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FLIGHT TEST EVALUATION OF PREDICTED LIGHT AIRCRAFT DRAG, PERFORMANCE, AND STABILITY

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ABS: A technique was developed which permits simultaneous extraction of complete lift, drag, and thrust power curves from time histories of a single aircraft maneuver such as a pull up (from V max to V stall) and pushover (to V max for level flight). The technique, which is an extension of nonlinear equations of motion of the parameter identification methods of Iliff and Taylor and includes provisions for internal data compatibility improvement as well, was shown to be capable of correcting random errors in the most sensitive data channel and yielding highly
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A new technique was developed which permits simultaneous extraction of complete lift, drag, and thrust power curves from time histories of a single aircraft maneuver such as a pullup (from V_{max} to V_{stall}) and pushover (to V_{max} for level flight.) The technique is an extension to non-linear equations of motion of the parameter identification methods of Iliff and Taylor and includes provisions for internal data compatibility improvement as well. The technique was shown to be capable of correcting random errors in the most sensitive data channel and yielding highly accurate results. Flow charts, listings, sample inputs and outputs for the relevent routines are provided as appendices. This technique was applied to flight data taken on the ATLIT aircraft. Lack of adequate knowledge of the correct full-throttle thrust horsepower-true air-speed variation and considerable internal data inconsistency made it impossible to apply the trajectory matching features of the technique. The drag and power values obtained from the initial least squares estimate are about 15% less than the "true" values. Compared with predicted values developed using previous work at N. C. State, the extracted drag is generally higher. If one takes into account the rather "dirty" wing and fuselage existing at the time of the tests, however, the predictions are reasonably accurate. The steady state lift measurements agree well with the extracted values only for small values of α. The predicted value of the lift at α = 0 is about 33% below that found in steady state tests while the predicted lift slope is 13% below the steady state value. Because the data processing procedure was unable to proceed beyond this initial extraction, detailed performance and stability comparisions with predictions were not attempted.

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NOMENCLATURE

a_x	-	linear acceleration along x-body axis.
B	-	coefficient used in calculating bias error in α (p. 103).
c	-	specific fuel consumption.
C_D	-	drag coefficient.
C_L	-	lift coefficient.
C_ℓ	-	general representation of a parameter (p. 111).
CLA	-	rate of change of lift coefficient with angle of attack.
CLAO	-	lift coefficient when $\alpha = 0$.
CLAX	-	rate of change of lift coefficient with respect to α^x.
CLQ	-	rate of change in lift coefficient with pitching velocity.
D	-	drag.
D	-	weights on elements of cost function.
d	-	dimensionless numbers used to scale weights in cost function.
E_{m_i}	-	energy, measured at specific point.
f(t)	-	function of time.
$f(\alpha)$	-	functional representation for use in Newton-Raphson process (p. 106).
g	-	acceleration due to gravity.
h	-	altitude.
$\dot{h}$	-	rate of climb.
$\ddot{h}$	-	altitude acceleration.
H(n)	-	filter response.
J	-	cost function.
L	-	lift.
M	-	slope.

$\dot{m}$ - mass flow rate.

n - number of harmonics.

P - power (p. 36).

P - altitude pressure (p. 66).

P_S - stagnation pressure.

$\dot{P}$ - time rate of change of pressure.

q - pitching velocity.

$\dot{q}$ - pitching acceleration.

q_c - differential pressure between pitot and static pressures.

R - gas constant for air.

r - radial displacement or yaw rate.

S - area (p. 19).

S - fit error (p. 38).

S_T - tail area.

S_W - wing area.

T - thrust (p. 36).

T - total time (p. 53).

T - local free stream absolute temperature (p. 68).

t - time.

T_S - stagnation temperature.

u - component of aircraft velocity on x-body axis (p. 65).

u - fluid velocity (p. 70).

$\dot{u}$ - acceleration along the x-body axis.

V - velocity of aircraft along flight path.

$\dot{V}$ - acceleration of aircraft along flight path.

$\ddot{V}$ - rate of change of vehicle acceleration along flight path.

W - weight.

w - component of aircraft velocity along z-body axis.

WGTL - lower constraint weight.

WGTU - upper constraint weight.

x - horizontal displacement.

X - exponent in lift expression (p. 105).

X_{ax} - displacement of accelerometer from c.g.

α - angle of attack.

$\dot{\alpha}$ - time rate of change of angle of attack.

γ - flight path angle (p. 36).

γ - ratio of specific heats (p. 68).

$\dot{\gamma}$ - flight path angular velocity.

$\ddot{\gamma}$ - flight path angular acceleration.

$\dddot{\gamma}$ - rate of change of flight path angular acceleration.

δ^* - displacement thickness.

θ - pitch angle.

$\dot{\theta}$ - pitching velocity

λ - time interval.

μ - coefficient of viscosity.

ρ - density.

τ - time constant.

ϕ - bank angle.

ω - frequency.

SUBSCRIPTS

c	-	cutoff value.
DATA	-	refers to measured value.
DRAG	-	refers to values obtained from drag equation.
fus	-	fuselage.
LIFT	-	refers to values obtained from lift equation.
N	-	last point in data set.
t	-	tail.
t_v	-	vertical tail.

SUPERSCRIPTS

' - measured value.

" - lag-free value.

^ - estimated value of the variable.

A Note on the Units Used in This Work

The results presented in the first 24 figures were all obtained using computer programs written prior to 1974. At that time U. S. customary units were the units most commonly used in this country by engineers and scientists in the General Aviation field. The programs reflect that usage. Because of the expense of converting a large number of old programs to S.I. units and the continuing usage of U. S. customary units by a majority of the professionals in the field, subsequent calculations were done using U. S. customary units. The computer programs newly written for the present work were, however, provided with alternate output and plot routines which give the results in S.I. units. These alternate output forms can be selected in lieu of U.S. customary units by specifying a particular parameter value at the time the data are read in. Figure 44 is an example of the S.I. output.

INTRODUCTION

The value of any predictive procedure depends rather fundamentally upon its success in forecasting the behavior of the item with which it's associated under actual use conditions. Thus, a technique for predicting the lift, drag, and pitching moment of a proposed aircraft is useful to the extent that it foretells the forces and moments which will be experienced by the flight hardware. It is usually in the nature of things that the better the job the technique does, the more difficult and expensive it is to use. Fortunately, the introduction of increasingly sophisticated digital computers has made it possible to increase the rigor of lift, drag, and moment predictive techniques without significant increases in the cost of employing them. This process can be expected to continue as computer capabilities improve.

Even a supposedly rigorous technique, however, may not be useful if it does not do a good job of predicting what actually occurs. The analytical model, for example, may be too crude or important effects may not have been treated at all. It is therefore important that new predictive techniques be evaluated critically under actual use conditions before they are employed extensively for preliminary design activity.

It was intended that this procedure be followed in the case of the predictive techniques developed in Reference 1. The vehicle to which they were applied was a modified Piper Seneca (ATLIT). The predictions of lift, drag, and pitching moment to be encountered during cruise flight were developed using the computer program described in Reference 1 and the vehicle's geometry as obtained from Piper shop drawings. Performance predictions and stability predictions were also made using in these instances the programs described in References 2 and 3. The aircraft itself was then flight tested to determine the parameter values actually experienced. This report outlines the methods by which the parameter predictions were obtained, presents their results, describes the methods by which the parameter values were obtained from flight data, and gives these results.

LIFT AND DRAG PREDICTION

Wing

The ATLIT airplane employs a straight, tapered wing with a GA(W)-1 airfoil section 17% thick. The computational technique distributes 65 regions of constant vorticity on the surface of the airfoil, calculates from this an inviscid flow field and pressure distribution, then determines the boundary layer growth corresponding to this pressure distribution, and recomputes the inviscid flow field of a pseudo airfoil whose ordinates are now the physical airfoil ordinates plus the local values of δ^* with a modification so as to locate the trailing edge stagnation point downstream in the wake. This process goes through four iterations so that the computed pressure distribution obtained after the last potential (inviscid) solution is essentially the same as that used to generate the boundary layer solution which formed the basis for that potential solution. The program gives section lift, drag, and moment. The drag includes both skin friction drag and form drag. However, because of the flow model used, extensive regions of flow separation cannot be treated. For this reason, the data are unreliable above $C_L = 0.8$.

The outputs (lift, drag, and moment vs. α for a given Reynolds number) from the airfoil program are fed into a curve fitting routine which provides polynomial representations of the results for use by the wing program. This program uses lifting line theory to modify the local angle of attack which the airfoil data "sees" according to spanwise changes in twist, camber, thickness, and chord length. Spanwise variations in Reynolds number are handled by providing as input tip and root data at the correct Reynolds number with the program interpolating to obtain the data for other spanwise stations. Inviscid wing-fuselage interference is treated by transforming the fuselage mathematically into a vertical slit and distributing its effects along the span. The output of the program is the three-dimensional lift, drag, and pitching moment of the wing. Note that the drag includes both profile and induced drags.

The same procedure is employed to find the contributions of the tail surfaces to the overall aircraft lift, drag, and moment. The vertical tail was considered to be half of a symmetric surface unaffected by the presence of the horizontal tail. The horizontal tail was assumed to be unaffected by the presence of the vertical tail, propeller slip-stream, or the downwash of the wing.

The input data and results of the various computations are shown in figures 1 through 7.

```
                         *****   CASE INPUT   *****

          WHITCOMB/A=-4.,-2.0.2.4.6.8.10.12.14/RN=5.7.FREE TRANSITION/M=.15

 NXU   NXL  IWRITE   IALPHA   IPUNCH
 38    38     3        0        1

          XU =  0.0            0.200000E-02 0.500000E-02 0.125000E-01 0.250000E-01 0.375000E-01 0.500000E-01 0.750000E-01
                0.100000E 00 0.125000E 00 0.150000E 00 0.175000E 00 0.200000E 00 0.250000E 00 0.300000E 00 0.350000E 00
                0.400000E 00 0.450000E 00 0.500000E 00 0.550000E 00 0.575000E 00 0.600000E 00 0.625000E 00 0.650000E 00
                0.675000E 00 0.700000E 00 0.725000E 00 0.750000E 00 0.775000E 00 0.800000E 00 0.825000E 00 0.850000E 00
                0.875000E 00 0.900000E 00 0.925000E 00 0.950000E 00 0.975000E 00 0.100000E 01
          ZU =  0.0            0.130000E-01 0.204000E-01 0.307000E-01 0.417000E-01 0.496500E-01 0.558900E-01 0.655100E-01
                0.730000E-01 0.790000E-01 0.840000E-01 0.883999E-01 0.919999E-01 0.977000E-01 0.101600E 00 0.104000E 00
                0.104910E 00 0.104450E 00 0.102580E 00 0.991000E-01 0.966800E-01 0.937099E-01 0.900600E-01 0.859900E-01
                0.813600E-01 0.763400E-01 0.709200E-01 0.651300E-01 0.590700E-01 0.528600E-01 0.464600E-01 0.398800E-01
                0.331500E-01 0.263900E-01 0.196100E-01 0.128700E-01 0.609000E-02-0.700000E-03
          XL =  0.0            0.200000E-02 0.500000E-02 0.125000E-01 0.250000E-01 0.375000E-01 0.500000E-01 0.750000E-01
                0.100000E 00 0.125000E 00 0.150000E 00 0.175000E 00 0.200000E 00 0.250000E 00 0.300000E 00 0.350000E 00
                0.400000E 00 0.450000E 00 0.500000E 00 0.550000E 00 0.575000E 00 0.600000E 00 0.625000E 00 0.650000E 00
                0.675000E 00 0.700000E 00 0.725000E 00 0.750000E 00 0.775000E 00 0.800000E 00 0.825000E 00 0.850000E 00
                0.875000E 00 0.900000E 00 0.925000E 00 0.950000E 00 0.975000E 00 0.100000E 01
          ZL =  0.0           -0.930000E-02-0.138000E-01-0.205000E-01-0.269000E-01-0.319000E-01-0.358000E-01-0.421000E-01
               -0.470000E-01-0.510000E-01-0.543000E-01-0.570000E-01-0.593000E-01-0.627000E-01-0.645000E-01-0.652000E-01
               -0.649000E-01-0.635000E-01-0.610000E-01-0.570000E-01-0.540000E-01-0.508000E-01-0.469000E-01-0.428000E-01
               -0.384000E-01-0.340000E-01-0.294000E-01-0.249000E-01-0.204000E-01-0.160000E-01-0.120000E-01-0.860000E-02
               -0.580000E-02-0.360000E-02-0.250000E-02-0.260000E-02-0.400000E-02-0.800000E-02

 NA = 10     ANGLES OF ATTACK W.R.T. REFERENCE LINE (IALPHA=0) OR W.R.T. LONGEST CHORDLINE (IALPHA=1)

        -0.400000E 01   -0.200000E 01    0.0            0.200000E 01   0.400000E 01   0.600000E 01
         0.800000E 01    0.100000E 02    0.120000E 02   0.140000E 02

 NM =    1              FSMACH           = 0.150000E 00

CREF =  0.100000E 01   SF =  0.100000E 01   TO =  0.518690E 03   RN =  0.570000E 01   PR =  0.770000E 00   KF =  0.100000E 01

                 LTRAN      XTRAN          ZTRAN

UPPER SURFACE      0         0.0            0.0
LOWER SURFACE      0         0.0            0.0


   WHITCOMB/A=-4.,-2.0.2.4.6.8.10.12.14/RN=5.7.FREE TRANSITION/M=.15
                      FSMACH =  0.15000

*************************************************************************
*    ALPHA          CL           CD         CM(NOSE)     CM(1/4-CHORD)  *
*                                                                       *
*  -4.000000     -0.023224     0.006249    -0.086099     -0.092000     *
*  -2.000000      0.213498     0.005605    -0.150842     -0.097549     *
*   0.0           0.438188     0.006357    -0.212167     -0.102620     *
*   2.000000      0.666128     0.007707    -0.274192     -0.107695     *
*   4.000000      0.894763     0.009055    -0.335486     -0.112182     *
*   6.000000      1.120211     0.010642    -0.395287     -0.116490     *
*   8.000000      1.338393     0.012475    -0.451681     -0.119905     *
*  10.000000      1.548673     0.015151    -0.504635     -0.122691     *
*  12.000000      1.748252     0.017997    -0.552386     -0.123939     *
*  14.000000      1.928573     0.021817    -0.591455     -0.122314     *
*************************************************************************
```

FIGURE 1

```
*****    CASE INPUT    *****

0009/A=-6.-4.-2.0.2.4.6.8.10.12/FREE TRANSITION/M=.15/RN=3.0/SF=CREF=1.0

NXU   NXL  IWRITE   IALPHA   IPUNCH
19    19     3        0        1

XU =  0.0          0.500000E-02 0.125000E-01 0.250000E-01 0.500000E-01 0.750000E-01 0.100000E 00 0.150000E 00
      0.200000E 00 0.250000E 00 0.300000E 00 0.400000E 00 0.500000E 00 0.600000E 00 0.700000E 00 0.800000E 00
      0.900000E 00 0.950000E 00 0.100000E 01
ZU =  0.0          0.100000E-01 0.142000E-01 0.196100E-01 0.266600E-01 0.315000E-01 0.351200E-01 0.400900E-01
      0.430300E-01 0.445600E-01 0.450100E-01 0.435200E-01 0.397100E-01 0.342300E-01 0.274800E-01 0.196700E-01
      0.108600E-01 0.605000E-02 0.950000E-03
XL =  0.0          0.500000E-02 0.125000E-01 0.250000E-01 0.500000E-01 0.750000E-01 0.100000E 00 0.150000E 00
      0.200000E 00 0.250000E 00 0.300000E 00 0.400000E 00 0.500000E 00 0.600000E 00 0.700000E 00 0.800000E 00
      0.900000E 00 0.950000E 00 0.100000E 01
ZL =  0.0         -0.100000E-01-0.142000E-01-0.196100E-01-0.266600E-01-0.315000E-01-0.351200E-01-0.400900E-01
     -0.430300E-01-0.445600E-01-0.450100E-01-0.435200E-01-0.397100E-01-0.342300E-01-0.274800E-01-0.196700E-01
     -0.108600E-01-0.605000E-02-0.950000E-03

NA = 10     ANGLES OF ATTACK W.R.T. REFERENCE LINE (IALPHA=0) OR W.R.T. LONGEST CHORDLINE (IALPHA=1)

      -0.600000E 01   -0.400000E 01   -0.200000E 01    0.0            0.200000E 01    0.400000E 01
       0.600000E 01    0.800000E 01    0.100000E 02    0.120000E 02

NM =    1              FSMACH           = 0.150000E 00

CREF =  0.100000E 01   SF =  0.100000E 01   TO =  0.518690E 03   RN =  0.300000E 01   PR =  0.770000E 00   KF =  0.100000E 01

                 LTRAN      XTRAN           ZTRAN

UPPER SURFACE      0        0.0             0.0
LOWER SURFACE      0        0.0             0.0

0009/A=-6.-4.-2.0.2.4.6.8.10.12/FREE TRANSITION/M=.15/RN=3.0/SF=CREF=1.0
                     FSMACH =  0.15000
```

ALPHA	CL	CD	CM(NOSE)	CM(1/4-CHORD)
-6.000000	-0.639027	0.007929	0.161376	0.002287
-4.000000	-0.430504	0.007073	0.110331	0.002844
-2.000000	-0.216409	0.006283	0.055765	0.001641
0.0	0.000019	0.005804	-0.000008	-0.000004
2.000000	0.216441	0.006282	-0.055780	-0.001647
4.000000	0.430541	0.007070	-0.110348	-0.002852
6.000000	0.639190	0.007936	-0.161459	-0.002330
8.000000	0.853717	0.009510	-0.215147	-0.003464
10.000000	1.060093	0.011856	-0.265412	-0.003900
12.000000	1.251046	0.015075	-0.309520	-0.002810

FIGURE 2

TWO DIMENSIONAL AIRFOIL DATA INPUT

WHITCOMB/A=-4.-2.0.2.4.6.8.10.12.14/RN=5.7.FREE TRANSITION/M=.15
THE NUMBER OF DATA POINTS IS = 10

ALPHA	CL	CD	CM
-4.000000	-0.023224	0.006249	-0.092000
-2.000000	0.213500	0.005605	-0.097549
0.0	0.438190	0.006357	-0.102620
2.000000	0.666130	0.007707	-0.107690
4.000000	0.894760	0.009055	-0.112180
6.000000	1.120199	0.010642	-0.116490
8.000000	1.338400	0.012475	-0.119910
10.000000	1.548699	0.015151	-0.122690
12.000000	1.748300	0.017997	-0.123940
14.000000	1.928499	0.021817	-0.122310

TWO DIMENSIONAL CURVE FIT FUNCTION DATA
OF THE FORM Y=C(0)+C(1)*X+C(2)*X**2+...

WHITCOMB/A=-4.-2.0.2.4.6.8.10.12.14/RN=5.7.FREE TRANSITION/M=.15

	C(0)	C(1)	C(2)	C(3)	C(4)				
CL VERSUS ALPHA	0.43993	0.11427	-0.00019	0.00002	-0.00000	DOMAIN=	-4.0000	TO	14.0000
CD VERSUS CL	0.00608	-0.00466	0.01623	-0.01096	0.00311	DOMAIN=	-0.0232	TO	1.9285
CM VERSUS CL	-0.09253	-0.02625	0.01076	-0.00997	0.00377	DOMAIN=	-0.0232	TO	1.9285
ALPHA VERSUS CL	-3.81031	8.41611	0.87390	-0.86891	0.32962	DOMAIN=	-0.0232	TO	1.9285

FIGURE 3

TWO DIMENSIONAL AIRFOIL DATA INPUT

0009/A=-6.-4.-2.0.2.4.6.8.10.12/FREE TRANSITION/M=.15/RN=3.0/SF=CREF=1.0

THE NUMBER OF DATA POINTS IS = 10

ALPHA	CL	CD	CM
-6.000000	-0.639030	0.007929	0.002287
-4.000000	-0.430500	0.007073	0.002844
-2.000000	-0.216410	0.006283	0.001641
0.0	0.000019	0.005804	-0.000004
2.000000	0.216440	0.006282	-0.001647
4.000000	0.430540	0.007070	-0.002852
6.000000	0.639190	0.007936	-0.002330
8.000000	0.853720	0.009509	-0.003464
10.000000	1.060100	0.011856	-0.003900
12.000000	1.250999	0.015075	-0.002810

TWO DIMENSIONAL CURVE FIT FUNCTION DATA
OF THE FORM Y=C(0)+C(1)*X+C(2)*X**2+...

0009/A=-6.-4.-2.0.2.4.6.8.10.12/FREE TRANSITION/M=.15/RN=3.0/SF=CREF=1.0

	C(0)	C(1)	C(2)	C(3)	C(4)				
CL VERSUS ALPHA	-0.00109	0.10769	0.00012	-0.00002	-0.00000	DOMAIN=	-6.0000	TO	12.0000
CD VERSUS CL	0.00608	0.00006	0.00407	-0.00036	0.00131	DOMAIN=	-0.6390	TO	1.2510
CM VERSUS CL	0.00011	-0.00721	0.00001	0.00685	-0.00310	DOMAIN=	-0.6390	TO	1.2510
ALPHA VERSUS CL	0.01138	9.28779	-0.11110	0.14828	0.09731	DOMAIN=	-0.6390	TO	1.2510

FIGURE 4

TWO DIMENSIONAL CURVE FIT FUNCTION DATA
OF THE FORM Y=C(0)+C(1)*X+C(2)*X**2+...

WHITCOMB/A=-4,-2,0,2,4,6,8,10,12,14/RN=5.7,FREE TRANSITION/M=.15
THICKNESS RATIO= 0.17

	C(0)	C(1)	C(2)	C(3)	C(4)				
CL VERSUS ALPHA	0.43993	0.11427	-0.00019	0.00002	-0.00000	DOMAIN=	-4.0000	TO	14.0000
CD VERSUS CL	0.00608	-0.00466	0.01623	-0.01096	0.00311	DOMAIN=	-0.0232	TO	1.9285
CM VERSUS CL	-0.09253	-0.02625	0.01074	-0.00997	0.00377	DOMAIN=	-0.0232	TO	1.9285
ALPHA VERSUS CL	-3.81030	8.41610	0.87385	-0.86887	0.32961	DOMAIN=	-0.0232	TO	1.9285

WHITCOMB/A=-4,-2,0,2,4,6,8,10,12,14/RN=5.7,FREE TRANSITION/M=.15
THICKNESS RATIO= 0.17

	C(0)	C(1)	C(2)	C(3)	C(4)				
CL VERSUS ALPHA	0.43993	0.11427	-0.00019	0.00002	-0.00000	DOMAIN=	-4.0000	TO	14.0000
CD VERSUS CL	0.00608	-0.00466	0.01623	-0.01096	0.00311	DOMAIN=	-0.0232	TO	1.9285
CM VERSUS CL	-0.09253	-0.02625	0.01075	-0.00997	0.00377	DOMAIN=	-0.0232	TO	1.9285
ALPHA VERSUS CL	-3.81030	8.41610	0.87385	-0.86887	0.32961	DOMAIN=	-0.0232	TO	1.9285

M=.15 WHITCOMB AIRFOIL/RN=5.7 MILLION/17 PERCENT THICK NEW NASA WING

BODY HEIGHT / SPAN . . . . . . =	0.11	BODY WIDTH / SPAN. . . . . . . =	0.10
ASPECT RATIO . . . . =	10.18	WING HEIGHT / SPAN . . . . . . =	-0.04
WING BODY INCIDENCE, DEG . . =	0.0	TIP THICKNESS CHORD. . . . . . =	0.17
ROOT THICKNESS CHORD . . . . =	0.17	GEOMETRIC TWIST, DEG . . . . . =	-3.00
NUMBER OF SPANWISE STATIONS. =	20.00	AERODYNAMIC TWIST, DEG . . . . =	-3.00
TAPER RATIO. . . . . =	0.50	REYNOLDS NUMBER. . . . . =	5.70

COORDINATES OF MOMENT REFERENCE POINT X= 0.0 Z= 0.0
VALUE OF DISCRIMINANT. . . . = 0.001000

THREE DIMENSIONAL LIFT, DRAG, AND MOMENT DATA

ALPHA	CL	CDP	CDI	CD	CM
-4.000000	-0.134572	0.006471	0.000845	0.007316	-0.088299
-2.000000	0.063437	0.005717	0.000328	0.006045	-0.093561
0.0	0.259755	0.005686	0.002663	0.008349	-0.098313
2.000000	0.454469	0.006348	0.007784	0.014132	-0.102669
4.000000	0.648288	0.007393	0.015658	0.023051	-0.106861
6.000000	0.841228	0.008643	0.026248	0.034890	-0.110939
8.000000	1.032696	0.010037	0.039469	0.049506	-0.114788
10.000000	1.221716	0.011624	0.055164	0.066788	-0.118148
12.000000	1.405899	0.013535	0.072973	0.086508	-0.120638
14.000000	1.582717	0.015940	0.092385	0.108325	-0.121863

FIGURE 5

TWO DIMENSIONAL CURVE FIT FUNCTION DATA
OF THE FORM Y=C(0)+C(1)*X+C(2)*X**2+...

ATLIT HORIZONTAL TAIL SECTION--0009/A=-6,-4,-2,0,2,4,6,8,10,12/RN=3./M=.15
THICKNESS RATIO= 0.09

	C(0)	C(1)	C(2)	C(3)	C(4)				
CL VERSUS ALPHA	-0.00109	0.10769	0.00012	-0.00002	-0.00000	DOMAIN=	-6.0000	TO	12.0000
CD VERSUS CL	0.00608	0.00006	0.00407	-0.00036	0.00131	DOMAIN=	-0.6390	TO	1.2510
CM VERSUS CL	0.00011	-0.00721	0.00001	0.00685	-0.00310	DOMAIN=	-0.6390	TO	1.2510
ALPHA VERSUS CL	0.01138	9.28780	-0.11110	0.14829	0.09729	DOMAIN=	-0.6390	TO	1.2510

ATLIT HORIZONTAL TAIL SECTION--0009/A=-6,-4,-2,0,2,4,6,8,10,12/RN=3./M=.15
THICKNESS RATIO= 0.09

	C(0)	C(1)	C(2)	C(3)	C(4)				
CL VERSUS ALPHA	-0.00109	0.10769	0.00012	-0.00002	-0.00000	DOMAIN=	-6.0000	TO	12.0000
CD VERSUS CL	0.00608	0.00006	0.00407	-0.00036	0.00131	DOMAIN=	-0.6390	TO	1.2510
CM VERSUS CL	0.00011	-0.00721	0.00001	0.00685	-0.00310	DOMAIN=	-0.6390	TO	1.2510
ALPHA VERSUS CL	0.01138	9.28780	-0.11110	0.14829	0.09729	DOMAIN=	-0.6390	TO	1.2510

ATLIT HORIZONTAL TAIL USING NACA 0009 AIRFOIL/RN=3.0 MILLION MACH#=.15

BODY HEIGHT / SPAN . . . . . . =	0.16	BODY WIDTH / SPAN. . . . . . . =	0.15
ASPECT RATIO . . . . =	4.75	WING HEIGHT / SPAN . . . . . . =	0.0
WING BODY INCIDENCE, DEG . . . =	0.0	TIP THICKNESS CHORD. . . . . . =	0.09
ROOT THICKNESS CHORD . . . . . =	0.09	GEOMETRIC TWIST, DEG . . . . . =	0.0
NUMBER OF SPANWISE STATIONS. =	20.00	AERODYNAMIC TWIST, DEG . . . . =	0.0
TAPER RATIO. . . . . =	1.00	REYNOLDS NUMBER. . . . . =	3.00

COORDINATES OF MOMENT REFERENCE POINT X= 0.0 Z= 0.0
VALUE OF DISCRIMINANT. . . . . = 0.001000

THREE DIMENSIONAL LIFT, DRAG, AND MOMENT DATA

ALPHA	CL	CDP	CDI	CD	CM
-6.000000	-0.449000	0.006908	0.017090	0.023998	0.002427
-4.000000	-0.300239	0.006339	0.007641	0.013980	0.002019
-2.000000	-0.150733	0.006026	0.001925	0.007951	0.001169
0.0	-0.000492	0.005933	-0.000000	0.005933	0.000115
2.000000	0.149765	0.006041	0.001901	0.007942	-0.000943
4.000000	0.300187	0.006352	0.007636	0.013988	-0.001863
6.000000	0.450217	0.006890	0.017182	0.024072	-0.002552
8.000000	0.599307	0.007694	0.030441	0.038136	-0.002976
10.000000	0.746855	0.008821	0.047263	0.056084	-0.003152
12.000000	0.892116	0.010332	0.067407	0.077739	-0.003152

FIGURE 6

TWO DIMENSIONAL CURVE FIT FUNCTION DATA
OF THE FORM Y=C(0)+C(1)*X+C(2)*X**2+...

ATLIT VERTICAL TAIL SECTION--0009/A=-6.,-4.,-2.,0.,2.,4.,6.,8.,10.,12/RN=3./M=.15
THICKNESS RATIO= 0.09

	C(0)	C(1)	C(2)	C(3)	C(4)				
CL VERSUS ALPHA	-0.00109	0.10769	0.00012	-0.00002	-0.00000	DOMAIN=	-6.0000	TO	12.0000
CD VERSUS CL	0.00608	0.00006	0.00407	-0.00036	0.00131	DOMAIN=	-0.6390	TO	1.2510
CM VERSUS CL	0.00011	-0.00721	0.00001	0.00685	-0.00310	DOMAIN=	-0.6390	TO	1.2510
ALPHA VERSUS CL	0.01138	9.28780	-0.11110	0.14829	0.09729	DOMAIN=	-0.6390	TO	1.2510

ATLIT VERTICAL TAIL SECTION--0009/A=-6.,-4.,-2.,0.,2.,4.,6.,8.,10.,12/RN=3./M=.15
THICKNESS RATIO= 0.09

	C(0)	C(1)	C(2)	C(3)	C(4)				
CL VERSUS ALPHA	-0.00109	0.10769	0.00012	-0.00002	-0.00000	DOMAIN=	-6.0000	TO	12.0000
CD VERSUS CL	0.00608	0.00006	0.00407	-0.00036	0.00131	DOMAIN=	-0.6390	TO	1.2510
CM VERSUS CL	0.00011	-0.00721	0.00001	0.00685	-0.00310	DOMAIN=	-0.6390	TO	1.2510
ALPHA VERSUS CL	0.01138	9.28780	-0.11110	0.14829	0.09729	DOMAIN=	-0.6390	TO	1.2510

ATLIT VERTICAL TAIL USING NACA 0009 AIRFOIL/RN=3.0 MILLION/MACH#=.15

BODY HEIGHT / SPAN . . . . . . =	0.05	BODY WIDTH / SPAN. . . . . . . =	0.05
ASPECT RATIO . . . . =	3.60	WING HEIGHT / SPAN . . . . . . =	0.0
WING BODY INCIDENCE, DEG . . =	0.0	TIP THICKNESS CHORD. . . . . . =	0.09
ROOT THICKNESS CHORD . . . . . =	0.09	GEOMETRIC TWIST, DEG . . . . . =	0.0
NUMBER OF SPANWISE STATIONS. =	20.00	AERODYNAMIC TWIST, DEG . . . . =	0.0
TAPER RATIO. . . . . =	0.40	REYNOLDS NUMBER. . . . . =	3.00
COORDINATES OF MOMENT REFERENCE POINT		X= 0.0 Z= 0.0	
VALUE OF DISCRIMINANT. . . . =	0.001000		

THREE DIMENSIONAL LIFT, DRAG, AND MOMENT DATA

ALPHA	CL	CDP	CDI	CD	CM
-6.000000	-0.378216	0.006636	0.012877	0.019513	0.002436
-4.000000	-0.252761	0.006277	0.005751	0.012028	0.001845
-2.000000	-0.126856	0.006075	0.001449	0.007524	0.001033
0.0	-0.000549	0.006015	0.000000	0.006015	0.000119
2.000000	0.125829	0.006088	0.001425	0.007514	-0.000797
4.000000	0.252360	0.006295	0.005733	0.012028	-0.001638
6.000000	0.378752	0.006643	0.012913	0.019556	-0.002344
8.000000	0.504801	0.007149	0.022939	0.030087	-0.002878
10.000000	0.630221	0.007833	0.035755	0.043587	-0.003226
12.000000	0.754719	0.008724	0.051280	0.060004	-0.003395

FIGURE 7

Fuselage and Nacelles

The program to compute the forces and moments on isolated, quasi-streamlined bodies having a plane of symmetry represents the half-surface by 560 flat panels of more or less equal area. On each panel is distributed a uniform source whose strength is such that the flow due to all sources is everywhere parallel to the surface. Then, a streamline which goes through the centroid of a particular panel is traced upstream to its inception point. Along this streamline is calculated the boundary layer displacement thickness and skin friction by a momentum integral method. This is done for all 560 panels. At the downstream end of the body the wake is arbitrarily assumed to begin at the upstream end of the last two sets of panels. The angle of the wake leaving the body is determined by the history of the boundary layer displacement up to that point. This wake is then paneled to a stagnation point downstream in the physical wake and the inviscid pressure distribution on the body plus wake body recomputed. The calculated skin friction is integrated over the body to find the skin friction drag and the recomputed pressure distribution is integrated in the normal and axial directions to find the lift and form drag. The same data are also used in computing the pitching moment.

Because the boundary layer routine used is two-dimensional it is not valid when the flow is expanding or contracting rapidly, i.e., near the nose or tail of a body, or when there is a significant cross flow, i.e., at angle of attack. For this reason the aircraft drag computation is reasonable only in the cruise configuration. In the context of an overall drag computation this is not unduly limiting because the wing drag calculation fails for high angles of attack as well. Several attempts were made to extend the angle of attack range of the computation at least for axisymmetric bodies, by using an axisymmetric finite difference boundary layer routine in the plane of symmetry in order to locate the lee-side separation point and then applying the Allen-Perkins (Ref. 4) technique to determine the normal force. However, the computed separation point was not regularly located sufficiently close to physical separation point (as found experimentally) to make this approach viable.

Modeling fuselages and nacelles for the purposes of drag computation as isolated bodies of course ignores interference effects. While it is conceivable that the inviscid aspects of interference could be treated adequately (and in fact have been in many cases), it will require a general three-dimensional boundary layer solution to treat the viscous aspects adequately. Since such solution techniques will be some time in coming, it continues to be necessary to treat these effects empirically. Because other approximations in the model can be expected to yield uncertainties of the same order of magnitude, no attempt was made to account for these effects.

Figures 8 through 11 show the input data and calculated results for the ATLIT fuselage and nacelles.

```
ATLIT WITH M=21 AND N=29 YIELDING 560 PANELS -- FUSELAGE ONLY
        1                             1 21  29
0.      7.5     16.5    25.5    35.0    45.0    55.0    65.0    75.0    86.5      XFUS10
97.5    108.    118.5   129.5   140.5   151.0   162.0   172.5   184.0   195.5     XFUS20
207.5   220.5   232.0   244.5   256.5   273.0   293.0   312.6   339.0             XFUS29
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   Y1
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000   Y1
 0.0000                                                                  Y1
43.250043.250043.250043.250043.250043.250043.250043.250043.250043.2500   Z1
43.250043.250043.250043.250043.250043.250043.250043.250043.250043.2500   Z1
43.2500                                                                  Z1
 0.0000 0.9000 1.8000 2.7750 3.7375 4.7375 5.7875 6.7500 7.5750 8.1250   Y2
 8.3250 8.1750 7.6625 6.8750 5.8500 4.8375 3.8000 2.7750 1.8000 0.9000   Y2
 0.0000                                                                  Y2
38.012538.025038.112538.275038.512538.875039.425040.162541.150042.3125   Z2
43.600044.862546.100047.100047.900048.462548.850049.125049.275049.3500   Z2
49.4000                                                                  Z2
 0.0000 1.3875 2.6375 4.1625 5.8813 7.6500 9.525011.225012.125012.5625   Y3
12.700012.525011.875010.6875 9.1500 7.4875 5.7875 4.2250 2.7750 1.3875   Y3
 0.0000                                                                  Y3
35.700035.718735.762535.875036.087536.475037.262538.712540.475042.4375   Z3
44.412546.400048.287549.900051.100051.913052.450052.775052.950053.0500   Z3
53.0750                                                                  Z3
 0.0000 1.6750 3.4375 5.4500 7.675010.187512.775014.213015.125015.4875   Y4
15.588015.500014.825013.475011.5130 9.3875 7.2500 5.2250 3.3750 1.6500   Y4
 0.0000                                                                  Y4
34.462534.462534.462534.462534.512534.900036.150037.887540.500042.9125   Z4
45.037547.487549.875051.925053.475054.425055.000055.338055.538055.6250   Z4
55.6630                                                                  Z4
 0.0000 1.5250 3.4750 5.1750 8.513011.363014.375016.450017.275017.6000   Y5
17.675017.650017.088015.675013.500010.8380 8.2500 5.9250 3.8130 1.8250   Y5
 0.0000                                                                  Y5
33.425033.425033.425033.425033.425033.575034.575037.087539.900042.7250   Z5
44.875048.250051.000053.462555.225056.313056.900057.225057.388057.4750   Z5
57.5000                                                                  Z5
 0.0000 2.1000 4.2375 6.6375 9.362512.750016.275018.225019.063019.3750   Y6
19.488019.500019.175018.025015.688012.6750 9.7000 6.7000 4.7880 2.1375   Y6
 0.0000                                                                  Y6
32.262532.262532.262532.262532.262532.312533.250035.675038.837541.9625   Z6
45.025048.062551.262554.100056.350057.625058.263058.625058.763058.8250   Z6
58.8750                                                                  Z6
 0.0000 2.2500 4.6090 7.109010.690014.656018.594020.440021.030021.2500   Y7
21.340021.330021.047019.780017.190013.690010.3750 7.3100 4.7000 2.3100   Y7
 0.0000                                                                  Y7
31.187 31.187 31.187 31.187 31.187 31.187 31.22   35.281 39.375 42.344   Z7
45.797 49.156 52.563 55.875 58.188 59.422 60.0    60.25  60.42  60.44    Z7
60.44                                                                    Z7
 0.0000 2.5780 5.2500 8.187511.656016.063020.406022.270022.688022.8600   Y8
22.906022.950022.730021.610018.780014.970011.2500 8.0000 5.1250 2.5000   Y8
 0.0000                                                                  Y8
30.585030.585030.585030.585030.585030.585031.395035.022038.460042.6320   Z8
46.319049.945053.585057.365059.898061.257061.773061.960062.085062.1160   Z8
62.1160                                                                  Z8
 0.0000 2.5750 5.2500 8.200011.675016.075020.950022.825023.225023.5750   Y9
23.850023.975023.875022.875019.950016.000012.0500 8.6375 5.4500 2.6750   Y9
 0.0000                                                                  Y9
29.25  29.25  29.25  29.25  29.25  29.25  30.225 34.05  38.275042.0750   Z9
45.925049.775053.650057.688060.538061.925062.463062.650062.800062.8130   Z9
62.8380                                                                  Z9
 0.0000 3.0000 6.750010.750014.500019.250021.250022.500023.500024.0000   Y10
```


FIGURE 8

```
24.500024.750024.750023.500020.500016.500012.7500 9.0000 5.7500 2.8750   Y10
 0.0000                                                                   Y10
27.750027.750027.750027.750027.750030.000034.000037.875041.7500          Z10
45.500049.500053.625057.500060.500062.250063.000063.250063.250063.2500   Z10
63.2500                                                                   Z10
 0.0000 3.5000 7.750011.875016.125019.875022.750024.750025.500025.8750   Y11
26.000025.500024.875023.625021.750018.750015.000011.0000 7.0000 3.5000   Y11
 0.0000                                                                   Y11
27.000027.000027.000027.000027.000027.000030.750036.000040.375044.6250   Z11
48.750052.875056.500060.875064.500067.500069.500070.375070.500070.5000   Z11
70.5000                                                                   Z11
 0.0000 3.7500 7.500011.500015.250020.250024.250025.375025.875026.2500   Y12
26.500026.000025.500025.000024.000021.625017.750013.0000 8.3750 4.1250   Y12
 0.0000                                                                   Y12
26.585026.585026.585026.585026.585026.585031.585037.835042.335046.7100   Z12
50.835055.085059.335063.460067.835071.835074.085074.960075.085075.0850   Z12
75.0850                                                                   Z12
 0.0000 4.125010.000015.000020.500023.250025.125025.750026.125026.2500   Y13
26.250026.000025.500025.000024.000021.625017.750012.8750 8.3750 4.1250   Y13
 0.0000                                                                   Y13
25.650025.650025.650025.650025.650028.025033.025038.150042.900047.1500   Z13
51.400055.650059.900064.150068.900073.275075.900076.900077.150077.1500   Z13
77.1500                                                                   Z13
 0.0000 5.125010.250015.000021.625024.000025.500026.000026.200026.3000   Y14
26.500026.300026.250026.250025.500022.875018.750013.5000 8.6250 4.2500   Y14
 0.0000                                                                   Y14
25.250025.250025.250025.250025.250027.750033.000038.250043.000047.3750   Z14
51.750056.000060.375064.750070.125074.500077.250078.125078.250078.2500   Z14
78.2500                                                                   Z14
 0.0000 5.000010.000014.750022.500023.750025.000025.750026.250026.5000   Y15
26.500026.500026.250026.000025.125022.500018.375013.3750 8.5000 4.2500   Y15
 0.0000                                                                   Y15
24.750024.750024.750024.750024.750027.370032.620037.620042.250046.6250   Z15
51.000055.250059.500064.250069.125073.500076.000077.000077.250077.2500   Z15
77.2500                                                                   Z15
 0.0000 4.1250 9.875014.875020.750023.250025.000025.625026.125026.3750   Y16
26.500026.250026.000025.250024.125021.500017.500013.0000 8.2500 4.0000   Y16
 0.0000                                                                   Y16
24.330024.330024.330024.330024.330026.580031.580036.705041.330045.5800   Z16
49.830053.955058.330062.830067.580071.705 74.58   75.58   75.83   75.83  Z16
75.83                                                                     Z16
 0.0000 4.7500 9.750014.500020.750022.875024.750025.625026.250026.3750   Y17
26.500026.250025.875025.250024.000021.500017.500012.8750 8.3750 4.0000   Y17
 0.0000                                                                   Y17
23.750023.750023.750023.750023.750026.370031.250036.000040.500044.8750   Z17
49.250053.500057.625062.125066.500070.625073.250074.375074.750074.7500   Z17
74.7500                                                                   Z17
 0.0000 4.6250 9.500014.000020.250022.500024.500025.250025.750025.8750   Y18
26.000025.750025.125024.375023.000020.500017.875012.5000 8.1250 4.0000   Y18
 0.0000                                                                   Y18
23.600023.600023.600023.600023.600025.850030.600035.350039.850044.1000   Z18
48.350052.350056.475060.850064.975068.850071.350072.850073.100073.1000   Z18
73.1000                                                                   Z18
 0.0000 3.8750 9.250014.000019.500021.750023.625024.250024.375024.5000   Y19
24.500024.375024.250023.625022.250019.750016.000012.0000 7.8750 3.7500   Y19
 0.0000                                                                   Y19
23.000023.000023.000023.000023.000025.250029.750034.625039.000043.1250   Z19
47.000050.750055.000059.000063.000 67.0    69.5    71.0    71.5    71.5   Z19
71.5                                                                      Z19
 0.0000 3.7500 9.250013.24   19.00   21.25   22.50   23.25   23.625 23.75 Y20
```

FIGURE 8 CONT'D

```
24.00   23.75   23.50   22.75   21.75   19.25   15.75   12.00    7.75   3.75      Y20
 0.0000                                                                           Y20
22.600022.600022.600022.600022.600024.850029.350034.100038.975042.2250            Z20
46.350050.100054.225058.350062.225065.850068.350069.600070.100070.1000            Z20
70.1000                                                                           Z20
 0.0000 3.6250 8.750013.000018.500020.250021.250021.625021.750021.8750            Y21
22.000021.875021.625021.000019.750017.625014.750011.2500 7.2500 3.5000            Y21
 0.0000                                                                           Y21
23.25   23.25   23.25   23.25   23.25   25.50   30.37   34.87   38.875 42.5       Z21
46.000049.500053.125056.750060.250063.750066.500068.000068.500068.5000            Z21
68.5000                                                                           Z21
 0.0000 4.5000 8.375012.500017.750018.500019.250019.625019.875020.0000            Y22
20.000019.750019.625019.375018.625017.000014.250010.7500 7.0000 3.3750            Y22
 0.0000                                                                           Y22
24.000024.000024.000024.000024.000027.000031.500035.500039.000042.375             Z22
45.500048.625052.000055.375059.000062.500065.125066.625067.000067.0000            Z22
67.                                                                               Z22
 0.0000 4.0000 8.000012.300016.700017.350018.000018.250018.400018.4500            Y23
18.500018.400018.100017.600017.100015.900013.500010.1500 6.6000 3.2000            Y23
 0.0000                                                                           Y23
25.500025.500025.500025.500025.500028.100032.400036.150039.500042.5500            Z23
45.500048.400051.400054.500057.900061.400064.100065.400065.500065.5000            Z23
65.5000                                                                           Z23
 0.0000 4.0000 8.000010.000015.550016.000016.400016.600016.610016.6200            Y24
16.625016.600016.400016.050015.400014.150012.0000 9.1000 6.0000 2.9000            Y24
 0.0000                                                                           Y24
27.25   27.25   27.25   27.25   27.25   29.5    33.55   37.     40.     42.85     Z24
45.5    48.1    50.9    53.7    56.7    59.65   62.05   63.4    63.7    63.72     Z24
63.75                                                                             Z24
 0.0000 4.3750 7.625011.125013.875014.375014.688014.813014.875014.9380            Y25
15.000014.875014.813014.375014.000012.875010.9380 8.3750 5.4375 2.6875            Y25
 0.0000                                                                           Y25
28.420028.420028.420028.420029.400031.775034.400037.650040.275042.7750            Z25
45.212547.525049.962552.525055.275057.900060.025061.275061.713061.9000            Z25
61.9630                                                                           Z25
 0.0000 2.4000 4.8000 7.600011.400012.150012.500012.650012.800012.9000            Y26
13.000012.800012.500012.100011.500010.6000 9.2000 7.1000 4.8000 2.4000            Y26
 0.0000                                                                           Y26
30.000030.000030.000030.000030.000032.900035.900038.500040.800042.9000            Z26
45.000047.000049.100051.200053.400055.600057.600059.000059.600059.9000            Z26
60.0000                                                                           Z26
 0.0000 1.8125 3.8125 6.0000 7.8750 9.1250 9.5000 9.6875 9.8125 9.8750            Y27
 9.8750 9.8125 9.7500 9.5000 9.2500 8.5625 7.3750 5.7500 3.8125 1.8750            Y27
 0.0000                                                                           Y27
33.101  33.101  33.101  33.187  34.125  35.875  38.     40.125  41.875  43.5      Z27
45.063  46.625  48.25   49.875  51.813  53.563  55.188  56.375  57.0    57.188    Z27
57.25                                                                             Z27
 0.0000 1.6000 3.2500 4.8500 6.3000 6.9500 7.3500 7.4000 7.4500 7.5000            Y28
 7.5000 7.4000 7.2000 7.0000 6.6000 6.1000 5.4000 4.3000 3.1000 1.6000            Y28
 0.0000                                                                           Y28
35.500035.500035.500036.000037.300038.550040.200041.700043.000044.3000            Z28
45.500046.700047.900049.100050.300051.600052.900053.950054.750055.3000            Z28
55.5000                                                                           Z28
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000            Y29
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000            Y29
 0.0000                                                                           Y29
43.250043.250043.250043.250043.250043.250043.250043.250043.250043.2500            Z29
43.250043.250043.250043.250043.250043.250043.250043.250043.250043.2500            Z29
43.2500                                                                           Z29
X Z OUT   45. 10.    30.                          14. ORT                        1
```

FIGURE 8 CONT'D

```
ATLIT NACELLE WITH N=21 AND M=21 YIELDING 400 PANELS ON THE BODY
         1                         1 21  21
0.0     1.5     3.75    6.75    11.25   15.0    20.0    24.5    30.0    34.5      XFUS10
40.0    45.75   51.0    56.5    62.5    68.5    74.     79.5    86.0    94.5      XFUS20
116.0                                                                             XFUS21
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  Y1
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  Y1
 0.0000                                                                 Y1
26.500026.500026.500026.500026.500026.500026.500026.500026.500026.5000  Z1
26.500026.500026.500026.500026.500026.500026.500026.500026.500026.5000  Z1
26.5000                                                                 Z1
 0.0000 1.5000 2.9500 4.5000 6.5000 8.875011.875015.320016.875017.3750  Y2
17.625017.750017.420014.750011.5000 8.6250 6.3750 4.5000 2.9200 1.3750  Y2
 0.0000                                                                 Y2
18.000018.000018.000018.000018.080018.125018.300019.125021.500024.2500  Z2
27.000029.800032.625034.500035.375035.625035.750035.875035.900035.9500  Z2
36.0000                                                                 Z2
 0.0000 1.5000 3.3750 5.2500 7.125010.125013.500016.500017.750018.0000  Y3
18.125018.250018.125016.000012.8750 9.8750 7.3750 5.1250 3.3750 1.6250  Y3
 0.0000                                                                 Y3
16.000016.000016.000016.000016.000016.120016.375017.750020.375023.3750  Z3
26.250029.125032.250034.375035.625036.125036.250036.375036.500036.5000  Z3
36.5000                                                                 Z3
 0.     1.703  3.453  5.375  7.719  10.438 13.5   16.25  17.813 18.438  Y4
18.75   18.719 18.234 16.578 13.719 10.672 8.     5.594  3.625  1.7813  Y4
0.                                                                      Y4
14.688 14.719 14.813 14.904 15.03  15.28  15.875 17.438 19.922 22.75    Z4
25.813 28.625 31.688 34.125 35.438 36.078 36.406 36.625 36.703 36.75    Z4
36.78                                                                   Z4
 0.0000 1.7813 3.6250 5.6563 8.000010.750013.875016.688018.125018.7190  Y5
18.938019.000018.625017.000014.156011.0000 8.2500 5.8750 3.5635 1.8750  Y5
 0.0000                                                                 Y5
14.6    14.6   14.631 14.694 14.819 15.069 15.788 17.406 20.    22.938  Z5
26.063 28.969 32.025 34.744 36.275 37.025 37.337 37.525 37.588 37.619   Z5
37.619                                                                  Z5
 0.0000 1.7813 3.6250 5.6563 8.000010.750013.875016.688018.125018.7190  Y6
18.938019.000018.625017.000014.156011.0000 8.2500 5.8750 3.5635 1.8750  Y6
 0.0000                                                                 Y6
14.750014.750014.781214.843714.968715.218715.937517.656220.250023.1875  Z6
26.312529.218832.375035.094036.625037.375037.687037.875037.938037.9690  Z6
37.9690                                                                 Z6
 0.0000 1.8750 3.7810 5.9060 8.375011.187014.313016.812018.250018.7190  Y7
18.938019.000018.718017.250014.250011.0620 8.6880 5.9380 3.7500 1.8750  Y7
 0.0000                                                                 Y7
14.844014.844014.875014.907015.000015.312016.157018.000020.625023.6880  Z7
26.625029.812032.750035.406037.125037.812038.156038.312038.344038.3440  Z7
38.3750                                                                 Z7
 0.0000 1.8750 3.7810 5.9060 8.375011.187014.313016.812018.250018.7190  Y8
18.938019.000018.718017.250014.250011.0620 8.6880 5.9380 3.7500 1.8750  Y8
 0.0000                                                                 Y8
15.094015.094015.125015.157015.250015.562016.407018.250020.875023.9380  Z8
26.875030.062033.000035.656037.375038.062038.406038.562038.594038.5940  Z8
38.6250                                                                 Z8
 0.0000 1.7500 3.7188 5.8438 8.312511.240014.281016.688018.000018.6250  Y9
18.906019.000018.813017.438014.500011.1560 8.2813 5.8750 3.7188 1.7500  Y9
 0.0000                                                                 Y9
15.500015.500015.500015.500015.500015.719016.562018.531021.250024.3120  Z9
27.125030.250033.312536.156037.719038.375038.625038.719038.750038.7800  Z9
38.8750                                                                 Z9
 0.0000 1.7500 3.7188 5.8438 8.312511.240014.281016.688018.000018.6250  Y10
18.906019.000018.813017.438014.500011.1560 8.2813 5.8750 3.7188 1.7500  Y10
 0.0000                                                                 Y10
15.625015.625015.625015.625015.625015.844016.687018.656021.375024.4370  Z10
27.250030.375033.437536.281037.844038.500038.750038.844038.875038.9050  Z10
39.0000                                                                 Z10
```

FIGURE 9

```
 0.0000 1.7188 3.7188 6.1250 8.312511.468014.406016.656017.750018.4380  Y11
18.813019.000018.813017.375014.125010.7190 7.9375 5.6563 3.5938 1.7500  Y11
 0.0000                                                                 Y11
16.125016.125016.125016.125016.125016.125016.719018.937021.719024.5000  Z11
27.500030.562533.750036.313037.875038.375038.563038.656038.688038.6880  Z11
38.7190                                                                 Z11
 0.0000 1.7188 3.7188 6.1250 8.312511.468014.406016.656017.750018.4380  Y12
18.813019.000018.813017.375014.125010.7190 7.9375 5.6563 3.5938 1.7500  Y12
 0.0000                                                                 Y12
16.000016.000016.000016.000016.000016.000016.594018.812021.594024.3750  Z12
27.375030.437533.625036.188037.750038.250038.438038.531038.563038.5630  Z12
38.5940                                                                 Z12
 0.0000 1.7188 3.7188 6.1250 8.312511.468014.406016.656017.750018.4380  Y13
18.813019.000018.813017.375014.125010.7190 7.9375 5.6563 3.5938 1.7500  Y13
 0.0000                                                                 Y13
16.406 16.406 16.406 16.406 16.406 16.406 16.95  19.156 21.9   24.63    Z13
27.5   30.494 33.63  36.144 37.656 38.156 38.344 38.438 38.469 38.469   Z13
38.5                                                                    Z13
 0.0000 1.6250 3.2500 5.1250 7.250010.000013.500017.0   18.5   19.0000  Y14
19.000019.000019.000017.5   13.625010.0000 7.2500 5.1250 3.25001.625    Y14
 0.0000                                                                 Y14
17.500017.570017.620017.620017.670017.750017.830018.625021.500024.625   Z14
27.750030.750033.875036.875037.700037.750037.830037.875037.930038.0000  Z14
38.0000                                                                 Z14
 0.0000 1.6250 3.2500 4.8750 7.1250 9.625013.000016.755018.625018.7500  Y15
18.800018.875019.000016.85  13.1250 9.6250 7.0000 5.0000 3.1250 1.6250  Y15
 0.0000                                                                 Y15
18.000018.000018.000018.000018.000018.075018.125018.875021.625024.7500  Z15
27.750030.750034.000036.500037.250037.350037.375037.400037.450037.5000  Z15
37.5000                                                                 Z15
 0.0000 1.3750 3.0000 4.5000 6.5000 8.875012.000016.375018.625018.7500  Y16
18.800018.875019.000016.000011.8750 8.7500 6.3750 4.5000 2.8750 1.5000  Y16
 0.0000                                                                 Y16
18.500018.500018.500018.580018.600018.625018.750019.000021.375024.5000  Z16
27.500030.500033.750035.625036.125036.250036.300036.375036.420036.4500  Z16
36.5000                                                                 Z16
 0.0000 1.3750 2.7500 4.1250 6.0000 8.125011.125015.125018.500018.6250  Y17
18.750018.875018.500014.875011.0000 8.1250 6.0000 4.1250 2.6250 1.3750  Y17
 0.0000                                                                 Y17
19.250019.250019.250019.250019.250019.300019.375019.625021.375024.5000  Z17
27.500030.500033.500035.000035.375035.500035.625035.650035.700035.7500  Z17
35.7500                                                                 Z17
 0.0000 1.1250 2.3750 3.6250 5.2500 7.1250 9.625013.250017.750018.5000  Y18
18.500018.500018.000013.5000 9.6250 7.1250 5.1250 3.6250 2.2500 1.1250  Y18
 0.0000                                                                 Y18
20.3   20.3   20.3   20.3   20.375 20.375 20.5   20.75  21.68  24.5     Z18
27.5   30.375 33.32  34.375 34.5   34.56  34.625 34.64  34.7   34.75    Z18
34.75                                                                   Z18
 0.0000 1.0000 2.0000 3.0000 4.2500 5.7500 8.000011.125015.875017.7500  Y19
17.750017.750015.750011.3750 8.0000 5.8750 4.2500 3.0000 1.8750 0.8750  Y19
 0.0000                                                                 Y19
21.    21.05  21.05  21.05  21.05  21.125 21.2   21.25  21.75  24.125   Z19
27.    29.75  32.125 32.75  32.8   32.85  32.875 32.9   32.95  33.      Z19
33.                                                                     Z19
 0.0000 1.2500 3.0000 4.7500 6.7500 9.375011.625014.125015.0   15.3750  Y20
15.375015.375015.375014.125011.6250 9.3750 6.7500 4.7500 3.0000 1.2500  Y20
 0.0000                                                                 Y20
22.750022.760022.770022.790022.810022.850022.875022.950023.500025.2500  Z20
26.750028.250030.000030.550030.625030.650030.690030.710030.730030.7400  Z20
30.7500                                                                 Z20
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  Y21
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000  Y21
 0.0000                                                                 Y21
26.500026.500026.500026.500026.500026.500026.500026.500026.500026.5000  Z21
26.500026.500026.500026.500026.500026.500026.500026.500026.500026.5000  Z21
26.5000                                                                 Z21
X Z OUT  45. 10.   30.                       12. ORT                    1
```


FIGURE 9 CONT'D

```
POTENTIAL FLOW PROGRAM  SECTION 1

ATLIT WITH M=21 AND N=29 YIELDING 560 PANELS -- FUSELAGE ONLY

NO. OF QUADS.  = 560
NO. OF SECTIONS=   1
MAX. NO. OF ITERATIONS X FLOW 150

VINF = 160.000000    VO =   0.000160    ROE =   0.002378
REFA = 155.000000    IWRITE =  2
1 PLANES OF SYMMETRY

CONVERGENCE CRITERIA . 0.00010

     PRESSURE LIFT AND DRAG COEFFICIENTS

      *****************************
           PRESSURE CL =     0.00329
           PRESSURE CD =     0.00222
       REFERENCE AREA =   155.00000
      REYNOLDS NUMBER =  0.2825E 08
      *****************************

        FRICTION DRAG COEFFICIENT

      *****************************
           FRICTION CD =     0.01057
       REFERENCE AREA =   155.00000
      REYNOLDS NUMBER =  0.2825E 08
           BODY LENGTH =    28.25000
      *****************************

        TOTAL BODY COEFFICIENTS

      *****************************
         TOTAL BODY CL =     0.00300
         TOTAL BODY CD =     0.01299
       REFERENCE AREA =   155.00000
      REYNOLDS NUMBER =  0.2825E 08
           BODY LENGTH =    28.25000
      *****************************
```

FIGURE 10

```
POTENTIAL FLOW PROGRAM  SECTION 1

ATLIT NACELLE WITH N=21 AND M=21 YIELDING 400 PANELS ON THE BODY

NO. OF QUADS.  = 400
NO. OF SECTIONS=   1
MAX. NO. OF ITERATIONS X FLOW 150

VINF = 160.000000    VO =   0.000160    ROE =   0.002378
REFA = 155.000000    IWRITE =  2
1 PLANES OF SYMMETRY

CONVERGENCE CRITERIA . 0.00010

     PRESSURE LIFT AND DRAG COEFFICIENTS

      *****************************
           PRESSURE CL =     0.00230
           PRESSURE CD =     0.00391
       REFERENCE AREA =   155.00000
      REYNOLDS NUMBER =  0.9667E 07
      *****************************

        FRICTION DRAG COEFFICIENT

      *****************************
           FRICTION CD =     0.00308
       REFERENCE AREA =   155.00000
      REYNOLDS NUMBER =  0.9667E 07
           BODY LENGTH =     9.66667
      *****************************

        TOTAL BODY COEFFICIENTS

      *****************************
         TOTAL BODY CL =     0.00235
         TOTAL BODY CD =     0.00722
       REFERENCE AREA =   155.00000
      REYNOLDS NUMBER =  0.9667E 07
           BODY LENGTH =     9.66667
      *****************************
```

FIGURE 11

Protuberances

No accounting for the drag due to protuberances was deemed necessary in the drag buildup since the probable magnitude of these effects is within the uncertainty bounds of the nacelle, fuselage, and interference drag computations.

Calculated and Estimated Lift-Drag Polar

As shown in Table I, summing the results of the previous calculations yields a drag polar represented by the equation

$$C_D = .035832 + .040561\, C_L^{1.94} \; . \tag{1}$$

This polar, as indicated previously, does <u>not</u> include the effects of flow separations at the higher lift coefficients. In an effort to develop a more accurate polar upon which to base performance estimates, full scale wind tunnel test data on a similar aircraft (Ref. 5) were examined and fitted by the equation

$$C_D = 0.035 + 0.051\, C_L^{2} + 0.00138\, C_L^{13.42} \; . \tag{2}$$

Plots of these equations are shown in figure 12. Note that the two curves differ little for $C_L < 0.8$. Above $C_L = 0.8$ it is to be expected that equation (2) will more nearly represent the behavior of the ATLIT than equation (1). Despite the fact that equation (2) describes the drag of an unpowered airplane and that drag under some conditions of powered flight may exceed the drag in unpowered flight, equations (1) and (2) were treated as the probable boundaries for the actual ATLIT drag polar. Because of the relatively smaller ATLIT wing area (compared with the aircraft tested in Ref. 5) it is not expected that the ATLIT drag will rise as rapidly with increasing C_L as it does for the aircraft of Ref. 5. Thus, even if the ATLIT drag in powered flight is somewhat greater than in unpowered flight, the drag should be below the boundary given by equation (2).

TABLE I ATLIT DRAG BUILDUP

C.G. @ 26.5% MAC

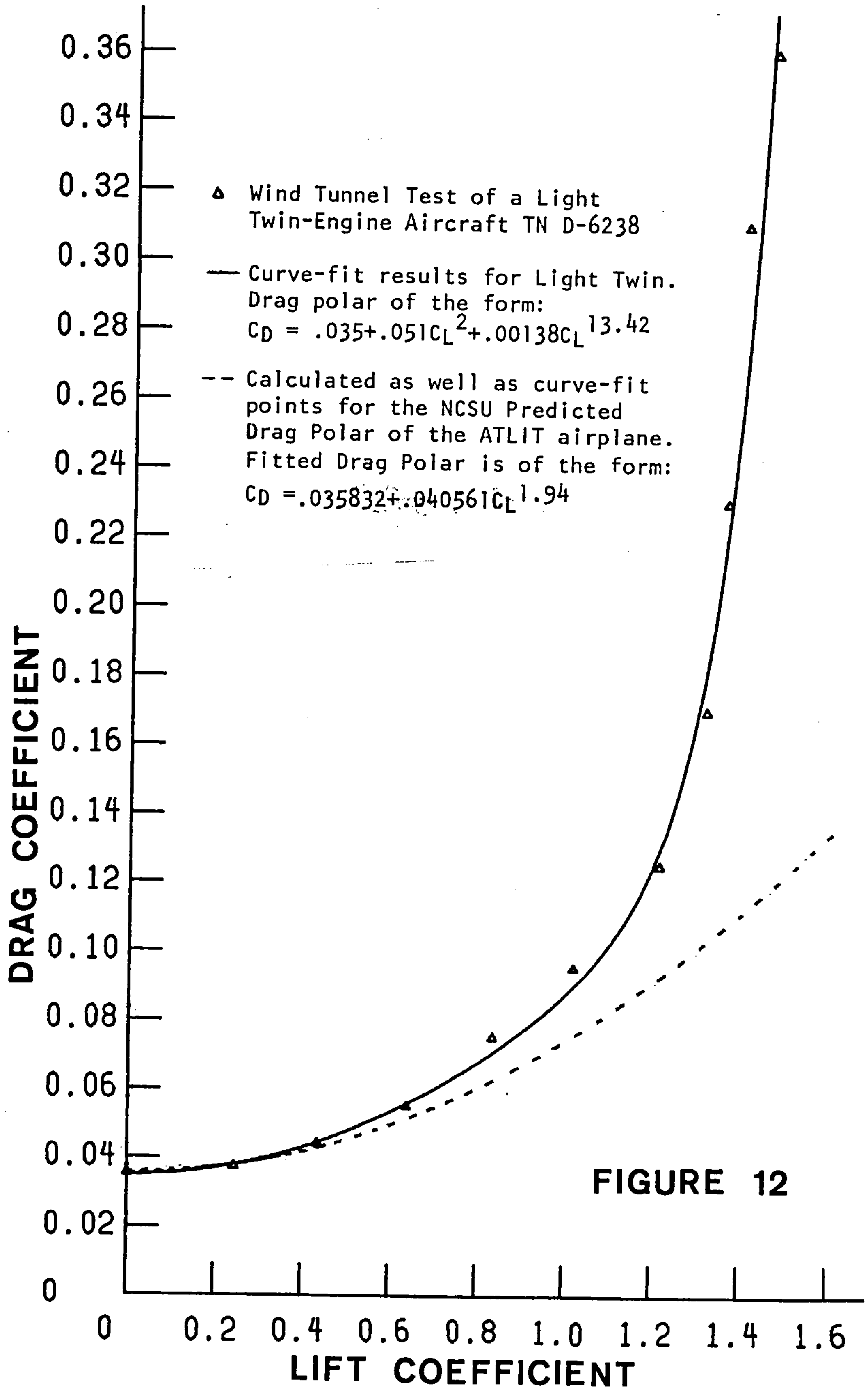
α_{wing}	$C_{L_{wing}}$	TRIM C_{L_t} S_t/S_w	C_{D_t} S_t/S_w	C_{D_w}	$C_{D_{TOTAL}}$	C_L
-4	-.134569	-.003474	.001879	.007316	.038473	-.138043
-2	.063437	.001638	.001852	.006045	.037175	.065075
0	.259752	.006707	.0019772	.008349	.039604	.266459
2	.454464	.011736	.00200	.014132	.04541	.4662
4	.648280	.016741	.00210	.023051	.054429	.66502
6	.841217	.021724	.002184	.034891	.066353	.86294
8	1.032682	.02666	.002265	.049506	.081049	1.05934
10	1.221700	.031549	.002346	.066789	.098413	1.25324
12	1.405880	.036306	.002424	.086509	.118211	1.442
14	1.582697	.040872	.002618	.108327	.140223	1.6235

$$C_{D_{TOTAL}} = C_{D_w} + C_{D_t} S_t/S_w + C_{D_{t_v}} S_v/S_w + C_{D_{fus}} + 2\, C_{D_{NACELLE}}$$

$$= C_{D_w} + C_{D_t} S_t/S_w + .0018487 + .01299 + 2(.00722)$$

$$= C_{D_w} + C_{D_t} S_t/S_w + .0292787$$

$$C_L = C_{L_w} + C_{L_t} S_t/S_w$$



DRAG COEFFICIENT
0.36
0.34
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0
Wind Tunnel Test of a Light Twin-Engine Aircraft TN D-6238
Curve-fit results for Light Twin. Drag polar of the form:
$C_D = .035 + .051C_L^2 + .00138C_L^{13.42}$
Calculated as well as curve-fit points for the NCSU Predicted Drag Polar of the ATLIT airplane. Fitted Drag Polar is of the form:
$C_D = .035832 + .040561C_L^{1.94}$
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
LIFT COEFFICIENT

FIGURE 12

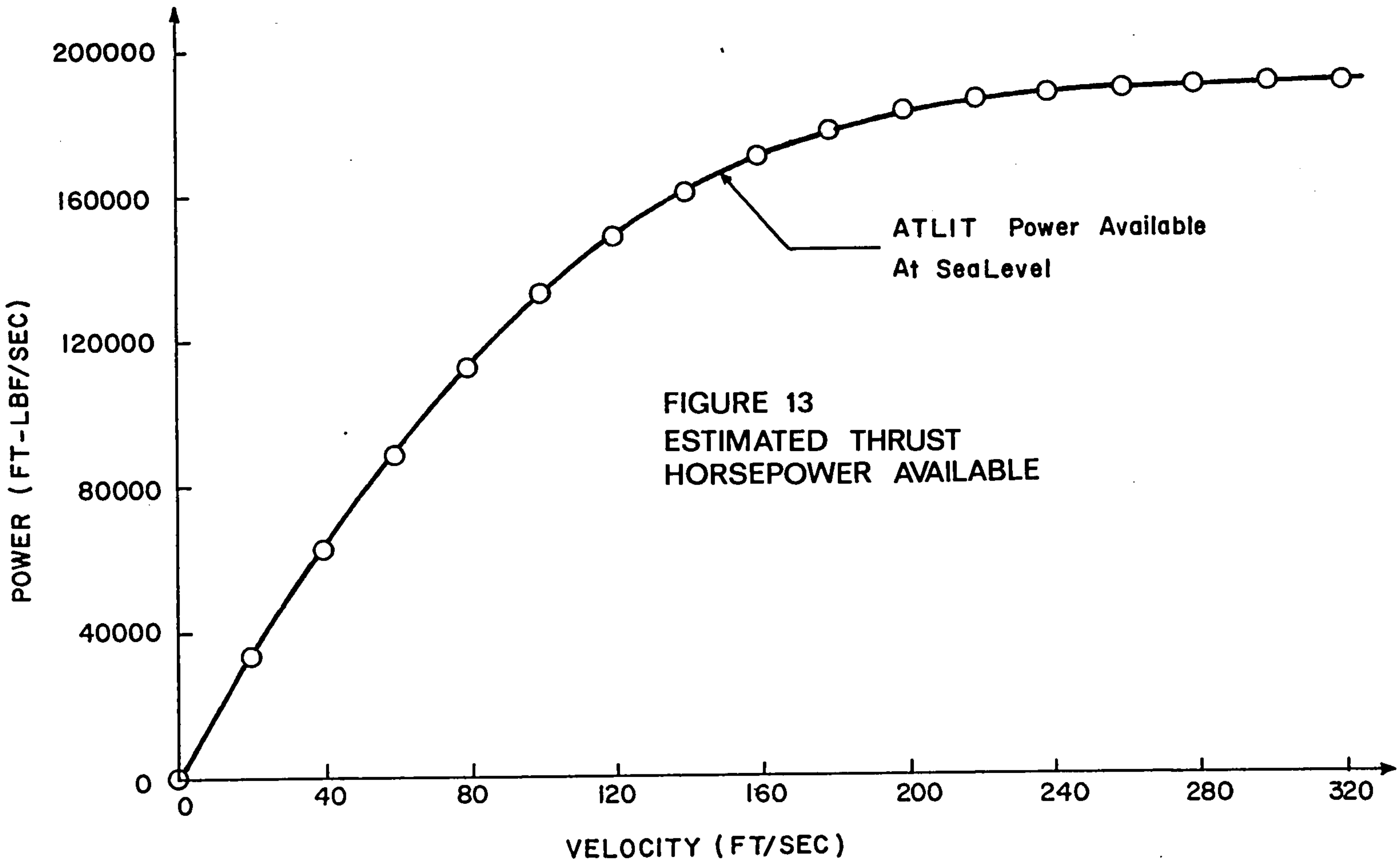


FIGURE 13
ESTIMATED THRUST
HORSEPOWER AVAILABLE

PERFORMANCE PREDICTIONS

The drag polars given by equations (1) and (2) were submitted to the point performance program described in Ref. 2 along with the thrust horsepower data given in figure 13. The latter were derived from engine test cell data and propeller performance charts. They do not include any installation-dependent effects. The data given in Table II represent the output of this program. It will be noted that, compared with the original Seneca, only small improvements in rate-of-climb and cruise speed are expected. This can be explained by the fact that although the airfoil itself offers about a 10% improvement in L/D at $C_L = 0.8$ (the nominal C_L for climb) the wing is responsible for only about 40% of the total drag. Overall aircraft drag is, as a result, only about 4% lower.

TABLE II COMPARISON OF PREDICTED ATLIT PERFORMANCE USING THRUST HORSEPOWER DATA SHOWN IN FIG. 13 WITH PIPER SENECA

Performance characteristics	Predicted using light-twin polar from wind tunnel tests (TND-6238) 4200 lbs	Piper Seneca	Predicted using NCSU parabolic polar 4200 lbs
Max. level flight speed (ft/sec)	300.00	286.0	298.9
Min. level flight speed (ft/sec)	123.7	101.2	47.23
Max. rate of climb (ft/sec)	27.1	22.67	28.35
Single engine rate of climb (ft/sec)*	6.06	3.167	7.81
Best rate of climb speed (ft/sec)	168.2	154.0	162.76
Best single engine rate of climb speed (ft/sec)*	155.8	154.0	144.07
Maximum climb angle (degrees)	10.17		12.34°
Maximum climb angle speed (ft/sec)	144.5	132.0	105.42
Best range speed (ft/sec)	167.0	160.0	153.48
Service ceiling (ft)	19,681	18,000	22,525
Absolute ceiling (ft)	21,077	19,400	24,157
Single engine service ceiling (ft)	5,623	3,650	8,852
Single engine absolute ceiling (ft)	7,791	5,000	11,353

* Single engine characteristics were computed using a $C_D = 1.05C_D$ to account for the vertical tail drag and half the estimated power.

STABILITY PREDICTIONS

The stability predictions for the ATLIT were developed using the aircraft's geometric and inertial parameters and the computer programs described in Ref. 3. The input data and results are shown in figures 14 through 17 and 18 through 21.

PERTINENT AIRPLANE CHARACTERISTICS

DENSITY (SLUGS/FT**3)	= 0.00199	VELOCITY (FT/SEC)	= 286.00000
MASS (SLUGS)	= 124.22400	IYY (SLUG-FT**2)	=2560.00000
THRUST (POUNDS)	= 0.0	ZJ (FT)	= 0.0
G*COS(GAMMA) (FT/SEC/SEC)	= 32.00000	G*SIN(GAMMA) (FT/SEC/SEC)	= 0.0
COS(XZ)	= 1.00000	SIN(XZ)	= 0.0
WING AREA (FT**2)	= 155.00000	HORZ. TAIL AREA (FT**2)	= 38.74300
WING SPAN (FT)	= 39.70000	HORZ. TAIL SPAN (FT)	= 13.56000
WING CHORD (FT)	= 4.11000	HORZ. TAIL CHORD (FT)	= 2.85715
WING ASPECT RATIO	= 10.16832	HORZ. TAIL ASPECT RATIO	= 4.74598
WING TAPER RATIO	= 0.50000	HORZ. TAIL TAPER RATIO	= 1.00000
WING ALPHA (DEGREES)	= 0.22900	TAIL ALPHA (DEGREES)	= -1.63372
IWING (DEGREES)	= 0.50000	ITAIL (DEGREES)	= 0.0
DOWNWASH ANGLE (DEGREES)	= 1.36272	DOWNWASH/ALPHA	= 0.42627
ELEVATOR ANGLE (DEGREES)	= 1.63372	ELEVATOR AREA (FT**2)	= 38.74300
TAIL EFFICIENCY	= 0.90000	ELEVATOR CHORD (FT)	= 2.85715
2-D WING CLA	= 0.12163	2-D TAIL CLA	= 0.11500
CDPIE	= 0.03510	2-D WING CDA	= 0.04670
2-D WING CL	= 0.37984		

DISTANCES

LENGTH OF FUSELAGE (FT)	= 27.67000	WIDTH OF FUSELAGE (FT)	= 4.33000
C.G. TO TAIL QUARTER-CHORD (FT)	= 16.00000	WING TO TAIL QUARTER-CHORD (FT)	= 16.00000
C.G. TO WING A.C.(CHORDWISE) (FT)	= 0.0	C.G. TO WING A.C.(VERTICAL) (FT)	= 0.0
NOSE TO WING QUARTER-CHORD (FT)	= 10.25500	C.G. TO WING QUARTER-CHORD (FT)	= 0.0
C.G. TO THRUST AXIS (FT)	= 0.0		

LONGITUDINAL STABILITY DERIVATIVES

CL = 0.3174	CLA = 5.6891	CLDA = 3.2591	CLQ = 7.6455	CLDE = 0.9419	CLU = 0.0	CT = 0.0
CD = 0.0383	CDA = 0.1610	CDDA = 0.0	CDQ = 0.0	CDDE = 0.0	CDJ = 0.0	CTU = 0.0
CM = 0.0	CMA = -1.5001	CMDA =-12.6873	CMQ =-29.7635	CMDE = -3.6667	CMU = 0.0	CTRPM = 0.0

DENOMINATOR ROOTS

ROOT(1) =	-0.01279	+J	-0.14030
ROOT(2) =	-0.01279	+J	0.14030
ROOT(3) =	-4.07258	+J	-4.65815
ROOT(4) =	-4.07258	+J	4.65815

	NATURAL FREQ UNDAMPED	NATURAL FREQ DAMPED	DAMPING RATIO	TIME FOR 1/2 DAMPING	SETTLING TIME
SHORT PERIOD	6.18742	4.65815	0.65820	0.17020	0.73558
PHUGOID	0.14089	0.14030	0.09076	54.20667	234.27487

FIGURE 14

PERTINENT AIRPLANE CHARACTERISTICS

DENSITY (SLUGS/FT**3)	= 0.00199	VELOCITY (FT/SEC)	= 286.00000
MASS (SLUGS)	= 124.22400	IYY (SLUG-FT**2)	=2560.00000
THRUST (POUNDS)	= 0.0	ZJ (FT)	= 0.0
G*COS(GAMMA) (FT/SEC/SEC)	= 32.00000	G*SIN(GAMMA) (FT/SEC/SEC)	= 0.0
COS(XZ)	= 1.00000	SIN(XZ)	= 0.0
WING AREA (FT**2)	= 182.73000	HORZ. TAIL AREA (FT**2)	= 38.74300
WING SPAN (FT)	= 39.70000	HORZ. TAIL SPAN (FT)	= 13.56000
WING CHORD (FT)	= 4.75000	HORZ. TAIL CHORD (FT)	= 2.85715
WING ASPECT RATIO	= 8.62524	HORZ. TAIL ASPECT RATIO	= 4.74598
WING TAPER RATIO	= 0.50000	HORZ. TAIL TAPER RATIO	= 1.00000
WING ALPHA (DEGREES)	= 0.22900	TAIL ALPHA (DEGREES)	= -1.81752
IWING (DEGREES)	= 0.50000	ITAIL (DEGREES)	= 0.0
DOWNWASH ANGLE (DEGREES)	= 1.54652	DOWNWASH/ALPHA	= 0.48215
ELEVATOR ANGLE (DEGREES)	= 1.81752	ELEVATOR AREA (FT**2)	= 38.74300
TAIL EFFICIENCY	= 0.90000	ELEVATOR CHORD (FT)	= 2.85715
2-D WING CLA	= 0.12163	2-D TAIL CLA	= 0.11500
CDPIE	= 0.03510	2-D WING CDA	= 0.04670
2-D WING CL	= 0.37984		

DISTANCES

LENGTH OF FUSELAGE (FT)	= 27.67000	WIDTH OF FUSELAGE (FT)	= 4.33000
C.G. TO TAIL QUARTER-CHORD (FT)	= 16.00000	WING TO TAIL QUARTER-CHORD (FT)	= 16.00000
C.G. TO WING A.C.(CHORDWISE) (FT)	= 0.0	C.G. TO WING A.C.(VERTICAL) (FT)	= 0.0
NOSE TO WING QUARTER-CHORD (FT)	= 10.25500	C.G. TO WING QUARTER-CHORD (FT)	= 0.0
C.G. TO THRUST AXIS (FT)	= 0.0		

LONGITUDINAL STABILITY DERIVATIVES

CL = 0.3083	CLA = 5.5081	CLDA = 2.7055	CLQ = 5.6115	CLDE = 0.7989	CLU = 0.0	CT = 0.0
CD = 0.0386	CDA = 0.1735	CDDA = 0.0	CDQ = 0.0	CDDE = 0.0	CDJ = 0.0	CTU = 0.0
CM = 0.0	CMA = -0.3582	CMDA = -9.1134	CMQ =-18.9018	CMDE = -2.6912	CMU = 0.0	CTRPM = 0.0

DENOMINATOR ROOTS

ROOT(1) =	-0.01610	+J	-0.11915
ROOT(2) =	-0.01610	+J	0.11915
ROOT(3) =	-4.33009	+J	-0.90362
ROOT(4) =	-4.33009	+J	0.90362

	NATURAL FREQ UNDAMPED	NATURAL FREQ DAMPED	DAMPING RATIO	TIME FOR 1/2 DAMPING	SETTLING TIME
SHORT PERIOD	4.42337	0.90362	0.97891	0.16008	0.69183
PHUGOID	0.12023	0.11915	0.13393	43.04546	186.03745

FIGURE 15

PERTINENT AIRPLANE CHARACTERISTICS

DENSITY (SLUGS/FT**3)	= 0.00238	VELOCITY (FT/SEC)	= 161.00000
MASS (SLUGS)	= 124.22400	IYY (SLUG-FT**2)	=2560.00000
THRUST (POUNDS)	= 0.0	ZJ (FT)	= 0.0
G*COS(GAMMA) (FT/SEC/SEC)	= 32.03800	G*SIN(GAMMA) (FT/SEC/SEC)	= 3.22000
COS(XZ)	= 1.00000	SIN(XZ)	= 0.0
WING AREA (FT**2)	= 155.00000	HORZ. TAIL AREA (FT**2)	= 38.74300
WING SPAN (FT)	= 39.70000	HORZ. TAIL SPAN (FT)	= 13.56000
WING CHORD (FT)	= 4.11000	HORZ. TAIL CHORD (FT)	= 2.85715
WING ASPECT RATIO	= 10.16832	HORZ. TAIL ASPECT RATIO	= 4.74598
WING TAPER RATIO	= 0.50000	HORZ. TAIL TAPER RATIO	= 1.00000
WING ALPHA (DEGREES)	= 5.60050	TAIL ALPHA (DEGREES)	= 1.51893
IWING (DEGREES)	= 0.50000	ITAIL (DEGREES)	= 0.0
DOWNWASH ANGLE (DEGREES)	= 3.58157	DOWNWASH/ALPHA	= 0.41020
ELEVATOR ANGLE (DEGREES)	= -1.51893	ELEVATOR AREA (FT**2)	= 38.74300
TAIL EFFICIENCY	= 0.90000	ELEVATOR CHORD (FT)	= 2.85715
2-D WING CLA	= 0.11606	2-D TAIL CLA	= 0.11500
CDPIE	= 0.03510	2-D WING CDA	= 0.03603
2-D WING CL	= 0.99830		

DISTANCES

LENGTH OF FUSELAGE (FT)	= 27.67000	WIDTH OF FUSELAGE (FT)	= 4.33000
C.G. TO TAIL QUARTER-CHORD (FT)	= 16.00000	WING TO TAIL QUARTER-CHORD (FT)	= 16.00000
C.G. TO WING A.C.(CHORDWISE) (FT)	= 0.0	C.G. TO WING A.C.(VERTICAL) (FT)	= 0.0
NOSE TO WING QUARTER-CHORD (FT)	= 10.25500	C.G. TO WING QUARTER-CHORD (FT)	= 0.0
C.G. TO THRUST AXIS (FT)	= 0.0		

LONGITUDINAL STABILITY DERIVATIVES

CL = 0.8342	CLA = 5.4747	CLDA = 3.1362	CLQ = 7.6455	CLDE = 0.9419	CLU = 0.0	CT = 0.0
CD = 0.0571	CDA = 0.3251	CDDA = 0.0	CDQ = 0.0	CDDE = 0.0	CDU = 0.0	CTU = 0.0
CM = 0.0	CMA = -1.5615	CMDA =-12.2090	CMQ =-29.7635	CMDE = -3.6667	CMU = 0.0	CTRPM = 0.0

DENOMINATOR ROOTS

ROOT(1) = -0.00293 +J -0.24574
ROOT(2) = -0.00293 +J 0.24574
ROOT(3) = -2.70232 +J -2.86218
ROOT(4) = -2.70232 +J 2.86218

	NATURAL FREQ UNDAMPED	NATURAL FREQ DAMPED	DAMPING RATIO	TIME FOR 1/2 DAMPING	SETTLING TIME
SHORT PERIOD	3.93632	2.86218	0.68651	0.25650	1.10857
PHUGOID	0.24576	0.24574	0.01192	236.65381	1022.79003

FIGURE 16

PERTINENT AIRPLANE CHARACTERISTICS

DENSITY (SLUGS/FT**3)	= 0.00238	VELOCITY (FT/SEC)	= 161.00000
MASS (SLUGS)	= 124.22400	IYY (SLUG-FT**2)	=2560.00000
THRUST (POUNDS)	= 0.0	ZJ (FT)	= 0.0
G*COS(GAMMA) (FT/SEC/SEC)	= 32.03800	G*SIN(GAMMA) (FT/SEC/SEC)	= 3.22000
COS(XZ)	= 1.00000	SIN(XZ)	= 0.0
WING AREA (FT**2)	= 182.73000	HORZ. TAIL AREA (FT**2)	= 38.74300
WING SPAN (FT)	= 39.70000	HORZ. TAIL SPAN (FT)	= 13.56000
WING CHORD (FT)	= 4.75000	HORZ. TAIL CHORD (FT)	= 2.85715
WING ASPECT RATIO	= 8.62524	HORZ. TAIL ASPECT RATIO	= 4.74598
WING TAPER RATIO	= 0.50000	HORZ. TAIL TAPER RATIO	= 1.00000
WING ALPHA (DEGREES)	= 5.60050	TAIL ALPHA (DEGREES)	= 1.03586
IWING (DEGREES)	= 0.50000	ITAIL (DEGREES)	= 0.0
DOWNWASH ANGLE (DEGREES)	= 4.06464	DOWNWASH/ALPHA	= 0.46453
ELEVATOR ANGLE (DEGREES)	= -1.03586	ELEVATOR AREA (FT**2)	= 38.74300
TAIL EFFICIENCY	= 0.90000	ELEVATOR CHORD (FT)	= 2.85715
2-D WING CLA	= 0.11606	2-D TAIL CLA	= 0.11500
CDPIE	= 0.03510	2-D WING CDA	= 0.03603
2-D WING CL	= 0.99830		

DISTANCES

LENGTH OF FUSELAGE (FT)	= 27.67000	WIDTH OF FUSELAGE (FT)	= 4.33000
C.G. TO TAIL QUARTER-CHORD (FT)	= 16.00000	WING TO TAIL QUARTER-CHORD (FT)	= 16.00000
C.G. TO WING A.C.(CHORDWISE) (FT)	= 0.0	C.G. TO WING A.C.(VERTICAL) (FT)	= 0.0
NOSE TO WING QUARTER-CHORD (FT)	= 10.25500	C.G. TO WING QUARTER-CHORD (FT)	= 0.0
C.G. TO THRUST AXIS (FT)	= 0.0		

LONGITUDINAL STABILITY DERIVATIVES

CL = 0.8104	CLA = 5.3068	CLDA = 2.6067	CLQ = 5.6115	CLDE = 0.7989	CLU = 0.0	CT = 0.0
CD = 0.0596	CDA = 0.3570	CDDA = 0.0	CDQ = 0.0	CDDE = 0.0	CDU = 0.0	CTU = 0.0
CM = 0.0	CMA = -0.4291	CMDA = -8.7804	CMQ =-18.9018	CMDE = -2.6912	CMU = 0.0	CTRPM = 0.0

DENOMINATOR ROOTS

ROOT(1) =	-0.01317	+J	-0.21385
ROOT(2) =	-0.01317	+J	0.21385
ROOT(3) =	-2.86418	+J	-0.72226
ROOT(4) =	-2.86418	+J	0.72226

	NATURAL FREQ UNDAMPED	NATURAL FREQ DAMPED	DAMPING RATIO	TIME FOR 1/2 DAMPING	SETTLING TIME
SHORT PERIOD	2.95384	0.72226	0.96965	0.24201	1.04592
PHUGOID	0.21426	0.21385	0.06146	52.63901	227.49962

FIGURE 17

PERTINENT AIRPLANE CHARACTERISTICS

RHO	0.001988	WING AREA	155.000000	MASS	124.224000	G*COS(GAMMA)	32.000000
U	286.0000	CHORD	4.110000	SPAN	39.3500	G*SIN(GAMMA)	0.0
IXX	5250.0000	IXZ	0.0	IZZ	7323.0000	CL	0.317400
SA	0.0	DIH	7.000000	ZW	1.083300	FUSVOL	285.680651
H	4.292000	SV	19.500000	BV	5.883000	RI	0.916700
TR	0.500000	ZV	2.667000	ETAV	0.960000	SBS	80.909591
LF	27.400000	LT	16.000000	XM	10.000000	HI	2.833000
H2	2.833000	W	4.330000	SAH	0.0	CLA2DW	6.969399
BH	13.558000	SH	36.500000	TRH	1.000000	CLA2DH	6.589500
BA	8.600000	CA	0.662000	SR	7.600000	ALPHA	0.003996
CDO	0.035100	YI	7.939800	HNOSE	1.300000	WNOSE	2.000000
HFCY	2.833000	WFCY	4.000000	LFCY	6.667000	LNH	10.000000
HBCY	4.000000	WBCY	4.250000	LBCY	13.667000		

LATERAL STABILITY DERIVATIVES

CYB	-0.479767	CLB	-0.165963	CNB	0.124548	CYP	-0.240417	CLP	-0.586804	CNP	-0.041782
CYR	0.324597	CLR	0.099626	CNR	-0.142518	CYDA	0.0	CLDA	0.173526	CNDA	-0.014204
CYDR	0.226060	CLDR	0.015322	CNDR	-0.088241						

DENOMINATOR ROOTS

ROOT(1) =	-0.30404	+J	-3.01431
ROOT(2) =	-0.30404	+J	3.01431
ROOT(3) =	-4.02414	+J	0.0
ROOT(4) =	-0.01499	+J	0.0
ROOT(5) =	0.0	+J	0.0

	NATURAL FREQ UNDAMPED	NATURAL FREQ DAMPED	DAMPING RATIO	TIME FOR 1/2 DAMPING	SETTLING TIME
DUTCH ROLL	3.0296	3.0143	0.10036	2.27981	9.85307

FIGURE 18

PERTINENT AIRPLANE CHARACTERISTICS

RHO = 0.001988	WING AREA =182.730000	MASS =124.224000	G*COS(GAMMA) = 32.000000
U = 286.0000	CHORD = 4.750000	SPAN = 39.3500	G*SIN(GAMMA) = 0.0
IXX = 5250.0000	IXZ = 0.0	IZZ =7323.0000	CL = 0.317400
SA = 0.0	DIH = 7.000000	ZW = 1.083300	FUSVOL =285.680651
H = 4.292000	SV = 19.500000	BV = 5.883000	R1 = 0.916700
TR = 0.500000	ZV = 2.667000	ETAV = 0.960000	SBS = 80.909591
LF = 27.400000	LT = 16.000000	XM = 10.000000	H1 = 2.833000
H2 = 2.833000	W = 4.330000	SAH = 0.0	CLA2DW = 6.969399
BH = 13.558000	SH = 36.500000	TRH = 1.000000	CLA2DH = 6.589500
BA = 8.600000	CA = 0.662000	SR = 7.600000	ALPHA = 0.003996
CDO = 0.035100	YI = 7.939800	HNOSE= 1.300000	WNOSE = 2.000000
HFCY= 2.833000	WFCY = 4.000000	LFCY = 6.667000	LMH = 10.000000
HBCY= 4.000000	WBCY = 4.250000	LBCY = 13.667000	

LATERAL STABILITY DERIVATIVES

CYB = -0.399758	CLB = -0.163115	CNB = 0.100244	CYP = -0.223734	CLP = -0.536032	CNP = -0.036939
CYR = 0.263831	CLR = 0.094446	CNR = -0.117575	CYDA = 0.0	CLDA = 0.153825	CNDA = -0.012239
CYDR = 0.191755	CLDR = 0.012996	CNDR =-0.074850			

DENOMINATOR ROOTS

ROOT(1) =	-0.28228	+J	-2.96730
ROOT(2) =	-0.28228	+J	2.96730
ROOT(3) =	-4.33740	+J	0.0
ROOT(4) =	-0.01724	+J	0.0
ROOT(5) =	0.0	+J	0.0

	NATURAL FREQ UNDAMPED	NATURAL FREQ DAMPED	DAMPING RATIO	TIME FOR 1/2 DAMPING	SETTLING TIME
DUTCH ROLL	2.9807	2.9673	0.09470	2.45549	10.61234

FIGURE 19

PERTINENT AIRPLANE CHARACTERISTICS

RHO = 0.002378	WING AREA =155.000000	MASS =124.224000	G*COS(GAMMA) = 32.038000
U = 161.0000	CHORD = 4.110000	SPAN = 39.3500	G*SIN(GAMMA) = 3.220000
IXX = 5250.0000	IXZ = 0.0	IZZ =7323.0000	CL = 0.834200
SA = 0.0	DIH = 7.000000	ZW = 1.083300	FUSVOL =285.680651
H = 4.292000	SV = 19.500000	BV = 5.883000	R1 = 0.916700
TR = 0.500000	ZV = 2.667000	ETAV = 0.960000	SBS = 80.909591
LF = 27.400000	LT = 16.000000	XM = 10.000000	H1 = 2.833000
H2 = 2.833000	W = 4.330000	SAH = 0.0	CLA2DW = 6.650238
BH = 13.558000	SH = 36.500000	TRH = 1.000000	CLA2DH = 6.589500
BA = 8.600000	CA = 0.662000	SR = 7.600000	ALPHA = 0.097747
CDO = 0.035100	YI = 7.939800	HNOSE= 1.300000	WNOSE = 2.000000
HFCY= 2.833000	WFCY = 4.000000	LFCY = 6.667000	LMH = 10.000000
HBCY= 4.000000	WBCY = 4.250000	LBCY = 13.667000	

LATERAL STABILITY DERIVATIVES

CYB = -0.479767	CLB = -0.223541	CNB = 0.130041	CYP = -0.312663	CLP = -0.570755	CNP = -0.090307
CYR = 0.398499	CLR = 0.225509	CNR = -0.136648	CYDA = 0.0	CLDA = 0.178526	CNDA = -0.037332
CYDR = 0.226060	CLDR = 0.015322	CNDR =-0.088241			

DENOMINATOR ROOTS

ROOT(1) =	-0.11234	+J	-2.07583
ROOT(2) =	-0.11234	+J	2.07583
ROOT(3) =	-2.83109	+J	0.0
ROOT(4) =	0.01510	+J	0.0
ROOT(5) =	0.0	+J	0.0

	NATURAL FREQ UNDAMPED	NATURAL FREQ DAMPED	DAMPING RATIO	TIME FOR 1/2 DAMPING	SETTLING TIME
DUTCH ROLL	2.0789	2.0758	0.05404	6.17008	26.66638

FIGURE 20

PERTINENT AIRPLANE CHARACTERISTICS

RHO = 0.002378	WING AREA =182.730000	MASS =124.224000	G*COS(GAMMA) = 32.038000
U = 161.0000	CHORD = 4.750000	SPAN = 39.3500	G*SIN(GAMMA) = 3.220000
IXX = 5250.0000	IXZ = 0.0	IZZ =7323.0000	CL = 0.834200
SA = 0.0	DIH = 7.000000	ZW = 1.083300	FUSVOL =285.680651
H = 4.292000	SV = 19.500000	BV = 5.883000	R1 = 0.916700
TR = 0.500000	ZV = 2.667000	ETAV = 0.960000	SBS = 80.909591
LF = 27.400000	LT = 16.000000	XM = 10.000000	H1 = 2.833000
H2 = 2.833000	W = 4.330000	SAH = 0.0	CLA2DW = 6.650238
BH = 13.558000	SH = 36.500000	TRH = 1.000000	CLA2DH = 6.589500
BA = 8.600000	CA = 0.662000	SR = 7.600000	ALPHA = 0.097747
CDO = 0.035100	YI = 7.939800	HNOSE= 1.300000	WNOSE = 2.000000
HFCY= 2.833000	WFCY = 4.000000	LFCY = 6.667000	LMH = 10.000000
HBCY= 4.000000	WBCY = 4.250000	LBCY = 13.667000	

LATERAL STABILITY DERIVATIVES

CYB = -0.399758	CLB = -0.235618	CNB = 0.104904	CYP = -0.296921	CLP = -0.522844	CNP = -0.080538
CYR = 0.337733	CLR = 0.218601	CNR = -0.110318	CYDA = 0.0	CLDA = 0.153825	CNDA = -0.032167
CYDR = 0.191755	CLDR = 0.012996	CNDR =-0.074850			

DENOMINATOR ROOTS

ROOT(1) =	-0.07526	+J	-2.09412
ROOT(2) =	-0.07526	+J	2.09412
ROOT(3) =	-3.07710	+J	0.0
ROOT(4) =	0.01002	+J	0.0
ROOT(5) =	0.0	+J	0.0

	NATURAL FREQ UNDAMPED	NATURAL FREQ DAMPED	DAMPING RATIO	TIME FOR 1/2 DAMPING	SETTLING TIME
DUTCH ROLL	2.0955	2.0941	0.03592	9.21014	39.80514

FIGURE 21

MEASURING DRAG AND THRUST IN FLIGHT

The Concept

Most techniques for the determination of aircraft drag in flight rely on the fact that when the aircraft is in unaccelerated flight, the forces along its x-axis, principally the thrust and drag, are in balance. Then, if one knows the propulsive thrust for a particular flight condition, he automatically knows the aircraft drag at that condition. Thus, to apply these techniques one must know that $\dot{V} = 0$ as well as the propulsive thrust as a function of flight speed, altitude, and power setting.

This, unfortunately, is not determined easily. Although engine output can be measured accurately on a test stand as a function of altitude and power setting and propeller characteristics can be determined in a test cell as a function of RPM and flight velocity, the flow disturbances caused by putting a cowled engine behind a propeller and mounting the whole on an airplane are not readily determined *a priori*. Hence, efforts have been made from time to time to measure inflight thrust using such techniques as the torque reaction produced by the engine or the vehicle acceleration at constant altitude produced by varying power levels.

The reader will readily appreciate the difficulties which such techniques entail. In the case of the ATLIT aircraft, instrumentation to measure reaction torques was not available and the longitudinal accelerometer provided in the instrument package was not considered a primary test instrument, at least initially. Further, the establishment of really unaccelerated flight at many different speeds is very consuming of flight test time. It is for these reasons that an effort was made to develop an alternate technique to measure thrust and drag simultaneously in accelerated flight.

The origin of the concept is quite simple. Recent workers attempting to extract the values of stability derivatives from flight data have all faced the problem of fitting an analytical model containing thirteen or more undetermined coefficients to a set of four or five simultaneous time histories. That is, the number of unknowns greatly exceeds the number of independent equations one can write to describe the motion. The problem is usually attacked (see Ref. 6 for example) by fitting the equations to the time histories at a number of different times. Theoretically, one need only fit the equation the same number of times as one desires to find coefficient values. In practice, it is fit many, many times and the values which best satisfy the time history in some statistical sense are chosen. If the initial estimates of the parameter values are reasonably accurate, the procedure usually converges on the correct values. However, since the system is not determinant, convergence is not guaranteed.

The problem in determining both drag and thrust simultaneously in flight is that there is one more unknown than there is equation. Mathematically this means that for any flight condition there are an infinite number of sets of T and D which satisfy the equation. For any T there is only one D, but one can find the corresponding D for any arbitrary choice of T whether it has any physical meaning or not.

Following the fairly successful approach used in stability derivative extraction, it was reasoned that if one would write the equation of motion substituting flight data for different times in the flight, he could create a system of equations equal to the number of unknowns. Formally, the equation of motion of the vehicle along its trajectory in the X-Z terrestrial plane is

$$\frac{\dot{V}}{g} + \sin\gamma = \frac{T - D}{W} . \tag{3}$$

In order to apply the technique, we wish to express the thrust and drag in a polynomial expansion of some easily-measured flight variable with the coefficients to be undetermined constants. Now, the thrust is known to depend primarily upon flight speed for a given power setting so that we choose the representation

$$T = \frac{\cos\alpha}{V}\left[P_0 + P_1V + P_2V^2\right] . \tag{4}$$

In other words, we assume that the power-speed relationship is a parabola. Given the characteristics of most propellers, P_0 and P_1 will be positive and P_2 negative. We insert the cos α term because we assume that the propeller thrust is always applied along the x-body axis rather than along the flight path. Drag, on the other hand, is always defined with respect to the flight path. We can represent the drag by the equation

$$D = 1/2\ \rho SV^2\left[C_{D_0} + C_{D_1}\alpha^2 + C_{D_2}\alpha^6\right] , \tag{5}$$

where α is measured from zero lift and the sixth power for the third term was chosen on the basis of curve fits to some actual data. Note, however, that we may alter the model to represent a particular situation more accurately without affecting the validity of the procedure.

Substituting these relationships into the equation of motion yields

$$\frac{W\dot{V}}{g} + W\sin\gamma = \frac{\cos\alpha}{V}\left[P_0 + P_1V + P_2V^2\right] - \frac{1}{2}\rho SV^2\left[C_{D_0} + C_{D_1}\alpha^2 + C_{D_2}\alpha^6\right] . \tag{6}$$

This equation has six unknown but constant coefficients. By determining the flight values of γ, W, V, $\dot{V}$, ρ, and α at six different times we create a system of six linear equations in six unknowns. This can then be solved for the values of P_0, P_1, P_2, C_{D_0}, C_{D_1}, and C_{D_2}.

Difficulties in Concept Execution

Unfortunately, this system of equations is what mathematicians call ill-conditioned; that is, very small changes in any of the measured values (α, W, V, $\dot{V}$, γ, ρ) can cause the coefficient values (P_0, P_1, etc.) to change radically. Further, the solution guarantees to pass through the six selected points only. For any other speed, acceleration, angle of attack, weight, flight path angle, or altitude, the thrust or drag computed with these six coefficients may be quite wrong. In addition, the coefficient values themselves may be ridiculous (for example, a negative C_{D_1} value), yet the total drag as determined from $C_{D_0} + C_{D_1} \alpha^2 + C_{D_2} \alpha^6$ may be very reasonable.

These problems are to some extent traceable to the adequacy of the analytical model used. A model which does not well represent what actually occurs will, when fit to the data using this procedure, produce nonsense numbers for some of the coefficients, i.e., nonsense numbers in the physical sense but absolutely correct numbers in the mathematical sense. For example, if the speed-power relation should in fact be a constant, then an attempt to fit it with a parabola will usually yield non-zero values for P_1 and P_2. While for the speeds, etc. at which the data are submitted to the solution routine the sum of the three terms will be correct, individually the values make little physical sense. Thus, a successful solution routine must have a provision for examining the results (at least manually) for reasonableness and for changing the analytical model if the results are not reasonable.

There is also a problem concerned with the selection of the six data sets submitted to the solution routine. The reader will recognize that if one selects six points very close together in speed, the data must be extremely accurate because all significance can be lost in taking the differences between adjacent numbers as one does in solving a system of six equations.

Amelioration of Solution Difficulties

One means of selecting the six points to be submitted to the solution routine so that it will yield reasonable results is to select those points where the velocities are given by

$$
\begin{aligned}
V_1 &= V_{min} \text{ for the maneuver} \\
V_2 &= V_{max} \text{ for the maneuver} \\
V_3 &= V_1 \left[\frac{V_2}{V_1}\right]^{1/5} \\
V_4 &= V_3 \left[\frac{V_2}{V_1}\right]^{1/5} \\
V_5 &= V_4 \left[\frac{V_2}{V_1}\right]^{1/5} \\
V_6 &= V_5 \left[\frac{V_2}{V_1}\right]^{1/5} .
\end{aligned}
\tag{7}
$$

This procedure spaces the points over all the available data giving emphasis to the portion of the drag curve when changes with speed are most rapid. Where applied to theoretically-generated data, the original coefficients can be recovered to within 1%.

For a variety of reasons, flight measurements will never be as accurate or as noise-free as theoretically-generated data. One then asks the question, "How can I use the remainder of the data (the sets of α, ρ, γ, V, $\dot{V}$, W beyond the six sets mentioned above) taken during a 30-second maneuver to improve the accuracy of the coefficient extraction procedure?" The classical answer is to fit the assumed form of the curve (equation 6) to the data by a least-squares technique. What this does is to determine those values of the coefficients (P_0, P_1, P_2, C_{D_0}, C_{D_1}, C_{D_2}) which make the sum of the squares of the distances from the curve to each of the data points a minimum. The procedure is the following:

Let S be defined by the equation

$$S = \sum_{i=1}^{N} \left[\frac{W_i \dot{V}_i}{g} + W_i \sin(\theta_i - \alpha_i) - \frac{\cos \alpha_i}{V_i} P_0 - \cos \alpha_i P_1 - V_i \cos \alpha_i P_2 + \frac{\rho_i S V_i^2}{2} C_{D_0} + \frac{\rho_i S V_i^2}{2} \alpha_i^2 C_{D_1} + \frac{\rho_i S V_i^2}{2} \alpha_i^6 C_{D_2} \right]^2 , \quad (8)$$

where the subscript i refers to the value of the variable at the i^{th} time. This equation is a measure of the precision with which the theoretical model with six unknown constants (P_0, P_1, P_2, C_{D_0}, C_{D_1}, C_{D_2}) satisfies the experimental data. The closer S is to zero, the better the fit. We wish to minimize the error with respect to all six unknowns. Thus, we set

$$\frac{\partial S}{\partial P_0} = 0 = -2 \sum_{i=1}^{N} \left[\frac{\cos \alpha}{V_i}\right] \left[a_1 - a_2 P_0 - a_3 P_1 - a_4 P_2 + a_5 C_{D_0} + a_6 C_{D_1} + a_7 C_{D_2}\right]$$

$$\frac{\partial S}{\partial P_1} = 0 = -2 \sum_{i=1}^{N} [a_3] \left[a_1 - a_2 P_0 - a_3 P_1 - a_4 P_2 + a_5 C_{D_0} + a_6 C_{D_1} + a_7 C_{D_2}\right]$$

$$\frac{\partial S}{\partial P_2} = 0 = -2 \sum_{i=1}^{N} [a_4] \left[a_1 - a_2 P_0 - a_3 P_1 - a_4 P_2 + a_5 C_{D_0} + a_6 C_{D_1} + a_7 C_{D_2}\right]$$

$$\frac{\partial S}{\partial C_{D_0}} = 0 = 2 \sum_{i=1}^{N} [a_5] \left[a_1 - a_2 P_0 - a_3 P_1 - a_4 P_2 + a_5 C_{D_0} + a_6 C_{D_1} + a_7 C_{D_2}\right]$$

$$\frac{\partial S}{\partial C_{D_1}} = 0 = 2 \sum_{i=1}^{N} [a_6] \left[a_1 - a_2 P_0 - a_3 P_1 - a_4 P_2 + a_5 C_{D_0} + a_6 C_{D_1} + a_7 C_{D_2}\right]$$

$$\frac{\partial S}{\partial C_{D_2}} = 0 = 2 \sum_{i=1}^{N} [a_7] \left[a_1 - a_2 P_0 - a_3 P_1 - a_4 P_2 + a_5 C_{D_0} + a_6 C_{D_1} + a_7 C_{D_2}\right] \quad (9)$$

where

$$a_1 = \frac{W_i \dot{V}_i}{g} + W_i \sin(\theta_i - \alpha_i) \qquad a_2 = \frac{\cos \alpha_i}{V_i}$$

$$a_3 = \cos \alpha_i$$

$$a_4 = V_i \cos \alpha_i$$

$$a_5 = \frac{\rho_i S V_i^2}{2}$$

$$a_6 = \frac{\rho_i S V_i^2}{2} \alpha_i^2$$

$$a_7 = \frac{\rho_i S V_i^2}{2} \alpha_i^6 .$$

In expanded form these equations may be written

$$\sum_{i=1}^{N} \frac{\cos \alpha_i}{V_i} \left[\frac{W_i \dot{V}_i}{g} + W_i \sin(\theta_i - \alpha_i) \right] = \sum_{i=1}^{N} \frac{\cos^2 \alpha_i}{V_i^2} P_0 + \sum_{i=1}^{N} \frac{\cos^2 \alpha_i}{V_i} P_1$$

$$+ \sum_{i=1}^{N} \cos^2 \alpha_i \, P_2 - \sum_{i=1}^{N} \frac{\rho_i S V_i^2}{2} \cos \alpha_i \, C_{D_0}$$

$$- \sum_{i=1}^{N} \frac{\rho_i S V_i^2}{2} \alpha_i^2 \cos \alpha_i \, C_{D_1} + \sum_{i=1}^{N} \frac{\rho_i S V_i^2}{2} \alpha_i^6 \cos \alpha_i \, C_{D_2} . \qquad (10)$$

•
•
•
•
•
•

The term $\sum_{i=1}^{N} \frac{\cos^2 \alpha_i}{V_i^2}$ multiplying P_0 represents a sum of terms $\frac{\cos^2 \alpha}{V}$, for each of the N data points in the set. Once this and the similar sums are formed, one has simply a system of six first order algebraic equations in six unknowns which can be solved with some labor for the values of the six unknown coefficients. These coefficient values provide the "best" fit, using the model chosen, to the set encompassing all the data points. The coefficient values may change, of course, if data are added to or deleted from the set. Needless to say, the coefficient values may be in error if the data contains spurious signals or if the model chosen does not represent the physical situation adequately. Also if the data points are not well-distributed over the entire speed range, the coefficients which are the principal contributors to the function value in an underrepresented speed region may be in error. As a result of these factors it is necessary to approach the extraction process with some care.

Despite these difficulties, the following example is illustrative of what can be done using this method. Figure 22 shows the assumed drag variation with angle of attack and figure 23 the assumed power variation with speed. These data were then inserted in the NCSU path performance program described in Ref. 2 to obtain time histories of ρ, α, V, W, $\dot{V}$, and γ. These and related time histories are shown in figure 24. The path performance program is a forward integration scheme which varies the integration step size according to an error criterion. Thus the time histories will all contain very small errors which cause the time histories to differ very slightly from the true values of the functions at any particular time. One cannot, therefore, expect to recover the exact values of the drag and power expressions by proceeding in this fashion. The values of the time histories shown in figure 24 at each 0.1 seconds were then submitted to the least squares routine. The coefficients developed by the program match the first six significant digits of the coefficients in the power and drag functions which were used to generate the time histories. The recovered coefficients, when inserted in the equation with the values of the parameters from PATH at each of almost 300 points, satisfy the equation to within 10^{-19} or better for the sum of all points.

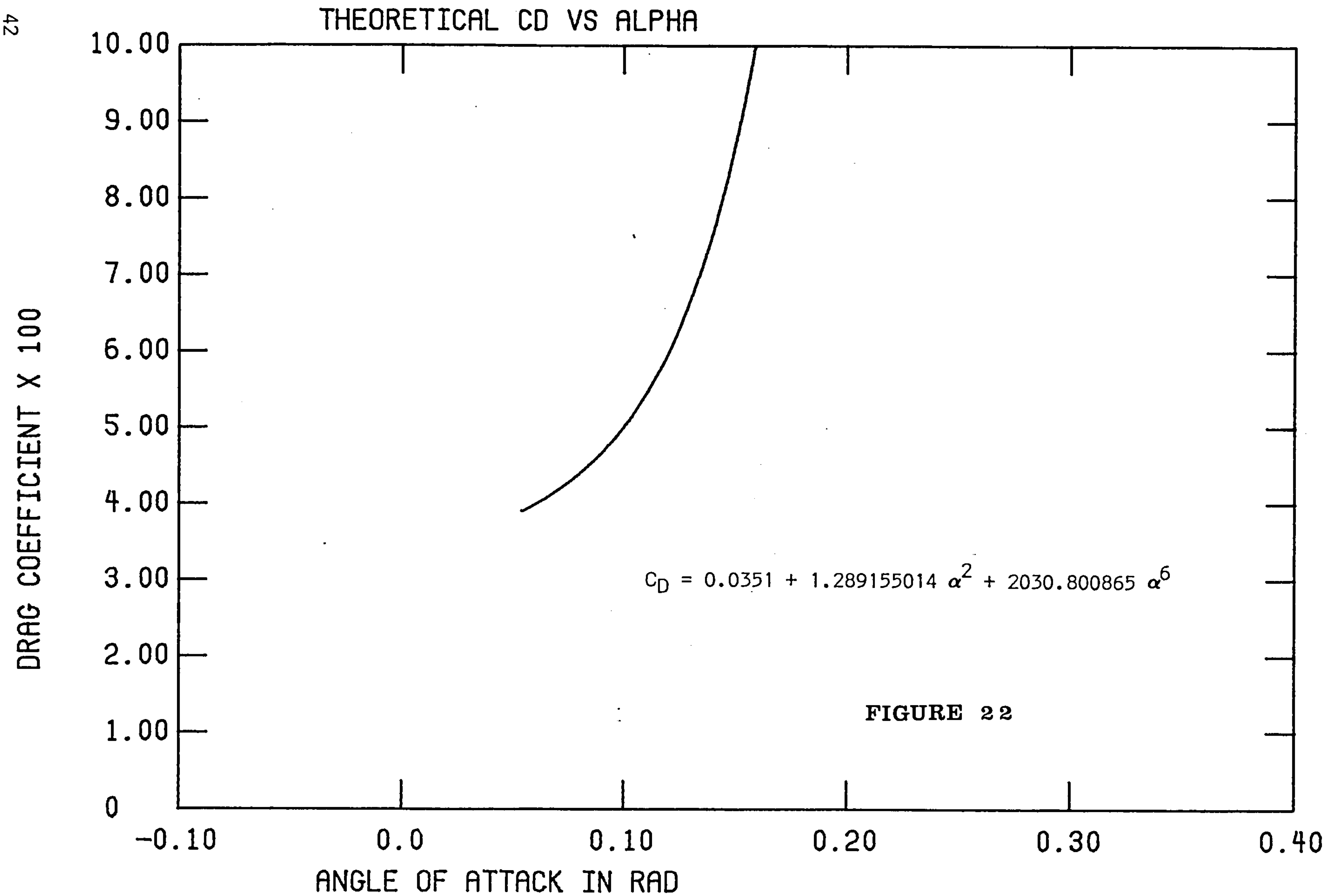

THEORETICAL CD VS ALPHA
DRAG COEFFICIENT X 100
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0
-0.10
0.0
0.10
0.20
0.30
0.40
ANGLE OF ATTACK IN RAD
$C_D = 0.0351 + 1.289155014\ \alpha^2 + 2030.800865\ \alpha^6$

FIGURE 22

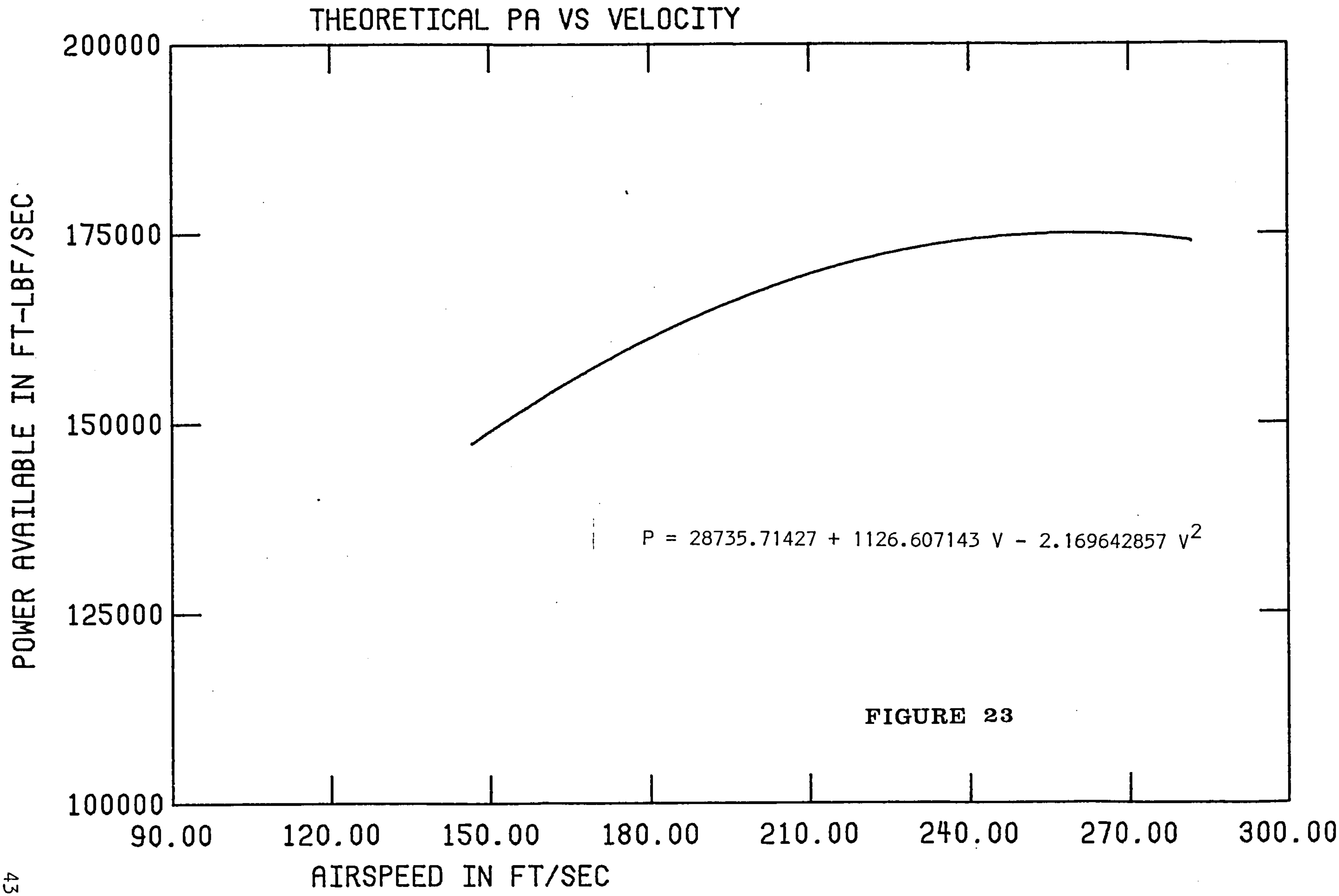

THEORETICAL PA VS VELOCITY
200000
175000
150000
125000
100000
POWER AVAILABLE IN FT-LBF/SEC
90.00
120.00
150.00
180.00
210.00
240.00
270.00
300.00
AIRSPEED IN FT/SEC
P = 28735.71427 + 1126.607143 V - 2.169642857 V^2

FIGURE 23

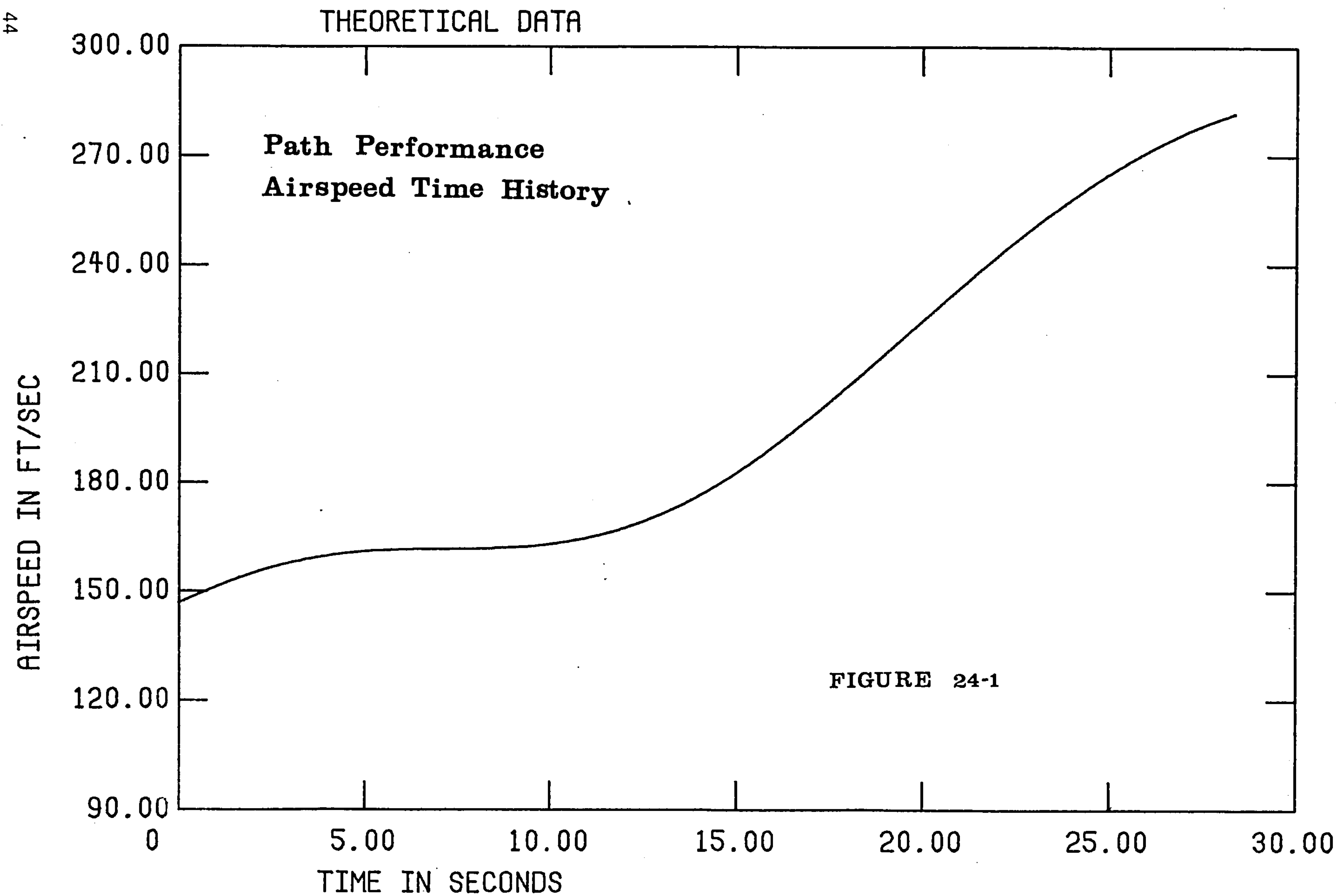

THEORETICAL DATA
Path Performance
Airspeed Time History
AIRSPEED IN FT/SEC
300.00
270.00
240.00
210.00
180.00
150.00
120.00
90.00
0
5.00
10.00
15.00
20.00
25.00
30.00
TIME IN SECONDS

FIGURE 24-1

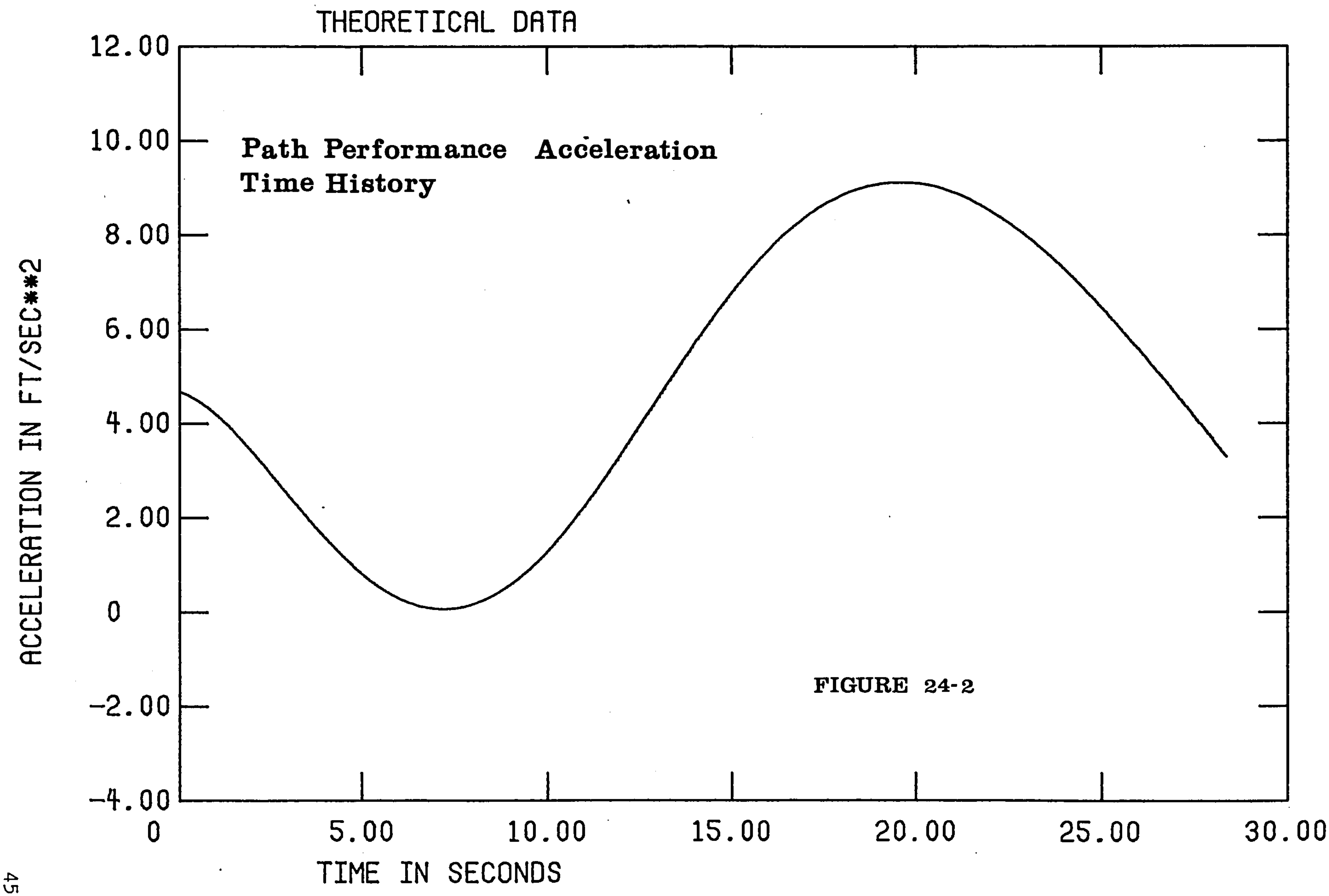
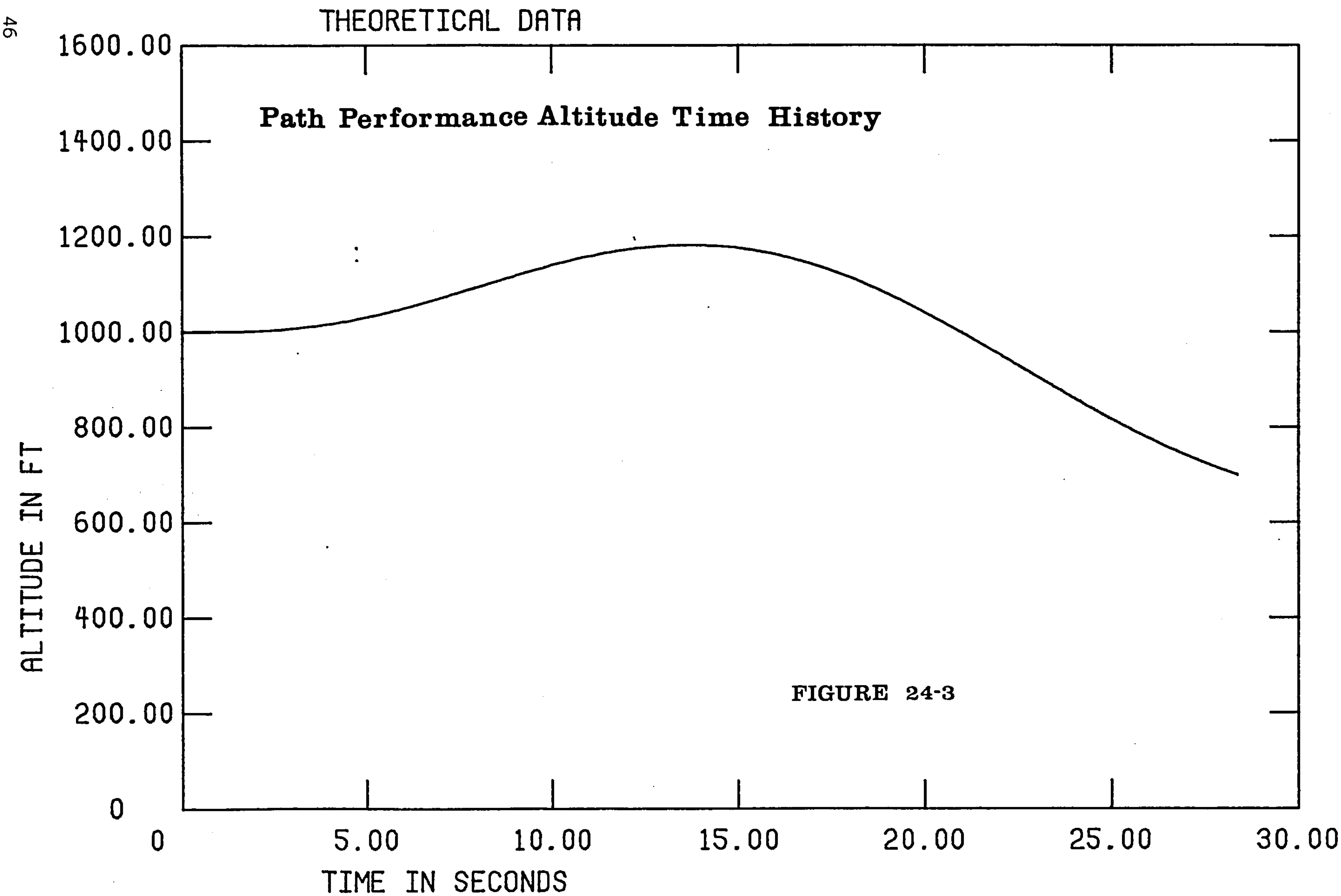

THEORETICAL DATA
Path Performance Acceleration
Time History
ACCELERATION IN FT/SEC**2
12.00
10.00
8.00
6.00
4.00
2.00
0
-2.00
-4.00
0
5.00
10.00
15.00
20.00
25.00
30.00
TIME IN SECONDS

FIGURE 24-2


THEORETICAL DATA
Path Performance Altitude Time History
FIGURE 24-3
ALTITUDE IN FT
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0
0
5.00
10.00
15.00
20.00
25.00
30.00
TIME IN SECONDS

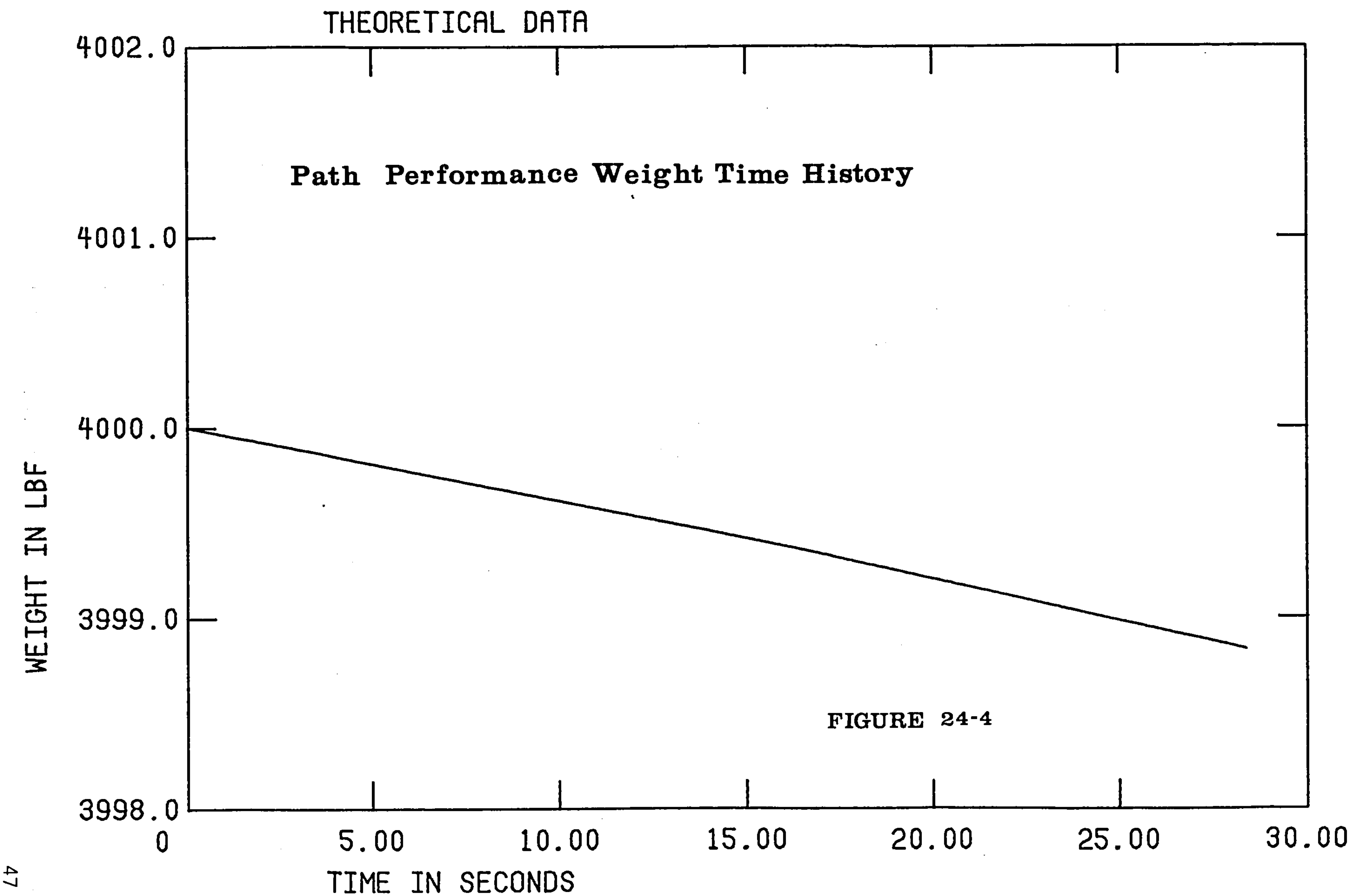
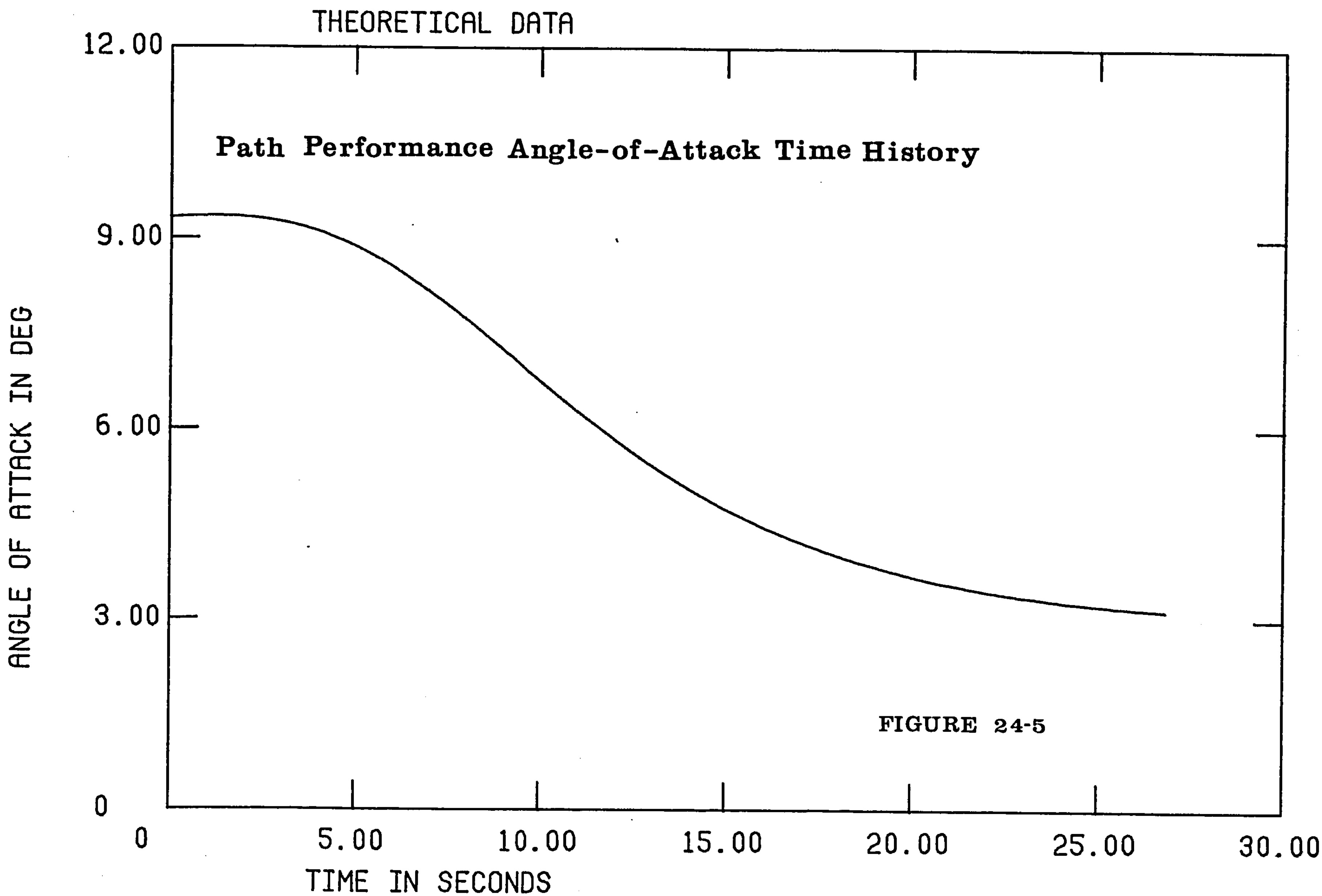

THEORETICAL DATA
Path Performance Weight Time History
4002.0
4001.0
4000.0
3999.0
3998.0
WEIGHT IN LBF
0
5.00
10.00
15.00
20.00
25.00
30.00
TIME IN SECONDS

FIGURE 24-4



Path Performance Angle-of-Attack Time History

FIGURE 24-5

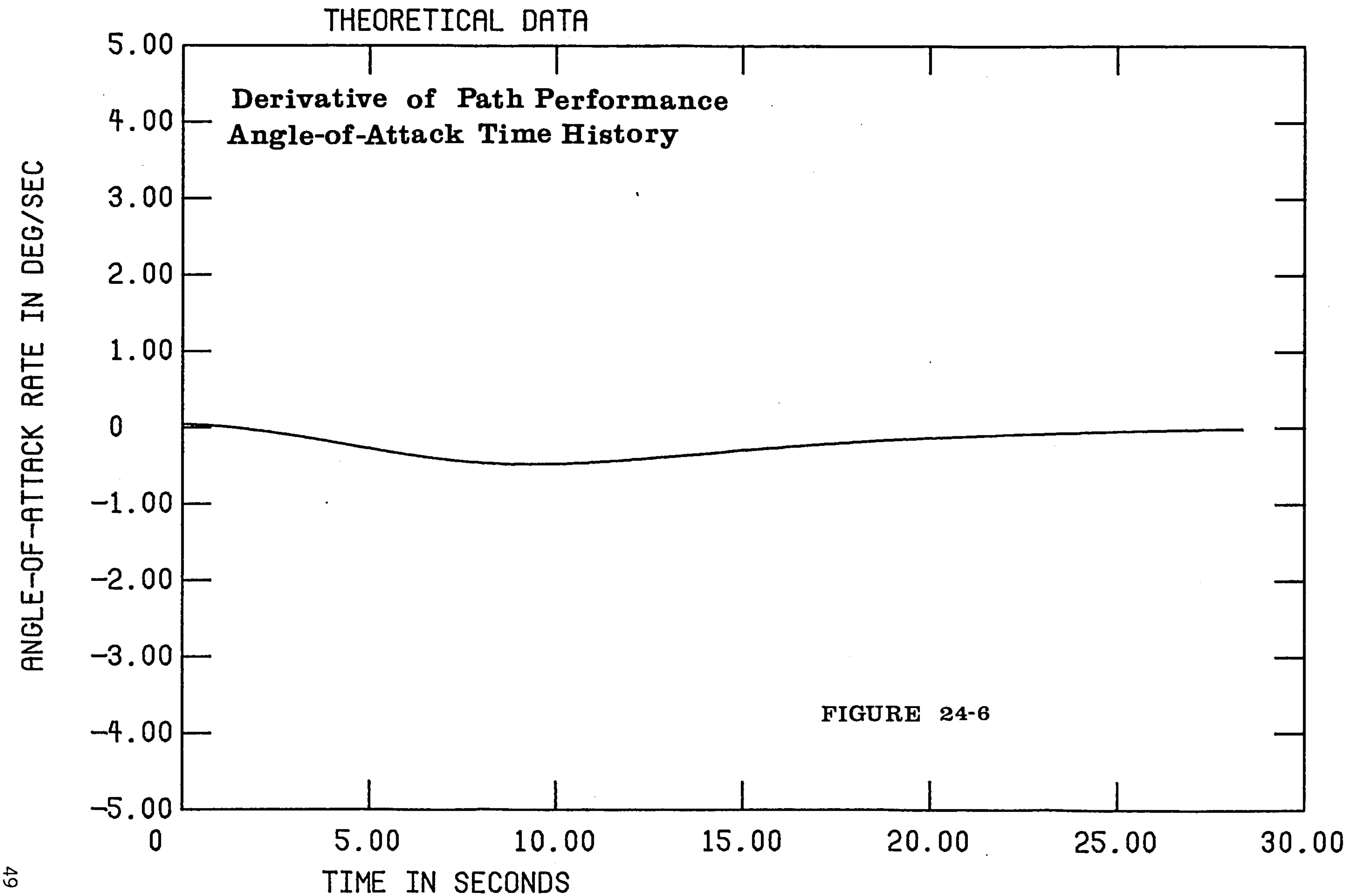
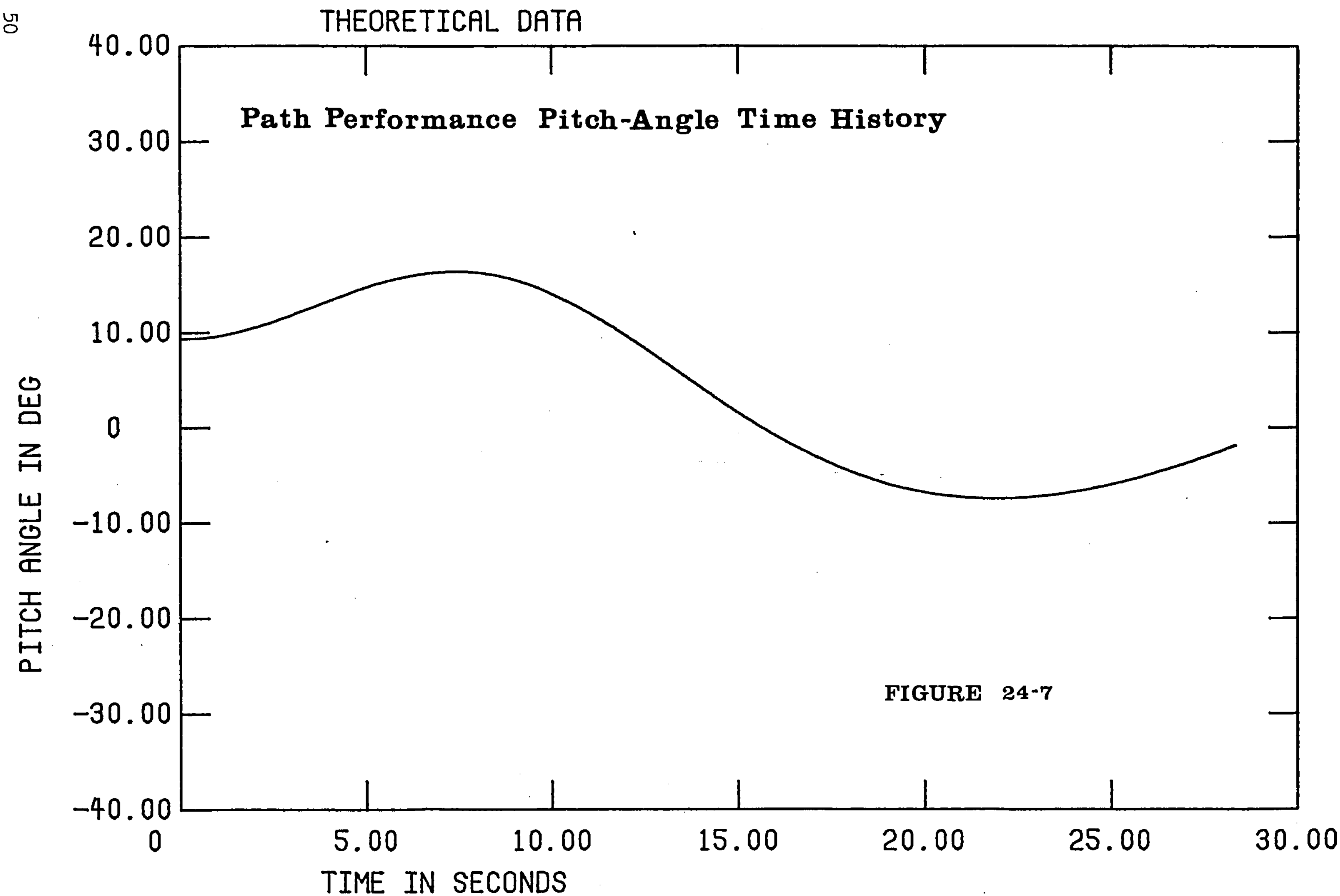

THEORETICAL DATA
Derivative of Path Performance
Angle-of-Attack Time History
ANGLE-OF-ATTACK RATE IN DEG/SEC
5.00
4.00
3.00
2.00
1.00
0
-1.00
-2.00
-3.00
-4.00
-5.00
0
5.00
10.00
15.00
20.00
25.00
30.00
TIME IN SECONDS

FIGURE 24-6



Path Performance Pitch-Angle Time History

FIGURE 24-7

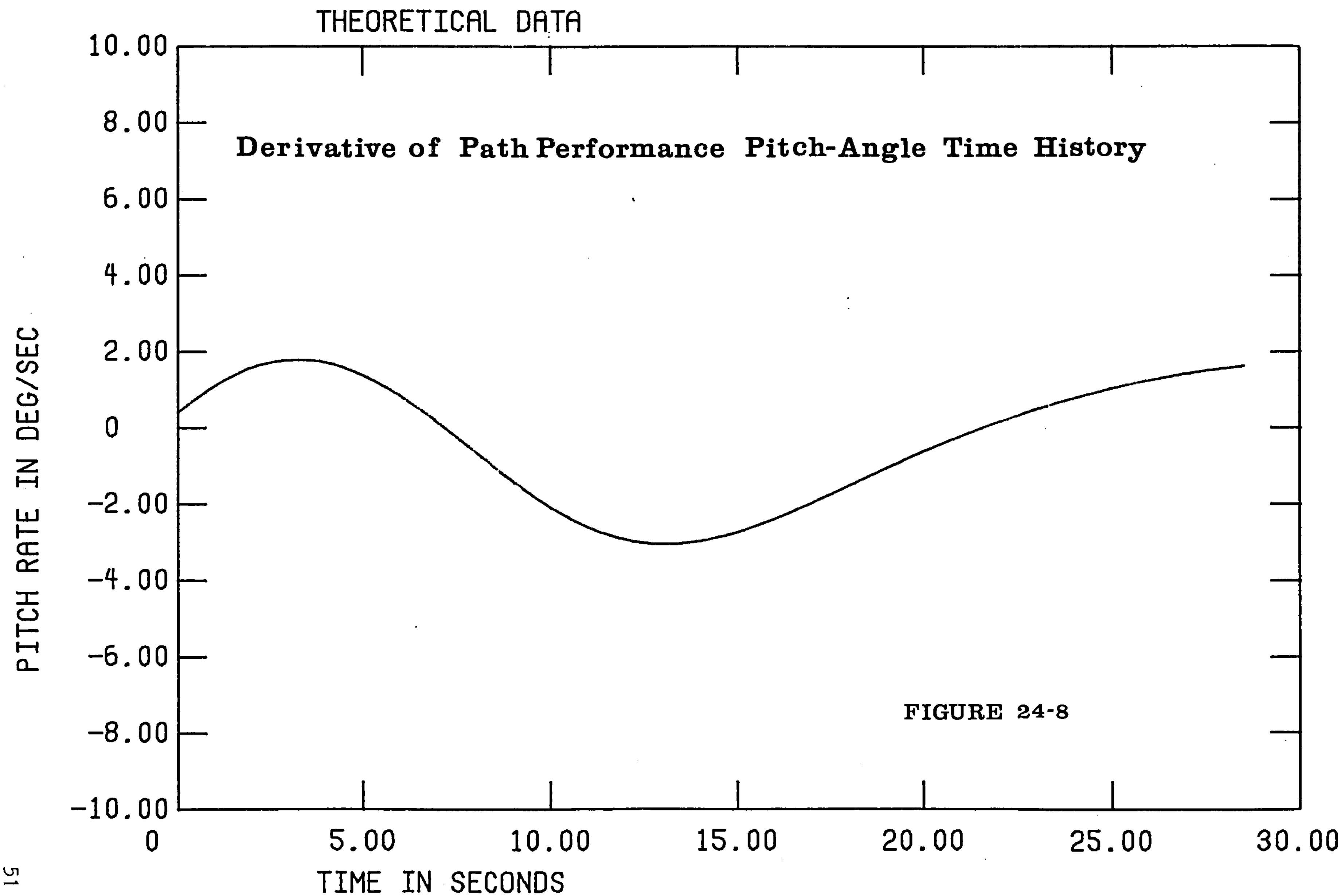
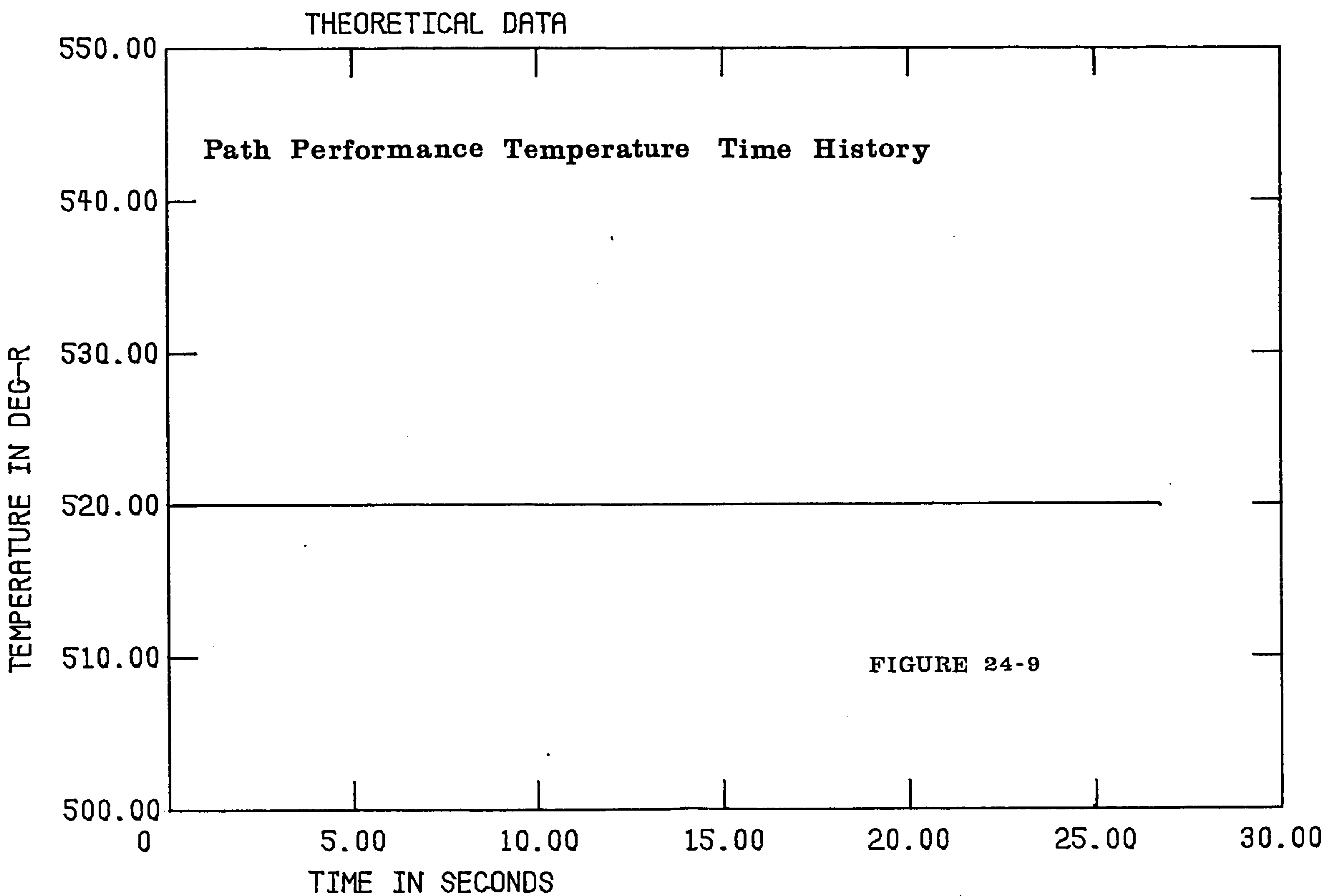

THEORETICAL DATA
Derivative of Path Performance Pitch-Angle Time History
PITCH RATE IN DEG/SEC
10.00
8.00
6.00
4.00
2.00
0
-2.00
-4.00
-6.00
-8.00
-10.00
0
5.00
10.00
15.00
20.00
25.00
30.00
TIME IN SECONDS

FIGURE 24-8



Path Performance Temperature Time History

FIGURE 24-9

Data Filtering

All records of the flight of actual aircraft will contain spurious contributions to the data signals arising from electrical noise, instrument errors, structural vibrations, and atmospheric turbulence. Since the model we have chosen to represent the aircraft does not include such effects, it is desirable to remove them, in so far as possible, before submitting the data to the coefficient extraction routine. Not doing so may cause the extraction routine to produce physically-meaningless results.

All filtering schemes proceed from the idea that continuous data signals are composites, each signal made up of sine waves of all frequencies. Each of these sine waves in the composite has a definite amplitude and phase relationship to the other sine waves making up the signal. By suppressing those frequencies which, on the basis of analysis or experience, cannot arise from the aircraft behavior of interest, one can remove most of the spurious contributions to the signal. Traditionally, filtering was done on continuous signals using frequency sensitive passive networks. In the present case, however, the flight data were received in digital form so that the filtering was accomplished mathematically using a computer*.

It is first necessary to represent the data set by its contributing sine waves. Let $f(t_i)_{i=1,2,3,\cdots N}$ represent the points in the data set, i.e., the value of a particular signal at discrete points of time. Let T = the total time over which we choose to make the analysis. Then over the interval t = 0 to t = T we obtain a set of N values of the signal which, for reasons of simplicity, we choose to separate by a fixed time interval, $\Delta t = \frac{T}{N-1}$.

In order to reduce the numerical problems encountered with a Fourier series representation of a function, we will let

$$f(t_i) = f_a(t_i) + f_b(t_i) \qquad t_1 \le t_i \le t_N \tag{11}$$

where

$$f_b(t_i) = f(t_1) + \frac{f(t_N) - f(t_1)}{T} t_i , \tag{12}$$

and

$$f_a(t_i) = f(t_i) - f_b(t_i) . \tag{13}$$

---

* The data are, nevertheless, just digitized samples of continuous functions. For this reason we have chosen to employ mathematical techniques more appropriate to such functions than the more commonly used digital filtering techniques which seem more appropriate to the analysis of data which are inherently trains of impulses.

We will also add to these data the set

$$f(t_i) = f_c(t_i) + f_d(t_i) \qquad t_N \le t_i \le t_{2N} \tag{14}$$

where

$$f_d(t_i) = f(t_N) - \frac{f(t_{2N}) - f(t_N)}{T}(t_i - T) \tag{15}$$

and

$$f_c(t_i) = f_a(2T - t_i) \ . \tag{16}$$

By this device, the set described by $f_b(t_i)$, $f_d(t_i)$ can always be represented analytically by

$$f_1(t_i) = f(t_1) + \frac{f(t_N) - f(t_1)}{2} - \frac{4}{\pi^2} \sum_{n=1,3,5,\ldots}^{\infty} \frac{f(t_N) - f(t_1)}{N^2} \cos \frac{n\pi t_i}{T} \ . \tag{17}$$

The set represented by $f_a(t_i)$, $f_c(t_i)$ can be expressed by

$$f_2(t_i) = a_o + \sum_{n=1,2,3,\ldots}^{\infty} a_n \cos \frac{n\pi t_i}{T} \ , \tag{18}$$

where

$$a_o = \frac{1}{2T}\int_o^T f_a(t_i)dt + \frac{1}{2T}\int_T^{2T} f_c(t_i)dt \ , \tag{19}$$

and

$$a_n = \frac{1}{T}\int_o^T f_a(t_i)\cos \frac{n\pi t}{T} \ dt + \frac{1}{T}\int_T^{2T} f_c(t_i)\cos \frac{n\pi t}{T} \ dt \ . \tag{20}$$

To carry out the integrations of (19) and (20), we will assume that $f_a(t)$ and $f_c(t)$ are really continuous functions over the interval of interest. The expression $f_a(t_i)$ represents just the value of this function at time t_i, $t_i - t_N$, rather than being an impulse at t_i with an amplitude equal to $f_a(t_i)$. Since the analytical form of $f_a(t)$ is unknown, we must choose some means to represent it. If an original analog record of the data is available, then the functional form used to represent $f_a(t)$ from t_i to t_{i+1} should be chosen such that it does not vary from the original record by more than some small amount anywhere between t_i and t_{i+1}. Two forms are commonly employed for this purpose: a straight line between two adjacent points and a parabola connecting three adjacent points. The unknown function is therefore represented piecewise by a series of elementary functions of the same form. This provides a function which is everywhere continuous but which has discontinuous slopes at the points where the pieces join. The error criterion chosen determines the maximum value of Δt. Usually, the parabolic form will permit a larger Δt for the same error. Note that by approximating the unknown function in this fashion one is in effect already applying some smoothing in the interval (t_i, t_{i+1}) since the regenerated function can never do more than match the approximate form.

The maximum frequency component that can be defined adequately by these representations is one for which $\omega = \frac{\pi}{2\Delta t}$ radians, that is, one described by five samples. Its linear segment representation has a maximum error of 29% and its parabolic segment representation a maximum error of 6%. For a sampling rate of 10/second we should certainly limit our consideration to frequencies of less than 2.5 Hz.

From the foregoing we conclude that, in the absence of the original analog record, we must assume that the sampling rate represented by the data set was <u>at least</u> four times the highest frequency of interest. We experience no difficulty in evaluating a_n for any n we choose, however; this is in sharp contrast to the usual treatments of sampled data where the highest value of n which may be used without obtaining spurious results is half the sampling rate. We come to this result because the integrations of (19) and (20) are carried out analytically although piecewise - in effect providing an infinite sampling rate. To employ the parabolic representation, we take

$$f_a(t_i) = A\, t_i^2 + B\, t_i + C\ , \tag{21}$$

$$f_a(t_{i+1}) = A\, t_{i+1}^2 + B\, t_{i+1} + C\ , \tag{22}$$

$$f_a(t_{i+2}) = A\, t_{i+2}^2 + B\, t_{i+2} + C\ . \tag{23}$$

Then

$$A = \frac{\left[\frac{f_a(t_i) - f_a(t_{i+1})}{t_i - t_{i+1}} - \frac{f_a(t_{i+1}) - f_a(t_{i+2})}{t_{i+1} - t_{i+2}}\right]}{\left[\frac{t_i^2 - t_{i+1}^2}{t_i - t_{i+1}} - \frac{t_{i+1}^2 - t_{i+2}^2}{t_{i+1} - t_{i+2}}\right]} \tag{24}$$

$$B = \frac{f_a(t_i) - f_a(t_{i+1})}{t_i - t_{i+1}} - \left[\frac{t_i^2 - t_{i+1}^2}{t_i - t_{i+1}}\right] A \tag{25}$$

$$C = f_a(t_i) - A\,t_i^2 - B\,t_i \tag{26}$$

and

$$a_o = \frac{1}{2T}\sum_i \int_i^{i+2} \left[A\,t^2 + B\,t + C\right] dt = \frac{1}{2T}\sum_i \left[\frac{A\,t^3}{3} + \frac{B\,t^2}{2} + C\,t\right]_i^{i+2} \tag{27}$$

$$a_n = \frac{1}{T}\sum_i \int_i^{i+2} \left[A\,t^2 + B\,t + C\right] \cos\frac{n\pi t}{T}\, dt$$

$$= \frac{1}{T}\sum_i \left[A\left(2t\,\frac{T^2}{n^2\pi^2}\cos\frac{n\pi t}{T} + \frac{Tt^2}{n\pi}\sin\frac{n\pi t}{T} - \frac{2T^3}{n^3\pi^3}\sin\frac{n\pi t}{T}\right)\right.$$

$$\left. + B\left(\frac{T^2}{n^2\pi^2}\cos\frac{n\pi t}{T} + \frac{Tt}{n\pi}\sin\frac{n\pi t}{T}\right) + \frac{CT}{n\pi}\sin\frac{n\pi t}{T}\right]_i^{i+2} . \tag{28}$$

When

$$\begin{vmatrix} f_a(t_i) & -t_i^2 & -t_i \\ f_a(t_{i+1}) & -t_{i+1}^2 & -t_{i+1} \\ f_a(t_{i+2}) & -t_{i+2}^2 & -t_{i+2} \end{vmatrix} < 10^{-5} , \tag{29}$$

the curvature of the data record is insufficient to require the use of a parabolic approximation and a linear approximation to $f(t)$ will provide the same result. In this case

$$f_a(t_i) = M\,t_i + D \tag{30}$$

$$f_a(t_{i+1}) = M\,t_{i+1} + D\ , \tag{31}$$

then

$$M = \frac{f_a(t_{i+1}) - f_a(t_i)}{t_{i+1} - t_i} \tag{32}$$

$$D = f_a(t_i) - M\,t_i \tag{33}$$

and

$$a_o = \frac{1}{2T}\sum_i \left[\frac{M\,t^2}{2} + D\,t\right]_i^{i+1}$$

$$a_n = \frac{1}{T}\sum_i \left[M\left(\frac{T^2}{n^2\pi^2}\cos\frac{n\pi t}{T} + \frac{Tt}{n\pi}\sin\frac{n\pi t}{T}\right) + \frac{DT}{n\pi}\sin\frac{n\pi t}{T}\right]_i^{i+1}\ . \tag{34}$$

The complete function is then represented by

$$f(t_i) = f_1(t_i) + f_2(t_i) \qquad t_1 \leq t_i \leq t_N\ . \tag{35}$$

An alternate form of (35) which involves fewer computations is

$$f(t_i) = f(t_1) + \frac{f(t_N) - f(t_1)}{T}\,t_i + a_o + \sum_{n=1,2,3,\ldots}^{\infty} a_n \cos\left(\frac{n\pi t_i}{T}\right)$$

$$t_1 \leq t_i \leq t_N\ . \tag{36}$$

Note that through the use of this procedure only deviations from a type of mean function value must be treated numerically. Fewer data points are therefore necessary to fit the function adequately and fewer harmonics must be calculated to regenerate the deviation portion of the function with acceptable accuracy. The reasons for adding the mirror image of the function from t_1 to t_N as a "tail" to the original function are that (a) it makes the function even, possibly reducing the number of coefficients which must be calculated, (b) it improves the coefficient definition because more data are now included in the integration, and (c) it offers the opportunity to calculate $f'(t_i)$ since the coefficients of its series representation will usually decrease in value with increasing numbers of harmonics. This may not be the case if the "tail" is not added.

For those cases better represented by an odd function, i.e., using only sine terms, one has merely to change the sign of $f_c(t_i)$ to make the function odd. If, however, one is willing to calculate both sine and cosine coefficients and perform the regeneration using both sine and cosine terms, then the "tail" can be dispensed with. Generally, one can obtain a better definition of the function for a given value of n by using both sine and cosine terms. Nevertheless, in some cases an equally good representation can be secured using a sine or a cosine series with less than 2n terms. This practice then results in a savings in computational time. The choice as to which procedure to follow is, until more experience with each is obtained, somewhat arbitrary.

The accuracy with which a parabolic fit represents the data over two time intervals depends of course on the size of Δt. The smallest value of Δt is fixed by the data sampling rate. If a smaller time interval is needed to obtain a satisfactory fit, it is necessary to interpolate points between the sampled values. It has been found that a fifth-order Newtonian interpolation formula generally provides a sufficiently accurate representation to generate the required intermediate points. This formula, for even time increments, is

$$\begin{aligned}\phi(t) = y_o &+ \frac{y_1 - y_o}{t_1 - t_o}(t - t_o) + \frac{y_2 - 2y_1 + y_o}{2(t_1 - t_o)^2}(t - t_o)(t - t_1) \\ &+ \frac{y_3 - 3y_2 + 3y_1 - y_o}{6(t_1 - t_o)^3}(t - t_o)(t - t_1)(t - t_2) \\ &+ \frac{y_4 - 4y_3 + 6y_2 - 4y_1 + y_o}{24(t_1 - t_o)^4}(t - t_o)(t - t_1)(t - t_2)(t - t_3) \\ &+ \frac{y_5 - 5y_4 + 10y_3 - 10y_2 + 5y_1 - y_o}{120(t_1 - t_o)^5}(t - t_o)(t - t_1)(t - t_2)(t - t_3)(t - t_4) \; . \end{aligned} \tag{37}$$

$y_o,\ldots,y_5$ represent six values of the function one wishes to interpolate between. These y values correspond to times $t_o,\ldots,t_5$. $\phi(t)$ can be found using this formula for any t between t_o and t_5 and it may also be used to extrapolate $\phi(t)$ to a short time before t_o and a short time after t_5. Note that $\phi(t_o) \equiv y_o$, etc.

Now if the slope of the parabolic representation of the function at t_2 approaching from the left is different by more than ε from the slope of the parabolic representation of the function at t_2 approaching from the right, we calculate $\phi(t_{1/2})$ and $\phi(t_{3/2})$ and fit a parabola first through y_o, $\phi(t_{1/2})$, and y_1, and then through y_1, $\phi(t_{3/2})$, and y_2, etc. We can continue to divide the intervals in half until the slope difference at t_2 is less than ε. As a practical matter, however, more than three such divisions will result in excessively long data sets since we begin with as many as 450 points. Three divisions will result in a set of 3593 points. If ε is set to a desirable value, say 10^{-10}, one will usually find that with actual noisy data it will be necessary to interpolate as many points as permissable in order for ε to approach this value. With smooth data, multiple interpolations will not be necessary.

Since the procedure described above permits one to describe a signal time history in terms of its harmonic content, it is therefore possible to reduce the amplitudes of or eliminate certain constituent frequencies from the set before regenerating the signal - in essence filtering out the unwanted contributions to any desired degree - without any disruption of the phase relationships among the remaining contributions. This represents a level of filter performance far above that possible with passive elements in analog circuits. The choice of which frequencies to suppress and to what extent can generally be made on the following grounds:

1. If the aircraft itself is fairly rigid, frequencies above the principal stability modes should decline in amplitude at about 12 db per octave. This means that generally there should be little contribution to the vehicle's response to control surface deflections or changes in power level at frequencies above 1 to 2 Hz. If the data show significant harmonic content above these frequencies, it can usually be traced to engine-or-turbulence-induced structural vibrations or to electrical noise in the signal transducer, encorder, or recorder.
2. Spurious signals at lower frequencies can be separated from the data, provided their magnitudes are known a priori.

Following these guidelines we may now proceed to perform the attenuation of the higher frequency harmonics in a more rigorous fashion. It will be observed that attempts to regenerate functions having substantial high frequency content with a truncated series always lead to a function having considerable "ripple". For example, attempts to represent a square wave with a truncated series will always show a ripple or oscillation about the correct value at the leading edge and the trailing edge of the square wave. This phenomenon is not observed when square waves are passed through low-pass filter networks so that there is obviously some difference between the action of a low-pass filter and mere truncation of the generating series.

It has been demonstrated mathematically (Ref. 7) that to avoid these ripples the variation of a_n with n for (28), for example, must be continuous. Truncating the series representation of a function means that $a_n(n)$ is discontinuous at the last value of n (unless of course the value of a_n for this and all higher values of n is already zero). A desirable low-pass digital filter design is, therefore, one which suppresses the a_n's sharply above a cutoff value for n, one which leaves the values of a_n for $n \le n_c$ unattenuated, and one which does this in a continuous fashion. One means discussed in the literature (Ref. 7) is to multiply the a_n's in the series representation by the function H(n), where H is defined by

$$H(n) = \left| \begin{array}{l|l} 1 & \text{for } n \le n_c \\ \cos^2\left(\pi \dfrac{n - n_c}{n_c}\right) & \text{for } n_c < n < (3/2)n_c \quad . \\ 0 & \text{for } n \ge (3/2)n_c \end{array} \right. \tag{38}$$

H(n), it will be noted, is everywhere continuous and has a continuous first derivative.

The cutoff harmonic can be obtained from the following expression:

$$n_c = \frac{5T}{\pi} .$$

This is equivalent to saying that we will accept all the sine waves required to represent the function without attenuation up to a frequency of 10 radians/sec at which point we begin the "rolloff". We accept no energy in the signal beyond a frequency of 15 radians per second. Of course, n_c can be adjusted to match the response characteristics of the airplane under test. With flight records usually running 30-40 seconds n_c will be about 50 and the maximum value of n needed is about 75. With this constraint (36) becomes

$$\overline{f(t_i)} = f(t_1) + \frac{f(t_N) - f(t_1)}{T} t_i + a_o + \sum_{n=1,2,3,\ldots}^{n=75} a_n H(n)\cos\left(\frac{n\pi t_i}{T}\right)$$

$$t_1 \le t_i \le t_N \tag{39}$$

Usually, n_c can be adjusted downward if the flight maneuver is carried out with less than maximum aircraft response.

One of the more common types of noise in flight test data is caused by the failure of the digital encoding or conversion device to register the higher order bits. When this happens there is a sudden small jump in the indicated value. These jumps are generally in the same direction and do not occur in a completely random fashion. As a result, they cannot be treated as gaussian noise; further, they introduce a bias error into data filtered by our fourier routine. One means of dealing with this problem is to recognize that the aircraft states are dynamically capable of only finite rates of change. The change in altitude pressure with time, for example, is limited by the airspeed, altitude, and flight path angle. Any pressure change in excess of this value is obviously spurious. In place of the spurious value we can take the value determined from the vehicle dynamics through the following process:

Assume altitude temperature is equal to standard sea level value. Then

$$\dot{P} = 4.26P_o(1 - 6.86 \times 10^{-6}h)^{3.26}(- 6.86 \times 10^{-6})\dot{h}$$

But $\dot{h} = V\sin\gamma = V\sin(\theta - \alpha)$.

$$\text{So} \quad \dot{P} = 4.26P_o\left(\frac{P}{P_o}\right)^{\frac{3.26}{4.26}} (- 6.86 \times 10^{-6})V\sin(\theta - \alpha).$$

θ and α come from instrument readings. To allow for errors in these values we take as the maximum value

$$\dot{P}_{max} = - 2.922 \times 10^{-5} \, P_o^{0.2347} \, P^{0.76526} \, V\sin[1.2(\theta - \alpha)]. \qquad (40)$$

Thus the next pressure value cannot change more than $\dot{P}\Delta t$ from the previous value. If it does, we are justified in replacing the indication by $P_{Previous} + \dot{P}\Delta t$. Although this procedure will not eliminate the effects of "bit dropout," it will reduce materially the bias and low frequency errors which normally result therefrom. The Fourier procedure is then much more likely to yield the accurate data needed for effective parameter extraction.

Computation of Derivatives

The drag and power extraction scheme presented above requires that at least one parameter ($\dot{\alpha}$) which is not commonly measured be supplied as an input time history. We are therefore forced to differentiate $\alpha(t)$ in some fashion in order to obtain $\dot{\alpha}(t)$. Because of the fourier series representation used in (39), we may easily compute the derivative of this function analytically:

$$f'(t_i) = \frac{f(t_N) - f(t_i)}{T} - \frac{\pi}{T} \sum_{n=1,2,3,\ldots}^{n=75} a_n \, n \, H(n) \sin\left(\frac{n\pi t_i}{T}\right)$$

$$t_1 \leq t_i \leq t_N \,. \tag{41}$$

This process may be applied to any data set for which a derivative is needed and for which it is otherwise unavailable.

Some examples of the application of this procedure are shown in figures 25-26. In figure 25 an angle-of-attack time history as read from a "quick look" record is reproduced. Note the high degree of irregularity. This data was read every 1/4 second. When submitted to the fourier analysis routine with $n_c = 10$, the smooth curve shown in figure 25 is obtained. The angle of attack rate is shown in figure 26. The data are quite smooth and appear to be a reliable smoothing of the original. The maneuver for which these data were obtained was a pushover-pullup. The "humps" in the data at roughly 6-second intervals are believed to be a consequence of the excitation of the aircraft's longitudinal short period mode by the maneuver. Calculations indicate the short period mode can be expected to have this period for the test configuration.

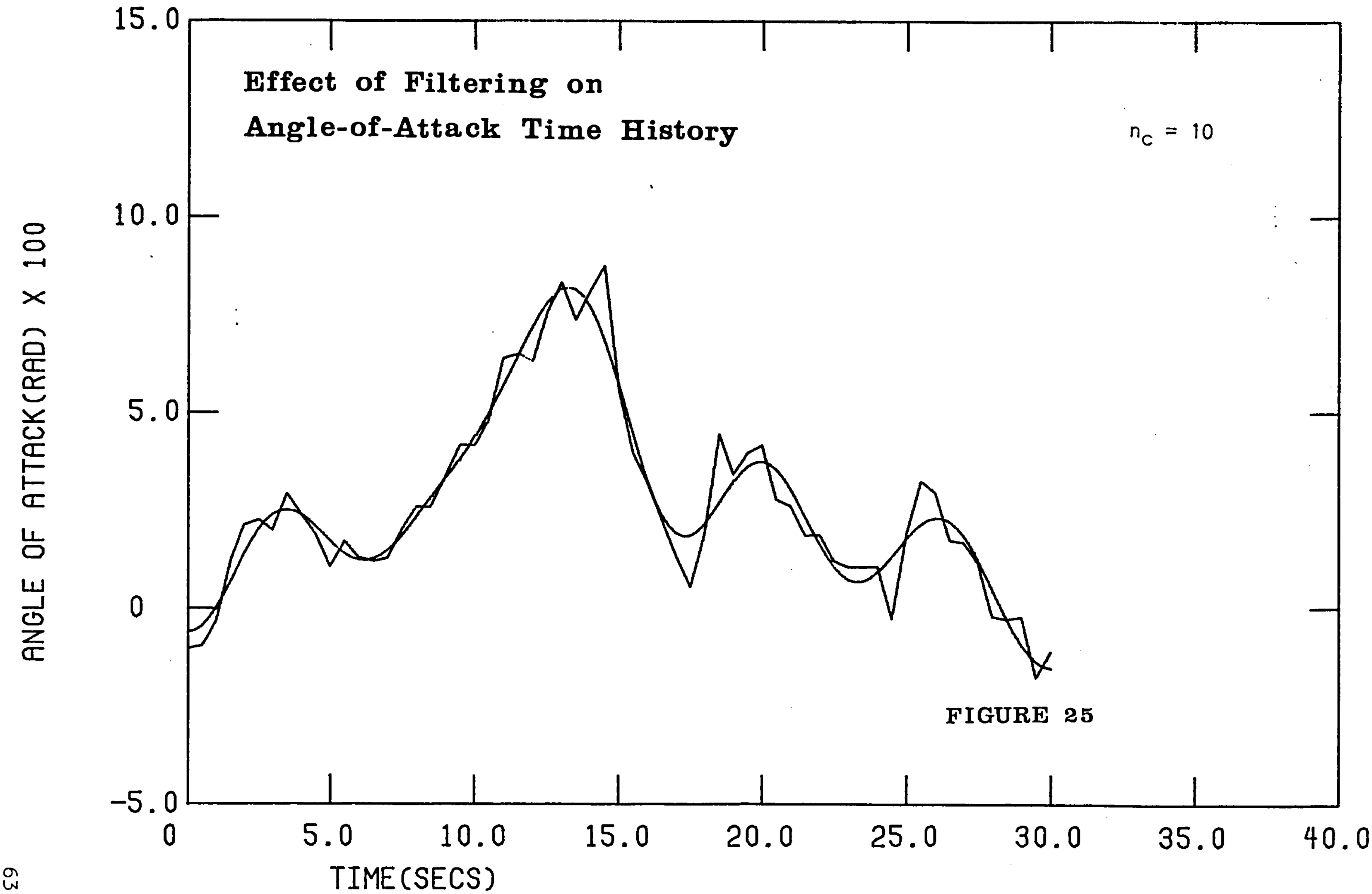

Effect of Filtering on
Angle-of-Attack Time History
n_c = 10
15.0
10.0
5.0
0
-5.0
ANGLE OF ATTACK(RAD) X 100
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
TIME(SECS)

FIGURE 25

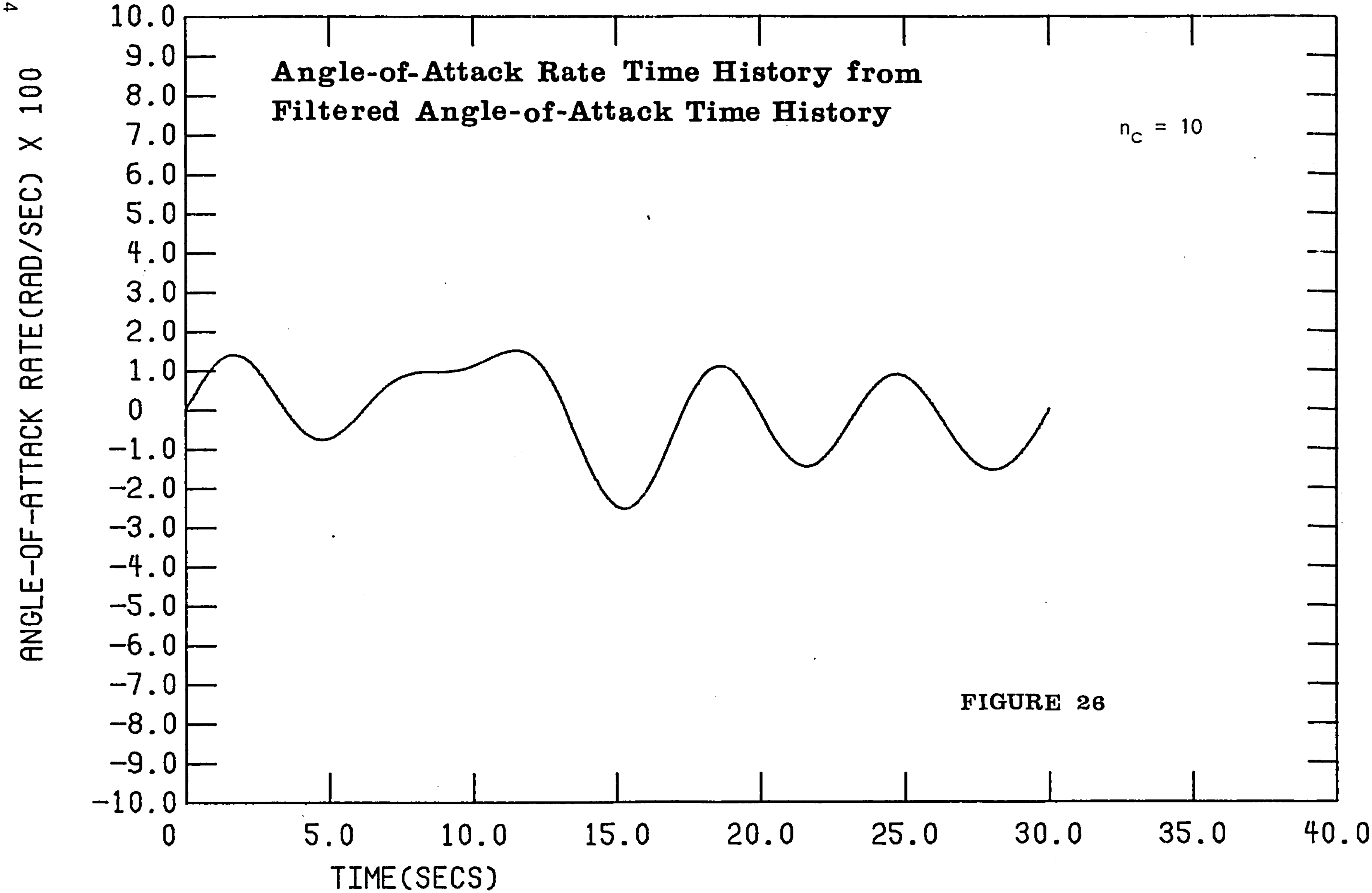

Angle-of-Attack Rate Time History from Filtered Angle-of-Attack Time History
n_c = 10
ANGLE-OF-ATTACK RATE(RAD/SEC) X 100
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
-10.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
TIME(SECS)

FIGURE 26

Comparison of Computed Acceleration Along the Flight Path with that Determined from Accelerometer Indications

The scheme to extract drag and thrust simultaneously from flight data has been found to require accurate indications of the acceleration along the vehicle's flight path in order to yield acceptable results. Usually it is not possible to locate the measuring instrument (accelerometer) precisely at the vehicle's center of gravity, so that it is necessary to correct the instrument's indication for this fact and then to relate the acceleration along the vehicle's x-body axis to the longitudinal acceleration along the flight path.

Accelerometers are generally masses constrained to move along the axis of a tube and centered by springs at either end. The position of the mass relative to the center of a tube is proportional to the acceleration and is measured electrically. When the aircraft accelerates along the flight path, the mass moves aft of the center of the tube. Now, the same effect is produced when the accelerometer is tilted nose up even though there is no acceleration. Thus, it is necessary to subtract a term $g \sin \theta$ from the accelerometer indication to account for this effect.

If the accelerometer is located x feet in front of the c.g., its mass is caused to move forward as a result of the angular rotation of the aircraft by an amount $x\, q^2$. One must therefore add this term to the accelerometer indication. Similarly, if the accelerometer axis is located z feet below the x-body axis then the accelerometer mass is displaced rearward by an amount proportional to $z\, \dot{q}$.

The linear acceleration along the x-body axis in terms of the accelerometer indication location, and angular velocity is therefore

$$a_x = a_{x_{ind}} - g \sin \theta + x\, q^2 - z\, \dot{q}\ . \qquad (42)$$

We desire the acceleration not along the x-body axis but rather along the flight path. We know that for motion in the x-z terrestrial plane

$$a_x = \dot{u} + q\, w \qquad (43)$$

and

$$u = V \cos \alpha \qquad (44)$$

$$w = + \sin \alpha\ , \qquad (45)$$

where V is the velocity of the aircraft along its flight path and u and w are components of this velocity along the principal axes of the aircraft. In terms of (44) and (45)

$$a_x = \dot{V}\cos\alpha - V\dot{\alpha}\sin\alpha + qV\sin\alpha$$

$$= \dot{V}\cos\alpha - V(\dot{\alpha} - q)\sin\alpha \ . \qquad (46)$$

Equating (42) and (46) yields

$$a_{x_{ind}} - g\sin\theta + xq^2 - z\dot{q} = \dot{V}\cos\alpha - V(\dot{\alpha} - q)\sin\alpha \ . \qquad (47)$$

Then solving for $\dot{V}$, one has

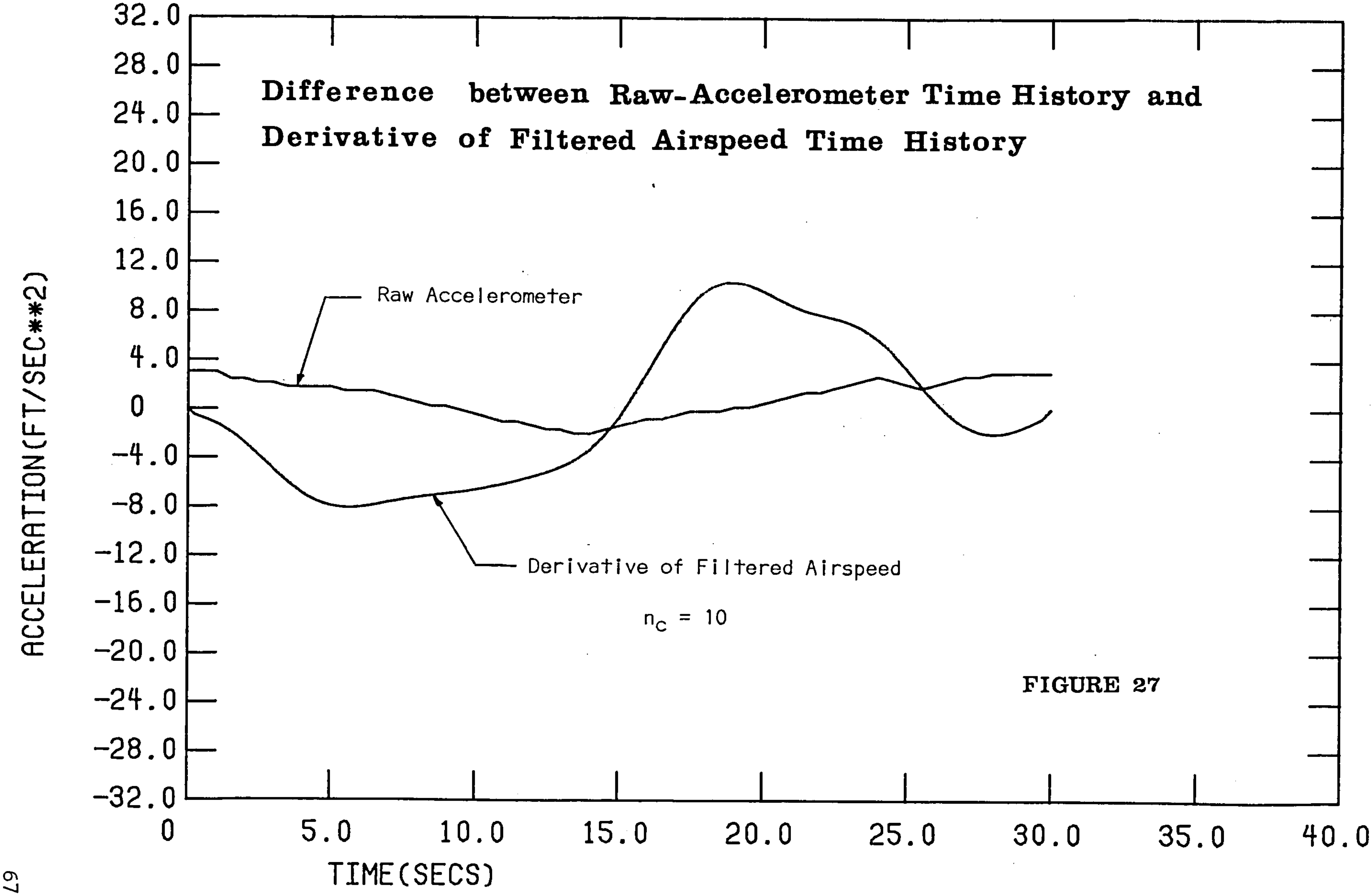
$$\dot{V} = \frac{a_{x_{ind}} - g\sin\theta + xq^2 - z\dot{q}}{\cos\alpha} + V(\dot{\alpha} - q)\tan\alpha \ . \qquad (48)$$

The value given by (48) should now be the same as that obtained by differentiating the variation of true airspeed with time. The differences between a raw accelerometer indication and the derivative of the true airspeed with time for an actual flight record are shown in figure 27.

Of course one does not measure true airspeed directly. An airspeed sensor measures only a pressure difference. This difference is affected by the sensitivity of the pitot and static pressure sources to angle of attack, the disturbance to the free stream pressure at the static pressure source resulting from the presence of the aircraft, the compressibility of the air, and the difference in pneumatic lags of the pitot and static pressure lines. The pneumatic lag also introduces a time delay in the airspeed indication. Since the airspeed indicator is calibrated for standard sea level conditions, any variation in atmospheric temperature will affect the airspeed at a given pressure difference.

The theory of the pitot-static tube assumes that the air is brought to rest at the pitot pressure source adiabatically and that the static source senses the pressure in the free stream (i.e., away from the airplane). With these assumptions, it is easy to show that the true flow velocity is related to the measured pressures by

$$V = \sqrt{\frac{2\gamma RT}{(\gamma-1)}\left\{\left[\frac{q_c}{P} + 1\right]^{\frac{\gamma-1}{\gamma}} - 1\right\}} \ , \qquad (49)$$



Difference between Raw-Accelerometer Time History and
Derivative of Filtered Airspeed Time History
Raw Accelerometer
Derivative of Filtered Airspeed
$n_c = 10$
ACCELERATION(FT/SEC**2)
32.0
28.0
24.0
20.0
16.0
12.0
8.0
4.0
0
-4.0
-8.0
-12.0
-16.0
-20.0
-24.0
-28.0
-32.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
TIME(SECS)

FIGURE 27

where P is the altitude pressure, q_c is the difference between the pitot and static pressures, T is the local free stream absolute temperature, R is the gas constant for air and γ is the ratio of specific heats of air (1.4 for diatomic gases at normal temperatures). The P indication for use in this equation comes from the static pressure source of the pitot-static tube and the T indication from a temperature measuring device. Since one cannot measure the local free stream temperature readily while the vehicle is in motion, temperature sensing devices most often measure the stagnation temperature, T_s, which is related to the free stream temperature by

$$T = \frac{T_s}{\left[\frac{q_c}{P} + 1\right]^{\frac{\gamma-1}{\gamma}}} . \qquad (50)$$

In terms of the stagnation temperature, the true airspeed is given by

$$V = \sqrt{\frac{2\gamma RT_s}{(\gamma-1)} \left\{1 - \left[\frac{q_c}{P} + 1\right]^{\frac{1-\gamma}{\gamma}}\right\}} . \qquad (51)$$

Unfortunately, it is usually not possible to locate the static pressure source on an airplane in a region where the static pressure is the same as the free stream value. Hence, the static pressure indication is in error by an amount ΔP. This "position error" so called is felt in both the altitude and q_c indications. If we call P' the measured altitude pressure and q_c' the measured pressure difference then because

$$q_c' + P' = q_c + P = P_s , \qquad (52)$$

and

$$P = P' - \Delta P ,$$

one can write

$$\frac{q_c + P}{P} = \frac{q_c' + P'}{P' - \Delta P} = \frac{1 + \frac{P'}{q_c'}}{\frac{P'}{q_c'} - \frac{\Delta P}{q_c'}} , \qquad (53)$$

in terms of the measured values and the static source position error which is usually determined by flight calibration and is expressed in terms of $\frac{\Delta P}{q_c'}$ as a function of q_c' or indicated airspeed. With this effect included the expression for true airspeed becomes

$$V = \sqrt{\frac{2\gamma R T_s}{(\gamma-1)} \left\{ 1 - \left[\frac{1 + \frac{P'}{q_c'}}{\frac{P'}{q_c'} - \frac{\Delta P}{q_c'}} \right]^{\frac{1-\gamma}{\gamma}} \right\}} . \qquad (54)$$

Fortunately, modern pitot-static tubes are relatively insensitive to changes in angle of attack so that the q_c' and P' indications do not depend on the tube's inclination to the airstream over the useful range of aircraft angles of attack. The position error, however, does depend upon angle of attack and aircraft configuration. At steady speed and constant weight the position error can be related, as it commonly is, to q_c' or indicated airspeed, but during maneuvers it may be necessary to employ a correlation with angle of attack instead. Whether this is necessary must be determined by calibration. If it is, one must then determine true airspeed and true angle of attack iteratively.

The compressibility correction mentioned earlier is already included in (54). Conventional airspeed indicators, it may be noted, are simply mechanizations of the equation

$$V_i = \sqrt{\frac{2q_c}{\rho_o}} , \qquad (55)$$

where ρ_o is the mass density of the air at standard sea level conditions. If the airspeed indicator calibration includes compressibility effects, equation (49) with standard sea level pressure and temperature is mechanized.

If pneumatic signals transmitted through the pitot and static lines travel at different speeds* then the q_c' and P' values will be in error. In most aircraft with pressure sensors located in the cabin area the pneumatic lines are long enough that their response characteristics can be considered analogous to those of resistance-capacitance electrical circuits. The "resistance" is proportional to length/(diameter)^4 while the "capacitance" is proportional to system volume. Since the static system includes more instruments than the pitot system and, frequently, larger volumes, the static line diameter must be larger than the pitot or a restriction must be placed in the pitot line in order to keep the response times equal. Even if the line responses are equal, $V(t)$ will lag the correct value by a time which is proportional to $\dot{h}$ and $\dot{V}$.

A procedure by which equation (54) may be modified to account for lag is the following: We begin by recalling that the equation describing the axial motion of a compressible fluid in a tube is

* Speed is used here in the sense of the time or rate at which the transducer indication responds to changes in the aircraft's pressure field. It does not refer to the speed at which acoustic signals are propagated through pneumatic lines.

$$\rho \frac{\partial u}{\partial t} + \rho u \frac{\partial u}{\partial x} = - \frac{\partial P}{\partial x} + \frac{\partial}{\partial x} (\mu \frac{\partial u}{\partial x}) + \frac{1}{r} \frac{\partial}{\partial r} (\mu r \frac{\partial u}{\partial r}) \ . \tag{56}$$

Here u is the fluid velocity, μ the coefficient of viscosity, x the axial distance and r the radial distance. In conjunction with the foregoing, one may also write the equation describing the conservation of matter

$$\frac{\partial \rho}{\partial t} + \rho \frac{\partial u}{\partial x} + u \frac{\partial \rho}{\partial x} = 0 \ . \tag{57}$$

Examination of the first equation reveals it to be a mixed parabolic and elliptic-type non-linear partial differential equation. As such there are at least two characteristic propagational velocities by which the fluid adjusts itself to changing boundary conditions. One is infinite. The other, as we may discover by temporarily ignoring the effects of fluid viscosity, is approximately what we understand as the speed of sound. This characteristic information transfer mechanism is always present. The importance of the infinite propagational velocity in determining the gross behavior of the fluid motion depends, of course, on the relative importance of the viscous stress terms in the equation.

The reason for relating the foregoing bit of mathematical wisdom is that we cannot solve the equation for typical boundary conditions without prodigious effort and must therefore resort to some gross approximations. Under these conditions it is desirable to extract as much information as possible about the character of the solution of the general equation in order to ascertain the reasonableness of the approximate solutions.

Suppose we model the aircraft static or total pressure systems as a very long straight tube terminated on the instrument end by a finite volume. Let us assume that the flow through this tube is always <u>isothermal</u>, i.e., it is slow enough that heat can be transferred to and from the tube walls as a fluid particle traverses the length of the tube. The pressure in the volume at the instrument end of the tube is then directly proportional to the mass flux through the tube to the volume. Depending upon the ratio of the pressures across the tube and the tube length,

$$\dot{m} \sim P_\infty \text{ for short tubes and } P_\infty/P_{instrument} \geq 2 \tag{58}$$

$$\dot{m} \sim \sqrt{P_\infty - P_{instrument}} \text{ for short-to-intermediate length tubes and } P_\infty/P_{instrument} < 2 \tag{59}$$

$$\dot{m} \sim (P_\infty - P_{instrument}) \text{ for very long tubes.} \tag{60}$$

These results can all be obtained from the foregoing equations and the equation of state, $P = \rho RT$, after some manipulation. The first two results are obtained assuming $\mu = 0$. The second assumes in addition that the velocity is slow enough that $\rho \approx$ constant. The third result is obtained by assuming that the viscous stresses are sufficiently important that the terms on the left side of the equation are small by comparison. This of course is only true in very long tubes (L/D > 100). The instantaneous rate of change of pressure in the instrument volume is then

$$\dot{P}_{instrument} = (P_\infty - P_{instrument}) \frac{1}{\tau} \tag{61}$$

where τ is a proportionality constant having the units of time. Note that in general both P_∞ and $P_{instrument}$ may change with time. From this expression it is easy to show that in terms of the instrument reading

$$P_\infty = P_{instrument} + \tau \dot{P}_{instrument} \, . \tag{62}$$

τ is determined empirically by allowing P_∞ to change instantaneously from one value to another. For this case we may easily write

$$\frac{dP_{instrument}}{(P_\infty - P_{instrument})} = \frac{dt}{\tau} , \tag{63}$$

whose solution is

$$- \ell n \, (P_\infty - P_{instrument}) = t/\tau + c \, . \tag{64}$$

the boundary conditions are

$$\text{when } \; t = 0, \; P_{instrument} = P_{instrument_o}$$

$$\text{when } \; t \to \infty, \; P_{instrument} \to P_\infty \, ,$$

thus

$$P_{instrument} = P_{instrument_o} \, e^{-t/\tau} + P_\infty(1 - e^{-t/\tau}). \tag{65}$$

By measuring P_∞, $P_{instrument}$, $P_{instrument_o}$, and time, τ is readily determined.

The above analysis assumes that a change in P_∞ is instantly communicated to the gas in the instrument volume. Because acoustic waves are the dominant communication mechanism when the fluid is essentially at rest, changes in P_∞ are felt in the instrument volume some λ seconds later with the arrival of the acoustic wave generated by the change in P_∞. λ can also be measured experimentally. With this effect included the air pressures at the pitot-static opening in terms of the instrument readings are represented by

$$P_\infty(t) = P_{\text{instrument}}(t + \lambda) + \tau \dot{P}_{\text{instrument}}(t + \lambda) \tag{66}$$

Note that P_∞ at t seconds is given in terms of the instrument reading and its instantaneous rate of change at $(t + \lambda)$ seconds.

If now q_c'' is the lag-free value of the impact pressure,
P'' is the lag-free value of the static pressure,
P_s'' is the lag-free value of the stagnation pressure,
τ_1, λ_1 / τ_2, λ_2 are, respectively, the measured time constants of the stagnation and static systems,

then

$$q_c''(t) = P_s'' - P_s'(t + \lambda_1) + \tau_1 \dot{P}_s'(t + \lambda_1) - P'(t + \lambda_2)$$

$$- \tau_2 \dot{P}'(t + \lambda_2). \tag{67}$$

$$P''(t) = P'(t + \lambda_2) + \tau_2 \dot{P}'(t + \lambda_2) \tag{68}$$

These values of q_c'' and P'' should be substituted for q_c' and P' in equation (54) to obtain a lag-free value of V(t).

Typical values for the ATLIT flight test system are

$\tau_1 = 0.040$ seconds

$\lambda_1 = 0.025$ seconds

$\tau_2 = 0.150$ seconds

$\lambda_2 = 0.033$ seconds

$\dot{V}_{max} = \pm 8$ ft/sec^2 @ 120 ft/sec

$$P_s = 2133 \text{ psf @ S.L. and } 120 \text{ ft/sec}$$

$$P = 2116 \text{ psf @ S.L.}$$

$$\dot{h} = 35 \text{ ft/sec}$$

With these numbers

$$q_c'' = 2133 - .040\ (2.358976) - 2116 + 0.15\ (2.1635)$$

$$= 2133 - .094359 - 2116 - .324525 = 17.23 \text{ psf while } q_c' = 17 \text{ psf.}$$

the error in q_c' is therefore 0.23 psf or 1.35% while the error in P is 0.0153%. Thus it appears that if one seeks to minimize data errors a lag correction in the airspeed is required.

When all necessary corrections have been made to the pressure indications, one can create V(t) by use of equation (54). These data can then be submitted to the Fourier analysis procedure to smooth V(t) and to find $\dot{V}(t)$. As noted above, this value should agree closely with that determined from equation (48) if the totality of the data are self-consistent. Observe, however, that the latter computation requires that one input five separate measurements plus the derivatives of two, while the former only requires three measurements plus some calibration data. Thus, it is to be expected that $\dot{V}$ computed from pressure and temperature data will generally be the more reliable value.

Correction of Angle of Attack Indications

In addition to factors such as transducer linearity, gain, and bias, the angle of attack indication is affected by the presence of the carrying aircraft and by its rotation. It will be recognized that for an angle of attack vane located x feet ahead of the c.g. an incremental angle,

$$\Delta\alpha = \tan^{-1}\left(\frac{xq}{V}\right), \tag{69}$$

must be subtracted from the transducer indication to account for vehicle rotation. In addition, there is usually a relationship of the type

$$\alpha_{true} = C_1\ \alpha_{indicated} + C_2\ , \tag{70}$$

between the angle of attack measured in the neighborhood of the aircraft and the true (i.e., at infinity) angle of attack. The values of C_1 and C_2 depend upon the location of the vane relative to the aircraft and the geometry of the aircraft. They are therefore almost always found from flight calibration tests since the flow field about complex shapes such as complete aircraft is almost impossible to determine analytically. Assuming that these coefficients are known, one may write the expression for true angle of attack as

$$\alpha_{true} = C_1 \left(\alpha_{indicated} - \tan^{-1} \left(\frac{xq}{V} \right) \right) + C_2 \ . \tag{71}$$

Note that the value of V used in (71) should be that obtained from (54). One may then smooth $\alpha_{true}(t)$ and compute the derivative, $\dot{\alpha}(t)$, by the Fourier analysis procedure.

Determination of $\rho(t)$

Equation (6) requires as an input $\rho(t)$. This is readily determined from

$$\rho = \frac{(P' - \Delta P)}{RT_s} \left[\frac{1 + \frac{P'}{q_c'}}{\frac{P'}{q_c} - \frac{\Delta P}{q_c'}} \right]^{\frac{\gamma-1}{\gamma}} \ . \tag{72}$$

If the altitude pressure transducer is calibrated in feet, then the appropriate pressure versus altitude function must be employed to convert the indications to pressure values.

The density values may also require smoothing before the data can be inserted into (10).

Conditioning of Other Data Inputs to the Drag and Power Extraction Method

In addition to the velocity, angle of attack, and atmospheric density, equations (10) require $W(t)$ and $\theta(t)$ as inputs. Fortunately, for the maneuvers of interest W changes so little that it can be taken to be constant or at most varying linearly during a maneuver. Usually θ requires no corrections beyond the instrument calibration if the erection mechanism is disabled during the maneuver. Since the indication is sampled and since there may be electrical, airframe, and turbulence-induced noise, smoothing may still be necessary. This is also true for the pitch rate indication, q, which is used in the C_L computation and the α and a_x corrections.

More General Power and Drag Models

In a normally-aspirated engine the manifold pressure and hence the power output for a given throttle setting will usually vary directly with the atmospheric density. Thus, if the maneuver to provide data for the power and drag extraction process involves a change in altitude, there will be a change in power at a given speed corresponding to the change in ρ even if the pilot does not change his throttle setting or RPM. To account for this we need to multiply the expression for power by (Ref. 8)

$$\frac{\rho_{ref}/\rho_o - 0.165}{\rho/\rho_o - 0.165}, \tag{73}$$

where ρ_o is the standard sea-level value of ρ and ρ_{ref} is the value of ρ at the beginning of the maneuver.

The parabolic form of the speed-power relation used in equation (6) is obviously satisfactory over small differences in speed and should represent the thrust horsepower of fixed-pitch propellers reasonably well over most of the aircraft's speed envelope. The higher efficiency levels provided by a constant speed propeller at the lower speeds, however, makes it necessary to employ a higher order polynomial or other function having additional degrees of freedom (coefficients) to represent the thrust horsepower adequately over a wide speed range. Variants of one such function were chosen for further study:

$$P = P_1 + \frac{P_2}{V^{1/2}} + P_3V + P_4V^2 + P_5V^3 \tag{74}$$

These are shown in Table IIIa.

One will note also that the drag expression is really satisfactory only if α is measured from zero lift. Since the angle reference for flight data is often quite arbitrary, it is difficult to establish the angle for zero lift *a priori*. To accommodate an arbitrary reference, i.e., to replace α by $\alpha - \alpha_o$ in equation (5), requires that the representation for C_D contain all powers of α through 6. We choose, however, to investigate only three variants of the following form which are shown in Table IIIa:

$$C_D = C_{D_0} + C_{D_1}\alpha + C_{D_2}\alpha^2 + C_{D_3}\alpha^3 + C_{D_4}\alpha^6. \tag{75}$$

POWER AND DRAG COEFFICIENT MODELS

(1) $P = P_0$

(2) $P = P_0 + P_1/V^{\frac{1}{2}}$

(3) $P = P_0 + P_2V$

(4) $P = P_0 + P_1/V^{\frac{1}{2}} + P_2V$

(5) $P = P_0 + P_2V + P_3V^2$

(6) $P = P_0 + P_1/V^{\frac{1}{2}} + P_2V + P_3V^2$

(7) $P = P_0 + P_2V + P_3V^2 + P_4V^3$

(8) $P = P_0 + P_1/V^{\frac{1}{2}} + P_2V + P_3V^2 + P_4V^3$

(1) $C_D = C_{D_0} + C_{D_2}\alpha^2$

(2) $C_D = C_{D_0} + C_{D_2}\alpha^2 + C_{D_4}\alpha^6$

(3) $C_D = C_{D_0} + C_{D_1}\alpha + C_{D_2}\alpha^2 + C_{D_3}\alpha^3 + C_{D_4}\alpha^6$

TABLE III-a

RECOVERED RESULTS WITH VARIOUS MODELS

NOISE-FREE

Model	C_{D_0}	C_{D_1}	C_{D_2}	C_{D_3}	C_{D_4}
1-1	0.025010125		4.189265490		
1-2	0.027715936		1.840217248		2218.55390095
1-3	0.193206335	-5.536545497	55.990804759	-190.595121623	6365.50170689
2-1	0.041300870		3.314574182		
2-2	0.041723838		1.369905822		1934.85508995
2-3	0.032149511	0.256910853	1.083170012	-6.930257732	2636.82627991
3-1	0.052512561		3.397605844		
3-2	0.053437421		1.223230343		2098.00447603
3-3	0.104358253	-1.981087659	19.854161098	-61.409698497	3230.30712823
4-1	-0.007815849		3.258242555		
4-2	0.047922733		1.291498595		2019.91892771
4-3	0.043314322	0.136168241	0.321188551	2.111106052	2052.79056339
5-1	-0.140402432		3.358351516		
5-2	0.035099999		1.289155014		2030.80086563
5-3	0.035099999	9.0×10^{-10}	1.289155007	1.9×10^{-8}	2030.80086599
6-1	0.851148482		2.718117586		
6-2	0.019408889		1.334792323		1977.60389095
6-3	0.035100000	-1.8×10^{-9}	1.289155029	-4.1×10^{-8}	2030.80086584
7-1	7.097803213		-2.479854764		
7-2	0.035099997		1.289155018		2030.80086585
7-3	0.035099849	3.35×10^{-7}	1.289152488	6.77×10^{-6}	2030.80087789
8-1	-6.419749124		8.756565254		
8-2	0.035099983		1.289155030		2030.80086168
8-3	0.035100002	-9.7×10^{-8}	1.289155975	-3.4×10^{-6}	2030.80094408

TABLE III-b

RECOVERED RESULTS WITH VARIOUS MODELS

NOISE-FREE

Model	P_0	P_1	P_2	P_3	P_4
1-1	172998.85079				
1-2	157655.47027				
1-3	127308.04933				
2-1	371192.98528	-2517765.9582			
2-2	334247.89394	-2218423.0065			
2-3	357094.45551	-2438740.6304			
3-1	69229.86429		701.819787		
3-2	60885.13175		660.124537		
3-3	84876.34799		410.940847		
4-1	1497321.54687	-11640184.7950	-2759.609819		
4-2	190924.27594	-1057400.1205	347.238354		
4-3	208960.25776	-1218458.9820	321.099439		
5-1	-272355.27164		5603.220066	-22.8622086	
5-2	28735.71416		1126.607146	-2.1696429	
5-3	28735.71414		1126.607143	-2.1696428	
6-1	11652672.75547	-77120339.5902	-52677.486678	142.0135471	
6-2	18.26865	-1.35×10^{-10}	1536.512079	-4.0512608	
6-3	28735.71427	-1.71×10^{-5}	1126.607143	-2.1696429	
7-1	-1038549.98441		20472.763195	-119.6962928	1.496383665
7-2	28735.71431		1126.607142	-2.1696429	-5.35×10^{-10}
7-3	28735.71429		1126.607056	-2.1696417	-2.80×10^{-8}
8-1	25533616.98900	-1.6×10^{8}	-133353.421168	433.4378086	-1.726554460
8-2	28735.71427	4.5×10^{-7}	1126.607134	-2.1696427	-3.2×10^{-9}
8-3	28735.71633	3.2×10^{-4}	1126.607117	-2.1696428	-2.2×10^{-10}

TABLE III-c

The three drag expressions and the eight power expressions give us a total of 24 analytical models with which we can attempt to fit experimental data. It will probably be necessary to employ all of the models or at least this number of models until experience with data for a particular aircraft permits one to discard those models which do not apply. The results obtained by fitting all these models to the theoretical data of figure 24 are shown in Table IIIb. If one compares the results for case 5-2 with figures 22 and 23, one will see immediately the very good agreement which the extraction method can provide.

One may also ask why should one also employ a model which is simply a reduced form of a more general model? The answer lies in the extreme sensitivity of the coefficient solutions to small errors in the data. Generally, the more general models are more sensitive to these errors so that under these circumstances a simpler form may yield reasonable results whereas the more general form may yield nonsense numbers. It should be recalled that since any power, if accompanied by a suitable drag, will solve the equation of motion, these physically absurd numbers are legitimate mathematical solutions. How then does one determine whether the solutions obtained are reasonable?

The first means of assessing the reasonableness of the solution set is to use them along with the experimental data in the proper form of equation (8). For 300 data points a value of $S < 10^{-13}$ generally indicates coefficient values within 1% or so of the correct values. (For the exact coefficient values, $S < 10^{-21}$.) Coefficient values in error by 5%, for example, may still be of interest, but with errors of this size it may become difficult to identify the best model and coefficient set merely by checking to see which model gives the smallest value of S. S_{min} will now be on the order of 10^{-6} for 300 points, but the coefficient set for S_{min} may give absurd powers and drags. For this reason it is desirable to add a second constraint which an acceptable model and coefficient set must satisfy: The horsepower for any speed must be positive and less than Y (Y = 400 for ATLIT); C_D must be positive and less than Z (Z = 0.12 for ATLIT) for any α. One frequently finds that with noisy data very few of the 24 coefficient sets satisfy this second constraint.

Effect of Data Errors on Coefficient Extractions

We have noted above that by operating on exact data it is possible for the coefficient extraction procedure to recover the values of the coefficients in the power and drag polynomials to six significant figures. We have also noted that this procedure is quite sensitive to data inaccuracies. In order to place some quantitative bound on this sensitivity, the exact input data were artificially degraded and resubmitted to the coefficient extraction procedure to determine how the coefficient values were altered. Two types of degradation were employed: random noise and constant bias. For the random noise a random number generator was employed at each 0.1 seconds of each trace and the output scaled so as to be 1% of the maximum value of the function, e.g., 1% of the maximum value of V(t) during the maneuver. These scaled noise values were then added to the exact function values to obtain the degraded data. For this experiment, all data which would normally be measured in flight were degraded. This was too noisy. No coefficient set would satisfy the reasonableness criterion.

The data were then filtered with $n_c = 10$. For comparison, the filtered and unfiltered data are shown in figure 28. Note that the filtering routine does a very good job of removing the high frequency noise. Note also that employing a random number generator in the manner indicated means that the random noise usually has a non-zero mean (bias error). Despite the filtering, the coefficient extraction routine would not yield reasonable results. It also failed for $n_c = 6$ and $n_c = 4$. The magnitude of the random contributions was then reduced from 1% of maximum signal to 0.1%. With no filtering the extraction procedure again failed. However, with filtering ($n_c = 6$), two models gave reasonable results. These were

$$P = 371959.0785 - \frac{2702612.22}{V^{1/2}}$$

$$C_D = .00676 + 1.52053\alpha - 18.77305\alpha^2 + 87.8915\alpha^3 - 1295.7649\alpha^6$$

and

$$P = 16594.89367 + 1308.3421V - 3.024425V^2$$

$$C_D = .027766 + 1.345608\alpha^2 + 1985.1565\alpha^6.$$

The second of these (see also Table IV) is the correct functional form. Although the coefficient values for this form individually are in error by as much as 73%, the recovered power, for example, is only in error by 6.3% at 200 ft/sec. The errors in drag are even smaller.

RECOVERED RESULTS WITH RESIDUAL NOISE

1/10 of 1% Random Noise
$n_c = 6$

Model 2-3

$P_0 = 371959.0785$

$P_1 = -2702612.2226$

$C_{D_0} = 0.006761$

$C_{D_1} = 1.520529$

$C_{D_2} = -18.773051$

$C_{D_3} = 87.891504$

$C_{D_4} = -1295.764876$

Model 5-2

$P_0 = 16594.89367$

$P_2 = 1308.34213$

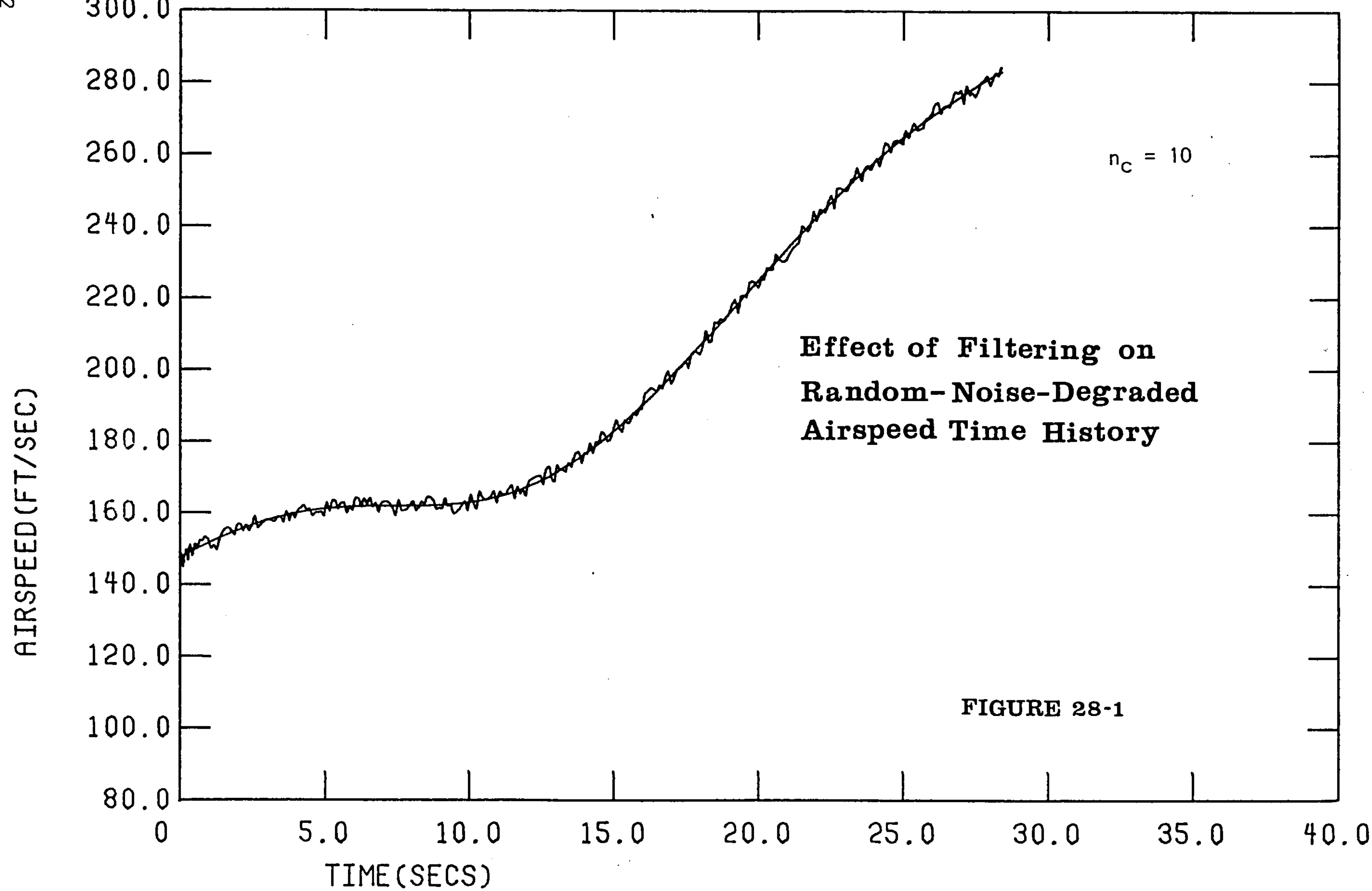
$P_3 = -3.02442$

$C_{D_0} = 0.02777$

$C_{D_2} = 1.34561$

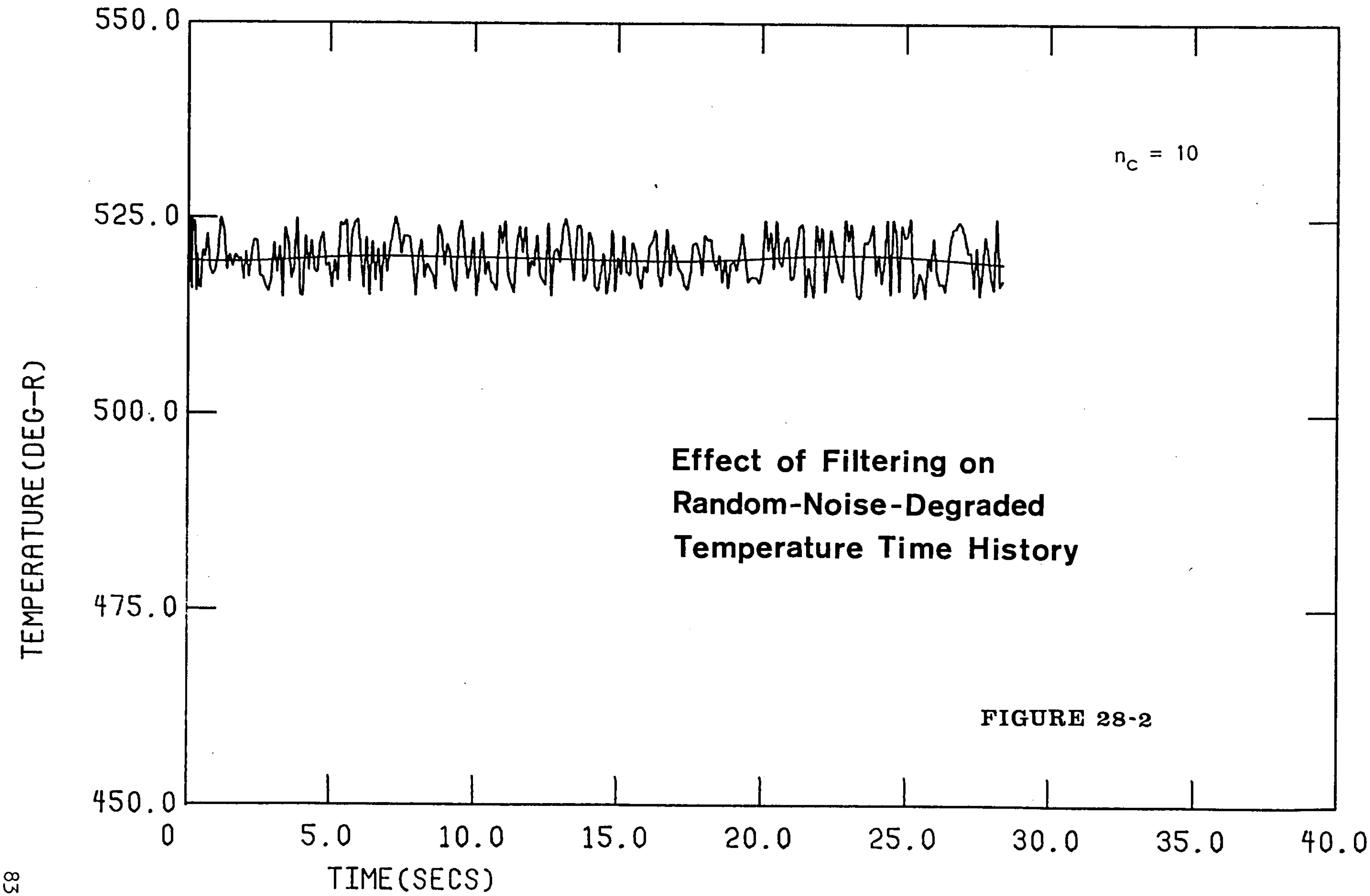
$C_{D_4} = 1985.15652$

TABLE IV



Effect of Filtering on Random-Noise-Degraded Airspeed Time History

FIGURE 28-1



Effect of Filtering on Random-Noise-Degraded Temperature Time History

FIGURE 28-2

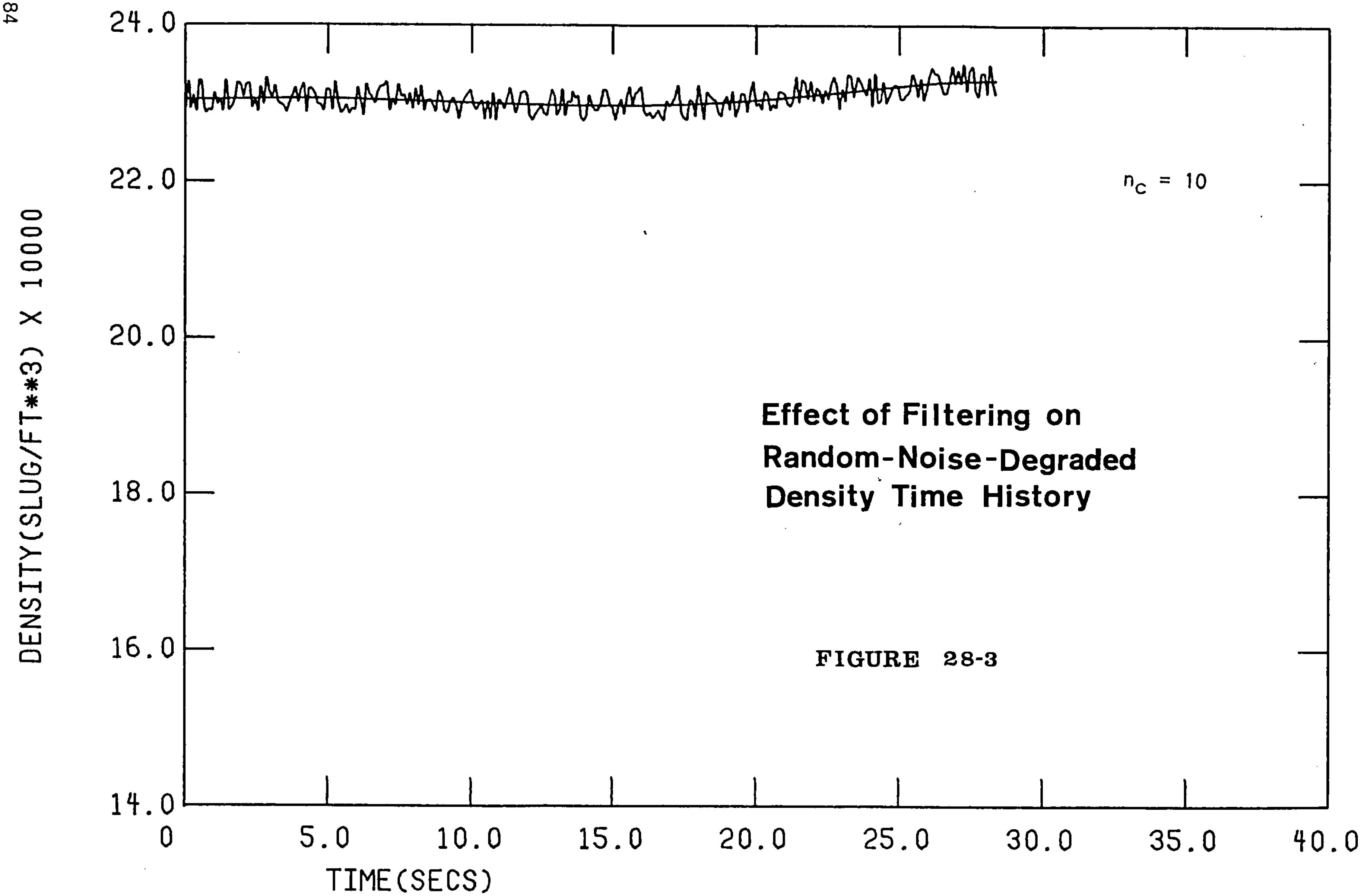
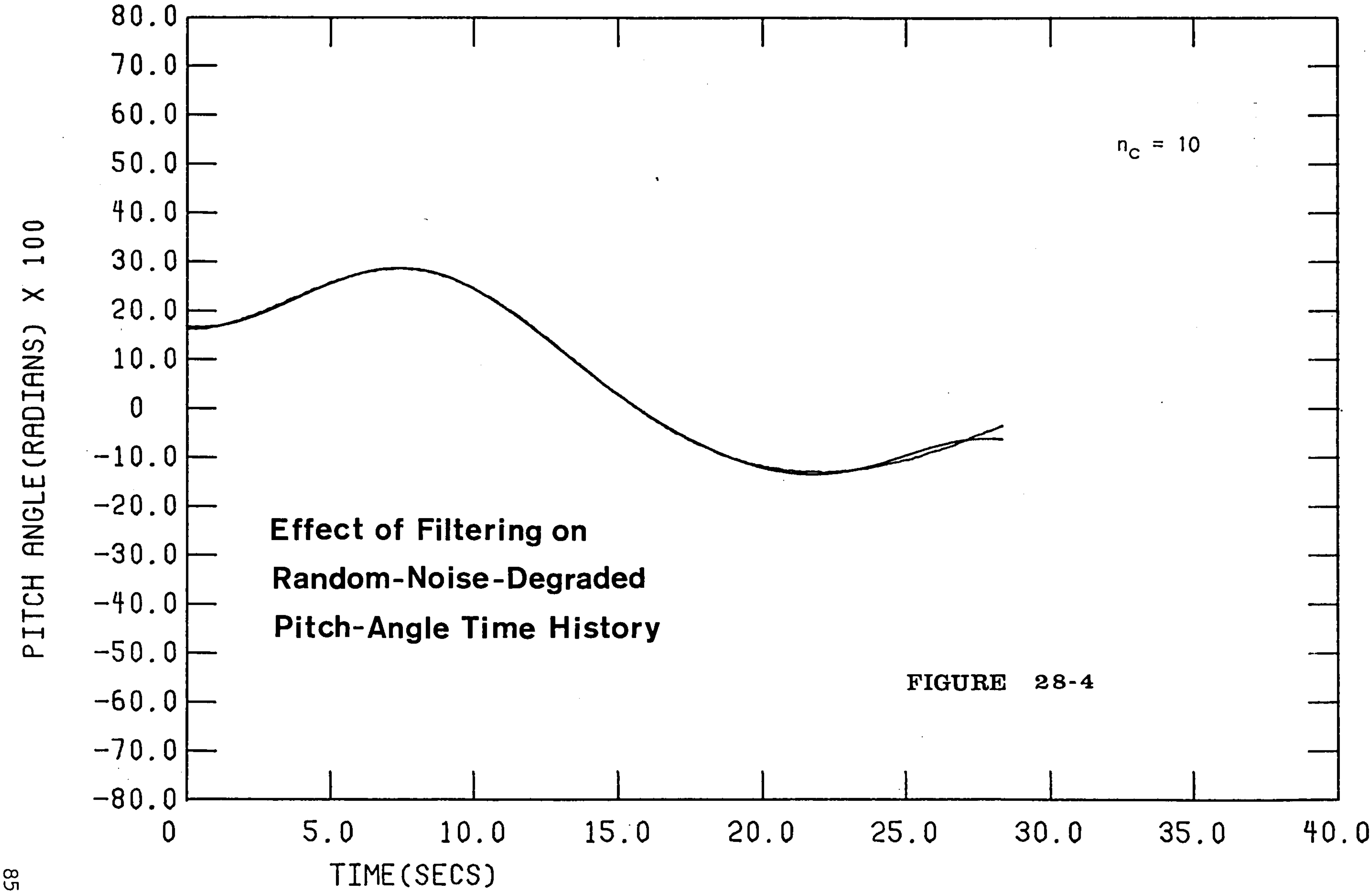

24.0
22.0
20.0
18.0
16.0
14.0
DENSITY(SLUG/FT**3) X 10000
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
TIME(SECS)
n_c = 10
Effect of Filtering on
Random-Noise-Degraded
Density Time History

FIGURE 28-3



Effect of Filtering on Random-Noise-Degraded Pitch-Angle Time History

FIGURE 28-4

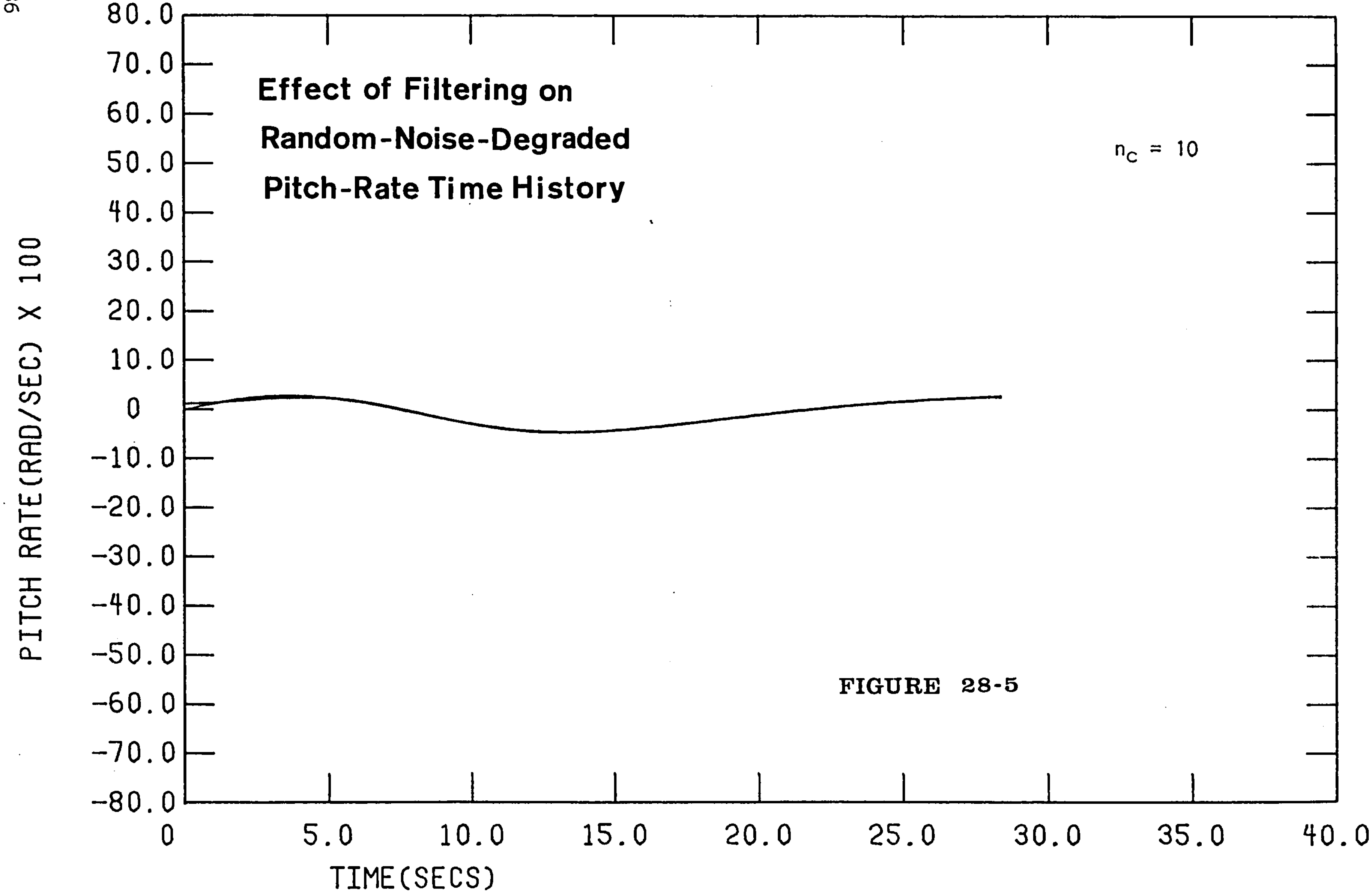
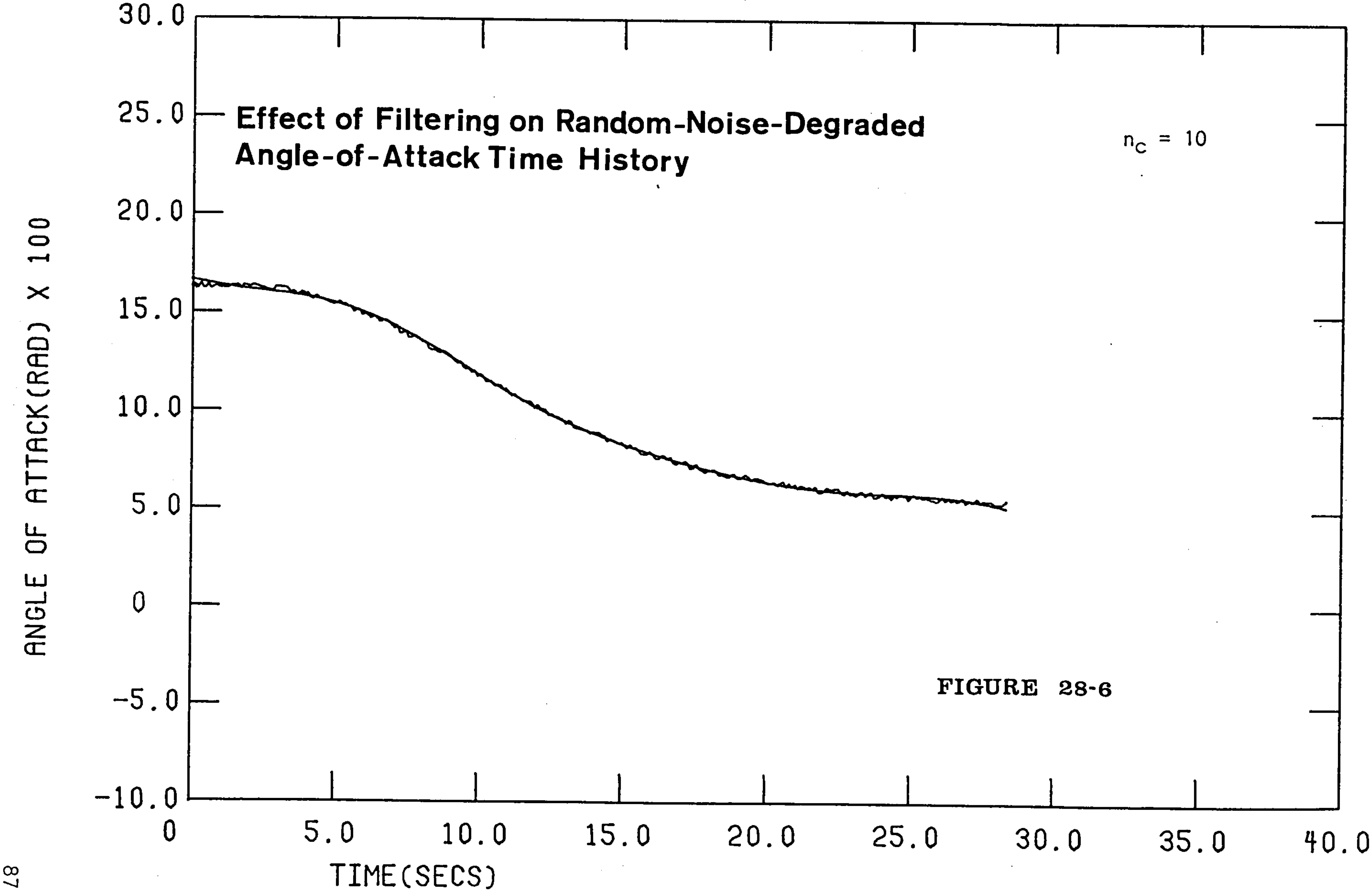
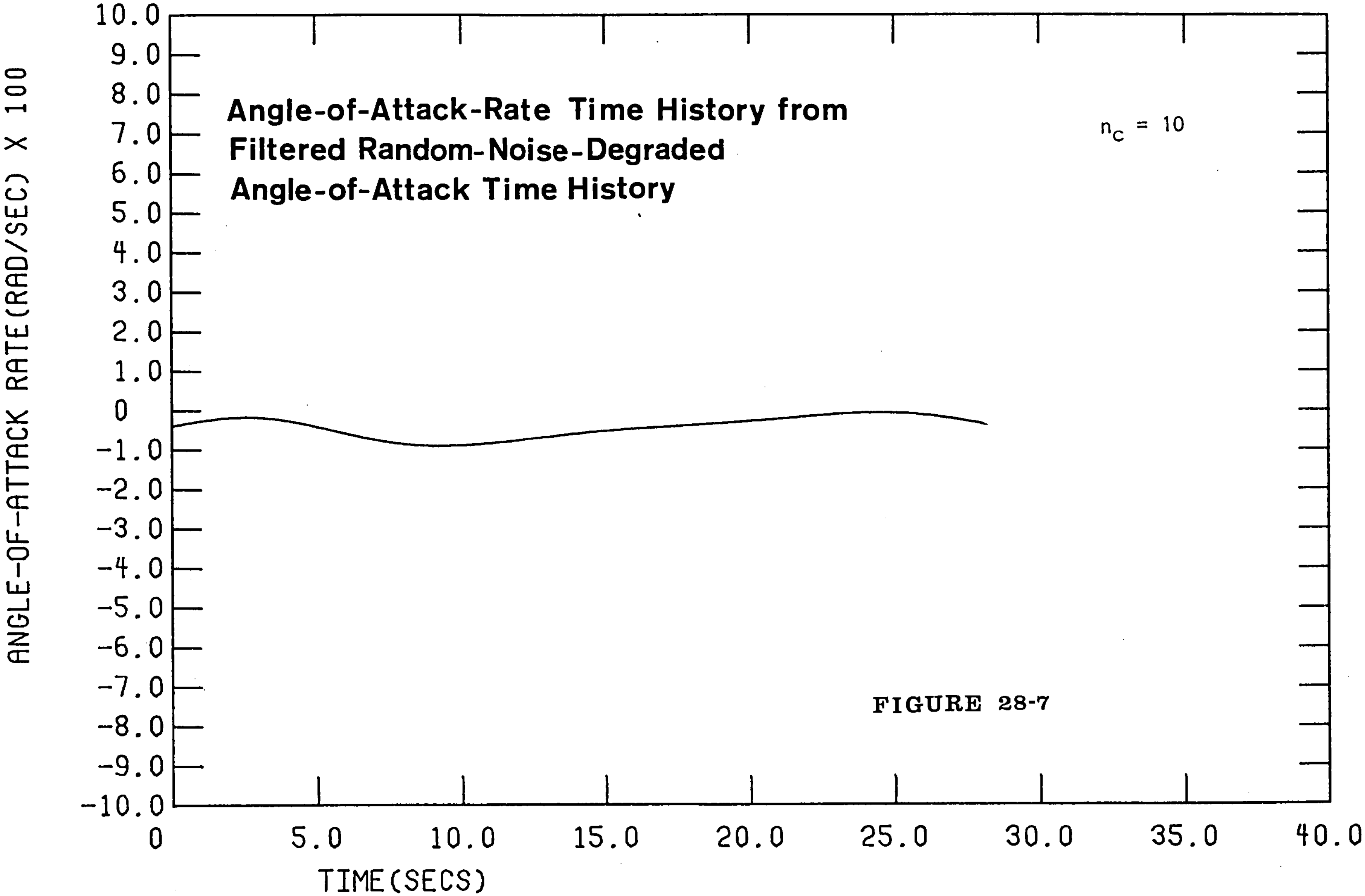

Effect of Filtering on
Random-Noise-Degraded
Pitch-Rate Time History
n_c = 10
PITCH RATE(RAD/SEC) X 100
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
TIME(SECS)

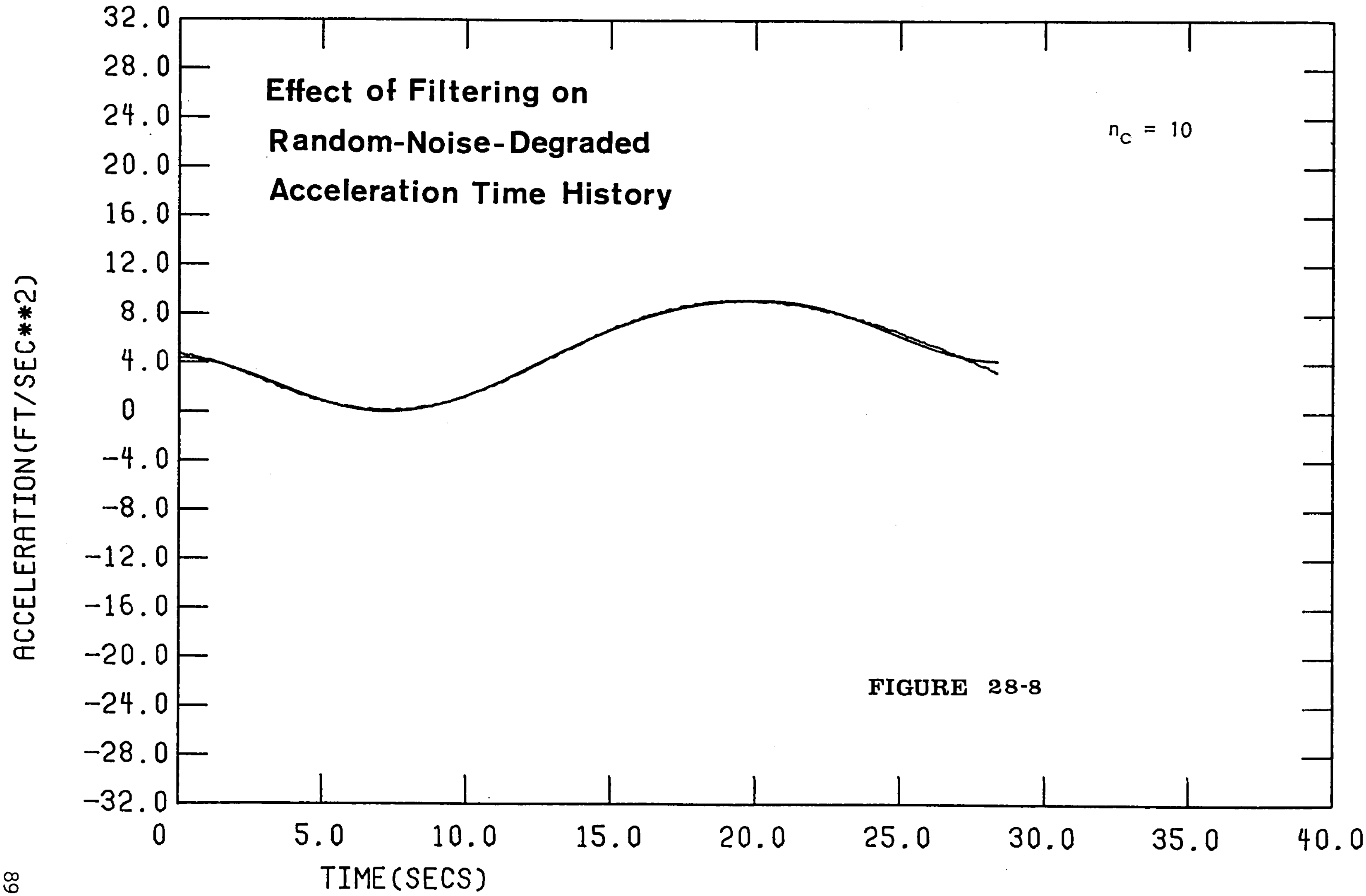
FIGURE 28-5


Effect of Filtering on Random-Noise-Degraded Angle-of-Attack Time History
n_c = 10
FIGURE 28-6
ANGLE OF ATTACK(RAD) X 100
30.0
25.0
20.0
15.0
10.0
5.0
0
-5.0
-10.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
TIME(SECS)



Angle-of-Attack-Rate Time History from Filtered Random-Noise-Degraded Angle-of-Attack Time History

FIGURE 28-7



Effect of Filtering on
Random-Noise-Degraded
Acceleration Time History
n_c = 10
ACCELERATION(FT/SEC**2)
32.0
28.0
24.0
20.0
16.0
12.0
8.0
4.0
0
-4.0
-8.0
-12.0
-16.0
-20.0
-24.0
-28.0
-32.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
TIME(SECS)

FIGURE 28-8

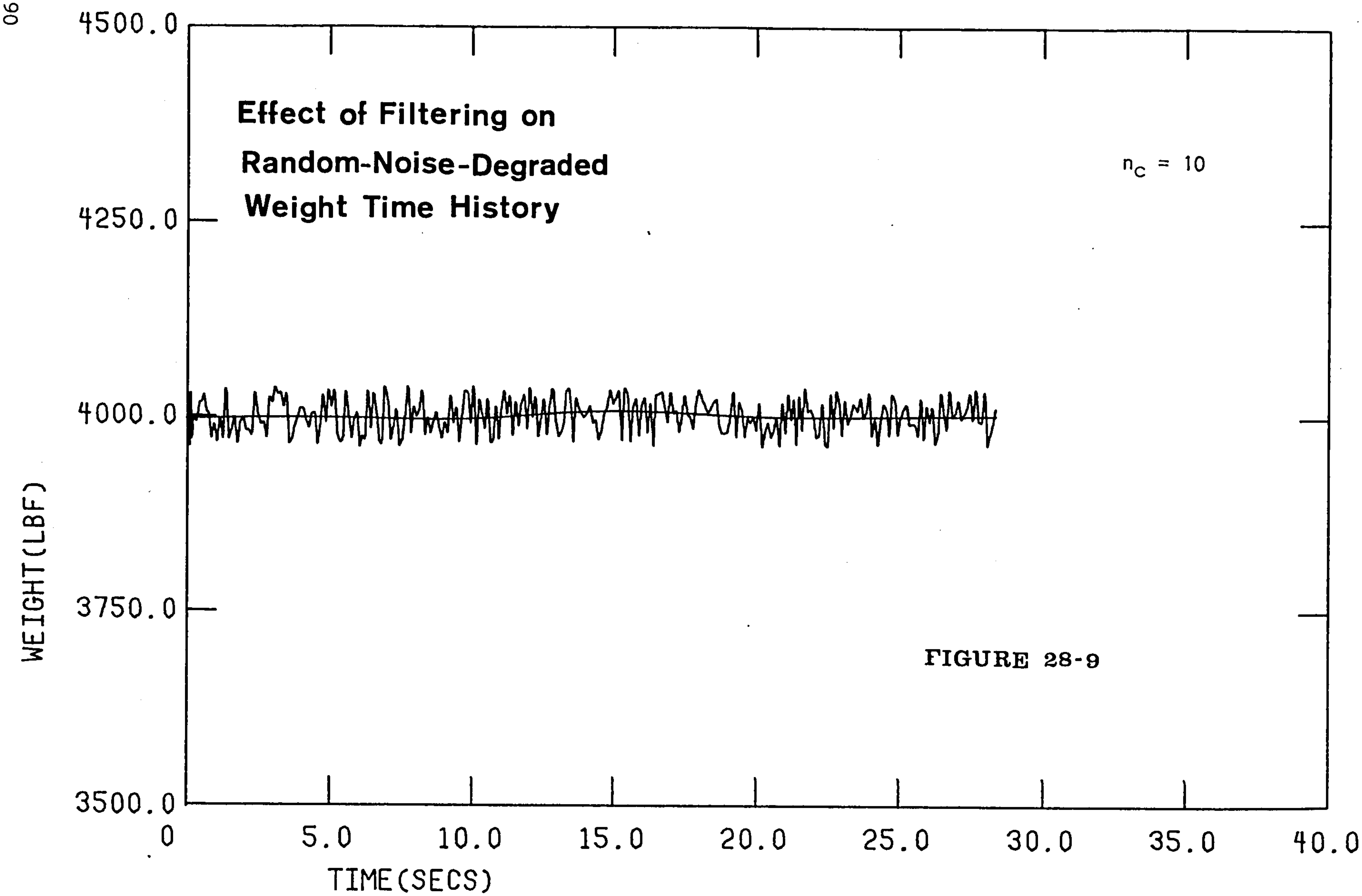

Effect of Filtering on
Random-Noise-Degraded
Weight Time History
n_C = 10
4500.0
4250.0
4000.0
3750.0
3500.0
WEIGHT(LBF)
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
TIME(SECS)

FIGURE 28-9

A second experiment degraded the data traces individually by a constant bias error. Reproduced as figures 29 through 38 are the recovered speed-power and drag-alpha characteristics for various bias errors compared with the undegraded characteristics used to generate the data traces. Generally, the characteristics for the largest bias error which can yield reasonable results are shown along with the characteristics for smaller bias errors so that the reader may assess the linearity of the change in characteristics with the change in bias error. Note that weight and altitude bias errors of the magnitude shown are not particularly serious. As might be expected, bias errors in airspeed affect the power determination primarily and have little influence on drag. The same is true with regard to bias errors in $\dot{V}$. Bias errors in θ and α, however, are extremely destructive. Even a 0.7° error in θ results in about a 10% error in C_{D_0} while a - 1.9° error in θ results in an error of about 37% in C_{D_0}. The case for a bias error of + 1.9° failed (i.e., gave a power exceeding the limit of 400 H.P.). An angle of attack bias error of as little as 0.1° is noticeable in the final result while an α bias error of 1.6° results in drag and power errors in the neighborhood of 30-40%. In addition, the shapes of the curves are altered drastically.

These results demonstrate the extreme sensitivity of the coefficient extraction procedure to typical noise and instrument errors encountered in flight test work. This is true even after the data have been filtered to remove the noise components which occur at frequencies above the usual aircraft responses to control deflections. Thus, to obtain accurate drag and power data using this procedure some means must be employed to reduce the noise components in the data at what might be termed signal frequencies.

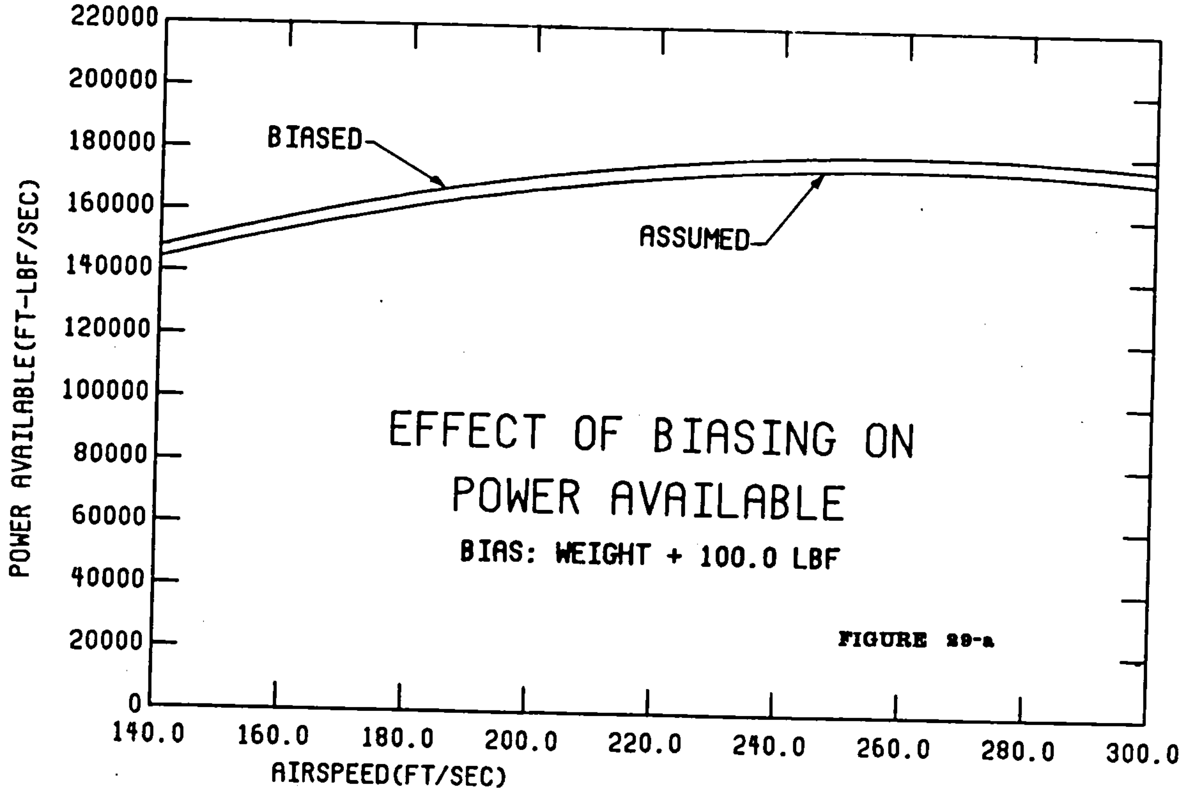


FIGURE 29-a

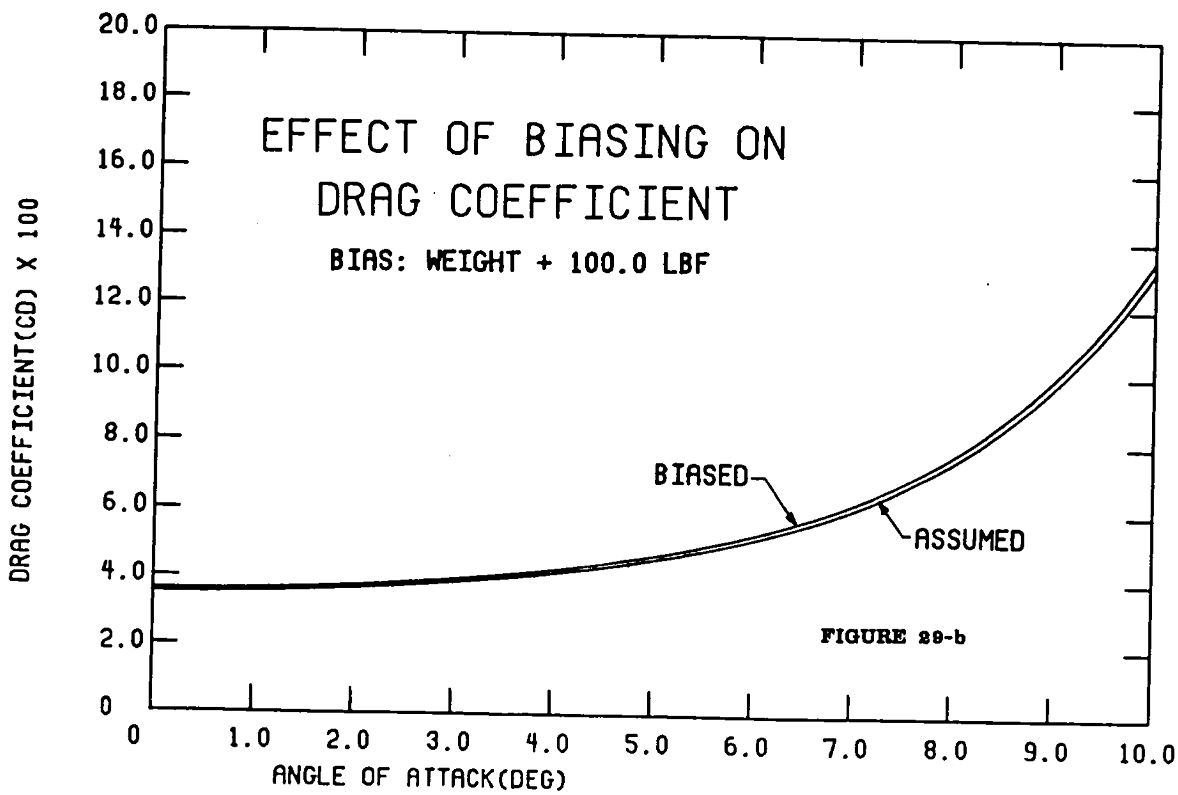
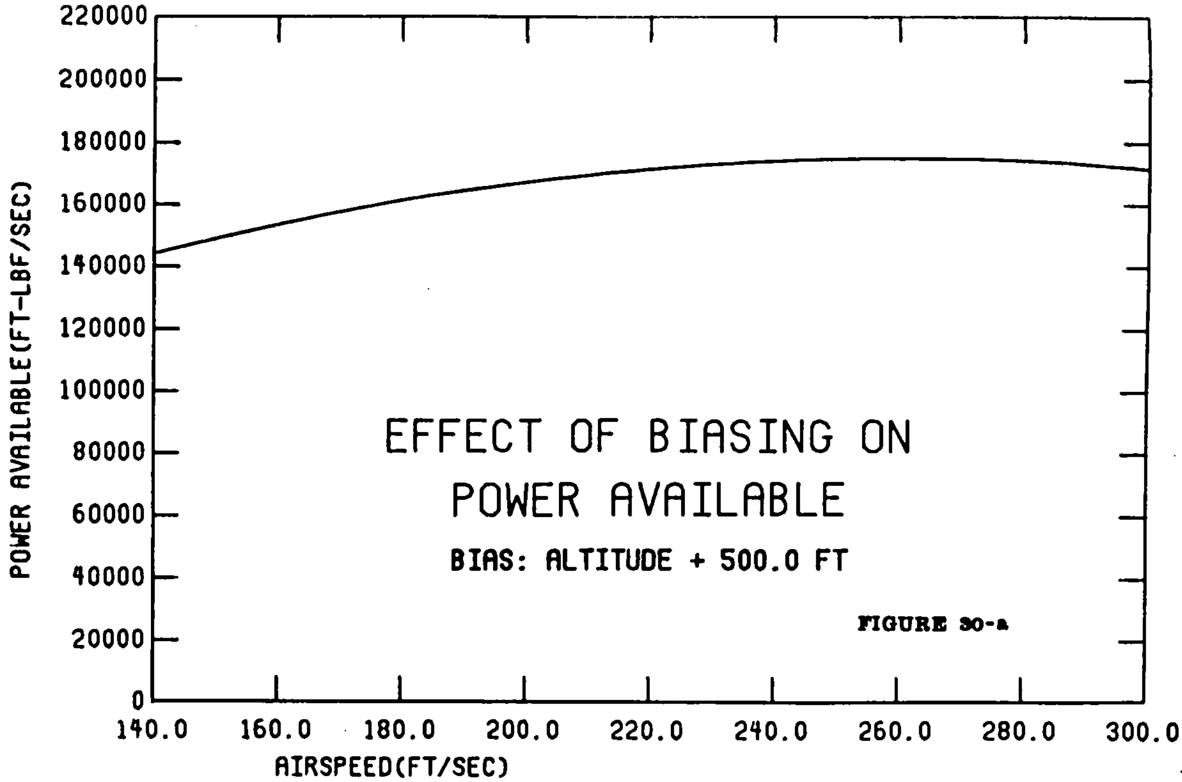
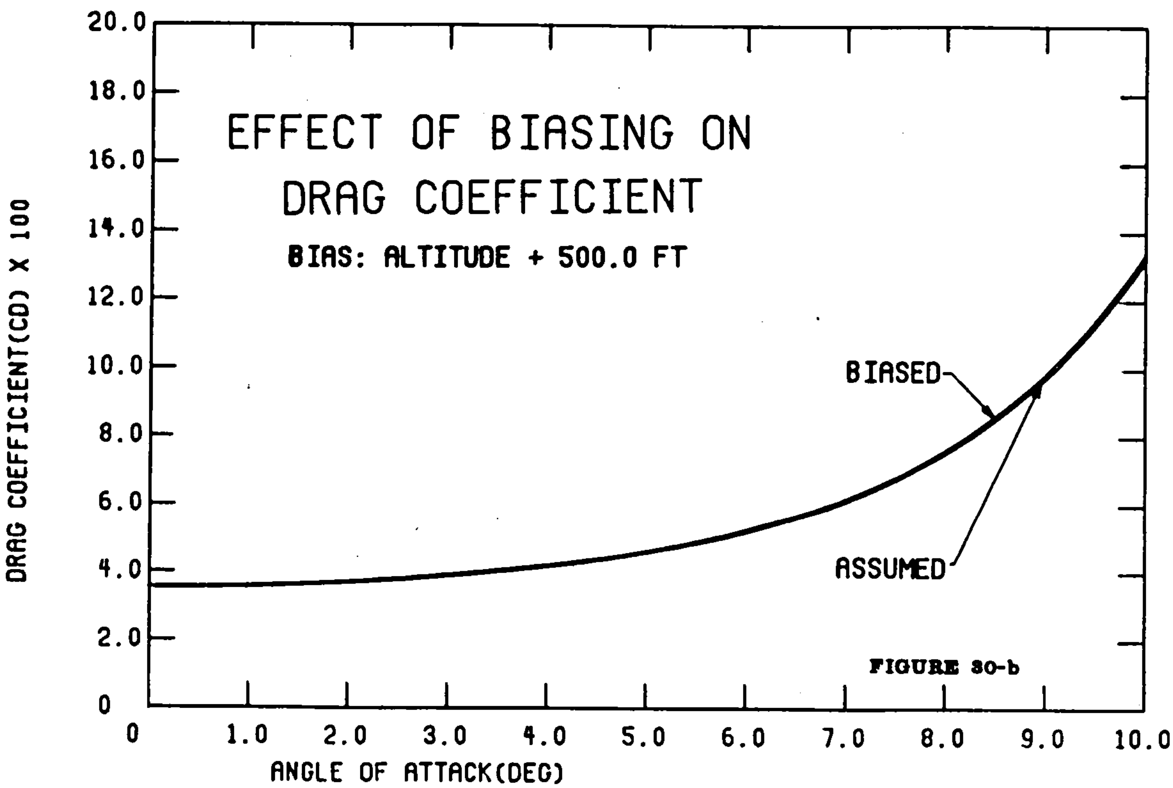


FIGURE 29-b


EFFECT OF BIASING ON
POWER AVAILABLE
BIAS: ALTITUDE + 500.0 FT
FIGURE 30-a
POWER AVAILABLE(FT-LBF/SEC)
AIRSPEED(FT/SEC)
0
20000
40000
60000
80000
100000
120000
140000
160000
180000
200000
220000
140.0
160.0
180.0
200.0
220.0
240.0
260.0
280.0
300.0


EFFECT OF BIASING ON
DRAG COEFFICIENT
BIAS: ALTITUDE + 500.0 FT
BIASED
ASSUMED
FIGURE 30-b
DRAG COEFFICIENT(CD) X 100
ANGLE OF ATTACK(DEG)
0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0

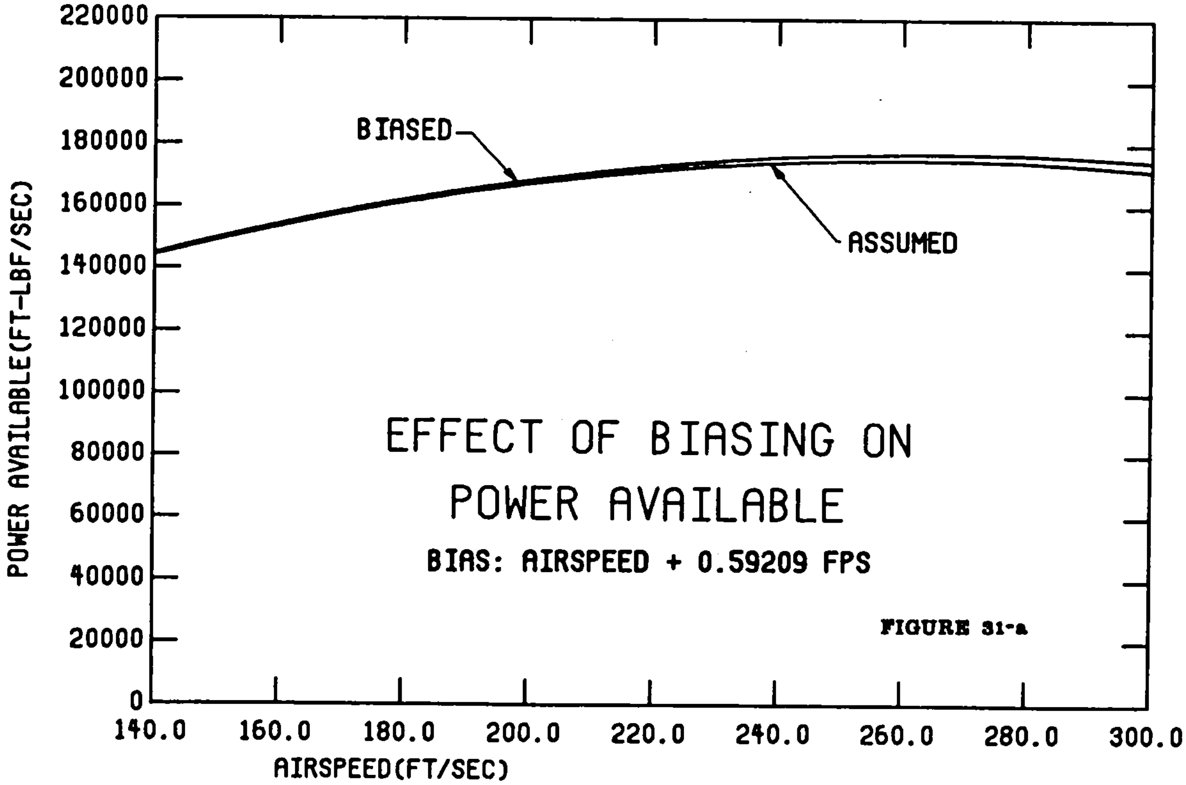


FIGURE 31-a

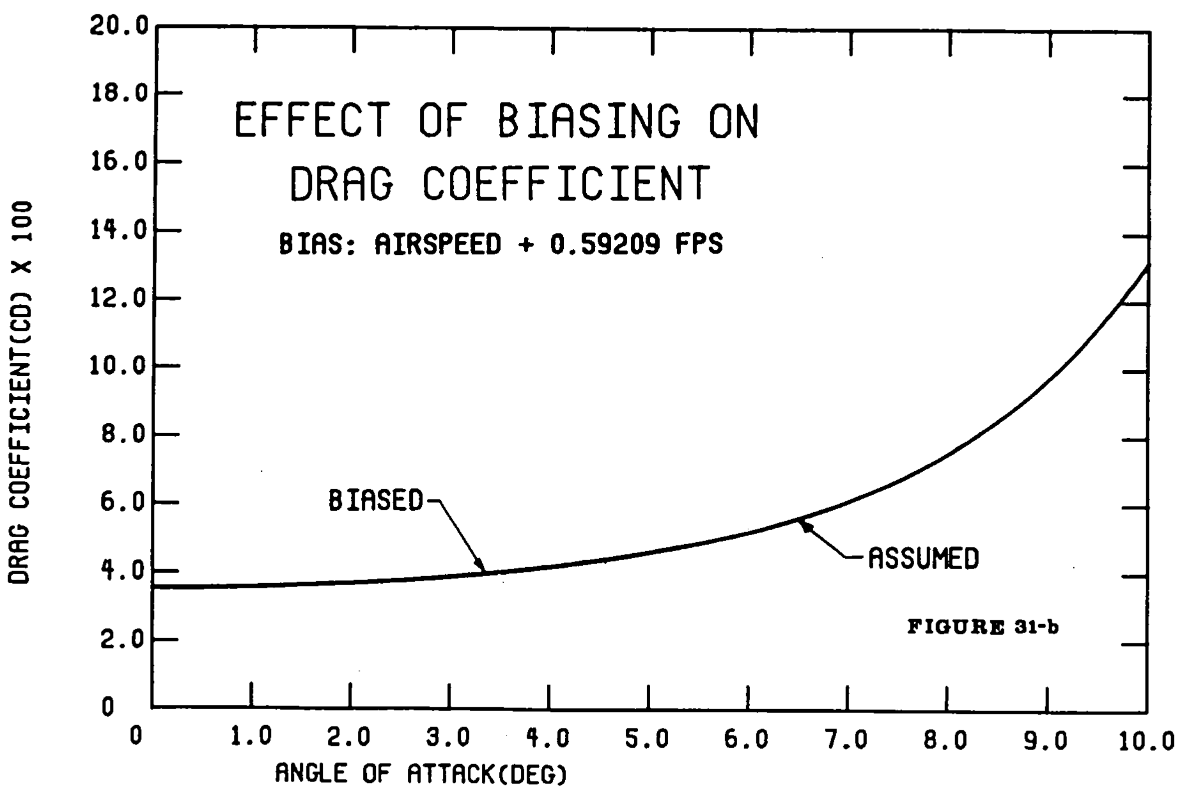


FIGURE 31-b

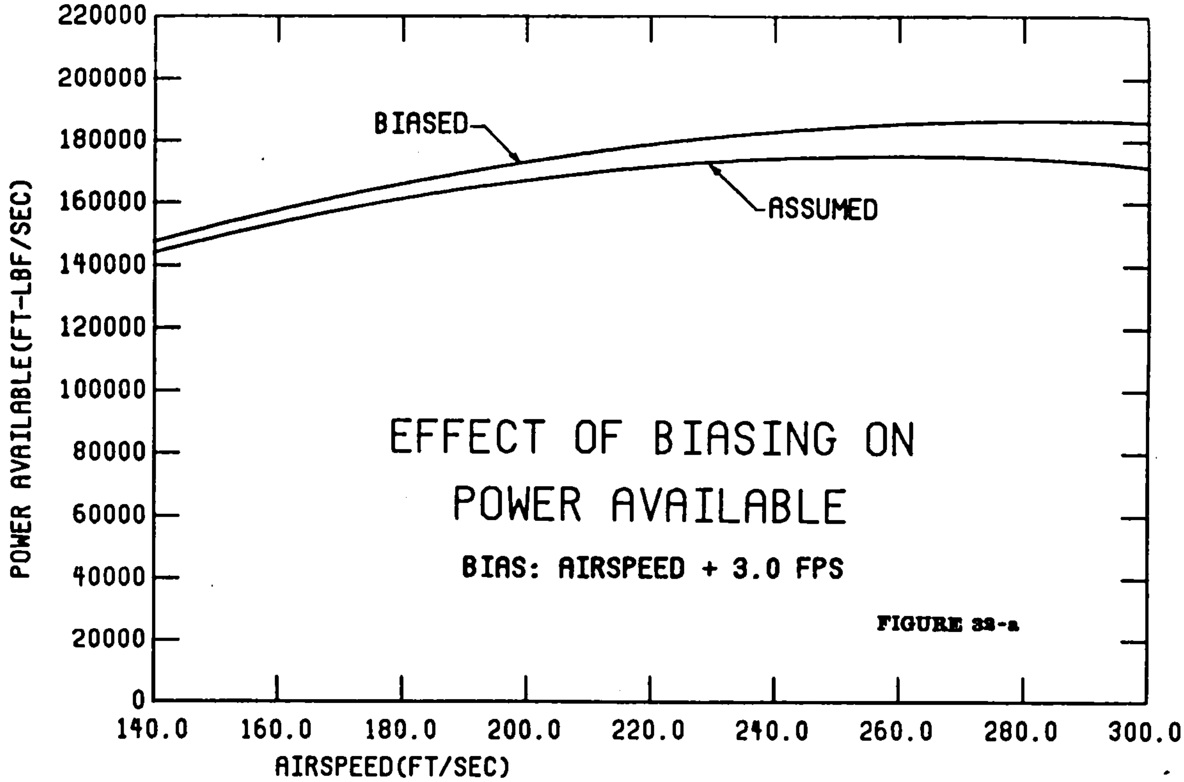


FIGURE 32-a

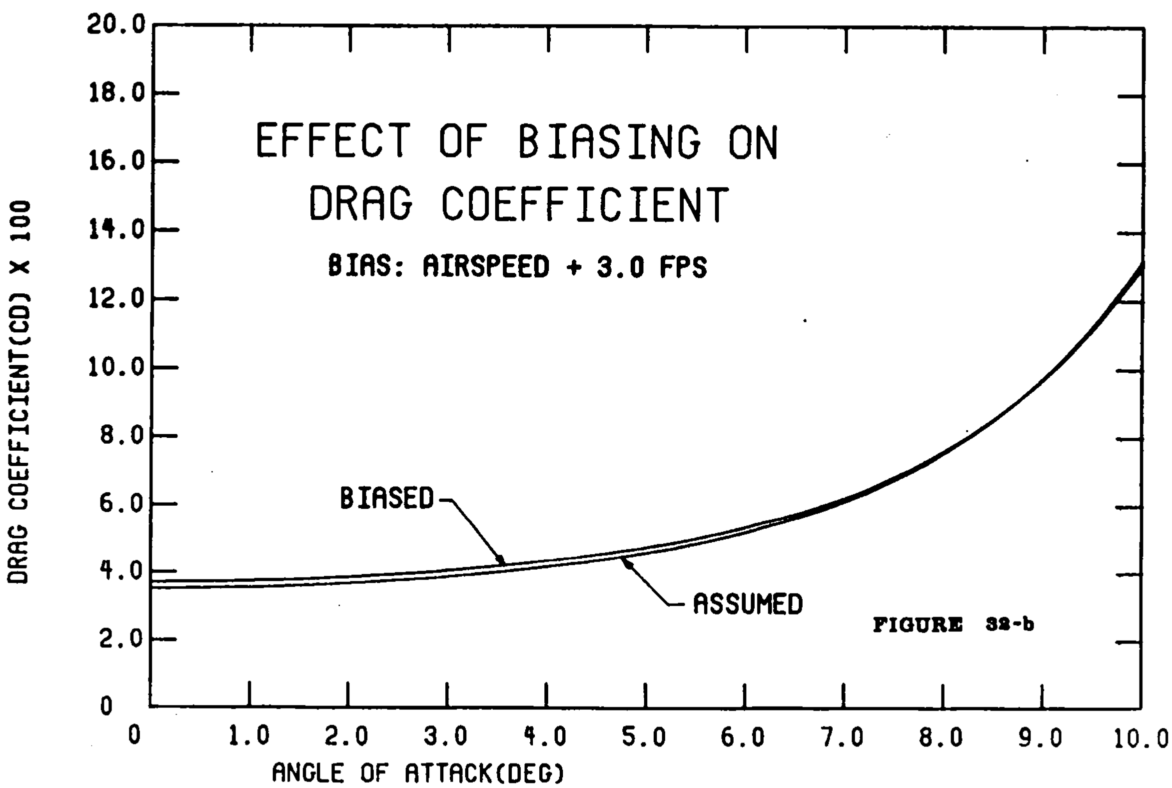


FIGURE 32-b

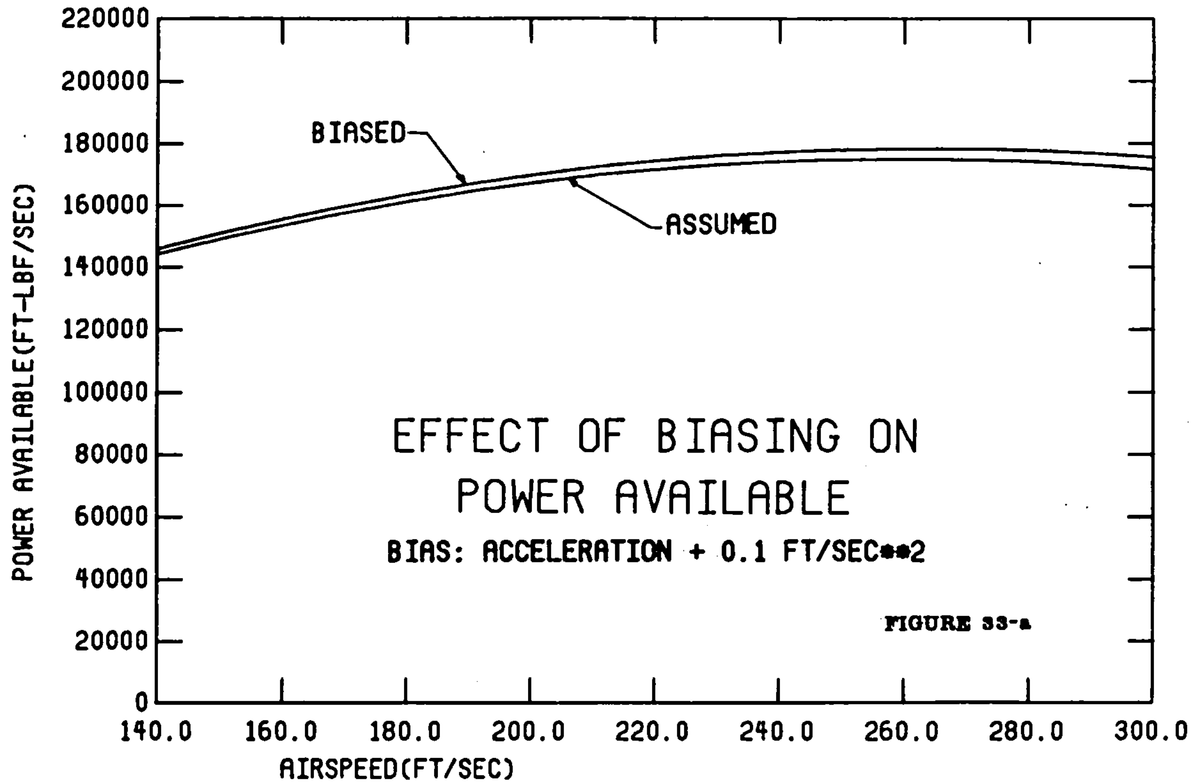


FIGURE 33-a

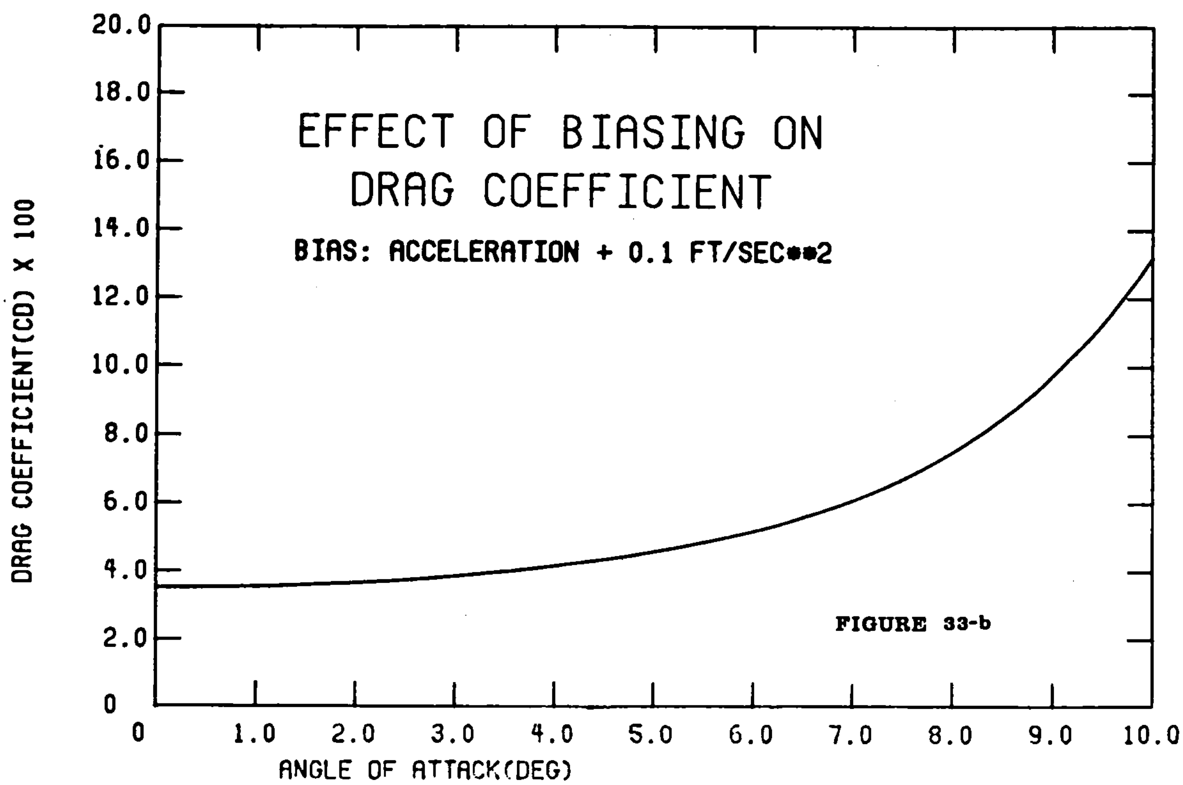


FIGURE 33-b

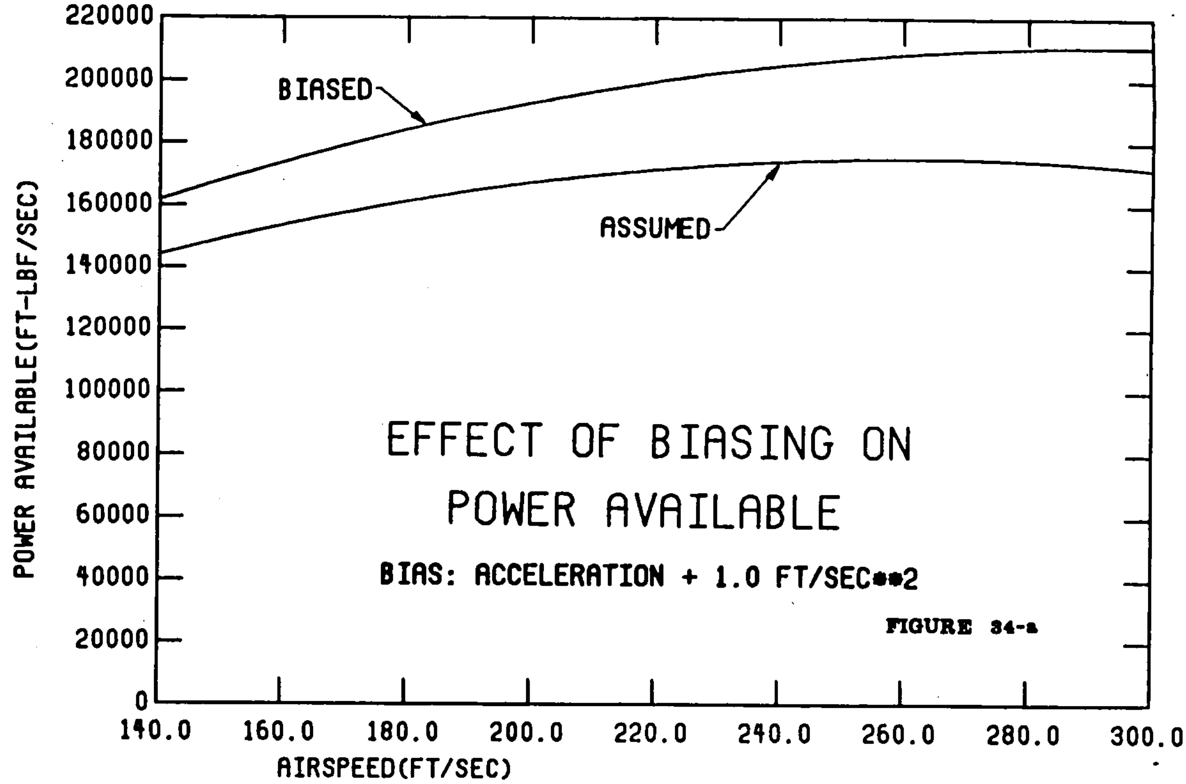


FIGURE 34-a

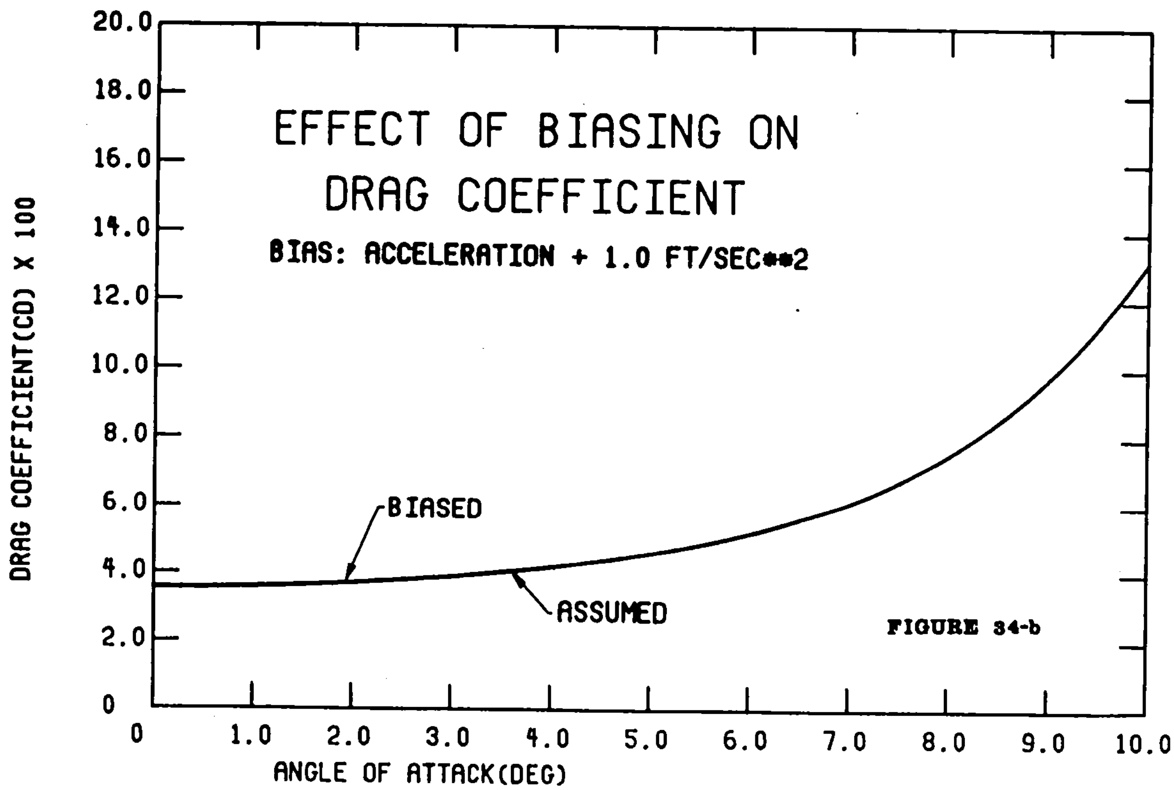


FIGURE 34-b

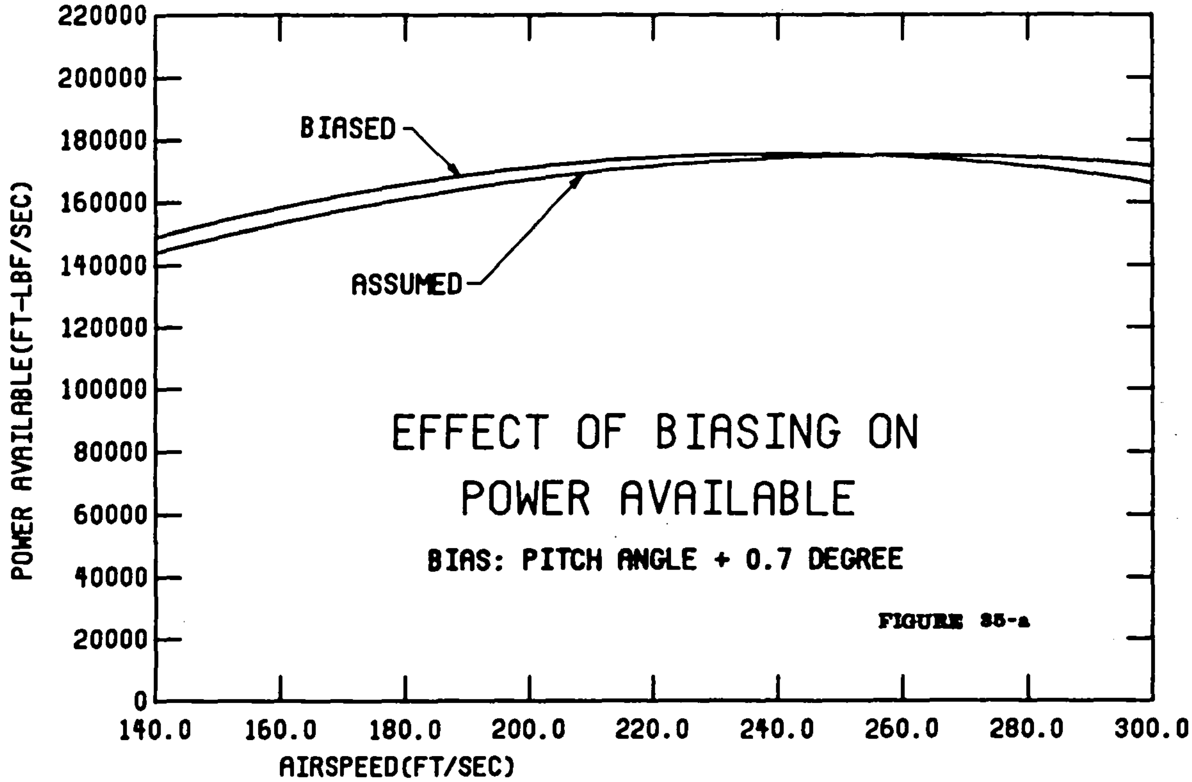


FIGURE 35-a

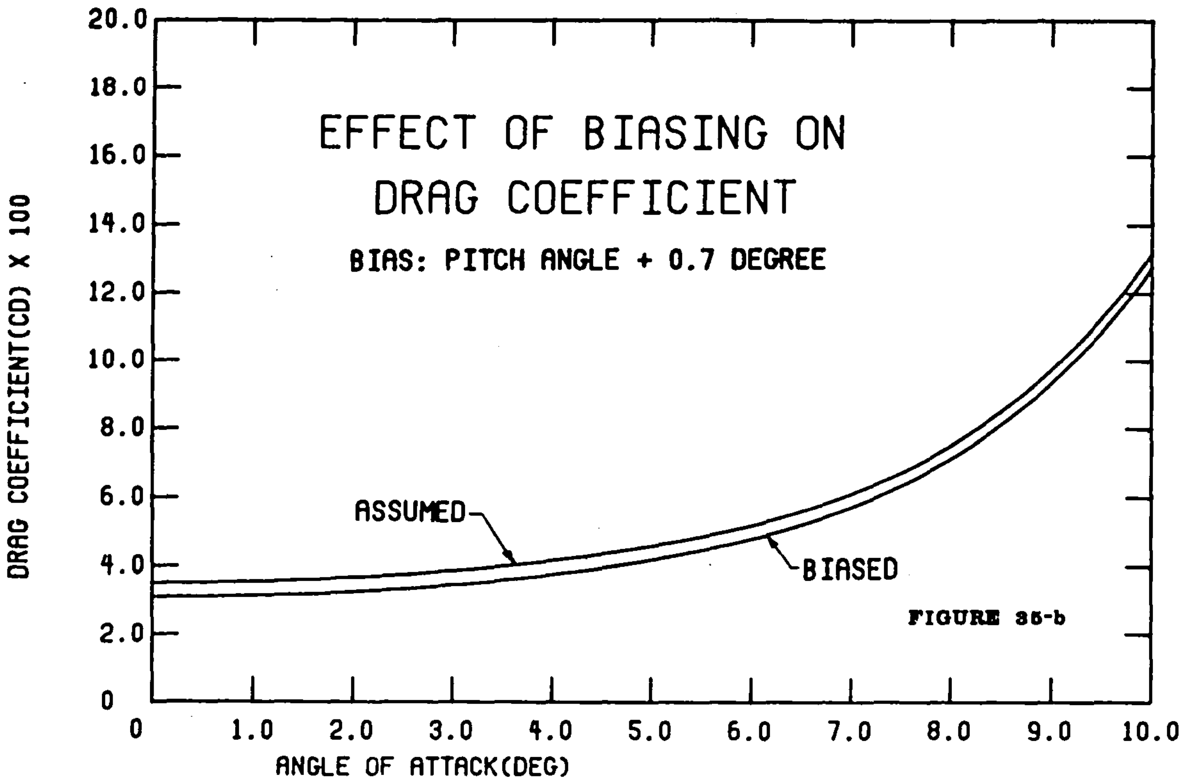


FIGURE 35-b

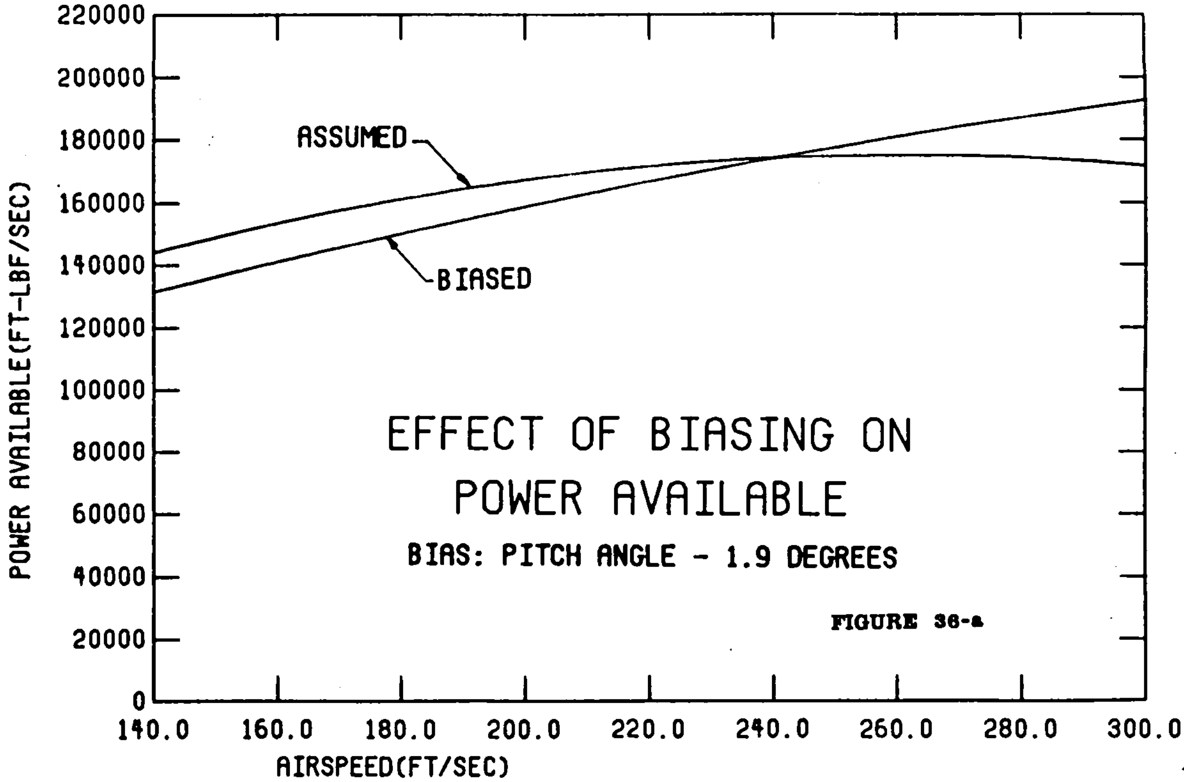


FIGURE 36-a

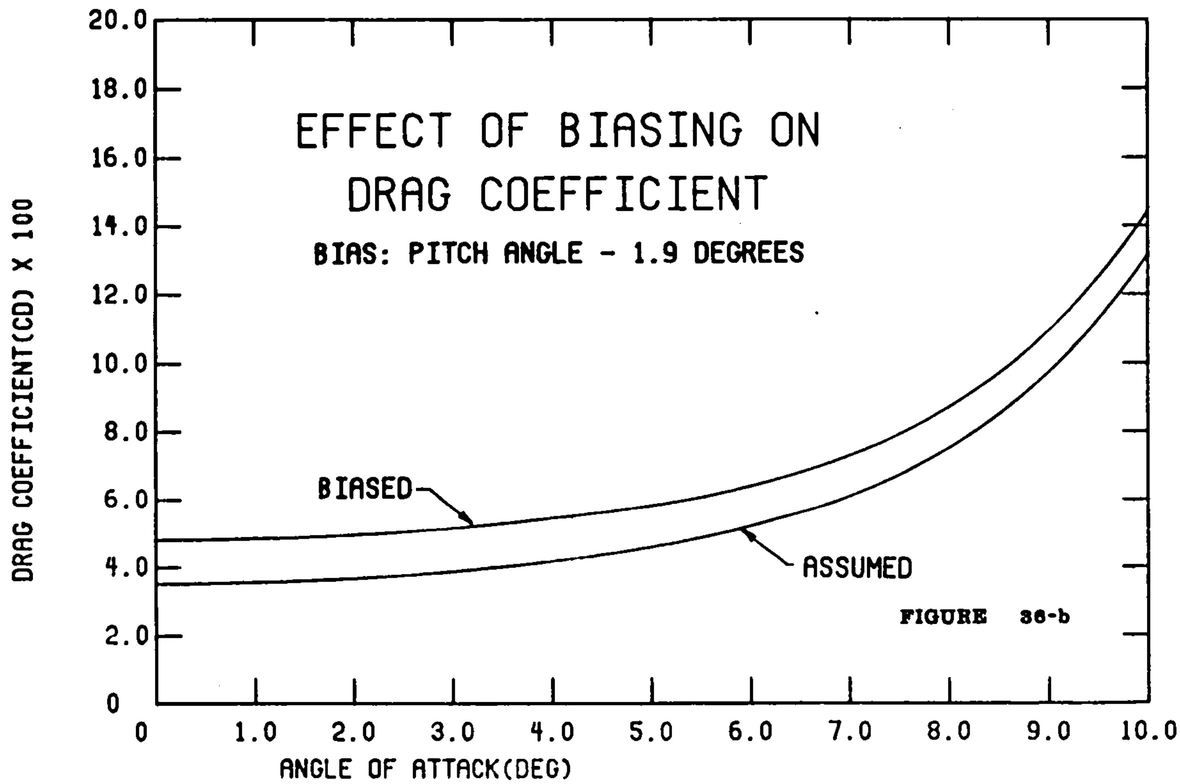


FIGURE 36-b

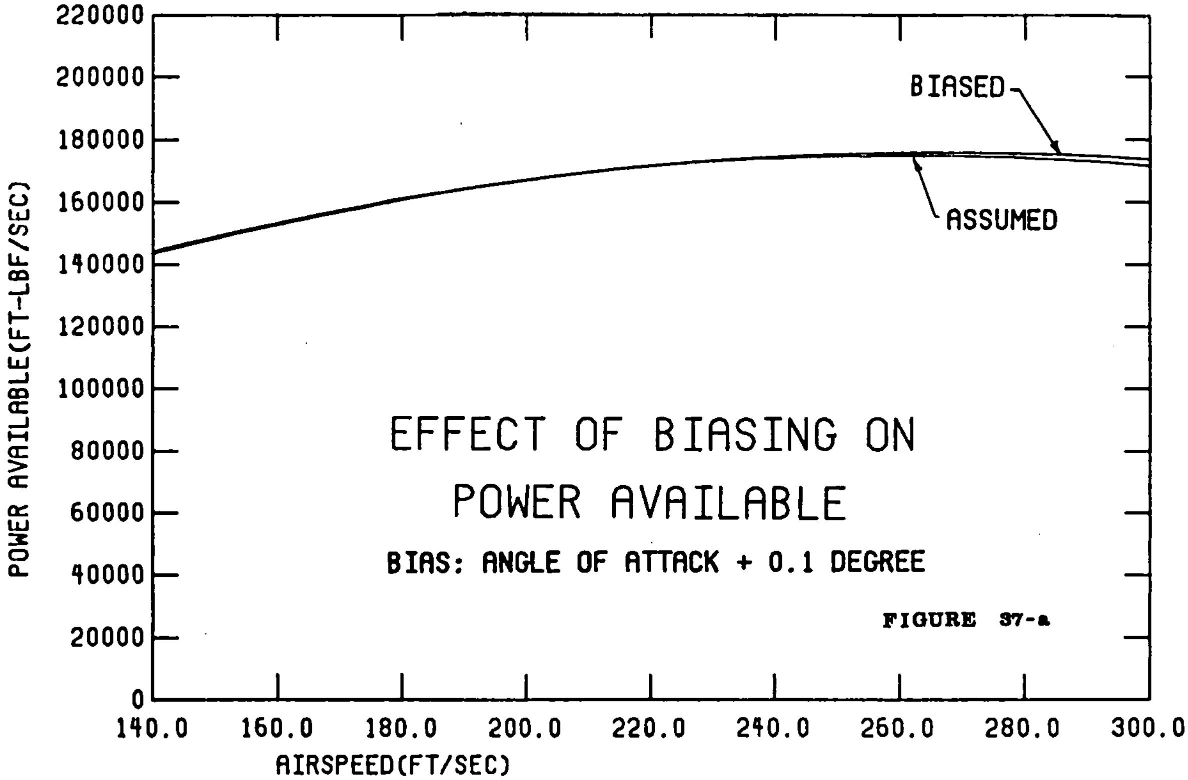


FIGURE 37-a

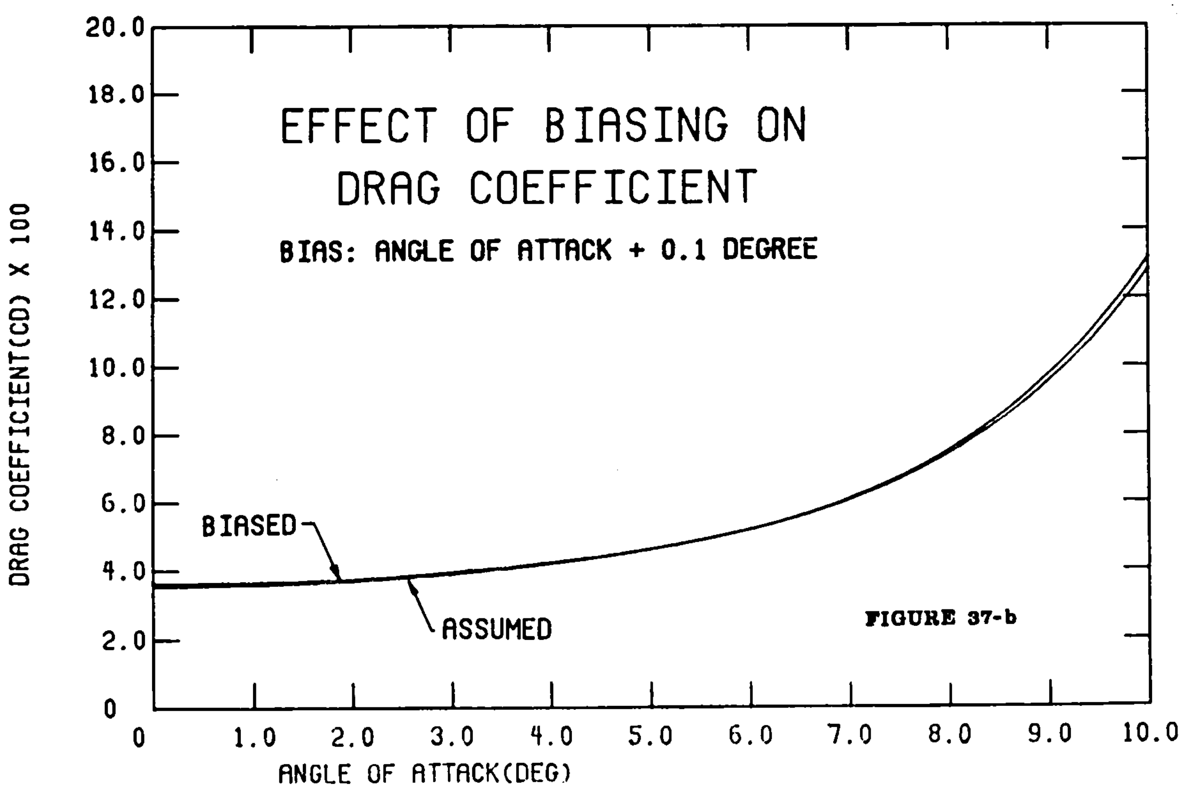


FIGURE 37-b

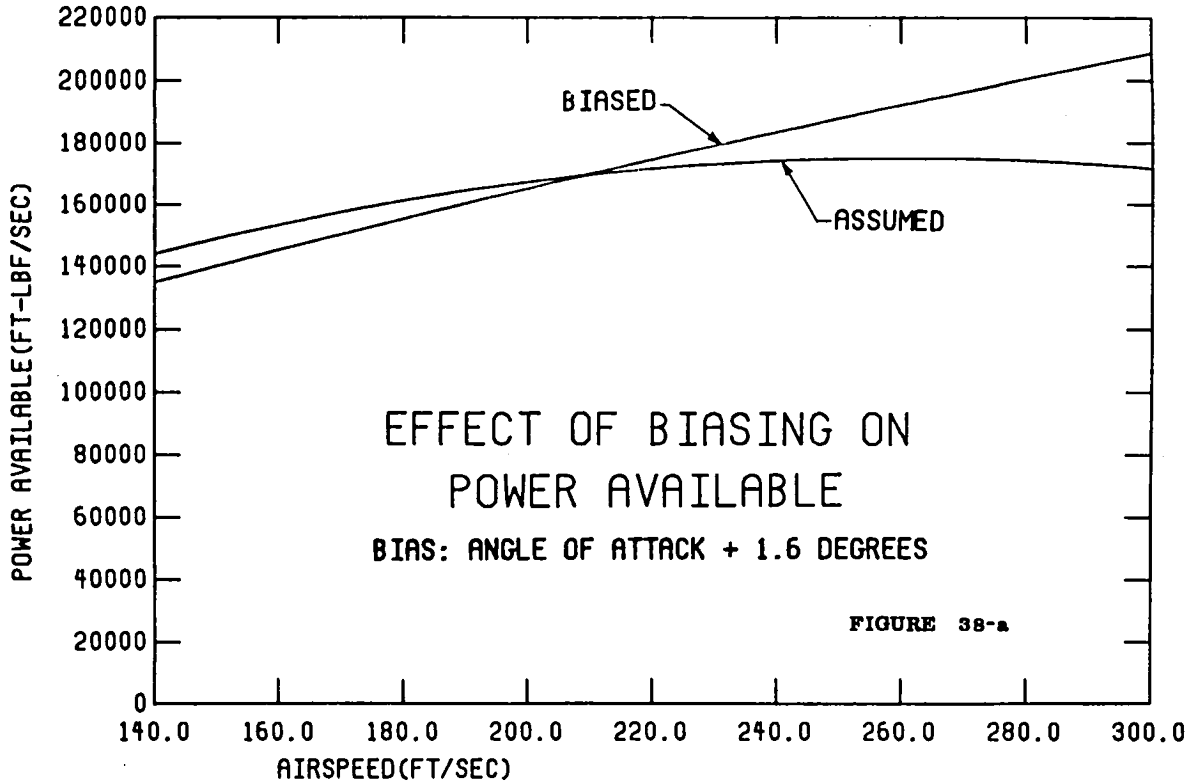


FIGURE 38-a

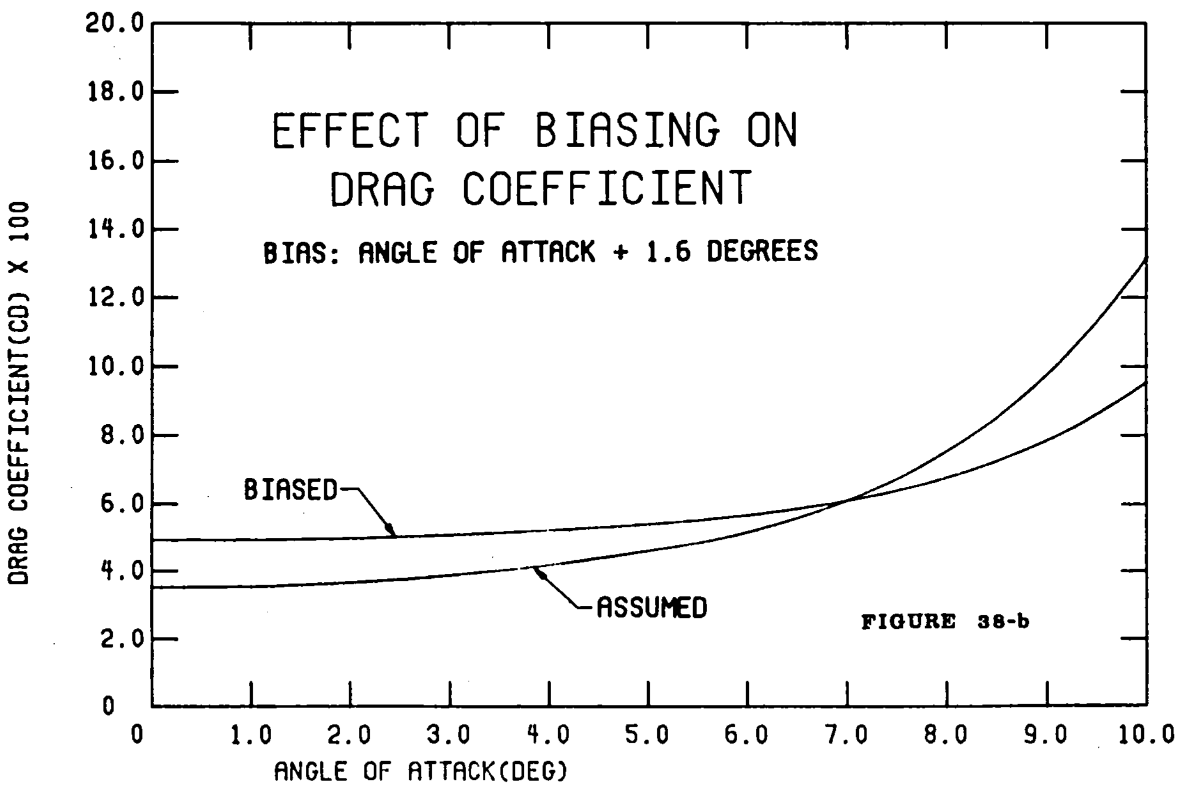


FIGURE 38-b

Reduction of Noise at Signal Frequencies

The filtering technique discussed previously has been shown to be highly effective at suppressing noise components in the data at frequencies above the principal components of the aircraft response. There may, however, still be spurious contributions to the filtered signal from instrument biases, changes in instrument gains, and atmospheric turbulence at frequencies below this cutoff value. These contributions cannot be removed without employing additional information about the system. Since we do not know precisely the nature of these contributions, we will make some assumptions, based on our knowledge of the physics of the situation, to provide the required additional information. If we do this properly, we should be able to improve on the results produced by error-reduction techniques which assume the "noise" in each data channel to be "white" with a zero mean.

For reasons which will become evident later, we will assume that the filtered altitude and velocity data are correct as they stand. The other channels (α, θ, W, a_x, and $\dot{\theta}$), we can be reasonably confident, contain bias, gain, and various types of frequency-dependent errors to some degree.

In order to extract the coefficients of the power and drag models successfully, we have shown that we must have self-consistent data on which to operate. If any data channel contains spurious information, this severely limits our ability to extract the correct model with reasonable coefficient values. Thus, it is important that we take steps to assure, at the least, that our data set is self-consistent. We will therefore adopt a policy of modifying the filtered measured α, θ, and W data so that they form a consistent set with V and h. So long as these modifications are not excessive, say greater than 1% of the maximum data values, we can justify our changes by saying that the altered values still lie within the normal error bounds of the data*.

1. Reduction of Bias Error in α

We seek to modify α initially in order to remove significant bias errors. To this end we write equation (6) in the form

---

*This is a somewhat different approach from those usually used to counter the extreme sensitivity of the least squares estimator to noisy data. Most investigators employ different, less sensitive identifiers (e.g., Newton-Raphson Maximum Likelihood, Gram, Kalman Filter, etc.) which may include provisions for treating certain types of random noise, but they do not modify the input data as such. According to a private communication from Dr. G. J. Dobeck of the Naval Coastal Systems Laboratory, Panama City, Florida, the best estimator for a particular problem depends upon the problem. Since the present problem is rather different from those usually described in the literature, it is not surprising that the more common procedures are not readily adapted to it. For the reader with a good mathematical background interested in a comparison of the characteristics of several of these identifiers, Dr. Dobeck's Ph.D. thesis at the University of South Florida, "System Identification and Application to Undersea Vehicles", is recommended.

$$S = \sum_{i=1}^{N}\left[\frac{W_i\dot{V}_i}{g} + W_i\ \sin(\theta_i - \alpha_i) - W_i\ \Delta\alpha\ \cos(\theta_i - \alpha_i) - \left(\frac{P_o}{V_i} + P_1\right.\right.$$

$$\left. + P_2V_1\right)\cos\ \alpha_i + \Delta\alpha\ \sin\ \alpha_i\left(\frac{P_o}{V_i} + P_1 + P_2V_i\right) + \frac{\rho_i SV_i^2}{2}\left(C_{D_o} + C_{D_1}\ \alpha_i^2\right.$$

$$\left.\left. + C_{D_2}\ \alpha_i^6\right) + \frac{\rho_i SV_i^2}{2}\left(2\alpha_i\ \Delta\alpha_i\ C_{D_1} + 6\alpha_i^5\ \Delta\alpha_i\ C_{D_2}\right)\right]^2 \tag{76}$$

where it has been assumed for the purposes of this analysis that cos $\Delta\alpha = 1$, sin $\Delta\alpha = \Delta\alpha$, and $(\alpha + \Delta\alpha)^6 = \alpha^6 + 6(\Delta\alpha)a^5$. We then minimize S with respect to $\Delta\alpha$ to yield

$$\Delta\alpha = -\frac{\sum_{i=1}^{N} B_oB_1}{\sum_{i=1}^{N} B_o^2}\ . \tag{77}$$

Here,

$$B_o = -\ W_i\ \cos(\theta_i - \alpha_i) + \sin\ \alpha_i\left(\frac{P_o}{V_i} + P_1 + P_2V_i\right)$$

$$+ \frac{\rho_i SV_i^2}{2}\left[2\alpha_i\ C_{D_1} + 6\alpha_i^5\ C_{D_2}\right] \tag{78}$$

and

$$B_1 = \frac{W_i\dot{V}_i}{g} + W_i\ \sin(\theta_i - \alpha_i) - \left[\frac{P_o}{V_i} + P_1 + P_2V_1\right]\cos\ \alpha_i$$

$$+ \frac{\rho_i SV_i^2}{2}\left[C_{D_o} + C_{D_1}\ \alpha_i^2 + C_{D_2}\ \alpha_i^6\right]. \tag{79}$$

(This form will be the same for each of the 23 other models used to represent the data, only the values of B_0 and B_1 will be different.) The result of this computation is then the amount which must be added to α in order to minimize the fit error for the particular model employed. Since we are not certain that the model with the lowest fit error using degraded data is the best model when the data have been "treated", we will add only 2/3 of $\Delta\alpha$ to α_i before we repeat the extraction process. The result, we then assume, is the smallest fit error which can be obtained by removing a bias from the α data.

2. Establishing the Probable Values of α and the Coefficients of the Lift Equation

Since the equation has been shown to be most sensitive to errors in α, we will endeavor to employ a procedure for establishing the proper range of α values which is not heavily dependent upon the value of α. We begin by choosing to fit the data in a least squares sense with the model

$$P = P_o \; V^{1/3}$$

$$C_D = C_{D_0} + C_{D_1}\,\alpha + C_{D_2}\,\alpha^2 + C_{D_3}\,\alpha^3 + C_{D_4}\,\alpha^4 \; . \tag{80}$$

This power model was selected on the basis of early full-scale wind tunnel test results as being a reasonably good representation of the actual power into the airstream. We recognize in addition that the equation relating forces and motions normal to the flight path can be written

$$\dot{\gamma} = \frac{gSV}{2W}\,C_L(\alpha)\,\rho(h) - \frac{g\cos\gamma}{V} + \frac{g\,P\sin\alpha}{WV^2} \; , \tag{81}$$

where $$\rho(h) = \rho_0(1 - 6.86 \times 10^{-6}h)^{4.26} \; , \tag{82}$$

$$\gamma = \sin^{-1}(\dot{h}/V) \; , \tag{83}$$

and $$\dot{\gamma} = \frac{1}{\sqrt{1-(\dot{h}/V)^2}} \left[\frac{V\ddot{h} - \dot{h}\dot{V}}{V^2}\right] . \tag{84}$$

$\dot{h}$ is available as a consequence of the filtering operation and $\ddot{h}$ or, alternately, $\dot{\gamma}$ can be obtained by spline fitting the $\dot{h}$ data or the computed values of γ. Note that these equations involve only velocity and altitude (which we have already assumed to be noise-free) and their derivatives. In the interests of data consistency we have chosen to ignore the fact for the time being that γ is also $\theta - \alpha$.

Now (81) can be rearranged to represent C_L in the form

$$C_L = \frac{2W}{g \rho SV^2} \left[\dot{\gamma} + \frac{g \cos \gamma}{V} - \frac{g P \sin \alpha}{WV^2} \right] . \tag{85}$$

We know also that a reasonably accurate representation of the drag coefficient is

$$C_D = \overline{C}_{D_o} + \overline{C}_{D_1} C_L + \overline{C}_{D_2} C_L^2 . \tag{86}$$

With this representation we will write equation (6) as

$$\frac{\dot{V}}{g} + \sin \gamma = \frac{\overline{P}_0 V^{1/3}}{WV} \cos \alpha - \frac{\rho SV^2}{2W} (C_{D_1} + C_{D_1} C_L + \overline{C}_{D_2} C_L^2) . \tag{87}$$

With the power values obtained from (80) we solve for $C_L(t)$ from (85). Given these values, we find $\overline{P}_0$, $\overline{C}_{D_o}$, $\overline{C}_{D_1}$, and $\overline{C}_{D_2}$ from (87) in a least squares sense. Using the value of $\overline{P}_0$ found in this fashion, we reenter (85) and find a new value of $C_L(5)$. This is then used to extract new values of P_0, C_{D_o}, C_{D_1}, and C_{D_2} from (87). The process is repeated until the change in the four coefficients from one iteration to the next is less than 0.001%

As a result of the foregoing, we now have a reasonably reliable picture of $C_L(t)$. This we then fit to the bias-free α-data by a least-squares-distance routine (described in detail in NASA TN D-6374 and also in a later section of this report) using the following model:

$$\{C_{L_i} - CLQ[\dot{\theta}_i]\} = CLAO + CLA[\alpha_i] + CLAX[\alpha_i]^X . \tag{88}$$

Initially we assume X = 2.0 in order to solve for CLQ by a linear least squares method. With CLQ determined, we subtract the term CLQ*$\dot{\theta}_i$ from C_{L_i} before we apply the least squares distance method to determine new values for the remaining coefficients*. We will assume that CLQ has this same value for the remainder of the data reduction procedures applied to a particular data set. The LSD routine determines the values of coefficients CLAO, CLA, CLAX, and X in this model which minimize the perpendicular distance from the curve represented by (88) to the data points.

We then adjust the values of α at every time point so that they satisfy (88) exactly. We employ for this purpose a second order Newton-Raphson procedure: If we call

$$f(\alpha_{i_k}) = (\text{CLAX})\ \alpha_{i_k}^{X} + (\text{CLA})\ \alpha_{i_k} + \text{CLAO} - \{C_{L_i} - \text{CLQ}[\dot{\theta}]\} \tag{89a}$$

$$f'(\alpha_{i_k}) = (X)\cdot(\text{CLAX})\ \alpha_{i_k}^{X-1} + \text{CLA} \tag{89b}$$

$$f''(\alpha_{i_k}) = (X)\cdot(X-1)\cdot(\text{CLAX})\ \alpha_{i_k}^{X-2}\ , \tag{89c}$$

where α_{i_k} is the bias-free value of the α-data at time point i, then the value of $^k\alpha_{i_{k+1}}$ closest to α_{i_k} which will make $f(\alpha_{i_{k+1}}) \to 0$ is given by

---

*We recognize that the values found for CLAO, CLA, CLAX, and X will vary somewhat as the center of gravity location - and to some extent the weight and altitude - is changed because they include a lift contribution arising from the elevator deflection required to attain trimmed flight. This lift contribution varies only with speed - hence α, if the weight and altitude are relatively constant. In maneuvering flight an additional elevator deflection (and thus an additional lift component) is necessary to induce rotation; this can be accounted for by a term proportional to $\dot{\theta}$ so that the α contribution found by the LSD method will then be virtually independent of rotational velocity. At a given c.g. location, initial weight, nominal altitude, and throttle position, the CLAO, CLA, CLAX, and X found by this approach should be the same whether the aircraft performs a level flight acceleration - deceleration or a pullup - pushover. The values of CLAO, CLA, CLAX, and X, however, may also depend upon throttle position because (a) the thrust axis may not intersect the c.g., (b) the lift distribution over the wing may be affected by the application of power, and (c) the flow field approaching the horizontal tail may be altered. For this reason the coefficient values should be determined at several different power settings, different altitudes, and different weights. One would also expect the drag coefficient values to be somewhat dependent upon power level.

$$\alpha_{i_{k+1}} = \alpha_{i_k} - \frac{f'(\alpha_{i_k})}{f''(\alpha_{i_k})} \pm \sqrt{\left[\frac{f'(\alpha_{i_k})}{f''(\alpha_{i_k})}\right]^2 - 2\left[\frac{f(\alpha_{i_k})}{f''(\alpha_{i_k})}\right]} \tag{90}$$

The choice of signs on the radical is made according to the following rationale:

If $f'(\alpha_{i_k})\cdot f''(\alpha_{i_k}) < 0$ use the negative sign on the radical.

If $f'(\alpha_{i_k})\cdot f''(\alpha_{i_k}) > 0$ use the positive sign on the radical.

Occasionally,

$$\left[\frac{f'(\alpha_{i_k})}{f''(\alpha_{i_k})}\right]^2 - 2\left[\frac{f(\alpha_{i_k})}{f''(\alpha_{i_k})}\right] < 0$$

because the radius of curvature of $f(\alpha_{i_k})$ at α_{i_k} no longer intersects the abscissa. When this happens, the computer cannot perform the operation. In such a circumstance the following procedure is suggested:

1. Choose as an initial estimate for $\alpha_{i_{k+1}}$

$$\alpha_{i_{k+1}} = \alpha_{i_k} - \frac{f'(\alpha_{i_k})}{f''(\alpha_{i_k})} \tag{91}$$

2. If $|f(\alpha_{i_{k+1}})| < |f(\alpha_{i_k})|$, then try (90) again.

3. If the radicand is again negative, try

$$\alpha_{i_{k+2}} = \alpha_{i_{k+1}} - \frac{f'(\alpha_{i_{k+1}})}{f''(\alpha_{i_{k+1}})} \tag{92}$$

and see if $|f(\alpha_{i_{k+2}})| < |f(\alpha_{i_{k+1}})|$. As long as

$|f(\alpha_{i_{k+n}})| < |f(\alpha_{i_{k+n-1}})|$, use either (90) or (91) as indicated.

4. Continue until either $|f(\alpha_{i_{k+n}})| < 10^{-15}$ or $|f'(\alpha_{i_{k+n}})| < 10^{-15}$.

In the former case the new root is found with sufficient accuracy. In the latter, a real root does not exist close to the starting point and we select the value of α for which $f(\alpha)$ approaches zero most closely. Note that the use of a least squares procedure does not guarantee that the coefficients chosen for any particular data point yield a root; only that the sum of $[f(\alpha_i)]^2$ is a minimum for the particular model used. Thus, an individual $f(\alpha_i)$ may be non-zero with no crossing of the abscissa for any α close to α_i.

With the revised set of α values given by the foregoing procedure, we now reenter the coefficient extraction routine, i.e., equation (6) or some alternate version thereof, with $\gamma = \theta - \alpha$ to find "updated" values of the P and C_D coefficients. We look, of course, for the model giving the lowest fit error. Its coefficients, along with the data, form the basis of our next step.

3. <u>Modification of α-data to yield a more Consistent Data Set</u>

In this step we seek to modify α slightly at each point in time by a different amount so as to (a) more nearly satisfy equation (81) at all times and (b) reduce the fit error obtained with equation (6). We begin by using the latest power data in (81) and solving for $C_L(t)$. With the least-squares-distance procedures we then update the values for CLAO, CLA, CLAX, and X. If we now substitute for α_i an "improved" value which is given by

$$\alpha_i + F \, \Delta \, \alpha_i \, ,$$

where F is a factor permitting us to apply all or part of the correction during any particular iteration, and where $\Delta\alpha_i$ is defined* by

---

*$\Delta\alpha_i$ is the value by which α_i must be changed to satisfy (81) exactly. We could of course employ our Newton-Raphson procedure to determine it. We have chosen, however, to assume that $\Delta\alpha_i$ is very small and can be represented with satisfactory accuracy by one term in a binomial expansion.

$$\Delta\alpha_i = \frac{\dot{\gamma}_i + \frac{g}{V_i}\cos\gamma_i - \frac{g\,S\rho_i\,V_i}{2W_i}\left\{CLQ(\dot{\theta}_i)+CLAO+CLA(\alpha_i)+CLAX(\alpha_i)^X\right\} - \frac{g\,P_i}{W_i V_i^2}\sin\alpha_i}{\frac{g\,S\rho_i\,V_i}{2W_i}\;X\cdot CLAX\cdot\alpha_i + CLA \;+\; \frac{g\,P_i\,\cos\alpha_i}{W_i\;V_i^2}}, \tag{93}$$

Then the sum of the squares of the amount by which we fail to satisfy equation (81) at each time point (a quantity which we call S_2) should decrease. We will usually take F = 0.3 on the first two iterations and 1.0 on subsequent iterations. Before we substitute $\alpha_i + F\,\Delta\,\alpha_i$ for α_i in equation (6), however, we will update the θ-data so that it is more consistent with both γ and the revised α values. We assume for the present purpose that θ contains a gain error and a bias error which we will determine by fitting the θ-data with

$$\sin^{-1}\left[\frac{\dot{h}}{v}\right] + \alpha_i + F\,\Delta\,\alpha_i = A\,\theta_i + B \tag{94}$$

in order to determine A and B in a least squares sense. The new θ_i is simply $A\,\theta_{i_{old}} + B$. This value of θ plus the revised α value are then substituted into the appropriate version of equation (6) to extract the coefficient values. With new power coefficients from this extraction the cycle is repeated until the fit error, S, reaches a minimum, usually in two or three more iterations. This minimum is determined by comparing the fit error after each iteration with the fit error obtained for the previous iteration.

It will be observed that the power, computed using the coefficients obtained from the last extraction, is the principal mechanism by which $\Delta\alpha_i$ is modified in (93). It will also be observed that $\Delta\alpha_i$ is relatively insensitive to very small changes in power. As a result, when the fit error for 300 points is less than about 10^{-10}, the $\Delta\alpha_i$ are generally 2×10^{-4} or less. These small modifications in α result in total power values which are very little different from those of the previous iteration. Hence, the reduction in fit error during the next iteration becomes miniscule. Some other means must therefore be employed to speed the reduction of the fit error to the desired range of 10^{-13} or less.

4. Modification of α-data by Trajectory Comparison

What we have as a result of the previous procedures is a set of lift, drag, and power coefficients obtained in a least squares manner from input V, h, and W data and modified α and θ data. We will now use the coefficient set and some assumptions regarding the accuracy of the input data to calculate the trajectory of the vehicle during the time in question. As the vehicle moves along its trajectory in the terrestrial X-Z plane, its position in space and its orientation may be described by a set of time histories. These time histories are the solutions of the system of equations (6), (81), (82), and (83) plus the relationship

$$\dot{W} = - cP \tag{95}$$

where c is the specific fuel consumption. Examination of the system will show that two of the 5 time histories must be specified a priori in order to obtain a unique solution. As we have indicated, we choose to assume that V and h and their derivatives may be considered to be accurate and noise-free. As a result we may readily develop the following time histories:

$$\begin{array}{lll} V(t) & h(t) & \rho(t) \\ \dot{V}(t) & \dot{h}(t) & \gamma(t) \\ \ddot{V}(t) & \ddot{h}(t) & \dot{\gamma}(t). \end{array} \tag{96}$$

If we now combine equations (6) and (81) to yield

$$\frac{\dot{\gamma}_i}{g} + \frac{\cos \gamma_i}{V_i} = \frac{\rho_i S V_i}{2W_i} C_{L_i} + \frac{\tan \alpha_i}{V_i} \left[\frac{\dot{V}_i}{g} + \sin \gamma_i + \frac{\rho_i S V_i^2}{2W_i} C_{D_i} \right] \tag{97}$$

we observe that as a consequence of (96) only $\alpha(t)$ and $W(t)$ are unknown in (97). But (95) can be written

$$W_{i+1} = W_i - c[P_0 + P_1 V_i + P_2 V_i^2]\,\Delta t - c\left(\frac{\Delta t}{2}\right)^2 [P_1 \dot{V}_i + 2P_2 V_i \dot{V}_i]$$

$$- c\left(\frac{\Delta t}{6}\right)^3 [P_1 \ddot{V}_i + 2P_2(\dot{V}_i^2 + V_i \ddot{V}_i)] \, . \qquad (98)$$

This permits us to determine W(t) given its initial value. With the results of (98) substituted into (97), we may solve (97) at each time point for α_i using the second order Newton-Raphson scheme. Thus, we can determine the $\alpha(t)$ which is compatible with any particular set of C_L, C_D, and P coefficients and the time histories given by (96).

$\alpha(t)$ found in this manner will not be the same as that found from step 3 above. We desire to modify the α-data resulting from step 3 so that it will be somewhat closer to that given by the trajectory computation. At the same time we wish to modify the C_L, C_D, and P coefficients so that they will yield an α-trajectory closer to the $\alpha(t)$ resulting from step 3. We begin as follows. If we call α_{m_i} the value of α_i resulting from step 3 and α_{t_i} the result of the trajectory calculation, then the result we seek is to minimize

$$J = \sum_{i=1}^{N} [(\alpha_{m_i} - \alpha_{t_i})^2] \, . \qquad (99)$$

This will occur when $\frac{\partial J}{\partial C_{D_0}}, \frac{\partial J}{\partial C_{D_1}}, \frac{\partial J}{\partial C_{D_2}}, \ldots, \frac{\partial J}{\partial CLAX} = 0.$

In order to minimize J with respect to all eight C_D and C_L coefficients simultaneously, we observe that a first order Taylor series expansion for $\frac{\partial J}{\partial C_{D_0}}$ in terms of the eight coefficients may be written

$$\left[\frac{\partial J}{\partial C_{D_0}}\right]_{k+1} = \left[\frac{\partial J}{\partial C_{D_0}}\right]_k + \frac{\partial}{\partial C_{D_0}}\left[\frac{\partial J}{\partial C_{D_0}}\right](C_{D_{0_{k+1}}} - C_{D_{0_k}}) + \frac{\partial}{\partial C_{D_1}}\left[\frac{\partial J}{\partial C_{D_0}}\right](C_{D_{1_{k+1}}} - C_{D_{1_k}})$$

$$+ \frac{\partial}{\partial C_{D_2}}\left[\frac{\partial J}{\partial C_{D_2}}\right](C_{D_{2_{k+1}}} - C_{D_{2_k}}) + \ldots.$$

$$\text{or } \left[\frac{\partial J}{\partial C_{D_0}}\right]_{k+1} = \left[\frac{\partial J}{\partial C_{D_0}}\right]_k + \sum_{\ell=1}^{8} \frac{\partial}{\partial C_\ell}\left[\frac{\partial J}{\partial C_{D_0}}\right](C_{\ell_{k+1}} - C_{\ell_k}) \qquad (100)$$

where $C_1 = C_{D_0}$, $C_2 = C_{D_1}$, $C_3 = C_{D_2}$, ...,

$$\frac{\partial J}{\partial C_{D_0}} = 2 \sum_{i=1}^{N} \left[(\alpha_{m_i} - \alpha_{t_i}) \frac{\partial \alpha_{t_i}}{\partial C_{D_0}} \right], \tag{101}$$

and
$$\frac{\partial}{\partial C_\ell} \left(\frac{\partial J}{\partial C_{D_0}} \right) = 2 \sum_{i=1}^{N} \left[(\alpha_{m_i} - \alpha_{t_i}) \frac{\partial^2 \alpha_{t_i}}{\partial C_{D_0} \partial C_\ell} - \left(\frac{\partial \alpha_{t_i}}{\partial C_{D_0}} \right) \left(\frac{\partial \alpha_{t_i}}{\partial C_\ell} \right) \right]. \tag{102}$$

We will assume that we can neglect $(\alpha_{m_i} - \alpha_{t_i}) \dfrac{\partial^2 \alpha_{t_i}}{\partial C_{D_0} \partial C_\ell}$ in comparison to the other term in (102). Such a step will not affect the final answer, only the rate of convergence. In this particular instance the $\dfrac{\partial \alpha_{t_i}}{\partial C_\ell}$ must be evaluated numerically although, where possible, it is desirable to do this analytically. The value of the derivative at a particular time point is found by determining the change in α_{t_i} produced by small changes (1%) to either side of the original value of C_L in (97). All other C_ℓ's are held constant during the process.

When $C_{\ell_{k+1}}$ have the proper values, all the $\left(\dfrac{\partial J}{\partial C_\ell} \right)_{k+1} = 0$. This fact permits us to write a system of eight linear equations,

$$\left(\frac{\partial J}{\partial C_{D_0}} \right)_k + \sum_{\ell=1}^{8} \left[\frac{\partial}{\partial C_\ell} \left(\frac{\partial J}{\partial C_{D_0}} \right)_k (C_{\ell_{k+1}} - C_{\ell_k}) \right] = 0 ,$$

$$\vdots \tag{103}$$

$$\left(\frac{\partial J}{\partial CLAX} \right)_k + \sum_{\ell=1}^{8} \left[\frac{\partial}{\partial C_\ell} \left(\frac{\partial J}{\partial CLAX} \right)_k (C_{\ell_{k+1}} - C_{\ell_k}) \right] = 0 ,$$

which we must solve for the eight new values of $C_{\ell_{k+1}}$. Although we may not actually wish to obtain the solutions in this fashion, we can find them from

$$C_{\ell_{k+1}} = C_{\ell_k} + \{A\}^{-1}\,\{B\}^* , \tag{104}$$

$$\text{where } \{A\} = \begin{bmatrix} 2\sum_{i=1}^{N} \frac{\partial \alpha_{t_i}}{\partial C_{D_0}} \frac{\partial \alpha_{t_i}}{\partial C_{D_0}} & \cdots & 2\sum_{i=1}^{N} \frac{\partial \alpha_{t_i}}{\partial C_{D_0}} \frac{\partial \alpha_{t_i}}{\partial CLAX} \\ \vdots & & \vdots \\ 2\sum_{i=1}^{N} \frac{\partial \alpha_{t_i}}{\partial CLAX} \frac{\partial \alpha_{t_i}}{\partial C_{D_0}} & \cdots & 2\sum_{i=1}^{N} \frac{\partial \alpha_{t_i}}{\partial CLAX} \frac{\partial \alpha_{t_i}}{\partial CLAX} \end{bmatrix} \tag{105}$$

$$\{B\} = \begin{bmatrix} 2\sum_{i=1}^{N} (\alpha_{m_i} - \alpha_{t_i}) \frac{\partial \alpha_{t_i}}{\partial C_{D_0}} \\ \vdots \\ 2\sum_{i=1}^{N} (\alpha_{m_i} - \alpha_{t_i}) \frac{\partial \alpha_{t_i}}{\partial CLAX} \end{bmatrix} . \tag{106}$$

(104) is in effect a generalized first order Newton-Raphson procedure.

With the $C_{\ell_{k+1}}$ values substituted into (97) we determine a new trajectory. We call the α values for this new trajectory $\bar{\alpha}_{t_i}$. We then define

$$\bar{\alpha}_{m_i} = \alpha_{m_i} + 0.5\,(\bar{\alpha}_{t_i} - \alpha_{m_i}) \tag{107}$$

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*The A matrix in this formulation may, for some sets of physical data, be rather ill-conditioned. As a result, the values of $C_{\ell_{k+1}}$ obtained by various solution techniques may all be substantially in error as well as different. The user should therefore employ the actual technique presented in subsequent sections of this report with care until the reasonableness of the solutions is apparent.

and $\theta_i = \gamma_i + \bar{\alpha}_{m_i}$. With these values plus the measured values of V_i, $\dot{V}_i$, ρ_i, $\dot{\gamma}_i$, and W_i, we enter the coefficient extraction routine and the C_L vs. α curve fit procedure to obtain new power, drag, and lift coefficients and to check the resulting fit error.

Prior to beginning another iteration of this process with the latest C_L and C_D coefficients, we update our value for the specific fuel consumption, c, in the following fashion:

$$c = \frac{1}{N - 1} \sum_{j=1}^{N-1} \left(\frac{W_{j+1} - W_j}{P_j} \right). \tag{108}$$

Here, W_j are the input values of the weight and P_j are the values of the power computed using the latest power coefficient.

By repeating the foregoing trajectory comparison with the updated value of $\bar{\alpha}_{m_i}$ two or three times, we arrive at a situation where both the α values and the fit errors have improved. By this time, however, $(\bar{\alpha}_{m_i} - \bar{\alpha}_{t_i}) \to 0$, so that no further improvement is possible with this approach.

It will be evident after a short reflection that if a negative C_{D_1} is obtained during a coefficient extraction, the implication is that α for zero lift is positive. This is a condition the designer of the aircraft will usually avoid if he is aware of it because it leads inherently to high cruise drag with conventional quasi-symmetric fuselages. Thus, if the minimum fit error model contains a C_{D_1} which, as a result of the least squares curve fit procedure, yields a negative value, one would appear to be justified on physical grounds in using as the basis for further operations the most similar model having C_{D_1} and $C_{D_3} \equiv 0$. This is a procedure we will usually follow in applying the foregoing trajectory comparison to reduce the noise in the α-channel.

It is necessary to point out, however, that light aircraft fuselages tend to be very non-symmetric about their x-y planes. It is possible, because of this asymmetry, that the minimum fuselage drag does not occur when the relative wind is parallel to the x-body axis. If the existence of this condition is suspected for the aircraft under test, the negative value for C_{D_1} must be accepted.

The benefit obtained from the α-trajectory comparison described in this section and the preceding three noise-reduction steps has been to reduce the noise in the α and θ channels and improve the overall data consistency to the point that the extracted coefficients are usually sufficiently close to the "correct" values that they can form a useful starting set for the application of a Newton-Raphson identifier.

Application of Newton-Raphson Identifier

The Newton-Raphson Identifier as employed by Taylor and Iliff (Ref. 15) and others is a means of finding the values of unknown coefficients in the equations of motion which tend to minimize the squares of differences between the measured time histories of aircraft state parameters and computed solutions to the equations of motion involving the same parameters. It is assumed that the solutions change linearly with a change in coefficient value. Furthermore, since the equations of motion used by Iliff and Taylor are linear first-order differential equations, the solutions are readily determined and the "cost function" minimization procedure can be joined with the solution procedure without undue difficulty. When forming the cost function it is desirable to include as many independent differences between measurement and computation as possible, since the more closely the number of differences approaches the number of unknowns in the problem, the more determinant it is, i.e., the more likely the procedure is to give reasonable coefficient values.

The present problem differs from that of Iliff and Taylor in that the equations of motion are non-linear. The solution procedure is therefore quite different, much more complex, and must be carried out independently of the minimization. The minimization yields a linearized approximation to the change in the coefficient values needed to minimize the difference between the flight time histories and the computed values of the same states. In the limit as the differences approach zero, the linearized approximations approach the exact values. Another significant difference from the Iliff and Taylor approach is that the present equations of motion have no specific forcing function(s). As noted above, any two states which are known _a priori_ may serve this purpose. We have chosen to use the true airspeed along the flight path as the principle forcing function. Since the power into the airstream is specified as a function of true airspeed in our formulation of the problem, the power at any time is known if the coefficients in the power-velocity model are given. We use as initial coefficient values for this model those obtained from the previous noise-reduction procedure.† With the power and velocity specified as functions of time, it is then possible to determine a unique trajectory. The procedure is as follows:

1. Determine the weight at t_{j+1} from

$$W_{j+1} = W_j - c\Delta t(P_0 + P_1V_j + P_2V_j^2) - c\,\frac{\Delta t^2}{2}\,(P_1\dot{V}_j + 2P_2V_j\dot{V}_j)$$
$$- c\,\frac{\Delta t^3}{6}\,(P_1\ddot{V}_j + 2P_2\dot{V}_j^2 + 2P_2V_j\ddot{V}_j)$$
$$- c\,\frac{\Delta t^4}{24}\,(P_1\dddot{V}_j + 6P_2\dot{V}_j\ddot{V}_j + 2P_2V_j\dddot{V}_j) \qquad (109)$$

$W_{j=1}$ = weight at beginning of maneuver (from test data)
V_j is specified
$\dot{V}_j, \ddot{V}_j, \dddot{V}_j$ are computed by the method of splines from V_j, $\dot{V}_j$, and $\ddot{V}_j$

†It is well known that the rate of convergence of the Newton-Raphson procedure decreases as the error in the estimated values of the coefficients increases. Thus it is desirable to begin the procedure with values as close to the "correct" values as one can reasonably manage.

2. $\gamma_{j=1}$ is determined from $\sin^{-1}(\dot{h}_1/V_1)$ since h_1 and $\dot{h}_1$ are available from the measured data. $\rho_{j=1}$ is determined from

$$\rho_{j=1} = \rho_0(1-6.86 \times 10^{-6}\ h_{j=1})^{4.26}\ . \qquad (110)$$

3. α_j is found from

$$\frac{\dot{V}_j}{g} + \sin\gamma_j = \frac{(P_0+P_1V_j+P_2V_j^2)\cos\alpha_j}{W_jV_j} - \frac{\rho_jSV_j^2}{2W_j}[C_{D_0} + C_{D_2}\ \alpha_j^2 + C_{D_4}\ \alpha_j^6] \qquad (111)$$

by the second-order Newton-Raphson technique.

4. $\dot{\gamma}_j$ is given by

$$\dot{\gamma}_j = \frac{g\rho_jSV_jC_L(\alpha_j)}{2W_j} + \frac{g(P_0 + P_1V_j + P_2V_j^2)\sin\alpha_j}{W_jV_j^2} - \frac{g\cos\gamma_j}{V_j}\ . \qquad (112)$$

5. γ_{j+1} is determined by forward integration of (112) using the following scheme:

   a. With the Runge-Kutta method, determine γ for the first 8 points of the data set.

   b. With γ, α, w, and ρ known at these points,one can then find $\dot{\gamma}$ at the eight points through (112).

   c. Represent $\dot{\gamma}(t)$ over the last six points of the interval by a fifth-order polynomial using Newton's interpolation formula:

$$\dot{\gamma}(t) = a_o + a_1(t - t_{j-5}) + a_2(t - t_{j-5})\ (t - t_{j-4}) + a_3(t - t_{j-5})$$

$$\cdot\ (t - t_{j-4})(t - t_{j-3}) + a_4(t - t_{j-5})(t - t_{j-4})(t - t_{j-3})(t - t_{j-2})$$

$$+\ a_5(t - t_{j-5})(t - t_{j-4})(t - t_{j-3})(t - t_{j-2})(t - t_{j-1})\ , \qquad (113a)$$

where $a_o = \dot{\gamma}_{j-5}$

$$a_1 = \frac{\dot{\gamma}_{j-4} - \dot{\gamma}_{j-5}}{t_{j-4} - t_{j-5}}$$

$$a_2 = [\dot{\gamma}_{j-3} - (a_o + a_1 \{t_{j-3} - t_{j-5}\})]/[(t_{j-3} - t_{j-5})(t_{j-3} - t_{j-4})]$$

$$a_3 = [\dot{\gamma}_{j-2} - (a_o + a_1\{t_{j-2} - t_{j-5}\} + a_2(t_{j-2} - t_{j-5})(t_{j-2} - t_{j-4}))]$$

$$\div [(t_{j-2} - t_{j-5})(t_{j-2} - t_{j-4})(t_{j-2} - t_{j-3})]$$

$$a_4 = [\dot{\gamma}_{j-1} - (a_o + a_1\{t_{j-1} - t_{j-5}\} + a_2(t_{j-1} - t_{j-5})(t_{j-1} - t_{j-4})$$

$$+ a_3(t_{j-1} - t_{j-5})(t_{j-1} - t_{j-4})(t_{j-1} - t_{j-3}))]/[(t_{j-1} - t_{j-5})$$

$$\cdot (t_{j-1} - t_{j-4})(t_{j-1} - t_{j-3})(t_{j-1} - t_{j-2})]$$

$$a_5 = [\dot{\gamma}_j - (a_o + a_1\{t_j - t_{j-5}\} + a_2(t_j - t_{j-5})(t_j - t_{j-4})$$

$$+ a_3(t_j - t_{j-5})(t_j - t_{j-4})(t_j - t_{j-3}) + a_4(t_j - t_{j-5})(t_j - t_{j-4})$$

$$\cdot (t_j - t_{j-3})(t_j - t_{j-2}))]/[(t_j - t_{j-5})(t_j - t_{j-4})(t_j - t_{j-3})$$

$$\cdot (t_j - t_{j-2})(t_j - t_{j-1})].$$

d. Extrapolate the formula to t_{j+1}. This is done simply by letting $t \leq t_{j+1}$.

e. Integrate the extrapolated formula term-by-term analytically and evaluate the result between the limits t_{j-5} and t_{j+1}:

$$\hat{\gamma}_{j+1} = \gamma_{j-5} + \int_{t_{j-5}}^{t_{j+1}} \dot{\gamma}\, dt$$

$$\text{or } \hat{\gamma}_{j+1}=\gamma_{j-5}+\dot{\gamma}_{j-5}(t_{j+1}-t_{j-5})+\frac{\dot{\gamma}_{j-4}-\dot{\gamma}_{j-5}}{t_{j-4}-t_{j-5}}\left[\frac{1}{2}(t^2_{j+1}-t^2_{j-5})-t_{j-5}(t_{j+1}-t_{j-5})\right]+\ \ldots . \tag{113b}$$

At each step we then subtract t_{j-5} from all time values in order to extend the formula's range.

f. Estimate ρ_{j+1} from

$$\hat{\rho}_{j+1} = \rho_j + 4.26\rho_o(1 - 6.86 \times 10^{-6}\ h_j)^{3.26}\ (-\ 6.86 \times 10^{-6})V_j\ \sin\gamma_j\ \Delta t \tag{114a}$$

and α_{j+1} initially from

$$\hat{\alpha}_{j+1} = \alpha_j + 0.25\left[\frac{\alpha_j - \alpha_{j-1}}{t_j - t_{j-1}}\right]\Delta t \tag{114b}$$

with corrections which are determined by comparing the value of γ_{j+1} from (113b) using the $\hat{\rho}_{j+1}$ and $\hat{\alpha}_{j+1}$ with the value of γ_{j+1} from (111) using the same ρ and α values. Then

$$(\hat{\alpha}_{j+1})_{k+1} = (\hat{\alpha}_{j+1})_k + \frac{(\Delta\ \gamma_{j+1})_k}{\left[\left(\frac{\partial\gamma}{\partial\alpha}\right)_{j+1}\right]_k}\ , \tag{115a}$$

$$\text{where } \frac{\partial\gamma}{\partial\alpha} = \frac{-\ (P\ \sin\hat{\alpha}/wv) - \frac{\rho s v^2}{2w}\left[2\hat{\alpha}\ C_{D_2} + 6C_{D_4}\ \hat{\alpha}^5\right]}{\sqrt{1 - \left(\frac{P\ \cos\hat{\alpha}}{wv} - \frac{\rho s v^2}{2w}\ C_D - \frac{\dot{V}}{g}\right)^2}}\ . \tag{115b}$$

These k iterations are continued until $\Delta\gamma_{j+1} < 10^{-13}$. As a result, γ_{j+1} computed by the predictor equator (113b) is compatible with the other variable values to a high degree.

g. Determine $\hat{\dot{\gamma}}_{j+1}$ from (112) using the latest predicted values of $\hat{\gamma}_{j+1}$, $\hat{\rho}_{j+1}$, and $\hat{\alpha}_{j+1}$. Calculate a <u>corrected</u> value for γ_{j+1} from

$$\gamma_{j+1} = \gamma_{j-5} + \int_{t_{j-5}}^{t_{j+1}} \dot{\gamma}\, dt \tag{116a}$$

where now

$$\dot{\gamma} = - P(\gamma - \gamma_{j-5}) + A + B(t - t_{j-5}) + C(t - t_{j-5})^2 + D(t - t_{j-5})^3$$

$$+ E(t - t_{j-5})^4 + F(t - t_{j-5})^5 \tag{116b}$$

if $P > 10^{-2}$. In this equation, an extension of the procedure described by Smith in Ref. 2,

$$P = - \left[\frac{- \dot{\gamma}_{j+1} + 6\dot{\gamma}_j - 15\dot{\gamma}_{j-1} + 20\dot{\gamma}_{j-2} - 15\dot{\gamma}_{j-3} + 6\dot{\gamma}_{j-4} - \dot{\gamma}_{j-5}}{- \gamma_{j+1} + 6\gamma_j - 15\gamma_{j-1} + 20\gamma_{j-2} - 15\gamma_{j-3} + 6\gamma_{j-4} - \gamma_{j-5}}\right]$$

$$A = \dot{\gamma}_{j-5}$$

$$B = \left(\frac{12\dot{\gamma}_j - 75\dot{\gamma}_{j-1} + 200\dot{\gamma}_{j-2} - 300\dot{\gamma}_{j-3} + 300\dot{\gamma}_{j-4} - 137\dot{\gamma}_{j-5}}{60(t_{j-4} - t_{j-5})}\right)$$

$$+ P\left(\frac{12\gamma_j - 75\gamma_{j-1} + 200\gamma_{j-2} - 300\gamma_{j-3} + 300\gamma_{j-4} - 137\gamma_{j-5}}{60(t_{j-4} - t_{j-5})}\right)$$

$$C = \left(\frac{- 10\dot{\gamma}_j + 61\dot{\gamma}_{j-1} - 156\dot{\gamma}_{j-2} + 214\dot{\gamma}_{j-3} - 154\dot{\gamma}_{j-4} + 45\dot{\gamma}_{j-5}}{24(t_{j-4} - t_{j-5})^2}\right)$$

$$+ P\left(\frac{- 10\gamma_j + 61\gamma_{j-1} - 156\gamma_{j-2} + 214\gamma_{j-3} - 154\gamma_{j-4} + 45\gamma_{j-5}}{24(t_{j-4} - t_{j-5})^2}\right)$$

$$D = \left(\frac{7\dot{\gamma}_j - 41\dot{\gamma}_{j-1} + 98\dot{\gamma}_{j-2} - 118\dot{\gamma}_{j-3} + 71\dot{\gamma}_{j-4} - 17\dot{\gamma}_{j-5}}{24(t_{j-4} - t_{j-5})^3}\right)$$

$$+ P\left(\frac{7\gamma_j - 41\gamma_{j-1} + 98\gamma_{j-2} - 118\gamma_{j-3} + 71\gamma_{j-4} - 17\gamma_{j-5}}{24(t_{j-4} - t_{j-5})^3}\right)$$

$$E = \left(\frac{-2\dot{\gamma}_j + 11\dot{\gamma}_{j-1} - 24\dot{\gamma}_{j-2} + 26\dot{\gamma}_{j-3} - 14\dot{\gamma}_{j-4} + 3\dot{\gamma}_{j-5}}{24(t_{j-4} - t_{j-5})^4} \right)$$

$$+ P\left(\frac{-2\gamma_j + 11\gamma_{j-1} - 24\gamma_{j-2} + 26\gamma_{j-3} - 14\gamma_{j-4} + 3\gamma_{j-5}}{24(t_{j-4} - t_{j-5})^4} \right)$$

$$F = \left(\frac{\dot{\gamma}_j - 5\dot{\gamma}_{j-1} + 10\dot{\gamma}_{j-2} - 10\dot{\gamma}_{j-3} + 5\dot{\gamma}_{j-4} - \dot{\gamma}_{j-5}}{120(t_{j-4} - t_{j-5})^5} \right)$$

$$+ P\left(\frac{\gamma_j - 5\gamma_{j-1} + 10\gamma_{j-2} - 10\gamma_{j-3} + 5\gamma_{j-4} - \gamma_{j-5}}{120(t_{j-4} - t_{j-5})^5} \right) \qquad (116c)$$

for the case in which the time intervals are even. For uneven time intervals, the expressions are much more complex.

If $P \leq 10^{-2}$, we represent $\dot{\gamma}$ in (116a) by (113a) plus the term

$$a_6(t - t_{j-5})(t - t_{j-4})(t - t_{j-3})(t - t_{j-2})(t - t_{j-1})(t - t_j) \qquad (116d)$$

where $a_6 = [\hat{\dot{\gamma}}_{j+1} - (a_o + a_1\{t_{j+1} - t_{j-5}\} + a_2(t_{j+1} - t_{j-5})(t_{j+1} - t_{j-4})$

$+ a_3(t_{j+1} - t_{j-5})(t_{j+1} - t_{j-4})(t_{j+1} - t_{j-3}) + a_4(t_{j+1} - t_{j-5})$

$\cdot (t_{j+1} - t_{j-4})(t_{j+1} - t_{j-3})(t_{j+1} - t_{j-2}) + a_5(t_{j+1} - t_{j-5})$

$\cdot (t_{j+1} - t_{j-4})(t_{j+1} - t_{j-3})(t_{j+1} - t_{j-2})$

$\cdot (t_{j+1} - t_{j-1}))]/[(t_{j+1} - t_{j-5})(t_{j+1} - t_{j-4})(t_{j+1} - t_{j-3})$

$\cdot (t_{j+1} - t_{j-2})(t_{j+1} - t_{j-1})(t_{j+1} - t_j)]$. $\qquad$ (116e)

The $\hat{\gamma}_{j+1}$ in (116c) or (116e) is obtained from the predictor equation (113b). Its use in the corrector equation (116a) gives us the final, updated value of γ_{j+1}. Despite the attention to accuracy evidenced by the use of this procedure, the very "stiff" nature of (112), the fact that the Taylor expansion for h(see below) is truncated at four terms, and the fact that with any forward integration scheme the errors accumulate as one marches along, require that the step size be kept relatively small (0.01 sec. or less) if the desired accuracy (errors no larger than 1 part in 10^6 for a 30 second trajectory) is to be maintained. As a result, run times per iteration will be on the order of 4 minutes on an IBM 370/165.

6. h_{j+1} is found from

$$h_{j+1} = h_j + (V_j \sin \gamma_j)\Delta t + (\dot{V}_j \sin \gamma_j + V \dot{\gamma}_j \cos \gamma_j) \frac{\Delta t^2}{2}$$

$$+ (\ddot{V}_j \sin \gamma_j + \dot{V}_j\dot{\gamma}_j \cos \gamma_j + V \ddot{\gamma}_j \cos \gamma_j - V \dot{\gamma}_j^2 \sin \gamma_j) \frac{\Delta t^3}{6}$$

$$+ \left[(\dddot{V}_j - 2\dot{V}_j\dot{\gamma}_j^2 - 3V_j\dot{\gamma}_j\ddot{\gamma}_j)\sin \gamma_j + (2\ddot{V}_j\dot{\gamma}_j + 2\dot{V}_j\ddot{\gamma}_j + V_j\dddot{\gamma}_j - V_j\dot{\gamma}_j^3)\cos \gamma_j\right] \frac{\Delta t^{4*}}{24} \tag{117}$$

and ρ_{j+1} from h_{j+1}. $\ddot{\gamma}$ and $\dddot{\gamma}$ are found by differentiating (113a) and (116d) analytically. (118)

7. With ρ_{j+1} and γ_{j+1} known, α_{j+1} is determined by the Newton-Raphson technique from (111).

All of the variable values at t_{j+1} have now been determined. The process is then repeated to find the variable values at t_{j+2} and so on to t_N.

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*A four term expansion is used because to employ additional terms would require data which are not readily available. High accuracy in the representation of the altitude can therefore be maintained only by using a relatively small step size.

The determination of $h(t)$, $\alpha(t)$, $\rho(t)$, $\gamma(t)$, $\dot{\gamma}(t)$, and $W(t)$ by this integration procedure provides the raw material from which one can form and evaluate a cost function. It will be recalled that we have assumed the measured values of V and h and their derivatives to be correct. We can, as a result, form the following "measured" variables:

$$h_{m_i} ,$$

$$\gamma_{m_i} = \sin^{-1}\left(\frac{\dot{h}_{m_i}}{V_{m_i}}\right),$$

$$\dot{\gamma}_{m_i} = \frac{1}{\sqrt{1 - \left(\dfrac{\dot{h}_{m_i}}{V_{m_i}}\right)^2}}\left[\frac{\ddot{h}_{m_i}}{V_{m_i}} - \frac{\dot{h}_{m_i}\dot{V}_{m_i}}{V_{m_i}^2}\right], \tag{119}$$

and

$$E_{m_i} = h_{m_i} + \frac{V_{m_i}^2}{2g} ,$$

all of which may be compared with values computed along the trajectory. Furthermore, the variation of each of these variables with each of the power, lift, and drag coefficients can be evaluated analytically* for each time point.

We can also develop two additional comparisons if we are willing to make some assumptions regarding the quality and character of the flight data. We will develop a "measured" weight time history by fitting a fourth-order polynomial to the computed values of W_i. At W_1 and W_N, however, the experimental values weighted by N^3 are used in the least squares curve fit routine. The partial derivatives of W_{t_i} with respect to the power coefficients can, of course, be readily evaluated analytically.

If we now assume that the filtered value of $\dot{\theta}$ has an accuracy roughly comparable to that of V and h, then we can take as the "measured" value of α

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*An analytical evaluation is both faster and more accurate than a numerical one.

$$\alpha_{m_i} = \int_{t_{i=1}}^{t_i} \dot{\theta}_{m_i}\, dt + \theta_1 - \sin^{-1}\left[\frac{\dot{h}_{m_i}}{V_{m_i}}\right] \tag{120}$$

In this case the partial derivatives of α_{t_i} with respect to the lift and drag coefficients must be evaluated numerically by the Newton-Raphson procedure. The partials of α_{t_i} with respect to the power coefficients are taken to be zero. Alternately, the measured values of α may be used in place of those computed by (120) if α is known to be accurate. These procedures permit us to form the following cost function:

$$J_2 = \sum_{i=1}^{N}\Big[D_1(h_{m_i} - h_{t_i})^2 + D_2(\gamma_{m_i} - \gamma_{t_i})^2 + D_3(\dot{\gamma}_{m_i} - \dot{\gamma}_{t_i})^2 + D_4(W_{m_i} - W_{t_i})^2$$

$$+ D_5(E_{m_i} - E_{t_i})^2 + D_6(\alpha_{m_i} - \alpha_{t_i})^2\Big], \tag{121}$$

where the D's are weights which may be applied to the various differences. If, for example, α_m is not regarded highly, its weight, D_6, may be taken to be very small compared with the other weights. We may then proceed as before to determine the changes in the 13 (possible) coefficients which tend to minimize J_2 by minimizing $(h_{m_i} - h_{t_i})$, etc.* With the new coefficient values we then proceed to calculate a new trajectory, find a new value for the cost function, develop new coefficient values, and so on, until $J_2 < 10^{-13}$ or is as small as it will get.

In order to add the various constituent items of the cost function (121) properly, it is desirable that each item be dimensionless, else one is placed in the position of adding feet to pounds, a situation whose result is somewhat difficult to interpret. We choose, therefore, to expand our concept of weights in (121) and write

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*Again, some care must be exercised in solving the system of 13 equations for the 13 new coefficient values because the state space, being nearly flat, leads inevitably to a relatively ill-conditioned matrix. The technique described with the program user instructions later in this report was found, after some experimentation, to be effective with a limited number of test cases. It may not be as effective in all cases, however.

$$D_1 = \frac{d_1}{h^2_{max}} \qquad D_4 = \frac{d_4}{W^2_{max}}$$

$$D_2 = \frac{d_2}{\gamma^2_{max}} \qquad D_5 = \frac{d_5}{E^2_{max}}$$

$$D_3 = \frac{d_3}{\dot{\gamma}^2_{max}} \qquad D_6 = \frac{d_6}{\alpha^2_{max}} , \tag{122}$$

where the lower case d's are now dimensionless numbers which can serve the purpose of altering the importance of the variables with respect to one another. Normally, we take the d's = 1.0.

Additionally, we note the importance of updating, by (108), the specific fuel consumption, c, after each iteration. Given a set of power coefficients and the velocity time history, c uniquely determines W_j. The weight at each point has a relatively important effect on the values of α, γ, and ρ which are determined by the integration procedure.

One way to restrict the range of the individual coefficient values produced by the Newton-Raphson identifier to physically realizable values is to include a priori values of the coefficients in the cost function. These values, obtained from previous flight or wind tunnel tests, can be used to influence the values extracted from the current flight test data. Inclusion of these values is simply another way, as Iliff and Taylor (Ref. 15) point out, of "making use of all the information available to obtain the estimates and insuring that no change is made in the (coefficient value) unless there is sufficient information in the flight data." To effect this step, we add the terms

$$\begin{gathered} \frac{d_7}{P^2_{0_m}} (P_{0_m} - P_0)^2 \\ \frac{d_8}{P^2_{1_m}} (P_{1_m} - P_1)^2 \\ \vdots \\ \frac{d_{19}}{(CLAX_m)^2} (CLAX_m - CLAX)^2 \end{gathered} \tag{123}$$

to those inside the brackets of J_2. Here, the subscript "m" refers to the *a priori* values. Then the additional partial derivatives are given by

$$\begin{matrix} \dfrac{2d_7}{P_{0_m}^2}(P_{0_m} - P_0) \\ \vdots \\ \dfrac{2d_{19}}{(CLAX_m)^2}(CLAX_m - CLAX) \end{matrix} , \tag{124}$$

and the additional second partial derivatives by

$$\begin{matrix} \dfrac{2d_7}{P_{0_m}^2} \\ \vdots \\ \dfrac{2d_{19}}{(CLAX_m)^2} \end{matrix} . \tag{125}$$

The revised matrix equation for the coefficients is then obtained by adding (124) to the appropriate elements of the existing B matrix and (125) to the appropriate diagonal elements of the A matrix. As an initial estimate we take each lower case d, d_7 .... d_{19}, as ten times the coefficient value squared if we have a reasonable estimate of the correct coefficient values, and 0 if we do not.

Finally, for convenience of reference, the complete form of the matrix equation developed from (121), (124), and (125) is given below:

$$\begin{bmatrix} \Delta P_0 \\ \Delta P_1 \\ \Delta P_2 \\ \Delta P_3 \\ \Delta P_4 \\ \Delta C_{D_0} \\ \Delta C_{D_1} \\ \Delta C_{D_2} \\ \Delta C_{D_3} \\ \Delta C_{D_4} \\ \Delta C_{L_{A_0}} \\ \Delta C_{L_A} \\ \Delta C_{L_{A_X}} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} & a_{15} & a_{16} & a_{17} & a_{18} & a_{19} & a_{110} & a_{111} & a_{112} & a_{113} \\ a_{21} & a_{22} & a_{23} & a_{24} & a_{25} & a_{26} & a_{27} & a_{28} & a_{29} & a_{210} & a_{211} & a_{212} & a_{213} \\ a_{31} & a_{32} & a_{33} & a_{34} & a_{35} & a_{36} & a_{37} & a_{38} & a_{39} & a_{310} & a_{311} & a_{312} & a_{313} \\ a_{41} & a_{42} & a_{43} & a_{44} & a_{45} & a_{46} & a_{47} & a_{48} & a_{49} & a_{410} & a_{411} & a_{412} & a_{413} \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & a_{56} & a_{57} & a_{58} & a_{59} & a_{510} & a_{511} & a_{512} & a_{513} \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} & a_{67} & a_{68} & a_{69} & a_{610} & a_{611} & a_{612} & a_{613} \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & a_{77} & a_{78} & a_{79} & a_{710} & a_{711} & a_{712} & a_{713} \\ a_{81} & a_{82} & a_{83} & a_{84} & a_{85} & a_{86} & a_{87} & a_{88} & a_{89} & a_{810} & a_{811} & a_{812} & a_{813} \\ a_{91} & a_{92} & a_{93} & a_{94} & a_{95} & a_{96} & a_{97} & a_{98} & a_{99} & a_{910} & a_{911} & a_{912} & a_{913} \\ a_{101} & a_{102} & a_{103} & a_{104} & a_{105} & a_{106} & a_{107} & a_{108} & a_{109} & a_{1010} & a_{1011} & a_{1012} & a_{1013} \\ a_{111} & a_{112} & a_{113} & a_{114} & a_{115} & a_{116} & a_{117} & a_{118} & a_{119} & a_{1110} & a_{1111} & a_{1112} & a_{1113} \\ a_{121} & a_{122} & a_{123} & a_{124} & a_{125} & a_{126} & a_{127} & a_{128} & a_{129} & a_{1210} & a_{1211} & a_{1212} & a_{1213} \\ a_{131} & a_{132} & a_{133} & a_{134} & a_{135} & a_{136} & a_{137} & a_{138} & a_{139} & a_{1310} & a_{1311} & a_{1312} & a_{1313} \end{bmatrix}^{-1} \bullet \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \\ b_5 \\ b_6 \\ b_7 \\ b_8 \\ b_9 \\ b_{10} \\ b_{11} \\ b_{12} \\ b_{13} \end{bmatrix} \tag{126}$$

where

$$a_{11} = \frac{2d_1}{h_{max}^2} \sum_{i=1}^{N} \frac{\partial h_{t_i}}{\partial P_0} \frac{\partial h_{t_i}}{\partial P_0} + \frac{2d_2}{\gamma_{max}^2} \sum_{i=1}^{N} \frac{\partial \gamma_{t_i}}{\partial P_0} \frac{\partial \gamma_{t_i}}{\partial P_0} + \frac{2d_3}{\dot{\gamma}_{max}^2} \sum_{i=1}^{N} \frac{\partial \dot{\gamma}_{t_i}}{\partial P_0} \frac{\partial \dot{\gamma}_{t_i}}{\partial P_0}$$

$$+ \frac{2d_4}{W_{max}^2} \sum_{i=1}^{N} \frac{\partial W_{t_i}}{\partial P_0} \frac{\partial W_{t_i}}{\partial P_0} + \frac{2d_5}{E_{max}^2} \sum_{i=1}^{N} \frac{\partial E_{t_i}}{\partial P_0} \frac{\partial E_{t_i}}{\partial P_0} + \frac{2d_6}{\alpha_{max}^2} \sum_{i=1}^{N} \frac{\partial \alpha_{t_i}}{\partial P_0} \frac{\partial \alpha_{t_i}}{\partial P_0} + \frac{2d_7}{P_{0_m}^2}$$

$$+ \frac{2d_2}{\gamma_{max}^2} \sum_{i=1}^{N} (\gamma_{m_i} - \gamma_{t_i}) \frac{\partial^2 \gamma_{t_i}}{\partial P_0^2} + \frac{2d_3}{\dot{\gamma}_{max}^2} \sum_{i=1}^{N} (\dot{\gamma}_{m_i} - \dot{\gamma}_{t_i}) \frac{\partial^2 \dot{\gamma}_{t_i}}{\partial P_0^2}$$

$$+ \frac{2d_1}{h_{max}^2} \sum_{i=1}^{N} (h_{m_i} - h_{t_i}) \frac{\partial^2 h_{t_i}}{\partial P_0^2} \tag{127}$$

is a typical diagonal element and

$$a_{12} = \frac{2d_1}{h_{max}^2} \sum_{i=1}^{N} \frac{\partial h_{t_i}}{\partial P_0} \frac{\partial h_{t_i}}{\partial P_1} + \frac{2d_2}{\gamma_{max}^2} \sum_{i=1}^{N} \frac{\partial \gamma_{t_i}}{\partial P_0} \frac{\partial \gamma_{t_i}}{\partial P_1} + \frac{2d_3}{\dot{\gamma}_{max}^2} \sum_{i=1}^{N} \frac{\partial \dot{\gamma}_{t_i}}{\partial P_0} \frac{\partial \dot{\gamma}_{t_i}}{\partial P_1}$$

$$+ \frac{2d_4}{W_{max}^2} \sum_{i=1}^{N} \frac{\partial W_{t_i}}{\partial P_0} \frac{\partial W_{t_i}}{\partial P_1} + \frac{2d_5}{E_{max}^2} \sum_{i=1}^{N} \frac{\partial E_{t_i}}{\partial P_0} \frac{\partial E_{t_i}}{\partial P_1} + \frac{2d_6}{\alpha_{max}^2} \sum_{i=1}^{N} \frac{\partial \alpha_{t_i}}{\partial P_0} \frac{\partial \alpha_{t_i}}{\partial P_1}$$

$$+ \frac{2d_2}{\gamma_{max}^2} \sum_{i=1}^{N} (\gamma_{m_i} - \gamma_{t_i}) \frac{\partial^2 \gamma_{t_i}}{\partial P_0 \partial P_1} + \frac{2d_3}{\dot{\gamma}_{max}} \sum_{i=1}^{N} (\dot{\gamma}_{m_i} - \dot{\gamma}_{t_i}) \frac{\partial^2 \dot{\gamma}_{t_i}}{\partial P_0 \partial P_1}$$

$$+ \frac{2d_1}{h_{max}^2} \sum_{i=1}^{N} (h_{m_i} - h_{t_i}) \frac{\partial^2 h_{t_i}}{\partial P_0 \partial P_1} \tag{128}$$

is a typical off-diagonal element of the A matrix;

$$b_1 = \frac{2d_1}{h^2_{max}} \sum_{i=1}^{N} (h_{m_i} - h_{t_i}) \frac{\partial h_{t_i}}{\partial P_0} + \frac{2d_2}{\gamma^2_{max}} \sum_{i=1}^{N} (\gamma_{m_i} - \gamma_{t_i}) \frac{\partial \gamma_{t_i}}{\partial P_0}$$

$$+ \frac{2d_3}{\dot{\gamma}^2_{max}} \sum_{i=1}^{N} (\dot{\gamma}_{m_i} - \dot{\gamma}_{t_i}) \frac{\partial \dot{\gamma}_{t_i}}{\partial P_0} + \frac{2d_4}{W^2_{max}} \sum_{i=1}^{N} (W_{m_i} - W_{t_i}) \frac{\partial W_{t_i}}{\partial P_0} \tag{129}$$

$$+ \frac{2d_5}{E^2_{max}} \sum_{i=1}^{N} (E_{m_i} - E_{t_i}) \frac{\partial E_{t_i}}{\partial P_0} + \frac{2d_6}{\alpha^2_{max}} \sum_{i=1}^{N} (\alpha_{m_i} - \alpha_{t_i}) \frac{\partial \alpha_{t_i}}{\partial P_0} + \frac{2d_7}{P^2_{0_m}} (P_{0_m} - P_0)$$

is a typical element of the B matrix. Note that the number of elements depends upon the number of unknown coefficients. For example, for 9 unknown coefficients, the A matrix has 81 elements and the B matrix has 9 elements. Note also that some of the partials do not exist, i.e., $\frac{\partial \alpha}{\partial P}$, $\frac{\partial W}{\partial C_L}$, etc. Some of the second partial derivatives, e.g. those involving E and W, also do not exist. Second partial derivatives involving α are omitted; since the first partials must be evaluated numerically, there is no straightforward way to obtain the second partials at the same time. In addition, in an effort to speed convergence, tolerances are set on all differences, $(\alpha_{m_i} - \alpha_{t_i})$ etc. When this difference is less than the established tolerance, the difference is set to zero. Since α_{m_i} for the test cases was known to contain some error, the tolerance for $(\alpha_{m_i} - \alpha_{t_i})$ was set at 6×10^{-5} radians. At this value the α-differences at each value of i became zero. No second partial derivative values are then necessary.

APPLICATION OF CONSTRAINTS TO MINIMIZATION OF COST FUNCTION

The parameter space described by these equations is nearly flat and has many local minima. As a result, repeated application of (126) usually leads to one of these local minima rather than to the global minimum. To find the global minimum two additional procedures are applied. The first is to constrain the recovered parameter values to lie between certain limits. For example, one would not expect an aircraft with a relatively low power loading like the ATLIT to have a C_{L_α} flaps up of more than 6.3. Similarly, the CLAX term, if it has a value, is not likely to be positive. The CLAO term will usually lie between -0.5 and +0.5. One can usually assign reasonable upper and lower limits to the other parameter values on the basis of wind tunnel tests, analysis, or previous experience. The parameter values can be constrained to lie within these limits by comparing the parameter values obtained after performing the operation described in (126) with the limits and adding a term

$$WGTL(P_0 - P_{0_{lower\ limit}}) \tag{130}$$

to the b_1 element and the term

$$WGTL \tag{131}$$

to the a_{11} element in (126) if $P_0 < P_{0_{lower\ limit}}$. Similarly if $P_0 > P_{0_{upper\ limit}}$ one adds

$$WGTU(P_0 - P_{0_{upper\ limit}}) \tag{132}$$

to the b_1 element and

$$WGTU \tag{133}$$

to the a_{11} element. The matrix manipulation is again carried out and the new parameter values are compared with the imposed limits. If any of the parameter values still does not lie within the limiting values, WGTU or WGTL, whichever is appropriate, is increased by a factor of 10 for that parameter and the matrix operation repeated.

While this operation will prevent parameter values from being grossly ridiculous in the physical sense, it does not insure convergence to a global minimum. There are two reasons:

1. The limits will almost always be chosen independently of one another and may in fact lie on different slopes of a local minima. Thus, the parameter values may not readily move off these limits if the weights, WGTL and WGTU, are reduced on subsequent iterations.

2. A number of the diagonal elements of the A matrix are much smaller than the off-diagonal elements in the same column or row. Such ill-conditioning can lead to relatively large excursions in some of the parameter values from iteration to iteration. These excursions may actually be large enough to cause the parameter value to move from one limit to the other in one iteration. Since the trajectory is very sensitive to the parameter values used to compute it, large changes in parameter values cannot be used to find the global minimum because the computed trajectory will cross the input trajectory on each iteration; the cost function increases very rapidly in these circumstances.

Two means have been found useful for conditioning the A matrix to alleviate this problem. The first method sets the off-diagonal elements, a_{12}, a_{13}, ... a_{113}, a_{21}, a_{31}, ... a_{131}, to zero and retains only a_{11}. This is equivalent to saying that any changes in P_0 do not depend upon the values of the other parameters nor do the other parameters depend upon P_0; changes in P_0 depend only on the agreement between the computed and measured trajectories. This is not as preposterous as it may at first appear. Consider the physical situation: All of the data on which the procedure operates is at a speed considerably above V = 0, the speed at which the power equals P_0. P_0, for the example cases at least, is much smaller (about a factor of 10) than the other terms in the power expression which also contributes to the ill-conditioning. Note, however, that the system can still converge to the global minimum when the off-diagonal elements are set to zero because $b_1 \to 0$ as the global minimum is approached.

The second method for improving the conditioning of the A matrix starts by extracting the power coefficients from both the drag <u>and</u> the lift equations. If the system has not converged to a global minimum and produced compatible data trajectories, the power coefficients extracted by fitting the two equations to the same data will be different. Then by imposing a priori power coefficients of the type

$$\frac{G\, P_{0_{DRAG}}^2}{(G-1)P_{0_{DRAG}} + P_{0_{LIFT}}} \tag{134}$$

and supplying these with moderate weights, one can condition the system to converge reasonably rapidly to a new minimum. This will usually be much closer to the global minimum than the previous one. Then, by relaxing the weights on the a priori values somewhat, the system may adjust itself even closer to the global minimum. In (134) $P_{0_{DRAG}}$ is the P_0 coefficient extracted from the drag or $\dot{V}$ equation, $P_{0_{LIFT}}$ is the P_0 coefficient extracted from the lift or $\dot{\gamma}$ equation, and G is an arbitrarily-selected constant. G should be about 10 for the higher order coefficients and about 100 for P_0.

This is to account for the fact that because power is a small term in the $\dot{\gamma}$ equation, the parameter values from this equation will be more in error than those from the $\dot{V}$ equation. The correct a priori values should therefore lie closer to the parameter values derived from the $\dot{V}$ equation. The reason this procedure is effective is that when power is specified the system is actually determinant* at every speed; thus, specifying a priori values for the power coefficients will cause the system to converge fairly rapidly to some minimum. If the a priori values are exact, the lift and drag parameter values will be recovered with good accuracy but not exactly. The trick then is to choose G properly, use the first method, or develop some combination technique. Unfortunately, experience in working with the system is necessary in order to select the best approach. This situation, it may be mentioned, is not uncommon in parameter identification work at the present time.

If the a priori technique represented by equation (134) and its subsequent relaxations is permitted to go through a number of iterations one finds, not surprisingly, that the changes in the coefficient values get smaller and smaller each iteration. To permit this situation to continue beyond a certain point is (a) not cost-effective and (b) does not guarantee convergence of the coefficients to exact values. To aid computationally in the convergence to at least a local minimum those coefficients which do not change at least 1.5×10^{-6} times their value are "frozen" and the system reduced accordingly. CLA, however, is treated differently. When $\Delta CLA/CLA < 1.5 \times 10^{-6}$ but still positive, CLA is increased by 1.0×10^{-3}. This is done because it was found that CLA is the key parameter in determining which local minimum the system converges to. Near the correct value of CLA the state space must be very flat because the system will converge** to a very small cost function for <u>any</u> value of CLA. This value of the cost function will be very slightly greater than the global minimum so that the prospects for reaching the global minimum without some "nudging" of this kind are quite remote.

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* That is to say the total lift or total drag are determinate. The individual coefficients in the polynomial expansions for lift and drag must still be found as before.

** By converge we mean reach a value from which it will not differ significantly despite numerous additional iterations.

EXAMPLE APPLICATION OF NOISE REDUCTION AND NEWTON-RAPHSON PROCEDURE

The efficacy of the foregoing procedures is indicated by the following example: If only the α-channel of the theoretical data set is degraded by 1% α_{max} random noise and then filtered with $n_c = 10$, errors remaining in α are still on the order of 2×10^{-3} radians. When this computed data set is submitted to the least squares coefficient extraction procedure, the fit error obtained for the correct model is 0.294823×10^{-4} and the six coefficients are:

$P_0 = 49398.169$

$P_2 = 857.520129$

$P_3 = -\ 1.005276788$

$C_{D_0} = .0440371829$

$C_{D_2} = 1.390709638$

$C_{D_4} = 1947.263799$

The α-bias error found ($-.111455 \times 10^{-8}$) is too small to justify a correction.

When the data are fit with a power model of $P_0 V^{1/3}$ and a five term drag model the fit error is $0.11828259 \times 10^{-3}$. When the drag model is changed to $C_D = C_{D_0} + C_{D_1} C_L^2$ the fit error becomes $0.30286167 \times 10^{-3}$ and the coefficients are

$P_0 = 31825.6829$

$C_{D_0} = .036226989$

$C_{D_1} = .0932119$

The program then uses a least-square distance routine to fit the α-data to the C_L values found from the $\dot{\gamma}$-equation with the following result:

$$C_L = -\ 0.002163327 + 6.35788976\alpha - 0.3823769\alpha^2$$

The individual α points are then moved to satisfy this equation.

When the coefficient extraction is repeated, the fit error for the correct model is now reduced to 0.1846867×10^{-6} and the coefficients are

$P_0 = 25354.595$

$P_2 = 1173.542$

$P_3 = 2.377407$

$C_{D_0} = .03342$

$C_{D_2} = 1.29939516$

$C_{D_4} = 2005.55596$

The C_L coefficients are then updated with the result that

$$C_L = -\ 0.0017838557 + 6.34847\alpha - 0.310849\alpha^{2.0304627}$$

After 4 iterations of the α-modification procedure discussed in section 3 above, the minimum fit error for the correct model is 0.33751×10^{-7} and the coefficients are

$P_0 = 26881.7756$ $\qquad C_{D_0} = .033792832$

$P_2 = 1156.25239$ $\qquad C_{D_2} = 1.2885474567$

$P_3 = -2.3179596$ $\qquad C_{D_4} = 2017.21169779$

The lift coefficient equation has then become

$$C_L = -\ .001782573568 + 6.34888117\alpha - 0.3160536\alpha^{2.04393}$$

The trajectory comparison procedure yields a fit error of 0.15515×10^{-8} with the following coefficients:

$P_0 = 28740.475$ $\qquad C_{D_0} = .03503665$

$P_2 = 1127.26152$ $\qquad C_{D_2} = 1.3017466$

$P_3 = -2.17339$ $\qquad C_{D_4} = 1991.91279$

It is at this point that the Newton-Raphson Identifier is first applied. Using the foregoing coefficients and the latest value for the specific fuel consumption, we compute differences between the "measured" values and the latest calculated values of the variables along the flight trajectory as well as the values of the partial derivatives at each point. When these are properly summed and placed in the appropriate A and B matrices, we solve the system of equations to find the quantities by which the coefficients should be changed to reduce the difference between the "measured" trajectory and the computed trajectory. The new coefficients found by eight iterations of this procedure are then

$P_0 = 28735.87794$ $\qquad C_{D_0} = .03510029979$ $\qquad$ CLA0 = $.254462293 \times 10^{-7}$

$P_2 = 1126.60939679$ $\qquad C_{D_2} = 1.28590$ $\qquad$ CLA = 6.29327993

$P_3 = -2.1696485666$ $\qquad C_{D_4} = 2016.338978$ $\qquad$ CLAX = $-.301975855 \times 10^{-8}$

When these, along with a revised specific fuel consumption, are used in the subsequent trajectory computation, the fit error is less than 6×10^{-12}. Tables V and VI show the results achieved after 29 iterations. The fit error at this point is 1.3336×10^{-13} and the residual error in α averages about 1.2×10^{-5} radians. Additional iterations may be used until the final fit error of 6.553×10^{-14} — the value obtained with time histories computed from the correct theoretical coefficients — is approached. Note that in these circumstances the average residual error in α is less than 0.6928×10^{-5} radians, or about one part in 100,000. There is evidence to suggest, however, that most of this error is a result of the use of only 16 decimal digits in the integration routine. In that event, users with an extended precision capability should find the ultimate fit error to be somewhat lower ($\sim 10^{-22}$).

The example cited here shows that with flight data that are not excessively noisy or otherwise erroneous, the simple least squares procedure described earlier in this report can be extended and modified to accommodate such errors successfully and still produce reliable coefficient values. In the present case the reduction in fit error was more than eight orders of magnitude.

When this more powerful procedure was first applied to actual flight data, however, the initial fit error was about 10^{-1} (about 1000 times as large as for the test case) and no reduction could be obtained. Examination of the input data revealed that the α, θ, and $\sin^{-1}(\dot{h}/V)$ data were very incompatible. It was immediately obvious that it would be necessary to reduce this incompatibility in some rational fashion before the procedure described above could begin to function effectively.

TABLE V. EFFECT OF NOISE REDUCTION EFFORTS ON RANDOM NOISE-CORRUPTED α-DATA (OTHER CHANNELS NOISE FREE)

Pt.	α-values after smoothing by low-pass filter	α-values after application of noise-reduction program	Theoretical α-values
1	.1648561	.162610	.1625865
6	.1646336	.162650	.1626264
11	.1642220	.162726	.1627021
16	.1635306	.162858	.1628342
21	.1627125	.163017	.1629993
26	.1622586	.163060	.1630357
31	.1621283	.162896	.1628721
36	.1620319	.162473	.1624490
41	.1617028	.161753	.1617295
46	.1609460	.160710	.1606867
51	.1596614	.159317	.1592940
56	.1578413	.157549	.1572621
61	.1555447	.155404	.1553815
66	.1528620	.152898	.1528759
71	.1498808	.150048	.1500260
76	.1466639	.146872	.1468503
81	.1432434	.143406	.1433850
86	.1396289	.139697	.1396771
91	.1358230	.135794	.1357737
96	.1318381	.131741	.1317222
101	.1277057	.127589	.1275701
106	.1234775	.123383	.1233655
111	.1192182	.119174	.1191564
116	.1149943	.115007	.1149901
121	.1108633	.110919	.1109024
126	.1068668	.106936	.1069206
131	.1030291	.103087	.1030717
136	.0993605	.0993959	.0993814
141	.0958635	.0958769	.0958629
146	.0925384	.0925358	.0925223
151	.0896943	.0896856	.0896724
156	.0867033	.0866978	.0866851
161	.0838952	.0838976	.0838853
166	.0812729	.0812796	.0812676
171	.0788341	.0788380	.0788264
176	.0765706	.0765671	.0765559
181	.0744685	.0744597	.0744487
186	.0725120	.0725069	.0724962
191	.0706878	.0707004	.0706899
196	.0689884	.0690313	.0690211

TABLE V. (Continued)

Pt.	α-values after smoothing by low-pass filter	α-values after application of noise-reduction program	Theoretical α-values
201	.0674143	.0674917	.0674817
206	.0659714	.0660735	.0660637
211	.0646669	.0647690	.0647594
216	.0635016	.0635702	.0635607
221	.0624647	.0624701	.0624609
226	.0615312	.0614627	.0614536
231	.0606668	.0605417	.0605327
236	.0598368	.0597010	.0596921
241	.0590192	.0589354	.0589267
246	.0582159	.0582405	.0582318
251	.0574569	.0576115	.0576030
256	.0567929	.0570441	.0570357
261	.0562780	.0565344	.0565260
266	.0559444	.0560788	.0560705
271	.0557777	.0556742	.0556659
276	.0557012	.0553170	.0553088
281	.0555776	.0550045	.0549963
286	.0552280	.0547339	.0547258
291	.0544669	.0545027	.0544945
296	.0531435	.0543080	.0543000
298	.0524357	.0542399	.0542318

Fit error = 1.3336×10^{-13}

TABLE VI. COEFFICIENT VALUES OBTAINED WITH NOISE REDUCTION PROCEDURE

	Theoretical values used to generate data time histories	Values retrieved from noise reduction procedure
P_0	28,735.71427	28,738.72144
P_1	1,126.60714	1,126.5699
P_2	- 2.169642857	- 2.1694849
C_{D_0}	0.035100000	0.03510121
C_{D_1}	0	
C_{D_2}	1.289155014	1.2887796
C_{D_3}	0	
C_{D_4}	2,030.800865	2,028.977898

A PRIORI IMPROVEMENT OF DATA COMPATIBILITY

A diligent investigation into the sources of α, θ, and γ incompatibility in the flight data revealed the possibility of at least the following sources of error in the individual data channels which had not been treated earlier:

1. alignment errors in the installation of the α and θ transducers
2. a bias error in the pitch rate gyro indication
3. a drift in the pitch angle indication
4. excessive lag or other dynamic effects in the pneumatic altitude and airspeed indications
5. gain and bias errors in the pressure instrument calibrations and in the position error calibrations
6. a phase lead in the θ and temperature indications relative to the other channels

It will be appreciated that many of these effects are not readily quantified in the usual calibration procedures. To make the flight data sufficiently self-compatible to be usable in the lift, drag, and power extraction routine, the filtered input measurements were altered as follows:

1. A bias, calculated from

$$\theta_b = \sin^{-1}\left(\frac{Ax_N}{g}\right) - \theta_N \; , \qquad (135)$$

was added to the input θ data. The subscript N refers to the last data value in the set.

2. A bias, calculated from

$$\dot{\theta}_b = \frac{\theta_N - \int_1^T \dot{\theta}\, dt - \theta_1}{T} \; , \qquad (136)$$

was added to the input $\dot{\theta}$ data. As a result of these steps the Ax, θ, and $\dot{\theta}$ traces were found to be quite self-consistent. If the time integral of $\dot{\theta}$ did not then match $\theta(t)$,

3. The phase lead of θ with respect to the other data channels was found by determining the value of τ which maximizes

$$\sum_{i=1}^{N} \left\{ \theta_i * \left[\int_1^i \dot{\theta}(i - \tau)\, di + \theta_1 \right] \right\} . \qquad (137)$$

The phase lead was eliminated by dropping τ data points from the beginning of each data trace <u>except</u> θ and temperature.

The opportunity to determine the compatibility of the pneumatic data (V and h) with the inertial data and the angle of attack follows from the kinematic equation for the longitudinal body axis acceleration and the definition of rate of climb:

$$Ax = \dot{V} \cos \alpha + V(\dot{\theta} - \dot{\alpha})\sin \alpha + g \sin \theta - X_{ax} \dot{\theta}^2 \tag{138}$$

$$h_i = \int_1^i V \sin (\theta - \alpha)\, dt + h_1 \, . \tag{139}$$

Examination of the first equation will show that if one assumes that as a result of 1, 2, and 3 above Ax, θ, and $\dot{\theta}$ are now correct and compatible among themselves, a compatible value for either V or α can be found by solving a differential equation assuming the other variable to be correct. If one assumes that α is correct then a compatible value of V(t) is the solution of the equation

$$\dot{V}_j = \left[\frac{Ax_j - g \sin \theta_j + X_{ax} \dot{\theta}_j^2}{\cos \alpha_j}\right] - V_j(\dot{\theta}_j - \dot{\alpha}_j) \tan \alpha_j \tag{140}$$

with the initial condition $V_1 = V_1$ from pneumatic data at the first data point.

This solution is obtained quite readily by the technique described earlier to integrate the trajectory equations (112).

If, on the other hand, V is assumed to be the error-free variable, α can be determined by a slight variation of the same solution procedure. To obtain the proper form one first makes the substitution

$$u = \cos \alpha \tag{141}$$

whence (138) can be written

$$\dot{u}_j = \left[\frac{Ax_j - g \sin \theta_j + X_{ax} \dot{\theta}_j^2}{V_j}\right] - \left[\frac{\dot{V}_j}{V_j}\right] u_j - \dot{\theta}_j S_j \sqrt{1 - u_j^2} \, . \tag{142}$$

Here S_j has the value ± 1.0. The correct value is determined by the following logic:

a. choose as S_1 the value corresponding to the measured α_1. This value of α is also used to begin the integration.

b. If $S_j > 0$, $u_j > 0.9999$, and $\{-u_j/[S_j(\sqrt{1-u_j^2} + 10^{-12})]\} < 0$,

then the sign of S_j is changed for the next value of j.

c. The same is true if $S_j < 0$, $u_j > 0.9999$, and $\{-\dot{u}_j/[S_j(\sqrt{1-u_j^2} + 10^{-12})]\} > 0$.

The computed value of α at any point is then

$$\alpha_j = \sin^{-1} \{S_j \sqrt{1-u_j^2}\} . \tag{143}$$

An effort was made to calculate α in this manner but the solutions had ridiculously large magnitudes. Efforts were also made to apply gain and bias corrections to the velocity in an effort to improve the result. This too failed to produce physically reasonable results. The various lag constants were then varied over large ranges with the same end result. It was therefore concluded that the velocity and altitude data contained substantial errors, probably resulting from a combination of excessive lags, dynamic effects, and perhaps incorrect gains and biases. It was therefore necessary to assume that α was correct in order to solve for V.

The initial results were quite encouraging in that they were qualitatively similar to the input data but displayed quantitative differences of up to 20 ft/sec at certain times. It was found that this difference could be reduced significantly by assuming a drift in the pitch gyro indication of 8×10^{-4} rad/sec. Subtracting this "drift" from the input pitch angle indication led to a calculated velocity that usually differed from the input by less than 1.5 ft/sec. As a consequence of these findings

4. The input velocity was overwritten by the solution of (140) and

5. The input altitude was overwritten by

$$h(t) = \int_1^t V \sin (\theta - \alpha)\, dt + h_1 \tag{144}$$

where V is the result of the previous step. Comparisons of the calculated velocity and altitude with the input V and H data are shown for a typical pull-up-pushover in figure 39. Note that differences of this magnitude would make it impossible for the coefficient extraction procedure to operate successfully.

While the foregoing actions produce a reasonably compatible data set, they do not guarantee its accuracy. The reader is cautioned that while these data, when processed by the coefficient extraction program, will yield physically reasonable numbers if the proper model is available, such results may not be the correct values for the particular aircraft under investigation. This could easily happen if errors in the α-channel, for example, are masked by the compatibility improvement scheme. Note also that the solution of (140) is not very sensitive to the exact value of gain and bias used for the α position error. Compare, for example, figure 39 with figure 40.

In an effort to fine-tune the data for improved compatibility before its submission to the coefficient extraction program, a number of other procedures were applied. The first represents γ by $\theta - \alpha$ and calculates $\dot{\gamma}$ from this by the method of splines. This value of $\dot{\gamma}$ is substituted into (138) now written as

$$Ax = \dot{V} \cos \alpha + V \dot{\gamma} \sin \alpha + g \sin \theta - X_{ax} \dot{\theta}^2 . \tag{145}$$

Assuming that V, $\dot{V}$, θ, $\dot{\theta}$, $\dot{\gamma}$, and Ax are known, α is determined at each point by the second-order Newton-Raphson technique. The resulting α values are fit to the input α values using a second order polynomial:

$$\alpha_j = K_1 \alpha^2_{DATA_j} + K_2 \alpha_{DATA_j} + K_3 . \tag{146}$$

α_{DATA_j} is then replaced by values computed from this equation. K_1, K_2, and K_3 are found by the method of least squares. Since α may now be slightly different, new values of γ are computed and fit to the previous values by

$$\gamma_j = K_4 \gamma^2_{j_{OLD}} + K_5 \gamma_{j_{OLD}} + K_6 \tag{147}$$

with K_4, K_5, and K_6 determined in a least squares sense. The new values of γ are replaced by those computed from the equation.

A new $\dot{\gamma}$, defined as $2K_4 \gamma_{j_{OLD}} \dot{\gamma}_{j_{OLD}} + K_5 \dot{\gamma}_{j_{OLD}}$, is used to find new α's. The cycle is repeated a number of times until K_1 and $K_3 \rightarrow 0$ and $K_2 \rightarrow 1.0$ as closely as possible.

The final "tuning" assumes that bias errors may still be present in α and θ and that there may be a small residual acceleration sensitivity in the static pressure indication. The latter is important primarily in those cases where V is assumed to be correct and a compatible α must be calculated. It serves principally as a check when α is taken to be correct and a compatible V is calculated. For this final tuning we construct the cost function

$$J_3 = \sum_{j=1}^{N} \left[\frac{d_{20}}{P_{m_1}^2} (P_{m_j} - P_{c_j})^2 + \frac{d_{21}}{Ax_{max}^2} (Ax_{m_j} - Ax_{c_j})^2 + \frac{d_{22}}{A_m^2} (A_m - A)^2 \right.$$

$$\left. + \frac{d_{23}}{B_m^2} (B_m - B)^2 + \frac{d_{24}}{C_m^2} (C_m - C)^2 + \frac{d_{25}}{D_m^2} (D_m - D) + \frac{d_{26}}{G_m^2} (G_m - G)^2 \right] , \quad (148)$$

$$\text{where } P_{c_j} = \frac{P_0}{T_0} T_j \left\{ 1 - 6.86 \times 10^{-6} \left[\int_1^{t_j} V_j \sin(\theta_j - \alpha_j) dt_j \right.\right.$$

$$\left.\left. + G \int_1^{t_j} V_j \cos(\theta_j - \alpha_j) dt_j + h_1 \right] \right\}^{4.26} + A\dot{\theta}_j^2 + BAx_j + Cg\sin\theta_j \quad (149)$$

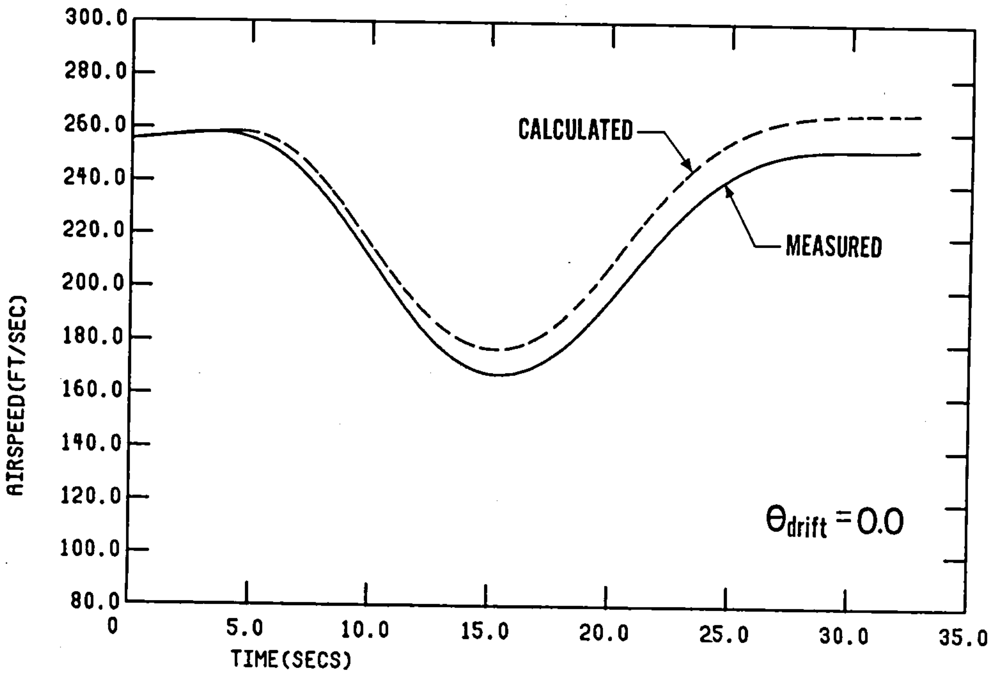
$$Ax_{c_j} = \dot{V}_j \cos\alpha_j + V_j(\dot{\theta}_j - \dot{\alpha}_j)\sin\alpha_j + X_{ax}\dot{\theta}_j^2 + D(V_j[\dot{\theta}_j - \dot{\alpha}_j]\cos\alpha_j$$

$$+ g\cos\theta_j - \dot{V}_j \sin\alpha_j) + G(\dot{V}_j \sin\alpha_j - V_j(\dot{\theta}_j - \dot{\alpha}_j)\cos\alpha_j) , \quad (150)$$

$$D = \theta_{bias} ,$$

$$G = \gamma_{bias} \text{ or } (\theta_{bias} - \alpha_{bias}) ; \quad \alpha_{bias} = D - G , \quad (151)$$

and minimize J_3 with respect to A, B, C, D, and G, using the Newton-Raphson procedure. With these values we apply bias corrections to θ and α and an "acceleration correction" to P_{m_j}. We then return to the beginning of the data processing activity, calculate new velocities, altitudes, and angles of attack, and again minimize J_3 with respect to A, B, C. D, and G. This procedure may be repeated until J_3 has in fact reached a minimum. A priori values may be included for the parameters if known. Even approximate a priori parameter values may be used to advantage during the processing of the first few data runs to insure reasonable results and easier detection of "bugs". Typical results for the ATLIT obtained by applying the entire calibration-filtering-compatibility improvement procedure (called FDR1) are shown in Appendix A.



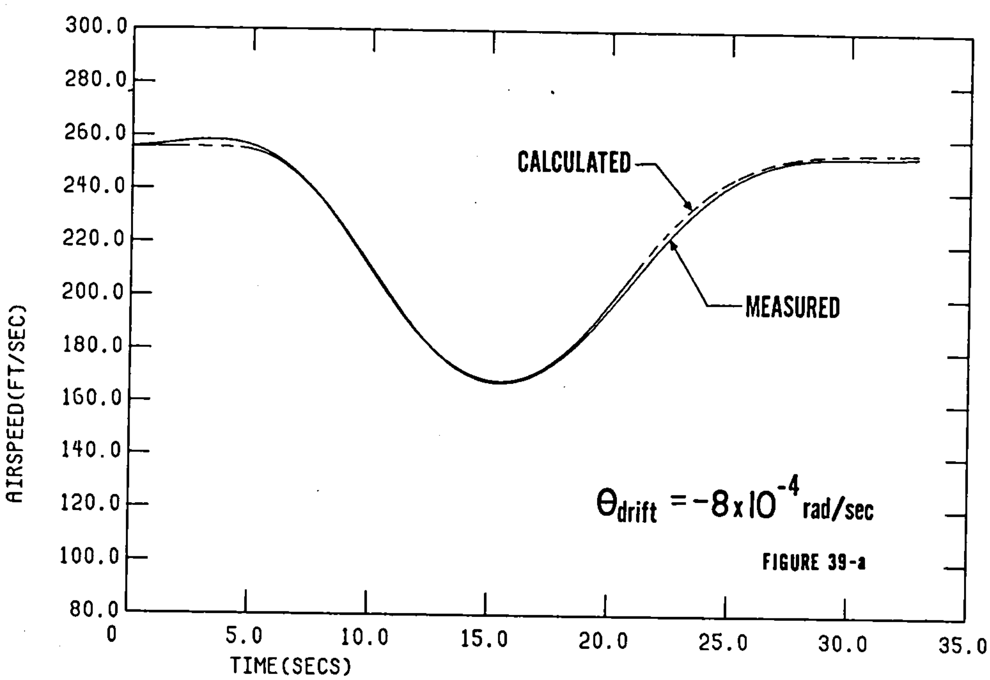
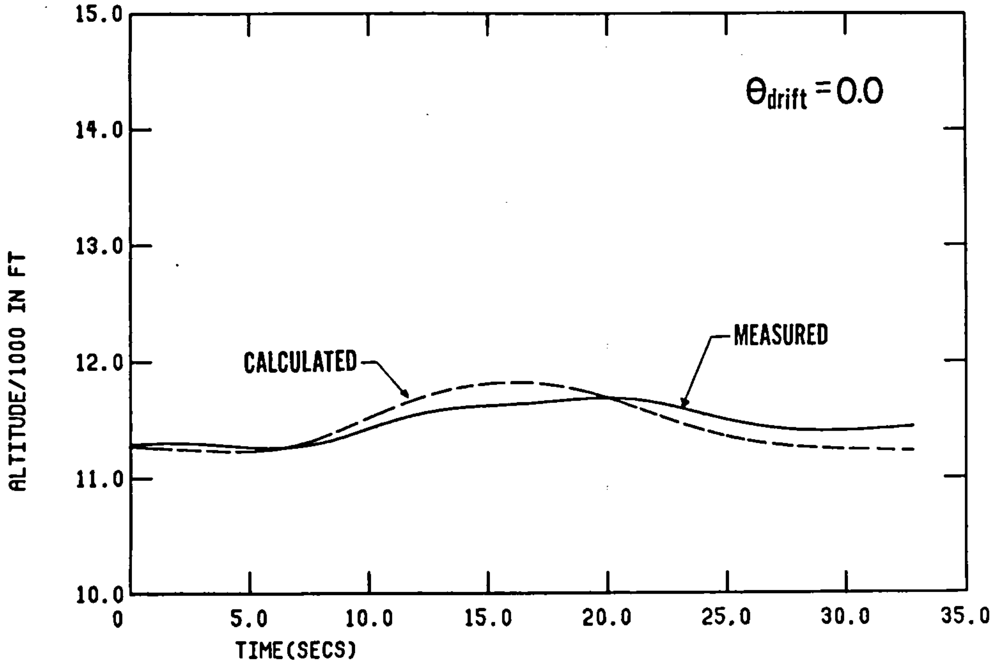
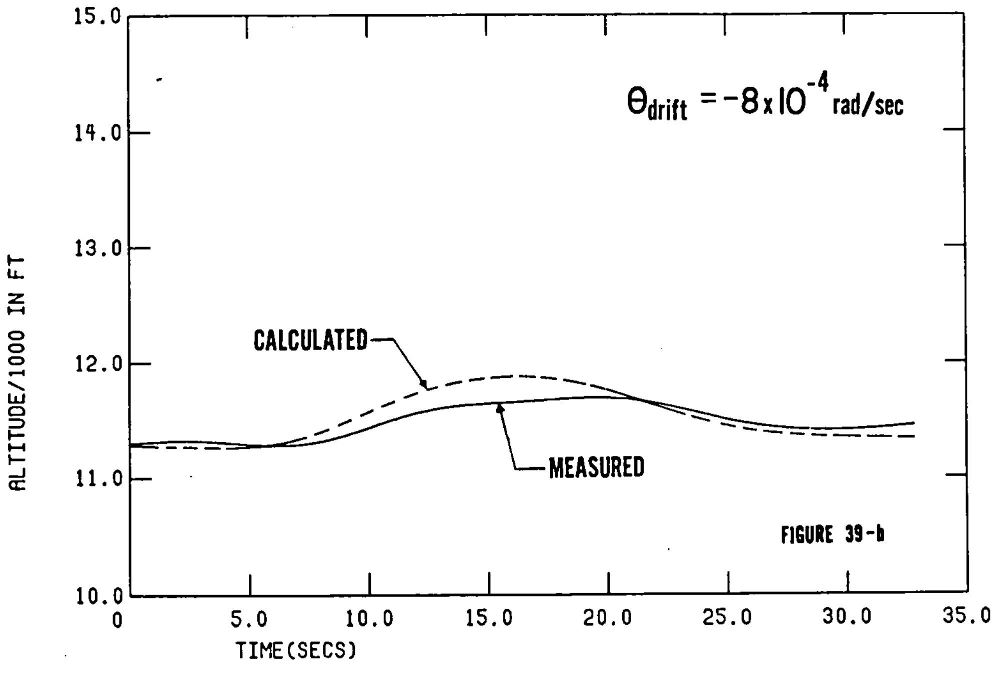


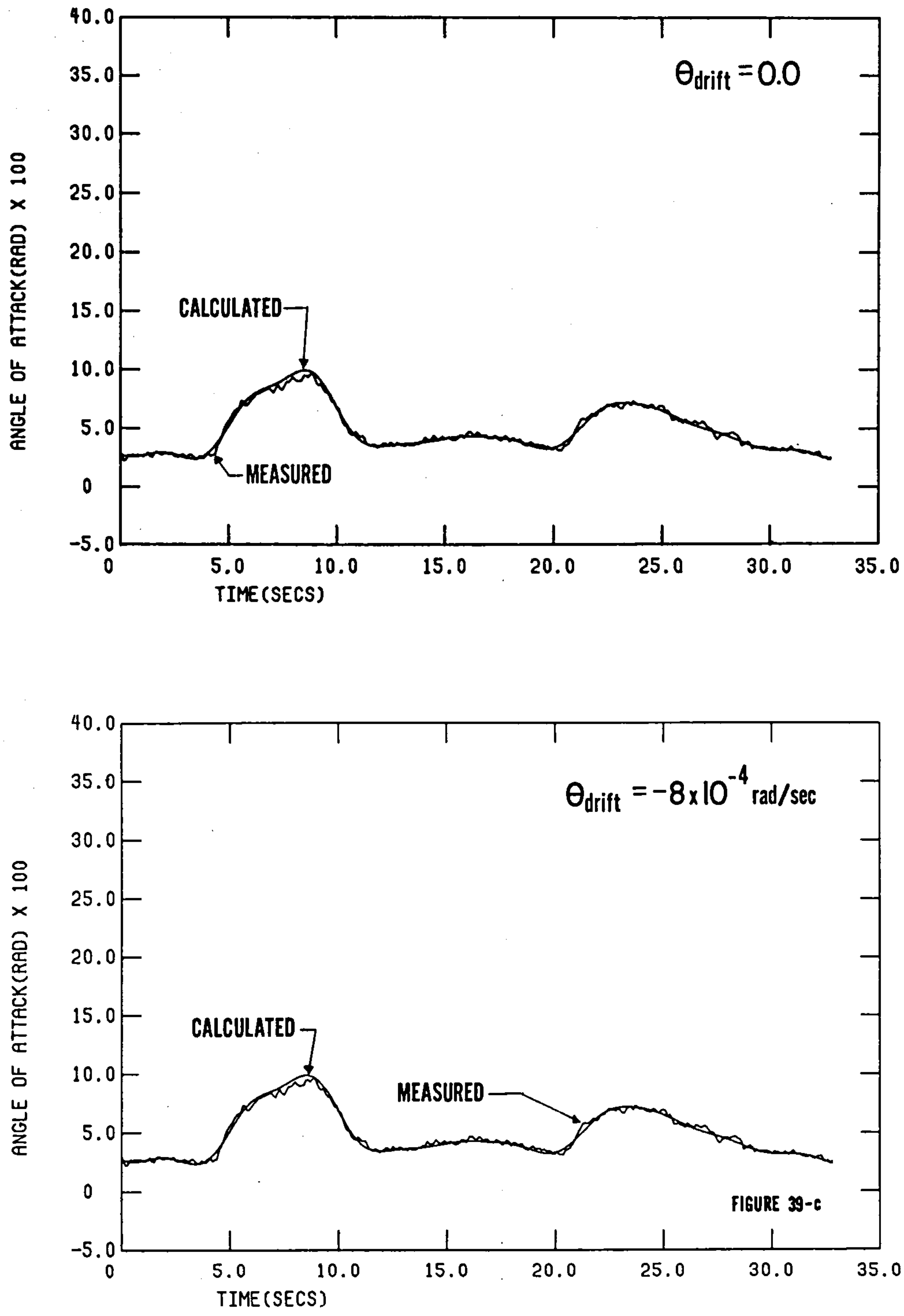
FIGURE 39-a

COMPARISON OF CALCULATED PULLUP-PUSHOVER TRAJECTORY WITH MEASURED VALUES. ASSUMED α POSITION ERROR CORRECTIONS: GAIN = 0.8667, BIAS = 0.0047.

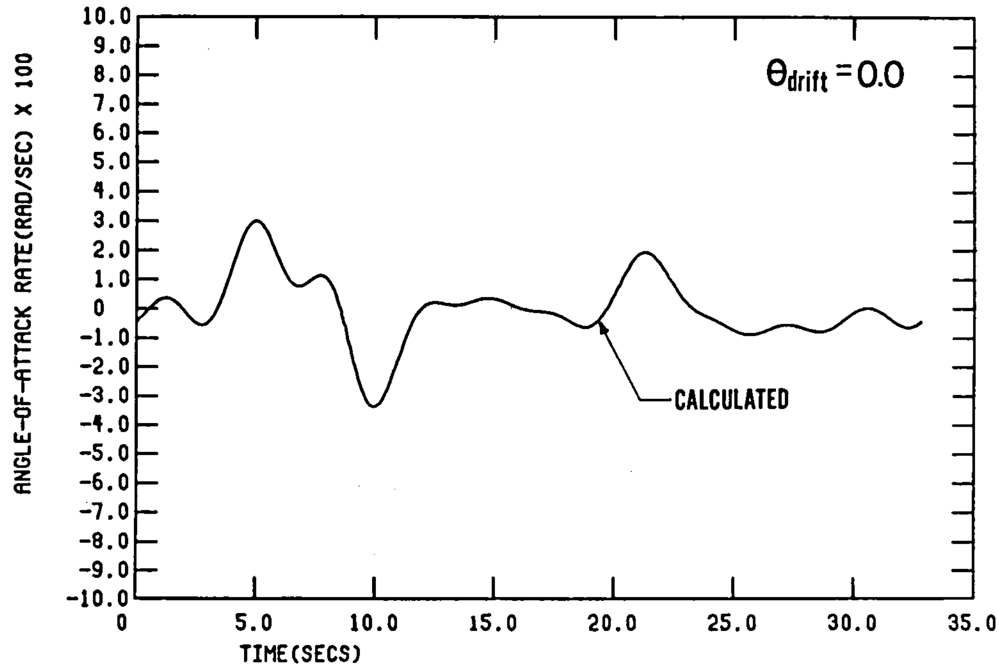


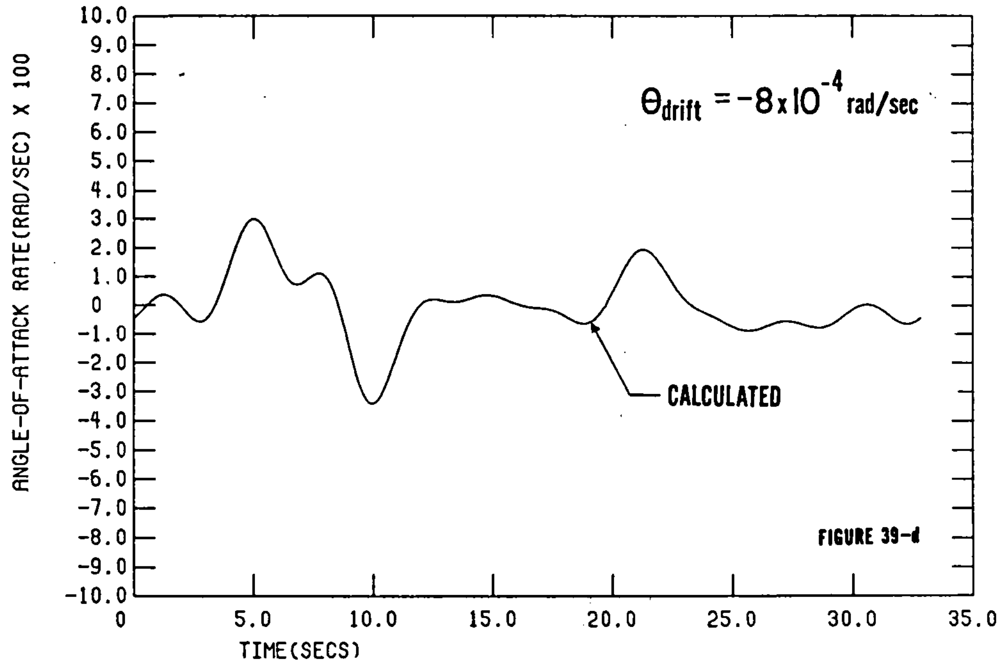


COMPARISON OF CALCULATED PULLUP-PUSHOVER TRAJECTORY WITH MEASURED VALUES. ASSUMED α POSITION ERROR CORRECTIONS: GAIN = 0.8667, BIAS = 0.0047.

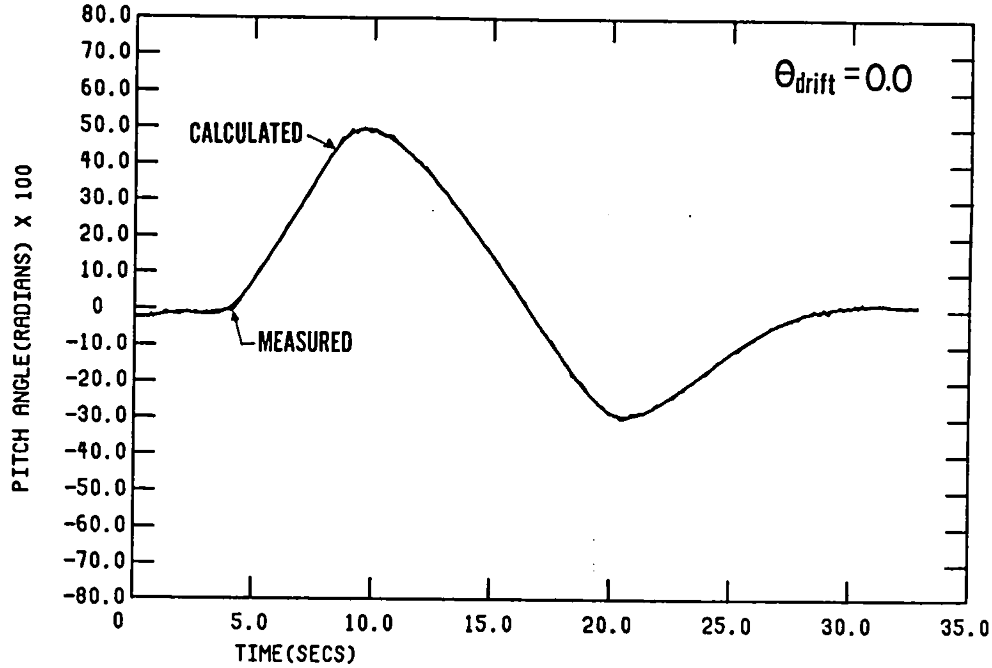


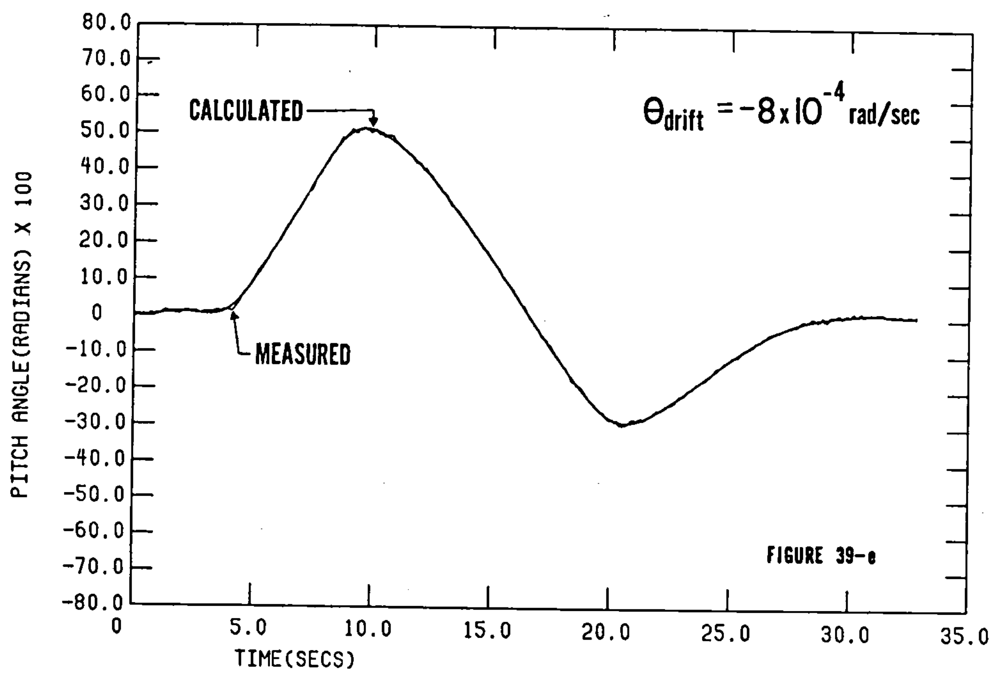
COMPARISON OF CALCULATED PULLUP-PUSHOVER TRAJECTORY WITH MEASURED VALUES. ASSUMED α POSITION ERROR CORRECTIONS: GAIN = 0.8667, BIAS = 0.0047.



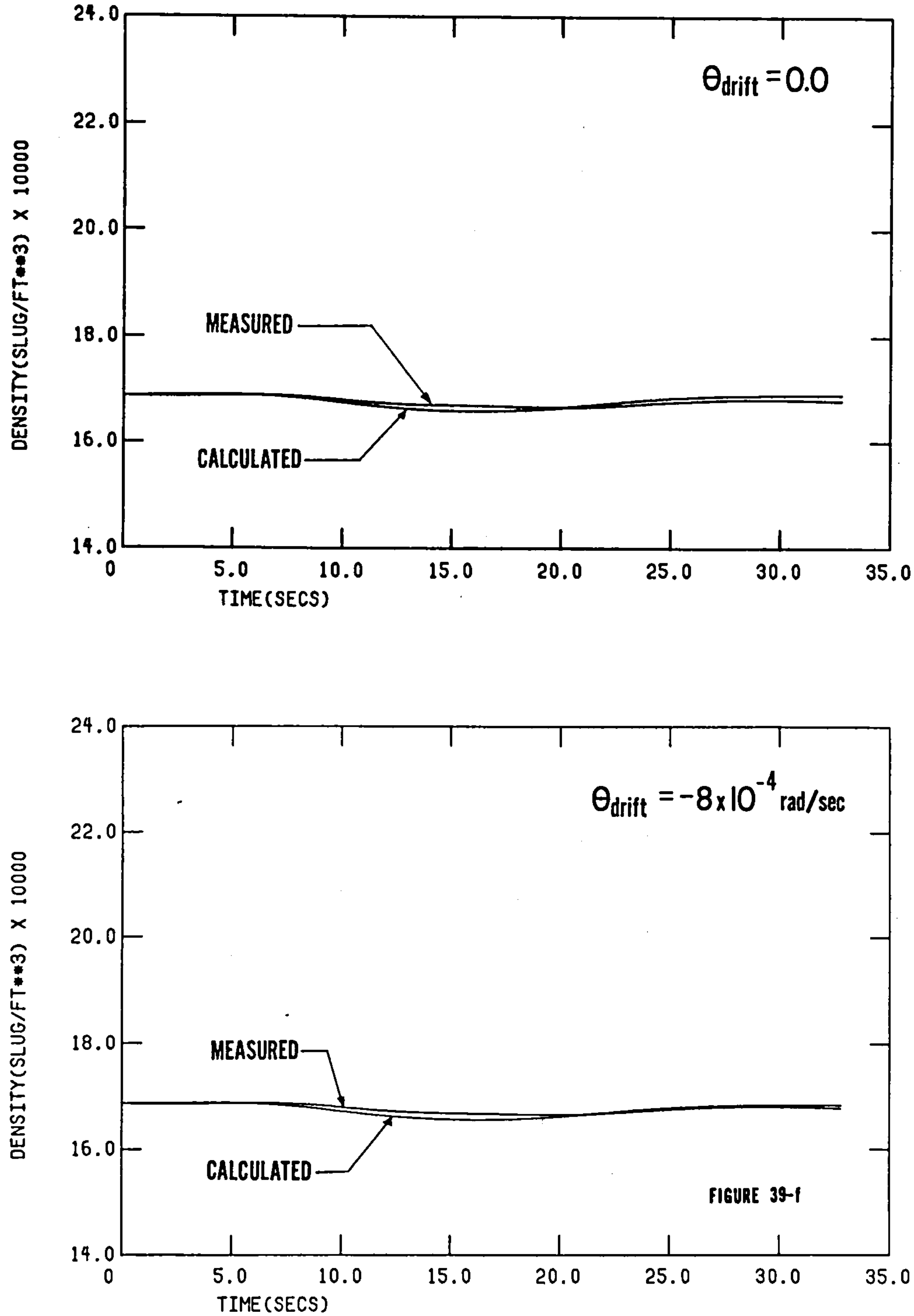


COMPARISON OF CALCULATED PULLUP-PUSHOVER TRAJECTORY WITH MEASURED VALUES. ASSUMED α POSITION ERROR CORRECTIONS: GAIN = 0.8667, BIAS = 0.0047.





COMPARISON OF CALCULATED PULLUP-PUSHOVER TRAJECTORY WITH MEASURED VALUES. ASSUMED α POSITION ERROR CORRECTIONS: GAIN = 0.8667, BIAS = 0.0047.



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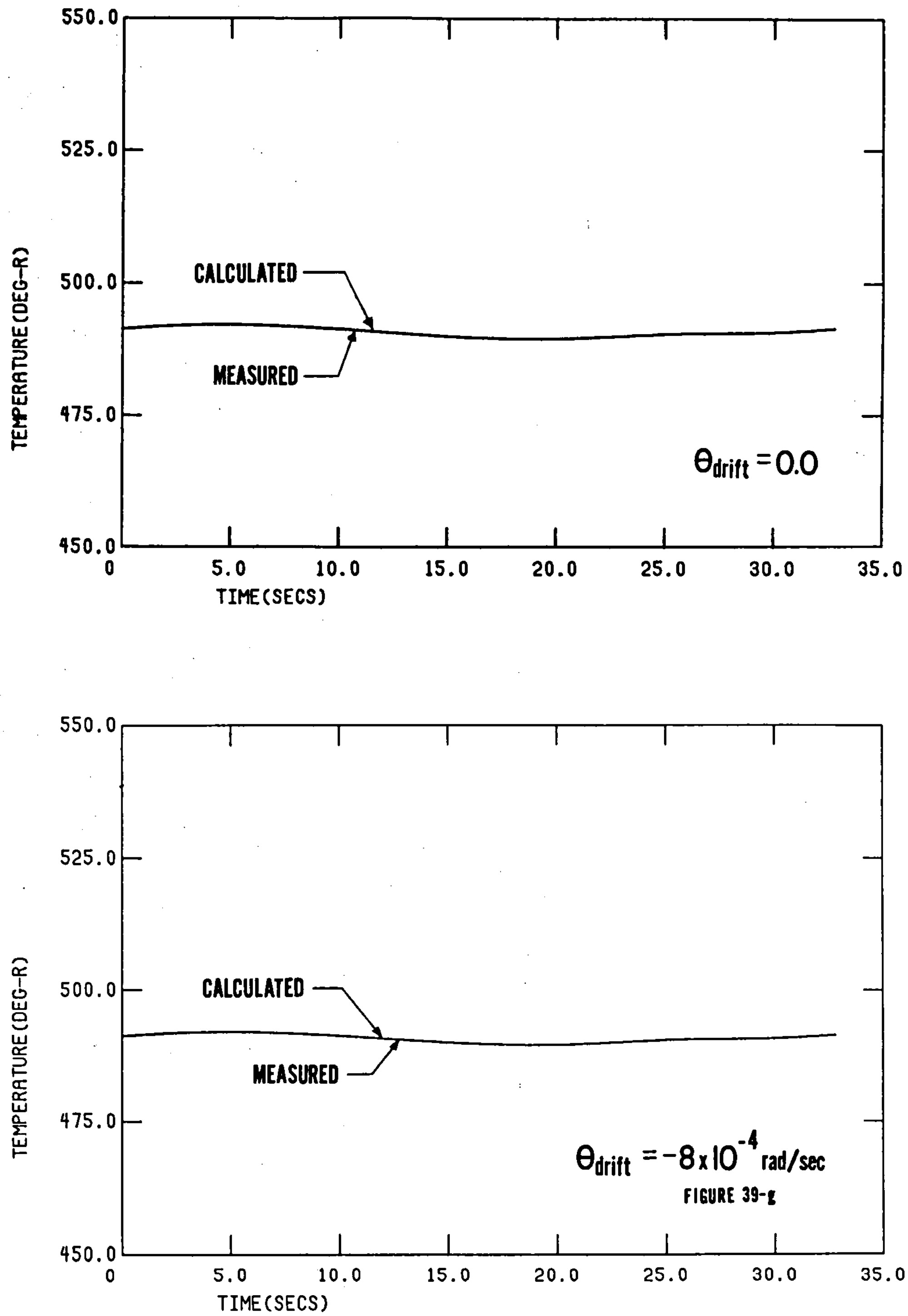
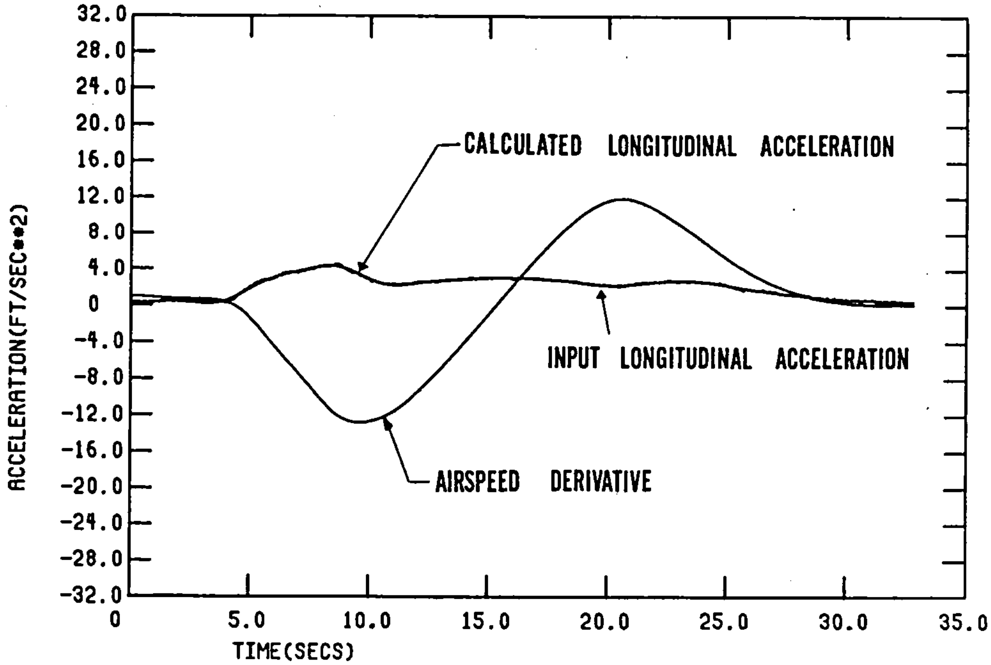
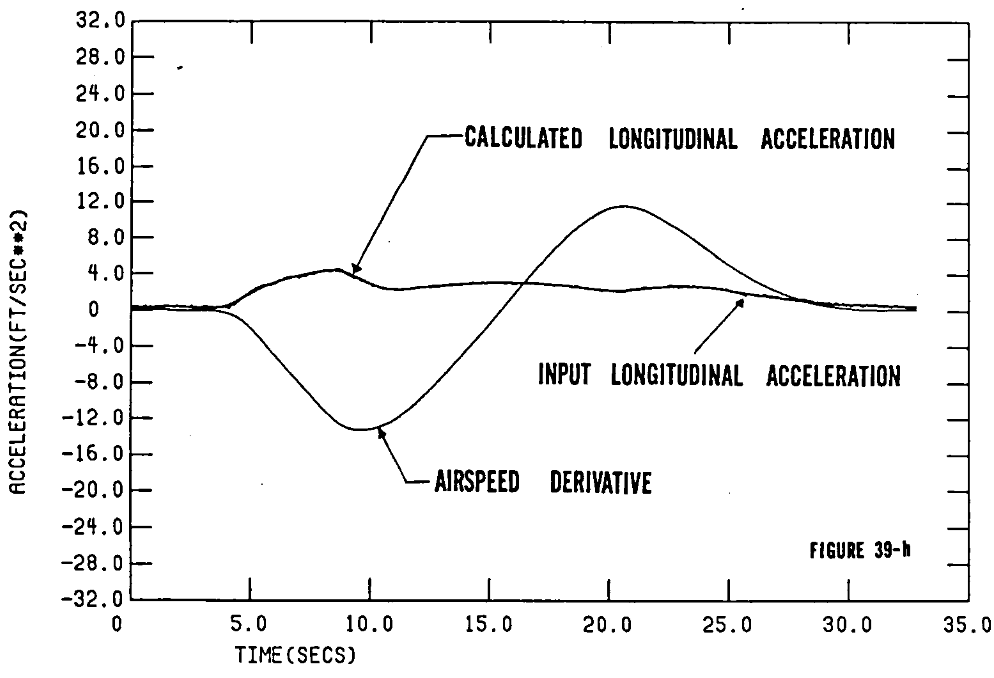


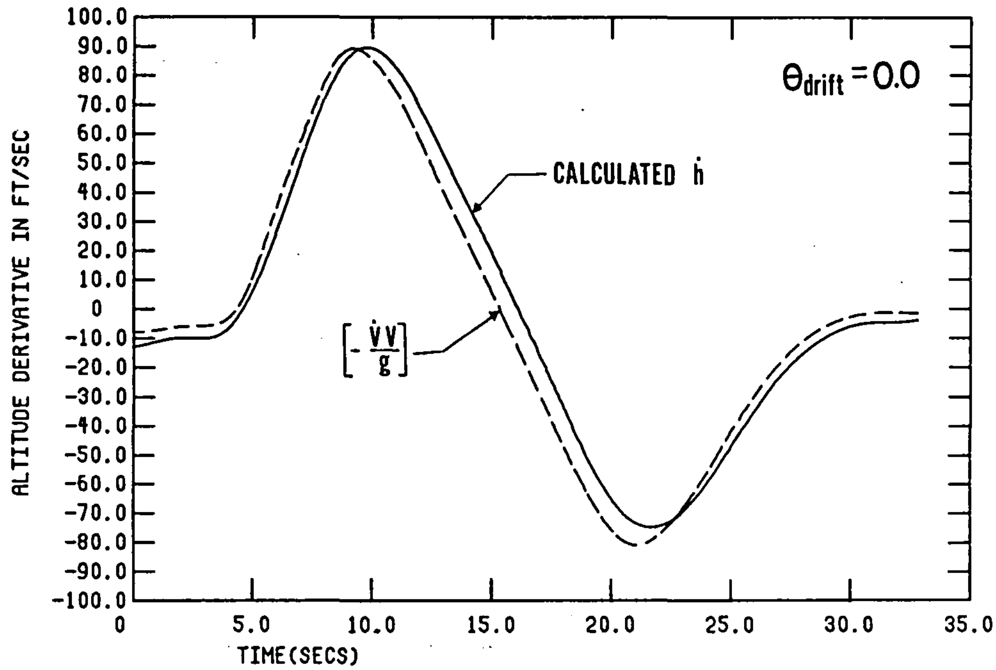
FIGURE 39-g

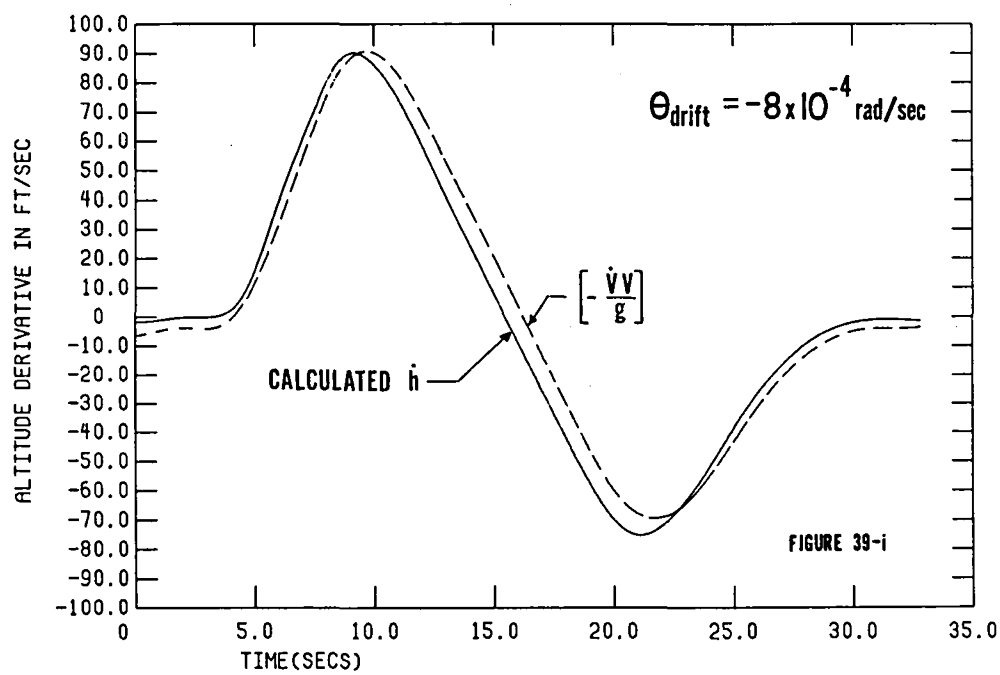
COMPARISON OF CALCULATED PULLUP-PUSHOVER TRAJECTORY WITH MEASURED VALUES. ASSUMED α POSITION ERROR CORRECTIONS: GAIN = 0.8667, BIAS = 0.0047.





COMPARISON OF CALCULATED PULLUP-PUSHOVER TRAJECTORY WITH MEASURED VALUES. ASSUMED α POSITION ERROR CORRECTIONS: GAIN = 0.8667, BIAS = 0.0047.





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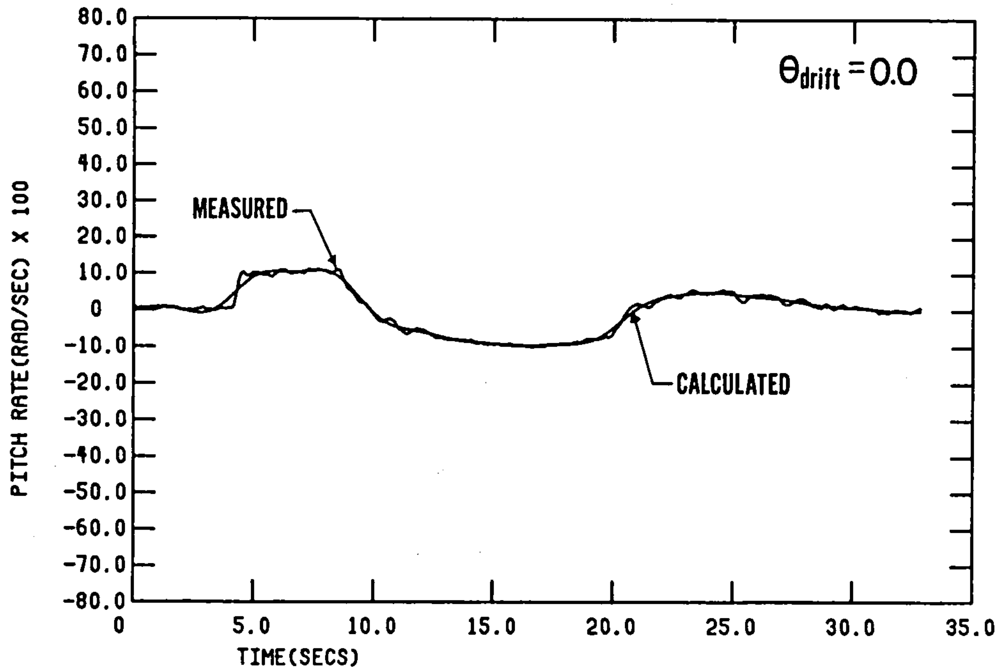

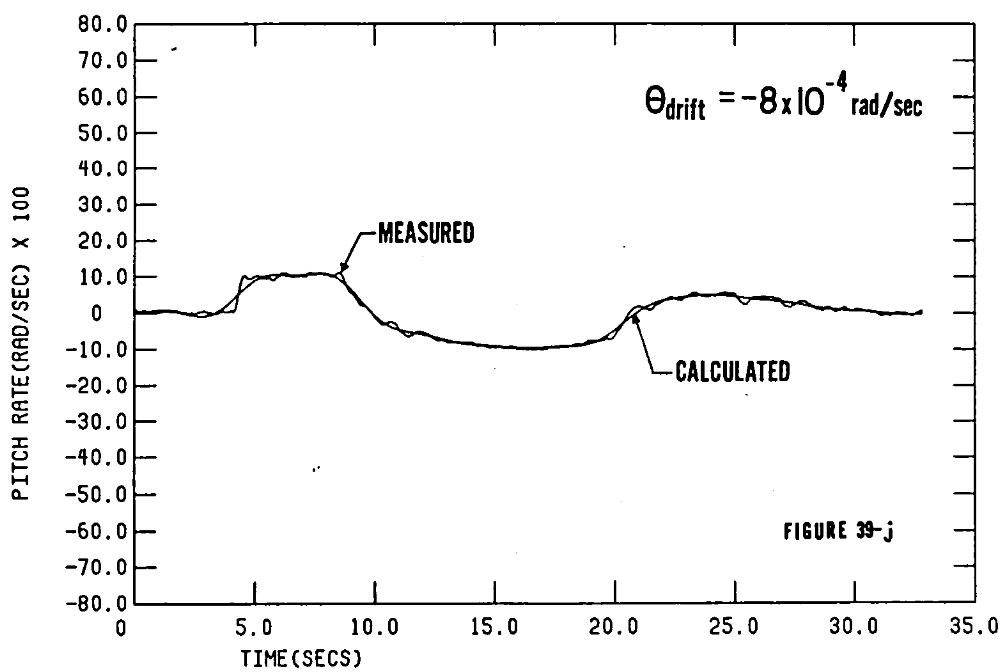

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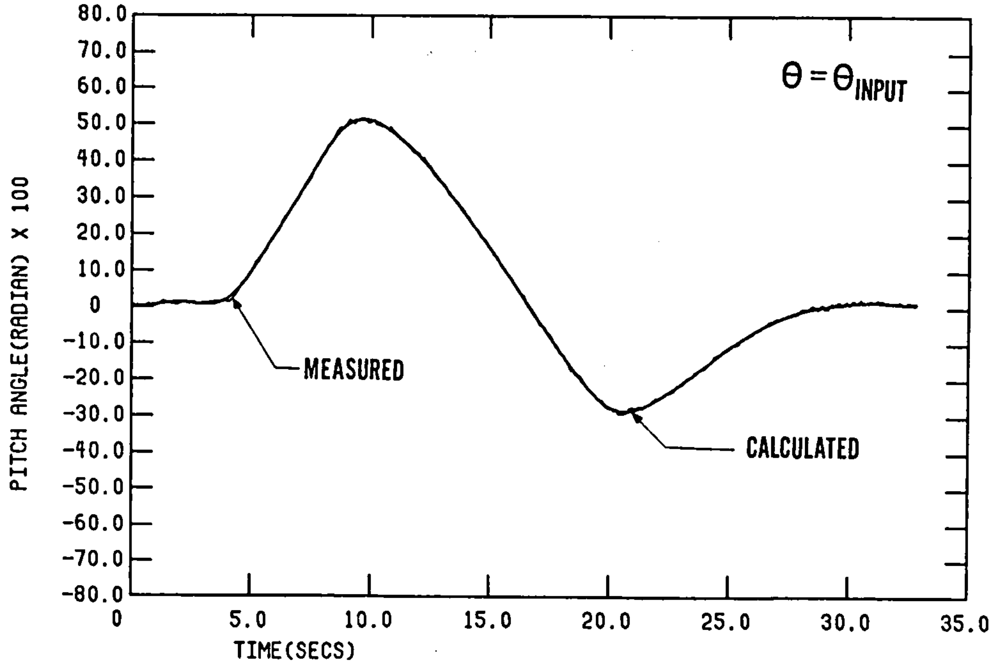
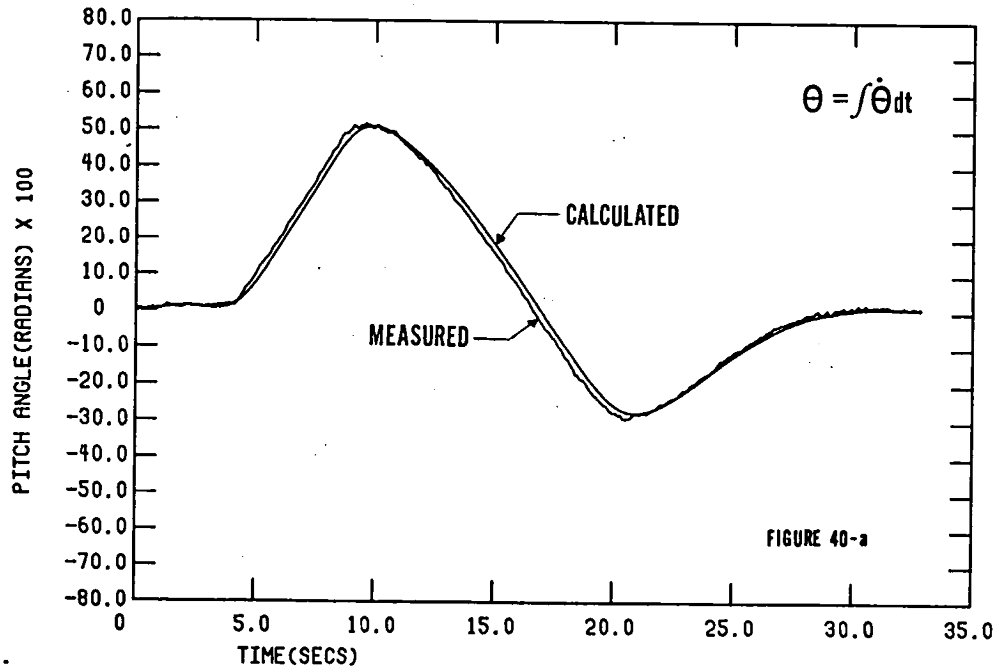
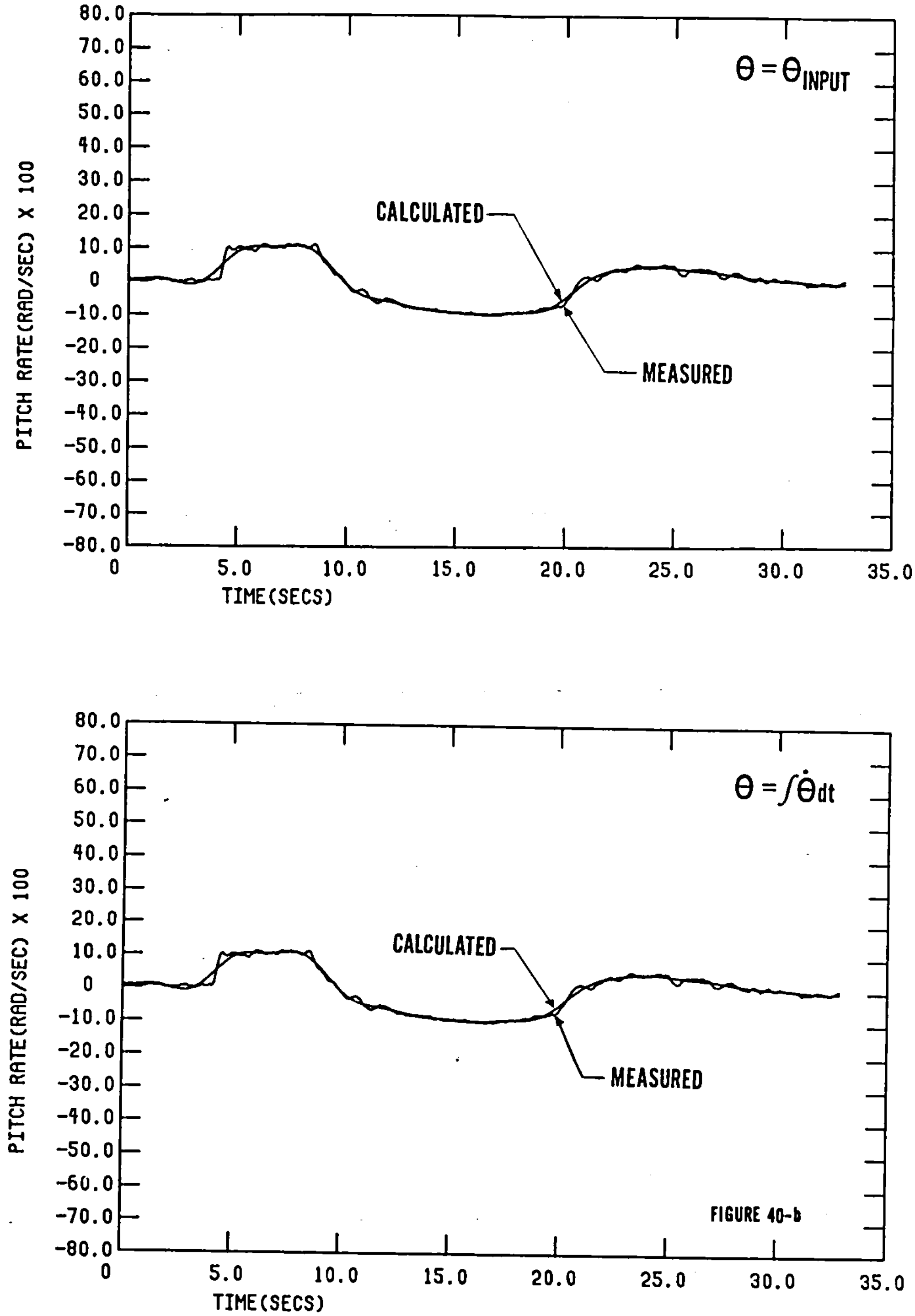




EFFECT OF USING $\int\dot{\theta}dt$ FOR θ IN CALCULATED SOLUTIONS. ASSUMED θ_{drift} = $-0.025\,t/T$. ASSUMED α POSITION ERROR CORRECTIONS GAIN 1.1538, BIAS -0.02 RADIANS.



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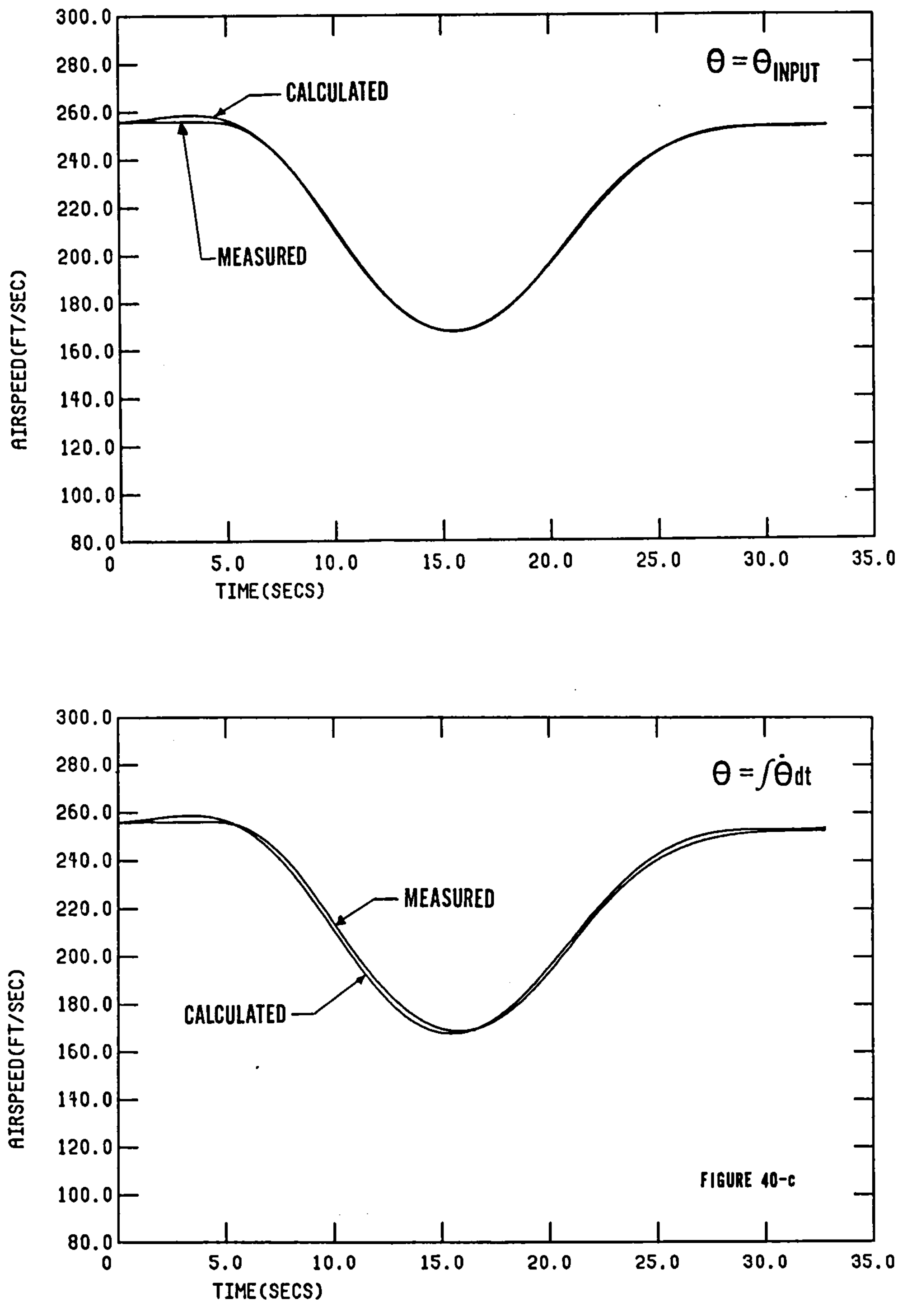

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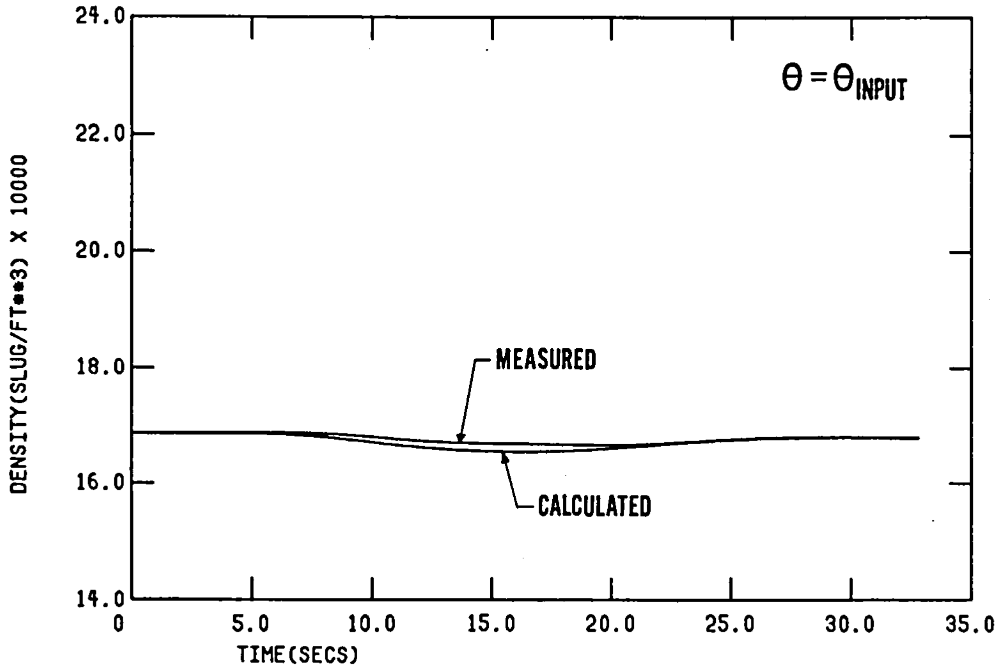

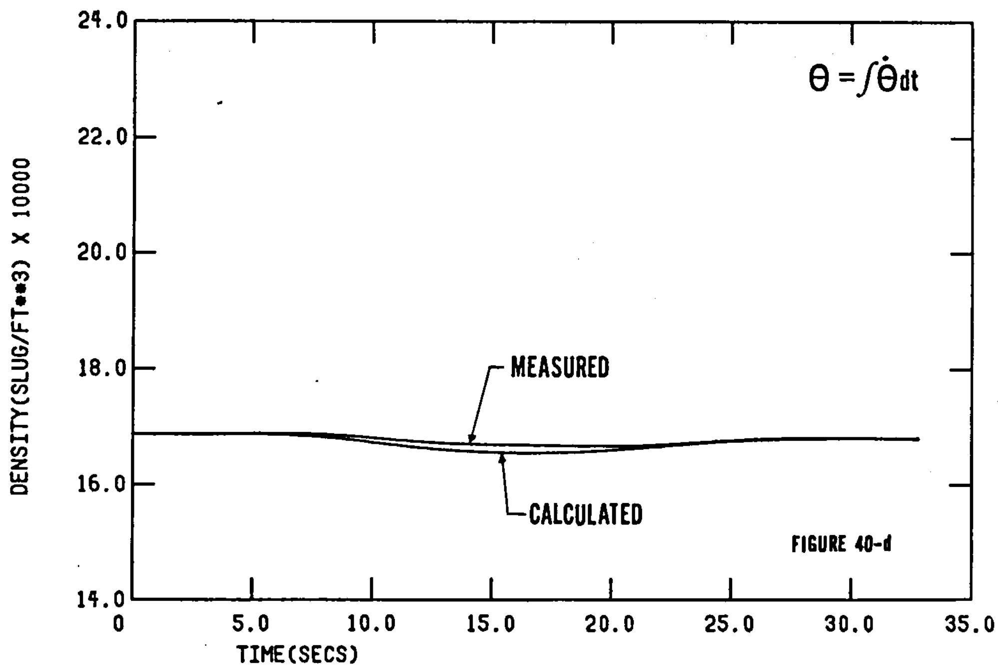

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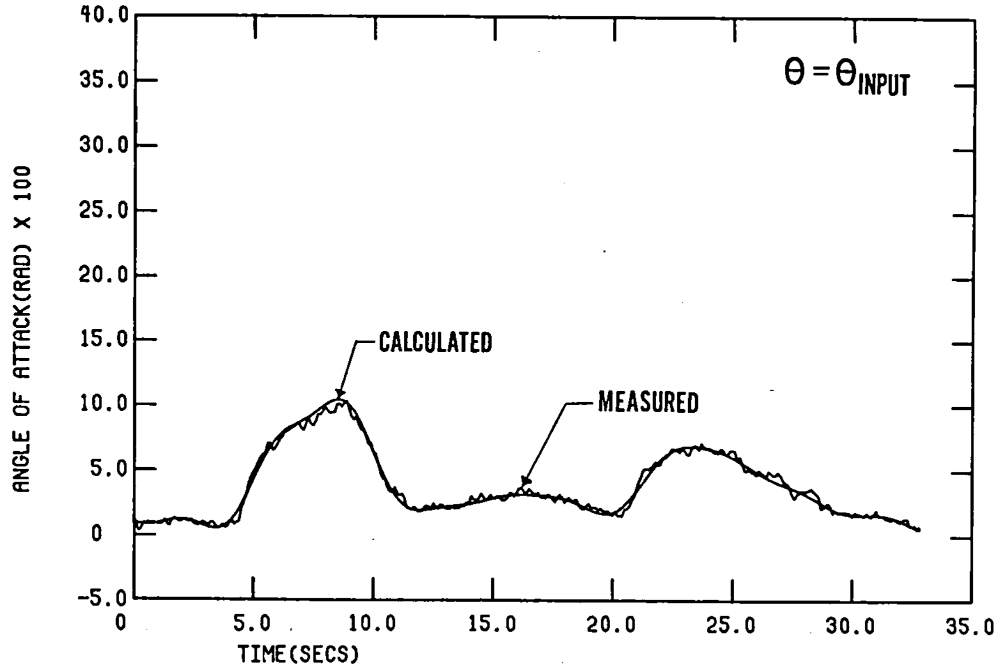
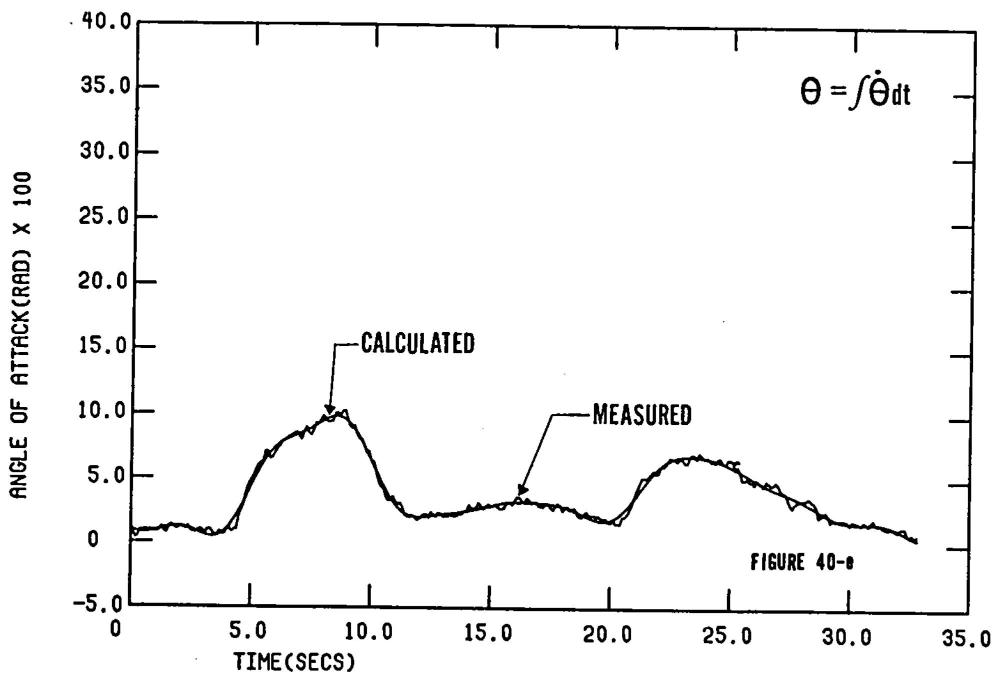
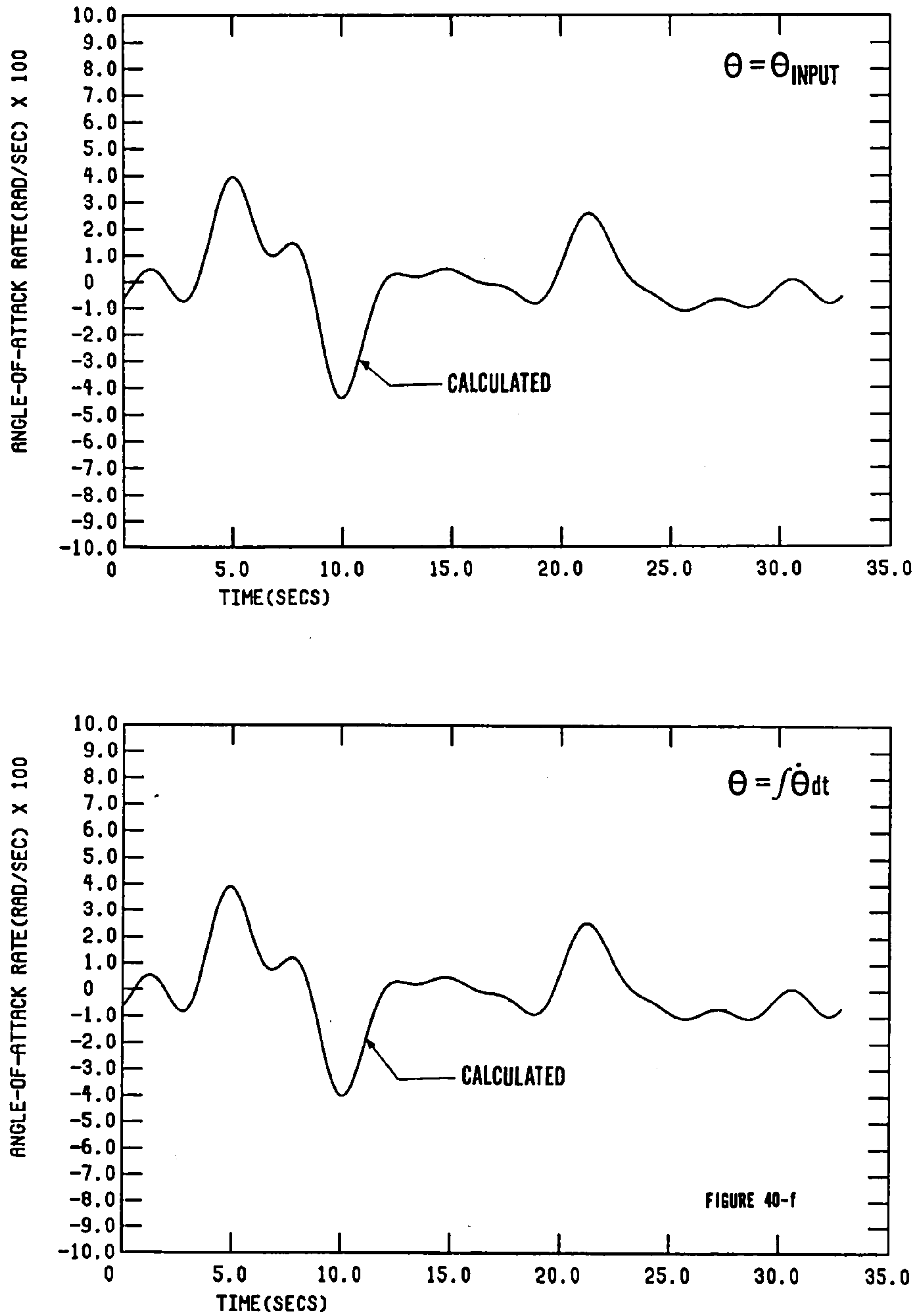
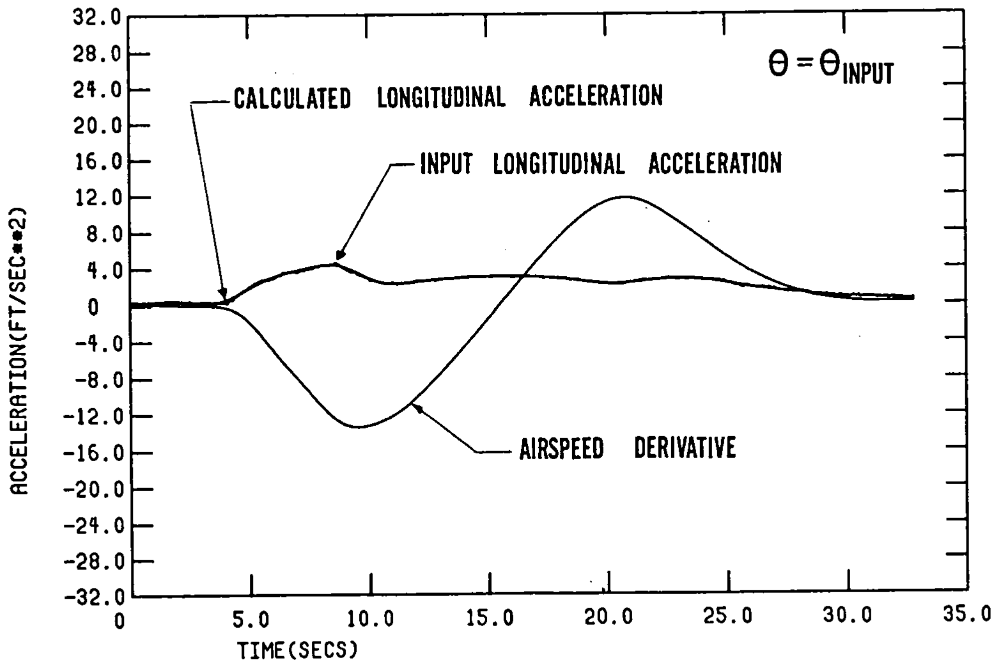




EFFECT OF USING $\int \dot{\theta} dt$ FOR θ IN CALCULATED SOLUTIONS. ASSUMED $\theta_{drift} = -0.025\, t/T$. ASSUMED α POSITION ERROR CORRECTIONS GAIN 1.1538, BIAS -0.02 RADIANS.



EFFECT OF USING $\int \dot{\theta} dt$ FOR θ IN CALCULATED SOLUTIONS. ASSUMED θ_{drift} = $-0.025\, t/T$. ASSUMED α POSITION ERROR CORRECTIONS GAIN 1.1538, BIAS -0.02 RADIANS.



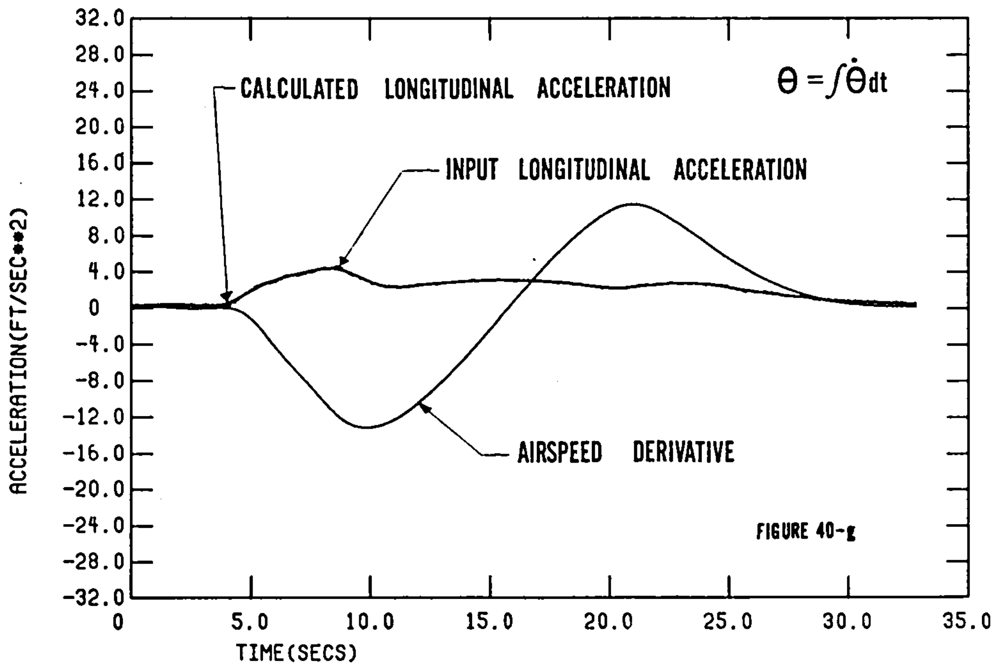
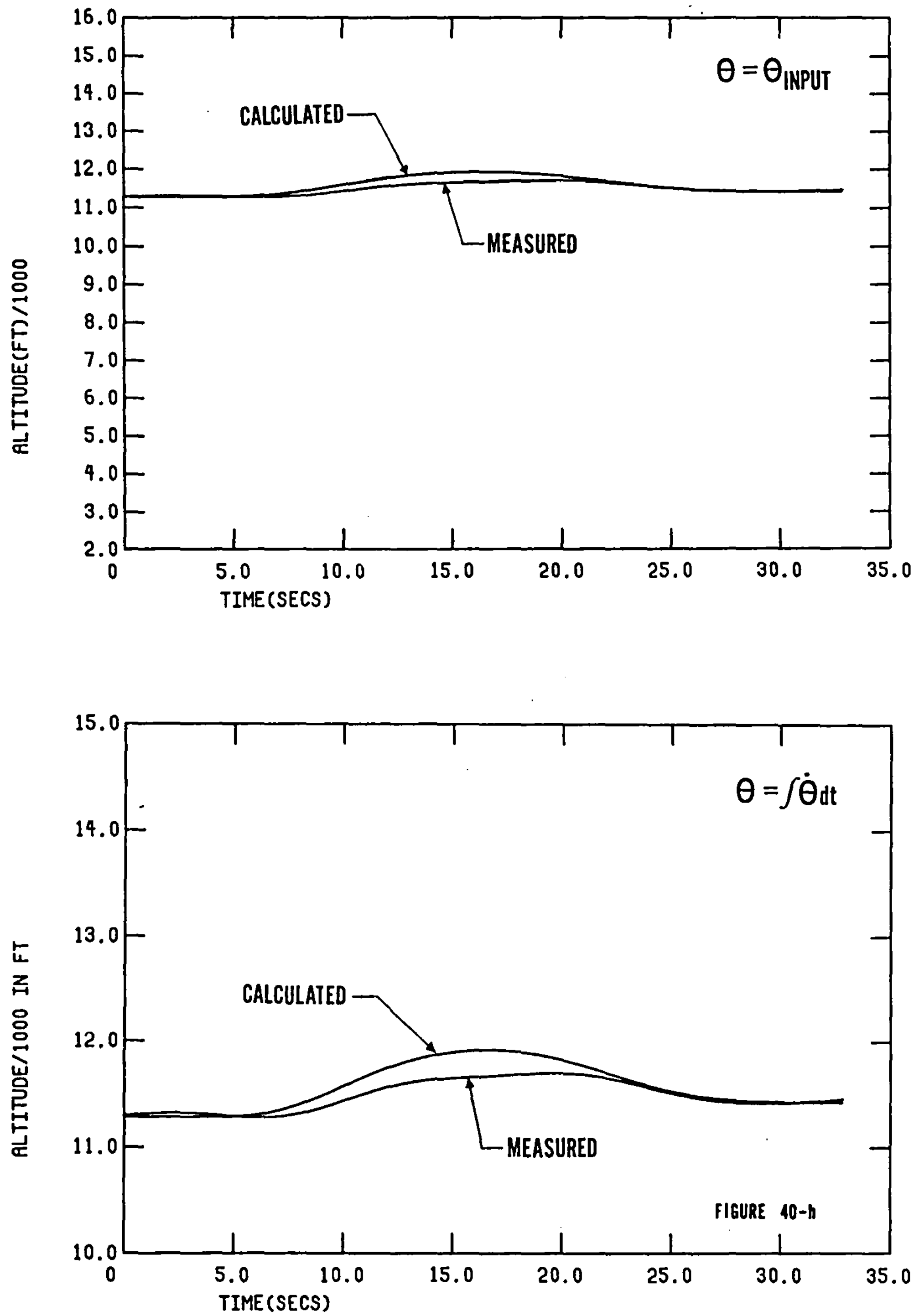


FIGURE 40-g

EFFECT OF USING $\int\dot{\theta}dt$ FOR θ IN CALCULATED SOLUTIONS. ASSUMED θ_{drift} = $-0.025\, t/T$. ASSUMED α POSITION ERROR CORRECTIONS GAIN 1.1538, BIAS -0.02 RADIANS.



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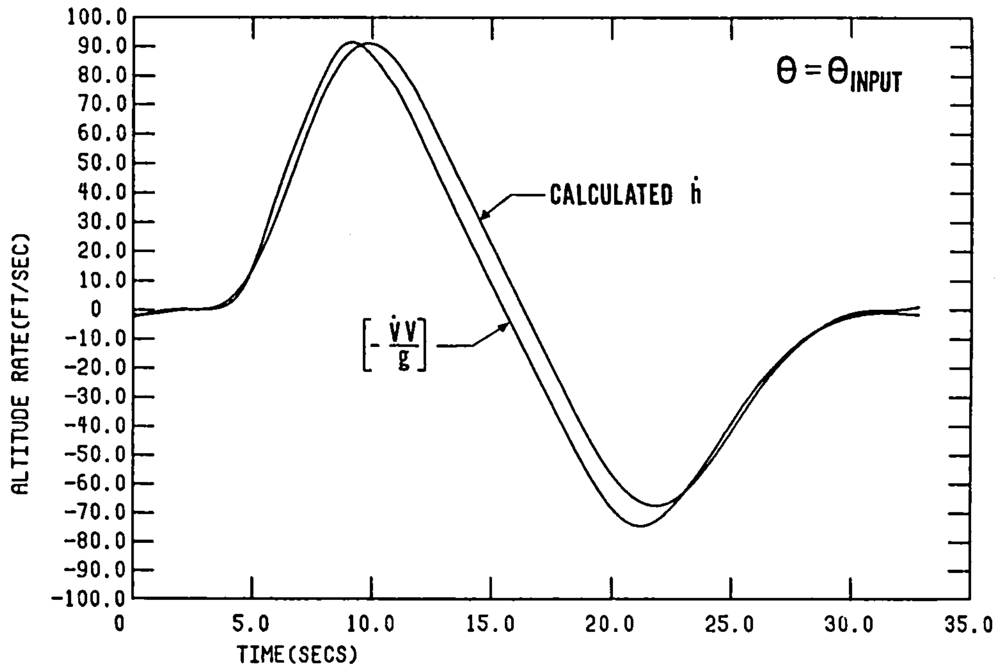
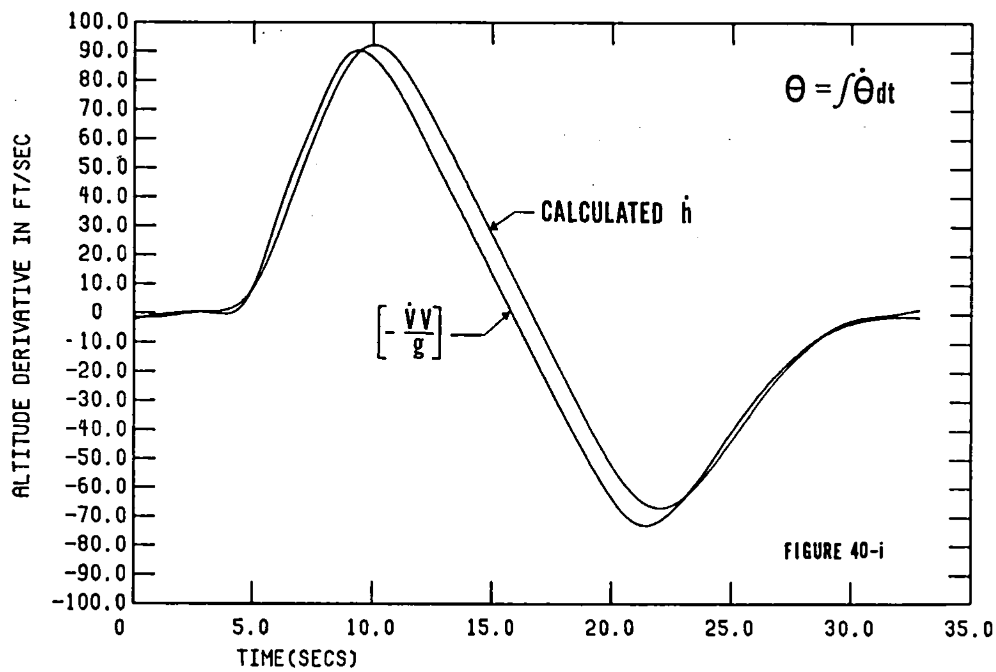
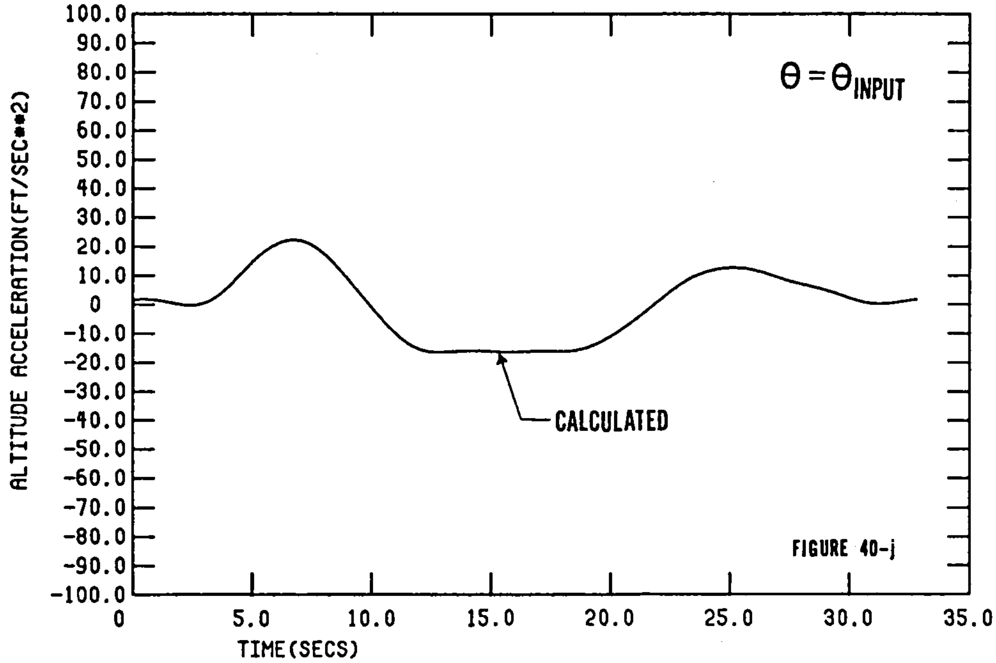
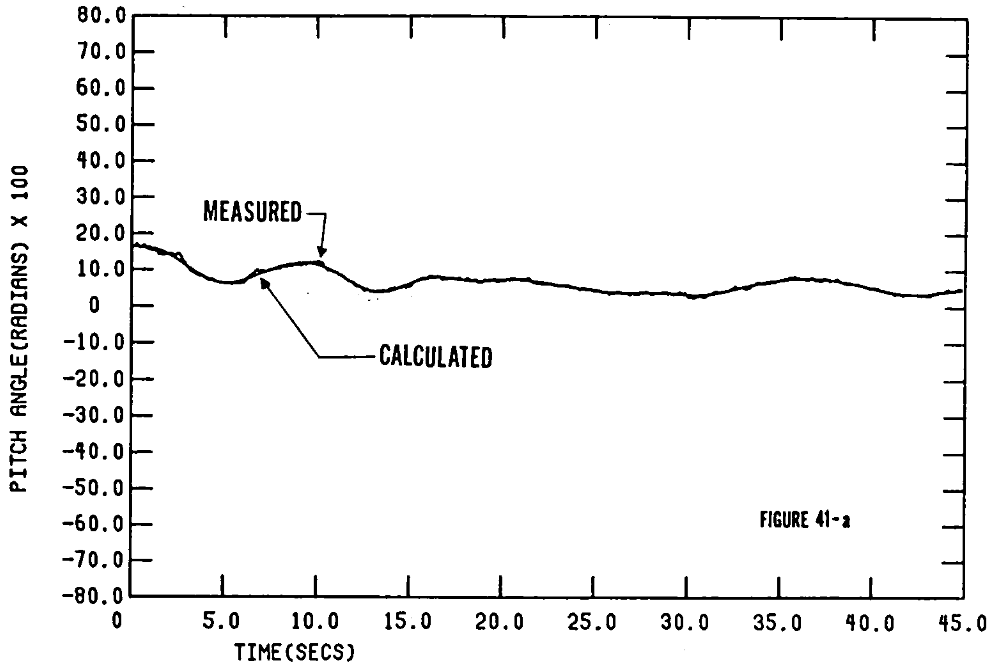


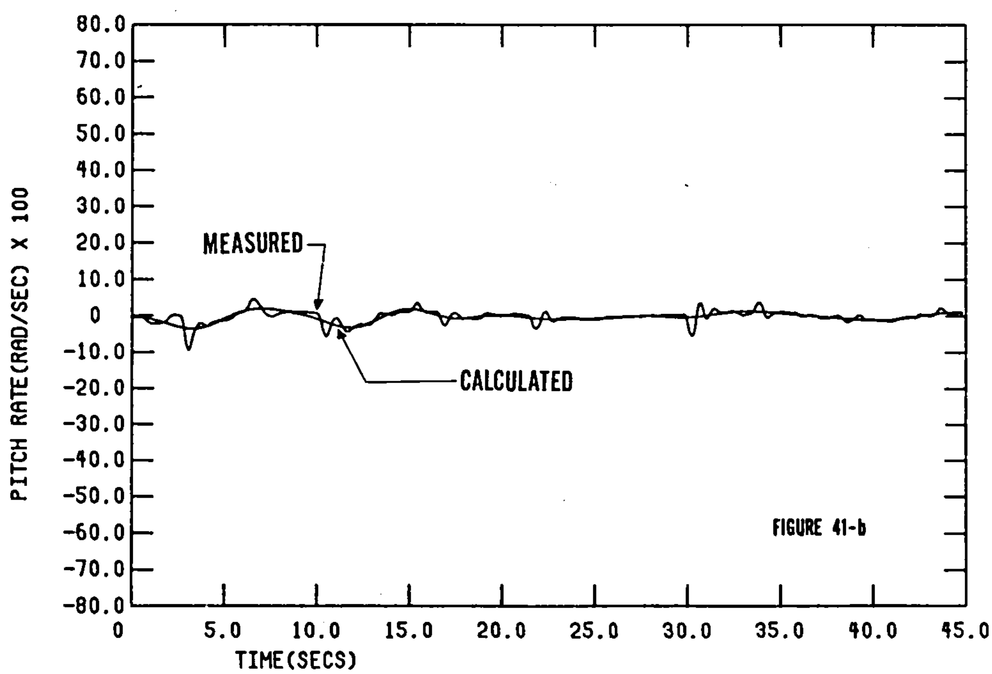


EFFECT OF USING $\int \dot{\theta} dt$ FOR θ IN CALCULATED SOLUTIONS. ASSUMED $\theta_{drift} = -0.025\,t/T$. ASSUMED α POSITION ERROR CORRECTIONS GAIN 1.1538, BIAS -0.02 RADIANS.

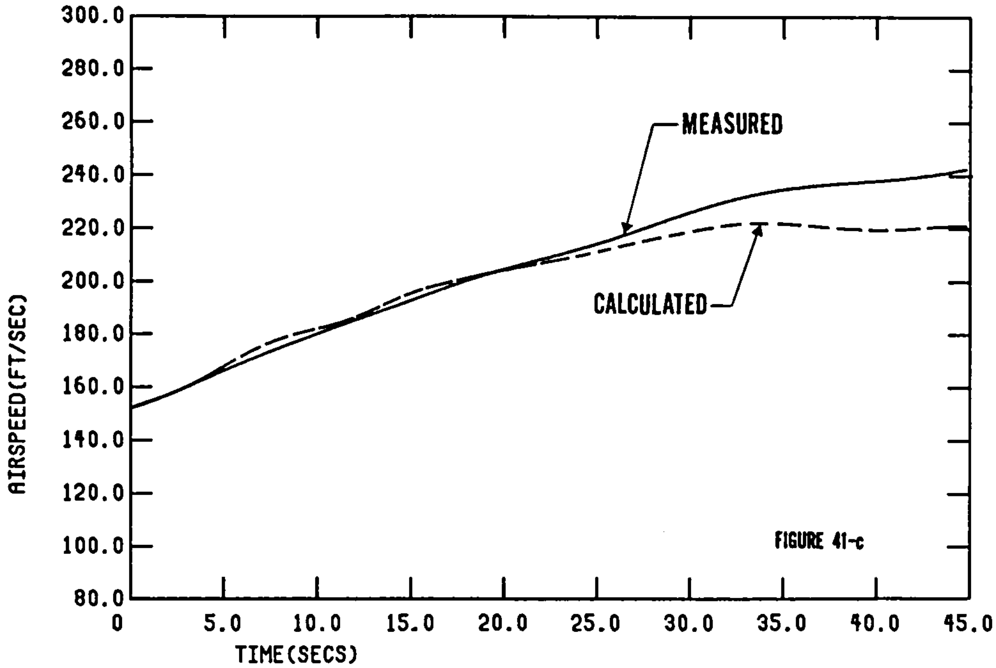


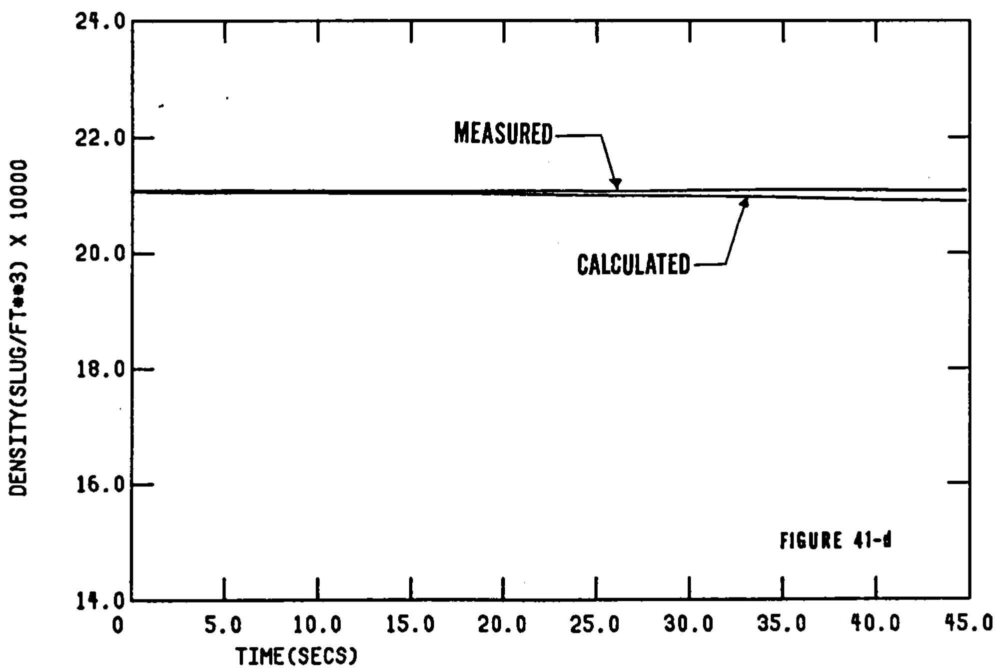
EFFECT OF USING $\int \dot{\theta} dt$ FOR θ IN CALCULATED SOLUTIONS. ASSUMED θ_{drift} = $-0.025\, t/T$. ASSUMED α POSITION ERROR CORRECTIONS GAIN 1.1538, BIAS -0.02 RADIANS.



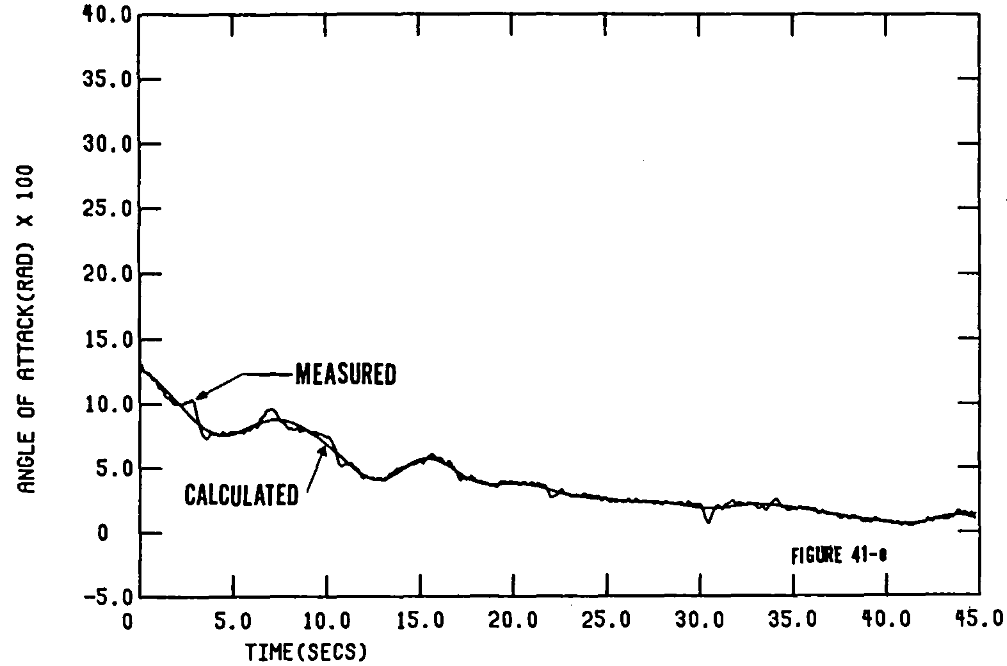


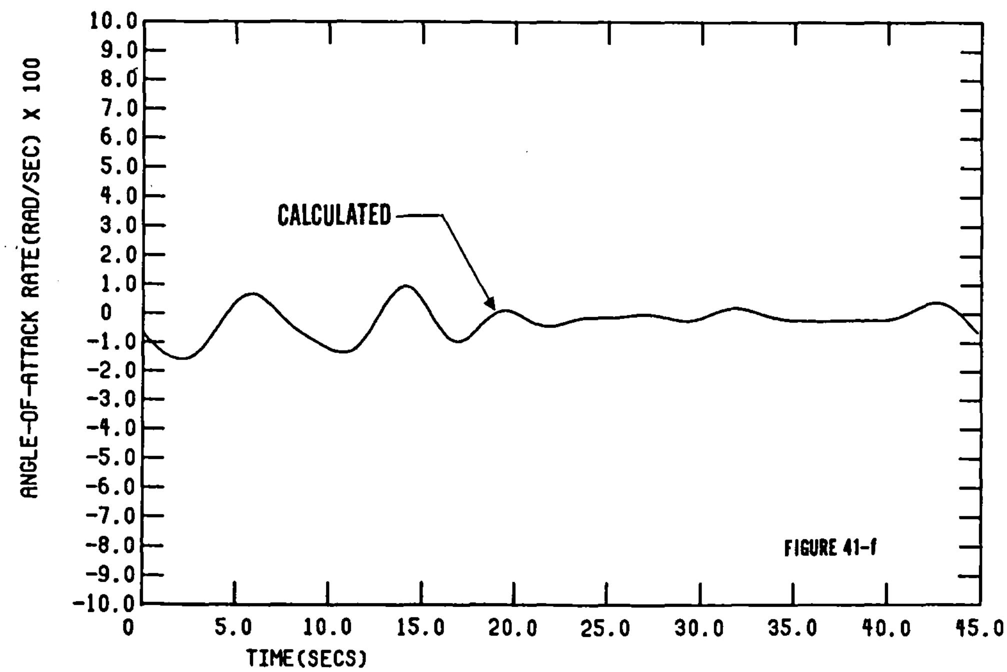
LEVEL FLIGHT ACCELERATION: COMPARISON OF MEASURED AND COMPUTED VALUES. NO θ DRIFT ASSUMED. α POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.0047.



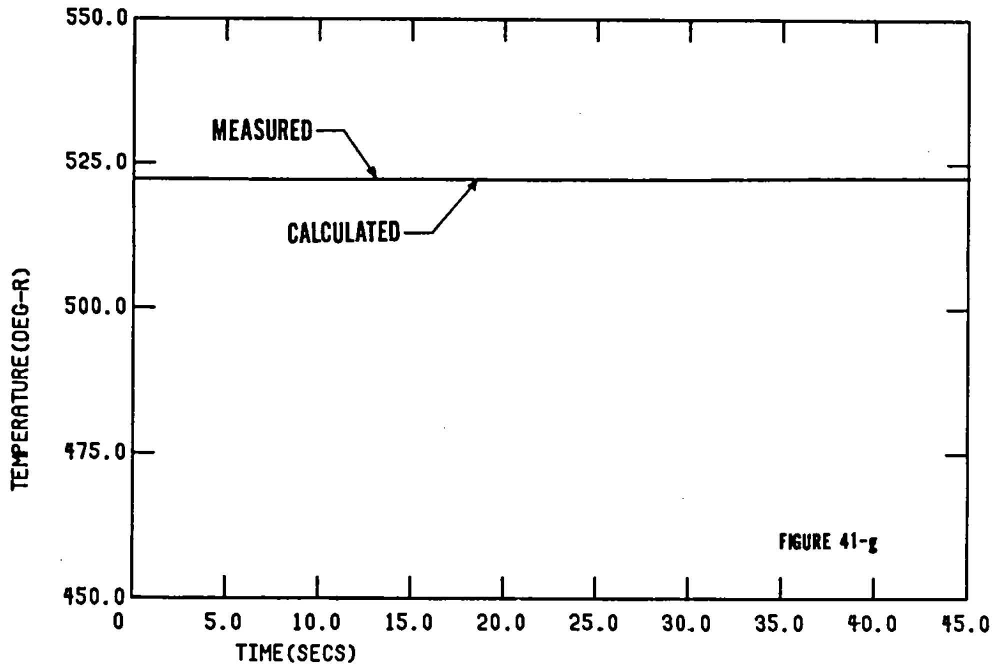


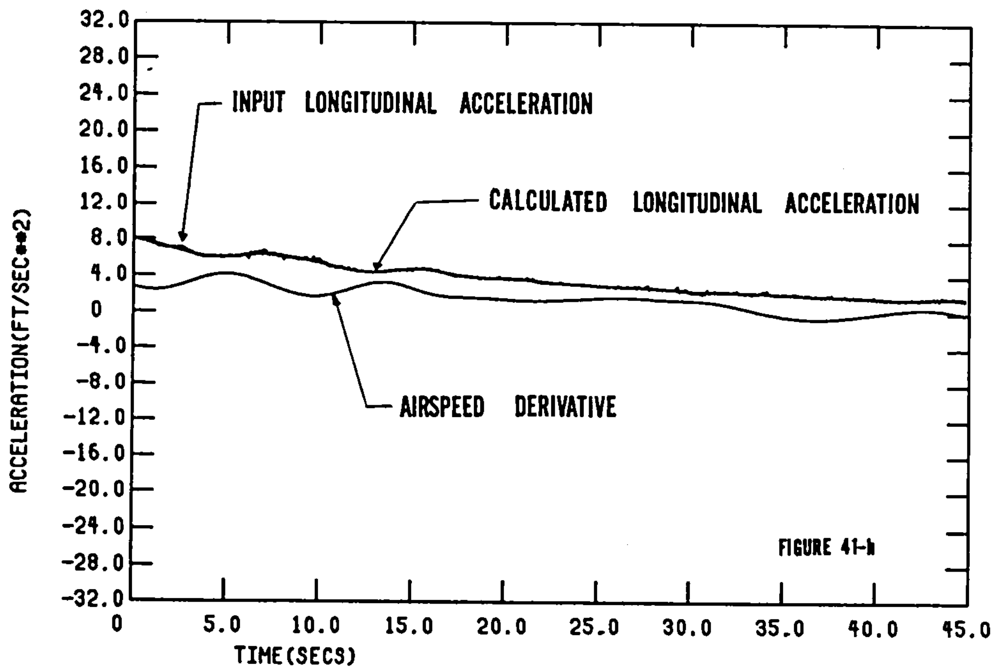
LEVEL FLIGHT ACCELERATION: COMPARISON OF MEASURED AND COMPUTED VALUES. NO θ DRIFT ASSUMED. α POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.0047.



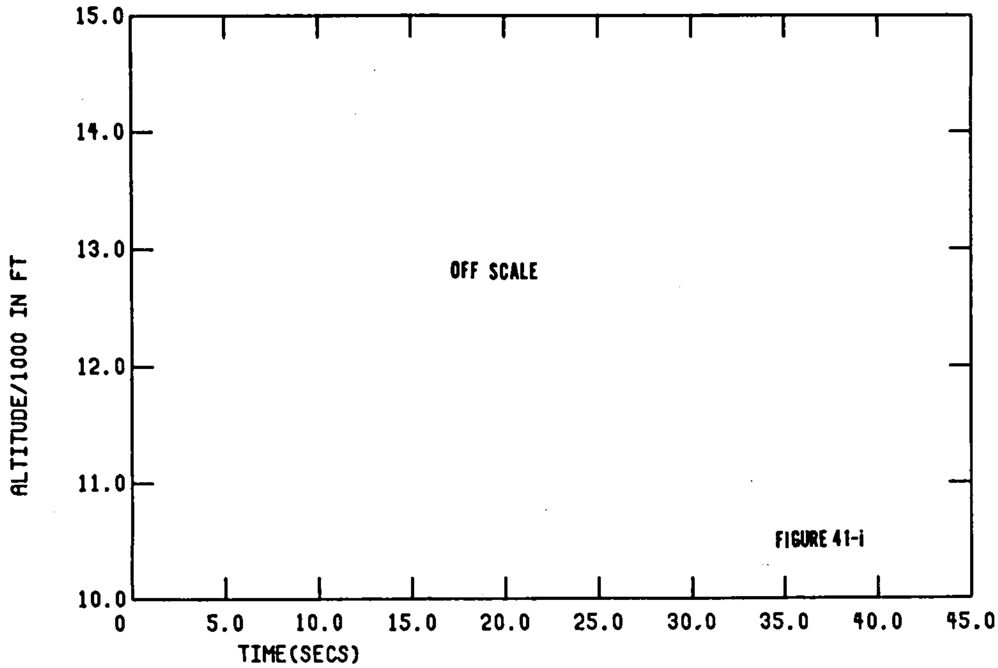


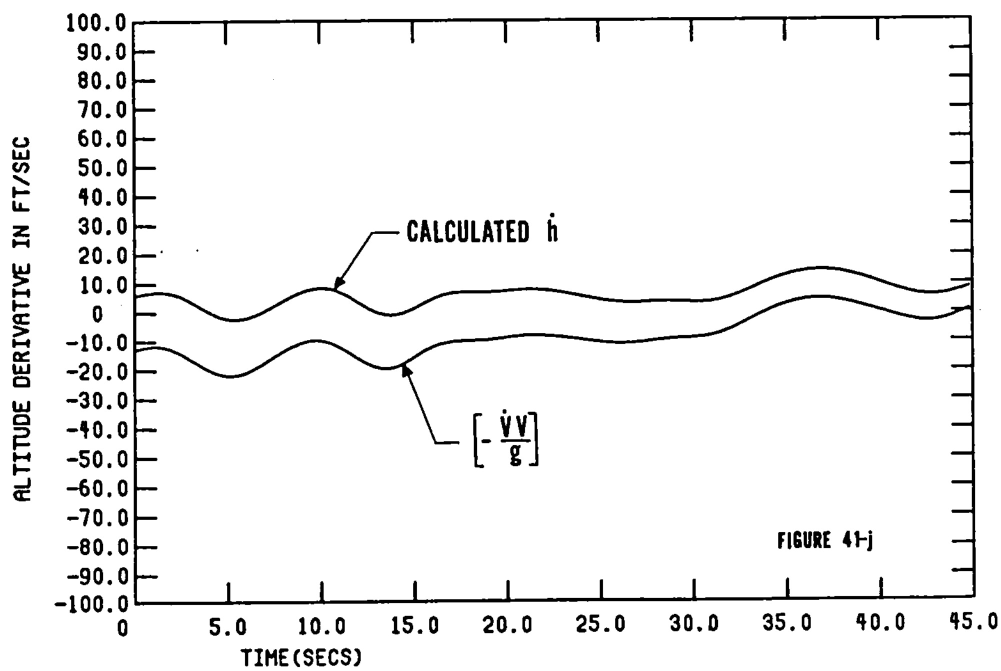
LEVEL FLIGHT ACCELERATION: COMPARISON OF MEASURED AND COMPUTED VALUES. NO θ DRIFT ASSUMED. α POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.0047.





LEVEL FLIGHT ACCELERATION: COMPARISON OF MEASURED AND COMPUTED VALUES. NO θ DRIFT ASSUMED. α POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.0047.





LEVEL FLIGHT ACCELERATION: COMPARISON OF MEASURED AND COMPUTED VALUES. NO θ DRIFT ASSUMED. α POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.0047.

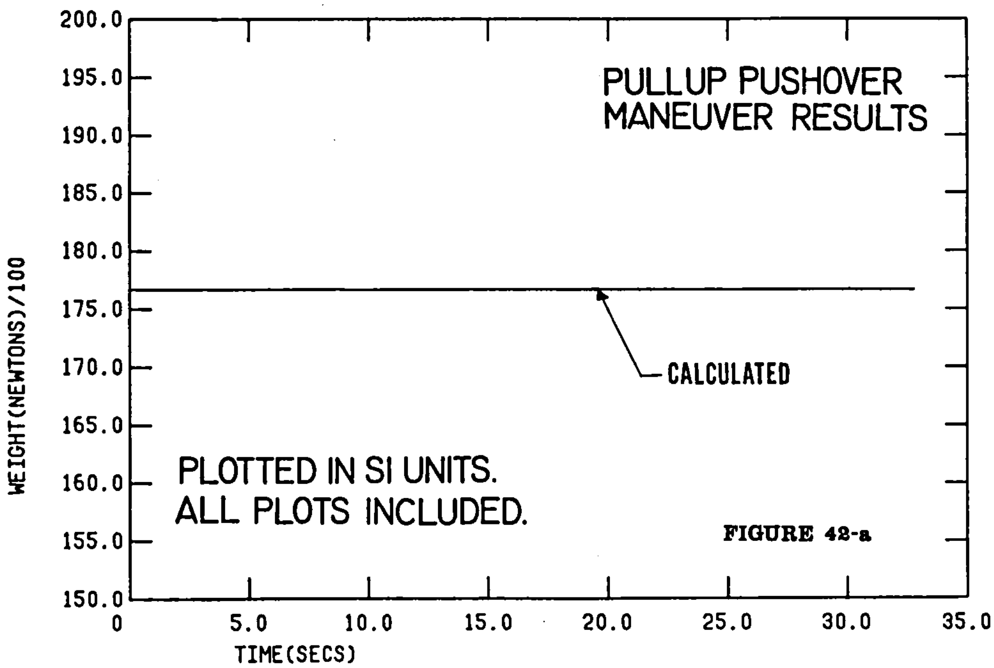


FIGURE 42-a

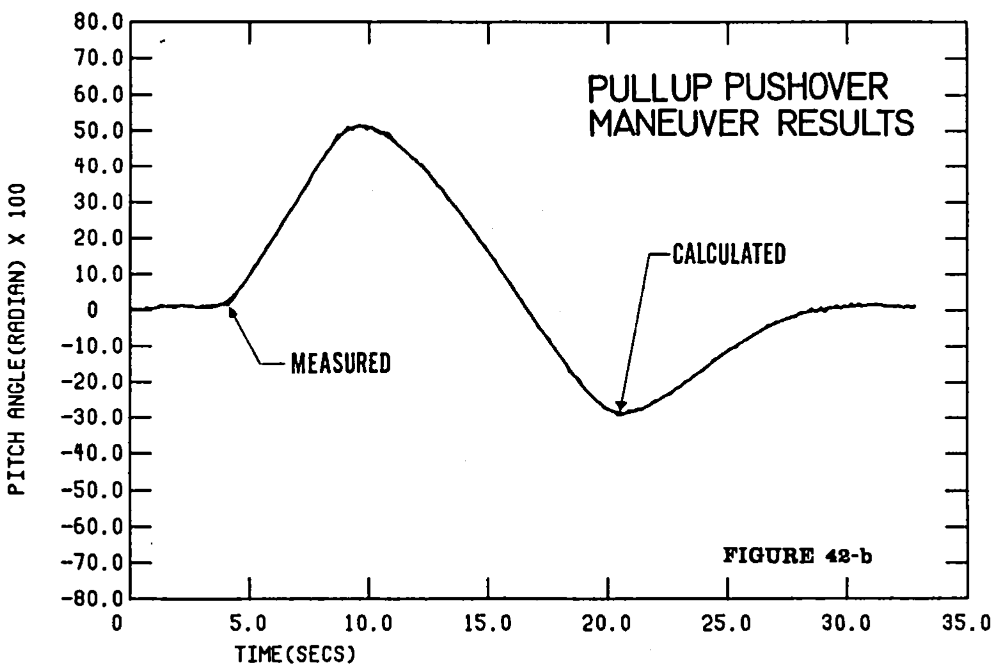
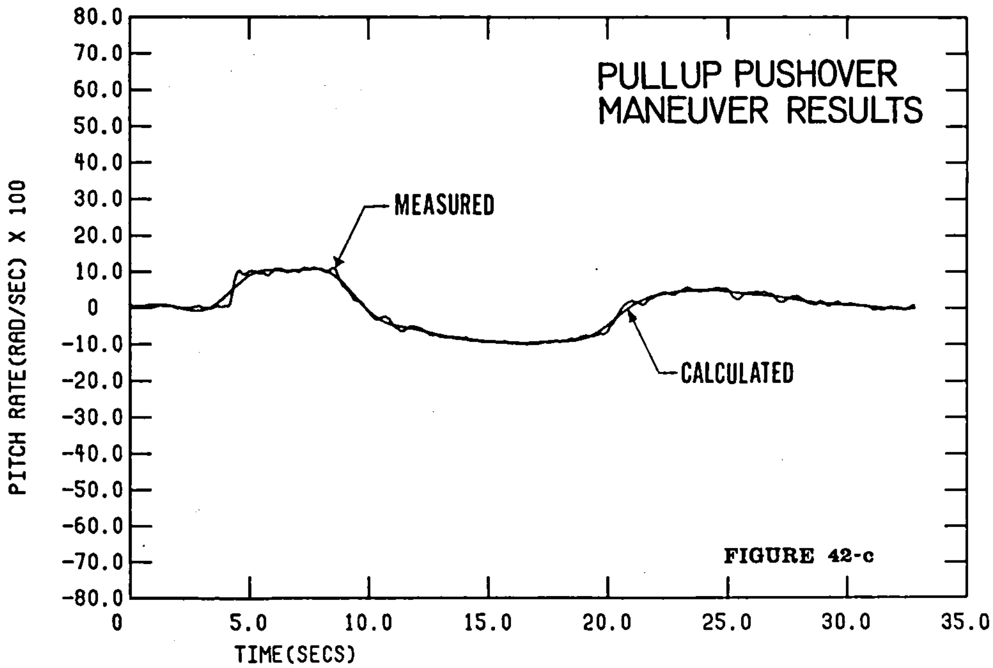
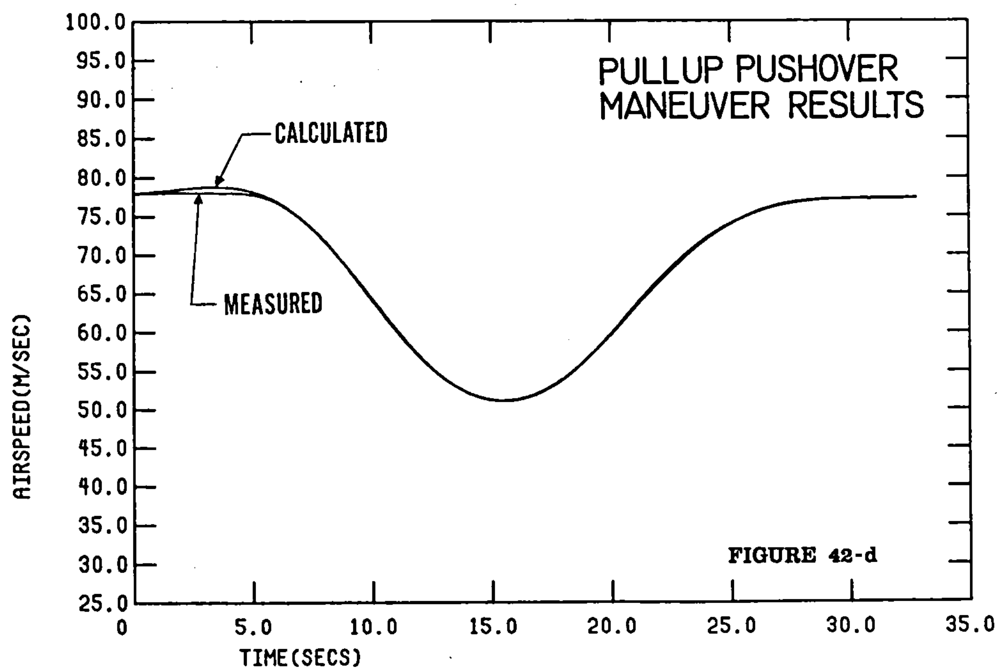
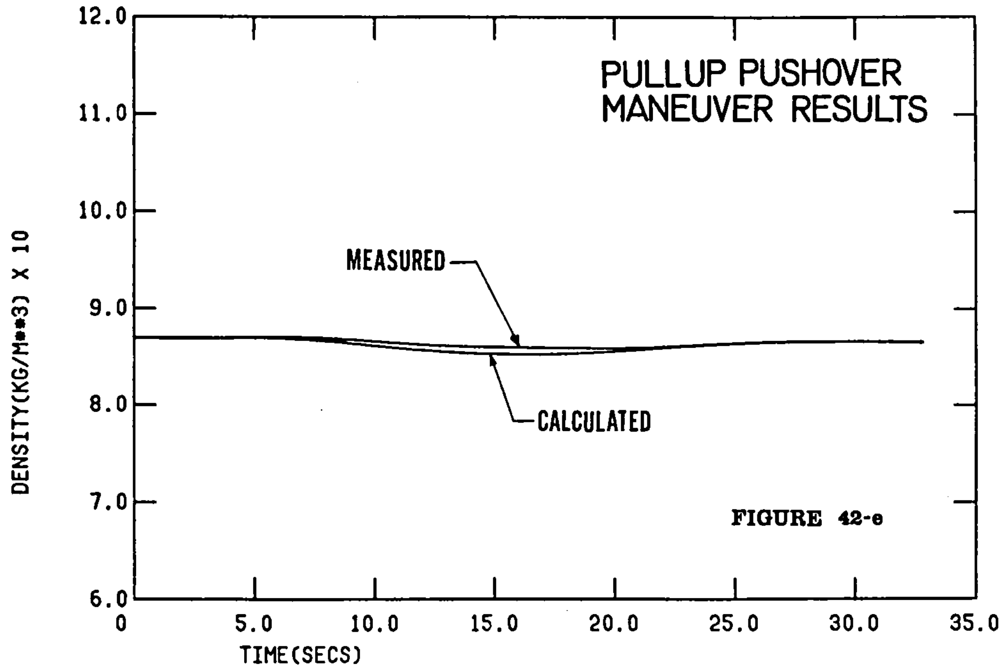
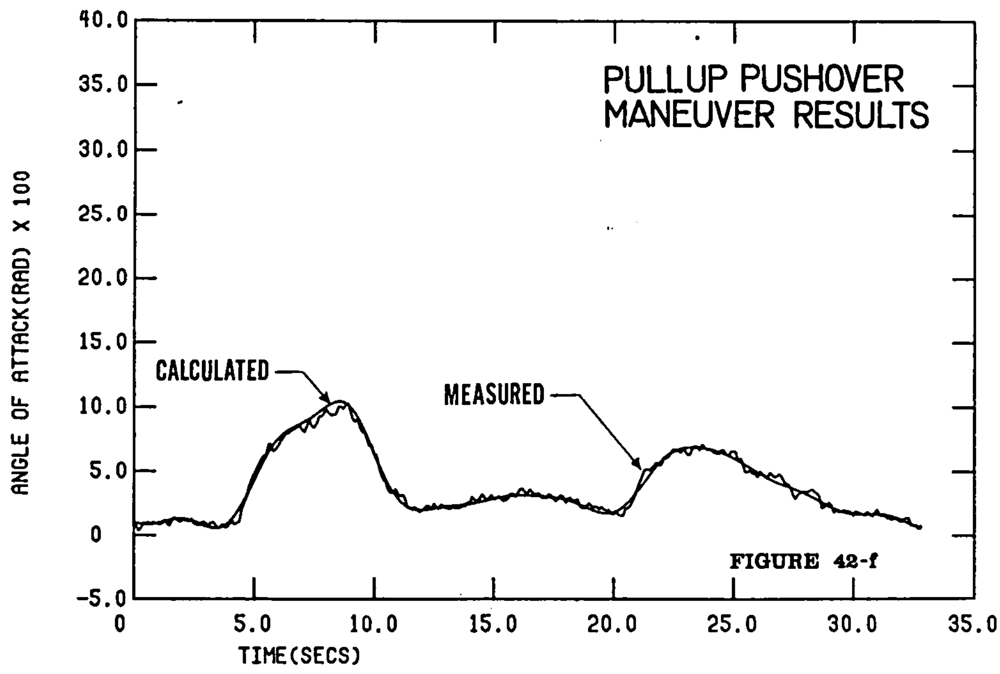


FIGURE 42-b


PULLUP PUSHOVER
MANEUVER RESULTS
MEASURED
CALCULATED
FIGURE 42-c
PITCH RATE(RAD/SEC) X 100
TIME(SECS)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0


PULLUP PUSHOVER
MANEUVER RESULTS
CALCULATED
MEASURED
FIGURE 42-d
AIRSPEED(M/SEC)
TIME(SECS)
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0


PULLUP PUSHOVER MANEUVER RESULTS
MEASURED
CALCULATED
FIGURE 42-e
DENSITY(KG/M**3) X 10
TIME(SECS)
12.0
11.0
10.0
9.0
8.0
7.0
6.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0


PULLUP PUSHOVER MANEUVER RESULTS
CALCULATED
MEASURED
FIGURE 42-f
ANGLE OF ATTACK(RAD) X 100
TIME(SECS)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
-5.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0

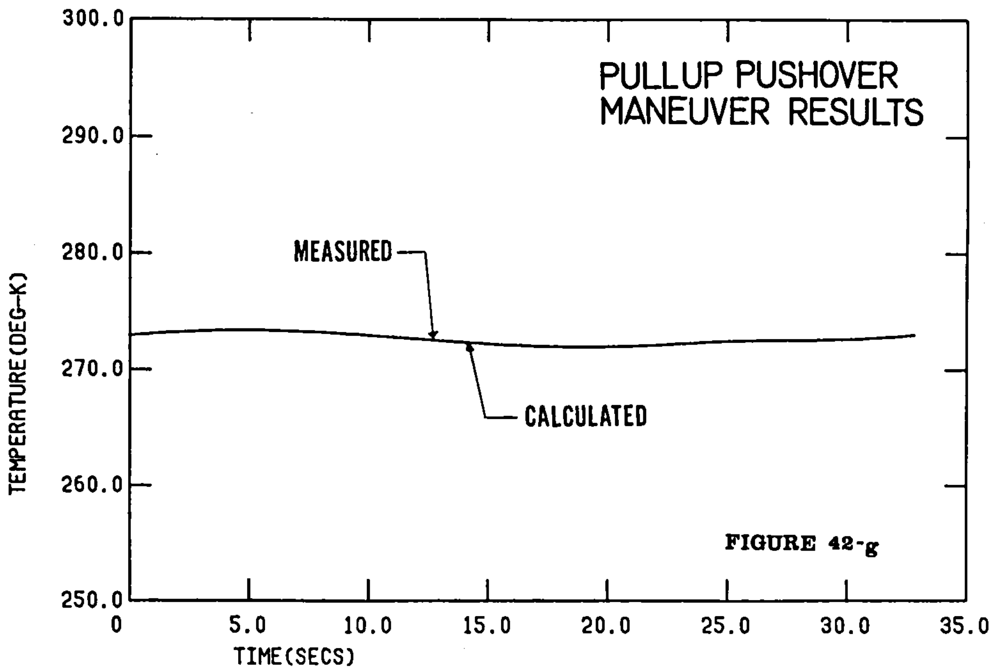


FIGURE 42-g

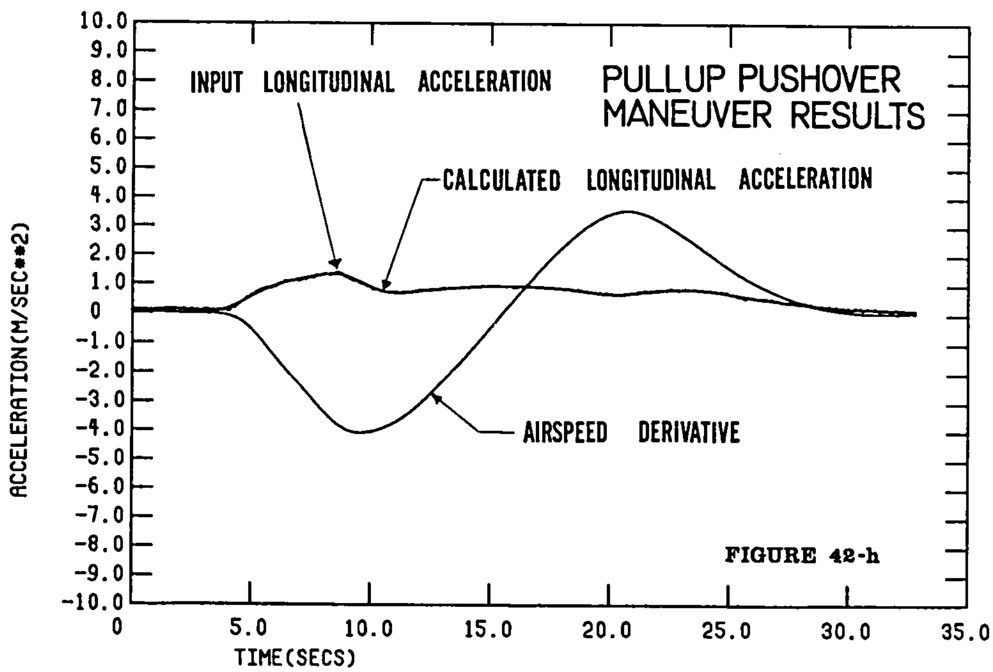
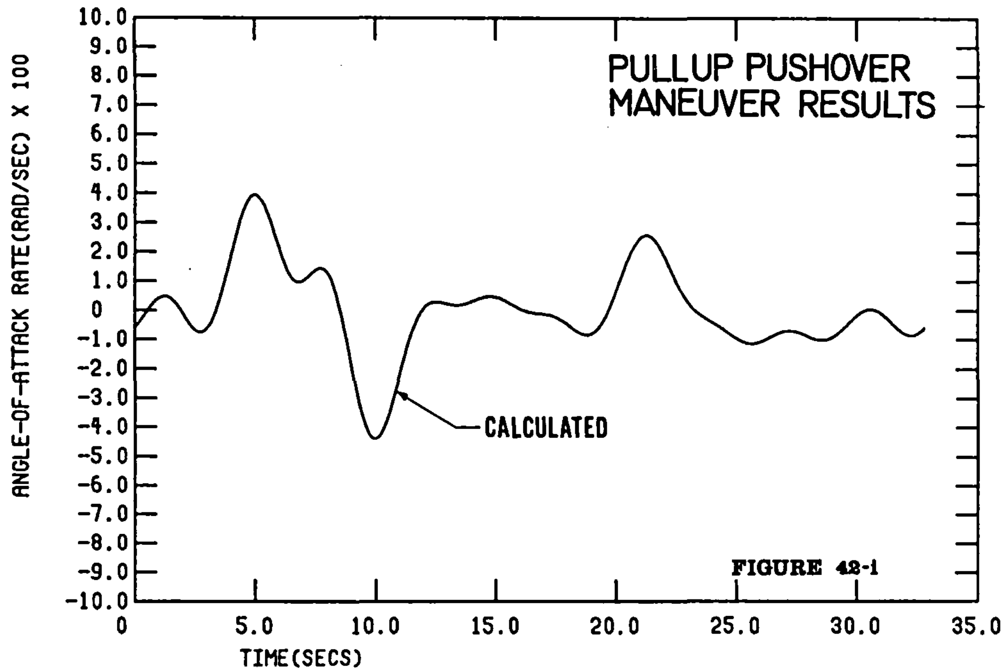
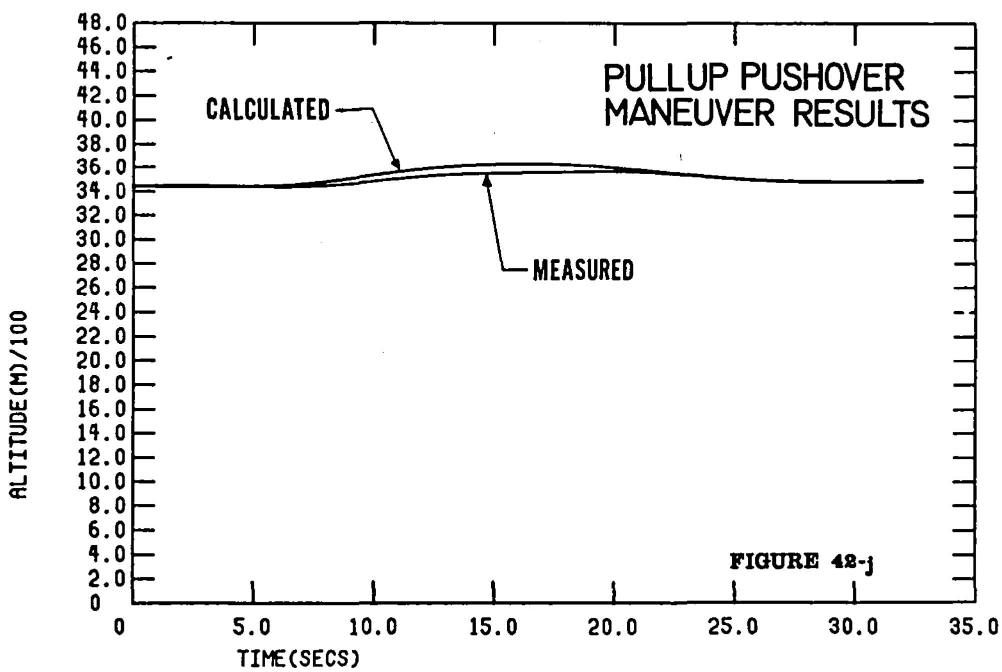


FIGURE 42-h


PULLUP PUSHOVER
MANEUVER RESULTS
CALCULATED
FIGURE 42-i
ANGLE-OF-ATTACK RATE(RAD/SEC) X 100
TIME(SECS)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
-10.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0


PULLUP PUSHOVER
MANEUVER RESULTS
CALCULATED
MEASURED
FIGURE 42-j
ALTITUDE(M)/100
TIME(SECS)
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0

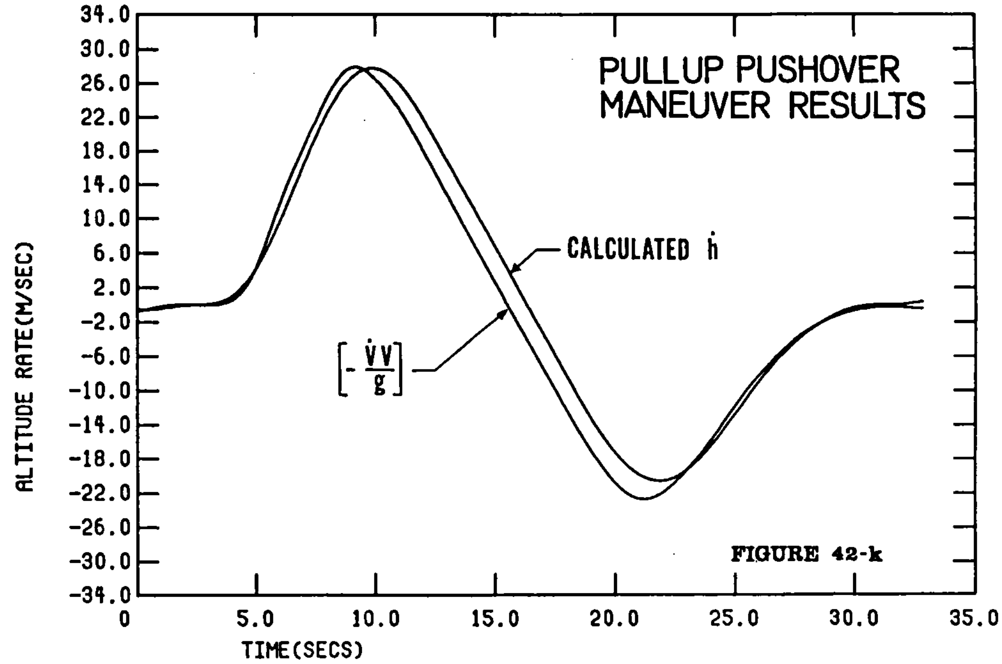


FIGURE 42-k

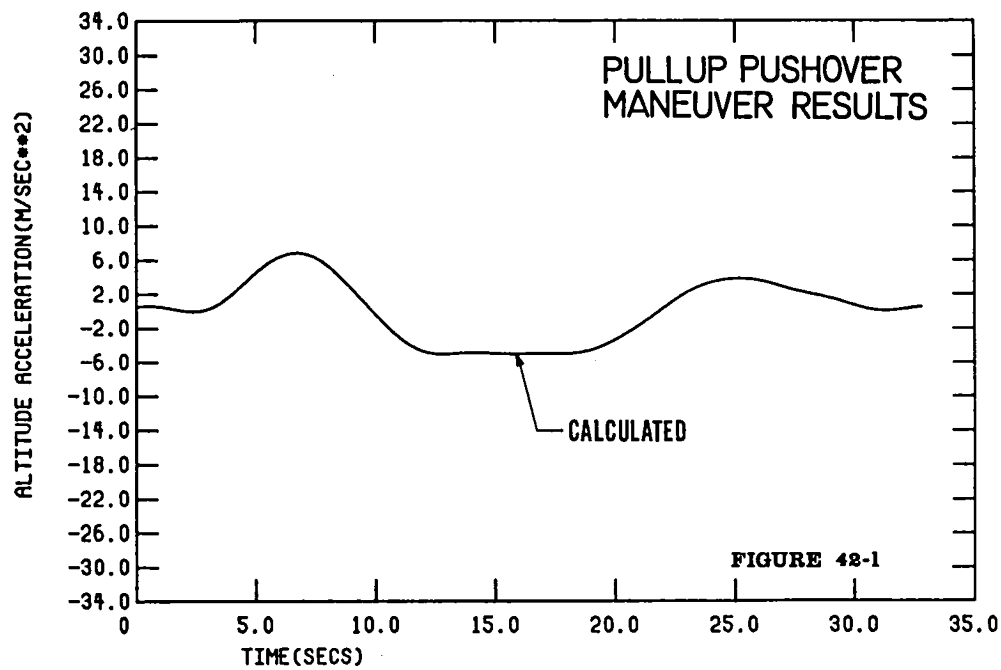
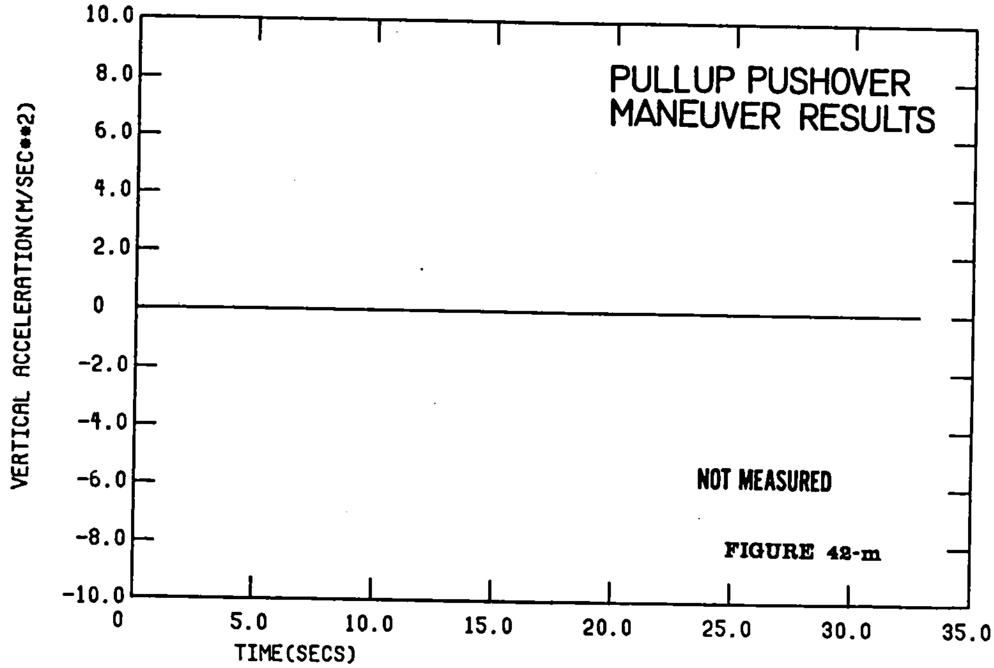
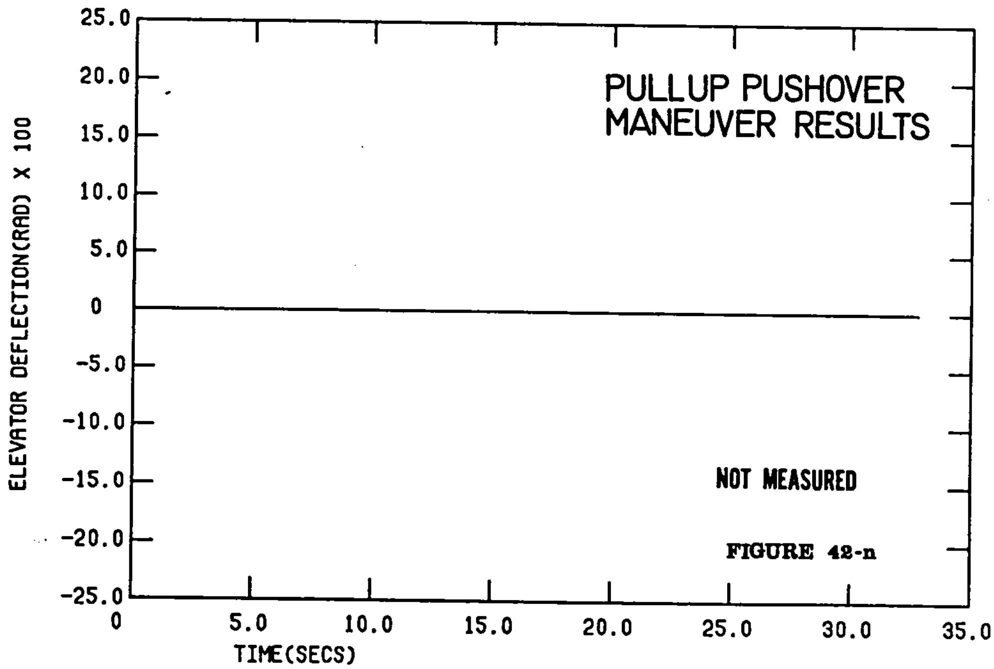


FIGURE 42-1


PULLUP PUSHOVER
MANEUVER RESULTS
NOT MEASURED
FIGURE 42-m
VERTICAL ACCELERATION(M/SEC**2)
TIME(SECS)
10.0
8.0
6.0
4.0
2.0
0
-2.0
-4.0
-6.0
-8.0
-10.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0


PULLUP PUSHOVER
MANEUVER RESULTS
NOT MEASURED
FIGURE 42-n
ELEVATOR DEFLECTION(RAD) X 100
TIME(SECS)
25.0
20.0
15.0
10.0
5.0
0
-5.0
-10.0
-15.0
-20.0
-25.0
0
5.0
10.0
15.0
20.0
25.0
30.0
35.0

EXPERIENCE WITH FLIGHT DATA AFTER APPLICATION OF DATA COMPATIBILITY IMPROVEMENT PROCEDURE

Most of the problems encountered attempting to use actual flight data have been enumerated previously. As methods were developed to circumvent the gross inconsistencies present in the data, not surprisingly some smaller problems to the planned utilization of the data began to become apparent. These were of two types. The first is illustrated in figure 43. This shows θ corrected for bias error and drift plotted against the integral of $\dot{\theta}$ corrected for bias error for a pullup-pushover maneuver. Note that the functions begin and end near zero and the peaks lie on the 45° perfect correlation line. In between, however, there is a significant difference between the two measurements. Discussions with the flight crew revealed that it was extremely difficult to maintain a wing-level, yaw-rate-free attitude during the pullup-pushover maneuver. Since in three dimensions

$$\theta(t) = \int_0^t (g \cos \phi - r \sin \phi)dt + \theta_1 ,$$

it is quite apparent that a yaw rate (r) combined with a small bank angle (ϕ) can produce a significant departure in the integral of $\dot{\theta}$, i.e., q from that measured by a free gyro. Similarly, a reasonable bank angle alone can result in the integral of the rate trace being below the attitude gyro indication during pullups and above it during pushovers. This follows simply from the fact that the cos ϕ term decreases the effective pitch rate. Note also that the effect is most pronounced when the pitch rate is greatest. Finally, there is a possibility that one of the gyros is mounted at a slight cant relative to the other, which would produce the same net effect.

The difference shown in figure 43 is sufficient to produce a rather significant difference in the extracted power and drag coefficients if one substitutes $\int\dot{\theta}dt$ for θ in the data submitted to the extraction procedure. For example, at maximum level flight speed the extracted thrust horsepower is about 22% greater if $\int\dot{\theta}dt$ is used than if θ is used. The lower figure is more consistent with that expected, given engine and propeller test data. The fit error with $\int\dot{\theta}dt$ is also about a factor of 2 greater than with θ. For these reasons it seems advisable to employ θ in place of $\int\dot{\theta}dt$.

The second type of problem which became apparent after some experience with the results of the data compatibility procedure is the extent to which one could specify a priori the correct form of the lift and drag models. It had been assumed initially that the maneuvers were sufficiently slow that contributions from terms such as $C_{L_{\dot{\alpha}}}$, $C_{D_{\dot{\alpha}}}$, $C_{D_{\dot{\theta}}}$, and $C_{L_{\dot{\theta}}}$ could be safely ignored. Inclusion of such terms in the model extractions lowered the fit errors by a factor of two or more. Further, the values of $C_{L_{\dot{\alpha}}}$, $C_{L_{\dot{\theta}}}$, etc,

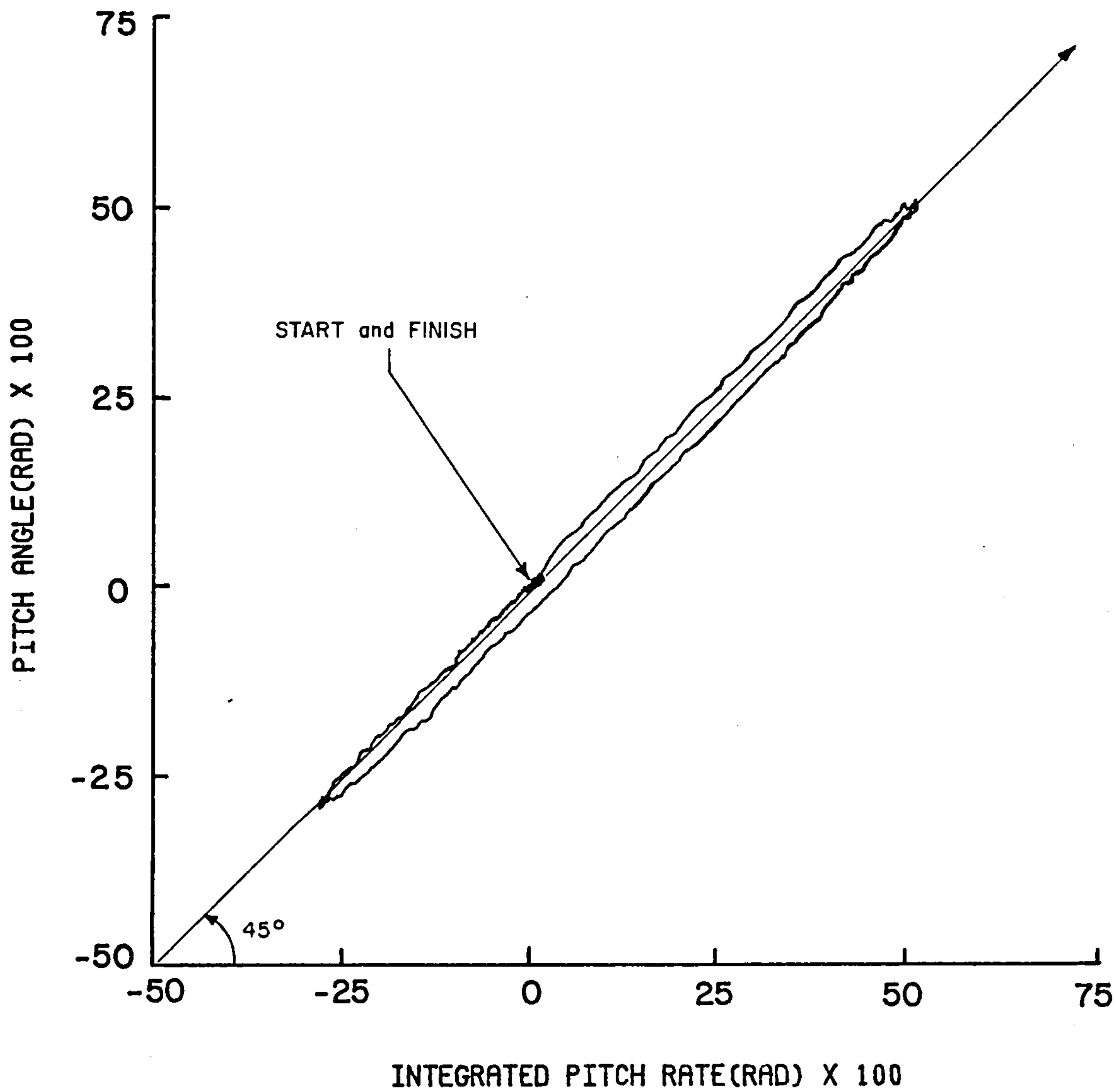

75
50
25
0
-25
-50
PITCH ANGLE(RAD) X 100
START and FINISH
45°
-50
-25
0
25
50
75
INTEGRATED PITCH RATE(RAD) X 100

FIGURE 43

extracted indicated these therms could contribute as much as 10% to the overall C_L or C_D. Thus, it seems desirable to include these terms in the procedure whenever possible. That these terms would be important for the ATLIT airplane was not appreciated until the development work on the Noise Reduction -- Newton-Raphson procedure was almost complete and the end of the grant period was near at hand. Because of the very considerable time necessary to expand the computer program to accommodate these additional parameters, it was not possible to undertake this task for the present report. Instead, an expanded version of the initial least squares parameter extraction procedure was prepared. (MDLCK. See Appendix B for description). Most of the ATLIT results discussed in the next section were obtained using this limited procedure. An assessment of the validity of the parameter values obtained by this procedure can be obtained by comparing the fit error obtained with that found at various stages in the test case (random computation of the α-channel).

OTHER APPROACHES TO THE PROBLEM

Gerlach's Method

While the method described in the present report to find both the drag and the power from accelerated flight data was developed specifically for the ATLIT test program, it is similar in some respects to the scheme outlined by Gerlach (Ref. 9) in a 1970 SAE Business Aircraft Meeting paper. Subsequent results are discussed in Ref. 10. Gerlach assumes, for example, that while the engine brake horsepower is known a priori (as a function of manifold pressure and RPM), the actual power into the airstream is a quadratic function of this brake horsepower. His procedure is intended to yield the values of the three coefficients in this quadratic function. Similarly, he assumes a simple parabolic drag polar and a linear lift curve and the procedure is intended to yield values of $C_{D_{min}}$, span efficiency factor, C_{L_α}, and $C_{L_{\alpha=0}}$.

The data time histories used in the extraction process are obtained as follows:

$$\alpha = \theta - \sin^{-1}\left[\frac{\dfrac{\Delta h_p - \int\int_o^{t_f} (Ax \sin\theta - Az \cos\theta - g)dt^2}{\Delta t}}{V} + \frac{\int_o^t (Ax \sin\theta - Az\cos\theta - g)dt}{V}\right] \qquad (152)$$

$$\theta = -\tan^{-1}\left.\frac{Ax}{Az}\right|_{t=0} + \int_o^t \dot{\theta}\, dt \qquad (153)$$

Here V is determined by the usual pressure and temperature instrumentation. Δh_p is the total change in altitude represented by the maneuver according to static pressure instrumentation, Δt is the total time of the maneuver, t_f the time at the end of the maneuver and Ax and Az are accelerometer indications along the body axes.

Gerlach indicates that the α, θ, and γ values obtained this way are inadequate because of slight inaccuracies in the determination of initial values and small zero shifts in Ax, Az, and $\dot{\theta}$. He then proceeds to find corrections for these errors by writing:

$$\Delta\Delta h(t) = \Delta\Delta h_0 + \Delta\theta_0\, K_1(t) + \Delta\dot{h}_0\, K_2(t) + \Delta Ax_0\, K_3(t) + Az_0\, K_4(t)$$

$$+ \Delta\dot{\theta}_0\, K_5(t) + \varepsilon_h \tag{154}$$

where the $\Delta\Delta h(t)$ is the difference in the altitude obtained from pressure data and integration of the accelerometers; $\Delta\theta_0$, ΔAx_0, ΔAz_0, $\Delta\dot{\theta}_0$, $\Delta\dot{h}_0$ are initial bias errors, ε_h is the noise component of $\Delta\Delta h$, and $\Delta\Delta h_0$ is a remaining constant which should turn out to be zero. The variables $K_1 \ldots . K_5$ are said to be known functions of time but the method by which they are obtained is not given in the paper. Gerlach performs the same operation with regard to the difference in airspeed obtained from pressure data and accelerometer integrations. Using regression analysis, Gerlach finds corrections to his data. The corrected α, $\dot{\theta}$, h, and V data are then used in a system of equations

$$C_x = C_{x_0} + C_{x_{\Delta Pt}}\left(\frac{\Delta Pt}{\frac{1}{2}\rho V^2}\right) + C_{x_\alpha}\, \alpha + C_{x_{\alpha^2}}\, \alpha^2 + C_{x_{\dot{\alpha}}}\, \frac{\dot{\alpha}\bar{c}}{V} \tag{155}$$

$$C_z = C_{z_0} + C_{z_{\Delta Pt}}\left(\frac{\Delta Pt}{\frac{1}{2}\rho V^2}\right) + C_{z_\alpha}\, \alpha + C_{z_{\dot{\theta}}}\, \frac{\dot{\theta}\bar{c}}{V} + C_{z_\delta}\, \delta_e \tag{156}$$

$$C_m = C_{m_0} + C_{m_{\Delta Pt}}\left(\frac{\Delta Pt}{\frac{1}{2}\rho V^2}\right) + C_{m_\alpha}\, \alpha + C_{m_{\alpha^2}}\, \alpha^2 + C_{m_{\dot{\theta}}}\, \frac{\dot{\theta}\bar{c}}{V} + C_{m_\delta}\, \delta_e \tag{157}$$

$$\frac{\Delta Pt}{\frac{1}{2}\rho V^2} = a + b\left[\frac{P}{\frac{1}{2}\rho V^3}\right] + c\left[\frac{P}{\frac{1}{2}\rho V^3}\right]^2 \tag{158}$$

Here P is the brake horsepower at a given manifold pressure and RPM, ΔP_t is the change in total pressure at some point in the slipstream, δ_e is the elevator deflection, and a, b, and c are undetermined constants. This gives a total of 19 constants to be determined from four equations. Gerlach does not provide sufficient detail in the paper to identify the procedure by which he extracts these coefficient values but one could employ the least squares procedure by setting

$$C_x = \frac{w(Ax + g \sin\theta)}{g\frac{1}{2}\rho V^2 S}\ , \tag{159}$$

$$C_z = \frac{w(Az - g \cos\theta)}{g\frac{1}{2}\rho V^2 S}\ , \text{ and} \tag{160}$$

$$C_m = \frac{\ddot{\theta} I_{yy}}{\bar{c}\frac{1}{2}\rho S V^2} \quad (161)$$

The reader will recognize several of these constant coefficients as familiar stability derivatives. Gerlach indicates further that by correcting the data to steady flight conditions by means of the chosen aerodynamic model, one can find the rate of climb as a function of speed, the elevator angle as a function of speed, and the drag polar. The details of the method are not supplied in the paper or the subsequent reference.

How does Gerlach's method compare with the method described in the present report? The latter does not include the pitching degree of freedom so that one cannot use it to extract longitudinal short period stability information as Gerlach does. On the other hand the flight maneuvers used in the present work are chosen so as to experience a large part of the aircraft's angle of attack and speed range rather than "small" perturbations about an equilibrium state from which one would normally extract short period information. Gerlach follows the latter approach. Gerlach apparently chooses integration of accelerations as his method of data smoothing, rather than filtering, and uses regression techniques for the removal of bias errors. A similar approach is followed in the present method to remove bias errors. The application of bias corrections is apparently the only device Gerlach uses to improve interparameter data consistency. He seems to have settled on a single, relatively simple aerodynamic model. The form of the equations to which the regression analysis is applied is also quite different from that employed herein since the equations serve a different purpose. The identification of thrust horsepower as a function of speed is not as evident in Gerlach's approach as in the present method. Finally, the philosophy adopted here is that by limiting one's consideration to motions of the center of gravity in the vertical plane and thus to performance problems alone, the consequent reduction in mathematical complexity should permit one to do a better job sorting out errors in the flight data and extracting thrust horsepower and drag.

Iliff's Method

Iliff (Ref. 12) employed a very interesting variant of his stability analysis procedure to determine lift and drag from pushover-pullup maneuver data. He did not attempt to determine thrust at the same time because "... an independent estimate of thrust is necessary". He assumes the following aerodynamic model

$$C_x = C_{x_o} + C_{x_\alpha} \alpha + C_{x_{\delta_e}} \delta_e + C_{x_{\alpha^2}} \alpha^2 + C_{x_{\alpha\delta_e}} \alpha\delta_e + C_{x_{\delta_e^2}} \delta_e^2 \quad (162)$$

$$C_z = C_{z_o} + C_{z_\alpha}\,\alpha + C_{z_{\delta_e}}\,\delta_e + C_{z_{\alpha^2}}\,\alpha^2 + C_{z_{\alpha\delta_e}}\,\alpha\delta_e + C_{z_{\delta_e^2}}\,\delta_e^2 \tag{163}$$

$$C_L = -\,C_z \cos\alpha + C_x \sin\alpha \tag{164}$$

$$C_D = -\,C_x \cos\alpha - C_z \sin\alpha \tag{165}$$

and writes the six equations

$$\dot{q} = M_V V + M_q q + M_\alpha \alpha + M_{\alpha^2}\alpha^2 + M_{\delta_e}\delta_e + M_{\delta_e^2}\delta_e^2 + M_{\alpha\delta_e}\alpha\delta_e + M_o \tag{166}$$

$$\dot{\alpha} = Z_V V + Z_\alpha \alpha + Z_{\alpha^2}\alpha^2 + Z_{\delta_e}\delta_e + Z_{\delta_e^2}\,\delta_e^2 + Z_{\alpha\delta_e}\alpha\delta_e + Z_o + q + \frac{g}{V}\cos\theta_o - \frac{g}{V}\,\theta\sin\theta_o \tag{167}$$

$$\dot{V} = X_V V + X_\alpha \alpha + X_{\alpha^2}\alpha^2 + X_{\delta_e}\delta_e + X_{\delta_e^2}\delta_e^2 + X_o + \frac{T}{W}g - g\sin\theta_o - g\,\theta\cos\theta_o \tag{168}$$

$$\dot{\theta} = q$$

$$A_z = -\frac{V}{g}(Z_V V + Z_\alpha \alpha + Z_{\alpha^2}\alpha^2 + Z_{\delta_e}\delta_e + Z_{\delta_e^2}\delta_e^2 + Z_{\alpha\delta_e}\alpha\delta_e + Z_o) \tag{169}$$

$$A_x = \frac{1}{g}(X_V V + X_\alpha \alpha + X_{\alpha^2}\alpha^2 + X_{\delta_e}\delta_e + X_{\delta_e^2}\delta_e^2 + X_{\alpha\delta_e}\alpha\delta_e + X_o + \frac{T}{W}g) \tag{170}$$

δ_e, V, q, α, θ, $\dot{q}$, A_z, and A_x are available as measured functions of time and T, the net thrust, W, and θ_o are taken as constants which are assumed known during a given maneuver. If one calls α^2, $\alpha\delta_e$, and θ separate variables distinct from α and $\dot{\theta}$, then by specifying δ_e as a function of time, one has a system of six equations with constant coefficients which can be solved for

$q(t)$
$\alpha(t)$
$V(t)$
$\theta(t)$
$\alpha^2(t)$
$\alpha\delta_e(t)$,

provided values of the constant coefficients are supplied. Since the equations are linear, the general form of the solution may be written down immediately and the partial derivatives for the Newton-Raphson equations evaluated by substitution of these solutions in the analytical expressions or evaluated numerically by finite differences. The cost function to be minimized is constructed of differences squared between the measured and computed values of q, α, V, θ, $\dot{q}$, A_z, and A_x. The minimization is achieved when the constant coefficients, M_q, $\dot{M}_V$, M_α, etc., assume those values which produce solutions to the system of six equations most nearly matching the measured data in a least squares sense.

In the form presented in the paper, Iliff solves for the values of 22 constants and 7 measurement biases. These include the 12 constants necessary to evaluate $C_x = x/(\frac{1}{2}\rho SV^2)$ and $C_z = Z/(\frac{1}{2}\rho SV^2)$. Note that the thrust must be known a priori in order to separate X_o from the constant $\frac{1}{g}(X_o + \frac{T}{W} g)$. X_o, of course, is the major contributor to C_{D_o}. Iliff also assumes that the thrust axis is coincident with the x-body axis and his formulation is in terms of a body axis system rather then a wind axis system as used here.

The acceleration equations as written are for true accelerations; hence, the gravitational contributions to the usual instrument indications must first be removed before they are used in the minimization.

Iliff's model includes three non-linear terms which he is able to accommodate by writing three additional equations and calling these non-linear terms additional linear variables. Obviously, this process cannot be continued to a significant degree so that he must content himself with fairly simple lift and drag models if he is to avoid the non-linear solution techniques followed in the present work. This means that he must limit himself to maneuvers sufficiently restricted that the changes in all the variables are linear. He cannot evaluate the entire lift and drag curves in a single maneuver if the non-linearities of the complete curves extend beyond the form chosen. In the present work somewhat more complex models are investigated. In Iliff's formulation only small excusions in pitch angle about the initial value are permitted. That restriction does not exist in the present formulation. Iliff's as well as the present models do not include rate terms. One final difference is the inclusion of $C_{x_{\delta_e}}$, $C_{x_{\alpha\delta_e}}$, and $C_{x_{\delta_e^2}}$ terms in the drag expression; those terms are not included explicitly in the present formulation. It was pointed out earlier, however, that for a given weight and c.g. location these effects would be included implicitly by the nature of the extraction process in the coefficients of the drag expression. The values of these coefficients in the present formulation would, therefore, be expected to change with changes in c.g. location or weight.

The Iliff paper illustrates very clearly the trade offs involved in activities of this type. If one is content with restricted aerodynamic models, evaluation over a limited speed range, and no thrust determination, then the trajectory computation is very much simpler. Since trajectory evaluation consumes at least 75% of the computational time and is responsible for much of the error in the present procedure, the time and accuracy advantage of the simpler procedure cannot be dismissed easily.

Some of Iliff's more recent studies in parameter estimation applied to stability and control problems are reported in references 13, 14, and 15. Other minimization algorithms are described in reference 16.

DISCUSSION OF RESULTS

Figure 44 presents the two data sets from which the lift, drag, and power data shown in figures 45, 46, and 47 were obtained. The drift value shown for the pullup-pushover maneuver was chosen after several trials to produce a good match between the measured velocity and the computed value. The α-gain and α-bias values used are those found by the flight calibration of the α-vane for the position error. The rough α-curve is the measured α values as modified by this calibration. The smooth α-curve is the filtered α data modified by the compatibility improvement scheme. The modification is responsible for the difference one sees between the peak measured values and the smooth values. The smooth curve on the θ plot is that produced from the input data by the filtering procedure. The $\dot{h}$ curve is obtained by differentiation of the fourier series representations of h.

To obtain the velocity match shown for the level flight acceleration it was necessary to employ a non-linear θ drift, one for which almost all the effect occurs in the last half of the maneuver. Note also that this drift has the opposite sign from that required with the pullup-pushover, an indication perhaps, of the random nature of the "drift". It would appear from the figure, however, that some further refinement of the non-linear drift function is necessary in order to achieve a really acceptable match.

Figure 46a shows the extracted drag coefficient values obtained with three different models for the pullup-pushover manuever. Only the steady state components are plotted to facilitate comparison with the results of Holmes (Ref. 11) and the predictions. However, the complete drag coefficient expression obtained, including the rate terms, is shown on the figure. The power expressions associated with each of the extracted drag results are shown in figure 47a. It will be observed that the model giving the lowest fit error obviously is not an accurate representation of the aircraft's thrust horsepower. If one assumes that the drag found by Holmes is approximately correct, then it is seen that result (a) provides the best fit by best straddling the actual drag. The most reasonable power expression, (c), lies below both the expected power and the steady-state drag for all values and hence has the largest fit error. We may remark here that the fit error obtained by including the rate terms in the drag and power expressions is almost an order of magnitude smaller than the fit error for the same expressions without any of the rate terms.

A number of other power models, for example

$$P = P_o \ln V_1$$

$$P = P_o + P_2V + P_3V^2 \text{ , and}$$

$$P = P_o + P_1V^x$$

where x has various values from 0.2 to 0.6, were investigated with no apparent improvement in the results.

The estimated power shown in figure 47a for 256 fps would appear to be consistent with the drag coefficient near $\alpha = 0$ shown in figure 46a, because the extracted power and drag values for model (c) -- which are related by an equation -- are both approximately the same as these values. At the low speed end of the data the estimated power is either a little low or the drag value derived from Ref. 11 is a little high or both. A power value of 103,000 ft-lbs/sec at 167 ft/sec is consistent with a drag coefficient value of about 0.98 at an $\alpha = 0.104$.

One explanation for the failure of the extracted values to agree better with what are probably reasonable power and drag is a possible error in the α position error calibration. The extraction process is, of course, more sensitive to the value of α than to the value of any other variable. As an experiment an extraction was performed on a data set with a larger value of α gain along with a negative bias value. The resulting α values were therefore centered about those used for the present extraction. Interestingly, the extracted power curve using model (c) had a considerably shallower slope than the result shown in figure 47a. Since the calculated flight velocity is not particularly sensitive to the values of α used in integrating the kinematic equation, it seems possible that an adjustment to α sufficient to bring the extracted results into much better agreement with the "accepted" values can be achieved while preserving the congruence between the calculated velocity and the measured value.

We may note in passing that the aircraft was flown in a rather "dirty" condition. This fact is no doubt primarily responsible for the measured drag being much greater ($\sim$ 25%) than the predicted value. When the aircraft was "cleaned up" for the full-scale wind tunnel tests the measured drag was found to be about 15% less* than the predicted value.

Figure 46b shows the extracted drag coefficients obtained from the level flight acceleration at 4000' depicted in figure 44. To obtain this result it was necessary to omit the rate terms from the drag model but retain them for the power expression. Note that the speed range and angle of attack range covered by the two data sets are approximately the same. The rates at which the variables change, of course, are much lower in the level flight acceleration. It would appear that the rates are below whatever threshold value is needed to give meaningful extractions. Also the fit error -- extrapolated to the same number of data points -- is about three times as large for the level flight acceleration as for the pullup-pushover. This would seem to indicate that maneuvers featuring more rapid parameter changes or larger parameter changes make possible more accurate coefficient extractions. They also aid in masking data measuring and acquisition defects. The ideal maneuvers, however, should not be so rapid as to excite more unsteady aerodynamic effects or so large as to uncover even more non-linearities.

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*Private communication.

The value of C_{D_o} found from the level flight acceleration is 7.5% lower than that recovered from the pullup-pushover. Considering the fact that fit errors for both data sets are still excessive, this agreement is quite good. This value (0.0468) is about 13% below that given by Holmes. The uncharacteristic variation in the drag coefficient with angle of attack is indicative of a problem in the data submitted to the extraction routine. Note that in figure 44 the match between the measured and computed values of velocity is much poorer than for the pullup-pushover. In addition a much more unusual "drift" correction to θ was required to achieve even this level of congruence. One might suggest that perhaps a relatively low frequency gust to which the α vane responded more completely than did the aircraft (hence θ and $\dot{\theta}$) as a whole was responsible for spurious contributions to the computed aircraft velocity. Analysis of several more maneuvers would be required to determine the validity of this contention. In any event, the extracted variation of C_D with α for the level flight acceleration must, for the present, be regarded as having the correct order of magnitude and little more.

The failure of the extracted power values shown in figure 47b to agree more closely with those extrapolated from sea level full scale wind tunnel results is another indication of the higher level of error present in the level flight acceleration data set. Qualitatively, however, the power results are similar to those for the pullup-pushover, a favorable indication. There is some evidence also that the estimated power value for 4000' is perhaps just a little larger than is actually the case. Note the relatively good agreement obtained for $\alpha \to 0$ during the pullup-pushover. If the power and drag are in approximate equilibrium at $\alpha \approx 0.01$ and if the C_{D_o} value here is about 0.053, then one would expect a power into the airstream of about 149,000 ft-lbs/sec while the extimated value is about 153,000 ft-lbs/sec.

The differences between the extracted values and those determined from speed power measurements are about what one would expect, given the magnitude of the fit error. It was noted during the discussion of the computed theoretical case that a fit error of about 4×10^{-5} for 300 points (30 seconds of data) would be equivalent to an error of about 5% in drag or power. The fit error of 4×10^{-4} for 300 points in the pullup-pushover indicates a power or drag error of about 15%, which is about that found. A fit error of 2×10^{-3} for 450 points in the level flight acceleration indicates an error of about 30%. The extracted power values appear to differ by about 20% from the extimated values while the drag coefficient values are on the average about 40% below the values of Ref. 11.

Some 30 different aerodynamic models were investigated in an effort to reduce the fit error. None showed a significantly lower error while also yielding a reasonable C_{D_o} value. On the basis of these results one must conclude that the reason for the high fit error is more likely to be found in the lack of internal consistency in the data for this particular maneuver than it is in the failure to identify an appropriate aerodynamic model.

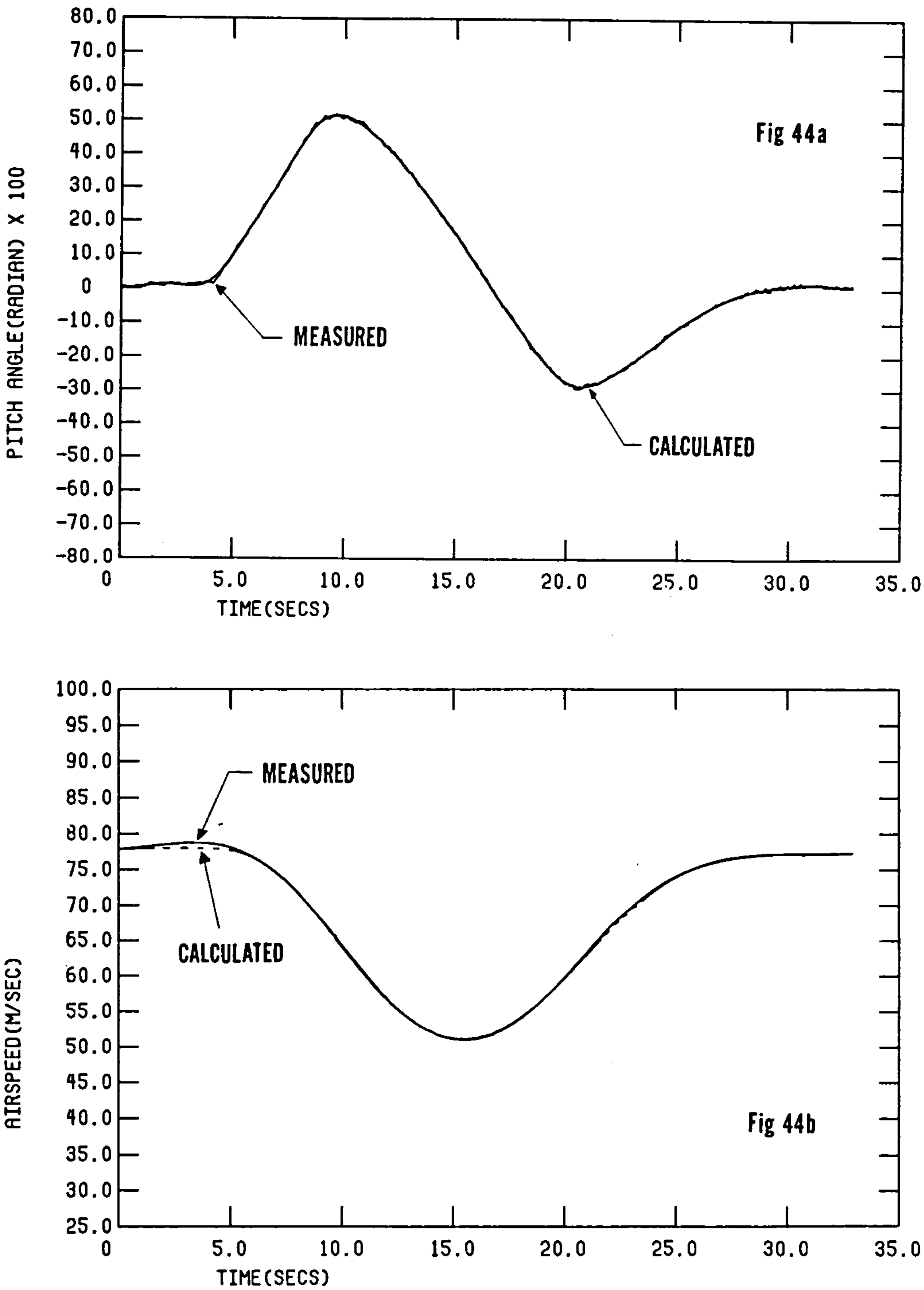
The importance of choosing a satisfactory model is illustrated by the results of an experiment using theoretical trajectory data. (Figure 22). The last term in the 5 term drag model was changed from α^6 to α^4. This single change caused the fit error to increase fifteen orders of magnitude. The coefficients to the other terms in both the drag and power models also changed significantly. C_{D_O}, for example, almost doubled. This extreme sensitivity to small changes in the model is a consequence of the ill-conditioned nature of the "A" matrix in the least squares procedure.

The extracted values of lift coefficient vs. α are shown in figure 45 along with the predicted values and the results of Holmes (Ref. 11). The extraction models used did <u>not</u> include rate terms. The values of $C_{L_{\alpha=0}}$ extracted from the pullup-pushover is about 7% higher than Holmes' result while that obtained from the level flight acceleration is about 10% high. Except for the upward curvature in the result extracted from the level flight acceleration the two maneuvers gave essentially the same lift result. The curvature in the level flight result is thought to be due to the failure of the "drift" model used to produce a better match between the measured and the computed flight velocities. (See figure 44).

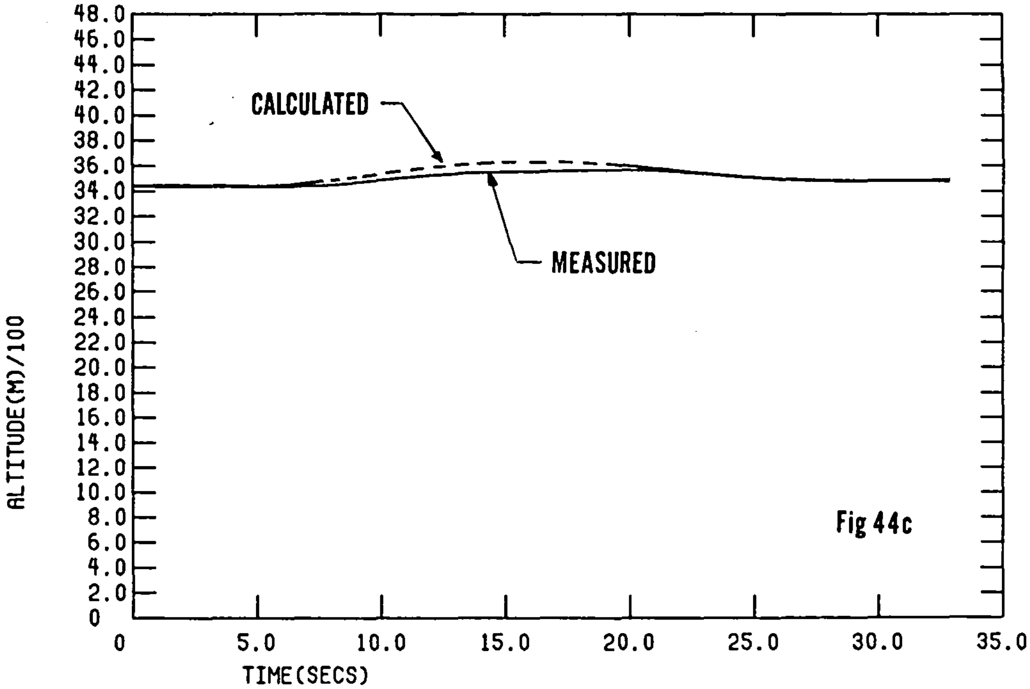
The agreement between the extracted result and the steady state results of Holmes is good for $\alpha < 0.02$ radians, the highest speeds of the data sets. Elsewhere, the present results exhibit a lower lift slope. The extracted value of C_{L_α} is even smaller than predicted. The reason for this is uncertain but several possibilities come to mind: (a) the lift model does not account for the excess power available at the lower speeds in the form rate terms. (b) the excess power available may reduce the span efficiency by moving the load inboard. (c) the down thrust due to offset of the thrust axis may be greater than thought. Which, if any, of these is correct can be determined only after further study. Both the pullup-pushover maneuver and the steady speed-power data of Holmes indicate that the lift curve is essentially linear for $\alpha \leq 0.1$. This is fortunate since significant reductions in the complexity of subsequent calculations can be obtained by employing a linear lift curve model.

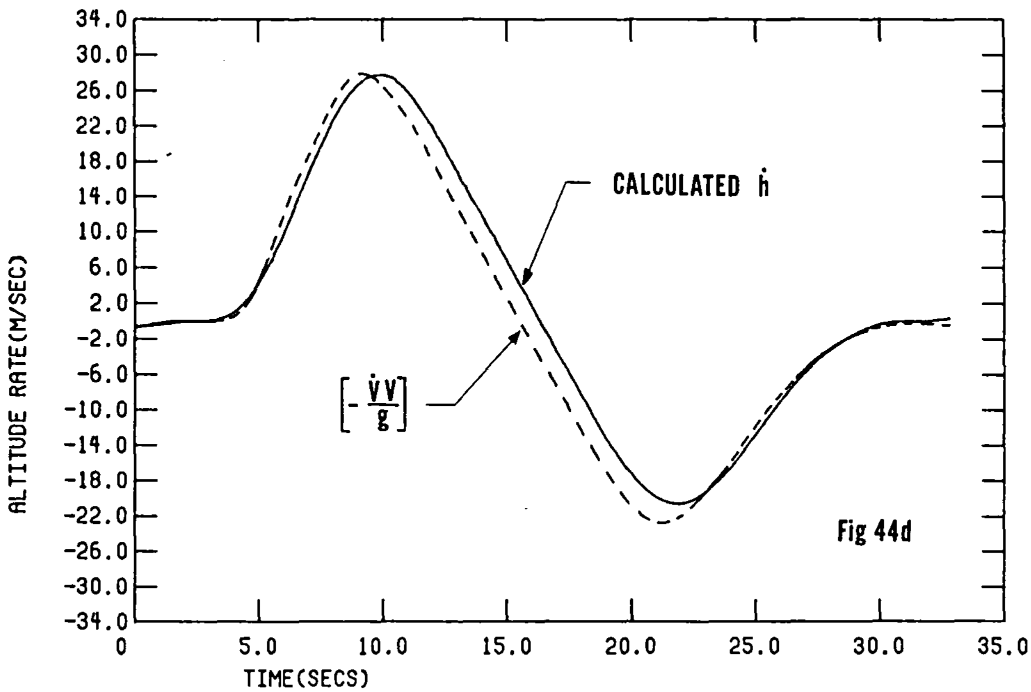
Obviously, the prediction for $C_{L_{\alpha=0}}$ is in error. This would seem to indicate that (a) the wing incidence angle is different from that assumed in developing the prediction, (b) the airfoil trailing edge shape is different from nominal, (c) the instrument reference line is different from that assumed to be the reference in developing the prediction, or (d) some combination of the above. Because, of the large difference which manifested itself in this case, $C_{L_{\alpha=0}}$ is a factor which should be checked closely when developing predictions.

The 13.5% increase in C_{L_α} over the predicted value would appear to be due the higher than nominal dynamic pressures over those areas of the wing swept by the propeller slipstream, an effect not included in the prediction. The area affected and the magnitude of the increase in dynamic pressure can probably be determined adequately by propeller momentum theory. These effects should be included in future predictions.

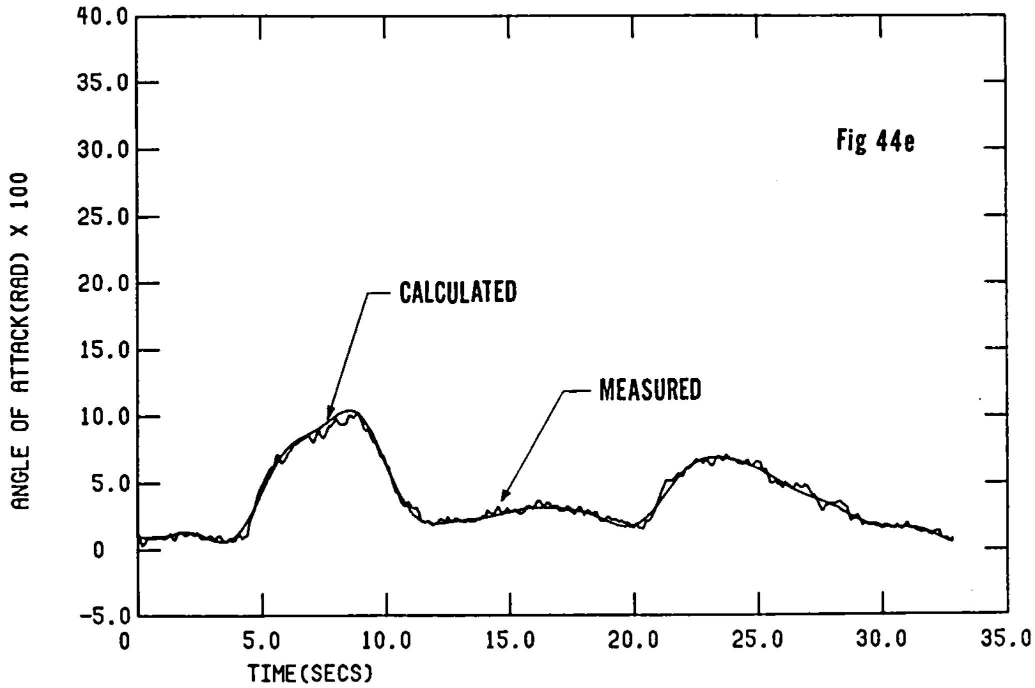


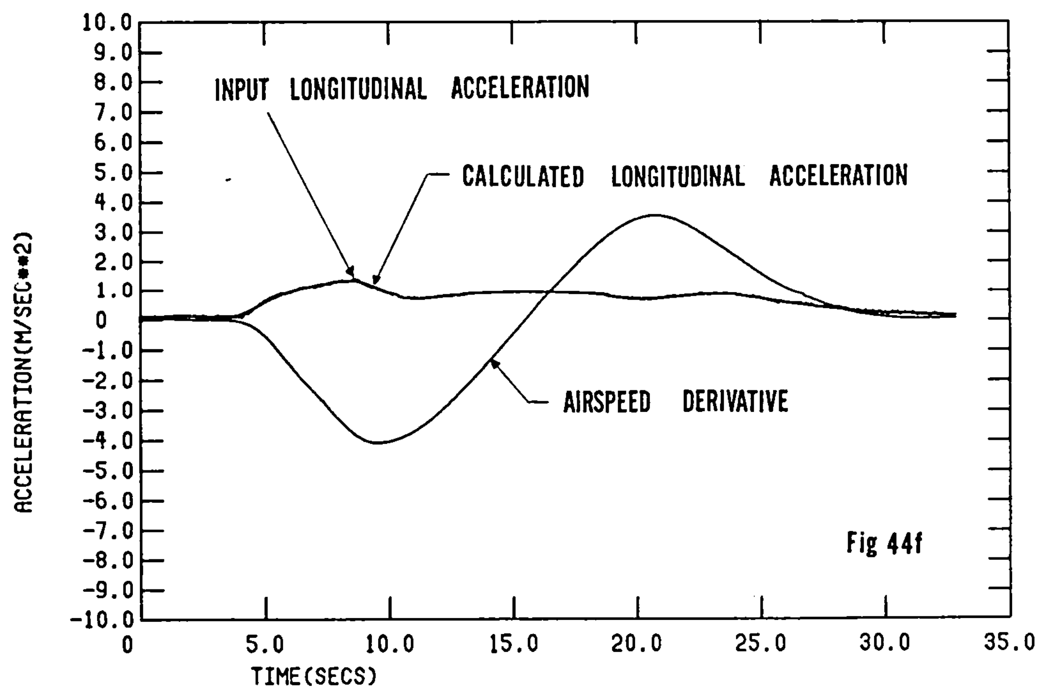
PULLUP-PUSHOVER MANEUVER ANALYZED FOR LIFT, DRAG, AND POWER.
POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.01. θ_{DRIFT} = -0.028 RAD.



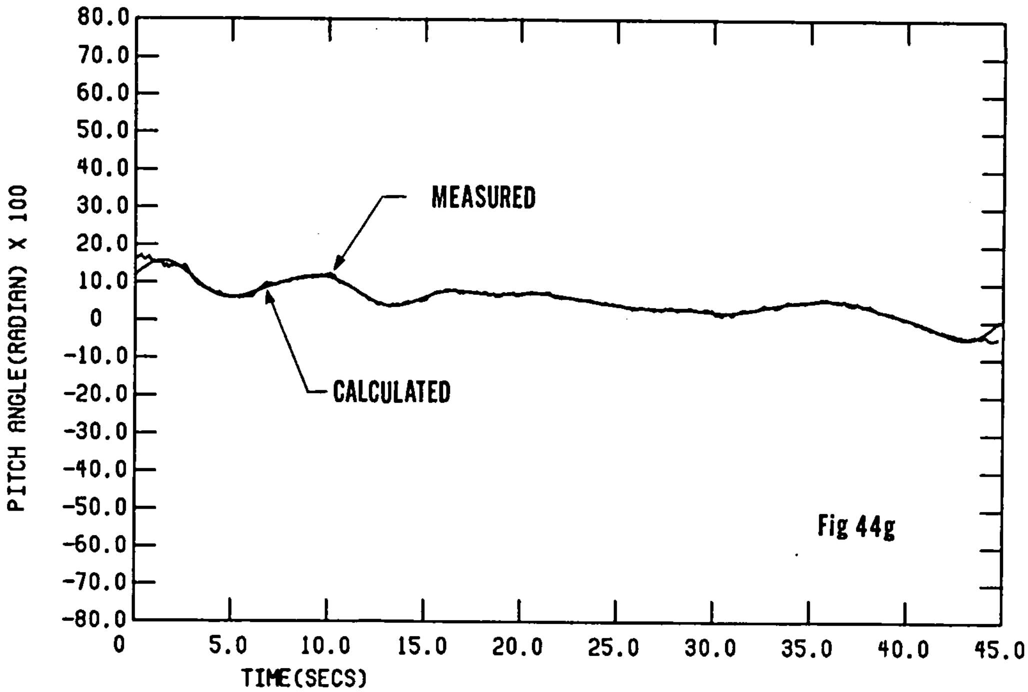


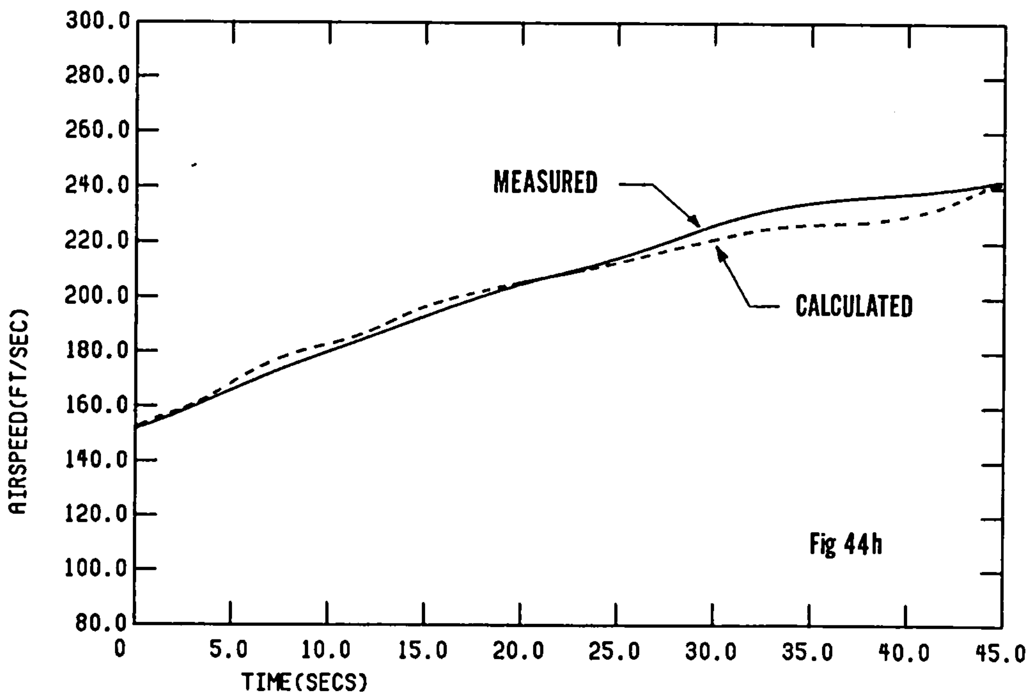
PULLUP-PUSHOVER MANEUVER ANALYZED FOR LIFT, DRAG, AND POWER.
POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.01. θ_{DRIFT} = -0.028 RAD.



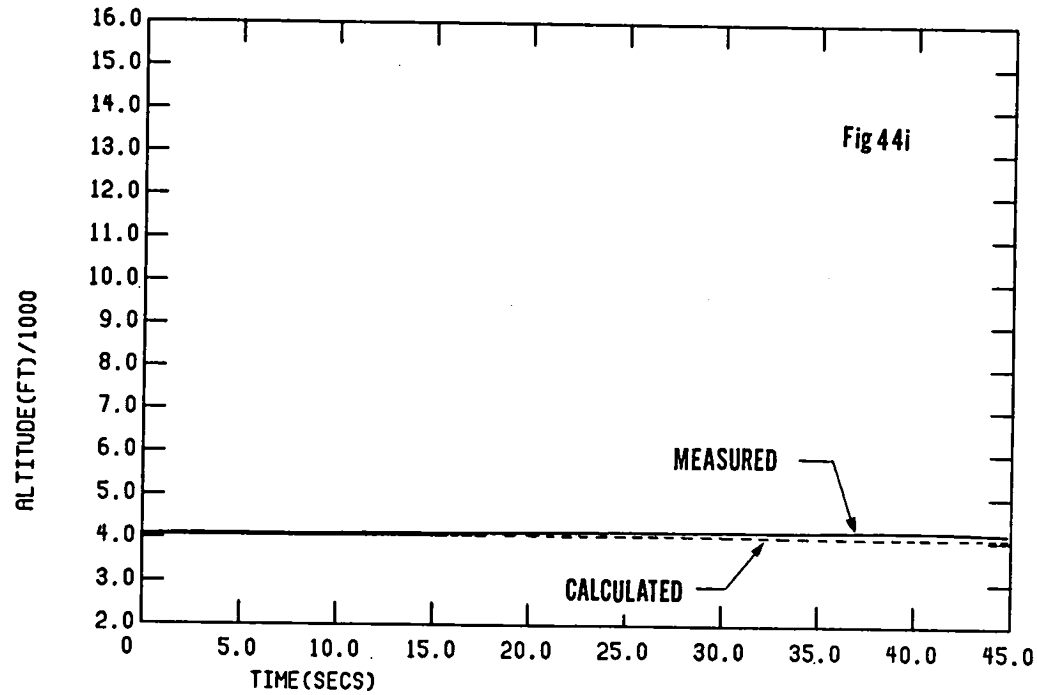


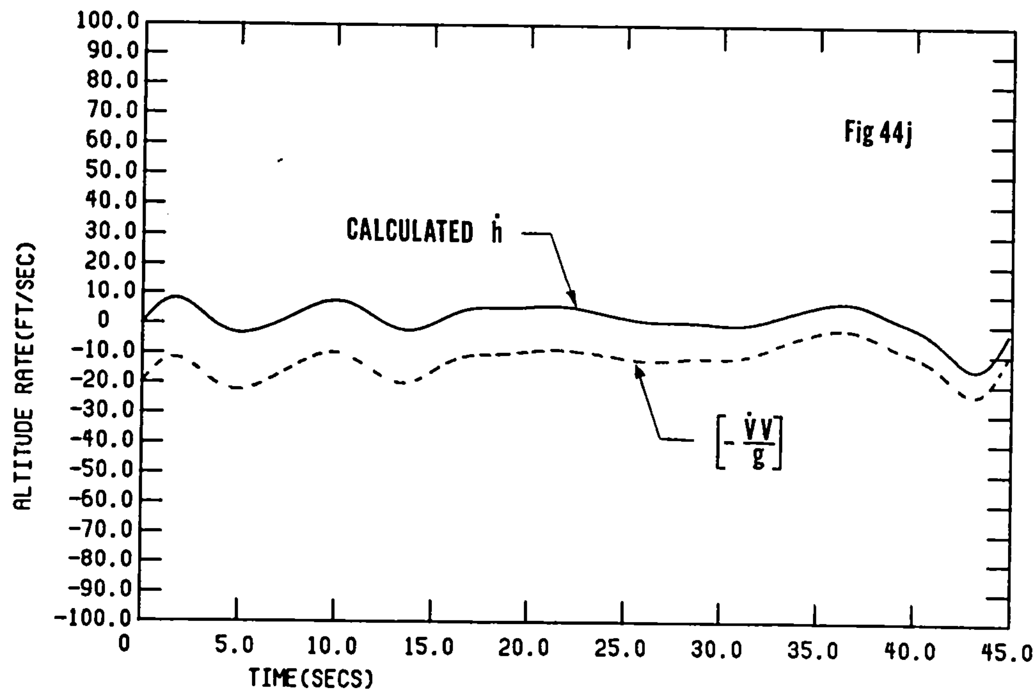
PULLUP-PUSHOVER MANEUVER ANALYZED FOR LIFT, DRAG, AND POWER.
POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.01. θ_{DRIFT} = -0.028 RAD.



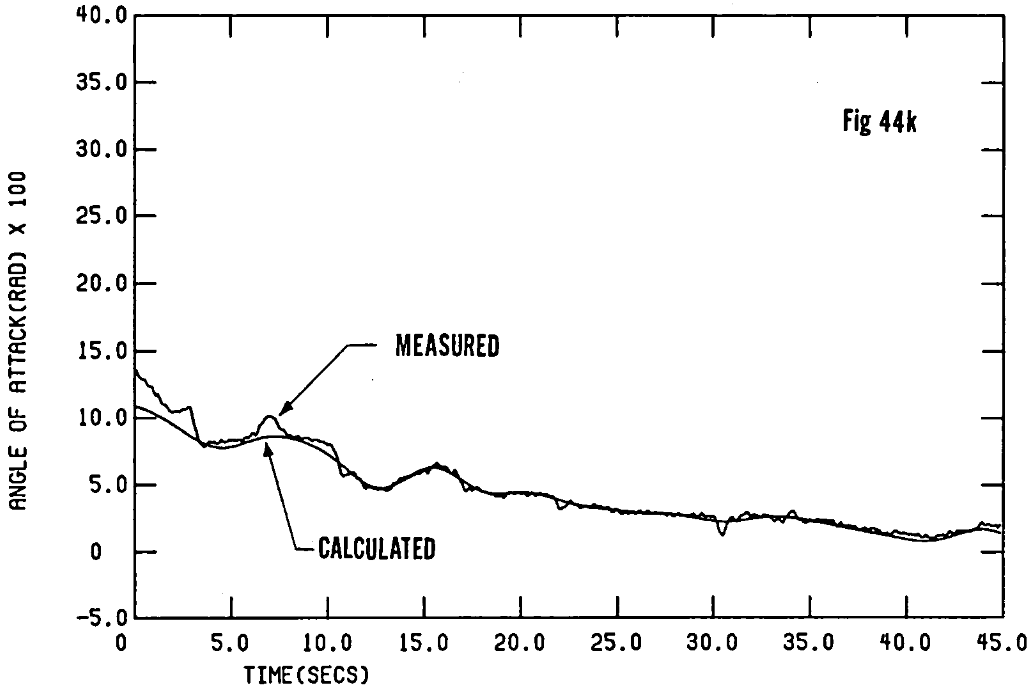


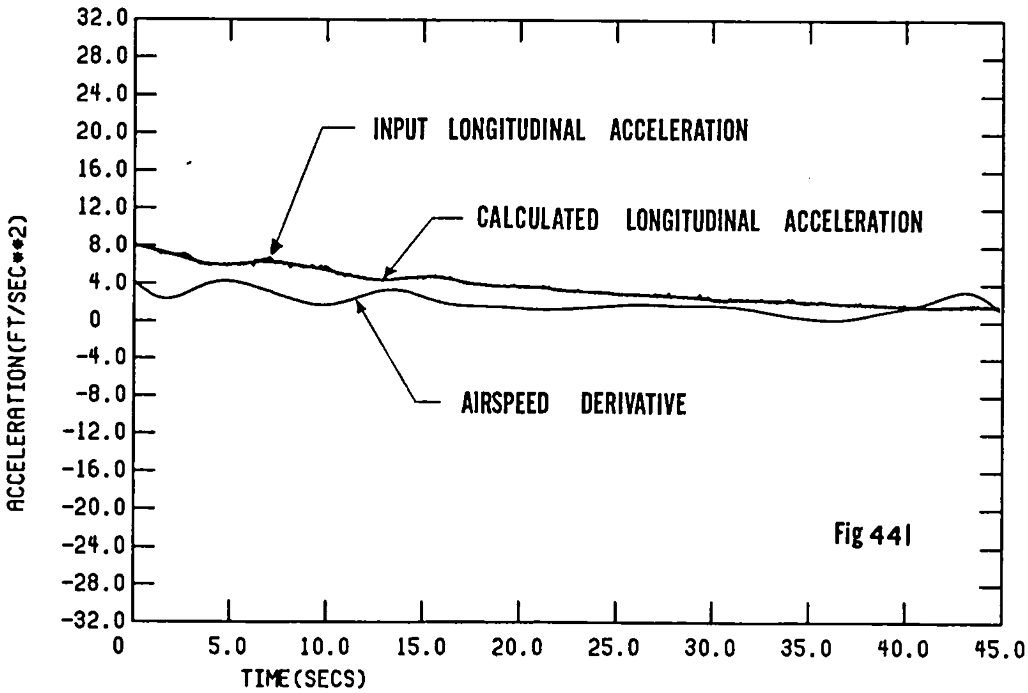
LEVEL-FLIGHT-ACCELERATION MANEUVER ANALYZED FOR LIFT, DRAG, AND POWER. POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.01, θ_{DRIFT} = -.10 RAD. (SEE TEXT)





LEVEL-FLIGHT-ACCELERATION MANEUVER ANALYZED FOR LIFT, DRAG, AND POWER. POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.01, θ_{DRIFT} = -.10 RAD. (SEE TEXT)





LEVEL-FLIGHT-ACCELERATION MANEUVER ANALYZED FOR LIFT, DRAG, AND POWER. POSITION ERROR CORRECTION: GAIN = 0.8667, BIAS = 0.01, θ_{DRIFT} = -.10 RAD. (SEE TEXT)

STEADY STATE LIFT COEFFICIENT EXTRACTED FROM MANEUVERING FLIGHT

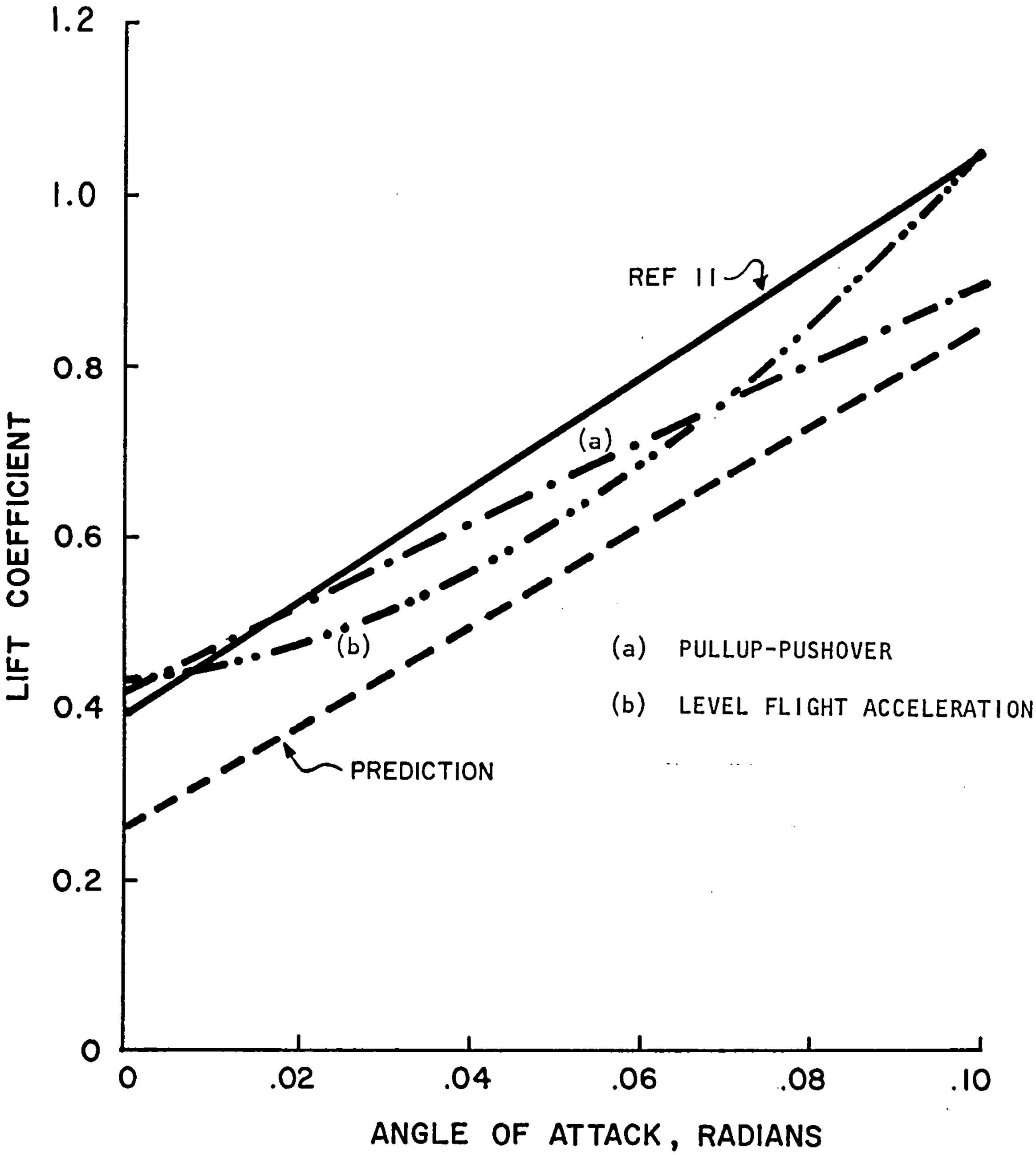


FIG 45

STEADY STATE DRAG COEFFICIENT EXTRACTED
FROM PULLUP - PUSHOVER AT 11,000'

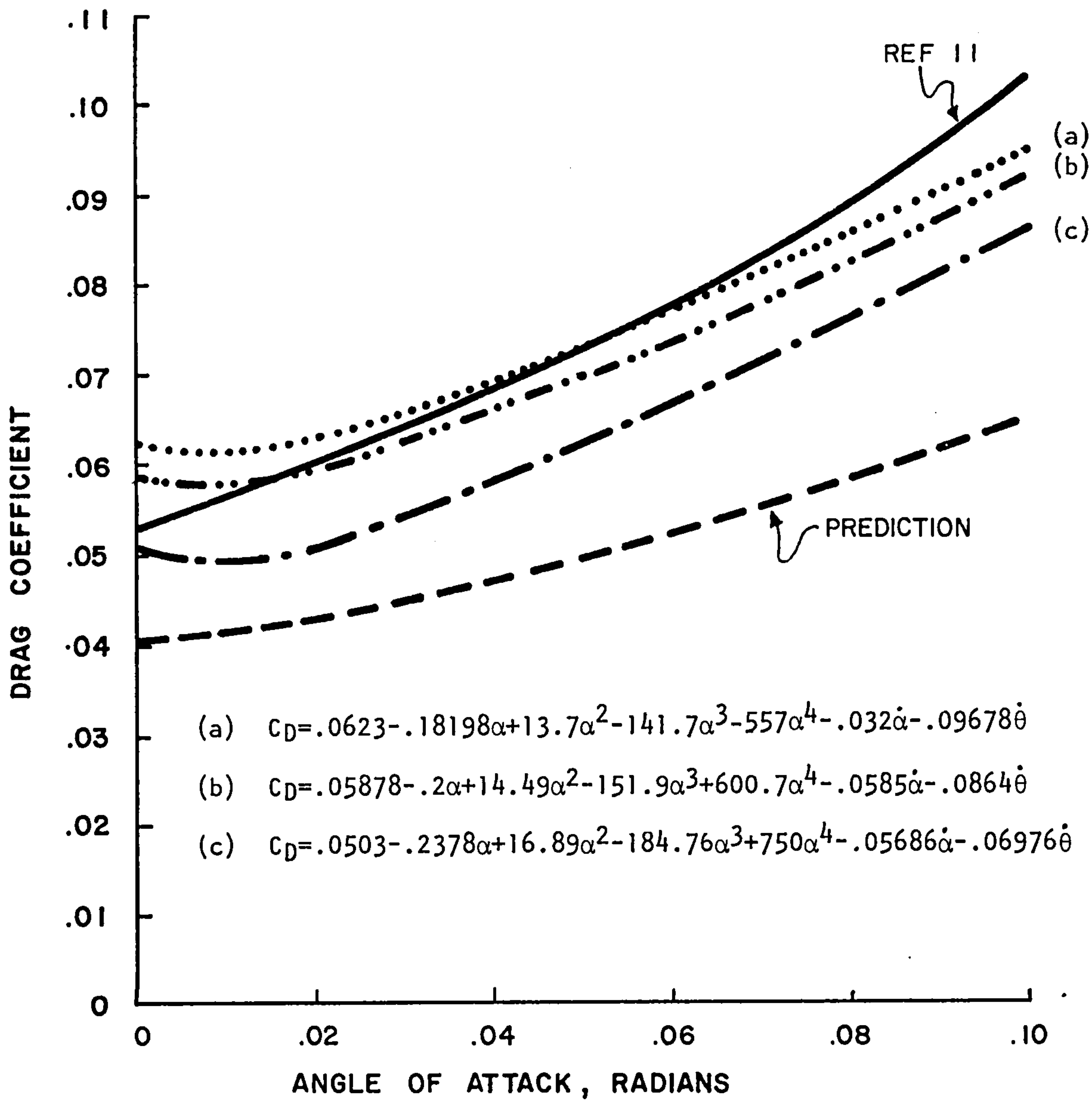


FIG 46a

STEADY STATE DRAG COEFFICIENT EXTRACTED FROM LEVEL FLIGHT ACCELERATION AT 4000'

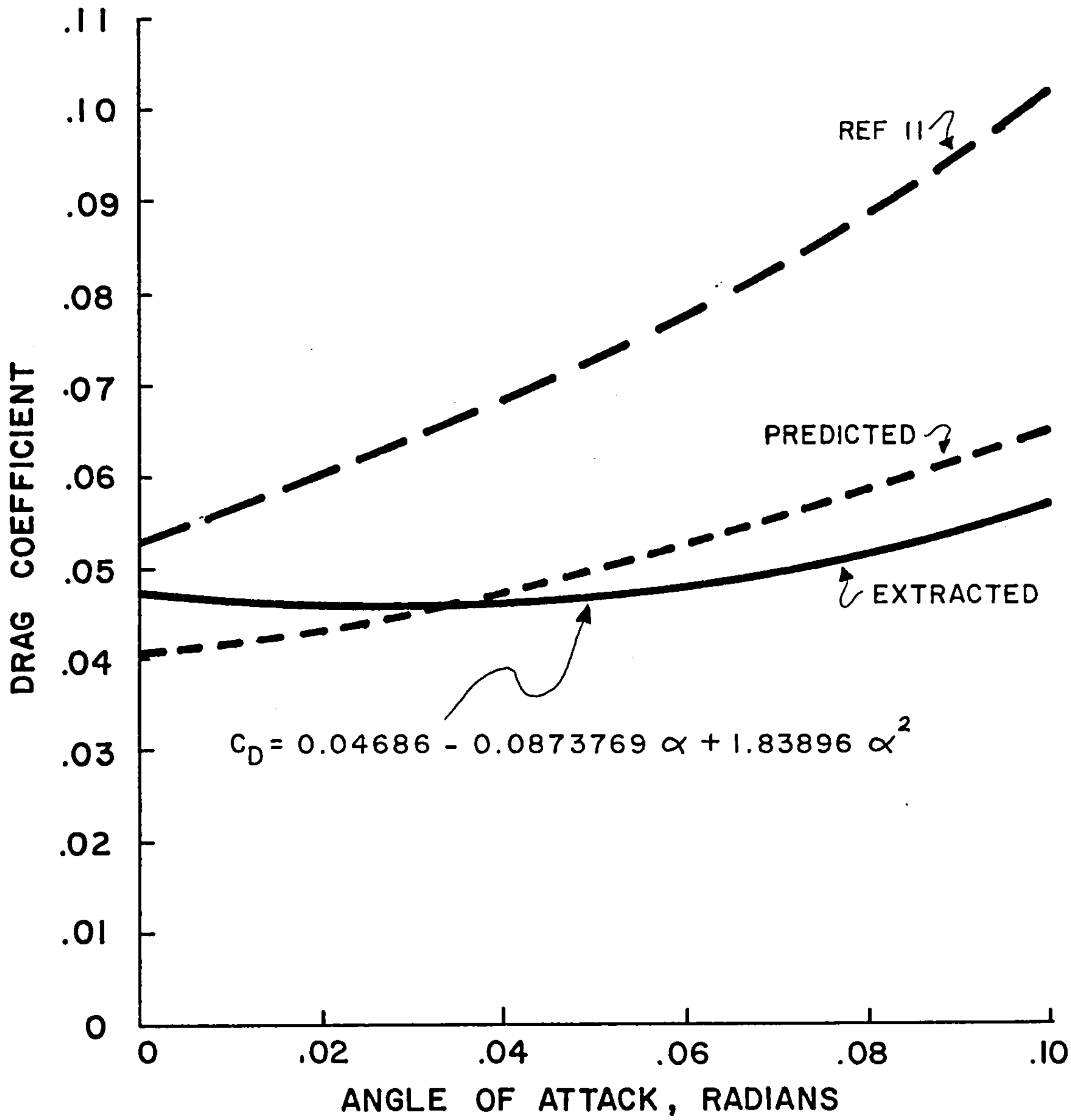
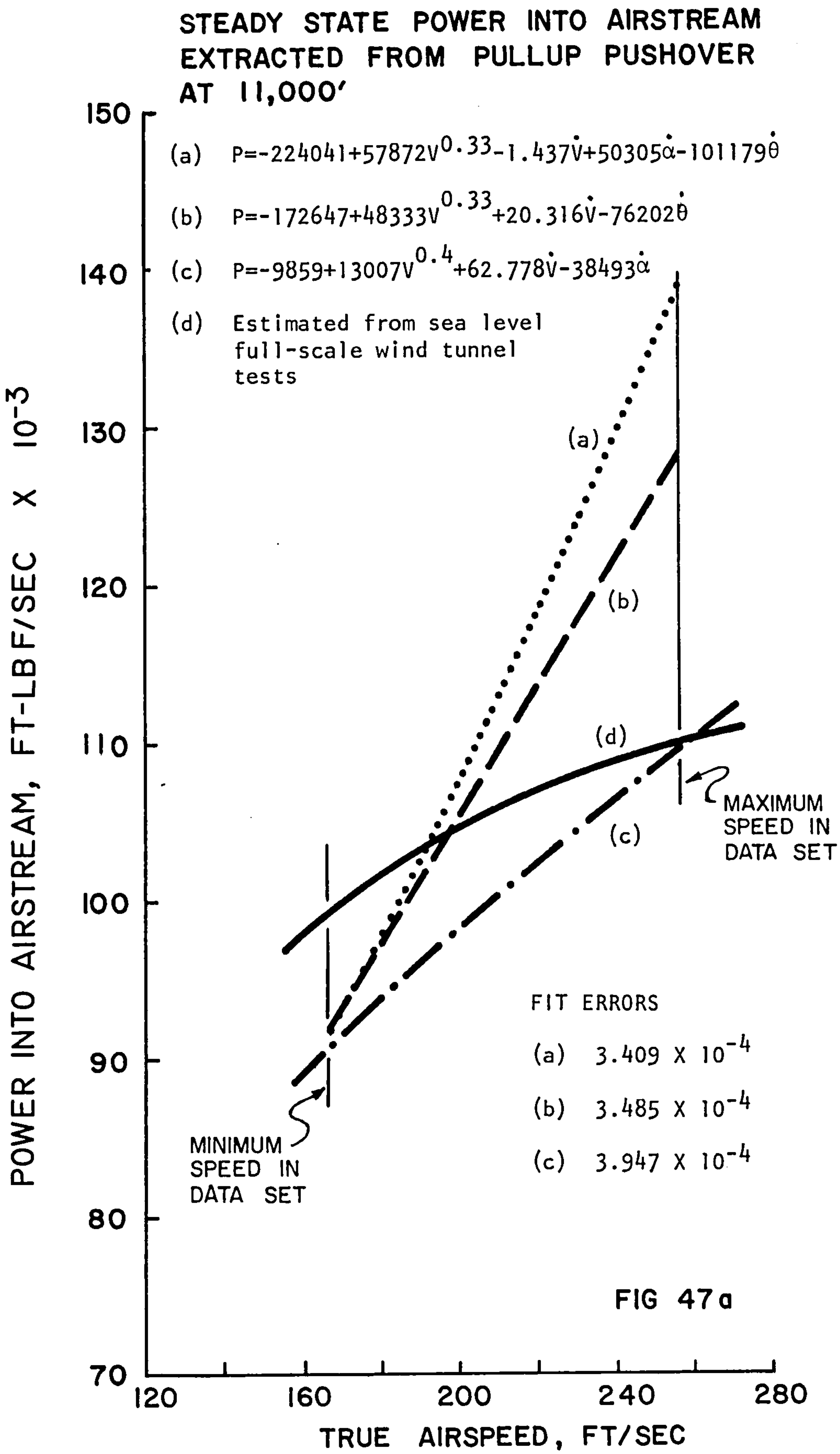


FIG 46b



STEADY STATE POWER INTO AIRSTREAM EXTRACTED FROM PULLUP PUSHOVER AT 11,000′
(a) $P=-224041+57872V^{0.33}-1.437\dot{V}+50305\dot{\alpha}-101179\dot{\theta}$
(b) $P=-172647+48333V^{0.33}+20.316\dot{V}-76202\dot{\theta}$
(c) $P=-9859+13007V^{0.4}+62.778\dot{V}-38493\dot{\alpha}$
(d) Estimated from sea level full-scale wind tunnel tests
(a)
(b)
(d)
(c)
MAXIMUM SPEED IN DATA SET
MINIMUM SPEED IN DATA SET
FIT ERRORS
(a) 3.409×10^{-4}
(b) 3.485×10^{-4}
(c) 3.947×10^{-4}
POWER INTO AIRSTREAM, FT-LBF/SEC X 10^{-3}
TRUE AIRSPEED, FT/SEC
150
140
130
120
110
100
90
80
70
120
160
200
240
280

FIG 47a

STEADY STATE POWER INTO AIRSTREAM EXTRACTED FROM LEVEL FLIGHT ACCELERATION AT 4000'

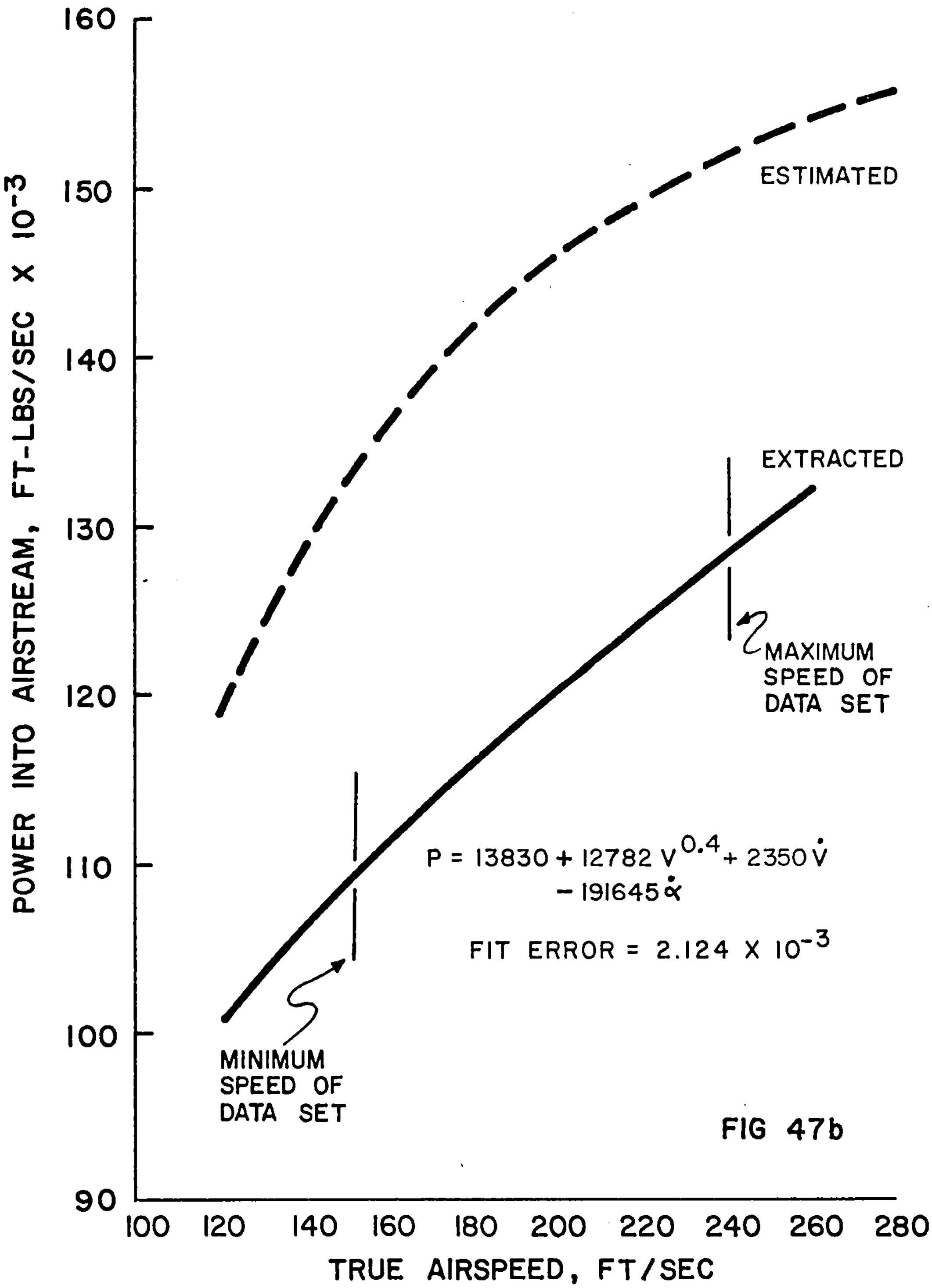


FIG 47b

A NOTE ON STABILITY AND PERFORMANCE EVALUATION

It had been planned to use the lift, drag, and power data extracted from typical maneuvers such as pullup-pushovers to evaluate the aircraft performance parameters. This procedure is analogous to that followed during prediction of the aircraft's performance except that one now substitutes the extracted or measured values of the lift, drag, and power for the estimated values. If extractions are carried out for several altitudes, several power settings, and several configurations, a rather complete picture of the aircraft's performance potential can be developed. However, because of the limited accuracy obtained thus far for the lift, drag, and power in flight as well as the limited number of maneuvers analyzed, this plan was not pursued.

It had also been planned to use the Iliff-Taylor program (Ref. 6) to extract stability derivative values from flight records. Some short stabilator, aileron, and rudder pulse maneuvers suitable for this purpose were flown. It was intended that at least the stabilator pulse records be processed through both FDR1 and FDR2 so as to make them as internally self-consistent as possible. FDR2 is, in fact, provided with a means of arranging the final version of the data in a form suitable for additional processing (punched cards or tape). Because of difficulties in defining adequate lift, drag, and power models and in lowering the fit errors, this plan was also aborted.

The reader interested in comparing the predicted with the measured performance and stability should be aware that full scale wind tunnel tests of the aircraft have been run at the Langley Research Center. Publication of the test results is expected in the near future. Researchers at the Langley Research Center have also been attempting to extract stability derivative values from the flight data by several techniques. It is understood they have also been stymied thus far by the problem of internally inconsistent data. The steady flight test results are available in Holmes (Ref. 11).

CONCLUSIONS

1. A technique has been developed which has demonstrated the ability to extract complete lift, drag, and thrust horsepower curves simultaneously from simulated time histories of a single aircraft maneuver covering the entire speed range.

2. The technique presently does not include rate terms in the model of the aircraft and these may be necessary in real world situations.

3. The technique requires rather accurate input data in order to yield acceptable results.

4. Some success has been achieved in developing an input data compatibility improvement routine.

5. The extraction technique is apparently quite sensitive to small computational errors and should therefore be run with the maximum precision available.

6. Preliminary results indicate reasonable agreement with other flight test techniques and extrapolations of full scale wind tunnel tests even though the trajectory matching features of the technique could not be used because these do not include rate terms in the model of the aircraft at the present time.

SUGGESTIONS FOR FUTURE WORK

It will be apparent to the careful reader that a proper understanding of the correct or best power model for this airplane has not yet been achieved. Until it is, FDR2 cannot hope to yield results with low fit errors. In this connection it would be desirable to employ a non-linear least squares technique -- one which calculates its own exponent values for at least the velocity dependence of the thrust horsepower -- to determine how the data can be fit more effectively. Note that an initial fit error about 10 times lower than that currently obtained will be necessary before FDR2 can proceed satisfactory.

If, as now seems likely, the rate terms are sufficiently important as to require inclusion in the aircraft model, FDR2 will require substantial revision to provide for these terms in the various routines. Because of the complexity they will introduce in HPATH if included as variables it may be desirable to assume that the coefficients for the rate terms are "frozen" so far as HPATH (see Appendix C) is concerned.

Much of the difficulty encountered in obtaining convergence of the trajectory match procedure is thought to be related to the precision with which (a) the equations of motion can be integrated and (b) the "A" matrix in the Newton-Raphson coefficient modification equations can be inverted. It is highly desirable that the efficacy of doubling the number of decimal digits employed in these calculations be investigated. Currently 16 decimal digits are the maximum which can be used at the local computing facility.

Despite the fact that some success was achieved in improving the self-compatibility of the flight data this is really no substitute for flight data which is inherently more self-consistent. Accordingly, it would be desirable to try the entire procedure with data whose internal consistency is known to be superior to that used here.

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APPENDICES

APPENDIX A

FLIGHT DATA REDUCTION PROGRAM # 1

User Instructions – FDRI

The program is written in FORTRAN IV and is designed to execute in double precision on an IBM 370/165 computer with an average execution time of 8 minutes 12 seconds for each maneuver data set. Execution requires approximately 724,000 bytes of core storage. The program is intended to handle data from only one flight during a given run. It is divided into two sections. The first section

(a) adjusts the input data, if desired, for an assumed phase shift,
(b) converts time, weight, pitch angle, pitch rate, airspeed, static pressure, angle of attack, total temperature, longitudinal acceleration, vertical acceleration, and elevator or stabilator deflection to compatible computational units,
(c) calculates the lag corrections to the static and dynamic pressures,
(d) applies the position-error correction ratio $\Delta p/q_c'$,
(e) applies the acceleration-dependent corrections to the static pressure,
(f) converts total temperature to static temperature, static pressure to density, density to altitude, and indicated airspeed to true airspeed,
(g) corrects the pitch angle indication for a known initial bias,
(h) corrects the angle-of-attack indication for the instrument location, and
(i) calibrates the angle-of-attack indication for a known or assumed bias and gain.

The second section

(a) performs Fourier-series analysis and filtering on the weight, pitch angle, pitch rate, airspeed, density, angle of attack, static temperature, longitudinal acceleration, altitude, vertical acceleration, and elevator or stabilator time histories,
(b) integrates the pitch rate indication to obtain the pitch angle indication,
(c) calculates
  (1) the acceleration from the airspeed,
  (2) the angle-of-attack rate-of-change from the Fourier-series-and-filter modification of the angle of attack or from the differentiation of a cubic-spline fit of the input angles of attack,
  (3) the density from altitude,
  (4) the altitude's rate of change and acceleration from the Fourier-series-and-filter modification of the altitude or from the differentiations of a cubic-spline fit of the "input" altitude time history,
  (5) the compatible angle-of-attack values from other time histories,

(6) the compatible altitude and its rate-of-change values from the integration of the flight-path rate of change, and

(7) the inertial-compatible airspeed,

(d) performs a minimization technique with or without a priori values to make the data more consistent,

(e) plots the time histories,

(f) writes the results in English or SI units, and

(g) produces punched output for the FLIGHT DATA REDUCTION #2 program.

The program requires the specification of the following input:

FDR1 Section 1

CARD 1:

(a) The number of maneuvers NSETS in a single flight to be analyzed: NSETS is a right-adjusted integer number less than or equal to 10 and occupying columns 1-5. If NSETS is not an integer number between 0 and 10, the program will terminate permaturely.

(b) The desired type of output units METRIC for all data sets (maneuvers):

If METRIC = 0, the output will be in English units. If METRIC = 1, the output will be in SI units. METRIC is a right-adjusted integer number occupying columns 6-10. The specification of METRIC only affects the output listings. The punched output is in English units.

CARD 2:

The weight-time-history code ICODE for each of the NSETS maneuvers:

If ICODE = 0, a continuous weight time history is produced from the first or preceding weight time history, assuming no elapsed time between the maneuvers. If ICODE = 1, a continuous weight time history is produced from the first or preceding weight time history with elapsed time considered between the maneuvers. The weight-time-history codes for the NSETS maneuvers are right-adjusted integer numbers with each maneuver's ICODE occupying 5 columns. (The ICODE parameter is used in conjunction with the ELAP parameter below.)

CARD 3:

(a) The maximum number of minimization-improvement iterations NUMBER to be used for the maneuver:

NUMBER is a right-adjusted integer number less than or equal to 10 and occupying columns 1-5. If NUMBER is less than zero, NUMBER will be set to zero. If NUMBER is greater than 10, logic errors will result beyond 10 iterations.

(b) The elapsed time ELAP to the maneuver in seconds:

For the first maneuver, ELAP should be the elapsed time from takeoff or engine-start to the beginning of the first maneuver. For the successive maneuvers, ELAP should be the elapsed time from the end of the previous maneuver to the beginning of the next maneuver. ELAP may be set equal to zero for any of the successive maneuvers. ELAP is a floating-point number occupying columns 6-15. (The ELAP parameter is used in conjunction with the ICODE parameter above.)

(c) The data set file number JFILE:

JFILE is a right-adjusted integer number occupying columns 16-20 and specifying that the data is to be read from cards, magnetic tape, disk, etc. The user must supply the suitable job control cards for the tape and/or disk reads. The JFILE parameter controls only the reading of CARDS (12 + MPTS + 1), ...,(12 + MPTS + 2K). All other data is expected to be in card form.

(d) The variable location numbers IVL(I), I = 1-9:

The variable location number "names" the variable occupying a particular data field on the records containing the time histories. IVL(I) are right-adjusted integer numbers each occupying 5 columns beginning at column 21. The program assumes that for each recorded time point there are 10 variables: time, pitch angle, pitch rate, airspeed, static pressure, angle of attack, stagnation temperature, longitudinal acceleration, vertical acceleration, and elevator or stabilator deflection. The program also assumes that "time" will always occupy the first data field. For the variables in the second through the tenth data fields, the following IVL's must correspond to the variable name:

Variable Name	IVL
Pitch angle	2
Pitch rate	3
Airspeed	4
Static pressure	5
Angle of attack	6
Stagnation temperature	7
Longitudinal acceleration	8
Vertical acceleration	10
Elevator (Stabilator) deflection	11

For example: If the time history variables were ordered as "time", "longitudinal acceleration", "pitch angle", "airspeed", "pitch rate", "static pressure", "angle of attack", "vertical acceleration", "stagnation temperature", and "elevator deflection", the IVL's would correspondingly be IVL(1)=8, IVL(2)=2, IVL(3)=4, IVL(4)=3, IVL(5)=5, IVL(6)=6, IVL(7)=10, IVL(8)=7, and IVL(9)=11.

CARD 4:

The 80 characters of the array TITLE which are used as a header for identifying the output:

Since the program allows more than one flight maneuver to be analyzed in a given run, TITLE is used as a control variable to end execution. Termination of execution is achieved by following the last maneuver's data set to be analyzed by a title card having only the word END in the first three columns.

CARD 5:

(a) The Fourier-series filter-cutoff harmonic NCH(1) for the lag corrections in the airspeed's static pressure system,
(b) The Fourier-series filter-cutoff harmonic NCH(2) for the lag corrections in the altitude's static pressure system,
(c) The Fourier-series filter-cutoff harmonic NCH(3) for the lag corrections in the altitude's and airspeed's stagnation pressure system,
(d) The Fourier-series filter-cutoff harmonic NCH(4) for the lag corrections in the stagnation temperature system:

NCH(1), NCH(2), NCH(3), and NCH(4) must be right-adjusted integer numbers greater than 0 but less than 66. Each NCH(I) occupies 5 columns with NCH(1) beginning at column 1.

(e) The lag time interval XLM(1)* in seconds for the stagnation pressure system,
(f) The lag time interval XLM(2)* in seconds for the altitude's static pressure system,
(g) The lag time interval XLM(3)* in seconds for the airspeed's static pressure system,
(h) The lag time constant TAU(1)* in seconds for the stagnation pressure system,
(i) The lag time constant TAU(2)* in seconds for the altitude's static pressure system,
(j) The lag time constant TAU(3)* in seconds for the airspeed's static pressure system,

XLM(1), XLM(2), XLM(3), TAU(1), TAU(2), and TAU(3) are floating-point numbers each occupying 10 columns beginning at column 21.

CARD 6:

(a) The assumed number of data points NSPTS to be indicative of a required phase shift:

If NSPTS is less than zero, NSPTS will be set to its absolute value. The value of (NSPTS x sampling rate) should not exceed

---

*These parameters are defined in the discussion accompanying equations.

unity; however, this suggestion is not mandatory. NSPTS is a right-adjusted integer number less than the total number of data points occupying columns 1-5.

(b) The pitch angle linear drift DRIFT:

DRIFT is used by the equation:

$$(\text{pitch angle})_{new} = (\text{pitch angle})_{old} + \text{DRIFT}$$

$$\times \text{ (point number/total number of points)}$$

If DRIFT = 0.0, the application is bypassed. DRIFT is a floating-point number in radians/second occupying 15 columns beginning at column 6.

CARD 7:

(a) The phase shift parameter LSP(1) for pitch angle,
(b) the phase shift parameter LSP(2) for pitch rate,
(c) the phase shift parameter LSP(3) for airspeed,
(d) the phase shift parameter LSP(4) for static pressure,
(e) the phase shift parameter LSP(5) for angle of attack,
(f) the phase shift parameter LSP(6) for stagnation temperature,
(g) the phase shift parameter LSP(7) for longitudinal acceleration,
(h) the phase shift parameter LSP(8) for vertical acceleration, and
(i) the phase shift parameter LSP(9) for the elevator or stabilator deflection:

If LSP(I) = 0, no phase shift is desired on variable "I" (or variable "I" was recorded by commutation). If LSP(I) = 1, a phase shift is desired on variable "I" (or variable "I" was recorded by frequency modulation). LSP(I) are right-adjusted integer numbers each occupying 5 columns beginning at column 1.

CARD 8:

(a) The aircraft's wing area S in square feet,
(b) the aircraft's gross takeoff weight GWT in pounds force,
(c) the fuel consumption rate FCR1 in pounds force per second from takeoff or engine-start to the first maneuver,
(d) the fuel consumption rate FCR2 in pounds force per second during the maneuvers,
(e) the angle-of-attack-instrument location XACG in feet from the aircraft's center of gravity,
(f) the pitch-angle-instrument-bias correction PCCG in radians,
(g) the calibration factor CALP1 to the angle of attack, and
(h) the calibration term CALP2 in radians to the angle of attack:

It should be noted that the program assumes FCR1 for the fuel consumption rate between maneuvers where the elapsed time ELAP is nonzero. XACG is a positive quantity if the instrument is ahead of the cg and negative if it is behind the cg. S, GWT, FCR1, FCR2, XACG, PCCG, CALP1, and CALP2 are floating-point numbers each occupying 10 columns beginning at column 1.

CARDS 9, 10, 11:

(a) The conversion factor CF(1) of time to seconds,
(b) the conversion factor CF(2) of weight to pounds force,
(c) the conversion factor CF(3) of pitch angle to radians,
(d) the conversion factor CF(4) of pitch rate to radian per second,
(e) the conversion factor CF(5) of airspeed to feet per second,
(f) the conversion factor CF(6) of static pressure to pounds force per square foot,
(g) the conversion factor CF(7) of angle of attack to radians,
(h) the conversion factor CF(8) of stagnation temperature in the equation $T(°R)=CF(8)xT(°X)+CF(9)$ for degrees Rankine,
(i) the conversion term CF(9) of stagnation temperature in the equation $T(°R)=CF(8)xT(°X)+CF(9)$ for degrees Rankine,
(j) the conversion factor CF(10) of longitudinal acceleration to feet per squared second,
(k) the conversion factor CF(11) of vertical acceleration to feet per squared second, and
(l) the conversion factor CF(12) of elevator or stabilator deflection to radians:

If CF(8) = 0.0, CF(8) is set equal to 1.0. CF(1) through CF(12) are double-precision floating-point numbers occupying 20 card-columns each. CF(1) through CF(4) are contained on the ninth input-data card beginning with column 1, CF(5) through CF(8) are contained on the tenth input-data card, and CF(9) through CF(12) are contained on the eleventh input-data card beginning with column 1.

CARD 12:

The number of points MPTS on the (ratio-of-the-pressure-difference-to-the-dynamic-pressure versus the-indicated-airspeed) curve for the position-error pressure corrections:

MPTS must be greater than zero and no larger than 20. MPTS is a right-adjusted integer number occupying columns 1-2.

CARD 13,...,(12 + MPTS):

The measured values of the ratio of the pressure difference to the dynamic pressure DPQCP, and the measured values of the indicated airspeed VE in feet per second:

It is suggested that the values of DPQCP and VE span a sufficiently large region to include the input data's speed range. DPQCP and VE are floating-point numbers occupying columns 1-20 and columns 21-40, respectively, for each of the MPTS cards.

CARDS (12 + MPTS + 1), ..., (12 + MPTS + 2K):

The time histories of time TIME(K), pitch angle D(K,IVL=2), pitch rate D(K,IVL=3), airspeed D(K,IVL=4), static pressure D(K,IVL=5), angle of attack D(K,IVL=6), stagnation temperature D(K,IVL=7), longitudinal acceleration D(K,IVL=8), vertical acceleration D(K,IVL=10), and elevator or stabilator deflection D(K,IVL=11) for K=1 through K=450(maximum).

It should be noted that IVL parameters in D(K,IVL) correspond to the variable location numbers IVL(I) described on page 211. The duration of a maneuver is determined either by a maximum count of 450 data points and the perception of two(2) user-supplied blank or zero cards within the next 1000 counts or by the perception of two(2) user-supplied blank or zero cards.* TIME(K) and the D(K,IVL)'s are double-precision floating-point numbers. Two(2) cards describe a single data point with TIME(K) always occupying columns 1-15 on the first card. Each card contains five variables each occupying 15 columns beginning at column 1.

FDR1 Section 2

CARD (12 + MPTS + 2K + 1):

(a) The Fourier-series analysis code IFS(1) for weight,
(b) the Fourier-series analysis code IFS(2) for pitch angle,
(c) the Fourier-series analysis code IFS(3) for pitch rate,
(d) the Fourier-series analysis code IFS(4) for airspeed,
(e) the Fourier-series analysis code IFS(5) for density,
(f) the Fourier-series analysis code IFS(6) for angle of attack,
(g) the Fourier-series analysis code IFS(7) for static temperature,
(h) the Fourier-series analysis code IFS(8) for acceleration,
(i) the Fourier-series analysis code IFS(9) for altitude,
(j) the Fourier-series analysis code IFS(10) for vertical acceleration, and
(k) the Fourier-series analysis code IFS(11) for elevator or stabilator deflection:

If IFS(I) = 0, analysis is performed on the "I"th time history.
IF IFS(I) = 1, no analysis is performed on the "I"th time history.
IFS(I) are right-adjusted integer numbers each occupying 1 column beginning at column 1.

---

*In general, data sets will consist of more than 450 points. In order that the parameters of successive data sets are properly entered, all "extra" time-history data of the present maneuver must be ignored. The extra 1000-count specification "implies" that within 1000 data points beyond the maximum 450 data points the two(2) user-supplied blank or zero cards will be encountered.

CARD (12 + MPTS + 2K + 2):

(a) The acceleration-determination code IPRC(1):
If IPRC(1) = 0, the acceleration is calculated by the differentiation of the airspeed time history. If IPRC(1) = 1, the longitudinal acceleration is transformed into the rate-of-change of airspeed by the kinematic relationship between the aircraft's body axis and its flight path.

(b) The degree of computation on the longitudinal acceleration IPRC(2):
If IPRC(2) = 0, the longitudinal acceleration is transformed into the rate-of-change of airspeed by the kinematic relationship between the aircraft's body axis and its flight path and is smoothed by Fourier series and filtering. If IPRC(2) = 1, the longitudinal acceleration is only transformed into the rate-of-change of airspeed by the kinematic relationship between the aircraft's body axis and its flight path. If IPRC(2) = 2, the input values of longitudinal acceleration are retained. The following chart should be consulted in specifying IFS(4), IPRC(1), and IPRC(2) so that the program produces desired results:

Parameter Combinations	Results
IFS(4)=0, IPRC(1)=0, IPRC(2)=0	Result #1
IFS(4)=0, IPRC(1)=0, IPRC(2)=1	Result #1
IFS(4)=0, IPRC(1)=0, IPRC(2)=2	Result #1
IFS(4)=0, IPRC(1)=1, IPRC(2)=0	Result #2
IFS(4)=0, IPRC(1)=1, IPRC(2)=1	Result #3
IFS(4)=0, IPRC(1)=1, IPRC(2)=2	Illegal combination
IFS(4)=1, IPRC(1)=0, IPRC(2)=0	Result #4
IFS(4)=1, IPRC(1)=0, IPRC(2)=1	Result #4
IFS(4)=1, IPRC(1)=0, IPRC(2)=2	Illegal combination
IFS(4)=1, IPRC(1)=1, IPRC(2)=0	Result #4
IFS(4)=1, IPRC(1)=1, IPRC(2)=1	Result #4
IFS(4)=1, IPRC(1)=1, IPRC(2)=2	Illegal combination

Result #1: Airspeed will be the smoothed input airspeed. Acceleration will be the differentiation of the smoothed airspeed.

Result #2: Airspeed will be the smoothed input airspeed. Acceleration will be the Fourier-series-smoothed rate-of-change of airspeed transformation of the longitudinal acceleration.

Result #3: Airspeed will be the smoothed input airspeed. Acceleration will be the unsmoothed rate-of-change of airspeed transformation of the longitudinal acceleration.

Result #4: Airspeed will be the input airspeed. Acceleration will be the Fourier-series-smoothed rate-of-change of airspeed transformation of longitudinal acceleration.

(c) The method of angle-of-attack rate computation IPRC(3):
If IPRC(3) = 0, the angle-of-attack rate will be calculated by the differentiation of the angle-of-attack's Fourier series. If IPRC(3) = 1, the angle-of-attack rate will be the differentiation of a cubic-spline fit of the angle of attack. It should be noted that if IFS(6) = 1 and IPRC(3) = 0, the program will set IPRC(3) = 1. IPRC(3) is a right-adjusted integer number occupying 1 column beginning at column 3.

(d) The overall Fourier-series analysis code IPRC(4):
If IPRC(4) = 0, Fourier-series analysis will be performed on the time histories whose IFS(I) are zero. If IPRC(4) = 1, no Fourier-series analysis will be performed even if IFS(I) = 0. The specification of IPRC(4) = 1 provides a means to analyze "raw" data. IPRC(4) is a right-adjusted integer number occupying one column beginning at column 4.

(e) The overall plotting code IPRC(5):
If IPRC(5) = 0, plots are requested. If IPRC(5) = 1, no plots are requested. IPRC(5) is a right-adjusted integer number occupying one column beginning at column 5.

(f) The punch code IPRC(6):
If IPRC(6) = 0, punched output is requested. If IPRC(6) = 1, no punched output is requested. IPRC(6) is a right-adjusted integer number occupying one column beginning at column 6.

(g) The pitch-angle determination code IPRC(7):
If IPRC(7) = 0, the pitch-angle time history will be the "modified" input pitch-angle time history. If IPRC(7) = 1, the pitch-angle time history will be the integrated pitch-rate time history. IPRC(7) is a right-adjusted integer number occupying one column beginning at column 7.

(h) The compatibility check IPRC(8):
If IPRC(8) = 0, the compatibility check is bypassed. If IPRC(8) = 1, an angle-of-attack time history will be computed to be compatible with other time histories. If IPRC(8) = 2, an altitude time history will be computed to be pneumatically compatible with other time histories. It should be noted that the compatible altitude time history will exist only on the altitude-time-history plot whereas the compatible angle-of-attack time history will replace the existing angle-of-attack time history. Generally, IPRC(8) should be zero. IPRC(8) is a right-adjusted integer number occupying one column beginning at column 8.

(i) The calculation code of the inertial-compatible altitude and airspeed IPRC(9):
If IPRC(9) = 0, the calculation of the inertial-compatible altitude and airspeed will be bypassed. If IPRC(9) = 1, the inertial-compatible altitude and airspeed will be computed. (If only the inertial-compatible airspeed is desired, see the discussion of FAC1 and FAC2 below.)

(j) The distance XAX in feet of the longitudinal accelerometer from the aircraft's cg:

XAX is a positive quantity if the accelerometer is ahead of the cg and a negative quantity if the accelerometer is behind the cg. Parameter XAX is a double-precision floating-point number occupying 15 columns beginning at column 11.

(k) The fraction of the pneumatic-compatible altitude FAC1 and the fraction of the inertial-compatible altitude FAC2:

The sum of FAC1 and FAC2 should be equal to 1.0; that is, FAC1 + FAC2 = 1.0. If only the inertial-compatible airspeed is desired, the user must specify IPRC(9) = 1, FAC1 = 1.0, and FAC2 = 0.0. Parameters FAC1 and FAC2 are double-precision floating-point numbers each occupying 15 columns beginning at column 26.

(l) The data sampling rate DSPS per second:

Parameter DSPS is a double-precision floating-point number occupying 15 columns beginning at column 56.

CARD (12 + MPTS + 2K + 3):

(a) The plot code IP(1) for weight,
(b) the plot code IP(2) for pitch angle,
(c) the plot code IP(3) for pitch rate,
(d) the plot code IP(4) for airspeed,
(e) the plot code IP(5) for density,
(f) the plot code IP(6) for angle of attack,
(g) the plot code IP(7) for static temperature,
(h) the plot code IP(8) for acceleration,
(i) the plot code IP(9) for angle-of-attack rate,
(j) the plot code IP(10) for altitude,
(k) the plot code IP(11) for altitude rate of change,
(l) the plot code IP(12) for altitude acceleration,
(m) the plot code IP(13) for vertical acceleration, and
(n) the plot code IP(14) for the elevator or stabilator deflection.

If IP(I)=0, a plot is produced for the "I"th time history. If IP(I)=1, no plot is produced for the "I"th time history. IP(I) are right-adjusted integer numbers each occupying one column beginning at column 1.

CARD (12 + MPTS + 2K + 4):

(a) The filter cutoff harmonic NC(1) for weight,
(b) the filter cutoff harmonic NC(2) for pitch angle,
(c) the filter cutoff harmonic NC(3) for pitch rate,
(d) the filter cutoff harmonic NC(4) for airspeed,
(e) the filter cutoff harmonic NC(5) for density,
(f) the filter cutoff harmonic NC(6) for angle of attack,
(g) the filter cutoff harmonic NC(7) for static temperature,
(h) the filter cutoff harmonic NC(8) for acceleration,
(i) the filter cutoff harmonic NC(9) for altitude,

(j) the filter cutoff harmonic NC(10) for vertical, and
(k) the filter cutoff harmonic NC(11) for the elevator or stabilator deflection.

All NC(I) are right-adjusted integer numbers each occupying 5 columns beginning at column 1. It is mandatory that $0 < NC(I) < 66$.

CARDS (12 + MPTS + 2K + 5), ..., (12 + MPTS + 2K + 10):

(a) The a priori value AP(1) in feet per second squared and its weight W(1) for the first linear acceleration dependency,
(b) the a priori value AP(2) in feet per second squared and its weight W(2) for the second linear acceleration dependency,
(c) the a priori value AP(3) in feet per second squared and its weight W(3) for the third linear acceleration dependency,
(d) the a priori value AP(4) in radians and its weight W(4) for the pitch angle bias,
(e) the a priori value AP(5) and its weight W(5) for the phase shift, and
(f) the a priori value AP(6) in radians and its weight W(6) for the flight-path-angle bias:

AP(I) and W(I) are double-precision floating-point numbers each occupying 20 columns beginning at column 1. Each of the six(6) input cards contains the AP(I) and W(I) that correspond to the dependency or bias under consideration.

CARDS (12 + MPTS + 2K + 11), ..., (12 + MPTS + 2K + 10 + NUMBER!/(NUMBER-1)!):

(a) The code IR(1) for the calculation of the first linear acceleration dependency,
(b) the code IR(2) for the calculation of the second linear acceleration dependency,
(c) the code IR(3) for the calculation of the third linear acceleration dependency,
(d) the code IR(4) for the calculation of the pitch-angle bias,
(e) the code IR(5) for the calculation of the phase shift, and
(f) the code IR(6) for the calculation of the flight-path-angle bias.

If IR(I) = 0, the calculation for the "I"th variable is excluded. If IR(I) = 1, the calculation for the "I"th variable is included. The calculation of at least one variable, preferably two, must be included. Failure to specify at least one variable will terminate the program prematurely. Parameters IR(I) are right-adjusted integer numbers each occupying one column beginning at column 1. It is necessary to provide [(NUMBER!)/(NUMBER-1)!] input cards containing the IR(I) codes.

For a given run consisting of one or more data sets (maneuvers), cards 1 and 2 need to be specified only once. Cards 3 through (12 + MPTS + 2K + 10 + NUMBER!/(NUMBER-1)!) need to be specified for each maneuver.

Program Listing — FDRI

```
C     PROGRAM:  FLIGHT DATA REDUCTION #1 (FDR1)  F.O. SMETANA/ S.R. FOX
C
C
C                 ********************************
C                 *                              *
C                 *  DATA REDUCTION SECTION NO. 1  *
C                 *                              *
C                 ********************************
C
C
C
C     GIVEN VALUES OF THE AIRCRAFT CHARACTERISTICS AND THE AIRCRAFT'S
C     FLIGHT TIME HISTORIES OF PITCH ANGLE, PITCH RATE, AIRSPEED, STATIC
C     PRESSURE, ANGLE OF ATTACK, TOTAL TEMPERATURE, LONGITUDINAL ACCEL-
C     ERATION, VERTICAL ACCELERATION, AND ELEVATOR (OR STABILATOR)
C     DEFLECTION, THIS SECTION PERFORMS THE FOLLOWING:
C
C        1) ADJUSTS DATA, IF DESIRED, FOR AN ASSUMED PHASE SHIFT
C
C        2) CONVERTS TIME TO SECONDS
C
C        3) COMPUTES TOTAL MANEUVER EXECUTION TIME
C
C        4) COMPUTES AIRCRAFT'S WEIGHT TIME HISTORY
C
C        5) CONVERTS WEIGHT TO POUNDS FORCE
C
C        6) CONVERTS PITCH ANGLE TO RADIANS
C
C        7) CONVERTS PITCH RATE TO RADIANS PER SECOND
C
C        8) CONVERTS AIRSPEED TO FEET PER SECOND
C
C        9) CONVERTS STATIC PRESSURE TO POUNDS FORCE PER SQUARE FOOT
C
C       10) CONVERTS ANGLE OF ATTACK TO RADIANS
C
C       11) CONVERTS TOTAL TEMPERATURE TO DEGREES RANKINE
C
C       12) CONVERTS LONGITUDINAL ACCELERATION TO FEET PER
C           SECOND SQUARED
C
C       13) CONVERTS VERTICAL ACCELERATION TO FEET PER SECOND SQUARED
C
C       14) CONVERTS ELEVATOR (OR STABILATOR) DEFLECTION TO RADIANS
C
C       15) CALCULATES LAG CORRECTIONS TO STATIC PRESSURE AND DYNAMIC
C           PRESSURE
C
C       16) CALCULATES POSITION ERROR CORRECTION RATIO DP/QC'
C
C       17) CALCULATES ACCELERATION-DEPENDENT CORRECTIONS TO STATIC
C           PRESSURE
C
C       18) CONVERTS TOTAL TEMPERATURE TO STATIC TEMPERATURE
C
C       19) CONVERTS STATIC PRESSURE TO DENSITY
C
C       20) CONVERTS DENSITY TO ALTITUDE
C
C       21) CONVERTS INDICATED AIRSPEED TO TRUE AIRSPEED
C
C       22) CORRECTS PITCH ANGLE INDICATION FOR KNOWN INITIAL BIAS AND
C           ANGLE OF ATTACK INDICATION FOR INSTRUMENT LOCATION
C
C       23) CALIBRATES ANGLE OF ATTACK INDICATION
C
C       24) PREPARES DATA FOR DATA REDUCTION SECTION NO. 2
C
C
C
C     THE FOLLOWING COMMENT CARDS DESCRIBE THE NECESSARY INPUT FOR
C     DATA REDUCTION SECTION NO.1.  FOR A MORE PRECISE DESCRIPTION,
C     CONSULT THE USERS INSTRUCTIONS.
C
C
C INPUT *** CARD 1
C
C             NSETS   ->  NUMBER OF DATA SETS TO BE ANALYZED
C                         ( -1 < NSETS < 11 )
C
C             METRIC  ->  TYPE OF OUTPUT UNITS
C                         METRIC=0 :  ENGLISH UNITS
C                         METRIC=1 :  SI UNITS
C
C
C
C INPUT *** CARD 2
C
C             ICODE  ->  ICODE=0 :  CONTINUOUS WEIGHT TIME HISTORY
C                                   (CONTINUOUS FROM FIRST OR PRECEDING
C                                   WEIGHT TIME HISTORY WITH NO ELAPSED
C                                   TIME CONSIDERATIONS BETWEEN MANEUVERS)
C
C                        ICODE=1 :  DISCONTINUOUS WEIGHT TIME HISTORY
C                                   (CONTINUOUS FROM FIRST OR PRECEDING
C                                   WEIGHT TIME HISTORY WITH ELAPSED TIME
C                                   CONSIDERATIONS BETWEEN MANEUVERS)
C
C
C
C INPUT *** CARD 3
C
C             NUMBER -> MAXIMUM NUMBER OF IMPROVEMENT ITERATIONS
C
C             ELAP   -> ELAPSED TIME TO MANEUVER IN SECONDS
C
C             JFILE  -> DATA SET FILE NUMBER
C
C             IVL(1) -> LOCATION NUMBER OF VARIABLE IN 2ND DATA FIELD
C             IVL(2) -> LOCATION NUMBER OF VARIABLE IN 3RD DATA FIELD
C             IVL(3) -> LOCATION NUMBER OF VARIABLE IN 4TH DATA FIELD
C             IVL(4) -> LOCATION NUMBER OF VARIABLE IN 5TH DATA FIELD
C             IVL(5) -> LOCATION NUMBER OF VARIABLE IN 6TH DATA FIELD
C             IVL(6) -> LOCATION NUMBER OF VARIABLE IN 7TH DATA FIELD
C             IVL(7) -> LOCATION NUMBER OF VARIABLE IN 8TH DATA FIELD
C             IVL(8) -> LOCATION NUMBER OF VARIABLE IN 9TH DATA FIELD
C             IVL(9) -> LOCATION NUMBER OF VARIABLE IN 10TH DATA FIELD
C
C
```

```
C
C INPUT *** 'CARD' 4      (FROM DATA SET JFILE)
C
C         TITLE  -> TITLE CARD FOR MANEUVER
C
C
C
C INPUT *** CARD 5
C
C         NCH(1) -> FOURIER SERIES CUTOFF HARMONIC FOR AIRSPEED'S
C                   STATIC PRESSURE MEASUREMENTS    0<NCH(1)<66
C
C         NCH(2) -> FOURIER SERIES CUTOFF HARMONIC FOR ALTITUDE'S
C                   STATIC PRESSURE MEASUREMENTS    0<NCH(2)<66
C
C         NCH(3) -> FOURIER SERIES CUTOFF HARMONIC FOR AIRSPEED'S AND
C                   ALTITUDE'S STAGNATION PRESSURE    0<NCH(3)<66
C
C         NCH(4) -> FOURIER SERIES CUTOFF HARMONIC FOR STAGNATION
C                   TEMPERATURE MEASUREMENTS    0<NCH(4)<66
C
C         XLM(1) -> LAG TIME INTERVAL FOR STAGNATION PRESSURE SYSTEMS
C                   IN SECONDS
C
C         XLM(2) -> LAG TIME INTERVAL FOR ALTITUDE'S STATIC PRESSURE
C                   SYSTEMS IN SECONDS
C
C         XLM(3) -> LAG TIME INTERVAL FOR AIRSPEED'S STATIC PRESSURE
C                   SYSTEMS IN SECONDS
C
C         TAU(1) -> LAG TIME CONSTANT FOR STAGNATION PRESSURE SYSTEMS
C                   IN SECONDS
C
C         TAU(2) -> LAG TIME CONSTANT FOR ALTITUDE'S STATIC PRESSURE
C                   SYSTEMS IN SECONDS
C
C         TAU(3) -> LAG TIME CONSTANT FOR AIRSPEED'S STATIC PRESSURE
C                   SYSTEMS IN SECONDS
C
C
C
C INPUT *** CARD 6
C
C         NSPTS  -> ASSUMED NUMBER OF DATA POINTS TO BE INDICATIVE OF
C                   A REQUIRED PHASE SHIFT
C
C         DRIFT  -> PITCH ANGLE DRIFT (RADIAN/SEC) USED BY:
C                   PITCH ANGLE(NEW)=PITCH ANGLE(OLD)+DRIFT*(POINT
C                                   NUMBER)/(TOTAL NUMBER OF POINTS)
C
C
C
C INPUT *** CARD 7
C
C         LSP(1) -> PHASE SHIFT PARAMETER FOR PITCH ANGLE
C                   LSP(1)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(1)=1 :  SHIFT (FREQUENCY MODULATION)
C
C         LSP(2) -> PHASE SHIFT PARAMETER FOR PITCH RATE
C                   LSP(2)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(2)=1 :  SHIFT (FREQUENCY MODULATION)
C
C         LSP(3) -> PHASE SHIFT PARAMETER FOR AIRSPEED
C                   LSP(3)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(3)=1 :  SHIFT (FREQUENCY MODULATION)
C
C         LSP(4) -> PHASE SHIFT PARAMETER FOR STATIC PRESSURE
C                   LSP(4)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(4)=1 :  SHIFT (FREQUENCY MODULATION)
C
C         LSP(5) -> PHASE SHIFT PARAMETER FOR ANGLE OF ATTACK
C                   LSP(5)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(5)=1 :  SHIFT (FREQUENCY MODULATION)
C
C         LSP(6) -> PHASE SHIFT PARAMETER FOR STAGNATION TEMPERATURE
C                   LSP(6)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(6)=1 :  SHIFT (FREQUENCY MODULATION)
C
C         LSP(7) -> PHASE SHIFT PARAMETER FOR LONGITUDINAL ACCELERATION
C                   LSP(7)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(7)=1 :  SHIFT (FREQUENCY MODULATION)
C
C         LSP(8) -> PHASE SHIFT PARAMETER FOR VERTICAL ACCELERATION
C                   LSP(8)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(8)=1 :  SHIFT (FREQUENCY MODULATION)
C
C         LSP(9) -> PHASE SHIFT PARAMETER FOR ELEVATOR DEFLECTION
C                   LSP(9)=0 :  NO SHIFT (COMMUTATION)
C                   LSP(9)=1 :  SHIFT (FREQUENCY MODULATION)
C
C
C
C INPUT *** CARD 8
C
C         S      -> WING AREA IN SQUARE FEET
C
C         GWT    -> GROSS TAKEOFF WEIGHT IN POUNDS FORCE
C
C         FCR1   -> FUEL CONSUMPTION RATE IN POUNDS FORCE PER SECOND
C                   FROM TAKEOFF TO FIRST MANEUVER
C
C         FCR2   -> FUEL CONSUMPTION RATE IN POUNDS FORCE PER SECOND
C                   DURING MANEUVERS
C
C         XACG   -> ANGLE-OF-ATTACK INSTRUMENT LOCATION FROM CENTER OF
C                   GRAVITY (POSITIVE IF XACG AHEAD CG, NEGATIVE IF
C                   XACG BEHIND CG) IN FEET
C
C         PCCG   -> KNOWN PITCH-ANGLE INSTRUMENT BIAS CORRECTION IN
C                   RADIANS
C
C         CALF1  -> CALIBRATION FACTOR TO ANGLE OF ATTACK
C
C         CALF2  -> CALIBRATION TERM TO ANGLE OF ATTACK IN RADIANS
C
C
C
C INPUT *** CARDS 9,10,11     CONVERSION FACTORS OR TERMS
C
C         CF(1)  -> TIME TO SECONDS
```

```
C
C         CF(2)  -> WEIGHT TO POUNDS FORCE
C
C         CF(3)  -> PITCH ANGLE TO RADIANS
C
C         CF(4)  -> PITCH RATE TO RADIANS PER SECOND
C
C         CF(5)  -> AIRSPEED TO FEET PER SECOND
C
C         CF(6)  -> STATIC PRESSURE TO POUNDS FORCE PER SQUARE FOOT
C
C         CF(7)  -> ANGLE OF ATTACK TO RADIANS
C
C         CF(8)  -> TEMPERATURE FACTOR FOR DEGREES RANKINE
C                      T = CF(8)*TEMP + CF(9)
C         CF(9)  -> TEMPERATURE TERM FOR DEGREES RANKINE
C                      T = CF(8)*TEMP + CF(9)
C         CF(10) -> LONGITUDINAL ACCELERATION TO FEET PER
C                   SQUARED SECOND
C
C         CF(11) -> VERTICAL ACCELERATION TO FEET PER SQUARED SECONDS
C
C         CF(12) -> ELEVATOR DEFLECTION TO RADIANS
C
C
C
C INPUT *** CARD 12
C
C         NPTS   -> NUMBER OF POINTS ON DPQCP VS. VE CURVE <21
C
C
C INPUT *** CARDS 13,...,(12+NPTS)
C
C         DPQCP  -> MEASURED POSITION ERROR CORRECTION RATIO
C
C         VE     -> MEASURED VALUES OF INDICATED AIRSPEED IN FEET PER
C                   SECOND
C
C
C
C INPUT *** 'CARDS' (12+NPTS+1),...,(12+NPTS+K)     (FROM DATA SET JFILE)
C
C         IDENTIFICATION OF NECESSARY INPUT TIME HISTORIES
C
C                 TIME(I)  -> TIME
C                 D(I,2)   -> PITCH ANGLE
C                 D(I,3)   -> PITCH RATE
C                 D(I,4)   -> AIRSPEED
C                 D(I,5)   -> STATIC PRESSURE
C                 D(I,6)   -> ANGLE OF ATTACK
C                 D(I,7)   -> STAGNATION TEMPERATURE
C                 D(I,8)   -> LONGITUDINAL ACCELERATION
C                 D(I,10)  -> VERTICAL ACCELERATION
C                 D(I,11)  -> ELEVATOR DEFLECTION
C
C
C
C
C               **********************************
C                      *                                 *
C                      *  DATA REDUCTION SECTION NO. 2   *
C                      *                                 *
C                      ***********************************
C
C
C
C THE FOLLOWING PROGRAM CAPABILITIES ARE OPTIONAL.  THE USER MUST
C SPECIFY THE DESIRED OPTIONS.  THE USER SHOULD CONSULT THE USERS
C INSTRUCTIONS ('FOR1',SECTION 2) FOR 'ILLEGAL' OPTION COMBINATIONS.
C GIVEN VALUES OF THE AIRCRAFT CHARACTERISTICS AND TIME HISTORIES OF
C WEIGHT, PITCH ANGLE, PITCH RATE, AIRSPEED, DENSITY, ANGLE-OF-
C ATTACK, STATIC TEMPERATURE, LONGITUDINAL ACCELERATION, ALTITUDE,
C VERTICAL ACCELERATION, AND ELEVATOR (OR STABILATOR) DEFLECTION,
C THIS SECTION PERFORMS THE FOLLOWING:
C
C
C    1) PERFORMS FOURIER ANALYSIS AND FILTERING ON WEIGHT TIME
C       HISTORY
C
C    2) PERFORMS FOURIER ANALYSIS AND FILTERING ON PITCH ANGLE TIME
C       HISTORY
C
C    3) PERFORMS FOURIER ANALYSIS AND FILTERING ON PITCH RATE TIME
C       HISTORY
C
C    4) INTEGRATES PITCH RATE TO OBTAIN PITCH ANGLE, IF DESIRED
C
C    5) PERFORMS FOURIER ANALYSIS AND FILTERING ON AIRSPEED TIME
C       HISTORY
C
C    6) CALCULATES ACCELERATION FROM AIRSPEED
C
C    7) PERFORMS FOURIER ANALYSIS AND FILTERING ON DENSITY TIME
C       HISTORY
C
C    8) PERFORMS FOURIER ANALYSIS AND FILTERING ON ANGLE-OF-ATTACK
C       TIME HISTORY
C
C    9) CALCULATES ANGLE-OF-ATTACK RATE FROM THE FOURIER-FILTER
C       MODIFICATION OF ANGLE OF ATTACK OR FROM DIFFERENTIATION OF
C       SPLINED-INPUT ANGLE OF ATTACK
C
C   10) PERFORMS FOURIER ANALYSIS AND FILTERING OF STATIC
C       TEMPERATURE TIME HISTORY
C
C   11) CONVERTS LONGITUDINAL ACCELERATION INTO ACCELERATION
C       COMPATIBLE WITH AIRSPEED
C
C   12) PERFORMS FOURIER ANALYSIS AND FILTERING OF LONGITUDINAL
C       ACCELERATION TIME HISTORY
C
C   13) PERFORMS FOURIER ANALYSIS AND FILTERING OF ALTITUDE TIME
C       HISTORY
C
C   14) CALCULATES DENSITY FROM ALTITUDE
C
C   15) CALCULATES ALTITUDE RATE OF CHANGE AND ACCELERATION FROM
C       DIFFERENTIATIONS OF THE FOURIER-FILTER MODIFICATION OF
C       ALTITUDE OR SPLINED-INPUT ALTITUDE
```

```
C
C        16) CALCULATES COMPATIBLE ANGLE-OF-ATTACK VALUES FROM OTHER
C            TIME HISTORIES
C
C        17) CALCULATES COMPATIBLE ALTITUDE AND ALTITUDE RATE FROM
C            INTEGRAL OF DERIVATIVE OF FLIGHT-PATH ANGLE
C
C        18) PERFORMS FOURIER ANALYSIS AND FILTERING ON VERTICAL
C            ACCELERATION TIME HISTORY
C
C        19) PERFORMS FOURIER ANALYSIS AND FILTERING ON ELEVATOR (OR
C            STABILATOR) DEFLECTION TIME HISTORY
C
C        20) PERFORMS MINIMIZATION WITH OR WITHOUT A PRIORI VALUES FOR
C            DATA COMPATIBILITY
C
C        21) PLOTS TIME HISTORIES
C
C        22) WRITES RESULTS IN ENGLISH OR SI UNITS
C
C        23) PUNCHES CARDS FOR USE IN PROGRAM 'FDR2'
C
C
C
C      THE FOLLOWING COMMENT CARDS DESCRIBE THE NECESSARY INPUT FOR
C      DATA REDUCTION SECTION NO.2.  FOR A MORE PRECISE DESCRIPTION,
C      CONSULT THE USERS INSTRUCTIONS.
C
C
C INPUT *** CARD (12+NPTS+K+1)
C
C         IFS(1) ->  FOURIER ANALYSIS ON WEIGHT TIME HISTORY
C                    IFS(1)=0  -> YES
C                    IFS(1)=1  -> NO
C
C         IFS(2) ->  FOURIER ANALYSIS ON PITCH ANGLE TIME HISTORY
C                    IFS(2)=0  -> YES
C                    IFS(2)=1  -> NO
C
C         IFS(3) ->  FOURIER ANALYSIS ON PITCH RATE TIME HISTORY
C                    IFS(3)=0  -> YES
C                    IFS(3)=1  -> NO
C
C         IFS(4) ->  FOURIER ANALYSIS ON AIRSPEED TIME HISTORY
C                    IFS(4)=0  -> YES
C                    IFS(4)=1  -> NO
C
C         IFS(5) ->  FOURIER ANALYSIS ON DENSITY TIME HISTORY
C                    IFS(5)=0  -> YES
C                    IFS(5)=1  -> NO
C
C         IFS(6) ->  FOURIER ANALYSIS ON ANGLE OF ATTACK TIME HISTORY
C                    IFS(6)=0  -> YES
C                    IFS(6)=1  -> NO
C
C         IFS(7) ->  FOURIER ANALYSIS ON STATIC TEMPERATURE TIME HISTORY
C                    IFS(7)=0  -> YES
C                    IFS(7)=1  -> NO
C
C         IFS(8) ->  FOURIER ANALYSIS ON 'ACCELERATION' TIME HISTORY
C                    IFS(8)=0  -> YES
C                    IFS(8)=1  -> NO
C
C         IFS(9) ->  FOURIER ANALYSIS ON ALTITUDE TIME HISTORY
C                    IFS(9)=0  -> YES
C                    IFS(9)=1  -> NO
C
C         IFS(10)->  FOURIER ANALYSIS ON VERTICAL ACCELERATION HISTORY
C                    IFS(10)=0 -> YES
C                    IFS(10)=1 -> NO
C
C         IFS(11)->  FOURIER ANALYSIS ON (ELEVATOR/STABILATOR) HISTORY
C                    IFS(11)=0 -> YES
C                    IFS(11)=1 -> NO
C
C
C
C INPUT *** CARD (12+NPTS+K+2)
C
C         IPRC(1)->  METHOD OF ACCELERATION DETERMINATION
C                    IPRC(1)=0 -> DERIVATIVE OF AIRSPEED TIME HISTORY
C                    IPRC(1)=1 -> CONVERTED LONGITUDINAL ACCELERATION
C
C         IPRC(2)->  DEGREE OF COMPUTATION ON LONGITUDINAL ACCELERATION
C                    IPRC(2)=0 -> LONGITUDINAL ACCELERATION CONVERTED TO
C                                 RATE-OF-CHANGE OF AIRSPEED BY TRANS-
C                                 FORMATION AND SMOOTHED BY FILTERING
C                    IPRC(2)=1 -> LONGITUDINAL ACCELERATION CONVERTED TO
C                                 RATE-OF-CHANGE OF AIRSPEED BY TRANS-
C                                 FORMATION
C                    IPRC(2)>1 -> ORIGINAL LONGITUDINAL ACCELERATION
C
C         IPRC(3)->  METHOD OF ANGLE-OF-ATTACK RATE COMPUTATION
C                    IPRC(3)=0 -> DERIVATIVE OF ANGLE-OF-ATTACK HISTORY
C                    IPRC(3)=1 -> DERIVATIVE OF SPLINED ANGLE OF ATTACK
C
C         IPRC(4)->  OVERALL FOURIER ANALYSIS CODE
C                    IPRC(4)=0 -> REQUEST FOURIER ANALYSIS
C                    IPRC(4)=1 -> DECLINE FOURIER ANALYSIS
C
C         IPRC(5)->  OVERALL PLOTTING CODE
C                    IPRC(5)=0 -> REQUEST PLOTS
C                    IPRC(5)=1 -> DECLINE PLOTS
C
C         IPRC(6)->  PUNCH CODE
C                    IPRC(6)=0 -> REQUEST PUNCHED CARDS
C                    IPRC(6)=1 -> DECLINE PUNCHED CARDS
C
C         IPRC(7)->  METHOD OF PITCH ANGLE DETERMINATION
C                    IPRC(7)=0 -> ORIGINAL PITCH-ANGLE TIME HISTORY
C                    IPRC(7)=1 -> INTEGRATION OF PITCH-RATE TIME HISTORY
C
C         IPRC(8)->  COMPATIBILITY CHECK
C                    IPRC(8)=0 -> BYPASS COMPATIBILITY CHECK
C                    IPRC(8)=1 -> COMPUTE COMPATIBLE ANGLE OF ATTACK
C                    IPRC(8)=2 -> COMPUTE COMPATIBLE ALTITUDE
C
C         IPRC(9)->  CALCULATION OF INERTIAL-COMPATIBLE ALTITUDE
C                    IPRC(9)=0 -> BYPASS ANALYSIS
C                    IPRC(9)=1 -> PERFORM ANALYSIS
```

```
C
C        XAX    ->  LOCATION OF ACCELEROMETER FROM CG IN FEET
C                   (POSITIVE IF AHEAD, NEGATIVE IF BEHIND)
C
C        FAC1   ->  FRACTION OF PNEUMATIC-COMPATIBLE ALTITUDE SUCH THAT
C                   FAC1+FAC2=1.0
C        FAC2   ->  FRACTION OF INERTIAL-COMPATIBLE ALTITUDE SUCH THAT
C                   FAC1+FAC2=1.0
C
C        DSPS   ->  DATA SAMPLING RATE (PER SECOND)
C
C
C
C INPUT *** CARD (12+NPTS+K+3)
C
C        IP(1)  ->  PLOT CODE FOR WEIGHT TIME HISTORY
C                   IP(1)=0  -> REQUESTED
C                   IP(1)=1  -> NOT REQUESTED
C
C        IP(2)  ->  PLOT CODE FOR PITCH ANGLE TIME HISTORY
C                   IP(2)=0  -> REQUESTED
C                   IP(2)=1  -> NOT REQUESTED
C
C        IP(3)  ->  PLOT CODE FOR PITCH RATE TIME HISTORY
C                   IP(3)=0  -> REQUESTED
C                   IP(3)=1  -> NOT REQUESTED
C
C        IP(4)  ->  PLOT CODE FOR AIRSPEED TIME HISTORY
C                   IP(4)=0  -> REQUESTED
C                   IP(4)=1  -> NOT REQUESTED
C
C        IP(5)  ->  PLOT CODE FOR DENSITY TIME HISTORY
C                   IP(5)=0  -> REQUESTED
C                   IP(5)=1  -> NOT REQUESTED
C
C        IP(6)  ->  PLOT CODE FOR ANGLE OF ATTACK TIME HISTORY
C                   IP(6)=0  -> REQUESTED
C                   IP(6)=1  -> NOT REQUESTED
C
C        IP(7)  ->  PLOT CODE FOR STATIC TEMPERATURE TIME HISTORY
C                   IP(7)=0  -> REQUESTED
C                   IP(7)=1  -> NOT REQUESTED
C
C        IP(8)  ->  PLOT CODE FOR ACCELERATION TIME HISTORY
C                   IP(8)=0  -> REQUESTED
C                   IP(8)=1  -> NOT REQUESTED
C
C        IP(9)  ->  PLOT CODE FOR ANGLE-OF-ATTACK RATE TIME HISTORY
C                   IP(9)=0  -> REQUESTED
C                   IP(9)=1  -> NOT REQUESTED
C
C        IP(10) ->  PLOT CODE FOR ALTITUDE TIME HISTORY
C                   IP(10)=0 -> REQUESTED
C                   IP(10)=1 -> NOT REQUESTED
C
C        IP(11) ->  PLOT CODE FOR ALTITUDE RATE TIME HISTORY
C                   IP(11)=0 -> REQUESTED
C                   IP(11)=1 -> NOT REQUESTED
C
C        IP(12) ->  PLOT CODE FOR ALTITUDE ACCELERATION TIME HISTORY
C                   IP(12)=0 -> REQUESTED
C                   IP(12)=1 -> NOT REQUESTED
C
C        IP(13) ->  PLOT CODE FOR VERTICAL ACCELERATION TIME HISTORY
C                   IP(13)=0 -> REQUESTED
C                   IP(13)=1 -> NOT REQUESTED
C
C        IP(14) ->  PLOT CODE FOR (ELEVATOR/STABILATOR) TIME HISTORY
C                   IP(14)=0 -> REQUESTED
C                   IP(14)=1 -> NOT REQUESTED
C
C
C
C INPUT *** CARD (12+NPTS+K+4)
C
C        NC(1)  ->  FILTER CUTOFF HARMONIC FOR WEIGHT
C                   ( 0 < NC(1) < 66 )
C
C        NC(2)  ->  FILTER CUTOFF HARMONIC FOR PITCH ANGLE
C                   ( 0 < NC(2) < 66 )
C
C        NC(3)  ->  FILTER CUTOFF HARMONIC FOR PITCH RATE
C                   ( 0 < NC(3) < 66 )
C
C        NC(4)  ->  FILTER CUTOFF HARMONIC FOR AIRSPEED
C                   ( 0 < NC(4) < 66 )
C
C        NC(5)  ->  FILTER CUTOFF HARMONIC FOR DENSITY
C                   ( 0 < NC(5) < 66 )
C
C        NC(6)  ->  FILTER CUTOFF HARMONIC FOR ANGLE OF ATTACK
C                   ( 0 < NC(6) < 66 )
C
C        NC(7)  ->  FILTER CUTOFF HARMONIC FOR STATIC TEMPERATURE
C                   ( 0 < NC(7) < 66 )
C
C        NC(8)  ->  FILTER CUTOFF HARMONIC FOR ACCELERATION
C                   ( 0 < NC(8) < 66 )
C
C        NC(9)  ->  FILTER CUTOFF HARMONIC FOR ALTITUDE
C                   ( 0 < NC(9) < 66 )
C
C        NC(10) ->  FILTER CUTOFF HARMONIC FOR VERTICAL ACCELERATION
C                   ( 0 < NC(10) < 66 )
C
C        NC(11) ->  FILTER CUTOFF HARMONIC FOR ELEVATOR/STABILATOR
C                   DEFLECTION     (0 < NC(11) < 66)
C
C
C INPUT *** CARDS (12+NPTS+K+5), ... ,(12+NPTS+K+10)
C
C        AP(1), W(1)   ->  A PRIORI VALUE AND ITS WEIGHT FOR THE FIRST
C                          LINEAR ACCELERATION DEPENDENCY
C
C        AP(2), W(2)   ->  A PRIORI VALUE AND ITS WEIGHT FOR THE SECOND
C                          LINEAR ACCELERATION DEPENDENCY
C
C        AP(3), W(3)   ->  A PRIORI VALUE AND ITS WEIGHT FOR THE THIRD
C                          LINEAR ACCELERATION DEPENDENCY
C
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C        AP(4), W(4)  ->  A PRIORI VALUE AND ITS WEIGHT FOR THE PITCH
C                         ANGLE BIAS
C
C        AP(5), W(5)  ->  A PRIORI VALUE AND ITS WEIGHT FOR THE PHASE
C                         SHIFT
C
C        AP(6), W(6)  ->  A PRIORI VALUE AND ITS WEIGHT FOR THE FLIGHT
C                         PATH ANGLE BIAS
C
C
C
C INPUT *** CARDS (12+NPTS+K+11), ....,(12+NPTS+K+10+NUMBER1/(NUMBER-1) !)
C
C  EES CARD:
C
C        IR(1)  ->  CODE FOR THE CALCULATION OF THE FIRST LINEAR
C                   ACCELERATION DEPENDENCY
C                   IR(1)=0  -> EXCLUDE
C                   IR(1)=1  -> INCLUDE
C
C        IR(2)  ->  CODE FOR THE CALCULATION OF THE SECOND LINEAR
C                   ACCELERATION DEPENDENCY
C                   IR(2)=0  -> EXCLUDE
C                   IR(2)=1  -> INCLUDE
C
C        IR(3)  ->  CODE FOR THE CALCULATION OF THE THIRD LINEAR
C                   ACCELERATION DEPENDENCY
C                   IR(3)=0  -> EXCLUDE
C                   IR(3)=1  -> INCLUDE
C
C        IR(4)  ->  CODE FOR THE CALCULATION OF THE PITCH ANGLE BIAS
C                   IR(4)=0  -> EXCLUDE
C                   IR(4)=1  -> INCLUDE
C
C        IR(5)  ->  CODE FOR THE CALCULATION OF THE PHASE SHIFT
C                   IR(5)=0  -> EXCLUDE
C                   IR(5)=1  -> INCLUDE
C
C        IR(6)  ->  CODE FOR THE CALCULATION OF THE FLIGHT PATH ANGLE
C                   BIAS
C                   IR(6)=0  -> EXCLUDE
C                   IR(6)=1  -> INCLUDE
C
C
C
      IMPLICIT REAL*8(A-H,O-Z)
      EXTERNAL PHIDER
      DIMENSION WMIN(10),DPQCP(20),VE(20),AA(4,20),ICODE(11),XN(450,1),C
     1N(450,4),ISP(9),NCH(4),XLM(3),TAU(3),CF(12),PA(450),SVPC(10),NVPC(
     110),IVL(9)
      COMMON TITLE(20),D(450,11),TIME(450),A(100),B(100),F1(450),F2(450)
     1,F3(450),ASPD(450),P(450),PD(450),PS(450),PSD(450),TT,RHO,PI,G,JPL
     1OT,METRIC,JREAD,JWRITE,JPUNCH,IERR
      COMMON /TEMP1/ST(450,4),PAR(6),PSL,TSL,IPAR
      DATA XEND/4HEND /
C
C***  SPECIFY CARRIAGE CONTROL FOR INSTALLATION
      JREAD=1
      JWRITE=3
      JPUNCH=2
C***  INITIALIZE PARAMETERS
      G=32.2DC
      GAMMA=1.4D0
      R=1716.1612D0
      RHC=0.002378D0
      TSL=518.72D0
      PSL=14.7D0*144.0D0
      PI=3.141592653589793D0
      JPLOT=0
      KJ=1
C
C
      READ (JREAD,1) NSETS,METRIC
    1 FORMAT (2I5)
C
      IF (NSETS.LE.0.OR.NSETS.GT.10) GO TO 121
C
C
      READ (JREAD,2) (ICODE(I),I=1,NSETS)
    2 FORMAT (10I5)
C
      ICODE(NSETS+1)=0
C
C
    3 READ (JREAD,4) NUMBER,ELAP,JFILE,(IVL(I),I=1,9)
    4 FORMAT (I5,F10.0,10I5)
C
C
    5 READ (JFILE,6) (TITLE(I),I=1,20)
    6 FORMAT (20A4)
C
C***  CHECK FOR EXECUTION TERMINATION
      IF (TITLE(1).EQ.XEND) GO TO 123
C***  INITIALIZE ERROR CODES
      IERR=0
      INC=0
C
C
      READ (JREAD,7) NCH(1),NCH(2),NCH(3),NCH(4),XLM(1),XLM(2),XLM(3),TA
     1U(1),TAU(2),TAU(3)
    7 FORMAT (4I5,6F10.0)
C
C
      READ (JREAD,8) NSPTS,DRIFT
    8 FORMAT (I5,F15.C)
C
C***  FORCE NSPTS TO BE POSITIVE
      NSPTS=IABS(NSPTS)
C
C
      READ (JREAD,9) (LSP(I),I=1,9)
    9 FORMAT (9I5)
C
C
      READ (JREAD,10) S,GWT,FCR1,FCR2,XACG,PCCG,CALP1,CALP2
   10 FORMAT (8F10.0)
C
C
      READ (JREAD,11) CF(1),CF(2),CF(3),CF(4),CF(5),CF(6),CF(7),CF(8),CF
     1(9),CF(10),CF(11),CF(12)
```

```
   11 FORMAT (4D20.0/4D20.0/4D20.0)
C
C
      READ (JREAD,12) NPTS
   12 FORMAT (I2)
C
C
      READ (JREAD,13) (VE(I),DPQCP(I),I=1,NPTS)
   13 FORMAT (2F20.0)
C
      K=1
C
C
   14 READ (JFILE,15) TIME(K),D(K,IVL(1)),D(K,IVL(2)),D(K,IVL(3)),D(K,IV
     1L(4)),D(K,IVL(5)),D(K,IVL(6)),D(K,IVL(7)),D(K,IVL(8)),D(K,IVL(9))
   15 FORMAT (5D15.8/5D15.8)
C***  CHECK FOR DATA SET END OF FILE
      IF (K.GE.450) GO TO 21
      IF (D(K,5).EQ.0.0D0) GO TO 20
      IF (K.GE.2) GO TO 16
      GO TO 17
C***  CHECK FOR EQUAL OR DECREASING TIME
   16 IF (TIME(K).LE.TIME(K-1)) GO TO 18
   17 K=K+1
      GO TO 14
   18 WRITE (JWRITE,19) K
   19 FORMAT (1H1,///,11X,54H*** EQUAL OR DECREASING TIME ENCOUNTERED ON
     1 DATA CARD(,I3,42H).  PROCEEDING WITH NEXT DATA SET, IF ANY.)
      IERR=1
   20 K=K-1
      IF (IERR.NE.0) GO TO 22
      GO TO 24
C***  SAFETY CHECK FOR ARRAY OVERFLOW
   21 IF (D(K,5).EQ.0.0D0) GO TO 20
      K=K-1
   22 JK=1000
C***  THIS READ STATEMENT READS CARDS REMAINING AFTER MAXIMUM CARD
C***  COUNT INTO DUMMY VARIABLES
      DO 23 JP=1,JK
      READ (JFILE,15) D1,D2,D3,D4,D5,D6,D7,D8,D9,D10
      IF (D5.EQ.0.0D0) GO TO 24
   23 CONTINUE
C***  CHECK ON TOTAL NUMBER OF POINTS
   24 IF (K.LT.13) GO TO 25
      IF (IERR.NE.0) GO TO 117
      GO TO 27
   25 WRITE (JWRITE,26)
   26 FORMAT (1X,///,10X,79HNUMBER OF DATA POINTS IS LESS THAN 13 .  PRO
     1CEEDING WITH NEXT DATA SET, IF ANY.)
      IERR=1
C***  CHECK FOR A NEW DATA SET
      GO TO 117
C***  CHECK FOR INCONSISTENCIES IN FOURIER SERIES SPECIFICATIONS
   27 IF ((NCH(1).LE.0.OR.NCH(2).LE.0).OR.(NCH(3).LE.0.OR.NCH(4).LE.0))I
     1NC=1
      IF (INC.NE.0) WRITE (JWRITE,28)
   28 FORMAT (1H1,///,1X,'NCH(1), NCH(2), NCH(3), AND/OR NCH(4) HAVE(HAS
     1) BEEN SPECIFIED INCORRECTLY AS BEING LESS THAN OR EQUAL TO ZERO.'
     1)
      IF (INC.NE.0)IERR=1
      IF (IERR.NE.0) GO TO 117
C***  COMPUTE TOTAL TIME AND TIME POINTS IN CORRECT UNITS
      IF (CF(1).EQ.0.0D0) GO TO 29
      TT=(TIME(K)-TIME(1))*CF(1)
      TPT1=TIME(1)
      GO TO 30
   29 TT=TIME(K)-TIME(1)
      TPT1=TIME(1)
   30 DO 32 I=1,K
      IF (CF(1).EQ.0.0D0) GO TO 31
      TIME(I)=(TIME(I)-TPT1)*CF(1)
      GO TO 32
   31 TIME(I)=TIME(I)-TPT1
   32 CONTINUE
C***  WRITE TITLE, WING AREA, REFERENCE DENSITY, G, AND TOTAL TEST TIME
      WRITE (JWRITE,33) (TITLE(I),I=1,20)
   33 FORMAT (1H1,////,23X,84('*'),/,23X,'*',82X,'*',/,23X,'*',20A4,2X,'
     1*',/,23X,'*',82X,'*',/,23X,84('*'))
C***  WRITE INPUT PARAMETERS
      WRITE (JWRITE,34) NSETS
   34 FORMAT (1X,///,29X,71('-'),/,29X,'|',69X,'|',/,29X,'|',39X,6HNSETS
     1=,I3,21X,'|',/,29X,'|',4X,26HSECTION 1 INPUT PARAMETERS,23X,5HICOD
     1E,11X,'|')
      WRITE (JWRITE,35) (ICODE(I),I=1,NSETS)
   35 FORMAT (29X,'|',56X,I1,12X,'|')
      WRITE (JWRITE,36)
   36 FORMAT (29X,'|',69X,'|')
      WRITE (JWRITE,37) METRIC,XLM(1),FCR1,CF(1),NCH(1),XLM(2),FCR2,CF(2
     1),NCH(2),XLM(3),XACG,CF(3),NCH(3),TAU(1),PCCG,CF(4),NCH(4),TAU(2),
     1CALP1,CF(5),S,TAU(3),CALP2,CF(6),NPTS,GWT,NSPTS,CF(7),LSP(1),LSP(2
     1),LSP(3),LSP(4),CF(8),LSP(5),LSP(6),LSP(7),LSP(8),CF(9),LSP(9),FLA
     1P,DRIFT,CF(10),CF(11),CF(12)
   37 FORMAT (29X,'|',3X,'METRIC= ',I3,2X,'XLM(1)= ',F7.4,2X,'FCR1= ',F9
     1.6,2X,'CF(1)= ',D10.3,2X,'|',/,29X,'|',3X,'NCH(1)= ',I3,2X,'XLM(2)
     1= ',F7.4,2X,'FCR2= ',F9.6,2X,'CF(2)= ',D10.3,2X,'|',/,29X,'|',3X,'
     1NCH(2)= ',I3,2X,'XLM(3)= ',F7.4,2X,'XACG= ',F9.6,2X,'CF(3)= ',D10.
     13,2X,'|',/,29X,'|',3X,'NCH(3)= ',I3,2X,'TAU(1)= ',F7.4,2X,'PCCG= '
     1,F9.6,2X,'CF(4)= ',D10.3,2X,'|',/,29X,'|',3X,'NCH(4)= ',I3,2X,'TAU
     1(2)= ',F7.4,2X,'CALP1= ',F8.4,2X,'CF(5)= ',D10.3,2X,'|',/,29X,'|',
     13X,'S= ',F8.4,2X,'TAU(3)= ',F7.4,2X,'CALP2= ',F8.4,2X,'CF(6)= ',D1
     10.3,2X,'|',/,29X,'|',3X,'NPTS= ',I3,4X,'GWT= ',F10.5,2X,'NSPTS= ',
     1I3,7X,'CF(7)= ',D10.3,2X,'|',/,29X,'|',3X,'LSP(1)= ',I1,2X,'LSP(2)
     1= ',I1,2X,'LSP(3)= ',I1,2X,'LSP(4)= ',I1,5X,'CF(8)= ',D10.3,2X,'|'
     1,/,29X,'|',3X,'LSP(5)= ',I1,2X,'LSP(6)= ',I1,2X,'LSP(7)= ',I1,2X,'
     1LSP(8)= ',I1,5X,'CF(9)= ',D10.3,2X,'|',/,29X,'|',3X,'LSP(9)= ',I1,
     12X,'FLAP= ',F9.6,3X,'DRIFT= ',F9.2,2X,'CF(10)=',D10.3,2X,'|',/,29X
     1,'|',50X,'CF(11)=',D10.3,2X,'|',/,29X,'|',50X,'CF(12)=',D10.3,2X,'
     1|',/,29X,'|',69X,'|',/,29X,'|',20X,'VE',9X,'DPQCP',33X,'|',/,29X,'
     1|',69X,'|')
      WRITE (JWRITE,38) (VE(I),DPQCP(I),I=1,NPTS)
   38 FORMAT (29X,'|',17X,F9.4,3X,F9.6,31X,'|')
      WRITE (JWRITE,39)
   39 FORMAT (29X,'|',69('_'),'|')
      IF (METRIC.NE.0) GO TO 41
      WRITE (JWRITE,40) S,RHO,G,TT
   40 FORMAT (1X,//,38X,51('*'),/,38X,'*',49X,'*',/,38X,'*',13H WING ARE
     1A = ,F10.5,6H FT**2,20X,'*',/,38X,'*',21H REFERENCE DENSITY = ,F10
     1.8,11H SLUG/FT**3,7X,'*',/,38X,'*',31H ACCELERATION DUE TO GRAVITY
     1 = ,F7.4,10H FT/SEC**2,1X,'*',/,38X,'*',19H TOTAL TEST TIME = ,F10
     1.4,8H SECONDS,12X,'*',/,38X,'*',49X,'*',/,38X,51('*'))
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      GO TO 43
   41 SXM=S*(0.3048D0)**2
      RHOXM=RHO*515.38D0
      GXM=G*0.3048D0
      WRITE (JWRITE,42) SXM,RHOXM,GXM,TT
   42 FORMAT (1X,//,38X,51('*'),/,38X,'*',49X,'*',/,38X,'*',13H WING ARE
     1A = ,F11.5,5H M**2,20X,'*',/,38X,'*',21H REFERENCE DENSITY = ,F12.
     18,8H KG/M**3,8X,'*',/,38X,'*',31H ACCELERATION DUE TO GRAVITY = ,F
     18.4,9H M/SEC**2,1X,'*',/,38X,'*',19H TOTAL TEST TIME = ,F10.4,8H S
     1ECONDS,12X,'*',/,38X,'*',49X,'*',/,38X,51('*'))
C***  COMPUTE AIRCRAFT WEIGHT TIME HISTORY
   43 IF (ICODE(KJ).EQ.0) IGWT=1
      IF (ICODE(KJ).NE.0) IGWT=0
      IF (KJ.GT.1.AND.IGWT.EQ.1) GO TO 47
      IF (KJ.EQ.1)WMXM(KJ)=GWT-FCR1*ELAP
      IF (KJ.GT.1.AND.IGWT.EQ.0) GO TO 44
      GO TO 45
   44 WMXM(KJ)=WMXM(KJ-1)-FCR1*ELAP
   45 DO 46 I=1,K
   46 D(I,1)=WMXM(KJ)-FCR2*TIME(I)
      WMXM(KJ)=D(K,1)
      GO TO 48
   47 WMXM(KJ)=WMXM(KJ-1)
      GO TO 45
C***  CONVERT FLIGHT PARAMETERS TO COMPATIBLE UNITS
   48 DO 58 I=1,K
      IF (CF(2).EQ.0.0D0) GO TO 49
C***  CONVERT WEIGHT TO LBF
      D(I,1)=D(I,1)*CF(2)
   49 IF (CF(3).EQ.0.0D0) GO TO 50
C***  CONVERT PITCH ANGLE TO RADIANS
      D(I,2)=D(I,2)*CF(3)
C***  APPLY PITCH ANGLE DRIFT IF SPECIFIED
      IF (DRIFT.NE.0) D(I,2)=D(I,2)+DRIFT*DFLOAT(I)/K
   50 IF (CF(4).EQ.0.0D0) GO TO 51
C***  CONVERT PITCH RATE TO RADIANS/SEC
      D(I,3)=D(I,3)*CF(4)
   51 IF (CF(5).EQ.0.0D0) GO TO 52
C***  CONVERT AIRSPEED TO FT/SEC
      D(I,4)=D(I,4)*CF(5)
   52 IF (CF(6).EQ.0.0D0) GO TO 53
C***  CONVERT STATIC PRESSURE TO LBF/FT**2
      D(I,5)=D(I,5)*CF(6)
   53 IF (CF(7).EQ.0.0D0) GO TO 54
C***  CONVERT ANGLE OF ATTACK TO RADIANS
      D(I,6)=D(I,6)*CF(7)
   54 IF (CF(8).EQ.0.0D0.AND.CF(9).EQ.0.0D0) GO TO 55
C***  CONVERT TEMPERATURE TO DEGREES RANKINE
      D(I,7)=CF(8)*D(I,7)+CF(9)
   55 IF (CF(10).EQ.0.0D0) GO TO 56
C***  CONVERT LONGITUDINAL ACCELERATION TO FT/SEC**2
      D(I,8)=D(I,8)*CF(10)
   56 IF (CF(11).EQ.0.0D0) GO TO 57
C***  CONVERT VERTICAL ACCELERATION TO FT/SEC**2
      D(I,10)=D(I,10)*CF(11)
   57 IF (CF(12).EQ.0.0D0) GO TO 58
C***  CONVERT ELEVATOR (OR STABILATOR) DEFLECTION TO RADIANS
      D(I,11)=D(I,11)*CF(12)
   58 CONTINUE
C***  ADJUST DATA FOR AN ASSUMED PHASE SHIFT
      IF (NSPTS.NE.0) CALL SHIFT(K,LSP,NSPTS)
C***  COMPUTE PITCH ANGLE BIAS
      PAB=DARSIN(D(K,8)/G)-D(K,2)
C***  ADD PITCH ANGLE BIAS TO PITCH ANGLE
      DO 59 I=1,K
   59 D(I,2)=D(I,2)+PAB
C***  INTEGRATE PITCH RATE
      PRI=0.0D0
      KM1=K-1
      DO 60 I=1,KM1
   60 PRI=PRI+0.5D0*(TIME(I+1)-TIME(I))*(D(I+1,3)+D(I,3))
C***  COMPUTE PITCH RATE BIAS
      PRB=-(PRI+D(1,2)-D(K,2))/TT
C***  ADD PITCH RATE BIAS TO PITCH RATE
      DO 61 I=1,K
   61 D(I,3)=D(I,3)+PRB
C***  INITIALIZE PARAMETERS FOR PHASE SHIFT DETERMINATION
      NSPTS=0
      L=1
   62 NPC=K-NSPTS
      STS=0.0D0
C***  START SUMMATION PROCESS
      DO 64 I=1,NPC
C***  INTEGRATE PITCH RATE
      PRI=D(1,2)
      DO 63 J=1,I
      IF (J.EQ.1) GO TO 63
      PRI=PRI+0.5D0*(TIME(J)-TIME(J-1))*(D(J,3)+D(J-1,3))
   63 CONTINUE
C***  SUM PRODUCTS OF PITCH ANGLES
   64 STS=STS+(PRI-D(K,2))*(D(I+NSPTS,2)-D(K,2))
C***  STORE VALUES
      SVPC(L)=STS
      NVPC(L)=NSPTS
C***  TEST FOR MAXIMUM PHASE SHIFT
      IF (NSPTS.EQ.10) GO TO 65
C***  INCREASE PHASE SHIFT AND COUNTER
      NSPTS=NSPTS+1
      L=L+1
      GO TO 62
C***  DETERMINE MAXIMUM PITCH-ANGLE PRODUCT
   65 STS=SVPC(1)
      DO 66 I=1,10
   66 IF (SVPC(I).GT.STS) STS=SVPC(I)
      DO 67 I=1,10
      L=I
   67 IF (SVPC(I).EQ.STS) GO TO 68
   68 NSPTS=NVPC(L)
      WRITE (JWRITE,69) NSPTS,PAB,PRB
   69 FORMAT (1X,//,35X,31HCALCULATED PHASE SHIFT COUNT = ,I2,/,35X,31HC
     1ALCULATED PITCH ANGLE BIAS  = ,1PD19.12,7H RADIAN,/,35X,31HCALCULA
     1TED PITCH RATE BIAS   = ,1PD19.12,8H RAD/SEC)
C***  ADJUST DATA POINTS, IF NECESSARY, FOR A CALCULATED PHASE SHIFT
      IF (NSPTS.NE.0) CALL SHIFT(K,LSP,NSPTS)
C***  COMPUTE PARAMETERS FOR TOTAL TEMPERATURE
      MPT=(3*NCH(4))/2
      MPTP1=MPT+1
      ITEST=0
C***  INITIALIZE IMPROVEMENT COEFFICIENTS
      DO 70 I=1,6
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   70 PAB(I)=0.0D0
      IPAB=0
      IF (NUMBER.LT.0)NUMBER=0
      NUM=NUMBER+1
C***  BEGIN IMPROVEMENT ITERATION
      DO 119 JJJJ=1,NUM
      TD=TIME(K)-TIME(1)
      DO 71 I=1,K
      TX=TIME(I)-TIME(1)
      F1(I)=D(I,7)-(D(1,7)+(D(K,7)-D(1,7))/TD*TX)
   71 CONTINUE
C***  COMPUTE AND SMOOTH FOURIER COEFFICIENTS OF STAGNATION TEMPERATURE
      CALL FARAF(F1,K,MPTP1,NCH(4))
C***  REGENERATE SMOOTHED STAGNATION TEMPERATURE
      X1=A(1)
      DO 73 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,7)+(D(K,7)-D(1,7))/TD*TX
      X3=0.0D0
      DO 72 N=2,MPTP1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   72 CONTINUE
      F1(L)=X1+X2+X3
   73 CONTINUE
C***  DETERMINE FEASIBILITY OF STATIC PRESSURE BEHAVIOR AND MAKE ANY
C***  NECESSARY CORRECTIONS
      KM1=K-1
      DO 74 I=1,KM1
      SN=1.0D0
C***  CALCULATE AN ALTITUDE BY ASSUMING CONSTANT TEMPERATURE
      H=(1.0D0-(D(I,5)/PSI)**(1.0D0/4.26D0))/6.86D-6
C***  CALCULATE A LIMITING ALTITUDE DERIVATIVE MAGNITUDE
      HD=DABS(D(I,4)*DSIN(1.2DC*(D(I,2)-D(I,6))))
C***  CALCULATE A LIMITING STATIC PRESSURE DERIVATIVE MAGNITUDE
      PDPA=DABS(-6.86D-6*4.26D0*PSI*HD*(1.0D0-6.86D-6*H)**3.26D0)
C***  CALCULATE TWO-POINT STATIC PRESSURE DERIVATIVE OF INPUT DATA
      PPI=(D(I+1,5)-D(I,5))/(TIME(I+1)-TIME(I))
C***  DETERMINE DIRECTION OF DERIVATIVE
      IF (DABS(PPI).NE.PPI) SN=-1.0D0
C***  CHECK MAGNITUDES OF STATIC PRESSURE DERIVATIVES AND APPLY SMALLEST
      IF (DABS(PPI).LE.DABS(PDPA))ASLP=DABS(PPI)
      IF (DABS(PPI).GT.DABS(PDPA))ASLP=DABS(PDPA)
C***  COMPUTE 'NEW' STATIC PRESSURE
      D(I+1,5)=D(I,5)+SN*ASLP*(TIME(I+1)-TIME(I))
   74 CONTINUE
C***  DEFINE STATIC AND STAGNATION PRESSURES
      DO 75 I=1,K
      ASPD(I)=D(I,4)
      D(I,7)=F1(I)
      P(I)=D(I,5)
      PA(I)=D(I,5)
      PS(I)=P(I)+0.5D0*PSL/(R*TSL)*D(I,4)**2
   75 CONTINUE
C***  COMPUTE LAG-CORRECTED STATIC PRESSURE AND QC
      MP=(3*NCH(1))/2
      MPA=(3*NCH(2))/2
      MPS=(3*NCH(3))/2
      MPP1=MP+1
      MPAP1=MPA+1
      MPSP1=MPS+1
      TD=TIME(K)-TIME(1)
C***  COMPUTE DEVIATIONS OF STATIC PRESSURES AND STAGNATION PRESSURE
      DO 76 I=1,K
      TX=TIME(I)-TIME(1)
      F1(I)=P(I)-(P(1)+(P(K)-P(1))/TD*TX)
      F2(I)=PA(I)-(PA(1)+(PA(K)-PA(1))/TD*TX)
   76 F3(I)=PS(I)-(PS(1)+(PS(K)-PS(1))/TD*TX)
C***  SET TIME CONSTANTS AND TIME INTERVALS TO ZERO IF SPECIFIED
      IF (JJJJ.EQ.1) GC TC 78
      DO 77 I=1,3
      XLM(I)=0.0D0
   77 TAU(I)=0.0D0
C***  COMPUTE AND SMOOTH FOURIER COEFFICIENTS OF AIRSPEED'S STATIC
C***  PRESSURE
   78 CALL FARAF(F1,K,MPP1,NCH(1))
C***  REGENERATE AIRSPEED'S SMOOTHED STATIC PRESSURE AT (TIME-LAMBDA)
      X1=A(1)
      DC 80 L=1,K
      TX=TIME(L)-TIME(1)-XLM(3)
      X2=P(1)+(P(K)-P(1))/TD*TX
      X3=0.0D0
      DC 79 N=2,MPP1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*(TIME(L)-XLM(3))/TT)+B(N)*DSIN(2*(N-1)*
     1PI*(TIME(L)-XLM(3))/TT)
   79 CONTINUE
      F1(L)=X1+X2+X3
   80 CONTINUE
C***  COMPUTE DERIVATIVE CF AIRSPEED'S STATIC PRESSURE AT (TIME-LAMBDA)
      XD1=(F(K)-P(1))/TD
      DO 82 L=1,K
      XD2=0.0D0
      DO 81 N=1,MP
      XD2=XD2+2*N*PI/TT*(-A(N+1)*DSIN(2*N*PI*(TIME(L)-XLM(3))/TT)+B(N+1)
     1*DCOS(2*N*PI*(TIME(I)-XLM(3))/TT))
   81 CONTINUE
      PD(L)=XD1+XD2
   82 CONTINUE
C***  COMPUTE FULLY LAG-CORRECTED STATIC PRESSURE FOR AIRSPEED
      DC 83 L=1,K
      P(L)=F1(L)+TAU(3)*PD(L)
      IF (L.EQ.K) P(L)=P(L-1)
   83 CONTINUE
C***  COMPUTE AND SMOOTH FOURIER COEFFICIENTS OF ALTITUDE'S STATIC
C***  PRESSURE
      CALL FARAF(F2,K,MPAP1,NCH(2))
C***  REGENERATE ALTITUDE'S SMOOTHED STATIC PRESSURE AT (TIME-LAMBDA)
      X1=A(1)
      DO 85 L=1,K
      TX=TIME(L)-TIME(1)-XLM(2)
      X2=PA(1)+(PA(K)-PA(1))/TD*TX
      X3=0.0D0
      DO 84 N=2,MPAP1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*(TIME(L)-XLM(2))/TT)+B(N)*DSIN(2*(N-1)*
     1PI*(TIME(L)-XLM(2))/TT)
   84 CONTINUE
      F2(L)=X1+X2+X3
   85 CONTINUE
C***  COMPUTE DERIVATIVE OF ALTITUDE'S STATIC PRESSURE AT (TIME-LAMBDA)
      XD1=(PA(K)-PA(1))/TD
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      DO 87 L=1,K
      XD2=0.0D0
      DO 86 N=1,NPA
      XD2=XD2+2*N*PI/TT*(-A(N+1)*DSIN(2*N*PI*(TIME(L)-XLH(2))/TT)+B(N+1)
     1*DCOS(2*N*PI*(TIME(L)-XLH(2))/TT))
   86 CONTINUE
      PD(L)=XD1+XD2
   87 CONTINUE
C***  COMPUTE FULLY LAG-CORRECTED STATIC PRESSURE FOR ALTITUDE
      DO 88 L=1,K
      PA(L)=P2(L)+TAU(2)*PD(L)
      IF (L.EQ.K) PA(L)=PA(L-1)
   88 CONTINUE
C***  COMPUTE AND SMOOTH FOURIER COEFFICIENTS OF STAGNATION PRESSURE
      CALL PARAF(P3,K,NPSP1,NCH(3))
C***  REGENERATE SMOOTHED STAGNATION PRESSURE AT (TIME-LAMBDA)
      X1=A(1)
      DO 90 L=1,K
      TX=TIME(L)-TIME(1)-XLH(1)
      X2=PS(1)+(PS(K)-PS(1))/TD*TX
      X3=0.0D0
      DO 89 N=2,NPSP1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*(TIME(L)-XLH(1))/TT)+B(N)*DSIN(2*(N-1)*
     1PI*(TIME(L)-XLH(1))/TT)
   89 CONTINUE
      P3(L)=X1+X2+X3
   90 CONTINUE
C***  COMPUTE DERIVATIVE OF STAGNATION PRESSURE AT (TIME-LAMBDA)
      XD1=(PS(K)-PS(1))/TD
      DO 92 L=1,K
      XD2=0.0D0
      DO 91 N=1,NPS
      XD2=XD2+2*N*PI/TT*(-A(N+1)*DSIN(2*N*PI*(TIME(L)-XLH(1))/TT)+B(N+1)
     1*DCOS(2*N*PI*(TIME(L)-XLH(1))/TT))
   91 CONTINUE
      PSD(L)=XD1+XD2
   92 CONTINUE
C***  COMPUTE FULLY LAG-CORRECTED STAGNATION PRESSURE
      DO 93 L=1,K
      PS(L)=P3(L)+TAU(1)*PSD(L)
      IF (L.EQ.K) PS(L)=PS(L-1)
   93 CONTINUE
      RPT=RHO*TSL/PSL
      DPQC=-2000.0D0
      NPTSM1=NPTS-1
C***  SPLINE FIT POSITION ERROR CORRECTION RATIO DP/QC' WITH RESPECT TO
C***  INDICATED AIRSPEED
      CALL SPLINE(NPTS,DPQCP,VE,AA)
C***  CALCULATE INDICATED AIRSPEED
      DO 97 I=1,K
C***  THE MEASURED INDICATED AIRSPEED IS USED IN CONJUNCTION WITH THE
C***  INDICATED POSITION-ERROR-CORRECTION AIRSPEED TO FIND DPQC
      VIND=ASPD(I)
C***  INTERPOLATE FOR APPLICATION OF CORRECTION RATIO
      IF (VIND.LT.VE(1)) DPQC=DPQCP(1)
      IF (VIND.GT.VE(NPTS)) DPQC=DPQCP(NPTS)
      IF (DPQC.EQ.DPQCP(1).OR.DPQC.EQ.DPQCP(NPTS)) GO TO 96
      DO 94 J=1,NPTSM1
      IF (VE(J).LE.VIND.AND.VE(J+1).GT.VIND) GO TO 95
   94 CONTINUE
      J=NPTSM1
   95 CX1=AA(1,J)
      CX2=AA(2,J)
      CX3=AA(3,J)
      CX4=AA(4,J)
C***  COMPUTE INTERPOLATED CORRECTION RATIO
      DPQC=((CX1*VIND+CX2)*VIND+CX3)*VIND+CX4
   96 PP=P(I)
      IF (DPQC.EQ.-2000.0D0)IERR=1
      IF (IERR.NE.0) GO TO 117
      PH=PA(I)
      PF=PS(I)-P(I)
      DP=DPQC*PF
      PL=PP+DP
      PLH=PH+DP
C***  COMPUTE STATIC TEMPERATURE FROM STAGNATION TEMPERATURE, DENSITY
C***  FROM STATIC PRESSURE, ALTITUDE FROM DENSITY, AND TRUE AIRSPEED
C***  FROM INDICATED AIRSPEED
      ST(I,1)=D(I,7)
      D(I,7)=D(I,7)/((1.0D0+PH/PF)/(PH/PF+DPQC))**((GAMMA-1.0D0)/GAMMA)
      ST(I,2)=D(I,5)
      D(I,5)=RPT*(PLH/D(I,7))
      D(I,9)=(1.0D0-(D(I,5)/RHO)**(1.0D0/4.26D0))/6.86D-6
      ST(I,3)=D(I,4)
      ST(I,4)=D(I,8)
      D(I,4)=DSQRT(2.0D0*GAMMA*PL/((GAMMA-1.0D0)*D(I,5))*(((1.0D0+PP/PF)
     1/(PP/PF+DPQC))**((GAMMA-1.0D0)/GAMMA)-1.0D0))
C***  CORRECT PITCH ANGLE AND ANGLE OF ATTACK FOR INSTRUMENT LOCATION
      IF (JJJJ.GT.1) GO TO 97
      D(I,2)=D(I,2)+PCCG
      D(I,6)=D(I,6)-DATAN(XACG*D(I,3)/D(I,4))
C***  CALIBRATE ANGLE OF ATTACK
      IF (CALP1.EQ.0.0D0)CALP1=1.0D0
      D(I,6)=CALP1*D(I,6)+CALP2
   97 CONTINUE
C***  CHECK FOR INITIAL PRINTOUT
      IF (JJJJ.GT.1) GO TO 116
C***  WRITE RESULTS IN COMPATIBLE UNITS
      IF (METRIC.NE.0) GO TO 109
C***  WRITE RESULTS IN ENGLISH UNITS
      WRITE (JWRITE,98)
   98 FORMAT (1X,//,31X,68('*'),/,31X,'*',66X,'*',/,31X,'*',6X,53HCONVER
     1SION OF INITIAL FLIGHT DATA TO COMPATIBLE UNITS,7X,'*',/,31X,'*',6
     16X,'*',/,31X,68('*'),/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X,'|
     1',19X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4HTI
     1ME,8X,'|',6X,6HWEIGHT,7X,'|',3X,11HPITCH ANGLE,5X,'|',4X,10HPITCH
     1RATE,5X,'|',5X,8HAIRSPEED,6X,'*',/,6X,'*',19X,'|',6X,6H(SECS),7X,'
     1|',7X,5H(LBF),7X,'|',4X,9H(RADIANS),6X,'|',3X,12H(RADIAN/SEC),4X,'
     1|',5X,8H(FT/SEC),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',1
     19X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 100 I=1,K
      WRITE (JWRITE,99) I,TIME(I),(D(I,J),J=1,4)
   99 FORMAT (6X,'*',7X,I3,9X,'|',6X,F7.3,6X,'|',5X,F9.3,5X,'|',3X,F11.7
     1,5X,'|',4X,F10.7,5X,'|',5X,F8.4,6X,'*')
  100 CONTINUE
      WRITE (JWRITE,101)
  101 FORMAT (6X,'*',119X,'*',/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X
     1,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4
     1HTIME,8X,'|',5X,7HDENSITY,7X,'|',2X,15HANGLE OF ATTACK,2X,'|',4X,1
     11HTEMPERATURE,4X,'|',3X,12HLONG. ACCEL.,4X,'*',/,6X,'*',19X,'|',6X
```

```
     1,6H(SECS),7X,'|',3X,12H(SLUG/FT**3),4X,'|',4X,9H(RADIANS),6X,'|',6
     1X,7H(DEG-R),6X,'|',4X,11H(FT/SEC**2),4X,'*',/,6X,'*',19X,'|',19X,'
     1|',19X,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 103 I=1,K
      WRITE (JWRITE,102) I,TIME(I),(D(I,J),J=5,8)
  102 FORMAT (6X,'*',7X,I3,9X,'|',6X,F7.3,6X,'|',4X,F10.8,5X,'|',4X,F11.
     17,4X,'|',4X,F9.2,6X,'|',4X,F9.5,6X,'*')
  103 CONTINUE
      WRITE (JWRITE,104)
  104 FORMAT (6X,'*',119X,'*',/,6X,121('*'))
      WRITE (JWRITE,105)
  105 FORMAT (6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',4X
     1,10HDATA POINT,5X,'|',7X,4HTIME,8X,'|',5X,8HALTITUDE,6X,'|',3X,12H
     1VERT. ACCEL.,4X,'|',2X,14HELEV. DEFLECT.,3X,'*',/,6X,'*',19X,'|',6
     1X,6H(SECS),7X,'|',6X,6H(FEET),7X,'|',4X,11H(FT/SEC**2),4X,'|',4X,9
     1H(RADIANS),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'*'
     1,/,6X,'*',99('-'),'*')
      DO 107 I=1,K
      WRITE (JWRITE,106) I,TIME(I),(D(I,J),J=9,11)
  106 FORMAT (6X,'*',7X,I3,9X,'|',6X,F7.3,6X,'|',4X,F10.3,5X,'|',4X,F9.5
     1,6X,'|',4X,F9.5,6X,'*')
  107 CONTINUE
      WRITE (JWRITE,108)
  108 FORMAT (6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'*',/,6X,101('*
     1'))
      GO TO 116
C***  WRITE RESULTS IN SI UNITS
  109 WRITE (JWRITE,110)
  110 FORMAT (1X,//,31X,68('*'),/,31X,'*',66X,'*',/,31X,'*',6X,53HCONVER
     1SION OF INITIAL FLIGHT DATA TO COMPATIBLE UNITS,7X,'*',/,31X,'*',6
     16X,'*',/,31X,68('*'),/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X,'|
     1',19X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4HTI
     1ME,8X,'|',6X,6HWEIGHT,7X,'|',3X,11HPITCH ANGLE,5X,'|',4X,10HPITCH
     1RATE,5X,'|',5X,8HAIRSPEED,6X,'*',/,6X,'*',19X,'|',6X,6H(SECS),7X,'
     1|',5X,9H(NEWTONS),5X,'|',4X,9H(RADIANS),6X,'|',3X,12H(RADIAN/SEC),
     14X,'|',6X,7H(M/SEC),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|
     1',19X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 111 I=1,K
      WS=D(I,1)*4.4482D0
      VS=D(I,4)*0.3048D0
      WRITE (JWRITE,99) I,TIME(I),WS,D(I,2),D(I,3),VS
  111 CONTINUE
      WRITE (JWRITE,112)
  112 FORMAT (6X,'*',119X,'*',/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X
     1,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4
     1HTIME,8X,'|',5X,7HDENSITY,7X,'|',2X,15HANGLE OF ATTACK,2X,'|',4X,1
     11HTEMPERATURE,4X,'|',3X,12HLONG. ACCEL.,4X,'*',/,6X,'*',19X,'|',6X
     1,6H(SECS),7X,'|',4X,9H(KG/M**3),6X,'|',5X,9H(RADIANS),5X,'|',6X,7H
     1(DEG-K),6X,'|',4X,10H(M/SEC**2),5X,'*',/,6X,'*',19X,'|',19X,'|',19
     1X,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 113 I=1,K
      DS=D(I,5)*515.38D0
      AS=D(I,8)*0.3048D0
      TK=D(I,7)*0.5555556D0
  113 WRITE (JWRITE,102) I,TIME(I),DS,D(I,6),TK,AS
      WRITE (JWRITE,104)
      WRITE (JWRITE,114)
  114 FORMAT (6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',4X
     1,10HDATA POINT,5X,'|',7X,4HTIME,8X,'|',5X,8HALTITUDE,6X,'|',3X,12H
     1VERT. ACCEL.,4X,'|',2X,14HELEV. DEFLECT.,3X,'*',/,6X,'*',19X,'|',6
     1X,6H(SECS),7X,'|',5X,8H(METERS),6X,'|',4X,10H(M/SEC**2),5X,'|',4X,
     19H(RADIANS),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'*
     1',/,6X,'*',99('-'),'*')
      DO 115 I=1,K
      HS=D(I,9)*0.3048D0
      VAS=D(I,10)*0.3048D0
      WRITE (JWRITE,106) I,TIME(I),HS,VAS,D(I,11)
  115 CONTINUE
      WRITE (JWRITE,108)
C***  ENACT FOURIER ANALYSIS AND FILTERING ROUTINE
  116 CALL SEC2(K,JJJJ,NUM,LSP,ITEST,S)
  117 IF (IERR.NE.0) WRITE (JWRITE,118)
  118 FORMAT (1X,////,15X,'USER ERROR***CONSULT USER INSTRUCTIONS***TO N
     1EXT DATA SET, IF ANY',////)
      IF (IERR.NE.0.OR.ITEST.NE.0) GO TO 120
  119 CONTINUE
  120 KJ=KJ+1
C***  CHECK FOR PRESENCE OF ADDITIONAL DATA SETS
      IF ((KJ-1).EQ.NSETS) GO TO 5
      IF (KJ.LE.NSETS) GO TO 3
C***  TERMINATE PROGRAM EXECUTION
  121 WRITE (JWRITE,122)
  122 FORMAT (1X,////,15X,56HINPUT PARAMETER NSETS IS PROBABLY SPECIFIED
     1 INCORRECTLY.,////)
C***  TERMINATE PLOT ROUTINES
  123 IF (JPLOT.NE.0) CALL PICSIZ(0.0,0.0)
      STOP
      END
```

```
      SUBROUTINE SEC2(K,JP,NUM,LSP,ITEST,S)
C
C***  SUBROUTINE SEC2 IS A SUBROUTINE THAT PERFORMS FOURIER ANALYSIS AND
C***  ATTEMPTS TO MAKE THE DATA MORE COMPATIBLE
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION TRG(21),IR(6),DY(450),DX(450),AX(450),FX(450),DV(450),HD
     1(450),H(450),IFS(11),IPRC(9),IP(14),NC(11),SS(450,11),LSP(9),TST(4
     150,16)
      COMMON TITLE(20),D(450,11),TIME(450),A(100),B(100),F1(450),F2(450)
     1,F3(450),F4(450),F5(450),F6(450),F7(450),F8(450),TT,RHO,PI,G,JKS,M
     1ETRIC,JREAD,JWRITE,JPUNCH,IERR
      COMMON /CARRY/F11(450),F12(450)
      COMMON /TEMP1/ST(450,4),PAR(6),PSL,TSL,IPAR
      COMMON /TEMP2/F9(450),F10(450),F13(450),F14(450),AP(6),W(6)
      COMMON /BCM/IBS(10,6)
      DATA TRG/.0D0,5.0D0,10.0D0,15.0D0,20.0D0,25.0D0,30.0D0,35.0D0,40.0
     1D0,45.0D0,50.0D0,55.0D0,60.0D0,65.0D0,70.0D0,75.0D0,80.0D0,85.0D0,
     190.0D0,95.0D0,100.0D0/,NS/15/,NI/3/
C
C
C
C***  CHECK ON BYPASS
      IF (JP.GT.1) GO TO 10
C
C
      READ (JREAD,1) (IFS(I),I=1,11)
    1 FORMAT (11I1)
C
```

```
C
      READ (JREAD,2) (IPRC(I),I=1,9),XAX,FAC1,FAC2,DSPS
    2 FORMAT (9I1,1X,4D15.0)
C
C***  CHECK FOR INPUT ERROR
      IF (IPRC(1).NE.0.AND.IPRC(2).EQ.2) GO TO 64
C
C
      READ (JREAD,3) (IP(I),I=1,14)
    3 FORMAT (14I1)
C
C
      READ (JREAD,4) (NC(I),I=1,11)
    4 FORMAT (11I5)
C
C
      READ (JREAD,5) (AP(I),W(I),I=1,6)
    5 FORMAT (2D20.0)
C
C
      NUMX=NUM-1
      IF(NUMX.EQ.0) NUMX=1
      DO 8 J=1,NUMX
      READ (JREAD,6) (IR(I),I=1,6)
    6 FORMAT (6I1)
C
C
C
      DO 7 JJ=1,6
    7 IRS(J,JJ)=IR(JJ)
    8 CONTINUE
C***  CHECK FOR ZERO OR NEAR-ZERO A PRIORI VALUE
      DO 9 I=1,6
      IF (DABS(AP(I)).LT.1.0D-10)AP(I)=1.0D-10
    9 CONTINUE
C***  ADJUST TO ODD NUMBER OF POINTS
   10 IF (((K/2)*2).EQ.K) K=K-1
      K1=K
      TT=TIME(K)-TIME(1)
C***  DEFINE NEW ARRAYS
      DO 11 I=1,K
C***  DEFINE WEIGHT
      F1(I)=D(I,1)
C***  DEFINE PITCH ANGLE
      F2(I)=D(I,2)
C***  DEFINE PITCH RATE
      F3(I)=D(I,3)
C***  DEFINE AIRSPEED
      F4(I)=D(I,4)
C***  DEFINE DENSITY
      F5(I)=D(I,5)
C***  DEFINE ANGLE OF ATTACK
      F6(I)=D(I,6)
C***  DEFINE TEMPERATURE
      F7(I)=D(I,7)
C***  DEFINE LONGITUDINAL ACCELERATION
      F8(I)=D(I,8)
      AX(I)=D(I,8)
C***  DEFINE ALTITUDE
      F10(I)=D(I,9)
C***  INITIALIZE ALTITUDE RATE
      F11(I)=0.0D0
C***  DEFINE VERTICAL ACCELERATION
      F13(I)=D(I,10)
C***  DEFINE ELEVATOR (OR STABILATOR) DEFLECTION
      F14(I)=D(I,11)
   11 CONTINUE
C***  STORE INITIAL DATA FOR PLOTTING
      IF (IPRC(5).NE.0.OR.JP.NE.1) GO TO 13
      DO 12 I=1,K
      DO 12 J=1,11
   12 SS(I,J)=D(I,J)
C***  CHECK FOR OVERALL FOURIER SERIES ANALYSIS
   13 IF (IPRC(4).NE.0) GO TO 92
C***  COMPUTE TERMINATION HARMONICS
      M1=(3*NC(1))/2
      M2=(3*NC(2))/2
      M3=(3*NC(3))/2
      M4=(3*NC(4))/2
      M5=(3*NC(5))/2
      M6=(3*NC(6))/2
      M7=(3*NC(7))/2
      M8=(3*NC(8))/2
      M9=(3*NC(9))/2
      M10=(3*NC(10))/2
      M11=(3*NC(11))/2
C***  CHECK FOR INCORRECT INPUT
      IF ((((IFS(1).EQ.0.AND.M1.LE.0).OR.((IFS(2).EQ.0.AND.M2.LE.0).OR.(
     1IFS(3).EQ.0.AND.M3.LE.0))).OR.(((IFS(4).EQ.0.AND.M4.LE.0).OR.(IFS(
     15).EQ.0.AND.M5.LE.0)).OR.((IFS(6).EQ.0.AND.M6.LE.0).OR.(IFS(7).EQ.
     10.AND.M7.LE.0)))).OR.((((IFS(8).EQ.0.AND.M8.LE.0).OR.(IFS(9).EQ.0.
     1AND.M9.LE.0)).OR.((IFS(10).EQ.0.AND.M10.LE.0).OR.(IFS(11).EQ.0.AND
     1.M11.LE.0))))) GO TO 126
C***  COMPUTE DEVIATIONS FOR TIME HISTORIES
      TD=TIME(K)-TIME(1)
      DO 23 I=1,K
      TX=TIME(I)-TIME(1)
      IF (IFS(1).NE.0) GO TO 14
      F1(I)=D(I,1)-(D(1,1)+(D(K,1)-D(1,1))/TD*TX)
   14 IF (IFS(2).NE.0) GO TO 15
      F2(I)=D(I,2)-(D(1,2)+(D(K,2)-D(1,2))/TD*TX)
   15 IF (IFS(3).NE.0) GO TO 16
      F3(I)=D(I,3)-(D(1,3)+(D(K,3)-D(1,3))/TD*TX)
   16 IF (IFS(4).NE.0) GO TO 17
      F4(I)=D(I,4)-(D(1,4)+(D(K,4)-D(1,4))/TD*TX)
   17 IF (IFS(5).NE.0) GO TO 18
      F5(I)=D(I,5)-(D(1,5)+(D(K,5)-D(1,5))/TD*TX)
   18 IF (IFS(6).NE.0) GO TO 19
      F6(I)=D(I,6)-(D(1,6)+(D(K,6)-D(1,6))/TD*TX)
   19 IF (IFS(7).NE.0) GO TO 20
      F7(I)=D(I,7)-(D(1,7)+(D(K,7)-D(1,7))/TD*TX)
   20 IF (IFS(9).NE.0) GO TO 21
      F10(I)=D(I,9)-(D(1,9)+(D(K,9)-D(1,9))/TD*TX)
   21 IF (IFS(10).NE.0) GO TO 22
      F13(I)=D(I,10)-(D(1,10)+(D(K,10)-D(1,10))/TD*TX)
   22 IF (IFS(11).NE.0) GO TO 23
      F14(I)=D(I,11)-(D(1,11)+(D(K,11)-D(1,11))/TD*TX)
   23 CONTINUE
      IF (IFS(1).NE.0) GO TO 26
C***  PERFORM FOURIER ANALYSIS ON WEIGHT TIME HISTORY
```

```
      M1P1=M1+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL FABAF(F1,K,M1P1,NC(1))
C***  REGENERATE WEIGHT TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 25 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,1)+(D(K,1)-D(1,1))/TD*TX
      X3=0.0D0
      DO 24 N=2,M1P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   24 CONTINUE
   25 F1(L)=X1+X2+X3
   26 IF (IFS(2).NE.0) GO TO 29
C***  PERFORM FOURIER ANALYSIS ON PITCH ANGLE TIME HISTORY
      M2P1=M2+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL FABAF(F2,K,M2P1,NC(2))
C***  REGENERATE PITCH ANGLE TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 28 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,2)+(D(K,2)-D(1,2))/TD*TX
      X3=0.0D0
      DO 27 N=2,M2P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   27 CONTINUE
   28 F2(L)=X1+X2+X3
   29 IF (IFS(3).NE.0) GO TO 32
C***  PERFORM FOURIER ANALYSIS ON PITCH RATE TIME HISTORY
      M3P1=M3+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL FABAF(F3,K,M3P1,NC(3))
C***  REGENERATE PITCH RATE TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 31 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,3)+(D(K,3)-D(1,3))/TD*TX
      X3=0.0D0
      DO 30 N=2,M3P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   30 CONTINUE
   31 F3(L)=X1+X2+X3
C***  INTEGRATE PITCH RATE TO OBTAIN PITCH ANGLE, IF DESIRED
      PA1=F2(1)
      IF (IPRC(7).NE.0) CALL TRAP(K,TIME,F3,F2,PA1)
   32 IF (IFS(4).NE.0) GO TO 37
C***  PERFORM FOURIER ANALYSIS ON AIRSPEED TIME HISTORY
      M4P1=M4+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL FABAF(F4,K,M4P1,NC(4))
C***  REGENERATE AIRSPEED TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 34 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,4)+(D(K,4)-D(1,4))/TD*TX
      X3=0.0D0
      DO 33 N=2,M4P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   33 CONTINUE
   34 F4(L)=X1+X2+X3
      IF (IPRC(1).NE.0) GO TO 37
C***  COMPUTE ACCELERATION (DERIVATIVE OF AIRSPEED) TIME HISTORY
      XD1=(D(K,4)-D(1,4))/TD
      DO 36 L=1,K
      XD2=0.0D0
      DO 35 N=1,M4
      XD2=XD2+2*N*PI/TT*(-A(N+1)*DSIN(2*N*PI*TIME(L)/TT)+B(N+1)*DCOS(2*N
     1*PI*TIME(L)/TT))
   35 CONTINUE
   36 F8(L)=XD1+XD2
C***  CHECK FOR ACCELERATION-INPUT-OPTION COMPATIBILITY
   37 IF (IFS(4).NE.0.AND.IPRC(1).EQ.0)IPRC(1)=1
      IF (IFS(5).NE.0) GO TO 40
C***  PERFORM FOURIER ANALYSIS ON DENSITY TIME HISTORY
      M5P1=M5+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL FABAF(F5,K,M5P1,NC(5))
C***  REGENERATE DENSITY TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 39 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,5)+(D(K,5)-D(1,5))/TD*TX
      X3=0.0D0
      DO 38 N=2,M5P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   38 CONTINUE
   39 F5(L)=X1+X2+X3
   40 IF (IFS(6).NE.0) GO TO 45
C***  PERFORM FOURIER ANALYSIS ON ANGLE-OF-ATTACK TIME HISTORY
      M6P1=M6+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL FABAF(F6,K,M6P1,NC(6))
C***  REGENERATE ANGLE-OF-ATTACK TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 42 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,6)+(D(K,6)-D(1,6))/TD*TX
      X3=0.0D0
      DO 41 N=2,M6P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   41 CONTINUE
   42 F6(L)=X1+X2+X3
      IF (IPRC(3).NE.0) GO TO 45
C***  COMPUTE ANGLE-OF-ATTACK RATE TIME HISTORY
      XD1=(D(K,6)-D(1,6))/TD
      DO 44 L=1,K
      XD2=0.0D0
      DO 43 N=1,M6
      XD2=XD2+2*N*PI/TT*(-A(N+1)*DSIN(2*N*PI*TIME(L)/TT)+B(N+1)*DCOS(2*N
     1*PI*TIME(L)/TT))
   43 CONTINUE
   44 F9(L)=XD1+XD2
      IF (IFS(6).EQ.0.AND.IPRC(3).EQ.0) GO TO 47
```

```
   45 IPRC(3)=1
      IF (IFS(6).NE.0) WRITE (JWRITE,46)
   46 FORMAT (1X,////,15X,9CHWARNING -> ANGLE-OF-ATTACK RATE WAS COMPUTE
     1D USING UNSMOOTHED ANGLE-OF-ATTACK TIME HISTORY,////)
      CALL FNI(K,F6,TIME,F9,DY,1,NS,NI)
   47 IF (IFS(7).NE.0) GO TO 50
C***  PERFORM FOURIER ANALYSIS ON TEMPERATURE TIME HISTORY
      M7P1=M7+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL PARAF(F7,K,M7P1,NC(7))
C***  REGENERATE TEMPERATURE TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 49 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,7)+(D(K,7)-D(1,7))/TD*TX
      X3=0.0D0
      DO 48 N=2,M7P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   48 CONTINUE
   49 F7(L)=X1+X2+X3
C***  PERFORM FOURIER ANALYSIS ON LONGITUDINAL ACCELERATION TIME HISTORY
   50 LLX=0
      GO TO 53
   51 IF (IPRC(2).LT.0.OR.IPRC(2).GE.2) GO TO 60
      IF (IPRC(2).NE.0.AND.IPRC(1).NE.0) IPRC(1)=0
C***  CONVERT LONGITUDINAL ACCELERATION INTO 'COMPATIBLE' ACCELERATION
      DO 52 JJ=1,K
      D(JJ,8)=(AX(JJ)-G*DSIN(F2(JJ))+XAX*F3(JJ)*F3(JJ))/DCOS(F6(JJ))+F4(
     1JJ)*(F9(JJ)-F3(JJ))*(DSIN(F6(JJ))/DCOS(F6(JJ)))
      IF (IPRC(8).EQ.0) GO TO 52
      DV(JJ)=D(JJ,8)
      D(JJ,8)=AX(JJ)
   52 CONTINUE
      IF (IPRC(8).NE.0) GO TO 53
      IF (IPRC(2).EQ.1) GO TO 60
C***  COMPUTE DEVIATIONS FOR LONGITUDINAL ACCELERATION
   53 DO 54 I=1,K
      TX=TIME(I)-TIME(1)
   54 FX(I)=D(I,8)-(D(1,8)+(D(K,8)-D(1,8))/TD*TX)
      M8P1=M8+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL PARAF(FX,K,M8P1,NC(8))
C***  REGENERATE ACCELERATION TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 56 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,8)+(D(K,8)-D(1,8))/TD*TX
      X3=0.0D0
      DO 55 N=2,M8P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   55 CONTINUE
      DY(L)=X1+X2+X3
      IF (LLX.EQ.0) ST(L,4)=DY(L)
   56 CONTINUE
      IF (LLX.NE.0) GO TO 57
      LLX=1
      GO TO 51
   57 DO 59 JJ=1,K
      IF (IPRC(8).EQ.0) GO TO 58
      D(JJ,8)=DV(JJ)
      DV(JJ)=DY(JJ)
      GO TO 59
   58 D(JJ,8)=DY(JJ)
   59 CONTINUE
C***  ARRANGE FOR CORRECT LISTING
   60 IF (IPRC(2).EQ.0.AND.IPRC(1).NE.0) GO TO 61
      GO TO 63
   61 DO 62 JJ=1,K
      F8(JJ)=D(JJ,8)
   62 D(JJ,8)=AX(JJ)
   63 IF (IPRC(1).NE.0.AND.IPRC(2).EQ.2) GO TO 64
      GO TO 66
   64 WRITE (JWRITE,65)
   65 FORMAT (1X,///,5X,'THE VALUES OF IPRC(1) AND IPRC(2) ARE NOT COMPA
     1TIBLE.  RETURNING TO NEXT DATA SET, IF ANY.',///)
      IERR=1
      RETURN
   66 IF (IFS(9).NE.0) GO TO 71
C***  PERFORM FOURIER ANALYSIS ON ALTITUDE TIME HISTORY
      M9P1=M9+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL PARAF(F10,K,M9P1,NC(9))
C***  REGENERATE ALTITUDE TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 68 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,9)+(D(K,9)-D(1,9))/TD*TX
      X3=0.0D0
      DO 67 N=2,M9P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   67 CONTINUE
      F10(L)=X1+X2+X3
C***  ADJUST DENSITY TO BE COMPATIBLE WITH ALTITUDE
      IF (IFS(5).NE.0) F5(L)=RHO*(1.0D0-6.86D-06*F10(L))**4.26D0
   68 CONTINUE
C***  COMPUTE DERIVATIVE OF ALTITUDE TIME HISTORY
      XD1=(D(K,9)-D(1,9))/TD
      DO 70 L=1,K
      XD3=0.0D0
      XD2=0.0D0
      DO 69 N=1,M9
      XD2=XD2+2*N*PI/TT*(-A(N+1)*DSIN(2*N*PI*TIME(L)/TT)+B(N+1)*DCOS(2*N
     1*PI*TIME(L)/TT))
      XD3=XD3-(2*N*PI/TT)**2*(A(N+1)*DCOS(2*N*PI*TIME(L)/TT)+B(N+1)*DSIN
     1(2*N*PI*TIME(L)/TT))
   69 CONTINUE
      F12(L)=XD3
   70 F11(L)=XD1+XD2
   71 IF (IFS(9).EQ.0) GO TO 73
      WRITE (JWRITE,72)
   72 FORMAT (1X,////,15X,86HWARNING -> ALTITUDE  DERIVATIVES  WERE COMP
     1UTED USING UNSMOOTHED ALTITUDE TIME HISTORY,////)
      CALL FNI(K,F10,TIME,F11,F12,2,NS,NI)
   73 IF (IPRC(8).EQ.0) GO TO 83
      IF (IPRC(8).GE.2) GO TO 80
C***  USING NEWTON-RAPHSON METHOD, FIND COMPATIBLE ANGLE OF ATTACK
      LCNT=0
```

```
      DO 78 L=1,K
      ITR=0
      ALP=F6(L)
      XP1=G*F11(L)/F4(L)+F8(L)
      XP2=G*DSQRT(1.0D0-(F11(L)/F4(L))**2)+(F4(L)*F12(L)-F11(L)*F8(L))/(
     1F4(L)*DSQRT(1.0D0-(F11(L)/F4(L))**2))
   74 ITR=ITR+1
      FN=AX(L)-XP1*DCOS(ALP)-XP2*DSIN(ALP)+XAX*F3(L)*F3(L)
      FNP=XP1*DSIN(ALP)-XP2*DCOS(ALP)
      FNPP=XP1*DCOS(ALP)+XP2*DSIN(ALP)
      RAD=(FNP/FNPP)*(FNP/FNPP)-2.0D0*(FN/FNPP)
      ALP1=ALP
      IF (RAD.LT.0.0D0) GO TO 76
      IF ((FNP*FNPP).LT.0.0D0) GO TO 75
      ALP=ALP-FNP/FNPP+DSQRT(RAD)
      GO TO 77
   75 ALP=ALP-FNP/FNPP-DSQRT(RAD)
      GO TO 77
   76 ALP=ALP-FNP/FNPP
      LCNT=LCNT+1
      GO TO 78
   77 IF (DABS(ALP1-ALP).LT.1.0D-15.OR.ITR.EQ.20) GO TO 78
      GO TO 74
   78 F6(L)=ALP
      IF (LCNT.NE.0) WRITE (JWRITE,79) LCNT
   79 FORMAT (1X,//,18X,104H*** DURING NEWTON-RAPHSON TO FIND COMPATIBLE
     1 ANGLE OF ATTACK, THE ROUTINE WISHED TO SEEK  COMPLEX  ROOTS,I3,7H
     1 TIMES.,//)
      GO TO 83
C***  FIND COMPATIBLE DERIVATIVE OF FLIGHT-PATH ANGLE
   80 DO 81 L=1,K
   81 DY(L)=(AX(L)-G*DSIN(F2(L))+XAX*F3(L)*F3(L)-F8(L)*DCOS(F6(L)))/(F4(
     1L)*DSIN(F6(L)))
      G0=F2(1)-F6(1)
C***  INTEGRATE DERIVATIVE OF FLIGHT-PATH ANGLE
      CALL TRAP(K,TIME,DY,DX,G0)
C***  COMPUTE ALTITUDE RATE
      DO 82 L=1,K
   82 HD(L)=F4(L)*DSIN(DX(L))
      H0=F10(1)
C***  INTEGRATE ALTITUDE RATE
      CALL TRAP(K,TIME,HD,H,H0)
   83 IF (IPRC(9).EQ.0) GO TO 86
C***  FIND AN INERTIAL-COMPATIBLE ALTITUDE AND DENSITY
      H0=F10(1)
      DO 84 L=1,K
      CALL SEC4(L,K,XAX)
   84 DX(L)=F4(L)*DSIN(F2(L)-F6(L))
      CALL TRAP(K,TIME,DX,DY,H0)
      DO 85 L=1,K
      F10(L)=FAC1*F10(L)+FAC2*DY(L)
   85 F5(L)=RHO*(1.0D0-6.86D-6*F10(L))**4.26D0
      CALL FNI(K,F10,TIME,F11,F12,2,NS,NI)
   86 IF (IFS(10).NE.0) GO TO 89
C***  PERFORM FOURIER ANALYSIS ON VERTICAL ACCELERATION
      M10P1=M10+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL FARAF(F13,K,M10P1,NC(10))
C***  REGENERATE VERTICAL ACCELERATION TIME HISTORY (SMOOTHED)
      X1=A(1)
      DO 88 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,10)+(D(K,10)-D(1,10))/TD*TX
      X3=0.0D0
      DO 87 N=2,M10P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   87 CONTINUE
   88 F13(L)=X1+X2+X3
   89 IF (IFS(11).NE.0) GO TO 92
C***  PERFORM FOURIER ANALYSIS ON ELEVATOR (OR STABILATOR) DEFLECTION
      M11P1=M11+1
C***  COMPUTE FOURIER SERIES COEFFICIENTS
      CALL FARAF(F14,K,M11P1,NC(11))
C***  REGENERATE (ELEVATOR/STABILATOR) DEFLECTION TIME HISTORY(SMOOTHED)
      X1=A(1)
      DO 91 L=1,K
      TX=TIME(L)-TIME(1)
      X2=D(1,11)+(D(K,11)-D(1,11))/TD*TX
      X3=0.0D0
      DO 90 N=2,M11P1
      X3=X3+A(N)*DCOS(2*(N-1)*PI*TIME(L)/TT)+B(N)*DSIN(2*(N-1)*PI*TIME(L
     1)/TT)
   90 CONTINUE
   91 F14(L)=X1+X2+X3
C***  WRITE INPUT PARAMETERS
   92 IF (JF.NE.1) GO TO 96
      WRITE (JWRITE,93) IFS(1),NC(1),IP(1),IP(13),IFS(2),NC(2),IP(2),IP(
     114),IFS(3),NC(3),IP(3),IPRC(1),IFS(4),NC(4),IP(4),IPRC(2),IFS(5),N
     1C(5),IP(5),IPRC(3),IFS(6),NC(6),IP(6),IPRC(4),IFS(7),NC(7),IP(7),I
     1PRC(5),IFS(8),NC(8),IP(8),IPRC(6),IFS(9),NC(9),IP(9),IPRC(7),IFS(1
     10),NC(10),IP(10),IPRC(8),IFS(11),NC(11),IP(11),IPRC(9),XAX,IP(12)
   93 FORMAT (1H1,////,42X,48('_'),/,42X,'|',46X,'|',/,42X,'|',10X,26HSE
     1CTION 2 INPUT PARAMETERS,10X,'|',/,42X,'|',46X,'|',/,42X,'|',2X,'I
     1FS(1)=',I2,2X,'NC(1)=',I3,2X,'IP(1)=',I2,2X,'IP(13)=',I2,3X,'|',/,
     142X,'|',2X,'IFS(2)=',I2,2X,'NC(2)=',I3,2X,'IP(2)=',I2,2X,'IP(14)='
     1,I2,3X,'|',/,42X,'|',2X,'IFS(3)=',I2,2X,'NC(3)=',I3,2X,'IP(3)=',I2
     1,2X,'IPRC(1)=',I2,2X,'|',/,42X,'|',2X,'IFS(4)=',I2,2X,'NC(4)=',I3,
     12X,'IP(4)=',I2,2X,'IPRC(2)=',I2,2X,'|',/,42X,'|',2X,'IFS(5)=',I2,2
     1X,'NC(5)=',I3,2X,'IP(5)=',I2,2X,'IPRC(3)=',I2,2X,'|',/,42X,'|',2X,
     1'IFS(6)=',I2,2X,'NC(6)=',I3,2X,'IP(6)=',I2,2X,'IPRC(4)=',I2,2X,'|'
     1,/,42X,'|',2X,'IFS(7)=',I2,2X,'NC(7)=',I3,2X,'IP(7)=',I2,2X,'IPRC(
     15)=',I2,2X,'|',/,42X,'|',2X,'IFS(8)=',I2,2X,'NC(8)=',I3,2X,'IP(8)=
     1',I2,2X,'IPRC(6)=',I2,2X,'|',/,42X,'|',2X,'IFS(9)=',I2,2X,'NC(9)='
     1,I3,2X,'IP(9)=',I2,2X,'IPRC(7)=',I2,2X,'|',/,42X,'|',2X,'IFS(10)='
     1,I1,2X,'NC(10)=',I2,2X,'IP(10)=',I1,2X,'IPRC(8)=',I2,2X,'|',/,42X,
     1'|',2X,'IFS(11)=',I1,2X,'NC(11)=',I2,2X,'IP(11)=',I1,2X,'IPRC(9)='
     1,I2,2X,'|',/,42X,'|',2X,'XAX=',F12.8,6X,'IP(12)=',I1,14X,'|',/,36X
     1,6('_'),'|',46X,'|',6('_'),/,36X,'|',58X,'|')
      WRITE (JWRITE,94) (I,AP(I),I,W(I),I=1,6)
   94 FORMAT (36X,'| AP(',I1,')=',1PD19.12,7X,'W(',I1,')=',1PD19.12,' |'
     1)
      WRITE (JWRITE,95)
   95 FORMAT (36X,'|',58('_'),'|',///)
C***  TEMPORARILY STORE VALUES
   96 DO 97 I=1,K
      TST(I,1)=D(I,1)
      TST(I,2)=F2(I)
      TST(I,3)=D(I,2)
      TST(I,4)=F3(I)
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      TST(I,5)=D(I,3)
      TST(I,6)=ST(I,3)
      TST(I,7)=F4(I)
      TST(I,8)=ST(I,2)
      TST(I,9)=F6(I)
      TST(I,10)=D(I,6)
      TST(I,11)=F9(I)
      TST(I,12)=ST(I,1)
      TST(I,13)=ST(I,4)
      TST(I,14)=F8(I)
      TST(I,15)=F13(I)
      TST(I,16)=F14(I)
   97 CONTINUE
      KS=K
C***  EXACT MINIMIZATION TECHNIQUE
      CALL SEC3(K,XAI,LSP,ITEST,JE,NUM,DSPS)
      IF (IERR.NE.0) RETURN
      IF (ITEST.EQ.0) GO TO 99
C***  REDEFINE PARAMETERS TO PREVIOUS ITERATIONS
      K=KS
      DO 98 I=1,K
      D(I,1)=TST(I,1)
      F2(I)=TST(I,2)
      D(I,2)=TST(I,3)
      F3(I)=TST(I,4)
      D(I,3)=TST(I,5)
      D(I,4)=TST(I,6)
      F4(I)=TST(I,7)
      D(I,5)=TST(I,8)
      F6(I)=TST(I,9)
      D(I,6)=TST(I,10)
      F9(I)=TST(I,11)
      D(I,8)=TST(I,13)
      F8(I)=TST(I,14)
      F13(I)=TST(I,15)
      F14(I)=TST(I,16)
   98 CONTINUE
   99 IF (JP.NE.NUM.AND.ITEST.EQ.0) GO TO 125
C***  CHECK FOR OVERALL PLOT OPTION
      IF (IPRC(5).NE.0) GO TO 102
C***  RESET WITH INITIAL DATA
      DO 100 I=1,K
      DO 100 J=1,11
  100 D(I,J)=SS(I,J)
      JKS=1
C***  DEFINE PLOT CODES
C***  WARNING-- WARNING-- THE FOLLOWING PLOTTING ROUTINES MAY NOT BE
C***  COMPATIBLE FOR OTHER INSTALLATIONS.  THE USER SHOULD INQUIRE AT
C***  HIS INSTALLATION'S PROGRAMMING SERVICES.
C***  COMPUTE TIME SPACING FOR PLOTTING
      TORG=TIME(K)
      DO 101 I=2,21
      IF (TORG.GT.TRG(I-1).AND.TORG.LE.TRG(I))TPTP=TRG(I)
      IF (TORG.EQ.TRG(I-1))TPTP=TRG(I-1)
  101 CONTINUE
      CALL PLOTIT(K,TPTP,IP,IPS,IPEC,H,HD,XAX)
  102 IF (METRIC.NE.0) GO TO 113
C***  WRITE RESULTS IN ENGLISH UNITS
      WRITE (JWRITE,103)
  103 FORMAT (1X,//,31X,68('*'),/,31X,'*',66X,'*',/,31X,'*',8X,48HFOURIE
     1R SERIES ANALYSIS WITH SPECIFIED HARMONICS,10X,'*',/,31X,'*',66X,'
     1*',/,31X,68('*'),/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X,'|',19
     1X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4HTIME,8
     1X,'|',6X,6HWEIGHT,7X,'|',3X,11HPITCH ANGLE,5X,'|',4X,10HPITCH RATE
     1,5X,'|',5X,8HAIRSPEED,6X,'*',/,6X,'*',19X,'|',6X,6H(SECS),7X,'|',7
     1X,5H(LBF),7X,'|',4X,9H(RADIANS),6X,'|',3X,12H(RADIAN/SEC),4X,'|',5
     1X,8H(FT/SEC),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'
     1|',19X,'*',/,6X,'*',119('-'),'*')
      DO 104 I=1,K
  104 WRITE (JWRITE,105) I,TIME(I),F1(I),F2(I),F3(I),F4(I)
  105 FORMAT (6X,'*',7X,I3,9X,'|',6X,F7.3,6X,'|',5X,F9.3,5X,'|',3X,F11.7
     1,5X,'|',4X,F10.7,5X,'|',5X,F8.4,6X,'*')
      WRITE (JWRITE,106)
  106 FORMAT (6X,'*',119X,'*',/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X
     1,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4
     1HTIME,8X,'|',5X,7HDENSITY,7X,'|',2X,15HANGLE OF ATTACK,2X,'|',4X,1
     11HTEMPERATURE,4X,'|',3X,12HACCELERATION,4X,'*',/,6X,'*',19X,'|',6X
     1,6H(SECS),7X,'|',3X,12H(SLUG/FT**3),4X,'|',4X,9H(RADIANS),6X,'|',6
     1X,7H(DEG-R),6X,'|',4X,11H(FT/SEC**2),4X,'*',/,6X,'*',19X,'|',19X,'
     1|',19X,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 107 I=1,K
  107 WRITE (JWRITE,108) I,TIME(I),F5(I),F6(I),F7(I),F8(I)
  108 FORMAT (6X,'*',7X,I3,9X,'|',6X,F7.3,6X,'|',4X,F10.8,5X,'|',4X,F11.
     17,4X,'|',7X,F6.2,6X,'|',4X,F9.5,6X,'*')
      WRITE (JWRITE,109)
  109 FORMAT (6X,'*',119X,'*',/,6X,121('*'))
      WRITE (JWRITE,110)
  110 FORMAT (6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X
     1,'|',16X,'*',/,6X,'*',1X,10HDATA POINT,1X,'|',3X,4HTIME,3X,'|',1X,
     120HANGLE-OF-ATTACK RATE,1X,'|',1X,8HALTITUDE,1X,'|',1X,13HALTITUDE
     1 RATE,1X,'|',1X,11HALT. ACCEL.,1X,'|',1X,12HVERT. ACCEL.,1X,'|',1X
     1,14HELEV. DEFLECT.,1X,'*',/,6X,'*',12X,'|',2X,6H(SECS),2X,'|',5X,1
     12H(RADIAN/SEC),5X,'|',3X,4H(FT),3X,'|',4X,8H(FT/SEC),3X,'|',1X,11H
     1(FT/SEC**2),1X,'|',2X,11H(FT/SEC**2),1X,'|',3X,9H(RADIANS),4X,'*',
     1/,6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X,'|',1
     16X,'*',/,6X,'*',119('-'),'*')
      WRITE (JWRITE,111) (I,TIME(I),F9(I),F10(I),F11(I),F12(I),F13(I),F1
     14(I),I=1,K1)
  111 FORMAT (6X,'*',4X,I4,4X,'|',2X,F6.3,2X,'|',5X,F12.9,5X,'|',1X,F8.2
     1,1X,'|',4X,F7.2,4X,'|',2X,F8.2,3X,'|',4X,F6.2,4X,'|',4X,F8.5,4X,'*
     1')
      WRITE (JWRITE,112)
  112 FORMAT (6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X
     1,'|',16X,'*',/,6X,121('*'))
      GO TO 120
C***  WRITE RESULTS IN SI UNITS
  113 WRITE (JWRITE,114)
  114 FORMAT (1X,//,31X,68('*'),/,31X,'*',66X,'*',/,31X,'*',8X,48HFOURIE
     1R SERIES ANALYSIS WITH SPECIFIED HARMONICS,10X,'*',/,31X,'*',66X,'
     1*',/,31X,68('*'),/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X,'|',19
     1X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4HTIME,8
     1X,'|',6X,6HWEIGHT,7X,'|',3X,11HPITCH ANGLE,5X,'|',4X,10HPITCH RATE
     1,5X,'|',5X,8HAIRSPEED,6X,'*',/,6X,'*',19X,'|',6X,6H(SECS),7X,'|',5
     1X,9H(NEWTONS),5X,'|',4X,9H(RADIANS),6X,'|',3X,12H(RADIAN/SEC),4X,'
     1|',6X,7H(M/SEC),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19
     1X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 115 I=1,K
      WS=F1(I)*4.4482D0
      VS=F4(I)*0.3048D0
  115 WRITE (JWRITE,105) I,TIME(I),WS,F2(I),F3(I),VS
```

```
      WRITE (JWRITE,116)
  116 FORMAT (6X,'*',119X,'*',/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X
     1,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4
     1HTIME,8X,'|',5X,7HDENSITY,7X,'|',2X,15HANGLE OF ATTACK,2X,'|',4X,1
     11HTEMPERATURE,4X,'|',3X,12HACCELERATION,4X,'*',/,6X,'*',19X,'|',6X
     1,6H(SECS),7X,'|',4X,9H(KG/M**3),6X,'|',4X,9H(RADIANS),6X,'|',6X,7H
     1(DEG-K),6X,'|',4X,10H(M/SEC**2),5X,'*',/,6X,'*',19X,'|',19X,'|',19
     1X,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 117 I=1,K
      DS=F5(I)*515.38D0
      AS=F8(I)*0.3048D0
      TK=F7(I)*0.5555556D0
  117 WRITE (JWRITE,108) I,TIME(I),DS,F6(I),TK,AS
      WRITE (JWRITE,109)
      WRITE (JWRITE,110)
  118 FORMAT (6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X
     1,'|',16X,'*',/,6X,'*',1X,10HDATA POINT,1X,'|',3X,4HTIME,3X,'|',1X,
     120HANGLE-OF-ATTACK RATE,1X,'|',1X,8HALTITUDE,1X,'|',1X,13HALTITUDE
     1 RATE,1X,'|',1X,11HALT. ACCEL.,1X,'|',1X,12HVERT. ACCEL.,1X,'|',1X
     1,14HELEV. DEFLECT.,1X,'*',/,6X,'*',12X,'|',2X,6H(SECS),2X,'|',5X,1
     12H(RADIAN/SEC),5X,'|',1X,8H(METERS),1X,'|',4X,7H(M/SEC),4X,'|',2X,
     110H(M/SEC**2),1X,'|',2X,10H(M/SEC**2),2X,'|',3X,9H(RADIANS),4X,'*'
     1,/,6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X,'|',
     116X,'*',/,6X,'*',119('-'),'*')
      DO 119 I=1,K
      HS=F10(I)*0.3048D0
      HDS=F11(I)*0.3048D0
      HDDS=F12(I)*0.3048D0
      AZS=F13(I)*0.3048D0
  119 WRITE (JWRITE,111) I,TIME(I),F9(I),HS,HDS,HDDS,AZS,F14(I)
      WRITE (JWRITE,112)
C***  PUNCH RESULTS
  120 IF (IPRC(6).NE.0) GO TO 125
      WRITE (JPUNCH,121) (TITLE(I),I=1,20)
  121 FORMAT (20A4)
      WRITE (JPUNCH,122) K,S,RHO,G,TT
  122 FORMAT (I10,4D15.8)
      DO 123 I=1,K
  123 WRITE (JPUNCH,124) TIME(I),F1(I),F2(I),F3(I),F4(I),F5(I),F6(I),F7(
     1I),F8(I),F9(I),F10(I),F11(I),F12(I),F13(I),F14(I)
  124 FORMAT (3D25.16/3D25.16/3D25.16/3D25.16/3D25.16)
C***  TRANSFER TO READ NEW DATA OR TO CONTINUE LOOP
  125 RETURN
C***  ERROR IDENTIFICATION MESSAGE
  126 WRITE (JWRITE,127)
  127 FORMAT (1X,///,20X,'THE SPECIFICATION OF IPS(?) TO NC(?) IS INCORR
     1ECT.  PROCEEDING WITH NEXT DATA SET, IF ANY.')
      IERR=1
      RETURN
      END


      SUBROUTINE PLOTIT(K,TPTX,IP,IPS,IPRC,H,HD,XAX)
C
C***  SUBROUTINE PLOTIT PLOTS TIME HISTORIES
C
      IMPLICIT REAL*8 (A-H,O-Z)
      DIMENSION KD(5),IP(14),IPS(11),IPRC(9),H(450),HD(450)
      COMMON TITLE(20),D(450,11),TIME(450),A(100),B(100),F1(450),F2(450)
     1,F3(450),F4(450),F5(450),F6(450),F7(450),F8(450),TT,RHO,PI,G,JKS,M
     1ETRIC,JREAD,JWRITE,JPUNCH,IERR
      COMMON /CARRY/F11(450),F12(450)
      COMMON /TEMP1/ST(450,4),PAR(6),PSL,TSL,IPAR
      COMMON /TEMP2/F9(450),F10(450),F13(450),F14(450),AP(6),W(6)
      REAL*4 XRD(4,450),XD(4,450),YRD(4,450),YD(4,450),TPTP
C
      TPTP=TPTX
      DO 1 I=1,K
      IF (I.LE.5) KD(I)=-1
      DO 1 J=1,4
    1 XRD(J,I)=TIME(I)
C***  PLOT WEIGHT TIME HISTORY
      IF (IP(1).NE.0) GO TO 4
      N=1
      IF (IPS(1).EQ.0)N=2
      DO 2 I=1,K
      YRD(1,I)=D(I,1)
      IF (IPS(1).EQ.0)YRD(2,I)=F1(I)
      IF (METRIC.NE.0)YRD(1,I)=YRD(1,I)*4.4482D0/100.0D0
    2 IF (METRIC.NE.0.AND.IPS(1).EQ.0)YRD(2,I)=YRD(2,I)*4.4482D0/100.0D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 3
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,3500.0,4500
     1.0,250.0,1,'WEIGHT(LBF)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _')
      GO TO 4
    3 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,150.0,200.0
     1,5.0,1,'WEIGHT(NEWTONS)/100_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _'
     1)
C***  PLOT PITCH ANGLE TIME HISTORY
    4 IF (IP(2).NE.0) GO TO 6
      N=1
      IF (IPS(2).EQ.0)N=2
      DO 5 I=1,K
      YRD(1,I)=D(I,2)*100.0D0
    5 IF (IPS(2).EQ.0)YRD(2,I)=F2(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-80.0,80.0,
     110.0,1,'PITCH ANGLE(RADIAN) X 100_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,
     11,' _')
C***  PLOT PITCH RATE TIME HISTORY
    6 IF (IP(3).NE.0) GO TO 8
      N=1
      IF (IPS(3).EQ.0)N=2
      DO 7 I=1,K
      YRD(1,I)=D(I,3)*100.0D0
    7 IF (IPS(3).EQ.0)YRD(2,I)=F3(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-80.0,80.0,
     110.0,1,'PITCH RATE(RAD/SEC) X 100_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,
     11,' _')
C***  PLOT AIRSPEED TIME HISTORY
    8 IF (IP(4).NE.0) GO TO 11
      N=1
      IF (IPS(4).EQ.0)N=2
      DO 9 I=1,K
      YRD(1,I)=D(I,4)
      IF (IPS(4).EQ.0)YRD(2,I)=F4(I)
      IF (METRIC.NE.0)YRD(1,I)=YRD(1,I)*0.3048D0
    9 IF (METRIC.NE.0.AND.IPS(4).EQ.0)YRD(2,I)=YRD(2,I)*0.3048D0
```

```
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 10
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,80.0,300.0,
     120.0,1,'AIRSPEED(FT/SEC)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _')
      GO TO 11
   10 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,25.0,100.0,
     15.0,1,'AIRSPEED(M/SEC)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _')
C***  PLOT DENSITY TIME HISTORY
   11 IF (IP(5).NE.0) GO TO 14
      N=1
      IF (IFS(5).EQ.0)N=2
      DO 12 I=1,K
      YRD(1,I)=D(I,5)*10000.0D0
      IF (IFS(5).EQ.0)YRD(2,I)=F5(I)*10000.0D0
      IF (METRIC.NE.0)YRD(1,I)=D(I,5)*5153.8D0
   12 IF (METRIC.NE.0.AND.IFS(5).EQ.0)YRD(2,I)=F5(I)*5153.8D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 13
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,14.0,24.0,2
     1.0,1,'DENSITY(SLUG/FT**3)  X 10000_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,
     11,' _')
      GO TO 14
   13 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,6.0,12.0,1.
     10,1,'DENSITY(KG/M**3)  X 10_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _')
C***  PLOT ANGLE OF ATTACK TIME HISTORY
   14 IF (IP(6).NE.0) GO TO 16
      N=1
      IF (IFS(6).EQ.0)N=2
      DO 15 I=1,K
      YRD(1,I)=D(I,6)*100.0D0
   15 IF (IFS(6).EQ.0)YRD(2,I)=F6(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-5.0,40.0,5
     1.0,1,'ANGLE OF ATTACK(RAD)  X 100_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1
     1,' _')
C***  PLOT TEMPERATURE TIME HISTORY
   16 IF (IP(7).NE.0) GO TO 19
      N=1
      IF (IFS(7).EQ.0)N=2
      DO 17 I=1,K
      YRD(1,I)=D(I,7)
      IF (IFS(7).EQ.0)YRD(2,I)=F7(I)
      IF (METRIC.NE.0)YRD(1,I)=5.0/9.0*(D(I,7)-491.72D0)+273.18D0
   17 IF (METRIC.NE.0.AND.IFS(7).EQ.0)YRD(2,I)=5.0/9.0*(F7(I)-491.72)+27
     13.18D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 18
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,450.0,550.0
     1,25.0,1,'TEMPERATURE(DEG-R)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _'
     1)
      GO TO 19
   18 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,250.0,300.0
     1,10.0,1,'TEMPERATURE(DEG-K)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _'
     1)
C***  PLOT ACCELERATION TIME HISTORY
   19 IF (IP(8).NE.0) GO TO 22
      N=2
      IF (IFS(8).EQ.0)N=3
      DO 20 I=1,K
      YRD(1,I)=D(I,8)
      YRD(2,I)=F8(I)*DCOS(F6(I))+F4(I)*(F3(I)-F9(I))*DSIN(F6(I))-XAX*F3(
     1I)**2+G*DSIN(F2(I))+PAR(4)*(G*DCOS(F2(I))+F4(I)*(F3(I)-F9(I))*DCOS
     1(F6(I))-F8(I)*DSIN(F6(I)))-IPAR*G*DCOS(F2(I))*F3(I)-PAR(6)*(F4(I)*
     1(F3(I)-F9(I))*DCOS(F6(I))-F8(I)*DSIN(F6(I)))
      IF (IFS(8).EQ.0)YRD(3,I)=F8(I)
      IF (METRIC.EQ.0) GO TO 20
      YRD(1,I)=YRD(1,I)*0.3048D0
      YRD(2,I)=YRD(2,I)*0.3048D0
      IF (IFS(8).EQ.0)YRD(3,I)=YRD(3,I)*0.3048D0
   20 CONTINUE
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 21
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-32.0,32.0,
     14.0,1,'ACCELERATION(FT/SEC**2)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,'
     1 _')
      GO TO 22
   21 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-10.0,10.0,
     11.0,1,'ACCELERATION(M/SEC**2)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,'
     1_')
C***  PLOT ANGLE-OF-ATTACK RATE TIME HISTORY
   22 IF (IP(9).NE.0) GO TO 24
      N=1
      DO 23 I=1,K
   23 YRD(1,I)=F9(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-10.0,10.0,
     11.0,1,'ANGLE-OF-ATTACK RATE(RAD/SEC)  X 100_',YRD,YD,1,4,N,450,K,K,
     1K,K,0,KD,1,' _')
C***  PLOT ALTITUDE TIME HISTORY
   24 IF (IP(10).NE.0) GO TO 30
      N=1
      IF ((IFS(9).NE.0.AND.((IPRC(8).GE.2.AND.IPRC(9).EQ.0).OR.(IPRC(8).
     1LT.2.AND.IPRC(9).NE.0))).OR.(IFS(9).EQ.0.AND.(IPRC(8).LT.2.AND.IPR
     1C(9).EQ.0)))N=2
      IF ((IFS(9).NE.0.AND.(IPRC(8).GE.2.AND.IPRC(9).NE.0)).OR.(IFS(9).E
     1Q.0.AND.(IPRC(8).GE.2.AND.IPRC(9).EQ.0)).OR.(IFS(9).EQ.0.AND.(IPRC
     1(8).LT.2.AND.IPRC(9).NE.0)))N=3
      IF (IFS(9).EQ.0.AND.(IPRC(8).GE.2.AND.IPRC(9).NE.0))N=4
      DO 28 I=1,K
      YRD(1,I)=D(I,9)/1000.0D0
      IF (IFS(9).EQ.0) GO TO 25
      IF (IPRC(8).GE.2) YRD(2,I)=H(I)/1000.0D0
      IF (IPRC(8).GE.2.AND.IPRC(9).NE.0)YRD(3,I)=F10(I)/1000.0D0
      IF (IPRC(8).LT.2) YRD(2,I)=F10(I)/1000.0D0
      GO TO 26
   25 YRD(2,I)=F10(I)/1000.0D0
      IF (IPRC(8).GE.2) YRD(3,I)=H(I)/1000.0D0
      IF (IPRC(8).GE.2.AND.IPRC(9).NE.0)YRD(4,I)=F10(I)/1000.0D0
      IF (IPRC(8).LT.2.AND.IPRC(9).NE.0)YRD(3,I)=F10(I)/1000.0D0
   26 IF (METRIC.EQ.0) GO TO 28
      DO 27 J=1,N
   27 YRD(J,I)=YRD(J,I)*0.3048D0*10.0D0
   28 CONTINUE
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 29
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,2.0,16.0,1.
     10,1,'ALTITUDE(FT)/1000_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _')
      GO TO 30
   29 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,0.0,48.0,2.
     10,1,'ALTITUDE(M)/100 _',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _')
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```
C***  PLOT ALTITUDE RATE TIME HISTORY
   30 IF (IP(11).NE.0) GO TO 34
      N=2
      IF (IPRC(8).GE.2) N=3
      DO 32 I=1,K
      YRD(1,I)=F11(I)
      YRD(2,I)=-F4(I)*F8(I)/G
      IF (IPRC(8).GE.2) YRD(3,I)=HD(I)
      IF (METRIC.EQ.0) GO TO 32
      DO 31 J=1,N
   31 YRD(J,I)=YRD(J,I)*0.3048D0
   32 CONTINUE
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 33
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-100.0,100.
     10,10.0,1,'ALTITUDE RATE(FT/SEC)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,
     1' _')
      GO TO 34
   33 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-34.0,34.0,
     14.0,1,'ALTITUDE RATE(M/SEC)_',YRD,YD,1,4,N,450,K,K,K,K,0,KD,1,' _'
     1)
C***  PLOT ALTITUDE ACCELERATION TIME HISTORY
   34 IF (IP(12).NE.0) GO TO 37
      DO 35 I=1,K
      YRD(1,I)=F12(I)
   35 IF (METRIC.NE.0) YRD(1,I)=F12(I)*0.3048D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 36
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-100.0,100.
     10,10.0,1,'ALTITUDE ACCELERATION(FT/SEC**2)_',YRD,YD,1,4,1,450,K,K,
     1K,K,0,KD,1,' _')
      GO TO 37
   36 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-34.0,34.0,
     14.0,1,'ALTITUDE ACCELERATION(M/SEC**2)_',YRD,YD,1,4,1,450,K,K,K,K,
     10,KD,1,' _')
C***  PLOT VERTICAL ACCELERATION TIME HISTORY
   37 IF (IP(13).NE.0) GO TO 41
      N=1
      IF (IFS(10).EQ.0) N=2
      DO 39 I=1,K
      YRD(1,I)=D(I,10)
      IF (IFS(10).EQ.0) YRD(2,I)=F13(I)
      IF (METRIC.EQ.0) GO TO 39
      DO 38 J=1,N
   38 YRD(J,I)=YRD(J,I)*0.3048D0
   39 CONTINUE
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 40
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-32.0,32.0,
     14.0,1,'VERTICAL ACCELERATION(FT/SEC**2)_',YRD,YD,1,4,N,450,K,K,K,K
     1,0,KD,1,' _')
      GO TO 41
   40 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-10.0,10.0,
     12.0,1,'VERTICAL ACCELERATION(M/SEC**2)_',YRD,YD,1,4,N,450,K,K,K,K,
     10,KD,1,' _')
C***  PLOT ELEVATOR DEFLECTION TIME HISTORY
   41 IF (IP(14).NE.0) GO TO 43
      N=1
      IF (IFS(11).EQ.0) N=2
      DO 42 I=1,K
      YRD(1,I)=D(I,11)*100.0D0
   42 IF (IFS(11).EQ.0) YRD(2,I)=F14(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-25.0,25.0,
     15.0,1,'ELEVATOR DEFLECTION(RAD) X 100_',YRD,YD,1,4,N,450,K,K,K,K,0
     1,KD,1,' _')
   43 RETURN
      END


      SUBROUTINE SEC3(K,XAX,LSP,ITEST,LL,NUM,DSPS)
C
C***  SUBROUTINE SEC3 CALCULATES BIASES, PHASE SHIFT, AND OTHER DATA-
C***  DEPENDENT PARAMETERS BY A MINIMIZATION TECHNIQUE AND ADJUSTS THE
C***  DATA ACCORDINGLY
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION WR(2,6),DWK(2),F(3),X(3),TOL(2),TWK(21),TWJ(6),TWKK(36),
     1RR(21),CC(6),C(6,6),Z(6,1),WB(100),LSP(9),BX(36),DW(2),COST(10),SD
     1V(10,6),ACOST(10),SL(450,3),SR(450,1),SWK(250),DFPA(450),FPA1(450)
     1,FPA2(450),SA(450,2)
      COMMON TITLE(20),D(450,11),TIME(450),A(100),B(100),F1(450),F2(450)
     1,F3(450),F4(450),F5(450),F6(450),F7(450),F8(450),TT,RHO,PI,G,JKS,M
     1ETRIC,JREAD,JWRITE,JPUNCH,IERR
      COMMON /CARRY/F11(450),F12(450)
      COMMON /TEMP1/ST(450,4),PAR(6),PSL,TSL,IPAR
      COMMON /TEMP2/F9(450),F10(450),F13(450),F14(450),AP(6),W(6)
      INTEGER LLSPM(10)/0,1,1,1,1,1,1,1,1,1/
C
C***  INITIALIZE PARAMETERS
      LCNT=0
      LMAX=10
      ITEST=0
      DO 1 J=1,6
      IF (LL.GT.1) W(J)=W(J)/2.0D0
    1 PAR(J)=0.0D0
      X1=PSL/TSL
      X2=F10(1)
C***  COMPUTE FLIGHT PATH ANGLE AND ITS DERIVATIVE
      DO 2 L=1,K
      FPA1(L)=DARSIN(F11(L)/F4(L))
      FPA2(L)=FPA1(L)
      DFPA(L)=(F4(L)*F12(L)-F11(L)*F8(L))/(F4(L)*DSQRT(1.0D0-(F11(L)/F4(
     1L))**2)*F4(L))
    2 CONTINUE
C***  FIND COMPATIBLE ANGLE OF ATTACK
    3 MCNT=0
      DO 9 L=1,K
C***  SOLVE FOR ANGLE OF ATTACK BY NEWTON RAPHSON
      ITR=0
      ALP=F6(L)
      XP1=G*DSIN(FPA2(L))+F8(L)
      XP2=G*DCOS(FPA2(L))+DFPA(L)*F4(L)
    4 ITR=ITR+1
      FN=ST(L,4)-XP1*DCOS(ALP)-XP2*DSIN(ALP)+XAX*F3(L)*F3(L)
      FNP=XP1*DSIN(ALP)-XP2*DCOS(ALP)
      FNPP=XP1*DCOS(ALP)+XP2*DSIN(ALP)
      RAD=(FNP/FNPP)*(FNP/FNPP)-2.0D0*(FN/FNPP)
      ALP1=ALP
```

```
      IF (RAD.LT.0.0D0) GO TO 6
      IF ((FNP*FNPP).LT.0.0D0) GO TO 5
      ALP=ALP-FNP/FNPP+DSQRT(RAD)
      GO TO 7
    5 ALP=ALP-FNP/FNPP-DSQRT(RAD)
      GO TO 7
    6 ALP=ALP-FNP/FNPP
      MCNT=MCNT+1
      GO TO 8
    7 IF (DABS(ALP1-ALP).LT.1.0D-15.OR.ITR.EQ.20) GO TO 8
      GO TO 4
C***  FORM COEFFICIENTS FOR LEAST SQUARES
    8 SR(L,1)=ALP
      SL(L,1)=1.0D0
      SL(L,2)=F6(L)
      SL(L,3)=F6(L)*F6(L)
    9 CONTINUE
      IF (MCNT.NE.0) WRITE (JWRITE,10) MCNT
   10 FORMAT (1X,//,18X,104H*** DURING NEWTON-RAPHSON TO FIND COMPATIBLE
     1 ANGLE OF ATTACK, THE ROUTINE WISHED TO SEEK  COMPLEX  ROOTS,I3,7H
     1 TIMES.,//)
C***  ENACT LEAST SQUARES TO DETERMINE BIAS AND GAIN ESTIMATES
      CALL LLSQAR(SL,SR,K,3,1,450,450,15,SWK,IER,JWRITE)
      WRITE (JWRITE,11) (SR(L,1),L=1,3)
   11 FORMAT (31X,'COMPATIBILITY ESTIMATES OF THE |   BIAS = ',1PD23.15,
     1/,31X,'BIAS AND GAINS BETWEEN INPUT   |-> FIRST-ORDER GAIN  = ',1P
     1D23.15,/,31X,'AND CALCULATED ANGLE OF ATTACK |   SECOND-ORDER GAIN
     1 = ',1PD23.15,/)
C***  COMPUTE AN ANGLE-OF-ATTACK VARIANCE INDICATION AND NEW VALUES OF
C***  ANGLE OF ATTACK
      AVI=0.0D0
      DO 12 L=1,K
      SA(L,1)=F6(L)
      OLD=F6(L)
      F6(L)=SR(1,1)+F6(L)*(SR(2,1)+F6(L)*SR(3,1))
   12 AVI=AVI+(F6(L)-OLD)*(F6(L)-OLD)
      WRITE (JWRITE,13) AVI
   13 FORMAT (31X,'ANGLE-OF-ATTACK VARIANCE INDICATION = ',1PD13.6,//)
C***  CHECK FOR INCREASING FIT ERROR
      IF (LCNT.EQ.0)SAVI=AVI
      IF (LCNT.EQ.0) GO TO 16
      IF (AVI.GT.SAVI) GO TO 14
      SAVI=AVI
      GO TO 16
C***  RESET ANGLE OF ATTACK AND FLIGHT PATH ANGLE
   14 DO 15 L=1,K
      F6(L)=SA(L,1)
      IF (LCNT.EQ.1)SA(L,2)=FPA1(L)
   15 FPA2(L)=SA(L,2)
C***  BEGIN LOOP FOR SUCCESSIVE MINIMIZATIONS
   16 CALL FNI(K,F6,TIME,F9,F14,1,15,3)
C***  TEST FOR MAXIMUM ITERATION OF INCREASING FIT ERROR
      IF (LCNT.GE.10.OR.AVI.GT.SAVI) GO TO 19
C***  DETERMINE COMPATIBILITY ESTIMATES FOR FLIGHT PATH ANGLE
      XGAM=F2(1)-F6(1)
      IF (LCNT.NE.0)XGAM=FPA2(1)
C***  FORM THE COEFFICIENTS FOR LEAST SQUARES
      SR(1,1)=XGAM
      SL(1,1)=1.0D0
      SL(1,2)=FPA2(1)
      SL(1,3)=FPA2(1)**2
      DO 17 L=2,K
C***  INTEGRATE RATES FOR FLIGHT PATH ANGLE
      XGAM=F2(L)-F6(L)
      SR(L,1)=XGAM
      SL(L,1)=1.0D0
      SL(L,2)=FPA2(L)
   17 SL(L,3)=FPA2(L)**2
C***  ENACT LEAST SQUARES FOR BIAS AND GAINS
      CALL LLSQAR(SL,SR,K,3,1,450,450,15,SWK,IER,JWRITE)
C***  COMPUTE THE FITTED FLIGHT PATH ANGLE
      DO 18 L=1,K
      IF (LCNT.GT.0)SA(L,2)=FPA2(L)
   18 FPA2(L)=SR(1,1)+SR(2,1)*FPA2(L)+SR(3,1)*FPA2(L)**2
C***  OBTAIN ITS DERIVATIVE
      CALL FNI(K,FPA2,TIME,DFPA,F14,1,15,3)
C***  RECOMPUTE COMPATIBLE ANGLE OF ATTACK
      LCNT=LCNT+1
      GO TO 3
C***  COMPUTE NEW ALTITUDE AND STATIC PRESSURE
   19 HX=X2
      DO 21 L=1,K
      IF (L.EQ.1) GO TO 20
      HX=HX+0.5D0*(TIME(L)-TIME(L-1))*(F4(L)*DSIN(FPA2(L))+F4(L-1)*DSIN(
     1FPA2(L-1)))
   20 ST(L,2)=X1*F7(L)*(1.0D0-6.86D-6*HX)**4.26D0
   21 CONTINUE
      XPAR=0.0D0
      DO 46 L=1,LMAX
      IF (LL.EQ.NUM) GO TO 25
      WRITE (JWRITE,22) LL,L
   22 FORMAT (31X,'ITERATION',I2,3X,'SUBITERATION',I2,/)
C***  STORE DELTA VALUES
      DO 23 I=1,6
   23 SDV(L,I)=PAR(I)
C***  INITIALIZE MATRICES
      DO 24 JXP=1,21
      RR(JXP)=0.0D0
      IF (JXP.GT.6) GO TO 24
      CC(JXP)=0.0D0
   24 CONTINUE
C***  COMPUTE MAXIMUM PRESSURE AND ACCELERATION
   25 XMAX=DABS(ST(1,2))
      YMAX=DABS(ST(1,4))
      DO 26 JXP=2,K
      IF (DABS(ST(JXP,2)).GT.XMAX)XMAX=DABS(ST(JXP,2))
      IF (DABS(ST(JXP,4)).GT.YMAX)YMAX=DABS(ST(JXP,4))
   26 CONTINUE
C***  COMPUTE WEIGHT FACTORS
      DW(1)=1.0D0/(XMAX*XMAX)
      DW(2)=1.0D0/(YMAX*YMAX)
      X(1)=0.0D0
      X(2)=0.0D0
      X(3)=0.0D0
      TOL(1)=0.0D0
      TOL(2)=0.0D0
C***  BEGIN COMPUTING PARAMETERS FOR PARTIAL DERIVATIVE EVALUATIONS
      DO 35 I=1,K
      X4=F3(I)-F9(I)
      X5=F2(I)-F6(I)
```

```
      X6=F3(I)*F3(I)
      X7=G*DSIN(F2(I))
      X8=G*DCOS(F2(I))
      X9=F8(I)*DCOS(F6(I))
      X10=F8(I)*DSIN(F6(I))
      X11=F4(I)*X4*DSIN(F6(I))
      X12=F4(I)*X4*DCOS(F6(I))
      X13=X12-X10
C***  CHECK FOR INITIAL POINT CALCULATION
      IF (I.NE.1) GO TO 27
      X(1)=X2
      X3=0.0D0
   27 IF (I.EQ.1) GO TO 29
      X3=(F7(I)-F7(I-1))/(TIME(I)-TIME(I-1))
C***  FIND POINT-TO-POINT INTEGRALS
      F(1)=F4(I)*DSIN(X5)+F4(I-1)*DSIN(F2(I-1)-F6(I-1))
      F(2)=F4(I)*DCOS(X5)+F4(I-1)*DCOS(F2(I-1)-F6(I-1))
      F(3)=F3(I)*F4(I)*DCOS(X5)+F3(I-1)*F4(I-1)*DCOS(F2(I-1)-F6(I-1))
      DO 28 J=1,3
   28 X(J)=X(J)+0.5D0*(TIME(I)-TIME(I-1))*F(J)
   29 X14=1.0D0-6.86D-6*(X(1)+PAR(6)*X(2)-XPAR*X(3))
      X15=X14**3.26D0
      IF (LL.EQ.NUM) GO TO 30
C***  COMPUTE PARTIAL DERIVATIVES
      WK(1,1)=X6
      WK(2,1)=0.0D0
      WK(1,2)=ST(I,4)
      WK(2,2)=0.0D0
      WK(1,3)=X7
      WK(2,3)=0.0D0
      WK(1,4)=0.0D0
      WK(2,4)=X8+X13
      WK(1,5)=X1*F7(I)*X15*(29.2236D-6*(X(3)*(1.0D0-XPAR*X3/F7(I)))-X3*X
     114/F7(I))
      WK(2,5)=-F3(I)*X8
      WK(1,6)=-29.2236D-6*X1*F7(I)*(1.0D0-XPAR*X3/F7(I))*X15*X(2)
      WK(2,6)=-X13
C***  COMPUTE STATIC PRESSURE AND LONGITUDINAL ACCELERATION
   30 DWK(1)=X1*F7(I)*(1.0D0-XPAR*X3/F7(I))*X15*X14+PAR(1)*X6+PAR(2)*ST(
     1I,4)+PAR(3)*X7
      DWK(2)=X9+X11-XAX*X6+X7+PAR(4)*(X8+X13)-XPAR*X8*F3(I)-PAR(6)*X13
C***  COMPUTE PRESSURE AND LONGITUDINAL ACCELERATION DIFFERENCES
      DWK(1)=ST(I,2)-DWK(1)
      DWK(2)=ST(I,4)-DWK(2)
      IF (LL.EQ.NUM) GO TO 33
C***  SUM MATRICES OF PARTIALS
      JP=0
      STWJ=0.0D0
      DO 32 JJ=1,6
      DO 31 J=1,2
      JP=JP+1
      TWK(JP)=WK(J,JJ)*DSQRT(DW(J))
   31 STWJ=STWJ+TWK(JP)*DWK(J)*DSQRT(DW(J))
   32 TWJ(JJ)=STWJ
      MS=0
      CALL MATA(TWK,TWKK,2,6,MS)
      CALL MADD(RR,TWKK,6,6,1)
      CALL MADD(CC,TWJ,6,1,0)
C***  SUM DIFFERENCES SQUARED
   33 DO 34 J=1,2
   34 TOL(J)=TOL(J)+DWK(J)*DWK(J)
   35 CONTINUE
C***  COMPUTE COST FUNCTION AND TOLERANCES
      PCF=0.0D0
      IF (LL.EQ.NUM) GO TO 37
      DO 36 J=1,6
   36 PCF=PCF+W(J)*(PAR(J)-AP(J))**2/(AP(J)*AP(J))
   37 COST(L)=DW(1)*TOL(1)+DW(2)*TOL(2)+PCF
      DO 38 I=1,2
   38 TOL(I)=TOL(I)/K
      WRITE (JWRITE,39) COST(L),(TOL(I),I=1,2)
   39 FORMAT (31X,'COST FUNCTION (J) = ',1PD23.16,/,31X,'WITH:',/,37X,'S
     1TATIC PRESSURE TOLERANCE = ',1PD23.16,/,37X,'LONGITUDINAL ACCELERA
     1TION TOLERANCE = ',1PD23.16,///)
C***  CHECK FOR INCREASE IN COST FUNCTION
      IF (LL.EQ.NUM) GO TO 56
      IF (L.LT.3) GO TO 40
      IF (COST(L).GE.COST(L-1)) GO TO 47
C***  ADJUST MATRICES FOR LEAST SQUARES SOLUTION
   40 CALL MSTR(RR,RX,6,1,0)
      JP=0
      DO 42 JJ=1,6
      DO 41 J=1,6
      XFAC=1.0D0
      IF (JJ.EQ.J) XFAC=1.00005D0
      JP=JP+1
      XC=RX(JP)
      IF (J.EQ.JJ) XC=XC+2.0D0*W(JJ)/(AP(JJ)*AP(JJ))
      C(J,JJ)=XC*XFAC
   41 CONTINUE
      Z(JJ,1)=CC(JJ)+2.0D0*W(JJ)*(AP(JJ)-PAR(JJ))/(AP(JJ)*AP(JJ))
   42 CONTINUE
      M=6
C***  REDUCE MATRIX ORDER AS SPECIFIED BY USER
      CALL REDUCE(C,Z,M,LI)
      IF (M.EQ.0)ITEST=1
      IF (ITEST.NE.0) GO TO 56
C***  EXACT LEAST SQUARES SOLUTION
      CALL LLSQAR(C,Z,M,M,1,6,6,15,WR,IER,JWRITE)
C***  TEST FOR ERROR
      IF (IER.EQ.129)IERR=1
      IF (IERR.NE.0) RETURN
      CALL RESET(Z,M)
C***  WRITE SOLUTION VALUES
      WRITE (JWRITE,43) (Z(I,1),I=1,6)
   43 FORMAT (38X,'1ST LINEAR ACCELERATION DEPENDENCY DELTA= ',D13.6,/,3
     18X,'2ND LINEAR ACCELERATION DEPENDENCY DELTA= ',D13.6,/,38X,'3RD L
     1INEAR ACCELERATION DEPENDENCY DELTA= ',D13.6,/,38X,'PITCH ANGLE BI
     1AS DELTA = ',D13.6,/,38X,'PHASE SHIFT DELTA = ',D13.6,/,38X,'FLIGH
     1T PATH ANGLE DELTA= ',D13.6,/)
C***  SUM DELTAS
      DO 44 J=1,6
   44 PAR(J)=SDV(L,J)+Z(J,1)
      WRITE (JWRITE,45) (PAR(I),I=1,6)
   45 FORMAT (42X,'UPDATED 1ST LINEAR ACCELERATION DEPENDENCY= ',D13.6,/
     1,42X,'UPDATED 2ND LINEAR ACCELERATION DEPENDENCY= ',D13.6,/,42X,'U
     1PDATED 3RD LINEAR ACCELERATION DEPENDENCY= ',D13.6,/,42X,'UPDATED
     1PITCH ANGLE BIAS= ',D13.6,/,42X,'UPDATED PHASE SHIFT= ',D13.6,/,42
     1X,'UPDATED FLIGHT PATH ANGLE BIAS= ',D13.6,///)
      XPAR=PAR(5)
```

```
   46 CONTINUE
      ACOST(LL)=COST(L)
      GO TO 49
C***  ADJUST COST FUNCTION AND DELTAS
   47 ACOST(LL)=COST(L-1)
      DO 48 J=1,6
   48 PAR(J)=SDV(L-1,J)
C***  TEST FOR INCREASE IN COST FUNCTION
   49 IF (LL.EQ.1) GO TO 50
      IF (ACOST(LL).GE.ACOST(LL-1))ITEST=1
   50 IF (ITEST.EQ.1.OR.LL.EQ.NUM) GO TO 54
C***  WRITE BEST RESULTS
      WRITE (JWRITE,51) L,ACOST(LL)
   51 FORMAT (36X,13HOF THE ABOVE ,I2,44H ITERATIONS, THE BEST COST FUNC
     1TION HAS BEEN,/,36X,22HCHOSEN TO BE EQUAL TO ,D23.16,16H, AND THE
     1VALUES,/,36X,61HASSOCIATED WITH THIS COST FUNCTION (PHASE SHIFT VA
     1LUE IS SUB-,/,36X,62HJECT TO A MAGNITUDE AND SIGN RESTRICTION) WIL
     1L BE USED TO MOD-,/,36X,9HIFY DATA.,////)
C***  DETERMINE PHASE SHIFT
      IF (PAR(5).GT.1.0D0)PAR(5)=1.0D0
      IF (PAR(5).LT.0.0D0)IPAR=0
      IF (IPAR.EQ.0) GO TO 52
      PAR(5)=DSPS*PAR(5)
      LP=PAR(5)
      LPX=LP+1
      XLP=LP
      XLPX=LPX
      IF ((PAR(5)-XLP).LT.0.5D0)IPAR=LP
      IF ((XLPX-PAR(5)).LE.0.5D0)IPAR=LPX
      PAR(5)=PAR(5)/DSPS
C***  ADJUST DATA WITH RESPECT TO DETERMINED DATA-DEPENDENT PARAMETERS
   52 KM=K-IPAR
      DO 53 I=1,KM
      K=KM
      D(I,1)=F1(I)
      IF (LSP(1).NE.0)F2(I)=F2(I+IPAR)
      F2(I)=F2(I)+PAR(4)
      D(I,2)=F2(I)
      IF (LSP(2).NE.0)F3(I)=F3(I+IPAR)
      D(I,3)=F3(I)
      IF (LSP(3).NE.0)ST(I,3)=ST(I+IPAR,3)
      D(I,4)=ST(I,3)
      IF (LSP(3).NE.0)F4(I)=F4(I+IPAR)
      IF (LSP(4).NE.0)ST(I,2)=ST(I+IPAR,2)
      D(I,5)=ST(I,2)
      IF (LSP(5).NE.0)F6(I)=F6(I+IPAR)
      F6(I)=F6(I)+PAR(4)-PAR(6)
      D(I,6)=F6(I)
      IF (LSP(5).NE.0)F9(I)=F9(I+IPAR)
      IF (LSP(6).NE.0)ST(I,1)=ST(I+IPAR,1)
      D(I,7)=ST(I,1)
      IF (LSP(7).NE.0)ST(I,4)=ST(I+IPAR,4)
      D(I,8)=ST(I,4)
      IF (LSP(7).NE.0)F8(I)=F8(I+IPAR)
      IF (LSP(8).NE.0)F13(I)=F13(I+IPAR)
      IF (LSP(9).NE.0)F14(I)=F14(I+IPAR)
C***  CHECK FOR REDEFINING INPUT STATIC PRESSURE
      IF (LLSPM(LL).EQ.0) GO TO 53
      ST(I,2)=ST(I,2)-(PAR(1)*F3(I)**2+PAR(2)*ST(I,4)+PAR(3)*G*DSIN(F2(I
     1)))
   53 CONTINUE
   54 IF (ITEST.NE.0.AND.M.NE.0) WRITE (JWRITE,55)
   55 FORMAT (36X,58HNO COST FUNCTION HAS BEEN DETERMINED TO BE BETTER T
     1HAN THE,/,36X,56HPREVIOUS BEST COST FUNCTION.  THEREFORE, ITERATIO
     1NS HAVE,/,36X,15HBEEN CONCLUDED.,//)
   56 RETURN
      END


      SUBROUTINE REDUCE(C,Z,M,LL)
C
C***  SUBROUTINE REDUCE DECREASES THE ORDER OF A SYMMETRIC MATRIX BY THE
C***  ELIMINATION OF THE I-TH ROW AND COLUMN
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION C(6,6),Z(6,1),IR(6),B(6,6),S(6,1)
      COMMON /ROW/IRS(10,6)
C
C***  INITIALIZE PARAMETERS
      MM=M
      DO 1 I=1,6
    1 IR(I)=IRS(LL,I)
      IJ=0
      NM=0
      IP=0
C***  DETERMINE FIRST ROW/COLUMN NOT ELIMINATED
      DO 2 I=1,M
      IF (IR(I).NE.0)IJ=I
      IF (IR(I).NE.0) GO TO 3
    2 CONTINUE
C***  IF IJ=0, USER SPECIFIED A NO MATRIX CONDITION
      GO TO 8
C***  DEFINE NEW ELEMENTS IN TERMS OF OLD ELEMENTS
    3 DO 5 I=1,M
      IF (IR(I).EQ.0) GO TO 5
      NM=NM+1
      IP=IP+1
      JP=0
      DO 4 J=IJ,M
      IF (IR(J).EQ.0) GO TO 4
      JP=JP+1
      B(IP,JP)=C(I,J)
    4 CONTINUE
      S(IP,1)=Z(I,1)
    5 CONTINUE
C***  DEFINE UPDATED ELEMENTS BY THE NEW ELEMENTS
      M=NM
      DO 7 I=1,M
      DO 6 J=1,M
      C(I,J)=B(I,J)
    6 CONTINUE
      Z(I,1)=S(I,1)
    7 CONTINUE
      RETURN
C***  SET CODE FOR NO-MATRIX SPECIFICATION
    8 M=0
      RETURN
C
      ENTRY RESET(Z,M)
```

```
C
C***  ENTRY RESET ADJUSTS THE SOLUTION TO BE COMPATIBLE WITH THE
C***  ORIGINAL MATRIX
C
      NN=0
      N=NN
      DO 9 I=1,N
      S(I,1)=0.0D0
      IF (IR(I).EQ.0) GO TO 9
      NN=NN+1
      S(I,1)=Z(NN,1)
    9 CONTINUE
      DO 10 I=1,N
   10 Z(I,1)=S(I,1)
      RETURN
      END


      SUBROUTINE SHIFT(K,LSP,NSPTS)
C
C***  SUBROUTINE SHIFT ADJUSTS DATA FOR PHASE SHIFT
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION LSP(9)
      COMMON TL(20),D(450,11),T(450),A(100),B(100),F1(450),F2(450),F3(45
     10),AS(450),P(450),PD(450),PS(450),PSD(450),TT,RHO,PI,G,JP,M,JR,JW,
     1JH
C
      L=1
      KN=K-NSPTS
      DO 2 I=1,9
      IF (I.GT.7) L=2
      IF (LSP(I).EQ.0) GO TC 2
      DO 1 J=1,KN
    1 D(J,I+L)=D(J+NSPTS,I+L)
    2 CONTINUE
      K=KN
      RETURN
      END


      SUBROUTINE PARAF(FNT,K,NP1,NC)
C
C***  SUBROUTINE PARAF USES PARABOLIC INTEGRATION TO FORM FOURIER
C***  SERIES COEFFICIENTS
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION FNT(K),AA(100),BB(100),X(3593),F(3593),XY(3593),Y(3593)
      COMMON TL(20),D(450,11),TM(450),A(100),B(100),F1(450),F2(450),F3(4
     150),ASPD(450),P(450),PD(450),PS(450),PSD(450),TT,RHO,PI,G,JP,MC,JR
     1,JW,JH
      REAL*8 NN
C
C***  THE DIMENSION OF THE LARGE ARRAYS ARE DETERMINED BY:
C***  (1)   N1=450+(450-1)*(NIP-1)
C***  (2)   N2=N1+(N1-1)*(NIP-1)
C***  (3)   N3=N2+(N2-1)*(NIP-1)  ----> N3=DIMENSION
C***  INITIALIZE PARAMETERS
      W0=2.0D0*PI/TT
      TOL=1.0D-10
      KK=K
      DC 1 I=1,K
      X(I)=TM(I)
    1 F(I)=FNT(I)
      KN=K
C***  BEGIN IMPROVEMENT SCHEME
      DO 9 JJK=1,3
      KCNT=(KN-1)/2
      L=1
      IP=0
C***  DETERMINE SLOPE DIFFERENCES
      DC 4 J=1,KCNT
      R=((F(L)-F(L+1))/(X(L)-X(L+1))-(F(L+1)-F(L+2))/(X(L+1)-X(L+2)))/(X
     1(L)-X(L+2))
      S=(F(L)-F(L+1))/(X(L)-X(L+1))-(X(L)+X(L+1))*R
      T=F(L)-X(L)*(R*X(L)+S)
      S1=2.0D0*R*X(L)+S
      S2=2.0D0*R*X(L+2)+S
      IF (J.GT.1) GO TO 2
      GC TO 3
    2 IF (J.EQ.2) AMSD=DABS(S1-SX)
      IF (DABS(S1-SX).GT.TOL) IP=IP+1
      IF (DABS(S1-SX).GT.AMSD) AMSD=DABS(S1-SX)
    3 SX=S2
    4 L=L+2
      IF (IP.NE.0) GO TO 5
      GC TO 10
C***  USE NEWTON'S INTERPOLATION FORMULA TO COMPUTE ADDITIONAL POINTS
    5 NIP=1
      DP=1.0D-12
      M=0
      L=1
      J=6
      XX=X(L)
      XXH=X(K)
      XC=C.0D0
    6 M=M+1
C***  DETERMINE ARGUMENT VALUES
      XX=XX+XC
      IF (DABS(XX-XXH).LT.DP) XX=XXH
      IF (XX.GT.XXH) GO TC 7
      IF (DABS(XX-X(L+1)).LT.DP) XX=X(L+1)
      IF (XX.EQ.X(L+1).AND.XX.LT.XXH) L=L+1
      IF (DABS(XX-X(J-2)).LT.DP) XX=X(J-2)
      IF (XX.EQ.X(J-2).AND.J.LT.K) J=J+1
C***  COMPUTE THE NEWTONIAN COEFFICIENTS
      A0=F(J-5)
      A1=(F(J-4)-F(J-5))/(X(J-4)-X(J-5))
      A2=(F(J-3)-(A0+A1*(X(J-3)-X(J-5))))/((X(J-3)-X(J-5))*(X(J-3)-X(J-4
     1)))
      A3=(F(J-2)-(A0+A1*(X(J-2)-X(J-5))+A2*(X(J-2)-X(J-5))*(X(J-2)-X(J-4
     1))))/((X(J-2)-X(J-5))*(X(J-2)-X(J-4))*(X(J-2)-X(J-3)))
      A4=(F(J-1)-(A0+A1*(X(J-1)-X(J-5))+A2*(X(J-1)-X(J-5))*(X(J-1)-X(J-4
     1))+A3*(X(J-1)-X(J-5))*(X(J-1)-X(J-4))*(X(J-1)-X(J-3))))/((X(J-1)-X
     1(J-5))*(X(J-1)-X(J-4))*(X(J-1)-X(J-3))*(X(J-1)-X(J-2)))
      A5=(F(J)-(A0+A1*(X(J)-X(J-5))+A2*(X(J)-X(J-5))*(X(J)-X(J-4))+A3*(X
     1(J)-X(J-5))*(X(J)-X(J-4))*(X(J)-X(J-3))+A4*(X(J)-X(J-5))*(X(J)-X(J
     1-4))*(X(J)-X(J-3))*(X(J)-X(J-2))))/((X(J)-X(J-5))*(X(J)-X(J-4))*(X
```

```
     1(J)-X(J-3))*(X(J)-X(J-2))*(X(J)-X(J-1)))
C***  COMPUTE ADDITIONAL FUNCTION VALUES
      Y(M)=A0+A1*(XX-X(J-5))+A2*(XX-X(J-5))*(XX-X(J-4))+A3*(XX-X(J-5))*(
     1XX-X(J-4))*(XX-X(J-3))+A4*(XX-X(J-5))*(XX-X(J-4))*(XX-X(J-3))*(XX-
     1X(J-2))+A5*(XX-X(J-5))*(XX-X(J-4))*(XX-X(J-3))*(XX-X(J-2))*(XX-X(J
     1-1))
      XY(M)=XX
      XC=(X(L+1)-X(L))/(NIP+1)
      GO TO 6
    7 KN=M-1
      K=KN
      DO 8 I=1,KN
      X(I)=XY(I)
    8 F(I)=Y(I)
    9 CONTINUE
C***  DETERMINE NUMBER OF INTERVALS
   10 KC=(K-1)/2
      L=1
      DO 17 J=1,KC
C***  SOLVE 3 EQUATIONS OVER INTERVAL
      R=((F(L)-F(L+1))/(X(L)-X(L+1))-(F(L+1)-F(L+2))/(X(L+1)-X(L+2)))/(X
     1(L)-X(L+2))
      S=(F(L)-F(L+1))/(X(L)-X(L+1))-(X(L)+X(L+1))*R
      T=F(L)-X(L)*(R*X(L)+S)
C***  COMPUTE ZEROTH COEFFICIENTS FOR INTERVAL
      AA(1)=(R*(X(L+2)**3-X(L)**3)/3.0D0+S*(X(L+2)**2-X(L)**2)/2.0D0+T*(
     1X(L+2)-X(L)))/(TT)
      BB(1)=0.0D0
      DO 11 N=2,MP1
      MN=N-1
C***  COMPUTE FIRST AND UPPER COEFFICIENTS FOR INTERVAL
      AA(N)=R*(2.0D0*X(L+2)*DCOS(MN*WO*X(L+2))/(MN**2*WO**2)+(MN**2*WO**
     12*X(L+2)**2-2.0D0)*DSIN(MN*WO*X(L+2))/(MN**3*WO**3))/(TT)+S*(DCOS(
     1MN*WO*X(L+2))/(MN**2*WO**2)+X(L+2)*DSIN(MN*WO*X(L+2))/(MN*WO))/(TT
     1)+(T*DSIN(MN*WO*X(L+2))/(MN*WO))/(TT)-(R*(2.0D0*X(L)*DCOS(MN*WO*X(
     1L))/(MN**2*WO**2)+(MN**2*WO**2*X(L)**2-2.0D0)*DSIN(MN*WO*X(L))/(MN
     1**3*WO**3))/(TT)+S*(DCOS(MN*WO*X(L))/(MN**2*WO**2)+X(L)*DSIN(MN*WO
     1*X(L))/(MN*WO))/(TT)+(T*DSIN(MN*WO*X(L))/(MN*WO))/(TT))
      AA(N)=2.0D0*AA(N)
      BB(N)=R*(2.0D0*X(L+2)*DSIN(MN*WO*X(L+2))/(MN**2*WO**2)-(MN**2*WO**
     12*X(L+2)**2-2.0D0)*DCOS(MN*WO*X(L+2))/(MN**3*WO**3))/(TT)+S*(DSIN(
     1MN*WO*X(L+2))/(MN**2*WO**2)-X(L+2)*DCOS(MN*WO*X(L+2))/(MN*WO))/(TT
     1)-(T*DCOS(MN*WO*X(L+2))/(MN*WO))/(TT)-(R*(2.0D0*X(L)*DSIN(MN*WO*X(
     1L))/(MN**2*WO**2)-(MN**2*WO**2*X(L)**2-2.0D0)*DCOS(MN*WO*X(L))/(MN
     1**3*WO**3))/(TT)+S*(DSIN(MN*WO*X(L))/(MN**2*WO**2)-X(L)*DCOS(MN*WO
     1*X(L))/(MN*WO))/(TT)-(T*DCOS(MN*WO*X(L))/(MN*WO))/(TT))
      BB(N)=2.0D0*BB(N)
   11 CONTINUE
      IF (J.EQ.1) GO TO 12
      GO TO 14
C***  SUM FOURIER SERIES COEFFICIENTS
   12 DO 13 JJ=1,MP1
      A(JJ)=AA(JJ)
      B(JJ)=BB(JJ)
   13 CONTINUE
   14 IF (J.GE.2) GO TO 15
      GO TO 17
   15 DO 16 JJ=1,MP1
      B(JJ)=B(JJ)+BB(JJ)
   16 A(JJ)=A(JJ)+AA(JJ)
   17 L=L+2
C***  FILTER FOURIER SERIES COEFFICIENTS TO REDUCE NOISE
      CALL FILTER(A,B,NC,MP1)
      K=KK
      RETURN
      END


      SUBROUTINE TRAP(ND,X,DY,Y,YO)
C
C***  SUBROUTINE TRAP INTEGRATES A FUNCTION BY TRAPEZOIDAL RULE
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION X(ND),DY(ND),Y(ND)
C
C***  INTIALIZE PARAMETERS
      S2=YO
      IF (ND-1)  4,3,1
C***  INTEGRATE OVER INTERVAL AND SUM
    1 DO 2 I=2,ND
      S1=S2
      S2=S2+0.5D0*(X(I)-X(I-1))*(DY(I)+DY(I-1))
    2 Y(I-1)=S1
    3 Y(ND)=S2
    4 RETURN
      END


      SUBROUTINE FNI(K,F,X,FP,FPP,ND,NS,NI)
C
C***  SUBROUTINE FNI USES NEWTON'S INTERPOLATION FORMULA TO COMPUTE
C***  ADDITIONAL POINTS FOR CUBIC SPLINE ANALYSIS
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION F(K),X(K),FP(K),FPP(K),XY(1827),Y(1827),AA(4,1827),FPS(1
     1827)
C
C***  THE ARRAYS ARE PROTECTED AGAINST 'OVERFLOW' BY THE FOLLOWING CARDS
      NB=K+(K-1)*NI+2*NS
      IF (NB.LE.1827) GO TO 1
      NI=3
      NS=15
      NB=K+(K-1)*NI+2*NS
C***  INITIALIZE PARAMETERS
    1 DF=1.0D-12
      H=X(4)-X(1)
      XX=-H
      XC=DABS(XX/(NS+1))
      XXH=DABS(XX)+X(K)
      XCH=XC
      M=0
      L=1
      J=6
    2 M=M+1
C***  DETERMINE THE INTERVAL IN QUESTION
      XX=XX+XC
      IF (DABS(XX-XXH).LT.DF) XX=XXH
      IF (XX.GE.XXH) GO TO 3
```

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      IF (DABS(XX-X(L)).LT.DF)XX=X(L)
      IF (DABS(XX-X(L+1)).LT.DF)XX=X(L+1)
      IF (XX.EQ.X(L+1).AND.XX.LT.X(K))L=L+1
      IF (DABS(XX-X(J-2)).LT.DF)XX=X(J-2)
      IF (XX.EQ.X(J-2).AND.J.LT.K)J=J+1
C***  COMPUTE THE NEWTONIAN COEFFICIENTS
      A0=F(J-5)
      A1=(F(J-4)-F(J-5))/(X(J-4)-X(J-5))
      A2=(F(J-3)-(A0+A1*(X(J-3)-X(J-5))))/((X(J-3)-X(J-5))*(X(J-3)-X(J-4
     1)))
      A3=(F(J-2)-(A0+A1*(X(J-2)-X(J-5))+A2*(X(J-2)-X(J-5))*(X(J-2)-X(J-4
     1))))/((X(J-2)-X(J-5))*(X(J-2)-X(J-4))*(X(J-2)-X(J-3)))
      A4=(F(J-1)-(A0+A1*(X(J-1)-X(J-5))+A2*(X(J-1)-X(J-5))*(X(J-1)-X(J-4
     1))+A3*(X(J-1)-X(J-5))*(X(J-1)-X(J-4))*(X(J-1)-X(J-3))))/((X(J-1)-X
     1(J-5))*(X(J-1)-X(J-4))*(X(J-1)-X(J-3))*(X(J-1)-X(J-2)))
      A5=(F(J)-(A0+A1*(X(J)-X(J-5))+A2*(X(J)-X(J-5))*(X(J)-X(J-4))+A3*(X
     1(J)-X(J-5))*(X(J)-X(J-4))*(X(J)-X(J-3))+A4*(X(J)-X(J-5))*(X(J)-X(J
     1-4))*(X(J)-X(J-3))*(X(J)-X(J-2))))/((X(J)-X(J-5))*(X(J)-X(J-4))*(X
     1(J)-X(J-3))*(X(J)-X(J-2))*(X(J)-X(J-1)))
C***  COMPUTE ADDITIONAL POINTS BY INTERPOLATION
      Y(N)=A0+A1*(XX-X(J-5))+A2*(XX-X(J-5))*(XX-X(J-4))+A3*(XX-X(J-5))*(
     1XX-X(J-4))*(XX-X(J-3))+A4*(XX-X(J-5))*(XX-X(J-4))*(XX-X(J-3))*(XX-
     1X(J-2))+A5*(XX-X(J-5))*(XX-X(J-4))*(XX-X(J-3))*(XX-X(J-2))*(XX-X(J
     1-1))
      XY(N)=XX
C***  DETERMINE INTERVAL INCREMENT
      IF (XX.GE.X(1).AND.XX.LT.X(K))XC=(X(L+1)-X(L))/(NI+1)
      IF (XX.GE.X(K))XC=XCN
      GO TO 2
    3 KN=N-1
C***  COMPUTE FIRST DERIVATIVE BY DIFFERENTIATION OF SPLINE FIT
      CALL SPLINE(KN,Y,XY,AA)
      L1=NS+1
      L2=KN-NS
      L3=NI+1
      II=0
      DO 4 I=L1,L2,L3
      II=II+1
      J=I
      IF (I.EQ.L2)J=J-1
      FP(II)=3.0D0*AA(1,J)*XY(I)**2+2.0D0*AA(2,J)*XY(I)+AA(3,J)
    4 CONTINUE
C***  CHECK FOR SECOND DERIVATIVE REQUEST
      IF (ND.EQ.2) GO TO 5
      GO TO 8
C***  COMPUTE ALL FIRST DERIVATIVES FOR SPLINE FIT
    5 DO 6 I=1,KN
      J=I
      IF (I.EQ.KN)J=J-1
    6 FPS(I)=3.0D0*AA(1,J)*XY(I)**2+2.0D0*AA(2,J)*XY(I)+AA(3,J)
C***  COMPUTE SECOND DERIVATIVE BY DIFFERENTIATION OF SPLINED FIRST
C***  DERIVATIVE
      CALL SPLINE(KN,FPS,XY,AA)
      II=0
      DO 7 I=L1,L2,L3
      II=II+1
      J=I
      IF (I.EQ.L2)J=J-1
      FPP(II)=3.0D0*AA(1,J)*XY(I)**2+2.0D0*AA(2,J)*XY(I)+AA(3,J)
    7 CONTINUE
    8 RETURN
      END


      SUBROUTINE SEC4(L,K,XAX)
C
C***  SUBROUTINE SEC4 CONTROLS THE ANGLE-OF-ATTACK CALCULATIONS BY THE
C***  DIFFERENTIAL EQUATION SOLUTION
C
      IMPLICIT REAL*8(A-H,O-Z)
      COMMON TL(20),D(450,11),TM(450),A(100),B(100),F1(450),F2(450),F3(4
     150),F4(450),F5(450),F6(450),F7(450),F8(450),TT,RHO,PI,G,JKS,M,JR,J
     1W,JF,IERR
      COMMON /TEMP1/ST(450,4),PAR(6),PSL,TSL,IPAR
      COMMON /PARM/GR,DAX
      COMMON /BLK1/Z(450,5)
      COMMON /LABX/IWR,IR
      COMMON /TEMP2/F9(450),F10(450),F13(450),F14(450),AP(6),W(6)
C
      IF (L.GT.1) GO TO 2
C***  INITIALIZE PARAMETERS AT FIRST POINT FOR ALL POINTS
      ISET=0
      IWR=JW
      IR=IERR
      DAX=XAX
      GR=G
      DO 1 I=1,K
      Z(I,1)=ST(I,4)
      Z(I,2)=F2(I)
      Z(I,3)=F3(I)
      Z(I,4)=F9(I)
    1 Z(I,5)=F6(I)
      Y=F4(L)
      DY=(ST(L,4)-G*DSIN(Z(L,2))+XAX*Z(L,3)**2)/DCOS(Z(L,5))-Y*((Z(L,3)-
     1Z(L,4))*DTAN(Z(L,5)))
      GO TO 6
C***  COMPUTE TIME INCREMENT AND SET TIME TO PREVIOUS POINT
    2 H=TM(L)-TM(L-1)
      J=L-1
      T=TM(J)
C***  ENACT PREDICTOR-CORRECTOR
      CALL TRENOR(H,T,Y,DY,J,ISET)
C***  CHECK FOR ERROR
      IERR=IR
      IF (IERR.NE.0) GO TO 4
      GO TO 6
    4 WRITE (JWRITE,5)
    5 FORMAT (1X,/,10X,'AN ERROR OCCURRED IN THE PREDICTOR-CORRECTOR ROU
     1TINE',///)
      RETURN
C***  DEFINE NEW AIRSPEED AND ACCELERATION
    6 F4(L)=Y
      F8(L)=DY
      RETURN
      END


      SUBROUTINE TRENOR(H,XX,YY,DYY,J,ISET)
```

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C
C***  SUBROUTINE TRENOR SOLVES A DIFFERENTIAL EQUATION BY PREDICTOR-
C***  CORRECTOR METHODS
C
      IMPLICIT REAL*8(A-H,O-Z)
      EXTERNAL PHIDER
      COMMON /PARM/G,XAX
      COMMON /PCR/DY(7),X(7),Y(7)
      COMMON /LABX/JWRITE,IF
      COMMON /CRCOEF/P,AC,A1,A2,A3,A4,A5,HH
      COMMON /BLK1/Z(450,5)
      COMMON /BLK2/PM(5)
C
C***  INITIALIZE PARAMETERS FOR FF
      DO 1 I=1,5
    1 PM(I)=Z(J,I)
C***  COMPUTE DERIVATIVE AT BEGINNING OF INTERVAL
      CALL FF(XX,YY,DYY)
      DY(7)=DYY
C***  TEST FOR INITIALIZATION
      IF (ISET)  2,2,4
C***  DEFINE VARIABLES INITIALLY
    2 DO 3 I=1,7
      Y(I)=YY
      DY(I)=DYY
    3 X(I)=XX
C***  BEGIN RUNGE KUTTA
      K=1
      LK=6
      ISET=1
      GO TO 5
    4 IF (K.LT.7) K=K+1
      IF (K-7)  5,10,10
C***  DEFINE VARIABLES FOR FF
    5 Y2=YY+0.5D0*H*DYY
      DO 6 I=1,5
    6 PM(I)=(Z(J,I)+Z(J+1,I))/2.0D0
C***  COMPUTE DERIVATIVE AT INTERVAL MIDPOINT
      CALL FF(XX+0.5D0*H,Y2,DY2)
      Y3=YY+0.5D0*H*DY2
C***  UPDATE DERIVATIVE AT INTERVAL MIDPOINT
      CALL FF(XX+0.5D0*H,Y3,DY3)
C***  APPLY CORRECTIVE PROCEDURE FOR RUNGE KUTTA
      IF (DABS(DY2-DYY).LT.1.0D-15) GO TO 7
      P=-2.0D0*(DY3-DY2)/(DY2-DYY)/H
      IF ((P*H).LT.1.0D-04) GO TO 7
C***  COMPUTE 'STIFF-EQUATION' F COEFFICIENTS
      F0=0.0D0
      IF ((-P*H).LT.174.673D0.AND.(-P*H).GT.-180.218D0)F0=DEXP(-P*H)
      F1=-(F0-1.0D0)/P/H
      F2=-(F1-1.0D0)/P/H
      F3=-(F2-0.5D0)/P/H
      Y4=YY+H*(2.0D0*DY3*F2+DYY*(F1-2.0D0*F2)+DY2*P*H*F2)
      AP=1.0D0
      IKP=0
      GO TO 8
C***  SET F COEFFICIENTS TO STANDARD ADAMS-BASHFORTH F COEFFICIENTS
    7 F1=1.0D0
      F2=0.5D0
      F3=1.666666666666667D-1
      P=0.0D0
      Y4=YY+H*DY3
C***  DEFINE VARIABLES FOR FF
    8 DO 9 I=1,5
    9 PM(I)=Z(J+1,I)
C***  COMPUTE DERIVATIVE AT END OF INTERVAL
      CALL FF(XX+H,Y4,DY4)
      B=-3.0D0*(DYY+P*YY)+2.0D0*(DY2+P*Y2)+2.0D0*(DY3+P*Y3)-(DY4+P*Y4)
      C=4.0D0*((DYY+P*YY)-(DY2+P*Y2)-(DY3+P*Y3)+(DY4+P*Y4))
      YR=YY+H*(DYY*F1+B*F2+C*F3)
C***  UPDATE DERIVATIVE AT END OF INTERVAL BY CORRECTOR
      CALL FF(XX+H,YR,DYR)
      GO TO 17
   10 DO 11 I=1,6
      Y(I)=Y(I+1)
      DY(I)=DY(I+1)
   11 X(I)=X(I+1)
      X(7)=X(6)+H
C***  CALL PREDICTOR TO PREDICT Y AT NEXT POINT
   12 DO 13 I=1,6
   13 CALL PHICEF(I)
      K=7
      LK=LK+1
      PRDCT=Y(1)+PHIDER(6,X(7),-1,1,0)-PHIDER(6,X(1),-1,1,0)
C***  DEFINE VARIABLE FOR FF
      DO 14 I=1,5
   14 PM(I)=Z(J+1,I)
C***  USING PREDICTED Y, COMPUTE ITS DERIVATIVE
      CALL FF(X(7),PRDCT,DY(7))
      CALL PHICEF(7)
C***  GENERATE COEFFICIENTS NECESSARY FOR 'STIFF-EQUATION' CORRECTOR
      CALL FCEF
C***  TEST FOR SUITABLE CORRECTOR
      IF ((P*HH).LT.1.0D-02) GO TO 15
C***  CORRECT Y BY 'STIFF-EQUATION' CORRECTOR
      CALL FMETH
      GO TO 16
C***  CORRECT Y BY MODIFIED TRENOR CORRECTOR
   15 Y(7)=Y(1)+PHIDER(7,X(7),-1,1,0)-PHIDER(7,X(1),-1,1,0)
   16 YR=Y(7)
C***  COMPUTE FUNCTION DERIVATIVE BY FF
      CALL FF(X(7),YR,DYR)
      DY(7)=DYR
C***  TEST FOR POSSIBLE ERRORS
      IF (IR.NE.0) RETURN
C***  UPDATE PARAMETERS
   17 IF (LK.EQ.7) GO TO 20
      IF (LK.GT.7) GO TO 19
      DO 18 I=1,6
      Y(I)=Y(I+1)
      DY(I)=DY(I+1)
   18 X(I)=X(I+1)
      X(7)=X(6)+H
   19 Y(7)=YR
      DY(7)=DYR
      IF (K.EQ.6) GO TO 12
   20 YY=Y(7)
      DYY=DY(7)
      XX=X(7)
      RETURN
```

```
      END

      SUBROUTINE FF(T,Y,DY)
C
C***  SUBROUTINE FF CALCULATES DERIVATIVES FOR ANGLE OF ATTACK
C***  PREDICTIONS
C
      IMPLICIT REAL*8(A-H,O-Z)
      COMMON /PARM/G,XAX
      COMMON /BLK2/X(5)
C
      DY=(X(1)-G*DSIN(X(2))-XAX*X(3)**2)/DCOS(X(5))-Y*((X(3)-X(4))*DTAN(
     1X(5)))
      RETURN
      END

      SUBROUTINE PHICEF(I)
C
C***  SUBROUTINE PHICEF COMPUTES COEFFICIENTS FOR NEWTON'S FORWARD
C***  INTERPOLATION SCHEME FOR NON-EQUIDISTANT INTERVALS FOR THE
C***  FOLLOWING FUNCTION PHI:
C***    PHI(X)=A(1)+A(2)*(X-X(1))+A(3)*(X-X(1))*(X-X(2))+...
C***                ...+A(I)*(X-X(1))*(X-X(2))*...*(X-X(I-1))+...
C***                ...+A(N)*(X-X(1))*(X-X(2))*...*(X-X(N-1)).
C***  BY USING A RECURSION FORMULA, PHICEF CAN BE USED TO COMPUTE BOTH
C***  DERIVATIVES AND ANTIDERIVATIVES OF PHI.  PHICEF MUST BE CALLED IN
C***  CONSECUTIVELY-INCREASING VALUES OF I FOR THE RECURSION FORMULA TO
C***  BE CORRECT.
C
      IMPLICIT REAL*8(A-H,O-Z)
      COMMON /AWRK/A(7),C(7,8)
      COMMON /PCR/F(7),X(7),Y(7)
      COMMON /LABX/JWRITE,IERR
C
      IF (I.LT.1.OR.I.GT.7) GO TO 8
C***  TRANSLATE
      SVE=X(1)
      DO 1 J=1,I
    1 X(J)=X(J)-SVE
C***  CALCULATE THE C-COEFFICIENTS
      J=1
C***  NOTE: C(I,1)=1 FOR ALL I
      C(I,J)=1D0
    2 J=J+1
      IF (J.GT.I) GO TO 3
      C(I,J)=X(I-1)*C(I-1,J-1)+C(I-1,J)
      GO TO 2
C***  NOTE: C(I,I+1)=0 FOR ALL I
    3 C(I,I+1)=0D0
C***  CALCULATE A(I)
      A(I)=0D0
      DNM=1D0
      J=1
    4 IF (J.GT.I-1) GO TO 5
      A(I)=A(I)+A(J)*CNM
      DNM=DNM*(X(I)-X(J))
      J=J+1
      GO TO 4
    5 A(I)=(F(I)-A(I))/DNM
C***  RESET
      DO 6 J=1,I
    6 X(J)=X(J)+SVE
    7 RETURN
    8 IERR=1
      WRITE (JWRITE,9) I
    9 FORMAT (1H ,'***PHICEF ERROR: I=',I3,' BUT 0<I<8 IS REQUIRED***')
      GO TO 7
      END

      SUBROUTINE LLSQAR(A,B,M,NA,NB,IA,IB,IDGT,WKAREA,IER,JWRITE)
C
C***  SUBROUTINE LLSQAR PERFORMS A LEAST SQUARES SOLUTION OF A OVER-
C***  DETERMINED SYSTEM OF LINEAR EQUATIONS
C
      DIMENSION A(IA,1),B(IB,1),WKAREA(1)
      REAL*8 SUM
      REAL*8 A,B,WKAREA
C
C***  INITIALIZE IER
      IER=0
C***  FIND THE PSEUDO-INVERSE OF MATRIX A
      CALL LPSDOR(A,M,NA,IA,A,IDGT,WKAREA,IER,JWRITE)
      IF (IER.NE.0) GO TO 5
C***  SOLVE THE EQUATION BY MULTIPLYING A-INVERSE AND B
      DO 4 I=1,NB
      DO 2 J=1,NA
      CALL VXPZRO
      DO 1 K=1,M
      CALL VXPMUL(A(K,J),B(K,I))
    1 CONTINUE
      CALL VXPSTO(SUM)
      WKAREA(J)=SUM
    2 CONTINUE
C***  MOVE THE RESULTS INTO MATRIX B
      DO 3 J=1,NA
      B(J,I)=WKAREA(J)
    3 CONTINUE
    4 CONTINUE
      GO TO 6
    5 IER=129
      CALL UERTST(IER,6HLLSQAR,JWRITE)
    6 RETURN
      END

      SUBROUTINE LPSDOR(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)
C
C***  SUBROUTINE LPSDOR FINDS THE PSEUDO-INVERSE OF A MATRIX
C
      DIMENSION A(IA,1),AINV(IA,1),WKAREA(N,1)
      REAL*8 A,AINV,WKAREA,BIGA,ARN,ZERO,ETA
      REAL*8 SUM,DETA
C
```

```
C***  INITIALIZE IER
      IER=0
      NP1=N+1
      NP2=N+2
      NP3=N+3
C***  FIND THE LARGEST ELEMENT OF A
      BIGA=0.D0
      DO 1 I=1,M
      DO 1 II=1,N
      IF (BIGA.GE.DABS(A(I,II))) GO TO 1
      BIGA=DABS(A(I,II))
    1 CONTINUE
      AMN=M*N
      ETA=DSQRT(AMN)/(10.**IDGT)*BIGA
C***  CALCULATE THE SINGULAR VALUE DECOMPOSITION OF A
      CALL LSVALR(A,M,N,IA,N,1,WKAREA(1,N+4),WKAREA(1,NP1),AINV,WKAREA)
      DO 2 I=1,N
    2 WKAREA(I,NP2)=WKAREA(I,NP1)
C***  SORT THE SINGULAR VALUES ARRAY INTO ASCENDING SEQUENCE BY ABSOLUTE
C***  VALUE
      CALL VSCRTM(WKAREA(1,NP2),N)
      DETA=ETA**2
      CALL VXPZRO
C***  COMPARE SINGULAR VALUES AND ETA
      DO 3 I=1,N
      IP=I
      CALL VXPMUL(WKAREA(I,NP2),WKAREA(I,NP2))
      CALL VXPSTO(SUM)
      IF (SUM.GT.DETA) GO TO 4
    3 CONTINUE
      IER=129
      GO TO 15
    4 IP=IP-1
      IF (IP.NE.0) GO TO 5
      ZERO=0.D0
      GO TO 6
    5 ZERO=WKAREA(IP,NP2)
    6 DO 10 I=1,N
      IF (WKAREA(I,NP1).LE.ZERO) GO TO 8
      DO 7 J=1,N
    7 WKAREA(J,I)=WKAREA(J,I)/WKAREA(I,NP1)
      GO TO 10
C***  SET WKAREA(J,I)=0.0, FOR J=1,...,N, IF WKAREA(I,NP1).LE.ZERO
    8 DO 9 J=1,N
    9 WKAREA(J,I)=0.0
   10 CONTINUE
      DO 14 I=1,M
      DO 12 J=1,N
      CALL VXPZRO
      DO 11 K=1,N
   11 CALL VXPMUL(WKAREA(J,K),AINV(I,K))
      CALL VXPSTO(SUM)
   12 WKAREA(J,NP3)=SUM
C***  MOVE THE RESULTS INTO MATRIX AINV
      DO 13 J=1,N
   13 AINV(I,J)=WKAREA(J,NP3)
   14 CONTINUE
      GO TO 16
   15 CALL UERTST(IER,6HLPSDOR,JWRITE)
   16 RETURN
      END
```

```
      SUBROUTINE LSVALR(A,M,N,IA,IV,ISW,WKAREA,Q,U,V)
C
C***  SUBROUTINE LSVALR DETERMINES THE SINGULAR VALUE DECOMPOSITION OF A
C***  MATRIX
C
      DIMENSION A(IA,1),U(IA,1),V(IV,1),Q(1),WKAREA(1)
      REAL*8A,WKAREA,Q,U,V,EPS,TOL
      REAL*8F,G,H,X,Y,Z,C,S,HR,GR,DPS,ONE,ZERO
      DATA TOL/Z0D10000C0CC00000/,DPS/Z341000000000000/
      DATA ONE/1.0D0/,ZERO/0.0D0/
C
      EPS=DPS
      DO 1 I=1,M
      DO 1 J=1,N
      U(I,J)=A(I,J)
    1 CONTINUE
C***  HOUSEHOLDER'S REDUCTION TO BIDIAGONAL FORM
      X=0.D0
      G=0.D0
      DO 17 I=1,N
      WKAREA(I)=G
      CALL VXPZRO
      L=I+1
      DO 2 J=I,M
    2 CALL VXPMUL(U(J,I),U(J,I))
      CALL VXPSTO(S)
      IF (S.GE.TOL) GO TO 3
      G=0.D0
      GO TO 7
    3 F=U(I,I)
      G=-DSQRT(S)
      IF (F.LT.0.D0)G=-G
      H=F*G-S
      HR=1.0/H
      U(I,I)=F-G
      IF (L.GT.N) GO TO 7
      DO 6 J=L,N
      CALL VXPZRO
      DO 4 K=I,M
    4 CALL VXPMUL(U(K,I),U(K,J))
      CALL VXPSTO(S)
      F=S*HR
      DO 5 K=I,M
    5 U(K,J)=U(K,J)+F*U(K,I)
    6 CONTINUE
    7 Q(I)=G
      CALL VXPZRO
      IF (L.GT.N) GO TO 9
      DO 8 J=L,N
    8 CALL VXPMUL(U(I,J),U(I,J))
      CALL VXPSTO(S)
    9 IF (S.GE.TOL) GO TO 10
      G=0.D0
      GO TO 16
   10 IF (I.LT.N) F=U(I,I+1)
      G=-DSQRT(S)
```

```
      IF (F.LT.0.D0) G=-G
      H=F*G-S
      HR=1.0/H
      IF (I.LT.N) U(I,I+1)=F-G
      IF (L.GT.N) GO TO 12
      DO 11 J=L,N
   11 WKAREA(J)=U(I,J)*HR
   12 IF (L.GT.M) GO TO 16
      DO 15 J=L,M
      CALL VXPZRO
      IF (L.GT.N) GO TO 15
      DO 13 K=L,N
   13 CALL VXPMUL(U(J,K),U(I,K))
      CALL VXPSTO(S)
      DO 14 K=L,N
   14 U(J,K)=U(J,K)+S*WKAREA(K)
   15 CONTINUE
   16 Y=DABS(Q(I))+DABS(WKAREA(I))
      IF (Y.GT.X) X=Y
   17 CONTINUE
C***  ACCUMULATION OF RIGHT HAND TRANSFORMATIONS
      IF (ISW.EQ.0) GO TO 37
      DO 25 I=1,N
      II=N-I+1
      IF (G.EQ.0.D0) GO TO 22
      IF (L.GT.N) GO TO 24
      H=U(II,II+1)*G
      HR=1.0/H
      DO 18 J=L,N
   18 V(J,II)=U(II,J)*HR
      DO 21 J=L,N
      CALL VXPZRO
      DO 19 K=L,N
   19 CALL VXPMUL(U(II,K),V(K,J))
      CALL VXPSTO(S)
      DO 20 K=L,N
   20 V(K,J)=V(K,J)+S*V(K,II)
   21 CONTINUE
   22 IF (L.GT.N) GO TO 24
      DO 23 J=L,N
      V(J,II)=0.D0
   23 V(II,J)=0.D0
   24 V(II,II)=1.0D0
      G=WKAREA(II)
   25 L=II
C***  ACCUMULATION OF LEFT HAND TRANSFORMATIONS
      DO 36 I=1,N
      II=N-I+1
      LL=II+1
      G=Q(II)
      IF (LL.GT.N) GO TO 27
      DO 26 J=LL,N
   26 U(II,J)=0.D0
   27 IF (G.EQ.0.D0) GO TO 33
      H=U(II,II)*G
      HR=1.0/H
      IF (LL.GT.N) GO TO 31
      DO 30 J=LL,N
      CALL VXPZRO
      DO 28 K=LL,M
   28 CALL VXPMUL(U(K,II),U(K,J))
      CALL VXPSTO(S)
      F=S*HR
      DO 29 K=II,M
   29 U(K,J)=U(K,J)+F*U(K,II)
   30 CONTINUE
   31 GR=1.0/G
      DO 32 J=II,M
   32 U(J,II)=U(J,II)*GR
      GO TO 35
   33 DO 34 J=II,M
   34 U(J,II)=0.D0
   35 U(II,II)=U(II,II)+1.0D0
   36 CONTINUE
C***  DIAGONALIZATION OF THE BIDIAGONAL FORM
   37 EPS=EPS*X
      DO 57 K=1,N
      KK=N-K+1
C***  TEST F SPLITTING
   38 DO 39 L=1,KK
      LL=KK-L+1
      IF (DABS(WKAREA(LL)).LE.EPS) GO TO 45
      IF (LL.EQ.1) GO TO 45
      IF (DABS(Q(LL-1)).LE.EPS) GO TO 40
   39 CONTINUE
C***  CANCELLATION OF WKAREA(L) IF LL.GT.1
   40 C=0.D0
      S=1.0D0
      L1=LL-1
      IF (KK.LT.LL) GO TO 45
      DO 44 I=LL,KK
      F=S*WKAREA(I)
      WKAREA(I)=C*WKAREA(I)
      IF (DABS(F).LE.EPS) GO TO 45
      G=Q(I)
      Q(I)=DSQRT(F*F+G*G)
      H=Q(I)
      IF (H.NE.ZERO) GO TO 41
      C=ZERO
      S=ONE
      GO TO 42
   41 C=G/H
      S=-F/H
   42 IF (ISW.EQ.0) GO TO 44
      DO 43 J=1,M
      Y=U(J,L1)
      Z=U(J,I)
      U(J,L1)=Y*C+Z*S
   43 U(J,I)=-Y*S+Z*C
   44 CONTINUE
C***  TEST F CONVERGENCE
   45 Z=Q(KK)
      IF (LL.EQ.KK) GO TO 55
C***  SHIFT FROM BOTTOM 2X2 MINOR
      X=Q(LL)
      IF (KK.GT.1) Y=Q(KK-1)
      IF (KK.GT.1) G=WKAREA(KK-1)
      H=WKAREA(KK)
      F=((Y-Z)*(Y+Z)+(G-H)*(G+H))/(2.D0*H*Y)
      G=DSQRT(F*F+ONE)
```

```
      IF (F.LT.0.D0) F=((X-Z)*(X+Z)+H*(Y/(F-G)-H))/X
      IF (F.GE.0.D0) F=((X-Z)*(X+Z)+H*(Y/(F+G)-H))/X
C***  NEXT QR TRANSFORMATION
      C=1.0D0
      S=1.0D0
      L2=LL+1
      IF (KK.LT.L2) GO TO 54
      DO 53 I=L2,KK
      G=WKAREA(I)
      Y=Q(I)
      H=S*G
      G=C*G
      Z=DSQRT(F*F+H*H)
      WKAREA(I-1)=Z
      IF (Z.NE.ZERO) GO TO 46
      C=ZERO
      S=ONE
      GO TO 47
   46 C=F/Z
      S=H/Z
   47 F=X*C+G*S
      G=-X*S+G*C
      H=Y*S
      Y=Y*C
      IF (ISW.EQ.0) GO TO 49
      DO 48 J=1,N
      X=V(J,I-1)
      Z=V(J,I)
      V(J,I-1)=X*C+Z*S
   48 V(J,I)=-X*S+Z*C
   49 Z=DSQRT(F*F+H*H)
      Q(I-1)=Z
      IF (Z.NE.ZERO) GO TO 50
      C=ZERO
      S=ONE
      GO TO 51
   50 C=F/Z
      S=H/Z
   51 F=C*G+S*Y
      X=-S*G+C*Y
      IF (ISW.EQ.0) GO TO 53
      DO 52 J=1,M
      Y=U(J,I-1)
      Z=U(J,I)
      U(J,I-1)=Y*C+Z*S
   52 U(J,I)=-Y*S+Z*C
   53 CONTINUE
   54 WKAREA(LL)=ZERO
      WKAREA(KK)=F
      Q(KK)=X
      GO TO 38
C***  CONVERGENCE
   55 IF (Z.GE.ZERO) GO TO 57
      Q(KK)=-Z
      IF (ISW.EQ.0) GO TO 57
      DO 56 J=1,N
   56 V(J,KK)=-V(J,KK)
   57 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE UERTST(IER,NAME,JWRITE)
C
C***  SUBROUTINE UERTST GENERATES ERROR MESSAGES
C
      DIMENSION ITYP(5,4),IBIT(4)
      INTEGER*2 NAME(3)
      INTEGER WARN,WARF,TERM,JWRITE
      EQUIVALENCE (IBIT(1),WARN),(IBIT(2),WARF),(IBIT(3),TERM)
      DATA ITYP/'WARN','ING ','    ','    ','    ','WARN','ING(','WITH',
     1' FIX',')   ','TERM','INAL','    ','    ','    ','NON-','DEFI','NE
     1D ','    ','    '/,IBIT/32,64,128,0/
C
      IER2=IER
      IF (IER2.GE.WARN) GO TO 1
C***  UNDEFINED
      IER1=4
      GO TO 4
    1 IF (IER2.LT.TERM) GO TO 2
C***  TERMINAL
      IER1=3
      GO TO 4
    2 IF (IER2.LT.WARF) GO TO 3
C***  WARNING (WITH FIX)
      IER1=2
      GO TO 4
C***  WARNING
    3 IER1=1
C***  EXTRACT 'N'
    4 IER2=IER2-IBIT(IER1)
C***  PRINT ERROR MESSAGE
      WRITE (JWRITE,5) (ITYP(I,IER1),I=1,5),NAME,IER2,IER
    5 FORMAT (1X,/,1X,'ERROR MESSAGE FROM UERTST',2X,5A4,4X,3A2,4X,I2,2X
     1,'IER= ',I3)
      RETURN
      END
```

```
      SUBROUTINE VSORTM(A,LA)
C
C***  SUBROUTINE VSORTM SORTS ARRAYS BY ABSOLUTE VALUE
C
      DIMENSION A(1),IU(21),IL(21)
      REAL*8A,T,TT
C
C***  FIND ABSOLUTE VALUES OF ARRAY A
      DO 1 I=1,LA
      IF (A(I).LT.0.0)A(I)=-A(I)
    1 CONTINUE
C
      ENTRY VSORTA(A,LA)
C
C***  ENTRY VSORTA SORTS ARRAYS BY ALGEBRAIC VALUE
C
      M=1
      I=1
      J=LA
```

```
      R=.375
    2 IF (I.EQ.J) GO TO 11
      IF (R.GT..5898437) GO TO 4
      R=R+3.90625E-2
      GO TO 5
    4 R=R-.21875
    5 K=I
C***  SELECT A CENTRAL ELEMENT OF THE ARRAY AND SAVE IT IN LOCATION T
      IJ=I+(J-I)*R
      T=A(IJ)
C***  IF FIRST ELEMENT OF ARRAY IS GREATER THAT T, INTERCHANGE WITH T
      IF (A(I).LE.T) GO TO 6
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
    6 L=J
C***  IF LAST ELEMENT OF ARRAY IS LESS THAN T, INTERCHANGE WITH T
      IF (A(J).GE.T) GO TO 8
      A(IJ)=A(J)
      A(J)=T
      T=A(IJ)
C***  IF FIRST ELEMENT OF ARRAY IS GREATER THAN T, INTERCHANGE WITH T
      IF (A(I).LE.T) GO TO 8
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
      GO TO 8
    7 TT=A(L)
      A(L)=A(K)
      A(K)=TT
C***  FIND AN ELEMENT IN SECOND HALF OF ARRAY WHICH IS SMALLER THAN T
    8 L=L-1
      IF (A(L).GT.T) GO TO 8
C***  FIND AN ELEMENT IN FIRST HALF OF ARRAY WHICH IS GREATER THAN T
    9 K=K+1
      IF (A(K).LT.T) GO TO 9
C***  INTERCHANGE THESE ELEMENTS
      IF (K.LE.L) GO TO 7
C***  SAVE UPPER AND LOWER SUBSCRIPTS OF THE ARRAY YET TO BE SORTED
      IF (L-I.LE.J-K) GO TO 10
      IL(M)=I
      IU(M)=L
      I=K
      M=M+1
      GO TO 12
   10 IL(M)=K
      IU(M)=J
      J=L
      M=M+1
      GO TO 12
C***  BEGIN AGAIN ON ANOTHER PORTION OF UNSORTED ARRAY
   11 M=M-1
      IF (M.EQ.0) RETURN
      I=IL(M)
      J=IU(M)
   12 IF (J-I.GE.11) GO TO 5
      IF (I.EQ.1) GO TO 2
      I=I-1
   13 I=I+1
      IF (I.EQ.J) GO TO 11
      T=A(I+1)
      IF (A(I).LE.T) GO TO 13
      K=I
   14 A(K+1)=A(K)
      K=K-1
      IF (T.LT.A(K)) GO TO 14
      A(K+1)=T
      GO TO 13
      END
```

```
      SUBROUTINE MADD(A,B,N,M,MS)
C
C***  SUBROUTINE MADD ADDS TWO MATRICES
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(1),B(1)
C
      NM=N*M
C***  CHECK FOR UPPER TRIANGULAR STORAGE MODE
      IF (MS.EQ.1) NM=N*(N+1)/2
C***  SUM THE MATRICES ELEMENT BY ELEMENT
      DO 1 I=1,NM
    1 A(I)=A(I)+B(I)
      RETURN
      END
```

```
      SUBROUTINE MSTR(A,R,N,MSA,MSR)
C
C***  SUBROUTINE MSTR CHANGES THE STORAGE MODE OF THE MATRIX
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(1),R(1)
C
      DO 5 I=1,N
      DO 5 J=1,N
C***  IF MATRIX R IS GENERAL, FORM ELEMENT
      IF (MSR) 1,2,1
C***  IF IN LOWER TRIANGLE OF SYMMETRIC OR DIAGONAL R, BYPASS
    1 IF (I-J) 2,2,5
    2 CALL LOC(I,J,IR,N,N,MSR)
C***  IF IN UPPER AND OFF-DIAGONAL OF DIAGONAL R, BYPASS
      IF (IR) 5,5,3
C***  FORM R(I,J)
    3 R(IR)=0.0D0
      CALL LOC(I,J,IA,N,N,MSA)
C***  IF THERE IS NO A(I,J), LEAVE R(I,J) AT 0.0
      IF (IA) 5,5,4
    4 R(IR)=A(IA)
    5 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE FILTER(A,B,NCUT,NF1)
C
```

```
C***  SUBROUTINE FILTER IS A LOW-PASS FILTER USED TO REDUCE HIGH NOISE
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(NP1),B(NP1)
C
C***  INITIALIZE PARAMETERS
      PI=3.14159265358979300
      X=NCUT
      XXX=3.0D0/2.0D0*X
      DO 4 N=1,NP1
C***  TEST FOR ARGUMENT RANGE FOR FILTERING
      XX=N
      IF (XX.GE.X.AND.XX.LE.XXX) GO TO 1
      GO TO 2
    1 A(N)=A(N)*(DCOS(PI*(XX-X)/X))**2
      B(N)=B(N)*(DCOS(PI*(XX-X)/X))**2
    2 IF (XX.GT.XXX) GO TO 3
      GO TO 4
    3 A(N)=0.0D0
      B(N)=0.0D0
    4 CONTINUE
      RETURN
      END


      SUBROUTINE SPLINE(N,Y,X,AA)
C
C***  SUBROUTINE SPLINE FINDS THE RELATIONSHIP BETWEEN FUNCTION VALUES
C***  AND ALLOWS THE CALCULATION OF DERIVATIVES
C***       REFERENCE FOR THIS METHOD IS:
C***       THE THEORY OF SPLINES AND THEIR APPLICATIONS
C***       J.H. AHLBERG, ET AL, ACADEMIC PRESS, NEW YORK, 1967
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION AA(4,N),X(N),Y(N),H(1827),Q(1827),U(1827)
C
      NM1=N-1
      DO 1 I=1,NM1
    1 H(I)=X(I+1)-X(I)
C***  MODIFIED LEFT-HAND END CONDITION THAT ALLEVIATES THE NEED TO
C***  SPECIFY THE X-DERIVATIVE OF Y AT POINT 1
      Q(1)=-31.0D0/32.0D0
      H1=H(1)
      H2=H(2)
      H3=H(3)
      U(1)=Y(1)*(32.0D0*H1+42.0D0*H2+21.0D0*H3)/(H1+H2)/(H1+H2+H3)-Y(2)*
     1(11.0D0*H1+42.0D0*H2+21.0D0*H3)/(H2+H3)/H2+Y(3)*H1*(11.0D0*H1+21.0
     1D0*(H2+H3))/(H1+H2)/H2/H3-Y(4)*H1*(11.0D0*H1+21.0D0*H2)/(H2+H3)/(H
     11+H2+H3)/H3
C***  GENERATE INTERNAL U(I) BY ALGORITHMN GIVEN BY AHLBERG
      U(1)=3.0D0*U(1)/H1/16.0D0
      HM=H(1)
      YY=Y(2)
      YM=Y(1)
      DO 2 I=2,NM1
      HH=H(I)
      YP=Y(I+1)
      D=3.0D0*((YP-YY)/HH-(YY-YM)/HM)/(HH+HM)
      C=0.5D0*HH/(HH+HM)
      A=0.5D0-C
      P=A*C(I-1)+1.0D0
      Q(I)=-C/P
      U(I)=(D-A*U(I-1))/P
      HM=HH
      YM=YY
    2 YY=YP
C***  MODIFIED RIGHT-HAND END CONDITION THAT ALLEVIATES THE NEED TO
C***  SPECIFY THE X-DERIVATIVE OF Y AT POINT N
      A=31.0D0/32.0D0
      P=A*Q(N-1)+1.0D0
      H1=H(NM1)
      H2=H(NM1-1)
      H3=H(NM1-2)
      D=Y(N)*(32.0D0*H1+42.0D0*H2+21.0D0*H3)/(H1+H2)/(H1+H2+H3)-Y(NM1)*(
     111.0D0*H1+42.0D0*H2+21.0D0*H3)/(H2+H3)/H2+Y(NM1-1)*H1*(11.0D0*H1+2
     11.0D0*(H2+H3))/(H1+H2)/H2/H3-Y(NM1-2)*H1*(11.0D0*H1+21.0D0*H2)/(H2
     1+H3)/(H1+H2+H3)/H3
      D=3.0D0*D/H1/16.0D0
      U(N)=(D-A*U(N-1))/P
C***  SOLVE FOR THE SPLINE COEFFICIENTS CORRESPONDING TO AHLBERG M(0) TO
C***  M(N) AND STORE THEM IN THE U(I)
      DO 3 J=1,NM1
      I=N-J
    3 U(I)=Q(I)*U(I+1)+U(I)
C***  FORM THE SPLINE COEFFICIENTS FOR THE CONVENTIONAL FORM OF A CUBIC
C***  POLYNOMIAL FROM THE U(I)
      UU=U(1)
      XX=X(1)
      YY=Y(1)
      DO 4 I=1,NM1
      UP=U(I+1)
      XP=X(I+1)
      YP=Y(I+1)
      HH=H(I)
      AA(1,I)=(UP-UU)/HH/6.0D0
      AA(2,I)=0.5D0*(XP*UU-XX*UP)/HH
      AA(3,I)=0.5D0*(UP*XX*XX-UU*XP*XP)/HH+(UU-UP)*HH/6.0D0+(YP-YY)/HH
      AA(4,I)=(UU*XP*XP*XP-UP*XX*XX*XX)/HH/6.0D0+(UP*XX-UU*XP)*HH/6.0D0+
     1(YY*XP-YP*XX)/HH
      XX=XP
      UU=UP
    4 YY=YP
      RETURN
      END


      SUBROUTINE PCEF
C
C***  SUBROUTINE PCEF CALCULATES THE COEFFICIENTS FOR THE 'STIFF-
C***  EQUATION' CORRECTOR
C
      IMPLICIT REAL*8(A-Z)
      REAL*8 TOL/1.0D-2/
      COMMON /PCR/DY0,DY1,DY2,DY3,DY4,DY5,DY6,X0,X1,X2,X3,X4,X5,X6,Y0,Y1
     1,Y2,Y3,Y4,Y5,Y6
      COMMON /CRCOEF/F,A0,A1,A2,A3,A4,A5,H
C
C***  DEFINE DIFFERENCES
```

```
      T(X)=X-X0
      W(Y)=Y-Y0
      V(DY)=DY-DY0
C***  CALCULATE X-DIFFERENCES
      T0=T(X0)
      T1=T(X1)
      T2=T(X2)
      T3=T(X3)
      T4=T(X4)
      T5=T(X5)
      T6=T(X6)
C***  CALCULATE Y-DIFFERENCES RELATIVE TO Y0
      W0=W(Y0)
      W1=W(Y1)
      W2=W(Y2)
      W3=W(Y3)
      W4=W(Y4)
      W5=W(Y5)
      W6=W(Y6)
C***  CALCULATE DY-DIFFERENCES RELATIVE TO DY0
      V0=V(DY0)
      V1=V(DY1)
      V2=V(DY2)
      V3=V(DY3)
      V4=V(DY4)
      V5=V(DY5)
      V6=V(DY6)
C***  EQUATION 1
      B0=V1/T1
      B2=-T1
      B3=B2*T1
      B4=B3*T1
      B5=B4*T1
      B6=W1/T1
C***  EQUATION 2
      C=T2*(B2+T2)
      C0=(V2-T2*B0)/C
      C3=-(T2*(B3+T2*T2))/C
      C4=-(T2*(B4+T2*T2*T2))/C
      C5=-(T2*(B5+T2*T2*T2*T2))/C
      C6=(W2-T2*B6)/C
C***  UPDATE EQUATION 2
      D0=B2*C0+B0
      D3=B2*C3+B3
      D4=B2*C4+B4
      D5=B2*C5+B5
      D6=B2*C6+B6
C***  EQUATION 3
      E=T3*(D3+T3*(C3+T3))
      E0=(V3-(T3*(D0+T3*C0)))/E
      E4=-(T3*(D4+T3*(C4+T3*T3)))/E
      E5=-(T3*(D5+T3*(C5+T3*T3*T3)))/E
      E6=(W3-T3*(D6+T3*C6))/E
C***  UPDATE EQUATION 3
      F0=D3*E0+D0
      F4=D3*E4+D4
      F5=D3*E5+D5
      F6=D3*E6+D6
      G0=C3*E0+C0
      G4=C3*E4+C4
      G5=C3*E5+C5
      G6=C3*E6+C6
C***  EQUATION 4
      H=T4*(F4+T4*(G4+T4*(E4+T4)))
      H0=(V4-(T4*(F0+T4*(G0+T4*E0))))/H
      H5=-(T4*(F5+T4*(G5+T4*(E5+T4*T4))))/H
      H6=(W4-(T4*(F6+T4*(G6+T4*E6))))/H
C***  UPDATE EQUATION 4
      I0=F4*H0+F0
      I5=F4*H5+F5
      I6=F4*H6+F6
      J0=G4*H0+G0
      J5=G4*H5+G5
      J6=G4*H6+G6
      K0=E4*H0+E0
      K5=E4*H5+E5
      K6=E4*H6+E6
C***  EQUATION 5
      L=T5*(I5+T5*(J5+T5*(K5+T5*(H5+T5))))
      L0=(V5-(T5*(I0+T5*(J0+T5*(K0+T5*H0)))))/L
      L6=(W5-(T5*(I6+T5*(J6+T5*(K6+T5*H6)))))/L
C***  UPDATE EQUATION 5
      M0=I5*L0+I0
      M6=I5*L6+I6
      N0=J5*L0+J0
      N6=J5*L6+J6
      Q0=K5*L0+K0
      Q6=K5*L6+K6
      R0=H5*L0+H0
      R6=H5*L6+H6
      H=X6-X0
      P=(T6*(M6+T6*(N6+T6*(Q6+T6*(R6+T6*L6))))-W6)
      IF (DABS(P).LT.1.0D-33) P=1.0D-33
      XNM=-(T6*(M0+T6*(N0+T6*(Q0+T6*(R0+T6*L0))))-V6)
      IF (DABS(XNM).LT.1.0D-33) XNM=1.0-33
C***  CHECK EXPONENTS TO PREVENT UNDERFLOWS AND OVERFLOWS
      TEXP=DLOG(DABS(XNM))-DLOG(DABS(P))
      IF (TEXP.LT.-77.0D0) GO TO 5
      IF (TEXP.LE.74.0D0) GO TO 1
      IX1=-1.0D0
      IX2=-1.0D0
      IF (DABS(XNM).EQ.XNM) IX1=1.0D0
      IF (DABS(P).EQ.P) IX2=1.0D0
      IXS=IX1*IX2
      P=-1.0D+74
      IF (IXS.GT.0.0D0) P=1.0D+74
      IF (P.LT.0.0D0) GO TO 5
      GO TO 2
C***  CALCULATE COEFFICIENTS
    1 P=XNM/P
C***  TEST FOR MACHINE LIMIT
    2 IF ((P*H).LT.22.0D0) GO TO 3
      P=22.0D0/H
    3 IF (P.LT.TOL) GO TO 5
      A0=DY0
      A1=M0+P*M6
      A2=N0+P*N6
      A3=Q0+P*Q6
      A4=R0+P*R6
      A5=L0+P*L6
```

```
    4 RETURN
    5 F=0D0
      GO TO 4
      END


      FUNCTION PHIDER(N,XX,K,ICF1,ICF2)
C
C***  FUNCTION PHIDER IS CAPABLE OF COMPUTING THE DERIVATIVE AND/OR
C***  ANTIDERIVATIVE OF PHI (AS DESCRIBED IN SUBROUTINE PHICEF).  IT
C***  SHOULD BE NOTED THAT
C***  N  DEFINES THE NUMBER OF TERMS OF PHI TO USE OR THE NUMBER OF
C***  TERMS THAT ARE AVAILABLE TO USE
C***  XX DEFINES THE VALUE OF X AT WHICH TO CALCULATE THE DERIVATIVE OR
C***  ANTIDERIVATIVE
C***  K SPECIFIES THE DERIVATIVE TO TO CALCULATE: K MAY BE ANY INTEGER
C***  SUCH THAT POSITIVE (DERIVATIVES), ZERO (PHI), NEGATIVE (ANTIDERI-
C***  VATIVES)).
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION DFACT(13)
      COMMON /ANRK/A(7),C(7,8)
      COMMON /LABX/JWRITE,IERR
      COMMON /PCR/F(7),X(7),Y(7)
      DATA DFACT/1.0D0,1.0D0,2.0D0,6.0D0,2.4D1,1.2D2,7.2D2,5.04D3,4.032D
     14,3.6288D5,3.6288D6,3.99168D7,4.790016D8/
C
      IF (N.LT.1.OR.N.GT.7) GO TO 9
C***  TRANSLATE
      SVE=X(1)
      DO 1 I=1,N
    1 X(I)=X(I)-SVE
      XX=XX-SVE
    2 IF (ICF1.GT.ICF2) GO TO 3
      CALL PHICEF(ICF1)
      ICF1=ICF1+1
      GO TO 2
    3 PHIDER=0D0
      I=K+1
      IF (I.LT.1) I=1
    4 IF (I.GT.N) GO TO 6
      S=1D0
      CPT=0D0
      J2=I-K
      IF (J2.GT.I) J2=I
      DO 5 J=1,J2
      CPT=CPT+S*DFACT(I-J+1)/DFACT(I-J-K+1)*C(I,J)*(XX**(I-J-K))
    5 S=-S
      PHIDER=PHIDER+A(I)*CPT
      I=I+1
      GO TO 4
C***  RESET
    6 XX=XX+SVE
      DO 7 I=1,N
    7 X(I)=X(I)+SVE
    8 RETURN
    9 IERR=1
      WRITE (JWRITE,10) N
   10 FORMAT (1H ,'*** PHIDER ERROR: N=',I11,' BUT 1<=N<=7 REQUIRED')
      GO TO 8
      END


      SUBROUTINE PMETH
C
C***  SUBROUTINE PMETH PRODUCES A CORRECTED VALUE OF Y(N+1)
C
      IMPLICIT REAL*8(A-Z)
      COMMON /CRCCEF/P,A0,A1,A2,A3,A4,A5,H
      COMMON /PCR/DY0,DY1,DY2,DY3,DY4,DY5,DY6,X0,X1,X2,X3,X4,X5,X6,Y0,Y1
     1,Y2,Y3,Y4,Y5,Y6
C
      PH=P*H
C***  COMPUTE THE TREANOR F-VALUES
      F0=0.0D0
      IF ((-PH).LT.174.673D0.AND.(-PH).GT.-180.218D0)F0=DEXP(-PH)
      F1=(F0-1D0)/(-PH)
      F2=(F1-1D0)/(-PH)
      F3=(F2-(1D0/2D0))/(-PH)
      F4=(F3-(1D0/6D0))/(-PH)
      F5=(F4-(1D0/24D0))/(-PH)
      F6=(F5-(1D0/120D0))/(-PH)
C***  COMPUTE A CORRECTED VALUE OF Y(N+1)
      Y6=Y0+H*(A0*F1+H*(A1*F2+H*(2D0*A2*F3+H*(6D0*A3*F4+H*(24D0*A4*F5+H*
     1120D0*A5*F6)))))
      RETURN
      END

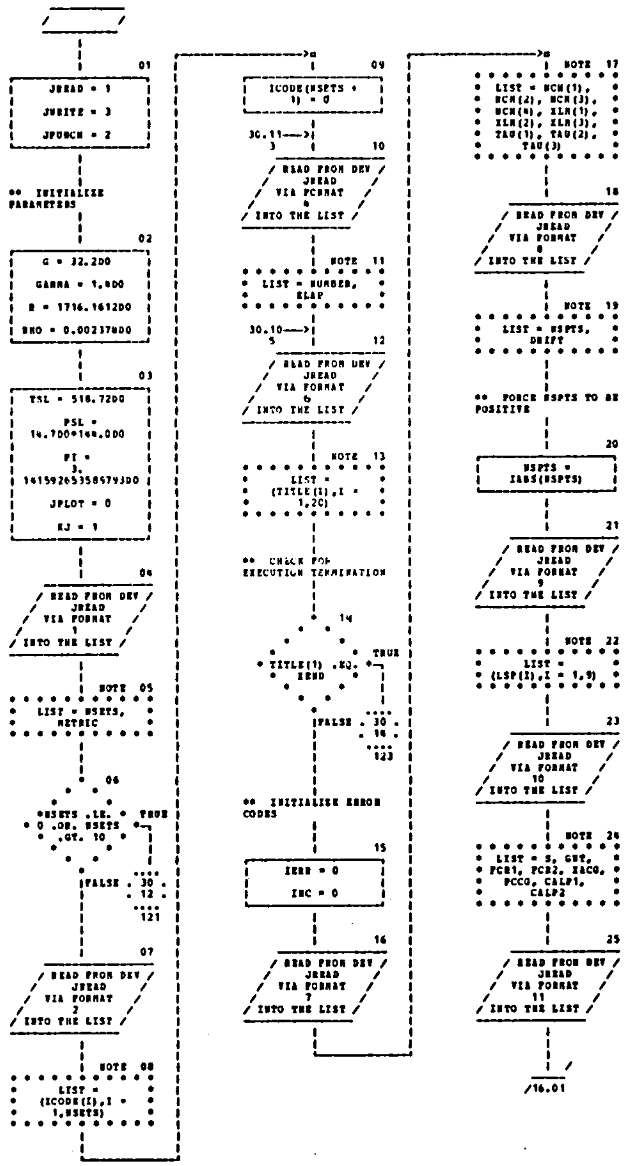

      SUBROUTINE LOC(I,J,IR,N,M,MS)
C
C***  SUBROUTINE LOC COMPUTES A VECTOR SUBSCRIPT FOR AN ELEMENT IN A
C***  MATRIX OF SPECIFIED STORAGE MODE
C
      IX=I
      L=J
      IF (MS-1)  1,2,5
    1 IRX=N*(L-1)+IX
      GO TO 7
    2 IF (IX-L)  3,4,4
    3 IRX=IX+(L*L-L)/2
      GO TO 7
    4 IRX=L+(IX*IX-IX)/2
      GO TO 7
    5 IRX=0
      IF (IX-L)  7,6,7
    6 IRX=IX
    7 IR=IRX
      RETURN
      END


      SUBROUTINE MATA(A,R,N,M,MS)
C
C***  SUBROUTINE MATA PREMULTIPLIES A MATRIX BY ITS TRANSPOSE TO FORM
C***  A SYMMETRIC MATRIX
```

```
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(1),R(1)
C
      DO 6 K=1,M
      KX=(K*K-K)/2
      DO 6 J=1,M
      IF (J-K)  1,1,6
    1 IR=J+KX
      R(IR)=0.0D0
      DO 6 I=1,N
      IF (MS)  2,4,2
    2 CALL LOC(I,J,IA,N,M,MS)
      CALL LOC(I,K,IB,N,M,MS)
      IF (IA)  3,6,3
    3 IF (IB)  5,6,5
    4 IA=N*(J-1)+I
      IB=N*(K-1)+I
    5 R(IR)=R(IR)+A(IA)*A(IB)
    6 CONTINUE
      RETURN
      END
```

Flowchart — FDRI

CHART TITLE - PROCEDURES



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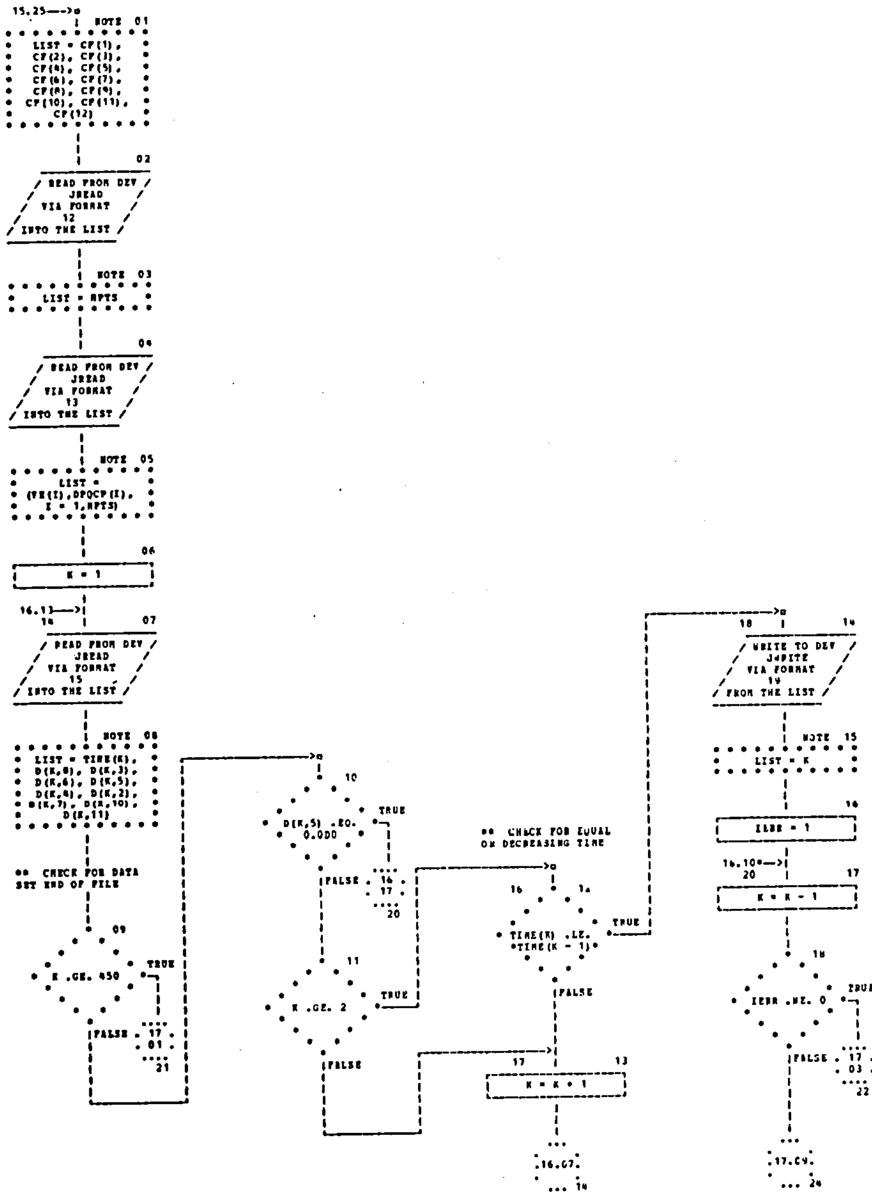

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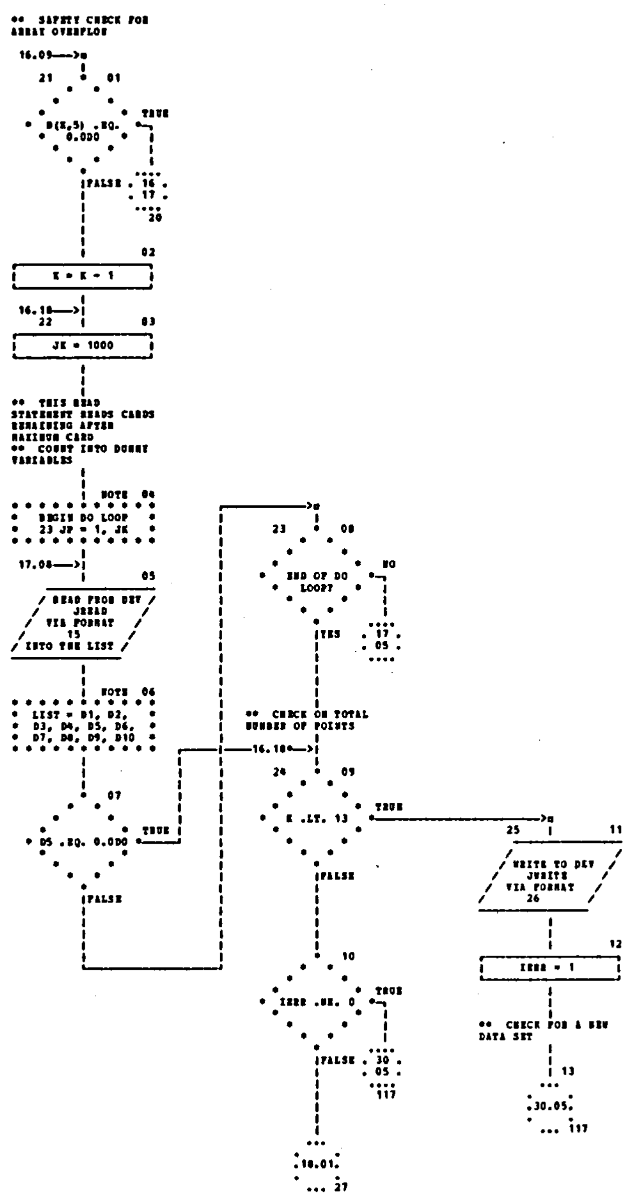

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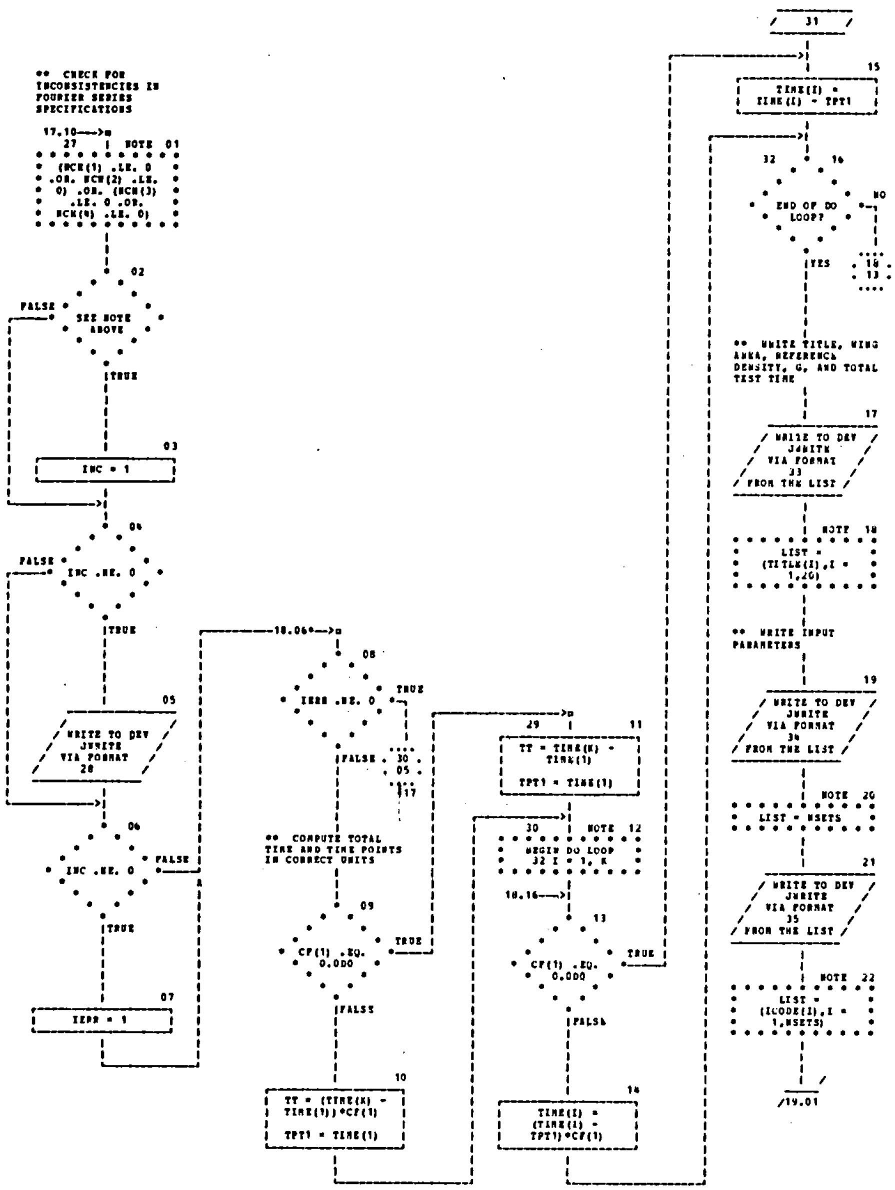

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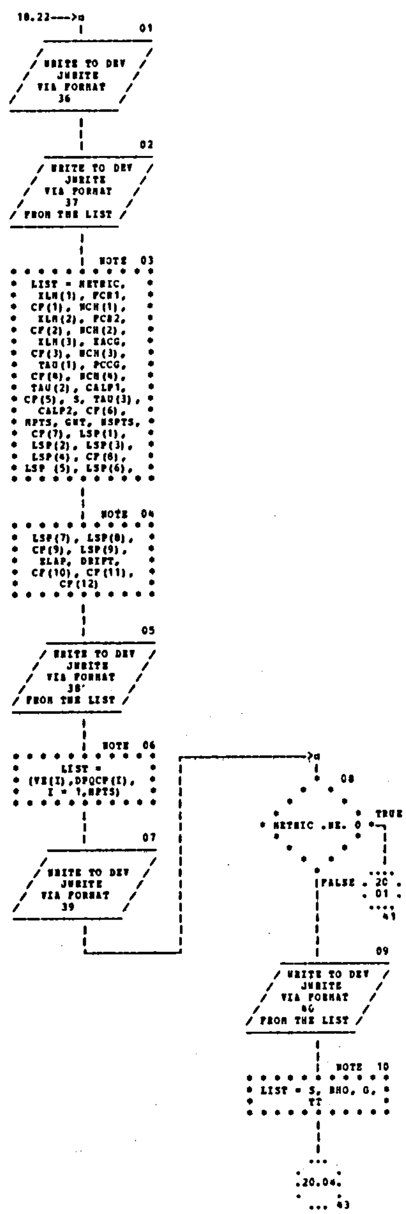

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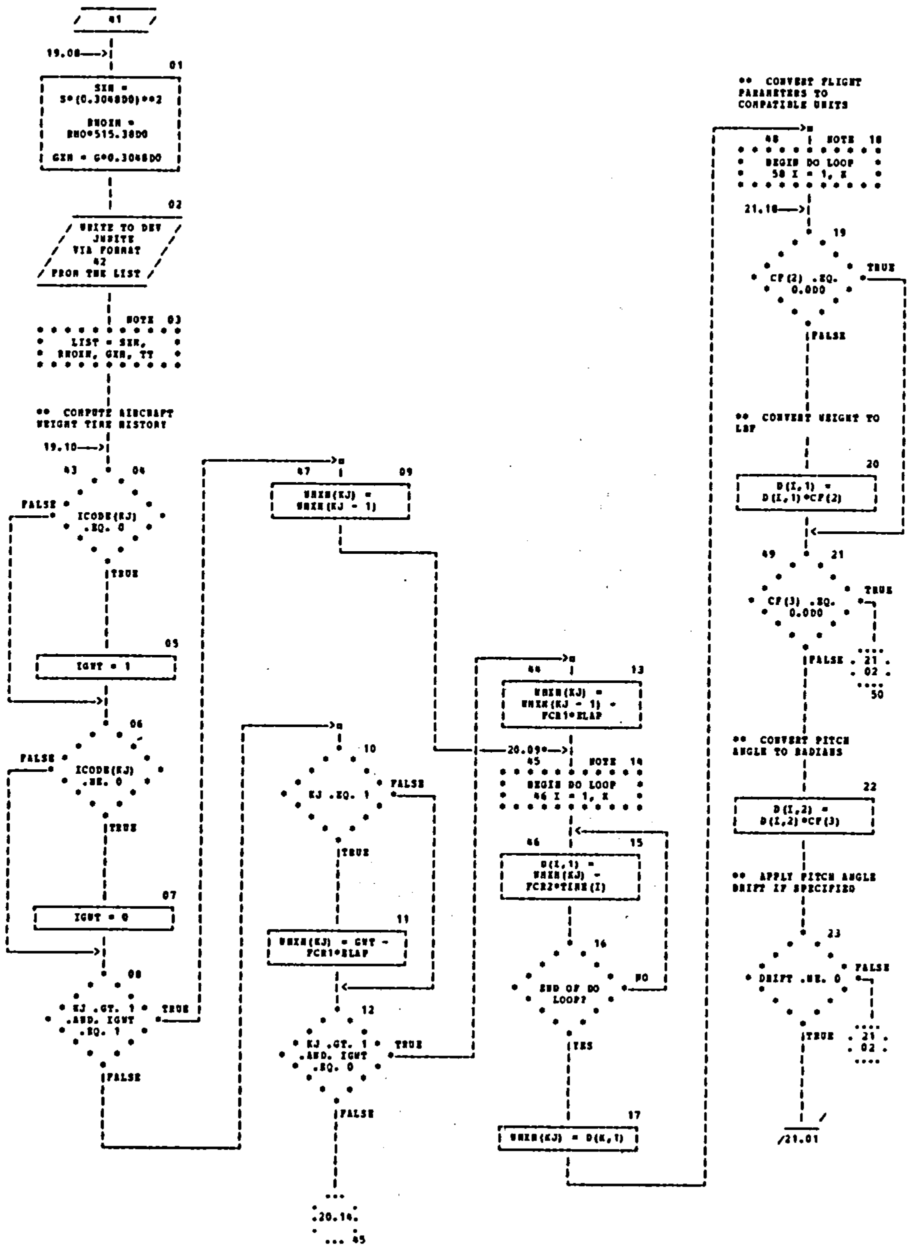

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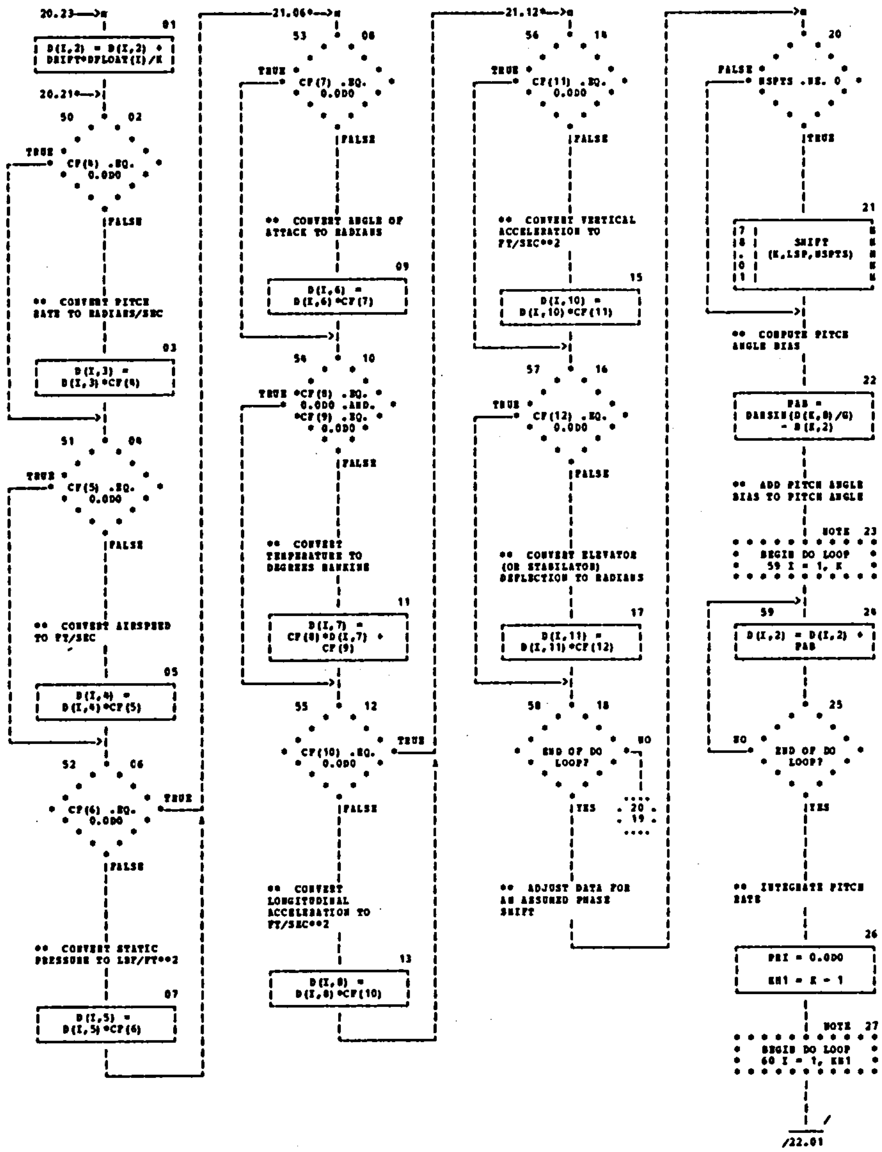

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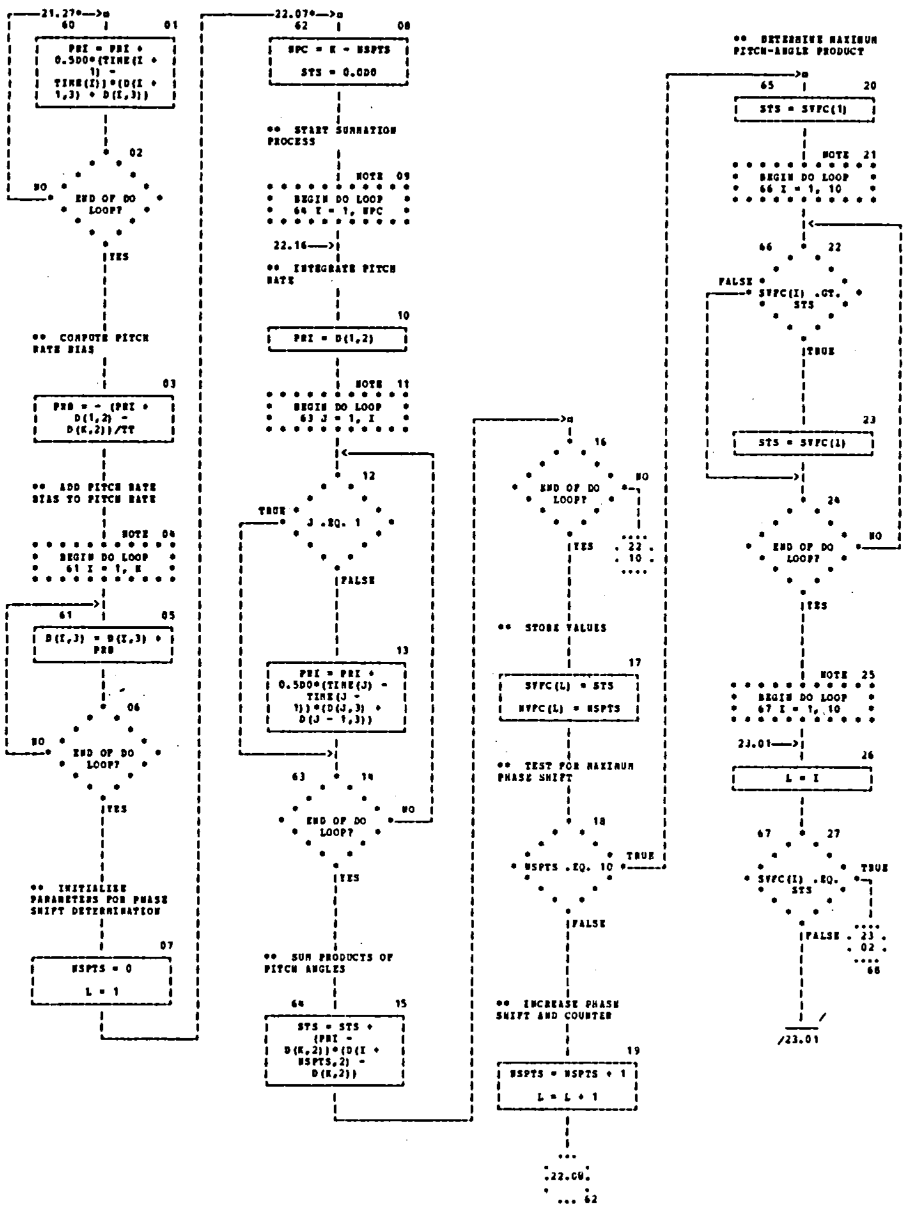

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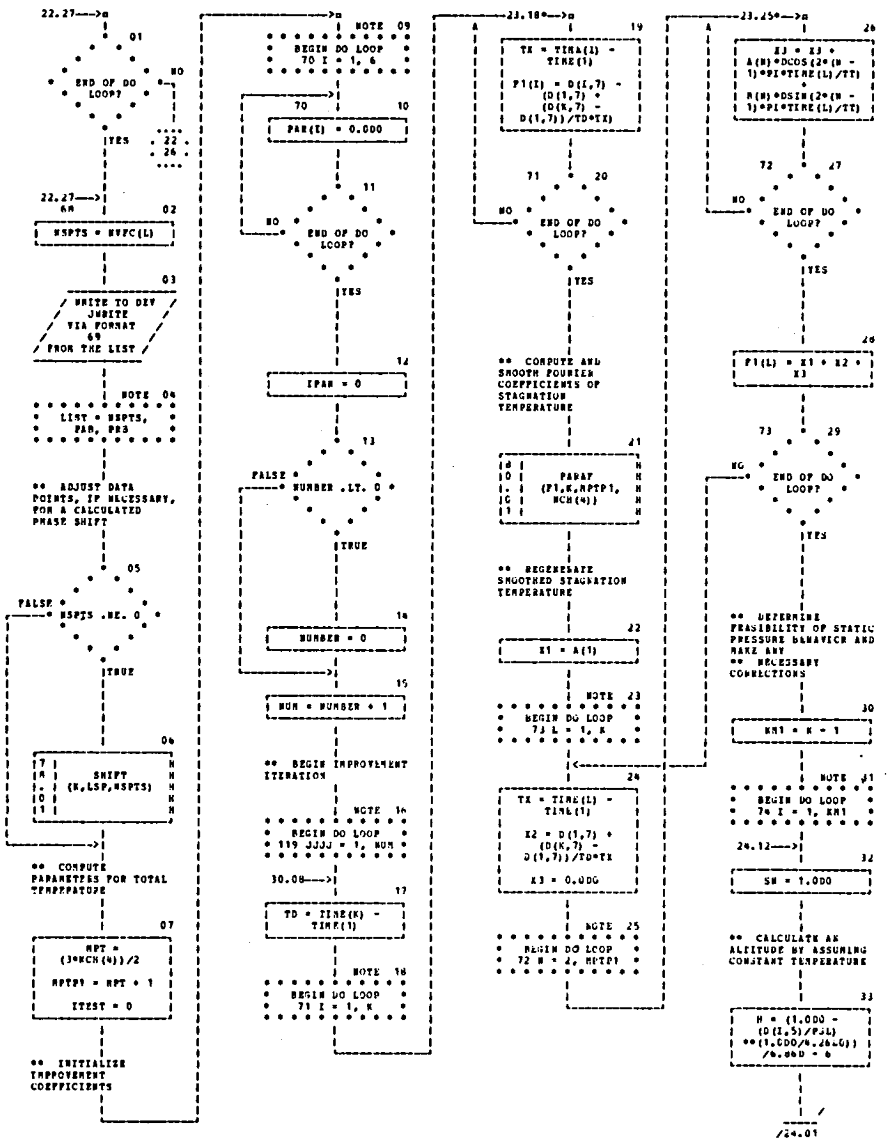

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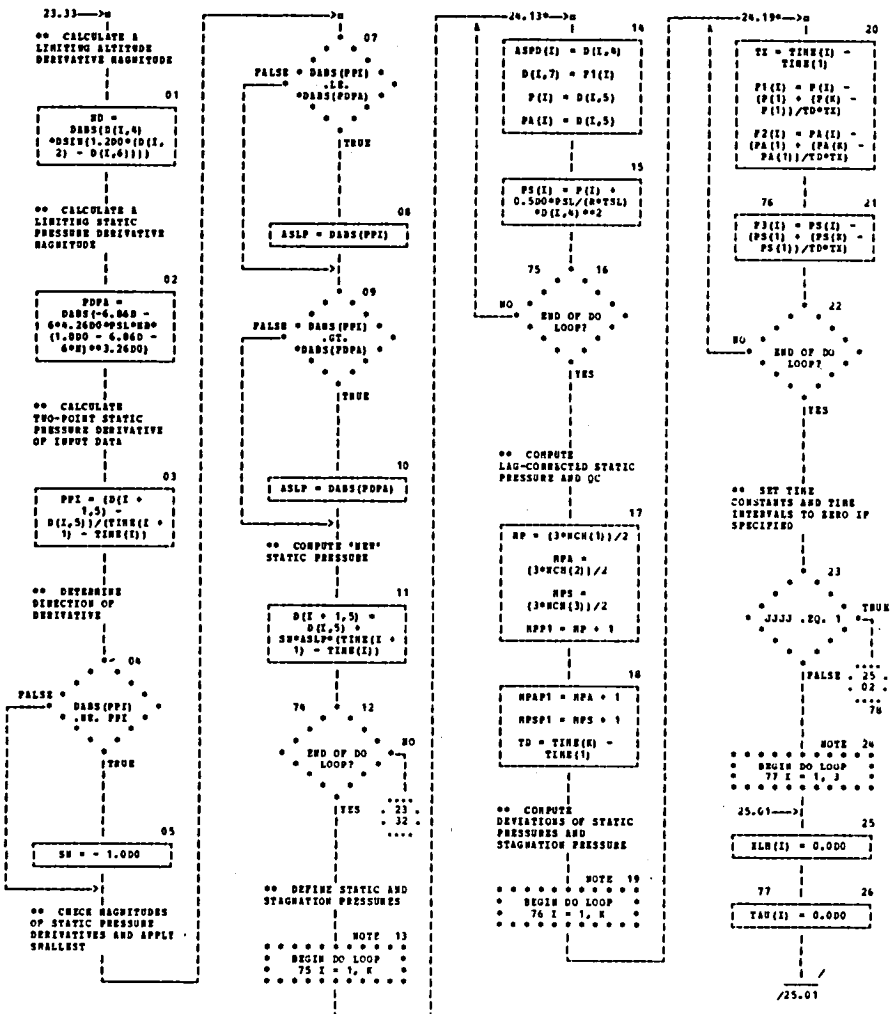

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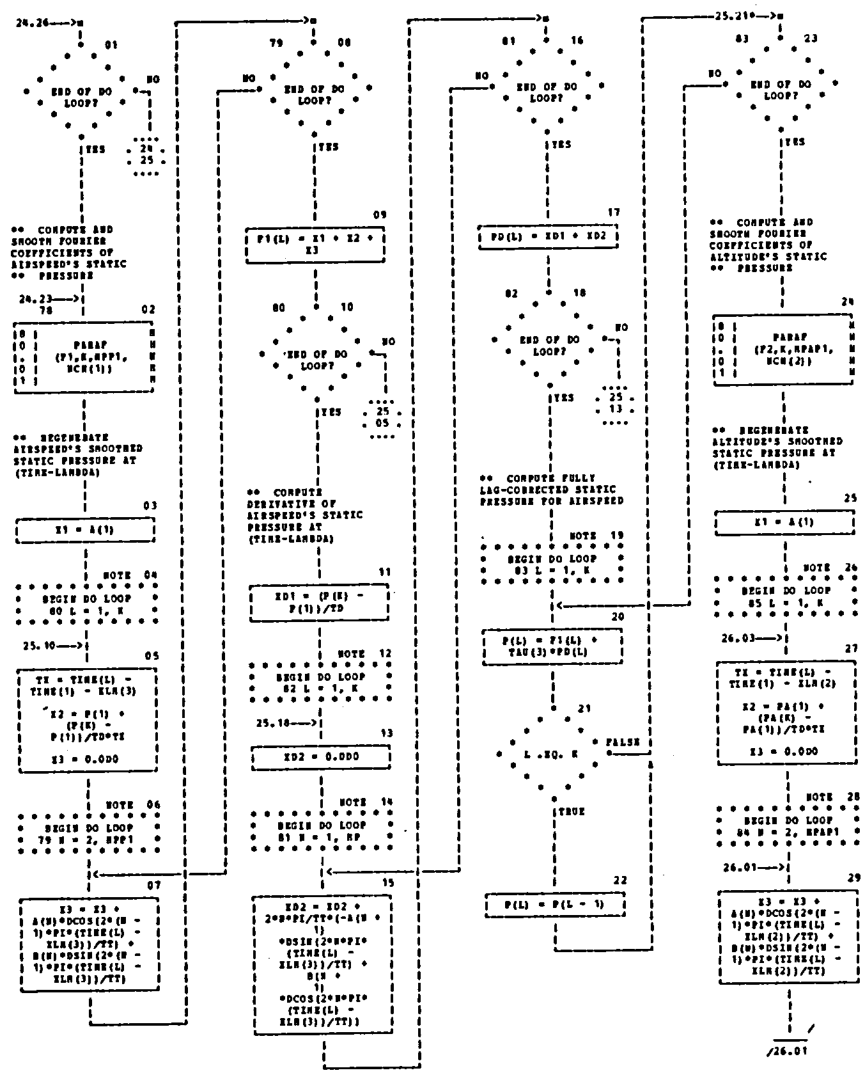

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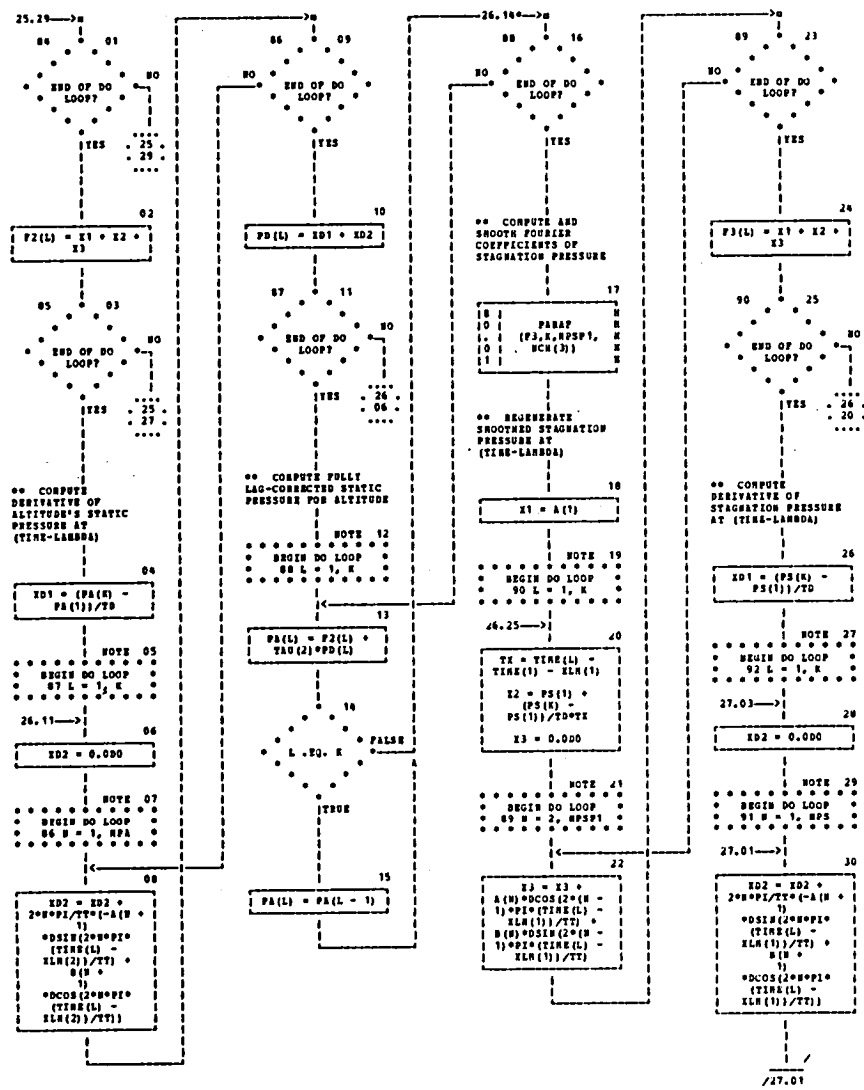

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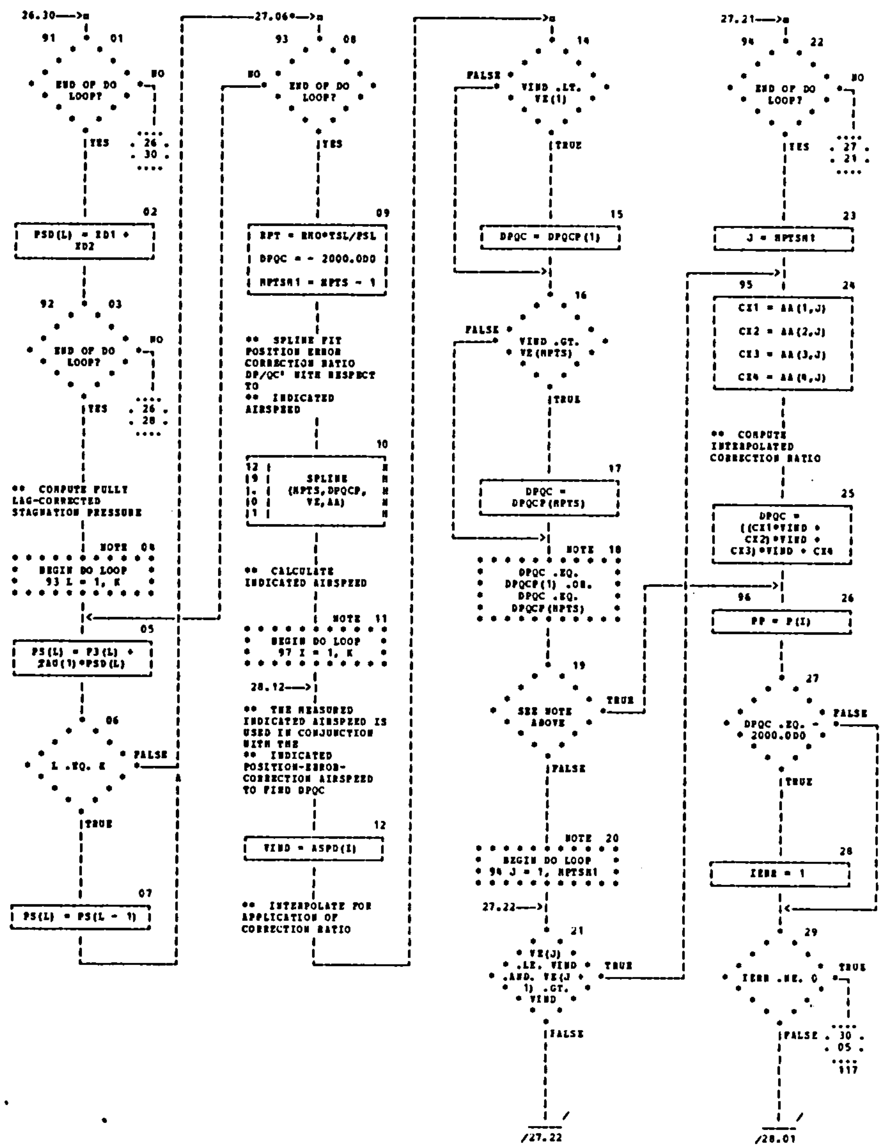


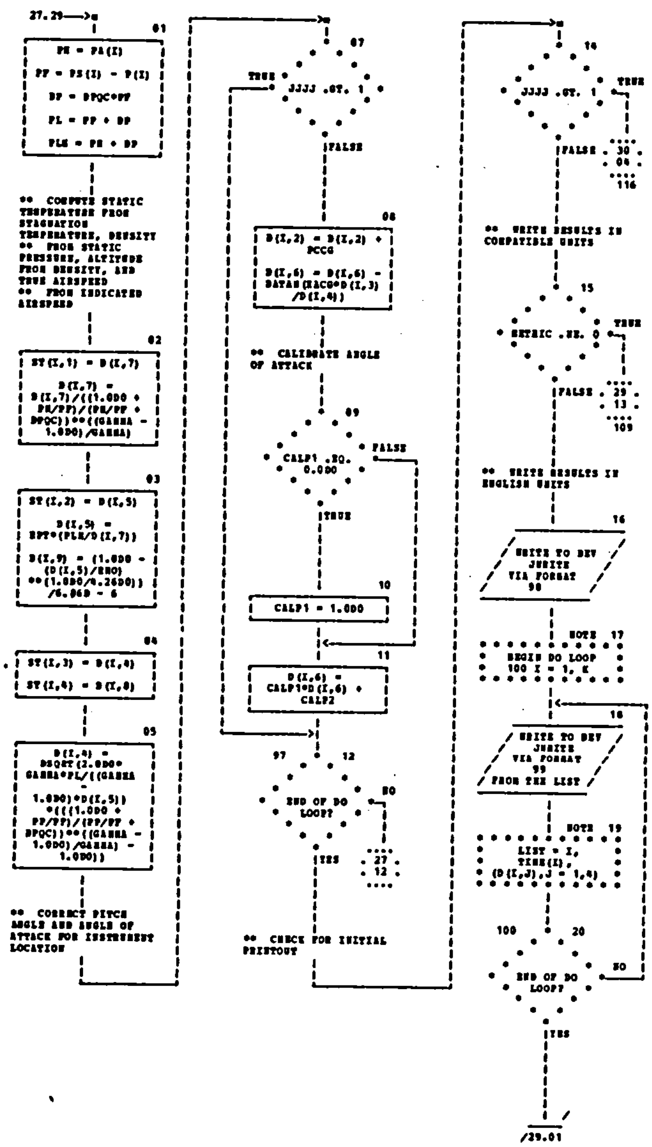
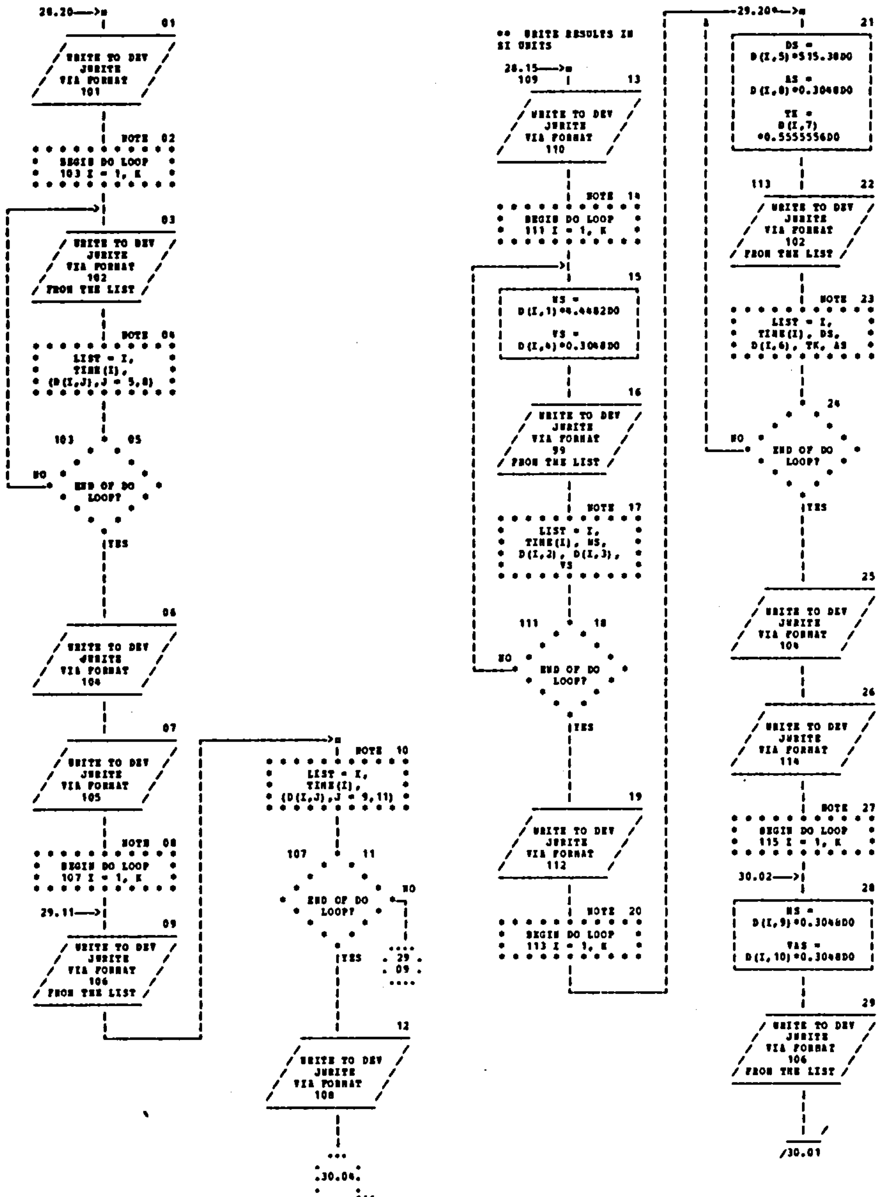

27.29
PS = PA(I)
DP = DPQC*PF
** COMPUTE STATIC TEMPERATURE FROM STAGNATION TEMPERATURE, DENSITY ** FROM STATIC PRESSURE, ALTITUDE FROM DENSITY, AND TRUE AIRSPEED ** FROM INDICATED AIRSPEED
ST(I,1) = D(I,7)
ST(I,2) = D(I,5)
ST(I,3) = D(I,4)
ST(I,4) = D(I,8)
** CORRECT PITCH ANGLE AND ANGLE OF ATTACK FOR INSTRUMENT LOCATION
JJJJ .GT. 1
TRUE
FALSE
** CALIBRATE ANGLE OF ATTACK
CALP1 .EQ. 0.0D0
CALP1 = 1.0D0
END OF DO LOOP?
NO
YES
** CHECK FOR INITIAL PRINTOUT
** WRITE RESULTS IN COMPATIBLE UNITS
METRIC .NE. 0
** WRITE RESULTS IN ENGLISH UNITS
WRITE TO DEV JWRITE VIA FORMAT 98
BEGIN DO LOOP 100 I = 1, K
WRITE TO DEV JWRITE VIA FORMAT 99 FROM THE LIST
/29.01

CHART TITLE - PROCEDURES



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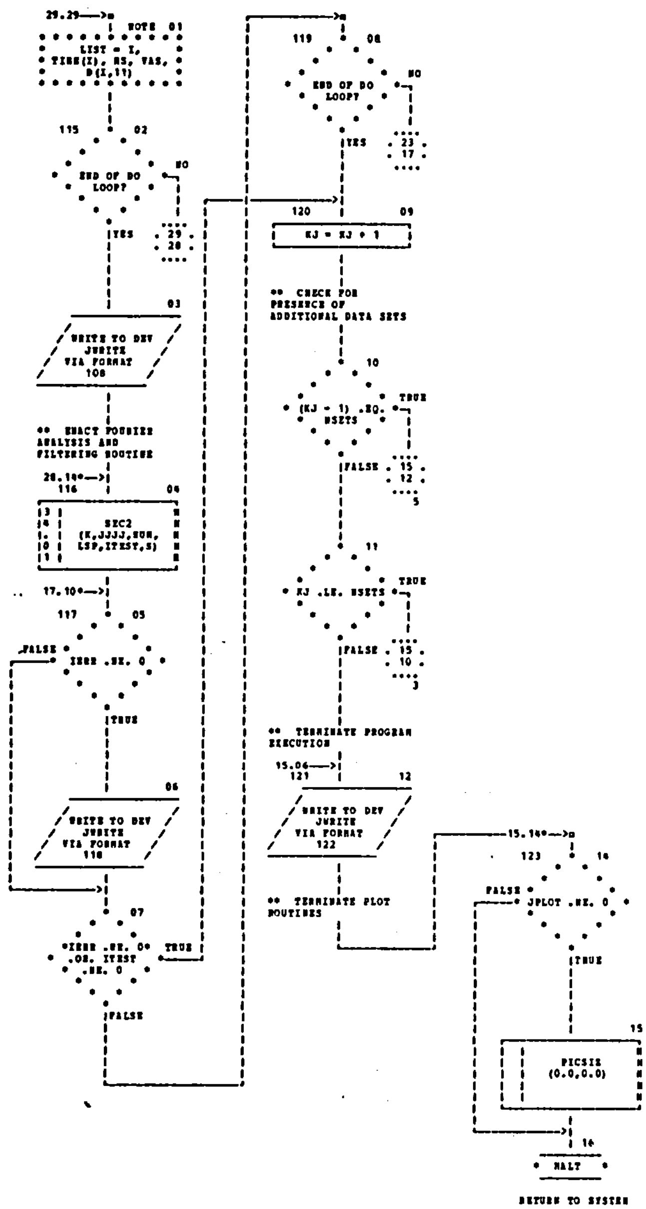


CHART TITLE - SUBROUTINE SEC2(X,JP,NUM,LSP,ITEST,S)

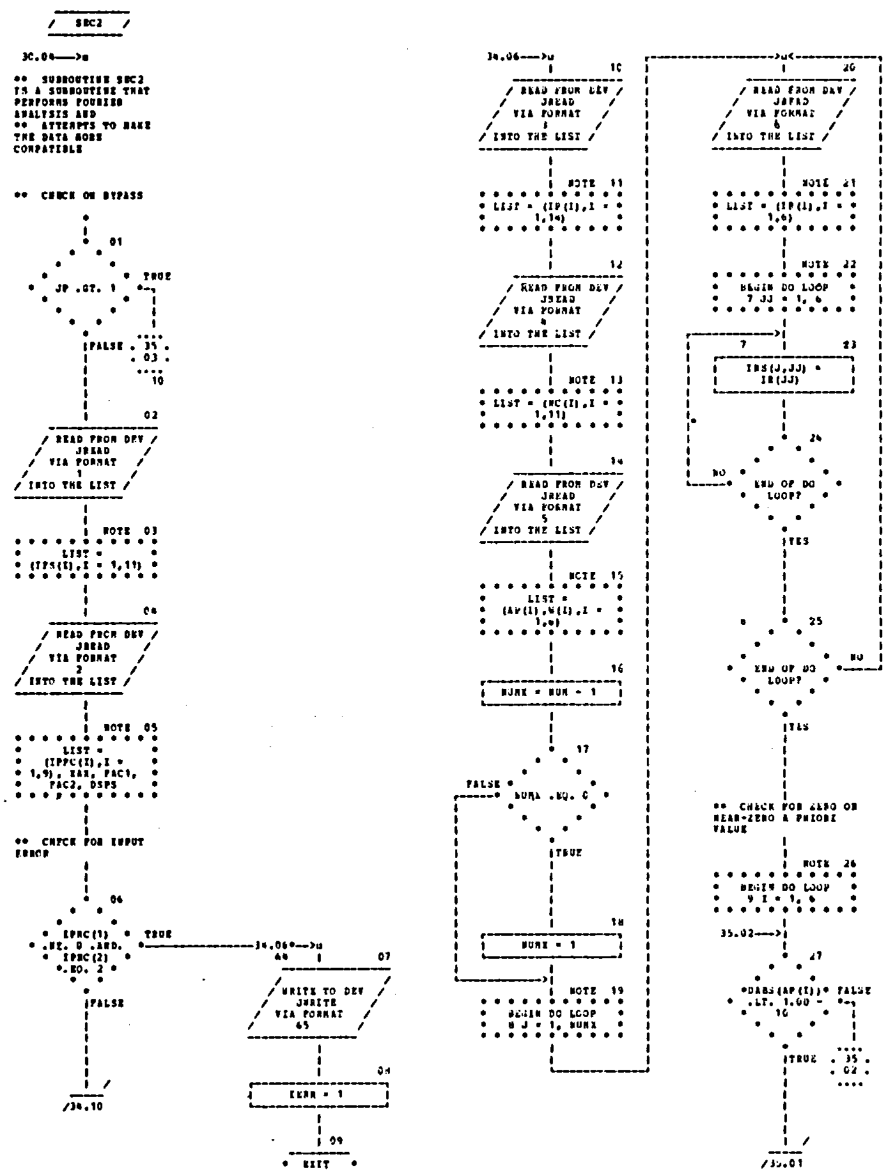


CHART TITLE - SUBROUTINE SEC2(K,JP,NUM,LSP,ITEST,S)

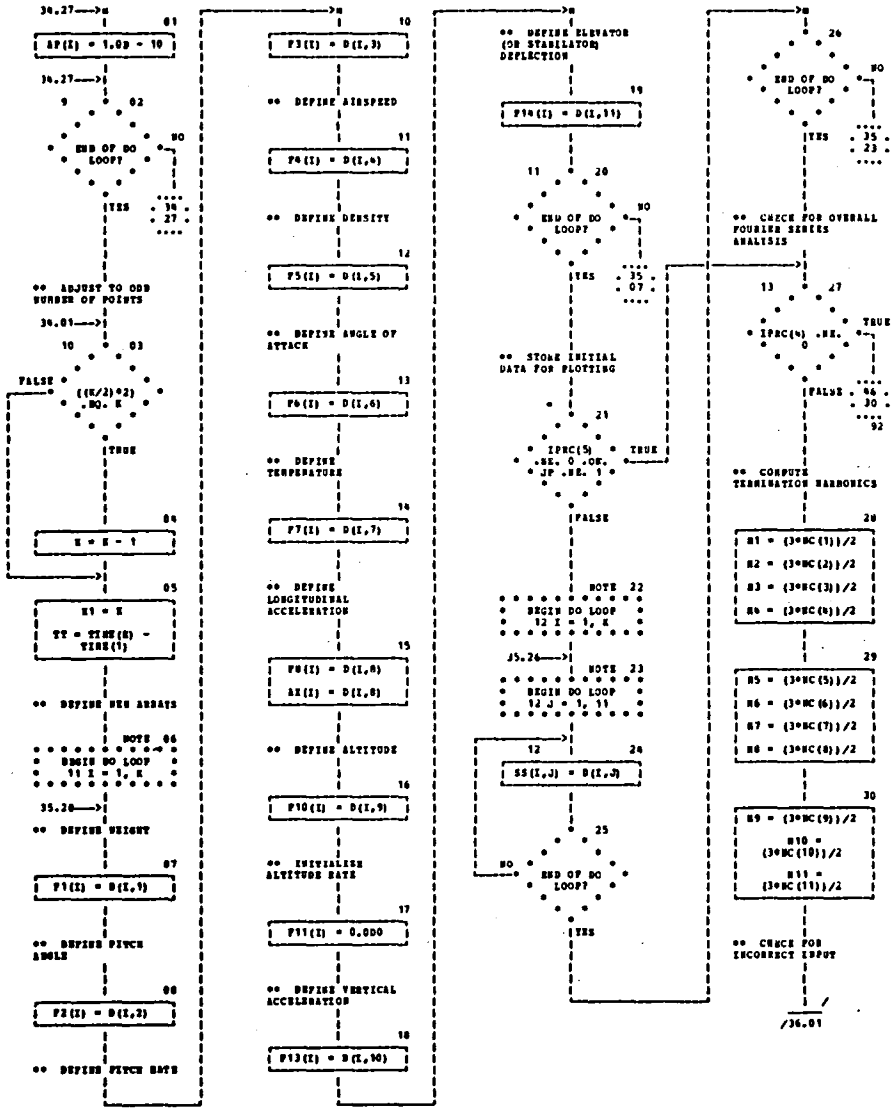


CHART TITLE - SUBROUTINE SBC2(K,JP,NOR,LSP,ITEST,S)

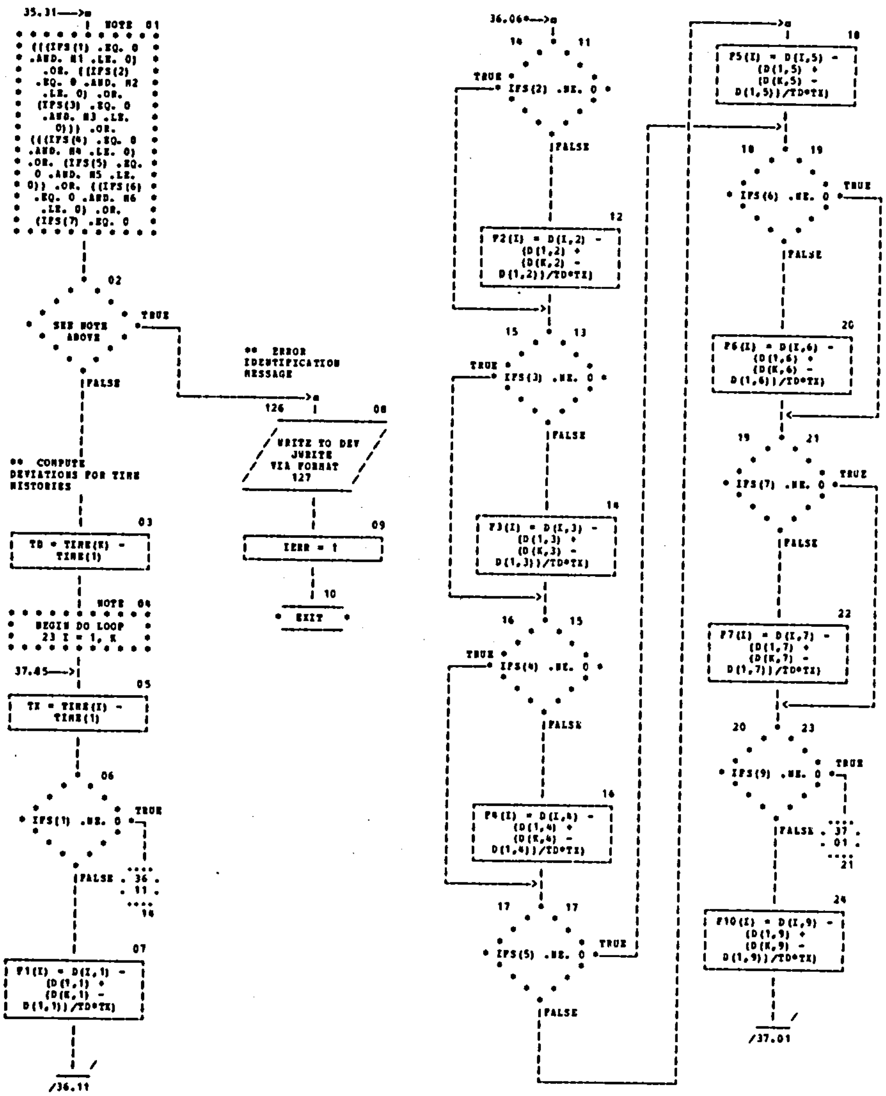


CHART TITLE - SUBROUTINE SEC2(K,JP,NOR,LSP,ITEST,S)

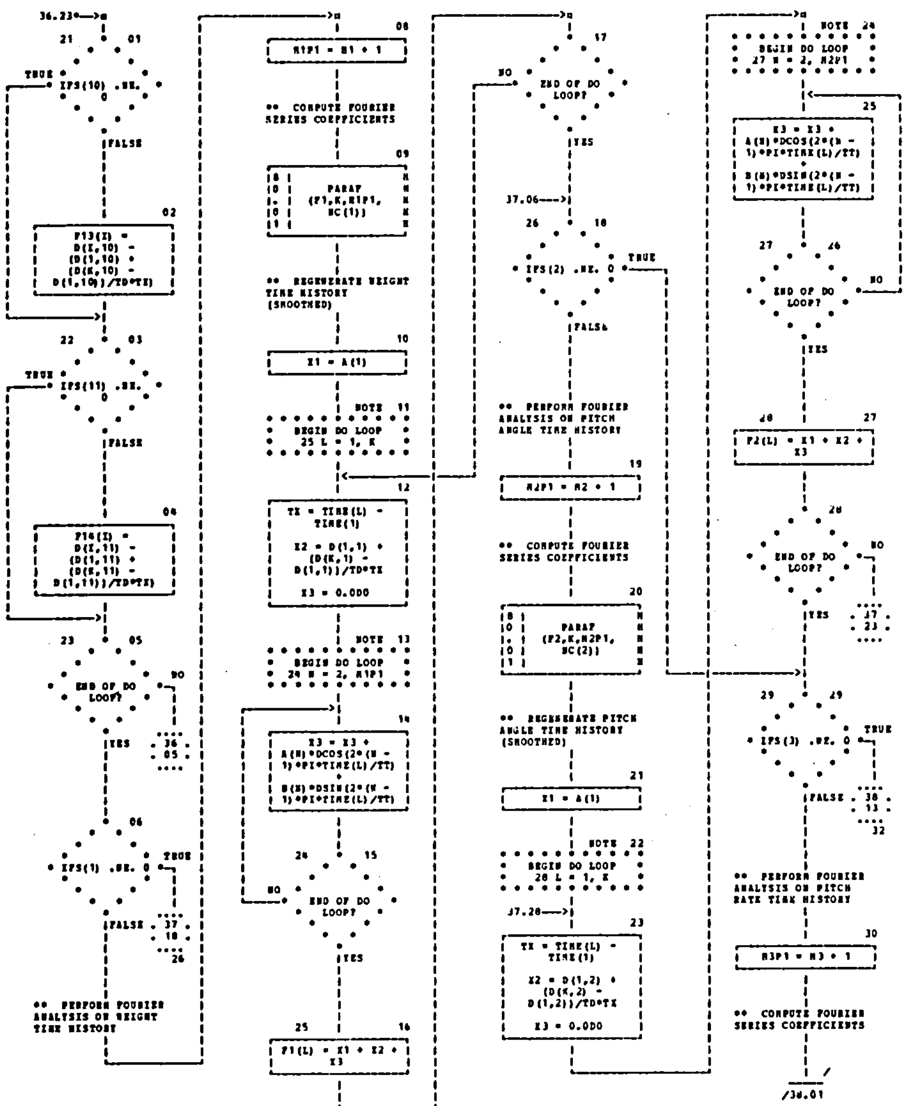
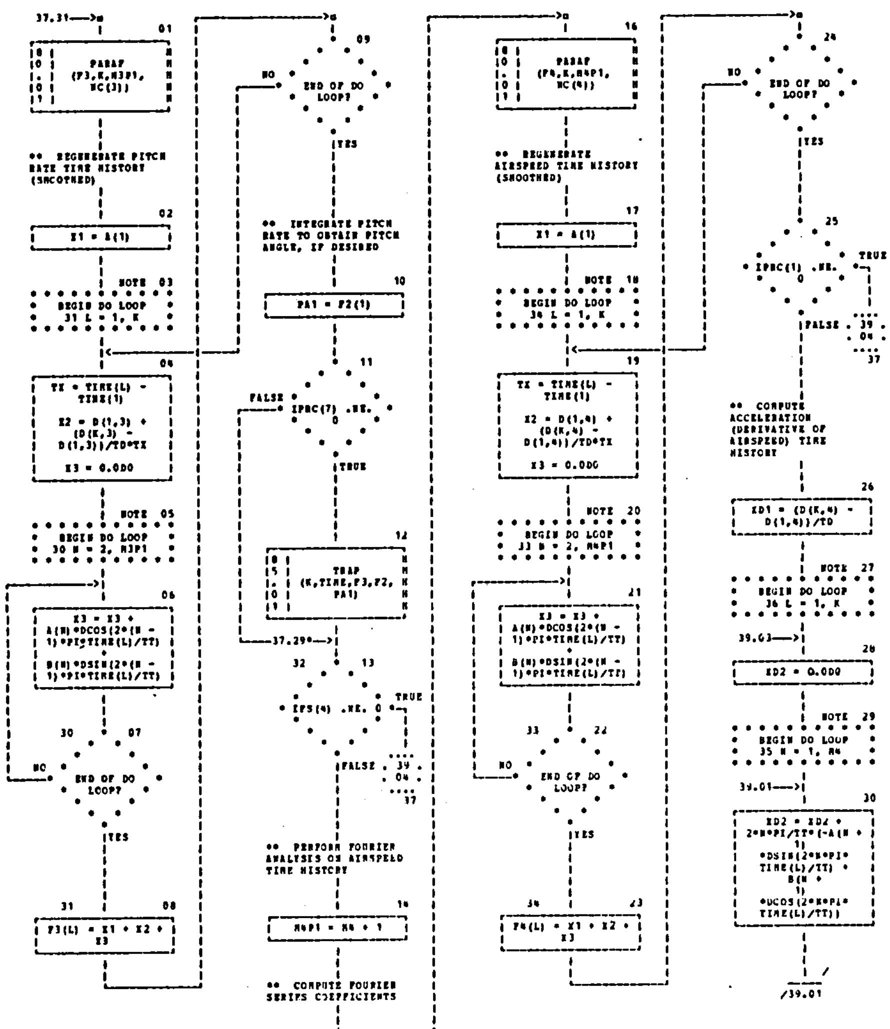


CHART TITLE - SUBROUTINE SEC2(K,JP,NUM,LSP,ITEST,S)



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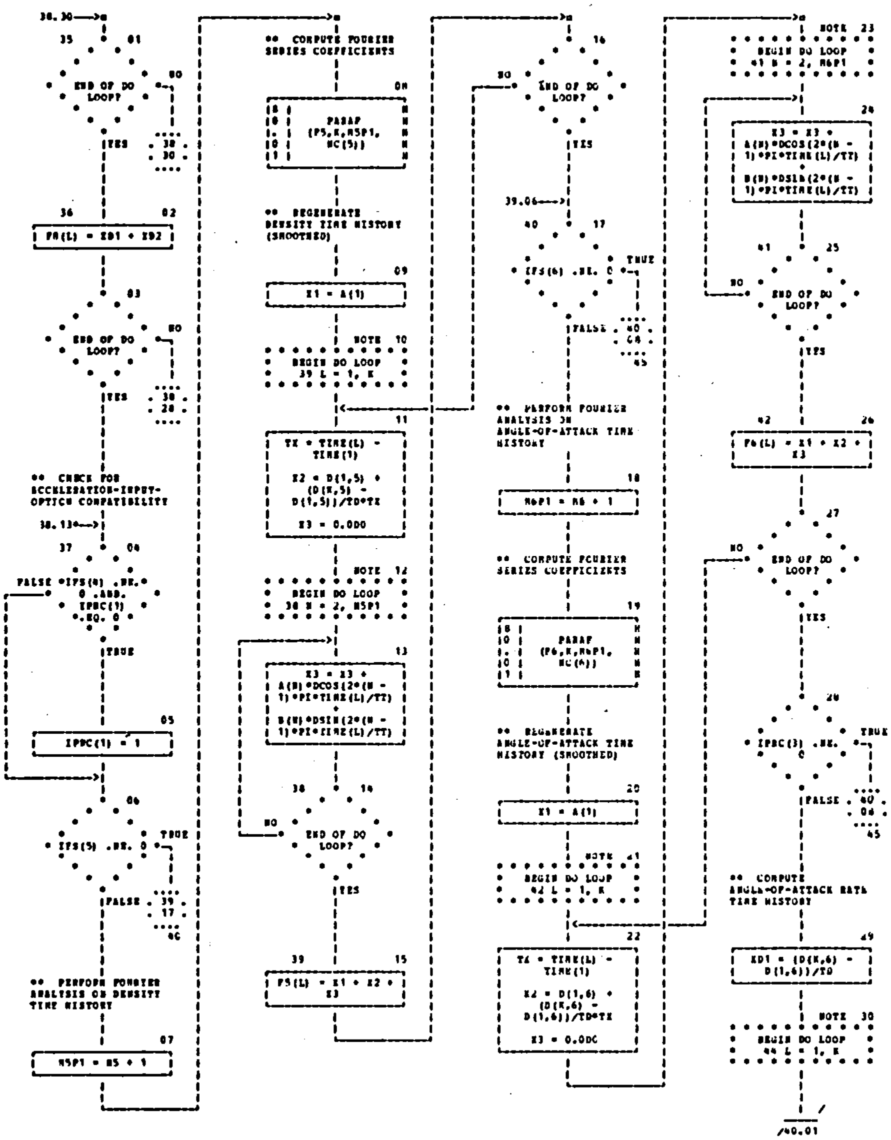

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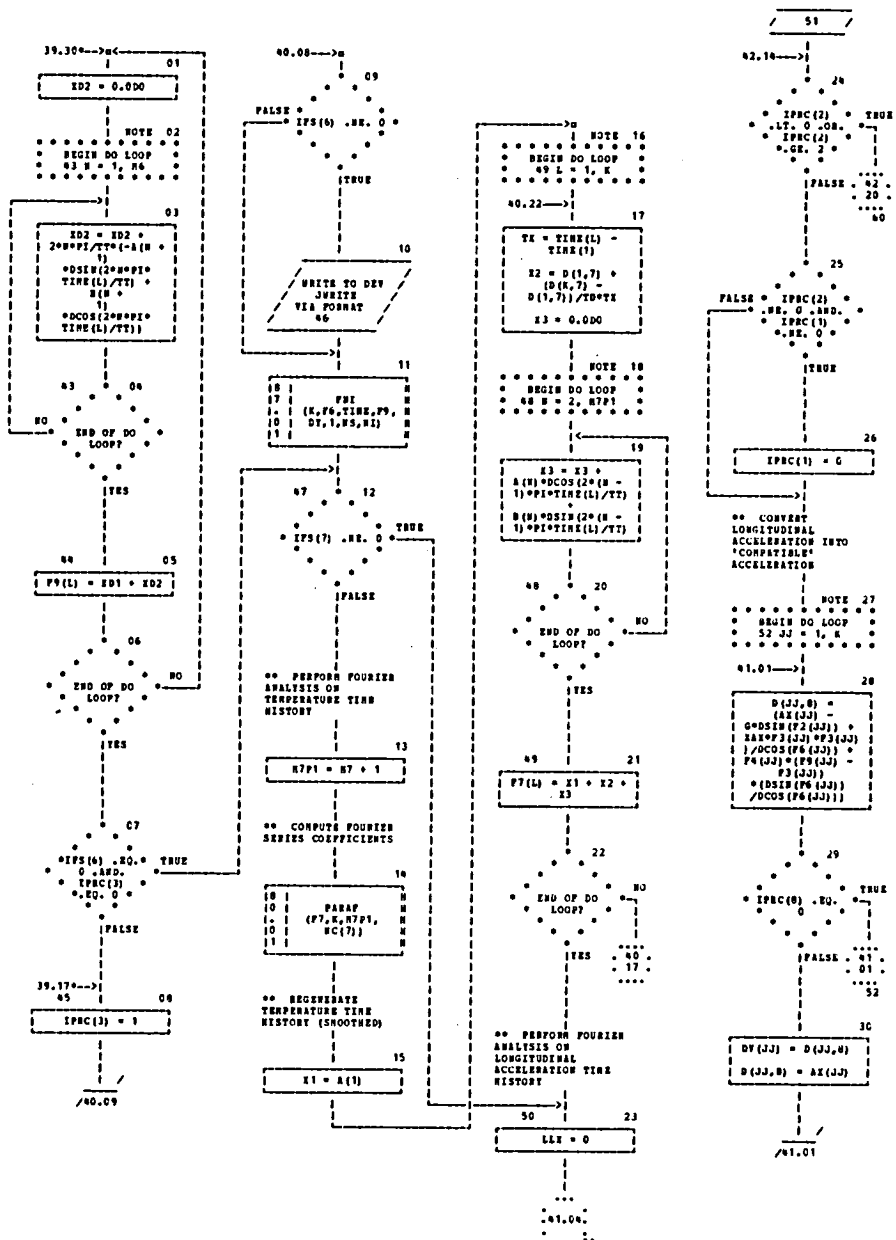

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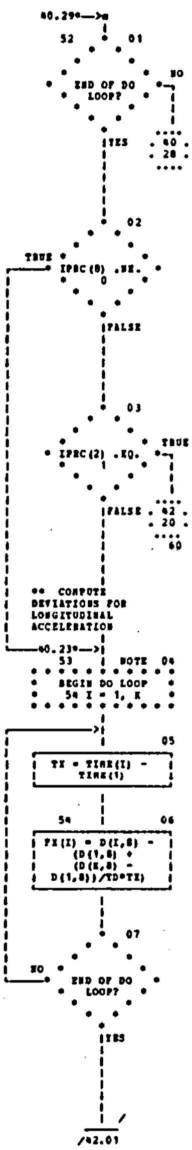
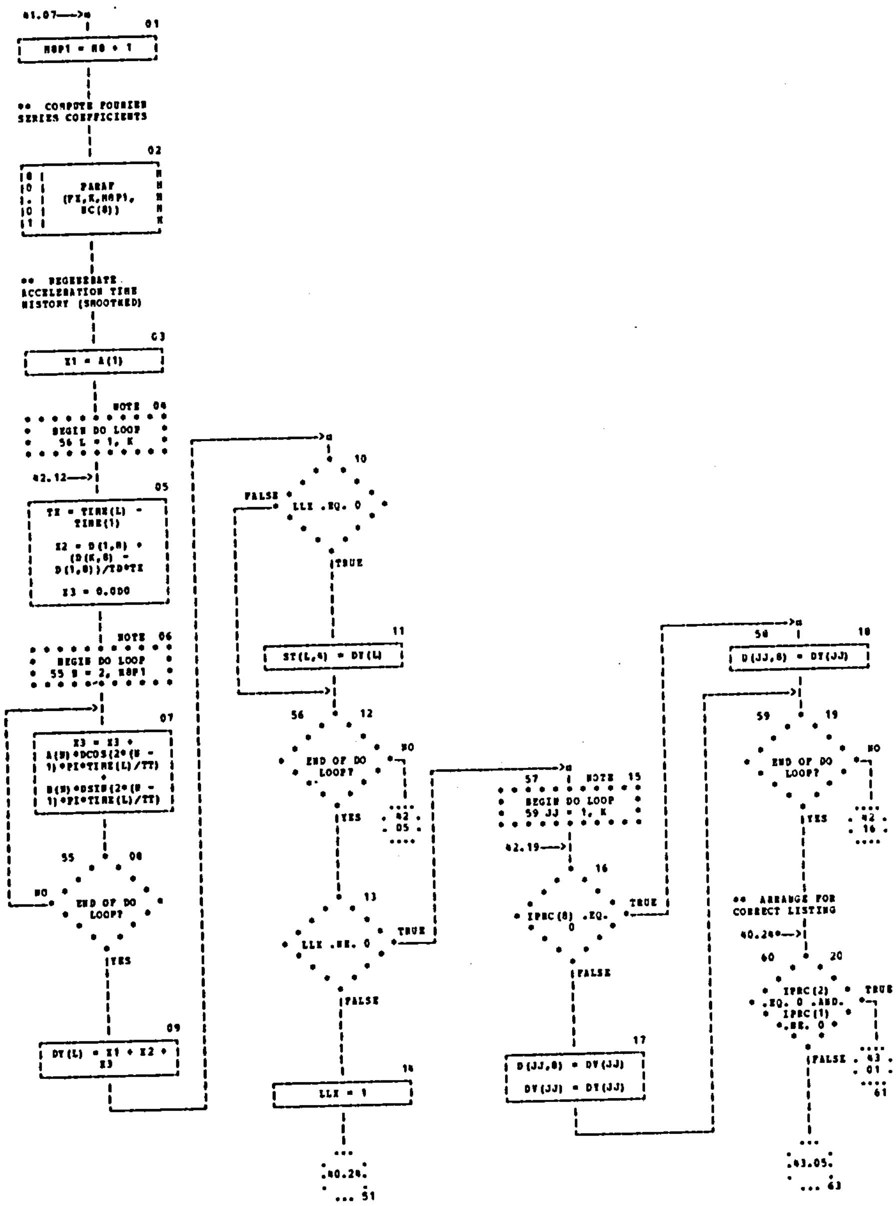


CHART TITLE - SUBROUTINE SEC2(K,JP,NUM,LSP,ITEST,S)



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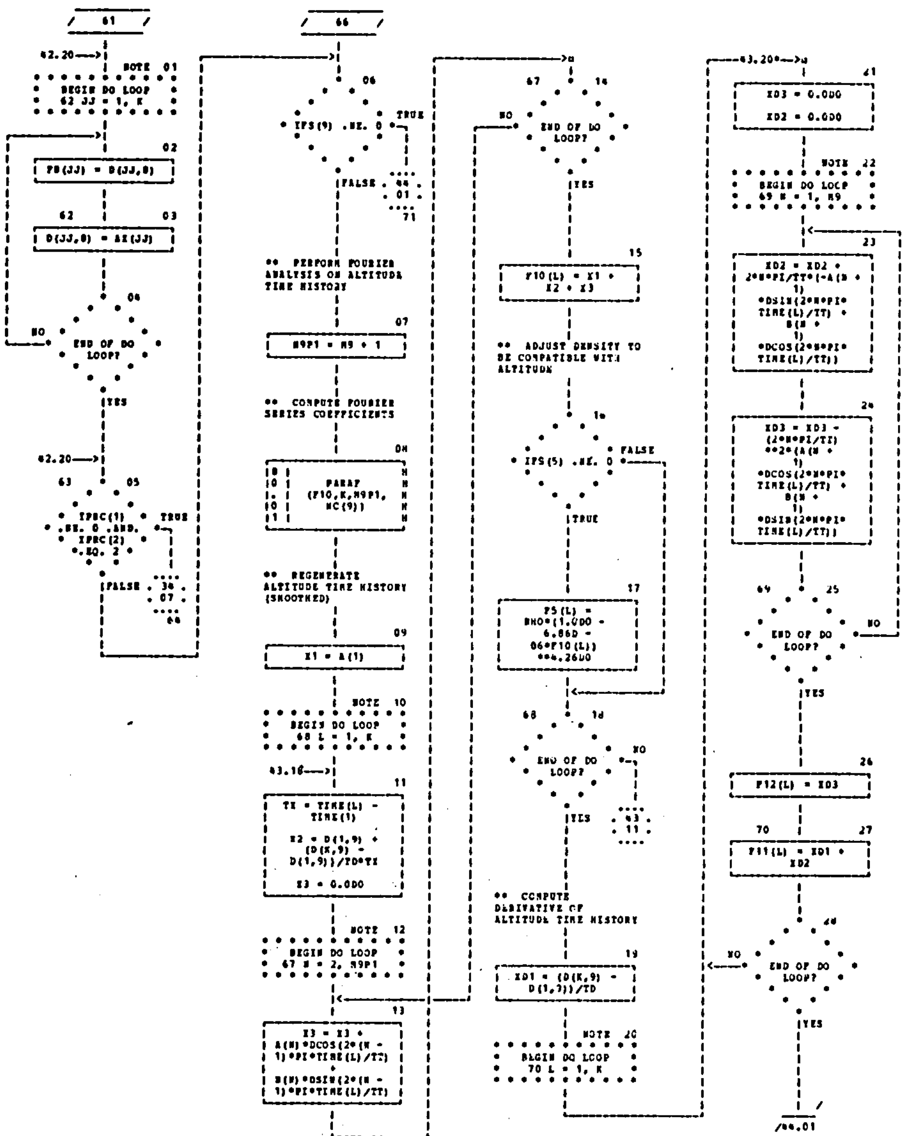


CHART TITLE - SUBROUTINE SEC2(K,JP,NUM,LSP,ITEST,S)

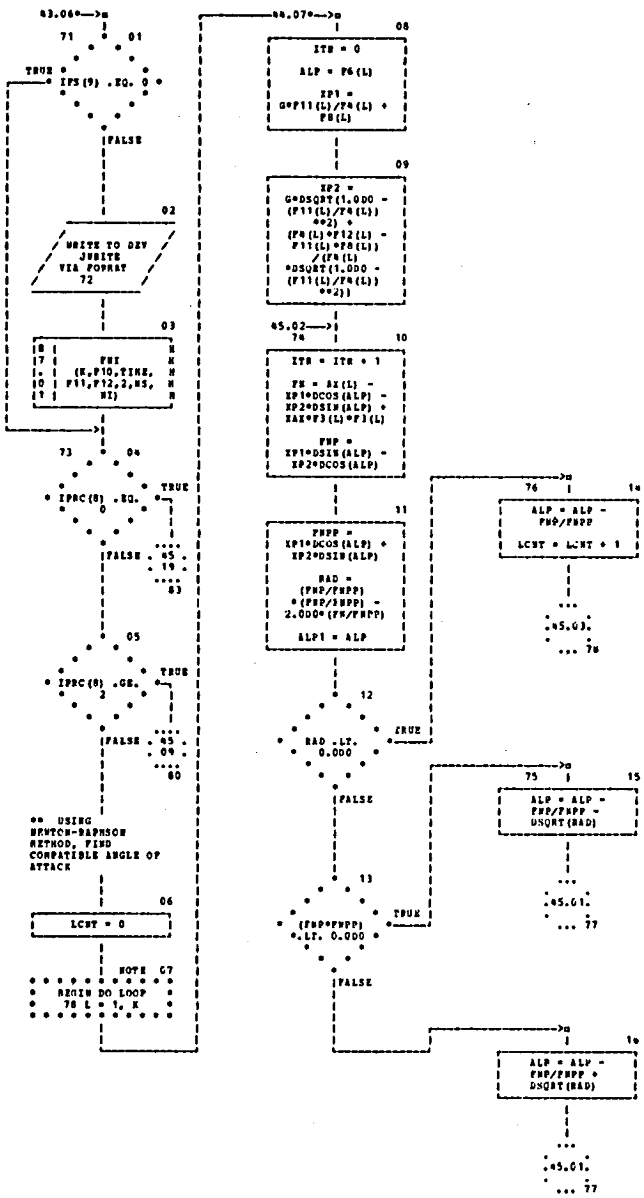
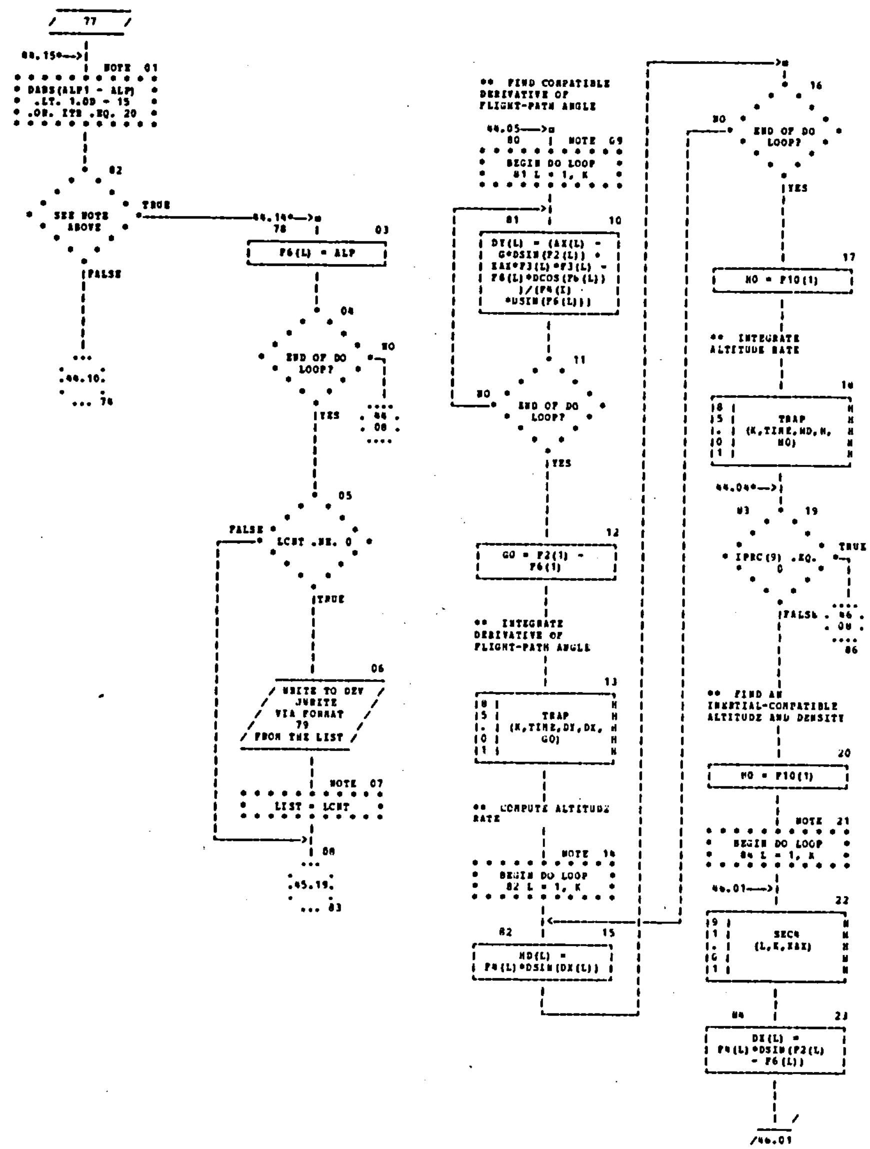


CHART TITLE - SUBROUTINE SEC2(K,JP,NUM,LSP,ITEST,S)



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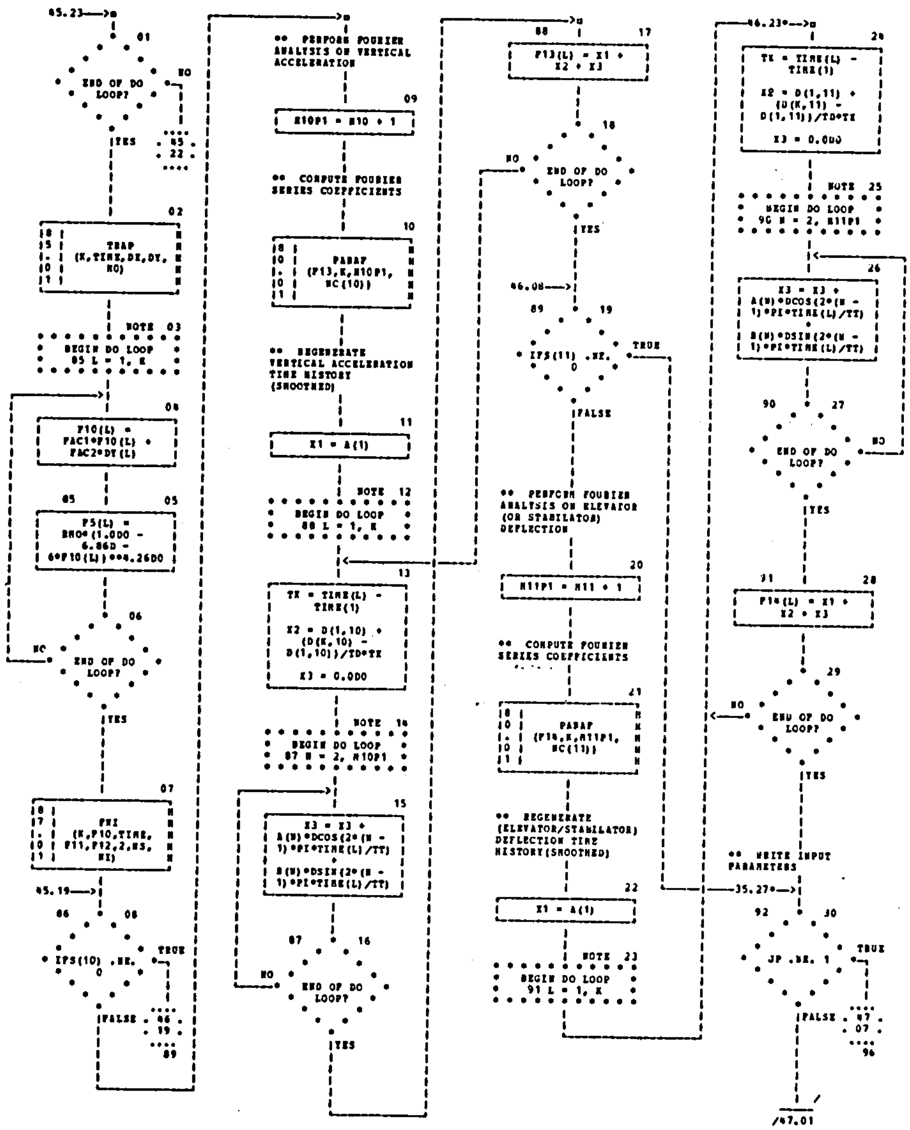

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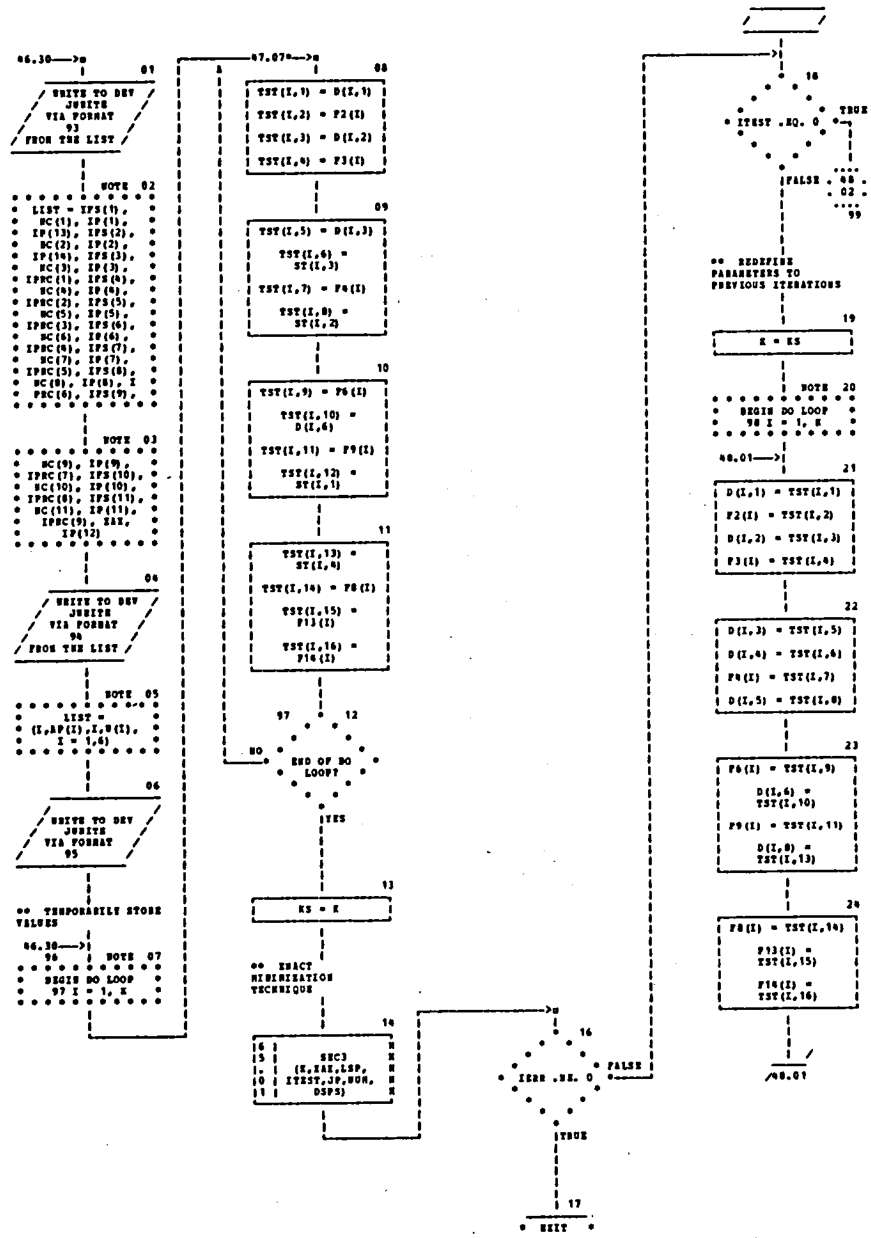


CHART TITLE - SUBROUTINE SEC2(K,JP,NUM,LSP,ITEST,S)

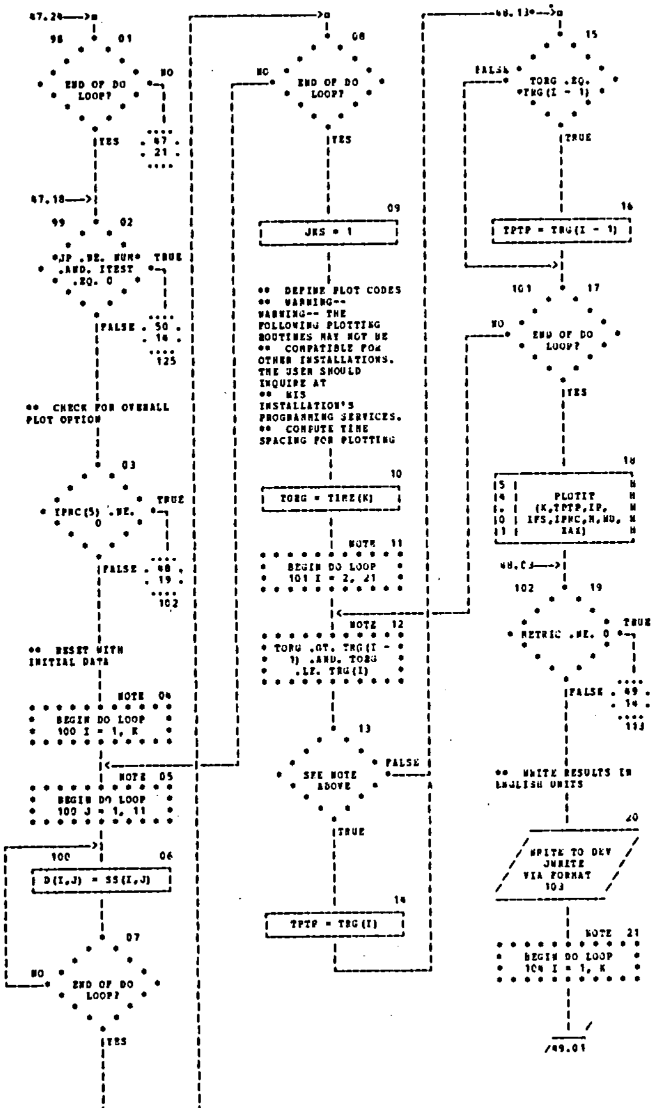


CHART TITLE - SUBROUTINE SEC2(K,JP,NUM,LSP,ITEST,S)

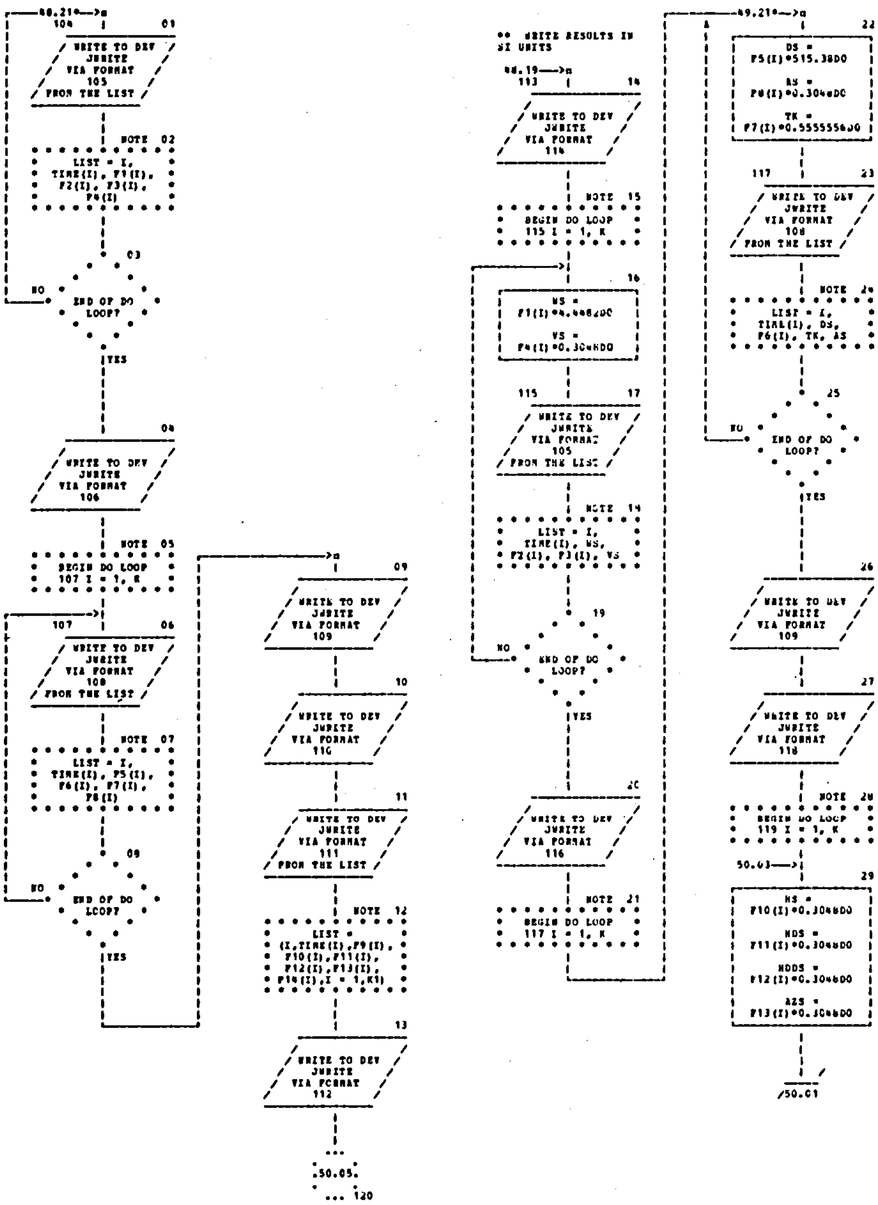


CHART TITLE - SUBROUTINE SEC2(K,JP,NUR,LSF,ITEST,S)

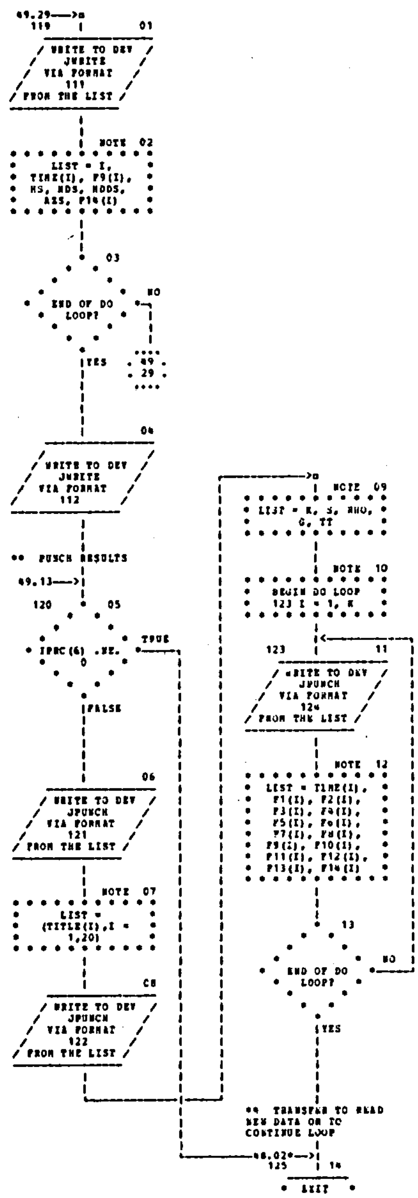


CHART TITLE - SUBROUTINE PLOTIT(N,TPTI,IP,IPS,IPSC,K,ND,IAN)

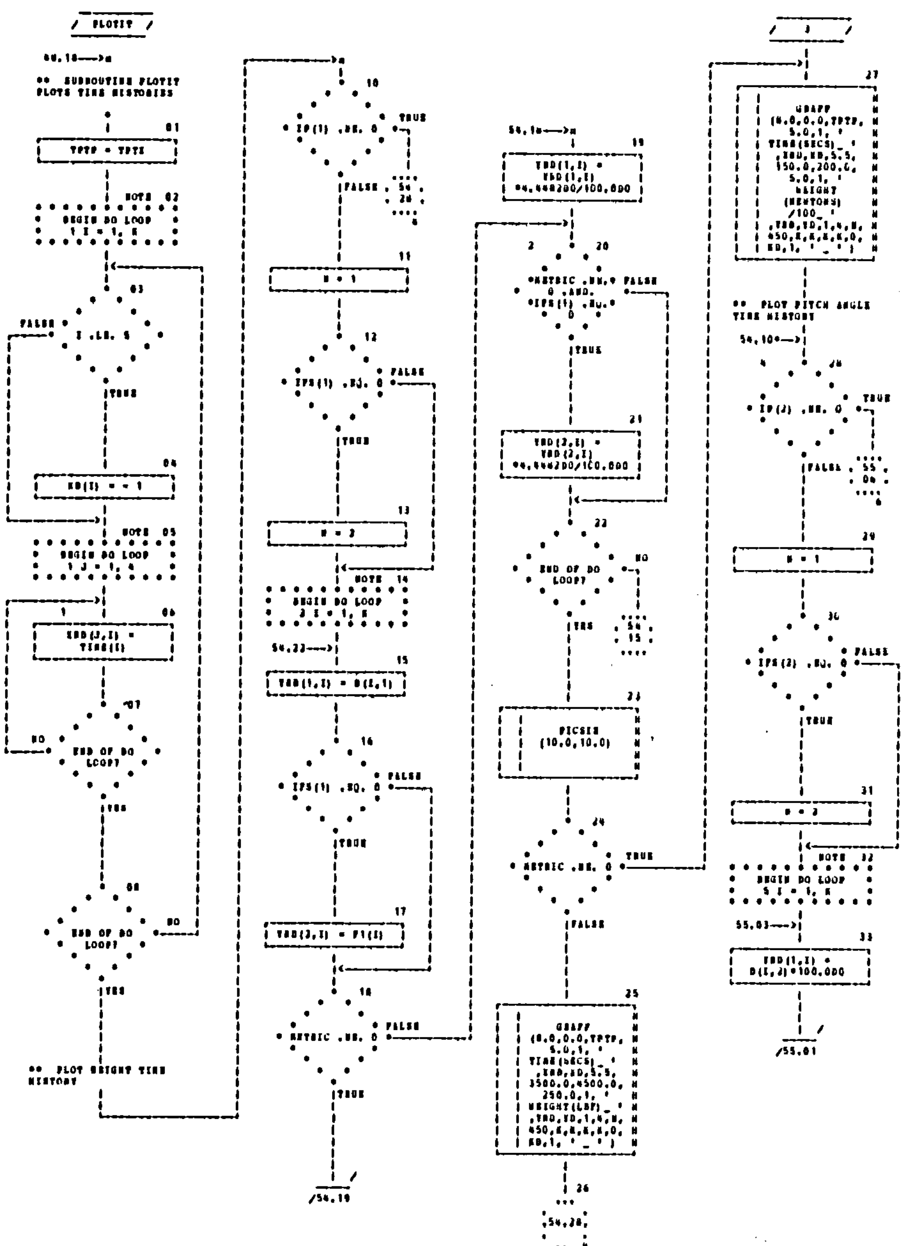


CHART TITLE - SUBROUTINE PLOTIT(K,TPTI,IP,IPS,IPBC,N,ND,IAX)

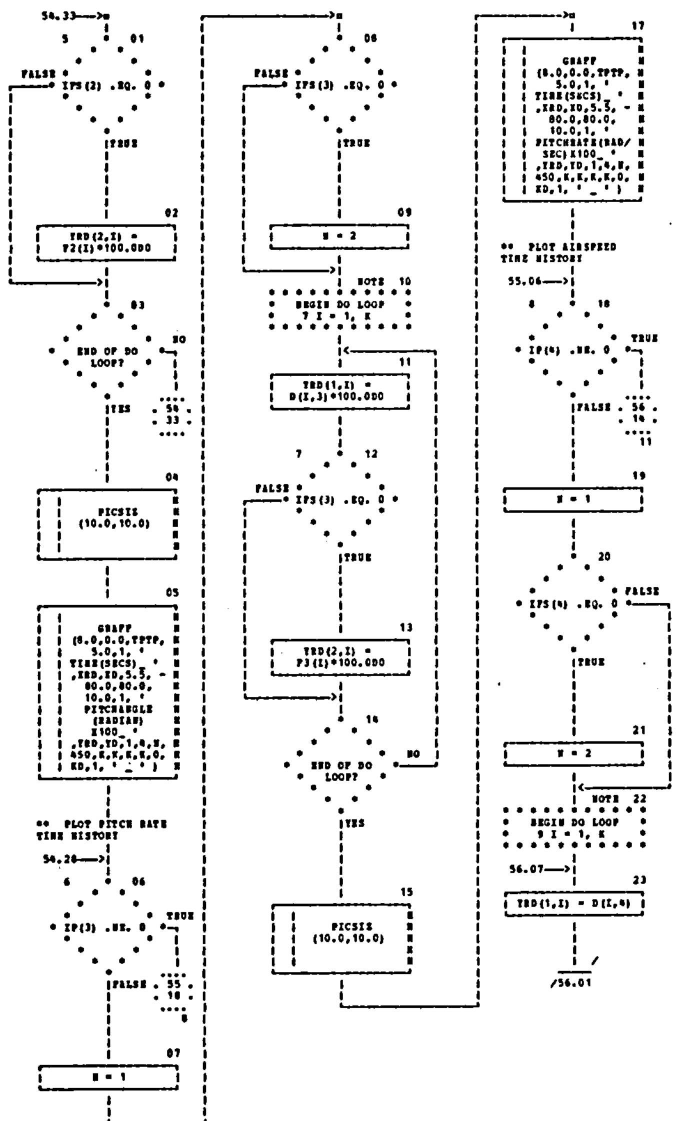


CHART TITLE - SUBROUTINE PLOTIT(X,TPTX,IP,IFS,IPRC,N,ND,XAX)

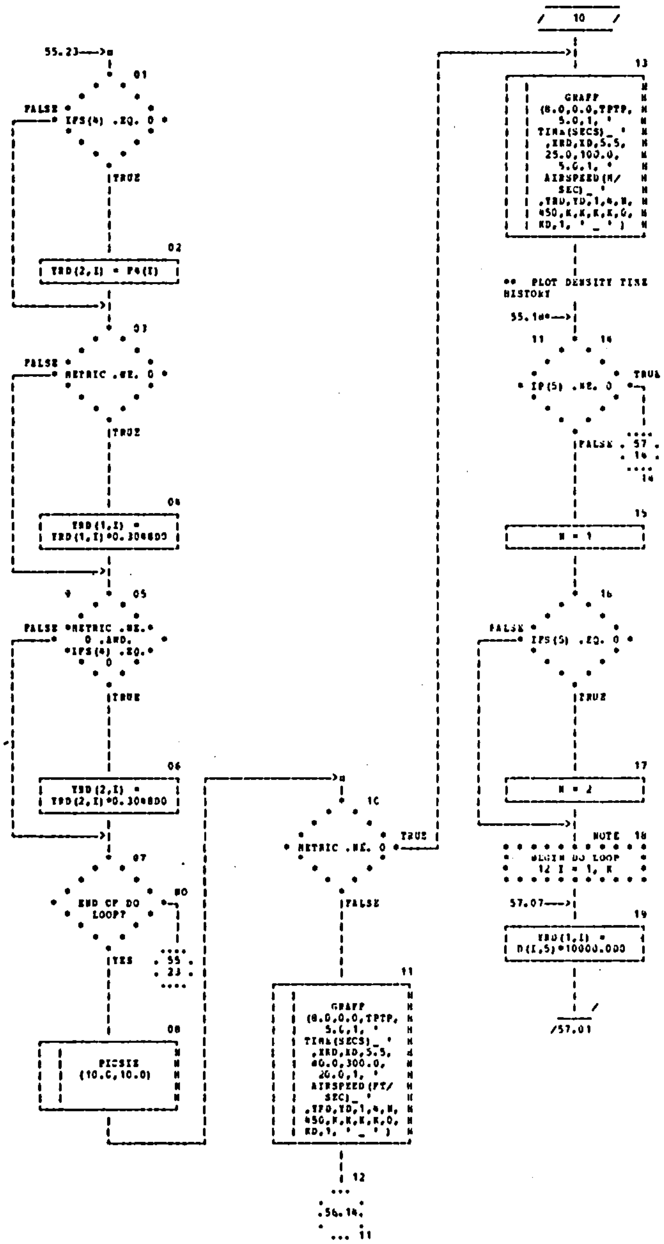


CHART TITLE - SUBROUTINE PLOTIT(K,TPTX,IP,IPS,IPRC,N,ND,XAX)

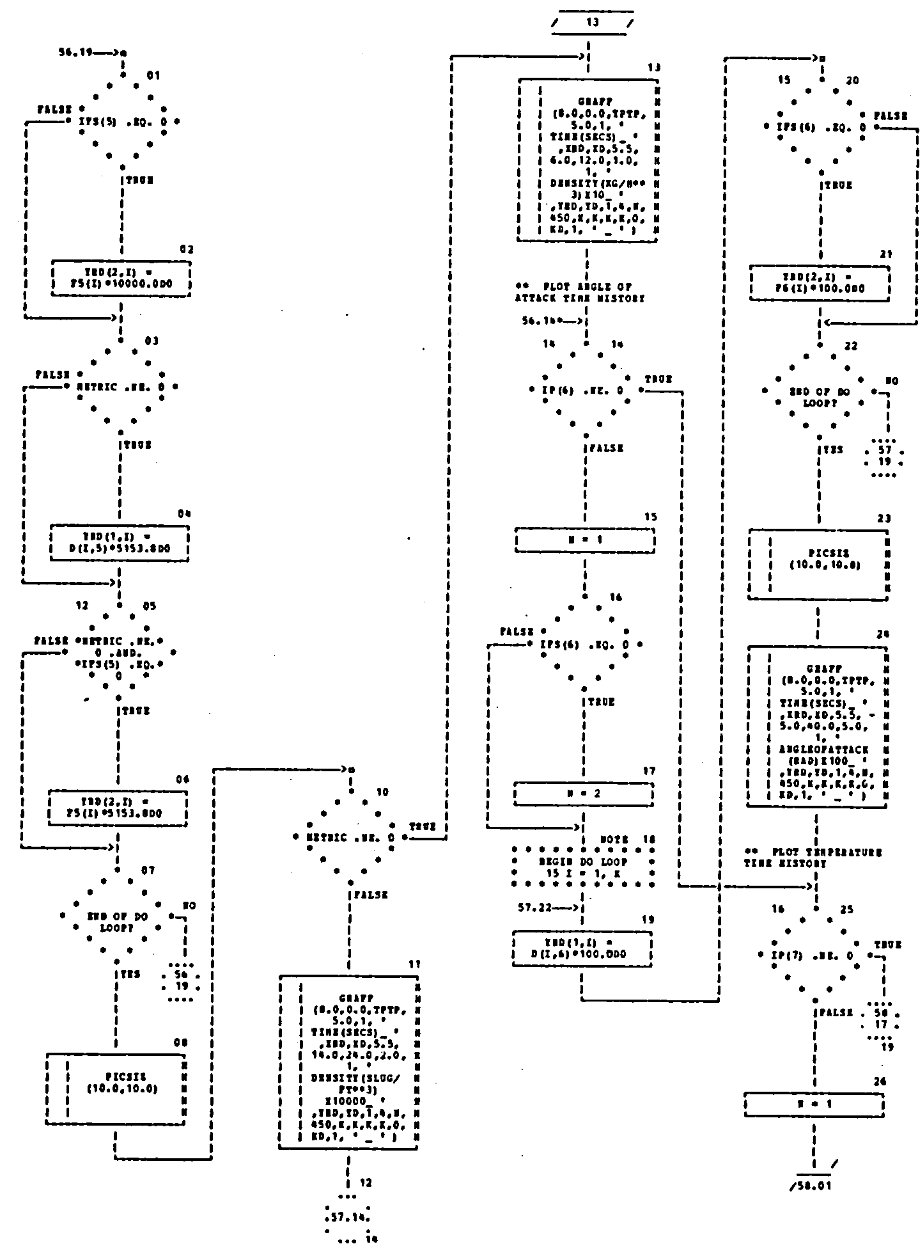


CHART TITLE - SUBROUTINE PLOTIT(K,TPTI,IP,IPS,IPSC,N,ND,IAI)

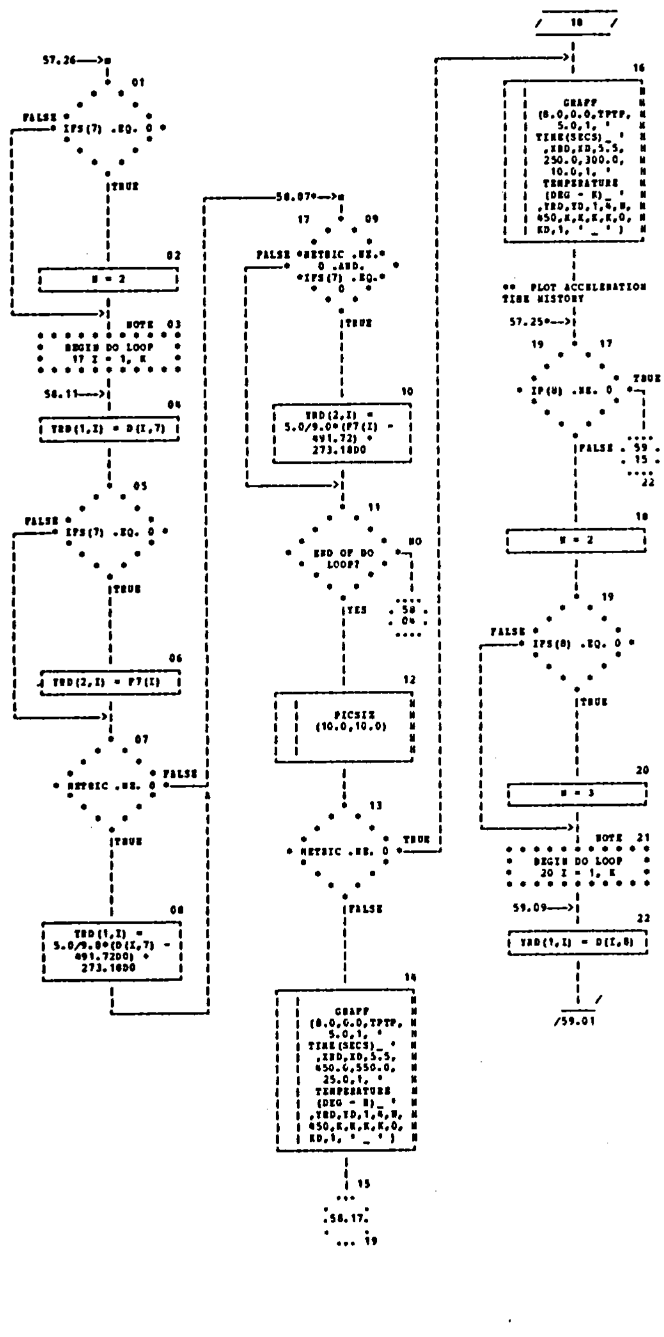


CHART TITLE - SUBROUTINE PLOTIT(K,TPTX,IP,IPS,IPRC,N,ND,XAX)

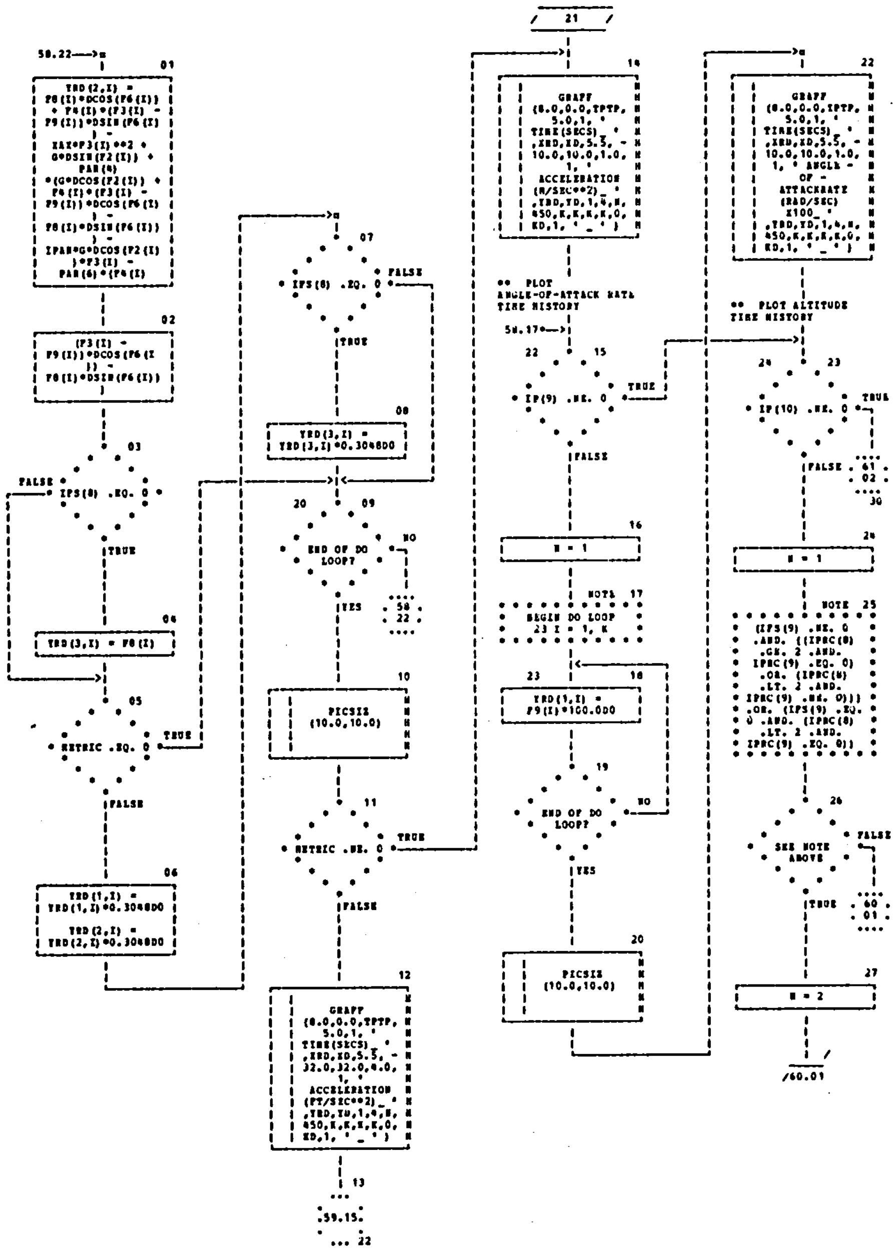


CHART TITLE - SUBROUTINE PLOTIT(K,TPTZ,IP,IPS,IPRC,N,ND,XAX)

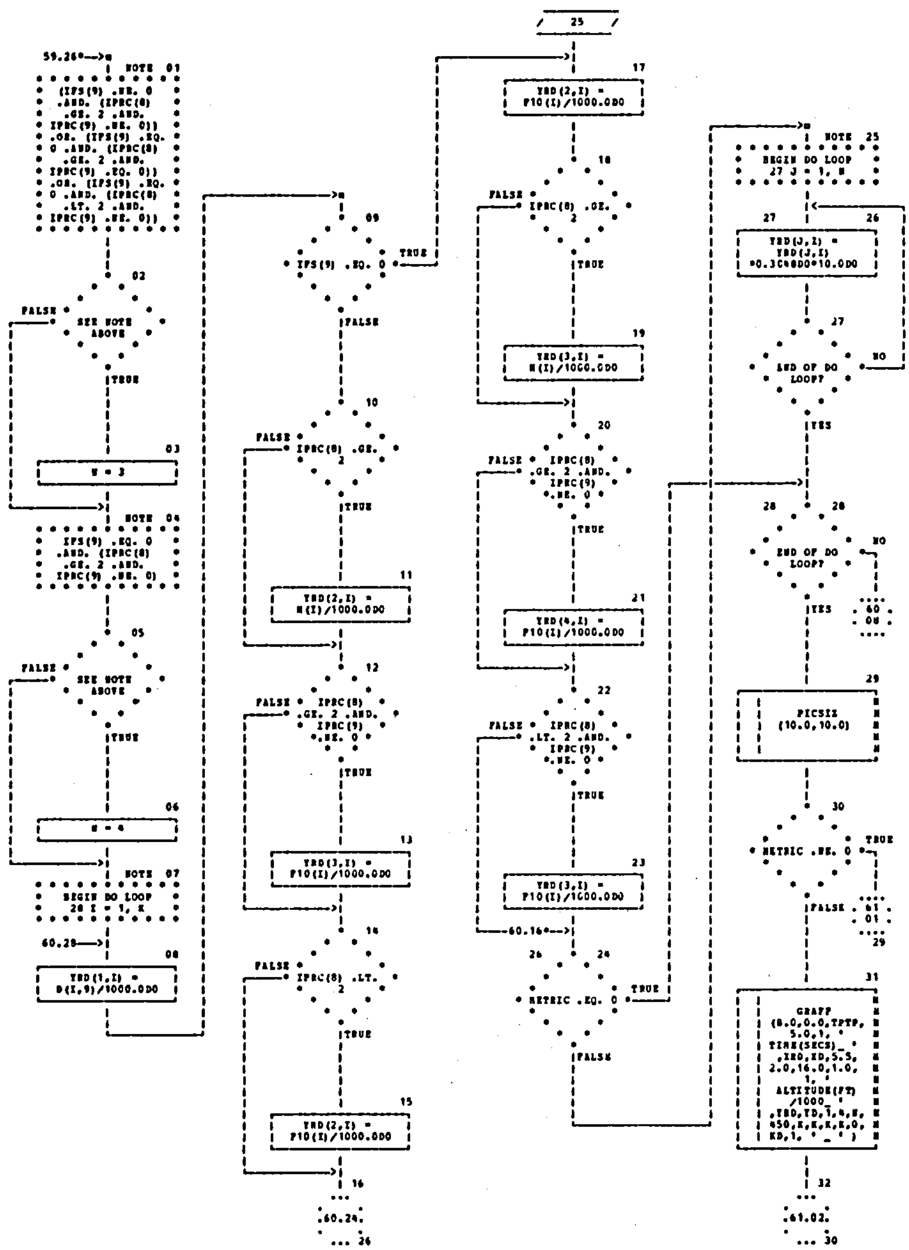


CHART TITLE - SUBROUTINE PLOTIT(K,TPTI,IP,IPS,IPRC,N,ND,NAX)

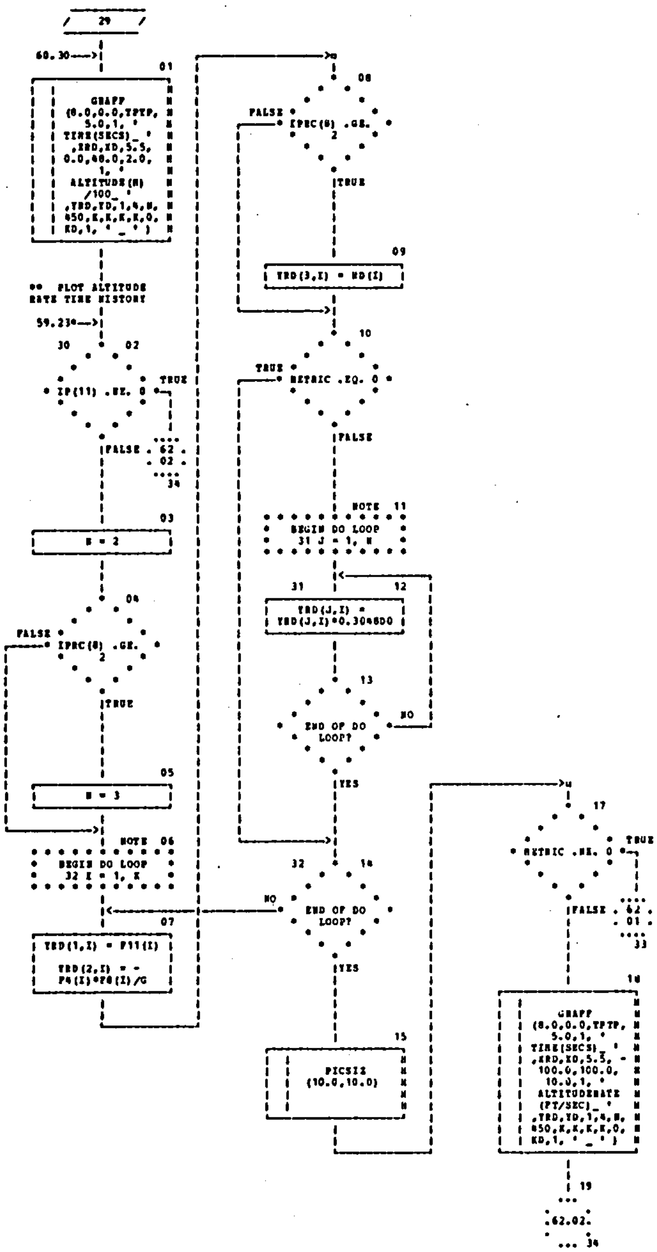


CHART TITLE - SUBROUTINE PLOTIT(K,TPTX,IP,IPS,IPRC,N,ND,IAX)

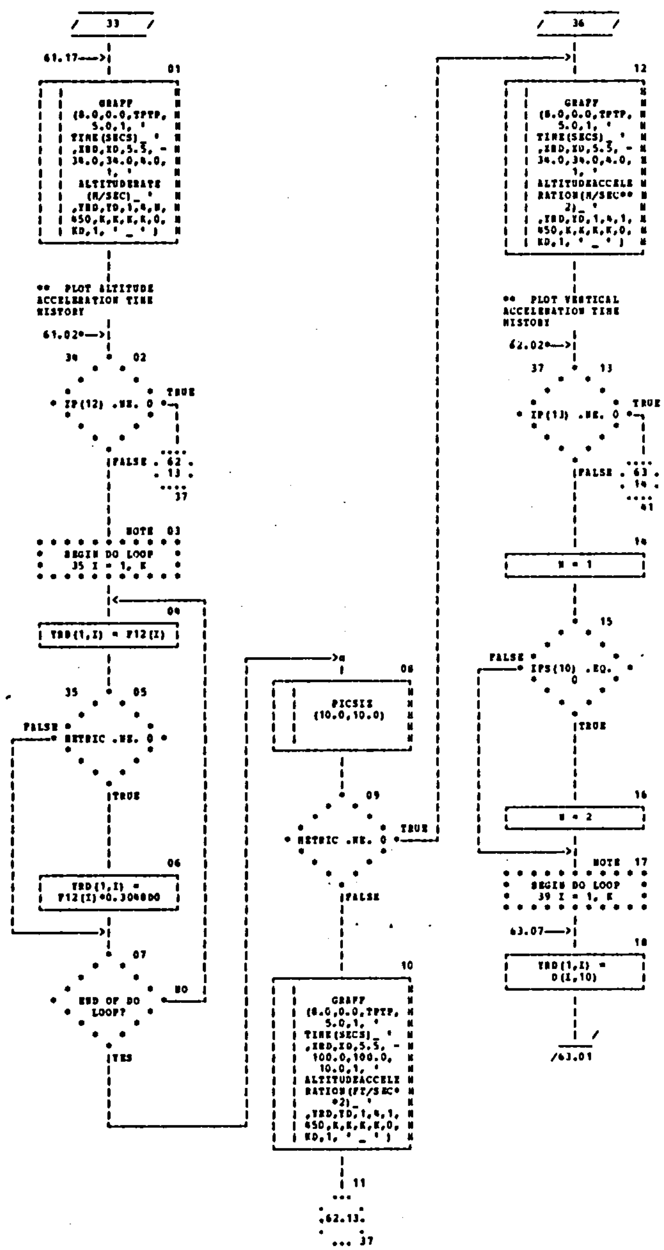


CHART TITLE - SUBROUTINE PLOTIT(K,TPTX,IP,IPS,IPRC,N,ND,XAX)

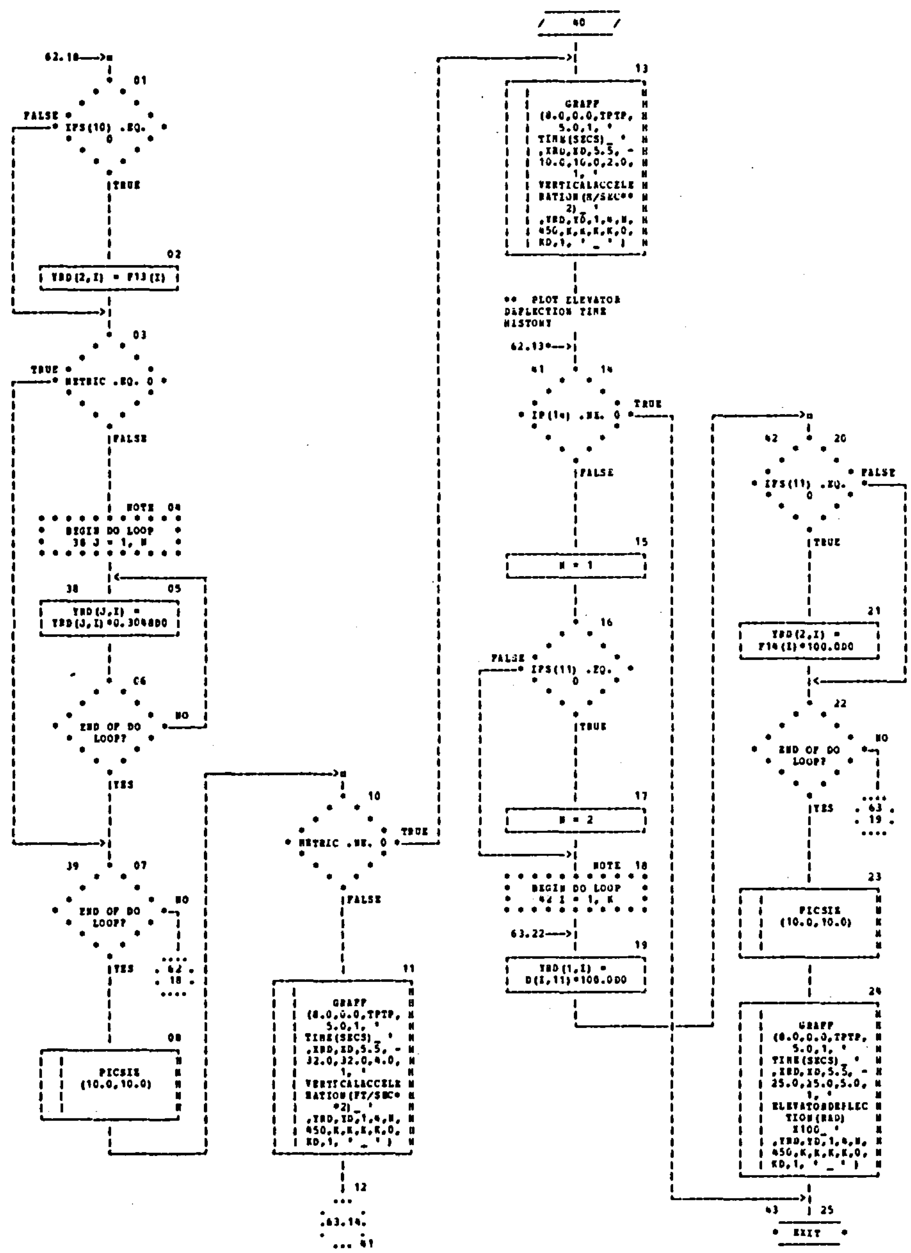


CHART TITLE - SUBROUTINE SEC3(K,XAK,LSP,ITEST,LL,NOH,DSPS)

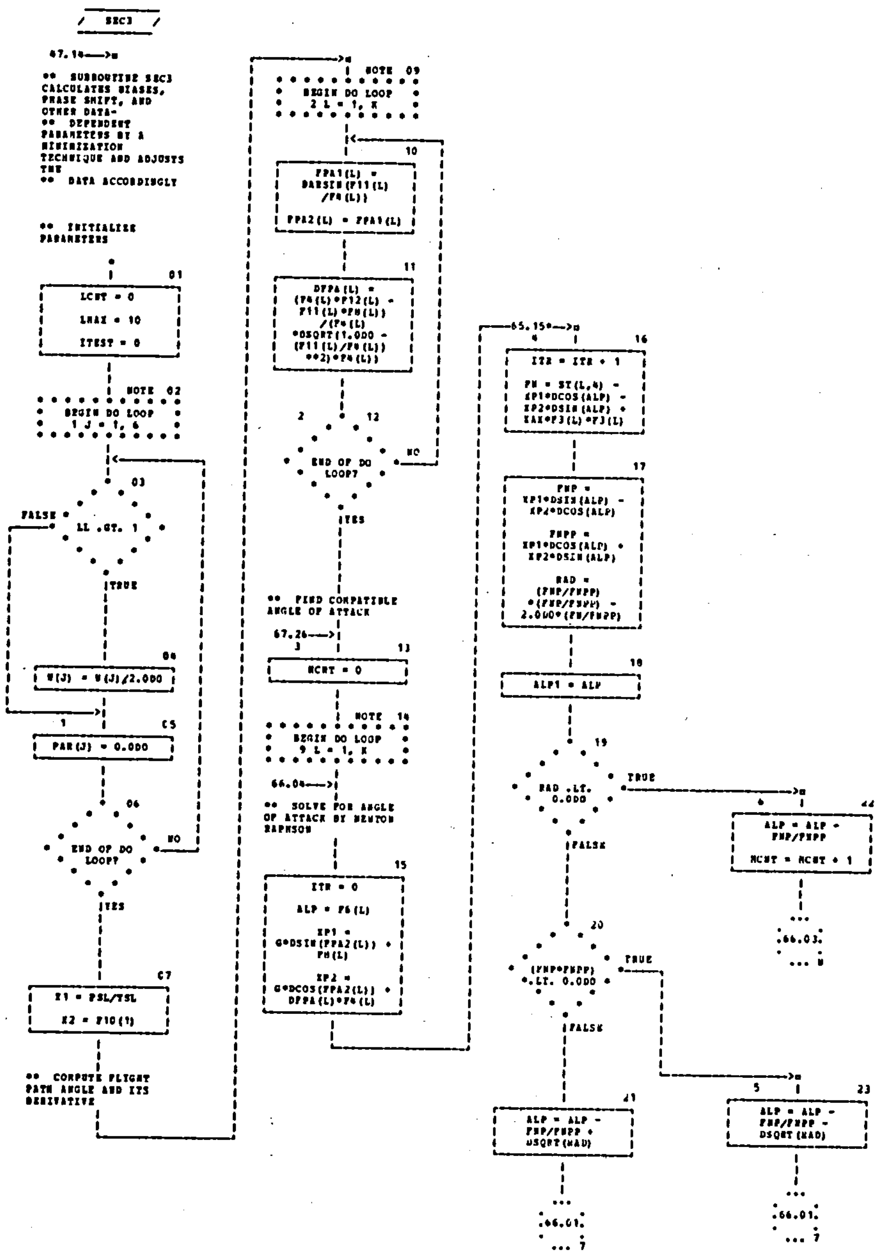


CHART TITLE - SUBROUTINE SEC3(K,EAE,LSP,ITEST,LL,NUM,DSPS)

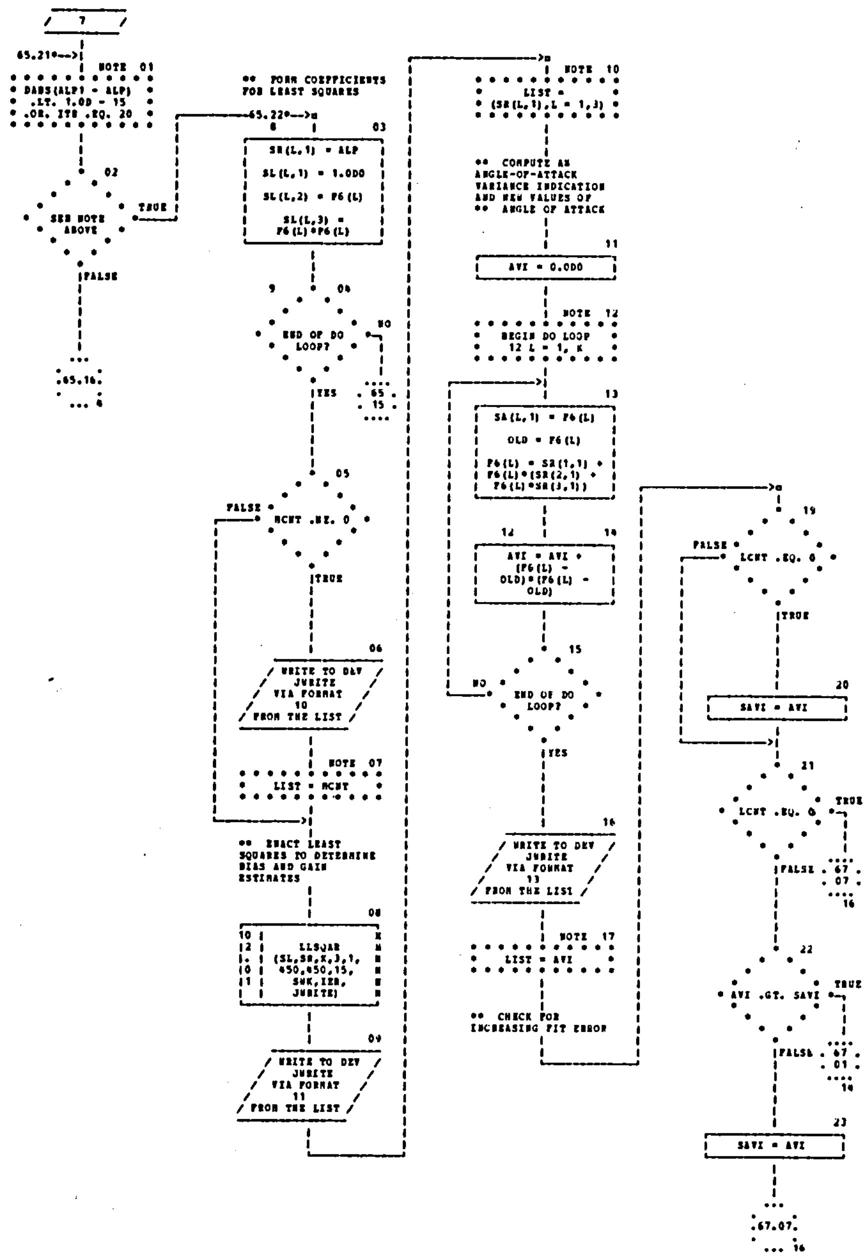


CHART TITLE - SUBROUTINE SRC3(K,EAX,LSP,ITEST,LL,NUM,DSPS)

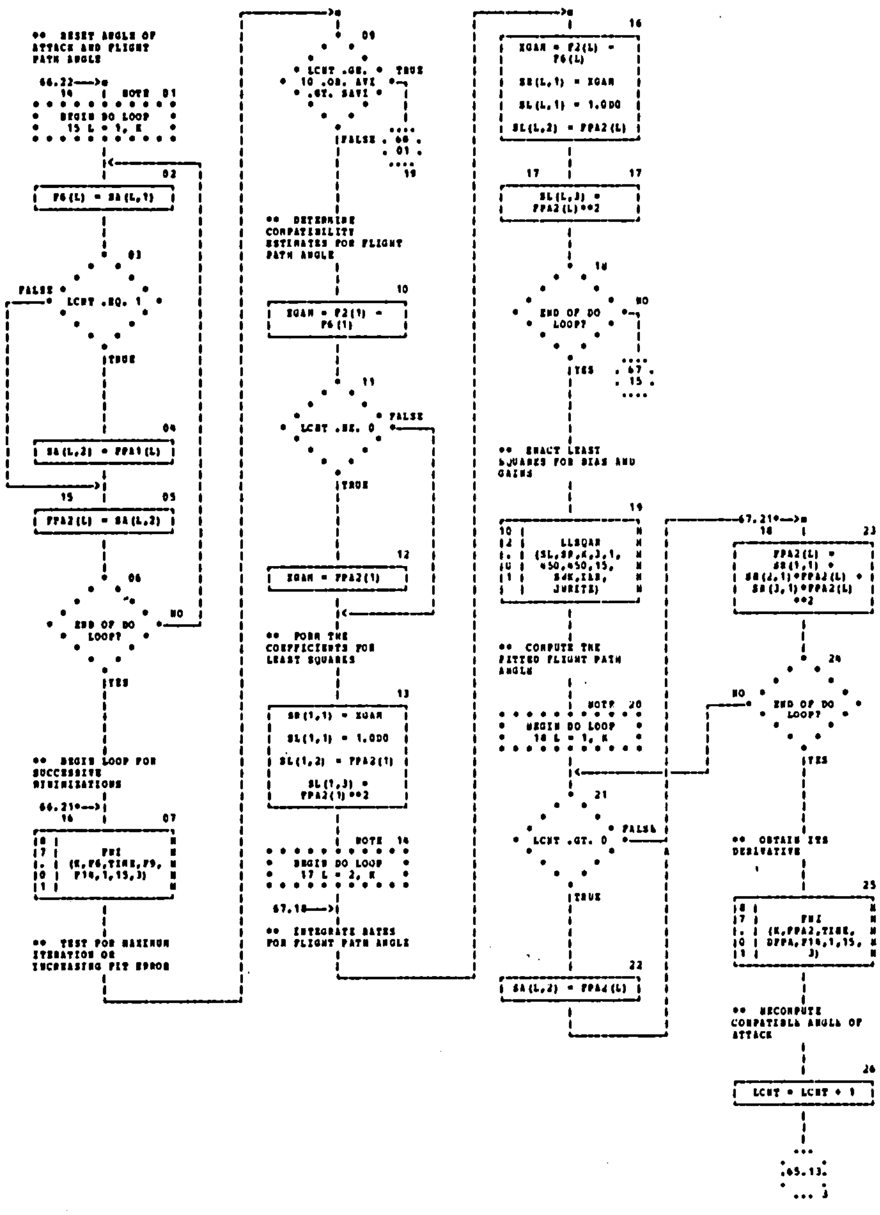


CHART TITLE - SUBROUTINE SEC3(K,XAX,LSP,ITEST,LL,NUM,DSPS)

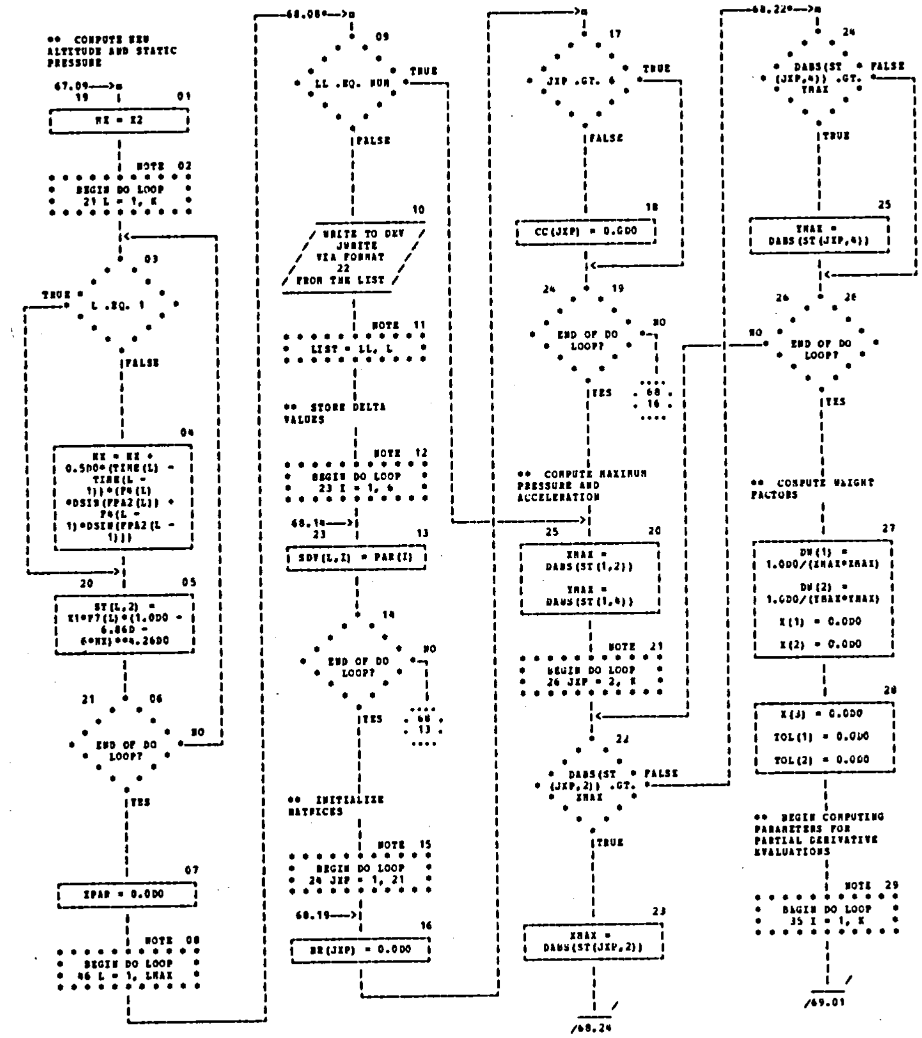


CHART TITLE - SUBROUTINE SEC3(X,XAX,LSP,ITEST,LL,NUM,DSPS)

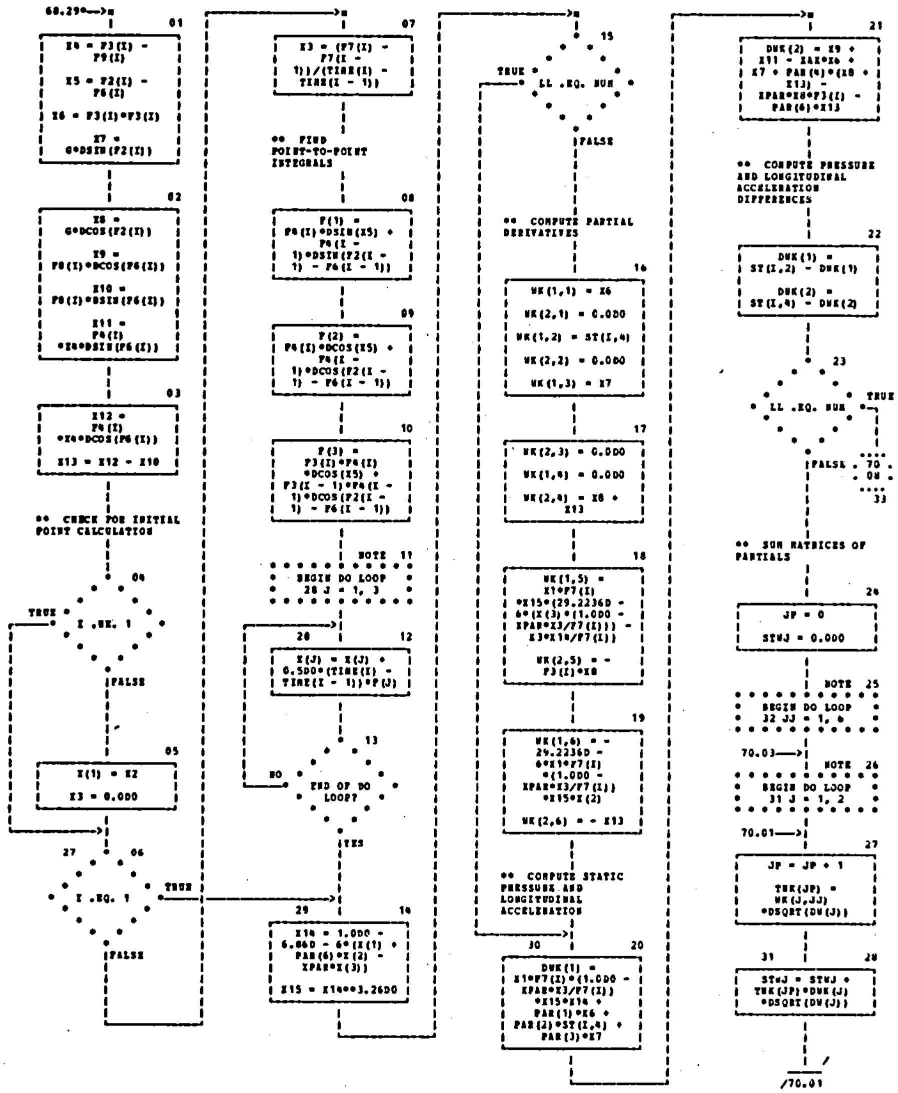


CHART TITLE - SUBROUTINE SEC3(K,XAX,LSP,ITEST,LL,NUM,DSPS)

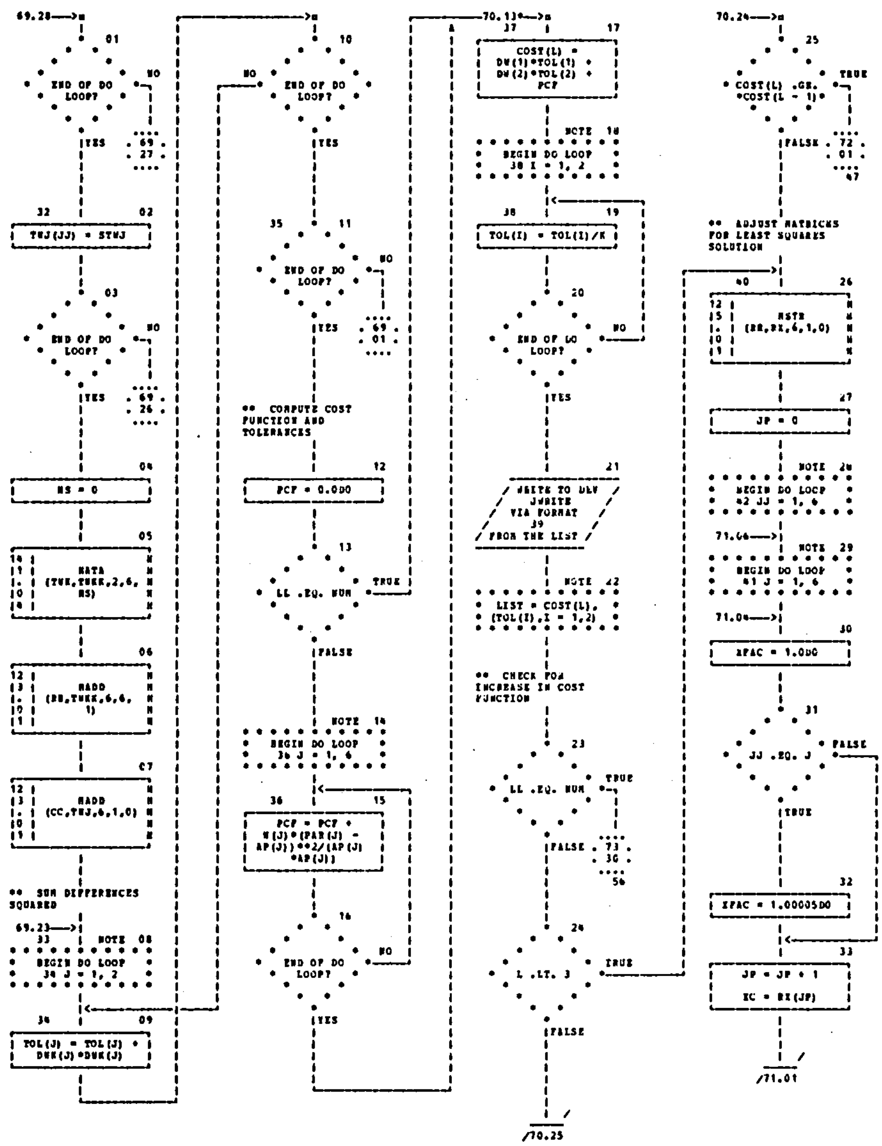


CHART TITLE - SUBROUTINE SEC3(K,XAX,LSP,ITEST,LL,NUM,DSPS)

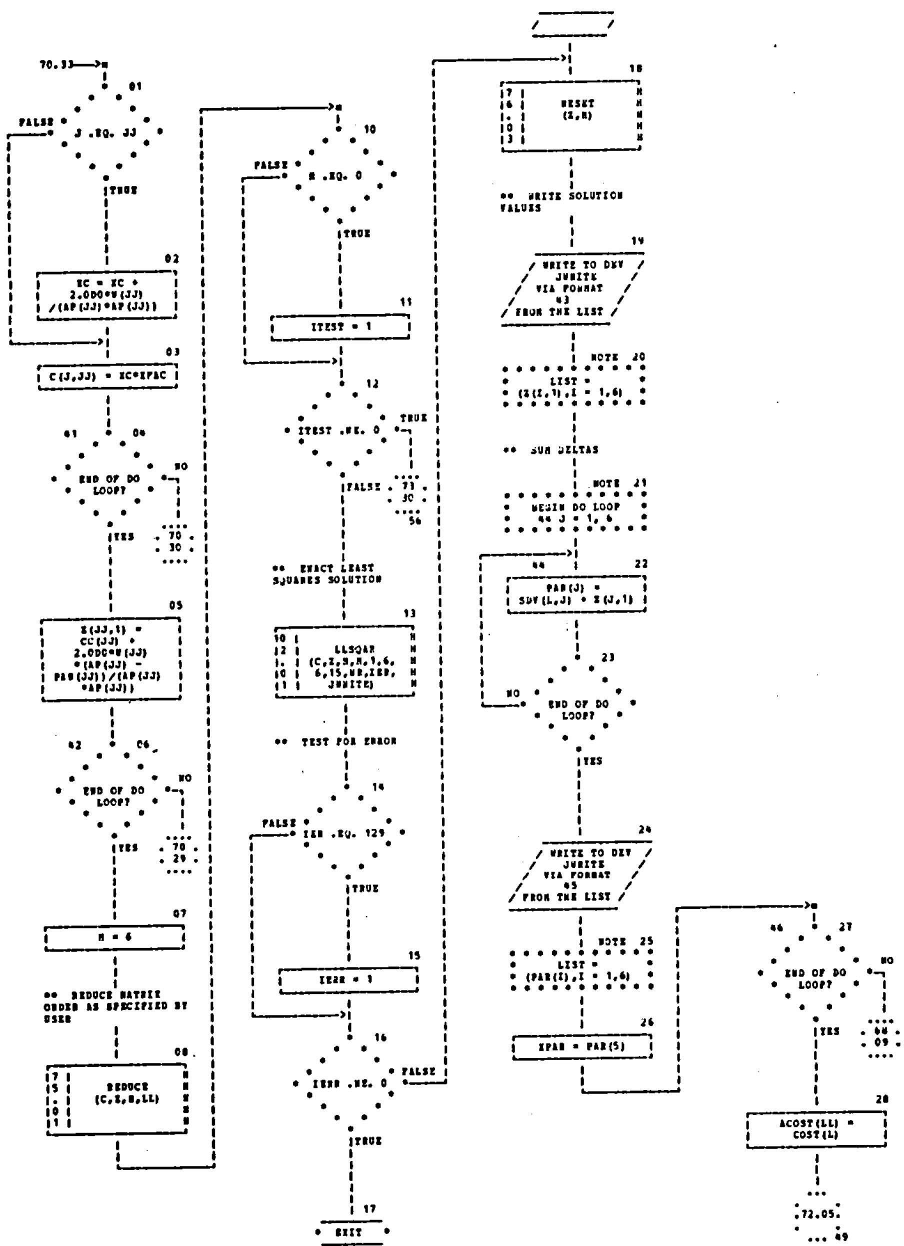


CHART TITLE - SUBROUTINE SEC3(K,XAX,LSP,ITEST,LL,NUR,DSPS)

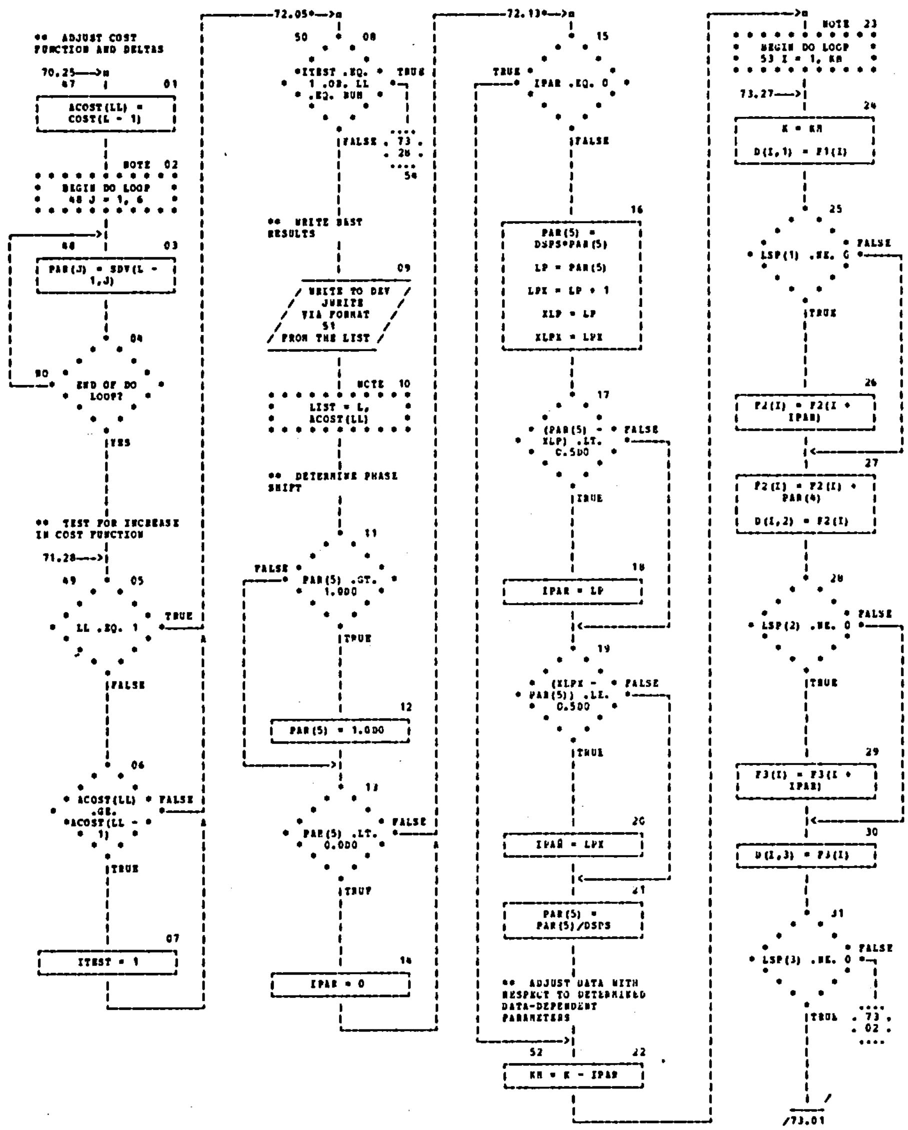


CHART TITLE - SUBROUTINE SEC3(K,KAX,LSP,ITEST,LL,NUM,DSPS)

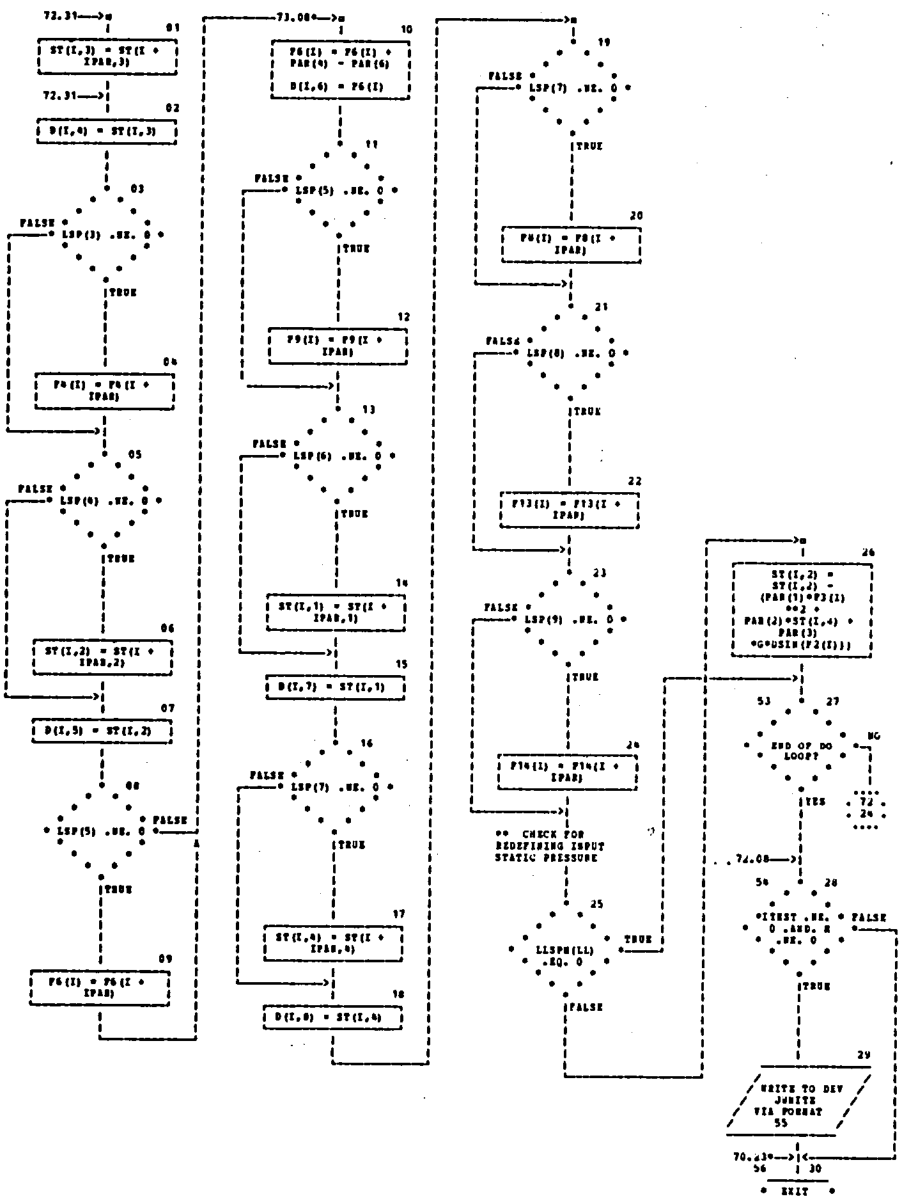


CHART TITLE - SUBROUTINE REDUCE(C,Z,N,LL)

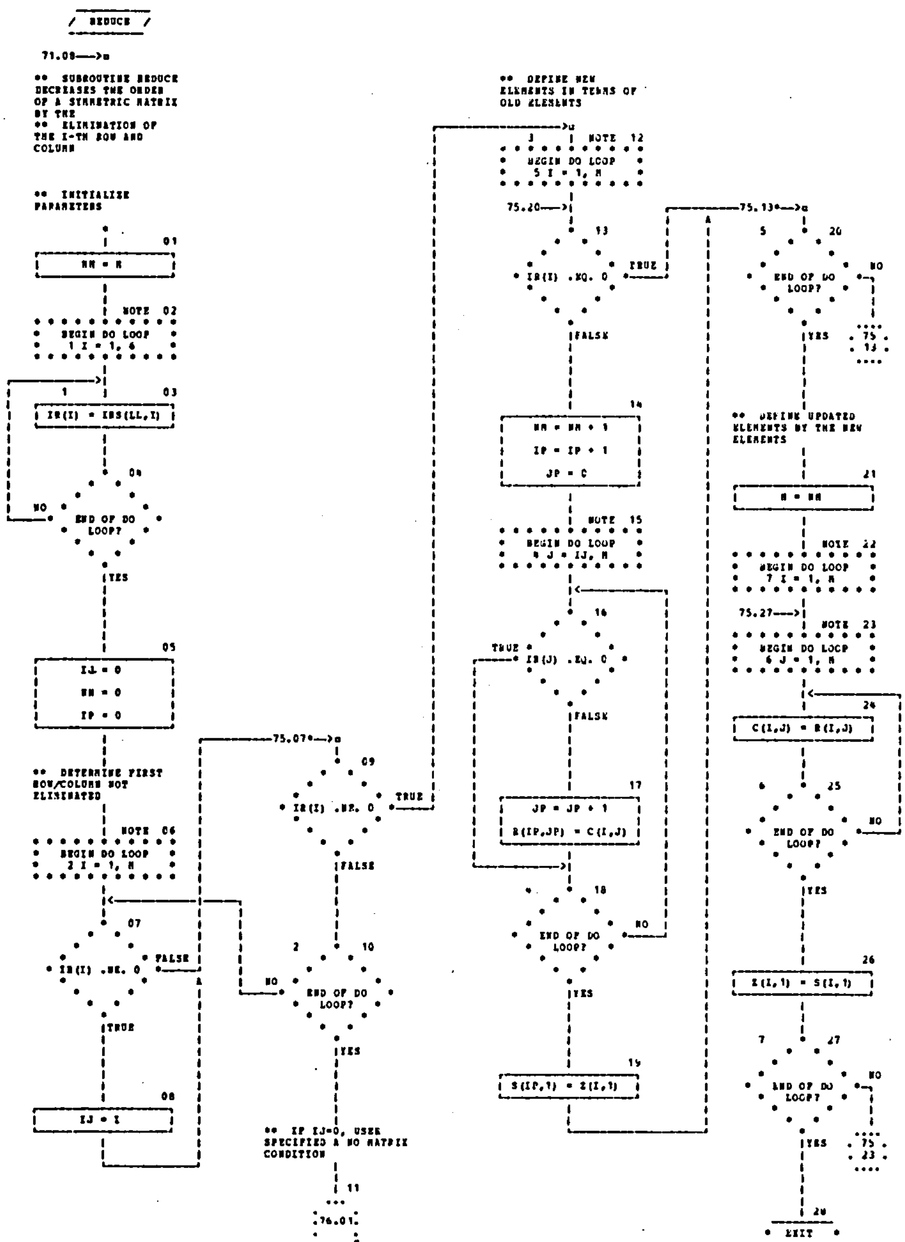


CHART TITLE - SUBROUTINE REDUCE(C,Z,N,LL)

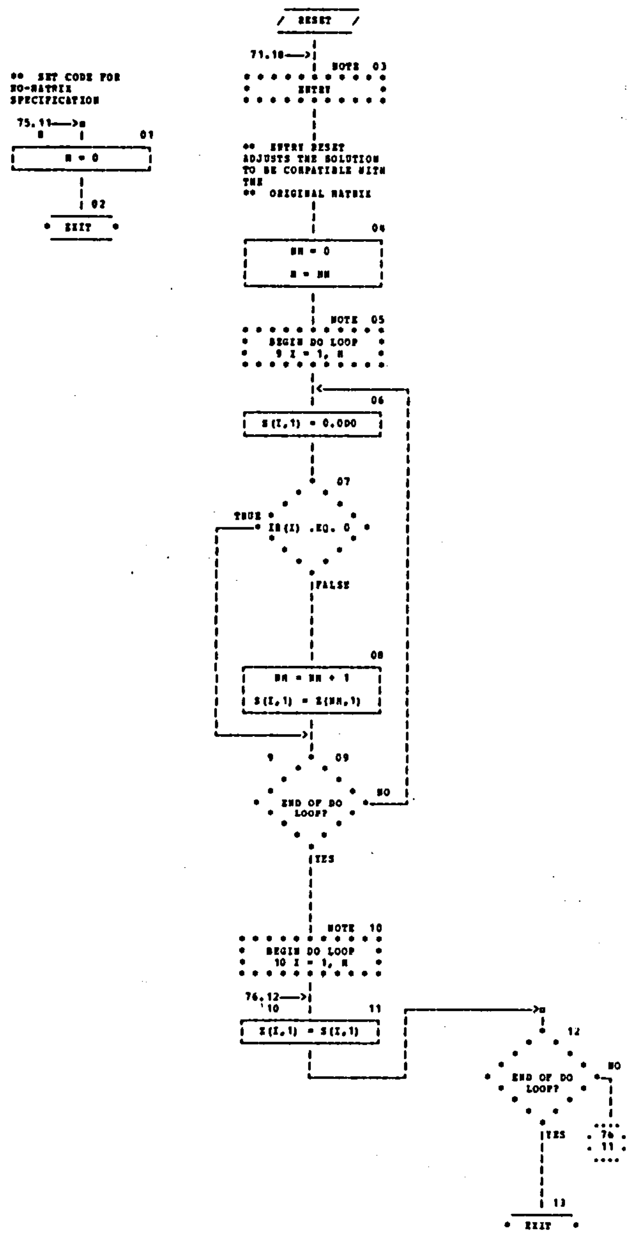


CHART TITLE - SUBROUTINE SHIFT(K,LSP,NSPTS)

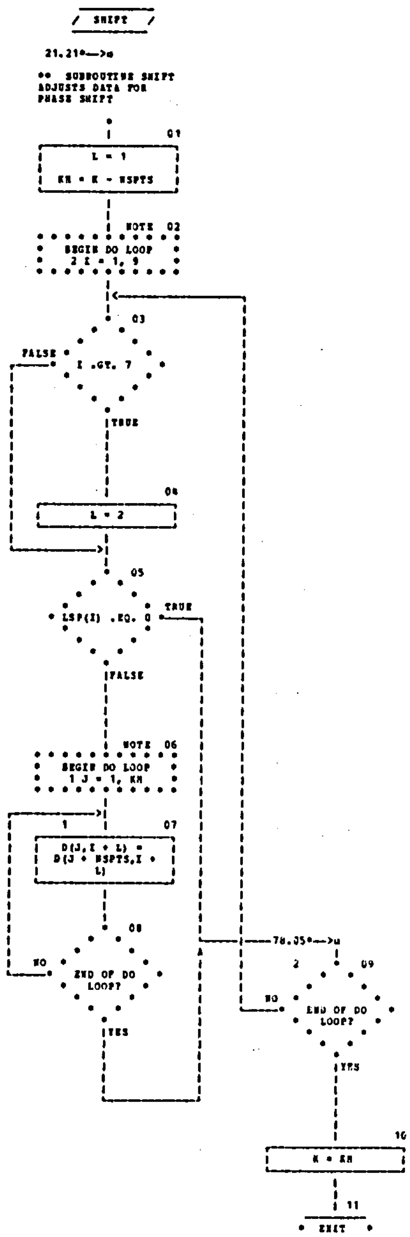


CHART TITLE - SUBROUTINE PARAF(FNT,K,NP1,NC)

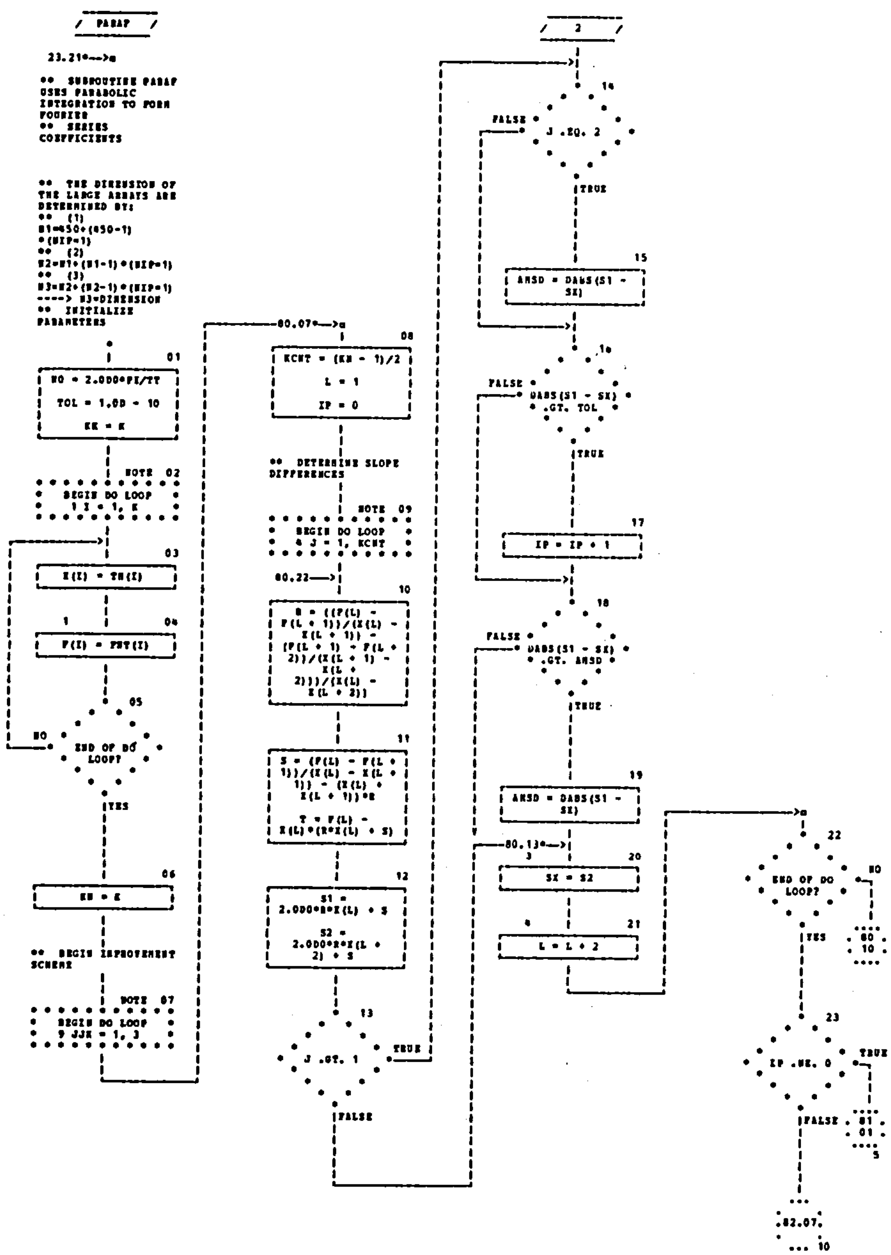


CHART TITLE - SUBROUTINE PARAF(FNT,K,NP1,NC)

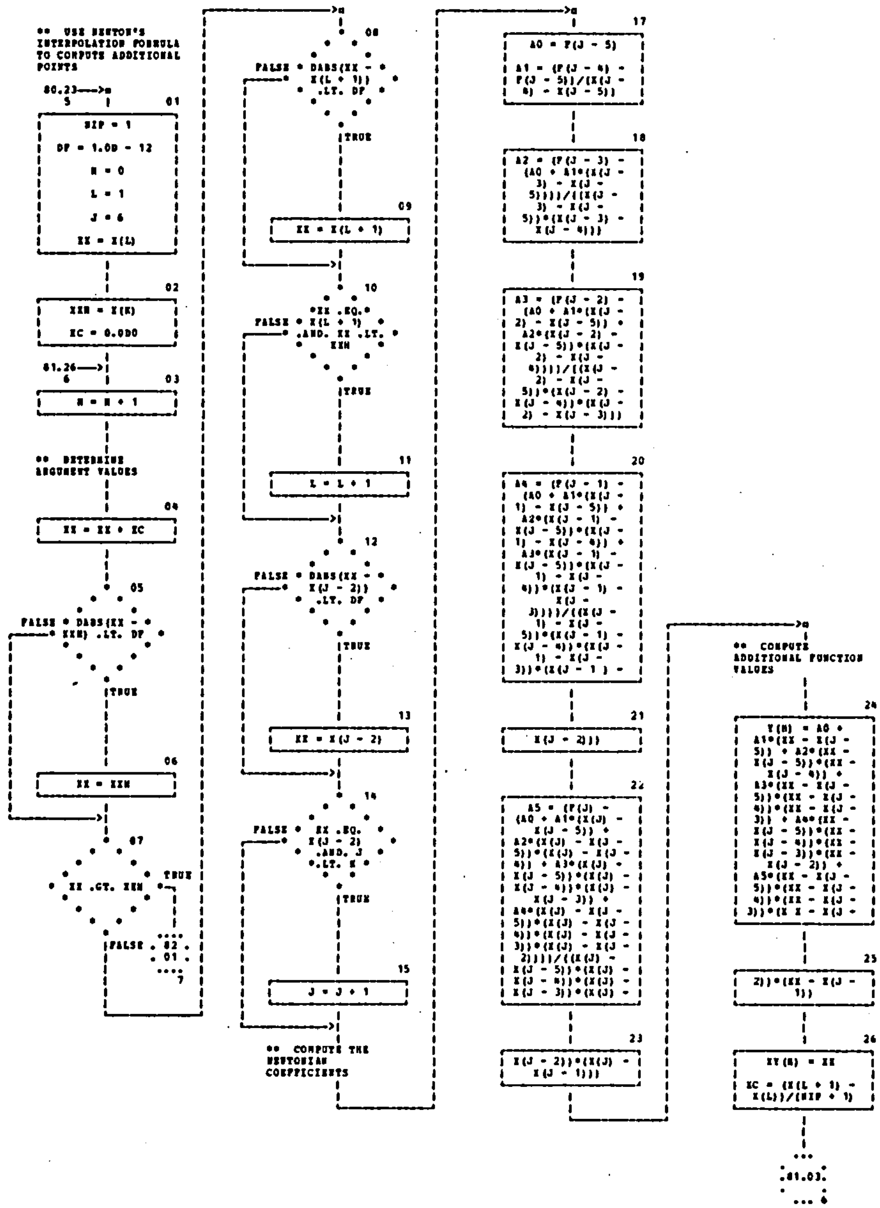


CHART TITLE - SUBROUTINE PARAF(FNT,K,NP1,NC)

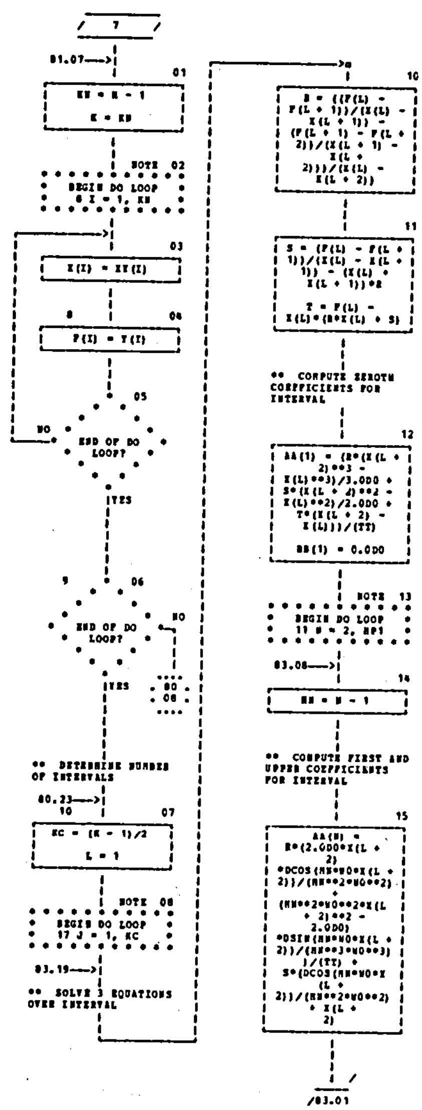


CHART TITLE - SUBROUTINE PARAF(FNT,K,NP1,NC)

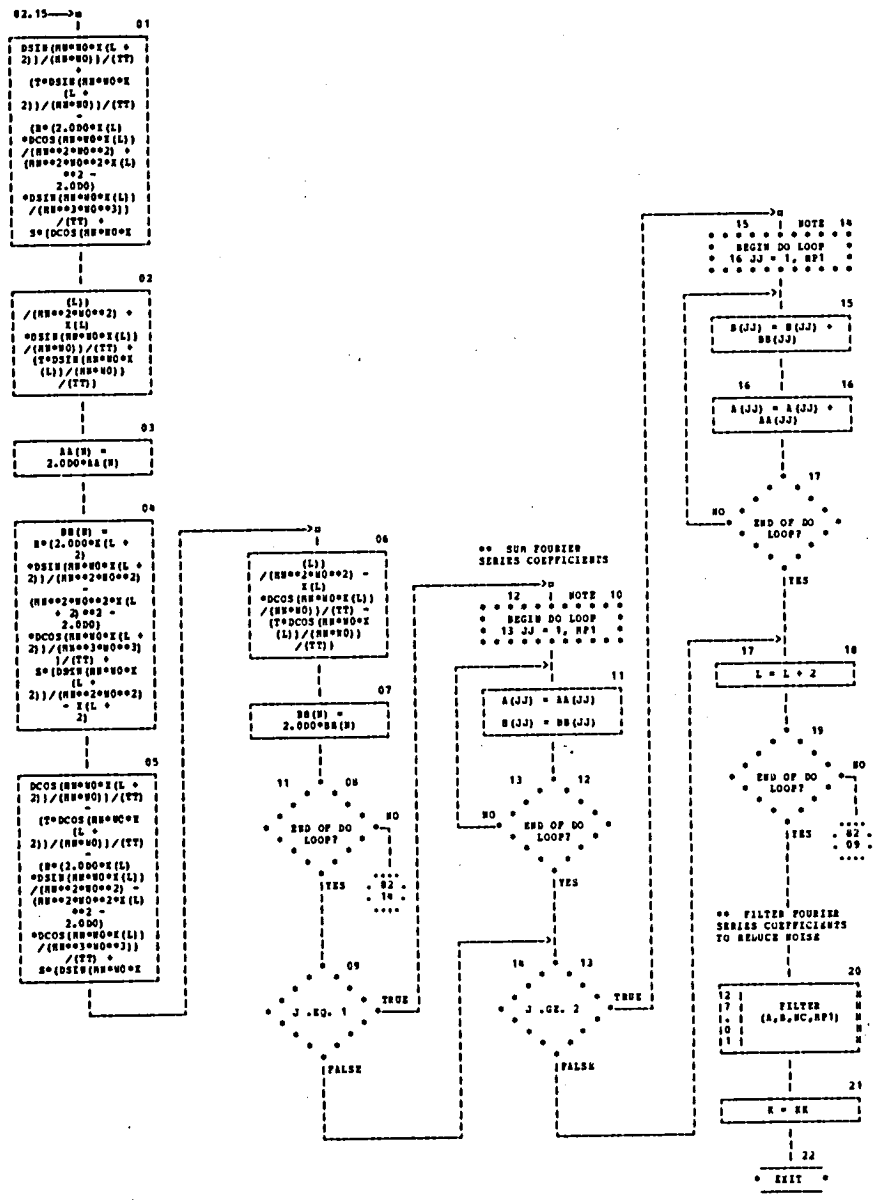


CHART TITLE - SUBROUTINE TRAP(ND,X,DY,Y,Y0)

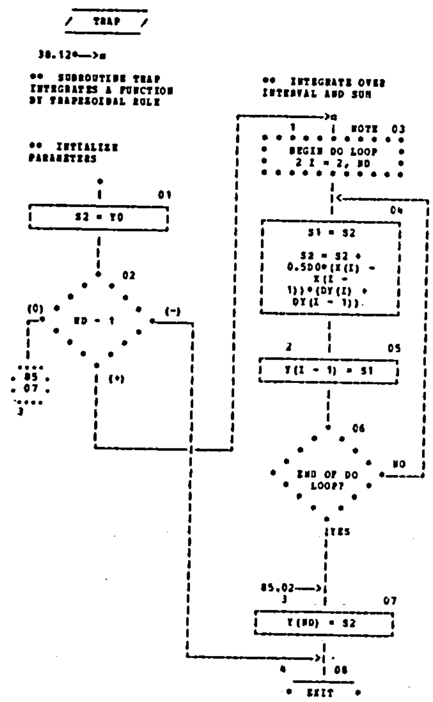


CHART TITLE - SUBROUTINE PHI(K,F,X,FP,FPP,ND,NS,NI)

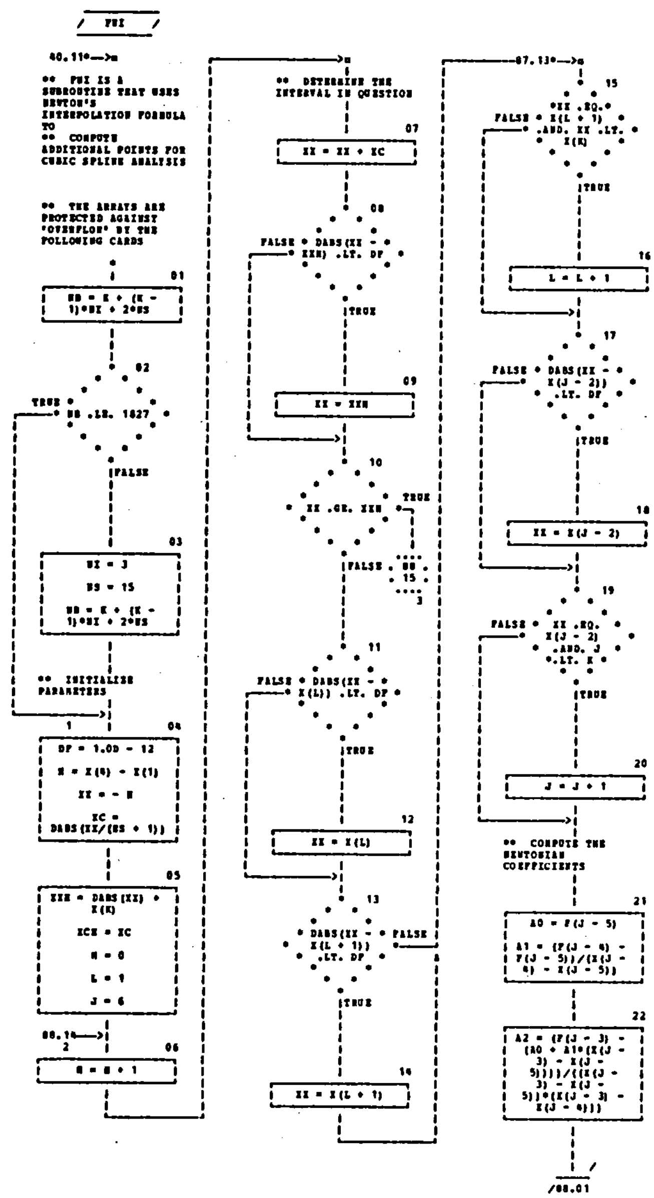


CHART TITLE - SUBROUTINE FDI(K,F,X,FP,FPP,ND,NS,NI)

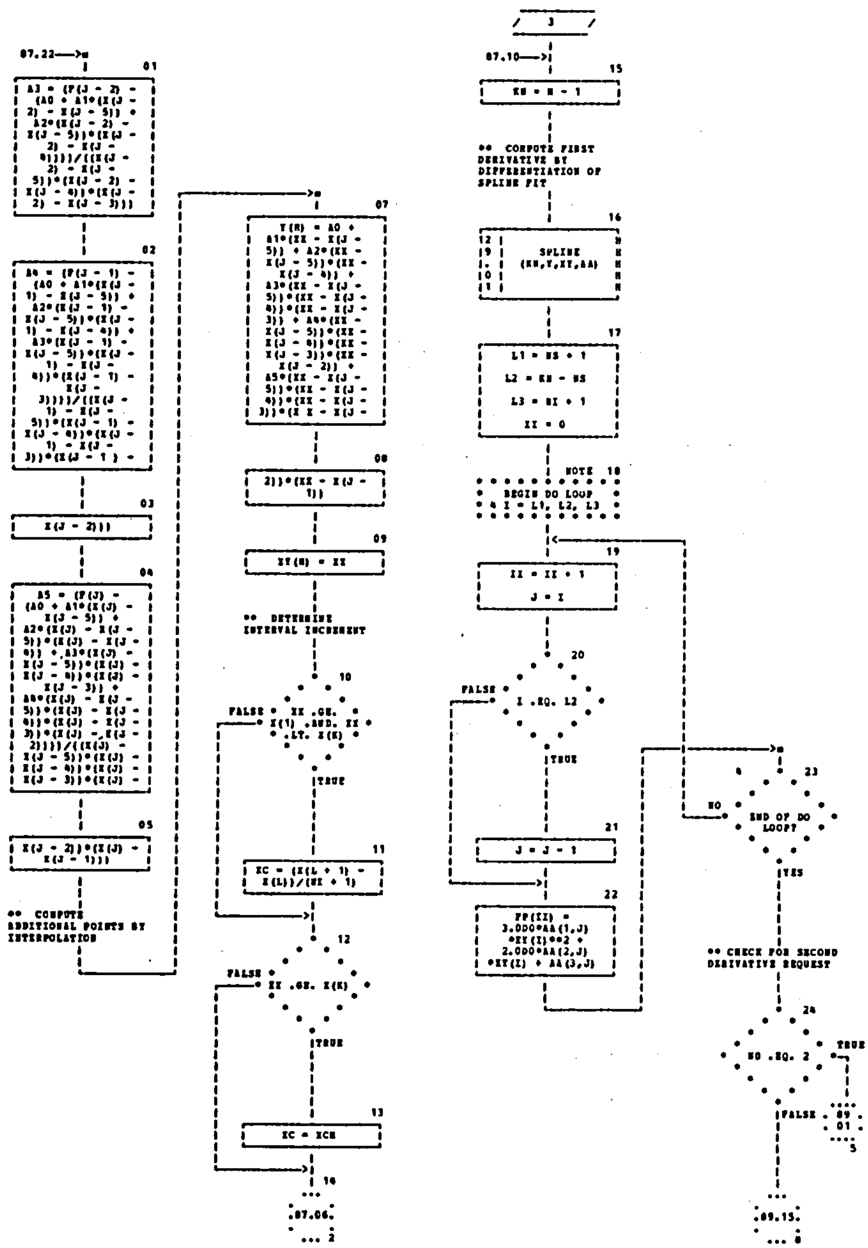


CHART TITLE - SUBROUTINE FNI(K,F,X,FP,FPP,ND,NS,NI)

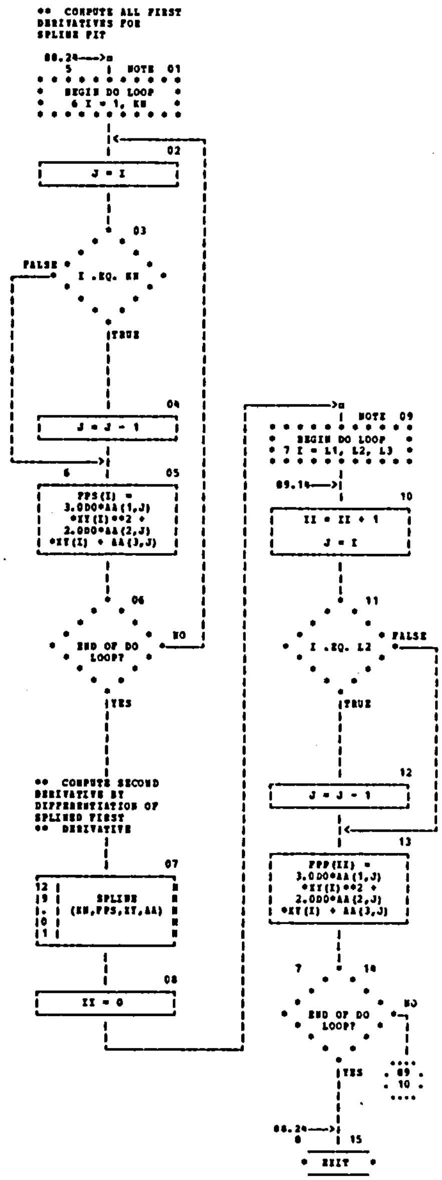


CHART TITLE - SUBROUTINE SEC4(L,K,XAX)

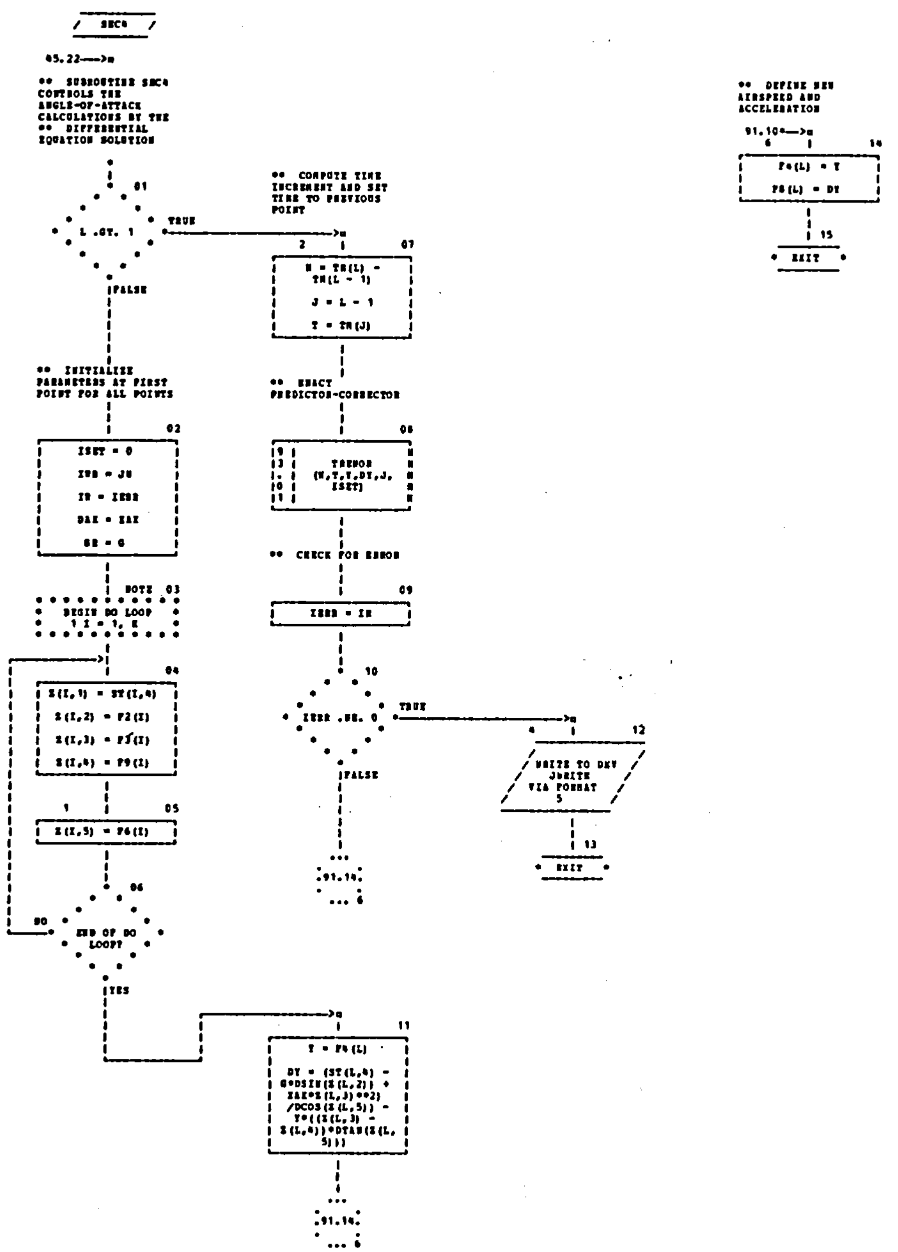


CHART TITLE - SUBROUTINE TRENOR(N,XX,YY,DYY,J,ISET)

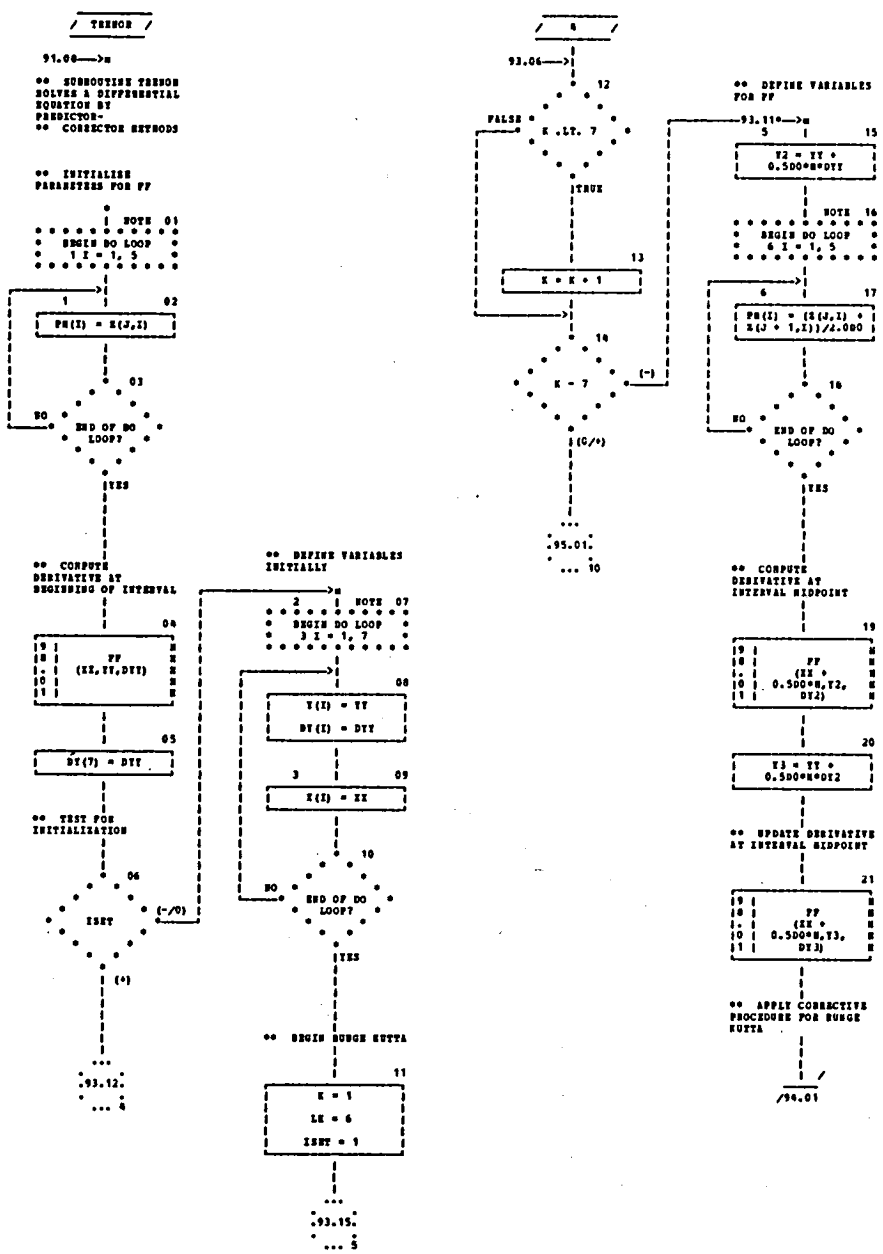


CHART TITLE - SUBROUTINE TRENOR(N,XX,YY,DYY,J,ISET)

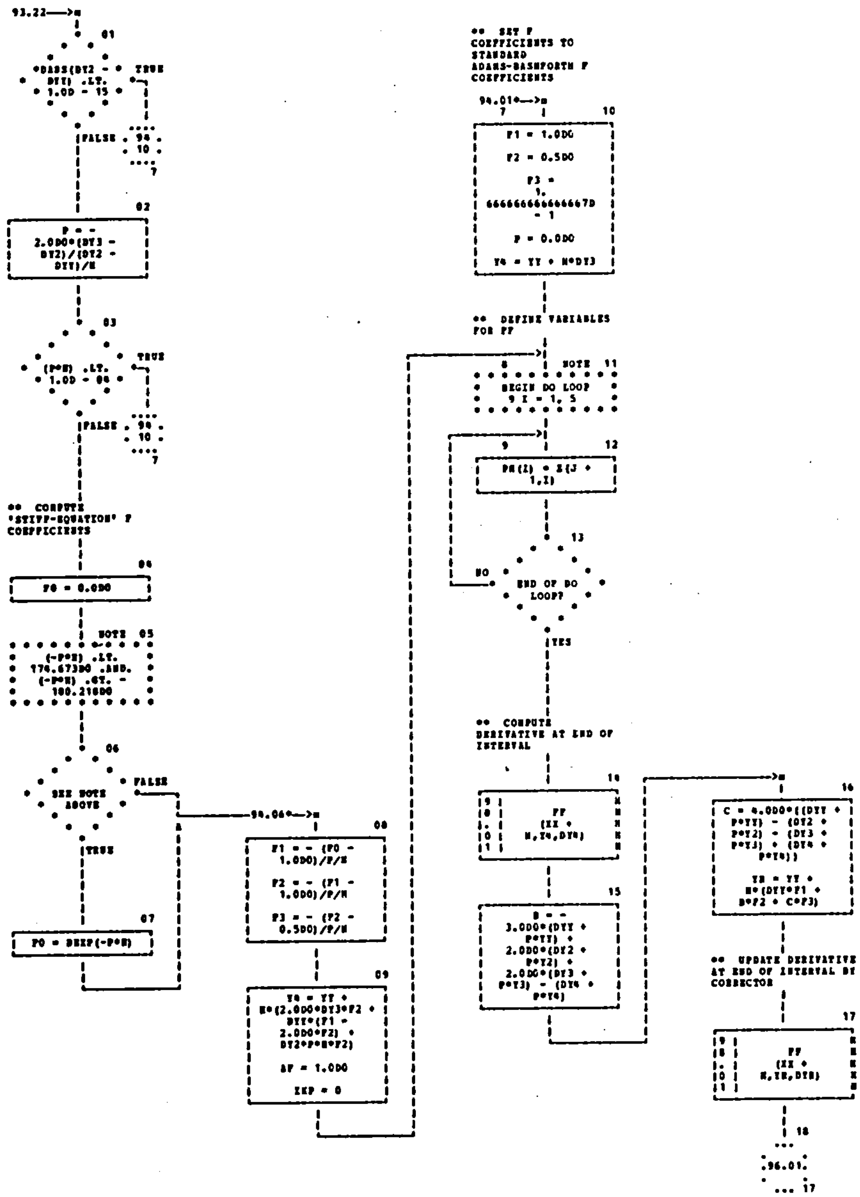


CHART TITLE - SUBROUTINE TRENOR(N,XX,YY,DYY,J,ISET)

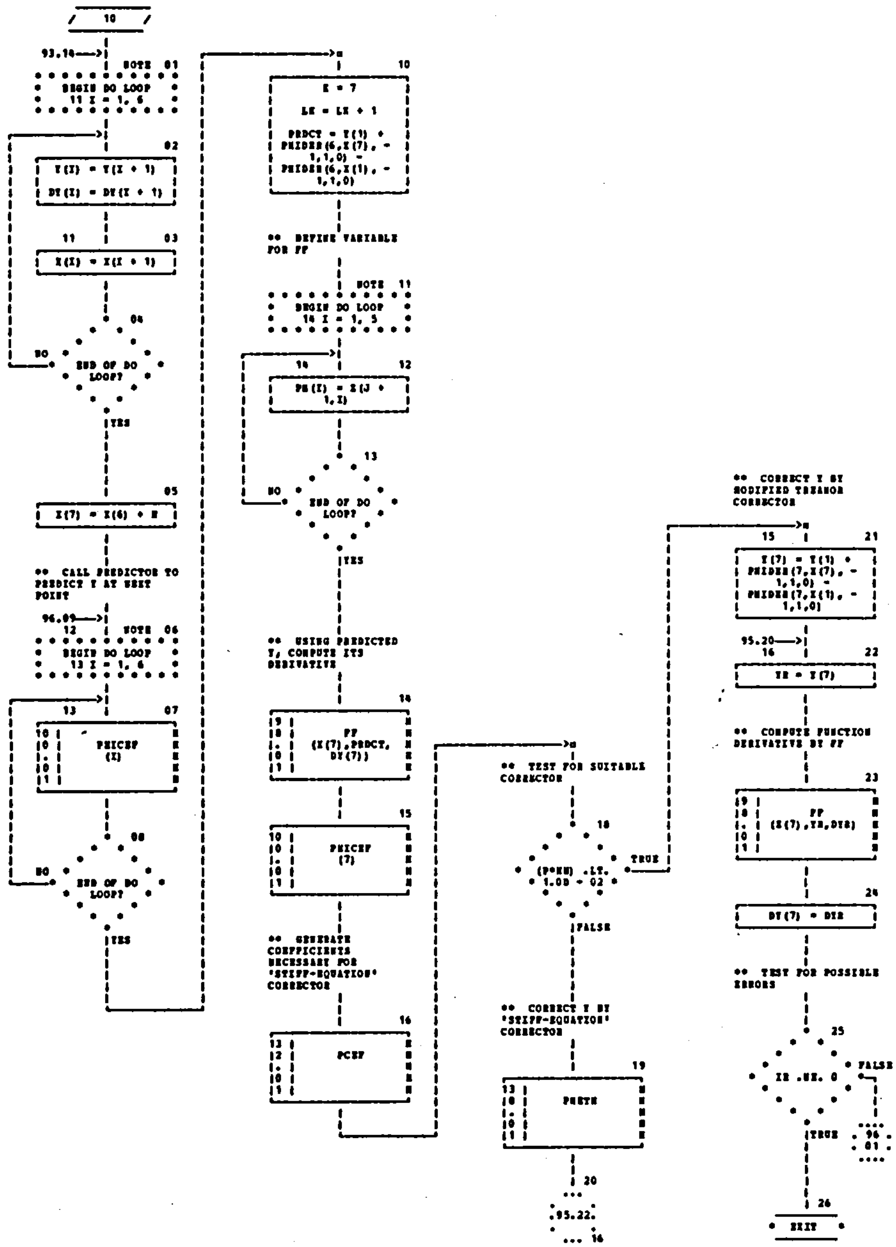


CHART TITLE - SUBROUTINE TRENOR(H,XX,YY,DYY,J,ISET)

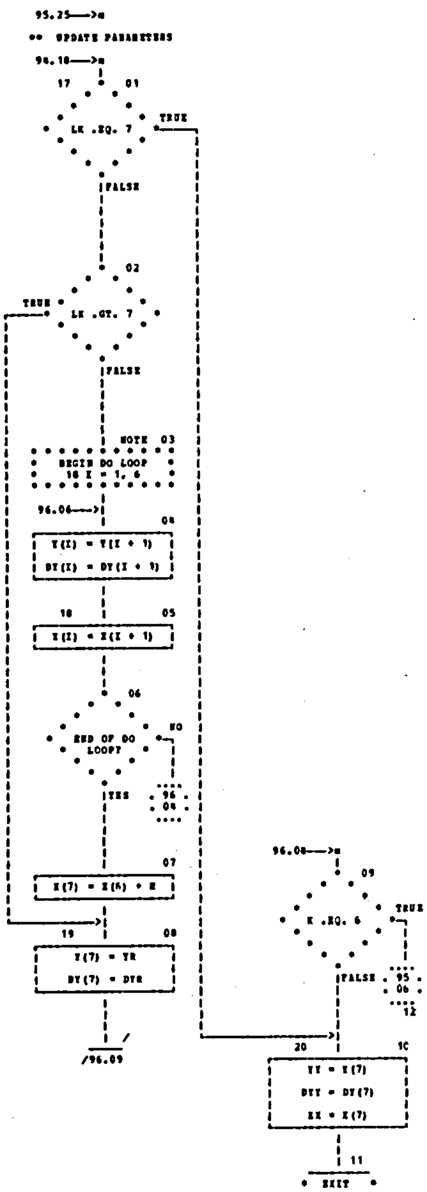


CHART TITLE - SUBROUTINE FF(T,Y,DY)

```
          ----------
         /   FF    /
         ----------

   93.04*--->m

  **  SUBROUTINE FF
  CALCULATES
  DERIVATIVES FOR ANGLE
  OF ATTACK
  **  PREDICTIONS

               *
               I          01
  ------------------------
  I    DY = (X(1) -       I
  I  G*DSIN(X(2)) -       I
  I   XAI*X(3)**2)        I
  I   /DCOS(X(5)) -       I
  I    T*((X(3) -         I
  I X(4))*DTAN(X(5)))     I
  ------------------------
               I
               I
               I 02
           ---------
          *  EXIT  *
           ---------
```

CHART TITLE - SUBROUTINE PHICEF(I)

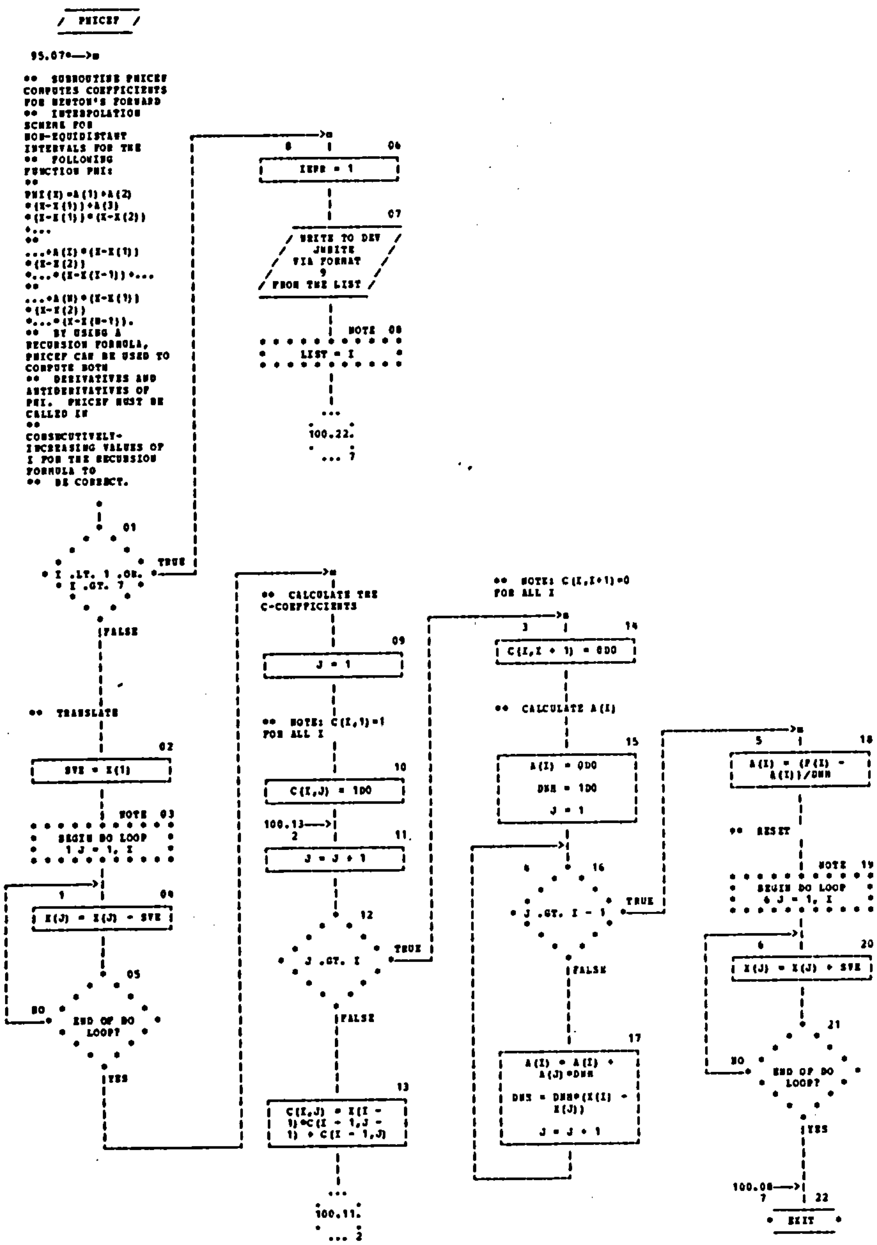


CHART TITLE - SUBROUTINE LLSQAR(A,B,M,NA,NB,IA,IB,IDGT,WKAREA,IER,JWRITE)

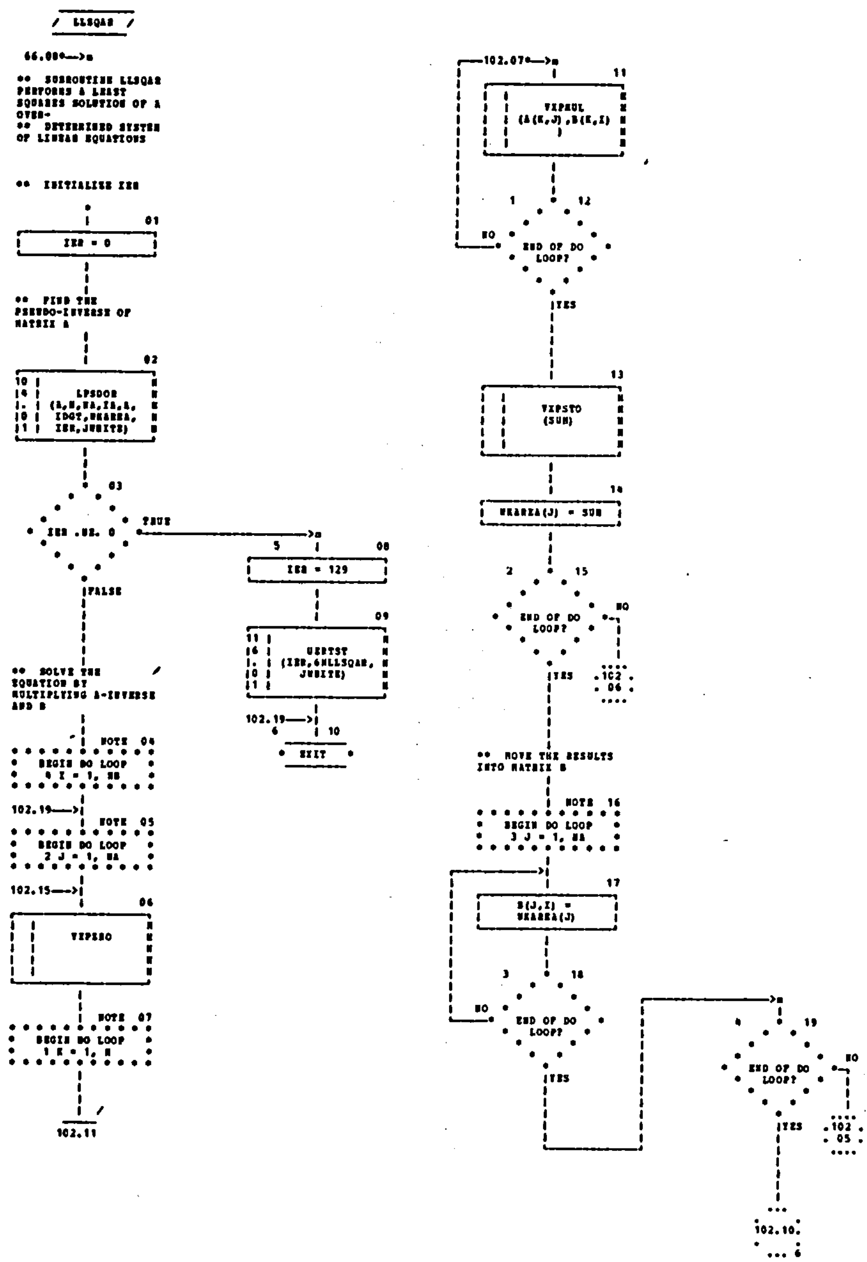


CHART TITLE - SUBROUTINE LPSDOR(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)

```
                    / /  LPSDOR  /

                    102.02---->*

                    **  SUBROUTINE LPSDOR
                    FIND THE
                    PSEUDO-INVERSE OF A
                    MATRIX


                    **  INITIALIZE IER

                               *
                               |          01
                    ------------------------
                    |       IER = 0        |
                    |                      |
                    |     NP1 = N + 1      |
                    |                      |
                    |     NP2 = N + 2      |
                    |                      |
                    |     NP3 = N + 3      |
                    ------------------------
                               |
                               |
                    **  FIND THE LARGEST
                    ELEMENT OF A
                               |
                               |          02
                    ------------------------
                    |     BIGA = 0.D0      |
                    ------------------------
                               |
                               |   NOTE  03
                    * * * * * * * * * * * *
                    *    BEGIN DO LOOP    *
                    *     1 I = 1, M      *
                    * * * * * * * * * * * *
                               |
                    105.01---->|
                               |   NOTE  04
                    * * * * * * * * * * * *
                    *    BEGIN DO LOOP    *
                    *     1 II = 1, N     *
                    * * * * * * * * * * * *
                               |
                               |<-------------
                               |             |
                               *   05        |
                            *     *          |
                          *         *        |
                  TRUE  * BIGA .GE.  *       |
                 -------* DABS(A(I,II)) *    |
                 |        *         *        |
                 |          *     *          |
                 |             *             |
                 |             |FALSE        |
                 |             |             |
                 |             |        06   |
                 |    ---------------------  |
                 |    |      BIGA =       |  |
                 |    |   DABS(A(I,II))   |  |
                 |    ---------------------  |
                 |             |             |
                 ------------->|             |
                          1    *   07        |
                            *     *          |
                          *         *        |
                        *             *  NO  |
                      *  END OF DO     *------
                        *  LOOP?     *
                          *         *
                            *     *
                               *
                               |YES
                               |
                               |
                               |
                               |  /
                             -----
                             105.01
```

CHART TITLE - SUBROUTINE LPSDOR(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)

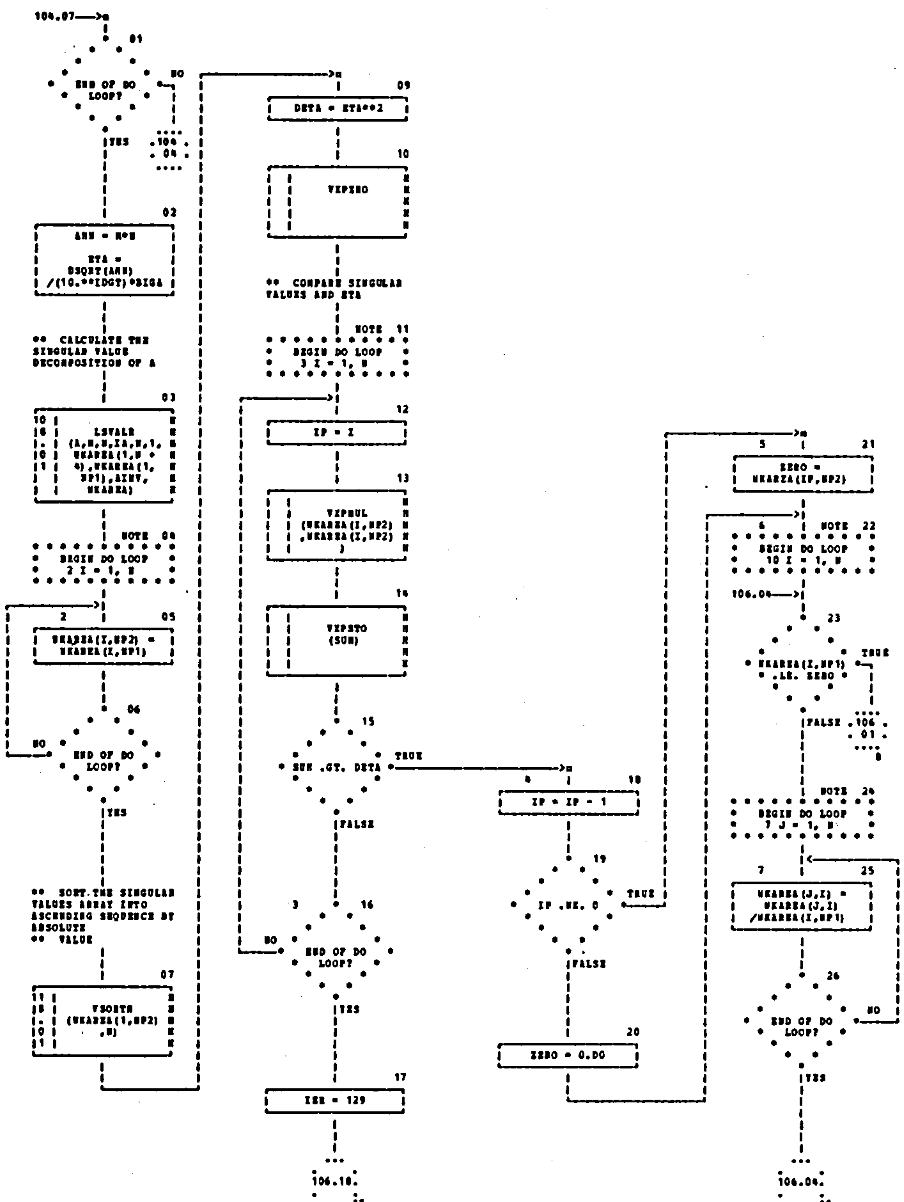


CHART TITLE - SUBROUTINE LPSDOR(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)

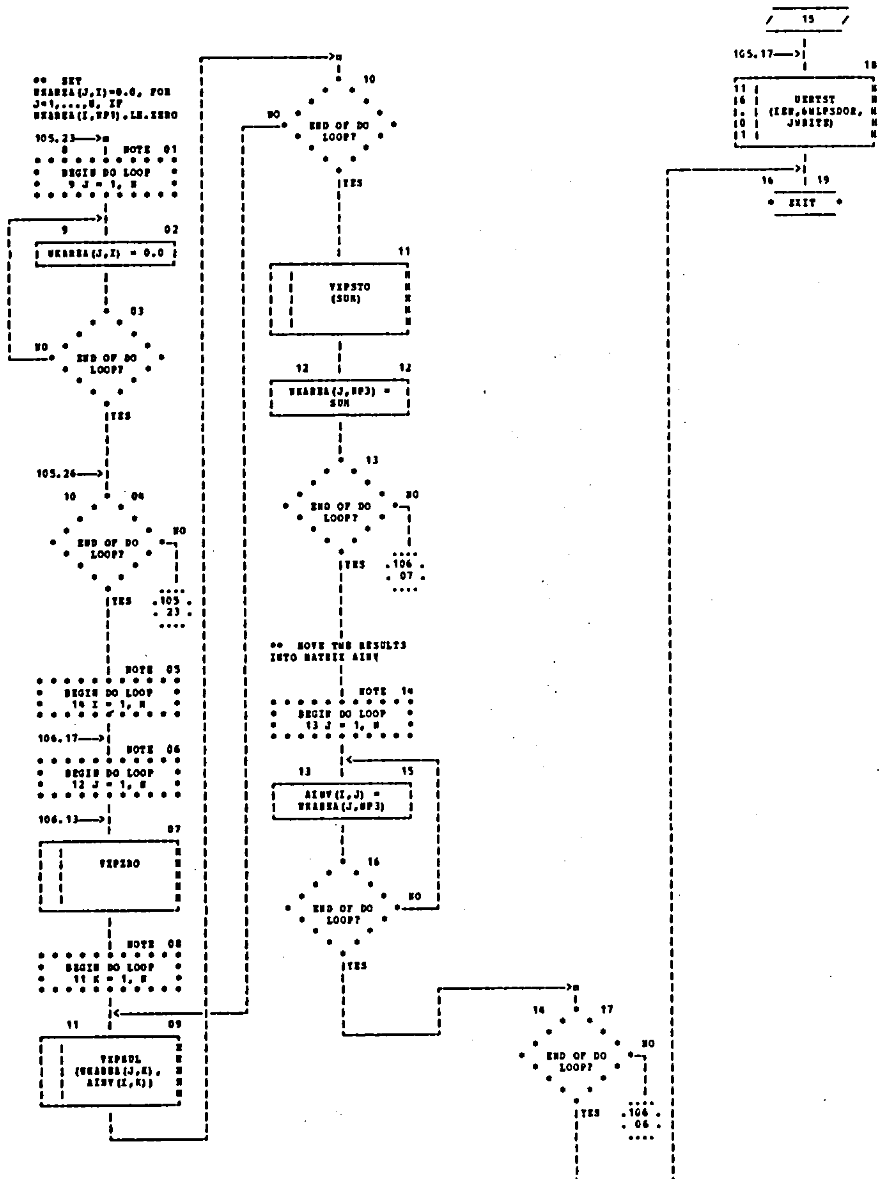


CHART TITLE - SUBROUTINE LSVALR(A,N,M,IA,IT,ISV,WKAREA,Q,U,V)

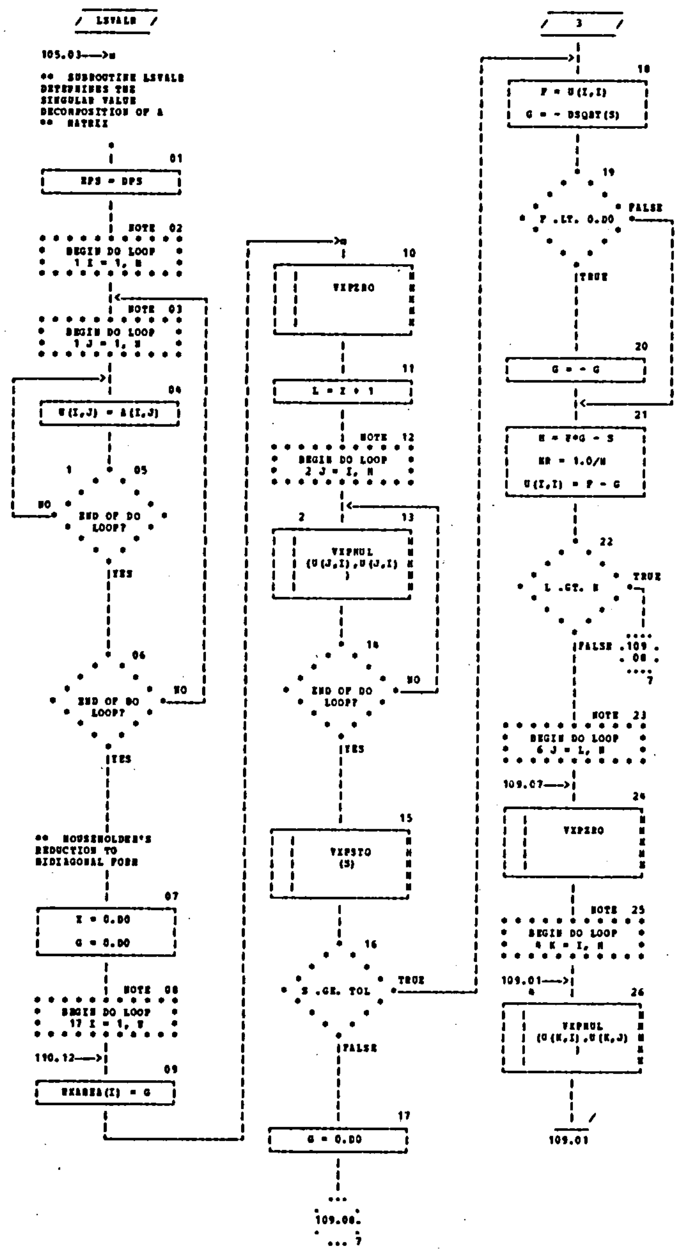


CHART TITLE - SUBROUTINE LSVALE(A,N,S,IA,IV,ISW,WKAREA,Q,U,V)

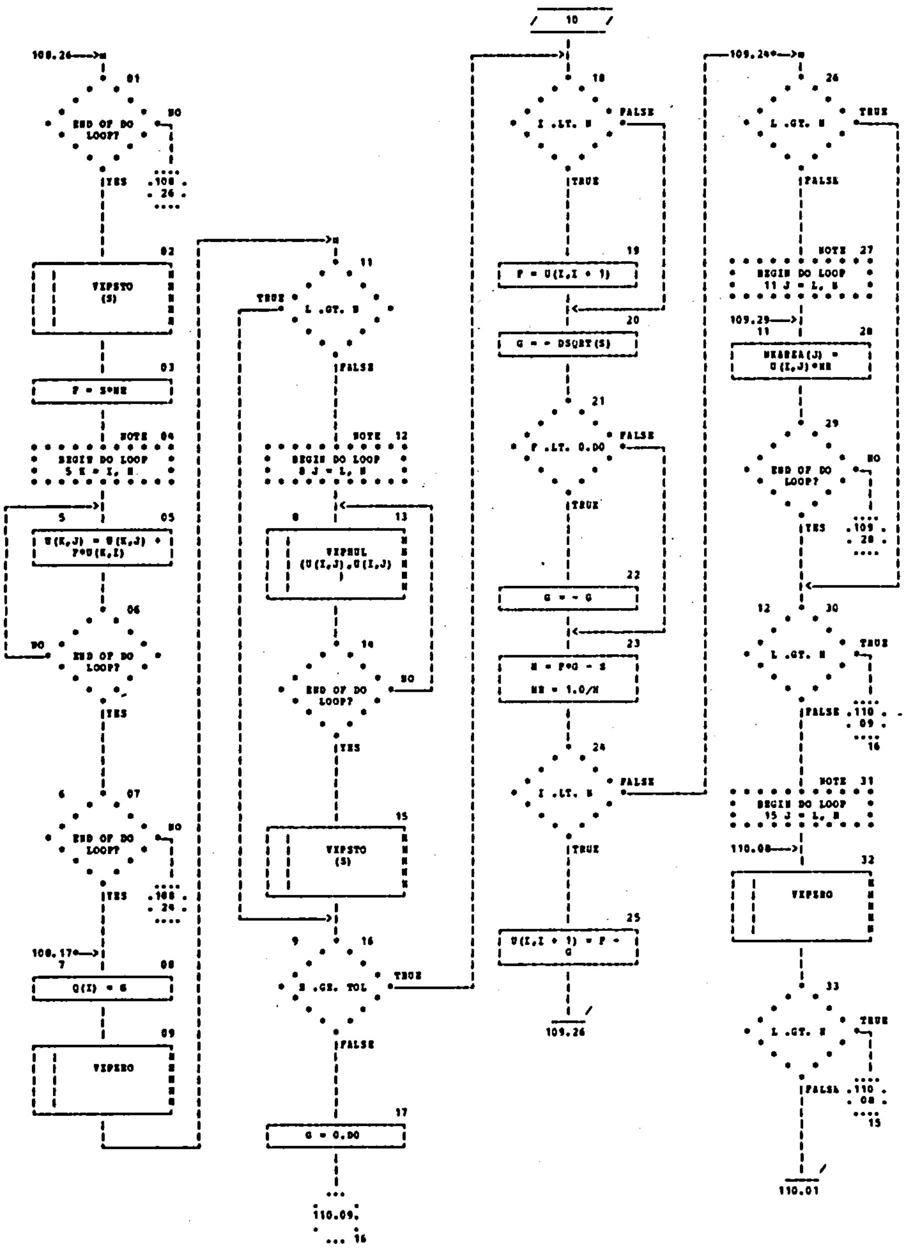


CHART TITLE - SUBROUTINE LSVALR(L,N,M,IA,IV,ISW,WKAREA,Q,U,V)

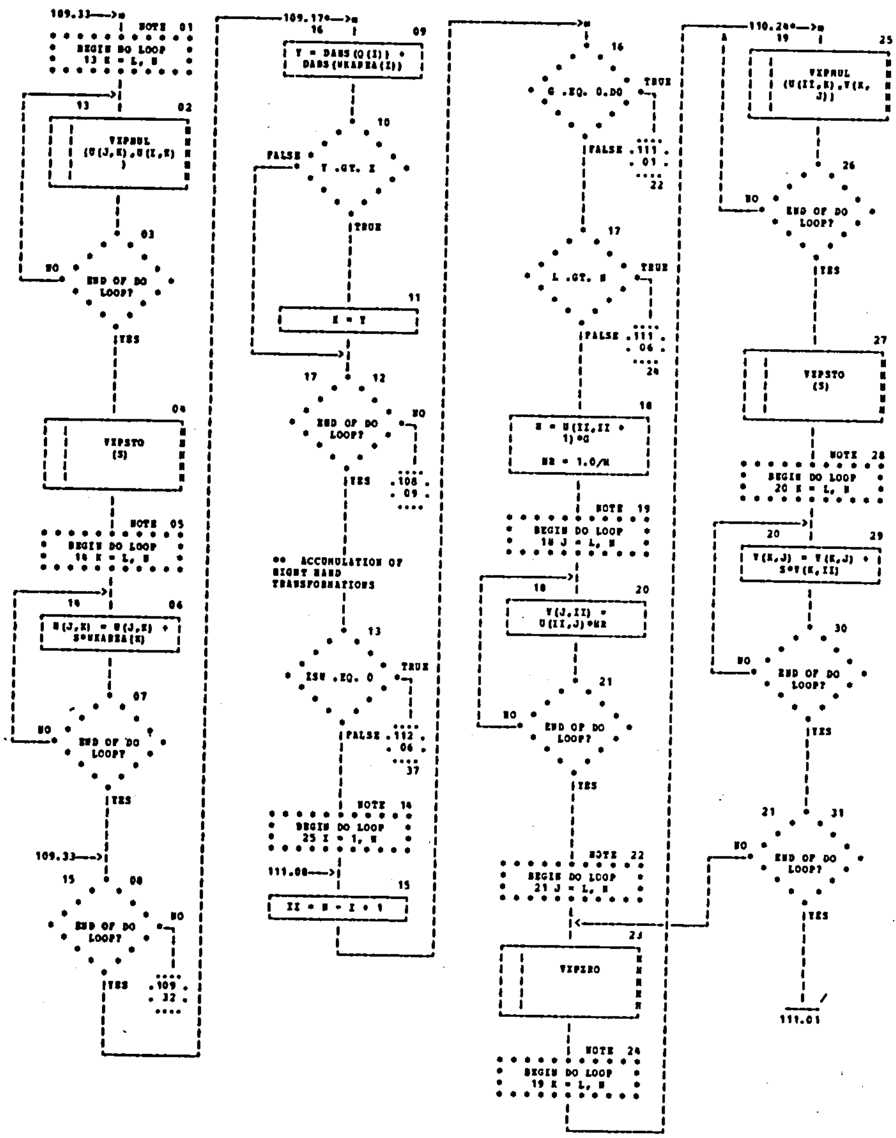


CHART TITLE - SUBROUTINE LSVALR(A,N,M,IA,IV,ISW,SKASNA,Q,U,V)

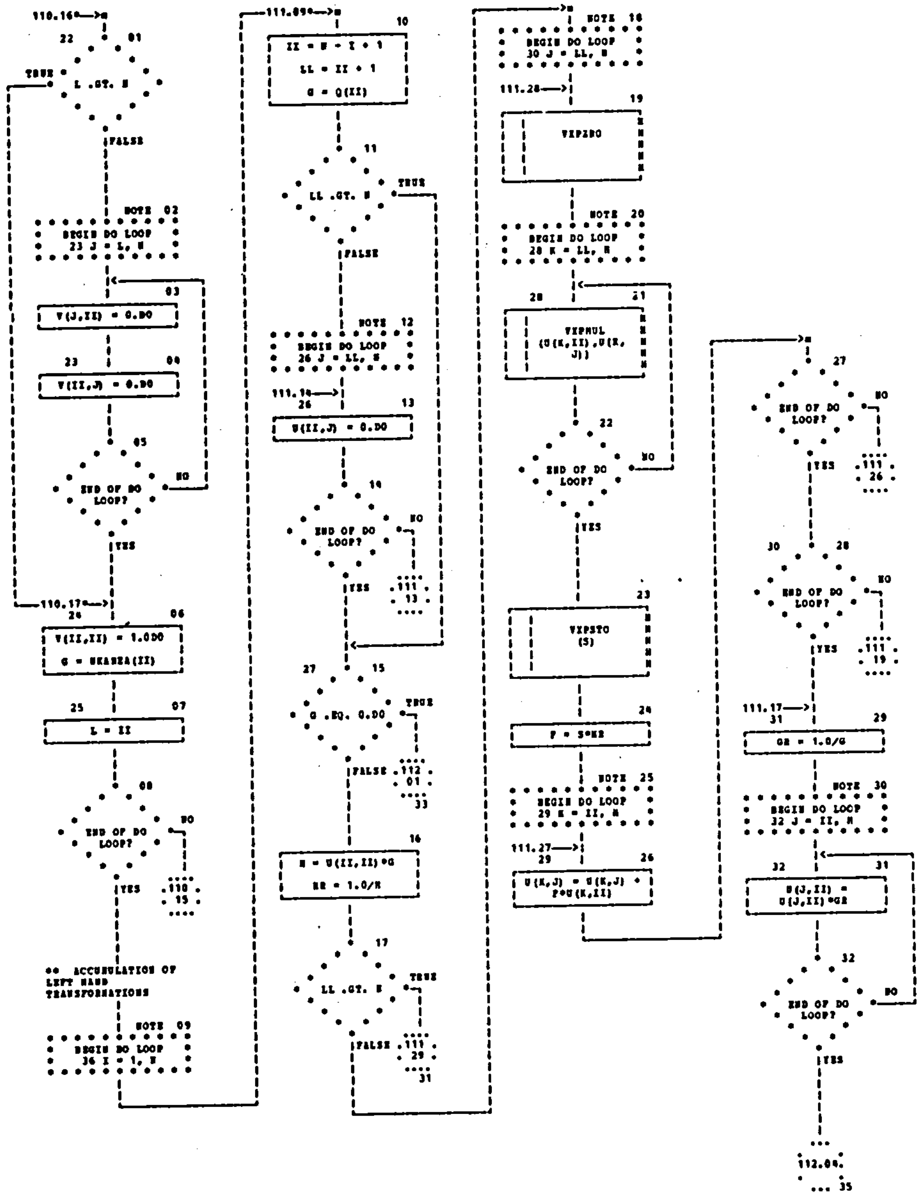


CHART TITLE - SUBROUTINE LSVALR(A,N,M,IA,IV,ISW,WKAREA,Q,U,V)

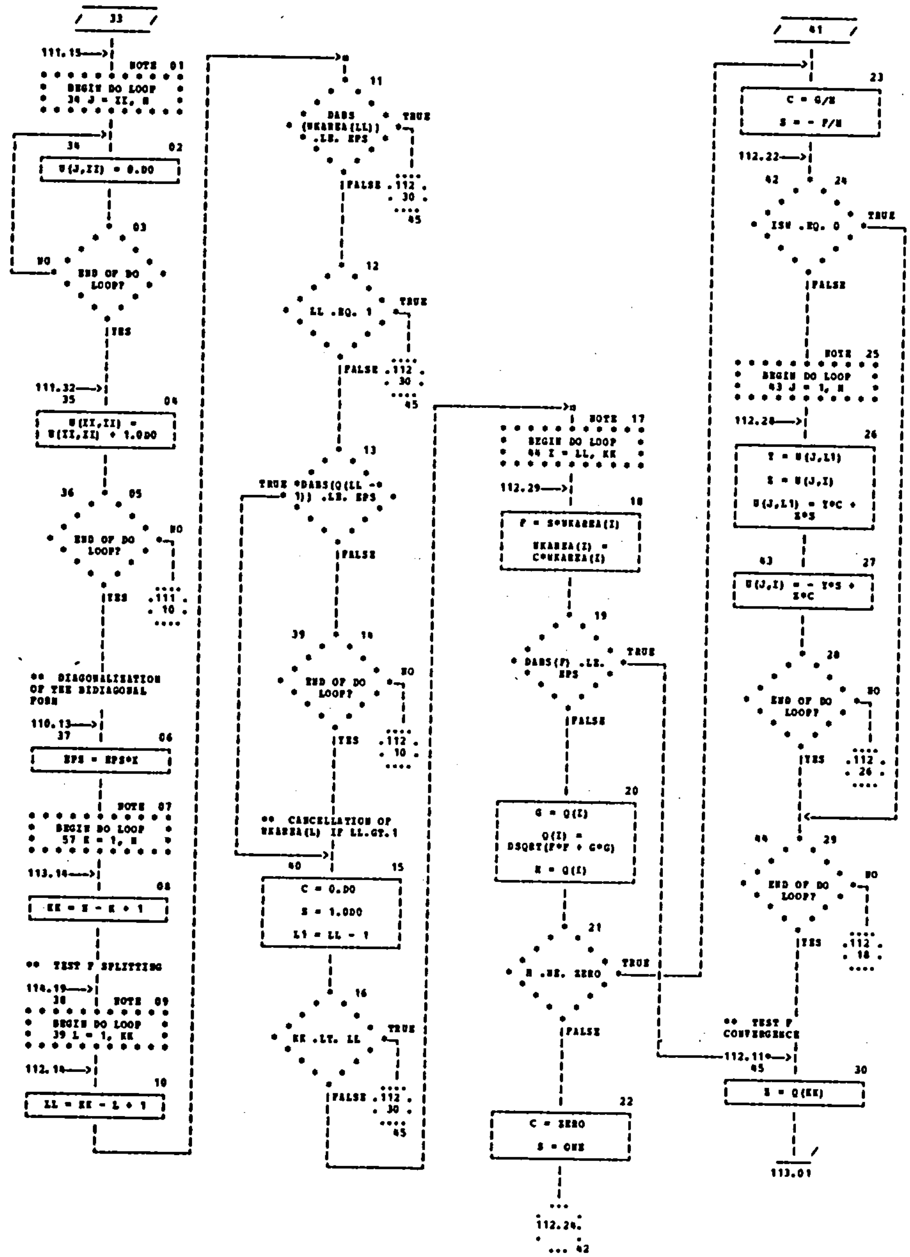


CHART TITLE - SUBROUTINE LRVALS(A,B,N,IA,IV,ISW,WKAREA,Q,U,V)

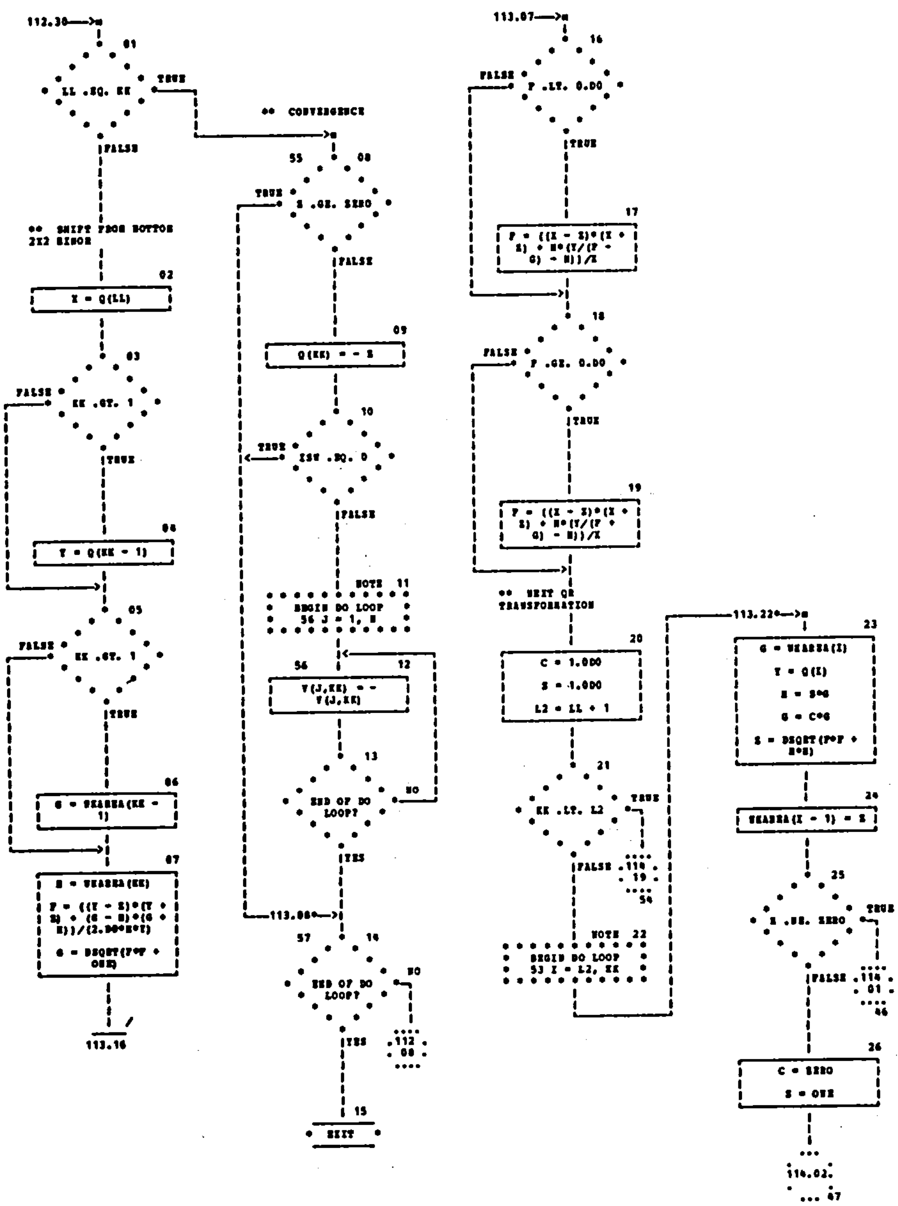


CHART TITLE - SUBROUTINE LEVALS(A,H,U,IA,IV,ISW,WKAREA,Q,N,V)

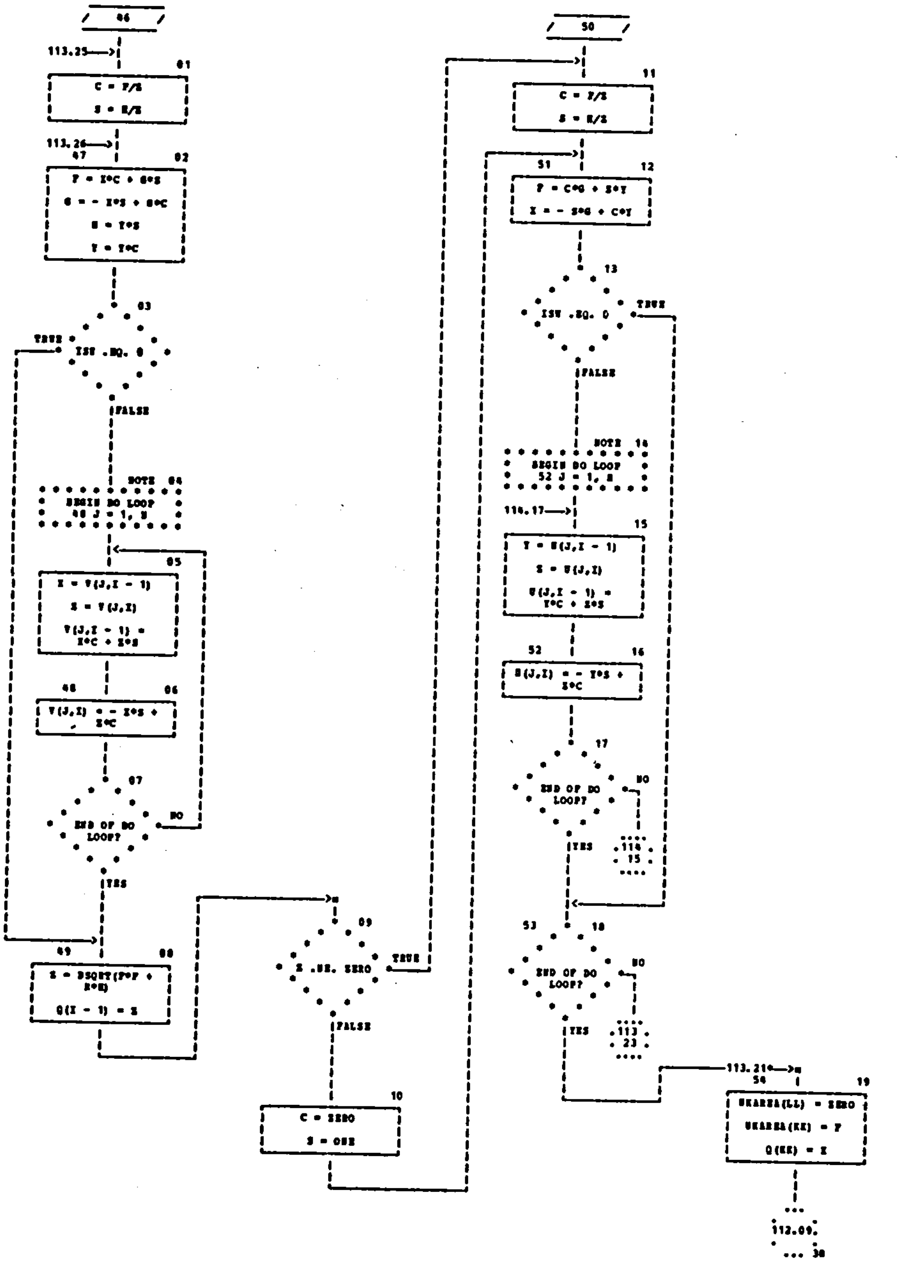


CHART TITLE - SUBROUTINE UERTST(IER,NAME,JUNIT)

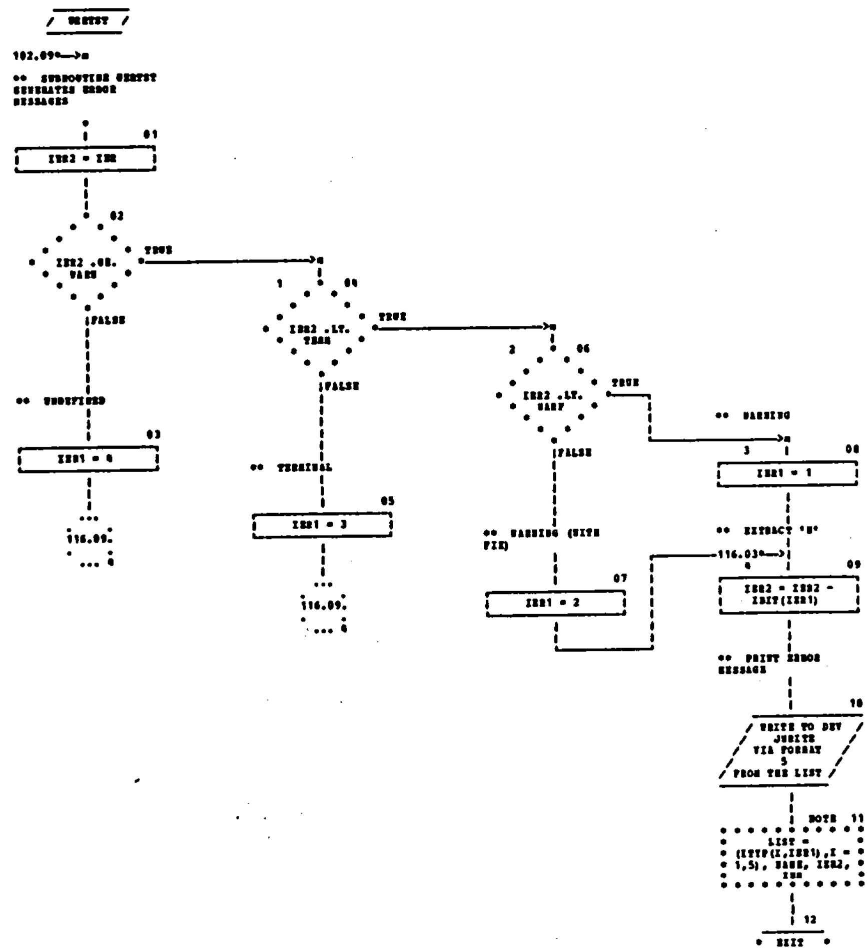


CHART TITLE - SUBROUTINE VSORTE(A,LA)

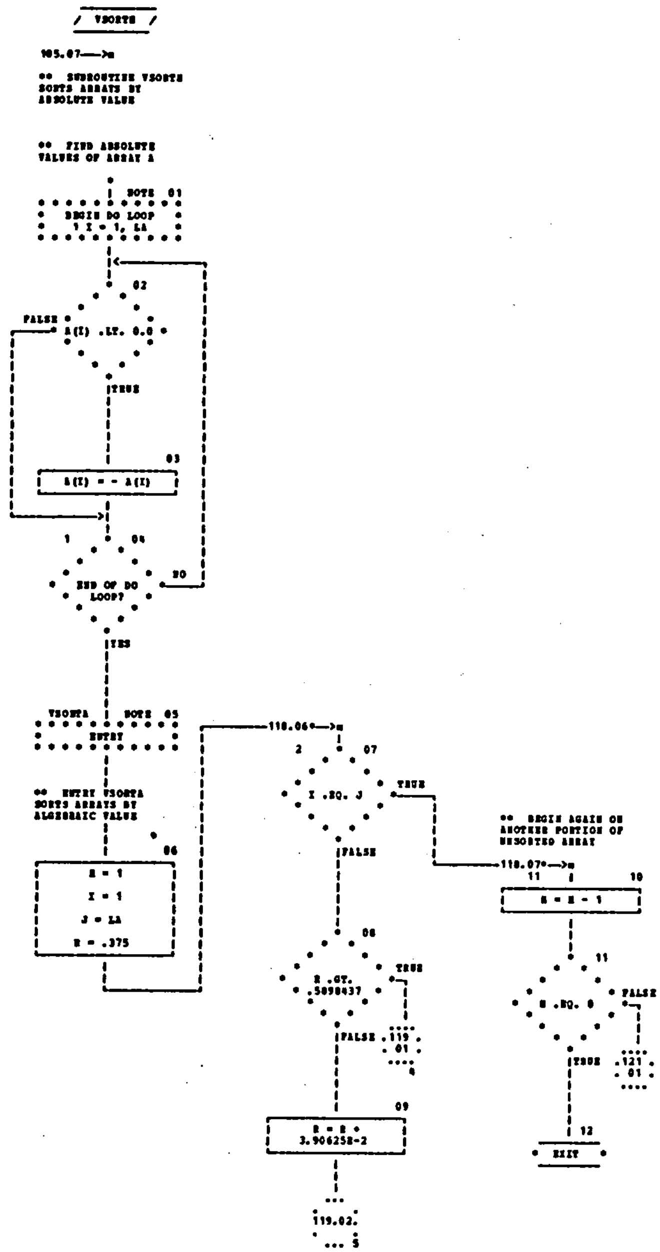


CHART TITLE - SUBROUTINE TSORTR(A,LA)

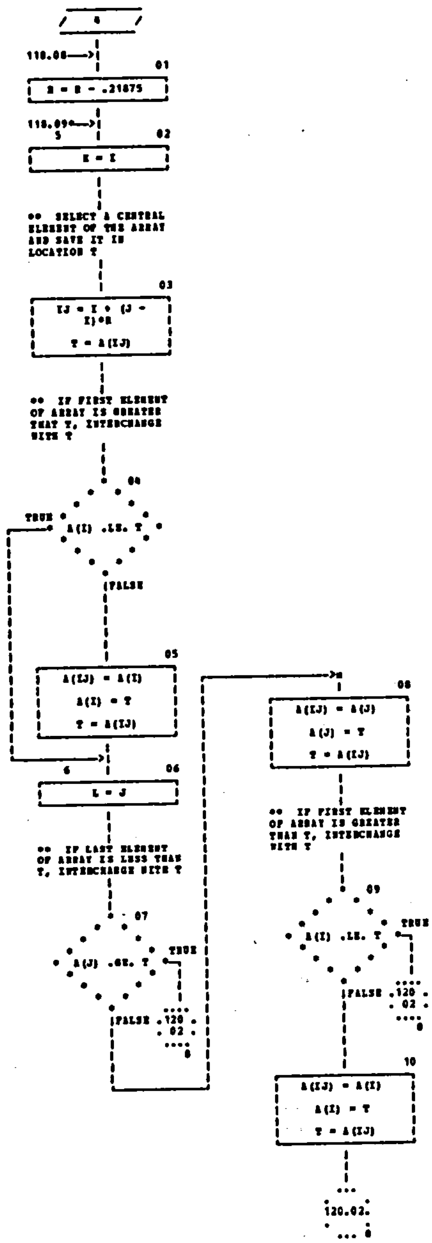


CHART TITLE - SUBROUTINE VSORTN(A,LA)

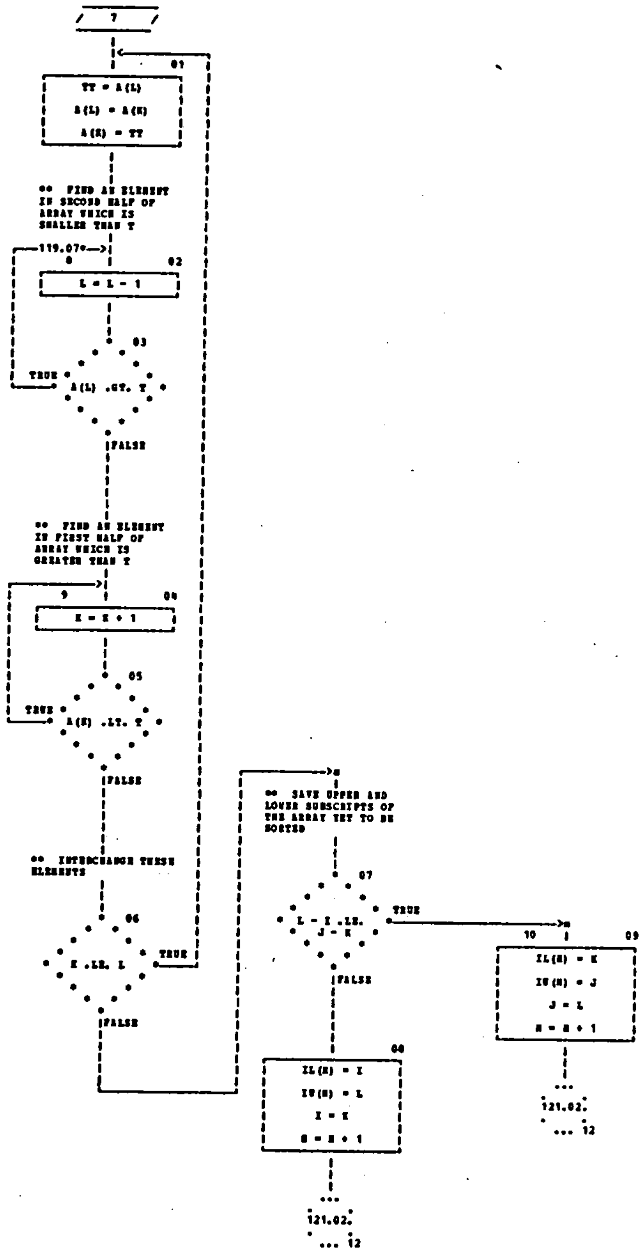


CHART TITLE - SUBROUTINE VSORTN(A,LA)

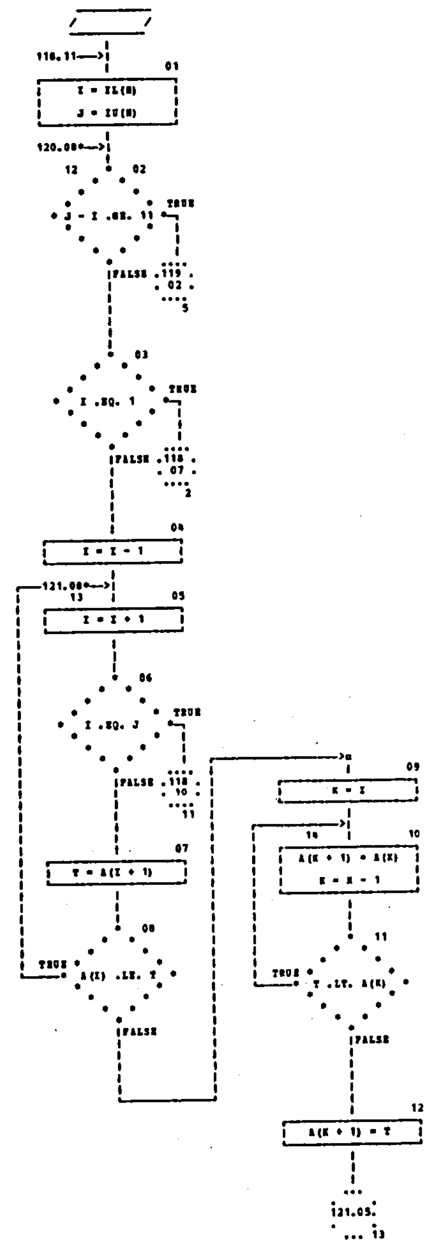


CHART TITLE - SUBROUTINE MADD(A,B,N,M,MS)

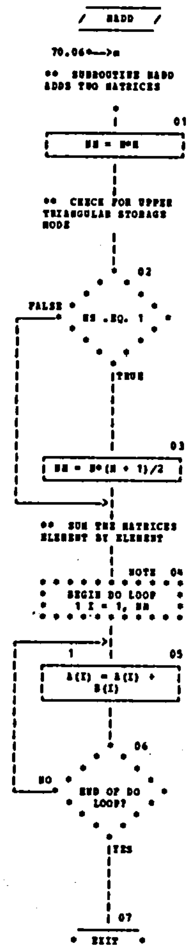


CHART TITLE - SUBROUTINE MSTR(A,R,N,MSA,MSR)

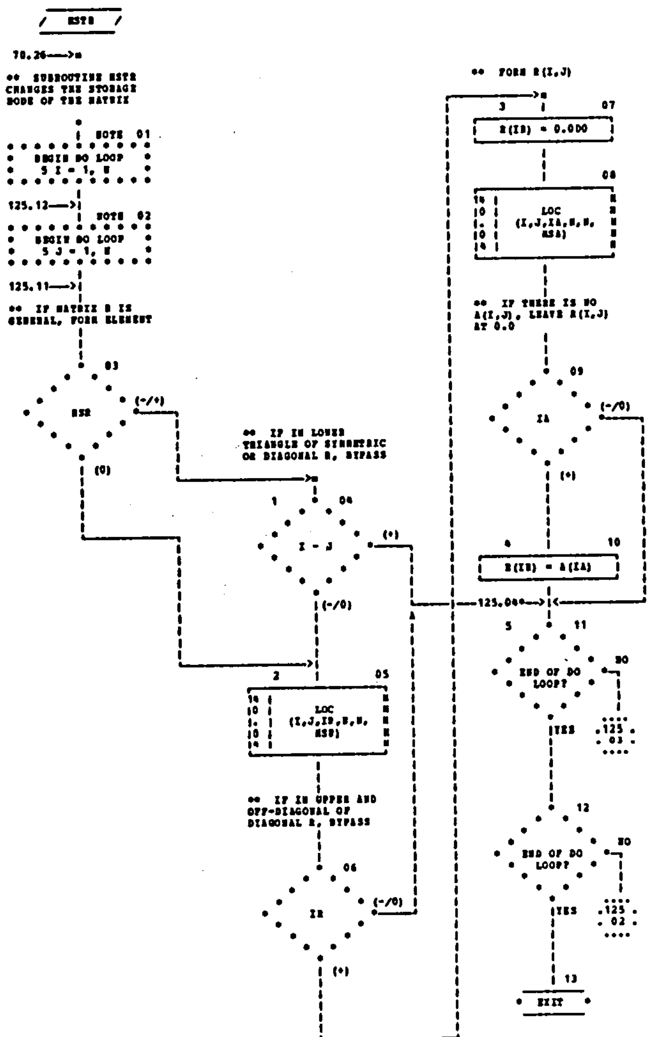


CHART TITLE - SUBROUTINE FILTER(A,B,BCUT,NP1)

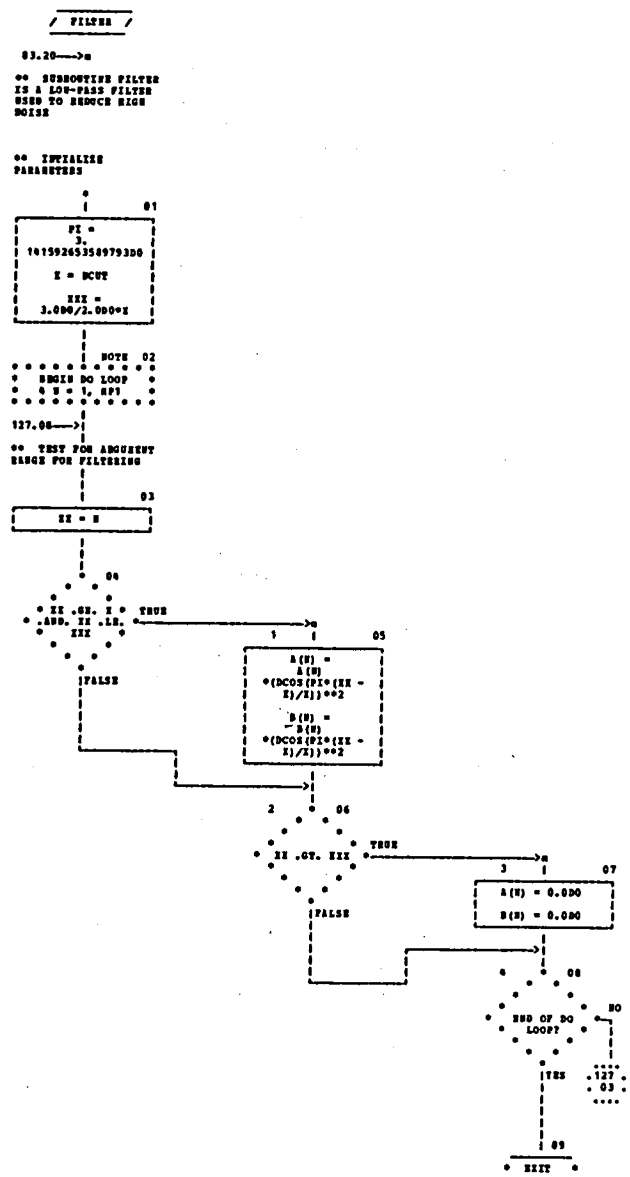
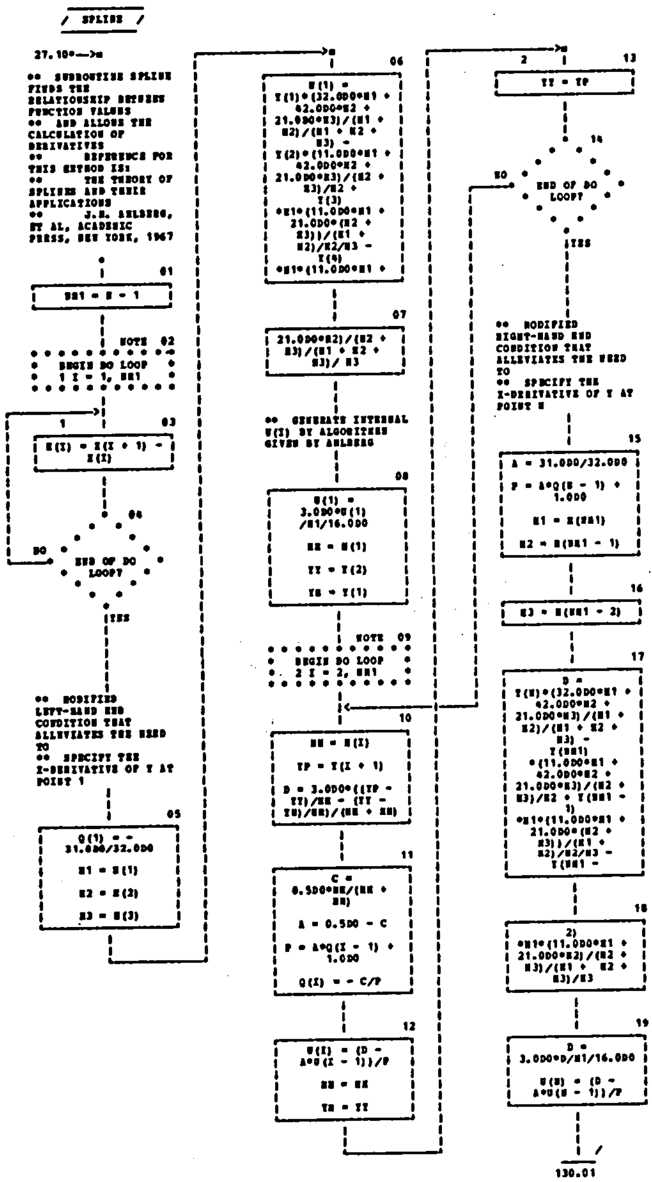


CHART TITLE - SUBROUTINE SPLINE(N,Y,X,AA)



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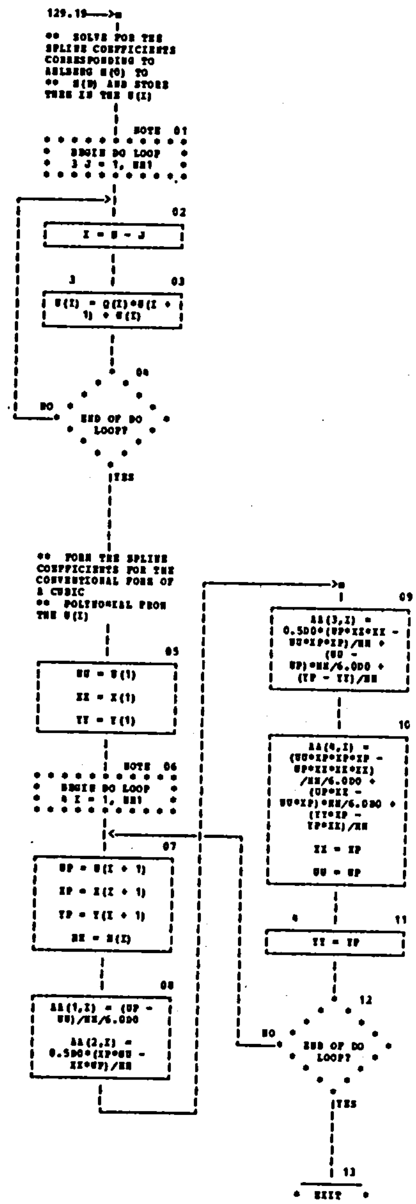
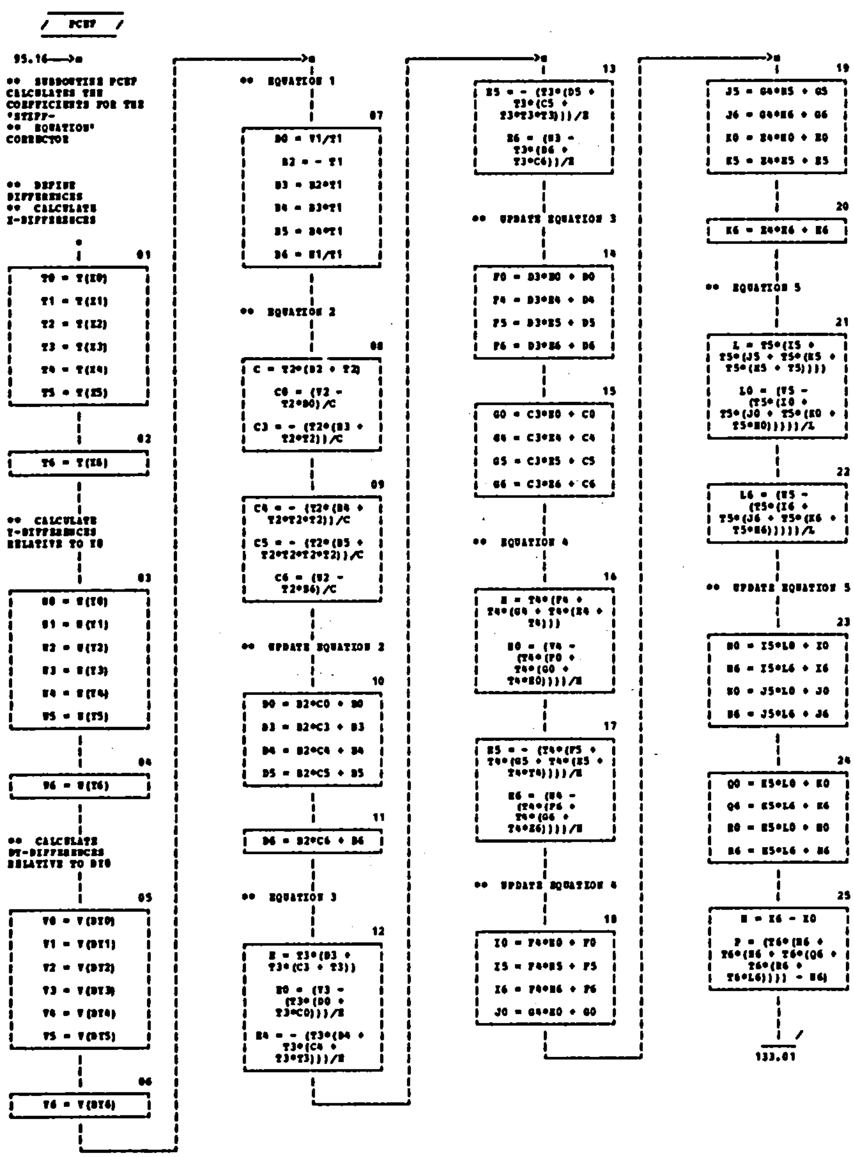


CHART TITLE - SUBROUTINE PCSF



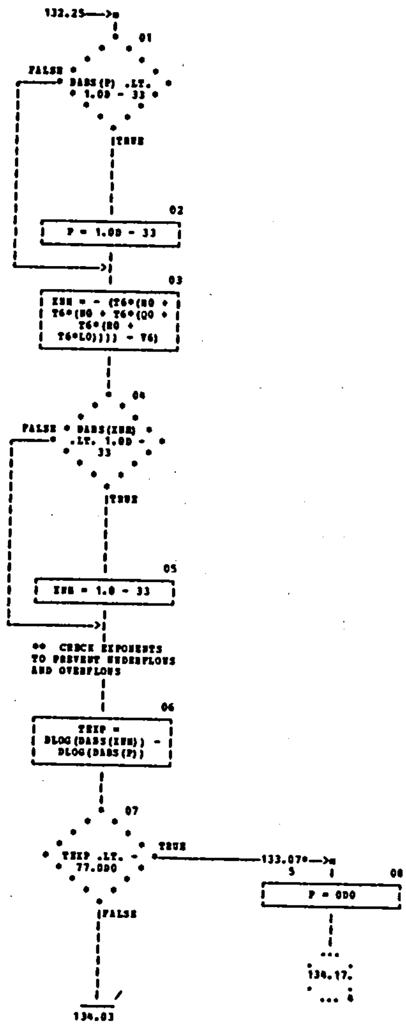

132.25
01
FALSE
DABS(P) .LT. 1.0D - 33
TRUE
02
P = 1.0D - 33
03
XNN = - (T6*(N0 + T6*(M0 + T6*(Q0 + T6*(R0 + T6*L0)))) - T6)
04
FALSE
DABS(XNN) .LT. 1.0D - 33
TRUE
05
XNN = 1.0 - 33
** CHECK EXPONENTS TO PREVENT UNDERFLOWS AND OVERFLOWS
06
TEXP = DLOG(DABS(XNN)) - DLOG(DABS(P))
07
TEXP .LT. - 77.0D0
TRUE
FALSE
133.07*
5
08
P = 0D0
134.17.
134.03

CHART TITLE - SUBROUTINE PCEF

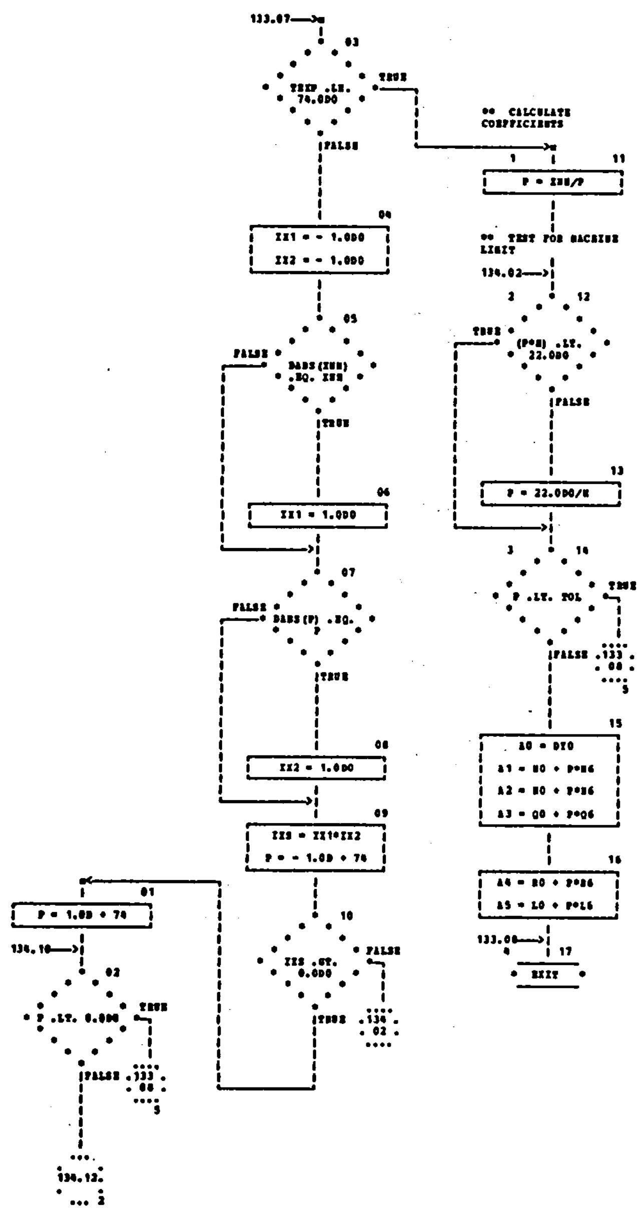


CHART TITLE - FUNCTION PHIDER(N,XX,K,ICF1,ICF2)

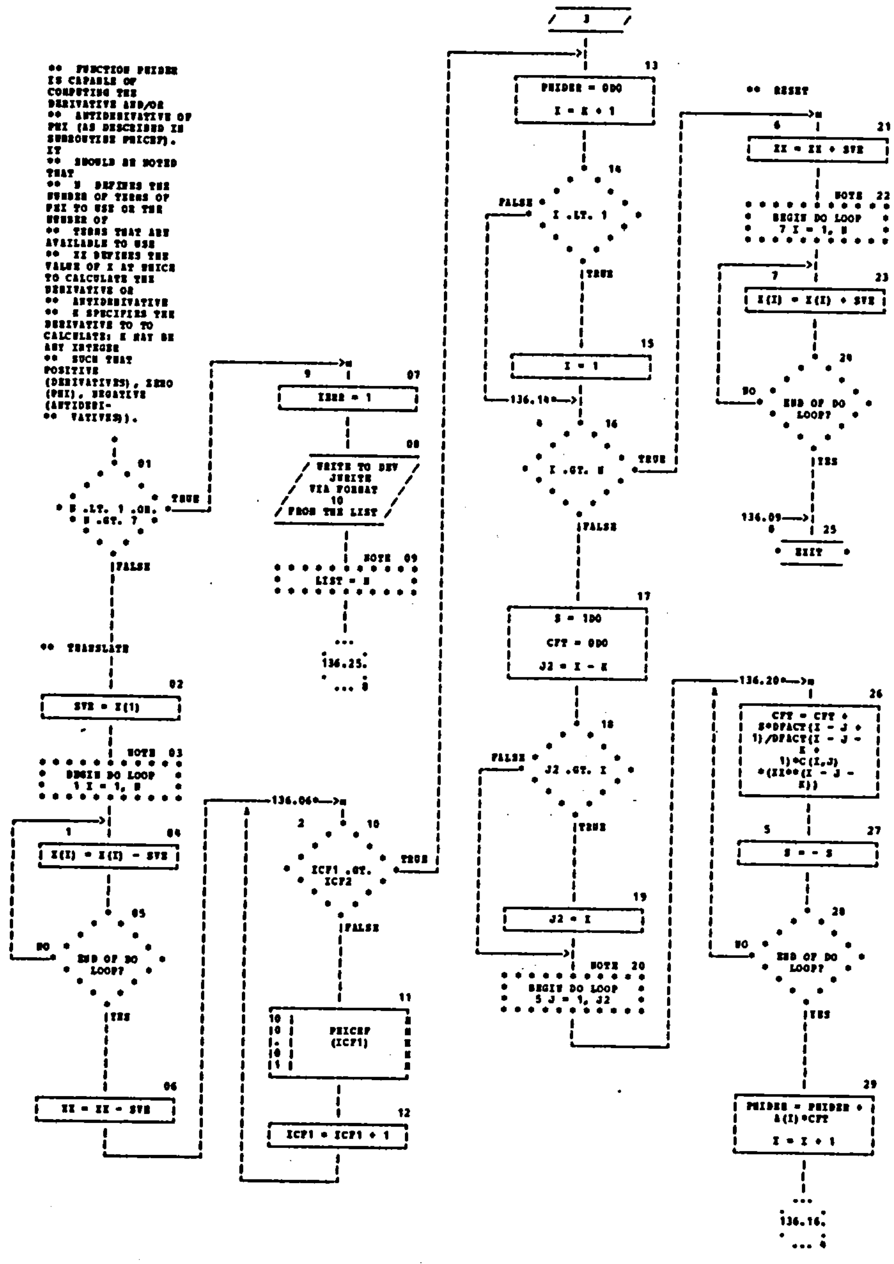


CHART TITLE - SUBROUTINE PERTH

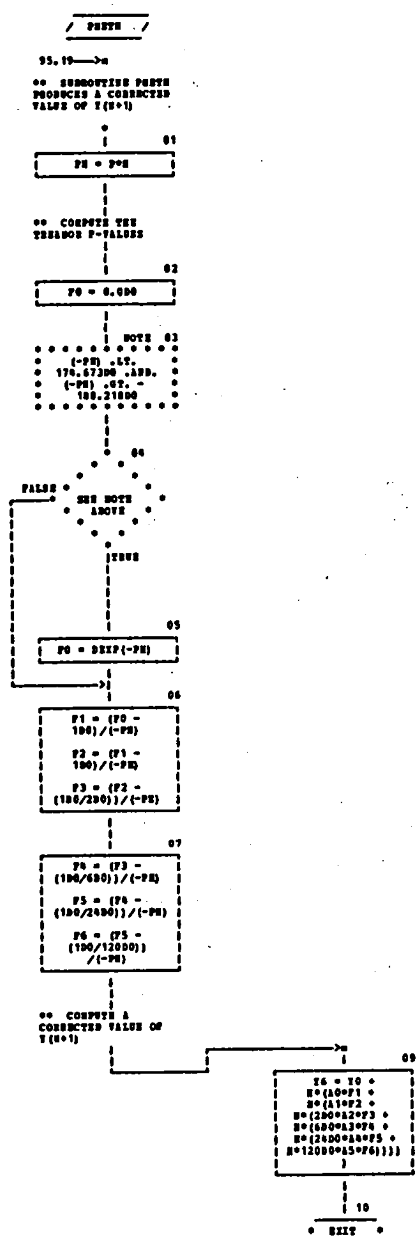


CHART TITLE - SUBROUTINE LOC(I,J,IR,N,M,MS)

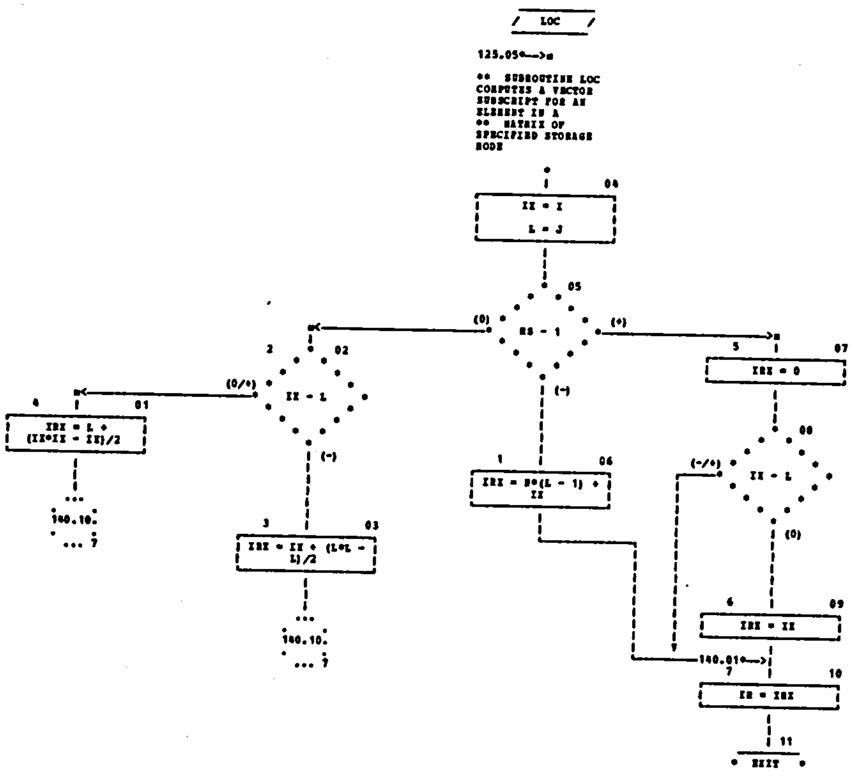
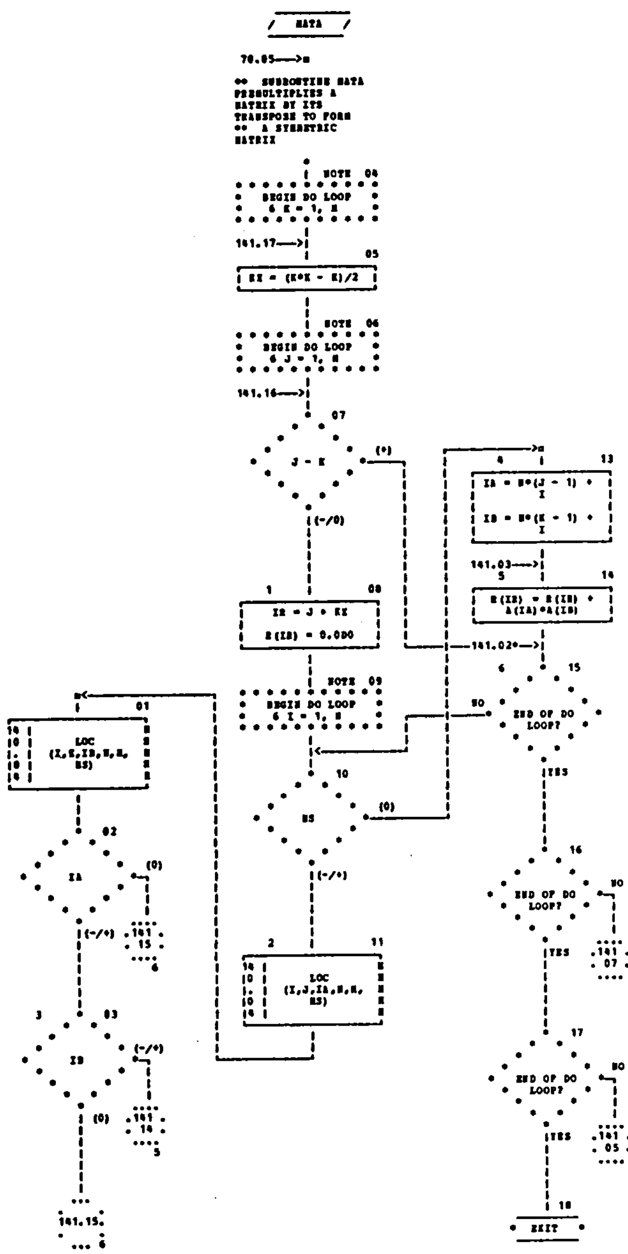


CHART TITLE - SUBROUTINE MATA(A,R,N,M,MS)



Sample Input – FDRI

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    4    4    4    4 0.025    0.033     0.025     0.040     0.30      0.040
    0  -0.025
    0    1    1    1    1    0    1    0    0
155.0      3972.0     0.0323529 0.0323529 14.437    0.0        1.1538    -0.02
          0.0D0                 0.0D0          0.017453292 5D0       0.017453292 5D0
  1.68894D0                     0.0D0          0.017453292 5D0                1.0D0
  459.72D0                -32.1741D0
12
117.333                -0.045
132.0                  -0.025
146.667                -0.010
161.333                -0.002
176.0                   0.003
190.667                 0.007
205.333                 0.010
220.0                   0.012
234.667                 0.012
249.333                 0.013
264.0                   0.013
278.667                 0.014
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7.36173010D+04-3.74429528D-02	1.94009586D+00	2.73709647D+00	1.41780350D+03	630
1.26372089D+02-2.38367673D+00	3.60967703D+01			630
7.36174010D+04-3.74540336D-02	1.96972250D+00	2.80004077D+00	1.41900479D+03	631
1.26745679D+02-2.11275489D+00	3.62667805D+01			631
7.36175010D+04-3.85733105D-02	1.81087448D+00	2.76840888D+00	1.41779124D+03	632
1.26464405D+02-1.72409720D+00	3.61728606D+01			632
7.36176010D+04-4.07675412D-02	1.52816249D+00	2.76872836D+00	1.41780350D+03	633
1.26563294D+02-1.58421377D+00	3.62080802D+01			633
7.36177010D+04-4.07232180D-02	1.33779697D+00	2.80067973D+00	1.41901704D+03	634
1.27030121D+02-1.65122385D+00	3.64748983D+01			634
7.36178010D+04-3.63458374D-02	1.02356749D+00	2.83103371D+00	1.41904156D+03	635
1.26750426D+02-1.55238442D+00	3.62998655D+01			635
7.36179010D+04-3.74041700D-02	8.04835906D-01	2.70386717D+00	1.42146865D+03	636
1.26942009D+02-1.29439639D+00	3.65047815D+01			636
7.36180010D+04-3.35033220D-02	7.72372991D-01	2.63932547D+00	1.42141963D+03	637
1.27313927D+02-1.00625311D+00	3.65666839D+01			637
7.36181010D+04-2.75135108D-02	6.46618169D-01	2.50832518D+00	1.41657769D+03	638
1.27031069D+02-1.33125131D+00	3.60778733D+01			638

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7.36182010D+04-3.18465682D-02 5.57107959D-01 2.06011763D+00 1.41781575D+03  639
1.26650033D+02-1.48621197D+00 3.62859911D+01                                639
7.36183010D+04-2.64053146D-02 9.65259632D-01 2.13033986D+00 1.42025510D+03  640
1.27505613D+02-1.38234716D+00 3.63799112D+01                                640
7.36184010D+04-3.07716145D-02 1.21298758D+00 2.22587450D+00 1.42144414D+03  641
1.27502780D+02-8.31189471D-01 3.61760623D+01                                641
7.36185010D+04-2.85219799D-02 1.02230693D+00 2.28786037D+00 1.41899253D+03  642
1.27219395D+02-1.40747516D+00 3.62765205D+01                                642
7.36186010D+04-2.31139685D-02 6.75929676D-01 2.15845748D+00 1.41660221D+03  643
1.26941064D+02-1.48369973D+00 3.61717934D+01                                643
7.36187010D+04-3.07162107D-02 3.65481880D-01 1.87504835D+00 1.42024285D+03  644
1.27224125D+02-8.13600727D-01 3.60650664D+01                                644
7.36188010D+04-2.30308627D-02 5.23699615D-01 2.00093697D+00 1.42023059D+03  645
1.27409334D+02-7.29837715D-01 3.68121547D+01                                645
7.36189010D+04-2.25487896D-02 7.44322050D-01 1.93767318D+00 1.41904156D+03  646
1.27222235D+02-8.11924661D-01 3.61856685D+01                                646
7.36190010D+04-2.90539166D-02 9.64314204D-01 1.93831214D+00 1.42144414D+03  647
1.27222235D+02-6.49425926D-01 3.64866377D+01                                647
7.36191010D+04-2.14073512D-02 1.11748969D+00 2.00125645D+00 1.41901704D+03  648
1.27223180D+02-4.00651762D-01 3.62891933D+01                                648
7.36192010D+04-2.47153184D-02 8.33832277D-01 1.96930508D+00 1.41901704D+03  649
1.27320538D+02-8.73070733D-01 3.60757392D+01                                649
7.36193010D+04-2.62834264D-02 5.53326261D-01 1.93735370D+00 1.41900479D+03  650
1.27693241D+02-7.39051670D-01 3.60650663D+01                                650
7.36194010D+04-1.86701030D-02 5.84528612D-01 1.90444390D+00 1.41781575D+03  651
1.27599933D+02-4.14053837D-01 3.66670060D+01                                651
7.36195010D+04-2.51656899D-02 5.86734591D-01 1.77951371D+00 1.42025510D+03  652
1.27600875D+02-7.02195667D-01 3.62155520D+01                                652
7.36196010D+04-1.69801069D-02 8.04205629D-01 1.93735371D+00 1.42143188D+03  653
1.27693241D+02-5.74877415D-01 3.65656156D+01                                653
7.36197010D+04-2.08643337D-02 7.09653157D-01 1.90540233D+00 1.41780350D+03  654
1.27600875D+02-1.02457989D-01 3.64097948D+01                                654
7.36198010D+04-2.52084725D-02 6.15415824D-01 1.87313148D+00 1.41901704D+03  655
1.27692297D+02-5.79902310D-01 3.64845034D+01                                655
7.36199010D+04-2.08643337D-02 5.51750564D-01 1.80954821D+00 1.41905381D+03  656
1.27511261D+02-4.22947340D-01 3.63081321D+01                                656
7.36200010D+04-2.51530690D-02 4.27886575D-01 1.77919423D+00 1.42269446D+03  657
1.28068609D+02-2.62341373D-02 3.64663597D+01                                657
7.36201010D+04-1.53344337D-02 5.20548213D-01 1.90476338D+00 1.42266994D+03  658
1.27879645D+02-5.43884387D-01 3.62208881D+01                                658
7.36202010D+04-2.08421723D-02 4.26310880D-01 1.80922874D+00 1.42024285D+03  659
1.27600875D+02-3.59608303D-01 3.63542963D+01                                659
7.36203010D+04-2.30031610D-02 3.63591037D-01 1.74724285D+00 1.42025510D+03  660
1.27696066D+02-3.06000000D-01 3.63884492D+01                                660
7.36204010D+04-1.97228954D-02 3.30186709D-01 1.87472887D+00 1.42143188D+03  661
1.27877763D+02-2.36477324D-01 3.64770325D+01                                661
7.36205010D+04-2.08421722D-02 1.08393038D-01 1.96738822D+00 1.41782801D+03  662
1.27414053D+02-2.90085052D-01 3.63212114D+01                                662
7.36206010D+04-2.29920804D-02-2.63892130D-01 1.74596495D+00 1.42146865D+03  663
1.27696066D+02-3.06000000D-01 3.62806549D+01                                663
7.36207010D+04-1.85592959D-02-1.38434703D-01 1.74596495D+00 1.42143188D+03  664
1.27883415D+02-1.04970588D-01 3.61098919D+01                                664
7.36208010D+04-1.42206971D-02-4.63065887D-02 1.74500652D+00 1.41780350D+03  665
1.27974635D+02-2.50716540D-01 3.66552659D+01                                665
7.36209010D+04-1.91189343D-02-1.70820838D-01 1.64979135D+00 1.41900479D+03  666
1.27786479D+02-1.09996332D-01 3.69028733D+01                                666
7.36210010D+04-1.53122722D-02-1.69248874D-01 1.61783998D+00 1.41780350D+03  667
1.27600875D+02-3.74684658D-01 3.67630613D+01                                667
7.36211010D+04-1.85814573D-02-1.14053125D-02 1.58684703D+00 1.41904156D+03  668
1.27697006D+02-5.38859308D-01 3.68740569D+01                                668
7.36212010D+04-1.63539844D-02 2.07438280D-01 1.65011083D+00 1.42145640D+03  669
1.27574635D+02-4.96978317D-01 3.66872852D+01                                669
7.36213010D+04-1.31180412D-02 2.99613148D-01 1.64915240D+00 1.42021834D+03  670
1.27781757D+02-5.37184059D-01 3.67619935D+01                                670
7.36214010D+04-1.86202396D-02 1.75366063D-01 1.55393723D+00 1.41779124D+03  671
1.27128581D+02-4.98653564D-01 3.65858946D+01                                671
7.36215010D+04-2.02271305D-02 2.06180233D-01 1.52326376D+00 1.41781575D+03  672
1.27224125D+02-6.56126434D-01 3.62657135D+01                                672
7.36216010D+04-1.63927667D-02 1.74108494D-01 1.61847893D+00 1.42025510D+03  673
1.27414053D+02-3.12701688D-01 3.64759648D+01                                673
7.36217010D+04-1.69468647D-02 7.91508445D-02 1.65011083D+00 1.42145640D+03  674
1.27685518D+02-4.88601379D-01 3.65293290D+01                                674
7.36218010D+04-1.74621806D-02-7.77495393D-02 1.64723555D+00 1.42025510D+03  675
1.27132357D+02-6.44000000D-01 3.65698850D+01                                675
7.36219010D+04-1.41486728D-02-2.00377443D-01 1.36254847D+00 1.42148091D+03  676
1.27601817D+02-5.87441685D-01 3.63863150D+01                                676
7.36220010D+04-1.19766031D-02-1.17197122D-02 1.36286794D+00 1.42265769D+03  677
1.27786479D+02-3.35317236D-01 3.64236688D+01                                677
7.36221010D+04-1.41597535D-02 1.77255124D-01 1.39322194D+00 1.41902930D+03  678
1.27598990D+02-4.42532267D-01 3.66371229D+01                                678
7.36222010D+04-1.30847992D-02 3.96684213D-01 1.26765278D+00 1.42026736D+03  679
1.27507459D+02-5.59800000D-01 3.65037148D+01                                679
7.36223010D+04-1.52568690D-02 5.22754176D-01 1.36510427D+00 1.42269446D+03  680
1.27696066D+02-4.00553244D-01 3.62531782D+01                                680
7.36224010D+04-1.30737186D-02 6.45987912D-01 1.61847893D+00 1.42265769D+03  681
1.27675873D+02-3.57932571D-01 3.65698843D+01                                681
 THIS MUST BE A BLANK CARD
 THIS MUST BE A BLANK CARD
10000010011
01000001 -.123897583300  0.0D0          1.0D0            10.0D0
000000000000               PLOT CARD
   -1   10   10   10   10   10   -1   10   10   -1   -1
0.0D0                0.0D0
0.0D0                0.0D0
0.0D0                0.0D0
0.0D0                0.0D0
0.0D0                0.0D0
0.0D0                0.0D0
000101
END
```

Sample Output – FDRI

ALTIT 2ND MANEUVER-FLAPS UP- PULL UP/PUSH OVER -FLIGHT RECORD 40 / TAPE 33

```
                                          NSETS=  1
 SECTION 1 INPUT PARAMETERS                             ICODE
                                                          1

METRIC=    1  XLH(1)=  0.0250  FCR1=  0.032353  CF(1)=  0.0
NCH(1)=    4  XLH(2)=  0.0330  FCR2=  0.032353  CF(2)=  0.0
NCH(2)=    4  XLH(3)=  0.0250  XACG= 14.437000  CF(3)=  0.175D-01
NCH(3)=    4  TAU(1)=  0.0400  PCCG=  0.0       CF(4)=  0.175D-01
NCH(4)=    4  TAU(2)=  0.3000  CALP1=   1.1538  CF(5)=  0.169D 01
S= 155.0000   TAU(3)=  0.0400  CALP2=  -0.0200  CF(6)=  0.0
NPTS=  12     GUT= 3972.00000  NSPTS=    0      CF(7)=  0.175D-01
LSP(1)= 0  LSP(2)= 1  LSP(3)= 1  LSP(4)= 1      CF(8)=  0.100D 01
LSP(5)= 1  LSP(6)= 0  LSP(7)= 1  LSP(8)= 0      CF(9)=  0.460D 03
LSP(9)= 0  ELAP= 15.200000   DRIFT=     -0.03   CF(10)=-0.322D 02
                                                CF(11)= 0.0
                                                CF(12)= 0.0
```

VE	DPOCP
117.3330	-0.045000
132.0000	-0.025000
146.6670	-0.010000
161.3330	-0.002000
176.0000	0.003000
190.6670	0.007000
205.3330	0.010000
220.0000	0.012000
234.6670	0.012000
249.3330	0.013000
264.0000	0.013000
278.6670	0.014000

WING AREA = 14.39997 M**2
REFERENCE DENSITY = 1.22557364 KG/M**3
ACCELERATION DUE TO GRAVITY = 9.8146 M/SEC**2
TOTAL TEST TIME = 32.9000 SECONDS

CALCULATED PHASE SHIFT COUNT = 0
CALCULATED PITCH ANGLE BIAS = 4.4310676201680-02 RADIAN
CALCULATED PITCH RATE BIAS = -2.6545985389010-03 RAD/SEC

CONVERSION OF INITIAL FLIGHT DATA TO COMPATIBLE UNITS

DATA POINT	TIME (SECS)	WEIGHT (NEWTONS)	PITCH ANGLE (RADIANS)	PITCH RATE (RADIAN/SEC)	AIRSPEED (M/SEC)
1	0.0	17666.063	0.0034870	0.0086200	77.8687
2	0.100	17666.049	0.0033813	0.0058696	77.8898
3	0.200	17666.034	0.0033038	0.0031742	77.9123
4	0.300	17666.020	0.0017971	0.0058971	77.9365
5	0.400	17666.005	0.0030955	0.0058861	77.9617
6	0.500	17665.991	0.0016748	0.0047749	77.9901
7	0.600	17665.977	-0.0012817	0.0026076	78.0172
8	0.700	17665.962	0.0081166	0.0036968	78.0466
9	0.800	17665.948	0.0005996	0.0036693	78.0774
10	0.900	17665.933	0.0052020	0.0009549	78.1079
11	1.000	17665.919	0.0043222	0.0015092	78.1409
12	1.100	17665.905	0.0067317	0.0026381	78.1737
13	1.200	17665.890	0.0092033	0.0064582	78.2058
14	1.300	17665.876	0.0149465	0.0075308	78.2405
15	1.400	17665.861	0.0131709	0.0058806	78.2773
16	1.500	17665.847	0.0101712	0.0042688	78.3102
17	1.600	17665.833	0.0108557	0.0064472	78.3434
18	1.700	17665.818	0.0086017	0.0064307	78.3790
19	1.800	17665.804	0.0079996	0.0047694	78.4140
20	1.900	17665.790	0.0067397	0.0020141	78.4471
21	2.000	17665.775	0.0110497	-0.0012238	78.4803
22	2.100	17665.761	0.0133569	0.0009275	78.5135
23	2.200	17665.746	0.0147431	-0.0012457	78.5454
24	2.300	17665.732	0.0136779	-0.0012293	78.5736
25	2.400	17665.718	0.0101181	0.0003732	78.6040
26	2.500	17665.703	0.0122352	-0.0023158	78.6307
27	2.600	17665.689	0.0132997	0.0004281	78.6553
28	2.700	17665.674	0.0089551	0.0031522	78.6785
29	2.800	17665.660	0.0082946	0.0037180	78.6987
30	2.900	17665.646	0.0086428	0.0058641	78.7171
31	3.000	17665.631	0.0126605	0.0025582	78.7349
32	3.100	17665.617	0.0113713	-0.0012293	78.7471
33	3.200	17665.602	0.0118803	0.0083842	78.7542
34	3.300	17665.588	0.0127494	-0.0012512	78.7610
35	3.400	17665.574	0.0136585	-0.0017671	78.7638
36	3.500	17665.559	0.0159950	0.0009824	78.7618
37	3.600	17665.545	0.0132293	0.0042578	78.7536
38	3.700	17665.530	0.0155949	0.0053195	78.7446
39	3.800	17665.516	0.0173993	0.0026021	78.7288
40	3.900	17665.502	0.0185164	0.0031797	78.7066
41	4.000	17665.487	0.0161132	0.0064197	78.6816
42	4.100	17665.473	0.0136309	0.0037628	78.6524
43	4.200	17665.459	0.0210639	0.0106160	78.6184
44	4.300	17665.444	0.0300521	0.0425492	78.5722
45	4.400	17665.430	0.0390403	0.0770836	78.5236
46	4.500	17665.415	0.0530283	0.0994854	78.4687
47	4.600	17665.401	0.0651896	0.1037295	78.4091
48	4.700	17665.387	0.0723350	0.0955388	78.3414
49	4.800	17665.372	0.0795982	0.0933935	78.2659
50	4.900	17665.358	0.0904869	0.0967160	78.1838
51	5.000	17665.343	0.1007031	0.1021728	78.0962
52	5.100	17665.329	0.1128481	0.1032810	78.0009
53	5.200	17665.315	0.1258067	0.1021453	77.8941
54	5.300	17665.300	0.1327406	0.1004675	77.7844
55	5.400	17665.286	0.1426060	0.0961054	77.6678
56	5.500	17665.271	0.1498983	0.0955773	77.5378
57	5.600	17665.257	0.1567378	0.0971615	77.4009
58	5.700	17665.243	0.1727430	0.0922383	77.2607

59	5.800	17665.228	0.1821851	0.0901370	77.1095
60	5.900	17665.214	0.1890966	0.0978161	76.9485
61	6.000	17665.199	0.2020028	0.1033280	76.7792
62	6.100	17665.185	0.2088858	0.1098630	76.6040
63	6.200	17665.171	0.2208271	0.1098630	76.4206
64	6.300	17665.156	0.2361893	0.1098300	76.2320
65	6.400	17665.142	0.2472973	0.1065075	76.0285
66	6.500	17665.128	0.2584649	0.1010561	75.8189
67	6.600	17665.113	0.2640621	0.1005335	75.8992
68	6.700	17665.099	0.2782384	0.1027119	75.3792
69	6.800	17665.084	0.2863494	0.1027394	75.1397
70	6.900	17665.070	0.2956503	0.1054238	74.8995
71	7.000	17665.056	0.3053492	0.1015952	74.6563
72	7.100	17665.041	0.3193811	0.1000385	74.3935
73	7.200	17665.027	0.3276964	0.1077066	74.1225
74	7.300	17665.012	0.3363926	0.1120303	73.8533
75	7.400	17664.998	0.3480216	0.1987408	73.5798
76	7.500	17664.984	0.3594711	0.1065790	73.2893
77	7.600	17664.969	0.3764707	0.1082512	72.9870
78	7.700	17664.955	0.3857076	0.1120248	72.6873
79	7.800	17664.940	0.3932337	0.1082127	72.3757
80	7.900	17664.926	0.4069440	0.1082127	72.0559
81	8.000	17664.912	0.4166366	0.1081632	71.7316
82	8.100	17664.897	0.4270255	0.1032345	71.4031
83	8.200	17664.883	0.4423478	0.1006225	71.0645
84	8.300	17664.868	0.4471364	0.1016612	70.7211
85	8.400	17664.854	0.4551849	0.1066065	70.3667
86	8.500	17664.840	0.4682705	0.1109466	70.0107
87	8.600	17664.825	0.4811767	0.1091424	69.6466
88	8.700	17664.811	0.4911883	0.0921008	69.2974
89	8.800	17664.797	0.4894120	0.0761648	68.9194
90	8.900	17664.782	0.4963143	0.0619452	68.5482
91	9.000	17664.768	0.5025341	0.0558997	68.1793
92	9.100	17664.753	0.5129458	0.0503714	67.7977
93	9.200	17664.739	0.5071100	0.0421091	67.4051
94	9.300	17664.725	0.5333320	0.0327412	67.0252
95	9.400	17664.710	0.5118513	0.0218278	66.6398
96	9.500	17664.696	0.5116926	0.0196492	66.2438
97	9.600	17664.681	0.5173621	0.0195687	65.8526
98	9.700	17664.667	0.5129006	0.0135264	65.4546
99	9.800	17664.653	0.5113629	0.0063703	65.0554
100	9.900	17664.638	0.5040359	-0.0013390	64.6553
101	10.000	17664.624	0.5081121	-0.0106519	64.2511
102	10.100	17664.609	0.5124221	-0.0183458	63.8524
103	10.200	17664.595	0.5012942	-0.0270879	63.4453
104	10.300	17664.581	0.4994448	-0.0319831	63.0676
105	10.400	17664.566	0.4963329	-0.0324825	62.6595
106	10.500	17664.552	0.4919737	-0.0281141	62.2685
107	10.600	17664.537	0.4969270	-0.0259248	61.8776
108	10.700	17664.523	0.4947168	-0.0243330	61.4932
109	10.800	17664.509	0.4943488	-0.0281800	61.0911
110	10.900	17664.494	0.4825028	-0.0326690	60.7131
111	11.000	17664.480	0.4757622	-0.0468561	60.3369
112	11.100	17664.466	0.4698387	-0.0528697	59.9467
113	11.200	17664.451	0.4601435	-0.0567332	59.5722
114	11.300	17664.437	0.4572900	-0.0527424	59.2141
115	11.400	17664.422	0.4490123	-0.0659692	58.8424
116	11.500	17664.408	0.4456185	-0.0626710	58.4834
117	11.600	17664.394	0.4390228	-0.0588166	58.1277
118	11.700	17664.379	0.4304553	-0.0538960	57.7757
119	11.800	17664.365	0.4216057	-0.0506527	57.4359
120	11.900	17664.350	0.4219977	-0.0522990	57.1023
121	12.000	17664.336	0.4166637	-0.0539454	56.7737
122	12.100	17664.322	0.4038449	-0.0556082	56.4439
123	12.200	17664.307	0.4058208	-0.0599064	56.1400
124	12.300	17664.293	0.3945441	-0.0627568	55.8451
125	12.400	17664.278	0.3882765	-0.0676704	55.5224
126	12.500	17664.264	0.3800098	-0.0698985	55.2414
127	12.600	17664.250	0.3674345	-0.0753369	54.9776
128	12.700	17664.235	0.3588798	-0.0758638	54.6897
129	12.800	17664.221	0.3509386	-0.0742448	54.4188
130	12.900	17664.206	0.3420915	-0.0783753	54.1806
131	13.000	17664.192	0.3361614	-0.0797217	53.9364
132	13.100	17664.178	0.3298496	-0.0797384	53.6979
133	13.200	17664.163	0.3180784	-0.0813571	53.4651
134	13.300	17664.149	0.3063073	-0.0802705	53.2602
135	13.400	17664.135	0.3009832	-0.0802705	53.0473
136	13.500	17664.120	0.2940071	-0.0802469	52.8543
137	13.600	17664.106	0.2881567	-0.0819113	52.6719
138	13.700	17664.091	0.2774627	-0.0813845	52.5001
139	13.800	17664.077	0.2688686	-0.0833144	52.3233
140	13.900	17664.063	0.2616293	-0.0830144	52.1948
141	14.000	17664.048	0.2609488	-0.0830034	52.0164
142	14.100	17664.034	0.2424090	-0.0819717	51.8875
143	14.200	17664.019	0.2327190	-0.0874376	51.7869
144	14.300	17664.005	0.2219712	-0.0906864	51.6615
145	14.400	17663.991	0.2138110	-0.0895943	51.5108
146	14.500	17663.976	0.2042034	-0.0890730	51.4269
147	14.600	17663.962	0.1931486	-0.0912626	51.3634
148	14.700	17663.947	0.1857632	-0.0929035	51.2868
149	14.800	17663.933	0.1800148	-0.0939736	51.2031
150	14.900	17663.919	0.1704222	-0.0923602	51.1598
151	15.000	17663.904	0.1606516	-0.0939791	51.1059
152	15.100	17663.890	0.1514703	-0.0920815	51.0687
153	15.200	17663.875	0.1420967	-0.0918114	51.0573
154	15.300	17663.861	0.1351206	-0.0934087	51.0439
155	15.400	17663.847	0.1217413	-0.0961687	51.0285
156	15.500	17663.832	0.1089175	-0.0945336	51.0421
157	15.600	17663.818	0.1010265	-0.0939626	51.0407
158	15.700	17663.804	0.0918368	-0.0912791	51.0624
159	15.800	17663.789	0.0833968	-0.0945553	51.1131
160	15.900	17663.775	0.0760148	-0.0961852	51.1544
161	16.000	17663.760	0.0644323	-0.0961797	51.1744
162	16.100	17663.746	0.0630114	-0.0986419	51.2298
163	16.200	17663.732	0.0416482	-0.0961907	51.3074
164	16.300	17663.717	0.0344109	-0.0967614	51.4070
165	16.400	17663.703	0.0292476	-0.0994614	51.4546
166	16.500	17663.688	0.0119796	-0.0978590	51.5549
167	16.600	17663.674	0.0030622	-0.1305648	51.6704
168	16.700	17663.660	-0.0083612	-0.0994669	51.7542
169	16.800	17663.645	-0.0173839	-0.0983803	51.8771
170	16.900	17663.631	-0.0282487	-0.0983968	52.0319
171	17.000	17663.616	-0.0387511	-0.1000102	52.1656
172	17.100	17663.602	-0.0497182	-0.0983639	52.3112
173	17.200	17663.588	-0.0560480	-0.0966956	52.4589
174	17.300	17663.573	-0.0614013	-0.0929038	52.6160
175	17.400	17663.559	-0.0723831	-0.0939956	52.8032
176	17.500	17663.544	-0.0769177	-0.0945443	52.9934
177	17.600	17663.530	-0.0881041	-0.0950712	53.1705
178	17.700	17663.516	-0.1011217	-0.0934138	53.3427
179	17.800	17663.501	-0.1079917	-0.0906474	53.5623
180	17.900	17663.487	-0.1197629	-0.0907194	53.7993
181	18.000	17663.473	-0.1304376	-0.0928705	53.9868
182	18.100	17663.458	-0.1361272	-0.0906974	54.2114
183	18.200	17663.444	-0.1486001	-0.0906919	54.4606
184	18.300	17663.429	-0.1673889	-0.0901187	54.6913
185	18.400	17663.415	-0.1763792	-0.0868394	54.9228
186	18.500	17663.401	-0.1737707	-0.0452370	55.1885
187	18.600	17663.386	-0.1678197	-0.0979316	55.4568
188	18.700	17663.372	-0.1883633	-0.0857309	55.7206
189	18.800	17663.357	-0.1965937	-0.0829660	55.9876
190	18.900	17663.343	-0.2049030	-0.0780699	56.2679

191	19.000	17663.329	-0.2181392	-0.0775211	56.8540
192	19.100	17663.314	-0.2239280	-0.0769778	56.8397
193	19.200	17663.300	-0.2312696	-0.0769888	57.1398
194	19.300	17663.285	-0.2372223	-0.0780699	57.4306
195	19.400	17663.271	-0.2446077	-0.0774991	57.7326
196	19.500	17663.257	-0.2519931	-0.0747772	58.0548
197	19.600	17663.242	-0.2579166	-0.0741900	58.3576
198	19.700	17663.228	-0.2594981	-0.0698765	58.6775
199	19.800	17663.213	-0.2696319	-0.0731089	59.0107
200	19.900	17663.199	-0.2756870	-0.0703263	59.3320
201	20.000	17663.185	-0.2802070	-0.0634863	59.6402
202	20.100	17663.170	-0.2791132	-0.0516679	59.9748
203	20.200	17663.156	-0.2859723	-0.0450441	60.3115
204	20.300	17663.142	-0.2825210	-0.0346172	60.6413
205	20.400	17663.127	-0.2961791	-0.0241684	60.9668
206	20.500	17663.113	-0.2962548	-0.0115629	61.3045
207	20.600	17663.098	-0.2941698	-0.0006145	61.6393
208	20.700	17663.084	-0.2916726	0.0076024	61.9772
209	20.800	17663.070	-0.2862807	0.0130812	62.3234
210	20.900	17663.055	-0.2792515	0.0163707	62.6579
211	21.000	17663.041	-0.2794734	0.0185490	62.9988
212	21.100	17663.026	-0.2810111	0.0185106	63.3346
213	21.200	17663.012	-0.2776952	0.0146984	63.6683
214	21.300	17662.998	-0.2757827	0.0146489	64.0013
215	21.400	17662.983	-0.2803174	0.0097367	64.3423
216	21.500	17662.969	-0.2745454	0.0086915	64.6798
217	21.600	17662.954	-0.2704693	0.0131252	65.0083
218	21.700	17662.940	-0.2676212	0.0207934	65.3351
219	21.800	17662.926	-0.2647731	0.0251720	65.6701
220	21.900	17662.911	-0.2574807	0.0273944	66.0024
221	22.000	17662.897	-0.2531707	0.0318005	66.3129
222	22.100	17662.882	-0.2526862	0.0367293	66.6328
223	22.200	17662.868	-0.2493604	0.0394797	66.9543
224	22.300	17662.854	-0.2439978	0.0422191	67.2594
225	22.400	17662.839	-0.2392638	0.0438144	67.5739
226	22.500	17662.825	-0.2370004	0.0399856	67.8813
227	22.600	17662.811	-0.2356143	0.0383356	68.1772
228	22.700	17662.796	-0.2312458	0.0366908	68.4809
229	22.800	17662.782	-0.2225353	0.0356676	68.7686
230	22.900	17662.767	-0.2153130	0.0422356	69.0591
231	23.000	17662.753	-0.2151725	0.0455306	69.3478
232	23.100	17662.739	-0.2108040	0.0482921	69.6343
233	23.200	17662.724	-0.2021082	0.0521482	69.9033
234	23.300	17662.710	-0.1969795	0.0564938	70.1676
235	23.400	17662.695	-0.1950045	0.0553662	70.4374
236	23.500	17662.681	-0.1864471	0.0515156	70.7029
237	23.600	17662.667	-0.1808332	0.0477090	70.9489
238	23.700	17662.652	-0.1783944	0.0482371	71.1997
239	23.800	17662.638	-0.1727394	0.0465923	71.4498
240	23.900	17662.623	-0.1698182	0.0455361	71.6843
241	24.000	17662.609	-0.1680812	0.0488036	71.9168
242	24.100	17662.595	-0.1607596	0.0487981	72.1460
243	24.200	17662.580	-0.1551345	0.0482866	72.3669
244	24.300	17662.566	-0.1485285	0.0515651	72.5843
245	24.400	17662.551	-0.1383708	0.0526817	72.7922
246	24.500	17662.537	-0.1332274	0.0554157	72.9955
247	24.600	17662.523	-0.1318994	0.0564773	73.1975
248	24.700	17662.508	-0.1263022	0.0537434	73.3889
249	24.800	17662.494	-0.1202974	0.0526652	73.5754
250	24.900	17662.480	-0.1167914	0.0537434	73.7459
251	25.000	17662.465	-0.1111949	0.0525552	73.9243
252	25.100	17662.451	-0.1064755	0.0426537	74.1025
253	25.200	17662.436	-0.1038794	0.0327962	74.2601
254	25.300	17662.422	-0.1031213	0.0273119	74.4176
255	25.400	17662.408	-0.1000845	0.0235053	74.5724
256	25.500	17662.393	-0.0911651	0.0241379	74.7178
257	25.600	17662.379	-0.0879954	0.0329282	74.8552
258	25.700	17662.364	-0.0824573	0.0405579	74.9957
259	25.800	17662.350	-0.0804864	0.0411190	75.1243
260	25.900	17662.336	-0.0762058	0.0427362	75.2497
261	26.000	17662.321	-0.0724073	0.0411300	75.3677
262	26.100	17662.307	-0.0655827	0.0438584	75.4816
263	26.200	17662.292	-0.0631878	0.0443920	75.5867
264	26.300	17662.278	-0.0600473	0.0432808	75.6974
265	26.400	17662.264	-0.0540853	0.0411245	75.7992
266	26.500	17662.249	-0.0512372	0.0432973	75.8886
267	26.600	17662.235	-0.0460102	0.0427142	75.9791
268	26.700	17662.220	-0.0400149	0.0388966	76.0685
269	26.800	17662.206	-0.0389942	0.0383356	76.1489
270	26.900	17662.192	-0.0373157	0.0365973	76.2250
271	27.000	17662.177	-0.0320992	0.0261732	76.3029
272	27.100	17662.163	-0.0326720	0.0185380	76.3731
273	27.200	17662.149	-0.0295169	0.0174269	76.4356
274	27.300	17662.134	-0.0260841	0.0152870	76.4961
275	27.400	17662.120	-0.0253265	0.0191376	76.5587
276	27.500	17662.105	-0.0220691	0.0229827	76.6142
277	27.600	17662.091	-0.0221156	0.0262997	76.6615
278	27.700	17662.077	-0.0165191	0.0112010	76.7073
279	27.800	17662.062	-0.0184287	0.0312065	76.7530
280	27.900	17662.048	-0.0137760	0.0317235	76.7905
281	28.000	17662.033	-0.0070684	0.0289511	76.8307
282	28.100	17662.019	-0.0047027	0.0240169	76.8645
283	28.200	17662.005	-0.0059480	0.0206944	76.8923
284	28.300	17661.990	-0.0042987	0.0152100	76.9238
285	28.400	17661.976	0.0001263	0.0113924	76.9485
286	28.500	17661.961	0.0050816	0.0108259	76.9694
287	28.600	17661.947	-0.0030668	0.0086310	76.9933
288	28.700	17661.933	-0.0034468	0.0070688	77.0141
289	28.800	17661.918	-0.0017098	0.0141924	77.0258
290	28.900	17661.904	0.0078340	0.0185160	77.0410
291	29.000	17661.889	-0.0022999	0.0151883	77.0565
292	29.100	17661.875	-0.0037060	0.0091426	77.0703
293	29.200	17661.861	0.0079137	0.0337243	77.0778
294	29.300	17661.846	0.0092999	0.0064857	77.0846
295	29.400	17661.832	0.0077914	0.0103363	77.0930
296	29.500	17661.818	0.0105528	0.0141759	77.0987
297	29.600	17661.803	0.0148160	0.0168493	77.1031
298	29.700	17661.789	0.0064970	0.0118985	77.1058
299	29.800	17661.774	0.0087633	0.0370328	77.1054
300	29.900	17661.760	0.0143568	0.0075474	77.1078
301	30.000	17661.746	0.0092520	0.0375859	77.1088
302	30.100	17661.731	0.0113984	0.0113014	77.1086
303	30.200	17661.717	0.0195879	0.0097312	77.1093
304	30.300	17661.702	0.0111592	0.0080864	77.1082
305	30.400	17661.688	0.0138228	0.0369753	77.1091
306	30.500	17661.674	0.0206710	0.0048134	77.1042
307	30.600	17661.659	0.0116635	0.0264307	77.1049
308	30.700	17661.645	0.0147010	0.0347459	77.1064
309	30.800	17661.630	0.0155609	0.0336913	77.1052
310	30.900	17661.616	0.0160945	0.0031082	77.1037
311	31.000	17661.602	0.0160471	-0.0007626	77.1076
312	31.100	17661.587	0.0153336	-0.0372604	77.1061
313	31.200	17661.573	0.0147646	-0.0350707	77.1061
314	31.300	17661.558	0.0161470	-0.0334628	77.1075
315	31.400	17661.544	0.0165272	-0.0356360	77.1116
316	31.500	17661.530	0.0136318	-0.0356085	77.1166
317	31.600	17661.515	0.0108907	-0.0328537	77.1204
318	31.700	17661.501	0.0115459	0.0300659	77.1239
319	31.800	17661.487	0.0107684	0.0325746	77.1319
320	31.900	17661.472	0.0113651	0.0304361	77.1448
321	32.000	17661.458	0.0085409	0.0209439	77.1529
322	32.100	17661.443	0.0144591	0.0203842	77.1614

323	32.200	17661.429	0.0113133	-0.0012732	77.1706
324	32.300	17661.415	0.0085183	-0.0040116	77.1877
325	32.400	17661.400	0.0094367	-0.0061818	77.1979
326	32.500	17661.386	0.0137613	-0.0028591	77.2119
327	32.600	17661.371	0.0118143	0.0004391	77.2300
328	32.700	17661.357	0.0096918	0.0042688	77.2489
329	32.800	17661.342	0.0121965	0.0064692	77.2670
330	32.900	17661.328	0.0130636	0.0066200	77.2661

DATA POINT	TIME (SECS)	DENSITY (KG/M**3)	ANGLE OF ATTACK (RADIANS)	TEMPERATURE (DEG-K)	LONG. ACCEL. (M/SEC**2)
1	0.0	0.86927415	0.0126186	272.92	0.07941
2	0.100	0.86922587	0.0076478	272.94	0.10115
3	0.200	0.86917826	0.0027470	272.96	0.12250
4	0.300	0.86913124	0.0048321	272.97	0.10631
5	0.400	0.86908847	0.0096226	272.99	0.10088
6	0.500	0.86903967	0.0090643	273.00	0.09582
7	0.600	0.86899668	0.0098360	273.02	0.12734
8	0.700	0.86895446	0.0091347	273.03	0.08279
9	0.800	0.86891342	0.0097671	273.05	0.15786
10	0.900	0.86887620	0.0093002	273.06	0.07420
11	1.000	0.86883795	0.0086273	273.08	0.11723
12	1.100	0.86880317	0.0088670	273.09	0.11702
13	1.200	0.86877149	0.0096186	273.11	0.09572
14	1.300	0.86874081	0.0120686	273.12	0.11740
15	1.400	0.86871192	0.0083310	273.14	0.13359
16	1.500	0.86868739	0.0072132	273.15	0.13866
17	1.600	0.86866277	0.0121809	273.16	0.12805
18	1.700	0.86864537	0.0134433	273.18	0.18261
19	1.800	0.86862802	0.0122577	273.19	0.11740
20	1.900	0.86861440	0.0108317	273.20	0.13337
21	2.000	0.86860389	0.0113011	273.21	0.11723
22	2.100	0.86859536	0.0128130	273.22	0.11740
23	2.200	0.86859038	0.0113731	273.23	0.13318
24	2.300	0.86858999	0.0107643	273.24	0.09550
25	2.400	0.86859061	0.0126232	273.25	0.09593
26	2.500	0.86859559	0.0068686	273.26	0.13864
27	2.600	0.86860393	0.0080143	273.27	0.10637
28	2.700	0.86861492	0.0078913	273.28	0.10620
29	2.800	0.86862941	0.0091417	273.29	0.09006
30	2.900	0.86864648	0.0102645	273.30	0.09028
31	3.000	0.86866808	0.0091780	273.30	0.11202
32	3.100	0.86868825	0.0069068	273.31	0.13337
33	3.200	0.86871528	0.0099874	273.32	0.11718
34	3.300	0.86874289	0.0100671	273.32	0.11176
35	3.400	0.86877321	0.0076331	273.33	0.10626
36	3.500	0.86880637	0.0054513	273.33	0.09572
37	3.600	0.86884301	0.0069029	273.33	0.11718
38	3.700	0.86887932	0.0083566	273.34	0.11153
39	3.800	0.86891876	0.0059902	273.34	0.08485
40	3.900	0.86896075	0.0066221	273.35	0.10604
41	4.000	0.86900261	0.0096108	273.35	0.07365
42	4.100	0.86904495	0.0110306	273.35	0.06469
43	4.200	0.86908952	0.0080783	273.35	0.24151
44	4.300	0.86913497	0.0098622	273.35	0.17264
45	4.400	0.86918041	0.0102913	273.35	0.28917
46	4.500	0.86922599	0.0203641	273.35	0.32448
47	4.600	0.86927029	0.0258604	273.35	0.40028
48	4.700	0.86931509	0.0309280	273.35	0.44944
49	4.800	0.86935970	0.0393999	273.35	0.52487
50	4.900	0.86940303	0.0449493	273.35	0.54193
51	5.000	0.86944357	0.0484417	273.35	0.63350
52	5.100	0.86948351	0.0518934	273.35	0.65044
53	5.200	0.86952352	0.0561537	273.35	0.73183
54	5.300	0.86955834	0.0600951	273.34	0.77476
55	5.400	0.86959009	0.0622878	273.34	0.79670
56	5.500	0.86962251	0.0630325	273.34	0.83983
57	5.600	0.86965069	0.0711920	273.34	0.85091
58	5.700	0.86967267	0.0708090	273.33	0.88279
59	5.800	0.86969268	0.0652219	273.33	0.84558
60	5.900	0.86970950	0.0666624	273.32	0.88876
61	6.000	0.86972207	0.0701344	273.32	0.90527
62	6.100	0.86972849	0.0738269	273.31	0.94356
63	6.200	0.86973003	0.0754600	273.31	1.00803
64	6.300	0.86972454	0.0792679	273.30	1.00363
65	6.400	0.86971769	0.0794831	273.30	1.10041
66	6.500	0.86970390	0.0811169	273.29	1.10052
67	6.600	0.86968546	0.0824188	273.29	1.11138
68	6.700	0.86965632	0.0838399	273.28	1.12214
69	6.800	0.86962786	0.0848034	273.27	1.12228
70	6.900	0.86958868	0.0858152	273.27	1.13267
71	7.000	0.86954010	0.0822292	273.26	1.10085
72	7.100	0.86949197	0.0804570	273.25	1.14419
73	7.200	0.86943737	0.0856876	273.24	1.17629
74	7.300	0.86937058	0.0897731	273.24	1.16086
75	7.400	0.86929522	0.0848602	273.23	1.23060
76	7.500	0.86921928	0.0837441	273.22	1.21482
77	7.600	0.86913011	0.0874790	273.21	1.22023
78	7.700	0.86904515	0.0929137	273.20	1.25303
79	7.800	0.86894641	0.0925358	273.19	1.30649
80	7.900	0.86884594	0.0950835	273.18	1.29626
81	8.000	0.86873581	0.0982060	273.17	1.32074
82	8.100	0.86861811	0.0953163	273.16	1.35003
83	8.200	0.86849637	0.0935696	273.15	1.32836
84	8.300	0.86836802	0.0940967	273.14	1.31261
85	8.400	0.86823672	0.0944048	273.13	1.35025
86	8.500	0.86809764	0.1004240	273.12	1.36084
87	8.600	0.86794365	0.1004835	273.11	1.40983
88	8.700	0.86779560	0.0988225	273.10	1.39326
89	8.800	0.86764490	0.1015713	273.09	1.34938
90	8.900	0.86748338	0.1028298	273.08	1.28302
91	9.000	0.86731414	0.0965178	273.06	1.23027
92	9.100	0.86714560	0.0905096	273.05	1.18145
93	9.200	0.86697739	0.0885737	273.04	1.13794
94	9.300	0.86679724	0.0904691	273.03	1.08977
95	9.400	0.86661554	0.0842373	273.01	1.11084
96	9.500	0.86643539	0.0808641	273.00	1.06712
97	9.600	0.86624920	0.0798710	272.99	0.99728
98	9.700	0.86606389	0.0751713	272.98	1.00206
99	9.820	0.86587622	0.0693599	272.96	0.94264
100	9.900	0.86568747	0.0708220	272.95	0.91568
101	10.000	0.86549951	0.0635954	272.93	0.90381
102	10.100	0.86530662	0.0622178	272.92	0.79670
103	10.200	0.86511059	0.0545615	272.91	0.83928
104	10.300	0.86491887	0.0466498	272.89	0.79594
105	10.400	0.86473319	0.0428787	272.88	0.76357
106	10.500	0.86454037	0.0418377	272.86	0.75260
107	10.600	0.86434988	0.0352769	272.85	0.73099
108	10.700	0.86415858	0.0326044	272.83	0.72040
109	10.800	0.86397889	0.0323325	272.82	0.73620
110	10.900	0.86379110	0.0358580	272.80	0.70427
111	11.000	0.86360849	0.0319449	272.79	0.73647
112	11.100	0.86343292	0.0299386	272.77	0.73072
113	11.200	0.86325682	0.0309008	272.76	0.69324
114	11.300	0.86307836	0.0281895	272.74	0.70959
115	11.400	0.86291197	0.0214886	272.73	0.73110
116	11.500	0.86274578	0.0208036	272.71	0.73118
117	11.600	0.86258449	0.0196729	272.70	0.73683

118	11.700	0.86242828	0.0211742	272.68	0.73658
119	11.800	0.86227380	0.0202548	272.66	0.74228
120	11.900	0.86212347	0.0178858	272.65	0.77465
121	12.000	0.86197873	0.0167098	272.63	0.78852
122	12.100	0.86184230	0.0201808	272.62	0.79627
123	12.200	0.86170246	0.0224187	272.60	0.79627
124	12.300	7.86156688	0.0221199	272.59	0.79638
125	12.400	0.86145183	0.0194623	272.57	0.80691
126	12.500	0.86132702	0.0241317	272.56	0.78573
127	12.600	0.86120339	0.0220975	272.54	0.81805
128	12.700	0.86109680	0.0203043	272.53	0.82315
129	12.800	0.86099563	0.0233668	272.51	0.79649
130	12.900	0.86088712	0.0228405	272.50	0.81821
131	13.000	0.86078981	0.0207336	272.48	0.83972
132	13.100	0.86069884	0.0207620	272.47	0.83994
133	13.200	0.86061412	0.0204309	272.45	0.86133
134	13.300	0.86052615	0.0221882	272.44	0.85069
135	13.400	0.86045004	0.0209119	272.42	0.86150
136	13.500	0.86037396	0.0209415	272.41	0.86698
137	13.600	0.86030170	0.0211641	272.39	0.87779
138	13.700	0.86023313	0.0230236	272.38	0.88339
139	13.800	0.86017447	0.0228978	272.37	0.90489
140	13.900	0.86010374	0.0251584	272.35	0.90489
141	14.000	0.86006099	0.0246995	272.34	0.90478
142	14.100	0.86000528	0.0295888	272.33	0.89436
143	14.200	0.85994520	0.0275798	272.31	0.92673
144	14.300	0.85990199	0.0266584	272.30	0.93737
145	14.400	0.85987260	0.0276881	272.29	0.92651
146	14.500	0.85982910	0.0316486	272.28	0.91586
147	14.600	0.85978029	0.0293022	272.26	0.92678
148	14.700	0.85974272	0.0269430	272.25	0.94275
149	14.800	0.85971379	0.0283638	272.24	0.92662
150	14.900	0.85967408	0.0307338	272.23	0.92678
151	15.000	0.85964271	0.0283623	272.22	0.94280
152	15.100	0.85961212	0.0289104	272.21	0.93210
153	15.200	0.85957477	0.0300607	272.19	0.93759
154	15.300	0.85954286	0.0282976	272.18	0.94834
155	15.400	0.85951620	0.0266645	272.17	0.94829
156	15.500	0.85948213	0.0271492	272.16	0.94291
157	15.600	0.85945811	0.0284053	272.15	0.94275
158	15.700	0.85942871	0.0319564	272.14	0.92683
159	15.800	0.85939137	0.0322471	272.13	0.94834
160	15.900	0.85936133	0.0298855	272.12	0.94834
161	16.000	0.85934331	0.0330983	272.12	0.89401
162	16.100	0.85931434	0.0362197	272.11	0.90391
163	16.200	0.85927959	0.0362339	272.10	0.93737
164	16.300	0.85923912	0.0337046	272.09	0.92678
165	16.400	0.85922268	0.0332898	272.08	0.94280
166	16.500	0.85918786	0.0357155	272.07	0.93216
167	16.600	0.85914982	0.0340231	272.07	0.94286
168	16.700	0.85912753	0.0313643	272.06	0.93737
169	16.800	0.85909223	0.0325088	272.05	0.92662
170	16.900	0.85904681	0.0324496	272.05	0.92662
171	17.000	0.85501692	0.0293990	272.04	0.92662
172	17.100	0.85897692	0.0292102	272.03	0.92651
173	17.200	0.85894310	0.0290541	272.03	0.91543
174	17.300	0.85890841	0.0318323	272.02	0.88328
175	17.400	0.85886434	0.0306058	272.02	0.89403
176	17.500	0.85882217	0.0280587	272.01	0.89398
177	17.600	0.85878865	0.0262000	272.01	0.89844
178	17.700	0.85876060	0.0292237	272.00	0.87220
179	17.800	0.85871607	0.0314586	272.00	0.86139
180	17.900	0.85866772	0.0294666	271.99	0.85617
181	18.000	0.85864398	0.0252188	271.99	0.87198
182	18.100	0.85860832	0.0280011	271.99	0.83977
183	18.200	0.85856609	0.0287360	271.98	0.84520
184	18.300	0.85853581	0.0261117	271.98	0.85026
185	18.400	0.85850939	0.0270540	271.98	0.81799
186	18.500	0.85847254	0.0274835	271.98	0.81810
187	18.600	0.85843894	0.0225534	271.98	0.82086
188	18.700	0.85841191	0.0210408	271.97	0.82864
189	18.800	0.85838812	0.0207849	271.97	0.80678
190	18.900	0.85836336	0.0238034	271.97	0.76917
191	19.000	0.85834095	0.0246670	271.97	0.77444
192	19.100	0.85832376	0.0220355	271.97	0.76363
193	19.200	0.85830530	0.0220003	271.97	0.75809
194	19.300	0.85829621	0.0220420	271.97	0.74196
195	19.400	0.85828745	0.0200640	271.98	0.74158
196	19.500	0.85827487	0.0216798	271.98	0.70432
197	19.600	0.85827660	0.0198838	271.98	0.74131
198	19.700	0.85827601	0.0192754	271.98	0.67716
199	19.800	0.85827478	0.0194936	271.98	0.71475
200	19.900	0.85828463	0.0166735	271.99	0.70910
201	20.000	0.85830618	0.0161158	271.99	0.68211
202	20.100	0.85832093	0.0188643	271.99	0.67130
203	20.200	0.85834019	0.0157408	272.00	0.66603
204	20.300	0.85836826	0.0154906	272.00	0.67678
205	20.400	0.85840384	0.0153063	272.01	0.67657
206	20.500	0.85843897	0.0206340	272.01	0.65522
207	20.600	0.85848079	0.0210267	272.02	0.67141
208	20.700	0.85852634	0.0229463	272.03	0.67689
209	20.800	0.85857287	0.0270074	272.03	0.68808
210	20.900	0.85863007	0.0312634	272.04	0.73110
211	21.000	0.85869383	0.0368792	272.05	0.73099
212	21.100	0.85875488	0.0420249	272.05	0.72078
213	21.200	0.85882636	0.0462101	272.06	0.77444
214	21.300	0.85890247	0.0513161	272.07	0.76385
215	21.400	0.85897861	0.0517034	272.08	0.78014
216	21.500	0.85906028	0.0511718	272.09	0.79616
217	21.600	0.85915013	0.0527657	272.10	0.78530
218	21.700	0.85924423	0.0547486	272.11	0.77460
219	21.800	0.85933712	0.0569470	272.12	0.78014
220	21.900	0.85943421	0.0548813	272.13	0.79649
221	22.000	0.85954510	0.0552487	272.14	0.81778
222	22.100	0.85965341	0.0606177	272.15	0.79649
223	22.200	0.85976279	0.0604419	272.16	0.81810
224	22.300	0.85988241	0.0621854	272.17	0.82875
225	22.400	0.85999844	0.0646541	272.18	0.81837
226	22.500	0.86011925	0.0674904	272.20	0.85617
227	22.600	0.86024609	0.0663523	272.21	0.87187
228	22.700	0.86037070	0.0664676	272.22	0.82907
229	22.800	0.86050322	0.0646822	272.23	0.85026
230	22.900	0.86063392	0.0680130	272.24	0.81805
231	23.000	0.86076503	0.0658680	272.25	0.82359
232	23.100	0.86089640	0.0631124	272.27	0.83983
233	23.200	0.86103613	0.0628974	272.28	0.85036
234	23.300	0.86117698	0.0677124	272.29	0.82875
235	23.400	0.86131281	0.0697130	272.30	0.81032
236	23.500	0.86144890	0.0693362	272.31	0.85058
237	23.600	0.86159339	0.0664616	272.32	0.85020
238	23.700	0.86173246	0.0708856	272.34	0.81273
239	23.800	0.86186889	0.0690942	272.35	0.82086
240	23.900	0.86201080	0.0672753	272.36	0.82848
241	24.000	0.86215026	0.0676856	272.37	0.79089
242	24.100	0.86228781	0.0670342	272.38	0.79649
243	24.200	0.86242598	0.0645326	272.39	0.81767
244	24.300	0.86256184	0.0643070	272.40	0.78552
245	24.400	0.86269860	0.0636344	272.41	0.79408
246	24.500	0.86283331	0.0664396	272.42	0.77444
247	24.600	0.86296383	0.0665380	272.43	0.76395
248	24.700	0.86309537	0.0629090	272.44	0.79024
249	24.800	0.86322444	0.0623680	272.45	0.73142

250	24.900	0.86335745	0.0685071	272.46	0.76303
251	25.000	0.86348027	0.0685646	272.46	0.69829
252	25.100	0.86359753	0.0649207	272.47	0.67678
253	25.200	0.86372106	0.0579763	272.48	0.67648
254	25.300	0.86383868	0.0602211	272.48	0.63849
255	25.400	0.86395171	0.0559609	272.49	0.61161
256	25.500	0.86406466	0.0495676	272.50	0.61128
257	25.600	0.86417699	0.0494206	272.50	0.57048
258	25.700	0.86427929	0.0509935	272.51	0.52558
259	25.800	0.86438346	0.0484124	272.51	0.61118
260	25.900	0.86448332	0.0482821	272.52	0.56811
261	26.000	0.86458132	0.0458919	272.52	0.54257
262	26.100	0.86467555	0.0501522	272.53	0.54638
263	26.200	0.86476685	0.0481946	272.53	0.54084
264	26.300	0.86485255	0.0469788	272.54	0.52487
265	26.400	0.86493841	0.0444212	272.54	0.54106
266	26.500	0.86501960	0.0488262	272.54	0.54638
267	26.600	0.86509705	0.0476743	272.54	0.54041
268	26.700	0.86516911	0.0460215	272.55	0.48181
269	26.800	0.86524068	0.0460809	272.55	0.53492
270	26.900	0.86530695	0.0488045	272.55	0.47073
271	27.000	0.86537032	0.0461876	272.55	0.50266
272	27.100	0.86543067	0.0422185	272.55	0.46986
273	27.200	0.86548999	0.0403760	272.55	0.41609
274	27.300	0.86554505	0.0390433	272.56	0.41593
275	27.400	0.86559335	0.0357418	272.56	0.39979
276	27.500	0.86564071	0.0309832	272.56	0.39958
277	27.600	0.86568774	0.0282551	272.56	0.37828
278	27.700	0.86573064	0.0317066	272.56	0.39947
279	27.800	0.86576854	0.0330543	272.56	0.36718
280	27.900	0.86580659	0.0342887	272.56	0.36730
281	28.000	0.86583819	0.0330360	272.56	0.37828
282	28.100	0.86586904	0.0341692	272.56	0.39979
283	28.200	0.86589903	0.0350326	272.57	0.39936
284	28.300	0.86592232	0.0360063	272.57	0.35643
285	28.400	0.86594530	0.0330977	272.57	0.36681
286	28.500	0.86596665	0.0324386	272.57	0.32856
287	28.600	0.86598197	0.0299425	272.57	0.26962
288	28.700	0.86599817	0.0211407	272.57	0.31231
289	28.800	0.86601007	0.0219646	272.58	0.25898
290	28.900	0.86601913	0.0230038	272.58	0.30177
291	29.000	0.86602434	0.0250713	272.58	0.27971
292	29.100	0.86602708	0.0228639	272.59	0.22647
293	29.200	0.86603023	0.0175137	272.59	0.30122
294	29.300	0.86603049	0.0198680	272.59	0.22586
295	29.400	0.86602657	0.0183394	272.60	0.22113
296	29.500	0.86602125	0.0180994	272.60	0.28492
297	29.600	0.86601366	0.0191910	272.61	0.20993
298	29.700	0.86600430	0.0188736	272.61	0.24237
299	29.800	0.86599402	0.0185826	272.62	0.25778
300	29.900	0.86597934	0.0178640	272.63	0.18309
301	30.000	0.86596296	0.0163387	272.63	0.24683
302	30.100	0.86594489	0.0182643	272.64	0.16652
303	30.200	0.86592309	0.0177296	272.65	0.20461
304	30.300	0.86590172	0.0171879	272.66	0.24721
305	30.400	0.86587627	0.0159007	272.67	0.20461
306	30.500	0.86585227	0.0155118	272.68	0.24667
307	30.600	0.86582300	0.0179339	272.69	0.18038
308	30.700	0.86579144	0.0161186	272.70	0.20439
309	30.800	0.86575981	0.0149422	272.71	0.22558
310	30.900	0.86572682	0.0175479	272.72	0.19342
311	31.000	0.86568918	0.0196687	272.73	0.20439
312	31.100	0.86565342	0.0158376	272.74	0.22548
313	31.200	0.86561563	0.0154935	272.75	0.18200
314	31.300	0.86557594	0.0153683	272.77	0.13946
315	31.400	0.86553362	0.0139939	272.78	0.18749
316	31.500	0.86548999	0.0129487	272.79	0.18016
317	31.600	0.86544645	0.0121432	272.81	0.18222
318	31.700	0.86540260	0.0131687	272.82	0.16038
319	31.800	0.86535563	0.0130405	272.84	0.12864
320	31.900	0.86530547	0.0112680	272.85	0.18260
321	32.000	0.86525815	0.0106128	272.87	0.19036
322	32.100	0.86521061	0.0125670	272.88	0.18876
323	32.200	0.86516287	0.0133130	272.90	0.16419
324	32.300	0.86511070	0.0134353	272.91	0.17125
325	32.400	0.86506324	0.0074431	272.93	0.13875
326	32.500	0.86501617	0.0076329	272.94	0.11745
327	32.600	0.86496335	0.0080273	272.96	0.13886
328	32.700	0.86491309	0.0052469	272.98	0.12832
329	32.800	0.86486442	0.0070648	272.99	0.14962
330	32.900	0.86480963	0.0120258	273.01	0.12821

DATA POINT	TIME (SECS)	ALTITUDE (METERS)	VERT. ACCEL. (M/SEC**2)	ELEV. DEFLECT. (RADIANS)
1	0.0	3442.098	0.0	0.0
2	0.100	3442.632	0.0	0.0
3	0.200	3443.159	0.0	0.0
4	0.300	3443.680	0.0	0.0
5	0.400	3444.186	0.0	0.0
6	0.500	3444.693	0.0	0.0
7	0.600	3445.169	0.0	0.0
8	0.700	3445.637	0.0	0.0
9	0.800	3446.089	0.0	0.0
10	0.900	3446.513	0.0	0.0
11	1.000	3446.927	0.0	0.0
12	1.100	3447.312	0.0	0.0
13	1.200	3447.683	0.0	0.0
14	1.300	3448.003	0.0	0.0
15	1.400	3448.327	0.0	0.0
16	1.500	3448.594	0.0	0.0
17	1.600	3448.834	0.0	0.0
18	1.700	3449.060	0.0	0.0
19	1.800	3449.252	0.0	0.0
20	1.900	3449.400	0.0	0.0
21	2.000	3449.521	0.0	0.0
22	2.100	3449.613	0.0	0.0
23	2.200	3449.669	0.0	0.0
24	2.300	3449.673	0.0	0.0
25	2.400	3449.666	0.0	0.0
26	2.500	3449.611	0.0	0.0
27	2.600	3449.519	0.0	0.0
28	2.700	3449.397	0.0	0.0
29	2.800	3449.236	0.0	0.0
30	2.900	3449.047	0.0	0.0
31	3.000	3448.841	0.0	0.0
32	3.100	3448.585	0.0	0.0
33	3.200	3448.286	0.0	0.0
34	3.300	3447.980	0.0	0.0
35	3.400	3447.644	0.0	0.0
36	3.500	3447.277	0.0	0.0
37	3.600	3446.871	0.0	0.0
38	3.700	3446.469	0.0	0.0
39	3.800	3446.032	0.0	0.0
40	3.900	3445.567	0.0	0.0
41	4.000	3445.104	0.0	0.0
42	4.100	3444.635	0.0	0.0
43	4.200	3444.148	0.0	0.0
44	4.300	3443.638	0.0	0.0

45	4.400	3443.138	0.0	0.0
46	4.500	3442.631	0.0	0.0
47	4.600	3442.140	0.0	0.0
48	4.700	3441.646	0.0	0.0
49	4.800	3441.151	0.0	0.0
50	4.900	3440.671	0.0	0.0
51	5.000	3440.210	0.0	0.0
52	5.100	3439.781	0.0	0.0
53	5.200	3439.338	0.0	0.0
54	5.300	3438.952	0.0	0.0
55	5.400	3438.601	0.0	0.0
56	5.500	3438.242	0.0	0.0
57	5.600	3437.930	0.0	0.0
58	5.700	3437.687	0.0	0.0
59	5.800	3437.466	0.0	0.0
60	5.900	3437.288	0.0	0.0
61	6.000	3437.141	0.0	0.0
62	6.100	3437.070	0.0	0.0
63	6.200	3437.053	0.0	0.0
64	6.300	3437.113	0.0	0.0
65	6.400	3437.189	0.0	0.0
66	6.500	3437.342	0.0	0.0
67	6.600	3437.546	0.0	0.0
68	6.700	3437.860	0.0	0.0
69	6.800	3438.183	0.0	0.0
70	6.900	3438.617	0.0	0.0
71	7.000	3439.154	0.0	0.0
72	7.100	3439.687	0.0	0.0
73	7.200	3440.291	0.0	0.0
74	7.300	3441.030	0.0	0.0
75	7.400	3441.864	0.0	0.0
76	7.500	3442.705	0.0	0.0
77	7.600	3443.604	0.0	0.0
78	7.700	3444.633	0.0	0.0
79	7.800	3445.704	0.0	0.0
80	7.900	3446.838	0.0	0.0
81	8.000	3448.058	0.0	0.0
82	8.100	3449.362	0.0	0.0
83	8.200	3450.710	0.0	0.0
84	8.300	3452.132	0.0	0.0
85	8.400	3453.586	0.0	0.0
86	8.500	3455.127	0.0	0.0
87	8.600	3456.834	0.0	0.0
88	8.700	3458.474	0.0	0.0
89	8.800	3460.145	0.0	0.0
90	8.900	3461.935	0.0	0.0
91	9.000	3463.812	0.0	0.0
92	9.100	3465.681	0.0	0.0
93	9.200	3467.546	0.0	0.0
94	9.300	3469.544	0.0	0.0
95	9.400	3471.560	0.0	0.0
96	9.500	3473.559	0.0	0.0
97	9.600	3475.625	0.0	0.0
98	9.700	3477.685	0.0	0.0
99	9.800	3479.765	0.0	0.0
100	9.900	3481.861	0.0	0.0
101	10.000	3483.949	0.0	0.0
102	10.100	3486.075	0.0	0.0
103	10.200	3488.269	0.0	0.0
104	10.300	3490.399	0.0	0.0
105	10.400	3492.462	0.0	0.0
106	10.500	3494.603	0.0	0.0
107	10.600	3496.723	0.0	0.0
108	10.700	3498.849	0.0	0.0
109	10.800	3500.848	0.0	0.0
110	10.900	3502.936	0.0	0.0
111	11.000	3505.001	0.0	0.0
112	11.100	3506.921	0.0	0.0
113	11.200	3508.880	0.0	0.0
114	11.300	3510.866	0.0	0.0
115	11.400	3512.718	0.0	0.0
116	11.500	3514.568	0.0	0.0
117	11.600	3516.364	0.0	0.0
118	11.700	3518.103	0.0	0.0
119	11.800	3519.824	0.0	0.0
120	11.900	3521.498	0.0	0.0
121	12.000	3523.111	0.0	0.0
122	12.100	3524.631	0.0	0.0
123	12.200	3526.189	0.0	0.0
124	12.300	3527.700	0.0	0.0
125	12.400	3528.982	0.0	0.0
126	12.500	3530.373	0.0	0.0
127	12.600	3531.781	0.0	0.0
128	12.700	3532.917	0.0	0.0
129	12.800	3534.068	0.0	0.0
130	12.900	3535.278	0.0	0.0
131	13.000	3536.363	0.0	0.0
132	13.100	3537.377	0.0	0.0
133	13.200	3538.322	0.0	0.0
134	13.300	3539.304	0.0	0.0
135	13.400	3540.183	0.0	0.0
136	13.500	3541.001	0.0	0.0
137	13.600	3541.808	0.0	0.0
138	13.700	3542.573	0.0	0.0
139	13.800	3543.227	0.0	0.0
140	13.900	3544.017	0.0	0.0
141	14.000	3544.494	0.0	0.0
142	14.100	3545.115	0.0	0.0
143	14.200	3545.706	0.0	0.0
144	14.300	3546.268	0.0	0.0
145	14.400	3546.595	0.0	0.0
146	14.500	3547.082	0.0	0.0
147	14.600	3547.626	0.0	0.0
148	14.700	3548.046	0.0	0.0
149	14.800	3548.369	0.0	0.0
150	14.900	3548.812	0.0	0.0
151	15.000	3549.162	0.0	0.0
152	15.100	3549.504	0.0	0.0
153	15.200	3549.921	0.0	0.0
154	15.300	3550.277	0.0	0.0
155	15.400	3550.578	0.0	0.0
156	15.500	3550.955	0.0	0.0
157	15.600	3551.223	0.0	0.0
158	15.700	3551.551	0.0	0.0
159	15.800	3551.968	0.0	0.0
160	15.900	3552.304	0.0	0.0
161	16.000	3552.605	0.0	0.0
162	16.100	3552.829	0.0	0.0
163	16.200	3553.217	0.0	0.0
164	16.300	3553.669	0.0	0.0
165	16.400	3553.852	0.0	0.0
166	16.500	3554.241	0.0	0.0
167	16.600	3554.666	0.0	0.0
168	16.700	3554.916	0.0	0.0
169	16.800	3555.309	0.0	0.0
170	16.900	3555.816	0.0	0.0
171	17.000	3556.150	0.0	0.0
172	17.100	3556.597	0.0	0.0
173	17.200	3556.978	0.0	0.0
174	17.300	3557.362	0.0	0.0
175	17.400	3557.858	0.0	0.0
176	17.500	3558.326	0.0	0.0

177	17.600	3558.700	0.0	0.0
178	17.700	3559.014	0.0	0.0
179	17.800	3559.511	0.0	0.0
180	17.900	3560.051	0.0	0.0
181	18.000	3560.317	0.0	0.0
182	18.100	3560.718	0.0	0.0
183	18.200	3561.187	0.0	0.0
184	18.300	3561.525	0.0	0.0
185	18.400	3561.821	0.0	0.0
186	18.500	3562.232	0.0	0.0
187	18.600	3562.608	0.0	0.0
188	18.700	3562.910	0.0	0.0
189	18.800	3563.176	0.0	0.0
190	18.900	3563.463	0.0	0.0
191	19.000	3563.703	0.0	0.0
192	19.100	3563.895	0.0	0.0
193	19.200	3564.102	0.0	0.0
194	19.300	3564.203	0.0	0.0
195	19.400	3564.301	0.0	0.0
196	19.500	3564.442	0.0	0.0
197	19.600	3564.422	0.0	0.0
198	19.700	3564.429	0.0	0.0
199	19.800	3564.443	0.0	0.0
200	19.900	3564.333	0.0	0.0
201	20.000	3564.092	0.0	0.0
202	20.100	3563.927	0.0	0.0
203	20.200	3563.712	0.0	0.0
204	20.300	3563.398	0.0	0.0
205	20.400	3563.000	0.0	0.0
206	20.500	3562.608	0.0	0.0
207	20.600	3562.140	0.0	0.0
208	20.700	3561.631	0.0	0.0
209	20.800	3561.111	0.0	0.0
210	20.900	3560.472	0.0	0.0
211	21.000	3559.760	0.0	0.0
212	21.100	3559.078	0.0	0.0
213	21.200	3558.279	0.0	0.0
214	21.300	3557.429	0.0	0.0
215	21.400	3556.578	0.0	0.0
216	21.500	3555.666	0.0	0.0
217	21.600	3554.663	0.0	0.0
218	21.700	3553.612	0.0	0.0
219	21.800	3552.574	0.0	0.0
220	21.900	3551.490	0.0	0.0
221	22.000	3550.252	0.0	0.0
222	22.100	3549.043	0.0	0.0
223	22.200	3547.822	0.0	0.0
224	22.300	3546.487	0.0	0.0
225	22.400	3545.192	0.0	0.0
226	22.500	3543.843	0.0	0.0
227	22.600	3542.419	0.0	0.0
228	22.700	3541.038	0.0	0.0
229	22.800	3539.859	0.0	0.0
230	22.900	3538.102	0.0	0.0
231	23.000	3536.639	0.0	0.0
232	23.100	3535.174	0.0	0.0
233	23.200	3533.616	0.0	0.0
234	23.300	3532.047	0.0	0.0
235	23.400	3530.532	0.0	0.0
236	23.500	3529.015	0.0	0.0
237	23.600	3527.404	0.0	0.0
238	23.700	3525.855	0.0	0.0
239	23.800	3524.334	0.0	0.0
240	23.900	3522.753	0.0	0.0
241	24.000	3521.200	0.0	0.0
242	24.100	3519.668	0.0	0.0
243	24.200	3518.129	0.0	0.0
244	24.300	3516.618	0.0	0.0
245	24.400	3515.094	0.0	0.0
246	24.500	3513.594	0.0	0.0
247	24.600	3512.141	0.0	0.0
248	24.700	3510.677	0.0	0.0
249	24.800	3509.240	0.0	0.0
250	24.900	3507.760	0.0	0.0
251	25.000	3506.394	0.0	0.0
252	25.100	3505.089	0.0	0.0
253	25.200	3503.715	0.0	0.0
254	25.300	3502.407	0.0	0.0
255	25.400	3501.150	0.0	0.0
256	25.500	3499.894	0.0	0.0
257	25.600	3498.656	0.0	0.0
258	25.700	3497.507	0.0	0.0
259	25.800	3496.349	0.0	0.0
260	25.900	3495.239	0.0	0.0
261	26.000	3494.150	0.0	0.0
262	26.100	3493.103	0.0	0.0
263	26.200	3492.066	0.0	0.0
264	26.300	3491.136	0.0	0.0
265	26.400	3490.215	0.0	0.0
266	26.500	3489.279	0.0	0.0
267	26.600	3488.419	0.0	0.0
268	26.700	3487.618	0.0	0.0
269	26.800	3486.823	0.0	0.0
270	26.900	3486.065	0.0	0.0
271	27.000	3485.383	0.0	0.0
272	27.100	3484.713	0.0	0.0
273	27.200	3484.054	0.0	0.0
274	27.300	3483.443	0.0	0.0
275	27.400	3482.906	0.0	0.0
276	27.500	3482.380	0.0	0.0
277	27.600	3481.858	0.0	0.0
278	27.700	3481.382	0.0	0.0
279	27.800	3480.961	0.0	0.0
280	27.900	3480.539	0.0	0.0
281	28.000	3480.188	0.0	0.0
282	28.100	3479.845	0.0	0.0
283	28.200	3479.512	0.0	0.0
284	28.300	3479.254	0.0	0.0
285	28.400	3478.958	0.0	0.0
286	28.500	3478.762	0.0	0.0
287	28.600	3478.592	0.0	0.0
288	28.700	3478.445	0.0	0.0
289	28.800	3478.280	0.0	0.0
290	28.900	3478.179	0.0	0.0
291	29.000	3478.121	0.0	0.0
292	29.100	3478.091	0.0	0.0
293	29.200	3478.056	0.0	0.0
294	29.300	3478.053	0.0	0.0
295	29.400	3478.096	0.0	0.0
296	29.500	3478.155	0.0	0.0
297	29.600	3478.240	0.0	0.0
298	29.700	3478.344	0.0	0.0
299	29.800	3478.458	0.0	0.0
300	29.900	3478.621	0.0	0.0
301	30.000	3478.803	0.0	0.0
302	30.100	3479.003	0.0	0.0
303	30.200	3479.236	0.0	0.0
304	30.300	3479.482	0.0	0.0
305	30.400	3479.765	0.0	0.0
306	30.500	3480.031	0.0	0.0
307	30.600	3480.356	0.0	0.0
308	30.700	3480.707	0.0	0.0

309	30.800	3481.058	0.0	0.0
310	30.900	3481.424	0.0	0.0
311	31.000	3481.842	0.0	0.0
312	31.100	3482.239	0.0	0.0
313	31.200	3482.659	0.0	0.0
314	31.300	3483.100	0.0	0.0
315	31.400	3483.570	0.0	0.0
316	31.500	3484.054	0.0	0.0
317	31.600	3484.538	0.0	0.0
318	31.700	3485.025	0.0	0.0
319	31.800	3485.546	0.0	0.0
320	31.900	3486.104	0.0	0.0
321	32.000	3486.629	0.0	0.0
322	32.100	3487.157	0.0	0.0
323	32.200	3487.688	0.0	0.0
324	32.300	3488.267	0.0	0.0
325	32.400	3488.795	0.0	0.0
326	32.500	3489.340	0.0	0.0
327	32.600	3489.904	0.0	0.0
328	32.700	3490.463	0.0	0.0
329	32.800	3491.004	0.0	0.0
330	32.900	3491.613	0.0	0.0

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                    SECTION 2 INPUT PARAMETERS

           IFS(1)= 1   NC(1)= -1   IP(1)= 0   IP(13)= 0
           IFS(2)= 0   NC(2)= 10   IP(2)= 0   IP(14)= 0
           IFS(3)= 0   NC(3)= 10   IP(3)= 0   IPRC(1)= 0
           IFS(4)= 0   NC(4)= 10   IP(4)= 0   IPRC(2)= 1
           IFS(5)= 0   NC(5)= 10   IP(5)= 0   IPRC(3)= 0
           IFS(6)= 0   NC(6)= 10   IP(6)= 0   IPRC(4)= 0
           IFS(7)= 1   NC(7)= -1   IP(7)= 0   IPRC(5)= 0
           IFS(8)= 0   NC(8)= 10   IP(8)= 0   IPRC(6)= 0
           IFS(9)= 0   NC(9)= 10   IP(9)= 0   IPRC(7)= 0
           IFS(10)=1   NC(10)=-1   IP(10)=0   IPRC(8)= 0
           IFS(11)=1   NC(11)=-1   IP(11)=0   IPRC(9)= 1
           XAX= -0.12389758            IP(12)=0

     AP(1)= 1.0000000000000-10        W(1)= 0.0
     AP(2)= 1.0000000000000D-10       W(2)= 0.0
     AP(3)= 1.0000000000000D-10       W(3)= 0.0
     AP(4)= 1.0000000000000D-10       W(4)= 0.0
     AP(5)= 1.0000000000000D-10       W(5)= 0.0
     AP(6)= 1.0000000000000D-10       W(6)= 0.0

COMPATIBILITY ESTIMATES OF THE |   BIAS =   9.3856424618702300-04
BIAS AND GAINS BETWEEN INPUT   |-> FIRST-ORDER GAIN  =   9.2715664560011670-01
AND CALCULATED ANGLE OF ATTACK |   SECOND-ORDER GAIN =   9.6781323946780620-01

ANGLE-OF-ATTACK VARIANCE INDICATION =  2.1191330-04

COMPATIBILITY ESTIMATES OF THE |   BIAS =   3.5686461944139930-04
BIAS AND GAINS BETWEEN INPUT   |-> FIRST-ORDER GAIN  =   9.9091267576596620-01
AND CALCULATED ANGLE OF ATTACK |   SECOND-ORDER GAIN =   9.9287267517299700-02

ANGLE-OF-ATTACK VARIANCE INDICATION =  1.7583390-05

COMPATIBILITY ESTIMATES OF THE |   BIAS =   2.8447386472825440-04
BIAS AND GAINS BETWEEN INPUT   |-> FIRST-ORDER GAIN  =   1.3002899561462170 00
AND CALCULATED ANGLE OF ATTACK |   SECOND-ORDER GAIN =  -2.2618578237886440-02

ANGLE-OF-ATTACK VARIANCE INDICATION =  2.1372640-05

ITERATION 1   SUBITERATION 1

COST FUNCTION (J) =  8.1095286996644930D-03
WITH:
      STATIC PRESSURE TOLERANCE =  4.4043131866056080D-03
      LONGITUDINAL ACCELERATION TOLERANCE =  4.7836039044142950D-04

        1ST LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        2ND LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        3RD LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        PITCH ANGLE BIAS DELTA = -0.664262D-03
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        PHASE SHIFT DELTA =  0.0
        FLIGHT PATH ANGLE DELTA= -0.233901D-02

            UPDATED 1ST LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 2ND LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 3RD LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED PITCH ANGLE BIAS= -0.664262D-03
            UPDATED PHASE SHIFT=  0.0
            UPDATED FLIGHT PATH ANGLE BIAS= -0.233901D-02


ITERATION 1   SUBITERATION 2

COST FUNCTION (J) =  2.2670982828190970D-02
WITH:
       STATIC PRESSURE TOLERANCE =  2.3009465947978980D-01
       LONGITUDINAL ACCELERATION TOLERANCE =  1.3225388727970160D-03


        1ST LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        2ND LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        3RD LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        PITCH ANGLE BIAS DELTA =  0.533546D-03
        PHASE SHIFT DELTA =  0.0
        FLIGHT PATH ANGLE DELTA=  0.329728D-02

            UPDATED 1ST LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 2ND LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 3RD LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED PITCH ANGLE BIAS= -0.130723D-03
            UPDATED PHASE SHIFT=  0.0
            UPDATED FLIGHT PATH ANGLE BIAS=  0.958276D-03


ITERATION 1   SUBITERATION 3

COST FUNCTION (J) =  6.2085746882634810D-03
WITH:
       STATIC PRESSURE TOLERANCE =  1.2900150478162760D-02
       LONGITUDINAL ACCELERATION TOLERANCE =  3.6286218808085640D-04


        1ST LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        2ND LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        3RD LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        PITCH ANGLE BIAS DELTA = -0.841967D-04
        PHASE SHIFT DELTA =  0.0
        FLIGHT PATH ANGLE DELTA= -0.520521D-03

            UPDATED 1ST LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 2ND LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 3RD LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED PITCH ANGLE BIAS= -0.214919D-03
            UPDATED PHASE SHIFT=  0.0
            UPDATED FLIGHT PATH ANGLE BIAS=  0.437753D-03


ITERATION 1   SUBITERATION 4

COST FUNCTION (J) =  5.8094186859755870D-03
WITH:
       STATIC PRESSURE TOLERANCE =  7.7406881946161370D-04
       LONGITUDINAL ACCELERATION TOLERANCE =  3.4402363715684170D-04


        1ST LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        2ND LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        3RD LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        PITCH ANGLE BIAS DELTA =  0.132421D-04
        PHASE SHIFT DELTA =  0.0
        FLIGHT PATH ANGLE DELTA=  0.818657D-04

            UPDATED 1ST LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 2ND LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 3RD LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED PITCH ANGLE BIAS= -0.201677D-03
            UPDATED PHASE SHIFT=  0.0
            UPDATED FLIGHT PATH ANGLE BIAS=  0.519619D-03


ITERATION 1   SUBITERATION 5

COST FUNCTION (J) =  5.8670843604849140D-03
WITH:
       STATIC PRESSURE TOLERANCE =  1.4981966754492100D-03
       LONGITUDINAL ACCELERATION TOLERANCE =  3.4271211363231930D-04


        1ST LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        2ND LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        3RD LINEAR ACCELERATION DEPENDENCY DELTA=  0.0
        PITCH ANGLE BIAS DELTA = -0.208266D-05
        PHASE SHIFT DELTA =  0.0
        FLIGHT PATH ANGLE DELTA= -0.128763D-04

            UPDATED 1ST LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 2ND LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED 3RD LINEAR ACCELERATION DEPENDENCY=  0.0
            UPDATED PITCH ANGLE BIAS= -0.203760D-03
            UPDATED PHASE SHIFT=  0.0
            UPDATED FLIGHT PATH ANGLE BIAS=  0.506763D-03


ITERATION 1   SUBITERATION 6

COST FUNCTION (J) =  5.8680289517165900D-03
WITH:
       STATIC PRESSURE TOLERANCE =  1.3550147464220600D-03
       LONGITUDINAL ACCELERATION TOLERANCE =  3.4281385677011870D-04


      OF THE ABOVE  6 ITERATIONS, THE BEST COST FUNCTION HAS BEEN
      CHOSEN TO BE EQUAL TO  0.58670843604849140D-02, AND THE VALUES
      ASSOCIATED WITH THIS COST FUNCTION (PHASE SHIFT VALUE IS SUB-
      JECT TO A MAGNITUDE AND SIGN RESTRICTION) WILL BE USED TO MOD-
      IFY DATA.


COMPATIBILITY ESTIMATES OF THE |    BIAS =   6.7412956004448150D-04
BIAS AND GAINS BETWEEN INPUT   |-> FIRST-ORDER GAIN  =   9.3158092682910430D-01
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AND CALCULATED ANGLE OF ATTACK |   SECOND-ORDER GAIN =   9.0494923469608810-01

ANGLE-OF-ATTACK VARIANCE INDICATION =  2.0807230-06

COMPATIBILITY ESTIMATES OF THE |   BIAS =   3.5483829756373890-06
BIAS AND GAINS BETWEEN INPUT   |-> FIRST-ORDER GAIN  =   9.9077858437200300-01
AND CALCULATED ANGLE OF ATTACK |   SECOND-ORDER GAIN =   9.8971377674680600-02

ANGLE-OF-ATTACK VARIANCE INDICATION =  1.7052130-05

COMPATIBILITY ESTIMATES OF THE |   BIAS =   2.8919610405360770-06
BIAS AND GAINS BETWEEN INPUT   |-> FIRST-ORDER GAIN  =   9.9961035685720360-01
AND CALCULATED ANGLE OF ATTACK |   SECOND-ORDER GAIN =  -1.5039151944841880-02

ANGLE-OF-ATTACK VARIANCE INDICATION =  2.0220490-05

COST FUNCTION (J) =  8.3832076277039400D-03
WITH:
      STATIC PRESSURE TOLERANCE =  4.1763058806484110D-03
      LONGITUDINAL ACCELERATION TOLERANCE =  4.8376357620583830D-04
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FOURIER SERIES ANALYSIS WITH SPECIFIED HARMONICS

DATA POINT	TIME (SECS)	WEIGHT (NEWTONS)	PITCH ANGLE (RADIANS)	PITCH RATE (RADIAN/SEC)	AIRSPEED (M/SEC)
1	0.0	17666.063	0.0001668	0.0006116	77.9111
2	0.100	17666.049	0.0002340	0.0015716	77.9177
3	0.200	17666.034	0.0004361	0.0024112	77.9244
4	0.300	17666.020	0.0007776	0.0033076	77.9311
5	0.400	17666.005	0.0012572	0.0042354	77.9377
6	0.500	17665.991	0.0018695	0.0051650	77.9443
7	0.600	17665.977	0.0026046	0.0060651	77.9506
8	0.700	17665.962	0.0034484	0.0069029	77.9567
9	0.800	17665.948	0.0043829	0.0076453	77.9625
10	0.900	17665.933	0.0053865	0.0082596	77.9680
11	1.000	17665.919	0.0064342	0.0087152	77.9731
12	1.100	17665.905	0.0074989	0.0089849	77.9778
13	1.200	17665.890	0.0085516	0.0090462	77.9820
14	1.300	17665.876	0.0095626	0.0088792	77.9858
15	1.400	17665.861	0.0105024	0.0084763	77.9890
16	1.500	17665.847	0.0113427	0.0078336	77.9918
17	1.600	17665.833	0.0120578	0.0069569	77.9941
18	1.700	17665.818	0.0126244	0.0058613	77.9959
19	1.800	17665.804	0.0130253	0.0045709	77.9973
20	1.900	17665.790	0.0132474	0.0031196	77.9983
21	2.000	17665.775	0.0132844	0.0015502	77.9990
22	2.100	17665.761	0.0131368	-0.0000863	77.9993
23	2.200	17665.746	0.0128128	-0.0017313	77.9994
24	2.300	17665.732	0.0123281	-0.0033203	77.9992
25	2.400	17665.718	0.0117069	-0.0047841	77.9990
26	2.500	17665.703	0.0109808	-0.0060610	77.9986
27	2.600	17665.689	0.0101892	-0.0070490	77.9982
28	2.700	17665.674	0.0093781	-0.0077073	77.9977
29	2.800	17665.660	0.0086000	-0.0079591	77.9973
30	2.900	17665.646	0.0079120	-0.0077437	77.9969
31	3.000	17665.631	0.0073753	-0.0070086	77.9965
32	3.100	17665.617	0.0070533	-0.0057113	77.9961
33	3.200	17665.602	0.0070106	-0.0038213	77.9956
34	3.300	17665.588	0.0073107	-0.0013212	77.9950
35	3.400	17665.574	0.0080152	0.0017920	77.9942
36	3.500	17665.559	0.0091819	0.0055063	77.9931
37	3.600	17665.545	0.0108631	0.0097951	77.9915
38	3.700	17665.530	0.0131043	0.0146167	77.9892
39	3.800	17665.516	0.0159436	0.0199157	77.9860
40	3.900	17665.502	0.0194097	0.0256241	77.9816
41	4.000	17665.487	0.0236221	0.0316631	77.9757
42	4.100	17665.473	0.0282901	0.0379480	77.9679
43	4.200	17665.459	0.0337128	0.0443756	77.9577
44	4.300	17665.444	0.0397792	0.0508574	77.9446
45	4.400	17665.430	0.0464687	0.0572915	77.9281
46	4.500	17665.415	0.0537816	0.0635813	77.9075
47	4.600	17665.401	0.0615904	0.0696348	77.8822
48	4.700	17665.387	0.0699407	0.0753673	77.8518
49	4.800	17665.372	0.0787527	0.0807043	77.8148
50	4.900	17665.358	0.0879728	0.0855830	77.7714
51	5.000	17665.343	0.0975451	0.0899547	77.7206
52	5.100	17665.329	0.1074130	0.0937853	77.6618
53	5.200	17665.315	0.1175210	0.0970567	77.5945
54	5.300	17665.300	0.1278160	0.0997666	77.5182
55	5.400	17665.286	0.1382490	0.1019283	77.4325
56	5.500	17665.271	0.1487760	0.1035700	77.3370
57	5.600	17665.257	0.1593591	0.1047329	77.2315
58	5.700	17665.243	0.1699675	0.1054700	77.1159
59	5.800	17665.228	0.1805775	0.1058433	76.9901
60	5.900	17665.214	0.1911729	0.1059214	76.8542
61	6.000	17665.199	0.2017447	0.1057769	76.7082
62	6.100	17665.185	0.2122911	0.1054835	76.5522
63	6.200	17665.171	0.2228160	0.1051126	76.3863
64	6.300	17665.156	0.2333289	0.1047313	76.2108
65	6.400	17665.142	0.2438430	0.1043990	76.0256
66	6.500	17665.128	0.2543743	0.1041655	75.8315
67	6.600	17665.113	0.2649400	0.1040689	75.6280
68	6.700	17665.099	0.2755672	0.1041344	75.4153
69	6.800	17665.084	0.2862410	0.1043728	75.1937
70	6.900	17665.070	0.2970037	0.1047803	74.9631
71	7.000	17665.056	0.3078527	0.1053365	74.7235
72	7.100	17665.041	0.3187901	0.1060152	74.4750
73	7.200	17665.027	0.3298112	0.1067655	74.2175
74	7.300	17665.012	0.3409041	0.1075332	73.9510
75	7.400	17664.998	0.3520493	0.1082528	73.6753
76	7.500	17664.984	0.3632193	0.1088526	73.3904
77	7.600	17664.969	0.3743788	0.1092562	73.0963
78	7.700	17664.955	0.3854855	0.1093862	72.7930
79	7.800	17664.940	0.3964902	0.1091667	72.4805
80	7.900	17664.926	0.4073364	0.1085261	72.1500
81	8.000	17664.912	0.4179708	0.1073995	71.8280
82	8.100	17664.897	0.4283253	0.1057317	71.4884
83	8.200	17664.883	0.4383479	0.1034787	71.1401
84	8.300	17664.868	0.4479448	0.1006097	70.7836
85	8.400	17664.854	0.4570827	0.0971083	70.4192
86	8.500	17664.840	0.4656925	0.0929730	70.0473
87	8.600	17664.825	0.4737189	0.0882180	69.6686
88	8.700	17664.811	0.4811122	0.0828723	69.2836
89	8.800	17664.797	0.4878297	0.0769794	68.8931
90	8.900	17664.782	0.4938368	0.0705960	68.4978
91	9.000	17664.768	0.4991060	0.0637901	68.0979
92	9.100	17664.753	0.5036208	0.0566394	67.6947
93	9.200	17664.739	0.5073725	0.0492288	67.2888

94	9.300	17664.725	0.5103616	0.0416482	66.8809
95	9.400	17664.710	0.5125974	0.0339895	66.4715
96	9.500	17664.696	0.5140975	0.0263444	66.0614
97	9.600	17664.681	0.5148806	0.0188026	65.6512
98	9.700	17664.667	0.5149960	0.0114472	65.2412
99	9.800	17664.653	0.5144622	0.0043552	64.8321
100	9.900	17664.638	0.5133260	-0.0024059	64.4241
101	10.000	17664.624	0.5116309	-0.0087791	64.0177
102	10.100	17664.609	0.5094223	-0.0147193	63.6132
103	10.200	17664.595	0.5067457	-0.0201937	63.2109
104	10.300	17664.581	0.5036462	-0.0251821	62.8110
105	10.400	17664.566	0.5001667	-0.0296772	62.4137
106	10.500	17664.552	0.4963478	-0.0336838	62.0195
107	10.600	17664.537	0.4922263	-0.0372177	61.6284
108	10.700	17664.523	0.4878351	-0.0403081	61.2408
109	10.800	17664.509	0.4832025	-0.0429807	60.8570
110	10.900	17664.494	0.4783524	-0.0452864	60.4772
111	11.000	17664.480	0.4733037	-0.0472691	60.1017
112	11.100	17664.466	0.4680738	-0.0489793	59.7310
113	11.200	17664.451	0.4626640	-0.0504691	59.3652
114	11.300	17664.437	0.4570896	-0.0517902	59.0047
115	11.400	17664.422	0.4513509	-0.0529924	58.6499
116	11.500	17664.408	0.4454462	-0.0541221	58.3011
117	11.600	17664.394	0.4393801	-0.0552211	57.9585
118	11.700	17664.379	0.4331438	-0.0563284	57.6225
119	11.800	17664.365	0.4267361	-0.0574643	57.2933
120	11.900	17664.350	0.4201537	-0.0586605	56.9712
121	12.000	17664.336	0.4133939	-0.0599292	56.6564
122	12.100	17664.322	0.4064553	-0.0612785	56.3490
123	12.200	17664.307	0.3993381	-0.0627100	56.0494
124	12.300	17664.293	0.3920442	-0.0642189	55.7575
125	12.400	17664.278	0.3845775	-0.0657951	55.4735
126	12.500	17664.264	0.3769441	-0.0674240	55.1977
127	12.600	17664.250	0.3691519	-0.0690876	54.9700
128	12.700	17664.235	0.3612108	-0.0707689	54.6705
129	12.800	17664.221	0.3531322	-0.0724372	54.4194
130	12.900	17664.206	0.3449286	-0.0740803	54.1766
131	13.000	17664.192	0.3366135	-0.0756746	53.9423
132	13.100	17664.178	0.3282006	-0.0772018	53.7165
133	13.200	17664.163	0.3197036	-0.0786459	53.4993
134	13.300	17664.149	0.3111366	-0.0799945	53.2907
135	13.400	17664.135	0.3025089	-0.0812390	53.0908
136	13.500	17664.120	0.2938340	-0.0823746	52.8996
137	13.600	17664.106	0.2851203	-0.0834008	52.7172
138	13.700	17664.091	0.2763750	-0.0843208	52.5437
139	13.800	17664.077	0.2676031	-0.0851416	52.3791
140	13.900	17664.063	0.2588077	-0.0858731	52.2234
141	14.000	17664.048	0.2499806	-0.0865278	52.0768
142	14.100	17664.034	0.2411477	-0.0871200	51.9393
143	14.200	17664.019	0.2322791	-0.0876650	51.8110
144	14.300	17664.005	0.2233793	-0.0881785	51.6918
145	14.400	17663.991	0.2144426	-0.0886784	51.5820
146	14.500	17663.976	0.2054624	-0.0891695	51.4815
147	14.600	17663.962	0.1964318	-0.0896725	51.3904
148	14.700	17663.947	0.1873440	-0.0901938	51.3087
149	14.800	17663.933	0.1781924	-0.0907396	51.2365
150	14.900	17663.919	0.1689714	-0.0913129	51.1739
151	15.000	17663.904	0.1596764	-0.0919136	51.1209
152	15.100	17663.890	0.1503046	-0.0925380	51.0774
153	15.200	17663.875	0.1408548	-0.0931794	51.0435
154	15.300	17663.861	0.1313269	-0.0938283	51.0193
155	15.400	17663.847	0.1217242	-0.0944730	51.0047
156	15.500	17663.832	0.1120511	-0.0950999	50.9998
157	15.600	17663.818	0.1023137	-0.0956947	51.0046
158	15.700	17663.804	0.0925202	-0.0962425	51.0189
159	15.800	17663.789	0.0826800	-0.0967290	51.0429
160	15.900	17663.775	0.0728035	-0.0971412	51.0765
161	16.000	17663.760	0.0629023	-0.0974677	51.1197
162	16.100	17663.746	0.0529879	-0.0977000	51.1724
163	16.200	17663.732	0.0430719	-0.0978322	51.2346
164	16.300	17663.717	0.0331658	-0.0978620	51.3063
165	16.400	17663.703	0.0232797	-0.0977903	51.3874
166	16.500	17663.688	0.0134232	-0.0976220	51.4779
167	16.600	17663.674	0.0036039	-0.0973649	51.5776
168	16.700	17663.660	-0.0061718	-0.0970304	51.6866
169	16.800	17663.645	-0.0158908	-0.0966321	51.8049
170	16.900	17663.631	-0.0255767	-0.0961867	51.9322
171	17.000	17663.616	-0.0352023	-0.0957080	52.0686
172	17.100	17663.602	-0.0447771	-0.0952163	52.2139
173	17.200	17663.588	-0.0543034	-0.0947273	52.3682
174	17.300	17663.573	-0.0637843	-0.0942561	52.5313
175	17.400	17663.559	-0.0732237	-0.0938154	52.7032
176	17.500	17663.544	-0.0826257	-0.0934147	52.8837
177	17.600	17663.530	-0.0919940	-0.0930593	53.0728
178	17.700	17663.516	-0.1013317	-0.0927499	53.2703
179	17.800	17663.501	-0.1106403	-0.0924821	53.4762
180	17.900	17663.487	-0.1199196	-0.0922459	53.6902
181	18.000	17663.473	-0.1291666	-0.0920262	53.9125
182	18.100	17663.458	-0.1383762	-0.0918021	54.1426
183	18.200	17663.444	-0.1475395	-0.0915481	54.3806
184	18.300	17663.429	-0.1566444	-0.0912341	54.6262
185	18.400	17663.415	-0.1656762	-0.0908268	54.8794
186	18.500	17663.401	-0.1746124	-0.0902899	55.1398
187	18.600	17663.386	-0.1834331	-0.0895859	55.4074
188	18.700	17663.372	-0.1921108	-0.0886771	55.6819
189	18.800	17663.357	-0.2006161	-0.0875269	55.9631
190	18.900	17663.343	-0.2089169	-0.0861008	56.2508
191	19.000	17663.329	-0.2169789	-0.0843682	56.5447
192	19.100	17663.314	-0.2247665	-0.0823035	56.8447
193	19.200	17663.300	-0.2322434	-0.0798867	57.1504
194	19.300	17663.285	-0.2393729	-0.0771048	57.4616
195	19.400	17663.271	-0.2461198	-0.0739325	57.7780
196	19.500	17663.257	-0.2524492	-0.0704324	58.0994
197	19.600	17663.242	-0.2583300	-0.0665553	58.4253
198	19.700	17663.228	-0.2637335	-0.0623402	58.7557
199	19.800	17663.213	-0.2686346	-0.0578142	59.0900
200	19.900	17663.199	-0.2730128	-0.0530114	59.4281
201	20.000	17663.185	-0.2768521	-0.0479726	59.7695
202	20.100	17663.170	-0.2801419	-0.0427439	60.1139
203	20.200	17663.156	-0.2828768	-0.0373758	60.4610
204	20.300	17663.142	-0.2850369	-0.0319216	60.8103
205	20.400	17663.127	-0.2866875	-0.0264360	61.1616
206	20.500	17663.113	-0.2877793	-0.0209739	61.5143
207	20.600	17663.098	-0.2883478	-0.0155886	61.8681
208	20.700	17663.084	-0.2884128	-0.0103303	62.2225
209	20.800	17663.070	-0.2879980	-0.0052455	62.5772
210	20.900	17663.055	-0.2871306	-0.0003750	62.9317
211	21.000	17663.041	-0.2858401	0.0042463	63.2856
212	21.100	17663.026	-0.2841579	0.0085905	63.6383
213	21.200	17663.012	-0.2821166	0.0126373	63.9896
214	21.300	17662.998	-0.2797491	0.0163737	64.3391
215	21.400	17662.983	-0.2770879	0.0197943	64.6862
216	21.500	17662.969	-0.2741647	0.0229009	65.0306
217	21.600	17662.954	-0.2710096	0.0257020	65.3721
218	21.700	17662.940	-0.2676508	0.0282119	65.7102
219	21.800	17662.926	-0.2641130	0.0304501	66.0446
220	21.900	17662.911	-0.2604199	0.0324398	66.3750
221	22.000	17662.897	-0.2565911	0.0342072	66.7013
222	22.100	17662.882	-0.2526434	0.0357799	67.0231
223	22.200	17662.868	-0.2485910	0.0371863	67.3404
224	22.300	17662.854	-0.2444449	0.0384537	67.6528
225	22.400	17662.839	-0.2402138	0.0396081	67.9603

226	22.500	17662.825	-0.2359038	0.0406727	68.2628
227	22.600	17662.811	-0.2315196	0.0416673	68.5601
228	22.700	17662.796	-0.2270638	0.0426081	68.8521
229	22.800	17662.782	-0.2225368	0.0435069	69.1388
230	22.900	17662.767	-0.2179446	0.0443712	69.4201
231	23.000	17662.753	-0.2132830	0.0452042	69.6959
232	23.100	17662.739	-0.2085568	0.0460051	69.9662
233	23.200	17662.724	-0.2037619	0.0467606	70.2309
234	23.300	17662.710	-0.1989060	0.0474903	70.4900
235	23.400	17662.695	-0.1939907	0.0481573	70.7434
236	23.500	17662.681	-0.1890203	0.0487595	70.9910
237	23.600	17662.667	-0.1840004	0.0492849	71.2329
238	23.700	17662.652	-0.1789360	0.0497215	71.4690
239	23.800	17662.638	-0.1738409	0.0500582	71.6992
240	23.900	17662.623	-0.1687181	0.0502855	71.9235
241	24.000	17662.609	-0.1635795	0.0503960	72.1419
242	24.100	17662.595	-0.1584355	0.0503851	72.3543
243	24.200	17662.580	-0.1532968	0.0502508	72.5606
244	24.300	17662.566	-0.1481762	0.0499946	72.7613
245	24.400	17662.551	-0.1430786	0.0496214	72.9559
246	24.500	17662.537	-0.1380200	0.0491385	73.1445
247	24.600	17662.523	-0.1330079	0.0485563	73.3273
248	24.700	17662.508	-0.1280510	0.0478877	73.5043
249	24.800	17662.494	-0.1231567	0.0471472	73.6754
250	24.900	17662.480	-0.1183316	0.0463505	73.8409
251	25.000	17662.465	-0.1135801	0.0455142	74.0006
252	25.100	17662.451	-0.1089067	0.0446546	74.1551
253	25.200	17662.436	-0.1043137	0.0437872	74.3041
254	25.300	17662.422	-0.0998025	0.0429263	74.4477
255	25.400	17662.408	-0.0953735	0.0420842	74.5861
256	25.500	17662.393	-0.0910264	0.0412709	74.7194
257	25.600	17662.379	-0.0867601	0.0404940	74.8478
258	25.700	17662.364	-0.0825731	0.0397577	74.9714
259	25.800	17662.350	-0.0784639	0.0390636	75.0902
260	25.900	17662.336	-0.0744308	0.0384103	75.2045
261	26.000	17662.321	-0.0704726	0.0377938	75.3142
262	26.100	17662.307	-0.0665883	0.0372074	75.4197
263	26.200	17662.292	-0.0627777	0.0366426	75.5208
264	26.300	17662.278	-0.0590411	0.0360893	75.6178
265	26.400	17662.264	-0.0553799	0.0355363	75.7106
266	26.500	17662.249	-0.0517960	0.0349720	75.7998
267	26.600	17662.235	-0.0482923	0.0343851	75.8850
268	26.700	17662.220	-0.0448724	0.0337647	75.9665
269	26.800	17662.206	-0.0415406	0.0331012	76.0442
270	26.900	17662.192	-0.0383015	0.0323867	76.1185
271	27.000	17662.177	-0.0351604	0.0316153	76.1892
272	27.100	17662.163	-0.0321223	0.0307833	76.2566
273	27.200	17662.149	-0.0291924	0.0298895	76.3206
274	27.300	17662.134	-0.0263758	0.0289351	76.3815
275	27.400	17662.120	-0.0236766	0.0279239	76.4392
276	27.500	17662.105	-0.0210986	0.0268619	76.4939
277	27.600	17662.091	-0.0186447	0.0257570	76.5457
278	27.700	17662.077	-0.0163166	0.0246190	76.5947
279	27.800	17662.062	-0.0141151	0.0234589	76.6409
280	27.900	17662.048	-0.0120396	0.0222888	76.6844
281	28.000	17662.033	-0.0100883	0.0211210	76.7254
282	28.100	17662.019	-0.0082582	0.0199679	76.7640
283	28.200	17662.005	-0.0065451	0.0188414	76.8002
284	28.300	17661.990	-0.0049437	0.0177526	76.8342
285	28.400	17661.976	-0.0034477	0.0167113	76.8660
286	28.500	17661.961	-0.0020501	0.0157256	76.8957
287	28.600	17661.947	-0.0007431	0.0148021	76.9235
288	28.700	17661.933	0.0004813	0.0139454	76.9495
289	28.800	17661.918	0.0016315	0.0131578	76.9737
290	28.900	17661.904	0.0027156	0.0124398	76.9962
291	29.000	17661.889	0.0037417	0.0117898	77.0172
292	29.100	17661.875	0.0047170	0.0112044	77.0366
293	29.200	17661.861	0.0056482	0.0106786	77.0546
294	29.300	17661.846	0.0065412	0.0102056	77.0713
295	29.400	17661.832	0.0074006	0.0097779	77.0867
296	29.500	17661.818	0.0082298	0.0093866	77.1008
297	29.600	17661.803	0.0090310	0.0090226	77.1138
298	29.700	17661.789	0.0098051	0.0086763	77.1258
299	29.800	17661.774	0.0105516	0.0083381	77.1367
300	29.900	17661.760	0.0112686	0.0079987	77.1467
301	30.000	17661.746	0.0119530	0.0076496	77.1558
302	30.100	17661.731	0.0126007	0.0072827	77.1641
303	30.200	17661.717	0.0132066	0.0068913	77.1717
304	30.300	17661.702	0.0137648	0.0064697	77.1786
305	30.400	17661.688	0.0142691	0.0060137	77.1848
306	30.500	17661.674	0.0147128	0.0055206	77.1905
307	30.600	17661.659	0.0150895	0.0049893	77.1957
308	30.700	17661.645	0.0153929	0.0044203	77.2005
309	30.800	17661.630	0.0156176	0.0038161	77.2048
310	30.900	17661.616	0.0157590	0.0031807	77.2089
311	31.000	17661.602	0.0158138	0.0025200	77.2126
312	31.100	17661.587	0.0157801	0.0018414	77.2162
313	31.200	17661.573	0.0156579	0.0011539	77.2196
314	31.300	17661.558	0.0154490	0.0004682	77.2229
315	31.400	17661.544	0.0151573	-0.0002039	77.2261
316	31.500	17661.530	0.0147891	-0.0008498	77.2293
317	31.600	17661.515	0.0143526	-0.0014557	77.2326
318	31.700	17661.501	0.0138584	-0.0020076	77.2359
319	31.800	17661.487	0.0133191	-0.0024914	77.2393
320	31.900	17661.472	0.0127491	-0.0028934	77.2428
321	32.000	17661.458	0.0121645	-0.0032006	77.2465
322	32.100	17661.443	0.0115827	-0.0034012	77.2504
323	32.200	17661.429	0.0110220	-0.0034855	77.2545
324	32.300	17661.415	0.0105009	-0.0034458	77.2588
325	32.400	17661.400	0.0100381	-0.0032773	77.2634
326	32.500	17661.386	0.0096516	-0.0029784	77.2681
327	32.600	17661.371	0.0093580	-0.0025511	77.2730
328	32.700	17661.357	0.0091723	-0.0020013	77.2781
329	32.800	17661.343	0.0091072	-0.0013393	77.2833

DATA POINT	TIME (SECS)	DENSITY (KG/M**3)	ANGLE OF ATTACK (RADIANS)	TEMPERATURE (DEG-K)	ACCELERATION (M/SEC**2)
1	0.0	0.86954072	0.0102682	272.91	0.06614
2	0.100	0.86954719	0.0096939	272.93	0.06687
3	0.200	0.86955318	0.0092223	272.94	0.06710
4	0.300	0.86955866	0.0088623	272.96	0.06677
5	0.400	0.86956363	0.0086197	272.97	0.06587
6	0.500	0.86956809	0.0084969	272.99	0.06438
7	0.600	0.86957201	0.0084923	273.01	0.06232
8	0.700	0.86957543	0.0086007	273.02	0.05970
9	0.800	0.86957833	0.0088133	273.04	0.05657
10	0.900	0.86958075	0.0091174	273.05	0.05295
11	1.000	0.86958270	0.0094973	273.07	0.04893
12	1.100	0.86958421	0.0099343	273.08	0.04456
13	1.200	0.86958532	0.0104073	273.10	0.03993
14	1.300	0.86958606	0.0108936	273.11	0.03512
15	1.400	0.86958647	0.0113696	273.13	0.03023
16	1.500	0.86958660	0.0118111	273.14	0.02536
17	1.600	0.86958648	0.0121956	273.16	0.02061
18	1.700	0.86958617	0.0125013	273.17	0.01608
19	1.800	0.86958571	0.0127096	273.18	0.01187
20	1.900	0.86958518	0.0128052	273.19	0.00807
21	2.000	0.86958462	0.0127770	273.21	0.00473

22	2.100	0.86958306	0.0126187	273.22	0.00191
23	2.200	0.86958320	0.0124296	273.23	-0.00036
24	2.300	0.86958256	0.0119144	273.24	-0.00207
25	2.400	0.86958195	0.0113841	273.25	-0.00327
26	2.500	0.86958139	0.0107581	273.26	-0.00399
27	2.600	0.86958087	0.0100494	273.27	-0.00432
28	2.700	0.86958037	0.0092941	273.28	-0.00435
29	2.800	0.86957985	0.0085203	273.29	-0.00421
30	2.900	0.86957927	0.0077630	273.30	-0.00405
31	3.000	0.86957858	0.0070694	273.30	-0.00402
32	3.100	0.86957769	0.0064482	273.31	-0.00431
33	3.200	0.86957652	0.0059686	273.32	-0.00514
34	3.300	0.86957496	0.0056691	273.33	-0.00674
35	3.400	0.86957289	0.0055563	273.33	-0.00938
36	3.500	0.86957018	0.0056941	273.34	-0.01330
37	3.600	0.86956667	0.0061026	273.34	-0.01909
38	3.700	0.86956219	0.0068071	273.35	-0.02693
39	3.800	0.86955658	0.0078275	273.35	-0.03736
40	3.900	0.86954963	0.0091779	273.35	-0.05088
41	4.000	0.86954116	0.0108655	273.36	-0.06806
42	4.100	0.86953094	0.0128905	273.36	-0.08945
43	4.200	0.86951876	0.0152462	273.36	-0.11564
44	4.300	0.86950440	0.0179182	273.36	-0.14719
45	4.400	0.86948762	0.0208852	273.36	-0.18459
46	4.500	0.86946819	0.0241190	273.36	-0.22828
47	4.600	0.86944587	0.0275848	273.36	-0.27856
48	4.700	0.86942043	0.0312425	273.36	-0.33562
49	4.800	0.86939164	0.0350471	273.36	-0.39949
50	4.900	0.86935925	0.0389500	273.36	-0.47000
51	5.000	0.86932304	0.0429003	273.36	-0.54685
52	5.100	0.86928279	0.0468466	273.36	-0.62954
53	5.200	0.86923828	0.0507379	273.35	-0.71746
54	5.300	0.86918930	0.0545259	273.35	-0.80982
55	5.400	0.86913566	0.0581658	273.35	-0.90582
56	5.500	0.86907716	0.0616187	273.34	-1.00455
57	5.600	0.86901362	0.0648620	273.34	-1.10514
58	5.700	0.86894487	0.0678608	273.33	-1.20673
59	5.800	0.86887077	0.0705690	273.33	-1.30855
60	5.900	0.86879116	0.0730290	273.32	-1.40995
61	6.000	0.86870592	0.0752222	273.32	-1.51037
62	6.100	0.86861492	0.0771587	273.31	-1.60945
63	6.200	0.86851808	0.0788564	273.31	-1.70694
64	6.300	0.86841530	0.0803399	273.30	-1.80274
65	6.400	0.86830650	0.0816398	273.29	-1.89691
66	6.500	0.86819164	0.0827904	273.29	-1.98957
67	6.600	0.86807067	0.0838287	273.28	-2.08098
68	6.700	0.86794356	0.0847925	273.27	-2.17143
69	6.800	0.86781030	0.0857186	273.26	-2.26124
70	6.900	0.86767091	0.0866412	273.26	-2.35075
71	7.000	0.86752541	0.0875906	273.25	-2.44027
72	7.100	0.86737384	0.0885916	273.24	-2.53006
73	7.200	0.86721625	0.0896623	273.23	-2.62032
74	7.300	0.86705272	0.0908136	273.22	-2.71117
75	7.400	0.86688335	0.0920479	273.21	-2.80263
76	7.500	0.86670825	0.0933597	273.20	-2.89463
77	7.600	0.86652783	0.0947348	273.19	-2.98698
78	7.700	0.86634135	0.0961508	273.18	-3.07937
79	7.800	0.86614986	0.0975777	273.17	-3.17140
80	7.900	0.86595322	0.0989787	273.16	-3.26257
81	8.000	0.86575164	0.1003117	273.15	-3.35226
82	8.100	0.86554530	0.1015300	273.14	-3.43980
83	8.200	0.86533442	0.1025845	273.13	-3.52448
84	8.300	0.86511923	0.1034254	273.12	-3.60552
85	8.400	0.86489994	0.1040038	273.11	-3.68218
86	8.500	0.86467681	0.1042738	273.10	-3.75373
87	8.600	0.86445008	0.1041941	273.09	-3.81951
88	8.700	0.86422000	0.1037302	273.08	-3.87895
89	8.800	0.86398685	0.1028584	273.07	-3.93161
90	8.900	0.86375088	0.1015522	273.05	-3.97717
91	9.000	0.86351236	0.0998131	273.04	-4.01547
92	9.100	0.86327156	0.0976413	273.03	-4.04649
93	9.200	0.86302876	0.0950505	273.02	-4.07040
94	9.300	0.86278423	0.0920446	273.01	-4.08745
95	9.400	0.86253824	0.0887171	272.99	-4.09806
96	9.500	0.86229107	0.0850496	272.98	-4.10269
97	9.600	0.86204300	0.0811119	272.97	-4.10188
98	9.700	0.86179429	0.0769577	272.95	-4.09619
99	9.800	0.86154523	0.0726484	272.94	-4.08617
100	9.900	0.86129609	0.0682356	272.93	-4.07232
101	10.000	0.86104712	0.0637678	272.92	-4.05508
102	10.100	0.86079861	0.0593621	272.90	-4.03480
103	10.200	0.86055082	0.0550144	272.89	-4.01174
104	10.300	0.86030402	0.0507968	272.87	-3.98607
105	10.400	0.86005845	0.0467589	272.86	-3.95787
106	10.500	0.85981438	0.0429326	272.85	-3.92711
107	10.600	0.85957205	0.0393609	272.83	-3.89374
108	10.700	0.85933171	0.0360676	272.82	-3.85764
109	10.800	0.85909360	0.0330726	272.81	-3.81867
110	10.900	0.85885794	0.0303887	272.79	-3.77670
111	11.000	0.85862495	0.0280216	272.78	-3.73159
112	11.100	0.85839486	0.0259707	272.76	-3.68326
113	11.200	0.85816784	0.0242294	272.75	-3.63165
114	11.300	0.85794411	0.0227856	272.73	-3.57678
115	11.400	0.85772382	0.0216233	272.72	-3.51870
116	11.500	0.85750716	0.0207214	272.71	-3.45751
117	11.600	0.85729426	0.0200566	272.69	-3.39335
118	11.700	0.85708528	0.0196030	272.68	-3.32642
119	11.800	0.85688034	0.0193335	272.66	-3.25693
120	11.900	0.85667954	0.0192203	272.65	-3.18511
121	12.000	0.85648299	0.0192357	272.63	-3.11120
122	12.100	0.85629078	0.0193531	272.62	-3.03543
123	12.200	0.85610297	0.0195474	272.60	-2.95803
124	12.300	0.85591963	0.0197956	272.59	-2.87921
125	12.400	0.85574080	0.0200776	272.57	-2.79916
126	12.500	0.85556652	0.0203762	272.56	-2.71804
127	12.600	0.85539682	0.0206772	272.54	-2.63600
128	12.700	0.85523172	0.0209701	272.53	-2.55315
129	12.800	0.85507122	0.0212474	272.51	-2.46957
130	12.900	0.85491532	0.0215050	272.50	-2.38534
131	13.000	0.85476403	0.0217416	272.48	-2.30051
132	13.100	0.85461732	0.0219586	272.47	-2.21511
133	13.200	0.85447518	0.0221692	272.45	-2.12915
134	13.300	0.85433761	0.0223486	272.44	-2.04264
135	13.400	0.85420457	0.0225330	272.42	-1.95556
136	13.500	0.85407605	0.0227194	272.41	-1.86792
137	13.600	0.85395203	0.0229149	272.39	-1.77970
138	13.700	0.85383250	0.0231263	272.38	-1.69088
139	13.800	0.85371742	0.0233596	272.37	-1.60145
140	13.900	0.85360680	0.0236196	272.35	-1.51140
141	14.000	0.85350061	0.0239103	272.34	-1.42072
142	14.100	0.85339886	0.0242337	272.32	-1.32942
143	14.200	0.85330152	0.0245903	272.31	-1.23749
144	14.300	0.85320861	0.0249788	272.30	-1.14495
145	14.400	0.85312012	0.0253964	272.29	-1.05182
146	14.500	0.85303605	0.0258387	272.27	-0.95813
147	14.600	0.85295641	0.0263302	272.26	-0.86392
148	14.700	0.85288121	0.0267740	272.25	-0.76922
149	14.800	0.85281046	0.0272527	272.23	-0.67409
150	14.900	0.85274417	0.0277283	272.22	-0.57857
151	15.000	0.85268234	0.0281928	272.21	-0.48274
152	15.100	0.85262499	0.0286183	272.20	-0.38663
153	15.200	0.85257214	0.0290674	272.19	-0.29033

154	15.300	0.85252379	0.0294437	272.17	-0.19390
155	15.400	0.85247994	0.0297917	272.16	-0.09739
156	15.500	0.85244062	0.0300972	272.15	-0.00089
157	15.600	0.85240581	0.0303574	272.14	0.09555
158	15.700	0.85237553	0.0305709	272.13	0.19187
159	15.800	0.85234978	0.0307378	272.12	0.28800
160	15.900	0.85232856	0.0308596	272.11	0.38389
161	16.000	0.85231185	0.0309382	272.10	0.47947
162	16.100	0.85229967	0.0309779	272.09	0.57470
163	16.200	0.85229200	0.0309828	272.08	0.66954
164	16.300	0.85228884	0.0309576	272.07	0.76392
165	16.400	0.85229018	0.0309072	272.07	0.85782
166	16.500	0.85229601	0.0308364	272.06	0.95120
167	16.600	0.85230633	0.0307496	272.05	1.04401
168	16.700	0.85232112	0.0306499	272.05	1.13623
169	16.800	0.85234038	0.0305403	272.04	1.22781
170	16.900	0.85236411	0.0304220	272.03	1.31873
171	17.000	0.85239231	0.0302949	272.02	1.40894
172	17.100	0.85242496	0.0301578	272.02	1.49842
173	17.200	0.85246207	0.0300080	272.01	1.58712
174	17.300	0.85250365	0.0298413	272.01	1.67499
175	17.400	0.85254968	0.0296528	272.00	1.76199
176	17.500	0.85260018	0.0294365	272.00	1.84805
177	17.600	0.85265514	0.0291858	271.99	1.93313
178	17.700	0.85271458	0.0288939	271.99	2.01714
179	17.800	0.85277848	0.0285544	271.99	2.10001
180	17.900	0.85284685	0.0281614	271.98	2.18166
181	18.000	0.85291969	0.0277100	271.98	2.26200
182	18.100	0.85299699	0.0271966	271.98	2.34093
183	18.200	0.85307874	0.0266205	271.97	2.41835
184	18.300	0.85316493	0.0259818	271.97	2.49414
185	18.400	0.85325554	0.0252840	271.97	2.56821
186	18.500	0.85335055	0.0245332	271.97	2.64043
187	18.600	0.85344993	0.0237383	271.97	2.71069
188	18.700	0.85355363	0.0229102	271.97	2.77888
189	18.800	0.85366162	0.0220640	271.97	2.84489
190	18.900	0.85377384	0.0212162	271.97	2.90861
191	19.000	0.85389022	0.0203856	271.97	2.96993
192	19.100	0.85401072	0.0195929	271.97	3.02876
193	19.200	0.85413524	0.0188601	271.97	3.08500
194	19.300	0.85426370	0.0182098	271.97	3.13855
195	19.400	0.85439602	0.0176649	271.97	3.18932
196	19.500	0.85453210	0.0172477	271.98	3.23720
197	19.600	0.85467184	0.0169796	271.98	3.28211
198	19.700	0.85481512	0.0168800	271.98	3.32393
199	19.800	0.85496183	0.0169646	271.98	3.36255
200	19.900	0.85511185	0.0172546	271.99	3.39787
201	20.000	0.85526505	0.0177551	271.99	3.42975
202	20.100	0.85542131	0.0184762	272.00	3.45908
203	20.200	0.85558048	0.0194222	272.00	3.48272
204	20.300	0.85574244	0.0205933	272.01	3.50354
205	20.400	0.85590703	0.0219854	272.01	3.52043
206	20.500	0.85607412	0.0235901	272.02	3.53327
207	20.600	0.85624356	0.0253952	272.03	3.54194
208	20.700	0.85641518	0.0273841	272.03	3.54639
209	20.800	0.85658885	0.0295368	272.04	3.54655
210	20.900	0.85676435	0.0318301	272.05	3.54239
211	21.000	0.85694164	0.0342378	272.06	3.53392
212	21.100	0.85712045	0.0367315	272.06	3.52120
213	21.200	0.85730064	0.0392815	272.07	3.50431
214	21.300	0.85748204	0.0418570	272.08	3.48337
215	21.400	0.85766448	0.0444273	272.09	3.45855
216	21.500	0.85784777	0.0469623	272.10	3.43004
217	21.600	0.85803175	0.0494532	272.11	3.39808
218	21.700	0.85821622	0.0518133	272.12	3.36291
219	21.800	0.85840101	0.0540789	272.13	3.32481
220	21.900	0.85858592	0.0562091	272.14	3.28405
221	22.000	0.85877078	0.0581869	272.15	3.24092
222	22.100	0.85895539	0.0599993	272.16	3.19570
223	22.200	0.85913957	0.0616370	272.17	3.14865
224	22.300	0.85932314	0.0630951	272.18	3.10002
225	22.400	0.85950592	0.0643723	272.19	3.05003
226	22.500	0.85968771	0.0654710	272.20	2.99889
227	22.600	0.85986836	0.0663967	272.21	2.94675
228	22.700	0.86004768	0.0671577	272.22	2.89376
229	22.800	0.86022551	0.0677644	272.23	2.84003
230	22.900	0.86040168	0.0682286	272.24	2.78564
231	23.000	0.86057606	0.0685632	272.26	2.73065
232	23.100	0.86074847	0.0687813	272.27	2.67510
233	23.200	0.86091875	0.0688960	272.28	2.61902
234	23.300	0.86108688	0.0689194	272.29	2.56242
235	23.400	0.86125261	0.0688626	272.30	2.50534
236	23.500	0.86141586	0.0687353	272.31	2.44778
237	23.600	0.86157653	0.0685455	272.32	2.38976
238	23.700	0.86173450	0.0682995	272.33	2.33133
239	23.800	0.86188969	0.0680015	272.34	2.27253
240	23.900	0.86204201	0.0676546	272.35	2.21341
241	24.000	0.86219136	0.0672592	272.36	2.15405
242	24.100	0.86233769	0.0668156	272.37	2.09454
243	24.200	0.86248092	0.0663226	272.38	2.03498
244	24.300	0.86262098	0.0657780	272.39	1.97548
245	24.400	0.86275753	0.0651798	272.40	1.91616
246	24.500	0.86289142	0.0645256	272.41	1.85714
247	24.600	0.86302169	0.0638135	272.42	1.79855
248	24.700	0.86314862	0.0630426	272.43	1.74052
249	24.800	0.86327217	0.0622125	272.44	1.68315
250	24.900	0.86339231	0.0613243	272.44	1.62658
251	25.000	0.86350903	0.0603803	272.45	1.57090
252	25.100	0.86362231	0.0593843	272.46	1.51619
253	25.200	0.86373214	0.0583414	272.47	1.46255
254	25.300	0.86383852	0.0572580	272.47	1.41002
255	25.400	0.86394145	0.0561415	272.48	1.35866
256	25.500	0.86404094	0.0550005	272.49	1.30849
257	25.600	0.86413701	0.0538440	272.49	1.25953
258	25.700	0.86422968	0.0526815	272.50	1.21179
259	25.800	0.86431898	0.0515224	272.50	1.16525
260	25.900	0.86440494	0.0503759	272.51	1.11990
261	26.000	0.86448760	0.0492506	272.51	1.07571
262	26.100	0.86456702	0.0481534	272.52	1.03265
263	26.200	0.86464325	0.0470913	272.52	0.99067
264	26.300	0.86471633	0.0460688	272.52	0.94976
265	26.400	0.86478634	0.0450893	272.53	0.90996
266	26.500	0.86485334	0.0441541	272.53	0.87096
267	26.600	0.86491741	0.0432632	272.53	0.83301
268	26.700	0.86497860	0.0424144	272.54	0.79599
269	26.800	0.86503700	0.0416042	272.54	0.75990
270	26.900	0.86509268	0.0408275	272.54	0.72470
271	27.000	0.86514572	0.0400780	272.54	0.69039
272	27.100	0.86519619	0.0393483	272.55	0.65698
273	27.200	0.86524417	0.0386304	272.55	0.62445
274	27.300	0.86528972	0.0379159	272.55	0.59282
275	27.400	0.86533293	0.0371966	272.55	0.56210
276	27.500	0.86537386	0.0364643	272.55	0.53230
277	27.600	0.86541258	0.0357118	272.56	0.50344
278	27.700	0.86544914	0.0349329	272.56	0.47552
279	27.800	0.86548362	0.0341225	272.56	0.44857
280	27.900	0.86551607	0.0332776	272.56	0.42260
281	28.000	0.86554655	0.0323967	272.56	0.39762
282	28.100	0.86557511	0.0314777	272.56	0.37365
283	28.200	0.86560181	0.0305255	272.57	0.35064
284	28.300	0.86562669	0.0295426	272.57	0.32872
285	28.400	0.86564981	0.0285357	272.57	0.30775

286	28.500	0.86567122	0.0278412	272.57	0.28777
287	28.600	0.86569098	0.0264781	272.57	0.26875
288	28.700	0.86570914	0.0254462	272.58	0.25067
289	28.800	0.86572574	0.0244261	272.58	0.23350
290	28.900	0.86574026	0.0234280	272.58	0.21720
291	29.000	0.86575456	0.0224686	272.59	0.20173
292	29.100	0.86576668	0.0215478	272.59	0.18707
293	29.200	0.86577791	0.0206844	272.59	0.17318
294	29.300	0.86578771	0.0198886	272.60	0.16003
295	29.400	0.86579636	0.0191591	272.60	0.14758
296	29.500	0.86580392	0.0185110	272.61	0.13583
297	29.600	0.86581048	0.0179488	272.61	0.12475
298	29.700	0.86581611	0.0174658	272.62	0.11433
299	29.800	0.86582090	0.0170714	272.62	0.10456
300	29.900	0.86582493	0.0167603	272.63	0.09545
301	30.000	0.86582827	0.0165284	272.64	0.08699
302	30.100	0.86583100	0.0163690	272.64	0.07918
303	30.200	0.86583321	0.0162738	272.65	0.07201
304	30.300	0.86583497	0.0162323	272.66	0.06548
305	30.400	0.86583634	0.0162324	272.67	0.05958
306	30.500	0.86583739	0.0162600	272.68	0.05430
307	30.600	0.86583818	0.0163033	272.69	0.04963
308	30.700	0.86583877	0.0163451	272.70	0.04555
309	30.800	0.86583920	0.0163714	272.71	0.04204
310	30.900	0.86583951	0.0163677	272.72	0.03909
311	31.000	0.86583973	0.0163203	272.73	0.03667
312	31.100	0.86583989	0.0162169	272.74	0.03477
313	31.200	0.86584000	0.0160468	272.75	0.03338
314	31.300	0.86584006	0.0158017	272.76	0.03249
315	31.400	0.86584012	0.0154753	272.78	0.03206
316	31.500	0.86584013	0.0150645	272.79	0.03209
317	31.600	0.86584008	0.0145680	272.80	0.03256
318	31.700	0.86583997	0.0139906	272.82	0.03343
319	31.800	0.86583976	0.0133386	272.83	0.03466
320	31.900	0.86583943	0.0126121	272.84	0.03621
321	32.000	0.86583895	0.0118112	272.86	0.03802
322	32.100	0.86583829	0.0110062	272.87	0.04003
323	32.200	0.86583740	0.0101525	272.89	0.04215
324	32.300	0.86583626	0.0092800	272.90	0.04430
325	32.400	0.86583482	0.0084273	272.92	0.04638
326	32.500	0.86583305	0.0075920	272.93	0.04832
327	32.600	0.86583090	0.0067989	272.95	0.05002
328	32.700	0.86582836	0.0060655	272.96	0.05140
329	32.800	0.86582539	0.0054077	272.98	0.05238

DATA POINT	TIME (SECS)	ANGLE-OF-ATTACK RATE (RADIAN/SEC)	ALTITUDE (METERS)	ALTITUDE RATE (M/SEC)	ALT. ACCEL. (M/SEC**2)	VERT. ACCEL. (M/SEC**2)	ELEV. DEFLECT. (RADIANS)
1	0.0	-0.006210038	3439.15	-0.74	0.51	0.0	0.0
2	0.100	-0.005346949	3439.08	-0.69	0.54	0.0	0.0
3	0.200	-0.004170505	3439.01	-0.64	0.56	0.0	0.0
4	0.300	-0.003019563	3438.95	-0.58	0.57	0.0	0.0
5	0.400	-0.001927926	3438.89	-0.52	0.55	0.0	0.0
6	0.500	-0.000631957	3438.84	-0.46	0.58	0.0	0.0
7	0.600	0.000531064	3438.80	-0.41	0.57	0.0	0.0
8	0.700	0.001623047	3438.76	-0.35	0.56	0.0	0.0
9	0.800	0.002607294	3438.73	-0.29	0.54	0.0	0.0
10	0.900	0.003449239	3438.70	-0.24	0.52	0.0	0.0
11	1.000	0.004117811	3438.68	-0.19	0.49	0.0	0.0
12	1.100	0.004586681	3438.67	-0.14	0.45	0.0	0.0
13	1.200	0.004835446	3438.65	-0.10	0.41	0.0	0.0
14	1.300	0.004850714	3438.65	-0.06	0.36	0.0	0.0
15	1.400	0.004627021	3438.64	-0.03	0.32	0.0	0.0
16	1.500	0.004167530	3438.64	0.00	0.27	0.0	0.0
17	1.600	0.003484456	3438.64	0.02	0.22	0.0	0.0
18	1.700	0.002599163	3438.64	0.04	0.17	0.0	0.0
19	1.800	0.001541984	3438.65	0.06	0.12	0.0	0.0
20	1.900	0.000351418	3438.66	0.07	0.07	0.0	0.0
21	2.000	-0.000926703	3438.66	0.07	0.03	0.0	0.0
22	2.100	-0.002240669	3438.67	0.07	-0.00	0.0	0.0
23	2.200	-0.003534553	3438.68	0.07	-0.03	0.0	0.0
24	2.300	-0.004750124	3438.68	0.07	-0.04	0.0	0.0
25	2.400	-0.005828915	3438.69	0.06	-0.05	0.0	0.0
26	2.500	-0.006714349	3438.70	0.06	-0.04	0.0	0.0
27	2.600	-0.007353812	3438.70	0.06	-0.02	0.0	0.0
28	2.700	-0.007700587	3438.71	0.06	0.01	0.0	0.0
29	2.800	-0.007715543	3438.71	0.06	0.06	0.0	0.0
30	2.900	-0.007168537	3438.72	0.07	0.13	0.0	0.0
31	3.000	-0.006639450	3438.73	0.09	0.21	0.0	0.0
32	3.100	-0.005518862	3438.74	0.11	0.31	0.0	0.0
33	3.200	-0.004008357	3438.75	0.15	0.43	0.0	0.0
34	3.300	-0.002120482	3438.77	0.20	0.56	0.0	0.0
35	3.400	0.000121602	3438.79	0.26	0.71	0.0	0.0
36	3.500	0.002684718	3438.82	0.34	0.88	0.0	0.0
37	3.600	0.005526485	3438.86	0.44	1.06	0.0	0.0
38	3.700	0.008596299	3438.91	0.55	1.26	0.0	0.0
39	3.800	0.011836434	3438.97	0.69	1.47	0.0	0.0
40	3.900	0.015183269	3439.05	0.85	1.69	0.0	0.0
41	4.000	0.018560618	3439.14	1.03	1.93	0.0	0.0
42	4.100	0.021921178	3439.26	1.24	2.17	0.0	0.0
43	4.200	0.025168107	3439.39	1.46	2.42	0.0	0.0
44	4.300	0.028236743	3439.55	1.72	2.67	0.0	0.0
45	4.400	0.031056477	3439.74	2.00	2.93	0.0	0.0
46	4.500	0.033560750	3439.95	2.31	3.19	0.0	0.0
47	4.600	0.035687157	3440.20	2.64	3.46	0.0	0.0
48	4.700	0.037389591	3440.48	3.00	3.72	0.0	0.0
49	4.800	0.038520327	3440.80	3.38	3.98	0.0	0.0
50	4.900	0.039151959	3441.16	3.79	4.23	0.0	0.0
51	5.000	0.039569042	3441.56	4.23	4.48	0.0	0.0
52	5.100	0.039271316	3442.00	4.69	4.72	0.0	0.0
53	5.200	0.038474395	3442.49	5.17	4.95	0.0	0.0
54	5.300	0.037206811	3443.04	5.68	5.17	0.0	0.0
55	5.400	0.035524343	3443.63	6.20	5.38	0.0	0.0
56	5.500	0.033478623	3444.28	6.75	5.59	0.0	0.0
57	5.600	0.031145030	3444.98	7.32	5.77	0.0	0.0
58	5.700	0.028604962	3445.74	7.91	5.94	0.0	0.0
59	5.800	0.025945603	3446.56	8.51	6.10	0.0	0.0
60	5.900	0.023258370	3447.45	9.13	6.25	0.0	0.0
61	6.000	0.020625197	3448.39	9.76	6.39	0.0	0.0
62	6.100	0.018134899	3449.40	10.40	6.49	0.0	0.0
63	6.200	0.015959767	3450.47	11.05	6.59	0.0	0.0
64	6.300	0.013562578	3451.61	11.72	6.67	0.0	0.0
65	6.400	0.012192211	3452.81	12.39	6.74	0.0	0.0
66	6.500	0.010881834	3454.09	13.06	6.78	0.0	0.0
67	6.600	0.009947861	3455.43	13.74	6.82	0.0	0.0
68	6.700	0.009389578	3456.83	14.43	6.83	0.0	0.0
69	6.800	0.009189460	3458.31	15.11	6.92	0.0	0.0
70	6.900	0.009314099	3459.86	15.79	6.80	0.0	0.0
71	7.000	0.009715675	3461.47	16.47	6.75	0.0	0.0
72	7.100	0.010333473	3463.15	17.14	6.69	0.0	0.0
73	7.200	0.011098190	3464.90	17.81	6.61	0.0	0.0
74	7.300	0.011930462	3466.71	18.46	6.51	0.0	0.0
75	7.400	0.012747760	3468.59	19.11	6.39	0.0	0.0
76	7.500	0.013465236	3470.53	19.74	6.26	0.0	0.0
77	7.600	0.013969209	3472.54	20.36	6.10	0.0	0.0
78	7.700	0.014270218	3474.60	20.96	5.93	0.0	0.0
79	7.800	0.014206031	3476.73	21.54	5.74	0.0	0.0
80	7.900	0.013744536	3478.91	22.11	5.54	0.0	0.0
81	8.000	0.012853639	3481.15	22.66	5.32	0.0	0.0

82	8.100	0.011447390	3483.44	23.17	5.09	0.0	0.0
83	8.200	0.009560263	3485.78	23.67	4.84	0.0	0.0
84	8.300	0.007176062	3488.17	24.14	4.59	0.0	0.0
85	8.400	0.004314755	3490.61	24.58	4.32	0.0	0.0
86	8.500	0.001015114	3493.09	25.00	4.05	0.0	0.0
87	8.600	-0.002666213	3495.61	25.39	3.77	0.0	0.0
88	8.700	-0.006656458	3498.17	25.76	3.48	0.0	0.0
89	8.800	-0.010869222	3500.76	26.09	3.19	0.0	0.0
90	8.900	-0.015207663	3503.38	26.39	2.89	0.0	0.0
91	9.000	-0.019560188	3506.04	26.67	2.59	0.0	0.0
92	9.100	-0.023844476	3508.72	26.91	2.29	0.0	0.0
93	9.200	-0.027931625	3511.42	27.13	1.98	0.0	0.0
94	9.300	-0.031730184	3514.14	27.31	1.68	0.0	0.0
95	9.400	-0.035149856	3516.88	27.46	1.37	0.0	0.0
96	9.500	-0.038112696	3519.63	27.58	1.07	0.0	0.0
97	9.600	-0.040555624	3522.39	27.68	0.76	0.0	0.0
98	9.700	-0.042432181	3525.17	27.74	0.46	0.0	0.0
99	9.800	-0.043713458	3527.94	27.77	0.16	0.0	0.0
100	9.900	-0.044388233	3530.72	27.77	-0.14	0.0	0.0
101	10.000	-0.044462348	3533.49	27.74	-0.44	0.0	0.0
102	10.100	-0.043957461	3536.26	27.68	-0.74	0.0	0.0
103	10.200	-0.042909272	3539.03	27.59	-1.03	0.0	0.0
104	10.300	-0.041365387	3541.78	27.47	-1.32	0.0	0.0
105	10.400	-0.039382961	3544.52	27.33	-1.61	0.0	0.0
106	10.500	-0.037026255	3547.25	27.15	-1.89	0.0	0.0
107	10.600	-0.034364225	3549.95	26.95	-2.16	0.0	0.0
108	10.700	-0.031468232	3552.63	26.72	-2.43	0.0	0.0
109	10.800	-0.028409948	3555.29	26.46	-2.69	0.0	0.0
110	10.900	-0.025259485	3557.93	26.18	-2.93	0.0	0.0
111	11.000	-0.022083773	3560.53	25.88	-3.17	0.0	0.0
112	11.100	-0.018946184	3563.10	25.55	-3.40	0.0	0.0
113	11.200	-0.015900393	3565.64	25.20	-3.61	0.0	0.0
114	11.300	-0.012999457	3568.14	24.83	-3.81	0.0	0.0
115	11.400	-0.010285103	3570.60	24.43	-4.00	0.0	0.0
116	11.500	-0.007792197	3573.03	24.03	-4.17	0.0	0.0
117	11.600	-0.005547414	3575.41	23.60	-4.33	0.0	0.0
118	11.700	-0.003569074	3577.75	23.16	-4.48	0.0	0.0
119	11.800	-0.001967182	3580.04	22.71	-4.60	0.0	0.0
120	11.900	-0.000443653	3582.29	22.24	-4.72	0.0	0.0
121	12.000	0.000707272	3584.49	21.76	-4.82	0.0	0.0
122	12.100	0.001598400	3586.64	21.28	-4.90	0.0	0.0
123	12.200	0.002248789	3588.74	20.78	-4.97	0.0	0.0
124	12.300	0.002682765	3590.79	20.28	-5.02	0.0	0.0
125	12.400	0.002928814	3592.80	19.78	-5.07	0.0	0.0
126	12.500	0.003018359	3594.75	19.27	-5.10	0.0	0.0
127	12.600	0.002984468	3596.65	18.76	-5.12	0.0	0.0
128	12.700	0.002860588	3598.50	18.25	-5.13	0.0	0.0
129	12.800	0.002579291	3600.30	17.74	-5.14	0.0	0.0
130	12.900	0.002471118	3602.05	17.22	-5.13	0.0	0.0
131	13.000	0.002263573	3603.75	16.71	-5.12	0.0	0.0
132	13.100	0.002380290	3605.39	16.19	-5.11	0.0	0.0
133	13.200	0.001940403	3606.98	15.66	-5.09	0.0	0.0
134	13.300	0.001958135	3608.53	15.18	-5.37	0.0	0.0
135	13.400	0.001842613	3610.02	14.67	-5.05	0.0	0.0
136	13.500	0.001597901	3611.46	14.17	-5.03	0.0	0.0
137	13.600	0.002023237	3612.85	13.66	-5.01	0.0	0.0
138	13.700	0.002213451	3614.19	13.16	-5.00	0.0	0.0
139	13.800	0.002459533	3615.49	12.66	-4.98	0.0	0.0
140	13.900	0.002749321	3616.73	12.17	-4.97	0.0	0.0
141	14.000	0.003068278	3617.92	11.67	-4.96	0.0	0.0
142	14.100	0.003400309	3619.06	11.17	-4.95	0.0	0.0
143	14.200	0.003728611	3620.15	10.68	-4.95	0.0	0.0
144	14.300	0.004036494	3621.20	10.18	-4.96	0.0	0.0
145	14.400	0.004308165	3622.19	9.69	-4.96	0.0	0.0
146	14.500	0.004529435	3623.13	9.19	-4.97	0.0	0.0
147	14.600	0.004688337	3624.03	8.69	-4.98	0.0	0.0
148	14.700	0.004775614	3624.87	8.20	-4.99	0.0	0.0
149	14.800	0.004785094	3625.67	7.70	-5.00	0.0	0.0
150	14.900	0.004713895	3626.41	7.20	-5.02	0.0	0.0
151	15.000	0.004562505	3627.11	6.69	-5.03	0.0	0.0
152	15.100	0.004334683	3627.75	6.19	-5.04	0.0	0.0
153	15.200	0.004037233	3628.35	5.69	-5.05	0.0	0.0
154	15.300	0.003679629	3628.89	5.18	-5.06	0.0	0.0
155	15.400	0.003273521	3629.38	4.67	-5.07	0.0	0.0
156	15.500	0.002832152	3629.82	4.16	-5.08	0.0	0.0
157	15.600	0.002369694	3630.21	3.66	-5.09	0.0	0.0
158	15.700	0.001900555	3630.55	3.15	-5.09	0.0	0.0
159	15.800	0.001438673	3630.84	2.64	-5.09	0.0	0.0
160	15.900	0.000996841	3631.08	2.13	-5.08	0.0	0.0
161	16.000	0.000586091	3631.27	1.62	-5.08	0.0	0.0
162	16.100	0.000215165	3631.41	1.12	-5.07	0.0	0.0
163	16.200	-0.000109902	3631.49	0.61	-5.06	0.0	0.0
164	16.300	-0.000386066	3631.53	0.10	-5.06	0.0	0.0
165	16.400	-0.000613411	3631.51	-0.40	-5.05	0.0	0.0
166	16.500	-0.000795140	3631.45	-0.91	-5.04	0.0	0.0
167	16.600	-0.000937408	3631.33	-1.41	-5.03	0.0	0.0
168	16.700	-0.001049011	3631.17	-1.91	-5.02	0.0	0.0
169	16.800	-0.001140942	3630.95	-2.42	-5.02	0.0	0.0
170	16.900	-0.001225834	3630.68	-2.92	-5.01	0.0	0.0
171	17.000	-0.001317296	3630.37	-3.42	-5.01	0.0	0.0
172	17.100	-0.001429190	3630.00	-3.92	-5.01	0.0	0.0
173	17.200	-0.001574866	3629.58	-4.42	-5.01	0.0	0.0
174	17.300	-0.001766379	3629.12	-4.92	-5.01	0.0	0.0
175	17.400	-0.002013734	3628.60	-5.42	-5.01	0.0	0.0
176	17.500	-0.002324192	3628.03	-5.92	-5.01	0.0	0.0
177	17.600	-0.002701650	3627.41	-6.43	-5.02	0.0	0.0
178	17.700	-0.003146159	3626.75	-6.93	-5.02	0.0	0.0
179	17.800	-0.003653573	3626.03	-7.43	-5.02	0.0	0.0
180	17.900	-0.004215384	3625.26	-7.93	-5.01	0.0	0.0
181	18.000	-0.004818733	3624.44	-8.43	-5.01	0.0	0.0
182	18.100	-0.005446627	3623.57	-8.94	-4.99	0.0	0.0
183	18.200	-0.006078346	3622.66	-9.43	-4.98	0.0	0.0
184	18.300	-0.006690037	3621.69	-9.93	-4.96	0.0	0.0
185	18.400	-0.007255480	3620.67	-10.42	-4.93	0.0	0.0
186	18.500	-0.007746983	3619.60	-10.91	-4.89	0.0	0.0
187	18.600	-0.008136381	3618.49	-11.40	-4.85	0.0	0.0
188	18.700	-0.008396086	3617.32	-11.88	-4.80	0.0	0.0
189	18.800	-0.008500155	3616.11	-12.36	-4.74	0.0	0.0
190	18.900	-0.008425313	3614.85	-12.83	-4.67	0.0	0.0
191	19.000	-0.008151896	3613.55	-13.29	-4.59	0.0	0.0
192	19.100	-0.007664678	3612.19	-13.75	-4.51	0.0	0.0
193	19.200	-0.006953546	3610.80	-14.19	-4.41	0.0	0.0
194	19.300	-0.006013993	3609.36	-14.63	-4.31	0.0	0.0
195	19.400	-0.004847443	3607.87	-15.05	-4.20	0.0	0.0
196	19.500	-0.003461370	3606.35	-15.47	-4.08	0.0	0.0
197	19.600	-0.001869248	3604.78	-15.87	-3.96	0.0	0.0
198	19.700	-0.000090317	3603.17	-16.26	-3.83	0.0	0.0
199	19.800	0.001850801	3601.53	-16.63	-3.69	0.0	0.0
200	19.900	0.003924622	3599.85	-17.00	-3.55	0.0	0.0
201	20.000	0.006097447	3598.13	-17.34	-3.40	0.0	0.0
202	20.100	0.008332106	3596.38	-17.68	-3.25	0.0	0.0
203	20.200	0.010588800	3594.59	-17.99	-3.09	0.0	0.0
204	20.300	0.012826003	3592.78	-18.29	-2.93	0.0	0.0
205	20.400	0.015301436	3590.94	-18.58	-2.77	0.0	0.0
206	20.500	0.017073092	3589.06	-18.85	-2.60	0.0	0.0
207	20.600	0.019000278	3587.17	-19.10	-2.43	0.0	0.0
208	20.700	0.020744690	3585.25	-19.34	-2.25	0.0	0.0
209	20.800	0.022271454	3583.30	-19.56	-2.07	0.0	0.0
210	20.900	0.023550161	3581.34	-19.75	-1.89	0.0	0.0
211	21.000	0.024555758	3579.35	-19.94	-1.70	0.0	0.0
212	21.100	0.025269404	3577.35	-20.09	-1.51	0.0	0.0
213	21.200	0.025676110	3575.34	-20.23	-1.32	0.0	0.0

214	21.300	0.025780194	3573.31	-20.38	-1.13	0.0	0.0
215	21.400	0.025575515	3571.27	-20.48	-0.93	0.0	0.0
216	21.500	0.025075429	3569.22	-20.56	-0.73	0.0	0.0
217	21.600	0.024297481	3567.16	-20.60	-0.52	0.0	0.0
218	21.700	0.023265616	3565.10	-20.64	-0.32	0.0	0.0
219	21.800	0.022010331	3563.03	-20.66	-0.11	0.0	0.0
220	21.900	0.020565596	3560.97	-20.66	0.10	0.0	0.0
221	22.000	0.018965589	3558.90	-20.64	0.31	0.0	0.0
222	22.100	0.017262304	3556.84	-20.60	0.51	0.0	0.0
223	22.200	0.015484301	3554.78	-20.54	0.72	0.0	0.0
224	22.300	0.013675263	3552.73	-20.46	0.92	0.0	0.0
225	22.400	0.011972627	3550.69	-20.36	1.12	0.0	0.0
226	22.500	0.010110364	3548.66	-20.23	1.32	0.0	0.0
227	22.600	0.008417943	3546.64	-20.09	1.51	0.0	0.0
228	22.700	0.006819548	3544.64	-19.93	1.70	0.0	0.0
229	22.800	0.005333540	3542.66	-19.75	1.87	0.0	0.0
230	22.900	0.003972215	3540.69	-19.56	2.05	0.0	0.0
231	23.000	0.002741823	3538.75	-19.34	2.21	0.0	0.0
232	23.100	0.001642851	3536.82	-19.11	2.37	0.0	0.0
233	23.200	0.000670532	3534.92	-18.87	2.52	0.0	0.0
234	23.300	-0.000184447	3533.05	-18.61	2.66	0.0	0.0
235	23.400	-0.000935090	3531.20	-18.34	2.79	0.0	0.0
236	23.500	-0.001597129	3529.38	-18.05	2.91	0.0	0.0
237	23.600	-0.002188008	3527.59	-17.76	3.02	0.0	0.0
238	23.700	-0.002725855	3525.83	-17.45	3.13	0.0	0.0
239	23.800	-0.003228488	3524.10	-17.13	3.23	0.0	0.0
240	23.900	-0.003712498	3522.41	-16.80	3.32	0.0	0.0
241	24.000	-0.004192441	3520.74	-16.47	3.40	0.0	0.0
242	24.100	-0.004680174	3519.11	-16.12	3.47	0.0	0.0
243	24.200	-0.005184352	3517.52	-15.77	3.54	0.0	0.0
244	24.300	-0.005710105	3515.96	-15.42	3.60	0.0	0.0
245	24.400	-0.006258909	3514.43	-15.05	3.65	0.0	0.0
246	24.500	-0.006828638	3512.95	-14.69	3.70	0.0	0.0
247	24.600	-0.007413792	3511.50	-14.31	3.74	0.0	0.0
248	24.700	-0.008005917	3510.08	-13.94	3.78	0.0	0.0
249	24.800	-0.008594125	3508.71	-13.56	3.80	0.0	0.0
250	24.900	-0.009165758	3507.37	-13.18	3.83	0.0	0.0
251	25.000	-0.009707114	3506.07	-12.79	3.84	0.0	0.0
252	25.100	-0.010204217	3504.81	-12.41	3.85	0.0	0.0
253	25.200	-0.010643593	3503.59	-12.04	3.85	0.0	0.0
254	25.300	-0.011012998	3502.41	-11.64	3.85	0.0	0.0
255	25.400	-0.011302087	3501.26	-11.26	3.83	0.0	0.0
256	25.500	-0.011502977	3500.16	-10.87	3.82	0.0	0.0
257	25.600	-0.011610685	3499.09	-10.49	3.79	0.0	0.0
258	25.700	-0.011623427	3498.06	-10.12	3.76	0.0	0.0
259	25.800	-0.011542759	3497.07	-9.74	3.72	0.0	0.0
260	25.900	-0.011373580	3496.11	-9.37	3.67	0.0	0.0
261	26.000	-0.011123966	3495.19	-9.01	3.62	0.0	0.0
262	26.100	-0.010804886	3494.31	-8.65	3.56	0.0	0.0
263	26.200	-0.010429787	3493.46	-8.30	3.49	0.0	0.0
264	26.300	-0.010014076	3492.65	-7.95	3.42	0.0	0.0
265	26.400	-0.009574534	3491.87	-7.61	3.35	0.0	0.0
266	26.500	-0.009128664	3491.13	-7.28	3.27	0.0	0.0
267	26.600	-0.008694017	3490.41	-6.96	3.19	0.0	0.0
268	26.700	-0.008287520	3489.73	-6.64	3.11	0.0	0.0
269	26.800	-0.007924813	3489.09	-6.34	3.02	0.0	0.0
270	26.900	-0.007619645	3488.47	-6.04	2.94	0.0	0.0
271	27.000	-0.007383328	3487.88	-5.75	2.86	0.0	0.0
272	27.100	-0.007224289	3487.32	-5.47	2.77	0.0	0.0
273	27.200	-0.007147719	3486.78	-5.19	2.69	0.0	0.0
274	27.300	-0.007155345	3486.28	-4.93	2.61	0.0	0.0
275	27.400	-0.007245332	3485.80	-4.67	2.53	0.0	0.0
276	27.500	-0.007412319	3485.34	-4.42	2.46	0.0	0.0
277	27.600	-0.007647590	3484.91	-4.18	2.39	0.0	0.0
278	27.700	-0.007939381	3484.51	-3.94	2.32	0.0	0.0
279	27.800	-0.008273297	3484.12	-3.72	2.25	0.0	0.0
280	27.900	-0.008632843	3483.76	-3.49	2.19	0.0	0.0
281	28.000	-0.009000037	3483.43	-3.28	2.13	0.0	0.0
282	28.100	-0.009356077	3483.11	-3.07	2.07	0.0	0.0
283	28.200	-0.009682055	3482.81	-2.86	2.01	0.0	0.0
284	28.300	-0.009959659	3482.54	-2.66	1.96	0.0	0.0
285	28.400	-0.010171869	3482.28	-2.47	1.90	0.0	0.0
286	28.500	-0.010303591	3482.04	-2.28	1.84	0.0	0.0
287	28.600	-0.010342225	3481.82	-2.10	1.78	0.0	0.0
288	28.700	-0.010278142	3481.62	-1.93	1.72	0.0	0.0
289	28.800	-0.010105045	3481.44	-1.76	1.65	0.0	0.0
290	28.900	-0.009820225	3481.27	-1.60	1.59	0.0	0.0
291	29.000	-0.009424683	3481.12	-1.44	1.52	0.0	0.0
292	29.100	-0.008923140	3480.98	-1.30	1.44	0.0	0.0
293	29.200	-0.008323921	3480.86	-1.16	1.36	0.0	0.0
294	29.300	-0.007638736	3480.75	-1.02	1.28	0.0	0.0
295	29.400	-0.006882354	3480.65	-0.90	1.20	0.0	0.0
296	29.500	-0.006072196	3480.57	-0.78	1.11	0.0	0.0
297	29.600	-0.005227841	3480.50	-0.68	1.03	0.0	0.0
298	29.700	-0.004370483	3480.43	-0.58	0.94	0.0	0.0
299	29.800	-0.003522327	3480.38	-0.49	0.85	0.0	0.0
300	29.900	-0.002705953	3480.33	-0.41	0.76	0.0	0.0
301	30.000	-0.001963660	3480.30	-0.34	0.67	0.0	0.0
302	30.100	-0.001256797	3480.27	-0.27	0.59	0.0	0.0
303	30.200	-0.000665096	3480.24	-0.22	0.50	0.0	0.0
304	30.300	-0.000186038	3480.22	-0.17	0.43	0.0	0.0
305	30.400	0.000165756	3480.21	-0.13	0.35	0.0	0.0
306	30.500	0.000379072	3480.20	-0.10	0.29	0.0	0.0
307	30.600	0.000446572	3480.19	-0.08	0.23	0.0	0.0
308	30.700	0.000365174	3480.18	-0.06	0.18	0.0	0.0
309	30.800	0.000136310	3480.18	-0.04	0.13	0.0	0.0
310	30.900	-0.000233935	3480.17	-0.03	0.10	0.0	0.0
311	31.000	-0.000734843	3480.17	-0.02	0.07	0.0	0.0
312	31.100	-0.001351234	3480.17	-0.01	0.05	0.0	0.0
313	31.200	-0.002063793	3480.17	-0.01	0.04	0.0	0.0
314	31.300	-0.002849563	3480.17	-0.01	0.04	0.0	0.0
315	31.400	-0.003682582	3480.17	-0.00	0.04	0.0	0.0
316	31.500	-0.004534656	3480.17	0.00	0.06	0.0	0.0
317	31.600	-0.005376234	3480.17	0.01	0.08	0.0	0.0
318	31.700	-0.006177371	3480.17	0.02	0.10	0.0	0.0
319	31.800	-0.006908721	3480.17	0.03	0.13	0.0	0.0
320	31.900	-0.007542545	3480.17	0.04	0.17	0.0	0.0
321	32.000	-0.008083682	3480.18	0.06	0.21	0.0	0.0
322	32.100	-0.008420441	3480.19	0.09	0.25	0.0	0.0
323	32.200	-0.008625402	3480.20	0.11	0.29	0.0	0.0
324	32.300	-0.008656066	3480.21	0.14	0.33	0.0	0.0
325	32.400	-0.008505361	3480.23	0.18	0.37	0.0	0.0
326	32.500	-0.008171968	3480.24	0.22	0.41	0.0	0.0
327	32.600	-0.007660479	3480.27	0.26	0.45	0.0	0.0
328	32.700	-0.006981328	3480.30	0.31	0.48	0.0	0.0
329	32.800	-0.006150721	3480.33	0.36	0.51	0.0	0.0

APPENDIX B

MODEL CHECK PROGRAM

User Instructions – MDLCK

The program is written in FORTRAN IV and is designed to run in double precision on an IBM 370/165 computer with an average execution time of 20 seconds per case. Execution requires approximately 146,000 bytes of core storage. Given the output of the FDR1 program (Appendix A), this program provides a quick means of determining feasible power-drag model forms and initial estimates of the power and drag coefficients which would shorten the execution time of the FDR2 program (see Appendix C).* The program requires the specification of the following input data:

CARD 1:

The read unit number IDS:

IDS is a right-adjusted integer number occupying columns 1-5 and specifying that the data is to be read from cards, magnetic tape, disk, etc. The user must supply the suitable job control cards for the tape and/or disk reads. The IDS parameter controls only the reading of CARDS 2, 3, and (4,...,3 + 5K). All other data is expected in CARD form.

CARD 2:

The title array TITLE1:

The 80 characters of the array TITLE1 are used for identifying output. TITLE1 is provided by the first card of the punched output of the FDR1 program.

CARD 3:

(a) The total number of points K in the data set,
(b) The aircraft's wing area S in square feet,
(c) The sea-level atmospheric density RHO in slug/ft^3,
(d) The acceleration due to gravity G in ft/sec^2, and
(e) The total elapsed time for the maneuver TT in seconds:

K is a right-adjusted integer number occupying columns 1-10. S, RHO, G, and TT are double-precision floating-point numbers each occupying 15 columns beginning at column 11. These values are provided by the second card of the punched output of the FDR1 program.

---

*It must be emphasized that this program allows greater freedom in the specification of the power-drag model forms than does the FDR2 program. This program allows the inclusion of term for the rates of other independent variables, while the FDR2 program allows only "steady-state" conditions.

CARDS 4,...,(3 + 5K):

The time histories of time T, weight F1, pitch angle F2, pitch rate F3, airspeed F4, density F5, angle of attack F6, static temperature X1, acceleration F8, angle-of-attack rate F9, altitude X2, altitude rate X3, altitude acceleration X4, vertical acceleration X5, and elevator deflection X6:

The variables T, F1, F2, F3, F4, F5, F6, X1, F8, F9, X2, X3, X4, X5, and X6 are double-precision floating-point numbers each occupying 25 columns. These variables are provided by the remaining punched output of the FDR1 program.

CARD (3 + 5K + 1):

The title array TITLE:

The 80 characters of the array TITLE are used for additional data set identification. Since this program allows more than one power-drag model form to be analyzed in a given run, TITLE is also used as a control variable to end execution. Termination of execution is achieved by following the last model-form data cards by a title card having only the word END in the first three card columns.

CARD (3 + 5K + 2):

(a) The power-drag model form parameters LOC(I):

The LOC(I), I = 1,...,15 parameters determine the specific model form to be used. The general form of the power and drag-coefficient equations are

$$\text{Power} = P_0 + P_1 V^{EX1} + P_2 V^{EX2} + P_3 V^{EX3} + P_4 V^{EX4} + P_5 \dot{V} + P_6 \dot{\alpha} + P_7 \dot{\theta}$$

$$C_D = C_{D_0} + C_{D_1} \alpha^{IEX1} + C_{D_2} \alpha^{IEX2} + C_{D_3} \alpha^{IEX3} + C_{D_4} \alpha^{IEX4} + C_{D_5} \dot{\alpha} + C_{D_6} \dot{\theta}$$

Through the use of the LOC(I) parameters, the user may include or exclude as many terms as desired. It is mandatory that at least one power term and at least one drag-coefficient term is included; otherwise, the program will terminate prematurely. The following chart should be used in the specification of the desired model(s):

LOC parameter	Corresponding Coefficient
LOC(1)	P_0
LOC(2)	P_1
LOC(3)	P_2
LOC(4)	P_3
LOC(5)	P_4
LOC(6)	P_5
LOC(7)	P_6
LOC(8)	P_7
LOC(9)	C_{D_0}
LOC(10)	C_{D_1}
LOC(11)	C_{D_2}
LOC(12)	C_{D_3}
LOC(13)	C_{D_4}
LOC(14)	C_{D_5}
LOC(15)	C_{D_6}

If LOC(I) = 0, the corresponding coefficient term will be <u>excluded</u> from the analysis. If LOC(I) = 1, the corresponding coefficient term will be <u>included</u> in the analysis. These parameters are right-adjusted integer numbers each occupying 1 column beginning at column 1.

(b) The desired type of output units METRIC:
If METRIC = Ø, the output will be in English units. If METRIC = 1, the output will be in SI units. METRIC is a right-adjusted integer number occupying column 16.

CARD (3 + 5K + 3):

(a) The exponent EX1 on the second power-coefficient term,
(b) The exponent EX2 on the third power-coefficient term,
(c) The exponent EX3 on the fourth power-coefficient term,
(d) The exponent EX4 on the fifth power-coefficient term,
(e) The exponent IEX1 on the second drag-coefficient term,
(f) The exponent IEX2 on the third drag-coefficient term,
(g) The exponent IEX3 on the fourth drag-coefficient term, and
(h) The exponent IEX4 on the fifth drag-coefficient term:

EX1, EX2, EX3, and EX4 are floating-point numbers each occupying 10 columns beginning at column 1. No two of these exponents may have the same value; otherwise, a singular matrix will terminate execution. IEX1, IEX2, IEX3, and IEX4 are right-adjusted integer numbers each occupying 5 columns beginning at column 41. No two of these exponents may have the same value; otherwise, a singular matrix will terminate execution.

CARD (3 + 5K + 4):

(a) The lower allowable limit PLOW of the power available in foot-pounds per second,
(b) The upper allowable limit PHIGH of the power available in foot-pounds per second,
(c) The lower allowable limit CDLOW of the drag coefficient,
(d) The upper allowable limit CDHIGH of the drag coefficient, and
(e) The thrust incidence angle TIA in radians:

PLOW, PHIGH, CDLOW, CDHIGH, and TIA are floating-point numbers each occupying 10 columns beginning at column 1.

For a given run consisting of more than one power-drag model form, cards (3 + 5K + 1) through (3 + 5K + 4) must be repeated for each model form.

Program Listing — MDLCK

```
C
C  PROGRAM: MODEL FORMS CHECK (MDLCK)             F.O. SMETANA & S.R. FOX
C
C
C               ****************************************
C               *                                      *
C               *   M O D E L   F O R M S   C H E C K  *
C               *                                      *
C               ****************************************
C
C
C
C     GIVEN THE OUTPUT OF FLIGHT DATA REDUCTION PROGRAM #1, THIS PROGRAM
C     ALLOWS THE USER TO DETERMINE THE MODEL FORM(S) FOR THE POWER AND
C     DRAG COEFFICIENTS FOR FLIGHT DATA REDUCTION PROGRAM #2.  IT SHOULD
C     BE EMPHASIZED THAT THIS PROGRAM ALLOWS GREATER FREEDOM THAN FLIGHT
C     DATA REDUCTION PROGRAM #2 IN THE REPRESENTATION OF THE POWER AND
C     DRAG FUNCTIONS.
C
C
C
C     THE FOLLOWING COMMENT CARDS DESCRIBE THE NECESSARY INPUT FOR THIS
C     PROGRAM.  FOR A MORE PRECISE DESCRIPTION, CONSULT THE USERS IN-
C     STRUCTIONS.
C
C INPUT *** CARD 1
C
C         IDS    -> READ UNIT NUMBER (ALLOWS READING OF CARDS, DISK,
C                   TAPE, ETC OF THE OUTPUT OF FLIGHT DATA REDUCTION
C                   PROGRAM #1)
C
C
C
C INPUT *** CARD 2  (OUTPUT OF FLIGHT DATA REDUCTION PROGRAM #1)
C
C        TITLE1 -> TITLE CARD FOR MANEUVER
C
C
C
C INPUT *** CARD 3  (OUTPUT OF FLIGHT DATA REDUCTION PROGRAM #1)
C
C        K      -> NUMBER OF POINTS IN DATA SET
C
C        S      -> AIRCRAFT'S WING AREA IN SQUARE FEET
C
C        RHO    -> SEA-LEVEL ATMOSPHERIC DENSITY IN SLUG/FT**3
C
C        G      -> ACCELERATION DUE TO GRAVITY IN FT/SEC**2
C
C        TT     -> TOTAL ELAPSED TIME FOR MANEUVER IN SECONDS
C
C
C
C INPUT *** CARDS 4,....,(3+5K)  (OUTPUT FROM 'FDR1')
C
C        IDENTIFICATION OF NECESSARY INPUT TIME HISTORIES
C
C             T      -> TIME (DUMMY VARIABLE)
C             F1(I)  -> WEIGHT
C             F2(I)  -> PITCH ANGLE
C             F3(I)  -> PITCH RATE
C             F4(I)  -> AIRSPEED
C             F5(I)  -> DENSITY
C             F6(I)  -> ANGLE OF ATTACK
C             X1     -> STATIC TEMPERATURE (DUMMY VARIABLE)
C             F8(I)  -> ACCELERATION
C             F9(I)  -> ANGLE OF ATTACK RATE
C             X2     -> ALTITUDE (DUMMY VARIABLE)
C             X3     -> ALTITUDE RATE (DUMMY VARIABLE)
C             X4     -> ALTITUDE ACCELERATION (DUMMY VARIABLE)
C             X5     -> VERTICAL ACCELERATION (DUMMY VARIABLE)
C             X6     -> ELEVATOR/STABILATOR DEFLECTION (DUMMY VARIABLE)
C
C
C
C INPUT *** CARD (3+5K+1)
C
C        TITLE  -> TITLE CARD FOR ADDITIONAL LABELING OR PROGRAM
C                  TERMINATION
C
C
C
C INPUT *** CARD (3+5K+2)  (CONSULT USERS INSTRUCTIONS)
C
C        LOC(I) -> MODEL SOLUTION FORM (CHOSEN BY CARD COLUMN NUMBER)
C                  LOC(I)=0  -> SKIP COEFFICIENT
C                  LOC(I)=1  -> INCLUDE COEFFICIENT
C
C        METRIC -> OUTPUT PRINT CODE
C                  METRIC=0  -> OUTPUT PRINTED IN ENGLISH UNITS
C                  METRIC=1  -> OUTPUT PRINTED IN SI UNITS
C
C
C
C INPUT *** CARD (3+5K+3)  (CONSULT USERS INSTRUCTIONS)
C
C        EX1    -> EXPONENT ON SECOND POWER-COEFFICIENT TERM
C
C        EX2    -> EXPONENT ON THIRD POWER-COEFFICIENT TERM
C
C        EX3    -> EXPONENT ON FOURTH POWER-COEFFICIENT TERM
C
C        EX4    -> EXPONENT ON FIFTH POWER-COEFFICIENT TERM
C
C        IEX1   -> EXPONENT ON SECOND DRAG-COEFFICIENT TERM (INTEGER)
C
C        IEX2   -> EXPONENT ON THIRD DRAG-COEFFICIENT TERM (INTEGER)
C
C        IEX3   -> EXPONENT ON FOURTH DRAG-COEFFICIENT TERM (INTEGER)
C
C        IEX4   -> EXPONENT ON FIFTH DRAG-COEFFICIENT TERM (INTEGER)
C
C
C
C INPUT *** CARD (3+5K+4)
C
C        PLOW   -> LOWER LIMIT OF ALLOWABLE POWER AVAILABLE (FT-LB/SEC)
C
C        PHIGH  -> UPPER LIMIT OF ALLOWABLE POWER AVAILABLE (FT-LB/SEC)
C
```

```
C          CDLOW  -> LOWER LIMIT OF ALLOWABLE DRAG COEFFICIENT
C
C          CDHIGH -> UPPER LIMIT OF ALLOWABLE DRAG COEFFICIENT
C
C          TIA    -> THRUST INCIDENCE ANGLE IN RADIANS
C
C
C
C *** ADDITIONAL MODEL FORMS MAY BE SPECIFIED BY 'REPEATING' PROCESS
C     FROM CARD(3+5K+1) THROUGH CARD(3+5K+4).  THE PROGRAM IS TERMINATED
C     WHEN CARD(3+5K+1) CONTAINS THE WORD 'END' IN THE FIRST THREE CARD
C     COLUMNS.
C
C
C
      IMPLICIT REAL*8(A-H.O-Z)
      DIMENSION LOC(15).TITLE(20).TITLE1(20)
      COMMON F1(450).F2(450).F3(450).F4(450).F5(450).F6(450).F8(450).F9(
     1450).C(450.15).X(450.1).WKAR(450).CFM(15).SGN(4).EX1.EX2.EX3.EX4.G
     1.S.RHO.TIA.PLOW.PHIGH.CDLOW.CDHIGH.JREAD.JWRITE.IEX1.IEX2.IEX3.IEX
     14.METRIC
      DATA XEND/4HEND /
C
C
C***  SPECIFY CARRIAGE CONTROL FOR INSTALLATION
      JREAD=1
      JPUNCH=2
      JWRITE=3
C
C***  READ INPUT DATA
C
C
      READ (JREAD.1) IDS
    1 FORMAT (I5)
C***  CHECK IDS FOR ERROR
      IF (IDS.EQ.JPUNCH.OR.IDS.EQ.JWRITE) GO TO 11
      READ (IDS.2) (TITLE1(I).I=1.20)
    2 FORMAT (20A4)
      READ (IDS.3) K.S.RHO.G
    3 FORMAT (I10.4D15.8)
      DO 5 I=1.K
      READ (IDS.4) T.F1(I).F2(I).F3(I).F4(I).F5(I).F6(I).X1.F8(I).F9(I).
     1X2.X3.X4.X5.X6
    4 FORMAT (3D25.16)
    5 CONTINUE
C***  SET CASE COUNTER
      ICASE=0
    6 READ (JREAD.2) (TITLE(I).I=1.20)
C***  CHECK FOR PROGRAM TERMINATION
      IF (TITLE(1).EQ.XEND) GO TO 13
      READ (JREAD.7) (LOC(I).I=1.15).METRIC
    7 FORMAT (16I1)
      READ (JREAD.8) EX1.EX2.EX3.EX4.IEX1.IEX2.IEX3.IEX4
    8 FORMAT (4F10.0.4I5)
      READ (JREAD.9) PLOW.PHIGH.CDLOW.CDHIGH.TIA
    9 FORMAT (5F10.0)
C
C
      WRITE (JWRITE.10) (TITLE1(I).I=1.20).(TITLE(I).I=1.20).IDS.LOC(1).
     1LOC(7).LOC(13).EX1.PLOW.K.LOC(2).LOC(8).LOC(14).EX2.PHIGH.IEX1.LOC
     1(3).LOC(9).LOC(15).EX3.CDLOW.IEX2.LOC(4).LOC(10).S.EX4.CDHIGH.IEX3
     1.LOC(5).LOC(11).G.METRIC.IEX4.LOC(4).LOC(12).TIA.RHO
   10 FORMAT (1H1.////.20X.84('-')./.20X.'|'.82X.'|'./.20X.'|'.1X.20A4.1
     1X.'|'./.20X.'|'.1X.20A4.1X.'|'./.20X.'|'.82X.'|'./.20X.'|'.1X.'INP
     1UT PARAMETERS:'.64X.'|'./.20X.'|'.82X.'|'./.20X.'|'.2X.'IDS='.I..'
     1 LOC(1)='.I3.' LOC(7)='.I3.' LOC(13)='.I2.2X.'EX1='.F10.6.2X.'PLOW
     1='.F11.2.5X.'|'./.20X.'|'.2X.'K ='.I5.' LOC(2)='.I3.' LOC(8)='.I3.
     1' LOC(14)='.I2.2X.'EX2='.F10.6.2X.'PHIGH='.F11.2.4X.'|'./.20X.'|'.
     12X.'IEX1='.I3.' LOC(3)='.I3.' LOC(9)='.I3.' LOC(15)='.I2.2X.'EX3='
     1.F10.6.2X.'CDLOW='.F11.8.4X.'|'./.20X.'|'.2X.'IEX2='.I3.' LOC(4)='
     1.I3.' LOC(10)='.I2.' S='.F8.3.2X.'EX4='.F10.6.2X.'CDHIGH='.F10.6.4
     1X.'|'./.20X.'|'.2X.'IEX3='.I3.' LOC(5)='.I3.' LOC(11)='.I2.' G='.F
     18.5.2X.'METRIC='.I3.27X.'|'./.20X.'|'.2X.'IEX4='.I3.' LOC(6)='.I3.
     1' LOC(12)='.I2.' TIA='.F6.4.2X.'RHO='.1PD15.8.18X.'|'./.20X.'|'.82
     1X.'|'./.20X.84('-'))
C***  UPDATE CASE COUNTER AND ENACT MODEL SOLUTION
      ICASE=ICASE+1
      CALL MODEL(K.ICASE.LOC)
C***  CONTINUE TO NEXT CASE IF ANY
      GO TO 6
C***  WRITE ERROR MESSAGE
   11 WRITE (JWRITE.12)
   12 FORMAT (1X.////.20X.'INPUT ERROR *** IDS IS INCORRECT')
   13 STOP
      END


      SUBROUTINE MODEL(K.ICASE.LOC)
C
C***  SUBROUTINE MODEL CALCULATES THE POWER AND DRAG COEFFICIENTS OF THE
C***  USER-SPECIFIED MODEL FROM THE EQUATION OF MOTION TANGENT TO THE
C***  FLIGHT PATH
C
      IMPLICIT REAL*8(A-H.O-Z)
      DIMENSION TS(15).LOC(15).LLOC(15).H(8)
      COMMON F1(450).F2(450).F3(450).F4(450).F5(450).F6(450).F8(450).F9(
     1450).C(450.15).X(450.1).WKAR(450).CFM(15).SGN(4).EX1.EX2.EX3.EX4.G
     1.S.RHO.TIA.PLOW.PHIGH.CDLOW.CDHIGH.JREAD.JWRITE.IEX1.IEX2.IEX3.
     14.METRIC
      DATA FAIL/4HNOGO/
C
      WRITE (JWRITE.1)
    1 FORMAT (1X.////.50X.27HM O D E L   S O L U T I O N./)
C***  DETERMINE NUMBER OF UNKNOWNS
      NUM=15
      ICK1=0
      ICK2=0
      JC=0
      DO 6 I=1.15
      IF (LOC(I))  21.2.3
    2 NUM=NUM-1
      GO TO 6
    3 JC=JC+1
      LLOC(JC)=I
      IF ((I-8))  4.4.5
    4 ICK1=ICK1+1
      GO TO 6
    5 ICK2=ICK2+1
    6 CONTINUE
```

```
C***  DETERMINE IF AT LEAST ONE POWER COEFFICIENT AND ONE DRAG COEF-
C***  FICIENT IS SPECIFIED
      IF (ICK1.EQ.0.OR.ICK2.EQ.0) GO TO 21
C***  BEGIN MODEL SOLUTION
      NFL=0
      CALL CHNGE(SGN)
      DO 8 I=1.K
      AM=DABS(F6(I))
C***  TEST FOR NEGATIVE ANGLES OF ATTACK
      IF (F6(I).LT.0.0D0) CALL SIGNS(SGN.IEX1.IEX2.IEX3.IEX4)
C***  DETERMINE GENERAL TERMS FOR MATRIX FORMULATION
      TS(1)=DCOS(F6(I)+TIA)/(F1(I)*F4(I))
      TS(2)=TS(1)*F4(I)**EX1
      TS(3)=TS(1)*F4(I)**EX2
      TS(4)=TS(1)*F4(I)**EX3
      TS(5)=TS(1)*F4(I)**EX4
      TS(6)=TS(1)*F8(I)
      TS(7)=TS(1)*F9(I)
      TS(8)=TS(1)*F3(I)
      TS(9)=-F5(I)*S*F4(I)**2/(2.0D0*F1(I))
      TS(10)=TS(9)*SGN(1)*AM**IEX1
      TS(11)=TS(9)*SGN(2)*AM**IEX2
      TS(12)=TS(9)*SGN(3)*AM**IEX3
      TS(13)=TS(9)*SGN(4)*AM**IEX4
      TS(14)=TS(9)*F9(I)
      TS(15)=TS(9)*F3(I)
      IF (F6(I).LT.0.0D0) CALL CHNGE(SGN)
C***  FORM COEFFICIENTS FOR LEAST SQUARES
      DO 7 J=1.NUM
    7 C(I.J)=TS(LLOC(J))
    8 X(I.1)=F8(I)/G+DSIN(F2(I)-F6(I))
C***  ENACT LEAST SQUARES
      CALL LLSQAR(C.X.K.NUM.1.450.450.16.WKAR.IER.JWRITE)
C***  CHECK FOR ERROR
      IF (IER.EQ.129) GO TO 9
      GO TO 11
    9 WRITE (JWRITE.10)
   10 FORMAT (1X.//.10X.'ZERO MATRIX ENCOUNTERED IN THIS MODEL CASE.  TO
     1 NEXT MODEL CASE. IF ANY.')
      RETURN
C***  DEFINE COEFFICIENTS IN CORRECT ORDER
   11 DO 12 J=1.15
   12 CFM(J)=0.0D0
      DO 13 J=1.NUM
   13 CFM(LLOC(J))=X(J.1)
C***  DETERMINE FIT ERROR
      SSX=0.0D0
      DO 14 J=1.K
      AM=DABS(F6(J))
      IF (F6(J).LT.0.0D0) CALL SIGNS(SGN.IEX1.IEX2.IEX3.IEX4)
      P=CFM(1)+CFM(2)*F4(J)**EX1+CFM(3)*F4(J)**EX2+CFM(4)*F4(J)**EX3+CFM
     1(5)*F4(J)**EX4+CFM(6)*F8(J)+CFM(7)*F9(J)+CFM(8)*F3(J)
      CD=CFM(9)+CFM(10)*SGN(1)*AM**IEX1+CFM(11)*SGN(2)*AM**IEX2+CFM(12)*
     1SGN(3)*AM**IEX3+CFM(13)*SGN(4)*AM**IEX4+CFM(14)*F9(J)+CFM(15)*F3(J
     1)
C***  CHECK POWER AND DRAG COEFFICIENT RANGE
      IF ((P.LE.PLOW.OR.P.GT.PHIGH).OR.(CD.LT.CDLOW.OR.CD.GE.CDHIGH))NFL
     1=NFL+1
      SS=DCOS(F6(J)+TIA)*P/(F1(J)*F4(J))-(F5(J)*S*F4(J)**2/(2.0D0*F1(J))
     1*CD+F8(J)/G+DSIN(F2(J)-F6(J)))
   14 SSX=SSX+SS*SS
C***  WRITE MODEL VALUES
      IF (METRIC.NE.0) GO TO 18
      IF (NFL.GT.0) GO TO 16
      WRITE (JWRITE.15) ICASE.CFM(1).CFM(9).CFM(2).CFM(10).CFM(3).CFM(11
     1).CFM(4).CFM(12).NFL.CFM(5).CFM(13).CFM(6).CFM(14).CFM(7).CFM(15).
     1CFM(8).SSX
   15 FORMAT (28X.76('*')./.28X.'*'.74X.'*'./.28X.'*'.2X.'CASE'.I2.4X.'P
     10 = '.1PD23.16.3X.'CD0 = '.1PD23.16.2X.'*'./.28X.'*'.12X.'P1 = '.1
     1PD23.16.3X.'CD1 = '.1PD23.16.2X.'*'./.28X.'*'.1X.'POINT'.6X.'P2 = 
     1'.1PD23.16.3X.'CD2 = '.1PD23.16.2X.'*'./.28X.'*'.1X.'FAILURES'.3X.
     1'P3 = '.1PD23.16.3X.'CD3 = '.1PD23.16.2X.'*'./.28X.'*'.1X.'='.I4.6
     1X.'P4 = '.1PD23.16.3X.'CD4 = '.1PD23.16.2X.'*'./.28X.'*'.12X.'P5 =
     1 '.1PD23.16.3X.'CD5 = '.1PD23.16.2X.'*'./.28X.'*'.12X.'P6 = '.1PD2
     13.16.3X.'CD6 = '.1PD23.16.2X.'*'./.28X.'*'.12X.'P7 = '.1PD23.16.34
     1X.'*'./.28X.'*'.74X.'*'./.28X.'*'.1X.'FIT ERROR= '.D23.16.39X.'*'.
     1/.28X.'*'.74X.'*'./.28X.76('*'))
      RETURN
   16 WRITE (JWRITE.17) ICASE.CFM(1).CFM(9).CFM(2).CFM(10).CFM(3).CFM(11
     1).CFM(4).CFM(12).NFL.CFM(5).CFM(13).CFM(6).CFM(14).CFM(7).CFM(15).
     1CFM(8).FAIL
   17 FORMAT (28X.76('*')./.28X.'*'.74X.'*'./.28X.'*'.2X.'CASE'.I2.4X.'P
     10 = '.1PD23.16.3X.'CD0 = '.1PD23.16.2X.'*'./.28X.'*'.12X.'P1 = '.1
     1PD23.16.3X.'CD1 = '.1PD23.16.2X.'*'./.28X.'*'.1X.'POINT'.6X.'P2 = 
     1'.1PD23.16.3X.'CD2 = '.1PD23.16.2X.'*'./.28X.'*'.1X.'FAILURES'.3X.
     1'P3 = '.1PD23.16.3X.'CD3 = '.1PD23.16.2X.'*'./.28X.'*'.1X.'='.I4.6
     1X.'P4 = '.1PD23.16.3X.'CD4 = '.1PD23.16.2X.'*'./.28X.'*'.12X.'P5 =
     1 '.1PD23.16.3X.'CD5 = '.1PD23.16.2X.'*'./.28X.'*'.12X.'P6 = '.1PD2
     13.16.3X.'CD6 = '.1PD23.16.2X.'*'./.28X.'*'.12X.'P7 = '.1PD23.16.34
     1X.'*'./.28X.'*'.74X.'*'./.28X.'*'.1X.'FIT ERROR= '.A4.58X.'*'./.28
     1X.'*'.74X.'*'./.28X.76('*'))
      RETURN
   18 DO 19 L=1.8
   19 H(L)=CFM(L)*1.355818D-3
      IF (NFL.GT.0) GO TO 20
      WRITE (JWRITE.15) ICASE.H(1).CFM(9).H(2).CFM(10).H(3).CFM(11).H(4)
     1.CFM(12).NFL.H(5).CFM(13).H(6).CFM(14).H(7).CFM(15).H(8).SSX
      RETURN
   20 WRITE (JWRITE.17) ICASE.H(1).CFM(9).H(2).CFM(10).H(3).CFM(11).H(4)
     1.CFM(12).NFL.H(5).CFM(13).H(6).CFM(14).H(7).CFM(15).H(8).FAIL
      RETURN
   21 WRITE (JWRITE.22)
   22 FORMAT (1X.////.20X.'INPUT ERROR ***.USER SPECIFIED AT LEAST ONE L
     1OC PARAMETER INCORRECTLY.')
      RETURN
      END
```

```
      SUBROUTINE SIGNS(Y.X1.X2.X3.X4)
C
C***  SUBROUTINE SIGNS DETERMINES THE CORRECT SIGN ON TERMS IN
C***  COMPUTING THE DRAG COEFFICIENT EXPRESSION OR ITS DERIVATIVES IN
C***  RELATION TO ARGUMENT AND EXPONENTS
C
      IMPLICIT REAL*8(A-H.O-Z)
      INTEGER*4 X1.X2.X3.X4
      DIMENSION Y(4).L(4)
C
      DO 1 I=1.4
```

```
    1 Y(I)=1.0D0
      L(1)=X1
      L(2)=X2
      L(3)=X3
      L(4)=X4
      DO 2 I=1,4
      IF (((L(I)/2)*2).NE.L(I))Y(I)=-1.0D0
    2 CONTINUE
      RETURN
      ENTRY CHNGE(Y)
      DO 3 I=1,4
    3 Y(I)=1.0D0
      RETURN
      END


      SUBROUTINE LLSQAR(A,B,M,NA,NB,IA,IB,IDGT,WKAREA,IER,JWRITE)
C
C***  SUBROUTINE LLSQAR PERFORMS A LEAST SQUARES SOLUTION OF A OVER-
C***  DETERMINED SYSTEM OF LINEAR EQUATIONS
C
      DIMENSION A(IA,1),B(IB,1),WKAREA(1)
      REAL*8 SUM
      REAL*8 A,B,WKAREA
C
C***  INITIALIZE IER
      IER=0
C***  FIND THE PSEUDO-INVERSE OF MATRIX A
      CALL LPSDOR(A,M,NA,IA,A,IDGT,WKAREA,IER,JWRITE)
      IF (IER.NE.0) GO TO 5
C***  SOLVE THE EQUATION BY MULTIPLYING A-INVERSE AND B
      DO 4 I=1,NB
      DO 2 J=1,NA
      CALL VXPZRO
      DO 1 K=1,M
      CALL VXPMUL(A(K,J),B(K,I))
    1 CONTINUE
      CALL VXPSTO(SUM)
      WKAREA(J)=SUM
    2 CONTINUE
C***  MOVE THE RESULTS INTO MATRIX B
      DO 3 J=1,NA
      B(J,I)=WKAREA(J)
    3 CONTINUE
    4 CONTINUE
      GO TO 6
    5 IER=129
      CALL UERTST(IER,6HLLSQAR,JWRITE)
    6 RETURN
      END


      SUBROUTINE LPSDOR(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)
C
C***  SUBROUTINE LPSDOR FIND THE PSEUDO-INVERSE OF A MATRIX
C
      DIMENSION A(IA,1),AINV(IA,1),WKAREA(N,1)
      REAL*8 A,AINV,WKAREA,BIGA,AMN,ZERO,ETA
      REAL*8 SUM,DETA
C
C***  INITIALIZE IER
      IER=0
      NP1=N+1
      NP2=N+2
      NP3=N+3
C***  FIND THE LARGEST ELEMENT OF A
      BIGA=0.D0
      DO 1 I=1,M
      DO 1 II=1,N
      IF (BIGA.GE.DABS(A(I,II))) GO TO 1
      BIGA=DABS(A(I,II))
    1 CONTINUE
      AMN=M*N
      ETA=DSQRT(AMN)/(10.**IDGT)*BIGA
C***  CALCULATE THE SINGULAR VALUE DECOMPOSITION OF A
      CALL LSVALR(A,M,N,IA,N,1,WKAREA(1,N+4),WKAREA(1,NP1),AINV,WKAREA)
      DO 2 I=1,N
    2 WKAREA(I,NP2)=WKAREA(I,NP1)
C***  SORT THE SINGULAR VALUES ARRAY INTO ASCENDING SEQUENCE BY ABSOLUTE
C***  VALUE
      CALL VSORTM(WKAREA(1,NP2),N)
      DETA=ETA**2
      CALL VXPZRO
C***  COMPARE SINGULAR VALUES AND ETA
      DO 3 I=1,N
      IP=I
      CALL VXPMUL(WKAREA(I,NP2),WKAREA(I,NP2))
      CALL VXPSTO(SUM)
      IF (SUM.GT.DETA) GO TO 4
    3 CONTINUE
      IER=129
      GO TO 15
    4 IP=IP-1
      IF (IP.NE.0) GO TO 5
      ZERO=0.D0
      GO TO 6
    5 ZERO=WKAREA(IP,NP2)
    6 DO 10 I=1,N
      IF (WKAREA(I,NP1).LE.ZERO) GO TO 8
      DO 7 J=1,N
    7 WKAREA(J,I)=WKAREA(J,I)/WKAREA(I,NP1)
      GO TO 10
C***  SET WKAREA(J,I)=0.0, FOR J=1,....,N, IF WKAREA(I,NP1).LE.ZERO
    8 DO 9 J=1,N
    9 WKAREA(J,I)=0.0
   10 CONTINUE
      DO 14 I=1,N
      DO 12 J=1,N
      CALL VXPZRO
      DO 11 K=1,N
   11 CALL VXPMUL(WKAREA(J,K),AINV(I,K))
      CALL VXPSTO(SUM)
   12 WKAREA(J,NP3)=SUM
C***  MOVE THE RESULTS INTO MATRIX AINV
      DO 13 J=1,N
   13 AINV(I,J)=WKAREA(J,NP3)
   14 CONTINUE
      GO TO 16
```

```
   15 CALL UERTST(IER.6HLPSDOR.JWRITE)
   16 RETURN
      END


      SUBROUTINE LSVALR(A.M.N.IA.IV.ISW.WKAREA.Q.U.V)
C
C***  SUBROUTINE LSVALR DETERMINES THE SINGULAR VALUE DECOMPOSITION OF A
C***  MATRIX
C
      DIMENSION A(IA.1).U(IA.1).V(IV.1).Q(1).WKAREA(1)
      REAL*8A.WKAREA.Q.U.V.EPS.TOL
      REAL*8F.G.H.X.Y.Z.C.S.HR.GR.DPS.ONE.ZERO
      DATA TOL/Z001000000000000/.DPS/Z341000000000000/
      DATA ONE/1.0D0/.ZERO/0.0D0/
C
      EPS=DPS
      DO 1 I=1.N
      DO 1 J=1.N
      U(I.J)=A(I.J)
    1 CONTINUE
C***  HOUSEHOLDER'S REDUCTION TO BIDIAGONAL FORM
      X=0.D0
      G=0.D0
      DO 17 I=1.N
      WKAREA(I)=G
      CALL VXPZRO
      L=I+1
      DO 2 J=I.M
    2 CALL VXPMUL(U(J.I).U(J.I))
      CALL VXPSTO(S)
      IF (S.GE.TOL) GO TO 3
      G=0.D0
      GO TO 7
    3 F=U(I.I)
      G=-DSQRT(S)
      IF (F.LT.0.D0)G=-G
      H=F*G-S
      HR=1.0/H
      U(I.I)=F-G
      IF (L.GT.N) GO TO 7
      DO 6 J=L.N
      CALL VXPZRO
      DO 4 K=I.M
    4 CALL VXPMUL(U(K.I).U(K.J))
      CALL VXPSTO(S)
      F=S*HR
      DO 5 K=I.M
    5 U(K.J)=U(K.J)+F*U(K.I)
    6 CONTINUE
    7 Q(I)=G
      CALL VXPZRO
      IF (L.GT.N) GO TO 9
      DO 8 J=L.N
    8 CALL VXPMUL(U(I.J).U(I.J))
      CALL VXPSTO(S)
    9 IF (S.GE.TOL) GO TO 10
      G=0.D0
      GO TO 16
   10 IF (I.LT.N)F=U(I.I+1)
      G=-DSQRT(S)
      IF (F.LT.0.D0)G=-G
      H=F*G-S
      HR=1.0/H
      IF (I.LT.N)U(I.I+1)=F-G
      IF (L.GT.N) GO TO 12
      DO 11 J=L.N
   11 WKAREA(J)=U(I.J)*HR
   12 IF (L.GT.M) GO TO 16
      DO 15 J=L.M
      CALL VXPZRO
      IF (L.GT.N) GO TO 15
      DO 13 K=L.N
   13 CALL VXPMUL(U(J.K).U(I.K))
      CALL VXPSTO(S)
      DO 14 K=L.N
   14 U(J.K)=U(J.K)+S*WKAREA(K)
   15 CONTINUE
   16 Y=DABS(Q(I))+DABS(WKAREA(I))
      IF (Y.GT.X)X=Y
   17 CONTINUE
C***  ACCUMULATION OF RIGHT HAND TRANSFORMATIONS
      IF (ISW.EQ.0) GO TO 37
      DO 25 I=1.N
      II=N-I+1
      IF (G.EQ.0.D0) GO TO 22
      IF (L.GT.N) GO TO 24
      H=U(II.II+1)*G
      HR=1.0/H
      DO 18 J=L.N
   18 V(J.II)=U(II.J)*HR
      DO 21 J=L.N
      CALL VXPZRO
      DO 19 K=L.N
   19 CALL VXPMUL(U(II.K).V(K.J))
      CALL VXPSTO(S)
      DO 20 K=L.N
   20 V(K.J)=V(K.J)+S*V(K.II)
   21 CONTINUE
   22 IF (L.GT.N) GO TO 24
      DO 23 J=L.N
      V(J.II)=0.D0
   23 V(II.J)=0.D0
   24 V(II.II)=1.0D0
      G=WKAREA(II)
   25 L=II
C***  ACCUMULATION OF LEFT HAND TRANSFORMATIONS
      DO 36 I=1.N
      II=N-I+1
      LL=II+1
      G=Q(II)
      IF (LL.GT.N) GO TO 27
      DO 26 J=LL.N
   26 U(II.J)=0.D0
   27 IF (G.EQ.0.D0) GO TO 33
      H=U(II.II)*G
      HR=1.0/H
      IF (LL.GT.N) GO TO 31
      DO 30 J=LL.N
```

```
      CALL VXPZRO
      DO 28 K=LL.N
   28 CALL VXPMUL(U(K.II).U(K.J))
      CALL VXPSTO(S)
      F=S*HR
      DO 29 K=II.N
   29 U(K.J)=U(K.J)+F*U(K.II)
   30 CONTINUE
   31 GR=1.0/G
      DO 32 J=II.N
   32 U(J.II)=U(J.II)*GR
      GO TO 35
   33 DO 34 J=II.N
   34 U(J.II)=0.D0
   35 U(II.II)=U(II.II)+1.0D0
   36 CONTINUE
C***  DIAGONALIZATION OF THE BIDIAGONAL FORM
   37 EPS=EPS*X
      DO 57 K=1.N
      KK=N-K+1
C***  TEST F SPLITTING
   38 DO 39 L=1.KK
      LL=KK-L+1
      IF (DABS(WKAREA(LL)).LE.EPS) GO TO 45
      IF (LL.EQ.1) GO TO 45
      IF (DABS(Q(LL-1)).LE.EPS) GO TO 40
   39 CONTINUE
C***  CANCELLATION OF WKAREA(L) IF LL.GT.1
   40 C=0.D0
      S=1.0D0
      L1=LL-1
      IF (KK.LT.LL) GO TO 45
      DO 44 I=LL.KK
      F=S*WKAREA(I)
      WKAREA(I)=C*WKAREA(I)
      IF (DABS(F).LE.EPS) GO TO 45
      G=Q(I)
      Q(I)=DSQRT(F*F+G*G)
      H=Q(I)
      IF (H.NE.ZERO) GO TO 41
      C=ZERO
      S=ONE
      GO TO 42
   41 C=G/H
      S=-F/H
   42 IF (ISW.EQ.0) GO TO 44
      DO 43 J=1.M
      Y=U(J.L1)
      Z=U(J.I)
      U(J.L1)=Y*C+Z*S
   43 U(J.I)=-Y*S+Z*C
   44 CONTINUE
C***  TEST F CONVERGENCE
   45 Z=Q(KK)
      IF (LL.EQ.KK) GO TO 55
C***  SHIFT FROM BOTTOM 2X2 MINOR
      X=Q(LL)
      IF (KK.GT.1)Y=Q(KK-1)
      IF (KK.GT.1)G=WKAREA(KK-1)
      H=WKAREA(KK)
      F=((Y-Z)*(Y+Z)+(G-H)*(G+H))/(2.D0*H*Y)
      G=DSQRT(F*F+ONE)
      IF (F.LT.0.D0)F=((X-Z)*(X+Z)+H*(Y/(F-G)-H))/X
      IF (F.GE.0.D0)F=((X-Z)*(X+Z)+H*(Y/(F+G)-H))/X
C***  NEXT QR TRANSFORMATION
      C=1.0D0
      S=1.0D0
      L2=LL+1
      IF (KK.LT.L2) GO TO 54
      DO 53 I=L2.KK
      G=WKAREA(I)
      Y=Q(I)
      H=S*G
      G=C*G
      Z=DSQRT(F*F+H*H)
      WKAREA(I-1)=Z
      IF (Z.NE.ZERO) GO TO 46
      C=ZERO
      S=ONE
      GO TO 47
   46 C=F/Z
      S=H/Z
   47 F=X*C+G*S
      G=-X*S+G*C
      H=Y*S
      Y=Y*C
      IF (ISW.EQ.0) GO TO 49
      DO 48 J=1.N
      X=V(J.I-1)
      Z=V(J.I)
      V(J.I-1)=X*C+Z*S
   48 V(J.I)=-X*S+Z*C
   49 Z=DSQRT(F*F+H*H)
      Q(I-1)=Z
      IF (Z.NE.ZERO) GO TO 50
      C=ZERO
      S=ONE
      GO TO 51
   50 C=F/Z
      S=H/Z
   51 F=C*G+S*Y
      X=-S*G+C*Y
      IF (ISW.EQ.0) GO TO 53
      DO 52 J=1.M
      Y=U(J.I-1)
      Z=U(J.I)
      U(J.I-1)=Y*C+Z*S
   52 U(J.I)=-Y*S+Z*C
   53 CONTINUE
   54 WKAREA(LL)=ZERO
      WKAREA(KK)=F
      Q(KK)=X
      GO TO 38
C***  CONVERGENCE
   55 IF (Z.GE.ZERO) GO TO 57
      Q(KK)=-Z
      IF (ISW.EQ.0) GO TO 57
      DO 56 J=1.N
   56 V(J.KK)=-V(J.KK)
   57 CONTINUE
```

```
      RETURN
      END


      SUBROUTINE UERTST(IER,NAME,JWRITE)
C
C***  SUBROUTINE UERTST GENERATES ERROR MESSAGES
C
      DIMENSION ITYP(5,4),IBIT(4)
      INTEGER*2 NAME(3)
      INTEGER WARN,WARF,TERM,JWRITE
      EQUIVALENCE (IBIT(1),WARN),(IBIT(2),WARF),(IBIT(3),TERM)
      DATA ITYP/'WARN','ING ','    ','    ','    ','WARN','ING(','WITH',
     1' FIX',')   ','TERM','INAL','    ','    ','    ','NON-','DEFI','NE
     1D ','    ','    '/,IBIT/32,64,128,0/
C
      IER2=IER
      IF (IER2.GE.WARN) GO TO 1
C***  UNDEFINED
      IER1=4
      GO TO 4
    1 IF (IER2.LT.TERM) GO TO 2
C***  TERMINAL
      IER1=3
      GO TO 4
    2 IF (IER2.LT.WARF) GO TO 3
C***  WARNING (WITH FIX)
      IER1=2
      GO TO 4
C***  WARNING
    3 IER1=1
C***  EXTRACT 'N'
    4 IER2=IER2-IBIT(IER1)
C***  PRINT ERROR MESSAGE
      WRITE (JWRITE,5) (ITYP(I,IER1),I=1,5),NAME,IER2,IER
    5 FORMAT (1X,/,1X,'ERROR MESSAGE FROM UERTST',2X,5A4,4X,3A2,4X,I2,2X
     1,'IER= ',I3)
      RETURN
      END


      SUBROUTINE VSORTM(A,LA)
C
C***  SUBROUTINE VSORTM SORTS ARRAYS BY ABSOLUTE VALUE
C
      DIMENSION A(1),IU(21),IL(21)
      REAL*8A,T,TT
C
C***  FIND ABSOLUTE VALUES OF ARRAY A
      DO 1 I=1,LA
      IF (A(I).LT.0.0)A(I)=-A(I)
    1 CONTINUE
C
      ENTRY VSORTA(A,LA)
C
C***  ENTRY VSORTA SORTS ARRAYS BY ALGEBRAIC VALUE
C
      M=1
      I=1
      J=LA
      R=.375
    2 IF (I.EQ.J) GO TO 11
      IF (R.GT..5898437) GO TO 4
      R=R+3.90625E-2
      GO TO 5
    4 R=R-.21875
    5 K=I
C***  SELECT A CENTRAL ELEMENT OF THE ARRAY AND SAVE IT IN LOCATION T
      IJ=I+(J-I)*R
      T=A(IJ)
C***  IF FIRST ELEMENT OF ARRAY IS GREATER THAT T, INTERCHANGE WITH T
      IF (A(I).LE.T) GO TO 6
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
    6 L=J
C***  IF LAST ELEMENT OF ARRAY IS LESS THAN T, INTERCHANGE WITH T
      IF (A(J).GE.T) GO TO 8
      A(IJ)=A(J)
      A(J)=T
      T=A(IJ)
C***  IF FIRST ELEMENT OF ARRAY IS GREATER THAN T, INTERCHANGE WITH T
      IF (A(I).LE.T) GO TO 8
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
      GO TO 8
    7 TT=A(L)
      A(L)=A(K)
      A(K)=TT
C***  FIND AN ELEMENT IN SECOND HALF OF ARRAY WHICH IS SMALLER THAN T
    8 L=L-1
      IF (A(L).GT.T) GO TO 8
C***  FIND AN ELEMENT IN FIRST HALF OF ARRAY WHICH IS GREATER THAN T
    9 K=K+1
      IF (A(K).LT.T) GO TO 9
C***  INTERCHANGE THESE ELEMENTS
      IF (K.LE.L) GO TO 7
C***  SAVE UPPER AND LOWER SUBSCRIPTS OF THE ARRAY YET TO BE SORTED
      IF (L-I.LE.J-K) GO TO 10
      IL(M)=I
      IU(M)=L
      I=K
      M=M+1
      GO TO 12
   10 IL(M)=K
      IU(M)=J
      J=L
      M=M+1
      GO TO 12
C***  BEGIN AGAIN ON ANOTHER PORTION OF UNSORTED ARRAY
   11 M=M-1
      IF (M.EQ.0) RETURN
      I=IL(M)
      J=IU(M)
   12 IF (J-I.GE.11) GO TO 5
      IF (I.EQ.1) GO TO 2
      I=I-1
```

```
13 I=I+1
   IF (I.EQ.J) GO TO 11
   T=A(I+1)
   IF (A(I).LE.T) GO TO 13
   K=I
14 A(K+1)=A(K)
   K=K-1
   IF (T.LT.A(K)) GO TO 14
   A(K+1)=T
   GO TO 13
   END
```

Flowchart — MDLCK

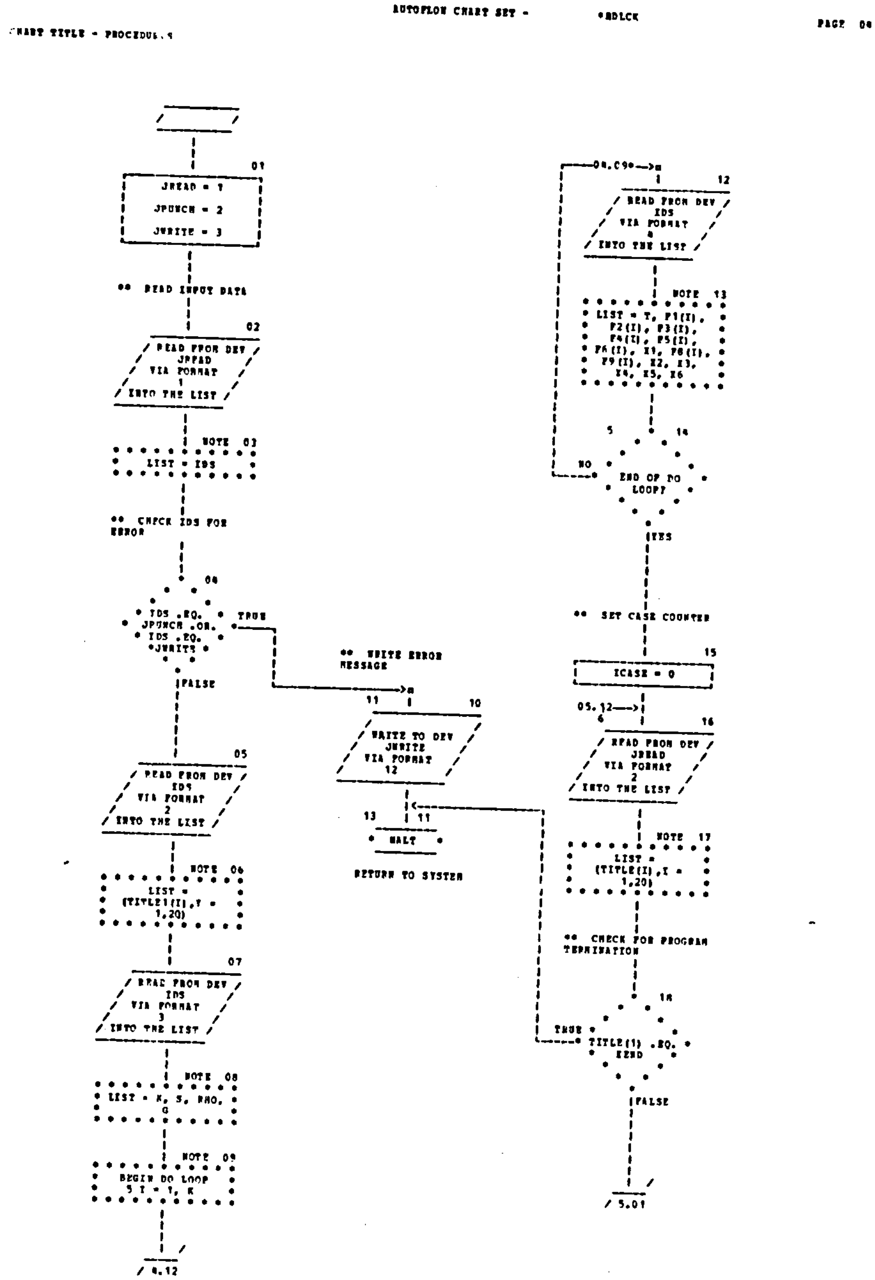


CHART TITLE - PROCEDURES

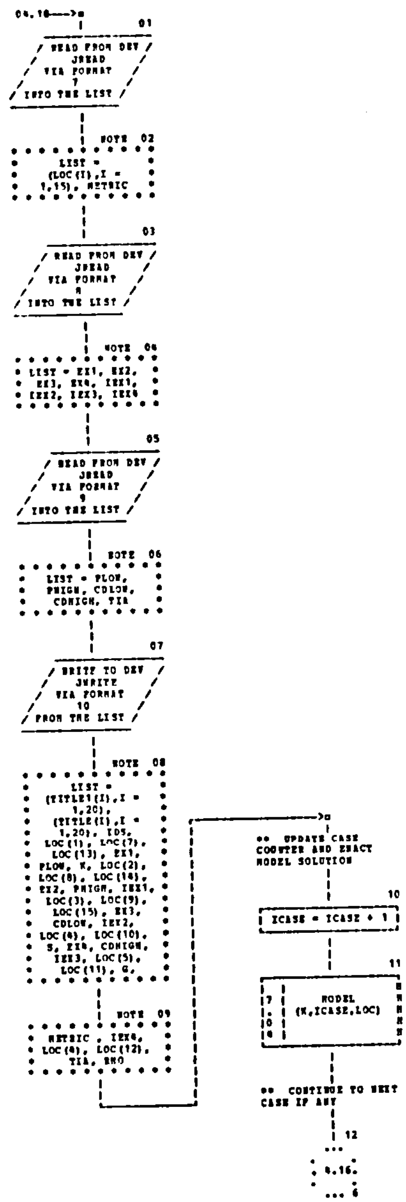


CHART TITLE - SUBROUTINE MODEL(K,ICASE,LOC)

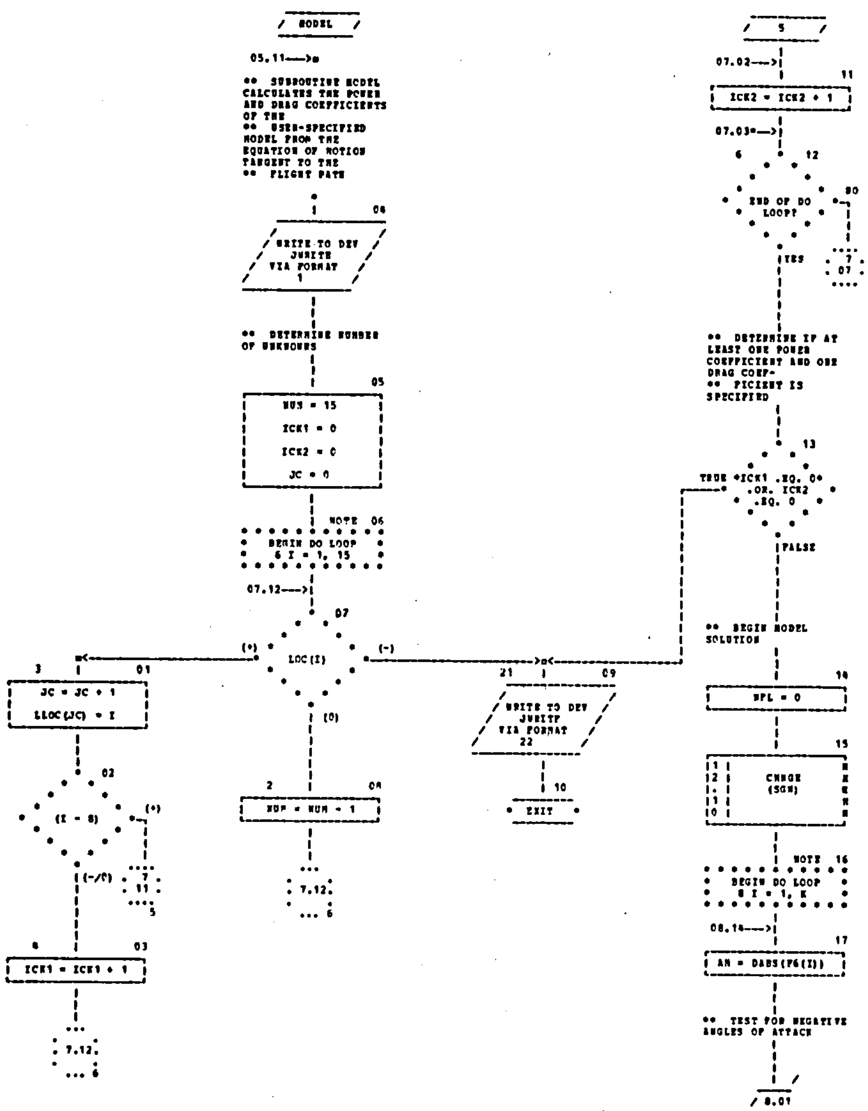


CHART TITLE - SUBROUTINE MODEL(K,ICASE,LOC)

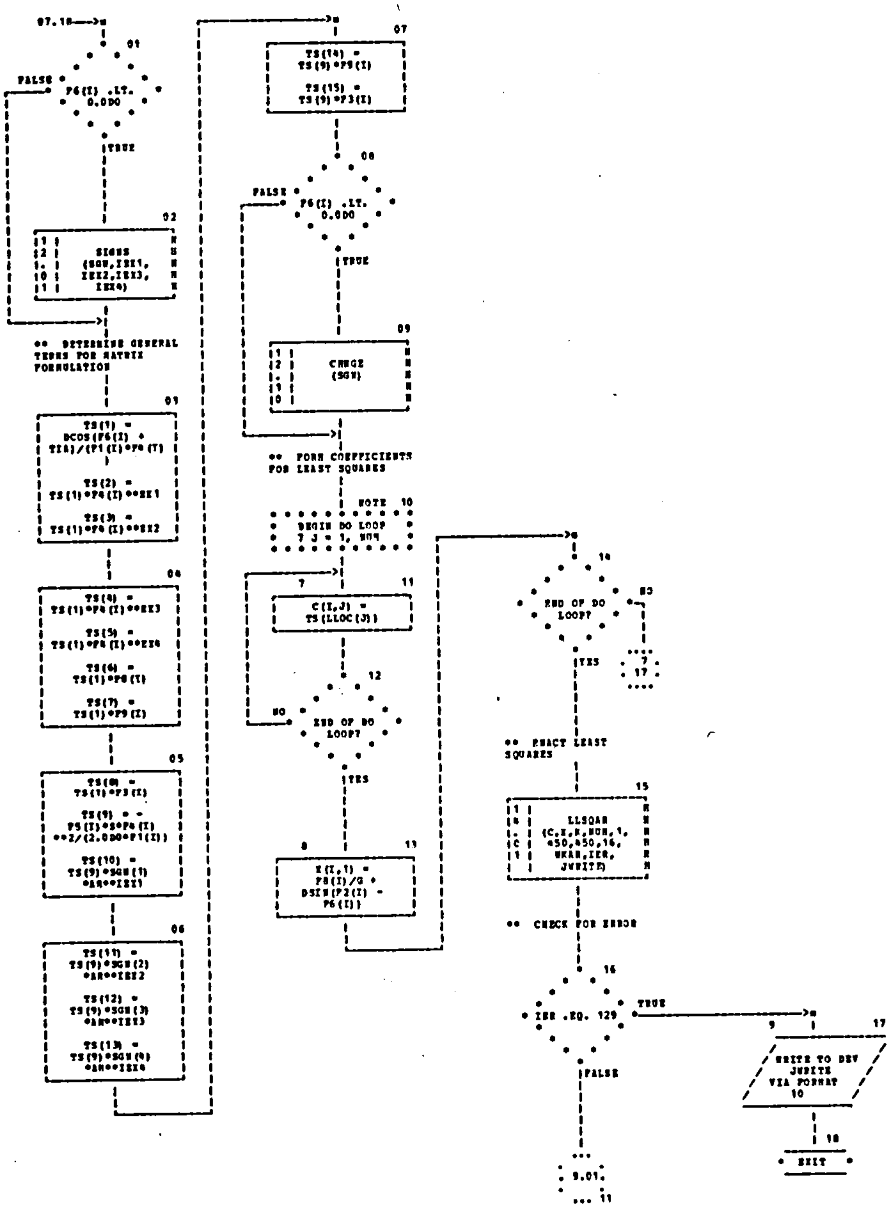


CHART TITLE - SUBROUTINE MODEI(K,ICASE,LOC)

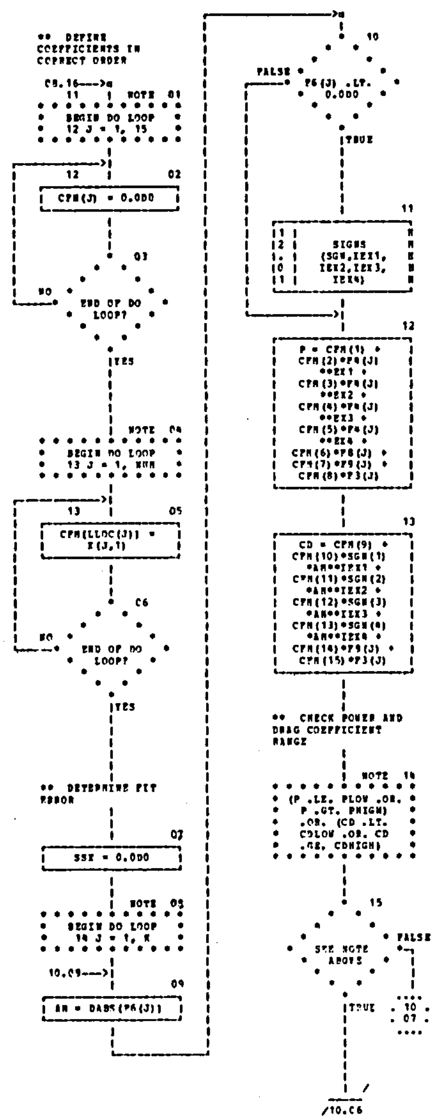


CHART TITLE - SUBROUTINE MODEL(K,ICASE,LOC)

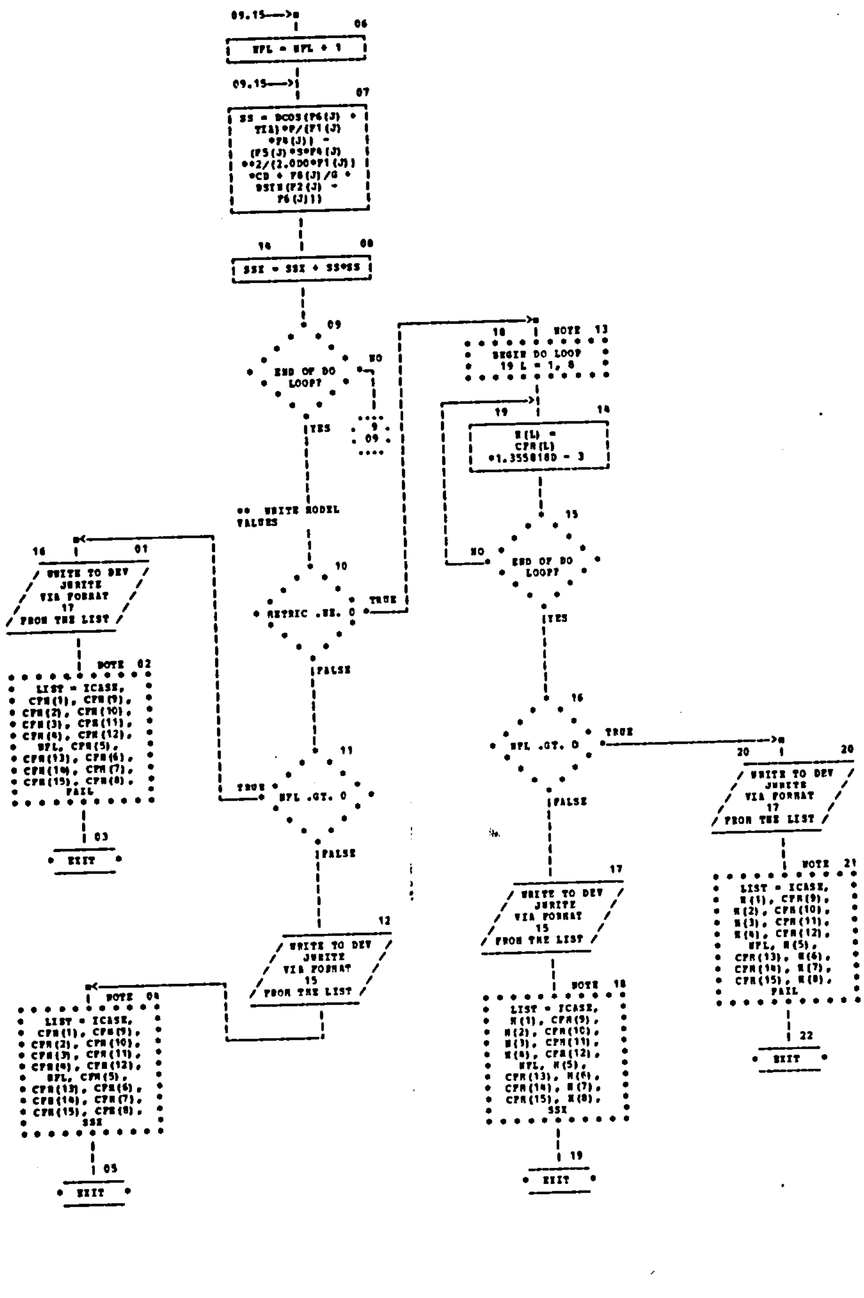


CHART TITLE - SUBROUTINE SIGNS(Y,X1,X2,X3,X4)

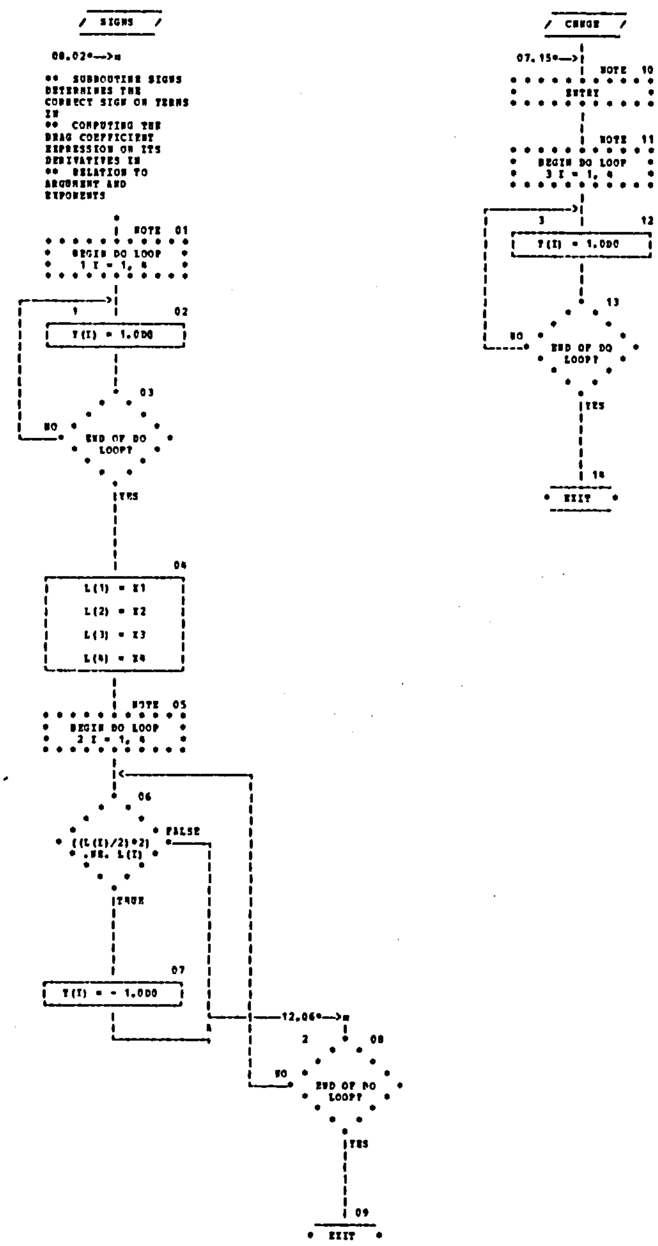


CHART TITLE - SUBROUTINE LLSQAR(A,B,M,NA,NB,IA,IB,IDGT,WKAREA,IER,JUNITE)

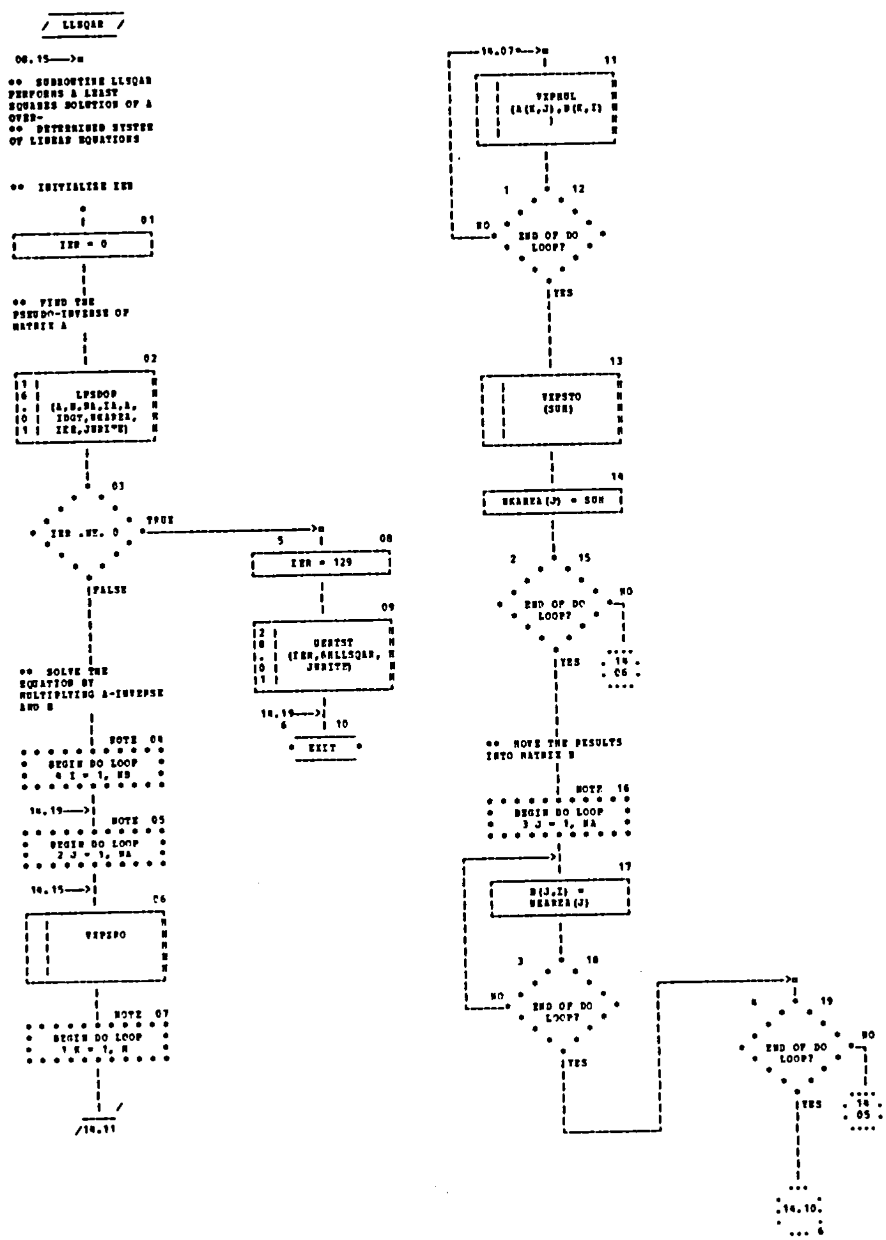


CHART TITLE - SUBROUTINE LPSDOR(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)

```
              ___________
             / LPSDOR   /
            ‾‾‾‾‾‾‾‾‾‾‾
       14.02---->*

     **  SUBROUTINE LPSDOR
     FIND THE
     PSEUDO-INVERSE OF A
     MATRIX


     **  INITIALIZE IER

                 *
                 |          01
     ---------------------------
     |        IER = 0          |
     |                         |
     |      NP1 = N + 1        |
     |                         |
     |      NP2 = N + 2        |
     |                         |
     |      NP3 = N + 3        |
     ---------------------------
                 |
                 |
     **  FIND THE LARGEST
     ELEMENT OF A
                 |
                 |          02
     ---------------------------
     |      BIGA = 0.D0        |
     ---------------------------
                 |
                 |    NOTE  03
     * * * * * * * * * * * *
     *    BEGIN DO LOOP      *
     *     1 I = 1, M        *
     * * * * * * * * * * * *
                 |
       17.01---->|
                 |    NOTE  04
     * * * * * * * * * * * *
     *    BEGIN DO LOOP      *
     *     1 II = 1, N       *
     * * * * * * * * * * * *
                 |
                 |<-------------------
                 *   05              |
              *     *                |
           *           *             |
   TRUE  *  BIGA .GE.    *           |
   -----*  DABS(A(I,II))  *          |
   |       *           *             |
   |          *     *                |
   |             *                   |
   |             |FALSE              |
   |             |                   |
   |             |                   |
   |             |           06      |
   |    ------------------------     |
   |    |     BIGA =           |     |
   |    |   DABS(A(I,II))      |     |
   |    ------------------------     |
   |             |                   |
   ------------->|                   |
                 |                   |
          1      *      07           |
              *     *                |
           *           *        NO   |
        *   END OF DO    *-----------
           *  LOOP?    *
              *     *
                 *
                 |YES
                 |
                 |
                 |
                 |  /
              ‾‾‾‾‾
             /17.01
```

CHART TITLE - SUBROUTINE LPSDOR(A,M,V,IA,AINV,IDGT,WKAREA,IER,JWRITE)

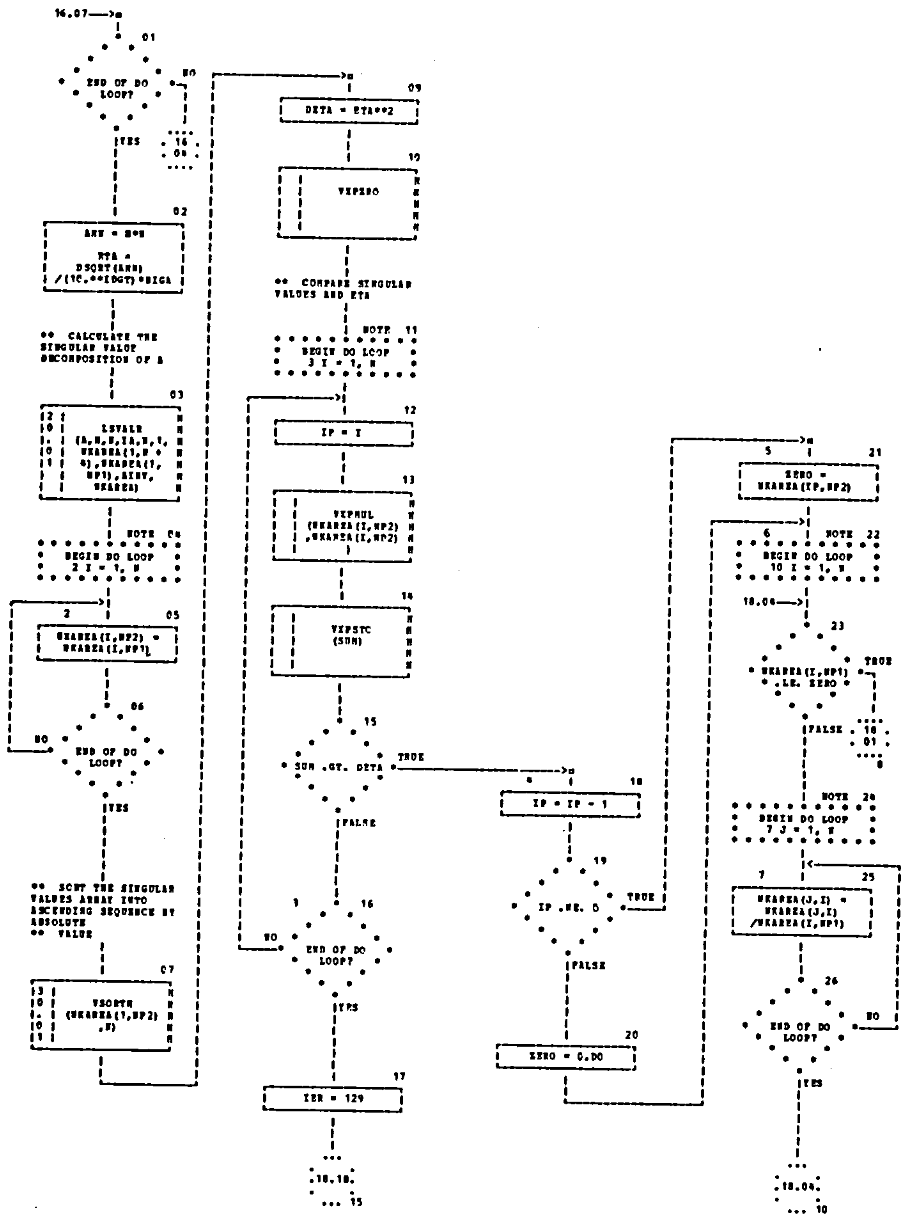


CHART TITLE - SUBROUTINE LPSDCR(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)

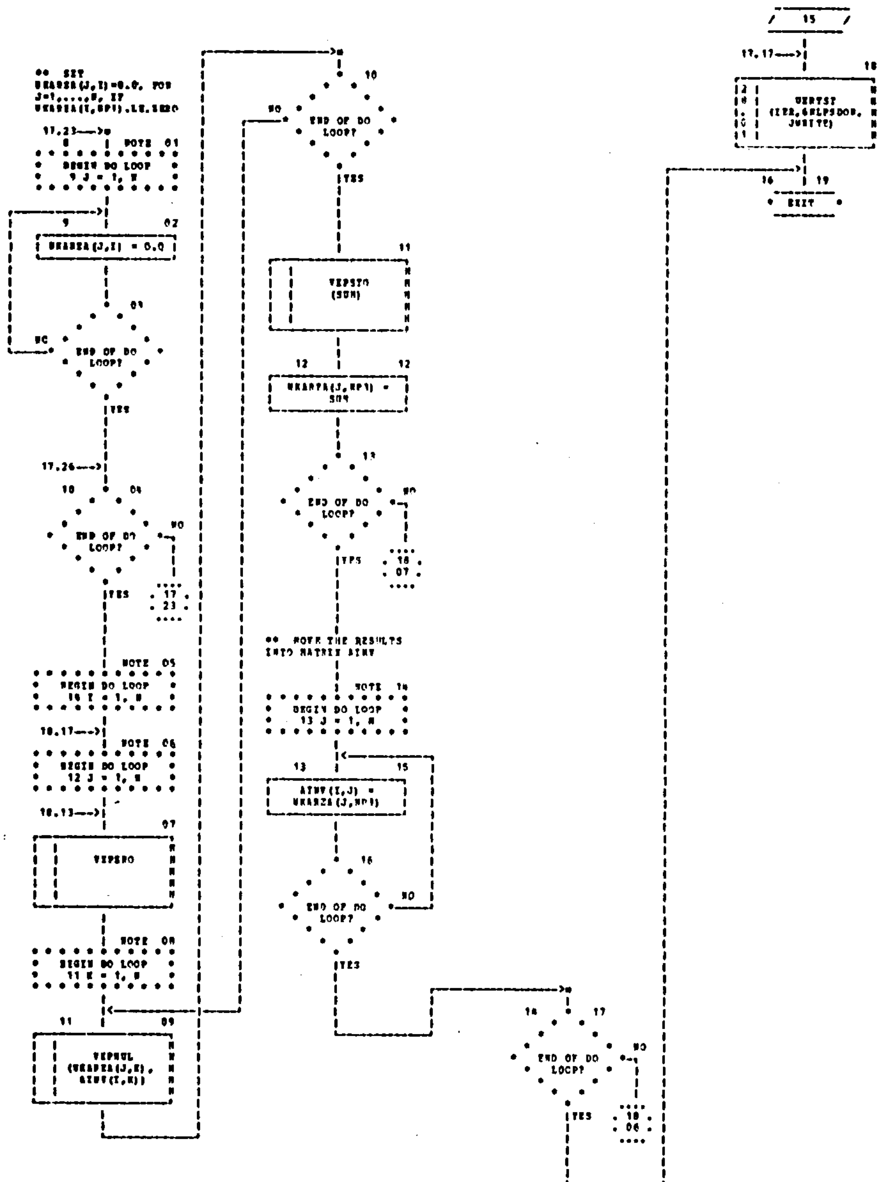


CHART TITLE - SUBROUTINE LSVALR(A,M,N,IA,IV,ISV,WKAREA,Q,U,V)

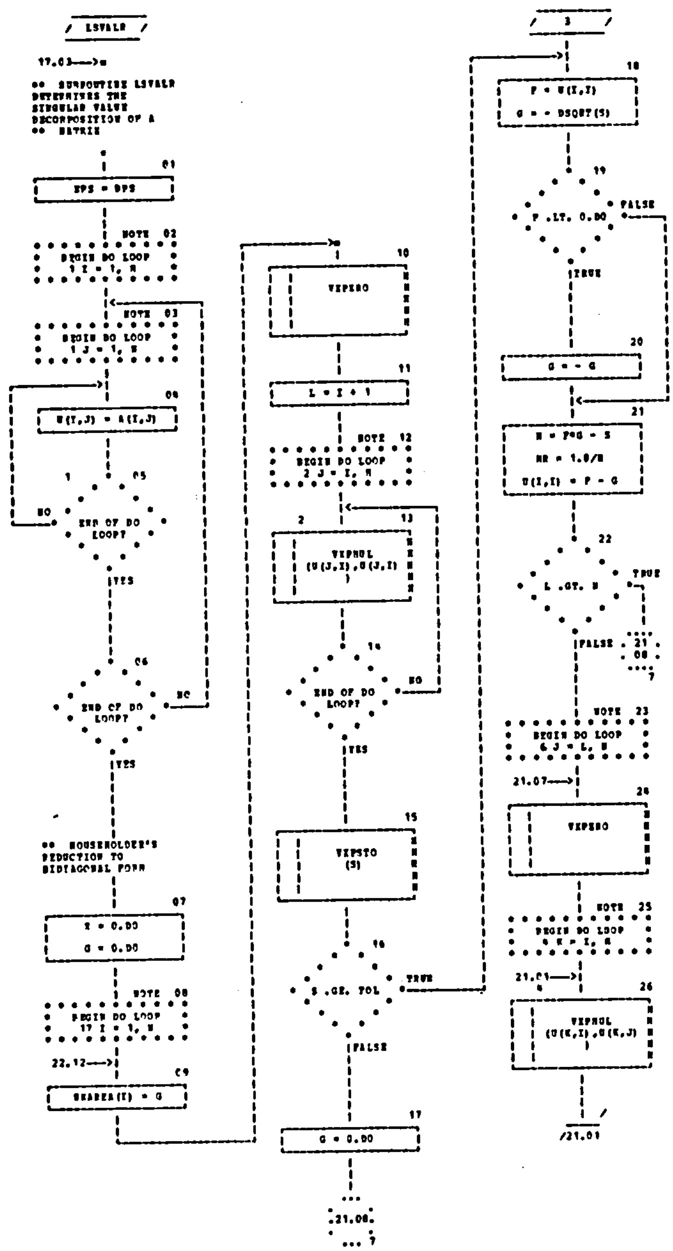


CHART TITLE - SUBROUTINE LSVALS(A,M,N,IA,IV,ISW,WKAREA,Q,U,V)

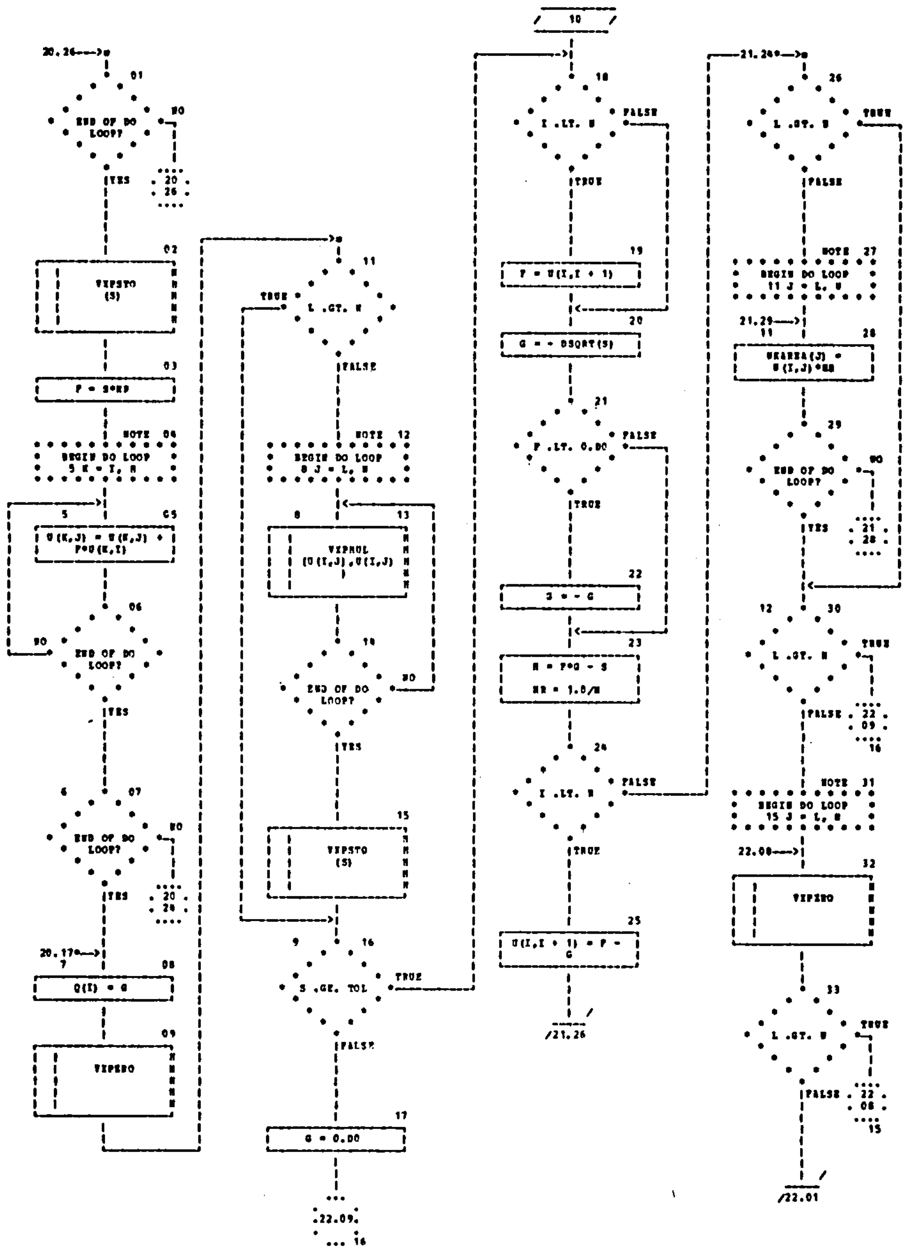


CHART TITLE - SUBROUTINE LSVALR(A,M,N,IA,IV,ISW,WKAREA,Q,U,V)

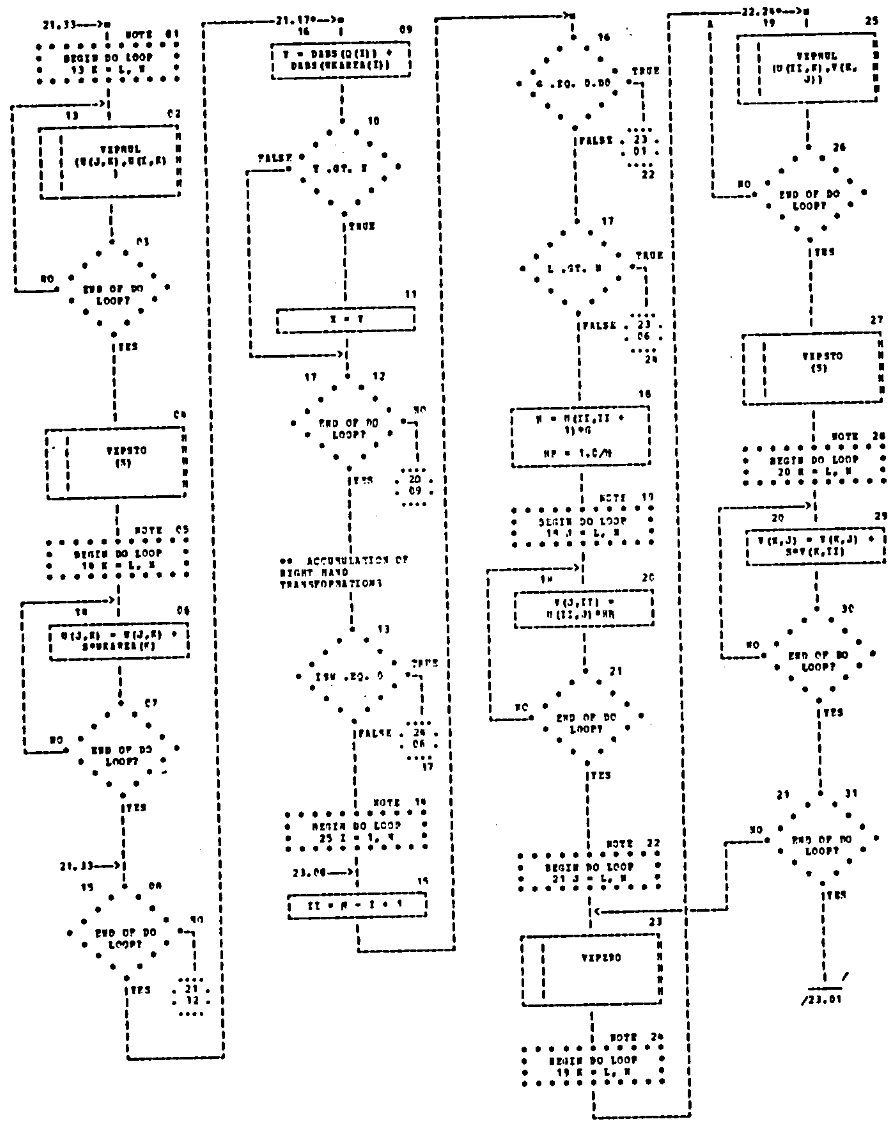


CHART TITLE - SUBROUTINE LSVALR(L,M,N,IA,IT,TSW,WKAPIA,Q,U,V)

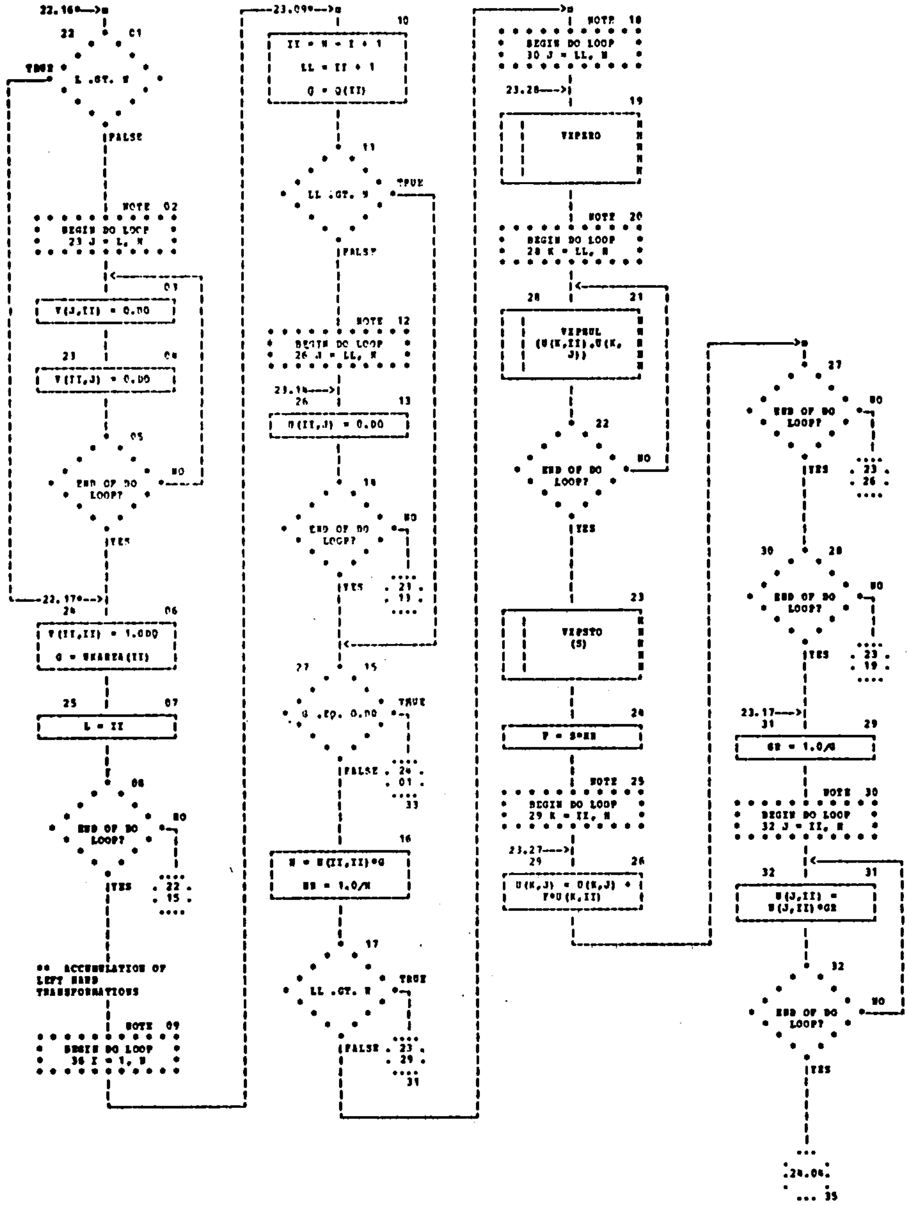


CHART TITLE - SUBROUTINE LSVALR(A,M,N,IA,IV,ISN,WKAREA,Q,U,V)

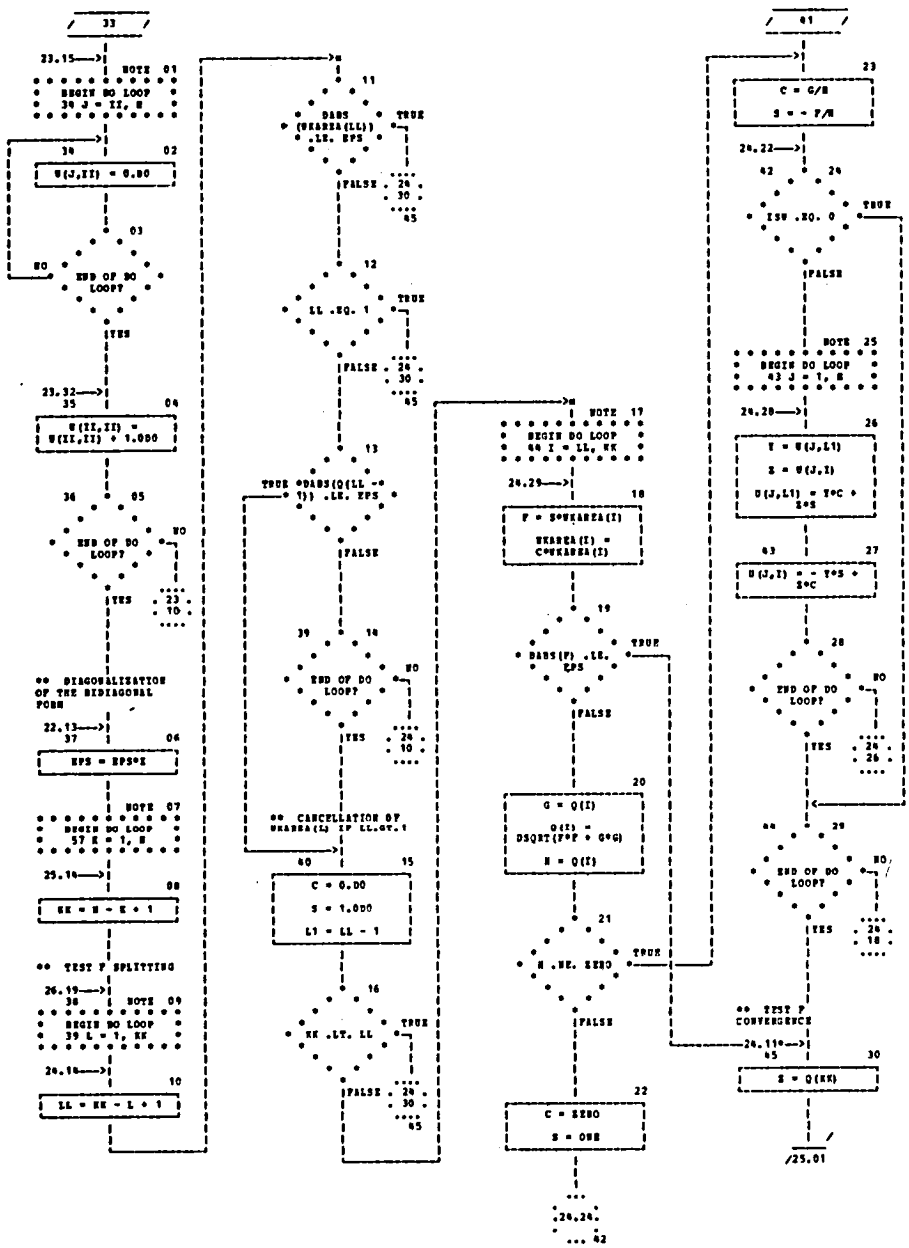


CHART TITLE - SUBROUTINE LSVALR(A,M,N,IA,IV,ISV,WKAREA,Q,U,V)

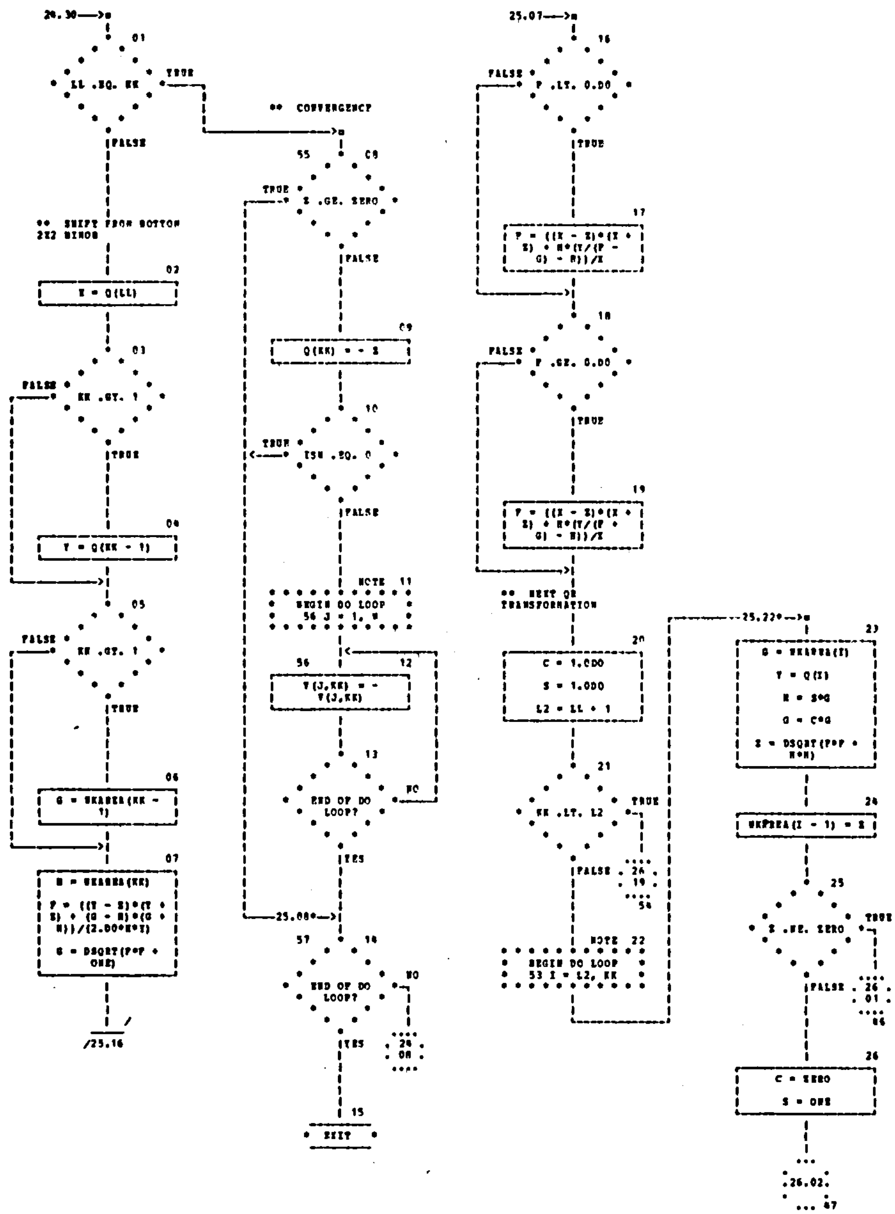


CHART TITLE - SUBROUTINE LSVALR(A,M,N,IA,IV,ISW,WKAREA,Q,U,V)

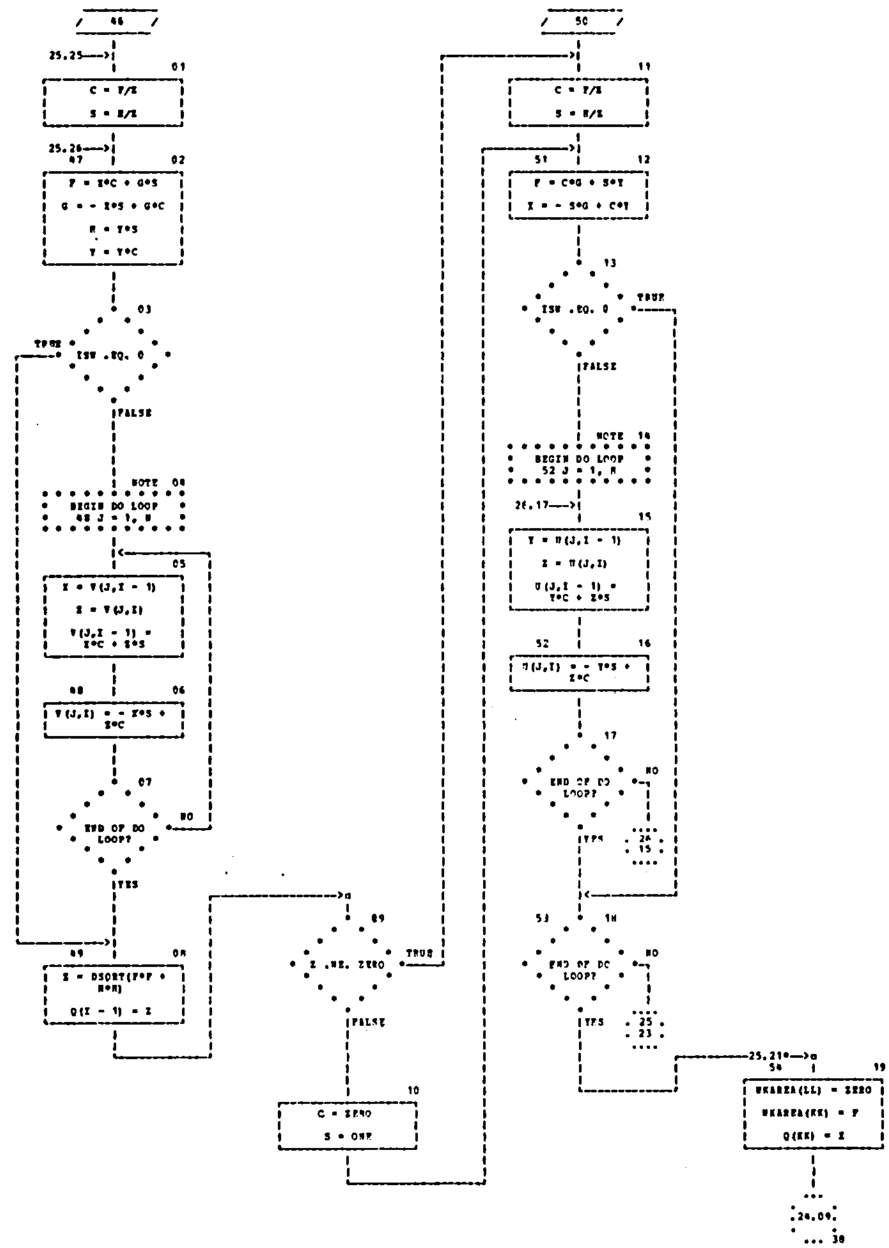


CHART TITLE - SUBROUTINE UERTST(IER,NAME,JWRITE)

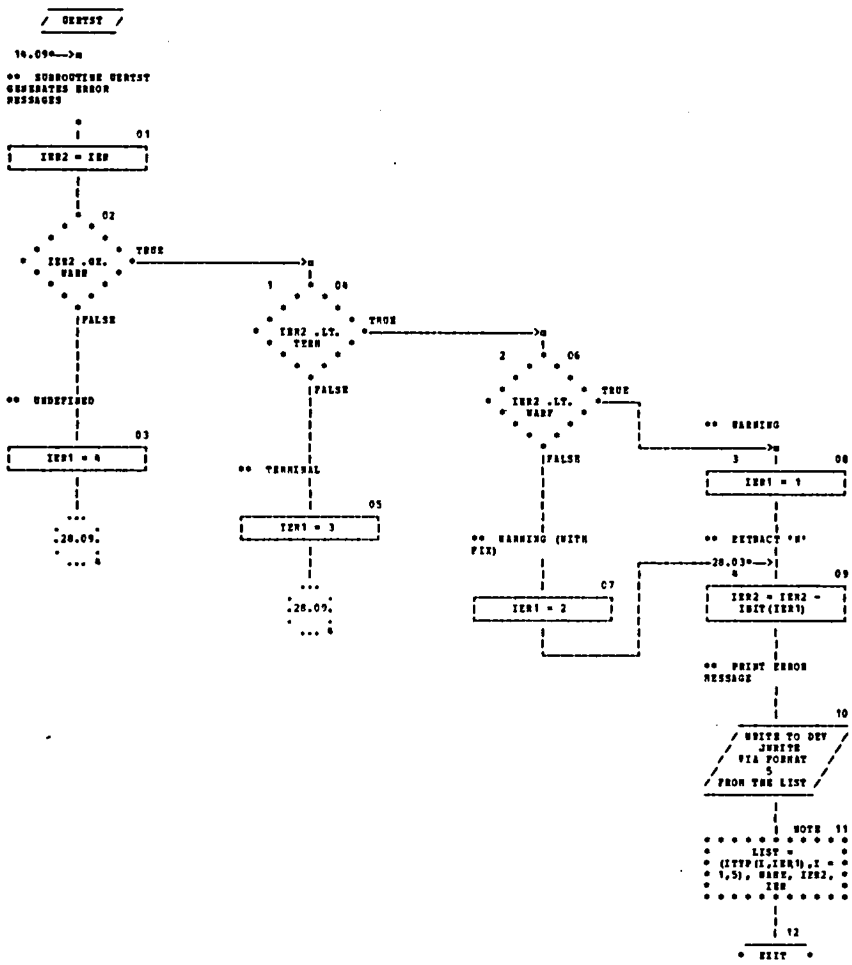


CHART TITLE - SUBROUTINE VSORTH(A,LA)

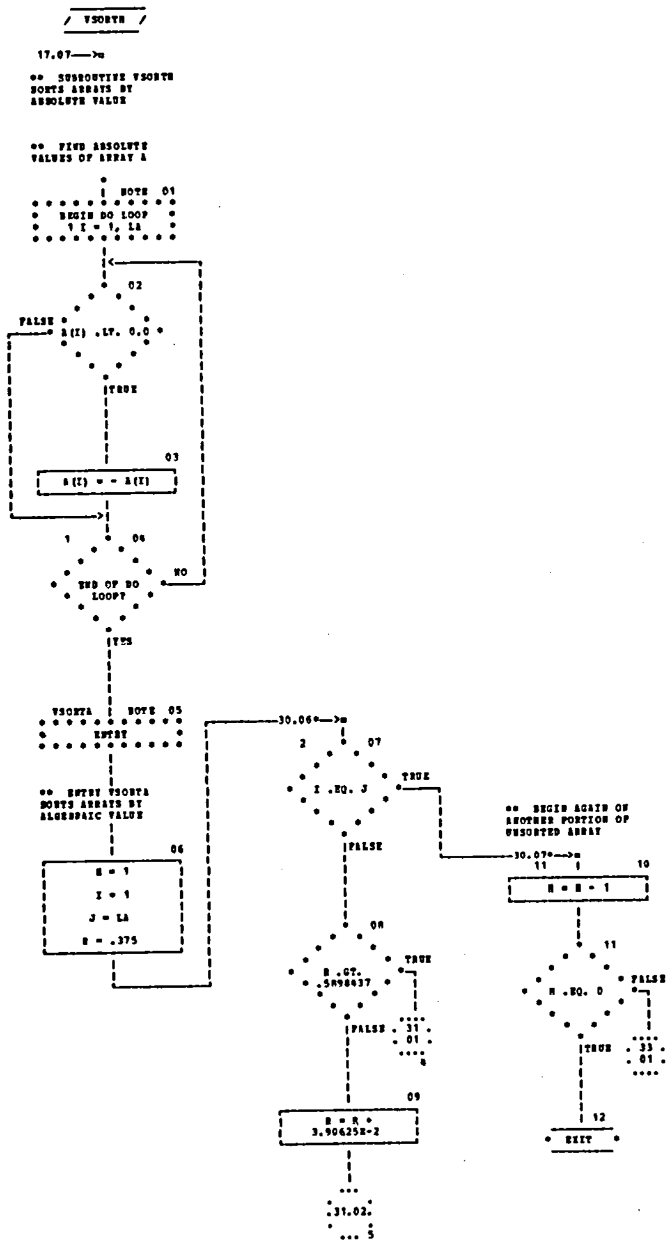
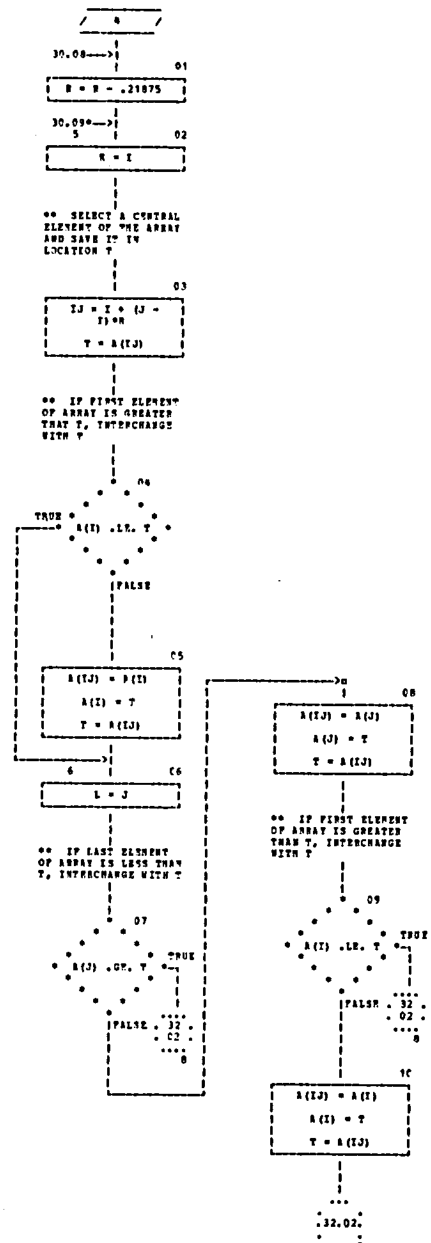


CHART TITLE - SUBROUTINE VSORTN(A,LA)



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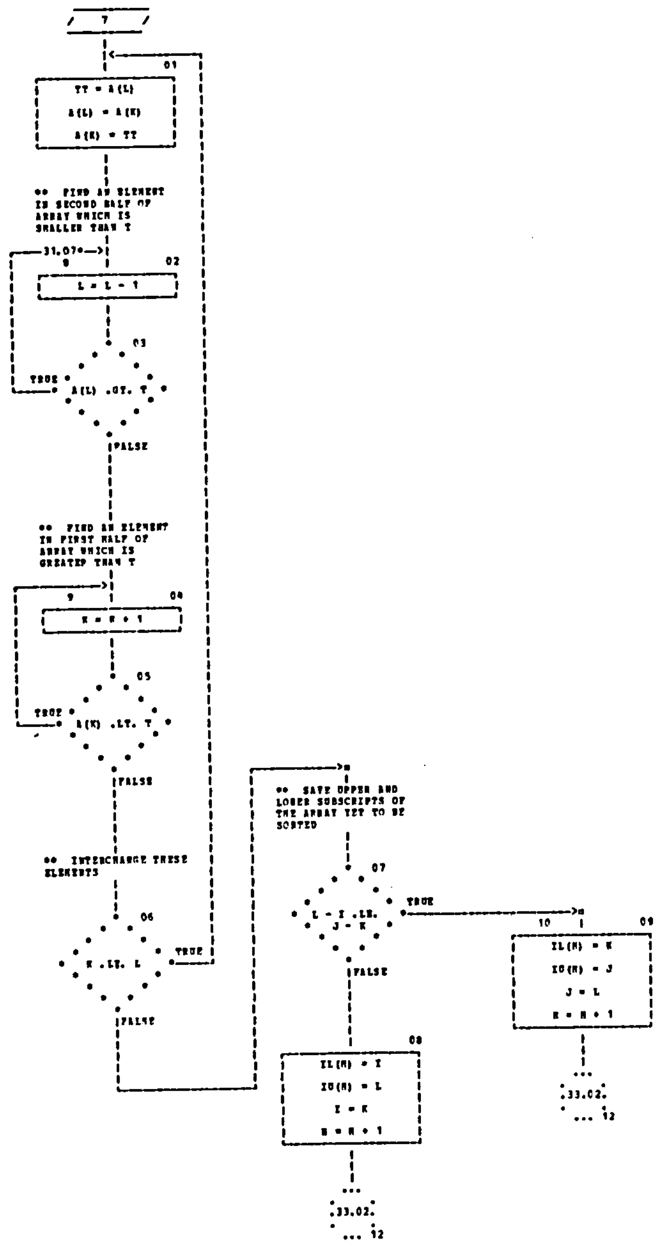

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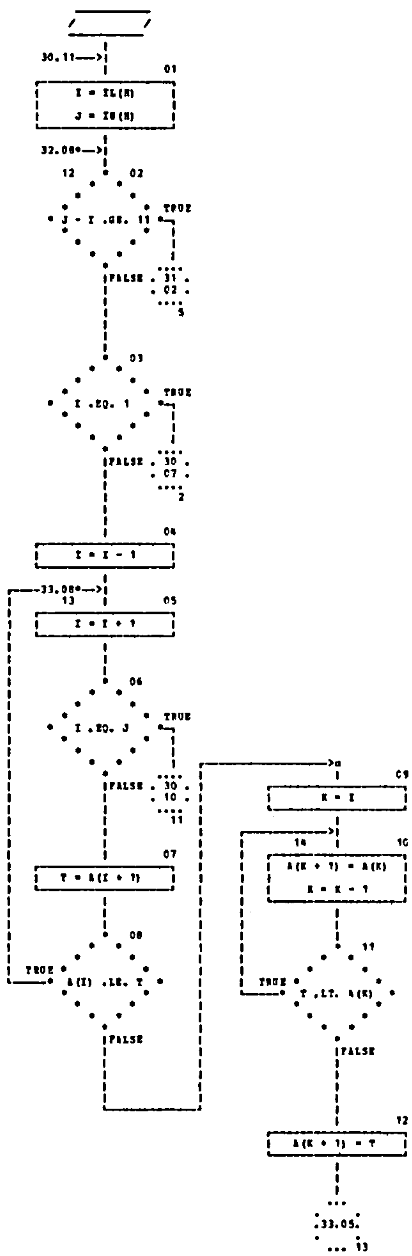

Sample Input — MDLCK

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  1
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-0.1131482894783744D 00   0.0                       0.0
 0.3169999999999709D 02   0.3970482648990000D 04    0.1383282763914071D-01
-0.1998502025403890D-02   0.2544573378573077D 03    0.1686097117128005D-02
 0.3527718905006238D-01   0.4910863697209998D 03    0.1006059436032068D 00
-0.4593909483740165D-02   0.1130362845176916D 05   -0.5395499651114786D 01
-0.8336439652930490D-01   0.0                       0.0
 0.3180000000000291D 02   0.3970479413700000D 04    0.1329441344355139D-01
-0.2482336360259132D-02   0.2544676051476610D 03    0.1686125956018061D-02
 0.3479013450305736D-01   0.4911111396139896D 03    0.1043158470942166D 00
-0.5136712748849969D-02   0.1130308856139978D 05   -0.5401458284093167D 01
-0.3241560382565466D-01   0.0                       0.0
 0.3190000000000873D 02   0.3970476178410000D 04    0.1272533238495986D-01
-0.2884317637584522D-02   0.2544782851314156D 03    0.1686154811690171D-02
 0.3425227530872402D-01   0.4911359121940947D 03    0.1088190794119749D 00
-0.5606714398324719D-02   0.1130254836392760D 05   -0.5401306565437096D 01
 0.3863649767026800D-01   0.0                       0.0
 0.3200000000000000D 02   0.3970472943120000D 04    0.1214166624569854D-01
-0.3191481856695064D-02   0.2544894055114374D 03    0.1686183646254031D-02
 0.3367184179383340D-01   0.4911619940123647D 03    0.1139567815925571D 00
-0.5985294591254630D-02   0.1130200856868264D 05   -0.5393102078458583D 01
 0.1283829723124654D 00   0.0                       0.0
 0.3210000000000582D 02   0.3970469707830000D 04    0.1156078018845720D-01
-0.3392150593842684D-02   0.2545010637188582D 03    0.1686212411843831D-02
 0.3305880053773303D-01   0.4911886291484021D 03    0.1195459638257420D 00
-0.6256452446394389D-02   0.1130147007169984D 05   -0.5375058129412025D 01
 0.2351156308984628D 00   0.0                       0.0
 0.3219999999999709D 02   0.3970466472540000D 04    0.1100092200800448D-01
-0.3476432507746578D-02   0.2545132939968245D 03    0.1686241051529593D-02
 0.3242456269203462D-01   0.4912157591364168D 03    0.1253814841309102D 00
```

```
-0.6407385928830944D-02   0.1130093393864695D 05   -0.5345573629429566D 01
 0.3568345035160973D 00   0.0                       0.0
 0.3230000000000291D 02   0.3970463237250000D 04    0.1048076157989773D-01
-0.3436726571497794D-02   0.2545261109987791D 03    0.1686269500389065D-02
 0.3178163937627461D-01   0.4912423538966180D 03    0.1312397577056061D 00
-0.6428967354921821D-02   0.1130040138474857D 05   -0.5303263992877817D 01
 0.4912110556743414D 00   0.0                       0.0
 0.3240000000000873D 02   0.3970460001960000D 04    0.1001888074249872D-01
-0.3268209094883137D-02   0.2545395483899340D 03    0.1686297686746438D-02
 0.3114325541457526D-01   0.4912704139782438D 03    0.1368840316489756D 00
-0.6316098991548724D-02   0.1129987375158943D 05   -0.5246991188929997D 01
 0.6356421653072175D 00   0.0                       0.0
 0.3250000000000000D 02   0.3970456766670000D 04    0.9633226376486205D-02
-0.2969284371096101D-02   0.2545535301916754D 03    0.1686325533562456D-02
 0.3052293393361683D-01   0.4912984359445295D 03    0.1420709337535360D 00
-0.6067939114781317D-02   0.1129935248108590D 05   -0.5175891018455104D 01
 0.7372602455992066D 00   0.0                       0.0
 0.3260000000000582D 02   0.3970453531380000D 04    0.9340541781503835D-02
-0.2541977214784325D-02   0.2545679546066401D 03    0.1686352959969379D-02
 0.2993406501997266D-01   0.4913263135550952D 03    0.1465578619092076D 00
-0.5687998296086238D-02   0.1129883908674892D 05   -0.5089400280726011D 01
 0.9429307241120917D 00   0.0                       0.0
 0.3269999999999709D 02   0.3970450296090000D 04    0.9155793473203365D-02
-0.1992244937497855D-02   0.2545827827701494D 03    0.1686379882949445D-02
 0.2938947176105895D-01   0.4913544909803883D 03    0.1501108114580745D 00
-0.5184075290938672D-02   0.1129833512226354D 05   -0.4987283305232381D 01
 0.1099240537332040D 01   0.0                       0.0
 0.3280000000000291D 02   0.3970447060800000D 04    0.9091612131432590D-02
-0.1330186574259819D-02   0.2545979094192030D 03    0.1686406219127290D-02
 0.2890098665197853D-01   0.4913851755077768D 03    0.1525122544657942D 00
-0.4568193594213898D-02   0.1129784214793841D 05   -0.4869641998379279D 01
 0.1252858828058777D 01   0.0                       0.0
    M2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78
11000110111111110
0.33      1.0       2.0       3.0              1    2    3    4
0.0       220000.0  0.03      0.2       0.0
    M2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78
11000111111111110
0.33      1.0       2.0       3.0              1    2    3    4
0.0       220000.0  0.03      0.2       0.0
    M2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78
11000100111111110
0.33      1.0       2.0       3.0              1    2    3    4
0.0       220000.0  0.03      0.2       0.0
    M2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78
11000101111111110
0.33      1.0       2.0       3.0              1    2    3    4
0.0       220000.0  0.03      0.2       0.0
END
```

Sample Output — MDLCK

```
ATLIT 2ND MANEUVER-FLAPS UP- PULL UP/PUSH OVER -FLIGHT RECORD 40 / TAPE 33
 M2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78

INPUT PARAMETERS:

 IDS=    1 LOC(1)=  1 LOC(7)=  0 LOC(13)= 1  EX1=  0.330000  PLOW=        0.0
 K =   329 LOC(2)=  1 LOC(8)=  0 LOC(14)= 0  EX2=  1.000000  PHIGH=  220000.00
 IEX1=   1 LOC(3)=  0 LOC(9)=  1 LOC(15)= 0  EX3=  2.000000  CDLOW= 0.03000000
 IEX2=   2 LOC(4)=  0 LOC(10)= 1 S= 155.000  EX4=  3.000000  CDHIGH=  0.200000
 IEX3=   3 LOC(5)=  0 LOC(11)= 1 G=32.20000  METRIC=  0
 IEX4=   4 LOC(6)=  0 LOC(12)= 1 TIA=0.0     RHO= 2.37800000D-03
```

```
                         M O D E L   S O L U T I O N

 CASE 1     P0 = -1.90754272958462900 04   CD0 =  9.78587915598057000-02
            P1 =  1.87832835644918800 04   CD1 = -3.11278146337659400 00
 POINT      P2 =  0.0                      CD2 =  7.52192540765266700 01
 FAILURES   P3 =  0.0                      CD3 = -7.17761414118644900 02
 =    0     P4 =  0.0                      CD4 =  2.53151923050996400 03
            P5 =  0.0                      CD5 =  0.0
            P6 =  0.0                      CD6 =  0.0
            P7 =  0.0

 FIT ERROR=  1.26783821634769000-03
```

```
ATLIT 2ND MANEUVER-FLAPS UP- PULL UP/PUSH OVER -FLIGHT RECORD 40 / TAPE 33
 M2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78

INPUT PARAMETERS:

 IDS=    1 LOC(1)=  1 LOC(7)=  0 LOC(13)= 1  EX1=  0.330000  PLOW=        0.0
 K =   329 LOC(2)=  0 LOC(8)=  0 LOC(14)= 0  EX2=  1.000000  PHIGH=  220000.00
 IEX1=   1 LOC(3)=  1 LOC(9)=  1 LOC(15)= 0  EX3=  2.000000  CDLOW= 0.03000000
 IEX2=   2 LOC(4)=  1 LOC(10)= 0 S= 155.000  EX4=  3.000000  CDHIGH=  0.200000
 IEX3=   3 LOC(5)=  0 LOC(11)= 1 G=32.20000  METRIC=  0
 IEX4=   4 LOC(6)=  1 LOC(12)= 0 TIA=0.0     RHO= 2.37800000D-03
```

```
                         M O D E L   S O L U T I O N

 CASE 2     P0 =  1.25720896738471200 05   CD0 =  1.13976115297927900-01
            P1 =  0.0                      CD1 =  0.0
 POINT      P2 = -8.83054711637881700 02   CD2 =  2.28921974721985600 00
 FAILURES   P3 =  5.11779179637063500 00   CD3 =  0.0
 = 139      P4 =  0.0                      CD4 =  4.94636604722750400-01
            P5 =  0.0                      CD5 =  0.0
            P6 =  0.0                      CD6 =  0.0
            P7 =  0.0

 FIT ERROR= NOGO
```

```
--------------------------------------------------------------------------------
!                                                                              !
!   ATLIT 2ND MANEUVER-FLAPS UP- PULL UP/PUSH OVER -FLIGHT RECORD 40 / TAPE 33 !
!    M2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78 !
!                                                                              !
! INPUT PARAMETERS:                                                            !
!                                                                              !
!  IDS=    1 LOC(1)=  1 LOC(7)=  1 LOC(13)= 1  EX1=  0.330000  PLOW=      0.0  !
!  K =   329 LOC(2)=  1 LOC(8)=  1 LOC(14)= 1  EX2=  1.000000  PHIGH= 220000.00 !
!  IEX1=   1 LOC(3)=  0 LOC(9)=  1 LOC(15)= 1  EX3=  2.000000  CDLOW= 0.03000000 !
!  IEX2=   2 LOC(4)=  0 LOC(10)= 1 S= 155.000  EX4=  3.000000  CDHIGH=  0.200000 !
!  IEX3=   3 LOC(5)=  0 LOC(11)= 1 G=32.20000  METRIC=  0                      !
!  IEX4=   4 LOC(6)=  0 LOC(12)= 1 TIA=0.0     RHO= 2.37800000D-03             !
!                                                                              !
--------------------------------------------------------------------------------
```

M O D E L   S O L U T I O N

```
***********************************************************************
*                                                                     *
*  CASE 3    P0 = -1.6727993236693100D 05   CD0 =  1.0578236177750270D-01  *
*            P1 =  4.6225563944157660D 04   CD1 = -2.9522029821300210D 00  *
* POINT      P2 =  0.0                      CD2 =  7.1582277591681330D 01  *
* FAILURES   P3 =  0.0                      CD3 = -6.7968774725152030D 02  *
* =    0     P4 =  0.0                      CD4 =  2.3604573381351100D 03  *
*            P5 =  1.0251808370680070D 02   CD5 = -3.7985910360145450D-02  *
*            P6 =  3.8167648764190490D 04   CD6 = -3.0345692924638160D-02  *
*            P7 = -7.5874764891120240D 04                             *
*                                                                     *
* FIT ERROR=  4.0330476066782180D-04                                  *
*                                                                     *
***********************************************************************
```

```
--------------------------------------------------------------------------------
!                                                                              !
!   ATLIT 2ND MANEUVER-FLAPS UP- PULL UP/PUSH OVER -FLIGHT RECORD 40 / TAPE 33 !
!    M2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78 !
!                                                                              !
! INPUT PARAMETERS:                                                            !
!                                                                              !
!  IDS=    1 LOC(1)=  1 LOC(7)=  0 LOC(13)= 1  EX1=  0.330000  PLOW=      0.0  !
!  K =   329 LOC(2)=  1 LOC(8)=  0 LOC(14)= 1  EX2=  1.000000  PHIGH= 220000.00 !
!  IEX1=   1 LOC(3)=  0 LOC(9)=  1 LOC(15)= 1  EX3=  2.000000  CDLOW= 0.03000000 !
!  IEX2=   2 LOC(4)=  0 LOC(10)= 1 S= 155.000  EX4=  3.000000  CDHIGH=  0.200000 !
!  IEX3=   3 LOC(5)=  0 LOC(11)= 1 G=32.20000  METRIC=  0                      !
!  IEX4=   4 LOC(6)=  0 LOC(12)= 1 TIA=0.0     RHO= 2.37800000D-03             !
!                                                                              !
--------------------------------------------------------------------------------
```

M O D E L   S O L U T I O N

```
***********************************************************************
*                                                                     *
*  CASE 4    P0 = -2.7421737821759680D 04   CD0 =  1.0170408476488630D-01  *
*            P1 =  2.0739496227345200D 04   CD1 = -3.3236150323255800D 00  *
* POINT      P2 =  0.0                      CD2 =  8.1810452665467010D 01  *
* FAILURES   P3 =  0.0                      CD3 = -7.8777244545713970D 02  *
* =    0     P4 =  0.0                      CD4 =  2.7685680185972000D 03  *
*            P5 =  1.5325397679023000D 02   CD5 = -2.9569289621422700D-02  *
*            P6 =  0.0                      CD6 = -1.3805895088386370D-02  *
*            P7 =  0.0                                                *
*                                                                     *
* FIT ERROR=  4.4129020022670690D-04                                  *
*                                                                     *
***********************************************************************
```

```
---------------------------------------------------------------------------
!                                                                         !
!   ATLIT 2ND MANEUVER-FLAPS UP- PULL UP/PUSH OVER -FLIGHT RECORD 40 / TAPE 33   !
!    N2 CALP1=0.8667,CALP2=0.01,DRIFT=-0.0247,INPUT THETA,ATLIT PU/PO 11/16/78   !
!                                                                         !
! INPUT PARAMETERS:                                                       !
!                                                                         !
!  IDS=    1 LOC(1)=  1 LOC(7)=  0 LOC(13)= 1  EX1=  0.330000  PLOW=        0.0     !
!  K =   329 LOC(2)=  1 LOC(8)=  1 LOC(14)= 1  EX2=  1.000000  PHIGH=  220000.00    !
!  IEX1=   1 LOC(3)=  0 LOC(9)=  1 LOC(15)= 1  EX3=  2.000000  CDLOW= 0.03000000   !
!  IEX2=   2 LOC(4)=  0 LOC(10)= 1 S= 155.000  EX4=  3.000000  CDHIGH=  0.200000   !
!  IEX3=   3 LOC(5)=  0 LOC(11)= 1 G=32.20000  METRIC=  0                          !
!  IEX4=   4 LOC(6)=  0 LOC(12)= 1 TIA=0.0     RHO= 2.37800000D-03                 !
!                                                                         !
---------------------------------------------------------------------------
```

M O D E L   S O L U T I O N

```
*************************************************************************
*                                                                       *
*  CASE 5    P0 = -1.3766976406211250D 05   CD0 =  1.0459972275408370D-01  *
*            P1 =  4.0706173894969020D 04   CD1 = -3.0241526545201370D 00  *
* POINT      P2 =  0.0                      CD2 =  7.3345800606244400D 01  *
* FAILURES   P3 =  0.0                      CD3 = -6.9741647600744210D 02  *
* =    0     P4 =  0.0                      CD4 =  2.4235066074519010D 03  *
*            P5 =  1.1585437965626160D 02   CD5 = -5.9431180733862110D-02  *
*            P6 =  0.0                      CD6 = -2.3753420317233120D-02  *
*            P7 = -6.2007517024450910D 04                                  *
*                                                                       *
* FIT ERROR=  4.0574138034874030D-04                                      *
*                                                                       *
*************************************************************************
```

APPENDIX C

FLIGHT DATA REDUCTION PROGRAM # 2

User Instructions – FDR2

The program is written in FORTRAN IV and is designed to execute in double-precision on an IBM 370/165 computer with an average execution time of 60 minutes for each maneuver data set. Execution requires approximately 936,000 bytes of core storage. Given the output of the FDR1 program (Appendix A), this program

(a) prints the input data in English or SI units,
(b) solves as many as 18 different model sets of power and drag coefficients,
(c) updates all rates for compatibility,
(d) calculates (1) a bias for the angle of attack values,
 (2) a 1/3-power model and iterates for initial convergence of the coefficients in the lift expression,
 (3) the coefficient values in the lift expression,
 (4) new values of angle of attack from the expression of the lift function, and
 (5) the frequency-dependent corrections to the angle-of-attack values,
(e) integrates the aircraft's equations of motion in the x-z plane to obtain time histories of both aircraft and flight path parameters, assuming airspeed and altitude are correct,
(f) estimates a specific fuel consumption,
(g) modifies the angle-of-attack values to obtain a better match with the aircraft's trajectory,
(h) predicts the flight path trajectory in an iterative procedure to attempt an improvement in the power, lift, and drag coefficients,
(i) computes the confidence levels for the angle-of-attack values and the pitch-angle values,
(j) prints the output results in English or SI units, and
(k) punches cards for stability analysis.

The program requires the specification of the following input:

CARD 1:

The title array TITLE.

The 80 characters of the array TITLE are used as control variables to end execution. Execution termination is achieved by following the last data card with a title card having only the word END in the first three card columns. It should be observed that on all other occasions this card behaves simply as a dummy card. Therefore, the user may wish to use this card to supply additional data set labeling.

CARD 2:

(a) The read unit number IDS:
IDS is a right-adjusted integer number occupying columns 1-5 and specifying that the data is to be read from cards, magnetic tape, disk, etc. The user must supply the suitable job control cards for the tape and/or disk reads. The IDS parameter controls only the reading of CARDS 33, 34, and (35,...,34 + 5K). All other data is expected in card form.

(b) The input-data print code INPUT:
INPUT is a right-adjusted integer number occupying columns 6-10. If INPUT = 0, the input time histories are printed. If INPUT = 1, the input time histories are <u>not</u> printed.

(c) The plot code IPLOT:
IPLOT is a right-adjusted integer number occupying columns 11-15. If IPLOT = 0, plots will be allowed. If IPLOT = 1, no plots will be allowed.

(d) The punch code IPUNCH:
IPUNCH is a right-adjusted integer number occupying columns 16-20. If IPUNCH = 0, no cards will be punched. If IPUNCH = 1, cards will be punched.

(e) The desired type of input and output units METRIC:
If METRIC = 0, the input and output will be in English units. If METRIC = 1, the input and output will be in SI units. METRIC is a right-adjusted integer number occupying columns 21-25. The specification of METRIC only affects the listings. The punched output is in English units.

(f) The lift function code MTH:
MTH is a right-adjusted integer number, occupying columns 26-30, specifying the form of lift-coefficient equation. The following chart indicates the available forms:

MTH	FORM
0	$C_L = x_o + x_1\alpha$
1	$C_L = x_o + x_1\alpha + x_2\dot{\theta}$
2	$C_L = x_o + x_1\alpha + x_2\alpha^{x_3}$
3	$C_L = x_o + x_1\alpha + x_2\alpha^{x_3} + x_4\dot{\theta}$
4	$C_L = x_o + x_1\alpha^{x_2}$
5	$C_L = x_o + x_1\alpha^{x_2} + x_3\dot{\theta}$

If MTH > 5 or MTH < 0, the program sets MTH = 0.

(g) The method by which the coefficients in the lift expression are determined, MCLCC:

MCLCC is a right-adjusted integer number occupying columns 31-35. If MCLCC = 0, the lift coefficients (x_i's) are calculated by a linear-least-squares procedure. If MCLCC = 1, the lift coefficients (x_i's) are calculated by a least-square-distance procedure. If the user specifies MCLCC = 1 and the procedure is not capable of converging, the progarm defaults to MCLCC = 0.

(h) The maximum number MAXHPI of iterative attempts to improve the power, lift, and drag coefficients by trajectory predictions:

MAXHPI is a right-adjusted integer number, occupying columns 36-40, with a maximum permissible value of 5. MAXHPI does not control the preset number of sub-iterations between the power-drag model solutions.

CARD 3:

(a) The exponent EX1 on the second power-coefficient term,
(b) The exponent EX2 on the third power-coefficient term,
(c) The exponent EX3 on the fourth power-coefficient term,
(d) The exponent EX4 on the fifth power-coefficient term,
(e) The exponent IEX1 on the second drag-coefficient term,
(f) The exponent IEX2 on the third drag-coefficient term,
(g) The exponent IEX3 on the fourth drag-coefficient term, and
(h) The exponent IEX4 on the fifth drag-coefficient term:

EX1, EX2, EX3, and EX4 are floating-point numbers each occupying 10 columns beginning at column 1. It should be noted that no two of these exponents must have the same value; otherwise, execution will terminate. IEX1, IEX2, IEX3, IEX4 are right-adjusted integer numbers each occupying 5 columns beginning at column 41. It should be noted that no two of these exponents must have the same value; otherwise, execution will terminate.

CARD 4:

The power-drag model solution forms IMODEL(I),I=1,...,18:

IMODEL(I) are right-adjusted integer numbers, each occupying 1 column beginning at column 1, specifying the model(s) to be used for the determination of the power and drag coefficients. The general power and drag coefficient equations are

$$P = P_0 + P_1 V^{EX1} + P_2 V^{EX2} + P_3 V^{EX3} + P_4 V^{EX4} \quad \text{and}$$

$$C_D = C_{D_0} + C_{D_1} \alpha^{IEX1} + C_{D_2} \alpha^{IEX2} + C_{D_3} \alpha^{IEX3} + C_{D_4} \alpha^{IEX4}$$

Through the use of IMODEL(I), various combinations of the coefficients can be specified*. If IMODEL(I) = 0, the model will be bypassed. If IMODEL(I) = 1, the model solution will be performed. It is mandatory that at least one model is specified; otherwise, the program will terminate prematurely. The following chart should be used for the specification of the desired model(s):

IMODEL(I)	Coefficients Determined by Analysis
I = 1	P_0, C_{D_0}, C_{D_2}
I = 2	$P_0, P_1, C_{D_0}, C_{D_2}$
I = 3	$P_0, P_1, C_{D_0}, C_{D_2}, C_{D_4}$
I = 4	$P_0, P_1, C_{D_0}, C_{D_1}, C_{D_2}, C_{D_3}, C_{D_4}$
I = 5	$P_0, P_2, C_{D_0}, C_{D_2}$
I = 6	$P_0, P_2, C_{D_0}, C_{D_2}, C_{D_4}$
I = 7	$P_0, P_2, C_{D_0}, C_{D_1}, C_{D_2}, C_{D_3}, C_{D_4}$
I = 8	$P_0, P_1, P_2, C_{D_0}, C_{D_2}$
I = 9	$P_0, P_1, P_2, C_{D_0}, C_{D_2}, C_{D_4}$
I = 10	$P_0, P_1, P_2, C_{D_0}, C_{D_1}, C_{D_2}, C_{D_3}, C_{D_4}$
I = 11	$P_0, P_2, P_3, C_{D_0}, C_{D_2}$
I = 12	$P_0, P_2, P_3, C_{D_0}, C_{D_2}, C_{D_4}$
I = 13	$P_0, P_2, P_3, C_{D_0}, C_{D_1}, C_{D_2}, C_{D_3}, C_{D_4}$

*The user may wish to specify different models than those models provided. In order for this to be accomplished, the users must change the DATA statement and the INTEGER statement in Subroutine MODEL. The DATA statement assumes that 18 "different" models, each with a maximum of 10 coefficients for the power-drag model, will be specified. The INTEGER statement indicates the numbers of unknowns in the models of the DATA statement.

Chart (Continued)

IMODEL(I)	Coefficients Determined by Analysis
I = 14	$P_0, C_{D_0}, C_{D_1}, C_{D_2}$
I = 15	$P_0, P_1, C_{D_0}, C_{D_1}, C_{D_2}$
I = 16	$P_0, P_2, C_{D_0}, C_{D_1}, C_{D_2}$
I = 17	$P_0, P_1, P_2, C_{D_0}, C_{D_1}, C_{D_2}$
I = 18	$P_0, P_2, P_3, C_{D_0}, C_{D_1}, C_{D_2}$

CARD 5:

(a) The lower allowable limit PLOW of the power available in foot-pounds per second,
(b) The upper allowable limit PHIGH of the power available in foot-pounds per second,
(c) The lower allowable limit CDLOW of the drag coefficient,
(d) The upper allowable limit CDHIGH of the drag coefficient,
(e) The thrust incidence angle TIA in radians,
(f) The estimated initial flight-path-angle bias TARE in radians, and
(g) The estimated initial altitude bias HTARE in feet:

PLOW, PHIGH, CDLOW, CDHIGH, and TIA are floating-point numbers each occupying 10 columns beginning at column 1. TARE and HTARE are double-precision floating-point numbers each occupying 15 columns beginning at column 51.

CARDS 6,...,18:

(a) The a priori value AP(1) in ft-lb_f/sec and its weight WGT(1) for the first power coefficient P_0,
(b) The a priori value AP(2) in suitable power units* and its weight WGT(2) for the second power coefficient P_1,
(c) The a priori value AP(3) in suitable power units* and its weight WGT(3) for the third power coefficient P_2,
(d) The a priori value AP(4) in suitable power units* and its weight WGT(4) for the fourth power coefficient P_3,
(e) The a priori value AP(5) in suitable power units* and its weight WGT(5) for the fifth power coefficient P_4,

---

*Since the "coefficients" of the power and drag coefficients' equations, given in the discussion of CARD 4, and the lift coefficients' equation, given in the discussion of CARD 2(f), are user-dependent, the user must specify the a priori values in suitable units.

(f) The a priori value AP(6) and its weight WGT(6) for the first drag coefficient C_{D_0},

(g) The a priori value AP(7) in suitable drag units* and its weight WGT(7) for the second drag coefficient C_{D_1},

(h) The a priori value AP(8) in suitable drag units* and its weight WGT(8) for the third drag coefficient C_{D_2},

(i) The a priori value AP(9) in suitable drag units* and its weight WGT(9) for the fourth drag coefficient C_{D_3},

(j) The a priori value AP(10) in suitable drag units* and its weight WGT(10) for the fifth drag coefficient C_{D_4},

(k) The a priori value AP(11) and its weight WGT(11) for the lift coefficient $C_{L_{\alpha_0}}$,

(l) The a priori value AP(12) in per radian and its weight WGT(12) for the lift coefficient C_{L_α}, and

(m) The a priori value AP(13) in suitable lift units* and its weight WGT(13) for the lift coefficient $C_{L_{\alpha_x}}$:

AP(I) and WGT(I) are double-precision floating-point numbers each occupying 20 columns beginning at column 1. Each of the thírteen (13) input cards contains the AP(I) and WGT(I) that correspond to the coefficient under consideration. A zero weight on any of the a priori values prevents the application of an a priori value to that coefficient.

CARD 19:

(a) The plot code IP(1) for weight,
(b) The plot code IP(2) for pitch angle,
(c) The plot code IP(3) for pitch rate,
(d) The plot code IP(4) for airspeed,
(e) The plot code IP(5) for density,
(f) The plot code IP(6) for angle of attack,
(g) The plot code IP(7) for static temperature,
(h) The plot code IP(8) for acceleration,
(i) The plot code IP(9) for angle-of-attack rate,
(j) The plot code IP(10) for altitude,
(k) The plot code IP(11) for altitude rate,
(l) The plot code IP(12) for altitude acceleration,
(m) The plot code IP(13) for vertical acceleration,

*(See previous note).

(n) The plot code IP(14) for elevator or stabilator deflection,
(o) The plot code IP(15) for lift coefficient versus angle of attack,
(p) The Plot code IP(16) for drag coefficient versus angle of attack,
(q) The plot code IP(17) for lift coefficient versus drag coefficient, and
(r) The plot code IP(18) for power available versus airspeed:

If IP(I) = 0, a plot is produced for the "I"th time history.
If IP(i) = 1, no plot is produced for the "I"th time history.
IP(I) are right-adjusted integer numbers each occupying one column beginning at column 1.

CARDS 20,...,32:

(a) The minimal allowable constraint CRMIN(1) and the maximal allowable constraint CRMAX(1) for the power coefficient P_0^*,
(b) The minimal allowable constraint CRMIN(2) and the maximal allowable constraint CRMAX(2) for the power coefficient P_1^*,
(c) The minimal allowable constraint CRMIN(3) and the maximal allowable constraint CRMAX(3) for the power coefficient P_2^*,
(d) The minimal allowable constraint CRMIN(4) and the maximal allowable constraint CRMAX(4) for the power coefficient P_3^*,
(e) The minimal allowable constraint CRMIN(5) and the maximal allowable constraint CRMAX(5) for the power coefficient P_4^*,
(f) The minimal allowable constraint CRMIN(6) and the maximal allowable constraint CRMAX(6) for the drag coefficient $C^*_{D_0}$,
(g) The minimal allowable constraint CRMIN(7) and the maximal allowable constraint CRMAX(7) for the drag coefficient $C^*_{D_1}$,
(h) The minimal allowable constraint CRMIN(8) and the maximal allowable constraint CRMAX(8) for the drag coefficient $C^*_{D_2}$,
(i) The minimal allowable constraint CRMIN(9) and the maximal allowable constraint CRMAX(9) for the drag coefficient $C^*_{D_3}$,
(j) The minimal allowable constraint CRMIN(10) and the maximal allowable constraint CRMAX(10) for the drag coefficient $C^*_{D_4}$,
(k) The minimal allowable constraint CRMIN(11) and the maximal allowable constraint CRMAX(11) for the lift coefficient $C^*_{L_{\alpha_0}}$,
(l) The minimal allowable constraint CRMIN(12) and the maximal allowable constraint CRMAX(12) for the lift coefficient $C^*_{L_\alpha}$, and
(m) The minimal allowable constraint CRMIN(13) and the maximal allowable constraint CRMAX(13) for the lift coefficient $C^*_{L_{\alpha_X}}$:

---

*Since the "coefficients" of the power, drag and lift coefficients' equations are user-dependent, the user must specify the values of CRMIN(I) and CRMAX(I) in suitable units.

CRMIN(I) and CRMAX(I) are double-precision floating-point numbers each occupying 20 columns beginning at column 1. Each of the thirteen (13) input cards contains the CRMIN(I) and CRMAX(I) that correspond to the coefficient under consideration.

CARD 33:

The title array TITLE:

The 80 characters of the array TITLE are used for identifying output. TITLE is provided by the first card of the punched output of the FDR1 program.

CARD 34:

(a) The total number of points K in the data set,
(b) The aircraft's wing area S in square feet,
(c) The sea-level atmospheric density RHO in slug/ft^3,
(d) The acceleration due to gravity G in ft/sec^2, and
(e) The total elapsed time for the maneuver TT in seconds:

K is a right-adjusted integer number occupying columns 1-10. S, RHO, G, and TT are double-precision floating-point numbers each occupying 15 columns beginning at column 11. These values are provided by the second card of the punched output of the FDR1 program.

CARD 35,...,(34 + 5K):

The time histories of time TIME(I), weight F1(I), pitch angle F2(I), pitch rate F3(I), airspeed F4(I), density F5(I), angle of attack F6(I), static temperature F7(I), acceleration F8(I), angle-of-attack rate F9(I), altitude F10(I), altitude rate F11(I), altitude acceleration F12(I), vertical acceleration F13(I), and elevator or stabilator deflection F14(I):

The variables TIME(I) and F1(I) through F14(I) are double-precision floating-point numbers each occupying 25 columns. These variables are provided by the remaining punched output of the FDR1 program.

For a given run consisting of more than one data set, cards 1 through (34 + 5K) must be specified for each data set.

Program Listing — FDR2

```
C   PROGRAM:  FLIGHT DATA REDUCTION #2 ( FDR2 )  F.O. SMETANA & S.R. FOX
C
C
C       **************************************************
C       *                                                *
C       *   F L I G H T   D A T A   R E D U C T I O N  2 *
C       *                                                *
C       **************************************************
C
C
C
C     GIVEN VALUES OF THE AIRCRAFT CHARACTERISTICS AND THE AIRCRAFT'S
C     FLIGHT TIME HISTORIES OF WEIGHT, PITCH ANGLE, PITCH RATE, AIRSPEED
C     DENSITY, ANGLE OF ATTACK, STATIC TEMPERATURE, ACCELERATION, ANGLE-
C     OF-ATTACK RATE, ALTITUDE, ALTITUDE RATE, ALTITUDE ACCELERATION,
C     VERTICAL ACCELERATION, AND ELEVATOR (OR STABILATOR) DEFLECTION,
C     THIS PROGRAM PERFORMS THE FOLLOWING:
C
C        1) PRINTS INPUT DATA IN ENGLISH OR SI UNITS
C
C        2) SOLVES UP THROUGH 18 DIFFERENT MODEL SOLUTIONS FOR POWER
C           AND DRAG COEFFICIENTS
C
C        3) CALCULATES A BIAS FOR THE ANGLE-OF-ATTACK VALUES
C
C        4) UPDATES ALL RATES FOR COMPATIBILITY
C
C        5) COMPUTES A 1/3-POWER MODEL ITERATION FOR INITIAL CONVERGENCE
C
C        6) COMPUTES THE LIFT COEFFICIENTS
C
C        7) INSPECTS THE ANGLE-OF-ATTACK VALUES DUE TO THE LIFT COEF-
C           FICIENTS
C
C        8) CALCULATES FREQUENCY-DEPENDENT CORRECTIONS TO ANGLE-OF-
C           ATTACK VALUES
C
C        9) INTEGRATES THE AIRCRAFT'S EQUATIONS OF MOTION TO OBTAIN TIME
C           HISTORIES OF BOTH AIRCRAFT AND FLIGHT PATH PARAMETERS ASSUM-
C           ING AIRSPEED AND ALTITUDE ARE CORRECT
C
C       10) CALCULATES A SPECIFIC FUEL CONSUMPTION
C
C       11) MODIFIES ANGLE-OF-ATTACK VALUES DUE TO THE INTEGRATION OF
C           AIRCRAFT'S EQUATION OF MOTION
C
C
C       13) PREDICTS THE FLIGHT PATH TRAJECTORY IN AN ITERATIVE PROCE-
C           DURE TO ATTEMPT AN IMPROVEMENT IN THE POWER, LIFT, AND DRAG
C           COEFFICIENTS
C
C       14) COMPUTES CONFIDENCE LEVELS FOR ANGLE-OF-ATTACK VALUES AND
C           PITCH-ANGLE VALUES
C
C       15) PRINTS OUTPUT RESULTS IN ENGLISH OR SI UNITS
C
C       16) PUNCHES CARDS FOR STABILITY ANALYSIS
C
C
C
C      THE FOLLOWING COMMENT CARDS DESCRIBE THE NECESSARY INPUT FOR THIS
C      PROGRAM.  FOR A MORE PRECISE DESCRIPTION, CONSULT THE USERS IN-
C      STRUCTIONS.
C
C
C INPUT *** CARD 1
C
C          TITLE  -> FIRST TITLE CARD (DUMMY CARD, EXCEPT FOR PROGRAM
C                    TERMINATION)
C
C
C
C INPUT *** CARD 2
C
C          IDS    -> READ UNIT NUMBER (ALLOWS READING OF CARDS, DISK,
C                    TAPE, ETC OF PUNCHED CARDS FROM 'FDR1')
C
C          INPUT  -> CODE FOR INPUT DATA PRINT
C                    INPUT=0  -> PRINT INPUT DATA
C                    INPUT=1  -> NO PRINT
C
C          IPLOT  -> PLOT CODE
C                    IPLOT=0  -> PLOT
C                    IPLOT=1  -> NO PLOT
C
C          IPUNCH -> PUNCH CODE
C                    IPUNCH=0 -> NO PUNCH
C                    IPUNCH=1 -> PUNCH CARDS
C
C          METRIC -> INPUT/OUTPUT PRINT CODE
C                    METRIC=0 -> INPUT & OUTPUT PRINTED IN ENGLISH UNITS
C                    METRIC=1 -> INPUT & OUTPUT PRINTED IN SI UNITS
C
C          MTH    -> LIFT FUNCTION FORM CODE
C                    MTH=0 -> CL=X0+X1*A
C                    MTH=1 -> CL=X0+X1*A+X2*B
C                    MTH=2 -> CL=X0+X1*A+X2*A**X3
C                    MTH=3 -> CL=X0+X1*A+X2*A**X3+X4*B
C                    MTH=4 -> CL=X0+X1*A**X3
C                    MTH=5 -> CL=X0+X1*A**X3+X4*B
C                        WHERE: A=ANGLE OF ATTACK
C                               B=PITCH RATE
C
C          MCLCC  -> METHOD OF LIFT COEFFICIENT CALCULATION
C                    MCLCC=0 -> LINEAR LEAST SQUARES
C                    MCLCC=1 -> LEAST SQUARE DISTANCE
C
C          MAXMPI -> MAXIMUM NUMBER OF ITERATIVE ATTEMPTS TO IMPROVE THE
C                    POWER, LIFT, AND DRAG COEFFICIENTS BY TRAJECTORY
C                    PREDICTIONS  (-1<MAXMPI<6)
C
C
C
C INPUT *** CARD 3  (CONSULT USERS INSTRUCTIONS)
C
C          EX1    -> EXPONENT ON SECOND POWER-COEFFICIENT TERM
C
```

```
C        EX2    -> EXPONENT ON THIRD POWER-COEFFICIENT TERM
C
C        EX3    -> EXPONENT ON FOURTH POWER-COEFFICIENT TERM
C
C        EX4    -> EXPONENT ON FIFTH POWER-COEFFICIENT TERM
C
C        IEX1   -> EXPONENT ON SECOND DRAG-COEFFICIENT TERM (INTEGER)
C
C        IEX2   -> EXPONENT ON THIRD DRAG-COEFFICIENT TERM  (INTEGER)
C
C        IEX3   -> EXPONENT ON FOURTH DRAG-COEFFICIENT TERM (INTEGER)
C
C        IEX4   -> EXPONENT ON FIFTH DRAG-COEFFICIENT TERM  (INTEGER)
C
C
C
C INPUT *** CARD 4  (CONSULT USERS INSTRUCTIONS)
C
C        IMODEL -> MODEL SOLUTION FORM (CHOSEN BY CARD COLUMN NUMBER)
C                  IMODEL=0  -> SKIP MODEL
C                  IMODEL=1  -> SOLVE MODEL
C
C
C
C INPUT *** CARD 5
C
C        PLOW   -> LOWER LIMIT OF ALLOWABLE POWER AVAILABLE (FT-LB/SEC)
C
C        PHIGH  -> UPPER LIMIT OF ALLOWABLE POWER AVAILABLE (FT-LB/SEC)
C
C        CDLOW  -> LOWER LIMIT OF ALLOWABLE DRAG COEFFICIENT
C
C        CDHIGH -> UPPER LIMIT OF ALLOWABLE DRAG COEFFICIENT
C
C        TIA    -> THRUST INCIDENCE ANGLE IN RADIANS
C
C        TARE   -> ESTIMATED INITIAL FLIGHT-PATH-ANGLE BIAS IN RADIANS
C
C        HTARE  -> ESTIMATED INITIAL ALTITUDE BIAS IN FEET
C
C
C
C INPUT *** CARDS 6, ... ,18
C
C        AP(1), WGT(1)   -> A PRIORI VALUE AND WEIGHT FOR P0
C        AP(2), WGT(2)   -> A PRIORI VALUE AND WEIGHT FOR P1
C        AP(3), WGT(3)   -> A PRIORI VALUE AND WEIGHT FOR P2
C        AP(4), WGT(4)   -> A PRIORI VALUE AND WEIGHT FOR P3
C        AP(5), WGT(5)   -> A PRIORI VALUE AND WEIGHT FOR P4
C        AP(6), WGT(6)   -> A PRIORI VALUE AND WEIGHT FOR CD0
C        AP(7), WGT(7)   -> A PRIORI VALUE AND WEIGHT FOR CD1
C        AP(8), WGT(8)   -> A PRIORI VALUE AND WEIGHT FOR CD2
C        AP(9), WGT(9)   -> A PRIORI VALUE AND WEIGHT FOR CD3
C        AP(10), WGT(10) -> A PRIORI VALUE AND WEIGHT FOR CD4
C        AP(11), WGT(11) -> A PRIORI VALUE AND WEIGHT FOR CLA0
C        AP(12), WGT(12) -> A PRIORI VALUE AND WEIGHT FOR CLA
C        AP(13), WGT(13) -> A PRIORI VALUE AND WEIGHT FOR CLAX
C
C
C
C INPUT *** CARD 19
C
C        IP(1)  -> PLOT CODE FOR WEIGHT TIME HISTORY
C                  IP(1)=0  -> REQUESTED
C                  IP(1)=1  -> NOT REQUESTED
C
C        IP(2)  -> PLOT CODE FOR PITCH ANGLE TIME HISTORY
C                  IP(2)=0  -> REQUESTED
C                  IP(2)=1  -> NOT REQUESTED
C
C        IP(3)  -> PLOT CODE FOR PITCH RATE TIME HISTORY
C                  IP(3)=0  -> REQUESTED
C                  IP(3)=1  -> NOT REQUESTED
C
C        IP(4)  -> PLOT CODE FOR AIRSPEED TIME HISTORY
C                  IP(4)=0  -> REQUESTED
C                  IP(4)=1  -> NOT REQUESTED
C
C        IP(5)  -> PLOT CODE FOR DENSITY TIME HISTORY
C                  IP(5)=0  -> REQUESTED
C                  IP(5)=1  -> NOT REQUESTED
C
C        IP(6)  -> PLOT CODE FOR ANGLE OF ATTACK TIME HISTORY
C                  IP(6)=0  -> REQUESTED
C                  IP(6)=1  -> NOT REQUESTED
C
C        IP(7)  -> PLOT CODE FOR TEMPERATURE TIME HISTORY
C                  IP(7)=0  -> REQUESTED
C                  IP(7)=1  -> NOT REQUESTED
C
C        IP(8)  -> PLOT CODE FOR ACCELERATION TIME HISTORY
C                  IP(8)=0  -> REQUESTED
C                  IP(8)=1  -> NOT REQUESTED
C
C        IP(9)  -> PLOT CODE FOR ANGLE-OF-ATTACK RATE TIME HISTORY
C                  IP(9)=0  -> REQUESTED
C                  IP(9)=1  -> NOT REQUESTED
C
C        IP(10) -> PLOT CODE FOR ALTITUDE TIME HISTORY
C                  IP(10)=0 -> REQUESTED
C                  IP(10)=1 -> NOT REQUESTED
C
C        IP(11) -> PLOT CODE FOR ALTITUDE RATE TIME HISTORY
C                  IP(11)=0 -> REQUESTED
C                  IP(11)=1 -> NOT REQUESTED
C
C        IP(12) -> PLOT CODE FOR ALTITUDE ACCELERATION TIME HISTORY
C                  IP(12)=0 -> REQUESTED
C                  IP(12)=1 -> NOT REQUESTED
C
C        IP(13) -> PLOT CODE FOR VERTICAL ACCELERATION TIME HISTORY
C                  IP(13)=0 -> REQUESTED
C                  IP(13)=1 -> NOT REQUESTED
C
C        IP(14) -> PLOT CODE FOR ELEVATOR/STABILATOR TIME HISTORY
C                  IP(14)=0 -> REQUESTED
C                  IP(14)=1 -> NOT REQUESTED
C
C        IP(15) -> PLOT CODE FOR LIFT COEFFICIENT VS ANGLE OF ATTACK
C                  IP(15)=0 -> REQUESTED
```

```
C                IP(15)=1 -> NOT REQUESTED
C
C        IP(16) -> PLOT CODE FOR DRAG COEFFICIENT VS ANGLE OF ATTACK
C                IP(16)=0 -> REQUESTED
C                IP(16)=1 -> NOT REQUESTED
C
C        IP(17) -> PLOT CODE FOR LIFT COEFFICIENT VS DRAG COEFFICIENT
C                IP(17)=0 -> REQUESTED
C                IP(17)=1 -> NOT REQUESTED
C
C        IP(18) -> PLOT CODE FOR POWER AVAILABLE VS AIRSPEED
C                IP(18)=0 -> REQUESTED
C                IP(18)=1 -> NOT REQUESTED
C
C
C
C INPUT *** CARDS 20, ... ,32
C
C        CRMIN(1), CRMAX(1)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR P0
C        CRMIN(2), CRMAX(2)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR P1
C        CRMIN(3), CRMAX(3)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR P2
C        CRMIN(4), CRMAX(4)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR P3
C        CRMIN(5), CRMAX(5)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR P4
C        CRMIN(6), CRMAX(6)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR CD0
C        CRMIN(7), CRMAX(7)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR CD1
C        CRMIN(8), CRMAX(8)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR CD2
C        CRMIN(9), CRMAX(9)   -> MINIMUM & MAXIMUM CONSTRAINTS FOR CD3
C        CRMIN(10), CRMAX(10)-> MINIMUM & MAXIMUM CONSTRAINTS FOR CD4
C        CRMIN(11), CRMAX(11)-> MINIMUM & MAXIMUM CONSTRAINTS FOR CLA0
C        CRMIN(12), CRMAX(12)-> MINIMUM & MAXIMUM CONSTRAINTS FOR CLA
C        CRMIN(13), CRMAX(13)-> MINIMUM & MAXIMUM CONSTRAINTS FOR CLAX
C
C
C INPUT *** CARD 33
C
C        TITLE  -> TITLE CARD FOR MANEUVER (PUNCHED CARD FROM 'FDR1')
C
C
C INPUT *** CARD 34 (PUNCHED CARD FROM 'FDR1')
C
C        K       -> NUMBER OF POINTS IN DATA SET
C
C        S       -> AIRCRAFT'S WING AREA IN SQUARE FEET
C
C        RHO     -> SEA-LEVEL ATMOSPHERIC DENSITY IN SLUG/FT**3
C
C        G       -> ACCELERATION DUE TO GRAVITY IN FT/SEC**2
C
C        TT      -> TOTAL ELAPSED TIME FOR MANEUVER IN SECONDS
C
C
C INPUT *** CARDS 35, ... ,(34+5K)  (PUNCHED CARDS FROM 'FDR1')
C
C        IDENTIFICATION OF NECESSARY INPUT TIME HISTORIES
C
C              TIME(I)  ->  TIME
C              F1(I)    ->  WEIGHT
C              F2(I)    ->  PITCH ANGLE
C              F3(I)    ->  PITCH RATE
C              F4(I)    ->  AIRSPEED
C              F5(I)    ->  DENSITY
C              F6(I)    ->  ANGLE OF ATTACK
C              F7(I)    ->  STATIC TEMPERATURE
C              F8(I)    ->  ACCELERATION
C              F9(I)    ->  ANGLE-OF-ATTACK RATE
C              F10(I)   ->  ALTITUDE
C              F11(I)   ->  ALTITUDE RATE
C              F12(I)   ->  ALTITUDE ACCELERATION
C              F13(I)   ->  VERTICAL ACCELERATION
C              F14(I)   ->  ELEVATOR (OR STABILATOR) DEFLECTION
C
C
C
      IMPLICIT REAL*8(A-H,O-Z)
      EXTERNAL VA,DDV,DDDV,ALP,DVA,PHIDER
      DIMENSION TITLE(20),IMODEL(18),FIT(2),ALPHA(450),THETA(450),DUM(45
     10),AL(4),WRK(1367),IP(18),TRG(21),NHPI(5),IHPATH(5)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WEAR(250),CFM(14),SGM(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),CL(450),CD(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPI,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
      COMMON /LAB2/YCEPT,ICD,MTH,MCLCC
      COMMON /LAB8/ALPHA1,P1,PAC(8),Z1,Z2
      COMMON /LAB9/ADF(450)
      COMMON /LAB1/AP(13),WGT(13),CRMIN(13),CRMAX(13)
      INTEGER NLLS(6)/2,3,3,4,2,3/,NLSD(6)/2,2,4,4,3,3/
      DATA TRG/0.0D0,5.0D0,10.0D0,15.0D0,20.0D0,25.0D0,30.0D0,35.0D0,40.
     10D0,45.0D0,50.0D0,55.0D0,60.0D0,65.0D0,70.0D0,75.0D0,80.0D0,85.0D0
     1,90.0D0,95.0D0,100.0D0/,IHPATH/6,5,5,5,8/,XEND/4HEND /
C
C
C*** SPECIFY CARRIAGE CONTROL FOR INSTALLATION
      JREAD=1
      JWRITE=3
      JPUNCH=2
      JPLOT=0
C
C
    1 READ (JREAD,2) (TITLE(I),I=1,20)
    2 FORMAT (20A4)
C
C*** CHECK FOR PROGRAM TERMINATION
      IF (TITLE(1).EQ.XEND) GO TO 200
C*** INITIALIZE CODES
      LPRG=1
      ISPT=0
      LPSS=0
      IERR=0
      IUP=0
      ISW=0
      IER=0
      IPATH=0
      FITOK=1.0D-13
      LPRGMX=1
      ITERM=0
```

```
C
C
      READ (JREAD,3) IDS,INPUT,IPLOT,IPUNCH,METRIC,MTH,NCLCC,MAXHPI
    3 FORMAT (8I5)
C
C***  CHECK FOR ERROR IN IDS
      IF (IDS.LE.3)IDS=JREAD
C
C
      READ (JREAD,4) EX1,EX2,EX3,EX4,IEX1,IEX2,IEX3,IEX4
    4 FORMAT (4F10.0,4I5)
C
C
      READ (JREAD,5) (IMODEL(I),I=1,18)
    5 FORMAT (18I1)
C
C
      READ (JREAD,6) PLOW,PHIGH,CDLOW,CDHIGH,TIA,TARE,HTARE
    6 FORMAT (5F10.0,2D15.0)
C
C
      READ (JREAD,7) (AP(I),WGT(I),I=1,13)
    7 FORMAT (2D20.0)
C
C
      READ (JREAD,8) (IP(I),I=1,18)
    8 FORMAT (18I1)
C
C
      READ (JREAD,9) (CRMIN(I),CRMAX(I),I=1,13)
    9 FORMAT (2D20.0)
C
C
      READ (IDS,10) (TITLE(I),I=1,20)
   10 FORMAT (20A4)
C
C
      READ (IDS,11) K,S,RHO,G,TT
   11 FORMAT (I10,4D15.8)
C
      DO 14 I=1,K
C
C
      READ (IDS,12) TIME(I),F1(I),F2(I),F3(I),F4(I),F5(I),F6(I),F7(I),F8
     1(I),F9(I),F10(I),F11(I),F12(I),F13(I),F14(I)
   12 FORMAT (3D25.16)
C
C
C
C
C***  TEST FOR INCREASING TIME
      IF (I.EQ.1) GO TO 14
      IF (TIME(I).GT.TIME(I-1)) GO TO 14
      WRITE (JWRITE,13) I
   13 FORMAT (1X,//,10X,'PROGRAM FOUND TIME VALUE = OR < TIME OF PREVIOU
     1S POINT AT PT ',I3)
      GO TO 1
   14 CONTINUE
C***  THESE TWO COMMENT CARDS ARE SUPPLIED SOLELY FOR THE USER TO USE
C***  AT HIS CONVENIENCE
C***  CHECK FOR MTH OR MAXHPI ERRORS
      IF (MTH.LT.0.OR.MTH.GT.5)MTH=0
      MAXHPI=IABS(MAXHPI)
      IF (MAXHPI.GT.5) MAXHPI=5
C***  DETERMINE MODEL NUMBERS
      IKM=0
      DO 15 IL=1,18
      IF (IMODEL(IL).EQ.0) GO TO 15
      IKM=IKM+1
      IEQNM(IKM)=IL
   15 CONTINUE
C***  CHECK FOR MODEL ERROR
      IF (IKM.EQ.0) WRITE (JWRITE,16)
   16 FORMAT (1X,//,10X,'ERROR DETECTED IN MODEL CODE.  TO NEXT DATA SET
     1, IF ANY.')
      IF (IKM.EQ.0) GO TO 1
      L1=1
      L2=IKM
C***  PRINT TITLE
      WRITE (JWRITE,17) (TITLE(I),I=1,20)
   17 FORMAT (1H1,////,23X,84('*'),/,23X,'*',82X,'*',/,23X,'*',20A4,2X,'
     1*',/,23X,'*',82X,'*',/,23X,84('*'))
C***  WRITE INPUT PARAMETERS
      WRITE (JWRITE,18) IDS,EX1,PLOW,TIA,INPUT,EX2,PHIGH,TARE,IPLOT,EX3,
     1CDLOW,HTARE,IPUNCH,EX4,CDHIGH,G,METRIC,K,S,RHO,TT,MTH,IEX1,IEX2,IE
     1X3,IEX4,(IMODEL(I),I=1,18),(IP(I),I=1,18)
   18 FORMAT (1X,//,18X,95('-'),//,19X,'INPUT PARAMETERS:',//,27X,'IDS
     1=',I2,2X,'EX1=',F10.7,2X,'PLOW=',D16.9,2X,'TIA=',D16.9,/,27X,'INPU
     1T=',I2,2X,'EX2=',F10.7,2X,'PHIGH=',D15.8,2X,'TARE=',D15.8,/,27X,'I
     1PLOT=',I2,2X,'EX3=',F10.7,2X,'CDLOW=',D15.8,2X,'HTARE=',D14.7,/,27
     1X,'IPUNCH=',I1,2X,'EX4=',F10.7,2X,'CDHIGH=',D14.7,2X,'G=',F10.7,/,
     127X,'METRIC=',I1,2X,'K=',I3,2X,'S=',F5.1,2X,'RHO=',D17.10,2X,'TT='
     1,F9.6,/,27X,'MTH  =',I2,2X,'IEX1=',I3,2X,'IEX2=',I3,2X,'IEX3=',I3,
     12X,'IEX4=',I3,2X,'IMODEL(1)=',I2,/,27X,'IMODEL(2)=',I2,2X,'IMODEL(
     13)=',I2,2X,'IMODEL(4)=',I2,2X,'IMODEL(5)=',I2,2X,'IMODEL(6)=',I2,/
     1,27X,'IMODEL(7)=',I2,2X,'IMODEL(8)=',I2,2X,'IMODEL(9)=',I2,2X,'IMO
     1DEL(10)=',I1,2X,'IMODEL(11)=',I1,/,27X,'IMODEL(12)=',I1,2X,'IMODEL
     1(13)=',I1,2X,'IMODEL(14)=',I1,2X,'IMODEL(15)=',I1,2X,'IMODEL(16)='
     1,I1,/,27X,'IMODEL(17)=',I1,2X,'IMODEL(18)=',I1,2X,'IP(1)=',I2,2X,'
     1IP(2)=',I2,2X,'IP(3)=',I2,2X,'IP(4)=',I2,/,27X,'IP(5)=',I2,2X,'IP(
     16)=',I2,2X,'IP(7)=',I2,2X,'IP(8)=',I2,2X,'IP(9)=',I2,2X,'IP(10)=',
     1I1,2X,'IP(11)=',I1,/,27X,'IP(12)=',I1,2X,'IP(13)=',I1,2X,'IP(14)='
     1,I1,2X,'IP(15)=',I1,2X,'IP(16)=',I1,2X,'IP(17)=',I1,2X,'IP(18)=',I
     11)
      WRITE (JWRITE,19) (I,AP(I),I,WGT(I),I,CRMIN(I),I,CRMAX(I),I=1,13)
   19 FORMAT (19X,'AP(',I2,')=',1PD14.7,2X,'WGT(',I2,')=',1PD11.4,2X,'CR
     1MIN(',I2,')=',1PD13.6,2X,'CRMAX(',I2,')=',1PD13.6)
      WRITE (JWRITE,20)
   20 FORMAT (1X,/,18X,95('-'))
      IF (METRIC.NE.0) GO TO 22
      WRITE (JWRITE,21) S,RHO,G,TT
   21 FORMAT (1X,//,38X,51('*'),/,38X,'*',49X,'*',/,38X,'*',13H WING ARE
     1A = ,F10.5,6H FT**2,20X,'*',/,38X,'*',21H REFERENCE DENSITY = ,F10
     1.8,11H SLUG/FT**3,7X,'*',/,38X,'*',31H ACCELERATION DUE TO GRAVITY
     1 = ,F7.4,10H FT/SEC**2,1X,'*',/,38X,'*',19H TOTAL TEST TIME = ,F10
     1.4,8H SECONDS,12X,'*',/,38X,'*',49X,'*',/,38X,51('*'))
      GO TO 24
   22 SXM=S*0.3048D0**2
      RHCM=RHO*515.38D0
      GXM=G*0.3048D0
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```
      WRITE (JWRITE,23) SIM,RHOM,GXM,TT
   23 FORMAT (1X,//,38X,51('*'),/,38X,'*',49X,'*',/,38X,'*',13H WING ARE
     1A = ,F11.5,5H M**2,20X,'*',/,38X,'*',21H REFERENCE DENSITY = ,F12.
     18,8H KG/M**3,8X,'*',/,38X,'*',31H ACCELERATION DUE TO GRAVITY = ,F
     18.4,9H M/SEC**2,1X,'*',/,38X,'*',19H TOTAL TEST TIME = ,F10.4,8H S
     1ECONDS,12X,'*',/,38X,'*',49X,'*',/,38X,51('*'))
C***  CHECK FOR INITIAL INPUT AND MODIFIED INPUT PRINTOUT
   24 IF (INPUT.NE.0) GO TO 47
   25 IF (METRIC.NE.0) GO TO 28
      IF (ISW.EQ.0) WRITE (JWRITE,26) LPRG
      IF (ISW.NE.0) WRITE (JWRITE,27) LPRG
   26 FORMAT (1X,//,31X,68('*'),/,31X,'*',66X,'*',/,31X,'*',12X,'INITIAL
     1 INPUT DATA (FOR PROGRAM LOOP#',I2,')',14X,'*',/,31X,'*',66X,'*',/
     1,31X,68('*'),/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|
     1',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4HTIME,8X,'|
     1',6X,6HWEIGHT,7X,'|',3X,11HPITCH ANGLE,5X,'|',4X,10HPITCH RATE,5X,
     1'|',5X,8HAIRSPEED,6X,'*',/,6X,'*',19X,'|',6X,6H(SECS),7X,'|',7X,5H
     1(LBF),7X,'|',4X,9H(RADIANS),6X,'|',3X,12H(RADIAN/SEC),4X,'|',5X,8H
     1(FT/SEC),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'|',1
     19X,'*',/,6X,'*',119('-'),'*')
   27 FORMAT (1X,//,31X,68('*'),/,31X,'*',66X,'*',/,31X,'*',14X,'MODIFIE
     1D DATA (FOR PROGRAM LOOP#',I2,')',17X,'*',/,31X,'*',66X,'*',/,31X,
     168('*'),/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X
     1,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4HTIME,8X,'|',6X,
     16HWEIGHT,7X,'|',3X,11HPITCH ANGLE,5X,'|',4X,10HPITCH RATE,5X,'|',5
     1X,8HAIRSPEED,6X,'*',/,6X,'*',19X,'|',6X,6H(SECS),7X,'|',7X,5H(LBF)
     1,7X,'|',4X,9H(RADIANS),6X,'|',3X,12H(RADIAN/SEC),4X,'|',5X,8H(FT/S
     1EC),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'|',19X,'*
     1',/,6X,'*',119('-'),'*')
      GO TO 31
   28 IF (ISW.EQ.0) WRITE (JWRITE,29) LPRG
      IF (ISW.NE.0) WRITE (JWRITE,30) LPRG
   29 FORMAT (1X,//,31X,68('*'),/,31X,'*',66X,'*',/,31X,'*',12X,'INITIAL
     1 INPUT DATA (FOR PROGRAM LOOP#',I2,')',14X,'*',/,31X,'*',66X,'*',/
     1,31X,68('*'),/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|
     1',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4HTIME,8X,'|
     1',6X,6HWEIGHT,7X,'|',3X,11HPITCH ANGLE,5X,'|',4X,10HPITCH RATE,5X,
     1'|',5X,8HAIRSPEED,6X,'*',/,6X,'*',19X,'|',6X,6H(SECS),7X,'|',5X,9H
     1(NEWTONS),5X,'|',4X,9H(RADIANS),6X,'|',3X,12H(RADIAN/SEC),4X,'|',6
     1X,7H(M/SEC),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'|
     1',19X,'*',/,6X,'*',119('-'),'*')
   30 FORMAT (1X,//,31X,68('*'),/,31X,'*',66X,'*',/,31X,'*',14X,'MODIFIE
     1D DATA (FOR PROGRAM LOOP#',I2,')',17X,'*',/,31X,'*',66X,'*',/,31X,
     168('*'),/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X
     1,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4HTIME,8X,'|',6X,
     16HWEIGHT,7X,'|',3X,11HPITCH ANGLE,5X,'|',4X,10HPITCH RATE,5X,'|',5
     1X,8HAIRSPEED,6X,'*',/,6X,'*',19X,'|',6X,6H(SECS),7X,'|',5X,9H(NEWT
     1ONS),5X,'|',4X,9H(RADIANS),6X,'|',3X,12H(RADIAN/SEC),4X,'|',6X,7H(
     1M/SEC),6X,'*',/,6X,'*',19X,'|',19X,'|',19X,'|',19X,'|',19X,'|',19X
     1,'*',/,6X,'*',119('-'),'*')
   31 IF (METRIC.NE.0) GO TO 41
C***  WRITE INPUT IN ENGLISH UNITS
      DO 32 I=1,K
   32 WRITE (JWRITE,33) I,TIME(I),F1(I),F2(I),F3(I),F4(I)
   33 FORMAT (6X,'*',7X,I3,9X,'|',6X,F7.3,6X,'|',4X,F10.4,5X,'|',3X,F11.
     17,5X,'|',4X,F10.7,5X,'|',5X,F8.4,6X,'*')
      WRITE (JWRITE,34)
   34 FORMAT (6X,'*',119X,'*',/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X
     1,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4
     1HTIME,8X,'|',5X,7HDENSITY,7X,'|',2X,15HANGLE OF ATTACK,2X,'|',4X,1
     11HTEMPERATURE,4X,'|',3X,12HACCELERATION,4X,'*',/,6X,'*',19X,'|',6X
     1,6H(SECS),7X,'|',3X,12H(SLUG/FT**3),4X,'|',4X,9H(RADIANS),6X,'|',6
     1X,7H(DEG-R),6X,'|',4X,11H(FT/SEC**2),4X,'*',/,6X,'*',19X,'|',19X,'
     1|',19X,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 35 I=1,K
   35 WRITE (JWRITE,36) I,TIME(I),F5(I),F6(I),F7(I),F8(I)
   36 FORMAT (6X,'*',7X,I3,9X,'|',6X,F7.3,6X,'|',4X,F10.8,5X,'|',4X,F11.
     17,4X,'|',7X,F6.2,6X,'|',4X,F9.5,6X,'*')
      WRITE (JWRITE,37)
   37 FORMAT (6X,'*',119X,'*',/,6X,121('*'))
      WRITE (JWRITE,38)
   38 FORMAT (6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X
     1,'|',16X,'*',/,6X,'*',1X,10HDATA POINT,1X,'|',3X,4HTIME,3X,'|',1X,
     120HANGLE-OF-ATTACK RATE,1X,'|',1X,8HALTITUDE,1X,'|',1X,13HALTITUDE
     1 RATE,1X,'|',1X,11HALT. ACCEL.,1X,'|',1X,12HVERT. ACCEL.,1X,'|',1X
     1,14HELEV. DEFLECT.,1X,'*',/,6X,'*',12X,'|',2X,6H(SECS),2X,'|',5X,1
     12H(RADIAN/SEC),5X,'|',3X,4H(FT),3X,'|',4X,8H(FT/SEC),3X,'|',1X,11H
     1(FT/SEC**2),1X,'|',2X,11H(FT/SEC**2),1X,'|',3X,9H(RADIANS),4X,'*',
     1/,6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X,'|',1
     16X,'*',/,6X,'*',119('-'),'*')
      WRITE (JWRITE,39) (I,TIME(I),F9(I),F10(I),F11(I),F12(I),F13(I),F14
     1(I),I=1,K)
   39 FORMAT (6X,'*',4X,I4,4X,'|',2X,F6.3,2X,'|',5X,F12.9,5X,'|',1X,F8.2
     1,1X,'|',4X,F7.2,4X,'|',2X,F8.2,3X,'|',4X,F6.2,4X,'|',4X,F8.5,4X,'*
     1')
      WRITE (JWRITE,40)
   40 FORMAT (6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X
     1,'|',16X,'*',/,6X,121('*'))
      IF (IPATH.NE.0) GO TO 174
      IF (ISW.NE.0) GO TO 150
      GO TO 47
C***  WRITE INPUT IN SI UNITS
   41 DO 42 I=1,K
      WS=F1(I)*4.4482D0
      VS=F4(I)*0.3048D0
   42 WRITE (JWRITE,33) I,TIME(I),WS,F2(I),F3(I),VS
      WRITE (JWRITE,43)
   43 FORMAT (6X,'*',119X,'*',/,6X,121('*'),/,6X,'*',19X,'|',19X,'|',19X
     1,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',4X,10HDATA POINT,5X,'|',7X,4
     1HTIME,8X,'|',5X,7HDENSITY,7X,'|',2X,15HANGLE OF ATTACK,2X,'|',4X,1
     11HTEMPERATURE,4X,'|',3X,12HACCELERATION,4X,'*',/,6X,'*',19X,'|',6X
     1,6H(SECS),7X,'|',4X,9H(KG/M**3),6X,'|',4X,9H(RADIANS),6X,'|',6X,7H
     1(DEG-K),6X,'|',4X,10H(M/SEC**2),5X,'*',/,6X,'*',19X,'|',19X,'|',19
     1X,'|',19X,'|',19X,'|',19X,'*',/,6X,'*',119('-'),'*')
      DO 44 I=1,K
      DS=F5(I)*515.38D0
      AS=F8(I)*0.3048D0
      TK=5.0D0/9.0D0*(F7(I)-491.72D0)+273.18D0
   44 WRITE (JWRITE,36) I,TIME(I),DS,F6(I),TK,AS
      WRITE (JWRITE,37)
      WRITE (JWRITE,45)
   45 FORMAT (6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X
     1,'|',16X,'*',/,6X,'*',1X,10HDATA POINT,1X,'|',3X,4HTIME,3X,'|',1X,
     120HANGLE-OF-ATTACK RATE,1X,'|',1X,8HALTITUDE,1X,'|',1X,13HALTITUDE
     1 RATE,1X,'|',1X,11HALT. ACCEL.,1X,'|',1X,12HVERT. ACCEL.,1X,'|',1X
     1,14HELEV. DEFLECT.,1X,'*',/,6X,'*',12X,'|',2X,6H(SECS),2X,'|',5X,1
     12H(RADIAN/SEC),5X,'|',1X,8H(METERS),1X,'|',4X,7H(M/SEC),4X,'|',2X,
     110H(M/SEC**2),1X,'|',2X,10H(M/SEC**2),2X,'|',3X,9H(RADIANS),4X,'*'
     1,/,6X,'*',12X,'|',10X,'|',22X,'|',10X,'|',15X,'|',13X,'|',14X,'|',
     116X,'*',/,6X,'*',119('-'),'*')
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      DO 46 I=1,K
      HS=F10(I)*0.3048D0
      HDS=F11(I)*0.3048D0
      HDDS=F12(I)*0.3048D0
      AZS=F13(I)*0.3048D0
   46 WRITE (JWRITE,39) I,TIME(I),F9(I),HS,HDS,HDDS,AZS,F14(I)
      WRITE (JWRITE,40)
C***  CHECK FOR PROGRAM DIRECTION
      IF (IPATH.NE.0) GO TO 174
      IF (ISW.NE.0) GO TO 150
C***  CALL MODEL EXTRACTION
   47 CALL MODEL(K,LPRG,FIT,NNB)
      IF (IERR.NE.0) GO TO 1
C***  CHECK FIT ERROR
      IF (LPRG.EQ.1.AND.FIT(LPRG).EQ.1.0D+60) GO TO 1
      IJKL=1
      IF (LPRG.GT.1)IJKL=2
C***  STORE BEST MODEL COEFFICIENTS
      CALL FITERR(FIT,IJKL,CFM)
      IF (LPRG.NE.1) GO TO 49
C***  DETERMINE MAXIMUM PITCH ANGLE AND ANGLE OF ATTACK
      AMAX=F6(1)
      TMAX=F2(1)
      DO 48 I=1,K
      ALPHA(I)=F6(I)
      THETA(I)=F2(I)
      IF (DABS(F6(I)).GT.DABS(AMAX))AMAX=F6(I)
   48 IF (DABS(F2(I)).GT.DABS(TMAX))TMAX=F2(I)
C***  CHECK FIT ERROR
   49 IF (FIT(LPRG).LT.FITOK) GO TO 50
C***  CALCULATE BIAS IN ANGLE OF ATTACK
      CALL ABIAS(K,LPRG,FIT,NNB)
      IF (IERR.NE.0) GO TO 1
C***  UPDATE RATES FOR COMPATIBILITY
   50 IF (IUP.EQ.0) GO TO 51
      CALL FNI(K,F2,TIME,F3,DUM,1,15,3,0)
      CALL FNI(K,F6,TIME,F9,DUM,1,15,3,0)
C***  CALCULATE POWER, DRAG COEFFICIENT AND LIFT COEFFICIENT
   51 SD2=S/2.0DC
      CALL CHNGE(SGN)
      DO 52 I=1,K
      PWRA(I)=CFM(1)+CFM(2)*F4(I)**EX1+CFM(3)*F4(I)**EX2+CFM(4)*F4(I)**E
     1X3+CFM(5)*F4(I)**EX4
      AM=F6(I)
      IF (F6(I).LT.0.0D0) CALL SIGNS(SGN,IEX1,IEX2,IEX3,IEX4)
      CD(I)=CFM(6)+CFM(7)*SGN(1)*AM**IEX1+CFM(8)*SGN(2)*AM**IEX2+CFM(9)*
     1SGN(3)*AM**IEX3+CFM(10)*SGN(4)*AM**IEX4
      CL(I)=F1(I)/(SD2*F5(I)*F4(I)**2)*(DCOS(F2(I)-F6(I))+F4(I)*(F3(I)-F
     19(I))/G-DSIN(F6(I)+TIA)*PWRA(I)/(F4(I)*F1(I)))
      IF (F6(I).LT.0.0D0) CALL CHNGE(SGN)
      IF (FIT(LPRG).LT.FITOK.AND.IUP.EQ.0)FT1(I)=DARSIN(F11(I)/F4(I))
   52 CONTINUE
C***  CHECK FIT ERROR AND BYPASS CODES
      IF (ITERM.NE.0) GO TO 187
      IF (FIT(LPRG).LT.FITOK.AND.IUP.EQ.0) GO TO 70
      IF (FIT(LPRG).LT.FITOK.AND.IUP.NE.0) GO TO 178
      IF (LPSS.NE.0) GO TO 140
      LPSS=1
C***  CALCULATE FLIGHT-PATH ANGLE
      DO 53 I=1,K
   53 FT1(I)=DARSIN(F11(I)/F4(I))
C***  CALCULATE FLIGHT-PATH-ANGLE RATE OF CHANGE
      CALL FNI(K,FT1,TIME,FT2,DUM,1,15,3,0)
C***  SET UP LEAST-SQUARES COEFFICIENTS FOR 1/3 POWER TERM
      DO 54 I=1,K
      C(I,1)=DCOS(F6(I)+TIA)/(F1(I)*F4(I))*F4(I)**0.33333D0
      C(I,2)=-F5(I)*S*F4(I)**2/(2.0D0*F1(I))
      C(I,3)=C(I,2)*F6(I)
      C(I,4)=C(I,3)*F6(I)
      C(I,5)=C(I,4)*F6(I)
      C(I,6)=C(I,5)*F6(I)
   54 X(I,1)=F8(I)/G+DSIN(F2(I)-F6(I))
C***  PERFORM LEAST SQUARES
      CALL LLSQAR(C,X,K,6,1,450,450,15,WKAR,IER,JWRITE)
      IF (IER.EQ.129) WRITE (JWRITE,55)
   55 FORMAT (1X,//,10X,'ZERO MATRIX ENCOUNTERED IN LEAST SQUARES.  TO N
     1EXT DATA SET, IF ANY.')
      IF (IER.EQ.129) GO TO 1
C***  DETERMINE FIT ERROR
      TNF=0.0D0
      DO 56 I=1,K
      XNF=DCOS(F6(I)+TIA)*(X(1,1)*F4(I)**0.33333D0)/(F1(I)*F4(I))-(F5(I)
     1*S*F4(I)**2/(2.0D0*F1(I))*(X(2,1)+X(3,1)*F6(I)+X(4,1)*F6(I)*F6(I)+
     1X(5,1)*F6(I)*F6(I)*F6(I)+X(6,1)*F6(I)*F6(I)*F6(I)*F6(I))+F8(I)/G+D
     1SIN(F2(I)-F6(I)))
   56 TNF=TNF+XNF*XNF
C***  WRITE COEFFICIENTS AND FIT ERROR
      IF (METRIC.NE.0) GO TO 58
      WRITE (JWRITE,57) (X(I,1),I=1,6),TNF
   57 FORMAT (1X,//,13X,106('.'),/,13X,'.',104X,'.',/,13X,'.',18X,'INITI
     1ALIZATION OF COEFFICIENT CONVERGENCE SCHEME BY 1/3 POWER MODEL',19
     1X,'.',/,13X,'.',104X,'.',/,13X,'.',1X,'FORM:',2X,'P = ',1PD12.5,'*
     1V**1/3',73X,'.',/,13X,'.',104X,'.',/,13X,'.',8X,'CD= ',1PD12.5,' +
     1 ',1PD12.5,'*A + ',1PD12.5,'*A**2 + ',1PD12.5,'*A**3 + ',1PD12.5,'
     1*A**4',3X,'.',/,13X,'.',104X,'.',/,13X,'.',10X,'WHERE:  V = AIRSPE
     1ED(FT/SEC)',66X,'.',/,13X,'.',18X,'A = ANGLE OF ATTACK(RADIAN)',59
     1X,'.',/,13X,'.',104X,'.',/,13X,'. FIT ERROR = ',D16.9,75X,'.',/,13
     1X,'.',104X,'.',/,13X,106('.'))
      GO TO 60
   58 CF1=X(1,1)*1.355818D-3
      WRITE (JWRITE,59) CF1,(X(I,1),I=2,6),TNF
   59 FORMAT (1X,//,13X,106('.'),/,13X,'.',104X,'.',/,13X,'.',18X,'INITI
     1ALIZATION OF COEFFICIENT CONVERGENCE SCHEME BY 1/3 POWER MODEL',19
     1X,'.',/,13X,'.',104X,'.',/,13X,'.',1X,'FORM:',2X,'P = ',1PD12.5,'*
     1V**1/3',73X,'.',/,13X,'.',104X,'.',/,13X,'.',8X,'CD= ',1PD12.5,' +
     1 ',1PD12.5,'*A + ',1PD12.5,'*A**2 + ',1PD12.5,'*A**3 + ',1PD12.5,'
     1*A**4',3X,'.',/,13X,'.',104X,'.',/,13X,'.',10X,'WHERE:  V = AIRSPE
     1ED(M/SEC) ',66X,'.',/,13X,'.',18X,'A = ANGLE OF ATTACK(RADIAN)',59
     1X,'.',/,13X,'.',104X,'.',/,13X,'. FIT ERROR = ',D16.9,75X,'.',/,13
     1X,'.',104X,'.',/,13X,106('.'))
   60 CF1=X(1,1)
C***  CHECK FOR FURTHER IMPROVEMENT
      IF (TNF.GT.(5*FIT(LPRG))) GO TO 72
C***  COMPUTE LIFT COEFFICIENT BASED ON 1/3 POWER MODEL AND EXTRACT NEW
C***  COEFFICIENTS UNTIL CONVERGENCE
      ITER=0
   61 DO 62 I=1,K
      W=F1(I)
      V=F4(I)
      R=F5(I)
```

```
      A=F6(I)
      DV=F8(I)
      HD=F11(I)
      DUM(I)=2.0D0*W/(G*S*R*V)*(FT2(I)+G*DCOS(FT1(I))/V-G*DSIN(A+TIA)*CF
     11*V**0.33333D0/(W*V*V))
      C(I,1)=DCOS(A+TIA)/(W*V)*V**0.33333D0
      C(I,2)=-R*S*V*V/(2.0D0*W)
      C(I,3)=C(I,2)*DUM(I)
      C(I,4)=C(I,3)*DUM(I)
   62 X(I,1)=DV/G+DSIN(F2(I)-F6(I))
C***  STORE VALUES FOR COMPARISON
      IF (ITER.EQ.0) GO TO 63
      SX1=CF1
      SX2=CF2
      SX3=CF3
      SX4=CF4
C***  PERFORM LEAST SQUARES
   63 CALL LLSQAR(C,X,K,4,1,450,450,15,WKAR,IER,JWRITE)
      IF (IER.EQ.129) WRITE (JWRITE,55)
      IF (IER.EQ.129) GO TO 1
C***  COMPUTE FIT ERROR
      TSX=C.0D0
      DO 64 I=1,K
      W=F1(I)
      V=F4(I)
      R=F5(I)
      A=F6(I)
      DV=F8(I)
      HD=F11(I)
      XSX=DCOS(A+TIA)*X(1,1)*V**0.33333D0/(W*V)-(R*S*V*V/(2.0D0*W)*(X(2,
     11)+X(3,1)*DUM(I)+X(4,1)*DUM(I)*DUM(I))+DV/G+DSIN(F2(I)-F6(I)))
   64 TSX=TSX+XSX*XSX
C***  TEST FCR CONVERGENCE
      IF (ITER.EQ.0) GO TO 68
      LLL=0
      IF (DABS(SX1-X(1,1)).LT.1.0D-06) LLL=LLL+1
      IF (DABS(SX2-X(2,1)).LT.1.0D-06) LLL=LLL+1
      IF (DABS(SX3-X(3,1)).LT.1.0D-06) LLL=LLL+1
      IF (DABS(SX4-X(4,1)).LT.1.0D-06) LLL=LLL+1
C***  WRITE COEFFICIENTS
      IF (METRIC.NE.0) GO TO 66
      WRITE (JWRITE,65) SX1,X(1,1),ITER,SX2,X(2,1),LLL,SX3,X(3,1),TSX,SX
     14,X(4,1)
   65 FORMAT (25X,83('.'),/,25X,'.',39X,'.',8X,'PAST',15X,'PRESENT',7X,'
     1.',/,25X,'.',39X,'.',1X,1PD18.11,3X,1PD18.11,1X,'.',/,25X,'. COEFF
     1ICIENT CONVERGENCE ITERATION #',I2,' . ',1PD18.11,3X,1PD18.11,' .'
     1,/,25X,'. NUMBER OF COEFFICIENTS PASSED =',I2,5X,'. ',1PD18.11,3X,
     11PD18.11,' .',/,25X,'. FIT ERROR = ',1PD20.13,6X,'. ',1PD18.11,3X,
     11PD18.11,' .',/,25X,83('.'))
      GO TO 67
   66 P0=SX1*1.355818D-3
      P1=X(1,1)*1.355818D-3
      WRITE (JWRITE,65) P0,P1,ITER,SX2,X(2,1),LLL,SX3,X(3,1),XSX,SX4,X(4
     1,1)
   67 IF (LLL.EQ.4) GO TO 70
   68 ITER=ITER+1
      IF (ITER.GT.20) GO TO 70
      CF1=X(1,1)
      CF2=X(2,1)
      CF3=X(3,1)
      CF4=X(4,1)
      WRITE (JWRITE,69)
   69 FORMAT (77X,'.',/,77X,'.',/,75X,5('.'),/,76X,'. .',/,77X,'.')
      GO TO 61
   70 IF (FIT(LPRG).LT.FITOK) GO TO 72
      DO 71 I=1,K
   71 CL(I)=DUM(I)
C***  OBTAIN INITIAL ESTIMATES ON LIFT COEFFICIENTS
   72 INTST=0
      EXPX=2.0D0
      GO TO 86
   73 INTST=1
      CALL LLSQAR(C,X,K,N,1,450,450,15,WKAR,IER,JWRITE)
      IF (IER.EQ.129) WRITE (JWRITE,55)
      IF (IER.EQ.129) GO TO 1
C***  INITIALIZE LEAST-SQUARE-DISTANCE COEFFICIENTS
      INTET=0
      GO TO 104
   74 INTET=1
      AL(1)=CFM(11)
      AL(2)=CFM(12)
      AL(3)=CFM(13)
      AL(4)=2.0D0
      HCLQ=CFM(14)
C***  PRINT OUT ESTIMATES
      WRITE (JWRITE,75) (AL(I),I=1,4),CFM(14)
   75 FORMAT (1X,///,48X,'INITIAL ESTIMATES OF LIFT COEFFICIENTS',//,53X
     1,'CLA0=',D23.16,/,53X,'CLA =',D23.16,/,53X,'CLAX=',D23.16,/,53X,'E
     1XPX=',D23.16,/,53X,'CLQ =',D23.16,/)
C***  CHECK LIFT FUNCTION CODE FOR DETERMINATION OF NUMBER OF UNKNOWNS
      N=NLLS(MTH+1)
      IF (MCLCC.NE.0) N=NLSD(MTH+1)
      IF (MCLCC.EQ.0) GO TO 87
C***  ADJUST CL'S, IF NECESSARY, FOR PITCH RATE DEPENDENCY
   76 IF ((MTH.EQ.0.OR.MTH.EQ.2).OR.MTH.EQ.4) GO TO 78
      DO 77 I=1,K
   77 CL(I)=CL(I)-CFM(14)*F3(I)
C***  ORDER DATA FOR DETERMINING LIFT COEFFICIENTS
   78 CALL ASCEN(K,CL,F6,X1,X2)
C***  CHECK FOR NEGATIVE OR ZERO X2'S
      JJ=0
      DO 79 I=1,K
      IF (X2(I).GT.0.0D0) GO TO 80
   79 JJ=JJ+1
   80 KM=K-JJ
      IF (KM.EQ.K) GO TO 83
C***  STORE VALUES FOR LATTER COMPUTATION
      DO 81 I=1,JJ
      WKAR(I)=X2(I)
   81 WKAR(I+JJ)=X1(I)
C***  ADJUST REMAINING POINTS FOR LEAST-SQUARE DISTANCE
      DO 82 I=1,KM
      X1(I)=X1(JJ+I)
   82 X2(I)=X2(JJ+I)
   83 LM=0
C***  PERFORM LEAST-SQUARE-DISTANCE FIT
      CALL LSD(X2,X1,KM,AL,N,RMS,LM,IERR,JWRITE,MTH)
      IF (LM.NE.0) GO TO 84
      ICD=1
      CFM(11)=AL(1)
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      CFM(12)=AL(2)
      CFM(13)=AL(3)
      EXPX=AL(4)
C***  COMPUTE INTERCEPT
      IF (JJ.EQ.0) GO TO 114
      YCEPT=WKAR(JJ+JJ)-CFM(12)*WKAR(JJ)
      GO TO 114
C***  DEFAULT TO LINEAR LEAST-SQUARES FIT
   84 IF ((MTH.EQ.0.OR.MTH.EQ.2).OR.MTH.EQ.4) GO TO 86
      DO 85 I=1,K
   85 CL(I)=CL(I)+CFM(14)*F3(I)
   86 N=NLLS(MTH+1)
C***  PERFORM LINEAR LEAST-SQUARES FIT
   87 MTHP1=MTH+1
      DO 94 I=1,K
      IF (F6(I).LE.0.0.AND.MTH.GE.2) GO TO 95
      C(I,1)=1.0D0
      GO TO (88,89,90,91,92,93),MTHP1
   88 C(I,2)=F6(I)
      GO TO 94
   89 C(I,2)=F6(I)
      C(I,3)=F3(I)
      GO TO 94
   90 C(I,2)=F6(I)
      C(I,3)=F6(I)**EXPX
      GO TO 94
   91 C(I,2)=F6(I)
      C(I,3)=F6(I)**EXPX
      C(I,4)=F3(I)
      GO TO 94
   92 C(I,2)=F6(I)**EXPX
      GO TO 94
   93 C(I,2)=F6(I)**EXPX
      C(I,3)=F3(I)
   94 X(I,1)=CL(I)
      IF (INTST.EQ.0) GO TO 73
      ICD=2
      GO TO 103
   95 EXPX=2.0D0
      DO 102 I=1,K
      C(I,1)=1.0D0
      GO TO (96,97,98,99,100,101),MTHP1
   96 C(I,2)=F6(I)
      GO TO 102
   97 C(I,2)=F6(I)
      C(I,3)=F3(I)
      GO TO 102
   98 C(I,2)=F6(I)
      C(I,3)=F6(I)*F6(I)
      GO TO 102
   99 C(I,2)=F6(I)
      C(I,3)=F6(I)*F6(I)
      C(I,4)=F3(I)
      GO TO 102
  100 C(I,2)=F6(I)*F6(I)
      GO TO 102
  101 C(I,2)=F6(I)*F6(I)
      C(I,3)=F3(I)
  102 X(I,1)=CL(I)
      IF (INTST.EQ.0) GO TO 73
      ICD=3
  103 CALL LLSQAR(C,X,K,N,1,450,450,15,WKAR,IER,JWRITE)
      IF (IER.EQ.129) WRITE (JWRITE,55)
      IF (IER.EQ.129) GO TO 1
  104 CFM(11)=X(1,1)
      DO 105 I=12,14
  105 CFM(I)=0.0D0
      GO TO (106,107,108,109,110,111),MTHP1
  106 CFM(12)=X(2,1)
      GO TO 112
  107 CFM(12)=X(2,1)
      CFM(14)=X(3,1)
      GO TO 112
  108 CFM(12)=X(2,1)
      CFM(13)=X(3,1)
      GO TO 112
  109 CFM(12)=X(2,1)
      CFM(13)=X(3,1)
      CFM(14)=X(4,1)
      GO TO 112
  110 CFM(13)=X(2,1)
      GO TO 112
  111 CFM(13)=X(2,1)
      CFM(14)=X(3,1)
  112 LM=0
      IF (INTET.EQ.0) GO TO 74
C***  WRITE OUT LIFT COEFFICIENTS
      WRITE (JWRITE,113)
  113 FORMAT (1X,//,48X,'LIFT COEFFICIENTS: BY LINEAR LEAST SQUARES',/)
      GO TO 116
  114 WRITE (JWRITE,115)
  115 FORMAT (1X,//,48X,'LIFT COEFFICIENTS: BY LEAST SQUARE DISTANCE',/)
  116 WRITE (JWRITE,117) CFM(11),CFM(12),CFM(13),EXPX,CFM(14)
  117 FORMAT (53X,'CLA0=',D23.16,/,53X,'CLA =',D23.16,/,53X,'CLAX=',D23.
     116,/,53X,'EXPX=',D23.16,/,53X,'CLQ=',D23.16,//)
C***  CHECK PROGRAM DIRECTION
      IF (IPATH.NE.0) GO TO 150
C***  CHECK FIT ERROR
      TFX=0.0D0
      DO 123 I=1,K
      GO TO (118,120,121),ICD
  118 IF (F6(I).GT.0.0D0) GO TO 119
      CLX=CFM(12)*F6(I)+YCEPT+HCLQ*F3(I)
      CL(I)=CL(I)+HCLQ*F3(I)
      GO TO 122
  119 CLX=CFM(11)+CFM(12)*F6(I)+CFM(13)*F6(I)**EXPX+HCLQ*F3(I)
      CL(I)=CL(I)+HCLQ*F3(I)
      GO TO 122
  120 CLX=CFM(11)+CFM(12)*F6(I)+CFM(13)*F6(I)**EXPX+CFM(14)*F3(I)
      GO TO 122
  121 CLX=CFM(11)+CFM(12)*F6(I)+CFM(13)*F6(I)*F6(I)+CFM(14)*F3(I)
  122 XFX=CL(I)-CLX
  123 TFX=TFX+XFX*XFX
      WRITE (JWRITE,124) TFX
  124 FORMAT (53X,'LIFT COEFFICIENT FIT ERROR= ',D23.16,//)
C***  CHECK FOR A BYPASS
      IF (FIT(LPRG).LT.FITOK) GO TO 178
      IF (TNF.GT.(5*FIT(LPRG))) GO TO 140
C***  READJUST ANGLE OF ATTACK BY NEWTON-RAPHSON ON LIFT EXPRESSION
      MCNT=0
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      DO 137 I=1,K
      ICNT=0
      A=F6(I)
      X2(I)=A
      X1(I)=CL(I)
  125 ICNT=ICNT+1
      GO TO (126,127,128),ICD
  126 IF (A.GT.0.0D0) GO TO 127
      XX=CFM(12)*A+YCEPT+HCLQ*F3(I)-CL(I)
      XP=CFM(12)
      XPP=0.0D0
      GO TO 129
  127 XX=CFM(11)+CFM(12)*A+CFM(13)*A**EXPX+CFM(14)*F3(I)-CL(I)
      XP=CFM(12)+EXPX*CFM(13)*A**(EXPX-1.0D0)
      XPP=EXPX*(EXPX-1.0D0)*A**(EXPX-2.0D0)
      GO TO 129
  128 XX=CFM(11)+CFM(12)*A+CFM(13)*A*A+CFM(14)*F3(I)-CL(I)
      XP=CFM(12)+2*CFM(13)*A
      XPP=2*CFM(13)
  129 RAD=(XP/XPP)*(XP/XPP)-2.0D0*(XX/XPP)
      A1=A
      IF (RAD.LT.0.0D0) GO TO 131
      IF ((XP*XPP).LT.0.0D0) GO TO 130
      A=A-XP/XPP+DSQRT(RAD)
      GO TO 132
  130 A=A-XP/XPP-DSQRT(RAD)
      GO TO 132
  131 A=A-XP/XPP
      MCNT=MCNT+1
      GO TO 133
  132 IF (DABS(A1-A).LT.1.0D-15.OR.ICNT.EQ.20) GO TO 133
      GO TO 125
  133 F6(I)=A
C***  COMPUTE NEW LIFT COEFFICIENT
      GO TO (134,135,136),ICD
  134 IF (A.GT.0.0D0) GO TO 135
      CL(I)=CFM(12)*A+YCEPT+HCLQ*F3(I)
      GO TO 137
  135 CL(I)=CFM(11)+CFM(12)*A+CFM(13)*A**EXPX+CFM(14)*F3(I)
      GO TO 137
  136 CL(I)=CFM(11)+CFM(12)*A+CFM(13)*A*A+CFM(14)*F3(I)
  137 CONTINUE
      IF (MCNT.NE.0) WRITE (JWRITE,138) MCNT
  138 FORMAT (1X,//,9X,94H*** DURING NEWTON-RAPHSON FOR ANGLE OF ATTACK
     1IN  MAIN , ROUTINE WISHED TO SEEK COMPLEX ROOTS ,I3,7H TIMES.)
C***  PERFORM MODEL EXTRACTION
      CALL MODEL(K,LPRG,FIT,NMB)
      IF (IERR.NE.0) GO TO 1
      IUP=1
      IF (FIT(LPRG).LT.FITOK) GO TO 50
C***  TEST FOR IMPROVEMENT
      SX=FIT(LPRG)
      CALL FITERR(FIT,2,CFM)
      IF (FIT(LPRG).EQ.SX) GO TO 140
C***  REDEFINE ANGLE OF ATTACK AND LIFT COEFFICIENTS
      DO 139 I=1,K
      F6(I)=X2(I)
  139 CL(I)=X1(I)
C***  PERFORM FREQUENCY-DEPENDENT CORRECTIONS TO ANGLE OF ATTACK
  140 CALL ALPDEL(K,LPRG,NMB,FIT)
      IF (IERR.NE.0) GO TO 1
C***  CHECK FIT ERROR
      IUP=1
  141 IF (FIT(LPRG).LT.FITOK) GO TO 50
C***  INTERMEDIATE PRINTOUT OF POWER, DRAG, AND LIFT COEFFICIENTS
      WRITE (JWRITE,142) EX1,EX2,EX3,EX4,IEX1,IEX2,IEX3,IEX4,EXPX
  142 FORMAT (1X,///,16X,100('/'),/,16X,'/',98('*'),'/',/,16X,'/*',96X,'
     1*/',/,16X,'/*',2X,'INTERMEDIATE',4X,'GENERAL EXPRESSIONS FOR POWER
     1, DRAG COEFFICIENT, AND LIFT COEFFICIENT',9X,'*/',/,16X,'/*',96X,'
     1*/',/,16X,'/*',96X,'*/',/,16X,'/*',3X,'P = P0 + P1*V**',1PD12.5,'
     1+ P2*V**',1PD12.5,' + P3*V**',1PD12.5,' + P4*V**',1PD12.5,3X,'*/',
     1/,16X,'/*',96X,'*/',/,16X,'/*',20X,'CD = CD0 + CD1*A**',I2,' + CD2
     1*A**',I2,' + CD3*A**',I2,' + CD4*A**',I2,20X,'*/',/,16X,'/*',96X,'
     1*/',/,16X,'/*',24X,'CL = CLAC + CLA*A + CLAX*A**',1PD12.5,' + CLQ*
     1R',24X,'*/',/,16X,'/*',96X,'*/',/,16X,'/*',96X,'*/',/,16X,'/*',3X,
     1'WHERE:',87X,'*/',/,16X,'/*',96X,'*/')
      IF (METRIC.NE.0) GO TO 144
      WRITE (JWRITE,143)
  143 FORMAT (16X,'/*',11X,'V = AIRSPEED(FT/SEC)',65X,'*/',/,16X,'/*',11
     1X,'A = ANGLE OF ATTACK(RADIAN)',58X,'*/',/,16X,'/*',11X,'R = PITCH
     1 RATE(RADIAN/SEC)',59X,'*/',/,16X,'/*',96X,'*/')
      GO TO 146
  144 WRITE (JWRITE,145)
  145 FORMAT (16X,'/*',11X,'V = AIRSPEED(M/SEC)',66X,'*/',/,16X,'/*',11X
     1,'A = ANGLE OF ATTACK(RADIAN)',58X,'*/',/,16X,'/*',11X,'R = PITCH
     1RATE(RADIAN/SEC)',59X,'*/',/,16X,'/*',96X,'*/')
      GO TO 148
  146 WRITE (JWRITE,147) CFM(1),CFM(6),CFM(11),CFM(2),CFM(7),CFM(12),CFM
     1(3),CFM(8),CFM(13),CFM(4),CFM(9),CFM(14),CFM(5),CFM(10)
  147 FORMAT (16X,'/*',9X,'P0 = ',D18.11,3X,'CD0 = ',D18.11,3X,'CLA0 = '
     1,D18.11,9X,'*/',/,16X,'/*',9X,'P1 = ',D18.11,3X,'CD1 = ',D18.11,3X
     1,'CLA  = ',D18.11,9X,'*/',/,16X,'/*',9X,'P2 = ',D18.11,3X,'CD2 = '
     1,D18.11,3X,'CLAX = ',D18.11,9X,'*/',/,16X,'/*',9X,'P3 = ',D18.11,3
     1X,'CD3 = ',D18.11,3X,'CLQ  = ',D18.11,9X,'*/',/,16X,'/*',9X,'P4 =
     1',D18.11,3X,'CD4 = ',D18.11,37X,'*/',/,16X,'/*',96X,'*/',/,16X,'/'
     1,98('*'),'/',/,16X,100('/'),///)
      GO TO 149
  148 P0=CFM(1)*1.355818D-3
      P1=CFM(2)*1.355818D-3
      P2=CFM(3)*1.355818D-3
      P3=CFM(4)*1.355818D-3
      P4=CFM(5)*1.355818D-3
      WRITE (JWRITE,147) P0,CFM(6),CFM(11),P1,CFM(7),CFM(12),P2,CFM(8),C
     1FM(13),P3,CFM(9),CFM(14),P4,CFM(10)
C***  WRITE OUT INTERMEDIATE RESULTS
  149 ISW=1
      GO TO 25
C***  PERFORM PATH PERFORMANCE ASSUMING AIRSPEED AND ALTITUDE GIVEN
  150 IPATH=IPATH+1
      KM1=K-1
C***  COMPUTE SPECIFIC FUEL CONSUMPTION
      SFC=0.0D0
      DO 151 I=1,KM1
      V=F4(I)
      PX=CFM(1)+CFM(2)*V**EX1+CFM(3)*V**EX2+CFM(4)*V**EX3+CFM(5)*V**EX4
  151 SFC=SFC+(F1(I)-F1(I+1))/(TIME(I+1)-TIME(I))/PX
      CSFC=SFC/KM1
C***  WRITE SPECIFIC FUEL CONSUMPTION
      IF (METRIC.NE.0) GO TO 153
      WRITE (JWRITE,152) CSFC
```

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  152 FORMAT (1X,////,27X,38HESTIMATED SPECIFIC FUEL CONSUMPTION = ,1PD2
     10.13,21H LBF/(FT-LBF/SEC)/SEC,//)
      GO TO 155
  153 SCSFC=CSFC*4448.2D0/1.3558D0
      WRITE (JWRITE,154) SCSFC
  154 FORMAT (1X,////,27X,38HESTIMATED SPECIFIC FUEL CONSUMPTION = ,1PD2
     10.13,9H N/KW-SEC)
  155 IF (CSFC.LE.0.0D0) WRITE (JWRITE,156)
  156 FORMAT (1X,/,27X,'SPECIFIC FUEL CONSUMPTION IS NEGATIVE OR ZERO. T
     1O NEXT DATA SET, IF ANY.')
C***  TEST MAGNITUDE OF CSFC
      IF (CSFC.LE.0.0D0) GO TO 1
      IF (CSFC.GT.0.4D-06)CSFC=0.4D-06
      IF (CSFC.LT.0.4D-07)CSFC=0.4D-07
      IF (METRIC.NE.0) GO TO 157
      IF (CSFC.EQ.0.4D-06.OR.CSFC.EQ.0.4D-07) WRITE (JWRITE,152) CSFC
      GO TO 158
  157 SCSFC=CSFC*4448.2D0/1.3558D0
      IF (CSFC.EQ.0.4D-06.OR.CSFC.EQ.0.4D-07) WRITE (JWRITE,154) SCSFC
C***  STORE PARAMETERS
  158 IF (IPATH.EQ.1) GO TO 159
      IF (FIT(LPRG).GT.WRK(1)) GO TO 162
  159 WRK(1)=FIT(LPRG)
      WRK(2)=CSFC
      WRK(3)=EXPX
      DO 160 I=1,14
  160 WRK(I+3)=CFM(I)
      DO 161 I=1,K
      WRK(I+17)=F1(I)
      WRK(I+17+K)=F2(I)
  161 WRK(I+17+K+K)=F6(I)
C***  CHECK FOR MAXIMUM ITERATION
  162 IF (IPATH.GE.7) GO TO 168
C***  ENACT PATH PERFORMANCE ROUTINE
      CALL PATH(K,CSFC,IPATH)
      IF (IERR.NE.0) GO TO 1
C***  CHECK FOR PITCH ANGLE MODIFICATION
      IF (IPATH.GE.2)ISPT=1
C***  ADJUST ANGLE OF ATTACK AND PITCH ANGLE
      FAC=0.5D0
      DO 165 I=1,K
      IF (IPATH.GE.3)FAC=-0.5D0
      F6(I)=F6(I)+FAC*ADF(I)
      IF (ISPT.NE.0)F2(I)=F6(I)+FT1(I)
      IF (I.EQ.1) GO TO 165
      DW=F1(I)-F1(I-1)
      IF (DABS(DW).LT.0.0001D0) GO TO 163
      GO TO 165
  163 WRITE (JWRITE,164)
  164 FORMAT (1X,///,10X,'CONSECUTIVE WEIGHT POINTS FAILED TO CHANGE BY
     1MINIMUM ALLOWANCE. TO NEXT DATA SET, IF ANY.')
      GO TO 1
  165 CONTINUE
C***  ADJUST PITCH ANGLE
      CALL GAMX(K)
C***  PERFORM MODEL EXTRACTION
      CALL MODEL(K,LPRG,FIT,MNB)
C***  CHECK FOR APPROACHING MAXIMUM ITERATION
      IF (IPATH.LE.5) GO TO 166
      IPATH=IPATH+1
C***  UPDATE LIFT COEFFICIENTS
  166 DO 167 I=1,K
      V=F4(I)
      PX=CFM(1)+CFM(2)*V**EX1+CFM(3)*V**EX2+CFM(4)*V**EX3+CFM(5)*V**EX4
  167 CL(I)=(2.0D0*F1(I)/(F5(I)*S*V*G))*(FT2(I)+G*DCOS(FT1(I))/V-G*PX*DS
     1IN(F6(I)+TIA)/(F1(I)*V*V))
      GO TO 76
C***  DEFINE BEST PARAMETERS
  168 FIT(LPRG)=WRK(1)
      CSFC=WRK(2)
      EXPX=WRK(3)
      DO 169 I=1,14
  169 CFM(I)=WRK(I+3)
      DO 170 I=1,K
      F1(I)=WRK(I+17)
      F2(I)=WRK(I+17+K)
  170 F6(I)=WRK(I+17+K+K)
C***  WRITE PARAMETERS
      IF (METRIC.NE.0) GO TO 172
      WRITE (JWRITE,171) FIT(LPRG),CSFC
  171 FORMAT (1X,///,15X,25H'BEST' MODEL FIT ERROR = ,1PD23.16,/,15X,35H
     1'BEST' SPECIFIC FUEL CONSUMPTION = ,1PD20.13,21H LBF/(FT-LBF/SEC)/
     1SEC)
      GO TO 141
  172 SCSFC=CSFC*4448.2D0/1.3558D0
      WRITE (JWRITE,173) FIT(LPRG),SCSFC
  173 FORMAT (1X,///,15X,25H'BEST' MODEL FIT ERROR = ,1PD23.16,/,15X,35H
     1'BEST' SPECIFIC FUEL CONSUMPTION = ,1PD20.13,9H N/KW-SEC)
      GO TO 141
C***  ENACT TRAJECTORY PREDICTION ROUTINE
  174 IF (MAXHPI.EQ.0) GO TO 177
C***  DO NOT ALLOW AP(I)'S TO BE EQUAL TO ZERO
      DO 175 I=1,13
  175 IF (DABS(AP(I)).LT.1.0D-10)AP(I)=1.0D-10
      DO 176 I=1,MAXHPI
      NHPI(I)=IHPATH(I)
C***  DETERMINE POWER AND LIFT COEFFICIENTS FROM EQUATION OF MOTION
C***  NORMAL TO FLIGHT PATH OR ADJUST A PRIORI WEIGHTS
      CALL GDEQM(K,MNB,I)
      CALL HPATH(K,CSFC,MNB,LPRG,FIT,TARE,HTARE,NHPI(I))
  176 CONTINUE
C***  CALL MODEL EXTRACTION ROUTINE
  177 CALL MODEL(K,LPRG,FIT,MNB)
C***  DETERMINE CONFIDENCE MAGNITUDES FOR ANGLE OF ATTACK AND PITCH
C***  ANGLE
  178 XALP=0.0D0
      XTHE=0.0D0
      DO 179 I=1,K
      XALP=XALP+(DABS((ALPHA(I)-F6(I))/AMAX))**2
  179 XTHE=XTHE+(DABS((THETA(I)-F2(I))/TMAX))**2
      XALP=XALP/K
      XTHE=XTHE/K
      WRITE (JWRITE,180) XALP,XTHE
  180 FORMAT (1X,///,43X,'ANGLE-OF-ATTACK CONFIDENCE = ',D20.13,/,43X,'P
     1ITCH ANGLE CONFIDENCE = ',D20.13,///)
C***  CHECK FIT ERROR FOR POSSIBLE ANALYSIS TERMINATION
      IF (FIT(LPRG).LE.FITOK) GO TO 181
C***  PROCEED WITH NEXT PROGRAM LOOP (LPRG+1)
      LPRG=LPRG+1
C***  TEST FOR SPECIFIED LOOP MAXIMUM
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      IF (LPRG.GT.LPRGMX) GO TO 181
C***  RESET INSTRUCTION CODES FOR NEXT LOOP
      ISPT=0
      LPSS=0
      IUP=0
      ISW=0
      IPATH=0
C***  TRANSFER TO CONTROL POINT
      GO TO 25
C***  WRITE FINAL RESULTS
  181 WRITE (JWRITE,182) EX1,EX2,EX3,EX4,IEX1,IEX2,IEX3,IEX4,EXPX
  182 FORMAT (1X,///,16X,100('/'),/,16X,'/',98('*'),'/',/,16X,'/*',96X,'
     1*/',/,16X,'/*',2X,'****FINAL****',4X,'GENERAL EXPRESSIONS FOR POWER
     1, DRAG COEFFICIENT, AND LIFT COEFFICIENT',9X,'*/',/,16X,'/*',96X,'
     1*/',/,16X,'/*',96X,'*/',/,16X,'/*',3X,'P = P0 + P1*V**',1PD12.5,'
     1+ P2*V**',1PD12.5,' + P3*V**',1PD12.5,' + P4*V**',1PD12.5,3X,'*/',
     1/,16X,'/*',96X,'*/',/,16X,'/*',20X,'CD = CD0 + CD1*A**',I2,' + CD2
     1*A**',I2,' + CD3*A**',I2,' + CD4*A**',I2,20X,'*/',/,16X,'/*',96X,'
     1*/',/,16X,'/*',24X,'CL = CLA0 + CLA*A + CLAX*A**',1PD12.5,' + CLQ*
     1R',24X,'*/',/,16X,'/*',96X,'*/',/,16X,'/*',96X,'*/',/,16X,'/*',3X,
     1'WHERE:',87X,'*/',/,16X,'/*',96X,'*/')
      IF (METRIC.NE.0) GO TO 183
      WRITE (JWRITE,143)
      GO TO 184
  183 WRITE (JWRITE,145)
      GO TO 185
  184 WRITE (JWRITE,147) CFM(1),CFM(6),CFM(11),CFM(2),CFM(7),CFM(12),CFM
     1(3),CFM(8),CFM(13),CFM(4),CFM(9),CFM(14),CFM(5),CFM(10)
      GO TO 186
  185 P0=CFM(1)*1.355818D-3
      P1=CFM(2)*1.355818D-3
      P2=CFM(3)*1.355818D-3
      P3=CFM(4)*1.355818D-3
      P4=CFM(5)*1.355818D-3
      WRITE (JWRITE,147) P0,CFM(6),CFM(11),P1,CFM(7),CFM(12),P2,CFM(8),C
     1FM(13),P3,CFM(9),CFM(14),P4,CFM(10)
C***  SET CODE FOR UPDATE ON POWER, AND DRAG AND LIFT COEFFICIENT
  186 ITERM=1
      GO TO 50
C***  WRITE RESULTS
  187 WRITE (JWRITE,188)
  188 FORMAT (1X,///,9X,113('*'))
      DO 197 I=1,K
      IF (METRIC.NE.0) GO TO 190
      WRITE (JWRITE,189) F1(I),F10(I),F2(I),F11(I),F3(I),F12(I),F4(I),F1
     13(I),I,F5(I),F14(I),F6(I),CL(I),F7(I),CD(I),F8(I),PWRA(I),F9(I),FT
     11(I)
  189 FORMAT (9X,'*',13X,'|',47X,'|',49X,'*',/,9X,'*',13X,'|',1X,'WEIGHT
     1',14X,'= ',D12.5,' LBF     ',4X,'| ALTITUDE',14X,'= ',D12.5,' FT',9
     1X,'*',/,9X,'*',13X,'|',1X,'PITCH ANGLE',9X,'= ',D12.5,' RADIAN',5X
     1,'| ALTITUDE RATE',9X,'= ',D12.5,' FT/SEC',5X,'*',/,9X,'*',13X,'|
     1PITCH RATE',10X,'= ',D12.5,' RADIAN/SEC | ALTITUDE-RATE RATE',4X,'
     1= ',D12.5,' FT/SEC**2',2X,'*',/,9X,'*',13X,'| AIRSPEED',12X,'= ',D
     112.5,' FT/SEC',5X,'| VERTICAL ACCELERATION = ',D12.5,' FT/SEC**2',
     12X,'*',/,9X,'* DATA PT ',I3,' | DENSITY',13X,'= ',D12.5,' SLUG/FT*
     1*3 | ELEVATOR DEFLECTION',3X,'= ',D12.5,' RADIAN',5X,'*',/,9X,'*',
     113X,'| ANGLE OF ATTACK',5X,'= ',D12.5,' RADIAN',5X,'| LIFT COEFFIC
     1IENT( CL )= ',D12.5,12X,'*',/,9X,'*',13X,'| TEMPERATURE',9X,'= ',D
     112.5,' DEGREES-R  | DRAG COEFFICIENT( CD )= ',D12.5,12X,'*',/,9X,'
     1*',13X,'| ACCELERATION',8X,'= ',D12.5,' FT/SEC**2  | POWER AVAILAB
     1LE',7X,'= ',D12.5,' FT-LBF/SEC *',/,9X,'*',13X,'| ANGLE-OF-ATTACK
     1RATE= ',D12.5,' RADIAN/SEC | FLIGHT PATH ANGLE',5X,'= ',D12.5,' RA
     1DIAN',5X,'*',/,9X,'*',13X,'|',47X,'|',49X,'*',/,9X,113('*'))
      GO TO 192
  190 W=F1(I)*4.4482D0
      ALT=F10(I)*0.3048D0
      ALTR=F11(I)*0.3048D0
      ALT2R=F12(I)*0.3048D0
      V=F4(I)*0.3048D0
      AZ=F13(I)*0.3048D0
      RHX=F5(I)*32.16D0*16.02D0
      T=5.0D0/9.0D0*(F7(I)-491.72D0)+273.18D0
      DV=F8(I)*0.3048D0
      P=PWRA(I)*1.3558D0/1000.0D0
      WRITE (JWRITE,191) W,ALT,F2(I),ALTR,F3(I),ALT2R,V,AZ,I,RHX,F14(I),
     1F6(I),CL(I),T,CD(I),DV,P,F9(I),FT1(I)
  191 FORMAT (9X,'*',13X,'|',47X,'|',49X,'*',/,9X,'*',13X,'|',1X,'WEIGHT
     1',14X,'= ',D12.5,' NEWTONS',4X,'| ALTITUDE',14X,'= ',D12.5,' M ',9
     1X,'*',/,9X,'*',13X,'|',1X,'PITCH ANGLE',9X,'= ',D12.5,' RADIAN',5X
     1,'| ALTITUDE RATE',9X,'= ',D12.5,' M/SEC ',5X,'*',/,9X,'*',13X,'|
     1PITCH RATE',10X,'= ',D12.5,' RADIAN/SEC | ALTITUDE-RATE RATE',4X,'
     1= ',D12.5,' M/SEC**2 ',2X,'*',/,9X,'*',13X,'| AIRSPEED',12X,'= ',D
     112.5,' M/SEC ',5X,'| VERTICAL ACCELERATION = ',D12.5,' M/SEC**2 ',
     12X,'*',/,9X,'* DATA PT ',I3,' | DENSITY',13X,'= ',D12.5,' KG/M**3
     1   | ELEVATOR DEFLECTION',3X,'= ',D12.5,' RADIAN',5X,'*',/,9X,'*',
     113X,'| ANGLE OF ATTACK',5X,'= ',D12.5,' RADIAN',5X,'| LIFT COEFFIC
     1IENT( CL )= ',D12.5,12X,'*',/,9X,'*',13X,'| TEMPERATURE',9X,'= ',D
     112.5,' DEGREES-K  | DRAG COEFFICIENT( CD )= ',D12.5,12X,'*',/,9X,'
     1*',13X,'| ACCELERATION',8X,'= ',D12.5,' M/SEC**2   | POWER AVAILAB
     1LE',7X,'= ',D12.5,' KILOWATTS  *',/,9X,'*',13X,'| ANGLE-OF-ATTACK
     1RATE= ',D12.5,' RADIAN/SEC | FLIGHT PATH ANGLE',5X,'= ',D12.5,' RA
     1DIAN',5X,'*',/,9X,'*',13X,'|',47X,'|',49X,'*',/,9X,113('*'))
C***  PUNCH CARDS
  192 IF (IPUNCH.EQ.0) GO TO 197
      IF (I.NE.1) GO TO 195
      WRITE (JPUNCH,193) (TITLE(J),J=1,20)
  193 FORMAT (20A4)
      WRITE (JPUNCH,194) K,S,RHO,TT,EX1,EX2,EX3,EX4,IEX1,IEX2,IEX3,IEX4,
     1(CFM(J),J=1,14)
  194 FORMAT (I5,5X,D18.11,2X,D18.11,2X,D18.11,/,4(D18.11,2X),/,4(I1,1X)
     1,2X,3(D18.11,2X),/,4(D18.11,2X),/,4(D18.11,2X),/,3(D18.11,2X))
  195 WRITE (JPUNCH,196) TIME(I),F1(I),F2(I),F3(I),F4(I),F5(I),F6(I),F7(
     1I),F8(I),F9(I),F10(I),F11(I),F12(I),F13(I),F14(I),CL(I),CD(I),PWRA
     1(I)
  196 FORMAT (D18.11,2X,D18.11,2X,D18.11,2X,D18.11)
  197 CONTINUE
C***  CHECK FOR PLOTS
      IF (IPLOT.NE.0) GO TO 199
      JPLOT=1
C***  DEFINE PLOT CODES
C***  WARNING-- WARNING-- THE FOLLOWING PLOTTING ROUTINES MAY NOT BE
C***  COMPATIBLE FOR OTHER INSTALLATIONS.  THE USER SHOULD INQUIRE AT
C***  HIS INSTALLATION'S PROGRAMMING SERVICES.
C***  COMPUTE TIME SPACING FOR PLOTTING
      TORG=TIME(K)
      DO 198 I=2,21
      IF (TORG.GT.TRG(I-1).AND.TORG.LE.TRG(I))TPTX=TRG(I)
      IF (TORG.EQ.TRG(I-1))TPTX=TRG(I-1)
  198 CONTINUE
      CALL PLOTIT(K,TPTX,IP)
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C***  CHECK FOR NEW DATA SET
  199 GO TO 1
C***  TERMINATE PLOT ROUTINES AND PROGRAM
  200 IF (JPLOT.NE.0) CALL PICSIZ(0.0,0.0)
      STOP
      END


      SUBROUTINE PLOTIT(K,TPTX,IP)
C
C***  SUBROUTINE PLOTIT PLOTS TIME HISTORIES, CL VS ALPHA, CD VS ALPHA,
C***  CL VS CD, AND POWER VS AIRSPEED
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION KD(5),DUM(450),IP(18)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CFM(14),SGM(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),CL(450),CD(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
      COMMON /LAB2/YCEPT,ICD,MTH,MCLCC
      REAL*4 XRD(2,450),XD(2,450),YRD(2,450),YD(2,450),TPTP
C
      TPTP=TPTX
      DO 1 I=1,K
      IF (I.LE.5)KD(I)=-1
    1 XRD(1,I)=TIME(I)
C***  PLOT WEIGHT TIME HISTORY
      IF (IP(1).NE.0) GO TO 4
      DO 2 I=1,K
      YRD(1,I)=F1(I)
    2 IF (METRIC.NE.0)YRD(1,I)=YRD(1,I)*4.4482D0/100.0D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 3
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,3500.0,4500
     1.0,250.0,1,'WEIGHT(LBF)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _')
      GO TO 4
    3 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,150.0,200.0
     1,5.0,1,'WEIGHT(NEWTONS)/100_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _'
     1)
C***  PLOT PITCH ANGLE TIME HISTORY
    4 IF (IP(2).NE.0) GO TO 6
      DO 5 I=1,K
    5 YRD(1,I)=F2(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-80.0,80.0,
     110.0,1,'PITCH ANGLE(RADIAN) X 100_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,
     11,' _')
C***  PLOT PITCH RATE TIME HISTORY
    6 IF (IP(3).NE.0) GO TO 8
      DO 7 I=1,K
    7 YRD(1,I)=F3(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-80.0,80.0,
     110.0,1,'PITCH RATE(RAD/SEC) X 100_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,
     11,' _')
C***  PLOT AIRSPEED TIME HISTORY
    8 IF (IP(4).NE.0) GO TO 11
      DO 9 I=1,K
      YRD(1,I)=F4(I)
    9 IF (METRIC.NE.0)YRD(1,I)=YRD(1,I)*0.3048D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 10
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,80.0,300.0,
     120.0,1,'AIRSPEED(FT/SEC)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _')
      GO TO 11
   10 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,25.0,100.0,
     15.0,1,'AIRSPEED(M/SEC)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _')
C***  PLOT DENSITY TIME HISTORY
   11 IF (IP(5).NE.0) GO TO 14
      DO 12 I=1,K
      YRD(1,I)=F5(I)*10000.0D0
   12 IF (METRIC.NE.0)YRD(1,I)=F5(I)*5153.8D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 13
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,14.0,24.0,2
     1.0,1,'DENSITY(SLUG/FT**3) X 10000_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,
     11,' _')
      GO TO 14
   13 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,6.0,12.0,1.
     10,1,'DENSITY(KG/M**3) X 10_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _')
C***  PLOT ANGLE OF ATTACK TIME HISTORY
   14 IF (IP(6).NE.0) GO TO 16
      DO 15 I=1,K
   15 YRD(1,I)=F6(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-5.0,40.0,5
     1.0,1,'ANGLE OF ATTACK(RAD) X 100_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1
     1,' _')
C***  PLOT TEMPERATURE TIME HISTORY
   16 IF (IP(7).NE.0) GO TO 19
      DO 17 I=1,K
      YRD(1,I)=F7(I)
   17 IF (METRIC.NE.0)YRD(1,I)=5.0D0/9.0D0*(F7(I)-491.72D0)+273.18D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 18
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,450.0,550.0
     1,25.0,1,'TEMPERATURE(DEG-R)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _'
     1)
      GO TO 19
   18 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,250.0,300.0
     1,10.0,1,'TEMPERATURE(DEG-K)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _'
     1)
C***  PLOT ACCELERATION TIME HISTORY
   19 IF (IP(8).NE.0) GO TO 22
      DO 20 I=1,K
      YRD(1,I)=F8(I)
   20 IF (METRIC.NE.0)YRD(1,I)=F8(I)*0.3048D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 21
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-32.0,32.0,
     14.0,1,'ACCELERATION(FT/SEC**2)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,'
     1 _')
      GO TO 22
   21 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-10.0,10.0,
     11.0,1,'ACCELERATION(M/SEC**2)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,'
     1_')
C***  PLOT ANGLE-OF-ATTACK RATE TIME HISTORY
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   22 IF (IP(9).NE.0) GO TO 24
      DO 23 I=1,K
   23 YRD(1,I)=F9(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-10.0,10.0,
     11.0,1,'ANGLE-OF-ATTACK RATE(RAD/SEC) X 100_',YRD,YD,1,2,1,450,K,0,
     10,0,0,KD,1,' _')
C***  PLOT ALTITUDE TIME HISTORY
   24 IF (IP(10).NE.0) GO TO 27
      DO 25 I=1,K
      YRD(1,I)=F10(I)/1000.0D0
   25 IF (METRIC.NE.0)YRD(1,I)=F10(I)/100.0D0*0.3048D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 26
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,2.0,16.0,1.
     10,1,'ALTITUDE(FT)/1000_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _')
      GO TO 27
   26 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,0.0,48.0,2.
     10,1,'ALTITUDE(M)/100 _',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _')
C***  PLOT ALTITUDE RATE TIME HISTORY
   27 IF (IP(11).NE.0) GO TO 30
      DO 28 I=1,K
      YRD(1,I)=F11(I)
   28 IF (METRIC.NE.0)YRD(1,I)=F11(I)*0.3048D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 29
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-100.0,100.
     10,10.0,1,'ALTITUDE RATE(FT/SEC)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,
     1' _')
      GO TO 30
   29 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-34.0,34.0,
     14.0,1,'ALTITUDE RATE(M/SEC)_',YRD,YD,1,2,1,450,K,0,0,0,0,KD,1,' _'
     1)
C***  PLOT ALTITUDE ACCELERATION TIME HISTORY
   30 IF (IP(12).NE.0) GO TO 33
      DO 31 I=1,K
      YRD(1,I)=F12(I)
   31 IF (METRIC.NE.0)YRD(1,I)=F12(I)*0.3048D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 32
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-100.0,100.
     10,10.0,1,'ALTITUDE ACCELERATION(FT/SEC**2)_',YRD,YD,1,2,1,450,K,0,
     10,0,0,KD,1,' _')
      GO TO 33
   32 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-34.0,34.0,
     14.0,1,'ALTITUDE ACCELERATION(M/SEC**2)_',YRD,YD,1,2,1,450,K,0,0,0,
     10,KD,1,' _')
C***  PLOT VERTICAL ACCELERATION TIME HISTORY
   33 IF (IP(13).NE.0) GO TO 36
      DO 34 I=1,K
      YRD(1,I)=F13(I)
   34 IF (METRIC.NE.0)YRD(1,I)=F13(I)*0.3048D0
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 35
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-32.0,32.0,
     14.0,1,'VERTICAL ACCELERATION(FT/SEC**2)_',YRD,YD,1,2,1,450,K,0,0,0
     1,0,KD,1,' _')
      GO TO 36
   35 CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-10.0,10.0,
     12.0,1,'VERTICAL ACCELERATION(M/SEC**2)_',YRD,YD,1,2,1,450,K,0,0,0,
     10,KD,1,' _')
C***  PLOT ELEVATOR DEFLECTION TIME HISTORY
   36 IF (IP(14).NE.0) GO TO 38
      DO 37 I=1,K
   37 YRD(1,I)=F14(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,TPTP,5.0,1,'TIME(SECS)_',XRD,XD,5.5,-25.0,25.0,
     15.0,1,'ELEVATOR DEFLECTION(RAD) X 100_',YRD,YD,1,2,1,450,K,0,0,0,0
     1,KD,1,' _')
C***  PLOT LIFT COEFFICIENT VS ANGLE OF ATTACK
   38 IF (IP(15).NE.0) GO TO 44
      KD(2)=0
      CALL ASCEN(K,CL,F6,X1,X2)
      DO 42 I=1,K
      XRD(1,I)=X2(I)*100.0D0
      YRD(1,I)=X1(I)*10.0D0
      XRD(2,I)=XRD(1,I)
      GO TO (39,40,41),ICD
   39 IF (F6(I).GT.0.0D0) GO TO 40
      DUM(I)=CFM(12)*F6(I)+YCEPT+CFM(14)*F3(I)
      GO TO 42
   40 DUM(I)=CFM(11)+CFM(12)*F6(I)+CFM(13)*F6(I)**EXPX+CFM(14)*F3(I)
      GO TO 42
   41 DUM(I)=CFM(11)+CFM(12)*F6(I)+CFM(13)*F6(I)**2+CFM(14)*F3(I)
   42 CONTINUE
      CALL ASCEN(K,DUM,F6,X1,X2)
      DO 43 I=1,K
   43 YRD(2,I)=X1(I)*10.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,-5.0,40.0,5.0,1,'ANGLE OF ATTACK(RAD) X 100_',XRD,X
     1D,5.5,0.0,20.0,2.0,1,'LIFT COEFFICIENT X 10_',YRD,YD,1,2,2,450,K,K
     1,0,0,0,KD,1,' _')
C***  PLOT DRAG COEFFICIENT VS ANGLE OF ATTACK
   44 IF (IP(16).NE.0) GO TO 46
      CALL ASCEN(K,CD,F6,X1,X2)
      DO 45 I=1,K
      XRD(1,I)=X2(I)*100.0D0
   45 YRD(1,I)=X1(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,-5.0,40.0,5.0,1,'ANGLE OF ATTACK(RAD) X 100_',XRD,X
     1D,5.5,0.0,15.0,1.0,1,'DRAG COEFFICIENT X 100_',YRD,YD,1,2,1,450,K,
     10,0,0,0,KD,1,' _')
C***  PLOT LIFT COEFFICIENT VS DRAG COEFFICIENT
   46 IF ((IP(17).NE.0.OR.IP(15).NE.0).OR.IP(16).NE.0) GO TO 49
      CALL ASCEN(K,CL,CD,X1,X2)
      DO 47 I=1,K
      XRD(1,I)=X2(I)*100.0D0
      XRD(2,I)=XRD(1,I)
   47 YRD(1,I)=X1(I)*100.0D0
      CALL ASCEN(K,DUM,CD,X1,X2)
      DO 48 I=1,K
   48 YRD(2,I)=X1(I)*100.0D0
      CALL PICSIZ(10.0,10.0)
      CALL GRAFF(8.0,0.0,15.0,1.0,1,'DRAG COEFFICIENT (CD) X 100_',XRD,X
     1D,5.5,0.0,200.0,20.0,1,'LIFT COEFFICIENT (CL) X 100_',YRD,YD,1,2,2
     1,450,K,K,0,0,0,KD,1,' _')
C***  PLOT POWER AVAILABLE VS AIRSPEED
   49 IF (IP(18).NE.0) GO TO 52
      CALL ASCEN(K,PWRA,F4,X1,X2)
      DO 50 I=1,K
```

```
      XRD(1,I)=X2(I)
      YRD(1,I)=X1(I)/1000.0D0
      IF (METRIC.EQ.0) GO TO 50
      XRD(1,I)=XRD(1,I)*0.3048D0
      YRD(1,I)=X1(I)*1.3558D0/1000.0
   50 CONTINUE
      CALL PICSIZ(10.0,10.0)
      IF (METRIC.NE.0) GO TO 51
      CALL GRAFF(8.0,80.0,300.0,20.0,1,'AIRSPEED(FT/SEC)_',XRD,XD,5.5,20
     1.0,220.0,20.0,1,'POWER AVAILABLE(FT-LBF/SEC)/1000_',YRD,YD,1,2,1,4
     150,K,0,0,0,0,KD,1,' _')
      GO TO 52
   51 CALL GRAFF(8.0,25.0,100.0,5.0,1,'AIRSPEED(M/SEC)_',XRD,XD,5.5,30.0
     1,300.0,10.0,1,'POWER AVAILABLE(KILOWATTS)_',YRD,YD,1,2,1,450,K,0,0
     1,0,0,KD,1,' _')
   52 RETURN
      END


      SUBROUTINE ABIAS(K,LPRG,FIT,MNB)
C
C***  SUBROUTINE ABIAS CALCULATES A CONSTANT BIAS IN ANGLE OF ATTACK
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION FIT(2),ST(10)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),CL(450),XX(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNS(18),IERR
C
C***  INITIALIZE PARAMETERS
      IT=0
      BF=0.6667D0
C***  STORE PERTINENT INFORMATION
    1 SM1=FIT(LPRG)
      DO 2 I=1,10
    2 ST(I)=CFM(I)
C***  STEP AND CHECK COUNTER
      IT=IT+1
      IF (IT.GE.2) GO TO 12
C***  SET LOOP PARAMETERS
      CALL CHNGE(SGN)
      CALL CHNGE(SGD)
      IX1=IEX1-1
      IX2=IEX2-1
      IX3=IEX3-1
      IX4=IEX4-1
      BB=0.0D0
      BBB=0.0D0
C***  CALCULATE THE BIAS SUMS
      DO 4 I=1,K
      W=F1(I)
      T=F2(I)
      V=F4(I)
      R=F5(I)
      A=F6(I)
      AM=DABS(A)
      IF (A.GE.0.0D0) GO TO 3
      CALL SIGNS(SGN,IEX1,IEX2,IEX3,IEX4)
      CALL SIGNS(SGD,IX1,IX2,IX3,IX4)
    3 P=CFM(1)+CFM(2)*V**EX1+CFM(3)*V**EX2+CFM(4)*V**EX3+CFM(5)*V**EX4
      CD=CFM(6)+CFM(7)*SGN(1)*AM**IEX1+CFM(8)*SGN(2)*AM**IEX2+CFM(9)*SGN
     1(3)*AM**IEX3+CFM(10)*SGN(4)*AM**IEX4
      B0=G*DSIN(A+TIA)/(W*V)*P+G*S*R*V*V/(2.0D0*W)*(SGD(1)*IEX1*AM**IX1*
     1CFM(7)+SGD(2)*IEX2*AM**IX2*CFM(8)+SGD(3)*IEX3*AM**IX3*CFM(9)+SGD(4
     1)*IEX4*AM**IX4*CFM(10))
      B1=F8(I)-G*DCOS(A+TIA)/(W*V)*P+G*S*R*V*V/(2.0D0*W)*CD+G*DSIN(T-A)
      BB=BB+B0*B1
      BBB=BBB+B0*B0
      IF (A.GE.0.0D0) GO TO 4
      CALL CHNGE(SGN)
      CALL CHNGE(SGD)
    4 CONTINUE
C***  CALCULATE THE BIAS
      ABS=-BB/BBB
      WRITE (JWRITE,5) ABS
    5 FORMAT (1X,/,30X,70('-'),/,30X,'|',68X,'|',/,30X,'|',3X,46HCALCULA
     1TED CONSTANT BIAS IN ANGLE OF ATTACK = ,1PD16.9,3X,'|')
      IF (DABS(ABS).LT.5.0D-07) GO TO 7
      WRITE (JWRITE,6)
    6 FORMAT (30X,'|',68X,'|',/,30X,70('-'))
      GO TO 9
    7 WRITE (JWRITE,8)
    8 FORMAT (30X,'|',3X,'ANGLE-OF-ATTACK BIAS < 5.0D-07.  BYPASSING ANA
     1LYSIS.',13X,'|',/,30X,'|',68X,'|',/,30X,70('-'),//)
      RETURN
C***  CORRECT ANGLE OF ATTACK
    9 DO 10 I=1,K
   10 F6(I)=F6(I)+ABS*BF
C***  PERFORM MODEL EXTRACTION
      CALL MODEL(K,LPRG,FIT,MNB)
      IF (IERR.NE.0) RETURN
      SM2=FIT(LPRG)
C***  CHECK FIT ERROR
      IF (SM2.LT.SM1) GO TO 1
      FIT(LPRG)=SM1
C***  READJUST ANGLE OF ATTACK
      DO 11 I=1,K
   11 F6(I)=F6(I)-ABS*BF
   12 DO 13 I=1,10
   13 CFM(I)=ST(I)
      RETURN
      END


      SUBROUTINE ALPDEL(K,LPRG,MNB,FIT)
C
C***  SUBROUTINE ALPDEL PERFORMS FREQUENCY-DEPENDENT CORRECTIONS TO THE
C***  VALUES OF ANGLE OF ATTACK
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION FIT(2),ST(4,450),SA(4,450),FC(4,11),AL(4)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),CL(450),CD(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
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     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
      COMMON /LAB2/YCEPT,ICD,MTH,MCLCC
      INTEGER NLLS(6)/2,3,3,4,2,3/,NLSD(6)/2,2,4,4,3,3/
C
C***  INITIALIZE PARAMETERS
      BS3=0.3D0
      IUP=0
      IT=0
      WRITE (JWRITE,1)
    1 FORMAT (6X,120('*'),/,6X,6('*'),1X,46HBEGIN FREQUENCY CORRECTIONS
     1TO ANGLE OF ATTACK,1X,6('*'))
C***  STORE PERTINENT INFORMATION
      DO 2 I=1,K
      ST(1,I)=F2(I)
    2 SA(1,I)=F6(I)
      DO 3 I=1,10
    3 FC(1,I)=CFM(I)
      FC(1,11)=FIT(LPRG)
C***  CHECK AND STEP COUNTER
    4 IF (IT.GE.3) GO TO 59
      IT=IT+1
      WRITE (JWRITE,5) IT
    5 FORMAT (1X,//,6X,'ITERATION#',I2,/)
      IF (IT.GT.2) BS3=1.0D0
C***  COMPUTE POWER AVAILABLE AND LIFT COEFFICIENT
    6 DO 7 I=1,K
      PWRA(I)=CFM(1)+CFM(2)*F4(I)**EX1+CFM(3)*F4(I)**EX2+CFM(4)*F4(I)**E
     1X3+CFM(5)*F4(I)**EX4
    7 CL(I)=(2.0D0*F1(I)/(F5(I)*F4(I)*G*S))*(FT2(I)+G*DCOS(FT1(I))/F4(I)
     1-G*PWRA(I)*DSIN(F6(I)+TIA)/(F1(I)*F4(I)**2))
C***  CHECK LIFT FUNCTION CODE FOR DETERMINATION OF NUMBER OF UNKNOWNS
      N=NLLS(MTH+1)
      IF (MCLCC.NE.0) N=NLSD(MTH+1)
      IF (MCLCC.EQ.0) GO TO 20
C***  ADJUST CL'S, IF NECESSARY, FOR PITCH RATE DEPENDENCY
      IF ((MTH.EQ.0.OR.MTH.EQ.2).OR.MTH.EQ.4) GO TO 10
      DO 9 I=1,K
    9 CL(I)=CL(I)-CFM(14)*F3(I)
C***  ORDER DATA FOR DETERMINING LIFT COEFFICIENTS
   10 CALL ASCEN(K,CL,F6,X1,X2)
C***  CHECK FOR NEGATIVE OR ZERO X2'S
      JJ=0
      DO 11 I=1,K
      IF (X2(I).GT.0.0D0) GO TO 12
   11 JJ=JJ+1
   12 KM=K-JJ
      IF (KM.EQ.K) GO TO 15
C***  STORE VALUES FOR LATER COMPUTATION
      DO 13 I=1,JJ
      WKAR(I)=X2(I)
   13 WKAR(I+JJ)=X1(I)
C***  ADJUST REMAINING POINTS FOR LEAST-SQUARE DISTANCE
      DO 14 I=1,KM
      X1(I)=X1(JJ+I)
   14 X2(I)=X2(JJ+I)
C***  INITIALIZE LEAST-SQUARE-DISTANCE COEFFICIENTS
   15 AL(1)=CFM(11)
      AL(2)=CFM(12)
      AL(3)=CFM(13)
      AL(4)=EXPX
      LM=0
C***  PERFORM LEAST-SQUARE-DISTANCE FIT
      CALL LSD(X2,X1,KM,AL,N,RMS,LM,IERR,JWRITE,MTH)
      IF (LM.NE.0) GO TO 17
      WRITE (JWRITE,16)
   16 FORMAT (1X,//,45X,42HLIFT COEFFICIENTS BY LEAST-SQUARE DISTANCE,/)
C***  DEFINE CODE AND LIFT COEFFICIENTS
      ICD=1
      CFM(11)=AL(1)
      CFM(12)=AL(2)
      CFM(13)=AL(3)
      EXPX=AL(4)
C***  COMPUTE INTERCEPT
      IF (JJ.EQ.0) GO TO 47
      YCEPT=WKAR(JJ+JJ)-CFM(12)*WKAR(JJ)
      GO TO 47
C***  DEFAULT TO LINEAR LEAST-SQUARES FIT
   17 IF ((MTH.EQ.0.OR.MTH.EQ.2).OR.MTH.EQ.4) GO TO 19
      DO 18 I=1,K
   18 CL(I)=CL(I)+CFM(14)*F3(I)
   19 N=NLLS(MTH+1)
C***  PERFORM LINEAR LEAST-SQUARES FIT
   20 MTHP1=MTH+1
      DO 27 I=1,K
      IF (F6(I).LE.0.0.AND.MTH.GE.2) GO TO 28
      C(I,1)=1.0D0
      GO TO (21,22,23,24,25,26),MTHP1
   21 C(I,2)=F6(I)
      GO TO 27
   22 C(I,2)=F6(I)
      C(I,3)=F3(I)
      GO TO 27
   23 C(I,2)=F6(I)
      C(I,3)=F6(I)**EXPX
      GO TO 27
   24 C(I,2)=F6(I)
      C(I,3)=F6(I)**EXPX
      C(I,4)=F3(I)
      GO TO 27
   25 C(I,2)=F6(I)**EXPX
      GO TO 27
   26 C(I,2)=F6(I)**EXPX
      C(I,3)=F3(I)
   27 X(I,1)=CL(I)
      ICD=2
      GO TO 36
   28 EXPX=2.0D0
      DO 35 I=1,K
      C(I,1)=1.0D0
      GO TO (29,30,31,32,33,34),MTHP1
   29 C(I,2)=F6(I)
      GO TO 35
   30 C(I,2)=F6(I)
      C(I,3)=F3(I)
      GO TO 35
   31 C(I,2)=F6(I)
      C(I,3)=F6(I)*F6(I)
      GO TO 35
   32 C(I,2)=F6(I)
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      C(I,3)=F6(I)*F6(I)
      C(I,4)=F3(I)
      GO TO 35
   33 C(I,2)=F6(I)*F6(I)
      GO TO 35
   34 C(I,2)=F6(I)*F6(I)
      C(I,3)=F3(I)
   35 X(I,1)=CL(I)
      ICD=3
   36 CALL LLSQAR(C,X,K,N,1,450,450,15,WKAR,IER,JWRITE)
      IF (IER.EQ.129) WRITE (JWRITE,37)
   37 FORMAT (1X,//,10X,'ZERO MATRIX ENCOUNTERED.  LOCATION:ALPDEL.  TO
     1NEXT DATA SET, IF ANY.',//)
      IF (IER.EQ.129)IERR=1
      IF (IERR.NE.0) RETURN
      CFM(11)=X(1,1)
      DO 38 I=12,14
   38 CFM(I)=0.0D0
      GO TO (39,40,41,42,43,44),MTHP1
   39 CFM(12)=X(2,1)
      GO TO 45
   40 CFM(12)=X(2,1)
      CFM(14)=X(3,1)
      GO TO 45
   41 CFM(12)=X(2,1)
      CFM(13)=X(3,1)
      GO TO 45
   42 CFM(12)=X(2,1)
      CFM(13)=X(3,1)
      CFM(14)=X(4,1)
      GO TO 45
   43 CFM(13)=X(2,1)
      GO TO 45
   44 CFM(13)=X(2,1)
      CFM(14)=X(3,1)
   45 WRITE (JWRITE,46)
   46 FORMAT (1X,//,45X,41HLIFT COEFFICIENTS BY LINEAR LEAST SQUARES,/)
      LM=0
   47 WRITE (JWRITE,48) CFM(11),CFM(12),CFM(13),EXPX,CFM(14)
   48 FORMAT (52X,7HCLA0 = ,D23.16,/,52X,7HCLA  = ,D23.16,/,52X,7HCLAX =
     1 ,D23.16,/,52X,7HEXPX = ,D23.16,/,52X,7HCLQ  = ,D23.16,//)
C***  CHECK ON UPDATE CODE
      IF (IUP.NE.0) WRITE (JWRITE,49)
   49 FORMAT (6X,6('*'),1X,46H END  FREQUENCY CORRECTIONS TO ANGLE OF AT
     1TACK,1X,6('*'),/,6X,120('*'))
      IF (IUP.NE.0) GO TO 64
C***  INITIALIZE FIT ERROR SUM
      TSX=0.0D0
C***  SOLVE FOR ANGLE OF ATTACK BY NEWTON-RAPHSON
      MCNT=0
      DO 54 I=1,K
      CALL NEWTON(I,A,MCNT)
      ALP=A-F6(I)
C***  COMPUTE FREQUENCY-DEPENDENT ANGLE-OF-ATTACK CORRECTIONS
      F6(I)=F6(I)+BS3*ALP
C***  COMPUTE FIT ERROR
      GO TO (50,51,52),ICD
   50 IF (F6(I).GT.0.0D0) GO TO 51
      CLX=CFM(12)*F6(I)+YCEPT+CFM(14)*F3(I)
      GO TO 53
   51 CLX=CFM(11)+CFM(12)*F6(I)+CFM(13)*F6(I)**EXPX+CFM(14)*F3(I)
      GO TO 53
   52 CLX=CFM(11)+CFM(12)*F6(I)+CFM(13)*F6(I)*F6(I)+CFM(14)*F3(I)
   53 SX=(FT2(I)-G*S*F5(I)*F4(I)*CLX/(2.0D0*F1(I))+G*DCOS(FT1(I))/F4(I)-
     1G*PWRA(I)*DSIN(F6(I)+TIA)/(F1(I)*F4(I)**2))
      TSX=TSX+SX*SX
   54 CONTINUE
      IF (MCNT.NE.0) WRITE (JWRITE,55) MCNT
   55 FORMAT (1X,//,9X,94H*** DURING NEWTON-RAPHSON FOR ANGLE OF ATTACK
     1IN NEWTON, ROUTINE WISHED TO SEEK COMPLEX ROOTS ,I3,7H TIMES.)
      WRITE (JWRITE,56) TSX
   56 FORMAT (1X,//,30X,52HFREQUENCY-DEPENDENT FIT ERROR FOR ANGLE OF AT
     1TACK = ,D20.13,//)
C***  COMPUTE PITCH ANGLE CORRECTION DUE TO CORRECTIONS IN ANGLE OF
C***  ATTACK
      CALL GAMX(K)
C***  PERFORM MODEL EXTRACTIONS
      CALL MODEL(K,LPRG,FIT,MNB)
      IF (IERR.NE.0) RETURN
C***  STORE UPDATED VALUES
      DO 57 I=1,10
   57 FC(IT+1,I)=CFM(I)
      FC(IT+1,11)=FIT(LPRG)
      DO 58 I=1,K
      ST(IT+1,I)=F2(I)
   58 SA(IT+1,I)=F6(I)
      GO TO 4
C***  TEST FIT ERROR
   59 IPL=IT+1
      FIT(LPRG)=FC(1,11)
      DO 60 J=1,IPL
   60 IF (FC(J,11).LT.FIT(LPRG)) FIT(LPRG)=FC(J,11)
      DO 61 J=1,IPL
   61 IF (FC(J,11).EQ.FIT(LPRG)) NFIT=J
C***  REDEFINE COEFFICIENTS
      DO 62 I=1,10
   62 CFM(I)=FC(NFIT,I)
C***  RESET PITCH ANGLE AND ANGLE OF ATTACK
      DO 63 I=1,K
      F2(I)=ST(NFIT,I)
   63 F6(I)=SA(NFIT,I)
      IUP=1
      GO TO 6
   64 RETURN
      END
```

```
      SUBROUTINE NEWTON(I,ALP,MCNT)
C
C***  SUBROUTINE NEWTON USES A MODIFIED SECOND-ORDER NEWTON-RAPHSON
C***  METHOD TO ADJUST THE VALUES OF ANGLE OF ATTACK
C
      IMPLICIT REAL*8(A-H,O-Z)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),XX(450),YY(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
```

```
      COMMON /LAB2/YCEPT,ICD,MTH,MCLCC
C
C
C***  INITIALIZE PARAMETERS
      ISZ=0
      W=F1(I)
      V=F4(I)
      R=F5(I)
      GD=FT2(I)
      HD=F11(I)
      P=PWRA(I)
      GAM=DARSIN(HD/V)
    1 A=F6(I)
C***  BEGIN ITERATION
      ICK=0
    2 A0=A
C***  COMPUTE LIFT COEFFICIENT AND DERIVATIVES
      GO TO (3,4,5),ICD
    3 IF (A.GT.0.0D0) GO TO 4
      CL=CFM(12)*A+YCEPT
      DCL=CFM(12)
      DDCL=0.0D0
      GO TO 6
    4 CL=CFM(11)+CFM(12)*A+CFM(13)*A**EXPX+CFM(14)*F3(I)
      DCL=CFM(12)+EXPX*CFM(13)*A**(EXPX-1.0D0)
      DDCL=EXPX*(EXPX-1.0D0)*CFM(13)*A**(EXPX-2.0D0)
      GO TO 6
    5 CL=CFM(11)+CFM(12)*A+CFM(13)*A*A+CFM(14)*F3(I)
      DCL=CFM(12)+2.0D0*CFM(13)*A
      DDCL=2.0D0*CFM(13)
C***  FORM NEWTON-RAPHSON EQUATION
    6 H=GD-(G*S*R*V*CL/(2.0D0*W)+G*DSIN(A+TIA)*P/(W*V*V))+G*DCOS(GAM)/V
      HP=-((G*S*R*V)/(2.0D0*W)*DCL+G*P*DCOS(A+TIA)/(W*V*V))
      XZ=DABS((P+H*W*V*V/(DSIN(A+TIA)+1.0D-6))/P)
C***  CHECK FOR NEAR-ZERO SLOPE
      IF (DABS(HP).LT.1.0D-15.AND.ISZ.EQ.4) GO TO 11
      IF (DABS(HP).GE.1.0D-15) GO TO 7
      ISZ=ISZ+1
C***  MODIFY POWER AND START ITERATION AGAIN
      P=P*XZ
      GO TO 1
    7 HPP=G*P*DSIN(A+TIA)/(W*V*V)-G*S*R*V*DDCL/(2.0D0*W)
      RAD=(HP/HPP)*(HP/HPP)-2.0D0*(H/HPP)
C***  ADJUST VALUES OF ANGLE OF ATTACK
      IF (RAD.LT.0.0D0) GO TO 9
      IF ((HP*HPP).LT.0.0D0) GO TO 8
      A=A-HP/HPP+DSQRT(RAD)
      GO TO 10
    8 A=A-HP/HPP-DSQRT(RAD)
      GO TO 10
    9 A=A-HP/HPP
      MCNT=MCNT+1
      GO TO 11
   10 ICK=ICK+1
      IF (DABS(A-A0).LE.1.0D-15.OR.ICK.GE.20) GO TO 11
      GO TO 2
   11 ALP=A
      RETURN
      END
```

```
      SUBROUTINE MODEL(K,LPRG,FIT,MNB)
C
C***  SUBROUTINE MODEL CALCULATES THE POWER AND DRAG COEFFICIENTS OF THE
C***  SPECIFIED MODELS FROM THE EQUATION OF MOTION TANGENT TO THE FLIGHT
C***  PATH
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION FIT(2),ST(18,11),TS(10),LOC(10,18)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),CL(450),XX(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
      INTEGER IEQN(18)/3,4,5,7,4,5,7,5,6,8,5,6,8,4,5,5,6,6/
      DATA LOC/1,6,8,0,0,0,0,0,0,0,1,2,6,8,0,0,0,0,0,C,1,2,6,8,10,0,0,0,
     10,0,1,2,6,7,8,9,10,0,0,0,1,3,6,8,0,0,0,0,0,0,1,3,6,8,10,0,0,0,0,0,
     11,3,6,7,8,9,10,0,0,0,1,2,3,6,8,0,0,0,0,0,1,2,3,6,8,10,0,0,0,0,1,2,
     13,6,7,8,9,10,0,0,1,3,4,6,8,0,0,0,0,0,1,3,4,6,8,10,0,0,0,0,1,3,4,6,
     17,8,9,10,0,0,1,6,7,8,0,0,0,0,0,0,1,2,6,7,8,0,0,0,0,0,1,3,6,7,8,0,0
     1,0,0,0,1,2,3,6,7,8,0,0,0,0,1,3,4,6,7,8,0,0,0,0/
C
      WRITE (JWRITE,1)
    1 FORMAT (1X,////,50X,29HM O D E L   S O L U T I O N S,/)
      WRITE (JWRITE,2)
    2 FORMAT (28X,76('*'),/,28X,'*',74X,'*')
C***  BEGIN ANALYSIS ON SPECIFIED MODELS
      DO 14 LKMM=L1,L2
C***  DETERMINE SPECIFIC MODEL AND NUMBER OF UNKNOWNS
      JCNT=IEQNM(LKMM)
      NUM=IEQN(JCNT)
      NPL=0
      CALL CHNGE(SGN)
      DO 4 I=1,K
      AM=DABS(F6(I))
C***  TEST FOR NEGATIVE ANGLES OF ATTACK
      IF (F6(I).LT.0.0D0) CALL SIGNS(SGN,IEX1,IEX2,IEX3,IEX4)
C***  DETERMINE GENERAL TERMS FOR MATRIX FORMULATION
      TS(1)=DCOS(F6(I)+TIA)/(F1(I)*F4(I))
      TS(2)=TS(1)*F4(I)**EX1
      TS(3)=TS(1)*F4(I)**EX2
      TS(4)=TS(1)*F4(I)**EX3
      TS(5)=TS(1)*F4(I)**EX4
      TS(6)=-F5(I)*S*F4(I)**2/(2.0D0*F1(I))
      TS(7)=TS(6)*SGN(1)*AM**IEX1
      TS(8)=TS(6)*SGN(2)*AM**IEX2
      TS(9)=TS(6)*SGN(3)*AM**IEX3
      TS(10)=TS(6)*SGN(4)*AM**IEX4
      IF (F6(I).LT.0.0D0) CALL CHNGE(SGN)
C***  FORM COEFFICIENTS FOR LEAST SQUARES
      DO 3 J=1,NUM
    3 C(I,J)=TS(LOC(J,JCNT))
    4 X(I,1)=F8(I)/G+DSIN(F2(I)-F6(I))
C***  ENACT LEAST SQUARES
      CALL LLSQAR(C,X,K,IEQN(JCNT),1,450,450,16,WKAR,IER,JWRITE)
C***  CHECK FOR ERROR
      IF (IER.EQ.129) GO TO 5
      GO TO 7
```

```
    5 WRITE (JWRITE,6)
    6 FORMAT (1X,//,10X,'ZERO MATRIX ENCOUNTERED IN MODEL.  TO NEXT DATA
     1 SET, IF ANY.',//)
      IERR=1
      RETURN
C***  STORE VALUES FOR COMPARISON
    7 DO 8 J=1,10
    8 ST(JCNT,J)=X(J,1)
C***  DEFINE COEFFICIENTS IN CORRECT ORDER
      DO 9 J=1,10
    9 CFM(J)=0.0D0
      DO 10 J=1,NUM
   10 CFM(LOC(J,JCNT))=X(J,1)
C***  DETERMINE FIT ERROR
      SSX=0.0D0
      DO 11 J=1,K
      AM=DABS(F6(J))
      IF (F6(J).LT.0.0D0) CALL SIGNS(SGN,IEX1,IEX2,IEX3,IEX4)
      P=CFM(1)+CFM(2)*F4(J)**EX1+CFM(3)*F4(J)**EX2+CFM(4)*F4(J)**EX3+CFM
     1(5)*F4(J)**EX4
      CD=CFM(6)+CFM(7)*SGN(1)*AM**IEX1+CFM(8)*SGN(2)*AM**IEX2+CFM(9)*SGN
     1(3)*AM**IEX3+CFM(10)*SGN(4)*AM**IEX4
C***  CHECK POWER AND DRAG COEFFICIENT RANGE
      IF ((P.LE.PLOW.OR.P.GT.PHIGH).OR.(CD.LT.CDLOW.OR.CD.GE.CDHIGH))NFL
     1=NFL+1
      SS=DCOS(F6(J)+TIA)*P/(F1(J)*F4(J))-(F5(J)*S*F4(J)**2/(2.0D0*F1(J))
     1*CD+F8(J)/G+DSIN(F2(J)-F6(J)))
   11 SSX=SSX+SS*SS
      IF (NFL.GT.0)SSX=1.0D+60
C***  WRITE MODEL VALUES
      IF (METRIC.NE.0) GO TO 13
      WRITE (JWRITE,12) JCNT,CFM(1),CFM(6),CFM(2),CFM(7),CFM(3),CFM(8),C
     1FM(4),CFM(9),NFL,CFM(5),CFM(10),SSX
   12 FORMAT (28X,'*',1X,'MODEL ',I2,3X,'P0 = ',1PD23.16,3X,'CD0 = ',1PD
     123.16,2X,'*',/,28X,'*',12X,'P1 = ',1PD23.16,3X,'CD1 = ',1PD23.16,2
     1X,'*',/,28X,'*',1X,'POINT',6X,'P2 = ',1PD23.16,3X,'CD2 = ',1PD23.1
     16,2X,'*',/,28X,'*',1X,'FAILURES',3X,'P3 = ',1PD23.16,3X,'CD3 = ',1
     1PD23.16,2X,'*',/,28X,'*',1X,'=',I4,6X,'P4 = ',1PD23.16,3X,'CD4 = '
     1,1PD23.16,2X,'*',/,28X,'*',74X,'*',/,28X,'*',1X,'FIT ERROR= ',D23.
     116,39X,'*',/,28X,'*',74X,'*',/,28X,'*',74('.'),'*',/,28X,'*',74X,'
     1*')
      GO TO 14
   13 P0=CFM(1)*1.355818D-3
      P1=CFM(2)*1.355818D-3
      P2=CFM(3)*1.355818D-3
      P3=CFM(4)*1.355818D-3
      P4=CFM(5)*1.355818D-3
      WRITE (JWRITE,12) JCNT,P0,CFM(6),P1,CFM(7),P2,CFM(8),P3,CFM(9),NFL
     1,P4,CFM(10),SSX
   14 ST(JCNT,11)=SSX
C***  DETERMINE BEST MODEL BY FIT ERROR
      ICC=IEQNM(1)
      FIT(LPRG)=ST(ICC,11)
      DO 15 J=L1,L2
      ICC=IEQNM(J)
   15 IF (ST(ICC,11).LT.FIT(LPRG))FIT(LPRG)=ST(ICC,11)
      DO 16 J=L1,L2
      ICC=IEQNM(J)
   16 IF (ST(ICC,11).EQ.FIT(LPRG))MNB=ICC
      WRITE (JWRITE,2)
      IF (FIT(LPRG).EQ.1.0D+60) GO TO 18
      WRITE (JWRITE,17) MNB
   17 FORMAT (28X,'**',21X,'MODEL ',I2,' FOUND TO BE BEST FIT',22X,'**',
     1/,28X,'*',74X,'*',/,28X,76('*'),////)
      GO TO 20
   18 WRITE (JWRITE,19)
   19 FORMAT (28X,'**',21X,'NO MODEL FOUND TO BE ADEQUATE',22X,'**',/,28
     1X,'*',74X,'*',/,28X,76('*'),////)
C***  UPDATE COEFFICIENT VALUES
   20 DO 21 J=1,10
   21 CFM(J)=0.0D0
      NUM=IEQN(MNB)
      DO 22 J=1,NUM
   22 CFM(LOC(J,MNB))=ST(MNB,J)
      RETURN
      END
```

```
      SUBROUTINE F(T,Y,DY,C,KJK,J,IPATH,MCNT,NCNT)
C
C***  SUBROUTINE F USES THE HORIZONTAL- AND VERTICAL-PLANE EQUATIONS OF
C***  MOTION TO COMPUTE COMPATIBLE FLIGHT PATH PARAMETERS
C
      IMPLICIT REAL*8(A-H,O-Z)
      EXTERNAL VA,DDV,DDDV,ALP,DVA,PHIDER
      DIMENSION Y(4),DY(4),CX(6)
      COMMON TM(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F7(
     1450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450),
     1Z(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(45
     10),PWRA(450),XX(450),YY(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S,R
     1HO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX2,
     1IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
      COMMON /LAB8/ALP1,P1,PAC(8),CL,CD
C
C***  CALCULATE AIRCRAFT WEIGHT
      IF (J.NE.1) GO TO 1
      Y(1)=F1(J)
      GO TO 2
    1 Y(1)=Y(1)+DY(1)*(T-TM(J-1))+DYN*(T-TM(J-1))**2/2.0D0+DDYN*(T-TM(J-
     11))**3/6.0D0
C***  COMPUTE DENSITY FACTOR
    2 FM=(1.0D0-6.86D-6*Y(2))**4.26D0
C***  INITIALIZE PARAMETERS
      ICNT=0
      A=F6(J)
      TD=F3(J)
      C1=(2.0D0*Y(1)/(G*S*RHO*FM*Y(3)))*(DY(4)+G*DCOS(Y(4))/Y(3))
      C2=2.0D0*Y(1)/(G*S*RHO*FM*Y(3)*Y(3))
      C3=C2*(DY(3)+G*DSIN(Y(4)))
C***  START NEWTON-RAPHSON ITERATION
      JR=0
    3 ICNT=ICNT+1
C***  CALCULATE CL, CD, AND THEIR DERIVATIVES
      CALL CLCD(JR,A,TD,CFM,IEX1,IEX2,IEX3,IEX4,EXPX,CX)
C***  CALCULATE NEWTON-RAPHSON EQUATIONS
      FX=CX(1)+DTAN(A)*(C3+CX(2))-C1
      F1P=CX(3)+(C3+CX(2))/(DCOS(A)*DCOS(A))+DTAN(A)*CX(5)
      F1PP=CX(4)+(2.0D0*CX(5)+2.0D0*(C3+CX(2))*DTAN(A))/DCOS(A)**2+CX(6)
     1*DTAN(A)
```

```
C***  SOLVE FOR ANGLE OF ATTACK
      RAD=(F1P/F1PP)*(F1P/F1PP)-2.0D0*(FX/F1PP)
      A1=A
      IF (RAD.LT.0.0D0) GO TO 5
      IF ((F1P*F1PP).LT.0.0D0) GO TO 4
      A=A-F1P/F1PP+DSQRT(RAD)
      GO TO 6
    4 A=A-F1P/F1PP-DSQRT(RAD)
      GO TO 6
    5 A=A-F1P/F1PP
      MCNT=MCNT+1
      GO TO 7
C***  TEST FOR CONVERGENCE OR MAXIMUM ITERATION
    6 IF (DABS(A1-A).LT.1.0D-15.OR.ICNT.EQ.20) GO TO 7
      GO TO 3
C***  UPDATE CL, CD, POWER, AND WEIGHT DERIVATIVES
    7 JR=1
      ALP1=A
      CALL CLCD(JR,A,TD,CFM,IEX1,IEX2,IEX3,IEX4,EXPX,CX)
      CL=CX(1)
      CD=CX(2)
      P1=Y(1)*Y(3)/(G*DCOS(ALP1+TIA))*(DY(3)+G*S*RHO*FH*Y(3)**2*CX(2)/(2
     1.0D0*Y(1))+G*DSIN(Y(4)))
      IF (P1.LT.0.0D0)IERR=1
      IF (IERR.NE.0) RETURN
      DY(1)=-C*P1
      DYW=-C*DY(3)*(EX1*CFM(2)*Y(3)**(EX1-1.0D0)+EX2*CFM(3)*Y(3)**(EX2-1
     1.0D0)+EX3*CFM(4)*Y(3)**(EX3-1.0D0)+EX4*CFM(5)*Y(3)**(EX4-1.0D0))
      DDF=DDY(T)
      DDYW=-C*(EX1*CFM(2)*((EX1-1.0D0)*Y(3)**(EX1-2.0D0)*DY(3)+Y(3)**(EX
     11-1.0D0)*DDF)+EX2*CFM(3)*((EX2-1.0D0)*Y(3)**(EX2-2.0D0)*DY(3)+Y(3)
     1**(EX2-1.0D0)*DDF)+EX3*CFM(4)*((EX3-1.0D0)*Y(3)**(EX3-2.0D0)*DY(3)
     1+Y(3)**(EX3-1.0D0)*DDF)+EX4*CFM(5)*((EX4-1.0D0)*Y(3)**(EX4-2.0D0)*
     1DY(3)+Y(3)**(EX4-1.0D0)*DDF))
C***  COMPUTE PARTIAL DERIVATIVES OF EQUATION OF MOTION
      IF (KJK.EQ.2) GO TO 8
      R1=RHO*FH
      CALL PARTAL(J,Y(1),R1,ALP1,Y(3),DY(3),DY(2),Y(4),DY(4),PAC,NCNT)
    8 RETURN
      END


      SUBROUTINE PATH(N,C,IPATH)
C
C***  SUBROUTINE PATH INTEGRATES THE VEHICLE EQUATIONS OF MOTION TO
C***  OBTAIN TIME HISTORIES OF BOTH VEHICLE AND FLIGHT PATH PARAMETERS
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION DY(4),Y(4),SC(450,8)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),Z(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),XX(450),YY(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
      COMMON /LAB8/ALP1,P1,PAC(8),CL,CD
      COMMON /LAB9/ADF(450)
C
C***  INITIALIZE PARAMETERS
      GAMMAX=1.0D0
      VMIN=80.0D0
      CALL CHNGE(SGN)
C***  WRITE HEADER TITLE
      WRITE (JWRITE,1) IPATH
    1 FORMAT (1X,///,43X,47('*'),/,43X,'*',45X,'*',/,43X,'*',2X,'PATH PE
     1RFORMANCE ANALYSIS ITERATION NO.',I2,2X,'*',/,43X,'*',3X,'(ALTITUD
     1E AND AIRSPEED ASSUMED CORRECT)',3X,'*',/,43X,'*',45X,'*',/,43X,47
     1('*'),//)
C***  COMPUTE ACCELERATION DERIVATIVE
      IF (IPATH.NE.1) GO TO 2
      CALL FNI(N,F8,TIME,FT1,FT2,0,15,3,2)
C***  COMPUTE MINIMUM WEIGHT
    2 WEMPTY=F1(N)-1.0D0
C***  BEGIN LOOP FOR CORRECTIONS
      DO 16 KJK=1,2
C***  WRITE LABELS IN ENGLISH OR SI UNITS
      IF (METRIC.EQ.0) WRITE (JWRITE,3) KJK
      IF (METRIC.NE.0) WRITE (JWRITE,4) KJK
    3 FORMAT (1X,/,51X,'PATH PERFORMANCE SUBITERATION',I2,//,13X,'TIME',
     17X,'ALTITUDE',5X,'AIRSPEED',6X,'GAMMA',7X,'ALPHA',10X,'CL',11X,'CD
     1',9X,'WEIGHT',9X,'POWER',/,12X,'(SECS)',8X,'(FT)',7X,'(FT/SEC)',6X
     1,'(RAD)',7X,'(RAD)',35X,'(LBF)',6X,'(FT-LBF/SEC)',/)
    4 FORMAT (1X,/,51X,'PATH PERFORMANCE SUBITERATION',I2,//,13X,'TIME',
     17X,'ALTITUDE',5X,'AIRSPEED',6X,'GAMMA',7X,'ALPHA',10X,'CL',11X,'CD
     1',9X,'WEIGHT',9X,'POWER',/,12X,'(SECS)',6X,'(METERS)',6X,'(M/SEC)'
     1,6X,'(RAD)',7X,'(RAD)',33X,'(NEWTONS)',2X,'(KW)',/)
C***  BEGIN INTEGRATION
      I=1
      T=TIME(I)
      Y(1)=F1(I)
      Y(2)=F10(I)
      Y(3)=F4(I)
      Y(4)=FT1(I)
      DY(2)=F11(I)
      DY(3)=F8(I)
      DY(4)=FT2(I)
      MCNT=0
      NCNT=0
C***  ENACT SOLUTION ROUTINE
      CALL F(T,Y,DY,C,KJK,I,IPATH,MCNT,NCNT)
C***  CHECK FOR ERROR
      IF (IERR.NE.0) RETURN
C***  WRITE RESULTS
      IF (METRIC.NE.0) GO TO 6
      WRITE (JWRITE,5) T,Y(2),Y(3),Y(4),ALP1,CL,CD,Y(1),P1
    5 FORMAT (9X,9(1PD12.5,1X))
      GO TO 7
    6 WS=Y(1)*4.4482D0
      HS=Y(2)*0.3048D0
      VS=Y(3)*0.3048D0
      P1S=P1*1.3558D0/1000.0D0
      WRITE (JWRITE,5) T,HS,VS,Y(4),ALP1,CL,CD,WS,P1S
C***  STORE ANGLE OF ATTACK DIFFERENCE AND PARTIAL DERIVATIVES
    7 ADF(I)=ALP1-F6(I)
      IF (KJK.EQ.2) GO TO 9
      DO 8 L=1,8
    8 SC(I,L)=PAC(L)
C***  CONTINUE INTEGRATION
    9 DO 13 I=2,N
```

```
      T=TIME(I)
      Y(1)=F1(I)
      Y(2)=F10(I)
      Y(3)=F4(I)
      Y(4)=FT1(I)
      DY(2)=F11(I)
      DY(3)=F8(I)
      DY(4)=FT2(I)
C***  EXACT SOLUTION ROUTINE
      CALL F(T,Y,DY,C,KJK,I,IPATH,MCNT,NCNT)
C***  CHECK FOR ERROR
      IF (IERR.NE.0) RETURN
C***  CHECK FOR TOLERANCE LIMITS
      IF (Y(1).LT.WEMPTY) GO TO 17
      IF (Y(2).LT.0.0D0) GO TO 19
      IF (DABS(Y(4)).GT.GAMMAX) GO TO 21
      IF (Y(3).LT.VMIN) GO TO 23
C***  WRITE RESULTS
      IF (METRIC.NE.0) GO TO 10
      WRITE (JWRITE,5) T,Y(2),Y(3),Y(4),ALP1,CL,CD,Y(1),P1
      GO TO 11
   10 WS=Y(1)*4.4482D0
      HS=Y(2)*0.3048D0
      VS=Y(3)*0.3048D0
      P1S=P1*1.3558D0/1000.0D0
      WRITE (JWRITE,5) T,HS,VS,Y(4),ALP1,CL,CD,WS,P1S
C***  STORE ANGLE OF ATTACK
   11 ADF(I)=ALP1-F6(I)
      IF (KJK.EQ.2) GO TO 13
      DO 12 L=1,8
   12 SC(I,L)=PAC(L)
   13 CONTINUE
      IF (MCNT.NE.0) WRITE (JWRITE,14) MCNT
   14 FORMAT (1X,//,9X,94H*** DURING NEWTON-RAPHSON FOR ANGLE OF ATTACK
     1IN    F    , ROUTINE WISHED TO SEEK COMPLEX ROOTS ,I3,7H TIMES.)
      IF (KJK.EQ.2) GO TO 16
      IF (NCNT.NE.0) WRITE (JWRITE,15) NCNT
   15 FORMAT (1X,//,9X,94H*** DURING NEWTON-RAPHSON FOR ANGLE OF ATTACK
     1IN PARTAL, ROUTINE WISHED TO SEEK COMPLEX ROOTS ,I3,7H TIMES.)
C***  CALL DELTA CORRECTION ROUTINE
      CALL DCR(N,ADF,SC,CFM,JWRITE)
   16 CONTINUE
      RETURN
C***  ERROR MESSAGES (TERMINATING)
   17 WRITE (JWRITE,18)
   18 FORMAT (1X,//,10X,'AIRCRAFT WEIGHT MINIMUM DECREASED BY 1 LBF OR 4
     1.482 NEWTONS. DATA REJECTED.')
      GO TO 25
   19 WRITE (JWRITE,20)
   20 FORMAT (1X,//,10X,'ALTITUDE BECAME LESS THAN ZERO. DATA REJECTED.'
     1)
      GO TO 25
   21 WRITE (JWRITE,22)
   22 FORMAT (1X,//,10X,'ABSOLUTE VALUE OF FLIGHT PATH ANGLE EXCEEDED 1
     1RADIAN. DATA REJECTED.')
      GO TO 25
   23 WRITE (JWRITE,24)
   24 FORMAT (1X,//,10X,'AIRSPEED BECAME LESS THAN THE MINIMUM SPEED. DA
     1TA REJECTED.')
   25 IERR=1
      RETURN
      END
```

```
      SUBROUTINE PARTAL(J,W,R,ALP,V,DV,DH,FPA,DFPA,PAC,NCNT)
C
C***  SUBROUTINE PARTAL COMPUTES NUMERICALLY THE PARTIAL DERIVATIVES OF
C***  THE LIFT AND DRAG COEFFICIENTS
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION CX(8),PAC(8),FX(2),CXX(6)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),NKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),CL(450),CD(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
C
C***  INITIALIZE FACTORS AND PARAMETERS
      FX(1)=0.99D0
      FX(2)=1.01D0
      TD=F3(J)
      IN=0
      JC=1
C***  STORE LIFT AND DRAG COEFFICIENTS
      DO 1 I=1,8
    1 CX(I)=CFM(I+5)
C***  COMPUTE COEFFICIENTS FOR EQUATION OF MOTION
      C1=(2.0D0*W/(G*S*R*V))*(DFPA+G*DCOS(FPA)/V)
      C2=2.0D0*W/(G*S*R*V*V)
      C3=C2*(DV+G*DSIN(FPA))
C***  BEGIN COMPUTATION OF PARTIAL DERIVATIVES
      DO 9 JX=1,16
      A=ALP
      IF (IN.EQ.2) JC=JC+1
      IN=1
      IF (((JX/2)*2).EQ.JX) IN=2
C***  TEST FOR ZERO COEFFICIENT
      IF (CX(JC).NE.0.0D0) GO TO 2
      PAC(JC)=0.0D0
      GO TO 9
C***  MODIFY COEFFICIENT
    2 CFM(JC+5)=CX(JC)*FX(IN)
      ICNT=0
    3 ICNT=ICNT+1
      JR=0
C***  COMPUTE CL, CD, AND THEIR DERIVATIVES
      CALL CLCD(JR,A,TD,CFM,IEX1,IEX2,IEX3,IEX4,EXPX,CXX)
C***  FORM NEWTON-RAPHSON EQUATIONS
      FY=CXX(1)+DTAN(A)*(C3+CXX(2))-C1
      F1P=CXX(3)+(C3+CXX(2))/(DCOS(A)*DCOS(A))+DTAN(A)*CXX(5)
      F1PP=CXX(4)+(2.0D0*CXX(5)+2.0D0*(C3+CXX(2))*DTAN(A))/(DCOS(A)*DCOS
     1(A))+CXX(6)*DTAN(A)
C***  SOLVE FOR ANGLE OF ATTACK
      RAD=(F1P/F1PP)*(F1P/F1PP)-2.0D0*(FY/F1PP)
      AS=A
      IF (RAD.LT.0.0D0) GO TO 5
      IF ((F1P/F1PP).LT.0.0D0) GO TO 4
      A=A-F1P/F1PP+DSQRT(RAD)
```

```
      GO TO 6
    4 A=A-F1P/F1PP-DSQRT(RAD)
      GO TO 6
    5 A=A-F1P/F1PP
      NCNT=NCNT+1
      GO TO 7
    6 IF (DABS(AS-A).LT.1.0D-15.OR.ICNT.GE.20) GO TO 7
      GO TO 3
    7 IF (((JX/2)*2).NE.JX)A1=A
      IF (((JX/2)*2).EQ.JX)A2=A
      IF (((JX/2)*2).EQ.JX) GO TO 8
      GO TO 9
C***  COMPUTE PARTIAL DERIVATIVES AND RESET COEFFICIENTS
    8 PAC(JC)=(A2-A1)/(FX(2)-FX(1))/CX(JC)
      CFR(JC+5)=CX(JC)
    9 CONTINUE
      RETURN
      END


      SUBROUTINE FITERR(F,I,X)
C
C***  SUBROUTINE FITERR CHECKS FIT ERRORS AND STORES
C***  'BEST' MODEL EXTRACTION COEFFICIENTS
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION X(14),XX(14)
C
      IF (I.NE.1) GO TO 3
    1 F1=F
      DO 2 J=1,14
    2 XX(J)=X(J)
      RETURN
    3 F2=F
      IF (F2.LT.F1) GO TO 1
      F=F1
      DO 4 J=1,14
    4 X(J)=XX(J)
      RETURN
      END


      SUBROUTINE ASCEN(N,Y,X,YY,XX)
C
C***  SUBROUTINE ASCEN ORDERS DATA OF X VS. Y BY ASCENDING X
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION Y(N),YY(N),X(N),XX(N)
C
C***  STORE INPUT VALUES
      DO 1 J=1,N
      YY(J)=Y(J)
    1 XX(J)=X(J)
      NM1=N-1
C***  ARRANGE IN ASCENDING ORDER
      DO 3 J=1,NM1
      M=J
      MP1=J+1
      DO 2 I=MP1,N
    2 IF (XX(I).LT.XX(M))M=I
      T1=XX(J)
      T2=YY(J)
      XX(J)=XX(M)
      YY(J)=YY(M)
      XX(M)=T1
    3 YY(M)=T2
      RETURN
      END


      SUBROUTINE CLCD(L,A,PR,C,IEX1,IEX2,IEX3,IEX4,EX,B)
C
C***  SUBROUTINE CLCD CALCULATES LIFT AND DRAG COEFFICIENTS AND THEIR
C***  DERIVATIVES WHEN NEEDED
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION C(14),B(6),S(4)
      COMMON /LAB2/YCZPT,ICD,MTH,MCLCC
C
C***  COMPUTE DRAG COEFFICIENTS AND DERIVATIVES
      CALL CHNGE(S)
      IF (A.LT.0.0D0) CALL SIGNS(S,IEX1,IEX2,IEX3,IEX4)
      AM=DABS(A)
      B(2)=C(6)+S(1)*C(7)*AM**IEX1+S(2)*C(8)*AM**IEX2+S(3)*C(9)*AM**IEX3
     1+S(4)*C(10)*AM**IEX4
      IF (A.LT.0.0D0) CALL CHNGE(S)
      IF (L.NE.0) GO TO 1
      L1=IEX1-1
      L2=IEX2-1
      L3=IEX3-1
      L4=IEX4-1
      L5=L1-1
      L6=L2-1
      L7=L3-1
      L8=L4-1
      IF (A.LT.0.0D0) CALL SIGNS(S,L1,L2,L3,L4)
      B(5)=S(1)*IEX1*C(7)*AM**L1+S(2)*IEX2*C(8)*AM**L2+S(3)*IEX3*C(9)*AM
     1**L3+S(4)*IEX4*C(10)*AM**L4
      IF (A.LT.0.0D0) CALL SIGNS(S,L5,L6,L7,L8)
      B(6)=S(1)*IEX1*L1*C(7)*AM**L5+S(2)*IEX2*L2*C(8)*AM**L6+S(3)*IEX3*L
     13*C(9)*AM**L7+S(4)*IEX4*L4*C(10)*AM**L8
      IF (A.LT.0.0D0) CALL CHNGE(S)
C***  CHECK FORM FOR LIFT COEFFICIENT EXPRESSION
    1 GO TO (2,3,4),ICD
C***  COMPUTE LIFT COEFFICIENT AND DERIVATIVES
    2 IF (A.GT.0.0D0) GO TO 3
      B(1)=C(12)*A+Y+C(14)*PR
      IF (L.NE.0) GO TO 5
      B(3)=C(12)
      B(4)=0.0D0
      GO TO 5
    3 B(1)=C(11)+C(12)*A+C(13)*A**EX+C(14)*PR
      IF (L.NE.0) GO TO 5
      B(3)=C(12)+EX*C(13)*A**(EX-1.0D0)
      B(4)=EX*(EX-1.0D0)*C(13)*A**(EX-2.0D0)
      GO TO 5
    4 B(1)=C(11)+C(12)*A+C(13)*A*A+C(14)*PR
```

```
      IF (L.NE.0) GO TO 5
      B(3)=C(12)+2.0D0*C(13)*A
      B(4)=2.0D0*C(13)
    5 RETURN
      END


      SUBROUTINE DCR(N,AD,P,C,JWRITE)
C
C***  SUBROUTINE DCR SOLVES FOR DELTA CORRECTIONS TO BE APPLIED TO LIFT
C***  AND DRAG COEFFICIENTS
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION AD(450),P(450,8),C(14),F(8),A(8,2),B(8)
C
C***  INITIALIZE FACTORS AND COEFFICIENTS
      DO 1 J=1,8
      F(J)=1.0D0
      IF (C(J+5).EQ.0.0D0)F(J)=0.0D0
      A(J,1)=0.0D0
    1 A(J,2)=0.0D0
C***  SUM PRODUCTS OF PARTIALS
      DO 2 J=1,N
      DO 2 L=1,8
      A(L,1)=A(L,1)+P(J,L)*P(J,L)*F(L)
    2 A(L,2)=A(L,2)+P(J,L)*AD(J)*F(L)
C***  INITIALIZE DELTA CORRECTIONS
      DO 3 L=1,8
    3 B(L)=0.0D0
C***  CALCULATE CORRECTIONS
      DO 4 L=1,8
      IF (A(L,1).EQ.0.0D0) GO TO 4
      B(L)=A(L,2)/A(L,1)
    4 CONTINUE
C***  APPLY CORRECTIONS
      DO 5 L=1,8
      F(L)=C(L+5)
    5 C(L+5)=C(L+5)+B(L)
C***  WRITE OLD AND NEW DRAG AND LIFT COEFFICIENTS AND DELTAS
      WRITE (JWRITE,6) (F(L),B(L),C(L+5),L=1,8)
    6 FORMAT (1X,///,42X,'PATH PERFORMANCE DRAG AND LIFT COEFFICIENT UPD
     1ATE',//,42X,'OLD',22X,'DELTA',22X,'NEW',//,26X,'CD0 : ',D23.16,' +
     1 ',D23.16,' = ',D23.16,/,26X,'CD1 : ',D23.16,' + ',D23.16,' = ',D2
     13.16,/,26X,'CD2 : ',D23.16,' + ',D23.16,' = ',D23.16,/,26X,'CD3 :
     1',D23.16,' + ',D23.16,' = ',D23.16,/,26X,'CD4 : ',D23.16,' + ',D23
     1.16,' = ',D23.16,/,26X,'CLA0: ',D23.16,' + ',D23.16,' = ',D23.16,/
     1,26X,'CLA : ',D23.16,' + ',D23.16,' = ',D23.16,/,26X,'CLAX: ',D23.
     116,' + ',D23.16,' = ',D23.16,///)
      RETURN
      END


      SUBROUTINE SPLINE(N,Y,X,AA,IC)
C
C***  SUBROUTINE SPLINE FINDS THE RELATIONSHIP BETWEEN FUNCTION VALUES
C***  AND ALLOWS THE CALCULATION OF DERIVATIVES
C***       REFERENCE FOR THIS METHOD IS:
C***       THE THEORY OF SPLINES AND THEIR APPLICATIONS
C***       J.H. AHLBERG, ET AL, ACADEMIC PRESS, NEW YORK, 1967
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION X(N),Y(N),AA(4,N),BB(4,1827),CC(4,1827),DD(4,1827),H(182
     17),Q(1827),U(1827),EE(4,1827)
C
      NM1=N-1
      DO 1 I=1,NM1
    1 H(I)=X(I+1)-X(I)
C***  MODIFIED LEFT-HAND END CONDITION THAT ALLEVIATES THE NEED TO
C***  SPECIFY THE X-DERIVATIVE OF Y AT POINT 1
      Q(1)=-31.0D0/32.0D0
      H1=H(1)
      H2=H(2)
      H3=H(3)
      U(1)=Y(1)*(32.0D0*H1+42.0D0*H2+21.0D0*H3)/(H1+H2)/(H1+H2+H3)-Y(2)*
     1(11.0D0*H1+42.0D0*H2+21.0D0*H3)/(H2+H3)/H2+Y(3)*H1*(11.0D0*H1+21.0
     1D0*(H2+H3))/(H1+H2)/H2/H3-Y(4)*H1*(11.0D0*H1+21.0D0*H2)/(H2+H3)/(H
     11+H2+H3)/H3
C***  GENERATE INTERNAL U(I) BY ALGORITHMN GIVEN BY AHLBERG
      U(1)=3.0D0*U(1)/H1/16.0D0
      HM=H(1)
      YY=Y(2)
      YM=Y(1)
      DO 2 I=2,NM1
      HH=H(I)
      YP=Y(I+1)
      D=3.0D0*((YP-YY)/HH-(YY-YM)/HM)/(HH+HM)
      C=0.5D0*HH/(HH+HM)
      A=0.5D0-C
      P=A*Q(I-1)+1.0D0
      Q(I)=-C/P
      U(I)=(D-A*U(I-1))/P
      HM=HH
      YM=YY
    2 YY=YP
C***  MODIFIED RIGHT-HAND END CONDITION THAT ALLEVIATES THE NEED TO
C***  SPECIFY THE X-DERIVATIVE OF Y AT POINT N
      A=31.0D0/32.0D0
      P=A*Q(N-1)+1.0D0
      H1=H(NM1)
      H2=H(NM1-1)
      H3=H(NM1-2)
      D=Y(N)*(32.0D0*H1+42.0D0*H2+21.0D0*H3)/(H1+H2)/(H1+H2+H3)-Y(NM1)*(
     111.0D0*H1+42.0D0*H2+21.0D0*H3)/(H2+H3)/H2+Y(NM1-1)*H1*(11.0D0*H1+2
     11.0D0*(H2+H3))/(H1+H2)/H2/H3-Y(NM1-2)*H1*(11.0D0*H1+21.0D0*H2)/(H2
     1+H3)/(H1+H2+H3)/H3
      D=3.0D0*D/H1/16.0D0
      U(N)=(D-A*U(N-1))/P
C***  SOLVE FOR THE SPLINE COEFFICIENTS CORRESPONDING TO AHLBERG M(0) TO
C***  M(N) AND STORE THEM IN THE U(I)
      DO 3 J=1,NM1
      I=N-J
    3 U(I)=Q(I)*U(I+1)+U(I)
C***  FORM THE SPLINE COEFFICIENTS FOR THE CONVENTIONAL FORM OF A CUBIC
C***  POLYNOMIAL FROM THE U(I)
      UU=U(1)
      XX=X(1)
      YY=Y(1)
      DO 4 I=1,NM1
```

```
      UP=U(I+1)
      XP=X(I+1)
      YP=Y(I+1)
      HH=H(I)
      AA(1,I)=(UP-UU)/HH/6.0D0
      AA(2,I)=0.5D0*(XP*UU-XX*UP)/HH
      AA(3,I)=0.5D0*(UP*XX*XX-UU*XP*XP)/HH+(UU-UP)*HH/6.0D0+(YP-YY)/HH
      AA(4,I)=(UU*XP*XP*XP-UP*XX*XX*XX)/HH/6.0D0+(UP*XX-UU*XP)*HH/6.0D0+
     1(YY*XP-YP*XX)/HH
      XX=XP
      UU=UP
    4 YY=YP
      IF (IC.EQ.0) GO TO 13
C***  STORE COEFFICIENTS FOR LATTER USE
      GO TO (5,7,9,11),IC
    5 DO 6 I=1,NM1
      DO 6 J1=1,4
    6 BB(J1,I)=AA(J1,I)
      GO TO 13
    7 DO 8 I=1,NM1
      DO 8 J1=1,4
    8 CC(J1,I)=AA(J1,I)
      GO TO 13
    9 DO 10 I=1,NM1
      DO 10 J1=1,4
   10 DD(J1,I)=AA(J1,I)
      GO TO 13
   11 DO 12 I=1,NM1
      DO 12 J1=1,4
   12 EE(J1,I)=AA(J1,I)
   13 RETURN
C
      ENTRY VXX(T,Z)
C***  DETERMINE AIRSPEED AT TIME T
      IF (T.GT.X(1)) GO TO 14
      I=1
      GO TO 16
   14 DO 15 I=1,NM1
      IF (X(I).LE.T.AND.X(I+1).GT.T) GO TO 16
   15 CONTINUE
      I=NM1
   16 Z=((BB(1,I)*T+BB(2,I))*T+BB(3,I))*T+BB(4,I)
      RETURN
C
      ENTRY DVX(T,Z)
C***  DETERMINE ACCELERATION AT TIME T
      IF (T.GT.X(1)) GO TO 17
      I=1
      GO TO 19
   17 DO 18 I=1,NM1
      IF (X(I).LE.T.AND.X(I+1).GT.T) GO TO 19
   18 CONTINUE
      I=NM1
   19 Z=((CC(1,I)*T+CC(2,I))*T+CC(3,I))*T+CC(4,I)
      RETURN
C
      ENTRY DDVXX(T,Z)
C***  DETERMINE 2ND AIRSPEED DERIVATIVE AT TIME T
      IF (T.GT.X(1)) GO TO 20
      I=1
      GO TO 22
   20 DO 21 I=1,NM1
      IF (X(I).LE.T.AND.X(I+1).GT.T) GO TO 22
   21 CONTINUE
      I=NM1
   22 Z=3.0D0*CC(1,I)*T**2+2.0D0*CC(2,I)*T+CC(3,I)
      RETURN
C
      ENTRY AXX(T,Z)
C***  DETERMINE ANGLE OF ATTACK AT TIME T
      IF (T.GT.X(1)) GO TO 23
      I=1
      GO TO 25
   23 DO 24 I=1,NM1
      IF (X(I).LE.T.AND.X(I+1).GT.T) GO TO 25
   24 CONTINUE
      I=NM1
   25 Z=((DD(1,I)*T+DD(2,I))*T+DD(3,I))*T+DD(4,I)
      RETURN
C
      ENTRY DDDVX(T,Z)
C***  DETERMINE 3RD AIRSPEED DERIVATIVE
      IF (T.GT.X(1)) GO TO 26
      I=1
      GO TO 28
   26 DO 27 I=1,NM1
      IF (X(I).LE.T.AND.X(I+1).GT.T) GO TO 28
   27 CONTINUE
      I=NM1
   28 Z=3.0D0*EE(1,I)*T**2+2.0D0*EE(2,I)*T+EE(3,I)
      RETURN
      END
```

```
      SUBROUTINE FNI(K,F,X,FP,FPP,ND,NS,NI,IC)
C
C***  SUBROUTINE FNI USES NEWTON'S INTERPOLATION FORMULA TO COMPUTE
C***  ADDITIONAL POINTS FOR CUBIC SPLINE ANALYSIS
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION F(K),X(K),FP(K),FPP(K),XY(1827),Y(1827),AA(4,1827),FPS(1
     1827)
C
C***  THE ARRAYS ARE PROTECTED AGAINST 'OVERFLOW' BY THE FOLLOWING CARDS
      NB=K+(K-1)*NI+2*NS
      IF (NB.EQ.K) GO TO 4
      IF (NB.LE.1827) GO TO 1
      NI=3
      NS=15
      NB=K+(K-1)*NI+2*NS
C***  INITIALIZE PARAMETERS
    1 DP=1.0D-12
      H=X(2)-X(1)
      XX=-H
      XC=DABS(XX/(NS+1))
      XXH=DABS(XX)+X(K)
      XCH=XC
      N=0
      L=1
```

```
      J=6
    2 M=M+1
C***  DETERMINE THE INTERVAL IN QUESTION
      XX=XX+XC
      IF  (DABS(XX-XXH).LT.DF) XX=XXH
      IF  (XX.GE.XXH)  GO TO 3
      IF  (DABS(XX-X(L)).LT.DF) XX=X(L)
      IF  (DABS(XX-X(L+1)).LT.DF) XX=X(L+1)
      IF  (XX.EQ.X(L+1).AND.XX.LT.X(K)) L=L+1
      IF  (DABS(XX-X(J-2)).LT.DF) XX=X(J-2)
      IF  (XX.EQ.X(J-2).AND.J.LT.K) J=J+1
C***  COMPUTE THE NEWTONIAN COEFFICIENTS
      A0=F(J-5)
      A1=(F(J-4)-F(J-5))/(X(J-4)-X(J-5))
      A2=(F(J-3)-(A0+A1*(X(J-3)-X(J-5))))/((X(J-3)-X(J-5))*(X(J-3)-X(J-4
     1)))
      A3=(F(J-2)-(A0+A1*(X(J-2)-X(J-5))+A2*(X(J-2)-X(J-5))*(X(J-2)-X(J-4
     1))))/((X(J-2)-X(J-5))*(X(J-2)-X(J-4))*(X(J-2)-X(J-3)))
      A4=(F(J-1)-(A0+A1*(X(J-1)-X(J-5))+A2*(X(J-1)-X(J-5))*(X(J-1)-X(J-4
     1))+A3*(X(J-1)-X(J-5))*(X(J-1)-X(J-4))*(X(J-1)-X(J-3))))/((X(J-1)-X
     1(J-5))*(X(J-1)-X(J-4))*(X(J-1)-X(J-3))*(X(J-1)-X(J-2)))
      A5=(F(J)-(A0+A1*(X(J)-X(J-5))+A2*(X(J)-X(J-5))*(X(J)-X(J-4))+A3*(X
     1(J)-X(J-5))*(X(J)-X(J-4))*(X(J)-X(J-3))+A4*(X(J)-X(J-5))*(X(J)-X(J
     1-4))*(X(J)-X(J-3))*(X(J)-X(J-2))))/((X(J)-X(J-5))*(X(J)-X(J-4))*(X
     1(J)-X(J-3))*(X(J)-X(J-2))*(X(J)-X(J-1)))
C***  COMPUTE ADDITIONAL POINTS BY INTERPOLATION
      Y(M)=A0+A1*(XX-X(J-5))+A2*(XX-X(J-5))*(XX-X(J-4))+A3*(XX-X(J-5))*(
     1XX-X(J-4))*(XX-X(J-3))+A4*(XX-X(J-5))*(XX-X(J-4))*(XX-X(J-3))*(XX-
     1X(J-2))+A5*(XX-X(J-5))*(XX-X(J-4))*(XX-X(J-3))*(XX-X(J-2))*(XX-X(J
     1-1))
      XY(M)=XX
C***  DETERMINE INTERVAL INCREMENT
      IF  (XX.GE.X(1).AND.XX.LT.X(K)) XC=(X(L+1)-X(L))/(NI+1)
      IF  (XX.GE.X(K)) XC=XCH
      GO TO 2
    3 KN=M-1
    4 IF  (NB.EQ.K) KN=K
C***  COMPUTE SPLINE COEFFICIENTS
      CALL SPLINE(KN,Y,XY,AA,IC)
      IF  (IC.NE.0)  GO TO 9
C***  COMPUTE FIRST DERIVATIVE BY DIFFERENTIATION OF SPLINE FIT
      L1=NS+1
      L2=KN-NS
      L3=NI+1
      II=0
      DO 5 I=L1,L2,L3
      II=II+1
      J=I
      IF  (I.EQ.L2) J=J-1
      FP(II)=3.0D0*AA(1,J)*XY(I)**2+2.0D0*AA(2,J)*XY(I)+AA(3,J)
    5 CONTINUE
C***  CHECK FOR SECOND DERIVATIVE REQUEST
      IF  (ND.EQ.2)  GO TO 6
      GO TO 9
C***  COMPUTE ALL FIRST DERIVATIVES FOR SPLINE FIT
    6 DO 7 I=1,KN
      J=I
      IF  (I.EQ.KN) J=J-1
    7 FPS(I)=3.0D0*AA(1,J)*XY(I)**2+2.0D0*AA(2,J)*XY(I)+AA(3,J)
C***  COMPUTE SECOND DERIVATIVE BY DIFFERENTIATION OF SPLINED FIRST
C***  DERIVATIVE
      CALL SPLINE(KN,FPS,XY,AA,IC)
      II=0
      DO 8 I=L1,L2,L3
      II=II+1
      J=I
      IF  (I.EQ.L2) J=J-1
      FPP(II)=3.0D0*AA(1,J)*XY(I)**2+2.0D0*AA(2,J)*XY(I)+AA(3,J)
    8 CONTINUE
    9 RETURN
      END
```

```
      FUNCTION VA(T)
C
C***  FUNCTION VA (WITH SPLINE) DETERMINES THE AIRSPEED AT TIME T
C
      IMPLICIT REAL*8(A-H,O-Z)
C
      CALL VXX(T,X)
      VA=X
      RETURN
      END
```

```
      FUNCTION DDV(T)
C
C***  FUNCTION DDV (WITH SPLINE) DETERMINES THE SECOND DERIVATIVE OF
C***  AIRSPEED AT TIME T
C
      IMPLICIT REAL*8(A-H,O-Z)
C
      CALL DDVXX(T,X)
      DDV=X
      RETURN
      END
```

```
      FUNCTION DDDV(T)
C
C***  FUNCTION DDDV (WITH SPLINE) DETERMINES THE THIRD DERIVATIVE OF
C***  AIRSPEED AT TIME T
C
      IMPLICIT REAL*8(A-H,O-Z)
C
      CALL DDDVX(T,X)
      DDDV=X
      RETURN
      END
```

```
      FUNCTION ALP(T)
C
C***  FUNCTION ALP (WITH SPLINE) DETERMINES THE ANGLE OF ATTACK AT
C***  TIME T
C
```

```
      IMPLICIT REAL*8(A-H,O-Z)
C
      CALL AXX(T,X)
      ALP=X
      RETURN
      END


      FUNCTION DVA(T)
C
C***  FUNCTION DVA (WITH SPLINE) DETERMINES THE FIRST DERIVATIVE OF
C***  AIRSPEED
C
      IMPLICIT REAL*8(A-H,O-Z)
C
      CALL DVX(T,X)
      DVA=X
      RETURN
      END


      SUBROUTINE FF(T,YY,DYY,F,IPRM,DGAM,AF,IKP)
C
C***  SUBROUTINE FF COMPUTES THE DERIVATIVE OF THE FLIGHT PATH ANGLE
C
      IMPLICIT REAL*8(A-H,O-Z)
      EXTERNAL VA,DDV,DDDV,ALP,DVA,PHIDER
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),CL(450),SS(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
      COMMON /LAB7/A,R,W,R1
      COMMON /LAB4/IRHO
      COMMON /LAB5/GMX,DGMX,D2GM,D3GM
      COMMON /LAB6/T1,ADT
C
C***  SET PARAMETERS FOR ESTIMATIONS
      FTR=0.26D0
      IF (IPRM.EQ.0)CDL=0.0D0
      Y=VA(T)
C***  COMPUTE POWER
      P=CFM(1)+CFM(2)*Y**EX1+CFM(3)*Y**EX2+CFM(4)*Y**EX3+CFM(5)*Y**EX4
C***  STORE VALUES TEMPORARILY
      WXX=W
      AXX=A
      RXX=R
      H=R1
      DVX=DVA(T)
C***  CHECK FOR INITIAL TIME POINT
      IF (T1.EQ.0.0D0) GO TO 1
C***  COMPUTE AIRSPEED AND ACCELERATION AT PREVIOUS TIME POINT
      Z=T1
      V=VA(Z)
      DV=DVA(Z)
      V2=DDV(Z)
      V3=DDDV(Z)
C***  COMPUTE DERIVATIVES AT PREVIOUS TIME POINT
      DH=V*DSIN(GMX)
      D2H=DV*DSIN(GMX)+DGMX*V*DCOS(GMX)
      D3H=(V2-V*DGMX*DGMX)*DSIN(GMX)+(2.0D0*DV*DGMX+V*D2GM)*DCOS(GMX)
      D4H=(V3-3.0D0*V*DGMX*D2GM-3.0D0*DV*DGMX**2)*DSIN(GMX)+(3.0D0*V2*DG
     1MX-V*DGMX**3+3.0D0*DV*D2GM+V*D3GM)*DCOS(GMX)
      IF (D3GM.EQ.0.0D0) D4H=0.0D0
      TMT1=T-T1
C***  ESTIMATE ALTITUDE
      H=H+TMT1*(DH+TMT1*(D2H/2.0D0+TMT1*(D3H/6.0D0+TMT1*D4H/24.0D0)))
C***  ESTIMATE DENSITY
      R2=RHO*(1.0D0-6.86D-6*H)**4.26D0
      RNET=R2-R
C***  COMPUTE POWER AT PREVIOUS TIME POINT
      PX=CFM(1)+CFM(2)*V**EX1+CFM(3)*V**EX2+CFM(4)*V**EX3+CFM(5)*V**EX4
C***  DETERMINE WEIGHT DERIVATIVES AT PREVIOUS TIME POINT
      DW=-F*PX
      D2W=-F*DV*(EX1*CFM(2)*V**(EX1-1.0D0)+EX2*CFM(3)*V**(EX2-1.0D0)+EX3
     1*CFM(4)*V**(EX3-1.0D0)+EX4*CFM(5)*V**(EX4-1.0D0))
      D3W=-F*(DV**2*(EX1*CFM(2)*(EX1-1.0D0)*V**(EX1-2.0D0)+EX2*CFM(3)*(E
     1X2-1.0D0)*V**(EX2-2.0D0)+EX3*CFM(4)*(EX3-1.0D0)*V**(EX3-2.0D0)+EX4
     1*CFM(5)*(EX4-1.0D0)*V**(EX4-2.0D0))+V2*(EX1*CFM(2)*V**(EX1-1.0D0)+
     1EX2*CFM(3)*V**(EX2-1.0D0)+EX3*CFM(4)*V**(EX3-1.0D0)+EX4*CFM(5)*V**
     1(EX4-1.0D0)))
      D4W=-F*((EX1*CFM(2)*(EX1-1.0D0)*(EX1-2.0D0)*V**(EX1-3.0D0)+EX2*CFM
     1(3)*(EX2-1.0D0)*(EX2-2.0D0)*V**(EX2-3.0D0)+EX3*CFM(4)*(EX3-1.0D0)*
     1(EX3-2.0D0)*V**(EX3-3.0D0)+EX4*CFM(5)*(EX4-1.0D0)*(EX4-2.0D0)*V**(
     1EX4-3.0D0))*DV**3+3.0D0*DV*V2*(EX1*CFM(2)*(EX1-1.0D0)*V**(EX1-2.0D
     10)+EX2*CFM(3)*(EX2-1.0D0)*V**(EX2-2.0D0)+EX3*CFM(4)*(EX3-1.0D0)*V*
     1*(EX3-2.0D0)+EX4*CFM(5)*(EX4-1.0D0)*V*(EX4-2.0D0))+V3*(EX1*CFM(2)*
     1V**(EX1-1.0D0)+EX2*CFM(3)*V**(EX2-1.0D0)+EX3*CFM(4)*V**(EX3-1.0D0)
     1+EX4*CFM(5)*V**(EX4-1.0D0)))
C***  ESTIMATE ANGLE OF ATTACK
      AX=A+AF*FTR*ADT*TMT1
      IF (IPRM.NE.0) AX=A+AF*FTR*ADT*TMT1+AF*CDL
C***  ESTIMATE WEIGHT
      WX=W+AF*(TMT1*(DW+TMT1*(D2W/2.0D0+TMT1*(D3W/6.0D0+TMT1*D4W/24.0D0)
     1)))
C***  ESTIMATE DENSITY
      RX=R+AF*RNET
      A=AX
      W=WX
      R=RX
      GO TO 2
    1 A=AXX
      W=WXX
      R=RXX
C***  COMPUTE DRAG COEFFICIENT
    2 AM=DABS(A)
      IF (A.LT.0.0D0) CALL SIGNS(SGN,IEX1,IEX2,IEX3,IEX4)
      CD=CFM(6)+SGN(1)*CFM(7)*AM**IEX1+SGN(2)*CFM(8)*AM**IEX2+SGN(3)*CFM
     1(9)*AM**IEX3+SGN(4)*CFM(10)*AM**IEX4
      IF (A.LT.0.0D0) CALL CHNGE(SGN)
C***  ESTIMATE A FLIGHT PATH ANGLE FROM THE EQUATION OF MOTION
      ARG=P*DCOS(A)/(W*Y)-R*S*Y*Y*CD/(2.0D0*W)-DVX/G
      DARG=-(P*DSIN(A)/(W*Y)+R*S*Y*Y/(2.0D0*W)*(IEX1*CFM(7)*A**(IEX1-1)+
     1IEX2*CFM(8)*A**(IEX2-1)+IEX3*CFM(9)*A**(IEX3-1)+IEX4*CFM(10)*A**(I
     1EX4-1)))
      GAM1=DARSIN(ARG)
      DGDA=DARG/(DSQRT(1.0D0-ARG*ARG))
```

```
C***  DETERMINE DIFFERENCE IN 'PREDICTED' AND ABOVE ESTIMATION OF FLIGHT
C***  PATH ANGLE
      DGAM=YY-GAM1
C***  DETERMINE A CORRECTION TO ANGLE OF ATTACK THRU DERIVATIVES OF
C***  EQUATION OF MOTION
      IF (IKP.EQ.0) GO TO 3
      ADEL=DGAM/DGDA
      CDL=CDL+ADEL
C***  COMPUTE DERIVATIVE OF FLIGHT PATH ANGLE
    3 DYY=G*S*R*Y*(CFM(11)+CFM(12)*A+CFM(13)*A**EXPX)/(2.0D0*W)+G*P*DSIN
     1(A)/(W*Y*Y)-G*DCOS(YY)/Y
      XRHO=R
      A=AXX
      W=WXX
      R=RXX
      RETURN
      END


      SUBROUTINE TRENOR(H,XX,YY,D2Y,D3Y,D4Y,ISET,F,IPRM,KK,IR)
C
C***  SUBROUTINE TRENOR PREDICTS A FLIGHT PATH TRAJECTORY
C
      IMPLICIT REAL*8(A-H,O-Z)
      EXTERNAL VA,DDV,DDDV,ALP,DVA,PHIDER
      COMMON /TEST/ICKP
      COMMON /LAB3/DGAM
      COMMON /LAB6/T1,ADT
      COMMON /PCR/DY(7),X(7),Y(7)
      COMMON /LABX/JWRITE,IR
      COMMON /CRCOEF/P,A0,A1,A2,A3,A4,A5,HH
C
C***  INITIALIZE PARAMETERS
      AF=0.0D0
      IKP=0
C***  COMPUTE DERIVATIVE AT BEGINNING OF INTERVAL
      CALL FF(XX,YY,D2Y,F,IPRM,DGAM,AF,IKP)
      DY(7)=D2Y
      T1=XX
C***  TEST FOR INITIALIZATION
      IF (ISET)  1,1,3
C***  INITIALIZE PARAMETERS
    1 DO 2 I=1,7
      Y(I)=YY
      DY(I)=D2Y
    2 X(I)=XX
C***  BEGIN RUNGE KUTTA
      LK=6
      K=1
      ISET=1
      GO TO 4
    3 IF (K.LT.7)K=K+1
      IF (K-7)  4,7,7
C***  DEFINE VARIABLES FOR FF
    4 Y2=YY+0.5D0*H*D2Y
      AF=0.5D0
      IKP=0
C***  COMPUTE DERIVATIVE AT INTERVAL MIDPOINT
      CALL FF(XX+0.5D0*H,Y2,DY2,F,IPRM,DGAM,AF,IKP)
      Y3=YY+0.5D0*H*DY2
C***  UPDATE DERIVATIVE AT INTERVAL MIDPOINT
      CALL FF(XX+0.5D0*H,Y3,DY3,F,IPRM,DGAM,AF,IKP)
C***  APPLY CORRECTIVE PROCEDURE FOR RUNGE KUTTA
      IF (DABS(DY2-D2Y).LT.1.0D-15) GO TO 5
      P=-2.0D0*(DY3-DY2)/(DY2-D2Y)/H
      IF ((P*H).LT.1.0D-04) GO TO 5
C***  COMPUTE 'STIFF-EQUATION' F COEFFICIENTS
      F0=0.0D0
      IF ((-P*H).LT.174.673D0.AND.(-P*H).GT.-180.218D0)F0=DEXP(-P*H)
      F1=-(F0-1.0D0)/P/H
      F2=-(F1-1.0D0)/P/H
      F3=-(F2-0.5D0)/P/H
      Y4=YY+H*(2.0D0*DY3*F2+D2Y*(F1-2.0D0*F2)+DY2*P*H*F2)
      AF=1.0D0
      IKP=0
      GO TO 6
C***  SET F COEFFICIENTS TO STANDARD ADAMS-BASHFORTH F COEFFICIENTS
    5 F1=1.0D0
      F2=0.5D0
      F3=1.666666666666667D-1
      P=0.0D0
      Y4=YY+H*DY3
      AF=1.0D0
      IKP=0
C***  COMPUTE DERIVATIVE AT END OF INTERVAL
    6 CALL FF(XX+H,Y4,DY4,F,IPRM,DGAM,AF,IKP)
      B=-3.0D0*(D2Y+P*YY)+2.0D0*(DY2+P*Y2)+2.0D0*(DY3+P*Y3)-(DY4+P*Y4)
      C=4.0D0*((D2Y+P*YY)-(DY2+P*Y2)-(DY3+P*Y3)+(DY4+P*Y4))
      YR=YY+H*(D2Y*F1+B*F2+C*F3)
      IKP=1
C***  UPDATE DERIVATIVE AT END OF INTERVAL BY CORRECTOR
      CALL FF(XX+H,YR,DYR,F,IPRM,DGAM,AF,IKP)
      IKP=0
      GO TO 14
    7 IF (IPRM.NE.0) GO TO 9
      DO 8 I=1,6
      Y(I)=Y(I+1)
      DY(I)=DY(I+1)
    8 X(I)=X(I+1)
      X(7)=X(6)+H
C***  CALL PREDICTOR TO PREDICT Y AT NEXT POINT
    9 DO 10 I=1,6
   10 CALL PHICEF(I)
      K=7
      LK=LK+1
      PRDCT=Y(1)+PHIDER(6,X(7),-1,1,0)-PHIDER(6,X(1),-1,1,0)
C***  USING PREDICTED Y, COMPUTE ITS DERIVATIVE
      AF=1.0D0
      IKP=0
      CALL FF(X(7),PRDCT,DYP,F,IPRM,DGAM,AF,IKP)
      DY(7)=DYP
      CALL PHICEF(7)
C***  GENERATE COEFFICIENTS NECESSARY FOR 'STIFF-EQUATION' CORRECTOR
      CALL PCEF
C***  TEST FOR SUITABLE CORRECTOR
      IF ((P*HH).LT.1.0D-02) GO TO 12
      IF ((P*HH).GT.22.0D0)ICKP=ICKP+1
      IF ((P*HH).GT.22.0D0) WRITE (JWRITE,11)
   11 FORMAT (2X,20('*'),'P*HH > 22.0')
```

```
C***  CORRECT Y BY 'STIFF-EQUATION' CORRECTOR
      CALL PHETH
      GO TO 13
C***  CORRECT Y BY MODIFIED TREANOR CORRECTOR
   12 Y(7)=Y(1)+PHIDER(7,X(7),-1,1,0)-PHIDER(7,X(1),-1,1,0)
   13 YR=Y(7)
C***  COMPUTE 1ST DERIVATIVE OF FLIGHT PATH ANGLE
      AF=1.0D0
      IKP=1
      CALL FF(X(7),YR,DYR,F,IPRM,DGAM,AF,IKP)
      DY(7)=DYR
C***  COMPUTE 2ND DERIVATIVE OF FLIGHT PATH ANGLE
      D3Y=PHIDER(7,X(7),1,1,0)
C***  COMPUTE 3RD DERIVATIVE OF FLIGHT PATH ANGLE
      D4Y=PHIDER(7,X(7),2,1,0)
C***  TEST FOR POSSIBLE ERRORS
      IF (IR.NE.0) RETURN
   14 IF (DABS(DGAM).LT.1.0D-16)KK=1
      IF (IPRM.NE.IK.AND.KK.EQ.0) GO TO 18
      IF (LK.EQ.7) GO TO 17
      IF (LK.GT.7) GO TO 16
      DO 15 I=1,6
      Y(I)=Y(I+1)
      DY(I)=DY(I+1)
   15 X(I)=X(I+1)
      X(7)=X(6)+H
   16 Y(7)=YR
      DY(7)=DYR
      IF (K.EQ.6) GO TO 9
   17 YY=Y(7)
      D2Y=DY(7)
      XX=X(7)
   18 RETURN
      END


      SUBROUTINE WSUB(N,F,TM,WW,JWRITE)
C
C***  SUBROUTINE WSUB FITS THE WEIGHT TIME HISTORY WITH A TRIGOMETRIC
C***  POLYNOMIAL AND CHECKS ITS DERIVATIVE FOR DECREASING WEIGHT
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION F(N),TM(N),WW(N),C(450,9),X(450,1),WK(250)
C
C***  INITIALIZE PARAMETERS
      PI=3.141592653589793D0
      TT=TM(N)
      XT=PI/TT
C***  FORM LEAST-SQUARES COEFFICIENTS
      DO 1 J=1,N
      TEMP=F(J)-F(1)
      WT=1.0D0
      IF (J.EQ.1.OR.J.EQ.N)WT=N*N*N
      T=TM(J)
      TX=T/TT*PI
      C(J,1)=WT*T
      C(J,2)=WT*DCOS(TX)
      C(J,3)=WT*DSIN(TX)
      C(J,4)=WT*DCOS(2.0*TX)
      C(J,5)=WT*DSIN(2.0*TX)
      C(J,6)=WT*DCOS(3.0*TX)
      C(J,7)=WT*DSIN(3.0*TX)
      C(J,8)=WT*DCOS(4.0*TX)
      C(J,9)=WT*DSIN(4.0*TX)
    1 X(J,1)=WT*TEMP
C***  EXACT LEAST SQUARES
      CALL LLSQAR(C,X,N,9,1,450,450,15,WK,IER,JWRITE)
      DO 2 J=1,N
      T=TM(J)
      TX=T/TT*PI
C***  COMPUTE AND CHECK WEIGHT DERIVATIVE
      WD=X(1,1)-X(2,1)*XT*DSIN(TX)+X(3,1)*XT*DCOS(TX)-X(4,1)*2.0*XT*DSIN
     1(2.0*TX)+X(5,1)*2.0*XT*DCOS(2.0*TX)-X(6,1)*3.0*XT*DSIN(3.0*TX)+X(7
     1,1)*3.0*XT*DCOS(3.0*TX)-X(8,1)*4.0*XT*DSIN(4.0*TX)+X(9,1)*4.0*XT*D
     1COS(4.0*TX)
      IF (WD.GE.0.0D0) GO TO 3
C***  COMPUTE FITTED WEIGHT
      WX=X(1,1)*T+X(2,1)*DCOS(TX)+X(3,1)*DSIN(TX)+X(4,1)*DCOS(2.0*TX)+X(
     15,1)*DSIN(2.0*TX)+X(6,1)*DCOS(3.0*TX)+X(7,1)*DSIN(3.0*TX)+X(8,1)*D
     1COS(4.0*TX)+X(9,1)*DSIN(4.0*TX)
      WW(J)=WX+F(1)
    2 CCNTINUE
      GO TO 7
    3 WRITE (JWRITE,4)
    4 FORMAT (1X,//,10X,'WEIGHT DERIVATIVE FOUND TO BE > OR = ZERO.',//)
C***  REDUCE POLYNOMIAL TC FIRST ORDER IF WEIGHT DERIVATIVE IS FOUND
C***  POSITIVE
      DO 5 J=1,N
      TEMP=F(J)-F(1)
      WT=1.0D0
      IF (J.EQ.1.OR.J.EQ.N)WT=N*N*N
      C(J,1)=WT*TM(J)
      C(J,2)=WT
    5 X(J,1)=WT*TEMP
      CALL LLSQAR(C,X,2,1,450,450,15,WK,IER,JWRITE)
      DO 6 J=1,N
    6 WW(J]=X(1,1)*TM(J)+X(2,1)+F(1)
    7 RETURN
      END


      SUBROUTINE ADJUST(C,CC,CX,X,DSCALE,LLOC,MLOC,IP,NEQ)
C
C***  SUBROUTINE ADJUST ADJUSTS MATRICES DUE TO SUBROUTINE MPATH'S
C***  COEFFICIENT FREEZING
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION C(13,13),CC(13,1),CX(14),X(13),LLOC(13),MLOC(13),LOC(13)
     1,D(13,13),DSCALE(13)
C
C***  MODIFY CC-MATRIX AND DETERMINE LOCATIONS OF FROZEN COEFFICIENTS
      M=0
      DO 2 JXP=1,NEQ
      IF (CX(JXP).EQ.0.0D0.OR.LLOC(JXP).NE.0) GO TO 2
      M=M+1
      LOC(M)=0
      IF (MLOC(JXP).EQ.0) GO TO 2
      LOC(M)=1
```

```
      DO 1 L=1,IP
    1 CC(L,1)=CC(L,1)-C(M,L)*X(M)*DSCALE(M)
    2 CONTINUE
C***  UPDATE MATRICES
      LX=0
      DO 4 I=1,IP
      IF (LOC(I).EQ.1) GO TO 4
      LX=LX+1
      LM=0
      DO 3 J=1,IP
      IF (LOC(J).EQ.1) GO TO 3
      LM=LM+1
      D(LX,LM)=C(I,J)
    3 CONTINUE
      CC(LX,1)=CC(I,1)
    4 CONTINUE
C***  DEFINE NEW UPDATED MATRIX
      IP=LX
      DO 5 I=1,IP
      DO 5 J=1,IP
    5 C(J,I)=D(J,I)
      RETURN
      END


      SUBROUTINE PCEF
C
C***  SUBROUTINE PCEF CALCULATES THE COEFFICIENTS FOR THE 'STIFF-
C***  EQUATION' CORRECTOR
C
      IMPLICIT REAL*8(A-Z)
      REAL*8 TOL/1.0D-2/
      COMMON /PCR/DY0,DY1,DY2,DY3,DY4,DY5,DY6,X0,X1,X2,X3,X4,X5,X6,Y0,Y1
     1,Y2,Y3,Y4,Y5,Y6
      COMMON /CRCOEF/P,A0,A1,A2,A3,A4,A5,H
C
C***  DEFINE DIFFERENCES
      T(X)=X-X0
      W(Y)=Y-Y0
      V(DY)=DY-DY0
C***  CALCULATE X-DIFFERENCES
      T0=T(X0)
      T1=T(X1)
      T2=T(X2)
      T3=T(X3)
      T4=T(X4)
      T5=T(X5)
      T6=T(X6)
C***  CALCULATE Y-DIFFERENCES RELATIVE TO Y0
      W0=W(Y0)
      W1=W(Y1)
      W2=W(Y2)
      W3=W(Y3)
      W4=W(Y4)
      W5=W(Y5)
      W6=W(Y6)
C***  CALCULATE DY-DIFFERENCES RELATIVE TO DY0
      V0=V(DY0)
      V1=V(DY1)
      V2=V(DY2)
      V3=V(DY3)
      V4=V(DY4)
      V5=V(DY5)
      V6=V(DY6)
C***  EQUATION 1
      B0=V1/T1
      B2=-T1
      B3=B2*T1
      B4=B3*T1
      B5=B4*T1
      B6=W1/T1
C***  EQUATION 2
      C0=(V2-T2*B0)/C
      C3=-(T2*(B3+T2*T2))/C
      C4=-(T2*(B4+T2*T2*T2))/C
      C=T2*(B2+T2)
      C5=-(T2*(B5+T2*T2*T2*T2))/C
      C6=(W2-T2*B6)/C
C***  UPDATE EQUATION 2
      D0=B2*C0+B0
      D3=B2*C3+B3
      D4=B2*C4+B4
      D5=B2*C5+B5
      D6=B2*C6+B6
C***  EQUATION 3
      E=T3*(D3+T3*(C3+T3))
      E0=(V3-(T3*(D0+T3*C0)))/E
      E4=-(T3*(D4+T3*(C4+T3*T3)))/E
      E5=-(T3*(D5+T3*(C5+T3*T3*T3)))/E
      E6=(W3-T3*(D6+T3*C6))/E
C***  UPDATE EQUATION 3
      F0=D3*E0+D0
      F4=D3*E4+D4
      F5=D3*E5+D5
      F6=D3*E6+D6
      G0=C3*E0+C0
      G4=C3*E4+C4
      G5=C3*E5+C5
      G6=C3*E6+C6
C***  EQUATION 4
      H=T4*(F4+T4*(G4+T4*(E4+T4)))
      H0=(V4-(T4*(F0+T4*(G0+T4*E0))))/H
      H5=-(T4*(F5+T4*(G5+T4*(E5+T4*T4))))/H
      H6=(W4-(T4*(F6+T4*(G6+T4*E6))))/H
C***  UPDATE EQUATION 4
      I0=F4*H0+F0
      I5=F4*H5+F5
      I6=F4*H6+F6
      J0=G4*H0+G0
      J5=G4*H5+G5
      J6=G4*H6+G6
      K0=E4*H0+E0
      K5=E4*H5+E5
      K6=E4*H6+E6
C***  EQUATION 5
      L=T5*(I5+T5*(J5+T5*(K5+T5*(H5+T5))))
      L0=(V5-(T5*(I0+T5*(J0+T5*(K0+T5*H0)))))/L
      L6=(W5-(T5*(I6+T5*(J6+T5*(K6+T5*H6)))))/L
C***  UPDATE EQUATION 5
```

```
      M0=X5*L0+X0
      M6=X5*L6+X6
      N0=J5*L0+J0
      N6=J5*L6+J6
      Q0=K5*L0+K0
      Q6=K5*L6+K6
      R0=M5*L0+M0
      R6=M5*L6+M6
      H=X6-X0
      P=(T6*(M6+T6*(N6+T6*(Q6+T6*(R6+T6*L6))))-Y6)
      IF (DABS(P).LT.1.0D-33)P=1.0D-33
      XNM=-(T6*(M0+T6*(N0+T6*(Q0+T6*(R0+T6*L0))))-Y6)
      IF (DABS(XNM).LT.1.0D-33)XNM=1.0-33
C***  CHECK EXPONENTS TO PREVENT UNDERFLOWS AND OVERFLOWS
      TEXP=DLOG(DABS(XNM))-DLOG(DABS(P))
      IF (TEXP.LT.-77.0D0) GO TO 5
      IF (TEXP.LE.74.0D0) GO TO 1
      IX1=-1.0D0
      IX2=-1.0D0
      IF (DABS(XNM).EQ.XNM)IX1=1.0D0
      IF (DABS(P).EQ.P)IX2=1.0D0
      IXS=IX1*IX2
      P=-1.0D+74
      IF (IXS.GT.0.0D0)P=1.0D+74
      IF (P.LT.0.0D0) GO TO 5
      GO TO 2
C***  CALCULATE COEFFICIENTS
    1 P=XNM/P
C***  TEST FOR MACHINE LIMIT
    2 IF ((P*H).LT.22.0D0) GO TO 3
      P=22.0D0/H
    3 IF (P.LT.TOL) GO TO 5
      A0=DY0
      A1=M0+P*M6
      A2=N0+P*N6
      A3=Q0+P*Q6
      A4=R0+P*R6
      A5=L0+P*L6
    4 RETURN
    5 P=0D0
      GO TO 4
      END


      SUBROUTINE PHICEF(I)
C
C***  SUBROUTINE PHICEF COMPUTES COEFFICIENTS FOR NEWTON'S FORWARD
C***  INTERPOLATION SCHEME FOR NON-EQUIDISTANT INTERVALS FOR THE
C***  FOLLOWING FUNCTION PHI:
C***    PHI(X)=A(1)+A(2)*(X-X(1))+A(3)*(X-X(1))*(X-X(2))+...
C***                 ...+A(I)*(X-X(1))*(X-X(2))*...*(X-X(I-1))+...
C***                 ...+A(N)*(X-X(1))*(X-X(2))*...*(X-X(N-1)).
C***  BY USING A RECURSION FORMULA, PHICEF CAN BE USED TO COMPUTE BOTH
C***  DERIVATIVES AND ANTIDERIVATIVES OF PHI.  PHICEF MUST BE CALLED IN
C***  CONSECUTIVELY-INCREASING VALUES OF I FOR THE RECURSION FORMULA TO
C***  BE CORRECT.
C
      IMPLICIT REAL*8(A-H,O-Z)
      COMMON /AWRK/A(7),C(7,8)
      CCMMON /PCB/F(7),X(7),Y(7)
      COMMON /LABX/JWRITE,IERR
C
      IF (I.LT.1.OR.I.GT.7) GO TO 8
C***  TRANSLATE
      SVX=X(1)
      DO 1 J=1,I
    1 X(J)=X(J)-SVX
C***  CALCULATE THE C-COEFFICIENTS
      J=1
C***  NOTE: C(I,1)=1 FOR ALL I
      C(I,J)=1D0
    2 J=J+1
      IF (J.GT.I) GO TO 3
      C(I,J)=X(I-1)*C(I-1,J-1)+C(I-1,J)
      GO TO 2
C***  NOTE: C(I,I+1)=0 FOR ALL I
    3 C(I,I+1)=0D0
C***  CALCULATE A(I)
      A(I)=0D0
      DNM=1D0
      J=1
    4 IF (J.GT.I-1) GO TO 5
      A(I)=A(I)+A(J)*DNM
      DNM=DNM*(X(I)-X(J))
      J=J+1
      GO TO 4
    5 A(I)=(F(I)-A(I))/DNM
C***  RESET
      DO 6 J=1,I
    6 X(J)=X(J)+SVX
    7 RETURN
    8 IERR=1
      WRITE (JWRITE,9) I
    9 FORMAT (1H ,'***PHICEF ERROR: I=',I3,' BUT 0<I<8 IS REQUIRED***')
      GO TO 7
      END


      FUNCTION PHIDER(N,XX,K,ICF1,ICF2)
C
C***  FUNCTION PHIDER IS CAPABLE OF COMPUTING THE DERIVATIVE AND/OR
C***  ANTIDERIVATIVE OF PHI (AS DESCRIBED IN SUBROUTINE PHICEF).  IT
C***  SHOULD BE NOTED THAT
C***  N  DEFINES THE NUMBER OF TERMS OF PHI TO USE OR THE NUMBER OF
C***  TERMS THAT ARE AVAILABLE TO USE
C***  XX DEFINES THE VALUE OF X AT WHICH TO CALCULATE THE DERIVATIVE OR
C***  ANTIDERIVATIVE
C***  K SPECIFIES THE DERIVATIVE TO    CALCULATE: K MAY BE ANY INTEGER
C***  SUCH THAT POSITIVE (DERIVATIVES), ZERO (PHI), NEGATIVE (ANTIDERI-
C***  VATIVES)).
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION DFACT(13)
      COMMON /AWRK/A(7),C(7,8)
      COMMON /LABX/JWRITE,IERR
      COMMON /PCB/F(7),X(7),Y(7)
      DATA DFACT/1.0D0,1.0D0,2.0D0,6.0D0,2.4D1,1.2D2,7.2D2,5.04D3,4.032D
     14,3.6288D5,3.6288D6,3.99168D7,4.790016D8/
```

```
C
      IF (N.LT.1.OR.N.GT.7) GO TO 9
C***  TRANSLATE
      SVE=X(1)
      DO 1 I=1,N
    1 X(I)=X(I)-SVE
      XX=XX-SVE
    2 IF (ICF1.GT.ICF2) GO TO 3
      CALL PHICEF(ICF1)
      ICF1=ICF1+1
      GO TO 2
    3 PHIDER=0D0
      I=K+1
      IF (I.LT.1)I=1
    4 IF (I.GT.N) GO TO 6
      S=1D0
      CFT=0D0
      J2=I-K
      IF (J2.GT.I) J2=I
      DO 5 J=1,J2
      CFT=CFT+S*DFACT(I-J+1)/DFACT(I-J-K+1)*C(I,J)*(XX**(I-J-K))
    5 S=-S
      PHIDER=PHIDER+A(I)*CFT
      I=I+1
      GO TO 4
C***  RESET
    6 XX=XX+SVE
      DO 7 I=1,N
    7 X(I)=X(I)+SVE
    8 RETURN
    9 IERR=1
      WRITE (JWRITE,10) N
   10 FORMAT (1H ,'*** PHIDER ERROR: N=',I11,' BUT 1<=N<=7 REQUIRED')
      GO TO 8
      END


      SUBROUTINE PMETH
C
C***  SUBROUTINE PMETH PRODUCES A CORRECTED VALUE OF Y(N+1)
C
      IMPLICIT REAL*8(A-Z)
      COMMON /CRCOEF/P,A0,A1,A2,A3,A4,A5,H
      COMMON /PCR/DY0,DY1,DY2,DY3,DY4,DY5,DY6,X0,X1,X2,X3,X4,X5,X6,Y0,Y1
     1,Y2,Y3,Y4,Y5,Y6
C
      PH=P*H
C***  COMPUTE THE TREANOR F-VALUES
      F0=0.0D0
      IF ((-PH).LT.174.673D0.AND.(-PH).GT.-180.218D0) F0=DEXP(-PH)
      F1=(F0-1D0)/(-PH)
      F2=(F1-1D0)/(-PH)
      F3=(F2-(1D0/2D0))/(-PH)
      F4=(F3-(1D0/6D0))/(-PH)
      F5=(F4-(1D0/24D0))/(-PH)
      F6=(F5-(1D0/120D0))/(-PH)
C***  COMPUTE A CORRECTED VALUE OF Y(N+1)
      Y6=Y0+H*(A0*F1+H*(A1*F2+H*(2D0*A2*F3+H*(6D0*A3*F4+H*(24D0*A4*F5+H*
     1120D0*A5*F6)))))
      RETURN
      END


      SUBROUTINE LOC(I,J,IR,N,M,MS)
C
C***  SUBROUTINE LOC COMPUTES A VECTOR SUBSCRIPT FOR AN ELEMENT IN A
C***  MATRIX OF SPECIFIED STORAGE MODE
C
      IX=I
      L=J
      IF (MS-1)  1,2,5
    1 IRX=N*(L-1)+IX
      GO TO 7
    2 IF (IX-L)  3,4,4
    3 IRX=IX+(L*L-L)/2
      GO TO 7
    4 IRX=L+(IX*IX-IX)/2
      GO TO 7
    5 IRX=0
      IF (IX-L)  7,6,7
    6 IRX=IX
    7 IR=IRX
      RETURN
      END


      SUBROUTINE MATA(A,R,N,M,MS)
C
C***  SUBROUTINE MATA PREMULTIPLIES A MATRIX BY ITS TRANSPOSE TO FORM
C***  A SYMMETRIC MATRIX
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(1),R(1)
C
      DO 6 K=1,M
      KX=(K*K-K)/2
      DO 6 J=1,M
      IF (J-K)  1,1,6
    1 IR=J+KX
      R(IR)=0.0D0
      DO 6 I=1,N
      IF (MS)  2,4,2
    2 CALL LOC(I,J,IA,N,M,MS)
      CALL LOC(I,K,IB,N,M,MS)
      IF (IA)  3,6,3
    3 IF (IB)  5,6,5
    4 IA=N*(J-1)+I
      IB=N*(K-1)+I
    5 R(IR)=R(IR)+A(IA)*A(IB)
    6 CONTINUE
      RETURN
      END


      SUBROUTINE MADD(A,B,R,N,M,MSA,MSB)
C
```

```
C***  SUBROUTINE MADD ADDS TWO MATRICES ELEMENT BY ELEMENT TO FORM
C***  RESULTANT MATRIX
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(1),B(1),R(1)
C
C***  DETERMINE STORAGE MODE OF OUTPUT MATRIX
      IF (MSA-MSB)  2,1,2
    1 CALL LOC(N,M,NM,N,M,MSA)
      GO TO 13
    2 MTEST=MSA*MSB
      MSR=0
      IF (MTEST)  4,4,3
    3 MSR=1
    4 IF (MTEST-2)  6,6,5
    5 MSR=2
C***  LOCATE ELEMENTS AND PERFORM ADDITIONS
    6 DO 12 J=1,M
      DO 12 I=1,N
      CALL LOC(I,J,IJR,N,M,MSR)
      IF (IJR)  7,12,7
    7 CALL LOC(I,J,IJA,N,M,MSA)
      AEL=0.0
      IF (IJA)  8,9,8
    8 AEL=A(IJA)
    9 CALL LOC(I,J,IJB,N,M,MSB)
      BEL=0.0
      IF (IJB)  10,11,10
   10 BEL=B(IJB)
   11 R(IJR)=AEL+BEL
   12 CONTINUE
      RETURN
C***  ADD MATRICES OF LIKE-STORAGE MODE
   13 DO 14 I=1,NM
   14 R(I)=A(I)+B(I)
      RETURN
      END
```

```
      SUBROUTINE GAMX(K)
C
C***  SUBROUTINE GAMX CALCULATES A BIAS AND GAIN CORRECTION FOR VALUES
C***  OF PITCH ANGLE
C
      IMPLICIT REAL*8(A-H,O-Z)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CPM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),CL(450),XX(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
C
C***  FORM COEFFICIENTS FOR LEAST SQUARES
      DO 1 I=1,K
      C(I,1)=1.0D0
      C(I,2)=F2(I)
    1 X(I,1)=F6(I)+FT1(I)
C***  PERFORM LEAST SQUARES FOR GAIN AND BIAS
      CALL LLSQAR(C,X,K,2,1,450,450,16,WKAR,IER,JWRITE)
      IF (IER.EQ.129) GO TO 2
      GO TO 4
    2 WRITE (JWRITE,3)
    3 FORMAT (1X,////,10X,'ZERO MATRIX ENCOUNTERED IN SUBROUTINE GAMX.
     1TO NEXT DATA SET, IF ANY.',//)
      IERR=1
      RETURN
    4 WRITE (JWRITE,5) X(2,1),X(1,1)
    5 FORMAT (1X,/,42X,50('-'),/,42X,'|',48X,'|',/,42X,'|  PITCH-ANGLE G
     1AIN = ',1PD18.11,9X,'|',/,42X,'|  PITCH-ANGLE BIAS = ',1PD18.11,'
     1RADIAN  |',/,42X,'|',48X,'|',/,42X,50('-'),/)
C***  PERFORM CORRECTIONS TO PITCH ANGLE VALUES
      DO 6 I=1,K
    6 F2(I)=X(2,1)*F2(I)+X(1,1)
      RETURN
C
      ENTRY NPITCH(K)
C
C***  ENTRY NPITCH SOLVES FOR PITCH ANGLE BY NEWTON-RAPHSON
C
C***  INITIALIZE PARAMETERS
      CALL CHNGE(SGN)
C***  BEGIN SOLUTION LOOP
      DO 9 I=1,K
      IT=0
      TS=F2(I)
      T=TS
      AM=DABS(F6(I))
      IF (F6(I).LT.0.0D0) CALL SIGNS(SGN,IEX1,IEX2,IEX3,IEX4)
C***  COMPUTE POWER AND DRAG COEFFICIENT
      PWR=CPM(1)+CPM(2)*F4(I)**EX1+CPM(3)*F4(I)**EX2+CPM(4)*F4(I)**EX3+C
     1PM(5)*F4(I)**EX4
      CD=CPM(6)+SGN(1)*CPM(7)*AM**IEX1+SGN(2)*CPM(8)*AM**IEX2+SGN(3)*CPM
     1(9)*AM**IEX3+SGN(4)*CPM(10)*AM**IEX4
      IF (F6(I).LT.0.0D0) CALL CHNGE(SGN)
C***  FORM NEWTON-RAPHSON EQUATIONS
    7 FT=DCOS(F6(I)+TIA)*PWR/(F1(I)*F4(I))-(DSIN(T-F6(I))+F8(I)/G+F5(I)*
     1S*F4(I)**2*CD/(2.0D0*F1(I)))
      FTP=-DCOS(T-F6(I))
      IF (DABS(FTP).LT.1.0D-10) GO TO 8
      IT=IT+1
      TT=T-FT/FTP
      IF (DABS(TT-T).LT.1.0D-16.OR.IT.GE.40) GO TO 8
      T=TT
      GO TO 7
C***  ADJUST PITCH ANGLE
    8 F2(I)=TS+0.333333D0*(TS-T)
    9 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE LSD(X,Y,N,AL,M,RMS,LMET,IERR,JWRITE,MTH)
C
C***  SUBROUTINE LSD IS A MODIFICATION OF THE GENERAL LEAST-SQUARE-
C***  DISTANCE CURVE FITTING PROGRAM GIVEN IN THE FOLLOWING REFERENCE:
C***     A LEAST-SQUARE-DISTANCE CURVE-FITTING TECHNIQUE
C***     JOHN Q. HOWELL, NASA TN D-6374, JULY 1971
C
```

```
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(4,4),AL(4),B(4,1),DIS(450),DYDAL(4,450),W(450),X(N),XX
     1(450),Y(N),YY(450),SAL(4),NKAR(32),IPT(450)
C
C***  SET INITIAL PARAMETERS
      RANGE=0.01D0
      MX=100
      ERR=0.05D0
      RMSOLD=0.0D0
      MTHP1=MTH+1
C***  START ITERATION
      DO 30 ITER=1,MX
C***  FIND CLOSEST POINTS ON CURVE
      IFAIL=0
      DO 12 I=1,N
      W(I)=1.0D0
C***  OBTAIN INITIAL GUESS AT X-COORDINATE OF CLOSEST POINT
C***  (XX(I),YY(I)) ON CURVE TO DATA POINT (X(I),Y(I)) FROM THE
C***  INTERSECTION OF A PERPENDICULAR FROM THE DATA POINT WITH
C***  THE TANGENT TO THE CURVE AT THE POINT (X(I),F(X(I))) WHERE
C***  THE CURVE EQUATION IS Y = F(X)
      CALL FNCTNA(AL,X(I),F,DFDX,MTHP1)
      XX(I)=X(I)-(F-Y(I))*DFDX/(1.0D0+DFDX*DFDX)
C***  SEARCH ABOUT THIS POINT XX(I) FOR A SIGN CHANGE IN THE
C***  FUNCTION  (F(X) - Y(I))*DFDX + (X - X(I))
      IF (X(I).NE.0.0D0) GO TO 1
      YY(I)=F
      XX(I)=X(I)
      GO TO 11
    1 IF (I.NE.1) GO TO 2
      DXUPR=RANGE*(X(I+1)-X(I))
      DXLWR=RANGE*X(I)
      GO TO 3
    2 DXLWR=RANGE*(X(I)-X(I-1))
      DXUPR=DXLWR
      IF (I.NE.N)DXUPR=RANGE*(X(I+1)-X(I))
    3 XLWR=XX(I)
      XUPR=XLWR
      DO 5 J=1,100
      CALL FNCTNA(AL,XLWR,FLWR,DFLWR,MTHP1)
      CALL FNCTNA(AL,XUPR,FUPR,DFUPR,MTHP1)
      FUNLWR=(FLWR-Y(I))*DFLWR+(XLWR-X(I))
      FUNUPR=(FUPR-Y(I))*DFUPR+(XUPR-X(I))
      IF (FUNLWR*FUNUPR)  6,4,4
    4 XLWR=XLWR-DXLWR
      XUPR=XUPR+DXUPR
      IF (XLWR.LT.0.0D0)XLWR=0.0D0
    5 CONTINUE
      DIS(I)=0.0D0
      IFAIL=IFAIL+1
      IPT(IFAIL)=I
      W(I)=0.0D0
      GO TO 12
C***  SIGN CHANGE HAS BEEN FOUND.  FIND ROOT BY METHOD OF FALSE
C***  POSITION.
    6 XOLD=0.0D0
      DO 9 J=1,100
      XROOT=(XLWR*FUNUPR-XUPR*FUNLWR)/(FUNUPR-FUNLWR)
      IF (DABS(1.0D0-XOLD/XROOT).LT.1.0D-03) GO TO 10
      XOLD=XROOT
      CALL FNCTNA(AL,XROOT,FROOT,DFROOT,MTHP1)
      FUNRT=(FROOT-Y(I))*DFROOT+(XROOT-X(I))
      IF (FUNLWR*FUNRT)  7,10,8
    7 FUNUPR=FUNRT
      XUPR=XROOT
      GO TO 9
    8 FUNLWR=FUNRT
      XLWR=XROOT
    9 CONTINUE
      DIS(I)=0.0D0
      IFAIL=IFAIL+1
      IPT(IFAIL)=I
      W(I)=0.0D0
      GO TO 12
C***  CLOSEST POINT FOUND, NOW FIND DISTANCE
   10 XX(I)=XROOT
      YY(I)=FROOT
   11 DX=XX(I)-X(I)
      DY=YY(I)-Y(I)
      DIS(I)=DSQRT(DX*DX+DY*DY)
   12 CONTINUE
      IF (IFAIL.NE.0) WRITE (JWRITE,13) ITER
   13 FORMAT (1X,//,24X,79HTHE SHORTEST DISTANCE COULD NOT BE FOUND FOR
     1THE FOLLOWING POINTS ON ITERATION#,I3,1H:,/)
      IF (IFAIL.NE.0) WRITE (JWRITE,14) (IPT(I),I=1,IFAIL)
   14 FORMAT (24X,21(I3,1H,))
C***  COMPLETE SET OF CLOSEST POINTS AND DISTANCES FOUND
C***  NOW FIND NEW SET OF PARAMETERS
      PC=0.05D0
      IPCF=PC*N
C***  EXIT FROM ROUTINE IF 5 PERCENT OR MORE OF CLOSEST DISTANCES
C***  CANNOT BE FOUND
      IF (IFAIL.GE.IPCF)LNET=1
      IF (IFAIL.GT.IPCF.AND.ITER.EQ.1) GO TO 34
      IF (IFAIL.GE.IPCF) GO TO 32
      SUMDIS=0.0D0
      DO 15 I=1,N
   15 SUMDIS=SUMDIS+DIS(I)*DIS(I)
C***  FIND ROOT-MEAN-SQUARE DEVIATION
      RMS=DSQRT(SUMDIS/(N-IFAIL))
      IF (ITER.GT.1) GO TO 17
      RMSS=RMS
      DO 16 I=1,4
   16 SAL(I)=AL(I)
C***  CHECK FOR CONVERGENCE
   17 IF (DABS(RMS-RMSOLD).LT.ERR*RMS) GO TO 32
      IF (ITER.GT.1.AND.RMS.GT.RMSS) GO TO 32
      RMSS=RMS
      DO 18 I=1,4
   18 SAL(I)=AL(I)
C***  GENERATE MATRIX COEFFICIENTS OF LINEAR SIMULTANEOUS EQUATIONS
      CALL FNCTNB(AL,N,XX,YY,DYDAL,MTHP1)
      DO 21 K=1,M
      B(K,1)=0.0D0
      DO 21 I=1,N
      B(K,1)=B(K,1)+(Y(I)-YY(I))*DYDAL(K,I)*W(I)
      IF (W(I).EQ.0.0D0) GO TO 20
      IF (DIS(I).EQ.0.0D0) GO TO 19
      DYDAL(K,I)=(Y(I)-YY(I))*DYDAL(K,I)/DIS(I)
      GO TO 21
```

```
   19 CALL FNCTNA(AL,XX(I),F,DF,NTHP1)
      IF (DF.EQ.0.0D0) GO TO 20
      DYDAL(K,I)=DSQRT(1.0D0/(1.0D0+1.0D0/DF/DF))*DYDAL(K,I)
      GO TO 21
   20 DYDAL(K,I)=0.0D0
   21 CONTINUE
      DO 24 K=1,N
      DO 23 J=K,N
      A(K,J)=0.0D0
      DO 22 I=1,M
   22 A(K,J)=A(K,J)+DYDAL(K,I)*DYDAL(J,I)
   23 A(J,K)=A(K,J)
   24 CONTINUE
C***  INCREASE STABILITY WITH DAMPING TECHNIQUE
      T=0.0D0
      DO 25 I=1,N
   25 T=T+B(I,1)*B(I,1)
      WW=0.5D0*SUMDIS/T
      DO 26 I=1,N
   26 A(I,I)=A(I,I)+0.5D0/WW
C***  SOLVE THE LINEAR SIMULTANEOUS EQUATION FOR CORRECTIONS TO
C***  THE AL(I) AND GENERATE NEW AL(I)
      CALL LLSQAR(A,B,N,N,1,4,4,16,WKAR,IER,JWRITE)
      IF (IER.EQ.129)IERR=1
      IF (IERR.NE.0) GO TO 32
      AL(1)=AL(1)+B(1,1)
      GO TO (27,27,28,28,29,29),NTHP1
   27 AL(2)=AL(2)+B(2,1)
      GO TO 30
   28 AL(2)=AL(2)+B(2,1)
      AL(3)=AL(3)+B(3,1)
      AL(4)=AL(4)+B(4,1)
      GO TO 30
   29 AL(3)=AL(3)+B(2,1)
      AL(4)=AL(4)+B(3,1)
   30 CONTINUE
      WRITE (JWRITE,31) NX,ERR
   31 FORMAT (1X,9('*'),'AFTER',I4,' ITERATIONS |1.0 - RMS/RMSOLD|, THE
     1RELATIVE ERROR BETWEEN'/1X,11X,'TWO SUCCESSIVE VALUES OF RMS, STIL
     1L EXCEEDS THE SPECIFIED ERROR PARAMETER =',D10.3)
      RETURN
   32 RMS=RMSS
      DO 33 I=1,4
   33 AL(I)=SAL(I)
   34 RETURN
      END
```

```
      SUBROUTINE FNCTNA(A,X,Y,DYDX,NTHP1)
C
C***  SUBROUTINE FNCTNA COMPUTES THE VALUE OF THE FITTED FUNCTION AND
C***  ITS X-DERIVATIVE
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(4)
C
      GO TO (1,1,2,2,4,4),NTHP1
C***  CALCULATE FUNCTION VALUE AND ITS DERIVATIVE VALUE
    1 Y=A(1)+A(2)*X
      DYDX=A(2)
      RETURN
C***  CHECK ARGUMENT FOR ERROR
    2 IF (X.LE.0.0D0) GO TO 3
C***  CALCULATE FUNCTION VALUE AND ITS DERIVATIVE VALUE
      Y=A(1)+A(2)*X+A(3)*X**A(4)
      DYDX=A(2)+A(3)*A(4)*X**(A(4)-1.0D0)
      RETURN
C***  SET FUNCTION VALUE AND ITS DERIVATIVE VALUE
    3 Y=A(1)
      DYDX=0.0D0
      RETURN
C***  CHECK ARGUMENT FOR ERROR
    4 IF (X.LE.0.0D0) GO TO 5
C***  CALCULATE FUNCTION VALUE AND ITS DERIVATIVE VALUE
      Y=A(1)+A(3)*X**A(4)
      DYDX=A(3)*A(4)*X**(A(4)-1.0D0)
      RETURN
C***  SET FUNCTION VALUE AND ITS DERIVATIVE VALUE
    5 Y=A(1)
      DYDX=0.0D0
      RETURN
      END
```

```
      SUBROUTINE FNCTNB(A,N,X,Y,DYDA,NTHP1)
C
C***  SUBROUTINE FNCTNB COMPUTES THE VALUE OF THE FITTED FUNCTION
C***  AND ITS PARTIAL DERIVATIVES WITH RESPECT TO THE COEFFICIENTS
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(4),DYDA(4,N),X(N),Y(N)
C
      GO TO (1,1,3,3,6,6),NTHP1
C***  FOR NTH=0,1
    1 DO 2 I=1,N
C***  CALCULATE PARTIAL DERIVATIVES
      DYDA(1,I)=1.0D0
      DYDA(2,I)=X(I)
    2 Y(I)=A(1)+A(2)*X(I)
      RETURN
C***  FOR NTH=2,3
    3 DO 5 I=1,N
C***  CALCULATE PARTIAL DERIVATIVES
      DYDA(1,I)=1.0D0
      DYDA(2,I)=X(I)
C***  TEST ARGUMENT
      IF (X(I).LE.0.0D0) GO TO 4
      DYDA(3,I)=X(I)**A(4)
      DYDA(4,I)=A(3)*X(I)**A(4)*DLOG(X(I))
C***  CALCULATE FUNCTION VALUE
      Y(I)=A(1)+A(2)*X(I)+A(3)*X(I)**A(4)
      GO TO 5
C***  SET PARTIAL DERIVATIVES AND FUNCTION TO SPECIFIED VARIABLES
    4 DYDA(3,I)=0.0D0
      DYDA(4,I)=0.0D0
      Y(I)=A(1)
    5 CONTINUE
      RETURN
```

```
C***  FOR NTH=4,5
    6 DO 8 I=1,N
      DYDA(1,I)=1.0D0
C***  TEST ARGUMENT
      IF (X(I).LE.0.0D0) GO TO 7
      DYDA(2,I)=X(I)**A(4)
      DYDA(3,I)=A(3)*X(I)**A(4)*DLOG(X(I))
C***  CALCULATE FUNCTION VALUE
      Y(I)=A(1)+A(3)*X(I)**A(4)
      GO TO 8
    7 DYDA(2,I)=0.0D0
      DYDA(3,I)=0.0D0
      Y(I)=A(1)
    8 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE GDEQN(K,NNB,ICK)
C
C***  SUBROUTINE GDEQN SOLVES FOR POWER AND LIFT COEFFICIENTS BY USING
C***  EQUATION OF MOTION NORMAL TO FLIGHT PATH AND MODIFIES THE A PRIORI
C***  VALUES AND THEIR WEIGHTS, IF NEEDED
C
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION TS(8),LOC(8,18),COF(8),APWF(13,5)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),XX(450),CD(450),X1(450),X2(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNN(18),IERR
      COMMON /LAB1/AP(13),WGT(13),CRMIN(13),CRMAX(13)
      INTEGER IEQN(18)/4,5,5,5,5,5,5,6,6,6,6,6,6,4,5,5,6,6/
      DATA LOC/1,6,7,8,0,0,0,0,1,2,6,7,8,0,0,0,1,2,6,7,8,0,0,0,1,2,6,7,8
     1,0,0,0,1,3,6,7,8,0,0,0,1,3,6,7,8,0,0,0,1,3,6,7,8,0,0,0,1,2,3,6,7,8
     1,0,0,1,2,3,6,7,8,0,0,1,2,3,6,7,8,0,0,1,3,4,6,7,8,0,0,1,3,4,6,7,8,0
     1,0,1,3,4,6,7,8,0,0,1,6,7,8,0,0,0,0,1,2,6,7,8,0,0,0,1,3,6,7,8,0,0,0
     1,1,2,3,6,7,8,0,0,1,3,4,6,7,8,0,0/,APWF/1.0D0,1.0D0,1.0D0,1.0D0,1.0
     1D0,1.0D0,1.0D0,1.0D0,1.0D0,1.0D0,1.0D0,1.0D0,1.0D0,2.0D-2,1.0D+0,2
     1.0D-1,2.0D+4,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D
     1+0,1.0D+3,2.0D-3,1.0D+0,2.0D-2,2.0D+3,1.0D+0,1.0D+0,1.0D+0,1.0D+0,
     11.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+3,2.0D-4,1.0D+0,2.0D-3,2.0D+2,1.0
     1D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.CD+4,2.0D-5
     1,1.0D+0,2.0D-3,2.0D+1,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.
     10D+0,1.0D+0,1.0D+4/
C
      IF (ICK.GT.1) GO TO 17
      WRITE (JWRITE,1)
    1 FORMAT (1X,///,51X,30HNORMAL-TO-FLIGHT-PATH SOLUTION,/)
      WRITE (JWRITE,2)
    2 FORMAT (28X,76('*'),/,28X,'*',74X,'*')
C***  DETERMINE NUMBER OF UNKNOWNS
      NUM=IEQN(NNB)
      DO 5 I=1,K
C***  DETERMINE GENERAL TERMS FOR MATRIX FORMULATION
      TS(1)=DSIN(F6(I)+TIA)
      TS(2)=TS(1)*F4(I)**EX1
      TS(3)=TS(1)*F4(I)**EX2
      TS(4)=TS(1)*F4(I)**EX3
      TS(5)=TS(1)*F4(I)**EX4
      TS(6)=F5(I)*S*F4(I)**3/2.0D0
      TS(7)=TS(6)*F6(I)
      TS(8)=TS(6)*F6(I)**EXPX
C***  FORM COEFFICIENTS FOR LEAST SQUARES
      DO 4 J=1,NUM
    4 C(I,J)=TS(LOC(J,NNB))
    5 X(I,1)=F4(I)**2*F1(I)/G*(FT2(I)+G*DCOS(FT1(I))/F4(I))
C***  EXACT LEAST SQUARES
      CALL LLSQAR(C,X,K,IEQN(NNB),1,450,450,16,WKAR,IER,JWRITE)
C***  CHECK FOR ERROR
      IF (IER.EQ.129) GO TO 6
      GO TO 8
    6 WRITE (JWRITE,7)
    7 FORMAT (1X,//,10X,'ZERO MATRIX ENCOUNTERED IN GDEQN.  TO NEXT DATA
     1 SET, IF ANY.',//)
      IERR=1
      RETURN
C***  DEFINE COEFFICIENTS IN CORRECT ORDER
    8 DO 9 J=1,8
    9 COF(J)=0.0D0
      DO 10 J=1,NUM
   10 COF(LOC(J,NNB))=X(J,1)
C***  DETERMINE FIT ERROR
      SSX=0.0D0
      DO 11 J=1,K
      P=COF(1)+COF(2)*F4(J)**EX1+COF(3)*F4(J)**EX2+COF(4)*F4(J)**EX3+COF
     1(5)*F4(J)**EX4
      CL=COF(6)+COF(7)*F6(J)+COF(8)*F6(J)**EXPX
      SS=DSIN(F6(J)+TIA)*P+F5(J)*S*F4(J)**3/2.0D0*CL-(F4(J)**2*F1(J)/G*(
     1FT2(J)+G*DCOS(FT1(J))/F4(J)))
   11 SSX=SSX+SS*SS
C***  WRITE MODEL VALUES
      IF (METRIC.NE.0) GO TO 13
      WRITE (JWRITE,12) NNB,COF(1),COF(6),COF(2),COF(7),COF(3),COF(8),CO
     1F(4),COF(5),SSX
   12 FORMAT (28X,'*',1X,'MODEL ',I2,3X,'P0 = ',1PD23.16,3X,'CLA0= ',1PD
     123.16,2X,'*',/,28X,'*',12X,'P1 = ',1PD23.16,3X,'CLA = ',1PD23.16,2
     1X,'*',/,28X,'*',12X,'P2 = ',1PD23.16,3X,'CLAX= ',1PD23.16,2X,'*',/
     1,28X,'*',12X,'P3 = ',1PD23.16,34X,'*',/,28X,'*',12X,'P4 = ',1PD23.
     116,34X,'*',/,28X,'*',74X,'*',/,28X,'*',1X,'FIT ERROR= ',D23.16,39X
     1,'*',/,28X,'*',74X,'*',/,28X,76('*'))
      GO TO 14
   13 P0=COF(1)*1.355818D-3
      P1=COF(2)*1.355818D-3
      P2=COF(3)*1.355818D-3
      P3=COF(4)*1.355818D-3
      P4=COF(5)*1.355818D-3
      WRITE (JWRITE,12) NNB,P0,COF(6),P1,COF(7),P2,COF(8),P3,P4,SSX
   14 WRITE (JWRITE,15)
   15 FORMAT (28X,'*',74X,'*',/,28X,76('*'),//)
C***  MODIFY A PRIORI VALUES AND WEIGHTS IF NECESSARY
      IF (WGT(1).GT.0.0D0) GO TO 16
C***  MODIFICATICN TO FIRST-POWER-COEFFICIENT A PRIORI
      AP(1)=221.2D0*CFM(1)**2/(220.2D0*CFM(1)+COF(1))
      WGT(1)=AP(1)*AP(1)*20.0D0
C***  MODIFICATION TO SECOND-POWER-COEFFICIENT A PRIORI
      AP(2)=AP(2)
      WGT(2)=WGT(2)
```

```
C***  MODIFICATION TO THIRD-POWER-COEFFICIENT A PRIORI
      AP(3)=127.0D0*CPH(3)**2/(126.D0*CPH(3)+COF(3))
      WGT(3)=AP(3)*AP(3)*200.0D0
C***  MODIFICATION TO FOURTH-POWER-COEFFICIENT A PRIORI
      AP(4)=34.3D0*CPH(4)**2/(33.3D0*CPH(4)+COF(4))
      WGT(4)=AP(4)*AP(4)*2.0D+07
C***  MODIFICATION TO FIFTH-POWER-COEFFICIENT A PRIORI
      AP(5)=AP(5)
      WGT(5)=WGT(5)
   16 RETURN
C***  MODIFY A PRIORI WEIGHTS DUE TO TRAJECTORY PREDICTION ROUTINE'S
C***  ITERATION NUMBER
   17 DO 18 I=1,13
      IF (WGT(I).EQ.0.0D0) GO TO 18
      WGT(I)=AP(I)*AP(I)*APWF(I,ICK)
   18 CONTINUE
      RETURN
      END


      SUBROUTINE SIGNS(Y,X1,X2,X3,X4)
C
C***  SUBROUTINE SIGNS DETERMINES THE CORRECT SIGN ON TERMS IN
C***  COMPUTING THE DRAG COEFFICIENT EXPRESSION OR ITS DERIVATIVES IN
C***  RELATION TO ARGUMENT AND EXPONENTS
C
      IMPLICIT REAL*8(A-H,O-Z)
      INTEGER*4 X1,X2,X3,X4
      DIMENSION Y(4),L(4)
C
      DO 1 I=1,4
    1 Y(I)=1.0D0
      L(1)=X1
      L(2)=X2
      L(3)=X3
      L(4)=X4
      DO 2 I=1,4
      IF (((L(I)/2)*2).NE.L(I))Y(I)=-1.0D0
    2 CONTINUE
      RETURN
      ENTRY CHNGE(Y)
      DO 3 I=1,4
    3 Y(I)=1.0D0
      RETURN
      END


      SUBROUTINE LLSQAR(A,B,M,NA,NB,IA,IB,IDGT,WKAREA,IER,JWRITE)
C
C***  SUBROUTINE LLSQAR PERFORMS A LEAST SQUARES SOLUTION OF A OVER-
C***  DETERMINED SYSTEM OF LINEAR EQUATIONS
C
      DIMENSION A(IA,1),B(IB,1),WKAREA(1)
      REAL*8 SUM
      REAL*8 A,B,WKAREA
C
C***  INITIALIZE IER
      IER=0
C***  FIND THE PSEUDO-INVERSE OF MATRIX A
      CALL LPSDOR(A,M,NA,IA,A,IDGT,WKAREA,IER,JWRITE)
      IF (IER.NE.0) GO TO 5
C***  SOLVE THE EQUATION BY MULTIPLYING A-INVERSE AND B
      DO 4 I=1,NB
      DO 2 J=1,NA
      CALL VXPZRO
      DO 1 K=1,M
      CALL VXPMUL(A(K,J),B(K,I))
    1 CONTINUE
      CALL VXPSTO(SUM)
      WKAREA(J)=SUM
    2 CONTINUE
C***  MOVE THE RESULTS INTO MATRIX B
      DO 3 J=1,NA
      B(J,I)=WKAREA(J)
    3 CONTINUE
    4 CONTINUE
      GO TO 6
    5 IER=129
      CALL UERTST(IER,6HLLSQAR,JWRITE)
    6 RETURN
      END


      SUBROUTINE LPSDOR(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)
C
C***  SUBROUTINE LPSDOR FIND THE PSEUDO-INVERSE OF A MATRIX
C
      DIMENSION A(IA,1),AINV(IA,1),WKAREA(N,1)
      REAL*8 A,AINV,WKAREA,BIGA,AMN,ZERO,ETA
      REAL*8 SUM,DETA
C
C***  INITIALIZE IER
      IER=0
      NP1=N+1
      NP2=N+2
      NP3=N+3
C***  FIND THE LARGEST ELEMENT OF A
      BIGA=0.D0
      DO 1 I=1,M
      DO 1 II=1,N
      IF (BIGA.GE.DABS(A(I,II))) GO TO 1
      BIGA=DABS(A(I,II))
    1 CONTINUE
      AMN=M*N
      ETA=DSQRT(AMN)/(10.**IDGT)*BIGA
C***  CALCULATE THE SINGULAR VALUE DECOMPOSITION OF A
      CALL LSVALR(A,M,N,IA,N,1,WKAREA(1,N+4),WKAREA(1,NP1),AINV,WKAREA)
      DO 2 I=1,N
    2 WKAREA(I,NP2)=WKAREA(I,NP1)
C***  SORT THE SINGULAR VALUES ARRAY INTO ASCENDING SEQUENCE BY ABSOLUTE
C***  VALUE
      CALL VSORTM(WKAREA(1,NP2),N)
      DETA=ETA**2
      CALL VXPZRO
C***  COMPARE SINGULAR VALUES AND ETA
      DO 3 I=1,N
      IP=I
```

```
      CALL VXPMUL(WKAREA(I,NP2),WKAREA(I,NP2))
      CALL VXPSTO(SUM)
      IF (SUM.GT.DETA) GO TO 4
    3 CONTINUE
      IER=129
      GO TO 15
    4 IP=IP-1
      IF (IP.NE.0) GO TO 5
      ZERO=0.D0
      GO TO 6
    5 ZERO=WKAREA(IP,NP2)
    6 DO 10 I=1,N
      IF (WKAREA(I,NP1).LE.ZERO) GO TO 8
      DO 7 J=1,N
    7 WKAREA(J,I)=WKAREA(J,I)/WKAREA(I,NP1)
      GO TO 10
C***  SET WKAREA(J,I)=0.0, FOR J=1,...,N, IF WKAREA(I,NP1).LE.ZERO
    8 DO 9 J=1,N
    9 WKAREA(J,I)=0.0
   10 CONTINUE
      DO 14 I=1,N
      DO 12 J=1,N
      CALL VXPZRO
      DO 11 K=1,N
   11 CALL VXPMUL(WKAREA(J,K),AINV(I,K))
      CALL VXPSTO(SUM)
   12 WKAREA(J,NP3)=SUM
C***  MOVE THE RESULTS INTO MATRIX AINV
      DO 13 J=1,N
   13 AINV(I,J)=WKAREA(J,NP3)
   14 CONTINUE
      GO TO 16
   15 CALL UERTST(IER,6HLPSDOR,JWRITE)
   16 RETURN
      END


      SUBROUTINE LSVALR(A,M,N,IA,IV,ISW,WKAREA,Q,U,V)
C
C***  SUBROUTINE LSVALR DETERMINES THE SINGULAR VALUE DECOMPOSITION OF A
C***  MATRIX
C
      DIMENSION A(IA,1),U(IA,1),V(IV,1),Q(1),WKAREA(1)
      REAL*8A,WKAREA,Q,U,V,EPS,TOL
      REAL*8F,G,H,X,Y,Z,C,S,HR,GE,DPS,ONE,ZERO
      DATA TOL/Z0D10000000000000/,DPS/Z3410000000000000/
      DATA ONE/1.0D0/,ZERO/0.0D0/
C
      EPS=DPS
      DO 1 I=1,M
      DO 1 J=1,N
      U(I,J)=A(I,J)
    1 CONTINUE
C***  HOUSEHOLDER'S REDUCTION TO BIDIAGONAL FORM
      X=0.D0
      G=0.D0
      DO 17 I=1,N
      WKAREA(I)=G
      CALL VXPZRO
      L=I+1
      DO 2 J=I,M
    2 CALL VXPMUL(U(J,I),U(J,I))
      CALL VXPSTO(S)
      IF (S.GE.TOL) GO TO 3
      G=0.D0
      GO TO 7
    3 F=U(I,I)
      G=-DSQRT(S)
      IF (F.LT.0.D0)G=-G
      H=F*G-S
      HR=1.0/H
      U(I,I)=F-G
      IF (L.GT.N) GO TO 7
      DO 6 J=L,N
      CALL VXPZRO
      DO 4 K=I,M
    4 CALL VXPMUL(U(K,I),U(K,J))
      CALL VXPSTO(S)
      F=S*HR
      DO 5 K=I,M
    5 U(K,J)=U(K,J)+F*U(K,I)
    6 CONTINUE
    7 Q(I)=G
      CALL VXPZRO
      IF (L.GT.N) GO TO 9
      DO 8 J=L,N
    8 CALL VXPMUL(U(I,J),U(I,J))
      CALL VXPSTO(S)
    9 IF (S.GE.TOL) GO TO 10
      G=0.D0
      GO TO 16
   10 IF (I.LT.N) F=U(I,I+1)
      G=-DSQRT(S)
      IF (F.LT.0.D0)G=-G
      H=F*G-S
      HR=1.0/H
      IF (I.LT.N)U(I,I+1)=F-G
      IF (L.GT.N) GO TO 12
      DO 11 J=L,N
   11 WKAREA(J)=U(I,J)*HR
   12 IF (L.GT.M) GO TO 16
      DO 15 J=L,M
      CALL VXPZRO
      IF (L.GT.N) GO TO 15
      DO 13 K=L,N
   13 CALL VXPMUL(U(J,K),U(I,K))
      CALL VXPSTO(S)
      DO 14 K=L,N
   14 U(J,K)=U(J,K)+S*WKAREA(K)
   15 CONTINUE
   16 Y=DABS(Q(I))+DABS(WKAREA(I))
      IF (Y.GT.X)X=Y
   17 CONTINUE
C***  ACCUMULATION OF RIGHT HAND TRANSFORMATIONS
      IF (ISW.EQ.0) GO TO 37
      DO 25 I=1,N
      II=N-I+1
      IF (G.EQ.0.D0) GO TO 22
      IF (L.GT.N) GO TO 24
```

```
      H=U(II,II+1)*G
      HR=1.0/H
      DO 18 J=L,N
   18 V(J,II)=U(II,J)*HR
      DO 21 J=L,N
      CALL VXPZRO
      DO 19 K=L,N
   19 CALL VXPMUL(U(II,K),V(K,J))
      CALL VXPSTO(S)
      DO 20 K=L,N
   20 V(K,J)=V(K,J)+S*V(K,II)
   21 CCNTINUE
   22 IF (L.GT.N) GO TO 24
      DO 23 J=L,N
      V(J,II)=0.DO
   23 V(II,J)=0.DO
   24 V(II,II)=1.CDO
      G=WKAREA(II)
   25 L=II
C***  ACCUMULATION OF LEFT HAND TRANSFORMATIONS
      DO 36 I=1,N
      II=N-I+1
      LL=II+1
      G=Q(II)
      IF (LL.GT.N) GO TO 27
      DO 26 J=LL,N
   26 U(II,J)=0.DO
   27 IF (G.EQ.0.DO) GO TO 33
      H=U(II,II)*G
      HR=1.0/H
      IF (LL.GT.N) GO TO 31
      DO 30 J=LL,N
      CALL VXPZRO
      DO 28 K=LL,M
   28 CALL VXPMUL(U(K,II),U(K,J))
      CALL VXPSTO(S)
      F=S*HR
      DO 29 K=II,M
   29 U(K,J)=U(K,J)+F*U(K,II)
   30 CCNTINUE
   31 GR=1.0/G
      DO 32 J=II,M
   32 U(J,II)=U(J,II)*GR
      GO TO 35
   33 DO 34 J=II,M
   34 U(J,II)=0.DO
   35 U(II,II)=U(II,II)+1.0DO
   36 CCNTINUE
C***  DIAGONALIZATION OF THE BIDIAGONAL FORM
   37 EPS=EPS*X
      DO 57 K=1,N
      KK=N-K+1
C***  TEST F SPLITTING
   38 DO 39 L=1,KK
      LL=KK-L+1
      IF (DABS(WKAREA(LL)).LE.EPS) GO TO 45
      IF (LL.EQ.1) GO TO 45
      IF (DABS(Q(LL-1)).LE.EPS) GO TO 40
   39 CONTINUE
C***  CANCELLATION OF WKAREA(L) IF LL.GT.1
   40 C=0.DO
      S=1.0DO
      L1=LL-1
      IF (KK.LT.LL) GO TO 45
      DO 44 I=LL,KK
      F=S*WKAREA(I)
      WKAREA(I)=C*WKAREA(I)
      IF (DABS(F).LE.EPS) GO TO 45
      G=Q(I)
      Q(I)=DSQRT(F*F+G*G)
      H=Q(I)
      IF (H.NE.ZERO) GO TO 41
      C=ZERO
      S=ONE
      GO TO 42
   41 C=G/H
      S=-F/H
   42 IF (ISW.EQ.0) GO TO 44
      DO 43 J=1,M
      Y=U(J,L1)
      Z=U(J,I)
      U(J,L1)=Y*C+Z*S
   43 U(J,I)=-Y*S+Z*C
   44 CONTINUE
C***  TEST F CONVERGENCE
   45 Z=Q(KK)
      IF (LL.EQ.KK) GO TO 55
C***  SHIFT FROM BOTTCM 2X2 MINOR
      X=Q(LL)
      IF (KK.GT.1) Y=Q(KK-1)
      IF (KK.GT.1) G=WKAREA(KK-1)
      H=WKAREA(KK)
      F=((Y-Z)*(Y+Z)+(G-H)*(G+H))/(2.DC*H*Y)
      G=DSQRT(F*F+ONE)
      IF (F.LT.0.DO) F=((X-Z)*(X+Z)+H*(Y/(F-G)-H))/X
      IF (F.GE.0.DO) F=((X-Z)*(X+Z)+H*(Y/(F+G)-H))/X
C***  NEXT QR TRANSFCRMATION
      C=1.0DO
      S=1.0DO
      L2=LL+1
      IF (KK.LT.L2) GO TO 54
      DO 53 I=L2,KK
      G=WKAREA(I)
      Y=Q(I)
      H=S*G
      G=C*G
      Z=DSQRT(F*F+H*H)
      WKAREA(I-1)=Z
      IF (Z.NE.ZERO) GO TO 46
      C=ZERO
      S=ONE
      GO TO 47
   46 C=F/Z
      S=H/Z
   47 F=X*C+G*S
      G=-X*S+G*C
      H=Y*S
      Y=Y*C
      IF (ISW.EQ.0) GO TO 49
      DO 48 J=1,N
```

```
      X=V(J,I-1)
      Z=V(J,I)
      V(J,I-1)=X*C+Z*S
   48 V(J,I)=-X*S+Z*C
   49 Z=DSQRT(F*F+H*H)
      Q(I-1)=Z
      IF (Z.NE.ZERO) GO TO 50
      C=ZERO
      S=ONE
      GO TO 51
   50 C=F/Z
      S=H/Z
   51 F=C*G+S*Y
      X=-S*G+C*Y
      IF (ISW.EQ.0) GO TO 53
      DO 52 J=1,N
      Y=U(J,I-1)
      Z=U(J,I)
      U(J,I-1)=Y*C+Z*S
   52 U(J,I)=-Y*S+Z*C
   53 CONTINUE
   54 WKAREA(LL)=ZERO
      WKAREA(KK)=F
      Q(KK)=X
      GO TO 38
C***  CONVERGENCE
   55 IF (Z.GE.ZERO) GO TO 57
      Q(KK)=-Z
      IF (ISW.EQ.0) GO TO 57
      DO 56 J=1,N
   56 V(J,KK)=-V(J,KK)
   57 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE UERTST(IER,NAME,JWRITE)
C
C***  SUBROUTINE UERTST GENERATES ERROR MESSAGES
C
      DIMENSION ITYP(5,4),IBIT(4)
      INTEGER*2 NAME(3)
      INTEGER WARN,WARF,TERM,JWRITE
      EQUIVALENCE (IBIT(1),WARN),(IBIT(2),WARF),(IBIT(3),TERM)
      DATA ITYP/'WARN','ING ','    ','    ','    ','WARN','ING(','WITH',
     1' FIX',')   ','TERM','INAL','    ','    ','    ','NON-','DEFI','NE
     1D ','    ','    '/,IBIT/32,64,128,0/
C
      IER2=IER
      IF (IER2.GE.WARN) GO TO 1
C***  UNDEFINED
      IER1=4
      GO TO 4
    1 IF (IER2.LT.TERM) GO TO 2
C***  TERMINAL
      IER1=3
      GO TO 4
    2 IF (IER2.LT.WARF) GO TO 3
C***  WARNING (WITH FIX)
      IER1=2
      GO TO 4
C***  WARNING
    3 IER1=1
C***  EXTRACT 'N'
    4 IER2=IER2-IBIT(IER1)
C***  PRINT ERROR MESSAGE
      WRITE (JWRITE,5) (ITYP(I,IER1),I=1,5),NAME,IER2,IER
    5 FORMAT (1X,/,1X,'ERROR MESSAGE FROM UERTST',2X,5A4,4X,3A2,4X,I2,2X
     1,'IER= ',I3)
      RETURN
      END
```

```
      SUBROUTINE VSORTM(A,LA)
C
C***  SUBROUTINE VSORTM SORTS ARRAYS BY ABSOLUTE VALUE
C
      DIMENSION A(1),IU(21),IL(21)
      REAL*8A,T,TT
C
C***  FIND ABSOLUTE VALUES OF ARRAY A
      DO 1 I=1,LA
      IF (A(I).LT.0.0) A(I)=-A(I)
    1 CONTINUE
C
      ENTRY VSORTA(A,LA)
C
C***  ENTRY VSORTA SORTS ARRAYS BY ALGEBRAIC VALUE
C
      M=1
      I=1
      J=LA
      R=.375
    2 IF (I.EQ.J) GO TO 11
      IF (R.GT..5898437) GO TO 4
      R=R+3.90625E-2
      GO TO 5
    4 R=R-.21875
    5 K=I
C***  SELECT A CENTRAL ELEMENT OF THE ARRAY AND SAVE IT IN LOCATION T
      IJ=I+(J-I)*R
      T=A(IJ)
C***  IF FIRST ELEMENT OF ARRAY IS GREATER THAT T, INTERCHANGE WITH T
      IF (A(I).LE.T) GO TO 6
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
    6 L=J
C***  IF LAST ELEMENT OF ARRAY IS LESS THAN T, INTERCHANGE WITH T
      IF (A(J).GE.T) GO TO 8
      A(IJ)=A(J)
      A(J)=T
      T=A(IJ)
C***  IF FIRST ELEMENT OF ARRAY IS GREATER THAN T, INTERCHANGE WITH T
      IF (A(I).LE.T) GO TO 8
      A(IJ)=A(I)
      A(I)=T
      T=A(IJ)
```

```
      GO TO 8
    7 TT=A(L)
      A(L)=A(K)
      A(K)=TT
C***  FIND AN ELEMENT IN SECOND HALF OF ARRAY WHICH IS SMALLER THAN T
    8 L=L-1
      IF (A(L).GT.T) GO TO 8
C***  FIND AN ELEMENT IN FIRST HALF OF ARRAY WHICH IS GREATER THAN T
    9 K=K+1
      IF (A(K).LT.T) GO TO 9
C***  INTERCHANGE THESE ELEMENTS
      IF (K.LE.L) GO TO 7
C***  SAVE UPPER AND LOWER SUBSCRIPTS OF THE ARRAY YET TO BE SORTED
      IF (L-I.LE.J-K) GO TO 10
      IL(M)=I
      IU(M)=L
      I=K
      M=M+1
      GO TO 12
   10 IL(M)=K
      IU(M)=J
      J=L
      M=M+1
      GO TO 12
C***  BEGIN AGAIN ON ANOTHER PORTION OF UNSORTED ARRAY
   11 M=M-1
      IF (M.EQ.0) RETURN
      I=IL(M)
      J=IU(M)
   12 IF (J-I.GE.11) GO TO 5
      IF (I.EQ.1) GO TO 2
      I=I-1
   13 I=I+1
      IF (I.EQ.J) GO TO 11
      T=A(I+1)
      IF (A(I).LE.T) GO TO 13
      K=I
   14 A(K+1)=A(K)
      K=K-1
      IF (T.LT.A(K)) GO TO 14
      A(K+1)=T
      GO TO 13
      END


      SUBROUTINE HPATH(N,F,MNB,LPRG,FIT,TARE,HTARE,NHPI)
C
C***  SUBROUTINE HPATH CONTROLS THE TRAJECTORY PREDICTION ROUTINES AND
C***  PERFORMS AN ITERATIVE SCHEME TO ATTEMPT AN IMPROVEMENT IN THE
C***  POWER, LIFT, AND DRAG COEFFICIENTS
C
      IMPLICIT REAL*8(A-H,O-Z)
      EXTERNAL VA,DDV,DDDV,ALP,DVA,PHIDER
      DIMENSION TS(101),WW(450),FIT(2),HLD(3,450),FS(13),RX(169),CC(13),
     1DCX(13),CK(6),WK(6,13),TWJ(13),TOL(6),RS(169),TWKK(169),D(6),PAC(8
     1),ILOC(13),COST(20),U(13,13),Y(13,1),ENER(3),SNN(4),CTP(7),JLOC(13
     1),LLOC(13),PS(13),DF(6),XW(6),AA(4,450),RR(169),TWK(169),AP(169),Z
     1K(13,13),ZL(13,13),RQ(169),WGTL(13),WGTU(13),RXS(169),CCX(13),RWT(
     113,2),ZM(13,13),TWKX(169),YS(13,1),SCALE(13),DSL(13),MLOC(13),XHLD
     1(3,450),HCFM(11,13),SF(13)
      COMMON TIME(450),F1(450),F2(450),F3(450),F4(450),F5(450),F6(450),F
     17(450),F8(450),F9(450),F10(450),F11(450),F12(450),F13(450),F14(450
     1),C(450,11),X(450,1),WKAR(250),CFM(14),SGN(4),SGD(4),FT1(450),FT2(
     1450),PWRA(450),SS(450),ST(450),SU(450),SV(450),EX1,EX2,EX3,EX4,G,S
     1,RHO,TIA,EXPX,PLOW,PHIGH,CDLOW,CDHIGH,JREAD,JWRITE,JPUNCH,IEX1,IEX
     12,IEX3,IEX4,METRIC,L1,L2,IEQNM(18),IERR
      COMMON /LAB1/AP(13),WGT(13),CRMIN(13),CRMAX(13)
      COMMON /LAB2/YCPT,ICD,MTH,MCLCC
      COMMON /TEST/ICKP
      COMMON /LAB7/A,R,W,R1
      COMMON /LAB3/DGAM
      COMMON /LAB4/XRHO
      COMMON /LAB5/GMX,DGMX,D2GM,D3GM
      COMMON /LAB6/T1,ADT
      COMMON /LABX/IWRITE,IRRR
      DATA WGTL/1.0D+1,0.0D+0,5.0D+1,1.0D+3,0.0D+0,1.0D+5,0.0D+0,8.0D+2,
     10.0D+0,3.0D-4,0.0D+0,5.0D+0,1.0D+2/,WGTU/1.0D+1,0.0D+0,5.0D+1,9.0D
     1+3,0.0D+0,1.0D+5,0.0D+0,5.0D+1,0.0D+0,1.0D+5,0.0D+0,1.0D+2,1.0D+6/
     1,SCALE/1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0,1.0
     1D+0,1.0D+0,1.0D+0,1.0D+0,1.0D+0/,DF/1.6D+4,1.0D+1,1.5D-1,1.0D+0,1.
     16D+4,0.0D+0/
C
C***  SET SUBROUTINE PARAMETERS
      NEQ=13
      FXX=1.0D0
C***  INITIALIZE PARAMETERS
      IWRITE=JWRITE
      IRRR=IERR
      IX1=IEX1-1
      IX2=IEX2-1
      IX3=IEX3-1
      IX4=IEX4-1
      IXX1=IX1-1
      IXX2=IX2-1
      IXX3=IX3-1
      IXX4=IX4-1
      CALL CHNGE(SNN)
      CALL CHNGE(SGN)
      CALL CHNGE(SGD)
C***  ENACT SPLINES ON AIRSPEED AND ACCELERATION FOR INTERPOLATION
      CALL SPLINE(N,F4,TIME,AA,1)
      CALL SPLINE(N,F8,TIME,AA,2)
      DO 1 JXP=1,N
    1 WW(JXP)=DDV(TIME(JXP))
      CALL SPLINE(N,WW,TIME,AA,4)
C***  CALCULATE NUMBER OF MATRIX ELEMENTS
      NUM=NEQ
      MXD=NEQ*NEQ
C***  DETERMINE NUMBER OF VALID NONZERO COEFFICIENTS
      DO 2 I=1,NEQ
      IF (CFM(I).EQ.0.0D0)NUM=NUM-1
      HCFM(1,I)=CFM(I)
    2 JLCC(I)=0
C***  BEGIN HPATH ITERATION LOOP
      IPS=0
      LKK=0
      JK=0
    3 JK=JK+1
      LKK=LKK+1
```

```
      IF(JK.GT.NNPI.OR.LKK.GT.NNPI) GO TO 133
      IF (LKK.EQ.1) GO TO 5
      DO 4 LL=1,NEQ
      CRMIN(LL)=CRMIN(LL)*1.0000018D0
    4 CRMAX(LL)=CRMAX(LL)/1.0000018D0
    5 WRITE (JWRITE,6) LKK
    6 FORMAT (1X,///,33X,65HF L I G H T   P A T H   T R A J E C T O R Y
     1  P R E D I C T I O N,//,59X,11HITERATION #,I2,//,5X,'TIME',7X,'AL
     1TITUDE',5X,'AIRSPEED',4X,'FLIGHT PATH',3X,'ANGLE OF',7X,'LIFT',9X,
     1'DRAG',8X,'WEIGHT',8X,'POWER',5X,'ACCELERATION',/,44X,'ANGLE',7X,'
     1ATTACK',5X,'COEFFICIENT',2X,'COEFFICIENT',16X,'AVAILABLE')
      IF (METRIC.NE.0) GO TO 8
      WRITE (JWRITE,7)
    7 FORMAT (4X,'(SEC)',9X,'(FT)',7X,'(FT/SEC)',5X,'(RADIAN)',5X,'(RADI
     1AN)',33X,'(LBF)',5X,'(FT-LBF/SEC)',3X,'(FT/SEC)',/)
      GO TO 10
    8 WRITE (JWRITE,9)
    9 FORMAT (4X,'(SEC)',9X,'(M)',9X,'(M/SEC)',5X,'(RADIAN)',5X,'(RADIAN
     1)',32X,'(NEWTONS)',5X,'(KW)',9X,'(M/SEC)',/)
C***  INITIALIZE PARAMETERS
   10 DO 11 LL=1,3
   11 ERRR(LL)=0.0D0
      NCN=0
      LCN=0
      IPTS=99
      K=N+(N-1)*IPTS
      ICKP=0
      ADT=0.0D0
      DO 12 LL=1,13
      RWT(LL,1)=0.0D0
      RWT(LL,2)=0.0D0
   12 WK(5,LL)=0.0D0
      KPRINT=0
C***  CALCULATE MAXIMUMS FOR WEIGHTS
      XW(1)=F10(1)
      XW(2)=DABS(DARSIN(F11(1)/F4(1)))
      XW(3)=DABS(FT2(1))
      XW(4)=F1(1)
      XW(5)=F4(1)**2/(2.0D0*G)+F10(1)
      XW(6)=DABS(F6(1))
      DO 13 JXP=2,N
      IF (F10(JXP).GT.XW(1))XW(1)=F10(JXP)
      IF (DABS(DARSIN(F11(JXP)/F4(JXP))).GT.XW(2))XW(2)=DABS(DARSIN(F11(
     1JXP)/F4(JXP)))
      IF (DABS(FT2(JXP)).GT.XW(3))XW(3)=DABS(FT2(JXP))
      IF (F1(JXP).GT.XW(4))XW(4)=F1(JXP)
      IF ((F4(JXP)**2/(2.0D0*G)+F10(JXP)).GT.XW(5))XW(5)=F4(JXP)**2/(2.0
     1D0*G)+F10(JXP)
   13 IF (DABS(F6(JXP)).GT.XW(6))XW(6)=DABS(F6(JXP))
C***  CALCULATE WEIGHTS FOR LEAST SQUARES SOLUTION
      DO 14 I=1,6
   14 D(I)=DF(I)/XW(I)**2
C***  ENACT SPLINE ON ANGLE OF ATTACK FOR ROOT ESTIMATIONS
      CALL SPLINE(N,F6,TIME,AA,3)
C***  ENACT POLYNOMIAL FIT ROUTINE ON WEIGHT
      CALL WSUB(N,F1,TIME,WW)
C***  SET INITIAL VALUES
      TM(1)=TIME(1)
      L=1
      LC=1
      I1=L
      I1S=I1
      J=0
      ISET=0
      DO 15 JXP=1,6
   15 TOL(JXP)=0.0D0
C***  BEGIN ANALYSIS ON SET OF POINTS
      DO 88 IPT=2,N
      IPTS=9
      IF (IPT.EQ.2)IPTS=32
      IF (ICKP.NE.0)IPTS=19
      M=1
      IF (IPTS.EQ.0)M=0
      ICKP=0
      IPTSP1=IPTS+1
      K=K-(99-IPTS)
      IF (IPT.LE.2) GO TO 16
      TS=TM(L-1)
      TTPT=TM(1)
      TM(1)=TTM
      L=1
      I1=I1S
   16 DELT=(TIME(IPT)-TIME(IPT-1))/IPTSP1
C***  COMPUTE TIME POINTS BETWEEN INPUT TIME POINTS
      DO 17 JI=1,IPTSP1
      L=L+1
      LC=LC+1
   17 TM(L)=TM(L-1)+DELT
      TM(L)=TIME(IPT)
      TTM=TM(L)
C***  DETERMINE INTERVAL RANGE
      I2=LC
      I1S=I2
      I4=I2-1
      IF (I2.EQ.K)I4=I2
C***  BEGIN ANALYSIS ON INTERVAL RANGE
      DO 87 I=I1,I4
      IF (I.NE.1)AS=AF
      T=TM(I-I1+1)
      V=VA(T)
      DV=DVA(T)
      IF (I.NE.1.AND.KPRINT.EQ.M)AT=A
      A=ALP(T)
      IF (I.NE.1) GO TO 18
C***  DETERMINE PARAMETERS FOR FIRST POINT
      W=F1(I)
      R=F5(I)
      GFPA=DARSIN(F11(I)/F4(I))
      GFPA=GFPA+TARE
      H=F10(I)+HTARE
      T1=0.0D0
      R1=H
      TMT1=T-T1
      GO TO 20
C***  DETERMINE PREVIOUS TIME POINT VALUE
   18 IF (I.EQ.I1)T1=TS
      IF (I.NE.I1)T1=TM(I-I1)
C***  DETERMINE VALUES AT PREVIOUS TIME POINT
      Z=T1
      V=VA(Z)
```

```
      DV=DVA(Z)
      V2=DDV(Z)
      V3=DDDV(Z)
      P=CFM(1)+CFM(2)*V**EX1+CFM(3)*V**EX2+CFM(4)*V**EX3+CFM(5)*V**EX4
C***  COMPUTE WEIGHT DERIVATIVES
      DW=-F*P
      D2W=-F*DV*(EX1*CFM(2)*V**(EX1-1.0D0)+EX2*CFM(3)*V**(EX2-1.0D0)+EX3
     1*CFM(4)*V**(EX3-1.0D0)+EX4*CFM(5)*V**(EX4-1.0D0))
      D3W=-F*(DV**2*(EX1*CFM(2)*(EX1-1.0D0)*V**(EX1-2.0D0)+EX2*CFM(3)*(E
     1X2-1.0D0)*V**(EX2-2.0D0)+EX3*CFM(4)*(EX3-1.0D0)*V**(EX3-2.0D0)+EX4
     1*CFM(5)*(EX4-1.0D0)*V**(EX4-2.0D0))+V2*(EX1*CFM(2)*V**(EX1-1.0D0)+
     1EX2*CFM(3)*V**(EX2-1.0D0)+EX3*CFM(4)*V**(EX3-1.0D0)+EX4*CFM(5)*V**
     1(EX4-1.0D0)))
      D4W=-F*((EX1*CFM(2)*(EX1-1.0D0)*(EX1-2.0D0)*V**(EX1-3.0D0)+EX2*CFM
     1(3)*(EX2-1.0D0)*(EX2-2.0D0)*V**(EX2-3.0D0)+EX3*CFM(4)*(EX3-1.0D0)*
     1(EX3-2.0D0)*V**(EX3-3.0D0)+EX4*CFM(5)*(EX4-1.0D0)*(EX4-2.0D0)*V**(
     1EX4-3.0D0))*DV**3+3.0D0*DV*V2*(EX1*CFM(2)*(EX1-1.0D0)*V**(EX1-2.0D
     10)+EX2*CFM(3)*(EX2-1.0DC)*V**(EX2-2.0D0)+EX3*CFM(4)*(EX3-1.0D0)*V*
     1*(EX3-2.0D0)+EX4*CFM(5)*(EX4-1.0D0)*V*(EX4-2.0DG))+V3*(EX1*CFM(2)*
     1V**(EX1-1.0D0)+EX2*CFM(3)*V**(EX2-1.0D0)+EX3*CFM(4)*V**(EX3-1.0D0)
     1+EX4*CFM(5)*V**(EX4-1.0D0)))
C***  TEST FOR PARAMETERS' UPDATE
      TMT1=T-T1
      IF (KPRINT.NE.N) GO TO 19
      WT=W
      RT=R
      FPA=GMX
      DPFA=DGMX
C***  ESTIMATE WEIGHT, ALTITUDE, AND DENSITY AT NEXT POINT
   19 W=W+TMT1*(DW+TMT1*(D2W/2.0D0+TMT1*(D3W/6.0D0+TMT1*D4W/24.0D0)))
      DH=V*DSIN(GMX)
      D2H=DV*DSIN(GMX)+DGMX*V*DCCS(GMX)
      D3H=(V2-V*DGMX*DGMX)*DSIN(GMX)+(2.0D0*DV*DGMX+V*D2GM)*DCOS(GMX)
      D4H=(V3-3.0D0*V*DGMX*D2GM-3.0D0*DV*DGMX**2)*DSIN(GMX)+(3.0D0*V2*DG
     1MX-V*DGMX**3+3.0D0*DV*D2GM+V*D3GM)*DCOS(GMX)
      IF (I.LE.7)D4H=0.0D0
      H=H+TMT1*(DH+TMT1*(D2H/2.0D0+TMT1*(D3H/6.0D0+TMT1*D4H/24.0D0)))
      R1=R
      R=RHO*(1.0D0-6.86D-6*H)**4.26D0
      V=VA(T)
      DV=DVA(T)
C***  COMPUTE POWER
   20 P=CFM(1)+CFM(2)*V**EX1+CFM(3)*V**EX2+CFM(4)*V**EX3+CFM(5)*V**EX4
      ICK=0
   21 ICK=ICK+1
C***  COMPUTE DRAG COEFFICIENT AND DERIVATIVES WRT ANGLE OF ATTACK
      AM=DABS(A)
      IF (A.GE.0.0D0) GO TO 22
      CALL SIGNS(SNN,IEX1,IEX2,IEX3,IEX4)
      CALL SIGNS(SGN,IX1,IX2,IX3,IX4)
      CALL SIGNS(SGD,IXX1,IXX2,IXX3,IXX4)
   22 CD=CFM(6)+SNN(1)*CFM(7)*AM**IEX1+SNN(2)*CFM(8)*AM**IEX2+SNN(3)*CFM
     1(9)*AM**IEX3+SNN(4)*CFM(10)*AM**IEX4
      CDP=SGN(1)*IEX1*CFM(7)*AM**IX1+SGN(2)*IEX2*CFM(8)*AM**IX2+SGN(3)*I
     1EX3*CFM(9)*AM**IX3+SGN(4)*IEX4*CFM(10)*AM**IX4
      CDPP=SGD(1)*IEX1*IX1*CFM(7)*AM**IXX1+SGD(2)*IEX2*IX2*CFM(8)*AM**IX
     1X2+SGD(3)*IEX3*IX3*CFM(9)*AM**IXX3+SGD(4)*IEX4*IX4*CFM(10)*AM**IXX
     14
      IF (A.GE.0.0D0) GO TO 23
      CALL CHNGE(SNN)
      CALL CHNGE(SGN)
      CALL CHNGE(SGD)
C***  PERFORM NEWTON-RAPHSON TO DETERMINE 'ESTIMATED' ANGLE OF ATTACK
   23 FA=DCOS(A+TIA)*P/(W*V)-(R*S*V*V*CD/(2.0D0*W)+DV/G+DSIN(GFPA))
      FAP=-(DSIN(A+TIA)*P/(W*V)+R*S*V*V*CDP/(2.0D0*W))
      FAPP=-(DCOS(A+TIA)*P/(W*V)+R*S*V*V*CDPP/(2.0D0*W))
      RAD=(FAP/FAPP)*(FAP/FAPP)-2.0DC*(FA/FAPP)
      A1=A
      IF (RAD.LT.0.0D0) GO TO 25
      IF ((FAP*FAPP).LT.0.0D0) GO TO 24
      A=A-FAP/FAPP+DSQRT(RAD)
      GO TO 26
   24 A=A-FAP/FAPP-DSQRT(RAD)
      GO TO 26
   25 A=AS+0.26D0*ADT*TMT1
      LCM=LCM+1
      GO TO 27
   26 IF (DABS(A1-A).LT.1.0D-15.OR.ICK.EQ.20) GO TO 27
      GO TO 21
C***  COMPUTE LIFT COEFFICIENT FOR 'ESTIMATED' ANGLE OF ATTACK
   27 TDAPX=((I-I1)*F3(IPT)+(I4-I)*F3(IPT-1))/(I4-I1)
      GO TO (28,29,30),ICD
   28 IF (A.GT.0.0D0) GO TO 29
      CL=CFM(12)*A+YCPT+CFM(14)*TDAPX
      GO TO 31
   29 CL=CFM(11)+CFM(12)*A+CFM(13)*A**EXPX+CFM(14)*TDAPX
      GO TO 31
   30 CL=CFM(11)+CFM(12)*A+CFM(13)*A*A+CFM(14)*TDAPX
   31 AP=A
C***  WRITE OUT RESULTS
      IF (KPRINT.NE.0) GO TO 34
      IF (METRIC.NE.0) GO TO 33
      WRITE (JWRITE,32) T,H,V,GFPA,A,CL,CD,W,P,DV
   32 FORMAT (1X,10(1PD12.5,1X))
      GO TO 34
   33 ALT=H*0.3048D0
      VX=V*0.3048D0
      WX=W*4.4482D0
      PX=P*1.355818D-3
      DVM=DV*0.3048DC
      WRITE (JWRITE,32) T,ALT,VX,GFPA,A,CL,CD,WX,PX,DVM
C***  CALCULATE TIME INCREMENT
   34 IF (I.LT.K)TDEL=TM(I-I1+2)-TM(I-I1+1)
C***  SET FLIGHT PATH ANGLE
      GMX=GFPA
      IF (I.NE.1) GO TO 35
C***  SET FLIGHT-PATH-ANGLE DERIVATIVE FOR FIRST POINT
      DGFPA=G*S*R*V*CL/(2.0D0*W)-G*DCOS(GMX)/V+G*DSIN(A+TIA)*P/(W*V*V)
      D2G=0.0D0
      D3G=0.0D0
C***  SET OR DETERMINE PARAMETERS FOR TRAJECTORY PREDICTION
   35 IF (I.NE.1)DGMY=DGMX
      DGMX=DGFPA
      D2GM=D2G
      D3GM=D3G
      ADT=0.0D0
      IF (I.NE.1)ADT=(AP-AS)/TMT1
      IPRM=0
      KK=0
      MGAM=GFPA
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      MDGMM=DGFPA
      JL=0
      IK=10
      ST1=T1
      IJPL=0
      IF (I.LT.7)IK=0
C***  CALL TRAJECTORY PREDICTION ROUTINE
      IF (I.LT.K) CALL TRENOR(TDEL,T,GFPA,DGFPA,D2G,D3G,ISET,F,IPRN,KK,I
     1K)
      IERR=IRRR
      IF (IERR.NE.0) RETURN
      T=TM(I-I1+1)
      T1=ST1
      IF (I.EQ.6)IK=10
      IF (I.LT.6) GO TO 37
C***  ITERATE TRAJECTORY PREDICTION FOR BETTER ESTIMATION
      DO 36 JPL=1,IK
      IPRN=IPRN+1
      IJPL=JPL
      GFPA=MGAM
      IF (I.LT.K) CALL TRENOR(TDEL,T,GFPA,DGFPA,D2G,D3G,ISET,F,IPRN,KK,I
     1K)
      IERR=IRRR
      IF (IERR.NE.0) RETURN
      T=TM(I-I1+1)
      T1=ST1
      IF (KK.EQ.1) GO TO 37
   36 CONTINUE
   37 KPRINT=KPRINT+1
C***  TEST FOR INTERVAL RANGE END
      IF (IPTS.NE.0.AND.KPRINT.EQ.IPTSP1) KPRINT=0
C***  DEFINE VALUES FOR PARTIAL DERIVATIVE EVALUATIONS
      T=TM(I-I1+1)
      IF (I.GE.7) GO TO 38
      D2GM=0.0D0
      IF (I.NE.1) D2GM=(DGMX-DGMY)/(T-T1)
      D2G=D2GM
   38 ATX=A
      WTX=W
      RTX=R
      IF (I.NE.1) GO TO 41
C***  INITIALIZE MATRICES
      DO 39 JXP=1,NXD
      RR(JXP)=0.0D0
      RP(JXP)=0.0D0
      RQ(JXP)=0.0D0
   39 RS(JXP)=0.0D0
      DO 40 JXP=1,NUM
   40 CC(JXP)=0.0D0
C***  TEST FOR FIRST POINT DIRECTION
   41 IF (I.EQ.1) GO TO 71
C***  TEST FOR PARTIAL DERIVATIVE DETERMINATION
      IF (KPRINT.NE.1) GO TO 87
C***  DEFINE SCALAR VALUES AT PRESENT AND PREVIOUS POINTS
      J=J+1
      T1=TTPT
      IF (I.EQ.K)T1=TM(1)
      VP=VA(T)
      V=VA(T1)
      DV=DVA(T1)
      P=CPN(1)+CPN(2)*V**EX1+CPN(3)*V**EX2+CPN(4)*V**EX3+CPN(5)*V**EX4
      A=AT
      AM=DABS(A)
      TDAPX=((I-I1)*F3(IPT)+(I4-I)*F3(IPT-1))/(I4-I1)
      GO TO (42,43,44),ICD
   42 IF (A.GT.0.0D0) GO TO 43
      CL=CPN(12)*A+YCPT+CPN(14)*TDAPX
      GO TO 45
   43 CL=CPN(11)+CPN(12)*A+CPN(13)*A**EXPX+CPN(14)*TDAPX
      GO TO 45
   44 CL=CPN(11)+CPN(12)*A+CPN(13)*A*A+CPN(14)*TDAPX
   45 IF (A.LT.0.0D0) CALL SIGNS(SNN,IEX1,IEX2,IEX3,IEX4)
      CD=CPN(6)+SNN(1)*CPN(7)*AM**IEX1+SNN(2)*CPN(8)*AM**IEX2+SNN(3)*CPN
     1(9)*AM**IEX3+SNN(4)*CPN(10)*AM**IEX4
      IF (A.LT.0.0D0) CALL CHNGE(SNN)
      W=WT
      R=RT
      HDH=V*DSIN(FPA)
C***  FIND PARTIAL DERIVATIVES WRT ANGLE OF ATTACK
      CALL PARTAL(J,W,R,A,V,DV,HDH,FPA,DFPA,PAC,NCM)
C***  COMPUTE NECESSARY FACTORS AND TERMS FOR DERIVATIVE EVALUATIONS
      THT1=T-T1
      X1=V**EX1
      X2=V**EX2
      X3=V**EX3
      X4=V**EX4
      X5=A**IEX1
      X6=A**IEX2
      X7=A**IEX3
      X8=A**IEX4
      X9=DCOS(A+TIA)/(W*V)
      X10=R*S*V*V/(2.0D0*W)
      X11=DV/G
      X12=X9*P-(X10*CD+X11)
      X13=DSQRT(1.0D0-X12*X12)
      X14=G*THT1**2*X10/2.0D0
      X15=THT1*DCOS(A+TIA)/W
      X16=THT1**2*DV*X9/2.0D0
      X17=THT1**2*G*DSIN(A+TIA)/(2.0*W*V)
      X18=THT1**2*G/4.0D0
      X19=-THT1*V*X10
      X20=-THT1**2*DV*X10/2.0D0
      X21=G*DSIN(A+TIA)/(W*V*V)
      X22=DV+DDV(T1)*THT1/3.0D0
      X23=DV*DV*THT1/3.0D0
      X24=-X13*X14
      X25=G*S*R*V/(2.0D0*W)
      X26=X9*X9*X12/X13**3
      X27=X10*X10*X12/X13**3
      X28=X9*X10*X12/X13**3
      X29=-X14*X12/X13
C***  INITIALIZE PARAMETERS
      DO 46 JXP=1,10
   46 PS(JXP)=0.0D0
      JJX=0
C***  COMPUTE PARTIAL DERIVATIVES
      CTP(1)=-(X15+X16+(X13*X17+4.0D0*X18*X12*X9)-(X17*P)/X13*X12*X9)
      CTP(2)=X9/X13
      CTP(3)=X21+G/V*X12*X9/X13
      CTP(4)=-(X19+X20-4.0D0*X18*X12*X10-2.0D0*X18*X10**2*CL*X12/X13+X17
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     1*X12*X10*P/X13)
      CTP(5)=-X10/X13
      CTP(6)=-G/V*X12*X10/X13
      CTP(7)=0.0D0
      DO 70 JPK=1,NEQ
      IF (CFM(JPK).EQ.0.0D0.OR.JLOC(JPK).NE.0) GO TO 70
      JJX=JJX+1
      WK(2,JJX)=0.0D0
      WK(4,JJX)=0.0D0
      WK(6,JJX)=0.0D0
      GO TO (47,49,51,53,55,57,59,61,63,65,67,68,69),JPK
C***  COMPUTE PARTIALS WRT FIRST POWER COEFFICIENT
   47 DO 48 JXP=1,3
   48 WK(JXP,JJX)=CTP(JXP)
      WK(4,JJX)=F*THT1
      WK(5,JJX)=WK(5,JJX)+0.5D0*THT1*(DCOS(ATX+TIA)/WTX+DCOS(A+TIA)/W)
      PS(1)=CFM(1)*WK(5,JJX)
      GO TO 70
C***  COMPUTE PARTIALS WRT SECOND POWER COEFFICIENT
   49 DO 50 JL=1,3
   50 WK(JL,JJX)=CTP(JL)*X1
      WK(4,JJX)=F*(V**EX1*THT1+THT1**2/2.0D0*EX1*(X22*V**(EX1-1.0D0)+(EX
     11-1.0D0)*X23*V**(EX1-2.0D0)))
      WK(5,JJX)=WK(5,JJX)+0.5D0*THT1*(DCOS(ATX+TIA)*VP**EX1/WTX+DCOS(A+T
     1IA)*V**EX1/W)
      PS(2)=CFM(2)*WK(5,JJX)
      GO TO 70
C***  COMPUTE PARTIALS WRT THIRD POWER COEFFICIENT
   51 DO 52 JL=1,3
   52 WK(JL,JJX)=CTP(JL)*X2
      WK(4,JJX)=F*(V**EX2*THT1+THT1**2/2.0D0*EX2*(X22*V**(EX2-1.0D0)+(EX
     12-1.0D0)*X23*V**(EX2-2.0D0)))
      WK(5,JJX)=WK(5,JJX)+0.5D0*THT1*(DCOS(ATX+TIA)*VP**EX2/WTX+DCOS(A+T
     1IA)*V**EX2/W)
      PS(3)=CFM(3)*WK(5,JJX)
      GO TO 70
C***  COMPUTE PARTIALS WRT FOURTH POWER COEFFICIENT
   53 DO 54 JL=1,3
   54 WK(JL,JJX)=CTP(JL)*X3
      WK(4,JJX)=F*(V**EX3*THT1+THT1**2/2.0D0*EX3*(X22*V**(EX3-1.0D0)+(EX
     13-1.0D0)*X23*V**(EX3-2.0D0)))
      WK(5,JJX)=WK(5,JJX)+0.5D0*THT1*(DCOS(ATX+TIA)*VP**EX3/WTX+DCOS(A+T
     1IA)*V**EX3/W)
      PS(4)=CFM(4)*WK(5,JJX)
      GO TO 70
C***  COMPUTE PARTIALS WRT FIFTH POWER COEFFICIENT
   55 DO 56 JL=1,3
   56 WK(JL,JJX)=CTP(JL)*X4
      WK(4,JJX)=F*(V**EX4*THT1+THT1**2/2.0D0*EX4*(X22*V**(EX4-1.0D0)+(EX
     14-1.0D0)*X23*V**(EX4-2.0D0)))
      WK(5,JJX)=WK(5,JJX)+0.5D0*THT1*(DCOS(ATX+TIA)*VP**EX4/WTX+DCOS(A+T
     1IA)*V**EX4/W)
      PS(5)=CFM(5)*WK(5,JJX)
      GO TO 70
C***  COMPUTE PARTIALS WRT FIRST DRAG COEFFICIENT
   57 DO 58 JXP=1,4
   58 WK(JXP,JJX)=CTP(JXP+3)
      WK(5,JJX)=WK(5,JJX)-0.25D0*THT1*S*(RTX*VP**3/WTX+R*V**3/W)
      PS(6)=CFM(6)*WK(5,JJX)
      WK(6,JJX)=PAC(1)
      GO TO 70
C***  COMPUTE PARTIALS WRT SECOND DRAG COEFFICIENT
   59 DO 60 JL=1,4
   60 WK(JL,JJX)=CTP(JL+3)*X5
      WK(5,JJX)=WK(5,JJX)-0.25D0*THT1*S*(RTX*VP**3*ATX**IEX1/WTX+R*V**3*
     1A**IEX1/W)
      PS(7)=CFM(7)*WK(5,JJX)
      WK(6,JJX)=PAC(2)
      GO TO 70
C***  COMPUTE PARTIALS WRT THIRD DRAG COEFFICIENT
   61 DO 62 JL=1,4
   62 WK(JL,JJX)=CTP(JL+3)*X6
      WK(5,JJX)=WK(5,JJX)-0.25D0*THT1*S*(RTX*VP**3*ATX**IEX2/WTX+R*V**3*
     1A**IEX2/W)
      PS(8)=CFM(8)*WK(5,JJX)
      WK(6,JJX)=PAC(3)
      GO TO 70
C***  COMPUTE PARTIALS WRT FOURTH DRAG COEFFICIENT
   63 DO 64 JL=1,4
   64 WK(JL,JJX)=CTP(JL+3)*X7
      WK(5,JJX)=WK(5,JJX)-0.25D0*THT1*S*(RTX*VP**3*ATX**IEX3/WTX+R*V**3*
     1A**IEX3/W)
      PS(9)=CFM(9)*WK(5,JJX)
      WK(6,JJX)=PAC(4)
      GO TO 70
C***  COMPUTE PARTIALS WRT FIFTH DRAG COEFFICIENT
   65 DO 66 JL=1,4
   66 WK(JL,JJX)=CTP(JL+3)*X8
      WK(5,JJX)=WK(5,JJX)-0.25D0*THT1*S*(RTX*VP**3*ATX**IEX4/WTX+R*V**3*
     1A**IEX4/W)
      PS(10)=CFM(10)*WK(5,JJX)
      WK(6,JJX)=PAC(5)
      GO TO 70
C***  COMPUTE PARTIALS WRT FIRST LIFT COEFFICIENT
   67 WK(1,JJX)=X24
      WK(3,JJX)=X25
      WK(6,JJX)=PAC(6)
      GO TO 70
C***  COMPUTE PARTIALS WRT SECOND LIFT COEFFICIENT
   68 WK(1,JJX)=X24*A
      WK(3,JJX)=X25*A
      WK(6,JJX)=PAC(7)
      GO TO 70
C***  COMPUTE PARTIALS WRT THIRD LIFT COEFFICIENT
   69 WK(1,JJX)=X24*A**EXPX
      WK(3,JJX)=X25*A**EXPX
      WK(6,JJX)=PAC(8)
   70 CONTINUE
C***  COMPUTE DIFFERENCES FOR ALL POINTS
   71 CK(1)=H-F10(J+1)
      IF (DABS(CK(1)).LE.4.0D-06)CK(1)=0.0D0
      CK(2)=HGAM-DARSIN(F11(J+1)/F4(J+1))
      IF (DABS(HGAM).LT.6.0D-03)ICKP=1
      IF (DABS(CK(2)).LE.1.0D-08)CK(2)=0.0D0
      CK(3)=HDGMM-FT2(J+1)
      IF (DABS(CK(3)).LT.3.0D-07)CK(3)=0.0D0
      IF ((J+1).EQ.1) GO TO 77
C***  ZERO OUT SECOND-PARTIAL-DERIVATIVE ARRAYS
      DO 72 JPK=1,NEQ
      DO 72 JL=1,NEQ
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      ZM(JL,JPK)=0.0D0
      ZL(JL,JPK)=0.0D0
   72 ZK(JL,JPK)=0.0D0
C***  STORE FACTORS FOR 2ND PARTIAL DERIVATIVES
      FS(1)=1.0D0
      FS(2)=X1
      FS(3)=X2
      FS(4)=X3
      FS(5)=X4
      FS(6)=1.0D0
      FS(7)=X5
      FS(8)=X6
      FS(9)=X7
      FS(10)=X8
      FS(11)=1.0D0
      FS(12)=A
      FS(13)=A**EXPX
C***  COMPUTE SECOND PARTIALS OF FLIGHT PATH ANGLE, ITS RATE, AND
C***  ALTITUDE
      ZAP1=-CK(2)*X26
      ZAP2=CK(2)*X28
      ZAP3=-CK(3)*G*X9*X9/(V*X13)*(1.0D0+(X12/X13)**2)
      ZAP4=CK(3)*G*X9*X10/(V*X13)*(1.0D0+(X12/X13)**2)
      ZAP5=-CK(1)*(-X12*X9/X13*(2.0D0*X17+G*THT1**2*X12*X9/X13)+2.0D0*X1
     18*X9*X9/X13**2-(X14*CL+X17*P-2.0D0*X18*X13)*((X9*X12)**2/X13**3+X9
     1*X9/X13))
      ZAP6=-CK(1)*(X12/X13*X10*(X17+2.0D0*X18*X12*X9/X13)-2.0D0*X18*X10*
     1X9+(X14*CL+X17*P-2.0D0*X18*X13)*(X9*X10*X12**2/X13**3+X9*X10/X13))
      DO 73 JL=1,5
      DO 73 JM=1,5
      ZK(JM,JL)=ZAP1*FS(JM)*FS(JL)
      ZK(JM+5,JL)=ZAP2*FS(JM+5)*FS(JL)
      ZL(JM,JL)=ZAP3*FS(JM)*FS(JL)
      ZL(JM+5,JL)=ZAP4*FS(JM+5)*FS(JL)
      ZM(JM,JL)=ZAP5*FS(JM)*FS(JL)
   73 ZM(JM+5,JL)=ZAP6*FS(JM+5)*FS(JL)
      ZAP1=CK(2)*X28
      ZAP2=-CK(2)*X27
      ZAP3=CK(3)*G*X9*X10/(V*X13)*(1.0D0+(X12/X13)**2)
      ZAP4=-CK(3)*G*X10*X10/(V*X13)*(1.0D0+(X12/X13)**2)
      ZAP5=-CK(1)*(X12/X13*X10*(X17+2.0D0*X18*X12*X9/X13)-2.0D0*X18*X10*
     1X9+(X14*CL+X17*P-2.0D0*X18*X13)*(X9*X10*X12**2/X13**3+X9*X10/X13))
      ZAP6=-CK(1)*(X10**2*(2.0D0*X18*(1.0D0-X12**2/X13**2)-(X14*CL+X17*P
     1-2.0D0*X18*X13)*(X12**2/X13**3+1.0D0/X13)))
      DO 74 JL=6,10
      DO 74 JM=1,5
      ZK(JM,JL)=ZAP1*FS(JM)*FS(JL)
      ZK(JM+5,JL)=ZAP2*FS(JM+5)*FS(JL)
      ZL(JM,JL)=ZAP3*FS(JM)*FS(JL)
      ZL(JM+5,JL)=ZAP4*FS(JM+5)*FS(JL)
      ZM(JM,JL)=ZAP5*FS(JM)*FS(JL)
   74 ZM(JM+5,JL)=ZAP6*FS(JM+5)*FS(JL)
      ZAP7=-CK(1)*X29*X9
      ZAP8=CK(1)*X29*X10
C***  STORE PARTIALS OF LIFT COEFFICIENTS
      DO 75 JM=11,13
      DO 75 JL=1,5
      ZM(JM,JL)=ZAP7*FS(JL)*FS(JM)
      ZM(JM,JL+5)=ZAP8*FS(JL+5)*FS(JM)
      ZM(JL,JM)=ZM(JM,JL)
   75 ZM(JL+5,JM)=ZM(JM,JL+5)
C***  COMPUTE MATRIX OF 2ND PARTIALS OF J WRT MODEL COEFFICIENTS
      JJ=0
      JJJ=0
      DO 76 JPX=1,NEQ
      IF (CFM(JPX).EQ.0.0D0.OR.JLOC(JPX).NE.0) GO TO 76
      JJ=JJ+1
      DO 76 JPY=1,NEQ
      IF (CFM(JPY).EQ.0.0D0.OR.JLOC(JPY).NE.0) GO TO 76
      JJJ=JJJ+1
      TWK(JJJ)=ZK(JPX,JPY)*D(2)
      TWKK(JJJ)=ZL(JPX,JPY)*D(3)
      TWKX(JJJ)=ZM(JPX,JPY)*D(1)
   76 CONTINUE
C***  SUM MATRICES OF SECOND PARTIALS
      CALL MADD(RP,TWK,RP,JJ,JJ,0,0)
      CALL MADD(RQ,TWKK,RQ,JJ,JJ,0,0)
      CALL MADD(RS,TWKX,RS,JJ,JJ,0,0)
   77 CK(4)=WTX-WM(J+1)
      IF (DABS(CK(4)).GT.1.0D-04) GO TO 78
      WTX=WM(J+1)
      CK(4)=0.0D0
   78 ENER(1)=ENER(2)
      ENER(2)=ENER(3)
      P=CFM(1)+CFM(2)*F4(J+1)**EX1+CFM(3)*F4(J+1)**EX2+CFM(4)*F4(J+1)**E
     1X3+CFM(5)*F4(J+1)**EX4
      IF (ATX.LT.0.0D0) CALL SIGNS(SNN,IEX1,IEX2,IEX3,IEX4)
      AM=DABS(ATX)
      CD=CFM(6)+CFM(7)*SNN(1)*AM**IEX1+CFM(8)*SNN(2)*AM**IEX2+CFM(9)*SNN
     1(3)*AM**IEX3+CFM(10)*SNN(4)*AM**IEX4
      IF (ATX.LT.0.0D0) CALL CHNGE(SNN)
      ENER(3)=P*DCOS(ATX+TIA)/WTX-RTX*S*F4(J+1)**3/(2.0D0*WTX)*CD
      IF ((J+1).EQ.1) ENERGY=F4(1)**2/(2.0D0*G)+F10(1)
      IF ((J+1).GT.2) GO TO 79
      IF ((J+1).EQ.1) GO TO 80
      ENERGY=ENERGY+PS(1)+PS(2)+PS(3)+PS(4)+PS(5)+PS(6)+PS(7)+PS(8)+PS(9
     1)+PS(10)
      GO TO 80
   79 TA1=TIME(IPT-3)-TIME(IPT-2)
      TA2=0.0D0
      TA3=TIME(IPT-1)-TIME(IPT-2)
      C1=((ENER(1)-ENER(2))/(TA1-TA2)-(ENER(2)-ENER(3))/(TA2-TA3))/(TA1-
     1TA3)
      C2=(ENER(1)-ENER(2))/(TA1-TA2)-C1*(TA1+TA2)
      C3=ENER(1)-TA1*(C1*TA1+C2)
      ENERGY=ENERGY+C1/3.0D0*(TA3**3-TA2**3)+C2/2.0D0*(TA3**2-TA2**2)+C3
     1*(TA3-TA2)
   80 CK(5)=ENERGY-F4(J+1)**2/(2.0D0*G)-F10(J+1)
      IF ((J+1).EQ.2) ENERGY=ENERGY-CK(5)
      IF ((J+1).EQ.2) CK(5)=0.0D0
      IF (DABS(CK(5)).LT.3.0D-05) CK(5)=0.0D0
      CK(6)=ATX-F6(J+1)
      IF (DABS(CK(6)).LT.1.0D-03) CK(6)=0.0D0
      IF ((J+1).EQ.1) GO TO 83
C***  SUM MATRICES OF PARTIALS
      IP=0
      JJ=0
      DO 82 JXP=1,NEQ
      IF (CFM(JXP).EQ.0.0D0.OR.JLOC(JXP).NE.0) GO TO 82
      IP=IP+1
```

```
      STWJ=0.0D0
      DO 81 JP=1,6
      JJ=JJ+1
      TWK(JJ)=WK(JP,IP)*DSQRT(D(JP))
   81 STWJ=STWJ+TWK(JJ)*CK(JP)*DSQRT(D(JP))
      TWJ(IP)=STWJ
   82 CONTINUE
      MS=0
      CALL MATA(TWK,TWKK,6,IP,MS)
      CALL MADD(RR,TWKK,RR,IP,IP,0,1)
      CALL MADD(CC,TWJ,CC,IP,1,0,0)
C***  COMPUTE SUM OF SQUARED RESIDUALS
   83 DO 84 JXP=1,6
   84 TOL(JXP)=TOL(JXP)+CK(JXP)*CK(JXP)
C***  STORE AND DEFINE PARAMETERS
      A=ATX
      W=WTX
      R=RTX
      IF (LKK.EQ.1) GO TO 86
      DO 85 JXP=1,3
   85 XHLD(JXP,J+1)=HLD(JXP,J+1)
   86 HLD(1,J+1)=F1(J+1)
      HLD(2,J+1)=F5(J+1)
      HLD(3,J+1)=F6(J+1)
      F1(J+1)=W
      F5(J+1)=R
      F6(J+1)=A
   87 IF (IPTS.EQ.0.AND.KPRINT.EQ.IPTSP1) KPRINT=0
C***  PROCEED WITH NEXT POINT
   88 CONTINUE
      IF (LCM.NE.0) WRITE (JWRITE,89) LCM
   89 FORMAT (1X,//,9X,94H*** DURING NEWTON-RAPHSON FOR ANGLE OF ATTACK
     1IN  HPATH, ROUTINE WISHED TO SEEK COMPLEX ROOTS ,I3,7H TIMES.)
      IF (MCM.NE.0) WRITE (JWRITE,90) MCM
   90 FORMAT (1X,//,9X,94H*** DURING NEWTON-RAPHSON FOR ANGLE OF ATTACK
     1IN PARTAL, ROUTINE WISHED TO SEEK COMPLEX ROOTS ,I3,7H TIMES.)
C***  DETERMINE APPROPRIATE A PRIORI VALUE APPLICATION
      IJX=0
      DO 91 JXP=1,NEQ
      SF(JXP)=1.0D0
      IF (CFM(JXP).EQ.0.0D0.OR.JLOC(JXP).NE.0) GO TO 91
      IJX=IJX+1
      ILOC(IJX)=JXP
      DSL(IJX)=SCALE(JXP)
   91 CONTINUE
C***  COMPUTE THE  COST FUNCTION
      PCF=0.0D0
      PPCF=0.0D0
      DO 92 JXP=1,IP
C***  SET A PRIORI VALUE AS MODEL COEFFICIENT IF CONDITION IS MET
      IF (JLOC(ILOC(JXP)).NE.0) AP(ILOC(JXP))=CFM(ILOC(JXP))
   92 PPCF=PPCF+WGT(ILOC(JXP))*(CFM(ILOC(JXP))-AP(ILOC(JXP)))**2/(AP(ILO
     1C(JXP))*AP(ILOC(JXP)))
      DO 93 JXP=1,6
   93 PCF=PCF+D(JXP)*TOL(JXP)
      IF (IPS.NE.0) JK=1
      COST(JK)=PCF+PPCF
      WRITE (JWRITE,94) COST(JK)
   94 FORMAT (1X,///,33X,'COST FUNCTION (J) = ',1PD23.16,/,33X,'WITH:')
      DO 95 JXP=1,6
   95 TOL(JXP)=TOL(JXP)/N
      WRITE (JWRITE,96) (TOL(JXP),JXP=1,6)
   96 FORMAT (39X,'ALTITUDE TOLERANCE = ',D20.13,/,39X,'FLIGHT-PATH-ANGL
     1E TOLERANCE = ',D20.13,/,39X,'FLIGHT-PATH-ANGLE-DERIVATIVE TOLERAN
     1CE = ',D20.13,/,39X,'WEIGHT TOLERANCE = ',D20.13,/,39X,'ENERGY TOL
     1ERANCE = ',D20.13,/,39X,'ANGLE-OF-ATTACK TOLERANCE = ',D20.13,///)
C***  UPDATE COST FUNCTION
C***  CHECK COST FUNCTION WITH TOLERANCE FOR ITERATION TERMINATION
      IF (COST(JK).LT.1.0D-10) GO TO 133
      IF (JK.EQ.1) HCOST=COST(1)
C***  TEST FOR INCREASE IN COST FUNCTION
      IF (JK.GT.1.AND.COST(JK).GT.HCOST) GO TO 130
      HCOST=COST(JK)
C***  ADJUST MATRICES FOR LEAST SQUARES SOLUTION
      CALL MADD(RR,RP,RR,IP,IP,0,0)
      CALL MADD(RR,RQ,RR,IP,IP,0,0)
      CALL MADD(RR,RS,RX,IP,IP,0,0)
      MXDD=IP*IP
      IPS=0
      IPSMX=0
      DO 97 JL=1,MXDD
   97 RXS(JL)=RX(JL)
      DO 98 JL=1,IP
   98 CCX(JL)=CC(JL)
   99 IC=0
      IPSMX=IPSMX+1
      IF (IPS.EQ.0) GO TO 101
C***  APPLY CONSTRAINTS AND SIGN FACTOR, IF NEEDED
      JJ=0
      DO 100 JXP=1,NEQ
      IF (CFM(JXP).EQ.0.0D0.OR.JLOC(JXP).NE.0) GO TO 100
      JJ=JJ+1
      IF ((CFM(JXP)+FXX*Y(JJ,1)*SCALE(JXP)).GE.CRMIN(JXP).AND.(CFM(JXP)+
     1FXX*Y(JJ,1)*SCALE(JXP)).LE.CRMAX(JXP)) GO TO 100
      IF (IPSMX.GT.2.AND.RWT(JXP,1).NE.0.0D0)RWT(JXP,1)=RWT(JXP,1)*10.0D
     10
      IF (IPSMX.GT.2.AND.RWT(JXP,2).NE.0.0D0)RWT(JXP,2)=RWT(JXP,2)*10.0D
     10
      IF (IPSMX.GT.2.AND.(RWT(JXP,1).NE.0.0D0.OR.RWT(JXP,2).NE.0.0D0)) G
     1O TO 100
      IF ((CFM(JXP)+FXX*Y(JJ,1)*SCALE(JXP)).LT.CRMIN(JXP))RWT(JXP,1)=WGT
     1L(JXP)
      IF ((CFM(JXP)+FXX*Y(JJ,1)*SCALE(JXP)).GT.CRMAX(JXP))RWT(JXP,2)=WGT
     1U(JXP)
      IF (CFM(JXP).GT.CRMIN(JXP).AND.RWT(JXP,1).NE.0.0D0)SF(JXP)=-0.5D0
      IF (CFM(JXP).LT.CRMAX(JXP).AND.RWT(JXP,2).NE.0.0D0)SF(JXP)=-0.5D0
      IF ((JXP.EQ.8.AND.(FXX*Y(JJ,1)*SCALE(JXP)).LT.0.0D0).AND.(CFM(JXP)
     1+FXX*Y(JJ,1)*SCALE(JXP)).LT.CRMIN(JXP))CRMIN(JXP)=CRMIN(JXP)-FXX*Y
     1(JJ,1)*SCALE(JXP)
  100 CONTINUE
C***  FORM MATRIX FOR LEAST-SQUARES SOLUTION
  101 DO 103 JXP1=1,IP
      IF (DABS(CFM(ILOC(JXP1))).LT.1.0D-03.AND.ILOC(JXP1).EQ.11) AP(ILOC(
     1JXP1))=1.0D-10
      IF (DABS(CFM(ILOC(JXP1))).LT.1.0D-03.AND.ILOC(JXP1).EQ.11)WGT(ILOC
     1(JXP1))=1.0D-17
      IF (LKK.GT.4.AND.(WGT(ILOC(JXP1)).GT.0.0D0.AND.ILOC(JXP1).EQ.11))W
     1GT(ILOC(JXP1))=2.5D0*WGT(ILOC(JXP1))
      DO 102 JXP2=1,IP
      XFAC=1.0D0
```

```
      IF (JXP1.EQ.JXP2) XFAC=1.00005D0*DSL(JXP1)
      IC=IC+1
      XC=RX(IC)
      IF (JXP1.EQ.JXP2) XC=XC+2.0D0*WGT(ILOC(JXP1))/(AP(ILOC(JXP1))*AP(IL
     1OC(JXP1)))
      IF (JXP1.EQ.JXP2.AND.IPS.NE.0) XC=XC+2.0D0*RUT(ILOC(JXP1),1)+2.0D0*
     1RUT(ILOC(JXP1),2)
      U(JXP2,JXP1)=XC*XFAC
  102 ZM(JXP2,JXP1)=U(JXP2,JXP1)
      Y(JXP1,1)=-CC(JXP1)+2.0D0*WGT(ILOC(JXP1))*(AP(ILOC(JXP1))-CFM(ILOC
     1(JXP1)))/(AP(ILOC(JXP1))*AP(ILOC(JXP1)))
      IF (IPS.NE.0)Y(JXP1,1)=Y(JXP1,1)-2.0D0*SF(ILOC(JXP1))*RUT(ILOC(JXP
     11),1)*(CFM(ILOC(JXP1))-CRMIN(ILOC(JXP1)))+2.0D0*SF(ILOC(JXP1))*RUT
     1(ILOC(JXP1),2)*(CRMAX(ILOC(JXP1))-CFM(ILOC(JXP1)))
  103 YS(JXP1,1)=Y(JXP1,1)
C***  EXACT LEAST SQUARES SOLUTION
      CALL LLSQAR(U,Y,IP,IP,1,13,13,15,WKAR,IER,JWRITE)
C***  TEST FOR ERROR
      IF (IER.EQ.129)IERR=1
      IF (IERR.NE.0) RETURN
      IF (IPSMX.GE.3) GO TO 107
C***  TEST FOR APPLICATION OF CONSTRAINTS
      IFIX=0
      JJ=0
      DO 104 JXP=1,NEQ
      IF (CFM(JXP).EQ.0.0D0.OR.JLOC(JXP).NE.0) GO TO 104
      JJ=JJ+1
      IF ((CFM(JXP)+FXX*Y(JJ,1)*SCALE(JXP)).LT.CRMIN(JXP).OR.(CFM(JXP)+F
     1XX*Y(JJ,1)*SCALE(JXP)).GT.CRMAX(JXP))IFIX=1
      IPS=IFIX
  104 CONTINUE
C***  RESET MATRICES
      IF (IFIX.EQ.0) GO TO 107
      DO 105 JL=1,MXDD
  105 RX(JL)=RXS(JL)
      DO 106 JL=1,IP
  106 CC(JL)=CCX(JL)
      GO TO 99
C***  APPLY DELTAS TO POWER, DRAG, AND LIFT COEFFICIENTS
  107 WRITE (JWRITE,108) FXX
  108 FORMAT (1X,//,34X,'PREVIOUS COEFFICIENT',8X,F4.2,'*DELTA',9X,'NEW
     1COEFFICIENT',//)
      JJ=0
      NLCX=0
      DO 119 JXP=1,NEQ
      LLOC(JXP)=JLOC(JXP)
      NLOC(JXP)=0
      XX=0.0D0
      RS(JXP)=0.0D0
      ICK=1
      IF (CFM(JXP).EQ.0.0D0.OR.JLOC(JXP).NE.0) GO TO 115
      ICK=0
      JJ=JJ+1
      XX=Y(JJ,1)*DSL(JJ)
      IF (JXP.EQ.12) TC12=XX
      IF (DABS(XX/CFM(JXP)).LT.1.5D-06.OR.DABS(CFM(JXP)+FXX*XX).LT.3.0D-
     108) XX=0.0D0
      IF (JXP.EQ.12.AND.DABS(Y(JJ,1)*DSL(JJ)/CFM(JXP)).LT.1.5D-06) XX=1.0
     1D-03
      IF (XX.NE.0.0D0) GO TO 109
      ICK=1
      NLOC(JXP)=1
      JLOC(JXP)=1
      NLCX=NLCX+1
      XX=Y(JJ,1)*DSL(JJ)
  109 RS(JXP)=FXX*XX
      COLD=CFM(JXP)
      CFM(JXP)=CFM(JXP)+RS(JXP)
      IF (METRIC.NE.0) GO TO 112
      IF (ICK.EQ.0) WRITE (JWRITE,110) COLD,FXX,XX,CFM(JXP)
      IF (ICK.NE.0) WRITE (JWRITE,111) COLD,FXX,XX,CFM(JXP)
  110 FORMAT (34X,D20.13,' + ',F4.2,'*',D15.8,' = ',D20.13)
  111 FORMAT (34X,D20.13,' + ',F4.2,'*',D15.8,' = ',D20.13,3X,'(FROZEN)'
     1)
      GO TO 119
  112 IF (JXP.GT.5) GO TO 113
      CXM=COLD*1.355818D-3
      XX=XX*1.355818D-3
      CXY=CFM(JXP)*1.355818D-3
      GO TO 114
  113 CXM=COLD
      CXY=CFM(JXP)
  114 IF (ICK.EQ.0) WRITE (JWRITE,110) CXM,FXX,XX,CXY
      IF (ICK.NE.0) WRITE (JWRITE,111) CXM,FXX,XX,CXY
      GO TO 119
  115 IF (METRIC.NE.0) GO TO 116
      WRITE (JWRITE,111) CFM(JXP),FXX,XX,CFM(JXP)
      GO TO 119
  116 IF (JXP.GT.5) GO TO 117
      CXM=CFM(JXP)*1.355818D-3
      CXY=CFM(JXP)*1.355818D-3
      GO TO 118
  117 CXM=CFM(JXP)
      CXY=CXM
  118 WRITE (JWRITE,111) CXM,FXX,XX,CXY
  119 CONTINUE
C***  CHECK FOR ADJUSTMENT TO MATRICES DUE TO COEFFICIENT FREEZING
      IF (NLCX.EQ.0.OR.NLCX.GT.(JJ-2)) GO TO 128
      DO 120 JXP=1,NEQ
      IF (JXP.EQ.12.AND.RS(JXP).EQ.1.0D-03) CFM(12)=CFM(12)+1.0D-03
      IF (JXP.EQ.12.AND.(CFM(JXP).GT.6.296D0.AND.TC12.GT.0.0D0))CFM(JXP)
     1=CFM(JXP)+3.0D-03
  120 CFM(JXP)=CFM(JXP)-RS(JXP)*(1-NLOC(JXP))
      DO 121 II=1,10
  121 IF (CFM(12).GT.CRMAX(12))CFM(12)=CFM(12)-1.0D-03
C***  ADJUST MATRICES
      CALL ADJUST(ZM,YS,CFM,Y,DSL,LLOC,NLOC,IP,NEQ)
      WRITE (JWRITE,108) FXX
C***  COMPUTE NEW ADJUSTED DELTAS
      CALL LLSQAR(ZM,YS,IP,IP,1,13,13,15,WKAR,IER,JWRITE)
C***  TEST FOR ERROR
      IF (IER.EQ.129)IERR=1
      IF (IERR.NE.0) RETURN
C***  APPLY DELTAS
      JJ=0
      DO 127 JXP=1,NEQ
      XX=0.0D0
      ICK=1
      IF (CFM(JXP).EQ.0.0D0.OR.(((JLOC(JXP).EQ.LLOC(JXP)).AND.JLOC(JXP).
     1NE.0).OR.NLCC(JXP).NE.0)) GO TO 122
```

```
      ICK=0
      JJ=JJ+1
      XX=FXX*YS(JJ,1)*SCALE(JXP)
      CHLD=CFM(JXP)
  122 CFM(JXP)=CFM(JXP)+XX
      IF (METRIC.NE.0) GO TO 123
      IF (ICK.EQ.0) WRITE (JWRITE,110) CHLD,FXX,XX,CFM(JXP)
      IF (ICK.NE.0) WRITE (JWRITE,111) CFM(JXP),FXX,XX,CFM(JXP)
      GO TO 127
  123 IF (JXP.GT.5) GO TO 125
      CXH=CHLD*1.355818D-3
      XX=XX*1.355818D-3
      CXY=CFM(JXP)*1.355818D-3
      GO TO 126
  125 CXH=CHLD
      CXY=CFM(JXP)
  126 IF (ICK.EQ.0) WRITE (JWRITE,110) CXH,FXX,XX,CXY
      IF (ICK.NE.0) WRITE (JWRITE,111) CXY,FXX,XX,CXY
  127 CONTINUE
C***  START NEW ITERATION OR CONTINUE
  128 ICNT=0
      DO 129 JXP=1,NEQ
      HCFM(LKK+1,JXP)=CFM(JXP)
  129 IF (CFM(JXP).NE.0.0D0.AND.JLOC(JXP).NE.0)ICNT=ICNT+1
      IF ((NUM-ICNT).LE.2) GO TO 133
      GO TO 3
C***  READJUST COEFFICIENTS DUE TO TOLERANCE INCREASE
  130 DO 131 JXP=1,NEQ
  131 CFM(JXP)=HCFM(LKK-2,JXP)
C***  RESET PARAMETERS WITH RESPECT TO BEST TOLERANCE
      DO 132 IG=1,N
      F1(IG)=XHLD(1,IG)
      F5(IG)=XHLD(2,IG)
  132 F6(IG)=XHLD(3,IG)
C***  MAKE ADJUSTMENT TO PITCH ANGLE
  133 DO 134 I=1,N
  134 F2(I)=F6(I)+DARSIN(F11(I)/F4(I))
      RETURN
      END
```

Flowchart – FDR2

CHART TITLE - PROCEDURES

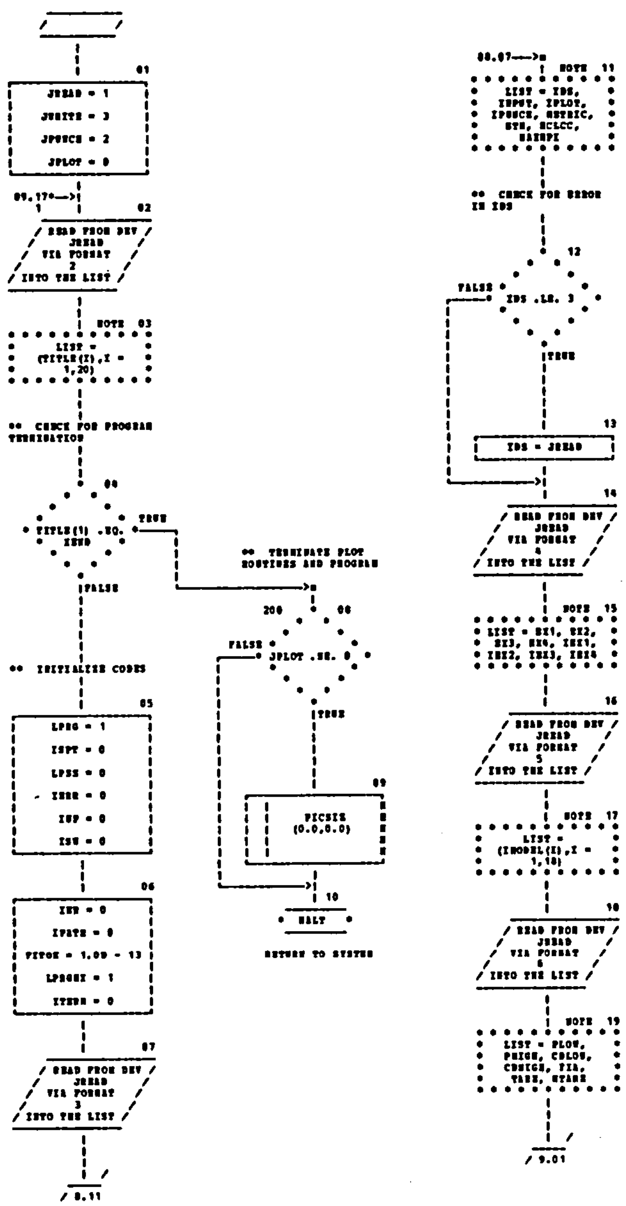
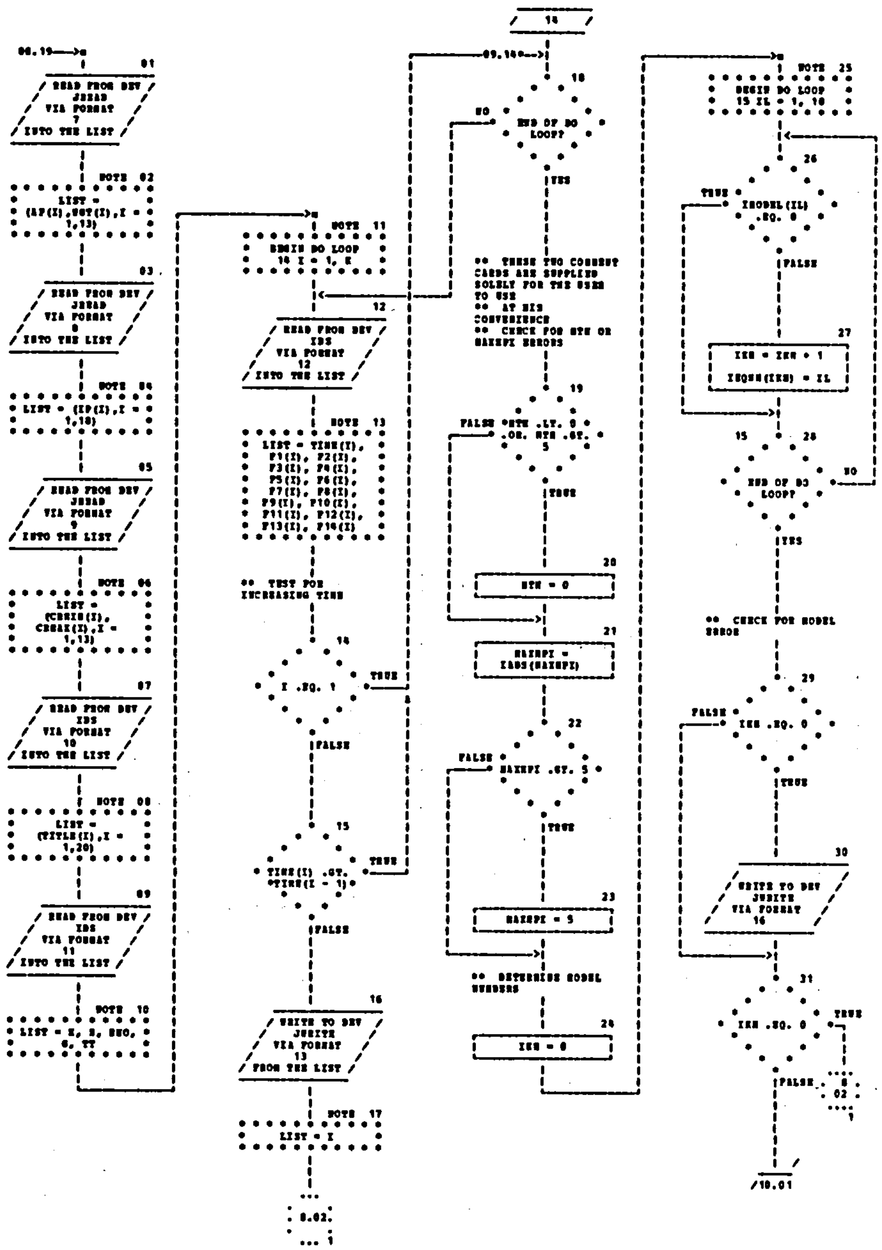


CHART TITLE - PROCEDURES



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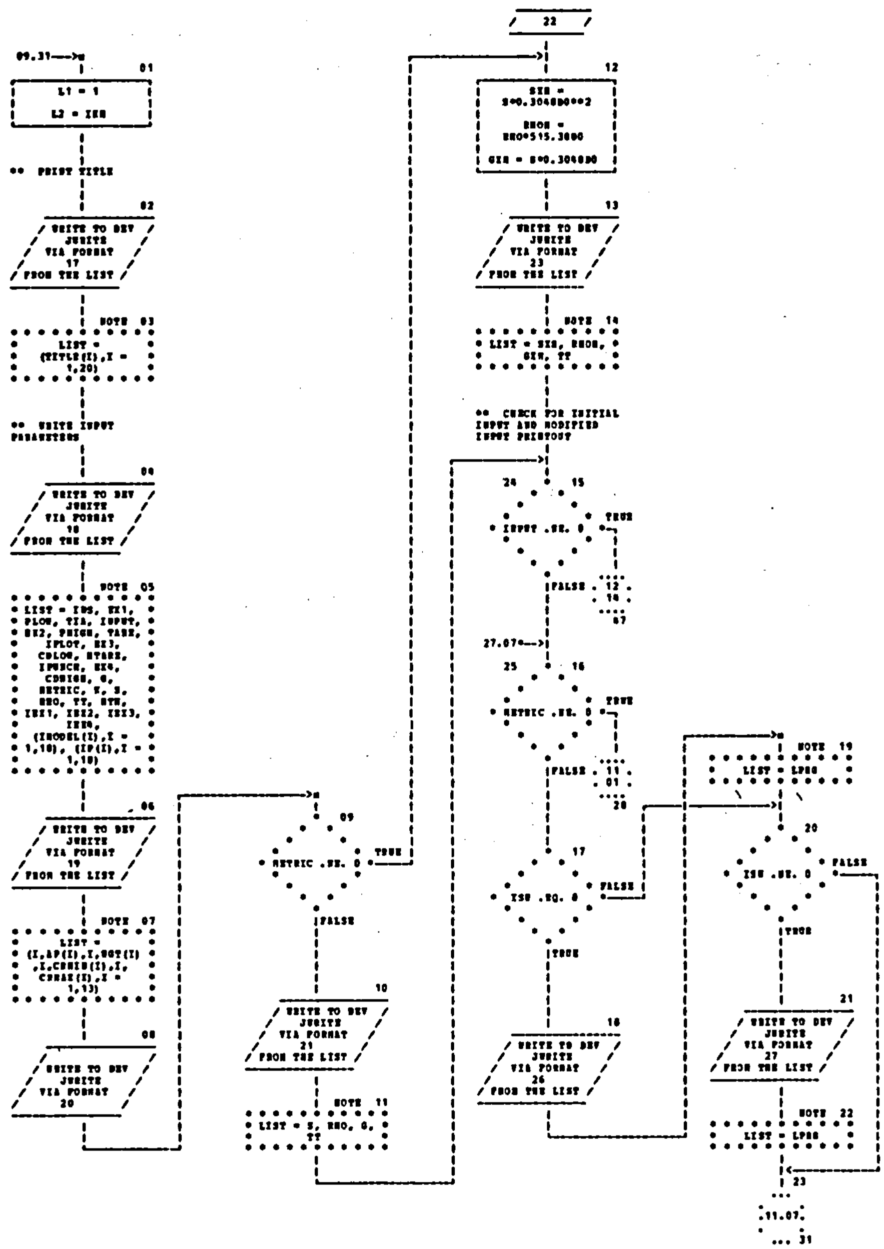
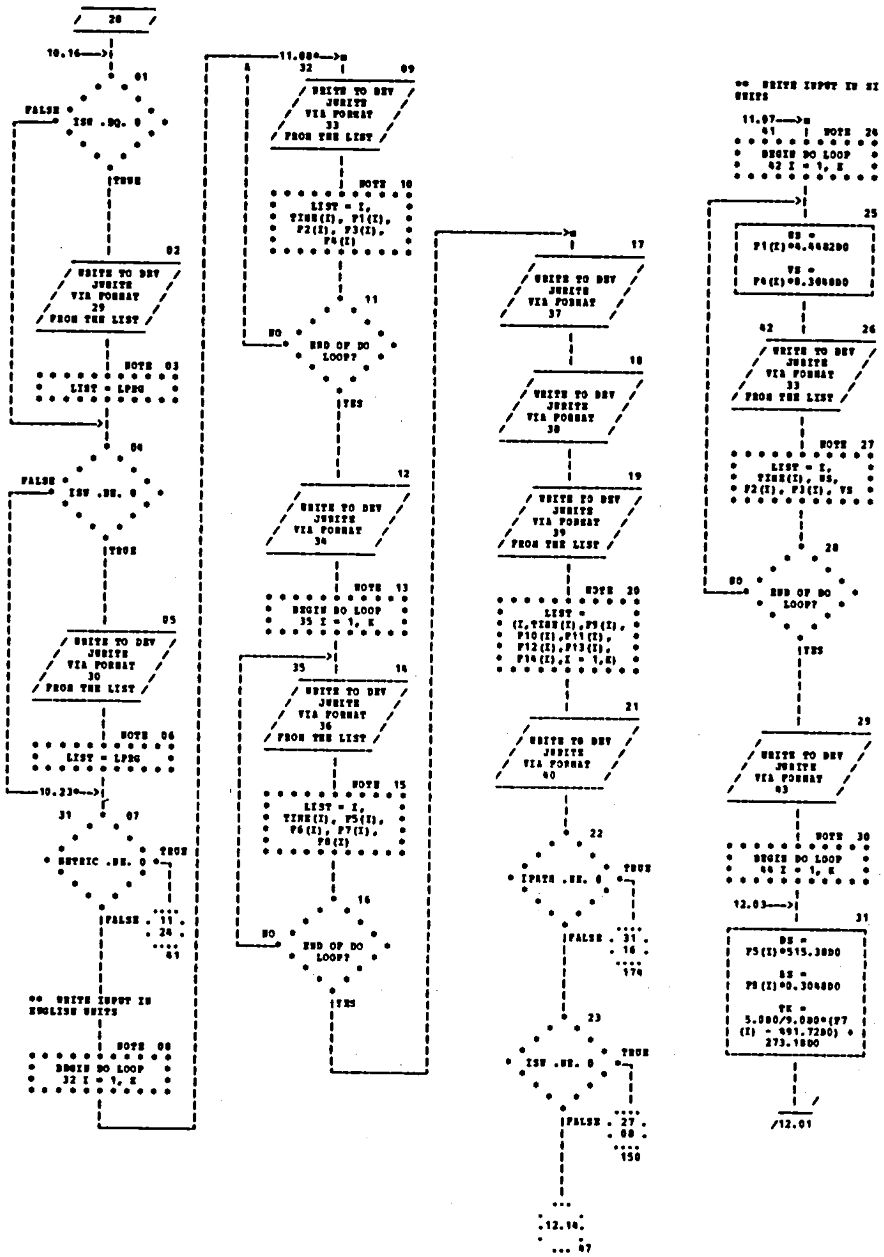


CHART TITLE - PROCEDURES



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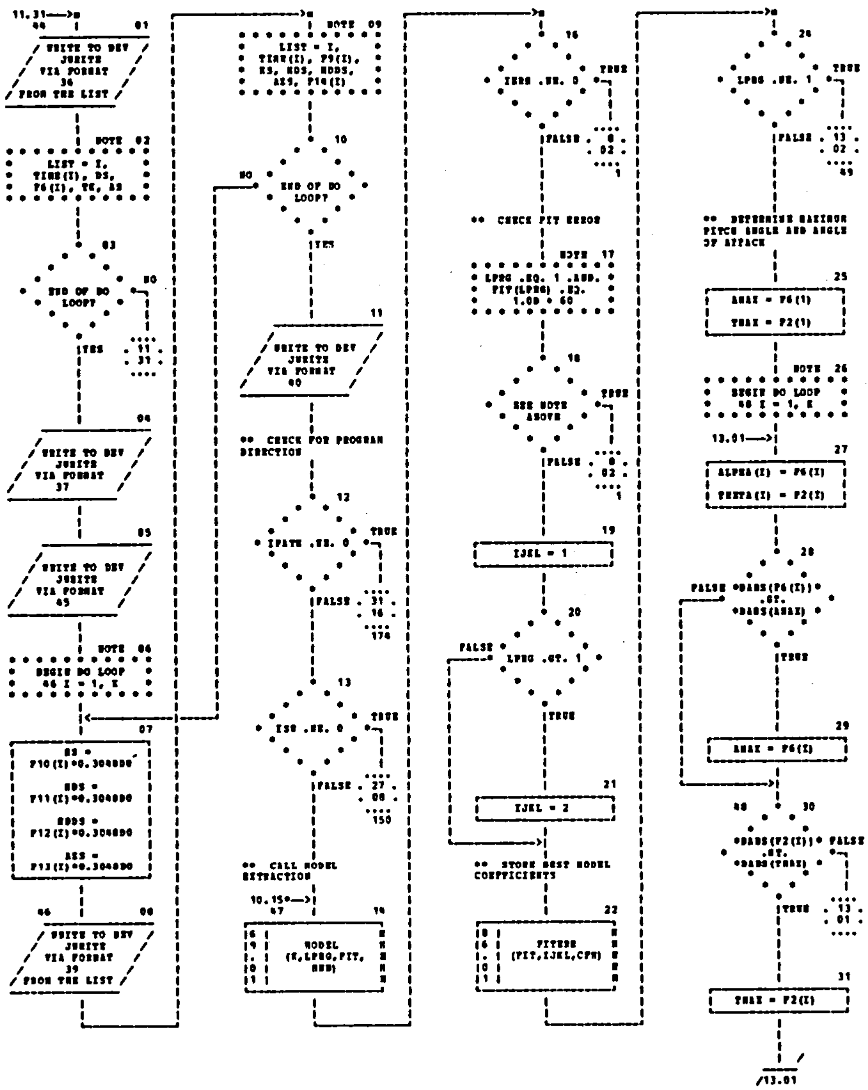
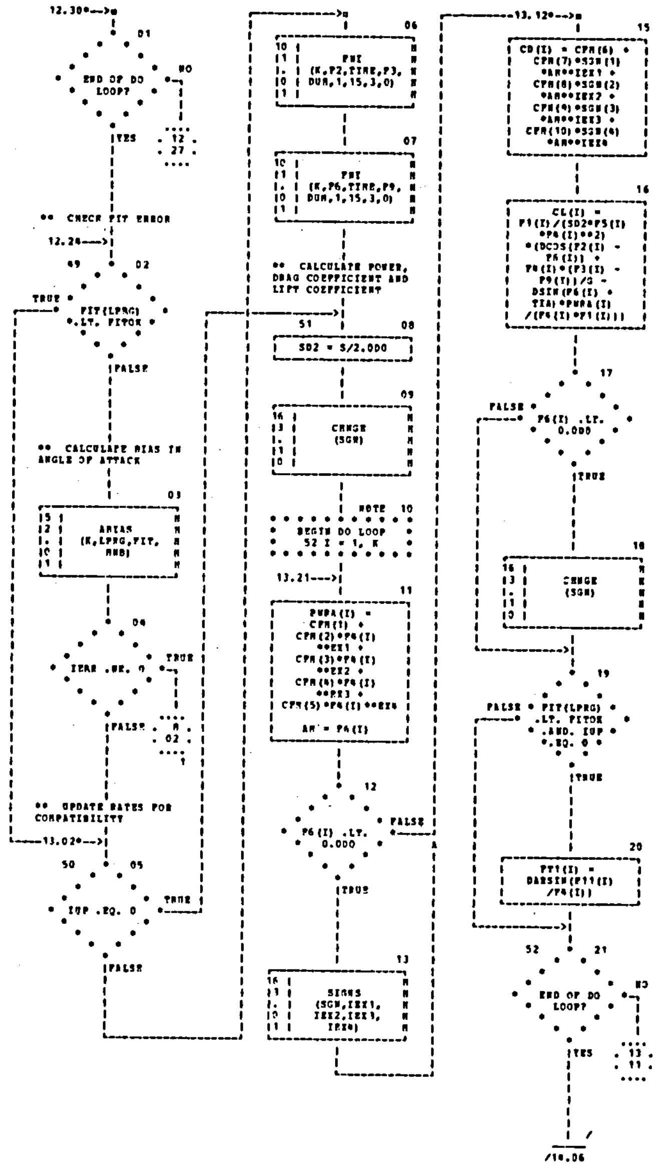



12.30*--->
01
END OF DO LOOP?
NO
YES
12
27
** CHECK FIT ERROR
12.28--->
49
02
TRUE
FIT(LPRG) .LT. FITOK
FALSE
** CALCULATE BIAS IN ANGLE OF ATTACK
03
ABIAS (K,LPRG,FIT, RNB)
04
IERR .NE. 0
TRUE
FALSE
02
** UPDATE RATES FOR COMPATIBILITY
13.02*--->
50
05
IUP .EQ. 0
TRUE
FALSE
06
FNI (K,P2,TIME,P3, DUR,1,15,3,0)
07
FNI (K,P6,TIME,P9, DUR,1,15,3,0)
** CALCULATE POWER, DRAG COEFFICIENT AND LIFT COEFFICIENT
51
08
SD2 = S/2.000
09
CHNGE (SGN)
NOTE 10
BEGIN DO LOOP
52 I = 1, K
13.21--->
11
PWRA(I) = CPN(1) + CPN(2)*P6(I) **EX1 + CPN(3)*P6(I) **EX2 + CPN(4)*P6(I) **EX3 + CPN(5)*P6(I)**EX4
AN = P6(I)
12
P6(I) .LT. 0.000
FALSE
TRUE
13
SIGNS (SGN,IEX1, IEX2,IEX3, IEX4)
13.12*--->
15
CD(I) = CPN(6) + CPN(7)*SGN(1) *AN**IEX1 + CPN(8)*SGN(2) *AN**IEX2 + CPN(9)*SGN(3) *AN**IEX3 + CPN(10)*SGN(4) *AN**IEX4
16
CL(I) = F1(I)/(SD2*F5(I) *P6(I)**2) *(DCOS(P2(I) - P6(I)) + P8(I)*(P3(I) - P9(I))/G - DSIN(P6(I) + TIA)*PWRA(I) /(P4(I)*F1(I)))
17
FALSE
P6(I) .LT. 0.000
TRUE
18
CHNGE (SGN)
19
FALSE
FIT(LPRG) .LT. FITOK .AND. IUP .EQ. 0
TRUE
20
PT1(I) = DARSIN(PT1(I) /P4(I))
52
21
END OF DO LOOP?
NO
YES
13
11
/14.06

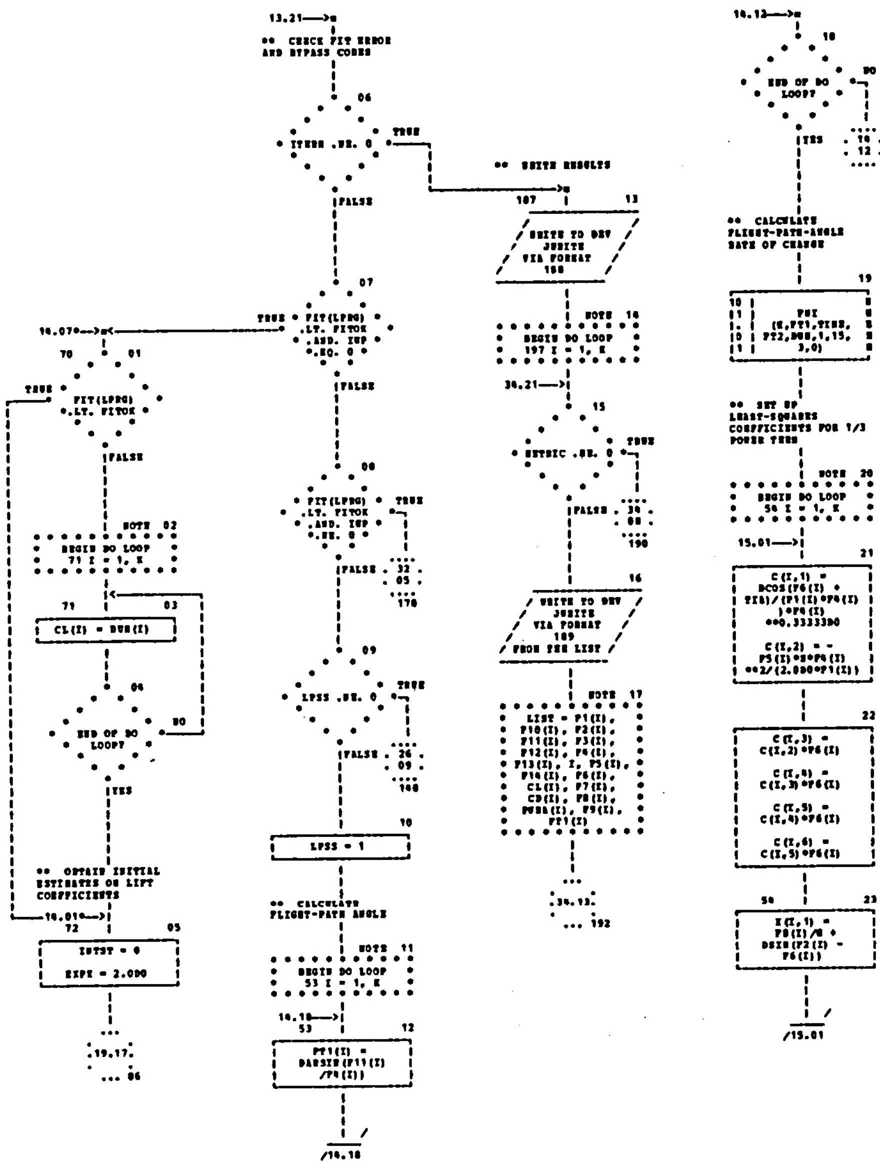

CHECK FIT ERROR AND BYPASS CODES
WRITE RESULTS
CALCULATE FLIGHT-PATH-ANGLE RATE OF CHANGE
SET UP LEAST-SQUARES COEFFICIENTS FOR 1/3 POWER TERM
OBTAIN INITIAL ESTIMATES OF LIFT COEFFICIENTS
CALCULATE FLIGHT-PATH ANGLE
LPSS = 1

CHART TITLE - PROCEDURES

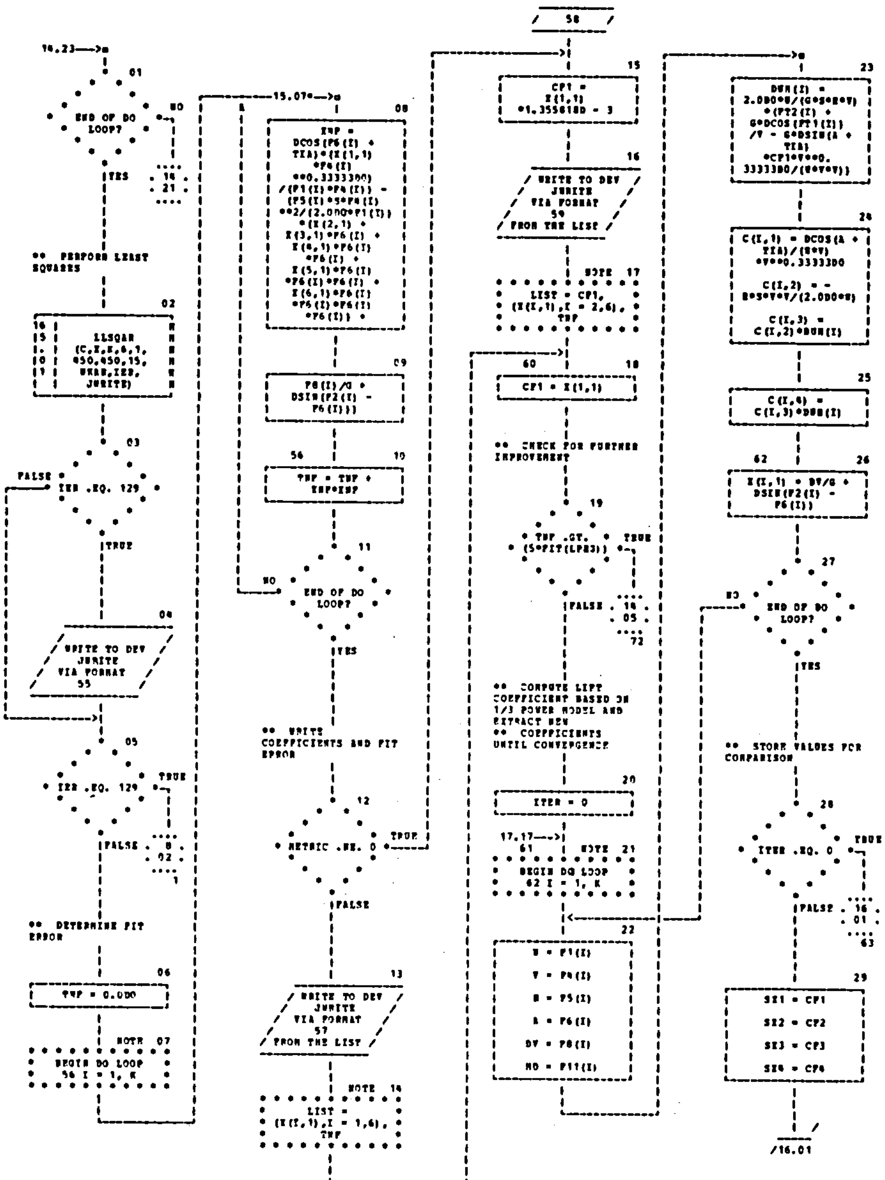


CHART TITLE - PROCEDURES

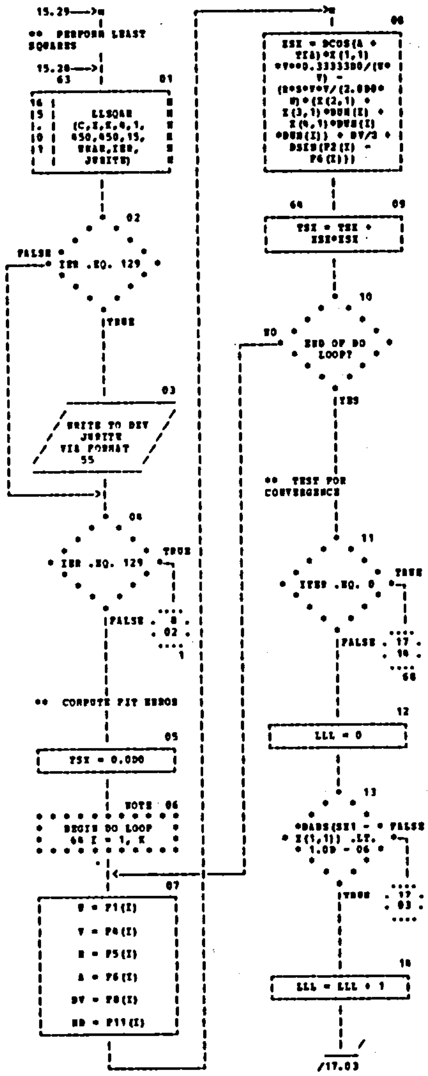


CHART TITLE - PROCEDURES

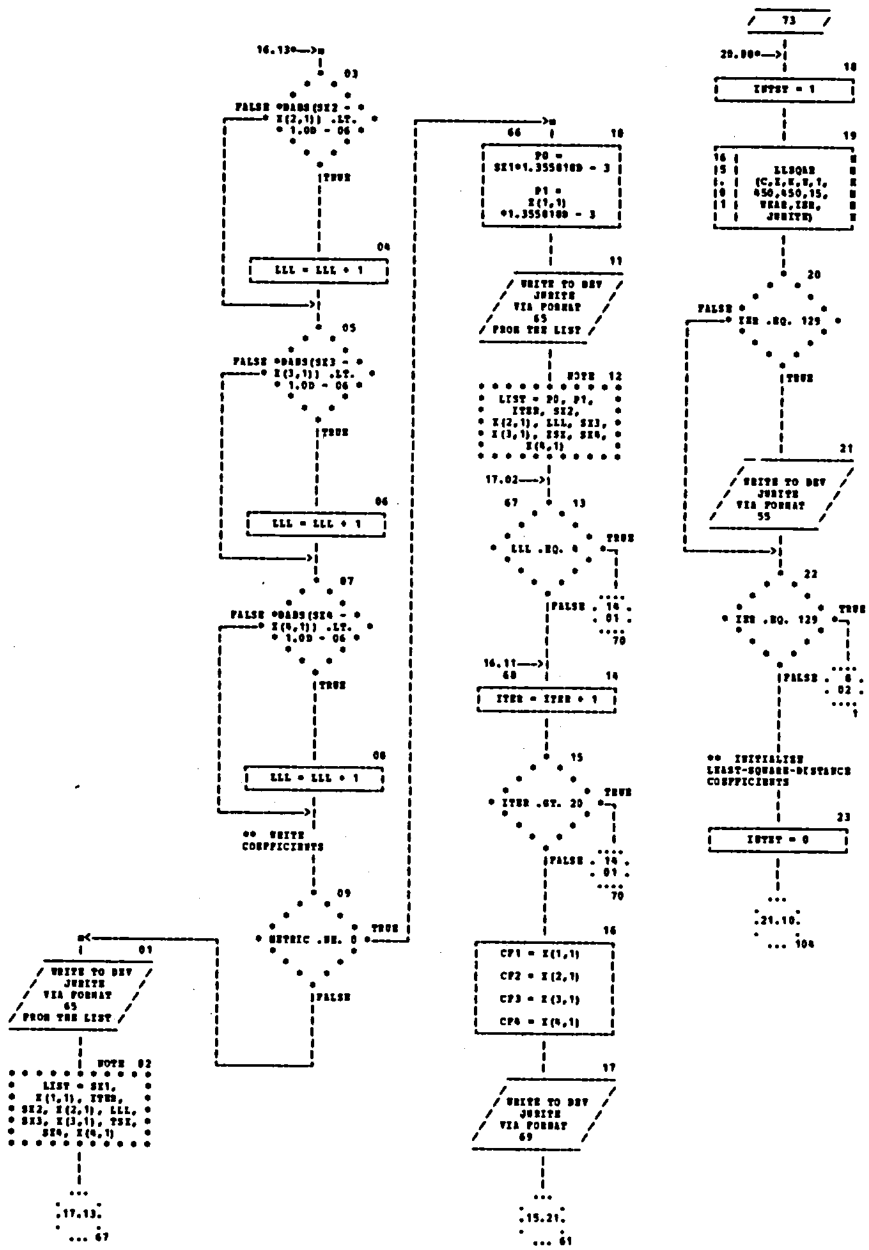
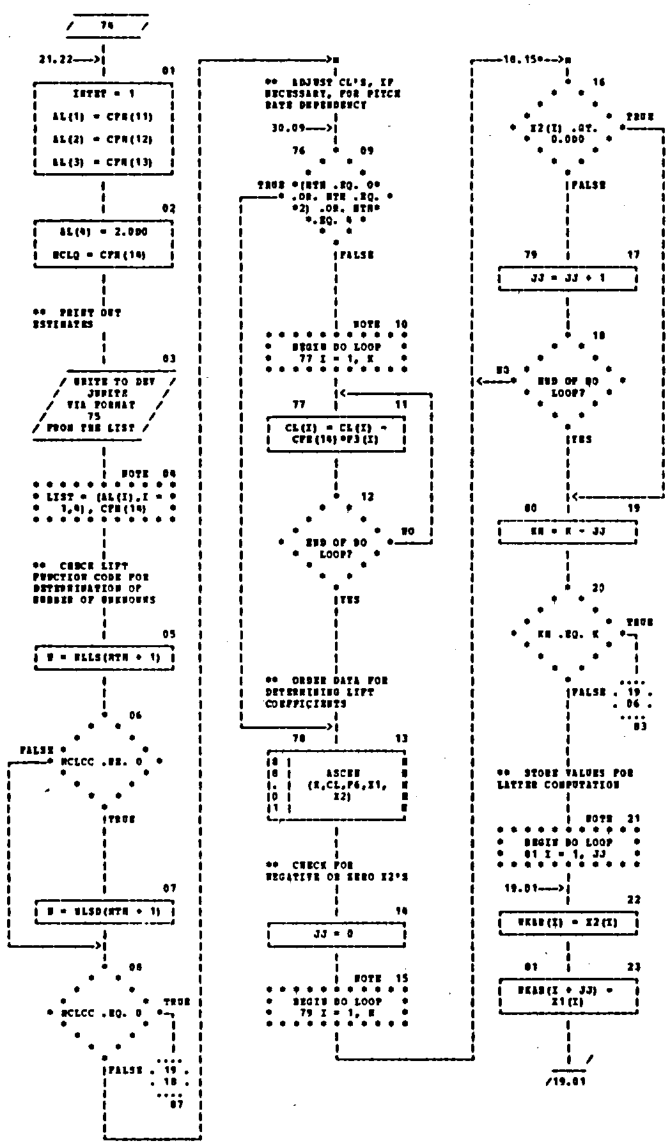


CHART TITLE - PROCEDURES



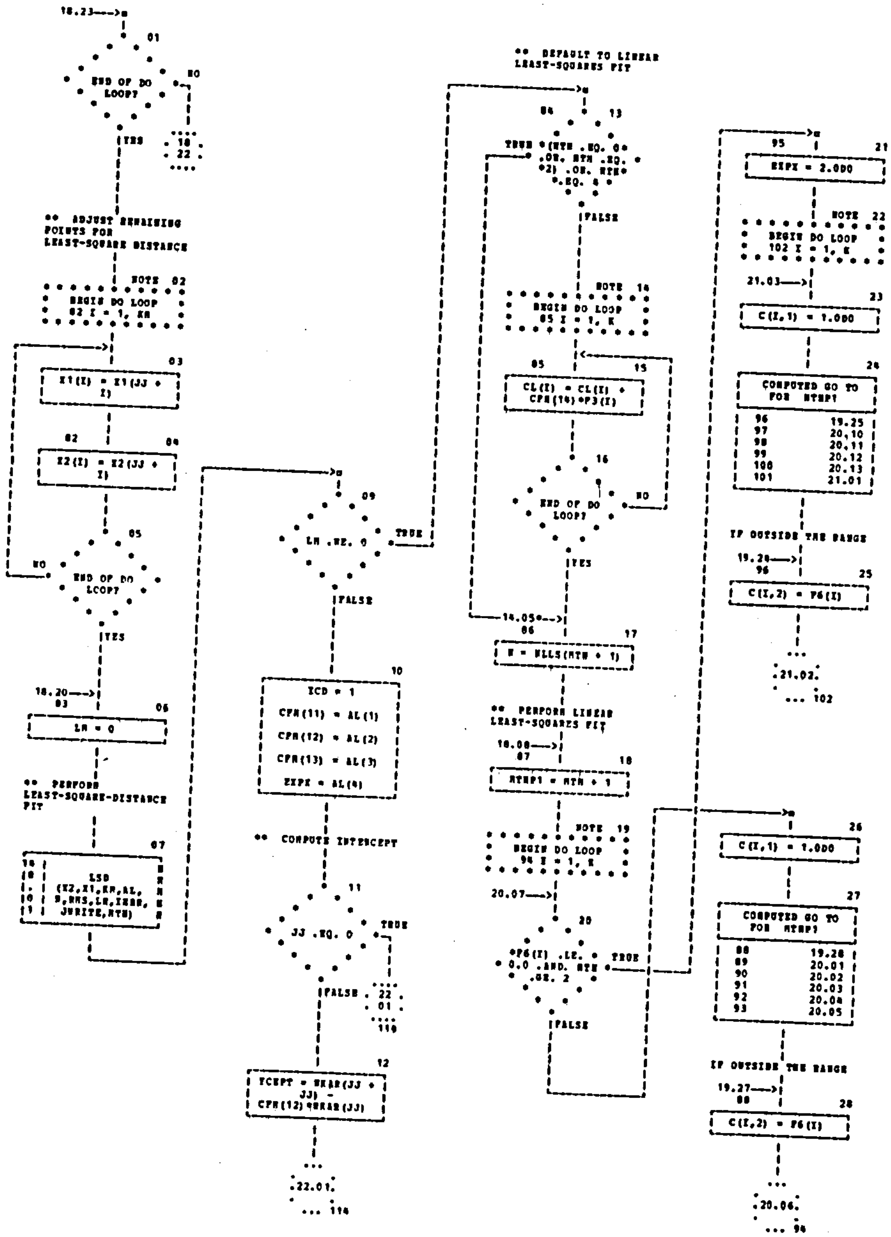

END OF DO LOOP?
** ADJUST REMAINING POINTS FOR LEAST-SQUARE DISTANCE
BEGIN DO LOOP 82 I = 1, KR
X1(I) = X1(JJ + I)
X2(I) = X2(JJ + I)
END OF DO LOOP?
LR = 0
** PERFORM LEAST-SQUARE-DISTANCE FIT
LSD (X2,X1,KR,AL, Y,RMS,LE,IERR, JWRITE,RTH)
LR .NE. 0
ICD = 1
CPR(11) = AL(1)
CPR(12) = AL(2)
CPR(13) = AL(3)
EXPX = AL(4)
** COMPUTE INTERCEPT
JJ .EQ. 0
YCEPT = XBAR(JJ + JJ) - CPR(12)*XBAR(JJ)
** DEFAULT TO LINEAR LEAST-SQUARES FIT
(RTH .EQ. 0 .OR. RTH .EQ. 2) .OR. RTH .EQ. 4
BEGIN DO LOOP 85 I = 1, K
CL(I) = CL(I) + CPR(14)*P3(I)
END OF DO LOOP?
K = NLLS(RTH + 1)
** PERFORM LINEAR LEAST-SQUARES FIT
RTHP1 = RTH + 1
BEGIN DO LOOP 94 I = 1, K
P6(I) .LE. 0.0 .AND. RTH .GE. 2
EXPX = 2.000
BEGIN DO LOOP 102 I = 1, K
C(I,1) = 1.000
COMPUTED GO TO FOR RTHP1
IF OUTSIDE THE RANGE
C(I,2) = P6(I)
C(I,1) = 1.000
COMPUTED GO TO FOR RTHP1
IF OUTSIDE THE RANGE
C(I,2) = P6(I)

CHART TITLE - PROCEDURES

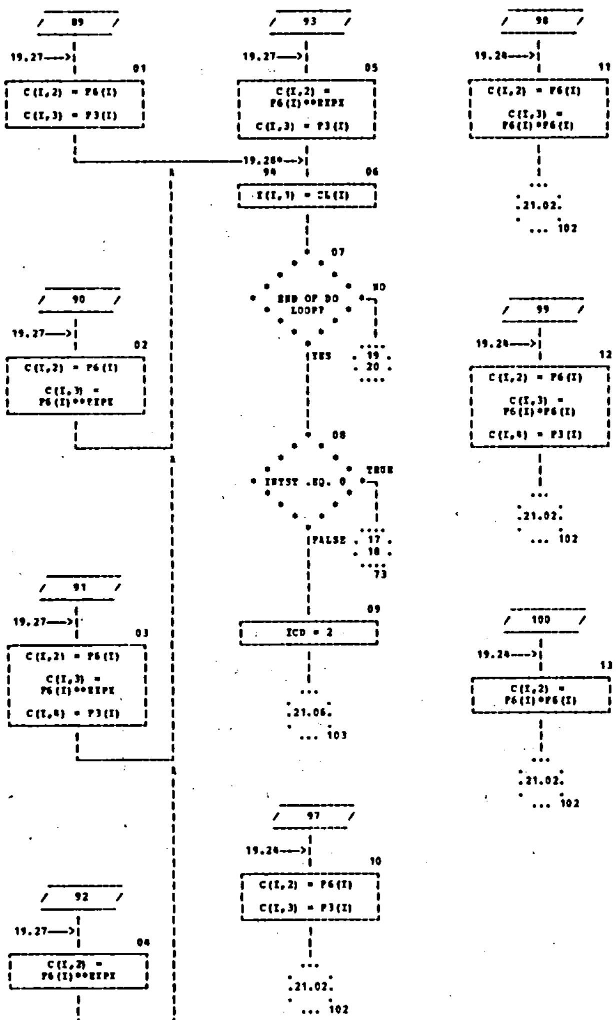


CHART TITLE - PROCEDURES

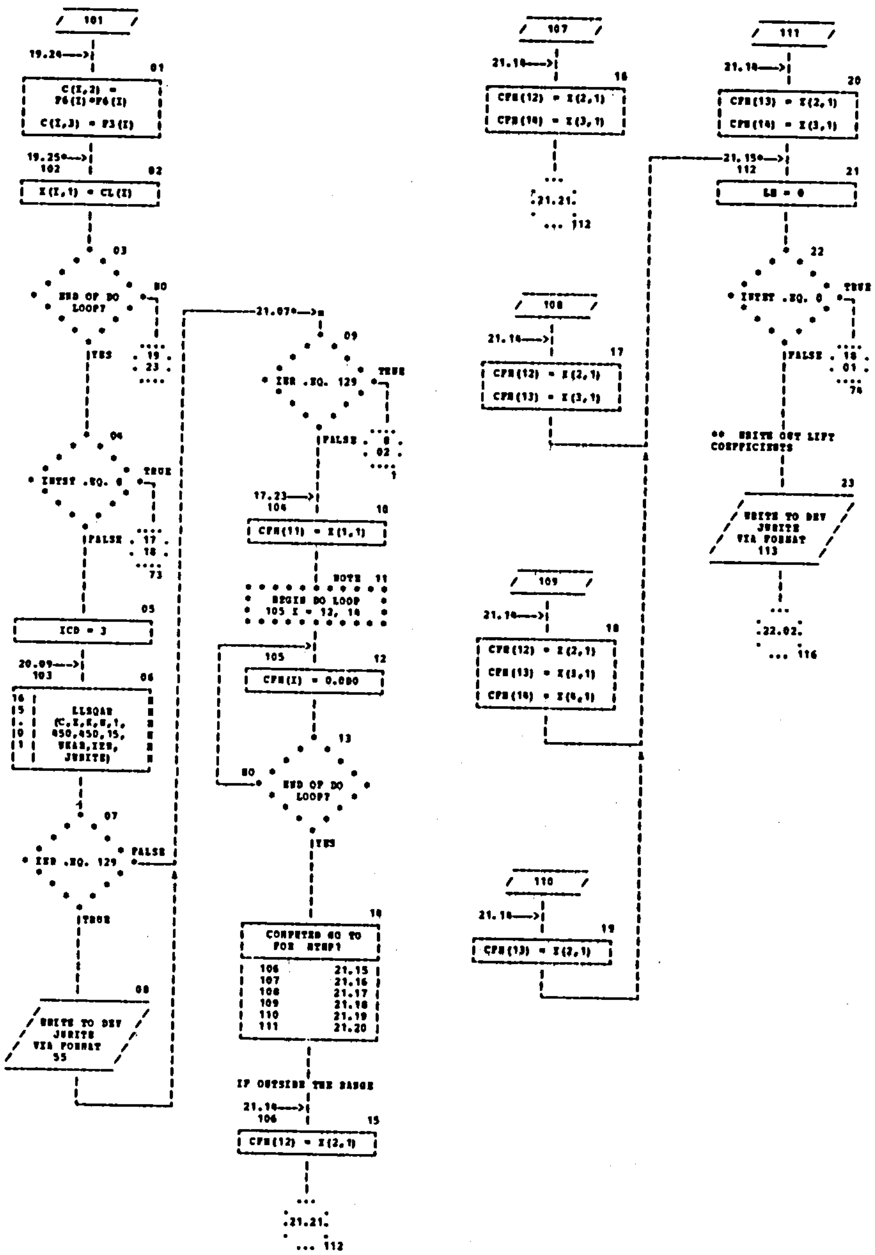
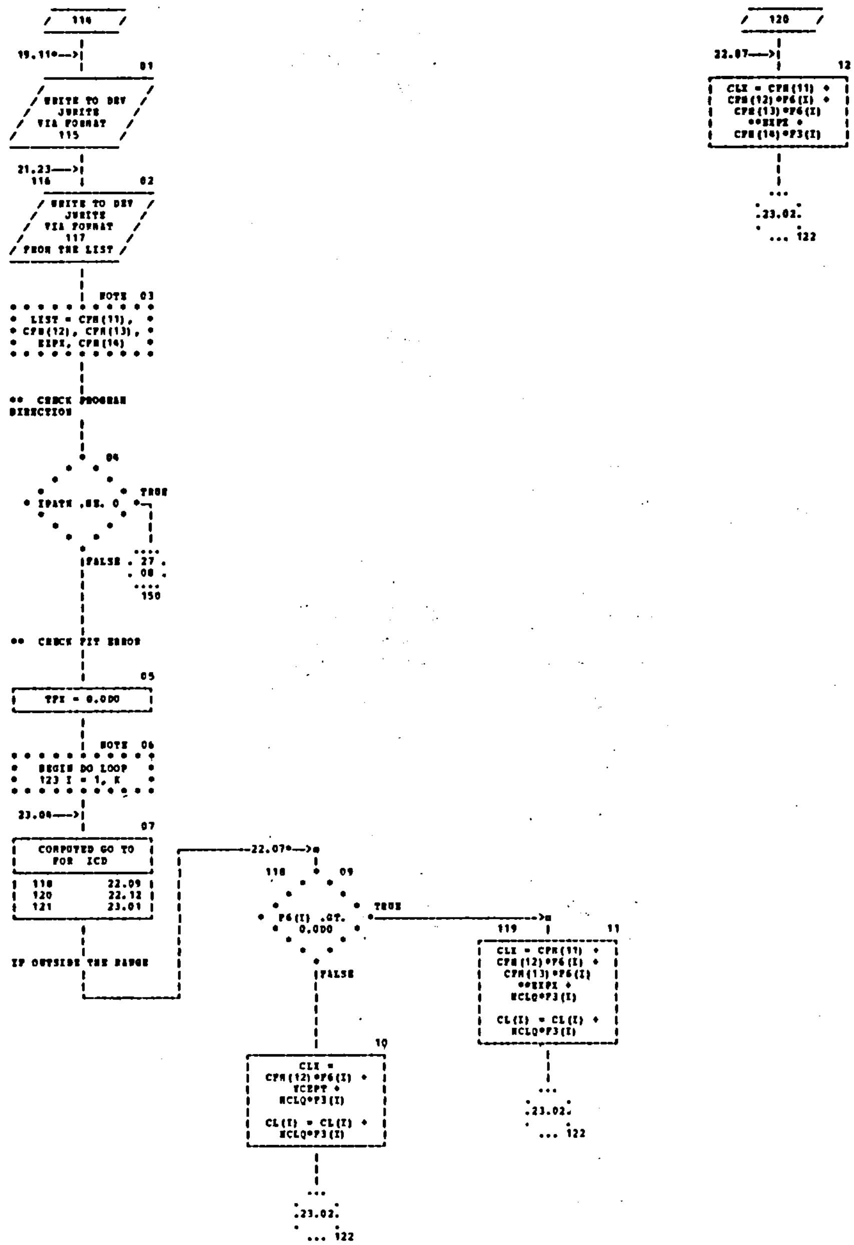


CHART TITLE - PROCEDURES



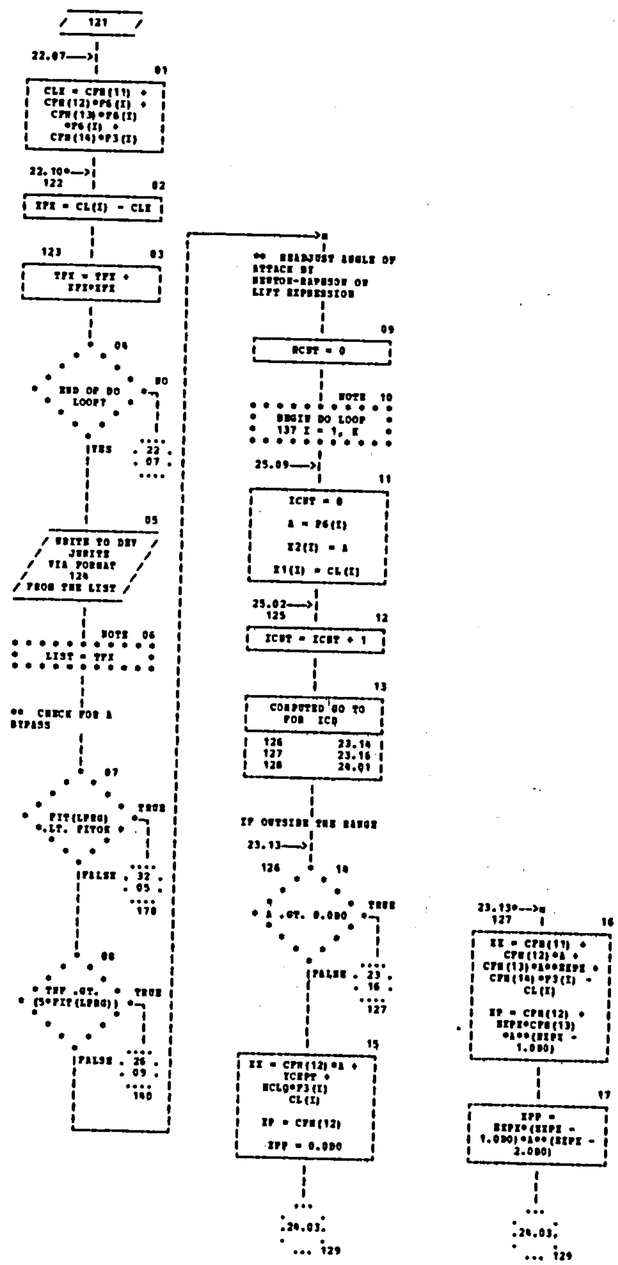
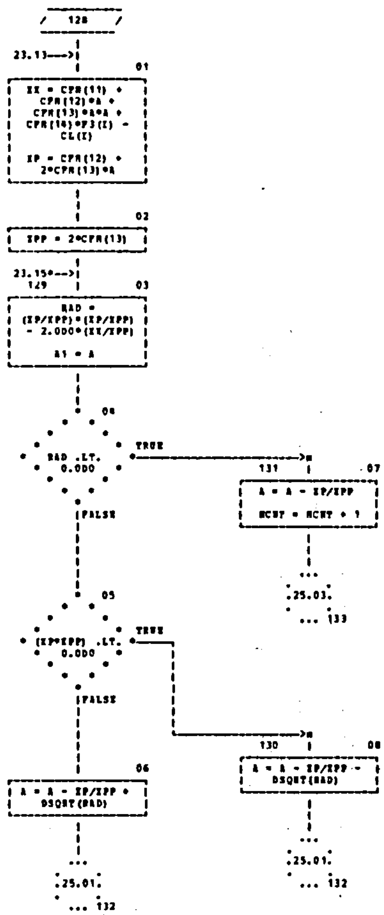

121
22.07
01
CLE = CFN(11) + CFN(12)*F6(I) + CFN(13)*F6(I) *F6(I) + CFN(14)*F3(I)
22.10*
122
02
EPE = CL(I) - CLE
123
03
TPE = TPE + EPE*EPE
04
END OF DO LOOP?
NO
YES
22 07
05
WRITE TO DEV JWRITE VIA FORMAT 124 FROM THE LIST
NOTE 06
LIST = TPE
** CHECK FOR A BYPASS
07
FIT(LPEG) .LT. FITOK
TRUE
FALSE
32 05
170
08
TPE .GT. (5*FIT(LPEG))
TRUE
FALSE
26 09
140
** READJUST ANGLE OF ATTACK BY NEWTON-RAPHSON OF LIFT EXPRESSION
09
NCNT = 0
NOTE 10
BEGIN DO LOOP 137 I = 1, K
25.09
11
ICNT = 0
A = F6(I)
X2(I) = A
X1(I) = CL(I)
25.02
125
12
ICNT = ICNT + 1
13
COMPUTED GO TO FOR ICQ
126 23.14
127 23.16
128 24.01
IF OUTSIDE THE RANGE
23.13
126
14
A .GT. 0.0D0
TRUE
FALSE
23 16
127
15
XX = CFN(12)*A + YCEPT + NCLQ*F3(I) CL(I)
XP = CFN(12)
XPP = 0.0D0
24.03
129
23.13*
127
16
XX = CFN(11) + CFN(12)*A + CFN(13)*A**EXPE + CFN(14)*F3(I) - CL(I)
XP = CFN(12) + EXPE*CFN(13) *A**(EXPE - 1.0D0)
17
XPP = EXPE*(EXPE - 1.0D0)*A**(EXPE - 2.0D0)
24.03
129

CHART TITLE - PROCEDURES



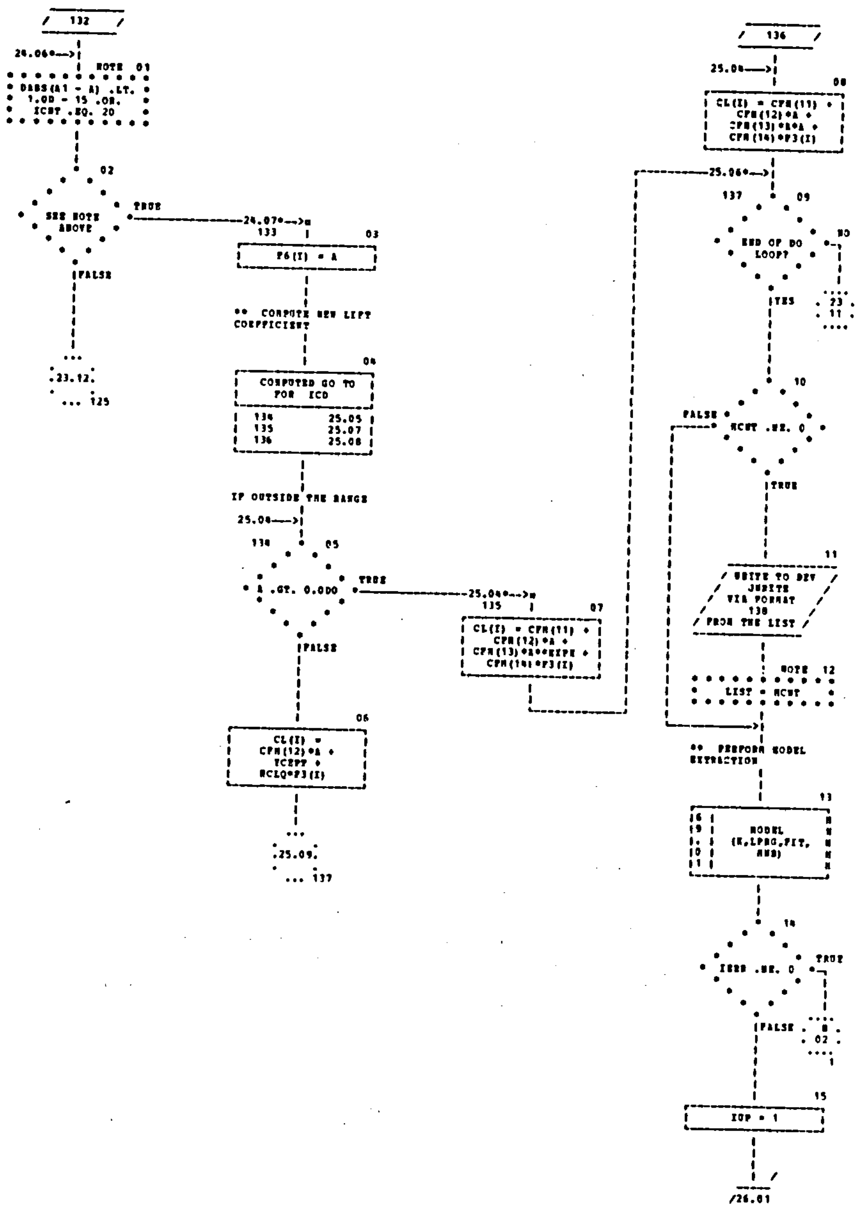
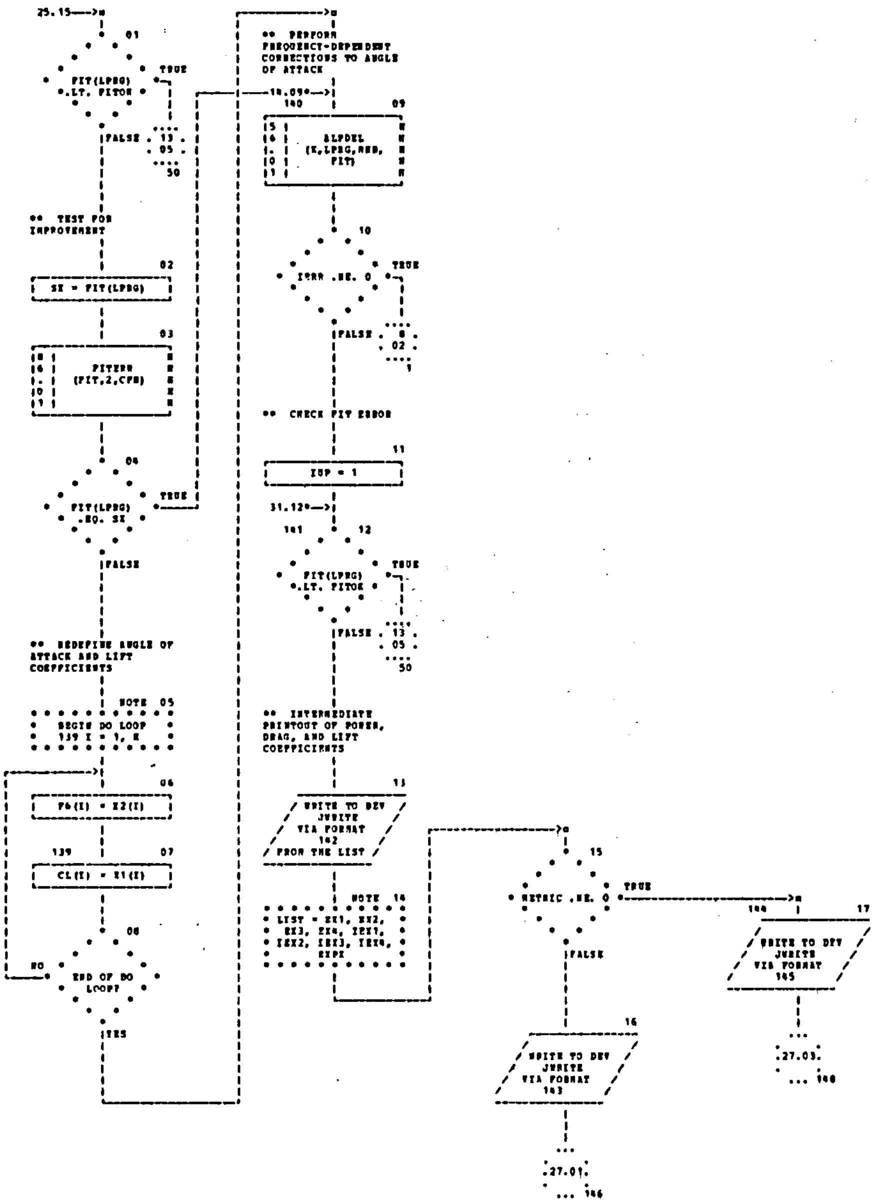

132
24.06*
NOTE 01
DABS(A1 - A) .LT. 1.0D - 15 .OR. ICBT .EQ. 20
02
SEE NOTE ABOVE
TRUE
FALSE
23.12.
125
24.07*
133
03
F6(I) = A
** COMPUTE NEW LIFT COEFFICIENT
04
COMPUTED GO TO FOR ICD
134 25.05
135 25.07
136 25.08
IF OUTSIDE THE RANGE
25.04
134
05
A .GT. 0.0D0
TRUE
FALSE
06
CL(I) = CPM(12)*A + TCEPT + RCLQ*P3(I)
25.09.
137
25.04*
135
07
CL(I) = CPM(11) + CPM(12)*A + CPM(13)*A**EXPE + CPM(14)*P3(I)
136
25.04
08
CL(I) = CPM(11) + CPM(12)*A + CPM(13)*A*A + CPM(14)*P3(I)
25.06*
137
09
END OF DO LOOP?
NO
YES
23 11
10
NCBT .NE. 0
FALSE
TRUE
11
WRITE TO DEV JWRITE VIA FORMAT 138 FROM THE LIST
NOTE 12
LIST = NCBT
** PERFORM MODEL EXTRACTION
13
MODEL (K,LPRG,FIT, NEB)
14
IERR .NE. 0
TRUE
FALSE
8 02
15
IOP = 1
26.01

CHART TITLE - PROCEDURES



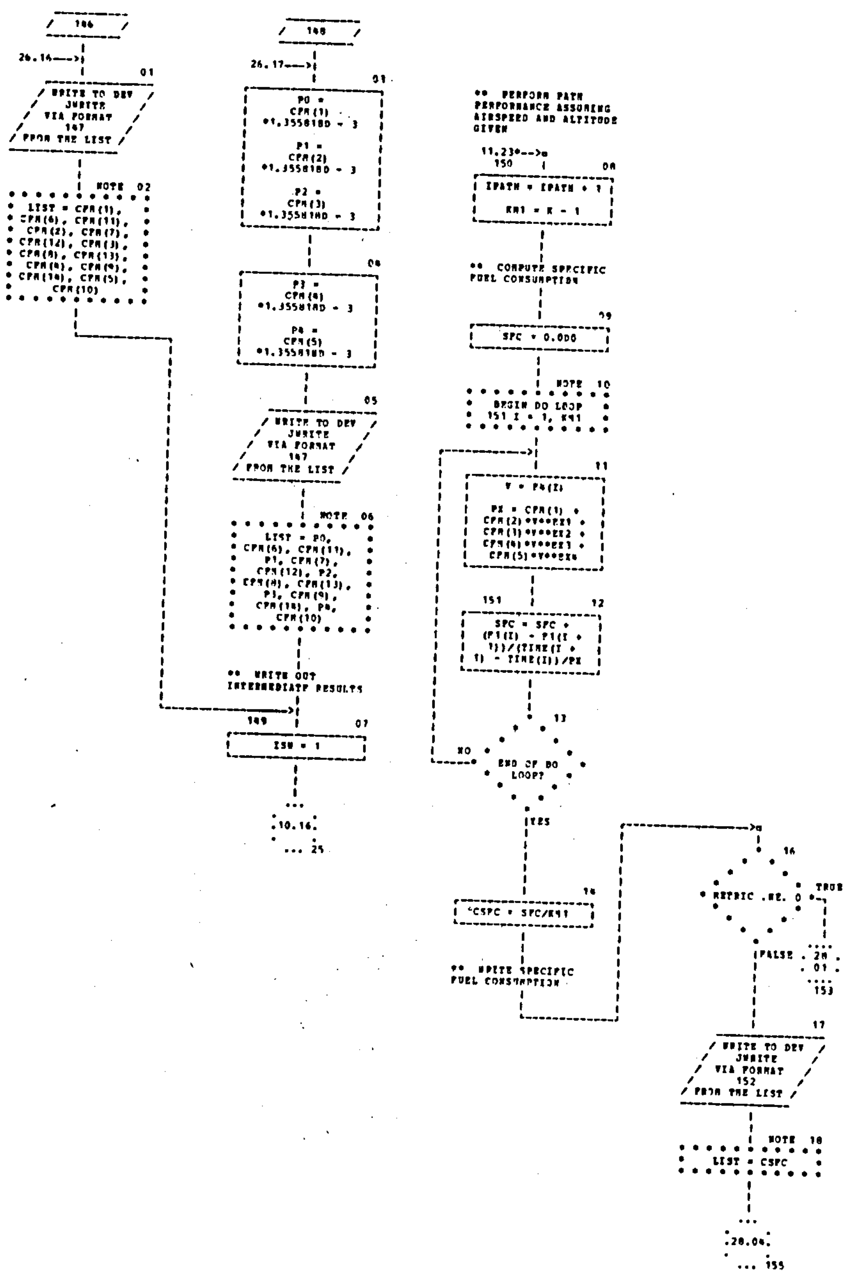

146
26.16--->
01
WRITE TO DEV JWRITE VIA FORMAT 147 FROM THE LIST
NOTE 02
LIST = CPR(1), CPR(6), CPR(11), CPR(2), CPR(7), CPR(12), CPR(3), CPR(8), CPR(13), CPR(4), CPR(9), CPR(14), CPR(5), CPR(10)
148
26.17--->
01
P0 = CPR(1) *1.355818D - 3
P1 = CPR(2) *1.355818D - 3
P2 = CPR(3) *1.355818D - 3
04
P3 = CPR(4) *1.355818D - 3
P4 = CPR(5) *1.355818D - 3
05
WRITE TO DEV JWRITE VIA FORMAT 147 FROM THE LIST
NOTE 06
LIST = P0, CPR(6), CPR(11), P1, CPR(7), CPR(12), P2, CPR(8), CPR(13), P3, CPR(9), CPR(14), P4, CPR(10)
** WRITE OUT INTERMEDIATE RESULTS
149
07
ISW = 1
10.16
25
** PERFORM PATH PERFORMANCE ASSUMING AIRSPEED AND ALTITUDE GIVEN
11.23*--->
150
08
IPATH = IPATH + 1
KM1 = K - 1
** COMPUTE SPECIFIC FUEL CONSUMPTION
09
SPC = 0.0D0
NOTE 10
BEGIN DO LOOP 151 I = 1, KM1
11
V = PA(I)
PX = CPR(1) + CPR(2)*V**EX1 + CPR(3)*V**EX2 + CPR(4)*V**EX3 + CPR(5)*V**EX4
151
12
SPC = SPC + (FT(I) - FT(I + 1))/(TIME(I + 1) - TIME(I))/PX
13
NO
END OF DO LOOP?
YES
14
CSPC = SPC/KM1
** WRITE SPECIFIC FUEL CONSUMPTION
16
METRIC .NE. 0
TRUE
28
01
153
FALSE
17
WRITE TO DEV JWRITE VIA FORMAT 152 FROM THE LIST
NOTE 18
LIST = CSPC
28.04
155

CHART TITLE - PROCEDURES

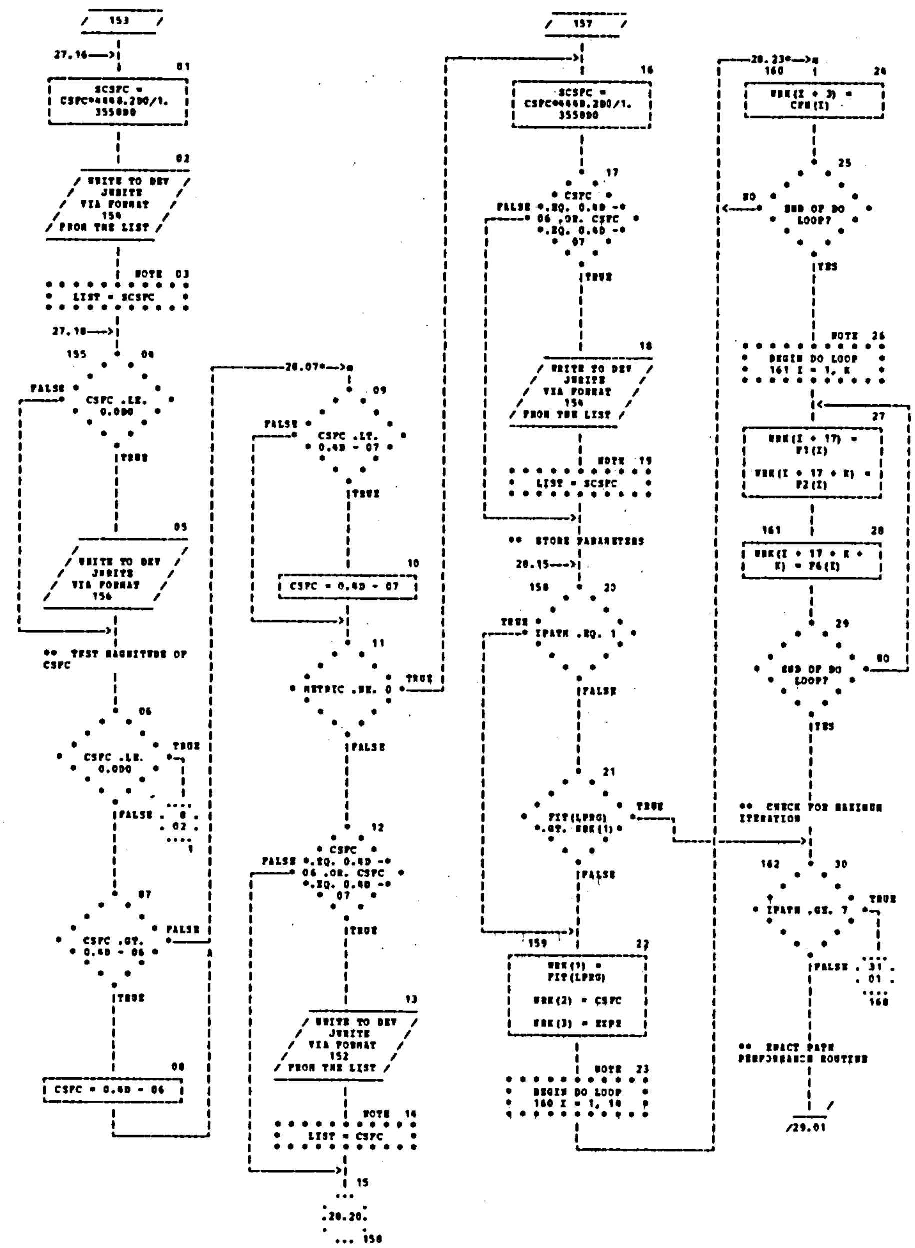


CHART TITLE - PROCEDURES

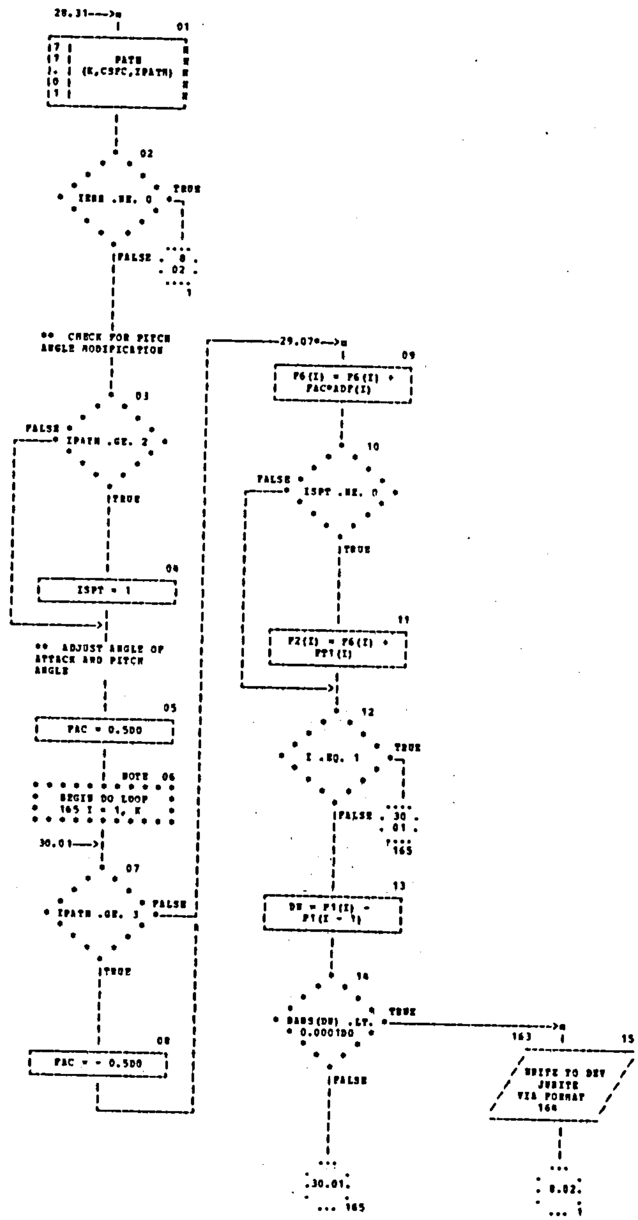


CHART TITLE - PROCEDURES

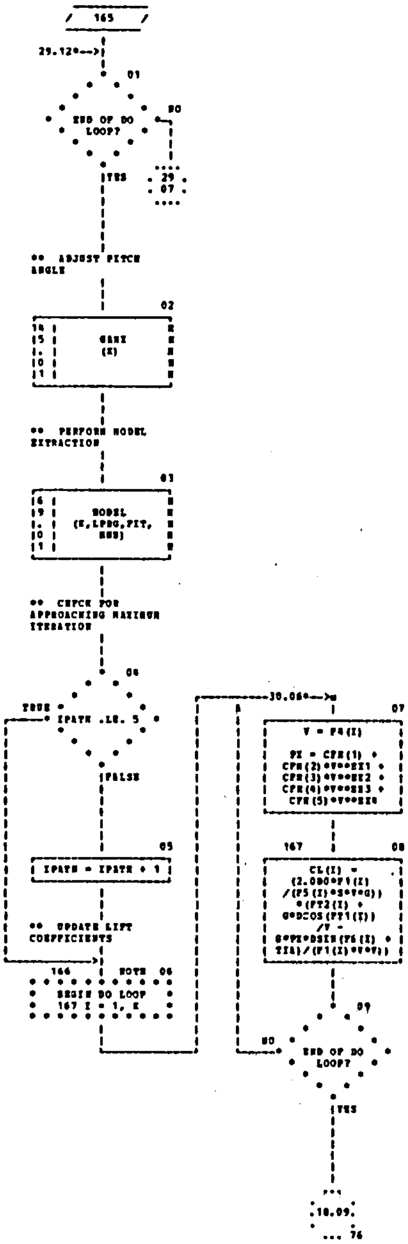


CHART TITLE - PROCEDURES

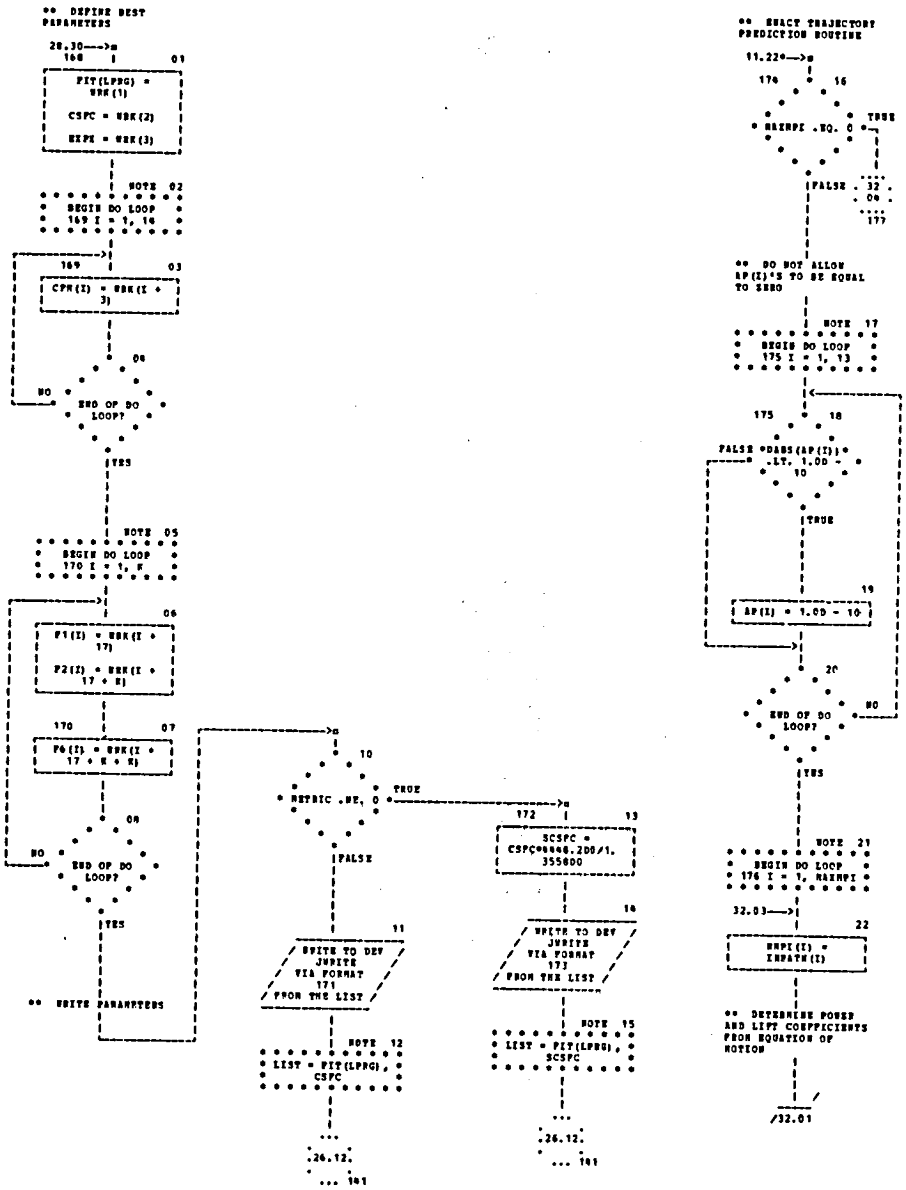


CHART TITLE - PROCEDURES

```
31.23--->*
         |
**  NORMAL TO FLIGHT
PATH OR ADJUST A
PRIORI WEIGHTS
         |
         |
         |          01
.--------------------.
|5 |                 *
|9 |      GDEQN      *
|. |    (K,NNB,I)    *
|0 |                 *
|1 |                 *
.--------------------.
         |
         |
         |          02
.--------------------.
|8 |                 *
|6 |      NPATH      *
|. |  (K,CSPC,NNB,   *
|0 | LPNG,FIT,TABE,  *
|1 | NTABE,NNPI(I))  *
.--------------------.
         |
         |
   176   *    03
       *   *
     *       *
   *           *    NO
 *   END OF DO   *--.
   *   LOOP?     *  |
     *       *      |
       *   *        |
         *         ....
         |YES     . 31 .
         |        . 22 .
         |         ....
         |
         |
         |
**  CALL MODEL
EXTRACTION ROUTINE
         |
 31.16--->|
   177   |          04
.--------------------.
|6 |                 *
|9 |      MODEL      *
|. | (K,LPNG,FIT,    *
|0 |      NNB)       *
|1 |                 *
.--------------------.
         |
         |
         |
**  DETERMINE
CONFIDENCE MAGNITUDES
FOR ANGLE OF ATTACK
AND PITCH
**  ANGLE
         |
 16.08*--->|
   178   |          05
.--------------------.
|   XALP = 0.0D0     |
|                    |
|   XTHE = 0.0D0     |
.--------------------.
         |
         |
         |  NOTE  06
* * * * * * * * * * * *
*    BEGIN DO LOOP    *
*    179 I = 1, K     *
* * * * * * * * * * * *
         |
 33.05--->|
         |          07
.--------------------.
|   XALP = XALP +    |
| (DABS((ALPHA(I) -  |
| F6(I))/AMAX))**2   |
.--------------------.
         |
         |
         |  /
       -----
      /33.04
```

CHART TITLE - PROCEDURES

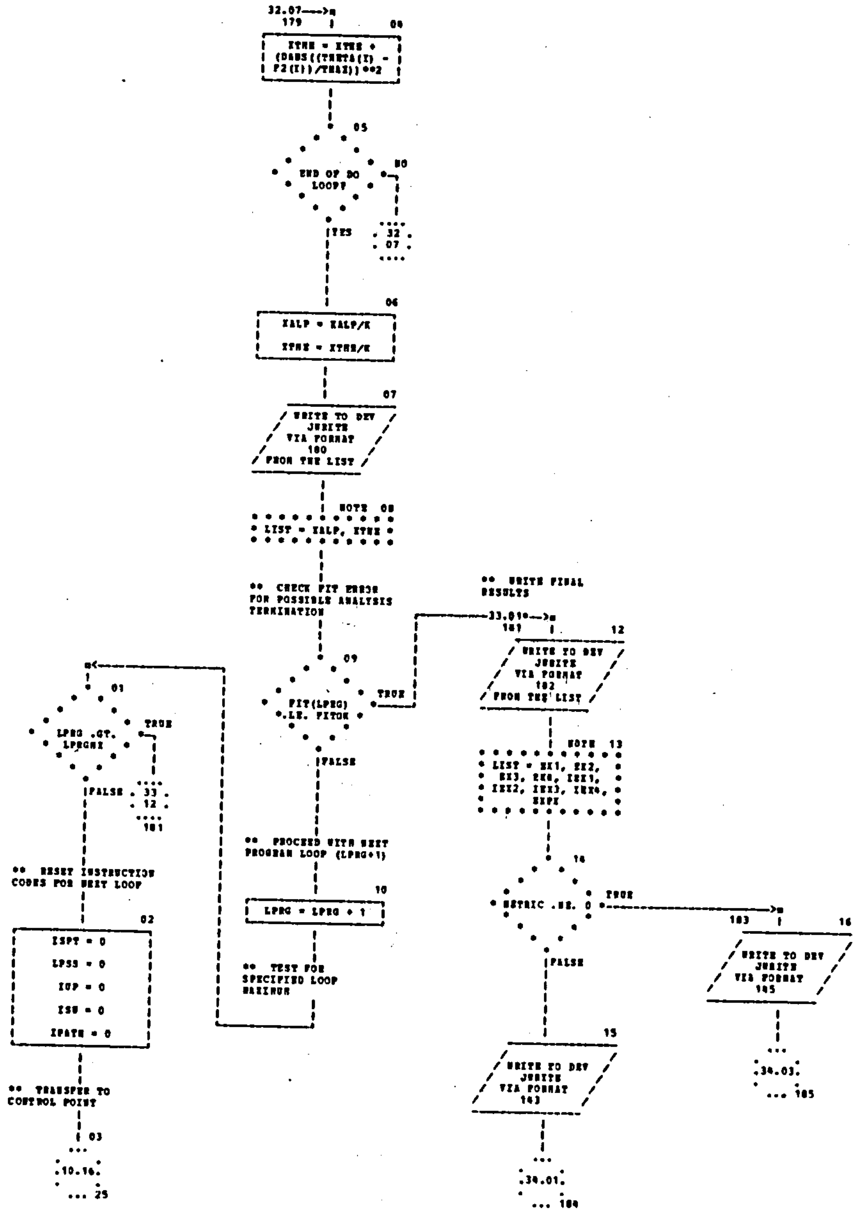
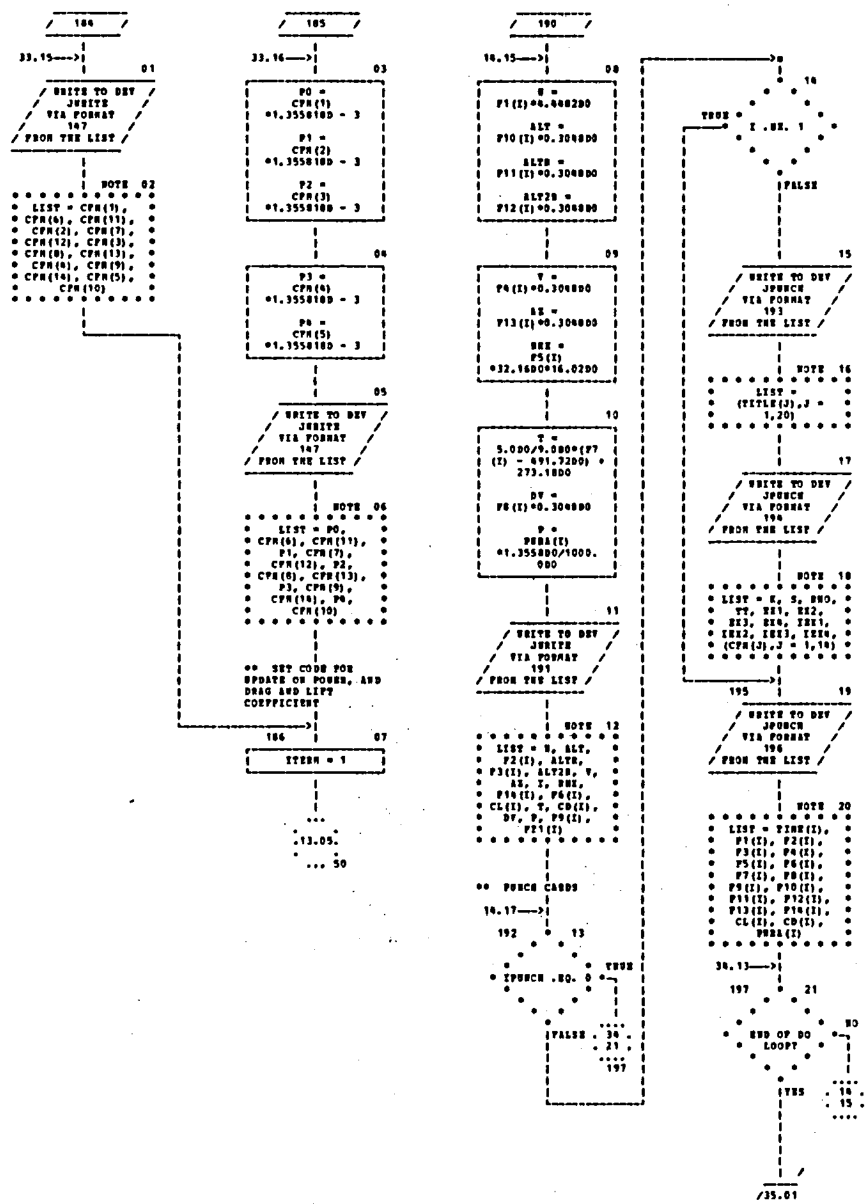


CHART TITLE - PROCEDURES



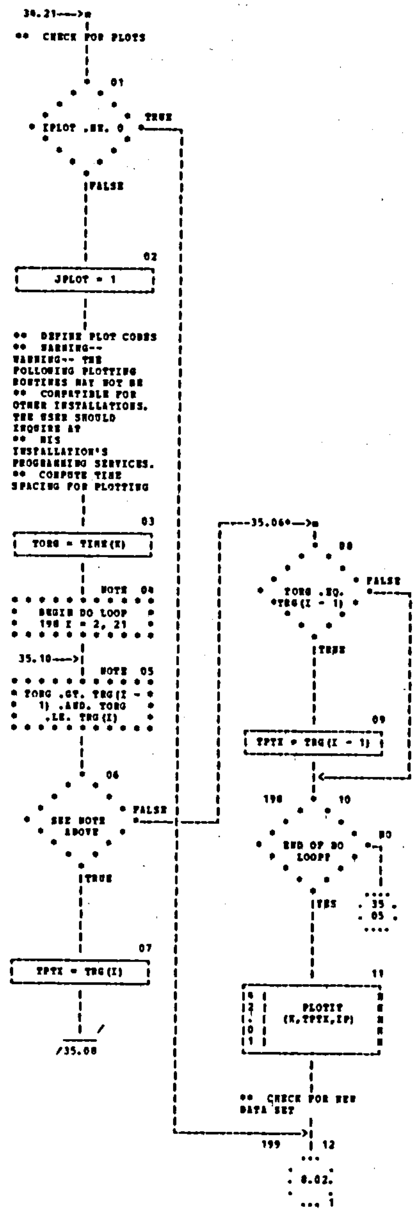

34.21
** CHECK FOR PLOTS
01
IPLOT .NE. 0
TRUE
FALSE
02
JPLOT = 1
** DEFINE PLOT CODES
** WARNING--
WARNING-- THE
FOLLOWING PLOTTING
ROUTINES MAY NOT BE
** COMPATIBLE FOR
OTHER INSTALLATIONS.
THE USER SHOULD
INQUIRE AT
** HIS
INSTALLATION'S
PROGRAMMING SERVICES.
** COMPUTE TIME
SPACING FOR PLOTTING
03
TORG = TIME(K)
NOTE 04
BEGIN DO LOOP
198 I = 2, 21
35.10
NOTE 05
TORG .GT. TRG(I - 1) .AND. TORG .LE. TRG(I)
06
SEE NOTE ABOVE
FALSE
TRUE
07
TPTX = TRG(I)
/35.08
35.06*
08
TORG .EQ. TRG(I - 1)
FALSE
TRUE
09
TPTX = TRG(I - 1)
198
10
END OF DO LOOP?
NO
35
05
YES
11
PLOTIT (K,TPTX,IP)
** CHECK FOR NEW DATA SET
199
12
8.02.
1

CHART TITLE - SUBROUTINE PLOTIT(K,TPTE,IP)

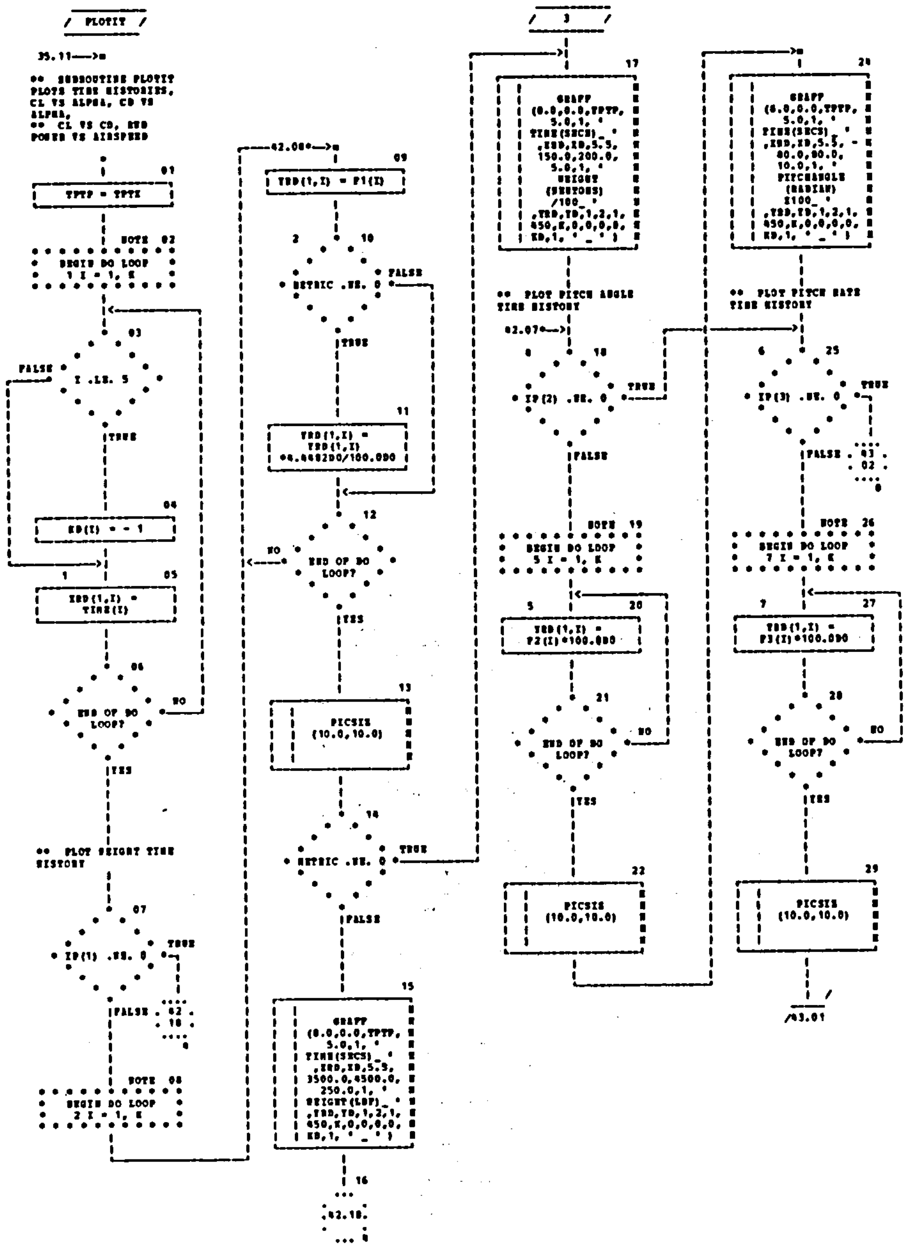


CHART TITLE - SUBROUTINE PLOTIT(K,TPTX,IP)

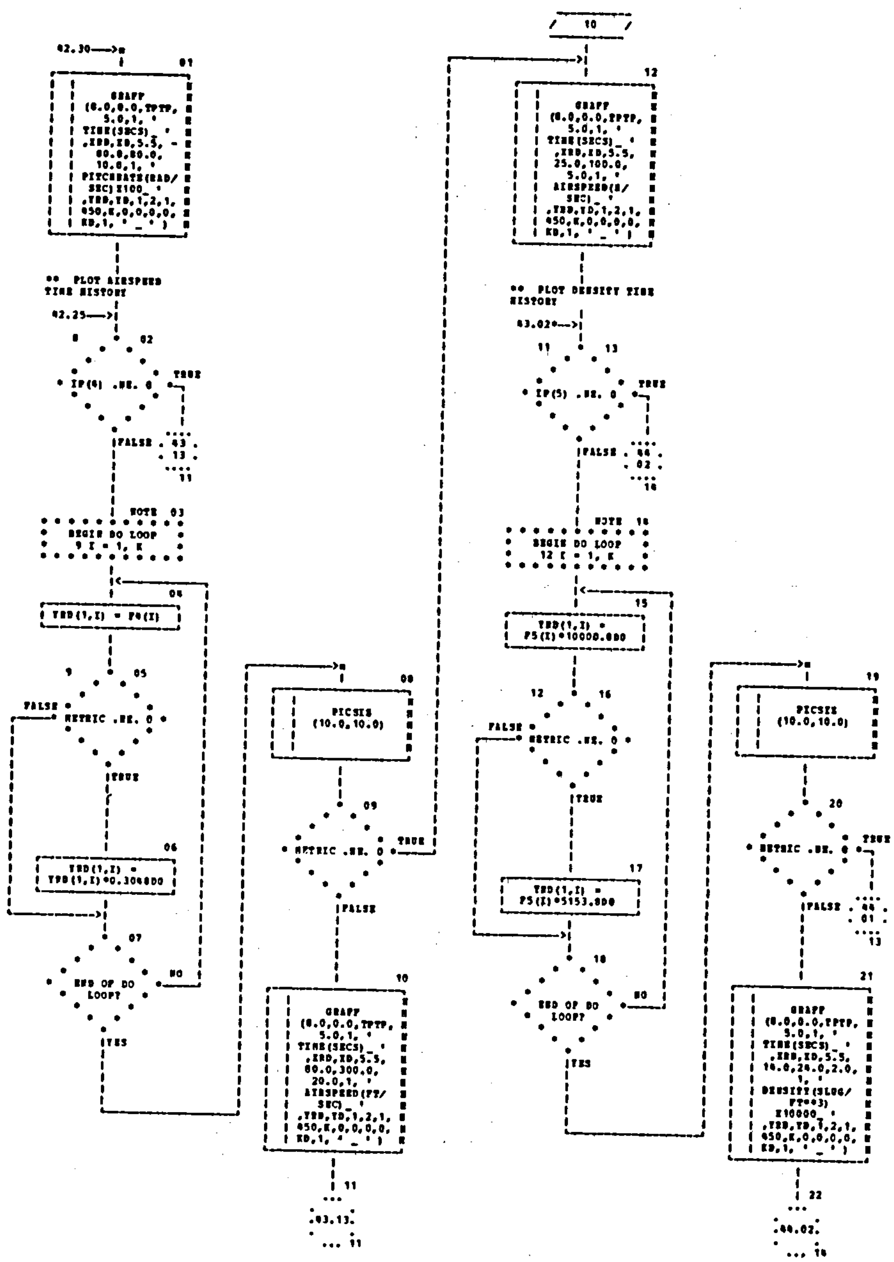
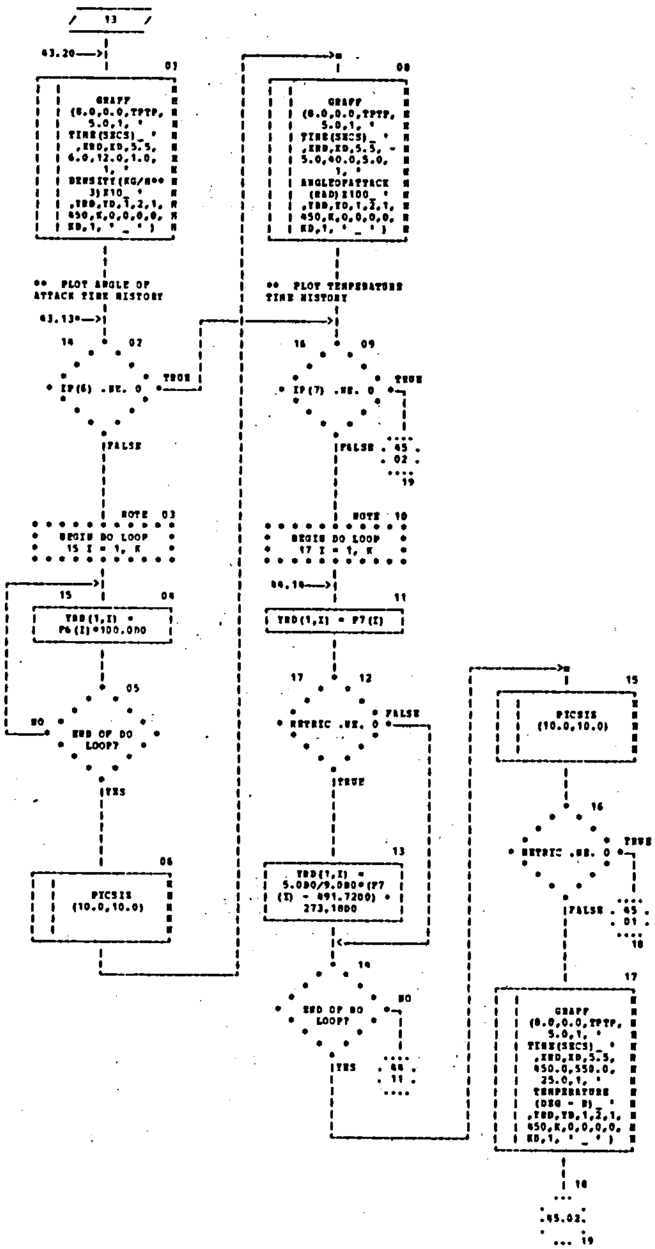


CHART TITLE - SUBROUTINE PLOTIT(K,TPTX,IP)



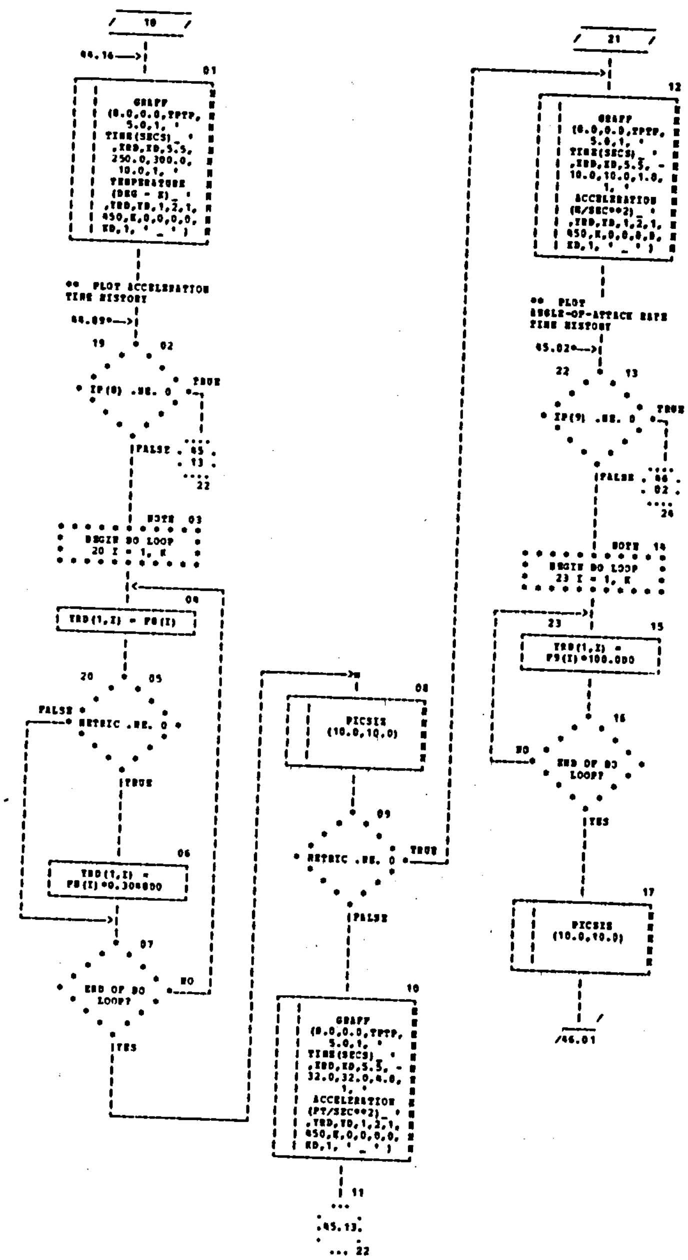

GRAFF
TIME(SECS)
TEMPERATURE
** PLOT ACCELERATION TIME HISTORY
TRUE
FALSE
NOTE
BEGIN DO LOOP
20 I = 1, K
METRIC .NE. 0
END OF DO LOOP?
YES
NO
PICSIZ
(10.0,10.0)
ACCELERATION
(FT/SEC**2)
** PLOT ANGLE-OF-ATTACK RATE TIME HISTORY
23 I = 1, K
/46.01

CHART TITLE - SUBROUTINE PLOTIT(K,TPTX,IP)

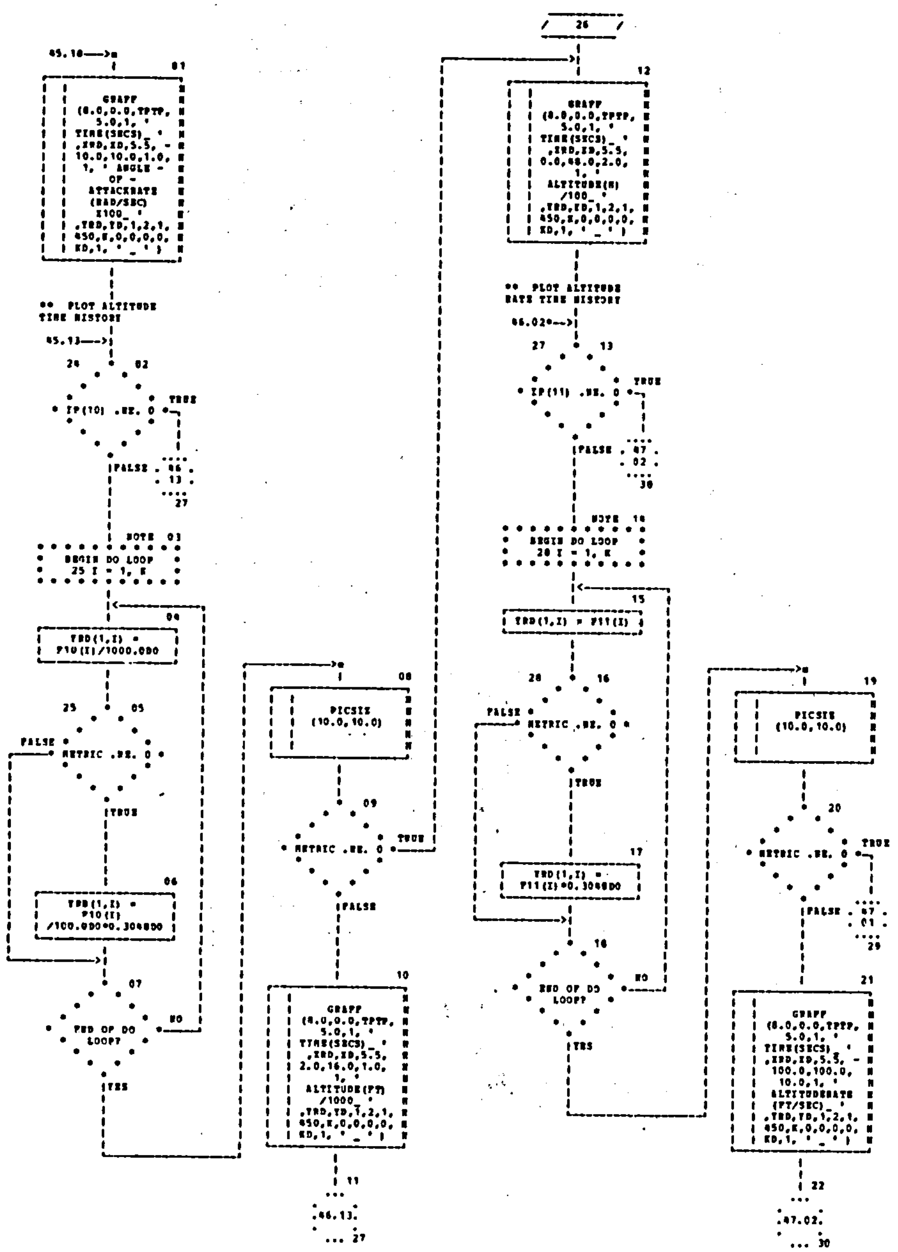


CHART TITLE - SUBROUTINE PLOTIT(K,TPTP,IP)

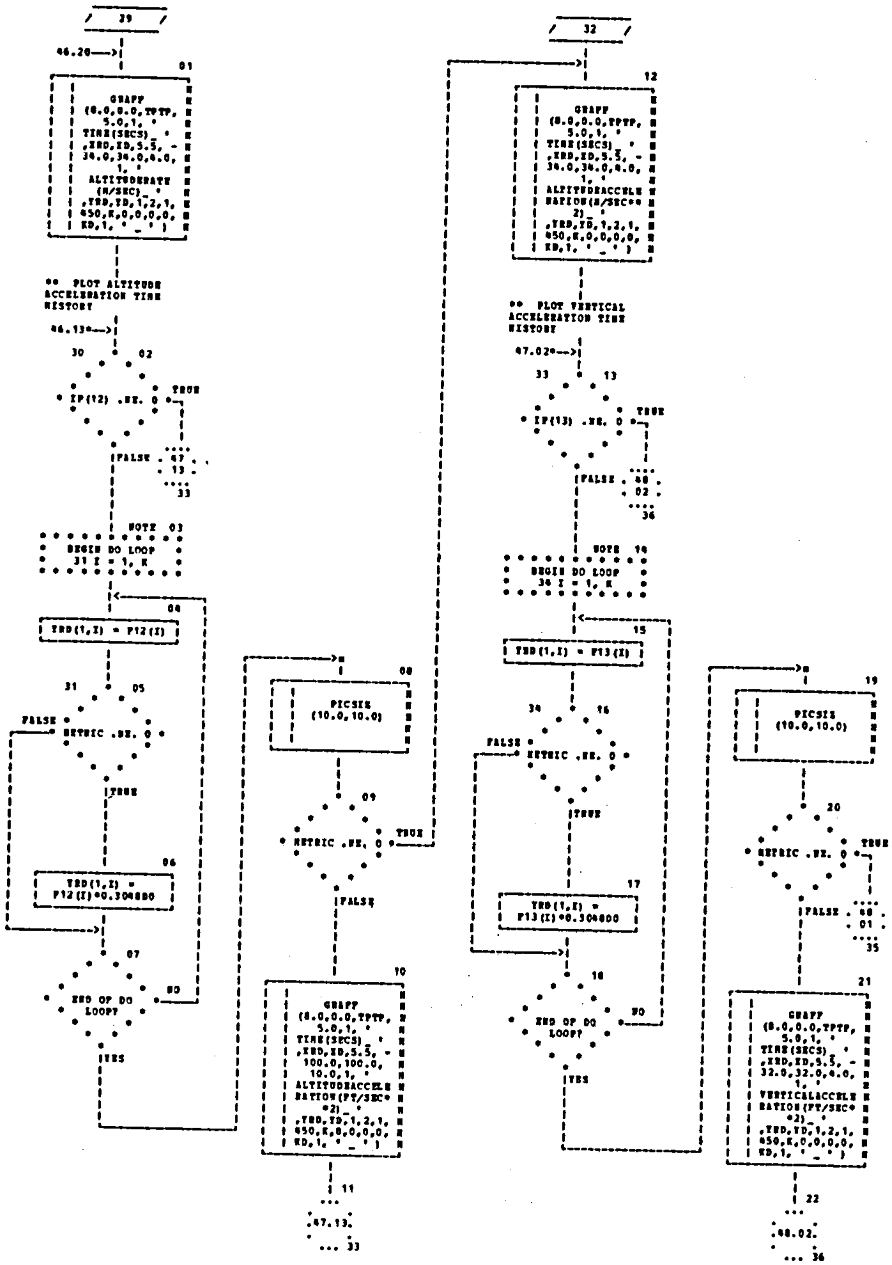


CHART TITLE - SUBROUTINE PLOTIT(K,TPTE,IP)

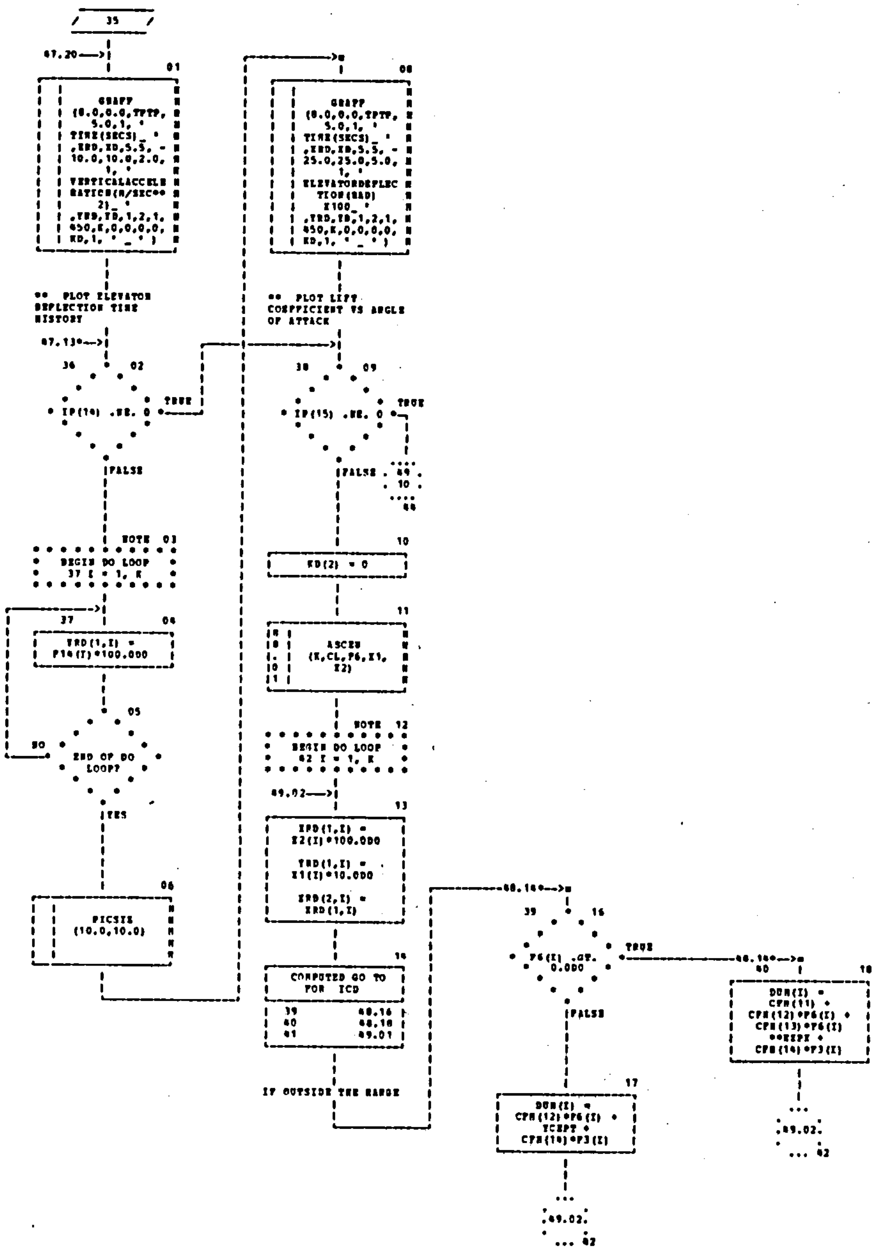


CHART TITLE - SUBROUTINE PLOTIT(K,TPTI,IP)

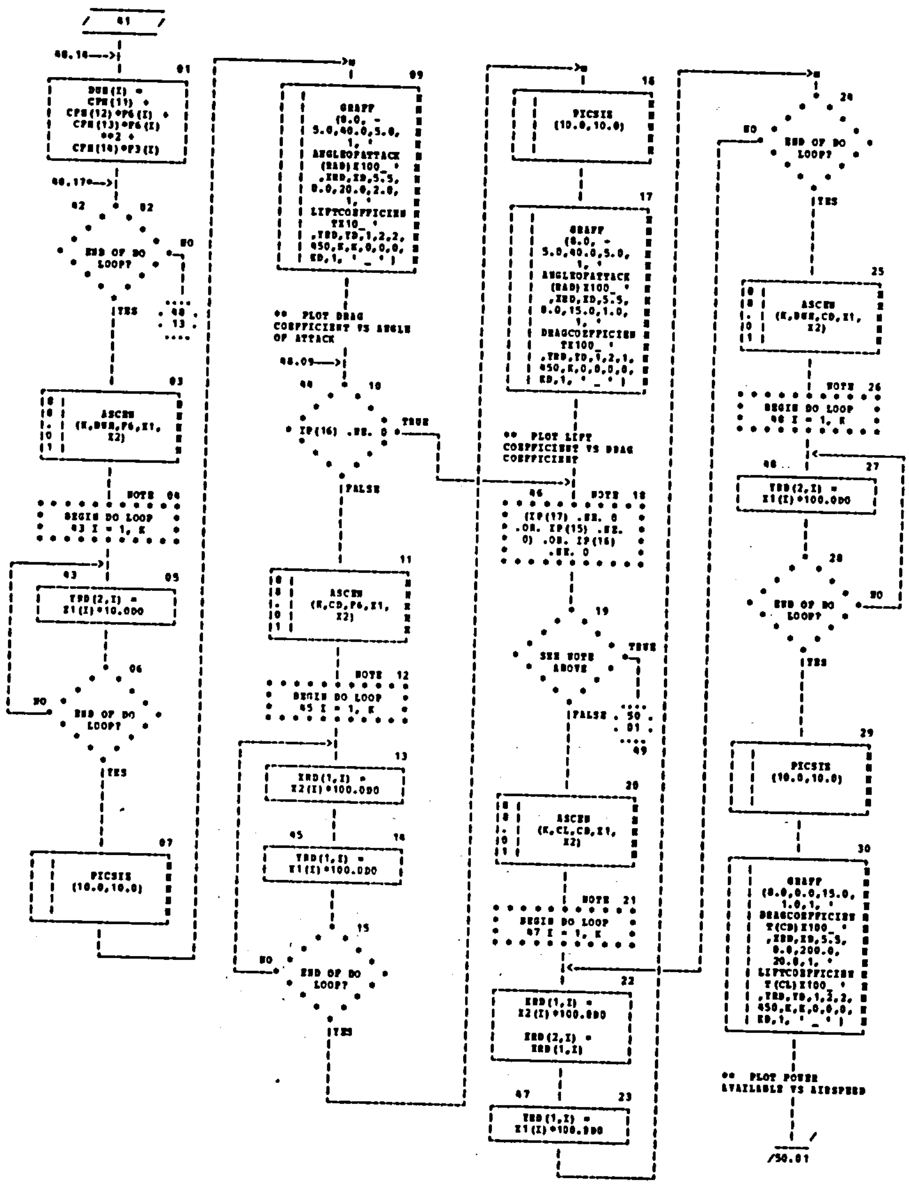


CHART TITLE - SUBROUTINE PLOTIT(K,TPTX,IP)

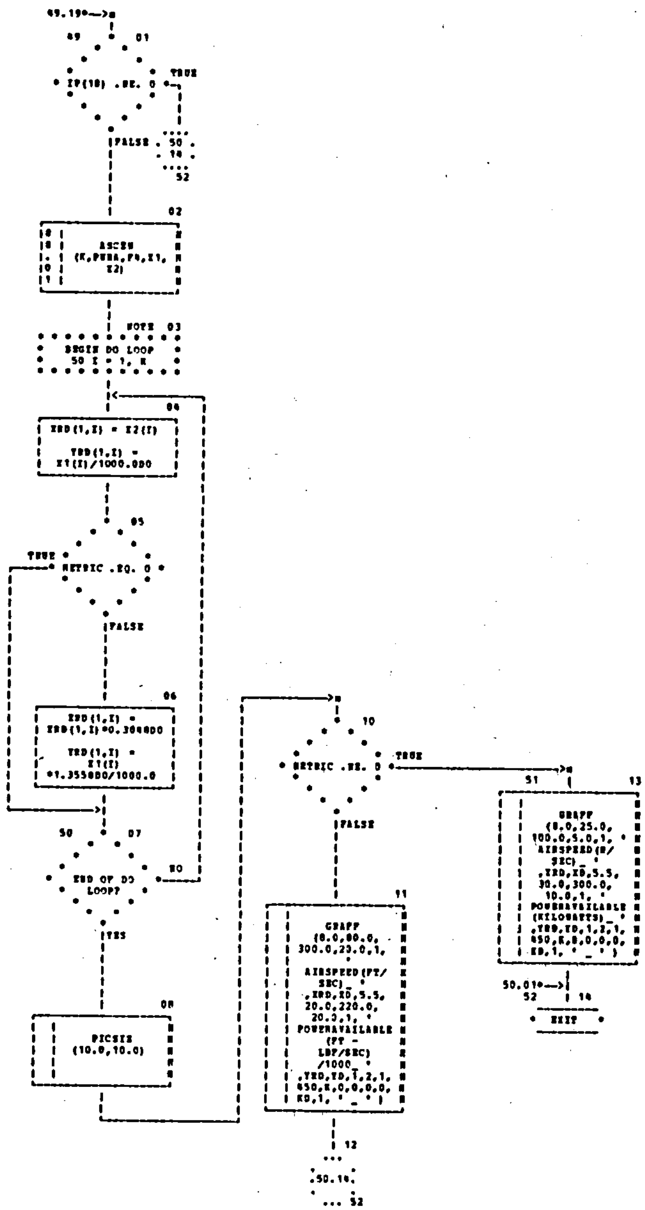


CHART TITLE - SUBROUTINE ABIAS(K,LPRG,PIT,SBB)

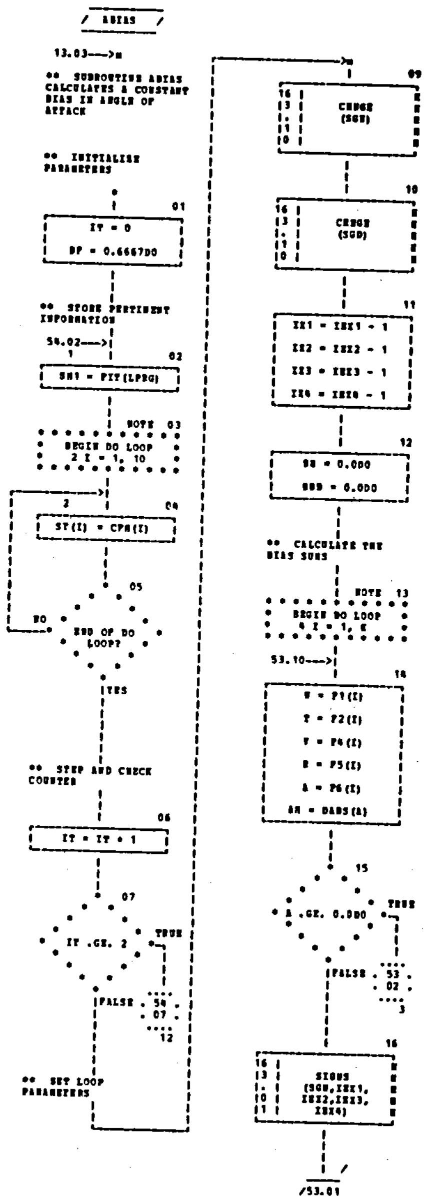


CHART TITLE - SUBROUTINE ABIAS(K,LPNG,FIT,NSB)

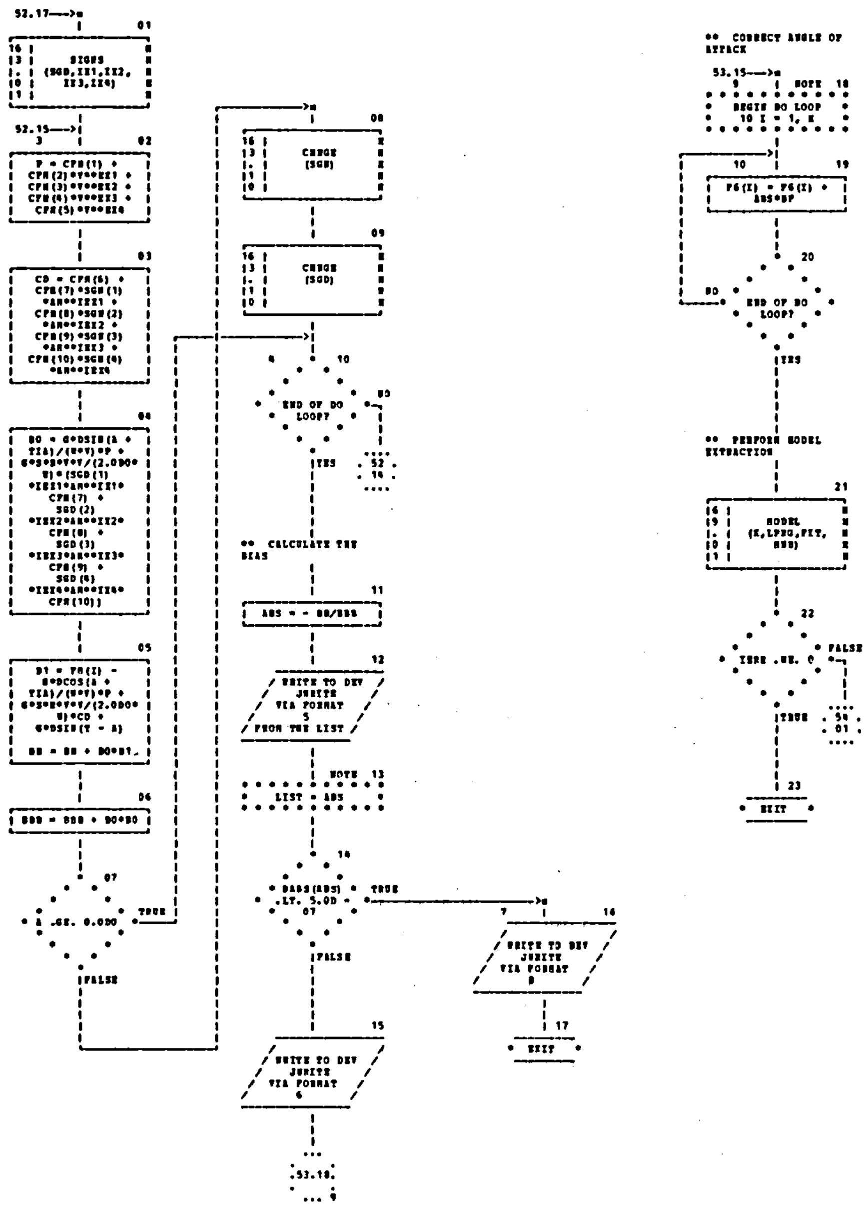


CHART TITLE - SUBROUTINE ADIAS(K,LPRG,FIT,END)

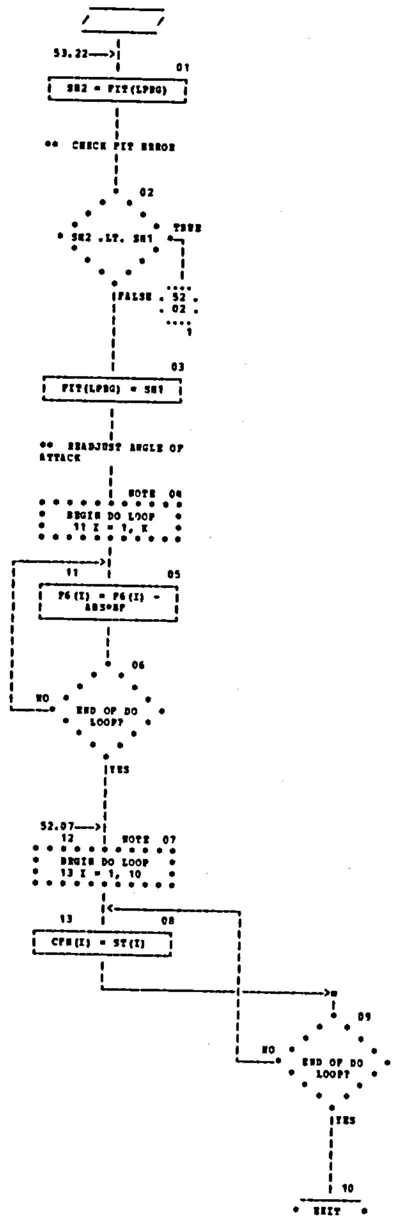


CHART TITLE - SUBROUTINE ALPDEL(K,LPRG,NND,FIT)

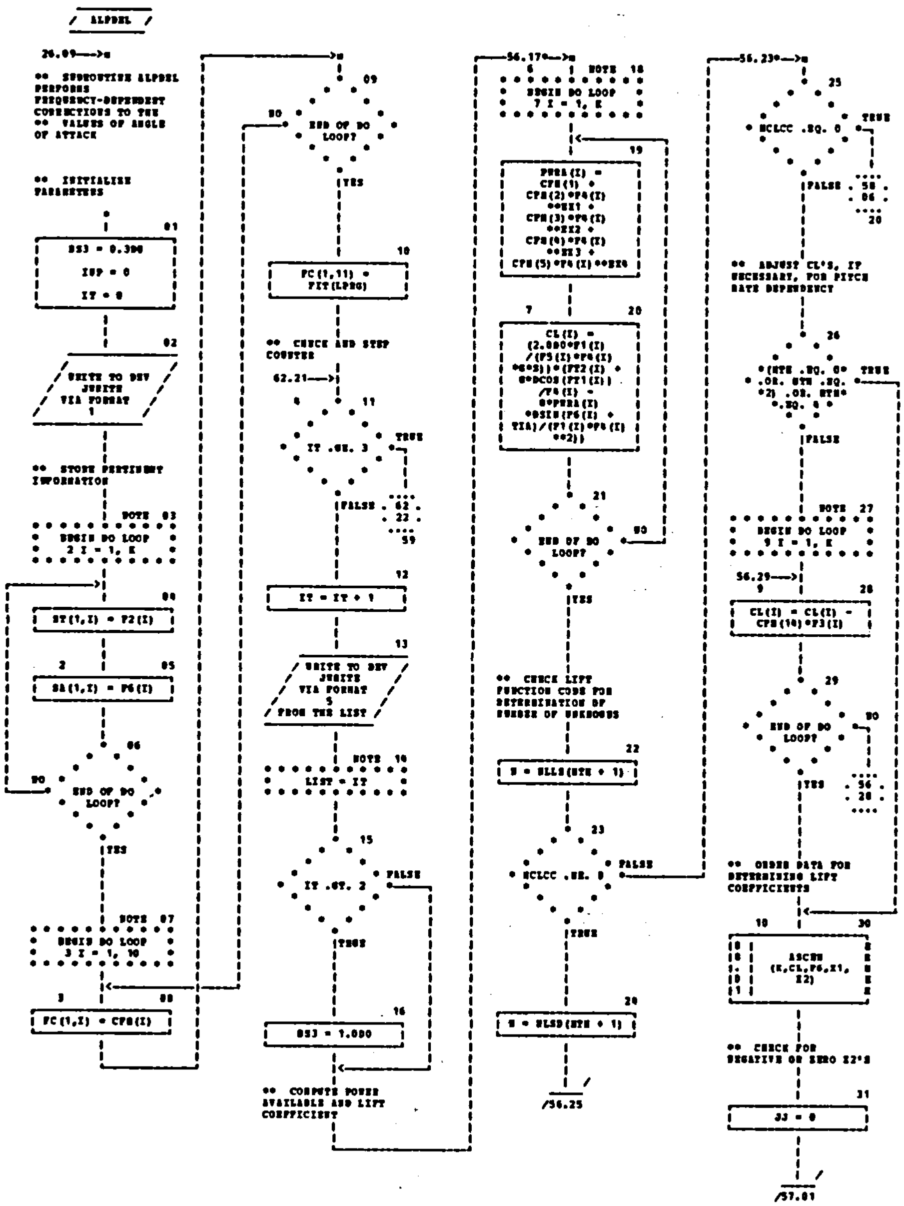


CHART TITLE - SUBROUTINE ALPDEL(K,LPBG,END,FIT)

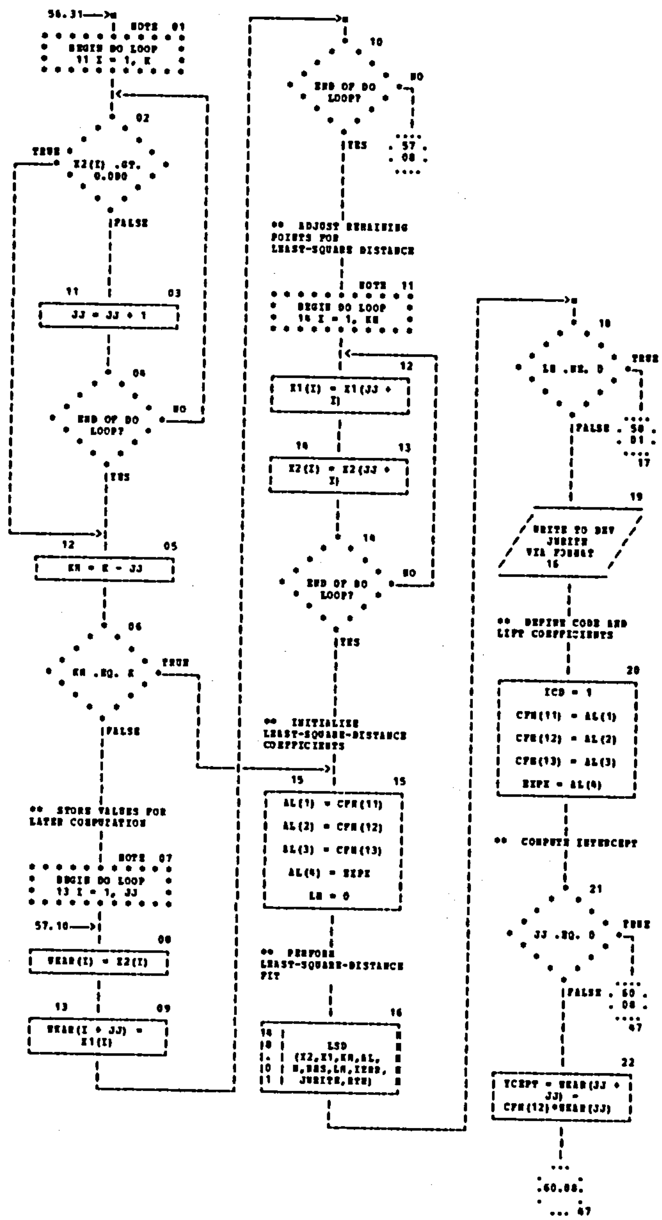


CHART TITLE - SUBROUTINE ALPDEL(K,LPRG,NUB,FIT)

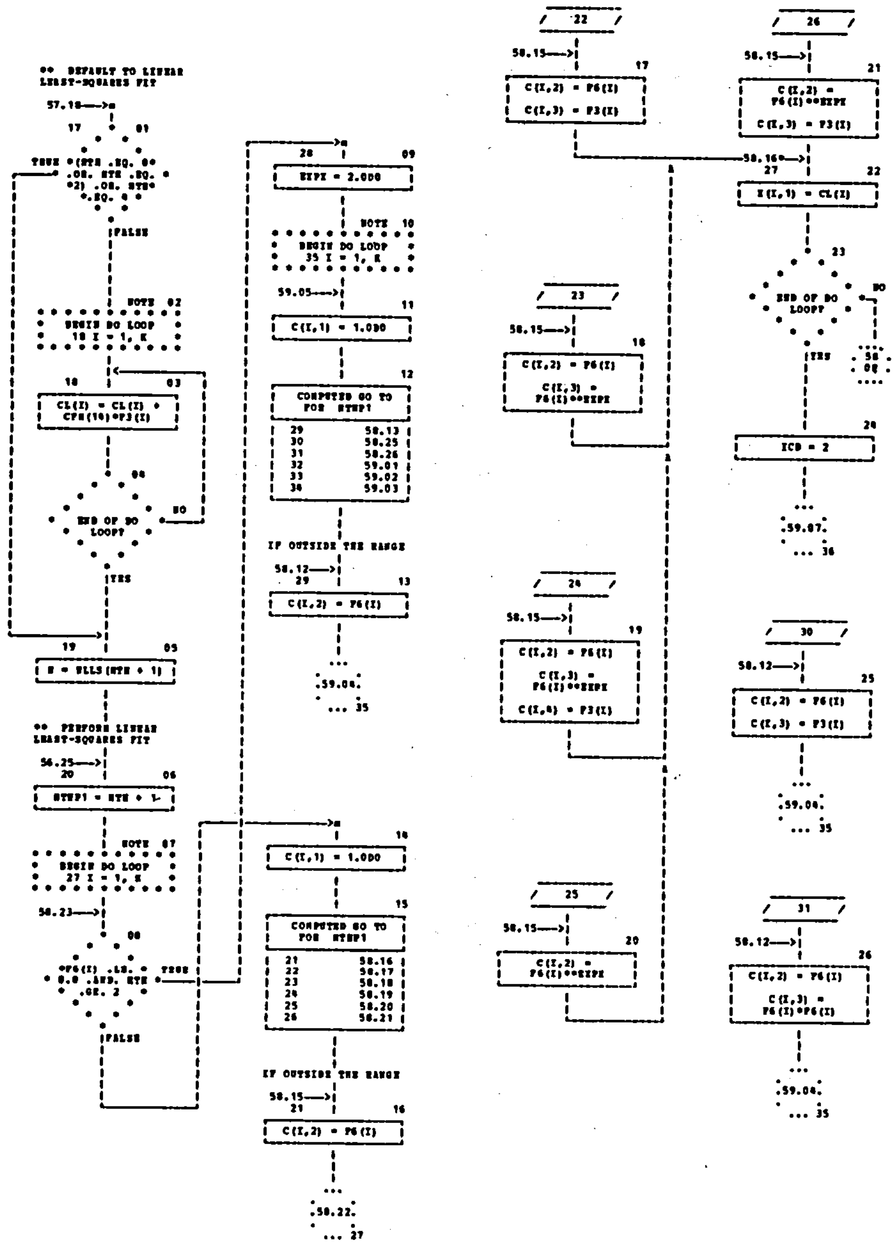


CHART TITLE - SUBROUTINE ALPDEL(K,LPEG,ERR,FIT)

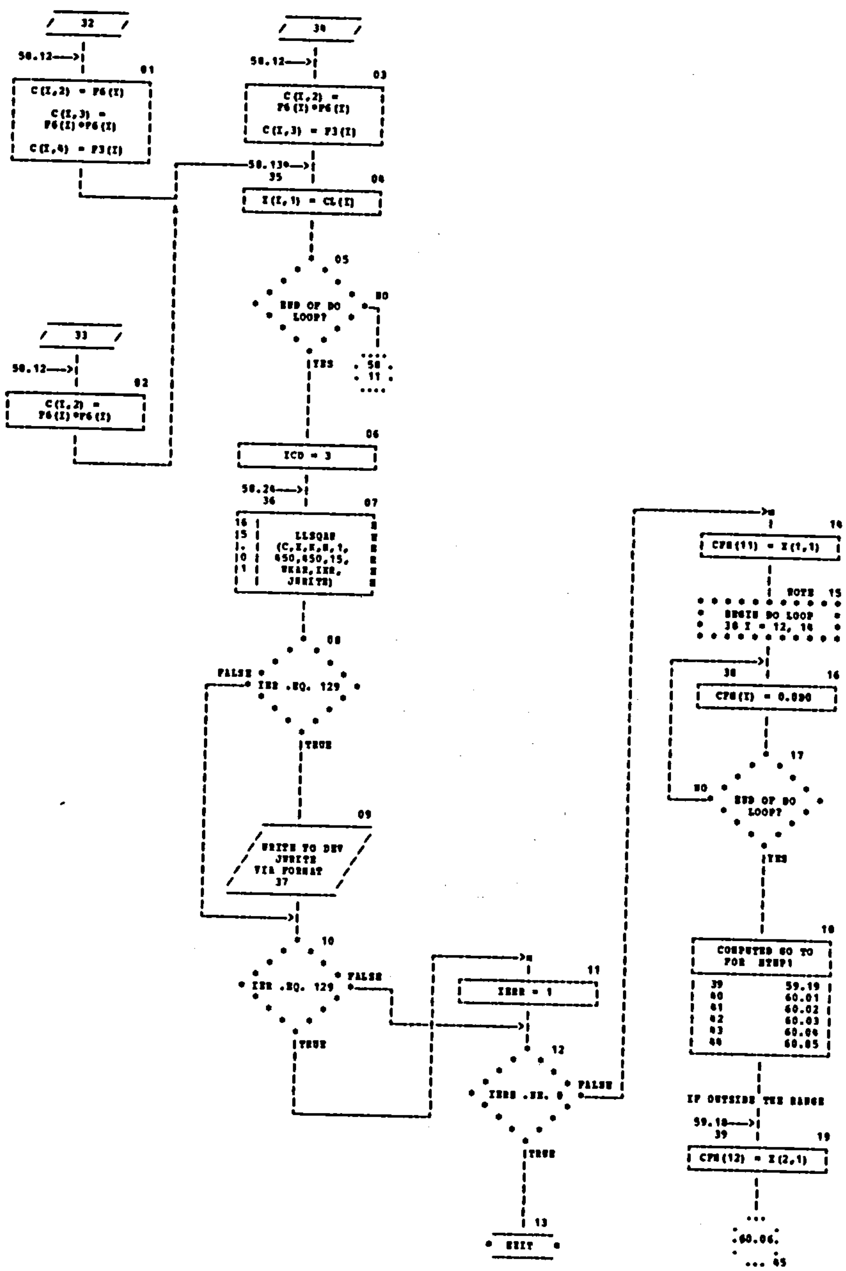


CHART TITLE - SUBROUTINE ALPDEL(X,LPRG,NRB,FIT)

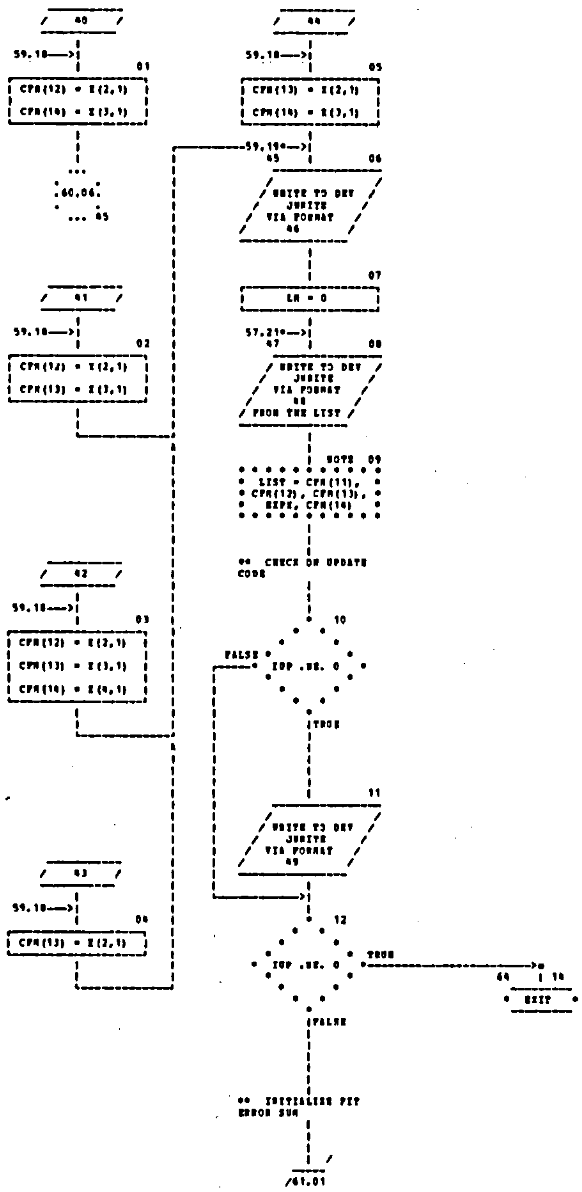


CHART TITLE - SUBROUTINE ALPDEL(K,LFRQ,NRR,FIT)

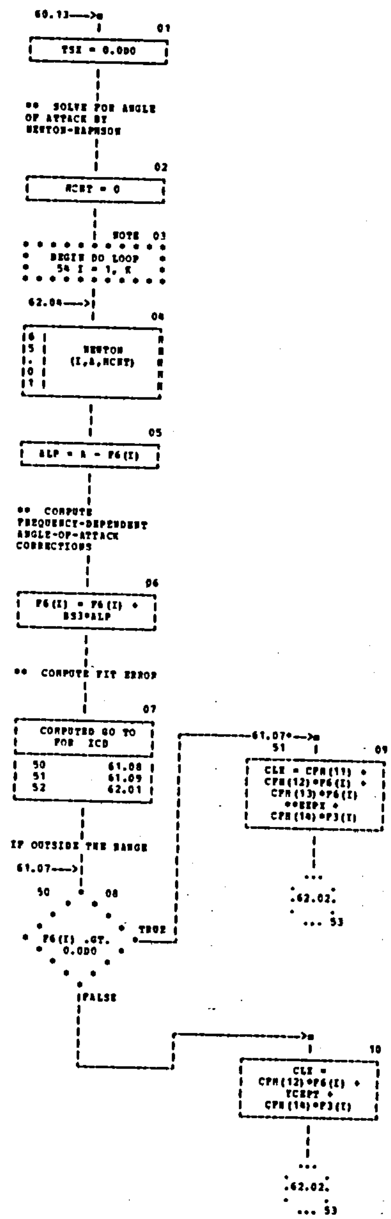
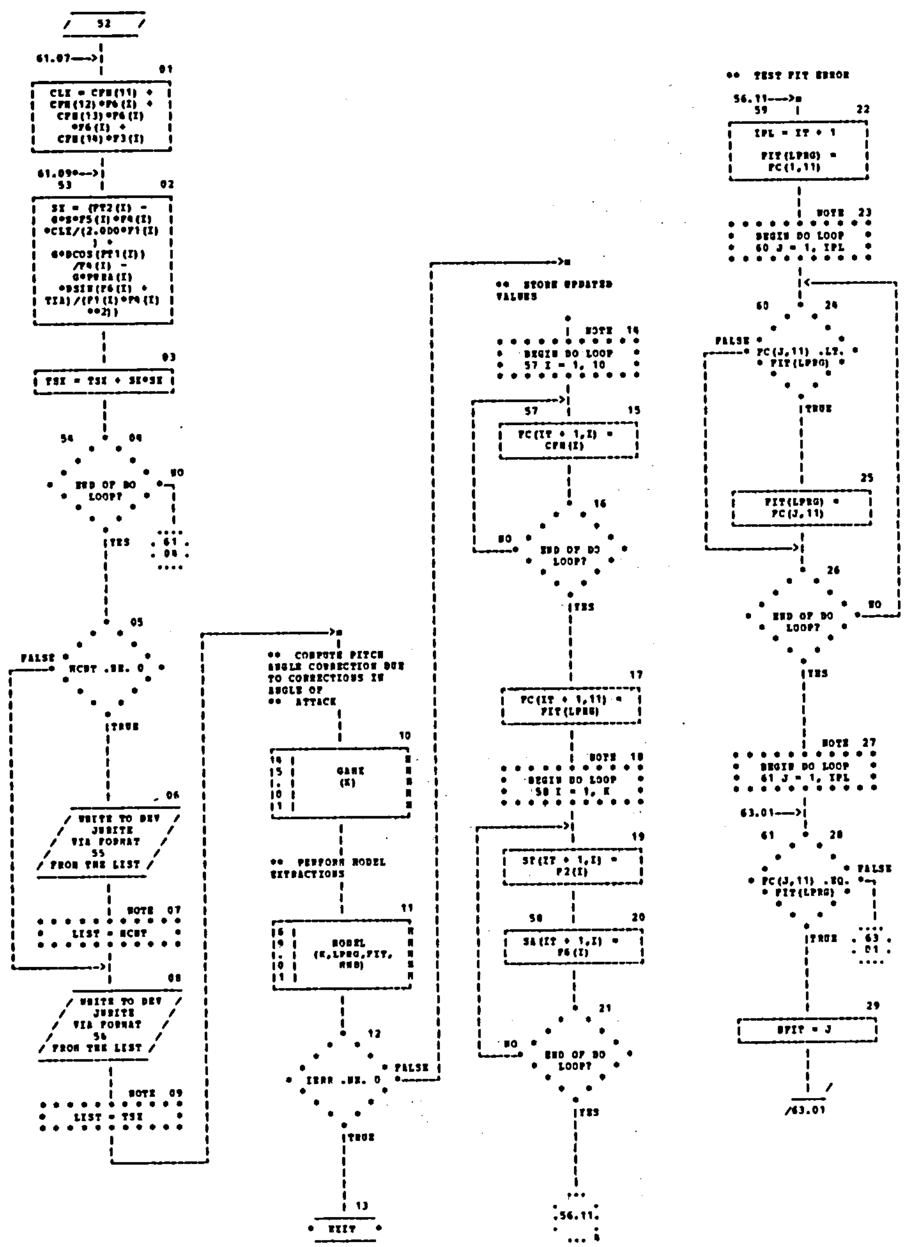


CHART TITLE - SUBROUTINE ALPDEL(K,LPRG,NNB,FIT)



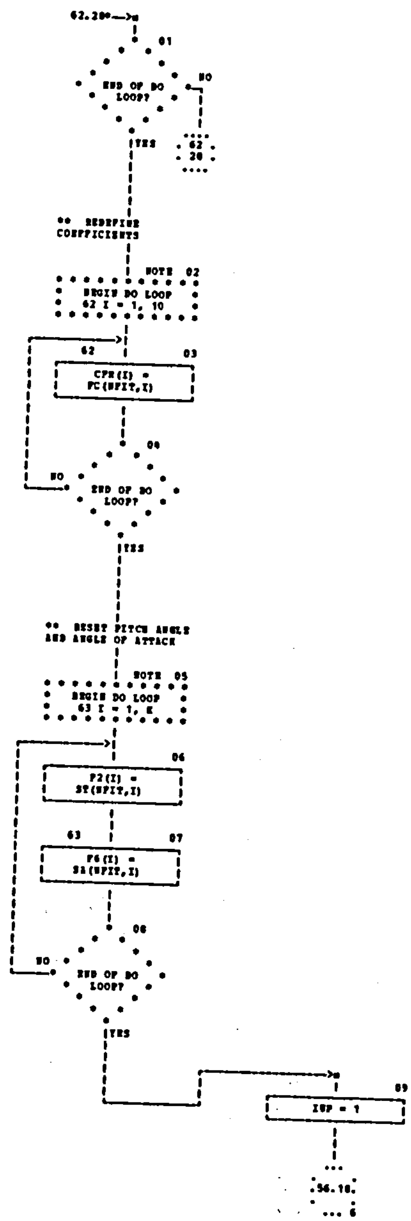

62.20*
01
END OF DO LOOP?
NO
62 20
YES
** REDEFINE COEFFICIENTS
NOTE 02
BEGIN DO LOOP 62 I = 1, 10
62
03
CPR(I) = FC(NFIT,I)
04
NO
END OF DO LOOP?
YES
** RESET PITCH ANGLE AND ANGLE OF ATTACK
NOTE 05
BEGIN DO LOOP 63 I = 1, K
06
F2(I) = ST(NFIT,I)
63
07
F6(I) = SA(NFIT,I)
08
NO
END OF DO LOOP?
YES
09
IUP = 1
56.18.
6

CHART TITLE - SUBROUTINE NEWTON(I,ALP,NCNT)

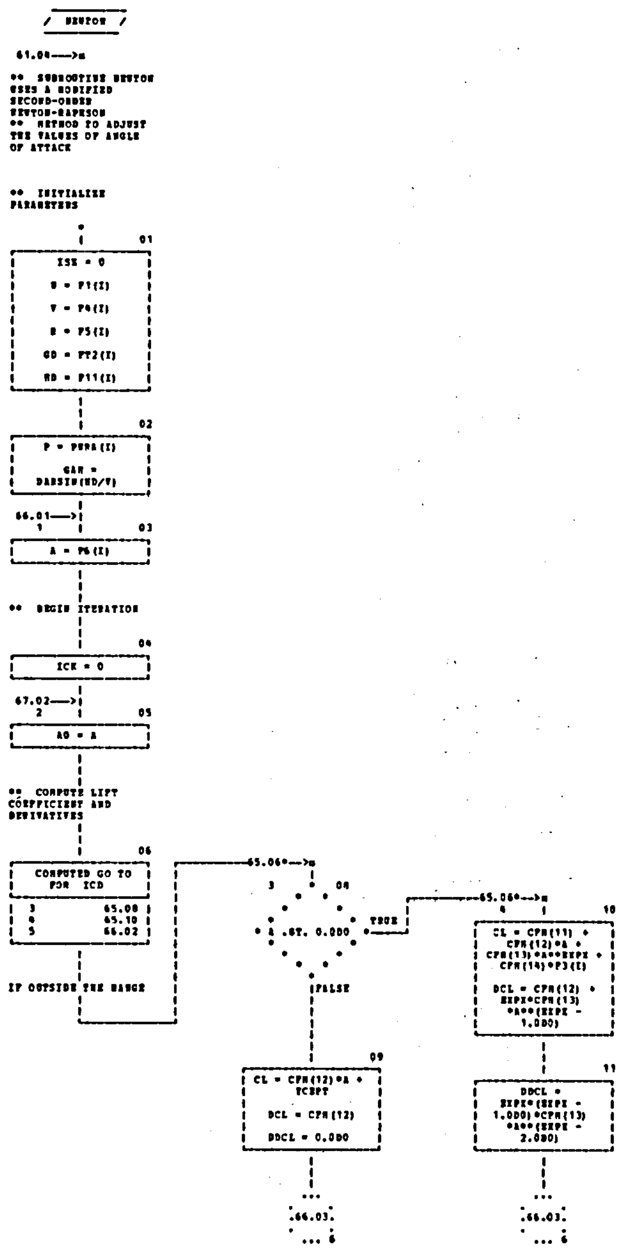


CHART TITLE - SUBROUTINE NEWTON(I,ALP,NCNT)

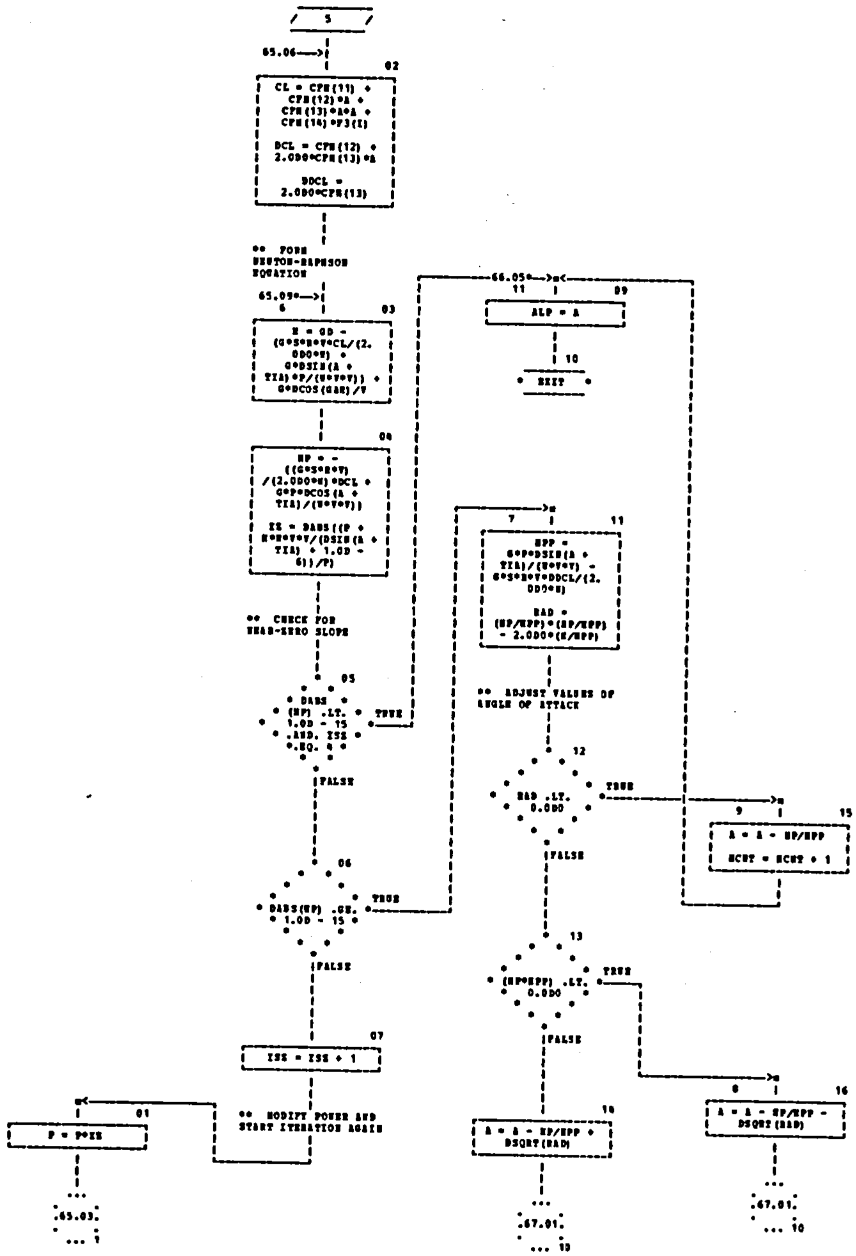


CHART TITLE - SUBROUTINE NEWTON(X,ALP,NCNT)

```
              -----------
             /    10     /
             -----------
                  |
       66.14*--->|
                  |            01
        ---------------------
       |   ICK = ICK + 1     |
        ---------------------
                  |
                  |
                  *     02
               *     *
            *DABS(A  *
          *- A0) .LE.  *   TRUE
        *   1.0D - 15    *--
          * .OR. ICK   *    |
            *.GE. 20*       |
               *     *      |
                  *        ....
                  |FALSE  . 66 .
                  |       . 09 .
                  |        ....
                  |          11
                  |
                 ...
                .   .
                .65.05.
                .   .
                 ... 2
```

CHART TITLE - SUBROUTINE MODEL(K,LPRG,FIT,NBD)

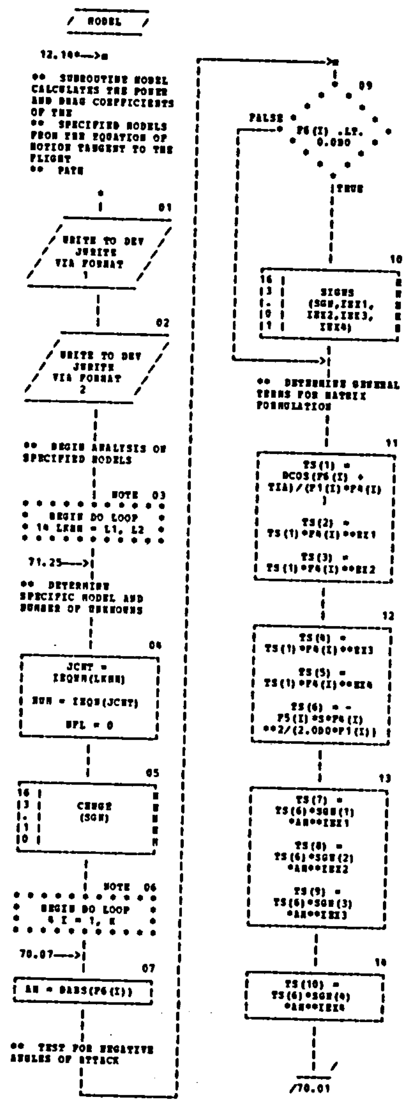


CHART TITLE - SUBROUTINE MODEL(X,LPRG,FIT,NUM)

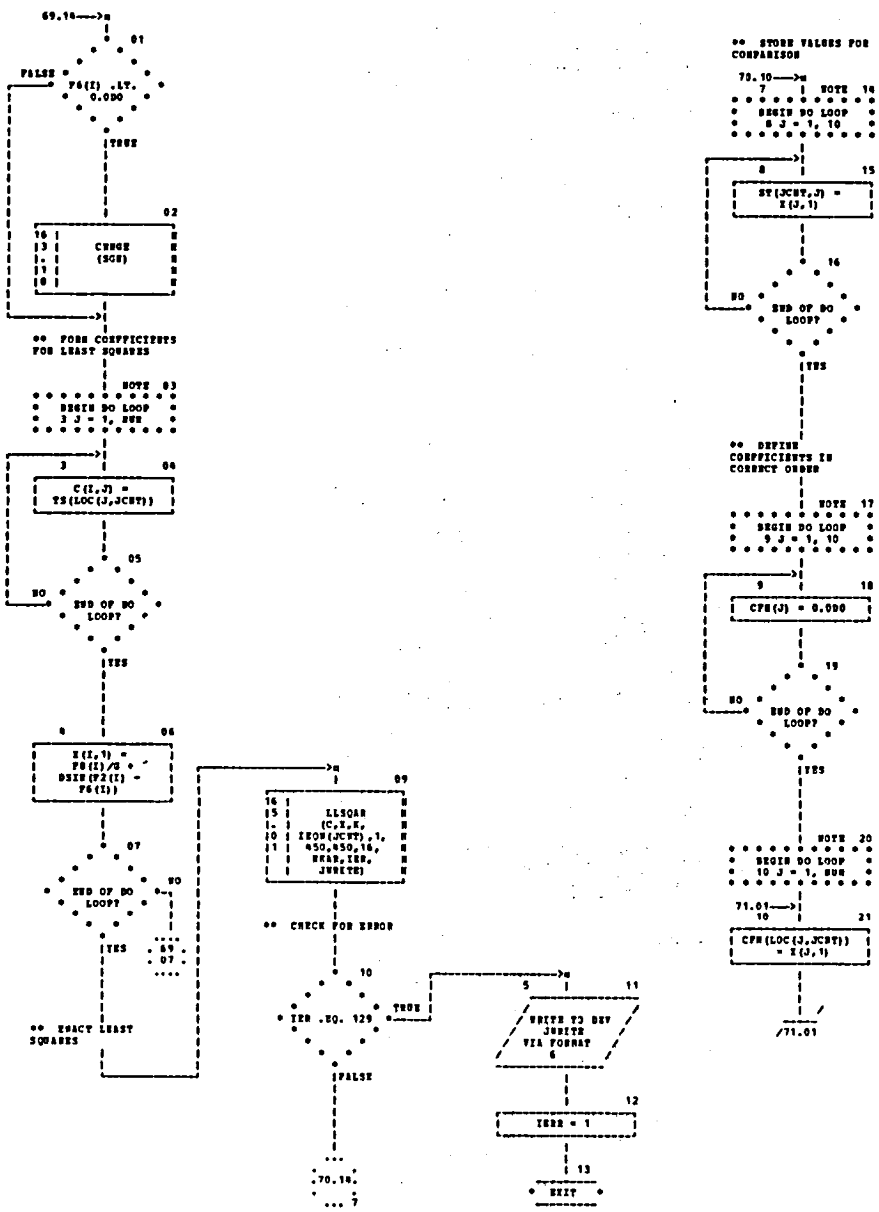


CHART TITLE - SUBROUTINE MODEL(K,LPRG,FIT,ERR)

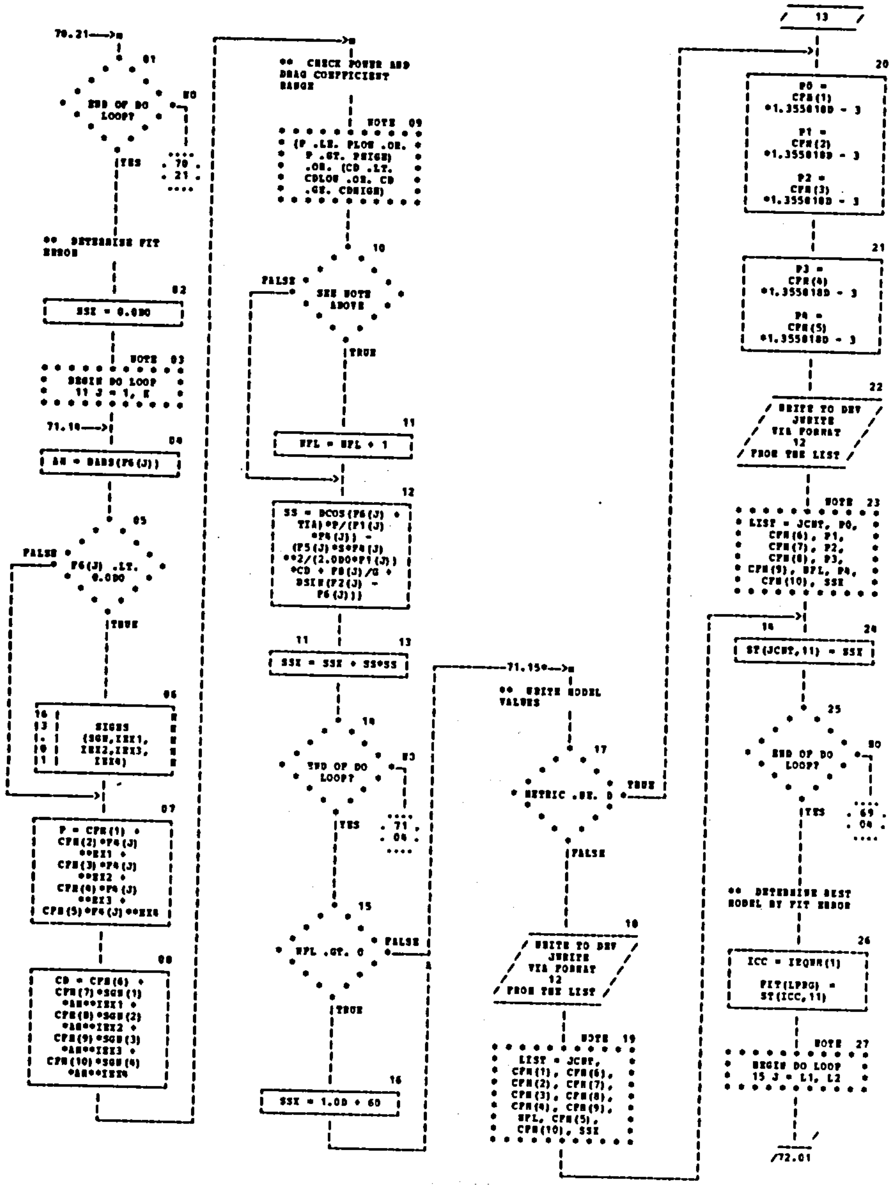


CHART TITLE - SUBROUTINE MODEL(K,LPRG,FIT,NBB)

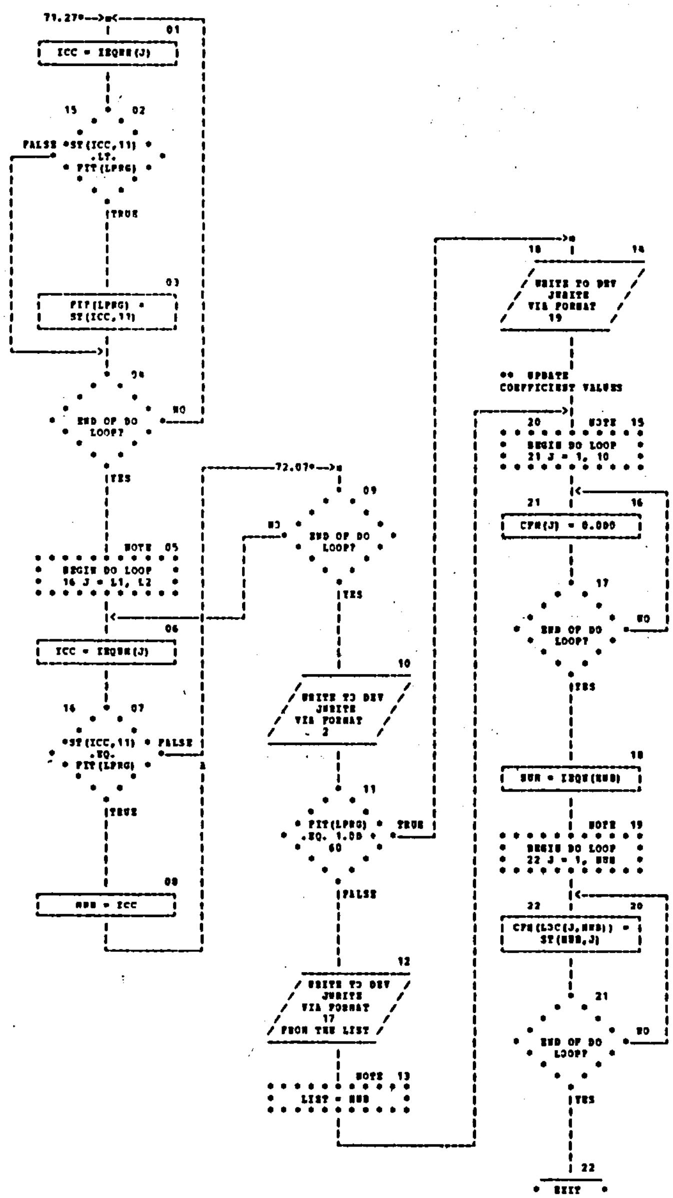


CHART TITLE - SUBROUTINE F(T,Y,DY,C,KJK,J,IPATH,NCNT,MCNT)

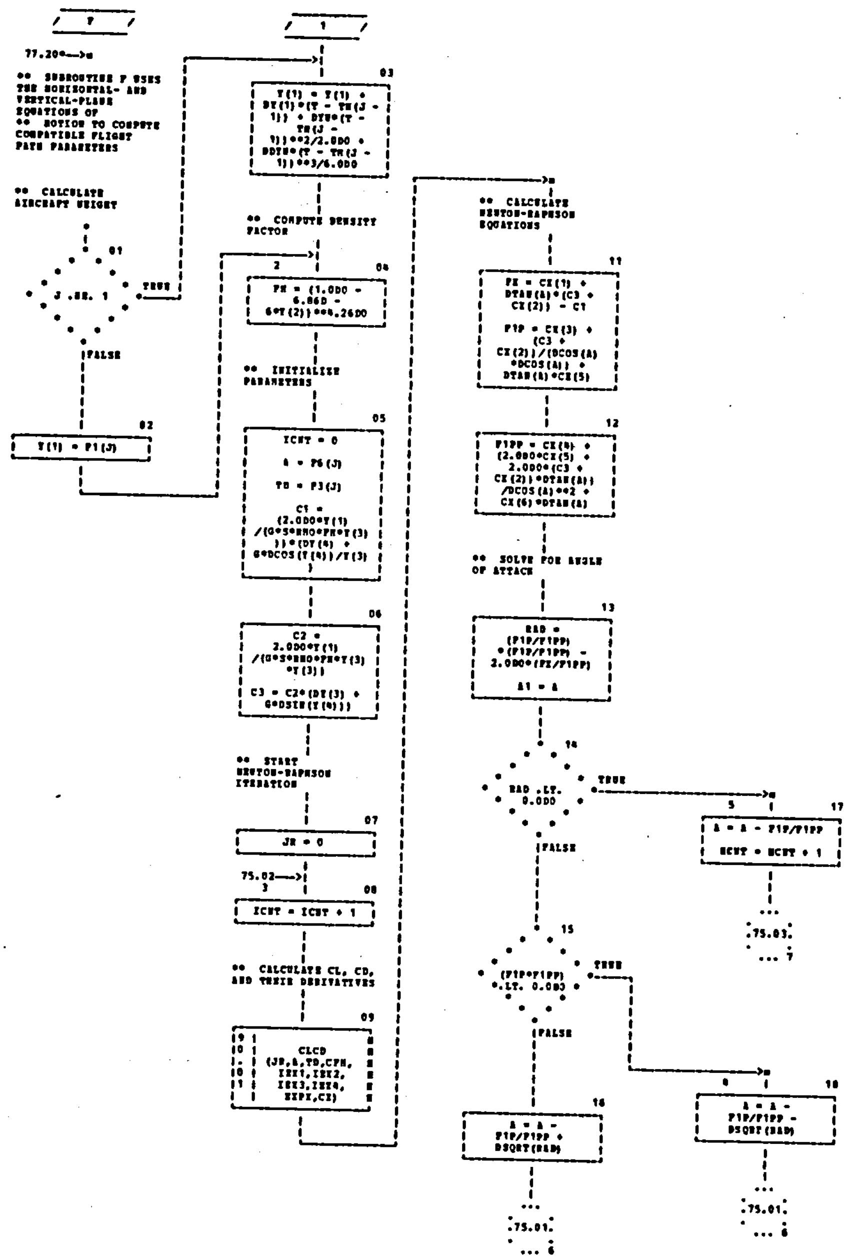


CHART TITLE - SUBROUTINE F(T,Y,DY,C,KJK,J,IPATH,NCNT,NCNT)

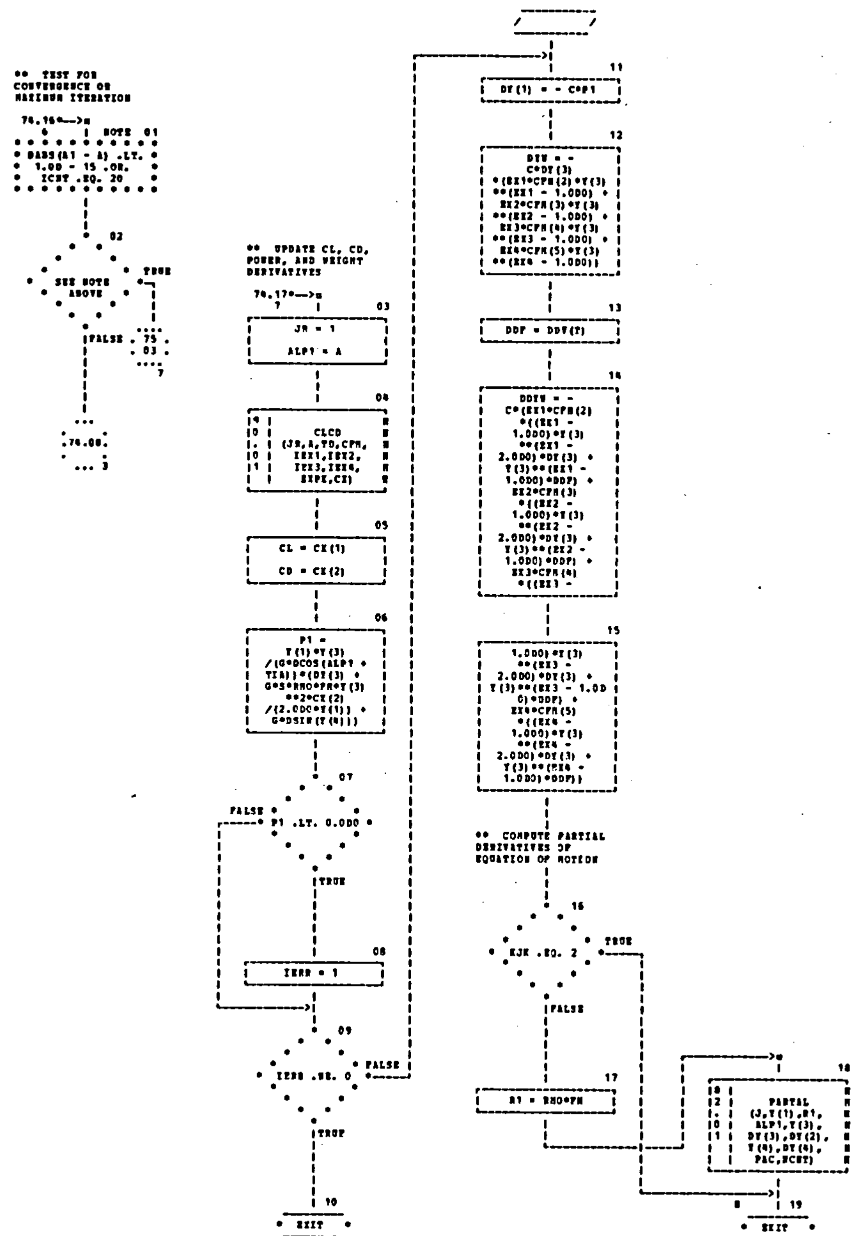


CHART TITLE - SUBROUTINE PATH(N,C,IPATH)

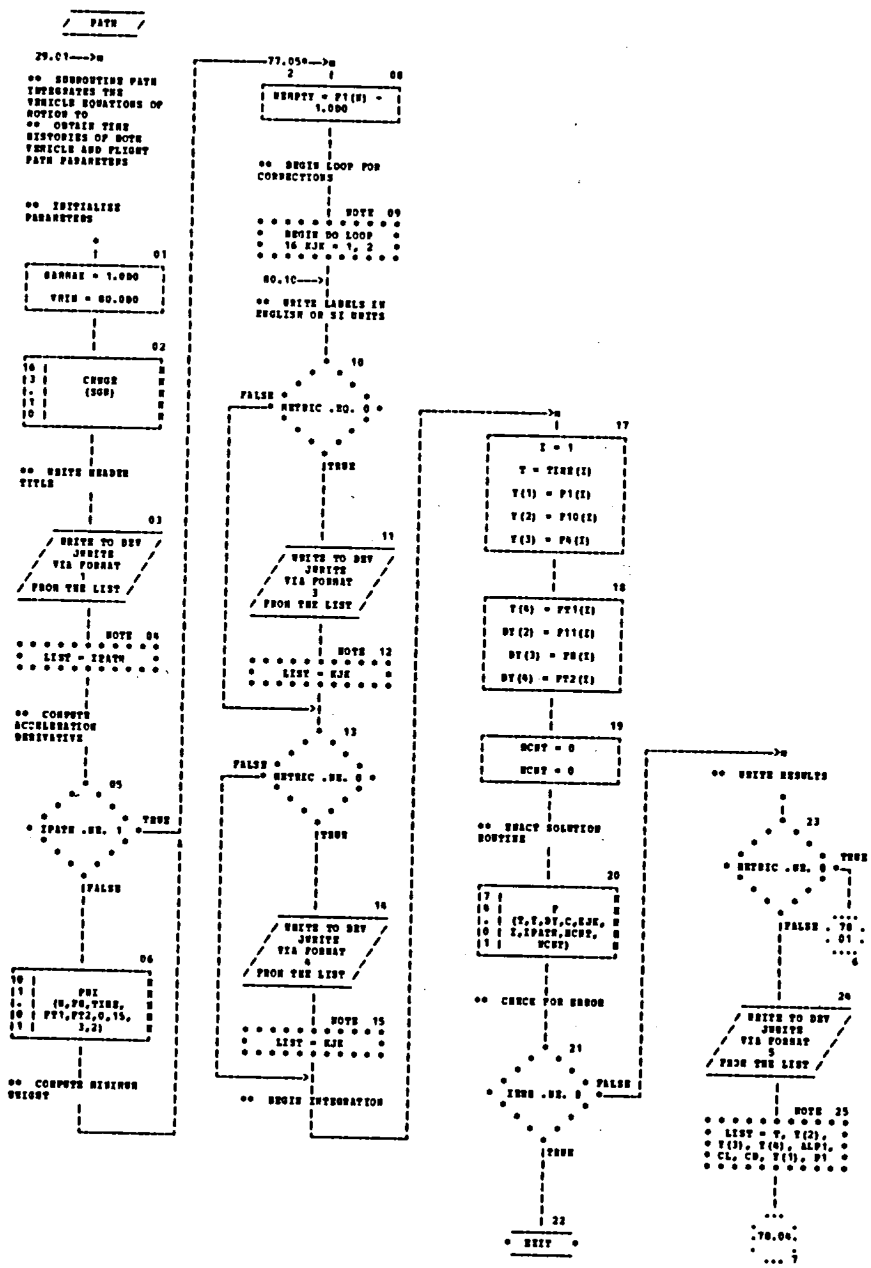


CHART TITLE - SUBROUTINE PATH(N,C,IPATH)

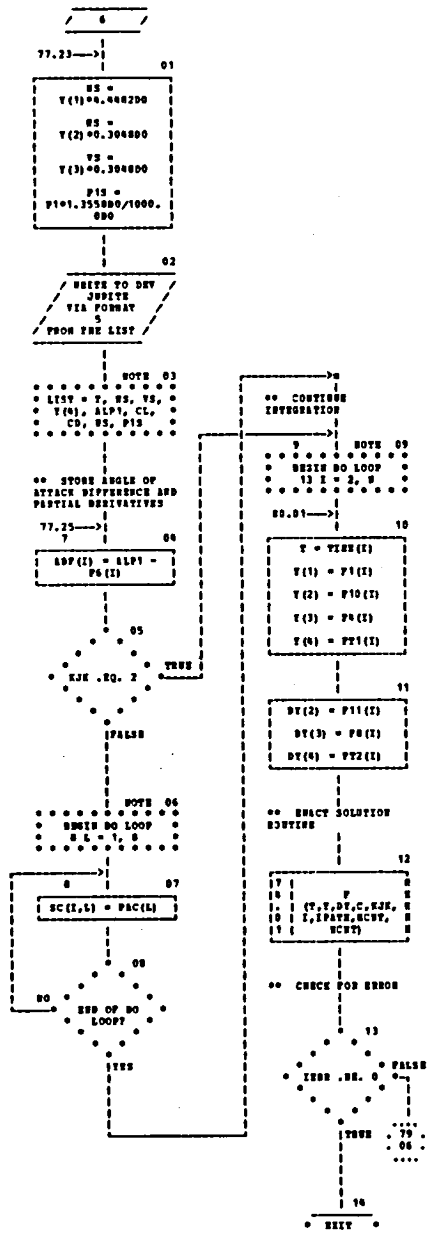


CHART TITLE - SUBROUTINE PATH(B,C,IPATH)

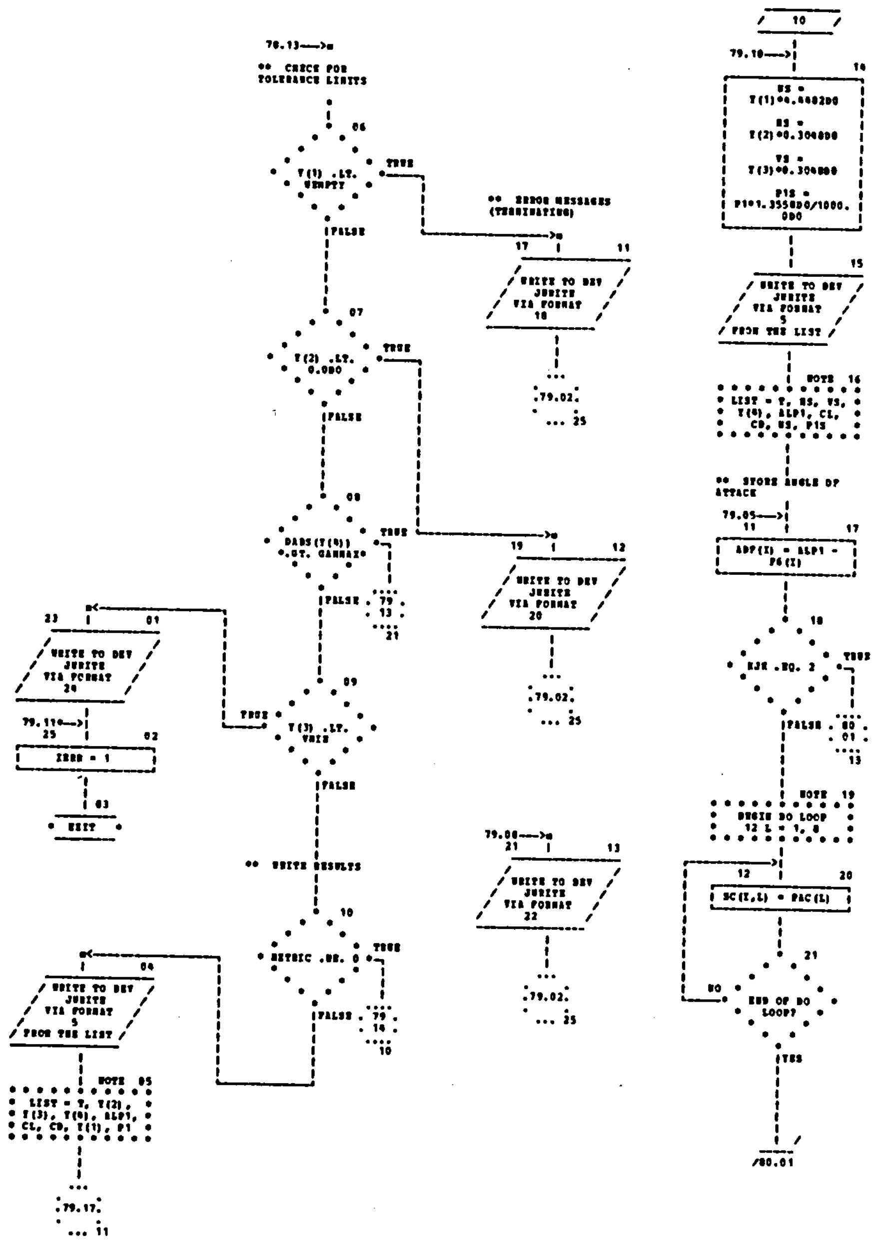
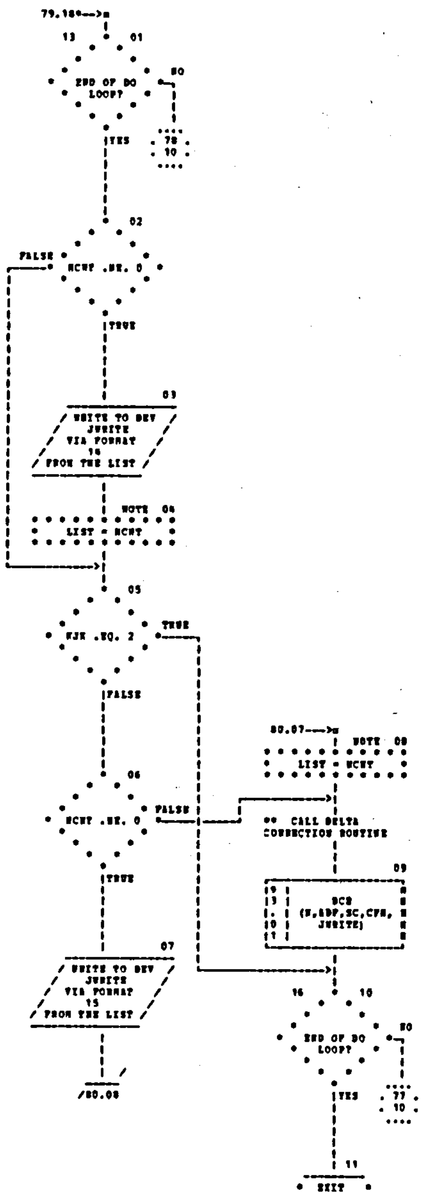


CHART TITLE - SUBROUTINE PATH(N,C,IPATH)



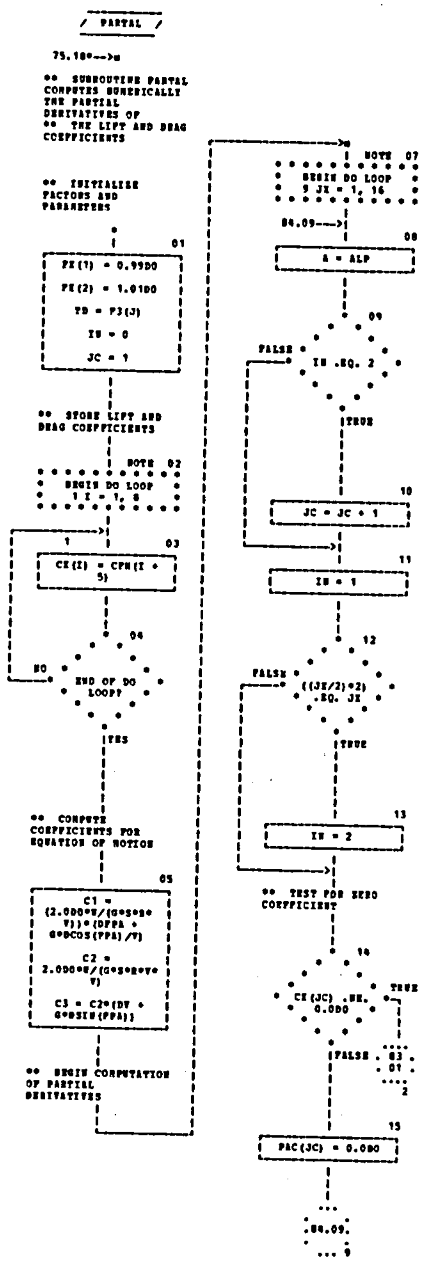

/ PARTAL /
75.10*-->*
** SUBROUTINE PARTAL COMPUTES NUMERICALLY THE PARTIAL DERIVATIVES OF
** THE LIFT AND DRAG COEFFICIENTS
** INITIALIZE FACTORS AND PARAMETERS
01
FX(1) = 0.99D0
FX(2) = 1.01D0
FD = F3(J)
IN = 0
JC = 1
** STORE LIFT AND DRAG COEFFICIENTS
NOTE 02
BEGIN DO LOOP 1 I = 1, 8
1
03
CX(I) = CPN(I + 5)
04
END OF DO LOOP?
NO
YES
** COMPUTE COEFFICIENTS FOR EQUATION OF MOTION
05
C1 = (2.0D0*W/(G*S*R*V))*(DFPA + G*DCOS(FPA)/V)
C2 = 2.0D0*W/(G*S*R*V*V)
C3 = C2*(DV + G*DSIN(FPA))
** BEGIN COMPUTATION OF PARTIAL DERIVATIVES
NOTE 07
BEGIN DO LOOP 9 JX = 1, 16
84.09--->
08
A = ALP
09
IN .EQ. 2
FALSE
TRUE
10
JC = JC + 1
11
IN = 1
12
((JX/2)*2) .EQ. JX
FALSE
TRUE
13
IN = 2
** TEST FOR ZERO COEFFICIENT
14
CX(JC) .NE. 0.0D0
TRUE
FALSE
83
01
2
15
PAC(JC) = 0.0D0
84.09
9

CHART TITLE - SUBROUTINE PARTAL(J,U,R,ALP,V,DV,DR,FPA,DFPA,PAC,NCNT)

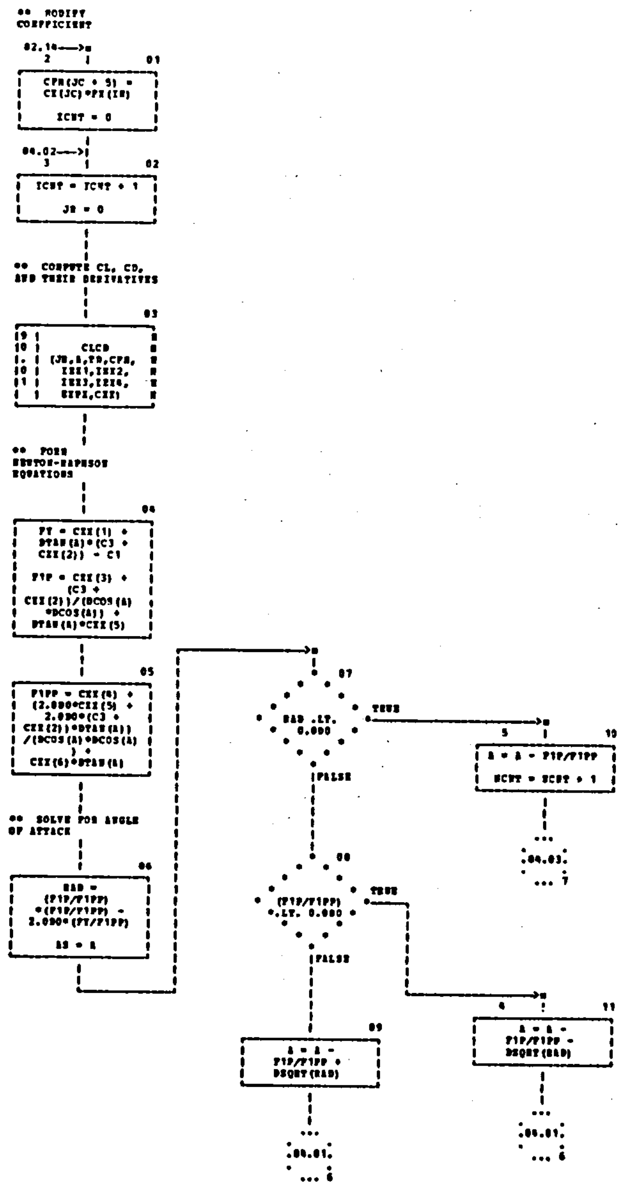


CHART TITLE - SUBROUTINE PARTAL(J,U,B,ALP,V,DV,DN,FPA,DFPA,FAC,NCST)

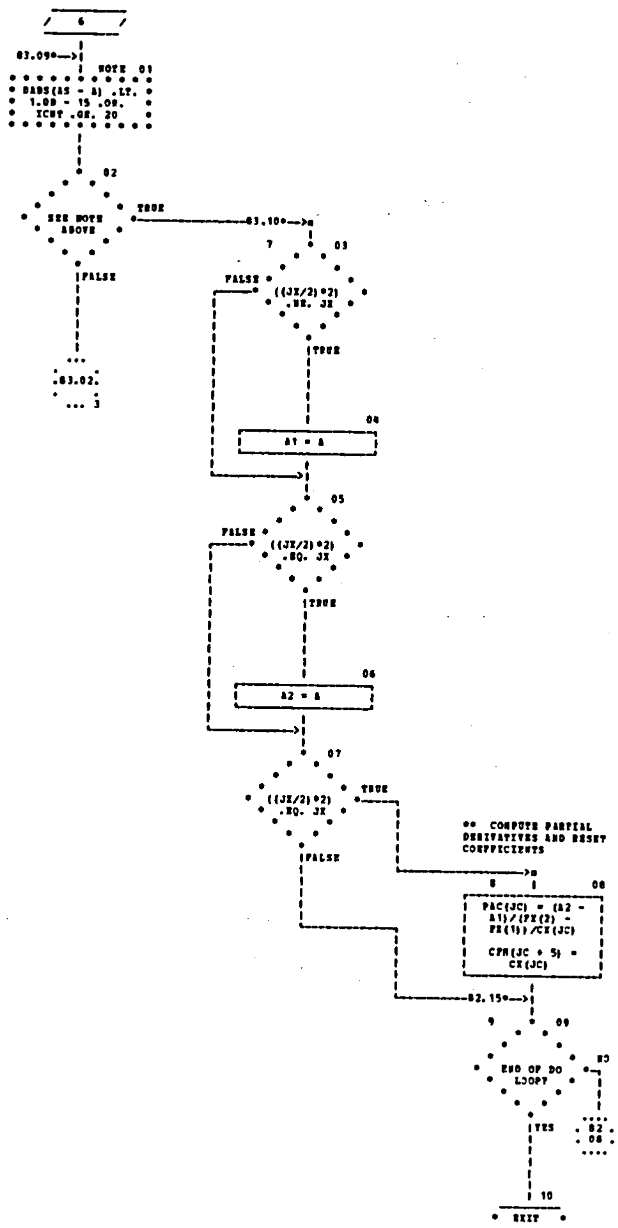


CHART TITLE - SUBROUTINE FITERR(F,I,X)

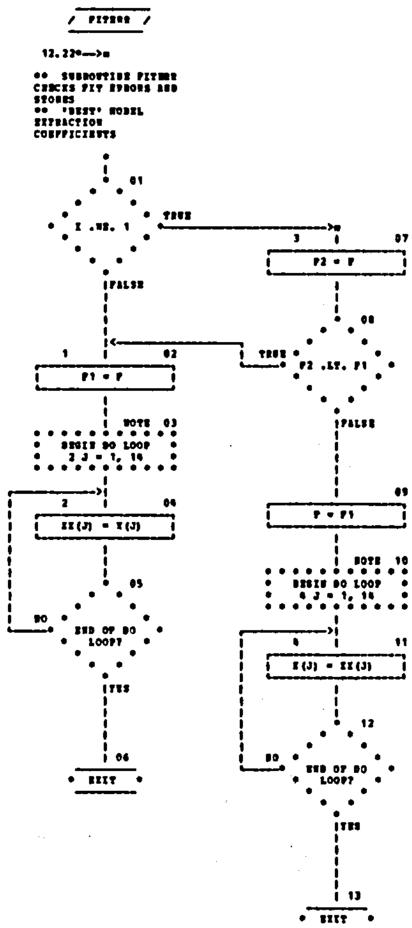


CHART TITLE - SUBROUTINE ASCEN(N,Y,X,YY,XX)

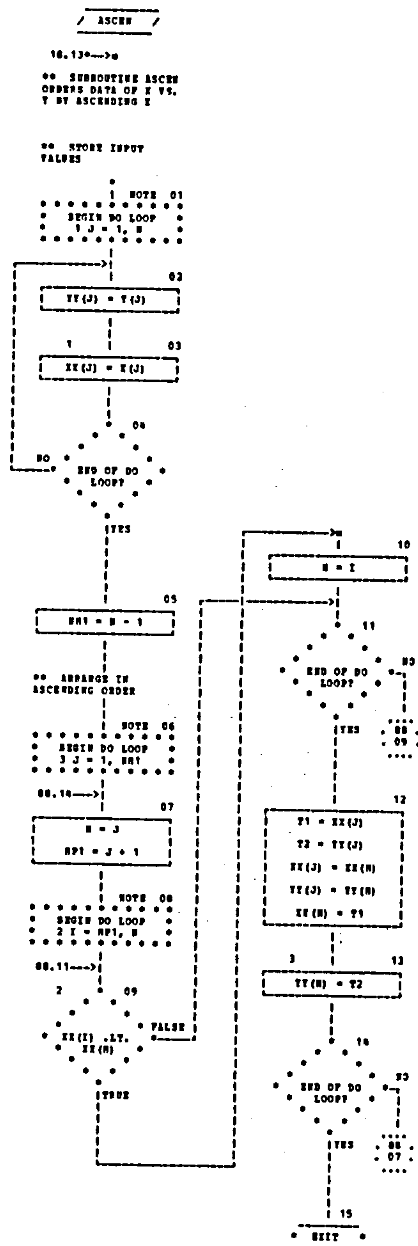


CHART TITLE - SUBROUTINE CLCD(L,A,PM,C,IXX1,IXX2,IXX3,IXX4,RE,D)

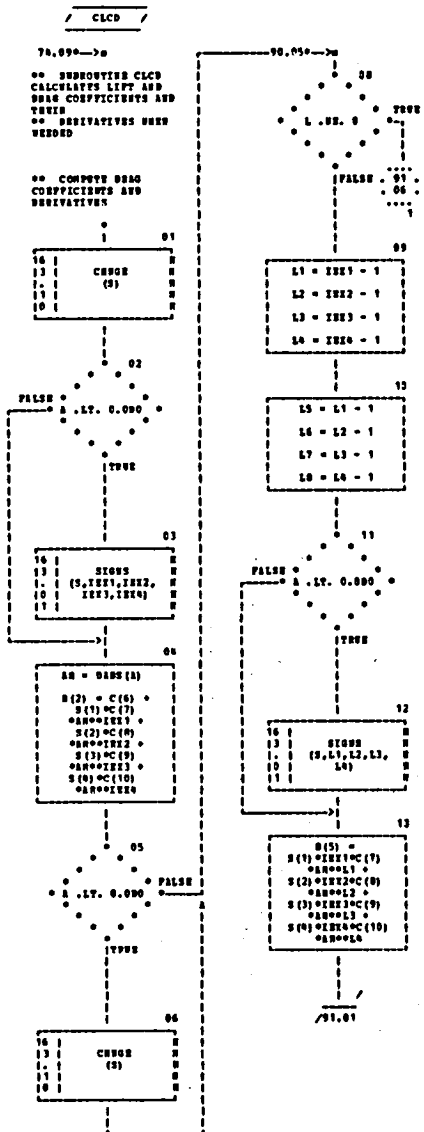


CHART TITLE - SUBROUTINE CLCD(L,A,PR,C,IEX1,IEX2,IEX3,IEX4,EX,B)

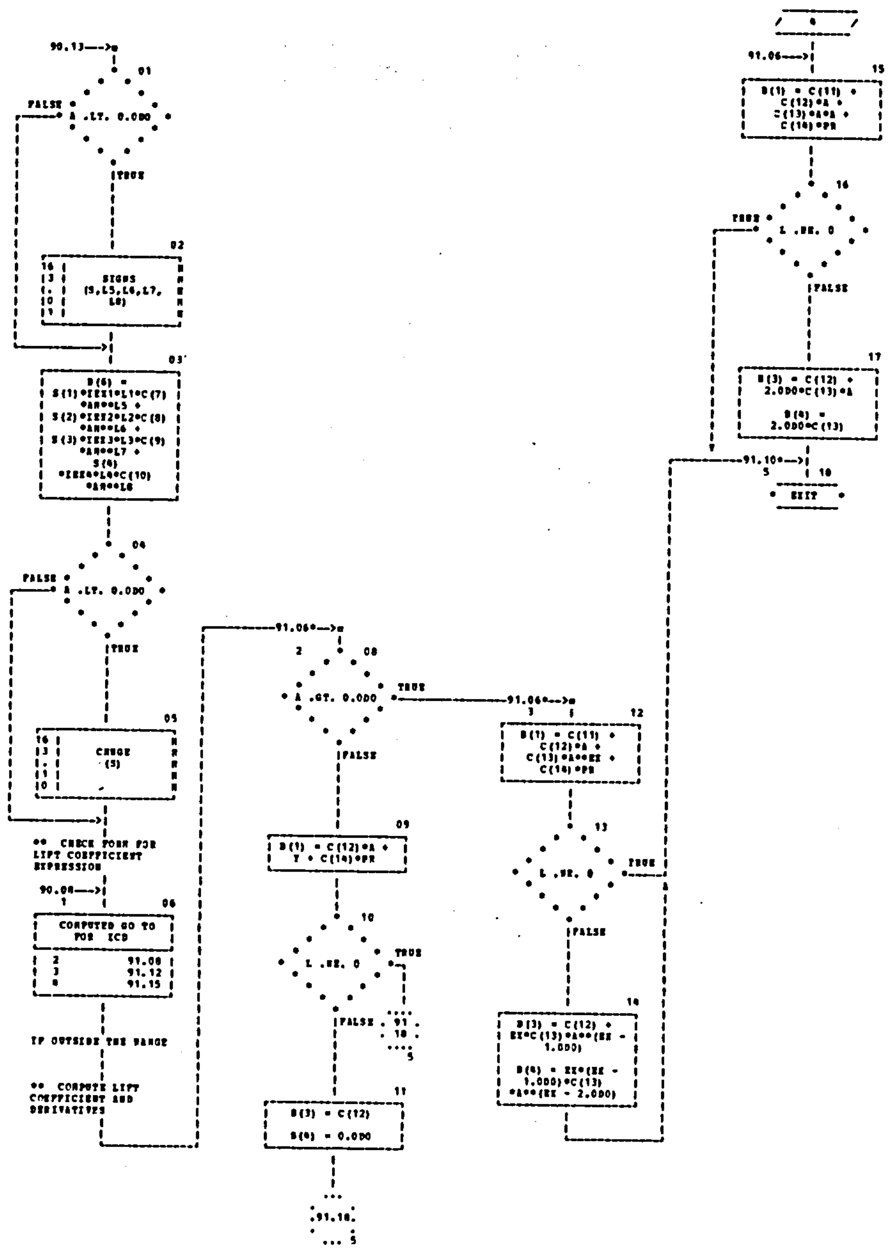


CHART TITLE - SUBROUTINE DCR(N,AD,P,C,JWRITE)

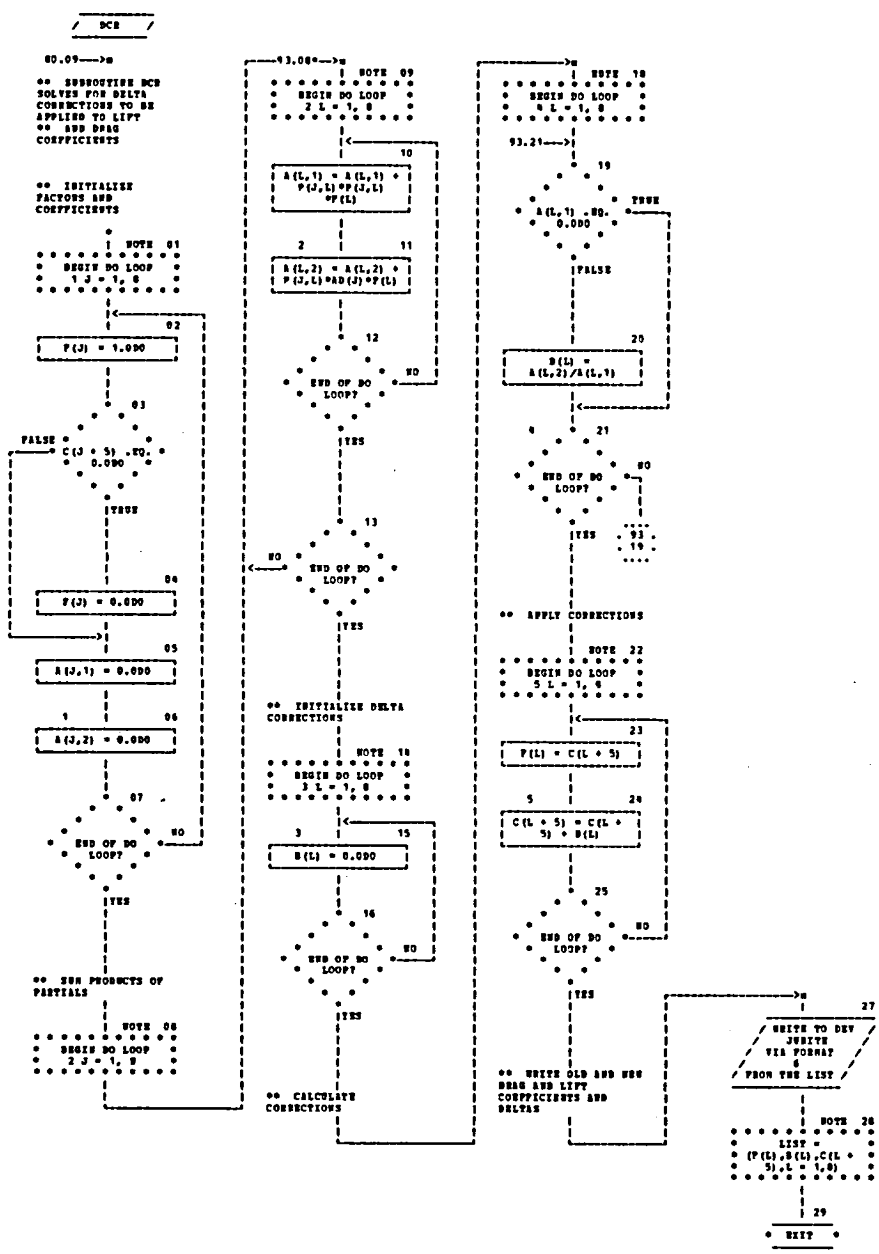


CHART TITLE - SUBROUTINE SPLINE(N,Y,X,AA,IC)

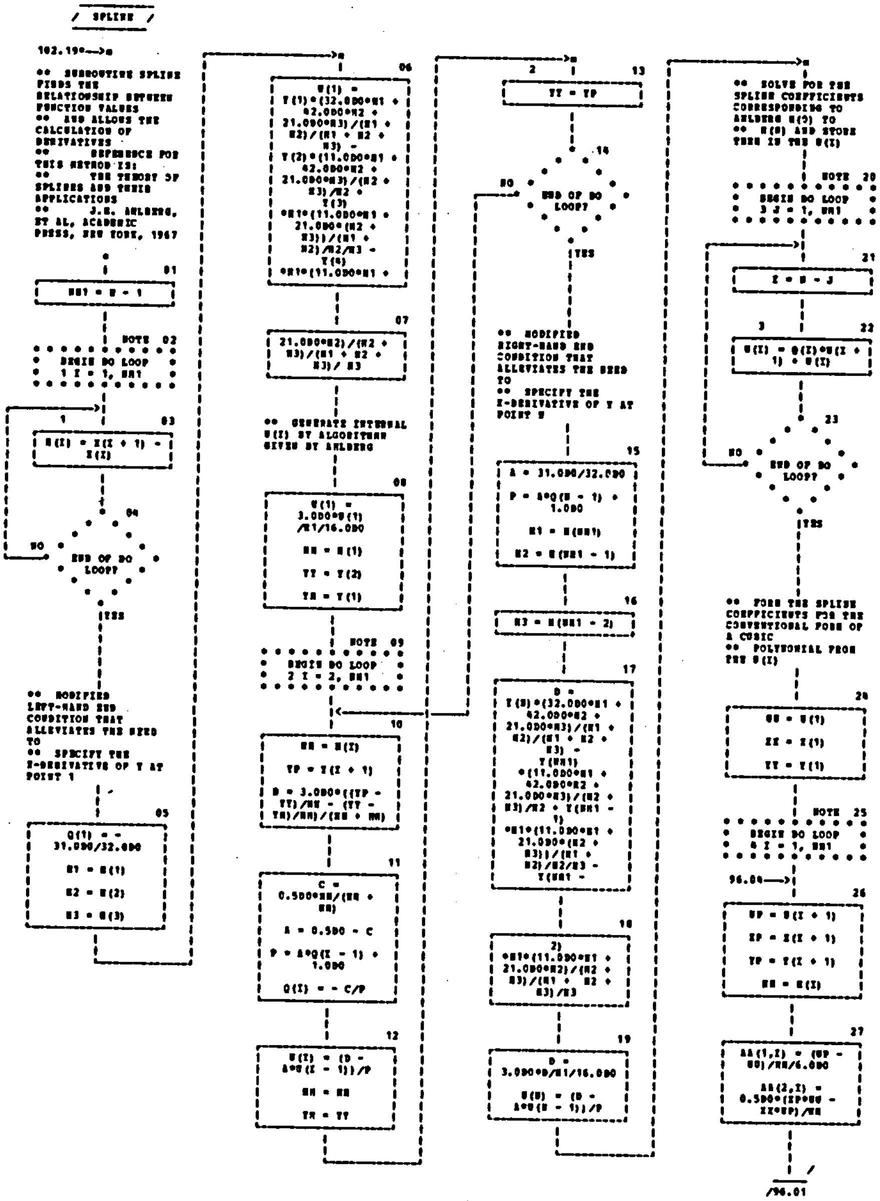


CHART TITLE - SUBROUTINE SPLINE(N,T,X,AA,IC)

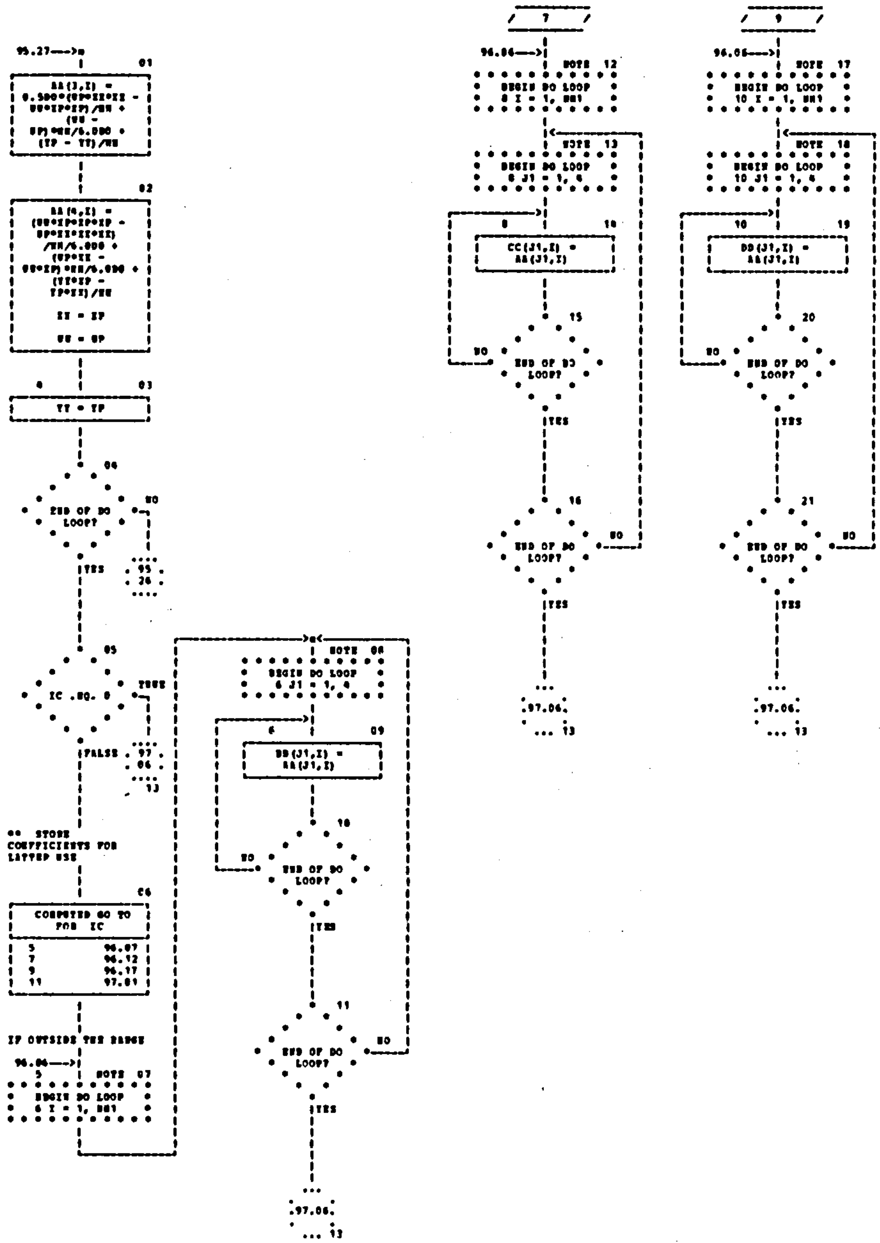


CHART TITLE - SUBROUTINE SPLINP(N,T,X,AA,IC)

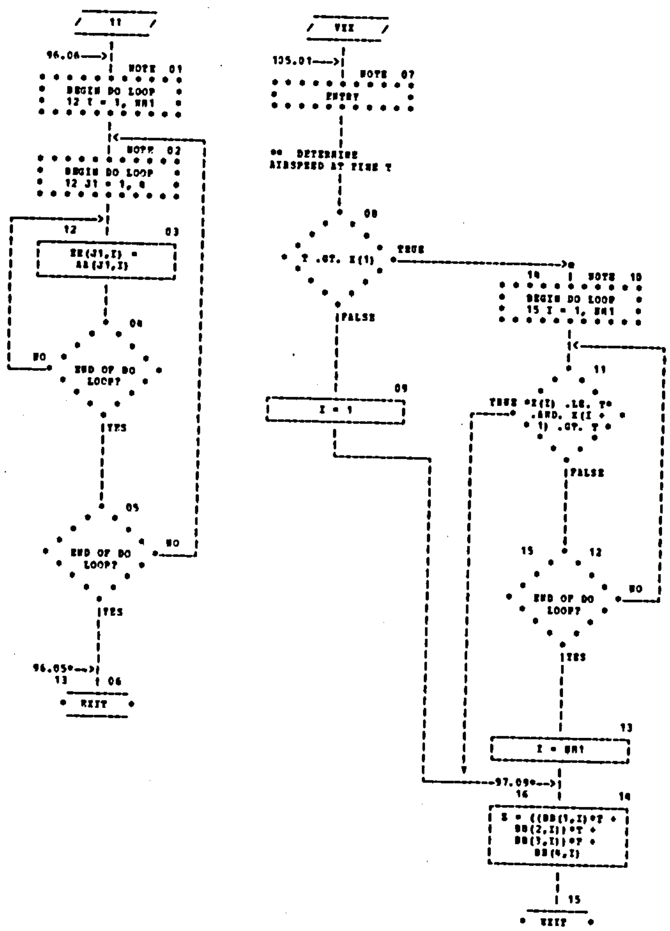


CHART TITLE - SUBROUTINE SPLINE(N,T,X,AA,IC)

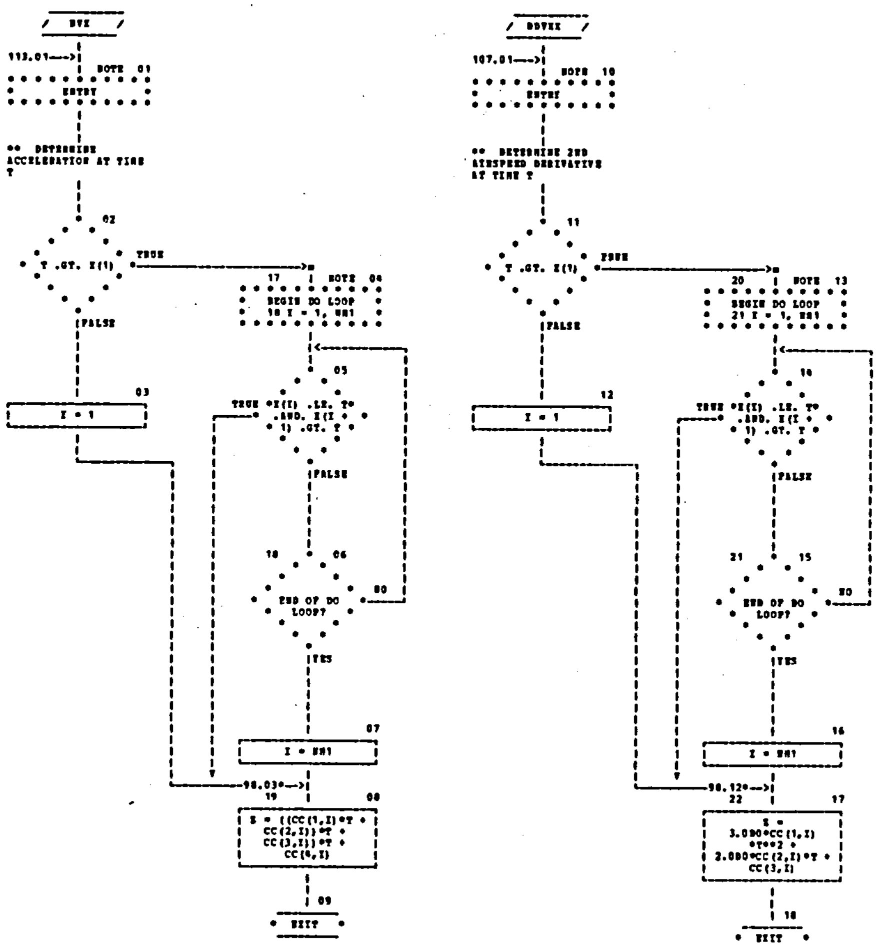


CHART TITLE - SUBROUTINE SPLINE(N,T,X,AA,IC)

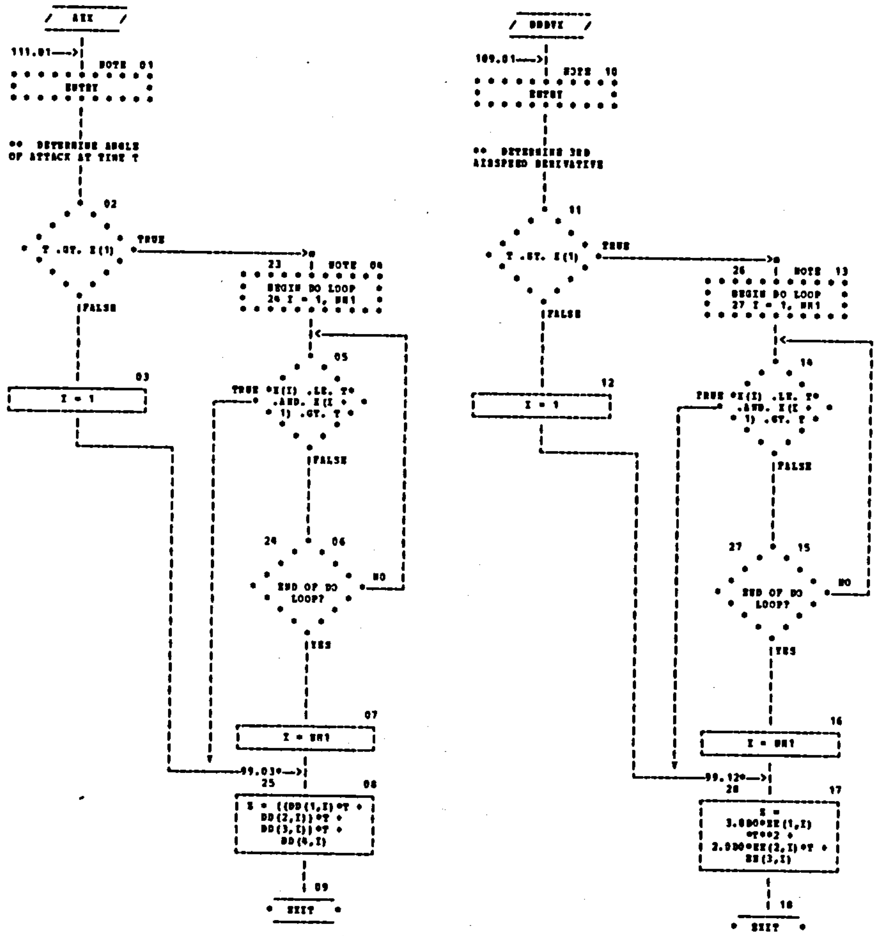


CHART TITLE - SUBROUTINE PSI(X,F,X,FP,FPP,ND,NS,NI,IC)

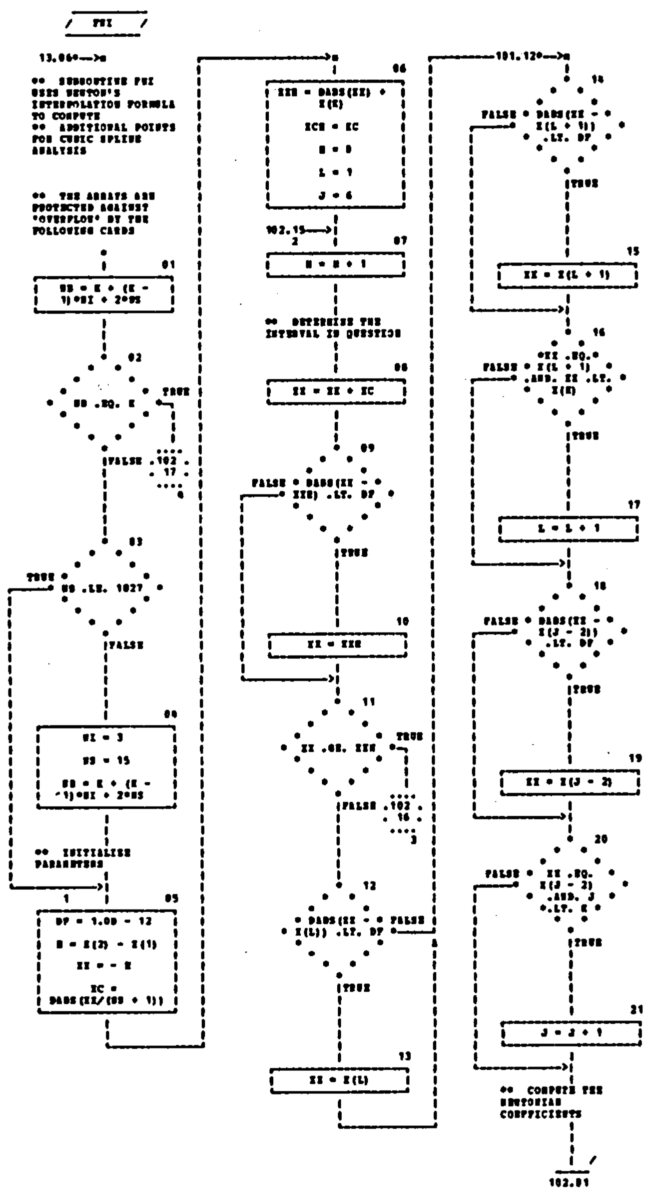


CHART TITLE - SUBROUTINE FIT(N,F,X,FP,FPP,ND,NS,NI,IC)

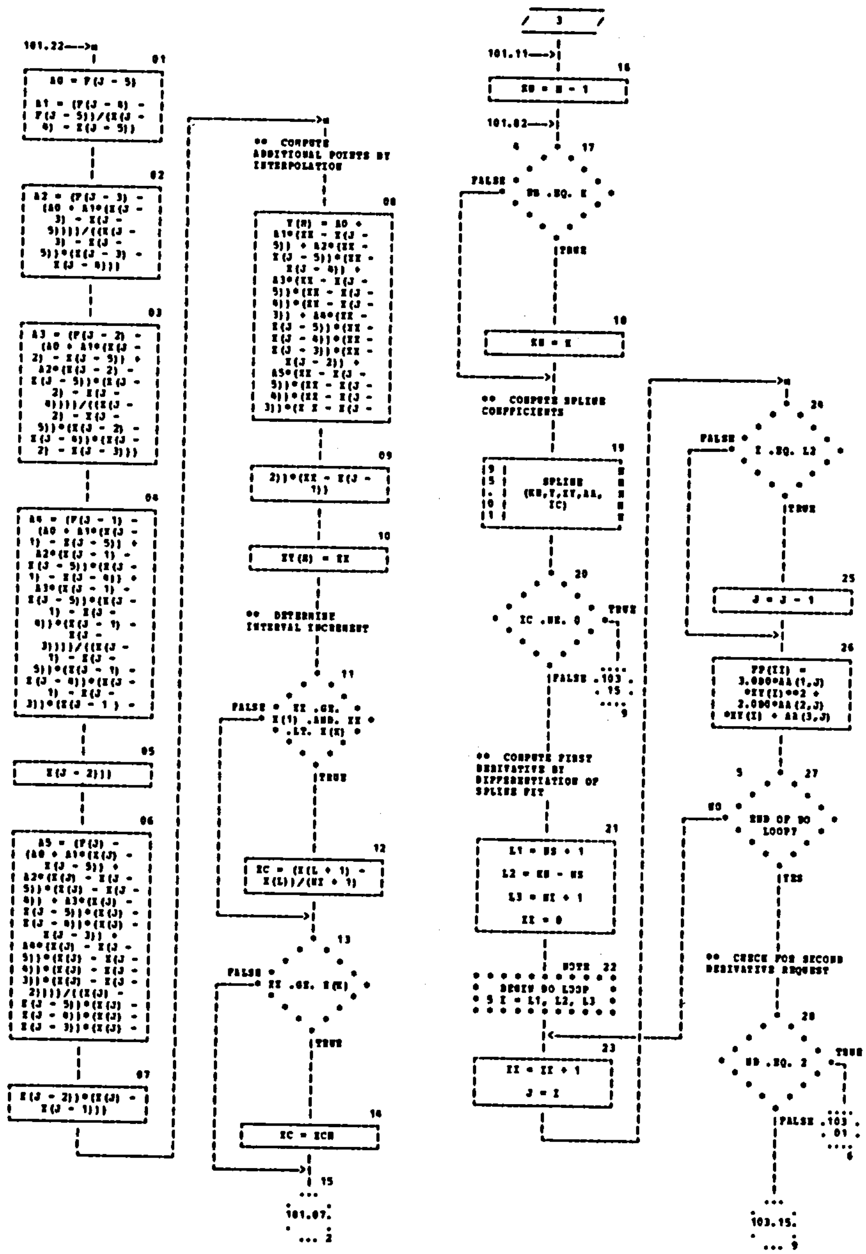


CHART TITLE - SUBROUTINE FDI(X,Y,E,FP,FPP,ND,NS,XI,IC)

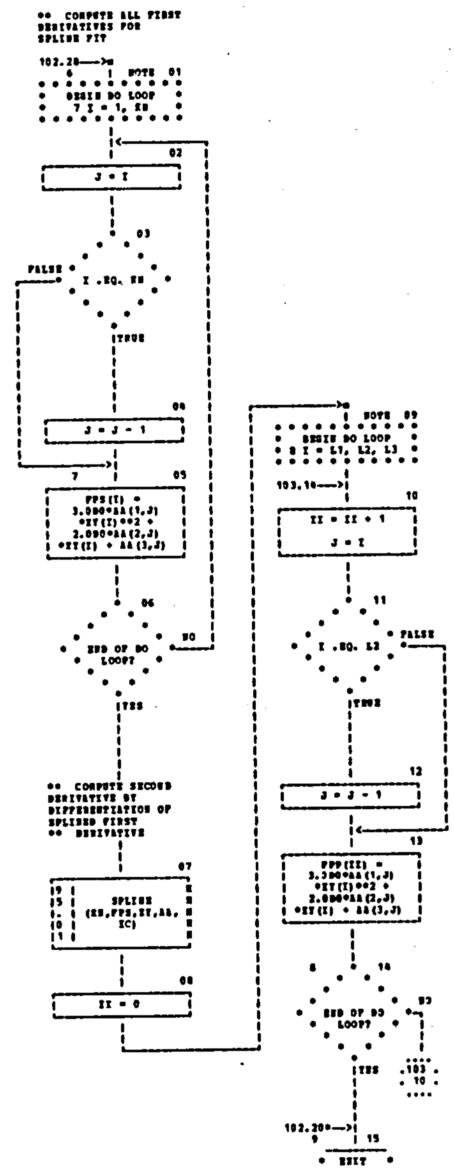


CHART TITLE - FUNCTION VA(T)

```
** FUNCTION VA (WITH
SPLINE) DETERMINES
THE AIRSPEED AT TIME
T

             *
             I             01
   ------------------------
   |9 |                   N
   |7 |       VEE         N
   |. |      (T,E)        N
   |0 |                   N
   |7 |                   N
   ------------------------
             I
             I
             I             32
   ------------------------
   I        VA = E        I
   ------------------------
             I
             I
             I 03
         ----------
       *   EXIT   *
         ----------
```


CHART TITLE - FUNCTION DDV(T)

```
** FUNCTION DDV
(WITH SPLINE)
DETERMINES THE SECOND
DERIVATIVE OF
** AIRSPEED AT TIME
T

             *
             I             01
   ------------------------
   |9 |                   N
   |8 |      DDVEE        N
   |. |      (T,E)        N
   |1 |                   N
   |0 |                   N
   ------------------------
             I
             I
             I             02
   ------------------------
   I       DDV = E        I
   ------------------------
             I
             I
             I 03
         ----------
       *   EXIT   *
         ----------
```

CHART TITLE - FUNCTION DDDV(T)

```
** FUNCTION DDDV
(WITH SPLINE)
DETERMINES THE THIRD
DERIVATIVE OF
**  AIRSPEED AT TIME
T

           *
           I          01
 --------------------
 I9 I               X
 I9 I    DDDVX      X
 I. I    (T,X)      X
 I1 I               X
 I0 I               X
 --------------------
           I
           I
           I          02
 --------------------
 I     DDDV = X     I
 --------------------
           I
           I
           I 03
       ---------
      *  EXIT   *
       ---------
```


CHART TITLE - FUNCTION ALP(T)

```
** FUNCTION ALP
(WITH SPLINE)
DETERMINES THE ANGLE
OF ATTACK AT
**  TIME T

           *
           I          01
 --------------------
 I9 I               X
 I9 I     AXX       X
 I. I    (T,X)      X
 I0 I               X
 I1 I               X
 --------------------
           I
           I
           I          02
 --------------------
 I     ALP = X      I
 --------------------
           I
           I
           I 03
       ---------
      *  EXIT   *
       ---------
```

CHART TITLE - FUNCTION DVA(T)

```
**  FUNCTION DVA
(WITH SPLINE)
DETERMINES THE FIRST
DERIVATIVE OF
**  AIRSPEED

              *
              I          01
  ---------------------------
 |9 |                       E
 |8 |        DVX            E
 |. |       (T,X)           E
 |0 |                       E
 |1 |                       E
  ---------------------------
              I
              I
              I          02
  ---------------------------
 |         DVA = X           |
  ---------------------------
              I
              I
              I 03
         -----------
        *   EXIT    *
         -----------
```

CHART TITLE - SUBROUTINE FP(T,TT,DTT,P,IPRN,DGAM,AF,IXP)

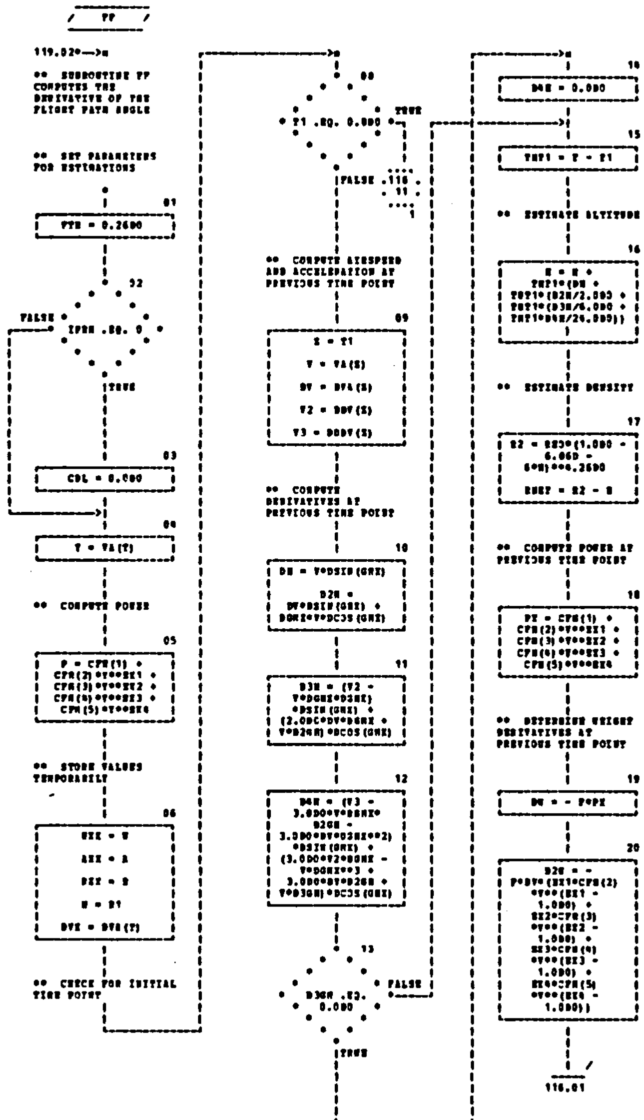


CHART TITLE - SUBROUTINE FF(T,YY,DYY,P,IPRN,DGAN,AP,IXP)

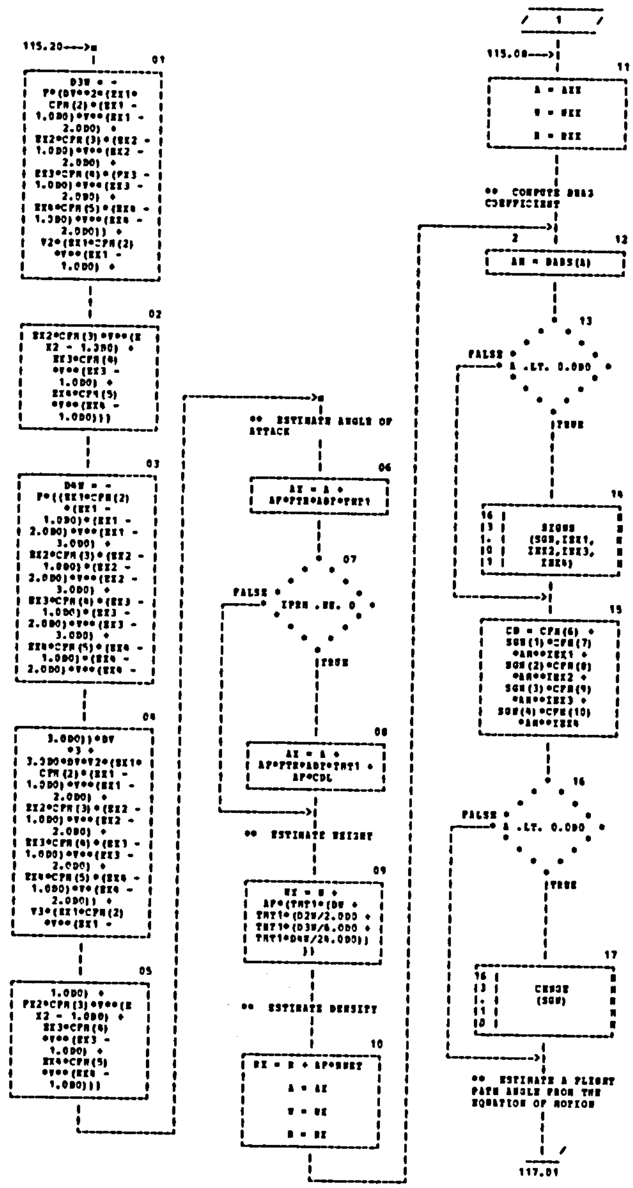


CHART TITLE - SUBROUTINE FF(T,YY,DYY,F,IPRN,DGAM,AF,IKP)

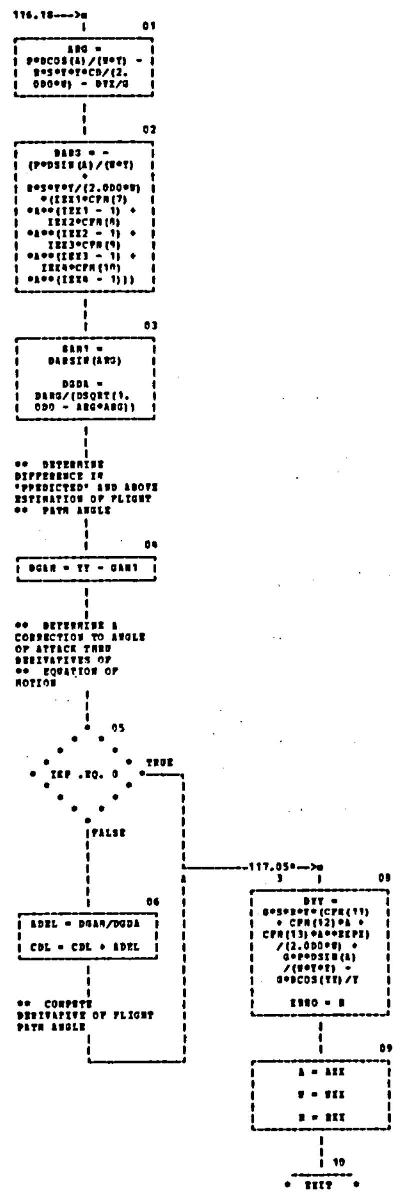


CHART TITLE - SUBROUTINE TRENOR(N,XX,YY,D2Y,D3Y,D4Y,ISET,P,IPRN,KK,IK)

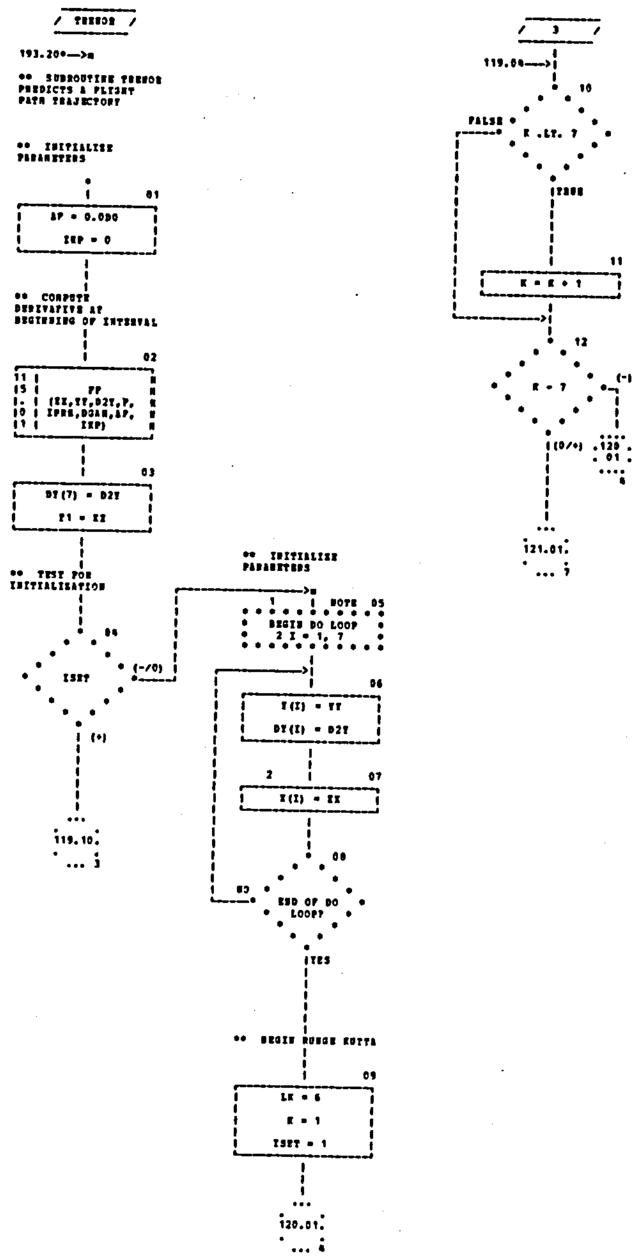


CHART TITLE - SUBROUTINE TRENOR(N,XX,YY,D2Y,D3Y,D4Y,ISET,F,IPRN,KK,IX)

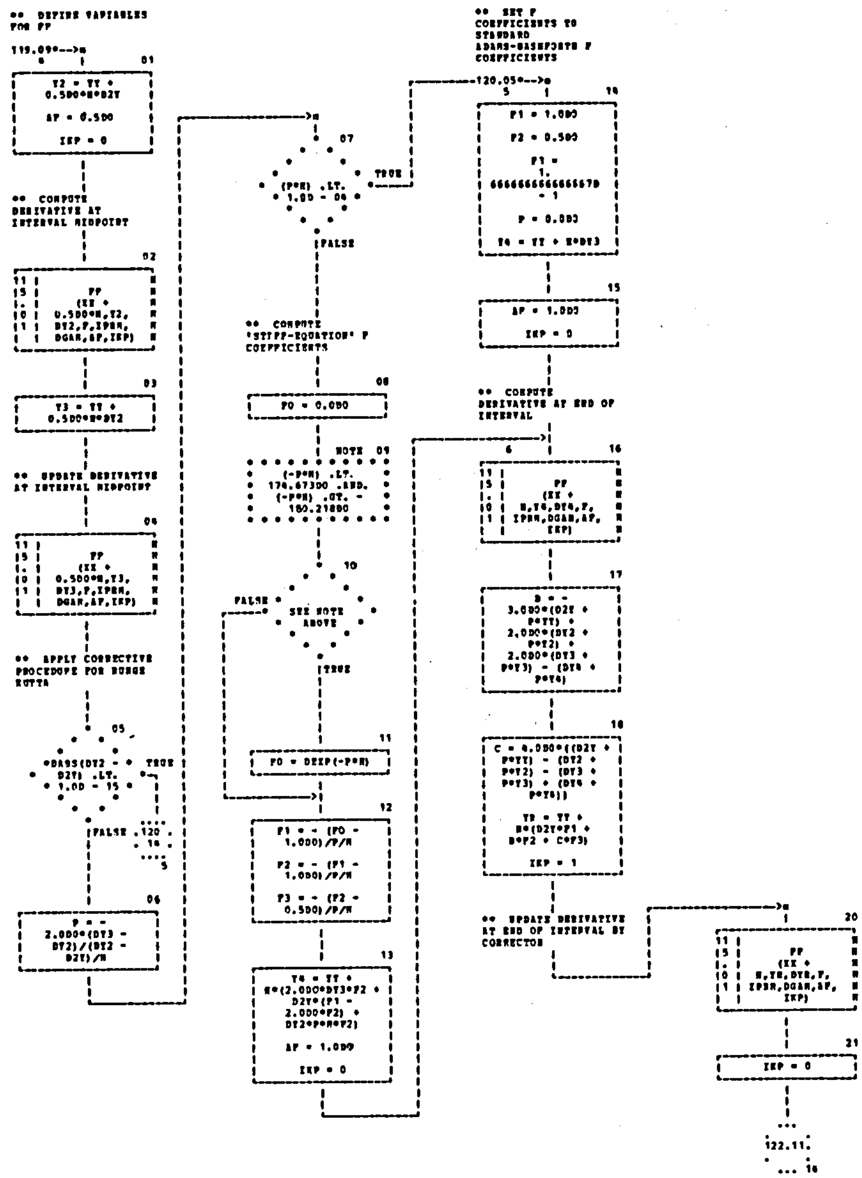


CHART TITLE - SUBROUTINE TRENOR(N,XX,YY,D2Y,D3Y,D4Y,ISET,P,IPRN,FK,IK)

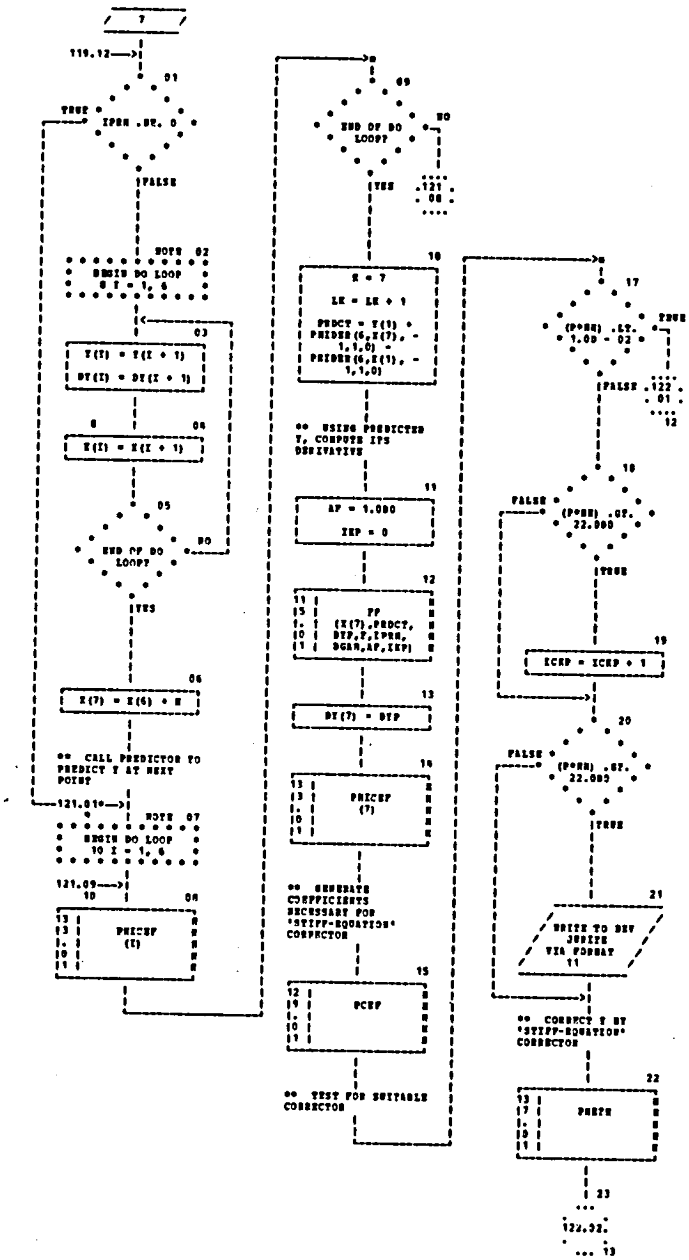


CHART TITLE - SUBROUTINE TRENOR(N,XX,YY,D2Y,D3Y,D4Y,ISET,F,IPRN,KK,IK)

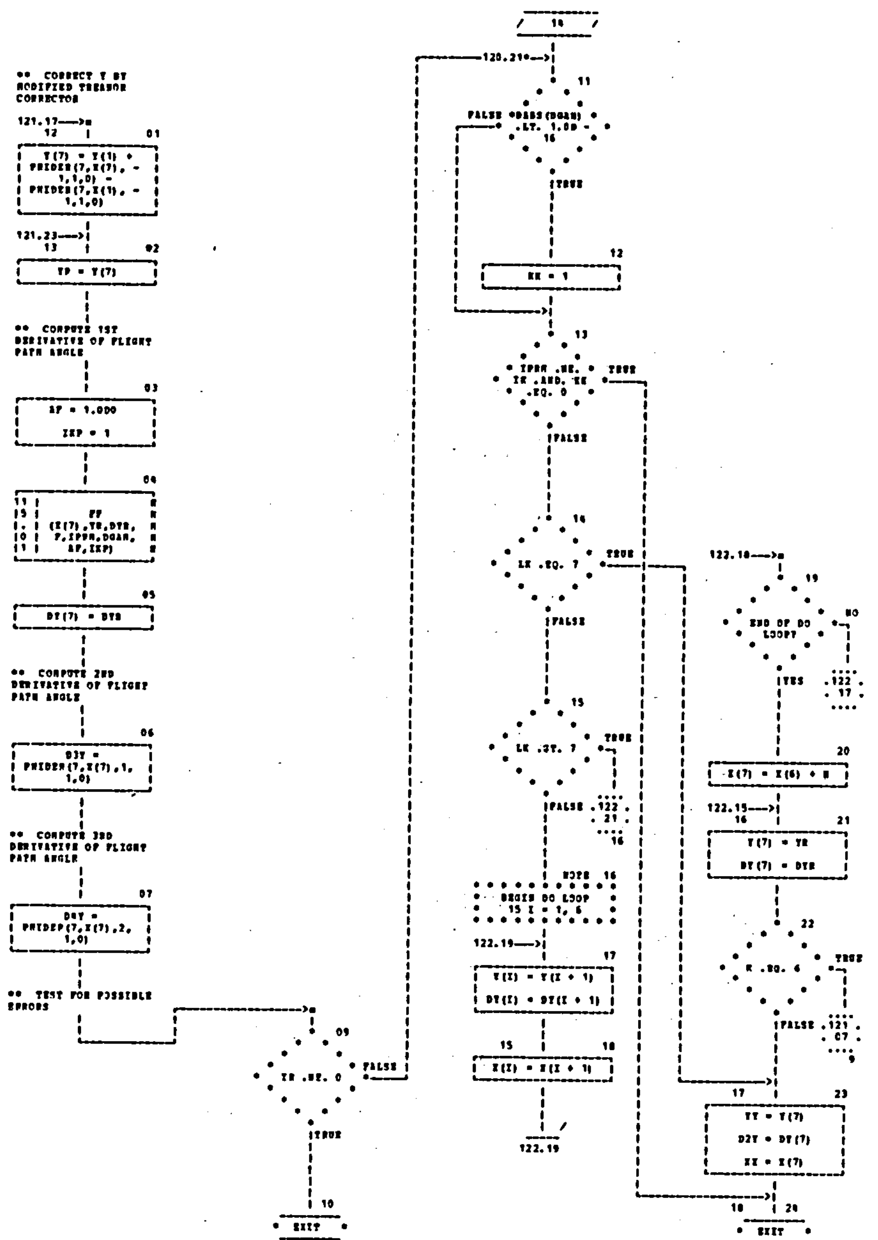


CHART TITLE - SUBROUTINE WSUB(N,F,TH,WE,JWRITE)

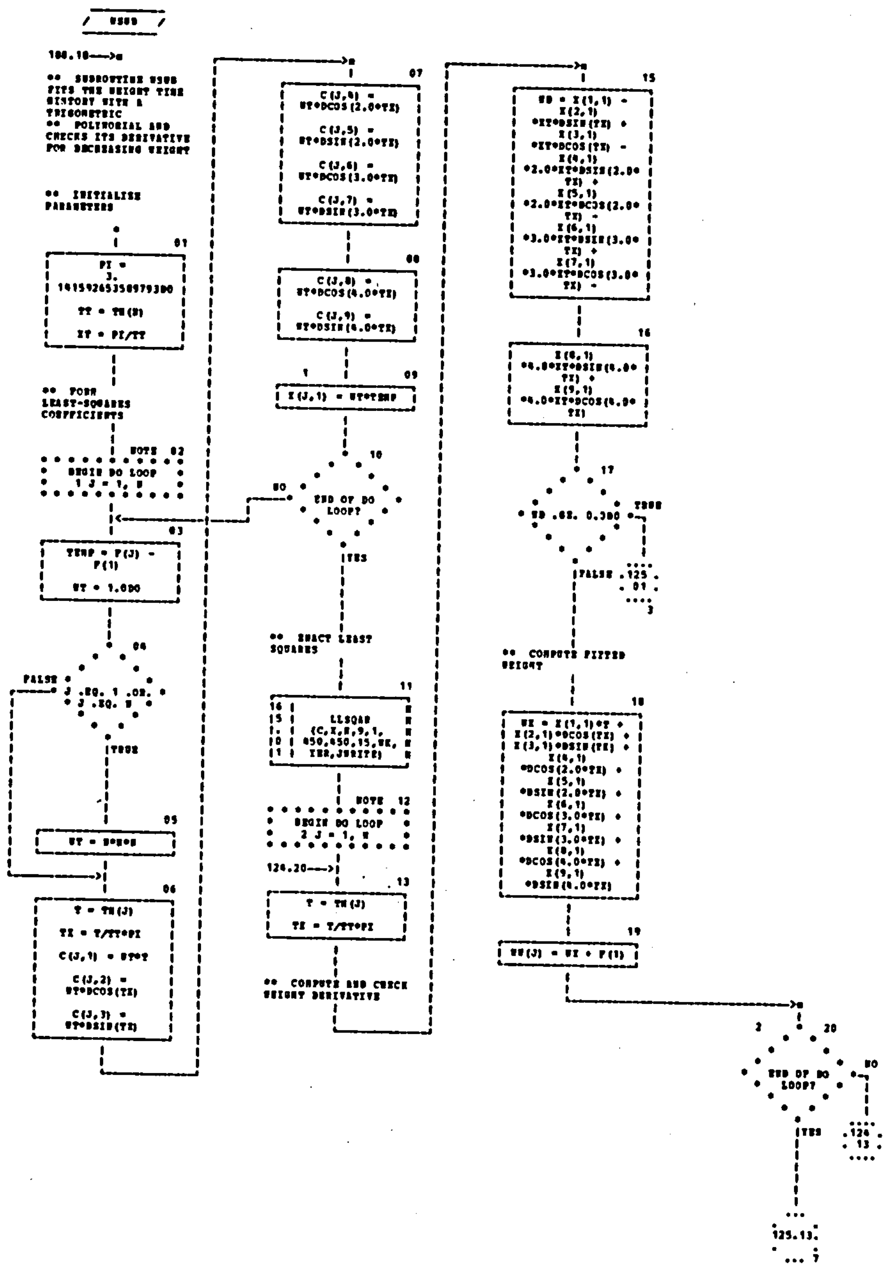


CHART TITLE - SUBROUTINE USUB(N,F,TH,WW,JWRITE)

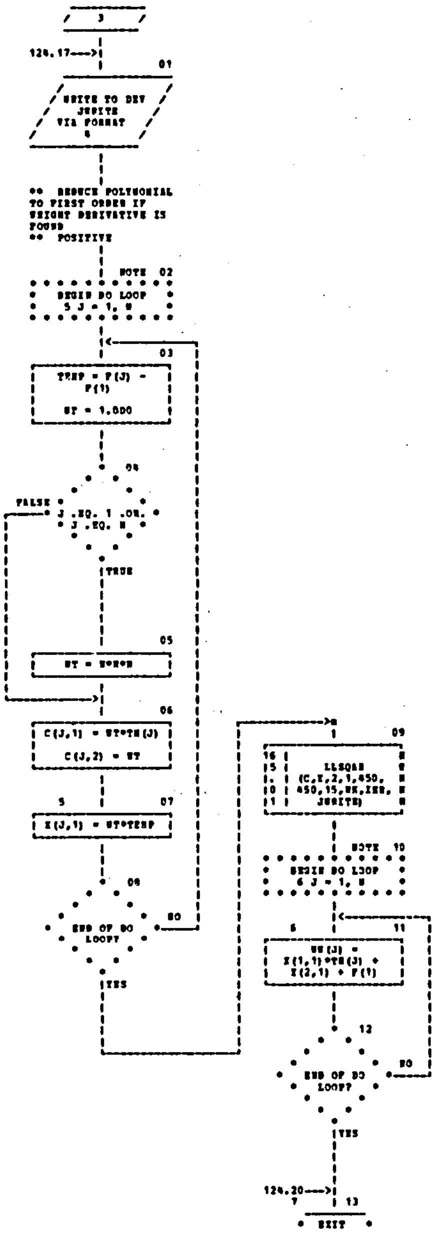


CHART TITLE - SUBROUTINE ADJUST(C,CC,CX,X,DSCALE,LLOC,NLOC,IP,NEQ)

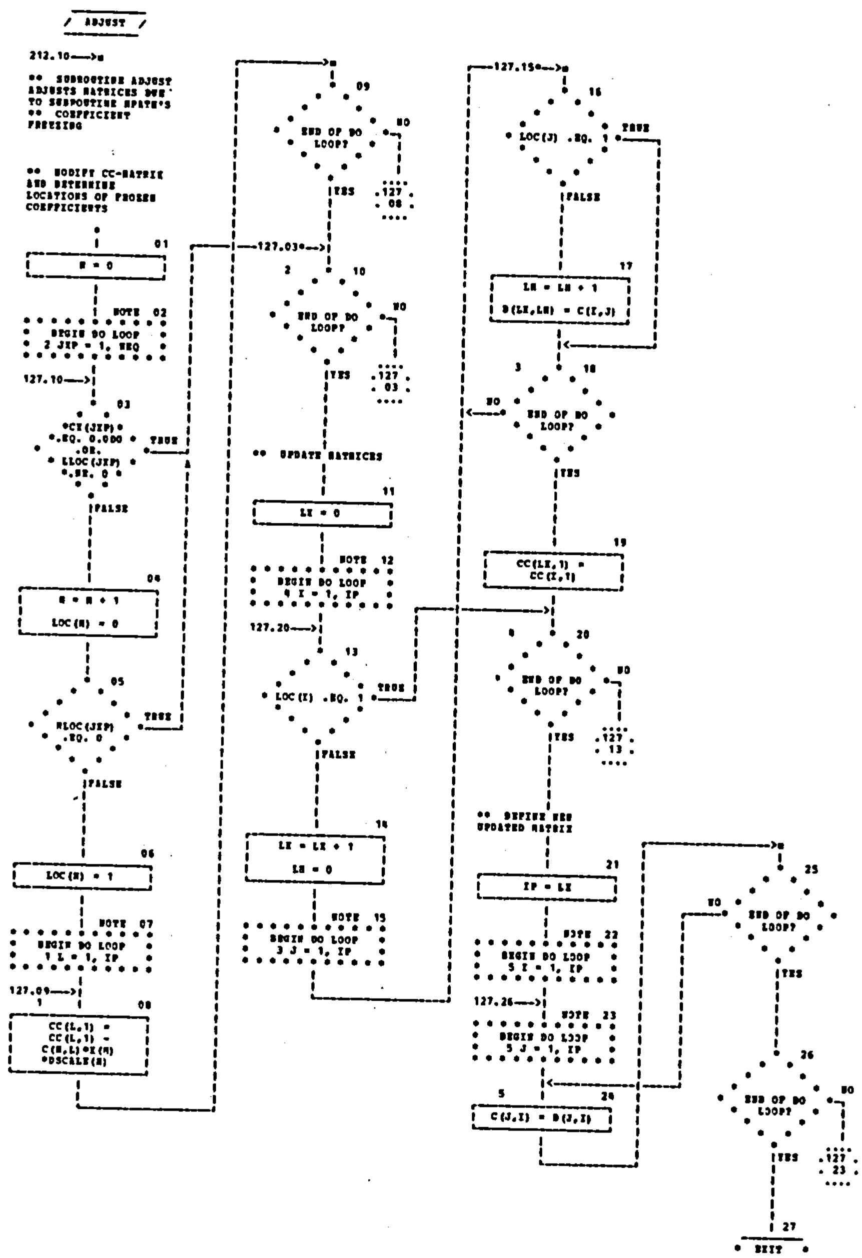


CHART TITLE - SUBROUTINE PCEF

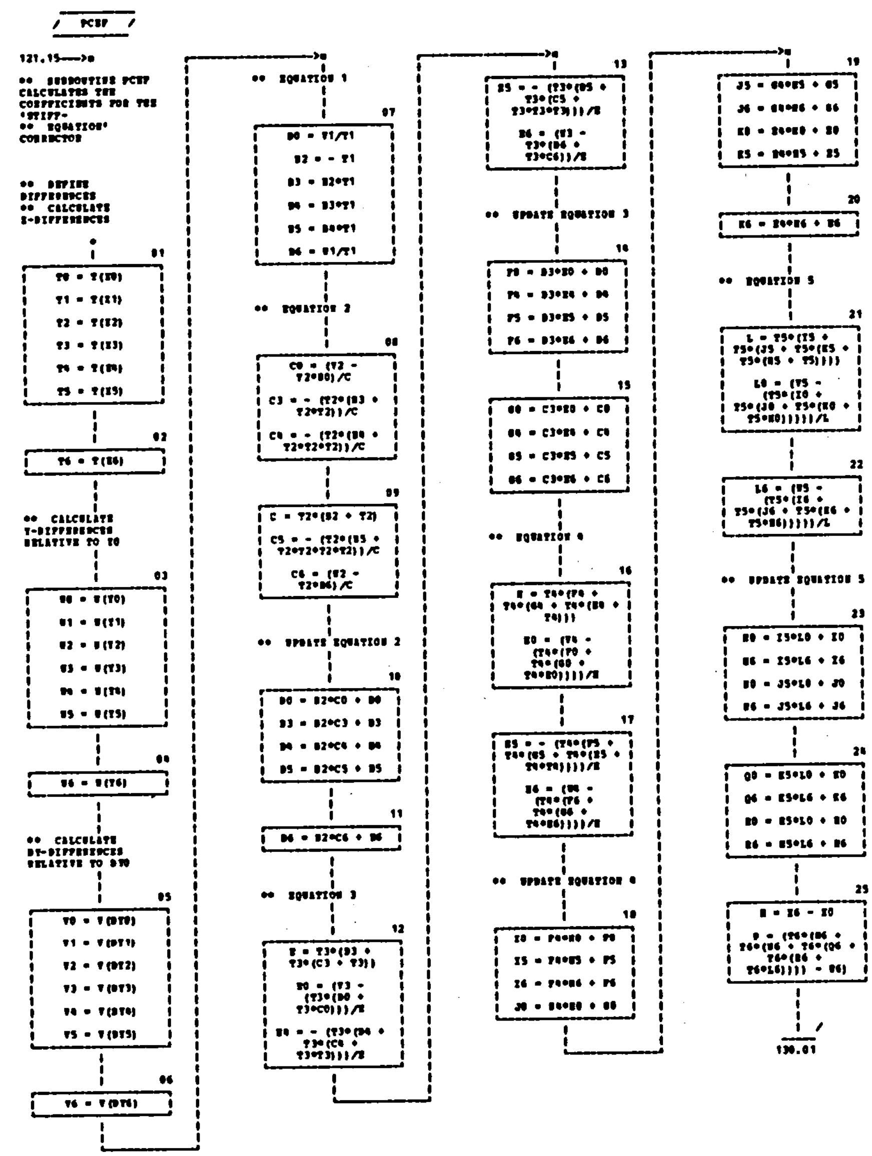


CHART TITLE - SUBROUTINE PCEP

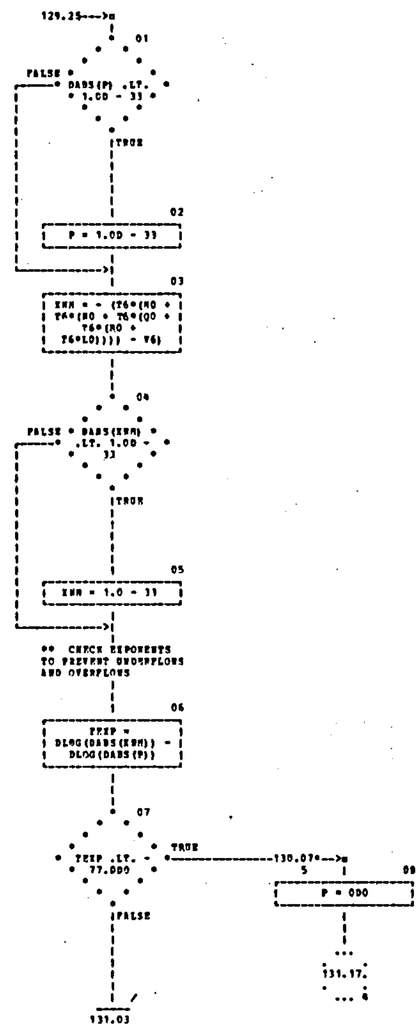


CHART TITLE - SUBROUTINE PCHP

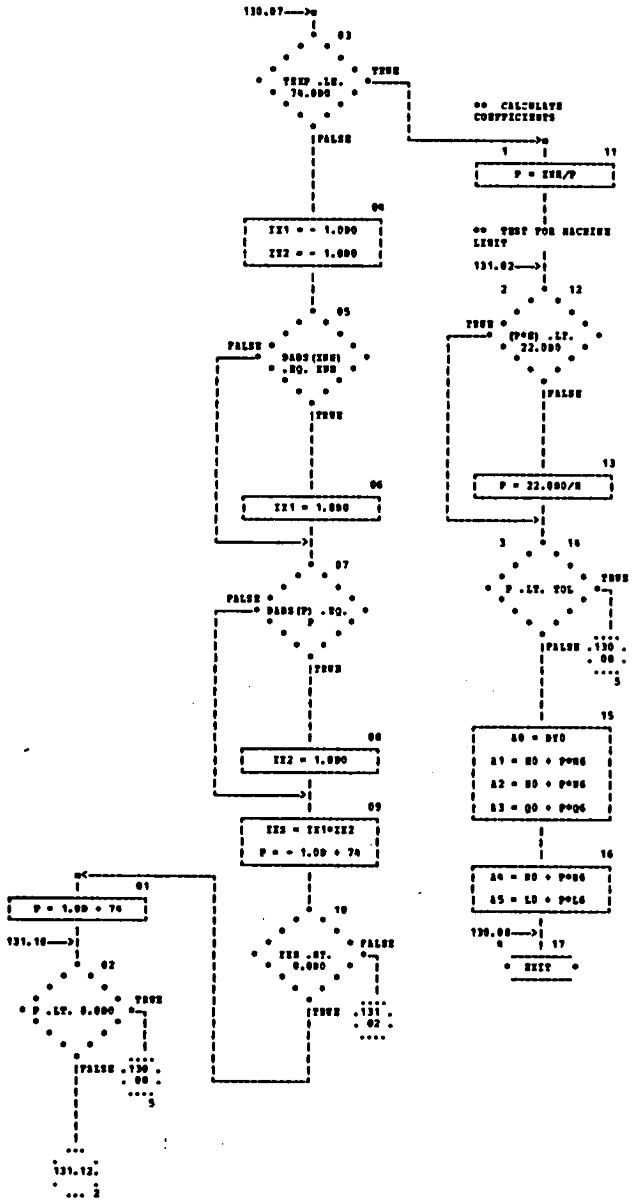


CHART TITLE - SUBROUTINE PHICEF(I)

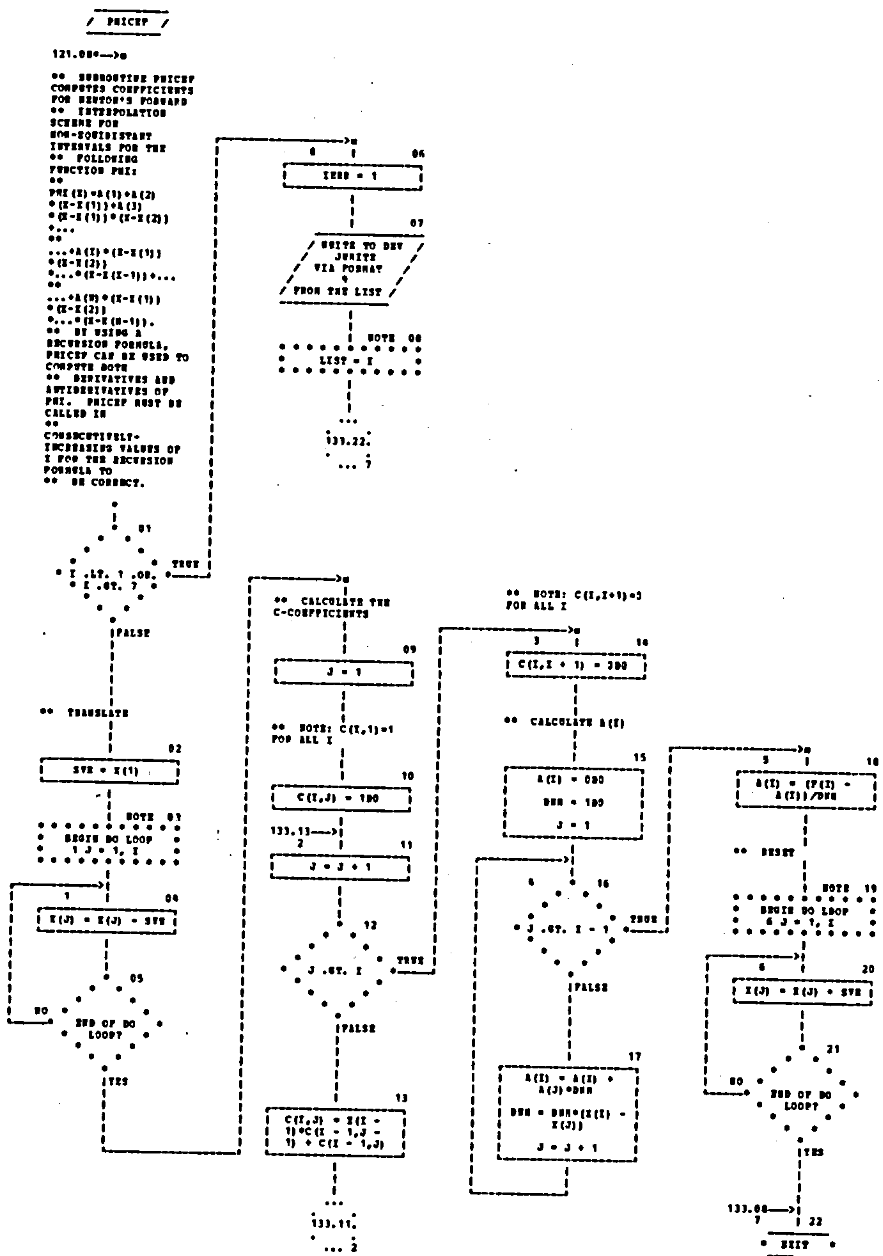


CHART TITLE - FUNCTION PHIDER(N,XX,K,ICP1,ICP2)

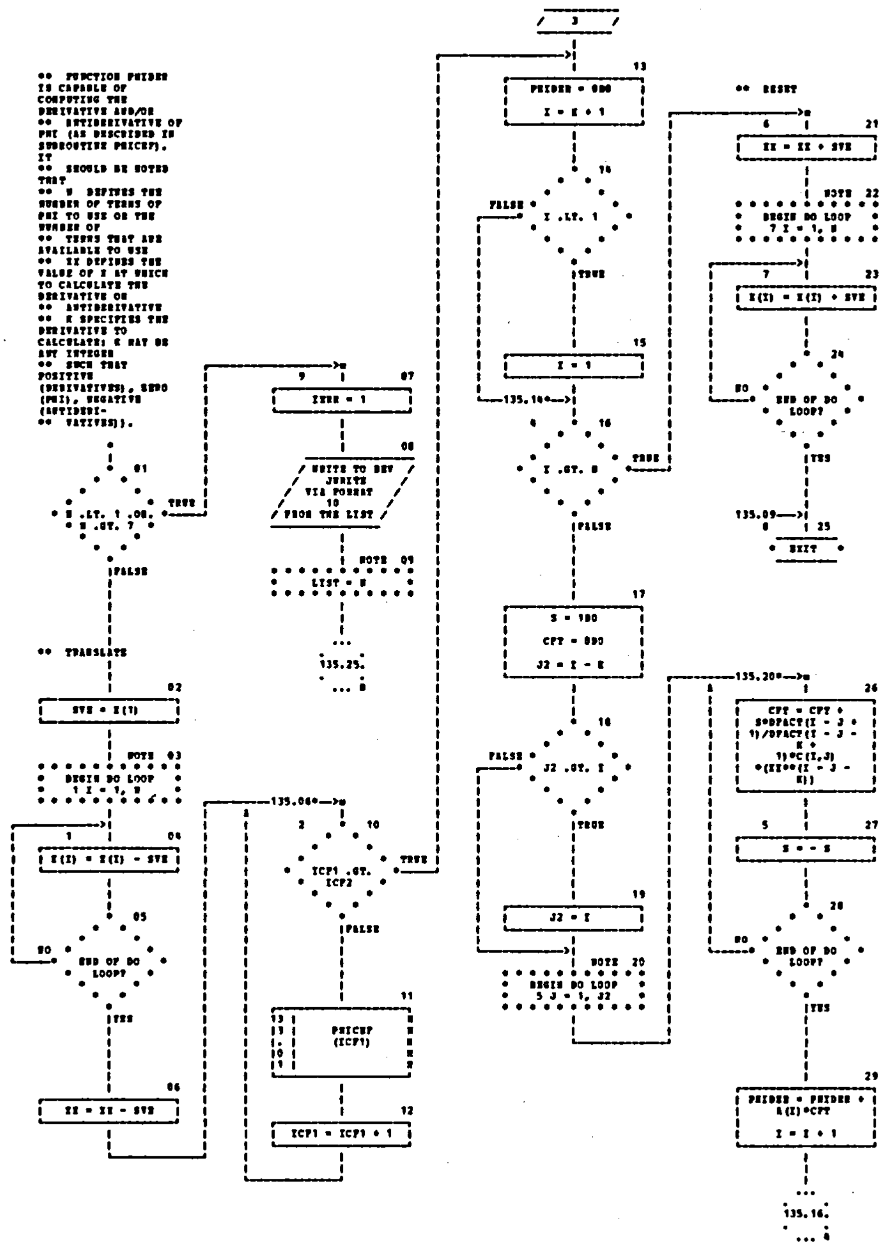


CHART TITLE - SUBROUTINE PHETH

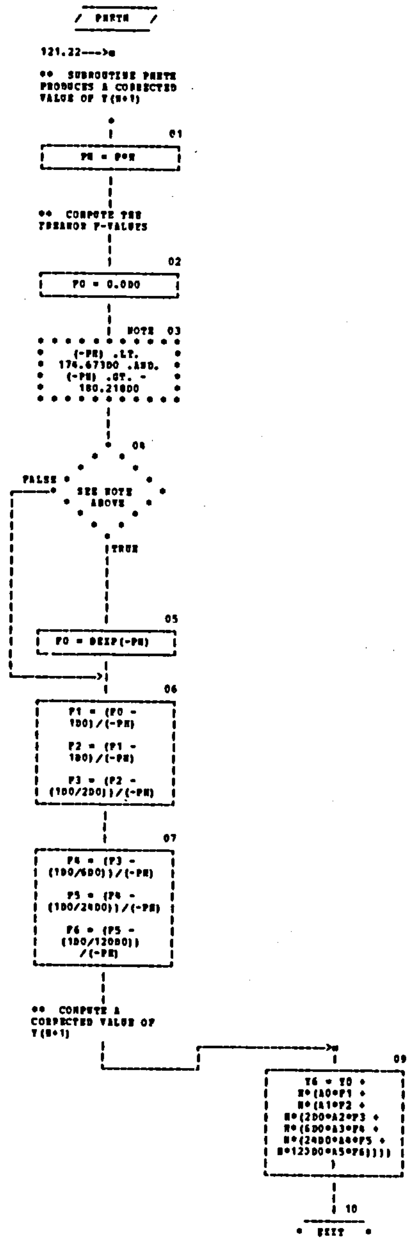


CHART TITLE - SUBROUTINE LOC(I,J,IR,N,M,MS)

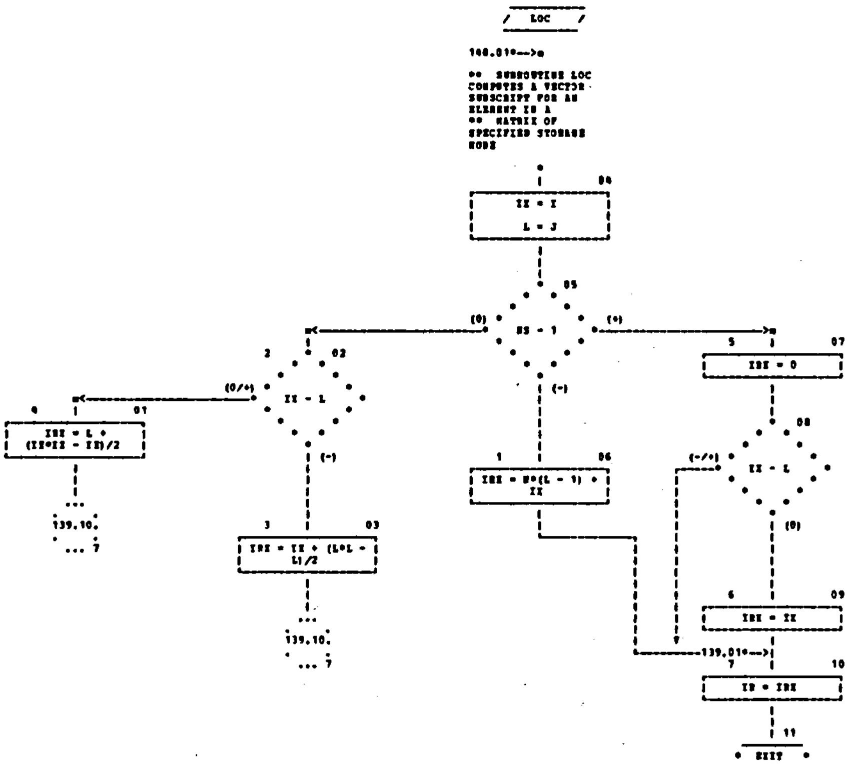


CHART TITLE - SUBROUTINE MATA(A,R,N,M,MS)

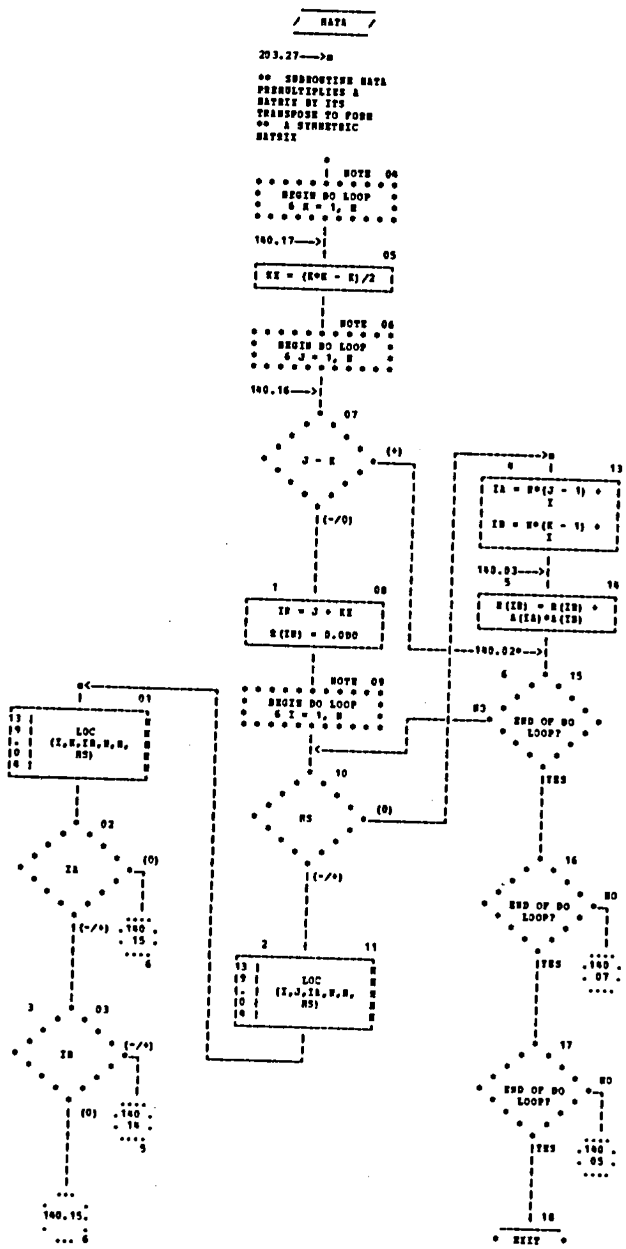


CHART TITLE - SUBROUTINE MADD(A,B,R,N,M,MSA,MSB)

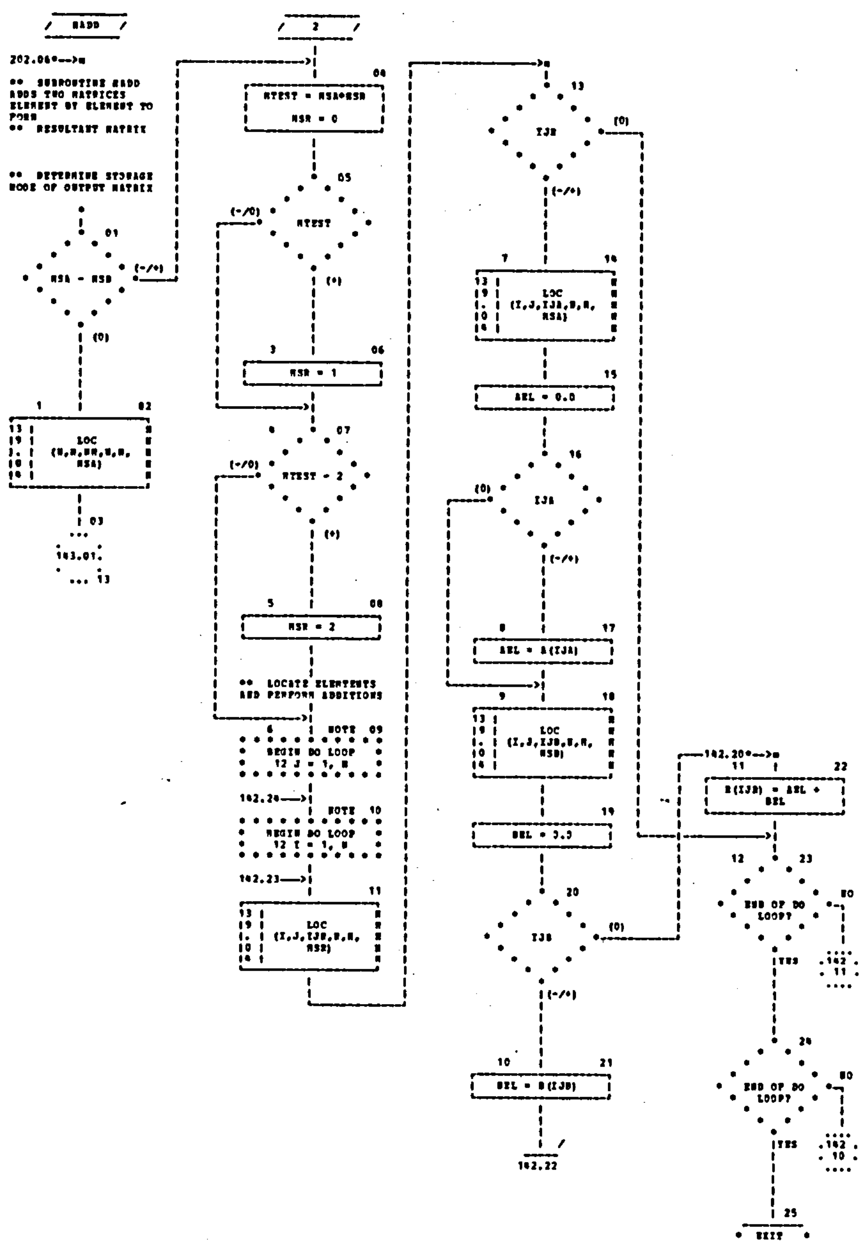


CHART TITLE - SUBROUTINE MADD(A,B,R,N,M,MSA,MSB)

```
                ** ADD MATRICES OF
                LIKE-STORAGE MODE

                142.03--->*
                    13    |  NOTE  01
                * * * * * * * * * * *
                *   BEGIN DO LOOP   *
                *   14 I = 1, NM    *
                * * * * * * * * * * *
                          |
             ----------->|
             |      14    |         32
             |  ---------------------
             |  |  R(I) = A(I) +    |
             |  |     B(I)          |
             |  ---------------------
             |            |
             |            |
             |            *  03
             |          *   *
             |        *       *
             |  NO  *           *
             ------>*  END OF DO  *
                    *   LOOP?     *
                      *       *
                        *   *
                          *
                          |YES
                          |
                          |
                          |
                          |  04
                      ---------
                      * EXIT *
                      ---------
```

CHART TITLE - SUBROUTINE GAIN(K)

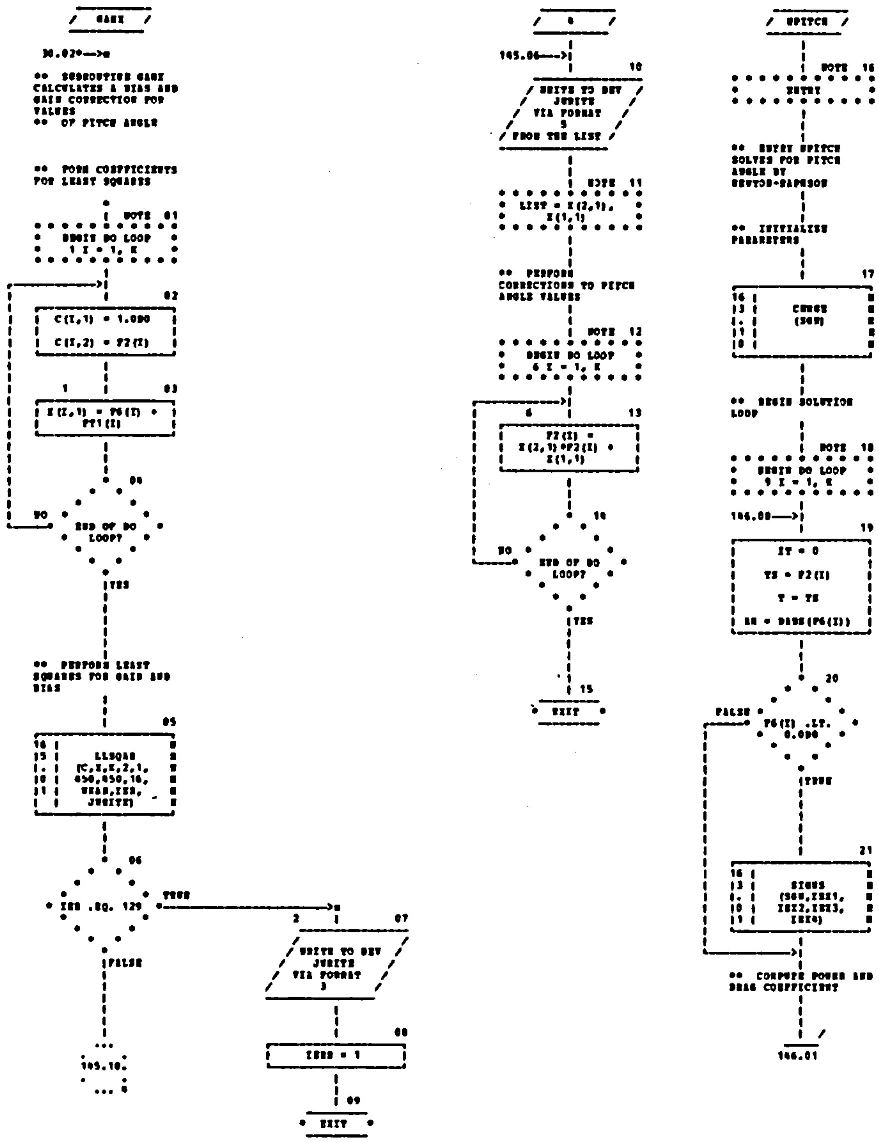


CHART TITLE - SUBROUTINE GAME(K)

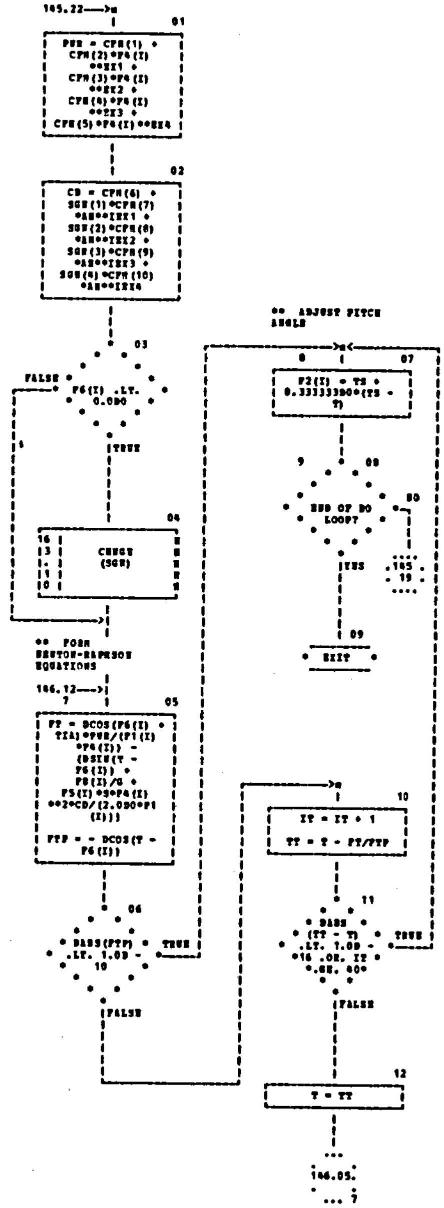


CHART TITLE - SUBROUTINE LSD(X,Y,W,AL,N,RMS,LAST,IERR,JWRITE,NTH)

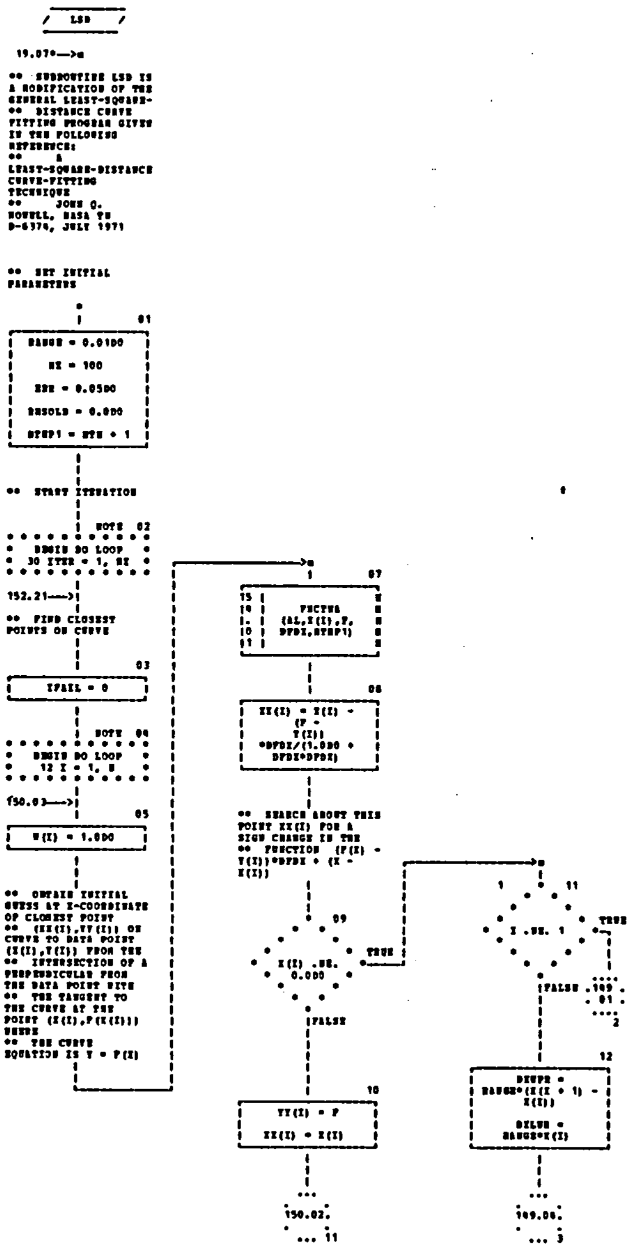


CHART TITLE - SUBROUTINE LSD(X,Y,N,AL,M,RHS,LAST,IERR,JWRITE,NTH)

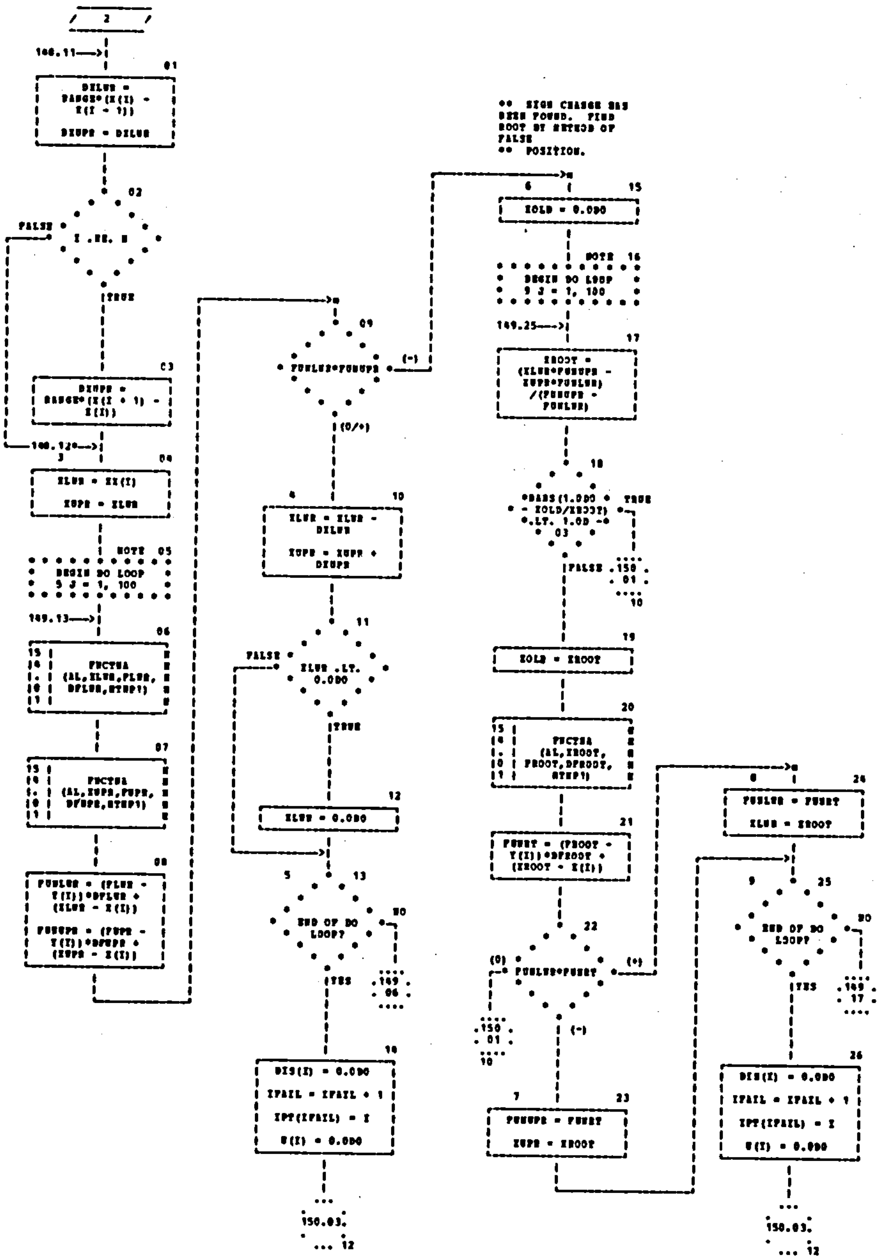


CHART TITLE - SUBROUTINE LSD(X,Y,N,AL,K,RMS,LSET,ITER,JWRITE,RTN)

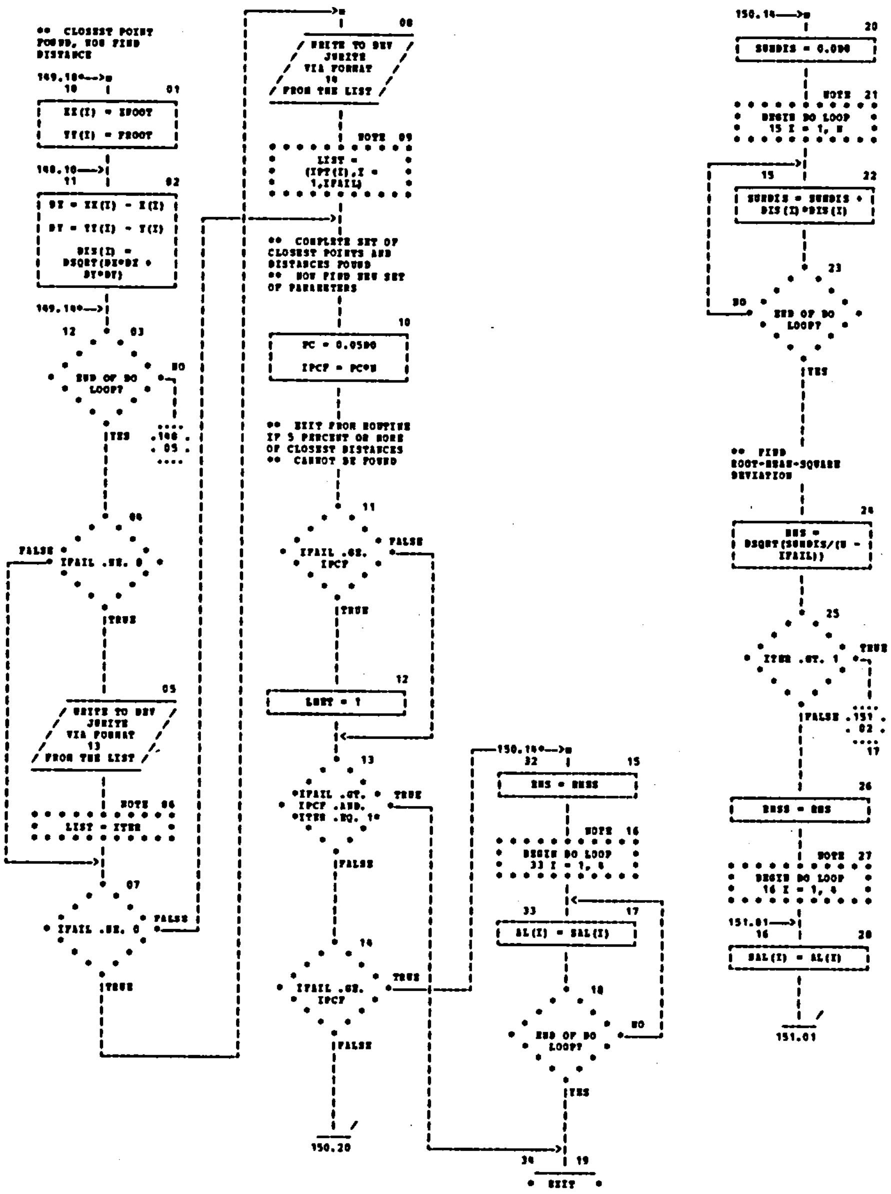


CHART TITLE - SUBROUTINE LSQ(X,Y,Z,AL,N,RES,LEFT,ITER,JWRITE,RTN)

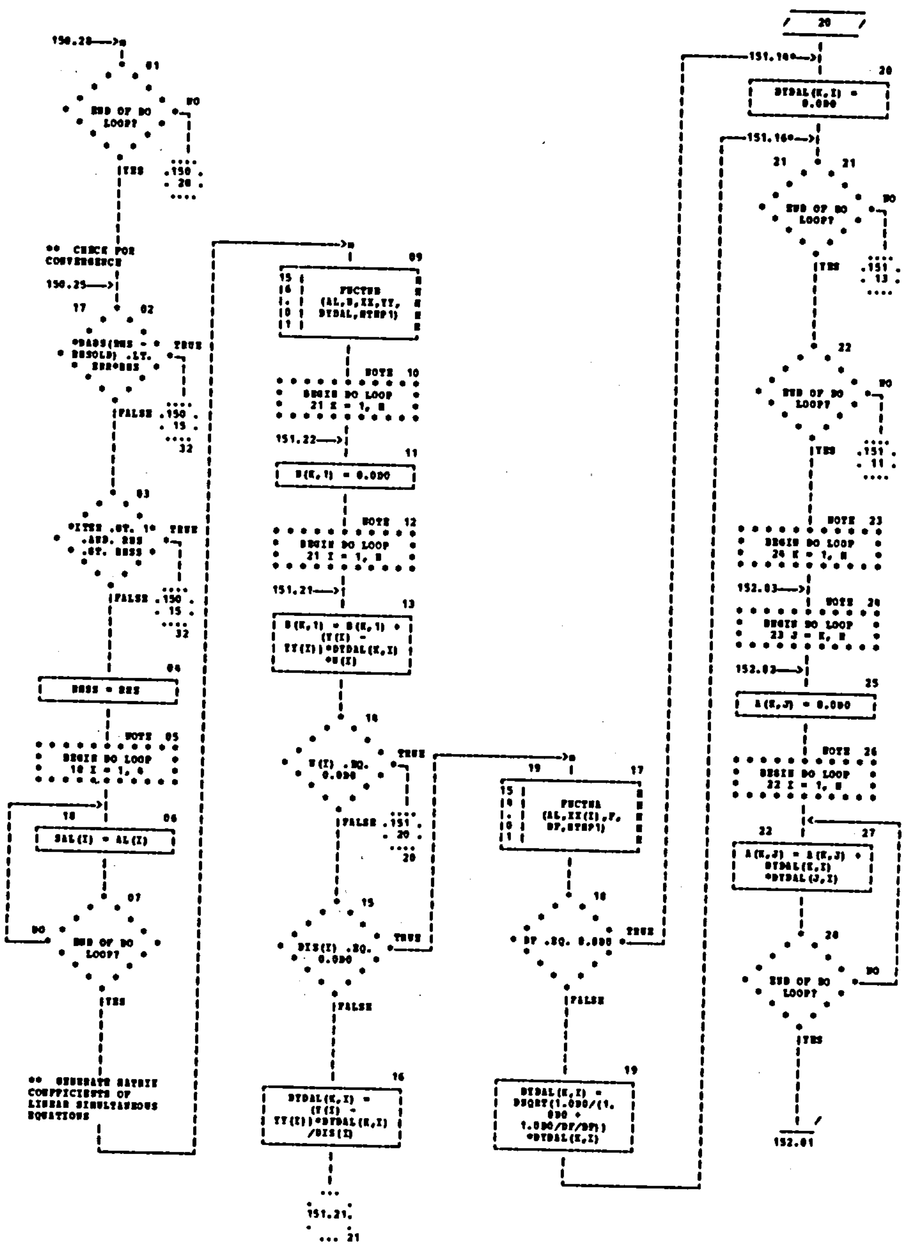


CHART TITLE - SUBROUTINE LSD(X,Y,N,AL,E,YHS,LEST,IERR,JWRITE,STH)

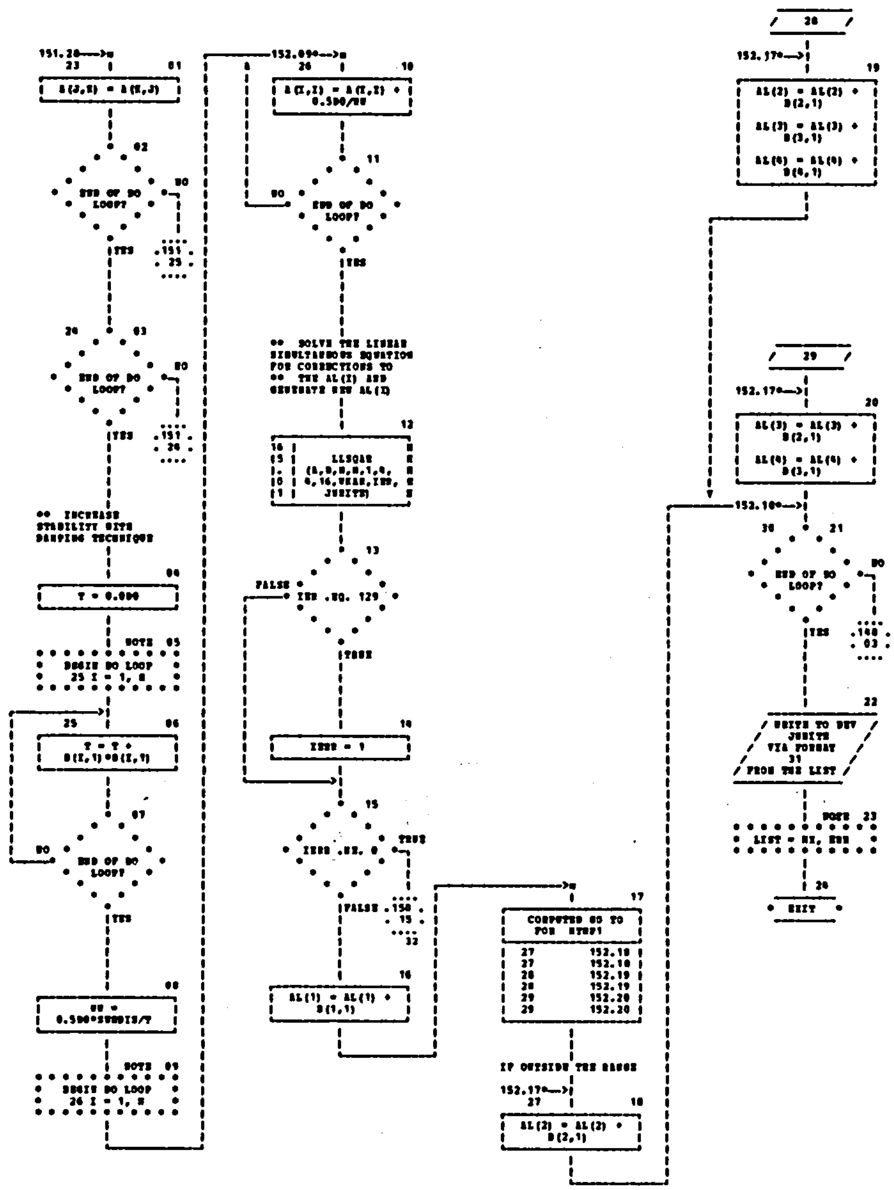


CHART TITLE - SUBROUTINE FNCTNA(A,X,Y,DYDX,NTYP1)

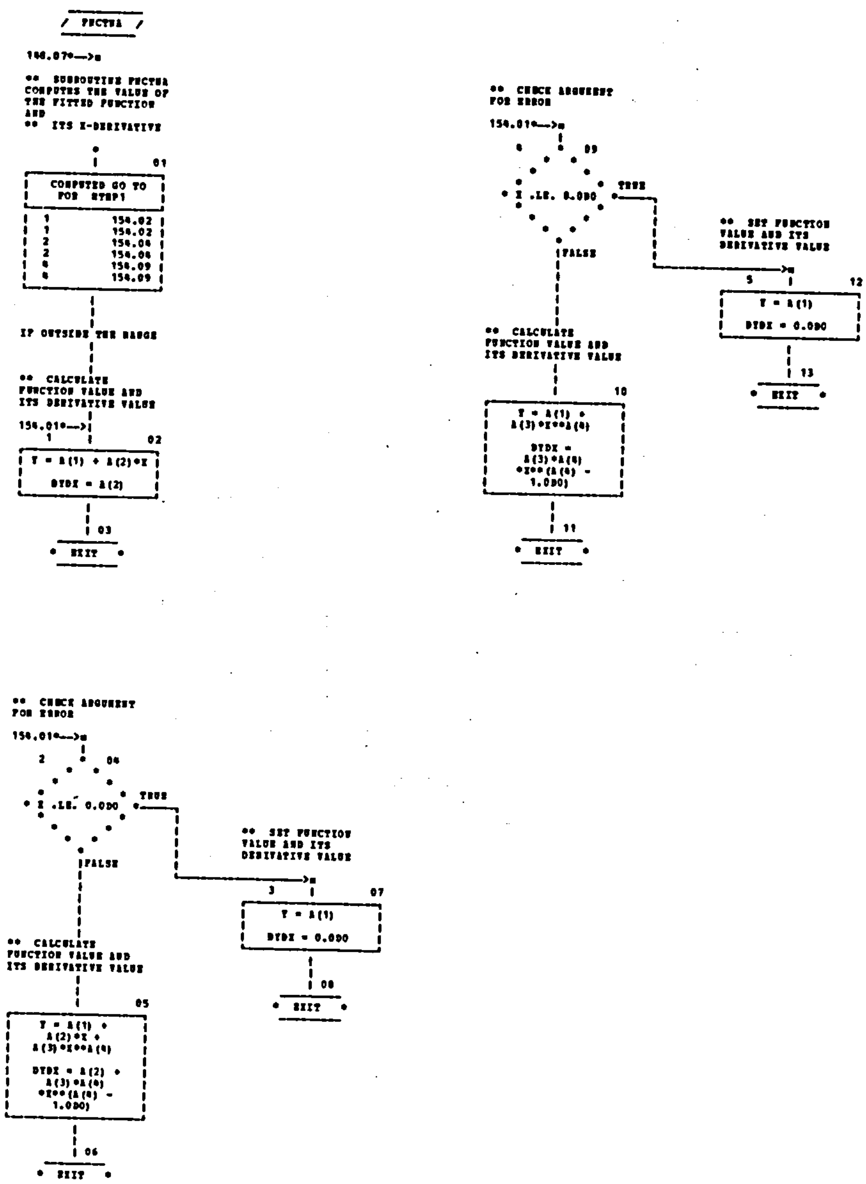


CHART TITLE - SUBROUTINE FNCTNB(A,N,X,Y,DYDA,NTEP1)

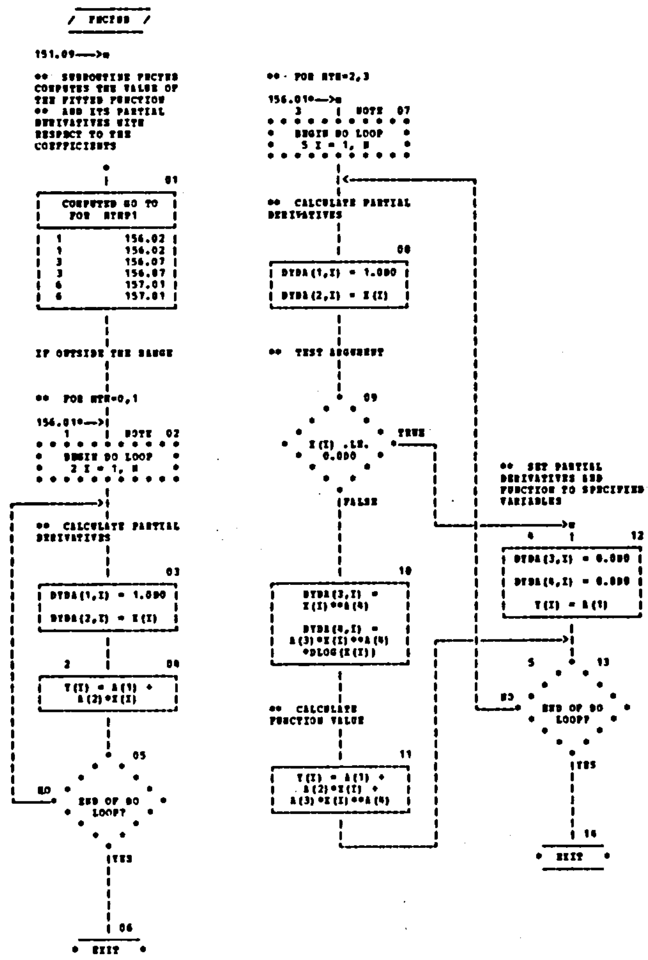


CHART TITLE - SUBROUTINE FNCTNB(A,N,X,Y,DYDA,NTMP1)

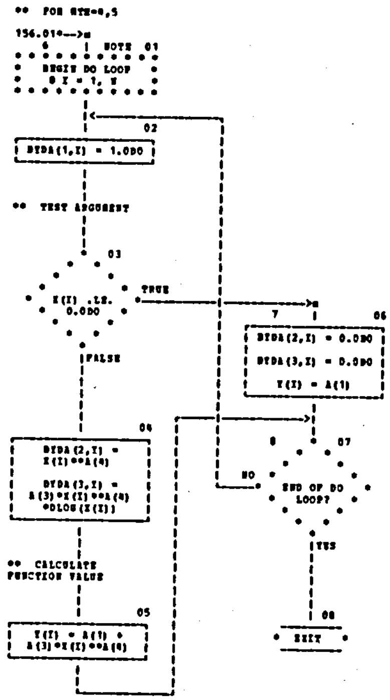


CHART TITLE - SUBROUTINE GDEQN(K,NNB,ICK)

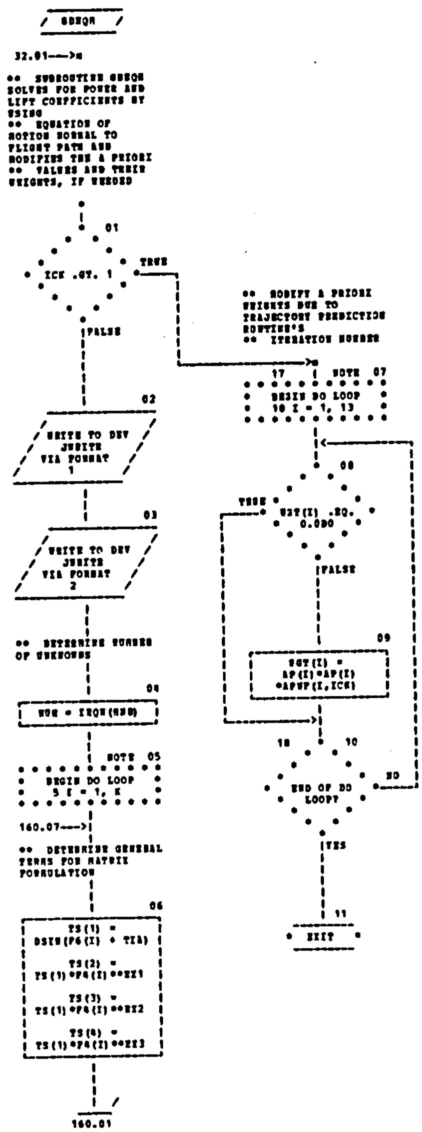


CHART TITLE - SUBROUTINE GDEQN(K,NNB,ICK)

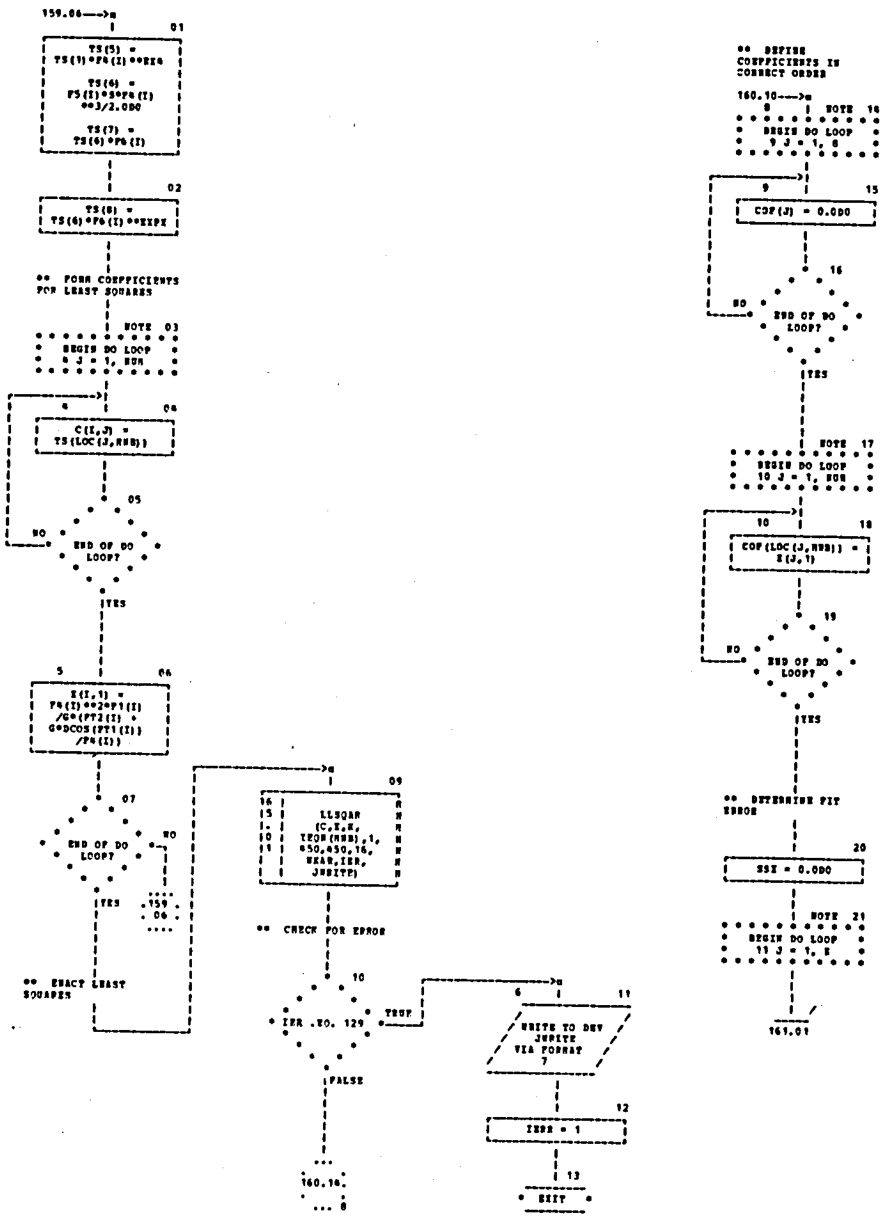


CHART TITLE - SUBROUTINE GDIQN(K,NSD,ICK)

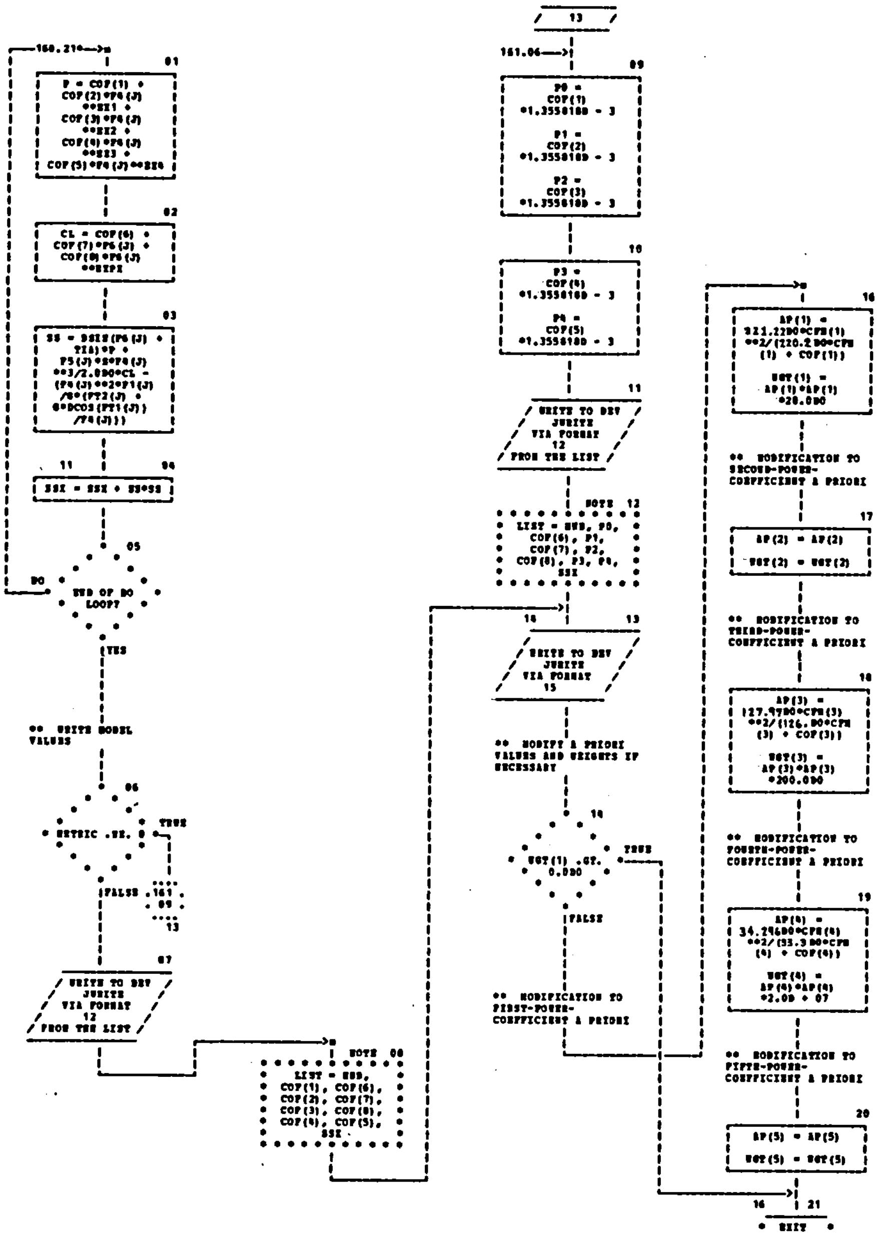


CHART TITLE - SUBROUTINE SIGNS(Y,X1,X2,X3,X4)

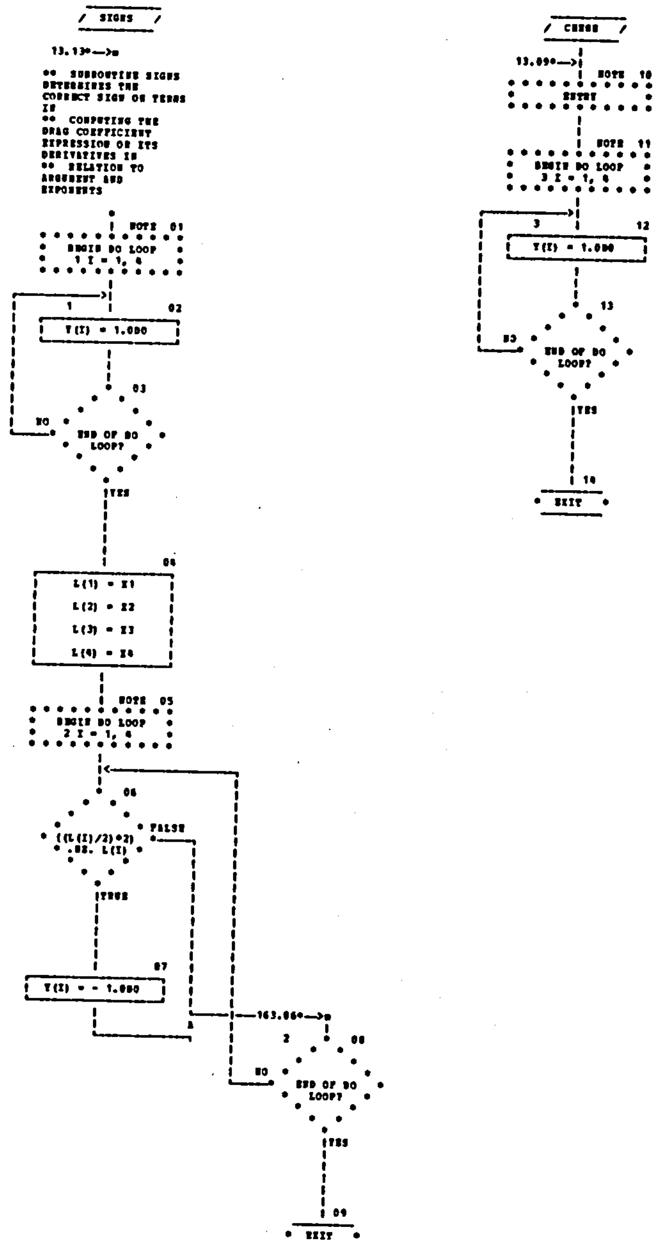


CHART TITLE - SUBROUTINE LLSQAR(A,B,M,NA,NB,IA,IB,IDGT,WKAREA,IER,JWRITE)

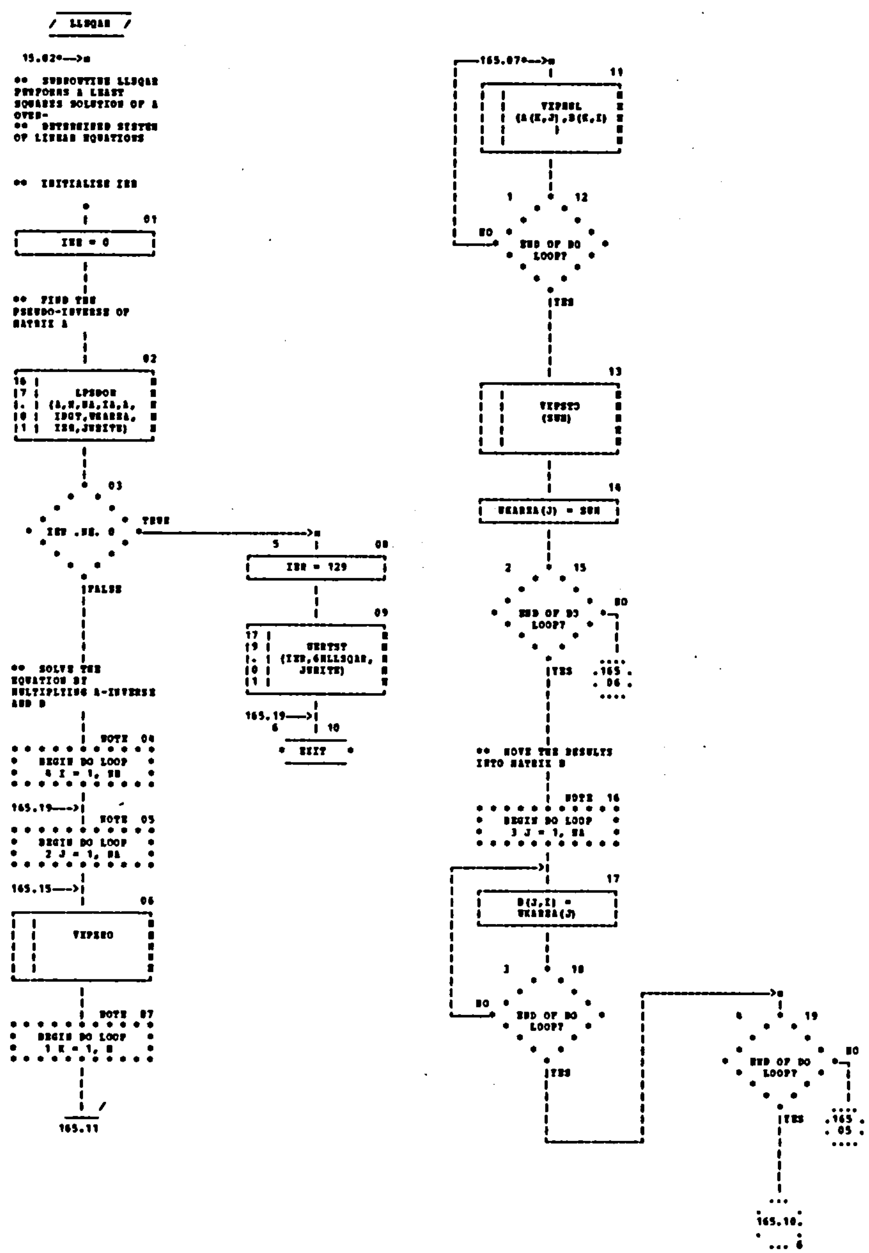


CHART TITLE - SUBROUTINE LPSDON(A,M,N,IA,AINV,IDGT,WKAREA,IER,JWRITE)

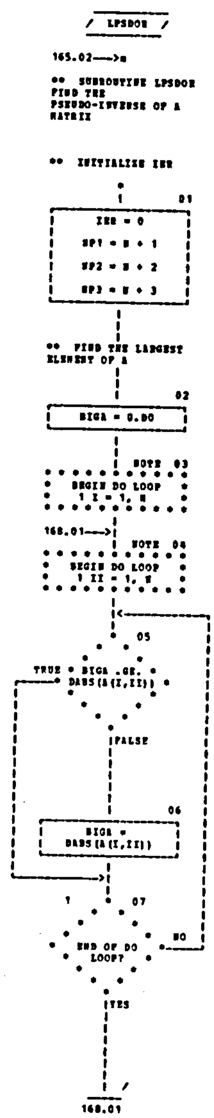


CHART TITLE - SUBROUTINE LPSDOF(A,M,N,IA,AINV,IDGT,WKAREA,IER,JSBITS)

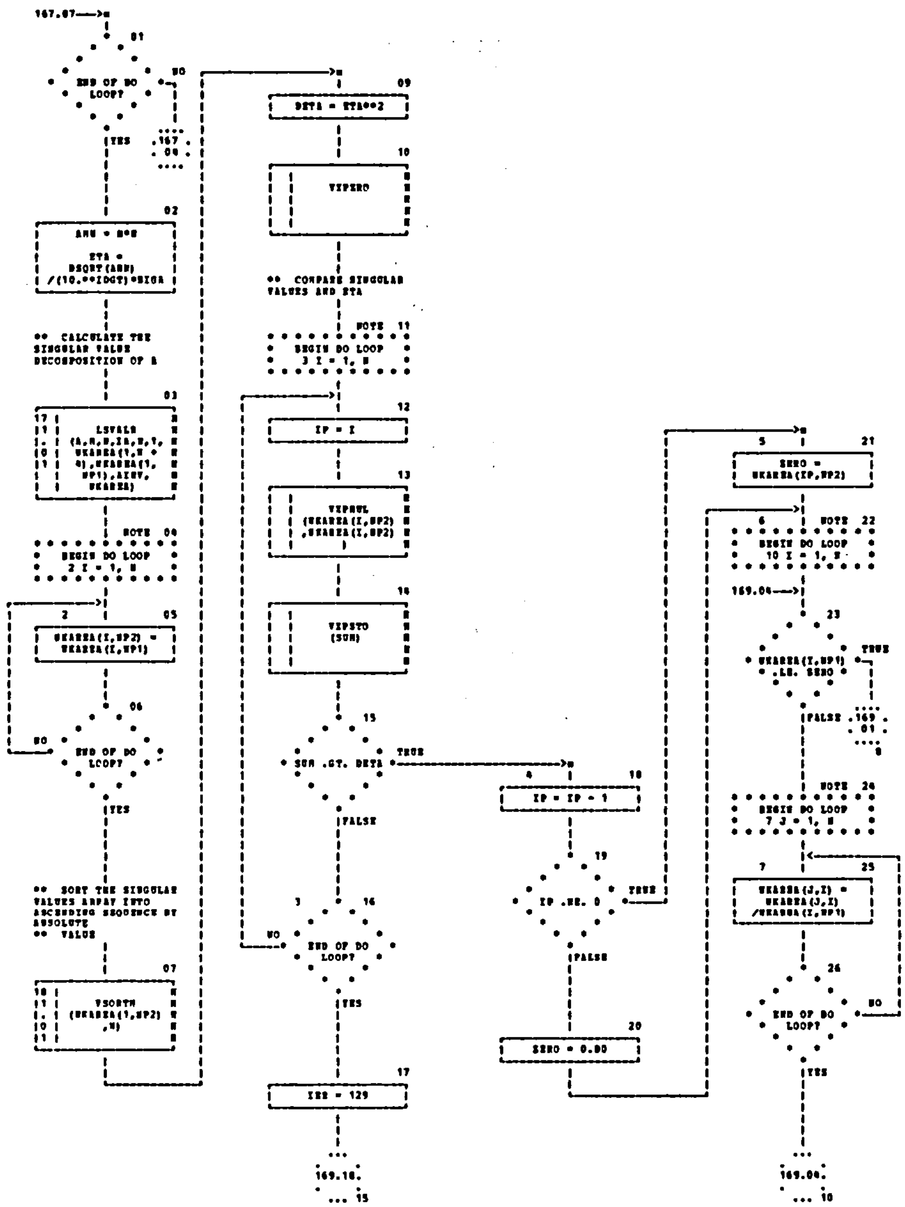


CHART TITLE - SUBROUTINE LPSDOR(A,N,K,IA,AINV,IDGT,WKAREA,IER,JBRITE)

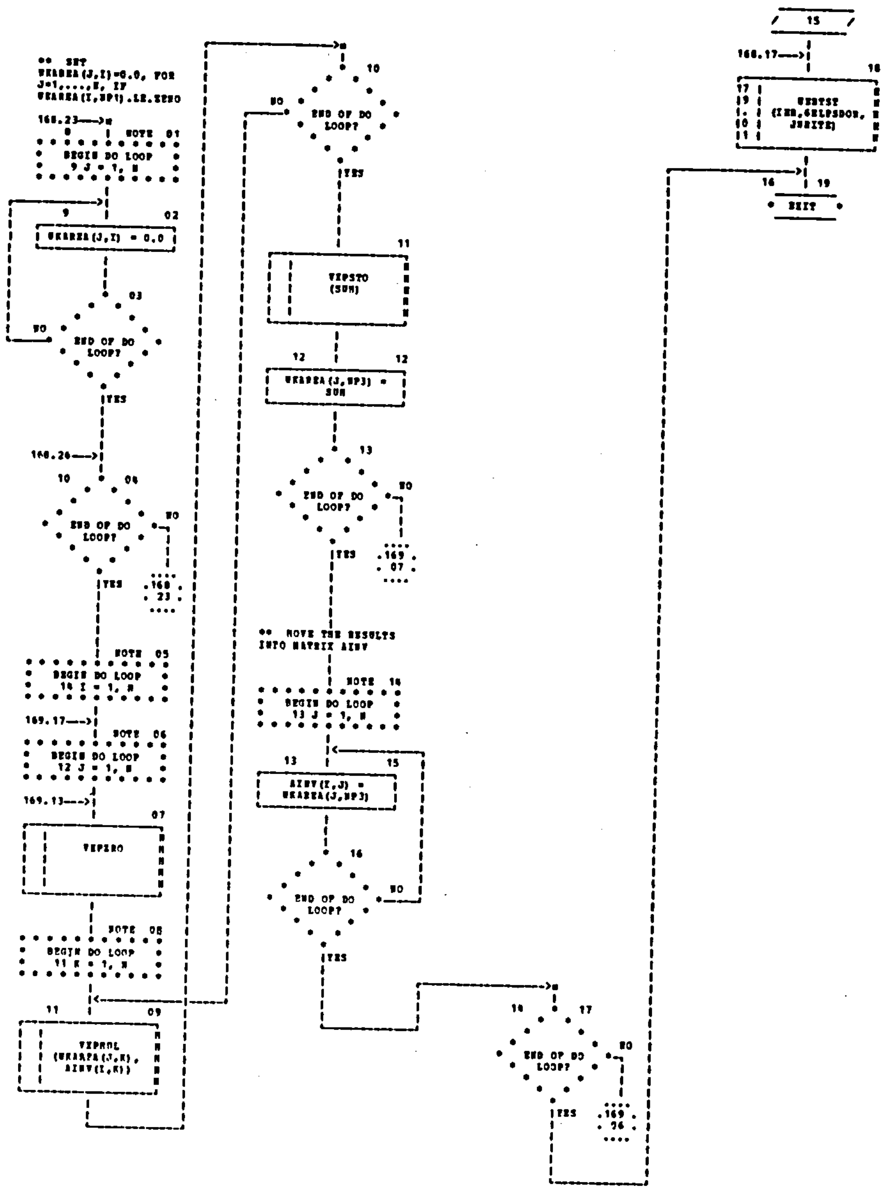


CHART TITLE - SUBROUTINE LSVALR(A,M,N,IA,IV,ISV,WKAREA,Q,U,V)

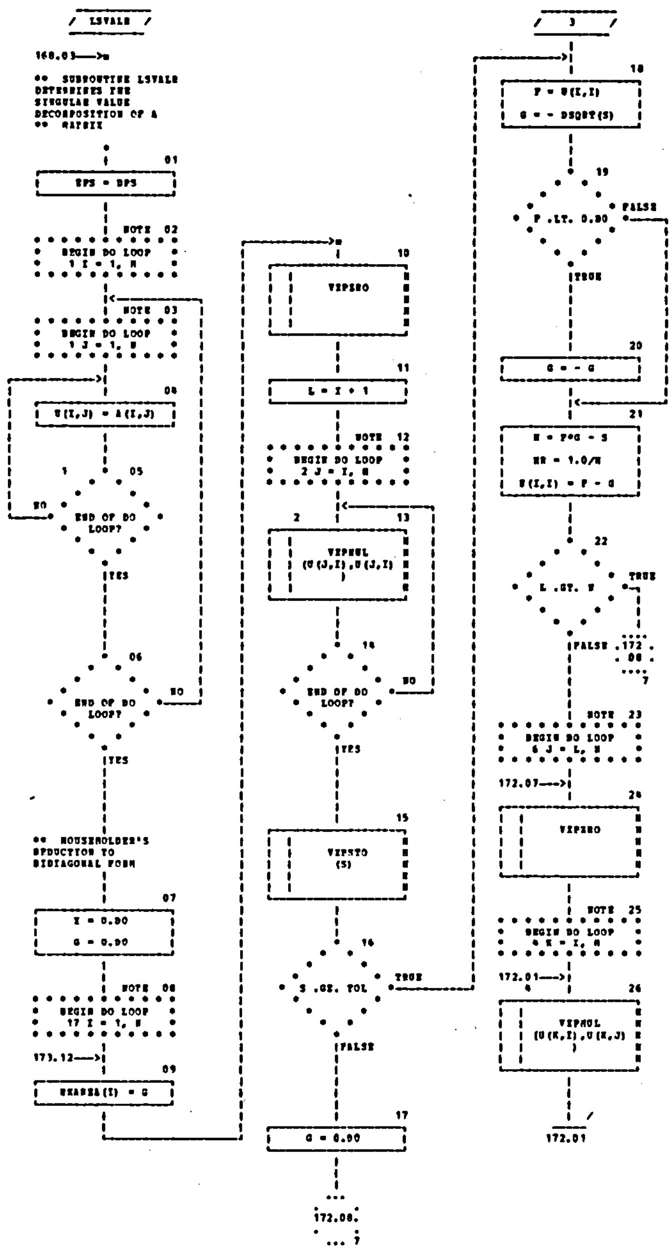


CHART TITLE - SUBROUTINE LSVALR(A,N,V,IA,IV,ISW,WKAREA,Q,U,V)

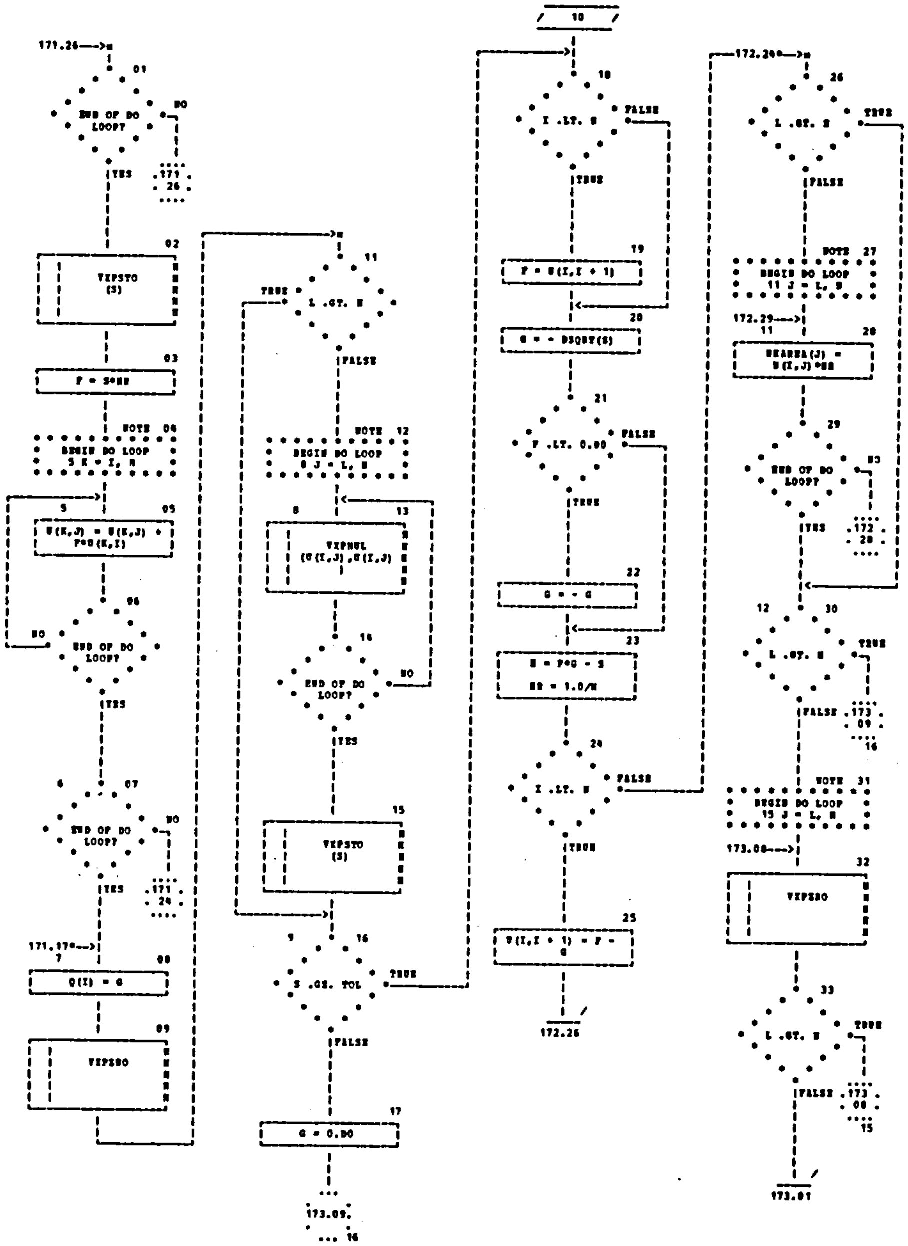


CHART TITLE - SUBROUTINE LSVALR(A,N,U,IA,IV,ISW,WKAREA,Q,U,V)

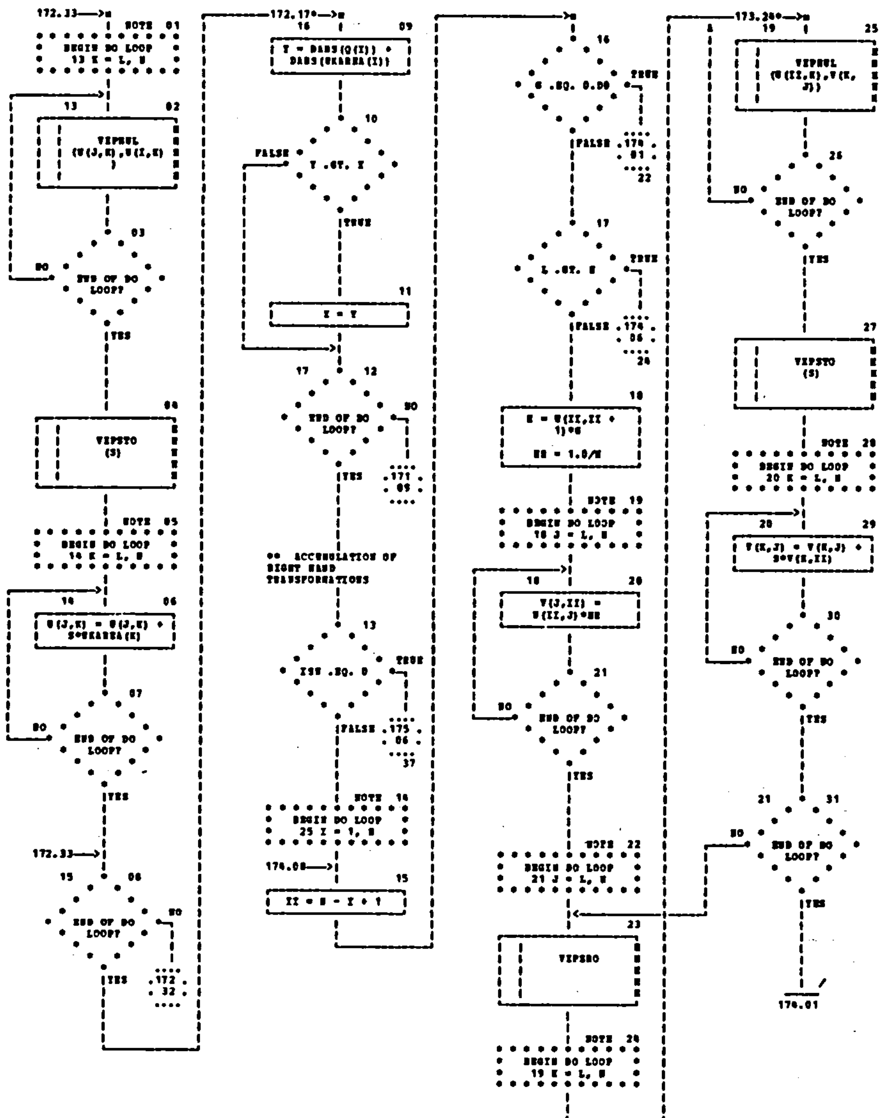


CHART TITLE - SUBROUTINE LSVALR(A,M,N,IA,IV,ISW,SKAREA,Q,U,V)

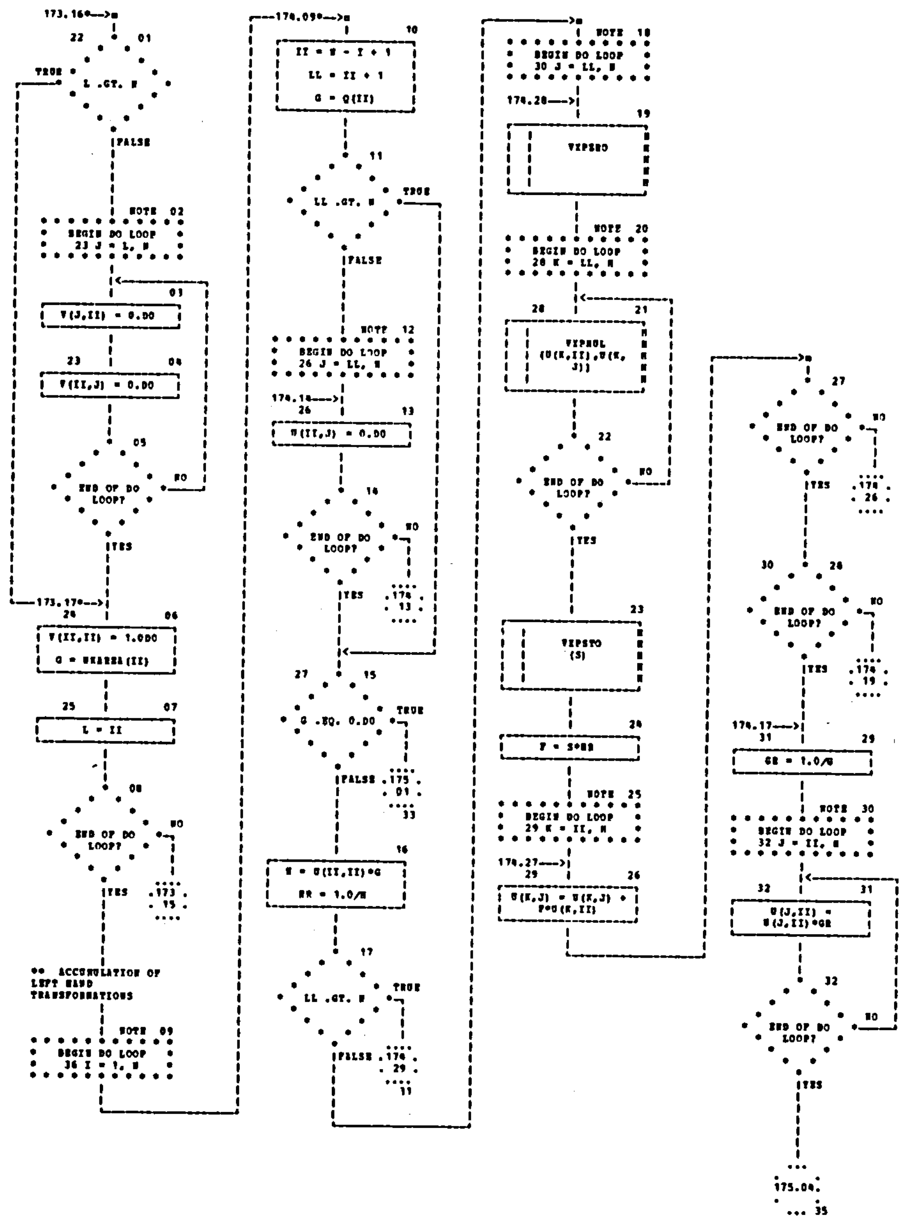


CHART TITLE - SUBROUTINE LSVALS(A,M,N,IA,IV,ISW,WKAREA,Q,U,V)

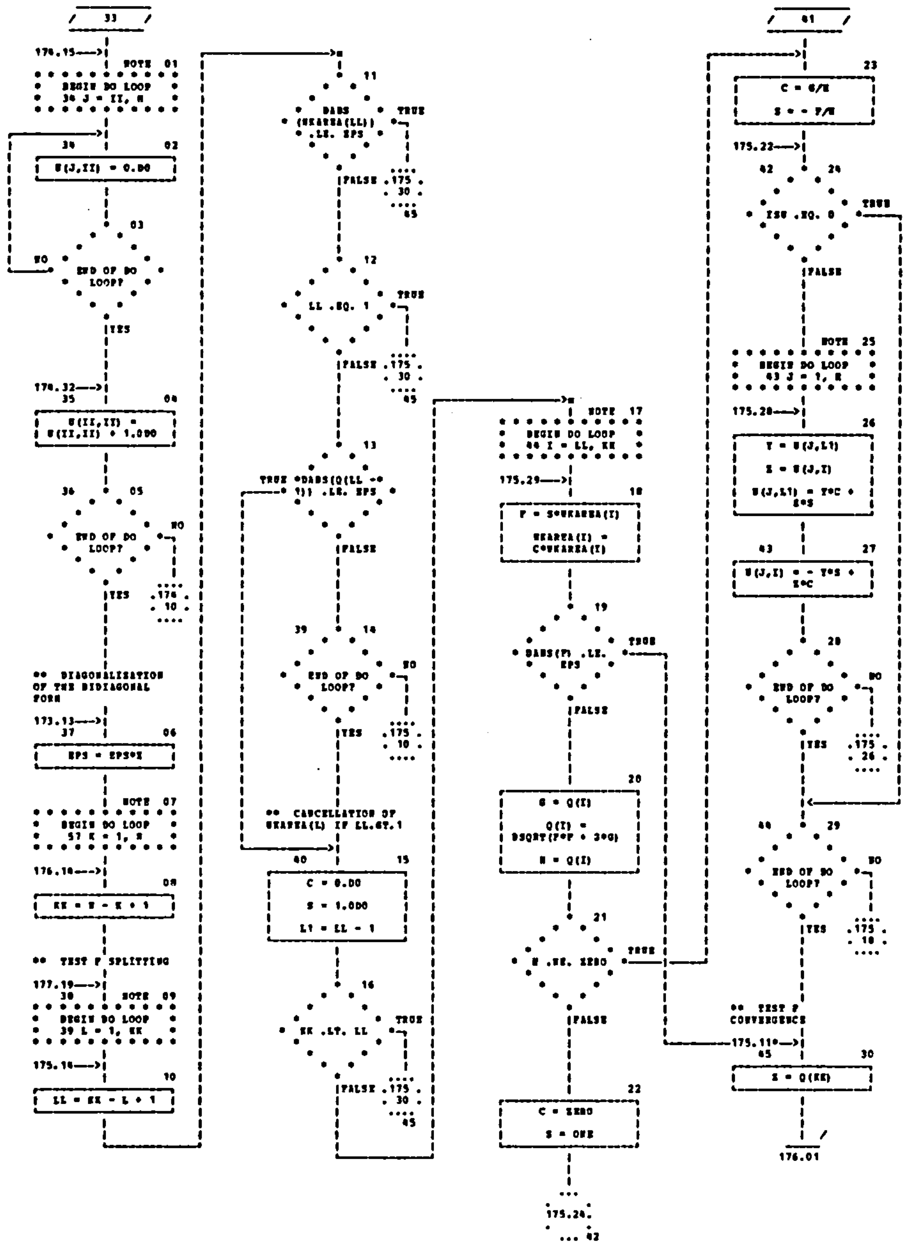


CHART TITLE - SUBROUTINE LSVALU(A,E,N,IA,IV,ISW,WKAREA,Q,U,V)

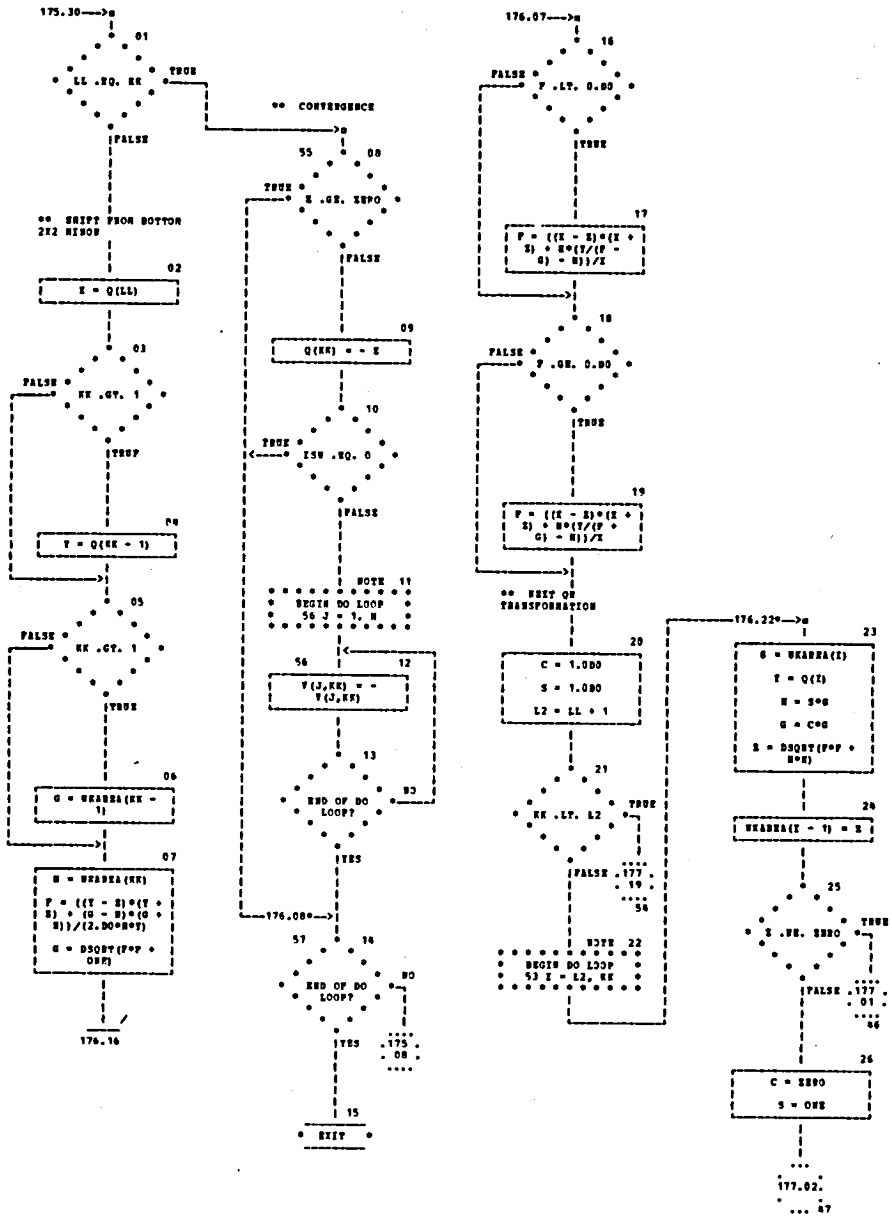


CHART TITLE - SUBROUTINE LSVALE(A,N,B,IA,IV,ISW,WKAREA,Q,U,V)

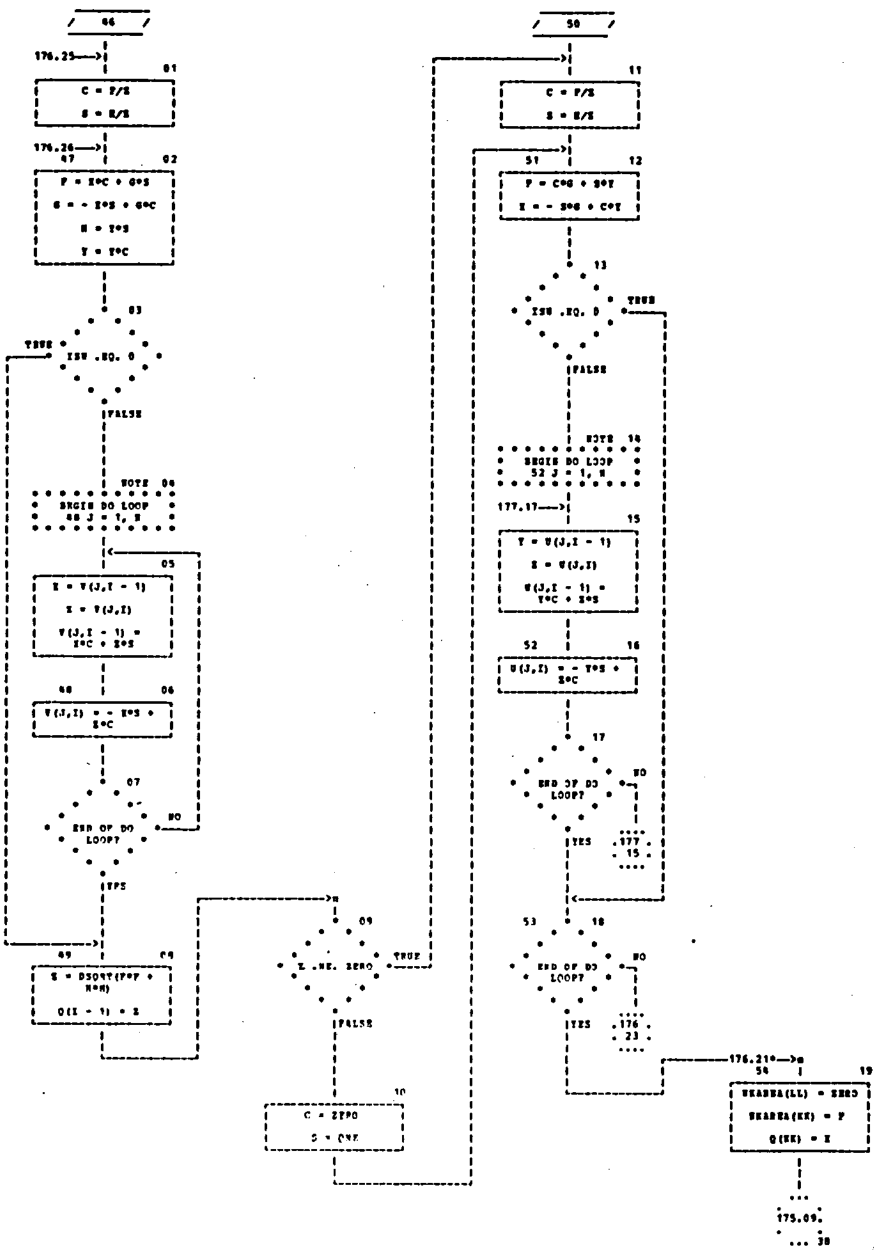


CHART TITLE - SUBROUTINE ERRTST(IER,WARN,JWRITE)

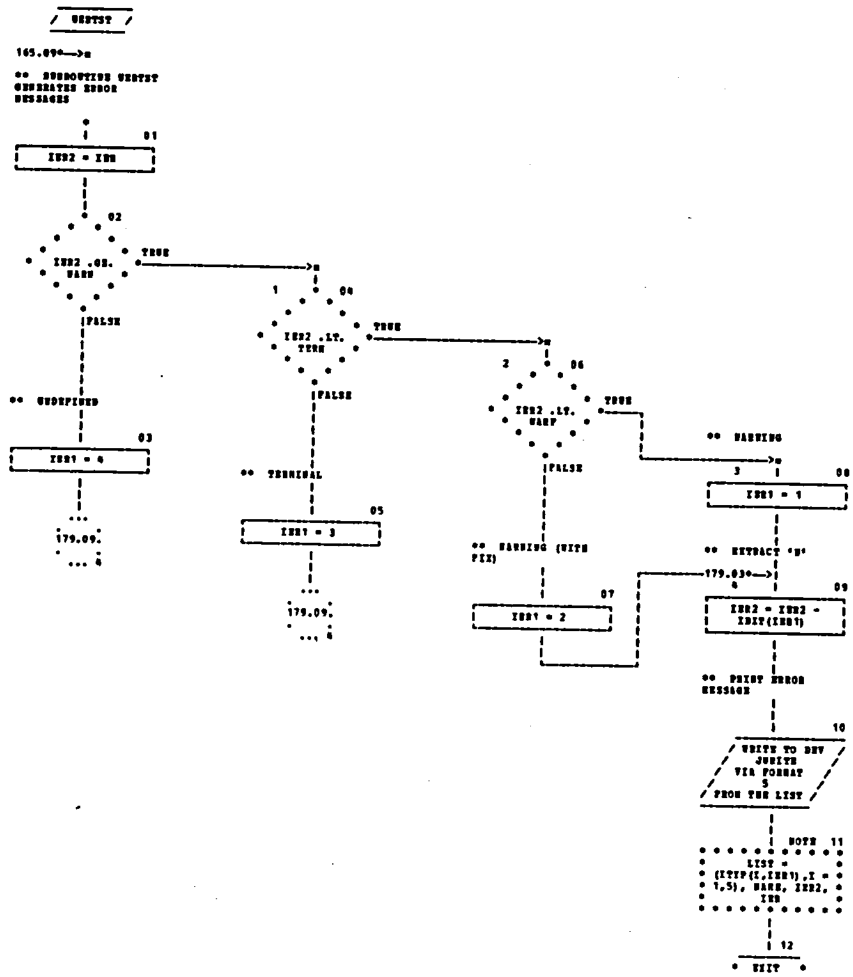


CHART TITLE - SUBROUTINE VSORTR(A,LA)

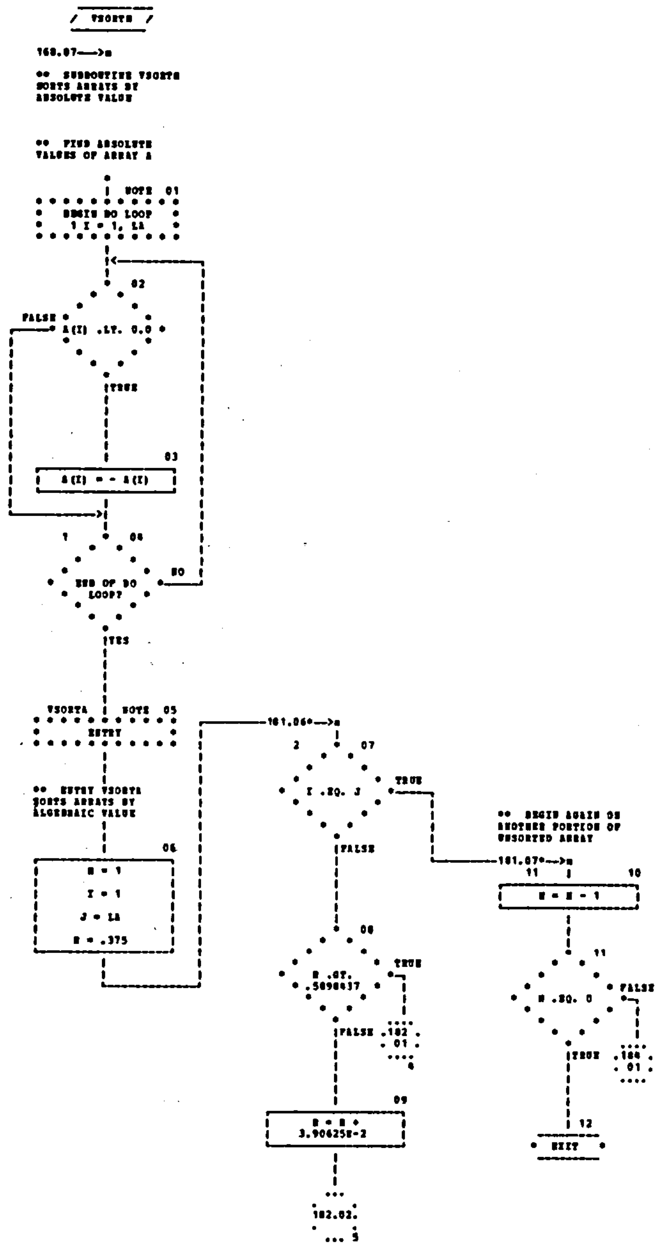


CHART TITLE - SUBROUTINE VSORTN(A,LA)

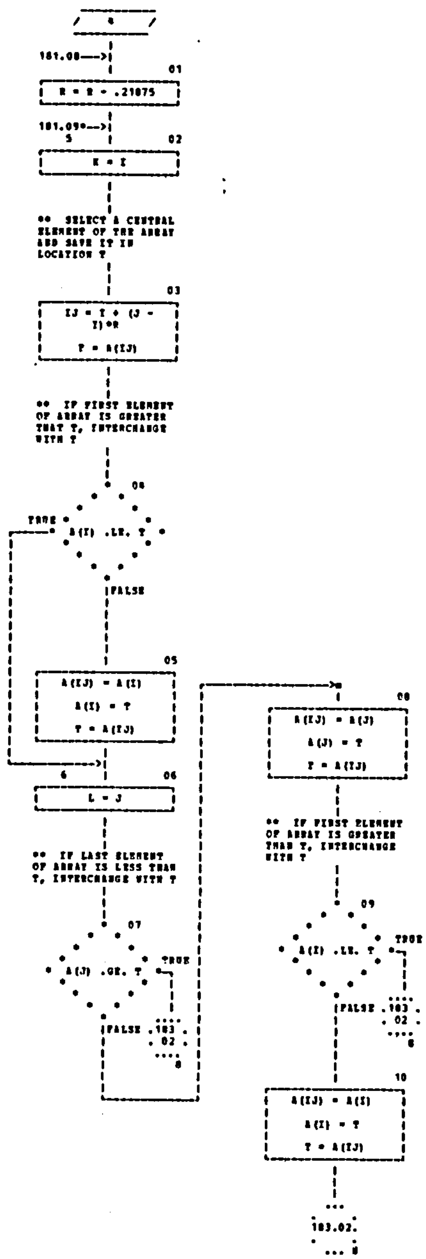


CHART TITLE - SUBROUTINE VSORTR(A,LA)

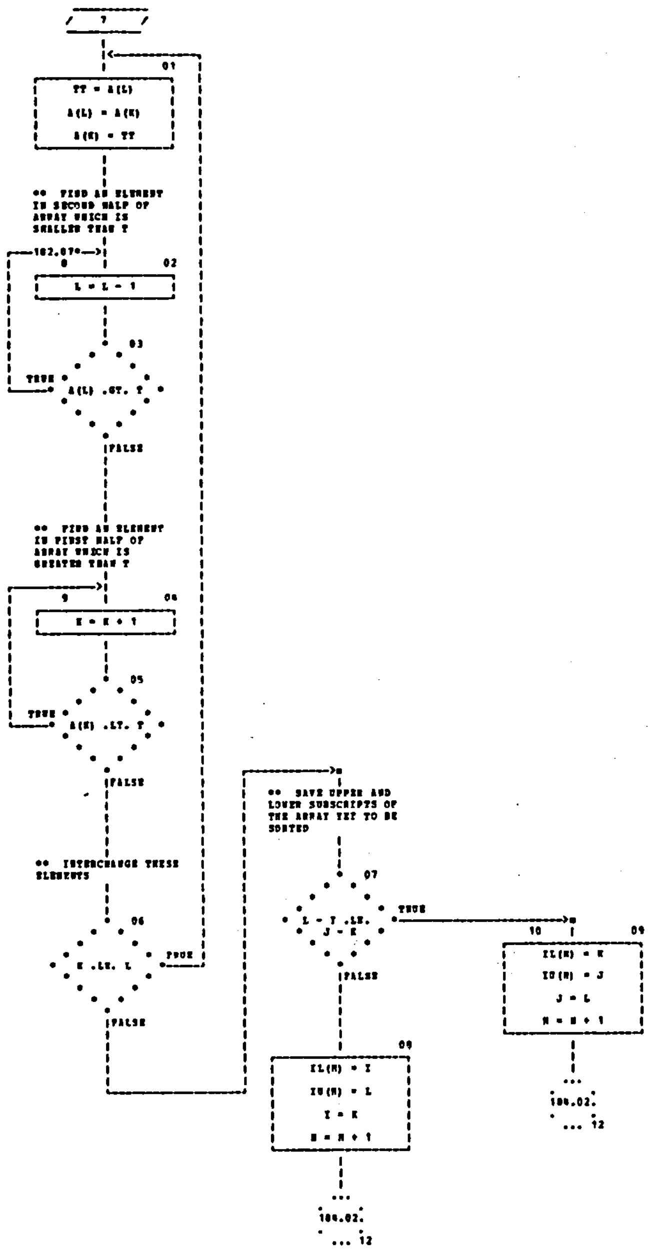


CHART TITLE - SUBROUTINE TSORTH(A,LA)

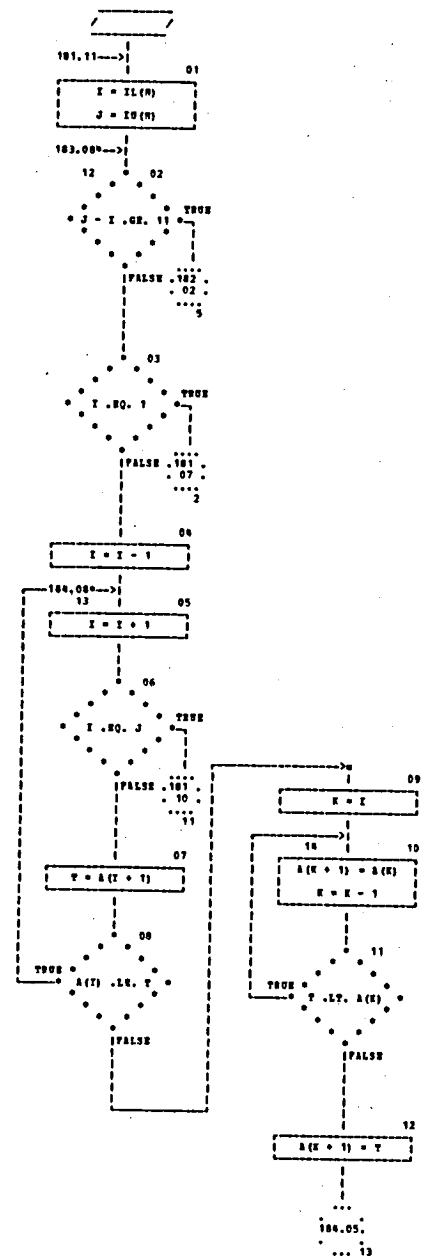


CHART TITLE - SUBROUTINE HPATH(N,F,NND,LPRG,PIT,TARE,NTARE,NNPI)

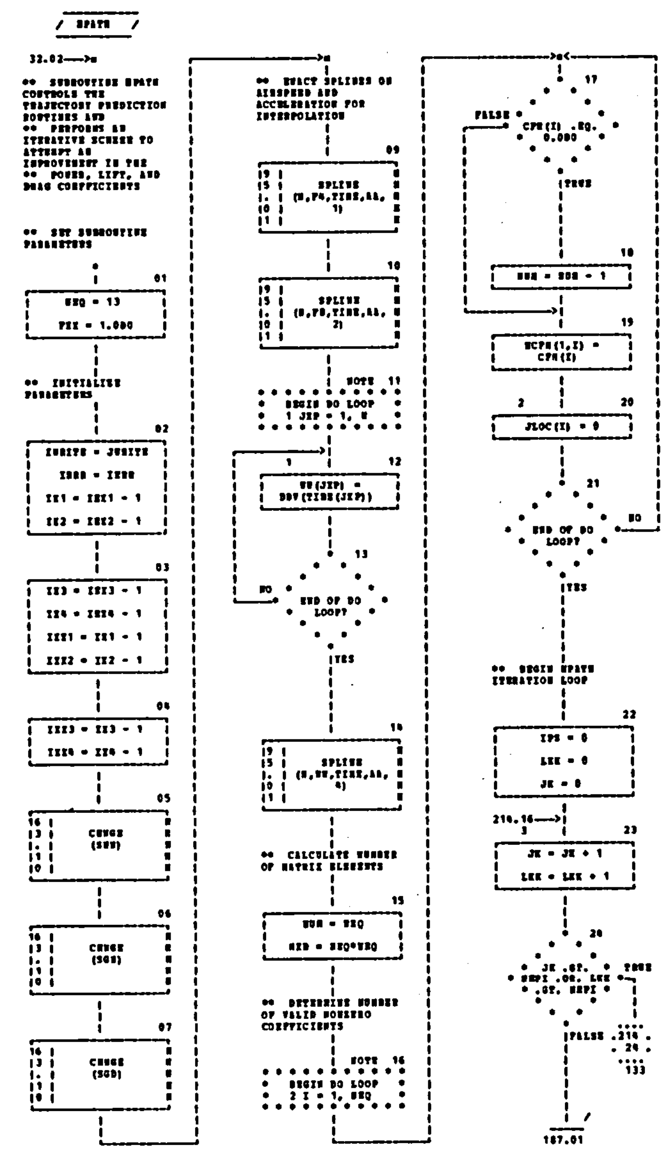


CHART TITLE - SUBROUTINE UPATH(N,F,NND,LPRG,FIT,TANK,HTANK,NEPT)

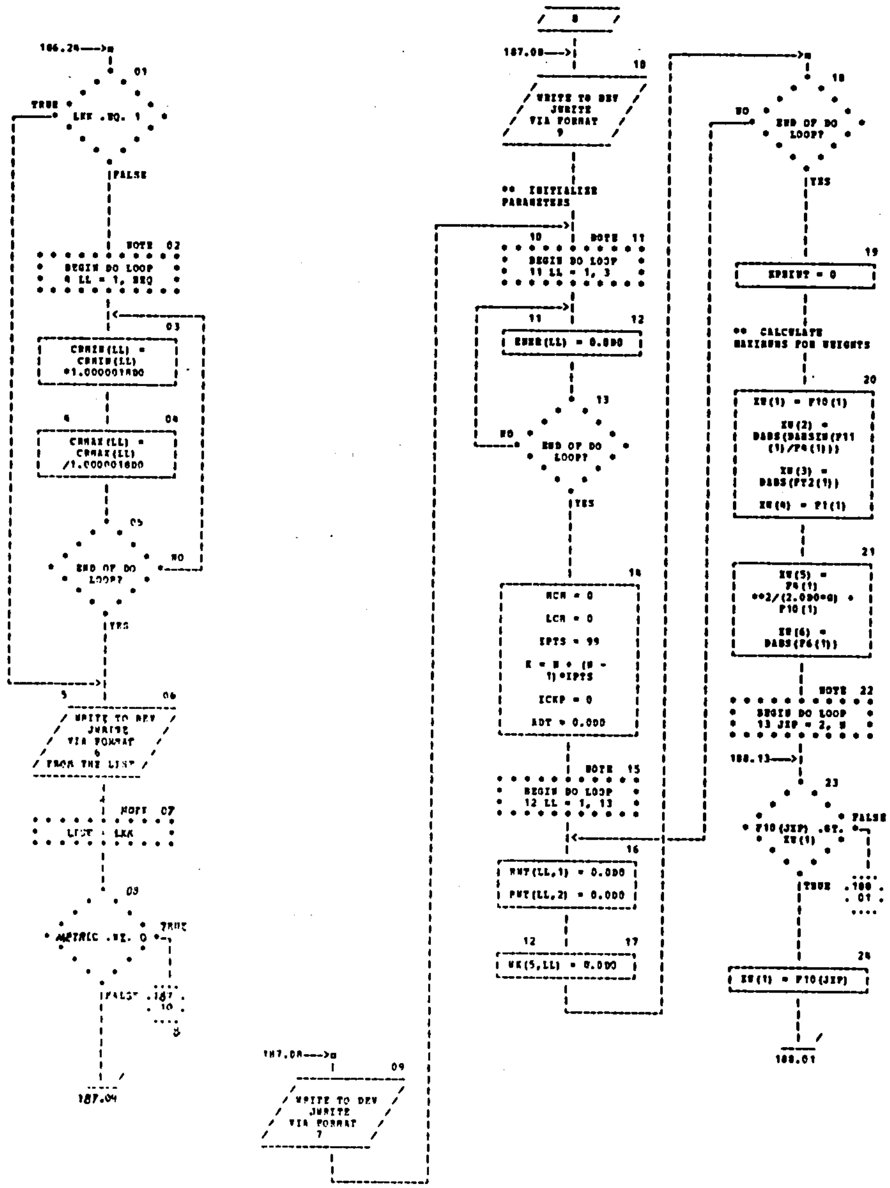


CHART TITLE - SUBROUTINE EPATH(N,F,NUD,LPRG,FIT,TABE,ETABE,NEPI)

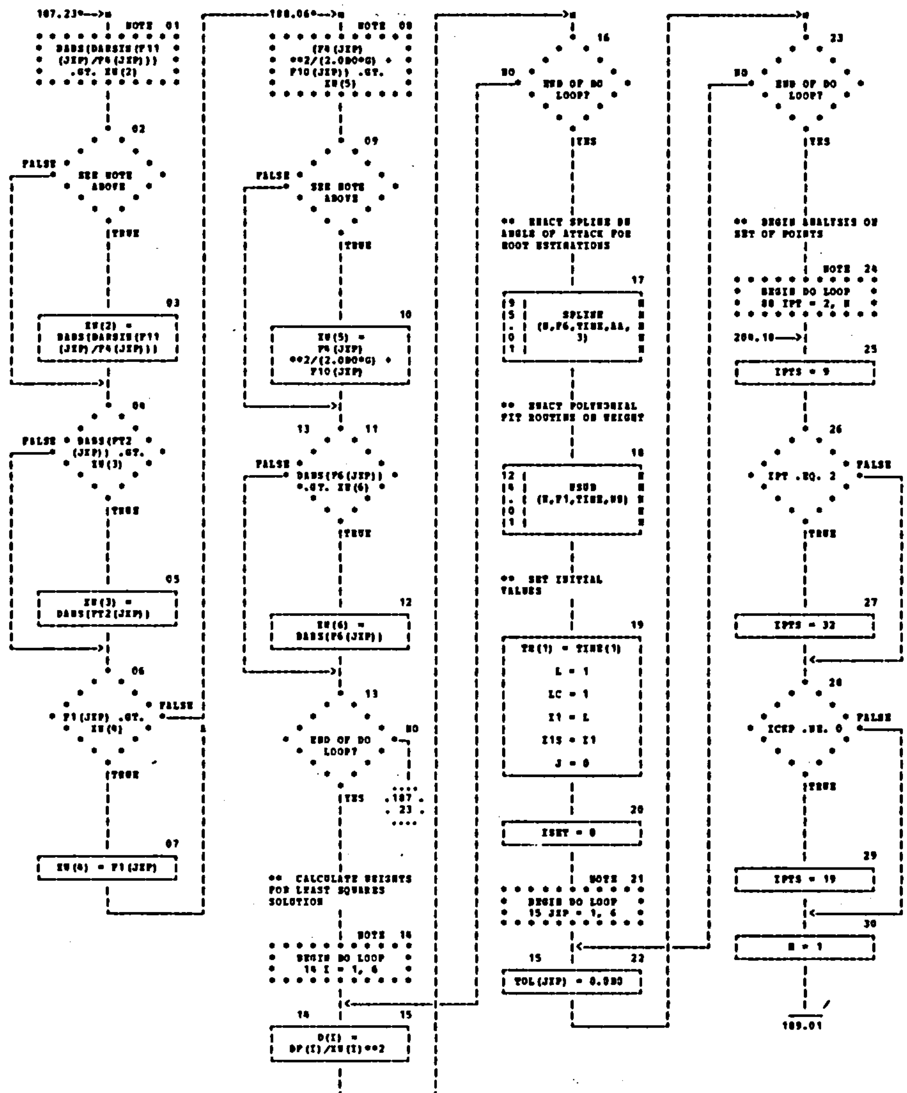


CHART TITLE - SUBROUTINE SPATH(?,P,???,LPRG,FIT,TABE,NTABE,NEPI)

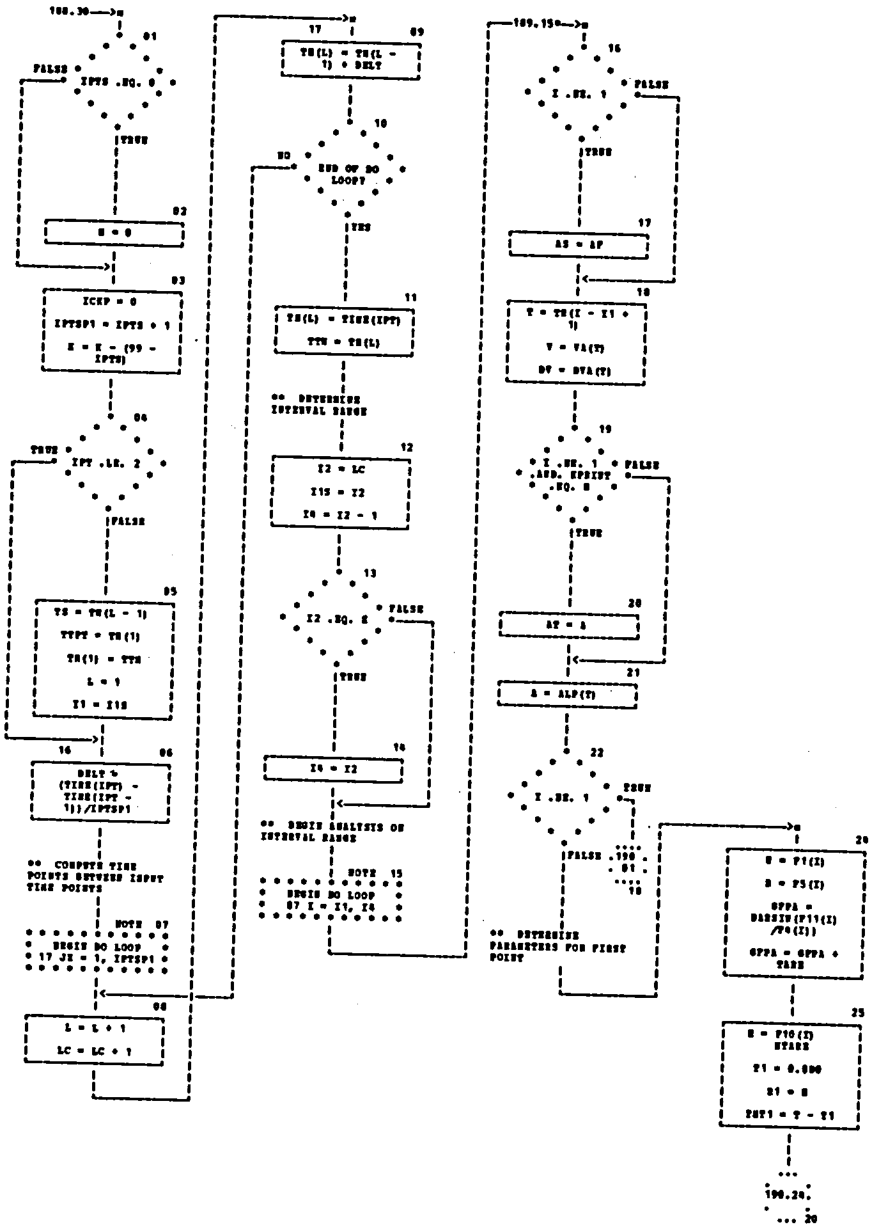


CHART TITLE - SUBROUTINE NPATH(N,F,ANB,LPRG,FIT,TARE,NTARE,NRPI)

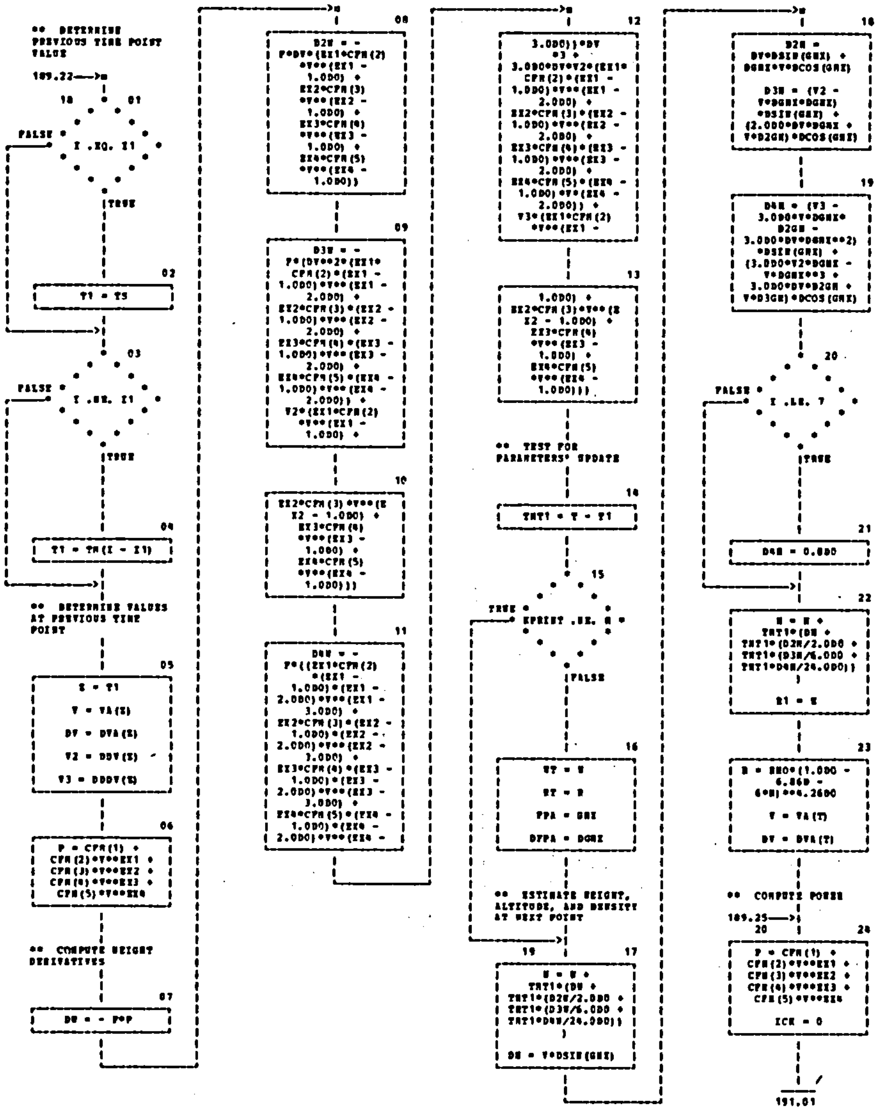


CHART TITLE - SUBROUTINE NPATH(U,F,ANB,LPRG,FIT,TANE,NTARE,NEPI)

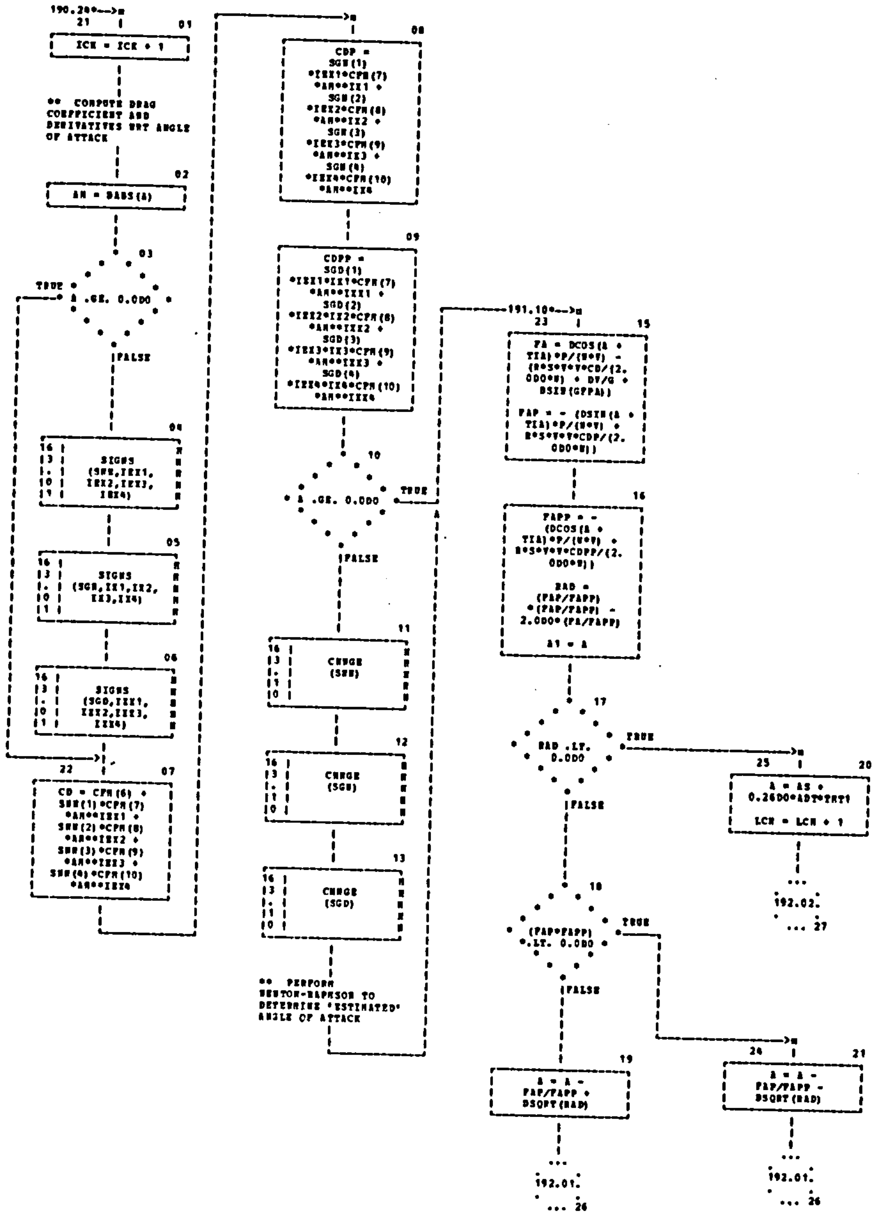


CHART TITLE - SUBROUTINE HPATH(H,F,RHO,LPRG,FIT,TABE,NTABE,NHPI)

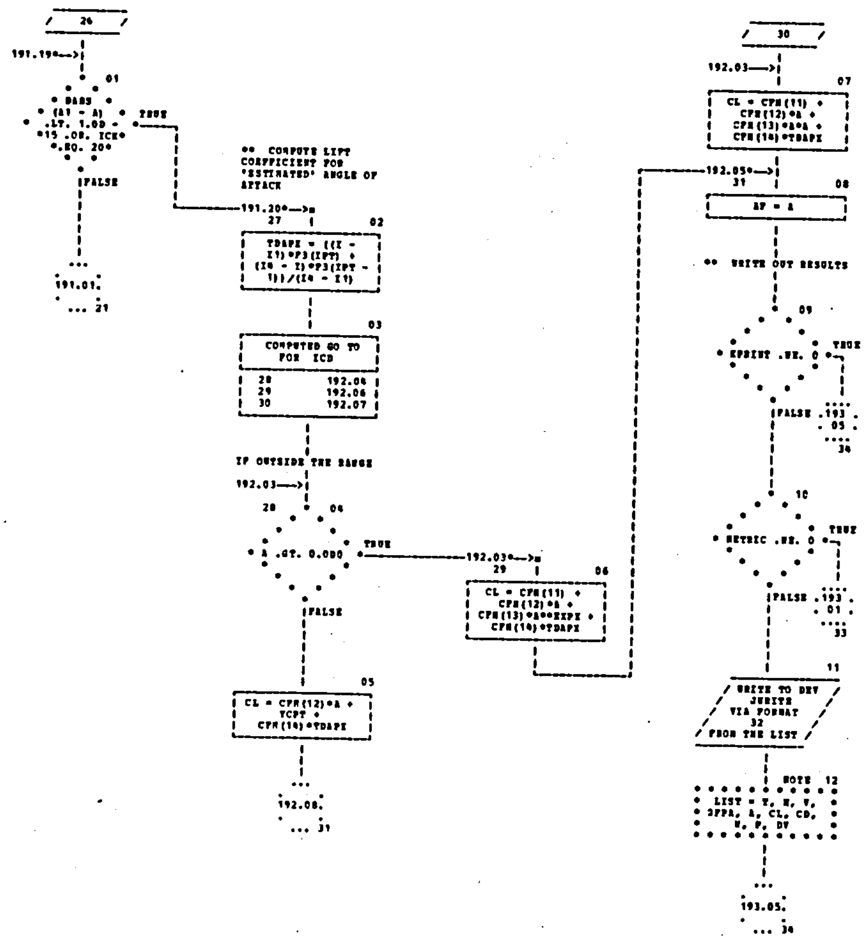


CHART TITLE - SUBROUTINE NPATH(H,V,RHO,LPRG,FIT,TABE,HTABE,NNPT)

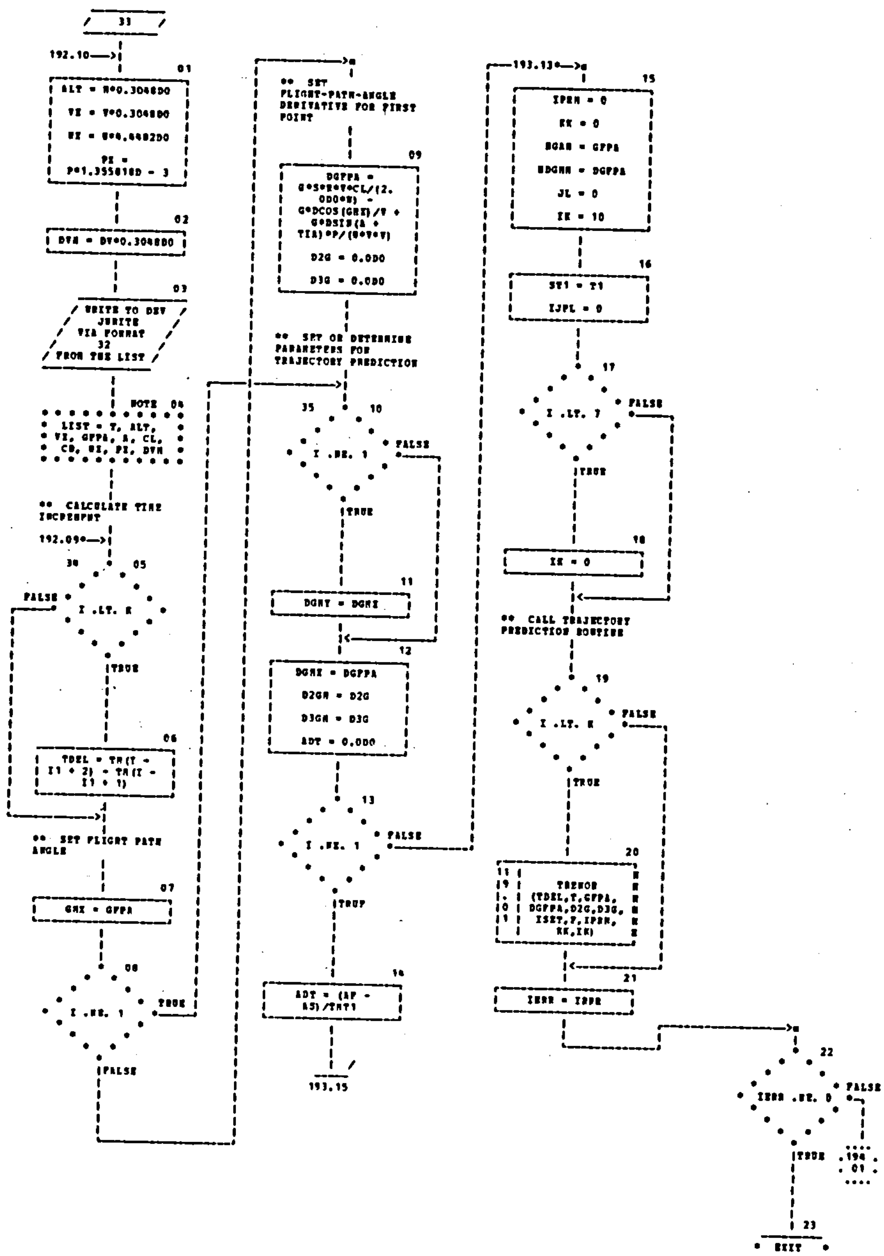


CHART TITLE - SUBROUTINE [illegible]

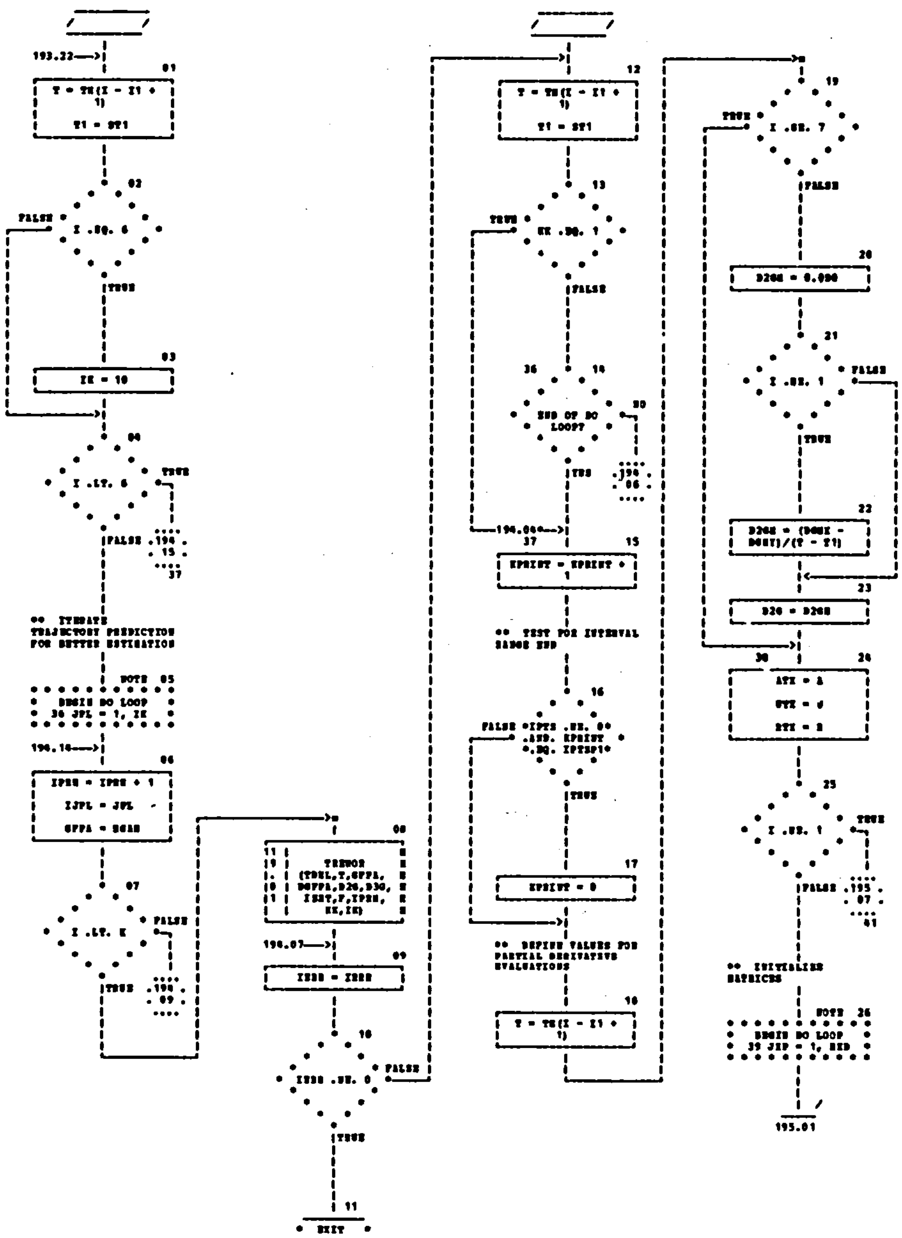


CHART TITLE - SUBROUTINE XPATH(U,F,NSB,LPRG,PIT,TARE,ETARE,UNPI)

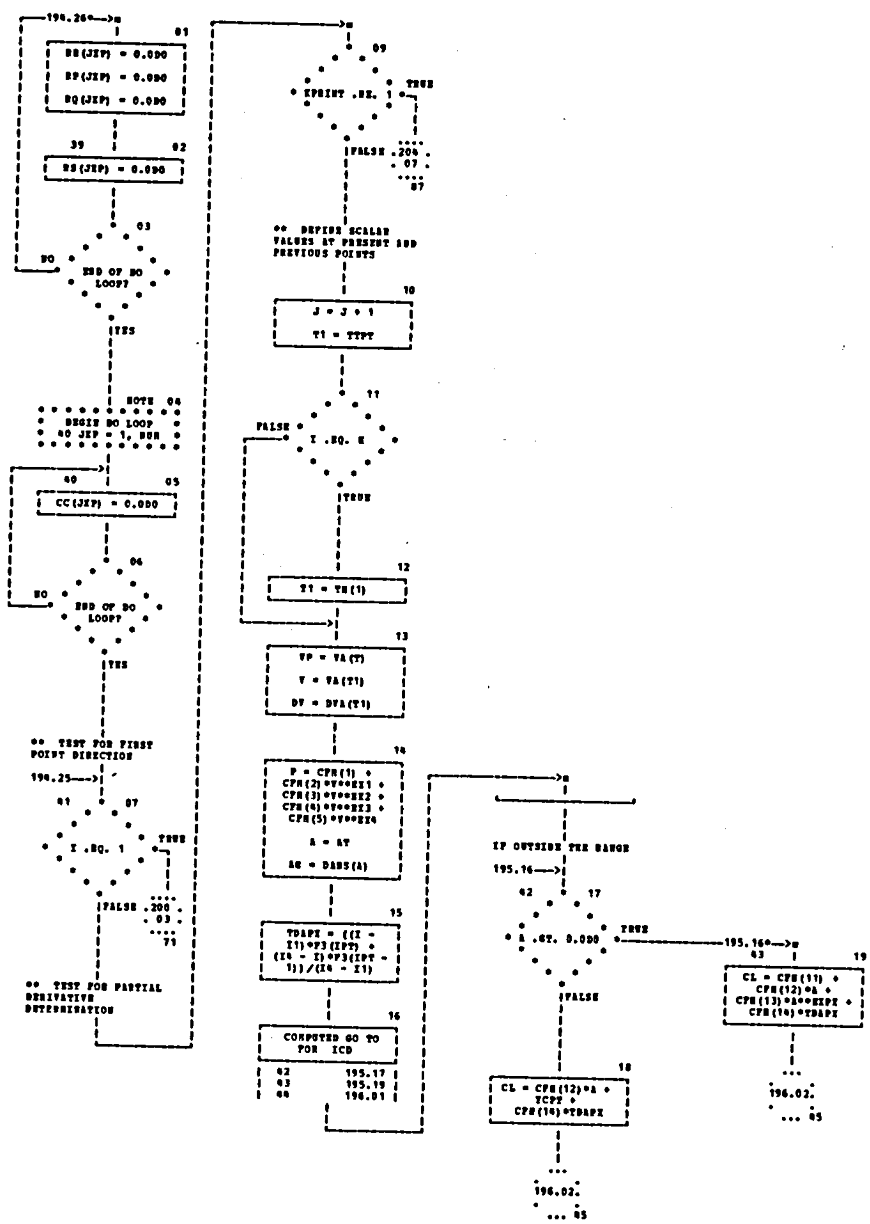


CHART TITLE - SUBROUTINE NPATH(N,P,NHN,LPRO,FIT,TABE,NTABE,NNPI)

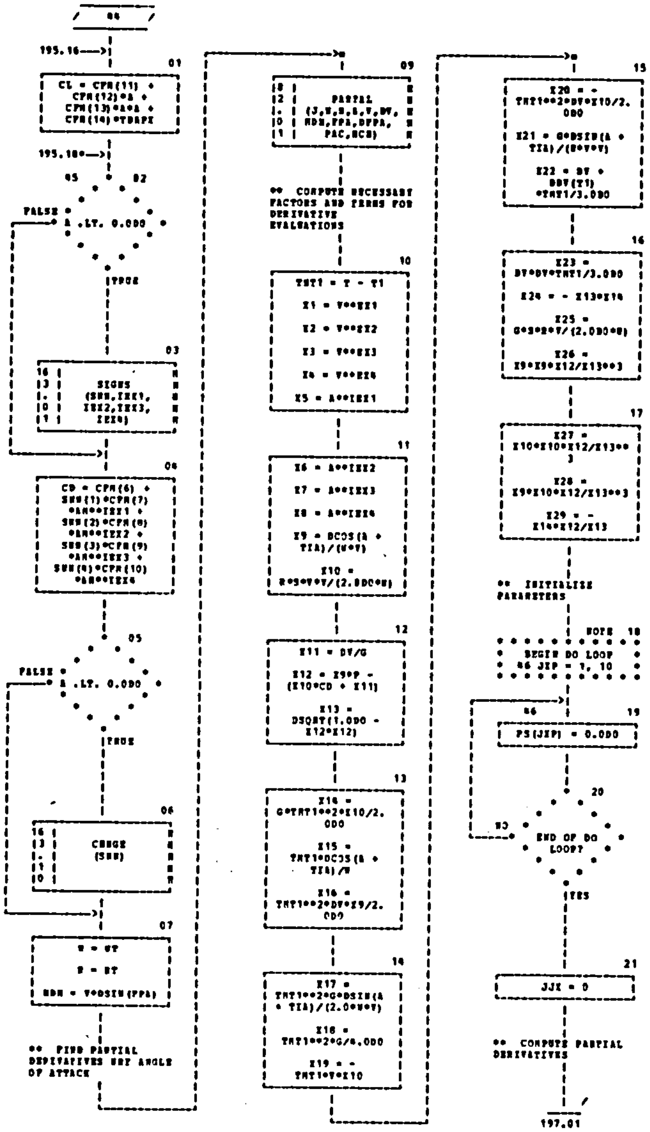


CHART TITLE - SUBROUTINE XPATH(X,P,RED,LPRG,FIT,TABE,NTABE,NEPI)

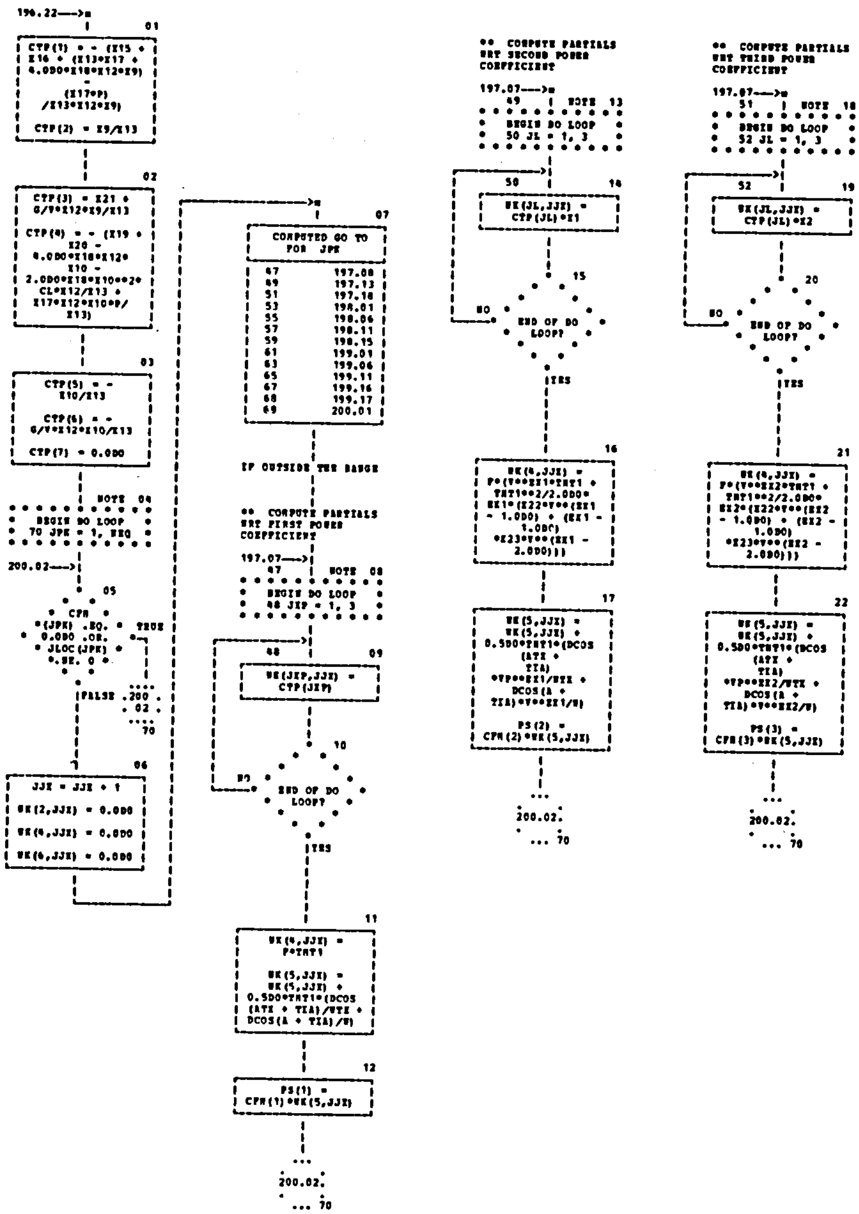


CHART TITLE - SUBROUTINE HPATH(U,F,NNB,LPRG,FIT,TABE,NTABE,NNPI)

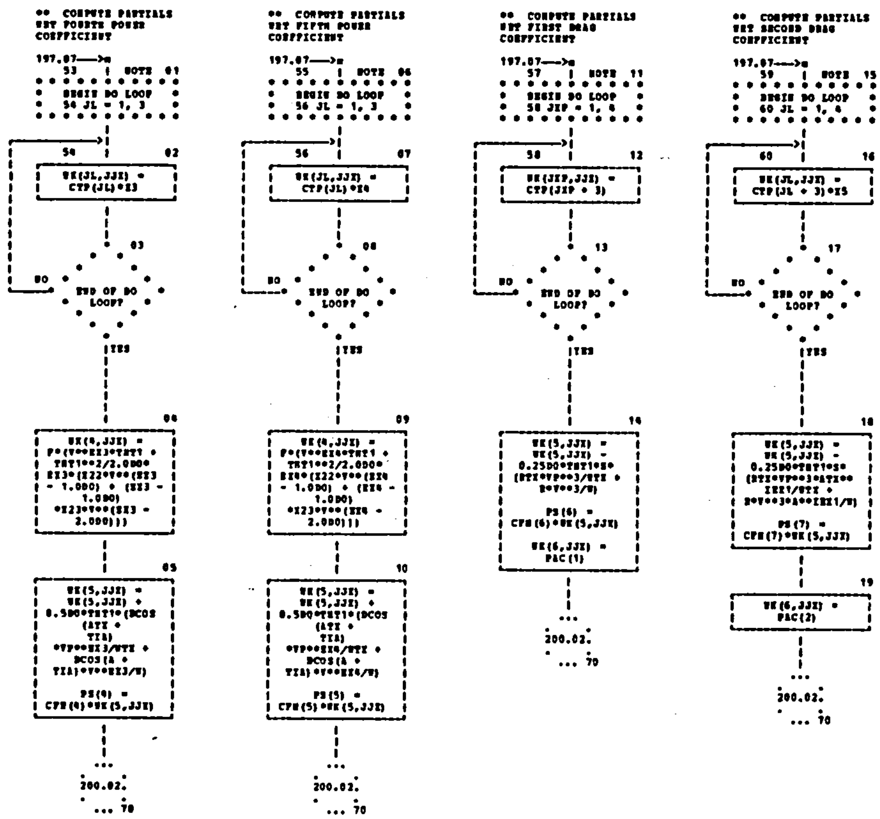


CHART TITLE - SUBROUTINE MPATH(N,P,NUB,LPRG,FIT,TABE,MTABE,NBPI)

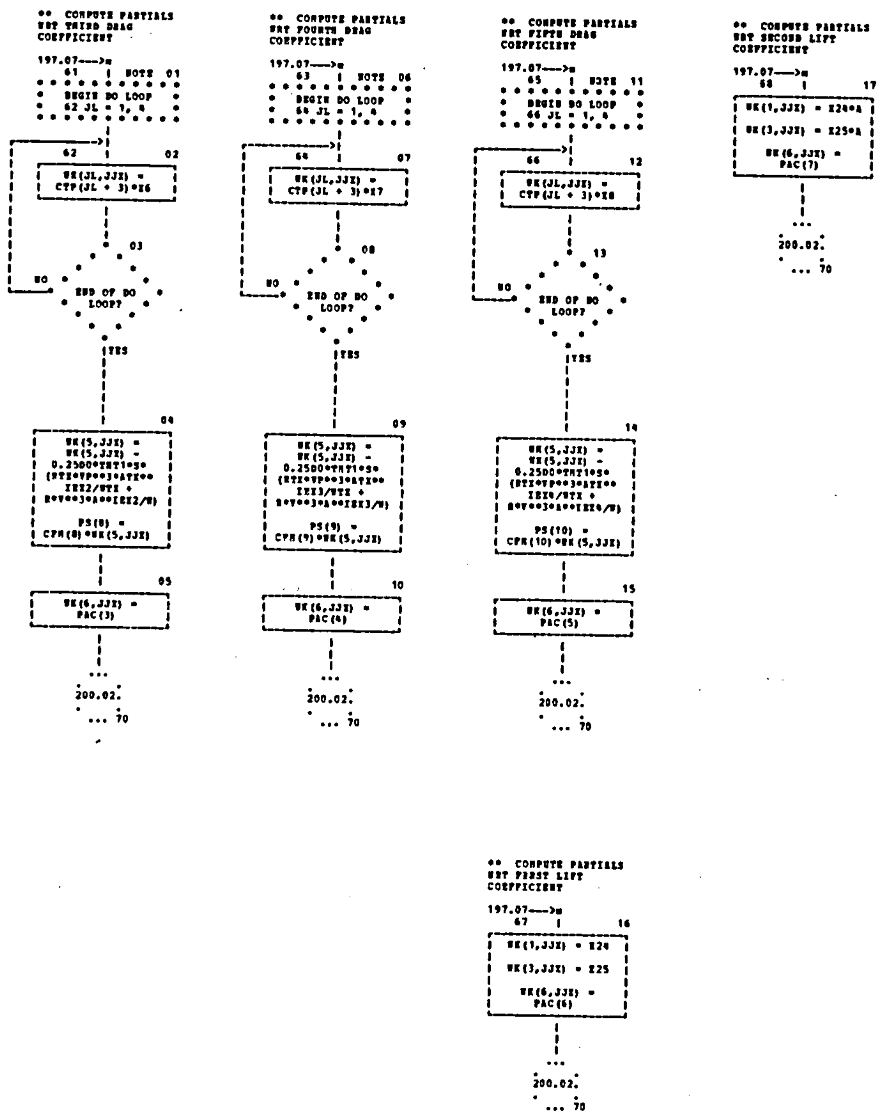
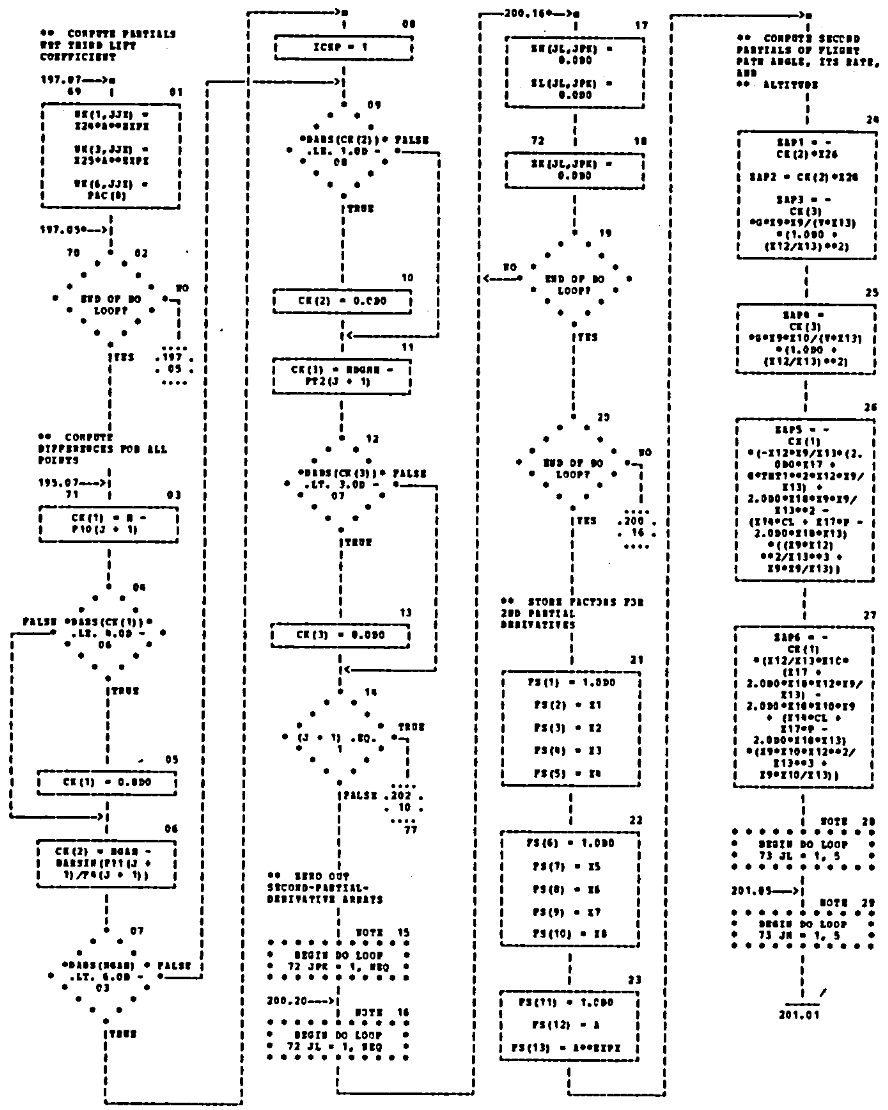


CHART TITLE - SUBROUTINE SPATH(N,P,NEQ,LPDG,FIT,TAPE,NTAPE,NEPI)



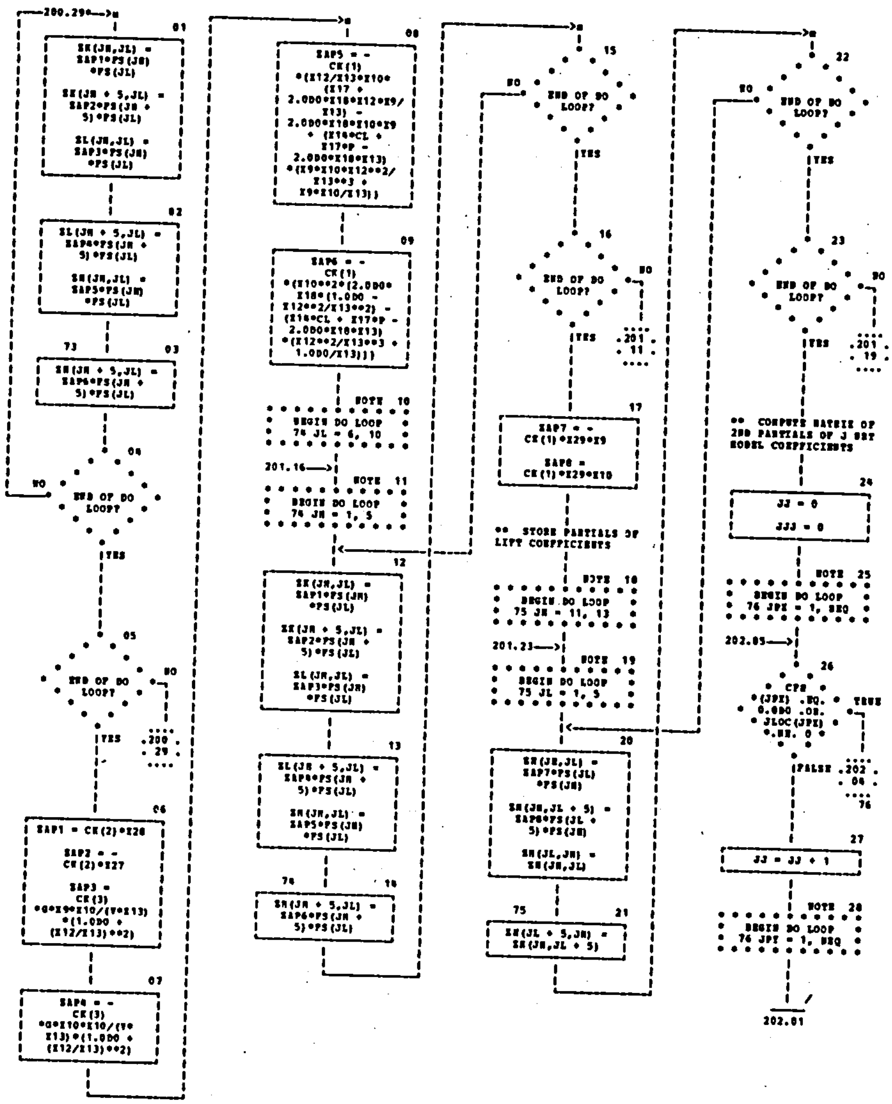

END OF DO LOOP?
BEGIN DO LOOP 74 JL = 6, 10
BEGIN DO LOOP 74 JN = 1, 5
STORE PARTIALS OF LIFT COEFFICIENTS
BEGIN DO LOOP 75 JN = 11, 13
BEGIN DO LOOP 75 JL = 1, 5
COMPUTE MATRIX OF 2ND PARTIALS OF J NET MODEL COEFFICIENTS
JJ = 0
JJJ = 0
BEGIN DO LOOP 76 JPI = 1, NEQ
JJ = JJ + 1
202.01

CHART TITLE - SUBROUTINE EPATH(N,F,NBB,LPRG,FIT,TARE,ETARE,NNPI)

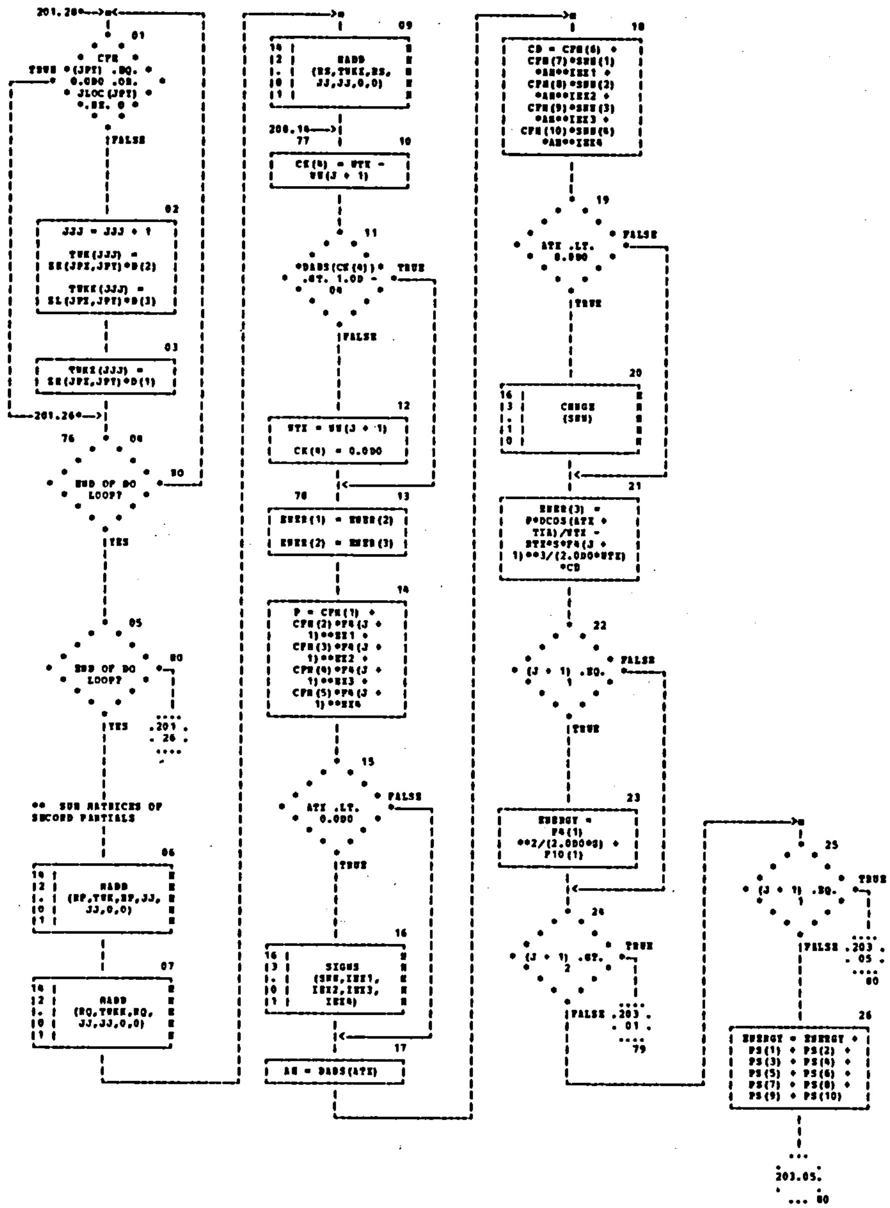


CHART TITLE - SUBROUTINE SPATH(N,P,NNS,LPRG,FIT,TABS,NTABS,NNPI)

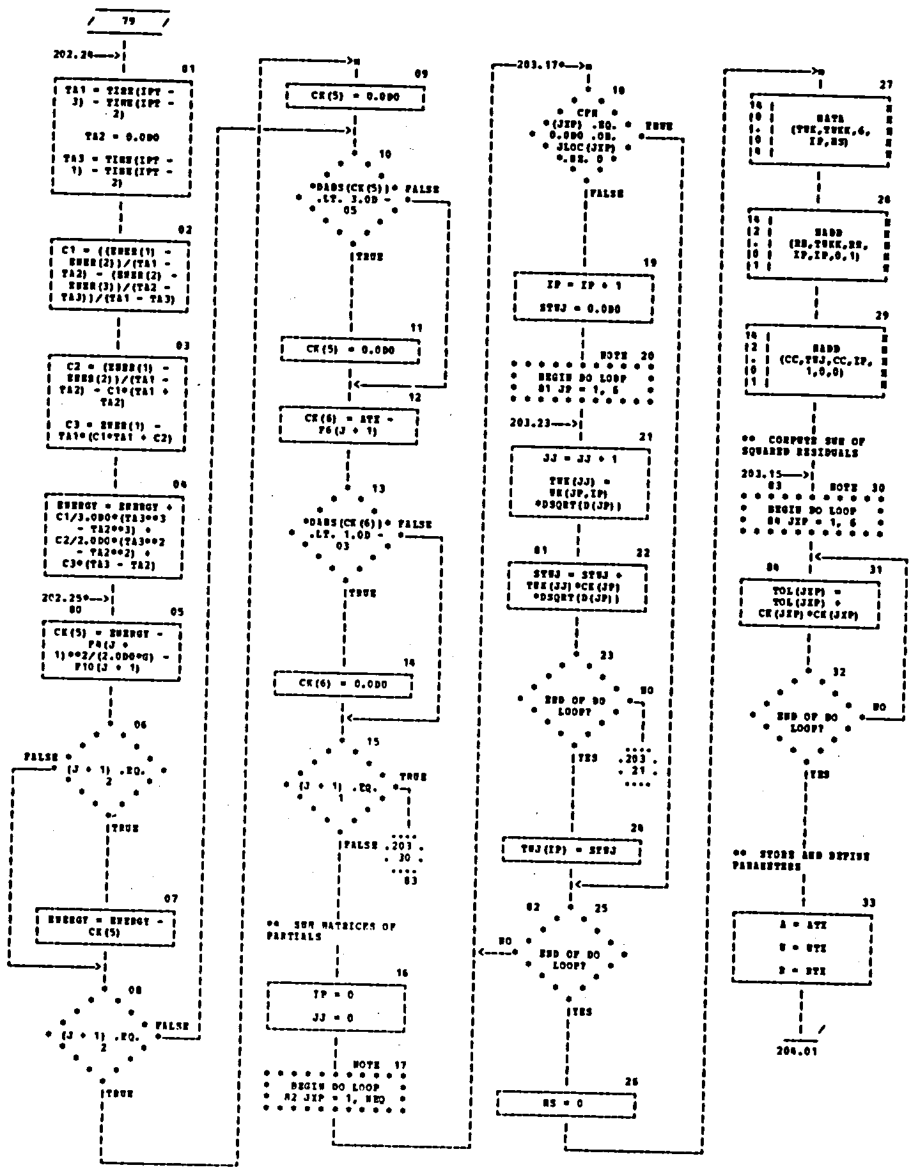


CHART TITLE - SUBROUTINE UPATE(N,P,NEB,LPRG,FIT,TARE,NTARE,NEPI)

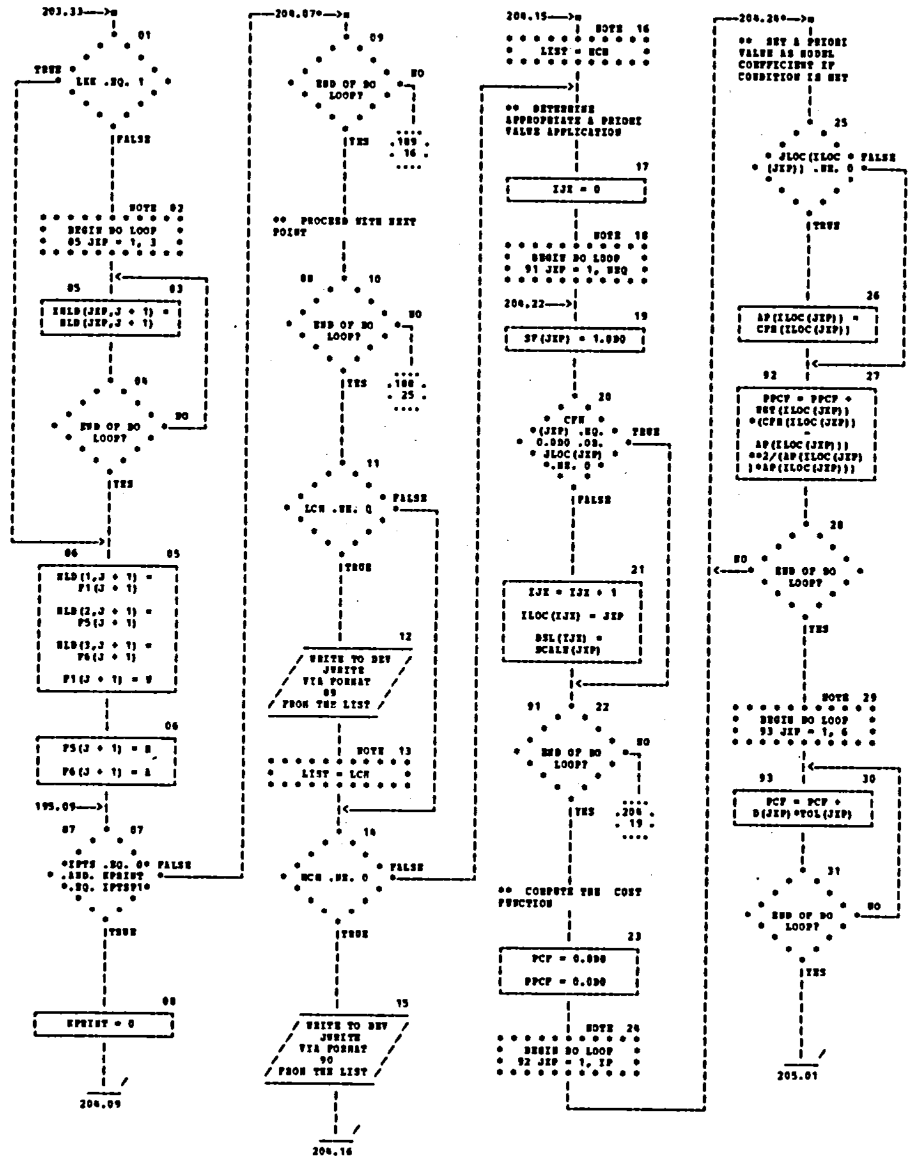


CHART TITLE - SUBROUTINE NPATH(N,F,NND,LPRG,FIT,TARE,NTARE,NNPI)

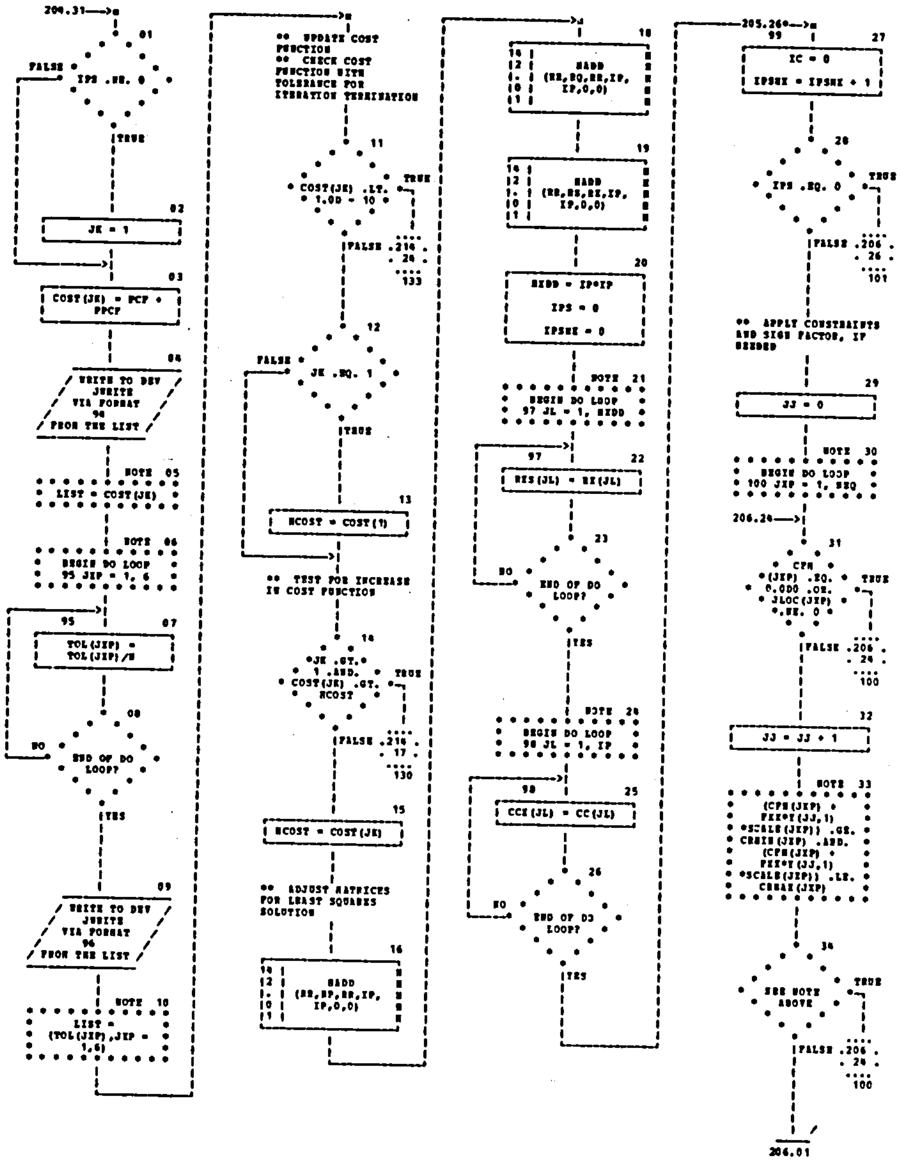


CHART TITLE - SUBROUTINE SPATH(N,F,NBB,LPRG,FIT,TABS,STARS,SHPT)

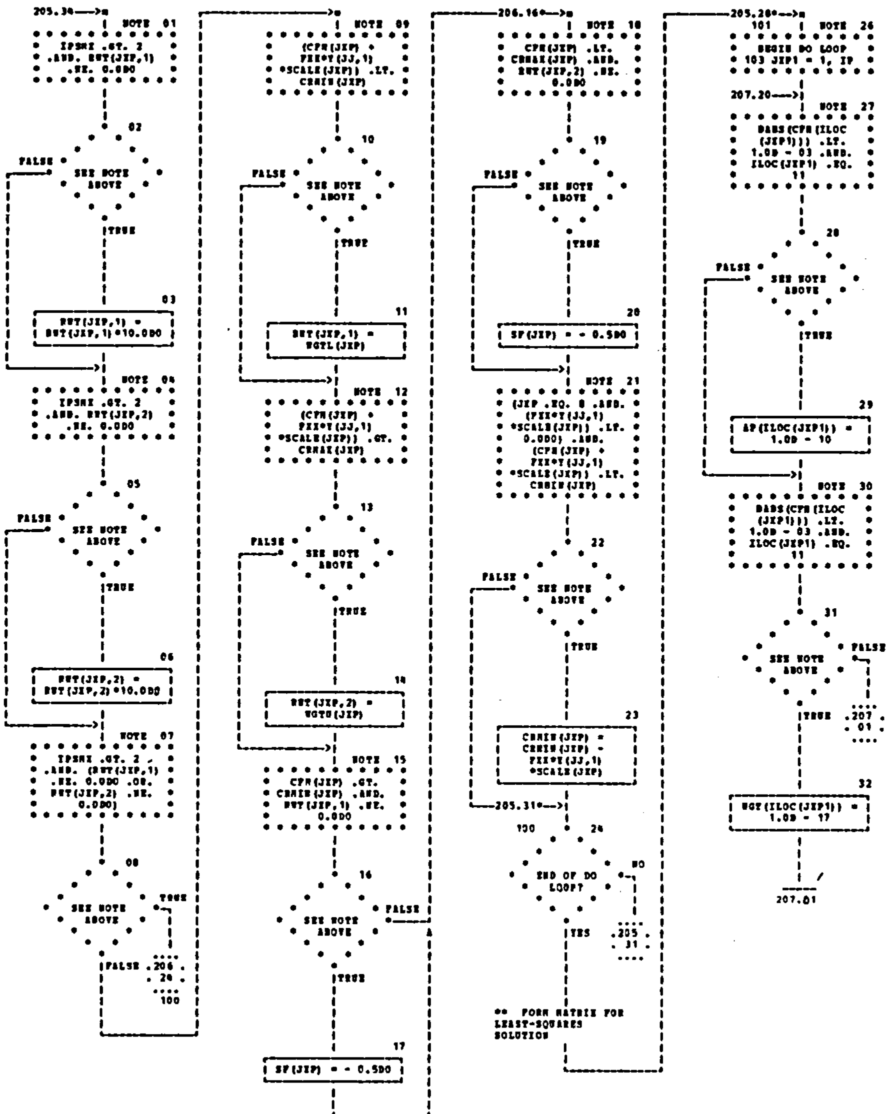


CHART TITLE - SUBROUTINE SPATH(U,P,NSB,LPRG,FIT,TABE,STABE,NRPT)

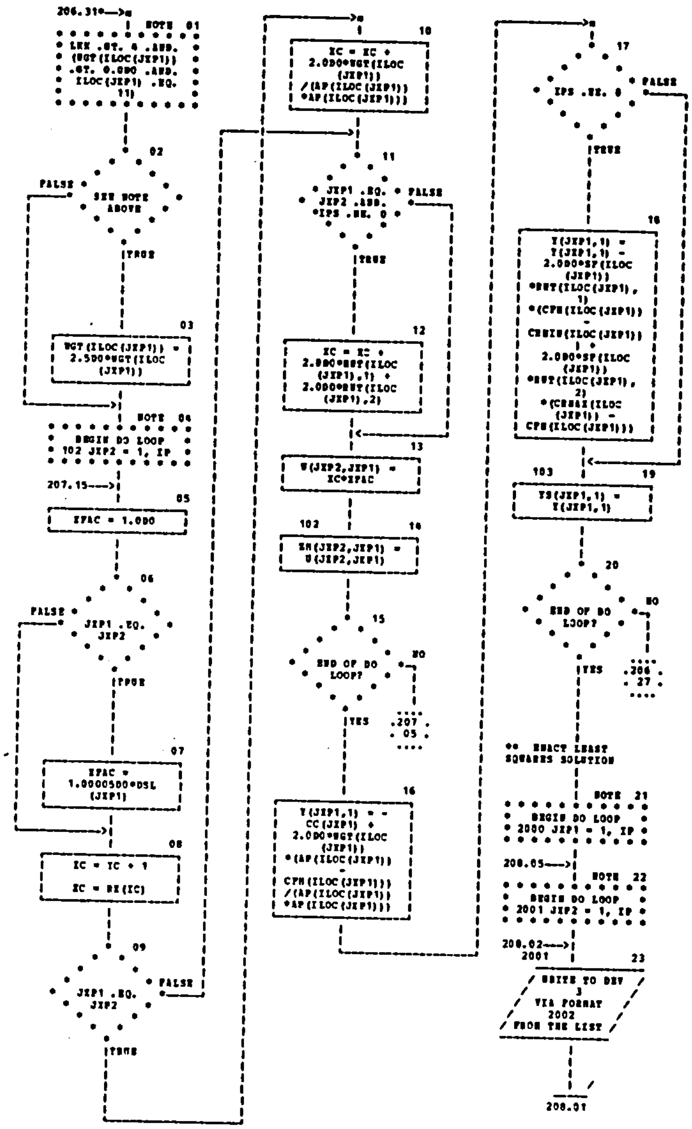


CHART TITLE - SUBROUTINE XPATH(W,Y,NSB,LPRG,FIT,TASK,STASK,XNPT)

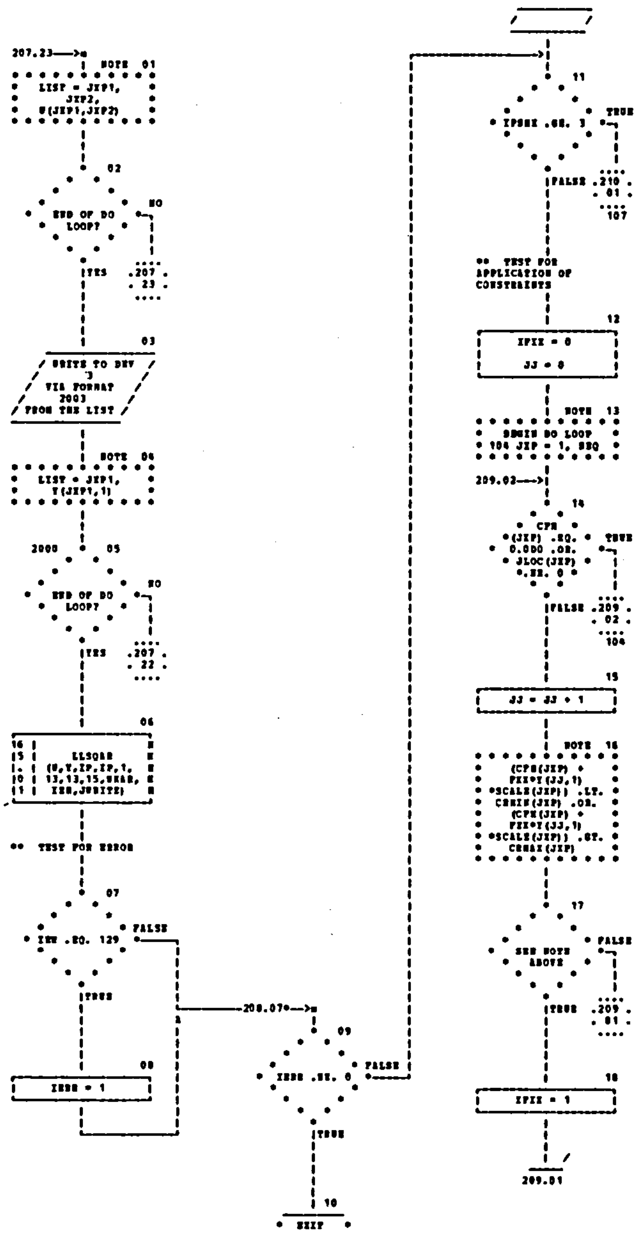


CHART TITLE - SUBROUTINE NPATH(N,F,NUB,LPRG,FIT,TARE,NTARE,NEPI)

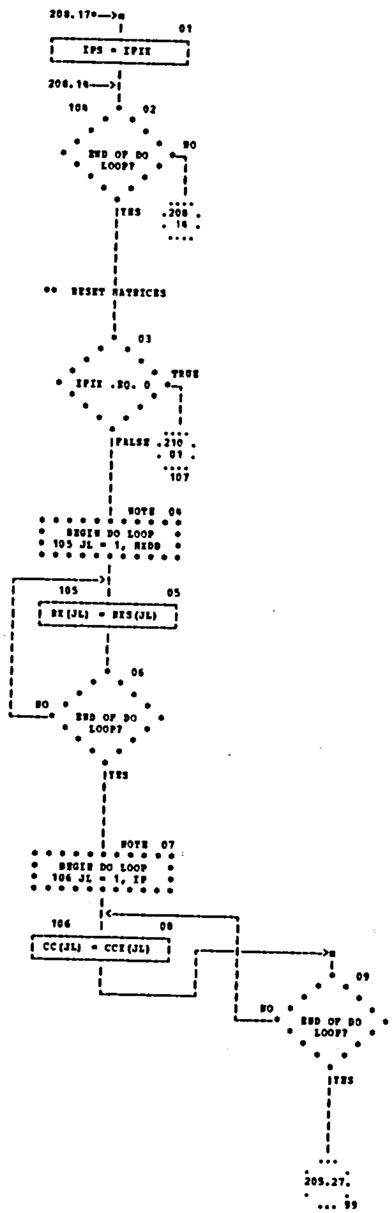
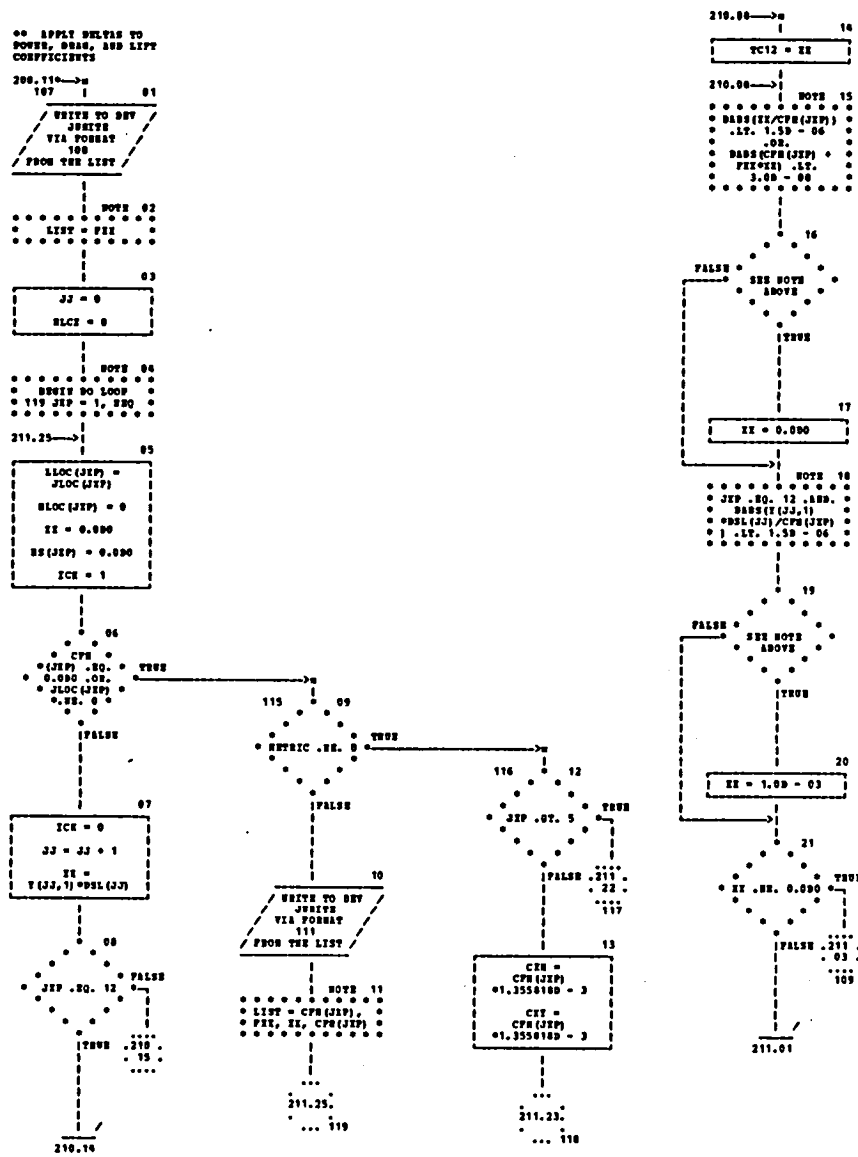


CHART TITLE - SUBROUTINE UPATE(U,V,NDB,LPRG,FIT,TABX,NTABX,NNPI)



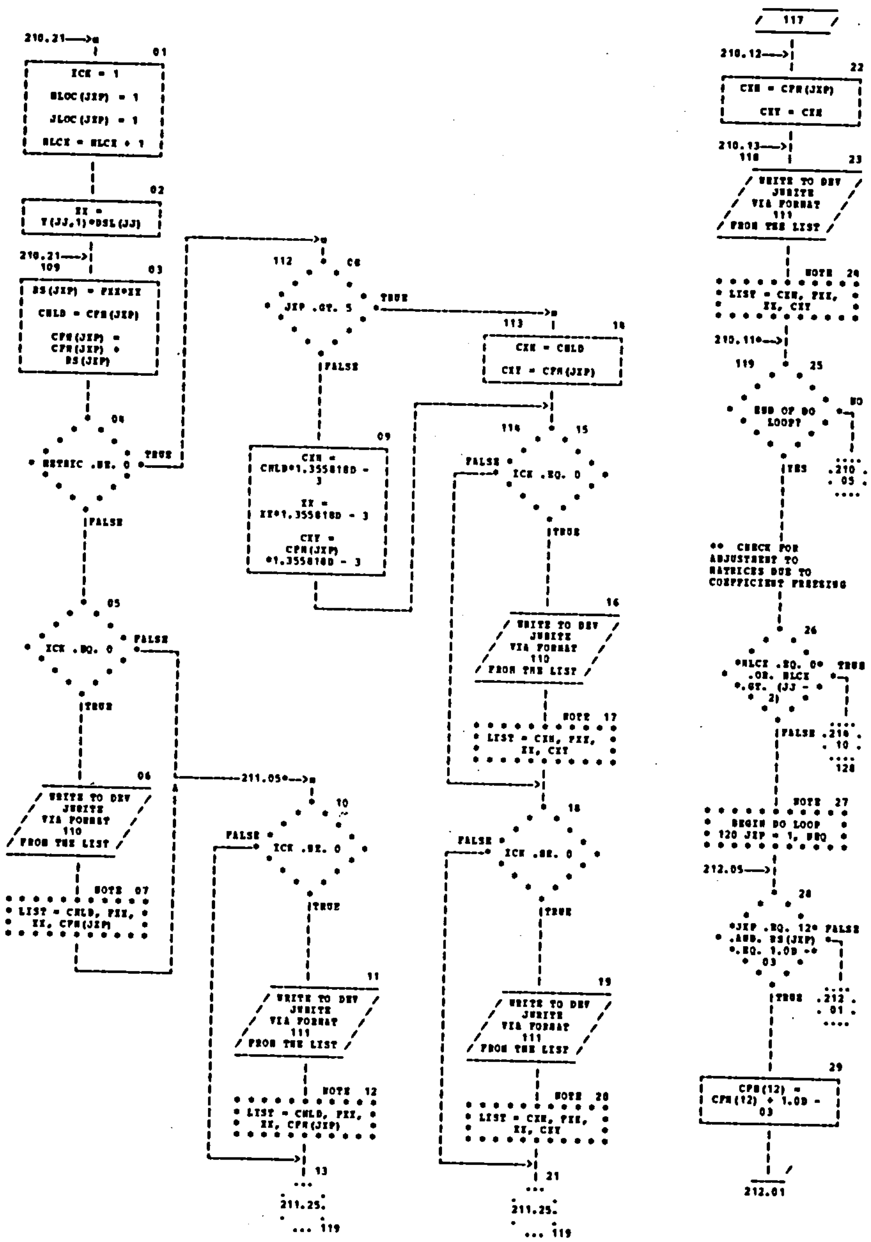


CHART TITLE - SUBROUTINE NPATH(N,F,NUD,LPRG,FIT,TABE,NTABE,NHPT)

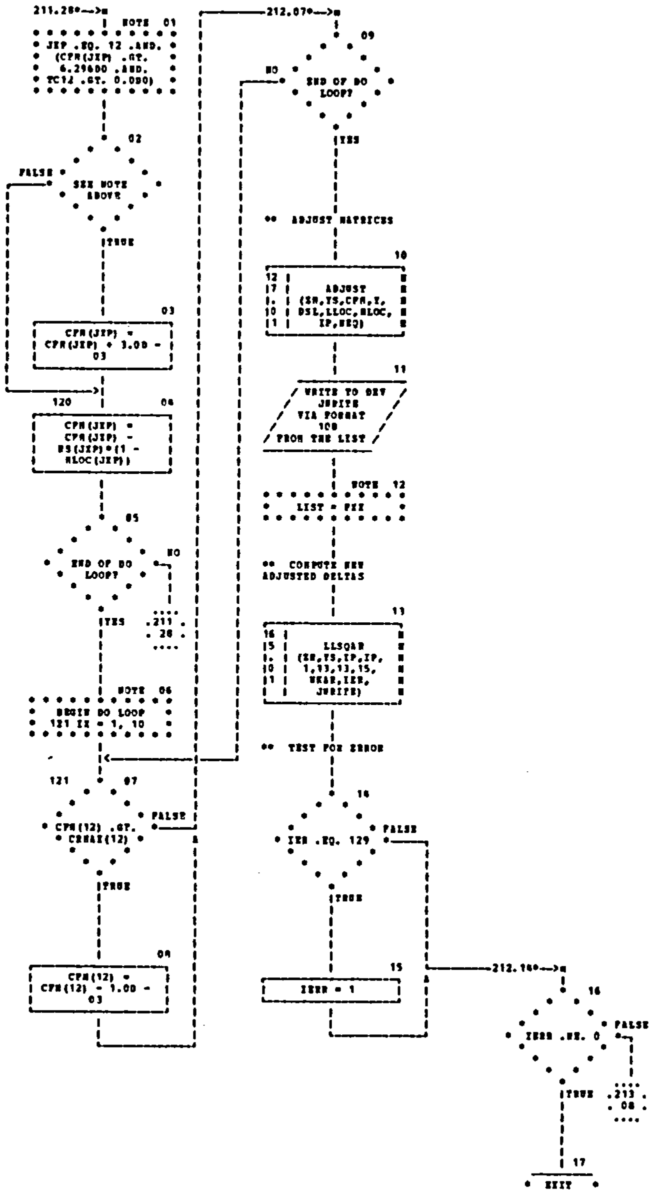


CHART TITLE - SUBROUTINE NPATH(N,P,NBB,LPRG,FIT,TARE,ETARE,ENPI)

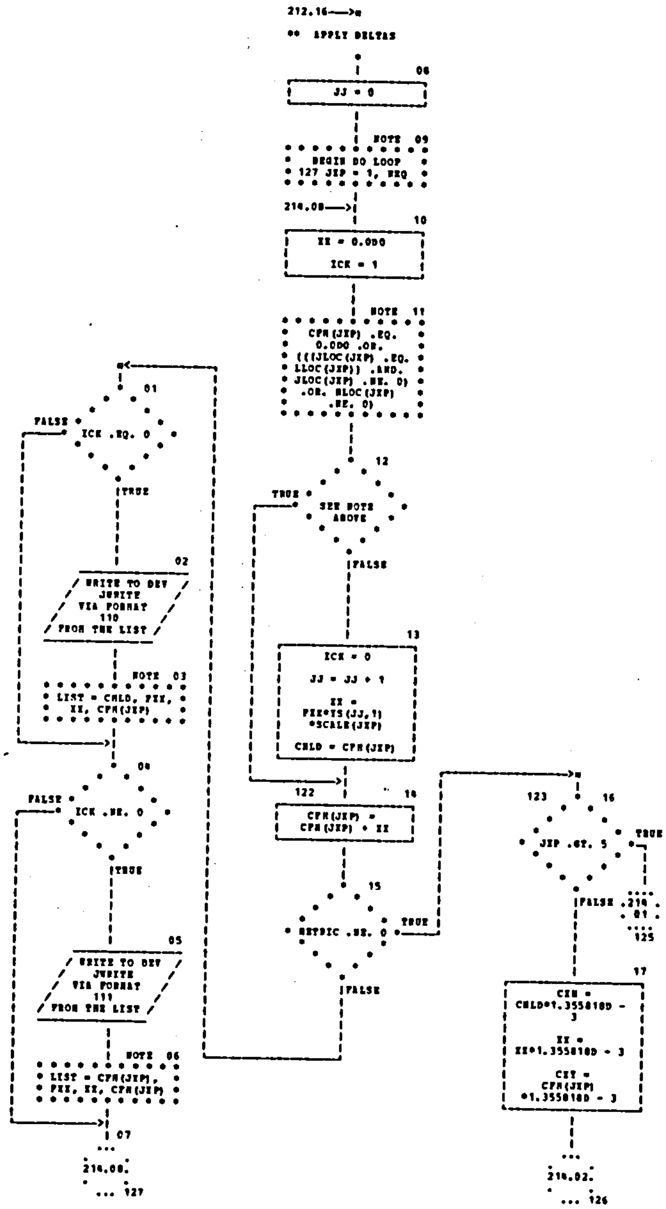
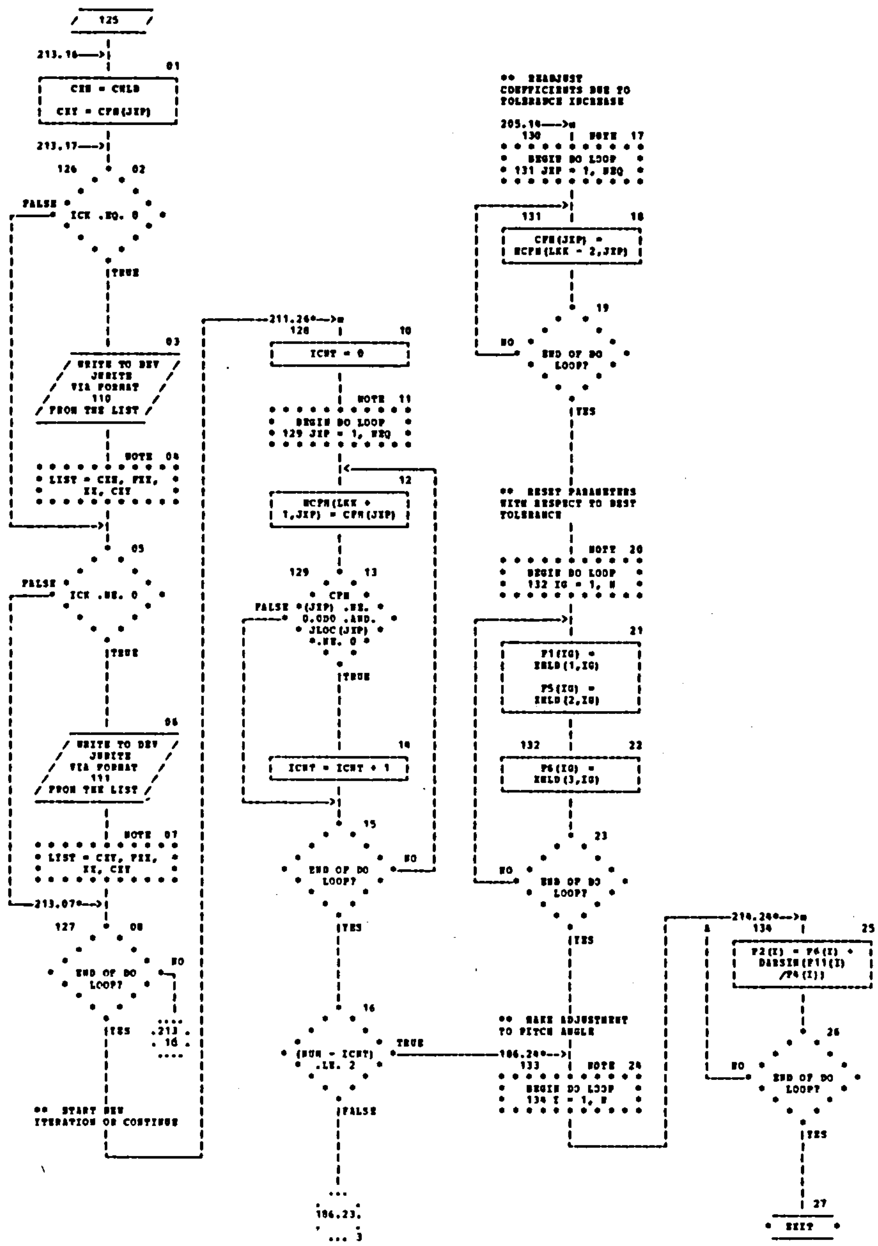


CHART TITLE - SUBROUTINE NPATH(N,F,NSD,LPRG,FIT,TASK,NTASK,NNPT)



Sample Input – FDR2

```
12345678901234567890123456789012345678901234567890123456789012345678901234567890

     PATH PERFORMANCE CORRUPTED THEORETICAL DATA
     1    0    0    0    0    2    1    1
0.3333    1.0        2.0        3.0            1    2    3    6
00000000001000000                                           MODEL CARD
0.0       220000.0  0.03       0.2        0.0               9.90D-09       1.05D-08
28735.71427D0        0.0D0
0.0D0                0.0D0
1126.607143D0        0.0D0
-2.169642857D0       0.0D0
0.0D0                0.0D0
0.0351D0             0.0D0
0.0D0                               1.0D-17
1.289155014D0        0.0D0
0.0D0                               1.0D-16
2030.800865D0        0.0D0
0.0D0                0.0D0
6.3D0                0.0D0
0.0D0                0.0D0
000000000000000000
28730.0D0            28740.0D0
0.0D0                0.0D0
1125.0D0             1128.2D0
-2.1729D0            -2.1665D0
0.0D0                0.0D0
0.03475D0            0.03545D0
0.0D0                0.0D0
1.2878D0             1.300D0
0.0D0                0.0D0
2010.0D0             2050.0D0
-0.5D0               0.5D0
6.25D0               6.3D0
-0.5D0               0.0D0
  NEW CORRUPTED THEORETICAL  FDR2  NC=10 ON 1/10 OF 1% RN  TEST DATA
      298 0.1550000D 03 0.2378000D-02 0.3220000D 02 0.2849000D 02
   0.0                      0.3999999663617570D 04   0.1626379051266506D 00
   0.6746509799602561D-02   0.1467390249070915D 03   0.2309777559636016D-02
   0.1648560765425594D 00   0.5200000000000000D 03   0.4664041953812637D 01
  -0.3801820652064249D-02   0.1000000040672511D 04   0.7545954040176251D-02
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   0.9999999999999997D-02   0.3999999291529504D 04   0.1627060695994274D 00
   0.6886337154536199D-02   0.1467856365361420D 03   0.2309777551455565D-02
   0.1648182138234927D 00   0.5200000000000000D 03   0.4658277064206305D 01
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   0.7165135373742044D-02   0.1468786858305570D 03   0.2309777516342973D-02
   0.1647434212402378D 00   0.5200000000000000D 03   0.4646625340484225D 01
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   0.5999999999999995D-01   0.3999997430227076D 04   0.1630677873765165D 00
   0.7581173254002090D-02   0.1470178187894979D 03   0.2309777414591846D-02
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-0.14111868683543680-02   0.71820545403943030 03  -0.30648368034069900 02
 0.69435086562735330 01   0.0                      0.0
 0.27589999999999720 02   0.39988746501518210 04  -0.52493359991862370-01
 0.26342963629998730-01   0.28023531844732400 03   0.23291981914692980-02
 0.54831618586091110-01   0.52000000000000000 03   0.39842050585792850 01
-0.16104727669575190-02   0.71517549793504420 03  -0.29949131784730310 02
 0.70408442901839340 01   0.0                      0.0
 0.27689999999999730 02   0.39988702550248680 04  -0.49847380422235610-01
 0.26575581575671220-01   0.28062842604801360 03   0.23294006407103100-02
 0.54660104204657610-01   0.52000000000000000 03   0.38779142661247130 01
-0.18217294196224470-02   0.71221594840086200 03  -0.29240274083461060 02
 0.71359327241281080 01   0.0                      0.0
 0.27789999999999720 02   0.39988658607901080 04  -0.47178452754715700-01
 0.26801927181714610-01   0.28101089512805050 03   0.23295982216985510-02
 0.54466907167147250-01   0.52000000000000000 03   0.37714382946760010 01
-0.20439485041580870-02   0.70932775629662000 03  -0.28522021131120260 02
 0.72287444463369540 01   0.0                      0.0
 0.27889999999999730 02   0.39988614674388510 04  -0.44487203740580530-01
 0.27022010147123940-01   0.28138270826230740 03   0.23297908699871980-02
 0.54250986204455920-01   0.52000000000000000 03   0.36647989800154840 01
-0.22760132974446560-02   0.70651184971553350 03  -0.27794602046320980 02
 0.73192506340991700 01   0.0                      0.0
 0.27989999999999720 02   0.39988570749610470 04  -0.41774259232281120-01

 0.27235837902831230-01   0.28174385020336770 03   0.23299785227145950-02
 0.54011416712792200-01   0.52000000000000000 03   0.35580180408671170 01
-0.25167090514985480-02   0.70376913369598680 03  -0.27058248793500290 02
 0.74074231860150950 01   0.0                      0.0
 0.28089999999999720 02   0.39988526833453250 04  -0.39040244207928050-01
 0.27443424221133270-01   0.28209430786986890 03   0.23301611186249700-02
 0.53747399985915570-01   0.52000000000000000 03   0.34511170795535350 01
-0.27647345907807940-02   0.70110048994087430 03  -0.26313196106325400 02
 0.74932348583324530 01   0.0                      0.0
 0.28189999999999720 02   0.39988482925790390 04  -0.36285781622184480-01
 0.27644793515534080-01   0.28243407033412020 03   0.23303385980885480-02
 0.53458271232362060-01   0.52000000000000000 03   0.33441175607070090 01
-0.30187149904121210-02   0.69850677654552030 03  -0.25559681378977410 02
 0.75766598392617890 01   0.0                      0.0
 0.28289999999999720 02   0.39988439026483020 04  -0.33511492130512310-01
 0.27839964039203710-01   0.28276312880746510 03   0.23305109031206830-02
 0.53143506277229400-01   0.52000000000000000 03   0.32370408014829370 01
-0.32772151796666870-02   0.69598882773959980 03  -0.24797944497427820 02
 0.76576740851216810 01   0.0                      0.0
 0.28389999999999710 02   0.39988395135380330 04  -0.30717995090202270-01
 0.28028946287125190-01   0.28308147662606680 03   0.23306779773998020-02
 0.52802726864331660-01   0.52000000000000000 03   0.31299079862919710 01
-0.35387543019934540-02   0.69354745364606660 03  -0.24028227693532010 02
 0.77362544138825670 01   0.0                      0.0
 0.28489999999999710 02   0.39988351252319970 04  -0.27905908725150390-01
 0.28211752973158420-01   0.28338910923818210 03   0.23308397662846760-02
 0.52435704491966160-01   0.52000000000000000 03   0.30227401704000500 01
-0.38018206520642310-02   0.69118344004954020 03  -0.23250775511314700 02
 0.78123778538388540 01   0.0                      0.0
END
```

Sample Output — FDR2

```
**************************************************************************
*                                                                        *
*      NEW CORRUPTED THEORETICAL  FDR2  SC=10 OR 1/10 OF 15 RR  TEST DATA  *
*                                                                        *
**************************************************************************

--------------------------------------------------------------------------------

INPUT PARAMETERS:

       IDS   = 5  EX1= 0.3333000  PLOW= 0.0                  TIA= 0.0
       INPUT= 0   EX2= 1.0000000  PHIGH= 0.22000000D 06  TAPE= 0.99000000D-08
       IPLOT= 0   EX3= 2.0000000  CDLOW= 0.30000000D-01  HTAPE= 0.16500000D-07
       IPUNCH=0   EX4= 3.0000000  CDHIGH= 0.20000000 00  G=32.2000000
       METRIC=0   K=298  S=155.0  RHO= 0.23780000000-02  TT=28.490000
       MTH  = 2  IEX1=  1  IEX2=  2  IEX3=  3  IEX4=  6  IMODEL(1)= 0
       IMODEL(2)= 0  IMODEL(3)= 0  IMODEL(4)= 0  IMODEL(5)= 0  IMODEL(6)= 0
       IMODEL(7)= 0  IMODEL(8)= 0  IMODEL(9)= 0  IMODEL(10)=0  IMODEL(11)=0
       IMODEL(12)=1  IMODEL(13)=0  IMODEL(14)=0  IMODEL(15)=0  IMODEL(16)=0
       IMODEL(17)=0  IMODEL(18)=0  IP(1)= 0  IP(2)= 0  IP(3)= 0  IP(4)= 0
       IP(5)= 0  IP(6)= 0  IP(7)= 0  IP(8)= 0  IP(9)= 0  IP(10)=0  IP(11)=0
       IP(12)=0  IP(13)=0  IP(14)=0  IP(15)=0  IP(16)=0  IP(17)=0  IP(18)=0
AP( 1)= 2.87357140D 04  WGT( 1)= 0.0          CRMIN( 1)= 2.8730000 04  CRMAX( 1)= 2.8740000 04
AP( 2)= 0.0             WGT( 2)= 0.0          CRMIN( 2)= 0.0           CRMAX( 2)= 0.0
AP( 3)= 1.12660710 03   WGT( 3)= 0.0          CRMIN( 3)= 1.1250000 03  CRMAX( 3)= 1.1282000 03
AP( 4)=-2.16964290 00   WGT( 4)= 0.0          CRMIN( 4)=-2.1729000 00  CRMAX( 4)=-2.1665000 00
AP( 5)= 0.0             WGT( 5)= 0.0          CRMIN( 5)= 0.0           CRMAX( 5)= 0.0
AP( 6)= 3.5100000D-02   WGT( 6)= 0.0          CRMIN( 6)= 3.4750000-02  CRMAX( 6)= 3.5450000-02
AP( 7)= 0.0             WGT( 7)= 1.00000-17   CRMIN( 7)= 0.0           CRMAX( 7)= 0.0
AP( 8)= 1.28915500 00   WGT( 8)= 0.0          CRMIN( 8)= 1.2878000 00  CRMAX( 8)= 1.3000000 00
AP( 9)= 0.0             WGT( 9)= 1.00000-16   CRMIN( 9)= 0.0           CRMAX( 9)= 0.0
AP(10)= 2.03680690 03   WGT(10)= 0.0          CRMIN(10)= 2.0100000 03  CRMAX(10)= 2.0500000 03
AP(11)= 0.0             WGT(11)= 0.0          CRMIN(11)=-5.0000000-01  CRMAX(11)= 5.0000000-01
AP(12)= 6.30000000 00   WGT(12)= 0.0          CRMIN(12)= 6.2500000 00  CRMAX(12)= 6.3000000 00
AP(13)= 0.0             WGT(13)= 0.0          CRMIN(13)=-5.0300000-01  CRMAX(13)= 0.0

--------------------------------------------------------------------------------

                 **************************************************
                 *                                                *
                 * WING AREA =  155.00000 FT**2                   *
                 * REFERENCE DENSITY = 0.00237800 SLUG/FT**3      *
                 * ACCELERATION DUE TO GRAVITY = 32.2000 FT/SEC**2 *
                 * TOTAL TEST TIME =    28.4900 SECONDS           *
                 *                                                *
                 **************************************************

            ************************************************************
            *                                                          *
            *          INITIAL INPUT DATA (FOR PROGRAM LOOP# 1)        *
            *                                                          *
            ************************************************************
```

DATA POINT	TIME (SECS)	WEIGHT (LBF)	PITCH ANGLE (RADIANS)	PITCH RATE (RADIAN/SEC)	AIRSPEED (FT/SEC)
1	0.0	3999.9997	0.1626379	0.0067465	146.7390
2	0.010	3999.9993	0.1627061	0.0068863	146.7856
3	0.020	3999.9989	0.1627756	0.0070259	146.8322
4	0.030	3999.9985	0.1628466	0.0071651	146.8787
5	0.040	3999.9982	0.1629189	0.0073041	146.9251
6	0.060	3999.9974	0.1630678	0.0075812	147.0178
7	0.080	3999.9967	0.1632222	0.0078571	147.1103
8	0.100	3999.9959	0.1633821	0.0081318	147.2025
9	0.120	3999.9952	0.1635474	0.0084053	147.2946
10	0.140	3999.9944	0.1637183	0.0086777	147.3862
11	0.180	3999.9930	0.1640762	0.0092187	147.5689
12	0.220	3999.9916	0.1644557	0.0097548	147.7505
13	0.260	3999.9900	0.1648565	0.0102859	147.9311
14	0.300	3999.9885	0.1652785	0.0108119	148.1106
15	0.340	3999.9870	0.1657214	0.0113328	148.2890
16	0.420	3999.9840	0.1666692	0.0123586	148.6424
17	0.500	3999.9810	0.1676982	0.0133628	148.9911
18	0.580	3999.9780	0.1688067	0.0143448	149.3349
19	0.660	3999.9750	0.1699928	0.0153039	149.6737
20	0.740	3999.9720	0.1712547	0.0162397	150.0073
21	0.840	3999.9682	0.1729358	0.0173758	150.4168
22	0.940	3999.9644	0.1747286	0.0184735	150.8176
23	1.040	3999.9607	0.1766292	0.0195319	151.2094
24	1.140	3999.9569	0.1786336	0.0205494	151.5921
25	1.240	3999.9531	0.1807376	0.0215241	151.9653
26	1.340	3999.9493	0.1829369	0.0224581	152.3289
27	1.440	3999.9455	0.1852271	0.0233414	152.6826
28	1.540	3999.9417	0.1876037	0.0241820	153.0263
29	1.640	3999.9380	0.1900620	0.0249762	153.3598
30	1.740	3999.9341	0.1925973	0.0257229	153.6829
31	1.840	3999.9303	0.1952050	0.0264215	153.9955
32	1.940	3999.9265	0.1978800	0.0270710	154.2975
33	2.040	3999.9227	0.2006175	0.0276714	154.5888
34	2.140	3999.9189	0.2034127	0.0282234	154.8694
35	2.240	3999.9151	0.2062606	0.0287274	155.1391
36	2.340	3999.9113	0.2091565	0.0291828	155.3979
37	2.440	3999.9074	0.2120956	0.0295896	155.6458
38	2.540	3999.9036	0.2150728	0.0299475	155.8828
39	2.640	3999.8998	0.2180834	0.0302563	156.1089
40	2.740	3999.8959	0.2211224	0.0305159	156.3241
41	2.840	3999.8921	0.2241850	0.0307263	156.5285
42	2.940	3999.8883	0.2272660	0.0308672	156.7221
43	3.040	3999.8844	0.2303607	0.0309988	156.9050
44	3.140	3999.8806	0.2334641	0.0310609	157.0773
45	3.240	3999.8767	0.2365713	0.0310736	157.2390
46	3.340	3999.8729	0.2396772	0.0310369	157.3904
47	3.440	3999.8691	0.2427770	0.0309510	157.5314
48	3.540	3999.8652	0.2458658	0.0308158	157.6623
49	3.640	3999.8614	0.2489385	0.0306315	157.7833
50	3.740	3999.8575	0.2519904	0.0303983	157.8944
51	3.840	3999.8537	0.2550166	0.0301162	157.9959
52	3.940	3999.8498	0.2580121	0.0297856	158.0880
53	4.040	3999.8459	0.2609721	0.0294066	158.1709
54	4.140	3999.8421	0.2638918	0.0289812	158.2448
55	4.240	3999.8382	0.2667668	0.0285118	158.3099
56	4.340	3999.8344	0.2695927	0.0279993	158.3665
57	4.440	3999.8305	0.2723653	0.0274444	158.4148
58	4.540	3999.8267	0.2750802	0.0268479	158.4551
59	4.640	3999.8228	0.2777335	0.0262107	158.4876
60	4.740	3999.8189	0.2803210	0.0255335	158.5127
61	4.840	3999.8151	0.2828389	0.0248172	158.5306
62	4.940	3999.8112	0.2852832	0.0240627	158.5416
63	5.040	3999.8074	0.2876502	0.0232707	158.5460
64	5.140	3999.8035	0.2899361	0.0224423	158.5441
65	5.240	3999.7997	0.2921375	0.0215782	158.5362
66	5.340	3999.7958	0.2942506	0.0206794	158.5226
67	5.440	3999.7919	0.2962722	0.0197467	158.5036

68	5.540	3999.7881	0.2981989	0.0187811	158.4796
69	5.640	3999.7842	0.3000274	0.0177834	158.4508
70	5.740	3999.7804	0.3017548	0.0167546	158.4177
71	5.840	3999.7765	0.3033773	0.0156957	158.3805
72	5.940	3999.7726	0.3048927	0.0146078	158.3397
73	6.040	3999.7688	0.3062978	0.0134916	158.2954
74	6.140	3999.7649	0.3075901	0.0123501	158.2482
75	6.240	3999.7611	0.3087671	0.0111856	158.1983
76	6.340	3999.7572	0.3098265	0.0099989	158.1461
77	6.440	3999.7534	0.3107662	0.0087916	158.0919
78	6.540	3999.7495	0.3115842	0.0075646	158.0362
79	6.640	3999.7457	0.3122785	0.0063197	157.9792
80	6.740	3999.7418	0.3128475	0.0050581	157.9213
81	6.840	3999.7380	0.3132896	0.0037810	157.8629
82	6.940	3999.7341	0.3136033	0.0024899	157.8043
83	7.040	3999.7303	0.3137872	0.0011860	157.7460
84	7.140	3999.7264	0.3138401	-0.0001291	157.6882
85	7.240	3999.7226	0.3137610	-0.0014543	157.6313
86	7.340	3999.7187	0.3135489	-0.0027881	157.5757
87	7.440	3999.7149	0.3132031	-0.0041292	157.5218
88	7.540	3999.7110	0.3127229	-0.0054762	157.4699
89	7.640	3999.7072	0.3121077	-0.0068277	157.4203
90	7.740	3999.7033	0.3113573	-0.0081824	157.3734
91	7.840	3999.6995	0.3104712	-0.0095389	157.3297
92	7.940	3999.6956	0.3094495	-0.0108958	157.2893
93	8.040	3999.6918	0.3082921	-0.0122518	157.2528
94	8.140	3999.6879	0.3069992	-0.0136054	157.2204
95	8.240	3999.6841	0.3055711	-0.0149552	157.1925
96	8.340	3999.6803	0.3040083	-0.0162999	157.1694
97	8.440	3999.6764	0.3023114	-0.0176380	157.1515
98	8.540	3999.6726	0.3004810	-0.0189683	157.1392
99	8.640	3999.6687	0.2985180	-0.0202893	157.1326
100	8.740	3999.6649	0.2964235	-0.0215997	157.1323
101	8.840	3999.6610	0.2941985	-0.0228982	157.1386
102	8.940	3999.6572	0.2918443	-0.0241833	157.1517
103	9.040	3999.6534	0.2893623	-0.0254537	157.1719
104	9.140	3999.6495	0.2867541	-0.0267082	157.1997
105	9.240	3999.6457	0.2840213	-0.0279453	157.2353
106	9.340	3999.6418	0.2811657	-0.0291638	157.2789
107	9.440	3999.6380	0.2781852	-0.0303624	157.3311
108	9.540	3999.6341	0.2750939	-0.0315398	157.3919
109	9.640	3999.6303	0.2718820	-0.0326948	157.4617
110	9.740	3999.6264	0.2685557	-0.0338260	157.5409
111	9.840	3999.6226	0.2651176	-0.0349323	157.6296
112	9.940	3999.6187	0.2615701	-0.0360125	157.7281
113	10.040	3999.6149	0.2579160	-0.0370654	157.8368
114	10.140	3999.6110	0.2541580	-0.0380907	157.9558
115	10.240	3999.6072	0.2502988	-0.0390883	158.0854
116	10.340	3999.6033	0.2463413	-0.0400573	158.2259
117	10.440	3999.5995	0.2422883	-0.0409970	158.3774
118	10.540	3999.5956	0.2381429	-0.0419065	158.5403
119	10.640	3999.5918	0.2339080	-0.0427851	158.7146
120	10.740	3999.5879	0.2295865	-0.0436320	158.9007
121	10.840	3999.5840	0.2251827	-0.0444465	159.0987
122	10.940	3999.5802	0.2206987	-0.0452279	159.3088
123	11.040	3999.5763	0.2161382	-0.0459756	159.5312
124	11.140	3999.5724	0.2115047	-0.0466891	159.7660
125	11.240	3999.5685	0.2068016	-0.0473676	160.0134
126	11.340	3999.5647	0.2020324	-0.0480108	160.2736
127	11.440	3999.5608	0.1972006	-0.0486181	160.5467
128	11.540	3999.5569	0.1923100	-0.0491890	160.8328
129	11.640	3999.5530	0.1873641	-0.0497232	161.1320
130	11.740	3999.5491	0.1823666	-0.0502203	161.4444
131	11.840	3999.5452	0.1773212	-0.0506799	161.7702
132	11.940	3999.5413	0.1722318	-0.0511018	162.1093
133	12.040	3999.5374	0.1671021	-0.0514859	162.4620
134	12.140	3999.5335	0.1619359	-0.0518334	162.8282
135	12.240	3999.5296	0.1567367	-0.0521446	163.2080
136	12.340	3999.5257	0.1515082	-0.0524196	163.6014
137	12.440	3999.5218	0.1462540	-0.0526585	164.0085
138	12.540	3999.5179	0.1409777	-0.0528617	164.4293
139	12.640	3999.5140	0.1356828	-0.0530292	164.8637
140	12.740	3999.5101	0.1303730	-0.0531614	165.3118
141	12.840	3999.5061	0.1250517	-0.0532585	165.7736
142	12.940	3999.5022	0.1197225	-0.0533210	166.2490
143	13.040	3999.4983	0.1143887	-0.0533492	166.7380
144	13.140	3999.4943	0.1090537	-0.0533434	167.2405
145	13.240	3999.4905	0.1037211	-0.0533042	167.7565
146	13.340	3999.4866	0.0983940	-0.0532319	168.2860
147	13.440	3999.4824	0.0930758	-0.0531272	168.8288
148	13.490	3999.4804	0.0904210	-0.0530627	169.1052
149	13.590	3999.4764	0.0851221	-0.0529130	169.6678
150	13.690	3999.4725	0.0798401	-0.0527261	170.2436
151	13.790	3999.4685	0.0745779	-0.0525116	170.8324
152	13.890	3999.4645	0.0693388	-0.0522669	171.4340
153	13.990	3999.4605	0.0641255	-0.0519926	172.0484
154	14.090	3999.4566	0.0589411	-0.0516903	172.6754
155	14.190	3999.4525	0.0537884	-0.0513605	173.3149
156	14.290	3999.4485	0.0486699	-0.0510044	173.9666
157	14.390	3999.4444	0.0435684	-0.0506226	174.6306
158	14.490	3999.4404	0.0385462	-0.0502160	175.3065
159	14.590	3999.4364	0.0335460	-0.0497853	175.9942
160	14.690	3999.4323	0.0285899	-0.0493314	176.6936
161	14.790	3999.4283	0.0236804	-0.0488552	177.4043
162	14.890	3999.4242	0.0188196	-0.0483573	178.1263
163	14.990	3999.4202	0.0140097	-0.0478387	178.8594
164	15.090	3999.4161	0.0092526	-0.0473000	179.6032
165	15.190	3999.4121	0.0045503	-0.0467423	180.3577
166	15.290	3999.4080	-0.0000953	-0.0461661	181.1226
167	15.390	3999.4039	-0.0046823	-0.0455724	181.8976
168	15.490	3999.3998	-0.0092092	-0.0449619	182.6826
169	15.590	3999.3957	-0.0136742	-0.0443354	183.4772
170	15.690	3999.3916	-0.0180758	-0.0436937	184.2814
171	15.790	3999.3875	-0.0224124	-0.0430375	185.0947
172	15.890	3999.3834	-0.0266828	-0.0423676	185.9171
173	15.990	3999.3792	-0.0308855	-0.0416847	186.7481
174	16.090	3999.3751	-0.0350193	-0.0409896	187.5877
175	16.190	3999.3710	-0.0390831	-0.0402833	188.4355
176	16.290	3999.3668	-0.0430757	-0.0395664	189.2913
177	16.390	3999.3627	-0.0469960	-0.0388397	190.1548
178	16.490	3999.3585	-0.0508433	-0.0381039	191.0257
179	16.590	3999.3544	-0.0546165	-0.0373596	191.9038
180	16.690	3999.3502	-0.0583150	-0.0366076	192.7889
181	16.790	3999.3460	-0.0619378	-0.0358485	193.6806
182	16.890	3999.3418	-0.0654844	-0.0350828	194.5787
183	16.990	3999.3376	-0.0689542	-0.0343113	195.4830
184	17.090	3999.3334	-0.0723465	-0.0335346	196.3931
185	17.190	3999.3292	-0.0756610	-0.0327532	197.3088
186	17.290	3999.3250	-0.0788970	-0.0319677	198.2298
187	17.390	3999.3208	-0.0820544	-0.0311786	199.1559
188	17.490	3999.3166	-0.0851327	-0.0303865	200.0868
189	17.590	3999.3124	-0.0881316	-0.0295920	201.0222
190	17.690	3999.3081	-0.0910510	-0.0287954	201.9619
191	17.790	3999.3039	-0.0938906	-0.0279973	202.9056
192	17.890	3999.2996	-0.0966534	-0.0271982	203.8529
193	17.990	3999.2954	-0.0993303	-0.0263984	204.8038
194	18.090	3999.2911	-0.1019301	-0.0255985	205.7578
195	18.190	3999.2869	-0.1044530	-0.0247988	206.7147
196	18.290	3999.2826	-0.1068899	-0.0239996	207.6744
197	18.390	3999.2783	-0.1092499	-0.0232014	208.6364
198	18.490	3999.2741	-0.1115302	-0.0224045	209.6006
199	18.590	3999.2698	-0.1137306	-0.0216092	210.5666

200	18.690	3999.2655	-0.1158521	-0.0208160	211.5343
201	18.790	3999.2612	-0.1178941	-0.0200250	212.5034
202	18.890	3999.2569	-0.1198572	-0.0192367	213.4736
203	18.990	3999.2526	-0.1217416	-0.0184513	214.4447
204	19.090	3999.2483	-0.1235476	-0.0176691	215.4164
205	19.190	3999.2440	-0.1252755	-0.0168903	216.3885
206	19.290	3999.2396	-0.1269238	-0.0161153	217.3607
207	19.390	3999.2353	-0.1284987	-0.0153442	218.3328
208	19.490	3999.2310	-0.1299947	-0.0145773	219.3046
209	19.590	3999.2267	-0.1314143	-0.0138149	220.2758
210	19.690	3999.2223	-0.1327579	-0.0130570	221.2463
211	19.790	3999.2180	-0.1340259	-0.0123041	222.2156
212	19.890	3999.2136	-0.1352198	-0.0115561	223.1837
213	19.990	3999.2093	-0.1363373	-0.0108134	224.1603
214	20.090	3999.2049	-0.1373817	-0.0100761	225.1152
215	20.190	3999.2006	-0.1383527	-0.0093442	226.0781
216	20.290	3999.1962	-0.1392507	-0.0086179	227.0389
217	20.390	3999.1919	-0.1400765	-0.0078973	227.9973
218	20.490	3999.1875	-0.1408304	-0.0071825	228.9531
219	20.590	3999.1831	-0.1415131	-0.0064736	229.9061
220	20.690	3999.1788	-0.1421253	-0.0057707	230.8561
221	20.790	3999.1744	-0.1426675	-0.0050740	231.8029
222	20.890	3999.1700	-0.1431403	-0.0043835	232.7463
223	20.990	3999.1656	-0.1435444	-0.0036993	233.6861
224	21.090	3999.1612	-0.1438804	-0.0030216	234.6220
225	21.190	3999.1569	-0.1441489	-0.0023503	235.5540
226	21.290	3999.1525	-0.1443507	-0.0016855	236.4818
227	21.390	3999.1481	-0.1444863	-0.0010274	237.4052
228	21.490	3999.1437	-0.1445564	-0.0003760	238.3240
229	21.590	3999.1393	-0.1445617	0.0002686	239.2381
230	21.690	3999.1349	-0.1445029	0.0009064	240.1473
231	21.790	3999.1305	-0.1443806	0.0015374	241.0513
232	21.890	3999.1261	-0.1441956	0.0021614	241.9501
233	21.990	3999.1217	-0.1439486	0.0027784	242.8435
234	22.090	3999.1173	-0.1436402	0.0033884	243.7313
235	22.190	3999.1129	-0.1432712	0.0039915	244.6132
236	22.290	3999.1085	-0.1428421	0.0045877	245.4893
237	22.390	3999.1041	-0.1423539	0.0051769	246.3593
238	22.490	3999.0996	-0.1418070	0.0057591	247.2230
239	22.590	3999.0952	-0.1412023	0.0063344	248.0803
240	22.690	3999.0908	-0.1405404	0.0069026	248.9311
241	22.790	3999.0864	-0.1398220	0.0074639	249.7752
242	22.890	3999.0820	-0.1390478	0.0080181	250.6124
243	22.990	3999.0776	-0.1382186	0.0085654	251.4427
244	23.090	3999.0732	-0.1373350	0.0091056	252.2659
245	23.190	3999.0688	-0.1363977	0.0096389	253.0818
246	23.290	3999.0643	-0.1354074	0.0101651	253.8903
247	23.390	3999.0599	-0.1343649	0.0106842	254.6913
248	23.490	3999.0555	-0.1332708	0.0111964	255.4847
249	23.590	3999.0511	-0.1321259	0.0117015	256.2703
250	23.690	3999.0467	-0.1309307	0.0121996	257.0481
251	23.790	3999.0422	-0.1296862	0.0126907	257.8178
252	23.890	3999.0378	-0.1283928	0.0131748	258.5794
253	23.990	3999.0334	-0.1270515	0.0136518	259.3326
254	24.090	3999.0290	-0.1256627	0.0141218	260.0779
255	24.190	3999.0246	-0.1242273	0.0145848	260.8144
256	24.290	3999.0202	-0.1227460	0.0150410	261.5425
257	24.390	3999.0157	-0.1212194	0.0154903	262.2619
258	24.490	3999.0113	-0.1196482	0.0159327	262.9725
259	24.590	3999.0069	-0.1180331	0.0163682	263.6743
260	24.690	3999.0025	-0.1163747	0.0167970	264.3671
261	24.790	3998.9981	-0.1146739	0.0172189	265.0509
262	24.890	3998.9936	-0.1129312	0.0176340	265.7256
263	24.990	3998.9892	-0.1111473	0.0180424	266.3910
264	25.090	3998.9848	-0.1093229	0.0184440	267.0472
265	25.190	3998.9804	-0.1074587	0.0188389	267.6939
266	25.290	3998.9760	-0.1055554	0.0192270	268.3313
267	25.390	3998.9716	-0.1036136	0.0196085	268.9590
268	25.490	3998.9672	-0.1016336	0.0199832	269.5772
269	25.590	3998.9627	-0.0996171	0.0203513	270.1867
270	25.690	3998.9583	-0.0975634	0.0207127	270.7845
271	25.790	3998.9539	-0.0954768	0.0210675	271.3736
272	25.890	3998.9495	-0.0933506	0.0214187	271.9525
273	25.990	3998.9451	-0.0911910	0.0217572	272.5216
274	26.090	3998.9407	-0.0889594	0.0220921	273.0807
275	26.190	3998.9363	-0.0867737	0.0224205	273.6298
276	26.290	3998.9319	-0.0845155	0.0227424	274.1688
277	26.390	3998.9275	-0.0822254	0.0230578	274.6976
278	26.490	3998.9231	-0.0799042	0.0233667	275.2162
279	26.590	3998.9187	-0.0775523	0.0236692	275.7245
280	26.690	3998.9142	-0.0751705	0.0239652	276.2226
281	26.790	3998.9098	-0.0727595	0.0242548	276.7103
282	26.890	3998.9054	-0.0703198	0.0245381	277.1876
283	26.990	3998.9010	-0.0678521	0.0248149	277.6545
284	27.090	3998.8966	-0.0653570	0.0250854	278.1110
285	27.190	3998.8922	-0.0628352	0.0253496	278.5569
286	27.290	3998.8878	-0.0602873	0.0256074	278.9924
287	27.390	3998.8834	-0.0577140	0.0258589	279.4173
288	27.490	3998.8790	-0.0551156	0.0261041	279.8316
289	27.590	3998.8747	-0.0524934	0.0263430	280.2353
290	27.690	3998.8703	-0.0498474	0.0265756	280.6284
291	27.790	3998.8659	-0.0471785	0.0268019	281.0109
292	27.890	3998.8615	-0.0444872	0.0270220	281.3827
293	27.990	3998.8571	-0.0417743	0.0272358	281.7439
294	28.090	3998.8527	-0.0390402	0.0274434	282.0943
295	28.190	3998.8483	-0.0362858	0.0276448	282.4341
296	28.290	3998.8439	-0.0335115	0.0278400	282.7631
297	28.390	3998.8395	-0.0307180	0.0280289	283.0815
298	28.490	3998.8351	-0.0279059	0.0282118	283.3891

DATA POINT	TIME (SECS)	DENSITY (SLUG/FT**3)	ANGLE OF ATTACK (RADIANS)	TEMPERATURE (DEG-R)	ACCELERATION (FT/SEC**2)
1	0.0	0.00230978	0.1648561	520.00	4.66404
2	0.010	0.00230978	0.1648182	520.00	4.65828
3	0.020	0.00230978	0.1647807	520.00	4.65247
4	0.030	0.00230978	0.1647434	520.00	4.64663
5	0.040	0.00230978	0.1647065	520.00	4.64074
6	0.060	0.00230978	0.1646336	520.00	4.62884
7	0.080	0.00230978	0.1645619	520.00	4.61679
8	0.100	0.00230978	0.1644914	520.00	4.60458
9	0.120	0.00230978	0.1644222	520.00	4.59221
10	0.140	0.00230978	0.1643543	520.00	4.57968
11	0.180	0.00230978	0.1642220	520.00	4.55416
12	0.220	0.00230978	0.1640947	520.00	4.52803
13	0.260	0.00230977	0.1639723	520.00	4.50129
14	0.300	0.00230977	0.1638547	520.00	4.47396
15	0.340	0.00230977	0.1637419	520.00	4.44604
16	0.420	0.00230977	0.1635306	520.00	4.38849
17	0.500	0.00230977	0.1633379	520.00	4.32871
18	0.580	0.00230976	0.1631632	520.00	4.26678
19	0.660	0.00230976	0.1630060	520.00	4.20278
20	0.740	0.00230975	0.1628656	520.00	4.13679
21	0.840	0.00230974	0.1627125	520.00	4.05163
22	0.940	0.00230973	0.1625827	520.00	3.96366
23	1.040	0.00230972	0.1624744	520.00	3.87302
24	1.140	0.00230970	0.1623857	520.00	3.77989
25	1.240	0.00230969	0.1623145	520.00	3.68446
26	1.340	0.00230967	0.1622586	520.00	3.58688

27	1.440	0.00230964	0.1622158	520.00	3.48735
28	1.540	0.00230962	0.1621837	520.00	3.38604
29	1.640	0.00230959	0.1621600	520.00	3.28314
30	1.740	0.00230956	0.1621423	520.00	3.17884
31	1.840	0.00230953	0.1621283	520.00	3.07331
32	1.940	0.00230950	0.1621155	520.00	2.96675
33	2.040	0.00230946	0.1621017	520.00	2.85934
34	2.140	0.00230942	0.1620846	520.00	2.75125
35	2.240	0.00230937	0.1620620	520.00	2.64266
36	2.340	0.00230932	0.1620319	520.00	2.53373
37	2.440	0.00230927	0.1619922	520.00	2.42464
38	2.540	0.00230922	0.1619411	520.00	2.31565
39	2.640	0.00230916	0.1618769	520.00	2.20661
40	2.740	0.00230910	0.1617979	520.00	2.09800
41	2.840	0.00230904	0.1617028	520.00	1.98996
42	2.940	0.00230897	0.1615903	520.00	1.88235
43	3.040	0.00230890	0.1614593	520.00	1.77564
44	3.140	0.00230882	0.1613087	520.00	1.66986
45	3.240	0.00230874	0.1611378	520.00	1.56516
46	3.340	0.00230866	0.1609460	520.00	1.46170
47	3.440	0.00230857	0.1607328	520.00	1.35960
48	3.540	0.00230848	0.1604978	520.00	1.25902
49	3.640	0.00230839	0.1602410	520.00	1.16008
50	3.740	0.00230829	0.1599621	520.00	1.06291
51	3.840	0.00230819	0.1596614	520.00	0.96766
52	3.940	0.00230809	0.1593391	520.00	0.87443
53	4.040	0.00230798	0.1589955	520.00	0.78336
54	4.140	0.00230787	0.1586309	520.00	0.69455
55	4.240	0.00230775	0.1582460	520.00	0.60811
56	4.340	0.00230763	0.1578413	520.00	0.52413
57	4.440	0.00230751	0.1574174	520.00	0.44269
58	4.540	0.00230739	0.1569751	520.00	0.36388
59	4.640	0.00230726	0.1565150	520.00	0.28777
60	4.740	0.00230713	0.1560380	520.00	0.21444
61	4.840	0.00230699	0.1555447	520.00	0.14395
62	4.940	0.00230685	0.1550360	520.00	0.07639
63	5.040	0.00230671	0.1545127	520.00	0.01181
64	5.140	0.00230657	0.1539754	520.00	-0.04973
65	5.240	0.00230642	0.1534250	520.00	-0.10817
66	5.340	0.00230627	0.1528620	520.00	-0.16345
67	5.440	0.00230612	0.1522872	520.00	-0.21553
68	5.540	0.00230596	0.1517011	520.00	-0.26434
69	5.640	0.00230580	0.1511044	520.00	-0.30984
70	5.740	0.00230564	0.1504974	520.00	-0.35200
71	5.840	0.00230548	0.1498808	520.00	-0.39076
72	5.940	0.00230531	0.1492548	520.00	-0.42609
73	6.040	0.00230514	0.1486199	520.00	-0.45795
74	6.140	0.00230498	0.1479762	520.00	-0.48631
75	6.240	0.00230480	0.1473242	520.00	-0.51115
76	6.340	0.00230463	0.1466639	520.00	-0.53245
77	6.440	0.00230446	0.1459956	520.00	-0.55020
78	6.540	0.00230428	0.1453193	520.00	-0.56437
79	6.640	0.00230410	0.1446351	520.00	-0.57496
80	6.740	0.00230392	0.1439432	520.00	-0.58196
81	6.840	0.00230374	0.1432434	520.00	-0.58536
82	6.940	0.00230356	0.1425360	520.00	-0.58516
83	7.040	0.00230338	0.1418208	520.00	-0.58134
84	7.140	0.00230319	0.1410979	520.00	-0.57391
85	7.240	0.00230301	0.1403672	520.00	-0.56287
86	7.340	0.00230283	0.1396289	520.00	-0.54822
87	7.440	0.00230264	0.1388828	520.00	-0.52997
88	7.540	0.00230245	0.1381291	520.00	-0.50812
89	7.640	0.00230227	0.1373679	520.00	-0.48269
90	7.740	0.00230208	0.1365991	520.00	-0.45367
91	7.840	0.00230190	0.1358230	520.00	-0.42110
92	7.940	0.00230171	0.1350397	520.00	-0.38497
93	8.040	0.00230153	0.1342493	520.00	-0.34532
94	8.140	0.00230134	0.1334520	520.00	-0.30219
95	8.240	0.00230116	0.1326482	520.00	-0.25550
96	8.340	0.00230098	0.1318381	520.00	-0.20539
97	8.440	0.00230079	0.1310221	520.00	-0.15184
98	8.540	0.00230061	0.1302004	520.00	-0.09490
99	8.640	0.00230043	0.1293735	520.00	-0.03458
100	8.740	0.00230026	0.1285418	520.00	0.02907
101	8.840	0.00230008	0.1277057	520.00	0.09601
102	8.940	0.00229990	0.1268658	520.00	0.16620
103	9.040	0.00229973	0.1260225	520.00	0.23960
104	9.140	0.00229956	0.1251763	520.00	0.31615
105	9.240	0.00229939	0.1243278	520.00	0.39582
106	9.340	0.00229922	0.1234775	520.00	0.47854
107	9.440	0.00229905	0.1226259	520.00	0.56425
108	9.540	0.00229889	0.1217737	520.00	0.65291
109	9.640	0.00229872	0.1209213	520.00	0.74444
110	9.740	0.00229857	0.1200693	520.00	0.83878
111	9.840	0.00229841	0.1192182	520.00	0.93585
112	9.940	0.00229825	0.1183685	520.00	1.03559
113	10.040	0.00229810	0.1175208	520.00	1.13793
114	10.140	0.00229796	0.1166756	520.00	1.24277
115	10.240	0.00229781	0.1158332	520.00	1.35005
116	10.340	0.00229767	0.1149943	520.00	1.45966
117	10.440	0.00229753	0.1141590	520.00	1.57159
118	10.540	0.00229739	0.1133280	520.00	1.66568
119	10.640	0.00229726	0.1125015	520.00	1.80187
120	10.740	0.00229713	0.1116798	520.00	1.92006
121	10.840	0.00229701	0.1108633	520.00	2.04016
122	10.940	0.00229689	0.1100522	520.00	2.16208
123	11.040	0.00229677	0.1092468	520.00	2.28573
124	11.140	0.00229666	0.1084473	520.00	2.41099
125	11.240	0.00229655	0.1076539	520.00	2.53778
126	11.340	0.00229644	0.1068668	520.00	2.66598
127	11.440	0.00229634	0.1060860	520.00	2.79550
128	11.540	0.00229625	0.1053118	520.00	2.92623
129	11.640	0.00229616	0.1045442	520.00	3.05806
130	11.740	0.00229607	0.1037833	520.00	3.19089
131	11.840	0.00229598	0.1030291	520.00	3.32459
132	11.940	0.00229590	0.1022817	520.00	3.45907
133	12.040	0.00229583	0.1015411	520.00	3.59421
134	12.140	0.00229576	0.1008074	520.00	3.72989
135	12.240	0.00229570	0.1000805	520.00	3.86602
136	12.340	0.00229564	0.0993605	520.00	4.00247
137	12.440	0.00229558	0.0986474	520.00	4.13915
138	12.540	0.00229553	0.0979411	520.00	4.27594
139	12.640	0.00229548	0.0972417	520.00	4.41273
140	12.740	0.00229544	0.0965491	520.00	4.54941
141	12.840	0.00229541	0.0958635	520.00	4.68589
142	12.940	0.00229538	0.0951847	520.00	4.82204
143	13.040	0.00229535	0.0945128	520.00	4.95778
144	13.140	0.00229533	0.0938477	520.00	5.09299
145	13.240	0.00229532	0.0931896	520.00	5.22758
146	13.340	0.00229531	0.0925384	520.00	5.36144
147	13.440	0.00229531	0.0918941	520.00	5.49448
148	13.490	0.00229531	0.0915746	520.00	5.56065
149	13.590	0.00229531	0.0909408	520.00	5.69227
150	13.690	0.00229532	0.0903140	520.00	5.82283
151	13.790	0.00229533	0.0896943	520.00	5.95223
152	13.890	0.00229535	0.0890817	520.00	6.08039
153	13.990	0.00229538	0.0884763	520.00	6.20721
154	14.090	0.00229541	0.0878781	520.00	6.33262
155	14.190	0.00229546	0.0872871	520.00	6.45652
156	14.290	0.00229549	0.0867033	520.00	6.57885
157	14.390	0.00229554	0.0861269	520.00	6.69952
158	14.490	0.00229559	0.0855579	520.00	6.81846

159	14.590	0.00229565	0.0849963	520.00	6.93560
160	14.690	0.00229571	0.0844420	520.00	7.05087
161	14.790	0.00229578	0.0838952	520.00	7.16421
162	14.890	0.00229586	0.0833569	520.00	7.27555
163	14.990	0.00229594	0.0828240	520.00	7.38484
164	15.090	0.00229602	0.0822995	520.00	7.49202
165	15.190	0.00229611	0.0817825	520.00	7.59702
166	15.290	0.00229621	0.0812729	520.00	7.69982
167	15.390	0.00229631	0.0807706	520.00	7.80035
168	15.490	0.00229642	0.0802757	520.00	7.89857
169	15.590	0.00229653	0.0797880	520.00	7.99444
170	15.690	0.00229665	0.0793075	520.00	8.08791
171	15.790	0.00229678	0.0788341	520.00	8.17896
172	15.890	0.00229691	0.0783678	520.00	8.26755
173	15.990	0.00229704	0.0779084	520.00	8.35364
174	16.090	0.00229718	0.0774558	520.00	8.43721
175	16.190	0.00229733	0.0770099	520.00	8.51824
176	16.290	0.00229748	0.0765706	520.00	8.59668
177	16.390	0.00229763	0.0761378	520.00	8.67254
178	16.490	0.00229779	0.0757112	520.00	8.74578
179	16.590	0.00229796	0.0752910	520.00	8.81639
180	16.690	0.00229813	0.0748767	520.00	8.88436
181	16.790	0.00229830	0.0744685	520.00	8.94967
182	16.890	0.00229849	0.0740660	520.00	9.01232
183	16.990	0.00229867	0.0736693	520.00	9.07229
184	17.090	0.00229886	0.0732781	520.00	9.12959
185	17.190	0.00229906	0.0728924	520.00	9.18420
186	17.290	0.00229926	0.0725120	520.00	9.23613
187	17.390	0.00229946	0.0721369	520.00	9.28537
188	17.490	0.00229967	0.0717670	520.00	9.33194
189	17.590	0.00229989	0.0714023	520.00	9.37582
190	17.690	0.00230010	0.0710425	520.00	9.41703
191	17.790	0.00230033	0.0706878	520.00	9.45558
192	17.890	0.00230055	0.0703380	520.00	9.49147
193	17.990	0.00230079	0.0699932	520.00	9.52470
194	18.090	0.00230102	0.0696533	520.00	9.55530
195	18.190	0.00230126	0.0693184	520.00	9.58328
196	18.290	0.00230151	0.0689884	520.00	9.60864
197	18.390	0.00230176	0.0686634	520.00	9.63140
198	18.490	0.00230201	0.0683435	520.00	9.65158
199	18.590	0.00230226	0.0680286	520.00	9.66920
200	18.690	0.00230252	0.0677188	520.00	9.68426
201	18.790	0.00230279	0.0674143	520.00	9.69680
202	18.890	0.00230306	0.0671149	520.00	9.70683
203	18.990	0.00230333	0.0668209	520.00	9.71436
204	19.090	0.00230360	0.0665323	520.00	9.71943
205	19.190	0.00230388	0.0662491	520.00	9.72205
206	19.290	0.00230416	0.0659714	520.00	9.72225
207	19.390	0.00230444	0.0656993	520.00	9.72004
208	19.490	0.00230473	0.0654328	520.00	9.71546
209	19.590	0.00230502	0.0651719	520.00	9.70852
210	19.690	0.00230532	0.0649166	520.00	9.69926
211	19.790	0.00230561	0.0646669	520.00	9.68769
212	19.890	0.00230591	0.0644229	520.00	9.67384
213	19.990	0.00230621	0.0641844	520.00	9.65775
214	20.090	0.00230652	0.0639514	520.00	9.63942
215	20.190	0.00230682	0.0637239	520.00	9.61891
216	20.290	0.00230713	0.0635016	520.00	9.59622
217	20.390	0.00230745	0.0632846	520.00	9.57139
218	20.490	0.00230776	0.0630725	520.00	9.54444
219	20.590	0.00230808	0.0628653	520.00	9.51541
220	20.690	0.00230839	0.0626628	520.00	9.48432
221	20.790	0.00230871	0.0624647	520.00	9.45120
222	20.890	0.00230904	0.0622707	520.00	9.41608
223	20.990	0.00230936	0.0620807	520.00	9.37899
224	21.090	0.00230968	0.0618943	520.00	9.33998
225	21.190	0.00231001	0.0617112	520.00	9.29899
226	21.290	0.00231034	0.0615312	520.00	9.25615
227	21.390	0.00231067	0.0613540	520.00	9.21145
228	21.490	0.00231100	0.0611793	520.00	9.16493
229	21.590	0.00231133	0.0610067	520.00	9.11660
230	21.690	0.00231166	0.0608360	520.00	9.06650
231	21.790	0.00231199	0.0606668	520.00	9.01467
232	21.890	0.00231233	0.0604990	520.00	8.96112
233	21.990	0.00231266	0.0603323	520.00	8.90588
234	22.090	0.00231300	0.0601665	520.00	8.84930
235	22.190	0.00231333	0.0600014	520.00	8.79049
236	22.290	0.00231367	0.0598368	520.00	8.73039
237	22.390	0.00231401	0.0596726	520.00	8.66872
238	22.490	0.00231434	0.0595088	520.00	8.60551
239	22.590	0.00231468	0.0593452	520.00	8.54080
240	22.690	0.00231501	0.0591820	520.00	8.47460
241	22.790	0.00231535	0.0590192	520.00	8.40696
242	22.890	0.00231569	0.0588568	520.00	8.33789
243	22.990	0.00231602	0.0586951	520.00	8.26743
244	23.090	0.00231636	0.0585342	520.00	8.19560
245	23.190	0.00231669	0.0583744	520.00	8.12244
246	23.290	0.00231702	0.0582159	520.00	8.04796
247	23.390	0.00231736	0.0580592	520.00	7.97221
248	23.490	0.00231769	0.0579045	520.00	7.89519
249	23.590	0.00231802	0.0577522	520.00	7.81696
250	23.690	0.00231835	0.0576029	520.00	7.73752
251	23.790	0.00231867	0.0574569	520.00	7.65692
252	23.890	0.00231900	0.0573146	520.00	7.57517
253	23.990	0.00231933	0.0571767	520.00	7.49230
254	24.090	0.00231965	0.0570434	520.00	7.40835
255	24.190	0.00231997	0.0569153	520.00	7.32333
256	24.290	0.00232029	0.0567929	520.00	7.23728
257	24.390	0.00232061	0.0566765	520.00	7.15022
258	24.490	0.00232093	0.0565665	520.00	7.06218
259	24.590	0.00232124	0.0564632	520.00	6.97318
260	24.690	0.00232155	0.0563670	520.00	6.88326
261	24.790	0.00232186	0.0562780	520.00	6.79243
262	24.890	0.00232217	0.0561965	520.00	6.70073
263	24.990	0.00232247	0.0561224	520.00	6.60817
264	25.090	0.00232277	0.0560558	520.00	6.51479
265	25.190	0.00232307	0.0559965	520.00	6.42061
266	25.290	0.00232337	0.0559444	520.00	6.32565
267	25.390	0.00232366	0.0558992	520.00	6.22994
268	25.490	0.00232395	0.0558605	520.00	6.13351
269	25.590	0.00232424	0.0558278	520.00	6.03639
270	25.690	0.00232452	0.0558004	520.00	5.93858
271	25.790	0.00232480	0.0557777	520.00	5.84013
272	25.890	0.00232508	0.0557587	520.00	5.74105
273	25.990	0.00232536	0.0557427	520.00	5.64137
274	26.090	0.00232563	0.0557285	520.00	5.54112
275	26.190	0.00232589	0.0557151	520.00	5.44031
276	26.290	0.00232616	0.0557012	520.00	5.33897
277	26.390	0.00232641	0.0556856	520.00	5.23713
278	26.490	0.00232667	0.0556669	520.00	5.13481
279	26.590	0.00232692	0.0556436	520.00	5.03204
280	26.690	0.00232717	0.0556144	520.00	4.92883
281	26.790	0.00232741	0.0555776	520.00	4.82520
282	26.890	0.00232765	0.0555319	520.00	4.72120
283	26.990	0.00232789	0.0554756	520.00	4.61682
284	27.090	0.00232812	0.0554072	520.00	4.51211
285	27.190	0.00232834	0.0553252	520.00	4.40708
286	27.290	0.00232856	0.0552280	520.00	4.30175
287	27.390	0.00232878	0.0551143	520.00	4.19614
288	27.490	0.00232899	0.0549826	520.00	4.09029
289	27.590	0.00232920	0.0548316	520.00	3.98421
290	27.690	0.00232940	0.0546601	520.00	3.87791

291	27.790	0.00232560	0.0544665	520.00	3.77144
292	27.890	0.00232579	0.0542510	520.00	3.66480
293	27.990	0.00232598	0.0540114	520.00	3.55802
294	28.090	0.00233016	0.0537474	520.00	3.45112
295	28.190	0.00233034	0.0534583	520.00	3.34412
296	28.290	0.00233051	0.0531435	520.00	3.23704
297	28.390	0.00233068	0.0528027	520.00	3.12991
298	28.490	0.00233084	0.0524357	520.00	
					3.02274

DATA POINT	TIME (SECS)	ANGLE-OF-ATTACK RATE (RADIAN/SEC)	ALTITUDE (FT)	ALTITUDE RATE (FT/SEC)	ALT. ACCEL. (FT/SEC**2)	VERT. ACCEL. (FT/SEC**2)	ELEV. DEFLECT. (RADIANS)
1	0.0	-0.003801821	1000.00	0.01	0.89	0.0	0.0
2	0.010	-0.003770723	1000.00	0.02	0.91	0.0	0.0
3	0.020	-0.003739628	1000.00	0.03	0.93	0.0	0.0
4	0.030	-0.003708538	1000.00	0.04	0.96	0.0	0.0
5	0.040	-0.003677485	1000.00	0.04	0.98	0.0	0.0
6	0.060	-0.003615318	1000.00	0.06	1.02	0.0	0.0
7	0.080	-0.003553238	1000.00	0.09	1.06	0.0	0.0
8	0.100	-0.003491232	1000.01	0.11	1.11	0.0	0.0
9	0.120	-0.003429318	1000.01	0.13	1.15	0.0	0.0
10	0.140	-0.003367517	1000.01	0.15	1.19	0.0	0.0
11	0.180	-0.003244322	1000.02	0.20	1.28	0.0	0.0
12	0.220	-0.003121794	1000.03	0.26	1.36	0.0	0.0
13	0.260	-0.003000078	1000.04	0.31	1.45	0.0	0.0
14	0.300	-0.002879321	1000.05	0.37	1.53	0.0	0.0
15	0.340	-0.002759664	1000.07	0.43	1.61	0.0	0.0
16	0.420	-0.002524218	1000.11	0.57	1.78	0.0	0.0
17	0.500	-0.002294346	1000.16	0.72	1.94	0.0	0.0
18	0.580	-0.002072619	1000.22	0.88	2.11	0.0	0.0
19	0.660	-0.001858561	1000.30	1.06	2.27	0.0	0.0
20	0.740	-0.001653045	1000.39	1.24	2.42	0.0	0.0
21	0.840	-0.001411747	1000.53	1.50	2.62	0.0	0.0
22	0.940	-0.001187215	1000.69	1.77	2.80	0.0	0.0
23	1.040	-0.000981535	1000.88	2.06	2.99	0.0	0.0
24	1.140	-0.000796013	1001.10	2.36	3.17	0.0	0.0
25	1.240	-0.000631766	1001.36	2.69	3.34	0.0	0.0
26	1.340	-0.000489723	1001.64	3.03	3.51	0.0	0.0
27	1.440	-0.000370583	1001.96	3.39	3.67	0.0	0.0
28	1.540	-0.000274867	1002.32	3.76	3.82	0.0	0.0
29	1.640	-0.000202871	1002.72	4.15	3.97	0.0	0.0
30	1.740	-0.000154686	1003.15	4.56	4.12	0.0	0.0
31	1.840	-0.000130200	1003.63	4.98	4.25	0.0	0.0
32	1.940	-0.000129105	1004.15	5.41	4.38	0.0	0.0
33	2.040	-0.000150999	1004.71	5.85	4.50	0.0	0.0
34	2.140	-0.000194902	1005.32	6.31	4.62	0.0	0.0
35	2.240	-0.000260266	1005.97	6.78	4.73	0.0	0.0
36	2.340	-0.000345988	1006.68	7.26	4.82	0.0	0.0
37	2.440	-0.000450923	1007.43	7.74	4.92	0.0	0.0
38	2.540	-0.000573907	1008.23	8.24	5.00	0.0	0.0
39	2.640	-0.000713267	1009.07	8.74	5.07	0.0	0.0
40	2.740	-0.000867841	1009.97	9.25	5.14	0.0	0.0
41	2.840	-0.001035999	1010.92	9.77	5.20	0.0	0.0
42	2.940	-0.001216167	1011.93	10.29	5.25	0.0	0.0
43	3.040	-0.001406716	1012.98	10.82	5.29	0.0	0.0
44	3.140	-0.001606035	1014.09	11.35	5.32	0.0	0.0
45	3.240	-0.001812500	1015.25	11.88	5.35	0.0	0.0
46	3.340	-0.002024513	1016.47	12.42	5.37	0.0	0.0
47	3.440	-0.002240515	1017.74	12.96	5.37	0.0	0.0
48	3.540	-0.002459004	1019.06	13.49	5.37	0.0	0.0
49	3.640	-0.002678546	1020.44	14.03	5.37	0.0	0.0
50	3.740	-0.002897789	1021.87	14.57	5.35	0.0	0.0
51	3.840	-0.003115474	1023.35	15.10	5.32	0.0	0.0
52	3.940	-0.003330448	1024.89	15.63	5.29	0.0	0.0
53	4.040	-0.003541665	1026.48	16.16	5.25	0.0	0.0
54	4.140	-0.003748201	1028.12	16.69	5.20	0.0	0.0
55	4.240	-0.003949249	1029.81	17.20	5.15	0.0	0.0
56	4.340	-0.004144132	1031.56	17.71	5.08	0.0	0.0
57	4.440	-0.004332293	1033.35	18.22	5.01	0.0	0.0
58	4.540	-0.004513303	1035.20	18.71	4.93	0.0	0.0
59	4.640	-0.004686852	1037.10	19.20	4.84	0.0	0.0
60	4.740	-0.004852751	1039.04	19.68	4.75	0.0	0.0
61	4.840	-0.005013920	1041.03	20.15	4.65	0.0	0.0
62	4.940	-0.005161386	1043.07	20.61	4.55	0.0	0.0
63	5.040	-0.005304272	1045.15	21.06	4.43	0.0	0.0
64	5.140	-0.005439793	1047.28	21.50	4.32	0.0	0.0
65	5.240	-0.005508237	1049.45	21.92	4.19	0.0	0.0
66	5.340	-0.005689965	1051.67	22.34	4.06	0.0	0.0
67	5.440	-0.005805393	1053.92	22.74	3.93	0.0	0.0
68	5.540	-0.005914982	1056.21	23.12	3.79	0.0	0.0
69	5.640	-0.006014230	1058.54	23.49	3.64	0.0	0.0
70	5.740	-0.006111657	1060.91	23.85	3.50	0.0	0.0
71	5.840	-0.006213794	1063.31	24.19	3.34	0.0	0.0
72	5.940	-0.006305177	1065.75	24.52	3.18	0.0	0.0
73	6.040	-0.006393330	1068.22	24.83	3.02	0.0	0.0
74	6.140	-0.006478767	1070.71	25.12	2.86	0.0	0.0
75	6.240	-0.006561954	1073.24	25.40	2.69	0.0	0.0
76	6.340	-0.006644352	1075.79	25.66	2.51	0.0	0.0
77	6.440	-0.006723363	1078.37	25.90	2.34	0.0	0.0
78	6.540	-0.006802344	1080.97	26.13	2.16	0.0	0.0
79	6.640	-0.006880084	1083.60	26.33	1.98	0.0	0.0
80	6.740	-0.006958394	1086.24	26.52	1.79	0.0	0.0
81	6.840	-0.007035908	1088.90	26.69	1.61	0.0	0.0
82	6.940	-0.007113281	1091.58	26.84	1.42	0.0	0.0
83	7.040	-0.007190589	1094.27	26.98	1.23	0.0	0.0
84	7.140	-0.007267850	1096.97	27.09	1.04	0.0	0.0
85	7.240	-0.007345623	1099.69	27.18	0.85	0.0	0.0
86	7.340	-0.007422015	1102.41	27.26	0.66	0.0	0.0
87	7.440	-0.007498683	1105.14	27.32	0.46	0.0	0.0
88	7.540	-0.007574929	1107.87	27.35	0.27	0.0	0.0
89	7.640	-0.007650277	1110.61	27.37	0.07	0.0	0.0
90	7.740	-0.007724607	1113.34	27.37	-0.12	0.0	0.0
91	7.840	-0.007797669	1116.08	27.35	-0.32	0.0	0.0
92	7.940	-0.007869088	1118.81	27.30	-0.51	0.0	0.0
93	8.040	-0.007938525	1121.54	27.24	-0.71	0.0	0.0
94	8.140	-0.008005625	1124.26	27.16	-0.90	0.0	0.0
95	8.240	-0.008070330	1126.97	27.06	-1.09	0.0	0.0
96	8.340	-0.008131384	1129.67	26.94	-1.29	0.0	0.0
97	8.440	-0.008189337	1132.36	26.81	-1.48	0.0	0.0
98	8.540	-0.008243551	1135.03	26.65	-1.67	0.0	0.0
99	8.640	-0.008293708	1137.69	26.47	-1.86	0.0	0.0
100	8.740	-0.008339513	1140.33	26.28	-2.05	0.0	0.0
101	8.840	-0.008380657	1142.94	26.06	-2.23	0.0	0.0
102	8.940	-0.008417023	1145.54	25.83	-2.42	0.0	0.0
103	9.040	-0.008448288	1148.11	25.58	-2.60	0.0	0.0
104	9.140	-0.008474326	1150.66	25.31	-2.79	0.0	0.0
105	9.240	-0.008495010	1153.17	25.02	-2.97	0.0	0.0
106	9.340	-0.008510252	1155.66	24.72	-3.15	0.0	0.0
107	9.440	-0.008520006	1158.11	24.39	-3.32	0.0	0.0
108	9.540	-0.008524260	1160.54	24.05	-3.50	0.0	0.0
109	9.640	-0.008523050	1162.92	23.69	-3.67	0.0	0.0
110	9.740	-0.008516444	1165.27	23.32	-3.84	0.0	0.0
111	9.840	-0.008504551	1167.59	22.93	-4.00	0.0	0.0
112	9.940	-0.008487508	1169.86	22.52	-4.17	0.0	0.0
113	10.040	-0.008465488	1172.09	22.09	-4.33	0.0	0.0
114	10.140	-0.008438691	1174.28	21.65	-4.49	0.0	0.0
115	10.240	-0.008407340	1176.42	21.20	-4.64	0.0	0.0
116	10.340	-0.008371681	1178.52	20.72	-4.80	0.0	0.0
117	10.440	-0.008331976	1180.56	20.24	-4.95	0.0	0.0

118	10.540	-0.008288503	1182.56	19.73	-5.09	0.0	0.0
119	10.640	-0.008241547	1184.51	19.22	-5.24	0.0	0.0
120	10.740	-0.008191399	1186.41	18.69	-5.38	0.0	0.0
121	10.840	-0.008138353	1188.25	18.14	-5.52	0.0	0.0
122	10.940	-0.008082701	1190.03	17.58	-5.65	0.0	0.0
123	11.040	-0.008024729	1191.76	17.01	-5.78	0.0	0.0
124	11.140	-0.007964718	1193.44	16.43	-5.91	0.0	0.0
125	11.240	-0.007902933	1195.05	15.83	-6.03	0.0	0.0
126	11.340	-0.007839629	1196.60	15.22	-6.16	0.0	0.0
127	11.440	-0.007775044	1198.09	14.60	-6.27	0.0	0.0
128	11.540	-0.007709398	1199.52	13.97	-6.39	0.0	0.0
129	11.640	-0.007642892	1200.89	13.32	-6.50	0.0	0.0
130	11.740	-0.007575705	1202.18	12.67	-6.61	0.0	0.0
131	11.840	-0.007507997	1203.42	12.00	-6.71	0.0	0.0
132	11.940	-0.007439905	1204.58	11.32	-6.81	0.0	0.0
133	12.040	-0.007371546	1205.68	10.64	-6.91	0.0	0.0
134	12.140	-0.007303013	1206.71	9.94	-7.00	0.0	0.0
135	12.240	-0.007234382	1207.67	9.24	-7.09	0.0	0.0
136	12.340	-0.007165706	1208.56	8.52	-7.18	0.0	0.0
137	12.440	-0.007097021	1209.38	7.80	-7.26	0.0	0.0
138	12.540	-0.007028347	1210.12	7.07	-7.34	0.0	0.0
139	12.640	-0.006959687	1210.79	6.33	-7.41	0.0	0.0
140	12.740	-0.006891031	1211.39	5.59	-7.48	0.0	0.0
141	12.840	-0.006822358	1211.91	4.84	-7.55	0.0	0.0
142	12.940	-0.006753638	1212.35	4.08	-7.62	0.0	0.0
143	13.040	-0.006684831	1212.72	3.32	-7.68	0.0	0.0
144	13.140	-0.006615895	1213.02	2.54	-7.73	0.0	0.0
145	13.240	-0.006546782	1213.23	1.77	-7.78	0.0	0.0
146	13.340	-0.006477446	1213.37	0.99	-7.83	0.0	0.0
147	13.440	-0.006407839	1213.43	0.20	-7.88	0.0	0.0
148	13.490	-0.006372920	1213.43	-0.19	-7.90	0.0	0.0
149	13.590	-0.006302825	1213.37	-0.98	-7.94	0.0	0.0
150	13.690	-0.006232358	1213.23	-1.78	-7.97	0.0	0.0
151	13.790	-0.006161489	1213.01	-2.58	-8.01	0.0	0.0
152	13.890	-0.006090194	1212.72	-3.38	-8.03	0.0	0.0
153	13.990	-0.006018462	1212.34	-4.19	-8.06	0.0	0.0
154	14.090	-0.005946288	1211.88	-4.99	-8.08	0.0	0.0
155	14.190	-0.005873682	1211.34	-5.80	-8.10	0.0	0.0
156	14.290	-0.005800660	1210.72	-6.61	-8.11	0.0	0.0
157	14.390	-0.005727253	1210.02	-7.42	-8.12	0.0	0.0
158	14.490	-0.005653502	1209.23	-8.24	-8.13	0.0	0.0
159	14.590	-0.005579458	1208.37	-9.05	-8.13	0.0	0.0
160	14.690	-0.005505185	1207.42	-9.86	-8.13	0.0	0.0
161	14.790	-0.005430754	1206.40	-10.67	-8.12	0.0	0.0
162	14.890	-0.005356247	1205.29	-11.49	-8.12	0.0	0.0
163	14.990	-0.005281781	1204.10	-12.30	-8.10	0.0	0.0
164	15.090	-0.005207364	1202.83	-13.11	-8.09	0.0	0.0
165	15.190	-0.005133185	1201.48	-13.91	-8.07	0.0	0.0
166	15.290	-0.005059319	1200.05	-14.72	-8.05	0.0	0.0
167	15.390	-0.004985874	1198.54	-15.52	-8.02	0.0	0.0
168	15.490	-0.004912958	1196.94	-16.32	-7.99	0.0	0.0
169	15.590	-0.004840676	1195.27	-17.12	-7.96	0.0	0.0
170	15.690	-0.004769134	1193.52	-17.92	-7.92	0.0	0.0
171	15.790	-0.004698431	1191.65	-18.71	-7.88	0.0	0.0
172	15.890	-0.004628661	1189.78	-19.49	-7.84	0.0	0.0
173	15.990	-0.004559910	1187.79	-20.28	-7.80	0.0	0.0
174	16.090	-0.004492255	1185.72	-21.05	-7.75	0.0	0.0
175	16.190	-0.004425764	1183.58	-21.82	-7.70	0.0	0.0
176	16.290	-0.004360491	1181.36	-22.59	-7.64	0.0	0.0
177	16.390	-0.004296480	1179.06	-23.35	-7.58	0.0	0.0
178	16.490	-0.004233758	1176.69	-24.11	-7.52	0.0	0.0
179	16.590	-0.004172341	1174.24	-24.86	-7.46	0.0	0.0
180	16.690	-0.004112227	1171.72	-25.60	-7.39	0.0	0.0
181	16.790	-0.004053402	1169.12	-26.33	-7.32	0.0	0.0
182	16.890	-0.003995836	1166.45	-27.06	-7.24	0.0	0.0
183	16.990	-0.003939478	1163.71	-27.78	-7.17	0.0	0.0
184	17.090	-0.003884274	1160.89	-28.50	-7.09	0.0	0.0
185	17.190	-0.003830147	1158.01	-29.20	-7.01	0.0	0.0
186	17.290	-0.003777011	1155.05	-29.90	-6.92	0.0	0.0
187	17.390	-0.003724767	1152.03	-30.58	-6.83	0.0	0.0
188	17.490	-0.003673307	1148.94	-31.26	-6.74	0.0	0.0
189	17.590	-0.003622512	1145.78	-31.93	-6.65	0.0	0.0
190	17.690	-0.003572259	1142.65	-32.59	-6.56	0.0	0.0
191	17.790	-0.003522419	1139.26	-33.24	-6.46	0.0	0.0
192	17.890	-0.003472861	1135.90	-33.88	-6.36	0.0	0.0
193	17.990	-0.003423452	1132.48	-34.52	-6.26	0.0	0.0
194	18.090	-0.003374084	1129.00	-35.14	-6.15	0.0	0.0
195	18.190	-0.003324871	1125.46	-35.76	-6.04	0.0	0.0
196	18.290	-0.003274856	1121.85	-36.36	-5.93	0.0	0.0
197	18.390	-0.003224810	1118.19	-36.93	-5.82	0.0	0.0
198	18.490	-0.003174336	1114.47	-37.51	-5.71	0.0	0.0
199	18.590	-0.003123353	1110.69	-38.07	-5.59	0.0	0.0
200	18.690	-0.003071793	1106.85	-38.63	-5.47	0.0	0.0
201	18.790	-0.003019609	1102.96	-39.17	-5.35	0.0	0.0
202	18.890	-0.002966772	1099.02	-39.70	-5.23	0.0	0.0
203	18.990	-0.002913277	1095.02	-40.21	-5.11	0.0	0.0
204	19.090	-0.002859139	1090.98	-40.72	-4.98	0.0	0.0
205	19.190	-0.002804397	1086.88	-41.21	-4.85	0.0	0.0
206	19.290	-0.002749114	1082.73	-41.69	-4.72	0.0	0.0
207	19.390	-0.002693376	1078.54	-42.16	-4.59	0.0	0.0
208	19.490	-0.002637297	1074.30	-42.61	-4.46	0.0	0.0
209	19.590	-0.002581006	1070.02	-43.05	-4.32	0.0	0.0
210	19.690	-0.002524658	1065.70	-43.47	-4.19	0.0	0.0
211	19.790	-0.002468429	1061.33	-43.88	-4.05	0.0	0.0
212	19.890	-0.002412511	1056.92	-44.28	-3.91	0.0	0.0
213	19.990	-0.002357111	1052.47	-44.66	-3.77	0.0	0.0
214	20.090	-0.002302480	1047.99	-45.03	-3.63	0.0	0.0
215	20.190	-0.002248757	1043.47	-45.39	-3.48	0.0	0.0
216	20.290	-0.002196268	1038.91	-45.73	-3.34	0.0	0.0
217	20.390	-0.002145220	1034.32	-46.06	-3.19	0.0	0.0
218	20.490	-0.002095850	1029.70	-46.37	-3.05	0.0	0.0
219	20.590	-0.002048385	1025.05	-46.67	-2.90	0.0	0.0
220	20.690	-0.002003045	1020.37	-46.95	-2.75	0.0	0.0
221	20.790	-0.001960034	1015.66	-47.22	-2.60	0.0	0.0
222	20.890	-0.001919537	1010.92	-47.47	-2.45	0.0	0.0
223	20.990	-0.001881716	1006.16	-47.71	-2.30	0.0	0.0
224	21.090	-0.001846701	1001.38	-47.93	-2.14	0.0	0.0
225	21.190	-0.001814598	996.58	-48.13	-1.99	0.0	0.0
226	21.290	-0.001785475	991.76	-48.33	-1.84	0.0	0.0
227	21.390	-0.001759362	986.91	-48.50	-1.68	0.0	0.0
228	21.490	-0.001736248	982.06	-48.66	-1.53	0.0	0.0
229	21.590	-0.001716081	977.18	-48.81	-1.37	0.0	0.0
230	21.690	-0.001698766	972.29	-48.94	-1.21	0.0	0.0
231	21.790	-0.001684167	967.40	-49.05	-1.06	0.0	0.0
232	21.890	-0.001672074	962.49	-49.15	-0.90	0.0	0.0
233	21.990	-0.001662265	957.57	-49.23	-0.74	0.0	0.0
234	22.090	-0.001654518	952.64	-49.30	-0.58	0.0	0.0
235	22.190	-0.001648458	947.71	-49.35	-0.43	0.0	0.0
236	22.290	-0.001643755	942.77	-49.38	-0.27	0.0	0.0
237	22.390	-0.001640025	937.83	-49.40	-0.11	0.0	0.0
238	22.490	-0.001636852	932.88	-49.40	0.05	0.0	0.0
239	22.590	-0.001633798	927.95	-49.39	0.21	0.0	0.0
240	22.690	-0.001630404	923.01	-49.36	0.37	0.0	0.0
241	22.790	-0.001626200	918.08	-49.32	0.52	0.0	0.0
242	22.890	-0.001620711	913.15	-49.26	0.68	0.0	0.0
243	22.990	-0.001613462	908.23	-49.18	0.84	0.0	0.0
244	23.090	-0.001603989	903.32	-49.09	1.00	0.0	0.0
245	23.190	-0.001591846	898.41	-48.98	1.16	0.0	0.0
246	23.290	-0.001576610	893.52	-48.86	1.31	0.0	0.0
247	23.390	-0.001557893	888.64	-48.72	1.47	0.0	0.0
248	23.490	-0.001535349	883.76	-48.56	1.63	0.0	0.0
249	23.590	-0.001508680	878.93	-48.39	1.78	0.0	0.0

250	23.690	-0.001477646	874.18	-48.21	1.94	0.0	0.0
251	23.790	-0.001442068	869.29	-48.00	2.09	0.0	0.0
252	23.890	-0.001401840	864.50	-47.79	2.25	0.0	0.0
253	23.990	-0.001356928	859.73	-47.56	2.40	0.0	0.0
254	24.090	-0.001307380	854.99	-47.31	2.55	0.0	0.0
255	24.190	-0.001253329	850.27	-47.05	2.70	0.0	0.0
256	24.290	-0.001194991	845.58	-46.77	2.85	0.0	0.0
257	24.390	-0.001132674	840.92	-46.47	3.00	0.0	0.0
258	24.490	-0.001066774	836.29	-46.17	3.15	0.0	0.0
259	24.590	-0.000997774	831.69	-45.84	3.30	0.0	0.0
260	24.690	-0.000926245	827.12	-45.51	3.45	0.0	0.0
261	24.790	-0.000852842	822.58	-45.16	3.59	0.0	0.0
262	24.890	-0.000778297	818.09	-44.79	3.74	0.0	0.0
263	24.990	-0.000703415	813.63	-44.41	3.88	0.0	0.0
264	25.090	-0.000629071	809.21	-44.01	4.02	0.0	0.0
265	25.190	-0.000556195	804.83	-43.60	4.16	0.0	0.0
266	25.290	-0.000485768	800.49	-43.18	4.30	0.0	0.0
267	25.390	-0.000418811	796.19	-42.74	4.44	0.0	0.0
268	25.490	-0.000356373	791.94	-42.29	4.58	0.0	0.0
269	25.590	-0.000299520	787.73	-41.83	4.71	0.0	0.0
270	25.690	-0.000249324	783.57	-41.35	4.84	0.0	0.0
271	25.790	-0.000206849	779.46	-40.86	4.98	0.0	0.0
272	25.890	-0.000173138	775.40	-40.36	5.11	0.0	0.0
273	25.990	-0.000149201	771.39	-39.84	5.24	0.0	0.0
274	26.090	-0.000136003	767.43	-39.31	5.36	0.0	0.0
275	26.190	-0.000134447	763.53	-38.77	5.49	0.0	0.0
276	26.290	-0.000145366	759.68	-38.21	5.61	0.0	0.0
277	26.390	-0.000169511	755.89	-37.64	5.73	0.0	0.0
278	26.490	-0.000207535	752.15	-37.06	5.85	0.0	0.0
279	26.590	-0.000259990	748.48	-36.47	5.97	0.0	0.0
280	26.690	-0.000327314	744.86	-35.87	6.09	0.0	0.0
281	26.790	-0.000409822	741.30	-35.26	6.20	0.0	0.0
282	26.890	-0.000507702	737.81	-34.63	6.31	0.0	0.0
283	26.990	-0.000621008	734.38	-33.99	6.42	0.0	0.0
284	27.090	-0.000749659	731.01	-33.34	6.53	0.0	0.0
285	27.190	-0.000893431	727.71	-32.69	6.64	0.0	0.0
286	27.290	-0.001051966	724.47	-32.02	6.74	0.0	0.0
287	27.390	-0.001224763	721.30	-31.34	6.84	0.0	0.0
288	27.490	-0.001411187	718.21	-30.65	6.94	0.0	0.0
289	27.590	-0.001610473	715.18	-29.95	7.04	0.0	0.0
290	27.690	-0.001821729	712.22	-29.24	7.14	0.0	0.0
291	27.790	-0.002043949	709.33	-28.52	7.23	0.0	0.0
292	27.890	-0.002276013	706.51	-27.79	7.32	0.0	0.0
293	27.990	-0.002516709	703.77	-27.06	7.41	0.0	0.0
294	28.090	-0.002764735	701.10	-26.31	7.49	0.0	0.0
295	28.190	-0.003018715	698.51	-25.56	7.58	0.0	0.0
296	28.290	-0.003277215	695.99	-24.80	7.66	0.0	0.0
297	28.390	-0.003538754	693.56	-24.03	7.74	0.0	0.0
298	28.490	-0.003801821	691.18	-23.25	7.81	0.0	0.0

M O D E L   S O L U T I O N S

```
MODEL 12   P0 =  4.93581693378428E7CD 04   CD0 =  4.4037182910839300D-02
           P1 =  0.0                       CD1 =  0.0
POINT      P2 =  8.5752012973184380D 02    CD2 =  1.3907096382734650D 00
FAILURES   P3 = -1.0052767849498400D 00    CD3 =  0.0
=   0      P4 =  0.0                       CD4 =  1.9472637990951000D 03

FIT ERROR=  2.9482344556487320D-05
```

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MODEL 12 FOUND TO BE BEST FIT
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CALCULATED CONSTANT BIAS IN ANGLE OF ATTACK = -1.3758531060-07
ANGLE-OF-ATTACK BIAS < 5.0D-07.  BYPASSING ANALYSIS.
```

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INITIALIZATION OF COEFFICIENT CONVERGENCE SCHEME BY 1/3 POWER MODEL

FORM:  P =  2.83390D 04*V**1/3

       CD=  1.44455D-01 + -4.36720D 00*A +  6.47583D 01*A**2 + -4.07313D 02*A**3 +  1.02004D 03*A**4

     WHERE:  V = AIRSPEED(FT/SEC)
             A = ANGLE OF ATTACK(RADIAN)

FIT ERROR =  8.7314186630-05
```

```
                                           PAST                PRESENT
                                     2.4494629487600 04   2.4574168285600 04
COEFFICIENT CONVERGENCE ITERATION # 1   1.0921577963600-01   1.0785382272600-01
NUMBER OF COEFFICIENTS PASSED = 0    -3.0704136140600-01  -3.0069703902200-01
FIT ERROR =  7.35100391749540-05      2.4917469743400-01   2.6368903943300-01
```

```
                                           PAST                PRESENT
                                     2.4574168285600 04   2.4672530379800 04
COEFFICIENT CONVERGENCE ITERATION # 2   1.0785382272600-01   1.0788167930800-01
NUMBER OF COEFFICIENTS PASSED = 0    -3.0069703902200-01  -3.0082676843300-01
FIT ERROR =  7.34425132217670-05      2.6368903943300-01   2.6380105787400-01
```

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                                                      PAST                   PRESENT
                                              2.45725303798D 04      2.45725641117D 04
                                              1.07881679308D-01      1.07881105535D-01
COEFFICIENT CONVERGENCE ITERATION # 3        -3.00826768433D-01     -3.00824096328D-01
NUMBER OF COEFFICIENTS PASSED = 1             2.63801057874D-01      2.63798750506D-01
FIT ERROR =  7.34439015894170-05
```

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                                                      PAST                   PRESENT
                                              2.45725641117D 04      2.45725634170D 04
                                              1.07881105535D-01      1.07881117352D-01
COEFFICIENT CONVERGENCE ITERATION # 4        -3.00824096328D-01     -3.00824181358D-01
NUMBER OF COEFFICIENTS PASSED = 3             2.63798750506D-01      2.63798798026D-01
FIT ERROR =  7.34438729956830-05
```

```
                                                      PAST                   PRESENT
                                              2.45725634170D 04      2.45725634313D 04
                                              1.07881117352D-01      1.07881117108D-01
COEFFICIENT CONVERGENCE ITERATION # 5        -3.00824181358D-01     -3.00824150225D-01
NUMBER OF COEFFICIENTS PASSED = 3             2.63798798026D-01      2.63798797046D-01
FIT ERROR =  7.34438736045670-05
```

```
                                                      PAST                   PRESENT
                                              2.45725634313D 04      2.45725634310D 04
                                              1.07881117108D-01      1.07881117113D-01
COEFFICIENT CONVERGENCE ITERATION # 6        -3.00824150225D-01     -3.00824150248D-01
NUMBER OF COEFFICIENTS PASSED = 4             2.63798797046D-01      2.63798797067D-01
FIT ERROR =  7.34438735724340-05
```

```
INITIAL ESTIMATES OF LIFT COEFFICIENTS

     CLAO=-0.70577921627205530-02
     CLA = 0.64650443812033310 01
     CLAX=-0.64798763235603810 00
     EXPX= 0.20000000000000000 01
     CLO = 0.0
```

```
LIFT COEFFICIENTS: BY LEAST SQUARE DISTANCE

     CLAO=-0.70577921627205530-02
     CLA = 0.64650443812033310 01
     CLAX=-0.64798763735603810 00
     EXPX= 0.20000000000000000 01
     CLO= 0.0

     LIFT COEFFICIENT FIT ERROR=  0.26506704477917600D-02
```

```
               M O D E L   S O L U T I O N S

MODEL 12     P0 =  2.75078599840527210D 04    CD0 =  3.45182318296780080-02
             P1 =  0.0                        CD1 =  0.0
POINT        P2 =  1.14084787667947200 03     CD2 =  1.31737568493482700 00
FAILURES     P3 = -2.23526219441737300 00     CD3 =  0.0
=    0       P4 =  0.0                        CD4 =  1.99131365864896000 03

FIT ERROR=  7.40616301673869300-08

                 MODEL 12 FOUND TO BE BEST FIT
```

```
****** BEGIN FREQUENCY CORRECTIONS TO ANGLE OF ATTACK ******

ITERATION# 1

               LIFT COEFFICIENTS BY LEAST-SQUARE DISTANCE

                    CLAO = -0.34147935610469070-02
                    CLA  =  0.63832043140372410 01
                    CLAX = -0.81321504977005010 00
                    EXPX =  0.20617851564802930 01
                    CLO  =  0.0

FREQUENCY-DEPENDENT FIT ERROR FOR ANGLE OF ATTACK =  0.92090992459220-07

       PITCH-ANGLE GAIN =  1.00042694646D 00
       PITCH-ANGLE BIAS =  3.61740631619D-05 RADIAN

               M O D E L   S O L U T I O N S
```

```
MODEL 12   P0 =  2.7C30228574166940D 04   CD0 =  3.37898522994930600-02
           P1 =  0.0                      CD1 =  0.0
POINT      P2 =  1.1855081449d723200 03   CD2 =  1.2991377480931200D 00
FAILURES   P3 = -2.3158505798459800D 00   CD3 =  0.0
 =   0     P4 =  0.0                      CD4 =  2.0074003876563220D 03

FIT ERROR=  7.6242337485368680D-08

                  MODEL 12 FOUND TO BE BEST FIT
```

ITERATION# 2

```
LIFT COEFFICIENTS BY LEAST-SQUARE DISTANCE

      CLA0 = -0.3288393446091276D-02
      CLA  =  0.6379863022368738D 01
      CLAX = -0.5245774221339048D 00
      EXPX =  0.2099523163426028D 01
      CLQ  =  0.0
```

```
FREQUENCY-DEPENDENT FIT ERROR FOR ANGLE OF ATTACK =  0.4312081474102D-07
```

```
 PITCH-ANGLE GAIN =  1.000002676740 00
 PITCH-ANGLE BIAS = -1.910061789750-07 RADIAN
```

M O D E L   S O L U T I O N S

```
MODEL 12   P0 =  2.6875719697492940D 04   CD0 =  3.37162862741516300-02
           P1 =  0.0                      CD1 =  0.0
POINT      P2 =  1.1575872426037310D 03   CD2 =  1.2982551730516210D 00
FAILURES   P3 = -2.3251617188141740D 00   CD3 =  0.0
 =   0     P4 =  0.0                      CD4 =  2.0081694877397420D 03

FIT ERROR=  6.8645271740490780D-08

                  MODEL 12 FOUND TO BE BEST FIT
```

ITERATION# 3

```
LIFT COEFFICIENTS BY LEAST-SQUARE DISTANCE

      CLA0 = -0.3288766972216341D-02
      CLA  =  0.6379943630077791D 01
      CLAX = -0.5245872951963168D 00
      EXPX =  0.2099577260968483D 01
      CLQ  =  0.0
```

```
FREQUENCY-DEPENDENT FIT ERROR FOR ANGLE OF ATTACK =  0.80939728036860-28
```

```
 PITCH-ANGLE GAIN =  1.000006258860 00
 PITCH-ANGLE BIAS = -4.466439930360-07 RADIAN
```

M O D E L   S O L U T I O N S

```
MODEL 12   P0 =  2.6515667963015080D 04   CD0 =  3.35446152241184800-02
           P1 =  0.0                      CD1 =  0.0
POINT      P2 =  1.1624343342530210D 03   CD2 =  1.2962115801563920D 00
FAILURES   P3 = -2.3468740578254750D 00   CD3 =  0.0
 =   0     P4 =  0.0                      CD4 =  2.0100184468776690D 03

FIT ERROR=  6.3815533966136650D-08

                  MODEL 12 FOUND TO BE BEST FIT
```

LIFT COEFFICIENTS BY LEAST-SQUARE DISTANCE

```
CLAO = -0.32915861184525310-02
CLA  =  0.63802093758433810 01
CLAX = -0.52408762365713790 00
EXPX =  0.20986558702098390 01
CLQ  =  0.0
```

****** END FREQUENCY CORRECTIONS TO ANGLE OF ATTACK ******

```
/////////////////////////////////////////////////////////////////////////////////////////
/*                                                                                     */
/*  INTERMEDIATE    GENERAL EXPRESSIONS FOR POWER, DRAG COEFFICIENT, AND LIFT COEFFICIENT */
/*                                                                                     */
/*   P = P0 + P1*V** 3.33300D-01 + P2*V** 1.000000 00 + P3*V** 2.000000 00 + P4*V** 3.000000 00 */
/*                                                                                     */
/*               CD = CD0 + CD1*A** 1 + CD2*A** 2 + CD3*A** 3 + CD4*A** 6              */
/*                                                                                     */
/*                  CL = CLA0 + CLA*A + CLAX*A** 2.09866D 00 + CLQ*R                   */
/*                                                                                     */
/*   WHERE:                                                                            */
/*                                                                                     */
/*          V = AIRSPEED(FT/SEC)                                                       */
/*          A = ANGLE OF ATTACK(RADIAN)                                                */
/*          R = PITCH RATE(RADIAN/SEC)                                                 */
/*                                                                                     */
/*      P0 =  0.26515667963D 05   CD0 =  0.33544615224D-01   CLA0 = -0.32915861185D-02 */
/*      P1 =  0.0                 CD1 =  0.0                 CLA  =  0.63802093758D 01 */
/*      P2 =  0.11624343343D 04   CD2 =  0.12962115802D 01   CLAX = -0.52408762356D 00 */
/*      P3 = -0.23468740578D 01   CD3 =  0.0                 CLQ  =  0.0               */
/*      P4 =  0.0                 CD4 =  0.20100164469D 04                             */
/*                                                                                     */
/////////////////////////////////////////////////////////////////////////////////////////
```

MODIFIED DATA (FOR PROGRAM LOOP# 1)

DATA POINT	TIME (SECS)	WEIGHT (LBF)	PITCH ANGLE (RADIANS)	PITCH RATE (RADIAN/SEC)	AIRSPEED (FT/SEC)
1	0.0	3999.9997	0.1627443	0.0067465	146.7390
2	0.010	3999.9993	0.1628125	0.0068863	146.7856
3	0.020	3999.9989	0.1628821	0.0070259	146.8322
4	0.030	3999.9985	0.1629531	0.0071651	146.8787
5	0.040	3999.9982	0.1630255	0.0073041	146.9251
6	0.060	3999.9974	0.1631744	0.0075812	147.0178
7	0.080	3999.9967	0.1633289	0.0078571	147.1103
8	0.100	3999.9959	0.1634888	0.0081318	147.2025
9	0.120	3999.9952	0.1636543	0.0084053	147.2945
10	0.140	3999.9944	0.1638252	0.0086777	147.3862
11	0.180	3999.9930	0.1641833	0.0092187	147.5689
12	0.220	3999.9915	0.1645629	0.0097548	147.7505
13	0.260	3999.9900	0.1649639	0.0102859	147.9311
14	0.300	3999.9885	0.1653861	0.0108119	148.1106
15	0.340	3999.9870	0.1658292	0.0113328	148.2890
16	0.420	3999.9840	0.1667774	0.0123586	148.6424
17	0.500	3999.9810	0.1678068	0.0133628	148.9911
18	0.580	3999.9780	0.1689158	0.0143448	149.3349
19	0.660	3999.9750	0.1701024	0.0153039	149.6737
20	0.740	3999.9720	0.1713649	0.0162397	150.0073
21	0.840	3999.9682	0.1730467	0.0173758	150.4168
22	0.940	3999.9644	0.1748402	0.0184735	150.8176
23	1.040	3999.9607	0.1767417	0.0195319	151.2094
24	1.140	3999.9569	0.1787470	0.0205496	151.5921
25	1.240	3999.9531	0.1808519	0.0215241	151.9653
26	1.340	3999.9493	0.1830522	0.0224551	152.3289
27	1.440	3999.9455	0.1853434	0.0233414	152.6826
28	1.540	3999.9417	0.1877210	0.0241820	153.0263
29	1.640	3999.9380	0.1901804	0.0249762	153.3598
30	1.740	3999.9341	0.1927168	0.0257229	153.6829
31	1.840	3999.9303	0.1953256	0.0264215	153.9955
32	1.940	3999.9265	0.1980018	0.0270710	154.2975
33	2.040	3999.9227	0.2007406	0.0276714	154.5888
34	2.140	3999.9189	0.2035369	0.0282234	154.8694
35	2.240	3999.9151	0.2063861	0.0287274	155.1391
36	2.340	3999.9113	0.2092832	0.0291828	155.3979
37	2.440	3999.9074	0.2122235	0.0295896	155.6458
38	2.540	3999.9036	0.2152021	0.0299475	155.8828
39	2.640	3999.8998	0.2182140	0.0302563	156.1089
40	2.740	3999.8959	0.2212544	0.0305159	156.3241
41	2.840	3999.8921	0.2243182	0.0307263	156.5285
42	2.940	3999.8883	0.2274036	0.0308872	156.7221
43	3.040	3999.8844	0.2304967	0.0309988	156.9050
44	3.140	3999.8806	0.2336014	0.0310609	157.0773
45	3.240	3999.8767	0.2367099	0.0310736	157.2390
46	3.340	3999.8729	0.2398172	0.0310369	157.3904
47	3.440	3999.8691	0.2429154	0.0309610	157.5314
48	3.540	3999.8652	0.2460085	0.0308158	157.6623
49	3.640	3999.8614	0.2490826	0.0306315	157.7833
50	3.740	3999.8575	0.2521358	0.0303983	157.8944
51	3.840	3999.8537	0.2551633	0.0301162	157.9959
52	3.940	3999.8498	0.2581601	0.0297856	158.0880
53	4.040	3999.8459	0.2611214	0.0294066	158.1709
54	4.140	3999.8421	0.2640424	0.0289812	158.2448
55	4.240	3999.8382	0.2669186	0.0285118	158.3099
56	4.340	3999.8344	0.2697458	0.0279993	158.3665
57	4.440	3999.8305	0.2725195	0.0274444	158.4148
58	4.540	3999.8267	0.2752357	0.0268479	158.4551
59	4.640	3999.8228	0.2778901	0.0262107	158.4876
60	4.740	3999.8189	0.2804788	0.0255335	158.5127
61	4.840	3999.8151	0.2829977	0.0248172	158.5306
62	4.940	3999.8112	0.2854431	0.0240627	158.5416
63	5.040	3999.8074	0.2878111	0.0232707	158.5460
64	5.140	3999.8035	0.2900981	0.0224423	158.5441
65	5.240	3999.7997	0.2923003	0.0215782	158.5362
66	5.340	3999.7958	0.2944144	0.0206794	158.5226
67	5.440	3999.7919	0.2964369	0.0197467	158.5036
68	5.540	3999.7881	0.2983644	0.0187811	158.4796
69	5.640	3999.7842	0.3001937	0.0177834	158.4508
70	5.740	3999.7804	0.3019216	0.0167546	158.4177
71	5.840	3999.7765	0.3035451	0.0156957	158.3805
72	5.940	3999.7726	0.3050611	0.0146075	158.3397
73	6.040	3999.7688	0.3064669	0.0134914	158.2956
74	6.140	3999.7649	0.3077597	0.0123501	158.2482
75	6.240	3999.7611	0.3089372	0.0111856	158.1983

76	6.340	3999.7572	0.3099971	0.0099989	158.1461
77	6.440	3999.7534	0.3109372	0.0087918	158.0919
78	6.540	3999.7495	0.3117655	0.0075646	158.0362
79	6.640	3999.7457	0.3124502	0.0063197	157.9792
80	6.740	3999.7418	0.3130194	0.0050581	157.9213
81	6.840	3999.7380	0.3134617	0.0037810	157.8629
82	6.940	3999.7341	0.3137755	0.0024899	157.8043
83	7.040	3999.7303	0.3139595	0.0011860	157.7460
84	7.140	3999.7264	0.3140124	-0.0001291	157.6882
85	7.240	3999.7226	0.3139333	-0.0014543	157.6313
86	7.340	3999.7187	0.3137211	-0.0027881	157.5757
87	7.440	3999.7149	0.3133762	-0.0041292	157.5218
88	7.540	3999.7110	0.3128946	-0.0054762	157.4699
89	7.640	3999.7072	0.3122793	-0.0068277	157.4203
90	7.740	3999.7033	0.3115285	-0.0081824	157.3734
91	7.840	3999.6995	0.3106421	-0.0095389	157.3297
92	7.940	3999.6956	0.3096199	-0.0108958	157.2893
93	8.040	3999.6918	0.3084620	-0.0122518	157.2528
94	8.140	3999.6879	0.3071686	-0.0136054	157.2204
95	8.240	3999.6841	0.3057399	-0.0149552	157.1925
96	8.340	3999.6803	0.3041764	-0.0162999	157.1694
97	8.440	3999.6764	0.3024787	-0.0176380	157.1515
98	8.540	3999.6726	0.3006475	-0.0189683	157.1392
99	8.640	3999.6687	0.2986837	-0.0202893	157.1326
100	8.740	3999.6649	0.2965882	-0.0215997	157.1323
101	8.840	3999.6610	0.2943623	-0.0228982	157.1386
102	8.940	3999.6572	0.2920070	-0.0241833	157.1517
103	9.040	3999.6534	0.2895240	-0.0254837	157.1719
104	9.140	3999.6495	0.2869146	-0.0267082	157.1997
105	9.240	3999.6457	0.2841806	-0.0279453	157.2353
106	9.340	3999.6418	0.2813237	-0.0291638	157.2789
107	9.440	3999.6380	0.2783460	-0.0303624	157.3311
108	9.540	3999.6341	0.2752493	-0.0315398	157.3919
109	9.640	3999.6303	0.2720360	-0.0326948	157.4617
110	9.740	3999.6264	0.2687083	-0.0338260	157.5409
111	9.840	3999.6226	0.2652687	-0.0349323	157.6296
112	9.940	3999.6187	0.2617197	-0.0360125	157.7281
113	10.040	3999.6149	0.2580640	-0.0370654	157.8368
114	10.140	3999.6110	0.2543043	-0.0380907	157.9558
115	10.240	3999.6072	0.2504434	-0.0390883	158.0854
116	10.340	3999.6033	0.2464842	-0.0400573	158.2259
117	10.440	3999.5995	0.2424294	-0.0409970	158.3774
118	10.540	3999.5956	0.2382822	-0.0419065	158.5403
119	10.640	3999.5918	0.2340455	-0.0427851	158.7146
120	10.740	3999.5879	0.2297225	-0.0436320	158.9007
121	10.840	3999.5840	0.2253164	-0.0444465	159.0987
122	10.940	3999.5802	0.2208304	-0.0452279	159.3088
123	11.040	3999.5763	0.2162680	-0.0459756	159.5312
124	11.140	3999.5724	0.2116324	-0.0466891	159.7660
125	11.240	3999.5685	0.2069273	-0.0473676	160.0134
126	11.340	3999.5647	0.2021560	-0.0480108	160.2736
127	11.440	3999.5608	0.1973221	-0.0486181	160.5467
128	11.540	3999.5569	0.1924293	-0.0491890	160.8328
129	11.640	3999.5530	0.1874813	-0.0497232	161.1320
130	11.740	3999.5491	0.1824816	-0.0502203	161.4444
131	11.840	3999.5452	0.1774341	-0.0506799	161.7702
132	11.940	3999.5413	0.1723425	-0.0511018	162.1093
133	12.040	3999.5374	0.1672106	-0.0514859	162.4620
134	12.140	3999.5335	0.1620420	-0.0518334	162.8282
135	12.240	3999.5296	0.1568405	-0.0521446	163.2080
136	12.340	3999.5257	0.1516097	-0.0524196	163.6014
137	12.440	3999.5218	0.1463533	-0.0526585	164.0085
138	12.540	3999.5179	0.1410746	-0.0528617	164.4293
139	12.640	3999.5140	0.1357775	-0.0530292	164.8637
140	12.740	3999.5100	0.1304654	-0.0531614	165.3118
141	12.840	3999.5061	0.1251418	-0.0532585	165.7736
142	12.940	3999.5022	0.1198102	-0.0533210	166.2490
143	13.040	3999.4982	0.1144741	-0.0533492	166.7380
144	13.140	3999.4943	0.1091368	-0.0533434	167.2405
145	13.240	3999.4903	0.1038018	-0.0533042	167.7565
146	13.340	3999.4864	0.0984724	-0.0532319	168.2860
147	13.440	3999.4824	0.0931519	-0.0531272	168.8288
148	13.490	3999.4804	0.0904960	-0.0530627	169.1052
149	13.590	3999.4764	0.0851948	-0.0529100	169.6678
150	13.690	3999.4725	0.0799104	-0.0527261	170.2436
151	13.790	3999.4685	0.0746460	-0.0525116	170.8324
152	13.890	3999.4645	0.0694045	-0.0522669	171.4340
153	13.990	3999.4605	0.0641890	-0.0519928	172.0484
154	14.090	3999.4565	0.0590024	-0.0516903	172.6754
155	14.190	3999.4525	0.0538474	-0.0513605	173.3149
156	14.290	3999.4485	0.0487267	-0.0510044	173.9666
157	14.390	3999.4444	0.0436429	-0.0506226	174.6306
158	14.490	3999.4404	0.0385986	-0.0502160	175.3065
159	14.590	3999.4364	0.0335961	-0.0497853	175.9942
160	14.690	3999.4323	0.0286379	-0.0493314	176.6936
161	14.790	3999.4283	0.0237263	-0.0488552	177.4043
162	14.890	3999.4242	0.0188634	-0.0483573	178.1263
163	14.990	3999.4202	0.0140513	-0.0478387	178.8594
164	15.090	3999.4161	0.0092921	-0.0473000	179.6032
165	15.190	3999.4121	0.0045878	-0.0467423	180.3577
166	15.290	3999.4080	-0.0000598	-0.0461661	181.1226
167	15.390	3999.4039	-0.0046488	-0.0455724	181.8976
168	15.490	3999.3998	-0.0091777	-0.0449619	182.6826
169	15.590	3999.3957	-0.0136446	-0.0443354	183.4772
170	15.690	3999.3916	-0.0180481	-0.0436937	184.2814
171	15.790	3999.3875	-0.0223867	-0.0430375	185.0947
172	15.890	3999.3834	-0.0266589	-0.0423676	185.9171
173	15.990	3999.3792	-0.0308635	-0.0416847	186.7481
174	16.090	3999.3751	-0.0349991	-0.0409896	187.5877
175	16.190	3999.3710	-0.0390646	-0.0402833	188.4355
176	16.290	3999.3668	-0.0430589	-0.0395664	189.2913
177	16.390	3999.3627	-0.0469810	-0.0388397	190.1548
178	16.490	3999.3585	-0.0508299	-0.0381039	191.0257
179	16.590	3999.3544	-0.0546048	-0.0373596	191.9038
180	16.690	3999.3502	-0.0583049	-0.0366076	192.7889
181	16.790	3999.3460	-0.0619293	-0.0358485	193.6806
182	16.890	3999.3418	-0.0654775	-0.0350828	194.5787
183	16.990	3999.3376	-0.0689487	-0.0343113	195.4830
184	17.090	3999.3334	-0.0723425	-0.0335346	196.3931
185	17.190	3999.3292	-0.0756584	-0.0327532	197.3088
186	17.290	3999.3250	-0.0788959	-0.0319677	198.2298
187	17.390	3999.3208	-0.0820546	-0.0311786	199.1589
188	17.490	3999.3166	-0.0851342	-0.0303865	200.0868
189	17.590	3999.3124	-0.0881345	-0.0295920	201.0222
190	17.690	3999.3081	-0.0910551	-0.0287954	201.9619
191	17.790	3999.3039	-0.0938960	-0.0279973	202.9056
192	17.890	3999.2996	-0.0966570	-0.0271982	203.8529
193	17.990	3999.2954	-0.0993380	-0.0263984	204.8036
194	18.090	3999.2911	-0.1019390	-0.0255985	205.7578
195	18.190	3999.2869	-0.1044600	-0.0247988	206.7147
196	18.290	3999.2826	-0.1069009	-0.0239996	207.6744
197	18.390	3999.2783	-0.1092620	-0.0232014	208.6364
198	18.490	3999.2741	-0.1115433	-0.0224045	209.6006
199	18.590	3999.2698	-0.1137449	-0.0216092	210.5666
200	18.690	3999.2655	-0.1158671	-0.0208160	211.5343
201	18.790	3999.2612	-0.1179100	-0.0200250	212.5034
202	18.890	3999.2569	-0.1198739	-0.0192367	213.4736
203	18.990	3999.2526	-0.1217591	-0.0184513	214.4447
204	19.090	3999.2483	-0.1235659	-0.0176691	215.4164
205	19.190	3999.2440	-0.1252946	-0.0168903	216.3885
206	19.290	3999.2396	-0.1269458	-0.0161153	217.3607
207	19.390	3999.2353	-0.1285192	-0.0153442	218.3328

208	19.490	3999.2310	-0.1300159	-0.0148773	219.3046
209	19.590	3999.2267	-0.1314361	-0.0138149	220.2758
210	19.690	3999.2223	-0.1327802	-0.0130570	221.2463
211	19.790	3999.2180	-0.1340488	-0.0123041	222.2156
212	19.890	3999.2136	-0.1352422	-0.0115561	223.1837
213	19.990	3999.2093	-0.1363612	-0.0108134	224.1503
214	20.090	3999.2049	-0.1374061	-0.0100761	225.1152
215	20.190	3999.2006	-0.1383774	-0.0093442	226.0781
216	20.290	3999.1962	-0.1392759	-0.0086179	227.0389
217	20.390	3999.1919	-0.1401020	-0.0078973	227.9973
218	20.490	3999.1875	-0.1408562	-0.0071825	228.9531
219	20.590	3999.1831	-0.1415393	-0.0064736	229.9061
220	20.690	3999.1788	-0.1421517	-0.0057707	230.8561
221	20.790	3999.1744	-0.1426942	-0.0050740	231.8029
222	20.890	3999.1700	-0.1431672	-0.0043835	232.7463
223	20.990	3999.1656	-0.1435714	-0.0036993	233.6861
224	21.090	3999.1612	-0.1439076	-0.0030216	234.6220
225	21.190	3999.1569	-0.1441762	-0.0023503	235.5540
226	21.290	3999.1525	-0.1443781	-0.0016855	236.4818
227	21.390	3999.1481	-0.1445137	-0.0010274	237.4052
228	21.490	3999.1437	-0.1445839	-0.0003760	238.3240
229	21.590	3999.1393	-0.1445892	0.0002686	239.2381
230	21.690	3999.1349	-0.1445303	0.0009064	240.1473
231	21.790	3999.1305	-0.1444080	0.0015374	241.0513
232	21.890	3999.1261	-0.1442230	0.0021614	241.9501
233	21.990	3999.1217	-0.1439758	0.0027784	242.8435
234	22.090	3999.1173	-0.1436673	0.0033884	243.7313
235	22.190	3999.1129	-0.1432981	0.0039915	244.6132
236	22.290	3999.1085	-0.1428689	0.0045877	245.4893
237	22.390	3999.1041	-0.1423804	0.0051769	246.3593
238	22.490	3999.0996	-0.1418333	0.0057591	247.2230
239	22.590	3999.0952	-0.1412283	0.0063344	248.0803
240	22.690	3999.0908	-0.1405661	0.0069026	248.9311
241	22.790	3999.0864	-0.1398474	0.0074639	249.7752
242	22.890	3999.0820	-0.1390729	0.0080181	250.6124
243	22.993	3999.0776	-0.1382433	0.0085654	251.4427
244	23.093	3999.0732	-0.1373593	0.0091056	252.2659
245	23.190	3999.0688	-0.1364216	0.0096389	253.0818
246	23.290	3999.0643	-0.1354309	0.0101651	253.8903
247	23.390	3999.0599	-0.1343879	0.0106842	254.6913
248	23.493	3999.0555	-0.1332934	0.0111964	255.4847
249	23.590	3999.0511	-0.1321479	0.0117015	256.2703
250	23.690	3999.0467	-0.1309523	0.0121996	257.0481
251	23.790	3999.0422	-0.1297072	0.0126907	257.8178
252	23.890	3999.0378	-0.1284133	0.0131748	258.5794
253	23.990	3999.0334	-0.1270713	0.0136518	259.3328
254	24.090	3999.0290	-0.1256820	0.0141218	260.0779
255	24.190	3999.0246	-0.1242459	0.0145848	260.8144
256	24.290	3999.0202	-0.1227639	0.0150410	261.5425
257	24.390	3999.0157	-0.1212367	0.0154903	262.2619
258	24.493	3999.0113	-0.1196648	0.0159327	262.9725
259	24.590	3999.0069	-0.1180490	0.0163682	263.6743
260	24.690	3999.0025	-0.1163899	0.0167970	264.3671
261	24.790	3998.9981	-0.1146883	0.0172189	265.0509
262	24.890	3998.9936	-0.1129449	0.0176340	265.7256
263	24.990	3998.9892	-0.1111632	0.0180424	266.3910
264	25.090	3998.9848	-0.1093351	0.0184440	267.0472
265	25.190	3998.9804	-0.1074700	0.0188389	267.6939
266	25.290	3998.9760	-0.1055659	0.0192270	268.3313
267	25.390	3998.9716	-0.1036232	0.0196085	268.9590
268	25.490	3998.9672	-0.1016427	0.0199832	269.5772
269	25.590	3998.9627	-0.0996250	0.0203513	270.1857
270	25.690	3998.9583	-0.0975739	0.0207127	270.7845
271	25.790	3998.9539	-0.0954839	0.0210675	271.3734
272	25.890	3998.9495	-0.0933558	0.0214157	271.9525
273	25.990	3998.9451	-0.0911961	0.0217572	272.5216
274	26.090	3998.9407	-0.0890076	0.0220921	273.0807
275	26.190	3998.9363	-0.0867760	0.0224205	273.6298
276	26.290	3998.9319	-0.0845168	0.0227424	274.1688
277	26.390	3998.9275	-0.0822257	0.0230578	274.6976
278	26.490	3998.9231	-0.0799035	0.0233667	275.2162
279	26.590	3998.9187	-0.0775506	0.0236692	275.7245
280	26.690	3998.9142	-0.0751678	0.0239652	276.2226
281	26.790	3998.9098	-0.0727557	0.0242548	276.7103
282	26.890	3998.9054	-0.0703149	0.0245381	277.1876
283	26.990	3998.9010	-0.0678461	0.0248149	277.6545
284	27.090	3998.8966	-0.0653500	0.0250854	278.1110
285	27.190	3998.8922	-0.0628271	0.0253496	278.5569
286	27.290	3998.8878	-0.0602781	0.0256074	278.9924
287	27.390	3998.8834	-0.0577036	0.0258589	279.4173
288	27.490	3998.8790	-0.0551043	0.0261041	279.8316
289	27.590	3998.8747	-0.0524807	0.0263430	280.2353
290	27.690	3998.8703	-0.0498336	0.0265756	280.6284
291	27.790	3998.8659	-0.0471635	0.0268019	281.0109
292	27.890	3998.8615	-0.0444711	0.0270220	281.3827
293	27.990	3998.8571	-0.0417569	0.0272358	281.7439
294	28.090	3998.8527	-0.0390217	0.0274434	282.0943
295	28.190	3998.8483	-0.0362661	0.0276448	282.4341
296	28.290	3998.8439	-0.0334906	0.0278400	282.7631
297	28.390	3998.8395	-0.0306958	0.0280289	283.0815
298	28.490	3998.8351	-0.0278825	0.0282118	283.3891

DATA POINT	TIME (SECS)	DENSITY (SLUG/FT**3)	ANGLE OF ATTACK (RADIANS)	TEMPERATURE (DEG-R)	ACCELERATION (FT/SEC**2)
1	0.0	0.00230978	0.1629030	520.00	4.66404
2	0.010	0.00230978	0.1629099	520.00	4.65828
3	0.020	0.00230978	0.1629167	520.00	4.65247
4	0.030	0.00230978	0.1629234	520.00	4.64663
5	0.040	0.00230978	0.1629302	520.00	4.64074
6	0.060	0.00230978	0.1629435	520.00	4.62884
7	0.080	0.00230978	0.1629567	520.00	4.61679
8	0.100	0.00230978	0.1629697	520.00	4.60458
9	0.120	0.00230978	0.1629825	520.00	4.59221
10	0.140	0.00230978	0.1629953	520.00	4.57968
11	0.180	0.00230978	0.1630201	520.00	4.55416
12	0.220	0.00230978	0.1630443	520.00	4.52803
13	0.260	0.00230977	0.1630677	520.00	4.50129
14	0.300	0.00230977	0.1630904	520.00	4.47394
15	0.340	0.00230977	0.1631125	520.00	4.44604
16	0.420	0.00230977	0.1631541	520.00	4.38849
17	0.503	0.00230977	0.1631923	520.00	4.32871
18	0.583	0.00230976	0.1632272	520.00	4.26678
19	0.663	0.00230976	0.1632585	520.00	4.20276
20	0.740	0.00230975	0.1632865	520.00	4.13679
21	0.840	0.00230974	0.1633155	520.00	4.05163
22	0.940	0.00230973	0.1633381	520.00	3.96365
23	1.040	0.00230972	0.1633541	520.00	3.87302
24	1.140	0.00230970	0.1633630	520.00	3.77989
25	1.240	0.00230969	0.1633648	520.00	3.68446
26	1.340	0.00230967	0.1633587	520.00	3.58688
27	1.440	0.00230964	0.1633441	520.00	3.48736
28	1.540	0.00230962	0.1633206	520.00	3.38606
29	1.640	0.00230959	0.1632882	520.00	3.28316
30	1.740	0.00230956	0.1632460	520.00	3.17884
31	1.840	0.00230953	0.1631937	520.00	3.07331
32	1.940	0.00230950	0.1631308	520.00	2.96675
33	2.040	0.00230946	0.1630569	520.00	2.85934
34	2.140	0.00230942	0.1629717	520.00	2.75128

35	2.240	0.00230937	0.1628749	520.00	2.64266
36	2.340	0.00230932	0.1627663	520.00	2.53373
37	2.440	0.00230927	0.1626487	520.00	2.42464
38	2.540	0.00230922	0.1625120	520.00	2.31555
39	2.640	0.00230916	0.1623677	520.00	2.20661
40	2.740	0.00230910	0.1622099	520.00	2.09800
41	2.840	0.00230904	0.1620392	520.00	1.98986
42	2.940	0.00230897	0.1618554	520.00	1.88235
43	3.040	0.00230890	0.1616584	520.00	1.77564
44	3.140	0.00230882	0.1614478	520.00	1.66986
45	3.240	0.00230874	0.1612236	520.00	1.56516
46	3.340	0.00230866	0.1609854	520.00	1.46170
47	3.440	0.00230857	0.1607330	520.00	1.35960
48	3.540	0.00230848	0.1604664	520.00	1.25902
49	3.640	0.00230839	0.1601851	520.00	1.16008
50	3.740	0.00230829	0.1598891	520.00	1.06291
51	3.840	0.00230819	0.1595780	520.00	0.96766
52	3.940	0.00230809	0.1592518	520.00	0.87443
53	4.040	0.00230798	0.1589101	520.00	0.78336
54	4.140	0.00230787	0.1585529	520.00	0.69458
55	4.240	0.00230775	0.1581801	520.00	0.60811
56	4.340	0.00230763	0.1577920	520.00	0.52413
57	4.440	0.00230751	0.1573887	520.00	0.44269
58	4.540	0.00230739	0.1569702	520.00	0.36380
59	4.640	0.00230726	0.1565368	520.00	0.28777
60	4.740	0.00230713	0.1560886	520.00	0.21444
61	4.840	0.00230699	0.1556257	520.00	0.14398
62	4.940	0.00230685	0.1551483	520.00	0.07639
63	5.040	0.00230671	0.1546565	520.00	0.01181
64	5.140	0.00230657	0.1541504	520.00	-0.04973
65	5.240	0.00230642	0.1536301	520.00	-0.10817
66	5.340	0.00230627	0.1530959	520.00	-0.16345
67	5.440	0.00230612	0.1525478	520.00	-0.21553
68	5.540	0.00230596	0.1519860	520.00	-0.26434
69	5.640	0.00230580	0.1514107	520.00	-0.30984
70	5.740	0.00230564	0.1508218	520.00	-0.35200
71	5.840	0.00230548	0.1502197	520.00	-0.39076
72	5.940	0.00230531	0.1496044	520.00	-0.42609
73	6.040	0.00230514	0.1489761	520.00	-0.45795
74	6.140	0.00230498	0.1483350	520.00	-0.48631
75	6.240	0.00230480	0.1476815	520.00	-0.51115
76	6.340	0.00230463	0.1470161	520.00	-0.53245
77	6.440	0.00230446	0.1463390	520.00	-0.55020
78	6.540	0.00230428	0.1456506	520.00	-0.56437
79	6.640	0.00230410	0.1449515	520.00	-0.57496
80	6.740	0.00230392	0.1442418	520.00	-0.58196
81	6.840	0.00230374	0.1435221	520.00	-0.58536
82	6.940	0.00230356	0.1427927	520.00	-0.58516
83	7.040	0.00230338	0.1420540	520.00	-0.58134
84	7.140	0.00230319	0.1413063	520.00	-0.57391
85	7.240	0.00230301	0.1405501	520.00	-0.56287
86	7.340	0.00230283	0.1397857	520.00	-0.54822
87	7.440	0.00230264	0.1390135	520.00	-0.52997
88	7.540	0.00230245	0.1382340	520.00	-0.50812
89	7.640	0.00230227	0.1374474	520.00	-0.48269
90	7.740	0.00230208	0.1366542	520.00	-0.45367
91	7.840	0.00230190	0.1358547	520.00	-0.42110
92	7.940	0.00230171	0.1350494	520.00	-0.38497
93	8.040	0.00230153	0.1342386	520.00	-0.34532
94	8.140	0.00230134	0.1334226	520.00	-0.30218
95	8.240	0.00230116	0.1326019	520.00	-0.25550
96	8.340	0.00230098	0.1317769	520.00	-0.20539
97	8.440	0.00230079	0.1309480	520.00	-0.15184
98	8.540	0.00230061	0.1301155	520.00	-0.09480
99	8.640	0.00230043	0.1292799	520.00	-0.03458
100	8.740	0.00230026	0.1284415	520.00	0.02907
101	8.840	0.00230008	0.1276007	520.00	0.09601
102	8.940	0.00229990	0.1267578	520.00	0.16620
103	9.040	0.00229973	0.1259134	520.00	0.23960
104	9.140	0.00229956	0.1250677	520.00	0.31615
105	9.240	0.00229939	0.1242212	520.00	0.39582
106	9.340	0.00229922	0.1233743	520.00	0.47884
107	9.440	0.00229905	0.1225272	520.00	0.56428
108	9.540	0.00229889	0.1216805	520.00	0.65291
109	9.640	0.00229872	0.1208346	520.00	0.74444
110	9.740	0.00229857	0.1199895	520.00	0.83878
111	9.840	0.00229841	0.1191461	520.00	0.93585
112	9.940	0.00229825	0.1183044	520.00	1.03559
113	10.040	0.00229810	0.1174651	520.00	1.13793
114	10.140	0.00229796	0.1166283	520.00	1.24277
115	10.240	0.00229781	0.1157943	520.00	1.35005
116	10.340	0.00229767	0.1149635	520.00	1.45969
117	10.440	0.00229753	0.1141358	520.00	1.57159
118	10.540	0.00229739	0.1133117	520.00	1.68568
119	10.640	0.00229726	0.1124913	520.00	1.80187
120	10.740	0.00229713	0.1116748	520.00	1.92006
121	10.840	0.00229701	0.1108624	520.00	2.04016
122	10.940	0.00229689	0.1100543	520.00	2.16208
123	11.040	0.00229677	0.1092509	520.00	2.28573
124	11.140	0.00229666	0.1084522	520.00	2.41099
125	11.240	0.00229655	0.1076585	520.00	2.53778
126	11.340	0.00229644	0.1068699	520.00	2.66598
127	11.440	0.00229634	0.1060869	520.00	2.79550
128	11.540	0.00229625	0.1053094	520.00	2.92623
129	11.640	0.00229615	0.1045378	520.00	3.05806
130	11.740	0.00229607	0.1037722	520.00	3.19089
131	11.840	0.00229598	0.1030130	520.00	3.32459
132	11.940	0.00229590	0.1022602	520.00	3.45907
133	12.040	0.00229583	0.1015141	520.00	3.59421
134	12.140	0.00229576	0.1007748	520.00	3.72989
135	12.240	0.00229570	0.1000428	520.00	3.86602
136	12.340	0.00229564	0.0993164	520.00	4.00247
137	12.440	0.00229558	0.0985975	520.00	4.13915
138	12.540	0.00229553	0.0978881	520.00	4.27594
139	12.640	0.00229548	0.0971832	520.00	4.41273
140	12.740	0.00229544	0.0964850	520.00	4.54941
141	12.840	0.00229541	0.0957952	520.00	4.68589
142	12.940	0.00229538	0.0951121	520.00	4.82204
143	13.040	0.00229535	0.0944363	520.00	4.95778
144	13.140	0.00229533	0.0937678	520.00	5.09299
145	13.240	0.00229532	0.0931067	520.00	5.22758
146	13.340	0.00229531	0.0924526	520.00	5.36144
147	13.440	0.00229531	0.0918062	520.00	5.49448
148	13.490	0.00229531	0.0914861	520.00	5.56068
149	13.590	0.00229531	0.0908509	520.00	5.69227
150	13.690	0.00229532	0.0902230	520.00	5.82283
151	13.790	0.00229533	0.0896029	520.00	5.95223
152	13.890	0.00229535	0.0889904	520.00	6.08039
153	13.990	0.00229538	0.0883855	520.00	6.20721
154	14.090	0.00229541	0.0877883	520.00	6.33262
155	14.190	0.00229545	0.0871987	520.00	6.45652
156	14.290	0.00229549	0.0866167	520.00	6.57885
157	14.390	0.00229554	0.0860423	520.00	6.69952
158	14.490	0.00229559	0.0854754	520.00	6.81846
159	14.590	0.00229568	0.0849160	520.00	6.93560
160	14.690	0.00229571	0.0843640	520.00	7.05087
161	14.790	0.00229578	0.0838193	520.00	7.16421
162	14.890	0.00229586	0.0832819	520.00	7.27555
163	14.990	0.00229594	0.0827519	520.00	7.38484
164	15.090	0.00229602	0.0822290	520.00	7.49202
165	15.190	0.00229611	0.0817134	520.00	7.59702
166	15.290	0.00229621	0.0812048	520.00	7.69982

167	15.390	0.00229631	0.0807034	520.00	7.80035
168	15.490	0.00229642	0.0802089	520.00	7.89857
169	15.590	0.00229653	0.0797215	520.00	7.99444
170	15.690	0.00229665	0.0792411	520.00	8.08791
171	15.790	0.00229678	0.0787675	520.00	8.17896
172	15.890	0.00229691	0.0783007	520.00	8.26755
173	15.990	0.00229704	0.0778408	520.00	8.35364
174	16.090	0.00229718	0.0773877	520.00	8.43721
175	16.190	0.00229733	0.0769412	520.00	8.51824
176	16.290	0.00229748	0.0765013	520.00	8.59668
177	16.390	0.00229763	0.0760680	520.00	8.67254
178	16.490	0.00229779	0.0756412	520.00	8.74578
179	16.590	0.00229796	0.0752208	520.00	8.81639
180	16.690	0.00229813	0.0748067	520.00	8.88436
181	16.790	0.00229830	0.0743989	520.00	8.94967
182	16.890	0.00229849	0.0739973	520.00	9.01232
183	16.990	0.00229867	0.0736018	520.00	9.07229
184	17.090	0.00229886	0.0732124	520.00	9.12959
185	17.190	0.00229906	0.0728290	520.00	9.18420
186	17.290	0.00229926	0.0724514	520.00	9.23613
187	17.390	0.00229946	0.0720798	520.00	9.28537
188	17.490	0.00229967	0.0717139	520.00	9.33194
189	17.590	0.00229989	0.0713537	520.00	9.37582
190	17.690	0.00230010	0.0709992	520.00	9.41703
191	17.790	0.00230033	0.0706502	520.00	9.45558
192	17.890	0.00230055	0.0703068	520.00	9.49147
193	17.990	0.00230079	0.0699688	520.00	9.52470
194	18.090	0.00230102	0.0696361	520.00	9.55530
195	18.190	0.00230126	0.0693087	520.00	9.58328
196	18.290	0.00230151	0.0689866	520.00	9.60864
197	18.390	0.00230176	0.0686696	520.00	9.63140
198	18.490	0.00230201	0.0683578	520.00	9.65158
199	18.590	0.00230226	0.0680510	520.00	9.66920
200	18.690	0.00230252	0.0677492	520.00	9.68426
201	18.790	0.00230279	0.0674523	520.00	9.69680
202	18.890	0.00230306	0.0671602	520.00	9.70683
203	18.990	0.00230333	0.0668730	520.00	9.71436
204	19.090	0.00230360	0.0665904	520.00	9.71943
205	19.190	0.00230388	0.0663126	520.00	9.72205
206	19.290	0.00230416	0.0660393	520.00	9.72225
207	19.390	0.00230444	0.0657706	520.00	9.72004
208	19.490	0.00230473	0.0655063	520.00	9.71546
209	19.590	0.00230502	0.0652465	520.00	9.70852
210	19.690	0.00230532	0.0649910	520.00	9.69926
211	19.790	0.00230561	0.0647398	520.00	9.68769
212	19.890	0.00230591	0.0644928	520.00	9.67384
213	19.990	0.00230621	0.0642500	520.00	9.65775
214	20.090	0.00230652	0.0640112	520.00	9.63942
215	20.190	0.00230682	0.0637765	520.00	9.61891
216	20.290	0.00230713	0.0635458	520.00	9.59622
217	20.390	0.00230745	0.0633191	520.00	9.57139
218	20.490	0.00230776	0.0630962	520.00	9.54444
219	20.590	0.00230808	0.0628772	520.00	9.51541
220	20.690	0.00230839	0.0626619	520.00	9.48432
221	20.790	0.00230871	0.0624504	520.00	9.45120
222	20.890	0.00230904	0.0622426	520.00	9.41608
223	20.990	0.00230936	0.0620385	520.00	9.37899
224	21.090	0.00230968	0.0618379	520.00	9.33995
225	21.190	0.00231001	0.0616409	520.00	9.29899
226	21.290	0.00231034	0.0614474	520.00	9.25615
227	21.390	0.00231067	0.0612573	520.00	9.21145
228	21.490	0.00231100	0.0610706	520.00	9.16493
229	21.590	0.00231133	0.0608873	520.00	9.11660
230	21.690	0.00231166	0.0607073	520.00	9.06650
231	21.790	0.00231199	0.0605305	520.00	9.01467
232	21.890	0.00231233	0.0603569	520.00	8.96112
233	21.990	0.00231266	0.0601865	520.00	8.90585
234	22.090	0.00231300	0.0600192	520.00	8.84900
235	22.190	0.00231333	0.0598549	520.00	8.79049
236	22.290	0.00231367	0.0596937	520.00	8.73039
237	22.390	0.00231401	0.0595355	520.00	8.66872
238	22.490	0.00231434	0.0593802	520.00	8.60551
239	22.590	0.00231468	0.0592279	520.00	8.54080
240	22.690	0.00231501	0.0590784	520.00	8.47460
241	22.790	0.00231535	0.0589318	520.00	8.40696
242	22.890	0.00231569	0.0587880	520.00	8.33789
243	22.990	0.00231602	0.0586469	520.00	8.26743
244	23.090	0.00231636	0.0585087	520.00	8.19560
245	23.190	0.00231669	0.0583731	520.00	8.12244
246	23.290	0.00231702	0.0582402	520.00	8.04796
247	23.390	0.00231736	0.0581099	520.00	7.97221
248	23.490	0.00231769	0.0579822	520.00	7.89519
249	23.590	0.00231802	0.0578570	520.00	7.81696
250	23.690	0.00231835	0.0577344	520.00	7.73782
251	23.790	0.00231867	0.0576143	520.00	7.65692
252	23.890	0.00231900	0.0574966	520.00	7.57517
253	23.990	0.00231933	0.0573814	520.00	7.49230
254	24.090	0.00231965	0.0572685	520.00	7.40838
255	24.190	0.00231997	0.0571580	520.00	7.32333
256	24.290	0.00232029	0.0570498	520.00	7.23726
257	24.390	0.00232061	0.0569439	520.00	7.15022
258	24.490	0.00232093	0.0568402	520.00	7.06218
259	24.590	0.00232124	0.0567388	520.00	6.97318
260	24.690	0.00232155	0.0566396	520.00	6.88326
261	24.790	0.00232186	0.0565426	520.00	6.79243
262	24.890	0.00232217	0.0564477	520.00	6.70073
263	24.990	0.00232247	0.0563550	520.00	6.60817
264	25.090	0.00232277	0.0562644	520.00	6.51479
265	25.190	0.00232307	0.0561759	520.00	6.42061
266	25.290	0.00232337	0.0560894	520.00	6.32565
267	25.390	0.00232366	0.0560049	520.00	6.22994
268	25.490	0.00232395	0.0559225	520.00	6.13351
269	25.590	0.00232424	0.0558420	520.00	6.03639
270	25.690	0.00232452	0.0557634	520.00	5.93858
271	25.790	0.00232480	0.0556868	520.00	5.84013
272	25.890	0.00232508	0.0556121	520.00	5.74105
273	25.990	0.00232536	0.0555392	520.00	5.64137
274	26.090	0.00232563	0.0554682	520.00	5.54112
275	26.190	0.00232589	0.0553990	520.00	5.44031
276	26.290	0.00232616	0.0553316	520.00	5.33897
277	26.390	0.00232641	0.0552659	520.00	5.23713
278	26.490	0.00232667	0.0552021	520.00	5.13481
279	26.590	0.00232692	0.0551399	520.00	5.03204
280	26.690	0.00232717	0.0550795	520.00	4.92883
281	26.790	0.00232741	0.0550207	520.00	4.82520
282	26.890	0.00232765	0.0549636	520.00	4.72120
283	26.990	0.00232789	0.0549082	520.00	4.61682
284	27.090	0.00232812	0.0548544	520.00	4.51211
285	27.190	0.00232834	0.0548022	520.00	4.40708
286	27.290	0.00232856	0.0547516	520.00	4.30176
287	27.390	0.00232878	0.0547025	520.00	4.19616
288	27.490	0.00232899	0.0546550	520.00	4.09029
289	27.590	0.00232920	0.0546090	520.00	3.98421
290	27.690	0.00232940	0.0545645	520.00	3.87791
291	27.790	0.00232960	0.0545215	520.00	3.77144
292	27.890	0.00232979	0.0544800	520.00	3.66480
293	27.990	0.00232998	0.0544399	520.00	3.55802
294	28.090	0.00233016	0.0544012	520.00	3.45112
295	28.190	0.00233034	0.0543639	520.00	3.34412
296	28.290	0.00233051	0.0543280	520.00	3.23704
297	28.390	0.00233068	0.0542934	520.00	3.12991
298	28.490	0.00233084	0.0542602	520.00	3.02274

DATA POINT	TIME (SECS)	ANGLE-OF-ATTACK RATE (RADIAN/SEC)	ALTITUDE (FT)	ALTITUDE RATE (FT/SEC)	ALT. ACCEL. (FT/SEC**2)	VERT. ACCEL. (FT/SEC**2)	ELEV. DEFLECT. (RADIANS)
1	0.0	-0.003801821	1000.00	0.01	0.89	0.0	0.0
2	0.010	-0.003770723	1000.00	0.02	0.91	0.0	0.0
3	0.020	-0.003739628	1000.00	0.03	0.93	0.0	0.0
4	0.030	-0.003708538	1000.00	0.04	0.96	0.0	0.0
5	0.040	-0.003677455	1000.00	0.04	0.98	0.0	0.0
6	0.060	-0.003615318	1000.00	0.06	1.02	0.0	0.0
7	0.080	-0.003553238	1000.00	0.09	1.06	0.0	0.0
8	0.100	-0.003491232	1000.01	0.11	1.11	0.0	0.0
9	0.120	-0.003429318	1000.01	0.13	1.15	0.0	0.0
10	0.140	-0.003367517	1000.01	0.15	1.19	0.0	0.0
11	0.180	-0.003244322	1000.02	0.20	1.28	0.0	0.0
12	0.220	-0.003121794	1000.03	0.26	1.36	0.0	0.0
13	0.260	-0.003000078	1000.04	0.31	1.45	0.0	0.0
14	0.300	-0.002879321	1000.05	0.37	1.53	0.0	0.0
15	0.340	-0.002759664	1000.07	0.43	1.61	0.0	0.0
16	0.420	-0.002524218	1000.11	0.57	1.78	0.0	0.0
17	0.500	-0.002294846	1000.16	0.72	1.94	0.0	0.0
18	0.580	-0.002072619	1000.22	0.88	2.11	0.0	0.0
19	0.660	-0.001858561	1000.30	1.06	2.27	0.0	0.0
20	0.740	-0.001653645	1000.39	1.24	2.42	0.0	0.0
21	0.840	-0.001411747	1000.53	1.50	2.62	0.0	0.0
22	0.940	-0.001187215	1000.69	1.77	2.80	0.0	0.0
23	1.040	-0.000981535	1000.88	2.06	2.99	0.0	0.0
24	1.140	-0.000796013	1001.10	2.36	3.17	0.0	0.0
25	1.240	-0.000631768	1001.36	2.69	3.34	0.0	0.0
26	1.340	-0.000489720	1001.64	3.03	3.51	0.0	0.0
27	1.440	-0.000370583	1001.96	3.39	3.67	0.0	0.0
28	1.540	-0.000274867	1002.32	3.76	3.82	0.0	0.0
29	1.640	-0.000202871	1002.72	4.15	3.97	0.0	0.0
30	1.740	-0.000154686	1003.15	4.56	4.12	0.0	0.0
31	1.840	-0.000130200	1003.63	4.98	4.25	0.0	0.0
32	1.940	-0.000129105	1004.15	5.41	4.38	0.0	0.0
33	2.040	-0.000150899	1004.71	5.85	4.50	0.0	0.0
34	2.140	-0.000194902	1005.32	6.31	4.62	0.0	0.0
35	2.240	-0.000260266	1005.97	6.78	4.73	0.0	0.0
36	2.340	-0.000345988	1006.68	7.26	4.82	0.0	0.0
37	2.440	-0.000450923	1007.43	7.74	4.92	0.0	0.0
38	2.540	-0.000573807	1008.23	8.24	5.00	0.0	0.0
39	2.640	-0.000713267	1009.07	8.74	5.07	0.0	0.0
40	2.740	-0.000867841	1009.97	9.25	5.14	0.0	0.0
41	2.840	-0.001035999	1010.92	9.77	5.20	0.0	0.0
42	2.940	-0.001216162	1011.93	10.29	5.25	0.0	0.0
43	3.040	-0.001406716	1012.98	10.82	5.29	0.0	0.0
44	3.140	-0.001606035	1014.09	11.35	5.32	0.0	0.0
45	3.240	-0.001812500	1015.25	11.88	5.35	0.0	0.0
46	3.340	-0.002024513	1016.47	12.42	5.37	0.0	0.0
47	3.440	-0.002240515	1017.74	12.96	5.37	0.0	0.0
48	3.540	-0.002459004	1019.06	13.49	5.37	0.0	0.0
49	3.640	-0.002678546	1020.44	14.03	5.37	0.0	0.0
50	3.740	-0.002897789	1021.87	14.57	5.35	0.0	0.0
51	3.840	-0.003115474	1023.35	15.10	5.32	0.0	0.0
52	3.940	-0.003330446	1024.89	15.63	5.29	0.0	0.0
53	4.040	-0.003541665	1026.48	16.16	5.25	0.0	0.0
54	4.140	-0.003748201	1028.12	16.68	5.20	0.0	0.0
55	4.240	-0.003949249	1029.81	17.20	5.15	0.0	0.0
56	4.340	-0.004144132	1031.56	17.71	5.08	0.0	0.0
57	4.440	-0.004332293	1033.35	18.22	5.01	0.0	0.0
58	4.540	-0.004513333	1035.20	18.71	4.93	0.0	0.0
59	4.640	-0.004686852	1037.10	19.20	4.84	0.0	0.0
60	4.740	-0.004852751	1039.04	19.68	4.75	0.0	0.0
61	4.840	-0.005010920	1041.03	20.15	4.65	0.0	0.0
62	4.940	-0.005161386	1043.07	20.61	4.55	0.0	0.0
63	5.040	-0.005304272	1045.16	21.06	4.43	0.0	0.0
64	5.140	-0.005439793	1047.28	21.50	4.32	0.0	0.0
65	5.240	-0.005568237	1049.45	21.92	4.19	0.0	0.0
66	5.340	-0.005689965	1051.67	22.34	4.06	0.0	0.0
67	5.440	-0.005805393	1053.92	22.74	3.93	0.0	0.0
68	5.540	-0.005914982	1056.21	23.12	3.79	0.0	0.0
69	5.640	-0.006019230	1058.54	23.49	3.64	0.0	0.0
70	5.740	-0.006118657	1060.91	23.85	3.50	0.0	0.0
71	5.840	-0.006213794	1063.31	24.19	3.34	0.0	0.0
72	5.940	-0.006305177	1065.75	24.52	3.18	0.0	0.0
73	6.040	-0.006393330	1068.22	24.83	3.02	0.0	0.0
74	6.140	-0.006478762	1070.71	25.12	2.86	0.0	0.0
75	6.240	-0.006561954	1073.24	25.40	2.69	0.0	0.0
76	6.340	-0.006643352	1075.79	25.66	2.51	0.0	0.0
77	6.440	-0.006723363	1078.37	25.90	2.34	0.0	0.0
78	6.540	-0.006802344	1080.97	26.13	2.16	0.0	0.0
79	6.640	-0.006880634	1083.60	26.33	1.98	0.0	0.0
80	6.740	-0.006958396	1086.24	26.52	1.79	0.0	0.0
81	6.840	-0.007033908	1088.90	26.69	1.61	0.0	0.0
82	6.940	-0.007113281	1091.58	26.84	1.42	0.0	0.0
83	7.040	-0.007190589	1094.27	26.98	1.23	0.0	0.0
84	7.140	-0.007267853	1096.97	27.09	1.04	0.0	0.0
85	7.240	-0.007346023	1099.69	27.18	0.85	0.0	0.0
86	7.340	-0.007422015	1102.41	27.26	0.66	0.0	0.0
87	7.440	-0.007498680	1105.14	27.32	0.46	0.0	0.0
88	7.540	-0.007574829	1107.87	27.35	0.27	0.0	0.0
89	7.640	-0.007650227	1110.61	27.37	0.07	0.0	0.0
90	7.740	-0.007724607	1113.34	27.37	-0.12	0.0	0.0
91	7.840	-0.007797669	1116.08	27.35	-0.32	0.0	0.0
92	7.940	-0.007869088	1118.81	27.33	-0.51	0.0	0.0
93	8.040	-0.007938525	1121.54	27.24	-0.71	0.0	0.0
94	8.140	-0.008005625	1124.26	27.16	-0.90	0.0	0.0
95	8.240	-0.008070030	1126.97	27.06	-1.09	0.0	0.0
96	8.340	-0.008131384	1129.67	26.94	-1.29	0.0	0.0
97	8.440	-0.008189337	1132.36	26.81	-1.48	0.0	0.0
98	8.540	-0.008243551	1135.03	26.65	-1.67	0.0	0.0
99	8.640	-0.008293708	1137.69	26.47	-1.86	0.0	0.0
100	8.740	-0.008339513	1140.33	26.28	-2.05	0.0	0.0
101	8.840	-0.008380697	1142.94	26.06	-2.23	0.0	0.0
102	8.940	-0.008417023	1145.54	25.83	-2.42	0.0	0.0
103	9.040	-0.008448288	1148.11	25.58	-2.60	0.0	0.0
104	9.140	-0.008474326	1150.65	25.31	-2.79	0.0	0.0
105	9.240	-0.008495010	1153.17	25.02	-2.97	0.0	0.0
106	9.340	-0.008510252	1155.66	24.72	-3.15	0.0	0.0
107	9.440	-0.008520004	1158.11	24.39	-3.32	0.0	0.0
108	9.540	-0.008524260	1160.54	24.05	-3.50	0.0	0.0
109	9.640	-0.008523050	1162.92	23.69	-3.67	0.0	0.0
110	9.740	-0.008516444	1165.27	23.32	-3.84	0.0	0.0
111	9.840	-0.008504551	1167.59	22.93	-4.00	0.0	0.0
112	9.940	-0.008487508	1169.86	22.52	-4.17	0.0	0.0
113	10.040	-0.008465488	1172.09	22.09	-4.33	0.0	0.0
114	10.140	-0.008438691	1174.28	21.65	-4.48	0.0	0.0
115	10.240	-0.008407340	1176.42	21.20	-4.64	0.0	0.0
116	10.340	-0.008371681	1178.52	20.72	-4.80	0.0	0.0
117	10.440	-0.008331976	1180.56	20.24	-4.95	0.0	0.0
118	10.540	-0.008288503	1182.56	19.73	-5.09	0.0	0.0
119	10.640	-0.008241547	1184.51	19.22	-5.24	0.0	0.0
120	10.740	-0.008191399	1186.41	18.69	-5.38	0.0	0.0
121	10.840	-0.008138353	1188.25	18.14	-5.52	0.0	0.0
122	10.940	-0.008082701	1190.03	17.58	-5.65	0.0	0.0
123	11.040	-0.008024729	1191.76	17.01	-5.78	0.0	0.0
124	11.140	-0.007964718	1193.44	16.43	-5.91	0.0	0.0
125	11.240	-0.007902933	1195.06	15.83	-6.03	0.0	0.0

126	11.340	-0.007839629	1196.60	15.22	-6.16	0.0	0.0
127	11.440	-0.007776044	1198.05	14.60	-6.27	0.0	0.0
128	11.540	-0.007709394	1199.52	13.97	-6.39	0.0	0.0
129	11.640	-0.007642892	1200.89	13.32	-6.50	0.0	0.0
130	11.740	-0.007575705	1202.18	12.67	-6.61	0.0	0.0
131	11.840	-0.007507997	1203.42	12.00	-6.71	0.0	0.0
132	11.940	-0.007439905	1204.58	11.32	-6.81	0.0	0.0
133	12.040	-0.007371546	1205.68	10.64	-6.91	0.0	0.0
134	12.140	-0.007303013	1206.71	9.94	-7.00	0.0	0.0
135	12.240	-0.007234382	1207.67	9.24	-7.09	0.0	0.0
136	12.340	-0.007165706	1208.56	8.52	-7.18	0.0	0.0
137	12.440	-0.007097021	1209.38	7.80	-7.26	0.0	0.0
138	12.540	-0.007028347	1210.12	7.07	-7.34	0.0	0.0
139	12.640	-0.006959687	1210.79	6.33	-7.41	0.0	0.0
140	12.740	-0.006891031	1211.39	5.59	-7.48	0.0	0.0
141	12.840	-0.006822358	1211.91	4.84	-7.55	0.0	0.0
142	12.940	-0.006753638	1212.36	4.08	-7.62	0.0	0.0
143	13.040	-0.006684831	1212.72	3.32	-7.68	0.0	0.0
144	13.140	-0.006615855	1213.02	2.54	-7.73	0.0	0.0
145	13.240	-0.006546782	1213.23	1.77	-7.78	0.0	0.0
146	13.340	-0.006477446	1213.37	0.99	-7.83	0.0	0.0
147	13.440	-0.006407839	1213.43	0.20	-7.86	0.0	0.0
148	13.490	-0.006372920	1213.43	-0.19	-7.90	0.0	0.0
149	13.590	-0.006302825	1213.37	-0.98	-7.94	0.0	0.0
150	13.690	-0.006232358	1213.23	-1.78	-7.97	0.0	0.0
151	13.790	-0.006161489	1213.01	-2.58	-8.01	0.0	0.0
152	13.890	-0.006090194	1212.72	-3.38	-8.03	0.0	0.0
153	13.990	-0.006018462	1212.34	-4.19	-8.06	0.0	0.0
154	14.090	-0.005946289	1211.88	-4.99	-8.08	0.0	0.0
155	14.190	-0.005873682	1211.34	-5.80	-8.10	0.0	0.0
156	14.290	-0.005800663	1210.72	-6.61	-8.11	0.0	0.0
157	14.390	-0.005727253	1210.02	-7.42	-8.12	0.0	0.0
158	14.490	-0.005653502	1209.23	-8.24	-8.13	0.0	0.0
159	14.590	-0.005579458	1208.37	-9.05	-8.13	0.0	0.0
160	14.690	-0.005505185	1207.42	-9.86	-8.13	0.0	0.0
161	14.790	-0.005430754	1206.40	-10.67	-8.12	0.0	0.0
162	14.890	-0.005356247	1205.29	-11.49	-8.12	0.0	0.0
163	14.990	-0.005281751	1204.10	-12.30	-8.10	0.0	0.0
164	15.090	-0.005207364	1202.83	-13.11	-8.09	0.0	0.0
165	15.190	-0.005133185	1201.48	-13.91	-8.07	0.0	0.0
166	15.290	-0.005059317	1200.05	-14.72	-8.05	0.0	0.0
167	15.390	-0.004985874	1198.54	-15.52	-8.02	0.0	0.0
168	15.490	-0.004912958	1196.94	-16.32	-7.99	0.0	0.0
169	15.590	-0.004840670	1195.27	-17.12	-7.96	0.0	0.0
170	15.690	-0.004769134	1193.52	-17.92	-7.92	0.0	0.0
171	15.790	-0.004698431	1191.69	-18.71	-7.88	0.0	0.0
172	15.890	-0.004628661	1189.78	-19.49	-7.84	0.0	0.0
173	15.990	-0.004559910	1187.79	-20.28	-7.80	0.0	0.0
174	16.090	-0.004492255	1185.72	-21.05	-7.75	0.0	0.0
175	16.190	-0.004425764	1183.58	-21.82	-7.70	0.0	0.0
176	16.290	-0.004360491	1181.36	-22.59	-7.64	0.0	0.0
177	16.390	-0.004296480	1179.06	-23.35	-7.58	0.0	0.0
178	16.490	-0.004233756	1176.69	-24.11	-7.52	0.0	0.0
179	16.590	-0.004172341	1174.24	-24.86	-7.46	0.0	0.0
180	16.690	-0.004112227	1171.72	-25.60	-7.39	0.0	0.0
181	16.790	-0.004053402	1169.12	-26.33	-7.32	0.0	0.0
182	16.890	-0.003995834	1166.45	-27.06	-7.24	0.0	0.0
183	16.990	-0.003939478	1163.71	-27.78	-7.17	0.0	0.0
184	17.090	-0.003884274	1160.89	-28.50	-7.09	0.0	0.0
185	17.190	-0.003830147	1158.01	-29.20	-7.01	0.0	0.0
186	17.290	-0.003777011	1155.05	-29.90	-6.92	0.0	0.0
187	17.390	-0.003724767	1152.03	-30.58	-6.83	0.0	0.0
188	17.490	-0.003673307	1148.94	-31.26	-6.74	0.0	0.0
189	17.590	-0.003622512	1145.78	-31.93	-6.65	0.0	0.0
190	17.690	-0.003572259	1142.55	-32.59	-6.56	0.0	0.0
191	17.790	-0.003522419	1139.26	-33.24	-6.46	0.0	0.0
192	17.890	-0.003472861	1135.90	-33.88	-6.36	0.0	0.0
193	17.990	-0.003423452	1132.48	-34.52	-6.26	0.0	0.0
194	18.090	-0.003374064	1129.00	-35.14	-6.15	0.0	0.0
195	18.190	-0.003324571	1125.46	-35.75	-6.04	0.0	0.0
196	18.290	-0.003274856	1121.85	-36.34	-5.93	0.0	0.0
197	18.390	-0.003224810	1118.19	-36.93	-5.82	0.0	0.0
198	18.490	-0.003174336	1114.47	-37.51	-5.71	0.0	0.0
199	18.590	-0.003123353	1110.69	-38.07	-5.59	0.0	0.0
200	18.690	-0.003071793	1106.85	-38.63	-5.47	0.0	0.0
201	18.790	-0.003019609	1102.96	-39.17	-5.35	0.0	0.0
202	18.890	-0.002966772	1099.02	-39.70	-5.23	0.0	0.0
203	18.990	-0.002913277	1095.02	-40.21	-5.11	0.0	0.0
204	19.090	-0.002859139	1090.98	-40.72	-4.98	0.0	0.0
205	19.190	-0.002804397	1086.88	-41.21	-4.85	0.0	0.0
206	19.290	-0.002749114	1082.73	-41.69	-4.72	0.0	0.0
207	19.390	-0.002693378	1078.54	-42.15	-4.59	0.0	0.0
208	19.490	-0.002637297	1074.30	-42.61	-4.46	0.0	0.0
209	19.590	-0.002581006	1070.02	-43.05	-4.32	0.0	0.0
210	19.690	-0.002524658	1065.70	-43.47	-4.19	0.0	0.0
211	19.790	-0.002468429	1061.33	-43.88	-4.05	0.0	0.0
212	19.890	-0.002412511	1056.92	-44.28	-3.91	0.0	0.0
213	19.990	-0.002357111	1052.47	-44.66	-3.77	0.0	0.0
214	20.090	-0.002302460	1047.99	-45.03	-3.63	0.0	0.0
215	20.190	-0.002248757	1043.47	-45.39	-3.48	0.0	0.0
216	20.290	-0.002196208	1038.91	-45.73	-3.34	0.0	0.0
217	20.390	-0.002145223	1034.32	-46.06	-3.19	0.0	0.0
218	20.490	-0.002095850	1029.70	-46.37	-3.05	0.0	0.0
219	20.590	-0.002048335	1025.05	-46.67	-2.90	0.0	0.0
220	20.690	-0.002003045	1020.37	-46.95	-2.75	0.0	0.0
221	20.790	-0.001960314	1015.66	-47.22	-2.60	0.0	0.0
222	20.890	-0.001919537	1010.92	-47.47	-2.45	0.0	0.0
223	20.990	-0.001881714	1006.16	-47.71	-2.30	0.0	0.0
224	21.090	-0.001846701	1001.38	-47.93	-2.14	0.0	0.0
225	21.190	-0.001814598	996.58	-48.13	-1.99	0.0	0.0
226	21.290	-0.001785473	991.76	-48.33	-1.84	0.0	0.0
227	21.390	-0.001759362	986.91	-48.50	-1.68	0.0	0.0
228	21.490	-0.001736248	982.06	-48.66	-1.53	0.0	0.0
229	21.590	-0.001716081	977.18	-48.81	-1.37	0.0	0.0
230	21.690	-0.001698764	972.29	-48.94	-1.21	0.0	0.0
231	21.790	-0.001684157	967.40	-49.05	-1.06	0.0	0.0
232	21.890	-0.001672074	962.46	-49.15	-0.90	0.0	0.0
233	21.990	-0.001662285	957.57	-49.24	-0.74	0.0	0.0
234	22.090	-0.001654518	952.64	-49.30	-0.58	0.0	0.0
235	22.190	-0.001648484	947.71	-49.35	-0.43	0.0	0.0
236	22.290	-0.001643755	942.77	-49.38	-0.27	0.0	0.0
237	22.390	-0.001640025	937.83	-49.40	-0.11	0.0	0.0
238	22.490	-0.001636958	932.89	-49.40	0.05	0.0	0.0
239	22.590	-0.001633794	927.95	-49.39	0.21	0.0	0.0
240	22.690	-0.001630404	923.01	-49.36	0.37	0.0	0.0
241	22.790	-0.001626201	918.08	-49.32	0.52	0.0	0.0
242	22.890	-0.001620711	913.15	-49.26	0.68	0.0	0.0
243	22.990	-0.001613462	908.23	-49.18	0.84	0.0	0.0
244	23.090	-0.001603949	903.32	-49.09	1.00	0.0	0.0
245	23.190	-0.001591840	898.41	-48.98	1.16	0.0	0.0
246	23.290	-0.001576613	893.52	-48.86	1.31	0.0	0.0
247	23.390	-0.001557893	888.64	-48.72	1.47	0.0	0.0
248	23.490	-0.001535349	883.78	-48.56	1.63	0.0	0.0
249	23.590	-0.001508680	878.93	-48.39	1.78	0.0	0.0
250	23.690	-0.001477646	874.10	-48.21	1.94	0.0	0.0
251	23.790	-0.001442064	869.29	-48.00	2.09	0.0	0.0
252	23.890	-0.001401849	864.50	-47.79	2.25	0.0	0.0
253	23.990	-0.001356924	859.73	-47.56	2.40	0.0	0.0
254	24.090	-0.001307389	854.99	-47.31	2.55	0.0	0.0
255	24.190	-0.001253329	850.27	-47.05	2.70	0.0	0.0
256	24.290	-0.001194991	845.58	-46.77	2.85	0.0	0.0
257	24.390	-0.001132674	840.92	-46.47	3.00	0.0	0.0

258	24.490	-0.001066774	834.29	-46.17	3.15	0.0	0.0
259	24.590	-0.000997774	831.69	-45.84	3.30	0.0	0.0
260	24.690	-0.000926245	827.12	-45.51	3.45	0.0	0.0
261	24.790	-0.000852842	822.88	-45.16	3.59	0.0	0.0
262	24.890	-0.000778297	818.09	-44.79	3.74	0.0	0.0
263	24.990	-0.000703415	813.63	-44.41	3.88	0.0	0.0
264	25.090	-0.000629071	809.21	-44.01	4.02	0.0	0.0
265	25.190	-0.000556195	804.83	-43.60	4.16	0.0	0.0
266	25.290	-0.000485768	800.49	-43.18	4.30	0.0	0.0
267	25.390	-0.000418811	796.19	-42.74	4.44	0.0	0.0
268	25.490	-0.000356373	791.94	-42.29	4.58	0.0	0.0
269	25.590	-0.000299525	787.73	-41.83	4.71	0.0	0.0
270	25.690	-0.000249324	783.57	-41.35	4.84	0.0	0.0
271	25.790	-0.000206849	779.46	-40.86	4.98	0.0	0.0
272	25.890	-0.000173134	775.40	-40.36	5.11	0.0	0.0
273	25.990	-0.000149201	771.39	-39.84	5.24	0.0	0.0
274	26.090	-0.000136003	767.43	-39.31	5.36	0.0	0.0
275	26.190	-0.000134447	763.53	-38.77	5.49	0.0	0.0
276	26.290	-0.000145366	759.68	-38.21	5.61	0.0	0.0
277	26.390	-0.000169511	755.89	-37.64	5.73	0.0	0.0
278	26.490	-0.000207535	752.15	-37.06	5.85	0.0	0.0
279	26.590	-0.000259990	748.48	-36.47	5.97	0.0	0.0
280	26.690	-0.000327314	744.86	-35.87	6.09	0.0	0.0
281	26.790	-0.000409822	741.30	-35.26	6.20	0.0	0.0
282	26.890	-0.000507702	737.81	-34.63	6.31	0.0	0.0
283	26.990	-0.000621008	734.36	-33.99	6.42	0.0	0.0
284	27.090	-0.000749659	731.01	-33.34	6.53	0.0	0.0
285	27.190	-0.000893431	727.71	-32.69	6.64	0.0	0.0
286	27.290	-0.001051966	724.47	-32.02	6.74	0.0	0.0
287	27.390	-0.001224763	721.30	-31.34	6.84	0.0	0.0
288	27.490	-0.001411187	718.21	-30.65	6.94	0.0	0.0
289	27.590	-0.001610473	715.18	-29.95	7.04	0.0	0.0
290	27.690	-0.001821729	712.22	-29.24	7.14	0.0	0.0
291	27.790	-0.002043949	709.33	-28.52	7.23	0.0	0.0
292	27.890	-0.002270013	706.51	-27.79	7.32	0.0	0.0
293	27.990	-0.002516703	703.77	-27.05	7.41	0.0	0.0
294	28.090	-0.002764735	701.10	-26.31	7.49	0.0	0.0
295	28.190	-0.003018715	698.51	-25.56	7.58	0.0	0.0
296	28.290	-0.003277213	695.99	-24.80	7.66	0.0	0.0
297	28.390	-0.003538754	693.55	-24.03	7.74	0.0	0.0
298	28.490	-0.003801821	691.18	-23.25	7.81	0.0	0.0

ESTIMATED SPECIFIC FUEL CONSUMPTION = 2.5613140417223D-07 LBF/(FT-LBF/SEC)/SEC

PATH PERFORMANCE ANALYSIS ITERATION NO. 1
(ALTITUDE AND AIRSPEED ASSUMED CORRECT)

PATH PERFORMANCE SUBITERATION 1

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.000000 03	1.467350 02	5.142430-05	1.629370-01	1.024610 00	1.055590-01	4.000000 03	1.466820 05
1.000000-02	1.000000 03	1.467860 02	1.128330-04	1.629390-01	1.024600 00	1.055710-01	4.000000 03	1.467040 05
2.000000-02	1.000000 03	1.468320 02	1.756700-04	1.629450-01	1.024700 00	1.055830-01	4.000000 03	1.467270 05
3.000000-02	1.000000 03	1.468790 02	2.399510-04	1.629520-01	1.024740 00	1.055960-01	4.000000 03	1.467490 05
4.000000-02	1.000000 03	1.469250 02	3.056500-04	1.629590-01	1.024780 00	1.056080-01	4.000000 03	1.467710 05
6.000000-02	1.000000 03	1.470180 02	4.413440-04	1.629720-01	1.024870 00	1.056320-01	4.000000 03	1.468150 05
8.000000-02	1.000000 03	1.471130 02	5.827150-04	1.629850-01	1.024950 00	1.056560-01	4.000000 03	1.468590 05
1.000000-01	1.000010 03	1.472020 02	7.257140-04	1.629980-01	1.025030 00	1.056790-01	4.000000 03	1.469030 05
1.200000-01	1.000010 03	1.472940 02	8.824440-04	1.630110-01	1.025110 00	1.057020-01	3.999990 03	1.469470 05
1.400000-01	1.000013 03	1.473860 02	1.040750-03	1.630240-01	1.025190 00	1.057250-01	3.999990 03	1.469910 05
1.800000-01	1.000020 03	1.475690 02	1.374100-03	1.630490-01	1.025340 00	1.057700-01	3.999990 03	1.470780 05
2.200000-01	1.000030 03	1.477510 02	1.729790-03	1.630730-01	1.025490 00	1.058140-01	3.999990 03	1.471640 05
2.600000-01	1.000040 03	1.479310 02	2.107470-03	1.630960-01	1.025640 00	1.058570-01	3.999990 03	1.472490 05
3.000000-01	1.000050 03	1.481110 02	2.507310-03	1.631190-01	1.025780 00	1.058980-01	3.999990 03	1.473340 05
3.400000-01	1.000070 03	1.482890 02	2.928250-03	1.631410-01	1.025920 00	1.059380-01	3.999990 03	1.474180 05
4.200000-01	1.000110 03	1.486420 02	3.835620-03	1.631820-01	1.026180 00	1.060130-01	3.999980 03	1.475840 05
5.000000-01	1.000160 03	1.489910 02	4.826180-03	1.632210-01	1.026410 00	1.060830-01	3.999980 03	1.477480 05
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2.47900D 01	8.22565D 02	2.65051D 02	-1.71200D-01	5.65545D-02	3.56276D-01	3.77562D-02	3.99899D 03	1.69763D 05
2.48900D 01	8.18087D 02	2.65726D 02	-1.69362D-01	5.64597D-02	3.55675D-01	3.77416D-02	3.99899D 03	1.69706D 05
2.49900D 01	8.13627D 02	2.66391D 02	-1.67485D-01	5.63669D-02	3.55087D-01	3.77274D-02	3.99898D 03	1.69648D 05
2.50900D 01	8.09206D 02	2.67047D 02	-1.65569D-01	5.62763D-02	3.54513D-01	3.77136D-02	3.99898D 03	1.69588D 05
2.51900D 01	8.04825D 02	2.67694D 02	-1.63616D-01	5.61878D-02	3.53953D-01	3.77001D-02	3.99898D 03	1.69527D 05
2.52900D 01	8.00486D 02	2.68331D 02	-1.61626D-01	5.61013D-02	3.53405D-01	3.76869D-02	3.99897D 03	1.69466D 05
2.53900D 01	7.96189D 02	2.68955D 02	-1.59599D-01	5.60168D-02	3.52870D-01	3.76741D-02	3.99897D 03	1.69403D 05
2.54900D 01	7.91937D 02	2.69577D 02	-1.57537D-01	5.59343D-02	3.52347D-01	3.76616D-02	3.99896D 03	1.69339D 05
2.55900D 01	7.87731D 02	2.70186D 02	-1.55439D-01	5.58538D-02	3.51837D-01	3.76494D-02	3.99896D 03	1.69274D 05
2.56900D 01	7.83572D 02	2.70784D 02	-1.53307D-01	5.57753D-02	3.51340D-01	3.76375D-02	3.99895D 03	1.69209D 05
2.57900D 01	7.79462D 02	2.71373D 02	-1.51141D-01	5.56986D-02	3.50854D-01	3.76259D-02	3.99895D 03	1.69143D 05
2.58900D 01	7.75401D 02	2.71952D 02	-1.48941D-01	5.56239D-02	3.50381D-01	3.76146D-02	3.99895D 03	1.69077D 05
2.59900D 01	7.71391D 02	2.72522D 02	-1.46709D-01	5.55510D-02	3.49919D-01	3.76037D-02	3.99894D 03	1.69010D 05
2.60900D 01	7.67434D 02	2.73081D 02	-1.44446D-01	5.54800D-02	3.49469D-01	3.75930D-02	3.99894D 03	1.68942D 05
2.61900D 01	7.63530D 02	2.73630D 02	-1.42150D-01	5.54107D-02	3.49031D-01	3.75826D-02	3.99893D 03	1.68875D 05
2.62900D 01	7.59681D 02	2.74169D 02	-1.39824D-01	5.53433D-02	3.48604D-01	3.75725D-02	3.99893D 03	1.68807D 05
2.63900D 01	7.55888D 02	2.74698D 02	-1.37468D-01	5.52777D-02	3.48188D-01	3.75627D-02	3.99892D 03	1.68740D 05
2.64900D 01	7.52153D 02	2.75216D 02	-1.35083D-01	5.52130D-02	3.47783D-01	3.75531D-02	3.99892D 03	1.68672D 05
2.65900D 01	7.48476D 02	2.75725D 02	-1.32668D-01	5.51516D-02	3.47389D-01	3.75439D-02	3.99891D 03	1.68604D 05
2.66900D 01	7.44858D 02	2.76222D 02	-1.30226D-01	5.50912D-02	3.47007D-01	3.75349D-02	3.99891D 03	1.68537D 05
2.67900D 01	7.41302D 02	2.76710D 02	-1.27756D-01	5.50324D-02	3.46634D-01	3.75261D-02	3.99891D 03	1.68469D 05
2.68900D 01	7.37808D 02	2.77188D 02	-1.25259D-01	5.49753D-02	3.46273D-01	3.75176D-02	3.99890D 03	1.68402D 05
2.69900D 01	7.34376D 02	2.77655D 02	-1.22735D-01	5.49199D-02	3.45921D-01	3.75094D-02	3.99890D 03	1.68336D 05
2.70900D 01	7.31010D 02	2.78111D 02	-1.20186D-01	5.48661D-02	3.45581D-01	3.75014D-02	3.99889D 03	1.68270D 05
2.71900D 01	7.27708D 02	2.78557D 02	-1.17612D-01	5.48138D-02	3.45250D-01	3.74937D-02	3.99889D 03	1.68204D 05
2.72900D 01	7.24473D 02	2.78992D 02	-1.15013D-01	5.47632D-02	3.44929D-01	3.74862D-02	3.99888D 03	1.68139D 05
2.73900D 01	7.21305D 02	2.79417D 02	-1.12390D-01	5.47142D-02	3.44618D-01	3.74789D-02	3.99888D 03	1.68075D 05
2.74900D 01	7.18205D 02	2.79832D 02	-1.09744D-01	5.46666D-02	3.44317D-01	3.74719D-02	3.99887D 03	1.68011D 05
2.75900D 01	7.15175D 02	2.80235D 02	-1.07076D-01	5.46207D-02	3.44026D-01	3.74651D-02	3.99887D 03	1.67949D 05
2.76900D 01	7.12216D 02	2.80628D 02	-1.04385D-01	5.45762D-02	3.43744D-01	3.74586D-02	3.99887D 03	1.67887D 05
2.77900D 01	7.09328D 02	2.81011D 02	-1.01673D-01	5.45332D-02	3.43472D-01	3.74522D-02	3.99886D 03	1.67826D 05
2.78900D 01	7.06513D 02	2.81383D 02	-9.89400D-02	5.44916D-02	3.43208D-01	3.74461D-02	3.99886D 03	1.67766D 05
2.79900D 01	7.03769D 02	2.81744D 02	-9.61867D-02	5.44515D-02	3.42954D-01	3.74402D-02	3.99885D 03	1.67707D 05
2.80900D 01	7.01100D 02	2.82094D 02	-9.34138D-02	5.44128D-02	3.42709D-01	3.74345D-02	3.99885D 03	1.67650D 05
2.81900D 01	6.98507D 02	2.82434D 02	-9.06219D-02	5.43755D-02	3.42473D-01	3.74291D-02	3.99884D 03	1.67593D 05
2.82900D 01	6.95989D 02	2.82763D 02	-8.78115D-02	5.43396D-02	3.42245D-01	3.74238D-02	3.99884D 03	1.67538D 05
2.83900D 01	6.93547D 02	2.83081D 02	-8.49832D-02	5.43050D-02	3.42026D-01	3.74187D-02	3.99884D 03	1.67484D 05
2.84900D 01	6.91183D 02	2.83389D 02	-8.21377D-02	5.42718D-02	3.41816D-01	3.74139D-02	3.99883D 03	1.67432D 05

PATH PERFORMANCE DRAG AND LIFT COEFFICIENT UPDATE

	OLD		DELTA		NEW
CD0 :	0.3354461522411846D-01	+	-0.1318418929434341D-02	=	0.3222619629468414D-01
CD1 :	0.0	+	0.0	=	0.0
CD2 :	0.1292211580163920D 01	+	-0.5686032077806958D-01	=	0.1235351259178331D 01
CD3 :	0.0	+	0.0	=	0.0
CD4 :	0.2010016446776653D 04	+	-0.7743140334407648D 02	=	0.1932585434333593D 04
CLA0:	-0.3791586118452531D-02	+	-0.1356476686275728D-03	=	-0.3927233787080104D-02
CLA :	0.6380209375843610D 01	+	-0.1326557059702320D-02	=	0.6378582520137411D 01
CLAI:	-0.5240762355713760D 00	+	-0.1107184027060878D-01	=	-0.5351591638277467D 00

PATH PERFORMANCE SUBITERATION 2

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.00000D 03	1.46735D 02	5.14243D-05	1.63124D-01	1.02521D 00	1.01616D-01	4.00000D 03	1.44427D 05
1.00000D-02	1.00000D 03	1.46786D 02	1.12833D-04	1.63131D-01	1.02526D 00	1.01628D-01	4.00000D 03	1.44447D 05
2.00000D-02	1.00000D 03	1.46832D 02	1.75676D-04	1.63138D-01	1.02530D 00	1.01640D-01	4.00000D 03	1.44467D 05
3.00000D-02	1.00000D 03	1.46874D 02	2.39951D-04	1.63144D-01	1.02534D 00	1.01652D-01	4.00000D 03	1.44487D 05
4.00000D-02	1.00000D 03	1.46925D 02	3.35656D-04	1.63151D-01	1.02538D 00	1.01664D-01	4.00000D 03	1.44507D 05
6.00000D-02	1.00000D 03	1.47018D 02	4.41344D-04	1.63164D-01	1.02547D 00	1.01687D-01	4.00000D 03	1.44546D 05
8.00000D-02	1.00000D 03	1.47110D 02	5.82718D-04	1.63178D-01	1.02565D 00	1.01710D-01	4.00000D 03	1.44586D 05

1.000000-01	1.000010 03	1.472020 02	7.297590-04	1.631910-01	1.025630 00	1.017330-01	4.000000 03	1.446250 05
1.200000-01	1.000010 03	1.472940 02	8.824440-04	1.632040-01	1.025710 00	1.017560-01	3.999990 03	1.446640 05
1.400000-01	1.000013 03	1.473463 02	1.034750-03	1.632160-01	1.025790 00	1.017780-01	3.999990 03	1.447030 05
1.800000-01	1.000020 03	1.475650 02	1.374160-03	1.632410-01	1.025940 00	1.018210-01	3.999990 03	1.447800 05
2.200000-01	1.000030 03	1.477510 02	1.729790-03	1.632650-01	1.026090 00	1.018660-01	3.999990 03	1.448570 05
2.600000-01	1.000040 03	1.479310 02	2.107470-03	1.632890-01	1.026240 00	1.019050-01	3.999990 03	1.449330 05
3.000000-01	1.000050 03	1.481110 02	2.507010-03	1.633120-01	1.026380 00	1.019450-01	3.999990 03	1.450090 05
3.400000-01	1.000070 03	1.482690 02	2.928250-03	1.633340-01	1.026520 00	1.019840-01	3.999990 03	1.450840 05
4.200000-01	1.000110 03	1.486420 02	3.831020-03	1.633760-01	1.026780 00	1.020570-01	3.999980 03	1.452320 05
5.000000-01	1.000160 03	1.489910 02	4.820180-03	1.634140-01	1.027020 00	1.021240-01	3.999980 03	1.453780 05
5.800000-01	1.000220 03	1.493160 02	5.900170-03	1.634490-01	1.027240 00	1.021860-01	3.999980 03	1.455200 05
6.600000-01	1.000300 03	1.496140 02	7.055320-03	1.634800-01	1.027430 00	1.022410-01	3.999970 03	1.456610 05
7.400000-01	1.000390 03	1.500370 02	8.289960-03	1.635080-01	1.027610 00	1.022900-01	3.999970 03	1.457990 05
8.400000-01	1.000530 03	1.504170 02	9.942410-03	1.635370-01	1.027790 00	1.023410-01	3.999960 03	1.459670 05
9.400000-01	1.000690 03	1.508180 02	1.171280-02	1.635600-01	1.027930 00	1.023810-01	3.999960 03	1.461310 05
1.043000 00	1.000880 03	1.512090 02	1.359760-02	1.635760-01	1.028030 00	1.024100-01	3.999960 03	1.462900 05
1.140000 00	1.001100 03	1.515920 02	1.559320-02	1.635850-01	1.028080 00	1.024260-01	3.999950 03	1.464450 05
1.240000 00	1.001360 03	1.519650 02	1.769560-02	1.635870-01	1.028100 00	1.024290-01	3.999950 03	1.465960 05
1.340000 00	1.001640 03	1.523290 02	1.990120-02	1.635810-01	1.028060 00	1.024160-01	3.999950 03	1.467430 05
1.443000 00	1.001960 03	1.526830 02	2.220590-02	1.635660-01	1.027970 00	1.023920-01	3.999940 03	1.468850 05
1.543000 00	1.002310 03	1.530260 02	2.460560-02	1.635430-01	1.027820 00	1.023510-01	3.999940 03	1.470230 05
1.640000 00	1.002720 03	1.533600 02	2.709620-02	1.635100-01	1.027620 00	1.022940-01	3.999930 03	1.471560 05
1.743000 00	1.003150 03	1.536830 02	2.967340-02	1.634680-01	1.027360 00	1.022190-01	3.999930 03	1.472850 05
1.840000 00	1.003630 03	1.539960 02	3.233280-02	1.634160-01	1.027030 00	1.021270-01	3.999910 03	1.474090 05
1.940000 00	1.004150 03	1.542980 02	3.507620-02	1.633530-01	1.026640 00	1.020160-01	3.999920 03	1.475290 05
2.040000 00	1.004710 03	1.545890 02	3.788090-02	1.632740-01	1.026180 00	1.018870-01	3.999920 03	1.476450 05
2.140000 00	1.005320 03	1.548690 02	4.076040-02	1.631930-01	1.025660 00	1.017370-01	3.999920 03	1.477560 05
2.243000 00	1.005970 03	1.551390 02	4.370410-02	1.630960-01	1.025040 00	1.015680-01	3.999910 03	1.478630 05
2.340000 00	1.006680 03	1.553980 02	4.670760-02	1.629870-01	1.024360 00	1.013790-01	3.999910 03	1.479660 05
2.443000 00	1.007430 03	1.556460 02	4.976590-02	1.628660-01	1.023610 00	1.011690-01	3.999900 03	1.480650 05
2.543000 00	1.008230 03	1.558830 02	5.287450-02	1.627330-01	1.022780 00	1.009390-01	3.999900 03	1.481590 05
2.643000 00	1.009070 03	1.561090 02	5.602880-02	1.625880-01	1.021870 00	1.006880-01	3.999900 03	1.482490 05
2.743000 00	1.009970 03	1.563240 02	5.922400-02	1.624290-01	1.020890 00	1.004160-01	3.999890 03	1.483360 05
2.840000 00	1.010920 03	1.565290 02	6.245350-02	1.622580-01	1.019820 00	1.001240-01	3.999890 03	1.484180 05
2.940000 00	1.011930 03	1.567220 02	6.571440-02	1.620730-01	1.018680 00	9.981030-02	3.999880 03	1.484960 05
3.040000 00	1.012980 03	1.569050 02	6.900510-02	1.618770-01	1.017450 00	9.947530-02	3.999880 03	1.485710 05
3.140000 00	1.014050 03	1.570770 02	7.231980-02	1.616660-01	1.016130 00	9.911960-02	3.999880 03	1.486410 05
3.243000 00	1.015250 03	1.572390 02	7.566880-02	1.614410-01	1.014730 00	9.874270-02	3.999870 03	1.487060 05
3.340000 00	1.016470 03	1.573900 02	7.899050-02	1.612020-01	1.013250 00	9.834480-02	3.999870 03	1.487710 05
3.443000 00	1.017743 03	1.575310 02	8.234300-02	1.609490-01	1.011670 00	9.792580-02	3.999870 03	1.488310 05
3.543000 00	1.019060 03	1.576620 02	8.569260-02	1.606920-01	1.010010 00	9.748580-02	3.999860 03	1.488870 05
3.640000 00	1.020440 03	1.577830 02	8.906370-02	1.604003-01	1.008253 00	9.702500-02	3.999860 03	1.489430 05
3.743000 00	1.021873 03	1.578940 02	9.238860-02	1.601330-01	1.006430 00	9.654330-02	3.999850 03	1.489890 05
3.840000 00	1.023350 03	1.579960 02	9.572250-02	1.597910-01	1.004490 00	9.604140-02	3.999850 03	1.490350 05
3.943000 00	1.024890 03	1.580890 02	9.904050-02	1.594660-01	1.002420 00	9.551900-02	3.999850 03	1.490780 05
4.043000 00	1.024880 03	1.581710 02	1.023190-01	1.591220-01	1.000240 00	9.497650-02	3.999840 03	1.491180 05
4.140000 00	1.026120 03	1.582450 02	1.056120-01	1.587643-01	9.980590-01	9.441420-02	3.999840 03	1.491550 05
4.240000 00	1.029410 03	1.583130 02	1.088460-01	1.583930-01	9.957310-01	9.383290-02	3.999830 03	1.491890 05
4.340000 00	1.031540 03	1.583060 02	1.120670-01	1.580010-01	9.933070-01	9.323340-02	3.999830 03	1.492200 05
4.440000 00	1.033350 03	1.584150 02	1.152180-01	1.575970-01	9.907880-01	9.261060-02	3.999830 03	1.492490 05
4.540000 00	1.035230 03	1.584550 02	1.183080-01	1.571770-01	9.881740-01	9.198340-02	3.999820 03	1.492750 05
4.640000 00	1.037100 03	1.584840 02	1.214560-01	1.567430-01	9.854670-01	9.133450-02	3.999820 03	1.492960 05
4.740000 00	1.039040 03	1.585130 02	1.244810-01	1.562940-01	9.826670-01	9.067090-02	3.999820 03	1.493190 05
4.840000 00	1.041030 03	1.585310 02	1.274570-01	1.558300-01	9.797750-01	8.999340-02	3.999810 03	1.493370 05
4.940000 00	1.043070 03	1.585420 02	1.303750-01	1.553510-01	9.767920-01	8.930290-02	3.999810 03	1.493540 05
5.040000 00	1.045150 03	1.585460 02	1.332290-01	1.548580-01	9.737190-01	8.860020-02	3.999800 03	1.493680 05
5.140000 00	1.047280 03	1.585440 02	1.360160-01	1.543510-01	9.705570-01	8.788630-02	3.999800 03	1.493800 05
5.240000 00	1.049450 03	1.585360 02	1.387320-01	1.538300-01	9.673060-01	8.716190-02	3.999800 03	1.493900 05
5.340000 00	1.051670 03	1.585230 02	1.413750-01	1.532940-01	9.639670-01	8.642790-02	3.999790 03	1.493990 05
5.440000 00	1.053920 03	1.585040 02	1.439390-01	1.527450-01	9.605420-01	8.568520-02	3.999790 03	1.494050 05
5.540000 00	1.056210 03	1.584800 02	1.464230-01	1.521820-01	9.570300-01	8.493450-02	3.999780 03	1.494100 05
5.640000 00	1.058540 03	1.584510 02	1.488210-01	1.516050-01	9.534330-01	8.417680-02	3.999780 03	1.494140 05
5.740000 00	1.060910 03	1.584180 02	1.511320-01	1.510150-01	9.497520-01	8.341270-02	3.999780 03	1.494160 05
5.840000 00	1.063310 03	1.583810 02	1.533510-01	1.504120-01	9.459880-01	8.264320-02	3.999770 03	1.494170 05
5.940000 00	1.065750 03	1.583400 02	1.554700-01	1.497950-01	9.421400-01	8.186890-02	3.999770 03	1.494160 05
6.040000 00	1.068220 03	1.582950 02	1.575040-01	1.491650-01	9.382110-01	8.109070-02	3.999760 03	1.494150 05
6.140000 00	1.070710 03	1.582480 02	1.594320-01	1.485230-01	9.342020-01	8.030940-02	3.999760 03	1.494120 05
6.240000 00	1.073240 03	1.581980 02	1.612570-01	1.478680-01	9.301150-01	7.952600-02	3.999760 03	1.494090 05
6.340000 00	1.075790 03	1.581460 02	1.629760-01	1.472010-01	9.259530-01	7.874160-02	3.999750 03	1.494050 05
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6.540000 00	1.080970 03	1.580360 02	1.660880-01	1.458330-01	9.174110-01	7.717330-02	3.999750 03	1.493950 05
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1.889000 01	1.099020 03	2.134740 02	-1.870460-01	6.723200-02	4.235840-01	3.800670-02	3.999250 03	1.649560 05
1.899000 01	1.095020 03	2.144450 02	-1.886420-01	6.694450-02	4.217670-01	3.795440-02	3.999250 03	1.650770 05
1.909000 01	1.090980 03	2.154160 02	-1.901640-01	6.666170-02	4.199790-01	3.790320-02	3.999240 03	1.651940 05
1.919000 01	1.086880 03	2.163880 02	-1.916130-01	6.638350-02	4.182210-01	3.785310-02	3.999240 03	1.653070 05
1.929000 01	1.082730 03	2.173610 02	-1.929890-01	6.611000-02	4.164920-01	3.780420-02	3.999240 03	1.654140 05
1.939000 01	1.078540 03	2.183330 02	-1.942930-01	6.584100-02	4.147910-01	3.775630-02	3.999230 03	1.655170 05
1.949000 01	1.074300 03	2.193050 02	-1.955240-01	6.557660-02	4.131190-01	3.770940-02	3.999230 03	1.656150 05
1.959000 01	1.070020 03	2.202760 02	-1.966820-01	6.531650-02	4.114750-01	3.766360-02	3.999220 03	1.657080 05
1.969000 01	1.065700 03	2.212460 02	-1.977690-01	6.506070-02	4.098580-01	3.761880-02	3.999220 03	1.657960 05
1.979000 01	1.061330 03	2.222160 02	-1.987850-01	6.480930-02	4.082680-01	3.757500-02	3.999210 03	1.658790 05
1.989000 01	1.056920 03	2.231840 02	-1.997300-01	6.456210-02	4.067040-01	3.753210-02	3.999210 03	1.659580 05
1.999000 01	1.052470 03	2.241500 02	-2.006050-01	6.431900-02	4.051670-01	3.749010-02	3.999210 03	1.660310 05
2.009000 01	1.047990 03	2.251150 02	-2.014100-01	6.408010-02	4.036560-01	3.744910-02	3.999200 03	1.661000 05
2.019000 01	1.043470 03	2.260780 02	-2.021450-01	6.384520-02	4.021710-01	3.740890-02	3.999200 03	1.661640 05
2.029000 01	1.038910 03	2.270390 02	-2.028110-01	6.361430-02	4.007100-01	3.736960-02	3.999190 03	1.662230 05
2.039000 01	1.034320 03	2.279970 02	-2.034100-01	6.338730-02	3.992750-01	3.733120-02	3.999190 03	1.662770 05
2.049000 01	1.029700 03	2.289530 02	-2.039400-01	6.316420-02	3.978640-01	3.729360-02	3.999180 03	1.663260 05
2.059000 01	1.025060 03	2.299060 02	-2.044030-01	6.294500-02	3.964780-01	3.725680-02	3.999180 03	1.663710 05
2.069000 01	1.020370 03	2.308560 02	-2.047990-01	6.272960-02	3.951150-01	3.722080-02	3.999170 03	1.664110 05
2.079000 01	1.015660 03	2.318030 02	-2.051280-01	6.251790-02	3.937760-01	3.718560-02	3.999170 03	1.664460 05
2.089000 01	1.010920 03	2.327460 02	-2.053930-01	6.230990-02	3.924600-01	3.715110-02	3.999170 03	1.664760 05
2.099000 01	1.006160 03	2.336860 02	-2.055920-01	6.210560-02	3.911680-01	3.711740-02	3.999160 03	1.665020 05
2.109000 01	1.001380 03	2.346220 02	-2.057260-01	6.190440-02	3.898980-01	3.708440-02	3.999160 03	1.665230 05
2.119000 01	9.965790 02	2.355540 02	-2.057970-01	6.170760-02	3.886500-01	3.705210-02	3.999150 03	1.665400 05
2.129000 01	9.917560 02	2.364820 02	-2.058040-01	6.151390-02	3.874250-01	3.702060-02	3.999150 03	1.665570 05
2.139000 01	9.869140 02	2.374050 02	-2.057490-01	6.132370-02	3.862210-01	3.698970-02	3.999140 03	1.665590 05
2.149000 01	9.820560 02	2.383240 02	-2.056320-01	6.113690-02	3.850390-01	3.695950-02	3.999140 03	1.665630 05
2.159000 01	9.771820 02	2.392380 02	-2.054530-01	6.095340-02	3.838790-01	3.692990-02	3.999140 03	1.665620 05
2.169000 01	9.722980 02	2.401470 02	-2.052130-01	6.077320-02	3.827380-01	3.690100-02	3.999130 03	1.665560 05
2.179000 01	9.673560 02	2.410510 02	-2.049130-01	6.059630-02	3.816190-01	3.687270-02	3.999130 03	1.665470 05
2.189000 01	9.624860 02	2.419500 02	-2.045540-01	6.042250-02	3.805200-01	3.684500-02	3.999120 03	1.665330 05
2.199000 01	9.575670 02	2.428430 02	-2.041360-01	6.025200-02	3.794400-01	3.681790-02	3.999120 03	1.665150 05
2.209000 01	9.526400 02	2.437310 02	-2.036590-01	6.008450-02	3.783810-01	3.679140-02	3.999110 03	1.664940 05
2.219000 01	9.477080 02	2.446130 02	-2.031250-01	5.992010-02	3.773410-01	3.676540-02	3.999110 03	1.664680 05
2.229000 01	9.427720 02	2.454890 02	-2.025340-01	5.975880-02	3.763190-01	3.674010-02	3.999100 03	1.664390 05
2.239000 01	9.378320 02	2.463590 02	-2.018870-01	5.960040-02	3.753170-01	3.671530-02	3.999100 03	1.664060 05
2.249000 01	9.328920 02	2.472230 02	-2.011840-01	5.944500-02	3.743340-01	3.669100-02	3.999100 03	1.663690 05
2.259000 01	9.279520 02	2.480800 02	-2.004260-01	5.929250-02	3.733690-01	3.666720-02	3.999090 03	1.663290 05
2.269000 01	9.230180 02	2.489310 02	-1.996140-01	5.914290-02	3.724220-01	3.664400-02	3.999090 03	1.662850 05
2.279000 01	9.180810 02	2.497750 02	-1.987490-01	5.899620-02	3.714940-01	3.662130-02	3.999080 03	1.662380 05
2.289000 01	9.131520 02	2.506120 02	-1.978300-01	5.885220-02	3.705830-01	3.659910-02	3.999080 03	1.661880 05
2.299000 01	9.082300 02	2.514430 02	-1.968590-01	5.871110-02	3.696890-01	3.657740-02	3.999070 03	1.661340 05
2.309000 01	9.033170 02	2.522660 02	-1.958370-01	5.857270-02	3.688130-01	3.655620-02	3.999070 03	1.660780 05
2.319000 01	8.984130 02	2.530820 02	-1.947630-01	5.843700-02	3.679540-01	3.653540-02	3.999060 03	1.660180 05
2.329000 01	8.935210 02	2.538900 02	-1.936390-01	5.830400-02	3.671130-01	3.651810-02	3.999060 03	1.659560 05
2.339000 01	8.886420 02	2.546910 02	-1.924660-01	5.817360-02	3.662870-01	3.649530-02	3.999060 03	1.658910 05
2.349000 01	8.837780 02	2.554850 02	-1.912430-01	5.804580-02	3.654780-01	3.647590-02	3.999050 03	1.658230 05
2.359000 01	8.789300 02	2.562700 02	-1.899730-01	5.792050-02	3.646860-01	3.645690-02	3.999050 03	1.657530 05
2.369000 01	8.741000 02	2.570480 02	-1.886540-01	5.779780-02	3.639090-01	3.643840-02	3.999040 03	1.656800 05
2.379000 01	8.692900 02	2.578180 02	-1.872890-01	5.767760-02	3.631480-01	3.642030-02	3.999040 03	1.656050 05
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2.399000 01	8.597330 02	2.593330 02	-1.844200-01	5.744450-02	3.616720-01	3.638530-02	3.999030 03	1.654470 05
2.409000 01	8.549890 02	2.600780 02	-1.829180-01	5.733150-02	3.609570-01	3.636850-02	3.999020 03	1.653660 05
2.419000 01	8.502710 02	2.608140 02	-1.813720-01	5.722090-02	3.602570-01	3.635200-02	3.999020 03	1.652820 05
2.429000 01	8.455810 02	2.615420 02	-1.797820-01	5.711260-02	3.595710-01	3.633580-02	3.999020 03	1.651970 05
2.439000 01	8.409180 02	2.622620 02	-1.781490-01	5.700660-02	3.589000-01	3.632010-02	3.999010 03	1.651100 05
2.449000 01	8.362860 02	2.629720 02	-1.764730-01	5.690290-02	3.582430-01	3.630470-02	3.999010 03	1.650210 05
2.459000 01	8.316860 02	2.636740 02	-1.747560-01	5.680140-02	3.576010-01	3.628970-02	3.999000 03	1.649310 05
2.469000 01	8.271180 02	2.643670 02	-1.729980-01	5.670210-02	3.569720-01	3.627510-02	3.999000 03	1.648390 05
2.479000 01	8.225860 02	2.650510 02	-1.712000-01	5.660500-02	3.563580-01	3.626080-02	3.998990 03	1.647460 05
2.489000 01	8.180870 02	2.657260 02	-1.693620-01	5.651010-02	3.557570-01	3.624690-02	3.998990 03	1.646520 05
2.499000 01	8.136270 02	2.663910 02	-1.674850-01	5.641730-02	3.551690-01	3.623330-02	3.998990 03	1.645570 05
2.509000 01	8.092060 02	2.670470 02	-1.655690-01	5.632660-02	3.545950-01	3.622000-02	3.998980 03	1.644610 05
2.519000 01	8.048250 02	2.676940 02	-1.636160-01	5.623800-02	3.540340-01	3.620700-02	3.998980 03	1.643640 05
2.529000 01	8.004860 02	2.683310 02	-1.616260-01	5.615140-02	3.534860-01	3.619440-02	3.998970 03	1.642670 05
2.539000 01	7.961890 02	2.689590 02	-1.595990-01	5.606690-02	3.529510-01	3.618210-02	3.998970 03	1.641690 05
2.549000 01	7.919370 02	2.695770 02	-1.575370-01	5.598440-02	3.524290-01	3.617010-02	3.998960 03	1.640700 05
2.559000 01	7.877310 02	2.701860 02	-1.554390-01	5.590380-02	3.519190-01	3.615850-02	3.998960 03	1.639710 05
2.569000 01	7.835720 02	2.707840 02	-1.533070-01	5.582520-02	3.514210-01	3.614710-02	3.998950 03	1.638710 05
2.579000 01	7.794620 02	2.713730 02	-1.511410-01	5.574860-02	3.509350-01	3.613600-02	3.998950 03	1.637720 05

2.58900D 01	7.76401D 02	2.71952D 02	-1.48941D-01	5.56738D-02	3.50462D-01	3.61252D-02	3.99895D 03	1.63672D 05
2.59900D 01	7.71391D 02	2.72522D 02	-1.46709D-01	5.56008D-02	3.50000D-01	3.61147D-02	3.99894D 03	1.63572D 05
2.60900D 01	7.67434D 02	2.73081D 02	-1.44446D-01	5.55296D-02	3.49550D-01	3.61045D-02	3.99894D 03	1.63472D 05
2.61900D 01	7.63530D 02	2.73630D 02	-1.42130D-01	5.54605D-02	3.49111D-01	3.60945D-02	3.99893D 03	1.63373D 05
2.62900D 01	7.59681D 02	2.74169D 02	-1.39824D-01	5.53930D-02	3.48684D-01	3.60848D-02	3.99893D 03	1.63273D 05
2.63900D 01	7.55848D 02	2.74698D 02	-1.37468D-01	5.53273D-02	3.48264D-01	3.60754D-02	3.99892D 03	1.63174D 05
2.64900D 01	7.52153D 02	2.75216D 02	-1.35093D-01	5.52634D-02	3.47863D-01	3.60663D-02	3.99892D 03	1.63076D 05
2.65900D 01	7.48476D 02	2.75725D 02	-1.32684D-01	5.52012D-02	3.47469D-01	3.60574D-02	3.99891D 03	1.62978D 05
2.66900D 01	7.44858D 02	2.76223D 02	-1.30226D-01	5.51407D-02	3.47086D-01	3.60488D-02	3.99891D 03	1.62881D 05
2.67900D 01	7.41302D 02	2.76710D 02	-1.27756D-01	5.50819D-02	3.46714D-01	3.60404D-02	3.99891D 03	1.62784D 05
2.68900D 01	7.37808D 02	2.77188D 02	-1.25259D-01	5.50248D-02	3.46352D-01	3.60323D-02	3.99890D 03	1.62689D 05
2.69900D 01	7.34376D 02	2.77655D 02	-1.22735D-01	5.49693D-02	3.46001D-01	3.60244D-02	3.99890D 03	1.62594D 05
2.70900D 01	7.31010D 02	2.78111D 02	-1.20186D-01	5.49155D-02	3.45660D-01	3.60167D-02	3.99889D 03	1.62500D 05
2.71900D 01	7.27708D 02	2.78557D 02	-1.17612D-01	5.48632D-02	3.45329D-01	3.60093D-02	3.99889D 03	1.62408D 05
2.72900D 01	7.24473D 02	2.78992D 02	-1.15013D-01	5.48126D-02	3.45008D-01	3.60021D-02	3.99888D 03	1.62316D 05
2.73900D 01	7.21305D 02	2.79417D 02	-1.12390D-01	5.47635D-02	3.44698D-01	3.59952D-02	3.99888D 03	1.62226D 05
2.74900D 01	7.18205D 02	2.79832D 02	-1.09744D-01	5.47159D-02	3.44396D-01	3.59885D-02	3.99887D 03	1.62137D 05
2.75900D 01	7.15175D 02	2.80235D 02	-1.07076D-01	5.46699D-02	3.44105D-01	3.59820D-02	3.99887D 03	1.62050D 05
2.76900D 01	7.12216D 02	2.80628D 02	-1.04385D-01	5.46254D-02	3.43823D-01	3.59757D-02	3.99887D 03	1.61963D 05
2.77900D 01	7.09325D 02	2.81011D 02	-1.01673D-01	5.45824D-02	3.43551D-01	3.59696D-02	3.99886D 03	1.61879D 05
2.78900D 01	7.06517D 02	2.81383D 02	-9.89460D-02	5.45408D-02	3.43287D-01	3.59638D-02	3.99886D 03	1.61796D 05
2.79900D 01	7.03769D 02	2.81744D 02	-9.61867D-02	5.45006D-02	3.43033D-01	3.59581D-02	3.99885D 03	1.61715D 05
2.80900D 01	7.01100D 02	2.82094D 02	-9.34138D-02	5.44619D-02	3.42788D-01	3.59527D-02	3.99885D 03	1.61635D 05
2.81900D 01	6.98507D 02	2.82434D 02	-9.06219D-02	5.44246D-02	3.42551D-01	3.59474D-02	3.99884D 03	1.61558D 05
2.82900D 01	6.95589D 02	2.82763D 02	-8.78115D-02	5.43887D-02	3.42324D-01	3.59424D-02	3.99884D 03	1.61482D 05
2.83900D 01	6.93547D 02	2.83081D 02	-8.49932D-02	5.43541D-02	3.42105D-01	3.59375D-02	3.99884D 03	1.61408D 05
2.84900D 01	6.91183D 02	2.83389D 02	-8.21377D-02	5.43208D-02	3.41894D-01	3.59329D-02	3.99883D 03	1.61336D 05

PITCH-ANGLE GAIN = 1.00015147203D 00
PITCH-ANGLE BIAS = 5.03459235701D-05 RADIAN

M O D E L   S O L U T I O N S

MODEL 12 P0 = 2.6079916151735810D 04 CD0 = 3.3234351370499780D-02
P1 = 0.0 CD1 = 0.0
POINT P2 = 1.1692348785329760D 03 CD2 = 1.2918375766979600D 00
FAILURES P3 = -2.3815670659668410D 00 CD3 = 0.0
= 0 P4 = 0.0 CD4 = 2.3064616478352630D 03

FIT ERROR= 8.1434939054453100D-08

MODEL 12 FOUND TO BE BEST FIT

LIFT COEFFICIENTS: BY LEAST SQUARE DISTANCE

CLA0=-0.3519065399163584D-02
CLA = 0.6384177051845278D 01
CLAX=-0.5294918798927023D 00
EXPX= 0.2055549851552467D 01
CLO= 0.0

ESTIMATED SPECIFIC FUEL CONSUMPTION = 2.5650906604510D-07 LBF/(FT-LBF/SEC)/SEC

PATH PERFORMANCE ANALYSIS ITERATION NO. 2
(ALTITUDE AND AIRSPEED ASSUMED CORRECT)

PATH PERFORMANCE SUBITERATION 1

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.00000D 03	1.46739D 02	6.14243D-05	1.63041D-01	1.02463D 00	1.05262D-01	4.00000D 03	1.46515D 05
1.00000D-02	1.00000D 03	1.46786D 02	1.12533D-04	1.63047D-01	1.02468D 00	1.05275D-01	4.00000D 03	1.46537D 05
2.00000D-02	1.00000D 03	1.46832D 02	1.75676D-04	1.63054D-01	1.02472D 00	1.05287D-01	4.00000D 03	1.46559D 05
3.00000D-02	1.00000D 03	1.46879D 02	2.39951D-04	1.63061D-01	1.02476D 00	1.05299D-01	4.00000D 03	1.46581D 05
4.00000D-02	1.00000D 03	1.46925D 02	3.05650D-04	1.63068D-01	1.02480D 00	1.05312D-01	4.00000D 03	1.46603D 05
6.00000D-02	1.00000D 03	1.47016D 02	4.41344D-04	1.63081D-01	1.02489D 00	1.05336D-01	4.00000D 03	1.46647D 05
8.00000D-02	1.00000D 03	1.47110D 02	5.82718D-04	1.63094D-01	1.02497D 00	1.05360D-01	4.00000D 03	1.46691D 05
1.00000D-01	1.00001D 03	1.47202D 02	7.29739D-04	1.63107D-01	1.02505D 00	1.05383D-01	4.00000D 03	1.46735D 05
1.20000D-01	1.00001D 03	1.47294D 02	8.82444D-04	1.63120D-01	1.02513D 00	1.05406D-01	3.99999D 03	1.46778D 05
1.40000D-01	1.00001D 03	1.47386D 02	1.04075D-03	1.63133D-01	1.02521D 00	1.05429D-01	3.99999D 03	1.46822D 05
1.80000D-01	1.00002D 03	1.47569D 02	1.37416D-03	1.63158D-01	1.02536D 00	1.05474D-01	3.99999D 03	1.46908D 05
2.20000D-01	1.00003D 03	1.47751D 02	1.72979D-03	1.63182D-01	1.02551D 00	1.05518D-01	3.99999D 03	1.46993D 05
2.60000D-01	1.00004D 03	1.47931D 02	2.10747D-03	1.63205D-01	1.02566D 00	1.05561D-01	3.99999D 03	1.47078D 05
3.00000D-01	1.00005D 03	1.48111D 02	2.50761D-03	1.63228D-01	1.02580D 00	1.05602D-01	3.99999D 03	1.47162D 05
3.40000D-01	1.00007D 03	1.48289D 02	2.92825D-03	1.63250D-01	1.02594D 00	1.05642D-01	3.99999D 03	1.47246D 05
4.20000D-01	1.00011D 03	1.48642D 02	3.83562D-03	1.63292D-01	1.02620D 00	1.05718D-01	3.99998D 03	1.47411D 05
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2.41900D 01	8.50271D 02	2.60814D 02	-1.81372D-01	5.72019D-02	3.60190D-01	3.75316D-02	3.99902D 03	1.69050D 05
2.42900D 01	8.45581D 02	2.61542D 02	-1.79782D-01	5.70937D-02	3.59505D-01	3.75148D-02	3.99902D 03	1.68995D 05
2.43900D 01	8.40918D 02	2.62262D 02	-1.78149D-01	5.69877D-02	3.58834D-01	3.74984D-02	3.99901D 03	1.68938D 05
2.44900D 01	8.36286D 02	2.62972D 02	-1.76473D-01	5.68840D-02	3.58177D-01	3.74824D-02	3.99901D 03	1.68879D 05
2.45900D 01	8.31685D 02	2.63674D 02	-1.74756D-01	5.67825D-02	3.57535D-01	3.74668D-02	3.99900D 03	1.68818D 05
2.46900D 01	8.27116D 02	2.64367D 02	-1.72998D-01	5.66833D-02	3.56907D-01	3.74516D-02	3.99900D 03	1.68756D 05
2.47900D 01	8.22585D 02	2.65051D 02	-1.71200D-01	5.65862D-02	3.56292D-01	3.74367D-02	3.99899D 03	1.68692D 05
2.48900D 01	8.18087D 02	2.65726D 02	-1.69362D-01	5.64913D-02	3.55691D-01	3.74222D-02	3.99899D 03	1.68626D 05
2.49900D 01	8.13627D 02	2.66391D 02	-1.67485D-01	5.63986D-02	3.55104D-01	3.74080D-02	3.99898D 03	1.68560D 05
2.50900D 01	8.09206D 02	2.67047D 02	-1.65569D-01	5.63079D-02	3.54530D-01	3.73942D-02	3.99898D 03	1.68492D 05
2.51900D 01	8.04825D 02	2.67694D 02	-1.63616D-01	5.62193D-02	3.53969D-01	3.73807D-02	3.99898D 03	1.68423D 05
2.52900D 01	8.00486D 02	2.68331D 02	-1.61626D-01	5.61328D-02	3.53421D-01	3.73676D-02	3.99897D 03	1.68353D 05
2.53900D 01	7.96189D 02	2.68959D 02	-1.59599D-01	5.60483D-02	3.52886D-01	3.73548D-02	3.99897D 03	1.68283D 05
2.54900D 01	7.91937D 02	2.69577D 02	-1.57537D-01	5.59658D-02	3.52364D-01	3.73423D-02	3.99896D 03	1.68211D 05
2.55900D 01	7.87731D 02	2.70186D 02	-1.55439D-01	5.58853D-02	3.51854D-01	3.73301D-02	3.99896D 03	1.68139D 05
2.56900D 01	7.83572D 02	2.70784D 02	-1.53307D-01	5.58067D-02	3.51356D-01	3.73183D-02	3.99895D 03	1.68066D 05
2.57900D 01	7.79462D 02	2.71373D 02	-1.51141D-01	5.57301D-02	3.50871D-01	3.73067D-02	3.99895D 03	1.67992D 05
2.58900D 01	7.75401D 02	2.71952D 02	-1.48941D-01	5.56553D-02	3.50397D-01	3.72955D-02	3.99895D 03	1.67919D 05
2.59900D 01	7.71391D 02	2.72522D 02	-1.46709D-01	5.55824D-02	3.49936D-01	3.72845D-02	3.99894D 03	1.67844D 05
2.60900D 01	7.67434D 02	2.73081D 02	-1.44446D-01	5.55114D-02	3.49486D-01	3.72739D-02	3.99894D 03	1.67770D 05
2.61900D 01	7.63530D 02	2.73630D 02	-1.42150D-01	5.54421D-02	3.49047D-01	3.72635D-02	3.99893D 03	1.67695D 05
2.62900D 01	7.59681D 02	2.74169D 02	-1.39824D-01	5.53747D-02	3.48620D-01	3.72534D-02	3.99893D 03	1.67621D 05
2.63900D 01	7.55888D 02	2.74698D 02	-1.37468D-01	5.53090D-02	3.48204D-01	3.72436D-02	3.99892D 03	1.67546D 05
2.64900D 01	7.52153D 02	2.75216D 02	-1.35083D-01	5.52451D-02	3.47799D-01	3.72341D-02	3.99892D 03	1.67471D 05
2.65900D 01	7.48476D 02	2.75725D 02	-1.32668D-01	5.51829D-02	3.47406D-01	3.72249D-02	3.99891D 03	1.67397D 05
2.66900D 01	7.44858D 02	2.76223D 02	-1.30226D-01	5.51224D-02	3.47023D-01	3.72159D-02	3.99891D 03	1.67323D 05
2.67900D 01	7.41302D 02	2.76710D 02	-1.27756D-01	5.50637D-02	3.46651D-01	3.72071D-02	3.99891D 03	1.67249D 05
2.68900D 01	7.37808D 02	2.77188D 02	-1.25259D-01	5.50066D-02	3.46289D-01	3.71987D-02	3.99890D 03	1.67176D 05
2.69900D 01	7.34376D 02	2.77655D 02	-1.22736D-01	5.49511D-02	3.45938D-01	3.71905D-02	3.99890D 03	1.67103D 05
2.70900D 01	7.31010D 02	2.78111D 02	-1.20186D-01	5.48973D-02	3.45557D-01	3.71825D-02	3.99889D 03	1.67031D 05
2.71900D 01	7.27768D 02	2.78557D 02	-1.17612D-01	5.48451D-02	3.45266D-01	3.71748D-02	3.99889D 03	1.66959D 05
2.72900D 01	7.24473D 02	2.78992D 02	-1.15013D-01	5.47944D-02	3.44945D-01	3.71673D-02	3.99888D 03	1.66888D 05
2.73900D 01	7.21305D 02	2.79417D 02	-1.12390D-01	5.47453D-02	3.44634D-01	3.71601D-02	3.99888D 03	1.66818D 05
2.74900D 01	7.18208D 02	2.79832D 02	-1.09744D-01	5.46978D-02	3.44333D-01	3.71531D-02	3.99887D 03	1.66749D 05
2.75900D 01	7.15175D 02	2.80235D 02	-1.07076D-01	5.46518D-02	3.44042D-01	3.71463D-02	3.99887D 03	1.66681D 05
2.76900D 01	7.12214D 02	2.80628D 02	-1.04385D-01	5.46073D-02	3.43760D-01	3.71398D-02	3.99887D 03	1.66614D 05
2.77900D 01	7.09328D 02	2.81011D 02	-1.01673D-01	5.45643D-02	3.43488D-01	3.71334D-02	3.99886D 03	1.66547D 05
2.78900D 01	7.06512D 02	2.81383D 02	-9.89400D-02	5.45227D-02	3.43224D-01	3.71273D-02	3.99886D 03	1.66483D 05
2.79900D 01	7.03769D 02	2.81744D 02	-9.61867D-02	5.44826D-02	3.42970D-01	3.71215D-02	3.99885D 03	1.66419D 05
2.80900D 01	7.01108D 02	2.82094D 02	-9.34138D-02	5.44439D-02	3.42725D-01	3.71158D-02	3.99885D 03	1.66356D 05
2.81900D 01	6.98567D 02	2.82434D 02	-9.06219D-02	5.44066D-02	3.42489D-01	3.71103D-02	3.99884D 03	1.66295D 05
2.82900D 01	6.95989D 02	2.82763D 02	-8.78115D-02	5.43706D-02	3.42261D-01	3.71051D-02	3.99884D 03	1.66236D 05
2.83900D 01	6.93547D 02	2.83081D 02	-8.49832D-02	5.43361D-02	3.42042D-01	3.71000D-02	3.99884D 03	1.66177D 05
2.84900D 01	6.91183D 02	2.83389D 02	-8.21377D-02	5.43028D-02	3.41832D-01	3.70952D-02	3.99883D 03	1.66120D 05

PATH PERFORMANCE DRAG AND LIFT COEFFICIENT UPDATE

	OLD		DELTA		NEW
CDO :	0.3323435137049978D-01	+	-0.1311136243330581D-02	=	0.3192321512716920D-01
CD1 :	0.0	+	0.0	=	0.0
CD2 :	0.1291837576697960D 01	+	-0.5617251721103705D-01	=	0.1235665059486923D 01
CD3 :	0.0	+	0.0	=	0.0
CD4 :	0.2030461647555263D 04	+	-0.7849270123984668D 02	=	0.1933968946615416D 04
CLA0:	-0.3519065399163584D-02	+	-0.1353593182976938D-03	=	-0.3654424717461278D-02
CLA :	0.6384177051843278D 01	+	-0.1319561560180056D-02	=	0.6382857470265098D 01
CLAX:	-0.5294918798927023D 00	+	-0.1013141908402072D-01	=	-0.5396232989767231D 00

PATH PERFORMANCE SUBITERATION 2

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.000000D 03	1.467390 02	5.142430-05	1.632310-01	1.025230 00	1.013720-01	4.000000 03	1.442900 05
1.000000-02	1.000000D 03	1.467860 02	1.128330-04	1.632380-01	1.025270 00	1.013840-01	4.000000 03	1.443100 05
2.000000-02	1.000000 03	1.468320 02	1.756760-04	1.632450-01	1.025310 00	1.013960-01	4.000000 03	1.443290 05
3.000000-02	1.000000 03	1.468790 02	2.399510-04	1.632520-01	1.025350 00	1.014080-01	4.000000 03	1.443490 05
4.000000-02	1.000000 03	1.469250 02	3.056560-04	1.632580-01	1.025390 00	1.014190-01	4.000000 03	1.443690 05
6.000000-02	1.000000 03	1.470180 02	4.413440-04	1.632720-01	1.025480 00	1.014430-01	4.000000 03	1.444060 05
8.000000-02	1.000000 03	1.471100 02	5.827180-04	1.632850-01	1.025560 00	1.014660-01	4.000000 03	1.444470 05
1.000000-01	1.000010 03	1.472020 02	7.257590-04	1.632980-01	1.025640 00	1.014890-01	4.000000 03	1.444860 05
1.200000-01	1.000010 03	1.472940 02	8.824440-04	1.633110-01	1.025720 00	1.015110-01	3.999990 03	1.445250 05
1.400000-01	1.000010 03	1.473860 02	1.040750-03	1.633240-01	1.025800 00	1.015340-01	3.999990 03	1.445640 05
1.800000-01	1.000020 03	1.475690 02	1.374160-03	1.633490-01	1.025960 00	1.015770-01	3.999990 03	1.446410 05
2.200000-01	1.000030 03	1.477510 02	1.729790-03	1.633730-01	1.026110 00	1.016200-01	3.999990 03	1.447170 05
2.600000-01	1.000040 03	1.479310 02	2.107470-03	1.633960-01	1.026250 00	1.016610-01	3.999990 03	1.447930 05
3.000000-01	1.000050 03	1.481110 02	2.507610-03	1.634190-01	1.026400 00	1.017010-01	3.999990 03	1.448680 05
3.400000-01	1.000070 03	1.482890 02	2.928250-03	1.634410-01	1.026530 00	1.017400-01	3.999990 03	1.449430 05
4.200000-01	1.000110 03	1.486420 02	3.835020-03	1.634830-01	1.026790 00	1.018130-01	3.999980 03	1.450900 05
5.000000-01	1.000160 03	1.489910 02	4.826180-03	1.635220-01	1.027030 00	1.018810-01	3.999980 03	1.452340 05
5.800000-01	1.000220 03	1.493350 02	5.900170-03	1.635570-01	1.027250 00	1.019430-01	3.999980 03	1.453760 05
6.600000-01	1.000300 03	1.496740 02	7.035320-03	1.635880-01	1.027450 00	1.019980-01	3.999970 03	1.455160 05
7.400000-01	1.000390 03	1.500070 02	8.289760-03	1.636160-01	1.027620 00	1.020470-01	3.999970 03	1.456530 05
8.400000-01	1.000520 03	1.504170 02	9.942410-03	1.636450-01	1.027600 00	1.020990-01	3.999960 03	1.458200 05
9.400000-01	1.000690 03	1.508130 02	1.171280-02	1.636680-01	1.027540 00	1.021390-01	3.999960 03	1.459820 05
1.040000 00	1.000880 03	1.512090 02	1.359760-02	1.636860-01	1.028040 00	1.021680-01	3.999960 03	1.461410 05
1.140000 00	1.001100 03	1.513920 02	1.559320-02	1.636930-01	1.028100 00	1.021830-01	3.999950 03	1.462950 05
1.240000 00	1.001360 03	1.519650 02	1.769560-02	1.636950-01	1.028110 00	1.021870-01	3.999950 03	1.464450 05
1.340000 00	1.001640 03	1.523290 02	1.990120-02	1.636890-01	1.028070 00	1.021760-01	3.999950 03	1.465900 05
1.440000 00	1.001950 03	1.526830 02	2.220590-02	1.636740-01	1.027980 00	1.021500-01	3.999940 03	1.467310 05
1.540000 00	1.002320 03	1.530260 02	2.460500-02	1.636510-01	1.027840 00	1.021090-01	3.999940 03	1.468680 05
1.640000 00	1.002720 03	1.533600 02	2.709620-02	1.636180-01	1.027630 00	1.020510-01	3.999930 03	1.470000 05
1.740000 00	1.003150 03	1.536830 02	2.967340-02	1.635760-01	1.027370 00	1.019770-01	3.999930 03	1.471280 05
1.840000 00	1.003630 03	1.539960 02	3.233280-02	1.635240-01	1.027040 00	1.018840-01	3.999930 03	1.472510 05
1.940000 00	1.004150 03	1.542980 02	3.507020-02	1.634600-01	1.026650 00	1.017740-01	3.999920 03	1.473730 05
2.040000 00	1.004710 03	1.545890 02	3.788090-02	1.633860-01	1.026190 00	1.016440-01	3.999920 03	1.474850 05
2.140000 00	1.005320 03	1.548690 02	4.076040-02	1.633010-01	1.025660 00	1.014940-01	3.999920 03	1.475950 05
2.240000 00	1.005970 03	1.551390 02	4.370410-02	1.632040-01	1.025060 00	1.013240-01	3.999910 03	1.477010 05
2.340000 00	1.006680 03	1.553980 02	4.670750-02	1.630950-01	1.024380 00	1.011340-01	3.999910 03	1.478020 05
2.440000 00	1.007430 03	1.556460 02	4.976590-02	1.629740-01	1.023630 00	1.009240-01	3.999900 03	1.479000 05
2.540000 00	1.008230 03	1.558830 02	5.287450-02	1.628410-01	1.022800 00	1.006940-01	3.999900 03	1.479930 05
2.640000 00	1.009070 03	1.561090 02	5.602880-02	1.626950-01	1.021890 00	1.004420-01	3.999900 03	1.480820 05
2.740000 00	1.009970 03	1.563240 02	5.922400-02	1.625370-01	1.020910 00	1.001700-01	3.999890 03	1.481680 05
2.840000 00	1.010920 03	1.565290 02	6.245550-02	1.623650-01	1.019840 00	9.987670-02	3.999890 03	1.482490 05
2.940000 00	1.011930 03	1.567220 02	6.571840-02	1.621810-01	1.018690 00	9.956240-02	3.999880 03	1.483260 05
3.040000 00	1.012980 03	1.569030 02	6.900810-02	1.619830-01	1.017460 00	9.922700-02	3.999880 03	1.483990 05
3.140000 00	1.014090 03	1.570770 02	7.231980-02	1.617720-01	1.016150 00	9.887040-02	3.999880 03	1.484693 05
3.240000 00	1.015250 03	1.572390 02	7.564880-02	1.615470-01	1.014750 00	9.849270-02	3.999870 03	1.485340 05
3.340000 00	1.016470 03	1.573990 02	7.896050-02	1.613080-01	1.013260 00	9.809390-02	3.999870 03	1.485970 05
3.440000 00	1.017740 03	1.575310 02	8.234000-02	1.610550-01	1.011690 00	9.767400-02	3.999870 03	1.486550 05
3.540000 00	1.019060 03	1.576620 02	8.569260-02	1.607870-01	1.010020 00	9.723300-02	3.999860 03	1.487100 05
3.640000 00	1.020440 03	1.577830 02	8.904370-02	1.605050-01	1.008270 00	9.677120-02	3.999860 03	1.487620 05
3.740000 00	1.021870 03	1.578940 02	9.238860-02	1.602080-01	1.006420 00	9.628860-02	3.999850 03	1.488100 05
3.840000 00	1.023350 03	1.579560 02	9.572250-02	1.598960-01	1.004480 00	9.578540-02	3.999850 03	1.488350 05
3.940000 00	1.024890 03	1.580880 02	9.904090-02	1.595690-01	1.002440 00	9.526190-02	3.999850 03	1.488970 05
4.040000 00	1.026480 03	1.581710 02	1.023390-01	1.592260-01	1.000310 00	9.471820-02	3.999840 03	1.489350 05
4.140000 00	1.028120 03	1.582450 02	1.056120-01	1.588680-01	9.980780-01	9.415470-02	3.999840 03	1.489710 05
4.240000 00	1.029810 03	1.583130 02	1.088560-01	1.584940-01	9.957500-01	9.357210-02	3.999830 03	1.490040 05
4.340000 00	1.031560 03	1.583600 02	1.120670-01	1.581040-01	9.933270-01	9.297130-02	3.999830 03	1.490340 05
4.440000 00	1.033350 03	1.584150 02	1.152380-01	1.576990-01	9.908080-01	9.235320-02	3.999830 03	1.490620 05
4.540000 00	1.035200 03	1.584550 02	1.183680-01	1.572800-01	9.881940-01	9.171850-02	3.999820 03	1.490860 05
4.640000 00	1.037100 03	1.584880 02	1.214500-01	1.568450-01	9.854870-01	9.106830-02	3.999820 03	1.491090 05
4.740000 00	1.039040 03	1.585130 02	1.244810-01	1.563950-01	9.826880-01	9.040330-02	3.999820 03	1.491280 05
4.840000 00	1.041030 03	1.585310 02	1.274570-01	1.559310-01	9.797960-01	8.972430-02	3.999810 03	1.491460 05
4.940000 00	1.043070 03	1.585420 02	1.303750-01	1.554520-01	9.768130-01	8.903240-02	3.999810 03	1.491610 05
5.040000 00	1.045160 03	1.585460 02	1.332290-01	1.549580-01	9.737400-01	8.832830-02	3.999800 03	1.491740 05
5.140000 00	1.047240 03	1.585440 02	1.360160-01	1.544510-01	9.705780-01	8.761290-02	3.999800 03	1.491850 05
5.240000 00	1.049450 03	1.585360 02	1.387320-01	1.539290-01	9.673270-01	8.688700-02	3.999800 03	1.491950 05
5.340000 00	1.051670 03	1.585230 02	1.413750-01	1.533930-01	9.639890-01	8.615150-02	3.999790 03	1.492020 05
5.440000 00	1.053920 03	1.585040 02	1.439390-01	1.528430-01	9.605640-01	8.540730-02	3.999790 03	1.492080 05
5.540000 00	1.056210 03	1.584800 02	1.464230-01	1.522790-01	9.570520-01	8.465520-02	3.999780 03	1.492120 05
5.640000 00	1.058540 03	1.584510 02	1.488210-01	1.517020-01	9.534560-01	8.389590-02	3.999780 03	1.492140 05
5.740000 00	1.060910 03	1.584180 02	1.511320-01	1.511120-01	9.497750-01	8.313040-02	3.999780 03	1.492150 05
5.840000 00	1.063310 03	1.583810 02	1.533510-01	1.505070-01	9.460100-01	8.235940-02	3.999770 03	1.492150 05
5.940000 00	1.065760 03	1.583400 02	1.554760-01	1.498900-01	9.421630-01	8.158360-02	3.999770 03	1.492140 05
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1.959000 01	1.070020 03	2.202760 02	-1.966820-01	6.535110-02	4.114920-01	3.735090-02	3.999220 03	1.651100 05
1.969000 01	1.065700 03	2.212460 02	-1.977690-01	6.509530-02	4.098750-01	3.730610-02	3.999220 03	1.651900 05
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2.659000 01	7.484760 02	2.757250 02	-1.326680-01	5.523250-02	3.474850-01	3.574760-02	3.998910 03	1.618060 05
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2.699000 01	7.343760 02	2.776550 02	-1.227350-01	5.500050-02	3.460170-01	3.571460-02	3.998900 03	1.613970 05
2.709000 01	7.310100 02	2.781110 02	-1.201860-01	5.494670-02	3.456760-01	3.570700-02	3.998890 03	1.612970 05
2.719000 01	7.277080 02	2.785570 02	-1.176120-01	5.489440-02	3.453450-01	3.569960-02	3.998890 03	1.611980 05
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2.739000 01	7.213050 02	2.794170 02	-1.123900-01	5.479470-02	3.447130-01	3.568550-02	3.998880 03	1.610050 05
2.749000 01	7.182050 02	2.798320 02	-1.097440-01	5.474710-02	3.444120-01	3.567880-02	3.998870 03	1.609110 05
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2.769000 01	7.122160 02	2.806280 02	-1.043850-01	5.465650-02	3.438390-01	3.566600-02	3.998870 03	1.607270 05
2.779000 01	7.093280 02	2.810110 02	-1.016730-01	5.461350-02	3.435660-01	3.566000-02	3.998860 03	1.606370 05
2.789000 01	7.065120 02	2.813830 02	-9.894000-02	5.457190-02	3.433030-01	3.565410-02	3.998860 03	1.605490 05
2.799000 01	7.037650 02	2.817440 02	-9.618670-02	5.453170-02	3.430490-01	3.564850-02	3.998850 03	1.604630 05
2.809000 01	7.011000 02	2.820940 02	-9.341360-02	5.449300-02	3.428030-01	3.564310-02	3.998850 03	1.603790 05
2.819000 01	6.985070 02	2.824340 02	-9.062190-02	5.445570-02	3.425670-01	3.563780-02	3.998840 03	1.602970 05
2.829000 01	6.959890 02	2.827630 02	-8.781130-02	5.441970-02	3.423390-01	3.563260-02	3.998840 03	1.602160 05
2.839000 01	6.935470 02	2.830810 02	-8.498320-02	5.438510-02	3.421200-01	3.562800-02	3.998840 03	1.601380 05
2.849000 01	6.911830 02	2.833890 02	-8.213770-02	5.435190-02	3.419100-01	3.562330-02	3.998830 03	1.600620 05

PITCH-ANGLE GAIN = 1.000000000000 00
PITCH-ANGLE BIAS = 3.306745909170-17 RADIAN

M O D E L   S O L U T I O N S

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MODEL 12     P0 =  2.865488525226580200 04     CD0 =  3.493507043654511 0D-02
             P1 =  0.0                         CD1 =  0.0
FCINT        P2 =  1.129096306100841 00 03     CD2 =  1.311407989492109 0D 00
FAILURES     P3 = -2.181859033138124 00 00     CD3 =  0.0
=   0        P4 =  0.0                         CD4 =  1.956493353706828 00 03

FIT ERROR=  7.034804716196190 00-09
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MODEL 12 FOUND TO BE BEST FIT

LIFT COEFFICIENTS: BY LEAST SQUARE DISTANCE

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CLA0=-3.366432544621598 20-02
CLA = 0.638280927337125 90 01
CLAX=-0.549500892036361 63 00
EXPX= 0.205031306193023 4D 01
CL0= 0.0
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ESTIMATED SPECIFIC FUEL CONSUMPTION = 2.527180338390 70-07 LBF/(FT-LBF/SEC)/SEC

PATH PERFORMANCE ANALYSIS ITERATION NO. 3
(ALTITUDE AND AIRSPEED ASSUMED CORRECT)

PATH PERFORMANCE SUBITERATION 1

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.000000 03	1.467390 02	5.142430-05	1.631550-01	1.024360 00	1.067480-01	4.000000 03	1.473690 05
1.000000-02	1.000000 03	1.467860 02	1.128330-04	1.631620-01	1.024400 00	1.067600-01	4.000000 03	1.473920 05
2.000000-02	1.000000 03	1.468320 02	1.756760-04	1.631680-01	1.024460 00	1.067730-01	4.000000 03	1.474150 05
3.000000-02	1.000000 03	1.468790 02	2.399510-04	1.631750-01	1.024490 00	1.067850-01	4.000000 03	1.474380 05
4.000000-02	1.000000 03	1.469250 02	3.056560-04	1.631820-01	1.024530 00	1.067970-01	4.000000 03	1.474610 05

6.000000D-02	1.000000D 03	1.470140D 02	4.413440D-04	1.631950D-01	1.024610 00	1.068210D-01	4.000000D 03	1.475060 05
8.000000D-02	1.000000D 03	1.471100 02	7.271160D-04	1.632000D-01	1.024690 00	1.068443D-01	4.000000D 03	1.475510 05
1.000000D-01	1.000010 03	1.472620 02	7.297540D-04	1.632220D-01	1.024780 00	1.068680D-01	4.000000D 03	1.475960 05
1.200000D-01	1.000010 03	1.472940 02	8.824440D-04	1.632340D-01	1.024860 00	1.068910D-01	3.999990D 03	1.476410 05
1.400000D-01	1.000010 03	1.473660 02	1.040750D-03	1.632470D-01	1.024930 00	1.069130D-01	3.999990D 03	1.476860 05
1.800000D-01	1.000020 03	1.475650 02	1.374160D-03	1.632720D-01	1.025090 00	1.069580D-01	3.999990D 03	1.477750 05
2.200000D-01	1.000030 03	1.477510 02	1.729790D-03	1.632960D-01	1.025240 00	1.070010D-01	3.999990D 03	1.478640 05
2.600000D-01	1.000040 03	1.479310 02	2.107470D-03	1.633200D-01	1.025390 00	1.070440D-01	3.999990D 03	1.479520 05
3.000000D-01	1.000050 03	1.481110 02	2.507610D-03	1.633430D-01	1.025530 00	1.070840D-01	3.999990D 03	1.480390 05
3.400000D-01	1.000070 03	1.482890 02	2.928250D-03	1.633650D-01	1.025670 00	1.071240D-01	3.999990D 03	1.481250 05
4.200000D-01	1.000110 03	1.486420 02	3.835020D-03	1.634060D-01	1.025920 00	1.071990D-01	3.999980D 03	1.482960 05
5.000000D-01	1.000160 03	1.489910 02	4.826160D-03	1.634450D-01	1.026160 00	1.072680D-01	3.999980D 03	1.484640 05
5.800000D-01	1.000220 03	1.493360 02	5.900170D-03	1.634800D-01	1.026380 00	1.073310D-01	3.999970D 03	1.486290 05
6.600000D-01	1.000300 03	1.496760 02	7.055320D-03	1.635110D-01	1.026580 00	1.073870D-01	3.999970D 03	1.487920 05
7.400000D-01	1.000390 03	1.500070 02	8.289960D-03	1.635390D-01	1.026750 00	1.074380D-01	3.999970D 03	1.489510 05
8.400000D-01	1.000520 03	1.504170 02	9.942410D-03	1.635680D-01	1.026930 00	1.074900D-01	3.999970D 03	1.491460 05
9.400000D-01	1.000690 03	1.508180 02	1.171280D-02	1.635910D-01	1.027070 00	1.075310D-01	3.999960 03	1.493360 05
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1.140000D 00	1.001100 03	1.515920 02	1.559370D-02	1.636160D-01	1.027230 00	1.075760D-01	3.999950 03	1.497010 05
1.240000D 00	1.001360 03	1.519650 02	1.769860D-02	1.636180D-01	1.027240 00	1.075800D-01	3.999950 03	1.498760 05
1.340000D 00	1.001640 03	1.523290 02	1.990120D-02	1.636120D-01	1.027200 00	1.075690D-01	3.999950 03	1.500460 05
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1.640000D 00	1.002720 03	1.533600 02	2.709620D-02	1.635410D-01	1.026760 00	1.074420D-01	3.999930D 03	1.505240 05
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1.940000D 00	1.004150 03	1.542980 02	3.507020D-02	1.633840D-01	1.025780 00	1.071580D-01	3.999920 03	1.509550 05
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2.140000D 00	1.005320 03	1.548690 02	4.076040D-02	1.632240D-01	1.024790 00	1.068720D-01	3.999920D 03	1.512160 05
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2.740000D 00	1.009970 03	1.563240 02	5.922400D-02	1.624610D-01	1.020050 00	1.055200D-01	3.999890D 03	1.518710 05
2.840000D 00	1.010920 03	1.565290 02	6.245560D-02	1.622900D-01	1.018980 00	1.052200D-01	3.999890 03	1.519620 05
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3.040000D 00	1.012980 03	1.569050 02	6.900810D-02	1.619080D-01	1.016610 00	1.045570D-01	3.999880 03	1.521290 05
3.140000D 00	1.014090 03	1.570770 02	7.231960D-02	1.616970D-01	1.015300 00	1.041920D-01	3.999880 03	1.522060 05
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3.640000D 00	1.020440 03	1.577830 02	8.904370D-02	1.604310D-01	1.007430 00	1.020480D-01	3.999860 03	1.525150 05
3.740000D 00	1.021870 03	1.578940 02	9.238860D-02	1.601350D-01	1.005590 00	1.015540D-01	3.999850 03	1.525630 05
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3.940000D 00	1.024890 03	1.580880 02	9.904090D-02	1.594960D-01	1.001610 00	1.005050D-01	3.999850 03	1.526470 05
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4.240000D 00	1.029810 03	1.583100 02	1.088560D-01	1.584220D-01	9.949340D-01	9.877740D-02	3.999830 03	1.527420 05
4.340000D 00	1.031560 03	1.583660 02	1.120670D-01	1.580330D-01	9.925140D-01	9.816310D-02	3.999830 03	1.527660 05
4.440000D 00	1.033350 03	1.584150 02	1.152380D-01	1.576290D-01	9.900000D-01	9.753100D-02	3.999830 03	1.527860 05
4.540000D 00	1.035200 03	1.584550 02	1.183680D-01	1.572090D-01	9.873910D-01	9.688190D-02	3.999820 03	1.528030 05
4.640000D 00	1.037100 03	1.584860 02	1.214500D-01	1.567750D-01	9.846880D-01	9.621680D-02	3.999820 03	1.528170 05
4.740000D 00	1.039040 03	1.585130 02	1.244810D-01	1.563260D-01	9.818930D-01	9.553650D-02	3.999820 03	1.528270 05
4.840000D 00	1.041030 03	1.585310 02	1.274570D-01	1.558620D-01	9.790060D-01	9.484190D-02	3.999810 03	1.528340 05
4.940000D 00	1.043070 03	1.585420 02	1.303750D-01	1.553830D-01	9.760290D-01	9.413390D-02	3.999810 03	1.528380 05
5.040000D 00	1.045150 03	1.585460 02	1.332290D-01	1.548900D-01	9.729610D-01	9.341330D-02	3.999800 03	1.528390 05
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5.240000D 00	1.049450 03	1.585360 02	1.387320D-01	1.538620D-01	9.665580D-01	9.193800D-02	3.999800 03	1.528330 05
5.340000D 00	1.051670 03	1.585230 02	1.413750D-01	1.533260D-01	9.632250D-01	9.118510D-02	3.999790 03	1.528260 05
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8.840000D 00	1.142940 03	1.571390 02	1.666280D-01	1.277770D-01	8.038170D-01	6.486180D-02	3.999660 03	1.522090 05
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9.140000D 00	1.150650 03	1.572000 02	1.617030D-01	1.252390D-01	7.879440D-01	6.305390D-02	3.999650 03	1.522360 05
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1.084000D 01	1.188250 03	1.590990 02	1.142800D-01	1.110080D-01	6.988120D-01	5.475630D-02	3.999580 03	1.530680 05
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1.104000D 01	1.191760 03	1.595310 02	1.068430D-01	1.093940D-01	6.886880D-01	5.398170D-02	3.999570 03	1.532550 05
1.114000D 01	1.193440 03	1.597660 02	1.030060D-01	1.085940D-01	6.836690D-01	5.360850D-02	3.999570 03	1.533560 05
1.124000D 01	1.195050 03	1.600130 02	9.909440D-02	1.077990D-01	6.786810D-01	5.324450D-02	3.999560 03	1.534620 05
1.134000D 01	1.196600 03	1.602740 02	9.511170D-02	1.070090D-01	6.737250D-01	5.288950D-02	3.999560 03	1.535740 05
1.144000D 01	1.198090 03	1.605470 02	9.106130D-02	1.062250D-01	6.688030D-01	5.254330D-02	3.999560 03	1.536910 05
1.154000D 01	1.199520 03	1.608330 02	8.694640D-02	1.054460D-01	6.639160D-01	5.220580D-02	3.999550 03	1.538130 05
1.164000D 01	1.200890 03	1.611320 02	8.277050D-02	1.046730D-01	6.590640D-01	5.187670D-02	3.999550 03	1.539400 05
1.174000D 01	1.202180 03	1.614440 02	7.853700D-02	1.039060D-01	6.542510D-01	5.155590D-02	3.999550 03	1.540730 05
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1.204000D 01	1.205680 03	1.624620 02	6.552680D-02	1.016440D-01	6.400480D-01	5.064170D-02	3.999530 03	1.545020 05
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2.29900D 01	9.08230D 02	2.51443D 02	-1.96859D-01	5.87240D-02	3.69515D-01	3.95377D-02	3.99907D 03	1.74594D 05
2.30900D 01	9.03317D 02	2.52266D 02	-1.95837D-01	5.85856D-02	3.68639D-01	3.95153D-02	3.99907D 03	1.74619D 05
2.31900D 01	8.98413D 02	2.53082D 02	-1.94763D-01	5.84499D-02	3.67781D-01	3.94934D-02	3.99906D 03	1.74640D 05
2.32900D 01	8.93521D 02	2.53890D 02	-1.93639D-01	5.83168D-02	3.66939D-01	3.94719D-02	3.99906D 03	1.74659D 05
2.33900D 01	8.88642D 02	2.54691D 02	-1.92466D-01	5.81864D-02	3.66114D-01	3.94510D-02	3.99906D 03	1.74674D 05
2.34900D 01	8.83778D 02	2.55485D 02	-1.91243D-01	5.80586D-02	3.65306D-01	3.94305D-02	3.99905D 03	1.74686D 05
2.35900D 01	8.78930D 02	2.56270D 02	-1.89973D-01	5.79334D-02	3.64514D-01	3.94105D-02	3.99905D 03	1.74696D 05
2.36900D 01	8.74100D 02	2.57048D 02	-1.88654D-01	5.78107D-02	3.63737D-01	3.93909D-02	3.99904D 03	1.74703D 05
2.37900D 01	8.69290D 02	2.57818D 02	-1.87289D-01	5.76905D-02	3.62977D-01	3.93718D-02	3.99904D 03	1.74707D 05
2.38900D 01	8.64500D 02	2.58579D 02	-1.85878D-01	5.75727D-02	3.62232D-01	3.93531D-02	3.99903D 03	1.74709D 05
2.39900D 01	8.59733D 02	2.59333D 02	-1.84420D-01	5.74573D-02	3.61502D-01	3.93349D-02	3.99903D 03	1.74708D 05
2.40900D 01	8.54989D 02	2.60078D 02	-1.82918D-01	5.73444D-02	3.60787D-01	3.93170D-02	3.99902D 03	1.74704D 05
2.41900D 01	8.50271D 02	2.60814D 02	-1.81372D-01	5.72338D-02	3.60087D-01	3.92996D-02	3.99902D 03	1.74699D 05
2.42900D 01	8.45581D 02	2.61542D 02	-1.79782D-01	5.71255D-02	3.59402D-01	3.92826D-02	3.99902D 03	1.74691D 05
2.43900D 01	8.40918D 02	2.62262D 02	-1.78149D-01	5.70195D-02	3.58731D-01	3.92660D-02	3.99901D 03	1.74680D 05
2.44900D 01	8.36286D 02	2.62972D 02	-1.76473D-01	5.69157D-02	3.58075D-01	3.92498D-02	3.99901D 03	1.74668D 05
2.45900D 01	8.31685D 02	2.63674D 02	-1.74756D-01	5.68142D-02	3.57433D-01	3.92339D-02	3.99900D 03	1.74654D 05
2.46900D 01	8.27118D 02	2.64367D 02	-1.72998D-01	5.67150D-02	3.56805D-01	3.92184D-02	3.99900D 03	1.74638D 05
2.47900D 01	8.22585D 02	2.65051D 02	-1.71200D-01	5.66179D-02	3.56190D-01	3.92033D-02	3.99899D 03	1.74620D 05
2.48900D 01	8.18087D 02	2.65726D 02	-1.69362D-01	5.65229D-02	3.55590D-01	3.91886D-02	3.99899D 03	1.74600D 05
2.49900D 01	8.13627D 02	2.66391D 02	-1.67485D-01	5.64301D-02	3.55003D-01	3.91742D-02	3.99898D 03	1.74578D 05
2.50900D 01	8.09206D 02	2.67047D 02	-1.65569D-01	5.63395D-02	3.54429D-01	3.91602D-02	3.99898D 03	1.74555D 05
2.51900D 01	8.04825D 02	2.67694D 02	-1.63616D-01	5.62509D-02	3.53868D-01	3.91466D-02	3.99898D 03	1.74531D 05
2.52900D 01	8.00486D 02	2.68331D 02	-1.61626D-01	5.61643D-02	3.53320D-01	3.91332D-02	3.99897D 03	1.74504D 05
2.53900D 01	7.96189D 02	2.68959D 02	-1.59599D-01	5.60798D-02	3.52785D-01	3.91202D-02	3.99897D 03	1.74477D 05
2.54900D 01	7.91937D 02	2.69577D 02	-1.57537D-01	5.59973D-02	3.52263D-01	3.91076D-02	3.99896D 03	1.74448D 05
2.55900D 01	7.87731D 02	2.70186D 02	-1.55439D-01	5.59167D-02	3.51754D-01	3.90952D-02	3.99896D 03	1.74419D 05

2.569000 01	7.835720 02	2.707840 02	-1.533070-01	5.583810-02	3.512560-01	3.908320-02	3.999950 03	1.743880 05
2.579000 01	7.794420 02	2.713730 02	-1.511410-01	5.576140-02	3.507710-01	3.907150-02	3.999950 03	1.743560 05
2.589000 01	7.754010 02	2.719520 02	-1.489410-01	5.568660-02	3.502980-01	3.906010-02	3.999950 03	1.743230 05
2.599000 01	7.713910 02	2.725220 02	-1.467090-01	5.561370-02	3.498360-01	3.904900-02	3.999940 03	1.742890 05
2.609000 01	7.674340 02	2.730810 02	-1.444460-01	5.554260-02	3.493860-01	3.903820-02	3.999940 03	1.742540 05
2.619000 01	7.635300 02	2.736300 02	-1.421530-01	5.547340-02	3.489480-01	3.902770-02	3.999930 03	1.742190 05
2.629000 01	7.596810 02	2.741690 02	-1.398240-01	5.540590-02	3.485210-01	3.901740-02	3.999930 03	1.741830 05
2.639000 01	7.558880 02	2.746980 02	-1.374680-01	5.534020-02	3.481050-01	3.900750-02	3.999920 03	1.741470 05
2.649000 01	7.521530 02	2.752160 02	-1.350830-01	5.527630-02	3.477000-01	3.899780-02	3.999920 03	1.741100 05
2.659000 01	7.484760 02	2.757250 02	-1.326680-01	5.521410-02	3.473070-01	3.898850-02	3.999910 03	1.740730 05
2.669000 01	7.448580 02	2.762230 02	-1.302260-01	5.515360-02	3.469240-01	3.897930-02	3.999910 03	1.740350 05
2.679000 01	7.413020 02	2.767100 02	-1.277560-01	5.509480-02	3.465520-01	3.897050-02	3.999910 03	1.739970 05
2.689000 01	7.378080 02	2.771880 02	-1.252590-01	5.503770-02	3.461900-01	3.896190-02	3.999900 03	1.739590 05
2.699000 01	7.343760 02	2.776550 02	-1.227360-01	5.498220-02	3.458390-01	3.895360-02	3.999900 03	1.739200 05
2.709000 01	7.310100 02	2.781110 02	-1.201860-01	5.492840-02	3.454980-01	3.894550-02	3.999890 03	1.738820 05
2.719000 01	7.277080 02	2.785570 02	-1.176120-01	5.487610-02	3.451680-01	3.893770-02	3.999890 03	1.738440 05
2.729000 01	7.244730 02	2.789920 02	-1.150130-01	5.482550-02	3.448470-01	3.893010-02	3.999880 03	1.738050 05
2.739000 01	7.213050 02	2.794170 02	-1.123900-01	5.477640-02	3.445370-01	3.892270-02	3.999880 03	1.737670 05
2.749000 01	7.182050 02	2.798320 02	-1.097440-01	5.472880-02	3.442360-01	3.891560-02	3.999870 03	1.737290 05
2.759000 01	7.151750 02	2.802350 02	-1.070760-01	5.468280-02	3.439440-01	3.890880-02	3.999870 03	1.736920 05
2.769000 01	7.122140 02	2.806280 02	-1.043860-01	5.463830-02	3.436630-01	3.890210-02	3.999870 03	1.736540 05
2.779000 01	7.093280 02	2.810110 02	-1.016730-01	5.459530-02	3.433900-01	3.889570-02	3.999860 03	1.736170 05
2.789000 01	7.065120 02	2.813830 02	-9.894600-02	5.455370-02	3.431270-01	3.888950-02	3.999860 03	1.735800 05
2.799000 01	7.037690 02	2.817440 02	-9.618670-02	5.451350-02	3.428730-01	3.888360-02	3.999850 03	1.735440 05
2.809000 01	7.011000 02	2.820940 02	-9.341380-02	5.447480-02	3.426280-01	3.887780-02	3.999850 03	1.735090 05
2.819000 01	6.985070 02	2.824340 02	-9.062190-02	5.443750-02	3.423920-01	3.887230-02	3.999840 03	1.734740 05
2.829000 01	6.959650 02	2.827630 02	-8.781150-02	5.440160-02	3.421640-01	3.886690-02	3.999840 03	1.734390 05
2.839000 01	6.935470 02	2.830810 02	-8.498320-02	5.436700-02	3.419450-01	3.886180-02	3.999840 03	1.734050 05
2.849000 01	6.911830 02	2.833890 02	-8.213770-02	5.433370-02	3.417350-01	3.885690-02	3.999830 03	1.733720 05

PATH PERFORMANCE DRAG AND LIFT COEFFICIENT UPDATE

	OLD		DELTA		NEW
CD0 :	0.34935073436545110-01	+	-0.13593582132911140-02	=	0.33575712223253990-01
CD1 :	0.0	+	0.0	=	0.0
CD2 :	0.13114079594921063 01	+	-0.60332035403124580-01	=	0.12510759240889840 01
CD3 :	0.0	+	0.0	=	0.0
CD4 :	0.19564933537068280 04	+	-0.84315687302461350 02	=	0.18721776964043673 04
CLA0 :	-0.36643254462159820-02	+	-0.13765996822209790-03	=	-0.38019854144380800-02
CLA :	0.63528002733712590 01	+	-0.13678138095236190-02	=	0.63814324595617360 01
CLA2 :	-0.54953089200636160 00	+	-0.10603408573311160-01	=	-0.56010430357937270 00

PATH PERFORMANCE SUBITERATION 2

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.000000 03	1.467390 02	8.142430-05	1.633570-01	1.026000 00	1.025390-01	4.000000 03	1.449620 05
1.000000-02	1.000000 03	1.467860 02	1.128330-04	1.633640-01	1.025040 00	1.025510-01	4.000000 03	1.449820 05
2.000000-02	1.000000 03	1.468320 02	1.756760-04	1.633710-01	1.025090 00	1.025630-01	4.000000 03	1.450030 05
3.000000-02	1.000000 03	1.468790 02	2.399510-04	1.633780-01	1.025130 00	1.025750-01	4.000000 03	1.450230 05
4.000000-02	1.000000 03	1.469250 02	3.056560-04	1.633850-01	1.025170 00	1.025860-01	4.000000 03	1.450430 05
6.000000-02	1.000000 03	1.470180 02	4.413440-04	1.633980-01	1.025250 00	1.026090-01	4.000000 03	1.450830 05
8.000000-02	1.000000 03	1.471100 02	5.827180-04	1.634110-01	1.025340 00	1.026320-01	4.000000 03	1.451240 05
1.000000-01	1.000010 03	1.472020 02	7.297590-04	1.634240-01	1.025420 00	1.026550-01	4.000000 03	1.451640 05
1.200000-01	1.000010 03	1.472940 02	8.824440-04	1.634370-01	1.025500 00	1.026770-01	3.999990 03	1.452040 05
1.400000-01	1.000010 03	1.473860 02	1.040750-03	1.634500-01	1.025580 00	1.026990-01	3.999990 03	1.452430 05
1.800000-01	1.000020 03	1.475690 02	1.374160-03	1.634750-01	1.025730 00	1.027420-01	3.999990 03	1.453230 05
2.200000-01	1.000030 03	1.477510 02	1.725790-03	1.635000-01	1.025880 00	1.027840-01	3.999990 03	1.454010 05
2.600000-01	1.000040 03	1.479310 02	2.107470-03	1.635230-01	1.026030 00	1.028240-01	3.999990 03	1.454790 05
3.000000-01	1.000050 03	1.481110 02	2.507010-03	1.635460-01	1.026170 00	1.028640-01	3.999990 03	1.455560 05
3.400000-01	1.000070 03	1.482890 02	2.928250-03	1.635680-01	1.026310 00	1.029020-01	3.999990 03	1.456330 05
4.200000-01	1.000110 03	1.486420 02	3.835070-03	1.636100-01	1.026570 00	1.029740-01	3.999980 03	1.457840 05
5.000000-01	1.000160 03	1.489910 02	4.826180-03	1.636490-01	1.026810 00	1.030410-01	3.999980 03	1.459330 05
5.800000-01	1.000220 03	1.493350 02	5.900170-03	1.636840-01	1.027030 00	1.031020-01	3.999980 03	1.460790 05
6.600000-01	1.000300 03	1.496740 02	7.055320-03	1.637150-01	1.027220 00	1.031560-01	3.999970 03	1.462230 05
7.430000-01	1.000390 03	1.500073 02	8.289960-03	1.637430-01	1.027400 00	1.032050-01	3.999970 03	1.463640 05
8.430000-01	1.000530 03	1.504170 02	9.942410-03	1.637730-01	1.027580 00	1.032560-01	3.999960 03	1.465370 05
9.400000-01	1.000690 03	1.508180 02	1.171240-02	1.637960-01	1.027720 00	1.032950-01	3.999960 03	1.467050 05
1.040000 00	1.000800 03	1.512090 02	1.359760-02	1.638120-01	1.027820 00	1.033270-01	3.999960 03	1.468690 05
1.140000 00	1.001100 03	1.515920 02	1.559320-02	1.638210-01	1.027860 00	1.033390-01	3.999950 03	1.470280 05
1.240000 00	1.001360 03	1.519650 02	1.769560-02	1.638230-01	1.027850 00	1.033420-01	3.999950 03	1.471840 05
1.340000 00	1.001640 03	1.523290 02	1.990120-02	1.638170-01	1.027850 00	1.033320-01	3.999950 03	1.473360 05
1.440000 00	1.001960 03	1.526830 02	2.220590-02	1.638020-01	1.027760 00	1.033060-01	3.999940 03	1.474810 05
1.560000 00	1.002320 03	1.530260 02	2.460560-02	1.637790-01	1.027620 00	1.032660-01	3.999940 03	1.476230 05
1.640000 00	1.002720 03	1.533600 02	2.709620-02	1.637460-01	1.027410 00	1.032090-01	3.999930 03	1.477610 05
1.740000 00	1.003150 03	1.536830 02	2.967340-02	1.637040-01	1.027150 00	1.031360-01	3.999930 03	1.478940 05
1.840000 00	1.003630 03	1.539960 02	3.233280-02	1.636510-01	1.026820 00	1.030450-01	3.999930 03	1.480230 05
1.940000 00	1.004150 03	1.542980 02	3.507020-02	1.635880-01	1.026430 00	1.029360-01	3.999920 03	1.481470 05
2.040000 00	1.004710 03	1.545890 02	3.798090-02	1.635140-01	1.025970 00	1.028080-01	3.999920 03	1.482680 05
2.140000 00	1.005320 03	1.548690 02	4.076040-02	1.634280-01	1.025440 00	1.026610-01	3.999920 03	1.483840 05
2.240000 00	1.005970 03	1.551390 02	4.370410-02	1.633310-01	1.024830 00	1.024940-01	3.999910 03	1.484960 05
2.340000 00	1.006680 03	1.553980 02	4.670750-02	1.632220-01	1.024160 00	1.023070-01	3.999910 03	1.486030 05
2.440000 00	1.007430 03	1.556460 02	4.976590-02	1.631000-01	1.023400 00	1.021003-01	3.999900 03	1.487070 05
2.540000 00	1.008230 03	1.558830 02	5.287450-02	1.629670-01	1.022580 00	1.018730-01	3.999900 03	1.488060 05
2.640000 00	1.009070 03	1.561090 02	5.602840-02	1.628210-01	1.021670 00	1.016250-01	3.999900 03	1.489020 05
2.740000 00	1.009970 03	1.563240 02	5.922400-02	1.626620-01	1.020680 00	1.013570-01	3.999890 03	1.489930 05
2.840000 00	1.010930 03	1.565290 02	6.245350-02	1.624910-01	1.019620 00	1.010690-01	3.999890 03	1.490810 05
2.940000 00	1.011930 03	1.567220 02	6.571840-02	1.623060-01	1.018470 00	1.007590-01	3.999880 03	1.491640 05
3.040000 00	1.012980 03	1.569050 02	6.901810-02	1.621080-01	1.017240 00	1.004290-01	3.999880 03	1.492440 05
3.140000 00	1.014090 03	1.570770 02	7.231960-02	1.618960-01	1.015930 00	1.000780-01	3.999880 03	1.493200 05
3.240000 00	1.015250 03	1.572390 02	7.564880-02	1.616710-01	1.014530 00	9.970610-02	3.999870 03	1.493920 05
3.340000 00	1.016470 03	1.573900 02	7.896650-02	1.614320-01	1.013040 00	9.931340-02	3.999870 03	1.494610 05
3.440000 00	1.017740 03	1.575310 02	8.234000-02	1.611780-01	1.011460 00	9.889990-02	3.999870 03	1.495270 05
3.540000 00	1.019060 03	1.576620 02	8.569260-02	1.609100-01	1.009800 00	9.846570-02	3.999860 03	1.495880 05
3.640000 00	1.020440 03	1.577830 02	8.904370-02	1.606270-01	1.008040 00	9.801090-02	3.999860 03	1.496470 05
3.740000 00	1.021870 03	1.578943 02	9.238860-02	1.603300-01	1.006190 00	9.753570-02	3.999850 03	1.497020 05
3.840000 00	1.023350 03	1.579960 02	9.572250-02	1.600170-01	1.004250 00	9.704020-02	3.999850 03	1.497540 05
3.940000 00	1.024890 03	1.580880 02	9.904090-02	1.596893-01	1.002210 00	9.652460-02	3.999850 03	1.498030 05
4.040000 00	1.026480 03	1.581710 02	1.023390-01	1.593460-01	1.000080 00	9.598910-02	3.999840 03	1.498490 05
4.140000 00	1.028120 03	1.582450 02	1.056120-01	1.589870-01	9.978480-01	9.543410-02	3.999840 03	1.498920 05
4.240000 00	1.029810 03	1.583100 02	1.088560-01	1.586120-01	9.955190-01	9.486020-02	3.999830 03	1.499320 05
4.340000 00	1.031560 03	1.583660 02	1.120670-01	1.582220-01	9.930950-01	9.426850-02	3.999830 03	1.499700 05
4.440000 00	1.033350 03	1.584150 02	1.152380-01	1.578170-01	9.905750-01	9.365950-02	3.999830 03	1.500050 05
4.540000 00	1.035200 03	1.584550 02	1.183680-01	1.573960-01	9.879610-01	9.303430-02	3.999820 03	1.500370 05
4.640000 00	1.037100 03	1.584880 02	1.214500-01	1.569610-01	9.852530-01	9.239370-02	3.999820 03	1.500660 05
4.740000 00	1.039040 03	1.585130 02	1.244810-01	1.565100-01	9.824530-01	9.173860-02	3.999820 03	1.500940 05
4.840000 00	1.041030 03	1.585310 02	1.274370-01	1.560450-01	9.795600-01	9.106950-02	3.999810 03	1.501180 05
4.940000 00	1.043070 03	1.585420 02	1.303750-01	1.555650-01	9.765770-01	9.038760-02	3.999810 03	1.501410 05
5.040000 00	1.046150 03	1.585460 02	1.332290-01	1.550710-01	9.735030-01	8.969370-02	3.999800 03	1.501610 05
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2.759000D 01	7.151750D 02	2.802350D 02	-1.070760D-01	5.473370D-02	3.440260D-01	3.737400D-02	3.998870D 03	1.675870D 05
2.769000D 01	7.122160D 02	2.806280D 02	-1.043850D-01	5.468910D-02	3.437440D-01	3.736760D-02	3.998870D 03	1.675250D 05
2.779000D 01	7.093280D 02	2.810110D 02	-1.016730D-01	5.464610D-02	3.434720D-01	3.736150D-02	3.998860D 03	1.674630D 05
2.789000D 01	7.065120D 02	2.813830D 02	-9.894600D-02	5.460440D-02	3.432090D-01	3.735560D-02	3.998860D 03	1.674030D 05
2.799000D 01	7.037690D 02	2.817440D 02	-9.618670D-02	5.456430D-02	3.429540D-01	3.734990D-02	3.998850D 03	1.673430D 05
2.809000D 01	7.011000D 02	2.820940D 02	-9.341380D-02	5.452550D-02	3.427090D-01	3.734440D-02	3.998850D 03	1.672850D 05
2.819000D 01	6.985070D 02	2.824340D 02	-9.062190D-02	5.448820D-02	3.424730D-01	3.733910D-02	3.998840D 03	1.672280D 05
2.829000D 01	6.959890D 02	2.827630D 02	-8.781150D-02	5.445220D-02	3.422450D-01	3.733400D-02	3.998840D 03	1.671720D 05
2.839000D 01	6.935470D 02	2.830810D 02	-8.498320D-02	5.441760D-02	3.420260D-01	3.732910D-02	3.998840D 03	1.671180D 05
2.849000D 01	6.911830D 02	2.833890D 02	-8.213770D-02	5.438440D-02	3.418160D-01	3.732440D-02	3.998830D 03	1.670650D 05

```
PITCH-ANGLE GAIN =  1.000000000000D 00
PITCH-ANGLE BIAS =  4.039267403390D-17 RADIAN
```

M O D E L   S O L U T I O N S

```
MODEL 12     P0 =  2.865797473352188D 04    C00 =  3.494723495440152D-02
             P1 =  0.0                      C01 =  0.0
POINT        P2 =  1.128911203322738D 03    C02 =  1.311177608930500D 00
FAILURES     P3 = -2.180923734076160D 00    C03 =  0.0
=   0        P4 =  0.0                      C04 =  1.967436713267584D 03

FIT ERROR=  6.362189797324094D-09
```

```
                 MODEL 12 FOUND TO BE BEST FIT
```

LIFT COEFFICIENTS: BY LEAST SQUARE DISTANCE

```
CLA0=-0.3390663679188254D-02
CLA = 0.6378227433967011D 01
CLAX=-0.2343643283595632D 00
EXPX= 0.2087840619666590D 01
CLQ= 0.0
```

ESTIMATED SPECIFIC FUEL CONSUMPTION = 2.52709003964350-07 LBF/(FT-LBF/SEC)/SEC

PATH PERFORMANCE ANALYSIS ITERATION NO. 4
(ALTITUDE AND AIRSPEED ASSUMED CORRECT)

PATH PERFORMANCE SUBITERATION 1

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
C.0	1.000000 03	1.467390 02	5.142430-05	1.630380-01	1.024390 00	1.067520-01	4.000000 03	1.473680 05
1.000000-02	1.000000 03	1.467860 02	1.128330-04	1.630450-01	1.024430 00	1.067640-01	4.000000 03	1.473910 05
2.000000-02	1.000000 03	1.468320 02	1.756760-04	1.630520-01	1.024480 00	1.067760-01	4.000000 03	1.474140 05
3.000000-02	1.000000 03	1.468750 02	2.399510-04	1.630580-01	1.024520 00	1.067880-01	4.000000 03	1.474370 05
4.000000-02	1.000000 03	1.469250 02	3.056560-04	1.630650-01	1.024560 00	1.068000-01	4.000000 03	1.474600 05
6.000000-02	1.000000 03	1.470180 02	4.413440-04	1.630780-01	1.024640 00	1.068240-01	4.000000 03	1.475050 05
8.000000-02	1.000000 03	1.471100 02	5.827180-04	1.630920-01	1.024720 00	1.068480-01	4.000000 03	1.475500 05
1.000000-01	1.000010 03	1.472020 02	7.297590-04	1.631050-01	1.024810 00	1.068710-01	4.000000 03	1.475950 05
1.200000-01	1.000010 03	1.472940 02	8.824440-04	1.631170-01	1.024890 00	1.068940-01	3.999990 03	1.476400 05
1.400000-01	1.000010 03	1.473860 02	1.040750-03	1.631300-01	1.024960 00	1.069170-01	3.999990 03	1.476850 05
1.800000-01	1.000020 03	1.475650 02	1.374160-03	1.631550-01	1.025120 00	1.069610-01	3.999990 03	1.477740 05
2.200000-01	1.000030 03	1.477510 02	1.729790-03	1.631790-01	1.025270 00	1.070050-01	3.999990 03	1.478630 05
2.600000-01	1.000040 03	1.479310 02	2.107470-03	1.632030-01	1.025420 00	1.070470-01	3.999990 03	1.479510 05
3.000000-01	1.000050 03	1.481110 02	2.507610-03	1.632250-01	1.025560 00	1.070880-01	3.999990 03	1.480380 05
3.400000-01	1.000070 03	1.482890 02	2.928250-03	1.632480-01	1.025690 00	1.071270-01	3.999990 03	1.481240 05
4.200000-01	1.000110 03	1.486420 02	3.835020-03	1.632890-01	1.025950 00	1.072020-01	3.999980 03	1.482950 05
5.000000-01	1.000160 03	1.489910 02	4.826180-03	1.633270-01	1.026190 00	1.072710-01	3.999950 03	1.484630 05
5.800000-01	1.000220 03	1.493350 02	5.900170-03	1.633620-01	1.026410 00	1.073340-01	3.999970 03	1.486280 05
6.600000-01	1.000300 03	1.496740 02	7.055320-03	1.633940-01	1.026600 00	1.073910-01	3.999970 03	1.487910 05
7.400000-01	1.000390 03	1.500070 02	8.289960-03	1.634220-01	1.026780 00	1.074410-01	3.999970 03	1.489500 05
8.400000-01	1.000530 03	1.504170 02	9.942410-03	1.634510-01	1.026960 00	1.074930-01	3.999960 03	1.491450 05
9.400000-01	1.000690 03	1.508180 02	1.171280-02	1.634730-01	1.027100 00	1.075340-01	3.999960 03	1.493350 05
1.040000 00	1.000880 03	1.512090 02	1.359760-02	1.634890-01	1.027200 00	1.075630-01	3.999960 03	1.495230 05
1.140000 00	1.001100 03	1.515920 02	1.559320-02	1.634980-01	1.027260 00	1.075790-01	3.999950 03	1.497000 05
1.240000 00	1.001360 03	1.519650 02	1.769960-02	1.635000-01	1.027270 00	1.075830-01	3.999950 03	1.498750 05
1.340000 00	1.001640 03	1.523290 02	1.990120-02	1.634940-01	1.027230 00	1.075720-01	3.999950 03	1.500450 05
1.440000 00	1.001960 03	1.526830 02	2.220590-02	1.634790-01	1.027140 00	1.075450-01	3.999940 03	1.502100 05
1.540000 00	1.002320 03	1.530260 02	2.460560-02	1.634560-01	1.026990 00	1.075030-01	3.999940 03	1.503690 05
1.640000 00	1.002720 03	1.533600 02	2.709620-02	1.634230-01	1.026790 00	1.074440-01	3.999930 03	1.505230 05
1.740000 00	1.003150 03	1.536830 02	2.967340-02	1.633910-01	1.026530 00	1.073680-01	3.999930 03	1.506720 05
1.840000 00	1.003630 03	1.539960 02	3.233280-02	1.633290-01	1.026200 00	1.072740-01	3.999930 03	1.508160 05
1.940000 00	1.004150 03	1.542980 02	3.507020-02	1.632660-01	1.025810 00	1.071600-01	3.999920 03	1.509540 05
2.040000 00	1.004710 03	1.545890 02	3.788090-02	1.631920-01	1.025350 00	1.070280-01	3.999920 03	1.510870 05
2.140000 00	1.005320 03	1.548690 02	4.076040-02	1.631070-01	1.024820 00	1.068750-01	3.999920 03	1.512150 05
2.240000 00	1.005970 03	1.551390 02	4.370410-02	1.630100-01	1.024210 00	1.067010-01	3.999910 03	1.513370 05
2.340000 00	1.006680 03	1.553980 02	4.670750-02	1.629010-01	1.023540 00	1.065070-01	3.999910 03	1.514540 05
2.440000 00	1.007430 03	1.556460 02	4.976590-02	1.627800-01	1.022790 00	1.062930-01	3.999900 03	1.515660 05
2.540000 00	1.008230 03	1.558830 02	5.287450-02	1.626470-01	1.021960 00	1.060570-01	3.999900 03	1.516720 05
2.640000 00	1.009070 03	1.561090 02	5.602880-02	1.625020-01	1.021060 00	1.058000-01	3.999900 03	1.517740 05
2.740000 00	1.009970 03	1.563240 02	5.922400-02	1.623440-01	1.020070 00	1.055220-01	3.999890 03	1.518700 05
2.840000 00	1.010920 03	1.565290 02	6.245550-02	1.621730-01	1.019010 00	1.052230-01	3.999890 03	1.519610 05
2.940000 00	1.011930 03	1.567220 02	6.571840-02	1.619890-01	1.017860 00	1.049010-01	3.999880 03	1.520470 05
3.040000 00	1.012980 03	1.569050 02	6.900810-02	1.617920-01	1.016640 00	1.045590-01	3.999880 03	1.521280 05
3.140000 00	1.014090 03	1.570770 02	7.231980-02	1.615810-01	1.015320 00	1.041950-01	3.999880 03	1.522040 05
3.240000 00	1.015250 03	1.572390 02	7.564880-02	1.613570-01	1.013930 00	1.038090-01	3.999870 03	1.522750 05
3.340000 00	1.016470 03	1.573900 02	7.899050-02	1.611180-01	1.012440 00	1.034010-01	3.999870 03	1.523420 05
3.440000 00	1.017740 03	1.575310 02	8.234000-02	1.608660-01	1.010870 00	1.029720-01	3.999870 03	1.524040 05
3.540000 00	1.019060 03	1.576620 02	8.569260-02	1.605990-01	1.009210 00	1.025210-01	3.999860 03	1.524610 05
3.640000 00	1.020440 03	1.577830 02	8.904370-02	1.603170-01	1.007460 00	1.020490-01	3.999860 03	1.525140 05
3.740000 00	1.021870 03	1.578940 02	9.238860-02	1.600210-01	1.005610 00	1.015560-01	3.999850 03	1.525620 05
3.840000 00	1.023350 03	1.579960 02	9.572250-02	1.597100-01	1.003670 00	1.010420-01	3.999850 03	1.526060 05
3.940000 00	1.024890 03	1.580880 02	9.904090-02	1.593830-01	1.001640 00	1.005070-01	3.999850 03	1.526460 05
4.040000 00	1.026480 03	1.581710 02	1.023390-01	1.590410-01	9.995090-01	9.995100-02	3.999840 03	1.526810 05
4.140000 00	1.028120 03	1.582450 02	1.056120-01	1.586830-01	9.972820-01	9.937490-02	3.999840 03	1.527130 05
4.240000 00	1.029810 03	1.583100 02	1.088560-01	1.583100-01	9.949580-01	9.877920-02	3.999830 03	1.527410 05
4.340000 00	1.031560 03	1.583660 02	1.120670-01	1.579220-01	9.925380-01	9.816490-02	3.999830 03	1.527650 05
4.440000 00	1.033350 03	1.584150 02	1.152380-01	1.575180-01	9.900240-01	9.753270-02	3.999830 03	1.527850 05
4.540000 00	1.035200 03	1.584550 02	1.183680-01	1.570990-01	9.874140-01	9.688360-02	3.999820 03	1.528020 05
4.640000 00	1.037100 03	1.584880 02	1.214500-01	1.566650-01	9.847120-01	9.621850-02	3.999820 03	1.528150 05
4.740000 00	1.039040 03	1.585130 02	1.244810-01	1.562170-01	9.819170-01	9.553810-02	3.999820 03	1.528250 05
4.840000 00	1.041030 03	1.585310 02	1.274570-01	1.557530-01	9.790300-01	9.484350-02	3.999810 03	1.528320 05
4.940000 00	1.043070 03	1.585420 02	1.303750-01	1.552750-01	9.760520-01	9.413540-02	3.999810 03	1.528360 05
5.040000 00	1.045150 03	1.585460 02	1.332290-01	1.547830-01	9.729840-01	9.341480-02	3.999800 03	1.528370 05
5.140000 00	1.047280 03	1.585440 02	1.360160-01	1.542760-01	9.698270-01	9.268250-02	3.999800 03	1.528360 05
5.240000 00	1.049450 03	1.585360 02	1.387320-01	1.537560-01	9.665810-01	9.193940-02	3.999800 03	1.528310 05
5.340000 00	1.051670 03	1.585230 02	1.413750-01	1.532210-01	9.632480-01	9.118640-02	3.999790 03	1.528250 05
5.440000 00	1.053920 03	1.585040 02	1.439390-01	1.526720-01	9.598280-01	9.042420-02	3.999790 03	1.528160 05
5.540000 00	1.056210 03	1.584800 02	1.464230-01	1.521100-01	9.563220-01	8.965390-02	3.999780 03	1.528040 05
5.640000 00	1.058540 03	1.584510 02	1.488210-01	1.515340-01	9.527310-01	8.887610-02	3.999780 03	1.527910 05
5.740000 00	1.060910 03	1.584180 02	1.511320-01	1.509440-01	9.490550-01	8.809180-02	3.999780 03	1.527760 05
5.840000 00	1.063310 03	1.583810 02	1.533510-01	1.503420-01	9.452970-01	8.730170-02	3.999770 03	1.527590 05
5.940000 00	1.065750 03	1.583400 02	1.554760-01	1.497260-01	9.414550-01	8.650660-02	3.999770 03	1.527400 05
6.040000 00	1.068220 03	1.582950 02	1.575040-01	1.490970-01	9.375320-01	8.570730-02	3.999760 03	1.527210 05
6.140000 00	1.070710 03	1.582480 02	1.594320-01	1.484550-01	9.335290-01	8.490470-02	3.999760 03	1.526990 05
6.240000 00	1.073240 03	1.581980 02	1.612570-01	1.478010-01	9.294480-01	8.409990-02	3.999760 03	1.526770 05
6.340000 00	1.075790 03	1.581460 02	1.629760-01	1.471350-01	9.252920-01	8.329380-02	3.999750 03	1.526540 05
6.440000 00	1.078370 03	1.580920 02	1.645870-01	1.464570-01	9.210630-01	8.248750-02	3.999750 03	1.526290 05
6.540000 00	1.080970 03	1.580360 02	1.660880-01	1.457680-01	9.167630-01	8.168180-02	3.999750 03	1.526050 05
6.640000 00	1.083600 03	1.579790 02	1.674760-01	1.450680-01	9.123940-01	8.087770-02	3.999740 03	1.525790 05
6.740000 00	1.086240 03	1.579210 02	1.687490-01	1.443580-01	9.079600-01	8.007590-02	3.999740 03	1.525540 05
6.840000 00	1.088900 03	1.578630 02	1.699050-01	1.436370-01	9.034630-01	7.927730-02	3.999730 03	1.525280 05
6.940000 00	1.091580 03	1.578040 02	1.709420-01	1.429070-01	8.989040-01	7.848260-02	3.999730 03	1.525020 05
7.040000 00	1.094270 03	1.577460 02	1.718590-01	1.421670-01	8.942860-01	7.769260-02	3.999730 03	1.524760 05
7.140000 00	1.096970 03	1.576880 02	1.726540-01	1.414190-01	8.896120-01	7.690790-02	3.999720 03	1.524500 05
7.240000 00	1.099690 03	1.576310 02	1.733250-01	1.406620-01	8.848840-01	7.612910-02	3.999720 03	1.524250 05
7.340000 00	1.102410 03	1.575760 02	1.738720-01	1.398970-01	8.801050-01	7.535700-02	3.999710 03	1.524000 05
7.440000 00	1.105140 03	1.575220 02	1.742930-01	1.391240-01	8.752760-01	7.459230-02	3.999710 03	1.523760 05
7.540000 00	1.107870 03	1.574700 02	1.745860-01	1.383440-01	8.704000-01	7.383460-02	3.999710 03	1.523530 05
7.640000 00	1.110610 03	1.574200 02	1.747520-01	1.375560-01	8.654800-01	7.308540-02	3.999700 03	1.523310 05
7.740000 00	1.113340 03	1.573730 02	1.747890-01	1.367620-01	8.605170-01	7.234480-02	3.999700 03	1.523110 05
7.840000 00	1.116080 03	1.573300 02	1.746970-01	1.359620-01	8.555180-01	7.161320-02	3.999700 03	1.522910 05
7.940000 00	1.118810 03	1.572890 02	1.744760-01	1.351560-01	8.504760-01	7.089110-02	3.999690 03	1.522740 05
8.040000 00	1.121540 03	1.572530 02	1.741240-01	1.343460-01	8.454010-01	7.017860-02	3.999690 03	1.522570 05
8.140000 00	1.124260 03	1.572200 02	1.736420-01	1.335270-01	8.402940-01	6.947610-02	3.999680 03	1.522430 05
8.240000 00	1.126970 03	1.571920 02	1.730290-01	1.327060-01	8.351570-01	6.878400-02	3.999680 03	1.522310 05
8.340000 00	1.129670 03	1.571690 02	1.722860-01	1.318800-01	8.299910-01	6.810250-02	3.999680 03	1.522210 05
8.440000 00	1.132360 03	1.571520 02	1.714130-01	1.310500-01	8.248010-01	6.743180-02	3.999670 03	1.522130 05
8.540000 00	1.135030 03	1.571390 02	1.704100-01	1.302170-01	8.195880-01	6.677210-02	3.999670 03	1.522070 05
8.640000 00	1.137690 03	1.571330 02	1.692780-01	1.293810-01	8.143540-01	6.612360-02	3.999660 03	1.522040 05
8.740000 00	1.140330 03	1.571320 02	1.680170-01	1.285410-01	8.091020-01	6.548640-02	3.999660 03	1.522040 05
8.840000 00	1.142940 03	1.571390 02	1.666280-01	1.277000-01	8.038340-01	6.486060-02	3.999660 03	1.522070 05
8.940000 00	1.145540 03	1.571520 02	1.651120-01	1.268560-01	7.985530-01	6.424640-02	3.999650 03	1.522130 05
9.040000 00	1.148110 03	1.571720 02	1.634700-01	1.260110-01	7.932610-01	6.364380-02	3.999650 03	1.522220 05
9.140000 00	1.150650 03	1.572000 02	1.617030-01	1.251640-01	7.879610-01	6.305280-02	3.999650 03	1.522340 05
9.240000 00	1.153170 03	1.572350 02	1.598130-01	1.243170-01	7.826550-01	6.247350-02	3.999640 03	1.522500 05
9.340000 00	1.155660 03	1.572790 02	1.578000-01	1.234690-01	7.773450-01	6.190600-02	3.999640 03	1.522690 05
9.440000 00	1.158110 03	1.573310 02	1.556670-01	1.226210-01	7.720340-01	6.135010-02	3.999630 03	1.522920 05

9.540000 00	1.160540 03	1.573920 02	1.534140-01	1.217740-01	7.667260-01	6.080690-02	3.999630 03	1.523190 05
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2.199000 01	9.575670 02	2.428430 02	-2.041340-01	6.023110-02	3.792620-01	3.979780-02	3.999120 03	1.741760 05
2.209000 01	9.526460 02	2.437310 02	-2.036590-01	6.006360-02	3.782030-01	3.976990-02	3.999110 03	1.742360 05
2.219000 01	9.477080 02	2.446130 02	-2.031290-01	5.989930-02	3.771630-01	3.974250-02	3.999110 03	1.742930 05
2.229000 01	9.427720 02	2.454890 02	-2.025460-01	5.973800-02	3.761430-01	3.971570-02	3.999100 03	1.743450 05
2.239000 01	9.378320 02	2.463590 02	-2.018870-01	5.957960-02	3.751410-01	3.968960-02	3.999100 03	1.743940 05
2.249000 01	9.328920 02	2.472230 02	-2.011840-01	5.942430-02	3.741580-01	3.966400-02	3.999100 03	1.744390 05
2.269000 01	9.279530 02	2.480800 02	-2.004260-01	5.927160-02	3.731940-01	3.963890-02	3.999090 03	1.744800 05

2.26900D 01	9.23018D 02	2.48931D 02	-1.99614D-01	5.91223D-02	3.72248D-01	3.96144D-02	3.99909D 03	1.74518D 05
2.27900D 01	9.18081D 02	2.49775D 02	-1.98749D-01	5.89756D-02	3.71319D-01	3.95904D-02	3.99908D 03	1.74553D 05
2.28900D 01	9.13152D 02	2.50612D 02	-1.97830D-01	5.88317D-02	3.70409D-01	3.95670D-02	3.99908D 03	1.74584D 05
2.29900D 01	9.08230D 02	2.51443D 02	-1.96859D-01	5.86906D-02	3.69516D-01	3.95441D-02	3.99907D 03	1.74612D 05
2.30900D 01	9.03317D 02	2.52266D 02	-1.95837D-01	5.85522D-02	3.68641D-01	3.95217D-02	3.99907D 03	1.74637D 05
2.31900D 01	8.98413D 02	2.53082D 02	-1.94763D-01	5.84165D-02	3.67782D-01	3.94998D-02	3.99906D 03	1.74659D 05
2.32900D 01	8.93521D 02	2.53890D 02	-1.93639D-01	5.82835D-02	3.66941D-01	3.94784D-02	3.99906D 03	1.74677D 05
2.33900D 01	8.88642D 02	2.54691D 02	-1.92466D-01	5.81532D-02	3.66116D-01	3.94576D-02	3.99906D 03	1.74693D 05
2.34900D 01	8.83778D 02	2.55485D 02	-1.91243D-01	5.80254D-02	3.65307D-01	3.94370D-02	3.99905D 03	1.74706D 05
2.35900D 01	8.78930D 02	2.56270D 02	-1.89973D-01	5.79002D-02	3.64518D-01	3.94170D-02	3.99905D 03	1.74715D 05
2.36900D 01	8.74100D 02	2.57048D 02	-1.88654D-01	5.77775D-02	3.63739D-01	3.93975D-02	3.99904D 03	1.74722D 05
2.37900D 01	8.69290D 02	2.57818D 02	-1.87289D-01	5.76573D-02	3.62978D-01	3.93784D-02	3.99904D 03	1.74727D 05
2.38900D 01	8.64500D 02	2.58579D 02	-1.85878D-01	5.75396D-02	3.62233D-01	3.93597D-02	3.99903D 03	1.74729D 05
2.39900D 01	8.59733D 02	2.59333D 02	-1.84420D-01	5.74243D-02	3.61503D-01	3.93414D-02	3.99903D 03	1.74728D 05
2.40900D 01	8.54989D 02	2.60078D 02	-1.82918D-01	5.73113D-02	3.60789D-01	3.93236D-02	3.99902D 03	1.74725D 05
2.41900D 01	8.50271D 02	2.60814D 02	-1.81372D-01	5.72007D-02	3.60089D-01	3.93062D-02	3.99902D 03	1.74719D 05
2.42900D 01	8.45581D 02	2.61542D 02	-1.79782D-01	5.70924D-02	3.59403D-01	3.92892D-02	3.99902D 03	1.74712D 05
2.43900D 01	8.40918D 02	2.62262D 02	-1.78149D-01	5.69865D-02	3.58733D-01	3.92726D-02	3.99901D 03	1.74702D 05
2.44900D 01	8.36284D 02	2.62972D 02	-1.76473D-01	5.68828D-02	3.58076D-01	3.92564D-02	3.99901D 03	1.74690D 05
2.45900D 01	8.31685D 02	2.63674D 02	-1.74756D-01	5.67813D-02	3.57434D-01	3.92406D-02	3.99900D 03	1.74676D 05
2.46900D 01	8.27116D 02	2.64367D 02	-1.72998D-01	5.66820D-02	3.56806D-01	3.92251D-02	3.99900D 03	1.74659D 05
2.47900D 01	8.22586D 02	2.65051D 02	-1.71200D-01	5.65850D-02	3.56192D-01	3.92100D-02	3.99899D 03	1.74642D 05
2.48900D 01	8.18087D 02	2.65726D 02	-1.69362D-01	5.64901D-02	3.55591D-01	3.91953D-02	3.99899D 03	1.74622D 05
2.49900D 01	8.13627D 02	2.66391D 02	-1.67455D-01	5.63973D-02	3.55004D-01	3.91809D-02	3.99898D 03	1.74601D 05
2.50900D 01	8.09206D 02	2.67047D 02	-1.65569D-01	5.63068D-02	3.54430D-01	3.91669D-02	3.99898D 03	1.74578D 05
2.51900D 01	8.04825D 02	2.67694D 02	-1.63616D-01	5.62180D-02	3.53869D-01	3.91533D-02	3.99898D 03	1.74553D 05
2.52900D 01	8.00486D 02	2.68331D 02	-1.61626D-01	5.61315D-02	3.53322D-01	3.91400D-02	3.99897D 03	1.74528D 05
2.53900D 01	7.96189D 02	2.68959D 02	-1.59599D-01	5.60470D-02	3.52787D-01	3.91270D-02	3.99897D 03	1.74500D 05
2.54900D 01	7.91937D 02	2.69577D 02	-1.57537D-01	5.59645D-02	3.52264D-01	3.91143D-02	3.99896D 03	1.74472D 05
2.55900D 01	7.87731D 02	2.70186D 02	-1.55439D-01	5.58840D-02	3.51755D-01	3.91020D-02	3.99896D 03	1.74442D 05
2.56900D 01	7.83572D 02	2.70784D 02	-1.53307D-01	5.58054D-02	3.51257D-01	3.90900D-02	3.99895D 03	1.74412D 05
2.57900D 01	7.79462D 02	2.71373D 02	-1.51141D-01	5.57287D-02	3.50772D-01	3.90783D-02	3.99895D 03	1.74380D 05
2.58900D 01	7.75401D 02	2.71952D 02	-1.48941D-01	5.56539D-02	3.50299D-01	3.90669D-02	3.99895D 03	1.74347D 05
2.59900D 01	7.71391D 02	2.72522D 02	-1.46709D-01	5.55810D-02	3.49837D-01	3.90558D-02	3.99894D 03	1.74314D 05
2.60900D 01	7.67434D 02	2.73081D 02	-1.44446D-01	5.55100D-02	3.49387D-01	3.90450D-02	3.99894D 03	1.74279D 05
2.61900D 01	7.63530D 02	2.73630D 02	-1.42150D-01	5.54407D-02	3.48949D-01	3.90345D-02	3.99893D 03	1.74244D 05
2.62900D 01	7.59681D 02	2.74169D 02	-1.39824D-01	5.53733D-02	3.48522D-01	3.90243D-02	3.99893D 03	1.74208D 05
2.63900D 01	7.55888D 02	2.74698D 02	-1.37468D-01	5.53076D-02	3.48106D-01	3.90143D-02	3.99892D 03	1.74172D 05
2.64900D 01	7.52153D 02	2.75216D 02	-1.35083D-01	5.52437D-02	3.47702D-01	3.90047D-02	3.99892D 03	1.74135D 05
2.65900D 01	7.48476D 02	2.75725D 02	-1.32668D-01	5.51815D-02	3.47308D-01	3.89953D-02	3.99891D 03	1.74098D 05
2.66900D 01	7.44858D 02	2.76223D 02	-1.30226D-01	5.51210D-02	3.46925D-01	3.89862D-02	3.99891D 03	1.74061D 05
2.67900D 01	7.41302D 02	2.76710D 02	-1.27756D-01	5.50622D-02	3.46553D-01	3.89774D-02	3.99891D 03	1.74023D 05
2.68900D 01	7.37808D 02	2.77188D 02	-1.25259D-01	5.50051D-02	3.46191D-01	3.89688D-02	3.99890D 03	1.73985D 05
2.69900D 01	7.34376D 02	2.77655D 02	-1.22735D-01	5.49497D-02	3.45840D-01	3.89605D-02	3.99890D 03	1.73947D 05
2.70900D 01	7.31010D 02	2.78111D 02	-1.20186D-01	5.48958D-02	3.45500D-01	3.89524D-02	3.99889D 03	1.73909D 05
2.71900D 01	7.27708D 02	2.78557D 02	-1.17612D-01	5.48436D-02	3.45169D-01	3.89446D-02	3.99889D 03	1.73870D 05
2.72900D 01	7.24473D 02	2.78992D 02	-1.15013D-01	5.47930D-02	3.44848D-01	3.89370D-02	3.99888D 03	1.73832D 05
2.73900D 01	7.21305D 02	2.79417D 02	-1.12390D-01	5.47439D-02	3.44538D-01	3.89296D-02	3.99888D 03	1.73794D 05
2.74900D 01	7.18205D 02	2.79832D 02	-1.09744D-01	5.46964D-02	3.44237D-01	3.89226D-02	3.99887D 03	1.73756D 05
2.75900D 01	7.15175D 02	2.80235D 02	-1.07076D-01	5.46503D-02	3.43945D-01	3.89157D-02	3.99887D 03	1.73719D 05
2.76900D 01	7.12216D 02	2.80628D 02	-1.04385D-01	5.46058D-02	3.43664D-01	3.89091D-02	3.99887D 03	1.73682D 05
2.77900D 01	7.09328D 02	2.81011D 02	-1.01673D-01	5.45628D-02	3.43391D-01	3.89027D-02	3.99886D 03	1.73645D 05
2.78900D 01	7.06512D 02	2.81383D 02	-9.89400D-02	5.45212D-02	3.43126D-01	3.88965D-02	3.99886D 03	1.73608D 05
2.79900D 01	7.03769D 02	2.81744D 02	-9.61867D-02	5.44811D-02	3.42874D-01	3.88905D-02	3.99885D 03	1.73572D 05
2.80900D 01	7.01100D 02	2.82094D 02	-9.34138D-02	5.44424D-02	3.42629D-01	3.88848D-02	3.99885D 03	1.73537D 05
2.81900D 01	6.98507D 02	2.82434D 02	-9.06219D-02	5.44051D-02	3.42393D-01	3.88792D-02	3.99884D 03	1.73502D 05
2.82900D 01	6.95989D 02	2.82763D 02	-8.78115D-02	5.43691D-02	3.42165D-01	3.88739D-02	3.99884D 03	1.73467D 05
2.83900D 01	6.93547D 02	2.83081D 02	-8.49832D-02	5.43346D-02	3.41946D-01	3.88688D-02	3.99884D 03	1.73434D 05
2.84900D 01	6.91183D 02	2.83389D 02	-8.21377D-02	5.43013D-02	3.41736D-01	3.88639D-02	3.99883D 03	1.73401D 05

PATH PERFORMANCE DRAG AND LIFT COEFFICIENT UPDATE

	OLD		DELTA		NEW
CD0 :	0.34947234984401520-01	+	-0.13599229953966710-02	=	0.33587311959004850-01
CD1 :	0.0	+	0.0	=	0.0
CD2 :	0.13111776085305000 01	+	-0.60047439243360836D-01	=	0.12507031164968913 01
CD3 :	0.0	+	0.0	=	0.0
CD4 :	0.19674387132e7584D 04	+	-0.48163422855873080 02	=	0.18822852904117110 04
CLA0:	-0.33906636791882540-02	+	-0.13758843557424940-03	=	-0.35282521147625040-02
CLA :	0.63782274339670110 01	+	-0.13682642984087530-02	=	0.63768590696686020 01
CLAX:	-0.53435432835956320 00	+	-0.11393310185900470-01	=	-0.54574763854546363 00

PATH PERFORMANCE SUBITERATION 2

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.00000D 03	1.46739D 02	5.14243D-05	1.63241D-01	1.02503D 00	1.02532D-01	4.00000D 03	1.44955D 05
1.00000D-02	1.00000D 03	1.46786D 02	1.12833D-04	1.63247D-01	1.02507D 00	1.02544D-01	4.00000D 03	1.44975D 05
2.00000D-02	1.00000D 03	1.46832D 02	1.75676D-04	1.63254D-01	1.02512D 00	1.02556D-01	4.00000D 03	1.44996D 05
3.33333D-02	1.00000D 03	1.46879D 02	2.39951D-04	1.63261D-01	1.02516D 00	1.02567D-01	4.00000D 03	1.45016D 05
4.00000D-02	1.00000D 03	1.46925D 02	3.05656D-04	1.63268D-01	1.02520D 00	1.02579D-01	4.00000D 03	1.45036D 05
6.00000D-02	1.00000D 03	1.47018D 02	4.41344D-04	1.63281D-01	1.02528D 00	1.02602D-01	4.00000D 03	1.45077D 05
8.00000D-02	1.00000D 03	1.47110D 02	5.82718D-04	1.63295D-01	1.02537D 00	1.02625D-01	4.00000D 03	1.45117D 05
1.00000D-01	1.00001D 03	1.47202D 02	7.29759D-04	1.63308D-01	1.02545D 00	1.02647D-01	4.00000D 03	1.45157D 05
1.20000D-01	1.00001D 03	1.47294D 02	8.82444D-04	1.63321D-01	1.02553D 00	1.02670D-01	3.99999D 03	1.45197D 05
1.40000D-01	1.00001D 03	1.47386D 02	1.04075D-03	1.63333D-01	1.02561D 00	1.02692D-01	3.99999D 03	1.45236D 05
1.80000D-01	1.00002D 03	1.47569D 02	1.37416D-03	1.63358D-01	1.02576D 00	1.02735D-01	3.99999D 03	1.45315D 05
2.20000D-01	1.00003D 03	1.47751D 02	1.72979D-03	1.63383D-01	1.02591D 00	1.02776D-01	3.99999D 03	1.45394D 05
2.60000D-01	1.00004D 03	1.47931D 02	2.10747D-03	1.63406D-01	1.02606D 00	1.02817D-01	3.99999D 03	1.45472D 05
3.00000D-01	1.00005D 03	1.48111D 02	2.50701D-03	1.63429D-01	1.02620D 00	1.02856D-01	3.99999D 03	1.45549D 05
3.40000D-01	1.00007D 03	1.48289D 02	2.92825D-03	1.63451D-01	1.02634D 00	1.02895D-01	3.99999D 03	1.45626D 05
4.20000D-01	1.00011D 03	1.48642D 02	3.83532D-03	1.63493D-01	1.02660D 00	1.02967D-01	3.99998D 03	1.45777D 05
5.00000D-01	1.00016D 03	1.48991D 02	4.82618D-03	1.63531D-01	1.02684D 00	1.03033D-01	3.99998D 03	1.45926D 05
5.80000D-01	1.00022D 03	1.49335D 02	5.90017D-03	1.63566D-01	1.02706D 00	1.03094D-01	3.99998D 03	1.46072D 05
6.60000D-01	1.00030D 03	1.49674D 02	7.05532D-03	1.63598D-01	1.02725D 00	1.03149D-01	3.99997D 03	1.46216D 05
7.40000D-01	1.00039D 03	1.50007D 02	8.28996D-03	1.63626D-01	1.02743D 00	1.03197D-01	3.99997D 03	1.46357D 05
8.40000D-01	1.00053D 03	1.50417D 02	9.94241D-03	1.63655D-01	1.02761D 00	1.03248D-01	3.99996D 03	1.46529D 05
9.40000D-01	1.00069D 03	1.50818D 02	1.17128D-02	1.63678D-01	1.02775D 00	1.03287D-01	3.99996D 03	1.46697D 05
1.04000D 00	1.00088D 03	1.51209D 02	1.35976D-02	1.63694D-01	1.02785D 00	1.03315D-01	3.99996D 03	1.46861D 05
1.14000D 00	1.00110D 03	1.51592D 02	1.55932D-02	1.63703D-01	1.02791D 00	1.03331D-01	3.99995D 03	1.47020D 05
1.24000D 00	1.00136D 03	1.51965D 02	1.76956D-02	1.63705D-01	1.02792D 00	1.03334D-01	3.99995D 03	1.47176D 05
1.34000D 00	1.00164D 03	1.52329D 02	1.99012D-02	1.63699D-01	1.02788D 00	1.03324D-01	3.99995D 03	1.47327D 05
1.44000D 00	1.00196D 03	1.52683D 02	2.22059D-02	1.63684D-01	1.02779D 00	1.03298D-01	3.99994D 03	1.47473D 05
1.54000D 00	1.00232D 03	1.53026D 02	2.46056D-02	1.63661D-01	1.02764D 00	1.03258D-01	3.99994D 03	1.47615D 05
1.64000D 00	1.00272D 03	1.53361D 02	2.70962D-02	1.63628D-01	1.02744D 00	1.03201D-01	3.99993D 03	1.47752D 05
1.74000D 00	1.00315D 03	1.53683D 02	2.96734D-02	1.63586D-01	1.02718D 00	1.03128D-01	3.99993D 03	1.47886D 05
1.84000D 00	1.00363D 03	1.53996D 02	3.23328D-02	1.63533D-01	1.02685D 00	1.03037D-01	3.99993D 03	1.48015D 05
1.94000D 00	1.00415D 03	1.54298D 02	3.50762D-02	1.63470D-01	1.02646D 00	1.02928D-01	3.99992D 03	1.48139D 05
2.04000D 00	1.00471D 03	1.54589D 02	3.78809D-02	1.63396D-01	1.02600D 00	1.02800D-01	3.99992D 03	1.48259D 05
2.14000D 00	1.00532D 03	1.54869D 02	4.07604D-02	1.63311D-01	1.02547D 00	1.02652D-01	3.99992D 03	1.48375D 05
2.24000D 00	1.00597D 03	1.55139D 02	4.37041D-02	1.63213D-01	1.02486D 00	1.02485D-01	3.99991D 03	1.48487D 05
2.34000D 00	1.00668D 03	1.55398D 02	4.67075D-02	1.63104D-01	1.02418D 00	1.02299D-01	3.99991D 03	1.48595D 05
2.44000D 00	1.00743D 03	1.55646D 02	4.97659D-02	1.62983D-01	1.02343D 00	1.02092D-01	3.99990D 03	1.48698D 05
2.54000D 00	1.00823D 03	1.55883D 02	5.28745D-02	1.62850D-01	1.02260D 00	1.01865D-01	3.99990D 03	1.48798D 05
2.64000D 00	1.00907D 03	1.56109D 02	5.60288D-02	1.62704D-01	1.02170D 00	1.01617D-01	3.99990D 03	1.48893D 05
2.74000D 00	1.00997D 03	1.56324D 02	5.92240D-02	1.62546D-01	1.02071D 00	1.01349D-01	3.99989D 03	1.48985D 05
2.84000D 00	1.01092D 03	1.56529D 02	6.24555D-02	1.62374D-01	1.01965D 00	1.01060D-01	3.99989D 03	1.49072D 05
2.94000D 00	1.01193D 03	1.56722D 02	6.57184D-02	1.62190D-01	1.01850D 00	1.00751D-01	3.99988D 03	1.49156D 05
3.04000D 00	1.01298D 03	1.56905D 02	6.90081D-02	1.61992D-01	1.01727D 00	1.00421D-01	3.99988D 03	1.49235D 05
3.14000D 00	1.01409D 03	1.57077D 02	7.23198D-02	1.61781D-01	1.01595D 00	1.00070D-01	3.99988D 03	1.49312D 05
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2.69900D 01	7.34376D 02	2.77655D 02	-1.22735D-01	5.50005D-02	3.45923D-01	3.74229D-02	3.99890D 03	1.68002D 05
2.70900D 01	7.31010D 02	2.78111D 02	-1.20186D-01	5.49466D-02	3.45582D-01	3.74152D-02	3.99889D 03	1.67935D 05
2.71900D 01	7.27708D 02	2.78557D 02	-1.17612D-01	5.48944D-02	3.45251D-01	3.74077D-02	3.99889D 03	1.67869D 05
2.72900D 01	7.24472D 02	2.78992D 02	-1.15013D-01	5.48437D-02	3.44930D-01	3.74004D-02	3.99888D 03	1.67803D 05
2.73900D 01	7.21305D 02	2.79417D 02	-1.12390D-01	5.47946D-02	3.44620D-01	3.73934D-02	3.99888D 03	1.67738D 05
2.74900D 01	7.18205D 02	2.79832D 02	-1.09744D-01	5.47470D-02	3.44319D-01	3.73866D-02	3.99887D 03	1.67674D 05
2.75900D 01	7.15175D 02	2.80235D 02	-1.07076D-01	5.47010D-02	3.44027D-01	3.73801D-02	3.99887D 03	1.67611D 05
2.76900D 01	7.12216D 02	2.80628D 02	-1.04385D-01	5.46565D-02	3.43745D-01	3.73738D-02	3.99887D 03	1.67549D 05
2.77900D 01	7.09328D 02	2.81011D 02	-1.01673D-01	5.46134D-02	3.43473D-01	3.73676D-02	3.99886D 03	1.67487D 05
2.78900D 01	7.06512D 02	2.81383D 02	-9.89400D-02	5.45718D-02	3.43210D-01	3.73617D-02	3.99886D 03	1.67427D 05
2.79900D 01	7.03769D 02	2.81744D 02	-9.61867D-02	5.45317D-02	3.42955D-01	3.73560D-02	3.99885D 03	1.67368D 05
2.80900D 01	7.01100D 02	2.82094D 02	-9.34138D-02	5.44929D-02	3.42710D-01	3.73505D-02	3.99885D 03	1.67310D 05
2.81900D 01	6.98507D 02	2.82434D 02	-9.06215D-02	5.44556D-02	3.42474D-01	3.73452D-02	3.99884D 03	1.67253D 05
2.82900D 01	6.95989D 02	2.82763D 02	-8.78116D-02	5.44196D-02	3.42246D-01	3.73402D-02	3.99884D 03	1.67197D 05
2.83900D 01	6.93547D 02	2.83081D 02	-8.49832D-02	5.43850D-02	3.42027D-01	3.73353D-02	3.99884D 03	1.67143D 05
2.84900D 01	6.91183D 02	2.83389D 02	-8.21377D-02	5.43518D-02	3.41817D-01	3.73306D-02	3.99883D 03	1.67090D 05

PITCH-ANGLE GAIN = 1.00000000000D 00
PITCH-ANGLE BIAS = 3.10850684540D-17 RADIAN

M O D E L   S O L U T I O N S

```
*                                                                          *
* MODEL 12    P0 =  2.865718204693605D 04   CD0 =  3.495983070157546D-02   *
*             P1 =  0.0                     CD1 =  0.0                     *
* POINT       P2 =  1.128753906168838D 03   CD2 =  1.310610745586093D 00   *
* FAILURES    P3 = -2.180026386401133D 00   CD3 =  0.0                     *
* =    0      P4 =  0.0                     CD4 =  1.978758451670838D 03   *
*                                                                          *
* FIT ERROR=  4.753516219399636D-09                                        *
*                                                                          *
****************************************************************************
*                                                                          *
****************************************************************************
*                                                                          *
**                     MODEL 12 FOUND TO BE BEST FIT                      **
*                                                                          *
****************************************************************************
```

LIFT COEFFICIENTS: BY LEAST SQUARE DISTANCE

```
CLA0=-0.3202348282264754D-02
CLA = 0.6377063218489990D 01
CLAX=-0.5019870278871464D 00
FXPX= 0.2089180816918498D 01
CLQ= 0.0
```

ESTIMATED SPECIFIC FUEL CONSUMPTION = 2.527031174760060D-07 LBF/(FT-LBF/SEC)/SEC

```
**************************************************
*                                                *
*  PATH PERFORMANCE ANALYSIS ITERATION NO. 5     *
*  (ALTITUDE AND AIRSPEED ASSUMED CORRECT)       *
*                                                *
**************************************************
```

PATH PERFORMANCE SUBITERATION 1

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.000000D 03	1.467390D 02	5.142430D-05	1.629210D-01	1.024420D 00	1.067520D-01	4.000000D 03	1.473660D 05
1.000000D-02	1.000000D 03	1.467860D 02	1.128330D-04	1.629280D-01	1.024460D 00	1.067640D-01	4.000000D 03	1.473890D 05
2.000000D-02	1.000000D 03	1.468320D 02	1.756760D-04	1.629350D-01	1.024510D 00	1.067760D-01	4.000000D 03	1.474110D 05
3.000000D-02	1.000000D 03	1.468790D 02	2.399510D-04	1.629410D-01	1.024550D 00	1.067890D-01	4.000000D 03	1.474340D 05
4.000000D-02	1.000000D 03	1.469250D 02	3.056560D-04	1.629480D-01	1.024590D 00	1.068010D-01	4.000000D 03	1.474570D 05
6.000000D-02	1.000000D 03	1.470180D 02	4.413440D-04	1.629610D-01	1.024670D 00	1.068240D-01	4.000000D 03	1.475020D 05
8.000000D-02	1.000000D 03	1.471100D 02	5.827180D-04	1.629750D-01	1.024760D 00	1.068480D-01	4.000000D 03	1.475480D 05
1.000000D-01	1.000010D 03	1.472020D 02	7.257590D-04	1.629880D-01	1.024840D 00	1.068710D-01	4.000000D 03	1.475930D 05
1.200000D-01	1.000010D 03	1.472940D 02	8.824440D-04	1.630000D-01	1.024920D 00	1.068940D-01	3.999990D 03	1.476380D 05
1.400000D-01	1.000010D 03	1.473860D 02	1.040750D-03	1.630130D-01	1.025000D 00	1.069170D-01	3.999990D 03	1.476830D 05
1.800000D-01	1.000020D 03	1.475690D 02	1.374160D-03	1.630380D-01	1.025160D 00	1.069620D-01	3.999990D 03	1.477720D 05
2.200000D-01	1.000030D 03	1.477510D 02	1.729790D-03	1.630620D-01	1.025300D 00	1.070050D-01	3.999990D 03	1.478600D 05
2.600000D-01	1.000040D 03	1.479310D 02	2.107470D-03	1.630850D-01	1.025450D 00	1.070470D-01	3.999990D 03	1.479480D 05
3.000000D-01	1.000050D 03	1.481110D 02	2.507010D-03	1.631080D-01	1.025590D 00	1.070880D-01	3.999990D 03	1.480350D 05
3.400000D-01	1.000070D 03	1.482890D 02	2.928250D-03	1.631300D-01	1.025730D 00	1.071280D-01	3.999990D 03	1.481220D 05
4.200000D-01	1.000110D 03	1.486420D 02	3.835020D-03	1.631720D-01	1.025980D 00	1.072020D-01	3.999980D 03	1.482920D 05
5.000000D-01	1.000160D 03	1.489910D 02	4.826180D-03	1.632100D-01	1.026220D 00	1.072710D-01	3.999980D 03	1.484600D 05
5.800000D-01	1.000220D 03	1.493350D 02	5.900170D-03	1.632450D-01	1.026440D 00	1.073340D-01	3.999970D 03	1.486260D 05
6.600000D-01	1.000300D 03	1.496740D 02	7.055320D-03	1.632760D-01	1.026630D 00	1.073910D-01	3.999970D 03	1.487880D 05
7.400000D-01	1.000390D 03	1.500070D 02	8.289900D-03	1.633040D-01	1.026810D 00	1.074410D-01	3.999970D 03	1.489470D 05
8.400000D-01	1.000530D 03	1.504170D 02	9.942410D-03	1.633330D-01	1.026990D 00	1.074930D-01	3.999960D 03	1.491420D 05
9.400000D-01	1.000690D 03	1.508180D 02	1.171280D-02	1.633560D-01	1.027130D 00	1.075340D-01	3.999960D 03	1.493320D 05
1.040000D 00	1.000880D 03	1.512090D 02	1.359760D-02	1.633720D-01	1.027230D 00	1.075630D-01	3.999960D 03	1.495170D 05
1.140000D 00	1.001100D 03	1.515920D 02	1.559320D-02	1.633830D-01	1.027280D 00	1.075790D-01	3.999950D 03	1.496970D 05
1.240000D 00	1.001360D 03	1.519650D 02	1.769560D-02	1.633820D-01	1.027300D 00	1.075820D-01	3.999950D 03	1.498720D 05
1.340000D 00	1.001640D 03	1.523290D 02	1.990120D-02	1.633760D-01	1.027260D 00	1.075710D-01	3.999950D 03	1.500420D 05
1.440000D 00	1.001960D 03	1.526830D 02	2.220590D-02	1.633610D-01	1.027170D 00	1.075450D-01	3.999940D 03	1.502060D 05
1.540000D 00	1.002320D 03	1.530260D 02	2.460560D-02	1.633360D-01	1.027020D 00	1.075030D-01	3.999940D 03	1.503660D 05
1.640000D 00	1.002720D 03	1.533600D 02	2.709620D-02	1.633060D-01	1.026820D 00	1.074440D-01	3.999930D 03	1.505200D 05
1.740000D 00	1.003150D 03	1.536830D 02	2.967340D-02	1.632630D-01	1.026550D 00	1.073670D-01	3.999930D 03	1.506690D 05
1.840000D 00	1.003630D 03	1.539960D 02	3.233280D-02	1.632110D-01	1.026230D 00	1.072730D-01	3.999930D 03	1.508120D 05
1.940000D 00	1.004150D 03	1.542980D 02	3.507620D-02	1.631480D-01	1.025840D 00	1.071600D-01	3.999920D 03	1.509510D 05
2.040000D 00	1.004710D 03	1.545890D 02	3.788090D-02	1.630740D-01	1.025380D 00	1.070270D-01	3.999920D 03	1.510840D 05
2.140000D 00	1.005320D 03	1.548690D 02	4.076040D-02	1.629890D-01	1.024850D 00	1.068740D-01	3.999920D 03	1.512110D 05
2.240000D 00	1.005970D 03	1.551390D 02	4.370410D-02	1.628920D-01	1.024240D 00	1.067010D-01	3.999910D 03	1.513340D 05
2.340000D 00	1.006680D 03	1.553980D 02	4.670750D-02	1.627840D-01	1.023570D 00	1.065070D-01	3.999910D 03	1.514510D 05
2.440000D 00	1.007430D 03	1.556460D 02	4.976890D-02	1.626630D-01	1.022810D 00	1.062920D-01	3.999900D 03	1.515620D 05
2.540000D 00	1.008230D 03	1.558830D 02	5.287450D-02	1.625300D-01	1.021990D 00	1.060560D-01	3.999900D 03	1.516690D 05
2.640000D 00	1.009070D 03	1.561090D 02	5.602880D-02	1.623850D-01	1.021080D 00	1.057990D-01	3.999900D 03	1.517700D 05
2.740000D 00	1.009970D 03	1.563240D 02	5.922400D-02	1.622270D-01	1.020100D 00	1.055210D-01	3.999890D 03	1.518660D 05
2.840000D 00	1.010920D 03	1.565290D 02	6.245560D-02	1.620570D-01	1.019040D 00	1.052220D-01	3.999890D 03	1.519570D 05
2.940000D 00	1.011930D 03	1.567220D 02	6.571840D-02	1.618730D-01	1.017890D 00	1.049010D-01	3.999880D 03	1.520430D 05
3.040000D 00	1.012980D 03	1.569050D 02	6.900810D-02	1.616760D-01	1.016660D 00	1.045580D-01	3.999880D 03	1.521250D 05
3.140000D 00	1.014090D 03	1.570770D 02	7.231980D-02	1.614680D-01	1.015360D 00	1.041940D-01	3.999880D 03	1.522010D 05
3.240000D 00	1.015260D 03	1.572390D 02	7.564880D-02	1.612410D-01	1.013950D 00	1.038080D-01	3.999870D 03	1.522720D 05
3.340000D 00	1.016470D 03	1.573900D 02	7.899050D-02	1.610030D-01	1.012470D 00	1.034000D-01	3.999870D 03	1.523380D 05
3.440000D 00	1.017740D 03	1.575310D 02	8.234000D-02	1.607510D-01	1.010900D 00	1.029710D-01	3.999870D 03	1.524000D 05
3.540000D 00	1.019060D 03	1.576620D 02	8.569260D-02	1.604840D-01	1.009230D 00	1.025200D-01	3.999860D 03	1.524570D 05
3.640000D 00	1.020440D 03	1.577830D 02	8.904170D-02	1.602030D-01	1.007480D 00	1.020480D-01	3.999860D 03	1.525100D 05
3.740000D 00	1.021870D 03	1.578940D 02	9.238860D-02	1.599070D-01	1.005640D 00	1.015550D-01	3.999850D 03	1.525580D 05
3.840000D 00	1.023350D 03	1.579960D 02	9.572250D-02	1.595960D-01	1.003700D 00	1.010410D-01	3.999850D 03	1.526020D 05
3.940000D 00	1.024890D 03	1.580880D 02	9.904090D-02	1.592700D-01	1.001660D 00	1.005060D-01	3.999850D 03	1.526420D 05
4.040000D 00	1.026480D 03	1.581710D 02	1.023390D-01	1.589290D-01	9.995340D-01	9.994980D-02	3.999840D 03	1.526780D 05
4.140000D 00	1.028120D 03	1.582450D 02	1.056120D-01	1.585710D-01	9.973070D-01	9.937370D-02	3.999840D 03	1.527090D 05
4.240000D 00	1.029810D 03	1.583100D 02	1.088560D-01	1.581990D-01	9.949830D-01	9.877800D-02	3.999830D 03	1.527370D 05
4.340000D 00	1.031560D 03	1.583660D 02	1.120670D-01	1.578110D-01	9.925630D-01	9.816360D-02	3.999830D 03	1.527610D 05
4.440000D 00	1.033350D 03	1.584150D 02	1.152380D-01	1.574070D-01	9.900480D-01	9.753140D-02	3.999830D 03	1.527810D 05
4.540000D 00	1.035200D 03	1.584550D 02	1.183680D-01	1.569890D-01	9.874390D-01	9.688230D-02	3.999820D 03	1.527980D 05
4.640000D 00	1.037100D 03	1.584880D 02	1.214500D-01	1.565560D-01	9.847360D-01	9.621710D-02	3.999820D 03	1.528110D 05
4.740000D 00	1.039040D 03	1.585130D 02	1.244810D-01	1.561080D-01	9.819410D-01	9.553670D-02	3.999820D 03	1.528220D 05
4.840000D 00	1.041030D 03	1.585310D 02	1.274570D-01	1.556450D-01	9.790540D-01	9.484200D-02	3.999810D 03	1.528280D 05
4.940000D 00	1.043070D 03	1.585420D 02	1.303750D-01	1.551680D-01	9.760760D-01	9.413380D-02	3.999810D 03	1.528320D 05
5.040000D 00	1.045150D 03	1.585460D 02	1.332290D-01	1.546760D-01	9.730070D-01	9.341320D-02	3.999800D 03	1.528340D 05
5.140000D 00	1.047280D 03	1.585440D 02	1.360160D-01	1.541700D-01	9.698500D-01	9.268080D-02	3.999800D 03	1.528320D 05
5.240000D 00	1.049460D 03	1.585360D 02	1.387320D-01	1.536500D-01	9.666040D-01	9.193770D-02	3.999800D 03	1.528280D 05
5.340000D 00	1.051670D 03	1.585230D 02	1.413760D-01	1.531160D-01	9.632710D-01	9.118460D-02	3.999790D 03	1.528210D 05
5.440000D 00	1.053920D 03	1.585040D 02	1.439390D-01	1.525680D-01	9.598510D-01	9.042240D-02	3.999790D 03	1.528120D 05
5.540000D 00	1.056210D 03	1.584800D 02	1.464230D-01	1.520060D-01	9.563450D-01	8.965200D-02	3.999780D 03	1.528000D 05
5.640000D 00	1.058540D 03	1.584510D 02	1.488210D-01	1.514310D-01	9.527540D-01	8.887420D-02	3.999780D 03	1.527870D 05
5.740000D 00	1.060910D 03	1.584180D 02	1.511320D-01	1.508420D-01	9.490780D-01	8.808980D-02	3.999780D 03	1.527720D 05
5.840000D 00	1.063310D 03	1.583810D 02	1.533510D-01	1.502400D-01	9.453190D-01	8.729960D-02	3.999770D 03	1.527550D 05
5.940000D 00	1.065750D 03	1.583400D 02	1.554760D-01	1.496250D-01	9.414780D-01	8.650440D-02	3.999770D 03	1.527370D 05
6.040000D 00	1.068220D 03	1.582950D 02	1.575040D-01	1.489970D-01	9.375550D-01	8.570500D-02	3.999760D 03	1.527170D 05
6.140000D 00	1.070710D 03	1.582480D 02	1.594320D-01	1.483560D-01	9.335510D-01	8.490240D-02	3.999760D 03	1.526950D 05
6.240000D 00	1.073240D 03	1.581960D 02	1.612570D-01	1.477020D-01	9.294700D-01	8.409750D-02	3.999760D 03	1.526730D 05
6.340000D 00	1.075790D 03	1.581460D 02	1.629760D-01	1.470370D-01	9.253140D-01	8.329130D-02	3.999750D 03	1.526500D 05
6.440000D 00	1.078370D 03	1.580920D 02	1.645870D-01	1.463600D-01	9.210840D-01	8.248490D-02	3.999750D 03	1.526250D 05

6.540000 00	1.080970 03	1.580360 02	1.660880D-01	1.456720D-01	9.167840D-01	8.167920D-02	3.999750 03	1.526010 05
6.640000 00	1.083600 03	1.579790 02	1.674760D-01	1.449730D-01	9.124160D-01	8.087490D-02	3.999740 03	1.525750 05
6.740000 00	1.086240 03	1.579210 02	1.687490D-01	1.442630D-01	9.079810D-01	8.007300D-02	3.999740 03	1.525490 05
6.840000 00	1.088900 03	1.578630 02	1.699050D-01	1.435430D-01	9.034840D-01	7.927430D-02	3.999730 03	1.525230 05
6.940000 00	1.091580 03	1.578040 02	1.709420D-01	1.428140D-01	8.989250D-01	7.847960D-02	3.999730 03	1.524970 05
7.040000 00	1.094270 03	1.577460 02	1.718390D-01	1.420750D-01	8.943070D-01	7.768950D-02	3.999730 03	1.524720 05
7.140000 00	1.096970 03	1.576880 02	1.726540D-01	1.413280D-01	8.896330D-01	7.690470D-02	3.999720 03	1.524460 05
7.240000 00	1.099690 03	1.576310 02	1.733250D-01	1.405720D-01	8.849060D-01	7.612590D-02	3.999720 03	1.524210 05
7.340000 00	1.102410 03	1.575760 02	1.738720D-01	1.398070D-01	8.801250D-01	7.535360D-02	3.999710 03	1.523960 05
7.440000 00	1.105140 03	1.575220 02	1.742930D-01	1.390350D-01	8.752960D-01	7.458860D-02	3.999710 03	1.523720 05
7.540000 00	1.107870 03	1.574700 02	1.745860D-01	1.382560D-01	8.704200D-01	7.383110D-02	3.999710 03	1.523490 05
7.640000 00	1.110610 03	1.574200 02	1.747520D-01	1.374690D-01	8.655000D-01	7.308190D-02	3.999700 03	1.523270 05
7.740000 00	1.113340 03	1.573730 02	1.747890D-01	1.366760D-01	8.605370D-01	7.234120D-02	3.999700 03	1.523060 05
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1.909000 01	1.090980 03	2.154160 02	-1.901640D-01	6.660320D-02	4.197820D-01	4.094640D-02	3.999240 03	1.706360 05
1.919000 01	1.086880 03	2.163880 02	-1.916130D-01	6.632530D-02	4.180240D-01	4.089370D-02	3.999240 03	1.708180 05
1.929000 01	1.082730 03	2.173610 02	-1.929890D-01	6.605190D-02	4.162960D-01	4.084220D-02	3.999240 03	1.709960 05
1.939000 01	1.078540 03	2.183330 02	-1.942930D-01	6.578310D-02	4.145960D-01	4.079170D-02	3.999230 03	1.711690 05
1.949000 01	1.074300 03	2.193050 02	-1.955240D-01	6.551880D-02	4.129250D-01	4.074240D-02	3.999230 03	1.713390 05
1.959000 01	1.070020 03	2.202760 02	-1.966820D-01	6.525880D-02	4.112810D-01	4.069420D-02	3.999220 03	1.715050 05

1.969000D 01	1.065730D 03	2.212460D 02	-1.977690D-01	6.500330D-02	4.096060D-01	4.064700D-02	3.999220D 03	1.716660D 05
1.979000D 01	1.061330D 03	2.222160D 02	-1.987950D-01	6.475200D-02	4.080760D-01	4.060080D-02	3.999210D 03	1.718230D 05
1.989000D 01	1.056920D 03	2.231840D 02	-1.997300D-01	6.450490D-02	4.066140D-01	4.055570D-02	3.999210D 03	1.719750D 05
1.999000D 01	1.052470D 03	2.241500D 02	-2.006650D-01	6.426200D-02	4.049780D-01	4.051150D-02	3.999200D 03	1.721240D 05
2.009000D 01	1.047990D 03	2.251150D 02	-2.014100D-01	6.402320D-02	4.034670D-01	4.046830D-02	3.999200D 03	1.722680D 05
2.019000D 01	1.043470D 03	2.260780D 02	-2.021450D-01	6.378850D-02	4.019830D-01	4.042600D-02	3.999200D 03	1.724070D 05
2.029000D 01	1.038910D 03	2.270390D 02	-2.028110D-01	6.355770D-02	4.005240D-01	4.038460D-02	3.999190D 03	1.725430D 05
2.039000D 01	1.034320D 03	2.279970D 02	-2.034100D-01	6.333090D-02	3.990880D-01	4.034410D-02	3.999190D 03	1.726740D 05
2.049000D 01	1.029700D 03	2.289530D 02	-2.039400D-01	6.310790D-02	3.976780D-01	4.030450D-02	3.999180D 03	1.728000D 05
2.059000D 01	1.025050D 03	2.299060D 02	-2.044030D-01	6.288680D-02	3.962920D-01	4.026570D-02	3.999180D 03	1.729220D 05
2.069000D 01	1.020370D 03	2.308560D 02	-2.047990D-01	6.267350D-02	3.949300D-01	4.022780D-02	3.999170D 03	1.730400D 05
2.079000D 01	1.015660D 03	2.318030D 02	-2.051260D-01	6.246200D-02	3.935920D-01	4.019070D-02	3.999170D 03	1.731540D 05
2.089000D 01	1.010920D 03	2.327460D 02	-2.053930D-01	6.225410D-02	3.922770D-01	4.015440D-02	3.999170D 03	1.732630D 05
2.099000D 01	1.006160D 03	2.336860D 02	-2.055920D-01	6.204990D-02	3.909850D-01	4.011890D-02	3.999160D 03	1.733680D 05
2.109000D 01	1.001360D 03	2.346220D 02	-2.057260D-01	6.184930D-02	3.897160D-01	4.008410D-02	3.999160D 03	1.734690D 05
2.119000D 01	9.965750D 02	2.355540D 02	-2.057970D-01	6.165220D-02	3.884640D-01	4.005010D-02	3.999150D 03	1.735660D 05
2.129000D 01	9.917560D 02	2.364820D 02	-2.058040D-01	6.145860D-02	3.872450D-01	4.001680D-02	3.999150D 03	1.736580D 05
2.139000D 01	9.869140D 02	2.374050D 02	-2.057490D-01	6.126850D-02	3.860420D-01	3.998430D-02	3.999140D 03	1.737460D 05
2.149000D 01	9.820540D 02	2.383240D 02	-2.056320D-01	6.108170D-02	3.848600D-01	3.995250D-02	3.999140D 03	1.738300D 05
2.159000D 01	9.771820D 02	2.392380D 02	-2.054530D-01	6.089840D-02	3.837000D-01	3.992130D-02	3.999130D 03	1.739100D 05
2.169000D 01	9.722950D 02	2.401470D 02	-2.052130D-01	6.071830D-02	3.825600D-01	3.989080D-02	3.999130D 03	1.739860D 05
2.179000D 01	9.673960D 02	2.410510D 02	-2.049130D-01	6.054140D-02	3.814420D-01	3.986100D-02	3.999130D 03	1.740580D 05
2.189000D 01	9.624860D 02	2.419500D 02	-2.045540D-01	6.036780D-02	3.803430D-01	3.983180D-02	3.999120D 03	1.741260D 05
2.199000D 01	9.575670D 02	2.428430D 02	-2.041360D-01	6.019730D-02	3.792640D-01	3.980330D-02	3.999120D 03	1.741900D 05
2.209000D 01	9.526400D 02	2.437310D 02	-2.036590D-01	6.003000D-02	3.782060D-01	3.977530D-02	3.999110D 03	1.742500D 05
2.219000D 01	9.477080D 02	2.446130D 02	-2.031250D-01	5.986570D-02	3.771650D-01	3.974800D-02	3.999110D 03	1.743070D 05
2.229000D 01	9.427720D 02	2.454890D 02	-2.025340D-01	5.970440D-02	3.761450D-01	3.972130D-02	3.999100D 03	1.743590D 05
2.239000D 01	9.378320D 02	2.463590D 02	-2.018870D-01	5.954610D-02	3.751430D-01	3.969510D-02	3.999100D 03	1.744080D 05
2.249000D 01	9.328920D 02	2.472230D 02	-2.011840D-01	5.939080D-02	3.741600D-01	3.966960D-02	3.999100D 03	1.744540D 05
2.259000D 01	9.279520D 02	2.480800D 02	-2.004260D-01	5.923840D-02	3.731960D-01	3.964450D-02	3.999090D 03	1.744950D 05
2.269000D 01	9.230150D 02	2.489310D 02	-1.996140D-01	5.908890D-02	3.722490D-01	3.962000D-02	3.999090D 03	1.745340D 05
2.279000D 01	9.180810D 02	2.497750D 02	-1.987490D-01	5.894220D-02	3.713210D-01	3.959610D-02	3.999080D 03	1.745690D 05
2.289000D 01	9.131520D 02	2.506120D 02	-1.978300D-01	5.879840D-02	3.704110D-01	3.957270D-02	3.999080D 03	1.746000D 05
2.299000D 01	9.082300D 02	2.514430D 02	-1.968590D-01	5.865730D-02	3.695160D-01	3.954980D-02	3.999070D 03	1.746280D 05
2.309000D 01	9.033170D 02	2.522660D 02	-1.958370D-01	5.851930D-02	3.686420D-01	3.952740D-02	3.999070D 03	1.746530D 05
2.319000D 01	8.984130D 02	2.530820D 02	-1.947630D-01	5.838340D-02	3.677840D-01	3.950560D-02	3.999060D 03	1.746750D 05
2.329000D 01	8.935210D 02	2.538930D 02	-1.936390D-01	5.825040D-02	3.669420D-01	3.948420D-02	3.999060D 03	1.746940D 05
2.339000D 01	8.886420D 02	2.546910D 02	-1.924660D-01	5.812010D-02	3.661170D-01	3.946330D-02	3.999060D 03	1.747100D 05
2.349000D 01	8.837760D 02	2.554850D 02	-1.912430D-01	5.799240D-02	3.653090D-01	3.944280D-02	3.999050D 03	1.747230D 05
2.359000D 01	8.789300D 02	2.562700D 02	-1.899730D-01	5.786720D-02	3.645170D-01	3.942290D-02	3.999050D 03	1.747330D 05
2.369000D 01	8.741000D 02	2.570480D 02	-1.886640D-01	5.774460D-02	3.637400D-01	3.940330D-02	3.999040D 03	1.747400D 05
2.379000D 01	8.692900D 02	2.578180D 02	-1.872890D-01	5.762460D-02	3.629800D-01	3.938430D-02	3.999040D 03	1.747450D 05
2.389000D 01	8.645000D 02	2.585790D 02	-1.858780D-01	5.750670D-02	3.622350D-01	3.936560D-02	3.999030D 03	1.747470D 05
2.399000D 01	8.597330D 02	2.593330D 02	-1.844200D-01	5.739140D-02	3.615050D-01	3.934740D-02	3.999030D 03	1.747460D 05
2.409000D 01	8.549890D 02	2.600780D 02	-1.829180D-01	5.727850D-02	3.607900D-01	3.932960D-02	3.999020D 03	1.747430D 05
2.419000D 01	8.502710D 02	2.608140D 02	-1.813720D-01	5.716790D-02	3.600900D-01	3.931220D-02	3.999020D 03	1.747380D 05
2.429000D 01	8.455810D 02	2.615420D 02	-1.797820D-01	5.705970D-02	3.594050D-01	3.929520D-02	3.999020D 03	1.747310D 05
2.439000D 01	8.409190D 02	2.622620D 02	-1.781490D-01	5.695370D-02	3.587340D-01	3.927860D-02	3.999010D 03	1.747210D 05
2.449000D 01	8.362880D 02	2.629720D 02	-1.764730D-01	5.685010D-02	3.580780D-01	3.926240D-02	3.999010D 03	1.747090D 05
2.459000D 01	8.316850D 02	2.636740D 02	-1.747560D-01	5.674860D-02	3.574360D-01	3.924660D-02	3.999000D 03	1.746950D 05
2.469000D 01	8.271180D 02	2.643670D 02	-1.729980D-01	5.664940D-02	3.568070D-01	3.923120D-02	3.999000D 03	1.746790D 05
2.479000D 01	8.225850D 02	2.650510D 02	-1.712000D-01	5.655240D-02	3.561930D-01	3.921610D-02	3.998990D 03	1.746620D 05
2.489000D 01	8.180870D 02	2.657260D 02	-1.693620D-01	5.645750D-02	3.555920D-01	3.920140D-02	3.998990D 03	1.746420D 05
2.499000D 01	8.136270D 02	2.663910D 02	-1.674850D-01	5.636470D-02	3.550050D-01	3.918710D-02	3.998980D 03	1.746210D 05
2.509000D 01	8.092060D 02	2.670470D 02	-1.655690D-01	5.627410D-02	3.544310D-01	3.917310D-02	3.998980D 03	1.745990D 05
2.519000D 01	8.048250D 02	2.676940D 02	-1.636160D-01	5.618550D-02	3.538710D-01	3.915940D-02	3.998970D 03	1.745740D 05
2.529000D 01	8.004860D 02	2.683310D 02	-1.616260D-01	5.609900D-02	3.533230D-01	3.914610D-02	3.998970D 03	1.745490D 05
2.539000D 01	7.961890D 02	2.689590D 02	-1.595990D-01	5.601460D-02	3.527880D-01	3.913320D-02	3.998970D 03	1.745220D 05
2.549000D 01	7.919370D 02	2.695770D 02	-1.575370D-01	5.593210D-02	3.522660D-01	3.912050D-02	3.998960D 03	1.744940D 05
2.559000D 01	7.877310D 02	2.701860D 02	-1.554390D-01	5.585160D-02	3.517560D-01	3.910820D-02	3.998960D 03	1.744640D 05
2.569000D 01	7.835720D 02	2.707840D 02	-1.533070D-01	5.577300D-02	3.512590D-01	3.909620D-02	3.998950D 03	1.744340D 05
2.579000D 01	7.794620D 02	2.713730D 02	-1.511410D-01	5.569640D-02	3.507730D-01	3.908450D-02	3.998950D 03	1.744020D 05
2.589000D 01	7.754010D 02	2.719520D 02	-1.489410D-01	5.562160D-02	3.503000D-01	3.907310D-02	3.998950D 03	1.743700D 05
2.599000D 01	7.713910D 02	2.725220D 02	-1.467090D-01	5.554870D-02	3.498380D-01	3.906210D-02	3.998940D 03	1.743360D 05
2.609000D 01	7.674340D 02	2.730810D 02	-1.444460D-01	5.547770D-02	3.493890D-01	3.905130D-02	3.998940D 03	1.743020D 05
2.619000D 01	7.635310D 02	2.736300D 02	-1.421500D-01	5.540850D-02	3.489500D-01	3.904080D-02	3.998930D 03	1.742670D 05
2.629000D 01	7.596810D 02	2.741690D 02	-1.398240D-01	5.534100D-02	3.485230D-01	3.903060D-02	3.998930D 03	1.742320D 05
2.639000D 01	7.558860D 02	2.746990D 02	-1.374680D-01	5.527540D-02	3.481070D-01	3.902070D-02	3.998920D 03	1.741950D 05
2.649000D 01	7.521530D 02	2.752160D 02	-1.350830D-01	5.521150D-02	3.477030D-01	3.901100D-02	3.998920D 03	1.741590D 05
2.659000D 01	7.484760D 02	2.757250D 02	-1.326800D-01	5.514930D-02	3.473090D-01	3.900170D-02	3.998910D 03	1.741220D 05
2.669000D 01	7.448560D 02	2.762230D 02	-1.302260D-01	5.508880D-02	3.469260D-01	3.899260D-02	3.998910D 03	1.740850D 05
2.679000D 01	7.413320D 02	2.767130D 02	-1.277560D-01	5.503010D-02	3.465540D-01	3.898370D-02	3.998910D 03	1.740470D 05
2.689000D 01	7.378080D 02	2.771480D 02	-1.252590D-01	5.497300D-02	3.461930D-01	3.897610D-02	3.998900D 03	1.740090D 05
2.699000D 01	7.343760D 02	2.776550D 02	-1.227350D-01	5.491750D-02	3.458410D-01	3.896680D-02	3.998900D 03	1.739710D 05
2.709000D 01	7.310100D 02	2.781110D 02	-1.201860D-01	5.486370D-02	3.455010D-01	3.895880D-02	3.998890D 03	1.739330D 05
2.719000D 01	7.277080D 02	2.785570D 02	-1.176120D-01	5.481150D-02	3.451700D-01	3.895100D-02	3.998890D 03	1.738950D 05
2.729000D 01	7.244730D 02	2.789920D 02	-1.150130D-01	5.476090D-02	3.448490D-01	3.894340D-02	3.998880D 03	1.738570D 05
2.739000D 01	7.213050D 02	2.794170D 02	-1.123900D-01	5.471180D-02	3.445390D-01	3.893610D-02	3.998880D 03	1.738190D 05
2.749000D 01	7.182050D 02	2.798320D 02	-1.097440D-01	5.466430D-02	3.442380D-01	3.892900D-02	3.998870D 03	1.737820D 05
2.759000D 01	7.151750D 02	2.802350D 02	-1.070760D-01	5.461830D-02	3.439460D-01	3.892210D-02	3.998870D 03	1.737440D 05
2.769000D 01	7.122160D 02	2.806280D 02	-1.043850D-01	5.457380D-02	3.436650D-01	3.891550D-02	3.998870D 03	1.737070D 05
2.779000D 01	7.093280D 02	2.810110D 02	-1.016730D-01	5.453080D-02	3.433920D-01	3.890910D-02	3.998860D 03	1.736700D 05
2.789000D 01	7.065120D 02	2.813830D 02	-9.894000D-02	5.448920D-02	3.431290D-01	3.890290D-02	3.998860D 03	1.736340D 05
2.799000D 01	7.037690D 02	2.817440D 02	-9.616070D-02	5.444910D-02	3.428750D-01	3.889700D-02	3.998850D 03	1.735980D 05
2.809000D 01	7.011000D 02	2.820940D 02	-9.341360D-02	5.441040D-02	3.426300D-01	3.889120D-02	3.998850D 03	1.735630D 05
2.819000D 01	6.985070D 02	2.824340D 02	-9.062190D-02	5.437310D-02	3.423940D-01	3.888570D-02	3.998840D 03	1.735280D 05
2.829000D 01	6.959890D 02	2.827630D 02	-8.781150D-02	5.433720D-02	3.421660D-01	3.888040D-02	3.998840D 03	1.734930D 05
2.839000D 01	6.935470D 02	2.830810D 02	-8.498370D-02	5.430260D-02	3.419470D-01	3.887530D-02	3.998840D 03	1.734600D 05
2.849000D 01	6.911830D 02	2.833890D 02	-8.213770D-02	5.426940D-02	3.417370D-01	3.887030D-02	3.998830D 03	1.734270D 05

PATH PERFORMANCE DRAG AND LIFT COEFFICIENT UPDATE

	OLD		DELTA		NEW
CD0 :	0.34359830701578460D-01	+	-0.13604226147034600D-02	=	0.33599408086867000D-01
CD1 :	0.0	+	0.0	=	0.0
CD2 :	0.13106107465580930D 01	+	-0.60613185196578870D-01	=	0.12499975603895150D 01
CD3 :	0.0	+	0.0	=	0.0
CD4 :	0.19787554516708380D 04	+	-0.86055831539299590D 02	=	0.18926996201315380D 04
CLA0:	-0.32023487822647540D-02	+	-0.13751130602706540D-03	=	-0.33398595882924390D-02
CLA :	0.63770632184899900D 01	+	-0.13688492840671040D-02	=	0.63756943692059230D 01
CLA1	-0.50198707278871464D 00	+	-0.11435211130843880D-01	=	-0.51342223901799030D 00

PATH PERFORMANCE SUBITERATION 2

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.000000D 03	1.467390D 02	5.142430D-05	1.631240D-01	1.025060D 00	1.025210D-01	4.000000D 03	1.449460D 05
1.333330D-02	1.000000D 03	1.467860D 02	1.126330D-04	1.631300D-01	1.025110D 00	1.025330D-01	4.000000D 03	1.449660D 05
2.000000D-02	1.000000D 03	1.468320D 02	1.756760D-04	1.631370D-01	1.025150D 00	1.025440D-01	4.000000D 03	1.449860D 05
3.000000D-02	1.000000D 03	1.468790D 02	2.399510D-04	1.631440D-01	1.025190D 00	1.025560D-01	4.000000D 03	1.450070D 05
4.000000D-02	1.000000D 03	1.469250D 02	3.056560D-04	1.631510D-01	1.025230D 00	1.025680D-01	4.000000D 03	1.450270D 05
6.000000D-02	1.000000D 03	1.470180D 02	4.413440D-04	1.631640D-01	1.025320D 00	1.025910D-01	4.000000D 03	1.450670D 05
8.000000D-02	1.000000D 03	1.471100D 02	5.827160D-04	1.631770D-01	1.025400D 00	1.026140D-01	4.000000D 03	1.451070D 05
1.000000D-01	1.000010D 03	1.472020D 02	7.297590D-04	1.631900D-01	1.025490D 00	1.026360D-01	4.000000D 03	1.451470D 05
1.200000D-01	1.000010D 03	1.472940D 02	8.824440D-04	1.632030D-01	1.025560D 00	1.026580D-01	3.999990D 03	1.451870D 05
1.400000D-01	1.000010D 03	1.473860D 02	1.040750D-03	1.632160D-01	1.025640D 00	1.026800D-01	3.999990D 03	1.452270D 05
1.800000D-01	1.000020D 03	1.475690D 02	1.374160D-03	1.632410D-01	1.025800D 00	1.027230D-01	3.999990D 03	1.453060D 05
2.200000D-01	1.000030D 03	1.477510D 02	1.729790D-03	1.632650D-01	1.025950D 00	1.027650D-01	3.999990D 03	1.453840D 05
2.600000D-01	1.000040D 03	1.479310D 02	2.107470D-03	1.632890D-01	1.026090D 00	1.028060D-01	3.999990D 03	1.454620D 05
3.000000D-01	1.000050D 03	1.481110D 02	2.537010D-03	1.633120D-01	1.026230D 00	1.028450D-01	3.999990D 03	1.455400D 05
3.400000D-01	1.000070D 03	1.482890D 02	2.928250D-03	1.633340D-01	1.026370D 00	1.028830D-01	3.999990D 03	1.456160D 05
4.200000D-01	1.000110D 03	1.486420D 02	3.835020D-03	1.633750D-01	1.026630D 00	1.029550D-01	3.999980D 03	1.457670D 05
5.000000D-01	1.000160D 03	1.489910D 02	4.820180D-03	1.634140D-01	1.026870D 00	1.030220D-01	3.999980D 03	1.459160D 05
5.800000D-01	1.000220D 03	1.493350D 02	5.900170D-03	1.634490D-01	1.027090D 00	1.030820D-01	3.999980D 03	1.460620D 05
6.600000D-01	1.000300D 03	1.496740D 02	7.055320D-03	1.634800D-01	1.027280D 00	1.031370D-01	3.999970D 03	1.462060D 05

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8.400000D-01	1.000520D 03	1.504170D 02	9.942410D-03	1.635370D-01	1.027640D 00	1.032360D-01	3.999960D 03	1.465190D 05
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3.040000D 00	1.012980D 03	1.569050D 02	6.900810D-02	1.618760D-01	1.017300D 00	1.004090D-01	3.999880D 03	1.492240D 05
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4.440000D 00	1.033350D 03	1.584150D 02	1.152380D-01	1.575950D-01	9.906250D-01	9.364090D-02	3.999830D 03	1.499860D 05
4.540000D 00	1.035200D 03	1.584550D 02	1.183680D-01	1.571760D-01	9.880110D-01	9.301580D-02	3.999820D 03	1.500180D 05
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2.17900D 01	9.67356D 02	2.41051D 02	-2.04913D-01	6.05960D-02	3.81533D-01	3.82829D-02	3.99913D 03	1.70092D 05
2.18900D 01	9.62486D 02	2.41950D 02	-2.04554D-01	6.04222D-02	3.80434D-01	3.82551D-02	3.99912D 03	1.70118D 05
2.19900D 01	9.57567D 02	2.42843D 02	-2.04137D-01	6.02517D-02	3.79355D-01	3.82278D-02	3.99912D 03	1.70140D 05
2.20900D 01	9.52646D 02	2.43731D 02	-2.03665D-01	6.00842D-02	3.78296D-01	3.82011D-02	3.99911D 03	1.70158D 05
2.21900D 01	9.47760D 02	2.44613D 02	-2.03125D-01	5.99198D-02	3.77256D-01	3.81750D-02	3.99911D 03	1.70173D 05
2.22900D 01	9.42772D 02	2.45489D 02	-2.02534D-01	5.97584D-02	3.76235D-01	3.81496D-02	3.99910D 03	1.70184D 05
2.23900D 01	9.37843D 02	2.46355D 02	-2.01887D-01	5.96000D-02	3.75233D-01	3.81246D-02	3.99910D 03	1.70190D 05
2.24900D 01	9.32892D 02	2.47223D 02	-2.01184D-01	5.94446D-02	3.74250D-01	3.81000D-02	3.99910D 03	1.70194D 05
2.25900D 01	9.27952D 02	2.48080D 02	-2.00420D-01	5.92921D-02	3.73285D-01	3.80761D-02	3.99909D 03	1.70194D 05
2.26900D 01	9.23015D 02	2.48931D 02	-1.99614D-01	5.91425D-02	3.72339D-01	3.80527D-02	3.99909D 03	1.70190D 05
2.27900D 01	9.18081D 02	2.49775D 02	-1.98749D-01	5.89957D-02	3.71410D-01	3.80298D-02	3.99908D 03	1.70183D 05
2.28900D 01	9.13152D 02	2.50612D 02	-1.97830D-01	5.88518D-02	3.70500D-01	3.80075D-02	3.99908D 03	1.70172D 05
2.29900D 01	9.08230D 02	2.51443D 02	-1.96865D-01	5.87106D-02	3.69607D-01	3.79856D-02	3.99907D 03	1.70159D 05
2.30900D 01	9.03317D 02	2.52266D 02	-1.95837D-01	5.85722D-02	3.68731D-01	3.79642D-02	3.99907D 03	1.70142D 05
2.31900D 01	8.98413D 02	2.53082D 02	-1.94763D-01	5.84365D-02	3.67872D-01	3.79433D-02	3.99906D 03	1.70122D 05
2.32900D 01	8.93521D 02	2.53890D 02	-1.93635D-01	5.83034D-02	3.67030D-01	3.79229D-02	3.99906D 03	1.70099D 05
2.33900D 01	8.88642D 02	2.54691D 02	-1.92460D-01	5.81730D-02	3.66205D-01	3.79029D-02	3.99906D 03	1.70074D 05
2.34900D 01	8.83778D 02	2.55485D 02	-1.91243D-01	5.80452D-02	3.65397D-01	3.78833D-02	3.99905D 03	1.70045D 05
2.35900D 01	8.78930D 02	2.56270D 02	-1.89973D-01	5.79199D-02	3.64604D-01	3.78643D-02	3.99905D 03	1.70014D 05
2.36900D 01	8.74100D 02	2.57048D 02	-1.88654D-01	5.77972D-02	3.63827D-01	3.78456D-02	3.99904D 03	1.69980D 05
2.37900D 01	8.69290D 02	2.57818D 02	-1.87286D-01	5.76770D-02	3.63067D-01	3.78274D-02	3.99904D 03	1.69944D 05
2.38900D 01	8.64500D 02	2.58579D 02	-1.85875D-01	5.75592D-02	3.62321D-01	3.78096D-02	3.99903D 03	1.69905D 05
2.39900D 01	8.59733D 02	2.59333D 02	-1.84423D-01	5.74438D-02	3.61591D-01	3.77921D-02	3.99903D 03	1.69864D 05
2.40900D 01	8.54989D 02	2.60078D 02	-1.82918D-01	5.73309D-02	3.60876D-01	3.77751D-02	3.99902D 03	1.69821D 05
2.41900D 01	8.50271D 02	2.60814D 02	-1.81377D-01	5.72202D-02	3.60176D-01	3.77585D-02	3.99902D 03	1.69775D 05
2.42900D 01	8.45581D 02	2.61542D 02	-1.79782D-01	5.71119D-02	3.59491D-01	3.77423D-02	3.99902D 03	1.69728D 05
2.43900D 01	8.40918D 02	2.62262D 02	-1.78149D-01	5.70059D-02	3.58820D-01	3.77264D-02	3.99901D 03	1.69679D 05
2.44900D 01	8.36286D 02	2.62972D 02	-1.76473D-01	5.69021D-02	3.58163D-01	3.77110D-02	3.99901D 03	1.69627D 05
2.45900D 01	8.31685D 02	2.63674D 02	-1.74750D-01	5.68006D-02	3.57521D-01	3.76959D-02	3.99900D 03	1.69574D 05
2.46900D 01	8.27116D 02	2.64367D 02	-1.72998D-01	5.67013D-02	3.56893D-01	3.76811D-02	3.99900D 03	1.69520D 05
2.47900D 01	8.22585D 02	2.65051D 02	-1.71200D-01	5.66042D-02	3.56278D-01	3.76667D-02	3.99899D 03	1.69464D 05
2.48900D 01	8.18087D 02	2.65726D 02	-1.69362D-01	5.65093D-02	3.55677D-01	3.76527D-02	3.99899D 03	1.69406D 05
2.49900D 01	8.13627D 02	2.66391D 02	-1.67485D-01	5.64165D-02	3.55090D-01	3.76390D-02	3.99898D 03	1.69347D 05
2.50900D 01	8.09206D 02	2.67047D 02	-1.65569D-01	5.63258D-02	3.54516D-01	3.76256D-02	3.99898D 03	1.69287D 05
2.51900D 01	8.04825D 02	2.67694D 02	-1.63616D-01	5.62372D-02	3.53955D-01	3.76125D-02	3.99898D 03	1.69225D 05
2.52900D 01	8.00486D 02	2.68331D 02	-1.61627D-01	5.61506D-02	3.53407D-01	3.75998D-02	3.99897D 03	1.69163D 05
2.53900D 01	7.96139D 02	2.68955D 02	-1.59599D-01	5.60661D-02	3.52872D-01	3.75874D-02	3.99897D 03	1.69099D 05
2.54900D 01	7.91937D 02	2.69577D 02	-1.57637D-01	5.59836D-02	3.52350D-01	3.75754D-02	3.99896D 03	1.69035D 05
2.55900D 01	7.87731D 02	2.70180D 02	-1.55439D-01	5.59030D-02	3.51840D-01	3.75636D-02	3.99896D 03	1.68973D 05
2.56900D 01	7.83572D 02	2.70784D 02	-1.53317D-01	5.58244D-02	3.51342D-01	3.75521D-02	3.99895D 03	1.68904D 05
2.57900D 01	7.79462D 02	2.71373D 02	-1.51141D-01	5.57477D-02	3.50857D-01	3.75410D-02	3.99895D 03	1.68837D 05
2.58900D 01	7.75401D 02	2.71952D 02	-1.48941D-01	5.56729D-02	3.50383D-01	3.75301D-02	3.99895D 03	1.68773D 05
2.59900D 01	7.71391D 02	2.72522D 02	-1.46709D-01	5.56000D-02	3.49922D-01	3.75195D-02	3.99894D 03	1.68703D 05
2.60900D 01	7.67434D 02	2.73081D 02	-1.44444D-01	5.55289D-02	3.49472D-01	3.75092D-02	3.99894D 03	1.68635D 05
2.61900D 01	7.63530D 02	2.73630D 02	-1.42150D-01	5.54596D-02	3.49033D-01	3.74992D-02	3.99893D 03	1.68567D 05
2.62900D 01	7.59681D 02	2.74169D 02	-1.39824D-01	5.53921D-02	3.48606D-01	3.74894D-02	3.99893D 03	1.68499D 05
2.63900D 01	7.55888D 02	2.74698D 02	-1.37468D-01	5.53264D-02	3.48190D-01	3.74799D-02	3.99892D 03	1.68430D 05
2.64900D 01	7.52153D 02	2.75216D 02	-1.35083D-01	5.52625D-02	3.47786D-01	3.74707D-02	3.99892D 03	1.68362D 05
2.65900D 01	7.48476D 02	2.75725D 02	-1.32666D-01	5.52003D-02	3.47392D-01	3.74618D-02	3.99891D 03	1.68294D 05
2.66900D 01	7.44859D 02	2.76223D 02	-1.30226D-01	5.51398D-02	3.47009D-01	3.74531D-02	3.99891D 03	1.68226D 05
2.67900D 01	7.41302D 02	2.76713D 02	-1.27756D-01	5.50810D-02	3.46637D-01	3.74446D-02	3.99891D 03	1.68158D 05
2.68900D 01	7.37806D 02	2.77186D 02	-1.25255D-01	5.50238D-02	3.46275D-01	3.74365D-02	3.99890D 03	1.68090D 05
2.69900D 01	7.34376D 02	2.77655D 02	-1.22735D-01	5.49683D-02	3.45924D-01	3.74285D-02	3.99890D 03	1.68023D 05

2.709000D 01	7.310100D 02	2.781110D 02	-1.201860D-01	5.491450D-02	3.455830D-01	3.742080D-02	3.998890D 03	1.679570D 05
2.719000D 01	7.277080D 02	2.785570D 02	-1.176120D-01	5.486220D-02	3.452520D-01	3.741330D-02	3.998890D 03	1.678910D 05
2.729000D 01	7.244730D 02	2.789920D 02	-1.150130D-01	5.481160D-02	3.449310D-01	3.740610D-02	3.998880D 03	1.678250D 05
2.739000D 01	7.213050D 02	2.794170D 02	-1.123900D-01	5.476250D-02	3.446210D-01	3.739910D-02	3.998880D 03	1.677610D 05
2.749000D 01	7.182050D 02	2.798320D 02	-1.097440D-01	5.471490D-02	3.443200D-01	3.739230D-02	3.998870D 03	1.676970D 05
2.759000D 01	7.151750D 02	2.802350D 02	-1.070760D-01	5.466890D-02	3.440280D-01	3.738580D-02	3.998870D 03	1.676330D 05
2.769000D 01	7.122160D 02	2.806280D 02	-1.043850D-01	5.462440D-02	3.437460D-01	3.737950D-02	3.998870D 03	1.675710D 05
2.779000D 01	7.093280D 02	2.810110D 02	-1.016730D-01	5.458130D-02	3.434740D-01	3.737330D-02	3.998860D 03	1.675100D 05
2.789000D 01	7.065120D 02	2.813830D 02	-9.894000D-02	5.453970D-02	3.432110D-01	3.736740D-02	3.998860D 03	1.674500D 05
2.799000D 01	7.037690D 02	2.817440D 02	-9.618670D-02	5.449960D-02	3.429570D-01	3.736180D-02	3.998850D 03	1.673910D 05
2.809000D 01	7.011000D 02	2.820940D 02	-9.341380D-02	5.446090D-02	3.427110D-01	3.735630D-02	3.998850D 03	1.673330D 05
2.819000D 01	6.985070D 02	2.824340D 02	-9.062190D-02	5.442350D-02	3.424750D-01	3.735100D-02	3.998840D 03	1.672760D 05
2.829000D 01	6.959880D 02	2.827630D 02	-8.781150D-02	5.438760D-02	3.422470D-01	3.734590D-02	3.998840D 03	1.672200D 05
2.839000D 01	6.935470D 02	2.830810D 02	-8.498320D-02	5.435300D-02	3.420280D-01	3.734100D-02	3.998840D 03	1.671660D 05
2.849000D 01	6.911830D 02	2.833890D 02	-8.213770D-02	5.431980D-02	3.418180D-01	3.733630D-02	3.998830D 03	1.671130D 05

PITCH-ANGLE GAIN = 1.000000000000000D 00
PITCH-ANGLE BIAS = 6.628479657830D-17 RADIAN

M O D E L   S O L U T I O N S

MODEL 12 P0 = 2.865004149610352D 04 CD0 = 3.497237442290458D-02
P1 = 0.0 CD1 = 0.0
POINT P2 = 1.128638535000360D 03 CD2 = 1.309048882153737D 00
FAILURES P3 = -2.179256195392161D 00 CD3 = 0.0
= 0 P4 = 0.0 CD4 = 1.990490092655901D 03

FIT ERROR= 3.093395880821481D-09

MODEL 12 FOUND TO BE BEST FIT

LIFT COEFFICIENTS: BY LEAST SQUARE DISTANCE

CLA0=-0.3066355232006993D-02
CLA = 0.6377968945801028D 01
CLAX=-0.4589762614817213D 00
EXPX= 0.2083582996690634D 01
CLQ= 0.0

ESTIMATED SPECIFIC FUEL CONSUMPTION = 2.8273231694325D-07 LBF/(FT-LBF/SEC)/SEC

PATH PERFORMANCE ANALYSIS ITERATION NO. 6
(ALTITUDE AND AIRSPEED ASSUMED CORRECT)

PATH PERFORMANCE SUBITERATION 1

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.000000D 03	1.467390D 02	5.142430D-05	1.628040D-01	1.024450D 00	1.067480D-01	4.000000D 03	1.473610D 05
1.000000D-02	1.000000D 03	1.467860D 02	1.128330D-04	1.628110D-01	1.024500D 00	1.067610D-01	4.000000D 03	1.473840D 05
2.000000D-02	1.000000D 03	1.468320D 02	1.756760D-04	1.628170D-01	1.024540D 00	1.067730D-01	4.000000D 03	1.474070D 05
3.000000D-02	1.000000D 03	1.468790D 02	2.399510D-04	1.628240D-01	1.024580D 00	1.067850D-01	4.000000D 03	1.474290D 05
4.000000D-02	1.000000D 03	1.469250D 02	3.056560D-04	1.628310D-01	1.024620D 00	1.067970D-01	4.000000D 03	1.474520D 05
6.000000D-02	1.000000D 03	1.470180D 02	4.413440D-04	1.628440D-01	1.024700D 00	1.068210D-01	4.000000D 03	1.474970D 05
8.000000D-02	1.000000D 03	1.471100D 02	5.827180D-04	1.628570D-01	1.024790D 00	1.068440D-01	4.000000D 03	1.475430D 05
1.000000D-01	1.000010D 03	1.472020D 02	7.297590D-04	1.628700D-01	1.024870D 00	1.068680D-01	4.000000D 03	1.475880D 05
1.200000D-01	1.000010D 03	1.472940D 02	8.824440D-04	1.628830D-01	1.024950D 00	1.068910D-01	3.999990D 03	1.476330D 05
1.400000D-01	1.000010D 03	1.473860D 02	1.040750D-03	1.628960D-01	1.025030D 00	1.069130D-01	3.999990D 03	1.476780D 05
1.800000D-01	1.000020D 03	1.475690D 02	1.374160D-03	1.629210D-01	1.025180D 00	1.069580D-01	3.999990D 03	1.477670D 05
2.200000D-01	1.000030D 03	1.477510D 02	1.729790D-03	1.629450D-01	1.025330D 00	1.070010D-01	3.999990D 03	1.478550D 05
2.600000D-01	1.000040D 03	1.479310D 02	2.107470D-03	1.629680D-01	1.025480D 00	1.070430D-01	3.999990D 03	1.479430D 05
3.000000D-01	1.000050D 03	1.481110D 02	2.507010D-03	1.629910D-01	1.025620D 00	1.070840D-01	3.999990D 03	1.480300D 05
3.400000D-01	1.000070D 03	1.482890D 02	2.928250D-03	1.630130D-01	1.025760D 00	1.071240D-01	3.999990D 03	1.481160D 05
4.200000D-01	1.000110D 03	1.486420D 02	3.835020D-03	1.630540D-01	1.026010D 00	1.071980D-01	3.999980D 03	1.482870D 05
5.000000D-01	1.000160D 03	1.489910D 02	4.826180D-03	1.630920D-01	1.026250D 00	1.072670D-01	3.999980D 03	1.484550D 05
5.800000D-01	1.000220D 03	1.493350D 02	5.900170D-03	1.631270D-01	1.026470D 00	1.073300D-01	3.999970D 03	1.486200D 05
6.600000D-01	1.000300D 03	1.496740D 02	7.055320D-03	1.631580D-01	1.026660D 00	1.073870D-01	3.999970D 03	1.487820D 05
7.400000D-01	1.000390D 03	1.500070D 02	8.289960D-03	1.631860D-01	1.026840D 00	1.074370D-01	3.999970D 03	1.489420D 05
8.400000D-01	1.000530D 03	1.504170D 02	9.942410D-03	1.632150D-01	1.027020D 00	1.074890D-01	3.999960D 03	1.491370D 05
9.400000D-01	1.000690D 03	1.508180D 02	1.171280D-02	1.632380D-01	1.027160D 00	1.075300D-01	3.999960D 03	1.493260D 05
1.040000D 00	1.000880D 03	1.512090D 02	1.359760D-02	1.632540D-01	1.027260D 00	1.075590D-01	3.999960D 03	1.495110D 05
1.140000D 00	1.001100D 03	1.515920D 02	1.559320D-02	1.632620D-01	1.027310D 00	1.075750D-01	3.999950D 03	1.496910D 05
1.240000D 00	1.001360D 03	1.519650D 02	1.769560D-02	1.632640D-01	1.027320D 00	1.075780D-01	3.999950D 03	1.498660D 05
1.340000D 00	1.001640D 03	1.523290D 02	1.990120D-02	1.632580D-01	1.027290D 00	1.075670D-01	3.999950D 03	1.500360D 05
1.440000D 00	1.001960D 03	1.526830D 02	2.220590D-02	1.632430D-01	1.027190D 00	1.075400D-01	3.999940D 03	1.502010D 05
1.540000D 00	1.002320D 03	1.530260D 02	2.460560D-02	1.632200D-01	1.027050D 00	1.074980D-01	3.999940D 03	1.503600D 05
1.640000D 00	1.002720D 03	1.533600D 02	2.709620D-02	1.631870D-01	1.026850D 00	1.074390D-01	3.999930D 03	1.505140D 05
1.740000D 00	1.003150D 03	1.536830D 02	2.967340D-02	1.631450D-01	1.026580D 00	1.073630D-01	3.999930D 03	1.506630D 05
1.840000D 00	1.003630D 03	1.539960D 02	3.233280D-02	1.630930D-01	1.026260D 00	1.072690D-01	3.999930D 03	1.508070D 05
1.940000D 00	1.004150D 03	1.542980D 02	3.507020D-02	1.630300D-01	1.025860D 00	1.071550D-01	3.999920D 03	1.509450D 05
2.040000D 00	1.004710D 03	1.545890D 02	3.788090D-02	1.629560D-01	1.025400D 00	1.070220D-01	3.999920D 03	1.510780D 05
2.140000D 00	1.005320D 03	1.548690D 02	4.076040D-02	1.628710D-01	1.024870D 00	1.068690D-01	3.999920D 03	1.512050D 05
2.240000D 00	1.005970D 03	1.551390D 02	4.370410D-02	1.627750D-01	1.024270D 00	1.066960D-01	3.999910D 03	1.513270D 05
2.340000D 00	1.006680D 03	1.553980D 02	4.670750D-02	1.626660D-01	1.023590D 00	1.065020D-01	3.999910D 03	1.514440D 05
2.440000D 00	1.007430D 03	1.556460D 02	4.976590D-02	1.625460D-01	1.022840D 00	1.062870D-01	3.999900D 03	1.515560D 05
2.540000D 00	1.008230D 03	1.558830D 02	5.287450D-02	1.624130D-01	1.022010D 00	1.060510D-01	3.999900D 03	1.516630D 05
2.640000D 00	1.009070D 03	1.561090D 02	5.602880D-02	1.622680D-01	1.021110D 00	1.057950D-01	3.999900D 03	1.517640D 05
2.740000D 00	1.009970D 03	1.563240D 02	5.922400D-02	1.621110D-01	1.020130D 00	1.055160D-01	3.999890D 03	1.518600D 05
2.840000D 00	1.010920D 03	1.565290D 02	6.245550D-02	1.619400D-01	1.019060D 00	1.052170D-01	3.999890D 03	1.519510D 05
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2.65900D 01	7.48476D 02	2.75725D 02	-1.32668D-01	5.51173D-02	3.47310D-01	3.90068D-02	3.99891D 03	1.74141D 05
2.66900D 01	7.44858D 02	2.76223D 02	-1.30226D-01	5.50568D-02	3.46927D-01	3.89977D-02	3.99891D 03	1.74104D 05
2.67900D 01	7.41302D 02	2.76710D 02	-1.27756D-01	5.49981D-02	3.46555D-01	3.89889D-02	3.99891D 03	1.74066D 05
2.68900D 01	7.37808D 02	2.77188D 02	-1.25259D-01	5.49410D-02	3.46194D-01	3.89803D-02	3.99890D 03	1.74029D 05
2.69900D 01	7.34376D 02	2.77655D 02	-1.22735D-01	5.48856D-02	3.45843D-01	3.89720D-02	3.99890D 03	1.73991D 05
2.70900D 01	7.31010D 02	2.78111D 02	-1.20186D-01	5.48318D-02	3.45502D-01	3.89640D-02	3.99889D 03	1.73953D 05
2.71900D 01	7.27708D 02	2.78557D 02	-1.17612D-01	5.47796D-02	3.45171D-01	3.89562D-02	3.99889D 03	1.73915D 05
2.72900D 01	7.24473D 02	2.78992D 02	-1.15013D-01	5.47290D-02	3.44850D-01	3.89486D-02	3.99888D 03	1.73877D 05
2.73900D 01	7.21305D 02	2.79417D 02	-1.12390D-01	5.46799D-02	3.44540D-01	3.89413D-02	3.99888D 03	1.73839D 05
2.74900D 01	7.18205D 02	2.79832D 02	-1.09744D-01	5.46324D-02	3.44239D-01	3.89342D-02	3.99887D 03	1.73802D 05
2.75900D 01	7.15175D 02	2.80235D 02	-1.07076D-01	5.45864D-02	3.43948D-01	3.89274D-02	3.99887D 03	1.73765D 05
2.76900D 01	7.12216D 02	2.80628D 02	-1.04385D-01	5.45420D-02	3.43666D-01	3.89208D-02	3.99887D 03	1.73728D 05
2.77900D 01	7.09328D 02	2.81011D 02	-1.01673D-01	5.44989D-02	3.43393D-01	3.89144D-02	3.99886D 03	1.73691D 05
2.78900D 01	7.06514D 02	2.81383D 02	-9.89460D-02	5.44574D-02	3.43130D-01	3.89082D-02	3.99886D 03	1.73655D 05
2.79900D 01	7.03769D 02	2.81744D 02	-9.61867D-02	5.44173D-02	3.42876D-01	3.89022D-02	3.99885D 03	1.73619D 05
2.80900D 01	7.01130D 02	2.82094D 02	-9.34138D-02	5.43786D-02	3.42631D-01	3.88965D-02	3.99885D 03	1.73584D 05
2.81900D 01	6.98507D 02	2.82434D 02	-9.06219D-02	5.43413D-02	3.42395D-01	3.88910D-02	3.99884D 03	1.73549D 05
2.82900D 01	6.95989D 02	2.82763D 02	-8.78115D-02	5.43054D-02	3.42167D-01	3.88857D-02	3.99884D 03	1.73515D 05
2.83900D 01	6.93547D 02	2.83081D 02	-8.49832D-02	5.42708D-02	3.41948D-01	3.88806D-02	3.99884D 03	1.73481D 05
2.84900D 01	6.91183D 02	2.83389D 02	-8.21377D-02	5.42376D-02	3.41738D-01	3.88757D-02	3.99883D 03	1.73449D 05

PATH PERFORMANCE DRAG AND LIFT COEFFICIENT UPDATE

	OLD		DELTA		NEW
CD0 :	0.34972374422904583D-01	+	-0.13607824075888579D-02	=	0.33611592015315730D-01
CD1 :	0.0	+	0.0	=	0.0
CD2 :	0.13396448821531170D 01	+	-0.60750096174450590D-01	=	0.12488978659792863D 01
CD3 :	0.0	+	0.0	=	0.0
CD4 :	0.19904900926559010D 04	+	-0.87114588339110930D 02	=	0.19033775504316790D 04
CLA0:	-0.30663552320069930D-02	+	-0.13742280294816510D-03	=	-0.32037780349531580D-02

CLA : 0.63779689458010280 01 + -0.13601929226000827D-02 = 0.63765997528784213 01
CLAXI -0.45897626148172130 00 + -0.10912269625787480-01 = -0.46988853100750870 00

PATH PERFORMANCE SUBITERATION 2

TIME (SECS)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	GAMMA (RAD)	ALPHA (RAD)	CL	CD	WEIGHT (LBF)	POWER (FT-LBF/SEC)
0.0	1.000000 03	1.467390 02	5.142430-05	1.630060-01	1.025100 00	1.025030-01	4.000000 03	1.449330 05
1.000000-02	1.000000 03	1.467863 02	1.128330-04	1.630133-01	1.025140 00	1.025150-01	4.000000 03	1.449530 05
2.000000-02	1.000000 03	1.468320 02	1.756760-04	1.630200-01	1.025180 00	1.025270-01	4.000000 03	1.449730 05
3.000000-02	1.000003 03	1.468790 02	2.399310-04	1.630270-01	1.025220 00	1.025380-01	4.000000 03	1.449940 05
4.000000-02	1.000000 03	1.469250 02	3.050500-04	1.630340-01	1.025270 00	1.025500-01	4.000000 03	1.450140 05
6.000000-02	1.000000 03	1.470160 02	4.413460-04	1.630470-01	1.025350 00	1.025730-01	4.000000 03	1.450540 05
8.000000-02	1.000000 03	1.471103 02	5.827180-04	1.630603-01	1.025430 00	1.025960-01	4.000000 03	1.450940 05
1.000000-01	1.000010 03	1.472020 02	7.287590-04	1.630730-01	1.025510 00	1.026180-01	4.000000 03	1.451340 05
1.200000-01	1.000010 03	1.472940 02	8.824440-04	1.630860-01	1.025590 00	1.026400-01	3.999990 03	1.451740 05
1.400000-01	1.000010 03	1.473860 02	1.040750-03	1.630993-01	1.025670 00	1.026620-01	3.999990 03	1.452140 05
1.800000-01	1.000020 03	1.475690 02	1.374160-03	1.631240-01	1.025830 00	1.027050-01	3.999990 03	1.452930 05
2.200000-01	1.000030 03	1.477513 02	1.729790-03	1.631480-01	1.025983 00	1.027470-01	3.999990 03	1.453710 05
2.600000-01	1.000040 03	1.479310 02	2.107470-03	1.631710-01	1.026130 00	1.027870-01	3.999990 03	1.454490 05
3.000000-01	1.000050 03	1.481110 02	2.507010-03	1.631940-01	1.026270 00	1.028270-01	3.999990 03	1.455260 05
3.400000-01	1.000070 03	1.482890 02	2.928250-03	1.632160-01	1.026410 00	1.028650-01	3.999990 03	1.456030 05
4.200000-01	1.000110 03	1.486420 02	3.835020-03	1.632580-01	1.026660 00	1.029370-01	3.999980 03	1.457540 05
5.000000-01	1.000160 03	1.489910 02	4.826180-03	1.632960-01	1.026900 00	1.030033-01	3.999980 03	1.459020 05
5.800000-01	1.000220 03	1.493350 02	5.900170-03	1.633310-01	1.027120 00	1.030640-01	3.999980 03	1.460480 05
6.600000-01	1.000300 03	1.496740 02	7.055320-03	1.633620-01	1.027320 00	1.031190-01	3.999970 03	1.461920 05
7.400000-01	1.000360 03	1.500070 02	8.289960-03	1.633900-01	1.027490 00	1.031670-01	3.999970 03	1.463330 05
8.400000-01	1.000530 03	1.504170 02	9.942410-03	1.634190-01	1.027670 00	1.032180-01	3.999960 03	1.465050 05
9.400000-01	1.000693 03	1.508183 02	1.171203-02	1.634423-01	1.027813 00	1.032570-01	3.999960 03	1.466730 05
1.040000 00	1.000880 03	1.512090 02	1.359760-02	1.634580-01	1.027910 00	1.032850-01	3.999960 03	1.468360 05
1.140000 00	1.001100 03	1.515920 02	1.559320-02	1.634670-01	1.027970 00	1.033003-01	3.999953 03	1.469953 05
1.240000 00	1.001360 03	1.519650 02	1.769500-02	1.634690-01	1.027980 00	1.033040-01	3.999950 03	1.471500 05
1.340000 00	1.001640 03	1.523290 02	1.990120-02	1.634630-01	1.027940 00	1.032930-01	3.999950 03	1.473010 05
1.440000 00	1.001963 03	1.526830 02	2.220590-02	1.634480-01	1.027850 00	1.032670-01	3.999940 03	1.474470 05
1.540000 00	1.002320 03	1.530260 02	2.460560-02	1.634250-01	1.027700 00	1.032270-01	3.999940 03	1.475890 05
1.640000 00	1.002720 03	1.533600 02	2.709620-02	1.633920-01	1.027500 00	1.031700-01	3.999930 03	1.477260 05
1.740000 00	1.003150 03	1.536830 02	2.967340-02	1.633500-01	1.027240 00	1.030970-01	3.999930 03	1.478590 05
1.840000 00	1.003630 03	1.539960 02	3.233280-02	1.632970-01	1.026910 00	1.030060-01	3.999930 03	1.479880 05
1.940000 00	1.004150 03	1.542980 02	3.507020-02	1.632340-01	1.026520 00	1.028970-01	3.999920 03	1.481130 05
2.040000 00	1.004710 03	1.545890 02	3.788090-02	1.631600-01	1.026060 00	1.027690-01	3.999920 03	1.482330 05
2.140000 00	1.005320 03	1.548690 02	4.076040-02	1.630750-01	1.025523 00	1.026213-01	3.999920 03	1.483490 05
2.240000 00	1.005970 03	1.551390 02	4.370410-02	1.629780-01	1.024920 00	1.024540-01	3.999910 03	1.484600 05
2.340000 00	1.006680 03	1.553980 02	4.670750-02	1.628690-01	1.024240 00	1.022670-01	3.999910 03	1.485680 05
2.440000 00	1.007430 03	1.556463 02	4.976570-02	1.627490-01	1.023690 00	1.020610-01	3.999900 03	1.486710 05
2.540000 00	1.008230 03	1.558830 02	5.287450-02	1.626160-01	1.022660 00	1.018340-01	3.999900 03	1.487710 05
2.640000 00	1.009070 03	1.561080 02	5.602840-02	1.624700-01	1.021750 00	1.015860-01	3.999900 03	1.488663 05
2.740000 00	1.009970 03	1.563240 02	5.922430-02	1.623120-01	1.020770 00	1.013180-01	3.999890 03	1.489570 05
2.840000 00	1.010920 03	1.565290 02	6.245550-02	1.621410-01	1.019700 00	1.010300-01	3.999890 03	1.490450 05
2.940000 00	1.011930 03	1.567220 02	6.571840-02	1.619570-01	1.018550 00	1.007200-01	3.999880 03	1.491280 05
3.040000 00	1.012980 03	1.569050 02	6.900810-02	1.617600-01	1.017320 00	1.003900-01	3.999880 03	1.492080 05
3.140000 00	1.014090 03	1.570770 02	7.231980-02	1.615490-01	1.016010 00	1.000390-01	3.999883 03	1.492843 05
3.240000 00	1.015250 03	1.572390 02	7.564880-02	1.613240-01	1.014610 00	9.966750-02	3.999870 03	1.493570 05
3.340000 00	1.016470 03	1.573900 02	7.899060-02	1.610860-01	1.013120 00	9.927490-02	3.999870 03	1.494260 05
3.440000 00	1.017743 03	1.575313 02	8.234000-02	1.608330-01	1.011540 00	9.886180-02	3.999870 03	1.494910 05
3.540000 00	1.019060 03	1.576620 02	8.569200-02	1.605680-01	1.009880 00	9.842760-02	3.999860 03	1.495530 05
3.640000 00	1.020440 03	1.577833 02	8.904373-02	1.602850-01	1.008120 00	9.797300-02	3.999860 03	1.496120 05
3.740000 00	1.021870 03	1.578940 02	9.238800-02	1.599890-01	1.006270 00	9.749800-02	3.999850 03	1.496670 05
3.840000 00	1.023350 03	1.579960 02	9.572250-02	1.596770-01	1.004330 00	9.700260-02	3.999850 03	1.497190 05
3.940000 00	1.024863 03	1.580883 02	9.904040-02	1.593530-01	1.002290 00	9.648720-02	3.999850 03	1.497680 05
4.040000 00	1.026440 03	1.581710 02	1.023340-01	1.590080-01	1.000160 00	9.595200-02	3.999840 03	1.498140 05
4.140000 00	1.028120 03	1.582453 02	1.056120-01	1.586503-01	9.979260-01	9.539720-02	3.999840 03	1.498580 05
4.240000 00	1.029810 03	1.583100 02	1.088500-01	1.582770-01	9.956670-01	9.482350-02	3.999830 03	1.498980 05
4.340000 00	1.031560 03	1.583660 02	1.120670-01	1.578890-01	9.931720-01	9.423200-02	3.999830 03	1.499360 05
4.440000 00	1.033350 03	1.584150 02	1.152360-01	1.574850-01	9.906620-01	9.362330-02	3.999830 03	1.499710 05
4.540000 00	1.035200 03	1.584550 02	1.183680-01	1.570660-01	9.880370-01	9.299830-02	3.999820 03	1.500030 05
4.640000 00	1.037103 03	1.584883 02	1.214503-01	1.566320-01	9.853293-01	9.235793-02	3.999820 03	1.500330 05
4.740000 00	1.039040 03	1.585130 02	1.244810-01	1.561830-01	9.825280-01	9.170290-02	3.999820 03	1.500600 05
4.840000 00	1.041030 03	1.585310 02	1.274573-01	1.557200-01	9.796350-01	9.103420-02	3.999810 03	1.500850 05
4.940000 00	1.043070 03	1.585420 02	1.303750-01	1.552420-01	9.766510-01	9.035260-02	3.999810 03	1.501080 05
5.040000 00	1.045150 03	1.585460 02	1.332290-01	1.547490-01	9.735770-01	8.965890-02	3.999800 03	1.501290 05
5.140000 00	1.047280 03	1.585440 02	1.360160-01	1.542430-01	9.704140-01	8.895413-02	3.999800 03	1.501470 05
5.240000 00	1.049450 03	1.585360 02	1.387320-01	1.537220-01	9.671620-01	8.823890-02	3.999800 03	1.501640 05
5.340000 00	1.051670 03	1.585230 02	1.413750-01	1.531870-01	9.638220-01	8.751420-02	3.999790 03	1.501793 05
5.440000 00	1.053920 03	1.585040 02	1.439350-01	1.526380-01	9.603960-01	8.678070-02	3.999790 03	1.501920 05
5.540000 00	1.056210 03	1.584803 02	1.464230-01	1.520760-01	9.568830-01	8.603940-02	3.999780 03	1.502033 05
5.640000 00	1.058543 03	1.584510 02	1.488320-01	1.515030-01	9.532860-01	8.529100-02	3.999780 03	1.502130 05
5.740000 00	1.060910 03	1.584180 02	1.511320-01	1.509110-01	9.496040-01	8.453640-02	3.999780 03	1.502210 05
5.840000 00	1.063310 03	1.583810 02	1.533510-01	1.503080-01	9.458380-01	8.377620-02	3.999770 03	1.502280 05
5.940000 00	1.065750 03	1.583400 02	1.554700-01	1.496920-01	9.419900-01	8.301130-02	3.999770 03	1.502330 05
6.040000 00	1.068220 03	1.582950 02	1.575040-01	1.490630-01	9.380600-01	8.224240-02	3.999760 03	1.502380 05
6.140000 00	1.070710 03	1.582483 02	1.594320-01	1.484213-01	9.340500-01	8.147040-02	3.999760 03	1.502410 05
6.240000 00	1.073240 03	1.581980 02	1.612570-01	1.477670-01	9.299620-01	8.069630-02	3.999760 03	1.502430 05
6.340000 00	1.075790 03	1.581460 02	1.629760-01	1.471010-01	9.257990-01	7.992110-02	3.999750 03	1.502453 05
6.440000 00	1.078370 03	1.580920 02	1.645870-01	1.464230-01	9.215630-01	7.914560-02	3.999750 03	1.502450 05
6.540000 00	1.080970 03	1.580360 02	1.660840-01	1.457340-01	9.172560-01	7.837090-02	3.999750 03	1.502460 05
6.640000 00	1.083603 03	1.579790 02	1.674760-01	1.450343-01	9.128813-01	7.759760-02	3.999740 03	1.502450 05
6.740000 00	1.086240 03	1.579210 02	1.687490-01	1.443240-01	9.084400-01	7.682670-02	3.999740 03	1.502440 05
6.840000 00	1.088900 03	1.578630 02	1.699050-01	1.436040-01	9.039350-01	7.605900-02	3.999730 03	1.502430 05
6.940000 00	1.091580 03	1.578040 02	1.709420-01	1.428740-01	8.993700-01	7.529500-02	3.999730 03	1.502420 05
7.040000 00	1.094270 03	1.577400 02	1.718590-01	1.421340-01	8.947450-01	7.453560-02	3.999730 03	1.502410 05
7.140000 00	1.096970 03	1.576880 02	1.726543-01	1.413863-01	8.900650-01	7.378140-02	3.999720 03	1.502400 05
7.240000 00	1.099690 03	1.576310 02	1.733250-01	1.406290-01	8.853300-01	7.303300-02	3.999720 03	1.502390 05
7.340000 00	1.102410 03	1.575760 02	1.738720-01	1.398640-01	8.805443-01	7.229100-02	3.999710 03	1.502380 05
7.440000 00	1.105140 03	1.575220 02	1.742930-01	1.390920-01	8.757080-01	7.155590-02	3.999710 03	1.502380 05
7.540000 00	1.107870 03	1.574703 02	1.745860-01	1.383110-01	8.708260-01	7.082820-02	3.999710 03	1.502383 05
7.640000 00	1.110610 03	1.574203 02	1.747520-01	1.375240-01	8.658990-01	7.010840-02	3.999700 03	1.502390 05
7.740000 00	1.113340 03	1.573730 02	1.747890-01	1.367300-01	8.609300-01	6.939690-02	3.999700 03	1.502410 05
7.840000 00	1.116080 03	1.573303 02	1.746973-01	1.359303-01	8.559210-01	6.869420-02	3.999700 03	1.502440 05
7.940000 00	1.118810 03	1.572890 02	1.744760-01	1.351240-01	8.508760-01	6.800050-02	3.999690 03	1.502480 05
8.040000 00	1.121540 03	1.572530 02	1.741240-01	1.343130-01	8.457950-01	6.731620-02	3.999690 03	1.502543 05
8.140000 00	1.124260 03	1.572200 02	1.736420-01	1.334960-01	8.406810-01	6.664170-02	3.999680 03	1.502610 05
8.240000 00	1.126970 03	1.571920 02	1.730290-01	1.326760-01	8.355380-01	6.597710-02	3.999680 03	1.502690 05
8.340000 00	1.129670 03	1.571693 02	1.722860-01	1.318503-01	8.303673-01	6.532280-02	3.999680 03	1.502790 05
8.440000 00	1.132360 03	1.571520 02	1.714130-01	1.310200-01	8.251700-01	6.467890-02	3.999670 03	1.502910 05
8.540000 00	1.135030 03	1.571390 02	1.704100-01	1.301870-01	8.199510-01	6.404560-02	3.999670 03	1.503050 05
8.640000 00	1.137690 03	1.571330 02	1.692783-01	1.293510-01	8.147110-01	6.342310-02	3.999660 03	1.503210 05
8.740000 00	1.140330 03	1.571323 02	1.680170-01	1.285120-01	8.094643-01	6.281150-02	3.999660 03	1.503390 05
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1.959000D 01	1.070020D 03	2.202760D 02	-1.966820D-01	6.528120D-02	4.113850D-01	3.908130D-02	3.999220D 03	1.684190D 05
1.969000D 01	1.065700D 03	2.212460D 02	-1.977690D-01	6.502560D-02	4.097680D-01	3.903620D-02	3.999220D 03	1.685430D 05
1.979000D 01	1.061330D 03	2.222160D 02	-1.987850D-01	6.477420D-02	4.081790D-01	3.899220D-02	3.999210D 03	1.686630D 05
1.989000D 01	1.056920D 03	2.231840D 02	-1.997300D-01	6.452710D-02	4.066160D-01	3.894910D-02	3.999210D 03	1.687780D 05
1.999000D 01	1.052470D 03	2.241530D 02	-2.006050D-01	6.428410D-02	4.050790D-01	3.890690D-02	3.999210D 03	1.688880D 05
2.009000D 01	1.047990D 03	2.251150D 02	-2.014100D-01	6.404520D-02	4.035680D-01	3.886570D-02	3.999200D 03	1.689940D 05
2.019000D 01	1.043470D 03	2.260780D 02	-2.021450D-01	6.381040D-02	4.020830D-01	3.882530D-02	3.999200D 03	1.690950D 05
2.029000D 01	1.038910D 03	2.270390D 02	-2.028110D-01	6.357950D-02	4.006230D-01	3.878580D-02	3.999190D 03	1.691910D 05
2.039000D 01	1.034320D 03	2.279970D 02	-2.034100D-01	6.335260D-02	3.991880D-01	3.874720D-02	3.999190D 03	1.692830D 05
2.049000D 01	1.029700D 03	2.289530D 02	-2.039400D-01	6.312960D-02	3.977770D-01	3.870940D-02	3.999190D 03	1.693700D 05
2.059000D 01	1.025050D 03	2.299060D 02	-2.044030D-01	6.291040D-02	3.963910D-01	3.867240D-02	3.999180D 03	1.694530D 05
2.069000D 01	1.020370D 03	2.308560D 02	-2.047990D-01	6.269500D-02	3.950290D-01	3.863620D-02	3.999170D 03	1.695310D 05
2.079000D 01	1.015660D 03	2.318030D 02	-2.051280D-01	6.248340D-02	3.936900D-01	3.860080D-02	3.999170D 03	1.696050D 05
2.089000D 01	1.010920D 03	2.327460D 02	-2.053930D-01	6.227550D-02	3.923750D-01	3.856610D-02	3.999170D 03	1.696740D 05
2.099000D 01	1.006160D 03	2.336860D 02	-2.055920D-01	6.207120D-02	3.910820D-01	3.853230D-02	3.999160D 03	1.697390D 05
2.109000D 01	1.001360D 03	2.346220D 02	-2.057260D-01	6.187050D-02	3.898130D-01	3.849910D-02	3.999160D 03	1.697990D 05
2.119000D 01	9.965790D 02	2.355540D 02	-2.057970D-01	6.167340D-02	3.885650D-01	3.846660D-02	3.999150D 03	1.698550D 05
2.129000D 01	9.917580D 02	2.364820D 02	-2.058040D-01	6.147970D-02	3.873400D-01	3.843490D-02	3.999150D 03	1.699060D 05
2.139000D 01	9.869140D 02	2.374050D 02	-2.057490D-01	6.128950D-02	3.861370D-01	3.840390D-02	3.999140D 03	1.699530D 05
2.149000D 01	9.820580D 02	2.383240D 02	-2.056320D-01	6.110270D-02	3.849550D-01	3.837350D-02	3.999140D 03	1.699960D 05
2.159000D 01	9.771820D 02	2.392380D 02	-2.054530D-01	6.091930D-02	3.837960D-01	3.834370D-02	3.999130D 03	1.700350D 05
2.169000D 01	9.722950D 02	2.401470D 02	-2.052130D-01	6.073920D-02	3.826550D-01	3.831470D-02	3.999130D 03	1.700690D 05
2.179000D 01	9.673960D 02	2.410510D 02	-2.049130D-01	6.056230D-02	3.815360D-01	3.828620D-02	3.999130D 03	1.701000D 05
2.189000D 01	9.624860D 02	2.419500D 02	-2.045540D-01	6.038860D-02	3.804370D-01	3.825840D-02	3.999120D 03	1.701260D 05
2.199000D 01	9.575670D 02	2.428430D 02	-2.041360D-01	6.021810D-02	3.793570D-01	3.823110D-02	3.999120D 03	1.701480D 05
2.209000D 01	9.526460D 02	2.437310D 02	-2.036590D-01	6.005060D-02	3.782980D-01	3.820450D-02	3.999110D 03	1.701670D 05
2.219000D 01	9.477060D 02	2.446130D 02	-2.031250D-01	5.988630D-02	3.772580D-01	3.817840D-02	3.999110D 03	1.701820D 05
2.229000D 01	9.427720D 02	2.454890D 02	-2.025340D-01	5.972490D-02	3.762370D-01	3.815290D-02	3.999100D 03	1.701920D 05
2.239000D 01	9.378320D 02	2.463590D 02	-2.018870D-01	5.956660D-02	3.752350D-01	3.812790D-02	3.999100D 03	1.702000D 05
2.249000D 01	9.328920D 02	2.472230D 02	-2.011840D-01	5.941120D-02	3.742520D-01	3.810350D-02	3.999100D 03	1.702030D 05
2.259000D 01	9.279520D 02	2.480800D 02	-2.004260D-01	5.925880D-02	3.732870D-01	3.807970D-02	3.999090D 03	1.702030D 05
2.269000D 01	9.230150D 02	2.489310D 02	-1.996140D-01	5.910920D-02	3.723410D-01	3.805630D-02	3.999090D 03	1.702000D 05
2.279000D 01	9.180810D 02	2.497750D 02	-1.987490D-01	5.896250D-02	3.714120D-01	3.803350D-02	3.999080D 03	1.701930D 05
2.289000D 01	9.131520D 02	2.506120D 02	-1.978300D-01	5.881860D-02	3.705010D-01	3.801110D-02	3.999080D 03	1.701820D 05
2.299000D 01	9.082300D 02	2.514410D 02	-1.968590D-01	5.867750D-02	3.696080D-01	3.798930D-02	3.999070D 03	1.701690D 05
2.309000D 01	9.033170D 02	2.522660D 02	-1.958370D-01	5.853910D-02	3.687330D-01	3.796800D-02	3.999070D 03	1.701520D 05
2.319000D 01	8.984130D 02	2.530820D 02	-1.947630D-01	5.840350D-02	3.678740D-01	3.794710D-02	3.999060D 03	1.701330D 05
2.329000D 01	8.935210D 02	2.538900D 02	-1.936390D-01	5.827050D-02	3.670320D-01	3.792670D-02	3.999060D 03	1.701100D 05
2.339000D 01	8.886420D 02	2.546910D 02	-1.924660D-01	5.814010D-02	3.662070D-01	3.790670D-02	3.999060D 03	1.700850D 05
2.349000D 01	8.837780D 02	2.554850D 02	-1.912430D-01	5.801230D-02	3.653980D-01	3.788720D-02	3.999050D 03	1.700560D 05
2.359000D 01	8.789300D 02	2.562700D 02	-1.899730D-01	5.788710D-02	3.646060D-01	3.786820D-02	3.999050D 03	1.700250D 05
2.369000D 01	8.741000D 02	2.570480D 02	-1.886540D-01	5.776440D-02	3.638290D-01	3.784950D-02	3.999040D 03	1.699920D 05
2.379000D 01	8.692900D 02	2.578180D 02	-1.872890D-01	5.764430D-02	3.630680D-01	3.783130D-02	3.999040D 03	1.699560D 05
2.389000D 01	8.645000D 02	2.585790D 02	-1.858780D-01	5.752660D-02	3.623230D-01	3.781360D-02	3.999030D 03	1.699170D 05
2.399000D 01	8.597330D 02	2.593330D 02	-1.844200D-01	5.741120D-02	3.615930D-01	3.779620D-02	3.999030D 03	1.698760D 05

2.409000 01	8.549890 02	2.600780 02	-1.829180-01	5.729820-02	3.608780-01	3.777920-02	3.999020 03	1.698330 05
2.419000 01	8.502710 02	2.608140 02	-1.813720-01	5.718760-02	3.601780-01	3.776260-02	3.999020 03	1.697880 05
2.429000 01	8.455810 02	2.618420 02	-1.797820-01	5.707940-02	3.594920-01	3.774640-02	3.999020 03	1.697410 05
2.439000 01	8.409180 02	2.622620 02	-1.781490-01	5.697340-02	3.588210-01	3.773060-02	3.999010 03	1.696920 05
2.449000 01	8.362860 02	2.629720 02	-1.764730-01	5.686970-02	3.581660-01	3.771510-02	3.999010 03	1.696410 05
2.459000 01	8.316950 02	2.636740 02	-1.747560-01	5.676820-02	3.575220-01	3.770000-02	3.999000 03	1.695880 05
2.469000 01	8.271180 02	2.643670 02	-1.729980-01	5.666890-02	3.568940-01	3.768530-02	3.999000 03	1.695330 05
2.479000 01	8.225890 02	2.650510 02	-1.712000-01	5.657190-02	3.562800-01	3.767090-02	3.998990 03	1.694770 05
2.489000 01	8.180870 02	2.657260 02	-1.693620-01	5.647700-02	3.556790-01	3.765690-02	3.998990 03	1.694200 05
2.499000 01	8.136270 02	2.663910 02	-1.674850-01	5.638420-02	3.550910-01	3.764320-02	3.998980 03	1.693610 05
2.509000 01	8.092060 02	2.670470 02	-1.655690-01	5.629350-02	3.545170-01	3.762990-02	3.998980 03	1.693010 05
2.519000 01	8.048250 02	2.676940 02	-1.636160-01	5.620490-02	3.539560-01	3.761690-02	3.998980 03	1.692400 05
2.529000 01	8.004860 02	2.683310 02	-1.616260-01	5.611840-02	3.534090-01	3.760420-02	3.998970 03	1.691770 05
2.539000 01	7.961890 02	2.689590 02	-1.595990-01	5.603390-02	3.528730-01	3.759180-02	3.998970 03	1.691140 05
2.549000 01	7.919370 02	2.695770 02	-1.575370-01	5.595140-02	3.523510-01	3.757970-02	3.998960 03	1.690500 05
2.559000 01	7.877310 02	2.701860 02	-1.554390-01	5.587080-02	3.518410-01	3.756800-02	3.998960 03	1.689850 05
2.569000 01	7.835720 02	2.707840 02	-1.533070-01	5.579220-02	3.513440-01	3.755650-02	3.998950 03	1.689190 05
2.579000 01	7.794620 02	2.713730 02	-1.511410-01	5.571560-02	3.508580-01	3.754540-02	3.998950 03	1.688530 05
2.589000 01	7.754010 02	2.719520 02	-1.489410-01	5.564080-02	3.503850-01	3.753450-02	3.998950 03	1.687860 05
2.599000 01	7.713910 02	2.725220 02	-1.467090-01	5.556790-02	3.499230-01	3.752400-02	3.998940 03	1.687190 05
2.609000 01	7.674340 02	2.730810 02	-1.444460-01	5.549680-02	3.494730-01	3.751370-02	3.998940 03	1.686510 05
2.619000 01	7.635300 02	2.736300 02	-1.421500-01	5.542760-02	3.490350-01	3.750370-02	3.998930 03	1.685830 05
2.629000 01	7.596810 02	2.741690 02	-1.398240-01	5.536010-02	3.486070-01	3.749390-02	3.998930 03	1.685150 05
2.639000 01	7.558880 02	2.746980 02	-1.374680-01	5.529440-02	3.481920-01	3.748450-02	3.998920 03	1.684470 05
2.649000 01	7.521530 02	2.752160 02	-1.350830-01	5.523050-02	3.477870-01	3.747530-02	3.998920 03	1.683790 05
2.659000 01	7.484760 02	2.757250 02	-1.326680-01	5.516830-02	3.473930-01	3.746630-02	3.998910 03	1.683110 05
2.669000 01	7.448580 02	2.762230 02	-1.302260-01	5.510780-02	3.470100-01	3.745770-02	3.998910 03	1.682430 05
2.679000 01	7.413020 02	2.767100 02	-1.277560-01	5.504910-02	3.466380-01	3.744920-02	3.998910 03	1.681750 05
2.689000 01	7.378080 02	2.771880 02	-1.252590-01	5.499190-02	3.462760-01	3.744100-02	3.998900 03	1.681080 05
2.699000 01	7.343760 02	2.776550 02	-1.227350-01	5.493650-02	3.459250-01	3.743310-02	3.998900 03	1.680410 05
2.709000 01	7.310100 02	2.781110 02	-1.201860-01	5.488260-02	3.455840-01	3.742540-02	3.998890 03	1.679740 05
2.719000 01	7.277080 02	2.785570 02	-1.176120-01	5.483040-02	3.452530-01	3.741800-02	3.998890 03	1.679090 05
2.729000 01	7.244730 02	2.789920 02	-1.150130-01	5.477980-02	3.449330-01	3.741070-02	3.998880 03	1.678430 05
2.739000 01	7.213050 02	2.794170 02	-1.123900-01	5.473070-02	3.446220-01	3.740380-02	3.998880 03	1.677790 05
2.749000 01	7.182050 02	2.798320 02	-1.097440-01	5.468310-02	3.443210-01	3.739700-02	3.998870 03	1.677150 05
2.759000 01	7.151750 02	2.802390 02	-1.070760-01	5.463710-02	3.440290-01	3.739050-02	3.998870 03	1.676520 05
2.769000 01	7.122160 02	2.806280 02	-1.043850-01	5.459260-02	3.437470-01	3.738410-02	3.998870 03	1.675900 05
2.779000 01	7.093280 02	2.810110 02	-1.016730-01	5.454960-02	3.434750-01	3.737800-02	3.998860 03	1.675290 05
2.789000 01	7.065120 02	2.813830 02	-9.894000-02	5.450800-02	3.432120-01	3.737210-02	3.998860 03	1.674680 05
2.799000 01	7.037690 02	2.817440 02	-9.618670-02	5.446790-02	3.429580-01	3.736650-02	3.998850 03	1.674090 05
2.809000 01	7.011000 02	2.820940 02	-9.341360-02	5.442920-02	3.427120-01	3.736100-02	3.998850 03	1.673510 05
2.819000 01	6.985070 02	2.824340 02	-9.062190-02	5.439190-02	3.424760-01	3.735570-02	3.998840 03	1.672950 05
2.829000 01	6.959890 02	2.827630 02	-8.781150-02	5.435590-02	3.422480-01	3.735060-02	3.998840 03	1.672390 05
2.839000 01	6.935470 02	2.830810 02	-8.498320-02	5.432130-02	3.420290-01	3.734580-02	3.998840 03	1.671850 05
2.849000 01	6.911830 02	2.833890 02	-8.213770-02	5.428810-02	3.418190-01	3.734110-02	3.998830 03	1.671320 05

```
----------------------------------------------------
|                                                  |
|  PITCH-ANGLE GAIN =  1.00000000000000 00         |
|  PITCH-ANGLE BIAS =  5.5231429398300-17 RADIAN   |
|                                                  |
----------------------------------------------------
```

M O D E L   S O L U T I O N S

```
*************************************************************************
*                                                                       *
* MODEL 12     P0 =  2.8633024263093630D 04   C00 =  3.4984411860749250D-02 *
*              P1 =  0.0                      C01 =  0.0                  *
* FCINT        P2 =  1.1285959342976660D 03   C02 =  1.3081582733928220D 00 *
* FAILURES     P3 = -2.1787207478932430D 00   C03 =  0.0                  *
* =    0       P4 =  0.0                      C04 =  2.0027622632305100D 03 *
*                                                                       *
* FIT ERROR=  1.5265750593985650D-09                                    *
*                                                                       *
*************************************************************************
*                                                                       *
*************************************************************************
*                                                                       *
**                  MODEL 12 FOUND TO BE BEST FIT                      **
*                                                                       *
*************************************************************************
```

LIFT COEFFICIENTS: BY LEAST SQUARE DISTANCE

```
CLA0=-0.2891686642385734D-02
CLA = 0.6376919249271473D 01
CLAX=-0.4305634978456659D 00
EXPX= 0.2068207403932144D 01
CLQ= 0.0
```

ESTIMATED SPECIFIC FUEL CONSUMPTION = 2.5270935944037D-07 LBF/(FT-LBF/SEC)/SEC

```
'BEST' MODEL FIT ERROR =  1.526975059398565OD-09
'BEST' SPECIFIC FUEL CONSUMPTION =  2.5270939944037D-07 LBF/(FT-LBF/SEC)/SEC
```

```
/////////////////////////////////////////////////////////////////////////////////////
/***********************************************************************************/
/*                                                                                 */
/*  INTERMEDIATE    GENERAL EXPRESSIONS FOR POWER, DRAG COEFFICIENT, AND LIFT COEFFICIENT  */
/*                                                                                 */
/*                                                                                 */
/*   P = P0 + P1*V** 3.333000-01 + P2*V** 1.000000 00 + P3*V** 2.000000 00 + P4*V** 3.000000 00  */
/*                                                                                 */
/*                 CD = C00 + C01*A** 1 + C02*A** 2 + C03*A** 3 + C04*A** 6        */
/*                                                                                 */
/*                    CL = CLA0 + CLA*A + CLAX*A** 2.068213 00 + CLQ*R             */
/*                                                                                 */
/*                                                                                 */
/*   WHERE:                                                                        */
/*                                                                                 */
/*          V = AIRSPEED(FT/SEC)                                                   */
/*          A = ANGLE OF ATTACK(RADIAN)                                            */
/*          R = PITCH RATE(RADIAN/SEC)                                             */
/*                                                                                 */
/*        P0 =  0.286330242630 05   C00 =  0.349844118610-01   CLA0 = -0.289168664240-02  */
/*        P1 =  0.0                 C01 =  0.0                 CLA  =  0.637691924933 01  */
/*        P2 =  0.112859593430 04   C02 =  0.130815827340 01   CLAX = -0.430563497850 00  */
/*        P3 = -0.217872074790 01   C03 =  0.0                 CLQ  =  0.0                */
/*        P4 =  0.0                 C04 =  0.200276226320 04                              */
/*                                                                                 */
/***********************************************************************************/
```

MODIFIED DATA (FOR PROGRAM LOOP# 1)

DATA POINT	TIME (SECS)	WEIGHT (LBF)	PITCH ANGLE (RADIANS)	PITCH RATE (RADIAN/SEC)	AIRSPEED (FT/SEC)
1	0.0	3999.9997	0.1627006	0.0067665	146.7390
2	0.010	3999.9993	0.1627686	0.0068863	146.7856
3	0.020	3999.9989	0.1628385	0.0070259	146.8322
4	0.030	3999.9985	0.1629095	0.0071651	146.8787
5	0.040	3999.9982	0.1629819	0.0073041	146.9251
6	0.060	3999.9978	0.1631308	0.0075812	147.0178
7	0.080	3999.9967	0.1632853	0.0078571	147.1103
8	0.100	3999.9959	0.1634453	0.0081318	147.2025
9	0.120	3999.9952	0.1636107	0.0084053	147.2945
10	0.140	3999.9944	0.1637817	0.0086777	147.3862
11	0.180	3999.9930	0.1641338	0.0092187	147.5689
12	0.220	3999.9915	0.1645194	0.0097348	147.7505
13	0.260	3999.9900	0.1649204	0.0102959	147.9311
14	0.300	3999.9885	0.1653426	0.0108119	148.1106
15	0.340	3999.9870	0.1657657	0.0113328	148.2890
16	0.420	3999.9840	0.1667338	0.0123586	148.6426
17	0.500	3999.9810	0.1677630	0.0133628	148.9911
18	0.580	3999.9780	0.1688717	0.0143448	149.3349
19	0.660	3999.9750	0.1700590	0.0153039	149.6737
20	0.740	3999.9720	0.1713206	0.0162397	150.0073
21	0.840	3999.9682	0.1730017	0.0173758	150.4165
22	0.940	3999.9644	0.1747545	0.0184735	150.8176
23	1.040	3999.9607	0.1766953	0.0195319	151.2094
24	1.140	3999.9569	0.1786996	0.0205498	151.5921
25	1.240	3999.9531	0.1808036	0.0215261	151.9653
26	1.340	3999.9493	0.1830032	0.0224551	152.3289
27	1.440	3999.9455	0.1852933	0.0233414	152.6826
28	1.540	3999.9417	0.1876698	0.0241820	153.0263
29	1.640	3999.9380	0.1901279	0.0249762	153.3598
30	1.740	3999.9341	0.1926631	0.0257229	153.6829
31	1.840	3999.9303	0.1952734	0.0264215	153.9955
32	1.940	3999.9265	0.1979451	0.0270713	154.2975
33	2.040	3999.9227	0.2006822	0.0276714	154.5888
34	2.140	3999.9189	0.2034768	0.0282234	154.8694
35	2.240	3999.9151	0.2063242	0.0287274	155.1391
36	2.340	3999.9113	0.2092194	0.0291828	155.3979
37	2.440	3999.9074	0.2121577	0.0295896	155.6458
38	2.540	3999.9036	0.2151342	0.0299475	155.8828
39	2.640	3999.8998	0.2181439	0.0302563	156.1089
40	2.740	3999.8960	0.2211819	0.0305159	156.3241
41	2.840	3999.8921	0.2242434	0.0307263	156.5285
42	2.940	3999.8883	0.2273234	0.0308872	156.7221
43	3.040	3999.8844	0.2304169	0.0309988	156.9050
44	3.140	3999.8806	0.2335190	0.0310636	157.0773
45	3.240	3999.8767	0.2366247	0.0310736	157.2390
46	3.340	3999.8729	0.2397292	0.0310369	157.3904
47	3.440	3999.8691	0.2428274	0.0309510	157.5314
48	3.540	3999.8652	0.2459145	0.0308158	157.6623
49	3.640	3999.8614	0.2489855	0.0306315	157.7833
50	3.740	3999.8575	0.2520356	0.0303983	157.8944
51	3.840	3999.8537	0.2550598	0.0301162	157.9959
52	3.940	3999.8498	0.2580533	0.0297856	158.0880
53	4.040	3999.8459	0.2610112	0.0294066	158.1709
54	4.140	3999.8421	0.2639287	0.0289812	158.2448
55	4.240	3999.8382	0.2668015	0.0285118	158.3099
56	4.340	3999.8344	0.2696250	0.0279993	158.3665
57	4.440	3999.8305	0.2723951	0.0274444	158.4148
58	4.540	3999.8267	0.2751075	0.0268479	158.4551
59	4.640	3999.8228	0.2777581	0.0262137	158.4876
60	4.740	3999.8190	0.2803429	0.0255335	158.5127
61	4.840	3999.8151	0.2828580	0.0248172	158.5306
62	4.940	3999.8112	0.2852996	0.0240627	158.5416
63	5.040	3999.8074	0.2876634	0.0232707	158.5460
64	5.140	3999.8035	0.2899464	0.0224423	158.5441
65	5.240	3999.7997	0.2921446	0.0215782	158.5362
66	5.340	3999.7958	0.2942546	0.0206794	158.5226
67	5.440	3999.7919	0.2962729	0.0197467	158.5036
68	5.540	3999.7881	0.2981963	0.0187811	158.4796
69	5.640	3999.7842	0.3000214	0.0177834	158.4508
70	5.740	3999.7804	0.3017452	0.0167546	158.4177
71	5.840	3999.7765	0.3033643	0.0156957	158.3805
72	5.940	3999.7726	0.3048764	0.0146375	158.3397
73	6.040	3999.7688	0.3062780	0.0134914	158.2954
74	6.140	3999.7649	0.3075667	0.0123501	158.2482
75	6.240	3999.7611	0.3087400	0.0111856	158.1983
76	6.340	3999.7572	0.3097957	0.0099999	158.1461
77	6.440	3999.7534	0.3107317	0.0087915	158.0919
78	6.540	3999.7495	0.3115459	0.0075666	158.0362
79	6.640	3999.7457	0.3122366	0.0063197	157.9792
80	6.740	3999.7418	0.3128018	0.0050581	157.9213
81	6.840	3999.7380	0.3132401	0.0037810	157.8629
82	6.940	3999.7341	0.3135500	0.0024899	157.8043
83	7.040	3999.7303	0.3137301	0.0011863	157.7460
84	7.140	3999.7264	0.3137792	-0.0001291	157.6882
85	7.240	3999.7226	0.3136963	-0.0014543	157.6313
86	7.340	3999.7187	0.3134805	-0.0027881	157.5757
87	7.440	3999.7149	0.3131309	-0.0041292	157.5218
88	7.540	3999.7110	0.3126470	-0.0054762	157.4699
89	7.640	3999.7072	0.3120281	-0.0068277	157.4203
90	7.740	3999.7033	0.3112739	-0.0081824	157.3734
91	7.840	3999.6995	0.3103842	-0.0095389	157.3297
92	7.940	3999.6956	0.3093589	-0.0108958	157.2893
93	8.040	3999.6918	0.3081979	-0.0122518	157.2529
94	8.140	3999.6879	0.3069015	-0.0136054	157.2204
95	8.240	3999.6841	0.3054700	-0.0149552	157.1925
96	8.340	3999.6803	0.3039038	-0.0162999	157.1694
97	8.440	3999.6764	0.3022034	-0.0176380	157.1515
98	8.540	3999.6726	0.3003697	-0.0189683	157.1392
99	8.640	3999.6687	0.2984035	-0.0202893	157.1326
100	8.740	3999.6649	0.2963058	-0.0215997	157.1323
101	8.840	3999.6610	0.2940777	-0.0228982	157.1386
102	8.940	3999.6572	0.2917205	-0.0241833	157.1517
103	9.040	3999.6534	0.2892355	-0.0254537	157.1719
104	9.140	3999.6495	0.2866244	-0.0267082	157.1997
105	9.240	3999.6457	0.2838888	-0.0279453	157.2353
106	9.340	3999.6418	0.2810304	-0.0291638	157.2789
107	9.440	3999.6380	0.2780513	-0.0303624	157.3311
108	9.540	3999.6341	0.2749535	-0.0315398	157.3919
109	9.640	3999.6303	0.2717391	-0.0326948	157.4617
110	9.740	3999.6264	0.2684104	-0.0338260	157.5409
111	9.840	3999.6226	0.2649700	-0.0349323	157.6296
112	9.940	3999.6187	0.2614204	-0.0360125	157.7281
113	10.040	3999.6149	0.2577641	-0.0370654	157.8368
114	10.140	3999.6110	0.2540041	-0.0383937	157.9558
115	10.240	3999.6072	0.2501430	-0.0390863	158.0854

116	10.340	3999.6033	0.2461837	-0.0403573	158.2259
117	10.440	3999.5995	0.2421290	-0.0409970	158.3774
118	10.540	3999.5956	0.2379819	-0.0419065	158.5403
119	10.640	3999.5918	0.2337455	-0.0427851	158.7146
120	10.740	3999.5879	0.2294229	-0.0436320	158.9007
121	10.840	3999.5840	0.2250174	-0.0444465	159.0987
122	10.940	3999.5802	0.2205321	-0.0452279	159.3088
123	11.040	3999.5763	0.2159705	-0.0459756	159.5312
124	11.140	3999.5724	0.2113359	-0.0466891	159.7660
125	11.240	3999.5685	0.2066316	-0.0473676	160.0134
126	11.340	3999.5647	0.2018616	-0.0480108	160.2736
127	11.440	3999.5608	0.1970291	-0.0486181	160.5467
128	11.540	3999.5569	0.1921377	-0.0491890	160.8328
129	11.643	3999.5530	0.1871911	-0.0497232	161.1320
130	11.740	3999.5491	0.1821931	-0.0502203	161.4444
131	11.840	3999.5452	0.1771473	-0.0506799	161.7702
132	11.940	3999.5413	0.1720575	-0.0511016	162.1093
133	12.040	3999.5374	0.1669275	-0.0514859	162.4620
134	12.140	3999.5335	0.1617609	-0.0518334	162.8282
135	12.240	3999.5296	0.1565619	-0.0521446	163.2080
136	12.340	3999.5257	0.1513324	-0.0524196	163.6014
137	12.440	3999.5218	0.1460776	-0.0526565	164.0085
138	12.540	3999.5179	0.1408034	-0.0528617	164.4293
139	12.640	3999.5140	0.1355085	-0.0530292	164.8637
140	12.740	3999.5100	0.1301979	-0.0531614	165.3118
141	12.840	3999.5061	0.1248772	-0.0532585	165.7736
142	12.940	3999.5022	0.1195482	-0.0533210	166.2490
143	13.040	3999.4982	0.1142148	-0.0533492	166.7380
144	13.140	3999.4943	0.1088803	-0.0533434	167.2405
145	13.240	3999.4903	0.1035482	-0.0533042	167.7565
146	13.340	3999.4864	0.0982213	-0.0532319	168.2860
147	13.440	3999.4824	0.0929038	-0.0531272	168.8288
148	13.490	3999.4804	0.0902496	-0.0530627	169.1052
149	13.590	3999.4764	0.0849518	-0.0529100	169.6678
150	13.690	3999.4725	0.0796699	-0.0527261	170.2436
151	13.790	3999.4685	0.0744086	-0.0525116	170.8324
152	13.890	3999.4645	0.0691703	-0.0522669	171.4340
153	13.990	3999.4605	0.0639579	-0.0519928	172.0484
154	14.090	3999.4565	0.0587744	-0.0516903	172.6754
155	14.190	3999.4525	0.0536226	-0.0513605	173.3149
156	14.290	3999.4485	0.0485051	-0.0510044	173.9666
157	14.390	3999.4444	0.0434245	-0.0506226	174.6306
158	14.490	3999.4404	0.0383834	-0.0502160	175.3365
159	14.590	3999.4364	0.0333862	-0.0497853	175.9942
160	14.690	3999.4323	0.0284293	-0.0493314	176.6936
161	14.790	3999.4283	0.0235209	-0.0488552	177.4043
162	14.890	3999.4242	0.0186613	-0.0483573	178.1263
163	14.990	3999.4202	0.0138525	-0.0478387	178.8594
164	15.090	3999.4161	0.0090966	-0.0473000	179.6032
165	15.190	3999.4121	0.0043935	-0.0467423	180.3577
166	15.290	3999.4080	-0.0002486	-0.0461661	181.1226
167	15.390	3999.4039	-0.0048346	-0.0455724	181.8976
168	15.490	3999.3998	-0.0093601	-0.0449619	182.6826
169	15.590	3999.3957	-0.0138238	-0.0443354	183.4772
170	15.690	3999.3916	-0.0182241	-0.0436937	184.2814
171	15.790	3999.3876	-0.0225595	-0.0430375	185.0947
172	15.890	3999.3834	-0.0268205	-0.0423676	185.9171
173	15.990	3999.3792	-0.0310298	-0.0416847	186.7481
174	16.090	3999.3751	-0.0351623	-0.0409896	187.5877
175	16.190	3999.3710	-0.0392247	-0.0402833	188.4355
176	16.290	3999.3668	-0.0432139	-0.0395664	189.2913
177	16.390	3999.3627	-0.0471349	-0.0388397	190.1548
178	16.490	3999.3586	-0.0509807	-0.0381039	191.0257
179	16.590	3999.3544	-0.0547526	-0.0373596	191.9038
180	16.690	3999.3502	-0.0584496	-0.0366076	192.7889
181	16.790	3999.3460	-0.0620710	-0.0358485	193.6806
182	16.890	3999.3418	-0.0656163	-0.0350828	194.5797
183	16.990	3999.3376	-0.0690846	-0.0343113	195.4853
184	17.090	3999.3334	-0.0724755	-0.0335346	196.3931
185	17.190	3999.3292	-0.0757885	-0.0327532	197.3088
186	17.290	3999.3250	-0.0790232	-0.0319677	198.2298
187	17.390	3999.3208	-0.0821792	-0.0311786	199.1559
188	17.490	3999.3166	-0.0852560	-0.0303865	200.0868
189	17.590	3999.3124	-0.0882536	-0.0295920	201.0222
190	17.690	3999.3081	-0.0911716	-0.0287954	201.9619
191	17.790	3999.3039	-0.0940098	-0.0279973	202.9056
192	17.890	3999.2996	-0.0967682	-0.0271982	203.8529
193	17.990	3999.2954	-0.0994466	-0.0263984	204.8038
194	18.090	3999.2911	-0.1020451	-0.0255985	205.7578
195	18.190	3999.2869	-0.1045636	-0.0247988	206.7147
196	18.290	3999.2826	-0.1070022	-0.0239996	207.6744
197	18.390	3999.2783	-0.1093606	-0.0232014	208.6364
198	18.490	3999.2741	-0.1116398	-0.0224045	209.6006
199	18.590	3999.2698	-0.1138391	-0.0216092	210.5666
200	18.690	3999.2655	-0.1159590	-0.0208160	211.5343
201	18.790	3999.2612	-0.1179997	-0.0200250	212.5034
202	18.890	3999.2569	-0.1199615	-0.0192367	213.4736
203	18.990	3999.2526	-0.1218445	-0.0184513	214.4447
204	19.090	3999.2483	-0.1236492	-0.0176691	215.4164
205	19.190	3999.2440	-0.1253759	-0.0168903	216.3885
206	19.290	3999.2396	-0.1270248	-0.0161153	217.3607
207	19.390	3999.2353	-0.1285965	-0.0153442	218.3328
208	19.490	3999.2310	-0.1300913	-0.0145773	219.3046
209	19.590	3999.2267	-0.1315096	-0.0138149	220.2758
210	19.690	3999.2223	-0.1328519	-0.0130573	221.2463
211	19.790	3999.2180	-0.1341187	-0.0123041	222.2156
212	19.890	3999.2136	-0.1353106	-0.0115561	223.1837
213	19.990	3999.2093	-0.1364277	-0.0108134	224.1503
214	20.090	3999.2049	-0.1374713	-0.0100761	225.1152
215	20.190	3999.2006	-0.1384408	-0.0093442	226.0781
216	20.290	3999.1962	-0.1393377	-0.0086179	227.0389
217	20.390	3999.1919	-0.1401622	-0.0078973	227.9973
218	20.490	3999.1875	-0.1409150	-0.0071825	228.9531
219	20.590	3999.1831	-0.1415967	-0.0064736	229.9061
220	20.690	3999.1788	-0.1422077	-0.0057707	230.8561
221	20.790	3999.1744	-0.1427488	-0.0050740	231.8029
222	20.890	3999.1700	-0.1432206	-0.0043835	232.7463
223	20.990	3999.1656	-0.1436236	-0.0036993	233.6861
224	21.090	3999.1612	-0.1439585	-0.0030216	234.6220
225	21.190	3999.1569	-0.1442260	-0.0023503	235.5540
226	21.290	3999.1526	-0.1444267	-0.0016855	236.4818
227	21.390	3999.1481	-0.1445613	-0.0010274	237.4052
228	21.490	3999.1437	-0.1446304	-0.0003760	238.3240
229	21.590	3999.1393	-0.1446347	0.0002686	239.2381
230	21.690	3999.1349	-0.1445749	0.0009064	240.1473
231	21.790	3999.1305	-0.1444517	0.0015374	241.0513
232	21.890	3999.1261	-0.1442658	0.0021614	241.9501
233	21.990	3999.1217	-0.1440178	0.0027784	242.8435
234	22.090	3999.1173	-0.1437084	0.0033884	243.7313
235	22.190	3999.1129	-0.1433385	0.0039915	244.6132
236	22.290	3999.1085	-0.1429086	0.0045877	245.4893
237	22.390	3999.1041	-0.1424194	0.0051769	246.3593
238	22.490	3999.0996	-0.1418717	0.0057591	247.2230
239	22.590	3999.0952	-0.1412661	0.0063344	248.0803
240	22.690	3999.0908	-0.1406033	0.0069026	248.9311
241	22.790	3999.0864	-0.1398841	0.0074639	249.7752
242	22.890	3999.0820	-0.1391091	0.0080181	250.6124
243	22.990	3999.0776	-0.1382791	0.0085654	251.4427
244	23.090	3999.0732	-0.1373947	0.0091056	252.2659
245	23.190	3999.0688	-0.1364566	0.0096389	253.0818
246	23.290	3999.0643	-0.1354656	0.0101651	253.8903
247	23.390	3999.0599	-0.1344223	0.0106842	254.6913

248	23.490	3999.0555	-0.1333275	0.0111964	255.4847
249	23.590	3999.0511	-0.1321818	0.0117015	256.2703
250	23.690	3999.0467	-0.1309659	0.0121996	257.0481
251	23.790	3999.0422	-0.1297406	0.0126907	257.8178
252	23.890	3999.0378	-0.1284466	0.0131748	258.5794
253	23.990	3999.0334	-0.1271046	0.0136518	259.3328
254	24.090	3999.0290	-0.1257151	0.0141218	260.0779
255	24.190	3999.0246	-0.1242791	0.0145848	260.8144
256	24.290	3999.0202	-0.1227971	0.0150410	261.5425
257	24.390	3999.0157	-0.1212699	0.0154903	262.2619
258	24.490	3999.0113	-0.1196980	0.0159327	262.9725
259	24.590	3999.0069	-0.1180823	0.0163682	263.6743
260	24.690	3999.0025	-0.1164234	0.0167970	264.3671
261	24.790	3998.9981	-0.1147220	0.0172189	265.0509
262	24.890	3998.9936	-0.1129787	0.0176340	265.7256
263	24.990	3998.9892	-0.1111943	0.0180424	266.3910
264	25.090	3998.9848	-0.1093693	0.0184440	267.0472
265	25.190	3998.9804	-0.1075046	0.0188389	267.6939
266	25.290	3998.9760	-0.1056007	0.0192270	268.3313
267	25.390	3998.9716	-0.1036584	0.0196085	268.9590
268	25.490	3998.9672	-0.1016782	0.0199832	269.5772
269	25.590	3998.9627	-0.0996610	0.0203513	270.1857
270	25.690	3998.9583	-0.0976072	0.0207127	270.7845
271	25.790	3998.9539	-0.0955177	0.0210675	271.3734
272	25.890	3998.9495	-0.0933930	0.0214157	271.9525
273	25.990	3998.9451	-0.0912339	0.0217572	272.5216
274	26.090	3998.9407	-0.0890409	0.0220921	273.0807
275	26.190	3998.9363	-0.0868148	0.0224205	273.6298
276	26.290	3998.9319	-0.0845562	0.0227424	274.1688
277	26.390	3998.9275	-0.0822657	0.0230578	274.6976
278	26.490	3998.9231	-0.0799440	0.0233667	275.2162
279	26.590	3998.9187	-0.0775918	0.0236692	275.7245
280	26.690	3998.9142	-0.0752097	0.0239652	276.2226
281	26.790	3998.9098	-0.0727982	0.0242548	276.7103
282	26.890	3998.9054	-0.0703582	0.0245381	277.1876
283	26.990	3998.9010	-0.0678901	0.0248149	277.6545
284	27.090	3998.8966	-0.0653947	0.0250854	278.1110
285	27.190	3998.8922	-0.0628726	0.0253496	278.5569
286	27.290	3998.8878	-0.0603244	0.0256074	278.9924
287	27.390	3998.8834	-0.0577507	0.0258589	279.4173
288	27.490	3998.8790	-0.0551522	0.0261041	279.8316
289	27.590	3998.8747	-0.0525295	0.0263430	280.2353
290	27.690	3998.8703	-0.0498833	0.0265756	280.6284
291	27.790	3998.8659	-0.0472141	0.0268019	281.0109
292	27.890	3998.8615	-0.0445226	0.0270220	281.3827
293	27.990	3998.8571	-0.0418394	0.0272358	281.7439
294	28.090	3998.8527	-0.0390751	0.0274434	282.0943
295	28.190	3998.8483	-0.0363204	0.0276448	282.4341
296	28.290	3998.8439	-0.0335459	0.0278400	282.7631
297	28.390	3998.8395	-0.0307522	0.0280289	283.0815
298	28.490	3998.8351	-0.0279399	0.0282118	283.3891

DATA POINT	TIME (SECS)	DENSITY (SLUG/FT**3)	ANGLE OF ATTACK (RADIANS)	TEMPERATURE (DEG-R)	ACCELERATION (FT/SEC**2)
1	0.0	0.00230978	0.1626492	520.00	4.66404
2	0.010	0.00230978	0.1626560	520.03	4.65826
3	0.020	0.00230978	0.1626628	520.00	4.65247
4	0.030	0.00230978	0.1626695	520.00	4.64663
5	0.040	0.00230978	0.1626762	520.00	4.64074
6	0.060	0.00230978	0.1626895	520.00	4.62884
7	0.080	0.00230978	0.1627026	520.00	4.61679
8	0.100	0.00230978	0.1627155	520.00	4.60458
9	0.120	0.00230978	0.1627283	520.00	4.59221
10	0.140	0.00230978	0.1627409	520.00	4.57968
11	0.180	0.00230978	0.1627656	520.00	4.55416
12	0.220	0.00230978	0.1627896	520.00	4.52803
13	0.260	0.00230977	0.1628129	520.00	4.50129
14	0.300	0.00230977	0.1628355	520.00	4.47396
15	0.343	0.00230977	0.1628575	520.00	4.44604
16	0.420	0.00230977	0.1628988	520.00	4.38849
17	0.500	0.00230977	0.1629369	520.00	4.32871
18	0.580	0.00230976	0.1629715	520.03	4.26676
19	0.660	0.00230976	0.1630027	520.00	4.20278
20	0.743	0.00230975	0.1630304	520.00	4.13679
21	0.840	0.00230974	0.1630593	520.00	4.05163
22	0.940	0.00230973	0.1630817	520.00	3.96365
23	1.040	0.00230972	0.1630976	520.00	3.87302
24	1.140	0.00230970	0.1631064	520.00	3.77989
25	1.243	0.00230969	0.1631082	520.00	3.68446
26	1.340	0.00230967	0.1631020	520.00	3.58688
27	1.440	0.00230964	0.1630874	520.00	3.48735
28	1.540	0.00230962	0.1630642	520.00	3.38604
29	1.640	0.00230959	0.1630317	520.00	3.28314
30	1.743	0.00230956	0.1629897	520.00	3.17884
31	1.840	0.00230953	0.1629376	520.00	3.07331
32	1.940	0.00230950	0.1628749	520.00	2.96675
33	2.040	0.00230946	0.1628013	520.00	2.85934
34	2.140	0.00230942	0.1627164	520.00	2.75125
35	2.240	0.00230937	0.1626200	520.00	2.64266
36	2.340	0.00230932	0.1625119	520.00	2.53373
37	2.440	0.00230927	0.1623919	520.00	2.42464
38	2.540	0.00230922	0.1622597	520.00	2.31555
39	2.640	0.00230916	0.1621151	520.00	2.20661
40	2.740	0.00230910	0.1619579	520.00	2.09800
41	2.840	0.00230904	0.1617880	520.00	1.98986
42	2.940	0.00230897	0.1616050	520.00	1.88235
43	3.040	0.00230890	0.1614088	520.00	1.77564
44	3.140	0.00230882	0.1611991	520.00	1.66986
45	3.240	0.00230874	0.1609759	520.00	1.56516
46	3.340	0.00230866	0.1607387	520.00	1.46170
47	3.440	0.00230857	0.1604874	520.00	1.35960
48	3.540	0.00230848	0.1602219	520.00	1.25902
49	3.640	0.00230839	0.1599418	520.00	1.16008
50	3.740	0.00230829	0.1596470	520.00	1.06291
51	3.840	0.00230819	0.1593373	520.00	0.96766
52	3.940	0.00230809	0.1590124	520.00	0.87443
53	4.040	0.00230798	0.1586721	520.00	0.78336
54	4.140	0.00230787	0.1583163	520.00	0.69455
55	4.240	0.00230775	0.1579450	520.00	0.60811
56	4.340	0.00230763	0.1575585	520.00	0.52413
57	4.440	0.00230751	0.1571567	520.00	0.44269
58	4.540	0.00230739	0.1567399	520.00	0.36388
59	4.640	0.00230726	0.1563082	520.00	0.28777
60	4.740	0.00230713	0.1558617	520.00	0.21444
61	4.840	0.00230699	0.1554005	520.00	0.14395
62	4.940	0.00230685	0.1549249	520.00	0.07639
63	5.040	0.00230671	0.1544348	520.00	0.01181
64	5.140	0.00230657	0.1539306	520.00	-0.04973
65	5.240	0.00230642	0.1534122	520.00	-0.10817
66	5.340	0.00230627	0.1528798	520.00	-0.16345
67	5.443	0.00230612	0.1523337	520.00	-0.21553
68	5.540	0.00230596	0.1517738	520.00	-0.26436
69	5.640	0.00230580	0.1512003	520.00	-0.30984
70	5.740	0.00230564	0.1506134	520.00	-0.35200
71	5.840	0.00230548	0.1500133	520.00	-0.39076
72	5.940	0.00230531	0.1493999	520.00	-0.42609
73	6.040	0.00230514	0.1487736	520.00	-0.45798
74	6.140	0.00230498	0.1481348	520.00	-0.48631

75	6.240	0.00230480	0.1474830	520.00	-0.51118
76	6.340	0.00230463	0.1468195	520.00	-0.53245
77	6.440	0.00230446	0.1461444	520.00	-0.55020
78	6.540	0.00230428	0.1454581	520.00	-0.56437
79	6.640	0.00230410	0.1447609	520.00	-0.57496
80	6.740	0.00230392	0.1440532	520.00	-0.58196
81	6.840	0.00230374	0.1433354	520.00	-0.58536
82	6.940	0.00230356	0.1426080	520.00	-0.58516
83	7.040	0.00230338	0.1418712	520.00	-0.58134
84	7.140	0.00230319	0.1411256	520.00	-0.57391
85	7.240	0.00230301	0.1403711	520.00	-0.56287
86	7.340	0.00230283	0.1396086	520.00	-0.54822
87	7.440	0.00230264	0.1388383	520.00	-0.52997
88	7.540	0.00230245	0.1380606	520.00	-0.50812
89	7.640	0.00230227	0.1372759	520.00	-0.48269
90	7.740	0.00230208	0.1364845	520.00	-0.45367
91	7.840	0.00230190	0.1356868	520.00	-0.42110
92	7.940	0.00230171	0.1348832	520.00	-0.38497
93	8.040	0.00230153	0.1340741	520.00	-0.34532
94	8.140	0.00230134	0.1332599	520.00	-0.30215
95	8.240	0.00230116	0.1324409	520.00	-0.25550
96	8.340	0.00230098	0.1316176	520.00	-0.20539
97	8.440	0.00230079	0.1307903	520.00	-0.15184
98	8.540	0.00230061	0.1299595	520.00	-0.09490
99	8.640	0.00230043	0.1291254	520.00	-0.03458
100	8.740	0.00230026	0.1282886	520.00	0.02907
101	8.840	0.00230008	0.1274493	520.00	0.09601
102	8.940	0.00229990	0.1266080	520.00	0.16620
103	9.040	0.00229973	0.1257681	520.00	0.23960
104	9.140	0.00229956	0.1249209	520.00	0.31615
105	9.240	0.00229939	0.1240759	520.00	0.39582
106	9.340	0.00229922	0.1232303	520.00	0.47854
107	9.440	0.00229905	0.1223847	520.00	0.56425
108	9.540	0.00229889	0.1215393	520.00	0.65291
109	9.640	0.00229872	0.1206947	520.00	0.74444
110	9.740	0.00229857	0.1198510	520.00	0.83878
111	9.840	0.00229841	0.1190089	520.00	0.93585
112	9.940	0.00229825	0.1181686	520.00	1.03559
113	10.040	0.00229810	0.1173304	520.00	1.13793
114	10.140	0.00229796	0.1164949	520.00	1.24277
115	10.240	0.00229781	0.1156622	520.00	1.35005
116	10.340	0.00229767	0.1148325	520.00	1.45969
117	10.440	0.00229753	0.1140061	520.00	1.57159
118	10.540	0.00229739	0.1131831	520.00	1.68568
119	10.640	0.00229726	0.1123638	520.00	1.80187
120	10.740	0.00229713	0.1115484	520.00	1.92006
121	10.840	0.00229701	0.1107371	520.00	2.04016
122	10.940	0.00229689	0.1099302	520.00	2.16208
123	11.040	0.00229677	0.1091277	520.00	2.28573
124	11.140	0.00229666	0.1083301	520.00	2.41099
125	11.240	0.00229655	0.1075374	520.00	2.53778
126	11.340	0.00229644	0.1067499	520.00	2.66598
127	11.440	0.00229634	0.1059676	520.00	2.79550
128	11.540	0.00229625	0.1051913	520.00	2.92623
129	11.640	0.00229615	0.1044207	520.00	3.05806
130	11.740	0.00229607	0.1036561	520.00	3.19089
131	11.840	0.00229598	0.1028977	520.00	3.32459
132	11.940	0.00229590	0.1021459	520.00	3.45907
133	12.040	0.00229583	0.1014007	520.00	3.59421
134	12.140	0.00229576	0.1006623	520.00	3.72989
135	12.240	0.00229570	0.0999311	520.00	3.86602
136	12.340	0.00229564	0.0992050	520.00	4.00247
137	12.440	0.00229558	0.0984876	520.00	4.13915
138	12.540	0.00229553	0.0977789	520.00	4.27594
139	12.640	0.00229548	0.0970749	520.00	4.41273
140	12.740	0.00229544	0.0963775	520.00	4.54941
141	12.840	0.00229541	0.0956884	520.00	4.68589
142	12.940	0.00229538	0.0950061	520.00	4.82204
143	13.040	0.00229535	0.0943311	520.00	4.95778
144	13.140	0.00229533	0.0936634	520.00	5.09299
145	13.240	0.00229532	0.0930030	520.00	5.22758
146	13.340	0.00229531	0.0923497	520.00	5.36144
147	13.440	0.00229531	0.0917040	520.00	5.49448
148	13.490	0.00229531	0.0913842	520.00	5.56065
149	13.590	0.00229531	0.0907498	520.00	5.69227
150	13.690	0.00229532	0.0901225	520.00	5.82283
151	13.790	0.00229533	0.0895031	520.00	5.95223
152	13.890	0.00229535	0.0888913	520.00	6.08039
153	13.990	0.00229538	0.0882870	520.00	6.20721
154	14.090	0.00229541	0.0876905	520.00	6.33262
155	14.190	0.00229545	0.0871016	520.00	6.45652
156	14.290	0.00229549	0.0865202	520.00	6.57885
157	14.390	0.00229554	0.0859465	520.00	6.69952
158	14.490	0.00229559	0.0853802	520.00	6.81846
159	14.590	0.00229565	0.0848213	520.00	6.93560
160	14.690	0.00229571	0.0842699	520.00	7.05087
161	14.790	0.00229578	0.0837258	520.00	7.16421
162	14.890	0.00229586	0.0831891	520.00	7.27555
163	14.990	0.00229594	0.0826595	520.00	7.38484
164	15.090	0.00229602	0.0821373	520.00	7.49202
165	15.190	0.00229611	0.0816221	520.00	7.59702
166	15.290	0.00229621	0.0811141	520.00	7.69982
167	15.390	0.00229631	0.0806132	520.00	7.80035
168	15.490	0.00229642	0.0801193	520.00	7.89857
169	15.590	0.00229653	0.0796324	520.00	7.99444
170	15.690	0.00229665	0.0791525	520.00	8.08791
171	15.790	0.00229678	0.0786794	520.00	8.17896
172	15.890	0.00229691	0.0782132	520.00	8.26755
173	15.990	0.00229704	0.0777537	520.00	8.35364
174	16.090	0.00229718	0.0773011	520.00	8.43721
175	16.190	0.00229733	0.0768551	520.00	8.51824
176	16.290	0.00229748	0.0764157	520.00	8.59668
177	16.390	0.00229763	0.0759828	520.00	8.67254
178	16.490	0.00229779	0.0755564	520.00	8.74578
179	16.590	0.00229796	0.0751365	520.00	8.81639
180	16.690	0.00229813	0.0747228	520.00	8.88436
181	16.790	0.00229830	0.0743155	520.00	8.94967
182	16.890	0.00229849	0.0739143	520.00	9.01232
183	16.990	0.00229867	0.0735192	520.00	9.07229
184	17.090	0.00229886	0.0731302	520.00	9.12959
185	17.190	0.00229906	0.0727472	520.00	9.18420
186	17.290	0.00229926	0.0723701	520.00	9.23613
187	17.390	0.00229946	0.0719988	520.00	9.28537
188	17.490	0.00229967	0.0716333	520.00	9.33194
189	17.590	0.00229989	0.0712735	520.00	9.37582
190	17.690	0.00230010	0.0709193	520.00	9.41703
191	17.790	0.00230033	0.0705707	520.00	9.45558
192	17.890	0.00230055	0.0702277	520.00	9.49147
193	17.990	0.00230079	0.0698900	520.00	9.52470
194	18.090	0.00230102	0.0695577	520.00	9.55530
195	18.190	0.00230126	0.0692307	520.00	9.58328
196	18.290	0.00230151	0.0689089	520.00	9.60864
197	18.390	0.00230176	0.0685922	520.00	9.63140
198	18.490	0.00230201	0.0682807	520.00	9.65158
199	18.590	0.00230226	0.0679742	520.00	9.66920
200	18.690	0.00230252	0.0676727	520.00	9.68426
201	18.790	0.00230279	0.0673761	520.00	9.69680
202	18.890	0.00230306	0.0670844	520.00	9.70683
203	18.990	0.00230333	0.0667974	520.00	9.71436
204	19.090	0.00230360	0.0665152	520.00	9.71943
205	19.190	0.00230388	0.0662376	520.00	9.72205
206	19.290	0.00230416	0.0659647	520.00	9.72225

207	19.390	0.00230444	0.0656962	520.00	9.72004
208	19.490	0.00230473	0.0654322	520.00	9.71546
209	19.590	0.00230502	0.0651727	520.00	9.70852
210	19.690	0.00230532	0.0649174	520.00	9.69926
211	19.790	0.00230561	0.0646665	520.00	9.68769
212	19.890	0.00230591	0.0644198	520.00	9.67384
213	19.990	0.00230621	0.0641772	520.00	9.65775
214	20.090	0.00230652	0.0639387	520.00	9.63942
215	20.190	0.00230682	0.0637043	520.00	9.61891
216	20.290	0.00230713	0.0634738	520.00	9.59622
217	20.390	0.00230745	0.0632473	520.00	9.57139
218	20.490	0.00230776	0.0630246	520.00	9.54444
219	20.590	0.00230808	0.0628058	520.00	9.51541
220	20.690	0.00230839	0.0625908	520.00	9.48432
221	20.790	0.00230871	0.0623796	520.00	9.45120
222	20.890	0.00230904	0.0621720	520.00	9.41608
223	20.990	0.00230936	0.0619680	520.00	9.37899
224	21.090	0.00230968	0.0617677	520.00	9.33998
225	21.190	0.00231001	0.0615709	520.00	9.29899
226	21.290	0.00231034	0.0613776	520.00	9.25615
227	21.390	0.00231067	0.0611877	520.00	9.21146
228	21.490	0.00231100	0.0610012	520.00	9.16493
229	21.590	0.00231133	0.0608181	520.00	9.11660
230	21.690	0.00231166	0.0606382	520.00	9.06650
231	21.790	0.00231199	0.0604616	520.00	9.01467
232	21.890	0.00231233	0.0602882	520.00	8.96112
233	21.990	0.00231266	0.0601180	520.00	8.90588
234	22.090	0.00231300	0.0599509	520.00	8.84900
235	22.190	0.00231333	0.0597868	520.00	8.79049
236	22.290	0.00231367	0.0596257	520.00	8.73039
237	22.390	0.00231401	0.0594676	520.00	8.66872
238	22.490	0.00231434	0.0593125	520.00	8.60551
239	22.590	0.00231468	0.0591603	520.00	8.54080
240	22.690	0.00231501	0.0590110	520.00	8.47460
241	22.790	0.00231535	0.0588646	520.00	8.40696
242	22.890	0.00231569	0.0587209	520.00	8.33789
243	22.990	0.00231602	0.0585800	520.00	8.26743
244	23.090	0.00231636	0.0584419	520.00	8.19560
245	23.190	0.00231669	0.0583065	520.00	8.12244
246	23.290	0.00231702	0.0581737	520.00	8.04796
247	23.390	0.00231736	0.0580435	520.00	7.97221
248	23.490	0.00231769	0.0579160	520.00	7.89519
249	23.590	0.00231802	0.0577910	520.00	7.81696
250	23.690	0.00231835	0.0576685	520.00	7.73752
251	23.790	0.00231867	0.0575485	520.00	7.65692
252	23.890	0.00231900	0.0574309	520.00	7.57517
253	23.990	0.00231933	0.0573158	520.00	7.49230
254	24.090	0.00231965	0.0572031	520.00	7.40835
255	24.190	0.00231997	0.0570926	520.00	7.32333
256	24.290	0.00232029	0.0569845	520.00	7.23728
257	24.390	0.00232061	0.0568787	520.00	7.15022
258	24.490	0.00232093	0.0567752	520.00	7.06218
259	24.590	0.00232124	0.0566739	520.00	6.97318
260	24.690	0.00232155	0.0565748	520.00	6.88326
261	24.790	0.00232186	0.0564779	520.00	6.79243
262	24.890	0.00232217	0.0563831	520.00	6.70073
263	24.990	0.00232247	0.0562905	520.00	6.60817
264	25.090	0.00232277	0.0562000	520.00	6.51479
265	25.190	0.00232307	0.0561115	520.00	6.42061
266	25.290	0.00232337	0.0560252	520.00	6.32565
267	25.390	0.00232366	0.0559408	520.00	6.22994
268	25.490	0.00232395	0.0558584	520.00	6.13351
269	25.590	0.00232424	0.0557780	520.00	6.03639
270	25.690	0.00232452	0.0556996	520.00	5.93858
271	25.790	0.00232480	0.0556230	520.00	5.84013
272	25.890	0.00232508	0.0555484	520.00	5.74105
273	25.990	0.00232536	0.0554756	520.00	5.64137
274	26.090	0.00232563	0.0554046	520.00	5.54112
275	26.190	0.00232589	0.0553355	520.00	5.44031
276	26.290	0.00232616	0.0552681	520.00	5.33897
277	26.390	0.00232641	0.0552026	520.00	5.23713
278	26.490	0.00232667	0.0551387	520.00	5.13481
279	26.590	0.00232692	0.0550767	520.00	5.03204
280	26.690	0.00232717	0.0550163	520.00	4.92883
281	26.790	0.00232741	0.0549576	520.00	4.82520
282	26.890	0.00232765	0.0549006	520.00	4.72120
283	26.990	0.00232789	0.0548452	520.00	4.61682
284	27.090	0.00232812	0.0547914	520.00	4.51211
285	27.190	0.00232834	0.0547393	520.00	4.40708
286	27.290	0.00232856	0.0546887	520.00	4.30175
287	27.390	0.00232878	0.0546397	520.00	4.19614
288	27.490	0.00232899	0.0545923	520.00	4.09029
289	27.590	0.00232920	0.0545463	520.00	3.98421
290	27.690	0.00232940	0.0545019	520.00	3.87791
291	27.790	0.00232960	0.0544589	520.00	3.77144
292	27.890	0.00232979	0.0544174	520.00	3.66480
293	27.990	0.00232998	0.0543774	520.00	3.55802
294	28.090	0.00233016	0.0543387	520.00	3.45112
295	28.190	0.00233034	0.0543015	520.00	3.34412
296	28.290	0.00233051	0.0542656	520.00	3.23704
297	28.390	0.00233068	0.0542311	520.00	3.12991
298	28.490	0.00233084	0.0541979	520.00	3.02274

DATA POINT	TIME (SECS)	ANGLE-OF-ATTACK RATE (RADIAN/SEC)	ALTITUDE (FT)	ALTITUDE RATE (FT/SEC)	ALT. ACCEL. (FT/SEC**2)	VERT. ACCEL. (FT/SEC**2)	ELEV. DEFLECT. (RADIANS)
1	0.0	-0.003801821	1000.00	0.01	0.89	0.0	0.0
2	0.010	-0.003770723	1000.00	0.02	0.91	0.0	0.0
3	0.020	-0.003739628	1000.00	0.03	0.93	0.0	0.0
4	0.030	-0.003708538	1000.00	0.04	0.96	0.0	0.0
5	0.040	-0.003677455	1000.00	0.04	0.98	0.0	0.0
6	0.060	-0.003615318	1000.00	0.06	1.02	0.0	0.0
7	0.080	-0.003553238	1000.00	0.09	1.06	0.0	0.0
8	0.100	-0.003491232	1000.01	0.11	1.11	0.0	0.0
9	0.120	-0.003429318	1000.01	0.13	1.15	0.0	0.0
10	0.140	-0.003367517	1000.01	0.15	1.19	0.0	0.0
11	0.180	-0.003244322	1000.02	0.20	1.28	0.0	0.0
12	0.220	-0.003121794	1000.03	0.26	1.36	0.0	0.0
13	0.260	-0.003000078	1000.04	0.31	1.45	0.0	0.0
14	0.300	-0.002879321	1000.05	0.37	1.53	0.0	0.0
15	0.340	-0.002759664	1000.07	0.43	1.61	0.0	0.0
16	0.420	-0.002524218	1000.11	0.57	1.78	0.0	0.0
17	0.500	-0.002294846	1000.16	0.72	1.94	0.0	0.0
18	0.580	-0.002072619	1000.22	0.88	2.11	0.0	0.0
19	0.660	-0.001858561	1000.30	1.06	2.27	0.0	0.0
20	0.740	-0.001653645	1000.39	1.24	2.42	0.0	0.0
21	0.840	-0.001411747	1000.53	1.50	2.62	0.0	0.0
22	0.940	-0.001187215	1000.69	1.77	2.80	0.0	0.0
23	1.040	-0.000981535	1000.88	2.06	2.99	0.0	0.0
24	1.140	-0.000796013	1001.10	2.36	3.17	0.0	0.0
25	1.240	-0.000631768	1001.36	2.69	3.34	0.0	0.0
26	1.340	-0.000489720	1001.64	3.03	3.51	0.0	0.0
27	1.440	-0.000370563	1001.96	3.39	3.67	0.0	0.0
28	1.540	-0.000274867	1002.32	3.76	3.82	0.0	0.0
29	1.640	-0.000202971	1002.72	4.15	3.97	0.0	0.0
30	1.740	-0.000154686	1003.15	4.56	4.12	0.0	0.0
31	1.840	-0.000130200	1003.63	4.98	4.25	0.0	0.0
32	1.940	-0.000129105	1004.15	5.41	4.38	0.0	0.0
33	2.040	-0.000150899	1004.71	5.85	4.50	0.0	0.0

34	2.140	-0.000194902	1005.32	6.31	4.62	0.0	0.0
35	2.240	-0.000260266	1005.97	6.78	4.73	0.0	0.0
36	2.340	-0.000345988	1006.68	7.26	4.82	0.0	0.0
37	2.440	-0.000450923	1007.43	7.74	4.92	0.0	0.0
38	2.540	-0.000573807	1008.23	8.24	5.00	0.0	0.0
39	2.640	-0.000713267	1009.07	8.74	5.07	0.0	0.0
40	2.740	-0.000867841	1009.97	9.25	5.14	0.0	0.0
41	2.840	-0.001035999	1010.92	9.77	5.20	0.0	0.0
42	2.940	-0.001216162	1011.93	10.29	5.25	0.0	0.0
43	3.040	-0.001406716	1012.98	10.82	5.29	0.0	0.0
44	3.140	-0.001606035	1014.09	11.35	5.32	0.0	0.0
45	3.240	-0.001812500	1015.25	11.88	5.35	0.0	0.0
46	3.340	-0.002024513	1016.47	12.42	5.37	0.0	0.0
47	3.440	-0.002240515	1017.74	12.96	5.37	0.0	0.0
48	3.540	-0.002459004	1019.06	13.49	5.37	0.0	0.0
49	3.640	-0.002678546	1020.44	14.03	5.37	0.0	0.0
50	3.740	-0.002897789	1021.87	14.57	5.35	0.0	0.0
51	3.840	-0.003115474	1023.35	15.10	5.32	0.0	0.0
52	3.940	-0.003330448	1024.89	15.63	5.29	0.0	0.0
53	4.040	-0.003541665	1026.48	16.16	5.25	0.0	0.0
54	4.140	-0.003748201	1028.12	16.68	5.20	0.0	0.0
55	4.240	-0.003949246	1029.81	17.20	5.15	0.0	0.0
56	4.340	-0.004144132	1031.56	17.71	5.08	0.0	0.0
57	4.440	-0.004332293	1033.35	18.22	5.01	0.0	0.0
58	4.540	-0.004513303	1035.20	18.71	4.93	0.0	0.0
59	4.640	-0.004686852	1037.10	19.20	4.84	0.0	0.0
60	4.740	-0.004852751	1039.04	19.68	4.75	0.0	0.0
61	4.840	-0.005010920	1041.03	20.15	4.65	0.0	0.0
62	4.940	-0.005161386	1043.07	20.61	4.55	0.0	0.0
63	5.040	-0.005304272	1045.15	21.06	4.43	0.0	0.0
64	5.140	-0.005439763	1047.28	21.50	4.32	0.0	0.0
65	5.240	-0.005568237	1049.45	21.92	4.19	0.0	0.0
66	5.340	-0.005689965	1051.67	22.34	4.06	0.0	0.0
67	5.440	-0.005805393	1053.92	22.74	3.93	0.0	0.0
68	5.540	-0.005914982	1056.21	23.12	3.79	0.0	0.0
69	5.640	-0.006019230	1058.54	23.49	3.64	0.0	0.0
70	5.740	-0.006118657	1060.91	23.85	3.50	0.0	0.0
71	5.840	-0.006213794	1063.31	24.19	3.34	0.0	0.0
72	5.940	-0.006305177	1065.75	24.52	3.18	0.0	0.0
73	6.040	-0.006393330	1068.22	24.83	3.02	0.0	0.0
74	6.140	-0.006478762	1070.71	25.12	2.86	0.0	0.0
75	6.240	-0.006561954	1073.24	25.40	2.69	0.0	0.0
76	6.340	-0.006643352	1075.79	25.66	2.51	0.0	0.0
77	6.440	-0.006723363	1078.37	25.90	2.34	0.0	0.0
78	6.540	-0.006802344	1080.97	26.13	2.16	0.0	0.0
79	6.640	-0.006880604	1083.60	26.33	1.98	0.0	0.0
80	6.740	-0.006958394	1086.24	26.52	1.79	0.0	0.0
81	6.840	-0.007035908	1088.90	26.69	1.61	0.0	0.0
82	6.940	-0.007113281	1091.58	26.84	1.42	0.0	0.0
83	7.040	-0.007190589	1094.27	26.98	1.23	0.0	0.0
84	7.140	-0.007267850	1096.97	27.09	1.04	0.0	0.0
85	7.240	-0.007345023	1099.69	27.18	0.85	0.0	0.0
86	7.340	-0.007422015	1102.41	27.26	0.66	0.0	0.0
87	7.440	-0.007498685	1105.14	27.32	0.46	0.0	0.0
88	7.540	-0.007574829	1107.87	27.35	0.27	0.0	0.0
89	7.640	-0.007650227	1110.61	27.37	0.07	0.0	0.0
90	7.740	-0.007724607	1113.34	27.37	-0.12	0.0	0.0
91	7.840	-0.007797669	1116.08	27.35	-0.32	0.0	0.0
92	7.940	-0.007869088	1118.81	27.30	-0.51	0.0	0.0
93	8.040	-0.007938525	1121.54	27.24	-0.71	0.0	0.0
94	8.140	-0.008005623	1124.26	27.16	-0.90	0.0	0.0
95	8.240	-0.008070030	1126.97	27.06	-1.09	0.0	0.0
96	8.340	-0.008131384	1129.67	26.94	-1.29	0.0	0.0
97	8.440	-0.008189337	1132.36	26.81	-1.48	0.0	0.0
98	8.540	-0.008243551	1135.03	26.65	-1.67	0.0	0.0
99	8.640	-0.008293708	1137.69	26.47	-1.86	0.0	0.0
100	8.740	-0.008339513	1140.33	26.28	-2.05	0.0	0.0
101	8.840	-0.008380697	1142.94	26.06	-2.23	0.0	0.0
102	8.940	-0.008417023	1145.54	25.83	-2.42	0.0	0.0
103	9.040	-0.008448288	1148.11	25.58	-2.60	0.0	0.0
104	9.140	-0.008474328	1150.65	25.31	-2.79	0.0	0.0
105	9.240	-0.008495010	1153.17	25.02	-2.97	0.0	0.0
106	9.340	-0.008510262	1155.66	24.72	-3.15	0.0	0.0
107	9.440	-0.008520004	1158.11	24.39	-3.32	0.0	0.0
108	9.540	-0.008524260	1160.54	24.05	-3.50	0.0	0.0
109	9.640	-0.008523050	1162.92	23.69	-3.67	0.0	0.0
110	9.740	-0.008516444	1165.27	23.32	-3.84	0.0	0.0
111	9.840	-0.008504551	1167.59	22.93	-4.00	0.0	0.0
112	9.940	-0.008487508	1169.86	22.52	-4.17	0.0	0.0
113	10.040	-0.008465486	1172.09	22.09	-4.33	0.0	0.0
114	10.140	-0.008438691	1174.28	21.65	-4.49	0.0	0.0
115	10.240	-0.008407340	1176.42	21.20	-4.64	0.0	0.0
116	10.340	-0.008371681	1178.52	20.72	-4.80	0.0	0.0
117	10.440	-0.008331976	1180.56	20.24	-4.95	0.0	0.0
118	10.540	-0.008288503	1182.56	19.73	-5.09	0.0	0.0
119	10.640	-0.008241547	1184.51	19.22	-5.24	0.0	0.0
120	10.740	-0.008191399	1186.41	18.69	-5.38	0.0	0.0
121	10.840	-0.008138353	1188.25	18.14	-5.52	0.0	0.0
122	10.940	-0.008082701	1190.03	17.58	-5.65	0.0	0.0
123	11.040	-0.008024729	1191.76	17.01	-5.78	0.0	0.0
124	11.140	-0.007964718	1193.44	16.43	-5.91	0.0	0.0
125	11.240	-0.007902933	1195.05	15.83	-6.03	0.0	0.0
126	11.340	-0.007839629	1196.60	15.22	-6.16	0.0	0.0
127	11.440	-0.007775044	1198.05	14.60	-6.27	0.0	0.0
128	11.540	-0.007709398	1199.52	13.97	-6.39	0.0	0.0
129	11.640	-0.007642892	1200.89	13.32	-6.50	0.0	0.0
130	11.740	-0.007575705	1202.18	12.67	-6.61	0.0	0.0
131	11.840	-0.007507997	1203.42	12.00	-6.71	0.0	0.0
132	11.940	-0.007439905	1204.58	11.32	-6.81	0.0	0.0
133	12.040	-0.007371546	1205.68	10.64	-6.91	0.0	0.0
134	12.140	-0.007303013	1206.71	9.94	-7.00	0.0	0.0
135	12.240	-0.007234382	1207.67	9.24	-7.09	0.0	0.0
136	12.340	-0.007165706	1208.56	8.52	-7.18	0.0	0.0
137	12.440	-0.007097021	1209.38	7.80	-7.26	0.0	0.0
138	12.540	-0.007028347	1210.12	7.07	-7.34	0.0	0.0
139	12.640	-0.006959687	1210.75	6.33	-7.41	0.0	0.0
140	12.740	-0.006891031	1211.39	5.59	-7.48	0.0	0.0
141	12.840	-0.006822358	1211.91	4.84	-7.55	0.0	0.0
142	12.940	-0.006753638	1212.35	4.08	-7.62	0.0	0.0
143	13.040	-0.006684831	1212.72	3.32	-7.68	0.0	0.0
144	13.140	-0.006615895	1213.02	2.54	-7.73	0.0	0.0
145	13.240	-0.006546782	1213.23	1.77	-7.78	0.0	0.0
146	13.340	-0.006477446	1213.37	0.99	-7.83	0.0	0.0
147	13.440	-0.006407839	1213.43	0.20	-7.88	0.0	0.0
148	13.490	-0.006372920	1213.43	-0.19	-7.90	0.0	0.0
149	13.590	-0.006302825	1213.37	-0.98	-7.94	0.0	0.0
150	13.690	-0.006232358	1213.23	-1.78	-7.97	0.0	0.0
151	13.790	-0.006161489	1213.01	-2.58	-8.01	0.0	0.0
152	13.890	-0.006090194	1212.72	-3.38	-8.03	0.0	0.0
153	13.990	-0.006018462	1212.34	-4.19	-8.06	0.0	0.0
154	14.090	-0.005946288	1211.88	-4.99	-8.08	0.0	0.0
155	14.190	-0.005873682	1211.34	-5.80	-8.10	0.0	0.0
156	14.290	-0.005800660	1210.72	-6.61	-8.11	0.0	0.0
157	14.390	-0.005727263	1210.02	-7.42	-8.12	0.0	0.0
158	14.490	-0.005653502	1209.23	-8.24	-8.13	0.0	0.0
159	14.590	-0.005579458	1208.37	-9.05	-8.13	0.0	0.0
160	14.690	-0.005505185	1207.42	-9.86	-8.13	0.0	0.0
161	14.790	-0.005430784	1206.40	-10.67	-8.12	0.0	0.0
162	14.890	-0.005356247	1205.25	-11.49	-8.12	0.0	0.0
163	14.990	-0.005281751	1204.10	-12.30	-8.10	0.0	0.0
164	15.090	-0.005207364	1202.83	-13.11	-8.09	0.0	0.0
165	15.190	-0.005133185	1201.48	-13.91	-8.07	0.0	0.0

166	16.290	-0.005059319	1200.08	-14.72	-8.05	0.0	0.0
167	16.390	-0.004988874	1198.64	-15.52	-8.02	0.0	0.0
168	16.490	-0.004912958	1196.94	-16.32	-7.99	0.0	0.0
169	16.590	-0.004840676	1195.27	-17.12	-7.96	0.0	0.0
170	16.690	-0.004769134	1193.62	-17.92	-7.92	0.0	0.0
171	16.790	-0.004698431	1191.65	-18.71	-7.88	0.0	0.0
172	16.890	-0.004628661	1189.78	-19.49	-7.84	0.0	0.0
173	16.990	-0.004559910	1187.79	-20.28	-7.80	0.0	0.0
174	16.090	-0.004492255	1185.72	-21.05	-7.75	0.0	0.0
175	16.193	-0.004425764	1183.88	-21.82	-7.70	0.0	0.0
176	16.290	-0.004360491	1181.36	-22.59	-7.64	0.0	0.0
177	16.390	-0.004296480	1179.06	-23.35	-7.58	0.0	0.0
178	16.490	-0.004233758	1176.65	-24.11	-7.52	0.0	0.0
179	16.590	-0.004172341	1174.24	-24.86	-7.46	0.0	0.0
180	16.690	-0.004112227	1171.72	-25.60	-7.39	0.0	0.0
181	16.790	-0.004053402	1169.12	-26.33	-7.32	0.0	0.0
182	16.890	-0.003995834	1166.45	-27.06	-7.24	0.0	0.0
183	16.990	-0.003939478	1163.71	-27.78	-7.17	0.0	0.0
184	17.090	-0.003884274	1160.89	-28.50	-7.09	0.0	0.0
185	17.190	-0.003830147	1158.01	-29.20	-7.01	0.0	0.0
186	17.290	-0.003777011	1155.05	-29.90	-6.92	0.0	0.0
187	17.390	-0.003724767	1152.03	-30.58	-6.83	0.0	0.0
188	17.490	-0.003673307	1148.94	-31.26	-6.74	0.0	0.0
189	17.590	-0.003622512	1145.78	-31.93	-6.65	0.0	0.0
190	17.690	-0.003572259	1142.55	-32.59	-6.56	0.0	0.0
191	17.790	-0.003522419	1139.26	-33.24	-6.46	0.0	0.0
192	17.890	-0.003472861	1135.90	-33.88	-6.36	0.0	0.0
193	17.990	-0.003423452	1132.48	-34.52	-6.26	0.0	0.0
194	18.090	-0.003374064	1129.00	-35.14	-6.15	0.0	0.0
195	18.190	-0.003324571	1125.46	-35.75	-6.04	0.0	0.0
196	18.290	-0.003274856	1121.86	-36.34	-5.93	0.0	0.0
197	18.390	-0.003224810	1118.19	-36.93	-5.82	0.0	0.0
198	18.490	-0.003174336	1114.47	-37.51	-5.71	0.0	0.0
199	18.590	-0.003123353	1110.69	-38.07	-5.59	0.0	0.0
200	18.690	-0.003071793	1106.85	-38.63	-5.47	0.0	0.0
201	18.790	-0.003019609	1102.96	-39.17	-5.35	0.0	0.0
202	18.890	-0.002966772	1099.02	-39.70	-5.23	0.0	0.0
203	18.990	-0.002913277	1095.02	-40.21	-5.11	0.0	0.0
204	19.090	-0.002859139	1090.98	-40.72	-4.98	0.0	0.0
205	19.190	-0.002804397	1086.88	-41.21	-4.85	0.0	0.0
206	19.290	-0.002749114	1082.73	-41.69	-4.72	0.0	0.0
207	19.390	-0.002693378	1078.54	-42.15	-4.59	0.0	0.0
208	19.490	-0.002637297	1074.30	-42.61	-4.46	0.0	0.0
209	19.590	-0.002581006	1070.02	-43.05	-4.32	0.0	0.0
210	19.690	-0.002524658	1065.70	-43.47	-4.19	0.0	0.0
211	19.790	-0.002468429	1061.33	-43.88	-4.05	0.0	0.0
212	19.890	-0.002412511	1056.92	-44.28	-3.91	0.0	0.0
213	19.990	-0.002357111	1052.47	-44.66	-3.77	0.0	0.0
214	20.090	-0.002302450	1047.99	-45.03	-3.63	0.0	0.0
215	20.190	-0.002248757	1043.47	-45.39	-3.48	0.0	0.0
216	20.290	-0.002196268	1038.91	-45.73	-3.34	0.0	0.0
217	20.390	-0.002145220	1034.32	-46.06	-3.19	0.0	0.0
218	20.490	-0.002095850	1029.70	-46.37	-3.05	0.0	0.0
219	20.590	-0.002048385	1025.05	-46.67	-2.90	0.0	0.0
220	20.690	-0.002003045	1020.37	-46.95	-2.75	0.0	0.0
221	20.790	-0.001960034	1015.66	-47.22	-2.60	0.0	0.0
222	20.890	-0.001919537	1010.92	-47.47	-2.45	0.0	0.0
223	20.990	-0.001881714	1006.16	-47.71	-2.30	0.0	0.0
224	21.090	-0.001846731	1001.38	-47.93	-2.14	0.0	0.0
225	21.190	-0.001814598	996.56	-48.13	-1.99	0.0	0.0
226	21.290	-0.001785475	991.76	-48.33	-1.84	0.0	0.0
227	21.390	-0.001759362	986.91	-48.50	-1.68	0.0	0.0
228	21.490	-0.001736248	982.06	-48.66	-1.53	0.0	0.0
229	21.590	-0.001716081	977.18	-48.81	-1.37	0.0	0.0
230	21.690	-0.001698764	972.29	-48.94	-1.21	0.0	0.0
231	21.790	-0.001684157	967.40	-49.05	-1.06	0.0	0.0
232	21.890	-0.001672074	962.49	-49.15	-0.90	0.0	0.0
233	21.990	-0.001662286	957.57	-49.23	-0.74	0.0	0.0
234	22.090	-0.001654518	952.64	-49.30	-0.58	0.0	0.0
235	22.190	-0.001648458	947.71	-49.35	-0.43	0.0	0.0
236	22.290	-0.001643755	942.77	-49.38	-0.27	0.0	0.0
237	22.390	-0.001640025	937.83	-49.40	-0.11	0.0	0.0
238	22.490	-0.001636852	932.89	-49.40	0.05	0.0	0.0
239	22.590	-0.001633798	927.95	-49.39	0.21	0.0	0.0
240	22.690	-0.001630404	923.01	-49.36	0.37	0.0	0.0
241	22.790	-0.001626200	918.08	-49.32	0.52	0.0	0.0
242	22.890	-0.001620711	913.15	-49.26	0.68	0.0	0.0
243	22.990	-0.001613462	908.23	-49.18	0.84	0.0	0.0
244	23.090	-0.001603989	903.32	-49.09	1.00	0.0	0.0
245	23.190	-0.001591846	898.41	-48.98	1.16	0.0	0.0
246	23.290	-0.001576610	893.52	-48.86	1.31	0.0	0.0
247	23.390	-0.001557893	888.64	-48.72	1.47	0.0	0.0
248	23.490	-0.001535349	883.78	-48.56	1.63	0.0	0.0
249	23.590	-0.001508680	878.93	-48.39	1.78	0.0	0.0
250	23.690	-0.001477646	874.10	-48.21	1.94	0.0	0.0
251	23.790	-0.001442068	869.29	-48.00	2.09	0.0	0.0
252	23.890	-0.001401840	864.50	-47.79	2.25	0.0	0.0
253	23.990	-0.001356928	859.73	-47.56	2.40	0.0	0.0
254	24.090	-0.001307383	854.99	-47.31	2.55	0.0	0.0
255	24.190	-0.001253329	850.27	-47.05	2.70	0.0	0.0
256	24.290	-0.001194991	845.58	-46.77	2.85	0.0	0.0
257	24.390	-0.001132674	840.92	-46.47	3.00	0.0	0.0
258	24.490	-0.001066774	836.29	-46.17	3.15	0.0	0.0
259	24.590	-0.000997774	831.69	-45.84	3.30	0.0	0.0
260	24.690	-0.000926245	827.12	-45.51	3.45	0.0	0.0
261	24.790	-0.000852542	822.58	-45.16	3.59	0.0	0.0
262	24.890	-0.000778297	818.05	-44.79	3.74	0.0	0.0
263	24.990	-0.000703415	813.63	-44.41	3.88	0.0	0.0
264	25.090	-0.000629071	809.21	-44.01	4.02	0.0	0.0
265	25.190	-0.000556195	804.83	-43.60	4.16	0.0	0.0
266	25.290	-0.000485768	800.49	-43.18	4.30	0.0	0.0
267	25.390	-0.000418811	796.19	-42.74	4.44	0.0	0.0
268	25.490	-0.000356373	791.94	-42.29	4.58	0.0	0.0
269	25.590	-0.000299520	787.73	-41.83	4.71	0.0	0.0
270	25.690	-0.000249324	783.57	-41.35	4.84	0.0	0.0
271	25.790	-0.000206849	779.46	-40.86	4.98	0.0	0.0
272	25.890	-0.000173139	775.40	-40.36	5.11	0.0	0.0
273	25.990	-0.000149201	771.39	-39.84	5.24	0.0	0.0
274	26.090	-0.000136303	767.43	-39.31	5.36	0.0	0.0
275	26.190	-0.000134447	763.53	-38.77	5.49	0.0	0.0
276	26.290	-0.000145366	759.68	-38.21	5.61	0.0	0.0
277	26.390	-0.000169511	755.89	-37.64	5.73	0.0	0.0
278	26.490	-0.000207535	752.15	-37.06	5.85	0.0	0.0
279	26.590	-0.000259993	748.46	-36.47	5.97	0.0	0.0
280	26.690	-0.000327314	744.84	-35.87	6.09	0.0	0.0
281	26.790	-0.000409522	741.30	-35.26	6.20	0.0	0.0
282	26.890	-0.000507702	737.81	-34.63	6.31	0.0	0.0
283	26.990	-0.000621008	734.38	-33.99	6.42	0.0	0.0
284	27.090	-0.000749859	731.01	-33.34	6.53	0.0	0.0
285	27.190	-0.000893431	727.71	-32.69	6.64	0.0	0.0
286	27.290	-0.001051966	724.47	-32.02	6.74	0.0	0.0
287	27.390	-0.001224763	721.30	-31.34	6.84	0.0	0.0
288	27.490	-0.001411187	718.21	-30.65	6.94	0.0	0.0
289	27.590	-0.001610473	715.18	-29.95	7.04	0.0	0.0
290	27.690	-0.001821729	712.22	-29.24	7.14	0.0	0.0
291	27.790	-0.002043949	709.33	-28.52	7.23	0.0	0.0
292	27.890	-0.002276013	706.51	-27.79	7.32	0.0	0.0
293	27.990	-0.002516709	703.77	-27.06	7.41	0.0	0.0
294	28.090	-0.002764735	701.10	-26.31	7.49	0.0	0.0
295	28.190	-0.003018715	698.51	-25.56	7.58	0.0	0.0
296	28.290	-0.003277215	695.99	-24.80	7.66	0.0	0.0
297	28.390	-0.003538754	693.56	-24.03	7.74	0.0	0.0

298	26.490	-3.003801821	691.18	-23.25	7.81	0.0	0.0

NORMAL-TO-FLIGHT-PATH SOLUTION

```
MODEL 12   P0 =  6.3583289643531020D 03   CLA0= -1.6951800515683580D-03
           P1 =  0.0                      CLA =  6.3454654866999950D 00
           P2 =  1.3795998035316530D 03   CLAX= -3.5488566679171570D-01
           P3 = -2.4949221689430780D 00
           P4 =  0.0

FIT ERROR=  7.8784343636517790D 03
```

F L I G H T   P A T H   T R A J E C T O R Y   P R E D I C T I O N

ITERATION # 1

TIME (SEC)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	FLIGHT PATH ANGLE (RADIAN)	ANGLE OF ATTACK (RADIAN)	LIFT COEFFICIENT	DRAG COEFFICIENT	WEIGHT (LBF)	POWER AVAILABLE (FT-LBF/SEC)	ACCELERATION (FT/SEC)
0.0	1.000000 03	1.467350 02	5.143420-05	1.626520-01	1.024260 00	1.066770-01	4.000000 03	1.473290 05	4.664040 00
1.000000-02	1.000000 03	1.467860 02	1.126230-04	1.626710-01	1.024380 00	1.067110-01	4.000000 03	1.473520 05	4.658280 00
2.000000-02	1.000000 03	1.468320 02	1.750380-04	1.626780-01	1.024430 00	1.067240-01	4.000000 03	1.473750 05	4.652470 00
3.000000-02	1.000000 03	1.468750 02	2.389880-04	1.626850-01	1.024470 00	1.067360-01	4.000000 03	1.473970 05	4.646630 00
4.000000-02	1.000000 03	1.469250 02	3.043690-04	1.626920-01	1.024510 00	1.067480-01	4.000000 03	1.474200 05	4.640740 00
6.000000-02	1.000000 03	1.470180 02	4.394140-04	1.627060-01	1.024600 00	1.067730-01	4.000000 03	1.474650 05	4.628840 00
8.000000-02	1.000000 03	1.471100 02	5.801840-04	1.627190-01	1.024680 00	1.067970-01	4.000000 03	1.475100 05	4.616790 00
1.000000-01	1.000010 03	1.472020 02	7.265600-04	1.627320-01	1.024760 00	1.068210-01	4.000000 03	1.475550 05	4.604580 00
1.200000-01	1.000010 03	1.472940 02	8.786300-04	1.627460-01	1.024850 00	1.068440-01	4.000000 03	1.476000 05	4.592210 00
1.400000-01	1.000010 03	1.473860 02	1.036320-03	1.627580-01	1.024930 00	1.068670-01	3.999990 03	1.476450 05	4.579680 00
1.833000-01	1.000020 03	1.475650 02	1.368510-03	1.627830-01	1.025080 00	1.069130-01	3.999990 03	1.477340 05	4.554160 00
2.200000-01	1.000030 03	1.477510 02	1.772960-03	1.628080-01	1.025240 00	1.069570-01	3.999990 03	1.478220 05	4.528030 00
2.600000-01	1.000040 03	1.479310 02	2.099480-03	1.628320-01	1.025390 00	1.070000-01	3.999990 03	1.479090 05	4.501290 00
3.000000-01	1.000060 03	1.481110 02	2.497900-03	1.628550-01	1.025530 00	1.070410-01	3.999990 03	1.479960 05	4.473960 00
3.400000-01	1.000170 03	1.482850 02	2.918020-03	1.628770-01	1.025670 00	1.070820-01	3.999990 03	1.480820 05	4.446040 00
4.200000-01	1.000110 03	1.486420 02	3.822610-03	1.629190-01	1.025930 00	1.071580-01	3.999980 03	1.482520 05	4.388490 00
5.000000-01	1.000160 03	1.489910 02	4.811710-03	1.629580-01	1.026180 00	1.072280-01	3.999980 03	1.484203 05	4.328710 00
5.833000-01	1.000230 03	1.493350 02	5.883710-03	1.629940-01	1.026430 00	1.072920-01	3.999980 03	1.485840 05	4.266780 00
6.660000-01	1.000300 03	1.496740 02	7.036650-03	1.630260-01	1.026600 00	1.073500-01	3.999970 03	1.487460 05	4.202780 00
7.400000-01	1.000350 03	1.500673 02	8.269760-03	1.630540-01	1.026780 00	1.074010-01	3.999970 03	1.489050 05	4.136790 00
8.400000-01	1.000530 03	1.503170 02	9.919670-03	1.630840-01	1.026900 00	1.074550-01	3.999970 03	1.490990 05	4.051630 00
9.400000-01	1.000690 03	1.506180 02	1.168830-02	1.631070-01	1.027110 00	1.074980-01	3.999960 03	1.492880 05	3.963650 00
1.040000 00	1.000980 03	1.512090 02	1.357110-02	1.631240-01	1.027210 00	1.075280-01	3.999960 03	1.494720 05	3.873020 00
1.140000 00	1.001100 03	1.515920 02	1.556470-02	1.631330-01	1.027270 00	1.075460-01	3.999960 03	1.496520 05	3.779890 00
1.240000 00	1.001350 03	1.518630 02	1.766540-02	1.631340-01	1.027290 00	1.075490-01	3.999950 03	1.498260 05	3.684460 00
1.340000 00	1.001640 03	1.523290 02	1.986930-02	1.631300-01	1.027250 00	1.075390-01	3.999950 03	1.499960 05	3.586880 00
1.440000 00	1.001960 03	1.526630 02	2.217230-02	1.631160-01	1.027160 00	1.075140-01	3.999950 03	1.501600 05	3.487350 00
1.540000 00	1.002320 03	1.532260 02	2.457050-02	1.630930-01	1.027020 00	1.074730-01	3.999940 03	1.503190 05	3.386040 00
1.640000 00	1.002710 03	1.533000 02	2.735960-02	1.630620-01	1.026820 00	1.074150-01	3.999940 03	1.504720 05	3.283140 00
1.740000 00	1.003130 03	1.536830 02	2.963540-02	1.630200-01	1.026560 00	1.073400-01	3.999930 03	1.506210 05	3.178840 00
1.840000 00	1.003620 03	1.539560 02	3.229350-02	1.629680-01	1.026240 00	1.072460-01	3.999930 03	1.507640 05	3.073310 00
1.940000 00	1.004140 03	1.542980 02	3.502960-02	1.629060-01	1.025850 00	1.071340-01	3.999930 03	1.509020 05	2.966750 00
2.040000 00	1.004700 03	1.545890 02	3.783910-02	1.628330-01	1.025390 00	1.070020-01	3.999920 03	1.510350 05	2.859340 00
2.140000 00	1.005310 03	1.548690 02	4.071760-02	1.627490-01	1.024870 00	1.068500-01	3.999920 03	1.511620 05	2.751250 00
2.240000 00	1.005970 03	1.551390 02	4.366030-02	1.626533-01	1.024270 00	1.066780-01	3.999920 03	1.512850 05	2.642660 00
2.340000 00	1.006670 03	1.553980 02	4.666280-02	1.625460-01	1.023590 00	1.064850-01	3.999910 03	1.514020 05	2.533730 00
2.440000 00	1.007420 03	1.556460 02	4.972030-02	1.624260-01	1.022850 00	1.062710-01	3.999910 03	1.515130 05	2.424640 00
2.540000 00	1.008210 03	1.558830 02	5.282820-02	1.622930-01	1.022020 00	1.060360-01	3.999900 03	1.516200 05	2.315580 00
2.640000 00	1.009060 03	1.561070 02	5.598190-02	1.621490-01	1.021120 00	1.057800-01	3.999900 03	1.517210 05	2.206610 00
2.740000 00	1.009950 03	1.563240 02	5.917650-02	1.619920-01	1.020143 00	1.055030-01	3.999900 03	1.518180 05	2.098080 00
2.840000 00	1.010910 03	1.565250 02	6.240740-02	1.618230-01	1.019060 00	1.052040-01	3.999890 03	1.519090 05	1.989960 00
2.940000 00	1.011910 03	1.567220 02	6.566990-02	1.616400-01	1.017940 00	1.048840-01	3.999890 03	1.519960 05	1.882350 00
3.040000 00	1.012970 03	1.569060 02	6.895930-02	1.614440-01	1.016710 00	1.045420-01	3.999880 03	1.520770 05	1.775640 00
3.140000 00	1.014080 03	1.570770 02	7.227080-02	1.612350-01	1.015410 00	1.041790-01	3.999880 03	1.521540 05	1.669860 00
3.240000 00	1.015240 03	1.572350 02	7.559970-02	1.610120-01	1.014010 00	1.037940-01	3.999880 03	1.522250 05	1.565160 00
3.340000 00	1.016450 03	1.573900 02	7.894120-02	1.607750-01	1.012530 00	1.033870-01	3.999870 03	1.522920 05	1.461700 00
3.440000 00	1.017720 03	1.575310 02	8.229070-02	1.605240-01	1.010960 00	1.029590-01	3.999870 03	1.523550 05	1.359680 00
3.540000 00	1.019040 03	1.576620 02	8.564350-02	1.602580-01	1.009300 00	1.025090-01	3.999870 03	1.524130 05	1.259020 00
3.640000 00	1.020420 03	1.577830 02	8.899480-02	1.599780-01	1.007550 00	1.020360-01	3.999860 03	1.524660 05	1.160080 00
3.740000 00	1.021850 03	1.578940 02	9.233990-02	1.596840-01	1.005710 00	1.015450-01	3.999860 03	1.525150 05	1.062910 00
3.840000 00	1.023330 03	1.579960 02	9.567420-02	1.593740-01	1.003780 00	1.010320-01	3.999850 03	1.525600 05	9.676860-01
3.940000 00	1.024860 03	1.580880 02	9.899300-02	1.590490-01	1.001750 00	1.004970-01	3.999850 03	1.526000 05	8.744300-01
4.040000 00	1.026450 03	1.581710 02	1.022520-01	1.587090-01	9.996190-01	9.994210-02	3.999850 03	1.526370 05	7.833870-01
4.140000 00	1.028090 03	1.582450 02	1.055060-01	1.583540-01	9.973950-01	9.936650-02	3.999840 03	1.526690 05	6.948620-01
4.240000 00	1.029790 03	1.583100 02	1.088130-01	1.579820-01	9.950740-01	9.877130-02	3.999840 03	1.526980 05	6.081140-01
4.340000 00	1.031530 03	1.583660 02	1.120210-01	1.575960-01	9.926870-01	9.815740-02	3.999830 03	1.527230 05	5.241320-01
4.440000 00	1.033330 03	1.584180 02	1.151940-01	1.571940-01	9.901440-01	9.752560-02	3.999830 03	1.527440 05	4.426940-01
4.540000 00	1.035170 03	1.584550 02	1.183240-01	1.567770-01	9.875380-01	9.687890-02	3.999830 03	1.527610 05	3.638800-01
4.640000 00	1.037070 03	1.584880 02	1.214670-01	1.563450-01	9.848370-01	9.621200-02	3.999820 03	1.527760 05	2.877690-01
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2.669000 01	7.448610 02	2.762230 02	-1.302010-01	5.502580-02	3.469340-01	3.900090-02	3.998910 03	1.741430 05	4.928830 00
2.679000 01	7.413050 02	2.767100 02	-1.277310-01	5.496710-02	3.465620-01	3.899210-02	3.998910 03	1.741060 05	4.825200 00
2.689000 01	7.378110 02	2.771680 02	-1.252340-01	5.491000-02	3.462000-01	3.898350-02	3.998910 03	1.740680 05	4.721200 00
2.699000 01	7.343810 02	2.776550 02	-1.227100-01	5.485460-02	3.458490-01	3.897530-02	3.998900 03	1.740310 05	4.616820 00
2.709000 01	7.310150 02	2.781110 02	-1.201610-01	5.480080-02	3.455080-01	3.896720-02	3.998900 03	1.739930 05	4.512110 00
2.719000 01	7.277140 02	2.785570 02	-1.175870-01	5.474860-02	3.451770-01	3.895940-02	3.998890 03	1.739560 05	4.407080 00
2.729000 01	7.244790 02	2.789920 02	-1.149880-01	5.469800-02	3.448560-01	3.895190-02	3.998890 03	1.739180 05	4.301780 00
2.739000 01	7.213120 02	2.794170 02	-1.123650-01	5.464890-02	3.445460-01	3.894460-02	3.998880 03	1.738810 05	4.196140 00
2.749000 01	7.182130 02	2.798320 02	-1.097190-01	5.460140-02	3.442450-01	3.893750-02	3.998880 03	1.738440 05	4.090290 00
2.759000 01	7.151840 02	2.802350 02	-1.070500-01	5.455540-02	3.439530-01	3.893070-02	3.998870 03	1.738070 05	3.984210 00
2.769000 01	7.122250 02	2.806280 02	-1.043590-01	5.451100-02	3.436710-01	3.892410-02	3.998870 03	1.737700 05	3.877910 00
2.779000 01	7.093380 02	2.810110 02	-1.016470-01	5.446800-02	3.433990-01	3.891770-02	3.998870 03	1.737330 05	3.771440 00
2.789000 01	7.065230 02	2.813830 02	-9.891360-02	5.442640-02	3.431350-01	3.891150-02	3.998860 03	1.736980 05	3.664800 00
2.799000 01	7.037810 02	2.817440 02	-9.616020-02	5.438630-02	3.428810-01	3.890560-02	3.998860 03	1.736620 05	3.558020 00
2.809000 01	7.011130 02	2.820940 02	-9.338710-02	5.434760-02	3.426360-01	3.889990-02	3.998850 03	1.736270 05	3.451120 00
2.819000 01	6.985200 02	2.824340 02	-9.059500-02	5.431030-02	3.424000-01	3.889440-02	3.998850 03	1.735930 05	3.344120 00
2.829000 01	6.960030 02	2.827630 02	-8.778460-02	5.427440-02	3.421720-01	3.888910-02	3.998840 03	1.735590 05	3.237040 00
2.839000 01	6.935620 02	2.830810 02	-8.495620-02	5.423980-02	3.419530-01	3.888400-02	3.998840 03	1.735260 05	3.129910 00
2.849000 01	6.911590 02	2.833890 02	-8.211060-02	5.420660-02	3.417420-01	3.887910-02	3.998840 03	1.734930 05	3.022740 00

COST FUNCTION (J) = 2.1078630137058000D 05
WITH:
ALTITUDE TOLERANCE = 0.8070205654489D-03
FLIGHT-PATH-ANGLE TOLERANCE = 0.4539916296596D-09
FLIGHT-PATH-ANGLE-DERIVATIVE TOLERANCE = 0.8733968663979D-10
WEIGHT TOLERANCE = 0.0
ENERGY TOLERANCE = 0.8071782758138D-03
ANGLE-OF-ATTACK TOLERANCE = 0.0

PREVIOUS COEFFICIENT		1.00*DELTA		NEW COEFFICIENT	
0.28633024263090D 05	+	1.00* 0.10211230D 03	=	0.28735136328650 05	
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
0.11285959342980D 04	+	1.00*-0.19537696D 01	=	0.11266421644630 04	
-0.21787207478630 01	+	1.00* 0.86060767D-02	=	-0.21701146403100 01	
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
-0.34984411863750-01	+	1.00*-0.88337427D-04	=	-0.35072749287360-01	
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
0.13081682733630 01	+	1.00*-0.85243380D-02	=	0.12996058958480 01	
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
0.20027692632310 04	+	1.00* 0.72306632D 01	=	0.20099902914260 04	
-0.28914696423860-02	+	1.00* 0.35127117D-02	=	0.62102640774760-03	
0.63769192449710 01	+	1.00*-0.76963131D-01	=	0.62999561479360 01	
-0.43058634978457D 00	+	1.00* 0.43053079D 00	=	-0.52703069912130-04	

F L I G H T   P A T H   T R A J E C T O R Y   P R E D I C T I O N

ITERATION # 2

TIME (SEC)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	FLIGHT PATH ANGLE (RADIAN)	ANGLE OF ATTACK (RADIAN)	LIFT COEFFICIENT	DRAG COEFFICIENT	WEIGHT (LBF)	POWER AVAILABLE (FT-LBF/SEC)	ACCELERATION (FT/SEC)
0.0	1.000000 03	1.447390 02	0.143420-08	1.626540-01	1.028130 00	1.006870-01	4.000000 03	1.473290 05	4.684040 00
1.000000-02	1.000000 03	1.447860 02	1.143560-06	1.626720-01	1.026250 00	1.006700-01	4.000000 03	1.473420 05	4.686260 00
2.000000-02	1.000000 03	1.448330 02	1.786920-06	1.626760-01	1.026240 00	1.006720-01	4.000000 03	1.473740 05	4.688470 00
3.000000-02	1.000000 03	1.448790 02	2.444460-06	1.626840-01	1.025320 00	1.006730-01	4.000000 03	1.473970 05	4.664630 00
4.000000-02	1.000000 03	1.449280 02	3.116260-06	1.626900-01	1.023360 00	1.006741-01	4.000000 03	1.474200 05	4.644740 00
6.000000-02	1.000000 03	1.470180 02	4.602250-06	1.627020-01	1.024630 00	1.006762-01	4.000000 03	1.474450 05	4.626840 00
8.000000-02	1.000000 03	1.471100 02	6.144700-06	1.627130-01	1.025900 00	1.007820-01	4.000000 03	1.475180 05	4.616790 00
1.000000-01	1.000000 03	1.472020 02	7.443400-06	1.627240-01	1.025580 00	1.006830-01	4.000000 03	1.475650 05	4.604880 00
1.200000-01	1.000010 03	1.472940 02	8.998140-06	1.627360-01	1.028080 00	1.006823-01	4.000000 03	1.476000 05	4.592210 00
1.400000-01	1.000010 03	1.473860 02	1.060870-05	1.627470-01	1.028720 00	1.006630-01	3.999990 03	1.476460 05	4.579680 00
1.600000-01	1.000020 03	1.474690 02	1.196660-05	1.627680-01	1.025850 00	1.006820-01	3.999990 03	1.477340 05	4.554160 00
1.800000-01	1.000030 03	1.477810 02	1.760520-05	1.627890-01	1.026990 00	1.006920-01	3.999990 03	1.478220 05	4.528030 00
2.200000-01	1.000040 03	1.479110 02	2.143280-05	1.628100-01	1.026120 00	1.006970-01	3.999990 03	1.479100 05	4.501290 00
2.600000-01	1.000060 03	1.481130 02	2.647780-05	1.628300-01	1.026240 00	1.006980-01	3.999990 03	1.479960 05	4.473940 00
3.000000-01	1.000070 03	1.482890 02	2.973620-05	1.628490-01	1.026360 00	1.007027-01	3.999990 03	1.480830 05	4.446840 00
3.400000-01	1.000110 03	1.484420 02	3.484030-05	1.628850-01	1.026590 00	1.007090-01	3.999980 03	1.482530 05	4.386490 00
4.200000-01	1.000160 03	1.485910 02	4.084710-05	1.629190-01	1.026800 00	1.007150-01	3.999980 03	1.484210 05	4.326710 00
5.000000-01	1.000230 03	1.493350 02	6.471970-05	1.629490-01	1.026990 00	1.007208-01	3.999980 03	1.485860 05	4.264793 00
6.000000-01	1.000310 03	1.498740 02	7.134970-05	1.629760-01	1.027160 00	1.007260-01	3.999970 03	1.487470 05	4.202780 00
7.400000-01	1.000400 03	1.500070 02	8.377080-05	1.630000-01	1.027310 00	1.007299-01	3.999970 03	1.489040 05	4.136790 00
8.400000-01	1.000540 03	1.504173 02	1.003840-04	1.630240-01	1.027460 00	1.007344-01	3.999970 03	1.491010 05	4.081630 00

9.40000D-01	1.00070D 03	1.50818D 02	1.18168D-02	1.63042D-01	1.02758D 00	1.07377D-01	3.99996D 03	1.49290D 05	3.96368D 00
1.04000D 00	1.00089D 03	1.51209D 02	1.37093D-02	1.63055D-01	1.02760D 00	1.07399D-01	3.99996D 03	1.49475D 05	3.87302D 00
1.14000D 00	1.00112D 03	1.51592D 02	1.57121D-02	1.63060D-01	1.02769D 00	1.07409D-01	3.99996D 03	1.49654D 05	3.77989D 00
1.24000D 00	1.00137D 03	1.51965D 02	1.78214D-02	1.63058D-01	1.02768D 00	1.07406D-01	3.99995D 03	1.49829D 05	3.68446D 00
1.34000D 00	1.00166D 03	1.52326D 02	2.00333D-02	1.63049D-01	1.02762D 00	1.07389D-01	3.99995D 03	1.49999D 05	3.58688D 00
1.44000D 00	1.00198D 03	1.52683D 02	2.23435D-02	1.63032D-01	1.02751D 00	1.07358D-01	3.99995D 03	1.50163D 05	3.48735D 00
1.54000D 00	1.00234D 03	1.53026D 02	2.47492D-02	1.63006D-01	1.02735D 00	1.07311D-01	3.99994D 03	1.50322D 05	3.38604D 00
1.64000D 00	1.00274D 03	1.53360D 02	2.72490D-02	1.62971D-01	1.02713D 00	1.07248D-01	3.99994D 03	1.50476D 05	3.28314D 00
1.74000D 00	1.00318D 03	1.53683D 02	2.98270D-02	1.62927D-01	1.02686D 00	1.07168D-01	3.99993D 03	1.50625D 05	3.17884D 00
1.84000D 00	1.00366D 03	1.53996D 02	3.24910D-02	1.62873D-01	1.02651D 00	1.07070D-01	3.99993D 03	1.50768D 05	3.07331D 00
1.94000D 00	1.00418D 03	1.54298D 02	3.52326D-02	1.62808D-01	1.02611D 00	1.06954D-01	3.99993D 03	1.50907D 05	2.96675D 00
2.04000D 00	1.00474D 03	1.54589D 02	3.80472D-02	1.62733D-01	1.02563D 00	1.06818D-01	3.99992D 03	1.51039D 05	2.85934D 00
2.14000D 00	1.00535D 03	1.54869D 02	4.09304D-02	1.62647D-01	1.02509D 00	1.06663D-01	3.99992D 03	1.51167D 05	2.75125D 00
2.24000D 00	1.00601D 03	1.55139D 02	4.38776D-02	1.62549D-01	1.02447D 00	1.06487D-01	3.99992D 03	1.51290D 05	2.64266D 00
2.34000D 00	1.00672D 03	1.55398D 02	4.68841D-02	1.62439D-01	1.02378D 00	1.06292D-01	3.99991D 03	1.51407D 05	2.53373D 00
2.44000D 00	1.00747D 03	1.55646D 02	4.99483D-02	1.62318D-01	1.02302D 00	1.06075D-01	3.99991D 03	1.51519D 05	2.42464D 00
2.54000D 00	1.00827D 03	1.55883D 02	5.30566D-02	1.62188D-01	1.02218D 00	1.05838D-01	3.99990D 03	1.51625D 05	2.31556D 00
2.64000D 00	1.00912D 03	1.56109D 02	5.62132D-02	1.62039D-01	1.02126D 00	1.05581D-01	3.99990D 03	1.51727D 05	2.20661D 00
2.74000D 00	1.01002D 03	1.56324D 02	5.94105D-02	1.61881D-01	1.02027D 00	1.05302D-01	3.99990D 03	1.51824D 05	2.09800D 00
2.84000D 00	1.01098D 03	1.56529D 02	6.26436D-02	1.61711D-01	1.01919D 00	1.05002D-01	3.99989D 03	1.51916D 05	1.98986D 00
2.94000D 00	1.01198D 03	1.56722D 02	6.59084D-02	1.61527D-01	1.01803D 00	1.04681D-01	3.99989D 03	1.52002D 05	1.88235D 00
3.04000D 00	1.01304D 03	1.56905D 02	6.91995D-02	1.61330D-01	1.01679D 00	1.04338D-01	3.99988D 03	1.52083D 05	1.77564D 00
3.14000D 00	1.01415D 03	1.57077D 02	7.25124D-02	1.61120D-01	1.01547D 00	1.03974D-01	3.99988D 03	1.52160D 05	1.66986D 00
3.24000D 00	1.01532D 03	1.57239D 02	7.58424D-02	1.60897D-01	1.01406D 00	1.03589D-01	3.99988D 03	1.52232D 05	1.56516D 00
3.34000D 00	1.01654D 03	1.57390D 02	7.91847D-02	1.60659D-01	1.01257D 00	1.03182D-01	3.99987D 03	1.52299D 05	1.46170D 00
3.44000D 00	1.01781D 03	1.57531D 02	8.25346D-02	1.60408D-01	1.01098D 00	1.02754D-01	3.99987D 03	1.52362D 05	1.35960D 00
3.54000D 00	1.01913D 03	1.57662D 02	8.58875D-02	1.60142D-01	1.00931D 00	1.02304D-01	3.99987D 03	1.52420D 05	1.25902D 00
3.64000D 00	1.02051D 03	1.57783D 02	8.92386D-02	1.59862D-01	1.00755D 00	1.01834D-01	3.99986D 03	1.52473D 05	1.16008D 00
3.74000D 00	1.02195D 03	1.57894D 02	9.25833D-02	1.59568D-01	1.00569D 00	1.01342D-01	3.99986D 03	1.52522D 05	1.06291D 00
3.84000D 00	1.02343D 03	1.57996D 02	9.59168D-02	1.59258D-01	1.00374D 00	1.00830D-01	3.99985D 03	1.52567D 05	9.67656D-01
3.94000D 00	1.02497D 03	1.58088D 02	9.92345D-02	1.58934D-01	1.00169D 00	1.00296D-01	3.99985D 03	1.52607D 05	8.74430D-01
4.04000D 00	1.02657D 03	1.58171D 02	1.02532D-01	1.58594D-01	9.99564D-01	9.97428D-02	3.99985D 03	1.52644D 05	7.83357D-01
4.14000D 00	1.02821D 03	1.58245D 02	1.05804D-01	1.58239D-01	9.97316D-01	9.91691D-02	3.99984D 03	1.52676D 05	6.94562D-01
4.24000D 00	1.02991D 03	1.58310D 02	1.09047D-01	1.57868D-01	9.94981D-01	9.85760D-02	3.99984D 03	1.52705D 05	6.08114D-01
4.34000D 00	1.03166D 03	1.58366D 02	1.12255D-01	1.57482D-01	9.92551D-01	9.79664D-02	3.99983D 03	1.52730D 05	5.24132D-01
4.44000D 00	1.03346D 03	1.58413D 02	1.15425D-01	1.57081D-01	9.90025D-01	9.73382D-02	3.99983D 03	1.52751D 05	4.42694D-01
4.54000D 00	1.03531D 03	1.58453D 02	1.18552D-01	1.56665D-01	9.87405D-01	9.66892D-02	3.99983D 03	1.52769D 05	3.63860D-01
4.64000D 00	1.03720D 03	1.58484D 02	1.21632D-01	1.56235D-01	9.84692D-01	9.60272D-02	3.99982D 03	1.52783D 05	2.87769D-01
4.74000D 00	1.03915D 03	1.58513D 02	1.24661D-01	1.55789D-01	9.81886D-01	9.53502D-02	3.99982D 03	1.52794D 05	2.14437D-01
4.84000D 00	1.04115D 03	1.58531D 02	1.27635D-01	1.55329D-01	9.78989D-01	9.46591D-02	3.99982D 03	1.52802D 05	1.43954D-01
4.94000D 00	1.04319D 03	1.58542D 02	1.30549D-01	1.54858D-01	9.76001D-01	9.39547D-02	3.99981D 03	1.52807D 05	7.63891D-02
5.04000D 00	1.04527D 03	1.58544D 02	1.33403D-01	1.54367D-01	9.72924D-01	9.32378D-02	3.99981D 03	1.52809D 05	1.18059D-02
5.14000D 00	1.04740D 03	1.58544D 02	1.36184D-01	1.53864D-01	9.69757D-01	9.25094D-02	3.99980D 03	1.52808D 05	-4.97340D-02
5.24000D 00	1.04958D 03	1.58536D 02	1.38897D-01	1.53347D-01	9.66502D-01	9.17703D-02	3.99980D 03	1.52804D 05	-1.08172D-01
5.34000D 00	1.05175D 03	1.58523D 02	1.41536D-01	1.52817D-01	9.63160D-01	9.10214D-02	3.99980D 03	1.52798D 05	-1.63453D-01
5.44000D 00	1.05405D 03	1.58504D 02	1.44097D-01	1.52273D-01	9.59731D-01	9.02634D-02	3.99979D 03	1.52790D 05	-2.18525D-01
5.54000D 00	1.05634D 03	1.58480D 02	1.46576D-01	1.51715D-01	9.56217D-01	8.94973D-02	3.99979D 03	1.52780D 05	-2.64338D-01
5.64000D 00	1.05868D 03	1.58461D 02	1.48976D-01	1.51144D-01	9.52618D-01	8.87239D-02	3.99978D 03	1.52767D 05	-3.09844D-01
5.74000D 00	1.06105D 03	1.58418D 02	1.51277D-01	1.50559D-01	9.48935D-01	8.79440D-02	3.99978D 03	1.52752D 05	-3.51999D-01
5.84000D 00	1.06346D 03	1.58381D 02	1.53492D-01	1.49961D-01	9.45170D-01	8.71584D-02	3.99978D 03	1.52736D 05	-3.90762D-01
5.94000D 00	1.06589D 03	1.58340D 02	1.55612D-01	1.49350D-01	9.41322D-01	8.63678D-02	3.99977D 03	1.52718D 05	-4.26091D-01
6.04000D 00	1.06836D 03	1.58295D 02	1.57636D-01	1.48727D-01	9.37392D-01	8.55731D-02	3.99977D 03	1.52699D 05	-4.57951D-01
6.14000D 00	1.07086D 03	1.58246D 02	1.59558D-01	1.48090D-01	9.33384D-01	8.47751D-02	3.99976D 03	1.52678D 05	-4.86312D-01
6.24000D 00	1.07339D 03	1.58196D 02	1.61378D-01	1.47442D-01	9.29297D-01	8.39749D-02	3.99976D 03	1.52656D 05	-5.11152D-01
6.34000D 00	1.07594D 03	1.58146D 02	1.63093D-01	1.46781D-01	9.25136D-01	8.31736D-02	3.99976D 03	1.52633D 05	-5.32453D-01
6.44000D 00	1.07852D 03	1.58092D 02	1.64658D-01	1.46109D-01	9.20903D-01	8.23719D-02	3.99975D 03	1.52609D 05	-5.50198D-01
6.54000D 00	1.08113D 03	1.58036D 02	1.66194D-01	1.45426D-01	9.16599D-01	8.15709D-02	3.99975D 03	1.52585D 05	-5.64372D-01
6.64000D 00	1.08375D 03	1.57976D 02	1.67576D-01	1.44732D-01	9.12228D-01	8.07714D-02	3.99975D 03	1.52559D 05	-5.74964D-01
6.74000D 00	1.08640D 03	1.57921D 02	1.68844D-01	1.44028D-01	9.07791D-01	7.99742D-02	3.99974D 03	1.52534D 05	-5.81963D-01
6.84000D 00	1.08906D 03	1.57863D 02	1.69995D-01	1.43314D-01	9.03292D-01	7.91803D-02	3.99974D 03	1.52508D 05	-5.85363D-01
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2.75900D 01	7.15289D 02	2.80235D 02	-1.07057D-01	5.45295D-02	3.43954D-01	3.89899D-02	3.99887D 03	1.74033D 05	3.98421D 00
2.76900D 01	7.12330D 02	2.80628D 02	-1.04366D-01	5.44847D-02	3.43672D-01	3.89833D-02	3.99887D 03	1.73998D 05	3.87791D 00
2.77900D 01	7.09442D 02	2.81011D 02	-1.01654D-01	5.44415D-02	3.43400D-01	3.89769D-02	3.99887D 03	1.73962D 05	3.77144D 00
2.78900D 01	7.06627D 02	2.81383D 02	-9.89208D-02	5.43997D-02	3.43136D-01	3.89708D-02	3.99886D 03	1.73927D 05	3.66480D 00
2.79900D 01	7.03885D 02	2.81744D 02	-9.61673D-02	5.43593D-02	3.42882D-01	3.89649D-02	3.99886D 03	1.73893D 05	3.55802D 00
2.80900D 01	7.01217D 02	2.82094D 02	-9.33942D-02	5.43264D-02	3.42637D-01	3.89591D-02	3.99885D 03	1.73859D 05	3.45112D 00
2.81900D 01	6.98623D 02	2.82434D 02	-9.06020D-02	5.42828D-02	3.42401D-01	3.89536D-02	3.99885D 03	1.73825D 05	3.34412D 00
2.82900D 01	6.96106D 02	2.82763D 02	-8.77914D-02	5.42467D-02	3.42173D-01	3.89483D-02	3.99884D 03	1.73793D 05	3.23704D 00
2.83900D 01	6.93665D 02	2.83081D 02	-8.49630D-02	5.42119D-02	3.41954D-01	3.89432D-02	3.99884D 03	1.73760D 05	3.12991D 00
2.84900D 01	6.91302D 02	2.83389D 02	-8.21173D-02	5.41785D-02	3.41743D-01	3.89383D-02	3.99884D 03	1.73729D 05	3.02274D 00

```
COST FUNCTION (J) =  6.3380143710268200D-02
WITH:
      ALTITUDE TOLERANCE =  0.13840405160360D-01
      FLIGHT-PATH-ANGLE TOLERANCE =  0.61725313028950D-08
      FLIGHT-PATH-ANGLE-DERIVATIVE TOLERANCE =  0.16923046531210D-08
      WEIGHT TOLERANCE =  0.0
      ENERGY TOLERANCE =  0.13840222152940D-01
      ANGLE-OF-ATTACK TOLERANCE =  0.0
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```
 PREVIOUS COEFFICIENT        1.00*DELTA          NEW COEFFICIENT

  0.2873513632565D 05 + 1.00* 0.51053512D-02 =  0.2873514143100D 05   (FROZEN)
  0.0                 + 1.00* 0.0            =  0.0                   (FROZEN)
  0.1126642164463D 04 + 1.00*-0.97766475D-04 =  0.1126642066696D 04   (FROZEN)
 -0.2170164140310D 01 + 1.00* 0.42621619D-06 = -0.2170163712093D 01   (FROZEN)
  0.0                 + 1.00* 0.0            =  0.0                   (FROZEN)
  0.3507274928736D-01 + 1.00* 0.17452974D-04 =  0.3509020226111D-01
  0.0                 + 1.00* 0.0            =  0.0                   (FROZEN)
  0.1299605839588D 01 + 1.00*-0.60086603D-02 =  0.1293597179313D 01
  0.0                 + 1.00* 0.0            =  0.0                   (FROZEN)
  0.2009992916426D 04 + 1.00* 0.16834394D 02 =  0.2026827310048D 04
  0.4210250677476D-03 + 1.00*-0.20872236D-03 =  0.2123027063316D-03
  0.6299956147935D 01 + 1.00* 0.10000000D-02 =  0.6300956147935D 01
 -0.3270366991213D-04 + 1.00* 0.24107406D-04 = -0.8596263513407D-05

 PREVIOUS COEFFICIENT        1.00*DELTA          NEW COEFFICIENT

  0.2873514143100D 05 + 1.00* 0.0            =  0.2873514143100D 05   (FROZEN)
  0.0                 + 1.00* 0.0            =  0.0                   (FROZEN)
  0.1126642066696D 04 + 1.00* 0.0            =  0.1126642066696D 04   (FROZEN)
 -0.2170163712093D 01 + 1.00* 0.0            = -0.2170163712093D 01   (FROZEN)
  0.0                 + 1.00* 0.0            =  0.0                   (FROZEN)
  0.3507274928736D-01 + 1.00* 0.17452973D-04 =  0.3509020226241D-01
  0.0                 + 1.00* 0.0            =  0.0                   (FROZEN)
  0.1299605839588D 01 + 1.00*-0.60086606D-02 =  0.1293597178963D 01
  0.0                 + 1.00* 0.0            =  0.0                   (FROZEN)
  0.2009992916426D 04 + 1.00* 0.16834394D 02 =  0.2026827310598D 04
  0.4210250677476D-03 + 1.00*-0.20872236D-03 =  0.2123027063131D-03
  0.6299956147935D 01 + 1.00* 0.11182243D-05 =  0.6299957266160D 01
 -0.3270366991213D-04 + 1.00* 0.24107406D-04 = -0.8596263512974D-05
```

F L I G H T   P A T H   T R A J E C T O R Y   P R E D I C T I O N

ITERATION # 3

TIME (SEC)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	FLIGHT PATH ANGLE (RADIAN)	ANGLE OF ATTACK (RADIAN)	LIFT COEFFICIENT	DRAG COEFFICIENT	WEIGHT (LBF)	POWER AVAILABLE (FT-LBF/SEC)	ACCELERATION (FT/SEC)
0.0	1.00000D 03	1.46735D 02	5.14342D-05	1.62562D-01	1.02434D 00	1.06680D-01	4.00000D 03	1.47329D 05	4.66404D 00
1.00000D-02	1.00000D 03	1.46786D 02	1.12643D-04	1.62581D-01	1.02447D 00	1.06715D-01	4.00000D 03	1.47352D 05	4.65828D 00
2.00000D-02	1.00000D 03	1.46832D 02	1.75280D-04	1.62588D-01	1.02451D 00	1.06727D-01	4.00000D 03	1.47374D 05	4.65247D 00
3.00000D-02	1.00000D 03	1.46879D 02	2.35349D-04	1.62595D-01	1.02455D 00	1.06739D-01	4.00000D 03	1.47397D 05	4.64663D 00
4.00000D-02	1.00000D 03	1.46925D 02	3.04851D-04	1.62601D-01	1.02459D 00	1.06751D-01	4.00000D 03	1.47420D 05	4.64074D 00
6.00000D-02	1.00000D 03	1.47018D 02	4.40136D-04	1.62615D-01	1.02468D 00	1.06776D-01	4.00000D 03	1.47465D 05	4.62884D 00
8.00000D-02	1.00000D 03	1.47110D 02	5.81115D-04	1.62628D-01	1.02476D 00	1.06799D-01	4.00000D 03	1.47510D 05	4.61679D 00
1.00000D-01	1.00001D 03	1.47202D 02	7.27766D-04	1.62641D-01	1.02484D 00	1.06823D-01	4.00000D 03	1.47555D 05	4.60458D 00
1.20000D-01	1.00001D 03	1.47294D 02	8.80068D-04	1.62654D-01	1.02493D 00	1.06846D-01	4.00000D 03	1.47600D 05	4.59221D 00
1.40000D-01	1.00001D 03	1.47386D 02	1.03800D-03	1.62667D-01	1.02501D 00	1.06869D-01	3.99999D 03	1.47645D 05	4.57968D 00
1.80000D-01	1.00002D 03	1.47565D 02	1.37066D-03	1.62692D-01	1.02516D 00	1.06915D-01	3.99999D 03	1.47734D 05	4.55416D 00
2.20000D-01	1.00003D 03	1.47751D 02	1.72558D-03	1.62716D-01	1.02532D 00	1.06958D-01	3.99999D 03	1.47822D 05	4.52803D 00
2.60000D-01	1.00004D 03	1.47931D 02	2.10257D-03	1.62740D-01	1.02546D 00	1.07001D-01	3.99999D 03	1.47910D 05	4.50129D 00
3.00000D-01	1.00005D 03	1.48111D 02	2.50144D-03	1.62762D-01	1.02561D 00	1.07042D-01	3.99999D 03	1.47996D 05	4.47396D 00
3.40000D-01	1.00007D 03	1.48285D 02	2.92202D-03	1.62784D-01	1.02575D 00	1.07082D-01	3.99999D 03	1.48083D 05	4.44604D 00
4.20000D-01	1.00011D 03	1.48642D 02	3.82753D-03	1.62826D-01	1.02601D 00	1.07158D-01	3.99998D 03	1.48253D 05	4.38849D 00
5.00000D-01	1.00016D 03	1.48991D 02	4.81753D-03	1.62865D-01	1.02625D 00	1.07228D-01	3.99998D 03	1.48421D 05	4.32871D 00
5.80000D-01	1.00022D 03	1.49335D 02	5.89041D-03	1.62900D-01	1.02647D 00	1.07291D-01	3.99998D 03	1.48586D 05	4.26678D 00
6.60000D-01	1.00030D 03	1.49674D 02	7.04453D-03	1.62931D-01	1.02667D 00	1.07349D-01	3.99997D 03	1.48747D 05	4.20278D 00
7.40000D-01	1.00039D 03	1.50007D 02	8.27923D-03	1.62959D-01	1.02685D 00	1.07399D-01	3.99997D 03	1.48906D 05	4.13679D 00
8.40000D-01	1.00053D 03	1.50417D 02	9.92947D-03	1.62988D-01	1.02703D 00	1.07453D-01	3.99997D 03	1.49101D 05	4.05163D 00
9.40000D-01	1.00069D 03	1.50818D 02	1.16986D-02	1.63011D-01	1.02718D 00	1.07494D-01	3.99996D 03	1.49290D 05	3.96365D 00
1.04000D 00	1.00088D 03	1.51209D 02	1.35826D-02	1.63028D-01	1.02728D 00	1.07524D-01	3.99996D 03	1.49475D 05	3.87302D 00
1.14000D 00	1.00110D 03	1.51592D 02	1.55772D-02	1.63037D-01	1.02734D 00	1.07541D-01	3.99996D 03	1.49654D 05	3.77989D 00
1.24000D 00	1.00136D 03	1.51965D 02	1.76789D-02	1.63039D-01	1.02735D 00	1.07545D-01	3.99995D 03	1.49829D 05	3.68446D 00
1.34000D 00	1.00164D 03	1.52329D 02	1.98836D-02	1.63033D-01	1.02731D 00	1.07534D-01	3.99995D 03	1.49999D 05	3.58688D 00
1.44000D 00	1.00196D 03	1.52683D 02	2.21876D-02	1.63019D-01	1.02722D 00	1.07508D-01	3.99995D 03	1.50163D 05	3.48736D 00
1.54000D 00	1.00232D 03	1.53026D 02	2.45866D-02	1.62996D-01	1.02708D 00	1.07466D-01	3.99994D 03	1.50322D 05	3.38604D 00
1.64000D 00	1.00271D 03	1.53360D 02	2.70764D-02	1.62964D-01	1.02688D 00	1.07408D-01	3.99994D 03	1.50476D 05	3.28314D 00
1.74000D 00	1.00315D 03	1.53683D 02	2.96530D-02	1.62922D-01	1.02662D 00	1.07333D-01	3.99993D 03	1.50625D 05	3.17884D 00
1.84000D 00	1.00363D 03	1.53996D 02	3.23118D-02	1.62871D-01	1.02629D 00	1.07239D-01	3.99993D 03	1.50768D 05	3.07331D 00
1.94000D 00	1.00415D 03	1.54298D 02	3.50486D-02	1.62809D-01	1.02590D 00	1.07126D-01	3.99993D 03	1.50907D 05	2.96675D 00
2.04000D 00	1.00471D 03	1.54589D 02	3.78587D-02	1.62736D-01	1.02544D 00	1.06994D-01	3.99992D 03	1.51039D 05	2.85934D 00
2.14000D 00	1.00532D 03	1.54869D 02	4.07377D-02	1.62652D-01	1.02491D 00	1.06842D-01	3.99992D 03	1.51167D 05	2.75125D 00
2.24000D 00	1.00597D 03	1.55139D 02	4.36809D-02	1.62556D-01	1.02431D 00	1.06669D-01	3.99992D 03	1.51290D 05	2.64266D 00
2.34000D 00	1.00667D 03	1.55398D 02	4.66838D-02	1.62449D-01	1.02363D 00	1.06476D-01	3.99991D 03	1.51407D 05	2.53373D 00
2.44000D 00	1.00742D 03	1.55646D 02	4.97417D-02	1.62329D-01	1.02288D 00	1.06262D-01	3.99991D 03	1.51519D 05	2.42464D 00
2.54000D 00	1.00822D 03	1.55883D 02	5.28499D-02	1.62198D-01	1.02205D 00	1.06028D-01	3.99990D 03	1.51625D 05	2.31556D 00
2.64000D 00	1.00907D 03	1.56109D 02	5.60037D-02	1.62054D-01	1.02115D 00	1.05772D-01	3.99990D 03	1.51727D 05	2.20661D 00
2.74000D 00	1.00997D 03	1.56324D 02	5.91965D-02	1.61898D-01	1.02016D 00	1.05495D-01	3.99990D 03	1.51824D 05	2.09800D 00
2.84000D 00	1.01092D 03	1.56529D 02	6.24255D-02	1.61729D-01	1.01910D 00	1.05196D-01	3.99989D 03	1.51915D 05	1.98986D 00
2.94000D 00	1.01192D 03	1.56722D 02	6.56920D-02	1.61548D-01	1.01795D 00	1.04876D-01	3.99989D 03	1.52002D 05	1.88235D 00
3.04000D 00	1.01298D 03	1.56905D 02	6.89813D-02	1.61353D-01	1.01673D 00	1.04535D-01	3.99988D 03	1.52083D 05	1.77564D 00
3.14000D 00	1.01408D 03	1.57077D 02	7.22926D-02	1.61144D-01	1.01541D 00	1.04172D-01	3.99988D 03	1.52160D 05	1.66986D 00
3.24000D 00	1.01524D 03	1.57239D 02	7.56212D-02	1.60922D-01	1.01402D 00	1.03787D-01	3.99988D 03	1.52232D 05	1.56516D 00
3.34000D 00	1.01646D 03	1.57390D 02	7.89625D-02	1.60687D-01	1.01253D 00	1.03381D-01	3.99987D 03	1.52299D 05	1.46170D 00
3.44000D 00	1.01773D 03	1.57531D 02	8.23116D-02	1.60437D-01	1.01096D 00	1.02953D-01	3.99987D 03	1.52362D 05	1.35960D 00
3.54000D 00	1.01905D 03	1.57662D 02	8.56638D-02	1.60173D-01	1.00929D 00	1.02503D-01	3.99987D 03	1.52420D 05	1.25902D 00
3.64000D 00	1.02043D 03	1.57783D 02	8.90145D-02	1.59895D-01	1.00754D 00	1.02033D-01	3.99986D 03	1.52473D 05	1.16008D 00
3.74000D 00	1.02185D 03	1.57894D 02	9.23589D-02	1.59601D-01	1.00569D 00	1.01541D-01	3.99986D 03	1.52522D 05	1.06291D 00
3.84000D 00	1.02334D 03	1.57996D 02	9.56925D-02	1.59294D-01	1.00375D 00	1.01028D-01	3.99985D 03	1.52567D 05	9.67656D-01
3.94000D 00	1.02487D 03	1.58048D 02	9.90105D-02	1.58971D-01	1.00172D 00	1.00494D-01	3.99985D 03	1.52607D 05	8.74430D-01
4.04000D 00	1.02646D 03	1.58171D 02	1.02308D-01	1.58632D-01	9.99589D-01	9.99400D-02	3.99985D 03	1.52644D 05	7.83357D-01
4.14000D 00	1.02810D 03	1.58245D 02	1.05581D-01	1.58279D-01	9.97361D-01	9.93654D-02	3.99984D 03	1.52676D 05	6.94552D-01
4.24000D 00	1.02980D 03	1.58310D 02	1.08825D-01	1.57910D-01	9.95036D-01	9.87712D-02	3.99984D 03	1.52705D 05	6.08114D-01
4.34000D 00	1.03154D 03	1.58366D 02	1.12034D-01	1.57528D-01	9.92615D-01	9.81583D-02	3.99983D 03	1.52730D 05	5.24132D-01
4.44000D 00	1.03334D 03	1.58415D 02	1.15206D-01	1.57126D-01	9.90099D-01	9.75276D-02	3.99983D 03	1.52751D 05	4.42694D-01
4.54000D 00	1.03518D 03	1.58455D 02	1.18335D-01	1.56712D-01	9.87489D-01	9.68800D-02	3.99983D 03	1.52769D 05	3.63880D-01

4.640000 00	1.037080 03	1.584380 02	1.214160-01	1.562420-01	9.847850-01	9.621630-02	3.999820 03	1.527830 05	2.877690-01
4.740000 00	1.039020 03	1.585130 02	1.244470-01	1.558390-01	9.819840-01	9.553740-02	3.999820 03	1.527940 05	2.144370-01
4.840000 00	1.041020 03	1.585310 02	1.274230-01	1.553800-01	9.791000-01	9.484410-02	3.999820 03	1.528020 05	1.439540-01
4.940000 00	1.043050 03	1.585420 02	1.303400-01	1.549470-01	9.761210-01	9.413740-02	3.999810 03	1.528070 05	7.638910-02
5.040000 00	1.045140 03	1.585460 02	1.331930-01	1.544200-01	9.730520-01	9.341810-02	3.999810 03	1.528090 05	1.180590-02
5.140000 00	1.047260 03	1.585440 02	1.359800-01	1.539190-01	9.698930-01	9.268720-02	3.999800 03	1.528080 05	-4.973400-02
5.240000 00	1.049430 03	1.585360 02	1.386960-01	1.534030-01	9.666460-01	9.194530-02	3.999800 03	1.528040 05	-1.081720-01
5.340000 00	1.051650 03	1.585230 02	1.413380-01	1.528740-01	9.633120-01	9.119360-02	3.999800 03	1.527980 05	-1.634830-01
5.440000 00	1.053900 03	1.585040 02	1.439020-01	1.523310-01	9.598910-01	9.043280-02	3.999790 03	1.527900 05	-2.158250-01
5.540000 00	1.056190 03	1.584800 02	1.463830-01	1.517740-01	9.563840-01	8.966330-02	3.999790 03	1.527800 05	-2.643380-01
5.640000 00	1.058520 03	1.584510 02	1.487830-01	1.512040-01	9.527910-01	8.888600-02	3.999780 03	1.527670 05	-3.098440-01
5.740000 00	1.060860 03	1.584180 02	1.510910-01	1.506210-01	9.491130-01	8.810330-02	3.999780 03	1.527520 05	-3.519990-01
5.840000 00	1.063240 03	1.583810 02	1.533120-01	1.500240-01	9.453550-01	8.731410-02	3.999780 03	1.527360 05	-3.907620-01
5.940000 00	1.065730 03	1.583400 02	1.554370-01	1.494140-01	9.415130-01	8.651990-02	3.999770 03	1.527180 05	-4.260910-01
6.040000 00	1.068150 03	1.582950 02	1.574600-01	1.487910-01	9.375890-01	8.572140-02	3.999770 03	1.526990 05	-4.579510-01
6.140000 00	1.070690 03	1.582460 02	1.593420-01	1.481550-01	9.335850-01	8.491960-02	3.999760 03	1.526780 05	-4.863120-01
6.240000 00	1.073220 03	1.581930 02	1.612160-01	1.475070-01	9.295030-01	8.411550-02	3.999760 03	1.526560 05	-5.111620-01
6.340000 00	1.075770 03	1.581410 02	1.629300-01	1.468460-01	9.253460-01	8.331010-02	3.999760 03	1.526330 05	-5.324830-01
6.440000 00	1.078350 03	1.580920 02	1.645460-01	1.461760-01	9.211140-01	8.250430-02	3.999750 03	1.526090 05	-5.501980-01
6.540000 00	1.080950 03	1.580360 02	1.660460-01	1.454940-01	9.168130-01	8.169910-02	3.999750 03	1.525850 05	-5.643720-01
6.640000 00	1.083570 03	1.579790 02	1.674330-01	1.448000-01	9.124460-01	8.089530-02	3.999750 03	1.525590 05	-5.749640-01
6.740000 00	1.086210 03	1.579210 02	1.687000-01	1.440960-01	9.080110-01	8.009390-02	3.999740 03	1.525340 05	-5.819630-01
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2.81900D 01	6.98432D 02	2.82434D 02	-9.06208D-02	5.43149D-02	3.42394D-01	3.89585D-02	3.99885D 03	1.73825D 05	3.34412D 00
2.82900D 01	6.95884D 02	2.82763D 02	-8.78103D-02	5.42787D-02	3.42166D-01	3.89532D-02	3.99884D 03	1.73793D 05	3.23704D 00
2.83900D 01	6.93442D 02	2.83081D 02	-8.49619D-02	5.42440D-02	3.41947D-01	3.89481D-02	3.99884D 03	1.73760D 05	3.12991D 00
2.84900D 01	6.91076D 02	2.83389D 02	-8.21364D-02	5.42106D-02	3.41736D-01	3.89432D-02	3.99884D 03	1.73729D 05	3.02274D 00

COST FUNCTION (J) = 2.366417070961665D-02
WITH:
ALTITUDE TOLERANCE = 0.5229630926413D-02
FLIGHT-PATH-ANGLE TOLERANCE = 0.6577678075664D-09
FLIGHT-PATH-ANGLE-DERIVATIVE TOLERANCE = 0.3035525447254D-10
WEIGHT TOLERANCE = 0.0
ENERGY TOLERANCE = 0.5229671017392D-02
ANGLE-OF-ATTACK TOLERANCE = 0.0

PREVIOUS COEFFICIENT		1.000*DELTA		NEW COEFFICIENT	
0.2873614143100D 05	+	1.00* 0.0	=	0.2873614143100D 05	(FROZEN)
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
0.1126642066696D 04	+	1.00* 0.0	=	0.1126642066696D 04	(FROZEN)
-0.2170163712093D 01	+	1.00* 0.0	=	-0.2170163712093D 01	(FROZEN)
0.0	+	1.00* 0.0	=	0.0	(FROZEN)

0.35090203226261D-01 + 1.00* 0.16562998D-04 = 0.35106745260530D-01
0.0 + 1.00* 0.0 = 0.0 (FROZEN)
0.12635971789630 01 + 1.00*-0.50822463D-02 = 0.12885149326650 01
0.0 + 1.00* 0.0 = 0.0 (FROZEN)
0.20768273105980 04 + 1.00* 0.53902451D 01 = 0.20322175857130 04
0.21230270631310-03 + 1.00*-0.13444774D-03 = 0.77884965704310-04
0.62999572681600 01 + 1.00* 0.10000000D-02 = 0.63009572681600 01
-0.05962635125740-05 + 1.00* 0.85034033D-05 = -0.90860200621700-07

FLIGHT PATH TRAJECTORY PREDICTION

ITERATION # 4

TIME (SEC)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	FLIGHT PATH ANGLE (RADIAN)	ANGLE OF ATTACK (RADIAN)	LIFT COEFFICIENT	DRAG COEFFICIENT	WEIGHT (LBF)	POWER AVAILABLE (FT-LBF/SEC)	ACCELERATION (FT/SEC)
0.0	1.000000 03	1.467390 02	5.143420-05	1.625720-01	1.024430 00	1.066790-01	4.000000 03	1.473290 05	4.664040 00
1.000000-02	1.000000 03	1.467060 02	1.128430-04	1.625910-01	1.024560 00	1.067140-01	4.000000 03	1.473620 05	4.658280 00
2.000000-02	1.000000 03	1.468320 02	1.756730-04	1.625970-01	1.024600 00	1.067260-01	4.000000 03	1.473743 05	4.652470 00
3.000000-02	1.000000 03	1.468750 02	2.399330-04	1.626040-01	1.024640 00	1.067380-01	4.000000 03	1.473970 05	4.646630 00
4.000000-02	1.000000 03	1.469250 02	3.056260-04	1.626110-01	1.024680 00	1.067500-01	4.000000 03	1.474200 05	4.640740 00
6.000000-02	1.000000 03	1.470180 02	4.412890-04	1.626240-01	1.024760 00	1.067740-01	4.000000 03	1.474650 05	4.628840 00
8.000000-02	1.000000 03	1.471100 02	5.826400-04	1.626370-01	1.024850 00	1.067980-01	4.000000 03	1.475100 05	4.616790 00
1.000000-01	1.000010 03	1.472020 02	7.296580-04	1.626500-01	1.024930 00	1.068210-01	4.000000 03	1.475553 05	4.604580 00
1.333000-01	1.000010 03	1.472940 02	8.823200-04	1.626630-01	1.025010 00	1.068440-01	4.000000 03	1.476000 05	4.592210 00
1.400000-01	1.000010 03	1.473860 02	1.040810-03	1.626750-01	1.025090 00	1.068660-01	3.999990 03	1.476450 05	4.579680 00
1.800000-01	1.000020 03	1.475650 02	1.373960-03	1.627000-01	1.025240 00	1.069110-01	3.999990 03	1.477340 05	4.554160 00
2.200000-01	1.000030 03	1.477510 02	1.729550-03	1.627240-01	1.025390 00	1.069540-01	3.999990 03	1.478220 05	4.528030 00
2.600000-01	1.000040 03	1.479310 02	2.107190-03	1.627470-01	1.025540 00	1.069960-01	3.999990 03	1.479100 05	4.501290 00
3.000000-01	1.000050 03	1.481110 02	2.506700-03	1.627690-01	1.025680 00	1.070370-01	3.999990 03	1.479960 05	4.473960 00
3.400000-01	1.000070 03	1.482960 02	2.927890-03	1.627910-01	1.025820 00	1.070760-01	3.999990 03	1.480830 05	4.446040 00
4.200000-01	1.000110 03	1.486420 02	3.834560-03	1.628320-01	1.026070 00	1.071510-01	3.999980 03	1.482530 05	4.388490 00
5.000000-01	1.000160 03	1.489910 02	4.825660-03	1.628700-01	1.026310 00	1.072190-01	3.999980 03	1.484210 05	4.328710 00
5.800000-01	1.000220 03	1.493350 02	5.899560-03	1.629040-01	1.026530 00	1.072820-01	3.999980 03	1.485863 05	4.266780 00
6.600000-01	1.000300 03	1.496740 02	7.054670-03	1.629350-01	1.026730 00	1.073380-01	3.999970 03	1.487470 05	4.202780 00
7.400000-01	1.000390 03	1.500070 02	8.289250-03	1.629630-01	1.026900 00	1.073880-01	3.999970 03	1.489060 05	4.136790 00
8.400000-01	1.000530 03	1.504170 02	9.941600-03	1.629910-01	1.027063 00	1.074400-01	3.999970 03	1.491010 05	4.051630 00
9.400000-01	1.000690 03	1.508180 02	1.171190-02	1.630140-01	1.027220 00	1.074810-01	3.999960 03	1.492900 05	3.963680 00
1.040000 00	1.000880 03	1.512090 02	1.359670-02	1.630300-01	1.027320 00	1.075100-01	3.999960 03	1.494750 05	3.873020 00
1.140000 00	1.001100 03	1.515920 02	1.559220-02	1.630380-01	1.027380 00	1.075260-01	3.999960 03	1.496540 05	3.779890 00
1.240000 00	1.001340 03	1.519650 02	1.769460-02	1.630400-01	1.027390 00	1.075290-01	3.999950 03	1.498290 05	3.684460 00
1.340000 00	1.001610 03	1.523290 02	1.990020-02	1.630340-01	1.027350 00	1.075180-01	3.999950 03	1.499990 05	3.586880 00
1.440000 00	1.001910 03	1.526830 02	2.220480-02	1.630190-01	1.027260 00	1.074920-01	3.999950 03	1.501630 05	3.487380 00
1.540000 00	1.002230 03	1.530260 02	2.460450-02	1.629960-01	1.027110 00	1.074490-01	3.999940 03	1.503220 05	3.386040 00
1.640000 00	1.002720 03	1.533030 02	2.709500-02	1.629640-01	1.026910 00	1.073910-01	3.999940 03	1.504760 05	3.283140 00
1.740000 00	1.003150 03	1.536830 02	2.967220-02	1.629230-01	1.026640 00	1.073150-01	3.999930 03	1.506250 05	3.178840 00
1.840000 00	1.003630 03	1.539960 02	3.233160-02	1.628700-01	1.026320 00	1.072200-01	3.999930 03	1.507680 05	3.073310 00
1.940000 00	1.004150 03	1.542980 02	3.506890-02	1.628080-01	1.025920 00	1.071070-01	3.999930 03	1.509070 05	2.966780 00
2.040000 00	1.004710 03	1.545890 02	3.787960-02	1.627350-01	1.025460 00	1.069780-01	3.999920 03	1.510390 05	2.859340 00
2.140000 00	1.005320 03	1.548690 02	4.075910-02	1.626510-01	1.024930 00	1.068220-01	3.999920 03	1.511670 05	2.751250 00
2.240000 00	1.005970 03	1.551390 02	4.370280-02	1.625550-01	1.024330 00	1.066490-01	3.999920 03	1.512900 05	2.642660 00
2.340000 00	1.006660 03	1.553980 02	4.670620-02	1.624470-01	1.023650 00	1.064560-01	3.999910 03	1.514070 05	2.533730 00
2.440000 00	1.007430 03	1.556460 02	4.976450-02	1.623280-01	1.022900 00	1.062420-01	3.999910 03	1.515190 05	2.424640 00
2.540000 00	1.008220 03	1.558830 02	5.287320-02	1.621970-01	1.022070 00	1.060060-01	3.999900 03	1.516250 05	2.315550 00
2.640000 00	1.009070 03	1.561090 02	5.602750-02	1.620630-01	1.021170 00	1.057600-01	3.999900 03	1.517270 05	2.206610 00
2.740000 00	1.009970 03	1.563240 02	5.922270-02	1.618970-01	1.020180 00	1.054730-01	3.999900 03	1.518240 05	2.098000 00
2.840000 00	1.010920 03	1.565290 02	6.245420-02	1.617280-01	1.019120 00	1.051740-01	3.999890 03	1.519150 05	1.989860 00
2.940000 00	1.011930 03	1.567220 02	6.571710-02	1.615460-01	1.017970 00	1.048630-01	3.999890 03	1.520020 05	1.882350 00
3.040000 00	1.012980 03	1.569050 02	6.900680-02	1.613510-01	1.016740 00	1.045120-01	3.999880 03	1.520830 05	1.775640 00
3.140000 00	1.014090 03	1.570770 02	7.231860-02	1.611430-01	1.015430 00	1.041480-01	3.999880 03	1.521600 05	1.669860 00
3.240000 00	1.015250 03	1.572390 02	7.564760-02	1.609210-01	1.014030 00	1.037630-01	3.999880 03	1.522320 05	1.565160 00
3.340000 00	1.016470 03	1.573900 02	7.898930-02	1.606850-01	1.012550 00	1.033560-01	3.999870 03	1.522990 05	1.461700 00
3.440000 00	1.017740 03	1.575310 02	8.233890-02	1.604360-01	1.010980 00	1.029280-01	3.999870 03	1.523620 05	1.359600 00
3.540000 00	1.019060 03	1.576620 02	8.569160-02	1.601720-01	1.009310 00	1.024790-01	3.999870 03	1.524200 05	1.259020 00
3.640000 00	1.020440 03	1.577830 02	8.904270-02	1.598930-01	1.007560 00	1.020080-01	3.999860 03	1.524730 05	1.160080 00
3.740000 00	1.021870 03	1.578940 02	9.238760-02	1.596000-01	1.005710 00	1.015150-01	3.999860 03	1.525220 05	1.062910 00
3.840000 00	1.023350 03	1.579960 02	9.572160-02	1.592930-01	1.003770 00	1.010020-01	3.999850 03	1.525670 05	9.676840-01
3.940000 00	1.024890 03	1.580880 02	9.904010-02	1.589700-01	1.001740 00	1.004680-01	3.999850 03	1.526070 05	8.744300-01
4.040000 00	1.026480 03	1.581710 02	1.023380-01	1.586320-01	9.996090-01	9.991330-02	3.999850 03	1.526440 05	7.833570-01
4.140000 00	1.028120 03	1.582450 02	1.056120-01	1.582780-01	9.973810-01	9.933820-02	3.999840 03	1.526760 05	6.945520-01
4.240000 00	1.029810 03	1.583100 02	1.088560-01	1.579090-01	9.950560-01	9.874360-02	3.999840 03	1.527050 05	6.081140-01
4.340000 00	1.031560 03	1.583660 02	1.120660-01	1.575260-01	9.926350-01	9.813030-02	3.999830 03	1.527300 05	5.241320-01
4.440000 00	1.033350 03	1.584150 02	1.152380-01	1.571260-01	9.901190-01	9.749920-02	3.999830 03	1.527510 05	4.426940-01
4.540000 00	1.035200 03	1.584550 02	1.183670-01	1.567110-01	9.875090-01	9.685110-02	3.999830 03	1.527690 05	3.638800-01
4.640000 00	1.037100 03	1.584880 02	1.214500-01	1.562820-01	9.848060-01	9.618690-02	3.999820 03	1.527830 05	2.877690-01
4.740000 00	1.039040 03	1.585130 02	1.244810-01	1.558380-01	9.820090-01	9.550760-02	3.999820 03	1.527940 05	2.144370-01
4.840000 00	1.041030 03	1.585310 02	1.274570-01	1.553800-01	9.791210-01	9.481380-02	3.999820 03	1.528020 05	1.439540-01
4.940000 00	1.043070 03	1.585420 02	1.303750-01	1.549070-01	9.761420-01	9.410660-02	3.999810 03	1.528070 05	7.638910-02
5.040000 00	1.045160 03	1.585460 02	1.332290-01	1.544200-01	9.730730-01	9.338690-02	3.999810 03	1.528090 05	1.180590-02
5.140000 00	1.047280 03	1.585440 02	1.360160-01	1.539190-01	9.699150-01	9.265540-02	3.999800 03	1.528080 05	-4.973400-02
5.240000 00	1.049450 03	1.585360 02	1.387330-01	1.534040-01	9.666680-01	9.191310-02	3.999800 03	1.528040 05	-1.081720-01
5.340000 00	1.051670 03	1.585230 02	1.413750-01	1.528740-01	9.633330-01	9.116070-02	3.999800 03	1.527980 05	-1.634530-01
5.440000 00	1.053920 03	1.585040 02	1.439400-01	1.523310-01	9.599120-01	9.039930-02	3.999790 03	1.527900 05	-2.155250-01
5.540000 00	1.056210 03	1.584800 02	1.464230-01	1.517750-01	9.564050-01	8.962960-02	3.999790 03	1.527800 05	-2.643380-01
5.640000 00	1.058540 03	1.584510 02	1.488220-01	1.512050-01	9.528120-01	8.885230-02	3.999780 03	1.527670 05	-3.098440-01
5.740000 00	1.060910 03	1.584180 02	1.511330-01	1.506210-01	9.491360-01	8.806840-02	3.999780 03	1.527520 05	-3.519990-01
5.840000 00	1.063310 03	1.583810 02	1.533520-01	1.500240-01	9.453760-01	8.727870-02	3.999780 03	1.527360 05	-3.907620-01
5.940000 00	1.065750 03	1.583400 02	1.554780-01	1.494150-01	9.415330-01	8.648400-02	3.999770 03	1.527180 05	-4.260910-01
6.040000 00	1.068220 03	1.582950 02	1.575060-01	1.487920-01	9.376090-01	8.568500-02	3.999770 03	1.526990 05	-4.579510-01
6.140000 00	1.070710 03	1.582480 02	1.594340-01	1.481560-01	9.336040-01	8.488270-02	3.999760 03	1.526780 05	-4.863120-01
6.240000 00	1.073240 03	1.581980 02	1.612590-01	1.475080-01	9.295220-01	8.407810-02	3.999760 03	1.526560 05	-5.111820-01
6.340000 00	1.075790 03	1.581460 02	1.629780-01	1.468480-01	9.253640-01	8.327210-02	3.999760 03	1.526330 05	-5.324530-01
6.440000 00	1.078370 03	1.580920 02	1.645890-01	1.461770-01	9.211330-01	8.246590-02	3.999750 03	1.526090 05	-5.501980-01
6.540000 00	1.080970 03	1.580360 02	1.660900-01	1.454940-01	9.168320-01	8.166020-02	3.999750 03	1.525850 05	-5.643720-01
6.640000 00	1.083600 03	1.579790 02	1.674780-01	1.448010-01	9.124620-01	8.085600-02	3.999750 03	1.525590 05	-5.749640-01
6.740000 00	1.086240 03	1.579210 02	1.687510-01	1.440970-01	9.080260-01	8.005410-02	3.999740 03	1.525340 05	-5.819630-01
6.840000 00	1.088900 03	1.578630 02	1.699070-01	1.433830-01	9.035270-01	7.925530-02	3.999740 03	1.525080 05	-5.853630-01
6.940000 00	1.091580 03	1.578040 02	1.709450-01	1.426590-01	8.989670-01	7.846050-02	3.999730 03	1.524820 05	-5.851560-01
7.040000 00	1.094270 03	1.577460 02	1.718620-01	1.419260-01	8.943470-01	7.767020-02	3.999730 03	1.524560 05	-5.813390-01
7.140000 00	1.096970 03	1.576880 02	1.726570-01	1.411840-01	8.896720-01	7.688530-02	3.999730 03	1.524310 05	-5.739110-01
7.240000 00	1.099650 03	1.576310 02	1.733280-01	1.404330-01	8.849420-01	7.610630-02	3.999720 03	1.524060 05	-5.628720-01
7.340000 00	1.102410 03	1.573760 02	1.738750-01	1.396750-01	8.801610-01	7.533380-02	3.999720 03	1.523810 05	-5.482240-01
7.440000 00	1.105140 03	1.575220 02	1.742960-01	1.389080-01	8.753310-01	7.456850-02	3.999710 03	1.523570 05	-5.299730-01
7.540000 00	1.107870 03	1.574700 02	1.745900-01	1.381340-01	8.704530-01	7.381080-02	3.999710 03	1.523340 05	-5.081240-01
7.640000 00	1.110610 03	1.574200 02	1.747560-01	1.373530-01	8.655310-01	7.306120-02	3.999710 03	1.523120 05	-4.826870-01
7.740000 00	1.113340 03	1.573730 02	1.747930-01	1.365650-01	8.605670-01	7.232020-02	3.999700 03	1.522920 05	-4.536740-01
7.840000 00	1.116060 03	1.573300 02	1.747010-01	1.357710-01	8.555630-01	7.158820-02	3.999700 03	1.522720 05	-4.210960-01
7.940000 00	1.118810 03	1.572890 02	1.744790-01	1.349710-01	8.505220-01	7.086560-02	3.999700 03	1.522540 05	-3.849710-01
8.040000 00	1.121540 03	1.572530 02	1.741270-01	1.341650-01	8.454460-01	7.015280-02	3.999690 03	1.522380 05	-3.453180-01
8.140000 00	1.124260 03	1.572200 02	1.736450-01	1.333540-01	8.403370-01	6.945000-02	3.999690 03	1.522240 05	-3.021510-01
8.240000 00	1.126970 03	1.571920 02	1.730330-01	1.325390-01	8.351980-01	6.875760-02	3.999680 03	1.522110 05	-2.554990-01
8.340000 00	1.129670 03	1.571690 02	1.722920-01	1.317190-01	8.300310-01	6.807560-02	3.999680 03	1.522010 05	-2.053870-01
8.440000 00	1.132360 03	1.571520 02	1.714170-01	1.308950-01	8.248390-01	6.740460-02	3.999680 03	1.521930 05	-1.518420-01
8.540000 00	1.135030 03	1.571390 02	1.704140-01	1.300670-01	8.196240-01	6.674460-02	3.999670 03	1.521870 05	-9.489590-02
8.640000 00	1.137690 03	1.571330 02	1.692820-01	1.292360-01	8.143890-01	6.609580-02	3.999670 03	1.521850 05	-3.458090-02
8.740000 00	1.140330 03	1.571320 02	1.680210-01	1.284020-01	8.091350-01	6.545840-02	3.999660 03	1.521860 05	2.906620-02
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1.979000 01	1.061320 03	2.222160 02	-1.987930-01	6.475080-02	4.080700-01	4.065890-02	3.999220 03	1.719300 05	9.687690 00
1.989000 01	1.056920 03	2.231840 02	-1.997380-01	6.450290-02	4.065080-01	4.061420-02	3.999210 03	1.720850 05	9.673840 00
1.999000 01	1.052470 03	2.241500 02	-2.006120-01	6.425910-02	4.049720-01	4.057040-02	3.999210 03	1.722360 05	9.657780 00
2.009000 01	1.047980 03	2.251150 02	-2.014170-01	6.401940-02	4.034610-01	4.052760-02	3.999200 03	1.723820 05	9.639420 00
2.019000 01	1.043460 03	2.260780 02	-2.021530-01	6.378380-02	4.019770-01	4.048580-02	3.999200 03	1.725240 05	9.618910 00
2.029000 01	1.038910 03	2.270390 02	-2.028190-01	6.355220-02	4.005170-01	4.044480-02	3.999200 03	1.726620 05	9.596220 00
2.039000 01	1.034320 03	2.279970 02	-2.034170-01	6.332450-02	3.990830-01	4.040470-02	3.999190 03	1.727950 05	9.571390 00
2.049000 01	1.029690 03	2.289530 02	-2.039480-01	6.310070-02	3.976730-01	4.036550-02	3.999190 03	1.729240 05	9.544440 00
2.059000 01	1.025040 03	2.299060 02	-2.044130-01	6.288070-02	3.962870-01	4.032720-02	3.999180 03	1.730490 05	9.515410 00
2.069000 01	1.020360 03	2.308560 02	-2.048070-01	6.266460-02	3.949250-01	4.028960-02	3.999180 03	1.731690 05	9.484320 00
2.079000 01	1.015650 03	2.318030 02	-2.051360-01	6.245220-02	3.935870-01	4.025290-02	3.999170 03	1.732860 05	9.451200 00
2.089000 01	1.010920 03	2.327460 02	-2.054010-01	6.224360-02	3.922720-01	4.021700-02	3.999170 03	1.733970 05	9.416080 00
2.099000 01	1.006160 03	2.336860 02	-2.056000-01	6.203850-02	3.909800-01	4.018180-02	3.999170 03	1.735050 05	9.378990 00
2.109000 01	1.001380 03	2.346220 02	-2.057350-01	6.183710-02	3.897110-01	4.014740-02	3.999160 03	1.736080 05	9.339980 00
2.119000 01	9.965730 02	2.355540 02	-2.058050-01	6.163920-02	3.884640-01	4.011380-02	3.999160 03	1.737070 05	9.298990 00
2.129000 01	9.917500 02	2.364820 02	-2.058130-01	6.144490-02	3.872390-01	4.008090-02	3.999150 03	1.738020 05	9.256150 00
2.139000 01	9.869080 02	2.374060 02	-2.057570-01	6.125400-02	3.860370-01	4.004870-02	3.999150 03	1.738930 05	9.211450 00
2.149000 01	9.820490 02	2.383240 02	-2.056400-01	6.106650-02	3.848550-01	4.001720-02	3.999140 03	1.739790 05	9.164930 00
2.159000 01	9.771750 02	2.392380 02	-2.054610-01	6.088230-02	3.836950-01	3.998630-02	3.999140 03	1.740620 05	9.116600 00
2.169000 01	9.722860 02	2.401470 02	-2.052220-01	6.070150-02	3.825560-01	3.995620-02	3.999130 03	1.741400 05	9.066500 00
2.179000 01	9.673800 02	2.410510 02	-2.049220-01	6.052400-02	3.814370-01	3.992670-02	3.999130 03	1.742140 05	9.014670 00
2.189000 01	9.624780 02	2.419500 02	-2.045630-01	6.034960-02	3.803380-01	3.989780-02	3.999130 03	1.742850 05	8.961120 00
2.199000 01	9.576890 02	2.428430 02	-2.041450-01	6.017840-02	3.792590-01	3.986960-02	3.999120 03	1.743520 05	8.905880 00
2.209000 01	9.526320 02	2.437310 02	-2.036680-01	6.001030-02	3.782000-01	3.984190-02	3.999120 03	1.744150 05	8.849000 00
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2.229000 01	9.427630 02	2.454890 02	-2.025430-01	5.968340-02	3.761400-01	3.978840-02	3.999110 03	1.745290 05	8.730390 00
2.239000 01	9.378240 02	2.463590 02	-2.018960-01	5.952440-02	3.751390-01	3.976260-02	3.999100 03	1.745800 05	8.668720 00
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2.259000 01	9.279430 02	2.480800 02	-2.004360-01	5.921640-02	3.731910-01	3.971250-02	3.999100 03	1.746730 05	8.540800 00
2.269000 01	9.230060 02	2.489310 02	-1.996240-01	5.906520-02	3.722450-01	3.968830-02	3.999090 03	1.747140 05	8.474600 00
2.279000 01	9.180710 02	2.497750 02	-1.987580-01	5.891790-02	3.713170-01	3.966460-02	3.999090 03	1.747510 05	8.406960 00
2.289000 01	9.131420 02	2.506120 02	-1.978400-01	5.877340-02	3.704070-01	3.964150-02	3.999080 03	1.747850 05	8.337890 00
2.299000 01	9.082200 02	2.514430 02	-1.968690-01	5.863170-02	3.695140-01	3.961880-02	3.999080 03	1.748160 05	8.267430 00
2.309000 01	9.033060 02	2.522660 02	-1.958460-01	5.849280-02	3.686380-01	3.959670-02	3.999070 03	1.748430 05	8.195600 00
2.319000 01	8.984040 02	2.530820 02	-1.947730-01	5.835650-02	3.677800-01	3.957500-02	3.999070 03	1.748680 05	8.122440 00

2.329000 01	8.935110 02	2.538960 02	-1.936490-01	5.822300-02	3.669380-01	3.956390-02	3.999060 03	1.748890 05	8.047960 00
2.339000 01	8.886310 02	2.546910 02	-1.924760-01	5.809210-02	3.661130-01	3.953320-02	3.999060 03	1.749080 05	7.972210 00
2.349000 01	8.837670 02	2.554850 02	-1.912530-01	5.796380-02	3.653050-01	3.951300-02	3.999060 03	1.749230 05	7.895190 00
2.359000 01	8.789190 02	2.562700 02	-1.899830-01	5.783800-02	3.645130-01	3.949320-02	3.999050 03	1.749360 05	7.816960 00
2.369000 01	8.740890 02	2.570480 02	-1.886640-01	5.771480-02	3.637370-01	3.947390-02	3.999050 03	1.749460 05	7.737920 00
2.379000 01	8.692780 02	2.578180 02	-1.872990-01	5.759410-02	3.629760-01	3.945500-02	3.999040 03	1.749530 05	7.656920 00
2.389000 01	8.644880 02	2.585790 02	-1.858880-01	5.747590-02	3.622310-01	3.943660-02	3.999040 03	1.749570 05	7.575170 00
2.399000 01	8.597200 02	2.593330 02	-1.844300-01	5.736010-02	3.615010-01	3.941860-02	3.999030 03	1.749590 05	7.492300 00
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2.469000 01	8.271040 02	2.643670 02	-1.730090-01	5.661460-02	3.568040-01	3.930360-02	3.999000 03	1.749100 05	6.883260 00
2.479000 01	8.225700 02	2.650510 02	-1.712100-01	5.651710-02	3.561900-01	3.928870-02	3.999000 03	1.748940 05	6.792430 00
2.489000 01	8.180720 02	2.657260 02	-1.693720-01	5.642180-02	3.555890-01	3.927420-02	3.998990 03	1.748770 05	6.700730 00
2.499000 01	8.136120 02	2.663910 02	-1.674950-01	5.632860-02	3.550020-01	3.926000-02	3.998990 03	1.748590 05	6.608170 00
2.509000 01	8.091910 02	2.670470 02	-1.655800-01	5.623750-02	3.544280-01	3.924620-02	3.998980 03	1.748380 05	6.514790 00
2.519000 01	8.048100 02	2.676940 02	-1.636270-01	5.614850-02	3.538670-01	3.923270-02	3.998980 03	1.748160 05	6.420610 00
2.529000 01	8.004700 02	2.683310 02	-1.616360-01	5.606160-02	3.533200-01	3.921960-02	3.998980 03	1.747930 05	6.325650 00
2.539000 01	7.961730 02	2.689590 02	-1.596100-01	5.597670-02	3.527850-01	3.920670-02	3.998970 03	1.747680 05	6.229940 00
2.549000 01	7.919210 02	2.695770 02	-1.575470-01	5.589380-02	3.522630-01	3.919420-02	3.998970 03	1.747420 05	6.133510 00
2.559000 01	7.877150 02	2.701860 02	-1.554500-01	5.581290-02	3.517530-01	3.918200-02	3.998960 03	1.747150 05	6.036390 00
2.569000 01	7.835550 02	2.707840 02	-1.533180-01	5.573400-02	3.512550-01	3.917020-02	3.998960 03	1.746870 05	5.938580 00
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2.589000 01	7.753830 02	2.719520 02	-1.489520-01	5.558190-02	3.502970-01	3.914740-02	3.998950 03	1.746270 05	5.741050 00
2.599000 01	7.713730 02	2.725220 02	-1.467200-01	5.550860-02	3.498350-01	3.913640-02	3.998950 03	1.745960 05	5.641370 00
2.609000 01	7.674150 02	2.730810 02	-1.444560-01	5.543720-02	3.493850-01	3.912570-02	3.998940 03	1.745640 05	5.541120 00
2.619000 01	7.635110 02	2.736300 02	-1.421610-01	5.536770-02	3.489470-01	3.911540-02	3.998940 03	1.745310 05	5.440310 00
2.629000 01	7.596620 02	2.741690 02	-1.398350-01	5.529990-02	3.485200-01	3.910530-02	3.998930 03	1.744970 05	5.338970 00
2.639000 01	7.558690 02	2.746980 02	-1.374790-01	5.523390-02	3.481040-01	3.909550-02	3.998930 03	1.744630 05	5.237130 00
2.649000 01	7.521330 02	2.752160 02	-1.350940-01	5.516970-02	3.477000-01	3.908590-02	3.998920 03	1.744290 05	5.134810 00
2.659000 01	7.484560 02	2.757250 02	-1.326790-01	5.510720-02	3.473060-01	3.907670-02	3.998920 03	1.743930 05	5.032040 00
2.669000 01	7.448380 02	2.762230 02	-1.302370-01	5.504650-02	3.469230-01	3.906770-02	3.998910 03	1.743580 05	4.928830 00
2.679000 01	7.412820 02	2.767100 02	-1.277670-01	5.498740-02	3.465510-01	3.905890-02	3.998910 03	1.743220 05	4.825200 00
2.689000 01	7.377870 02	2.771880 02	-1.252700-01	5.493000-02	3.461900-01	3.905040-02	3.998910 03	1.742860 05	4.721200 00
2.699000 01	7.343560 02	2.776550 02	-1.227460-01	5.487430-02	3.458390-01	3.904220-02	3.998900 03	1.742500 05	4.616820 00
2.709000 01	7.309880 02	2.781110 02	-1.201970-01	5.482020-02	3.454980-01	3.903420-02	3.998900 03	1.742140 05	4.512110 00
2.719000 01	7.276860 02	2.785570 02	-1.176230-01	5.476780-02	3.451670-01	3.902650-02	3.998890 03	1.741770 05	4.407080 00
2.729000 01	7.244510 02	2.789920 02	-1.150240-01	5.471690-02	3.448470-01	3.901900-02	3.998890 03	1.741410 05	4.301750 00
2.739000 01	7.212830 02	2.794170 02	-1.124020-01	5.466760-02	3.445360-01	3.901180-02	3.998880 03	1.741050 05	4.196140 00
2.749000 01	7.181830 02	2.798320 02	-1.097560-01	5.461980-02	3.442350-01	3.900480-02	3.998880 03	1.740690 05	4.090290 00
2.759000 01	7.151530 02	2.802350 02	-1.070870-01	5.457360-02	3.439440-01	3.899800-02	3.998870 03	1.740330 05	3.984210 00
2.769000 01	7.121930 02	2.806280 02	-1.043960-01	5.452890-02	3.436620-01	3.899150-02	3.998870 03	1.739980 05	3.877910 00
2.779000 01	7.093040 02	2.810110 02	-1.016840-01	5.448560-02	3.433900-01	3.898510-02	3.998870 03	1.739620 05	3.771440 00
2.789000 01	7.064880 02	2.813830 02	-9.895130-02	5.444390-02	3.431260-01	3.897900-02	3.998860 03	1.739270 05	3.664800 00
2.799000 01	7.037450 02	2.817440 02	-9.619830-02	5.440360-02	3.428720-01	3.897310-02	3.998860 03	1.738930 05	3.558020 00
2.809000 01	7.010760 02	2.820940 02	-9.342510-02	5.436470-02	3.426270-01	3.896750-02	3.998850 03	1.738590 05	3.451120 00
2.819000 01	6.984820 02	2.824340 02	-9.063320-02	5.432720-02	3.423910-01	3.896200-02	3.998850 03	1.738250 05	3.344120 00
2.829000 01	6.959640 02	2.827630 02	-8.782280-02	5.429110-02	3.421630-01	3.895670-02	3.998840 03	1.737930 05	3.237040 00
2.839000 01	6.935220 02	2.830810 02	-8.499460-02	5.425630-02	3.419450-01	3.895170-02	3.998840 03	1.737600 05	3.129910 00
2.849000 01	6.911580 02	2.833890 02	-8.214510-02	5.422290-02	3.417340-01	3.894680-02	3.998840 03	1.737290 05	3.022740 00

COST FUNCTION (J) = 3.06988592984012600-04
WITH:
ALTITUDE TOLERANCE = 0.6621716024463D-04
FLIGHT-PATH-ANGLE TOLERANCE = 0.35565622269540-10
FLIGHT-PATH-ANGLE-DERIVATIVE TOLERANCE = 0.34123640362850-11
WEIGHT TOLERANCE = 0.0
ENERGY TOLERANCE = 0.66127733839590-04
ANGLE-OF-ATTACK TOLERANCE = 0.0

PREVIOUS COEFFICIENT		1.00*DELTA		NEW COEFFICIENT	
0.28735141431030 05	+	1.00* 0.0	=	0.28735141431000 05	(FROZEN)
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
0.11266420660960 04	+	1.00* 0.0	=	0.11266420660960 04	(FROZEN)
-0.21701637120930 01	+	1.00* 0.0	=	-0.21701637120930 01	(FROZEN)
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
0.35100765260530-01	+	1.00*-0.45080290D-05	=	0.35102257231540-01	
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
0.12845149326650 01	+	1.00* 0.43309043D-03	=	0.12889480230960 01	
0.0	+	1.00* 0.0	=	0.0	(FROZEN)
0.20322175557130 04	+	1.00*-0.37454902D 00	=	0.20316430060940 04	
0.77854905704310-04	+	1.00*-0.47244336D-05	=	0.73130532099090-04	
0.63009577661600 01	+	1.00*-0.98367713D-03	=	0.62999735890320 01	
-0.90660200621700-07	+	1.00* 0.57493749D-05	=	0.56565180780590-05	

F L I G H T   P A T H   T R A J E C T O R Y   P R E D I C T I O N

ITERATION # 5

TIME (SEC)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	FLIGHT PATH ANGLE (RADIAN)	ANGLE OF ATTACK (RADIAN)	LIFT COEFFICIENT	DRAG COEFFICIENT	WEIGHT (LBF)	POWER AVAILABLE (FT-LBF/SEC)	ACCELERATION (FT/SEC)
0.0	1.000000 03	1.467360 02	5.143420-05	1.625710-01	1.024270 00	1.066790-01	4.000000 03	1.473290 05	4.664040 00
1.000000-02	1.000000 03	1.467860 02	1.124930-04	1.625910-01	1.024390 00	1.067140-01	4.000000 03	1.473520 05	4.658280 00
2.000000-02	1.000000 03	1.468320 02	1.749790-04	1.625980-01	1.024440 00	1.067270-01	4.000000 03	1.473740 05	4.652470 00
3.000000-02	1.000000 03	1.468760 02	2.369030-04	1.626050-01	1.024480 00	1.067390-01	4.000000 03	1.473970 05	4.646630 00
4.000000-02	1.000000 03	1.469250 02	3.042540-04	1.626120-01	1.024520 00	1.067520-01	4.000000 03	1.474200 05	4.640740 00
6.000000-02	1.000000 03	1.470180 02	4.392470-04	1.626250-01	1.024610 00	1.067760-01	4.000000 03	1.474650 05	4.628840 00
8.000000-02	1.000000 03	1.471100 02	5.749370-04	1.626380-01	1.024690 00	1.068000-01	4.000000 03	1.475100 05	4.616790 00
1.000000-01	1.000010 03	1.472020 02	7.263040-04	1.626520-01	1.024770 00	1.068240-01	4.000000 03	1.475550 05	4.604580 00
1.200000-01	1.000010 03	1.472940 02	8.783250-04	1.626650-01	1.024860 00	1.068480-01	4.000000 03	1.476000 05	4.592210 00
1.400000-01	1.000010 03	1.473860 02	1.035980-03	1.626780-01	1.024940 00	1.068710-01	3.999990 03	1.476450 05	4.579680 00
1.800000-01	1.000020 03	1.475690 02	1.368100-03	1.627030-01	1.025100 00	1.069170-01	3.999990 03	1.477340 05	4.554160 00
2.200000-01	1.000030 03	1.477510 02	1.722480-03	1.627270-01	1.025250 00	1.069610-01	3.999990 03	1.478220 05	4.528030 00
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2.129000 01	9.916400 02	2.364990 02	-2.058130-01	6.145530-02	3.872430-01	4.007960-02	3.999150 03	1.738020 05	9.256150 00
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2.149000 01	9.819330 02	2.383240 02	-2.056530-01	6.107690-02	3.848480-01	4.001600-02	3.999140 03	1.739790 05	9.164930 00
2.159000 01	9.771100 02	2.392360 02	-2.054530-01	6.089280-02	3.836860-01	3.998520-02	3.999140 03	1.740620 05	9.116600 00
2.169000 01	9.722240 02	2.401470 02	-2.052190-01	6.071190-02	3.825470-01	3.995500-02	3.999130 03	1.741400 05	9.066500 00
2.179000 01	9.672960 02	2.410510 02	-2.049190-01	6.053430-02	3.814340-01	3.992650-02	3.999130 03	1.742150 05	9.014670 00
2.189000 01	9.624190 02	2.419500 02	-2.045630-01	6.035990-02	3.803390-01	3.989860-02	3.999130 03	1.742850 05	8.961120 00
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2.209000 01	9.523740 02	2.437310 02	-2.036310-01	6.002070-02	3.782010-01	3.984370-02	3.999120 03	1.744150 05	8.849000 00
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2.259000 01	9.274650 02	2.480830 02	-2.004320-01	5.922550-02	3.731920-01	3.971110-02	3.999100 03	1.746730 05	8.540800 00
2.269000 01	9.224670 02	2.489310 02	-1.996230-01	5.907530-02	3.722460-01	3.968690-02	3.999090 03	1.747140 05	8.474600 00
2.279000 01	9.183130 02	2.497750 02	-1.987540-01	5.892910-02	3.713160-01	3.966320-02	3.999090 03	1.747510 05	8.406960 00
2.289000 01	9.133840 02	2.506120 02	-1.978300-01	5.878350-02	3.704080-01	3.964000-02	3.999080 03	1.747850 05	8.337890 00
2.299000 01	9.081260 02	2.514430 02	-1.968650-01	5.864180-02	3.695150-01	3.961740-02	3.999080 03	1.748160 05	8.267430 00
2.309000 01	9.032490 02	2.522680 02	-1.958420-01	5.850280-02	3.686390-01	3.959520-02	3.999070 03	1.748430 05	8.195600 00
2.319000 01	8.981930 02	2.530840 02	-1.947600-01	5.836530-02	3.677800-01	3.957360-02	3.999070 03	1.748670 05	8.122440 00
2.329000 01	8.930530 02	2.538970 02	-1.936370-01	5.823300-02	3.669390-01	3.955240-02	3.999060 03	1.748890 05	8.047960 00
2.339000 01	8.885740 02	2.546910 02	-1.924710-01	5.810200-02	3.661140-01	3.953170-02	3.999060 03	1.749080 05	7.972210 00
2.349000 01	8.837100 02	2.554850 02	-1.912490-01	5.797370-02	3.653060-01	3.951150-02	3.999060 03	1.749230 05	7.895190 00
2.359000 01	8.788190 02	2.562700 02	-1.899780-01	5.784800-02	3.645140-01	3.949170-02	3.999050 03	1.749360 05	7.816960 00
2.369000 01	8.740320 02	2.570480 02	-1.886600-01	5.772470-02	3.637370-01	3.947240-02	3.999050 03	1.749460 05	7.737520 00
2.379000 01	8.692130 02	2.578180 02	-1.872950-01	5.760400-02	3.629770-01	3.945350-02	3.999040 03	1.749530 05	7.656920 00
2.389000 01	8.644310 02	2.585790 02	-1.858830-01	5.748570-02	3.622330-01	3.943510-02	3.999040 03	1.749570 05	7.575170 00
2.399000 01	8.596030 02	2.593340 02	-1.844260-01	5.736990-02	3.615020-01	3.941700-02	3.999030 03	1.749590 05	7.492300 00
2.409000 01	8.549200 02	2.600780 02	-1.829240-01	5.725640-02	3.607870-01	3.939940-02	3.999030 03	1.749590 05	7.408350 00
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2.439000 01	8.408490 02	2.622620 02	-1.781540-01	5.693010-02	3.587310-01	3.934900-02	3.999020 03	1.749440 05	7.150220 00
2.449000 01	8.362160 02	2.629720 02	-1.764790-01	5.682590-02	3.580750-01	3.933290-02	3.999010 03	1.749340 05	7.062180 00
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2.479000 01	8.225140 02	2.650510 02	-1.712050-01	5.652680-02	3.561900-01	3.928710-02	3.999000 03	1.748940 05	6.792430 00
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2.499000 01	8.135570 02	2.663910 02	-1.674900-01	5.633820-02	3.550020-01	3.925830-02	3.998990 03	1.748590 05	6.608170 00
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2.519000 01	8.047540 02	2.676940 02	-1.636210-01	5.615810-02	3.538680-01	3.923100-02	3.998980 03	1.748160 05	6.420610 00
2.529000 01	8.004150 02	2.683310 02	-1.616310-01	5.607120-02	3.533200-01	3.921780-02	3.998980 03	1.747930 05	6.325650 00
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2.599000 01	7.713190 02	2.725220 02	-1.467150-01	5.551810-02	3.498360-01	3.913460-02	3.998950 03	1.745960 05	5.641370 00
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2.619000 01	7.634570 02	2.736300 02	-1.421550-01	5.537710-02	3.489480-01	3.911360-02	3.998940 03	1.745310 05	5.440310 00
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2.639000 01	7.558150 02	2.746980 02	-1.374730-01	5.524340-02	3.481050-01	3.909370-02	3.998930 03	1.744630 05	5.237130 00
2.649000 01	7.520800 02	2.752160 02	-1.350880-01	5.517910-02	3.477000-01	3.908410-02	3.998920 03	1.744290 05	5.134810 00
2.659000 01	7.484030 02	2.757250 02	-1.326730-01	5.511660-02	3.473070-01	3.907480-02	3.998920 03	1.743930 05	5.032040 00
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2.689000 01	7.377340 02	2.771880 02	-1.252640-01	5.493940-02	3.461900-01	3.904860-02	3.998910 03	1.742860 05	4.721200 00
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2.709000 01	7.309360 02	2.781110 02	-1.201910-01	5.482960-02	3.454980-01	3.903240-02	3.998900 03	1.742140 05	4.512110 00
2.719000 01	7.276340 02	2.785570 02	-1.176170-01	5.477710-02	3.451670-01	3.902470-02	3.998890 03	1.741770 05	4.407080 00
2.729000 01	7.243960 02	2.789920 02	-1.150180-01	5.472620-02	3.448470-01	3.901720-02	3.998890 03	1.741410 05	4.301750 00
2.739000 01	7.212310 02	2.794170 02	-1.123930-01	5.467690-02	3.445360-01	3.900990-02	3.998880 03	1.741050 05	4.196140 00
2.749000 01	7.181310 02	2.798320 02	-1.097490-01	5.462910-02	3.442350-01	3.900290-02	3.998880 03	1.740690 05	4.090290 00
2.759000 01	7.151010 02	2.802350 02	-1.070810-01	5.458290-02	3.439440-01	3.899610-02	3.998870 03	1.740330 05	3.984210 00
2.769000 01	7.121420 02	2.806280 02	-1.043900-01	5.453820-02	3.436620-01	3.898960-02	3.998870 03	1.739980 05	3.877910 00
2.779000 01	7.092530 02	2.810110 02	-1.016780-01	5.449490-02	3.433900-01	3.898330-02	3.998870 03	1.739620 05	3.771440 00
2.789000 01	7.064370 02	2.813830 02	-9.894480-02	5.445310-02	3.431260-01	3.897710-02	3.998860 03	1.739270 05	3.664800 00
2.799000 01	7.036940 02	2.817440 02	-9.619150-02	5.441280-02	3.428720-01	3.897120-02	3.998860 03	1.738930 05	3.558020 00
2.809000 01	7.010200 02	2.820940 02	-9.341860-02	5.437390-02	3.426270-01	3.896560-02	3.998850 03	1.738590 05	3.451120 00
2.819000 01	6.984320 02	2.824340 02	-9.062660-02	5.433640-02	3.423910-01	3.896010-02	3.998850 03	1.738250 05	3.344120 00
2.829000 01	6.959140 02	2.827630 02	-8.781620-02	5.430030-02	3.421630-01	3.895480-02	3.998840 03	1.737930 05	3.237040 00
2.839000 01	6.934720 02	2.830810 02	-8.498800-02	5.426560-02	3.419450-01	3.894980-02	3.998840 03	1.737600 05	3.129910 00
2.849000 01	6.911080 02	2.833890 02	-8.214250-02	5.423210-02	3.417340-01	3.894490-02	3.998840 03	1.737290 05	3.022740 00

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COST FUNCTION (J) =  1.2940479969072590D-02
WITH:
      ALTITUDE TOLERANCE =  0.2863771746919D-02
      FLIGHT-PATH-ANGLE TOLERANCE =  0.4448176851654D-09
      FLIGHT-PATH-ANGLE-DERIVATIVE TOLERANCE =  0.7928805784840D-10
      WEIGHT TOLERANCE =  0.0
      ENERGY TOLERANCE =  0.2863762685183D-02
      ANGLE-OF-ATTACK TOLERANCE =  0.0
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PREVIOUS COEFFICIENT        1.00*DELTA              NEW COEFFICIENT

 0.2873514143100D 05 + 1.00* 0.0                  =  0.2873614143100D 06   (FROZEN)
 0.0                 + 1.00* 0.0                  =  0.0                   (FROZEN)
 0.1126642066696D 04 + 1.00* 0.0                  =  0.1126642066696D 04   (FROZEN)
-0.2170163712093D 01 + 1.00* 0.0                  = -0.2170163712093D 01   (FROZEN)
 0.0                 + 1.00* 0.0                  =  0.0                   (FROZEN)
 0.3510225723154D-01 + 1.00* 0.369561920-05       =  0.3510695275074D-01
 0.0                 + 1.00* 0.0                  =  0.0                   (FROZEN)
 0.1288948023096D 01 + 1.00*-0.125989350-02       =  0.1287688129621D 01
 0.0                 + 1.00* 0.0                  =  0.0                   (FROZEN)
 0.2031843006394D 04 + 1.00*-0.41971775D 00       =  0.2031423288346D 04
 0.7313053209509D-04 + 1.00*-0.61341165D-04       =  0.1178937687943D-04
 0.6299735890032D 01 + 1.00*-0.15792197D-04      =  0.6299577968836D 01
 0.5655512678059D-05 + 1.00*-0.56582003D-05       =  0.3183437004384D-09   (FROZEN)

PREVIOUS COEFFICIENT        1.00*DELTA              NEW COEFFICIENT

 0.2873514143100D 05 + 1.00* 0.0                  =  0.2873514143100D 05   (FROZEN)
 0.0                 + 1.00* 0.0                  =  0.0                   (FROZEN)
 0.1126642066690D 04 + 1.00* 0.0                  =  0.1126642066690D 04   (FROZEN)
-0.2170163712093D 01 + 1.00* 0.0                  = -0.2170163712093D 01   (FROZEN)
 0.0                 + 1.00* 0.0                  =  0.0                   (FROZEN)
 0.3510225723164D-01 + 1.00* 0.36955193D-05       =  0.3510595275083D-01
 0.0                 + 1.00* 0.0                  =  0.0                   (FROZEN)
 0.1288948023096D 01 + 1.00*-0.12598935D-02       =  0.1287688129603D 01
 0.0                 + 1.00* 0.0                  =  0.0                   (FROZEN)
 0.2031843006094D 04 + 1.00*-0.41971772D 00       =  0.2031423288370D 04
 0.7313053209509D-04 + 1.00*-0.61341135D-04       =  0.1178937690259D-04
 0.6298973589032D 01 + 1.00*-0.15792196D-04      =  0.6298957796835D 01
 0.3183437004384D-09 + 1.00* 0.0                  =  0.3183437004384D-09   (FROZEN)
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F L I G H T   P A T H   T R A J E C T O R Y   P R E D I C T I O N

ITERATION # 6

TIME (SEC)	ALTITUDE (FT)	AIRSPEED (FT/SEC)	FLIGHT PATH ANGLE (RADIAN)	ANGLE OF ATTACK (RADIAN)	LIFT COEFFICIENT	DRAG COEFFICIENT	WEIGHT (LBF)	POWER AVAILABLE (FT-LBF/SEC)	ACCELERATION (FT/SEC)
0.0	1.000000D 03	1.467340 02	6.144420D-35	1.625920D-01	1.024170 00	1.066780D-01	4.000000 03	1.473290 05	4.664040 00
1.000000D-02	1.000000D 03	1.467660 02	1.122950D-04	1.626110D-01	1.024290 00	1.067140D-01	4.000000 03	1.473520 05	4.658280 00
2.000000D-02	1.000000D 03	1.468323 02	1.745850D-04	1.626180D-01	1.024343 00	1.067260D-01	4.000000 03	1.473740 05	4.652470 00
3.000000D-02	1.000000D 03	1.468790 02	2.383110D-04	1.626260D-01	1.024383 00	1.067390D-01	4.000000 03	1.473970 05	4.646630 00
4.000000D-02	1.000000D 03	1.469250 02	3.034710D-04	1.626320D-01	1.024430 00	1.067520D-01	4.000000 03	1.474200 05	4.640740 00
6.000000D-02	1.000000D 03	1.470180 02	4.380810D-04	1.626460D-01	1.024510 00	1.067760D-01	4.000000 03	1.474650 05	4.628840 00
8.000000D-02	1.000000D 03	1.471100 02	5.783540D-04	1.626600D-01	1.024600 00	1.068010D-01	4.000000 03	1.475100 05	4.616790 00
1.000000D-01	1.000000D 03	1.472020 02	7.263890D-04	1.626730D-01	1.024683 00	1.068250D-01	4.000000 03	1.475550 05	4.604580 00
1.200000D-01	1.000001D 03	1.472940 02	8.760420D-04	1.626860D-01	1.024770 00	1.068490D-01	4.000000 03	1.476000 05	4.592210 00
1.400000D-01	1.000001D 03	1.473860 02	1.033330D-03	1.626960D-01	1.024850 00	1.068730D-01	3.999990 03	1.476450 05	4.579680 00
1.800000D-01	1.000002D 03	1.475650 02	1.364750D-03	1.627250D-01	1.025010 00	1.069190D-01	3.999990 03	1.477340 05	4.554160 00
2.200000D-01	1.000003D 03	1.477510 02	1.718440D-03	1.627560D-01	1.025170 00	1.069640D-01	3.999990 03	1.478220 05	4.528030 00
2.600000D-01	1.000004D 03	1.479310 02	2.094250D-03	1.627740D-01	1.025320 00	1.070080D-01	3.999990 03	1.479100 05	4.501290 00
3.000000D-01	1.000005D 03	1.481110 02	2.491670D-03	1.627970D-01	1.025470 00	1.070510D-01	3.999990 03	1.479960 05	4.473960 00
3.400000D-01	1.000007D 03	1.482890 02	2.911140D-03	1.628200D-01	1.025610 00	1.070920D-01	3.999990 03	1.480830 05	4.446040 00
4.200000D-01	1.000010D 03	1.486420 02	3.814780D-03	1.628630D-01	1.025880 00	1.071690D-01	3.999980 03	1.482530 05	4.388490 00
5.000000D-01	1.000013D 03	1.489910 02	4.802730D-03	1.629020D-01	1.026130 00	1.072410D-01	3.999980 03	1.484210 05	4.328710 00
5.800000D-01	1.000022D 03	1.493350 02	5.873670D-03	1.629390D-01	1.026350 00	1.073070D-01	3.999980 03	1.485860 05	4.266780 00
6.600000D-01	1.000030D 03	1.496740 02	7.025950D-03	1.629710D-01	1.026560 00	1.073660D-01	3.999970 03	1.487470 05	4.202780 00
7.400000D-01	1.000040D 03	1.500070 02	8.257860D-03	1.630000D-01	1.026743 00	1.074180D-01	3.999970 03	1.489063 05	4.136790 00
8.200000D-01	1.000053D 03	1.504170 02	9.567670D-03	1.630300D-01	1.026930 00	1.074730D-01	3.999970 03	1.491010 05	4.051630 00
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1.14400D 01	1.19821D 03	1.60547D 02	9.10516D-02	1.06178D-01	6.68826D-01	5.25340D-02	3.99956D 03	1.53677D 05	2.79550D 00
1.15400D 01	1.19944D 03	1.60833D 02	8.69369D-02	1.05402D-01	6.63937D-01	5.21972D-02	3.99956D 03	1.53800D 05	2.92623D 00
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1.17400D 01	1.20210D 03	1.61444D 02	7.85280D-02	1.03867D-01	6.54269D-01	5.15489D-02	3.99955D 03	1.54061D 05	3.19089D 00
1.18400D 01	1.20334D 03	1.61770D 02	7.42467D-02	1.03109D-01	6.49492D-01	5.12371D-02	3.99955D 03	1.54200D 05	3.32459D 00
1.19400D 01	1.20450D 03	1.62109D 02	6.99033D-02	1.02357D-01	6.44757D-01	5.09333D-02	3.99954D 03	1.54344D 05	3.45907D 00
1.20400D 01	1.20560D 03	1.62462D 02	6.55183D-02	1.01612D-01	6.40062D-01	5.06374D-02	3.99954D 03	1.54493D 05	3.59421D 00
1.21400D 01	1.20663D 03	1.62828D 02	6.10563D-02	1.00874D-01	6.35411D-01	5.03491D-02	3.99953D 03	1.54647D 05	3.72989D 00
1.22400D 01	1.20759D 03	1.63206D 02	5.66226D-02	1.00142D-01	6.30802D-01	5.00682D-02	3.99953D 03	1.54806D 05	3.86602D 00
1.23400D 01	1.20866D 03	1.63601D 02	5.21167D-02	9.94171D-02	6.26236D-01	4.97946D-02	3.99953D 03	1.54970D 05	4.00247D 00
1.24400D 01	1.20925D 03	1.64006D 02	4.75623D-02	9.86991D-02	6.21713D-01	4.95276D-02	3.99952D 03	1.55139D 05	4.13915D 00
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1.31400D 01	1.21293D 03	1.67241D 02	1.52095D-02	9.38700D-02	5.91295D-01	4.78423D-02	3.99949D 03	1.56457D 05	5.09299D 00
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2.16900D 01	9.72196D 02	2.40147D 02	-2.05225D-01	6.07308D-02	3.82552D-01	3.99572D-02	3.99913D 03	1.74140D 05	9.06650D 00
2.17900D 01	9.67257D 02	2.41051D 02	-2.04925D-01	6.05531D-02	3.81433D-01	3.99276D-02	3.99913D 03	1.74215D 05	9.01467D 00
2.18900D 01	9.62386D 02	2.41950D 02	-2.04566D-01	6.03787D-02	3.80335D-01	3.98988D-02	3.99913D 03	1.74285D 05	8.96112D 00
2.19900D 01	9.57467D 02	2.42843D 02	-2.04146D-01	6.02075D-02	3.79256D-01	3.98735D-02	3.99912D 03	1.74352D 05	8.90588D 00
2.20900D 01	9.52541D 02	2.43731D 02	-2.03671D-01	6.00394D-02	3.78197D-01	3.98429D-02	3.99912D 03	1.74415D 05	8.84900D 00
2.21900D 01	9.47608D 02	2.44613D 02	-2.03137D-01	5.98743D-02	3.77158D-01	3.98158D-02	3.99911D 03	1.74474D 05	8.79049D 00
2.22900D 01	9.42671D 02	2.45489D 02	-2.02547D-01	5.97123D-02	3.76137D-01	3.97894D-02	3.99911D 03	1.74529D 05	8.73039D 00
2.23900D 01	9.37732D 02	2.46359D 02	-2.01899D-01	5.95533D-02	3.75135D-01	3.97635D-02	3.99910D 03	1.74580D 05	8.66872D 00
2.24900D 01	9.32791D 02	2.47223D 02	-2.01197D-01	5.93973D-02	3.74153D-01	3.97382D-02	3.99910D 03	1.74628D 05	8.60551D 00
2.25900D 01	9.27851D 02	2.48080D 02	-2.00439D-01	5.92442D-02	3.73188D-01	3.97134D-02	3.99910D 03	1.74673D 05	8.54080D 00
2.26900D 01	9.22913D 02	2.48931D 02	-1.99627D-01	5.90939D-02	3.72242D-01	3.96892D-02	3.99909D 03	1.74714D 05	8.47460D 00
2.27900D 01	9.17579D 02	2.49775D 02	-1.98761D-01	5.89466D-02	3.71314D-01	3.96655D-02	3.99909D 03	1.74751D 05	8.40696D 00
2.28900D 01	9.13050D 02	2.50612D 02	-1.97843D-01	5.88021D-02	3.70404D-01	3.96423D-02	3.99908D 03	1.74785D 05	8.33789D 00
2.29900D 01	9.08128D 02	2.51443D 02	-1.96872D-01	5.86603D-02	3.69511D-01	3.96197D-02	3.99908D 03	1.74816D 05	8.26743D 00
2.30900D 01	9.03214D 02	2.52266D 02	-1.95849D-01	5.85213D-02	3.68635D-01	3.95976D-02	3.99907D 03	1.74843D 05	8.19560D 00
2.31900D 01	8.98310D 02	2.53082D 02	-1.94776D-01	5.83851D-02	3.67777D-01	3.95759D-02	3.99907D 03	1.74868D 05	8.12244D 00
2.32900D 01	8.93418D 02	2.53890D 02	-1.93652D-01	5.82515D-02	3.66935D-01	3.95547D-02	3.99906D 03	1.74889D 05	8.04796D 00
2.33900D 01	8.88539D 02	2.54691D 02	-1.92479D-01	5.81205D-02	3.66111D-01	3.95341D-02	3.99906D 03	1.74908D 05	7.97221D 00
2.34900D 01	8.83674D 02	2.55485D 02	-1.91256D-01	5.79922D-02	3.65302D-01	3.95138D-02	3.99906D 03	1.74923D 05	7.89519D 00
2.35900D 01	8.78826D 02	2.56270D 02	-1.89986D-01	5.78664D-02	3.64510D-01	3.94941D-02	3.99905D 03	1.74936D 05	7.81696D 00
2.36900D 01	8.73996D 02	2.57048D 02	-1.88667D-01	5.77432D-02	3.63734D-01	3.94748D-02	3.99905D 03	1.74946D 05	7.73752D 00
2.37900D 01	8.69185D 02	2.57818D 02	-1.87302D-01	5.76224D-02	3.62973D-01	3.94559D-02	3.99904D 03	1.74953D 05	7.65692D 00
2.38900D 01	8.64395D 02	2.58579D 02	-1.85891D-01	5.75042D-02	3.62228D-01	3.94374D-02	3.99904D 03	1.74957D 05	7.57517D 00
2.39900D 01	8.59627D 02	2.59333D 02	-1.84434D-01	5.73883D-02	3.61498D-01	3.94194D-02	3.99903D 03	1.74959D 05	7.49230D 00
2.40900D 01	8.54883D 02	2.60078D 02	-1.82931D-01	5.72748D-02	3.60784D-01	3.94018D-02	3.99903D 03	1.74959D 05	7.40835D 00
2.41900D 01	8.50166D 02	2.60814D 02	-1.81385D-01	5.71637D-02	3.60084D-01	3.93846D-02	3.99902D 03	1.74956D 05	7.32333D 00
2.42900D 01	8.45474D 02	2.61542D 02	-1.79795D-01	5.70550D-02	3.59399D-01	3.93678D-02	3.99902D 03	1.74951D 05	7.23728D 00
2.43900D 01	8.40811D 02	2.62262D 02	-1.78162D-01	5.69485D-02	3.58726D-01	3.93514D-02	3.99902D 03	1.74944D 05	7.15022D 00
2.44900D 01	8.36179D 02	2.62972D 02	-1.76487D-01	5.68443D-02	3.58072D-01	3.93354D-02	3.99901D 03	1.74934D 05	7.06218D 00
2.45900D 01	8.31578D 02	2.63674D 02	-1.74770D-01	5.67423D-02	3.57429D-01	3.93197D-02	3.99901D 03	1.74923D 05	6.97318D 00
2.46900D 01	8.27010D 02	2.64367D 02	-1.73012D-01	5.66426D-02	3.56801D-01	3.93044D-02	3.99900D 03	1.74910D 05	6.88326D 00
2.47900D 01	8.22476D 02	2.65051D 02	-1.71213D-01	5.65451D-02	3.56187D-01	3.92895D-02	3.99900D 03	1.74894D 05	6.79243D 00
2.48900D 01	8.17974D 02	2.65726D 02	-1.69375D-01	5.64497D-02	3.55586D-01	3.92750D-02	3.99899D 03	1.74877D 05	6.70073D 00
2.49900D 01	8.13518D 02	2.66391D 02	-1.67496D-01	5.63565D-02	3.54999D-01	3.92608D-02	3.99899D 03	1.74859D 05	6.60817D 00
2.50900D 01	8.09097D 02	2.67047D 02	-1.65583D-01	5.62654D-02	3.54425D-01	3.92470D-02	3.99898D 03	1.74838D 05	6.51479D 00
2.51900D 01	8.04715D 02	2.67694D 02	-1.63630D-01	5.61764D-02	3.53865D-01	3.92335D-02	3.99898D 03	1.74816D 05	6.42061D 00
2.52900D 01	8.00376D 02	2.68331D 02	-1.61640D-01	5.60895D-02	3.53317D-01	3.92203D-02	3.99898D 03	1.74793D 05	6.32565D 00
2.53900D 01	7.96079D 02	2.68959D 02	-1.59613D-01	5.60046D-02	3.52782D-01	3.92075D-02	3.99897D 03	1.74768D 05	6.22994D 00
2.54900D 01	7.91827D 02	2.69577D 02	-1.57553D-01	5.59217D-02	3.52260D-01	3.91950D-02	3.99897D 03	1.74742D 05	6.13351D 00
2.55900D 01	7.87620D 02	2.70186D 02	-1.55453D-01	5.58407D-02	3.51750D-01	3.91828D-02	3.99896D 03	1.74715D 05	6.03639D 00
2.56900D 01	7.83461D 02	2.70784D 02	-1.53321D-01	5.57618D-02	3.51253D-01	3.91709D-02	3.99896D 03	1.74687D 05	5.93858D 00
2.57900D 01	7.79350D 02	2.71373D 02	-1.51155D-01	5.56847D-02	3.50768D-01	3.91594D-02	3.99895D 03	1.74657D 05	5.84013D 00
2.58900D 01	7.75288D 02	2.71952D 02	-1.48955D-01	5.56096D-02	3.50294D-01	3.91481D-02	3.99895D 03	1.74627D 05	5.74105D 00
2.59900D 01	7.71278D 02	2.72522D 02	-1.46723D-01	5.55363D-02	3.49833D-01	3.91372D-02	3.99895D 03	1.74596D 05	5.64137D 00
2.60900D 01	7.67320D 02	2.73081D 02	-1.44460D-01	5.54649D-02	3.49383D-01	3.91265D-02	3.99894D 03	1.74564D 05	5.54112D 00
2.61900D 01	7.63416D 02	2.73630D 02	-1.42166D-01	5.53953D-02	3.48945D-01	3.91161D-02	3.99894D 03	1.74531D 05	5.44031D 00
2.62900D 01	7.59567D 02	2.74169D 02	-1.39838D-01	5.53276D-02	3.48518D-01	3.91060D-02	3.99893D 03	1.74497D 05	5.33897D 00
2.63900D 01	7.55774D 02	2.74698D 02	-1.37482D-01	5.52616D-02	3.48102D-01	3.90962D-02	3.99893D 03	1.74463D 05	5.23713D 00
2.64900D 01	7.52038D 02	2.75216D 02	-1.35097D-01	5.51973D-02	3.47697D-01	3.90867D-02	3.99892D 03	1.74429D 05	5.13481D 00
2.65900D 01	7.48360D 02	2.75725D 02	-1.32683D-01	5.51348D-02	3.47304D-01	3.90774D-02	3.99892D 03	1.74393D 05	5.03204D 00
2.66900D 01	7.44743D 02	2.76223D 02	-1.30240D-01	5.50741D-02	3.46921D-01	3.90684D-02	3.99891D 03	1.74358D 05	4.92883D 00
2.67900D 01	7.41186D 02	2.76710D 02	-1.27770D-01	5.50150D-02	3.46549D-01	3.90597D-02	3.99891D 03	1.74322D 05	4.82520D 00
2.68900D 01	7.37691D 02	2.77188D 02	-1.25273D-01	5.49576D-02	3.46187D-01	3.90512D-02	3.99891D 03	1.74286D 05	4.72120D 00
2.69900D 01	7.34260D 02	2.77655D 02	-1.22750D-01	5.49018D-02	3.45836D-01	3.90430D-02	3.99890D 03	1.74250D 05	4.61682D 00
2.70900D 01	7.30892D 02	2.78111D 02	-1.20200D-01	5.48477D-02	3.45495D-01	3.90350D-02	3.99890D 03	1.74214D 05	4.51211D 00
2.71900D 01	7.27559D 02	2.78557D 02	-1.17626D-01	5.47953D-02	3.45165D-01	3.90272D-02	3.99889D 03	1.74177D 05	4.40708D 00
2.72900D 01	7.24355D 02	2.78992D 02	-1.15027D-01	5.47444D-02	3.44846D-01	3.90198D-02	3.99889D 03	1.74141D 05	4.30175D 00
2.73900D 01	7.21187D 02	2.79417D 02	-1.12405D-01	5.46950D-02	3.44534D-01	3.90125D-02	3.99888D 03	1.74105D 05	4.19614D 00
2.74900D 01	7.18087D 02	2.79832D 02	-1.09759D-01	5.46473D-02	3.44233D-01	3.90055D-02	3.99888D 03	1.74069D 05	4.09029D 00
2.75900D 01	7.15056D 02	2.80235D 02	-1.07090D-01	5.46010D-02	3.43941D-01	3.89987D-02	3.99887D 03	1.74033D 05	3.98421D 00
2.76900D 01	7.12096D 02	2.80628D 02	-1.04400D-01	5.45563D-02	3.43660D-01	3.89922D-02	3.99887D 03	1.73998D 05	3.87791D 00
2.77900D 01	7.09208D 02	2.81011D 02	-1.01687D-01	5.45131D-02	3.43387D-01	3.89859D-02	3.99887D 03	1.73962D 05	3.77144D 00
2.78900D 01	7.06392D 02	2.81383D 02	-9.89545D-02	5.44713D-02	3.43124D-01	3.89797D-02	3.99886D 03	1.73927D 05	3.66480D 00
2.79900D 01	7.03648D 02	2.81744D 02	-9.62012D-02	5.44309D-02	3.42870D-01	3.89739D-02	3.99886D 03	1.73893D 05	3.55802D 00
2.80900D 01	7.00979D 02	2.82094D 02	-9.34283D-02	5.43920D-02	3.42625D-01	3.89682D-02	3.99885D 03	1.73859D 05	3.45112D 00
2.81900D 01	6.98345D 02	2.82434D 02	-9.06364D-02	5.43545D-02	3.42389D-01	3.89627D-02	3.99885D 03	1.73825D 05	3.34412D 00
2.82900D 01	6.95867D 02	2.82763D 02	-8.78260D-02	5.43184D-02	3.42161D-01	3.89574D-02	3.99884D 03	1.73793D 05	3.23704D 00
2.83900D 01	6.93425D 02	2.83081D 02	-8.49975D-02	5.42837D-02	3.41942D-01	3.89524D-02	3.99884D 03	1.73760D 05	3.12991D 00
2.84900D 01	6.91061D 02	2.83389D 02	-8.21523D-02	5.42503D-02	3.41732D-01	3.89475D-02	3.99884D 03	1.73729D 05	3.02274D 00

```
COST FUNCTION (J) =  2.98638998435482500-02
WITH:
     ALTITUDE TOLERANCE =  0.66080511775640-02
     FLIGHT-PATH-ANGLE TOLERANCE =  0.10569817724570-08
     FLIGHT-PATH-ANGLE-DERIVATIVE TOLERANCE =  0.19561375774500-09
     WEIGHT TOLERANCE =  0.0
     ENERGY TOLERANCE =  0.66079840238090-02
     ANGLE-OF-ATTACK TOLERANCE =  0.0


 PREVIOUS COEFFICIENT        1.00*DELTA          NEW COEFFICIENT

  0.28735141431000D 05 + 1.00* 0.0              =  0.28735141431000D 05   (FROZEN)
  0.0                  + 1.00* 0.0              =  0.0                    (FROZEN)
  0.11266420666960D 04 + 1.00* 0.0              =  0.11266420666960D 04   (FROZEN)
 -0.21701637120930D 01 + 1.00* 0.0              = -0.21701637120930D 01   (FROZEN)
  0.0                  + 1.00* 0.0              =  0.0                    (FROZEN)
  0.35105952780830D-01 + 1.00* 0.22646327D-05   =  0.35108217383480D-01
  0.0                  + 1.00* 0.0              =  0.0                    (FROZEN)
  0.12876881296030D 01 + 1.00*-0.12979242D-02   =  0.12863902054370D 01
  0.0                  + 1.00* 0.0              =  0.0                    (FROZEN)
  0.20314232883700D 04 + 1.00*-0.14449491D 01   =  0.20299783392560D 04
  0.11789376902690D-04 + 1.00*-0.16696875D-04   = -0.49072980911230D-05
  0.62985577966836D 01 + 1.00*-0.11783399D-03   =  0.62986399628420D 01
  0.31834370043840D-09 + 1.00* 0.0              =  0.31834370043840D-09   (FROZEN)


                    M O D E L   S O L U T I O N S

*********************************************************************
```

```
*                                                                              *
* MODEL 12    P0 =  2.75717809020384620D 04    CD0 =  3.46284180689139950D-02  *
*             P1 =  0.0                        CD1 =  0.0                      *
* POINT       P2 =  1.14142013914234200 03     CD2 =  1.27919406602622200 00   *
* FAILURES    P3 = -2.23329715132061200 00     CD3 =  0.0                      *
* =   0       P4 =  0.0                        CD4 =  2.03531704063189400 03   *
*                                                                              *
* FIT ERROR=  4.99740448811460400-09                                           *
*                                                                              *
********************************************************************************
*                                                                              *
********************************************************************************
*                                                                              *
**                       MODEL 12 FOUND TO BE BEST FIT                        **
*                                                                              *
********************************************************************************
```

```
ANGLE-OF-ATTACK CONFIDENCE =  0.88494390492430-05
PITCH ANGLE CONFIDENCE =  0.14414361060640-07
```

```
///////////////////////////////////////////////////////////////////////////////////////////
/*****************************************************************************************/
/*                                                                                       */
/*  ****FINAL***    GENERAL EXPRESSIONS FOR POWER, DRAG COEFFICIENT, AND LIFT COEFFICIENT  */
/*                                                                                       */
/*                                                                                       */
/*  P = P0 + P1*V** 3.333000-01 + P2*V** 1.000000 00 + P3*V** 2.000000 00 + P4*V** 3.000000 00 */
/*                                                                                       */
/*                CD = CD0 + CD1*A** 1 + CD2*A** 2 + CD3*A** 3 + CD4*A** 6               */
/*                                                                                       */
/*                   CL = CLA0 + CLA*A + CLAX*A** 2.068210 00 + CLQ*R                     */
/*                                                                                       */
/*                                                                                       */
/*  WHERE:                                                                               */
/*                                                                                       */
/*         V = AIRSPEED(FT/SEC)                                                          */
/*         A = ANGLE OF ATTACK(RADIAN)                                                   */
/*         R = PITCH RATE(RADIAN/SEC)                                                    */
/*                                                                                       */
/*       P0 =  0.27571780902D 05   CD0 =  0.34628418069D-01   CLA0 = -0.49072980911D-05  */
/*       P1 =  0.0                 CD1 =  0.0                 CLA  =  0.62968399628D 01  */
/*       P2 =  0.11414201391D 04   CD2 =  0.12791940660D 01   CLAX =  0.31834370044D-09  */
/*       P3 = -0.22332971513D 01   CD3 =  0.0                 CLQ  =  0.0                */
/*       P4 =  0.0                 CD4 =  0.20353170406D 04                              */
/*                                                                                       */
/*****************************************************************************************/
///////////////////////////////////////////////////////////////////////////////////////////
```

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***************************************************************************************************
*             |                                                |                                  *
*             | WEIGHT               =  0.400000 04 LBF        | ALTITUDE                 =  0.100000 04 FT          *
*             | PITCH ANGLE          =  0.162640 00 RADIAN     | ALTITUDE RATE            =  0.754600-02 FT/SEC      *
*             | PITCH RATE           =  0.938200-02 RADIAN/SEC | ALTITUDE-RATE RATE       =  0.890800 00 FT/SEC**2   *
*             | AIRSPEED             =  0.146740 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0         FT/SEC**2   *
* DATA PT   1 | DENSITY              =  0.230960-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0         RADIAN      *
*             | ANGLE OF ATTACK      =  0.162590 00 RADIAN     | LIFT COEFFICIENT( CL )=     0.102440 01             *
*             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=     0.106050 00             *
*             | ACCELERATION         =  0.466400 01 FT/SEC**2  | POWER AVAILABLE          =  0.146970 06 FT-LBF/SEC  *
*             | ANGLE-OF-ATTACK RATE=   0.351300-02 RADIAN/SEC | FLIGHT PATH ANGLE        =  0.514240-04 RADIAN      *
*             |                                                |                                  *
***************************************************************************************************
*             |                                                |                                  *
*             | WEIGHT               =  0.400000 04 LBF        | ALTITUDE                 =  0.100000 04 FT          *
*             | PITCH ANGLE          =  0.162720 00 RADIAN     | ALTITUDE RATE            =  0.165620-01 FT/SEC      *
*             | PITCH RATE           =  0.717710-02 RADIAN/SEC | ALTITUDE-RATE RATE       =  0.912450 00 FT/SEC**2   *
*             | AIRSPEED             =  0.146790 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0         FT/SEC**2   *
* DATA PT   2 | DENSITY              =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0         RADIAN      *
*             | ANGLE OF ATTACK      =  0.162610 00 RADIAN     | LIFT COEFFICIENT( CL )=     0.102470 01             *
*             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=     0.106080 00             *
*             | ACCELERATION         =  0.465830 01 FT/SEC**2  | POWER AVAILABLE          =  0.147000 06 FT-LBF/SEC  *
*             | ANGLE-OF-ATTACK RATE=   0.964430-03 RADIAN/SEC | FLIGHT PATH ANGLE        =  0.112830-03 RADIAN      *
*             |                                                |                                  *
***************************************************************************************************
*             |                                                |                                  *
*             | WEIGHT               =  0.400000 04 LBF        | ALTITUDE                 =  0.100000 04 FT          *
*             | PITCH ANGLE          =  0.162790 00 RADIAN     | ALTITUDE RATE            =  0.257950-01 FT/SEC      *
*             | PITCH RATE           =  0.[illegible]8740-02 RADIAN/SEC | ALTITUDE-RATE RATE =  0.934060 00 FT/SEC**2   *
*             | AIRSPEED             =  0.146830 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0         FT/SEC**2   *
* DATA PT   3 | DENSITY              =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0         RADIAN      *
*             | ANGLE OF ATTACK      =  0.162620 00 RADIAN     | LIFT COEFFICIENT( CL )=     0.102470 01             *
*             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=     0.106100 00             *
*             | ACCELERATION         =  0.465760 01 FT/SEC**2  | POWER AVAILABLE          =  0.147020 06 FT-LBF/SEC  *
*             | ANGLE-OF-ATTACK RATE=   0.631400-03 RADIAN/SEC | FLIGHT PATH ANGLE        =  0.175680-03 RADIAN      *
*             |                                                |                                  *
***************************************************************************************************
*             |                                                |                                  *
*             | WEIGHT               =  0.400000 04 LBF        | ALTITUDE                 =  0.100000 04 FT          *
*             | PITCH ANGLE          =  0.162870 00 RADIAN     | ALTITUDE RATE            =  0.352440-01 FT/SEC      *
*             | PITCH RATE           =  0.722100-02 RADIAN/SEC | ALTITUDE-RATE RATE       =  0.955690 00 FT/SEC**2   *
*             | AIRSPEED             =  0.146880 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0         FT/SEC**2   *
* DATA PT   4 | DENSITY              =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0         RADIAN      *
*             | ANGLE OF ATTACK      =  0.162630 00 RADIAN     | LIFT COEFFICIENT( CL )=     0.102470 01             *
*             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=     0.106110 00             *
*             | ACCELERATION         =  0.464600 01 FT/SEC**2  | POWER AVAILABLE          =  0.147040 06 FT-LBF/SEC  *
*             | ANGLE-OF-ATTACK RATE=   0.721960-03 RADIAN/SEC | FLIGHT PATH ANGLE        =  0.239950-03 RADIAN      *
*             |                                                |                                  *
***************************************************************************************************
*             |                                                |                                  *
*             | WEIGHT               =  0.400000 04 LBF        | ALTITUDE                 =  0.100000 04 FT          *
*             | PITCH ANGLE          =  0.162940 00 RADIAN     | ALTITUDE RATE            =  0.449090-01 FT/SEC      *
*             | PITCH RATE           =  0.734460-02 RADIAN/SEC | ALTITUDE-RATE RATE       =  0.977280 00 FT/SEC**2   *
*             | AIRSPEED             =  0.146930 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0         FT/SEC**2   *
* DATA PT   5 | DENSITY              =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0         RADIAN      *
*             | ANGLE OF ATTACK      =  0.162630 00 RADIAN     | LIFT COEFFICIENT( CL )=     0.102480 01             *
*             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=     0.106120 00             *
*             | ACCELERATION         =  0.464070 01 FT/SEC**2  | POWER AVAILABLE          =  0.147060 06 FT-LBF/SEC  *
*             | ANGLE-OF-ATTACK RATE=   0.652690-03 RADIAN/SEC | FLIGHT PATH ANGLE        =  0.305660-03 RADIAN      *
*             |                                                |                                  *
***************************************************************************************************
*             |                                                |                                  *
*             | WEIGHT               =  0.400000 04 LBF        | ALTITUDE                 =  0.100000 04 FT          *
*             | PITCH ANGLE          =  0.163090 00 RADIAN     | ALTITUDE RATE            =  0.648850-01 FT/SEC      *
*             | PITCH RATE           =  0.761100-02 RADIAN/SEC | ALTITUDE-RATE RATE       =  0.102040 01 FT/SEC**2   *
*             | AIRSPEED             =  0.147020 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0         FT/SEC**2   *
* DATA PT   6 | DENSITY              =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0         RADIAN      *
*             | ANGLE OF ATTACK      =  0.162650 00 RADIAN     | LIFT COEFFICIENT( CL )=     0.102490 01             *
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*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106150 00              *
*              | ACCELERATION          =  0.462880 01 FT/SEC**2  | POWER AVAILABLE        =  0.147110 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.684220-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.441340-03 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100000 04 FT         *
*              | PITCH ANGLE           =  0.163240 00 RADIAN     | ALTITUDE RATE          =  0.857240-01 FT/SEC     *
*              | PITCH RATE            =  0.788630-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.106340 01 FT/SEC**2  *
*              | AIRSPEED              =  0.147110 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT    7 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162640 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102490 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106170 00              *
*              | ACCELERATION          =  0.461680 01 FT/SEC**2  | POWER AVAILABLE        =  0.147180 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.675760-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.582720-03 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100000 04 FT         *
*              | PITCH ANGLE           =  0.163400 00 RADIAN     | ALTITUDE RATE          =  0.107420 00 FT/SEC     *
*              | PITCH RATE            =  0.816050-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.110640 01 FT/SEC**2  *
*              | AIRSPEED              =  0.147200 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT    8 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162670 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102500 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106200 00              *
*              | ACCELERATION          =  0.460460 01 FT/SEC**2  | POWER AVAILABLE        =  0.147200 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.667190-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.729760-03 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100000 04 FT         *
*              | PITCH ANGLE           =  0.163570 00 RADIAN     | ALTITUDE RATE          =  0.129980 00 FT/SEC     *
*              | PITCH RATE            =  0.843360-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.114930 01 FT/SEC**2  *
*              | AIRSPEED              =  0.147290 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT    9 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162690 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102510 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106220 00              *
*              | ACCELERATION          =  0.459220 01 FT/SEC**2  | POWER AVAILABLE        =  0.147240 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.658540-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.882440-03 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100000 04 FT         *
*              | PITCH ANGLE           =  0.163740 00 RADIAN     | ALTITUDE RATE          =  0.153390 00 FT/SEC     *
*              | PITCH RATE            =  0.870540-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.119210 01 FT/SEC**2  *
*              | AIRSPEED              =  0.147390 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT   10 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162700 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102520 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106240 00              *
*              | ACCELERATION          =  0.457970 01 FT/SEC**2  | POWER AVAILABLE        =  0.147290 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.649760-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.104080-02 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100000 04 FT         *
*              | PITCH ANGLE           =  0.164100 00 RADIAN     | ALTITUDE RATE          =  0.202780 00 FT/SEC     *
*              | PITCH RATE            =  0.924650-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.127740 01 FT/SEC**2  *
*              | AIRSPEED              =  0.147570 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT   11 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162720 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102530 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106290 00              *
*              | ACCELERATION          =  0.455420 01 FT/SEC**2  | POWER AVAILABLE        =  0.147380 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.631850-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.137420-02 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100000 04 FT         *
*              | PITCH ANGLE           =  0.164480 00 RADIAN     | ALTITUDE RATE          =  0.255560 00 FT/SEC     *
*              | PITCH RATE            =  0.978070-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.136230 01 FT/SEC**2  *
*              | AIRSPEED              =  0.147750 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT   12 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162750 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102550 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106330 00              *
*              | ACCELERATION          =  0.452800 01 FT/SEC**2  | POWER AVAILABLE        =  0.147460 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.613520-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.172980-02 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100000 04 FT         *
*              | PITCH ANGLE           =  0.164880 00 RADIAN     | ALTITUDE RATE          =  0.311760 00 FT/SEC     *
*              | PITCH RATE            =  0.103110-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.144680 01 FT/SEC**2  *
*              | AIRSPEED              =  0.147930 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT   13 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162770 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102560 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106380 00              *
*              | ACCELERATION          =  0.450130 01 FT/SEC**2  | POWER AVAILABLE        =  0.147550 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.594720-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.210750-02 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100010 04 FT         *
*              | PITCH ANGLE           =  0.165300 00 RADIAN     | ALTITUDE RATE          =  0.371320 00 FT/SEC     *
*              | PITCH RATE            =  0.108360-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.153090 01 FT/SEC**2  *
*              | AIRSPEED              =  0.148110 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT   14 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162800 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102580 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106420 00              *
*              | ACCELERATION          =  0.447400 01 FT/SEC**2  | POWER AVAILABLE        =  0.147640 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.575480-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.250700-02 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100010 04 FT         *
*              | PITCH ANGLE           =  0.165750 00 RADIAN     | ALTITUDE RATE          =  0.434230 00 FT/SEC     *
*              | PITCH RATE            =  0.113560-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.161460 01 FT/SEC**2  *
*              | AIRSPEED              =  0.148290 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT   15 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162820 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102590 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106460 00              *
*              | ACCELERATION          =  0.444600 01 FT/SEC**2  | POWER AVAILABLE        =  0.147720 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.555800-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.292820-02 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100010 04 FT         *
*              | PITCH ANGLE           =  0.166700 00 RADIAN     | ALTITUDE RATE          =  0.570040 00 FT/SEC     *
*              | PITCH RATE            =  0.123800-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.178050 01 FT/SEC**2  *
*              | AIRSPEED              =  0.148640 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT   16 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162860 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102620 01              *
*              | TEMPERATURE           =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106540 00              *
*              | ACCELERATION          =  0.438850 01 FT/SEC**2  | POWER AVAILABLE        =  0.147890 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE=  0.515060-03 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.383500-02 RADIAN     *
*              |                                                |                                                   *
*****************************************************************************************************************
*              |                                                |                                                   *
*              | WEIGHT                =  0.400000 04 LBF        | ALTITUDE               =  0.100020 04 FT         *
*              | PITCH ANGLE           =  0.167730 00 RADIAN     | ALTITUDE RATE          =  0.719060 00 FT/SEC     *
*              | PITCH RATE            =  0.133830-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.194440 01 FT/SEC**2  *
*              | AIRSPEED              =  0.148990 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2  *
* DATA PT   17 | DENSITY               =  0.230930-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN     *
*              | ANGLE OF ATTACK       =  0.162900 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102640 01              *
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| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10661D 00
| ACCELERATION           =  0.43287D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14836D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE=  0.47251D-03 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.48262D-02 RADIAN

| WEIGHT                 =  0.40000D 04 LBF        | ALTITUDE              =  0.10002D 04 FT
| PITCH ANGLE            =  0.16884D 00 RADIAN     | ALTITUDE RATE         =  0.88110D 00 FT/SEC
| PITCH RATE             =  0.14364D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.21062D 01 FT/SEC**2
| AIRSPEED               =  0.14933D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  18 | DENSITY    =  0.23093D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16294D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10266D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10668D 00
| ACCELERATION           =  0.42668D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14822D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE=  0.42813D-03 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.59002D-02 RADIAN

| WEIGHT                 =  0.40000D 04 LBF        | ALTITUDE              =  0.10003D 04 FT
| PITCH ANGLE            =  0.17303D 00 RADIAN     | ALTITUDE RATE         =  0.10560D 01 FT/SEC
| PITCH RATE             =  0.15322D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.22657D 01 FT/SEC**2
| AIRSPEED               =  0.14967D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  19 | DENSITY    =  0.23093D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16297D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10268D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10674D 00
| ACCELERATION           =  0.42028D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14838D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE=  0.38191D-03 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.70553D-02 RADIAN

| WEIGHT                 =  0.40000D 04 LBF        | ALTITUDE              =  0.10004D 04 FT
| PITCH ANGLE            =  0.17129D 00 RADIAN     | ALTITUDE RATE         =  0.12435D 01 FT/SEC
| PITCH RATE             =  0.16257D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.24227D 01 FT/SEC**2
| AIRSPEED               =  0.15001D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  20 | DENSITY    =  0.23093D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16300D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10270D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10679D 00
| ACCELERATION           =  0.41368D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14854D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE=  0.33385D-03 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.82460D-02 RADIAN

| WEIGHT                 =  0.40000D 04 LBF        | ALTITUDE              =  0.10005D 04 FT
| PITCH ANGLE            =  0.17257D 00 RADIAN     | ALTITUDE RATE         =  0.14955D 01 FT/SEC
| PITCH RATE             =  0.17391D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.26153D 01 FT/SEC**2
| AIRSPEED               =  0.15042D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  21 | DENSITY    =  0.23092D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16303D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10272D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10684D 00
| ACCELERATION           =  0.40516D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14873D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE=  0.27117D-03 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.99424D-02 RADIAN

| WEIGHT                 =  0.40000D 04 LBF        | ALTITUDE              =  0.10007D 04 FT
| PITCH ANGLE            =  0.17477D 00 RADIAN     | ALTITUDE RATE         =  0.17265D 01 FT/SEC
| PITCH RATE             =  0.18488D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.28035D 01 FT/SEC**2
| AIRSPEED               =  0.15062D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  22 | DENSITY    =  0.23092D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16305D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10273D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10689D 00
| ACCELERATION           =  0.39637D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14892D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE=  0.20569D-03 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.11713D-01 RADIAN

| WEIGHT                 =  0.40000D 04 LBF        | ALTITUDE              =  0.10009D 04 FT
| PITCH ANGLE            =  0.17067D 00 RADIAN     | ALTITUDE RATE         =  0.20560D 01 FT/SEC
| PITCH RATE             =  0.19545D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.29871D 01 FT/SEC**2
| AIRSPEED               =  0.15121D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  23 | DENSITY    =  0.23092D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16307D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10274D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10692D 00
| ACCELERATION           =  0.38730D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14910D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE=  0.13710D-03 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.13598D-01 RADIAN

| WEIGHT                 =  0.40000D 04 LBF        | ALTITUDE              =  0.10011D 04 FT
| PITCH ANGLE            =  0.17867D 00 RADIAN     | ALTITUDE RATE         =  0.23637D 01 FT/SEC
| PITCH RATE             =  0.20551D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.31656D 01 FT/SEC**2
| AIRSPEED               =  0.15159D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  24 | DENSITY    =  0.23092D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16308D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10275D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10694D 00
| ACCELERATION           =  0.37799D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14928D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE=  0.64961D-04 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.15893D-01 RADIAN

| WEIGHT                 =  0.40000D 04 LBF        | ALTITUDE              =  0.10014D 04 FT
| PITCH ANGLE            =  0.18078D 00 RADIAN     | ALTITUDE RATE         =  0.26890D 01 FT/SEC
| PITCH RATE             =  0.21535D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.33391D 01 FT/SEC**2
| AIRSPEED               =  0.15197D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  25 | DENSITY    =  0.23092D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16308D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10275D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10694D 00
| ACCELERATION           =  0.36845D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14945D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.11516D-04 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.17696D-01 RADIAN

| WEIGHT                 =  0.39999D 04 LBF        | ALTITUDE              =  0.10016D 04 FT
| PITCH ANGLE            =  0.18298D 00 RADIAN     | ALTITUDE RATE         =  0.30313D 01 FT/SEC
| PITCH RATE             =  0.22466D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.35070D 01 FT/SEC**2
| AIRSPEED               =  0.15233D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  26 | DENSITY    =  0.23092D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16308D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10274D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10693D 00
| ACCELERATION           =  0.35869D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14962D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.92353D-04 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.19901D-01 RADIAN

| WEIGHT                 =  0.39999D 04 LBF        | ALTITUDE              =  0.10020D 04 FT
| PITCH ANGLE            =  0.18527D 00 RADIAN     | ALTITUDE RATE         =  0.33932D 01 FT/SEC
| PITCH RATE             =  0.23351D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.36690D 01 FT/SEC**2
| AIRSPEED               =  0.15268D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  27 | DENSITY    =  0.23091D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16307D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10273D 01
| TEMPERATURE            =  0.62000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.10691D 00
| ACCELERATION           =  0.34873D 01 FT/SEC**2  | POWER AVAILABLE       =  0.14978D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.17753D-03 RADIAN/SEC    | FLIGHT PATH ANGLE     =  0.22206D-01 RADIAN

| WEIGHT                 =  0.39999D 04 LBF        | ALTITUDE              =  0.10023D 04 FT
| PITCH ANGLE            =  0.18765D 00 RADIAN     | ALTITUDE RATE         =  0.37649D 01 FT/SEC
| PITCH RATE             =  0.24191D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.38250D 01 FT/SEC**2
| AIRSPEED               =  0.15303D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT  28 | DENSITY    =  0.23091D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
| ANGLE OF ATTACK        =  0.16304D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.10272D 01
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| TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106870 00
| ACCELERATION         =  0.338600 01 FT/SEC**2  | POWER AVAILABLE        =  0.149940 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.267130-03 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.246060-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100270 04 FT
             | PITCH ANGLE          =  0.190110 00 RADIAN     | ALTITUDE RATE          =  0.415500 01 FT/SEC
             | PITCH RATE           =  0.249850-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.397460 01 FT/SEC**2
             | AIRSPEED             =  0.153360 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   29 | DENSITY              =  0.230910-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.163010 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102700 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106810 00
             | ACCELERATION         =  0.328310 01 FT/SEC**2  | POWER AVAILABLE        =  0.150090 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.361080-03 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.270960-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100320 04 FT
             | PITCH ANGLE          =  0.192640 00 RADIAN     | ALTITUDE RATE          =  0.455960 01 FT/SEC
             | PITCH RATE           =  0.257310-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.411760 01 FT/SEC**2
             | AIRSPEED             =  0.153680 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   30 | DENSITY              =  0.230910-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162970 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102670 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106730 00
             | ACCELERATION         =  0.317880 01 FT/SEC**2  | POWER AVAILABLE        =  0.150240 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.459410-03 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.296730-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100360 04 FT
             | PITCH ANGLE          =  0.196250 00 RADIAN     | ALTITUDE RATE          =  0.497820 01 FT/SEC
             | PITCH RATE           =  0.264290-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.425370 01 FT/SEC**2
             | AIRSPEED             =  0.154000 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   31 | DENSITY              =  0.230900-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162920 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102640 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106640 00
             | ACCELERATION         =  0.307330 01 FT/SEC**2  | POWER AVAILABLE        =  0.150380 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.562130-03 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.323330-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100410 04 FT
             | PITCH ANGLE          =  0.197930 00 RADIAN     | ALTITUDE RATE          =  0.541010 01 FT/SEC
             | PITCH RATE           =  0.270780-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.438280 01 FT/SEC**2
             | AIRSPEED             =  0.154300 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   32 | DENSITY              =  0.230900-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162860 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102600 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106530 00
             | ACCELERATION         =  0.296680 01 FT/SEC**2  | POWER AVAILABLE        =  0.150520 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.665320-03 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.350700-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100470 04 FT
             | PITCH ANGLE          =  0.200670 00 RADIAN     | ALTITUDE RATE          =  0.585460 01 FT/SEC
             | PITCH RATE           =  0.276760-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.450450 01 FT/SEC**2
             | AIRSPEED             =  0.154590 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   33 | DENSITY              =  0.230900-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162790 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102550 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106400 00
             | ACCELERATION         =  0.285930 01 FT/SEC**2  | POWER AVAILABLE        =  0.150650 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.780430-03 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.378810-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100530 04 FT
             | PITCH ANGLE          =  0.203460 00 RADIAN     | ALTITUDE RATE          =  0.631060 01 FT/SEC
             | PITCH RATE           =  0.282330-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.461880 01 FT/SEC**2
             | AIRSPEED             =  0.154870 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   34 | DENSITY              =  0.230890-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162700 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102500 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106250 00
             | ACCELERATION         =  0.275120 01 FT/SEC**2  | POWER AVAILABLE        =  0.150780 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.894120-03 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.407600-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100600 04 FT
             | PITCH ANGLE          =  0.206310 00 RADIAN     | ALTITUDE RATE          =  0.677810 01 FT/SEC
             | PITCH RATE           =  0.287340-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.472540 01 FT/SEC**2
             | AIRSPEED             =  0.155140 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   35 | DENSITY              =  0.230890-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162610 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102440 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.106080 00
             | ACCELERATION         =  0.264270 01 FT/SEC**2  | POWER AVAILABLE        =  0.150900 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.100980-02 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.437040-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100670 04 FT
             | PITCH ANGLE          =  0.209210 00 RADIAN     | ALTITUDE RATE          =  0.725560 01 FT/SEC
             | PITCH RATE           =  0.291890-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.482430 01 FT/SEC**2
             | AIRSPEED             =  0.155400 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   36 | DENSITY              =  0.230880-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162500 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102370 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.105880 00
             | ACCELERATION         =  0.253370 01 FT/SEC**2  | POWER AVAILABLE        =  0.151020 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.112770-02 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.467080-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100740 04 FT
             | PITCH ANGLE          =  0.212150 00 RADIAN     | ALTITUDE RATE          =  0.774270 01 FT/SEC
             | PITCH RATE           =  0.295950-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.491520 01 FT/SEC**2
             | AIRSPEED             =  0.155650 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   37 | DENSITY              =  0.230880-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162380 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102300 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.105670 00
             | ACCELERATION         =  0.242460 01 FT/SEC**2  | POWER AVAILABLE        =  0.151130 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.124760-02 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.497660-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100820 04 FT
             | PITCH ANGLE          =  0.215120 00 RADIAN     | ALTITUDE RATE          =  0.823840 01 FT/SEC
             | PITCH RATE           =  0.299530-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.499820 01 FT/SEC**2
             | AIRSPEED             =  0.155880 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   38 | DENSITY              =  0.230870-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162250 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102220 01
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.105430 00
             | ACCELERATION         =  0.231650 01 FT/SEC**2  | POWER AVAILABLE        =  0.151230 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.136970-02 RADIAN/SEC  | FLIGHT PATH ANGLE      =  0.528780-01 RADIAN

             | WEIGHT               =  0.399990 04 LBF        | ALTITUDE               =  0.100910 04 FT
             | PITCH ANGLE          =  0.218140 00 RADIAN     | ALTITUDE RATE          =  0.874200 01 FT/SEC
             | PITCH RATE           =  0.302620-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.507310 01 FT/SEC**2
             | AIRSPEED             =  0.156110 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT   39 | DENSITY              =  0.230870-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.162110 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.102120 01
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|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10518D 00
|  ACCELERATION         =  0.22066D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15133D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.14938D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.56029D-01 RADIAN

DATA PT 40
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10100D 04 FT
|  PITCH ANGLE          =  0.22118D 00 RADIAN      |  ALTITUDE RATE          =  0.92527D 01 FT/SEC
|  PITCH RATE           =  0.30521D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.51398D 01 FT/SEC**2
|  AIRSPEED             =  0.15632D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23086D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16195D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10203D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10490D 00
|  ACCELERATION         =  0.20980D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15143D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.16201D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.59224D-01 RADIAN

DATA PT 41
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10109D 04 FT
|  PITCH ANGLE          =  0.22424D 00 RADIAN      |  ALTITUDE RATE          =  0.97697D 01 FT/SEC
|  PITCH RATE           =  0.30731D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.51983D 01 FT/SEC**2
|  AIRSPEED             =  0.15653D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23085D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16176D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10192D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10460D 00
|  ACCELERATION         =  0.19899D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15152D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.17485D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.62485D-01 RADIAN

DATA PT 42
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10119D 04 FT
|  PITCH ANGLE          =  0.22732D 00 RADIAN      |  ALTITUDE RATE          =  0.10292D 02 FT/SEC
|  PITCH RATE           =  0.30892D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.52485D 01 FT/SEC**2
|  AIRSPEED             =  0.15672D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23085D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16160D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10181D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10428D 00
|  ACCELERATION         =  0.18824D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15160D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.18791D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.65718D-01 RADIAN

DATA PT 43
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10130D 04 FT
|  PITCH ANGLE          =  0.23042D 00 RADIAN      |  ALTITUDE RATE          =  0.10819D 02 FT/SEC
|  PITCH RATE           =  0.31003D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.52903D 01 FT/SEC**2
|  AIRSPEED             =  0.15691D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23084D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16141D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10168D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10394D 00
|  ACCELERATION         =  0.17756D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15168D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.20117D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.69006D-01 RADIAN

DATA PT 44
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10141D 04 FT
|  PITCH ANGLE          =  0.23352D 00 RADIAN      |  ALTITUDE RATE          =  0.11353D 02 FT/SEC
|  PITCH RATE           =  0.31065D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.53238D 01 FT/SEC**2
|  AIRSPEED             =  0.15708D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23083D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16120D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10155D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10358D 00
|  ACCELERATION         =  0.16699D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15176D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.21465D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.72320D-01 RADIAN

DATA PT 45
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10153D 04 FT
|  PITCH ANGLE          =  0.23663D 00 RADIAN      |  ALTITUDE RATE          =  0.11884D 02 FT/SEC
|  PITCH RATE           =  0.31378D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.53490D 01 FT/SEC**2
|  AIRSPEED             =  0.15724D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23082D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16098D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10141D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10320D 00
|  ACCELERATION         =  0.15652D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15183D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.22834D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.75649D-01 RADIAN

DATA PT 46
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10165D 04 FT
|  PITCH ANGLE          =  0.23973D 00 RADIAN      |  ALTITUDE RATE          =  0.12419D 02 FT/SEC
|  PITCH RATE           =  0.31041D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.53657D 01 FT/SEC**2
|  AIRSPEED             =  0.15739D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23082D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16074D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10126D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10279D 00
|  ACCELERATION         =  0.14617D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15190D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.24225D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.78990D-01 RADIAN

DATA PT 47
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10177D 04 FT
|  PITCH ANGLE          =  0.24283D 00 RADIAN      |  ALTITUDE RATE          =  0.12956D 02 FT/SEC
|  PITCH RATE           =  0.30956D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.53742D 01 FT/SEC**2
|  AIRSPEED             =  0.15753D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23081D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16049D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10111D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10236D 00
|  ACCELERATION         =  0.13596D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15196D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.25637D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.82343D-01 RADIAN

DATA PT 48
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10191D 04 FT
|  PITCH ANGLE          =  0.24592D 00 RADIAN      |  ALTITUDE RATE          =  0.13494D 02 FT/SEC
|  PITCH RATE           =  0.30620D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.53742D 01 FT/SEC**2
|  AIRSPEED             =  0.15766D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23080D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.16023D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10094D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10191D 00
|  ACCELERATION         =  0.12590D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15202D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.27070D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.85693D-01 RADIAN

DATA PT 49
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10204D 04 FT
|  PITCH ANGLE          =  0.24900D 00 RADIAN      |  ALTITUDE RATE          =  0.14031D 02 FT/SEC
|  PITCH RATE           =  0.30635D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.53660D 01 FT/SEC**2
|  AIRSPEED             =  0.15778D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23079D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.15995D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10076D 01
|  TEMPERATURE          =  0.52000D 03 DEGREES-R   |  DRAG COEFFICIENT( CD )=  0.10144D 00
|  ACCELERATION         =  0.11601D 01 FT/SEC**2   |  POWER AVAILABLE        =  0.15207D 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.28524D-02 RADIAN/SEC  |  FLIGHT PATH ANGLE      =  0.89046D-01 RADIAN

DATA PT 50
|  WEIGHT               =  0.39999D 04 LBF         |  ALTITUDE               =  0.10219D 04 FT
|  PITCH ANGLE          =  0.25205D 00 RADIAN      |  ALTITUDE RATE          =  0.14567D 02 FT/SEC
|  PITCH RATE           =  0.30402D-01 RADIAN/SEC  |  ALTITUDE-RATE RATE     =  0.53495D 01 FT/SEC**2
|  AIRSPEED             =  0.15789D 03 FT/SEC      |  VERTICAL ACCELERATION  =  0.0         FT/SEC**2
|  DENSITY              =  0.23078D-02 SLUG/FT**3  |  ELEVATOR DEFLECTION    =  0.0         RADIAN
|  ANGLE OF ATTACK      =  0.15966D 00 RADIAN      |  LIFT COEFFICIENT( CL )=  0.10058D 01
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*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.100950 00               *
*            | ACCELERATION        =  0.106290 01 FT/SEC**2  | POWER AVAILABLE       =  0.152120 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.300000-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.923890-01 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399950 04 LBF        | ALTITUDE              =  0.102330 04 FT            *
*            | PITCH ANGLE         =  0.255070 00 RADIAN     | ALTITUDE RATE         =  0.151010 02 FT/SEC        *
*            | PITCH RATE          =  0.301200-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.532490 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158000 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 51 | DENSITY             =  0.230770-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.159350 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.100380 01               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.100440 00               *
*            | ACCELERATION        =  0.967660 00 FT/SEC**2  | POWER AVAILABLE       =  0.152160 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.316970-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.957230-01 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399980 04 LBF        | ALTITUDE              =  0.102490 04 FT            *
*            | PITCH ANGLE         =  0.253070 00 RADIAN     | ALTITUDE RATE         =  0.156320 02 FT/SEC        *
*            | PITCH RATE          =  0.297890-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.529200 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158090 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 52 | DENSITY             =  0.230760-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.159030 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.100180 01               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.999020-01               *
*            | ACCELERATION        =  0.874430 00 FT/SEC**2  | POWER AVAILABLE       =  0.152200 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.330150-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.990410-01 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399980 04 LBF        | ALTITUDE              =  0.102650 04 FT            *
*            | PITCH ANGLE         =  0.261030 00 RADIAN     | ALTITUDE RATE         =  0.161590 02 FT/SEC        *
*            | PITCH RATE          =  0.294130-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.525120 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158170 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 53 | DENSITY             =  0.230750-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.158690 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.999680 00               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.993470-01               *
*            | ACCELERATION        =  0.783360 00 FT/SEC**2  | POWER AVAILABLE       =  0.152240 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.345500-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.102340 00 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399960 04 LBF        | ALTITUDE              =  0.102810 04 FT            *
*            | PITCH ANGLE         =  0.263950 00 RADIAN     | ALTITUDE RATE         =  0.166820 02 FT/SEC        *
*            | PITCH RATE          =  0.289840-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.520230 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158240 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 54 | DENSITY             =  0.230740-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.158340 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.997450 00               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.987720-01               *
*            | ACCELERATION        =  0.694550 00 FT/SEC**2  | POWER AVAILABLE       =  0.152270 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.360980-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.105610 00 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399980 04 LBF        | ALTITUDE              =  0.102980 04 FT            *
*            | PITCH ANGLE         =  0.266830 00 RADIAN     | ALTITUDE RATE         =  0.171990 02 FT/SEC        *
*            | PITCH RATE          =  0.285150-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.514570 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158310 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 55 | DENSITY             =  0.230730-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.157970 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.995130 00               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.981770-01               *
*            | ACCELERATION        =  0.608110 00 FT/SEC**2  | POWER AVAILABLE       =  0.152300 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.376290-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.108860 00 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399980 04 LBF        | ALTITUDE              =  0.103160 04 FT            *
*            | PITCH ANGLE         =  0.269650 00 RADIAN     | ALTITUDE RATE         =  0.177100 02 FT/SEC        *
*            | PITCH RATE          =  0.280020-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.508150 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158370 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 56 | DENSITY             =  0.230710-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.157590 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.992710 00               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.975640-01               *
*            | ACCELERATION        =  0.524130 00 FT/SEC**2  | POWER AVAILABLE       =  0.152320 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.391460-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.112070 00 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399980 04 LBF        | ALTITUDE              =  0.103340 04 FT            *
*            | PITCH ANGLE         =  0.272420 00 RADIAN     | ALTITUDE RATE         =  0.182150 02 FT/SEC        *
*            | PITCH RATE          =  0.274470-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.500980 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158410 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 57 | DENSITY             =  0.230700-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.157190 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.990190 00               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.969130-01               *
*            | ACCELERATION        =  0.442090 00 FT/SEC**2  | POWER AVAILABLE       =  0.152340 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.406510-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.115240 00 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399980 04 LBF        | ALTITUDE              =  0.103520 04 FT            *
*            | PITCH ANGLE         =  0.275140 00 RADIAN     | ALTITUDE RATE         =  0.187120 02 FT/SEC        *
*            | PITCH RATE          =  0.268510-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.493090 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158460 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 58 | DENSITY             =  0.230690-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.156770 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.987580 00               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.962850-01               *
*            | ACCELERATION        =  0.363880 00 FT/SEC**2  | POWER AVAILABLE       =  0.152360 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.421420-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.118370 00 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399960 04 LBF        | ALTITUDE              =  0.103710 04 FT            *
*            | PITCH ANGLE         =  0.277790 00 RADIAN     | ALTITUDE RATE         =  0.192010 02 FT/SEC        *
*            | PITCH RATE          =  0.262130-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.484500 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158490 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 59 | DENSITY             =  0.230680-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.156340 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.984880 00               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.956200-01               *
*            | ACCELERATION        =  0.287770 00 FT/SEC**2  | POWER AVAILABLE       =  0.152380 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.436190-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.121450 00 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399980 04 LBF        | ALTITUDE              =  0.103900 04 FT            *
*            | PITCH ANGLE         =  0.280380 00 RADIAN     | ALTITUDE RATE         =  0.196810 02 FT/SEC        *
*            | PITCH RATE          =  0.255360-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.475220 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158510 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 60 | DENSITY             =  0.230660-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.155900 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.982080 00               *
*            | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.949410-01               *
*            | ACCELERATION        =  0.214440 00 FT/SEC**2  | POWER AVAILABLE       =  0.152390 06 FT-LBF/SEC    *
*            | ANGLE-OF-ATTACK RATE= -0.450840-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.124480 00 RADIAN        *
*            |                                              |                                                    *
*******************************************************************************************************************
*            |                                              |                                                    *
*            | WEIGHT              =  0.399980 04 LBF        | ALTITUDE              =  0.104100 04 FT            *
*            | PITCH ANGLE         =  0.282900 00 RADIAN     | ALTITUDE RATE         =  0.201510 02 FT/SEC        *
*            | PITCH RATE          =  0.248200-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.465280 01 FT/SEC**2     *
*            | AIRSPEED            =  0.158530 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2     *
* DATA PT 61 | DENSITY             =  0.230650-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN        *
*            | ANGLE OF ATTACK     =  0.156440 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.979190 00               *
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        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.94247D-01
        | ACCELERATION         =  0.14395D 03 FT/SEC**2  | POWER AVAILABLE       =  0.15239D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.46635D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.12746D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10431D 04 FT
        | PITCH ANGLE          =  0.28534D 00 RADIAN     | ALTITUDE RATE         =  0.20611D 02 FT/SEC
        | PITCH RATE           =  0.24065D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.45470D 01 FT/SEC**2
        | AIRSPEED             =  0.15854D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 62 | DENSITY           =  0.23064D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15497D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.97621D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.93540D-01
        | ACCELERATION         =  0.76369D-01 FT/SEC**2  | POWER AVAILABLE       =  0.15240D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.47973D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.13037D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10452D 04 FT
        | PITCH ANGLE          =  0.28771D 00 RADIAN     | ALTITUDE RATE         =  0.21060D 02 FT/SEC
        | PITCH RATE           =  0.23273D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.44349D 01 FT/SEC**2
        | AIRSPEED             =  0.15855D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 63 | DENSITY           =  0.23062D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15448D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.97314D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.92820D-01
        | ACCELERATION         =  0.11006D-01 FT/SEC**2  | POWER AVAILABLE       =  0.15240D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.49398D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.13323D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10473D 04 FT
        | PITCH ANGLE          =  0.29000D 00 RADIAN     | ALTITUDE RATE         =  0.21498D 02 FT/SEC
        | PITCH RATE           =  0.22444D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.43169D 01 FT/SEC**2
        | AIRSPEED             =  0.15854D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 64 | DENSITY           =  0.23061D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15358D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.96998D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.92088D-01
        | ACCELERATION         = -0.49734D-01 FT/SEC**2  | POWER AVAILABLE       =  0.15240D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.50810D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.13602D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10493D 04 FT
        | PITCH ANGLE          =  0.29220D 00 RADIAN     | ALTITUDE RATE         =  0.21924D 02 FT/SEC
        | PITCH RATE           =  0.21580D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.41931D 01 FT/SEC**2
        | AIRSPEED             =  0.15854D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 65 | DENSITY           =  0.23059D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15347D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.96674D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.91345D-01
        | ACCELERATION         = -0.10817D 00 FT/SEC**2  | POWER AVAILABLE       =  0.15240D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.52209D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.13873D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10517D 04 FT
        | PITCH ANGLE          =  0.29431D 00 RADIAN     | ALTITUDE RATE         =  0.22337D 02 FT/SEC
        | PITCH RATE           =  0.20681D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.40638D 01 FT/SEC**2
        | AIRSPEED             =  0.15852D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 66 | DENSITY           =  0.23058D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15294D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.96340D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.90593D-01
        | ACCELERATION         = -0.16345D 00 FT/SEC**2  | POWER AVAILABLE       =  0.15239D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.53594D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.14137D 00 RADIAN
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        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10539D 04 FT
        | PITCH ANGLE          =  0.29633D 00 RADIAN     | ALTITUDE RATE         =  0.22736D 02 FT/SEC
        | PITCH RATE           =  0.19748D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.39291D 01 FT/SEC**2
        | AIRSPEED             =  0.15860D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 67 | DENSITY           =  0.23056D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15239D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.95998D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.89831D-01
        | ACCELERATION         = -0.21553D 00 FT/SEC**2  | POWER AVAILABLE       =  0.15238D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.54966D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.14394D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10562D 04 FT
        | PITCH ANGLE          =  0.29826D 00 RADIAN     | ALTITUDE RATE         =  0.23122D 02 FT/SEC
        | PITCH RATE           =  0.18782D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.37893D 01 FT/SEC**2
        | AIRSPEED             =  0.15848D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 68 | DENSITY           =  0.23055D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15184D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.95647D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.89061D-01
        | ACCELERATION         = -0.26434D 00 FT/SEC**2  | POWER AVAILABLE       =  0.15237D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.56325D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.14642D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.13585D 04 FT
        | PITCH ANGLE          =  0.30009D 00 RADIAN     | ALTITUDE RATE         =  0.23494D 02 FT/SEC
        | PITCH RATE           =  0.17784D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.36446D 01 FT/SEC**2
        | AIRSPEED             =  0.15845D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 69 | DENSITY           =  0.23053D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15127D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.95288D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.88284D-01
        | ACCELERATION         = -0.30984D 00 FT/SEC**2  | POWER AVAILABLE       =  0.15236D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.57671D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.14882D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10609D 04 FT
        | PITCH ANGLE          =  0.30182D 00 RADIAN     | ALTITUDE RATE         =  0.23851D 02 FT/SEC
        | PITCH RATE           =  0.16755D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.34952D 01 FT/SEC**2
        | AIRSPEED             =  0.15842D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 70 | DENSITY           =  0.23051D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15068D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.94920D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.87499D-01
        | ACCELERATION         = -0.35200D 00 FT/SEC**2  | POWER AVAILABLE       =  0.15235D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.59004D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.15113D 00 RADIAN
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        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10633D 04 FT
        | PITCH ANGLE          =  0.30344D 00 RADIAN     | ALTITUDE RATE         =  0.24193D 02 FT/SEC
        | PITCH RATE           =  0.15696D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.33413D 01 FT/SEC**2
        | AIRSPEED             =  0.15838D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 71 | DENSITY           =  0.23050D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.15009D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.94544D 00
        | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.86709D-01
        | ACCELERATION         = -0.39076D 00 FT/SEC**2  | POWER AVAILABLE       =  0.15233D 06 FT-LBF/SEC
        | ANGLE-OF-ATTACK RATE= -0.60323D-02 RADIAN/SEC | FLIGHT PATH ANGLE     =  0.15335D 00 RADIAN
**********************************************************************************************************
        | WEIGHT               =  0.39998D 04 LBF        | ALTITUDE              =  0.10657D 04 FT
        | PITCH ANGLE          =  0.30495D 00 RADIAN     | ALTITUDE RATE         =  0.24519D 02 FT/SEC
        | PITCH RATE           =  0.14608D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.31832D 01 FT/SEC**2
        | AIRSPEED             =  0.15834D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
DATA PT 72 | DENSITY           =  0.23048D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
        | ANGLE OF ATTACK      =  0.14948D 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.94160D 00
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*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.859140-01                *
*              | ACCELERATION         = -0.426090 00 FT/SEC**2   | POWER AVAILABLE        =  0.152310 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.616300-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.155480 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399980 04 LBF         | ALTITUDE               =  0.106820 04 FT            *
*              | PITCH ANGLE          =  0.306360 00 RADIAN      | ALTITUDE RATE          =  0.248290 02 FT/SEC        *
*              | PITCH RATE           =  0.134920-01 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.302100 01 FT/SEC**2     *
*              | AIRSPEED             =  0.158300 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   73 | DENSITY              =  0.230470-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.148860 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.937670 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.851150-01                *
*              | ACCELERATION         = -0.457950 00 FT/SEC**2   | POWER AVAILABLE        =  0.152290 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.629190-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.157600 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399980 04 LBF         | ALTITUDE               =  0.107070 04 FT            *
*              | PITCH ANGLE          =  0.307650 00 RADIAN      | ALTITUDE RATE          =  0.251230 02 FT/SEC        *
*              | PITCH RATE           =  0.123500-01 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.285510 01 FT/SEC**2     *
*              | AIRSPEED             =  0.158250 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   74 | DENSITY              =  0.230450-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.148220 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.933670 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.843120-01                *
*              | ACCELERATION         = -0.486310 00 FT/SEC**2   | POWER AVAILABLE        =  0.152270 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.641750-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.159430 00 RADIAN        *
*              |                                                 |                                                     *
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*              |                                                 |                                                     *
*              | WEIGHT               =  0.399980 04 LBF         | ALTITUDE               =  0.107320 04 FT            *
*              | PITCH ANGLE          =  0.308830 00 RADIAN      | ALTITUDE RATE          =  0.254000 02 FT/SEC        *
*              | PITCH RATE           =  0.111850-01 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.268850 01 FT/SEC**2     *
*              | AIRSPEED             =  0.158200 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   75 | DENSITY              =  0.230430-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.147570 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.929590 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.835070-01                *
*              | ACCELERATION         = -0.511150 00 FT/SEC**2   | POWER AVAILABLE        =  0.152250 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.653930-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.161260 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399980 04 LBF         | ALTITUDE               =  0.107580 04 FT            *
*              | PITCH ANGLE          =  0.309890 00 RADIAN      | ALTITUDE RATE          =  0.256600 02 FT/SEC        *
*              | PITCH RATE           =  0.999830-02 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.251270 01 FT/SEC**2     *
*              | AIRSPEED             =  0.158180 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   76 | DENSITY              =  0.230410-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.146910 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.925430 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.827010-01                *
*              | ACCELERATION         = -0.532450 00 FT/SEC**2   | POWER AVAILABLE        =  0.152230 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.665730-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.162980 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399980 04 LBF         | ALTITUDE               =  0.107840 04 FT            *
*              | PITCH ANGLE          =  0.310830 00 RADIAN      | ALTITUDE RATE          =  0.259030 02 FT/SEC        *
*              | PITCH RATE           =  0.879060-02 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.233690 01 FT/SEC**2     *
*              | AIRSPEED             =  0.158090 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   77 | DENSITY              =  0.230400-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.146240 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.921200 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.818940-01                *
*              | ACCELERATION         = -0.553200 00 FT/SEC**2   | POWER AVAILABLE        =  0.152200 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.677150-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.164590 00 RADIAN        *
*              |                                                 |                                                     *
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*              |                                                 |                                                     *
*              | WEIGHT               =  0.399970 04 LBF         | ALTITUDE               =  0.108100 04 FT            *
*              | PITCH ANGLE          =  0.311650 00 RADIAN      | ALTITUDE RATE          =  0.261270 02 FT/SEC        *
*              | PITCH RATE           =  0.756350-02 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.215820 01 FT/SEC**2     *
*              | AIRSPEED             =  0.158040 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   78 | DENSITY              =  0.230380-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.145560 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.916890 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.810880-01                *
*              | ACCELERATION         = -0.564370 00 FT/SEC**2   | POWER AVAILABLE        =  0.152180 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.688230-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.166090 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399970 04 LBF         | ALTITUDE               =  0.108360 04 FT            *
*              | PITCH ANGLE          =  0.312340 00 RADIAN      | ALTITUDE RATE          =  0.263340 02 FT/SEC        *
*              | PITCH RATE           =  0.631630-02 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.197700 01 FT/SEC**2     *
*              | AIRSPEED             =  0.157980 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   79 | DENSITY              =  0.230360-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.144860 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.912520 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.802840-01                *
*              | ACCELERATION         = -0.574960 00 FT/SEC**2   | POWER AVAILABLE        =  0.152160 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.698870-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.167480 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399970 04 LBF         | ALTITUDE               =  0.108620 04 FT            *
*              | PITCH ANGLE          =  0.312910 00 RADIAN      | ALTITUDE RATE          =  0.265230 02 FT/SEC        *
*              | PITCH RATE           =  0.505640-02 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.179340 01 FT/SEC**2     *
*              | AIRSPEED             =  0.157920 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   80 | DENSITY              =  0.230340-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.144160 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.908090 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.794820-01                *
*              | ACCELERATION         = -0.581960 00 FT/SEC**2   | POWER AVAILABLE        =  0.152130 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.709170-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.168750 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399970 04 LBF         | ALTITUDE               =  0.108890 04 FT            *
*              | PITCH ANGLE          =  0.313350 00 RADIAN      | ALTITUDE RATE          =  0.266930 02 FT/SEC        *
*              | PITCH RATE           =  0.377910-02 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.160780 01 FT/SEC**2     *
*              | AIRSPEED             =  0.157860 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   81 | DENSITY              =  0.230320-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.143450 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.903590 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.786830-01                *
*              | ACCELERATION         = -0.585360 00 FT/SEC**2   | POWER AVAILABLE        =  0.152100 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.719090-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.169900 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399970 04 LBF         | ALTITUDE               =  0.109160 04 FT            *
*              | PITCH ANGLE          =  0.313660 00 RADIAN      | ALTITUDE RATE          =  0.268440 02 FT/SEC        *
*              | PITCH RATE           =  0.248770-02 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.142030 01 FT/SEC**2     *
*              | AIRSPEED             =  0.157800 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   82 | DENSITY              =  0.230310-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.142720 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.899030 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.778870-01                *
*              | ACCELERATION         = -0.585160 00 FT/SEC**2   | POWER AVAILABLE        =  0.152080 06 FT-LBF/SEC    *
*              | ANGLE-OF-ATTACK RATE= -0.728630-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.170940 00 RADIAN        *
*              |                                                 |                                                     *
*************************************************************************************************************************
*              |                                                 |                                                     *
*              | WEIGHT               =  0.399970 04 LBF         | ALTITUDE               =  0.109430 04 FT            *
*              | PITCH ANGLE          =  0.313880 00 RADIAN      | ALTITUDE RATE          =  0.269770 02 FT/SEC        *
*              | PITCH RATE           =  0.118360-02 RADIAN/SEC  | ALTITUDE-RATE RATE     =  0.123120 01 FT/SEC**2     *
*              | AIRSPEED             =  0.157750 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2     *
* DATA PT   83 | DENSITY              =  0.230290-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN        *
*              | ANGLE OF ATTACK      =  0.141990 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.894410 00                *
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           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.770970-01
           | ACCELERATION        = -0.581340 00 FT/SEC**2  | POWER AVAILABLE        =  0.152050 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.737790-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.171860 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.109760 04 FT
           | PITCH ANGLE         =  0.313900 00 RADIAN     | ALTITUDE RATE          =  0.270900 02 FT/SEC
           | PITCH RATE          = -0.131860-03 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.104070 01 FT/SEC**2
           | AIRSPEED            =  0.157690 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 84 | DENSITY             =  0.230270-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.141250 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.889730 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.763120-01
           | ACCELERATION        = -0.573910 00 FT/SEC**2  | POWER AVAILABLE        =  0.152030 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.746580-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.172650 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.109970 04 FT
           | PITCH ANGLE         =  0.313820 00 RADIAN     | ALTITUDE RATE          =  0.271850 02 FT/SEC
           | PITCH RATE          = -0.145730-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.848920 00 FT/SEC**2
           | AIRSPEED            =  0.157630 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 85 | DENSITY             =  0.230250-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.140500 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.885000 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.755320-01
           | ACCELERATION        = -0.562870 00 FT/SEC**2  | POWER AVAILABLE        =  0.152000 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.754980-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.173330 00 RADIAN

           | WEIGHT              =  0.399973 04 LBF        | ALTITUDE               =  0.110240 04 FT
           | PITCH ANGLE         =  0.313610 00 RADIAN     | ALTITUDE RATE          =  0.272600 02 FT/SEC
           | PITCH RATE          = -0.279140-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.656140 00 FT/SEC**2
           | AIRSPEED            =  0.157580 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 86 | DENSITY             =  0.230230-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.139740 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.880220 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.747600-01
           | ACCELERATION        = -0.548220 00 FT/SEC**2  | POWER AVAILABLE        =  0.151980 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.763020-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.173870 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.110510 04 FT
           | PITCH ANGLE         =  0.313260 00 RADIAN     | ALTITUDE RATE          =  0.273160 02 FT/SEC
           | PITCH RATE          = -0.413270-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.462550 00 FT/SEC**2
           | AIRSPEED            =  0.157520 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 87 | DENSITY             =  0.230210-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.138970 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.875390 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.739940-01
           | ACCELERATION        = -0.529970 00 FT/SEC**2  | POWER AVAILABLE        =  0.151960 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.770670-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.174290 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.110790 04 FT
           | PITCH ANGLE         =  0.312780 00 RADIAN     | ALTITUDE RATE          =  0.273530 02 FT/SEC
           | PITCH RATE          = -0.547990-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.268340 00 FT/SEC**2
           | AIRSPEED            =  0.157470 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 88 | DENSITY             =  0.230200-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.138200 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.870510 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.732360-01
           | ACCELERATION        = -0.508120 00 FT/SEC**2  | POWER AVAILABLE        =  0.151930 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.777940-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.174590 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.111060 04 FT
           | PITCH ANGLE         =  0.312170 00 RADIAN     | ALTITUDE RATE          =  0.273700 02 FT/SEC
           | PITCH RATE          = -0.683160-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.737010-01 FT/SEC**2
           | AIRSPEED            =  0.157420 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 89 | DENSITY             =  0.230180-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.137410 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.865590 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.724860-01
           | ACCELERATION        = -0.482650 00 FT/SEC**2  | POWER AVAILABLE        =  0.151910 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.784840-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.174750 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.111330 04 FT
           | PITCH ANGLE         =  0.311420 00 RADIAN     | ALTITUDE RATE          =  0.273670 02 FT/SEC
           | PITCH RATE          = -0.818660-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.121200 00 FT/SEC**2
           | AIRSPEED            =  0.157370 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 90 | DENSITY             =  0.230160-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.136630 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.860630 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.717450-01
           | ACCELERATION        = -0.453670 00 FT/SEC**2  | POWER AVAILABLE        =  0.151890 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.791360-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.174790 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.111610 04 FT
           | PITCH ANGLE         =  0.310530 00 RADIAN     | ALTITUDE RATE          =  0.273460 02 FT/SEC
           | PITCH RATE          = -0.954330-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.316170 00 FT/SEC**2
           | AIRSPEED            =  0.157330 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 91 | DENSITY             =  0.230140-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.135830 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.855620 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.710130-01
           | ACCELERATION        = -0.421100 00 FT/SEC**2  | POWER AVAILABLE        =  0.151870 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.797500-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.174700 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.111840 04 FT
           | PITCH ANGLE         =  0.309510 00 RADIAN     | ALTITUDE RATE          =  0.273040 02 FT/SEC
           | PITCH RATE          = -0.139000-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.511040 00 FT/SEC**2
           | AIRSPEED            =  0.157290 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 92 | DENSITY             =  0.230120-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.135030 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.850580 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.702910-01
           | ACCELERATION        = -0.384970 00 FT/SEC**2  | POWER AVAILABLE        =  0.151850 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.803260-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.174480 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.112180 04 FT
           | PITCH ANGLE         =  0.308360 00 RADIAN     | ALTITUDE RATE          =  0.272430 02 FT/SEC
           | PITCH RATE          = -0.122570-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.705660 00 FT/SEC**2
           | AIRSPEED            =  0.157280 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 93 | DENSITY             =  0.230100-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.134230 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.845510 00
           | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.695780-01
           | ACCELERATION        = -0.345320 00 FT/SEC**2  | POWER AVAILABLE        =  0.151840 06 FT-LBF/SEC
           | ANGLE-OF-ATTACK RATE= -0.808650-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.174120 00 RADIAN

           | WEIGHT              =  0.399970 04 LBF        | ALTITUDE               =  0.112430 04 FT
           | PITCH ANGLE         =  0.307060 00 RADIAN     | ALTITUDE RATE          =  0.271630 02 FT/SEC
           | PITCH RATE          = -0.136100-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.899860 00 FT/SEC**2
           | AIRSPEED            =  0.157220 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 94 | DENSITY             =  0.230090-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
           | ANGLE OF ATTACK     =  0.133410 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.840400 00
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| TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.668750-01
| ACCELERATION         = -0.302150 00 FT/SEC**2  | POWER AVAILABLE        =  0.151820 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.813680-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.173640 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.112700 04 FT
             | PITCH ANGLE          =  0.305630 00 RADIAN     | ALTITUDE RATE          =  0.270630 02 FT/SEC
             | PITCH RATE           = -0.169600-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.109350 01 FT/SEC**2
             | AIRSPEED             =  0.157190 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT  95  | DENSITY              =  0.230070-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.132600 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.836260 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.681820-01
             | ACCELERATION         = -0.255500 00 FT/SEC**2  | POWER AVAILABLE        =  0.151810 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.818260-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.173030 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.112970 04 FT
             | PITCH ANGLE          =  0.304060 00 RADIAN     | ALTITUDE RATE          =  0.269440 02 FT/SEC
             | PITCH RATE           = -0.163050-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.128640 01 FT/SEC**2
             | AIRSPEED             =  0.157170 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT  96  | DENSITY              =  0.230050-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.131780 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.830090 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.675000-01
             | ACCELERATION         = -0.205390 00 FT/SEC**2  | POWER AVAILABLE        =  0.151800 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.822490-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.172290 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.113240 04 FT
             | PITCH ANGLE          =  0.302370 00 RADIAN     | ALTITUDE RATE          =  0.268060 02 FT/SEC
             | PITCH RATE           = -0.176430-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.147840 01 FT/SEC**2
             | AIRSPEED             =  0.157160 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT  97  | DENSITY              =  0.230030-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.130950 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.824930 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.668290-01
             | ACCELERATION         = -0.151840 00 FT/SEC**2  | POWER AVAILABLE        =  0.151790 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.826330-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.171410 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.113500 04 FT
             | PITCH ANGLE          =  0.300540 00 RADIAN     | ALTITUDE RATE          =  0.266490 02 FT/SEC
             | PITCH RATE           = -0.189740-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.166940 01 FT/SEC**2
             | AIRSPEED             =  0.157140 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT  98  | DENSITY              =  0.230010-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.130130 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.819690 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.661700-01
             | ACCELERATION         = -0.948960-01 FT/SEC**2  | POWER AVAILABLE        =  0.151790 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.829790-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.170410 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.113770 04 FT
             | PITCH ANGLE          =  0.298570 00 RADIAN     | ALTITUDE RATE          =  0.264720 02 FT/SEC
             | PITCH RATE           = -0.202980-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.185930 01 FT/SEC**2
             | AIRSPEED             =  0.157130 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT  99  | DENSITY              =  0.229990-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.129290 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.814450 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.655210-01
             | ACCELERATION         = -0.345810-01 FT/SEC**2  | POWER AVAILABLE        =  0.151780 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.832860-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.169280 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.114030 04 FT
             | PITCH ANGLE          =  0.296480 00 RADIAN     | ALTITUDE RATE          =  0.262770 02 FT/SEC
             | PITCH RATE           = -0.216050-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.204780 01 FT/SEC**2
             | AIRSPEED             =  0.157130 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 100  | DENSITY              =  0.229980-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.128460 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.809200 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.648840-01
             | ACCELERATION         =  0.250660-01 FT/SEC**2  | POWER AVAILABLE        =  0.151780 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.835540-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.168020 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.114290 04 FT
             | PITCH ANGLE          =  0.294260 00 RADIAN     | ALTITUDE RATE          =  0.260630 02 FT/SEC
             | PITCH RATE           = -0.229040-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.223500 01 FT/SEC**2
             | AIRSPEED             =  0.157140 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 101  | DENSITY              =  0.229960-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.127620 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.803930 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.642580-01
             | ACCELERATION         =  0.960070-01 FT/SEC**2  | POWER AVAILABLE        =  0.151790 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.837840-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.166630 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.114550 04 FT
             | PITCH ANGLE          =  0.291900 00 RADIAN     | ALTITUDE RATE          =  0.258300 02 FT/SEC
             | PITCH RATE           = -0.241890-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.242060 01 FT/SEC**2
             | AIRSPEED             =  0.157150 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 102  | DENSITY              =  0.229940-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.126780 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.798640 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.636440-01
             | ACCELERATION         =  0.166200 00 FT/SEC**2  | POWER AVAILABLE        =  0.151790 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.839760-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.165110 00 RADIAN

             | WEIGHT               =  0.399970 04 LBF        | ALTITUDE               =  0.114810 04 FT
             | PITCH ANGLE          =  0.289410 00 RADIAN     | ALTITUDE RATE          =  0.255790 02 FT/SEC
             | PITCH RATE           = -0.254600-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.260460 01 FT/SEC**2
             | AIRSPEED             =  0.157170 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 103  | DENSITY              =  0.229920-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.125940 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.793350 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.630410-01
             | ACCELERATION         =  0.239600 00 FT/SEC**2  | POWER AVAILABLE        =  0.151800 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.841290-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.163470 00 RADIAN

             | WEIGHT               =  0.399960 04 LBF        | ALTITUDE               =  0.115070 04 FT
             | PITCH ANGLE          =  0.286810 00 RADIAN     | ALTITUDE RATE          =  0.253090 02 FT/SEC
             | PITCH RATE           = -0.267140-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.278670 01 FT/SEC**2
             | AIRSPEED             =  0.157200 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 104  | DENSITY              =  0.229910-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.125100 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.788050 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.624510-01
             | ACCELERATION         =  0.316150 00 FT/SEC**2  | POWER AVAILABLE        =  0.151810 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.842430-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.161700 00 RADIAN

             | WEIGHT               =  0.399960 04 LBF        | ALTITUDE               =  0.115320 04 FT
             | PITCH ANGLE          =  0.284070 00 RADIAN     | ALTITUDE RATE          =  0.250210 02 FT/SEC
             | PITCH RATE           = -0.279510-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.296700 01 FT/SEC**2
             | AIRSPEED             =  0.157240 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 105  | DENSITY              =  0.229890-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.124260 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.782740 00
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            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.618720-01
            | ACCELERATION           =  0.395820 00 FT/SEC**2  | POWER AVAILABLE          =  0.151830 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.843190-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.159810 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.118570 04 FT
            | PITCH ANGLE            =  0.281220 00 RADIAN     | ALTITUDE RATE            =  0.247160 02 FT/SEC
            | PITCH RATE             = -0.291700-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.314530 01 FT/SEC**2
            | AIRSPEED               =  0.157280 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 106 | DENSITY                =  0.229870-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.123420 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.777430 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.613040-01
            | ACCELERATION           =  0.478540 00 FT/SEC**2  | POWER AVAILABLE          =  0.151853 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.843560-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.157800 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.118810 04 FT
            | PITCH ANGLE            =  0.278240 00 RADIAN     | ALTITUDE RATE            =  0.243920 02 FT/SEC
            | PITCH RATE             = -0.303680-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.332180 01 FT/SEC**2
            | AIRSPEED               =  0.157330 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 107 | DENSITY                =  0.229900-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.122570 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.772123 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.607490-01
            | ACCELERATION           =  0.564250 00 FT/SEC**2  | POWER AVAILABLE          =  0.151870 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.843540-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.155670 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.116050 04 FT
            | PITCH ANGLE            =  0.275140 00 RADIAN     | ALTITUDE RATE            =  0.240520 02 FT/SEC
            | PITCH RATE             = -0.315460-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.349550 01 FT/SEC**2
            | AIRSPEED               =  0.157390 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 108 | DENSITY                =  0.229840-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.121730 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.766810 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.602050-01
            | ACCELERATION           =  0.652510 00 FT/SEC**2  | POWER AVAILABLE          =  0.151900 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.843140-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.153410 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.116290 04 FT
            | PITCH ANGLE            =  0.271930 00 RADIAN     | ALTITUDE RATE            =  0.236930 02 FT/SEC
            | PITCH RATE             = -0.327010-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.366720 01 FT/SEC**2
            | AIRSPEED               =  0.157460 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 109 | DENSITY                =  0.229820-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.120890 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.761500 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.596730-01
            | ACCELERATION           =  0.744440 00 FT/SEC**2  | POWER AVAILABLE          =  0.151930 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.847360-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.151040 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.116530 04 FT
            | PITCH ANGLE            =  0.268600 00 RADIAN     | ALTITUDE RATE            =  0.233180 02 FT/SEC
            | PITCH RATE             = -0.338320-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.383640 01 FT/SEC**2
            | AIRSPEED               =  0.157540 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 110 | DENSITY                =  0.229810-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.120040 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.756200 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.591530-01
            | ACCELERATION           =  0.838780 00 FT/SEC**2  | POWER AVAILABLE          =  0.151960 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.841190-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.148560 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.116760 04 FT
            | PITCH ANGLE            =  0.265160 00 RADIAN     | ALTITUDE RATE            =  0.229260 02 FT/SEC
            | PITCH RATE             = -0.349380-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.400310 01 FT/SEC**2
            | AIRSPEED               =  0.157630 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 111 | DENSITY                =  0.229790-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.119200 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.750913 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.586440-01
            | ACCELERATION           =  0.935860 00 FT/SEC**2  | POWER AVAILABLE          =  0.152000 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.839640-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.145960 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.116990 04 FT
            | PITCH ANGLE            =  0.261620 00 RADIAN     | ALTITUDE RATE            =  0.225180 02 FT/SEC
            | PITCH RATE             = -0.360180-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.416730 01 FT/SEC**2
            | AIRSPEED               =  0.157730 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 112 | DENSITY                =  0.229780-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.118360 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.745620 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.581470-01
            | ACCELERATION           =  0.103560 01 FT/SEC**2  | POWER AVAILABLE          =  0.152050 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.837700-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.143250 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.117210 04 FT
            | PITCH ANGLE            =  0.257960 00 RADIAN     | ALTITUDE RATE            =  0.220930 02 FT/SEC
            | PITCH RATE             = -0.370710-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.432870 01 FT/SEC**2
            | AIRSPEED               =  0.157840 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 113 | DENSITY                =  0.229760-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.117530 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.740360 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.576620-01
            | ACCELERATION           =  0.113790 01 FT/SEC**2  | POWER AVAILABLE          =  0.152090 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.835370-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.140430 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.117430 04 FT
            | PITCH ANGLE            =  0.254200 00 RADIAN     | ALTITUDE RATE            =  0.216520 02 FT/SEC
            | PITCH RATE             = -0.380960-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.448740 01 FT/SEC**2
            | AIRSPEED               =  0.157960 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 114 | DENSITY                =  0.229750-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.116690 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.735100 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.571870-01
            | ACCELERATION           =  0.124280 01 FT/SEC**2  | POWER AVAILABLE          =  0.152140 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.832750-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.137510 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.117640 04 FT
            | PITCH ANGLE            =  0.250340 00 RADIAN     | ALTITUDE RATE            =  0.211950 02 FT/SEC
            | PITCH RATE             = -0.390940-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.464320 01 FT/SEC**2
            | AIRSPEED               =  0.158090 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 115 | DENSITY                =  0.229730-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.115860 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.729870 00
            | TEMPERATURE            =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.567240-01
            | ACCELERATION           =  0.135010 01 FT/SEC**2  | POWER AVAILABLE          =  0.152200 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.829910-02 RADIAN/SEC    | FLIGHT PATH ANGLE        =  0.134480 00 RADIAN

            | WEIGHT                 =  0.399960 04 LBF        | ALTITUDE                 =  0.117850 04 FT
            | PITCH ANGLE            =  0.246390 00 RADIAN     | ALTITUDE RATE            =  0.207233 02 FT/SEC
            | PITCH RATE             = -0.400630-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.479610 01 FT/SEC**2
            | AIRSPEED               =  0.158230 03 FT/SEC     | VERTICAL ACCELERATION    =  0.0          FT/SEC**2
DATA PT 116 | DENSITY                =  0.229720-02 SLUG/FT**3 | ELEVATOR DEFLECTION      =  0.0          RADIAN
            | ANGLE OF ATTACK        =  0.115030 00 RADIAN     | LIFT COEFFICIENT( CL )=  0.724650 00
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          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.562720-01
          | ACCELERATION         =  0.145970 01 FT/SEC**2   | POWER AVAILABLE        =  0.152260 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.826850-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.131353 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.118060 04 FT
          | PITCH ANGLE          =  0.242330 00 RADIAN      | ALTITUDE RATE          =  0.202360 02 FT/SEC
          | PITCH RATE           = -0.413020-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.494610 01 FT/SEC**2
          | AIRSPEED             =  0.158380 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 117 | DENSITY            =  0.229700-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.114210 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.719450 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.558310-01
          | ACCELERATION         =  0.157160 01 FT/SEC**2   | POWER AVAILABLE        =  0.152330 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.823580-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.128120 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.118260 04 FT
          | PITCH ANGLE          =  0.238190 00 RADIAN      | ALTITUDE RATE          =  0.197340 02 FT/SEC
          | PITCH RATE           = -0.419120-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.509310 01 FT/SEC**2
          | AIRSPEED             =  0.158540 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 118 | DENSITY            =  0.229690-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.113390 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.714280 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.554000-01
          | ACCELERATION         =  0.168570 01 FT/SEC**2   | POWER AVAILABLE        =  0.152433 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.820090-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.124800 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.118450 04 FT
          | PITCH ANGLE          =  0.233950 00 RADIAN      | ALTITUDE RATE          =  0.192180 02 FT/SEC
          | PITCH RATE           = -0.427900-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.523710 01 FT/SEC**2
          | AIRSPEED             =  0.158710 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 119 | DENSITY            =  0.229680-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.112570 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.709123 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.549800-01
          | ACCELERATION         =  0.180190 01 FT/SEC**2   | POWER AVAILABLE        =  0.152470 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.816380-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.121380 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.118640 04 FT
          | PITCH ANGLE          =  0.229630 00 RADIAN      | ALTITUDE RATE          =  0.186873 02 FT/SEC
          | PITCH RATE           = -0.436370-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.537800 01 FT/SEC**2
          | AIRSPEED             =  0.158900 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 120 | DENSITY            =  0.229660-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.111750 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.703990 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.545690-01
          | ACCELERATION         =  0.192010 01 FT/SEC**2   | POWER AVAILABLE        =  0.152550 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.812460-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.117870 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.118820 04 FT
          | PITCH ANGLE          =  0.225220 00 RADIAN      | ALTITUDE RATE          =  0.181420 02 FT/SEC
          | PITCH RATE           = -0.444510-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.551570 01 FT/SEC**2
          | AIRSPEED             =  0.159100 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 121 | DENSITY            =  0.229650-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.110940 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.698890 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.541690-01
          | ACCELERATION         =  0.204020 01 FT/SEC**2   | POWER AVAILABLE        =  0.152640 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.808320-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.114280 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.119000 04 FT
          | PITCH ANGLE          =  0.220740 00 RADIAN      | ALTITUDE RATE          =  0.175840 02 FT/SEC
          | PITCH RATE           = -0.452330-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.565030 01 FT/SEC**2
          | AIRSPEED             =  0.159310 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 122 | DENSITY            =  0.229640-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.110140 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.693810 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.537780-01
          | ACCELERATION         =  0.216210 01 FT/SEC**2   | POWER AVAILABLE        =  0.152730 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.803970-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.110600 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.119180 04 FT
          | PITCH ANGLE          =  0.216180 00 RADIAN      | ALTITUDE RATE          =  0.170120 02 FT/SEC
          | PITCH RATE           = -0.459800-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.578170 01 FT/SEC**2
          | AIRSPEED             =  0.159530 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 123 | DENSITY            =  0.229630-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.109340 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.688763 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.533980-01
          | ACCELERATION         =  0.228570 01 FT/SEC**2   | POWER AVAILABLE        =  0.152830 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.799400-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.106840 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.119340 04 FT
          | PITCH ANGLE          =  0.211550 00 RADIAN      | ALTITUDE RATE          =  0.164280 02 FT/SEC
          | PITCH RATE           = -0.466940-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.590980 01 FT/SEC**2
          | AIRSPEED             =  0.159770 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 124 | DENSITY            =  0.229620-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.108540 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.683740 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.530260-01
          | ACCELERATION         =  0.241100 01 FT/SEC**2   | POWER AVAILABLE        =  0.152930 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.794620-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.103013 00 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.119500 04 FT
          | PITCH ANGLE          =  0.206840 00 RADIAN      | ALTITUDE RATE          =  0.158300 02 FT/SEC
          | PITCH RATE           = -0.473720-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.603460 01 FT/SEC**2
          | AIRSPEED             =  0.160010 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 125 | DENSITY            =  0.229610-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.107750 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.678750 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.526640-01
          | ACCELERATION         =  0.253780 01 FT/SEC**2   | POWER AVAILABLE        =  0.153030 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.789620-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.990940-01 RADIAN
          |                                                 |
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          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.119660 04 FT
          | PITCH ANGLE          =  0.202070 00 RADIAN      | ALTITUDE RATE          =  0.152210 02 FT/SEC
          | PITCH RATE           = -0.480150-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.615610 01 FT/SEC**2
          | AIRSPEED             =  0.160270 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 126 | DENSITY            =  0.229600-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.106960 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.673800 00
          | TEMPERATURE          =  0.520000 03 DEGREES-R   | DRAG COEFFICIENT( CD )=  0.523110-01
          | ACCELERATION         =  0.266600 01 FT/SEC**2   | POWER AVAILABLE        =  0.153143 06 FT-LBF/SEC
          | ANGLE-OF-ATTACK RATE= -0.784400-02 RADIAN/SEC   | FLIGHT PATH ANGLE      =  0.951120-01 RADIAN
          |                                                 |
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          |                                                 |
          | WEIGHT               =  0.399960 04 LBF         | ALTITUDE               =  0.119810 04 FT
          | PITCH ANGLE          =  0.197240 00 RADIAN      | ALTITUDE RATE          =  0.145990 02 FT/SEC
          | PITCH RATE           = -0.486220-01 RADIAN/SEC  | ALTITUDE-RATE RATE     = -0.627620 01 FT/SEC**2
          | AIRSPEED             =  0.160580 03 FT/SEC      | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 127 | DENSITY            =  0.229590-02 SLUG/FT**3  | ELEVATOR DEFLECTION    =  0.0          RADIAN
          | ANGLE OF ATTACK      =  0.106180 00 RADIAN      | LIFT COEFFICIENT( CL )=  0.668870 00
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	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.51966D-01
	ACCELERATION	= 0.27955D 01 FT/SEC**2	POWER AVAILABLE =	0.15326D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.77897D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.91061D-01 RADIAN
	WEIGHT	= 0.39996D 04 LBF	ALTITUDE =	0.11995D 04 FT
	PITCH ANGLE	= 0.19235D 00 RADIAN	ALTITUDE RATE =	0.13966D 02 FT/SEC
	PITCH RATE	= -0.49193D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.63888D 01 FT/SEC**2
	AIRSPEED	= 0.16083D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 128	DENSITY	= 0.22958D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.10540D 00 RADIAN	LIFT COEFFICIENT(CL)=	0.66399D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.51631D-01
	ACCELERATION	= 0.29262D 01 FT/SEC**2	POWER AVAILABLE =	0.15338D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.77332D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.86946D-01 RADIAN
	WEIGHT	= 0.39996D 04 LBF	ALTITUDE =	0.12009D 04 FT
	PITCH ANGLE	= 0.18740D 00 RADIAN	ALTITUDE RATE =	0.13322D 02 FT/SEC
	PITCH RATE	= -0.49727D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.65000D 01 FT/SEC**2
	AIRSPEED	= 0.16113D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 129	DENSITY	= 0.22957D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.10463D 00 RADIAN	LIFT COEFFICIENT(CL)=	0.65913D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.51303D-01
	ACCELERATION	= 0.30581D 01 FT/SEC**2	POWER AVAILABLE =	0.15351D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.76766D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.82770D-01 RADIAN
	WEIGHT	= 0.39995D 04 LBF	ALTITUDE =	0.12022D 04 FT
	PITCH ANGLE	= 0.18240D 00 RADIAN	ALTITUDE RATE =	0.12666D 02 FT/SEC
	PITCH RATE	= -0.50224D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.66077D 01 FT/SEC**2
	AIRSPEED	= 0.16144D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 130	DENSITY	= 0.22956D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.10387D 00 RADIAN	LIFT COEFFICIENT(CL)=	0.65432D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.50985D-01
	ACCELERATION	= 0.31909D 01 FT/SEC**2	POWER AVAILABLE =	0.15364D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.76138D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.78537D-01 RADIAN
	WEIGHT	= 0.39995D 04 LBF	ALTITUDE =	0.12034D 04 FT
	PITCH ANGLE	= 0.17736D 00 RADIAN	ALTITUDE RATE =	0.12000D 02 FT/SEC
	PITCH RATE	= -0.50684D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.67114D 01 FT/SEC**2
	AIRSPEED	= 0.16177D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 131	DENSITY	= 0.22955D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.10311D 00 RADIAN	LIFT COEFFICIENT(CL)=	0.64954D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.50674D-01
	ACCELERATION	= 0.33246D 01 FT/SEC**2	POWER AVAILABLE =	0.15378D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.75509D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.74250D-01 RADIAN
	WEIGHT	= 0.39995D 04 LBF	ALTITUDE =	0.12046D 04 FT
	PITCH ANGLE	= 0.17227D 00 RADIAN	ALTITUDE RATE =	0.11324D 02 FT/SEC
	PITCH RATE	= -0.51136D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.68123D 01 FT/SEC**2
	AIRSPEED	= 0.16211D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 132	DENSITY	= 0.22954D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.10236D 00 RADIAN	LIFT COEFFICIENT(CL)=	0.64481D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.50371D-01
	ACCELERATION	= 0.34591D 01 FT/SEC**2	POWER AVAILABLE =	0.15392D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.74857D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.69912D-01 RADIAN
	WEIGHT	= 0.39995D 04 LBF	ALTITUDE =	0.12057D 04 FT
	PITCH ANGLE	= 0.16714D 00 RADIAN	ALTITUDE RATE =	0.10634D 02 FT/SEC
	PITCH RATE	= -0.51490D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.69091D 01 FT/SEC**2
	AIRSPEED	= 0.16246D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 133	DENSITY	= 0.22953D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.10161D 00 RADIAN	LIFT COEFFICIENT(CL)=	0.64011D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.50076D-01
	ACCELERATION	= 0.35942D 01 FT/SEC**2	POWER AVAILABLE =	0.15406D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.74188D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.65527D-01 RADIAN
	WEIGHT	= 0.39995D 04 LBF	ALTITUDE =	0.12067D 04 FT
	PITCH ANGLE	= 0.16197D 00 RADIAN	ALTITUDE RATE =	0.99424D 01 FT/SEC
	PITCH RATE	= -0.51837D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.70023D 01 FT/SEC**2
	AIRSPEED	= 0.16283D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 134	DENSITY	= 0.22953D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.10087D 00 RADIAN	LIFT COEFFICIENT(CL)=	0.63546D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.49789D-01
	ACCELERATION	= 0.37299D 01 FT/SEC**2	POWER AVAILABLE =	0.15422D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.73510D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.61099D-01 RADIAN
	WEIGHT	= 0.39995D 04 LBF	ALTITUDE =	0.12077D 04 FT
	PITCH ANGLE	= 0.15677D 00 RADIAN	ALTITUDE RATE =	0.92377D 01 FT/SEC
	PITCH RATE	= -0.52148D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.70917D 01 FT/SEC**2
	AIRSPEED	= 0.16321D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 135	DENSITY	= 0.22952D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.10014D 00 RADIAN	LIFT COEFFICIENT(CL)=	0.63085D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.49509D-01
	ACCELERATION	= 0.38660D 01 FT/SEC**2	POWER AVAILABLE =	0.15437D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.72828D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.56631D-01 RADIAN
	WEIGHT	= 0.39995D 04 LBF	ALTITUDE =	0.12086D 04 FT
	PITCH ANGLE	= 0.15154D 00 RADIAN	ALTITUDE RATE =	0.85242D 01 FT/SEC
	PITCH RATE	= -0.52424D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.71776D 01 FT/SEC**2
	AIRSPEED	= 0.16360D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 136	DENSITY	= 0.22951D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.99417D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.62628D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.49237D-01
	ACCELERATION	= 0.40025D 01 FT/SEC**2	POWER AVAILABLE =	0.15453D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.72142D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.52127D-01 RADIAN
	WEIGHT	= 0.39996D 04 LBF	ALTITUDE =	0.12094D 04 FT
	PITCH ANGLE	= 0.14629D 00 RADIAN	ALTITUDE RATE =	0.78022D 01 FT/SEC
	PITCH RATE	= -0.52663D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.72600D 01 FT/SEC**2
	AIRSPEED	= 0.16401D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 137	DENSITY	= 0.22951D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.98699D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.62174D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.48971D-01
	ACCELERATION	= 0.41391D 01 FT/SEC**2	POWER AVAILABLE =	0.15470D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE=	-0.71451D-02 RADIAN/SEC	FLIGHT PATH ANGLE =	0.47590D-01 RADIAN
	WEIGHT	= 0.39996D 04 LBF	ALTITUDE =	0.12101D 04 FT
	PITCH ANGLE	= 0.14101D 00 RADIAN	ALTITUDE RATE =	0.70723D 01 FT/SEC
	PITCH RATE	= -0.52863D-01 RADIAN/SEC	ALTITUDE-RATE RATE =	-0.73380D 01 FT/SEC**2
	AIRSPEED	= 0.16443D 03 FT/SEC	VERTICAL ACCELERATION =	0.0 FT/SEC**2
DATA PT 138	DENSITY	= 0.22950D-02 SLUG/FT**3	ELEVATOR DEFLECTION =	0.0 RADIAN
	ANGLE OF ATTACK	= 0.97988D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.61729D 00

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| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.48712D-01
| ACCELERATION        =  0.42759D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15487D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.70756D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.43024D-01 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12108D 04 FT
| PITCH ANGLE         =  0.13572D 00 RADIAN     | ALTITUDE RATE          =  0.63347D 01 FT/SEC
| PITCH RATE          = -0.53031D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.74128D 01 FT/SEC**2
| AIRSPEED            =  0.16486D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 139 | DENSITY =  0.22950D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.97284D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.61285D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.48460D-01
| ACCELERATION        =  0.44127D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15505D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.70056D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.38434D-01 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12114D 04 FT
| PITCH ANGLE         =  0.13041D 00 RADIAN     | ALTITUDE RATE          =  0.55898D 01 FT/SEC
| PITCH RATE          = -0.53168D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.74841D 01 FT/SEC**2
| AIRSPEED            =  0.16531D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 140 | DENSITY =  0.22950D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.96887D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.60846D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.48215D-01
| ACCELERATION        =  0.45494D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15523D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.69351D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.33820D-01 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12119D 04 FT
| PITCH ANGLE         =  0.12809D 00 RADIAN     | ALTITUDE RATE          =  0.48380D 01 FT/SEC
| PITCH RATE          = -0.53262D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.75514D 01 FT/SEC**2
| AIRSPEED            =  0.16577D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 141 | DENSITY =  0.22949D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.95897D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.60411D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.47975D-01
| ACCELERATION        =  0.46859D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15542D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.68641D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.29189D-01 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12124D 04 FT
| PITCH ANGLE         =  0.11976D 00 RADIAN     | ALTITUDE RATE          =  0.40797D 01 FT/SEC
| PITCH RATE          = -0.53324D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.76151D 01 FT/SEC**2
| AIRSPEED            =  0.16625D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 142 | DENSITY =  0.22949D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.95214D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.59981D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.47742D-01
| ACCELERATION        =  0.48220D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15561D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.67927D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.24542D-01 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12127D 04 FT
| PITCH ANGLE         =  0.11442D 00 RADIAN     | ALTITUDE RATE          =  0.33151D 01 FT/SEC
| PITCH RATE          = -0.53352D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.76751D 01 FT/SEC**2
| AIRSPEED            =  0.16674D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 143 | DENSITY =  0.22949D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.94538D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.59556D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.47514D-01
| ACCELERATION        =  0.49576D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15580D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.67209D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.19884D-01 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12130D 04 FT
| PITCH ANGLE         =  0.10909D 00 RADIAN     | ALTITUDE RATE          =  0.25448D 01 FT/SEC
| PITCH RATE          = -0.53346D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.77314D 01 FT/SEC**2
| AIRSPEED            =  0.16724D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 144 | DENSITY =  0.22948D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.93870D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.59134D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.47293D-01
| ACCELERATION        =  0.50930D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15600D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.66485D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.15217D-01 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12132D 04 FT
| PITCH ANGLE         =  0.10375D 00 RADIAN     | ALTITUDE RATE          =  0.17690D 01 FT/SEC
| PITCH RATE          = -0.53307D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.77839D 01 FT/SEC**2
| AIRSPEED            =  0.16776D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 145 | DENSITY =  0.22948D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.93209D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.58718D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.47077D-01
| ACCELERATION        =  0.52276D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15620D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.65758D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.10845D-01 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12134D 04 FT
| PITCH ANGLE         =  0.98427D-01 RADIAN     | ALTITUDE RATE          =  0.98813D 00 FT/SEC
| PITCH RATE          = -0.53235D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.78328D 01 FT/SEC**2
| AIRSPEED            =  0.16829D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 146 | DENSITY =  0.22948D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.92555D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.58306D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.46866D-01
| ACCELERATION        =  0.53614D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15641D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.65025D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.58718D-02 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12134D 04 FT
| PITCH ANGLE         =  0.93108D-01 RADIAN     | ALTITUDE RATE          =  0.20256D 00 FT/SEC
| PITCH RATE          = -0.53130D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.78779D 01 FT/SEC**2
| AIRSPEED            =  0.16883D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 147 | DENSITY =  0.22948D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.91908D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.57899D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.46661D-01
| ACCELERATION        =  0.54945D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15662D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.64289D-02 RADIAN/SEC | FLIGHT PATH ANGLE      =  0.11998D-02 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12134D 04 FT
| PITCH ANGLE         =  0.90453D-01 RADIAN     | ALTITUDE RATE          = -0.19187D 00 FT/SEC
| PITCH RATE          = -0.53065D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.78990D 01 FT/SEC**2
| AIRSPEED            =  0.16911D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 148 | DENSITY =  0.22948D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.91588D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.57697D 00
| TEMPERATURE         =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.46560D-01
| ACCELERATION        =  0.55607D 01 FT/SEC**2  | POWER AVAILABLE        =  0.15673D 06 FT-LBF/SEC
| ANGLE-OF-ATTACK RATE= -0.63919D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.11346D-02 RADIAN
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| WEIGHT              =  0.39995D 04 LBF        | ALTITUDE               =  0.12134D 04 FT
| PITCH ANGLE         =  0.85154D-01 RADIAN     | ALTITUDE RATE          = -0.98377D 00 FT/SEC
| PITCH RATE          = -0.52912D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.79385D 01 FT/SEC**2
| AIRSPEED            =  0.16967D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2
DATA PT 149 | DENSITY =  0.22948D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN
| ANGLE OF ATTACK     =  0.90952D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.57297D 00
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            | TEMPERATURE             =  0.620000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.463620-01
            | ACCELERATION            =  0.569230 01 FT/SEC**2  | POWER AVAILABLE        =  0.156940 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.631730-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.679630-02 RADIAN

            | WEIGHT                  =  0.399950 04 LBF        | ALTITUDE               =  0.121320 04 FT
            | PITCH ANGLE             =  0.798720-01 RADIAN     | ALTITUDE RATE          = -0.177950 01 FT/SEC
            | PITCH RATE              = -0.627290-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.797440 01 FT/SEC**2
            | AIRSPEED                =  0.170240 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 150 | DENSITY                 =  0.229480-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.903240-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.569810 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.461700-01
            | ACCELERATION            =  0.582280 01 FT/SEC**2  | POWER AVAILABLE        =  0.157160 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.624250-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.104530-01 RADIAN

            | WEIGHT                  =  0.399950 04 LBF        | ALTITUDE               =  0.121300 04 FT
            | PITCH ANGLE             =  0.746090-01 RADIAN     | ALTITUDE RATE          = -0.257850 01 FT/SEC
            | PITCH RATE              = -0.626140-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.800650 01 FT/SEC**2
            | AIRSPEED                =  0.170830 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 151 | DENSITY                 =  0.229480-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.857040-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.568100 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.459820-01
            | ACCELERATION            =  0.595220 01 FT/SEC**2  | POWER AVAILABLE        =  0.157390 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.616720-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.150950-01 RADIAN

            | WEIGHT                  =  0.399950 04 LBF        | ALTITUDE               =  0.121270 04 FT
            | PITCH ANGLE             =  0.693700-01 RADIAN     | ALTITUDE RATE          = -0.338060 01 FT/SEC
            | PITCH RATE              = -0.622690-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.803490 01 FT/SEC**2
            | AIRSPEED                =  0.171430 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 152 | DENSITY                 =  0.229490-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.890910-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.561240 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.457990-01
            | ACCELERATION            =  0.608040 01 FT/SEC**2  | POWER AVAILABLE        =  0.157610 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.609140-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.197210-01 RADIAN

            | WEIGHT                  =  0.399950 04 LBF        | ALTITUDE               =  0.121230 04 FT
            | PITCH ANGLE             =  0.641560-01 RADIAN     | ALTITUDE RATE          = -0.418540 01 FT/SEC
            | PITCH RATE              = -0.619950-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.805950 01 FT/SEC**2
            | AIRSPEED                =  0.172050 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 153 | DENSITY                 =  0.229490-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.884860-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.557430 00
            | TEMPERATURE             =  0.620000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.456210-01
            | ACCELERATION            =  0.620720 01 FT/SEC**2  | POWER AVAILABLE        =  0.157840 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.601510-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.243290-01 RADIAN

            | WEIGHT                  =  0.399950 04 LBF        | ALTITUDE               =  0.121190 04 FT
            | PITCH ANGLE             =  0.589720-01 RADIAN     | ALTITUDE RATE          = -0.499240 01 FT/SEC
            | PITCH RATE              = -0.616930-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.808030 01 FT/SEC**2
            | AIRSPEED                =  0.172680 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 154 | DENSITY                 =  0.229490-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.878880-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.553660 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.454470-01
            | ACCELERATION            =  0.633260 01 FT/SEC**2  | POWER AVAILABLE        =  0.158060 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.593890-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.289160-01 RADIAN

            | WEIGHT                  =  0.399950 04 LBF        | ALTITUDE               =  0.121130 04 FT
            | PITCH ANGLE             =  0.538190-01 RADIAN     | ALTITUDE RATE          = -0.580130 01 FT/SEC
            | PITCH RATE              = -0.613630-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.809750 01 FT/SEC**2
            | AIRSPEED                =  0.173310 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 155 | DENSITY                 =  0.229500-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.872980-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.549940 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.452780-01
            | ACCELERATION            =  0.645650 01 FT/SEC**2  | POWER AVAILABLE        =  0.158310 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.586300-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.334790-01 RADIAN

            | WEIGHT                  =  0.399940 04 LBF        | ALTITUDE               =  0.121070 04 FT
            | PITCH ANGLE             =  0.487000-01 RADIAN     | ALTITUDE RATE          = -0.661180 01 FT/SEC
            | PITCH RATE              = -0.610070-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.811100 01 FT/SEC**2
            | AIRSPEED                =  0.173970 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 156 | DENSITY                 =  0.229500-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.867150-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.546270 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.451130-01
            | ACCELERATION            =  0.657890 01 FT/SEC**2  | POWER AVAILABLE        =  0.158550 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.578770-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.380150-01 RADIAN

            | WEIGHT                  =  0.399940 04 LBF        | ALTITUDE               =  0.121000 04 FT
            | PITCH ANGLE             =  0.436180-01 RADIAN     | ALTITUDE RATE          = -0.742340 01 FT/SEC
            | PITCH RATE              = -0.606250-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.812070 01 FT/SEC**2
            | AIRSPEED                =  0.174630 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 157 | DENSITY                 =  0.229500-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.861400-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.542660 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.449520-01
            | ACCELERATION            =  0.669950 01 FT/SEC**2  | POWER AVAILABLE        =  0.158790 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.571280-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.425220-01 RADIAN

            | WEIGHT                  =  0.399940 04 LBF        | ALTITUDE               =  0.120920 04 FT
            | PITCH ANGLE             =  0.385760-01 RADIAN     | ALTITUDE RATE          = -0.823580 01 FT/SEC
            | PITCH RATE              = -0.602180-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.812680 01 FT/SEC**2
            | AIRSPEED                =  0.175310 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 158 | DENSITY                 =  0.229510-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.855730-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.539080 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.447980-01
            | ACCELERATION            =  0.681850 01 FT/SEC**2  | POWER AVAILABLE        =  0.159040 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.563830-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.469970-01 RADIAN

            | WEIGHT                  =  0.399940 04 LBF        | ALTITUDE               =  0.120840 04 FT
            | PITCH ANGLE             =  0.335750-01 RADIAN     | ALTITUDE RATE          = -0.904860 01 FT/SEC
            | PITCH RATE              = -0.597880-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.812930 01 FT/SEC**2
            | AIRSPEED                =  0.175990 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 159 | DENSITY                 =  0.229520-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.850130-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.535580 00
            | TEMPERATURE             =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.446420-01
            | ACCELERATION            =  0.693560 01 FT/SEC**2  | POWER AVAILABLE        =  0.159280 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.556430-02 RADIAN/SEC     | FLIGHT PATH ANGLE      = -0.514370-01 RADIAN

            | WEIGHT                  =  0.399940 04 LBF        | ALTITUDE               =  0.120740 04 FT
            | PITCH ANGLE             =  0.286190-01 RADIAN     | ALTITUDE RATE          = -0.986150 01 FT/SEC
            | PITCH RATE              = -0.593340-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.812820 01 FT/SEC**2
            | AIRSPEED                =  0.176690 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 160 | DENSITY                 =  0.229520-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK         =  0.844600-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.532070 00
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             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.444920-01
             | ACCELERATION         =  0.705090 01 FT/SEC**2  | POWER AVAILABLE       =  0.159630 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.549080-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.558410-01 RADIAN
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             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.120640 04 FT
             | PITCH ANGLE          =  0.237090-01 RADIAN     | ALTITUDE RATE         = -0.106740 02 FT/SEC
             | PITCH RATE           = -0.458570-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.812350 01 FT/SEC**2
             | AIRSPEED             =  0.177400 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 161 | DENSITY              =  0.229530-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.839140-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.528630 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.443470-01
             | ACCELERATION         =  0.716420 01 FT/SEC**2  | POWER AVAILABLE       =  0.159780 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.541770-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.602050-01 RADIAN
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             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.120530 04 FT
             | PITCH ANGLE          =  0.188480-01 RADIAN     | ALTITUDE RATE         = -0.114860 02 FT/SEC
             | PITCH RATE           = -0.483590-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.811520 01 FT/SEC**2
             | AIRSPEED             =  0.178130 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 162 | DENSITY              =  0.229540-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.833760-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.525240 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.442050-01
             | ACCELERATION         =  0.727560 01 FT/SEC**2  | POWER AVAILABLE       =  0.160030 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.534510-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.645280-01 RADIAN
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             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.120410 04 FT
             | PITCH ANGLE          =  0.140380-01 RADIAN     | ALTITUDE RATE         = -0.122970 02 FT/SEC
             | PITCH RATE           = -0.478410-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.810340 01 FT/SEC**2
             | AIRSPEED             =  0.178860 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 163 | DENSITY              =  0.229540-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.828450-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.521900 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.440660-01
             | ACCELERATION         =  0.738480 01 FT/SEC**2  | POWER AVAILABLE       =  0.160280 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.527290-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.688070-01 RADIAN
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             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.120280 04 FT
             | PITCH ANGLE          =  0.928100-02 RADIAN     | ALTITUDE RATE         = -0.131070 02 FT/SEC
             | PITCH RATE           = -0.473020-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.808800 01 FT/SEC**2
             | AIRSPEED             =  0.179600 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 164 | DENSITY              =  0.229550-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.823220-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.518600 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.439310-01
             | ACCELERATION         =  0.749200 01 FT/SEC**2  | POWER AVAILABLE       =  0.160530 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.520110-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.730410-01 RADIAN
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             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.120150 04 FT
             | PITCH ANGLE          =  0.457850-02 RADIAN     | ALTITUDE RATE         = -0.139150 02 FT/SEC
             | PITCH RATE           = -0.467440-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.806920 01 FT/SEC**2
             | AIRSPEED             =  0.180360 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 165 | DENSITY              =  0.229560-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.818050-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.515340 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.437990-01
             | ACCELERATION         =  0.759700 01 FT/SEC**2  | POWER AVAILABLE       =  0.160790 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.512980-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.772270-01 RADIAN
**************************************************************************************************************
             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.120000 04 FT
             | PITCH ANGLE          = -0.672430-04 RADIAN     | ALTITUDE RATE         = -0.147200 02 FT/SEC
             | PITCH RATE           = -0.461680-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.804690 01 FT/SEC**2
             | AIRSPEED             =  0.181120 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 166 | DENSITY              =  0.229570-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.812960-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.512130 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.436700-01
             | ACCELERATION         =  0.769980 01 FT/SEC**2  | POWER AVAILABLE       =  0.161040 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.505900-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.813630-01 RADIAN
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             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.119850 04 FT
             | PITCH ANGLE          = -0.465450-02 RADIAN     | ALTITUDE RATE         = -0.155240 02 FT/SEC
             | PITCH RATE           = -0.455740-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.802120 01 FT/SEC**2
             | AIRSPEED             =  0.181900 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 167 | DENSITY              =  0.229580-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.807930-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.508970 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.435450-01
             | ACCELERATION         =  0.780030 01 FT/SEC**2  | POWER AVAILABLE       =  0.161300 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.498560-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.854480-01 RADIAN
**************************************************************************************************************
             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.119690 04 FT
             | PITCH ANGLE          = -0.918150-02 RADIAN     | ALTITUDE RATE         = -0.163250 02 FT/SEC
             | PITCH RATE           = -0.449640-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.799210 01 FT/SEC**2
             | AIRSPEED             =  0.182680 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 168 | DENSITY              =  0.229590-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.802980-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.505850 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.434220-01
             | ACCELERATION         =  0.789860 01 FT/SEC**2  | POWER AVAILABLE       =  0.161560 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.491870-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.894790-01 RADIAN
**************************************************************************************************************
             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.119530 04 FT
             | PITCH ANGLE          = -0.136470-01 RADIAN     | ALTITUDE RATE         = -0.171220 02 FT/SEC
             | PITCH RATE           = -0.443370-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.795960 01 FT/SEC**2
             | AIRSPEED             =  0.183480 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 169 | DENSITY              =  0.229600-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.798100-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.502770 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.433020-01
             | ACCELERATION         =  0.799440 01 FT/SEC**2  | POWER AVAILABLE       =  0.161810 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.484920-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.934560-01 RADIAN
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             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.119350 04 FT
             | PITCH ANGLE          = -0.180480-01 RADIAN     | ALTITUDE RATE         = -0.179160 02 FT/SEC
             | PITCH RATE           = -0.436960-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.792370 01 FT/SEC**2
             | AIRSPEED             =  0.184280 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 170 | DENSITY              =  0.229620-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.793280-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.499740 00
             | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.431860-01
             | ACCELERATION         =  0.808790 01 FT/SEC**2  | POWER AVAILABLE       =  0.162070 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE= -0.478020-02 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.973770-01 RADIAN
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             | WEIGHT               =  0.399940 04 LBF        | ALTITUDE              =  0.119170 04 FT
             | PITCH ANGLE          = -0.223850-01 RADIAN     | ALTITUDE RATE         = -0.187070 02 FT/SEC
             | PITCH RATE           = -0.430390-01 RADIAN/SEC | ALTITUDE-RATE RATE    = -0.788450 01 FT/SEC**2
             | AIRSPEED             =  0.185090 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 171 | DENSITY              =  0.229630-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0         RADIAN
             | ANGLE OF ATTACK      =  0.788540-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.496750 00
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*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.430720-01                *
*                | ACCELERATION        =  0.817900 01 FT/SEC**2  | POWER AVAILABLE        =  0.162330 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.471160-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.101240 00 RADIAN      *
*                |                                               |                                                    *
*********************************************************************************************************************
*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.118980 04 FT          *
*                | PITCH ANGLE         = -0.266560-01 RADIAN     | ALTITUDE RATE          = -0.194930 02 FT/SEC      *
*                | PITCH RATE          = -0.423650-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.784210 01 FT/SEC**2   *
*                | AIRSPEED            =  0.185920 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 172    | DENSITY             =  0.229640-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.763860-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.493800 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.429600-01                *
*                | ACCELERATION        =  0.826760 01 FT/SEC**2  | POWER AVAILABLE        =  0.162590 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.464360-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.105040 00 RADIAN      *
*                |                                               |                                                    *
*********************************************************************************************************************
*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.118780 04 FT          *
*                | PITCH ANGLE         = -0.308590-01 RADIAN     | ALTITUDE RATE          = -0.202780 02 FT/SEC      *
*                | PITCH RATE          = -0.416860-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.779630 01 FT/SEC**2   *
*                | AIRSPEED            =  0.186750 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 173    | DENSITY             =  0.229660-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.779250-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.490900 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.428520-01                *
*                | ACCELERATION        =  0.836360 01 FT/SEC**2  | POWER AVAILABLE        =  0.162840 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.457580-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.108780 00 RADIAN      *
*                |                                               |                                                    *
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*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.118570 04 FT          *
*                | PITCH ANGLE         = -0.349930-01 RADIAN     | ALTITUDE RATE          = -0.210620 02 FT/SEC      *
*                | PITCH RATE          = -0.409910-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.774730 01 FT/SEC**2   *
*                | AIRSPEED            =  0.187590 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 174    | DENSITY             =  0.229670-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.774710-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.488040 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.427460-01                *
*                | ACCELERATION        =  0.843720 01 FT/SEC**2  | POWER AVAILABLE        =  0.163100 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.450870-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.112460 00 RADIAN      *
*                |                                               |                                                    *
*********************************************************************************************************************
*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.118360 04 FT          *
*                | PITCH ANGLE         = -0.390570-01 RADIAN     | ALTITUDE RATE          = -0.218240 02 FT/SEC      *
*                | PITCH RATE          = -0.402850-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.769520 01 FT/SEC**2   *
*                | AIRSPEED            =  0.188440 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 175    | DENSITY             =  0.229680-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.770230-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.485220 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.426420-01                *
*                | ACCELERATION        =  0.851820 01 FT/SEC**2  | POWER AVAILABLE        =  0.163360 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.444230-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.116080 00 RADIAN      *
*                |                                               |                                                    *
*********************************************************************************************************************
*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.118140 04 FT          *
*                | PITCH ANGLE         = -0.430490-01 RADIAN     | ALTITUDE RATE          = -0.225910 02 FT/SEC      *
*                | PITCH RATE          = -0.395680-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.763980 01 FT/SEC**2   *
*                | AIRSPEED            =  0.189290 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 176    | DENSITY             =  0.229700-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.765820-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.482440 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.425410-01                *
*                | ACCELERATION        =  0.859670 01 FT/SEC**2  | POWER AVAILABLE        =  0.163610 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.437650-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.119630 00 RADIAN      *
*                |                                               |                                                    *
*********************************************************************************************************************
*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.117910 04 FT          *
*                | PITCH ANGLE         = -0.469700-01 RADIAN     | ALTITUDE RATE          = -0.233520 02 FT/SEC      *
*                | PITCH RATE          = -0.388410-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.758140 01 FT/SEC**2   *
*                | AIRSPEED            =  0.190150 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 177    | DENSITY             =  0.229710-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.761480-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.479710 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.424430-01                *
*                | ACCELERATION        =  0.867250 01 FT/SEC**2  | POWER AVAILABLE        =  0.163860 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.431150-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.123120 00 RADIAN      *
*                |                                               |                                                    *
*********************************************************************************************************************
*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.117670 04 FT          *
*                | PITCH ANGLE         = -0.508170-01 RADIAN     | ALTITUDE RATE          = -0.241070 02 FT/SEC      *
*                | PITCH RATE          = -0.381060-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.751980 01 FT/SEC**2   *
*                | AIRSPEED            =  0.191030 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 178    | DENSITY             =  0.229730-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.757230-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.477010 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.423460-01                *
*                | ACCELERATION        =  0.874580 01 FT/SEC**2  | POWER AVAILABLE        =  0.164120 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.424720-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.126540 00 RADIAN      *
*                |                                               |                                                    *
*********************************************************************************************************************
*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.117420 04 FT          *
*                | PITCH ANGLE         = -0.546910-01 RADIAN     | ALTITUDE RATE          = -0.248560 02 FT/SEC      *
*                | PITCH RATE          = -0.373610-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.745520 01 FT/SEC**2   *
*                | AIRSPEED            =  0.191900 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 179    | DENSITY             =  0.229750-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.752980-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.474350 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.422520-01                *
*                | ACCELERATION        =  0.881640 01 FT/SEC**2  | POWER AVAILABLE        =  0.164370 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.418350-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.129890 00 RADIAN      *
*                |                                               |                                                    *
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*                |                                               |                                                    *
*                | WEIGHT              =  0.399940 04 LBF        | ALTITUDE               =  0.117170 04 FT          *
*                | PITCH ANGLE         = -0.592890-01 RADIAN     | ALTITUDE RATE          = -0.255980 02 FT/SEC      *
*                | PITCH RATE          = -0.366090-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.738760 01 FT/SEC**2   *
*                | AIRSPEED            =  0.192760 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 180    | DENSITY             =  0.229760-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.748830-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.471740 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.421600-01                *
*                | ACCELERATION        =  0.888440 01 FT/SEC**2  | POWER AVAILABLE        =  0.164620 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.412060-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.133170 00 RADIAN      *
*                |                                               |                                                    *
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*                |                                               |                                                    *
*                | WEIGHT              =  0.399930 04 LBF        | ALTITUDE               =  0.116910 04 FT          *
*                | PITCH ANGLE         = -0.619120-01 RADIAN     | ALTITUDE RATE          = -0.263340 02 FT/SEC      *
*                | PITCH RATE          = -0.358500-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.731710 01 FT/SEC**2   *
*                | AIRSPEED            =  0.193680 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 181    | DENSITY             =  0.229780-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.744740-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.469160 00                *
*                | TEMPERATURE         =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.420710-01                *
*                | ACCELERATION        =  0.894970 01 FT/SEC**2  | POWER AVAILABLE        =  0.164870 06 FT-LBF/SEC  *
*                | ANGLE-OF-ATTACK RATE= -0.405830-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.136390 00 RADIAN      *
*                |                                               |                                                    *
*********************************************************************************************************************
*                |                                               |                                                    *
*                | WEIGHT              =  0.399930 04 LBF        | ALTITUDE               =  0.116650 04 FT          *
*                | PITCH ANGLE         = -0.664590-01 RADIAN     | ALTITUDE RATE          = -0.270620 02 FT/SEC      *
*                | PITCH RATE          = -0.350840-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.724360 01 FT/SEC**2   *
*                | AIRSPEED            =  0.194680 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2   *
* DATA PT 182    | DENSITY             =  0.229800-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN      *
*                | ANGLE OF ATTACK     =  0.740710-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.466630 00                *
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*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.419830-01                *
*              | ACCELERATION         =  0.901230 01 FT/SEC**2  | POWER AVAILABLE        =  0.165110 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.399670-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.139530 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.116370 04 FT           *
*              | PITCH ANGLE          = -0.689290-01 RADIAN     | ALTITUDE RATE          = -0.277820 02 FT/SEC       *
*              | PITCH RATE           = -0.343130-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.716730 01 FT/SEC**2    *
*              | AIRSPEED             =  0.195480 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 183  | DENSITY              =  0.229820-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.736750-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.464130 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.418970-01                *
*              | ACCELERATION         =  0.907230 01 FT/SEC**2  | POWER AVAILABLE        =  0.165360 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.393580-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.142600 00 RADIAN       *
*              |                                                |                                                    *
********************************************************************************************************************
*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.116090 04 FT           *
*              | PITCH ANGLE          = -0.723220-01 RADIAN     | ALTITUDE RATE          = -0.284950 02 FT/SEC       *
*              | PITCH RATE           = -0.335360-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.708810 01 FT/SEC**2    *
*              | AIRSPEED             =  0.196390 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 184  | DENSITY              =  0.229840-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.732840-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.461670 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.418140-01                *
*              | ACCELERATION         =  0.912960 01 FT/SEC**2  | POWER AVAILABLE        =  0.165600 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.387560-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.145610 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.115800 04 FT           *
*              | PITCH ANGLE          = -0.756360-01 RADIAN     | ALTITUDE RATE          = -0.292000 02 FT/SEC       *
*              | PITCH RATE           = -0.327550-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.700610 01 FT/SEC**2    *
*              | AIRSPEED             =  0.197310 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 185  | DENSITY              =  0.229860-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.729000-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.459240 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.417320-01                *
*              | ACCELERATION         =  0.918420 01 FT/SEC**2  | POWER AVAILABLE        =  0.165840 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.381610-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.148540 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.115510 04 FT           *
*              | PITCH ANGLE          = -0.788720-01 RADIAN     | ALTITUDE RATE          = -0.298960 02 FT/SEC       *
*              | PITCH RATE           = -0.319690-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.692140 01 FT/SEC**2    *
*              | AIRSPEED             =  0.198230 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 186  | DENSITY              =  0.229880-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.725210-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.456860 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.416520-01                *
*              | ACCELERATION         =  0.923610 01 FT/SEC**2  | POWER AVAILABLE        =  0.166080 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.375730-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.151390 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.115200 04 FT           *
*              | PITCH ANGLE          = -0.820300-01 RADIAN     | ALTITUDE RATE          = -0.305840 02 FT/SEC       *
*              | PITCH RATE           = -0.311800-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.683400 01 FT/SEC**2    *
*              | AIRSPEED             =  0.199160 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 187  | DENSITY              =  0.229900-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.721480-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.454510 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.415740-01                *
*              | ACCELERATION         =  0.928540 01 FT/SEC**2  | POWER AVAILABLE        =  0.166310 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.369910-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.154180 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.114890 04 FT           *
*              | PITCH ANGLE          = -0.851080-01 RADIAN     | ALTITUDE RATE          = -0.312630 02 FT/SEC       *
*              | PITCH RATE           = -0.303880-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.674390 01 FT/SEC**2    *
*              | AIRSPEED             =  0.200090 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 188  | DENSITY              =  0.229920-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.717810-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.452200 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.414980-01                *
*              | ACCELERATION         =  0.933190 01 FT/SEC**2  | POWER AVAILABLE        =  0.166550 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.364170-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.156890 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.114580 04 FT           *
*              | PITCH ANGLE          = -0.881070-01 RADIAN     | ALTITUDE RATE          = -0.319330 02 FT/SEC       *
*              | PITCH RATE           = -0.295930-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.665120 01 FT/SEC**2    *
*              | AIRSPEED             =  0.201020 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 189  | DENSITY              =  0.229940-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.714200-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.449920 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.414230-01                *
*              | ACCELERATION         =  0.937580 01 FT/SEC**2  | POWER AVAILABLE        =  0.166780 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.358490-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.159530 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.114260 04 FT           *
*              | PITCH ANGLE          = -0.910270-01 RADIAN     | ALTITUDE RATE          = -0.325930 02 FT/SEC       *
*              | PITCH RATE           = -0.287970-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.655600 01 FT/SEC**2    *
*              | AIRSPEED             =  0.201960 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 190  | DENSITY              =  0.229960-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.710640-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.447680 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.413510-01                *
*              | ACCELERATION         =  0.941700 01 FT/SEC**2  | POWER AVAILABLE        =  0.167000 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.352890-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.162090 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.113930 04 FT           *
*              | PITCH ANGLE          = -0.938670-01 RADIAN     | ALTITUDE RATE          = -0.332440 02 FT/SEC       *
*              | PITCH RATE           = -0.279990-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.645820 01 FT/SEC**2    *
*              | AIRSPEED             =  0.202910 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 191  | DENSITY              =  0.229980-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.707140-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.445480 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.412790-01                *
*              | ACCELERATION         =  0.945560 01 FT/SEC**2  | POWER AVAILABLE        =  0.167230 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.347350-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.164580 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.113590 04 FT           *
*              | PITCH ANGLE          = -0.966270-01 RADIAN     | ALTITUDE RATE          = -0.338850 02 FT/SEC       *
*              | PITCH RATE           = -0.271990-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.635800 01 FT/SEC**2    *
*              | AIRSPEED             =  0.203850 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 192  | DENSITY              =  0.230010-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.703690-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.443300 00                *
*              | TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.412130-01                *
*              | ACCELERATION         =  0.949150 01 FT/SEC**2  | POWER AVAILABLE        =  0.167450 06 FT-LBF/SEC   *
*              | ANGLE-OF-ATTACK RATE= -0.341880-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.167000 00 RADIAN       *
*              |                                                |                                                    *
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*              |                                                |                                                    *
*              | WEIGHT               =  0.399930 04 LBF        | ALTITUDE               =  0.113250 04 FT           *
*              | PITCH ANGLE          = -0.993060-01 RADIAN     | ALTITUDE RATE          = -0.345150 02 FT/SEC       *
*              | PITCH RATE           = -0.264000-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.625530 01 FT/SEC**2    *
*              | AIRSPEED             =  0.204800 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0           FT/SEC**2  *
* DATA PT 193  | DENSITY              =  0.230030-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0           RADIAN     *
*              | ANGLE OF ATTACK      =  0.700300-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.441170 00                *
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*              | TEMPERATURE        =  0.620000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.411420-01                 *
*              | ACCELERATION       =  0.952470 01 FT/SEC**2  | POWER AVAILABLE          =  0.167660 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.334480-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.169340 00 RADIAN     *
*              |                                              |                                                     *
************************************************************************************************************************
*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.112900 04 FT         *
*              | PITCH ANGLE        = -0.101910 00 RADIAN     | ALTITUDE RATE            = -0.351360 02 FT/SEC     *
*              | PITCH RATE         = -0.256000-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.615030 01 FT/SEC**2  *
*              | AIRSPEED           =  0.205760 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 194  | DENSITY            =  0.230050-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.696960-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.439070 00                 *
*              | TEMPERATURE        =  0.620000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.410750-01                 *
*              | ACCELERATION       =  0.955530 01 FT/SEC**2  | POWER AVAILABLE          =  0.167880 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.331150-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.171600 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.112550 04 FT         *
*              | PITCH ANGLE        = -0.104430 00 RADIAN     | ALTITUDE RATE            = -0.357450 02 FT/SEC     *
*              | PITCH RATE         = -0.246000-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.604290 01 FT/SEC**2  *
*              | AIRSPEED           =  0.206710 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 195  | DENSITY            =  0.230080-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.693680-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.437300 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.410110-01                 *
*              | ACCELERATION       =  0.958330 01 FT/SEC**2  | POWER AVAILABLE          =  0.168090 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.325880-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.173790 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.112190 04 FT         *
*              | PITCH ANGLE        = -0.106870 00 RADIAN     | ALTITUDE RATE            = -0.363440 02 FT/SEC     *
*              | PITCH RATE         = -0.240010-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.593330 01 FT/SEC**2  *
*              | AIRSPEED           =  0.207670 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 196  | DENSITY            =  0.230100-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.650450-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.434960 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.409470-01                 *
*              | ACCELERATION       =  0.960860 01 FT/SEC**2  | POWER AVAILABLE          =  0.168300 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.320670-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.175910 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.111820 04 FT         *
*              | PITCH ANGLE        = -0.109230 00 RADIAN     | ALTITUDE RATE            = -0.369320 02 FT/SEC     *
*              | PITCH RATE         = -0.232030-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.582140 01 FT/SEC**2  *
*              | AIRSPEED           =  0.208640 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 197  | DENSITY            =  0.230130-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.687260-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.432960 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.408850-01                 *
*              | ACCELERATION       =  0.963140 01 FT/SEC**2  | POWER AVAILABLE          =  0.168500 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.315530-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.177980 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.111450 04 FT         *
*              | PITCH ANGLE        = -0.111510 00 RADIAN     | ALTITUDE RATE            = -0.375080 02 FT/SEC     *
*              | PITCH RATE         = -0.224060-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.570740 01 FT/SEC**2  *
*              | AIRSPEED           =  0.209600 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 198  | DENSITY            =  0.230150-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.684130-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.430980 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.408240-01                 *
*              | ACCELERATION       =  0.965160 01 FT/SEC**2  | POWER AVAILABLE          =  0.168700 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.310460-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.179920 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.111070 04 FT         *
*              | PITCH ANGLE        = -0.113710 00 RADIAN     | ALTITUDE RATE            = -0.380730 02 FT/SEC     *
*              | PITCH RATE         = -0.216100-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.559120 01 FT/SEC**2  *
*              | AIRSPEED           =  0.210570 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 199  | DENSITY            =  0.230180-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.681060-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.429040 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.407650-01                 *
*              | ACCELERATION       =  0.966920 01 FT/SEC**2  | POWER AVAILABLE          =  0.168900 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.305430-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.181810 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.110690 04 FT         *
*              | PITCH ANGLE        = -0.115830 00 RADIAN     | ALTITUDE RATE            = -0.386260 02 FT/SEC     *
*              | PITCH RATE         = -0.208170-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.547290 01 FT/SEC**2  *
*              | AIRSPEED           =  0.211530 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 200  | DENSITY            =  0.230200-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.678030-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.427140 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.407070-01                 *
*              | ACCELERATION       =  0.968430 01 FT/SEC**2  | POWER AVAILABLE          =  0.169090 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.300480-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.183630 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.110300 04 FT         *
*              | PITCH ANGLE        = -0.117870 00 RADIAN     | ALTITUDE RATE            = -0.391680 02 FT/SEC     *
*              | PITCH RATE         = -0.200260-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.535260 01 FT/SEC**2  *
*              | AIRSPEED           =  0.212500 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 201  | DENSITY            =  0.230230-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.675050-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.425260 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.406500-01                 *
*              | ACCELERATION       =  0.969680 01 FT/SEC**2  | POWER AVAILABLE          =  0.169280 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.295580-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.185380 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.109930 04 FT         *
*              | PITCH ANGLE        = -0.119830 00 RADIAN     | ALTITUDE RATE            = -0.396970 02 FT/SEC     *
*              | PITCH RATE         = -0.192380-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.523030 01 FT/SEC**2  *
*              | AIRSPEED           =  0.213470 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 202  | DENSITY            =  0.230260-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.672110-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.423410 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.405950-01                 *
*              | ACCELERATION       =  0.970680 01 FT/SEC**2  | POWER AVAILABLE          =  0.169460 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.290760-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.187050 00 RADIAN     *
*              |                                              |                                                     *
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*              |                                              |                                                     *
*              | WEIGHT             =  0.399930 04 LBF        | ALTITUDE                 =  0.109500 04 FT         *
*              | PITCH ANGLE        = -0.121720 00 RADIAN     | ALTITUDE RATE            = -0.402140 02 FT/SEC     *
*              | PITCH RATE         = -0.184520-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.510610 01 FT/SEC**2  *
*              | AIRSPEED           =  0.214440 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 203  | DENSITY            =  0.230280-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.669230-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.421590 00                 *
*              | TEMPERATURE        =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.405400-01                 *
*              | ACCELERATION       =  0.971440 01 FT/SEC**2  | POWER AVAILABLE          =  0.169640 06 FT-LBF/SEC *
*              | ANGLE-OF-ATTACK RATE= -0.285990-02 RADIAN/SEC | FLIGHT PATH ANGLE        = -0.188640 00 RADIAN     *
*              |                                              |                                                     *
************************************************************************************************************************
*              |                                              |                                                     *
*              | WEIGHT             =  0.399920 04 LBF        | ALTITUDE                 =  0.109100 04 FT         *
*              | PITCH ANGLE        = -0.123520 00 RADIAN     | ALTITUDE RATE            = -0.407180 02 FT/SEC     *
*              | PITCH RATE         = -0.176700-01 RADIAN/SEC | ALTITUDE-RATE RATE       = -0.498000 01 FT/SEC**2  *
*              | AIRSPEED           =  0.215420 03 FT/SEC     | VERTICAL ACCELERATION =  0.0           FT/SEC**2  *
* DATA PT 204  | DENSITY            =  0.230310-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0           RADIAN     *
*              | ANGLE OF ATTACK    =  0.666390-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.419810 00                 *
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              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40487D-01
              | ACCELERATION         =  0.97194D 01 FT/SEC**2  | POWER AVAILABLE        =  0.16982D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.28129D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19016D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10869D 04 FT
              | PITCH ANGLE          = -0.12875D 00 RADIAN     | ALTITUDE RATE          = -0.41210D 02 FT/SEC
              | PITCH RATE           = -0.16891D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.46520D 01 FT/SEC**2
              | AIRSPEED             =  0.21639D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 205 | DENSITY              =  0.23034D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.66360D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.41805D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40435D-01
              | ACCELERATION         =  0.97221D 01 FT/SEC**2  | POWER AVAILABLE        =  0.16999D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.27665D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19161D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10827D 04 FT
              | PITCH ANGLE          = -0.12690D 00 RADIAN     | ALTITUDE RATE          = -0.41608D 02 FT/SEC
              | PITCH RATE           = -0.16116D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.47223D 01 FT/SEC**2
              | AIRSPEED             =  0.21736D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 206 | DENSITY              =  0.23037D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.66086D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.41632D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40385D-01
              | ACCELERATION         =  0.97222D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17016D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.27207D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19299D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10785D 04 FT
              | PITCH ANGLE          = -0.12848D 00 RADIAN     | ALTITUDE RATE          = -0.42154D 02 FT/SEC
              | PITCH RATE           = -0.16345D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.45908D 01 FT/SEC**2
              | AIRSPEED             =  0.21833D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 207 | DENSITY              =  0.23040D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.65816D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.41462D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40335D-01
              | ACCELERATION         =  0.97200D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17032D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.26755D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19429D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10743D 04 FT
              | PITCH ANGLE          = -0.12997D 00 RADIAN     | ALTITUDE RATE          = -0.42607D 02 FT/SEC
              | PITCH RATE           = -0.14674D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.44577D 01 FT/SEC**2
              | AIRSPEED             =  0.21930D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 208 | DENSITY              =  0.23042D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.65551D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.41295D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40287D-01
              | ACCELERATION         =  0.97155D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17048D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.26310D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19552D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10700D 04 FT
              | PITCH ANGLE          = -0.13139D 00 RADIAN     | ALTITUDE RATE          = -0.43046D 02 FT/SEC
              | PITCH RATE           = -0.13816D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.43229D 01 FT/SEC**2
              | AIRSPEED             =  0.22028D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 209 | DENSITY              =  0.23045D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.65290D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.41131D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40239D-01
              | ACCELERATION         =  0.97085D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17064D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.25872D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19668D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10657D 04 FT
              | PITCH ANGLE          = -0.13274D 00 RADIAN     | ALTITUDE RATE          = -0.43471D 02 FT/SEC
              | PITCH RATE           = -0.13058D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.41806D 01 FT/SEC**2
              | AIRSPEED             =  0.22125D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 210 | DENSITY              =  0.23048D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.65034D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.40969D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40193D-01
              | ACCELERATION         =  0.96993D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17079D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.25439D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19777D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10613D 04 FT
              | PITCH ANGLE          = -0.13403D 00 RADIAN     | ALTITUDE RATE          = -0.43883D 02 FT/SEC
              | PITCH RATE           = -0.12305D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.40487D 01 FT/SEC**2
              | AIRSPEED             =  0.22222D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 211 | DENSITY              =  0.23051D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.64781D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.40810D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40147D-01
              | ACCELERATION         =  0.96877D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17093D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.25013D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19879D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10569D 04 FT
              | PITCH ANGLE          = -0.13520D 00 RADIAN     | ALTITUDE RATE          = -0.44281D 02 FT/SEC
              | PITCH RATE           = -0.11537D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.39094D 01 FT/SEC**2
              | AIRSPEED             =  0.22318D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 212 | DENSITY              =  0.23054D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.64533D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.40654D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40103D-01
              | ACCELERATION         =  0.96738D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17108D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.24593D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.19973D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10525D 04 FT
              | PITCH ANGLE          = -0.13632D 00 RADIAN     | ALTITUDE RATE          = -0.44665D 02 FT/SEC
              | PITCH RATE           = -0.10814D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.37687D 01 FT/SEC**2
              | AIRSPEED             =  0.22415D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 213 | DENSITY              =  0.23057D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.64289D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.40500D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40059D-01
              | ACCELERATION         =  0.96577D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17121D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.24179D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.20060D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10480D 04 FT
              | PITCH ANGLE          = -0.13736D 00 RADIAN     | ALTITUDE RATE          = -0.45034D 02 FT/SEC
              | PITCH RATE           = -0.10077D-01 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.36267D 01 FT/SEC**2
              | AIRSPEED             =  0.22512D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 214 | DENSITY              =  0.23060D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.64050D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.40349D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.40017D-01
              | ACCELERATION         =  0.96394D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17135D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.23772D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.20141D 00 RADIAN

              | WEIGHT               =  0.39992D 04 LBF        | ALTITUDE               =  0.10435D 04 FT
              | PITCH ANGLE          = -0.13833D 00 RADIAN     | ALTITUDE RATE          = -0.45390D 02 FT/SEC
              | PITCH RATE           = -0.93481D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.34833D 01 FT/SEC**2
              | AIRSPEED             =  0.22608D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
  DATA PT 215 | DENSITY              =  0.23063D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
              | ANGLE OF ATTACK      =  0.63814D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.40201D 00
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	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39975D-01
	ACCELERATION	= 0.96189D 01 FT/SEC**2	POWER AVAILABLE	= 0.17148D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.23369D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20215D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10389D 04 FT
	PITCH ANGLE	= -0.13923D 00 RADIAN	ALTITUDE RATE	= -0.48731D 02 FT/SEC
	PITCH RATE	= -0.86167D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.33387D 01 FT/SEC**2
	AIRSPEED	= 0.22704D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 216	DENSITY	= 0.23066D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.63682D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.40055D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39934D-01
	ACCELERATION	= 0.95962D 01 FT/SEC**2	POWER AVAILABLE	= 0.17160D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.22972D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20281D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10343D 04 FT
	PITCH ANGLE	= -0.14006D 00 RADIAN	ALTITUDE RATE	= -0.46058D 02 FT/SEC
	PITCH RATE	= -0.78981D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.31929D 01 FT/SEC**2
	AIRSPEED	= 0.22800D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 217	DENSITY	= 0.23070D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.63364D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.39911D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39894D-01
	ACCELERATION	= 0.95714D 01 FT/SEC**2	POWER AVAILABLE	= 0.17172D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.22579D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20341D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10297D 04 FT
	PITCH ANGLE	= -0.14081D 00 RADIAN	ALTITUDE RATE	= -0.46370D 02 FT/SEC
	PITCH RATE	= -0.71833D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.30460D 01 FT/SEC**2
	AIRSPEED	= 0.22895D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 218	DENSITY	= 0.23073D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.63131D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.39770D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39855D-01
	ACCELERATION	= 0.98444D 01 FT/SEC**2	POWER AVAILABLE	= 0.17184D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.22192D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20394D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10250D 04 FT
	PITCH ANGLE	= -0.14149D 00 RADIAN	ALTITUDE RATE	= -0.46667D 02 FT/SEC
	PITCH RATE	= -0.64744D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.28980D 01 FT/SEC**2
	AIRSPEED	= 0.22991D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 219	DENSITY	= 0.23076D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.62911D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.39632D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39817D-01
	ACCELERATION	= 0.95154D 01 FT/SEC**2	POWER AVAILABLE	= 0.17196D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.21809D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20440D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10204D 04 FT
	PITCH ANGLE	= -0.14210D 00 RADIAN	ALTITUDE RATE	= -0.46949D 02 FT/SEC
	PITCH RATE	= -0.57715D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.27489D 01 FT/SEC**2
	AIRSPEED	= 0.23086D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 220	DENSITY	= 0.23079D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.62694D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.39496D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39780D-01
	ACCELERATION	= 0.94843D 01 FT/SEC**2	POWER AVAILABLE	= 0.17205D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.21431D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20480D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10157D 04 FT
	PITCH ANGLE	= -0.14265D 00 RADIAN	ALTITUDE RATE	= -0.47217D 02 FT/SEC
	PITCH RATE	= -0.53747D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.25969D 01 FT/SEC**2
	AIRSPEED	= 0.23180D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 221	DENSITY	= 0.23082D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.62482D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.39362D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39743D-01
	ACCELERATION	= 0.94812D 01 FT/SEC**2	POWER AVAILABLE	= 0.17216D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.21058D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20513D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10109D 04 FT
	PITCH ANGLE	= -0.14312D 00 RADIAN	ALTITUDE RATE	= -0.47469D 02 FT/SEC
	PITCH RATE	= -0.43842D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.24479D 01 FT/SEC**2
	AIRSPEED	= 0.23275D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 222	DENSITY	= 0.23085D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.62273D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.39230D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39708D-01
	ACCELERATION	= 0.94161D 01 FT/SEC**2	POWER AVAILABLE	= 0.17225D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.20691D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20539D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10062D 04 FT
	PITCH ANGLE	= -0.14352D 00 RADIAN	ALTITUDE RATE	= -0.47706D 02 FT/SEC
	PITCH RATE	= -0.37000D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.22961D 01 FT/SEC**2
	AIRSPEED	= 0.23369D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 223	DENSITY	= 0.23089D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.62068D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.39101D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39673D-01
	ACCELERATION	= 0.93760D 01 FT/SEC**2	POWER AVAILABLE	= 0.17235D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.20327D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20559D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.10014D 04 FT
	PITCH ANGLE	= -0.14386D 00 RADIAN	ALTITUDE RATE	= -0.47928D 02 FT/SEC
	PITCH RATE	= -0.30222D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.21434D 01 FT/SEC**2
	AIRSPEED	= 0.23462D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 224	DENSITY	= 0.23092D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.61867D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.38974D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39639D-01
	ACCELERATION	= 0.93399D 01 FT/SEC**2	POWER AVAILABLE	= 0.17244D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.19969D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20573D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.99658D 03 FT
	PITCH ANGLE	= -0.14413D 00 RADIAN	ALTITUDE RATE	= -0.48135D 02 FT/SEC
	PITCH RATE	= -0.23539D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.19900D 01 FT/SEC**2
	AIRSPEED	= 0.23555D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 225	DENSITY	= 0.23095D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.61669D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.38849D 00
	TEMPERATURE	= 0.52000D 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.39605D-01
	ACCELERATION	= 0.92990D 01 FT/SEC**2	POWER AVAILABLE	= 0.17252D 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.19616D-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.20580D 00 RADIAN
	WEIGHT	= 0.39992D 04 LBF	ALTITUDE	= 0.99176D 03 FT
	PITCH ANGLE	= -0.14433D 00 RADIAN	ALTITUDE RATE	= -0.48326D 02 FT/SEC
	PITCH RATE	= -0.16562D-02 RADIAN/SEC	ALTITUDE-RATE RATE	= -0.18356D 01 FT/SEC**2
	AIRSPEED	= 0.23648D 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 226	DENSITY	= 0.23098D-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.61476D-01 RADIAN	LIFT COEFFICIENT(CL)=	0.38727D 00

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             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39672D-01
             | ACCELERATION           =  0.92562D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17260D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.19268D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20580D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.98691D 03 FT
             | PITCH ANGLE            = -0.14447D 00 RADIAN     | ALTITUDE RATE          = -0.48502D 02 FT/SEC
             | PITCH RATE             = -0.10281D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.16810D 01 FT/SEC**2
             | AIRSPEED               =  0.23741D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 227 | DENSITY                =  0.23102D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.61283D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.38607D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39540D-01
             | ACCELERATION           =  0.92118D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17268D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.18925D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20675D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.98206D 03 FT
             | PITCH ANGLE            = -0.14454D 00 RADIAN     | ALTITUDE RATE          = -0.48662D 02 FT/SEC
             | PITCH RATE             = -0.37666D-03 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.15256D 01 FT/SEC**2
             | AIRSPEED               =  0.23832D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 228 | DENSITY                =  0.23105D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.61056D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.38489D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39609D-01
             | ACCELERATION           =  0.91649D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17276D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.18586D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20563D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.97718D 03 FT
             | PITCH ANGLE            = -0.14454D 00 RADIAN     | ALTITUDE RATE          = -0.48807D 02 FT/SEC
             | PITCH RATE             =  0.26799D-03 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.13696D 01 FT/SEC**2
             | AIRSPEED               =  0.23924D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 229 | DENSITY                =  0.23108D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.60912D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.38373D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39478D-01
             | ACCELERATION           =  0.91166D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17282D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.18253D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20546D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.97229D 03 FT
             | PITCH ANGLE            = -0.14448D 00 RADIAN     | ALTITUDE RATE          = -0.48936D 02 FT/SEC
             | PITCH RATE             =  0.90582D-03 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.12132D 01 FT/SEC**2
             | AIRSPEED               =  0.24015D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 230 | DENSITY                =  0.23112D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.60731D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.38259D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39448D-01
             | ACCELERATION           =  0.90665D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17288D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.17924D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20521D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.96740D 03 FT
             | PITCH ANGLE            = -0.14436D 00 RADIAN     | ALTITUDE RATE          = -0.49050D 02 FT/SEC
             | PITCH RATE             =  0.15368D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.10603D 01 FT/SEC**2
             | AIRSPEED               =  0.24105D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 231 | DENSITY                =  0.23115D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.60553D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.38147D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39419D-01
             | ACCELERATION           =  0.90147D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17295D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.17600D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20491D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.96249D 03 FT
             | PITCH ANGLE            = -0.14418D 00 RADIAN     | ALTITUDE RATE          = -0.49147D 02 FT/SEC
             | PITCH RATE             =  0.21608D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.89896D 00 FT/SEC**2
             | AIRSPEED               =  0.24195D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 232 | DENSITY                =  0.23118D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.60379D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.38037D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39390D-01
             | ACCELERATION           =  0.89611D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17300D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.17282D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20455D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.95757D 03 FT
             | PITCH ANGLE            = -0.14393D 00 RADIAN     | ALTITUDE RATE          = -0.49229D 02 FT/SEC
             | PITCH RATE             =  0.27778D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.74135D 00 FT/SEC**2
             | AIRSPEED               =  0.24284D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 233 | DENSITY                =  0.23122D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.60207D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37929D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39362D-01
             | ACCELERATION           =  0.89059D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17305D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.16968D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20414D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.95264D 03 FT
             | PITCH ANGLE            = -0.14362D 00 RADIAN     | ALTITUDE RATE          = -0.49296D 02 FT/SEC
             | PITCH RATE             =  0.33878D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.58347D 00 FT/SEC**2
             | AIRSPEED               =  0.24373D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 234 | DENSITY                =  0.23125D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.60039D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37823D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39335D-01
             | ACCELERATION           =  0.88490D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17313D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.16658D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20366D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.94771D 03 FT
             | PITCH ANGLE            = -0.14325D 00 RADIAN     | ALTITUDE RATE          = -0.49346D 02 FT/SEC
             | PITCH RATE             =  0.39910D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.42537D 00 FT/SEC**2
             | AIRSPEED               =  0.24461D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 235 | DENSITY                =  0.23128D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.59876D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37719D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39308D-01
             | ACCELERATION           =  0.87908D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17315D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.16352D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20313D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.94277D 03 FT
             | PITCH ANGLE            = -0.14282D 00 RADIAN     | ALTITUDE RATE          = -0.49381D 02 FT/SEC
             | PITCH RATE             =  0.45871D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.26710D 00 FT/SEC**2
             | AIRSPEED               =  0.24549D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 236 | DENSITY                =  0.23132D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.59712D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37617D 00
             | TEMPERATURE            =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39282D-01
             | ACCELERATION           =  0.87304D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17319D 06 FT-LBF/SEC
             | ANGLE-OF-ATTACK RATE=  -0.16050D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20253D 00 RADIAN

             | WEIGHT                 =  0.39991D 04 LBF        | ALTITUDE               =  0.93783D 03 FT
             | PITCH ANGLE            = -0.14233D 00 RADIAN     | ALTITUDE RATE          = -0.49400D 02 FT/SEC
             | PITCH RATE             =  0.51763D-02 RADIAN/SEC | ALTITUDE-RATE RATE     = -0.10873D 00 FT/SEC**2
             | AIRSPEED               =  0.24636D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0         FT/SEC**2
 DATA PT 237 | DENSITY                =  0.23135D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
             | ANGLE OF ATTACK        =  0.59553D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37517D 00
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            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39256D-01
            | ACCELERATION         =  0.86687D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17323D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.15751D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20189D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.93289D 03 FT
            | PITCH ANGLE          = -0.14179D 00 RADIAN     | ALTITUDE RATE          = -0.49403D 02 FT/SEC
            | PITCH RATE           =  0.57586D-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.49716D-01 FT/SEC**2
            | AIRSPEED             =  0.24722D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 238 | DENSITY              =  0.23138D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.59397D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37419D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39231D-01
            | ACCELERATION         =  0.86065D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17326D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.15456D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20118D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.92795D 03 FT
            | PITCH ANGLE          = -0.14118D 00 RADIAN     | ALTITUDE RATE          = -0.49390D 02 FT/SEC
            | PITCH RATE           =  0.63339D-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.20817D 00 FT/SEC**2
            | AIRSPEED             =  0.24808D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 239 | DENSITY              =  0.23142D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.59244D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37322D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39206D-01
            | ACCELERATION         =  0.85408D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17329D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.15168D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.20043D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.92301D 03 FT
            | PITCH ANGLE          = -0.14082D 00 RADIAN     | ALTITUDE RATE          = -0.49361D 02 FT/SEC
            | PITCH RATE           =  0.69021D-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.36658D 00 FT/SEC**2
            | AIRSPEED             =  0.24893D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 240 | DENSITY              =  0.23145D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.59094D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37227D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39182D-01
            | ACCELERATION         =  0.84746D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17332D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.14877D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.19961D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.91808D 03 FT
            | PITCH ANGLE          = -0.13980D 00 RADIAN     | ALTITUDE RATE          = -0.49316D 02 FT/SEC
            | PITCH RATE           =  0.74634D-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.52490D 00 FT/SEC**2
            | AIRSPEED             =  0.24978D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 241 | DENSITY              =  0.23149D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.58947D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37135D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39159D-01
            | ACCELERATION         =  0.84070D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17334D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.14593D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.19875D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.91315D 03 FT
            | PITCH ANGLE          = -0.13903D 00 RADIAN     | ALTITUDE RATE          = -0.49256D 02 FT/SEC
            | PITCH RATE           =  0.80177D-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.68308D 00 FT/SEC**2
            | AIRSPEED             =  0.25061D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 242 | DENSITY              =  0.23152D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.58802D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.37044D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39136D-01
            | ACCELERATION         =  0.83379D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17336D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.14312D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.19783D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.90823D 03 FT
            | PITCH ANGLE          = -0.13820D 00 RADIAN     | ALTITUDE RATE          = -0.49180D 02 FT/SEC
            | PITCH RATE           =  0.85649D-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.84106D 00 FT/SEC**2
            | AIRSPEED             =  0.25144D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 243 | DENSITY              =  0.23156D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.58660D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.36954D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39113D-01
            | ACCELERATION         =  0.82674D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17338D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.14036D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.19686D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.90332D 03 FT
            | PITCH ANGLE          = -0.13732D 00 RADIAN     | ALTITUDE RATE          = -0.49088D 02 FT/SEC
            | PITCH RATE           =  0.91052D-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.99880D 00 FT/SEC**2
            | AIRSPEED             =  0.25227D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 244 | DENSITY              =  0.23159D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.58521D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.36867D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39091D-01
            | ACCELERATION         =  0.81956D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17339D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.13762D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.19584D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.89841D 03 FT
            | PITCH ANGLE          = -0.13638D 00 RADIAN     | ALTITUDE RATE          = -0.48980D 02 FT/SEC
            | PITCH RATE           =  0.96384D-02 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.11562D 01 FT/SEC**2
            | AIRSPEED             =  0.25308D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 245 | DENSITY              =  0.23162D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.58385D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.36781D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39070D-01
            | ACCELERATION         =  0.81224D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17340D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.13493D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.19476D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.89352D 03 FT
            | PITCH ANGLE          = -0.13539D 00 RADIAN     | ALTITUDE RATE          = -0.48856D 02 FT/SEC
            | PITCH RATE           =  0.10165D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.13133D 01 FT/SEC**2
            | AIRSPEED             =  0.25389D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 246 | DENSITY              =  0.23166D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.58251D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.36697D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39049D-01
            | ACCELERATION         =  0.80460D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17341D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.13226D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.19364D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.88864D 03 FT
            | PITCH ANGLE          = -0.13435D 00 RADIAN     | ALTITUDE RATE          = -0.48717D 02 FT/SEC
            | PITCH RATE           =  0.10684D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.14700D 01 FT/SEC**2
            | AIRSPEED             =  0.25469D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 247 | DENSITY              =  0.23169D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.58121D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.36614D 00
            | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.39028D-01
            | ACCELERATION         =  0.79722D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17341D 06 FT-LBF/SEC
            | ANGLE-OF-ATTACK RATE= -0.12964D-02 RADIAN/SEC | FLIGHT PATH ANGLE      = -0.19247D 00 RADIAN

            | WEIGHT               =  0.39991D 04 LBF        | ALTITUDE               =  0.88378D 03 FT
            | PITCH ANGLE          = -0.13325D 00 RADIAN     | ALTITUDE RATE          = -0.48562D 02 FT/SEC
            | PITCH RATE           =  0.11196D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.16262D 01 FT/SEC**2
            | AIRSPEED             =  0.25548D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 248 | DENSITY              =  0.23172D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
            | ANGLE OF ATTACK      =  0.57992D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.36533D 00
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DATA PT	Parameter	Value	Parameter	Value
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.390083-01
	ACCELERATION	= 0.789520 01 FT/SEC**2	POWER AVAILABLE	= 0.173410 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.127050-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.191240 00 RADIAN
	WEIGHT	= 0.399910 04 LBF	ALTITUDE	= 0.878930 03 FT
	PITCH ANGLE	= -0.132110 00 RADIAN	ALTITUDE RATE	= -0.483920 02 FT/SEC
	PITCH RATE	= 0.117010-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.178190 01 FT/SEC**2
	AIRSPEED	= 0.256270 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 249	DENSITY	= 0.231750-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.578660-01 RADIAN	LIFT COEFFICIENT(CL)=	0.364540 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.389880-01
	ACCELERATION	= 0.781700 01 FT/SEC**2	POWER AVAILABLE	= 0.173410 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.124600-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.189970 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.874100 03 FT
	PITCH ANGLE	= -0.130910 00 RADIAN	ALTITUDE RATE	= -0.482060 02 FT/SEC
	PITCH RATE	= 0.121990-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.193710 01 FT/SEC**2
	AIRSPEED	= 0.257050 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 250	DENSITY	= 0.231790-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.577430-01 RADIAN	LIFT COEFFICIENT(CL)=	0.363760 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.389690-01
	ACCELERATION	= 0.773750 01 FT/SEC**2	POWER AVAILABLE	= 0.173410 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.121980-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.188650 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.869290 03 FT
	PITCH ANGLE	= -0.129670 00 RADIAN	ALTITUDE RATE	= -0.480050 02 FT/SEC
	PITCH RATE	= 0.126930-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.209160 01 FT/SEC**2
	AIRSPEED	= 0.257820 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 251	DENSITY	= 0.231820-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.576220-01 RADIAN	LIFT COEFFICIENT(CL)=	0.363000 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.389500-01
	ACCELERATION	= 0.765650 01 FT/SEC**2	POWER AVAILABLE	= 0.173400 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.119500-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.187290 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.864500 03 FT
	PITCH ANGLE	= -0.128370 00 RADIAN	ALTITUDE RATE	= -0.477680 02 FT/SEC
	PITCH RATE	= 0.131740-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.224550 01 FT/SEC**2
	AIRSPEED	= 0.258560 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 252	DENSITY	= 0.231850-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.575040-01 RADIAN	LIFT COEFFICIENT(CL)=	0.362260 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.389320-01
	ACCELERATION	= 0.757520 01 FT/SEC**2	POWER AVAILABLE	= 0.173390 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.117060-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.185883 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.859730 03 FT
	PITCH ANGLE	= -0.127030 00 RADIAN	ALTITUDE RATE	= -0.475500 02 FT/SEC
	PITCH RATE	= 0.136510-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.239860 01 FT/SEC**2
	AIRSPEED	= 0.259330 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 253	DENSITY	= 0.231880-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.573880-01 RADIAN	LIFT COEFFICIENT(CL)=	0.361530 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.389140-01
	ACCELERATION	= 0.749230 01 FT/SEC**2	POWER AVAILABLE	= 0.173380 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.114650-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.184420 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.854990 03 FT
	PITCH ANGLE	= -0.125640 00 RADIAN	ALTITUDE RATE	= -0.473080 02 FT/SEC
	PITCH RATE	= 0.141210-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.255100 01 FT/SEC**2
	AIRSPEED	= 0.260080 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 254	DENSITY	= 0.231920-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.572750-01 RADIAN	LIFT COEFFICIENT(CL)=	0.360810 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.388970-01
	ACCELERATION	= 0.740830 01 FT/SEC**2	POWER AVAILABLE	= 0.173370 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.112280-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.182920 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.850270 03 FT
	PITCH ANGLE	= -0.124210 00 RADIAN	ALTITUDE RATE	= -0.470450 02 FT/SEC
	PITCH RATE	= 0.145840-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.270250 01 FT/SEC**2
	AIRSPEED	= 0.260810 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 255	DENSITY	= 0.231950-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.571640-01 RADIAN	LIFT COEFFICIENT(CL)=	0.360113 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.388790-01
	ACCELERATION	= 0.732330 01 FT/SEC**2	POWER AVAILABLE	= 0.173350 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.109940-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.181370 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.845580 03 FT
	PITCH ANGLE	= -0.122730 00 RADIAN	ALTITUDE RATE	= -0.467680 02 FT/SEC
	PITCH RATE	= 0.150410-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.285320 01 FT/SEC**2
	AIRSPEED	= 0.261540 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 256	DENSITY	= 0.231980-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.570550-01 RADIAN	LIFT COEFFICIENT(CL)=	0.359430 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.388630-01
	ACCELERATION	= 0.723730 01 FT/SEC**2	POWER AVAILABLE	= 0.173330 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.107620-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.179780 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.840920 03 FT
	PITCH ANGLE	= -0.121200 00 RADIAN	ALTITUDE RATE	= -0.464750 02 FT/SEC
	PITCH RATE	= 0.154900-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.330290 01 FT/SEC**2
	AIRSPEED	= 0.262260 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 257	DENSITY	= 0.232010-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.569480-01 RADIAN	LIFT COEFFICIENT(CL)=	0.358760 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.388460-01
	ACCELERATION	= 0.715020 01 FT/SEC**2	POWER AVAILABLE	= 0.173310 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.105330-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.178150 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.836290 03 FT
	PITCH ANGLE	= -0.119630 00 RADIAN	ALTITUDE RATE	= -0.461670 02 FT/SEC
	PITCH RATE	= 0.169320-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.315170 01 FT/SEC**2
	AIRSPEED	= 0.262970 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 258	DENSITY	= 0.232040-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.568440-01 RADIAN	LIFT COEFFICIENT(CL)=	0.358100 00
	TEMPERATURE	= 0.520000 03 DEGREES-R	DRAG COEFFICIENT(CD)=	0.388310-01
	ACCELERATION	= 0.706220 01 FT/SEC**2	POWER AVAILABLE	= 0.173290 06 FT-LBF/SEC
	ANGLE-OF-ATTACK RATE	= -0.103070-02 RADIAN/SEC	FLIGHT PATH ANGLE	= -0.176670 00 RADIAN
	WEIGHT	= 0.399900 04 LBF	ALTITUDE	= 0.831690 03 FT
	PITCH ANGLE	= -0.118010 00 RADIAN	ALTITUDE RATE	= -0.458450 02 FT/SEC
	PITCH RATE	= 0.163680-01 RADIAN/SEC	ALTITUDE-RATE RATE	= 0.329950 01 FT/SEC**2
	AIRSPEED	= 0.263670 03 FT/SEC	VERTICAL ACCELERATION	= 0.0 FT/SEC**2
DATA PT 259	DENSITY	= 0.232070-02 SLUG/FT**3	ELEVATOR DEFLECTION	= 0.0 RADIAN
	ANGLE OF ATTACK	= 0.567420-01 RADIAN	LIFT COEFFICIENT(CL)=	0.357460 00

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*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.388150D-01              *
*               | ACCELERATION         =  0.697320D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173270D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.100830D-02 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.174760D 00 RADIAN      *
*               |                                                 |                                                    *
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*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.827120D 03 FT          *
*               | PITCH ANGLE          = -0.116360D 00 RADIAN     | ALTITUDE RATE          = -0.455070D 02 FT/SEC      *
*               | PITCH RATE           =  0.167970D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.344620D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.264370D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 260   | DENSITY              =  0.232110D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.866430D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.356830D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.388000D-01              *
*               | ACCELERATION         =  0.688330D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173240D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.986200D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.173000D 00 RADIAN      *
*               |                                                 |                                                    *
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*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.822580D 03 FT          *
*               | PITCH ANGLE          = -0.114680D 00 RADIAN     | ALTITUDE RATE          = -0.451650D 02 FT/SEC      *
*               | PITCH RATE           =  0.172180D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.359180D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.265050D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 261   | DENSITY              =  0.232140D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.865450D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.356220D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.387850D-01              *
*               | ACCELERATION         =  0.679240D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173210D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.964370D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.171200D 00 RADIAN      *
*               |                                                 |                                                    *
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*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.818090D 03 FT          *
*               | PITCH ANGLE          = -0.112910D 00 RADIAN     | ALTITUDE RATE          = -0.447890D 02 FT/SEC      *
*               | PITCH RATE           =  0.176340D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.373620D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.265730D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 262   | DENSITY              =  0.232170D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.864600D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.355620D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.387710D-01              *
*               | ACCELERATION         =  0.670070D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173180D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.942800D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.169360D 00 RADIAN      *
*               |                                                 |                                                    *
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*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.813630D 03 FT          *
*               | PITCH ANGLE          = -0.111130D 00 RADIAN     | ALTITUDE RATE          = -0.444080D 02 FT/SEC      *
*               | PITCH RATE           =  0.180420D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.387940D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.266390D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 263   | DENSITY              =  0.232200D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.863570D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.355030D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.387560D-01              *
*               | ACCELERATION         =  0.660820D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173150D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.921510D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.167480D 00 RADIAN      *
*               |                                                 |                                                    *
*********************************************************************************************************************
*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.809210D 03 FT          *
*               | PITCH ANGLE          = -0.109300D 00 RADIAN     | ALTITUDE RATE          = -0.440130D 02 FT/SEC      *
*               | PITCH RATE           =  0.184440D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.402140D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.267050D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 264   | DENSITY              =  0.232230D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.862650D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.354460D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.387430D-01              *
*               | ACCELERATION         =  0.651480D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173120D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.900490D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.165570D 00 RADIAN      *
*               |                                                 |                                                    *
*********************************************************************************************************************
*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.804830D 03 FT          *
*               | PITCH ANGLE          = -0.107440D 00 RADIAN     | ALTITUDE RATE          = -0.436040D 02 FT/SEC      *
*               | PITCH RATE           =  0.188390D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.416210D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.267690D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 265   | DENSITY              =  0.232260D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.861760D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.353890D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.387290D-01              *
*               | ACCELERATION         =  0.642060D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173080D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.879730D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.163620D 00 RADIAN      *
*               |                                                 |                                                    *
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*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.800490D 03 FT          *
*               | PITCH ANGLE          = -0.105540D 00 RADIAN     | ALTITUDE RATE          = -0.431810D 02 FT/SEC      *
*               | PITCH RATE           =  0.192270D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.430150D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.268330D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 266   | DENSITY              =  0.232290D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.860890D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.353350D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.387160D-01              *
*               | ACCELERATION         =  0.632570D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173050D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.859240D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.161630D 00 RADIAN      *
*               |                                                 |                                                    *
*********************************************************************************************************************
*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.796190D 03 FT          *
*               | PITCH ANGLE          = -0.103590D 00 RADIAN     | ALTITUDE RATE          = -0.427440D 02 FT/SEC      *
*               | PITCH RATE           =  0.196040D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.443950D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.268960D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 267   | DENSITY              =  0.232320D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.860050D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.352810D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.387030D-01              *
*               | ACCELERATION         =  0.622990D 01 FT/SEC**2  | POWER AVAILABLE        =  0.173010D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.839020D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.159600D 00 RADIAN      *
*               |                                                 |                                                    *
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*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.791940D 03 FT          *
*               | PITCH ANGLE          = -0.101610D 00 RADIAN     | ALTITUDE RATE          = -0.422930D 02 FT/SEC      *
*               | PITCH RATE           =  0.199830D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.457610D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.269580D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 268   | DENSITY              =  0.232350D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.859220D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.352290D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.386910D-01              *
*               | ACCELERATION         =  0.613350D 01 FT/SEC**2  | POWER AVAILABLE        =  0.172970D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.819070D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.157540D 00 RADIAN      *
*               |                                                 |                                                    *
*********************************************************************************************************************
*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.787730D 03 FT          *
*               | PITCH ANGLE          = -0.995980D-01 RADIAN     | ALTITUDE RATE          = -0.418280D 02 FT/SEC      *
*               | PITCH RATE           =  0.203510D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.471110D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.270190D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 269   | DENSITY              =  0.232370D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.858410D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.351780D 00              *
*               | TEMPERATURE          =  0.520000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.386790D-01              *
*               | ACCELERATION         =  0.603640D 01 FT/SEC**2  | POWER AVAILABLE        =  0.172940D 06 FT-LBF/SEC  *
*               | ANGLE-OF-ATTACK RATE= -0.799390D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.155440D 00 RADIAN      *
*               |                                                 |                                                    *
*********************************************************************************************************************
*               |                                                 |                                                    *
*               | WEIGHT               =  0.399900D 04 LBF        | ALTITUDE               =  0.783570D 03 FT          *
*               | PITCH ANGLE          = -0.975450D-01 RADIAN     | ALTITUDE RATE          = -0.413510D 02 FT/SEC      *
*               | PITCH RATE           =  0.207130D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.484470D 01 FT/SEC**2   *
*               | AIRSPEED             =  0.270780D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0          FT/SEC**2   *
* DATA PT 270   | DENSITY              =  0.232400D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0          RADIAN      *
*               | ANGLE OF ATTACK      =  0.857620D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.351280D 00              *
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|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38667D-01
|   ACCELERATION         =  0.59386D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17290D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.77997D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.15331D 00 RADIAN

|   WEIGHT               =  0.39990D 04 LBF        | ALTITUDE               =  0.77946D 03 FT
|   PITCH ANGLE          = -0.95456D-01 RADIAN     | ALTITUDE RATE          = -0.40863D 02 FT/SEC
|   PITCH RATE           =  0.21067D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.49767D 01 FT/SEC**2
|   AIRSPEED             =  0.27137D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 271 | DENSITY    =  0.23243D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55685D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.35080D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38656D-01
|   ACCELERATION         =  0.58401D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17285D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.76083D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.15114D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.77540D 03 FT
|   PITCH ANGLE          = -0.93332D-01 RADIAN     | ALTITUDE RATE          = -0.40335D 02 FT/SEC
|   PITCH RATE           =  0.21415D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.51071D 01 FT/SEC**2
|   AIRSPEED             =  0.27195D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 272 | DENSITY    =  0.23246D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55610D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.35032D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38644D-01
|   ACCELERATION         =  0.57411D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17281D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.74195D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.14894D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.77139D 03 FT
|   PITCH ANGLE          = -0.91173D-01 RADIAN     | ALTITUDE RATE          = -0.39838D 02 FT/SEC
|   PITCH RATE           =  0.21757D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.52359D 01 FT/SEC**2
|   AIRSPEED             =  0.27252D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 273 | DENSITY    =  0.23249D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55536D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34986D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38634D-01
|   ACCELERATION         =  0.56414D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17277D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.72334D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.14671D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.76743D 03 FT
|   PITCH ANGLE          = -0.88981D-01 RADIAN     | ALTITUDE RATE          = -0.39308D 02 FT/SEC
|   PITCH RATE           =  0.22092D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.53629D 01 FT/SEC**2
|   AIRSPEED             =  0.27308D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 274 | DENSITY    =  0.23251D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55465D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34941D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38623D-01
|   ACCELERATION         =  0.55411D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17273D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.70497D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.14445D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.76353D 03 FT
|   PITCH ANGLE          = -0.86755D-01 RADIAN     | ALTITUDE RATE          = -0.38766D 02 FT/SEC
|   PITCH RATE           =  0.22420D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.54883D 01 FT/SEC**2
|   AIRSPEED             =  0.27363D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 275 | DENSITY    =  0.23254D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55395D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34897D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38613D-01
|   ACCELERATION         =  0.54403D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17268D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.68681D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.14215D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.75968D 03 FT
|   PITCH ANGLE          = -0.84497D-01 RADIAN     | ALTITUDE RATE          = -0.38211D 02 FT/SEC
|   PITCH RATE           =  0.22742D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.56118D 01 FT/SEC**2
|   AIRSPEED             =  0.27417D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 276 | DENSITY    =  0.23257D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55328D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34855D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38603D-01
|   ACCELERATION         =  0.53396D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17264D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.66887D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.13982D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.75589D 03 FT
|   PITCH ANGLE          = -0.82207D-01 RADIAN     | ALTITUDE RATE          = -0.37643D 02 FT/SEC
|   PITCH RATE           =  0.23058D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.57336D 01 FT/SEC**2
|   AIRSPEED             =  0.27470D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 277 | DENSITY    =  0.23259D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55262D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34813D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38593D-01
|   ACCELERATION         =  0.52371D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17260D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.65113D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.13747D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.75215D 03 FT
|   PITCH ANGLE          = -0.79885D-01 RADIAN     | ALTITUDE RATE          = -0.37064D 02 FT/SEC
|   PITCH RATE           =  0.23366D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.58535D 01 FT/SEC**2
|   AIRSPEED             =  0.27522D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 278 | DENSITY    =  0.23262D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55197D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34773D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38583D-01
|   ACCELERATION         =  0.51348D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17255D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.63361D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.13508D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.74848D 03 FT
|   PITCH ANGLE          = -0.77534D-01 RADIAN     | ALTITUDE RATE          = -0.36473D 02 FT/SEC
|   PITCH RATE           =  0.23669D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.59716D 01 FT/SEC**2
|   AIRSPEED             =  0.27572D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 279 | DENSITY    =  0.23264D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55135D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34733D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38574D-01
|   ACCELERATION         =  0.50320D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17251D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.61630D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.13267D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.74486D 03 FT
|   PITCH ANGLE          = -0.75152D-01 RADIAN     | ALTITUDE RATE          = -0.35870D 02 FT/SEC
|   PITCH RATE           =  0.23965D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.60877D 01 FT/SEC**2
|   AIRSPEED             =  0.27622D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 280 | DENSITY    =  0.23267D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55074D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34695D 00
|   TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38565D-01
|   ACCELERATION         =  0.45288D 01 FT/SEC**2  | POWER AVAILABLE        =  0.17246D 06 FT-LBF/SEC
|   ANGLE-OF-ATTACK RATE= -0.59920D-03 RADIAN/SEC  | FLIGHT PATH ANGLE      = -0.13023D 00 RADIAN

|   WEIGHT               =  0.39989D 04 LBF        | ALTITUDE               =  0.74130D 03 FT
|   PITCH ANGLE          = -0.72741D-01 RADIAN     | ALTITUDE RATE          = -0.35255D 02 FT/SEC
|   PITCH RATE           =  0.24255D-01 RADIAN/SEC | ALTITUDE-RATE RATE     =  0.62019D 01 FT/SEC**2
|   AIRSPEED             =  0.27671D 03 FT/SEC     | VERTICAL ACCELERATION  =  0.0         FT/SEC**2
DATA PT 281 | DENSITY    =  0.23269D-02 SLUG/FT**3 | ELEVATOR DEFLECTION    =  0.0         RADIAN
|   ANGLE OF ATTACK      =  0.55015D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34658D 00
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              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38557D-01
              | ACCELERATION         =  0.48252D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17241D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.58231D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.12776D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.73781D 03 FT
              | PITCH ANGLE          = -0.70301D-01 RADIAN     | ALTITUDE RATE         = -0.34629D 02 FT/SEC
              | PITCH RATE           =  0.24538D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.63140D 01 FT/SEC**2
              | AIRSPEED             =  0.27719D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 282  | DENSITY              =  0.23272D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54958D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34622D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38548D-01
              | ACCELERATION         =  0.47212D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17237D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.56563D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.12526D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.73438D 03 FT
              | PITCH ANGLE          = -0.67833D-01 RADIAN     | ALTITUDE RATE         = -0.33993D 02 FT/SEC
              | PITCH RATE           =  0.24818D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.64242D 01 FT/SEC**2
              | AIRSPEED             =  0.27766D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 283  | DENSITY              =  0.23274D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54902D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34586D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38540D-01
              | ACCELERATION         =  0.46168D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17232D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.54917D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.12274D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.73181D 03 FT
              | PITCH ANGLE          = -0.65338D-01 RADIAN     | ALTITUDE RATE         = -0.33345D 02 FT/SEC
              | PITCH RATE           =  0.25086D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.65323D 01 FT/SEC**2
              | AIRSPEED             =  0.27811D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 284  | DENSITY              =  0.23276D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54848D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34552D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38532D-01
              | ACCELERATION         =  0.45121D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17228D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.53292D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.12019D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.72771D 03 FT
              | PITCH ANGLE          = -0.62817D-01 RADIAN     | ALTITUDE RATE         = -0.32686D 02 FT/SEC
              | PITCH RATE           =  0.25349D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.66383D 01 FT/SEC**2
              | AIRSPEED             =  0.27856D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 285  | DENSITY              =  0.23278D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54795D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34519D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38524D-01
              | ACCELERATION         =  0.44071D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17223D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.51687D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.11761D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.72447D 03 FT
              | PITCH ANGLE          = -0.60269D-01 RADIAN     | ALTITUDE RATE         = -0.32017D 02 FT/SEC
              | PITCH RATE           =  0.25607D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.67422D 01 FT/SEC**2
              | AIRSPEED             =  0.27899D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 286  | DENSITY              =  0.23281D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54744D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34487D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38517D-01
              | ACCELERATION         =  0.43017D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17219D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.50104D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.11501D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.72130D 03 FT
              | PITCH ANGLE          = -0.57695D-01 RADIAN     | ALTITUDE RATE         = -0.31338D 02 FT/SEC
              | PITCH RATE           =  0.25859D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.68440D 01 FT/SEC**2
              | AIRSPEED             =  0.27942D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 287  | DENSITY              =  0.23283D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54695D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34456D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38510D-01
              | ACCELERATION         =  0.41961D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17214D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.48543D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.11239D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.71821D 03 FT
              | PITCH ANGLE          = -0.55097D-01 RADIAN     | ALTITUDE RATE         = -0.30648D 02 FT/SEC
              | PITCH RATE           =  0.26104D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.69435D 01 FT/SEC**2
              | AIRSPEED             =  0.27983D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 288  | DENSITY              =  0.23285D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54647D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34426D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38503D-01
              | ACCELERATION         =  0.40903D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17210D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.47302D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.10974D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.71518D 03 FT
              | PITCH ANGLE          = -0.52475D-01 RADIAN     | ALTITUDE RATE         = -0.29949D 02 FT/SEC
              | PITCH RATE           =  0.26343D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.70408D 01 FT/SEC**2
              | AIRSPEED             =  0.28024D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 289  | DENSITY              =  0.23287D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54601D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34397D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38496D-01
              | ACCELERATION         =  0.39842D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17205D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.45483D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.10708D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.71222D 03 FT
              | PITCH ANGLE          = -0.49879D-01 RADIAN     | ALTITUDE RATE         = -0.29240D 02 FT/SEC
              | PITCH RATE           =  0.26575D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.71359D 01 FT/SEC**2
              | AIRSPEED             =  0.28063D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 290  | DENSITY              =  0.23289D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54556D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34369D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38489D-01
              | ACCELERATION         =  0.38779D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17201D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.43984D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.10439D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.70933D 03 FT
              | PITCH ANGLE          = -0.47160D-01 RADIAN     | ALTITUDE RATE         = -0.28522D 02 FT/SEC
              | PITCH RATE           =  0.26802D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.72287D 01 FT/SEC**2
              | AIRSPEED             =  0.28101D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 291  | DENSITY              =  0.23291D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54513D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34342D 00
              | TEMPERATURE          =  0.52000D 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.38483D-01
              | ACCELERATION         =  0.37714D 01 FT/SEC**2  | POWER AVAILABLE       =  0.17197D 06 FT-LBF/SEC
              | ANGLE-OF-ATTACK RATE= -0.42507D-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.10167D 00 RADIAN

              | WEIGHT               =  0.39989D 04 LBF        | ALTITUDE              =  0.70651D 03 FT
              | PITCH ANGLE          = -0.44469D-01 RADIAN     | ALTITUDE RATE         = -0.27795D 02 FT/SEC
              | PITCH RATE           =  0.27022D-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.73193D 01 FT/SEC**2
              | AIRSPEED             =  0.28138D 03 FT/SEC     | VERTICAL ACCELERATION =  0.0            FT/SEC**2
 DATA PT 292  | DENSITY              =  0.23293D-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0            RADIAN
              | ANGLE OF ATTACK      =  0.54471D-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.34315D 00
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|  TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.384770-01
|  ACCELERATION         =  0.366480 01 FT/SEC**2  | POWER AVAILABLE       =  0.171920 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.410510-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.989400-01 RADIAN
|                                                 |
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|                                                 |
|  WEIGHT               =  0.399890 04 LBF        | ALTITUDE              =  0.703770 03 FT
|  PITCH ANGLE          = -0.417560-01 RADIAN     | ALTITUDE RATE         = -0.270580 02 FT/SEC
|  PITCH RATE           =  0.272360-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.740740 01 FT/SEC**2
|  AIRSPEED             =  0.281740 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2
DATA PT 293 |  DENSITY  =  0.232950-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0          RADIAN
|  ANGLE OF ATTACK      =  0.544310-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.342900 00
|  TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.384710-01
|  ACCELERATION         =  0.355800 01 FT/SEC**2  | POWER AVAILABLE       =  0.171880 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.396160-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.961870-01 RADIAN
|                                                 |
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|                                                 |
|  WEIGHT               =  0.399890 04 LBF        | ALTITUDE              =  0.701100 03 FT
|  PITCH ANGLE          = -0.390220-01 RADIAN     | ALTITUDE RATE         = -0.263130 02 FT/SEC
|  PITCH RATE           =  0.274430-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.749320 01 FT/SEC**2
|  AIRSPEED             =  0.282090 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2
DATA PT 294 |  DENSITY  =  0.232970-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0          RADIAN
|  ANGLE OF ATTACK      =  0.543920-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.342650 00
|  TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.384660-01
|  ACCELERATION         =  0.345110 01 FT/SEC**2  | POWER AVAILABLE       =  0.171840 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.382020-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.934140-01 RADIAN
|                                                 |
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|                                                 |
|  WEIGHT               =  0.399880 04 LBF        | ALTITUDE              =  0.698510 03 FT
|  PITCH ANGLE          = -0.362670-01 RADIAN     | ALTITUDE RATE         = -0.255600 02 FT/SEC
|  PITCH RATE           =  0.276450-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.757670 01 FT/SEC**2
|  AIRSPEED             =  0.282430 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2
DATA PT 295 |  DENSITY  =  0.232980-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0          RADIAN
|  ANGLE OF ATTACK      =  0.543580-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.342420 00
|  TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.384600-01
|  ACCELERATION         =  0.334410 01 FT/SEC**2  | POWER AVAILABLE       =  0.171800 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.368070-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.906220-01 RADIAN
|                                                 |
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|                                                 |
|  WEIGHT               =  0.399880 04 LBF        | ALTITUDE              =  0.695990 03 FT
|  PITCH ANGLE          = -0.334930-01 RADIAN     | ALTITUDE RATE         = -0.247980 02 FT/SEC
|  PITCH RATE           =  0.278400-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.765770 01 FT/SEC**2
|  AIRSPEED             =  0.282760 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2
DATA PT 296 |  DENSITY  =  0.233000-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0          RADIAN
|  ANGLE OF ATTACK      =  0.543180-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.342190 00
|  TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.384550-01
|  ACCELERATION         =  0.323700 01 FT/SEC**2  | POWER AVAILABLE       =  0.171760 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.354310-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.878110-01 RADIAN
|                                                 |
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|                                                 |
|  WEIGHT               =  0.399880 04 LBF        | ALTITUDE              =  0.693660 03 FT
|  PITCH ANGLE          = -0.307600-01 RADIAN     | ALTITUDE RATE         = -0.240280 02 FT/SEC
|  PITCH RATE           =  0.280250-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.773630 01 FT/SEC**2
|  AIRSPEED             =  0.283080 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2
DATA PT 297 |  DENSITY  =  0.233020-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0          RADIAN
|  ANGLE OF ATTACK      =  0.542840-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.341970 00
|  TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.384500-01
|  ACCELERATION         =  0.312590 01 FT/SEC**2  | POWER AVAILABLE       =  0.171720 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.340740-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.849830-01 RADIAN
|                                                 |
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|                                                 |
|  WEIGHT               =  0.399880 04 LBF        | ALTITUDE              =  0.691180 03 FT
|  PITCH ANGLE          = -0.278870-01 RADIAN     | ALTITUDE RATE         = -0.232810 02 FT/SEC
|  PITCH RATE           =  0.282120-01 RADIAN/SEC | ALTITUDE-RATE RATE    =  0.781240 01 FT/SEC**2
|  AIRSPEED             =  0.283390 03 FT/SEC     | VERTICAL ACCELERATION =  0.0          FT/SEC**2
DATA PT 298 |  DENSITY  =  0.233030-02 SLUG/FT**3 | ELEVATOR DEFLECTION   =  0.0          RADIAN
|  ANGLE OF ATTACK      =  0.542500-01 RADIAN     | LIFT COEFFICIENT( CL )=  0.341760 00
|  TEMPERATURE          =  0.520000 03 DEGREES-R  | DRAG COEFFICIENT( CD )=  0.384450-01
|  ACCELERATION         =  0.302270 01 FT/SEC**2  | POWER AVAILABLE       =  0.171680 06 FT-LBF/SEC
|  ANGLE-OF-ATTACK RATE= -0.327350-03 RADIAN/SEC  | FLIGHT PATH ANGLE     = -0.821360-01 RADIAN
|                                                 |
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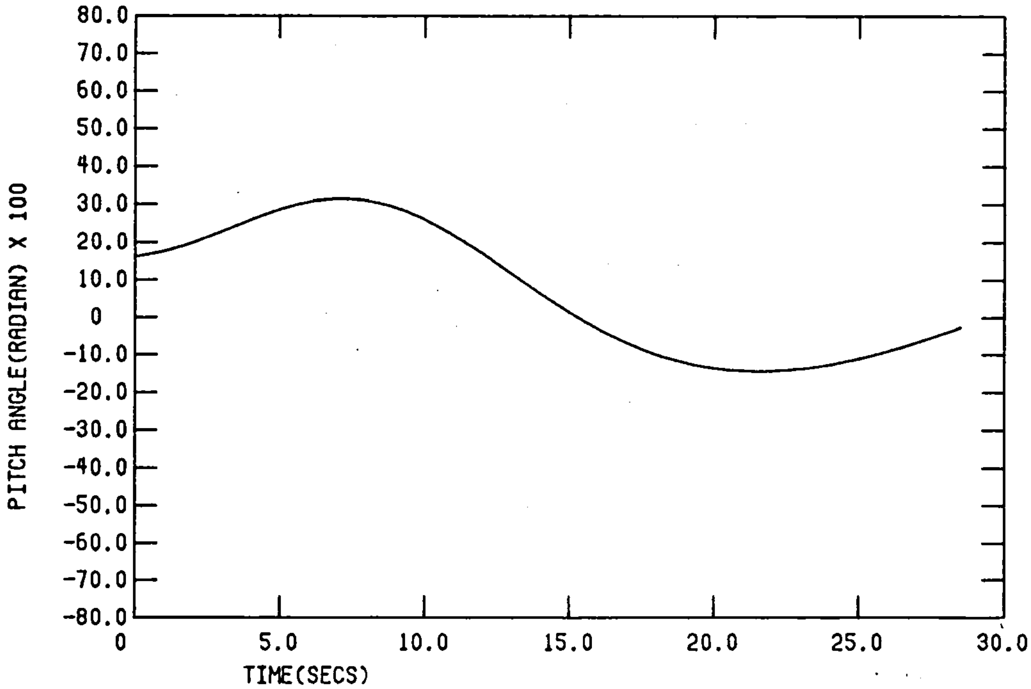
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-50.0
-60.0
-70.0
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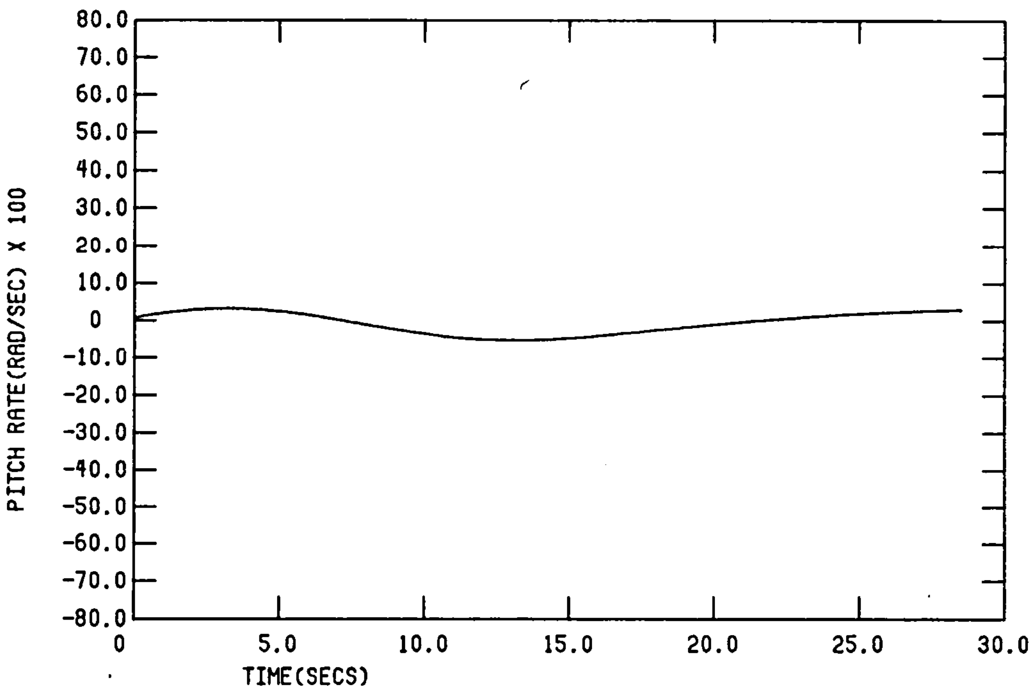
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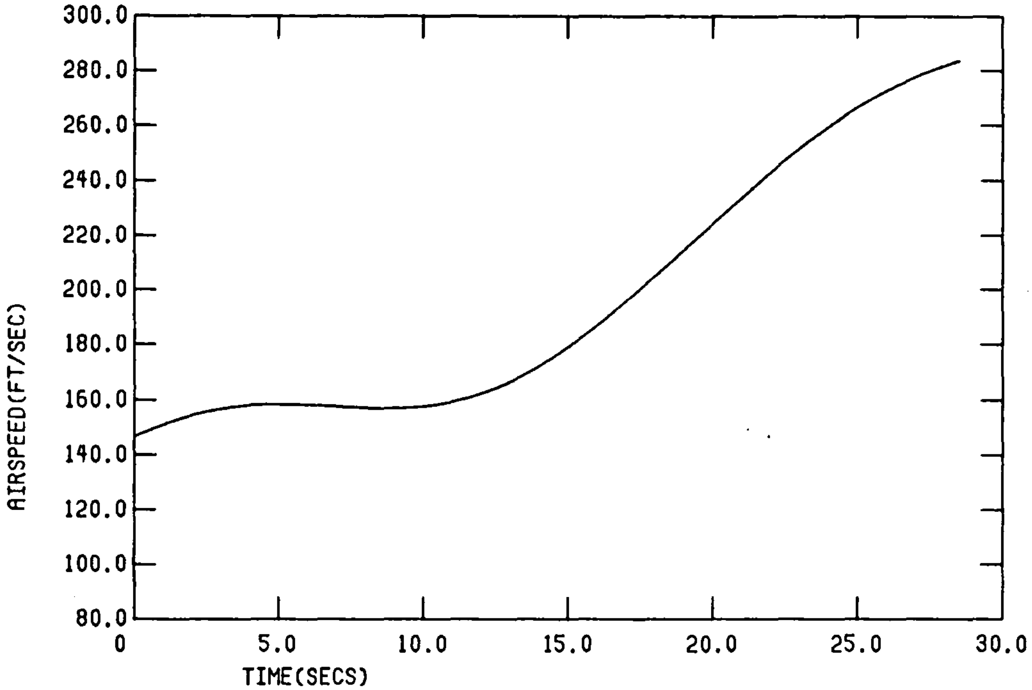
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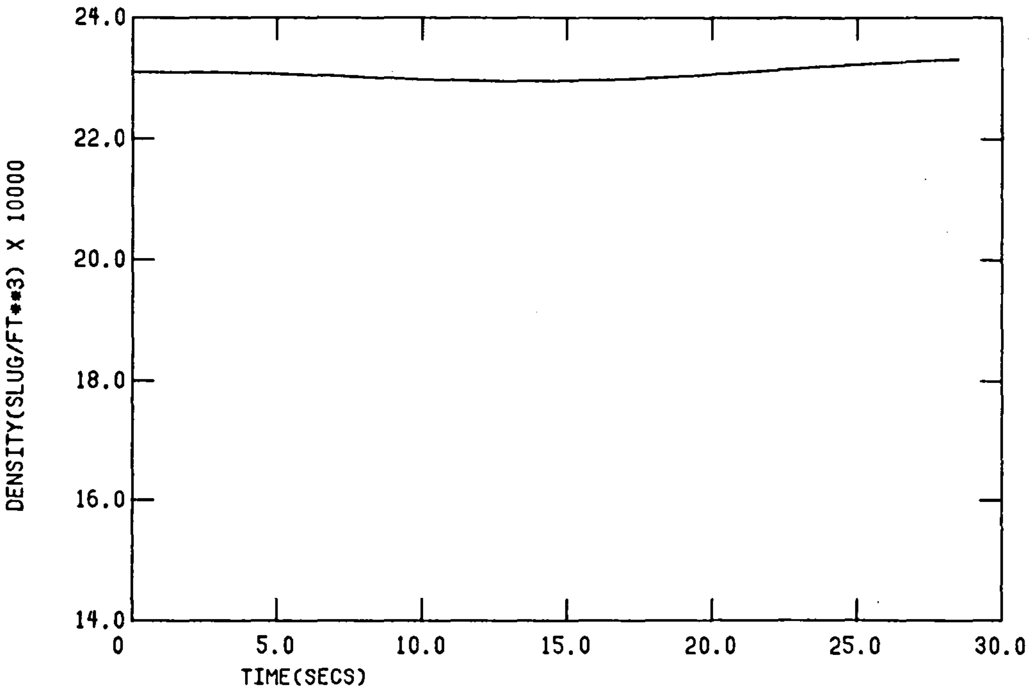
TIME(SECS)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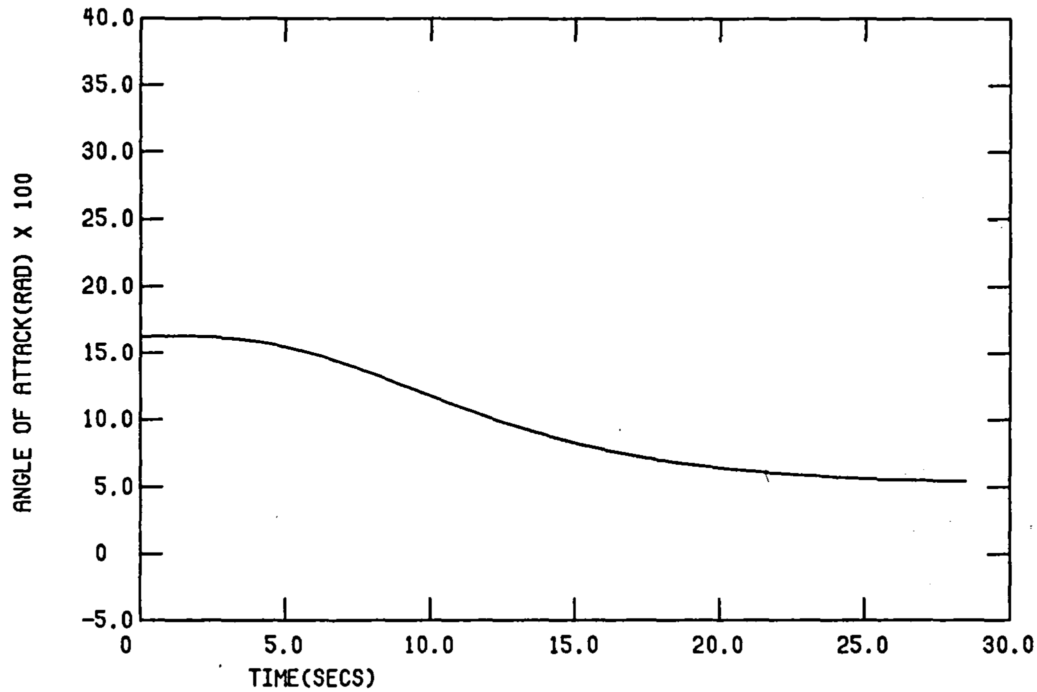
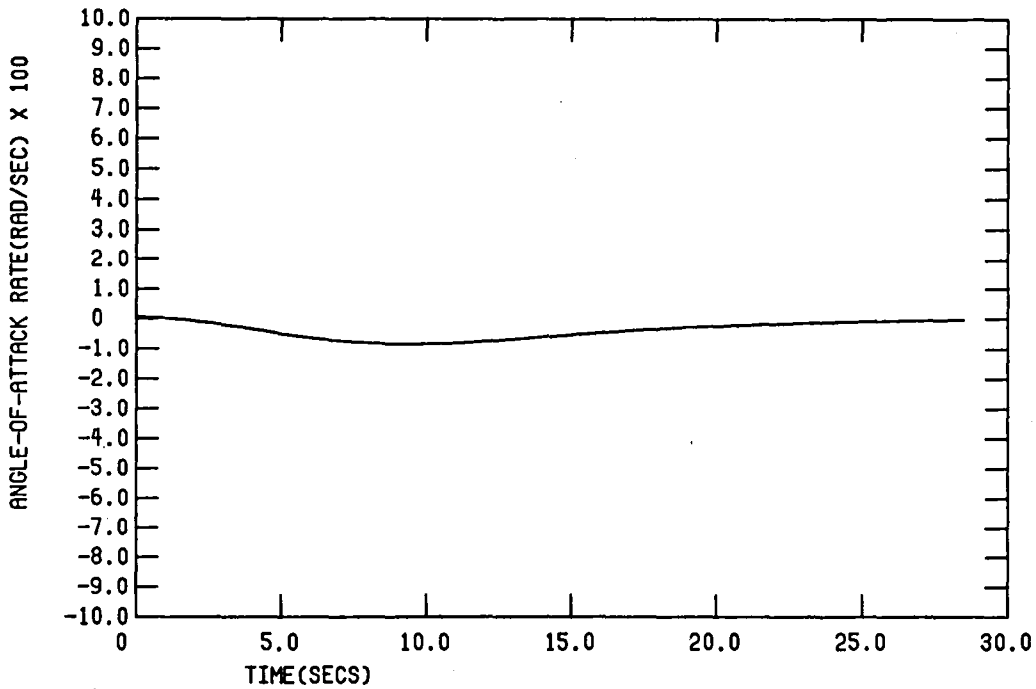
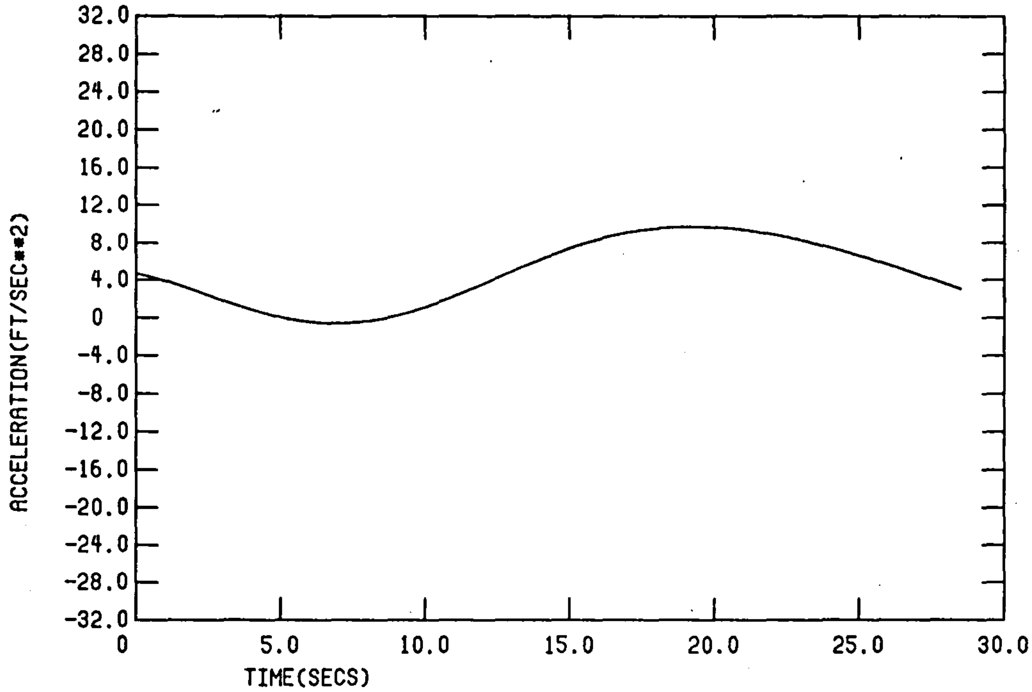
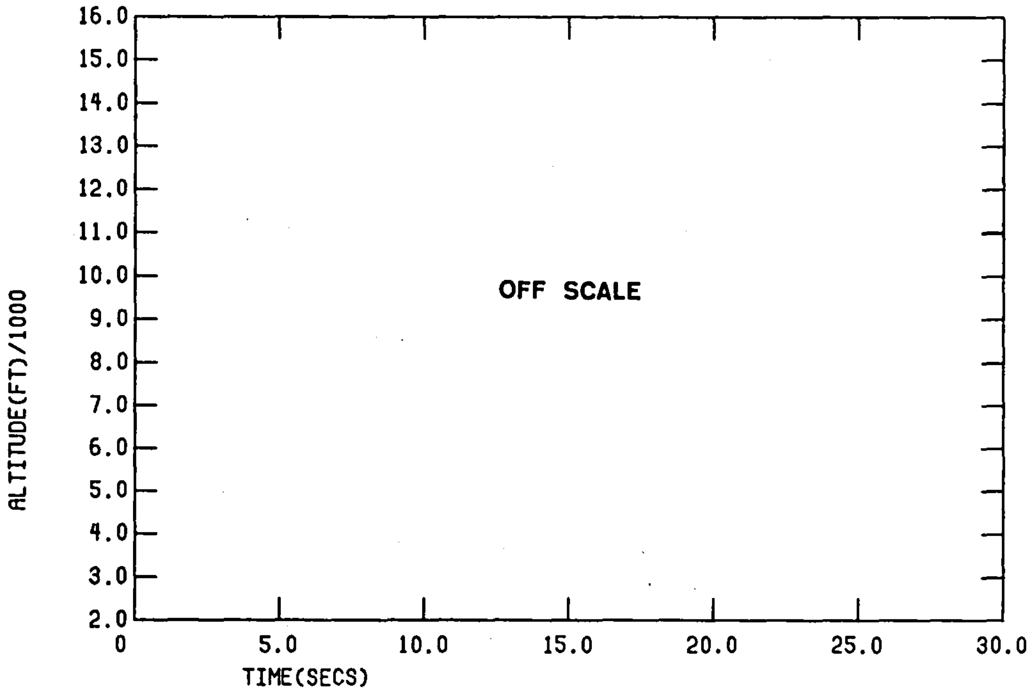
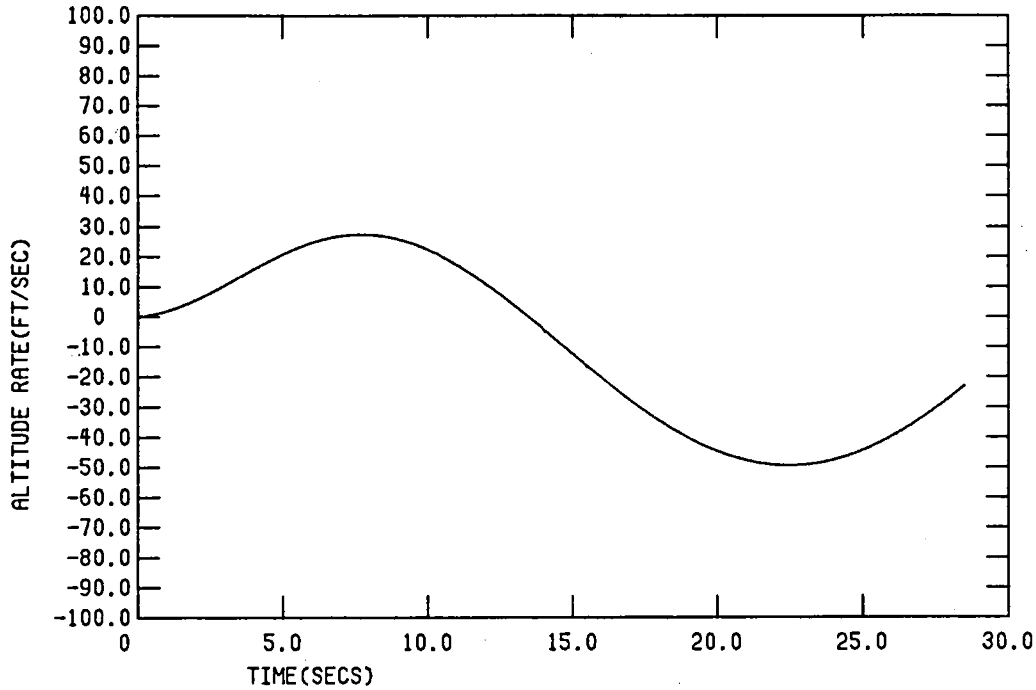
22.0
20.0
18.0
16.0
14.0
DENSITY(SLUG/FT**3) X 10000
0
5.0
10.0
15.0
20.0
25.0
30.0
TIME(SECS)


ANGLE OF ATTACK(RAD) X 100
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0
-5.0
0
5.0
10.0
15.0
20.0
25.0
30.0
TIME(SECS)

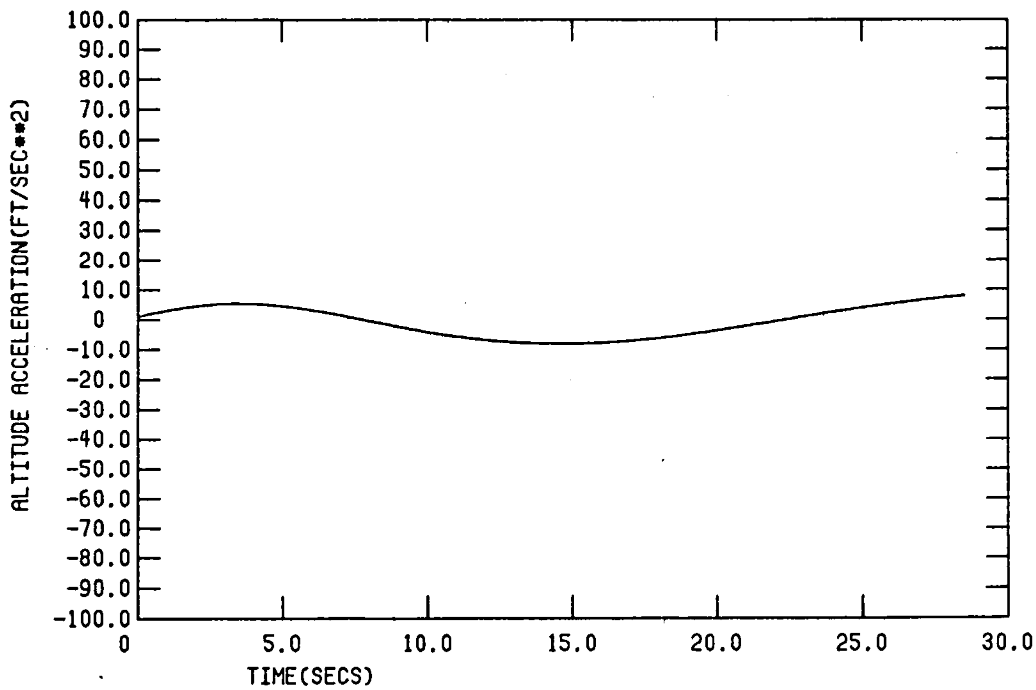

ANGLE-OF-ATTACK RATE(RAD/SEC) X 100
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
-10.0
0
5.0
10.0
15.0
20.0
25.0
30.0
TIME(SECS)


32.0
28.0
24.0
20.0
16.0
12.0
8.0
4.0
0
-4.0
-8.0
-12.0
-16.0
-20.0
-24.0
-28.0
-32.0
ACCELERATION(FT/SEC**2)
0
5.0
10.0
15.0
20.0
25.0
30.0
TIME(SECS)

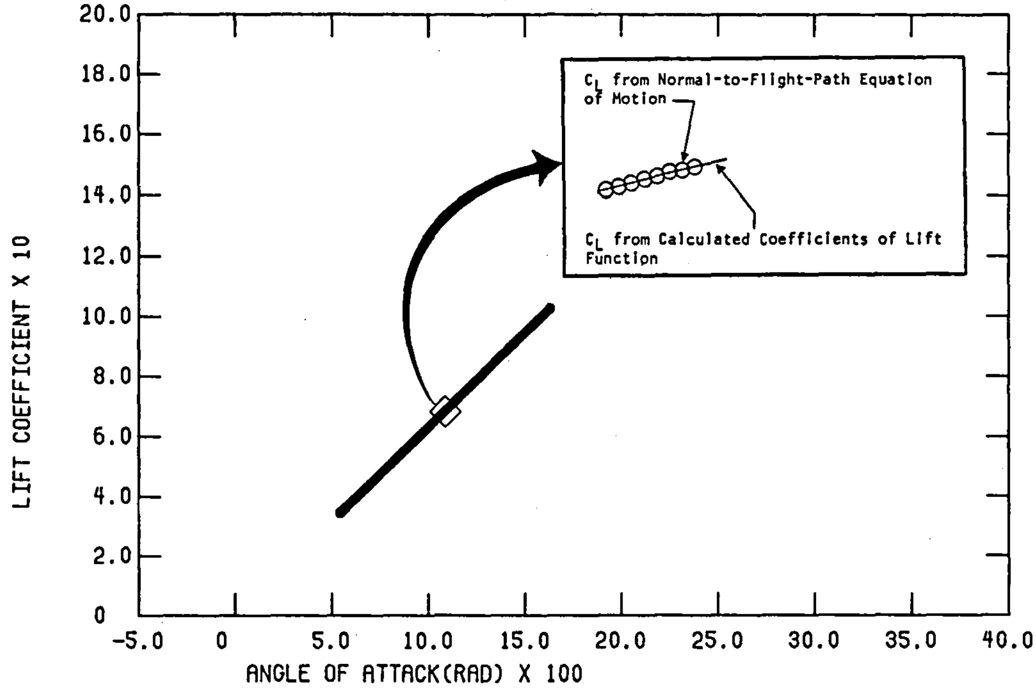

16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
ALTITUDE(FT)/1000
OFF SCALE
0
5.0
10.0
15.0
20.0
25.0
30.0
TIME(SECS)



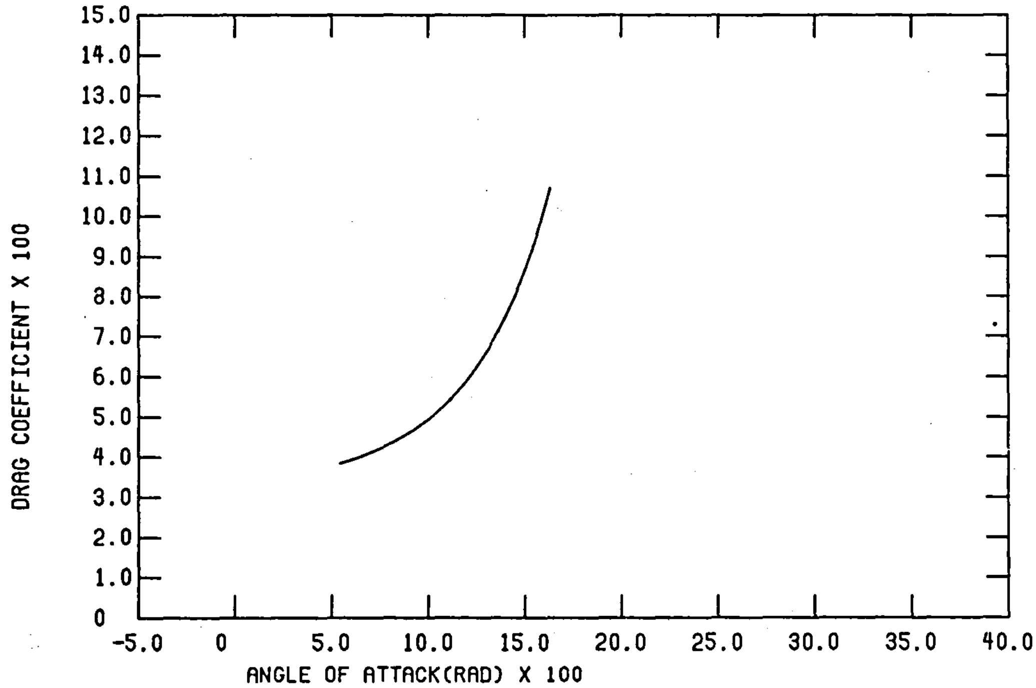
ALTITUDE RATE(FT/SEC)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
0
5.0
10.0
15.0
20.0
25.0
30.0
TIME(SECS)



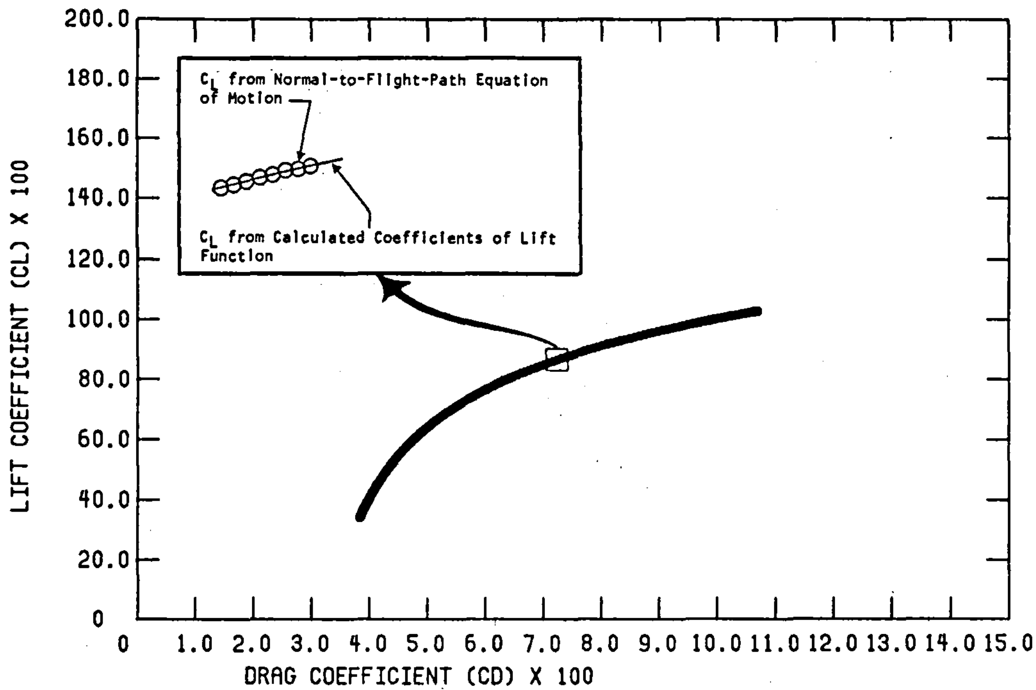
ALTITUDE ACCELERATION(FT/SEC**2)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
0
5.0
10.0
15.0
20.0
25.0
30.0
TIME(SECS)



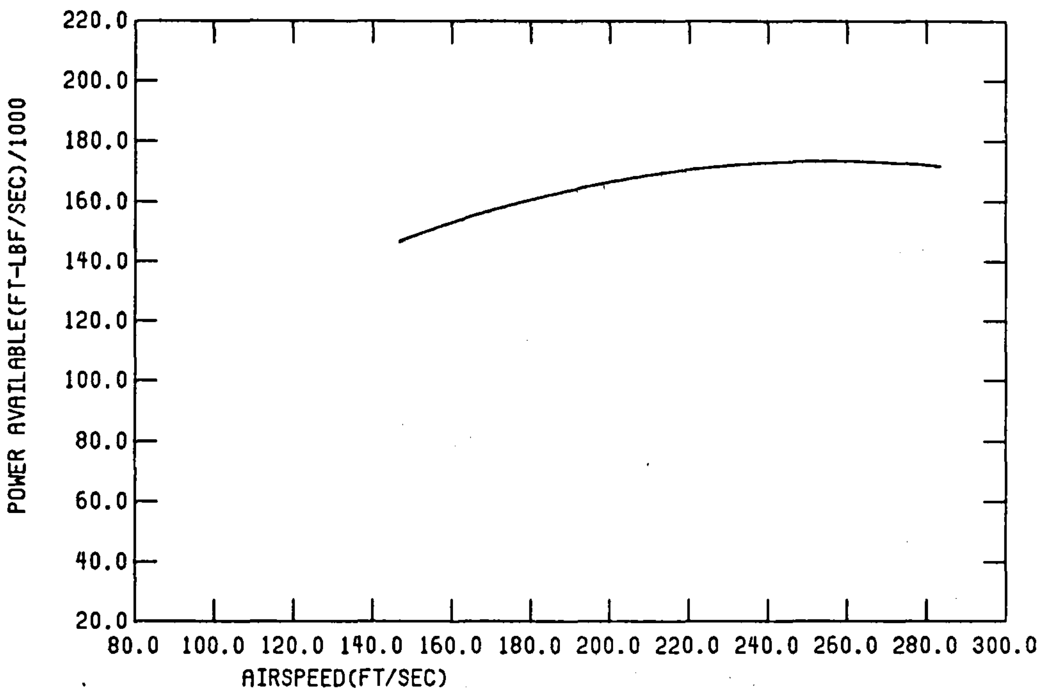
LIFT COEFFICIENT X 10
ANGLE OF ATTACK(RAD) X 100
C_L from Normal-to-Flight-Path Equation of Motion
C_L from Calculated Coefficients of Lift Function



DRAG COEFFICIENT X 100
ANGLE OF ATTACK(RAD) X 100



200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
LIFT COEFFICIENT (CL) X 100
DRAG COEFFICIENT (CD) X 100
C_L from Normal-to-Flight-Path Equation of Motion
C_L from Calculated Coefficients of Lift Function



220.0
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
220.0
240.0
260.0
280.0
300.0
POWER AVAILABLE(FT-LBF/SEC)/1000
AIRSPEED(FT/SEC)

The sample output reproduced here is intended to show generally the type of output which will be obtained from the program, including the final data format and the plotted results. Because only six iterations of the Newton-Raphson procedure were used in the interests of saving computer time and report space, the results are not as accurate as those which can be obtained with additional iterations. As mentioned earlier, with 29 iterations a fit error of 1.33×10^{-13} was obtained in contrast to the present value of 5×10^{-9}. Each additional iteration requires an average of 7 minutes of computer time on the local computer (IBM 370/165). Approximately 4 minutes is required for compilation and linking and 20 minutes for execution of the preliminary procedures, final data computation, and plotting. A full 29 iterations would therefore require about 227 minutes. The results shown here accomplished compile, link, and go in 55 minutes. All times are approximate because actual computational time is dependent on the computer workload at the time the job is processed.

One final note: FDR2 employs the subroutine LLSQAR to solve systems of equations of the type $Ax = b$ by obtaining the pseudo-inverse of A. This is a computing center library routine. It was selected from among the available library routines after some experimentation because it yielded the best results. The superior results are thought to be due to its use of double length words (i.e., 32 decimal digits) for the matrix multiplications and additions, a feature shared by none of the other library routines. Since the A matrices found in FDR2 are always somewhat ill-conditioned, this additional precision is apparently necessary to obtain reasonable results. In fact, additional precision beyond 32 decimal digits would be desirable because tests of the product AA^{-1} or $A^{-1}A$ indicate that the size of the off-diagonal elements may vary from 10^{-7} to 10^{-18} times the size of the diagonal elements. Since the routines which perform the double word arithmetic in LLSQAR are available locally only in assembler versions, they are not reproduced here. The reader desiring to install FDR2 at his own installation should substitute some alternate matrix solver for LLSQAR, taking care to provide at least 32 decimal digit precision.

A NOTE ADDED IN PROOF

It was noted on page 767 that several subroutines of the LLSQAR computer library package were available locally only in assembler versions. Since such versions are not readily transferable to other installations, they were not reproduced for this report. However, during the time the report was undergoing review at the Langley Research Center, it was possible to prepare Fortran versions of these routines. Copies are herewith appended. These routines were written to take advantage of the newly-installed Fortran H-extended compiler. For this reason the reader will note the Implicit Real *16 and Q specifications for the number of digits (35) to be used in calculations. If only 16 digits are available, the Q should be changed to D, the Implicit statement to Real *8, and Z in VXPMUL should read Z = 2.0D0 ** 27. When the calculations are performed on CDC machines in double precision the exponent in Z should remain at 55.

The installation of the extended precision compiler also made it possible to determine the effect of increased precision on the trajectory integration and the Newton-Raphson solution. Using the theoretical coefficients to compute the trajectory the various tolerances obtained were

	Double Precision	Extended Precision
Altitude	$.49921 \times 10^{-11}$	$.4368 \times 10^{-11}$
γ	$.22258 \times 10^{-15}$	$.22071 \times 10^{-15}$
$\dot{\gamma}$	$.26159 \times 10^{-13}$	$.261417 \times 10^{-13}$
Weight	N/A	N/A
Energy	N/A	$.1532055 \times 10^{-9}$
Angle of attack	N/A	N/A

When the extended precision trajectory solution was submitted to the coefficient extraction routine, the fit error with the correct model was 6.375×10^{-14} in contrast to 6.41×10^{-14} with the double precision version. Note that the fit error obtained using the theoretical trajectory data is about 10^{-19}; thus, the use of extended precision yields but a small improvement in the accuracy of the trajectory integration at six times the cost. The improvement in the individual values of $\gamma(t)$ and $\dot{\gamma}(t)$ was also modest, occurring generally in the fifth or sixth significant digit. This would indicate that precision is not a problem (if one carries at least 16 digits); rather the problem appears to lie in the computational method employed. The largest errors are observed to occur where γ is changing rapidly and has an appreciable value. This would suggest that the order of the approximating polynomial in the predictor-corrector should be increased from the current value of 5 to perhaps 7. The initial Runge-Kutta method should then also be increased from 4th order to 7th.

A more significant improvement resulting from the use of extended precision is obtained in the matrix manipulations. As a check, AA^{-1} is calculated after the solution for the change in coefficients. In double precision, the off-diagonal elements may reach 10^{-4}. In extended precision, they are less than 10^{-16}. Values of this low magnitude are necessary before one can confidently accept the calculated changes in the coefficient values.

Also examined during the period the report was under review was the adequacy of the power and drag models for representing the actual flight data. Three changes were found to improve the quantitative fit error and the qualitative agreement with the power and drag determined by steady-state methods by a modest amount:

1. A weight bias of +700 was introduced to account for the weight of the aircrew and other items.

2. A term, $C_{D_7}(\dot{h} + V\dot{V}/g)$, was added to the drag representation to account for the excess power effect on drag due to lift, etc.

3. A factor, $(\sigma_1 - 0.165)/(\sigma - 0.165)$, multiplied the power to a account for altitude changes during maneuvers.

However, a major improvement in both the agreement with steady-state test results and in the fit error was obtained by applying a small bias (<1°) to both α and θ and a small non-linear gain change (0.3% increase at max. value) to θ. The results of these changes are shown in the attached figures. Note that the qualitative agreement with the drag and power obtained by Holmes in steady flight is quite good. Quantitatively, the maximum drag difference is about 4.5% and the power difference is about 2.5%. The fit error of 3.37×10^{-4} is the lowest achieved to date. Additional improvements in fit and agreement with steady-state test results can be expected from further experimentation with gain and bias corrections to α, θ, and W. However, since the effort has been empirical to the present time, progress has been slow and expensive.

It was also possible to try a coefficient extraction with the level flight acceleration data using the same bias values as for the pullup-pushover. Results showed a fairly large fit error and poor qualitative agreement with the data of Holmes until the θ-gain was made $(1 - |\theta|)$. Then the fit error became 2.35×10^{-4} and C_D matched the valued obtained from the pullup-pushover quite closely. Unfortunately, the power was only about 10% greater than that found for the pullup-pushover (see following figures) whereas it should have been considerably higher, the maneuver having been conducted at 4,000' rather than the 11,000' altitude of the pullup-pushover.

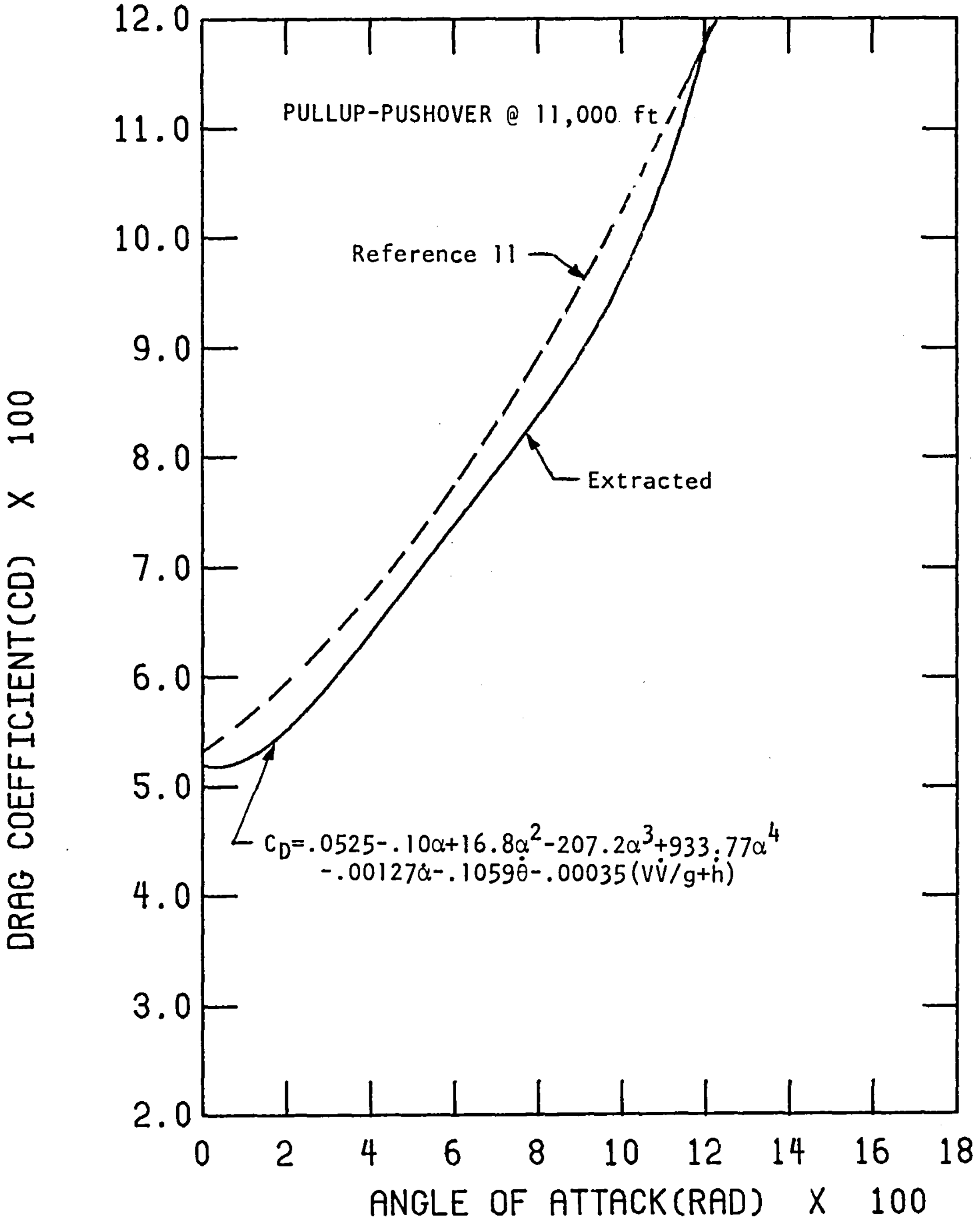
This experience reinforces the earlier evidence that small errors in the α and θ data, and to lesser extend in the V, ρ, and W measurements, can influence the extracted results significantly. It seems evident that these errors must be equalized (so that the data are then relatively self-consistent) before a trajectory matching procedure to determine the proper coefficient values can be employed successfully. It would also seem to be true that the error equalization procedure employed in FDR1 does not yet yield the required degree of self-consistency.

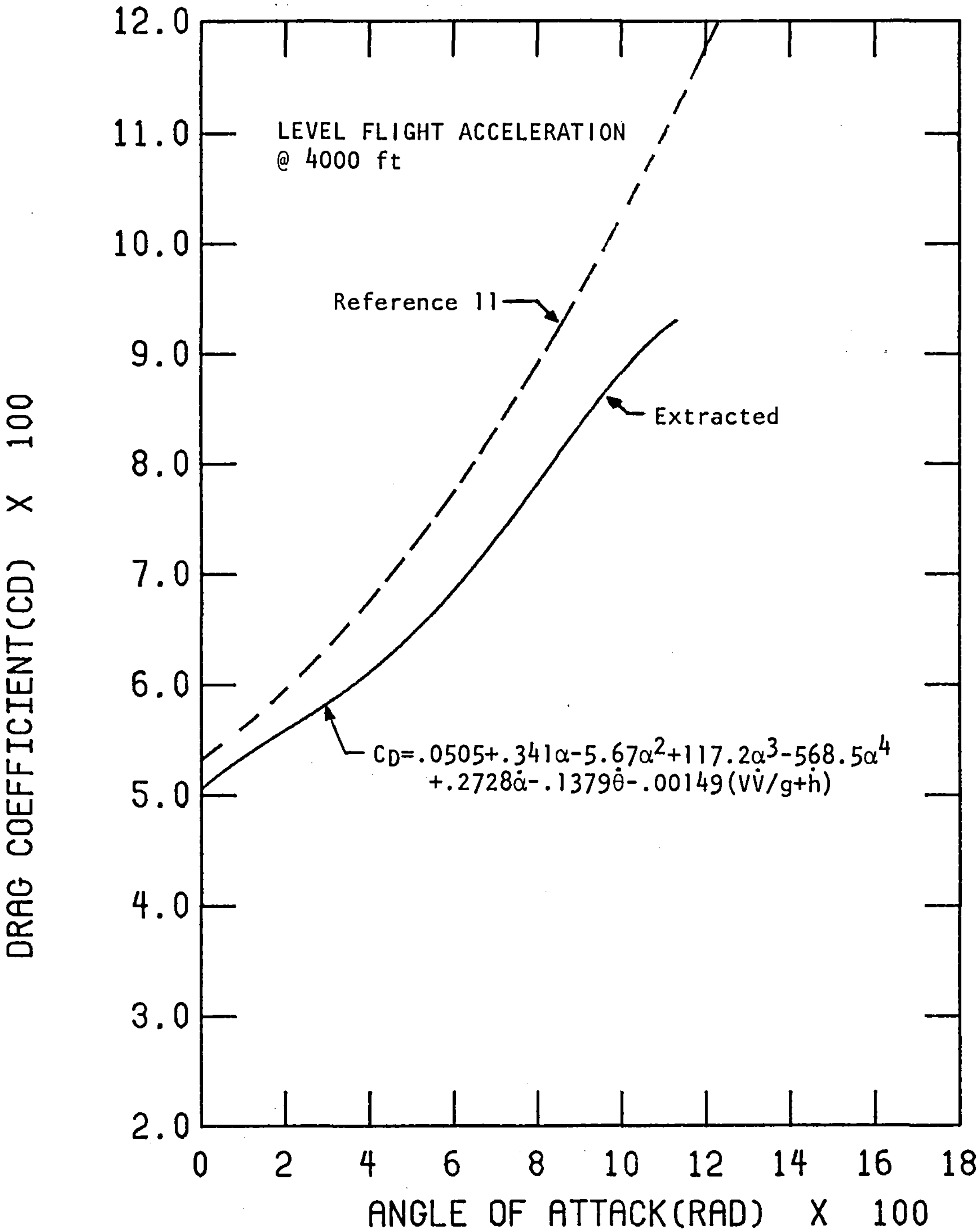
A more extensive discussion of one of the plots is perhaps necessary since the reviewers have raised the question of the significance of the $[-V\dot{V}/g]$ curve shown in several of the figures. In a conservative system, i.e. one in which there is no dissipation of energy by friction, the sum of the potential energy, h, and the kinetic energy, $V^2/2g$, is a constant throughout the flight. The time rate of change of the total energy is zero:

$$\dot{h} + \frac{V\dot{V}}{g} = 0$$

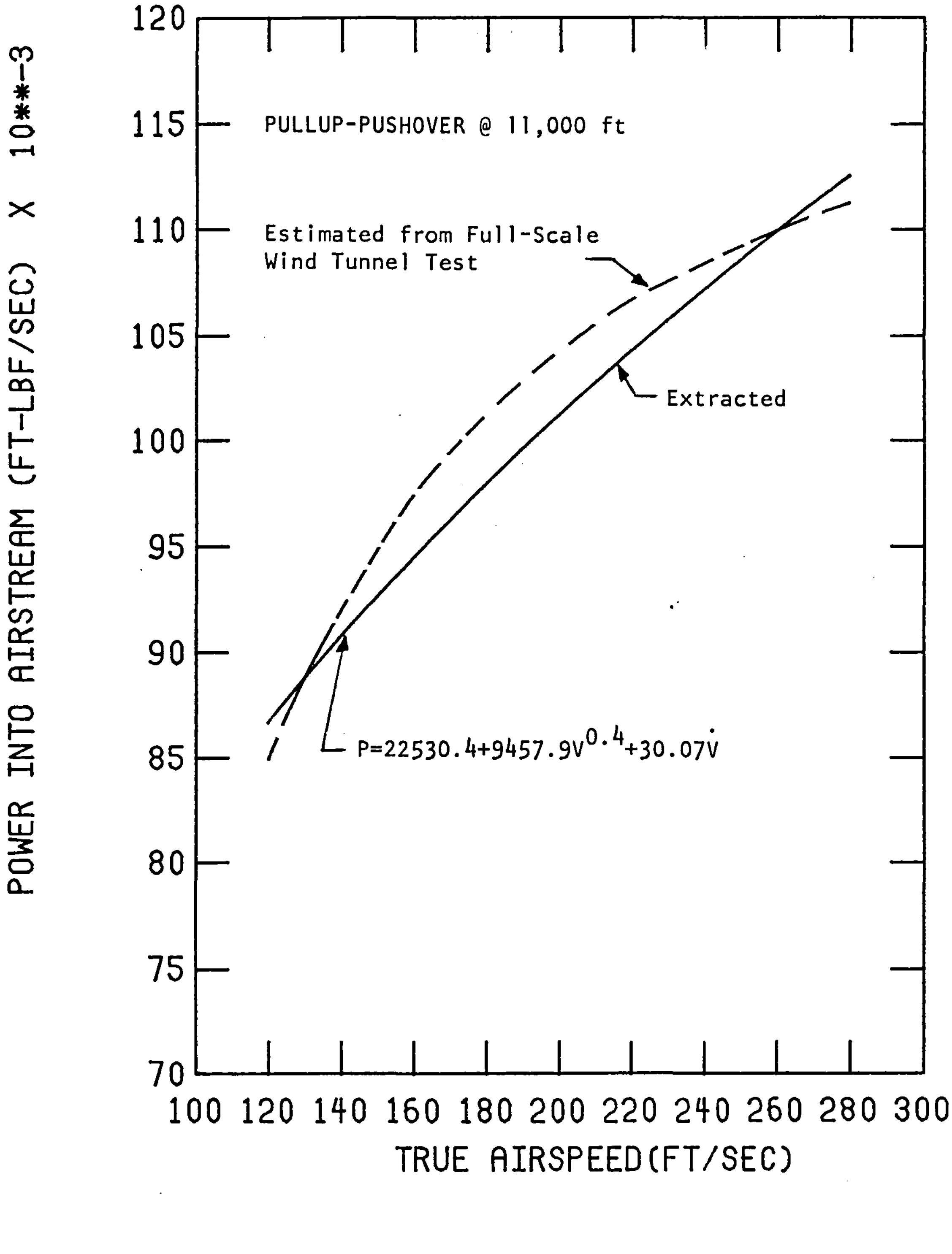
In a conservative system, then, the plots of $\dot{h}(t)$ and $\frac{-V(t)\dot{V}(t)}{g}$ would coincide. Plotting them in this way for a system which dissipates relatively small amount of energy through friction is an indication of how self-consistent the velocity and altitude information is during maneuvers. Note that in figure 39i the kinetic energy "lags" the potential energy until a drift is applied to θ. Then it "leads." Normally one would expect that the potential energy would be greater than the kinetic when thrust exceeds drag as in a pushover. Thus, one would expect that for a pullup-pushover $[-V\dot{V}/g]$ should be the same as $\dot{h}$ or lead slightly if the data are correct.

```
      SUBROUTINE VXPMUL (UU,VV)
      IMPLICIT REAL*16 (A-H, O-Z)
      COMMON/VXP/WM,WL
C
C***  MAKE DOUBLE LENGTH WORDS
      E = 0.0Q0
      IF (UU*VV.LT.0.0Q0) E=1.0Q0
      U=QABS(UU)
      V=QABS(VV)
      Z=2.0Q0**55
      PP=U*Z
      AM=(U-PP)+PP
      AL=U-AM
      PQ=V*Z
      BM=(V-PQ)+PQ
      BL=V-BM
C***  MULTIPLY
      CRM=AM*BM
      CCC=(AM*BL)+(BM*AL)+AL*BL)
      CCM=CRM+CCC
      CCL=(CRM-CCM)+CCC
C***  ADD
      IF(E.EQ.1.0Q)GO TO 5
      RM=WM+CCM
      IF(QABS(WM).GT.QABS(CCM)) SL=(WM-RM)+CCM+CCL+WL
      IF(QABS(WM).LT.QABS(CCM)) SL=(CCM-RM)+WM+WL+CCL
      GO TO 9
C***  SUBTRACT
    5 RM=WM-CCM
      IF(QABS(WM).GT.QABS(CCM)) SL=(WM-RM)-CCM-CCL+WL
      IF(QABS(WM).LT.QABS(CCM)) SL=(-CCM-RM)+WM+WL-CCL
    9 WM=RM+SL
      WL=(RM-WM)+SL
      RETURN
      END

      SUBROUTINE VXPZRO
      IMPLICIT REAL*16(A-H,O-Z)
      COMMON/VXP/WM,WL
      WM=0.0Q0
      WL=0.0Q0
      RETURN
      END

      SUBROUTINE VXPSTO(S)
      IMPLICIT REAL*16(A-H,O-Z)
      COMMON/VXP/WM,WL
      S=WM
      RETURN
      END
```

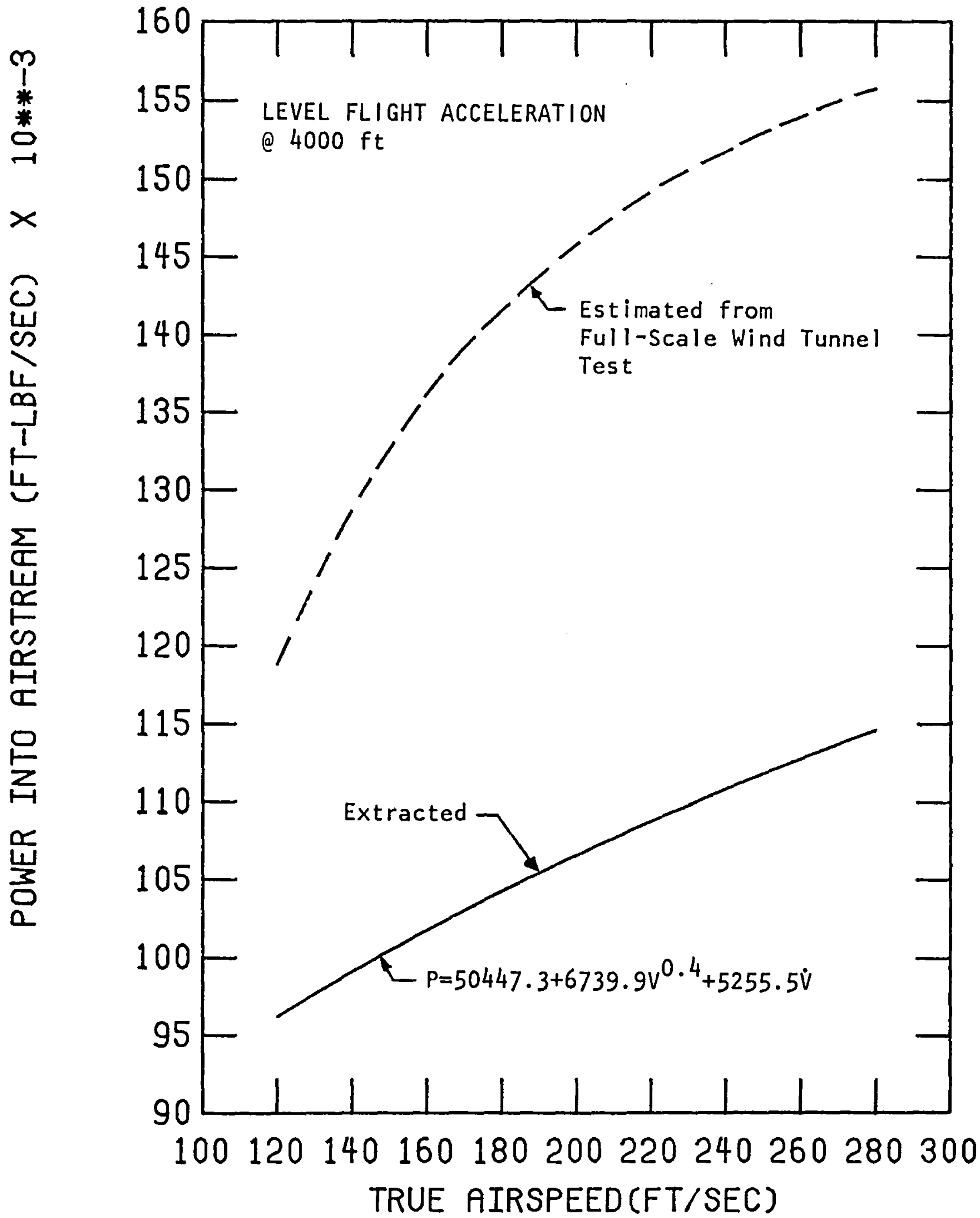

12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
0
2
4
6
8
10
12
14
16
18
PULLUP-PUSHOVER @ 11,000 ft
Reference 11
Extracted
$C_D = .0525 - .10\alpha + 16.8\alpha^2 - 207.2\alpha^3 + 933.77\alpha^4$
$- .00127\dot{\alpha} - .1059\dot{\theta} - .00035(V\dot{V}/g + \dot{h})$
DRAG COEFFICIENT(CD) X 100
ANGLE OF ATTACK(RAD) X 100



LEVEL FLIGHT ACCELERATION
@ 4000 ft
Reference 11
Extracted
$C_D = .0505 + .341\alpha - 5.67\alpha^2 + 117.2\alpha^3 - 568.5\alpha^4 + .2728\dot{\alpha} - .1379\dot{\theta} - .00149(V\dot{V}/g + \dot{h})$
DRAG COEFICIENT(CD) X 100
ANGLE OF ATTACK(RAD) X 100



PULLUP-PUSHOVER @ 11,000 ft
Estimated from Full-Scale Wind Tunnel Test
Extracted
P=22530.4+9457.9V^0.4+30.07V̇
POWER INTO AIRSTREAM (FT-LBF/SEC) X 10**-3
TRUE AIRSPEED(FT/SEC)
120
115
110
105
100
95
90
85
80
75
70
100 120 140 160 180 200 220 240 260 280 300



LEVEL FLIGHT ACCELERATION
@ 4000 ft
Estimated from
Full-Scale Wind Tunnel
Test
Extracted
P=50447.3+6739.9V^0.4+5255.5V̇
POWER INTO AIRSTREAM (FT-LBF/SEC) X 10**-3
TRUE AIRSPEED(FT/SEC)
160
155
150
145
140
135
130
125
120
115
110
105
100
95
90
100 120 140 160 180 200 220 240 260 280 300

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16. Abstract

A new technique was developed which permits simultaneous extraction of complete lift, drag, and thrust power curves from time histories of a single aircraft maneuver such as a pull-up (from V_{max} to V_{stall}) and pushover (to V_{max} for level flight). The technique is an extension of non-linear equations of motion of the parameter identification methods of Iliff and Taylor and includes provisions for internal data compatibility improvement as well. The technique was shown to be capable of correcting random errors in the most sensitive data channel and yielding highly accurate results. Flow charts, listings, sample inputs and outputs for the relevent routines are provided as appendices. This technique was applied to flight data taken on the ATLIT aircraft. Lack of adequate knowledge of the correct full-throttle thrust horsepower-true airspeed variation and considerable internal data inconsistency made it impossible to apply the trajectory matching features of the technique.

17. Key Words (Suggested by Author(s))
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Light aircraft performance

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