

NASA CR-108129
VOLUME III

(B. Hill)

A MATHEMATICAL MODEL FOR VERTICAL ATTITUDE TAKEOFF AND LANDING (VATOL) AIRCRAFT SIMULATION

(NASA-CR-108129-VOL-3) A MATHEMATICAL MODEL
FOR VERTICAL ATTITUDE TAKEOFF AND LANDING
(VATOL) AIRCRAFT SIMULATION. VOLUME 3:
USER'S MANUAL FOR VATOL SIMULATION PROGRAM
(Vought Corp., Dallas, Tex.) 420 p.

181-28000

Includes

35/00 51091

VOLUME III USERS' MANUAL FOR VATOL SIMULATION PROGRAM

BY ROBERT L. FORTENBAUGH

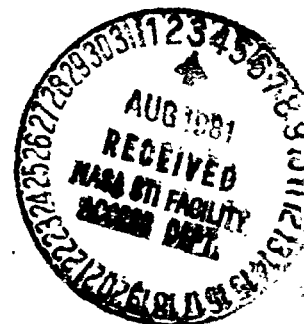
DECEMBER 1980

PREPARED UNDER CONTRACT NAS2-10294 BY

VOUGHT CORPORATION
DALLAS, TX 75265

FOR

AMES RESEARCH CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION



FOREWORD

This document is part of a three volume report prepared under NASA Ames Contract NAS2-10294, Mathematical Modeling for Vertical Attitude Take-Off and Landing (VATOL) Simulation. Volume I: Model Description and Application provides background and details of a generic mathematical model for simulation of VATOL aircraft concepts. A six-degree-of-freedom off-line (non-piloted) digital simulation program incorporating this model was developed and applied to the Vought SF-121 VATOL concept. Volume I gives results of this application which included development and demonstration of a control system for terminal VATOL operations. Volume II: Model Equations and Base Aircraft Data gives all the model equations and SF-121 aircraft data in a simulation data package format. This volume facilitated the development of a piloted VATOL simulation at NASA Ames. Volume III: Users Manual for VATOL Simulation Program provides a description of the six-degree-of-freedom off-line digital simulation program, instructions for its application, and examples of setup decks and output for several of the SF-121 application runs.

Project Monitor for NASA Ames was Mr. Gary Hill. The Principal Investigator for the Vought Corporation was Robert L. Fortenbaugh.

TABLE OF CONTENTS

	<u>Page</u>
Foreword	i
List of Figures	iv
List of Tables	v
1.0 Introduction	1
2.0 VATLAS Program Modules	3
2.1 The Main Program	3
2.2 The Aircraft - Specific Program Modules	3
2.2.1 FORCES	3
2.2.2 SYSEQS	7
2.2.3 DERIVS	13
2.2.4 ERROR	13
2.2.5 LIFDRG	17
2.2.6 WTRUN	17
2.2.7 NAMES	17
2.3 Standard Program Modules	18
2.3.1 TRIM	18
2.3.2 RUNGE	18
2.3.3 BATAN2	18
2.3.4 SIMQ	19
2.3.5 ATMOS	19
2.3.6 PCACT	19
2.3.7 Table Lookup and Interpolation Package	20
3.0 VATLAS COMMON Array	22
4.0 VATLAS Basic Load and Program Options	23
4.1 The Basic Data Load	23
4.2 Program Options	27
4.2.1 Option 1 - Store Lists of Input or Output Parameters	28
4.2.2 Option 2 - Read Data into COMMON Array	29
4.2.3 Option 3 - Write Data from COMMON Array	30
4.2.4 Option 4 - Time History Calculation	31
4.2.5 Option 5 - Time History Plotting	34
4.2.6 Option 6 - Set Up Trim Unknowns	37
4.2.7 Option 7 - Load Variable Formats	39
4.2.8 Option 8 - Trim Calculation	40
4.2.9 Option 9 - Set Up Stability Derivative Variables	41

TABLE OF CONTENTS (Continued)

	<u>Page</u>
4.2.10 Option 10 - Plot a Previously Stored Time History. .	43
4.2.11 Option 11 - Wind Tunnel Calculations	44
4.2.12 Option 12 - Trim Data Summary	45
5.0 Examples of VATLAS Applications	47
5.1 Example 1 - Transition Trim Run	47
5.2 Example 2 - Stationkeeping Time History Run	53
5.3 Example 3 - Wind Tunnel Data Run	53
5.4 Example 4 - Stationkeeping Plot Run	59
6.0 References	69
Appendix A - Definition and Location of COMMON Parameters for the VATLAS Program	A-1
Appendix B - VATLAS Program Listings	B-1
Appendix C - Listings of Basic Data Load Input Cards for VATLAS Application to Vought SF-121 Airplane	C-1
Appendix D - Example 1 (Transition Trim) Output	D-1
Appendix E - Example 2 (Stationkeeping Time History) Output	E-1
Appendix F - Example 3 (Wind Tunnel Data) Output	F-1

LIST OF FIGURES

	<u>Page</u>
1-1 Framework of OLSIM Routine	2
2-1 RCS-Propulsion Syst Interactions Model.	8
2-2 Generic Roll Control System Model	9
2-3 Generic Pitch Control System Model	10
2-4 Generic Yaw Control System Model	11
2-5 Generic Heave Control System Model	12
2-6 Interface of Flight Control System and Actuation System Models. .	14
2-7 Generic Actuator Model	15
2-8 Propulsion System Dynamics and Performance Model	16
5-1 Listing of Example 1 Input Data Deck Without Basic Data Load. . .	48
5-2 Listing of Example 2 Input Data Deck Without Basic Data Load. . .	54
5-3 Listing of Example 3 Input Data Deck Without Basic Data Load. . .	60
5-4 Listing of Example 4 Input Data Deck	61
5-5 Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind"	63

LIST OF TABLES

	<u>Page</u>
2-1 Summary of Decks in VATLAS UPDATE Source File	4
4-1 Symbols Available for VATLAS Time History Plots	36
4-2 Standard Trim Variable Sets for VATLAS Applications	38
4-3 List of Punched Output Data from Option 8 (Trim Calculations) . .	42

1.0 INTRODUCTION

The objective of this document is to provide a description of and instructions for using VATLAS (Vertical Attitude Takeoff and Landing Aircraft Simulation), the digital simulation program for application to vertical attitude takeoff and landing (VATOL) aircraft developed for installation on the NASA Ames CDC 7600 computer system. Details of the VATLAS mathematical models are provided in Volumes I and II of the contract documentation and will not be discussed here. The framework for VATLAS is supplied by Vought's OLSIM (Off-Line Simulation) routine depicted in figure 1-1.

OLSIM is a multi-purpose digital computer program which is used for stability and control analysis and flight control system design analysis in addition to off-line flight simulation. It provides a flexible framework and standardized modules which facilitate the development of off-line aircraft simulations. OLSIM runs under the control of VTOLTH, the main program, which calls the proper modules for executing user-specified options. These options include trim, stability derivative calculation, time history generation, and various input-output options. Standardized modules include TRIM which has a six DOF nonlinear trim capability, RUNGE which performs 4th order Runge-Kutta integration, and various table lookup and matrix computation routines. User supplied aircraft specific modules include FORCES for calculating forces and moments on the airplane, SYSEQS for control system equations and aircraft kinematics, and DERIVS which perturbs the aircraft about trim to generate stability derivatives. VATLAS is the OLSIM routine with the FORCES, SYSEQS, and DERIVS modules specialized to VATOL aircraft.

The aerodynamic model programmed in VATLAS is a modified version of the aerodynamic model described in reference (a). It calculates aerodynamic force and moment coefficients using DATCOM-type relations for all angles of attack and sideslip. To review the aerodynamic coefficients generated by this model, a special wind tunnel option is included in VATLAS. This option provides for the calculation of nondimensional aerodynamic coefficients as functions of angle of attack and sideslip.

This users manual continues in Section 2.0 with brief descriptions of VATLAS program modules. Section 3.0 provides a discussion of COMMON array segmenting which is the key to both understanding VATLAS input-output options and developing other aircraft simulations with the Vought OLSIM framework. The basic VATLAS program load and program options are detailed in Section 4.0. Examples of four commonly used VATLAS run setups are provided in Section 5.0. The examples cover a multi-trim run, a time history run, a wind tunnel run, and a plot run. Appendix A contains a definition of COMMON parameters (by convention, the phrase "COMMON parameters" encompasses program variables and constants) arranged in order by segment, while Appendix B contains listings of all VATLAS subroutines. Note that the program has been heavily commented to facilitate location of specific groups of equations or options.

One final note of advice to the prospective user: Because of its flexibility, VATLAS is not a simple program to learn, but once mastered it provides the familiar user with a powerful analytical tool. Careful study of the examples in Section 5.0 should ease this learning process.

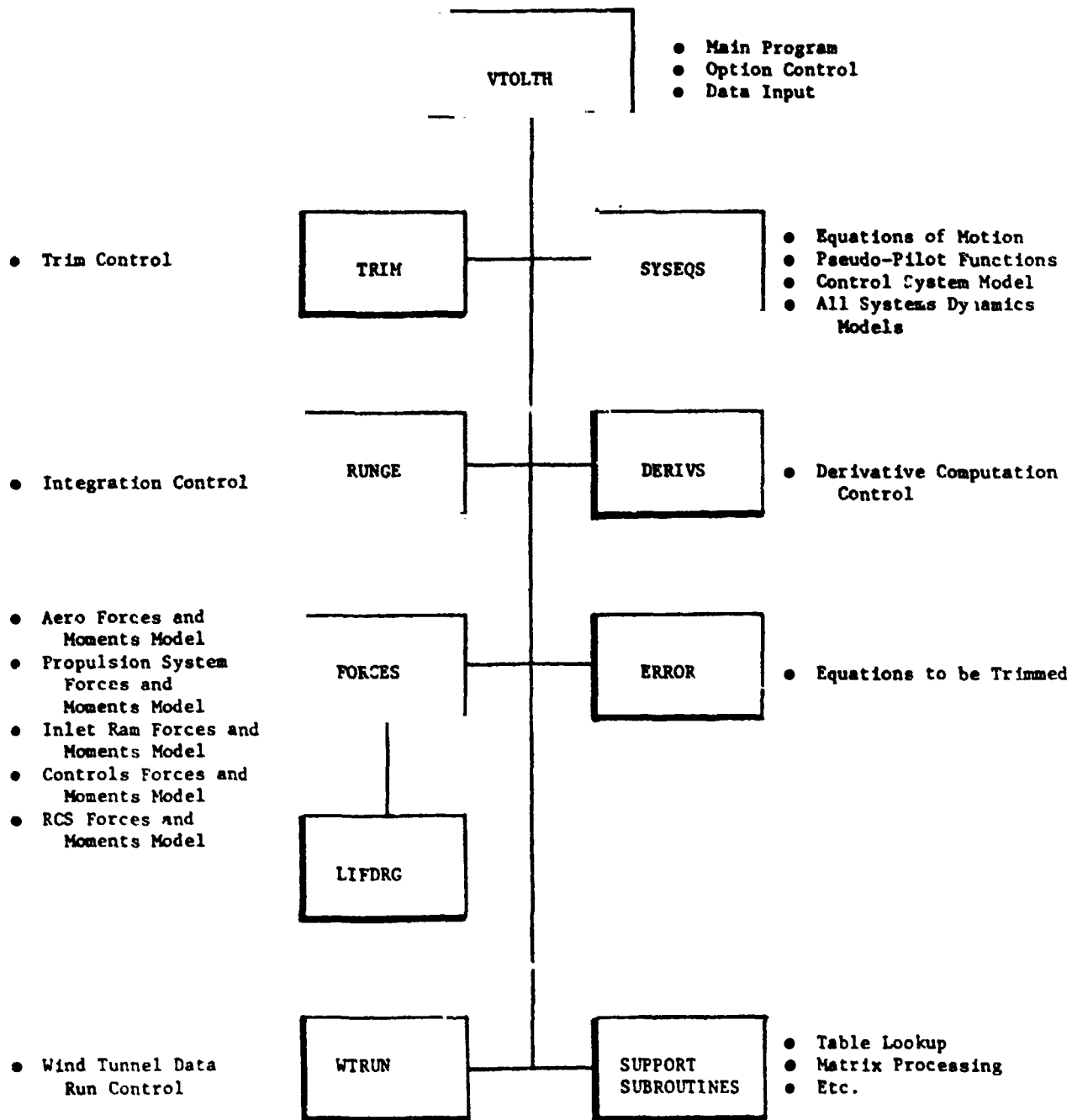


Figure 1-1. Framework of OLSIM Routine

2.0 VATLAS PROGRAM MODULES

The functions of the various VATLAS program modules are described in this section. VATLAS exists as an UPDATE* source file. This facilitates user interaction to modify VATLAS modules (i.e., "decks" in UPDATE terminology) by the use of UPDATE directives. A summary of VATLAS decks, their type and purpose, and their relative frequency of modification, as well as reasons for modification, are given in Table 2-1. Note that many of the decks are designated as "never" modified for VATLAS application. Users not knowledgeable in the application of UPDATE or equivalent utilities are referred to the UPDATE Reference Manual (Reference (b)).

2.1 The Main Program

VTOLTH is the main program module for VATLAS. It controls most of the input and output and all the calculations of the program based upon sequences of program options selected by the user from a group of twelve which are currently available. These options provide for loading or reading data in the COMMON array, specifying trim variables or variables for stability derivative calculations, directing a trim solution or a time history calculation, storing a list of variables for input or output, directing wind tunnel-type calculations with the aerodynamic model, and storing and printing summaries of a series of trim solutions. Specific loading instructions for each of these options and the Basic Data Load (BDL) are given in Section 4.0.

2.2 The Aircraft-Specific Program Modules

The VATOL aircraft-specific program modules include DERIVS, ERROR, FORCES, SYSEQS, LIFDRG, WTRUN, and NAMES. Should the user wish to apply the Vought OLSIM structure to an aircraft other than a VATOL, he would have to develop, as a minimum, the DERIVS, ERROR, FORCES, SYSEQS, and NAMES modules. LIFDRG and WTRUN were specially developed for VATLAS.

2.2.1 FORCES

Subroutine FORCES calculates the forces and moments applied to a VATOL aircraft by aerodynamics, propulsion system, inlet ram, Coriolis effects, and reaction control system (RCS). There is no reason to modify existing FORCES coding for application to any current VATOL concept. Future modifications might include the addition of a capability to calculate aerodynamic forces and moments from tabularized data as an alternative to the current DATCOM-type calculations and the addition of propulsion-induced aerodynamics.

The FORCES aerodynamics model calculates contributions for an aircraft with three lifting surfaces - wing, horizontal stabilizing surface, and vertical stabilizing surface - and a fuselage. Each lifting surface can have trailing and leading edge flaps whose effects are modeled with changes in C_m , C_L , and C_D per unit flap deflection and/or control surface whose

*UPDATE is the CDC utility which creates an easily referenceable source program and provides easily applied directives for modifying this program with a minimum of input. Equivalent utilities are available for other computer systems.

Table 2-1 Summary of Decks in VATLAS UPDATE Source File

UPDATE DECK NAME	DECK TYPE	PURPOSE	RELATIVE FREQ. OF MODIFICATIONS	REASONS TO MODIFY
VTOLTH	Main Program	Option and input/output control	Infrequently	Add/delete program options; input/output mods
TRIM	Subroutine	Controls trim solution	Never	---
RUNGE	Subroutine	Controls integration	Never	---
SETUP*	Entry point in RUNGE	Initializes integrators	Never	---
BATAN2	SUBROUTINE	Determines universe tangent in range Angle	Never	---
SIMQ	Subroutine	Solves system of equations by Gaussian elimination	Never	---
ATMOS	Subroutine	Provides standard and tropical day atmospheric data	Never	---
PCACT	Subroutine	General actuator model with position and rate limiting	Never	---
DERIVS	Subroutine	Stability derivative calculation	Infrequently	When derivatives are required for a variable not available in the 22 provided with the program

* Not an UPDATE deck; contained in the deck immediately above the dashed line.

Table 2-1 (continued) Summary of Decks in VATLAS UPDATE Source File

UPDATE DECK NAME	DECK TYPE	PURPOSE	RELATIVE FREQ. OF MODIFICATIONS	REASONS TO MODIFY
ERROR	Subroutine	Contains force, moment, and kinematic relations to be trimmed	Infrequently	Different trim logic or to add/delete relations to be trimmed.
FORCES	Subroutine	Calculates forces and moments applied to aircraft	Infrequently	Add/delete/modify force and moment calculations. Must be rewritten if new type aircraft other than VATOL is to be modeled.
SYSEQS	Subroutine	Calculates actuation and control system dynamics and aircraft kinematics. Also contains pseudo-pilot functions.	Frequently	Add/delete/modify control system, actuation system, or pseudo pilot functions.
DEQU*	Entry point in SYSEQS	Contains all system differential equations. Called only during time history run.	Frequently	Same as for SYSEQS.
LIFDRG	Subroutine	Generalized lift-drag calculations for lifting surface	Infrequently	Add/delete/modify aerodynamic lift-drag calculations common to all lifting surfaces.

* Not on UPDATE deck; contained in the deck immediately above the dashed line.

Table 2-1 (Completed) Summary of Decks in VATLAS UPDATE Source File

UPDATE DECK NAME	DECK TYPE	PURPOSE	RELATIVE FREQ. OF MODIFICATION	REASONS TO MODIFY
WTRUN	Subroutine	Controls calculation of wind tunnel type program output	Infrequently	Add independent variables other than angle of attack or sideslip.
NAMES	Common deck used in DERIVS, ERROR, FORCES, SYSEQS, WTRUN	Segments and names blank program COMMON	Frequently	Each time a variable or constant is added or deleted from the program.
Plotting package containing PLOTTER, AXIS, BNBCDV, DASLIN, DASPLT, SCALNG	All are subroutines	Controls generation of plots by CALCOMP routines.	Never if local computer system supports CALCOMP routines	If local computer system does not support CALCOMP routines (Required in NASA Ames installation of VATLAS)
Table look-up and interpolation package containing DTLU, STLU, INTRP, INTRP2, INTRP3, INTRP4, SEARCH	All are subroutines	Controls table look-up and interpolation	Never	---

effects are modeled with a change in angle of attack of the lifting surface per unit control deflection. The FORCES propulsion system can have one or two jet engines. Each engine has an inlet, thrust vectoring in two directions, and an independent throttle control. The FORCES RCS can have up to ten individually controlled jets located anywhere on the aircraft and oriented in any direction. Each jet can be specified as demand or continuous bleed. FORCES also models the RCS-propulsion system interactions (figure 2-1) appropriate to continuous and demand bleeding. The FORCES inlet ram model provides for changes in inlet ram magnitude, direction, and application point as functions of angles of attack and sideslip, airspeed, inlet mass flow rate and aircraft rotation rates. The FORCES Coriolis model provides for changes in forces and moments as functions of mass flow rate through the engine ducts and aircraft rotation rates

2.2.2 SYSEQS

Subroutine SYSEQS contains the equations for the aircraft kinematics, flight control system, actuation system and pseudo-pilot functions. SYSEQS will require modification more frequently than any other subroutine primarily because of the great variety of possible control systems and control system/actuation system interfaces. The user should not shy away from exercising his individuality and modifying SYSEQS to his requirements; VATLAS was designed to be easily modified.

The aircraft kinematics in SYSEQS use direction cosines to orient aircraft body axes to inertial space; this avoids the singularity at $\theta = 90$ deg in the standard Euler rate equations. The Euler rate equations are available and integrated in SYSEQS for application as required but are not fed into the kinematics. The integration of the Euler roll and yaw rate equations is suspended when θ is in the range 90 ± 0.00005 deg; this suspension introduces an error each time the appropriate range is encountered.

The flight control system provided in SYSEQS includes the generic roll, pitch, yaw and heave control systems depicted in figures 2-2 through 2-5. Feedback possibilities for moment control include stability and body axis angular rates, Euler angles and integrals of body axis angular rates; for heave control the only feedback is inertial axis heave rate (\dot{z}_e). Inputs from cockpit controllers can be shaped by combinations of gains and integrators to provide rate command, attitude command, or rate command-attitude hold type systems. Forward loop control can be proportional or proportional plus integral. The flight control system includes a switch programmed as a function of airspeed which can be used to change control laws or cockpit controller function as the aircraft enters the hover regime. System gains can be programmed as functions of airspeed or pitch angle. (Airspeed programming is indicated on the control system diagrams.) As shown in Figures 2-2 and 2-4, the control system switch reverses the conventional roles of pedals and lateral stick deflection for hover. In hover the pedals command body axis roll while the lateral stick commands body axis yaw. This role switching is required in a VATOL in which the cockpit is rotated 90 degrees to be parallel to the ground in hover. This is the first concept to be studied in the NASA-Ames piloted VATOL simulations.

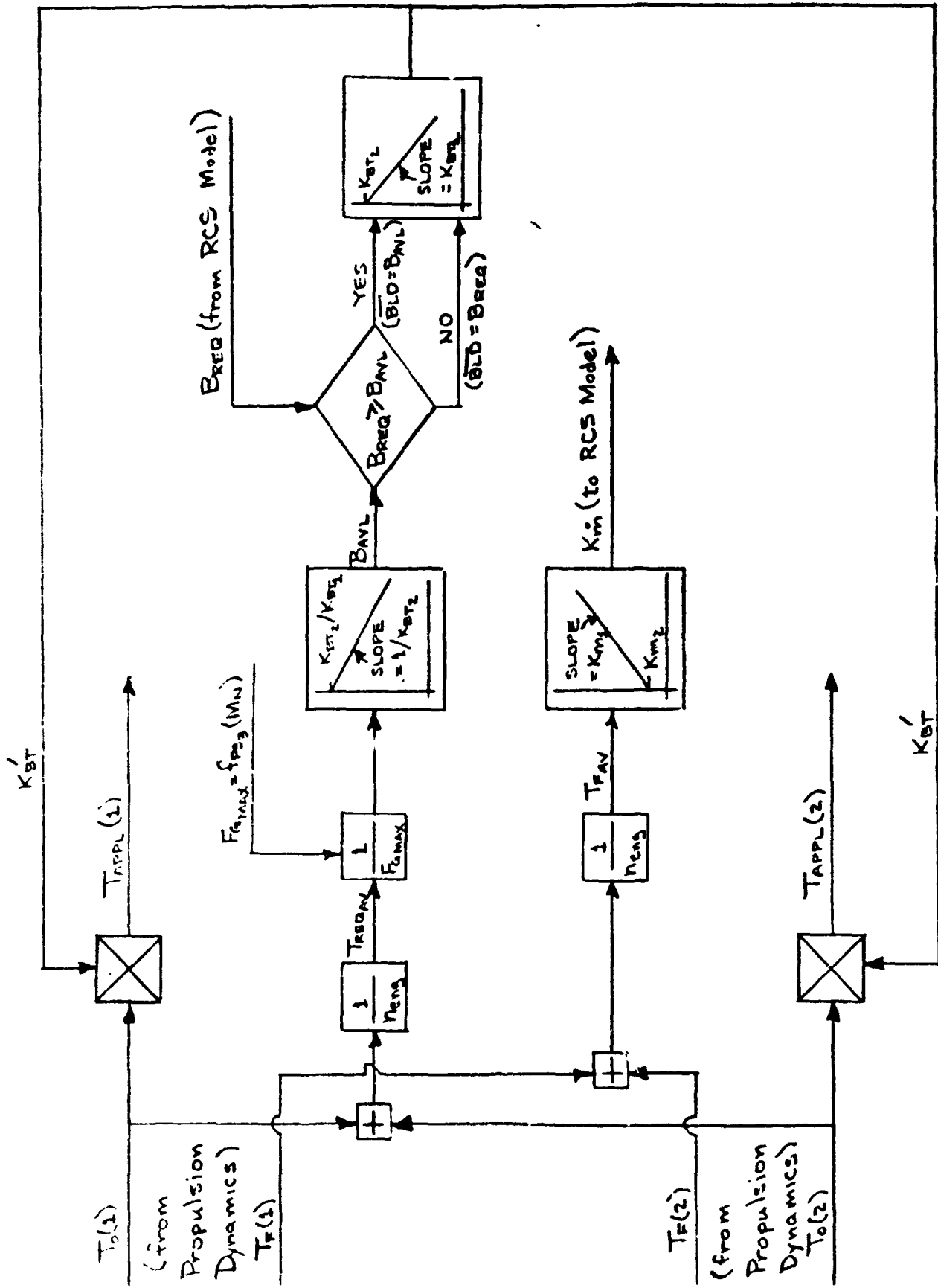
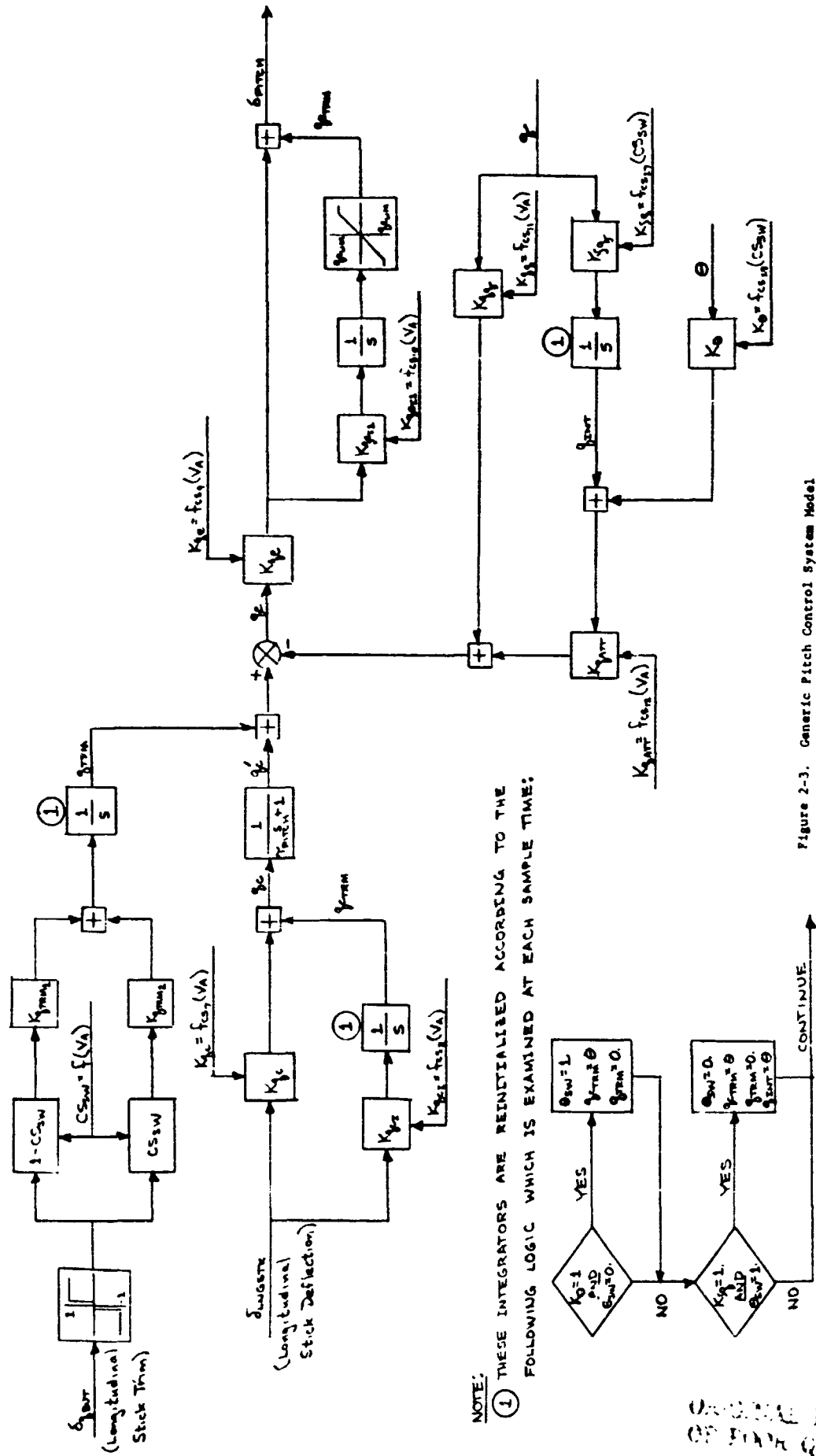


Figure 2-1. RCS-Propulsion System Interactions Model



NOTE: (1) THESE INTEGRATORS ARE REINITIALIZED ACCORDING TO THE FOLLOWING LOGIC WHICH IS EXAMINED AT EACH SAMPLE TIME:

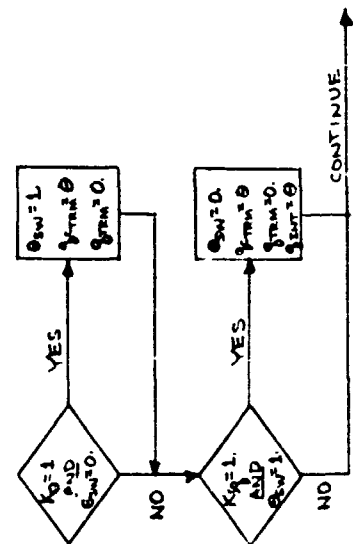


Figure 2-3. Generic Pitch Control System Model

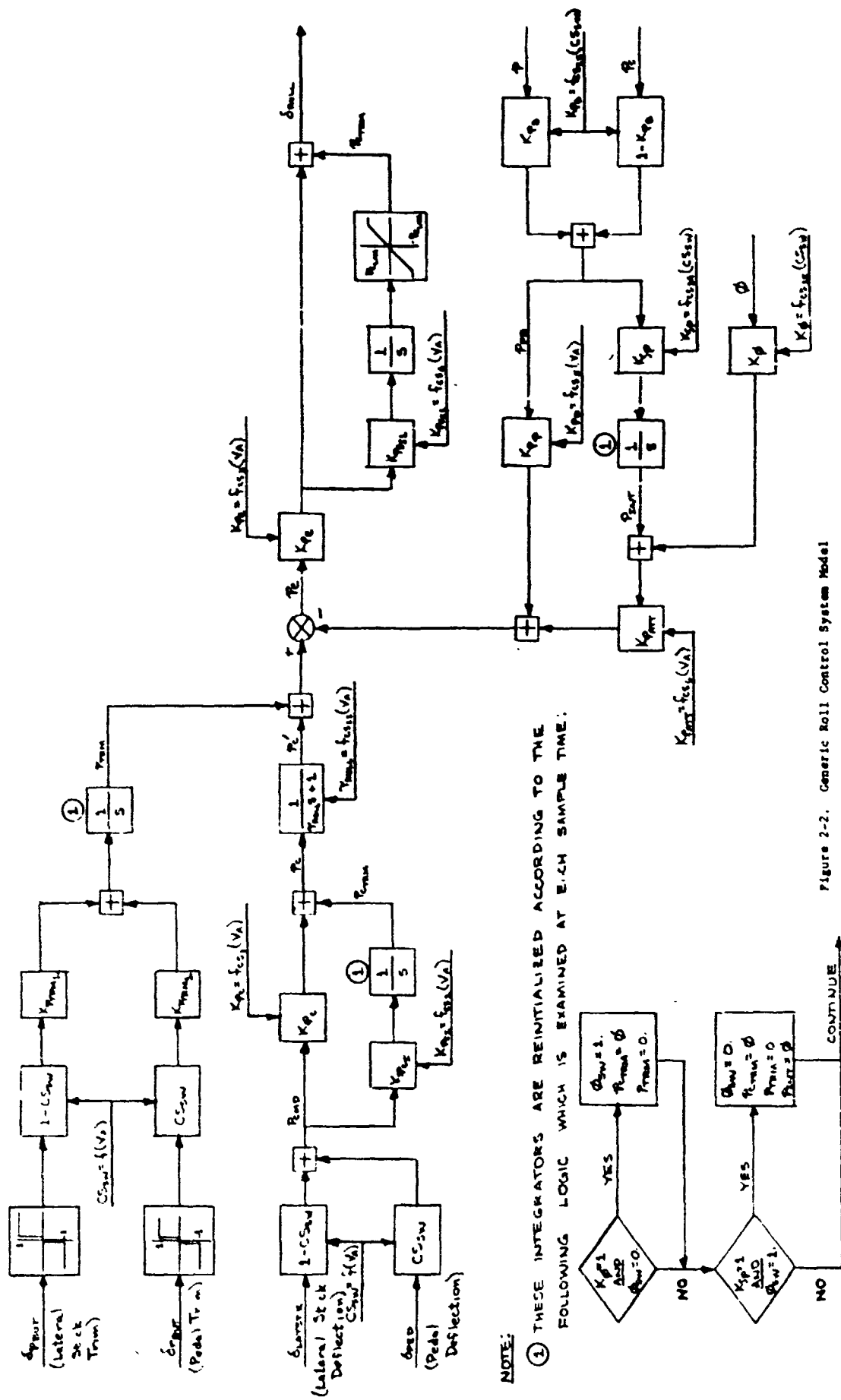
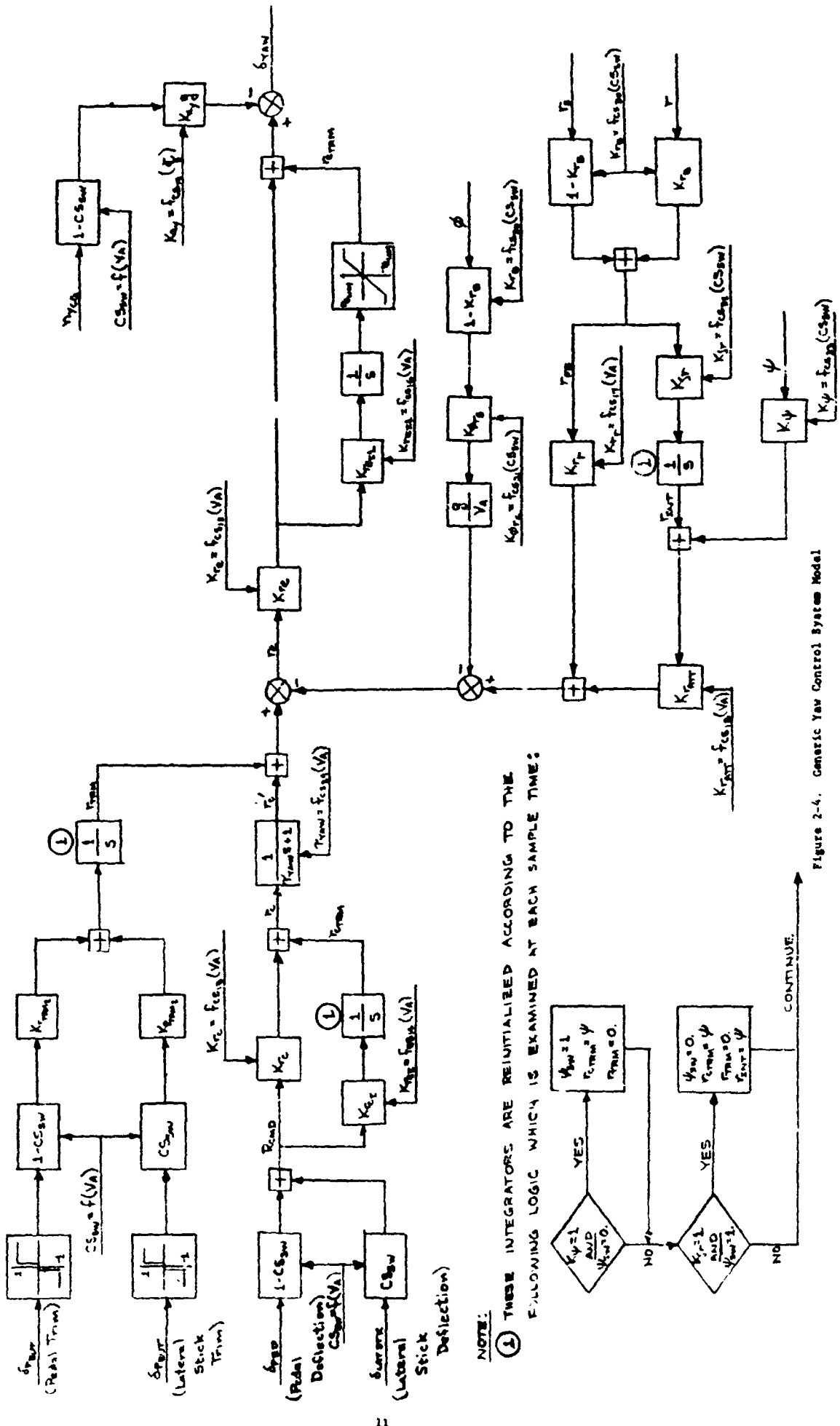


Figure 2-2. Generic Roll Control System Model



NOTE:
 (1) THESE INTEGRATORS ARE REINITIALIZED ACCORDING TO THE FOLLOWING LOGIC WHICH IS EXAMINED AT EACH SAMPLE TIME:

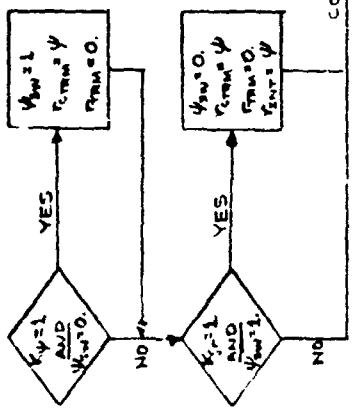


Figure 2-4. Generic Yaw Control System Model

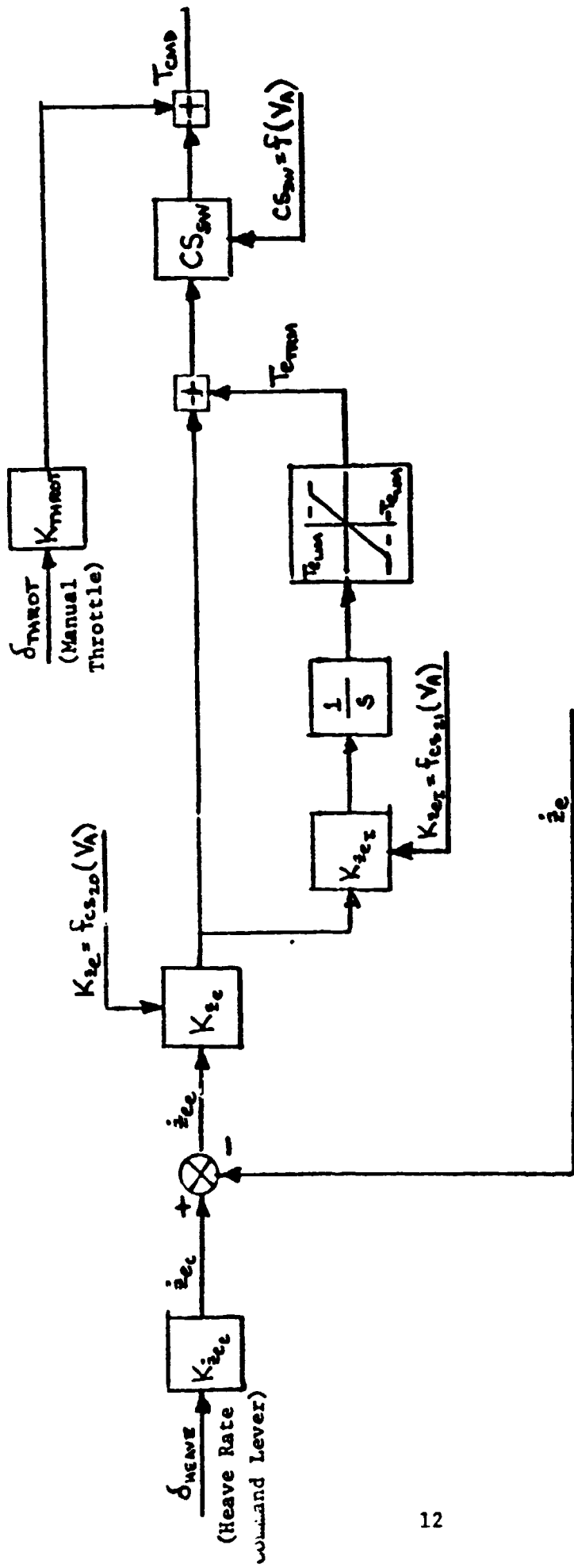


Figure 2-5. Generic Heave Control System Model

CONTROL SYSTEMS
OF SHIP STABILITY

The flight control system/actuation system interface provided in SYSEQS is depicted in Figure 2-6. The programmed aircraft can be controlled via pitch and yaw thrust deflection, thrust modulation, elevons which combine elevator and aileron functions, rudder, leading edge wing flaps, trailing edge horizontal stabilizer (canard) flaps, and RCS. In addition to providing roll control as indicated in Figure 2-6, the RCS will accept pitch, yaw, side force, and normal force commands.

With the exception of thrust commands, all the actuation system commands defined in Figure 2-6 are processed by the generic rate and position limited actuator model shown in Figure 2-7. This actuator model is programmed as subroutine PFACT. The thrust commands are processed by the thrust dynamics model depicted in Figure 2-8.

Subroutine SYSEQS has two sections of equations. One section, entered by a call to SYSEQS, is used only for trim and derivative calculations. The other section, entered by a call to DEQU, is used only during time history calculations and contains most of the differential equations in the simulation. As may be inferred many of the control system statics and control system/actuation interface equations are common to both sections while aircraft kinematics and control system and actuation system dynamics equations appear only in the DEQU section.

2.2.3 DERIVS

Subroutine DERIVS generates aircraft body axis stability derivatives about trim. It is called automatically during the trim program option. Changes in body axis forces and moments (X, Y, Z, L, M, N) are calculated for unit changes in the following variables: body axis airspeed components (u_{AS} , v_{AS} , w_{AS}); body axis rotation rates (p, q, r); elevator; aileron; rudder; wing leading edge flap; horizontal stabilizing surface (canard) trailing edge flap; RCS roll, pitch, yaw, normal force, and side force commands; thrust of each engine; pitch thrust deflection; and yaw thrust deflection. Since these variables encompass a wide range of control concepts, subroutine DERIVS should not require modification during any application of VATLAS. Total derivatives and the contributions to these derivatives from the wing, horizontal and vertical stabilizers, thrust, inlet ram, and RCS are calculated and printed by DERIVS.

2.2.4 ERROR

Subroutine ERROR contains the fifteen equations which must be balanced to attain a six DOF trim solution. These equations include balances between applied forces and linear accelerations, applied moments and angular accelerations, inertial and body axis translation accelerations and rates, and Euler angle rates and body axis rotation rates. ERROR also contains user-selected logic for trimming with or without ambient winds and in turns. ERROR is called only during trimming. To generate the data required for the fifteen trim balances ERROR cycles through FORCES and SYSEQS. ERROR is a fairly general routine and should not have to be modified for any application of VATLAS.

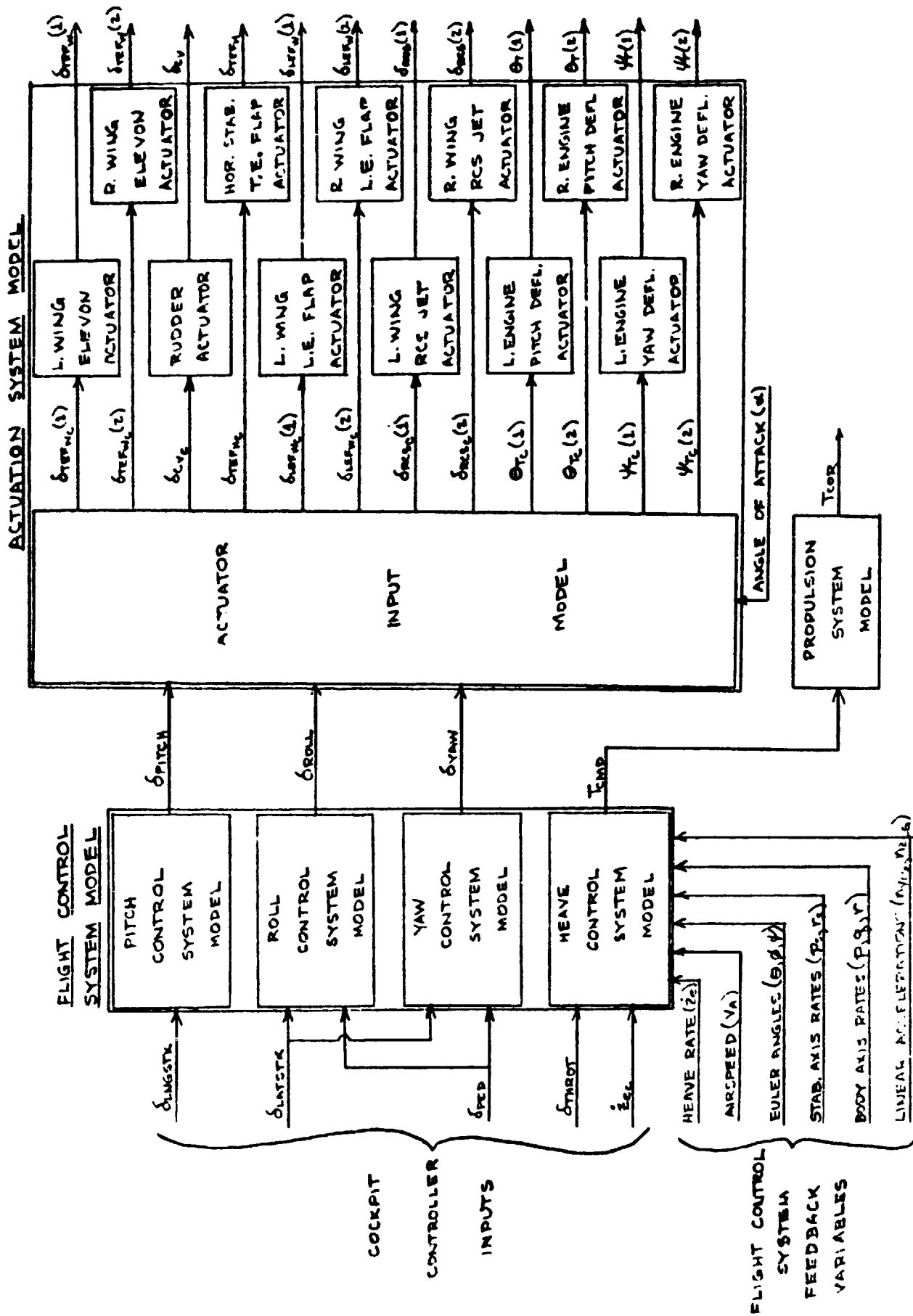


Figure 2-6. Interface of Flight Control System and Actuation System Model

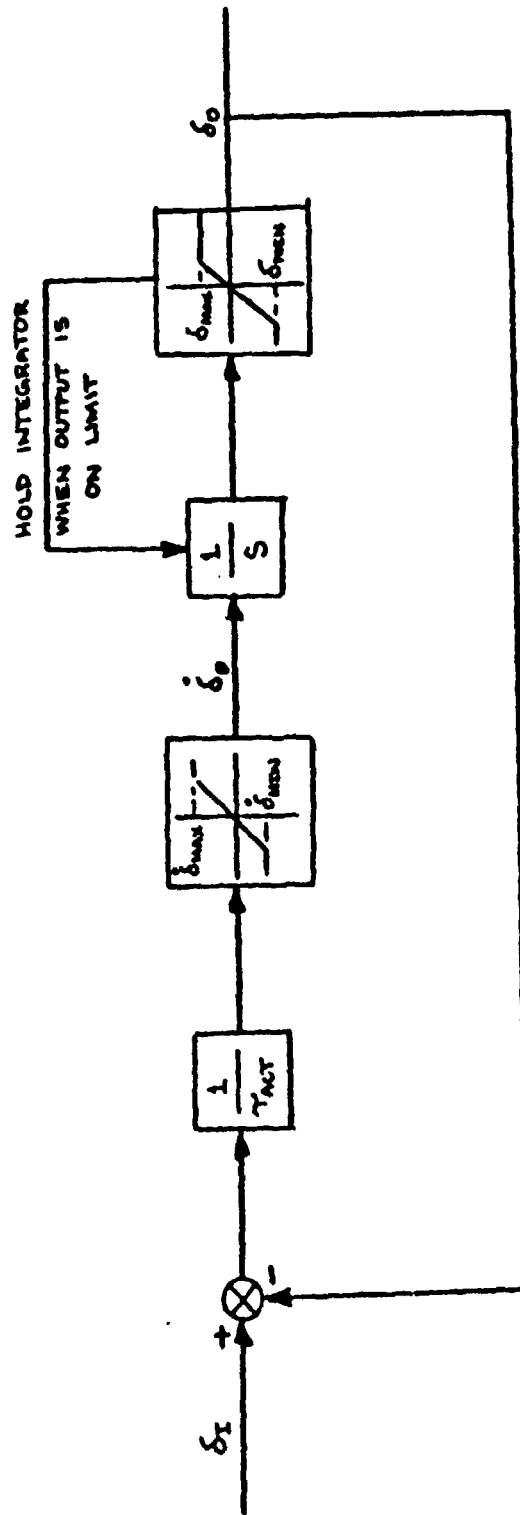
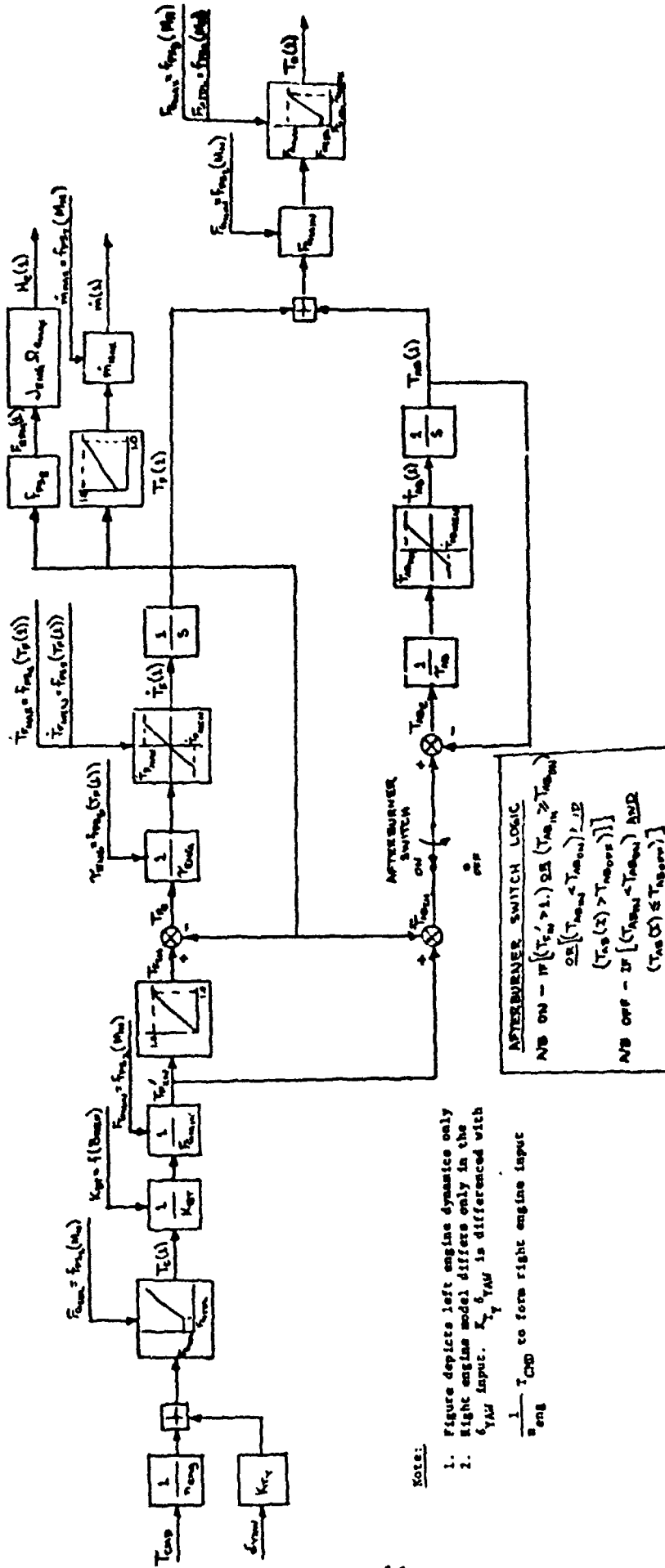


Figure 2-7. Generic Actuator Model



- Note:**
1. Figure depicts left engine dynamics only
 2. Right engine model differs only in the K_T input. K_T τ_{TAU} is differentiated with $\frac{1}{\omega_{eng}}$ to form right engine input

Figure 2-8. Propulsion System Dynamics and Performance Model

2.2.5 LIFDRG

Subroutine LIFDRG contains the generalized equations for calculating the lift, drag, moment, and center of pressure shift of the aero lifting surfaces. LIFDRG requires the surface angle of attack, leading and trailing edge flap deflections, and a series of aero constants to perform these calculations. The module should not have to be modified for any application of VATLAS.

2.2.6 WTRUN

Subroutine WTRUN controls the application of the aerodynamic model equations to generate wind tunnel-type data. Inputs for WTRUN specify the type of sweep to be run, angle of attack (α) or sideslip (β); initial and final angles in the sweep; and the incremental angle between data points. At each data point, total and component (due to wing, fuselage, horizontal stabilizer, and vertical stabilizer) nondimensional stability axis aero coefficients are calculated and printed out. Initial values may be placed on any variables which appear in the aero model so that dynamic derivatives and aero characteristics as functions of α and β can be generated. For example, C_{mq} as a function of α might be generated as follows: Run sweeps with pitch rate (q) = 0 and 0.05 or 0.1 rad/sec then calculate

$$C_{mq}(\alpha) = \frac{C_m(\alpha)|_{q_0=0.05 \text{ or } 0.10} - C_m(\alpha)|_{q_0=0}}{\left[\frac{(0.05 \text{ or } 0.10) c_w}{2 V_A} \right]}$$

where

$C_m(\alpha)|_{q_0 = A}$ is the pitch moment coefficient at α with $q_0 = A$

c_w = mean aerodynamic chord of the wing

V_A = reference airspeed (for convenience $V_A = 100$ ft/sec can be used)

WTRUN should not have to be modified for any application of VATLAS unless the user wants other than α or β sweeps.

2.2.7 NAMES

In UPDATE terminology, NAMES is a COMDECK (common deck). During a FORTRAN compile of the VATLAS UPDATE source file, NAMES is inserted in subroutines DERIVS, FORCES, SYSEQS, ERROR, and WTRUN. NAMES is simply a series of COMMON statements which order VATLAS variables and constants in the blank COMMON reserved by VTOLTH, the main program. As indicated in Appendix B, NAMES is heavily commented to clearly identify COMMON segments. The importance of COMMON segmenting to VATLAS applications will become evident in subsequent sections. Variables and constants listed in NAMES, which constitute over 95% of those used in VATLAS, are available for program input and output under the control of VTOLTH.

2.3 Standard Program Modules

The standardized program modules include TRIM, RUNGE, BATAN2, SIMQ, ATMOS, PFACT, and the table lookup and interpolation package. These modules have withstood the severe testing environment of extensive, critical use at Vought and should not be blamed for VATLAS failures to produce results; the message is "DON'T MODIFY THE STANDARDIZED MODULES." Since several of the modules are available to the user in developing program modifications, the formal parameters in their calling statements are defined below.

The VATLAS plotting package is a standardized module provided the user's computing facility supports the CALCOMP plotting utilities. The NASA-Ames CDC 7600 computing facility does not support CALCOMP, thus modifications to the Vought-supplied plotting module are required. Since the Vought routines have simplified the input data required to generate plots, it is recommended that the Vought input format be retained during these modifications. A description of this format is given in Section 4.0 when VATLAS Program Options 5 and 10 are discussed. An example of a plot deck and the resulting plot is included in Section 5.0.

2.3.1 TRIM

Subroutine TRIM controls the search for trim conditions. It has a six degree-of-freedom trim algorithm based on Newton's method of solving systems of non-linear equations. Instructions for trimming the aircraft in various standard trim conditions (e.g. 1g wings level, constant heading sideslip, coordinated turn, etc.) are provided in the discussion of Program Option 6 in Section 4.0. TRIM is not a user specified module; it is called automatically by Program Option 8.

2.3.2 RUNGE

Subroutine RUNGE controls and applies a 4th order Runge-Kutta algorithm for integration of the VATLAS differential equations during time history runs. Entry point SETUP in RUNGE is called once at the beginning of a time history to initialize all the integrators. RUNGE is not a user specified module; it is called automatically by Program Option 4.

2.3.3 BATAN2

BATAN2 is a function subroutine which determines the inverse tangent of Y/X in the range $-\pi < \tan^{-1}(Y/X) \leq \pi$. It avoids the problems of infinite or indeterminate operands when X = 0 or X = Y = 0. BATAN2 is a user specified subroutine whose application is demonstrated in the following example:

ANGLE = BATAN2 (Y,X)

where ANGLE = $\tan^{-1}(Y/X)$ in rad

2.3.4 SIMQ

Subroutine SIMQ solves a system of linear equations using a Gauss elimination algorithm. It is not a user specified module; it is called automatically during trim calculations.

2.3.5 ATMOS

Subroutine ATMOS provides air density, ambient temperature and pressure, temperature and pressure ratios, and speed of sound as functions of pressure altitude for standard and tropical day conditions. The atmosphere model is the U.S. Standard Atmosphere. ATMOS is user specified with the following statement:

```
CALL ATMOS (ALT, KATMOS, RH0, TAMB, PRESS, TRATIO, PRATIO,  
            VSOUND)
```

where

ALT = pressure altitude, ft

KATMOS = 1 for standard day, 2 for tropical day

RH0 = air density, slugs/ft³

TAMB = ambient temperature, deg R

PRESS = ambient pressure, lb/ft²

TRATIO - temperature ratio

PRATIO = pressure ratio

VSOUND = speed of sound, ft/sec

ALT and KATMOS must be defined before ATMOS is called.

2.3.6 PCACT

Subroutine PCACT implements the generic rate and position limited actuator depicted in figure 2-7. It is a user specified module and is called as follows:

```
CALL PCACT (DIN, DOUT, RLP, RLN, PLP, PLN, TAU, ITRIM, DOUTD)
```

where

DIN - actuator input

DOUT = actuator output

RLP = upper rate limit

RLN = lower rate limit

PLP = upper position limit

PLN = lower position limit

TAU = actuator time constant, sec

DOUTD = rate of change of actuator output

ITRIM indicates whether program is trimming or calculating a time history and is automatically controlled by program.

DIN, RLP, RLN, PLP, PLN, and TAU must be defined before PACT is called.

2.3.7 Table Lookup and Interpolation Package

The table lookup and interpolation module contains seven subroutines; STLU, DTLU, INTRP, INTRP2, INTRP3, INTRP4, SEARCH. Only STLU and DTLU are available for user specification; the other subroutines are called as required during applications of STLU or DTLU. STLU performs single table lookup and interpolation to determine $y = f(x)$ while DTLU performs double table lookup and interpolation to determine $z = f(x,y)$. The call to STLU is as follows:

```
CALL STLU (X, FX, L, XARG, U, KODE)
```

where

X is the table of independent variable values.

FX is the table of dependent variable values.

L is a fixed point constant equal to the number of entries in the X and FX tables. L is the minimum dimension of the X and FX arrays.

XARG is the current value of the independent variable.

U is the current value of the dependent variable.

KODE specifies the type of interpolation to be used; 2 for two point (linear) interpolation, 3 for three point (quadratic) interpolation, 4 for four point (cubic) interpolation. KODE = 2 for calls to STLU currently in VATLAS.

The X array should be loaded in order from smallest to largest value. Furthermore, to avoid indeterminate or infinite operands, two successive X array entries should not be equal.

The call to DTLU is as follows:

```
CALL DTLU (X, Y, FXY, L, M, XARG, U, KX, KY)
```

where

X is the table of the independent variable 1 values.

Y is the table of the independent variable 2 values

FXY is the table of the dependent variable values

L is a fixed point constant equal to the number of entries in the X table. L is the minimum dimension of the X array.

M is a fixed point constant equal to the number of entries in the Y table. M is the minimum dimension of the Y array. FXY must have a minimum of L times M entries.

XARG is the current value of independent variable 1.

YARG is the current value of independent variable 2.

U is the current value of the dependent variable.

KX and KY take on the same values as KODE in STLU and describe the type of interpolation to be applied along the independent variable 1 and 2 axes, respectively.

As for STLU, the X and Y arrays must be loaded in order from smallest to largest value. Similarly, two successive X or Y array entries should not be equal. The FXY table is loaded in the order: $f(X_1, Y_1)$ to $f(X_L, Y_1)$, $f(X_1, Y_2)$ to $f(X_L, Y_2)$, etc to $f(X_1, Y_M)$ to $f(X_L, Y_M)$.

3.0 VATLAS COMMON ARRAY

VTOLTH reserves 12000 words of blank COMMON in a single array called R. The purpose of the NAMES module is to label and arrange the R array with variables and constants used in subroutines DERIVS, FORCES, SYSEQS, ERROR, and WTRUN. These parameters are arranged in logical groupings called segments where, for example, one segment contains all the inlet ram related variables while another contains all the control system variables. A reference to the NAMES portion of the subroutine FORCES listing in Appendix B indicates that the VATLAS COMMON currently has forty five segments which consume approximately 3600 words of the R array.

When developing a new simulation within the OLSIM framework, the user is free to establish as many segments as he desires so long as the number of COMMON parameters does not exceed the 12000 allocated in the R array. With a few exceptions, COMMON segments can be arranged and numbered at will; the exceptions are as follows:

1. Segment 1 always has the same seven parameters which are in order: T, TO, DT, TMAX, DTPRNT, DTPL~~OT~~, TI. These COMMON parameters are defined in Appendix A along with all other parameters of the VATLAS COMMON.
2. Segment 2 contains all the variables to be integrated. At present a maximum of seventy are allowed. VATLAS uses sixty nine of this allocation.
3. Segment 3 contains the integrals of the Segment 2 variables aligned in the same order. Thus there are an equal number of Segment 2 and 3 variables and the first variable in Segment 3 is the integral of the first variable in Segment 2, etc.
4. Segment 5 contains the ranges or tolerances to which each component of the error vector in subroutine ERROR must be driven to achieve trim. These are constants which must be specified in the VATLAS Basic Load. VATLAS allocates nineteen locations for trim tolerances even though only fifteen are required in the trim solution.

For COMMON input and output as occurs in the Basic Load and many of the Program Options, the COMMON parameters are designated by segment number and location within that segment. For example, T is element 1 in segment 1, TMAX is element 4 in segment 1.

4.0 VATLAS BASIC LOAD AND PROGRAM OPTIONS

This section provides loading instructions and descriptions of the Basic Load for VATLAS and each of the program options. Parameters such as NTAP, NTAPD, NTAPW, etc. which refer to input or output file numbers required by VATLAS appear many times in this report section. The only file numbers currently available for use when quantifying these parameters are 1, 2, 3, 4, and 8 through 17. File numbers 5, 6, and 7 have prespecified purposes: file 5 is the INPUT file which contains input data on cards, file 6 is the OUTPUT file which contains data for the output printer, and file 7 is the PUNCH file which contains data to be punched on cards. To make other file numbers available to VATLAS, the first statement in VTOLTH (Appendix B) is modified to include TAPE XX, where XX is the new file number, in its list of formal parameters.

4.1 The Basic Data Load

The Basic Data Load (BDL) specifies how the R or COMMON array is to be segmented, a list of desired output parameters for use with Options 4 or 12, and many of those program constants designated as type N parameters in COMMON (see Appendix A). Data for Option 9 which specifies the variables to be used for stability derivative determination could also be considered in the BDL since these variables are not normally changed in the course of a VATLAS application. The list of output parameters will vary according to the type of run; two separate lists have been developed for VATLAS applications, one for summarizing data from a series of trim cases (Example 1 in Section 5.0) and one for specifying the variables to be stored during a time history run (Example 2 in Section 5.0). Only non-zero type N COMMON parameters require specification since standard run procedure is to initialize computer storage to zero.

The first two cards in the BDL are as follows:

<u>Card</u>	<u>Format</u>							
1	1I5	<table border="1"> <tr> <td>1 - 5</td> <td>6 - 80</td> </tr> <tr> <td>NEQS</td> <td>Blank</td> </tr> </table>	1 - 5	6 - 80	NEQS	Blank		
1 - 5	6 - 80							
NEQS	Blank							
2	2I5	<table border="1"> <tr> <td>1 - 5</td> <td>6 - 10</td> <td>11 - 80</td> </tr> <tr> <td>NTAP</td> <td>NTAPW</td> <td>Blank</td> </tr> </table>	1 - 5	6 - 10	11 - 80	NTAP	NTAPW	Blank
1 - 5	6 - 10	11 - 80						
NTAP	NTAPW	Blank						

where

NEQS is the number (≤ 70) of differential equations in the problem
 = 69 for VATLAS

NTAP is the number of the file which contains the BDL. NTAP = 5
 if the BDL is card input. If NTAP \neq 5, the appropriate file
 must be ATTACHED in the Control Card stream before entering
 VATLAS.

NTAPW is the number of the file where the BDL is to be copied. This allows the BDL to be stored on a file and thus eliminate a significant number of cards in the data deck. If NTAPW = 0 the BDL is not stored. If NTAPW ≠ 0, file NTAPW must be ATTACHED before entering VATLAS, then CATALOGed before ending the Control Card stream to insure that the data will be saved.

These two cards will always be required even though the BDL is stored on a file.

The next few cards in the BDL specify the number of segments in the R array and the number of storage locations in each segment:

Card	Format					
3	16I5	1 - 5	6 - 10	11 - 15	. . .	76 - 80
		NSEG	LENGTH(1)	LENGTH(2)	. . .	LENGTH(15)
4	16I5	1 - 5	6 - 10	11 - 15	. . .	76 - 80
		LENGTH(16)	. . .	. . .	. . .	LENGTH(31)
.				.		
.				.		
.				.		
2+NS	16I5	1 - 5	6 - 10	11 - 15	. . .	76 - 80
		. . .	. . .	. . .	LENGTH(NSEG)	

where

NSEG is the number (≤ 200) of segments in the R array.
= 45 for VATLAS

LENGTH(I) is the number of storage locations in segment I.

NS = $\frac{NSEG+1}{16}$ rounded to next highest integer value. NS = $\frac{45+1}{16} = 2.875 = 3$ for VATLAS

The next subset of BDL cards specify the list of desired output parameters for Option 4 (Time history) or 12 (Trim data summary):

Card	Format						
NS+1	2I5,E10.3,	1 - 5	6 - 10	11 - 20	21 - 25	26 - 30	31 - 78
.	2A5,12A4	I	J	SCAL(1)	LBL(1)	LBL(2)	LABEL
.							
.							
.							

NS+K	2I5,E10.3	1 - 5	6 - 10	11 - 20	21 - 25	26 - 30	31 - 78
.	2A5,12A4	I	J	SCAL(K)	LBL(2*K-1)	LBL(2*K)	LABEL
.							
.							

<u>Card</u>	<u>Format</u>						
NS+NØUT	2I5,E10.3, 2A5,12A4	1 - 5	6 - 10	11 - 20	21 - 25	26 - 30	31 - 78
		I	J	SCAL(NØUT)	LBL(2*NØUT -1)	LBL(2*NØUT)	LABEL

NS+NØUT+1	--	1 - 80
		Blank Card

where

NØUT is the number (≤ 120) output parameters

I is the segment number of the Kth output parameter

J is the element number of the Kth output parameter

SCAL(K) is the constant which scales the Kth parameter before it is output. An example of the use of SCAL(K) follows: most angles in the computer are in radian measure; it is desirable that these angles be output in degrees, therefore SCAL(K) for an angle parameter would be 57.296. In most cases, SCAL(K) will equal 1. since the computer variable has its normal units.

LBL(2*K-1) and LBL(2*K) contain the first five and second five alphanumerics, respectively, in the output parameter name. This name is not constrained to be the same as the coded name of the parameter given in Appendix A.

LABEL is an optional field and is used to further identify an output parameter on the computer printout. LABEL is not stored in the computer but is simply passed from input to output.

The list of output parameters is ended by a blank card. Even if no output parameters are desired (i.e., NØUT = 0), the blank card is required for the program to continue.

The final and usually longest subset of BDL cards directs the loading of the program constants. As noted above these are generally the type N parameters in COMMON. This subset and, equivalently, the BDL is ended by a blank card. The form for loading program constants is as follows:

Card Format
 NS+NØUT+2 4I5,12A4,
 (An input/
 output spec-
 ification
 card)

1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	67 - 70	71 - 80
I	J	K	L	LABEL	Blank	SCALE

NS+NØUT+3 7E10.3
 (A para-
 meter value
 card)

1 - 10	11 - 20	...	71 - 80
Value of COMMON parameter in Segment I Element J	Value of COMMON parameter in Segment I Element J+1	...	Blank

NS+NØUT+2
 +NCARD
 (A para-
 meter value
 card)

7E10.3

1 - 10	11 - 20	...	71 - 80
...	...	Value of COMMON parameter in Segment K Element L	Blank

NS+NØUT+3
 +NCARD 4I5,12A4
 2X,F10.6

1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 70	71 - 80
I	J	K	L	LABEL	Blank	SCALE

Last Card --
 of BDL

1 - 80
Blank Card

where

I, J, K, L specifies that the data contained on the next NCARD cards will fill all the locations in COMMON from Segment I, Element J to Segment K, Element L. Thus NLOC pieces of data must be contained on the NCARD cards.

NLOC is the number of COMMON locations from Segment I, Element J to Segment K, Element L.

NCARD = $\frac{NLOC}{7}$ rounded to next larger whole number. (i.e., to load 40 (=NLOC) locations requires 6(=NCARD) cards.

LABEL allows the user to define what data are being loaded. This will appear on the computer printout and will help identify what the data are. LABEL is simply passed from input to output and is lost when the next LABEL specification is loaded.

SCALE specifies the constant which scales the data on the next NCARD cards before they are loaded into COMMON. For example, aircraft fuselage stations, buttlines, and waterlines are generally given in inches; the computer finds it more convenient to work in feet. Thus SCALE would be 0.0833 and the card data would be in inches for aircraft locations.

Note that if the user does not care to identify his data input other than it is COMMON data, he can load all of COMMON with one specification card where, for VATLAS, I = J = 1, K = 45, L = 170. This would be followed by 513 (NCARD = $\frac{3585 \text{ locations (NLDC) in VATLAS COMMON}}{7}$ = 513) data cards

and a final blank card to end the BDL.

A copy of BDL cards for the VATLAS application to the Vought SF-121 airplane is given in Appendix C. The playback of this information during a computer run is shown in the printouts for Examples 1, 2 and 3 contained in Appendices D, E, and F, respectively.

4.2 Program Options

VATLAS has 12 options for managing program execution, input, and output. These are listed and described briefly below; their use and loading are detailed in subsequent paragraphs:

<u>Option</u>	<u>Function</u>
1	Create a file of input or output data specifications
2	Read data into COMMON array
3	Write data from COMMON array
4	Calculate a time history
5	Plot a time history
6	Set up trim unknowns
7	Load variable formats for trim summary or wind tunnel runs
8	Calculate trim
9	Specify variables for stability derivative calculations
10	Plot a time history stored on a binary file during a previous run
11	Calculate wind tunnel data
12	Print trim data summary

The data cards for each option form independent input modules. These modules are placed after the BDL in the order desired for program execution. Since some options depend on information supplied by other options this module ordering must adhere to certain guidelines. For example, options 4, 5, 8, 11 and 12 cannot be used alone; their application is governed by the following rules:

1. Options 6 and 9 must be placed before Option 8 which means that the aircraft cannot be trimmed until the trim and stability derivative variables have been specified.
2. Option 8 must be placed before Option 4; the aircraft must be trimmed before a time history can be calculated.
3. Option 4 must be placed before Option 5; the time history must be available before it can be plotted.
4. Options 7 and 8 must be placed before Option 12; the aircraft must be trimmed and the formats for printing a data summary, must be available before a trim summary can be printed.
5. Option 7 must be placed before Option 11; the formats for printing wind tunnel data must be available before the data can be printed.

Options 1, 2 and 3 can be used alone and can be placed almost anywhere in the sequence of options. The use of Option 10 requires only that a previously calculated and stored time history is available. It does not require a full BDL and frequently constitutes an entire computer run (i.e. a plot run).

4.2.1 Option 1 - Store Lists of Input or Output Parameters

Option 1 causes a list of input or output parameters to be stored on a local file. This Option is convenient when a series of trims or time histories are produced on a single computer run and the same set of parameters are to be input or output for each trim or time history. The format for Option 1 data cards except the first two and the last is that of an input/output specification card which was described in the section:

<u>Card</u>	<u>Format</u>		
1	1I5	1 - 5	6 - 80
		NØPT	Blank
2	1I5	1 - 5	6 - 80
		NTAP	Blank

Card Format

All others 4I5, 12A4,
except 2X,F10.6
last card
(Input/
output
specifi-
cation
cards)

1 - 5	6 - 10	11- 15	16 - 20	21 - 68	69 - 70	71 - 80
I	J	K	L	LABEL	Blank	SCALE

.
. .
. .

Last card --

1 - 80
Blank Card

where

NØPT is the option number which is equal to 1 in this case.

NTAP is the number of the local file where the input or output list is stored.

The parameters I, J, K, L LABEL, and SCALE were described in Section 4.1. When Option 1 is applied, it must be placed before the trim (Option 8) or time history (Option 4) options.

4.2.2 Option 2 - Read Data Into COMMON Array

Option 2 allows data to be read into the COMMON array under the direction of either a stored (by Option 1) list of input specifications or input specification cards in the input card stream. If a stored list is used then only the parameter value cards need to occur in the input data stream. If a stored list is not used then the parameter value cards are separated by input specification cards in exactly the same way that constants are loaded in the BDL. Option 2 is ordinarily used to initialize aircraft state and control variables; set up pseudo-pilot, control system, or aircraft configuration options; or change aircraft or control system constants before entering a trim, wind tunnel, or time history run. The sequence for Option 2 cards is as follows:

Card Format

1	1I5	1 - 5	6 - 80
		NØPT	Blank
2	1I5	1 - 5	6 - 80
		NTAP	Blank

Card Format

3(NTAP=5) (An input specification card)	4I5,12A4, 2X,F10.6	1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 70	71 - 80
		I	J	K	L	LABEL	Blank	SCALE

3(NTAP≠5)	7E10.3	1 - 10	11 - 20	. . .	71 - 80
		Value of first COMMON parameter specified by first input specification in file NTAP	Value of second...	. . .	Blank

If NTAP = 5, alternately load input specification cards and parameter value cards as required until last card.

If NTAP ≠ 5, load parameter value cards until last card; insure that the parameter value for the first parameter in each input specification on NTAP begins a new card.

Last card ---	1 - 80
	Blank card

where

NOPT = 2 indicating Option 2

NTAP is the number of the local file where the input specifications are found. NTAP = 5 is the INPUT file. NTAP ≠ 5 specifies the file where Option 1 stored the input specification list. The parameters I, J, K, L, LABEL and SCALE were described in Section 4.1.

4.2.3 Option 3 - Write Data from COMMON Array

Option 3 allows data to be written to OUTPUT from the COMMON array under the direction of either a stored (by Option 1) list of output specifications or output specification cards in the input card stream. If a stored list is used then only the first two cards in the Option 3 load are required. If a stored list is not used, then the Option 3 load must

include the appropriate output specification cards. Direct use of Option 3 through the NØPT route is rare in normal applications of VATLAS; instead automatic transfer to Option 3 capabilities is provided in Options 4 and 8 for printing out initial conditions for a time history or trim data at the end of an individual trim case. The sequence for Option 3 cards is as follows:

Card	Format		
1	1I5	1 - 5	6 - 80
		NØPT	Blank
2	1I5	1 - 5	6 - 80
		NTAP	Blank

If NTAP ≠ 5, the output specifications are found on the NTAP file and no more cards are required.

3 (NTAP=5) (An in- put/out- put spec- ification card)	4I5,12A4 2X,F10.6	1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 70	71 - 80
		I	J	K	L	LABEL	Blank	SCALE
.				.				
.				.				
.				.				

Last Card -- (NTAP=5)	1 - 80
	Blank Card

where

NØPT = 3 indicating Option 3

NTAP is the number of the local file where the output specifications are found. NTAP = 5 is the INPUT file. NTAP ≠ 5 specifies the file where Option 1 stored the output specification list.

The parameters I, J, K, L, LABEL, and SCALE were described in Section 4.1 except in this instance SCALE is the constant which scales the COMMON array data specified by I, J, K, L before they are printed.

4.2.4 Option 4 - Time History Calculation

Option 4 controls the calculation of one time history. Multiple time histories during the same computer run require multiple sets of Option 4 input cards. The sequence for one set of Option 4 input cards is as follows:

Card Format

1	1I5	1 - 5	6 - 80
		NØPT	Blank

2	5I5	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 80
		NTAPE(1)	NTAPE(2)	NTAPE(3)	NTAPE(4)	NTAPE(5)	Blank

If (NTAPE(4) = 5), cards 3 to 7 are

3	8A10	1 - 80
		FMT1

4	8A10	1 - 80
		FMT2

5	8A10	1 - 80
		FMT3

6	8A10	1 - 80
		FMT4

7	20A4	1 - 80
		TITLE

If (NTAPE(4) ≠ 5), card 3 is

3	20A4	1 - 80
		TITLE

where

NØPT = 4 indicating Option 4

NTAPE(1) specifies where input specifications are found when Option 4 automatically transfers to Option 2.

NTAPE(2) specifies where output specifications are found when Option 4 automatically transfers to Option 3.

NTAPE(3) specifies the local file where time history calculations are to be stored for plotting

NTAPE(4) specifies where the variable formats (FMT1, FMT2, etc.) are found. If NTAPE(4) = 5, the formats are found in the input card stream. If NTAPE(4) ≠ 5, the formats are found on local file NTAPE(4).

NTAPE(5) specifies where the variable formats are to be stored for future use during multiple time history runs. This parameter eliminates the requirements for cards 3 through 6 in all but the first of several time histories. NTAPE(5) would be nonzero only for the first time history. For subsequent time histories, NTAPE(5) would be zero and NTAPE(4) would be set to the nonzero NTAPE(5) value used in the first time history.

FMT1 is the format used to label the columns of the time history output. This format was the same for all VATLAS applications to date: (7X, 11(2A5))

FMT2 is the format of the data in the columns of the first page of the time history output. This format was also the same for all VATLAS applications to date: (5X, 11F10.3)

FMT3 is the format of the data in the columns of the second and subsequent pages of the time history output. This format was also the same for all VATLAS applications to date and is the same as FMT2: (5X, 11F10.3)

FMT4 is not currently used.

TITLE is the title which will appear at appropriate places in the computer printout.

An automatic transfer to Option 2 occurs after cards 3 or 7 (depending on NTAPE(4)) of the Option 4 load. In this transfer NTAP in Option 2 is set equal to NTAPE(1). This transfer provides for COMMON array changes before the integrators are initialized. The program now expects to see input data equivalent to that beginning at card 3 in the Option 2 load and continuing to the blank last card. If the user does not want to make R array changes he must load a blank card as card 4 or 8 (depending on NTAPE(4)) in the Option 4 card sequence.

The transfer to Option 2 is followed by an automatic call to SETUP to initialize the integrators and then an automatic transfer to Option 3 where NTAP in Option 3 is set equal to NTAPE(2). This transfer provides for printing out any COMMON array parameters before the time history calculations are initiated. The program expects to see input data equivalent to that beginning at card 3 in the Option 3 load and continuing to the blank last card. These data will be found either in the Option 4 input card stream (NTAPE(2) = 5) or in a local file (NTAPE(2) ≠ 5). If the user has not stored an appropriate output specification list and does not want to printout any COMMON array parameters he must load a blank card in the Option 4 card sequence.

Note that the time history output variables which are printed out and stored on local file NTAPE(3) (if NTAPE(3) ≠ 0) are those specified in the output parameter specification section of the EDL.

4.2.5 Option 5 - Time History Plotting

Option 5 controls the plotting of a single series of plots from a single time history run; it must be invoked for each series of plots to be generated. The subroutines which support Option 5 have standardized and simplified the interface with CALCOMP routines. (VATLAS will have to be modified if the user's computer facility does not support CALCOMP utilities.) Option 5 can be invoked in a computer run after a local time history data file has been created by an application of Option 4. When the time history data file is stored on one computer run and then plotted during a subsequent computer run, the Option 5 support subroutines are entered from Option 10. A sample data set and series of plots are provided in Example 4 in Section 5.0 to illustrate the generalized Option 5 inputs described below:

Card Format

1	1I5	1 - 5	6 - 80					
		NØPT	Blank					
2	8A10	1 - 40	41 - 80					
		TITLE1	TITLE 2					
3	2F10.3 4I10	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 80
		XI	YI	NVAR	NØREAD	IØP	ICL	Blank
.	
3+I	3I3,1X, 2A10, 2F10.2, 4F5.1, 2I5	1 - 3	4 - 6	7 - 9	10	11 - 20	21 - 30	31 - 40
		NØ(I)	ISYM(I)	IPT(I)	Blank	HEAD(1,I)	HEAD(2,I)	SV(I)
.	.	41 - 50	51 - 55	56 - 60	61 - 65	66 - 70	71 - 75	
.	.	SDV(I)	B(I)	C(I)	YAØ(I)	X2SHIFT(I)	ITIME(I)	
.	.	76 - 80						
.	.	NTITLE(I)						
.	

Card	Format	1 - 3	4 - 6	7 - 9	10	11 - 20	21 - 30
3+NVAR	3I3,1X, 2A10, 2F10.2, 4F5.1, 2I5	NØ(NVAR)	ISYM(NVAR)	IPT(NVAR)	Blank	HEAD(1,NVAR)	HEAD(2,NVAR)
		31 - 40	41 - 50	51 - 55	56 - 60	61 - 65	66 - 70
		SV(NVAR)	SDV(NVAR)	B(NVAR)	C(NVAR)	YAØ(NVAR)	X2SHFT(NVAR)
		71 - 75	76 - 80				
		ITIME(NVAR)	NTITLE(NVAR)				

where

NØT = 5 indicating Option 5

TITLE1 is the first line of the plot title

TITLE2 is the second line of the plot title

XI directs plotter pen to move from its reference to the left hand side of the first plot in the series. (A single "plot" consists of a suitably labeled and scaled ordinate axis and one or two time history traces. The time (or abscissa) axis may or may not be present.) Positive XI (in inches) moves pen to the right.

YI directs plotter pen to move from its reference to the top of the first plot in the series. Positive YI (in inches) moves pen down the page. The reference point for XI and YI ($X_I = Y_I = 0$) is generally at the upper left corner of the grid.

NVAR is the number of variables (≤ 30) to be plotted. Time must be included as a variable in this count; for example a plot of elevator deflection versus time requires NVAR = 2.

NØREAD \neq 0 means that the next NVAR cards in the Option 5 card sequence should be read; i.e. read cards 3+I to 3+NVAR. NØREAD = 0 means that the current series of plots is to be plotted according to the same instructions as the previous series and cards 3+I to 3+NVAR are eliminated from the Option 5 card sequence.

IØP = 1 for first series of plots, = 0 for all other plot series.

ICL = 1 for last series of plots, = 0 for all other plot series.

NØ(I) is the number of the variable to be plotted as determined from its position in the output specification list of the BDL. The first variable in the NØ(I) array must be time.

ISYM(I) is the number of the CALCOMP symbol to be placed every IPT(I) data point along the time history trace. The fourteen symbols available and their identification numbers are given in Table 4.1. If a symbol is not desired, then ISYM(I) = -1.

IPT(I) is the spacing in terms of data points between the symbols on the time history trace. If **ISYM(I) = -1**, **IPT(I)** is ignored.

HEAD(1,I) and **HEAD(2,I)** define the labeling for the plot axis.

SV(I) is the value of the plotted variable at the lower end of its axis.

SDV(I) is the scale factor of the plotted variable in units/inch
If **SV(I)** and **SDV(I)** are left blank, their values are determined by the **CALCOMP** automatic scaling option.

B(I) is the length of the axis to be drawn for variable **NØ(I)** in inches.

C(I) is the distance in inches down the page between the lower left hand corner of the axis of the plot of variable **NØ(I)** to the upper left hand corner of the axis of the plot for variable **NØ(I+1)**.
C(I) is positive down the page.

YAØ(I) is the distance in inches across the page between **XI** and the ordinate axis of variable **NØ(I)**. **YAØ** is positive to the right.

X2SHFT(I) is the distance in inches across the page between the first point of variable **NØ(I)** (i.e. the value of **NØ(I)** at initial time) and the first point of variable **NØ(I+1)**. **X2SHFT(I)** is positive to the right.

ITIME(I) specifies whether the time axis is to be plotted on the plot for variable **NØ(I)**. If **ITIME(I) = 1**, the time axis is plotted, = 0, the time axis is not plotted.

NTITLE(I) specifies whether **TITLE1** and **TITLE2** are to be printed at the bottom of the plot for variable **NØ(I)**.

Table 4-1 - Symbols Available for VATLAS Time History Plots

<u>ISYM(I)</u>	<u>SYMBOL</u>	<u>ISYM(I)</u>	<u>SYMBOL</u>
0	□	7	⋈
1	⊖	8	∇
2	△	9	∩
3	+	10	⊠
4	×	11	⋆
5	◇	12	⊗
6	⊕	13	|

Two variables can be plotted on the same axis system. This is automatically assumed by the program when the vertical scales for two successive variables are placed at exactly the same place (i.e. $C(I) = C(I+1)$ and $YA\emptyset(I) = YA\emptyset(I+1)$). The second variable, the $(I+1)$ th, will be plotted as a dashed line.

4.2.6 Option 6 - Set Up Trim Unknowns

Option 6 is applied to specify the fifteen independent variables which are to be perturbed to find a trim solution for the fifteen error equations in subroutine ERROR. Several standard sets of trim variables are specified by trim type in Table 4-2. These sets span a wide range of potential VATLAS applications. They do not begin, however, to exhaust all the variable sets which could be developed to trim the aircraft. Applications of two of the standard sets are demonstrated in Examples 1 (Transition Trim Variables) and 2 (Trim in a Wind Variables) in Section 5.0. The input card sequence for Option 6 is as follows:

Card	Format													
1	1I5	<table border="1"> <tr> <td>1 - 5</td> <td>6 - 80</td> </tr> <tr> <td>N\emptysetPT</td> <td>Blank</td> </tr> </table>	1 - 5	6 - 80	N \emptyset PT	Blank								
1 - 5	6 - 80													
N \emptyset PT	Blank													
2	1I5	<table border="1"> <tr> <td>1 - 5</td> <td>6 - 80</td> </tr> <tr> <td>NEQU</td> <td>Blank</td> </tr> </table>	1 - 5	6 - 80	NEQU	Blank								
1 - 5	6 - 80													
NEQU	Blank													
3	4I5,12A4	<table border="1"> <tr> <td>1 - 5</td> <td>6 - 10</td> <td>11 - 15</td> <td>16 - 20</td> <td>21 - 68</td> <td>69 - 80</td> </tr> <tr> <td>I</td> <td>J</td> <td>K</td> <td>L</td> <td>LABEL</td> <td>Blank</td> </tr> </table>	1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 80	I	J	K	L	LABEL	Blank
1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 80									
I	J	K	L	LABEL	Blank									
4	7E10.3	<table border="1"> <tr> <td>1 - 10</td> <td>11 - 20</td> <td>...</td> <td>71 - 80</td> </tr> <tr> <td>DZ(1)</td> <td>DZ(2)</td> <td>...</td> <td>Blank</td> </tr> </table>	1 - 10	11 - 20	...	71 - 80	DZ(1)	DZ(2)	...	Blank				
1 - 10	11 - 20	...	71 - 80											
DZ(1)	DZ(2)	...	Blank											
4+NCARD	7E10.3	<table border="1"> <tr> <td>1 - 10</td> <td>...</td> <td>71 - 80</td> </tr> <tr> <td>DZ(8)</td> <td>DZ(NL\emptysetC)</td> <td>Blank</td> </tr> </table>	1 - 10	...	71 - 80	DZ(8)	DZ(NL \emptyset C)	Blank						
1 - 10	...	71 - 80												
DZ(8)	DZ(NL \emptyset C)	Blank												
4+NCARD +1	4I5, 12A4	<table border="1"> <tr> <td>1 - 5</td> <td>6 - 10</td> <td>11 - 15</td> <td>16 - 20</td> <td>21 - 68</td> <td>69 - 80</td> </tr> <tr> <td>I</td> <td>J</td> <td>K</td> <td>L</td> <td>LABEL</td> <td>Blank</td> </tr> </table>	1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 80	I	J	K	L	LABEL	Blank
1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 80									
I	J	K	L	LABEL	Blank									
4+NCARD +2	7E10.3	<table border="1"> <tr> <td>1 - 10</td> <td>11 - 20</td> <td>...</td> <td>71 - 80</td> </tr> <tr> <td>DZ(NL\emptysetC+1)</td> <td>DZ(NL\emptysetC+2)</td> <td></td> <td>Blank</td> </tr> </table>	1 - 10	11 - 20	...	71 - 80	DZ(NL \emptyset C+1)	DZ(NL \emptyset C+2)		Blank				
1 - 10	11 - 20	...	71 - 80											
DZ(NL \emptyset C+1)	DZ(NL \emptyset C+2)		Blank											
.		.												
.		.												
.		.												
Last Card --		<table border="1"> <tr> <td>1 - 80</td> </tr> <tr> <td>Blank Card</td> </tr> </table>	1 - 80	Blank Card										
1 - 80														
Blank Card														

Table 4-2 Standard Trim Variable Sets for VATLAS Applications

A. Transition Trim Variables			B. Trim in a Turn Variables			C. Trim in a Wind Variables		
Variable Name	COMMON Segment	Location Element	Variable Name	COMMON Segment	Location Element	Variable Name	COMMON Segment	Location Element
ALPH	29	13	ALPH	29	13	U	3	1
BETA	29	14	BETA	29	14	V	3	2
P	3	4	P	3	4	W	3	3
Q	3	5	Q	3	5	P	3	4
R	3	6	R	3	6	Q	3	5
DRØLL	28	20	DRØLL	28	20	R	3	6
DYAW	28	29	DYAW	28	29	DRØLL	28	20
DPITCH	28	38	DPITCH	28	38	DYAW	28	29
XEDØT	2	16	XEDØT	2	16	DPITCH	28	38
YEDØT	2	17	YEDØT	2	17	PSI	3	66
NXCG	29	54	NXCG	29	54	THETA	3	64
NYCG	29	55	NZCG	29	56	NXCG	29	54
NZCG	29	56	THETA	3	64	NYCG	29	55
THETA	3	64	PHI	3	65	NZCG	29	56
TCMD	28	58	TCMD	28	58	TCMD	28	58

These variables will trim the aircraft to a user-specified airspeed (VA) and inertial heave rate (ZEDØT) and generate a standard longitudinal trim condition.

Note that with the exception of PHI replacing NYCG these variables are the same as the transition trim variables. To trim in a turn the user must specify, as a minimum, airspeed (VA) and turn radius (TURN-RAD) and set TRTURN ≠ 0. By additionally specifying lateral acceleration (NYCG), the aircraft will be trimmed in a non-coordinated turn; rate of change of airspeed (VADØT), the aircraft will be trimmed in a turn while decelerating or accelerating and/or flight path angle (GAMMA), the aircraft will be trimmed in a climbing or diving turn.

These variables will trim the aircraft in a hover in an ambient wind from any direction. The user must specify wind direction (PSIWIND) and speed (VWIND) and set AWIND ≠ 0. A head wind is PSIWIND = π rad = 180 deg.

where

$N\emptyset PT = 6$ indicating Option 6

$NEQU = 15$ - number of error equations in subroutine $ERR\emptyset R$

I, J, K, L specifies that all the $COMMON$ variables from Segment I Element J to Segment K Element L are to be trim variables.

$LABEL$ allows the user to identify these variables for printout. $LABEL$ is not stored in the computer and is lost when the next $LABEL$ specification is loaded.

$DZ(I)$ specifies the perturbation to be applied to trim variable I when trim matrix sensitivities to trim variables are calculated. The trim variables are numbered 1 to 15 in the order they are loaded; for example, trim variable 1 is the variable which is specified by card 3 to be Element J in Segment I .

$NL\emptyset C$ is the number of $COMMON$ locations from Segment I , Element J to Segment K , Element K

$NCARD = \frac{NL\emptyset C}{7}$ rounded to next larger whole number.

4.2.7 Option 7 - Load Variable Formats

The formats for printing the wind tunnel option (Option 11) outputs and the trim summary (Option 12) are loaded by Option 7. These sets of formats have been standardized for VATLAS applications and are given in Examples 1 (trim summary formats) and 3 (wind tunnel option formats) in Section 5.0. The input card sequence for Option 7 is as follows:

Card Format

1	1I5	1 - 5	6 - 80		
		$N\emptyset PT$	Blank		
2	8A10	1 - 10	11 - 20	...	71 - 80
		$FMTS(1,1)$	$FMTS(1,2)$	...	$FMTS(1,8)$
.
13	8A10	1 - 10	11 - 20	...	71 - 80
		$FMTS(12,1)$	$FMTS(12,2)$	...	$FMTS(12,8)$

where

NØPT = 7 indicating Option 7

FMTS(I,1), FMTS(I,2),...FMTS(I,8) specifies Ith variable format

There must be 13 cards in the Option 7 load. If less than twelve formats are required, load blank cards to maintain the total equal to 13.

4.2.8 Option 8 - Trim Calculation

Option 8 controls the calculation of trims. The sequence for Option 8 input cards is as follows:

Card Format

1	1I5	1 - 5	6 - 80					
		NØPT	Blank					
2	8I5	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35
		NTAPE(1)	NTAPE(2)	NTAPE(3)	NTAPE(4)	NCASES	NTAPD	IPUNCH
		36 - 40	41 - 80					
		IWRITE	Blank					
3	20A4	1 - 80						
		TITLE						

where

NØPT = 8 indicating Option 8

NTAPE(1) specifies where input specifications are found when Option 8 automatically transfers to Option 2.

NTAPE(2) specifies where output specifications are found when Option 8 automatically transfers to Option 3.

NTAPE(3) specifies where the data for the trim summary option (Option 12) are to be stored.

NTAPE(4) is not used.

NCASES is the number of trims to be calculated.

NTAPD specified where the variables for stability derivative calculations are stored by Option 9.

IPUNCH \neq 0 causes stability derivatives and initial conditions to be punched out for offline linear analyses. IPUNCH = 0 suppresses punched output. The list of data output by this directive are detailed in Table 4-3. This list was developed specifically for the SF-121 airplane application. The list is contained in DERIVS and can be easily altered by UPDATE directives.

IWRITE \neq 0 causes intermediate trim calculations to be printed out as an aid to debugging the program. IWRITE = 0 suppresses the intermediate trim calculations.

TITLE is the title which will appear at appropriate places in the computer printout.

An automatic transfer to Option 2 occurs after the program has read card 3 of the Option 8 load. In this transfer NTAP in Option 2 is set equal to NTAPE(1). This transfer provides for COMMON array changes prior to trimming. The program now expects to see input data equivalent to that beginning at card 3 in the Option 2 load and continuing to the blank last card. If the user does not want to make COMMON array changes he must load a blank card as card 4 in the Option 8 card sequence.

Option 8 next transfers control to the trim routines. When a trim has been found an automatic transfer to Option 3 occurs. In this transfer NTAP in Option 3 is set equal to NTAPE(2). This transfer provides for printing out the trim results. The program expects to see input data equivalent to that beginning at card 3 in the Option 3 load and continuing to the blank last card. These Option 3 data will be found either in the Option 8 input card stream (NTAPE(2) = 5) or in a local file (NTAPE(2) \neq 5). If the user has not stored an appropriate output specification list and does not want to print out any COMMON array parameters he must load a blank card in the Option 8 card sequence.

Also at the end of each trim, the program automatically loads NTAPE(3) (if it is \neq 0) with the values of those parameters specified in the list of output parameters in the BDL. If NTAPE(3) = 0, this procedure is bypassed since the user does not intend to print a trim data summary later in the computer run using Option 12.

The automatic transfer to Option 2 occurs before each trim case specified by the NCASES parameter. Similarly the transfer to Option 3 and loading NTAPE(3) occurs after each trim has been determined.

4.2.9 Option 9 - Set Up Stability Derivative Variables

Option 9 specifies the variables to be perturbed to generate stability derivatives. Since subroutine DERIVS, which controls stability derivative calculations, is fairly general and is based on a specific set of variables,

Table 4-3 List of Punched Output Data from Option 8 (Trim Calculation)

COLUMN CARD	1-10	11-20	21-30	31-40	41-50	51-60	61-70
1	VAS	WAS	Q	THETA	THETD	ALPH	VA
2	IX	IY	IZ	IXZ	WT	JENG	—
3	X/U	X/W	X/Q	X/DE	X/DFW	X/DFC	X/THT1
4	X/THT2	X/T1	X/T2	—	—	—	—
5	Z/U	Z/W	Z/Q	Z/DE	Z/DFW	Z/DFC	Z/THT1
6	Z/THT2	Z/T1	Z/T2	—	—	—	—
7	M/U	M/W	M/Q	M/DE	M/DFW	M/DFC	M/THT1
8	M/THT2	M/T1	M/T2	—	—	—	—
9	Y/V	Y/P	Y/R	Y/DA	Y/DR	Y/PSIT1	Y/PSIT2
10	Y/T1	Y/T2	Y/DRCR	—	—	—	—
11	L/V	L/P	L/R	L/DA	L/DR	L/PSIT1	L/PSIT2
12	L/T1	L/T2	L/DRCR	—	—	—	—
13	N/V	N/P	N/R	N/DA	N/DR	N/PSIT1	N/PSIT2
14	N/T1	N/T2	N/DRCR	—	—	—	—

where:

UAS,WAS = trim airspeed components along X and Z body axes (ft/sec)
 Q,THETD = trim pitch rate (rad/sec)
 THETA = trim pitch angle (rad)
 ALPH = trim pitch angle of attack (rad)
 VA = trim airspeed (ft/sec)
 IX,IY,IZ,IXZ = aircraft moments of inertia (slug ft²)
 WT = aircraft weight (lb)
 JENG = engine rotational moment of inertia (slug ft²)
 I/J = change in I acceleration per unit change in J variable where:
 I = X,Y,Z,L,M, or N and J = U,W,Q,DE,DFW,DFC,THT1,THT2,T1,T2,V,P,R,DA, DR,
 PSIT1,PSIT2, or DRCR
 X,Y,Z = translational accelerations along the X, Y, and Z body axes (ft/sec²)
 L,M,N = angular accelerations about the X,Y, and Z body axes (rad/sec²)
 U,V,W = airspeed components along X,Y, and Z body axes (ft/sec)
 P,Q,R = angular rates about X,Y, and Z body axes (rad/sec)
 DE = aerodynamic pitch control deflection (rad)
 DFW = wing leading edge flap deflection (rad)
 DFC = canard or horizontal stabilizer trailing edge flap deflection (rad)
 THT1,THT2 = pitch thrust deflection of left and right engines (rad)
 T1,T2 = thrust of left and right engines (lb)
 DA = aerodynamic roll control deflection (rad)
 DR = aerodynamic yaw control deflection (rad)
 PSIT1,PSIT2 = yaw thrust deflection of left and right engines (rad)
 DRCR = roll RCS normalized deflection

there should be no reason to ever change that set for any VATLAS applications. Option 9 could be considered, therefore as a part of the BDL. The VATLAS Option 9 data cards are given in the examples of Section 5.0 and are formatted as described below:

<u>Card</u>	<u>Format</u>				
1	1I5	1 - 5	6 - 80		
		NØPT	Blank		
2	1I5	1 - 5	6 - 80		
		NTAPD	Blank		
3	3I5	1 - 5	6 - 10	11 - 15	16 - 80
		I	J	NRD = 1	Blank
.	
.	
.	
3+NVAR	3I5	1 - 5	6 - 10	11 - 15	16 - 80
		I	J	NRD=NVAR	Blank
3+NVAR +1	--	1 - 80			
		Blank Card			

where

NØPT = 9 indicating Option 9

NTAPD is the local file where the variable list is to be stored

I is the segment number of the NRDth variable

J is the element number of the NRDth variable

NRD is the variable number within the list of variables. Normally the variables are loaded in order with NRD beginning at 1.

NVAR is the number of variables to be perturbed to generate stability derivatives. NVAR = 22 for VATLAS.

4.2.10 Option 10 - Plot a Previously Stored Time History

Option 10 controls the plotting of variables from a time history generated and stored during a previous computer run. Its input differs for that of Option 5 only in its first two cards:

Card Format

1	1I5	1 - 5	6 - 80		
		NØPT	Blank		
2	3I5	1 - 5	6 - 10	11 - 15	16 - 80
		NPTS	NØUT	NTAP	Blank

where

NØPT = 10 indicating Option 10

NPTS is the number of time samples in the time history (≤ 302)

NØUT is the number of output variables recorded at each time sample (≤ 120)

NTAP is the local file containing the time history data.

Starting with card 3, Option 10 input is identical to the Option 5 input which begins at card 2. In fact Option 10 transfers to Option 5 as soon as the above two cards are read.

Note that if the only purpose of a computer run is to plot a previously stored time history using Option 10, the output parameter list and the loading of program constants portions of the BDL can be deleted and replaced by two blank cards following that portion of the BDL which defines COMMON segments.

4.2.11 Option 11 - Wind Tunnel Calculations

Option 11 controls the application of the VATLAS aerodynamic model to calculate nondimensional coefficients in stability axes. Before Option 11 can be invoked, the variable formats required to print the wind tunnel calculations must be loaded by Option 7. The standard formats adopted for VATLAS application are given in Example 3 of Section 5.0. The input card sequence for Option 11 is as follows:

Card Format

1	1I5	1 - 5	6 - 80						
		NØPT	Blank						
2	3I5	1 - 5	6 - 10	11 - 15	16 - 80				
		IPITCH	IYAW	NTAP2	Blank				
3	7E10.3	1 - 10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
		AØAØ	DAØA	AØAMAX	PSIØ	DPSI	PSIMAX	VWIND	Blank

where

NØPT = 11 indicating Option 11

IPITCH ≠ 0 indicates that an angle of attack sweep is to be simulated.
IPITCH = 0 indicates angle of attack is to remain constant for the run.

IYAW ≠ 0 indicates that a yaw sweep is to be simulated. IYAW = 0 indicates yaw (sideslip) angle is to remain constant for the run.

NTAP2 is the local file for storing the calculations for later printing.

AØAØ is the initial angle of attack in degrees for an angle of attack sweep run.

DAØA is the angle of attack increment in degrees for the angle of attack sweep.

AØAMAX is the maximum angle of attack in degrees for an angle of attack sweep run.

PSIØ is the initial yaw angle in degrees for a yaw sweep run.

DPSI is the yaw angle increment in degrees for the yaw sweep.

PSIMAX is the maximum yaw angle in degrees for a yaw sweep run.

VWIND is the wind speed in ft/sec. Since the aerodynamics are incompressible and the coefficients are nondimensional VWIND can be set at any nonzero value.

Note that on one application of Option 11, either a yaw sweep or an angle of attack sweep, not both, can be run.

4.2.12 Option 12 - Trim Data Summary

Option 12 controls the printing of appropriate data from a series of trim conditions. The data to be included are designated by the list of output parameters in the BDL and are found on the local file specified as NTAPE(3) in the Option 8 input data. The formats for printing the data on each page (a maximum of 12 pages is allowed) of the data summary are loaded by Option 7. The format for the headings on each page is specified in the Option 12 input. The two cards required to initiate Option 12 are as follows:

<u>Card</u>	<u>Format</u>				
1	115				
	<table border="1"><tr><td>1 - 5</td><td>6 - 80</td></tr><tr><td>NØPT</td><td>Blank</td></tr></table>	1 - 5	6 - 80	NØPT	Blank
1 - 5	6 - 80				
NØPT	Blank				

Card Format

2 8A10

1 - 80
FMT1

where

NOPT = 12 indicating Option 12

FMT1 is the format for printing the page headings for the trim data summary. For VATLAS applications to date FMT1 has been set at (7X, 11(2A5)).

5.0 EXAMPLES OF VATLAS APPLICATIONS

This section presents four examples which demonstrate the application of most of the VATLAS options. Discussions of the examples emphasize the input card deck arrangement and the format of the subsequent printed output and plots. Discussion of the example outputs as they relate to the SF-121 baseline flight control system development is provided in Volume I. The four examples and the Options they apply are as follows:

- o Example 1 - Transition Trim Run (Basic Data Load plus Options 1, 2, 6, 7, 8, 9, and 12)
- o Example 2 - Stationkeeping Time History Run (Basic Data Load plus Options 1, 2, 4, 6, 8, and 9)
- o Example 3 - Wind Tunnel Data Run (Basic Data Load plus Options 2, 7, and 11)
- o Example 4 - Stationkeeping Plot Run (Options 5 - called implicitly by Option 10 - and 10)

An annotated listing of the Basic Data Load cards for the application of VATLAS to the SF-121 airplane is provided in Appendix C. Only the cards which follow the Basic Data Load in the example input decks will be presented in the example discussions.

5.1 Example 1 - Transition Trim Run

The transition trim run demonstrates the application of VATLAS to calculate a series of trim points along a wings level, constant altitude transition of the SF-121 airplane. The trims are at four airspeeds - 200 kt, 180 kt, 160 kt, and 140 kt - in that order. An annotated listing of the input deck is shown in Figure 5-1. Observe that Options 6 and 9 must precede Option 7 and that Options 7 and 8 must precede Option 12 in the input sequence. Also note the use of the SCALE parameter in the cards for Options 1 and 2 to load or print the data in units different from those used in the program. Finally note the placement of Option 2 before Option 8 to establish starting values for the trim at 200 kt. If these values are too far from the actual trim, a trim may not be obtained and the program will abort. In a multiple trim run the starting point for all cases after the first is the immediately preceding trim point. Therefore large steps between two adjacent trim cases should be avoided. For example, the program would likely abort if it is required to step from the 200 kt trim to a 60 kt trim. The user will have to experiment to find starting values and trim increments which are appropriate for his application.

A copy of the output of Example 1 is provided in Appendix D. Items of interest include the playback of the input data for the Basic Data Load and each Option, the stability derivative listing by components, and the trim summary table.

LISTING OF EXAMPLE 1 INPUT DATA DECK WITHOUT BASIC DATA LOAD

OPTION	LOAD	A LIST OF OUTPUT VARIABLES FOR PRINTING TRIM RESULTS	WEIGHT-POUNDS
1	OPTION 1-LOAD	A LIST OF OUTPUT VARIABLES FOR PRINTING TRIM RESULTS	
2	MTAP-ST	ORE AN OUTPUT LIST ON FILE TAPEZ	
4	1	1 WEIGHT-POUNDS	4.440
4	1	1 WEIGHT-NEWTONS	
4	2	5 IX,IV,IZ,IXZ(AIRCRAFT INERTIASI)-SLUG-FT**2	1.355
4	2	5 IX,IV,IZ,IXZ(AIRCRAFT INERTIASI)-KG-M**2	
14	10	10 JENGINE INERTIA)-SLUG-FT**2	1.355
14	10	10 JENGINE INERTIA)-KG-M**2	
29	45	45 ALTITUDE-FT	.3043
29	45	45 ALTITUDE-MET.	
29	10	10 TRUE AIRSPEED-KNOTS	.3040
29	9	9 TRUE AIRSPEED-FT/SEC	
29	9	9 TRUE AIRSPEED-M/SEC	
29	12	12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2	47.00
29	11	11 KACH NUMBER	515.30
29	12	12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2	.5902
29	4	4 RHO(AIR DENSITY)-SLUGS/FT**3	.3000
29	4	4 RHO(AIR DENSITY)-KG/M**3	
29	57	59 XOM,YOM,ZOM(AMB.WIND COMPONENTS-EARTH AXES)KT	.3043
29	57	59 XOM,YOM,ZOM(AMB.WIND COMPONENTS-EARTH AXES)FT/S	
29	57	59 XOM,YOM,ZOM(AMB.WIND COMPONENTS-EARTH AXES)M/S	
2	16	2 16 XEDOT,YEDOT,ZEDOT(FT/S)	.031056
2	16	2 16 XEDOT,YEDOT,ZEDOT(M/S)	.3043
41	4	41 XE2D,YE2D,ZE2D-FT/SEC**2	PARAMETER TO CONTROL
41	4	41 XE2D,YE2D,ZE2D-G	OUTPUT DATA UNITS
41	4	41 XE2D,YE2D,ZE2D-M/SEC**2	.031056
2	1	2 3 UDOT,VDOT,WDOT-FT/SEC**2	.3043
2	1	2 3 UDOT,VDOT,WDOT-M/SEC**2	
2	1	2 3 UDOT,VDOT,WDOT-H/SEC**2	
3	1	3 U.V.M (LINER. SPEED COMPONENTS)FT/SEC	.3040
3	1	3 U.V.M (LINER. SPEED COMPONENTS)M/SEC	
29	1	29 3 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC	.3040
29	1	29 3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC	
29	54	56 NXGG,NYCG,NZCG(BODY AXIS ACCEL.)-GEEES	57.29570
3	4	3 6 P.Q,R(BODY AXIS RATES)-DEG/SEC	57.29570
3	64	3 66 THETA,PHI,PSI(EULER ANGLES)-DEG	57.29570
29	13	29 14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG	57.29570
2	10	2 10 ZD(RATE OF SINK)-FT/MIN	60.000
2	10	2 10 ZD(RATE OF SINK)-FT/SEC	
2	10	2 10 ZD(RATE OF SINK)-M/SEC	.3043
20	20	20 NORM. ROLL CONTROL	
20	29	20 NORM. YAW CONTROL	
20	30	20 NORM. PITCH CONTROL	
3	26	3 27 TMT1,TMT2(THRUST DEFLECTION PITCH ANGLES)-DEG	57.29570
3	24	3 25 PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG	57.29570
3	19	3 19 LEFT ELEVON DEFLECTION-DEG	57.29570
3	20	3 20 RIGHT ELEVON DEFLECTION-DEG	57.29570
20	50	50 ELEVATOR COMMAND DEFLECTION-DEG	57.29570
20	51	51 AILERON COMMAND DEFLECTION-DEG	57.29570
3	26	3 29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)	
20	50	50 TCMD(THRUST COMMAND)-POUNDS	
20	50	50 TCMD(THRUST COMMAND)-NEWTONS	4.440
23	9	23 10 TGOR1,TGOR2(THRUST APPL. TO A/C)-POUNDS	

Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 1 of 5)

23	9	23	10	TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS	4.448
3	21	3	21	RUDDER DEFLECTION-DEG	57.29578
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS	4.448
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS	4.448
26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC	4.448
26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC	4.448
15	3	15	3	BLDREF(REFERENCE RCS BLEED)-PER CENT	4.448
26	7	26	7	BLDAVL	4.448
27	72	27	72	BLO(ACTUAL RCS BLEED)-PER CENT	4.448
3	30	3	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	4.448
3	30	3	39	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	57.29578
11	7	11	7	SIGY(ENGINE CENTER LINE ANGLE WRT FAL)-DEG	4.448
19	44	19	46	MM,LM,NM(ING PITCH,FOLL,YAW MOMENTS)-FT-LB	1.355
19	44	19	46	MM,LM,NM(ING PITCH,FOLL,YAW MOMENTS)-NEWTON-M	4.448
19	37	19	38	XM1,XM2(ING X FORCE)-POUNDS	4.448
19	37	19	38	XM1,XM2(ING X FORCE)-NEWTONS	4.448
19	39	19	40	ZM1,ZM2(ING Z FORCE)-POUNDS	4.448
19	39	19	40	ZM1,ZM2(ING Z FORCE)-NEWTONS	4.448
19	19	19	20	CLM1,CLM2(ING LIFT COEFFICIENT)	4.448
3	46	3	48	DFLAP(CANARD TE FLAP DEFLECTION)-DEG	57.29578
3	49	3	49	DFLAP(ING LE FLAP DEFLECTION)-DEG	57.29578
19	1	19	3	DXM,DYM,DZM(ING AERO FORCES)-POUNDS	4.408
19	1	19	3	DXM,DYM,DZM(ING AERO FORCES)-NEWTONS	1.355
19	4	19	6	OLM,OLM,OLM(ING AERO MOMENTS)-FT-POUNDS	4.448
19	4	19	6	OLM,OLM,OLM(ING AERO MOMENTS)-NEWTON-M	1.355
20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS	4.448
20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS	1.355
20	4	20	6	OLH,OLH,OLH(CANARD AERO MOMENTS)-FT-POUNDS	4.448
20	4	20	6	OLH,OLH,OLH(CANARD AERO MOMENTS)-NEWTON-M	1.355
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	4.448
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	1.355
21	4	21	6	OLV,OLV,OLV(VERT. TAIL AERO MOMENTS)-FT-POUNDS	4.448
21	4	21	6	OLV,OLV,OLV(VERT. TAIL AERO MOMENTS)-NEWTON-M	1.355
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS	4.448
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS	1.355
22	4	22	6	OLF,OLF,OLF(FUSELAGE AERO MOMENTS)-FT-POUNDS	4.448
22	4	22	6	OLF,OLF,OLF(FUSELAGE AERO MOMENTS)-NEWTON-M	1.355
29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS	4.448
29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS	1.355
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS	4.448
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M	1.355
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS	4.448
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS	1.355
23	4	23	6	DLT,DLT,DLT(DIRECT THRUST MOMENTS)-FT-POUNDS	4.448
23	4	23	6	DLT,DLT,DLT(DIRECT THRUST MOMENTS)-NEWTON-M	1.355
26	23	26	24	ME1,ME2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC	4.448
26	23	26	24	ME1,ME2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC	1.355
24	1	24	3	DXR,DYR,DZR(ARM FORCES)-POUNDS	4.448
24	1	24	3	DXR,DYR,DZR(ARM FORCES)-NEWTONS	1.355
24	4	24	6	OLR,OLR,OLR(ARM MOMENTS)-FT-POUNDS	4.448
24	4	24	6	OLR,OLR,OLR(ARM MOMENTS)-NEWTON-M	1.355
26	3	26	4	RPH1,RPH2(ENGINE ROT. SPEED)-RPM	4.448
27	1	27	3	DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS	4.448
27	1	27	3	DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS	1.355
27	4	27	6	OLRCS,OLRCS,OLRCS(RCS MOMENTS)-FT-POUNDS	4.448
27	4	27	6	OLRCS,OLRCS,OLRCS(RCS MOMENTS)-NEWTON-M	1.355
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS	4.448

Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 2 of 5)

25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS	4,449
25	4	25	6	DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS	
25	4	25	6	DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M	1.355
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS	
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS	4,448
29	29	29	31	SUML,SUMM,SUMN(TOT.L MOMENTS)-FT-POUNDS	
29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M	1.355
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS	
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M	1.355

BLANK CARD - END OF OPTION 1 LOAD

9 OPTION 9 LOAD DERIVATIVE QUANTITIES

9 STORE ON TAPE 9

29	1	1	UAS
29	3	2	WAS
3	5	3	G
28	50	4	DEG
3	49	5	DFLAPH
3	48	6	DFLAPH
28	54	7	DRCSF
28	57	8	DRCSF
26	34	9	TO(1)
26	35	10	TO(2)
3	26	11	THT(1)
3	27	12	THT(2)
29	2	13	WAS
3	4	14	P
3	6	15	R
3	21	16	DR
28	52	17	DAG
28	53	18	DRCSR
8	55	19	DRCSY
28	56	20	DRCSSF
3	24	21	PSIT(1)
3	25	22	PSIT(2)

DERIVATIVES ARE TAKEN WITH RESPECT TO THESE VARIABLES

BLANK CARD - END OF OPTION 9 LOAD

6 OPTION 6-SET UP TRANSITION TRIM VARIABLES

15 NEGU-NUMBER OF TRIM UNKNOWNNS

29 13 29 14 ALPHA,BETA

.01745

3 4 .01745 6 P,Q,R

.1 .1 .1

28 20 28 20 DROLL

.05

28 29 28 29 DYAH

.05

28 38 28 38 DPITCH

.05

2 16 2 17 XEDDY,VEDDY

2. 29 54 29 54 NXCG

.1

29 55 29 55 NYCG

.1

29 56 29 56 NZCG

.1

3 64 3 64 TMEYA

.01745

Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 3 of 5)


```

20 50 20 50 TCMD
10.
BLANK CARD - END OF OPTION 6 LOAD
2 OPTION 2-LOAD INITIAL CONDITIONS AND RUN CONTROL VARIABLES
5 NTAP - FIND OPTION 2 DATA ON FILE TAPES-INPUT
41 4 41 5 XE2D,VE2D 32.2
0. 51 0. 41 6 ZE2D 32.2
0. 2 16 2 17 XEOT,YEOT
330. 2 10 2 10 ZECOT
0. 3 10 3 10 ZE
-100. 2 65 2 66 PHID,PSID
0. 3 65 3 66PHI,PSI .01745
0. 3 64 3 64 THETA .01745
9.5 20 20 24 20 DRCLL
0. 20 27 20 29 DYAM
0. 20 30 20 30 OPITCH
0. 29 54 29 56 HXCG,MYCG,NZCG
0. 20 50 20 50 TCMD 1.609
6000. 29 9 29 9 YA .01745
200. 29 13 29 13 ALPH
9.5 1 3 1 7 DT,THAX,DT,PRINT,OT,PILOT,II
.025 0. 05
41 1 41 1 ANIMO
0. 41 2 41 2 VMIND 1.609
0. 41 7 41 7 YRNTURN
0. 41 10 41 10 TURNRAO
2640. 41 8 41 9 GAMMA,VADOT
43 7 43 7 ASKEEP
0. 16 7 16 12 AKU,AKV,AKH,AKES,AKVES,AKZES
43 129 43 129 ATRANS 2. .085
0. 43 6 43 6 ATIME
0. 43 132 43 139 TMR0TY(10)
.546 .553 .53 .173 .0033 .067

```

THESE DATA PROVIDE
STARTING VALUES
FOR THE TRIM SOLUTION

THE REMAINDER OF
THE DATA IN THIS
CALL TO OPTION 2
CONTROL THE TYPE
OF RUN AND SPECIFY
CONTROL INPUTS

Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 4 of 5)

```

.067 43 162 43 149 VAT(10) 60. 80. 100. 120. 1.589
0. 20. 40. 100. 100. 100.
200.
182. 43 152 43 159 THETCT(10) 66.89 36.65 22.72 16.3 .01745
8.24
43 1 43 5 ACMD(1)
1. 2.
43 9 43 16 CMO1(1)-OLNGSTK INPUT TABLE 0. 0. .01745
0. 10. 10. 0. 0.
43 29 43 36 CMO2(1)-DLATSTK INPUT TABLE 0. 0. .01745
0. 10. 10. 0. 0.
43 49 43 56 CMO3(1)-DPED INPUT TABLE 20. 20. 20. .01745
0. 20. 20. 20.
43 69 43 76 CMO4(1)-ZEDTC INPUT TABLE 10. 10. 0.
0. -10. -19.
43 89 43 96 CMO5(1)-THRATTLE INPUT TABLE 0. 0. 0.
0. 0. 0. 0.
43 109 43 116 TIMET(1)-INPUT CONTROL TIME TABLE 1.7 1.7 1.71
.3 .31 1. 1.01
40.

1 OPTION 1-LOAD PRIMARY TRIM PARAMETERS
1 MAP-STORE OPTION DATA LIST ON FILE TAPE1
29 9 29 9 VA AIRSPEED (IN KT) IS THE PRIMARY TRIM PARAMETER 1.589
TRIM SUMMARY DATA STORED ON TAPE1
TRIM OPTION 9 INCREASES
EXAMPLE 1 - TRANSITION TRIM RUN ON TAPE1
TRIM OUTPUT DATA SPECIFICATIONS ON TAPE1
(VA TRIM SPECIFICATION ON TAPE1)
NCASES=4, THEREFORE 4 TRIM AIRSPEEDS SPECIFIED
OPTION 7-LOAD FORMATS FOR PRINTING TRIM SUMMARY
(4X.F8.0.2X.10F10.2)
(4X.F8.0.2X.10F10.2)
(4X.F8.0.2X.10F10.2)
(4X.F8.0.2X.10F10.2)
(4X.F8.0.2X.10F10.2)
(4X.F8.0.2X.10E10.3)
(4X.F8.0.2X.10E10.3)
(4X.F8.0.2X.10E10.3)
(4X.F8.0.2X.10E10.3)
(4X.F8.0.2X.10E10.3)
(4X.F8.0.2X.10E10.3)
12 OPTION 12-TRIM DATA SUMMARY PRINTOUT
(7X.1112A51)

```

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Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 5 of 5)

5.2 Example 2 - Stationkeeping Time History Run

The stationkeeping time history run demonstrates the application of VATLAS to calculate the time history of a pseudo-pilot-controlled turn over a spot while hovering in a 35 kt wind. An annotated listing of the input deck is shown in Figure 5-2. The following items should be observed:

1. Options 6 and 9 must precede Option 8 in the input data deck and all three Options must precede Option 4.
2. The run uses pseudo-pilot-controlled stationkeeping logic thus the parameters AKU, AKV, AKW, AKXES, AKYES, and AKZES (Segment 16, elements 7-12) and ASKEEP (Segment 43, element 7) must be specified in the input deck before Option 4. Note that several of these parameters were specified in the Example 1 input deck (Figure 5-1); they were ignored, however, since the example did not include a time history.
3. An open-loop pseudo-pilot input to the pedal is used to rotate the airplane, thus the parameter ACMD(1) (Segment 43, element 1) and the entries in tables CMDT3 and TIMET (also in Segment 43) must also be specified before Option 4. Note that these parameters also had values but were ignored in Example 1 (Figure 5-1).
4. Example 2 requires a trim in a wind, thus the appropriate set of trim variables (Table 4-2) are introduced by Option 6. Furthermore, the parameters AWIND, VWIND, and PSIWIND (Segment 41, elements 1-3) must be specified before or with Option 8.
5. Since Example 2 is a time history, appropriate values for the integration control parameters in COMMON Segment 1 must be specified before invoking Option 4. These parameters had values in Example 1 (Figure 5-1) but were not required and thus ignored.

A copy of output of Example 2 is provided in Appendix E. The information is similar to that of Example 1 with the notable addition of the time history printout. The time history data were stored during the Example 2 run on local file TAPE4. This file was CATALOGed as a permanent file by the control cards for the run. The file was ATTACHED in Example 4 to demonstrate the use of the VATLAS plotting capability.

5.3 Example 3 - Wind Tunnel Data Run

The wind tunnel data run demonstrates the application of VATLAS to calculate six degrees of freedom stability axis wind tunnel data for the SF-121 airplane. Example 3 directs the execution of four wind tunnel runs: two on each of two different airplane configurations. For each configuration an angle of attack sweep from 0 to 90 deg in 5 deg increments at zero yaw angle and a yaw sweep from 0 to 90 deg in 5 deg increments at zero angle of attack are made; these runs require separate calls to Option 11. The configuration was set up by application of Option 2: the first configuration allows for the determination of pitch control effectiveness at symmetrical

LISTING OF EXAMPLE 2 INPUT DATA DECK WITHOUT BASIC DATA LOAD

OPTION	LOAD	A LIST OF OUTPUT VARIABLES FOR PRINTING TRIM RESULTS	NTAP-ST OR AN OUTPUT LIST ON FILE TAPE
1	1	1	1
2	1	4	1
3	1	4	1
4	1	4	1
5	1	4	1
6	1	4	1
7	1	4	1
8	1	4	1
9	1	4	1
10	1	4	1
11	1	4	1
12	1	4	1
13	1	4	1
14	1	4	1
15	1	4	1
16	1	4	1
17	1	4	1
18	1	4	1
19	1	4	1
20	1	4	1
21	1	4	1
22	1	4	1
23	1	4	1
24	1	4	1
25	1	4	1
26	1	4	1
27	1	4	1
28	1	4	1
29	1	4	1
30	1	4	1
31	1	4	1
32	1	4	1
33	1	4	1
34	1	4	1
35	1	4	1
36	1	4	1
37	1	4	1
38	1	4	1
39	1	4	1
40	1	4	1
41	1	4	1
42	1	4	1
43	1	4	1
44	1	4	1
45	1	4	1
46	1	4	1
47	1	4	1
48	1	4	1
49	1	4	1
50	1	4	1
51	1	4	1
52	1	4	1
53	1	4	1
54	1	4	1
55	1	4	1
56	1	4	1
57	1	4	1
58	1	4	1
59	1	4	1
60	1	4	1
61	1	4	1
62	1	4	1
63	1	4	1
64	1	4	1
65	1	4	1
66	1	4	1
67	1	4	1
68	1	4	1
69	1	4	1
70	1	4	1
71	1	4	1
72	1	4	1
73	1	4	1
74	1	4	1
75	1	4	1
76	1	4	1
77	1	4	1
78	1	4	1
79	1	4	1
80	1	4	1
81	1	4	1
82	1	4	1
83	1	4	1
84	1	4	1
85	1	4	1
86	1	4	1
87	1	4	1
88	1	4	1
89	1	4	1
90	1	4	1
91	1	4	1
92	1	4	1
93	1	4	1
94	1	4	1
95	1	4	1
96	1	4	1
97	1	4	1
98	1	4	1
99	1	4	1
100	1	4	1

NOTE USE OF SCALE
PARAMETER TO
CONTROL OUTPUT
DATA UNITS

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 1 of 5)

23	9	23	10	TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS	6.648
3	21	3	21	PUDDER DEFLECTION-DEG	57.29578
26	20	26	20	TRCS1(THRUST LOSS DUE TO RCS BLEED)-POUNDS	6.648
26	20	26	20	TRCS2(THRUST LOSS DUE TO RCS BLEED)-NEWTONS	6.648
26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC	6.654
26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC	6.654
15	3	15	3	BLOREF(REFERENCE RCS BLEED)-PER CENT	6.648
26	7	26	7	BLOAVL	6.648
27	72	27	72	BLO(ACTUAL RCS BLEED)-PER CENT	6.648
3	38	3	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	6.648
3	38	3	39	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	57.29578
11	7	11	7	SIGY(ENGINE CENTER LINE ANGLE WRT FVL)-DEG	6.648
19	44	19	46	PH,LM,NM(ING PITCH,ROLL,YAW MOMENTS)-FT-LB	6.648
19	44	19	46	PH,LM,NM(ING PITCH,ROLL,YAW MOMENTS)-NEWTON-M	1.855
19	37	19	38	XM1,XM2(ING X FORCE)-POUNDS	6.648
19	37	19	38	XM1,XM2(ING X FORCE)-NEWTONS	6.648
19	39	19	40	ZM1,ZM2(ING Z FORCE)-POUNDS	6.648
19	39	19	40	ZM1,ZM2(ING Z FORCE)-NEWTONS	6.648
3	48	3	48	OFLAP(CANARD TE FLAP DEFLECTION)-DEG	57.29578
3	49	3	49	OFLAP(ING LE FLAP DEFLECTION)-DEG	57.29578
19	1	19	3	DXM,DYM,DZM(ING AERO FORCES)-POUNDS	6.648
19	1	19	3	DXM,DYM,DZM(ING AERO FORCES)-NEWTONS	6.648
19	4	19	6	DLM,DMX,DMY(ING AERO MOMENTS)-FT-POUNDS	1.855
19	4	19	6	DLM,DMX,DMY(ING AERO MOMENTS)-NEWTON-M	6.648
20	1	20	3	DXM,DYM,DZM(CANARD AERO FORCES)-POUNDS	6.648
20	1	20	3	DXM,DYM,DZM(CANARD AERO FORCES)-NEWTONS	6.648
20	4	20	6	DLM,DMX,DMY(CANARD AERO MOMENTS)-FT-POUNDS	1.855
20	4	20	6	DLM,DMX,DMY(CANARD AERO MOMENTS)-NEWTON-M	6.648
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	6.648
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	6.648
21	4	21	6	DLV,DMV,DMY(VERT. TAIL AERO MOMENTS)-FT-POUNDS	1.855
21	4	21	6	DLV,DMV,DMY(VERT. TAIL AERO MOMENTS)-NEWTON-M	6.648
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS	6.648
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS	6.648
22	4	22	6	DLF,DMF,DMY(FUSELAGE AERO MOMENTS)-FT-POUNDS	1.855
22	4	22	6	DLF,DMF,DMY(FUSELAGE AERO MOMENTS)-NEWTON-M	6.648
29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS	6.648
29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS	6.648
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS	1.855
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M	6.648
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS	6.648
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS	6.648
23	4	23	6	DLT,DMT,DMY(DIRECT THRUST MOMENTS)-FT-POUNDS	1.855
23	4	23	6	DLT,DMT,DMY(DIRECT THRUST MOMENTS)-NEWTON-M	6.648
26	23	26	24	ME1,ME2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC	1.855
26	23	26	24	ME1,ME2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC	6.648
24	1	24	3	DXR,DYR,DZR(ARM FORCES)-POUNDS	6.648
24	1	24	3	DXR,DYR,DZR(ARM FORCES)-NEWTONS	6.648
24	4	24	6	DLR,DMR,DMY(ARM MOMENTS)-FT-POUNDS	1.855
24	4	24	6	DLR,DMR,DMY(ARM MOMENTS)-NEWTON-M	6.648
26	3	26	4	R.P. (RPM2) ENGINE ROT. SPEED)-RPM	1.855
27	1	27	3	DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS	6.648
27	1	27	3	DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS	6.648
27	4	27	6	DLRCS,DMRCS,DMYRCS(ACS MOMENTS)-FT-POUNDS	1.855
27	4	27	6	DLRCS,DMRCS,DMYRCS(ACS MOMENTS)-NEWTON-M	6.648
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS	6.648
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS	6.648

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 2 of 5)

25	1	25	3	DXCOR,DMCOR,DMCORICORIOLIS FORCES)-NEWTONS	6.649
25	4	25	6	DLCOR,DMCOR,DMCORICORIOLIS FORCES)-FT-POUNDS	1.855
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS	6.548
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS	1.855
29	29	29	31	SUNL,SUMH,SUMV(TOTAL MOMENTS)-FT-POUNDS	1.359
29	29	29	31	SUNL,SUMH,SUMV(TOTAL MOMENTS)-NEWTON-M	
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS	
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M	
BLANK CARD - END OF OPTION 1 LOAD					
9 OPTION 9-LOAD DERIVATIVE QUANTITIES					
9 STORE ON TAPE 9					
29	1	1	UAS		
29	3	2	WAS		
3	5	3	Q		
28	58	4	DEC		
3	49	5	DFLAPM		
3	48	6	DFLAPH		
28	54	7	DRCSF		
28	57	8	DRCSM		
26	34	9	TO(1)		
26	35	10	TO(2)		
3	26	11	THT(1)		
3	27	12	THT(2)		
29	2	13	VAS		
3	6	14	P		
3	6	15	R		
3	21	16	DR		
26	52	17	DAG		
28	58	18	DRCSR		
0	55	19	DRCSI		
28	56	20	DRCSF		
3	24	21	PSIT(1)		
3	25	22	PSIT(2)		
BLANK CARD - END OF OPTION 9 LOAD					
6 OPTION 6-SET UP TRIM IN A WIND VARIABLE'S					
15	MEQU-NUMBER OF TRIM UNKNOWN'S				
3	1	3	U,V,W		
2.	3	2.			
.1	3	4	3	P,Q,R	
.05	28	28	28	28	DROLL
.05	28	29	28	29	DYAM
.05	28	38	28	38	DPITCH
.01745	3	66	3	66	PSI
.1	29	54	29	56	MXCG,MXCG,MZCG
.01755	3	64	3	64	THETA
18.	28	58	28	58	TCMD
BLANK CARD - END OF OPTION 6 LOAD					
2 OPTION 2-LOAD INITIAL CONDITIONS AND RUN CONTROL VARIABLES					

DERIVATIVES ARE TAKEN WITH RESPECT TO THESE VARIABLES

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 3 of 5)

```

5      NTAP - FIND OPTION 2 DATA ON FILE TAPES-INPUT
41  5  41  5  XEZO, YEZO      32.2
0.  41  6  41  6  ZEZO      32.2
0.
2  16  2  17  XEDOT, YEDOT
0.  2  18  2  18  ZEDOT
0.
3  10  3  10  ZE
-100.
2  65  2  66  PHID, PSID
0.  3  65  3  66  PHI, PSI
0.  3  64  3  64  THETA
78.  20  20  20  20  DROLL
0.  20  29  20  29  DYAM
0.  20  30  20  30  DPITCH
-.1
29  54  29  56  NKCG, NTGG, NZCG
.90  0.  .195
1 900.
35. 29  9  29  9  VA
78. 29  13  29  13  ALPH
1  3  1  7  DT, TMAX, OF PRINT, DTPLOT, FI
.025  28.  .1
41  1  41  1  ANIND
35. 41  2  41  2  VIND
41  7  41  7  TANTURN
0.  41  10  41  10  TURNRAD
2640.
41  0  41  9  GAMMA, WADOT
43  7  43  7  ASKEEP
1.  16  7  16  12  AKU, AKV, AKW, AKIES, AKZES
5.  5.  .005  -.002
43  129  43  129  ATRANS
0.  43  6  43  6  ATIME
0.  43  132  43  139  FTHROTT(10)
.546  .553  .53
.067  .443  .173  .0033  .067
0.  43  142  43  149  VAT(10)  60.  00.  100.  120.  1.609
200.

```

THESE DATA PROVIDE STARTING VALUES FOR THE TRIM SOLUTION

THESE SPECIFY THAT INTEGRATION PROCEEDS IN 0.025 SEC INTERVALS FOR 20. SEC. DATA ARE PRINTED AND PLOTTED EVERY 0.1-SEC 1.609

THESE SPECIFY THAT AIRPLANE IS TO BE TRIMMED IN A 35 KT WIND.

THESE SPECIFY: A) THAT PSEUDO-PLOT IS TO STATOUREEP B) THE GAINS HE IS TO USE

THIS SPECIFIES NUMBER OF ENTRIES IN CMTS AND TIME TABLS

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 4 of 5)

```

43 152 43 159 TMECT(10) .01765
182. 58.5 85.5 66.89 16.65 22.72 16.3
0.24
43 1 43 5 ACMD(1) THIS SPECIFIES AN OPEN
LOOP PSEUDO-PILOT PEDAL INPUT
43 9 43 16 CMT1(1)-OLGSK INPUT TABLE .01765
0. 0. 10. 0. 0. 0.
43 29 43 36 CMT2(1)-OLATSK INPUT TABLE .01765
0. 0. 10. 0. 0. 0.
43 49 43 56 CMT3(1)-OPEO INPUT TABLE .01765
0. 0. 20. 20. 20. 20.
28. 43 69 43 76 CMT4(1)-ZEDTC INPUT TABLE
0. 0. -10. -10. 10. 0.
43 89 43 96 CMT5(1)-THROTTLE INPUT TABLE
0. 0. 0. 0. 0. 0.
43 109 43 116 TIME(1)-INPUT CONTROL TIME TABLE
0. .3 .31 1. 1.01 1.7 1.71
43.

```

THESE TABLES SPECIFY THE TIME HISTORY OF THE PEDAL INPUT

```

1 OPTION 1-LOAD PRIMARY TRIM PARAMETERS
1 NIAP-STORE OPTION DATA LIST ON FILE TAPES
41 3 41 3 PSIHND
8 TRIM OPTION
1 2 8
EXAMPLE 2 - STATIONKEEPING TIME HISTORY
180.4
4 OPTION 3 TIME HISTORY
5 5 4 5
(7X,11(245))
(5X,11F10.3)
(5X,11F10.3)
EXAMPLE 2 - STATIONKEEPING TIME HISTORY
BLANK CARD-NO TRANSFER TO OPTION 2 FOR MORE DATA
BLANK CARD-NO TRANSFER TO OPTION 3 FOR DATA OUTPUT

```

THESE IN COMBINATION SPECIFY THAT THE 35KFT WIND IS A HEADWIND (PSIWIND = 180 DEG.)

VARIABLE FORMATS FOR PRINTING TIME HISTORY FOUND ON INPUT (TAPES)

TIME HISTORY VALUES STORED ON TAPE4 FOR FUTURE PLOTS

BLANK CARD - END OF OPTION 2 LOAD

BLANK CARD - END OF OPTION 1 LOAD

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 5 of 5)

10 deg trailing edge up (TEU) elevon deflections with the canard trailing edge flap set at 25 deg and the wing leading edge flap at 30 deg. The second configuration maintains the same canard and wing flap settings but allows for the determination of roll control effectiveness at differential elevon deflections of 10 deg TEU on the left wing and 10 deg trailing edge down (TED) on the right wing.

The input data deck (minus the Basic Data Load) for Example 3 is listed with explanatory marginal notes on Figure 5-3. Note that Option 7 must precede Option 11 and that the Option 7 variable formats should be considered unchangeable for most wind tunnel applications of VATLAS. The order of the six events directed by Example 3 is as follows:

1. Set up pitch control effectiveness configuration (Configuration 1) with Option 2.
2. Run angle of attack sweep on Configuration 1 with Option 11.
3. Run yaw sweep on Configuration 1 with Option 11.
4. Set up roll control effectiveness configuration (Configuration 2) with Option 2.
5. Run angle of attack sweep on Configuration 2 with Option 11.
6. Run yaw sweep on Configuration 2 with Option 11.

The airspeed parameter on the third Option 11 card must be given a positive non-zero value for the Option to work. Since the Option generates non-dimensional aerodynamic coefficients and because the VATLAS aerodynamic model is not a function of airspeed, the selected airspeed value is not critical; Example 3 used a value of 100 ft/sec.

The output generated by VATLAS for Example 3 is listed in Appendix F. Note that the time history output specifications were inadvertently left in the Basic Data Load for Example 3. These constitute extraneous input cards and could have been replaced by one blank card (i.e., a time history was not generated by Example 3).

5.4 Example 4 - Stationkeeping Plot Run

The plot run demonstrates the application of VATLAS Option 10 and, by implication, Option 5 to plot a time history which was created in a previous run (Example 2). The input data deck to produce the plot is listed with explanatory notes on Figure 5-4. Two features of this deck which warrant special emphasis are the following:

1. Since Options 10 and 5 are the only VATLAS options used in Example 4, the COMMON variables are not addressed during the run. Thus only five cards are required for the Basic Data Load. VATLAS requires that at least one COMMON segment be set up by the Basic Data Load thus the COMMON storage allocation card for Example 4 designates one segment with one element (any number of elements could have been designated).

LISTING OF EXAMPLE 3 INPUT DATA DECK WITHOUT BASIC DATA LOAD

```

7  OPTION 7 - LOAD VARIABLE FORMATS FOR PRINTING WIND TUNNEL DATA
( 10X,32HD>AG COEFFICIENT BUILDUP )
( 10X,32HSIDE FORCE COEFFICIENT BUILDUP )
( 10X,32HLIFY COEFFICIENT BUILDUP )
( 10X,32HROLL MOMENT COEFFICIENT BUILDUP )
( 10X,32HPITCH MOMENT COEFFICIENT BUILDUP )
( 10X,32HYAW MOMENT COEFFICIENT BUILDUP )
( 10X,32HSUMMARY OF TOTAL COEFFICIENTS )
( 10X,5HALPHA,13X5HBETA ,10X5HMWING ,10X5HM.T. ,10X5HV.T. ,10X5HFUS ,10X5HTOTAL)
( 5X,7F14.6)
( 10X,5HALPHA,10X4HBETA,11X2HCD,13X2HCV,13X2HCL,13X2HCR,13X2HCM,13X2HCN)
( 5X,8F14.6)
( 5X,9F14.6)
2  OPTION 2 - LOAD CONTROL SETTINGS AND STATE VARIABLES FOR 1ST WT CONFIG.
5  N1AP - FIND OPTION 2 DATA ON TAPES=INPUT
3  60 3 43 DELAPH,DFLAPH .01745
25. 19 47 19 48 DAI,DA2 .01745
-10. (SYMMETRICAL 10 DEG TEU ELEVON DEFLECTION)
11 OPTION 11-1ST WT CONFIGURATION,AOA SWEEP FROM 0 TO 90 DEG IN 5 DG INCRE.
1 0 5 AOA SWEEP WITH DATA STORED ON TAPE4 100.
0. 5. 99. 0. 0.
11 OPTION 11-1ST WT CONFIGURATION,YAW SWEEP FROM 0 TO 90 DEG IN 5 DG INCRE.
0 1 5 YAW SWEEP WITH DATA STORED ON TAPE4 100.
0. 0. 0. 0. 0.
2  OPTION 2 - LOAD CONTROL SETTINGS AND STATE VARIABLES FOR 2ND WT CONFIG.
5  N1AP - FIND OPTION 2 DATA ON TAPES=INPUT
19 47 19 48 DAI,DA2 .01745
-10. (10 DEG DIFFERENTIAL ELEVON DEFLECTION)
11 OPTION 11-2ND WT CONFIGURATION,AOA SWEEP FROM 0 TO 90 DEG IN 5 DG INCRE
1 0 4 AOA SWEEP WITH DATA STORED ON TAPE4 100.
0. 5. 90. 0. 0.
11 OPTION 11-2ND WT CONFIGURATION,YAW SWEEP FROM 0 TO 90 DEG IN 5 DG INCRE
0 1 4 YAW SWEEP WITH DATA STORED ON TAPE4 100.
0. 0. 0. 0. 0.

```

THESE ARE THE VARIABLE FORMATS FOR PRINTING WT DATA. THEY ARE COMPATIBLE WITH THE GENERIC AERO MODEL IN VATLAS AND SHOULD NOT HAVE TO CHANGE FOR ANY APPLICATION OF THE MODEL TO PRODUCE WIND TUNNEL DATA

ESTABLISHES CONTROL SETTINGS FOR 1ST TWO WT RUNS:
 CANARD TEP DEFL.(DFLAPH)=25°
 WING LEF DEFL.(DFLAPW)=30°
 RIGHT(DA2) ELEVON DEFL.
 LEFT(DA1) ELEVON DEFL.= -10°
 SPECIFIES AOA SWEEP AT $\psi = 0^\circ$
 SPECIFIES YAW SWEEP AT ADA=0°

ESTABLISHES CONTROL SETTINGS FOR 2ND TWO WT RUNS:
 DFLAPH AND DFLAPW NOT SPEC. THEREFORE ARE SAME AS 1ST CONFIG.
 SPECIFIES AOA SWEEP AT $\psi = 0^\circ$
 SPECIFIES YAW SWEEP AT ADA=0°

AIRSPED IN FT/SEC. SINCE AERO DATA ARE NOT A FUNCTION OF AIRSPED, THIS PARAMETER CAN BE LOADED AT ANY NON ZERO VALUE

Figure 5-3. Listing of Example 3 Input Data Deck Without Basic Data Load

LISTING OF EXAMPLE 4 INPUT DATA DECK

FOR A RUN WHICH ONLY GENERATES PLOTS (i.e. USES OPTION 10 ONLY) THE BDL REDUCES TO FIVE CARDS

WHEN THESE TWO CARDS ARE READ THE PROGRAM AUTOMATICALLY INVOKES OPTION 5

THESE ARE CARDS 2 THROUGH 3+NVAR OF THE OPTION 5 INPUT DECK

Line	Card	Description	Value	Option 5
69		NEGS		
5		NTAP,NTAPM		
1		THIS IS ALL THAT IS REQUIRED FOR COMMON STORAGE SETUP		
		BLANK CARD-THIS SKIPS OUTPUT SPECS SECTION OF 3DL		
		BLANK CARD-THIS SKIPS COMMON LOAD SECTION OF ADL		
202		OPTION 10 PLOT PREVIOUSLY STORED TIME HISTORY		
		82 VAR WITH 202 FTS EA STORED IN TIME HIST. ON TAPE 4		
		PSUDO-PILOT FLOWN TURN OVER A SPOT WHILE ADVANCING IN A 35 KT WIND		
2.	1		1	
1	-1	TIMF-SLC	2.5	0
5	-1	3DUY ROLL RATE	10.	0
17	-1	PHI-JEG	200.	0
44	-1	NORM. KOLL CNTRL	200.	0
38	-1	AIRSPEDU-KT	5	0
73	-1	PEDAL COMMAND-JG/S	5	0
6	-1	3DUY PITCH RATE-DG/S	10.	1
16	-1	THETA-DEG	4	0
46	-1	NORM. PITCH CNTRL	10.	0
74	-1	LOG. STK. CMD.-DEG	4	0
39	-1	ALPHA-JEG	10.	0
7	-1	3DUY YAW RATE-DG/S	100.	0
18	-1	PSI-DEG	2.	0
45	-1	NORM. YAW CNTRL	20.	0
72	-1	LAT. STK. CMD.-DEG	.2	0
40	-1	ETA-DEG	10.	0
10	-1	XEDOT-FT/SEC	100.	1
13	-1	XE-FT	20.	0
11	-1	YEDOT-FT/SLC	10.	0
14	-1	YE-FT	40.	0
43	-1	NZCS-G	.4	0
42	-1	NYCS-G	.4	0
75	-1	HEAVE RATE CMD-FT/S	2.	1
47	-1	THRUST COMMAND-LB	2000.	0
48	-1	TRST B4 MCS CORRECT.A000.	1900.	0
41	-1	NXCS-G	.5	0
15	-1	ZE-FT	2.	0
12	-1	ZEDOT-FT/SEC	2.	1

Figure 5-4. Listing of Example 4 Input Data Deck

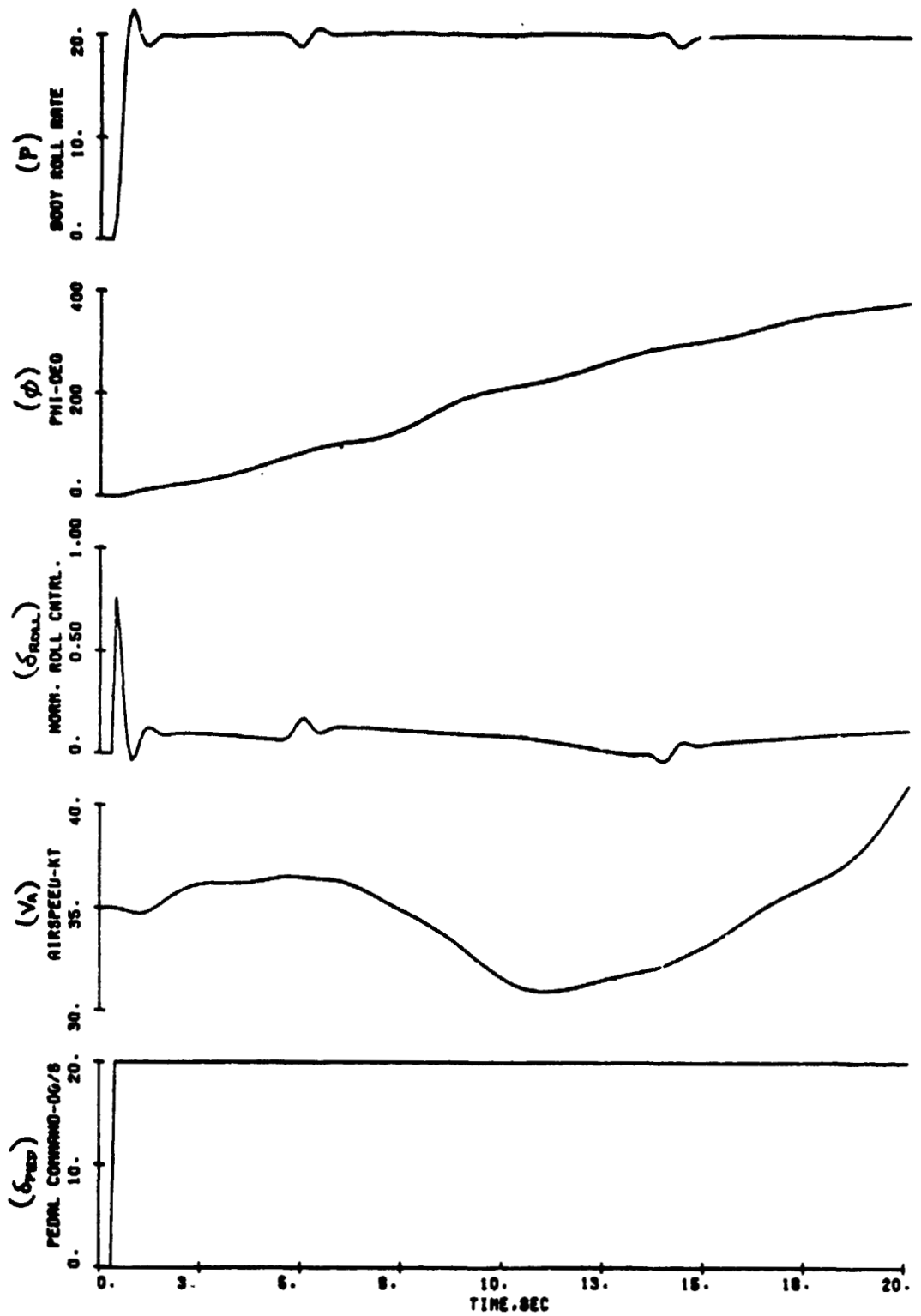
2. Not all of the variables stored during the time history run need be plotted. In Example 4, only 28 of the 82 available variables are plotted. The ordering in the variable list for Option 5 (10) is that the first variable is the independent variable and all remaining variables are plotted as functions of that variable. In Example 4, therefore, 27 variables are plotted versus time.

Although not indicated in the input data deck, the dimensioning and spacing of plots for Example 4 were keyed to 11 x 17 in. blank CALCOMP paper. This choice of paper is indigenous to VATLAS. Should the user desire different paper he must indicate this to the computer operator by a PAUSE card in the control cards for the run. Also not indicated in the input data deck is the process of making the standard CALCOMP subroutines available for the VATLAS plot routines. This is controlled by the control cards for the run. The control cards used to produce Example 4 on the Vought CDC 6600 Computer Facility are listed below:

<u>CONTROL CARD</u>	<u>EXPLANATORY NOTES</u>
FORTEN, TIOO.	Job Card
PROJECT, 1234xxxx9101, 253010, S1128*FORTENBAUGH.	Project Card
ATTACH, TAPE4, STATIONKEEPING, ID=FORTENBGH, MR=1.	Attach previously run time history
ATTACH, ONE, BINARYVATLAS, ID=FORTENBGH, MR=1.	Attach binary version of VATLAS
LIBRARY (CALCOMP)	Make CALCOMP routines available to VATLAS
LOAD (ONE)	Load the binary version of VATLAS preparatory to executing the program.
EXECUTE.	Execute the program and create the plot.
7	End of control card file.
8	
9	

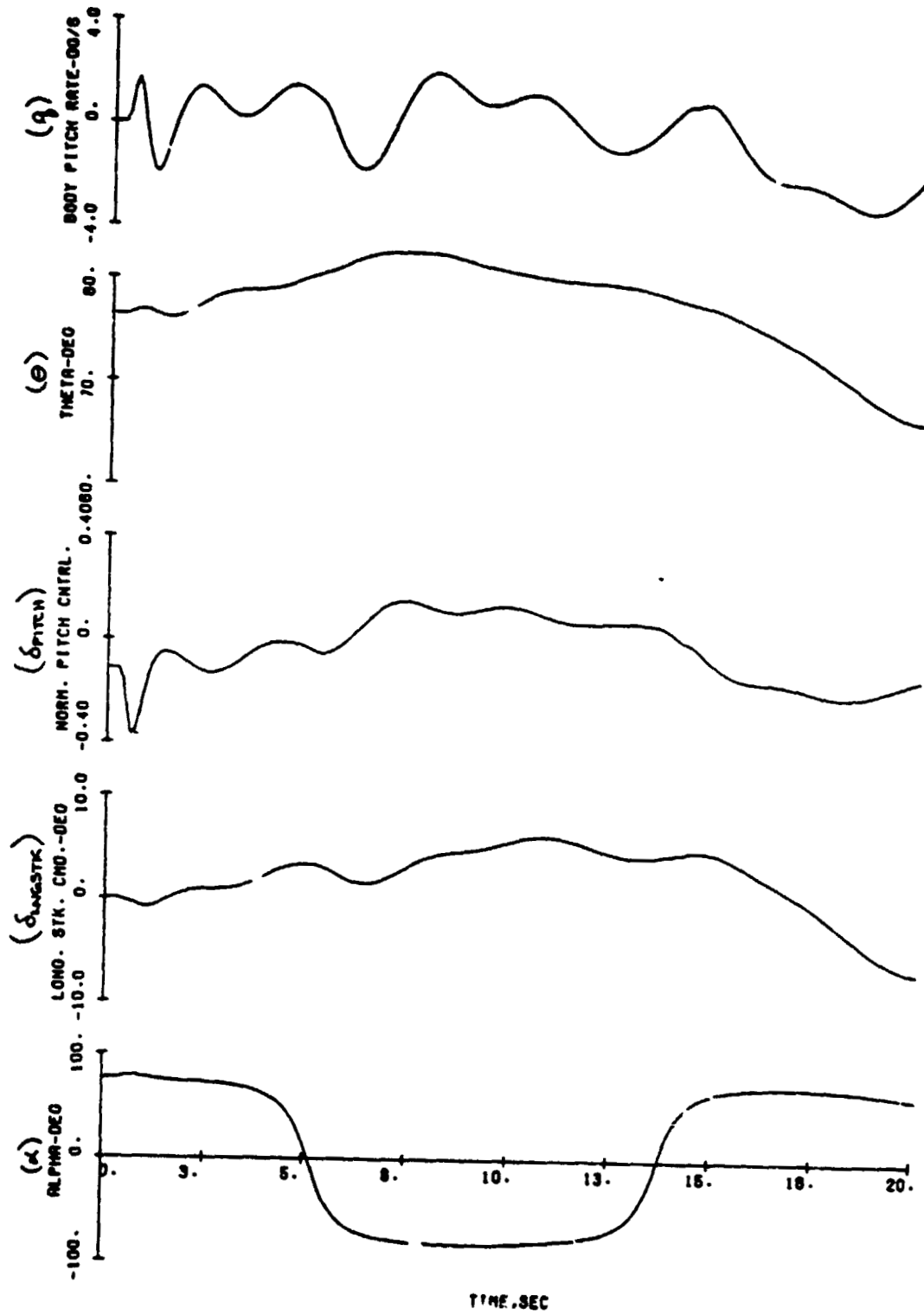
The user is cautioned against indiscriminate application of these control cards to attempt to reproduce the Example 4 results since control card formats vary slightly from facility to facility.

The plotted results of Example 4 are shown in Figure 5-5. These are photo-reduced copies of the original 11 x 17 output plots. To learn how to use the VATLAS plotting capability, the user is urged to study carefully the relations between plot spacing, dimensioning and labelling on Figure 5-5; the Option 5 instructions in Section 4.2.5; and the Example 4 input data



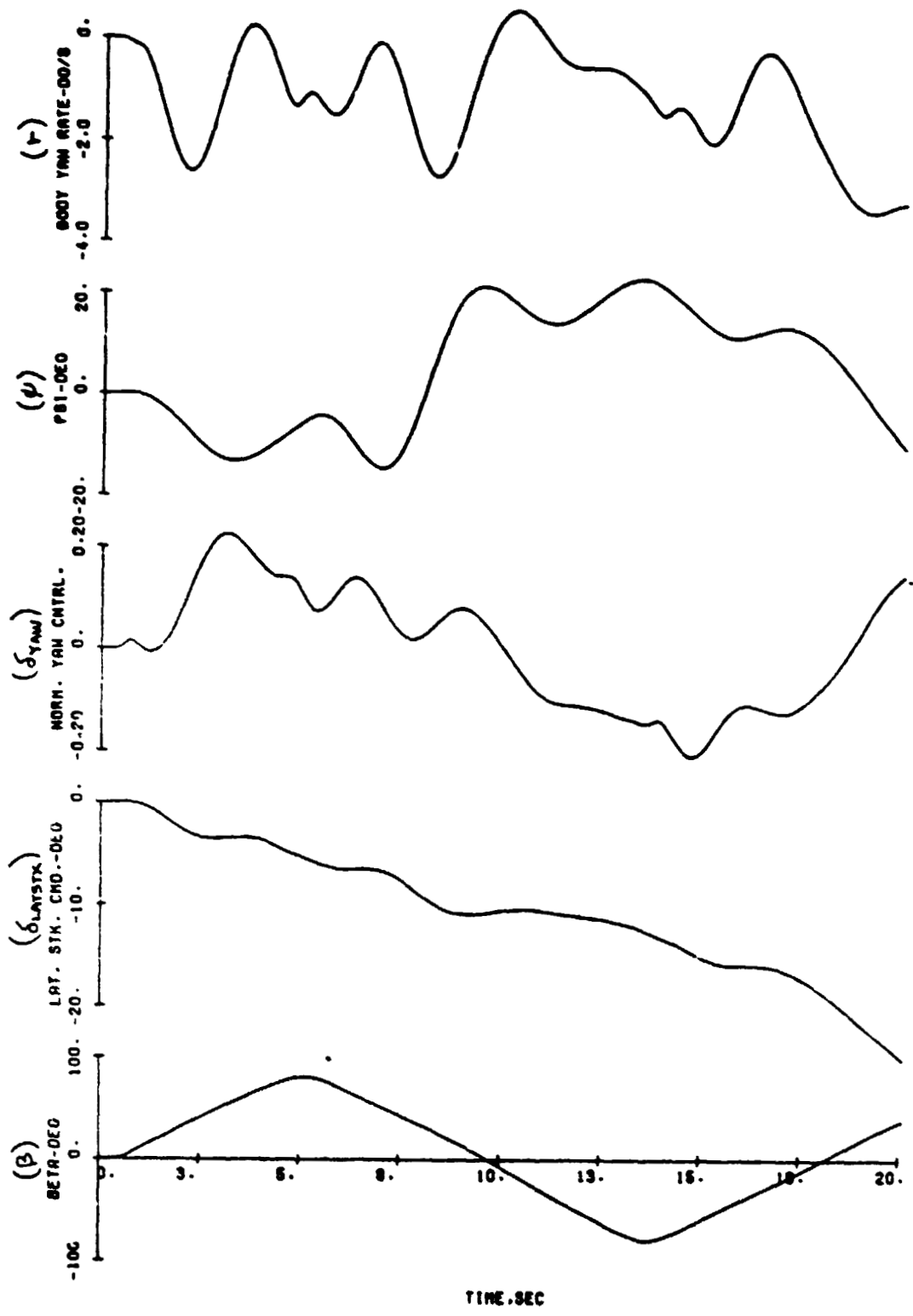
PSEUDO-PILOT FLOWN TURN OVER A SPOT
WHILE HOVERING IN A 35 KT WIND

Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind"



PSEUDO-PILOT FLIGHT TURN OVER A SPOT
WHILE HOVERING IN A 35 KT WIND

Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind"



PSEUDO-PILOT FLOWN TURN OVER A SPOT WHILE HOVERING IN A 35 KT WIND

Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind"

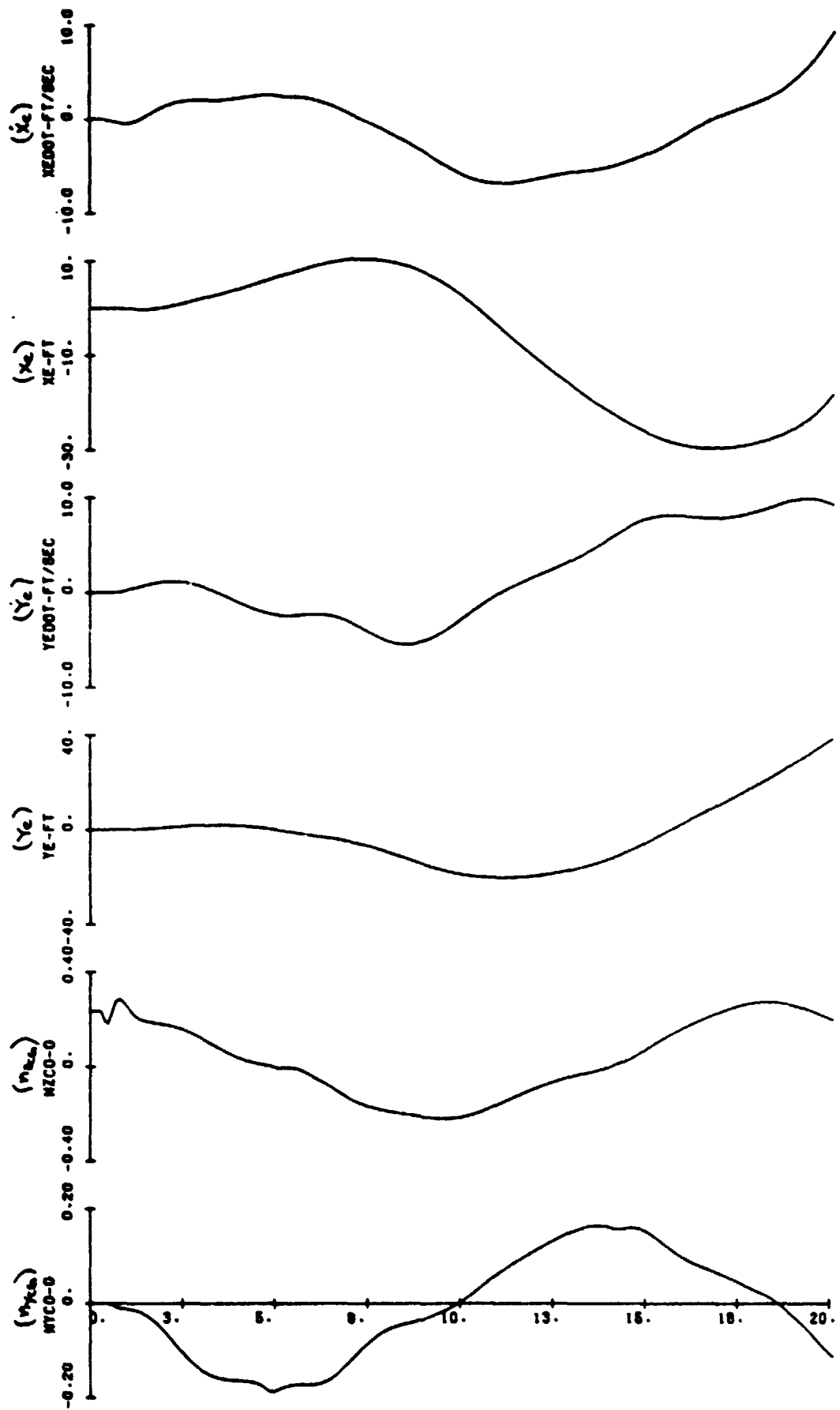


Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind"

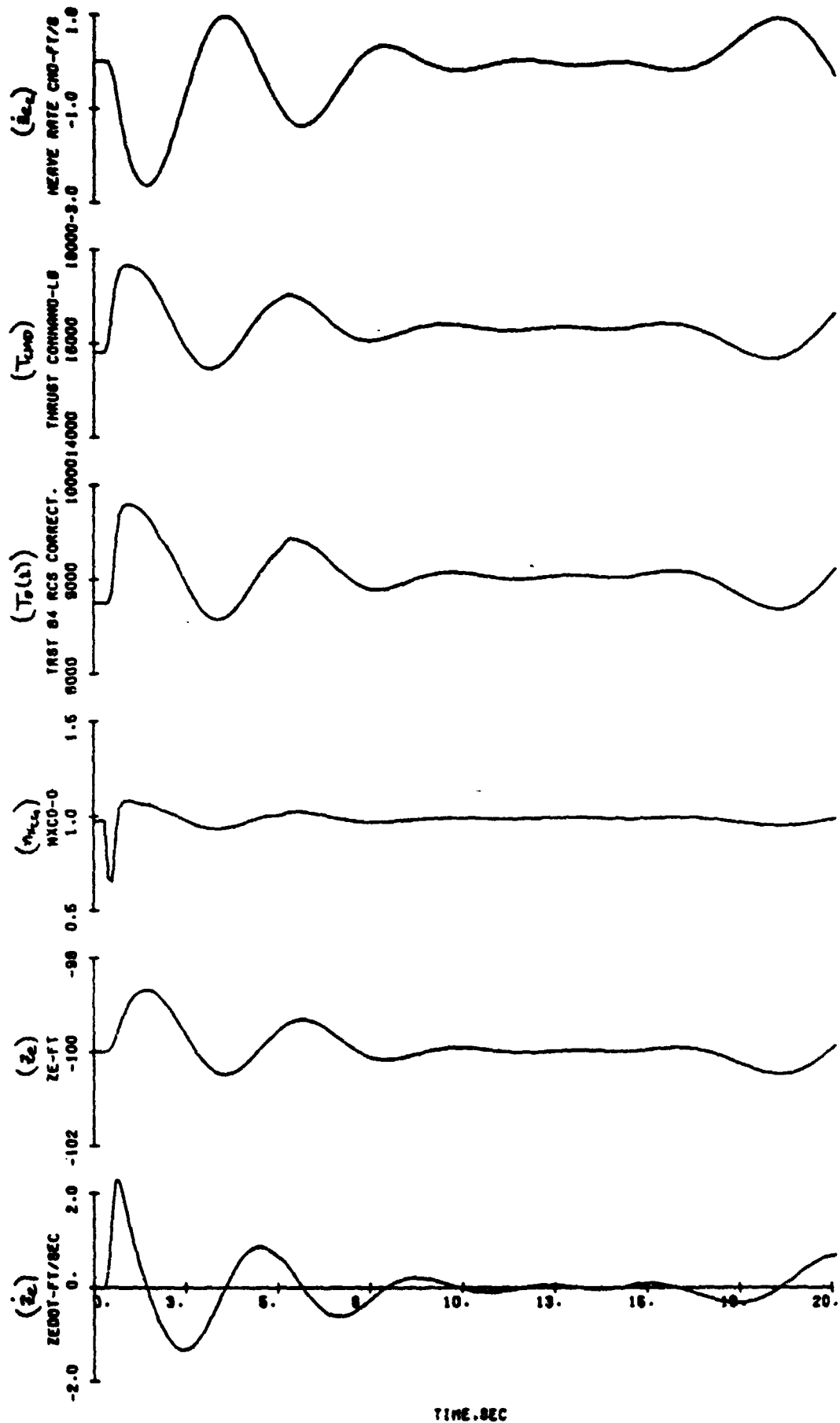


Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind"

TIME, SEC

deck. For reference scaling in this comparison, the ordinate axes of the original plots are 2.0 in. long and the abscissa (time) axes are 8.0 in. long.

6.0 REFERENCES

- (a) Clark, Jr. J. W., Low-Speed V/STOL Stability and Control Prediction - Volume I: Model Description and Validation, NADC Report 76323-30, 11 January 1977
- (b) Anonymous, UPDATE Reference Manual, Manual 60342400C, Control Data Corporation, June 1975 Revision

APPENDIX A

**DEFINITION AND LOCATION OF COMMON PARAMETERS
FOR THE VATLAS PROGRAM**

A.1 Introduction

This Appendix provides a listing by coded name and definition of all VATLAS COMMON parameters arranged in order by segment and element designation. Each parameter is indicated as type C or N where C means the parameter is calculated by the program and does not need to be quantified by program input and N means the parameter is not calculated and must be quantified by program input. Many of the parameters in COMMON are also used in Volume II of this report which describes the model equations and base aircraft data for VATOL simulation. The Volume II symbology for these parameters is included in parentheses following the definitions. Note that every parameter in COMMON is a REAL program variable; therefore all non zero input data to COMMON must have a decimal point.

A.2 Segment 1 - Time, Print and Plot Control Parameters

Segment	Element	Type	Coded Name	Units	Definition
1	1	C	T	sec	Time which is updated every DT seconds (t)
1	2	C	TO	sec	Time controlled by RUNGE which takes on three intermediate values between T and T+DT. Since 4th order Runge - Kutta integration is used, the basic integration interval must be divided in four parts.
1	3	N	DT	sec	Basic integration interval for RUNGE
1	4	N	TMAX	sec	Maximum value of T for a time history
1	5	N	DTPRNT	sec	Interval between times of printed output
1	6	N	DTPL OT	sec	Interval between times of plotted output
1	7	N	TI	sec	Initial time for time history; normally taken to be zero

A.3 Segment 2 - Variables to be Integrated

Segment	Element	Type	Coded Name	Units	Definition
2	1	C	UDOT	ft/sec ²	X body axis component of inertial acceleration (\dot{u})
2	2	C	VDOT	ft/sec ²	Y body axis component of inertial acceleration (\dot{v})
2	3	C	WDOT	ft/sec ²	Z body axis component of inertial acceleration (\dot{w})
2	4	C	PDOT	rad/sec ²	Body axis roll acceleration (\dot{p})
2	5	C	QDOT	rad/sec ²	Body axis pitch acceleration (\dot{q})
2	6	C	RDOT	rad/sec ²	Body axis yaw acceleration (\dot{r})
2	7	C	D11D	1/sec	Rate of change of d_{11} direction cosine (\dot{d}_{11})
2	8	C	D12D	1/sec	Rate of change of d_{12} direction cosine (\dot{d}_{12})
2	9	C	D13D	1/sec	Rate of change of d_{13} direction cosine (\dot{d}_{13})
2	10	C	D21D	1/sec	Rate of change of d_{21} direction cosine (\dot{d}_{21})
2	11	C	D22D	1/sec	Rate of change of d_{22} direction cosine (\dot{d}_{22})
2	12	C	D23D	1/sec	Rate of change of d_{23} direction cosine (\dot{d}_{23})
2	13	C	D31D	1/sec	Rate of change of d_{31} direction cosine (\dot{d}_{31})
2	14	C	D32D	1/sec	Rate of change of d_{32} direction cosine (\dot{d}_{32})
2	15	C	D33D	1/sec	Rate of change of d_{33} direction cosine (\dot{d}_{33})
2	16	C	XEDOT	ft/sec	X inertial axis component of inertial velocity (\dot{x}_e)
2	17	C	YEDOT	ft/sec	Y inertial axis component of inertial velocity (\dot{y}_e)

Segment	Element	Type	Coded Name	Units	Definition
2	18	C	ZEDOT	ft/sec	Z inertial axis component of inertial velocity (\dot{z}_e)
2	19	C	LELEVND	rad/sec	Left elevon deflection rate ($\dot{\delta}_{TEF_W(1)}$)
2	20	C	RELEVND	rad/sec	Right elevon deflection rate ($\dot{\delta}_{TEF_W(2)}$)
2	21	C	DRD	rad/sec	Rudder deflection rate ($\dot{\delta}_r$)
2	22-23	C	TABD(I)	1/sec	Normalized rate of change of afterburner thrust; I=1 for left engine, =2 for right engine ($\dot{T}_{AB}(I)$)
2	24-25	C	PSITD(I)	rad/sec	Yaw thrust deflection rate; I=1 for left engine, =2 for right engine ($\dot{\psi}_T(I)$)
2	26-27	C	THTD(I)	rad/sec	Pitch thrust deflection rate; I=1 for left engine, =2 for right engine ($\dot{\theta}_T(I)$)
2	28-37	C	DRCSA(I)	1/sec	Normalized area deflection rate of Ith RCS jet; space for 10 RCS jets, only 2 used for VATLAS ($\dot{\delta}_{RCS}(I)$)
2	38-47	C	FRCSAD(I)	lb/sec	Rate of change of force of Ith RCS jet; space for 10 RCS jets, only 2 used for VATLAS ($\dot{F}_{RCS_A}(I)$)
2	48	C	DFLAPHD	rad/sec	Canard trailing edge flap deflection rate ($\dot{\delta}_{TEF_H}$)
2	49	C	DFLAPWD	rad/sec	Wing leading edge flap deflection rate ($\dot{\delta}_{LEF_W}$)
2	50-51	C	TFRACD(I)	1/sec	Normalized rate of change of non-afterburning thrust; I=1 for left engine, =2 for right engine ($\dot{T}_F(I)$)
2	52	C	PCTRMD	rad/sec	Rate of change of roll command path integrator output (figure 2.2) ($\dot{p}_{C_{TRM}}$)
2	53	C	PINTD	rad/sec	Body axis roll rate; also coded as P in program (p)

Segment	Element	Type	Coded Name	Units	Definition
2	54	C	PETRM	rad/sec	Rate of change of roll forward path integrator output (figure 2.2) ($\dot{p}_{e_{TRM}}$)
2	55	C	RCTRM	rad/sec	Rate of change of yaw command path integrator output (figure 2.4) ($\dot{r}_{c_{TRM}}$)
2	56	C	RINTD	rad/sec	Body axis yaw rate; also coded as R in program (r)
2	57	C	RETRM	rad/sec	Rate of change of yaw forward path integrator output (figure 2.4) ($\dot{r}_{e_{TRM}}$)
2	58	C	YTRM	rad/sec	Rate of change of yaw trim input (figure 2.4) (\dot{r}_{TRM})
2	59	C	QCTRM	rad/sec	Rate of change of pitch command path integrator output (figure 2.3) ($\dot{q}_{c_{TRM}}$)
2	60	C	QINTD	rad/sec	Body axis pitch rate; also coded as Q in program (q)
2	61	C	QETRM	rad/sec	Rate of change of pitch forward path integrator output (figure 2.3) ($\dot{q}_{e_{TRM}}$)
2	62	C	PTRM	rad/sec	Rate of change of pitch trim input (figure 2.3) (\dot{q}_{TRM})
2	63	C	ZEDTRM	lb/sec	Rate of change of heave forward path integrator output (figure 2.5) ($\dot{T}_{e_{TRM}}$)
2	64	C	THETD	rad/sec	Rate of change of pitch angle ($\dot{\theta}$)
2	65	C	PHID	rad/sec	Rate of change of roll angle ($\dot{\phi}$)
2	66	C	PSID	rad/sec	Rate of change of yaw angle ($\dot{\psi}$)
2	67	C	LNGSTKD	1/sec	Rate of change of pitch input shaping filter output (\dot{q}'_c)
2	68	C	ROLLCD	1/sec	Rate of change of roll input shaping filter output (\dot{p}'_c)
2	69	C	YAWCD	1/sec	Rate of change of yaw input shaping filter output (\dot{r}'_c)

A.4 Segment 3 - Integrated Variables

Segment	Element	Type	Coded Name	Units	Definition
3	1	C	U	ft/sec	X body axis component of inertial velocity (u)
3	2	C	V	ft/sec	Y body axis component of inertial velocity (v)
3	3	C	W	ft/sec	Z body axis component of inertial velocity (w)
3	4	C	P	rad/sec	Body axis roll rate (p)
3	5	C	Q	rad/sec	Body axis pitch rate (q)
3	6	C	R	rad/sec	Body axis yaw rate (r)
3	7	C	D11	--	d_{11} direction cosine (d_{11})
3	8	C	D12	--	d_{12} direction cosine (d_{12})
3	9	C	D13	--	d_{13} direction cosine (d_{13})
3	10	C	D21	--	d_{21} direction cosine (d_{21})
3	11	C	D22	--	d_{22} direction cosine (d_{22})
3	12	C	D23	--	d_{23} direction cosine (d_{23})
3	13	C	D31	--	d_{31} direction cosine (d_{31})
5	14	C	D32	--	d_{32} direction cosine (d_{32})
3	15	C	D33	--	d_{33} direction cosine (d_{33})
3	16	C	XE	ft	X position of cg in inertial coordinates (x_e)
3	17	C	YE	ft	Y position of cg in inertial coordinates (y_e)
3	18	C	ZE	ft	Z position of cg in inertial coordinates (z_e)
3	19	C	LELVN	rad	Left elevon deflection ($\delta_{TEF_W} (1)$)
3	20	C	RELVN	rad	Right elevon deflection ($\delta_{TEF_W} (2)$)
3	21	C	DR	rad	Rudder deflection (δ_r)

Segment	Element	Type	Coded Name	Units	Definition
3	22-23	C	TAB(I)	--	Normalized afterburner thrust; I = 1 for left engine, =2 for right engine ($T_{AB}(I)$)
3	24-25	C	PSIT(I)	rad	Yaw thrust deflection; I=1 for left engine, =2 for right engine ($\psi_T(I)$)
3	26-27	C	THT(I)	rad	Pitch thrust deflection; I=1 for left engine, =2 for right engine ($\theta_T(I)$)
3	28-37	C	DRCS(I)	--	Normalized area of Ith RCS jet; space for 10 RCS jets, only 2 used for VATLAS ($\delta_{RCS}(I)$)
3	38-47	C	FRCSA(I)	lb	Force of Ith RCS jet; space for 10 RCS jets, only 2 used for VATLAS (F_{RCS_A})
3	48	C	DFLAPH	rad	Canard trailing edge flap deflection (δ_{TEF_H})
3	49	C	DFLAPW	rad	Wing leading edge flap deflection (δ_{LEF_W})
3	50-51	C	TFRAC(I)	--	Normalized non-afterburning thrust; I=1 for left engine, =2 for right engine (T_F)
3	52	C	PCTRM	rad	Roll command path integrator output (figure 2.2) ($p_{c_{TRM}}$)
3	53	C	PINT	rad	Integral of body axis roll rate (figure 2.2) (p_{INT})
3	54	C	PETRM	rad	Roll forward path integrator output (figure 2.2) ($p_{e_{TRM}}$)
3	55	C	RCTRM	rad	Yaw command path integrator output (figure 2.4) ($r_{c_{TRM}}$)
3	56	C	RINT	rad	Integral of body axis yaw rate (figure 2.4) (r_{INT})
3	57	C	RETRM	rad	Yaw forward path integrator output (figure 2.4) ($r_{e_{TRM}}$)
3	58	C	YTRM	rad	Yaw trim input (figure 2.4) (r_{TRM})
3	59	C	QCTRM	rad	Pitch command path integrator output (figure 2.3) ($q_{c_{TRM}}$)

Segment	Element	Type	Coded Name	Units	Definition
3	61	C	QETRM	rad	Pitch forward path integrator output (figure 2.3) ($q_{e_{TRM}}$)
3	62	C	PTRM	rad	Pitch trim input (figure 2.3) (q_{TRM})
3	63	C	ZEDTRM	lb	Heave forward path integrator output (figure 2.5) ($T_{e_{TRM}}$)
3	64	C	THETA	rad	Pitch Angle (θ)
3	65	C	PHI	rad	Roll Angle (ϕ)
3	66	C	PSI	rad	Yaw angle (ψ)
3	67	C	LNGSTK	---	Output of pitch input shaping filter (q'_c)
3	68	C	ROLLC	---	Output of roll input shaping filter (p'_c)
3	69	C	YAWC	---	Output of yaw input shaping filter (r'_c)

A.5 Segment 4 - Aircraft Mass, Geometry and Inertia Constants

Segment	Element	Type	Coded Name	Units	Definition
4	1	N	WT	lb	Aircraft weight (W)
4	2	N	IX	slug ft ²	Aircraft roll body axis inertia (I_x)
4	3	N	IY	slug ft ²	Aircraft pitch body axis inertia (I_y)
4	4	N	IZ	slug ft ²	Aircraft yaw body axis inertia (I_z)
4	5	N	IXZ	slug ft ²	Aircraft cross product of inertia (I_{xz})
4	6	N	FSCG	ft	Fuselage station of reference cg (FS_{CG})
4	7	N	BLCG	ft.	Buttline of reference cg (BL_{CG})
4	8	N	WLCG	ft.	Waterline of reference cg (WL_{CG})
4	9	N	GC	ft/sec ²	Acceleration due to gravity (g)
4	10	C	EAC	--	Inertia ratio = $(IZ - IY)/IX$
4	11	C	FAC	--	Inertia ratio = $(IY - IX)/IZ$
4	12	C	GAC	--	Inertia ratio = $(IZ - IX)/IY$
4	13	C	JX	--	Cross Product of inertia ratio = $-IXZ/IX$

Segment	Element	Type	Coded Name	Units	Definition
4	14	C	JY	--	Cross Product of inertia ratio = - IXZ/IY
4	15	C	JZ	--	Cross Product of inertia ratio = - IXZ/IZ
4	16	C	MASS	slug	Aircraft mass (m)
4	17	C	1 JXJZ	--	1 - JX*JZ

A.6 Segment 5- Tolerances for Errors in Trim Solutions

Segment	Element	Type	Coded Name	Units	Definition
5	1-19	N	T L(I)	Varies	Specifies the acceptable tolerance on the trim solution of the Ith trim equation. The trim equations are given in Subroutine ERROR.

A-7 Segment 6 - Aero Lift and Drag Constants

Segment	Element	Type	Coded Name	Units	Definition
6	1	N	AAER 0	--	Specifies whether aero data are to be calculated (AAER 0 = 0) or are stored in table format (AAER 0 ≠ 0).
<p>Note: For all subscripted constants in Segment 6; I = 1 corresponds to wing data, I = 2 to horizontal stabilizer (includes forward-canard-and-aft-conventional-locations), I = 3 to vertical stabilizer.</p>					
6	2,25,48	N	AER 0 (1,I)	--	Geometric or reference aspect ratio of Ith lifting surface (AR)
6	3,26,49	N	AER 0 (2,I)	--	Aspect ratio of exposed area of Ith lifting surface (AR _e)
6	4,27,50	N	AER 0 (3,I)	ft ²	Geometric or reference area of Ith lifting surface (S)
6	5,28,51	N	AER 0 (4,I)	ft ²	Exposed area of Ith lifting surface (S _e)
6	6,29,52	N	AER 0 (5,I)	rad	Sweep of geometric or reference quarter chord of Ith lifting surface ($\Lambda_{3/4}$)
6	7,30,53	N	AER 0 (6,I)	rad	Sweep of leading edge of Ith lifting surface (Λ_{LE})
6	8,31,54	N	AER 0 (7,I)	--	Reference taper ratio of Ith lifting surface (λ)

Segment	Element	Type	Coded Name	Units	Definition
6	9,32,55	N	AERØ(8,I)	--	Maximum lift coefficient of Ith lifting surface (C_{LMAX})
6	10,33,56	N	AERØ(9,I)	rad	Angle of attack for maximum lift coefficient of Ith lifting surface (α_0)
6	11,34,57	N	AERØ(10,I)	1/rad	Sectional lift curve slope of Ith lift surface (a_0)
6	12,35,58	N	AERØ(11,I)	--	Zero lift drag coefficient of Ith lifting surface (C_{D0})
6	13,36,59	N	AERØ(12,I)	--	Ratio of fuselage width at lifting surface intersection to lifting surface span for Ith lifting surface (d/b)
6	14,37,60	N	AERØ(13,I)	1/rad	Change in lift coefficient at zero angle of attack per unit trailing edge flap deflection for Ith lifting surface ($\Delta C_{L0} / \delta_{TEF}$)
6	15,38,61	N	AERØ(14,I)	1/rad	Change in lift coefficient at angle of attack for maximum lift per unit trailing edge flap deflection for Ith lifting surface. ($\Delta C_{LMAX} / \delta_{TEF}$)
6	16,39,62	N	AERØ(15,I)	1/rad	Change in drag coefficient per unit trailing edge flap deflection for Ith lifting surface ($\Delta C_D / \delta_{TEF}$)
6	17,40,63	N	AERØ(16,I)	1/rad	Change in pitching moment coefficient per unit trailing edge flap deflection for Ith lifting surface ($\Delta C_m / \delta_{TEF}$)
6	18,41,64	N	AERØ(17,i)	--	Change in angle of attack for maximum lift per unit leading edge flap deflection for Ith lifting surface ($\Delta \alpha_{MAX} / \delta_{LEF}$)
6	19,42,65	N	AERØ(18,I)	1/rad	Change in lift coefficient at zero angle of attack per unit leading edge flap deflection for Ith lifting surface ($\Delta C_{L0} / \delta_{LEF}$)
6	20,43,66	N	AERØ(19,I)	1/rad	Change in lift coefficient at angle of attack for maximum lift per unit leading edge flap deflection for Ith lifting surface ($\Delta C_{LMAX} / \delta_{LEF}$)

Segment	Element	Type	Coded Name	Units	Definition
6	21,44,67	N	AERO(20,I)	1/rad	Change in drag coefficient per unit leading edge flap deflection for Ith lifting surface ($\Delta C_D / \delta_{LEF}$)
6	22,45,68	N	AERO(21,I)	1/rad	Change in pitching moment coefficient per unit leading edge flap deflection for Ith lifting surface ($\Delta C_m / \delta_{LEF}$)
6	23,46,69	N	AERO(22,I)	rad	Difference between angle of attack for zero leading edge flap effectiveness and angle of attack for maximum lift, i.e. when (ALFA.GE. (AERO(22,I) + AERO(9,I)) the leading edge flap effectiveness equals zero ($\Delta \alpha_{LEF}$)
6	24,47,70	N	AERO(23,I)	rad	Difference between angle of attack for zero trailing edge flap effectiveness and angle of attack for maximum lift, i.e. when (ALFA.GE. (AERO(23,I) + AERO(9,I)) the trailing edge flap effectiveness equals zero ($\Delta \alpha_{TEF}$)
6	71,74,77	N	SURFCP(1,I)	--	Normalized (to Ith lifting surface mean aerodynamic chord) constant for calculating center of pressure shift of Ith lifting surface as a function of angle of attack. Appears as multiplier of cosine terms in the equations (CP ₁)
6	72,75,78	N	SURFCP(2,I)	--	Normalized (to Ith lifting surface mean aerodynamic chord) constant for calculating center of pressure shift of Ith lifting surface as a function of angle of attack. Appears as multiplier of sine terms in the equations (CP ₂)
6	73,76,79	N	SURFCP(3,I)	--	Normalized (to Ith lifting surface mean aerodynamic chord) constant for calculating center of pressure shift of Ith lifting surface as a function of angle of attack. Appears only in the high angle of attack equation for center of pressure shift (CP ₃)
6	80-82	C	CNAAO(I)	1/rad	Constant calculated by Subroutine FORCES for use by Subroutine LIFDRG to generate nonlinear Ith lifting surface lift coefficient ($C_{N_{\alpha_0}}$)

Segment	Element	Type	Coded Name	Units	Definition
6	83-85	C	AERK(I)	1/rad	Constant calculated by Subroutine FORCES for use by Subroutine LIFDRG to generate nonlinear Ith lifting surface lift coefficient (K).
6	86-88	C	EFS(I)	—	Oswald efficiency factor for Ith lifting surface calculated in Subroutine FORCES (e)
6	89-91	C	CLA(I)	1/rad	Linear lift curve slope of Ith lifting surface calculated in Subroutine FORCES ($C_{L\alpha e}$)

A.8 Segment 7 - Wing Aero Constants

Segment	Element	Type	Coded Name	Units	Definition
7	1	N	FSW	ft	Fuselage station of wing reference center of pressure (FS_W)
7	2	N	BLW1	ft	Buttline of reference center of pressure of left wing ($BL_W(1)$)
7	3	N	BLW2	ft	Buttline of reference center of pressure of right wing ($BL_W(2)$)
7	4	N	WLW	ft	Waterline of wing reference center of pressure (WL_W)
7	5	N	CW	ft	Mean aerodynamic chord of wing (c_w)
7	6	N	BW	ft	Reference wing span (b_w)
7	7	N	EKDA1	—	Change in left wing angle of attack per unit deflection of left wing control surface ($K_{\delta_c}(1)$)
7	8	N	EKDA2	—	Change in right wing angle of attack per unit deflection of right wing control surface ($K_{\delta_c}(2)$)
7	9	N	EIW	rad	Wing incidence angle
7	10	N	CLBOW	1/rad	Basic $C_{L\beta}$ of wing ($C_{L\beta_0}$)
7	11	N	CLBCLW	1/rad	Change in wing $C_{L\beta}$ per unit of wing lift coefficient ($C_{L\beta C_L}$)

Segment	Element	Type	Coded Name	Units	Definition
7	12	N	CLRCLW	1/rad	Change in wing C_{Lr} per unit of wing lift coefficient ($C_{Lr} C_L$)
7	13	N	CLPW	1/rad	Wing C_{Lp} (C_{LpW})
7	14	N	CNBOW	1/rad	Basic $C_{n\alpha}$ of wing ($C_{n\alpha_0}$)
7	15	N	CNBCL2W	1/rad	Change in wing $C_{n\alpha}$ per unit of wing lift coefficient squared. ($C_{n\alpha} C_L^2$)
7	16	N	CNRCL2W	1/rad	Change in wing C_{nr} per unit of wing lift coefficient squared ($C_{nr} C_L^2$)
7	17	N	CNRCDW	1/rad	Change in wing C_{nr} per unit of wing drag coefficient ($C_{nr} C_D$)
7	18	N	CNPCLW	1/rad	Change in wing C_{np} per unit of wing lift coefficient ($C_{np} C_L$)
7	19	N	CNPCDAW	--	Not used
7	20	N	CMOW	--	Zero lift pitching moment coefficient of wing (C_{m0W})
7	21	N	CMDFW	--	Not used
7	22	N	AEKEL	--	Number of entries in elevon effectiveness table (≤ 7)
7	23	N	CYBCL2W	1/rad	Change in wing $C_{Y\alpha}$ per unit of wing lift coefficient squared ($C_{Y\alpha} C_L^2$)
7	24	C	XWING1	ft	X body axis distance between aircraft reference cg and left wing reference center of pressure ($X_{WING}(1)$)
7	25	C	XWING2	ft	X body axis distance between aircraft reference cg and right wing reference center of pressure ($X_{WING}(2)$)
7	26	C	YWING1	ft	Y body axis distance between aircraft reference cg and left wing reference center of pressure ($Y_{WING}(1)$)

Segment	Element	Type	Coded Name	Units	Definition
7	27	C	YWING2	ft	Y body axis distance between aircraft reference cg and right wing reference center of pressure ($Y_{WING(2)}$)
7	28	C	ZWING1	ft	Z body axis distance between aircraft reference cg and left wing reference center of pressure ($Z_{WING(1)}$)
7	29	C	ZWING2	ft	Z body axis distance between aircraft reference cg and right wing reference center of pressure ($Z_{WING(2)}$)

A.9 Segment 8 - Horizontal Stabilizer Aero Constants

Segment	Element	Type	Coded Name	Units	Definition
8	1	N	FSH	ft	Fuselage station of horizontal stabilizer reference center of pressure (FS_H)
8	2	N	BLH	ft	Buttline of horizontal stabilizer reference center of pressure (BL_H)
8	3	N	WLH	ft	Waterline of horizontal stabilizer reference center of pressure (WL_H)
8	4	N	CH	ft	Mean aerodynamic chord of horizontal stabilizer (c_H)
8	5	N	BH	ft	Reference span of horizontal stabilizer (b_H)
8	6	N	EKADE	--	Change in horizontal stabilizer angle of attack per unit deflection of horizontal stabilizer control surface ($K_{\alpha \delta_e}$)
8	7	C or N	EIH	rad	Horizontal stabilizer incidence angle (i_H)
8	8	N	E /CLW	rad	Change in downwash angle per unit of wing lift coefficient (e/C_{LW})
8	9	N	CMPFH	--	Not used
8	10	N	CMOH	--	Zero lift pitching moment coefficient of horizontal stabilizer ($C_{m_{0H}}$)
8	11	N	DXHTO	--	Not used

Segment	Element	Type	Coded Name	Units	Definition
8	12	C	XH	ft	X body axis distance between aircraft cg and horizontal stabilizer reference center of pressure (X_H)
8	13	C	YH	ft	Y body axis distance between aircraft cg and horizontal stabilizer reference center of pressure (Y_H)
8	14	C	ZH	ft	Z body axis distance between aircraft cg and horizontal stabilizer reference center of pressure (Z_H)
8	15	C	XWEL	ft	Constants related to relative wing-horizonal stabilizer location and which are used to calculate dynamic pressure at the horizontal stabilizer (X_{WEL} , Z_{WEL} , A_{WEL} , D_{WEL})
8	16	C	ZWEL	ft	
8	17	C	AWEL	rad	
8	18	C	DWEL	--	

A.10 Segment 9 - Vertical Stabilizer Aero Constants

Segment	Element	Type	Coded Name	Units	Definition
9	1	N	FSV	ft	Fuselage station of vertical stabilizer reference center of pressure (FS_V)
9	2	N	BLV	ft	Buttline of vertical stabilizer reference center of pressure (BL_V)
9	3	N	WLV	ft	Waterline of vertical stabilizer reference center of pressure (WL_V)
9	4	N	CV	ft	Mean aerodynamic chord of vertical stabilizer (c_V)
9	5	N	BV	ft	Reference span of vertical stabilizer (b_V)
9	6	N	EKADR	--	Change in vertical stabilizer angle of attack per unit deflection of vertical stabilizer control surface ($K_{\alpha \delta_r}$)
9	7	C or N	EIV	rad	Vertical stabilizer incidence angle (i_V)
9	8	N	EKV	--	Sidewash coefficient (K_V)
9	9	N	CNOV	--	Zero side force yawing moment coefficient of vertical stabilizer ($C_{n_{o_v}}$)

Segment	Element	Type	Coded Name	Units	Definition
9	10	N	AEMRUD	—	Number of entries in rudder effectiveness table (≤ 7)
9	11-20	N	TALFA(I)	rad	Angles of attack for entries in vertical stabilizer effectiveness table (I=1 to AALFA)
9	21	N	AALFA	—	Number of entries in vertical stabilizer effectiveness table (≤ 10)
9	22-31	N	TVTEFF(I)	—	Vertical stabilizer effectiveness table entries (I = 1 to AALFA) ($f_{3AERO}(\alpha)$)
9	32	C	XV	ft	X body axis distance between aircraft cg and vertical stabilizer reference center of pressure (X_V)
9	33	C	YV	ft	Y body axis distance between aircraft cg and vertical stabilizer reference center of pressure (Y_V)
9	34	C	ZV	ft	Z body axis distance between aircraft cg and vertical stabilizer reference center of pressure (Z_V)

A.11 Segment 10 - Fuselage Aero Constants

Segment	Element	Type	Coded Name	Units	Definition
10	1	N	FSF	ft	Fuselage station of fuselage reference center of pressure (FS_F)
10	2	N	BLF	ft	Buttline of fuselage reference center of pressure (BL_F)
10	3	N	WLF	ft	Waterline of fuselage reference center of pressure (WL_F)
10	4	N	AQO	ft ²	Maximum fuselage axial force normalized to dynamic pressure ($(A/q)_{MAX}$)
10	5	N	SQMA	ft ²	Maximum fuselage side force normalized to dynamic pressure ($(S/q)_{MAX}$)
10	6	N	NFQM	ft ²	Maximum fuselage normal force normalized to dynamic pressure ($(NF/q)_{MAX}$)
10	7	N	MQMX1	ft ³	Maximum fuselage pitch moment in region ($\pi/18 + AOF$) $\leq \alpha \leq$ AIF - normalized to dynamic pressure ($(M/q)_{MAX_1}$)

Segment	Element	Type	Coded Name	Units	Definition
10	8	N	M _Q MX2	ft ³	Maximum fuselage pitch moment in region - $A1F < \alpha \leq \pi$ - normalized to dynamic pressure $((M/q)_{MAX2})$
10	9	N	N _Q MX1	ft ³	Maximum fuselage yaw moment in region - $\pi/18 \leq \alpha_{FY} \leq A2F$ - normalized to dynamic pressure where α_{FY} = fuselage sideslip angle $((N/q)_{MAX1})$
10	10	N	N _Q MX2	ft ³	Maximum fuselage yaw moment in region - $A2F < \alpha_{FY} \leq \pi$ - normalized to dynamic pressure $((N/q)_{MAX2})$
10	11	N	AOF	rad	Angle of attack where fuselage normal force equals zero (α_{0F})
10	12	N	A1F	rad	Angle of attack where fuselage pitch moment equals zero (α_{1F})
10	13	N	A2F	rad	Fuselage sideslip angle where fuselage yaw moment equals zero (α_{2F})
10	14	N	EN1	--	Exponent of cosine shaping function for fuselage axial force (n_1)
10	15	N	EN2	--	Exponent of sine shaping function for fuselage side force (n_2)
10	16	N	EN3	--	Exponent of sine shaping function for fuselage normal force (n_3)
10	17	N	EN4	--	Exponent of sine shaping function for fuselage pitch moment in the region $(\pi/18 + AOF) \leq \alpha \leq A1F$ (n_4)
10	18	N	EN5	--	Exponent of sine shaping function for fuselage pitch moment in the region $A1F < \alpha \leq \pi$ (n_5)
10	19	N	EN6	--	Exponent of sine shaping function for fuselage yaw moment in the region $\pi/18 \leq \alpha_{FY} \leq A2F$ (n_6)
10	20	N	EN7	--	Exponent of sine shaping function for fuselage yaw moment in the region $A2F \leq \alpha_{FY} \leq \pi$ (n_7)
10	21	N	DFSFO	ft	Maximum aft shift of fuselage center of pressure with angle of attack (ΔFS_{F0})

Segment	Element	Type	Coded Name	Units	Definition
10	22	N	ADFSF1	rad	Angle of attack where fuselage center of pressure begins to shift aft (A_{FS1})
10	23	N	ADFSF2	rad	Angle of attack where fuselage center of pressure shift equals DFSF0 (A_{FS2})
10	24	N	XKYF	--	Constant to control fuselage side force contribution to fuselage yaw moment (K_{YF})
10	25	C	XF	ft	X body axis distance between aircraft cg and fuselage reference center of pressure (X_F)
10	26	C	YF	ft	Y body axis distance between aircraft cg and fuselage reference center of pressure (Y_F)
10	27	C	ZF	ft	Z body axis distance between aircraft cg and fuselage reference center of pressure (Z_F)

A.12 Segment 11 - Direct Thrust Force and Moment Constants

Segment	Element	Type	Coded Name	Units	Definition
11	1-2	N	FSSW(I)	ft	Fuselage station of engine nozzle swivel point; I = 1 for left engine, = 2 for right engine ($FS_{SW}(I)$)
11	3-4	N	BLSW(I)	ft	Buttline of engine nozzle swivel point; I = 1 for left engine, = 2 for right engine ($BL_{SW}(I)$)
11	5-6	N	WLSW(I)	ft	Waterline of engine nozzle swivel point; I = 1 for left engine, = 2 for right engine ($WL_{SW}(I)$)
11	7	N	SIGY	rad	Inclination of engine centerline to fuselage reference line (σ_Y)
11	8	N	ELN	ft	Length of engine nozzle (l_{NOZ})
11	9	N	KAFT1	1/rad	Change of engine nozzle thrust efficiency per unit thrust turning angle (K_{AFT1})

Segment	Element	Type	Coded Name	Units	Definition
11	10	N	KAFI2	--	Engine nozzle thrust efficiency at zero thrust turning angle (K_{AFI_2})
11	11	N	AENG	--	Number of engines (≤ 2) (n_{eng})
11	12	C	CSIGY	--	$\cos(\sigma_Y)$
11	13	C	SSIGY	--	$\sin(\sigma_Y)$
11	14-15	C	XT(I)	ft	X body axis distance between aircraft cg and nozzle swivel point; I = 1 for left engine, = 2 for right engine ($X_T(I)$)
11	16-17	C	YT(I)	ft	Y body axis distance between aircraft cg and nozzle swivel point; I = 1 for left engine, = 2 for right engine ($Y_T(I)$)
11	18-19	C	ZT(I)	ft	Z body axis distance between aircraft cg and nozzle swivel point; I = 1 for left engine, = 2 for right engine ($Z_T(I)$)

A.13 Segment 12 - Inlet Ram Force and Moment Constants

Segment	Element	Type	Coded Name	Units	Definition
12	1-2	N	FSIN(I)	ft	Fuselage station of engine inlet force; I = 1 for left engine, = 2 for right engine ($FS_{IN}(I)$)
12	3-4	N	BLIN(I)	ft	Buttline of engine centerline at inlet face; I = 1 for left engine, = 2 for right engine ($BL_{IN}(I)$)
12	5-6	N	WLIN(I)	ft	Waterline of engine centerline at inlet face; I = 1 for left engine, = 2 for right engine ($WL_{IN}(I)$)
12	7	N	RINLET	ft	Equivalent inlet radius (r_{IN})
12	8	N	AVI	--	Number of entries in V/V_I table (≤ 5)
12	9	N	AATURN	--	Number of entries in ram moment arm, ram efficiency and incremental turning angle tables (≤ 8)

Segment	Element	Type	Coded Name	Units	Definition
12	10-11	C	XIN(I)	ft	X body axis distance between aircraft cg and engine inlet; I = 1 for left engine, = 2 for right engine ($X_{IN}(I)$)
12	12-13	C	YIN(I)	ft	Y body axis distance between aircraft cg and engine inlet; I = 1 for left engine, = 2 for right engine ($Y_{IN}(I)$)
12	14-15	C	ZIN(I)	ft	Z body axis distance between aircraft cg and engine inlet; I = 1 for left engine, = 2 for right engine ($Z_{IN}(I)$)

A.14 Segment 13 - Coriolis Force and Moment Constants

Segment	Element	Type	Coded Name	Units	Definition
13	1	N	ELDUCT	ft	Length of engine duct (l_{DUCT})

A.15 Segment 14 - Propulsion System Constants

Segment	Element	Type	Coded Name	Units	Definition
14	1	N	AMACH	--	Number of entries in Mach number table (≤ 4)
14	2	N	KBT1	1/%	Fractional change in thrust per percent bleed (K_{BT1})
14	3	N	KBT2	--	Fractional thrust at zero bleed (K_{BT2})
14	4	N	KM1	--	Fractional change in inlet mass flow rate per fractional change in thrust (K_{m1})
14	5	N	KM2	--	Fractional inlet mass flow rate at zero fractional thrust (K_{m2})
14	6	N	MEGMX	rad/sec	Maximum engine rotational speed in rad/sec (Ω_{eMAX})
14	7	N	RPMX	rpm	Maximum engine rotational speed in revolutions per minute
14	8	N	RCS	--	Indicates whether reaction control system is active; RCS $\neq 0$, RCS is active; = 0, RCS not active

Segment	Element	Type	Coded Name	Units	Definition
14	9	N	AFRAT	--	Number of entries in fractional thrust table for determining engine rotational speed (≤ 6)
14	10	N	JENG	slug ft ²	Engine rotational inertia per engine (J_{ENG})
14	11	N	AFRAC	--	Number of entries in fractional thrust table for engine dynamics parameters (≤ 10)
14	12	N	TAUAB	sec	Time constant for afterburner thrust dynamics (τ_{AB})
14	13	N	ABACCEL	1/sec	Acceleration limit of afterburner thrust ($T_{AB_{MAX}}$)
14	14	N	ABDECEL	1/sec	Deceleration limit of afterburner thrust ($T_{AB_{MIN}}$)
14	15	N	TAB ON	--	Level of TABIN when afterburner is lit ($T_{AB_{ON}}$)
14	16	N	TABOFF	--	Level of TAB(I) when afterburner is turned off ($T_{AB_{OFF}}$)
14	17	C	KBT	--	Fractional thrust level at reference bleed (K_{BT})

A.16 Segment 15 - RCS Force and Moment Constants

Segment	Element	Type	Coded Name	Units	Definition
15	1	N	ARCSJET	--	Number of RCS jets (≤ 10)
15	2	N	ABLDR	--	Number of entries in bleed tables (≤ 6)
15	3	N	ELDREF	%	Reference bleed (B_{REF})
15	4-13	N	FRCSMX(I)	lb	Maximum force of Ith jet ($F_{RCSMX}(I)$)
15	14-23	N	DEMAND(I)	--	Indicates whether jet I is demand bleed; DEMAND(I) = 1, jet I is demand; = 0, jet I is continuous bleed ($\overline{DMD}(I)$)
15	24-33	N	BLDMOR(I)	--	Indicates whether jet I requests additional bleed; BLD MOR(I)=1, jet I requests additional bleed; = 0, jet I <u>must</u> operate with available bleed ($\overline{BLDM}(I)$)

Segment	Element	Type	Coded Name	Units	Definition
15	34-83	N	RCSL(I,J)	--	Defines whether Jth control drives Ith jet; RCSL(I,J) \neq 0, Jth control drives Ith jet; = 0, Jth control does not drive Ith jet. J = 1 roll control; J = 2, pitch control; J = 3 yaw control; J = 4, side force control; J = 5, normal force control
15	84-93	N	FJRCS(I)	ft	Fuselage station of Ith jet ($FS_{JET}(I)$)
15	94-103	N	BLRCS(I)	ft	Buttline of Ith jet ($BL_{JET}(I)$)
15	104-113	N	WLRCS(I)	ft	Waterline of Ith jet ($WL_{JET}(I)$)
15	114-123	N	THTRCS(I)	rad	Pitch orientation of jet thrust line ($\theta_{JET}(I)$)
15	124-133	N	PSIRCS(I)	rad	Yaw orientation of jet thrust line ($\psi_{JET}(I)$)
15	134	C	FRCSMXR	--	Not used
15	135	C	FRCSMXO	lb	Total RCS force produced at reference conditions (reference bleed and zero control inputs); if all jets are demand bleed, then $FRCSMXO = 0$ ($FRCSMXO$)
15	136	C	FRCSMX1	--	Not used
15	137-146	C	CTHTRCS(I)	--	$\cos(\theta_{JET}(I))$
15	147-156	C	STHTRCS(I)	--	$\sin(\theta_{JET}(I))$
15	157-166	C	CPSIRCS(I)	--	$\cos(\psi_{JET}(I))$
15	167-176	C	SPSIRCS(I)	--	$\sin(\psi_{JET}(I))$
15	177-186	C	XJET(I)	ft	X body axis distance between aircraft cg and Ith jet ($X_{JET}(I)$)
15	187-196	C	YJET(I)	ft	Y body axis distance between aircraft cg and Ith jet ($Y_{JET}(I)$)
15	197-206	C	ZJET(I)	ft	Z body axis distance between aircraft cg and Ith jet ($Z_{JET}(I)$)

A.17 Segment 16 - Control System Constants

Segment	Element	Type	Coded Name	Units	Definition
16	1	N	DUM	--	Not used
16	2	N	AKZED	--	Not used in final version of program.
16	3	N	AKZEE1	--	Not used in final version of program.
16	4	N	AKZEE2	--	Not used in final version of program.
16	5	N	AKYED	--	Not used in final version of program.
16	6	N	AKYEE	--	Not used in final version of program.
16	7	N	AKU	sec	Pilot gain on ZEDOT feedback for stationkeeping option
16	8	N	AKV	sec	Pilot gain on YEDOT and XEDOT feedback in lateral position loop for stationkeeping option
16	9	N	AKW	sec	Pilot gain on XEDOT and YEDOT feedback in longitudinal position loop for stationkeeping option.
16	10	N	AKXES	1/sec	Pilot heave rate controller gain for stationkeeping option
16	11	N	AKYES	rad/ft	Pilot lateral stick gain for stationkeeping option
16	12	N	AKZES	rad/ft	Pilot longitudinal stick gain for stationkeeping option
16	13	N	CSV	--	Not used in final version of program.
16	14	N	VASW	ft/sec	Control system function switch speed (V_{ASW})
16	15	N	CS1	--	Not used in final version of program.
16	16	N	THETSW	--	Not used in final version of program.
16	17-24	N	TAKPC(I)	rad	Roll control system input gain table if the gain is a function of pitch angle.
16	25-32	N	TTHETA(I)	rad	Pitch angle table for determining control system gains.
16	33-40	N	TAKPE(I)	1/rad	Roll control system error gain table if the gain is a function of pitch angle.
16	41-48	N	TKPCI1(I)	rad/sec	Roll control system input integrator gain table if the gain is a function of pitch angle.

C-2

Segment	Element	Type	Coded Name	Units	Definition
16	49	N	ATHETA	—	Number of entries in control system gains pitch angle table (≤ 8)
16	50-57	N	TKPEL1(I)	rad/sec/ rad	Roll control system error integrator gain table*
16	58-65	N	TKP(I)	rad/rad/ sec	Roll control system roll rate feedback gain table*
16	66	N	PELIM	--	Output limit on roll control system error integrator (p_{eLIM})
16	67	N	AKDYDR	rad	Roll control to yaw control interconnect gain ($K_{\delta_y \delta_r}$)
16	68	N	KTHTR	rad	Pitch thrust deflection to roll control gain ($K_{\theta_T \delta_r}$)
16	69	N	KDA	rad	Differential wing trailing edge flap (elevon) deflection to roll control gain (K_{δ_a})
16	70-77	N	TAKRC(I)	rad	Yaw control system input gain table*
16	78-85	N	TAKRE(I)	1/rad	Yaw control system error gain table*
16	86-93	N	TKRCL1(I)	rad/sec	Yaw control system input integrator gain table*
16	94-101	N	TKREI1(I)	rad/sec/ rad	Yaw control system error integrator gain table*
16	102-109	N	TKR(I)	rad/rad/ sec	Yaw control system yaw rate feedback gain table*
16	110	N	RELIM	--	Output limit on yaw control system error integrator (r_{eLIM})
16	111	N	AKYTRM	rad/sec	Yaw control system trimmer gain
16	112	N	KPSIT	rad	Yaw thrust deflection to yaw control gain ($K_{\psi_T \delta_y}$)
16	113	N	KDR	rad	Rudder deflection to yaw control gain (K_{δ_r})
16	114-121	N	TAKAY(I)	rad/ft/ sec ²	Lateral acceleration feedback gain table; loaded as a function of TQBAR(I)

*Provided the gain is a function of pitch angle.

Segment	Element	Type	Coded Name	Units	Definition
16	122	N	KTY	lb	Thrust command to yaw control gain (K_{TY})
16	123-130	N	TAKQC(I)	rad	Pitch control system input gain table*
16	131-138	N	TAKQE(I)	rad/sec	Pitch control system error gain, table*
16	139-146	N	TKQCI(I)	rad/sec	Pitch control system input integration gain table*
16	147-154	N	TKQEI(I)	rad/sec/ rad	Pitch control system error integrator gain table*
16	155-162	N	TKQ(I)	rad/rad/ sec	Pitch control system pitch rate feedback gain table*
16	163	N	QELEM	—	Output limit on pitch control system error integrator (q_{eLIM})
16	164	N	AKPTKM	rad/sec	Pitch control system trimmer gain
16	165	N	DSTK	—	When the absolute value of longitudinal stick deflection is greater than DSTK, automatic pitch trimming is activated
16	166	N	KDE	rad	Symmetrical wing trailing edge flap (elevon) deflection to pitch control gain (K_{δ_e})
16	167	N	KTHP	rad	Pitch thrust deflection to pitch control gain ($K_{\theta_T \delta_p}$)
16	168-175	N	TAKZE(I)	lb/ft/sec	Heave control system error gain table*
16	176-183	N	TKZEI(I)	lb/sec/ ft/sec	Heave control system error integrator gain table*
16	184	N	AKTHROT	lb	Thrust command to manual throttle input gain (K_{THROT})
16	185	N	ZELIM	lb	Output limit on heave control system error integrator (T_{eLIM})
16	186	N	ELEVNR	rad	Reference elevon deflection (δ_{TEFW_R})
16	187-188	N	PSITRF(I)	rad	Reference yaw thrust deflection; I = 1 for left engine, =2 for right engine ($\psi_{TRF(I)}$)
16	189	N	KHFLAP1	—	Change in horizontal stabilizer trailing edge flap deflection per unit change in angle of attack (K_{TEFH1})

Segment	Element	Type	Coded Name	Units	Definition
16	190	N	KHFLAP2	rad	Horizontal stabilizer trailing edge flap deflection at zero angle of attack (K_{TEFH2})
16	191	N	KWFLAP1	—	Change in wing leading edge flap deflection per unit change in angle of attack (K_{LEFW1})
16	192	N	KWFLAP2	rad	Wing leading edge flap deflection at zero angle of attack (K_{LEFW2})
16	193	N	AQBAR	—	Number of entries in dynamic pressure table for lateral acceleration feedback gain (≤ 8)
16	194-201	N	TOBAR(X)	lb/ft ²	Dynamic pressure table for lateral acceleration feedback gain
16	202-209	N	TPITCH(I)	sec	Pitch input shaping filter time constant table if the time constant is a function of pitch angle
16	210-217	N	TROLL(I)	sec	Roll input shaping filter time constant table if the time constant is a function of pitch angle
16	218-225	N	TTYAW(I)	sec	Yaw input shaping filter time constant table if the time constant is a function of pitch angle

A.18 Segment 17 - Actuation System Constants

Segment	Element	Type	Coded Name	Units	Definition
17	1	N	LEURATL	rad/sec	Left wing trailing edge flap (elevon) actuator constants in order from element 1 to element 5: upper rate limit, lower rate limit, upper position limit, lower position limit, time constant
17	2	N	LELRATL	rad/sec	
17	3	N	LEUP SL	rad	
17	4	N	LELP SL	rad	
17	5	N	TLEL	sec	
17	6	N	REURATL	rad/sec	Right wing trailing edge flap (elevon) actuator constants in order from element 6 to element 10: upper rate limit, lower rate limit, upper position limit, lower position limit, time constant
17	7	N	RELRATL	rad/sec	
17	8	N	REUP SL	rad	
17	9	N	RELP SL	rad	
17	10	N	TREL	sec	
17	11	N	DRURATL	rad/sec	Vertical stabilizer control surface (Rudder) actuator constants in order from element 11 to element 15: upper rate limit, lower rate limit, upper position limit, lower position limit, time constant
17	12	N	DLRATL	rad/sec	
17	13	N	DRUP SL	rad	
17	14	N	DLRP SL	rad	
17	15	N	TDR	sec	

Segment	Element	Type	Coded Name	Units	Definition
17	16	N	HFURATL	rad/sec	Horizontal stabilizer trailing edge flap actuator constants in order from element 16 to element 20: upper rate limit, lower rate limit, upper position limit, lower position limit, time constant
17	17	N	HFLRATL	rad/sec	
17	18	N	HFLAPM	rad	
17	19	N	HFLAPMN	rad	
17	20	N	THF	sec	
17	21	N	WFURATL	rad/sec	Wing leading edge flap actuator constants in order from element 21 to element 25: upper rate limit, lower rate limit, upper position limit, lower position limit, time constant
17	22	N	WFLRATL	rad/sec	
17	23	N	WFLAPMX	rad	
17	24	N	WFLAPMN	rad	
17	25	N	TWF	sec	
17	26-27	N	THTURL(I)	rad/sec	Pitch thrust deflection actuator constants in order (two elements per constant where I = 1 is left engine and I = 2 is right engine) from element 26 to element 35: upper rate limit, lower rate limit, upper position limit, lower position limit, time constant
17	28-29	N	THTLRL(I)	rad/sec	
17	30-31	N	THRUPL(I)	rad	
17	32-33	N	THTLPL(I)	rad	
17	34-35	N	TTHT(I)	sec	
17	36-37	N	PSIURL(I)	rad/sec	Yaw thrust deflection actuator constants in order (two elements per constant where I = 1 is left engine and I = 2 is right engine) from element 36 to element 45: upper rate limit, lower rate limit, upper position limit, lower position limit, time constant
17	38-39	N	PSILRL(I)	rad/sec	
17	40-41	N	PSIUPL(I)	rad	
17	42-43	N	PSILPL(I)	rad	
17	44-45	N	TPSIT(I)	sec	
17	46-55	N	RCSURL(I)	--	RCS area actuator constants in order by groups of ten (up to ten RCS jets can be specified) from element 46 to element 95: upper rate limit (elements 46 to 55), lower rate limit (elements 56 to 65), upper position limit (elements 66 to 75), lower position limit (elements 76 to 85), time constants (elements 86 to 95)
17	56-65	N	RCSLRL(I)	--	
17	66-75	N	RCSUPL(I)	--	
17	76-85	N	RCSLPL(I)	--	
17	86-95	N	TAURCS(I)	sec	

Segment	Element	Type	Coded Name	Units	Definition
17	96-105	N	FRCSURL(I)	lb/sec	RCS force dynamics constants in order by groups of ten (up to ten RCS jets can be specified) from element 96 to element 145: upper rate limit (elements 96 to 105), lower rate limit (elements 106 to 115), upper position limit (elements 116 to 125), lower position limit (elements 126 to 135), time constant (elements 136 to 145)
17	106-115	N	FRCSLRL(I)	lb/sec	
17	116-125	N	FRCSUPL(I)	lb/	
17	126-135	N	FRCSLPL(I)	lb	
17	136-145	N	TAUFRCS(I)	sec	
17	146	N	DELIM	rad	Maximum commanded symmetrical wing trailing edge flap (elevon) deflection (δ_{eLIM})
17	147	N	DALIM	rad	Maximum commanded differential wing trailing edge flap (elevon) deflection (δ_{aLIM})
17	148	N	DRLIM	rad	Maximum commanded vertical stabilizer control surface (rudder) deflection (δ_{rLIM})

A.19 Segment 18 - Lift-Drag Variables

Segment	Element	Type	Coded Name	Units	Definition
18	1	C	LAMB1	--	Miscellaneous intermediate parameters associated with calculation of CNAAO(I), AEROK(I), EOS(1), and CIA(I). In Volume II symbology, these parameters are in order: $\tan \Lambda_{1/2}$, $C_{L_{\alpha e}}$, $K_{W(B)}$, C_1 , C_2 and J
18	2	C	CLAE	1/rad	
18	3	C	EKWB	--	
18	4	C	C1	--	
18	5	C	C2	--	
18	6	C	EJ	--	

A.20 Segment 19 - Wing Aero Variables

Segment	Element	Type	Coded Name	Units	Definition
19	1	C	DXW	lb	X body axis wing aerodynamic force (ΔX_W)
19	2	C	DYW	lb	Y body axis wing aerodynamic force (ΔY_W)
19	3	C	DZW	lb	Z body axis wing aerodynamic force (ΔZ_W)

Segment	Element	Type	Coded Name	Units	Definition
19	4	C	DLW	ft lb	Wing aerodynamic body axis roll moment (ΔL_W)
19	5	C	DMW	ft lb	Wing aerodynamic body axis pitch moment (ΔM_W)
19	6	C	DNW	ft lb	Wing aerodynamic body axis yaw moment (ΔN_W)
19	7	C	CLW	--	Total wing lift coefficient ($C_{L_{WT}}$)
19	8	C	ALFW	rad	Average local angle of attack of wing (α_{WT})
19	9	C	CDW	--	Total wing drag coefficient ($C_{D_{WT}}$)
19	10	C	UW	ft/sec	X body axis airspeed at wing center of pressure (u_W)
19	11	C	WV	ft/sec	Z body axis airspeed at wing center of pressure (w_W)
19	12	C	VXZ1	ft/sec	Total airspeed sensed by left wing in an X-Z body axis plane at the left wing center of pressure ($V_{XZ}(1)$)
19	13	C	VXZ2	ft/sec	Total airspeed sensed by right wing in an X-Z body axis plane at the right wing center of pressure ($V_{XZ}(2)$)
19	14	C	VXZ	ft/sec	Average total airspeed sensed by left and right wing halves ($V_{XZT} = 0.5 (V_{XZ}(1) + V_{XZ}(2))$)
19	15	C	DADA1	rad	Change in angle of attack of left wing due to left wing control surface deflection ($\Delta \alpha \delta_{CW}(1)$)
19	16	C	DADA2	rad	Change in angle of attack of right wing due to right wing control surface deflection ($\Delta \alpha \delta_{CW}(2)$)
19	17	C	ALFW1	rad	Local angle of attack of left wing ($\alpha'_W(1)$)
19	18	C	ALFW2	rad	Local angle of attack of right wing ($\alpha'_W(2)$)
19	19	C	CLW1	--	Lift coefficient of left wing ($C_{L_W}(1)$)
19	20	C	CLW2	--	Lift coefficient of right wing ($C_{L_W}(2)$)

Segment	Element	Type	Coded Name	Units	Definition
19	21	C	CDW1	—	Drag coefficient of left wing ($C_{D_W}(1)$)
19	22	C	CDW2	—	Drag coefficient of right wing ($C_{D_W}(2)$)
19	23	C	CDA	—	Not used
19	24	C	BETW	rad	Wing sideslip angle (β_W)
19	25	C	QWS	lb/ft ²	Dynamic pressure based on VXZ(\bar{q}_W)
19	26	C	QWSB	lb/ft	QWS*BW
19	27	C	BOV	sec	0.5 BW/VXZ(b/v)
19	28	C	LWP	ft lb	Wing stability axis roll moment (L_{W_S})
19	29	C	NWP	ft lb	Wing stability axis yaw moment (N_{W_S})
19	30	C	YWP	lb	Wing side force (Y_{W_S})
19	31	C	ALF1	rad	Left wing angle of attack ($\alpha'_W(1)$)
19	32	C	SALF1	—	sin (ALF1)
19	33	C	CALF1	—	cos (ALF1)
19	34	C	ALF2	rad	Right wing angle of attack ($\alpha'_W(2)$)
19	35	C	SALF2	—	sin (ALF2)
19	36	C	CALF2	—	cos (ALF2)
19	37	C	XW1	lb	X body axis left wing aerodynamic force ($X_W(1)$)
19	38	C	XW2	lb	X body axis right wing aerodynamic force ($X_W(2)$)
19	39	C	ZW1	lb	Z body axis left wing aerodynamic force ($Z_W(1)$)
19	40	C	ZW2	lb	Z body axis right wing aerodynamic force ($Z_W(2)$)
19	41	C	ALF	rad	Wing angle of attack (α')
19	42	C	SALF	—	sin (ALF)
19	43	C	CALF	—	cos (ALF)

Segment	Element	Type	Coded Name	Units	Definition
19	44	C	MW	ft lb	Wing aerodynamic pitch moment due to flaps and zero lift pitch (M_{WB})
19	45	C	LW	ft lb	Wing body axis roll moment without asymmetric lift effects (L_{WB})
19	46	C	NW	ft lb	Wing body axis yaw moment without asymmetric drag effects (N_{WB})
19	47	C	DA1	rad	Left wing trailing edge flap deflection (elevon) corrected for large deflection effects ($\delta'_{TEFW}(1)$)
19	48	C	DA2	rad	Right wing trailing edge flap deflection (elevon) corrected for large deflection effects ($\delta'_{TEFW}(2)$)
19	49	C	EKLEL	--	Large deflection correction factor for left wing elevon ($K_{TEFW}(1)$)
19	50	C	EKELR	--	Large deflection correction factor for right wing elevon ($K_{TEFW}(2)$)
19	51	C	CMW1	--	Left wing pitch moment coefficient due to flaps and zero lift pitch ($C_{mW}(1)$)
19	52	C	CMW2	--	Right wing pitch moment coefficient due to flaps and zero lift pitch ($C_{mW}(2)$)
19	53	C	DXWING1	--	Normalized (to CW) shift of left wing center of pressure as a function of angle of attack ($\Delta X_{WING}(1)$)
19	54	C	DXWING2	--	Normalized (to CW) shift of right wing center of pressure as a function of angle of attack ($\Delta X_{WING}(2)$)

A.21 Segment 20 - Horizontal Stabilizer Aero Variables

Segment	Element	Type	Coded Name	Units	Definition
20	1	C	DXH	lb	X body axis horizontal stabilizer aerodynamic force (ΔX_H)
20	2	C	DYH	lb	Y body axis horizontal stabilizer aerodynamic force (ΔY_H)

Segment	Element	Type	Coded Name	Units	Definition
20	3	C	DZH	lb	Z body axis horizontal stabilizer aerodynamic force (ΔZ_H)
20	4	C	DLH	ft lb	Horizontal stabilizer body axis roll moment (ΔL_H)
20	5	C	DMH	ft lb	Horizontal stabilizer body axis pitch moment (ΔM_H)
20	6	C	DNH	ft lb	Horizontal stabilizer body axis yaw moment (ΔN_H)
20	7	C	UH	ft/sec	X body axis airspeed at horizontal stabilizer center of pressure (u_H)
20	8	C	WH	ft/sec	Z body axis airspeed at horizontal stabilizer center of pressure (w_H)
20	9	C	ALFG	rad	Aircraft angle of attack (α), also coded as ALPH in segment 29
20	10	C	EPS	rad	Downwash angle (ϵ)
20	11	C	DALFW	rad	Incremented angle of attack for hacking angle of attack rate effects ($\Delta\alpha_1$ or $\Delta\alpha_2$)
20	12	C	CL1	--	Wing lift coefficient at DALFW where a positive α increment is used (C_{L1})
20	13	C	CL2	--	Wing lift coefficient at DALFW where a negative α increment is used (C_{L2})
20	14	C	CD1	--	Wing drag coefficient at DALFW where a positive α increment is used (C_{D1})
20	15	C	CD2	--	Wing drag coefficient at DALFW where a negative α increment is used (C_{D2})
20	16	C	DADE	rad	Change in horizontal stabilizer angle of attack due to horizontal stabilizer control surface deflection ($\Delta\alpha_{\delta_e}$)
20	17	C	ALFH	rad	Horizontal stabilizer local angle of attack (α_H)
20	18	C	CLH	--	Horizontal stabilizer lift coefficient (C_{LH})

Segment	Element	Type	Coded Name	Units	Definition
20	19	C	CDH	--	Horizontal stabilizer drag coefficient (C_{DH})
20	20	C	ANG	rad	Variables related to relative wing-horizonal stabilizer location and which are used to calculate dynamic pressure at the stabilizer (A_{HS} , D_{HS} , D_{HC} , Z)
20	21	C	DIS	--	
20	22	C	XI	--	
20	23	C	ZW	--	
20	24	C	DQOQO	--	Normalized dynamic pressure loss at horizontal stabilizer center of pressure ($\Delta \bar{q}/\bar{q}_0$)
20	25	C	ALFH1	rad	Horizontal stabilizer angle of attack ($= \tan^{-1} (WH/UH)$) (α_{H1})
20	26	C	SALFH1	--	$\sin (ALFH1)$
20	27	C	CALFH1	--	$\cos (ALFH1)$
20	28	C	DAH	rad	Change in horizontal stabilizer angle of attack due to angle of attack rate ($\Delta \alpha_H$)
20	29	C	DE	rad	Horizontal stabilizer control surface (i.e. elevator) deflection (δ_e)
20	30	C	QEFF	lb/ft ²	Effective dynamic pressure at horizontal stabilizer (\bar{q}_{EFF})
20	31	C	DAVG	rad	Average deflection of left and right wing trailing edge flaps (δ_{TEFA})
20	32	C	CMH	--	Horizontal stabilizer pitch moment coefficient due to flaps (C_{MH})
20	33	C	DXHT	--	Normalized (to CE) shift of horizontal stabilizer center of pressure as a function of angle of attack (ΔX_{HT})

A.22 Segment 21 - Vertical Stabilizer Aero Variables

Segment	Element	Type	Coded Name	Units	Definition
21	1	C	DXV	lb	X body axis vertical stabilizer aerodynamic force (ΔX_V)
21	2	C	DYV	lb	Y body axis vertical stabilizer aerodynamic force (ΔY_V)

Segment	Element	Type	Coded Name	Units	Definition
21	3	C	DZV	lb	Z body axis vertical stabilizer aerodynamic force (ΔZ_V)
21	4	C	DLV	ft lb	Vertical stabilizer body axis roll moment (ΔL_V)
21	5	C	DMV	ft lb	Vertical stabilizer body axis pitch moment (ΔM_V)
21	6	C	DNV	ft lb	Vertical stabilizer body axis yaw moment (ΔN_V)
21	7	C	UV	ft/sec	X body axis airspeed at vertical stabilizer center of pressure (u_V)
21	8	C	VV	ft/sec	Y body axis airspeed at vertical stabilizer center of pressure (v_V)
21	9	C	DADR	rad	Change in vertical stabilizer angle of attack due to vertical stabilizer control surface deflection ($\Delta \alpha_{\delta_r}$)
21	10	C	ALFV	rad	Vertical stabilizer local angle of attack (α_V)
21	11	C	CLV	--	Vertical stabilizer lift coefficient (C_{L_V})
21	12	C	CDV	--	Vertical stabilizer drag coefficient (C_{D_V})
21	13	C	ALFV1	rad	Vertical stabilizer angle of attack ($= \tan^{-1} (VV/UV)$) (α_{V1})
21	14	C	CALFV1	--	$\cos (ALFV1)$
21	15	C	SALFV1	--	$\sin (ALFV1)$
21	16	C	QOV	lb/ft ²	Effective dynamic pressure at vertical stabilizer (\bar{q}_V)
21	17	C	DRP	rad	Rudder deflection corrected for large deflection effects (δ_r)
21	18	C	EKR10D	--	Large deflection correction factor for rudder (K_{EFF_r})
21	19	C	CMV	--	Vertical stabilizer pitch moment coefficient due to flaps (C_{m_V})

Segment	Element	Type	Coded Name	Units	Definition
21	20	C	DXVT	--	Normalized (to CV) shift of vertical stabilizer center of pressure as a function of angle of attack (ΔX_{VT})
21	21	C	VTEFF	--	Vertical tail effectiveness factor (V_{TEFF})

A.23 Segment 22 - Fuselage Aero Variables

Segment	Element	Type	Coded Name	Units	Definition
22	1	C	DXF	lb	X body axis fuselage aerodynamic force (ΔX_F)
22	2	C	DYF	lb	Y body axis fuselage aerodynamic force (ΔY_F)
22	3	C	DZF	lb	Z body axis fuselage aerodynamic force (ΔZ_F)
22	4	C	DLF	ft lb	Fuselage body axis roll moment (ΔL_F)
22	5	C	DMF	ft lb	Fuselage body axis pitch moment (ΔM_F)
22	6	C	DNF	ft lb	Fuselage body axis yaw moment (ΔN_F)
22	7	C	ALFF	rad	Aircraft angle of attack (α), also coded as ALPH in segment 29 and ALFG in segment 20
22	8	C	ALFYF	rad	Fuselage yaw angle of attack (α_{F_Y})
22	9	C	ALFTF	rad	Fuselage total angle of attack ($= \tan^{-1} (\sqrt{VAS^2 + WAS^2}/UAS)$) (α_{F_T})
22	10	C	QXY	lb/ft ²	Dynamic pressure based on UAS and VAS ($= 1/2 \rho (UAS^2 + VAS^2)$) (\bar{q}_{xy})
22	11	C	QO	lb/ft ²	Total dynamic pressure (\bar{q}), also coded as QBAR in segment 29

Segment	Element	Type	Coded Name	Units	Definition
22	12	C	QXZ	lb/ft ²	Dynamic pressure based on UAS and WAS (= 1/2 ρ (UAS ² + WAS ²)) (q _{xz})
22	13	C	AQ	ft ²	Fuselage axial force coefficient (A/q)
22	14	C	AS	lb	Fuselage axial force (A _p)
22	15	C	SAF	—	sin (AF) - AF is element 17 in Segment 22
22	16	C	SQ	ft ²	Fuselage side force coefficient (S/q)
22	17	C	AF	rad	Angle redefined man, times while calculating fuselage aero forces and moments
22	18	C	NFQ	ft ²	Fuselage normal force coefficient (N _p /q)
22	19	C	MQ	ft ³	Fuselage pitch moment coefficient (M/q)
22	20	C	MQ1	ft ³	Fuselage pitch moment coefficient when AF = π ² / (18(A1F - A0F))
22	21	C	S	lb	Fuselage side force (S _p)
22	22	C	NF	lb	Fuselage normal force (N _p)
22	23	C	PITCHF	ft lb	Fuselage pitch moment about reference cg (M)
22	24	C	ALFYFD	—	Not used
22	25	C	NQ	ft ³	Fuselage yaw moment coefficient (N/q)
22	26	C	NQ1	ft ³	Fuselage yaw moment when AF = π ² / (18(A2F))
22	27	C	YAWF	ft lb	Fuselage yaw moment about reference cg (N)
22	28	C	DFSF	ft	Shift of fuselage center of pressure as a function of angle of attack (ΔFS _p)

A.24 Segment 23 - Direct Thrust Force and Moment Variables

NOTE: For all subscripted variables in segment 23, I=1 indicates left engine and I=2 indicates right engine

Segment	Element	Type	Coded Name	Units	Definition
23	1	C	DXT	lb	X body axis direct thrust force (X_{TRST})
23	2	C	DYT	lb	Y body axis direct thrust force (Y_{TRST})
23	3	C	DZT	lb	Z body axis direct thrust force (Z_{TRST})
23	4	C	DLT	ft/lb	Direct thrust body axis roll moment (L_{TRST})
23	5	C	DMT	ft/lb	Direct thrust body axis pitch moment (M_{TRST})
23	6	C	DNT	ft/lb	Direct thrust body axis yaw moment (N_{TRST})
23	7-8	C	AFT(I)	rad	Flow turning angle of exhaust ($A_{FT}(I)$)
23	9-10	C	TCOR (I)	lb	Net thrust applied to aircraft after correction for flow turning losses ($T_{COR}(I)$)
23	11-12	C	DX(I)	lb	X body axis force applied by Ith engine ($\Delta X(I)$)
23	13-14	C	DY(I)	lb	Y body axis force applied by Ith engine ($\Delta Y(I)$)
23	15-16	C	DZ(I)	lb	Z body axis force applied by Ith engine ($\Delta Z(I)$)
23	17-18	C	DFSSW(I)	ft	X body axis distance between nozzle swivel point and exit plane ($\Delta FS_{SW}(I)$)
23	19-20	C	DBLSW(I)	ft	Y body axis distance between nozzle swivel point and exit plane ($\Delta BL_{SW}(I)$)
23	21-22	C	DWLSW(I)	ft	Z body axis distance between nozzle swivel point and exit plane ($\Delta WL_{SW}(I)$)
23	23-24	C	SPSIT(I)	-	sin (PSIT(I))-PSIT(I) located in segment 3, elements 24 and 25
23	25-26	C	CPSIT(I)	-	cos (PSIT(I))-PSIT(I) located in segment 3, elements 24 and 25
23	27-28	C	STHT(I)	-	sin (THT(I)) THT(I) located in segment 3, elements 26 and 27
23	29-30	C	CTHT(I)	-	cos (THT(I))-THT(I) located in segment 3, elements 26 and 27
23	31	C	KAFT	-	Flow turning correction factor (K_{AFT})

A.25 Segment 24 - Inlet Ram Force and Moment Variables

NOTE: For all subscripted variables in segment 24, I=1 indicates left engine, I=2 indicates right engine.

Segment	Element	Type	Coded Name	Units	Definition
24	1	C	DXR	lb	X body axis inlet ram force (X_{RAM})
24	2	C	DYR	lb	Y body axis inlet ram force (Y_{RAM})
24	3	C	DZR	lb	Z body axis inlet ram force (Z_{RAM})
24	4	C	DLR	ft lb	Inlet ram body axis roll moment (I_{RAM})
24	5	C	DMR	ft lb	Inlet ram body axis pitch moment (M_{RAM})
24	6	C	DNR	ft lb	Inlet ram body axis yaw moment (N_{RAM})
24	7	C	VO	ft/sec	True airspeed (V_A), also coded as VA in segment 29
24	8	C	ATURNO	rad	Geometric inlet flow turning angle in X-Z inlet plane (A_{TURN})
24	9	C	BTURN	rad	Geometric inlet flow turning angle in X-Y inlet plane (B_{TURN})
24	10	C	CBTURN	-	cos (BTURN)
24	11	C	SBTURN	-	sin (BTURN)
24	12	C	VIN	ft/sec	Inlet flow velocity (V_{IN})
24	13-14	C	VOVI(I)	-	Ratio of true airspeed to inlet flow velocity ($VOV_{IN}(I)$)
24	15-16	C	ATURN(I)	rad	Actual inlet flow turning angle in X-Z inlet plane ($A_{TURN}(I)$)
24	17-18	C	ELRAM(I)	-	Inlet ram moment arm normalized to equivalent inlet diameter ($L_{RAM}(I)$)
24	19-20	C	DATURN(I)	rad	Difference between actual and geometric inlet flow turning angles ($\Delta A_{TURN}(I)$)
24	21-22	C	ETAR(I)	-	Ratio of actual to theoretical inlet ram force magnitude ($\eta_R(I)$)
24	23-24	C	FRAM(I)	lb	Actual inlet ram force magnitude ($F_{RAM}(I)$)
24	25	C	ELR	ft	Inlet ram force moment arm (distance along engine centerline from inlet face to inlet ram force application point)
24	26	C	WLRAM	ft	Waterline of inlet ram force application point (WL_{RAM})

Segment	Element	Type	Coded Name	Units	Definition
24	27	C	FSRAM	ft	Fuselage station of inlet ram force application point (FS_{RAM})
24	28	C	SATURN	-	Used to represent $\sin(ATURN(I))$ for all values of I
24	29	C	CATURN	-	Used to represent $\cos(ATURN(I))$ for all values of I
24	30-31	C	DXRO(I)	lb	X body axis inlet ram force due to freestream air flow ($\Delta X_{R_0}(I)$)
24	32-33	C	YRO(I)	lb	Y body axis inlet ram force due to freestream air flow ($\Delta Y_{R_0}(I)$)
24	34-35	C	DZRO(I)	lb	Z body axis inlet ram force due to freestream air flow ($\Delta Z_{R_0}(I)$)
24	36-37	C	DXRI(I)	lb	X body axis inlet ram force due inlet flow velocity induced by aircraft rotation rates ($\Delta X_{RI}(I)$)
24	38-39	C	DYRI(I)	lb	Y body axis inlet ram force due inlet flow velocity induced by aircraft rotation rates ($\Delta Y_{RI}(I)$)
24	40-41	C	DZRI(I)	lb	Z body axis inlet ram force due inlet flow velocity induced by aircraft rotation rates ($\Delta Z_{RI}(I)$)
24	42	C	UI	ft/sec	X body axis inlet flow velocity induced by aircraft rotation rates (u_I)
24	43	C	VI	ft/sec	Y body axis inlet flow velocity induced by aircraft rotation rates (v_I)
24	44	C	WI	ft/sec	Z body axis inlet flow velocity induced by aircraft rotation rates (w_I)

A.26 Segment 25 - Coriolis Force and Moment Variables

Segment	Element	Type	Coded Name	Units	Definition
25	1	C	DXCOR	lb	X body axis Coriolis force (X_{COR})
25	2	C	DYCOR	lb	Y body axis Coriolis force (Y_{COR})
25	3	C	DZCOR	lb	Z body axis Coriolis force (Z_{COR})
25	4	C	DLCOR	ft/lb	Coriolis body axis roll moment (L_{COR})
25	5	C	DMCOR	ft/lb	Coriolis body axis pitch moment (M_{COR})
25	6	C	DNCOR	ft/lb	Coriolis body axis yaw moment (N_{COR})

Segment	Element	Type	Coded Name	Units	Definition
25	7	C	ELC OR	ft	X distance from aircraft cg to engine inlet face measured along engine centerline.
25	8	C	EAC OR	ft	Z distance from aircraft cg to engine centerline measured parallel to engine inlet face.
25	9	C	DLC OR	ft/lb	Coriolis roll moment about engine centerline (L_{COR})
25	10	C	DMC OR	ft/lb	Coriolis body axis pitch moment; same as DMCOR (M_{COR})
25	11	C	DNC OR	ft/lb	Coriolis yaw moment perpendicular to plane defined by engine centerline and Y body axis (N_{COR})

A.27 Segment 26 - Propulsion System Variables

NOTE: For all subscripted variables in this segment, I=1 indicates left engine, I=2 indicates right engine.

Segment	Element	Type	Coded Name	Units	Definition
26	1-2	C	MDOT(I)	lbm/sec	Inlet mass flow rate ($\dot{m}(I)$)
26	3-4	C	RPM(I)	rev/min	Engine rpm
26	5-6	C	TRST(I)	lb	Engine thrust corrected for RCS bleed ($T_{APPL}(I)$)
26	7	C	BLDAVL	%	Bleed available (B_{AVL})
26	8	C	FGMAX	lb	Maximum afterburning thrust ($F_{G_{MAX}}$)
26	9	C	FGMIN	lb	Maximum non-afterburning thrust ($F_{G_{MIN}}$). Also minimum afterburning thrust.
26	10	C	FGIDL	lb	Idle thrust ($F_{G_{IDL}}$)
26	11	C	MDTMX	lbm/sec	Maximum inlet mass flow rate (\dot{m}_{MAX})
26	12	C	TRCSREF	-	Not used
26	13	C	TREQAV	lb	Average uncorrected (for RCS and flow turning effects) thrust ($T_{REQ_{AV}}$)
26	14-15	C	TREQ(I)	lb	Uncorrected (for RCS and flow turning effects) thrust of Ith engine ($T_o(I)$)
26	16	C	FRATIO	-	Ratio of uncorrected thrust to maximum non-afterburning thrust
26	17	C	FRPM	-	Fractional rpm (F_{RPM})

Segment	Element	Type	Coded Name	Units	Definition
26	18	C	KMDT	-	Fractional inlet mass flow rate.
26	19	C	KBTP	-	Thrust correction factor for RCS coupling (K_{BT})
26	20	C	TRCS	lb	Thrust loss due to RCS coupling (T_{RCS})
26	21-22	C	TC(I)	lb	Commanded thrust corrected for RCS reference bleed ($T_C(I)/K_{BT}$)
26	23-24	C	HE(I)	lb ft sec	Engine angular momentum ($H_e(I)$)
26	25-26	C	TFRACC(I)	-	Ratio of TC(I) to maximum non-afterburning thrust (T_{FIN})
26	27	C	TFRACIN	-	Used to represent TFRACC(I) for all values of I (T_{FIN})
26	28	C	FRACL	-	Ratio of maximum non-afterburning thrust to idle thrust ($F_{G_{IDL}}/F_{G_{MIN}}$)
26	29	C	TENG	sec	Engine time constant ($T_{ENG(I)}$)
26	30	C	TFRACE	-	Non-afterburning thrust dynamics loop error (T_{FE})
26	31	C	TABIN	-	Input to afterburning thrust dynamics loop ($T_{AB_{IN}}$)
26	32	C	BLOT3	-	Not used.
26	33	C	TABE	-	Afterburning thrust dynamics loop error (T_{AB_e})
26	34-35	C	T ϕ (I)	lb	Same as TREQ(I) ($T_o(I)$)

A.28 Segment 27 - RCS Force and Moment Variables

Segment	Element	Type	Coded Name	Units	Definition
27	1	C	DXRCS	lb	X body axis RCS force (X_{RCS})
27	2	C	DYRCS	lb	Y body axis RCS force (Y_{RCS})
27	3	C	DZRCS	lb	Z body axis RCS force (Z_{RCS})
27	4	C	DLRCS	ft/lb	RCS body axis roll moment (L_{RCS})
27	5	C	DMRCS	ft/lb	RCS body axis pitch moment (M_{RCS})
27	6	C	DNRCS	ft/lb	RCS body axis yaw moment (N_{RCS})
27	7	C	DFRCSDB	lb	RCS force produced by those demand jets which require additional bleed ($\Delta F_{RCS_{DMD}}$)
27	8	C	DFRCS	-	Not used.
27	9-18	C	FRCS(I)	lb	Uncorrected RCS force produced at Ith jet ($F_{RCS}(I)$)

Segment	Element	Type	Coded Name	Units	Definition
27	19	C	BLDREQ	X	Bleed required by RCS (B_{REQ})
27	20	C	FRCSAL	lb	Total RCS force available within bleed limits ($F_{RCS_{AL}}$)
27	21	C	FRCSLU	lb	Total RCS force desired ($F_{RCS_{LU}}$)
27	22-31	C	FRCS(I)	lb	Commanded RCS force at Ith jet corrected for bleed available and mass flow rate
27	32-41	C	DXRC(I)	lb	X body axis force produced by Ith jet ($\Delta X_{RCS(I)}$)
27	42-51	C	DYRC(I)	lb	Y body axis force produced by Ith jet ($\Delta Y_{RCS(I)}$)
27	52-61	C	DZRC(I)	lb	Z body axis force produced by Ith jet ($\Delta Z_{RCS(I)}$)
27	62-71	C	DRCS(I)	-	Commanded normalized area of Ith RCS jet ($\delta_{RCS_C(I)}$)
27	72	C	BLD	X	Bleed actually used by RCS (\overline{BLD})
27	73	C	FRCSDB	-	Not used.

A.29 Segment 28 - Control System Variables

Segment	Element	Type	Coded Name	Units	Definition
28	1	C	ZEE	-	Not used.
28	2	C	ZEIC	ft	Initial value of ZE
28	3	C	YEE	ft	Error in pseudo-pilot closed zero lateral drift loop
28	4	C	YEIC	ft	Initial value of YE
28	5-8	C	DXE,DYE, DZE,XES	-	Not used
28	9	C	YES	ft	Y body axis position error in pseudo-pilot stationkeeping option
28	10	C	ZES	ft	Z body axis position error in pseudo-pilot stationkeeping option
28	11	C	CSSW	-	Control system function switch gain (CS_{SW})
28	12	C	ROLLCMD	rad or rad/sec	Cockpit input to roll control system; combines lateral stick and pedal inputs in accordance with control system function switching (P_{CMD})
28	13	C	DLATSTK	rad or rad/sec	Lateral stick deflection (δ_{LATSTK})
28	14	C	AKPC	rad	Roll control system input gain (K_{PC})

Segment	Element	Type	Coded Name	Units	Definition
28	15	C	AKPCI	--	Roll input integrator selector gain ($K_{p_c I}$)
28	16	C	PCMD	rad	Shaped input to roll control system (P_c)
28	17	C	AKPE	1/rad	Roll control system error gain (K_{p_e})
28	18	C	AKPEI	--	Roll error integrator selector gain for roll control system ($K_{p_e I}$)
28	19	C	PE	rad	Roll control system error (p_e)
28	20	C	DROLL	-	Normalized roll control (δ_{ROLL})
28	21	C	YAWCMD	rad or rad/sec	Cockpit input to yaw control system; combines lateral stick and pedal inputs in accordance with control system function switching (R_{CMD})
28	22	C	DPED	rad or rad/sec	Pedal deflection (δ_{PED})
28	23	C	AKRC	rad	Yaw control system input gain (K_{r_c})
28	24	C	AKRCI	--	Yaw input integrator selector gain ($K_{r_c I}$)
28	25	C	YTRMBUT	-	Yaw control system trim input ($\delta_{r_{BUT}}$)
28	26	C	RE	rad	Yaw control system error (r_e)
28	27	C	AKRE	1/rad	Yaw control system error gain (K_{r_e})
28	28	C	AKREI	--	Yaw error integrator selector gain for yaw control system ($K_{r_e I}$)
28	29	C	DYAW	-	Normalized yaw control (δ_{YAW})
28	30	C	AKAY	rad/ft/sec ²	Lateral acceleration feedback gain (K_{a_y})
28	31	C	DLNGSTK	rad or rad/sec	Longitudinal stick deflection (δ_{LNGSTK})
28	32	C	AKQC	rad	Pitch control system input gain (K_{q_c})
28	33	C	AKQCI	--	Pitch input integrator selector gain ($K_{q_c I}$)
28	34	C	PTRMBUT	-	Pitch control system trim input ($\delta_{q_{BUT}}$)
28	35	C	QE	rad	Pitch control system error (q_e)
28	36	C	AKQE	1/rad	Pitch control system error gain (K_{q_e})

Segment	Element	Type	Coded Name	Units	Definition
28	39	C	AKQEI	--	Pitch error integrator selector gain for pitch control system ($K_{q_e I}$)
28	38	C	DPITCH	--	Normalized pitch control (δ_{PITCH})
28	39	C	ZEDTC	ft/sec	Heave control system input (\dot{z}_{e_c})
28	40	C	ZEDTE	ft/sec	Heave control system error (\dot{z}_{e_e})
28	41	C	AKZE	lb/ft/sec	Heave control system error gain (K_{z_e})
28	42	C	AKZEI	lb/sec/ft/sec	Heave control system error integrator gain ($K_{z_e I}, K_{z_e}$)
28	43	C	DTHROT	--	Manual throttle input (δ_{THROT})
28	44	C	DSIDEF	--	Normalized side force control
28	45	C	DNORNF	--	Normalized normal force control
28	46-47	C	PSITC(I)	rad	Commanded yaw thrust deflection for Ith engine I = 1 for left engine, I = 2 for right engine ($\psi_{TC}(I)$)
28	48-49	C	PTHTC(I)	rad	Commanded pitch thrust deflection for Ith engine; I = 1 for left engine, I = 2 for right engine ($\theta_{TC}(I)$)
28	50	C	DEC	rad	Commanded symmetrical elevon deflection (δ_{e_c})
28	51	C	DRC	rad	Commanded rudder deflection (δ_{r_c})
28	52	C	DAC	rad	Commanded differential elevon deflection (δ_{a_c})
28	53	C	DRCSR	--	Normalized command for RCS roll control
28	54	C	DRCSP	--	Normalized command for RCS pitch control
28	55	C	DRCSY	--	Normalized command for RCS yaw control
28	56	C	DRCSSF	--	Normalized command for RCS side force control
28	57	C	DRCSNF	--	Normalized command for RCS normal force control
28	58	C	TCMD	lb	Commanded thrust (T_{CMD})
28	59	C	HFLAPC	rad	Commanded canard trailing edge flap deflection ($\delta_{TEF_{HC}}$)

Segment	Element	Type	Coded Name	Units	Definition
28	60	C	WFLAPC	rad	Commanded wing leading edge flap deflection ($\delta_{LEF_{HC}}$)
28	61	C	LELEVNC	rad	Commanded left elevon deflection ($\delta_{TEF_{WC}}(1)$)
28	62	C	RELEVNC	rad	Commanded right elevon deflection ($\delta_{TEF_{WC}}(2)$)
28	63	C	AKPCII	rad/sec	Roll control system input integrator gain ($K_{pe_{II}}$)
28	64	C	AKPEII	1/sec	Multiplies roll control system error gain to form error integrator gain ($K_{pe_{II}}$)
28	65	C	AKP	rad/rad/sec	Roll control system roll rate feedback gain (K_{pp})
28	66	C	AKRCII	rad/sec	Yaw control system input integrator ($K_{r_{CTI}}$)
28	67	C	AKREII	1/sec	Multiplies yaw control system error gain to form error integrator gain ($K_{re_{II}}$)
28	68	C	AKR	rad/rad/sec	Yaw control system yaw rate feedback gain (K_{r_r})
28	69	C	AKQCII	rad/sec	Pitch control system input integrator gain ($K_{qc_{II}}$)
28	70	C	AKQEII	1/sec	Multiplies pitch control system error gain to form error integrator gain ($K_{qe_{II}}$)
28	71	C	AKQ	rad/rad/sec	Pitch control system pitch rate feedback gain (K_{qq})
28	72	C	AKZEII	1/sec	Multiplies heave control system error gain to form error integrator gain ($K_{ze_{II}}$)
28	73	N	CSVSW	--	Not used in final version of program.
28	74	C	TPITCH	sec	Pitch input shaping filter time constant
28	75	C	TROLL	sec	Roll input shaping filter time constant
28	76	C	TYAW	sec	Yaw input shaping filter time constant

A.30 Segment 29 - Miscellaneous Air Data, Force and Moment and Kinematic Variables

Segment	Element	Type	Coded Name	Units	Definition
29	1	C	UAS	ft/sec	X body axis component of airspeed (u_{AS})
29	2	C	VAS	ft/sec	Y body axis component of airspeed (v_{AS})
29	3	C	WAS	ft/sec	Z body axis component of airspeed (w_{AS})
29	4	C	RRD	slug/ft ³	Air density (ρ)
29	5	C	TAMB	deg R	Ambient air temperature (Available but not used in program)
29	6	C	VS OUND	ft/sec	Speed of sound (V_{SS})
29	7	C	TRATI 0	--	Temperature ratio (Available but not used in program)
29	8	C	PRATI 0	--	Pressure ratio (Available but not used in program)
29	9	C	VA	ft/sec	Total airspeed (V_A)
29	10	C	VK	kt	Total airspeed (V_A)
29	11	C	MN	--	Mach number (M_N)
29	12	C	QBAR	lb/ft ²	Dynamic pressure (\bar{q})
29	13	C	ALPH	rad	Angle of attack (α)
29	14	C	BETA	rad	Sideslip angle (β)
29	15	C'	ALFAD	rad/sec	Rate of change of angle of attack ($\dot{\alpha}$)
29	16	C	SALPH	--	$\sin(\alpha)$
29	17	C	CALPH	--	$\cos(\alpha)$
29	18	C	SBETA	--	$\sin(\beta)$
29	19	C	CBETA	--	$\cos(\beta)$
29	20	C	XAER 0	lb	Total X body axis aerodynamic force (X_{AERO})
29	21	C	YAER 0	lb	Total Y body axis aerodynamic force (Y_{AERO})
29	22	C	ZAER 0	lb	Total Z body axis aerodynamic force (Z_{AERO})
29	23	C	LAER 0	ft lb	Total aerodynamic body axis roll moment (L_{AERO})

Segment	Element	Type	Coded Name	Units	Definition
29	24	C	MAER0	ft lb	Total aerodynamic body axis pitch moment (M_{AERO})
29	25	C	NAER0	ft lb	Total aerodynamic body axis yaw moment (N_{AERO})
29	26	C	SUMFX	lb	Total X body axis applied force (X_{TOT})
29	27	C	SUMFY	lb	Total Y body axis applied force (Y_{TOT})
29	28	C	SUMFZ	lb	Total Z body axis applied force (Z_{TOT})
29	29	C	SUML	ft lb	Total body axis applied roll moment (L_{TOT})
29	30	C	SUMM	ft lb	Total body axis applied pitch moment (M_{TOT})
29	31	C	SUMN	ft lb	Total body axis applied yaw moment (N_{TOT})
29	32	C	D11P	--	Corrected d_{11} direction cosine (d'_{11})
29	33	C	D12P	--	Corrected d_{12} direction cosine (d'_{12})
29	34	C	D13P	--	Corrected d_{13} direction cosine (d'_{13})
29	35	C	D21P	--	Corrected d_{21} direction cosine (d'_{21})
29	36	C	D22P	--	Corrected d_{22} direction cosine (d'_{22})
29	37	C	D23P	--	Corrected d_{23} direction cosine (d'_{23})
29	38	C	D31P	--	Corrected d_{31} direction cosine (d'_{31})
29	39	C	D32P	--	Corrected d_{32} direction cosine (d'_{32})
29	40	C	D33P	--	Corrected d_{33} direction cosine (d'_{33})
29	41	C	DCMAG	--	Determinant of direction cosine matrix
29	42	C	UAIR	ft/sec	X body axis component of airmass velocity (u_{AIR})
29	43	C	VAIR	ft/sec	Y body axis component of airmass velocity (v_{AIR})
29	44	C	WAIR	ft/sec	Z body axis component of airmass velocity (w_{AIR})

Segment	Element	Type	Coded Name	Units	Definition
29	45	C	ALT	ft	Altitude ($= -z_e$)
29	46	C	RS	rad/sec	Stability axis yaw rate (r_g)
29	47	C	PS	rad/sec	Stability axis roll rate (p_g)
29	48-50	C	BL/T1(3)	--	Not used
29	51	C	GYROL	ft lb	Gyroscopic body axis roll moment (L_{GYRO})
29	52	C	GYROM	ft lb	Gyroscopic body axis pitch moment (M_{GYRO})
29	53	C	GYRON	ft lb	Gyroscopic body yaw moment (N_{GYRO})
29	54	C	NXCG	g	X body axis load factor (n_{XCG})
29	55	C	NYCG	g	Y body axis load factor (n_{YCG})
29	56	C	NZCG	g	Z body axis load factor (n_{ZCG})
29	57	C	XDW	ft/sec	X inertial axis airmass velocity component
29	58	C	YDW	ft/sec	Y inertial axis airmass velocity component
29	59	C	ZDW	ft/sec	Z inertial axis airmass velocity component
29	60-62	C	BL/T2(3)	--	Not used
29	63	C	LPRIME	rad/sec ²	Body axis roll moment adjusted to include cross product of inertia coupling of yaw moment. LPRIME equals PDOT at time zero with zero initial conditions on angular rates.
29	64	C	NPRIME	rad/sec ²	Body axis yaw moment adjusted to include cross product of inertia coupling of roll moment. NPRIME equals RDOT at time zero with zero initial conditions on angular rates.

Segment	Element	Type	Coded Name	Units	Definition
29	65	C	VE	ft/sec	Magnitude of inertial speed (= $\sqrt{U^2 + V^2 + W^2}$)
29	66	C	VEDT	ft/sec ²	Rate of change of magnitude of inertial speed.
29	67	C	VEEST	ft/sec	Predicted magnitude of inertial speed (VEEST = VEDT*DT + VE)

A.31 Segment 30 - Inlet Ram Forces and Moments Tables

Segment	Element	Type	Coded Name	Units	Definition
30	1-5	N	VOVIT(I)	--	Table entries for independent variable VОВI used to determine ram drag parameters (I is defined by AVOVI and must be ≤ 5)
30	6-13	N	ATURN(J)	rad	Table entries for independent variable ATURN used to determine inlet ram parameters (J is defined by AATURN and must be ≤ 8)
30	14-53	N	ELRAM(I,J)	--	Table entries for normalized (to equivalent inlet diameter) inlet ram moment arm. Table is addressed by defining values for VОВI and ATURN. ELRAM(I,J) is the value of ELRAM when VОВI = VОВIT(I) and ATURN = ATURN(J)
30	54-93	N	DATURN(I,J)	rad	Table entries for difference between actual and geometric inlet flow turning angles. Table is addressed by defining values for VОВI and ATURN. DATURN(I,J) is the value of DATURN when VОВI = VОВIT(I) and ATURN = ATURN(J)
30	94-133	N	ETART(I,J)	--	Table entries for ratio of actual to theoretical inlet ram force magnitude. Table is addressed by defining values for VОВI and ATURN. ETART(I,J) is the value of ETART(I,J) is the value of ETART when VОВI = VОВIT(I) and ATURN = ATURN(J)

A.32 Segment 31 - RCS Forces and Moments Tables

Segment	Element	Type	Coded Name	Units	Definition
31	1-6	N	FRCST(I)	lb	Entries for RCS force table. Table is used with BLDRT to determine RCS force as a function of bleed or vice versa. I is defined by ABLDR and must be ≤ 6 .
31	7-12	N	BLDRT(I)	%	Entries for bleed table. Table is used with FRCST to determine bleed as a function of RCS force or vice versa. I is defined by ABLDR and must be ≤ 6 . BLDRT (I) equals bleed when RCS force equals FRCST(I).

A.33 Segment 32 - Thrust Related Tables

Segment	Element	Type	Coded Name	Units	Definition
32	1-4	N	MNT(I)		Entries in Mach number table. Table used with TFGMAX, TFGMIN, TFGIDL and TMDT to obtain maximum and minimum afterburning thrust, idle thrust and maximum inlet mass flow rate as functions of Mach number. I is defined by AMACE and must be ≤ 4 .
32	5-8	N	TFGMAX(I)	lb	Entries in maximum afterburning thrust table. I must be ≤ 4 . TFGMAX(I) equals FGMAX at MN=MNT(I).
32	9-12	N	TFGMIN(I)	lb	Entries in minimum afterburning thrust table. I must be ≤ 4 . TFGMIN(I) equals FGMIN at MN=MNT(I).
32	13-16	N	TFGIDL(I)	lb	Entries in idle thrust table. I must be ≤ 4 . TFGIDL(I) equals FGIDL at MN=MNT(I).
32	17-20	N	TMDT(I)	lbm/sec	Entries in maximum inlet mass flow rate table. I must be ≤ 4 . TMDT(I) equals MDTMX at MN=MNT(I).

Segment	Element	Type	Coded Name	Units	Definition
32	21-26	N	TFRAT(I)	--	Entries in fractional non-after-burning thrust table. Table used with TRPN to obtain fractional engine rpm. I is defined by AFRAT and must be ≤ 6 .
32	27-32	N	TRPN(I)	--	Entries in fractional rpm table. I must be ≤ 6 . TRPN(I) equals FRPN at FRATIO=TFRAT(I).
32	33-42	N	TFRAC(I)	--	Entries in fractional non-after-burning thrust table. Table used with TACCEL, TDECEL, and TTENG to obtain engine acceleration and deceleration limits and time constant. I is defined by AFRAC and must be ≤ 10 .
32	43-52	N	TACCEL(I)	1/sec	Entries in acceleration limit table. I must be ≤ 10 . TACCEL(I) equals acceleration limit at TFRAC=TFRAC(I).
32	53-62	N	TDECEL(I)	1/sec	Entries in deceleration limit table. I must be ≤ 10 . TDECEL(I) equals deceleration limit at TFRAC=TFRAC(I).
32	63-72	N	TTENG(I)	sec	Entries in engine time constant table. I must be ≤ 10 . TTENG(I) equals TENG at TFRAC=TFRAC(I).

A.34 Segments 33 through 39 - Stability Derivative Arrays and Control Parameters

X, Y and Z force and roll, pitch and yaw moment stability derivatives are stored in that order in segments 33 through 38, i.e., X force derivatives are contained in segment 33, Y force derivatives in segment 34, etc. to yaw moment derivatives in segment 38. Stored within each segment are the total derivatives along with the contributions to those derivatives from each source of applied forces and moments.

Derivative contributions from wing, horizontal stabilizer, vertical stabilizer, fuselage, total aero, direct thrust, ram drag, Coriolis, and RCS are included. Derivatives are calculated for perturbations in 22 (space for 25 is available) state and/or control variables. These variables designated by I in the segment listing below are as follows:

<u>I</u>	<u>Perturbed Variable</u>	<u>Segment</u>	<u>Element</u>	<u>Units</u>
1	VAS	29	1	ft/sec
2	WAS	29	3	ft/sec
3	Q	3	5	rad/sec
4	DEC	28	50	rad
5	DPLAPW	3	49	rad
6	DPLAPH	3	48	rad
7	DRCSF	28	54	-
8	DRCSNF	28	57	-
9	T _W (1)	26	34	lb
10	T _W (2)	26	35	lb
11	THT(1)	3	26	rad
12	THT(2)	3	27	rad
13	VAS	29	2	ft/sec
14	P	3	4	rad/sec
15	R	3	6	rad/sec
16	DR	3	21	rad
17	DAC	28	52	rad
18	DRCSR	28	53	-
19	DRCSY	28	55	-
20	DRCSSF	28	56	-
21	PSIT(1)	3	24	rad
22	PSIT(2)	3	25	rad

Note in the segment listing that PUPIIV was adopted as a shorthand notation for "per unit perturbation in Ith variable"

<u>Segment</u>	<u>Element</u>	<u>Type</u>	<u>Coded Name</u>	<u>Units</u>	<u>Definition</u>
33	1-25	C	DXWG(I)	ft/sec ² / units of I	Change in wing X body axis force PUPIIV (per unit perturbation in Ith variable).
33	26-50	C	DXHS(I)	ft/sec ² / units of I	Change in horizontal stabilizer X body axis force PUPIIV.
33	51-75	C	DXVS(I)	ft/sec ² / units of I	Change in vertical stabilizer X body axis force PUPIIV.
33	76-100	C	DXFS(I)	ft/sec ² / units of I	Change in fuselage X body axis force PUPIIV.
33	101-125	C	DXAER(I)	ft/sec ² / units of I	Change in aerodynamic X body axis force PUPIIV.
33	126-150	C	DXTS(I)	ft/sec ² / units of I	Change in direct thrust X body axis force PUPIIV.
33	151-175	C	DXRAM(I)	ft/sec ² / units of I	Change in inlet ram X body axis force PUPIIV.

Segment	Element	Type	Coded Name	Units	Definition
33	176-200	C	DXCLS(I)	ft/sec ² / units of I	Change in Coriolis X body axis force PUPIIV.
33	201-225	C	DXRCSF(I)	ft/sec ² / units of I	Change in RCS X body axis force PUPIIV.
33	226-250	C	X(I)	ft/sec ² / units of I	Change in total X body axis force PUPIIV.
34	1-25	C	DYWG(I)	ft/sec ² / units of I	Change in wing Y body axis force per PUPIIV.
34	26-50	C	DYHS(I)	ft/sec ² / units of I	Change in horizontal stabilizer Y body axis force PUPIIV.
34	51-75	C	DYVS(I)	ft/sec ² / units of I	Change in vertical stabilizer Y body axis force PUPIIV.
34	76-100	C	DYFS(I)	ft/sec ² / units of I	Change in fuselage Y body axis force PUPIIV.
34	101-125	C	DYAER(I)	ft/sec ² / units of I	Change in aerodynamic Y body axis force PUPIIV.
34	126-150	C	DYTS(I)	ft/sec ² / units of I	Change in direct thrust Y body axis force PUPIIV.
34	151-175	C	DYRAM(I)	ft/sec ² / units of I	Change in inlet ram Y body axis force PUPIIV.
34	176-200	C	DYCLS(I)	ft/sec ² / units of I	Change in Coriolis Y body axis force PUPIIV.
34	201-225	C	DYRCSF(I)	ft/sec ² / units of I	Change in RCS Y body axis force PUPIIV.
34	226-250	C	Y(I)	ft/sec ² / units of I	Change in total Y body axis force PUPIIV.
35	1-25	C	DZWG(I)	ft/sec ² / units of I	Change in wing Z body axis force PUPIIV.
35	26-50	C	DZHS(I)	ft/sec ² / units of I	Change in horizontal stabilizer Z body axis force PUPIIV.
35	51-75	C	DZYS(I)	ft/sec ² / units of I	Change in vertical stabilizer Z body axis force PUPIIV.
35	76-100	C	DZFS(I)	ft/sec ² / units of I	Change in fuselage Z body axis force PUPIIV.

Segment	Element	Type	Coded Name	Units	Definition
35	101-125	C	DZAER(I)	ft/sec ² / units of I	Change in aerodynamic Z body axis force PUPIIV.
35	125-150	C	DZTS(I)	ft/sec ² / units of I	Change in direct thrust Z body axis force PUPIIV.
35	151-175	C	DZRAM(I)	ft/sec ² / units of I	Change in inlet ram Z body axis force PUPIIV.
35	176-200	C	DZCLS(I)	ft/sec ² / units of I	Change in Coriolis Z body axis force PUPIIV.
35	201-225	C	DZRCSF(I)	ft/sec ² / units of I	Change in RCS Z body axis force PUPIIV.
35	226-250	C	Z(I)	ft/sec ² / units of I	Change in total Z body axis force PUPIIV.
36	1-25	C	DLWG(I)	rad/sec ² / units of I	Change in wing body axis roll moment PUPIIV.
36	26-50	C	DLHS(I)	rad/sec ² / units of I	Change in horizontal stabilizer body axis roll moment PUPIIV.
36	51-75	C	DLVS(I)	rad/sec ² / units of I	Change in vertical stabilizer body axis roll moment PUPIIV.
36	76-100	C	DLFS(I)	rad/sec ² / units of I	Change in fuselage body axis roll moment PUPIIV.
36	101-125	C	DLAER(I)	rad/sec ² / units of I	Change in aerodynamic body axis roll moment PUPIIV.
36	126-150	C	DLTS(I)	rad/sec ² / units of I	Change in direct thrust body axis roll moment PUPIIV.
36	151-175	C	DLRAM(I)	rad/sec ² / units of I	Change in inlet ram body axis roll moment PUPIIV.
36	176-200	C	DLCLS(I)	rad/sec ² / units of I	Change in Coriolis body axis roll moment PUPIIV.
36	201-225	C	DLRCSF(I)	rad/sec ² / units of I	Change in RCS body axis roll moment PUPIIV.
36	226-250	C	AL(I)	rad/sec ² / units of I	Change in total body axis roll moment PUPIIV.

Segment	Element	Type	Coded Name	Units	Definition
37	1-25	C	DMWG(I)	rad/sec ² / units of I	Change in wing body axis pitch moment PUPIIV.
37	26-50	C	DMHS(I)	rad/sec ² / units of I	Change in horizontal stabilizer body axis pitch moment PUPIIV.
37	51-75	C	DMVS(I)	rad/sec ² / units of I	Change in vertical stabilizer body axis pitch moment PUPIIV.
37	76-100	C	DMFS(I)	rad/sec ² / units of I	Change in fuselage body axis pitch moment PUPIIV.
37	101-125	C	DMAER(I)	rad/sec ² / units of I	Change in aerodynamic body axis pitch moment PUPIIV.
37	126-150	C	DMTS(I)	rad/sec ² / units of I	Change in direct thrust body axis pitch moment PUPIIV.
37	151-175	C	DMRAM(I)	rad/sec ² / units of I	Change in inlet ram body axis pitch moment PUPIIV.
37	176-200	C	DMCLS(I)	rad/sec ² / units of I	Change in Coriolis body axis pitch moment PUPIIV.
37	201-225	C	DMRCSF(I)	rad/sec ² / units of I	Change in RCS body axis pitch moment PUPIIV.
37	226-250	C	AM(I)	rad/sec ² / units of I	Change in total body axis pitch moment PUPIIV.
38	1-25	C	DNWG(I)	rad/sec ² / units of I	Change in wing body axis yaw moment PUPIIV.
38	26-50	C	DNHS(I)	rad/sec ² / units of I	Change in horizontal stabilizer body axis yaw moment PUPIIV.
38	51-75	C	DNVS(I)	rad/sec ² / units of I	Change in vertical stabilizer body axis yaw moment PUPIIV.
38	76-100	C	DNFS(I)	rad/sec ² / units of I	Change in fuselage body axis yaw moment PUPIIV.
38	101-125	C	DNAER(I)	rad/sec ² / units of I	Change in aerodynamic body axis yaw moment PUPIIV.
38	126-150	C	DNTS(I)	rad/sec ² / units of I	Change in direct thrust body axis yaw moment PUPIIV.
38	151-175	C	DNRAM(I)	rad/sec ² / units of I	Change in inlet ram body axis yaw moment PUPIIV.
38	176-200	C	DNCLS(I)	rad/sec ² / units of I	Change in Coriolis body axis yaw moment PUPIIV.

Segment	Element	Type	Coded Name	Units	Definition
38	201-225	C	DNRCSP(I)	rad/sec ² / units of I	Change in RCS body axis yaw moment PUPIIV.
38	226-250	C	AN(I)	rad/sec ² / units of I	Change in total body axis yaw moment PUPIIV.

Segment 39 stores information regarding the number of variables to be perturbed to form stability derivatives and the size of these perturbations.

Segment	Element	Type	Coded Name	Units	Definition
39	1	N	ADER	-	Number of variables to be perturbed to form stability derivatives (≤ 25). In current program set-up, ADER=22.
39	2-26	N	DELV(I)	Varies	Size of perturbation in Ith variable to be used in computing stability derivatives.

A.35 Segment 40 - Scratch COMMON

Fifty locations labeled WORK have been set aside as segment 40 for use in making temporary program changes or for further program development. The WORK array is not used in the current program set-up.

A.36 Segment 41 - Miscellaneous Constants

Segment	Element	Type	Coded Name	Units	Definition
41	1	N	AWIND	-	AWIND not equal to zero indicates a moving airmass and that the trim in a wind option is to be invoked.
41	2	N	VWIND	ft/sec	Magnitude of airmass velocity (VWIND)
41	3	N	PSIWIND	rad	Direction of airmass velocity. For headwind, PSIWIND=180 deg=3.14159 rad. (VWIND)
41	4	N	XE2D	ft/sec ²	Initial value of aircraft inertial acceleration along X inertial axis

Segment	Element	Type	Coded Name	Units	Definition
41	5	N	YE2D	ft/sec ²	Initial value of aircraft inertial acceleration along Y inertial axis
41	6	N	ZE2D	ft/sec ²	Initial value of aircraft inertial acceleration along Z inertial axis
41	7	N	TRMTURN	--	TRMTURN not equal to zero indicates that airplane is to be trimmed in a steady turn. GAMMA, VADOT, and TURNRAD must be specified if TRMTURN ≠ 0.
41	8	N	GAMMA	rad	Airplane flight path angle
41	9	N	VADOT	ft/sec ²	Airplane deceleration along flight path
41	10	N	TURNRAD	ft	Radius of turn

A.37 Segment 42 - Aero Surface Effectiveness Tables

Segment	Element	Type	Coded Name	Units	Definition
42	1-7	N	ELEV(I)	rad	Entries in elevon table. Table used with EKELET to obtain elevon effectiveness as a function of elevon deflection. I is defined by AEKEL and must be ≤ 7.
42	8-14	N	EKELET(I)	-	Entries in elevon effectiveness table. I must be ≤ 7. EKELET(I) equals elevon effectiveness at ABS (LELEVN) or ABS (RELEVN) = (ELEV(I)).
42	15-21	N	RUDT(I)	rad	Entries in rudder table. Table used with EKRUDT to obtain rudder effectiveness as a function of rudder deflection. I is defined by AEKRUD and must be ≤ 7.
42	22-28	N	EKRUDT(I)	-	Entries in rudder effectiveness table. I must be ≤ 7. EKRUDT(I) equals rudder effectiveness at ABS(DR) = RUDT(I).

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A.38 Segment 43 - Pseudo-Pilot Input Control Data

Segment	Element	Type	Coded Name	Units	Definition
43	1-5	N	ACMD(I)	--	Each nonzero ACMD(I) specifies a cockpit control input time history which is to be imposed on the aircraft. ACMD(I) = 1. indicates DLNGSTK input, = 2. indicates DLATSTK input, = 3. indicates DPED input, = 4. indicates ZEDTC input, = 5. indicates THR ^{OT} input. For example, if ACMD(1) = 3. and ACMD(2) = 1., simultaneous DPED and DLNGSTK inputs are imposed on the aircraft.
43	6	N	ATIME	--	Number of entries in the cockpit control time history tables and must be ≤ 20
43	7	N	ASKEEP	--	ASKEEP not equal to zero activates pseudo-pilot stationkeeping loops.
43	8	N	AYEHLD	--	Not used in final version of program.
43	9-28	N	CMDT1(I)	varies	Entries in DLNGSTK input time history table. CMDT1(I) equals DLNGSTK when T(time) = TIMET(I).
43	29-48	N	CMDT2(I)	varies	Entries in DLATSTK input time history table. CMDT2(I) equals DLATSTK when T(time) = TIMET(I).
43	49-68	N	CMDT3(I)	varies	Entries in DPED input time history table. CMDT3(I) equals DPED when T(time) = TIMET(I)
43	69-88	N	CMDT4(I)	ft/sec	Entries in ZEDTC input time history table. CMDT4(I) equals ZEDTC when T(time) = TIMET(I)
43	89-108	N	CMDT5(I)	fractional throttle deflection	Entries in THROT input time history table. CMDT5(I) equals THROT when T(time) = TIMET(I).
43	109-128	N	TIMET(I)	sec	Entries in time table. Table used with CMDT1, CMDT2, CMDT3, CMDT4, and CMDT5. I is defined by ATIME and must be ≤ 20 .
43	129	N	ATRANS	--	ATRANS not equal to zero activates a pseudo-pilot flown transition.
43	130	N	AVAT	--	Number of entries in transition tables (THROT, VAT, and THETCT). Must be ≤ 10 .
43	131	N	TTRANS	sec	Time at which transition is initiated.

Segment	Element	Type	Coded Name	Units	Definition
43	132-141	N	THROTT(I)	fractional throttle deflection	Entries in transition throttle table. THROTT(I) equals manual throttle setting when VE or VEEST = VAT(I)
43	142-151	N	VAT(I)	ft/sec	Entries in transition speed table. Table used with THROTT and THETCT to obtain throttle setting and pitch angle as a function of inertial speed during transition.
43	152-161	N	THETCT(I)	rad	Entries in transition pitch angle table. THETCT(I) equals desired pitch angle when VE or VEEST = VAT(I)

A.39 Segment 44 - Tables, Constants, and Variables for Varying Feedback Control Laws

Segment	Element	Type	Coded Name	Units	Definition
44	1	N	ACSSW	--	Number of entries in control system variable selector tables. Must be ≤ 5 .
44	2-6	N	TCSSW1(I)	--	Entries in CSSW table. Table entered with CSSW and usjd with all other tables in this COMMON segment.
44	7-11	N	TAKQS(I)	--	Entries in pitch rate selector table. TAKQS(I) $\neq 0$. specifies that Q is feedback in pitch control system.
44	12-16	N	TKPINT(I)	--	Entries in integral of roll rate selector table. TKPINT(I) $\neq 0$. specifies that PINT is feedback in roll control system when CSSW=TCSSW1(I).
44	22-26	N	TKPB(I)	--	Entries in roll rate selector table TKPB(I) $\neq 0$. specifies P is feedback in roll control system when CSSW=TCSSW1(I). TKPB(I)=0. specifies PS feedback when CSSW=TCSSW1(I).
44	27-31	N	TKPS(I)	--	Not used in final version of program.
44	32-36	N	TKQINT(I)	--	Entries in integral of pitch rate selector table. TKQINT $\neq 0$. specifies that QINT is feedback in pitch control system when CSSW=TCSSW1(I).

Segment	Element	Type	Coded Name	Units	Definition
44	37-41	N	TKTHETA(I)	--	Entries in pitch angle selector table. TKTHETA(I)≠0. specifies that THETA is feedback in pitch control system when CSSW=TCSSW1(I).
44	42-46	N	TKRINT(I)	--	Entries in integral of yaw rate selector table. TKRINT≠0. specifies that RINT is feedback in yaw control system when CSSW=TCSSW1(I).
44	47-51	N	TKPSI(I)	--	Entries in yaw angle selector table. TKPSI(I)≠0. specifies that PSI is feedback in yaw control system when CSSW=TCSSW1(I).
44	52-56	N	TKRB(I)	--	Entries in yaw rate selector table. TKRB(I)≠0. specifies that R is feedback in yaw control system when CSSW=TCSSW1(I). TKRB(I)=0. specifies RS feedback when CSSW=TCSSW1(I).
44	57-61	N	TAKPCI(I)	--	Entries in roll input integrator selector table. TAKPCI(I)≠0. activates roll input integrator when CSSW=TCSSW1(I).
44	62-66	N	TAKPEI(I)	--	Entries in roll error integrator selector table. TAKPEI(I)≠0. Activitates roll error integration in roll control system when CSSW=TCSSW1(I)
44	67-71	N	TAKRCI(I)	--	Entries in yaw input integrator selector table. TAKRCI(I)≠0. activates yaw input integrator when CSSW=TCSSW1(I).
44	72-76	N	TAKREI(I)	--	Entries in yaw error integrator selector table. TAKREI(I)≠0 activates yaw error integrator in yaw control system when CSSW=TCSSW1(I).
44	77-81	N	TAKQCI(I)	--	Entries in pitch input integrator selector table. TAKQCI(I)≠0. activates pitch input integrator when CSSW=TCSSW1(I).
44	82-86	N	TAKQEI(I)	--	Entries in pitch error integrator selector table. TAKQEI(I)≠0. activates pitch error integrator in pitch control system when CSSW=TCSSW1(I).
44	87-91	N	TKRS(I)	--	Not used in final version of program.
44	92	N	AKPHIRS	varies	AKPHIRS≠0. specifies (GC/VA)* PHI feedback in yaw control system ($K_{\phi_{rs}}$).

Segment	Element	Type	Coded Name	Units	Definition
44	93	C	AKPINT	--	Integral of roll rate feedback selector gain for roll control system ($K_{\int p}$)
44	94	C	AKPHI	--	Roll angle feedback selector gain for roll control system. (K_{ϕ})
44	95	C	AKPB	--	Roll rate feedback selector gain for roll control system. AKPB=0. selects PS; AKPB=1. selects P; AKPB≠0. or 1. mixes P and PS. (K_{r_B})
44	96	C	AKPS	--	Not used in final version of program.
44	97	C	AKQINT	--	Integral of pitch rate feedback selector gain for pitch control system ($K_{\int q}$)
44	98	C	AKTHETA	--	Pitch angle feedback selector gain for pitch control system (K_{θ})
44	99	C	AKRINT	--	Integral of yaw rate feedback selector gain for yaw control system ($K_{\int r}$).
44	100	C	AKPSI	--	Yaw angle feedback selector gain for yaw control system (K_{ψ})
44	101	C	AKRB	--	Yaw rate feedback selector gain for yaw control system. AKRB=0. selects RS; AKRB=1. selects R; AKRB≠0. or 1. mixes R and RS. (K_{r_B})
44	102	C	AKRS	--	Not used in final version of program
44	103	C	AKQS	--	Pitch rate feedback selector gain for pitch control system.

A.40 Segment 45 - Tables and Constants for Control System Gains which Vary as Functions of Airspeed

Segment	Element	Type	Coded Name	Units	Definition
45	1	N	VELGATN	--	VELGAIN≠0. specifies that control system gains are functions of airspeed. VELGAIN=0. implies that control system gains are functions of pitch angle

Segment	Element	Type	Coded Name	Units	Definition
45	2	N	AVEL	--	Number of entries in control system gains airspeed table (≤ 8).
45	3-10	N	TVEL(I)	ft/sec	Airspeed table for determining control system gains
45	11-18	N	VAKPC(I)	rad	Roll control system input gain table if the gain is a function of airspeed.
45	19-26	N	VKPCI1(I)	rad/sec	Roll control system input integrator gain table if the gain is a function of airspeed.
45	27-31	N	VKPEI1(I)	rad/sec/ rad	Roll control system error integrator gain table if the gain is a function of airspeed.
45	35-42	N	VKP(I)	rad/rad/ sec	Roll control system roll rate feedback gain table if the gain is a function of airspeed
45	43-50	N	VAKPE(I)	1/rad	Roll control system error gain table if the gain is a function of airspeed
45	51-58	N	VAKRC(I)	rad	Yaw control system input gain table if the gain is a function of airspeed
45	59-66	N	VKRCI1(I)	rad/sec	Yaw control system input integrator gain table if the gain is a function of airspeed.
45	67-74	N	VKREI1(I)	rad/sec/ rad	Yaw control system error integrator gain table if the gain is a function of airspeed
45	75-82	N	VKR(I)	rad/rad/ sec	Yaw control system yaw rate feedback gain table if the gain is a function of airspeed.
45	83-90	N	VAKRE(I)	1/rad	Yaw control system error gain table if the gain is a function of airspeed
45	91-98	N	VAKQC(I)	rad	Pitch control system input gain table if the gain is a function of airspeed
45	99-106	N	VKQCI1(I)	rad/sec	Pitch control system input integrator gain table if the gain is a function of airspeed.

Segment	Element	Type	Coded Name	Units	Definition
45	107-114	N	VKQE11(I)	rad/sec/	Pitch control system error integrator gain table if the gain is a function of airspeed.
45	115-122	N	VKQ(I)	rad/rad/ sec	Pitch control system pitch rate feedback gain table if the gain is a function of airspeed.
45	123-130	N	VAKQE(I)	1/rad	Pitch control system error gain table if the gain is a function of airspeed
45	131-138	N	VAKZE(I)	lb/ft/sec	Heave control system error gain table if the gain is a function of airspeed
45	139-146	N	VKZE1(I)	lb/sec/ ft/sec	Heave control system error integrator gain table if the gain is a function of airspeed
45	147-154	N	VTPITCH(I)	sec	Pitch input shaping filter time constant table if the time constant is a function of airspeed
45	155-162	N	VTROLL(I)	sec	Roll input shaping filter time constant table if the time constant is a function of airspeed
45	163-170	N	VTYAW(I)	sec	Yaw input shaping filter time constant table if the time constant is a function of airspeed.

APPENDIX B
VATLAS PROGRAM LISTINGS

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1      PROGRAM VTOLTH INPUT, OUTPUT, TAPES=INPUT, TAPE6=OUTPJT,
2      TAPE1, TAPE2, TAPE3, TAPE4, PUNCH, TAPE7=PUNCH, TAPE8, TAPE9,
3      TAPE10, TAPE11, TAPE12, TAPE13, TAPE14, TAPE15, TAPE16, TAPE17)
4
5      DIMENSION DZ(19), IN(20)
6      DIMENSION NR(200), KK(20), SCAL(200), LBL(400), LABEL(12), OUT(2,200),
7      NTAPE(5), LENGTH(200), TLE(20), FMT1(8), FMT2(8), FMT3(8),
8      FMT4(8), FMTI(4), FMTOR(4)
9      DIMENSION TEMP(400)
10     DIMENSION FMTS(12,8), IFMT(8)
11     INTEGER FMTS
12     INTEGER TITLE, FMT1, FMT2, FMT3, FMTI, FMTO
13     INTEGER FMT4
14     COMMON/INTRIM/ ITRIM
15     COMMON NEQS, R(12000)
16     COMMON/RSEG/NR1, NR2, NR3, NR4, NR5, NR6, NR7, NR8, NR9, NR10, NR11
17     EQUIVALENCE (NR11, NR1)
18     EQUIVALENCE (R(1), T1), (R(2), T0), (R(3), DT), (R(4), THAXI), (R(5), DYPNT)
19     , (R(6), DTPLOT), (R(7), TI)
20     DATA ITRIM, JFLAG, IFLS, IRUN/ 0.0, 0.0, 0/
21     READ(5, 31006) NEQS
22     WRITE(6, 31051) NEQS
23     DO 50 I=1, 60
24     LBL(I)=4M
25
26     C
27     C R-ARRAY DIVISION INFO, OUTPUT SPECIFICATIONS, AND FIXED
28     C TABLES ARE READ FROM NTAP AND WRITTEN ON NTAP*(NMEN NTAPM .NE. 8)
29     C NTAP=5 DEJTES CARD INPUT
30     READ(5, 31001) NTAP, NTAPM
31     WRITE(6, 31052) NTAP, NTAPM
32
33     C DIVISION OF R-ARRAY
34     WRITE(6, 31002)
35     IF(NTAP.EQ.5) READ(NTAP, 31001) NSEG, (LENGTH(I), I=1, NSEG)
36     IF(NTAP.NE.5) READ(NTAP) NSEG, (LENGTH(I), I=1, NSEG)
37     IF(NTAPM.NE.0) WRITE(NTAPM) NSEG, (LENGTH(I), I=1, NSEG)
38     NR(1)=0
39     DO 1 I=2, NSEG
40     NR(I)=NR(I-1)+LENGTH(I-1)
41     WRITE(6, 31003)
42     DO 3 I=1, NSEG
43     WRITE(6, 31004) I, NR(I), LENGTH(I)
44
45     C OUTPUT SPECIFICATIONS
46     WRITE(6, 31005)
47     NOUT=1
48     N2=2*NOUT
49     N1=N2-1
50     IF(NTAP.EQ.5) READ(5, 31006) I, J, SCAL(NOUT), LBL(N1), LBL(N2),
51     LABEL
52     IF(NTAP.NE.5) READ(NTAP) I, J, SCAL(NOUT), LBL(N1), LBL(N2), LABEL
53     WRITE(6, 31007) I, J, SCAL(NOUT), LBL(N1), LBL(N2), LABEL
54     IF(NTAPM.NE.0) WRITE(NTAPM) I, J, SCAL(NOUT), LBL(N1), LBL(N2),
55     LABEL
56     IF(I) 13, 15, 11
57     KK(NOUT)=NR(I)+J
58     NOUT=NOUT+1

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GO TO 10
15 NOUT=NOUT-1
31049 FORMAT(4X,5MOUT=,IS)
WRITE(6,31049) NOUT
C
C STOPE FIXED TABLES
WRITE(5,31023)
20 CONTINUE
IF(NTAP.EQ.5) READ(5,31008) I,J,K,L,LABEL,SCALE
IF(NTAP.NE.5) READ(NTAP) I,J,K,L,LABEL,SCALE
WRITE(6,31009) I,J,K,L,LABEL,SCALE
IF(NTAP4.NE.0) WRITE(NTAP4) I,J,K,L,LABEL,SCALE
IF(I) 25,25,21
21 K1=NR(I)
K2=NR(I+1)
IF(NTAP.EQ.5) READ(5,31024) (R(I),I=K1,K2)
IF(NTAP.NE.5) READ(NTAP) (R(I),I=K1,K2)
WRITE(6,31011) (R(I),I=K1,K2)
IF(NTAP4.NE.0) WRITE(NTAP4) (R(I),I=K1,K2)
IF(SCALE) 22,20,22
22 DO 23 I=K1,K2
23 R(I)=R(I)*SCALE
GO TO 20
25 CONTINUE
100 READ(5,31001) NOPT
IF(EOF(5)) 101,102
101 STOP
102 CONTINUE
GO TO (30001,30002,30003,30004,30005,30006,30007,30008,30009,
1 30010,30011,30012),NOPT
C
C NOPT=1 STORE EQUIVALENT OF I/O LISTS
30001 READ(5,31011) NTAP
WRITE(6,31012) NTAP
200 READ(5,31006) I,J,K,L,LABEL,SCALE
WRITE(6,31009) I,J,K,L,LABEL,SCALE
WRITE(NTAP,31008) I,J,K,L,LABEL,SCALE
IF(I) 100,100,200
C
C NOPT=2 READ R
30002 READ(5,31001) NTAP
300 WRITE(6,31013) NTAP
302 IF(NTAP.NE.5) READ NO NTAP
FMT(1)= 10H(7E10.3)
FMT(2)= 10H(8F14.5)
301 READ(NTAP,31008) I,J,K,L,LABEL,SCALE
IF(I.LT.0) READ(NTAP,31031) FMT1,FMT0
IF(I.LT.0) WRITE(6,31031) FMT1,FMT0
I=IA35(I)
IF(I.NE.0) GO TO 606
IF(NOPT.EQ.2) GO TO 100
IF(NOPT.EQ.4) GO TO 501
IF(NOPT.EQ.8) GO TO 602
606 WRITE(6,31009) I,J,K,L,LABEL,SCALE
K1=NR(I)
K2=NR(K)+L
READ(5,FMT1) (R(I),I=K1,K2)
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115 WRITE(6,FMT0) (R(I),I=K1,K2)
    IF(SCALE) 303,301,303
    DO 304 I=1,K2
    304 R(I)=R(I)*SCALE
    GO TO 301

120 C
    C NOPT=3 WRITE R
    3003 READ(5,31001) NTAP
    400 WRITE(6,31014) NTAP
    402 IF(NTAP.NE.5) REMIND NTAP
    401 READ(NTAP,31008) I,J,K,L,LABEL,SCALE
    IF(I.NE.0) GO TO 607
    IF(NOPT.EQ.3) GO TO 100
    IF(NOPT.EQ.4) GO TO 502
    IF(NOPT.EQ.8.AND.IFLG.EQ.0) GO TO 604
    IF(NOPT.EQ.8.AND.IFLG.EQ.1) GO TO 602
    607 WRITE(6,31009) I,J,K,L,LABEL,SCALE
    K1=NR(I)+J
    K2=NR(K)+L
    IF(SCALE) 403,404,403
    403 DO 405 I=K1,K2
    405 R(I)=R(I)*SCALE
    WRITE(6,31011) (R(I),I=K1,K2)
    DO 406 I=K1,K2
    406 R(I)=R(I)/SCALE
    GO TO 401
    404 WRITE(6,31011) (R(I),I=K1,K2)
    GO TO 401

145 C
    C NOPT=4 TIME HISTORY
    30004 WRITE(6,31015)

150 C
    C INITIALIZE
    N1=NR(2)+1
    N2=NR(3)
    DO 500 I=N1,N2
    500 R(I)=0.0
    IF(JFLAG.EQ.0) GO TO 511
    J=0
    N1=NR(3)+1
    N2=NR(4)+6
    DO 510 I=N1,N2
    510 J=J+1
    R(I)=TEMP(J)
    N3=NR(20)+1
    N4=NR(30)
    DO 513 I=N3,N4
    513 J=J+1
    R(I)=TEMP(J)
    511 CONTINUE
    T0=TI

165 C
    C READ DEVICE NUMBERS
    C NTAPE(1) CONTAINS EQUIVALENT OF INPUT LIST
    C NTAPE(2) CONTAINS EQUIVALENT OF OUTPUT LIST DIMENSIONAL DERIVATIVES E
    C NTAPE(3) STORAGE FOR TIME HISTORY
    READ(5,31001) (NTAPE(I),I=1,5)

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NTAPE4=NTAPE(1)
IF(NTAPE4.EQ.5)5010,5020
5010 PEAD(5,31031)FMT1,FMT2,FMT3,FMT4
GO TO 5030
5020 REMIND NTAPES
READ(NTAPE4)FMT1,FMT2,FMT3,FMT4
5030 CONTINUE
P=AD(5,31017) TITLE
WRITE(6,31018) TITLE
WRITE(6,31016) (NTAPE(I),I=1,3)
WRITE(6,3105)FMT1,FMT2,FMT3,FMT4
NTAPES=NTAPE(5)
IF(NTAPES.NE.0)WRITE(NTAPES)FMT1,FMT2,FMT3,FMT4
NTAP=NTAPE(1)
GO TO 392
501 CALL SETUP
NTAP=NTAPE(2)
GO TO 402
C
C GENERATE STORE ON BINARY FILE AND PRINT TIME HISTORIES
502 NTAP=NTAPE(3)
REIND NTAP
IF(OTPLT.GT.OTPRNT) OTPLT = OTPRNT
N=JY=IFIX(JYPLT/DT+.001)
MPRINT=IFIX(OTPRNT/OTPLT+.001)
WRITE(6,31019)
WRITE(5,31018) TITLE
WRITE(6,FMT1) (LBL(I),I=1,22)
N=1
NPTS=0
GO TO 505
503 DO 504 J=1,NPLOT
504 CALL RUNGE
505 DO 506 J=1,NOUT
Y=KK(J)
OUT(N,J)=R(K)*SCAL(J)
NPTS=NPTS+1
JY=0
IF(JIM.EQ.1) GO TO 507
IF(N.EQ.40 .OR. TO .GT. TMAX) GO TO 507
IF(N.EQ.1 .OR. TO .GT. TMAX) GO TO 507
N=N+1
GO TO 503
507 WRITE(NTAP) ((OUT(I,J),J=1,NOUT),I=1,N)
WRITE(6,FMT2) ((OUT(I,J),J=1,11),I=1,N,MPRINT)
IF(JIM.EQ.1) GO TO 508
IF(TO .GT. TMAX) GO TO 508
N=1
GO TO 503
508 MARGIN=11
IF(NOUT.LE.MARGIN) GO TO 512
9508 REIND NTAP
JCOJT=MARGIN+1
KSOUT=JCOJT+9
IF(KSOUT.GT.NOUT) KSOUT=NOUT
WRITE(5,31019)
LSOUT=2*JCOJT-1

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230 MSOJT=2*KSOJT
WRITE (6,FMT1) (LBL(I),I=1,2), (LBL(I),I=LSOUT,MSOUT)
NBUF=NPTS
NN=1
DO 509 L=1,NBUF
IF (L.EQ.NBUF) NN=N
READ (NTAPE1) (OUT(I),J=1,NOUT), I=1,NN
509 WRITE (6,FMT3) (OUT(I),J=JSOUT,KSOJT), I=1,NN,MPRINT)
MARGIN=MARGIN+10
GO TO 8908
512 WRITE(6,3102) NPTS,NJUT,NTAP
GO TO 100
C
C NOPT=5 PLOT
30005 CALL PLOTERR(OUT,NPTS,NOUT,NTAP)
GO TO 180
245 C
C NOPT=6 SET UP TRIM UNKNOWNNS
30006 CONTINUE
READ(5,31001) MEQU
WRITE(6,3103) MEQU
M=1
L=1
611 READ(5,31008) I,J,K,L,LABEL
IF(I.EQ.8) GO TO 100
WRITE(6,31009) I,J,K,L,LABEL
N=NR(I)+J
N2=NR(K)+L
L2=L1+N2-N
PFAJ(5,31010) (OZ(I),I=L1,L2)
WRITE(6,31011) (OZ(I),I=L1,L2)
L1=L2+1
612 INCM=N
N=N+1
M=M+1
IF(M.GT.N2) GO TO 611
GO TO 612
C
C NOPT=7 LOAD VARIABLE FORMATS FOR TRIM SUMMARY (OPTION 12) AND
C MIND TUNNEL RUNS(OPTION 11)
30007 CONTINUE
WRITE(6,31020)
PFAJ(5,31031) (FMTS(I),J=1,8), I=1,12)
WRITE(6,31050) (FMTS(I),J=1,8), I=1,12)
GO TO 100
275 C
C NOPT=9 SIX DEGREES OF FREEDOM TRIM
30008 WRITE(6,31025)
C NTAPE11 CONTAINS EQUIVALENT OF INPUT LIST
C NTAPE12 CONTAINS EQUIVALENT OF OUTPUT LIST
C NTAPE13 IS OUTPUT FILE FOR TABBING BY OPTION 12
C NTAPE14 IS NOT USED.
C NCASES IS THE NUMBER OF TRIM CASES DESIRED
C NTAPD IS THE FILE SETUP BY OPTION 9 WHICH CONTAINS THE LIST
C OF TESTS TO USE FOR DERIVATIVE HACK.
C IPUNCH IS A FLAG. IPUNCH=1 CAUSES DERIVATIVE OUTPJT TO
C BE PUNCHED. IPUNCH=0 IS NO PUNCHED OUTPUT.
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C IWRITE,NE.0 CAUSES THE TRIM ROUTINE TO PRINT OUT DE-
C BUGGING INFO. NORMALLY IWRITE EQUALS 0.
C TAB OUTPUT IS SETUP IN THE CANNED INPUT STREAM AS IF
C IT WERE A TIME HISTORY.
C VARIABLES TO BE TRIMMED FOR MUST BE SPECIFIED IN OPT 6
C BEFORE CALLING THIS OPTION.
C
IIRIM=1
MCASE=0
READ(5,3101)NTAPE(I),I=1,4),MCASES,NTAPD,IPUNCH,IWRITE
IF(MCASES.EQ.0) NCASES= 1
WRITE(6,3103)NTAPE(ID,I=1,4),MCASES,NTAPD,IPUNCH,IWRITE
READ(5,31017) TITLE
NTAP2= NTAPE(3)
IF(NTAP2.NE.0) REMIND NTAP2
601 CONTINUE
WRITE(6,31018) TITLE
NTAPE=NTAPE(1)
WRITE(6,31046) NTAP
GO TO 302
602 CONTINUE
CALL TRIM(R,DZ,R(NRS),IN,IWRITE,NEQU,REFJNS(1102,603)
IFLG=0
NTAP=NTAPE(2)
WRITE(6,31047)
GO TO 402
603 CONTINUE
NTAP=NTAPE(2)
WRITE(6,31047)
IFLG=1
GO TO 402
604 CONTINUE
WRITE(6,31048)
IF(NTAPD.EQ.0) GO TO 672
IFLAG=0
IF(NTAPD.NE.0) REMIND NTAPD
670 READ(NTAP) I,J,NRD
IF(I.EQ.0) GO TO 671
K1= NR(I)+J
CALL DERIVS(K1,NRD,IFLAG,0,IPUNCH)
GO TO 670
671 WRITE(6,31018) TITLE
IF(IPUNCH.NE.0) WRITE(7,31017) TITLE
CALL DERIVS(K1,NRD,IFLAG,1,IPUNCH)
672 CONTINUE
N2=MEQS+4
DO 605 I=1,N2
N1=NR(I)+I
TEMP(I)=R(N1)
N3=NR(I30)-NR(281)
DO 620 I=1,N3
N4=NR(I281)+I
620 TLMPI(N2+I)=R(N4)
IF(NTAP2.EQ.0) GO TO 1102
DO 1101 I=1,NCUT
K=KK(I)

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345      SCALE=SCALE(I)
      IF(SCALE.EQ.0.) SCALE=1.
      1101 OUT(I,I)=R(K)*SCALE
      WRITE(NTAP2) (OUT(I,I),I=1,NOUT)
      1102 CONTINUE
      NCASE=NCASE+1
      IF(NCASE.LI.NCASES) GO TO 601
      JFLAG=1
      ITRIM=0
      IF(NTAP2.NE.0) REWIND NTAP2
      GO TO 100
355      C NOPT=9
      C
      C STORE INSTRUCTIONS FOR DERIVATIVE HACK
      30009 READ(5,31001) NTAPD
      WRITE(6,31030)
      IF(NTAPD.EQ.0) GO TO 180
      PEWIND NTAPD
      700 READ(5,31001) I,J,NRO
      WRITE(6,31004) I,J,NRO
      WRITE(NTAPD) I,J,NRO
      IF(I.EQ.0) GO TO 701
      GO TO 700
      701 PEWIND NTAPD
      GO TO 100
      C NOPT=10 PLOT A TIME HISTORY STORED ON BINARY FILE DURING A PREVIOUS
      C RUN
      30010 READ(5,31001) NPTS, NOUT, NTAP
      C
      C NPTS = NUMBER OF TIME HACKS
      C NOUT = NUMBER OF DEPENDENT VARIABLES
      375      C NTAP = SCRATCH FILE NUMBER THAT CONTAINS DATA
      C
      C GO TO 30005
      C
      30011 CONTINUE
      C NOPT=11 SIMULATED WIND TUNNEL KJNS
      C PRESET CONFIGURATION VARIABLES IN OPTION 2. INPUT IPITCH.NE.0 FOR
      C PITCH RUN, IYAH.NE.0 FOR YAW RUN. INPUT ANGLE VALUES IN DEGREES
      C FOR INITIAL VALUES (AOA,PSIO), INCREMENTS (DOA,DPST), AND MAX
      C VALUES (AOAMAX,PSIMAX) FOR DESIRED RUN. INPUT ABSOLUTE (POSITIVE)
      C VALUE FOR VIND IN FT/SEC. OUTPUT IS STORED ON NTAP2.
      C OUTPUT IS NONDIM COEFFS IN STABILITY AXES.
      385      C WRITE(5,31053)
      C READ(5,31006) IPITCH,IYAH,NTAP2
      C READ(5,31010) AOA,DOA,AOAMAX,PSIO,DPST,PSIMAX,VHIND
      C VIND=-VIND
      C REWIND NTAP2
      C CALL MTRUN (IPITCH,IYAH,NTAP2,AOA,DOA,AOAMAX,PSIO,DPST,PSIMAX,
      C VIND,NOUT)
      C PEWIND NTAP2
      395      C PUT OUTPUT DATA INTO R-ARRAY FOR PRINT MANIPULATIONS
      C KX=NRINSEGI*LENGTHINSEGI
      C LL=KX+32*NOJT-1
      C J1=KX
      C 811 CONTINUE

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VTOLTH 400

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Line No.	Code	Statement	Column
400		J2=J1+31	481
		READ(NTAP2)(R(J),J=J1,J2)	482
		J:=J2+1	483
		IF(J1.GT.LL)512,811	484
405	012	CONTINUE	485
		DD 810 IPAGE=1,7	486
		J1=KX	487
		WRITE(6,31019)	488
		DC 804 I=1,8	489
410		FMT1(I)=FMTS(IPAGE,I)	490
		J=8	491
		IF(IPAGE.EQ.7) J=10	492
		FMT2(I)=FMTS(J,I)	493
		J=9	494
		IF(IPAGE.EQ.7) J=11	495
415	806	FMT3(I)=FMTS(J,I)	496
		WRITE(6,FMT1)	497
		WRITE(5,FMT2)	498
		DC 805 I=1,NOU	499
420		IF(IPAGE.EQ.7)GO TO 806	500
		WRITE(6,FMT3) R(J1),R(J1+1),R(J1+K*IPAGE),K=1,38,6)	501
		GO TO 807	502
	806	WRITE(5,FMT3) R(J1),R(J1+1),R(J1+25*K),K=1,6)	503
	807	CONTINUE	504
425		J1=J1+32	505
	805	CONTINUE	506
	810	CONTINUE	507
		GO TO 100	508
430		C NOPR=12 PRINT DATA SUMMARY FROM TRIM.	509
		30012 CONTINUE	510
		WRITE(6,31054)	511
		READ(5,31031)FMT1	512
		IFG=1	513
		L=2	514
435		IRUN= NCASES	515
		K=JVAR=NOU	516
		IF(JVAR.GT.11)K=11	517
		FMT=2.	518
440	1201	WRITE(6,31019)	519
		WRITE(5,31018)TITLE	520
		DO 1204 I=1,8	521
		IFMT(I)=FMTS(IPG,I)	522
		REWIND NTAP2	523
		LOUT= 2*L-1	524
		KOUT= 2*K	525
445		WRITE(6,FMT1) LBL(1),LBL(2),(L/L(I),I=LOJT,KOUT)	526
		DO 1202 I=1,IRUN	527
		READ(NTAP2) (OUT(I,J),J=1,JVAR)	528
		WRITE(6,IFMT) OUT(I,1),(OUT(I,J),J=L,K)	529
450	1202	CONTINUE	530
		IF(K.EQ.JVAR) GO TO 1203	531
		IPG=IPG+1	532
		L=L+10	533
		K=K+10	534
		IF(K.GT.JVAR) K=JVAR	535
		IF(K.EQ.JVAR) FMT=3.	536
455		IF(IPG.SE.13) GO TO 1203	537

```

1203 IRUN= 0
GO TO 1201
GO TO 100
460 C
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511 C

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31001 FORMAT(16I5)
31002 FORMAT(1H1//5X19HDIVISION OF R-ARRAY//)
31003 FORMAT(13X1M1,8X5HNR(I),3X9HLENGTH(I),/)
31004 FORMAT(5X,3I10)
31005 FORMAT(//5) 1HOUTPUT SPECIFICATIONS//)
31006 FORMAT(2I5,E10.3,2A5,12A4)
31007 FORMAT(5X,2I5,F13.5,5X,2A5,12A4)
31008 FORMAT(5I5,12A4,2X,F10.6)
31009 FORMAT(5X,4I5,12A4,2X,F13.5)
31010 FORMAT(7E10.3)
31011 FORMAT(8F14.5)
31012 FORMAT(//5X,20HNOPT=1 STORE READ/WRITE INFO//,5X,5HNTAP=,I2//)
31013 FORMAT(//5X,13HNOPT=2 READ R//,5X,5HNTAP=,I2//)
31014 FORMAT(//5X,14HNOPT=3 WRITE R//,5X,5HNTAP=,I2//)
31015 FORMAT(1H1//5X19HNOPT=4 TIME HISTORY//)
31017 FORMAT(20A4)
31018 FORMAT(5X,20A4//)
31016 FORMAT(5X9HNTAPE(1)=,I2/5X9HNTAPE(2)=,I2/5X9HNTAPE(3)=,I2/
1 5X6HNTKIM=,I2)
31019 FORMAT(1H1//)
31020 FORMAT(//5X,35HNOPT=7 READ VARIABLE OUTPUT FORMATS//)
31023 FORMAT(//5X23HSTORE FIXED TABLES ETC.//)
31024 FORMAT(7E10.3)
31025 FORMAT(//5X24HNOPT=8 LONGITUDINAL TRIM//)
31026 FORMAT(20A4)
31028 FORMAT(44)
31029 FORMAT(5X,A4)
31030 FORMAT(//5X30HNOPT=9 DIMENSIONAL DERIVATIVES//5X22HPERTURBATION
1 VARIABLES//)
31031 FORMAT(4A10,4A10)
31032 FORMAT(//10X,5HNPTS=,I5/10X,5HNOUF=,I5/10X,5HNTAP=,I5//)
31033 FORMAT(5X9HNTAPE(1)=,I2/5X9HNTAPE(2)=,I2/5X9HNTAPE(3)=,I2/5X,9HNTA
1PE(4)=,I2/5X7HNCASES=,I3,5X6HNTAPD=,I2,5X7HNPJNCH=,I2/
2 5X,7HINWRITES=,I2)
31034 FORMAT(//5X,20HNOPT=6 SET UP TRIM UNKNOWNNS .
1 / 10X, 6H NEQU=,I2 )
31040 FORMAT(16A5)
31041 FORMAT(5X,14A5)
31045 FORMAT(5X,10HTRIM FOR ,*(A5,2X) )
31046 FORMAT( / 5X,26HCASE INPUT (READ FROM FILE ,I2,1H), / )
31047 FORMAT(1H1,5X,15HRESULTS OF TRIM ,//)
31048 FORMAT(//)
31050 FORMAT(5X,84I0)
31051 FORMAT(1X,I5,* NEQS *,//)
31052 FORMAT(1X,2I5,* NTAP,NTAPH *,//)
31053 FORMAT(//5X,34HNOPT=11 SIMULATED WIND TUNNEL RUNS//)
31054 FORMAT(//5X,36HNOPT=12 PRINT DATA SUMMARY FROM TRIM//)
END

```

```

1 SUBROUTINE ATMOSK(HALT, ATMOS, RHO, TAMB, PRESS, TRATIO, PRATIO, A)
C. HALT IS INPUT VALUE OF ALTITUDE, IN PRESSURE ALT IF IALT=1, TRUE
C. ALTITUDE IF IALT=0
C. H IS OUTPTJ VALUE OF PRESSURE ALTITUDE
C. KATMOS=1 IS STD DAY, KATMOS=2 IS TROPICAL DAY
POLY(A, B, C, D, E, F, G, X) = (((A*X+8)*X+C)*X+D)*X+E)*X+F)*X+G
PH09F(C1, C2, C3, C4, C5, C6, H) = C1*(C4*H+C5)*C6
IALT=1
OTEMP=0.
IF(KATMOS=1)*2, 22
IF(IALT) 3, 3.4
H=HALT
GO TO 5
3 H=2095549.E01*HALT/(2095549.E01+HALT)
5 IF(H-36089.) 6, 6.7
6 T=518.688-3.5662E-03*H*OTEMP
GO TO 300
7 IF(H-92021.) 8, 8.9
8 T=349.988*OTEMP
GO TO 301
9 IF(H-154199.) 10, 10.201
10 T=254.988+1.6459E-03*H*OTEMP
GO TO 302
300 PRESS=2116.216*(1.0-6.67535E-06*H)**5.2561
GO TO 303
301 PRESS=472.679 EXP(-4.80634E-05*(H-36089.))
GO TO 303
201 KEQR=1
302 RHO=RHO9F(17.7644E-5, 4.2200E-6, .65384, -12.38 3, H)
T1=254.988+1.6459E-03*H
PRESS=1716.500*RHO**T
RHO=PRESS/(1716.5*T)
A=49.02167*SQRT(T)
TRATIO=T/518.688
PRATIO=PRESS/2116.216
RETURN
200 IF(H-108000.) 501, 501.201
501 IF(H-36089.) 300, 301.582
502 IF(H-42021.) 301, 302.302
22 H=HALT
IF(IALT) 55, 55, 560
55 HTRJE=HALT
IF(HTRJE-38047.) 57, 58, 58
57 H=POLY(0.0, 0.0, 4.012238E-10, 1.114512323148E-14, 1.3128691463414E-07,
1.9.44833622E-31, 2.258686E-02, HTRJE)
GO TO 56
58 IF(HTRJE-59000.) 59, 60, 60
59 H=POLY(5.069870485225E-24, -1.3808730202E-18, 1.24218669297E-13,
1-5.4435518721E-09, 1.1565803963E-04, -4.578132E-03, 92.124, HTRJE)
GO TO 56
60 IF(HTRJE-70000.) 61, 62, 62
61 H=POLY(0.0, -1.744354766E-20, 5.835479E-15, -7.673314667E-10,
14.52559E-05, -1.87605611E-02, 48.7217, HTRJE)
GO TO 56
52 IF(HTRJE-82450.) 63, 64, 64
63 H=POLY(0.0, -2.2516894E-20, 7.162896248E-15, -8.7467296598E-10,

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ATMOSK 57
ATMOSK 58

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14.04318645E-05,-2.26405264650E-02,-3.9455.HTRUE)
GO TO 56
60 64 H=POLY(1.93091309634E-25,-8.7377368313961E-20,1.5700252579571E-14
1,-1.394093541954E-09,6.07826086912215E-05,-3.3433961E-2,-.8.HTRUE)
56 H=2885549.E01*H/(2085549.E01+H)
560 IF(H-36500.)31,31,32
31 T=5.89485E2-3.88357E-3*H+4.10173E-10*H*H+DTEMP
65 GO TO 500
32 IF(4.-45000.)33,33,34
33 T=5.69777E2-5.02206E-3*H+1.63672E-8*H*H+JTEMP
70 GO TO 500
34 IF(H-51595.)35,35,36
35 T=5.67652E2-4.93846E-3*H+1.55644E-8*H*H+DTEMP
36 IF(H-69620.)37,37,38
37 T=2.54887E2+1.33744E-3*H+7.36895E-9*H*H+JTEMP
75 GO TO 500
38 T=2.926E2+1.28409E-3*H+ 32372E-10*H*H+DTEMP
GO TO 500
END

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ATMOSX 59
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ATMOSX 78

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1 SUBROUTINE AXIS(XPAGE,YPAGE,IBCD,NCHAR,AXLEN,ANGLE,FIRSTV,DELTA)
2 J500353
3 DIMENSION IBCD(10),BCDMD(2)
4 C DRAWING AND LABELING 'N' AXIS FOR THE CALCOMP PLOTTER.
5 AKL = 0.
6 SINA = SIN(ANGLE/57.29578)
7 COSA = COS(ANGLE/57.29578)
8 XP = XPAGE
9 YP = YPAGE
10 CALL PLOT(XP,YP,3)
11 DELN = .2
12 IF(NCHAR.LT.0)DELN = -.2
13 FPN = ARS(FIRSTV + DELTA*AXLEN)
14 IF(ABS(FIRSTV).GT.FPN)FPN = ABS(FIRSTV)
15 CALL ANUCY(FPN,BCDMD,NDEC)
16 NDEC=2-NDEC
17 DEL = -FLOAT((NDEC+1)/2)*.1
18 IF(NDEC.LT.2)DEL=-.2
19 IF(NDEC.GT.8)NDEC = 8
20 IF(NDEC.LT.0)NDEC = -1
21 FPN = FIRSTV
22
23 1 CALL SYMBOL(XP,YP,.1,13,ANGLE,-1)
24 IF(ABS(FPN)-1.0E-07) 10,10,15
25 10 CALL NUMBER(XP-DELN*SINA,YP+DELN*COSA,.1,FPN,ANGLE,0)
26 GO TO 20
27 15 CALL NUMBER(XP+DEL*COSA-DELN*SINA,YP+DEL*SINA+DELN*COSA,
28 .1,FPN,ANGLE,NDEC)
29 AXL = AXL + 1.
30 IF(AXL-AXLEN)2,2,100
31 2 CALL PLOT(XP,YP,3)
32 XP = XP + COSA
33 YP = YP + SINA
34 CALL PLOT(XP,YP,2)
35 FPN = FPN + DELTA
36 GO TO 1
37 100 CONTINUE
38 C WRITE LABEL
39 DEL = .05*FLOAT(NCHAR)
40 DEL = .5*AXLEN-ABS(DEL)
41 DELN = .4
42 IF(NCHAR.LT.0)DELN = -.4
43 CALL SYMBOL( DEL*COSA-DELN*SINA, DEL*SINA+DELN*COSA,
44 .1,IBCD,ANGLE,IABS(NCHAR))
45 RETURN
46 END

```

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1      FUNCTION BATAN2(Y,X)
      C      HACK THE ARGUMENT OF Y/X
      C
5      C      PI= 3.141592654
      C
      IF(Y.EQ.0. .AND. X.EQ.0.) GO TO 11
      IF(Y.EQ.0. .AND. X.GT.0.) GO TO 12
      IF(Y.EQ.0. .AND. X.LT.0.) GO TO 13
      IF(Y.GT.0. .AND. X.EQ.0.) GO TO 14
      IF(Y.LT.0. .AND. X.EQ.0.) GO TO 15
      BATAN2= ATAN2(Y,X)
      RETURN
      C
15     C      11 BATAN2= 0.
      RETURN
      C
      C      12 BATAN2= 0.
      RETURN
      C
20     C      13 BATAN2= PI
      RETURN
      C
      C      14 BATAN2= PI/2.
      RETURN
      C
      C      15 BATAN2=-PI/2.
      RETURN
      END

```



```

1      SUBROUTINE 3NBCDV(0,8C04,1,NDS)
      JS0039
      DIMENSION 8C04D(2)
      C = ABS(D)
      NDS = 0
      IF(C)250,250,10
      10 IF(C-1,1,250,2
      1 00 100 I = 1,36
      NDS = NJS-1
      IF(C-10,1,NJS)100,150,150
      100 CONTINUE
      150 NJS = NDS+1
      250 8C04D(1) = C*18,1*(-NDS)
      RETURN
      2 0 ( 200 I = 1,36
      NDS = NJS+1
      IF(10,1,NJS-C)200,250,250
      200 CONTINUE
      GO TO 250
      20      END

```

3NBCDV 2
3NBCDV 3
3NBCDV 4
3NBCDV 5
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3NBCDV 11
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3NBCDV 16
3NBCDV 17
3NBCDV 18
3NBCDV 19
3NBCDV 20
3NBCDV 21

```

1 SUBROUTINE DASLIN(X,Y,N,K,J,L,DASH ,ISTYLE)
C
C SUBROUTINE LINE(X,Y,M,H,J,L)
C THIS PLINEX ALLOWS THE PROGRAMMER TO SELECT THE SIZE OF
C THE PLOT SYMBOLS PLACED ON HIS PLOTS.
C USE OF THE ROUTINE IS THE SAME AS THE CALCOMP LINE.
C N = NUMBER OF POINTS TO BE PLOTTED
C K = 1 SYMBOLS PLOTTED AT 0 DEG ANGLE - K = 2 SYMBOLS PLOTTED AT 9
C J CORRESPONDS TO SYSTEM ROUTINE INTY9
C L CORRESPONDS TO SYSTEM ROUTINE INTEQ
C DASH = LENGTH 0 SMALL DASHES AND SPACES WHICH COMBINE TO FORM LINE S
C ISTYLE = INTEGER WHOSE 16 LOWER ORDER BITS DEFINE THE LINE STYLE
C DASH LINE CAPABILITY ADDED 3-2-72
C
15 DIMENSION X(1),Y(1)
INTEGER STYMAX
DATA(STYMAX=1777778)
C
C H = .05
C M = .06
IF(K.EQ.1) AN=0.
IF(K.EQ.2) AN=90.
DX = (X(1)-(X(N+1)))/X(N+2)
OY = (Y(1)-(Y(N+1)))/Y(N+2)
JJ=IABS(J)
IF(JJ.EQ.0) JJ=1
IJ = JJ + 1
DO 4 I=1,N
IF(I.GT.1) GO TO 3
CALL PLOT(OX,OY,IJ)
IF(J.NE.0) CALL SYMBOL(OX,OY,H,L,AN,-1)
YOLO = X(N+1)
GO TO 4
3 CONTINUE
DX = (X(I)-YOLO)/X(N+2)
OY = (Y(I)-YOLO)/Y(N+2)
IF(J.GE.0) GO TO 8
CALL PLOT(OX,OY,IJ)
GO TO 10
8 IF(ISTYLE.GE.STYMAX.OR.ISTYLE.LE.0) GO TO 9
CALL DASPLT(OX,OY,DASH,ISTYLE)
GO TO 10
9 CALL PLOT(OX,OY,IJ)
10 CONTINUE
IF(IJ.NE.I) GO TO 4
IF(J.NE.0) CALL SYMBOL(OX,OY,H,L,AN,-1)
IJ = IJ + JJ
CONTINUE
RETURN
ENJ
50

```

2 DASLIN
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1  SUBROUTINE JASPLT (XPAGE, YPAGE, DASH, JSTYLE)
   INTEGER PNTST, SHIFT
   DATA (PNTST=100008), (SHIFT=177778)
5  1 SIZE=DASH
   5 DASH = -SIZE
   JSTYLE=0
   GO TO 1
10 10 SIZE=1
   20 IF (JSTYLE=JSTYLE) 30,40,30
   30 JSTYLE=JSTYLE
   GO TO 50
15 40 IF (RESIDU) 60,50,60
   50 RESIDU = SIZE
   60 CALL MHERE(X, Y, XDIFF)
   XDIFF=XPAGE-X
   YDIFF=YPAGE-Y
   TOTAL=SQRT (XDIFF*XDIFF+YDIFF*YDIFF)
   IF (TOTAL) 100,100,70
20 70 COSINE=XDIFF/TOTAL
   SINE=YDIFF/TOTAL
   DELX=SIZE*COSINE
   DELY=SIZE*SINE
   80 CONTINUE
   IPEN = 3
   IF (JSTYLE.GE.PNTST) IPEN = 2
110 IF (RESIDU - TOTAL) 120,160,170
120 IF (RESIDU - SIZE) 130,140,190
130 X=X+RESIDU * COSINE
   Y=Y+RESIDU * SINE
   TOTAL=TOTAL-RESIDU
   RESIDU =SIZE
   GO TO 150
140 X=X+DELX
   Y=Y+DELY
   TOTAL=TOTAL-RESIDU
   JSTYLE = JSTYLE * 2
150 IF (JSTYLE.GT.SHIFT) JSTYLE = JSTYLE - SHIFT
   CALL PLOT(X, Y, IPEN)
   GO TO 90
160 JSTYLE = JSTYLE * 2
   IF (JSTYLE.GT.SHIFT) JSTYLE = JSTYLE - SHIFT
170 RESIDU=RESIDU - TOTAL
   CALL PLOT(XPAGE, YPAGE, IPEN)
   JSTYLE=JSTYLE
180 RETURN
   END

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 DASPLT 48

```

1 SUBROUTINE DERIVS(KI,NRO,IFLAG,IPRINT,IPJNCH)
2 C Labeled COMMON to provide a flag to SYSEQS to say call is from
3 C DERIV for perturbation calculations.
4 C COMMON/INPPIV/NDRIV
5 C COMMON/INTRIM/ITRIM
6 C COMMON NEQS
7 C
8 C ***** SEGMENT 1 *****
9 C TIME,PRINT,AND PLOT CONTROL PARAMETERS,INPUT
10 C
11 C ***** SEGMENT 2 *****
12 C VARIABLES TO BE INTEGRATED IN TIME
13 C
14 C COMMON UDOT,VODOT,WODOT,PJOT,QJOT,RODOT,D11D,D12D,D13D,D21D,D22D,
15 C 1 23D,D31D,D32D,D33D,XEDOT,YEDOT,ZEDOT,LELEVND,RELEVND,DRD,
16 C 2 TABJ(2),P3ITD(2),Y4TD(2),DRCS0(10),FRCSA0(10),DFLAPHD,JFLAPHD,
17 C 3 TFRAC(2)
18 C
19 C CONTROL SYSTEM VARIABLES TO BE INTEGRATED
20 C
21 C COMMON PCTRM,D,PINTD,PETRM,D,PCTRM,D,RINTD,RETRM,D,YTRM,D,QCTRHD,QINTD,
22 C 1 QETRM,D,PIPHD,ZEOTRM
23 C
24 C EULER ANGLE RATES TO BE INTEGRATED
25 C
26 C COMMON THETD,PHID,PSID
27 C
28 C STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED
29 C
30 C COMMON LNGSTK0,ROLLCO,YAAC0
31 C
32 C ***** SEGMENT 3 *****
33 C INTEGRATED VARIABLES
34 C
35 C COMMON U,V,W,P,Q,R,D11,D12,D13,D21,D22,
36 C 1 D23,D31,D32,D33,AE,VE,ZE,LELEVN,RELEVN,DR,
37 C 2 TAB(2),PSIT(2),THT(2),DRCS(10),FRCSA(10),DFLAPH,DFLAPH,
38 C 3 TFRAC(2)
39 C
40 C INTEGRATED CONTROL SYSTEM VARIABLES
41 C
42 C COMMON PCTRY,PINT,PETRY,PCTPM,RINT,RETRM,ITRM,QCTRY,QINT,
43 C 1 QCTPY,PIRM,ZEOTRM
44 C
45 C EULER ANGLES
46 C
47 C COMMON THETA,PHI,PSI
48 C
49 C INTEGRATED STICK AND PEDAL FILTER VARIABLES
50 C
51 C COMMON LNGSTK,ROLLC,YAAC
52 C
53 C ***** SEGMENT 4 *****
54 C BASIC AIRCRAFT MASS, INERTIA, AND GEOMETRY CONSTANTS
55 C

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60 C COMMON MT,IX,IY,IZ,IXZ,FXCG,BLGG,HLGG,GC
C COMPUTED AIRCRAFT CONSTANTS
C COMMON EAC,FAC,GAC,JX,JY,JZ,MASS,OHXJZ
65 C ***** SEGMENT 5 *****
C ERRORS AND TOLERANCES FOR TRIM SOLUTION
C COMMON TOL(19)
C ***** SEGMENT 6 *****
70 C AERO LIFT AND DRAG CONSTANTS AND TABLES,INPUT
C COMMON AAERO,AERO(23,3),SURFCP(3,3)
C EQUIVALENCE IN THE AERO ARRAY ~ THE CONSTANTS ARE ARRANGED FOR EACH
C SURFACE IN THE FOLLOWING ORDER AQ,EXPOSED AQ,AREA,EXPOSED AREA,
75 C LAH30A1/4,LAMSDALE,PAPER RATIO,CLMAX,ALFAB,A0,C30,0/8,2L0/0F,CLMAX/3F,
C CDB/DF. SURFACE 1 IS WING, 2 IS HOR. STAB, 3 IS VERT. STAB.
C COMPUTED AERO LIFT AND DRAG CONSTANTS
80 C COMMON CMA0(3),ACROK(3),EOS(3),CLA(3)
C ***** SEGMENT 7 *****
85 C WING AERO CONSTANTS,INPUT
C COMMON FS4,BLW1,BLW2,MLM,CH,WM,EK0A1,EK0A2,EM,CLB0M,CL0CLM,CLRCLM
1 CLP4,CNB0M,CNBCL2M,CNRCL2M,CNRC0M,CNPSCLM,CNPG0M,CM04,CM0F
2 ,AKEEL,CY9CL2M
90 C COMPUTED WING AERO CONSTANTS
C COMMON XWING1,XWING2,YWING1,YWING2,ZWING1,ZWING2
95 C ***** SEGMENT 8 *****
C HORIZONTAL STABILIZER AERO CONSTANTS
1 COMMON FSH,BLH,MLM,CH,SM,EKADE,EM,EOCL4,CM0FH,CM0H
1 ,DXHT0
C COMPUTED HORIZONTAL STABILIZER CONSTANTS
100 C COMMON XH,YH,ZH,XMEL,ZMEL,DMEL
C ***** SEGMENT 9 *****
105 C VERTICAL STABILIZER AERO CONSTANTS
C COMMON FSV,BLV,MLV,CV,BY,EKADR,EIV,EKV,CNOV
2 ,AEKJD,TALFA(10),AALFA,VTTEFF(10)
C COMPUTED VERTICAL STABILIZER CONSTANTS
110 C COMMON XV,YV,ZV
C ***** SEGMENT 10 *****
95 NAMES
96 NAMES
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115 C FUSELAGE AERO CONSTANTS
C
COMMON FSF,BLF,MLF,AQ0,SQHX,NFQHX,MOQHX1,MOQHX2,NOQHX1,NOQHX2,
1 ADF,A1F,A2F,EN1,EN2,EN3,EN4,EN5,EN6,EN7
2 ,DFSF0,ADFSF1,ADFSF2,KKYF
C
120 C COMPUTED FUSELAGE AERO CONSTANTS
C
COMMON XF,YF,ZF
C
125 C ***** SEGMENT 11 *****
C DIRECT THRUST FORCE AND MOMENT CONSTANTS
C
COMMON FSSH(2),BLSH(2),ALSH(2),SIGY,ELN,KAFT1,KAFT2,AENG
C
130 C COMPUTED DIRECT THRUST CONSTANTS
C
COMMON CSIGY,SSIGY,XT(2),YT(2),ZT(2)
C
135 C ***** SEGMENT 12 *****
C RAM FORCE AND MOMENT CONSTANTS
C
COMMON FSTM(2),BLIN(2),MLIN(2),RINLET,AVOVI,AAURN
C
140 C COMPUTED RAM CONSTANTS
C
COMMON XIN(2),YIN(2),ZIN(2)
C
145 C ***** SEGMENT 13 *****
C CORIOLIS FORCE AND MOMENT CONSTANTS
C
COMMON ELDOCT
C
150 C ***** SEGMENT 14 *****
C PROPULSION SYSTEM CONSTANTS
C
COMMON AMACH,KBT1,KBT2,KM1,KM2,OMEGMX,RPMYX,RCS,AFRAT
1 ,JENG,AFPAC,TAUAB,ABACCEL,ABDECEL,TABCV
2 ,TABOFF
C
155 C COMPUTED PROPULSION SYSTEM CONSTANTS
C
COMMON KBT
C
160 C ***** SEGMENT 15 *****
C RCS FORCE AND MOMENT CONSTANTS
C
COMMON ARCSJET,ABLDR,BLDREF,FRCSMX(10),DEMAND(10),BLOHOR(10),
1 RCS1(10,5),FRCS(10),BLRCS(10),MLRCS(10),THIRCS(10),PSIRCS(10)
C
165 C COMPUTED RCS CONSTANTS
C
COMMON FRCSMXR,FRCSMX0,FRCSMX1,CTHRCS(10),STHRCS(10),SPSIRCS(10),
1 ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)
C
170 C ***** SEGMENT 16 *****
C CONTROL SYSTEM CONSTANTS

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NAMES 112
NAMES 113
NAMES 114
NAMES 115
NAMES 116
NAMES 117
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NAMES 121
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NAMES 123
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NAMES 125
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NAMES 166
NAMES 167
NAMES 168

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C
C
C PSEUDO-PILOT CONTROL SYSTEM CONSTANTS
C
C
C COMMON DUM,AKZE1,AKZE2,AKZE3,AKYED,AKYEE,
C 1 AKJ,AKV,AKW,AKX,AKY,AKZ
C
C CONTROL SYSTEM FUNCTION SWITCH CONSTANTS
C
C COMMON CSV,VASH,CSI,THETSH
C
C ROLL CONTROL SYSTEM CONSTANTS
C
C COMMON TAKP(8),TTHTA(8),TAKPE(8),TKPCI(8),ATHETA,TKP2(10),
C 1 TKP(8),PELIM,AKDYR,KTHR,KDA
C
C YAW CONTROL SYSTEM CONSTANTS
C
C COMMON TAKR(8),TAKRE(8),TKRCI(8),TKREI(8),TKR(8),RELIM,
C 1 AKYTR,KPSIT,KDR,TAKAY(8),KTY
C
C PITCH CONTROL SYSTEM CONSTANTS
C
C COMMON TAKQC(8),RAKQE(8),TKQCI(8),TKQEI(8),TKQ(8),QELIM,
C 1 AKPTR,DKTK,KJE,KTHP
C
C HEAVE CONTROL SYSTEM CONSTANTS
C
C COMMON TAKZE(8),FKZEI(8),AKTH,UT,ZELIM
C
C CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS
C
C COMMON ELEVNR,PSITRF(2)
C
C FLAP CONTROL SYSTEM CONSTANTS
C
C COMMON KMFLAP1,KHFLAP2,KMFLAP1,KMFLAP2
C
C DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS
C
C COMMON AQ3AP,TQBARI(8)
C
C STICK AND PEDAL FILTER TIME CONSTANT TABLES
C
C COMMON TTPITCH(8),TROLL(8),TTYAW(8)
C
C ***** SEGMENT 17 *****
C ACTUATION CONSTANTS
C
C COMMON LEJRATL,LELRATL,LEUPOS,LELPOS,LELSEL,
C 1 REJRATL,RELRATL,REUPOS,RELPOS,RELSL,
C 2 ORJRATL,ORLRATL,ORUPOS,ORLPOS,ORSL,
C 3 HFJRATL,HFLRATL,HFLAPX,HFLAPN,HF,
C 4 HFJPA TL,HFLRATL,HFLAPX,HFLAPN,HF,
C 5 THTUPL(2),THTLRL(2),THTUPL(2),THTPL(2),THT(2),
C 6 PSIURL(2),PSIURL(2),PSIUPL(2),PSILPL(2),TPSIT(2),
C 7 ACSURL(10),RCSURL(10),RCSUPL(10),RCSLPL(10),TAURCS(10)

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NAMES 170
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230      6 ,FRCSURL(10),FRCSURL(10),FRCSURL(10),FRCSURL(10),TAUFRCS(10)
      7 ,DELIM,DALIM,ORLIM
      C
      C ..... SEGMENT 16 .....
      C LIFT-DRAG VARIABLES
      C
      C COMMON LAMB1,CLAE,EKWB,C1,C2,EJ
      C
      C ..... SEGMENT 19 .....
      C WING AERO VARIABLES
      C
      C
      C COMMON DXM,DYM,DZM,OLM,OMM,OMH,CLM,ALFM,CDM,UM,M4,VXZ1,VXZ2,VXZ,
      C 1 DDAJ1,DADA2,ALFM1,ALFM2,CLM1,CLM2,CDM1,CDM2,CDM,CDM,BETM,QMS,QMSB,
      C 2 SOW,LWP,NMP,YMP,ALF1,SALF1,CALF1,ALF2,SALF2,CALF2,XM1,XM2,
      C 3 ZM1,ZM2,ALF,SALF,CALF,MM,LM,NM,DM1,DA2,EKELEL,EKELEL,CMM1,
      C 4 CMM2,DXWING1,DXWING2
      C
      C ..... SEGMENT 20 .....
      C HORIZONTAL STABILIZER AERO VARIABLES
      C
      C COMMON DXH,DYH,DZH,DLH,DMH,DMH,UM,MM,ALFG,EPS,DALFM,CL1,CL2,CD1,
      C 1 CDS,CADE,ALFH,CLH,CDH,ANG,DIS,XI,ZM,DOBQ0,ALFH1,SALFH1,CALFH1
      C 2 ,UAH,DE,QEFF,DAVG,CMH,DXHT
      C
      C ..... SEGMENT 21 .....
      C VERTICAL STABILIZER AERO VARIABLES
      C
      C COMMON DXV,DYV,DZV,JLV,DMV,DNV,UV,VV,DADR,ALFV,CLV,CDV,ALFV1,
      C 1 CALFV1,SALFV1,QDV,DRP,EKRD,CMV,DXVT,VTEFF
      C
      C ..... SEGMENT 22 .....
      C FUSELAGE AERO VARIABLES
      C
      C COMMON DXF,DYF,DZF,JLF,DMF,DMF,ALFF,ALFF,ALFF,QX,QX,QQ,AS,
      C 1 SAF,SQ,AF,NFOQ,MOQ,NOQ1,S,NF,PITCHF,ALFYFD,NOR,NOQ1,YAMF
      C 2 ,DFSF
      C
      C ..... SEGMENT 23 .....
      C DIRECT THRUST FORCE AND MOMENT VARIABLES
      C
      C COMMON DXT,DYT,DZT,OLT,DYT,DNT,AFT(2),TCJR(2),DX(2),DY(2),DZ(2),
      C 1 DFSSM(2),DBLSM(2),DALSM(2),SPSIT(2),SPSIT(2),STHT(2),CTHT(2)
      C 2 ,KAPT
      C
      C ..... SEGMENT 24 .....
      C RAM FORCE AND MOMENT VARIABLES
      C
      C COMMON DXR,DYR,DZR,CLR,DMR,DNR,VD,ATURN,STURN,CBTURN,SBTURN,VIN,
      C 1 VOJI(?),ATURN(2),ELRAM(2),DATURN(2),ETAR(2),FRAM(2),ELR,
      C 2 HLRAM,FSRAM,SATURN,CATURN,DXRD(2),DYRD(2),DZRD(2),DKRI(2),
      C 3 DYRI(2),DZRI(2),UI,VI,WI
      C
      C ..... SEGMENT 25 .....
      C CORIOLIS FORCE AND MOMENT VARIABLES
      C
      C COMMON DXCOR,DYCOR,DZCOR,DLCCOR,DHCCOR,DNCCOR,ELCCOR,EACOR,DLCCOR,
      C 1 DLCCOR,DNCCOR
  
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NAMES 226
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C ..... SEGMENT 26 .....
C PROPULSION SYSTEM VARIABLES
C
C   COMMON /OBT(2),RPM(2),TRST(2),BLD,AVL,FGHAX,FGMIN,FGIDL,MDTHK,
C   1 TRCK(1),TRQAV,TRQ(2),FRATIO,FRPH,KHJT,KBT,TRCS,TC(2)
C   2 ,HE(2),TRACC(2),TRACIN,FRACL,TENG,TRAGE,TABIN,BLOTS,TABE
C   3 ,TO(2)
C
C ..... SEGMENT 27 .....
C RCS FORCE AND MOMENT VARIABLES
C
C   COMMON DXRCS,DYRCS,DZRCS,DLPCS,DRCS,DKRCS,DFRCSDB,DFRCSO,FRCS(10)
C   1 ,BLJREQ,FRCSAL,FRCSLU,FRCS(10),DXR(10),DYR(10),DZRC(10),
C   2 DRCSC(10),BLD,FRCSDB
C
C ..... SEGMENT 28 .....
C CONTROL SYSTEM VARIABLES
C
C PSEUDO-PILOT CONTROL SYSTEM VARIABLES
C
C   COMMON ZEE,ZEIC,YEE,YEIC,DXE,DYE,DZE,XES,YES,ZES
C
C CONTROL SYSTEM FUNCTION SWITCH VARIABLES
C
C   COMMON CSSM
C
C ROLL CONTROL SYSTEM VARIABLES
C
C   COMMON ROLLCHD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL
C
C YAW CONTROL SYSTEM VARIABLES
C
C   COMMON YAWCHD,DPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYAW,AKAY
C
C PITCH CONTROL SYSTEM VARIABLES
C
C   COMMON DLVSTK,AKQC,AKQCI,PTRMUT,QE,AKQE,AKQEI,DPITCH
C
C HEAVE CONTROL SYSTEM VARIABLES
C
C   COMMON ZEDTC,ZEDTE,AKZE,AKZEI,DTHTOT
C
C ACTUATION SYSTEM INPUT VARIABLES
C
C   COMMON DSIDEF,DNORMF,PSITC(2),THFC(2),DE3,DRC,DAG,DRCSR,DRCSF,
C   1 DRCSY,DRCSSF,DRCSNF,TCMD,HFLAPC,MFLAPC,LELEVNC,RELEVNC
C
C ADDITIONAL CONTROL SYSTEM VARIABLES
C
C   COMMON AKQCI,AKQEI,AKP,AKRCI,AKREI,AKR,AKQCI,AKQEI,AKQ,
C   1 AKZEI,CSVSH,TPITCH,TROLL,TYAW
C
C ..... SEGMENT 29 .....
C AIR DATA VARIABLES

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NAMES 283
 NAMES 284
 NAMES 285
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COMMON UAS,VAS,WAS,RHO,TAMB,V SOUND,TRATIO,PRATIO,VA,VK,MN,QBAR,
1 ALPHA,BETA,ALFAD,SALPH,CALPHA,BETA,CBETA
345 C TOTAL AERO FORCE AND MOMENT VARIABLES NAMES 340
346 C NAMES 341
347 C NAMES 342
348 C NAMES 343
349 C NAMES 344
350 C COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO NAMES 345
351 C TOTAL FORCE AND MOMENT VARIABLES NAMES 346
352 C NAMES 347
353 C COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN NAMES 348
354 C CORRECTED DIRECTIONAL COSINES NAMES 349
355 C NAMES 350
356 C CAYON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG NAMES 351
357 C MISCELLANEOUS VARIABLES NAMES 352
358 C NAMES 353
359 C COMMON UAIR,VAIR,WAIR,ALTR,RS,PS,BLOT1(3) NAMES 354
360 1 ,GYROL,GYROM,GYRON,NKCG,NYCG,NZCG NAMES 355
361 2 ,ADJ,YON,ZDM,BLOT2(3),LPRIME,NPRIME NAMES 356
362 3 ,VE,VEDT,VEEST NAMES 357
363 C TABLES FOR RAM FORCES AND MOMENTS NAMES 358
364 C ***** SEGMENT 30 ***** NAMES 359
365 C TABLES FOR RAM FORCES AND MOMENTS NAMES 360
366 C ***** SEGMENT 31 ***** NAMES 361
367 C TABLES FOR RCS FORCES AND MOMENTS NAMES 362
368 C ***** SEGMENT 32 ***** NAMES 363
369 C CAYON FOCST(6),BLDRT(6) NAMES 364
370 C THRUST TABLES NAMES 365
371 C ***** SEGMENT 33 THRU 38 ***** NAMES 366
372 C COMMON WNT(4),TFGMX(4),TFGMIN(4),TFGIDL(4),TMDI(4),TFRAT(6),
1 TRPH(5),TFRACT(10),TACCEL(10),FDECEL(10),FTENG(10) NAMES 367
373 C STABILITY DERIVATIVES NAMES 368
374 C ***** SEGMENTS 33 THRU 38 ***** NAMES 369
375 C SEGMENT 33 NAMES 370
376 C COMMON UYAG(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),
1 DXRAM(25),DXCLS(25),DXRCSF(25),X(25) NAMES 371
377 C SEGMENT 34 NAMES 372
378 C COMMON DYAG(25),DYHS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),
1 DYRAM(25),DYCLS(25),DYRCSF(25),Y(25) NAMES 373
379 C SEGMENT 35 NAMES 374
380 C COMMON DZMG(25),DZHS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),
1 DZRAM(25),DZCLS(25),DZRCSF(25),Z(25) NAMES 375
381 C SEGMENT 36 NAMES 376
382 C COMMON DL+G(25),DLMS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),
1 DLRAM(25),DLCLS(25),DLRCSF(25),AL(25) NAMES 377
383 C SEGMENT 37 NAMES 378
384 C COMMON DMAG(25),DMHS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25),
1 DMRAM(25),DMCLS(25),DMRCSF(25),AM(25) NAMES 379
385 C NAMES 380
386 C NAMES 381
387 C NAMES 382
388 C NAMES 383
389 C NAMES 384
390 C NAMES 385
391 C NAMES 386
392 C NAMES 387
393 C NAMES 388
394 C NAMES 389
395 C NAMES 390
396 C NAMES 391
397 C NAMES 392
398 C NAMES 393
399 C NAMES 394
400 C NAMES 395
401 C NAMES 396

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400 C SEGMENT 38
COMMON DNMG(25),DNMS(25),DNVS(25),DNFS(25),DNAR(25),DNFS(25),DNVS(25),
1 DNRM(25),DNCLS(25),DNRCFS(25),AN(25)
C
405 C ..... SEGMENT 39 .....
C DERIVATIVE CONTROL
C
610 C COMMON ADER,DELVI(25)
C ..... SEGMENT 40 .....
C SCRATCH COMMON
COMMON WORK(50)
C
415 C ..... SEGMENT 41 .....
C MISCELLANEOUS CONSTANTS
C
420 C COMMON AHIND,VMIND,PSI4IND,XE2D,YE2D,ZE2D
1 TR4TURN,GAMMA,VADOT,TURNRAD
C ..... SEGMENT 42 .....
C AERO SURFACE EFFECTIVENESS TABLES
C
425 C ..... SEGMENT 43 .....
C PILOT INPUT CONTROL DATA
C
430 C COMMON AC40(5),ATINE,ASKEEP,AYEHLD,CMOT1(20),CMOT2(20),
1 CMOT3(20),CMOT4(20),CMOT5(20),TIMET(20),ATRANS,AVAT,TFRANS,
2 THROTT(10),VAT(10),THETCT(10)
C
435 C ..... SEGMENT 44 .....
C TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LAWS
C
COMMON ACSS4,TCSS4(5),TAKQS(5),TKPINT(5),TKPHI(5),TKPB(5),
1 TKPSI(5),TKQINT(5),FKTHETA(5),TKRINT(5),FKPSI(5),TKRB(5),
2 TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKQCI(5),TAKQEI(5),
3 TKRS(5),AKPHIS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,APRINT,
4 AKPSI,AKRB,AKRS,AKLS
C
440 C ..... SEGMENT 45 .....
C TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS 4MICH
C VARY AS FUNCTIONS OF AIRSPEED
C
445 C COMMON VELGAIN,AVEL,TVEL(8),VAKPC(8),VKP2(11),VKPEI(8),VKP(8),
1 JAKQE(8),VAKRC(8),VKRCI(8),VKREI(8),VVR(8),VAKRE(8),VAKQC(8),
2 VKQCI(8),VKQEI(8),VAKQE(8),VAKZE(8),VKZEI(8)
3 VTPITCH(8),VTROLL(8),VTY44(8)
REAL LAMB1
REAL LNGSTK,LNGSTKO
REAL IX,IY,IZ,IXZ,JX,JY,JZ,MASS
REAL NFOQ1,MOQMX1,MOQMX2,NOQMX1,NOQMX2
REAL KBT1,KBT2,KX1,KX2,KBT
REAL KPSIT,KHTP,KHTR,KDE,KDR,KOA,KTY
REAL LMP,IMP,NM,LW,M4
REAL NFOQ,MOQ,MOQ1,NOQ,NOQ1

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NAMES 397
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LINE NO.	CODE	TEXT	DERIVS	NAMES
454		REAL KHFLAP1,KHFLAP2,KHFLAP1,KHFLAP2		NAMES
455		REAL MDOT,MDTM,KHJT,KBTP		NAMES
456		REAL KAPT1,KAPT2,KAPT		NAMES
457		REAL LAERO,MAERO,NAERO		NAMES
458		REAL LEUPOS1,LEURATL,LEUPOS2,LEURATL,LRIME,NPRIME		NAMES
459		REAL LELEVND,LELEVNC,LELEVNC,MNT,NF,MN		NAMES
460		REAL JENG		NAMES
461		REAL NXCG,NYCG,NZCG		NAMES
465	C	DIMENSION NAME1(8),NAME2(25),A(500)		DERIVS
466	C			DERIVS
467	C	NAME1 LIST OF DEPENDENT VARIABLES		DERIVS
468	C	NAME2 LIST OF INDEPENDENT VARIABLES		DERIVS
469	C			DERIVS
470		EQUIVALENCE (A,T)		DERIVS
471		DATA NAME1/ 5H X/ 5H Y/ 5H Z/ 5H L/ 5H M/ 5H N/		DERIVS
472		DATA NAME2/ 5SH ,5H4 ,5HQ ,5HDE ,5HFLAP1,5HFLAP2,		DERIVS
473		1 5HORCS-,5HORCSN,5HTO1 ,5HTO2 ,5HTHT1 ,5HTHT2 ,5MV ,5HP		DERIVS
474		2 ,5HP ,5HOR ,5HDA ,5HORCSR,5HORCSY,5HORCSS,5HPSIT1,5HPSIT2		DERIVS
475		3 /		DERIVS
476		DATA ASTRIK,BLANK/ 1H,1H /		DERIVS
477		IF(IPRINT.EQ.1)GO TO 100		DERIVS
478		IF(IFLAG.NE.0)GO TO 1		DERIVS
480	C	INITIALIZATION		DERIVS
481	C	CALL SYSE3		DERIVS
482		CALL FORCES(0,)		DERIVS
483		NDER=IFIX(A*ER)		DERIVS
484		DMREF=DX4		DERIVS
485		DYREF=DY4		DERIVS
486		DZREF=DZ4		DERIVS
487		DLXREF=DL4		DERIVS
488		DMREF=DMA		DERIVS
489		DMREF=DM4		DERIVS
490		DMREF=DM4		DERIVS
491		DYREF=DY4		DERIVS
492		DZREF=DZ4		DERIVS
493		DLXREF=DL4		DERIVS
494		DMREF=DM4		DERIVS
495		DMREF=DM4		DERIVS
496		DYREF=DY4		DERIVS
497		DZREF=DZ4		DERIVS
498		DLXREF=DL4		DERIVS
499		DMREF=DM4		DERIVS
500		DMREF=DM4		DERIVS
501		DYREF=DY4		DERIVS
502		DZREF=DZ4		DERIVS
503		DLXREF=DL4		DERIVS
504		DMREF=DM4		DERIVS
505		DMREF=DM4		DERIVS
506		DYREF=DY4		DERIVS
507		DZREF=DZ4		DERIVS
508		DLXREF=DL4		DERIVS
509		DMREF=DM4		DERIVS
510		DMREF=DM4		DERIVS
511		DYREF=DY4		DERIVS
512		DZREF=DZ4		DERIVS
513		DLXREF=DL4		DERIVS
514		DMREF=DM4		DERIVS
515		DMREF=DM4		DERIVS
516		DYREF=DY4		DERIVS
517		DZREF=DZ4		DERIVS
518		DLXREF=DL4		DERIVS
519		DMREF=DM4		DERIVS
520		DMREF=DM4		DERIVS
521		DYREF=DY4		DERIVS
522		DZREF=DZ4		DERIVS
523		DLXREF=DL4		DERIVS
524		DMREF=DM4		DERIVS
525		DMREF=DM4		DERIVS
526		DYREF=DY4		DERIVS
527		DZREF=DZ4		DERIVS
528		DLXREF=DL4		DERIVS
529		DMREF=DM4		DERIVS
530		DMREF=DM4		DERIVS
531		DYREF=DY4		DERIVS
532		DZREF=DZ4		DERIVS
533		DLXREF=DL4		DERIVS
534		DMREF=DM4		DERIVS
535		DMREF=DM4		DERIVS
536		DYREF=DY4		DERIVS
537		DZREF=DZ4		DERIVS
538		DLXREF=DL4		DERIVS
539		DMREF=DM4		DERIVS
540		DMREF=DM4		DERIVS
541		DYREF=DY4		DERIVS
542		DZREF=DZ4		DERIVS
543		DLXREF=DL4		DERIVS
544		DMREF=DM4		DERIVS
545		DMREF=DM4		DERIVS
546		DYREF=DY4		DERIVS
547		DZREF=DZ4		DERIVS
548		DLXREF=DL4		DERIVS
549		DMREF=DM4		DERIVS
550		DMREF=DM4		DERIVS
551		DYREF=DY4		DERIVS
552		DZREF=DZ4		DERIVS
553		DLXREF=DL4		DERIVS
554		DMREF=DM4		DERIVS
555		DMREF=DM4		DERIVS

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515  DXTREF=DXI
      DYTRF=DYI
      CZTRF=DZI
      DLTREF=DLT
      DMTREF=DMT
      DNTREF=DNT
      DXRPF=DXR
      DYRPF=DYR
      DZRPF=DZR
      DLRREF=DLR
      DMRREF=DMR
      DNRREF=DNR
      DXCRF=DXCOR
      DYCREF=DYCOR
      DZCRF=DZCOR
      DLGREF=DLGCR
      DMCPEF=DMCOP
      DNGREF=DN COP
      DXRCSK=DXRCS
      DYRCSR=DYRCS
      DZRCSR=DZRCS
      BLRCSK=BLRCS
      DMRCSP=DMRCS
      DNRCSF=UNRCS
      XPEF=SUMFX
      YPEF=SUMFY
      ZPEF=SUMFZ
      ALREF=SUML
      AMREF=SUMM
      ANREF=SUMN
      IFLAG=1
      1 CONTINUE
      C PEKURBATION
      NDRIV=1
      DVAR=DELV(MRD)
      A(K1)=A(K1)+DVAR
      CALL SYSEQS
      CALL FORCES(0.)
      AMOV=MASS*DVAR
      DIY=IY*DVAR
      DIX=IX*DVAR
      DIZ=IZ*DVAR
      XMA=(DXH-DXAREF)/AMDV
      YMA=(DYH-DYAREF)/AMDV
      ZMA=(DZH-DZAREF)/AMDV
      ALMA=(DLH-OLHREF)/DIY
      AMMA=(DMH-DMHREF)/DIY
      XMA=(DXH-DXAREF)/AMDV
      YMA=(DYH-DYAREF)/AMDV
      ZMA=(DZH-DZAREF)/AMDV
      ALMA=(DLH-OLHREF)/DIY
      AMMA=(DMH-DMHREF)/DIY
      XVA=(DXV-DXVREF)/AMDV
      YVA=(DYV-DYVREF)/AMDV
      ZVA=(DZV-DZVREF)/AMDV
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B-27

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112 JERIVS

SUBROUTINE DERIVS 74/74 OPT=1

ALVA=(DLV-DLVREF)/DIX	DERIVS	113
AMVA=(DMV-DMVREF)/DIY	DERIVS	114
ANVA=(DNV-DNVREF)/DIZ	DERIVS	115
XFA=(DXF-DXREF)/AMDV	DERIVS	116
YFA=(DYF-DYREF)/AMDV	DERIVS	117
ZFA=(DZF-DZREF)/AMDV	DERIVS	119
ALFAA=(DLF-DLREF)/DIY	DERIVS	120
AMFA=(DMF-DMREF)/DIY	DERIVS	121
ANFA=(DNF-DNREF)/DIZ	DERIVS	122
XAEROA=(XAERO-DXAERF)/AMDV	DERIVS	123
YAEROA=(YAERO-DYAERF)/AMDV	DERIVS	124
ZAEPOA=(ZAERO-DZAERF)/AMDV	DERIVS	125
ALAECA=(LAERO-DLAERF)/DIX	DERIVS	126
AMAEPOA=(MAERO-DMAEPF)/DIY	DERIVS	127
ANAEPOA=(NAERO-DNAEPF)/DIZ	DERIVS	128
XTA=(DXT-DXTRF)/AMDV	DERIVS	129
YTA=(DYT-DYTRF)/AMDV	DERIVS	130
ZTA=(DZT-DZTRF)/AMDV	DERIVS	131
ALTA=(DLT-DLTRF)/DIX	DERIVS	132
AMTA=(DMT-DMTRF)/DIY	DERIVS	133
ANTA=(DNT-DNTRF)/DIZ	DERIVS	134
XRA=(DXR-DXPRF)/AMDV	DERIVS	135
YRA=(DYR-DYPRF)/AMDV	DERIVS	136
ZRA=(DZR-DZPRF)/AMDV	DERIVS	137
ALRA=(DLR-DLPRF)/DIX	DERIVS	138
AMRA=(DMR-DMPRF)/DIY	DERIVS	139
ANRA=(DNR-DNPRF)/DIZ	DERIVS	140
XCA=(DXC-DXCREF)/AMDV	DERIVS	141
YCA=(DYC-DYCREF)/AMDV	DERIVS	142
ZCA=(DZC-DZCREF)/AMDV	DERIVS	143
ALCA=(DLC-DLCREF)/DIX	DERIVS	144
AMCA=(DMC-DMCREF)/DIY	DERIVS	145
ANCA=(DNC-DNCREF)/DIZ	DERIVS	146
XGSA=(DXCS-DXCSR)/AMDV	DERIVS	147
YGSA=(DYCS-DYCSR)/AMDV	DERIVS	148
ZGSA=(DZCS-DZCSR)/AMDV	DERIVS	149
ALGSA=(DLCSD-DLCSDR)/DIX	DERIVS	150
AMGSA=(DMCS-DMCSR)/DIY	DERIVS	151
ANRCSA=(DNRLS-DNRCSR)/DIZ	DERIVS	152
XA=(SUMFX-XREF)/AMDV	DERIVS	153
YA=(SUMFY-YREF)/AMDV	DERIVS	154
ZA=(SUMFZ-ZREF)/AMDV	DERIVS	155
ALA=(SUML-ALREF)/DIX	DERIVS	156
AMA=(SUMM-AMREF)/DIY	DERIVS	157
ANA=(SUMN-ANREF)/DIZ	DERIVS	158
A(K1)=A(K1)-2.*DVAR	DERIVS	159
CALL SYSEQS	DERIVS	160
CALL FORCES(0.)	DERIVS	161
XWB=(DXWREF-DXW)/AMDV	DERIVS	162
YWB=(DYWREF-DYW)/AMDV	DERIVS	163
ZWB=(DZWREF-DZW)/AMDV	DERIVS	164
ALWB=(DLWREF-DLW)/DIX	DERIVS	165
AMWB=(DMWREF-DMW)/DIY	DERIVS	166
ANWB=(DNWREF-DNW)/DIZ	DERIVS	167
XHB=(DXHREF-DXH)/AMDV	DERIVS	168
YHB=(DYHREF-DYH)/AMDV	DERIVS	169

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170 TH8=(DYHREF-DYM)/AMDV
171 ZH9=(DZMREF-DZH)/AMDV
172 ALH8=(DLHREF-DLH)/DIY
173 AMH3=(DMHREF-DMH)/DIY
174 AMH3=(DMHREF-DMH)/DIY
175 XH8=(DXHREF-DXH)/AMDV
176 YH9=(DYHREF-DYH)/AMDV
177 ZH9=(DZMREF-DZH)/AMDV
178 ALH8=(DLHREF-DLH)/DIY
179 AMH3=(DMHREF-DMH)/DIY
180 ANH8=(DNHREF-DNH)/DIY
181 XH8=(DXHREF-DXH)/AMDV
182 YH9=(DYHREF-DYH)/AMDV
183 ZH9=(DZMREF-DZH)/AMDV
184 ALH8=(DLHREF-DLH)/DIY
185 AMH3=(DMHREF-DMH)/DIY
186 ANH8=(DNHREF-DNH)/DIY
187 XH8=(DXHREF-DXH)/AMDV
188 YH9=(DYHREF-DYH)/AMDV
189 ZH9=(DZMREF-DZH)/AMDV
190 ALH8=(DLHREF-DLH)/DIY
191 AMH3=(DMHREF-DMH)/DIY
192 ANH8=(DNHREF-DNH)/DIY
193 XH8=(DXHREF-DXH)/AMDV
194 YH9=(DYHREF-DYH)/AMDV
195 ZH9=(DZMREF-DZH)/AMDV
196 ALH8=(DLHREF-DLH)/DIY
197 AMH3=(DMHREF-DMH)/DIY
198 ANH8=(DNHREF-DNH)/DIY
199 XH8=(DXHREF-DXH)/AMDV
200 YH9=(DYHREF-DYH)/AMDV
201 ZH9=(DZMREF-DZH)/AMDV
202 ALH8=(DLHREF-DLH)/DIY
203 AMH3=(DMHREF-DMH)/DIY
204 ANH8=(DNHREF-DNH)/DIY
205 XH8=(DXHREF-DXH)/AMDV
206 YH9=(DYHREF-DYH)/AMDV
207 ZH9=(DZMREF-DZH)/AMDV
208 ALH8=(DLHREF-DLH)/DIY
209 AMH3=(DMHREF-DMH)/DIY
210 ANH8=(DNHREF-DNH)/DIY
211 XH8=(DXHREF-DXH)/AMDV
212 YH9=(DYHREF-DYH)/AMDV
213 ZH9=(DZMREF-DZH)/AMDV
214 ALH8=(DLHREF-DLH)/DIY
215 AMH3=(DMHREF-DMH)/DIY
216 ANH8=(DNHREF-DNH)/DIY
217 XH8=(DXHREF-DXH)/AMDV
218 YH9=(DYHREF-DYH)/AMDV
219 ZH9=(DZMREF-DZH)/AMDV
220 ALH8=(DLHREF-DLH)/DIY
221 AMH3=(DMHREF-DMH)/DIY
222 ANH8=(DNHREF-DNH)/DIY
223 XH8=(DXHREF-DXH)/AMDV
224 YH9=(DYHREF-DYH)/AMDV
225 ZH9=(DZMREF-DZH)/AMDV
226 ALH8=(DLHREF-DLH)/DIY

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630 AMH3=(DMHREF-DMH)/DIY
635 XH8=(DXHREF-DXH)/AMDV
640 YH9=(DYHREF-DYH)/AMDV
645 ZH9=(DZMREF-DZH)/AMDV
650 ALH8=(DLHREF-DLH)/DIY
655 AMH3=(DMHREF-DMH)/DIY
660 ANH8=(DNHREF-DNH)/DIY
665 XH8=(DXHREF-DXH)/AMDV
670 YH9=(DYHREF-DYH)/AMDV
675 ZH9=(DZMREF-DZH)/AMDV
680 ALH8=(DLHREF-DLH)/DIY

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DXWG(NRD)=(XWA+XWB)/2. DERIVS 227
 DXYS(NRD)=(XMA+XMB)/2. DERIVS 228
 DXVS(NRD)=(XVA+XVB)/2. DERIVS 229
 DXFS(NRD)=(XFA+XFB)/2. DERIVS 230
 DXEP(NRD)=(XAEPOA+XAEPOB)/2. DERIVS 231
 DXTS(NRD)=(XTA+XTB)/2. DERIVS 232
 DXRM(NRD)=(XRA+XRB)/2. DERIVS 233
 DXCLS(NRD)=(XCA+XCB)/2. DERIVS 234
 DXRSF(NRD)=(XRSA+XRCSB)/2. DERIVS 235
 DXW(NRD)=(ZWA+ZWB)/2. DERIVS 236
 DXMS(NRD)=(ZMA+ZMB)/2. DERIVS 237
 DXVS(NRD)=(ZVA+ZVB)/2. DERIVS 238
 DXFS(NRD)=(ZFA+ZFB)/2. DERIVS 239
 DXAEK(NRD)=(ZAEKOA+ZAEKOB)/2. DERIVS 240
 DXTS(NRD)=(ZTA+ZTB)/2. DERIVS 241
 DXAA(NRD)=(ZPA+ZPB)/2. DERIVS 242
 DXCLS(NRD)=(ZCA+ZCB)/2. DERIVS 243
 DXRSF(NRD)=(ZPCSA+ZRCSEB)/2. DERIVS 244
 X(NRD)=(XA+XB)/2. DERIVS 245
 Z(NRD)=(ZA+ZB)/2. DERIVS 246
 DMW(NRD)=(AMWA+AMWB)/2. DERIVS 247
 DMYS(NRD)=(AMMA+AMMB)/2. DERIVS 248
 DMVS(NRD)=(AMVA+AMVB)/2. DERIVS 249
 DMFS(NRD)=(AMFA+AMFB)/2. DERIVS 250
 DMEP(NRD)=(AMAEPOA+AMAEPOB)/2. DERIVS 251
 DMTS(NRD)=(AMTA+AMTB)/2. DERIVS 252
 DMRM(NRD)=(AMRA+AMRB)/2. DERIVS 253
 DMCLS(NRD)=(AMCA+AMCB)/2. DERIVS 254
 DMRSF(NRD)=(AMRSA+AMRCSB)/2. DERIVS 255
 MW(NRD)=(MWA+MWB)/2. DERIVS 256
 Z(NRD)=(ZA+ZB)/2. DERIVS 257
 DMW(NRD)=(AMWA+AMWB)/2. DERIVS 258
 DMYS(NRD)=(AMMA+AMMB)/2. DERIVS 259
 DMVS(NRD)=(AMVA+AMVB)/2. DERIVS 260
 DMFS(NRD)=(AMFA+AMFB)/2. DERIVS 261
 DMEP(NRD)=(AMAEPOA+AMAEPOB)/2. DERIVS 262
 DMTS(NRD)=(AMTA+AMTB)/2. DERIVS 263
 DMRM(NRD)=(AMRA+AMRB)/2. DERIVS 264
 DMCLS(NRD)=(AMCA+AMCB)/2. DERIVS 265
 DMRSF(NRD)=(AMRSA+AMRCSB)/2. DERIVS 266
 X(NRD)=XA DERIVS 267
 DXW(NRD)=XWA DERIVS 268
 DXYS(NRD)=XMA DERIVS 269
 DXVS(NRD)=XVA DERIVS 270
 DXFS(NRD)=XFA DERIVS 271
 DXEP(NRD)=XAEPOA DERIVS 272
 DXTS(NRD)=XTA DERIVS 273
 DXRM(NRD)=XRA DERIVS 274
 DXCLS(NRD)=XCA DERIVS 275
 DXRSF(NRD)=XRSA DERIVS 276
 X(NRD)=XA DERIVS 277
 DMW(NRD)=ZWA DERIVS 278
 DMYS(NRD)=ZMA DERIVS 279
 DMVS(NRD)=ZVA DERIVS 280
 DMFS(NRD)=ZFA DERIVS 281
 DMEP(NRD)=ZAEKOA DERIVS 282
 DMTS(NRD)=ZTA DERIVS 283
 DMRM(NRD)=ZPA DERIVS 284
 DMCLS(NRD)=ZCA DERIVS 285
 DMRSF(NRD)=ZPCSA DERIVS 286
 Z(NRD)=ZA DERIVS 287
 MW(NRD)=MWA DERIVS 288
 Z(NRD)=ZA DERIVS 289
 MW(NRD)=MWA DERIVS 290
 MW(NRD)=MWA DERIVS 291
 MW(NRD)=MWA DERIVS 292
 MW(NRD)=MWA DERIVS 293
 MW(NRD)=MWA DERIVS 294
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 MW(NRD)=MWA DERIVS 296
 MW(NRD)=MWA DERIVS 297
 MW(NRD)=MWA DERIVS 298
 MW(NRD)=MWA DERIVS 299
 MW(NRD)=MWA DERIVS 300

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C 500 CONTINUE
 C SINGLE SIDED DERIVATIVES. LONG. FORCES AND MOMENTS 4.R.T.
 C LATERAL-DIRECTIONAL PERTURBATIONS
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745      DMHS(NRD)=AMHA
          DMVS(NRD)=AMVA
          DMFS(NRD)=AMFA
          DMAER(NRD)=AMAEROA
          DMAS(NRD)=AMTA
          DMRA(NRD)=MRA
          DMCLS(NRD)=AMCA
          DMCSF(NRD)=AMRCSA
          AM(NRD)=AMA
          C
          499 CONTINUE
          C
          C LATERAL DIRECTIONAL DERIVATIVE COMPUTATION
          C
          C LONGITUDINAL DERIVATIVE COMPUTATION
          C
          760      DYHG(NRD)=(YMA+YMB)/2.
               DYHS(NRD)=(YMA+YMB)/2.
               DYVS(NRD)=(YVA+YVB)/2.
               DYFS(NRD)=(YFA+YFB)/2.
               DMAER(NRD)=(YAEROA+YAEROB)/2.
               DYTS(NRD)=(YTA+YTB)/2.
               DYRAM(NRD)=(YRA+YRB)/2.
               DYCLS(NRD)=(YCA+YCB)/2.
               DYCSF(NRD)=(YRCSA+YRCSB)/2.
               Y(NRD)=(YA+YB)/2.
               DLHG(NRD)=(ALMA+ALMB)/2.
               DLHS(NRD)=(ALMA+ALHB)/2.
               DLVS(NRD)=(ALVA+ALVB)/2.
               DLFS(NRD)=(ALFA+ALFB)/2.
               CLAER(NRD)=(ALAEROA+ALAEROB)/2.
               CLTS(NRD)=(ALTA+ALTB)/2.
               DLRA(NRD)=(ALRA+ALRB)/2.
               DLCSF(NRD)=(ALRCSA+ALRCSB)/2.
               AL(NRD)=(ALA+ALB)/2.
               DMHG(NRD)=(ANHA+ANHB)/2.
               DMHS(NRD)=(ANHA+ANHB)/2.
               DMVS(NRD)=(ANVA+ANVB)/2.
               DMFS(NRD)=(ANFA+ANFB)/2.
               DMAER(NRD)=(ANAEROA+ANAEROB)/2.
               DMAS(NRD)=(ANTA+ANTB)/2.
               DMRA(NRD)=(ANKA+ANKB)/2.
               DMCLS(NRD)=(ANCA+ANCB)/2.
               DMCSF(NRD)=(ANCSA+ANCSB)/2.
               AN(NRD)=(ANA+ANB)/2.
               RETURN
               100 CONTINUE
               NDIRV=0
               CALL SYSEQS
               CALL FORCES(0.)
               C
               C PUNCH DIMENSIONAL DERIVATIVES
               C
               IF(I>PUNCH.EQ.0)GO TO 400
               WRITE(7,2004)UAS,MAS,Q,THETA,THETD,ALPHA,VA

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DERIVS 266
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800   2004   FORMAT(7E10.5)
      WRITE(7,2004)(IX,IY,IZ,IXZ,MT,JENG
      WRITE(7,2004)(X(I),I=1,5),X(11),X(12),X(19),X(10)
      WRITE(7,2004)(Z(I),I=1,5),Z(11),Z(12),Z(13),Z(18)
      WRITE(7,2004)(A(I),I=1,6),AM(11),AM(12),AM(9),A(10)
      WRITE(7,2004)(Y(I),I=1,15),Y(17),Y(16),Y(21),Y(22),Y(9),Y(18),
      1   Y(11)
805   1   WRITE(7,2004)(AL(I),I=1,3,15),AL(17),AL(15),AL(21),AL(22),AL(9),
      1   AL(10),AL(18)
      1   WRITE(7,2004)(AN(I),I=1,3,15),AN(17),AN(15),AN(21),AN(22),AN(9),
      1   AN(10),AN(18)
810   1   AN(10),AN(18)
      400   CONTINUE
      C
      C   PRINT DIMENSIONAL DERIVATIVES
      C
815   WRITE(6,2000)
      WRITE(6,2001)
      DO 300 I=1,NDER
      PUNK=BLANK
      IF I.E.13.AND.I.LE.22,PUNK=ASTRIK
      WRITE(6,2002)
820   1   NAME(1),NAME2(1),DX4G(I),DXHS(I),DXVS(I),DXFS(I),DXAER(I),
      2   DXYS(I),DXRAM(I),DXCLS(I),DXRCSF(I),X(I),PUNK,
      3   NAME(1(3)),NAME2(I),ZHWG(I),ZHS(I),ZVS(I),ZFS(I),ZDAER(I),
      4   ZDTS(I),ZDRAM(I),ZCLS(I),ZRCSF(I),Z(I),PUNK,
      5   NAME(1(5)),NAME2(I),DMAG(I),DMS(I),DMVS(I),DMFS(I),DMAER(I),
      6   DMTS(I),DMRAM(I),DMCLS(I),DMRCSF(I),M(I),PUNK
      300   CONTINUE
830   WRITE(6,2003)
      WRITE(6,2001)
      DC 310 I=1,NDER
      PUNK=BLANK
      WRITE(6,2002)
835   1   NAME(1(2)),NAME2(1),DYWG(I),DYHS(I),DYVS(I),DYFS(I),DYAER(I),
      2   DYTS(I),DYRAM(I),DYCLS(I),DYRCSF(I),Y(I),PUNK,
      3   NAME(1(4)),NAME2(1),DLWG(I),DLHS(I),DLVS(I),DLFS(I),DLAER(I),
      4   DLTS(I),DLRAM(I),DLCLS(I),DLRCSF(I),AL(I),PUNK,
      5   NAME(1(6)),NAME2(1),DVG(I),DHS(I),DVS(I),DVS(I),DMAER(I),
      6   DNTS(I),DNRAM(I),DNCLS(I),DNRCSF(I),AN(I),PUNK
      310   CONTINUE
840   2000   FORMAT(1H1. ,34HLONGITUDINAL STABILITY DERIVATIVES//)
      2001   FORMAT(2X, , ,XIVATIVE,5X,4HWING,4X,9MAG),STAB.,1X,10HVERT,STAB.,
      1   3X,8HFUSELAGE,3X,83TOT,AERD,4X,5MTHRUST,5X,3MSAM,6X,8MCRUIOLIS
      2   ,5X,34RCS,7X,5MTOTAL//)
845   2002   FORMAT(1X,245,2X,10(1E10.4,1X),A1,/)
      2003   FORMAT(1H1,/,40X,41HLATERAL-DIRECTIONAL STABILITY DERIVATIVES//)
      RETURN
      END

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1      SUBROUTINE DTLU(X,Y,FX,Y,L,M,XARG,YARG,U,KX,KY)
2      DOUBLE TABLE LOCK-UP LAGRANGE INTERPOLATION U=F(X,Y)
3      C X APPIES MOST RAPIDLY IN TABULATING FXY-ARRAY
4      DIMENSION X(1),Y(1),FX(1),A(4),B(4)
5      DATA LOCK,LOCY,OXARG,OYARG,KXO,KYO/8,0,0,0,0,0,0,0 /
6      C CHECK FOR NECESSITY OF SEARCHING TABLES AND COMPUTING WEIGHTS
7      KX= IABS(KX)
8      KY= IABS(KY)
9      IF( LOCF(X).EQ.LOCK .AND. XARG.EQ.OXARG .AND. KX.EQ.KXO) GO TO 1
10     KXO=KX
11     LOCY= LOCF( )
12     OXARG= XARG
13     (ALL INTRP(X,L,XARG,I,A,IABS(KX)))
14     IF( LOCF(I).EQ.LOCY .AND. YARG.EQ.OYARG .AND. KY.EQ.KYO ) GO TO 2
15     KYO=KY
16     LOCY= LOCF(Y)
17     OYARG= YARG
18     CALL INTRP(Y,M,YARG,J,B,IABS(KY))
19     CONTINUE
20     K=(J-4)*L+1
21     U=0.
22     DO 100 INDX=1,4
23     K=K+L
24     U=U+9*(INDX)* (A(1)*FX(K-2)+A(2)*FX(K-1)+A(3)*FX(K)+
25     1 A(4)*FX(K+1))
26     RETURN
27     END
28

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ORIGINAL PAGE IS OF POOR QUALITY

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1 SUBROUTINE ERROR(E)
C
C CALCULATES ERRORS FOR TRIM ROUTINE
C
5 COMMON/INDRIV/NDRIV
COMMON/INTRIM/ITRIM
COMMON NEQS
C
10 C***** SEGMENT 1 *****
C TIME, PRINT, AND PLOT CONTROL PARAMETERS, INPUT
C
C COMMON T,TD,DT,TMAX,OTPPNT,DIPLDT,TI
C
15 C***** SEGMENT 2 *****
C VARIABLES TO BE INTEGRATED IN TIME
C
C COMMON UDOT,VDDOT,WDDOT,QDDOT,RODT,D11D,D12D,D13D,D21D,D22D,
1 D23D,D31D,D32D,D33D,XEDOT,YEDOT,ZEDOT,LELEVD,RELEVD,ORD,
2 TARD(2),PSITD(2),THFD(2),DRCS(10),FRCSA(10),DFLAPHD,DFLAPD,
3 TFRAC(2)
C
C CONTROL SYSTEM VARIABLES TO BE INTEGRATED
C
25 C COMMON PCTRMD,PINTD,PETRMD,RCRMD,RINTD,RETRMD,VTRMD,QCTRMD,QINTD,
1 QETRMD,PTRYD,ZETRMD
C
C EULER ANGLE RATES TO BE INTEGRATED
C
30 C COMMON THETD,PHID,PSID
C
C STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED
C
C COMMON LNGSTK,ROLLC,YAWC
35 C***** SEGMENT 3 *****
C INTEGRATED VARIABLES
C
C COMMON U,V,W,P,Q,R,D11,D12,D13,D21,D22,
40 D23,D31,D32,D33,XE,YE,ZE,LELEVN,RELEVN,DR,
1 TARD(2),PSITD(2),THFD(2),DRCS(10),FRCSA(10),DFLAPH,DFLAPH,
2 TFRAC(2)
C
C INTEGRATED CONTROL SYSTEM VARIABLES
C
45 C COMMON PCTRM,PINT,PETRM,RCRTRM,RINT,RETRM,VTRM,QCTR,
1 QETRM,PTPM,ZETRM
C
C EULER ANGLES
C
50 C COMMON THETA,PHI,PSI
C
C INTEGRATED STICK AND PEDAL FILTER VARIABLES
C
55 C COMMON LNGSTK,ROLLC,YAWC
C***** SEGMENT 4 *****

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- 2 ERROR
- 3 ERROR
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- 5 ERROR
- 6 NAMES
- 7 NAMES
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C BASIC AIRCRAFT MASS, INERTIA, AND GEOMETRY CONSTANTS
C
60 COMMON WT, IX, IY, IZ, IXX, FSCG, BLCG, WLCG, CC
C COMPUTED AIRCRAFT CONSTANTS
C
C COMMON EAC, FAC, GAC, JX, JY, JZ, MASS, OMXJZJ
65 C
C ***** SEGMENT 5 *****
C ERRORS AND TOLERANCE FOR TRIM SOLUTION
C
C COMMON TOL(19)
70 C ***** SEGMENT 6 *****
C AERO LIFT AND DRAG CONSTANTS AND TABLES, INPJT
C
C COMMON AERO, AERO(23, 3), SURFCPI(3, 3)
75 C
C EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH
C SURFACE IN THE FOLLOWING ORDER: AR, EXPOSED AR, AREA, EXPOSED AREA,
C LAMBDA1/4, LAMBDA1/2, TAPER RATIO, CLMAX, ALFAB, AD, CD0, D7/4, CL0/DF, CLMAX/DF,
C CD0/DF. SURFACE 1 IS WING, 2 IS HOR. STAB, 3 IS VERT. STAB.
C
C COMPUTED AERO LIFT AND DRAG CONSTANTS
80 C
C COMMON GNAO(3), AEROK(5), EOS(3), CLA(3)
C ***** SEGMENT 7 *****
65 C WING AERO CONSTANTS, INPJT
C
C COMMON FSM, BLW1, BLW2, WL4, CM, BM, EKDA1, EKDA2, EIM, CLB0M, CLBCLM, CLRCLM
90 1 , CLPM, CNB0M, CNBCL2M, CNRCL2M, CNRCDH, CNPCLM, CNPCJAM, CM0M, CMDFM
2 , AEKEL, DY9CL2M
C COMPUTED WING AERO CONSTANTS
C
C COMMON XWING1, XWING2, YWING1, YWING2, ZWING1, ZWING2
95 C ***** SEGMENT 8 *****
C HORIZONTAL STABILIZER AERO CONSTANTS
C
C COMMON FSH, BLH, BLH, WLH, CM, BH, EKADE, EIM, EOCL4, CMDFM, CM0H
100 1 , DKHT0
C COMPUTED HORIZONTAL STABILIZER CONSTANTS
C
C COMMON XM, YH, ZH, XWEL, Z4EL, AWEL, DWEL
105 C ***** SEGMENT 9 *****
C VERTICAL STABILIZER AERO CONSTANTS
C
C COMMON FSV, BLV, WLV, CV, BV, EKADR, EIV, EKV, CM0V
110 2 , AEKRJD, TALFA(10), AALFA, TVTEFF(10)
C COMPUTED VERTICAL STABILIZER CONSTANTS
C
C COMMON XV, YV, ZV

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BT 35

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115 C ..... SEGMENT 10 ..... NAMES 111
C FUSELAGE AERO CONSTANTS NAMES 112
C NAMES 113
COMMON FSF,BLF,ALF,AQQ0,SQMX,NFOQM,MOQM1,MOQM2,MOQM1,MOQM2,
1 AOF,A1F,A2F,EN1,EN2,EN3,EN4,EN5,EN6,EN7 NAMES 114
2 ,DFSFO,ADFSF1,ADFSF2,XKYF NAMES 115
C NAMES 116
C NAMES 117
C NAMES 118
C NAMES 119
C NAMES 120
C NAMES 121
C ..... SEGMENT 11 ..... NAMES 122
C DIRECT IMPJST FORCE AND MOMENT CONSTANTS NAMES 123
C NAMES 124
COMMON FSSW(2),WLSM(2),SIGY,ELN,KAF1,KAF2,AENG NAMES 125
C NAMES 126
C NAMES 127
C NAMES 128
C NAMES 129
C ..... SEGMENT 12 ..... NAMES 130
C RAM FORCE AND MOMENT CONSTANTS NAMES 131
C NAMES 132
C NAMES 133
COMMON FSYN(2),BLIN(2),ALIN(2),RINLET,AVO/I,AATJRN NAMES 134
C NAMES 135
C NAMES 136
C NAMES 137
C NAMES 138
C ..... SEGMENT 13 ..... NAMES 139
C CORIOLIS FORCE AND MOMENT CONSTANTS NAMES 140
C NAMES 141
C NAMES 142
C NAMES 143
C NAMES 144
C ..... SEGMENT 14 ..... NAMES 145
C PROPELLSION SYSTEM CONSTANTS NAMES 146
C NAMES 147
COMMON AMACH,KBT1,KBT2,K*1,K*2,OMEGMX,R*HMX,RCS,AFRAT
1 ,JENG,AFKAC,TAUAB,ACCEL,ABDECEL,TABON NAMES 148
2 ,TABOFF NAMES 149
C NAMES 150
C NAMES 151
C NAMES 152
C NAMES 153
C NAMES 154
C NAMES 155
C ..... SEGMENT 15 ..... NAMES 156
C RCS FORCE AND MOMENT CONSTANTS NAMES 157
C NAMES 158
COMMON APCJET,ABLOR,BLJREF,FRCSMX(10),JEMAND(10),BLOWR(10),
1 RCSL(10,5),FRCS(10),BLRCS(10),HLRCS(10),THRCS(10),PSIRCS(10)
C NAMES 159
C NAMES 160
C NAMES 161
C NAMES 162
C NAMES 163
C ..... SEGMENT 16 ..... NAMES 164
C COMPUTED R25 CONSTANTS NAMES 165
COMMON FRCSMXP,FRCSMX0,FRCSMX1,CTHRCS(10),STHRCS(10),CPSIRCS(10)
1 ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)
C NAMES 166
C NAMES 167

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	C	CONTROL SYSTEM CONSTANTS	NAMES	168
	C		NAMES	169
	C		NAMES	170
175	C	PSEUDO-PILOT CONTROL SYSTEM CONSTANTS	NAMES	171
	C	COMMON DUM,AKZED,AKZEE1,AKZEE2,AKYEE,AKYEE1, 1 AKJ,AKV,AKW,AKXES,AKYES,AKZES	NAMES	172
	C		NAMES	173
	C		NAMES	174
	C		NAMES	175
180	C	CONTROL SYSTEM FUNCTION SWITCH CONSTANTS	NAMES	176
	C	COMMON CSV,VASH,CSI,THETSM	NAMES	177
	C		NAMES	178
	C		NAMES	179
	C		NAMES	180
185	C	ROLL CONTROL SYSTEM CONSTANTS	NAMES	181
	C	COMMON TAKP2(8),TTMETA(8),TAKPE(8),TKPCI1(8),ATETA,TKPEII(8), 1 TKP(8),PELIM,AKDYOR,KTHTR,KOA	NAMES	182
	C		NAMES	183
	C		NAMES	184
	C		NAMES	185
190	C	YAW CONTROL SYSTEM CONSTANTS	NAMES	186
	C	COMMON TAKRC(8),TAKRE(8),TKRCII(8),TKREII(8),TKRC(8),RELIM, 1 AKYTRH,KPSIT,KOR,TAKAY(8),KTY	NAMES	187
	C		NAMES	188
	C		NAMES	189
	C		NAMES	190
195	C	PITCH CONTROL SYSTEM CONSTANTS	NAMES	191
	C	COMMON TAKQC(8),TAKQE(8),TKQCII(8),TKQEII(8),TKQC(8),QELIM, 1 AKPTRM,DSTK,KOE,KTHTP	NAMES	192
	C		NAMES	193
	C		NAMES	194
	C		NAMES	195
200	C	HEAVE CONTROL SYSTEM CONSTANTS	NAMES	196
	C	COMMON TAKZE(8),TKZEII(8),AKTHROT,ZELIM	NAMES	197
	C		NAMES	198
	C		NAMES	199
	C		NAMES	200
205	C	CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS	NAMES	201
	C	COMMON ELEVRNF,PSITRF(2)	NAMES	202
	C		NAMES	203
	C		NAMES	204
210	C	FLAP CONTROL SYSTEM CONSTANTS	NAMES	205
	C	COMMON KHFLAP1,KHFLAP2,KHFLAP1,KHFLAP2	NAMES	206
	C		NAMES	207
	C		NAMES	208
	C		NAMES	209
215	C	STICK AND PEDAL FILTER TIME CONSTANT TABLES	NAMES	210
	C	COMMON TPTITCH(8),TTROLL(8),TTYAK(8)	NAMES	211
	C		NAMES	212
	C		NAMES	213
	C		NAMES	214
220	C	ACTUATION CONSTANTS	NAMES	215
	C	COMMON LEJRATL,LELRATL,LEUPOSL,LELPOSL,LEL, 1 REURATL,REL RATL,REUPOSL,RELPOSL,TREL, 2 DRJRATL,DRLRATL,DRUPOSL,DRLPOSL,TR, 3 HFJRATL,HFLRATL,HFLAPMX,HFLAPMN,TF, 4 HFJRATL,HFLRATL,HFLAPMX,HFLAPMN,TF, 5 THTUPL(2),THTLR(2),THTUPL(2),THTLPL(2),TTHT(2), 6 PSILPL(2),PSILPL(2),PSILPL(2),PSIT(2),	NAMES	216
	C		NAMES	217
	C		NAMES	218
	C		NAMES	219
	C		NAMES	220
225	C		NAMES	221
	C		NAMES	222
	C		NAMES	223
	C		NAMES	224

B-37

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230      7      RCSURL(10),RCSURL(10),RCSURL(10),RCSURL(10),TAURCS(10)
          8      ,FRCSURL(10),FRCSURL(10),FRCSURL(10),FRCSURL(10),TAURFRCS(10)
          9      ,DELTA,DALIM,DRDIM
C
C ..... SEGMENT 18 .....
C LIFT-DPAG VARIABLES
C
C COMMON LAMB1,CLAE,EXAB,C1,C2,EJ
C ..... SEGMENT 19 .....
C WING AERO VARIABLES
C
C COMMON DXM,DYM,DZM,OLM,DMH,DMH,CLM,ALFM,CDM,UM,WM,VXZ1,VXZ2,VXZ,
1      JADAI,JADA2,ALF1,ALF2,CLM1,CLM2,CDM1,CDM2,BETA,QMS,QMSB,
2      BOV,LWP,NMP,YMP,ALF1,SALF1,CALF1,ALF2,SALF2,CALF2,XM1,XM2,
3      ZM1,ZM2,ALF,SALF,CALF,MM,LW,NM,JA1,JA2,EKELEL,EKELER,CHM1,
4      CHM2,DXWING1,DXWING2
C
C ..... SEGMENT 20 .....
C HORIZONTAL STABILIZER AERO VARIABLES
C
C COMMON OX1,DYH,DZM,OLM,DMH,DMH,UM,WM,ALF5,EPS,OLFM,CL1,CL2,CD1,
1      CD2,DADE,ALFH,CLM,CDH,ANG,JS,IS,XI,ZH,QQQB,ALFH1,SALFH1,CALFH1
2      ,DAH,DE,QEFF,DAWG,CMH,OXHT
C
C ..... SEGMENT 21 .....
C VERTICAL STABILIZER AERO VARIABLES
C
C COMMON OXV,DYV,DZV,OLV,DMV,DMV,UV,VV,DAQR,ALFV,CLV,COV,ALFV1,
1      CALFV1,SALFV1,QOV,JRP,EKRUD,CMV,OXVT,VTEFF
C
C ..... SEGMENT 22 .....
C FUSELAGE AERO VARIABLES
C
C COMMON OXF,DYF,DZF,DLF,DMF,DMF,ALFF,ALFF,ALFF,ALFF,2XY,QQ,QQZ,AQ,AS,
1      SAF,SQR,AF,NFOQ,MO2,MOQ1,S,NF,PITCHF,ALFYFO,NOQ,NOQ1,YAMF
2      ,DFSF
C
C ..... SEGMENT 23 .....
C DIRECT THRUST FORCE AND MOMENT VARIABLES
C
C COMMON OXT,OYT,OZT,DLT,DMT,DMT,AFT(2),FCOR(2),OK(2),DY(2),DZ(2),
1      DFSSH(2),DBLSH(2),DNLSH(2),SPSIT(2),SPSIT(2),STHT(2),CTHT(2)
2      ,KAFT
C
C ..... SEGMENT 24 .....
C RAM FORCE AND MOMENT VARIABLES
C
C COMMON DAK,DYR,DZR,DLR,DMR,DYR,VO,ATURN0,STURN,SBTURN,SBTURN,VIN,
1      JOVI(2),ATURN(2),ELRAM(2),JATURN(2),ETAR(2),FRAM(2),ELR,
2      WLRAM,FSRAM,SATURN,CATURN,DXR0(2),DYR0(2),DZR0(2),DXRI(2),
3      DYRI(2),DZRI(2),UI,VI,WI
C
C ..... SEGMENT 25 .....
C COPIOLIS FORCE AND MOMENT VARIABLES
C
C COMMON DXCOP,DYCOP,DZCOP,OLCOR,DMCOR,DMCOR,ELCOR,EACOR,JLCOR,
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1 DMCOPD,DNCORD
C
C ***** SEGMENT 26 *****
C PROPULSION SYSTEM VARIABLES
290
C COMMON MDOT(2),PPH(2),TRST(2),BLDAVL,CGMAX,FGHIN,FGIDL,MDTMX,
1 TRCSR,F,TREQ(2),FRATIO,FRPM,KDT,KBT,FRCS,T(2)
2 ,HE(2),TFRACC(2),TFRACIN,FRACL,TENG,TRACE,TABIN,BLOTS,TABE
3 ,TO(2)
295
C ***** SEGMENT 27 *****
C RCS FORCE AND MOMENT VARIABLES
C
C ***** SEGMENT 28 *****
300
C COMMON DXPCS,DYRCS,DZPCS,DLRCS,DMRCS,DNRCS,DFRCSDB,DFRCSDFRCS(10)
1 ,BLDPEQ,FRCSAL,FRCSLU,FRCS(10),DXRC(10),DYRC(10),DZRC(10),
2 ,DRCS(10),BLU,FRCSB
C ***** SEGMENT 29 *****
C CONTROL SYSTEM VARIABLES
C
C ***** SEGMENT 30 *****
305
C PSEUDO-PILOT CONTROL SYSTEM VARIABLES
C
C ***** SEGMENT 31 *****
310
C COMMON ZEE,ZEIC,YEE,YEIC,DXE,DYE,DZE,XES,YES,ZES
C CONTROL SYSTEM FUNCTION SWITCH VARIABLES
C
C ***** SEGMENT 32 *****
315
C COMMON CSSM
C
C ***** SEGMENT 33 *****
320
C COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL
C YAW CONTROL SYSTEM VARIABLES
C
C ***** SEGMENT 34 *****
325
C COMMON YAWCMD,OPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYAM,AKAY
C PITCH CONTROL SYSTEM VARIABLES
C
C ***** SEGMENT 35 *****
330
C COMMON DLVSTK,AKQC,AKQCI,PTRMBUT,QE,AKQE,AKQEI,DPTCH
C HEAVE CONTROL SYSTEM VARIABLES
C
C ***** SEGMENT 36 *****
335
C COMMON ZEDTC,ZEDTE,AKZE,AKZEI,DTHROT
C ACTUATION SYSTEM INPUT VARIABLES
C
C ***** SEGMENT 37 *****
340
C COMMON DSIOFF,DNORMF,PSITC(2),THTC(2),DEC,DRC,DAC,DRCSR,DRCSF,
1 DRCSY,DRCSSF,DRCSNF,TCMD,MFLAPC,MFLAP,LELEVNC,RELEVNC
C ADDITIONAL CONTROL SYSTEM VARIABLES
C
C ***** SEGMENT 38 *****
345
C COMMON AKPCI,AKPEI,AKP,AKRCI,AKREI,AKR,AKQCI,AKQEI,AKQ,
1 AKZEI,DSVSM,PTCH,TROLL,TYAM
C ***** SEGMENT 39 *****
350
C AIR DATA VARIABLES

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NAMES 282
NAMES 283
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C
COMMON UAS,VAS,WAS,PHO,TAMB,V SOUND,TRATIO,PRATIO,VA,K,MN,QBAR,
  1 ALPHA,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA
  345
C
C TOTAL AERO FORCE AND MOMENT VARIABLES
C
COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO
  350
C
C TOTAL FORCE AND MOMENT VARIABLES
C
COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMH,SUMN
  355
C
C CORRECTED DIRECTIONAL COSINES
C
COMMON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG
  360
C
C MISCELLANEOUS VARIABLES
C
COMMON UAIR,VAIR,WAIR,ALT,RS,PS,BLOT1(3)
  1   ,GYROL,GYROM,GYRON,NXCG,NYCG,NZCG
  2   ,XUM,YUM,ZUM,BLOT2(3),LPRIME,NPRIME
  3   ,VE,VEET,VEEST
  365
C
C ***** SEGMENT 30 *****
C
C TABLES FOR GAM FORCES AND MOMENTS
  370
C
C ***** SEGMENT 31 *****
C
C TABLES FOR RCS FORCES AND MOMENTS
  375
C
C COMMON FPCST(6),BLDRT(6)
C ***** SEGMENT 32 *****
C
C THRUST TABLES
  380
C
COMMON WNT(4),TFGMX(4),TFGMIN(4),TFGIDL(4),TMDT(4),TFRAT(6),
  1 TRM(6),TFRAC(10),TACCEL(10),TDECEL(10),TTENG(10)
  385
C
C ***** SEGMENTS 33 THRU 38 *****
C
C STABILITY DERIVATIVES
C
C
C
C
C
C
COMMON DX4G(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),
  1 OXRAM(25),DXCLS(25),DXRCSF(25),X(25)
C
C
C
C
COMMON DY4G(25),DYHS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),
  1 OYRAM(25),DYCLS(25),DYRCSF(25),Y(25)
C
C
C
C
COMMON DZ4G(25),DZHS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),
  1 OZRAM(25),DZCLS(25),DZRCSF(25),Z(25)
C
C
C
C
COMMON DL4G(25),DLHS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),
  1 OLRAM(25),DLCLS(25),DLRCSF(25),AL(25)
C
C
C
C
COMMON DM4G(25),DMHS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25)
  395
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1 DMCOPD,DNCORD
C
C ***** SEGMENT 26 *****
C POPULATION SYSTEM VARIABLES
C
290 COMMON MDDT(2),PPM(2),TRST(2),BLDVL,FGMAX,FGMIN,FGIDL,MDTHX,
1 TRCSPEF,TRCAJ,TRCA(2),FRATIO,FRPM,KBT,KBT,TRCS,TC(2)
2 ,HE(2),TRACC(2),TRACIN,FRACL,TENG,TRFACE,TABIN,BLDT3,TABE
3 ,TO(2)
C
295 ***** SEGMENT 27 *****
C RCS FORCE AND MOMENT VARIABLES
C
C
C COMMON DXPCS,DYPCS,DZPCS,DLRCS,DMRCS,DNRCS,DFRCSOB,DFRCS(10)
1 ,BLDPEQ,FRCSAL,FRCSLU,FRCS(10),DXRC(10),DYRC(10),DZRC(10),
2 DRCS(10),BLU,FRCSDB
C
C ***** SEGMENT 28 *****
C CONTROL SYSTEM VARIABLES
C
300
C
C PSEUDO-PILOT CONTROL SYSTEM VARIABLES
C
305
C
C COMMON ZEE,ZEIC,YEE,ZLJ,DXE,UBE,DZE,XES,YES,ZES
C
310
C CONTROL SYSTEM FUNCTION SWITCH VARIABLES
C
C
C COMMON CSSM
C
C ROLL CONTROL SYSTEM VARIABLES
C
315
C
C COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL
C
C YAW CONTROL SYSTEM VARIABLES
C
320
C
C COMMON YAWCMD,DPED,AKRC,AKRCI,YTRBUT,RE,AKRE,AKREI,DYB4,AKAY
C
C PITCH CONTROL SYSTEM VARIABLES
C
325
C
C COMMON DLGSTK,AKQC,AKQCI,PTRBUT,QE,AKQE,AKQEI,JPITCH
C
C
C HEAVE CONTROL SYSTEM VARIABLES
C
C
C COMMON ZEDTC,ZEDTE,AKZE,AKZEI,OTHROT
C
C ACTUATION SYSTEM INPUT VARIABLES
C
330
C
C COMMON OSIOFF,DMORMF,PSITC(2),THTC(2),DEU,DRC,DAC,DICSR,DRCS,
1 DRCSY,DRCSSF,DRCSNF,TCMD,HFLAPC,HFLAPC,LELEVNC,RELEVNC
C
C ADDITIONAL CONTROL SYSTEM VARIABLES
C
335
C
C COMMON AKPCI,AKPEI,AKP,AKRCI,AKREI,AKR,AKQCI,AKQEI,AKQ,
1 AKZEI,DSVSH,JPITCH,TROLL,TYAM
C
C ***** SEGMENT 29 *****
C AIR DATA VARIABLES
C
340

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Line	Code	Text	Line	Code	Text
345	C	COMMON UAS,VAS,WAS,RHO,TAMB,V SOUND,TRATIO,PRATIO,VA,VK,MN,QBAR, 1 ALPHA,BETA,ALFAJ,SALPH,CALPH,SBETA,CBETA	339	NAMES	
	C	TOTAL AERO FORCE AND MOMENT VARIABLES	340	NAMES	
350	C	COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO	341	NAMES	
	C	TOTAL FORCE AND MOMENT VARIABLES	342	NAMES	
	C	COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN	343	NAMES	
355	C	CORRECTED DIRECTIONAL COSINES	344	NAMES	
	C	COMMON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG	345	NAMES	
360	C	MISCELLANEOUS VARIABLES	346	NAMES	
	C	COMMON UAIR,VAIR,HAIR,ALT,RS,PS,BLOT1(3) 1 GYROL,GYRON,NXCG,NYCG,NZCG 2 XDM,YDM,ZDM,BLOTZ(3),LPRIME,NPRIME 3 VE,VECT,VEEST	347	NAMES	
365	C	***** SEGMENT 30 *****	348	NAMES	
	C	TABLES FOR RAM FORCES AND MOMENTS	349	NAMES	
370	C	***** SEGMENT 31 *****	350	NAMES	
	C	COMMON JOVIT(5),ATURN(8),ELRANT(5,8),DATURN(5,8),ETART(5,8)	351	NAMES	
	C	TABLES FOR RCS FORCE: AND MOMENTS	352	NAMES	
375	C	***** SEGMENT 32 *****	353	NAMES	
	C	COMMON FRCST(6),BLDRT(6)	354	NAMES	
	C	THRUST TABLES	355	NAMES	
380	C	***** SEGMENT 33 THRU 38 *****	356	NAMES	
	C	COMMON MNT(4),TFGMAX(4),TFGIN(4),TFGIDL(4),TMDT(4),TFRAT(6), 1 TRM(6),TFRCT(10),TACCEL(10),TDECEL(10),TTENG(10)	357	NAMES	
	C	STABILITY DERIVATIVES	358	NAMES	
385	C	***** SEGMENT 33 *****	359	NAMES	
	C	COMMON DX4G(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25), 1 DX2AH(25),DXCLS(25),DXRCS(25),X(25)	360	NAMES	
	C	SEGMENT 34	361	NAMES	
390	C	***** SEGMENT 34 *****	362	NAMES	
	C	COMMON DY4G(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25), 1 DYRAM(25),DYCLS(25),DYRCSF(25),Y(25)	363	NAMES	
	C	SEGMENT 35	364	NAMES	
395	C	***** SEGMENT 35 *****	365	NAMES	
	C	COMMON DZ4G(25),DZVS(25),DZFS(25),DZAE(25),DZTS(25), 1 DZRAM(25),DZCLS(25),DZRCSF(25),Z(25)	366	NAMES	
	C	SEGMENT 36	367	NAMES	
	C	COMMON DL4C(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25), 1 DLRAM(25),DLCLS(25),DLRCSF(25),AL(25)	368	NAMES	
	C	SEGMENT 37	369	NAMES	
	C	COMMON DM4G(25),DMHS(25),DMVS(25),DMAER(25),DMTS(25),	370	NAMES	

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400 1 1 DNRAM(25),DNCLS(25),DNRCSE(25),AN(25)
      C SECFAT 3R
      COMMON DNAG(25),DNMS(25),DNYS(25),DNFS(24),DNMR(25),DNFS(25),
      1 DNRAH(25),DNCLS(25),DNRCSE(25),AN(25)
401  C
402  C ..... SEGMENT 39 .....
      C DERIVATIVE CONTROL
403  C
404  C ..... SEGMENT 40 .....
      C COMMON ADER,DELV(25)
405  C
406  C ..... SEGMENT 41 .....
      C SECPATCH COMMON
      COMMON ORK(50)
407  C
408  C ..... SEGMENT 42 .....
      C MISCELLANEOUS CONSTANTS
409  C
410  C ..... SEGMENT 43 .....
      C COMMON AHIND,VMIND,PSIMIND,XE2D,YE2D,ZE2D
      1 ,TRNTJRN,GAMMA,VAODT,TURNRAD
411  C
412  C ..... SEGMENT 44 .....
      C AERO SURFACE EFFECTIVENESS TABLES
413  C
414  C ..... SEGMENT 45 .....
      C COMMON ELEWT(7),EKELET(7),RUD(7),EKRUOT(7)
415  C
416  C ..... SEGMENT 46 .....
      C PILOT INPUT CONTROL DATA
417  C
418  C ..... SEGMENT 47 .....
      C COMMON ACHD(5),ATIME,ASKEEP,AYEHLD,CHOT1(20),CHOT2(20),
      1 CHOT3(20),CMOT1(20),CMOT2(20),TIMET(20),ATRANS,AVAT,ITRANS,
      2 THROT(10),VAT(10),THEYCT(10)
419  C
420  C ..... SEGMENT 48 .....
      C TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LAWS
421  C
422  C ..... SEGMENT 49 .....
      C COMMON ACSNH,TCSSM(15),TAKQS(5),TKPINT(5),TKPHI(5),TKPB(5),
      1 TKPSI(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKPSI(5),TKRBI(5),
      2 TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKQCI(5),TAKQEI(5),
      3 TKRS(5),AKPHIRS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,AKRINT,
      4 AKPSI,AKRB,AKRS,AKLS
423  C
424  C ..... SEGMENT 50 .....
      C TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS WHICH
      VARY AS FUNCTIONS OF AIRSPEED
425  C
426  C ..... SEGMENT 51 .....
      C COMMON VFLGATN,AVEL,TVEL(8),VAKPC(8),VKPCI(8),VKPEI(8),VKP(8),
      1 VAKPE(8),VAKPC(8),VKRCI(8),VKREI(8),VKRI(8),VAKRE(8),VAKQC(8),
      2 VKQCI(8),VKQEI(8),VKQ(8),VAKQE(8),VAKZE(8),VKZEI(8)
      3 ,VTPIICH(8),VTROLL(8),VTY 3)
      REAL LAMBI
427  C
428  C ..... SEGMENT 52 .....
      REAL LNGSTK,LNGSTKD
429  C
430  C ..... SEGMENT 53 .....
      REAL IX,IV,I2,IX2,JX,JZ,MASS
431  C
432  C ..... SEGMENT 54 .....
      REAL NFOQ,MOGMX1,MOGMX2,NORMX1,NORMX2
433  C
434  C ..... SEGMENT 55 .....
      REAL KBT1,KGT2,KY1,KY2,CBT
435  C
436  C ..... SEGMENT 56 .....
      REAL KPSIT,KHTP,KHTR,KJE,KDR,KDA,KTY
437  C
438  C ..... SEGMENT 57 .....
      REAL LMP,VWP,HM,H,M,W

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REAL MFOR,MOD,MOQI,NOQ,NOQ1
REAL K4FLAP1,KHFLAP2,KWFLAP3,KAFLLP2
REAL MOOT,MOTMX,KMOT,K9TP
REAL KAFT1,K T2,KAPT
REAL LAERD,MLPO,HAERO
REAL LELPOS1,LELRAT,LEUPOS1,LEURATL,LPRIE,MPRIE
REAL LELEVD,LELEVN,LELEVNC,MNT,NF,MN
REAL JENG
REAL NYCC,NYCG,NZCG
C
DIMENSION E(19)
C
C C = 32.174
C C = GC
C MASS = 41/56
C DIRECTION COSINES
SENT=SIN(THETA)
COST=COS(THETA)
SPHI=SIN(PHI)
CPHI=COS(PHI)
SPSI=SIN(PSI)
CPSI=COS(PSI)
U11=COST*SPSI
U12=SPHI*SINT*CPSI-CPHI*SPSI
U13=CPHI*SINT*CPSI+SPHI*SPSI
U21=COST*SPSI
U22=CPHI*CPSI+SPHI*SINT*SPSI
U23=CPHI*SINT*SPSI-SPHI*CPSI
U31=-SINT
U32=SPHI*COST
U33=CPHI*COST
C BODY AXIS COMPONENTS OF WIND VELOCITY
XW=V*WIND*COS(PSI*IND)
YD=V*WIND*SIN(PSI*IND)
ZD=0.0
UAI9=U11*XD+U21*YD+U31*ZD
VAI9=U12*XD+U22*YD+U32*ZD
WAI9=U13*XD+U23*YD+U33*ZD
C OPTION TO TPLM IN WIND
IWINO=FIX(CAMIND)
IF(IWINO.EQ.0)GO TO 10
TRIM IN WIND
IF(1.570779.LE.ABS(PSI*IND).AND.ABS(PSI*IND).LE.1.570813)90,60
50 PHI=-1.570796
C TO 70
PHI=ATAN2(TAN(PSI*IND),SINT)
I(PSI*IND).LE.1.570796)PHI=PHI-3.141593
70 CONTINUE
C AIRSPEED COMPONENTS
UAS=J-UAI9
VAS=-VAT9
WAS=W-WAI9
C AIRSPEED,ALPHA,AND BETA
VAS19=(JAS+UAS+VAS+VAS+WAS+HAS)

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453 NAMES
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OF POOR QUALITY

SUBROUTINE ERROR 74/74 OPT=1

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515      ALPHA=BATAN2(MAS,UAS)
        IF(VA.LE.0.130.50
          30      BETA=0.
              GO TO 20
          40      CONTINUE
              BETA=ASIN(V.S/VA)
              GO TO 20
          10      CONTINUE
              TRIN WITH NO WIND
              AIRSPEED
          C      UAS = VA*COS(ALPHA)*COS(BETA)
          C      VAS = VA*SIN(BETA)
          C      MAS = VA*SIN(ALPHA)*COS(BETA)
          C
          C      OPTION TO TRY IN A TURN. REQUIRES SPECIFICATION OF VA,VADOT,
          C      ATURN,TURNRAD,AND GAMMA. ATURN,NE=0. INVOKES THE OPTION.
          C      ALSO SPECIFY PSI=0.
          C
          C      IF(TURN.EQ.0.1 GO TO 100
          C      SIN=SIN(GAMMA)
          C      COS=COS(GAMMA)
          C      ZDOT=-VA*SIN
          C      KE2D=VADOT*COS
          C      YE2)=(VA*LOS6)**2/TUPRAD
          C      ZE2D=-VADOT*SIN
          C      PSIN=(VA*CO5G)/TURNRAD
          C      100 CONTINUE
          C      INERTIAL (GROUND) SPEED
          C      U=UAS*UAIR
          C      V=VAS*VAIR
          C      W=MAS*MAIR
          C      20 CONTINUE
          C      UDOT=GG*(+NXCG+DJ1)+R*V-Q*W
          C      VDOT=GG*(+NYCG+DJ2)+P*W-R*U.
          C      WDOT=GG*(+O33-NZCG)+Q*U-P*V
          C      CONTROL SYSTE"
          C      CALL SYSEQS
          C      FORCES AND MOMENTS (THRUST AND AERO)
          C      CALL FORCES(B.)
          C      EROR EQUATIONS
          C      E(1)= MASS*(-UDOT+R*V-Q*W+O31*GG)+SJMFX
          C      E(2)= MASS*(-VDOT+P*W-Q*U+O32*GG)+SJMFY
          C      E(3)= MASS*(-WDOT+Q*U-P*V+O33*GG)+SUMFZ
          C      E(4)= -IX*PDOT+(IY-IZ)*Q+IXZ*(RDOT+P*Q)+SUML-GFROL
          C      E(5)= -IY*PDOT+(IZ-IX)*R+IY*(RDOT+P*Q)+SUMM-GYROM
          C      E(6)= -IZ*RDOT+(IY-IZ)*Q+IXZ*(RDOT+P*Q)+SUMN-GYROM
          C      E(7)=GG*(NZG-O33)+O13*(E2D+O23)+E2D+O33+E2Z
          C      E(8)= -XEDOT+O11*(U+O12*V+O13*W
          C      E(9)= -YEDOT+O21*(U+O22*V+O23*W
          C      E(10)= -ZEDOT+O31*(U+O32*V+O33*W
          C      E(11)=PHID-PSIU*SINT-P
          C      E(12)=T*MFID-CPHI+PSI*PCOST*SPHI-Q
          C      E(13)=T1-T2*SPHI+PSI*PCOST*CPHI-R
          C      E(14)=GG*(+NXCG-O31)+O11*(XE2D+O21)*YE2D+O31+E2D
          C      E(15)=GG*(+NYCG-O32)+O12*(XE2D+O22)*YE2D+O32+E2D
          C
          C      RETURN
516      ERROR
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519      ERROR
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525      ERROR
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SUBROUTINE ERROR 74774 OPT=1 FTN 6.6496 09/11/90 18.06.51 PAGE 11

END ERROR 113


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1  SUBROUTINE FORCES (FLAG)
COMMON/INDRIV/NDRIV
COMMON/INTRIM/ITRIM
COMMON NESS
C
5  C ***** SEGMENT 1 *****
C TIME,PRINT,AND PLOT CONTROL PARAMETERS,INPUT
C
10 C COMMON T,TO,DT,IMAX,UTPRNT,OTPLOT,ITI
C ***** SEGMENT 2 *****
C VARIABLES TO BE INTEGRATED IN TIME
C
15 C COMMON UDOT,VODT,WODT,POOT,QDOT,ROOT,D11J,D12D,D13D,D21D,D22D,
1 D23D,D31D,D32D,D33D,XEDOT,YEDOT,ZEDOT,LELEVNJ,RELEVND,DRJ,
2 TABJ(2),PSIJ(2),THTD(2),ORCSD(10),FRCS9(10),DFLAPHD,DFLAP4D,
3 TFRAC(2)
C
20 C CONTROL SYSTEM VARIABLES TO BE INTEGRATED
C
C COMMON PCIRMD,PINTD,PETRMD,PCTRMD,PIINTD,RETRMD,YTRMD,QCTRMD,QINTD,
1 QETRYD,PTRMD,ZEDTRMD
C
25 C EULER ANGL RATES TO BE INTEGRATED
C
C COMMON THETD,PHID,PSID
C
30 C STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED
C
C COMMON LNGSTKO,ROLLCO,YAMCO
C ***** SEGMENT 3 *****
C INTEGRATED VARIABLES
C
35 C COMMON U,V,W,P,Q,R,O11,O12,O13,O21,O22,
1 O23,O31,O32,O33,KE,YE,ZE,LELEFN,RELEVND,DR,
2 TAB(2),FSIT(2),THT(2),ORCS(10),FRCSA(10),DFLAPH,DFLAPM,
3 TFRAC(2)
C
40 C INTEGRATED CONTROL SYSTEM VARIABLES
C
C COMMON PCTRM,PINT,PETRY,PCTRM,RINT,RETRM,YTRM,QCTR,M,QINT,
1 QETRY,PTRM,ZEDTRM
C
45 C EULER ANGLES
C
C COMMON THETA,PHI,PSI
C
50 C INTEGRATED STICK AND PEDAL FILTER VARIABLES
C
C COMMON LNGSTK,ROLLC,YAMC
C ***** SEGMENT 4 *****
C BASIC AIRCRAFT MASS,INERTIA,AND GEOMETRY CONSTANTS
C
55 C COMMON MT,IX,IY,IZ,IXZ,IFSCG,BLOG,WLCC,GC
C

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C COMPUTED AIRCRAFT CONSTANTS
COMMON EA,FAC,GAC,JX,JY,JZ,MASS,OMJX,JZ
C ..... SEGMENT 5 .....
C ERRORS AND TOLERANCES FOR TRIM SOLUTION
C
COMMON TOL(19)
C ..... SEGMENT 6 .....
C AERO LIFT AND DRAG CONSTANTS AND TABLES,INPJT
C
COMMON AAERO,AERO(23,3),SURFCPI(3,3)
C
C EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH
C SURFACE IN THE FOLLOWING ORDER ARE EXPOSED AREA, EXPOSED AREA,
C LAMPDA1/4, LAMBDALE, TAPER RATIO, CLMAX, ALFAB, A0, C0N, D73, CL0/DF, CLMAX/JF,
C C00/DF. SURFACE 1 IS WING, 2 IS HOR. STAB, 3 IS VERT. STAB.
C
C COMPUTED AERO LIFT AND DRAG CONSTANTS
C
COMMON CNAAD(13),AEROK(13),EOS(3),CLA(3)
C ..... SEGMENT 7 .....
C WING AERO CONSTANTS,INPJT
C
COMMON FSW,RLW1,BLW2,MLW,CH,8M,EKDA1,EKDA2,EIM,CLB0M,CLBCL4,CLRCLM
1 ,CLP4,CNB0M,CNBCL2M,CNRCL2M,CNRCOM,CNPLM,CNPOAM,CM04,CHDFM
2 ,AEKEL,CYBCL2M
C
C COMPUTED WING AERO CONSTANTS
C
COMMON XWING1,XWING2,YWING1,YWING2,ZWING1,ZWING2
C ..... SEGMENT 8 .....
C HORIZONTAL STABILIZER AERO CONSTANTS
C
COMMON FSH,8LN,8LH,CH,3H,EKADE,EIH,EOCL4,CHDFH,CHOM
1 ,OAMT0
C
C COMPUTED HORIZONTAL STABILIZER CONSTANTS
C
COMMON XH,YH,ZH,XMEL,ZMEL,AMEL,DMEL
C ..... SEGMENT 9 .....
C VERTICAL STABILIZER AERO CONSTANTS
C
COMMON FSV,7LV,MLV,CV,3V,EKADR,EIV,EKV,CNDV
2 ,AEKRJD,TALFA(10),AALFA,TUTEFF(10)
C
C COMPUTED VERTICAL STABILIZER CONSTANTS
C
COMMON XV,YV,ZV
C ..... SEGMENT 10 .....
C FUSELAGE AERO CONSTANTS
C
COMMON FSF,BLF,HLF,AQQQ,SQMX,NFOQM,MOQK1,MOQM2,NOQM1,NOQM2,

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1 ADF,ALF,AZF,ENA,E12,FN3,EN4,EN5,EN6,EN7
2 DDFS0,ADFSF1,ADFSF2,AKYF
C COMPUTED FJSEFLAGE AERO CONSTANTS
C COMMON XF,YF,ZF
C ***** SEGMENT 11 *****
C DIRECT THRUST FORC AND MOMENT CONSTANTS
C COMMON FSSH(2),BLSH(2),ALSM(2),SIGY,ELN,KAFT1,KAFT2,AENG
C COMPUTED DIRECT THRUST CONSTANTS
C COMMON CSTGT,SSIGY,XT(2),YT(2),ZT(2)
C ***** SEGMENT 12 *****
C RAM FORCE AND MOMENT CONSTANTS
C COMMON FSN(2),BLIN(2),MLIN(2),RINLET,AVCVI,AATJRN
C COMPUTED RAM CONSTANTS
C COMMON XIN(2),IN(2),ZIN(2)
C ***** SEGMENT 13 *****
C CORIOLIS FORCE AND MOMENT CONSTANTS
C COMMON ELJUCT
C ***** SEGMENT 14 *****
C PROPUSSION SYSTEM CONSTANTS
C COMMON AMACH,KBT1,KBT2,KM1,KM2,OMEGYX,RPNHX,RCS,AFRAT
1 JENG,AFRAC,TAUAB,ABACCEL,ABDECEL,TABON
2 ,TA3OFF
C COMPUTED PROPUSSION SYSTEM CONSTANTS
C COMMON KBT
C ***** SEGMENT 15 *****
C RCS FORCE AND MOMENT CONSTANTS
C COMMON ARCSJET,ABLDR,BLJREF,FRCSMX(10),DEMAND(10),BLDMO2(10),
1 RCSL(10,5),FRCS(10),BLRCS(10),HLRCS(10),THRCS(10),PSIRCS(10)
C COMPUTED RCS CONSTANTS
C COMMON FRCSMXP,FRCSMX0,FRCSMX1,CTHRCS(10),STHRCS(10),CPSIRCS(10)
1 ,SPSIRCS(10),AJET(10),YJET(10),ZJET(10)
C ***** SEGMENT 16 *****
C CONTROL SYSTEM CONSTANTS
C PSEUDO-PILOT CONTROL SYSTEM CONSTANTS

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C
COMMON DUM,AKZED,AKZEE1,AKZEE2,AKVED,AKVEE,
1 AKU,AKV,AKW,AKX,AKY,AKZ
C
CONTROL SYSTEM FUNCTION SWITCH CONSTANTS
C
COMMON CSV,VASH,CSI,THETA
C
ROLL CONTROL SYSTEM CONSTANTS
C
COMMON TAKPC(1),TTHTA(1),TAKPE(1),TKPCI(1),ATHETA,TKPEI(1),
TKP(1),PELIM,AKOYDR,KTHR,KDA
C
YAW CONTROL SYSTEM CONSTANTS
C
COMMON TAKR(1),TAKRE(1),TKRCI(1),TKREI(1),TKR(1),RELIM,
AKYTRM,KPSIT,KDR,TAKAY(1),KTY
C
PITCH CONTROL SYSTEM CONSTANTS
C
COMMON TAKQC(1),TAKQL(1),TKQCI(1),TKQEI(1),TKQ(1),QELIM,
1 AKPTRM,DSYK,KDE,KTHP
C
HEAVE CONTROL SYSTEM CONSTANTS
C
COMMON TAKZF(1),TKZEI(1),AKTHROT,ZELIM
C
CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS
COMMON ELEVPF,PSITRF(2)
C
FLAP CONTROL SYSTEM CONSTANTS
COMMON KHFLAP1,KHFLAP2,KHFLAP3,KHFLAP4
C
DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS
COMMON AQBAR,TQBAP(3)
C
STICK AND PEDAL FILTER TIME CONSTANT TABLES
COMMON TPITCH(10),TTROLL(10),TTYAW(10)
C
***** SEGMENT 17 *****
C
ACTUATION CONSTANTS
C
COMMON LEJRAL,LELRAT,LELUPCSL,LELPOSL,LELTEL,
1 REJRAL,RELRAL,REUPOS,RELPOS,TEL,
2 DRJRAL,DRLRAT,DRUPOS,DRLPOS,DRTEL,
3 HFURAT,HFLRAL,HFLAPMX,HFLAPMN,HFTEL,
4 HFURAT,HFLRAL,HFLAPMX,HFLAPMN,HFTEL,
5 THUTL(2),THLRL(2),THUPL(2),THLPL(2),TTHT(2),
6 PSIJRL(2),PSILRL(2),PSIJPL(2),PSILPL(2),TPSIT(2),
7 RCSJRL(10),RCSLRL(10),RCSJPL(10),RCSLPL(10),TAURCS(10)
8 ,FRCSJRL(10),FRCSLRL(10),FRCSJPL(10),FRCSLPL(10),TAURCS(10)
9 ,DELIM,DALIM,DRLIM
C

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B-48

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Line No.	Code	Description	Line No.
230	C SEGMENT 18	229
	C	LIFT-DRAG VARIABLES	230
	C	.....	231
	C	COMMON LAMB1,CLAE,CKM8,C1,C2,EJ	232
	C	.....	233
	C	..... SEGMENT 19	234
	C	WING AERO VARIABLES	235
	C	.....	236
	C	COMMON OXW,DYW,DZM,OLM,OMW,OMV,CLM,ALFM,COM,UM,VM,VXZ,VXZ,	237
	C	1 OADA1,DAQA2,ALF1,ALF2,CL1,CL2,CLM,COM2,CJA,BE14,QMS,QM58,	238
	C	2 BOV,L4P,NWP,YMP,ALF1,CALF1,CALF2,CALF2,XM1,XM2,	239
	C	3 Z1,ZM2,ALF,CALF,CALF,MH,LM,NH,JA1,JA2,EKELEL,EKELER,CM1,	240
	C	4 CMW2,DXPING1,DXPING2	241
	C	.....	242
	C	..... SEGMENT 20	243
	C	HORIZONTAL STABILIZER AERO VARIABLES	244
	C	.....	245
	C	COMMON OX1,DY1,DZ1,OL1,OLM,OLH,OMH,OMV,UM,VM,VXZ,VXZ,CL1,CL2,CL1,	246
	C	1 CQ2,DADE,ALF,CLH,COM,ANG,DIS,XI,Z4,D2000,ALFH1,SALFH1,CALF1	247
	C	2 ,DAH,DC,QEFF,DAVG,CHH,DXHT	248
	C	.....	249
	C	..... SEGMENT 21	250
	C	VERTICAL STABILIZER AERO VARIABLES	251
	C	.....	252
	C	COMMON OXV,DYV,DZV,OLV,OLM,OLH,OMV,OMV,UM,VM,VXZ,VXZ,CLV,CLV,ALFV1,	253
	C	1 CALFV1,SALFV1,QOV,ORP,EKRU0,CMV,DXVT,VTEFF	254
	C	.....	255
	C	..... SEGMENT 22	256
	C	FUSELAGE AERO VARIABLES	257
	C	.....	258
	C	COMMON OXF,DYF,DZF,DLF,DLF,DLF,ALFF,ALFF,ALFF,ALFF,QK1,QK2,ROQ,AS,	259
	C	1 SAF,SQJ,AF,NFOQ,MOQ,MOQ1,S,NF,PITCHF,ALFYFD,NOQ,NOQ1,YAHF	260
	C	2 ,DFSF	261
	C	.....	262
	C	..... SEGMENT 23	263
	C	DIRECT THRUST FORCE AND MOMENT VARIABLES	264
	C	.....	265
	C	COMMON DKT,JYT,UZT,DLT,DMT,DMT,AFT(2),TCOR(2),OK(2),DY(2),OZ(2),	266
	C	1 DFSSM(2),OBSLW(2),DWLS,(2),SPSIT(2),CPSIT(2),STMT(2),CTMT(2)	267
	C	2 ,KAFT	268
	C	.....	269
	C	..... SEGMENT 24	270
	C	RAM FORCE AND MOMENT VARIABLES	271
	C	.....	272
	C	COMMON OXR,DYR,DZR,DLR,DLR,DLR,DLR,DLR,DLR,DLR,DLR,DLR,DLR,DLR,DLR,DLR,	273
	C	1 VOV1(2),ATURN(2),ELRAM(2),ELRAM(2),DATURN(2),ETAR(2),FRAM(2),ELR,	274
	C	2 WLRAM,FSRUM,SATURN,CATURN,DXR0(2),DYR0(2),OZR0(2),DXRI(2),	275
	C	3 DYRI(2),DZPI(2),UI,VI,WI	276
	C	.....	277
	C	..... SEGMENT 25	278
	C	CORIOLIS FORCE AND MOMENT VARIABLES	279
	C	.....	280
	C	COMMON JXCOR,DYCOR,DZCOR,ULCOR,OMCOR,DNCOR,ELCOR,EACOR,DLCORD,	281
	C	1 DMCOR,DMCOR	282
	C	283
	C SEGMENT 26	284
	C	PROPULSION SYSTEM VARIABLES	285

B-49

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C
COMMON MDJT(2),RPH(2),TRST(2),BLDAVL,FGMAI,FGMIN,FGIDL,MDTHX,
1  TRCSPEF,TRCAV,TRQ(2),FRATIO,FRPM,KRT,TRCS,TC(2)
2  ,HE(2),TFRACO(2),TFRACIN,FRACL,TENG,TFACE,TABIN,BLOYS,TABE
3  ,TO(2)
290
C
C***** SEGMENT 27 *****
C RCS FORCE AND MOMENT VARIABLES
291
C
C***** SEGMENT 28 *****
COMMON DXRCS,DYRCS,DZRCS,DLRCS,DMRCS,DNRCS,JFRCSDB,DFRCSDB,FRCS(10)
1  ,BLDREQ,FRCSAL,FRCSLU,FRCS(10),DXRC(10),DYRC(10),DZRC(10),
2  ,DRCS(10),BLD,FRCSDB
292
C
C***** SEGMENT 29 *****
C CONTROL SYSTEM VARIABLES
293
C
C PSEUDO-PILOT CONTROL SYSTEM VARIABLES
294
C
COMMON ZEE,ZEIC,YEL,YEIC,DXE,DYE,DZE,XES,YES,ZES
305
C
CONTROL SYSTEM FUNCTION SWITCH VARIABLES
306
C
COMMON CSSM
307
C
ROLL CONTROL SYSTEM VARIABLES
308
C
COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL
309
C
YAW CONTROL SYSTEM VARIABLES
310
C
COMMON YAWCMD,DPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYAA,AKAY
311
C
PITCH CONTROL SYSTEM VARIABLES
312
C
COMMON DLN5STK,AKQC,AKQCI,PTRMBUT,QE,AKQE,AKQEI,OPITCH
313
C
HEAVE CONTROL SYSTEM VARIABLES
314
C
COMMON ZEDTC,ZEDTE,AKZE,AKZEI,OTHROT
315
C
ACTUATION SYSTEM INPUT VARIABLES
316
C
COMMON JSIDEF,DNRKMF,PSITC(2),THTC(2),DEC,DRC,DAC,DRCSR,DRCSF,
1  ,OPJBY,DRCSSF,DRCSNF,THHD,HFLAPD,MFLAPC,LELEVND,RELEVNC
317
C
ADDITIONAL CONTROL SYSTEM VARIABLES
318
C
COMMON AKPCI,AKPEI,AKP,AKRCI,AKREI,AKR,AKQCI,AKQEI,AKQ,
1  AKZEI,CSVSM,TPITCH,TROLL,TYAM
319
C
AIR DATA VARIABLES
320
C
COMMON UAS,VAS,WAAS,RHO,YAHJ,V SOUND,TRATIO,PRATIO,VA,VK,MN,QBAR,
1  ALPH,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA
321
C

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C TOTAL AERO FORCE AND MOMENT VARIABLES
C
C COMMON XAERO, YAERO, ZAERO, LAERO, MAERO, MAEROJ
C
C TOTAL FORCE AND MOMENT VARIABLES
C
C COMMON SUMFX, SUMFY, SUMFZ, SUML, SUMM, SUMN
C
C CORRECTED DIRECTIONAL COSINES
C
C COMMON D11P, D12P, D13P, D21P, D22P, D23P, D31P, D32P, D33P, DCMAG
C
C MISCELLANEOUS VARIABLES
C
C COMMON UAIR, V, W, WAIR, ALT, RS, PS, BLOT1(3)
C 1 ,GYROL, GY, OM, GYRON, XCG, NYCG, NZCG
C 2 ,XCM, YDM, ZDM, BLOT2(3), LPRIME, NPRIME
C 3 ,VE, VEDT, VEEST
C
C ***** SEGMENT 30 *****
C TABLES FOR RAM FORCES AND MOMENTS
C
C COMMON VOIT(5), ATURN(10), ELRAMT(5,8), DATJRT(5,8), ETART(5,8)
C
C ***** SEGMENT 31 *****
C TABLES FOR RCS FORCES AND MOMENTS
C
C COMMON FCST(6), BLORT(6)
C
C ***** SEGMENT 32 *****
C THRUST TABLES
C
C COMMON MNT(4), TFGMAX(4), TFGMIN(4), TFGIDL(4), TMOT(4), TFRAT(6),
C 1 TRPH(6), TFRACT(10), TACCEL(10), TCECEL(10), TTENG(10)
C
C ***** SEGMENTS 33 THRU 38 *****
C STABILITY DERIVATIVES
C
C SEGMENT 33
C COMMON DXAG(25), DXHS(25), DXVS(25), DXFS(25), DXAER(25), DXTS(25),
C 1 DXRAM(25), DXCLS(25), DXRCSF(25), X(25)
C SEGMENT 34
C COMMON DYAG(25), DYHS(25), DYVS(25), DYFS(25), DYAER(25), DYTS(25),
C 1 DYRAM(25), DYCLS(25), DYRCSF(25), Y(25)
C SEGMENT 35
C COMMON DZAG(25), DZHS(25), DZVS(25), DZFS(25), DZAER(25), DZTS(25),
C 1 DZRAM(25), DZCLS(25), DZRCSF(25), Z(25)
C SEGMENT 36
C COMMON DL4G(25), DLHS(25), DLVS(25), DLFS(25), DLAER(25), DLTS(25),
C 1 DLRAM(25), DLCLS(25), DLRCSF(25), AL(25)
C SEGMENT 37
C COMMON DM4G(25), DMHS(25), DMVS(25), DMFS(25), DMAER(25), DMTS(25),
C 1 DMRAM(25), DMCLS(25), DMRCSF(25), AM(25)
C SEGMENT 38
C COMMON DN4G(25), DNHS(25), DNVS(25), DNFS(25), DNAER(25), DNMTS(25),
C 1 DNARAM(25), DNCLS(25), DNRCSF(25), AN(25)

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400 C ..... SEGMENT 39 .....
C DERIVATIVE CONTROL
C
405 C COMMON ADR,DELV(25)
C
410 C ..... SEGMENT 40 .....
C SCATCH COMMON
C COMMON MORK(50)
C
415 C ..... SEGMENT 41 .....
C MISCELLANEOUS CONSTANTS
C
420 C COMMON AHIND,VMIND,PSI4IND,XE2D,YE2D,ZE2D
C ,TRMTURN,GAMMA,VADDT,TURNRAD
C
425 C ..... SEGMENT 42 .....
C AERO SURFACE EFFECTIVENESS TABLES
C
430 C COMMON ELEVT(7),EKELET(7),RUDT(7),EKRUOT(7)
C ..... SEGMENT 43 .....
C PILOT INPUT CONTROL DATA
C
435 C COMMON ACMDS(5),ATIME,AKKEEP,AYEHLD,CHDT1(20),CHDT2(20),
C CHDT3(20),CHDT4(20),CMDT5(20),TIMET(20),ATRANS,AVAT,ITRANS,
C THROTT(10),VAT(10),THETCT(10)
C ..... SEGMENT 44 .....
C TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LANS
C
440 C COMMON ACSSN,TCSSHI(5),TAKQS(5),TKPINT(5),TKPHI(5),TKPB(5),
C TKPS(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKPSI(5),TKRB(5),
C TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKDCI(5),TAKQEI(5),
C T4,S(5),AKPHIRS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,ARTHETA,AKRINT,
C AK-SI,AKRB,AKRS,AKQS
C ..... SEGMENT 45 .....
C TABLES,CONSTANTS,AND VARIACLES FOR CONTROL SYSTEM GAINS WHICH
C VARY AS FUNCTIONS OF AIRSPEED
C
445 C COMMON VELGAIN,AVEL,TVEL(9),VAKPC(8),VKPCI(8),VKPEI(8),VKP(8),
C VAKPE(8),VAKRC(8),VKRCI(8),VKREI(8),VKR(8),VAKRE(8),VAKQC(8)
C ,VKQCI(8),VKQEI(8),VKQ(8),VAKQE(8),VAKZE(8),VKZEI(8)
C ,VTPITCH(9),VTROLL(8),VTYAH(8)
C REAL LAMB1
C REAL LNGSTK,LNGSTKO
C REAL IX,IY,IZ,IXZ,JK,JY,JZ,MASS
C REAL NFOQM,NOQM1,NOQM2,NOQM1,NOQM2
C REAL KBT1,KBT2,KMI,KM2,KBT
C REAL KPSIT,KTHTP,KHTR,KOE,KOR,KOA,KTY
C REAL LWP,VWP,NW,LW,MW
C REAL NFQ,MOQ,MOQ1,NOQ,NOQ1
C REAL KHFLAP1,KHFLAP2,K4FLAP1,K4FLAP2
C REAL MDT,M3TM,KMDT,K3TP
C REAL KAFI1,VAFT2,KAFT

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REAL LAERO,MAERO,NAEKO
REAL LELEPOS1,LELRAT1,LEJFOSL,LEURAT1,LEPRIME,NPRIME
REAL LELEVN1,LELEVN,LELEVNC,MNT,NF,MN
REAL JENG
PEAL NXCG,NYCG,NZCG
EQUIVALENCE(CDD4,AERO(11,1)),(AB4,AERO(9,1)),(ARM,AERO(1,1)),
1 (SM,AERO(3,2)),(SM,AERO(3,1)),(SV,AERO(3,3))
IF(MCALC.NE.0)GO TO 1000

C
C UNIVERSAL CONSTANTS
C
PI=3.14159
HALFPI=1.5708
GC=92.174
PI18=PI/18.

C
C CREATION OF FIXED POINT CONSTANTS FROM FLOATING POINT INPUT
C
NAEPO1=IFIX(AEPO)
NENG=IFIX(AENG)
NRCJET=IFIX(ARCJET)
NMACH=IFIX(AMACH)
NFRAT=IFIX(AFRAT)
NBLOR=IFIX(ABLOR)
NVUVI=IFIX(AVUVI)
NATJRM=IFIX(AATJRM)
NALFA=IFIX(AALFA)

C
C ONE TIME ONLY CALCULATIONS FOR AERO LIFT-DRAG EQUATIONS
C
IF(MAERO1.NE.0)GO TO 1001
DO 110 I=1,3
LAMB1=TAN(AE0(5,I))-(4./AERO(1,I))*0.25*(1.-AERO(7,I))/(1.+
1 AERO(7,I))
1 CLAE=2.*PI*AERO(2,I)/(2.*SQRT((2.*PI*AERO(2,I)/AERO(18,I))**2*(1.
1 +LAMB1**2)**4.))
EKW3=0.527*(1.+AERO(12,I))*1.534*0.473
CLA(I)=EKW3*CLAE*(AERO(6,I)/AERO(3,I))
C1=-0.029+AERO(7,I)*(3.712+AERO(7,I)*(-8.125+AERO(7,I)*4.47))
C2=-0.113+AERO(7,I)*(5.199+AERO(7,I)*(-7.208+AERO(7,I)*2.943))
EJ=.3*(1.+C1)*AERO(1,I)*COS(AERO(6,I))*((1.+C1)*(1.+C2)-((1.+C2)*
1 AERO(1,I)*TAN(AERO(6,I))/7.))**3)
AEROK(I)=1.528*SQRT(EJ)
IF(EJ.LT.0.)AEROK(I)=0.22*EJ
CNA3(I)=(AERO(8,I)/COS(AERO(9,I))-CLA(I)*SIM(2.,AERO(9,I))/2.))/
1 (SIN(AERO(9,I))*ABS(SIN(AERO(9,I))))
FOS(I)=0.527+AERO(2,I)*(0.1494-.01429*AERJ(2,I))
110 CONTINUE

C
C ONE TIME ONLY CALCULATIONS FOR WING AERO EQUATIONS
C
ZWING1=WLDC-WLW
XWING1=FS2G-FSW
ZWING2=ZWING1
XWING2=XWING1
YWING1=BL41-BLCG
YWING2=BLN2-9LCC

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NAMES 457
 NAMES 458
 NAMES 459
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 FORCES 4
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515 1 CNPCLM=(AERO(1,1)+6.*(AERO(1,1)+COS(AERO(5,1)))*(XWING1*TAN(AERO(
2 5.11)/(CH*AERO(1,1))+TAN(AERO(5,1))*2/12.1))/(16.*(AERO(1,1)
3 4.*COS(AERO(5,1))))
C
C ONE TIME ONLY CALCULATIONS FOR HORIZONTAL STABILIZER AERO EQUATIO
520 XH=FSCG-FSH
YH=BLH-BLCG
ZH=MLCG-WLH
XWEL=XWING1-YH-0.6*BM*COS(EI)/ARM
ZWEL=ZMINJ1-ZH+0.6*BM*SIN(EI)/ARM
AWEL=RATAN2(ZWEL,XWEL)
MWEL=SQRT(XWEL**2+ZFL**2)*ARM/BM
C
C ONE TIME ONLY CALCULATIONS FOR VERTICAL STABILIZER AERO EQUATIONS
530 XV=FSCG-FSV
YV=BLV-BLCG
ZV=MLCG-WLV
C
C ONE TIME ONLY CALCULATIONS FOR FUSELAGE AERO EQUATIONS
535 XF=FSCG-FSF
YF=BLF-BLCG
ZF=MLCG-WLF
1001 CONTINUE
C
C ONE TIME ONLY CALCULATIONS FOR DIRECT THRUST FORCES AND MOMENTS
540 DO 1 I=1,NENG
X(I)=FSCG-FSSM(I)
Y(I)=BLSM(I)-BLCG
Z(I)=MLCS-WLSM(I)
1 CONTINUE
C
C ONE TIME CALCULATIONS FOR RCS FORCES AND MOMENTS
550 KX1=KBT1*BLDREF+KBT2
CALL STLU(BLDR1,FRCS1,NBLDR,BLDREF,FRCSMXR,2)
FRCS1X0=0.
DO 3 I=1,NRCSJET
DT(RCS(I))=COS(THRCS(I))
ST(RCS(I))=SIN(THRCS(I))
CPS(RCS(I))=COS(PDIRCS(I))
SPS(RCS(I))=SIN(PDIRCS(I))
XJET(I)=FSCG-FSRCS(I)
YJET(I)=B-RCS(I)-BLCG
ZJET(I)=MLCG-WLRCS(I)
FRCSMX0=FRCSMX0+ABS(FRCSMX(I))*(1.-DEMAND(I))
3 CONTINUE
C
C ONE TIME ONLY CALCULATIONS FOR RAM FORCES AND MOMENTS
565 DO 2 I=1,NENG
XIN(I)=FSSG-FSIN(I)
YIN(I)=BLIN-BLCG
ZIN(I)=MLCG-WLIN(I)

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FORCES 56
FORCES 57
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FORCES 112

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2 CONTINUE
  NCALG=1
1800 CONTINUE
C
575 C ATMOSPHERE AND MACH NUMBER
C
  ALT=-ZE
  CALL ATMOSX(ALT,2,RHO,TAMB,PRESS,TRATIO,PRATIO,V,SOUND)
  VA=SQRT(U6S*UAS+VAS+VWS+VMS)
  VK=VA/1.6889
  GBAR=0.5*RHO*VA*VA
  MN=VA/V,SOUND
C
585 C SIN ANU COS OF ALPHA AND BETA. ALSO STAB. AXIS RATES
C
  CALPH=COS(ALPH)
  SALPH=SIN(ALPH)
  CBETA=COS(BETA)
  SBETA=SIN(BETA)
  PS=-P*SALPH-R*CALPH
  PS=PS*CALPH+R*SALPH
  IF(MAES01.NE.0)GO TO 1002
C
595 C AERO FORCE AND MOMENT CALCULATIONS BASED ON DATCO.I-TYPE METHODS
C
  WING AERO FORCES AND MOMENTS
  UM=UAS*Q*ZMING1
  WM=WAS-Q*YMING1
  VXZ1=SQRT(UM**2+WM**2)
  DAZ1=EKDA1*DA1
  ALFM1=BATAN2(WM,UM)+EIM
  CALL LIFDRAG(ALFM1,DA1,DFLAPM,CLM1,CDM1,CHN1,1,EOS,AEROK,CLA,CNAA0
1 UM,UAS*Q*ZMING2
  WM=WAS-Q*YMING2
  VXZ2=SQRT(UM**2+WM**2)
  DAZ2=EKDA2*DA2
  ALFA2=BATAN2(WM,UM)+EIA
  CALL LIFDRAG(ALFM2,DA2,DFLAPM,CLM2,CDM2,CHN2,1,EOS,AEROK,CLA,CNAA0
1 ,AERO,SURFPC,ALFS2,DXMING2)
  CLW=0.5*(CLM1+CLM2)
  COM=0.5*(CDM1+CDM2)
  ALFW=0.5*(ALFM1+ALFM2)
  VXZ=0.5*(VXZ1+VXZ2)
  DALFY=ALFY+.01745
  DAVG=0.5*(DA1+DA2)
  CALL LIFDRAG(DALFY,DAVG,DFLAPM,CL1,CD1,CM1,1,EOS,AEROK,CLA,CNAA0,
1 DALFM,ALFA-.01745
  CALL LIFDRAG(DALFM,DAVG,DFLAPM,CL2,CD2,CM2,1,EOS,AEROK,CLA,CNAA0,
1 BETH=BATAN2(VAS,VXZ)
  GMS=0.5*RHO*SM*VXZ**2
  GMS3=UMS*BM
  IF(VXZ.EQ.0.)11,12

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11 BOV=0.
12 GO TO 13
13 CONTINUE
630 LWP=QMSB*(CLBOM+CLBCLM)*CLM*8ETH*BOV*(CLRCLM*CLM*RS+CLPM*PS)
    NMP=QMSB*(CNBOM+CNBCLM)*CLM*8ETH*BOV*(CNBCLM*CLM*CLM*CLM*
1   CNRCLM*CLM)*RS*BOV*(CNPCLM*CLM)*PS)
    YMP=QMS*(CLBCLM*CLM*CLM*CLM*8ETH
    ALF1=AL*MI-FIM
    SALF1=SIN(ALF1)
    CALF1=COS(ALF1)
    ALF2=AL*WZ-EIH
    SALF2=SIN(ALF2)
    CALF2=COS(ALF2)
    XW1=0.5*QMS*(CLM1*SALF1-COM1*CALF1)
    ZW1=0.5*QMS*(-CLM1*CALF1-CDM1*SALF1)
    XW2=0.5*QMS*(CLM2*SALF2-CDM2*CALF2)
    ZW2=0.5*QMS*(-CLM2*CALF2-CDM2*SALF2)
    ALF=AL*WZ-EIH
    SALF=SIN(ALF)
    CALF=COS(ALF)
    MM=L4*CH*(CMOM+0.5*(CMW1+CMW2))
    LW=L*NP*CALF-NMP*SALF
    MW=L*WZ*SALF+MPP*CALF
    DXW=XW1+XW2
    DYW=YMP
    DZW=ZW1+ZW2
    DLW=L*WZ+ZW1*YMWING1+ZW2*YMWING2-0.5*YMP*(ZMWING1+ZMWING2)
    DMW=XW1*ZMWING1-ZW1*(XMWING1-DXWING1*CH)+XW2*ZMWING2-ZW2*(XMWING2-
1   DXWING2*CH)+MW
    DNM=NW-XW1*YMWING1-XW2*YMWING2+0.5*YMP*(YMWING1+YMWING2-CH*(DXWING1
1   +DXWING2))
    HORIZONTAL STABILIZER FORCES AND MOMENTS
    UH=UAS
    WF=UAS
    ALFG=BATAN2(WAS,UAS)
    EPS=EOCLM*CLM
    IF (ABS(UH).LE.5.)GO TO 38
    DAH=EOCLM*(L1-CL2)*ALFAD*(FSH-FSW)/(UH*.0349)
    CONTINUE
    DADE=CKADE*DE
    ALFH=BATAN2(WH,UH)*EPS+DAH+EIH
    CALL LIFOZAG(ALFH,DFLAPH,0.,CLM,CDM,CMH,2.,EJS,AEROK,CLA,CNAAB,
1   AERO,SJKFCP,ALFSH,JKHT)
    DXHT=DXHT*CH
    ANG=EPS-ALFG+AMEL
    DIS=DMEL*ABS(SIN(ANG))
    XI=DMEL*ABS(COS(ANG))
    ZW=0.68*SQRT(CDM*XI+0.15))
    DQ00=0.
    IF (DIS.LT.ZW.AND.ABS(ANG).LT.HALFPI)DQ00=2.*2*SQRT(CDM)*COS(DIS)
1   IF (DIS.GT.ZW)HALFPI/7H)**2/(XI+0.30)
    FOR CANARD CONFIGURATION,DQ000 ASSUMED = 0.
    
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685 IFIXH,GE,0.0D0000=0.
   QEFF=0.5*RH0*(1.-DQ000)* (UH*UH+WH*WH)*SH
   ALFH3=ALFH-EIH
   -DADE
   SALFHI=SIN(ALFHI)
   CALFHI=COS(ALFHI)
690 DXM=QEFF*(CLM*SALFHI-CJM*CALFHI)
   DYM=0.
   OZM=JIEFF*(-CLM*CALFHI-SJM*SALFHI)
   DLM=DZM*YH
   OMM=QLFF*CM*(CMGH+CMH)*XMH-ZH-DZM*(XM-DXAF)
   DNM=-OAM*YH
   C
   C
   C
   VERTICAL STABILIZER FORCES AND MOMENTS
   UV=UAS+QZV*OYV
   VV=VAS*(1.-LKV)-P*ZV+RXV
   DADR=EKADR*DRP
   ALFV=BATAN2(-VV,UV)*DADR+EV
   CALL LIFDRAG(ALFV,0.0,0.0,CLV,CDV,CHV,3,EO5,AEROK,CLB,CNAA0,AERO,
   SURFC*,ALFV,DXVT)
700 1 DXVT=DXVT*CV
   ALFV1=ALFV-DADR-EIV
   CALFV1=COS(ALFV1)
   SALFV1=SIN(ALFV1)
   CALL STLU(TALFA,TVEFF,NALFA,ALPH,VTEFF,Z)
710 QUV=0.5*RH0*(UV*2+VV*2)*SV*VTEFF
   DXV=QUV*(CLV*SALFV1+CDV*CALFV1)
   DZV=0.
   DLV=-OYV*ZV
   DMV=QAV*ZV
   DMV=QAV*CV*(CNQV+CHV)*DYV*(XV-DXVT)-DXV*YV
   C
   C
   C
   FUSELAGE FORCES AND MOMENTS
   ALFF=BATAN2(WAS,UAS)
   ALTF=BATAN2(-VAS,UAS)
   ALTF=BATAN2(SQRT(VAS*2+WAS*2),UAS)
   QXY=0.5*RH0*(UAS*2+VAS*2)
   QZ=0.5*RH0*(UAS*2+WAS*2)
   AQQ=AQQ*SIGN(1.,COS(ALTF))*ABS(COS(ALTF))*EN1
   AS=QO*AOQ
   IF(AJS(ALFF),LE,PI18)31,32
720 31 SAF=SIN(PI18)
   GO TO 33
   32 CONTINUE
   SAF=SIN(ALFF)
   SOQ=SOQM*SIGN(1.,SAF)*ABS(SAF)*EN2
730 33 CONTINUE
   IF(ABS(ALFF),LE,(PI18+ABF))34,35
   34 SAF=SIN(PI18)
   NFOQ=NFOQM*ALFF-AOF*(ABS(SAF)*EN3)/PI18
   GO TO 35
   35 CONTINUE
   AF=ALFF-AOF
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   FORCES 283

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745 SAF=SIN(AFI)
      NFOQ=NFOQM*SIGN(1.,SAF)*ABS(SAF)**EN3
      36 CONTINUE
      IF((12.*AOF-A1F).LE.ALFF.AND.ALFF.LE.(-PI18+AOF)).OR.
1      ((PI18+AOF).LE.ALFF.AND.ALFF.LE.(PI18+AOF))10.20
18 AF=PI*(ALFF-AOF)/(A1F-AOF)
      SAF=SIN(AFI)
      M04=M0QX1*SIGN(1.,SAF)*ABS(SAF)**EN4
      GO TO 50
750 20 CONTINUE
      IF((-PI18+AOF).LT.ALFF.AND.ALFF.LT.(PI18+AOF))30.48
      30 AF=PI*PI18/(A1F-AOF)
      SAF=SIN(AFI)
      M01=M0QX1*SIGN(1.,SAF)*ABS(SAF)**EN4
      M02=M0Q1*(ALFF-AOF)/PI18
      GO TO 50
755 40 AF=PI*(ALFF-A1F)/(PI+AOF-A1F)
      SAF=SIN(AFI)
      M03=M0QY2*SIGN(1.,SAF)*ABS(SAF)**EN5
      GO TO 50
760 50 CONTINUE
      S=QX*SQ
      MF=ZX*ZP*NF00
      PITCHF=M0Q*QXZ
765 IF((-A2F-LT.ALFF.AND.ALFF.LE.-PI18).OR.(PI18.LE.ALFF.AND.
1      ALFF.LE.A2F))60,70
      60 AF=PI*ALFF/A2F
      SAF=SIN(AFI)
      M0Q=M0QX1*SIGN(1.,SAF)*ABS(SAF)**EN6
      GO TO 100
770 70 IF(-PI18.LT.ALFF.AND.ALFF.LT.PI18)80,90
      80 AF=PI*PI18/A2F
      SAF=SIN(AFI)
      M01=M0QX1*SIGN(1.,SAF)*ABS(SAF)**EN6
      M02=M02L*ALFF/PI18
      GO TO 100
775 90 AF=PI*(ALFF-A2F)/(PI-A2F)
      SAF=SIN(AFI)
      M03=M0QY2*SIGN(1.,SAF)*ABS(SAF)**EN7
      GO TO 100
780 100 CONTINUE
      YMF=M0Q*QX1
      DFSF=0.
      1 IF(ABS(ALFF).GT.ADFS1)DFSF=(ABS(ALFF)-ADFS1)*JFSF0/(ADFSF2
      -ADFS1)
      IF(ABS(JFSF).GT.ABS(DFSF0))DFSF=DFSF0
      DXF=-AS
      DYF=S
      DZF=-NF
      DLF=JZF*YF-DYF*ZF
      DMF=PI*ITCHF*DXF*ZF-DZF*(XF-DFSF)
      DMF=YMF*XYF*DYF*(XF-DFSF)-DXF*YF
      C TOTAL AERO FORCES AND MOMENTS
      C
      C
795 XAERO=DXH*DXH+DXV*DXV
      YAERO=UYH*UYH+UYV*UYV
      ZAE=O=DZH*DZH+DZV*DZV
      LAERO=DLH*DLH+DLV*DLV

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      MAERO=DMH+DMH+DMV+DMF
      NAERO=DNH+DNH+DNV+DNF
      IF (FLAG.GT.1.) RETURN
      1002 CONTINUE

```

```

      C
      C
      C
      C
      C
      C
      C
      C
      C
      C

```

```

      AERO FORCE AND MOMENT CALCULATIONS USING TABULARIZED DATA
      (SECTION TO BE AUDED LATER)

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```

      DIRECT THRUST CALCULATIONS INCLUDING BLEED AVAIL, MASS FLOW RATES,
      AND ENGINE RPM

```

```

      CALL STLU(MNT, TMDT, NYMACH, MN, MOTHK, 2)
      IF (ITIM.NE.0) GO TO 580
      IF (TO(1).GT.FGMAX) TO(1)=FGMAX
      IF (TO(1).LT.FGOL) TO(1)=FGIOL

```

```

      580 CONTINUE
      TREQAV=0.5*(TO(1)+TO(2))
      GYROL=0.
      GYROM=0.
      GYRON=0.

```

```

      DO 600 I=1, NENG
      TREQ(I)=TO(I)
      FRATIO=TFRAC(I)
      MOOT(I)=NYMACH*(KM1+FRATIO+KM2)

```

```

      CALL STLU(TFRAT, TRPH, NFRAT, FRATIO, FRPM, 2)
      RPM(I)=FRPH+RPHMX
      HE(I)=JENS*FRPH+OMEGMX

```

```

      GYRO MOMENT CALCULATIONS
      GYROL=GYROL-HE(I)*SSIGY*Q
      GYROM=GYROM+HE(I)*(R*CSIGY+P*SSIGY)
      GYRON=GYRON-HE(I)*CSIGY*Q

```

```

      600 CONTINUE
      IF (RCS.EQ.0.) GO TO 610
      KMOI=1.
      PLDAVL=0.

```

```

      IF (TREQAV.LT.FGMAX) BLDLVL=(TREQAV/FGMAX-KBT2)/KBT1
      IF (TREQAV.LT.FGMIN) KMDI=KM1*TREQAV/FGMIN+KM2
      610 CONTINUE

```

```

      RCS FORCES AND MOMENTS
      DFRCDOB=0.
      SIGFRCS=0.

```

```

      DO 510 I=1, NRCSJET
      FPCS(I)=FRCSMX(I)*DRCS(I)
      IF (RCS(I).LE.0) FRCS(I)=0.
      IF (DEMAND(I).EQ.0.) FRCS(I)=FRCSMX(I)*(1.+JPCS(I))
      SIGFRCS=SIGFRCS+FRCS(I)
      DFRCDOB=ABS(FRCS(I))*DEMAND(I)*BLDMOR(I)+DFRCDOB

```

```

      510 CONTINUE
      IF (DEMAND(I)=0.) THEN RCS JET I IS CONTINJUS BLEED
      IF (DEMAND(I)=1.) THEN RCS JET I IS DEMAND BLEED
      IF (BLDMOR(I)=0.) THEN RCS JET I DOES NOT COMMAND ADDITIONAL BLEED
      IF (BLDMOR(I)=1.) THEN RCS JET I COMMANDS ADDITIONAL BLEED

```

```

      C
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      650
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C
510 CONTINUE
FRCSLU=(FRCSMX0+DFRCS08)/AENG
CALL STLU(FRCSL,BLDR,N,ULDR,FRCSLU,BLDREQ,2)
FRCSAL=FRCSLU
IF(BLDREQ.LT.BLDREF)BLDREQ=9LDREF
BLD=BLDREQ
IF(ITRIM.NE.0.OR.NDRIV.NE.0) GO TO 560
IF(BLDAVL.LT.BLDREQ)550,560
550 CALL STLU(BLDR,FKST,NBLDR,BLDAVL,FRCSAL,2)
BLD=BLDAVL
560 CONTINUE
DO 570 I=1,NRCSJET
IF(SIGFRCS.EQ.0.#520,530
FRCS(I)=0.
GO TO 540
530 CONTINUE
FRCS(I)=FRCS(I)*KMJT+AENG*FRCSAL/SIGFRCS
540 CONTINUE
IF(ITRIM.NE.0.OR.NDRIV.NE.0)FRCSA(I)=FRCS(I)
570 CONTINUE
DXRCS=0.
DYRCS=0.
DZRCS=0.
DLRCS=0.
DMRCS=0.
DNPCS=0.
DO 500 I=1,NRCSJET
DXR(I)=FRCSA(I)*CPSIRCS(I)*CTHRCS(I)
DYR(I)=FRCSA(I)*SPSIRCS(I)*CTHRCS(I)
DZC(I)=-FRCSA(I)*STHRCS(I)
DLXCS=DLRCS+DZRS(I)*YJET(I)-DYRCS(I)*ZJET(I)
DMRCS=DYRCS+DXR(I)*ZJET(I)-DZRC(I)*XJET(I)
DNPCS=DMPCS+DYR(I)*XJET(I)-DXR(I)*YJET(I)
DXRCS=DXRCS+DXR(I)
DYRCS=DYRCS+DYR(I)
DZRCS=DZRCS+DZR(I)
500 CONTINUE
500 CONTINUE
C
695 C ADJUST THRUST TO ACCOUNT FOR RCS COUPLING
C
KBT=KBT1*BLD+KBT2
IF(NDRIV.NE.0.OR.ITRIM.NE.0) KBT=KBT
DO 581 I=1,NENG
TRST(I)=T(I)*KJTP
581 CONTINUE
TRCS=AENG*TRQAV*(1.-KBT)
C
C THRUST VECTORED AND DIRECT THRUST FORCES AND MOMENTS
C
C CALCULATE THRUST APPLICATION POINT MRT NOZZLE SWIVEL POINT
C
SSIGY=205(SIGY)
SSIGY=SIN(SIGY)
DO 200 I=1,NENG
SPSIT(I)=SIN(PSIT(I))
CPSIT(I)=COS(PSIT(I))

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915 STHT(I)=SIN(THT(I))
    CTHT(I)=COS(THT(I))
    DFSSM(I)=ELN*(CPSIT(I))*CSIGY*CTHT(I)-STHT(I)*SSIGY
    UBLSM(I)=-ELN*SPSIT(I)*CTHT(I)
    DBLSM(I)=-ELN*(CPSIT(I))*SSIGY*CTHT(I)+CSIGY*STHT(I)
200 CONTINUE
    C
    C FLOW TURNING ANGLE CORRECTION TO THRUST
    DO 210 I=1,NENG
    AFT(I)=ACOS(CTHT(I))*CPSIT(I)
    KAFT=KAF1+AFT(I)+KAFT2
    ICOR(I)=KAFT*TRST(I)
210 CONTINUE
    C
    C DIRECT THRUST FORCES AND MOMENTS CALCULATIONS
    DXT=0.
    DYT=0.
    DZT=0.
    DXT=0.
    DYT=0.
    DZT=0.
    DO 220 I=1,NENG
    DX(I)=ICOR(I)*(CPHT(I))*CPSIT(I)*CSIGY-SSIGY*STHT(I)
    DY(I)=ICOR(I)*(CTHT(I))*SPSIT(I)
    DZ(I)=ICOR(I)*(-CTHT(I))*CPSIT(I)*SSIGY-CSIGY*STHT(I)
    DLT=DLT+DZ(I)*(Y(I)+DBLSM(I))-DY(I)*(ZT(I)-DBLSM(I))
    DMT=DMT+DX(I)*(ZT(I)-DBLSM(I))-DZ(I)*(XT(I)-DBLSM(I))
    DNT=DMT+DY(I)*(XT(I)-DBLSM(I))-DX(I)*(YT(I)+DBLSM(I))
    DYT=JXT+DY(I)
    DZT=JZT+DZ(I)
220 CONTINUE
    C
    C RAM FORCES AND MOMENTS
    V0=VA
    DXR=0.
    DZR=0.
    DLR=0.
    DMR=0.
    DNR=0.
    C
    C IF V0=0, SKIP CALCULATION OF BASIC RAM FORCES AND MOMENTS.
    C CALCULATE RAM EFFECTS DUE TO P,Q,R ONLY
    IF(V0.EQ.0.)GO TO 300
    ATURN=ACOS((UAS*CSIGY-WAS*SSIGY)/V0)
    BTURN=BATAN2IVAS,(WAS*CSIGY+UAS*SSIGY)
    CBTURN=COS(ATURN)
    SBTURN=SIN(ATURN)
    DO 310 I=1,NENG
    VIN=VDJ(I)/(GC*PI*RHO*RMLET**2)
    VOVI(I)=V0/VIN
    CALL DTLU(VOVI,ATURN,ELRAMT,ELRAM,NUOVI,NATJRN,VOVI(I),ATURN0,ELRAM(I)
    ,2,2)

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970 CALL DTLU(VOVI,ATURN,DA TURN,NUOVI,NATJRN,VOVI(I),ATURN,
1 JATJRN(I),2,2)
1 CALL DTLU(VOVI,ATURN,ETARI,NUOVI,NATURN,VOVI(I),ATURN,EPAR(I),
1 2,2)
ATURN(I)=ATURN+DATURN(I)
FRAM(I)=-MDOT(I)*VOETAR(I)/GC
ELR=RINLET*2.*ELRAM(I)
MLRAM=MLIN(I)*ELP*SSIGY
FSCG=F SIN(I)-ELR*CSIGY
SATJRN=SIM(ATURN(I))
CATJRN=COS(ATURN(I))
DZR(I)= FRAM(I)*CATURN*CSIGY+SSIGY*SATJRN*CBTURN
DZR(I)= FRAM(I)*SATURN*SBTURN
DZR(I)= FRAM(I)*(-CATURN*SSIGY+SATURN*CBTURN*SSIGY)
DZR=DLR+DZRO(I)*(YIN(I))-DYRO(I)*(WLCG-ALRAM)
DMR=DMR+DZRO(I)*(WLCG-ALRAM)-DZRO(I)*(FSCG-FSRAM)
DMR=DMR+DYRO(I)*(FSCG-FSRAM)-DXRO(I)*(YIN(I))
DXR=DXR+DXRO(I)
DYR=DYR+DYRO(I)
DZR=DZR+DZRO(I)
310 CONTINUE
300 CONTINUE
C
C AIRCRAFT ANGULAR RATES(P,Q,R) INDUCE VELOCITY INCREMENTS IN THE
C ENGINE INLET FLOW. THESE LEAD TO CHANGES IN RAM FORCES AND MOMENTS.
C THE INCREMENTAL FORCES ARE ASSUMED TO ACT AT THE INLET FACE.
C
DO 320 I=1,NENG
UI=Q*ZIN(I)-P*YIN(I)
VI=R*XIN(I)-P*ZIN(I)
WI=P*YIN(I)-Q*XIN(I)
DYRI(I)=-MDOT(I)*UI
DYRI(I)=-MDOT(I)*VI
DZRI(I)=-MDOT(I)*WI
DLR=DLR+DZRI(I)*YIN(I)-DYRI(I)*ZIN(I)
DMR=DMR+DXRI(I)*ZIN(I)-DZRI(I)*XIN(I)
ONS=ONS+DYRI(I)*XIN(I)-DXRI(I)*YIN(I)
DXR=DXR+DXRI(I)
DYR=DYR+DYRI(I)
DZR=DZR+DZRI(I)
320 CONTINUE
C
C CORIOLIS FORCES AND MOMENTS
DZCOR=0.
DYCOR=0.
DZCOR=0.
DZCOR=0.
CMCOR=0.
DNCOR=0.
DO 400 I=1,NENG
MDOT(I)=MDOT(I)/GC
ELCOR=XIN(I)*CSIGY-ZIN(I)*SSIGY
EACOR=-XIN(I)*SSIGY-ZIN(I)*CSIGY
DXCOR=DXCOR-2.*MDOT(I)*Q*ELDUCT*SSIGY
DYCOR=DYCOR+2.*MDOT(I)*R*ELDUCT*(R*CSIGY+P*SSIGY)
DZCOR=DZCOR-2.*MDOT(I)*Q*ELDUCT*CSIGY

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DLCORD=JLCORD-2.*MDO1(I)*ELDUCT*(VIN(I)*Q-EACOR*(2.*CSIGY+P*SSIGY)) FORCES 569
DMCORD=DMCORD+MDO1(I)*2*ELDUCT*(2.*ELCOR-ELDUCT) FORCES 570
DMCIRD=DMCIRD+MDO1(I)*ELDUCT*(R*CSIGY+P*SSIGY)*(2.*ELCOR-ELDUCT) FORCES 571
MDO1(I)=MDO1(I)+GC FORCES 572
CONT INJE FORCES 573
DLCOR=JLCORD*CSIGY+DMCIRD*SSIGY FORCES 574
DMCOR=DMCORD FORCES 575
DMCIRD=JLCORD*SSIGY+DMCIRD*CSIGY FORCES 576
TOTAL FORCES AND MOMENTS FORCES 577
C FORCES 578
C FORCES 579
C FORCES 580
SUMFX=XAERO+DXT+DXRCS+DXR+DXCOR FORCES 581
SUMFY=YAERO+DYT+DYRCS+DYR+DYCOR FORCES 582
SUMFZ=ZAERO+DZT+DZRCS+DZR+DZCOR FORCES 583
SUMM=LAERO+DLT+DLRCS+DLR+DLCOR FORCES 584
SUMN=MAERO+DMT+DMRCS+DMR+DMCOR FORCES 585
RETJRN FORCES 586
END FORCES 587

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SUBROUTINE INTRP
1 SUBROUTINE INTRP(X,N,XARG,J,A,KODE)
C THIS SUBROUTINE SEARCHES FOR THE LOCATION OF XARG IN THE ABSCISSA TABL
C X(I) AND COMPUTES THE INTERPOLATION COEFFICIENTS A(1),A(2),A(3) AND
C A(4) WHICH ARE FUNCTIONS OF X
C X.....INDEPENDENT VARIABLE TABLE
C N.....NUMBER OF POINTS INDEPENDENT VARIABLE TABLE
C XARG...VALUE OF X FOR WHICH THE DEPENDENT VARIABLE IS TO BE CALCULATE
C J.....INDEX OF THE FIRST POINT BEYOND XARG IN THE X-ARRAY
C A(1)...INTERPOLATION COEFFICIENTS
C KODE=2 TWO POINT INTERPOLATION (LINEAR)
C =3 THREE POINT INTERPOLATION (QUADRATIC)
C =-2,-3,-4 THE SEARCH AND CALCULATION OF INTERPOLATION
C COEFFICIENTS IS SUPPRESSED
C NOTE-FUNCTIONS THAT HAVE THE SAME INDEPENDENT VARIABLE TABLE HAVE THE
C SAME INTERPOLATION COEFFICIENTS
C DIMENSION X(1),A(1)
DO 1 I=1,4
1 A(I)=0.
IF(N.GT. 1) GO TO 2
J=1
A(3)=1.
RETURN
2 CONTINUE
IF(KODE .GT. 2 .AND. N .GT. 2) GO TO 3
CALL SEARCH(X,XARG,N,J)
CALL INTRP2(X(J-1),XARG,A(2))
RETURN
3 SGN=1.
IF(X(N) .LT. X(1)) SGN=-1.
IF(XARG.SGN .GE. X(1*SGN)) GO TO 4
J=3
CALL INTRP2(X,XARG,A)
RETURN
4 IF(XARG.SGN .LE. X(N)*SGN) GO TO 5
J=N-1
CALL INTRP2(X(J),XARG,A(3))
RETURN
5 CALL SEARCH(X,XARG,N,J)
IF(J .NE. 2) GO TO 6
J=3
CALL INTRP3(X,XARG,A)
RETURN
6 IF(J .NE. N) GO TO 7
CALL INTRP3(X(J-2),XARG,A)
RETURN
7 IF(KODE .NE. 3) GO TO 8
CALL INTRP3(X(J-2),XARG,A)
RETURN
8 CALL INTRP4(X(J-2),XARG,A)
RETURN
END
INTRP 2
INTRP 3
INTRP 4
INTRP 5
INTRP 6
INTRP 7
INTRP 8
INTRP 9
INTRP 10
INTRP 11
INTRP 12
INTRP 13
INTRP 14
INTRP 15
INTRP 16
INTRP 17
INTRP 18
INTRP 19
INTRP 20
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INTRP 48
INTRP 49
INTRP 50
INTRP 51
INTRP 52
INTRP 53

```

```
1 SUBROUTINE INTRP2(X,XIN,A)
C SUBROUTINE FOR GENERATING LAGRANGE INTERPOLATING
C COEFFICIENTS FOR TWO POINT INTERPOLATION
DIMENSION X(1),A(4)
A(1) = (XIN-X(2))/(X(1)-X(2))
A(2) = -(XIN-X(1))/(X(1)-X(2))
RETURN
END
```

INTRP2 2
INTRP2 3
INTRP2 4
INTRP2 5
INTRP2 6
INTRP2 7
INTRP2 8
INTRP2 9

```

1 SUBROUTINE INTRP3(X,XIN,A)
C SUBROUTINE FOR CALCULATING INTERPOLATION COEFFICIENTS FOR THREE POINT
C LAGRANGE INTERPOLATION
DIMENSION X(3),A(4)
A(1)=(XIN-X(2))*(XIN-X(3))/((X(1)-X(2))*(X(1)-X(3)))
A(2)=(XIN-X(1))*(XIN-X(3))/((X(2)-X(1))*(X(2)-X(3)))
A(3)=(XIN-X(1))*(XIN-X(2))/((X(3)-X(1))*(X(3)-X(2)))
RETURN
END
INTRP3 2
INTRP3 3
INTRP3 4
INTRP3 5
INTRP3 6
INTRP3 7
INTRP3 8
INTRP3 9
INTRP3 10

```

SUBROUTINE INTRP4

```

1 SUBROUTINE INTRP4(X,XIN,A)
2 INTRP4
3 C SUBROUTINE FOR CALCULATING INTERPOLATION COEFFICIENTS FOR FOUR POINT
4 INTRP4
5 C LAGRANGE INTERPOLATION
6 INTRP4
7 DIMENSION X(1:4),B(4),C(4)
8 INTRP4
9 CALL INTRP3(X,XIN,A)
10 CALL INTRP3(X(2),XIN,C)
11 TEMP1 = (XIN-X(3))/(X(2)-X(3))
12 TEMP2 = (XIN-X(4))/(X(2)-X(4))
13 A(1) = TEMP1 * B(1)
14 A(2) = (TEMP1 * B(2)) + (TEMP2 * C(1))
15 A(3) = (TEMP1 * B(3)) + (TEMP2 * C(2))
16 A(4) = (TEMP1 * B(4)) + (TEMP2 * C(3))
17 RETURN
18 END
19 INTRP4
20 INTRP4
21 INTRP4
22 INTRP4
23 INTRP4
24 INTRP4
25 INTRP4

```

```

1 SUBROUTINE LIFORAG(ALFA,DFLAPTE,DFLAPLE,CL,CO,CH,N,EC,AEROKC,CLAG, LIFORG
1 CNA0C,AERO,SURFCP,ALFS,DCP) LIFORG
2 DIMENSION AERO(23,3),CNA0C(3),EC(3),AEROKC(3),CLAC(3) LIFORG
3 DIMENSION SURFCP(3,3) LIFORG
4 PI=3.14159 LIFORG
5 HALFPI=1.5708 LIFORG
6 IF(ALFA.LE.0)270,280 LIFORG
7 270 IF(ALFA.LT.-PI)250,260 LIFORG
8 250 ALFA=ALFA+2.*PI LIFORG
9 GO TO 270 LIFORG
10 260 IF(ALFA.GT.PI)290,250 LIFORG
11 290 ALFA=ALFA-2.*PI LIFORG
12 GO TO 280 LIFORG
13 260 CONTINUE LIFORG
14 ALFS=ALFA LIFORG
15 IF(ALFA.GE.HALFPI)ALFS=PI-ALFA LIFORG
16 IF(ALFA.LT.0)ALFS=-ALFA LIFORG
17 IF(ALFA.LE.-HALFPI)ALFS=PI+ALFA LIFORG
18 CALFA=COS(ALFS) LIFORG
19 TANB=TAN(AERO(9,N)) LIFORG
20 TANA=0. LIFORG
21 IF(ALFS.LT.HALFPI)TANA=TAN(ALFS) LIFORG
22 CNA0=CNA0C(N) LIFORG
23 E=EC(N) LIFORG
24 AEROK=AEROK(N) LIFORG
25 CLA=CLAC(N) LIFORG
26 IF(ALFS.LE.AERO(9,N))10,20 LIFORG
27 DCNA0=AEROK*(COS(HALFPI*TANA/TANB)**2+4) LIFORG
28 DCP=AERO(11,N) LIFORG
29 DCP=SURFCP(1,N)*(CALFA-1.)+SURFCP(2,N)*SALFA LIFORG
30 GO TO 30 LIFORG
31 DCNAA=1.16-CNA0 LIFORG
32 IF(ALFS.LT.HALFPI)DCNAA=DCNAA*(1.-TANB/TANA)-1.55*SIN(PI*(1.-
33 5*TANB/TANA)**2*(AERO(11,N)-1.2*AERO(4,N)/AERO(3,N)))/((AERO
34 (9,N)-HALFPI)**2)+1.2*AERO(4,N)/AERO(3,N) LIFORG
35 DCP=(ALFS-AERO(9,N))*(SURFCP(3,N)-SURFCP(1,N))*COS(AERO(9,N)) LIFORG
36 -SURFCP(2,N)*SIN(AERO(9,N))/((HALFPI-AERO(9,N))+SURFCP(1,N))*
37 (COS(AERO(9,N))-1.)+SURFCP(2,N)*SIN(AERO(9,N)) LIFORG
38 CONTINUE LIFORG
39 CLP=(CLA*CALFA+(CNA0*DCNAA)*SALFA)*SALFA*CALFA LIFORG
40 AP=AERO(9,N)*AERO(23,N) LIFORG
41 IF(DFLAPTE.EQ.0.)190,200 LIFORG
42 CONTINUE LIFORG
43 DFLAP=DFLAPTE LIFORG
44 IF(ALFS.LE.AERO(9,N))40,50 LIFORG
45 DCL=AERO(13,N)*DFLAP+(AERO(16,N)-AERO(13,N))*DFLAP*ALFS/AERO(9,N) LIFORG
46 DCO=AERO(15,N)*DFLAP LIFORG
47 DCM=AERO(16,N)*DFLAP LIFORG
48 GO TO 80 LIFORG
49 50 IF(ALFS.GE.A9)60,70 LIFORG
50 DCL=0. LIFORG
51 DCO=0. LIFORG
52 DCM=0. LIFORG
53 GO TO 80 LIFORG
54 70 ASHAPE=(1.-((ALFS-AERO(9,N))/AERO(23,N))

```



```

DCL=AERO(14,N)*DFLAP+ASHAPE
DCD=AERO(15,N)*DFLAP+ASHAPE
DCM=AERO(16,N)*DFLAP+ASHAPE
80 CONTINUE
DCLTE=JCL
DCDTE=ABS(PCD)
DCMTE=DCM
90 TO 210
DCLTE=0.
DCDTE=0.
DCMTE=0.
70 IF(DFLAPLE.EQ.0.)220,230
230 CONTINUE
DFLAP=DFLAPLE
ALMAX=AERO(9,N)+AERO(17,N)*DFLAP
AB=ALMAX+AERO(22,N)
IF(ALFS.LE.ALMAX)140,150
100 DCL=AERO(14,N)*DFLAP+(AERO(19,N)-AERO(18,N))*DFLAP+ALFS/ALMAX
DCD=AERO(20,N)*DFLAP
DCM=AERO(21,N)*DFLAP
90 TO 180
150 IF(ALFS.GE.AB)160,170
160 DCL=0.
DCD=0.
DCM=0.
90 TO 180
170 ASHAPE=(1.-(ALFS-ALMAX)/AERO(22,N))
DCL=AERO(19,N)*DFLAP+ASHAPE
DCD=AERO(20,N)*DFLAP+ASHAPE
DCM=AERO(21,N)*DFLAP+ASHAPE
180 CONTINUE
DCLLE=JCL
DCULE=ARS(CDI)
DCMLE=DCM
90 TO 240
220 CONTINUE
DCLLE=0.
DCMLE=0.
240 CONTINUE
CLP=CLP+DCLTE+DCLLE
CDP=CDP+DTE+DCDLE
CM=DCMLE+DCMTE
1 IF(ALFA.GE.HALFPI.OR.(ALFA.LE.0..AND.ALFA.GT.-HALFPI))CLP=CLP+
2.*(DCLLE+DCLTE)
ALFI=CLP/(PI*AERO(2,N)*E)
CALFI=COS(ALFI)
SALFI=SIN(ALFI)
CL=CLP+CALFI+CDP+SALFI
CD=CLP+SALFI+CDP+CALFI
CD=ARS(CDI)
RETURN
END

```

59 LIFDRG
60 LIFDRG
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112 LIFDRG

1 SUBROUTINE PFACT(DIN,DOUT,RLP,RLN,PLP,PLN,TAU,ITRIM,DOUTO)
 C SUBROUTINE PFACT CALCULATES THE COMMANDED RATE FOR A GENERAL
 C P.C. ACTUATOR. THIS RATE IS INTEGRATED ALONG WITH THE EQUATIONS
 C OF MOTION TO OBTAIN OUTPUT DISPLACEMENT.

5 C C INPUTS.....

C C DIN COMMANDED DISPLACEMENT

C C DOUT INTEGRATED OUTPUT DISPLACEMENT

C C RLP RATE LIMIT, POSITIVE

C C RLN RATE LIMIT, NEGATIVE

C C PLP POSITION LIMIT, POSITIVE

C C PLN POSITION LIMIT, NEGATIVE

C C TAU ACTUATOR TIME CONSTANT

C C ITRIM A FLAG INDICATING MAIN ROUTINE IN TRIM OPTION

C C =0 TIME HISTORY, ETC.

C C =1 TRIMMING

C C OUTPUT.....

C C DOUTO ACTUATOR OUTPUT RATE

C C

20 C IF(ITRIM.EQ.1) GO TO 10

C

C IF(TAU.EQ.0.) GO TO 10

C C CALCULATE COMMAND RATE

C DOUTO= (1./TAU) * (DIN-DOUTO)

25 C C CHECK RATE LIMITS

C IF(DOUTO.LT.RLN) DOUTO= RLN

C IF(DOUTO.GT.RLP) DOUTO= RLP

C C LIMIT OUTPUT POSITION

C IF(DOOUT.GT.PLP) DOOUT=PLP

C IF(DOOUT.GE.PLP .AND. DOOUTO.GT.0.) DOOUTO=0.

C IF(DOOUT.LT.PLN) DOOUT=PLN

C IF(DOOUT.LE.PLN .AND. DOOUTO.LT.0.) DOOUTO=0.

C RETURN

35 C 10 DOUTO= 0.

C DOOUT= DIN

C RETURN

C END

PCACT 2
 PCACT 3
 PCACT 4
 PCACT 5
 PCACT 6
 PCACT 7
 PCACT 8
 PCACT 9
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 PCACT 40

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1 SUBROUTINE PLOT(A,IMAX,MOUT,NTAP)
  C3 DEBUG
  C3 STORES(NBUF,NLAST,M,IMAX,MOUT,NTAP)
  C3 ARRAYS(A,ORD)
5 C CALCOMP PLOTTING ROUTINE
  C THE TIME HISTORIES ARE STORED ON AN EXTERNAL DEVICE AS A BLOCK
  C FOR EACH TIME POINT
  C
  C NTAP EXTERNAL DEVICE WHERE TIME HISTORIES ARE STORED
  C MOUT NUMBER OF POINTS IN EACH BLOCK OF TIME HISTORY DATA. THESE POINTS
  C WILL BE V-VALUES OF TIME, BETA, ALPHA, Q, R, THETA, ETC.
  C NVAR NUMBER OF VARIABLES TO BE PLOTTED COUNTING TIME. NVAR=2 FOR A P
  C ALPHA VS. TIME FOR EXAMPLE.
  C A(I,J) IS A BUFFER STORAGE ARRAY. FORTY BLOCKS OF TIME HISTORY DATA ARE
  C READ FROM THE EXTERNAL DEVICE AND STORED IN THIS ARRAY. THE VAR
  C BEING PLOTTED IS STORED IN THE PLOTTING ARRAY JRD FOR THIS SEG
  C OF TIME AND FORTY MORE BLOCKS ARE THEN BROUGHT INTO THE ARRAY
  C THE EXTERNAL DEVICE
  C
  C IMAX..NUMBER OF DATA POINTS
  C TITLE1,TITLE2 LABEL OF PLOTS PRINTED IN TWO LINES
  C XI..MOVES PEN FROM LAST KNOWN POSITION TO LEFT HAND SIDE OF NEW PLOT
  C RIGHT,INCHES
  C YI..MOVES PEN FROM LAST KNOWN POSITION TO TOP OF NEW PLOT SET DOWN
  C MOREAD..WHEN MOREAD=1 PLOT CONTROL AND HEADING INFO ARE TO BE READ.
  C WHEN MOREAD=0 THIS INFO IS IDENTICAL TO PREVIOUS CASE AND IS NOT TO
  C BE READ
  C IOP = 1 FOR FIRST CALL TO SUBROUTINE, =0 FOR ALL OTHER CALLS
  C ICL = 1 FOR LAST CALL TO SUBROUTINE, =0 FOR ALL OTHER CALLS
  C NO'I' NUMBER OF THE VARIABLE TO BE PLOTTED AS DETERMINED BY ITS POSIT
  C IN THE OUTPUT SPECIFICATION (REFER TO A LISTING OF A TIME HISTO
  C ISYMH(I)..ISYMH(I)=1 NO SYMBOL IS PLOTTED.
  C ISYMH(I)=0 THROUGH 13 A SYMBOL FROM CALCOMP SYMBC TABLE IS
  C PLOTTED (SEE MANUAL)
  C IPT(I)..NUMBER OF DATA POINTS BETWEEN SYMBOLS
  C SV(I)..VALUE OF PLOTTED VARIABLE AT LOWER END OF SCALE
  C SDV(I)..SCALE FACTOR OF PLOTTED VARIABLE. UNITS/INCH
  C NOTE IF SV(I) AND SDV(I) ARE LEFT BLANK THE AUTOMATIC SCALING OPTION
  C SUPPLY VALUES FOR THE
  C
  C B(I)..SCALE LENGTH, INCHES
  C C(I)..Y-DISTANCE FROM LOWER LEFT HAND CORNER THIS PLOT TO UPPER
  C LEFT HAND CORNER OF NEXT PLOT. 0MMI, INCHES
  C YAO(I)..X-DISTANCE BETWEEN VERTICAL SCALE THIS PLOT AND VERTICAL
  C SCALE LAST PLOT (+ RIGHT), INCHES
  C X2SMFT(I)..X-DISTANCE BETWEEN LEFT SIDE OF THIS PLOT AND LEFT SIDE
  C OF LAST PLOT (+ RIGHT), INCHES
  C ITIME(I)..ITIME(I)-1 TIME SCALE IS PLOTTE'
  C ITIME=0 TIME SCALE IS NOT PLOTTED
  C NTITLE(I) NTITLE(I)=0 LABEL IS SUPPRESSED
  C NTITLE(I) NTITLE(I)=1 LABEL IS PRINTED
  C
  C LINE2 IS A TEST FOR PLOTTING A SECOND VARIABLE ON THE SAME PLOT AS THE
  C VARIABLE PRECEDING IT. THE ROUTINE WILL SET LINE2 EQUAL TO 1 WHENEVER
  C INPUT DATA INSTRUCTS THE ROUTINE TO PUT THE NEW VERTICAL SCALE IN THE
  C SAME PLACE AS THE PRECEDING ONE. WHEN LINE2 IS EQUAL TO 1 THE VARIABLE
  C BE PLOTTED AS A DASHED LINE ON THE PRECEDING SET OF AXES.
  C DIMENSION A(2,101,1,ORD),ABS(302), ABS(302), YAO(30), YAO(30),
  C 1 SDV(30),B(30),C(30),NC(30),YAO(30),YAO(30),TITLE(2),IBC(2),K2SMFT(30),
  C 2 ISYMH(30),ITIME(30),IPT(30),IFLAG(30)

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3  MTITLE(30),TITLE1(9),TITLE2(4)
INTEGER HEAD,TITL1,TITL2,TITL3,TITL4
DATA LINEZ /C/
DATA LAST-CLAST /C,0.0/
1004  FORMAT(3I3,1X,2A10,2F10.2,4F9.1,2I5)
1002  FORMAT(2F10.3,2I10)
1003  FMT(123M) TIME,SEC
1005  FORMAT(//5X,8A10)
1006  FORWAY ,A,2F10.2,4I10)
IBCD(1) =10H
IBCD(2) =10HME,SEC
1007  FORMAT(5X,3I3,1X,2A10,2F10.2,4F9.1,2I5)
HEAD(5,1C33) TITL1,TITL2
WRITE(6,1005) TITL1,TITL2
HEAD(5,1002) XI,YI,NVAR ,NOREAD,IOP,ICL
WRITE(5,1006) XI,YI,NVAR,NOREAD,IOP,ICL
IF(IOP.GT. 0) CALL PLJFS(5HCAL36.0,6,MPL0T,MFRAME)
IF(NOREAD.FQ. 0) GO TO 30
DO 10 I=1,NVAR
READ(5,1001) NO(I),ISYM(I),IPT(I),(HEAD(N,I),N=1,2),SV(I),
1 SDV(I),B(I),C(I),YAO(I),XZSHFT(I),ITIME(I),NTITLE(I))
WRITE(6,1007) NO(I),ISYM(I),IPT(I),(HEAD(N,I),N=1,2),SV(I),
1 SDV(I),B(I),C(I),YAO(I),XZSHFT(I),ITIME(I),NTITLE(I))
IFLAG(I)=0
IF(SOVI) .EQ. 0.) IFLAG(I)=1
10 CONTINUE
30 CALL PLOT(YI,XI,-3)
NBJF=IMAX
NLA=0
NBUF=NBJF+1
N=1
PEMIND NTAP
JJ=0
DO 200 L=1,NBUF
IF(L.EQ. NBUF) N=NLA
IF (N.EQ. 0) GO TO 200
DO 1236 I=1,N
READ (INTAP)(A(I,J),J=1,NOUT)
1236 CONTINUE
DO 201 I=1,N
JJ=JJ+1
201 00(JJ) =A(I,1)
200 CONTINUE
IF(IFLAG(1)) 204,204,205
204 00(IMAX+1)=SV(I)
OPD(IMAX+2)=SDV(I)
GO TO 206
205 CALL SCALING(ORD,8(1),IMAX+2)
SV(1)=OPD(IMAX+1)
SDV(1)=OPD(IMAX+2)
206 CONTINUE
DO 15 I=2,NVAR
IF(ISYM(I).GT. 13) ISYM(I) = 0
M=NO(I)
IF(N)15,15,14
14 DO 16 KD = 1,2

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72

PLOTTER 72
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PLOTTER 114
PLOTTER 115

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115      16 TTILA(KD)=HEAD(KD,I)
          IF(XSHFT(I).EQ.0.) GO TO 20
          CALL PLOT(0.,XSHFT(I),-3)
120      20 CALL PLOT (B(I),0.0,-3)
          M=1
          PENDING NTAP
          JJ=0
          DO 300 L=1,NBUF
            IF(L.EQ.NBUF) M=NLAST
            IF (M.EQ. 0) GO TO 300
            DO 1252 J=1,1
              READ (NTAP) (A(J,K),K=1,NOUT)
            1252 CONTINUE
            DO 301 J=1,M
              JJ=JJ+1
            301 ABS(JJ) I=A(J,M)
            300 CONTINUE
            IF(IFLAG(I)) 304,304,305
            304 ABS(IMAX+1)=SV(I)
              ABS(IMAX+2)=-SDV(I)
              GO TO 306
            305 CALL SCALING(ABS,B(I),IMAX+2)
              SV(I)=ABS(IMAX+1)
              SDV(I)=ABS(IMAX+2)
              ABS(IMAX+2)=-ABS(IMAX+2)
            306 CONTINUE
          C TEST TO SEE IF A SECOND LINE WILL BE PUT ON PRECEDING PLOT. IF 90, T
          C WILL NOT BE RE-DRAWN. THE SECOND LINE WILL BE PUT ON IN DASHED STYLE
          IF (B(I).EQ. BLAST .AND. B(I).EQ. CLAST .AND. X2SHFT(I).EQ. 0.)
            1 LINE2=1
            BLAST=B(I)
            CLAST=C(I)*(-1.)
            IF (LINE2.EQ. 1) GO TO 1937
            CALL AXIS(0.0,YA0(I),TTILA,20,0(I),100.0,SV(I),SDV(I))
            IF(IISYM(I).GE. 0) CALL SYMBOL(0.0,YA0(I)-.35,.07,IISYM(I),90.,-1)
            1937 CONTINUE
            IF(IISYM(I).LT. 0) IPT(I) = 0
            IF (LINE2) 1938,1938,1939
            1939 CONTINUE
            CALL LINE(ABS,ORD,IMAX,1,IPT(I),IISYM(I))
            GO TO 1940
            1939 CALL DASLIN(ABS,ORD,IMAX,1,0.0,0.03,1770308)
            1940 CONTINUE
            IF(IITIME(I).EQ. 0) GO TO 400
            YA=SV(I)/SDV(I)
            IMAX=SV(I)+B(I)*SDV(I)
            IF(YA.GT. 0) YA=-YA
            IF(SV(I).LT. 0 .AND. AMAX.LT. 0) YA=0.8
            IF(SV(I).GT. 0 .AND. AMAX.GT. 0) YA=0.0
            IF (LINE2.EQ. 1) GO TO 400
            CALL AXIS(YA,0.,4H ,-.4,B(I),90.,0.,SDV(I))
            XLABL=B(I)/2.-1.1
            CALL SYMBOL( .4,XLABL,.1,IBCD,90.,.20)
            CONTINUE
            400
            IF(TITLE(I).EQ. 0) GO TO 401
            IF (LINE2.EQ. 1) GO TO 401
            XLABL=B(I)/2.-.2.
120      116 PLOT
          117 PLOT
          118 PLOT
          119 PLOT
          120 PLOT
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          172 PLOT

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```

175 CALL SYMBOL( 0,XLABL,,1,TITLE1,90.,40)
    CALL SYMBOL( 1,XLABL,,1,TITLE2,90.,40)
    CONTINUE
    CALL PLOT (C(I),0.0,-3)
    LINEZ = 0
    15 CONTINUE
    100 CONTINUE
    180 IF(ICL.GT. 0) CALL PLOT(0.0.,999)
    RETURN
    END

```

```

PLOTTER 173
PLOTTER 174
PLOTTER 175
PLOTTER 176
PLOTTER 177
PLOTTER 178
PLOTTER 179
PLOTTER 180
PLOTTER 181
PLOTTER 182

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```

1  SUBROUTINE RUNGE
COMMON N,RT(7),R(100)
DIMENSION RTEMP(70),RI(70)
DO 205 I=1,N
RTEMP(I)=R(I+N)
DO 200 IC=1,4
TEMP=1.
GO TO (10,20,30),IC
10  TEMP=2.
30  RT(1)=RT(2)+T(3)/TEMP
DO 150 I=1,N
150  RI(I+N)=RI(I)+R (I)*RT(3)/TEMP
CALL DEQU
10  DO 152 I=1,N
152  RTEMP(I)=RTEMP(I)+TEMP*R (I)*RT(3)/6.
200  CONTINUE
RI(2)=RT(2)+RT(3)
DO 300 I=1,N
RI(I)=RTEMP(I)
RI(I+N)=RTEMP(I)
CALL DEQU
RETURN
ENTRY SETJP
CALL SYSEQS
CALL DEQU
DC 100 I=1,N
RTEMP(I)=R(I+N)
100  RI(I)=R(I+N)
RT(1)=RT(2)
RETURN
END

```

RUNGE 2
RUNGE 3
RUNGE 4
RUNGE 5
RUNGE 6
RUNGE 7
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RUNGE 30
RUNGE 31
RUNGE 32
RUNGE 33

```

1 SUBROUTINE SCALNG (X,M,M)
2 THIS SUBROUTINE IS FOR USE IN SCALING THE DATA TO BE PLOTTED WITH
3 THE GACOMP PLOTTER. X IS THE ARRAY OF POINTS, A IS THE LENGTH,
4 IN INCHES, OF THE AXIS TO BE USED, AND M IS THE NUMBER OF POINTS
5 PLUS 2. THE END PRODUCTS OF THIS ROUTINE ARE THE ADJUSTED MINIMUM,
6 STORED IN X(M-1), AND THE INCREMENT PER INCH OF SCALE STORED IN
7 X(M).
8 DIMENSION X(502)
9 N=M-2
10 DO 100 I=1,N
11 TEMP = X(I)
12 IF(I.GT.1) GO TO 50
13 XMIN = TEMP
14 XMAX = TEMP
15 GO TO 100
16 IF(TEMP.LE.XMIN) XMIN=TEMP
17 IF(TEMP.GE.XMAX) XMAX=TEMP
18 CONTINUE
19 X = ABS(XMAX-XMIN)
20 XICH = X/M
21 IF(XICH.EQ.0.) XICH = 1.
22 IF(XICH.GT.1.) GO TO 105
23 N=1
24 XICT = XICH*10.
25 IF(XICT.GT.1.) GO TO 132
26 XICT = XICT*10.
27 N=N+1
28 GO TO 133
29 N=0
30 XICT = XICH
31 IF(XICT.LE.10.) GO TO 132
32 M=N-1
33 XICT = XICT/10.
34 GO TO 134
35 IF(XICT.EQ.10.) GO TO 137
36 IF(XICT.LE.6.) GO TO 138
37 XIC = 10.
38 GO TO 200
39 IF(XICT.LE.2.) GO TO 139
40 XIC = 4.
41 GO TO 200
42 XIC = 2.
43 XINC = XIC*10.**(-N)
44 XMM=IFIX(XMIN/XINC)
45 XMY=XMIN
46 XMIN=FLOAT(XMM)
47 IF(XMM.GE.0.) GO TO 210
48 XMIN= XINC*(XMIN-1.)
49 GO TO 220
50 XMIN= XMIN*XINC
51 AMAX = XMIN + XINC*M + 0.25*XINC
52 IF(AMAX.GE.XMAX) GO TO 430
53 IF(XIC.LT.10.) GO TO 230
54 XINC = 20.*10.**(-N)
55 GO TO 300
56 IF(XIC.LT.4.) GO TO 240
57 XINC = 10.*10.**(-N)
58 SCALNG
59 SCALNG
60 SCALNG
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99 SCALNG
100 SCALNG

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69      GO TO 380
      XINC = 4.*10.**(-N)
      NXM = IFIX(XMN/XINC)
      XMIN = FLOAT(NXM)
      IF(XMN.GE.8.) GO TO 310
      XMIN = XINC*(XMIN-1.)
      GO TO 400
65      XMIN = XMIN*XINC
      X(M-1) = XMIN
      X(N) = XINC
      RETURN
      END
      SCALNG 59
      SCALNG 60
      SCALNG 61
      SCALNG 62
      SCALNG 63
      SCALNG 64
      SCALNG 65
      SCALNG 66
      SCALNG 67
      SCALNG 68
      SCALNG 69
      SCALNG 70

```

1	SUBROUTINE SEARCH(X,KARG,N,J) C BINARY SEARCH TECHNIQUE,I.E. SEARCH INTERVAL REDUCED BY 1/2 AT EACH C STEP	SEARCH	2
5	DIMENSION X(I) I=1 J=N	SEARCH	3
10	IF(J .EQ. 0 .OR. J .EQ. I .OR. J-I .EQ. 1) GO TO 7 IF(X(2) .LT. X(1)) GO TO 4 K=(I+J)/2 IF(XARG .GT. X(K)) GO TO 2 J=K GO TO 3	SEARCH	4
15	I=K IF(J-I .EQ. 1) GO TO 7 GO TO 1 K=(I+J)/2 IF(XARG .LT. X(K)) GO TO 5 J=K GO TO 6	SEARCH	5
20	I=K IF(J-I .EQ. 1) GO TO 7 GO TO 4 RETURN END	SEARCH	6
		SEARCH	7
		SEARCH	8
		SEARCH	9
		SEARCH	10
		SEARCH	11
		SEARCH	12
		SEARCH	13
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		SEARCH	24
		SEARCH	25

```

1      C      NBIG      SUBROUTINE SIMQ(A,B,N,DET,NBIG)
      C      DIMENSION SIZE
      C      DIMENSION A(1),B(1)
      C      FORWARD SOLUTION
      C      TOL=0.
      C      DET=1.
      C      JJ=N-NBIG
      C      DO 55 J=1,N
      C      JY=J+1
      C      JJ=JJ+NBIG
      C      BIGA=0.
      C      DO 30 I=J,N
      C      SEARCH FOR MAXIMUM COEFFICIENT IN COLJMN
      C      IJ=JJ+I
      C      IF(A3(BIGAI)-ABS(A(IJ))) 28,30,30
      C      BIGA=A(IJ)
      C      IMAX=I
      C      30 CONTINUE
      C      TEST FOR PIVOT LESS THAN TOLERANCE (SINGULAR MATRIX)
      C      IF(ABS(BIGAI).GT.TOL)GO TO 48
      C      DET=0.
      C      PETJRN
      C      INTERCHANGE ROWS IF NECESSARY
      C      DET=DET*BIGAI
      C      I1=J+NBIG*(J-2)
      C      IF(I1>MAX-J)
      C      IF(J.NE.IMAX) DET=-DET
      C      DO 50 K=J,N
      C      I1=I1+NBIG
      C      I2=I1+I
      C      SAVE=A(I1)
      C      A(I1)=A(I2)
      C      A(I2)=SAVE
      C      DIVIDE EQUATION BY LEADING COEFFICIENT
      C      A(I1)=A(I1)/BIGAI
      C      SAVE=B(IMAX)
      C      B(IMAX)=B(IJ)
      C      B(IJ)=SAVE/BIGAI
      C      ELIMINATE NEXT VARIABLE
      C      IF(J=N) 55,70,55
      C      IQS=NBIG*(J-1)
      C      DO 65 IX=JY,N
      C      IAJ=IQS+IX
      C      IT=J-IX
      C      DO 50 JX=JY,N

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B-79

2 SIMQ
3 SIMQ
4 SIMQ
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58 SIMQ

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60      IXJX=NBIG*(JX-1)*IX
        JX=IXJX+IT
        A(IXJX)=A(IXJX)-A(D J)*A(IJX)
        B(IX)=B(IK)-B(J)*A(IKJ)
        C
        C      BACK SOLUTION
        C
        65      NY=N-1
            IT=N*(NRIS+1)
            DO 80 J=1,NY
            IA=IT-J
            IB=N-J
            IC=N
            DO 80 K=1,J
            IA=IA-NBIC
            B(IB)=B(IB)-A(IA)*B(IC)
            80      IC=IC-1
        75      RETURN
            END
    
```

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SIMQ 59
SIMQ 60
SIMQ 61
SIMQ 62
SIMQ 63
SIMQ 64
SIMQ 65
SIMQ 66
SIMQ 67
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SIMQ 70
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SIMQ 72
SIMQ 73
SIMQ 74
SIMQ 75
SIMQ 76
SIMQ 77
    
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```

1 SUBROUTINE STLU(X,FX,L,KARG,U,KODE)
  C SINGLE TABLE LOCK-UP LAGRANGE INTERPOLATION J=F(X)
  DIMENSION X(1),FX(1),A(4)
  DATA LOCX,OXARG,KO/ 0.0,0.0 /
  CHECK FOR NECESSITY OF SEARCHING TABLES AND COMPUTING #EIGHTS
  K=IABS(KODE)
  IF( LOCF(K).EQ.LOCKX .AND. XARG.EQ.OXARG .AND. K.EQ.KO) GO TO 1
  LOCKX= LOCF(K)
  KO= IABS(KODE)
  OXARG= XARG
  CALL INTRPOLY,L,XARG,J,A,IABS(KODE))
  1 CONTINUE
  U=A(1)*FX(J-2)+A(2)*FX(J-1)+A(3)*FX(J)+A(4)*FX(J+1)
  RETURN
  END
15

```

STLU 2
STLU 3
STLU 4
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STLU 6
STLU 7
STLU 8
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STLU 10
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STLU 13
STLU 14
STLU 15
STLU 16

```

1 SUBROUTINE SYSEQS
COMMON/INDRIV/NDRIV
COMMON/INTRIM/INTRIM
COMMON NELS
C
C ***** SEGMENT 1 *****
C TIME,PRINT,ANU PLOT CONTROL PARAMETERS,INPUT
C
C COMMON T,TO,DT,THAX,OTPRNT,OTPLOT,TI
C
C ***** SEGMENT 2 *****
C VARIABLES TO BE INTEGRATED IN TIME
C
C COMMON UCOT,VDOT,WDOT,PDOT,QDOT,RDOT,D11,D12,D13D,D21D,D22D,
1 D23D,D31D,D32D,D33D,XEODT,YEODT,ZEODT,LELEVND,RELEVND,DRD,
2 TABD(2),PSID(2),THTD(2),DRCSO(10),FRCSAO(10),DFLAPHD,DFLAPD,
3 TFRACD(2)
C
C CONTROL SYSTEM VARIABLES TO BE INTEGRATED
C
C COMMON PCTRMD,PINTD,PETRMD,RCIRMD,RINTD,RETRMD,YEIRMD,QCIRMD,QINTD,
1 QETRMD,PTRMD,ZEOTRMD
C
C EULER ANGLE RATES TO BE INTEGRATED
C
C COMMON THETO,PHID,PSID
C
C STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED
C
C COMMON LMSYTKD,ROLLCO,YAWCO
C
C ***** SEGMENT 3 *****
C INTEGRATED VARIABLES
C
C COMMON U,V,W,P,Q,R,D11,D12,D13,D21,D22,
1 D23,D31,D32,D33,XE,YE,ZE,LELEVND,RELEVND,OR,
2 TAB(2),PSI(2),THT(2),DRCS(10),FRCSA(10),DFLAPH,DFLAPH,
3 TFRAC(2)
C
C INTEGRATED CONTROL SYSTEM VARIABLES
C
C COMMON PCTRMD,PINT,PETRM,RCTRM,RINT,RETRM,YTRM,QCTRM,QINT,
1 QETRM,PTRM,ZETRM
C
C EULER ANGLES
C
C COMMON THETA,PHI,PSI
C
C INTEGRATED STICK AND PEDAL FILTER VARIABLES
C
C COMMON LMSYTK,ROLLC,YAWC
C
C ***** SEGMENT 4 *****
C BASIC AIRCRAFT MASS, INERTIA, AND GEOMETRY CONSTANTS
C
C COMMON WT,IX,IY,IZ,IXZ,IFSCG,BLCG,HLCC,GC

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SYSEQS	NAMES
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SUBROUTINE SYSEQS      74/74  OPT=1
C
C   COMPUTED AIRCRAFT CONSTANTS
C
60  COMMON EAC,FAC,GAC,JX,JY,JZ,MASS,OMXJXZ
C
C   ..... SEGMENT 5 .....
C   ERRORS AND TOLERANCES FOR TRIM SOLUTION
C
65  COMMON TOL(19)
C   ..... SEGMENT 6 .....
C   AERO LIFT AND DRAG CONSTANTS AND TABLES.INPUT
C
70  COMMON AERO,AERO(23,3),SURECP(3,3)
C
C   EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH
C   SURFACE IN THE FOLLOWING ORDER: A,EXPOSED A, AREA EXPOSED AREA,
C   LAMBDA1/4, LAMBDA, TAPER RATIO, CLMAX, ALFAB, AB, COO, D/3, CLB/DF, CLMAX/DF,
C   COO/DF. SURFACE 1 IS WING, 2 IS HOR. STAB, 3 IS VERT. STAB.
C
75  C   COMPUTED AERO LIFT AND DRAG CONSTANTS
C
C   COMMON CNAO(3),AEROX(3),EOS(3),CLA(8)
C
C   ..... SEGMENT 7 .....
C   WING AERO CONSTANTS,INPJT
C
C   COMMON FSH,DLK1,BLH2,ML4,CH,8N,EKDA1,EKDA2,EIM,CL004,CL0CLM,CLRCLM
C   1 ,CLPH,CYBOM,CNRCL2H,CNRCL2H,CNRCDM,CNPLM,CNPGDM,CNBM,CNDFM
C   2 ,AEKEL,CY9CL2H
C
C   COMPUTED WING AERO CONSTANTS
C
C   COMMON XMING1,XMING2,YMING1,YMING2,ZMING1,ZMING2
C
C   ..... SEGMENT 8 .....
C   HORIZONTAL STABILIZER AERO CONSTANTS
C
C   COMMON FSH,BLM,MLH,CH,8H,EKAD,EIM,EOCLM,CNDFM,CN0H
C   1 ,OXHT0
C
C   COMPUTED HORIZONTAL STABILIZER CONSTANTS
C
C   COMMON XM,YH,ZH,XMEL,ZMEL,AMEL,OMEL
C
C   ..... SEGMENT 9 .....
C   VERTICAL STABILIZER AERO CONSTANTS
C
C   COMMON FSV,PLV,MLV,CV,BV,EKADR,EIV,EKV,CNOV
C   2 ,AEKRJO,TALFA(10),AALFA,TVEFF(10)
C
C   COMPUTED VERTICAL STABILIZER CONSTANTS
C
C   COMMON XV,YV,ZV
C
C   ..... SEGMENT 10 .....
C   FUSELAGE AERO CONSTANTS
C
C   COMMON FSF,BLF,HLF,AQOB,SOQMX,NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2,

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115 C 1 AOF,A1F,A2F,EN1,EN2,EN3,EN4,EN5,EN6,EN7
116 C 2 ,DPSFB,ADFSF1,ADFSF2,XYF
117 C
118 C COMPUTED FJSELAGE AERO CONSTANTS
119 C
120 C COMMON XF,VF,ZF
121 C
122 C ***** SEGMENT 11 *****
123 C DIRECT THRUST FORCE AND MOMENT CONSTANTS
124 C
125 C COMMON FSSM(2),BLSM(2),WLSM(2),SIGY,ELN,KAF11,KAF12,AEN2
126 C
127 C COMPUTED DIRECT THRUST CONSTANTS
128 C
129 C COMMON SSIGY,SSIGY,XT(2),YT(2),ZT(2)
130 C
131 C ***** SEGMENT 12 *****
132 C RAM FORCE AND MOMENT CONSTANTS
133 C
134 C COMMON FSLN(2),BLIN(2),ALIN(2),RINLET,AVOVI,AATJRY
135 C
136 C COMPUTED RAM CONSTANTS
137 C
138 C COMMON XIN(2),YIN(2),ZIN(2)
139 C
140 C ***** SEGMENT 13 *****
141 C CORIOLIS FORCE AND MOMENT CONSTANTS
142 C
143 C COMMON ELDUCT
144 C
145 C ***** SEGMENT 14 *****
146 C PROPULSION SYSTEM CONSTANTS
147 C
148 C COMMON AHACH,KBT1,KBT2,XM1,KM2,OMEGMX,PPHMX,RCS,APRAT
149 C 1 ,JENG,AFRAC,TAUAB,ABACCEL,ABDECEL,TA30N
150 C 2 ,TABOFF
151 C
152 C COMPUTED PROPULSION SYSTEM CONSTANTS
153 C
154 C COMMON KBT
155 C
156 C ***** SEGMENT 15 *****
157 C RCS FORCE AND MOMENT CONSTANTS
158 C
159 C COMMON ARSJET,ABL03,BLDREF,FRCSMX(10),DEYAND(10),BLDHOR(10),
160 C 1 RCSL(10,5),FSPS(10),BLRCS(10),LIRCS(10),THRCS(10),PSIRCS(10)
161 C
162 C COMPUTED RCS CONSTANTS
163 C
164 C COMMON FRC2SHXR,FRC5MX0,FRC5MX1,CTHTRCS(10),STHTRCS(10),CPSIRCS(10)
165 C 1 ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)
166 C
167 C ***** SEGMENT 16 *****
168 C CONTROL SYSTEM CONSTANTS
169 C
170 C PSEUDO-PILOT CONTROL SYSTEM CONSTANTS
171 C

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175      COMMON DUM,AKZED,AKZEE1,AKZEE2,AKYED,AKYEE,
1       AKJ,AKV,AKW,AKX,AKY,AKZ
176      CONTROL SYSTEM FUNCTION SWITCH CONSTANTS
177      COMMON GSV,VASH,CSI,THETSH
178      ROLL CONTROL SYSTEM CONSTANTS
179      COMMON TAKPC(8),THETA(8),TAKPE(8),TKPC11(8),ATHETA,TKPE11(8),
180      TKP(8),PELIM,AKOYDR,AKTHR,KDA
181      YAW CONTROL SYSTEM CONSTANTS
182      COMMON TAKRC(8),TAKRE(8),TKRC11(8),TKRE11(8),TKR(8),RELIM,
183      AKYTR1,PSIT1,KDR,TAKAY(8),ITY
184      FITCH CONTROL SYSTEM CONSTANTS
185      COMMON TAKQC(8),TAKQE(8),TKQC11(8),TKQE11(8),TKQ(8),QELIM,
186      AKPTRM,OSTK,KDE,KT4P
187      HEAVE CONTROL SYSTEM CONSTANTS
188      COMMON TAKZE(8),TKZE11(8),AKTHROT,ZELIM
189      CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS
190      COMMON ELEVRNF,PSITRF(2)
191      FLAP CONTROL SYSTEM CONSTANTS
192      COMMON KHFLAP1,KHFLAP2,KMFLAP1,KMFLAP2
193      DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS
194      COMMON AQBAR,TQBAR(8)
195      STICK AND PEDAL FILTER TIME CONSTANT TABLES
196      COMMON TITCH(8),TTROLL(8),TTYAH(8)
197      ACTUATION CONSTANTS
198      COMMON LEJRATL,LELRATL,LEUPOSL,LELPOS,LELIL,
199      REJRATL,RELATL,REUPOSL,RELPOS,REL,
200      DRJRATL,DRLRATL,DRUPOSL,DRLPOS,DRJ,
201      HFJRATL,HFLRATL,HFLAPX,HFLAPHN,TF,
202      WFJRATL,WFLRATL,WFLAPX,WFLAPHN,TF,
203      THURL(2),THLRL(2),THJPL(2),THLPL(2),TTHT(2),
204      PSILPL(2),PSILPL(2),PSILPL(2),TPSIT(2),
205      PCSUPL(10),RCSLRL(10),KCSUPL(10),RCSLPL(10),TAJRC(10),
206      ,FRCSJRL(10),FRCSLRL(10),FRCSUPL(10),FRCSLPL(10),TAUFRG,(10)
207      ,DELIM,DALIM,ORLIM
208
209      C
210
211
212
213
214
215      C***** SEGMENT 17 *****
216      C ACTUATION CONSTANTS
217
218      COMMON LEJRATL,LELRATL,LEUPOSL,LELPOS,LELIL,
219      REJRATL,RELATL,REUPOSL,RELPOS,REL,
220      DRJRATL,DRLRATL,DRUPOSL,DRLPOS,DRJ,
221      HFJRATL,HFLRATL,HFLAPX,HFLAPHN,TF,
222      WFJRATL,WFLRATL,WFLAPX,WFLAPHN,TF,
223      THURL(2),THLRL(2),THJPL(2),THLPL(2),TTHT(2),
224      PSILPL(2),PSILPL(2),PSILPL(2),TPSIT(2),
225      PCSUPL(10),RCSLRL(10),KCSUPL(10),RCSLPL(10),TAJRC(10),
226      ,FRCSJRL(10),FRCSLRL(10),FRCSUPL(10),FRCSLPL(10),TAUFRG,(10)
227      ,DELIM,DALIM,ORLIM
228
229      C

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C ..... SEGMENT 18 .....
C C LIFT-DRAG VARIABLES
C
C ..... SEGMENT 19 .....
C C WING AERO VARIABLES
C
C ..... SEGMENT 20 .....
C C HORIZONTAL STABILIZER AERO VARIABLES
C
C ..... SEGMENT 21 .....
C C VERTICAL STABILIZER AERO VARIABLES
C
C ..... SEGMENT 22 .....
C C FUSELAGE AERO VARIABLES
C
C ..... SEGMENT 23 .....
C C DIRECT THRUST FORCE AND MOMENT VARIABLES
C
C ..... SEGMENT 24 .....
C C RAM FORCE AND MOMENT VARIABLES
C
C ..... SEGMENT 25 .....
C C CORIOLIS FORCE AND MOMENT VARIABLES
C
C ..... SEGMENT 26 .....
C C PROPULSION SYSTEM VARIABLES

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230 NAMES
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C
COMMON MDOT(2),RPH(2),TRST(2),BLDAVL,FGMAX,FGMIN,FGIDL,MOTRX,
1  TQSP:F,TQDAV,TRQ(2),PRATIO,FRPH,K4JT,K8T,TRCS,TC(2)
2  ,HE(2),TFRACC(2),TFRACIN,FRACL,TENG,TFRACE,TABIN,BLOT3,TABE
3  ,TO(2)
290
C
C ***** SEGMENT 27 *****
C RCS FORCE AND MOMENT VARIABLES
295
COMMON DXRCS,DYRCS,DZRCS,DLRCS,DHRCS,DNRCS,DFRCS08,DFRCS0D,FRCS(10)
1  ,BLDPEQ,FRCSAL,FRCSLU,FRCSG(10),DXRC(10),DYRC(10),DZRC(10),
2  DRCSC(10),BLD,FRCS08
296
C
C ***** SEGMENT 28 *****
C CONTROL SYSTEM VARIABLES
300
C
C PSEUDO-PILOT CONTROL SYSTEM VARIABLES
305
COMMON ZEE,ZEIC,VLE,VEIC,DXE,DYE,DZE,XES,YES,ZES
C
C CONTROL SYSTEM FUNCTION SWITCH VARIABLES
310
COMMON CSSM
C
C ROLL CONTROL SYSTEM VARIABLES
COMMON ROLLCMD,DLATK,AKPC,AKPCI,PCMD,AKPE,AKF,I,PE,OROLL
315
C
C YAW CONTROL SYSTEM VARIABLES
COMMON YAWCMD,OPED,AKRC,AKSCI,YTRMBUT,RE,AKRE,AKREI,DYAN,AKAY
320
C
C PITCH CONTROL SYSTEM VARIABLES
COMMON DLNGSTK,AKQC,AKQCI,PTRNBUT,QE,AKQE,AKQEI,OPITCH
325
C
C HEAVE CONTROL SYSTEM VARIABLES
COMMON ZETJC,ZEDTE,AKZE,AKZEI,DTHROT
C
C ACTUATION SYSTEM INPUT VARIABLES
COMMON DSIDEF,DNORHF,PSITC(2),THYC(2),DEC,DRG,DAC,DRCSR,DRCSF,
1  DRCSY,DPCSSF,DRCSNF,TC40,HFLAPC,MFLA2G,LELEVNC,RELEVNC
330
C
C ADDITIONAL CONTROL SYSTEM VARIABLES
COMMON AKPCI,AKPEI,AKP,AKKCI,AKREI,AKR,AKQCI,AKQEI,AKQ,
1  AKZEI,CSVSN,TPITCH,TROLL,TYAN
335
C
C ***** SEGMENT 29 *****
C AIR DATA VARIABLES
COMMON UAS,VAS,WAS,RHO,TAMB,VUSOUND,TRATIO,PRATIO,VA,VK,HN,QBAR,
1  ALPH,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA
340
C

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Line No.	Code	Description	Line No.
343	C	TOTAL AERO FORCE AND MOMENT VARIABLES	NAMES
344	C	COMMON XAERO, YAERO, ZAERO, LAERO, MAERO, NAERO	NAMES
345	C	TOTAL FORCE AND MOMENT VARIABLES	NAMES
346	C	COMMON SUMFX, SUMFY, SUMFZ, SUHL, SUMH, SUMN	NAMES
347	C	CORRECTED DIRECTIONAL COSINES	NAMES
348	C	COMMON D11P, D12P, D13P, D21P, D22P, D23P, D31P, D32P, D33P, DCNAG	NAMES
349	C	MISCELLANEOUS VARIABLES	NAMES
350	C	COMMON UAIR, VAIR, WAIR, ALT, RS, PS, BLOT(1,3)	NAMES
351	C	1 GYROL, GYROM, CYRON, NXCG, NYCG, NZCG	NAMES
352	C	2 XDM, YDM, ZDM, BLOT2(3), LPRIME, NPRIME	NAMES
353	C	3 VE, VEDT, VEEST	NAMES
354	C	***** SEGMENT 30 *****	NAMES
355	C	TABLES FOR RAM FORCES AND MOMENTS	NAMES
356	C	COMMON VOVIT(5), ATURN(8), ELRANT(5,8), DTURN(5,8), ETART(5,8)	NAMES
357	C	***** SEGMENT 31 *****	NAMES
358	C	TABLES FOR RCS FORCES AND MOMENTS	NAMES
359	C	COMMON FR2ST(6), BLDRT(6)	NAMES
360	C	***** SEGMENT 32 *****	NAMES
361	C	THRUST TABLES	NAMES
362	C	COMMON MNT(4), TFGMAX(4), TFGHM(4), TFGIOL(4), THDT(4), TFRAT(6),	NAMES
363	C	1 TRM(5), TFRACT(10), TACCEL(10), TJECEL(10), TTENG(10)	NAMES
364	C	***** SEGMENTS 33 THRU 38 *****	NAMES
365	C	STABILITY DERIVATIVES	NAMES
366	C	SEGMENT 33	NAMES
367	C	COMMON DX4G(25), DXHS(25), DXVS(25), DXFS(25), DXAER(25), DXTS(25),	NAMES
368	C	1 DXRAM(25), DXCLS(25), DXRCSF(25), X(25)	NAMES
369	C	SEGMENT 34	NAMES
370	C	COMMON DY4G(25), DYHS(25), DYVS(25), DYFS(25), DYAER(25), DYTS(25),	NAMES
371	C	1 DYRAM(25), DYCLS(25), DYRCSF(25), Y(25)	NAMES
372	C	SEGMENT 35	NAMES
373	C	COMMON DZ4G(25), DZHS(25), DZVS(25), DZFS(25), DZAE(25), DZTS(25),	NAMES
374	C	1 DZRAM(25), DZCLS(25), DZRCSF(25), Z(25)	NAMES
375	C	SEGMENT 36	NAMES
376	C	COMMON DL4G(25), DLHS(25), DLVS(25), DLFS(25), DLAE(25), DLTS(25),	NAMES
377	C	1 DLRAM(25), DLCLS(25), DLRCSF(25), L(25)	NAMES
378	C	SEGMENT 37	NAMES
379	C	COMMON DM4G(25), DMHS(25), DMVS(25), DMFS(25), DMAER(25), DMTS(25),	NAMES
380	C	1 DMRAM(25), DMCLS(25), DMRCSF(25), M(25)	NAMES
381	C	SEGMENT 38	NAMES
382	C	COMMON DN4G(25), DNHS(25), DNVS(25), DNFS(25), DNAER(25), DNTS(25),	NAMES
383	C	1 DNRAM(25), DNCLS(25), DNRCSF(25), N(25)	NAMES
384	C	SEGMENT 39	NAMES
385	C	COMMON DO4G(25), DOHS(25), DOVS(25), DOFS(25), DOAER(25), DOTTS(25),	NAMES
386	C	1 DORAM(25), DOCLS(25), DORCSF(25), O(25)	NAMES
387	C	SEGMENT 40	NAMES
388	C	COMMON DP4G(25), DPHS(25), DPVS(25), DPFS(25), DPAER(25), DPTTS(25),	NAMES
389	C	1 DPRAM(25), DPCLS(25), DPRCSF(25), P(25)	NAMES
390	C	SEGMENT 41	NAMES
391	C	COMMON DQ4G(25), DQHS(25), DQVS(25), DQFS(25), DQAER(25), DQTS(25),	NAMES
392	C	1 DQRAM(25), DQCLS(25), DQRCSF(25), Q(25)	NAMES
393	C	SEGMENT 42	NAMES
394	C	COMMON DR4G(25), DRHS(25), DRVS(25), DRFS(25), DRAER(25), DRTTS(25),	NAMES
395	C	1 DRAM(25), DRCLS(25), DRCSF(25), R(25)	NAMES
396	C	SEGMENT 43	NAMES
397	C	COMMON DS4G(25), DSHS(25), DSVS(25), DSFS(25), DSAER(25), DSTTS(25),	NAMES
398	C	1 DSAM(25), DSCLS(25), DSRCSF(25), S(25)	NAMES
399	C	SEGMENT 44	NAMES
400	C	COMMON DT4G(25), DTHS(25), DTVS(25), DTFS(25), DTAER(25), DTTTS(25),	NAMES
401	C	1 DTRAM(25), DTCLS(25), DTRCSF(25), T(25)	NAMES

400	C	DERIVATIVE CONTROL	480	NAMES
	C	COMMON ADER,DELV(25)	401	NAMES
	C	SEGMENT 39	402	NAMES
405	C	COMMON ADER,DELV(25)	403	NAMES
	C	SEGMENT 40	404	NAMES
	C	SCRATCH COMMON	405	NAMES
	C	COMMON WORK(50)	406	NAMES
410	C	MISCELLANEOUS CONSTANTS	407	NAMES
	C	SEGMENT 41	408	NAMES
	C	COMMON AMIND,VMIND,PSIMIND,XE20,YE20,ZE20	409	NAMES
415	C	IRMTJRN,GAMMA,VADOT,TURNRAD	410	NAMES
	C	SEGMENT 42	411	NAMES
	C	AERO SURFACE EFFECTIVENESS TABLES	412	NAMES
420	C	COMMON ELEVT(7),EKELET(7),RUDT(7),EKRUOT(7)	413	NAMES
	C	SEGMENT 43	414	NAMES
	C	PILOT INPUT CONTROL DATA	415	NAMES
425	C	COMMON ACHQ(5),ATIME,ASKEEP,AYEHLD,CHDT1(20),CHDT2(20),	416	NAMES
	C	1 CHDT3(20),CHDT4(20),CHDT5(20),TINET(20),ATRANS,AVAT,YTRANS,	417	NAMES
	C	2 THROIT(10),VAT(10),THETCF(10)	418	NAMES
430	C	SEGMENT 44	419	NAMES
	C	TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LAWS	420	NAMES
	C	SEGMENT 45	421	NAMES
	C	COMMON ADCSM,TCSSM(5),TAKQS(5),TKPINT(5),TKPHI(5),TKPB(5),	422	NAMES
	C	1 TKPSI(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKPSI(5),TKRB(5),	423	NAMES
	C	2 TAKPEI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKZCI(5),TAKQEI(5),	424	NAMES
	C	3 TKRS(5),AKPHIS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,AKRINT,	425	NAMES
	C	4 AKPSI,AKRB,AKRS,AKJS	426	NAMES
435	C	SEGMENT 45	427	NAMES
	C	TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS #HIGH	428	NAMES
	C	VARY AS FUNCTIONS OF AIRSPEED	429	NAMES
440	C	SEGMENT 45	430	NAMES
	C	COMMON VELGAIN,AVEL,TVEL(8),VAKPC(8),VKPCI(8),VKPEI(8),VKP(8),	431	NAMES
	C	1 VAKPE(8),VAKRC(8),VKRCI(8),VKREI(8),VKRI(8),VAKRC(8),VAKQC(8)	432	NAMES
	C	2 ,VKQCI(8),VKQI(8),VKQI(8),VAKQE(8),VAKZE(8),VKZEI(8)	433	NAMES
	C	3 ,VTPTICH(8),VTROLL(8),VTYAH(8)	434	NAMES
445	C	REAL LANSI	435	NAMES
	C	REAL LNGSTK,LNGSTKO	436	NAMES
	C	REAL IA,IV,IZ,IXZ,JX,JY,JZ,MASS	437	NAMES
	C	REAL NFOO,MOQ,MOQX1,MOQX2,NOQMX1,NOQMX2	438	NAMES
450	C	REAL KBT1,KBT2,KM1,KY2,KBT	439	NAMES
	C	REAL KPSIT,KTHTP,KTHTR,KOE,KDR,KDA,<TY	440	NAMES
	C	REAL LWP,NWP,NM,LW,MH	441	NAMES
	C	REAL NFOQ,MOQ,MOQI,NOQI	442	NAMES
	C	REAL KHFLAP1,KHFLAP2,KAF LAP1,KAF LAP2	443	NAMES
	C	REAL MOOT,MOOTX,KMDT,K3TP	444	NAMES
455	C	REAL KAF T1,KAF T2,KAF T	445	NAMES
	C		446	NAMES
	C		447	NAMES
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REAL LAE90,MAERO,NAERO
REAL LELEPOST,LELRATL,LEUPOS,LEURATL,LPRI,MPRIME
REAL LELEVNO,LELEVN,LELEVNG,MNT,MF,MN
REAL JENG
REAL NXCG,MYCG,NZCG
DIMENSION DRCSN(9)
EQUIVALENCE (DRCSN(1),JRCNS)
IF(MCALC.VE.0)GO TO 1000
ONE TIME ONLY CALCULATIONS FOR KINEMATICS
C
EAC=(IZ-IX)/IX
FAC=(IY-IX)/IZ
GAC=(IZ-IX)/IY
JX=-IXZ/IX
JY=-IXZY
JZ=-IXZIZ
MASS=MT/G2
OMXJZ=1.-JK*JZ
NRCSJET=IFIX (ARCSET)
NEKEL=IFIX (AEKEL)
NEKRUD=IFIX (AEKRUD)
NFRAC=IFIX ( FRAU)
NVAT=IFIX (AVAT)
NTHETA=IFIX (ATHETA)
NOBAR=IFIX (AQBARI)
NVEL=IFIX (AVEL)
WCSS4=IFIX (ACSS4)
NENG=IFIX (AENG)
MMACH=IFIX (AMACHI)
KBT=KBT+3DREF+KBTZ
NTIME=IFIX (ATIME)
MCALG=1
1000 CONTINUE
C
C THRUST VECTORING COMMANDS
C
C SINCE NO DYNAMICS SET ACTUATOR OUTPUTS EQUAL TO INPUTS
        
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PSITC(1)=<PSIT*OYAH+AKYOR*OROLL+PSITRF(1)
PSITC(2)=<KPSIT*OYAH+AKDYOR*OROLL+PSITRF(2)
THTC(1)=<KTHTP*UPITCH+KTATR*OROLL
THTC(2)=<KTHTP*DPITCH-KTHTR*OROLL
WFLAPC=KMF LAPI*ALPH+KMF LAP2
WFLAPC=KMF LAPI*ALPH+KMF LAP2
DRC=KDR*OYA+AKDYOR*OROLL
TC(1)=TCH/AENG+KTY*OYAH
TC(2)=TCH/AENG+KTY*OYAH
TC(1)=TC(1)/KBT
TC(2)=TC(2)/KBT
IF(NOPIV.VE.0)GO TO 100
TO(1)=TC(1)
TO(2)=TC(2)
DRCSP=DPULL
OKCSP=DPITCH
DPCSY=OYAH
        
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515 DRCSF=DSIOEF
DPCSNF=DNORMF
DEC=KDE*DPITCH
DAG=KDA*OPOLL
DR=DRC
PSIT(1)=PSITC(1)
PSIT(2)=PSITC(1)
THT(1)=THTC(1)
THT(2)=THTC(2)
DFLAPH=HFLAPC
DFLAPH=HFLAPC
IF(DFLAPH.GE.HFLAPMX)DFLAPH=HFLAPMX
IF(DFLAPH.LE.HFLAPMN)DFLAPH=HFLAPMN
IF(DFLAPH.GE.HFLAPMX)DFLAPH=HFLAPMX
IF(DFLAPH.LE.HFLAPMN)DFLAPH=HFLAPMN
100 CONTINUE
530 CALL STLU(PIUDT,EKRUDT,NEKRUD,ABS(DR),EKRU,2)
DRP=DR*EKRU
DO 10 I=1,NRCSJET
DRCS(I)=0.
DC 10 J=1,5
DRCS(I)=RCSL(I,J)*DRCSN(J)+DRCS(I)
10 CONTINUE
DO 20 I=1,NRCSJET
DRCS(I)=DRCS(I)
20 CONTINUE
LELEVN=ELEVNR*DEC+DAC
RELEVN=ELEVNR*DEC+DAC
LELEVN=LELEVN
RELEVN=RELEVN
CALL STLU(ELEVT,EKELET,NEKELET,ABS(LELEVN),EKELEL,2)
CALL STLU(ELEVT,EKELET,NEKELET,ABS(RELEVN),EKELEL,2)
DA1=LELEVN*EKELEL
DA2=RELEVN*EKELEL
C
C
C PROPULSION SYSTEM INITIALIZATION
CALL STLU(MNT,TFGMAX,NMACH,MN,FGMAX,2)
CALL STLU(MNT,TFGIDL,NMACH,MN,FGIDL,2)
CALL STLU(MNT,TFGHIN,NMACH,MN,FGHIN,2)
DO 213 I=1,NENG
TFRAC(I)=TO(I)/FGHIN
TAB(I)=0.
IF(TFRAC(I).GE.1.)211,213
211 TAB(I)=TFRAC(I)-1.
TFRAC(I)=1.
213 CONTINUE
C
C INITIALIZE CONTROL SYSTEM FUNCTION SWITCH
C
C
C
C
C
C
C INITIALIZE ROLL CONTROL SYSTEM
CALL STLU(ICSSHI,TKPINT,NCSSM,CSSH,AKPINT,2)
CALL STLU(ICSSHI,TKPHI,NCSSM,CSSH,AKPHI,2)

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SYSEQS 56
SYSEQS 57
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SYSEQS 105
SYSEQS 106
SYSEQS 107
SYSEQS 108
SYSEQS 109
SYSEQS 110
SYSEQS 111
SYSEQS 112

16-1

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PHISM=1.-CSSM
IF(AKPHI.EQ.1.)261,262
261 PHISM=1.
P(CTR)=PHI
262 IF(AKPINT.EQ.1.)263,264
263 PHISM=0.
P(CTR)=P4I
PINT=PHI
264 CONTINUE
PETR=JROLL
500
C
C INITIALIZE YAW CONTROL SYSTEM
C
CALL STLU(TCSSM1,TKRINT,NCSSM,CSSM,AKRINT,2)
CALL STLU(TCSSM1,TKPSI,NCSSM,CSSM,AKPSI,2)
PSISM=1.-CSSM
IF(AKPSI.EQ.1.)271,272
271 PSISM=1.
P(CTR)=PSI
272 IF(AKPINT.EQ.1.)273,274
273 PSISM=0.
R(CTR)=PSI
274 CONTINUE
RETR=DYAD
YEIC=YE
590
C
C INITIALIZE PITCH CONTROL SYSTEM
C
CALL STLU(TCSSM1,TKQINT,NCSSM,CSSM,AKQINT,2)
CALL STLU(TCSSM1,TKMETA,NCSSM,CSSM,AKMETA,2)
THETA=1.-CSSM
IF(AKMETA.EQ.1.)251,252
251 THETA=1.
Q(CTR)=THETA
252 IF(AKQINT.EQ.1.)253,254
253 THETA=0.
Q(CTR)=THETA
QINT=THETA
254 CONTINUE
Q(CTR)=DPITCH
610
C
C INITIALIZE HEAVE CONTROL SYSTEM
C
TTHROT=TCMD
DTHROT=(1./AKTHROT)*TTHROT
THROTIC=DTHROT
ZEIC=ZE
500 CONTINUE
RETURN
620
C
C WHEN CALCULATING TIME HISTORIES, SYSEQS IS ENTERED AT THIS POINT
C
ENTRY DEQU
525
C
C
C
1 DC MAG=011*022*033+012*023*031+013*032*021-011*032*023-012*021*033
-013*022*031

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SYSEQS 113
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SYSEQS 164
SYSEQS 165
SYSEQS 166
SYSEQS 167
SYSEQS 168
SYSEQS 169

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011P=0.5*(011*(022*033-032*023)/DCMAG)
021P=0.5*(021*(032*013-012*033)/DCMAG)
031P=0.5*(031*(012*023-022*013)/DCMAG)
012P=0.5*(012*(031*023-021*033)/DCMAG)
022P=0.5*(022*(011*033-031*013)/DCMAG)
032P=0.5*(032*(021*013-011*023)/DCMAG)
013P=0.5*(013*(021*032-031*022)/DCMAG)
023P=0.5*(023*(031*012-011*032)/DCMAG)
033P=0.5*(033*(011*022-021*012)/DCMAG)
C
C BODY AXIS COMPONENTS OF WIND VELOCITY
C
UAIR=011P*XM+021P*YM+031P*ZD4
VAIR=012P*XM+022P*YM+032P*ZD4
WAIR=013P*XM+023P*YM+033P*ZD4
C
C AIRSPEED COMPONENTS
C
UASU=JAIR
VAS=VAIR
WAS=WAIR
C
C AIRSPEED, ALPHA, AND BETA
C
VA=SQRT(UAS*UAS+VAS*VAS+WAS*WAS)
ALPH=ATAN2(WAS,UAS)
BETA=0.
IF(VA.NE.0.)BETA=ASIN(VAS/VA)
ALFAD=0.
U2PH2=UAS*UAS+WAS*WAS
IF(U2PH2.NE.0.)ALFAD=(UAS*WOOT+WAS*WOOT)/J2PH2
CALL FORCESID.)
C
C PSEUDO PILOT FUNCTION IMPLEMENTATION
C
ISKEEP=1 ACTIVATES STATIONKEEPING LOG>S
ICMD=1 READS INPUT TIME HISTORY OF LONGITUDINAL STICK DEFLECT.
ICMD=2 READS INPUT TIME HISTORY OF LATERAL STICK DEFLECTION
ICMD=3 READS INPUT TIME HISTORY OF PEDAL DEFLECTION
ICMD=4 READS INPUT TIME HISTORY OF HEAVE CONTROL DEFLECTION
ICMD=5 READS INPUT TIME HISTORY OF THROTTLE DEFLECTION
C
ITRANS=1 ACTIVATES PSEUDO-PILOT FLOWN TRANSITION
C
C PSEUDO-PILOT TRANSITION LOGIC
C
ITRANS=IFX(ATRANS)
IF(ITRANS.EQ.0)GO TO 311
IF(170*GE.TTRANS.AND.T0.EQ.1)310,311
310 CONTINUE
VE=SQRT(U*U+V*V+W*W)
IF(VE.EQ.0.)312,313
313 VEOT=(U*UOJOT+V*VOJOT+W*WOJOT)/VE
GO TO 314
312 VEOT=0.

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SYSEQS 225
SYSEQS 226

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685      314 CONTINUE
        VEEST=VE+VEDT*DT
        CALL SILU(VAT,THECT,NVAT,VE,THECT1,2)
        CALL SILU(VAT,THECT,NVAT,VEEST,THECT2,2)
        THECTD1=(THECT2-THECT1)/DT
        IF((THECT1.GE.1.57DB)) THECT1=1.57DB
        DLNGSTK=(THECTD1
        CALL SILU(VAT,THROTT,NVAT,VE,DTHROT,2)
        311 CONTINUE
C
695      C PSEUDO-PILOT STATIONKEEPING LOGIC
C
        ISKEEP=IFIX(ASKEEP)
        IF((ISKEEP)306,307)
        306 CONTINUE
        ZES=-D13P*(YE+AKH*ZEDOT)-D23P*(YE+AKH*VEDOT)
        YES=-D12P*(XE+AKV*ZEDOT)-D22P*(XE+AKV*VEDOT)
        DLNGSTK=AKZFS*ZES
        DLATSTK=AKYLS*YES
        ZEDIC=AKYES*(ZEIC-ZE-AKV*ZEDOT)
        307 CONTINUE
C
705      C PSEUDO-PILOT OPEN LOOP INPUTS
C
        DO 355 I=1,5
        ICMD=IFIX(ICMD(I))
        IF((ICMD).EQ.0)GO TO 355
        GO TO (350,351,352,353,354),ICMD
        350 CALL SILU(TIMEI,CHDT1,NTIME,I,DLNGSTK,2)
        GO TO 355
        351 CALL SILU(TIMEI,CHDT2,NTIME,I,DLATSTK,2)
        GO TO 355
        352 CALL SILU(TIMEI,CHDT3,NTIME,I,DPED,2)
        GO TO 355
        353 CALL SILU(TIMEI,CHDT4,NTIME,I,ZEDIC,2)
        GO TO 355
        354 CALL SILU(TIMEI,CHDT5,NTIME,I,THROT,2)
        DTHROT=THROTIC+THROT
        355 CONTINUE
C
725      C CONTROL SYSTEM FUNCTION SWITCH. FUNCTION OF AIRSPEED.
C
        CSSM=0.
        IF((VA-VASH).LE.0.1)CSSM=1.
C
730      C VELGAIN.NE.0. INDICATES CONTROL SYSTEM GAINS ARE LOADED AS A
        C FUNCTION OF AIRSPEED
C
        IF((VELGAIN.NE.0.1)400,401)
        400 CONTINUE
        CALL SILU(TVEL,VAKP2,NVEL,VA,AKPC,2)
        CALL SILU(TVEL,VKPCI1,NVEL,VA,AKPCI1,2)
        CALL SILU(TVEL,VKPEI1,NVEL,VA,AKPEI1,2)
        CALL SILU(TVEL,VKP,NVEL,VA,AKP,2)
        CALL SILU(TVEL,VAKPE,NVEL,VA,AKPE,2)
        CALL SILU(TVEL,VKRC,NVEL,VA,AKRC,2)
        CALL SILU(TVEL,VKRCI1,NVEL,VA,AKRCI1,2)
        227 SYSEQS
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        283 SYSEQS

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Line No.	Code	Text	Line No.
745		CALL STLU(TVEL,VKREI1,NVEL,VA,AKREI1,2)	284 SYSEQS
		CALL STLU(TVEL,VKR,NVEL,VA,AKR,2)	285 SYSEQS
		CALL STLU(TVEL,VAKRE,NVEL,VA,AKRE,2)	286 SYSEQS
		CALL STLU(TVEL,VAKQC,NVEL,VA,AKQC,2)	287 SYSEQS
		CALL STLU(TVEL,VKQCI1,NVEL,VA,AKQCI1,2)	288 SYSEQS
		CALL STLU(TVEL,VKQEI1,NVEL,VA,AKQEI1,2)	289 SYSEQS
		CALL STLU(TVEL,VKQ,NVEL,VA,AKQ,2)	290 SYSEQS
750		CALL STLU(TVEL,VAKQE,NVEL,VA,AKQE,2)	291 SYSEQS
		CALL STLU(TVEL,VAKZE,NVEL,VA,AKZE,2)	292 SYSEQS
		CALL STLU(TVEL,VKZEI1,NVEL,VA,AKZEI1,2)	293 SYSEQS
		CALL STLU(TVEL,VPITCH,NVEL,VA,TPITCH,2)	294 SYSEQS
		CALL STLU(TVEL,VTROLL,NVEL,VA,TROLL,2)	295 SYSEQS
		CALL STLU(TVEL,VTYAM,NVEL,VA,TYAM,2)	296 SYSEQS
755		GO TO 402	297 SYSEQS
	C	PROGRAM T PANSFERS HERE IF VELGAIN=0. WHICH INDICATES CONTROL SYSTEM	298 SYSEQS
	C	GAINS ARE FUNCTIONS OF THETA	299 SYSEQS
	C		300 SYSEQS
	C		301 SYSEQS
760	401	CONT INJE	302 SYSEQS
		CALL STLU(THETA,TAKQC,NTHETA,THETA,AKP2,2)	303 SYSEQS
		CALL STLU(THETA,TKPCI1,NTHETA,THETA,AKPCI1,2)	304 SYSEQS
		CALL STLU(THETA,TKPEI1,NTHETA,THETA,AKPEI1,2)	305 SYSEQS
		CALL STLU(THETA,TKP,NTHETA,THETA,AKP,2)	306 SYSEQS
765		CALL STLU(THETA,TAKPE,NTHETA,THETA,AKPE,2)	307 SYSEQS
		CALL STLU(THETA,TAKRC,NTHETA,THETA,AKRC,2)	308 SYSEQS
		CALL STLU(THETA,TKRZI1,NTHETA,THETA,AKRZI1,2)	309 SYSEQS
		CALL STLU(THETA,TKREI1,NTHETA,THETA,AKREI1,2)	310 SYSEQS
		CALL STLU(THETA,TKR,NTHETA,THETA,AKR,2)	311 SYSEQS
		CALL STLU(THETA,TAKRE,NTHETA,THETA,AKRE,2)	312 SYSEQS
		CALL STLU(THETA,TAKQC,NTHETA,THETA,AKQC,2)	313 SYSEQS
		CALL STLU(THETA,TKQCI1,NTHETA,THETA,AKQCI1,2)	314 SYSEQS
		CALL STLU(THETA,TKQEI1,NTHETA,THETA,AKQEI1,2)	315 SYSEQS
		CALL STLU(THETA,TKQ,NTHETA,THETA,AKQ,2)	316 SYSEQS
770		CALL STLU(THETA,TAKQE,NTHETA,THETA,AKQE,2)	317 SYSEQS
		CALL STLU(THETA,TAKZE,NTHETA,THETA,AKZE,2)	318 SYSEQS
		CALL STLU(THETA,TKZEI1,NTHETA,THETA,AKZEI1,2)	319 SYSEQS
775		CONT INJE	320 SYSEQS
	402	CONT INJE	321 SYSEQS
780	C	SPECIFICATION OF FEEDBACK VARIABLE AS A FUNCTION OF THE CONTROL	322 SYSEQS
	C	SYSTEM FUNCTION SPIT:1	323 SYSEQS
	C		324 SYSEQS
		CALL STLU(TCSSM1,TKPINT,NCSSM,CSSM,AKPINT,2)	325 SYSEQS
		CALL STLU(TCSSM1,TKPHI,NCSSM,CSSM,AKPHI,2)	326 SYSEQS
		CALL STLU(TCSSM1,TKRINT,NCSSM,CSSM,AKRINT,2)	327 SYSEQS
785		CALL STLU(TCSSM1,TKPSI,NCSSM,CSSM,AKPSI,2)	328 SYSEQS
		CALL STLU(TCSSM1,TKQINT,NCSSM,CSSM,AKQINT,2)	329 SYSEQS
		CALL STLU(TCSSM1,TKTHETA,NCSSM,CSSM,AKTHETA,2)	330 SYSEQS
		CALL STLU(TCSSM1,TKPB,NCSSM,CSSM,AKPB,2)	331 SYSEQS
		CALL STLU(TCSSM1,TKPS,NCSSM,CSSM,AKPS,2)	332 SYSEQS
		CALL STLU(TCSSM1,TKRB,NCSSM,CSSM,AKRB,2)	333 SYSEQS
		CALL STLU(TCSSM1,TKRS,NCSSM,CSSM,AKRS,2)	334 SYSEQS
		CALL STLU(TCSSM1,TKPCI,NCSSM,CSSM,AKPCI,2)	335 SYSEQS
		CALL STLU(TCSSM1,TKPEI,NCSSM,CSSM,AKPEI,2)	336 SYSEQS
		CALL STLU(TCSSM1,TKYAGI,NCSSM,CSSM,AKYAGI,2)	337 SYSEQS
		CALL STLU(TCSSM1,TAKREI,NCSSM,CSSM,AKREI,2)	338 SYSEQS
		CALL STLU(TCSSM1,TAKQEI,NCSSM,CSSM,AKQEI,2)	339 SYSEQS
		CALL STLU(TCSSM1,TAKQEI,NCSSM,CSSM,AKQEI,2)	340 SYSEQS

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OF FOUR QUALITY

Line No.	Code	Text	SYSEQS
800		CALL STLJ(TCSSH1,TAKQS ,NGSSM,CSSM,AKQS ,2)	341 SYSEQS
800		CALL STLJ(THETA,TPITCH,NTHETA,THETA,TPITCH,2)	342 SYSEQS
800		CALL STLJ(THETA,YTROLL,NTHETA,THETA,TROLL,2)	343 SYSEQS
800		CALL STLJ(THETA,ITYAM,NTHETA,THETA,ITYAM,2)	344 SYSEQS
805	C	ROLL CONTROL SYSTEM	345 SYSEQS
805	C		346 SYSEQS
805	C		347 SYSEQS
810		POLLCMD=(1.-CSSM)*DLATST CSSM*DPED	348 SYSEQS
810		IF(TROLL.LE.0.)450,451	349 SYSEQS
810	450	KOLLC=ROLLCMD	350 SYSEQS
810	451	GO TO 452	351 SYSEQS
810	452	ROLLCD=(ROLLCMD-ROLLC)/TROLL	352 SYSEQS
810		LONTINUE	353 SYSEQS
815		PCTRMD=AK*CCI+AK*PCI*ROLLC	354 SYSEQS
815		IF(T.ME.T0)GO TO 269	355 SYSEQS
815	265	IF(AK*PHI.EQ.1.)265,266	356 SYSEQS
815	267	IF(PHISM.EQ.0.)267,266	357 SYSEQS
820		PINTR=PHI	358 SYSEQS
820	266	IF(AK*PINT.EQ.1.)268,269	359 SYSEQS
820	268	IF(PHISM.EQ.1.)270,269	360 SYSEQS
820	270	PHISA=0.	361 SYSEQS
825		PCTRM=PHI	362 SYSEQS
825		PINT=PHI	363 SYSEQS
825		CONTINUE	364 SYSEQS
830	C	YAM CONTROL SYSTEM	365 SYSEQS
830	C		366 SYSEQS
830	C		367 SYSEQS
830	C		368 SYSEQS
830	C		369 SYSEQS
830	C		370 SYSEQS
830	C		371 SYSEQS
830	C		372 SYSEQS
830	C		373 SYSEQS
830	C		374 SYSEQS
835		YAMCMD=(1.-CSSH)*DPED+CSSM*DLATSTK	375 SYSEQS
835		IF(TYAM.LE.0.01)*60,461	376 SYSEQS
835	460	YAMC=YAMCMD	377 SYSEQS
835	461	GO TO 462	378 SYSEQS
835	462	YAMCJ=(YAMCMD-YAMC)/TYAM	379 SYSEQS
840		RCTRMD=AK*CCI+AK*RCI*YAMC	380 SYSEQS
840		YTRMJ=AK*YTRM+CSSM*SIGN(1.,YTRMBUT)	381 SYSEQS
840		IF(ABS(YTRMBUT).LE.0.02)*YTRMD=0.	382 SYSEQS
840		IF(T.ME.T0)GO TO 279	383 SYSEQS
840	275	IF(AK*PSI.EQ.1.)275,276	384 SYSEQS
840	277	IF(PSISM.EQ.0.)277,276	385 SYSEQS
845		PSISA=1.	386 SYSEQS
845		PCTRM=PSI	387 SYSEQS
845		IF(AK*PINT.EQ.1.)278,279	388 SYSEQS
845		IF(PSISM.EQ.1.)280,279	389 SYSEQS
845	280	PSISA=0.	390 SYSEQS
845		RCTRM=PSI	391 SYSEQS
845		RINT=PSI	392 SYSEQS
845		CONTINUE	393 SYSEQS
850		PE=AK*PC*YAMC+RCTRM*YTRMJ- -AK*PIRS*(GC/VA)*PHI)	394 SYSEQS
850		FINTD=R	395 SYSEQS
855			396 SYSEQS
855			397 SYSEQS

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390 SYSEQS RETRD=AKZEI*AKZEI*AKRE*RE  
399 SYSEQS YF(ABS(ZEITR))*.GE.KELIM)RETRM=SIGN(QELIM,RETRM)  
400 SYSEQS .ALL.SFLUITCIBAR.TAKAY.VOR.3.QPAR.AKAY.2)  
401 SYSEQS DYAM=AKRE*RE*RETRM-(1.-CSSM)*AKAY*NYCGGG  
402 SYSEQS  
403 SYSEQS  
404 SYSEQS  
405 SYSEQS PTRMBUT=0.  
406 SYSEQS IF(1ARS>ID.NGSTK)*.GE.DSTK).AMO.(CSSM.NE.0.)PTRMBUT=SIGN(1.,  
407 SYSEQS 1 OLNSTK)  
408 SYSEQS  
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B-97

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915 TC(2)=TC(2)/KBT
IF(TC(1).LE.FGIDL)TC(1)=FGIDL
IF(TC(2).LE.FGIDL)TC(2)=FGIDL
ORCS4=DROLL
ORCS5=DPITCH
ORCS6=DIAM
ORCS7=JSTIFF
ORCS8=ONDRMF
DO 233 I=1,NRCSJET
ORCS(I)=0.
DD 233 J=1,5
ORCS(I)=RCSL(I,J)*ORCSN(J)*ORCS(I)
233 CONTINUE
ORC=KOR*DYAH+AKDYOR*DRLL
ORC=KOR*DPITCH
ORC=KOA*OROLL
IF(ABS(DEC).GE.DELIM)DEC=SIGN(DELIM,DEC)
IF(ABS(OAC).GE.DALIM)OAC=SIGN(DALIM,OAC)
IF(ABS(ORC).GE.DRLIM)ORC=SIGN(DRLIM,ORC)
LELEVNC=ELEVNR*DEC-DAC
DELEVNC=ELEVNR*DEC-DAC
C
935 C THRUST DYNAMICS CALCULATIONS
C
CALL STLU(MNT,TFGMAX,NYACH,MN,FGMAX,2)
CALL STLU(MNT,TFGIDL,NYACH,MN,FGIDL,2)
CALL STLU(MNT,TFGMIN,NYACH,MN,FGMIN,2)
FRACL=FGIDL/FGMIN
DD 200 I=1,NENG
TFRACC(I)=TC(I)/FGMIN
TFRACIN=TFRACC(I)
IF(TFRACIN.LE.FRACL)TFRACIN=FRACL
IF(TFRACIN.GE.1.)TFRACIN=1.
TFRAC=TFRACIN-TFRAC(I)
CALL STLU(TFRAC,TACCEL,NFRAC,TFRAC(I),ACCEL,2)
CALL STLU(TFRAC,TOCECEL,NFRAC,TFRAC(I),DECEL,2)
CALL STLU(TFRAC,TYENG,NFRAC,TFRAC(I),YENG,2)
TFRACD(I)=TFRACE/TENG
IF(TFRACD(I).GE.ACCEL)TFRACD(I)=ACCEL
IF(TFRACD(I).LE.DECEL)TFRACD(I)=DECEL
TABIN=TFRAC(I)-TFRAC(I)
IF(TFRACC(I).GT.1.)OP=TABIN*GE,TABON)GO TO 600
IF(TABIN.LT.TABON.AND.TAB(I).LE.TABOFF)TABIN=0.
600 CONTINUE
TABE=TABIN-TAB(I)
TABD(I)=TAB-/TAJAB
IF(TABD(I).GE.ABACCEL)TABD(I)=ABACCEL
IF(TABD(I).LE.ABOECEL)TABD(I)=ABOECEL
IF(TAB(I).LE.0.)TAB(I)=0.
TO(I)=FGMIN*(TAB(I)+TFRAC(I))
200 CONTINUE
C
965 C ACTUATION SYSTEM DYNAMICS
C
C LEFT ELEVON ACTUATOR
C
CALL PCACT(LELEVNC,LELEVN,LEURATL,LELRATL,LEUPOSL,LELPOSL,LEL,

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SYSEQS 709
SYSEQS 710
SYSEQS 711

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970      1      ITRIM,LELEVND)
          C
          C      RIGHT ELEVON ACTUATOR
          C
          CALL PFACT(MELEVND,RELEVND,RELATL,RELATL,REUPOS,RELPOS,TREL,
975      1      ITRIM,RELEVND)
          C
          C      RUDDER ACTUATOR
          C
          CALL PFACT(DRC,DR,DRURATL,DRLRATL,DRUPOS,DRALPOS,TOR,ITRIM,DRD)
980      C
          C      CANARD FLAP ACTUATOR
          C
          CALL PFACT(MFLAPC,DFLAPH,MFURATL,MFLRATL,MFLAPMX,MFLAPHN,TMP,
985      1      ITRIM,DFLAPHD)
          C
          C      WING FLAP ACTUATOR
          C
          CALL PFACT(MFLAPC,DFLAPH,MFURATL,MFLRATL,MFLAPMX,MFLAPHN,TMP,
990      1      ITRIM,DFLAPHD)
          C
          C      PITCH THRUST VECTOR ACTUATORS
          C
          DO 220 I=1,NENG
          CALL PFACT(THTC(I),THT(I),THTURL(I),THTURL(I),THTUPL(I),THTLPL(I),
995      1      ITRIM,THTO(I))
          C
          C      YAW THRUST VECTOR ACTUATORS
          C
          DO 221 I=1,NENG
          CALL PFACT(PSTC(I),PSIT(I),PSIURL(I),PSIURL(I),PSIPL(I),PSIPL(I)
1000      1      ITRIM,PSIT(I))
          C
          C      RCS NOZZLE AREA ACTUATORS
          C
          DO 222 I=1,NRCSJET
          CALL PFACT(DRCS(I),DRCS(I),RCSURL(I),RCSURL(I),RCSJPL(I),RCSJPL(I)
1010      1      ITRIM,DRCS(I))
          CALL PFACT(FRCS(I),FRCS(I),FRCSURL(I),FRCSURL(I),FRCSJPL(I),
1015      1      ITRIM,FRCS(I))
          C
          C      ADJUST AERODYNAMIC SURFACE EFFECTIVENESS FOR LARGE DEFLECTIONS
          C
          CALL STLU(PUOT,EKRUD,NEKRU,ABS(DR),EKRU,2)
          CALL STLU(ELEV,KELET,NEKEL,ABS(LELVN),EKELEL,2)
          CALL STLU(ELEV,KELET,NEKEL,ABS(LELVN),EKELEL,2)
          DRP=DR*EKRU
          DA1=LELVN*EKELEL
          DA2=RELEVND*EKELEL
          D11D=D12P*P-D13P*Q
          D12D=U13P*P-D11P*Q
          D13D=D11P*Q-D12P*P
          D21D=D22P*P-D23P*Q
          D22D=D23P*P-D21P*Q
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          SYSEQS 968

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0230=021P*Q-022P*P
 0310=032P*R-033P*Q
 0320=033P*P-031P*R
 0330=031P*Q-032P*P
 1030 C
 C CALCULATION OF THETA, PHI, AND PSI SIMPLY TO KEEP TRACK OF THEM.
 C THE CALCULATION AVOIDS THE SINGULARITY AT THETA=90 DEG BY
 C SUSPENDING CALCULATION OF PHIO AND PSIO AT THETA=90 + OR -.000057
 1035 C DEG
 C
 CPMI =COS(PHI)
 SPMI =SIN(PHI)
 THETA=C*CPHI-R*SPHI
 1040 IF(ABS(COS(THETA)),LE,.00001)GO TO 710
 PHIO=PTAN(THETA)*(Q*SPHI+R*CPHI)
 PSIO=(R*CPHI+Q*SPHI)/COS(THETA)
 710 CONTINUE
 C
 C EQUATIONS OF MOTION
 1045 C
 C
 UDOT=-Q*W+R*V+GC*U31P+SUMFX/MASS
 VDOT=-R*J+P*Q+GC*D32P+SJMFY/MASS
 WDOT=-P*V+Q*U+GC*D33P+SJMFZ/MASS
 1050 LPRIME=((SUML-GYROL)/IX-JX*(SUMN-GYRON)/IZ)/OMXJZ
 NPRI4E=((SUMN-GYRON)/IZ-JZ*(SUML-GYROL)/IX)/OMXJZ
 PDOT=DJ*(JX*FAC-JX)*P-1JA*JZ+EAC)*R)/OMXJZ+LPRIME
 QDOT=-JY*(R*Q-P*J)+GAC*P*P*(SUMH-GYROM)/IY
 RDOT=Q*(JZ-EAC+JZ)*R+(JZ*JX-FAC)*PI/OMXJZ+NPRI4E
 XEDOT=U*D11P+V*D12P+W*D13P
 YEDOT=U*D21P+V*D22P+W*D23P
 ZEDOT=U*D31P+V*D32P+W*D33P
 1055 NZCG=-1/MDOT*(P*V-Q*U)/GC+D33P
 MYCG=(WDOT+R*U-P*W)/GC+D32P
 1060 MXCG=(UDOT+Q*W-P*V)/GC+D31P
 PETJRN
 ENO

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 SYSEQS 604

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1 SUBROUTINE TRIM(Z,OZ,TOL,NZ,IMRITE,NEQU),RETURNS(ITRIM,IFLG)
C TRIMS THE AIRFRAME AND CONTROL SYSTEM USING AN N-SPACE NEWTON
C RAPHSON ITERATION METHOD.
C GAUSS ELIMINATION IS USED TO SOLVE SIMULTANEOUS LINEAR EQUATIONS.
C E ERRORS IN EQUATIONS TO BE SATISFIED
C TOL THE ITERATION WILL TERMINATE WHEN THE ERRORS(E) ARE LESS THAN TM
C TOL*(NACESITOL)
C Z THE ERRORS(E) ARE FUNCTIONS OF Z,F(Z). CERTAIN OF THESE PARAMETE
C SPECIFIED TO DEFINE A PARTICULAR MANUEVER AND THE REMAINDER ARE
C CALCULATED
C OZ STEP SIZE USED TO CALCULATE THE PARTIAL DERIVATIVES USED BY THE
C ALGORITHM
C NZ LOCATION IN THE Z-ARRAY OF THE PARAMETERS TO BE CALCULATED (THE
C REMAINING PARAMETERS MUST BE SPECIFIED)
C NOTE THERE ARE 16 EQUATIONS SO ONLY 16 PARAMETERS CAN BE UNKNOWN
C Z(I) UAS,VAS,WAS,P,Q,R,PHI,THETA,PSI,TA,DM,DR,DS,ALPHA,
C BETA,ANX,NY,NZ,XD,YD,ZD,VA,VP,UD,VJ,WD,PD,DD,RO,PMID,
C THETAD,PSID,T(16),THETAE(16),PSIE(16),TAN(16),PSIN(16)
C NOTE THE ABOVE LIST GIVES THE VARIABLES WHICH
C APPEAR IN Z (THE ORDER IS UNIMPORTANT)
C WARNING.....WARNING.....
C THE ORDER OF THE UZ(I) AND TOL(I) MUST BE COMPATABLE AND
C MUST CORRESPOND TO THE ORDER(WHATEVER IT IS) ESTABLISHED
C IN NOPT=6 AND STORED IN THE IN ARRAY.
C DIMENSION Z(1),OZ(1),TOL(1),NZ(1),A(19,19),
C E(19),ETEMP(19)
DEF=1.
IF(IMRITE.LT.0)GO TO 144
KOUNT=0
IF (IMRITE .NE. 0) IMRITE=-IMRITE
6 KOUNT=KOUNT+1
CALL ERROR(F)
IF(IMRITE .NE. 0) WRITE(6,30005)
IF(IMRITE .NE. 0) WRITE(6,30002) E
IF(KOUNT.GT. 15) GO TO 4
DO 10 I = 1,NEQU
IF(ABS(E(I)) .GE. TOL(I))GO TO 12
CONTINUE
18 RETURN
DO 1 J=1,NEQU
K=NZ(J)
IF(IMRITE .NE. 0) WRITE(6,30002) Z(K),OZ(J)
Z(K)=Z(K)+OZ(J)
CALL ERROR(ETEMP)
Z(K)=Z(K)-OZ(J)
DO 20 I=1,NEQU
A(I,J)=(ETEMP(I)-E(I))/OZ(J)
CONTINUE
20 CONTINUE
1 IF(IMRITE .NE. 0) WRITE(6,30002) ((A(I,J),J=1,NEQU),I=1,NEQU)
IF(DET.EQ. 0.) GO TO 22
CALL SIMQ(A,E,NEQU,DET,19)
IF(IMRITE .NE. 0) WRITE(6,30004) DET, (A(I,I),I=1,NEQU)
IF(IMRITE .NE. 0) WRITE(6,30002) E
IF(IMRITE.NE.0)RETURN IFLG
IF (DET .NE. 0.) GO TO 144
GO TO 6

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22      WRITE(6,30002)      WRITE(6,20127)
        WRITE(6,30003)      TRIM
60      WRITE(6,30002) E    TRIM
        RETURN ITRIM       TRIM
144     DO 2 I=1,NE U      TRIM
        KENZ(I)            TRIM
65      ZTEMP=Z(K)         TRIM
        Z(K)=Z(K)-E(I)     TRIM
2       IF(IWRITE.NE. 0)  TRIM(6,30002) ZTEMP,Z(K)
        GO TO 6            TRIM
70      WRITE(6,30003)     TRIM
        WRITE(6,30002) E   TRIM
        RETURN ITRIM      TRIM
20127  FORMAT(1X,6HCAUTION, SUBROUTINE SIMQ HAS RETURNED A ZERO DETERMIN
30001  1ANI. MATRIX A FOLLOWS.
30002  FORMAT(1X,6I2.5/1X,7G12.5/)
30003  FORMAT(32H THE ERROR ARRAY IS AS FOLLOWS
30004  FORMAT(1X,6I2.5)
30005  FORMAT(////)
90      END

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TRIM 80
TRIM 81

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1 SUBROUTINE ATRUN(IPITCH,IYAN,NTAP2,ADAO,DADA,AOAMAX,PSIO,DPSI,
  1 PSI MAX,THIND,IMAX
  COMMON/INJIV/NDRIV
  COMMON/INTKIM/ITRIM
  COMMON NEWS
  C
  C ***** SEGMENT 1 *****
  C TIME,PRINT,AND PLOT CONTROL PARAMETERS,INPUT
  C
  10 COMMON T,IO,DT,IMAX,UPTINT,DIPILOT,TI
  C
  C ***** SEGMENT 2 *****
  C VARIABLES TO BE INTEGRATED IN TIME
  C
  15 COMMON UDOT,VODOT,WODOT,QDOT,RODOT,DD1D,DD2D,DD3D,DD4D,DD5D,DD6D,DD7D,DD8D,DD9D,DD10D,DD11D,DD12D,DD13D,DD14D,DD15D,DD16D,DD17D,DD18D,DD19D,DD20D,DD21D,DD22D,DD23D,DD24D,DD25D,DD26D,DD27D,DD28D,DD29D,DD30D,DD31D,DD32D,DD33D,DD34D,DD35D,DD36D,DD37D,DD38D,DD39D,DD40D,DD41D,DD42D,DD43D,DD44D,DD45D,DD46D,DD47D,DD48D,DD49D,DD50D,DD51D,DD52D,DD53D,DD54D,DD55D,DD56D
  2 TABD(2),PSITO(2),THTD(2),ORCSD(10),FRCSAD(10),DFLAPHD,DFLAPHD,DFLAPHD,DFLAPHD,DFLAPHD,DFLAPHD,DFLAPHD,DFLAPHD,DFLAPHD,DFLAPHD
  3 TFRACD(2)
  C
  20 CONTROL SYSTEM VARIABLES TO BE INTEGRATED
  C
  C COMMON PCTRM,PINTO,PETRM,RCTRM,RINTD,RETRM,RTTRM,QCTRMD,QINTD,
  1 QETRM,QPTRM,ZETRM
  C
  25 C EULER ANGLE RATES TO BE INTEGRATED
  C
  C COMMON THETA,PHI,PSI
  C
  30 C STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED
  C
  C COMMON LNSTKD,ROLLCD,YAMCD
  C
  C ***** SEGMENT 3 *****
  C INTEGRATED VARIABLES
  C
  35 COMMON U,V,W,P,Q,R,DD11,DD12,DD13,DD21,DD22,
  1 DD23,DD31,DD32,DD33,XE,VE,ZE,LELEVM,RELEVM,DR,
  2 TAB(2),PSIT(2),THT(2),ORCS(10),FRCSA(10),DFLAPH,DFLAPH,
  3 TFRAC(2)
  C
  40 C INTEGRATED CONTROL SYSTEM VARIABLES
  C
  C COMMON PCTRM,PINT,PETRM,RCTRM,RINT,RETRM,RTTRM,QCTRMD,QINT,
  1 QETRM,QPTRM,ZETRM
  C
  45 C EULER ANGLES
  C
  C COMMON THETA,PHI,PSI
  C
  50 C INTEGRATED STICK AND PEDAL FILTER VARIABLES
  C
  C COMMON LNSTK,ROLLC,YAMC
  C
  C ***** SEGMENT 4 *****
  C BASIC AIRCRAFT MASS,INERTIA,AND GEOMETRY CONSTANTS
  C
  55 COMMON A,I,X,IY,IZ,IXZ,FSCG,BLCG,WLCC,G
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C COMPUTED AIRCRAFT CONSTANTS
C
60 C COMMON EAC,FAC,GAC,JX,JY,JZ,MASS,OMXJXZ
C
C ***** SEGMENT 5 *****
C ERPOS AND TOLERANCES FOR TPIM SOLUTION
C
65 C COMMON TOL(19)
C ***** SEGMENT 6 *****
C AEPO LIFT AND DRAG CONSTANTS AND TABLES,INPJT
C
70 C COMMON AEERD,AERO(23,3),SURFCP(3,3)
C
C EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH
C SURFACE IN THE FOLLOWING ORDER AR,EXPOSED AR,AREA,EXPOSED AREA,
C LAMBDA1/4,LAMBDALE,TAPER RATIO,CLMAX,ALFAB,AP,CD0,D/B,CL8/DF,CLMAX/DF,
C CD0/DF. SURFACE 1 IS WING, 2 IS HOR. STAB, 9 IS VERT. STAB.
C
C COMPUTED AERO LIFT AND DRAG CONSTANTS
C
C COMMON CNAAB(3),AEROK(3),EOS(3),CLA(3)
C ***** SEGMENT 7 *****
C WING AERO CONSTANTS,INPUT
C
C COMMON FSW,RLW1,BLW2,MLA,CH,BM,EKDA1,EKDA2,EIM,CLB04,CLBCLM,CLRCLM
1 ,CLP4,CV80M,CNBCL2M,CNRCL2M,CNRCDM,CNP3LM,CNPCDAM,CH0M,CHDFM
2 ,AEKEL,CYBCL2M
C
C COMPUTED WING AERO CONSTANTS
C
C COMMON XWING1,XWING2,YWING1,YWING2,ZWING1,ZWING2
C ***** SEGMENT 8 *****
C HORIZONTAL STABILIZER AERO CONSTANTS
C
C COMMON FSH,BLH,MLH,CH,BH,EKADE,EIH,E0CLM,CHDFH,CH0H
1 ,DXHT0
C
C COMPUTED HORIZONTAL STABILIZER CONSTANTS
C
C COMMON XH,YH,ZH,XHL,ZHL,AMEL,DWEL
C ***** SEGMENT 9 *****
C VERTICAL STABILIZER AERO CONSTANTS
C
C COMMON FSV,BLV,HLV,CV,BV,EKADR,EIV,EKV,CN0V
2 ,AEKRJO,TALFA(10),AALFA,TVTEFF(10)
C
C COMPUTED VERTICAL STABILIZER CONSTANTS
C
C COMMON Y,YV,ZV
C ***** SEGMENT 10 *****
C FUSELAGE AERO CONSTANTS
C

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9-104

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115 COMMON FSF,9LF,WLF,AQDB,SQDMA,NFOQM,MOQMX1,MOQMX2,MOQMX1,MOQMX2,
1 ADF,A1F,A2F,EN1,EN2,EN3,EN4,EN5,EN6,EN7
2 ,DESFO,ADFSF1,ADFSF2,KXYF
C
120 C COMPUTED FUSELAGE AERO CONSTANTS
C
C COMMON XF,YF,ZF
C
C ***** SEGMENT 11 *****
C DIRECT THRUST FORCE AND MOMENT CONSTANTS
C
125 COMMON FSSM(2),PLSM(2),PLSM(2),SIGY,ELN,KAPT1,KAPT2,AENG
C
C COMPUTED DIRECT THRUST CONSTANTS
C
130 COMMON CSIGY,SSIGY,XT(2),YT(2),ZT(2)
C
C ***** SEGMENT 12 *****
C RAM FORCE AND MOMENT CONSTANTS
C
135 COMMON FSN(2),BLIN(2),PLIN(2),RINLET,AVDVI,AAURN
C
C COMPUTED RAM CONSTANTS
C
C COMMON XIN(2),YIN(2),ZIN(2)
C
140 C ***** SEGMENT 13 *****
C GORIOLIS FORCE AND MOMENT CONSTANTS
C
C COMMON ELDUCT
C
145 C ***** SEGMENT 14 *****
C PROPULSION SYSTEM CONSTANTS
C
C COMMON AM8CH,KBT1,KBT2,KM1,KM2,OMEGMX,RPMX,RCS,AFRAT
150 1 ,JENG,AFPAC,TAUAB,ABACCEL,ABOCEL,TABON
2 ,TABOFF
C
C COMPUTED PROPULSION SYSTEM CONSTANTS
C
155 C COMMON KBT
C
C ***** SEGMENT 15 *****
C RCS FORCE AND MOMENT CONSTANTS
C
160 COMMON ARCSJET,ABLDR,BLJREF,FRCSMX(10),DEMAND(10),BLOMOR(10),
1 RCSL(10,5),FSKCS(10),BLPCS(10),HLRCS(10),THRCS(10),PSIRCS(10)
C
C COMPUTED RCS CONSTANTS
C
165 COMMON FRCSMXR,FRCSMXO,FRCSMX1,CTMTRCS(10),STMTRCS(10),CPSIRCS(10)
1 ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)
C
C ***** SEGMENT 16 *****
C CONTROL SYSTEM CONSTANTS
C
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C PSEUDO-PILOT CONTROL SYSTEM CONSTANTS
C
175 COMMON DUM,AKZED,AKZEE1,AKZEE2,AKYED,AKYEE,
1 AKU,AKV,AKW,AKX,AKY,AKZ
C CONTROL SYSTEM FUNCTION SWITCH CONSTANTS
C
180 COMMON CS0,IAS4,CS1,THEISW
C ROLL CONTROL SYSTEM CONSTANTS
C
185 COMMON TAKPC(8),TTHETA(8),TAKPE(8),TKPCI(8),ATHETA,TKPEI(8),
1 TKP(8),PELLM,AKOYDR,KTHIR,KOA
C YAW CONTROL SYSTEM CONSTANTS
C
190 COMMON TAKRC(8),TAKRE(8),TKRCI(8),TKKEI(8),TKR(8),RELIM,
1 AKYTRM,KPSIT,KDR,TAKAY(8),KTY
C PITCH CONTROL SYSTEM CONSTANTS
C
195 COMMON TAKQC(8),TAKQE(8),TKQCI(8),TKQEI(8),TKQ(8),QELIM,
1 AK2TRM,OSTK,KOE,KTHIP
C HEAVE CONTROL SYSTEM CONSTANTS
C
200 COMMON TAKZE(8),TKZEI(8),AKTHROT,ZELIM
C CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS
C
COMMON ELEYNRF,PSITRF(2)
C FLAP CONTROL SYSTEM CONSTANTS
C
COMMON KHFLAP1,KHFLAP2,KHFLAP1,KHFLAP2
C DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS
C
COMMON AQBAR,TOBAR(8)
C STICK AND PEDAL FILTER TIME CONSTANT TABLES
C
COMMON TPITCH(8),TTROLL(8),TTYAW(8)
C
215 C***** SEGMENT 17 *****
C ACTUATION CONSTANTS
C
COMMON LEURATL,LELRATL,LEUPOSL,LELPOSL,LEL,
1 REJRATL,RELRAITL,REUPOSL,RELPOSL,REL,
2 DRJRATL,DRLRATL,DRUPOSL,DRLPOSL,DR,
3 HFJRATL,HFLRAITL,HFLAPMX,HFLAPMN,TH,
4 HFJRAITL,HFLRAITL,HFLAPMX,HFLAPMN,TH,
5 THUPL(2),THLRL(2),THTJPL(2),THLPL(2),THTY(2),
6 PSIUPL(2),PSILPL(2),PSIUPL(2),PSILPL(2),TPSIT(2),
7 RCSUPL(10),RCSLPL(10),RCSUPL(10),RCSLPL(10),TAURCS(10)
8 ,FRCSURL(10),FRCSLRL(10),FRCSUPL(10),FRCSLPL(10),TAJFRCS(10)
9 ,DELIM,JALIM,ORLIM

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C
C ***** SEGMENT 19 *****
C LIFT-DRAG VARIABLES
C
C COMMON LAMB1,CLAE,EKMB,CL1,C2,EJ
C ***** SEGMENT 19 *****
C AING AERO VARIABLES
C
C COMMON UXM,DYM,UZM,OLM,JMH,DNH,CLM,ALFM,CDM,UM,WM,VXZ1,VXZ2,VXZ,
1 DADZ1,DADZ2,ALF1,ALF2,CLM1,CLM2,COM1,COM2,CJA,BETH,QMS,QMSB,
2 ROV,LMP,NWP,YMP,ALF1,SALF1,CALF1,ALF2,SALF2,CALF2,XM1,X4Z,
3 ZM1,Z4Z,ALF,SALF,CALF,MM,LW,NM,DA1,DA2,KELEL,EXELER,CHM1,
4 CMH2,DX4ING1,DX4ING2
C
C ***** SEG NT 20 *****
C HORIZONTAL STABILIZER AERO VARIABLES
C
C COMMON DXH,DYH,DZH,DLH,JMH,DNH,UM,WM,ALFG,EPS,DALFH,CL1,CL2,CD1,
1 CDZ,UADE,ALFH,CLH,CDH,ANG,DIS,XI,ZM,J0030,ALFH1,SALFH1,CALFH1
2 ,DAH,DE,QUEFF,DAVG,CMH,DXHT
C
C ***** SEGMENT 21 *****
C VERTICAL STABILIZER AERO VARIABLES
C
C COMMON DXV,DYV,DZV,DLV,DMV,DNV,UV,WV,DADR,ALFV,CLV,CDV,ALFV1,
1 CALFV1,SALFV1,QOV,DRP,EKRUD,CHV,DXVT,VTEFF
C
C ***** SEGMENT 22 *****
C FJSELAGE AERO VARIABLES
C
C COMMON DXF,DYF,DZF,DLF,DMF,DNF,ALFF,ALFF,ALFTF,QXV,QB,QXZ,AQG,AS,
1 SAF,SOQ,AF,NFOQ,MOQ,MCQ1,S,NF,PITCHF,ALFVFD,NOQ,NOQ1,YANF
2 ,OFSF
C
C ***** SEGMENT 23 *****
C DIRECT THPJST FORCE AND MOMENT VARIABLES
C
C COMMON DXT,DYT,DZT,DLT,DLT,DNT,DNT,AFT(2),TCOR(2),OX(2),OY(2),OZ(2),
1 OFSSW(2),DBLSW(2),DALSW(2),SPSIT(2),SPSIT(2),SYHT(2),CTHT(2)
2 ,KAPT
C
C ***** SEGMENT 24 *****
C RAM FORCE AND MOMENT VARIABLES
C
C COMMON DXR,DYR,DZR,DLR,DLR,DNR,VO,ATURN0,BTURN,CBTURN,S8TURN,VIN,
1 VOMI(2),ATURN(2),ELRAM(2),DATURN(2),ETAR(2),FRAM(2),ELR,
2 WLRAM,FSRAM,SATURN,CATURN,DXR0(2),DYR0(2),DZR0(2),DKRI(2),
3 DYAI(2),DZRI(2),UI,VI,WI
C
C ***** SEGMENT 25 *****
C CORIOLIS FORCE AND MOMENT VARIABLES
C
C COMMON DXCOP,DYCOR,DZCOR,DLCOR,DMCOR,DNCOR,DNCOR,ELCOR,E4ZOR,DLCOR,
1 DMZ3PO,DNCORD
C
C ***** SEGMENT 26 *****

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C      C      PROPULSION SYSTEM VARIABLES
C      COMMON MDJT(12),RPH(12),IRST(12),BLD,AVL,FGMAX,FGMIN,FGIDL,MDTMX,
1      TRCSPEF,TRQAV,TRQ(2),FPATIO,FRPM,KHDY,KBP,TRCS,T(2)
2      ME(12),TFRAC(7),TFRACIN,FRACL,TENG,TFRACE,TABIN,BLOG3,TABE
3      ,TO(12)
C
C***** SEGMENT 27 *****
C      RCS FORCE AND MOMENT VARIABLES
C
C      COMMON DXRCS,DYRCS,DZRCS,DLRCS,DMRCS,DNRCS,DJFRCSDB,DJFRCSO,DJFRCS(10)
1      ,BLDPEQ,FRCSAL,FRCSLU,FRCS(10),DXRC(10),DYRC(10),DZRC(10),
2      DRCS(10),BLD,FRCSDB
C
C***** SEGMENT 28 *****
C      CONTROL SYSTEM VARIABLES
C
C***** PSEUDO-PILOT CONTROL SYSTEM VARIABLES
C
C      COMMON ZEE,ZEIC,YEE,YEIC,OXE,DYE,DZE,XES,YES,ZES
C
C      CONTROL SYSTEM FUNCTION SWITCH VARIABLES
C
C      COMMON CSSM
C
C      ROLL CONTROL SYSTEM VARIABLES
C
C      COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL
C
C      YAW CONTROL SYSTEM VARIABLES
C
C      COMMON YA4CMD,DPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYA4,AKAY
C
C      PITCH CONTROL SYSTEM VARIABLES
C
C      COMMON DLNGSTK,AKQB,AKQCI,PTRMOUT,QE,AKQE,AKQEI,JPIFCH
C
C      HEAVE CONTROL SYSTEM VARIABLES
C
C      COMMON ZEDT,ZEDTE,AKZE,AKZEI,DTHROT
C
C      ACTUATION SYSTEM INPUT VARIABLES
C
C      COMMON DSIDEF,DNORWF,PSITC(12),THTC(12),DEC,DRC,DAC,DRCSR,DRCSO,
1      DRCSY,DKCSSF,DRCSNF,TCMD,MFLAPC,MFLAP3,LELEVNC,RELEVNC
C
C      ADDITIONAL CONTROL SYSTEM VARIABLES
C
C      COMMON AKPCI1,AKPEI1,AKP,AKRCI1,AKREI1,AKR,AKQCI1,AKQEI1,AKQ,
1      AKZEI1,SVSM,TPITCH,TROI L,TYAW
C***** SEGMENT 29 *****
C      AIR DATA VARIABLES
C
C      COMMON UAS,VAS,AAS,RHO,TAMB,V SOUND,TRATIO,PRATIO,VA,VK,HN,QBAR,
1      ALPHA,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA

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NAMES	341

B-108

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345	C	TOTAL AERO FORCE AND MOMENT VARIABLES	NAMES	392
	C		NAMES	393
	C	COMMON XAERO,VAERO,ZAERO,LAERO,MAERO,NAERO	NAMES	394
	C		NAMES	395
	C	TOTAL FORCE AND MOMENT VARIABLES	NAMES	396
	C		NAMES	397
350	C	COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN	NAMES	398
	C		NAMES	399
	C	CORRECTED DIRECTIONAL COSINES	NAMES	350
	C		NAMES	351
	C	COMMON D1P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG	NAMES	352
	C		NAMES	353
355	C	MISCELLANEOUS VARIABLES	NAMES	354
	C		NAMES	355
	C	COMMON VAIR,VAIR,VAIR,ALT,RS,PS,BLOT1(3)	NAMES	356
	C		NAMES	357
	C	1 .GROL,GYROM,GYROM,MXCG,NYCG,NZCG	NAMES	358
	C	2 .XDM,YDM,ZDM,BLOT2(3),LPRIME,NPRIME	NAMES	359
	C	3 .VE,VEOT,VEEST	NAMES	360
	C		NAMES	361
	C	***** SEGMENT 30 *****	NAMES	362
	C	TABLES FOR RCM FORCES AND MOMENTS	NAMES	363
	C		NAMES	364
365	C	COMMON VOIT(5),ATURN(8),ELRAMT(5,8),DATJUNT(5,8),ETART(5,8)	NAMES	365
	C		NAMES	366
	C	***** SEGMENT 31 *****	NAMES	367
	C	TABLES FOR RCS FORCES AND MOMENTS	NAMES	368
	C		NAMES	369
370	C	COMMON FRCS(6),BLDRT(6)	NAMES	370
	C		NAMES	371
	C	***** SEGMENT 32 *****	NAMES	372
	C	THRUST TABLES	NAMES	373
	C		NAMES	374
375	C	COMMON MNT(4),TFGMX(4),TFGMIN(4),TFGIOL(4),TMDT(4),TFRAT(6),	NAMES	375
	C	1 TRPM(6),TFRACT(10),TACCEL(10),TCECEL(10),TTENG(10)	NAMES	376
	C		NAMES	377
	C		NAMES	378
	C	***** SEGMENTS 33 THRU 38 *****	NAMES	379
	C	STABILITY DEPIVATIVE	NAMES	380
	C		NAMES	381
	C	SEGMENT 33	NAMES	382
	C	COMMON DX4G(25),DXMS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),	NAMES	383
	C	1 DXRAM(25),DXCLS(25),DXRCSF(25),X(25)	NAMES	384
385	C	SEGMENT 34	NAMES	385
	C	COMMON DY4G(25),DYMS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),	NAMES	386
	C	1 DYRAM(25),DYCLS(25),DYRCSF(25),Y(25)	NAMES	387
	C	SEGMENT 35	NAMES	388
	C	COMMON DZ4G(25),DZMS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),	NAMES	389
	C	1 DZRAM(25),DZCLS(25),DZRCSF(25),Z(25)	NAMES	390
390	C	SEGMENT 36	NAMES	391
	C	COMMON DL4G(25),DLMS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),	NAMES	392
	C	1 DLRAM(25),DLCLS(25),DLRCSF(25),AL(25)	NAMES	393
	C	SEGMENT 37	NAMES	394
	C	COMMON DM4G(25),DMMS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25),	NAMES	395
	C	1 DMRAM(25),DMCLS(25),DMRCSF(25),AM(25)	NAMES	396
	C	SEGMENT 38	NAMES	397
	C	COMMON DN4G(25),DNMS(25),DNVS(25),DNFS(25),DNAER(25),DNMS(25),	NAMES	398
	C		NAMES	399

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400 C 1 DNRAM(25),DNCLS(25),DNRCFS(25),AN(25)
C C
C C ..... SEGMENT 39 .....
C C DERIVATIVE CONTROL
C C
405 C COMMON ADER,DELV(25)
C C ..... SEGMENT 40 .....
C C SCRATCH COMMON
C C COMMON WORK(50)
C C
C C ..... SEGMENT 41 .....
C C MISCELLANEOUS CONSTANTS
C C
415 C COMMON AMIND,VMIND,PSI,IND,XE23,YE20,ZEC3
C C ,TRMTJRN,GAMMA,VADOT,TURNRAD
C C ..... SEGMENT 42 .....
C C AERO SURFACE EFFECTIVENESS TABLES
C C
420 C COMMON ELEV(7),EKELET(7),RUOT(7),EKRUOT(7)
C C ..... SEGMENT 43 .....
C C PILOT INPUT CONTROL DATA
C C
425 C COMMON ACMO(5),ATIME,ASKEEP,AYEHL0,CMOT1(20),CMOT2(20),
C C 1 CMOT3(20),CMOT4(20),CMOT5(20),TIMET(20),ATRANS,AVAT,TTTRANS,
C C 2 THROTT(10),VAT(10),THEICT(10)
C C ..... SEGMENT 44 .....
C C TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LANS
C C
430 C COMMON ACSSM,TCSSM1(5),TAKQS(5),TKPINT(5),TKPHI(5),TKPB(5),
C C 1 TKPSI(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKRSI(5),TKRB(5),
C C 2 TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKQCI(5),TAKQEI(5),
C C 3 TKRS(5),AKP4IPS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,ARRINT,
C C 4 AKPSI,AKPB,AKKS,AKJ3
C C ..... SEGMENT 45 .....
C C TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS WHICH
C C VARY AS FUNCTIONS OF AIRSPEED
C C
440 C COMMON VELGAIN,AVEL,TVEL(8),VAKPC(8),VAKPI1(8),VKPEI1(8),VKP(8),
C C 1 VAKPE(8),VAKRC(8),VKRCI(8),VKREI1(8),VKREI(8),VKR(8),VAKRE(8),VAKQC(8),
C C 2 ,VKQCI(8),VKQEI1(8),VKQ(8),VAKQE(8),VAKZE(8),VKZE(8),VKZEI1(8)
C C 3 ,VTPTICH(8),VTROLL(8),VTYAH(8)
C C REAL LAMB1
C C REAL LNGSTK,LNGSTKD
C C REAL IX,IY,IZ,IXZ,JX,JY,JZ,MASS
C C REAL NFOQ1,MOQMX1,MOQMX2,NOQMX1,NOQMX2
450 C REAL KAT1,KAT2,KM1,K42,KBT
C C REAL KPSIT,KTHTP,KTHTR,KOE,KOR,KD4,<TY
C C REAL LAP,NWP,N4,LW,MH
C C REAL NFOO,MOQ,MOQ1,NOQ,NOO1
C C REAL KHFLAP1,KHFLAP2,KHFLAP1,KHFLAP2
455 C REAL MDOT,MDTHX,KMDT,KSTP

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REAL KAFT1,KAF2,KAF3,KAF4
REAL LAEPJ,MAERO,MAERO
REAL LEPOSJ,LELRAJ,LEUPOSJ,LEURATL,LEPRIME,NPRIME
REAL LELEVND,LELEVH,LELEVNC,MNT,NF,MH
REAL JENG
REAL NXCS,NYCG,NZCS
DIMENSION RDM(5,5),DUM4(6),DUMH(6),DUMV(6),DUMT(6),DUMF(6)
EQUIVALENCE (DX4,DUM4(1)),(D,H,DUMH(1)),(DXV,DUMV(1)),(DXF,
1  DUMF(1)),(MAERO,DUMT(1))
RAD=57.2957795
U=0.0
V=0.0
W=0.0
IF(IPITCH.EQ.0) GO TO 20
PITCH RUN SETUP
IF(DAOA.EQ.0.0) RETJRN
DPSI=0.0
INAX=(AOAMAX-AOAO)/DAOA+1.01
GO TO 30
YAW RUN SETUP
DAOA=0.0
IF(DPSI.EQ.C.0) RETURN
INAX=(PSIMAX-PSIO)/DPSI+1.01
30 CONTINUE
AOA=AOA/RAD
BETAM=PSIO/RAD
DU 50 I=1,IYAX
CAOA=COS(AOA)
SAOA=SIN(AOA)
CBET=COS(BETAM)
SBET=SIN(BETAM)
UAIR=THIND*CAOA*CBET
VAIR=THIND*SBET
WAIR=THIND*SAOA*CBET
UAS=U-UAIR
VAS=V-VAIR
WAS=W-WAIR
ALPH=AOA
BETA=BETAM
CALL FORCES(10.)
ADUM=SM*QBAR
DO 40 L=1,6
RDM(L,L)=DJMH(L)
RDM(2,L)=DUMH(L)
RDM(3,L)=DJMJ(L)
RDM(4,L)=DUMF(L)
RDM(5,L)=DJMT(L)
40
505 C CONVERT AERC DATA FROM BODY TO STABILITY AXES
DO 47 K=1,5
XSUM=RDM(K,1)
ZSUM=RDM(K,3)
RDM(K,1)=-ZSUM*SALPH-XDUM*CALPH
RDM(K,3)=XDUM*SALPH-ZSUM*CALPH
XDUM=RDM(K,4)
ZDUM=RDM(K,6)
RDM(K,4)=XDUM*CALPH+ZDUM*SALPH

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515      RDUH(K,6)=ZJUM*CALPH-XDUM*SALPH
          DO 46 L=1,3
          46 RDUH(K,L)=RDUH(K,L)/ADUM
          DO 47 L=4,6
          RDUH(K,L)=RDUH(K,L)/ADUM/BM
520      IF(L.EQ.5) RDUH(K,L)=RDUH(K,L)*BM/CH
          47 CONTINUE
          C STORE OUTPUT ON NTAP2
          A=ALPH*RAJ
          B=BETA*RAJ
525      WRITE(NTAP2) A,3,((RDUH(K,L),L=1,6),K=1,5)
          C DEFINE NEXT AOA AND BETA COMBINATION
          AOA=AOA+DAOA/RAD
          RETAM=BETAM-DPSI/RAD
          50 CONTINUE
          RETURN
          ENJ
530

```

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MTRUN 56
MTRUN 57
MTRUN 58
MTRUN 59
MTRUN 60
MTRUN 61
MTRUN 62
MTRUN 63
MTRUN 64
MTRUN 65
MTRUN 66
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MTRUN 69
MTRUN 70
MTRUN 71
MTRUN 72
MTRUN 73

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APPENDIX C
LISTING OF BASIC DATA LOAD INPUT CARDS
FOR VATLAS APPLICATION TO
VOUGHT SF-121 AIRPLANE

LINE	NO.	DESCRIPTION	UNIT	VALUE	TOLERANCE	REMARKS
26	1 1.	MDOY-LB/S				
26	3 1.	APM-RAD/S				
26	7 1.	BDAVL				
27	19 1.	BLDREQ				
3	52 57.2958	PHTRM-DEG				
3	53 57.2958	P-INTE-DEG				
3	54 1.	P-ERR-INT				
3	55 57.2958	PSITRM-DEG				
3	56 57.2958	R-INTE-DEG				
3	57 1.	R-ERR-INT				
3	58 57.2958	PSITRMBUT				
3	59 57.2958	THTRM-DEG				
3	60 57.2958	Q-INTE-DEG				
3	61 1.	Q-ERR-INT				
3	62 57.2958	THTRMBUT				
3	63 1.	ZE-ERR-INT				
28	19 57.2958	P-ERR-DG/S				
28	26 57.2958	R-ERR-DG/S				
28	35 57.2958	C-ERR-DG/S				
28	40 1.	ZE-ERR-F/S				
28	12 1.	ROLLCMD				
28	21 1.	YAWCMD				
28	11 1.	CON.SYS.SH				
28	13 57.2958	DLATYK-OG				
28	22 57.2958	DPEO-DG/S				
28	31 57.2958	LNG-STK.				
28	39 1.	ZEOT-CMD.				
28	43 1.	THRATTLE				
28	1 1.	ZE-ERR-FT				
28	3 1.	YE-ERR-FY				
28	8 1.	XBODY-ER-F				
28	9 1.	YBODY-ER-F				
28	18 1.	ZBODY-ER-F				
28	20 1.	TRCS				
28	1 1.	BLANK CARD-END-TIME HISTORY OUTPUT SPECIFICATIONS				
16375.	7959.	5 WT,IX,IY,IZ,IXZ				
401.5	1 5	19 TOL(I,J)-TRIM TOLERANCES				
.5	.5	1.				
.1	.1	.02				
.5	.5	.02				
6	1 6	20 AERQ,AERO(I,J)-AERO LIFE-DEAG CONSTANTS				
2.3	2.3	350.				
1.06	1.06	593				
.172	.172	6.045				
.525	.525	.091				
1.047	1.047	2.25				
.1065	.1065	1.12				
.785	.785	.0865				
.00431	.00431	.925				
0.	0.	0.				
6	71 6	79 SURFCP(I,J)				
.571	.571	.175				
.976	.976	.735				

TIME HISTORY OUTPUT SPECIFICATIONS (CONTINUED)

BLANK CARD-END-TIME HISTORY OUTPUT SPECIFICATIONS

REMAINDER OF BASIC DATA LOAD DEVOTED TO LOADING COMMON TABLES AND CONSTANTS (BLANKS IN THE QUANTIFICATION OF COMMON ELEMENTS DESIGNATE ZERO VALUES)

.08333

-202.4

.749

.727

.495

.735

.976

335.	1	14	5	AMACH,KBT	,KB12,KM1,KM2				
	4.	14	1	14	1.	.0276	1.	.565	.435
		14	6	14	6	OMEGMX,RPMMX,RCS			
		14	9	14	1.	10159.			
		14	9	14	10	AFRAT,JENG			
		14	11	14	14	AFRAC,TAUAB,ABACCEL,ABCECEL			
		14	15	14	16	TABON,TABOFF			
		15	1	15	3	ARCSJET,ABLOR,BLDREF,			
		15	4	15	5	FRCSMX1,FRCSMX2			
		15	14	15	15	DEMAND1,DEMAND2			
		15	24	15	25	BLDHOR1,BLDHOR2			
		15	34	15	35	RCSL1,1,RCSL(2,1)			
		15	84	15	85	FRCS1,FRCS2			.08338
		15	94	15	95	BLRCS1,BLRCS2			.08338
		15	104	15	105	MLRCS1,MLRCS2			.08338
		15	114	15	115	TMRCS1,TMRCS2			.01745
		15	124	15	125	PSIRCS1,PSIRCS2			.01745
		16	13	16	13	CSV			
		16	14	16	14	VASH			1.681
		16	66	16	69	PELIM,AKDYOR,KTHTR,KDA			
		16	110	16	113	RELIM,AKYTRM,KPSIT,KOR			
		16	114	16	119	TAKAY(I)-LAT,ACCEL,FOBACK TABLE			.04
		16	122	16	122	KTR			
		16	163	16	167	DELIM,AKPTRM,DSIK,KDE,KTHIP			
		16	194	16	194	AKTHROT			
		16	185	16	185	ZELIM			
		16	186	16	188	ELEVREF,PSITRF(I)			
		16	189	16	192	KHFLAP1,KHFLAP2,KHFLAP1,KHFLAP2			
		16	193	16	193	AQBAR			
		16	194	16	199	TOBAR(I)-DYNAMIC PRESSURE TABLE			200.
		16	194	16	199	TOBAR(I)			20.
		16	194	16	199	TOBAR(I)			46.
		16	194	16	199	TOBAR(I)			127.

17	1	17	4	LEURATL,LELRATL,LEUPOSL,LELPOSL	.01745
35.		-35.	60.		
17	5	17	5	TLRL	
.05					
17	6	17	9	REURATL,RELURATL,REUPOSL,RELPOSL	.01745
35.		-35.	60.		
17	10	17	10	YRFL	
.05					
17	11	17	14	DRURATL,DRLRATL,DRUPOSL,DRLPOSL	.01745
100.		-100.	25.		
17	15	17	15	YR	
.05					
17	16	17	19	MFURATL,MFLRATL,MFLAPX,MFLAPM	.01745
10.		-10.	25.		
17	20	17	20	YMF	
.1					
17	21	17	24	MFURATL,MFLRATL,MFLAPX,MFLAPM	.01745
10.		-10.	30.		
17	25	17	25	YMF	
.1					
17	26	17	33	TYTURL(2),TYTLRL(2),TYTURL(2),TYTLPL(2)	.01745
50.		50.	-50.	15.	15.
-15.					
17	34	17	35	TYHT(2)	
.05					
17	36	17	43	PSIURL(2),PSIURL(2),PSIURL(2),PSIURL(2)	.01745
50.		50.	-50.	15.	15.
-15.					
17	44	17	45	IPSIT(2)	
.05					
17	46	17	47	PCSURL(2)	
18.		10.			
17	56	17	57	RCSLRL(2)	
-10.		-10.			
17	66	17	67	RCSURL(2)	
1.		1.			
17	76	17	77	RCSLPL(2)	
-1.		-1.			
17	86	17	87	TAURCS(2)	
.05					
17	96	17	97	FRCURL(2)	
1500.		1500.			
17	106	17	107	FRCURL(2)	
-1500.		-1500.			
17	116	17	117	FRCURL(2)	
1500.		1500.			
17	126	17	127	FRCURL(2)	
-1500.		-1500.			
17	136	17	37	TAURCS(2)	
.05					
17	146	17	148	DELIM:OALIM,ORLIM	.01745
25.		25.			
30	1	30	5	VOVIT(I)-VOVI TABLE FOR RAM F + M	
.227		.298	.514	10.	
30	6	30	11	ATURN(J)-ATURN TABLE FOR RAM F + M	.01745
20.		45.	70.	90.	100.
30	14	30	43	ELRAMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	.08333

.693	.234	.234	3.51	2.248	1.78	.973
1.842	4.54	3.433	2.996	2.437	1.765	1.042
4.884	3.818	3.564	3.564	4.07	2.437	4.87
3.564	3.564			4.07	4.004	3.818
30	54	30	83	83 DATUM(I,J)-DELTA ATURN TABLE FOR RAM F * M		
				12.91	12.91	12.91
7.72	5.08	5.08	19.47	19.47	12.41	11.59
11.59	15.65	15.65	12.11	11.59	11.59	8.44
8.44	6.83	12.59	12.59	8.44	8.44	6.83
12.59	12.59					
30	94	30	123	123 EYART(I,J)-RAM EFFIC. FACTOR TABLE		
1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.195	1.127	1.127	1.816
1.016	1.372	1.372	1.234	1.092	1.092	1.402
1.402	1.243	1.108	1.108	1.402	1.402	1.243
1.108	1.188					
31	1	31	6	6 FPST(II)-AVAIL. RCS FORCE TABLE		
	.01	170.	365.	500.	875.	
31	7	31	12	12 BLORT(II)-RCS BLEED TABLE		
	3.5	4.5	10.	15.	30.	
32	1	32	4	4 MNT(II)-MACH TABLE FOR PROPUSSION SYSTEM		
	.1	.2	.3			
32	5	32	8	8 TFCMAX(II)-MAX A/B THRUST TABLE		
15416.	15705.	16162.	16705.			
32	9	32	12	12 TFCMIN(II)-MIN A/B THRUST TABLE		
9323.	9491.	9772.	10105.			
32	13	32	16	16 TFCIDL(II)-IDLE THRUST TABLE		
629.	753.	1004.	1306.			
32	17	32	20	20 TMDT(II)-MAX. FLOW RATE TABLE		
138.2	148.1	143.1	146.5			
32	21	32	26	26 TFRAT(II)-FG/FGMIN TABLE		
	.20	.4	.6	.8	1.	
32	27	32	32	32 TAPM(II) - FRAC. RPM TABLE		
	.28	.49	.665	.835	1.	
32	33	32	38	38 TFRACT(II) - FRACTIONAL THRUST TABLE		
	.1333	.20	.3133	.6667	1.0	
32	43	32	48	48 TACCEL(II)-ACCELERATION LIMIT TABLE		
	.4	.4	.4	.4	.4	
.1	32	53	58	58 TOECEL(II) - DECELERATION LIMIT TABLE		
	.4	.475	.625	.875	1.	
32	63	32	68	68 TTENG(II)-ENGINE TIME CONSTANT		
	.5	.3	.2	.2		
1.	38	1	39	39 AGER,DELTA(I)		
	5.	5.	.1	.1745	.1745	.1745
.05	.05	100.	120.	.1745	.1745	5.
.1	.1	.1745	.1745	.05	.05	.05
.01745	.01745					
42	1	42	7	7 ELEV(II)-ELEVON TABLE		
	10.	20.	30.	40.	60.	100.
42	8	42	14	14 EMELET(II)-ELEVON EFFECTIVENESS TABLE		
	1.	.77	.59	.55	.45	.45
1.	62	15	62	21 RUOT(II)-RUDDER TABLE		
	10.	20.	30.	40.	60.	100.
42	22	42	28	28 ERUOT(II)-RUDDER EFFECTIVENESS TABLE		
	1.	.82	.52	.55	.47	.47
1.	44	1	44	3 ACSSM,TCSSM1		

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2.	44	7	44	1.	8	TAKOS			
1.	44	12	44	13	TKPINT				
8.	44	17	44	10	TKPHI				
1.	44	22	44	23	IKPB				
8.	44	27	44	28	TKPS				
1.	44	32	44	33	TKQINT				
44	37	44	38	IKMEIA					
1.	44	42	44	43	TKRINT				
8.	44	47	44	48	TKPSI				
8.	44	52	44	53	TKRB				
8.	44	57	44	58	TAKPCI				
1.	44	62	44	63	TAKPEI				
1.	44	67	44	68	TAKRCI				
8.	44	72	44	73	TAKREI				
1.	44	77	44	78	TAKQCI				
1.	44	82	44	83	TAKQEI				
1.	44	87	44	88	TKRS				
1.	44	92	44	92	AKPHIRS				
1.	45	1	45	1	VELGAIN				
1.	45	2	45	2	AVEL				
6.									1,500
45	3	45	8	TVEL					
8.	45	11	45	16	VAKPC	00.	120.	200.	
.3	45	19	45	24	VKPCI1	.3	.5	.5	
1.	45	27	45	32	VKFEI1	1.	1.	1.	
.6	45	35	45	40	VKF	.2	.2	.2	
.5	45	43	45	48	VAKPE	.5	.5	.5	
6.	45	51	45	56	VAKRC	2.	4.	2.	
1.	45	59	45	64	VKRCI1	1.	1.	1.	
0.						0.	0.	0.	

45	67	45	72	VKREI1	.2	.2	.2
.8	.8	.2					
45	75	45	80	VKF	1.	1.	1.
.5	.5	1.					
45	83	45	88	VAKRE	1.1	1.1	1.1
13.	13.	.3					
45	91	45	96	VAKQC	.3	.3	.3
1.	1.	.3					
45	99	45	104	VKQCII	1.	1.	1.
		1.					
45	107	45	112	VKQEI1	.2	.2	.2
.2	.2	.2					
45	115	45	120	VKQ	.5	.5	.5
.5	.5	.5					
45	123	45	128	VAKQE	15.	0.	5.
10.	10.	15.					
45	131	45	136	VAKZE			
-500.	-500.						
45	139	45	144	VKZEI1			
.2	.2						
45	147	45	152	VTPITGH			
.25	.25						
45	155	45	160	VTRDOLL	0.	0.	0.
0.	0.	0.					
45	163	45	168	WTYAH			
.25	.25						

BLANK CARD-END OF BASIC LOAD

LISTING OF TRIM SUMMARY OUTPUT SPECIFICATIONS FOR BASIC DATA LOAD

29	9	592	AIR SPEED
2	1	1.	UDOT
2	2	1.	V00T
2	3	1.	W00T
3	1	1.	U
3	2	1.	V
3	3	1.	M
3	4	57.2958	P-D/S
3	5	57.2958	Q-D/S
3	6	57.2958	R-D/S
29	13	57.2958	ALPHA-DG
29	14	57.2958	BETA-DG
41	4	1.	KE2D-F/S2
41	5	1.	YE2D-F/S2
41	6	1.	ZE2D-F/S2
2	16	1.	XE00T-F/S
2	17	1.	YE00T-F/S
2	18	1.	ZE00T-F/S
2	19	57.2958	THETA-D/S
2	20	57.2958	PHI-D/S
2	21	57.2958	PSI-D/S
3	64	57.2958	THETA-DG
3	65	57.2958	PHI-DEG
3	66	57.2958	PSI-DEG
28	52	57.2958	DA-DEG
28	50	57.2958	DE-DEG
28	21	57.2958	DR-DEG
28	20	1.	DROLL
28	38	1.	OPITCH
28	29	1.	DYAM
3	24	57.2958	PSIT(11)
3	26	57.2958	TMT(11)
3	19	57.2958	L-ELEV-DG
3	20	57.2958	R-ELEV-DG
27	9	1.	FRCS1-LB
27	10	1.	FRCS2-LB
27	19	1.	BLDRFQ
26	7	1.	BLDAVL
3	28	1.	DRSC1
3	29	1.	DRSC2
28	58	1.	TCMD-LB
26	34	1.	T01-LB
26	35	1.	T02-LB
26	14	1.	TRE1-LB
26	15	1.	TRE2-LB
26	5	1.	INST1-LB
26	6	1.	INST2-LB
23	9	1.	TCOR1-LB
23	10	1.	TCOR2-LB
26	3	1.	RPM1
26	4	1.	RPM2
26	1	1.	MDOT1
26	2	1.	MDOT2

THESE CARDS REPLACE THE TIME HISTORY OUTPUT SPECIFICATION CARDS IN THE BASIC DATA LOAD WHEN A TRIM SUMMARY (OPTION 12) IS DESIRED. IF NEITHER OPTION 4 (TIME HISTORY) NOR OPTION 12 IS CALLED IN A RUN, THEN THE OUTPUT SPECIFICATION CARDS IN THE BDL CAN BE REPLACED BY ONE BLANK CARD. (I.E. THE OUTPUT SPECIFICATION CARDS ARE NOT REQUIRED BY ANY OTHER VATLAS OPTIONS)

33	226	1.	X/U
35	226	1.	Z/U
37	226	1.	M/U
33	227	1.	X/M
35	227	1.	Z/A
37	227	1.	M/M
33	228	1.	X/Q
35	228	1.	Z/Q
37	228	1.	M/Q
33	229	1.	X/DE
35	229	1.	Z/DE
37	229	1.	M/DE
33	230	1.	X/FLAPA
35	230	1.	Z/FLAPA
37	230	1.	M/FLAPM
33	231	1.	X/FLAPC
35	231	1.	Z/FLAPC
37	231	1.	M/FLAPC
33	234	1.	X/T01
35	234	1.	Z/T01
37	234	1.	M/T01
33	235	1.	X/T0
35	235	1.	Z/T02
37	235	1.	M/T02
33	236	1.	X/THT1
35	236	1.	Z/THT1
37	236	1.	M/THT1
33	237	1.	X/THT2
35	237	1.	Z/THT2
37	237	1.	M/THT2
34	238	1.	Y/V
36	238	1.	L/V
38	238	1.	N/V
36	239	1.	Y/P
36	239	1.	L/P
38	239	1.	N/P
34	240	1.	Y/R
36	240	1.	L/R
38	240	1.	N/R
34	241	1.	Y/JP
36	241	1.	L/JP
38	241	1.	N/JP
34	242	1.	Y/OA
36	242	1.	L/OA
38	242	1.	N/OA
34	243	1.	Y/DRCSR
36	243	1.	L/DRCSR
38	243	1.	N/DRCSR
34	246	1.	Y/PSI11
36	246	1.	L/PSI11
38	246	1.	N/PSI11
34	247	1.	Y/PSI12
36	247	1.	L/PSI12
38	247	1.	N/PSI12

BLANK LARD-END TRIM SUMMARY OUTPUT SPECIFICATIONS

APPENDIX D

EXAMPLE 1 (TRANSITION TRIM) OUTPUT

69 MEOS

5 0 NTAP. NTAPM

DIVISION OF R-ARRAY

I	NR(I)	LENGTH(I)
1	0	7
2	7	69
3	76	69
4	145	17
5	162	19
6	181	91
7	272	29
8	301	18
9	319	34
10	353	27
11	380	19
12	399	15
13	414	1
14	415	17
15	432	206
16	638	225
17	863	148
18	1011	6
19	1017	54
20	1071	33
21	1104	21
22	1125	28
23	1153	31
24	1184	44
25	1228	11
26	1239	35
27	1274	73
28	1347	76
29	1423	67
30	1490	133
31	1623	12
32	1635	72
33	1787	258
34	1957	250
35	2207	250
36	2457	250
37	2707	250
38	2957	250
39	3207	26
40	3233	50
41	3283	10
42	3293	28
43	3321	161
44	3482	103
45	3585	178

ORIGINAL PAGE IS
OF POOR QUALITY

OUTPUT SPECIFICATIONS

					AIRSPED		
29	9	59200					
		1.00000	UOOT				
		1.00000	VOOT				
		1.00000	WOOT				
		1.00000	U				
		1.00000	V				
		1.00000	W				
		57.29500	P-D/S				
		57.29500	Q-D/S				
		57.29500	R-D/S				
		57.29500	ALPHA-OG				
		57.29500	BETA-OG				
		1.00000	XEZO-F/S2				
		1.00000	YEZO-F/S2				
		1.00000	ZEZO-F/S2				
		1.00000	XEDOT-F/S				
		1.00000	YEDOT-F/S				
		1.00000	ZEDOT-F/S				
		57.29500	THEYO-D/S				
		57.29500	PHIO-D/S				
		57.29500	PSIO-D/S				
		57.29500	THEYA-OG				
		57.29500	PHI-DEG				
		57.29500	PSI-DEG				
		57.29500	OM-DEG				
		57.29500	DE-DEG				
		57.29500	DR-DEG				
		1.00000	DKOLL				
		1.00000	DPITCH				
		1.00000	OYAN				
		57.29500	PSIT(1)				
		57.29500	THT(1)				
		57.29500	L-ELEV-OG				
		57.29500	P-ELEV-OG				
		1.00000	FRCS1-LB				
		1.00000	FRCS2-LB				
		1.00000	BLOREO				
		1.00000	BLOAVL				
		1.00000	DRSC1				
		1.00000	DRSC2				
		1.00000	TCHD-1				
		1.00000	TO1-LB				
		1.00000	TO2-LB				
		1.00000	TREO1-LB				
		1.00000	TREO2-LB				
		1.00000	TRST1-LB				
		1.00000	TRST2-LB				
		1.00000	TCOR1-LB				
		1.00000	TCOR2-LB				
		1.00000	RPH1				
		1.00000	RPN2				
		1.00000	MOOF1				
		1.00000	MOOF2				
		1.00000	X/U				
		1.00000	Z/U				
		1.00000	M/U				

33	227	1.00000	X/M
35	227	1.00000	Z/M
37	227	1.00000	M/M
37	228	1.00000	X/Q
35	228	1.00000	Z/Q
37	228	1.00000	M/Q
33	229	1.00000	X/DE
35	229	1.00000	Z/DE
37	229	1.00000	M/DE
33	230	1.00000	X/FLAPH
35	230	1.00000	Z/FLAPH
37	230	1.00000	M/FLAPH
33	231	1.00000	X/FLAPC
35	231	1.00000	Z/FLAPC
37	231	1.00000	M/FLAPC
33	234	1.00000	X/T01
35	234	1.00000	Z/T01
37	234	1.00000	M/T01
33	235	1.00000	X/T02
35	235	1.00000	Z/T02
37	235	1.00000	M/T02
33	236	1.00000	X/TMT1
35	236	1.00000	Z/TMT1
37	236	1.00000	M/TMT1
33	237	1.00000	X/TMT2
35	237	1.00000	Z/TMT2
37	237	1.00000	M/TMT2
34	238	1.00000	V/V
36	238	1.00000	L/V
36	238	1.00000	N/V
34	239	1.00000	V/P
36	239	1.00000	L/P
36	239	1.00000	N/P
34	240	1.00000	V/R
36	240	1.00000	L/R
36	240	1.00000	N/R
34	241	1.00000	V/DR
36	241	1.00000	L/DR
36	241	1.00000	N/DR
34	242	1.00000	V/DA
36	242	1.00000	L/DA
36	242	1.00000	N/DA
34	243	1.00000	V/DRCSR
36	243	1.00000	L/DRCSR
36	243	1.00000	N/DRCSR
34	246	1.00000	V/PSIT1
36	246	1.00000	L/PSIT1
36	246	1.00000	N/PSIT1
34	247	1.00000	V/PSIT2
36	247	1.00000	L/PSIT2
36	247	1.00000	N/PSIT2
36	247	1.00000	N/PSIT2
8	8	8.00000	BLANK CARD-END TRIM SUMMARY OUTPUT SPECIFICATIONS

NOU= 107

STORE FIXED TABLES ETC.

16375.0000	4	5	MT,IX,IZ,IXZ	0.00000	
	4	7	5269.0000	50337.0000	-202.40000
401.50000	6	8	FSCG,BLGG,WLCC	.00333	
	5	19	TOL(1)-TRIM TOLERANCES	0.00000	
.50000	5	00000	50000	1.00000	.50000
.10000	5	00000	.02000	1.00000	.50000
0.00000	6	7	AERO,AERO(I,J)-AERO	0.00000	
0.00000	6	7	LIFT-DRAG CONSTANTS	0.00000	
1.06000	6	7	350.00000	217.20000	.70900
-.34300	6	7	59300	.00394	.97400
2.25000	6	7	-.00590	.30400	.52500
0.00000	6	7	115.00000	.93400	1.04700
2.00000	6	7	6.04500	.44200	.10650
6.04500	6	7	0.00000	0.00000	0.00000
0.00000	6	7	60.00000	.78500	.30000
0.00000	6	7	0.00000	0.00000	0.00000
0.00000	6	7	0.00000	0.00000	0.00000
0.00000	6	7	0.00000	0.00000	0.00000
.57100	6	7	.17500	.73400	.74900
.97600	7	8	FSM,BLM1,BLM2,WLM	.00333	
448.00000	7	9	78.00000	78.00000	99.00000
14.50000	7	9	CM,BH,EKA1,EKA2,EIM	0.00000	
0.00000	7	10	29.30000	0.00000	0.00000
0.00000	7	13	CLB8W,CLBCLM,CLRCLM,CLPW	0.00000	
0.00000	7	14	-.23500	27500	-.19200
0.00000	7	19	CM80H,CM8CL2M,CM8CL2M,CM80M,CMPCCLM,CMPCDAM	0.00000	
0.00000	7	20	-.13200	-.16600	-.45300
0.00000	7	21	CM0H,CM0FM	0.00000	
0.00000	7	22	-.01910	0.00000	
7.00000	7	23	AEKEL	0.00000	
-.30800	7	23	CYBCL2M	0.00000	
312.50000	8	3	FSM,BLM,WLM	.00333	
6.42000	8	6	0.00000	115.00000	0.00000
	8	8	CM,BH,EKADE,EYM,E0CLM	0.00000	
-.05730	8	9	16.13000	0.00000	-.30730
536.00000	9	10	CMDFM,CM0H	0.00000	
0.00000	9	10	0.00000	0.00000	
0.00000	9	3	FSV,BLV,WLV	.00333	
0.00000	9	9	0.00000	157.00000	0.00000
0.49000	9	9	CV,BV,EKADR,EIV,EKV,CM0W	0.00000	
7.00000	9	10	7.75000	.50000	0.00000
7.00000	9	10	AEKRU0	0.00000	
-180.00000	9	11	28.00000	30.00000	60.00000
160.00000	9	21	180.00000	50.00000	149.00000
10.00000	9	21	AALFA	0.00000	150.00000
1.00000	9	22	TVTEFF(I)	0.00000	.70000
1.00000	9	31	1.00000	.25000	0.00000
1.00000	10	1	1.00000	0.00000	.25000
	10	3	FSF,BLF,WLF	.00333	.70000

16	66	16	69	PELIM,AKOVR,KTHR,KDA				0.0000
1.00000	0.0000	0.0000	-0.4360					0.0000
16	118	16	113	RELIM,AKYRM,KPSIT,KOR				0.0000
1.00000	0.0000	-0.2620	-0.4360					0.0000
16	114	16	119	TAKAYLI--LAT.ACCEL.FDBACK_TABLE				0.0000
0.00000	0.0000	0.0025	0.1050					0.0000
16	122	16	122	KTY				0.0000
0.00000								0.0000
16	163	16	167	DELIM,AKPRM,DSIK,KBE,KTHP				0.0000
1.00000	0.0000	0.0000	-0.2620					0.0000
16	164	16	164	AKTHROT				0.0000
30000.0000								0.0000
16	185	16	185	ZELIM				0.0000
30000.0000								0.0000
16	186	16	188	ELEVRF,PSITRF(I)				0.0000
0.00000	0.0000	0.0000						0.0000
16	189	16	192	KHFLAP1,KHFLAP2,KHFLAP1,KHFLAP2				0.0000
5.56000	-1.16400	0.17000	-0.10900					0.0000
16	193	16	193	AQBAR				0.0000
7.00000								0.0000
16	194	16	199	TORAR(I)--DYNAMIC PRESSURE TABLE				0.0000
0.00000	0.0000	20.0000	46.0000	127.0000				0.0000
17	1	17	4	LEURATL,LELRATL,LEUPOSL,LELPOSL				0.1745
35.00000	-35.00000	60.00000	-60.00000					0.0000
17	5	17	5	YLEL				0.0000
0.05000								0.1745
17	6	17	9	REURATL,RELURATL,REUPOSL,RELPOSL				0.0000
35.00000	-35.00000	60.00000	-60.00000					0.0000
17	10	17	10	IREL				0.0000
0.05000								0.1745
17	11	17	14	ORURATL,ORLRATL,ORUPOSL,ORLPOSL				0.0000
100.00000	-100.00000	25.00000	-25.00000					0.0000
17	15	17	15	TOR				0.0000
0.05000								0.1745
17	16	17	19	MFURATL,MFLURATL,MFLURATL,MFLURATL				0.0000
10.00000	-10.00000	25.00000	-12.00000					0.0000
17	20	17	20	THF				0.0000
0.10000								0.1745
17	21	17	24	MFURATL,MFLURATL,MFLURATL,MFLURATL				0.0000
10.00000	-10.00000	30.00000	0.00000					0.0000
17	25	17	25	THF				0.0000
0.10000								0.1745
17	26	17	33	THURL(2),THURL(2),THURL(2),THURL(2)				0.0000
50.00000	-50.00000	-50.00000	15.00000	-15.00000				0.0000
17	34	17	35	THHT(2)				0.0000
0.05000								0.1745
17	36	17	43	PSIURL(2),PSIURL(2),PSIURL(2),PSIURL(2)				0.0000
50.00000	-50.00000	-50.00000	15.00000	-15.00000				0.0000
17	44	17	45	TPSIT(2)				0.0000
0.05000								0.0000
17	46	17	47	ACSURL(2)				0.0000
10.00000								0.0000
17	56	17	57	ACSURL(2)				0.0000
-10.00000								0.0000
17	66	17	67	ACSURL(2)				0.0000
1.00000								0.0000
17	76	17	77	ACSURL(2)				0.0000

17	86	-1.00000	17	87	TAURGS(2)				0.00000
17	96	.05000	17	97	FRCSURL(2)				0.00000
15000	00000	15000	00000						0.00000
17	106	-15000	00000	17	107	FRCSURL(2)			0.00000
17	116	1500	00000	17	117	FRCSURL(2)			0.00000
17	126	-1500	00000	17	127	FRCSURL(2)			0.00000
17	136	.05000	17	137	TAURGS(2)				0.00000
17	146	.05000	17	148	DELIM, DALIM, ORLIM				.01745
25	00000	25	00000						0.00000
30	1	30	5	VOVIT(I)-VOVI TABLE FOR RAM F + M					0.00000
30	6	30	11	ATURN(I,J)-ATURN TABLE FOR RAM F + M					.01745
30	14	30	43	ELARM(I,J)-MOMENT ARM TABLE FOR RAM F + M					.08333
0	00000	0	00000						.97300
23680	23680	3	51000						1.04200
3	43300	2	99600						4.08400
3	56400	4	07000						3.56400
30	54	30	83	DATURN(I,J)-DELTA ATURN TABLE FOR RAM F + M					.01745
0	00000	0	00000						12.91000
5	08000	5	08000						11.59000
15	65000	12	11000						6.44000
12	59000	6	44000						12.59000
30	96	30	123	START(I,J)-RAM EFFIC. FACTOR TABLE					0.00000
1	00000	1	00000						1.00000
1	00000	1	00000						1.01600
1	37200	1	23600						1.40200
1	10800	1	40200						1.10800
31	1	31	6	FRCS(I)-AVAIL. RCS FORCE TABLE					0.00000
0	00000	0	01000						675.00000
31	12	31	12	BLDRT(I)-RCS BLEED TABLE					0.00000
0	00000	3	50000						30.00000
32	1	32	4	MNT(I)-MACH TABLE FOR PROPUSSION SYSTEM					0.00000
0	60000	0	10000						0.00000
15	16	00000	15785	00000					0.00000
32	12	32	12	TGMIN(I)-MIN A/B THRUST TABLE					0.00000
9	323	00000	9491	00000					0.00000
32	13	32	16	TGID(I)-IDLE THRUST TABLE					0.00000
629	30000	753	00000						0.00000
32	17	32	20	THOT(I)-MAX, FLOW RATE TABLE					0.00000
138	20000	140	10000						0.00000
32	21	32	26	TFRAT(I)-FG/FGMIN TABLE					0.00000
0	00000	0	20000						0.00000
32	27	32	32	TFRM(I)-FRAC. RPM TABLE					0.00000
0	00000	0	20000						0.00000
32	33	32	30	TFRAC(I)-FRACTIONAL THRUST TABLE					0.00000
0	60000	0	13330						1.00000
32	43	32	48	TACCEL(I)-ACCELERATION LIMIT TABLE					0.00000
0	10000	0	10000						.40000
32	53	32	50	TOECEL(I)-OLCELERATION LIMIT TABLE					0.00000

32	63	10000	40000	47500	62500	100000	100000	100000
32	63	60	TTENG(I)-ENGINE TIME CONSTANT					
39	1	50000	40000	30000	20000	20000	20000	20000
39	23	ADER, DELTA(I)						
22	00000	500000	500000	10000	01745	01745	01745	05000
05000	10000000	10000000	10000000	01745	01745	500000	01745	10000
01745	01745	05000	05000	05000	05000	05000	01745	01745
42	1	7	ELEV(I)-ELEVON TABLE					
000000	1000000	2000000	3000000	4000000	6000000	10000000	10000000	10000000
42	8	14	EKELET(I)-ELEVON EFFECTIVENESS TABLE					
1000000	1000000	70000	59000	53000	45000	45000	45000	45000
42	15	21	RUDT(I)-RUDDER TABLE					
000000	1000000	2000000	3000000	4000000	6000000	10000000	10000000	10000000
42	22	20	EKRU(I)-RUDDER EFFECTIVENESS TABLE					
1000000	1000000	02000	62000	55000	47000	47000	47000	47000
44	1	44	3	ACSSM, TCSSM1				
2000000	0000000	1000000	1000000					
44	7	44	8	YAKGS				
1000000	1000000	1000000	1000000					
44	12	44	13	TKPINT				
0000000	1000000	1000000	1000000					
44	17	44	18	TKPMI				
1000000	0000000	0000000	0000000					
44	22	44	23	TKPB				
0000000	1000000	1000000	1000000					
44	27	44	28	TKPS				
1000000	0000000	0000000	0000000					
44	32	44	33	TKQINT				
0000000	1000000	1000000	1000000					
44	37	44	38	TKMETHA				
1000000	0000000	0000000	0000000					
44	42	44	43	TKRINT				
0000000	1000000	1000000	1000000					
44	47	44	48	TKPSI				
0000000	0000000	0000000	0000000					
44	52	44	53	TKRB				
0000000	1000000	1000000	1000000					
44	57	44	58	TKMPCI				
1000000	0000000	0000000	0000000					
44	62	44	63	TKMPEI				
1000000	0000000	0000000	0000000					
44	67	44	68	TKMRCI				
0000000	1000000	1000000	1000000					
44	72	44	73	TKMREI				
1000000	0000000	0000000	0000000					
44	77	44	78	TKMCCI				
1000000	0000000	0000000	0000000					
44	82	44	83	TKMCEI				
1000000	0000000	0000000	0000000					
44	87	44	88	TKMRS				
1000000	0000000	0000000	0000000					
44	92	44	92	AMPHIRS				
1000000	0000000	0000000	0000000					
45	1	45	1	VELGAIN				
1000000	0000000	0000000	0000000					
45	2	45	2	AVEL				
6000000	0000000	0000000	0000000					

45	3	45	8	TVEL	60.00000	00.00000	120.00000	200.00000	1.60000
0.00000	59.50000	30000	16	VAKPC	.30000	.30000	.50000	0.00000	
45	11	45	24	VKPGI1	1.00000	1.00000	1.00000	0.00000	
45	19	45	32	VKPEI1	.20000	.20000	.20000	0.00000	
1.00000	1.00000	.60000	40	VKP	.50000	.50000	.50000	0.00000	
45	27	45	48	VAKPE	2.00000	2.00000	2.00000	0.00000	
45	35	05	56	VAKRC	1.00000	1.00000	1.00000	0.00000	
45	43	45	64	VKRCI1	0.00000	0.00000	0.00000	0.00000	
6.00000	6.00000	.80000	72	VKREI1	.20000	.20000	.20000	0.00000	
45	51	45	80	VKR	1.00000	1.00000	1.00000	0.00000	
45	59	45	88	VAKRE	.30000	.30000	.30000	0.00000	
0.00000	13.00000	45	96	VAKQC	1.00000	1.00000	1.00000	0.00000	
45	67	45	104	VKRCI1	1.00000	1.00000	1.00000	0.00000	
45	75	45	112	VKQEI1	.20000	.20000	.20000	0.00000	
45	83	45	120	VKQ	.50000	.50000	.50000	0.00000	
13.00000	1.00000	45	128	VAKQE	19.00000	19.00000	19.00000	5.00000	
45	91	45	136	VAKZE	0.00000	0.00000	0.00000	0.00000	
1.00000	1.00000	45	144	VKZEI1	0.00000	0.00000	0.00000	0.00000	
45	99	45	152	VTPITCH	0.00000	0.00000	0.00000	0.00000	
0.00000	0.00000	45	160	VTROLL	0.00000	0.00000	0.00000	0.00000	
45	107	45	168	VTYAW	0.00000	0.00000	0.00000	0.00000	
45	115	45	0		0.00000	0.00000	0.00000	0.00000	
500.00000	0.00000	0	0		0.00000	0.00000	0.00000	0.00000	
10.00000	10.00000	0	0		0.00000	0.00000	0.00000	0.00000	
45	123	45	0		0.00000	0.00000	0.00000	0.00000	
45	131	45	0		0.00000	0.00000	0.00000	0.00000	
45	139	45	0		0.00000	0.00000	0.00000	0.00000	
20000	20000	0	0		0.00000	0.00000	0.00000	0.00000	
25000	25000	0	0		0.00000	0.00000	0.00000	0.00000	
0.00000	0.00000	0	0		0.00000	0.00000	0.00000	0.00000	
45	147	05	0		0.00000	0.00000	0.00000	0.00000	
45	155	45	0		0.00000	0.00000	0.00000	0.00000	
0.00000	0.00000	0	0		0.00000	0.00000	0.00000	0.00000	
45	163	45	0		0.00000	0.00000	0.00000	0.00000	
25000	25000	0	0		0.00000	0.00000	0.00000	0.00000	
0	0	0	0		0.00000	0.00000	0.00000	0.00000	
					BLANK CARD-END OF BASIC LOAD				

MOPT=1 STORE_READ/WRITE INFO

NTAP= 2

4	1	4	1	WEIGHT-POUNDS				0.00000
4	1	4	1	WEIGHT-NEWTONS				4.44800
4	2	4	5	IX,IY,I,Z,IXI(AIRCRAFT INERTIA)-SLUG-FT**2				0.00000
4	2	4	5	IX,IY,I,Z,IYI(AIRCRAFT INERTIA)-KG-M**2				1.35500
14	10	14	10	JENG(ENGINE INERTIA)-SLUG-FT**2				0.00000
14	10	14	10	JENG(ENGINE INERTIA)-KG-M**2				1.35500
29	45	29	45	ALTITUDE-FT				0.00000

29	45	29	45	ALTITUDE-METERS					.30400
29	10	29	10	TRUE AIRSPEED-KNOTS					0.00000
29	9	29	9	TRUE AIRSPEED-FT/SEC					0.00000
29	9	29	9	TRUE AIRSPEED-M/SEC					.30400
29	12	29	12	QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2					0.00000
29	11	29	11	MACH NUMBER					0.00000
29	12	29	12	QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2					0.00000
29	12	29	12	QBAR(DYNAMIC PRESSURE)-SLUGS/FT**3					515.30000
29	6	29	6	RHO(AIR DENSITY)-KG/M**3					0.00000
29	6	29	6	RHO(AIR DENSITY)-M/SEC**2					.59020
29	57	29	57	XDM,YDM,ZDM(AMB. WIND COMPONENTS-EARTH AXES)FT/S					0.00000
29	57	29	57	XDM,YDM,ZDM(AMB. WIND COMPONENTS-EARTH AXES)M/S					.30400
29	16	2	16	XEDOT,YEDOT,ZEDOT(FT/S)					0.00000
2	16	2	16	XEDOT,YEDOT,ZEDOT(M/S)					.30400
41	6	41	6	XE2D,YE2D,ZE2D-FT/SEC**2					0.00000
41	6	41	6	XE2D,YE2D,ZE2D-M/SEC**2					.03106
41	6	41	6	XE2D,YE2D,ZE2D-M/SEC**2					.30400
2	1	2	1	UDDOT,VDDOT,NDOT-FT/SEC**2					0.00000
2	1	2	1	UDDOT,VDDOT,NDOT-M/SEC**2					.03106
2	1	2	1	UDDOT,VDDOT,NDOT-M/SEC**2					.30400
3	1	3	1	U,V,W(LINER. SPEED COMPONENTS)FT/SEC					0.00000
3	1	3	1	U,V,W(LINER. SPEED COMPONENTS)M/SEC					.30400
29	1	29	1	UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC					0.00000
29	54	29	54	UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC					.30400
3	4	3	4	MXGG,NYGG,MZGG(BODY AXIS ACCEL.)-GEES					0.00000
3	64	3	64	P,Q,R(BODY AXIS RATES)-DEG/SEC					57.29578
29	13	29	13	TETA,PHI,PSI(EULER ANGLES)-DEG					57.29578
2	10	2	10	LPMG,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG					60.00000
2	10	2	10	ZDRATE OF SINK)-FT/MIN					0.00000
2	10	2	10	ZDRATE OF SINK)-M/SEC					.30400
2	10	2	10	ZDRATE OF SINK)-M/SEC					0.00000
20	20	20	20	NORM. ROLL CONTROL					0.00000
20	29	20	29	NORM. YAW CONTROL					0.00000
20	30	20	30	NORM. PITCH CONTROL					0.00000
3	26	3	26	TMT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG					57.29578
3	24	3	24	PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG					57.29578
3	19	3	19	LEFT ELEVON DEFLECTION-DEG					57.29578
3	20	3	20	RIGHT ELEVON DEFLECTION-DEG					57.29578
20	50	20	50	ELEVATOR COMMAND DEFLECTION-DEG					57.29578
20	51	20	51	AILERON COMMAND DEFLECTION-DEG					57.29578
3	20	3	20	DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)					0.00000
20	50	20	50	TCMD(THRUST COMMAND)-NEWTONS					0.00000
20	50	20	50	TCD(THRUST COMMAND)-NEWTONS					4.44800
23	9	23	9	TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS					0.00000
23	9	23	9	TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS					4.44800
3	21	3	21	RUDDER DEFLECTION-DEG					57.29578
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS					0.00000
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS					4.44800
26	1	26	1	MDOOT1,MDOOT2(ENGINE INLET MASS FLOW)-LBM/SEC					0.00000
26	1	26	1	MDOOT1,MDOOT2(ENGINE INLET MASS FLOW)-KG/SEC					.45400
15	3	15	3	BLODFR(REFERENCE RCS BLEED)-PER CENT					0.00000
26	7	26	7	BLOAVL					0.00000
27	72	27	72	BLO(ACTUAL RCS BLEED)-PER CENT					0.00000
3	30	3	30	FRCS1,FRCS2(RCS JET FORCES)-POUNDS					0.00000
3	30	3	30	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS					4.44800
11	7	11	7	SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG					57.29578
19	44	19	44	MW,LM,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB					0.00000

19	44	19	46	MH,LM,NH(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M	1.35500
19	37	19	38	XW1,XW2(WING X FORCES)-POUNDS	0.00000
19	37	19	38	XW1,XW2(WING X FORCES)-NEWTONS	6.44800
19	39	19	40	ZW1,ZW2(WING Z FORCES)-POUNDS	0.00000
19	39	19	40	ZW1,ZW2(WING Z FORCES)-NEWTONS	6.44800
19	19	19	20	CLW1,CLW2(WING LIFT COEFFICIENT)	0.00000
3	48	3	48	DFLAPH(CANARD TE FLAP DEFLECTION)-DEG	57.29578
3	49	3	49	DFLAPH(WING LE FLAP DEFLECTION)-DEG	57.29578
19	1	19	3	DXM,DYM,DZM(WING AERO FORCES)-POUNDS	0.00000
19	1	19	3	DXM,DYM,DZM(WING AERO FORCES)-NEWTONS	6.44800
19	4	19	6	DLH,DMH,DNH(WING AERO MOMENTS)-FT-POUNDS	0.00000
19	4	19	6	DLH,DMH,DNH(WING AERO MOMENTS)-NEWTON-M	1.35500
20	1	20	3	DXM,DYM,DZM(CANARD AERO FORCES)-POUNDS	0.00000
20	1	20	3	DXM,DYM,DZM(CANARD AERO FORCES)-NEWTONS	6.44800
20	4	20	6	DLH,DMH,DNH(CANARD AERO MOMENTS)-FT-POUNDS	0.00000
20	4	20	6	DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M	1.35500
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	6.44800
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	0.00000
21	4	21	6	DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-FT-POUNDS	0.00000
21	4	21	6	DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M	1.35500
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS	0.00000
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS	6.44800
22	4	22	6	DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS	0.00000
22	4	22	6	DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M	1.35500
29	28	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS	0.00000
29	28	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS	6.44800
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS	0.00000
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M	1.35500
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS	0.00000
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS	6.44800
23	4	23	6	DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS	0.00000
23	4	23	6	DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M	1.35500
26	23	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC	0.00000
26	23	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC	1.35500
24	1	24	3	DXR,DYR,DZR(ARM FORCES)-POUNDS	0.00000
24	1	24	3	DXR,DYR,DZR(ARM FORCES)-NEWTONS	6.44800
24	4	24	6	DLR,DMR,DNR(ARM MOMENTS)-FT-POUNDS	0.00000
24	4	24	6	DLR,DMR,DNR(ARM MOMENTS)-NEWTON-M	1.35500
26	3	26	4	RPM1,RPM2(ENGINE ROT. SPEED)-RPM	0.00000
27	1	27	3	DXRCS,DYRCS,DZRC(SRCS FORCES)-POUNDS	0.00000
27	1	27	3	DXRCS,DYRCS,DZRC(SRCS FORCES)-NEWTONS	6.44800
27	4	27	6	DLRCS,DMRCS,DNRCS(SRCS MOMENTS)-FT-POUNDS	0.00000
27	4	27	6	DLRCS,DMRCS,DNRCS(SRCS MOMENTS)-NEWTON-M	1.35500
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS	0.00000
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS	6.44800
25	4	25	6	DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS	0.00000
25	4	25	6	DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M	1.35500
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS	0.00000
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS	6.44800
29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS	0.00000
29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M	1.35500
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS	0.00000
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M	1.35500
0	0	0	0	BLANK CARD - END OF OPTION 1 LOAD	0.00000

NOPT=9 DIMENSIONAL DERIVATIVES

PERTURBATION VARIABLES

29	1	1
29	3	2
3	5	3
28	58	4
3	49	5
3	48	6
28	54	7
28	57	8
26	34	9
26	35	10
3	26	11
3	27	12
29	2	13
3	4	14
3	6	15
3	21	16
26	52	17
28	53	18
8	55	19
28	56	20
3	24	21
3	25	22
0	0	0

P 14

NOPT=6 SET JP TRIM UNKNOWNNS

29	13	29	14	ALPHA,BETA
				MEQU=15
	.01745			.01745
3	3	6		P,Q,R
	.10000			.10000
28	20	28	20	DROLL
	.8500			
28	24	28	29	OYAM
	.05000			
28	30	28	30	DP ITCH
	.05000			
2	16	2	17	XEDOT,VEDOT
	2.00000			2.00000
29	54	29	54	NXCG
	.10000			
29	55	29	55	NYCG
	.10000			
29	56	29	56	NZCG
	.10000			
3	4	3	64	THETA
	.01745			
28	54	28	58	YCMD
	10.00000			

NOPT=2 READ R

NTAP= 5

41	4	41	3	XE2D, YE2D		2.20000	
0.00000		41	6	Z		32.20000	
9.00000		2	17	XE00L, YE00I		0.00000	
330.00000		2	18	Z, DCT		0.00000	
0.00000		3	16	Z		0.00000	
-100.00000		65	2	PHIL, PSID		0.00000	
0.00000		3	65	66PH1, PSI		.01745	
0.00000		3	64	THETA		.01745	
5.50000		20	20	20	20	0.00000	
0.00000		20	29	20	29	0.00000	
0.00000		20	30	20	30	0.00000	
0.00000		29	54	29	56	0.00000	
0.00000		20	50	20	50	0.00000	
5000.00000		29	9	9	VA	1.60900	
200.00000		29	13	29	13	ALPH	.01745
9.50000		1	7	DT, THAX, DTPRINT, DTPLT, TI		0.00000	
0.25000		41	1	AMIND		0.00000	
0.00000		41	2	VMIND		1.60900	
0.00000		41	7	TRMTURN		0.00000	
0.00000		41	10	TURNRAD		0.00000	
2640.00000		41	9	GAMMA, YADOT		0.00000	
0.00000		43	7	ASKEEP		0.00000	
0.00000		16	12	AKU, AKV, AKM, AKYES, AKZES		0.00000	
0.00000		43	129	ATRANS		0.00000	
0.00000		43	6	ATIME		0.00000	
0.00000		43	132	THROTT(10)		0.00000	
54600		43	142	VAT(10)		1.60900	
0.00000		40	0	0		100.00000	
0.00000		60	0	0		120.00000	
0.00000		44	300	0		0.06700	
0.00000		200	0	0		200.00000	

ORIGINAL PAGE IS OF POOR QUALITY

43 122 43 159 TNETCT(18) .01745
 102.98000 95.59000 85.50000 66.89000 36.65900 22.72000 16.31000 8.24000
 43 1 43 5 ACMD(1) 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
 43 9 43 16 CMT1(1)-DLNGSTK INPUT TABLE .01745
 0.00000 0.00000 10.00000 0.00000 0.00000 0.00000 0.00000
 43 29 43 16 CMT2(1)-D TSTK INPUT TABLE .01745
 0.00000 0.00000 10.00000 0.00000 0.00000 0.00000 0.00000
 43 49 43 56 CMT3(1)-OPED INPUT TABLE .01745
 0.00000 0.00000 20.00000 20.00000 20.00000 20.00000 20.00000
 43 69 43 76 CMT4(1)-ZEDTC INPUT TABLE 0.00000
 0.00000 0.00000 -10.00000 10.00000 0.00000 0.00000 0.00000
 43 89 43 96 CMT5(1)-THROTTLE INPUT TABLE 0.00000
 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
 43 109 43 116 TIMEF(1)-INPUT CONTROL TIME TABLE 0.00000
 0.00000 .30000 .51000 1.00000 1.01000 1.70000 1.71000 40.00000

NOPI=1 SIGSE READWRITE INFO

NTAP= 1

29 9 29 9 VA BLANK CARD - END OF OPTION 1 LOAD 1.60000
 0 0 0 0 0.00000

NOPI=1 LONGITUDINAL TRIM

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 NTAPE(4)= 0
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 NTAPE(96)= 0
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 NTAPE(98)= 0
 NTAPE(99)= 0
 NTAPE(100)= 0

EXAMPLE 1 - TRANSITION TRIM RUN

CASE INPUT (READ FROM FILE 6)

29 9 29 9 VA 1.60000
 200.00000

RESULTS OF TRIM

16375.00000	4	1	4	1	WEIGHT-POUNDS	0.00000
72636.00000	4	1	4	1	WEIGHT-NEWTONS	4.44800
7959.80000	2	4	5	IX, IY, IZ, IXZ (AIRCRAFT INERTIA) - SLUG-FT**2	0.00000	
	2	4	5	IX, IY, IZ, IXZ (AIRCRAFT INERTIA) - KG-M**2	1.35500	
10784.44500	14	14	10	JENG(ENGINE INERTIA) - SLUG-FT**2	0.00000	
	14	14	10	JENG(ENGINE INERTIA) - KG-M**2	1.35500	
4.25470	29	45	29	45 ALTITUDE-FT	0.00000	
100.00000	29	45	29	45 ALTITUDE-METERS	.30480	
36.48070	29	10	29	10 TRUE AIRSPEED-KNOTS	0.00000	
199.89342	29	9	29	9 TRUE AIRSPEED-FT/SEC	0.00000	
337.60000	29	9	29	9 TRUE AIRSPEED-M/SEC	.30480	
102.50048	29	12	29	12 QBAR(DYNAMIC PRESSURE) - POUNDS/FT**2	0.00000	
127.48668	29	11	29	11 MACH NUMBER	0.00000	
.29389	29	12	29	12 QBAR(DYNAMIC PRESSURE) - NEWTONS/M**2	47.88000	
6104.16752	29	4	29	4 RHO(AIR DENSITY) - SLUGS/FT**3	0.00000	
.00224	29	4	29	4 RHO(AIR DENSITY) - KG/M**3	515.36000	
1.15299	29	57	29	59 XOM, YOM, ZOM (AMB. WIND COMPONENTS - EARTH AXES) KT	.59020	
0.00000	29	57	29	59 XOM, YOM, ZOM (AMB. WIND COMPONENTS - EARTH AXES) FT/S	0.00000	
0.00000	29	57	29	59 XOM, YOM, ZOM (AMB. WIND COMPONENTS - EARTH AXES) M/S	.30480	
0.00000	2	16	2	18 XEDOT, YEDOT, ZEDOT (FT/S)	0.00000	
337.60031	2	16	2	18 XEDOT, YEDOT, ZEDOT (M/S)	.30480	
102.90057	41	6	41	6 XE20, YE20, ZE20 - FT/SEC**2	0.00000	
0.00000	41	6	41	6 XE20, YE20, ZE20 - G	.03106	
0.00000	41	6	41	6 XE20, YE20, ZE20 - M/SEC**2	.30480	
0.00000	2	1	2	3 UDOT, VDOT, WDOT - FT/SEC**2	0.00000	
0.00000	2	1	2	3 UDOT, VDOT, WDOT - G	.03106	
0.00000	2	1	2	3 UDOT, VDOT, WDOT - M/SEC**2	.30480	
0.00000	3	1	3	3 U, V, W (LINER. SPEED COMPONENTS) FT/SEC	0.00000	

334.11431	1	3	U, Y, M, L, INER. SPEED COMPONENTS) M/SEC	48.38790	30.488
101.83804	1	29	UAS, VAS, WAS (AIRSPEED COMPONENTS) FT/SEC	14.74863	0.00000
334.11431	1	29	UAS, VAS, WAS (AIRSPEED COMPONENTS) M/SEC	48.38790	30.488
101.83804	1	29	UAS, VAS, WAS (AIRSPEED COMPONENTS) FT/SEC	14.74863	0.00000
29	54	29	MXCG, NYCG, NZCG (BODY AXIS ACCEL.) G-EES	.98968	57.29578
24333	3	6	P, O, R (BODY AXIS RATES) DEG/SEC	-.00000	57.29578
3	64	3	THETA, PHI, PSI (EULER ANGLES) DEG	0.00000	57.29578
6.24053	13	29	ALPHA, BETA (ANGLES OF ATTACK AND SIDESLIP) DEG	-.00000	60.00000
8.24053	2	18	ZD (RATE OF SINK) FT/MIN	0.00000	0.00000
0.00000	2	18	ZD (RATE OF SINK) FT/SEC	0.00000	30.488
0.00000	2	18	ZD (RATE OF SINK) M/SEC	0.00000	0.00000
0.00000	28	28	NORM. ROLL CONTROL	0.00000	0.00000
-.00000	28	29	NORM. YAW CONTROL	0.00000	0.00000
0.00000	28	30	NORM. PITCH COM. ROL	0.00000	57.29578
0.03231	3	26	TH1, TH2 (THRUST DEFLECTION PITCH ANGLES) DEG	-.48507	57.29578
-.48507	3	24	PSI1, PSI2 (THRUST DEFLECTION PITCH ANGLES) DEG	-.00000	57.29578
-.00000	3	19	LEFT ELEVON DEFLECTION DEG	-.80722	57.29578
-.80722	3	20	RIGHT ELEVON DEFLECTION DEG	-.80722	57.29578
-.80722	28	58	ELEVATOR COMMAND DEFLECTION DEG	-.80722	57.29578
-.80722	28	51	AILERON COMMAND DEFLECTION DEG	-.00000	0.00000
-.00000	3	28	DRCS1, DRCS2 (ROLL RCS NORM. DEFLECTION)	-.00000	0.00000
0.00000	28	58	TCMD (THRUST COMMAND) POUNDS	3778.75155	0.00000
3778.75155	28	58	TCMD (THRUST COMMAND) NEWTONS	16807.886	4.44800
16807.886	9	23	TCOR1, TCOR2 (THRUST APPL. TO A/C) POUNDS	1887.29634	0.00000
1887.29634	9	23	TCOR1, TCOR2 (THRUST APPL. TO A/C) NEWTONS	8394.69413	4.44800
8394.69413	3	21	RUDDER DEFLECTION DEG	-.00000	57.29578
-.00000	26	20	TACS (THRUST LOSS DUE TO RCS BLEED) POUNDS	484.05955	0.00000
484.05955	26	20	TACS (THRUST LOSS DUE TO RCS BLEED) NEWTONS	1797.25689	4.44800
1797.25689	1	26	MOOT1, MOOT2 (ENGINE INLET MASS FLOWS) LBH/SEC	80.77861	0.00000
80.77861				80.77861	

7
18

26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC	.45400
36.67339	3	36.67349			0.00000
3.50000	3	3	3	BLOREF(REFERENCE RCS BLEED)-PER CENT	0.00000
31.56676	7	26	7	BLOAVL	0.00000
3.50000	72	27	72	BLOACTUAL RCS BLEED)-PER CENT	0.00000
0.00000	3	39	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	0.30000
0.00000	3	39	39	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	4.44800
0.00000	11	7	11	SIG(ENGINE CENTER LINE ANGLE MRT FRL)-DEG	57.29576
0.00000	19	46	46	MM,LM,MW(MING PITCH,ROLL,VAN MOMENTS)-FT-LB	0.00000
-1960.10856	19	46	46	MM,LM,MW(MING PITCH,ROLL,VAN MOMENTS)-NEWTON-M	1.35500
-2655.94710	19	36	36	XW1,XW2(MING X FORCE)-POUNDS	0.00000
393.15708	19	38	38	XW1,XW2(MING X FORCE)-NEWTONS	4.44800
1748.76270	19	40	40	ZW1,ZW2(MING Z FORCE)-POUNDS	0.00000
-7061.56847	19	40	40	ZW1,ZW2(MING Z FORCE)-NEWTONS	4.44800
31409.85654	19	20	20	CLW1,CLW2(MING LIFT COEFFICIENT)	0.00000
3.1577	3	48	48	OFLAPH(CANARD TE FLAP DEFLECTION)-DEG	57.29576
-11.99774	3	49	49	DFLAPH(CANARD LE FLAP DEFLECTION)-DEG	57.29576
23.53412	19	3	19	DXM,DYM,DZM(MING AERO FORCES)-POUNDS	0.00000
786.31416	19	3	19	DXM,DYM,DZM(MING AERO FORCES)-NEWTONS	4.44800
3497.52540	19	6	19	OLM,OLM,OLM(MING AERO MOMENTS)-FT-POUNDS	0.00000
0.00000	19	6	19	OLM,OLM,OLM(MING AERO MOMENTS)-NEWTON-M	1.35500
0.00000	19	3	19	DXM,DYM,DZM(CANARD AERO FORCES)-POUNDS	0.00000
-333.49703	20	3	20	DXM,DYM,DZM(CANARD AERO FORCES)-NEWTONS	4.44800
-1483.39480	20	6	20	OLM,OLM,OLM(CANARD AERO MOMENTS)-FT-POUNDS	0.00000
0.00000	20	6	20	OLM,OLM,OLM(CANARD AERO MOMENTS)-NEWTON-M	1.35500
0.00000	21	3	21	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	0.40800
-143.63169	21	3	21	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	0.00000
-32.29134	21	6	21	OLV,OLV,OLV(VERT TAIL AERO MOMENTS)-FT-POUNDS	0.00000
-0.00000	21	6	21	OLV,OLV,OLV(VERT. TAIL AERO MOMENTS)-NEWTON-M	1.35500
-0.00000	22	3	22	DXF,DTF,DZF(FUSELAGE AERO FORCES)-POUNDS	0.00000

-160.18719	.00000	-2037.55753			
22	3 DXF,DVF,DZF(FUSELAGE AERO FORCES)-NEWTONS			4.44800	
-801.47261	.00000	-9063.05199			
22	6 DLF,DMF,ONF(FUSELAGE AERO MOMENTS)-FT-POUNDS			0.00000	
8.00000	57287.48298	.00000		1.35500	
22	6 DLF,DMF,ONF(FUSELAGE AERO MOMENTS)-NEWTON-M			0.00000	
0.00000	77516.13944	.00000		0.00000	
29	22 XAERO,VAERO,ZAERO(TOTAL AERO FORCES)-POUNDS			0.44800	
240.33868	.00000	-15933.91777			
29	22 XAERO,VAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS			0.00000	
1069.02611	.00000	-70874.06624			
29	25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS			0.00000	
0.00000	-3662.78685	.00000		1.35500	
29	25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M			0.00000	
0.00000	-4963.87619	.00000		0.00000	
23	3 DXT,DVT,DZT(DIRECT THRUST FORCES)-POUNDS			4.44800	
3774.45741	-0.0000	31.95572			
23	3 DXT,DVT,DZT(DIRECT THRUST FORCES)-NEWTONS			0.00000	
16788.78657	-0.0000	142.13905			
23	6 DLT,DMT,DMT(DIRECT THRUST MOMENTS)-FT-POUNDS			0.00000	
-0.00000	83.57357	.00000		1.35500	
23	6 DLT,DMT,DMT(DIRECT THRUST MOMENTS)-NEWTON-M			0.00000	
-0.00000	113.24219	.00000		0.00000	
26	24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC			1.35500	
961.19377	961.19377			0.00000	
26	24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC			1.35500	
1302.41756	1302.41756			0.00000	
24	3 DXR,DYR,DZR(RAM FORCES)-POUNDS			0.00000	
-1667.71520	.00000	-304.88635		4.44800	
24	3 DXR,DYR,DZR(RAM FORCES)-NEWTONS			0.00000	
-7417.99488	.00000	-1352.57610		0.00000	
24	6 DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS			1.35500	
.00000	3578.87715	.00000		0.00000	
24	6 DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M			0.00000	
.00000	5849.37854	.00000		0.00000	
26	4 RPM1,RPM2(ENGINE ROT. SPEED)-RPM			0.00000	
2923.29252	2923.29252			0.00000	
27	3 DXRCS,DYRCS,DZRC(SRCS FORCES)-POUNDS			4.44800	
.00000	.00000	.00000		0.00000	
27	3 DXRCS,DYRCS,DZRC(SRCS FORCES)-NEWTONS			0.00000	
.00000	.00000	.00000		1.35500	
-0.00000	.00000	.00000		0.00000	
27	6 DLRCSD,DMRCS,DNRCS(SRCS MOMENTS)-FT-POUNDS			0.00000	
-0.00000	.00000	.00000		1.35500	
27	6 DLRCSD,DMRCS,DNRCS(SRCS MOMENTS)-NEWTON-M			0.00000	
-0.00000	.00000	.00000		0.00000	
25	3 DXCOR,DYCOR,DZCOR(CORLIOLIS FORCES)-POUNDS			4.44800	
0.00000	.00000	.00000		0.00000	
25	3 DXCOR,DYCOR,DZCOR(CORLIOLIS FORCES)-NEWTONS			0.00000	
0.00000	.00000	.00000		0.00000	
25	6 DLCOR,DMCOR,DNCOR(CORLIOLIS FORCES)-FT-POUNDS			1.35500	
-0.00000	.00000	.00000		0.00000	
25	6 DLCOR,DMCOR,DNCOR(CORLIOLIS FORCES)-NEWTON-M			0.00000	
-0.00000	.00000	.00000		0.00000	
29	28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS			0.00000	
2347.08152	.00000	-11206.04850		4.44800	
29	28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS			0.00000	
10439.81660	.00000	-72084.50329		0.00000	

29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS	0.00000
29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M	1.35500
51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS	0.00000
51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M	1.35500

EXAMPLE 1 - TRANSITION TRIM RUN

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	NOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	TMRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	-.5099E-02	-.4413E-02	-.3798E-03	-.2119E-02	-.1201E-01	0.	-.1668E-01	0.	.3639E-23	-.2269E-01
Z/U	-.6066E-01	.893E-02	0.	-.7868E-02	-.5963E-01	0.	-.1446E-03	.5343E-19	.1220E-19	-.5977E-01
W/U	-.2114E-02	-.1540E-02	.1776E-04	.2137E-02	-.1499E-02	0.	.2407E-04	.1378E-20	.1312E-20	-.1475E-02
X/W	.9907E-01	.3413E-02	0.	0.	.1025E+00	0.	.5961E-03	0.	.4203E-23	.1631E+00
Z/W	-.7277E+00	-.4332E-01	0.	-.1112E+00	-.8022E+00	0.	-.1234E-01	.1480E-19	.1410E-19	-.8945E+00
M/W	-.2563E-01	.2930E-02	0.	.3019E-01	.7494E-02	0.	.1352E-02	.3810E-21	.1515E-20	.0846E-02
X/Q	.3178E+00	-.5203E-01	.1036E-02	0.	.2676E+00	0.	.2577E-01	0.	.2505E-22	.2934E+00
Z/Q	-.2336E+01	.6690E+00	0.	0.	-.1667E+01	0.	.3584E+01	-.5508E+00	.8455E-19	.1366E+01
M/Q	-.8228E-01	-.4510E-01	-.8583E-04	0.	-.1277E+00	0.	-.3915E+00	-.1421E-01	.9031E-20	-.5335E+00
X/OE	.1394E+02	0.	0.	0.	.1359E+02	0.	0.	0.	0.	.1359E+02
Z/OE	-.7704E+02	.311E+01	0.	0.	-.7319E+02	0.	0.	0.	0.	-.7319E+02
M/OE	-.6841E+01	-.2738E+08	0.	0.	-.7115E+01	0.	0.	0.	0.	-.7115E+01
X/FLAPH	-.5304E+00	.1004E-02	0.	0.	-.5294E+00	0.	0.	0.	0.	-.5294E+00
Z/FLAPH	.1503E+00	-.1106E-01	0.	0.	.1392E+00	0.	0.	0.	0.	.1392E+00
M/FLAPH	-.2311E+00	.7865E-03	0.	0.	-.2303E+00	0.	0.	0.	0.	-.2303E+00
X/FLAPH	0.	.2631E+01	0.	0.	-.2831E+01	0.	0.	0.	0.	.2831E+01
Z/FLAPH	0.	-.2786E+01	0.	0.	-.2786E+01	0.	0.	0.	0.	-.2786E+01
M/FLAPH	0.	.9410E+00	0.	0.	.9410E+00	0.	0.	0.	0.	.9410E+00
X/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/T01	0.	0.	0.	0.	0.	.1773E-02	-.1662E-03	0.	.6125E-23	.1687E-02
Z/T01	0.	0.	0.	0.	0.	.1501E-04	-.3031E-04	.1241E-19	.2067E-19	-.1530E-04
M/T01	0.	0.	0.	0.	0.	.3798E-06	.3451E-05	.3201E-21	.2208E-20	.3831E-05
X/T02	0.	0.	0.	0.	0.	.1773E-02	-.1662E-03	0.	.6125E-23	.1507E-02
Z/T02	0.	0.	0.	0.	0.	.1501E-04	-.3031E-04	.1241E-19	.2067E-19	-.1530E-04
M/T02	0.	0.	0.	0.	0.	.3798E-06	.3451E-05	.3201E-21	.2208E-20	.3831E-05
X/TMT1	0.	0.	0.	0.	0.	.2655E+00	0.	0.	0.	.2655E+00
Z/TMT1	0.	0.	0.	0.	0.	-.3702E+01	0.	0.	0.	-.3702E+01
M/TMT1	0.	0.	0.	0.	0.	-.4463E+00	0.	0.	0.	-.4463E+00
X/TMT2	0.	0.	0.	0.	0.	.2655E+00	0.	0.	0.	.2655E+00
Z/TMT2	0.	0.	0.	0.	0.	-.3702E+01	0.	0.	0.	-.3702E+01
M/TMT2	0.	0.	0.	0.	0.	-.4463E+00	0.	0.	0.	-.4463E+00

X/Y	.1430E-14	.7148E-15	.7752E-03	0.	.7752E-03	0.	.3669E-04	0.	0.	.0119E-03
Z/Y	0.	.7148E-15	0.	.8935E-16	.1597E-05	.2534E-17	0.	0.	0.	.1597E-05
M/Y	.8851E-15	.2213E-15	-.3625E-04	0.	.1303E-16	-.7657E-07	.6530E-19	0.	0.	-.3632E-04
X/P	.7148E-13	.3574E-13	.3634E-03	0.	.3634E-03	0.	.7400E-04	0.	-.2726E-23	.4374E-03
Z/P	0.	.3574E-13	0.	.4467E-14	.1349E-04	.1267E-15	.9201E-20	0.	0.	.1349E-04
M/P	.4426E-13	.1106E-13	-.1699E-04	0.	.6915E-15	-.1536E-05	.3268E-17	0.	-.9820E-21	-.1853E-04
X/R	.7148E-13	.3574E-13	.1953E-02	0.	.1953E-02	0.	0.	0.	0.	.1953E-02
Z/R	0.	.3574E-13	0.	.4467E-14	0.	.1267E-15	0.	0.	0.	0.
M/R	.4426E-13	.1106E-13	-.9132E-04	0.	.6915E-15	.3269E-17	0.	0.	0.	-.9132E-04
X/DR	.4096E-12	.2048E-12	-.1019E+00	0.	-.1019E+00	0.	0.	0.	0.	-.1019E+00
Z/DR	0.	.2048E-12	0.	.2560E-13	0.	.7261E-15	0.	0.	0.	0.
M/DR	.2536E-12	.6341E-13	.4764E-02	0.	.3963E-14	.1873E-16	0.	0.	0.	.4764E-02
X/DA	-.3122E+01	.7149E-03	0.	-.3122E+01	0.	0.	0.	0.	0.	-.3122E+01
Z/DA	-.2905E+00	.7879E-02	0.	.2560E-13	0.	.7261E-15	0.	0.	0.	-.2903E+00
M/DA	-.9801E-02	.5601E-03	0.	.3963E-14	0.	.1873E-16	0.	0.	0.	-.9241E-02
X/DRCSR	.1430E-12	.7148E-13	0.	.2859E-12	0.	0.	0.	.4822E-08	0.	.4822E-08
Z/DRCSR	0.	.7148E-13	0.	.8935E-14	0.	.2534E-15	.1627E+01	0.	0.	.1627E+01
M/DRCSR	.8851E-13	.2213E-13	0.	.8851E-13	.1383E-14	.6537E-17	.1730E+00	0.	0.	.1730E+00
X/DRCSY	.1430E-12	.7148E-13	0.	.2859E-12	0.	0.	0.	.2729E-18	0.	.2729E-18
Z/DRCSY	0.	.7148E-13	0.	.8935E-14	0.	.2534E-15	.9210E-15	0.	0.	.9210E-15
M/DRCSY	.8851E-13	.2213E-13	0.	.8851E-13	.1383E-14	.6537E-17	.9830E-16	0.	0.	.9830E-16
X/DRCSS	.1430E-12	.7148E-13	0.	.2859E-12	0.	0.	0.	.2729E-18	0.	.2729E-18
Z/DRCSS	0.	.7148E-13	0.	.8935E-14	0.	.2534E-15	.9210E-15	0.	0.	.9210E-15
M/DRCSS	.8851E-13	.2213E-13	0.	.8851E-13	.1383E-14	.6537E-17	.9830E-16	0.	0.	.9830E-16
X/PSIT1	.4096E-12	.2048E-12	0.	.8193E-12	.3345E+00	0.	0.	.7820E-10	0.	.3345E+00
Z/PSIT1	0.	.2048E-12	0.	.2559E-02	0.	.7261E-15	.2639E-14	0.	0.	.2559E-02
M/PSIT1	.2536E-12	.6341E-13	0.	.2536E-12	.3870E-04	.1873E-16	.2819E-15	0.	0.	.3870E-04
X/PSIT2	.4096E-12	.2048E-12	0.	.8193E-12	.3345E+00	0.	0.	.7820E-10	0.	.3345E+00
Z/PSIT2	0.	.2048E-12	0.	.2559E-02	0.	.7261E-15	.2639E-14	0.	0.	.2559E-02
M/PSIT2	.2536E-12	.6341E-13	0.	.2536E-12	.3870E-04	.1873E-16	.2819E-15	0.	0.	.3870E-04

LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR. STAB.	VEKT. STAB.	FUSELAGE	TOT. AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	-.7073E-17 0.	-.7676E-16	.3610E-16	-.4765E-16 0.	.7002E-16	-.1314E-19 0.	-.4697E-16			
L/U	0.	-.2372E-16 0.	-.2372E-16 0.	.8149E-20	-.6999E-22	-.1047E-19	-.2373E-16			
N/U	-.7483E-16 0.	.7506E-17	-.6224E-16 0.	.3863E-19	.3056E-21	.4233E-24	-.6220E-16			
Y/M	.8174E-16 0.	0.	0.	.8174E-16 0.	-.1885E-19	-.3639E-20 0.	.8171E-16			
L/M	0.	0.	0.	0.	.2257E-20	-.1939E-22	-.9854E-20			
N/M	.7483E-16 0.	0.	0.	.7483E-16 0.	.5135E-20	.8689E-24	.7484E-16			
Y/Q	-.2624E-15 0.	.3710E-15 0.	.6334E-15 0.	.6042E-18	-.1183E-19 0.	.6340E-15				
L/Q	0.	.1147E-15 0.	.1147E-15 0.	0.	.2857E-15	-.7208E-19	.4003E-15			
N/Q	-.2494E-14 0.	-.3628E-16 0.	.2458E-14 0.	-.1214E-17	.2753E-21	.2914E-23	.2457E-14			
Y/OE	.9012E-14 0.	0.	0.	.9012E-14 0.	0.	0.	.9012E-14			
L/OE	0.	0.	0.	0.	0.	0.	0.			
N/OE	.3574E-14 0.	0.	0.	.3574E-14 0.	0.	0.	.3574E-14			
Y/FLAP	-.2589E-16 0.	0.	0.	-.2589E-16 0.	0.	0.	-.2589E-16			
L/FLAP	0.	0.	0.	0.	0.	0.	0.			
N/FLAP	.1429E-13 0.	0.	0.	.1429E-13 0.	0.	0.	.1429E-13			
Y/FL	0.	0.	0.	0.	0.	0.	0.			
L/FL	0.	0.	0.	0.	0.	0.	0.			
N/FL	0.	0.	0.	0.	0.	0.	0.			
Y/DRCSF	0.	0.	0.	0.	0.	0.	0.			
L/DRCSF	0.	0.	0.	0.	0.	0.	0.			
N/DRCSF	0.	0.	0.	0.	0.	0.	0.			
Y/DRCSN	0.	0.	0.	0.	0.	0.	0.			
L/DRCSN	0.	0.	0.	0.	0.	0.	0.			
N/DRCSN	0.	0.	0.	0.	0.	0.	0.			
Y/T01	0.	0.	0.	0.	-.1330E-17	.1477E-18	-.2693E-20 0.	-.1186E-17		
L/T01	0.	0.	0.	0.	-.1776E-05	.5330E-05	-.2190E-20	-.1762E-19	.3554E-05	
N/T01	0.	0.	0.	0.	.2862E-04	-.3988E-05	.6730E-22	.7124E-24	.2463E-04	
Y/T02	0.	0.	0.	0.	-.1330E-17	.1477E-18	-.2693E-20 0.	-.1186E-17		
L/T02	0.	0.	0.	0.	.1776E-05	-.5330E-05	.2167E-20	-.1762E-19	-.3554E-05	
N/T02	0.	0.	0.	0.	-.2862E-04	.3988E-05	-.6730E-22	.7124E-24	-.2463E-04	
Y/THT1	0.	0.	0.	0.	-.1992E-15 0.	0.	0.	-.1992E-15		
L/THT1	0.	0.	0.	0.	.4379E+00 0.	0.	0.	.4379E+00		
N/THT1	0.	0.	0.	0.	.4284E-02 0.	0.	0.	.4284E-02		
Y/THT2	0.	0.	0.	0.	-.1992E-15 0.	0.	0.	-.1992E-15		
L/THT2	0.	0.	0.	0.	-.4379E+00 0.	0.	0.	-.4379E+00		
N/THT2	0.	0.	0.	0.	-.4284E-02 0.	0.	0.	-.4284E-02		

Y/W	.776E-02	0.	-.1226E+00	-.5890E-01	-.1893E+00	0.	-.1235E-01	-.1280E-22	0.	-.2016E+00
L/V	-.3372E-01	0.	-.3790E-01	0.	-.7162E-01	0.	-.5580E-04	-.6862E-25	-.7044E-22	-.7169E-01
M/V	-.1205E-02	0.	.1199E-01	-.8289E-02	-.2421E-02	0.	-.1219E-02	.2996E-24	.3171E-26	.1203E-02
Y/P	0.	0.	-.5869E+00	0.	-.5869E+00	0.	-.2645E-01	-.6439E-21	0.	-.6133E+00
L/P	-.1326E+01	0.	-.1814E+00	0.	-.1507E+01	0.	-.1536E+00	.3431E-23	.3922E-20	-.1661E+01
M/P	-.3961E-01	0.	.5738E-01	0.	.1777E-01	0.	-.2606E-02	-.1498E-22	-.1586E-24	.1516E-01
Y/R	0.	0.	-.1363E+01	0.	-.1363E+01	0.	-.3584E+01	-.5508E+00	0.	-.1671E+01
L/R	.4170E+00	0.	.4212E+00	0.	.4212E+00	0.	-.1910E-01	.2935E-02	0.	.8220E+00
M/R	-.2091E-01	0.	-.1333E+00	0.	-.1542E+00	0.	-.3740E+00	-.1281E-01	0.	-.5410E+00
Y/DR	0.	0.	.2036E+02	0.	.2036E+02	0.	0.	0.	0.	.2036E+02
L/DR	0.	0.	.6293E+01	0.	.6293E+01	0.	0.	0.	0.	.6293E+01
M/DR	0.	0.	-.1991E+01	0.	-.1991E+01	0.	0.	0.	0.	-.1991E+01
Y/DA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DA	-.2874E+02	0.	0.	0.	-.2874E+02	0.	0.	0.	0.	-.2874E+02
M/DA	-.7893E+00	0.	0.	0.	-.7893E+00	0.	0.	0.	0.	-.7893E+00
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	0.	0.	0.	-.3703E+01	0.	0.	.3703E+01
L/PSIT1	0.	0.	0.	0.	0.	0.	-.1973E-01	0.	0.	.1973E-01
M/PSIT1	0.	0.	0.	0.	0.	0.	-.4024E+00	0.	0.	-.4024E+00
Y/PSIT2	0.	0.	0.	0.	0.	0.	.3703E+01	0.	0.	.3703E+01
L/PSIT2	0.	0.	0.	0.	0.	0.	.1973E-01	0.	0.	.1973E-01
M/PSIT2	0.	0.	0.	0.	0.	0.	-.4024E+00	0.	0.	-.4024E+00

EXAMPLE 1 - TRANSITION TRIM RUN

CASE 1 OUT (READ FROM FILE 1)

29 9 29 9 VA

100.00000

1.68000

RESULTS OF TRIM

16375.00000	1	1	WEIGHT-POUNDS	0.00000
72336.00000	1	1	WEIGHT-NEWTONS	6.44600
7959.00000	2	5	IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2	0.00000
			50331.00000	-202.40000
13784.44500	2	5	IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2	1.35500
			71285.19500	-274.25200
	14	10	JENG(ENGINE INERTIA)-SLUG-FT**2	0.00000
			3.14000	
	14	10	JENG(ENGINE INERTIA)-KG-M**2	1.35500
			4.25470	
	29	45	ALTITUDE-FT	0.00000
100.00000	29	45	ALTITUDE-METERS	.30480
	29	10	TRUE AIRSPEED-KNOTS	0.00000
179.90408	29	9	TRUE AIRSPEED-FT/SEC	0.00000
303.84000	29	9	TRUE AIRSPEED-M/SEC	.30480
	29	12	QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2	0.00000
			92.61043	
	29	12	QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2	67.88000
			103.26599	
	29	11	MACH NUMBER	0.00000
			.26450	
	29	4	RHO(AIR DENSITY)-SLUGS/FT**3	0.00000
			6944.37569	
	29	4	RHO(AIR DENSITY)-KG/M**3	515.36000
			.00224	
	29	59	XDM,YDM,ZDM(AMB. WIND COMPONENTS-EARTH AXES)KT	.59020
			1.15299	
	29	59	XDM,YDM,ZDM(AMB. WIND COMPONENTS-EARTH AXES)FT/S	0.00000
			0.00000	
	29	59	XDM,YDM,ZDM(AMB. WIND COMPONENTS-EARTH AXES)M/S	.30460
			0.00000	
	2	18	XEDOT,YEDOT,ZEDOT(FT/S)	0.00000
			303.84001	
	2	18	XEDOT,YEDOT,ZEDOT(M/S)	.30460
			92.61043	
	41	6	XE20,YE20,ZE20-FT/SEC**2	0.00000
			0.00000	
	41	6	XE20,YE20,ZE20-G	.03106
			0.00000	
	41	6	XE20,YE20,ZE20-M/SEC**2	30460
			0.00000	
	2	3	UDOT,VODOT,WODOT-FT/SEC**2	0.00000
			0.00000	
	2	3	UDOT,VODOT,WODOT-G	.03106
			0.00000	
	2	3	UDOT,VODOT,WODOT-M/SEC**2	.30480
			0.00000	
	3	1	U,V,W (INER. SPEED COMPONENTS)FT/SEC	0.00000

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26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC	0.45400
36.16630	3	15	3	BLDREF(REFERENCE RCS BLEED)-PER CENT	0.00000
3.50000	7	26	7	BLDAVL	0.00000
31.03030	27	72	72	BLD(ACTUAL RCS BLEED)-PER CENT	0.00000
3.50000	3	39	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	0.00000
0.00000	3	39	39	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	4.44800
0.00000	11	7	11	SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG	57.29576
0.00000	19	46	46	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-FT-LB	0.00000
-3716.02368	19	46	46	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M	1.35500
-5035.21200	19	38	38	XW1,XW2(WING X FORCE)-POUNDS	0.00000
597.85040	19	38	38	XW1,XW2(WING X FORCE)-NEWTONS	4.44800
2214.43809	19	40	40	ZW1,ZW2(WING Z FORCE)-POUNDS	0.00000
-6956.04363	19	40	40	ZW1,ZW2(WING Z FORCE)-NEWTONS	4.44800
-30940.46207	19	20	20	CLM1,CLM2(WING LIFT COEFFICIENT)	0.00000
38417	3	46	46	CLAPH(CANARD TE FLAP DEFLECTION)-DEG	57.29576
-11.99774	3	49	49	DFLAPH(WING LE FLAP DEFLECTION)-DEG	57.29576
28.91575	19	3	3	DXM,DYM,DZM(WING AERO FORCES)-POUNDS	0.00000
995.70061	19	3	3	DXM,DYM,DZM(WING AERO FORCES)-NEWTONS	4.44800
4428.7719	19	6	6	DLH,DLH,DLH(WING AERO MOMENTS)-FT-POUNDS	0.00000
0.00000	19	6	6	DLH,DLH,DLH(WING AERO MOMENTS)-NEWTON-M	1.35500
0.00000	20	3	3	DXM,DYM,DZM(CANARD AERO FORCES)-POUNDS	0.00000
-257.03433	20	3	3	DXM,DYM,DZM(CANARD AERO FORCES)-NEWTONS	4.44800
-1143.20070	20	6	6	DLH,DLH,DLH(CANARD AERO MOMENTS)-FT-POUNDS	0.000
0.00000	20	6	6	DLH,DLH,DLH(CANARD AERO MOMENTS)-NEWTON-M	1.35500
6.15000	21	3	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	4.44800
-115.52027	21	3	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	0.00000
-25.97241	21	6	6	DLV,DLV,DLV(VERT. TAIL AERO MOMENTS)-FT-POUNDS	0.00000
0.00000	21	6	6	DLV,DLV,DLV(VERT. TAIL AERO MOMENTS)-NEWTON-M	1.35500
0.00000	22	3	3	DXF,DXF,DXF(FUSELAGE AERO FORCES)-POUNDS	0.00000

-144.92724	1	22	0.0000	-1991.71256			
	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS				4.44000
-644.63636	1	22	0.0000	-8859.13748			
	22	6	DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS				0.00000
0.00000	4	22	5590.31680	0.0000			
	22	6	DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M				1.35500
0.00000	4	22	75772.02927	0.0000			
	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS				0.00000
567.76683	1	29	0.0000	-1953.76475			
	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS				4.44000
2525.42685	1	29	0.0000	-70517.54560			
	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS				0.00000
0.00000	4	29	-3551.14870	0.0000			
	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M				1.35500
0.00000	4	29	-4811.80649	0.0000			
	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS				0.00000
3615.63031	1	23	0.0000	16.39076			
	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS				0.44000
16082.32360	1	23	0.0000	72.90609			
	23	6	DLT,DMT,DMT(DIRECT THRUST MOMENTS)-FT-POUNDS				0.00000
	23	6	DLT,DMT,DMT(DIRECT THRUST MOMENTS)-NEWTON-M				1.35500
937.03650	1	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT*2/SEC			0.00000
	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M*2/SEC				1.35500
1269.68446	1	24	3	DXR,DYR,DZR(RAM FORCES)-POUNDS			0.00000
	24	3	DXR,DYR,DZR(RAM FORCES)-NEWTONS				4.44000
-1471.97242	1	24	0.0000	-311.58847			
	24	6	DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS				0.00000
-6547.33334	1	24	0.0000	-1385.94552			
	24	6	DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M				1.35500
0.00000	4	24	3648.45932	0.0000			
	26	4	RPM1,RPM2(ENGINE ROT. SPEED)-RPH				0.00000
0.00000	4	26	4943.66237	0.0000			
2849.82265	1	27	3	DXRCS,DYRCS,DZCRS(CRS FORCES)-POUNDS			0.00000
	27	3	DXRCS,DYRCS,DZCRS(CRS FORCES)-NEWTONS				4.44000
0.00000	4	27	0.0000	0.0000			
	27	6	DLRCS,DMRCS,DNRCS(CRS MOMENTS)-FT-POUNDS				0.00000
0.00000	4	27	0.0000	0.0000			
	27	6	DLRCS,DMRCS,DNRCS(CRS MOMENTS)-NEWTON-M				1.35500
0.00000	4	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS			0.00000
	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS				4.44000
0.00000	4	25	0.0000	0.0000			
	25	6	DLCOR,DMCOR,DNCCOR(CORIOLIS FORCES)-FT-POUNDS				0.00000
0.00000	4	25	0.0000	0.0000			
	25	6	DLCOR,DMCOR,DNCCOR(CORIOLIS FORCES)-NEWTON-M				1.35500
0.00000	4	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS			0.00000
	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS				4.44000
2711.42471	1	29	0.0000	-16148.96246			
	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS				4.44000
12068.41710	1	29	0.0000	-71830.58504			

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P 4

29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS) -FT-POUNDS	0.00000
-	0.00000	0.21348	-	0.00000	
29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS) -NEWTON-M	1.35500
-	0.00000	0.28976	-	0.00000	
29	51	29	53	GYROL,GYRON,GYRON(GYROSCOPIC MOMENTS) -FT-POUNDS	0.00000
0.00000	-	0.00000	0.00000		
29	51	29	53	GYROL,GYRON,GYRON(GYROSCOPIC MOMENTS) -NEWTON-M	1.35500
0.00000	-	0.00000	0.00000		

EXAMPLE 1 - TRANSITION TRIM RUN

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR. STAB.	VERT. STAB.	FUSELAGE	ROT. AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	-.632E-02	-.4037E-02	-.3406E-03	-.1901E-02	-.1060E-01	0.	-.1047E-01	0.	.7209E-22	-.2107E-01
Z/U	-.6930E-01	.7897E-02	0.	-.9180E-02	.7066E-01	0.	-.1517E-03	.2329E-19	.2433E-10	-.7001E-01
M/U	-.2654E-02	-.1367E-02	.1593E-04	.2493E-02	-.1512E-02	0.	.2458E-04	.6007E-21	.2590E-19	-.1487E-02
X/W	.1035E+00	.3971E-02	0.	-.1707E-15	.1075E+00	0.	.7174E-03	0.	.0496E-22	.1082E+00
Z/W	-.6730E+00	-.4316E-01	0.	-.1009E+00	-.0171E+00	0.	-.1215E-01	.6927E-20	.2067E-18	-.0293E+00
M/W	-.2394E-01	.2076E-02	0.	.2741E-01	.6340E-02	0.	.1332E-02	.1707E-21	.3062E-19	.7600E-02
X/Q	.3321E+00	-.6279E-01	.1646E-02	0.	.2709E+00	0.	.2548E-01	0.	.5767E-21	.2963E+00
Z/Q	-.2161E+01	.6802E+00	0.	0.	-.1480E+01	0.	.3535E+01	-.5432E+00	.1946E-17	.1511E+01
M/Q	-.7687E-01	-.4539E-01	-.7697E-04	0.	-.1223E+00	0.	-.3661E+00	-.1401E-01	.2079E-10	-.5225E+00
X/DE	.6470E+01	-.3590E+00	0.	0.	.6110E+01	0.	0.	0.	0.	.6110E+01
Z/DE	-.6106E+02	.3443E+01	0.	0.	-.5842E+02	0.	0.	0.	0.	-.5842E+02
M/DE	-.5540E+01	-.2404E+00	0.	0.	-.5780E+01	0.	0.	0.	0.	-.5780E+01
X/FLAPH	-.4142E+00	-.3207E-02	0.	0.	-.4174E+00	0.	0.	0.	0.	-.4174E+00
Z/FLAPH	-.6309E+00	.3069E-01	0.	0.	-.6802E+00	0.	0.	0.	0.	-.6802E+00
M/FLAPH	-.2120E+00	-.2143E-02	0.	0.	-.2149E+00	0.	0.	0.	0.	-.2149E+00
X/FLAPH	0.	.2294E+01	0.	0.	.2294E+01	0.	0.	0.	0.	.2294E+01
Z/FLAPH	0.	-.2244E+01	0.	0.	-.2244E+01	0.	0.	0.	0.	-.2244E+01
M/FLAPH	0.	.7602E+00	0.	0.	.7602E+00	0.	0.	0.	0.	.7602E+00
X/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/T01	0.	0.	0.	0.	.1774E-02	-.1492E-03	0.	0.	.1259E-21	.1625E-02
Z/T01	0.	0.	0.	0.	.8042E-05	-.3159E-04	.1245E-19	.4249E-18	.4249E-18	-.2354E-04
M/T01	0.	0.	0.	0.	-.4609E-06	.3578E-05	.3211E-21	.4539E-19	.4539E-19	.3117E-05
X/T02	0.	0.	0.	0.	.1774E-02	-.1492E-03	0.	0.	.1259E-21	.1625E-02
Z/T02	0.	0.	0.	0.	.8042E-05	-.3159E-04	.1245E-19	.4249E-18	.4249E-18	-.2354E-04
M/T02	0.	0.	0.	0.	-.4609E-06	.3578E-05	.3211E-21	.4539E-19	.4539E-19	.3117E-05
X/TMT1	0.	0.	0.	0.	.1361E+00	0.	0.	0.	0.	.1361E+00
Z/TMT1	0.	0.	0.	0.	-.3545E+01	0.	0.	0.	0.	-.3545E+01
M/TMT1	0.	0.	0.	0.	-.4274E+00	0.	0.	0.	0.	-.4274E+00
X/TMT2	0.	0.	0.	0.	.1351E+00	0.	0.	0.	0.	.1351E+00
Z/TMT2	0.	0.	0.	0.	-.3545E+01	0.	0.	0.	0.	-.3545E+01
M/TMT2	0.	0.	0.	0.	-.4274E+00	0.	0.	0.	0.	-.4274E+00

X/V	.4289E-14	0.	.7749E-03	.7140E-15	.7749E-03	-.5710E-14	.4065E-04	0.	0.	.8156E-03
Z/V	-.5361E-15	0.	-.3623E-04	0.	-.3623E-04	.6915E-17	-.1297E-06	.2004E-16	0.	.2123E-05
M/V	0.	-.3319E-15	-.3623E-04	0.	-.3623E-04	.6915E-17	-.1297E-06	.7232E-18	0.	-.3636E-04
X/P	.2144E-12	0.	.3634E-03	0.	.3634E-03	-.2259E-12	.7139E-04	0.	-.6821E-22	.4347E-03
Z/P	0.	-.2680E-13	0.	0.	0.	.2234E-14	.1510E-04	.1482E-14	-.2032E-10	.1510E-04
M/P	0.	.1660E-13	-.1699E-04	0.	-.1699E-04	.3498E-15	-.1711E-05	.3610E-16	-.2170E-19	-.1079E-04
X/R	.2144E-12	0.	.1933E-02	0.	.1933E-02	-.2259E-12	0.	0.	0.	.1953E-02
Z/R	0.	-.2680E-13	0.	0.	0.	.2234E-14	0.	.1402E-14	0.	0.
M/R	0.	.1660E-13	-.9131E-04	0.	-.9131E-04	.3498E-15	0.	.3610E-16	0.	-.9131E-04
X/OR	.1229E-11	0.	-.8195E-01	0.	-.8195E-01	-.1639E-11	0.	0.	0.	-.8195E-01
Z/OR	0.	-.1536E-12	0.	0.	0.	.1280E-13	0.	.6033E-14	0.	0.
M/OR	0.	.9511E-13	.3832E-02	0.	.3832E-02	.1981E-14	0.	.2072E-15	0.	.3832E-02
X/OA	-.7804E+01	-.2976E-02	.2500E-13	0.	-.7804E+01	-.1639E-11	0.	0.	0.	-.7804E+01
Z/OA	-.6687E+00	-.2640E-01	0.	0.	-.6687E+00	.1280E-13	0.	.6033E-14	0.	-.6687E+00
M/OA	-.2275E-01	.1908E-02	-.1466E-14	0.	-.2275E-01	.1981E-14	0.	.2072E-15	0.	-.2275E-01
X/ORCSR	.4289E-12	0.	.8935E-14	0.	.4289E-12	-.5710E-12	0.	.4788E-03	.4788E-03	.4788E-03
Z/ORCSR	0.	-.5361E-13	0.	0.	0.	.4467E-14	0.	.2804E-14	.1616E+01	.1616E+01
M/ORCSR	0.	.3319E-13	-.5106E-15	0.	0.	.6915E-15	0.	.7232E-16	.1726E+00	.1726E+00
X/DRCSY	.4289E-12	0.	.8935E-14	0.	.4289E-12	-.5710E-12	0.	0.	.9853E-19	0.
Z/DRCSY	0.	-.5361E-13	0.	0.	0.	.4467E-14	0.	.2804E-14	.3320E-15	0.
M/DRCSY	0.	.3319E-13	-.5106E-15	0.	0.	.6915E-15	0.	.7232E-16	.3555E-16	.5604E-14
X/DRCSS	.4289E-12	0.	.8935E-14	0.	.4289E-12	-.5710E-12	0.	0.	.9853E-19	0.
Z/DRCSS	0.	-.5361E-13	0.	0.	0.	.4467E-14	0.	.2804E-14	.3320E-15	0.
M/DRCSS	0.	.3319E-13	-.5106E-15	0.	0.	.6915E-15	0.	.7232E-16	.3555E-16	.5604E-14
X/PSIT1	.1229E-11	0.	.2500E-13	0.	.1229E-11	-.3883E+00	0.	0.	.2026E-18	-.3883E+00
Z/PSIT1	0.	-.1536E-12	0.	0.	0.	.1620E-02	0.	.8033E-14	.9537E-15	-.1620E-02
M/PSIT1	0.	.9511E-13	-.1466E-14	0.	0.	.1170E-03	0.	.2072E-15	.1019E-15	.1170E-03
X/PSIT2	.1229E-11	0.	.2500E-13	0.	.1229E-11	-.3883E+00	0.	0.	.2026E-18	-.3883E+00
Z/PSIT2	0.	-.1536E-12	0.	0.	0.	.1620E-02	0.	.8033E-14	.9537E-15	-.1620E-02
M/PSIT2	0.	.9511E-13	-.1466E-14	0.	0.	.1170E-03	0.	.2072E-15	.1019E-15	.1170E-03

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LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR-STAB.	VERT-STAB.	FUSELAGE	TOT-AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	-.6773E-17 0.	-.2410E-16	.1741E-16	-.1147E-16 0.	.5443E-18	-.3704E-19 0.	.3317E-20	-.2016E-21	-.2074E-18	-.1096E-16
L/U	-.2925E-14 0.	-.7449E-17 0.	-.2933E-14 0.	-.2357E-17	.2975E-16 0.	.1251E-16	.8803E-21	.6385E-23	.6226E-16	-.2933E-19
N/U	-.2694E-16 0.	-.2357E-17	.2447E-17	.2975E-16 0.	.3133E-19	-.1126E-19 0.	.9860E-21	-.5999E-22	-.2444E-18	-.4870E-16
Y/W	.5068E-16 0.	0.	0.	.4868E-16 0.	.8070E-20	.2619E-21	.9882E-23	.9342E-20	0.	0.
L/W	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/W	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/Q	.1563E-15 0.	.1165E-15 0.	.2728E-15 0.	.5368E-18	-.3881E-19 0.	.2733E-15	.1714E-14	.2057E-15	-.1659E-17	.2034E-14
L/Q	0.	.3600E-16 0.	.3600E-16 0.	.1714E-14	.2057E-15	-.1659E-17	.1206E-17	.9828E-21	.6788E-22	-.5002E-19
N/Q	-.4989E-14 0.	-.1139E-16 0.	-.5808E-14 0.	-.1206E-17	.9828E-21	.6788E-22	0.	0.	0.	0.
Y/OE	.6649E-14 0.	0.	0.	.6649E-14 0.	0.	0.	0.	0.	0.	.6649E-14
L/OE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/OE	-.7147E-13 0.	0.	0.	.7147E-13 0.	0.	0.	0.	0.	0.	.7147E-13
Y/FLAPM	.6147E-16 0.	0.	0.	.6147E-16 0.	0.	0.	0.	0.	0.	.6147E-16
L/FLAPM	-.8302E-12 0.	0.	0.	-.8302E-12 0.	0.	0.	0.	0.	0.	-.8302E-12
N/FLAPM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/T01	0.	0.	0.	0.	0.	-.5773E-18	.1172E-18	-.8473E-20 0.	-.3623E-18	-.4686E-18
L/T01	0.	0.	0.	0.	0.	-.9513E-06	.5554E-05	-.2234E-20	.1465E-22	.4683E-05
N/T01	0.	0.	0.	0.	0.	.2863E-04	-.3588E-05	.1971E-21	.1465E-22	.2585E-04
Y/T02	0.	0.	0.	0.	0.	-.5773E-18	.1172E-18	-.8473E-20 0.	-.3623E-18	-.4686E-18
L/T02	0.	0.	0.	0.	0.	.9513E-06	-.5554E-05	.2143E-20	.1465E-22	.4683E-05
N/T02	0.	0.	0.	0.	0.	-.2863E-04	.3588E-05	-.1971E-21	.1465E-22	.2585E-04
Y/TMT1	0.	0.	0.	0.	0.	-.4429E-16 0.	0.	0.	0.	-.4429E-16
L/TMT1	0.	0.	0.	0.	0.	.4194E+00 0.	0.	0.	0.	.4194E+00
N/TMT1	0.	0.	0.	0.	0.	-.2196E-02 0.	0.	0.	0.	-.2196E-02
Y/TMT2	0.	0.	0.	0.	0.	-.4429E-16 0.	0.	0.	0.	-.4429E-16
L/TMT2	0.	0.	0.	0.	0.	.4194E+00 0.	0.	0.	0.	.4194E+00
N/TMT2	0.	0.	0.	0.	0.	-.2196E-02 0.	0.	0.	0.	-.2196E-02

V/V	-.1835E-01 0.	-.1181E+00	-.5283E-01	-.1733E+00 0.	-.1217E-01	-.4852E-22 0.	-.1895E+00
L/V	-.3639E-01 0.	-.3403E-01 0.	-.7842E-01 0.	-.7842E-01 0.	-.6484E-04	-.2159E-24	-.1732E-28
N/V	-.1659E-02 0.	.1076E-01	-.7426E-02	.1677E-02 0.	-.1201E-02	.9426E-24	.7884E-25
Y/P	0.	-.5264E+00 0.	0.	-.5264E+00 0.	-.2609E-01	.2826E-28 0.	-.5525E+00
L/P	-.1212E+01 0.	-.1627E+00 0.	0.	-.1375E+01 0.	-.1515E+00	.1888E-22	.8642E-19
N/P	-.4101E-01 0.	.5147E-01 0.	0.	.1046E-01 0.	-.2578E-02	-.4713E-22	-.3582E-23
V/R	0.	.1223E+01 0.	0.	.1223E+01 0.	-.3535E+01	.5432E+00 0.	-.1769E+01
L/R	.4739E+00 0.	.3779E+00 0.	0.	.8517E+00 0.	-.1883E-01	.2895E-02 0.	-.0398E+00
N/R	-.2684E-01 0.	-.1195E+00 0.	0.	-.1456E+00 0.	-.3688E+00	-.1264E-01 0.	-.5271E+00
V/OR	0.	.1638E+02 0.	0.	.1638E+02 0.	0.	0.	.1638E+02
L/DE	0.	.5861E+01 0.	0.	.5861E+01 0.	0.	0.	.5861E+01
N/DR	0.	-.1601E+01 0.	0.	-.1601E+01 0.	0.	0.	-.1601E+01
Y/DA	0.	0.	0.	0.	0.	0.	0.
L/DA	-.2388E+02 0.	0.	0.	-.2388E+02 0.	0.	0.	-.2388E+02
N/DA	-.3292E+00 0.	0.	0.	-.3292E+00 0.	0.	0.	-.3292E+00
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.
L/DRCSR	0.	0.	0.	0.	0.	0.	0.
N/DRCSR	0.	0.	0.	0.	0.	0.	0.
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.
L/DRCSY	0.	0.	0.	0.	0.	0.	0.
N/DRCSY	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.
L/DRCSS	0.	0.	0.	0.	0.	0.	0.
N/DRCSS	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	.3546E+01 0.	0.	0.	.3546E+01
L/PSIT1	0.	0.	0.	.1889E-01 0.	0.	0.	.1889E-01
N/PSIT1	0.	0.	0.	-.3854E+00 0.	0.	0.	-.3854E+00
Y/PSIT2	0.	0.	0.	.3546E+01 0.	0.	0.	.3546E+01
L/PSIT2	0.	0.	0.	.1889E-01 0.	0.	0.	.1889E-01
N/PSIT2	0.	0.	0.	-.3854E+00 0.	0.	0.	-.3854E+00

EXAMPLE 1 - TRANSITION TRIM RUN

CASE INPUT (READ FROM FILE 1)

29 9 29 9 VA
160.00000

1.60000

RESULTS OF TRIM

16375.00000	1	1	WEIGHT-POUNDS	0.00000
72836.00000	1	1	WEIGHT-NEWTONS	6.44000
7959.00000	2	5 IX, IY, IZ, IXZ(AIRCRAFT INERTIAS)	-S,UG-FT**2	0.00000
			-262.40000	
10764.44500	2	5 IX, IY, IZ, IXZ(AIRCRAFT INERTIAS)	-KG-M**2	1.39500
			-274.25200	
3.14000	14	10 JENG(ENGINE INERTIA)	-SLUG-FT**2	0.00000
	14	10 JENG(ENGINE INERTIA)	-KG-M**2	1.39500
4.25478	29	45 ALTITUDE-FT		0.00000
100.00000	29	45 ALTITUDE-METERS		.30400
30.40000	29	10 TRUE AIRSPEED-KNOTS		0.00000
159.91674	29	9 TRUE AIRSPEED-FT/SEC		0.00000
276.00000	29	9 TRUE AIRSPEED-M/SEC		.30400
62.32030	29	12 QBAR(DYNAMIC PRESSURE)	-POUNDS/FT**2	0.00000
81.59200	29	11 MACH NUMBER		0.00000
.23511	29	12 QBAR(DYNAMIC PRESSURE)	-NEWTONS/M**2	47.00000
3906.66721	29	4 RHO(AIR DENSITY)	-SLUGS/FT**3	0.00000
.00224	29	4 RHO(AIR DENSITY)	-KG/M**3	515.39000
1.15299	29	59 XOH, YOH, ZOH(ANG. MIND COMPONENTS-EARTH AXES)KT		59020
0.00000	29	59 XOH, YOH, ZOH(ANG. MIND COMPONENTS-EARTH AXES)FT/S		0.00000
0.00000	29	59 XOH, YOH, ZOH(ANG. MIND COMPONENTS-EARTH AXES)M/S		.30400
0.00000	2	18 XEDOT, YEDOT, ZEDOT(FT/S)		0.00000
270.00010	2	18 XEDOT, YEDOT, ZEDOT(M/S)		.30400
82.32041	41	6 XE20, YE20, ZE20-FT/SEC**2		0.00000
0.00000	41	6 XE20, YE20, ZE20-G		.03106
0.00000	41	6 XE20, YE20, ZE20-M/SEC**2		.30400
0.00000	2	3 UDOT, VDOT, WDOT-F/SEC**2		0.00000
0.00000	2	3 UDOT, VDOT, WDOT-G		.03106
0.00000	2	3 UDOT, VDOT, WDOT-M/SEC**2		.30400
0.00000	3	3 U,V,W (INER. SPEED COMPONENTS)FT/SEC		0.00000

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OF POOR QUALITY

265.10090	3	3	U, Y, M	51.62091	SPEED COMPONENTS) M/SEC	0.30400
00.00275	29	3	UAS, VAS, WAS	15.73405	(AIRSPEED COMPONENTS) F7/SEC	0.00000
265.10090	29	3	UAS, VAS, WAS	51.62091	(AIRSPEED COMPONENTS) M/SEC	0.30400
00.00275	29	3	UAS, VAS, WAS	15.73405	(AIRSPEED COMPONENTS) M/SEC	0.00000
.29113	29	54	56 NXCG, NZCG	.98156	AXIS ACCEL. 1) -GEES	57.29570
-.00000	3	4	6 P, Q, R	.00000	(BODY AXIS RATES) -DEG/SEC	57.29570
11.01005	3	64	66 THETA, PHI, PSI	.00000	(EULER ANGLES) -DEG	57.29570
11.01005	29	13	14 ALPHA, BETA	.00000	(ANGLES OF ATTACK AND SIDESLIP) -DEG	60.00000
0.00000	2	18	2	18	ZD(RATE OF SINK) -FT/MIN	0.00000
0.00000	2	18	2	18	ZD(RATE OF SINK) -FT/SEC	0.00000
0.00000	2	18	2	18	ZD(RATE OF SINK) -M/SEC	0.30400
0.00000	28	28	28	28	NORM. ROLL CONTROL	0.00000
0.00000	28	29	28	29	NORM. YAW CONTROL	0.00000
0.00000	28	30	28	30	NORM. PITCH CONTROL	0.00000
-.03754	3	26	3	27	TMT1, TMT2 (THRUST DEFLECTION PITCH ANGLES) -DEG	57.29570
.56349	3	24	3	25	PSIT1, PSIT2 (THRUST DEFLECTION PITCH ANGLES) -DEG	57.29570
-.00000	3	19	3	19	LEFT ELEVON DEFLECTION -DEG	57.29570
.93772	3	20	3	20	RIGHT ELEVON DEFLECTION -DEG	57.29570
.93772	28	50	28	50	ELEVATOR COMMAND DEFLECTION -DEG	57.29570
.93772	28	51	28	51	AILERON COMMAND DEFLECTION -DEG	57.29570
-.00000	3	20	3	29	DRCS1, DRCS2 (ROLL RCS NORM. DEFLECTION)	0.00000
-.00000	28	50	28	50	TCHD (THRUST COMMAND) -POUNDS	0.00000
3540.90855	28	50	28	50	TCHD (THRUST COMMAND) -NEWTONS	4.44800
15750.31707	23	9	23	19	TCOR1, TCOR2 (THRUST APPL. TO A/D) -POUNDS	0.00000
1760.23066	23	9	23	10	TCOR1, TCOR2 (THRUST APPL. TO A/C) -NEWTONS	4.44800
7065.00999	3	21	3	21	RUDDER DEFLECTION -DEG	57.29570
-.00000	26	20	26	20	TRCS (THRUST LOSS DUE TO RCS BLEED) -POUNDS	0.00000
370.03570	26	20	26	20	TRCS (THRUST LOSS DUE TO RCS BLEED) -NEWTONS	4.44800
1604.17161	26	1	26	2	MOOT1, MOOT2 (ENGINE INLET MASS FLOWS) -LBM/SEC	0.00000
70.92400	26	1	26	2	MOOT1, MOOT2 (ENGINE INLET MASS FLOWS) -LBM/SEC	0.00000

D-36

26	1	26	2	MOOT1,MOOT2(ENGINE INLET MASS FLOWS)-KG/SEC	.45400
35	-0.3109	35	3	BLDREF(REFERENCE RCS BLEED)-PER CENT	0.00000
3	3	15	7	BLDAVL	0.00000
3	50000	26	7		
31	-0.0962	27	72	BLD(ACTUAL RCS BLEED)-PER CENT	0.00000
3	50000	3	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	0.00000
0	00000	3	39	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	4.44000
0	00000	11	7	SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG	57.29570
0	00000	19	46	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-FT-LB	0.00000
-6	500	44	19	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M	1.35500
19	44	19	30	XM1,XM2(WING X FORCES)-POUNDS	0.00000
549	-0.23633	37	30	XM1,XM2(WING X FORCES)-NEWTONS	4.44000
19	37	19	30	ZM1,ZM2(WING Z FORCES)-POUNDS	0.00000
2445	60074	39	40	ZM1,ZM2(WING Z FORCES)-NEWTONS	4.44000
-6830	-27617	19	40	CLM1,CLM2(WING LIFT COEFFICIENT)	0.00000
-30301	0.0041	19	40	OFLAPH(CANARD TE FLAP DEFLECTION)-DEG	57.29570
19	47609	3	49	DFLAPH(WING LE FLAP DEFLECTION)-DEG	57.29570
-5	42749	3	49		
29	99334	19	3	DXM,OYM,DZM(WING AERO FORCES)-POUNDS	0.00000
1899	64332	19	3	DXM,OYM,DZM(WING AERO FORCES)-NEWTONS	4.44000
4091	-21349	19	6	DLM,DMH,DMH(WING AERO MOMENTS)-FT-POUNDS	0.00000
0	0000	19	6	DLM,DMH,DMH(WING AERO MOMENTS)-NEWTON-M	1.35500
0	0000	20	3	DXM,OYM,DZM(CANARD AERO FORCES)-POUNDS	0.00000
-85	66010	20	3	DXM,OYM,DZM(CANARD AERO FORCES)-NEWTONS	4.44000
-381	0.649	20	6	DLM,DMH,DMH(CANARD AERO MOMENTS)-FT-POUNDS	0.00000
0	00000	20	6	DLM,DMH,DMH(CANARD AERO MOMENTS)-NEWTON-M	1.35500
-90	42300	21	3	DXV,OYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	4.44000
-20	32911	21	3	DXV,OYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	0.00000
-	00000	21	6	OLV,OMV,ONV(VERT TAIL AERO MOMENTS)-FT POUNDS	0.00000
-	00000	21	6	OLV,OMV,ONV(VERT. TAIL AERO MOMENTS)-NEWTON-M	1.35500
-	00000	22	3	DXF,OYF,DZF(FUSELAGE AERO FORCES)-POUNDS	0.00000

-113.43737	22	0.0000	-1064.56533			
	22	3	DMF,DYF,0ZF(FUSELAGE AERO FORCES)-NEWTONS			4.44000
-504.56944	22	6	DLF,DMF,DMF(FUSELAGE AERO MOMENTS)-FT-POUNDS			0.00000
0.00000	22	6	DLF,DMF,DMF(FUSELAGE AERO MOMENTS)-NEWTON-M			1.35500
0.00000	22	6	DLF,DMF,DMF(FUSELAGE AERO MOMENTS)-NEWTON-M			0.00000
0.00000	29	20	22 XAERO,YAERO,ZAEROC(TOTAL AERO FORCES)-POUNDS			4.44000
0.00000	29	20	22 XAERO,YAERO,ZAEROC(TOTAL AERO FORCES)-NEWTONS			0.00000
3915.20360	29	23	25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS			1.35500
0.00000	29	23	25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M			0.00000
0.00000	23	1	3 DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS			4.44000
3536.29030	23	1	3 DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS			0.00000
15729.41925	23	6	DLI,DMT,DMT(DIRECT THRUST MOMENTS)-FT-POUNDS			1.35500
	23	6	DLI,DMT,DMT(DIRECT THRUST MOMENTS)-NEWTON-M			0.00000
	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT*2/SEC			0.00000
926.79293	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M*2/SEC			1.35500
1255.00442	24	3	OXR,DYR,DZR(RAH FORCES)-POUNDS			0.00000
-1206.70116	24	3	OXR,DYR,DZR(RAH FORCES)-NEWTONS			4.44000
-5723.24677	24	6	DLR,DMR,DMR(RAH MOMENTS)-FT-POUNDS			0.00000
	24	6	DLR,DMR,DMR(RAH MOMENTS)-NEWTON-M			1.35500
0.00000	26	4	RPH1,RPH2(ENGINE ROT. SPEED)-RPH			0.00000
2010.66873	27	3	DXRCS,DYRCS,DZRCRCS(FORCES)-POUNDS			0.00000
0.00000	27	3	DXRCS,DYRCS,DZRCRCS(FORCES)-NEWTONS			4.44000
0.00000	27	6	DLRCS,DMRCS,DZCRCS(MOMENTS)-FT-POUNDS			0.00000
0.00000	27	6	DLRCS,DMRCS,DZCRCS(MOMENTS)-NEWTON-M			1.35500
0.00000	25	1	3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS			0.00000
0.00000	25	1	3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS			4.44000
0.00000	25	6	DLCOR,DMCOR,DZCMOR(CORIOLIS FORCES)-FT-POUNDS			0.00000
0.00000	25	6	DLCOR,DMCOR,DZCMOR(CORIOLIS FORCES)-NEWTON-M			1.35500
3129.80579	29	26	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS			0.00000
13921.37615	29	26	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS			4.44000

29	29	31	SUML,SUMM(SUMM(TOTAL MOMENTS))-FT-POUNDS	0.00000
.00000		.12353		
29	29	31	SUML,SUMM(SUMM(TOTAL MOMENTS))-NEWTON-M	1.35500
.00000		.16736		
29	51	53	GYROL,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS	0.00000
0.00000		.00000		
29	51	53	GYROL,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M	1.35500
0.00000		.00000		

EXAMPLE 1 - TRANSITION TRIM RUN

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	-.4360E-02	-.2169E-02	-.3013E-03	-.1602E-02	-.0520E-02	0.	-.1032E-01	0.	.1600E-22	-.1004E-01
Z/U	-.8554E-01	.5775E-02	0.	-.1027E-01	.9003E-01	0.	-.1597E-03	-.1190E-19	.5425E-19	-.9019E-01
M/U	-.3662E-02	-.7161E-03	.1409E-04	.2709E-02	-.1575E-02	0.	.2519E-04	-.3071E-21	.5795E-20	-.1550E-02
X/W	.1062E+00	.4623E-02	0.	-.0935E-16	.1100E+00	0.	.0556E-03	0.	.1939E-22	.1116E+00
Z/W	-.6032E+00	-.4316E-01	0.	-.9194E-01	.7353E+00	0.	-.1201E-01	-.3054E-20	.6543E-19	-.7473E+00
M/W	-.2160E-01	.2005E-02	0.	.2402E-01	.6100E-02	0.	.1316E-02	-.9941E-22	.6909E-20	.7426E-02
X/Q	.3405E+00	-.7181E-01	.1456E-02	0.	.2702E+00	0.	.2515E-01	0.	.1494E-21	.2953E+00
Z/Q	-.1927E+01	.6672E+00	0.	0.	-.1260E+01	0.	.3502E+01	-.5302E+00	.5041E-10	.1704E+01
M/Q	-.6936E-01	-.4460E-01	-.6810E-04	0.	-.1141E+00	0.	-.3025E+00	-.1300E-01	.5305E-19	-.5105E+00
X/DE	-.0535E+01	-.3261E+00	0.	0.	-.0861E+01	0.	0.	0.	0.	-.0861E+01
Z/DE	-.4941E+02	.2863E+01	0.	0.	-.4655E+02	0.	0.	0.	0.	-.4655E+02
M/DE	-.4400E+01	-.1956E+00	0.	0.	-.4693E+01	0.	0.	0.	0.	-.4603E+01
X/FLAP	-.3230E+00	-.0422E-02	0.	0.	-.3322E+00	0.	0.	0.	0.	-.3322E+00
Z/FLAP	-.1296E+01	.7393E-01	0.	0.	-.1222E+01	0.	0.	0.	0.	-.1222E+01
M/FLAP	-.1956E+00	-.5050E-02	0.	0.	-.2006E+00	0.	0.	0.	0.	-.2006E+00
X/FLAP	0.	.1709E+01	0.	0.	.1709E+01	0.	0.	0.	0.	.1709E+01
Z/FLAP	0.	-.1706E+01	0.	0.	-.1706E+01	0.	0.	0.	0.	-.1706E+01
M/FLAP	0.	.6010E+00	0.	0.	.6010E+00	0.	0.	0.	0.	.6010E+00
X/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/T01	0.	0.	0.	0.	0.	.1773E-02	-.1320E-03	0.	.2054E-22	.1641E-02
Z/T01	0.	0.	0.	0.	0.	-.1743E-04	.3248E-04	-.1240E-19	.9631E-19	-.4991E-04
M/T01	0.	0.	0.	0.	0.	-.3530E-05	.3663E-05	-.3220E-21	.1029E-19	.1324E-06
X/T02	0.	0.	0.	0.	0.	.1773E-02	-.1320E-03	0.	.2054E-22	.1641E-02
Z/T02	0.	0.	0.	0.	0.	-.1743E-04	.3248E-04	-.1240E-19	.9631E-19	-.4991E-04
M/T02	0.	0.	0.	0.	0.	-.3530E-05	.3663E-05	-.3220E-21	.1029E-19	.1324E-06
X/TMT1	0.	0.	0.	0.	0.	.2890E+00	0.	0.	0.	.2890E+00
Z/TMT1	0.	0.	0.	0.	0.	-.3460E+01	0.	0.	0.	-.3460E+01
M/TMT1	0.	0.	0.	0.	0.	-.4177E+00	0.	0.	0.	-.4177E+00
X/TMT2	0.	0.	0.	0.	0.	.2890E+00	0.	0.	0.	.2890E+00
Z/TMT2	0.	0.	0.	0.	0.	-.3460E+01	0.	0.	0.	-.3460E+01
M/TMT2	0.	0.	0.	0.	0.	-.4177E+00	0.	0.	0.	-.4177E+00

X/V	0.	.1787E-15	.7745E-03	0.	.7745E-03	-.5718E-10	.4579E-04	0.	.0203E-03
Z/V	0.	-.3574E-15	0.	0.	0.	0.	.2051E-05	-.3748E-16	0.
M/V	0.	.1106E-15	-.3621E-04	0.	-.3621E-04	0.	-.1956E-06	-.9669E-10	0.
X/P	0.	.0935E-14	.3633E-03	0.	.3633E-03	-.2059E-12	.7021E-04	0.	-.1917E-22
Z/P	0.	-.1787E-13	0.	0.	0.	0.	.1727E-04	-.1074E-14	-.5121E-19
M/P	0.	.5532E-14	-.1699	.34	-.1699	0.	-.1948E-05	-.4035E-16	-.5478E-20
X/R	0.	.0935E-14	.1953E-02	0.	.1953E-02	-.2059E-12	0.	0.	.1953E-02
Z/R	0.	-.1787E-13	0.	0.	0.	0.	0.	-.1074E-14	0.
M/R	0.	.5532E-14	-.9130E-04	0.	-.9130E-04	0.	-.2766E-14	-.4035E-16	0.
X/OR	0.	.5120E-13	-.6415E-01	0.	-.6415E-01	-.1639E-11	0.	0.	-.6415E-01
Z/OR	0.	-.1024E-12	0.	0.	0.	0.	0.	-.1074E-13	0.
M/OR	0.	.3170E-13	.2999E-02	0.	.2999E-02	0.	-.1585E-13	-.2771E-15	0.
X/DA	0.	-.7374E+00	.6920E-03	0.	-.7367E+00	-.1639E-11	0.	0.	-.7367E+00
Z/DA	0.	-.4228E-01	-.6074E-02	0.	-.4035E-01	0.	-.1074E-13	0.	-.4035E-01
M/DA	0.	-.1449E-02	.4149E-03	0.	-.1034E-02	0.	-.1505E-13	-.2771E-15	0.
X/DRCSR	0.	.1787E-13	0.	0.	0.	-.5718E-12	0.	0.	.4777E-03
Z/DRCSR	0.	-.3574E-13	0.	0.	0.	0.	0.	-.3748E-14	.1612E+01
M/DRCSR	0.	.1106E-13	0.	0.	.0851E-13	0.	-.5532E-14	-.9669E-16	.1722E+00
X/DRCSY	0.	.1787E-13	0.	0.	0.	-.5718E-12	0.	0.	-.3213E-10
Z/DRCSY	0.	-.3574E-13	0.	0.	0.	0.	0.	-.3748E-14	-.1004E-14
M/DRCSY	0.	.1106E-13	0.	0.	.0851E-13	0.	-.5532E-14	-.9669E-16	-.1150E-15
X/DRCSS	0.	.1787E-13	0.	0.	0.	-.5718E-12	0.	0.	-.3213E-10
Z/DRCSS	0.	-.3574E-13	0.	0.	0.	0.	0.	-.3748E-14	-.1004E-14
M/DRCSS	0.	.1106E-13	0.	0.	.0851E-13	0.	-.5532E-14	-.9669E-16	-.1150E-15
X/PSIT1	0.	.5120E-13	0.	0.	0.	-.2945E+00	0.	0.	-.9207E-10
Z/PSIT1	0.	-.1024E-12	0.	0.	0.	.2599E-02	0.	0.	-.3107E-14
M/PSIT1	0.	.3170E-13	0.	0.	.2536E-12	.5506E-03	-.1505E-13	-.2771E-15	-.3319E-15
X/PSIT2	0.	.5120E-13	0.	0.	0.	-.2945E+00	0.	0.	-.9207E-10
Z/PSIT2	0.	-.1024E-12	0.	0.	0.	.2599E-02	0.	0.	-.3107E-14
M/PSIT2	0.	.3170E-13	0.	0.	.2536E-12	.5506E-03	-.1505E-13	-.2771E-15	-.3319E-15

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LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR. STAB.	VERT. STAB.	FUSELAGE	TOT. AERO	THRUST	CAN	COROLIS	RCS	TOTAL
Y/U	-.1369E-17	0.	-.2276E-16	.3756E-17	-.2037E-16	0.	.1766E-19	.1172E-19	0.	-.2034E-16
L/U	0.	0.	-.7034E-17	0.	-.7034E-17	0.	.1622E-16	.6247E-22	.4625E-19	-.6026E-17
N/U	0.	0.	.2225E-17	.5279E-16	.2753E-17	0.	-.2063E-20	-.2720E-21	-.1070E-21	.2751E-17
Y/W	.1285E-16	0.	0.	0.	.1285E-16	0.	-.3090E-19	.3795E-20	0.	.1285E-16
L/W	0.	0.	0.	0.	0.	0.	.5252E-19	.2022E-22	.5579E-19	.1003E-16
N/W	0.	0.	0.	0.	0.	0.	-.1043E-20	-.0029E-22	-.2255E-23	-.1933E-20
Y/Q	.4131E-16	0.	.1000E-15	0.	.1513E-15	0.	.1295E-19	.1309E-19	0.	.1513E-15
L/Q	0.	0.	.3400E-16	0.	.3400E-16	0.	.1143E-14	0.	.4290E-10	.1177E-16
N/Q	-.2742E-14	0.	-.1076E-16	0.	-.2732E-14	0.	-.1221E-17	-.3232E-21	-.1730E-22	-.2732E-14
Y/DE	.1050E-14	0.	0.	0.	.1050E-14	0.	0.	0.	0.	.1050E-14
L/DE	.0302E-12	0.	0.	0.	.0302E-12	0.	0.	0.	0.	.0302E-12
N/DE	-.2144E-13	0.	0.	0.	-.2144E-13	0.	0.	0.	0.	-.2144E-13
Y/FLAP	.2732E-16	0.	0.	0.	.2732E-16	0.	0.	0.	0.	.2732E-16
L/FLAP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAP	-.2144E-13	0.	0.	0.	-.2144E-13	0.	0.	0.	0.	-.2144E-13
Y/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DFCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DFCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DFCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/T01	0.	0.	0.	0.	0.	-.4337E-10	.2474E-20	.2634E-20	0.	-.4205E-10
L/T01	0.	0.	0.	0.	0.	.2062E-09	.5711E-09	.2209E-20	.0211E-19	.7773E-09
N/T01	0.	0.	0.	0.	0.	.2061E-04	-.3160E-09	.6174E-22	-.3320E-23	.2061E-04
Y/T02	0.	0.	0.	0.	0.	-.4337E-10	.2474E-20	.2634E-20	0.	-.4205E-10
L/T02	0.	0.	0.	0.	0.	.2062E-09	.5711E-09	.2209E-20	.0211E-19	.7773E-09
N/T02	0.	0.	0.	0.	0.	.2061E-04	-.3160E-09	.6174E-22	-.3320E-23	.2061E-04
Y/THT1	0.	0.	0.	0.	0.	.7059E-16	0.	0.	0.	.7059E-16
L/THT1	0.	0.	0.	0.	0.	.4102E+00	0.	0.	0.	.4102E+00
N/THT1	0.	0.	0.	0.	0.	-.4664E-02	0.	0.	0.	-.4664E-02
Y/THT2	0.	0.	0.	0.	0.	.7059E-16	0.	0.	0.	.7059E-16
L/THT2	0.	0.	0.	0.	0.	.4102E+00	0.	0.	0.	.4102E+00
N/THT2	0.	0.	0.	0.	0.	-.4664E-02	0.	0.	0.	-.4664E-02

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2

Y/V	-.1617E-01 0.	-.9757E-01	-.4674E-01	-.1505E+00 0.	-.1205E-01	.1431E-22 0.	-.1705E+00
L/V	-.3931E-01 0.	-.3015E-01 0.	-.6946E-01 0.	-.6946E-01 0.	-.6418E-04	.7520E-25	.4386E-21
N/V	-.2179E-02 0.	.9335E-02	-.6570E-02	.7861E-03 0.	-.1190E-02	-.3203E-24	-.1765E-25
Y/P	0.	-.4658E+00 0.	-.4658E+00 0.	-.4658E+00 0.	-.2504E-01	-.7056E-21 0.	-.4916E+00
L/P	-.1105E+01 0.	-.1440E+00 0.	-.1249E+01 0.	-.1249E+01 0.	-.1501E+00	-.3760E-23	-.2163E-19
N/P	-.4140E-01 0.	.4954E-01 0.	.4149E-02 0.	.4149E-02 0.	-.2946E-02	.1641E-22	.8826E-24
Y/R	0.	.1002E+01 0.	.1002E+01 0.	.1002E+01 0.	-.3902E+01	.5302E+00 0.	-.1802E+01
L/R	.5512E+00 0.	.344E+00 0.	.8856E+00 0.	.8856E+00 0.	-.1066E-01	.2868E-02 0.	.8690E+00
N/R	-.3471E-01 0.	-.1058E+00 0.	-.1409E+00 0.	-.1409E+00 0.	-.3854E+00	-.1232E-01 0.	-.5105E+00
Y/OR	0.	.1282E+02 0.	.1282E+02 0.	.1282E+02 0.	0.	0.	.1282E+02
L/OR	0.	.3962E+01 0.	.3962E+01 0.	.3962E+01 0.	0.	0.	.3962E+01
N/OR	0.	-.1253E+01 0.	-.1253E+01 0.	-.1253E+01 0.	0.	0.	-.1253E+01
Y/OA	0.	0.	0.	0.	0.	0.	0.
L/OA	-.1843E+02 0.	0.	-.1843E+02 0.	-.1843E+02 0.	0.	0.	-.1843E+02
N/OA	.4343E+00 0.	0.	.4343E+00 0.	.4343E+00 0.	0.	0.	.4343E+00
Y/ORCSR	0.	0.	0.	0.	0.	0.	0.
L/ORCSR	0.	0.	0.	0.	0.	0.	0.
N/ORCSR	0.	0.	0.	0.	0.	0.	0.
Y/ORCSY	0.	0.	0.	0.	0.	0.	0.
L/ORCSY	0.	0.	0.	0.	0.	0.	0.
N/ORCSY	0.	0.	0.	0.	0.	0.	0.
Y/ORCSS	0.	0.	0.	0.	0.	0.	0.
L/ORCSS	0.	0.	0.	0.	0.	0.	0.
N/ORCSS	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	0.	0.	0.	0.
L/PSIT1	0.	0.	0.	0.	0.	0.	0.
N/PSIT1	0.	0.	0.	0.	0.	0.	0.
Y/PSIT2	0.	0.	0.	0.	0.	0.	0.
L/PSIT2	0.	0.	0.	0.	0.	0.	0.
N/PSIT2	0.	0.	0.	0.	0.	0.	0.

EXAMPLE 1 - TRANSITION TRIM RUN

CASE INPUT (READ FROM FILE 1)

140.00000

29 9 29 9 VA

1.60000

RESULTS OF TRIM

4	1	4	1	WEIGHT-POUNDS	0.0000	
16375.00000						
4	1	4	1	WEIGHT-NEWTONS	4.44800	
72036.00000						
4	5	IX, IY, IZ, IXZ (AIRCRAFT INERTIAS) - SLUG-FT**2		0.00000		
7959.00000	52609.80000	58337.00000	-202.40000			
4	5	IX, IY, IZ, IXZ (AIRCRAFT INERTIAS) - KG-M**2		1.35500		
30764.44500	71205.19500	79046.63500	-274.25200			
14	10	10	JENG (ENGINE INERTIA) - SLUG-FT**2	0.00000		
3.14000						
14	10	14	10	JENG (ENGINE INERTIA) - KG-M**2	1.35500	
4	29	45	29	45	ALTITUDE-FT	0.00000
4	29	45	29	45	ALTITUDE-METERS	.30460
100.00000						
30.48000						
29	10	29	10	TRUE AIRSPEED-KNOTS	0.00000	
139.92540						
29	9	29	9	TRUE AIRSPEED-FT/SEC	0.00000	
236.32000						
29	9	29	9	TRUE AIRSPEED-M/SEC	.30460	
72.83034						
29	12	29	12	QBAR (DYNAMIC PRESSURE) - POUNDS/FT**2	0.00000	
62.46955						
29	11	29	11	MACH NUMBER	0.00000	
.20573						
29	12	29	12	QBAR (DYNAMIC PRESSURE) - NEWTONS/M**2	47.80000	
2991.04200						
29	4	29	4	RHO (AIR DENSITY) - SLUGS/FT**3	0.00000	
.00224						
29	4	29	4	RHO (AIR DENSITY) - KG/M**3	515.30000	
1.15299						
29	57	29	59	XDM, YDM, ZDM (ANG. WIND COMPONENTS - EARTH AXES) KI	.59020	
0.00000	0.00000	0.00000				
29	57	29	59	XDM, YDM, ZDM (ANG. WIND COMPONENTS - EARTH AXES) FT/S	0.00000	
0.00000	0.00000	0.00000				
29	57	29	59	XDM, YDM, ZDM (ANG. WIND COMPONENTS - EARTH AXES) M/S	.30460	
0.00000	0.00000	0.00000				
2	16	2	16	XEDOT, YEDOT, ZEDOT (FT/S)	0.00000	
236.32007	-.00000	0.00000				
2	16	2	16	XEDOT, YEDOT, ZEDOT (M/S)	.30460	
72.03036	-.00000	0.00000				
41	4	41	6	XE20, YE20, ZE20 - FT/SEC**2	0.00000	
0.00000	0.00000	0.00000				
41	4	41	6	XE20, YE20, ZE20 - G	.03106	
0.00000	0.00000	0.00000				
41	4	41	6	XE20, YE20, ZE20 - M/SEC**2	.30460	
0.00000	0.00000	0.00000				
2	1	2	3	UDOT, VDOT, WDOT - FT/SEC**2	0.00000	
.00000	.00000	-.00000				
2	1	2	3	UDOT, VDOT, WDOT - G	.03106	
.00000	.00000	-.00000				
2	1	2	3	UDOT, VDOT, WDOT - M/SEC**2	.30460	
.00000	.00000	-.00000				
3	1	3	3	U, V, W (INER. SPEED COMPONENTS) FT/SEC	0.00000	

230.31300	3	3	U, Y, H (INER. SPEED COMPONENTS) M/SEC	52.94364	0.0000	30.600
70.19943	29	3	UAS, VAS, WAS (AIRSPEED COMPONENTS) FT/SEC	16.13722	0.0000	0.00000
230.31300	29	3	UAS, VAS, WAS (AIRSPEED COMPONENTS) M/SEC	52.94364	0.0000	30.600
70.19943	29	3	UAS, VAS, WAS (AIRSPEED COMPONENTS) FT/SEC	16.13722	0.0000	0.00000
22403	29	56	NXCG, NYCG, NZCG (BODY AXIS ACCEL.) -GEES	.97458	0.0000	0.00000
3	4	6	P, Q, R (BODY AXIS RATES) -DEG/SEC	-.00000	-.00000	57.29578
3	64	66	THETA, PHI, PSI (EULER ANGLES) -DEG	0.00000	0.00000	57.29578
12.94606	29	14	ALPHA, BETA (ANGLES OF ATTACK AND SIDESLIP) -DEG	-.00000	-.00000	57.29578
12.94606	2	18	ZD (RATE OF SINK) -FT/MIN	0.00000	0.00000	60.00000
0.00000	2	18	ZD (RATE OF SINK) -FT/SEC	0.00000	0.00000	0.00000
0.00000	2	18	ZD (RATE OF SINK) -M/SEC	0.00000	0.00000	30.400
0.00000	20	20	NORM. ROLL CONTROL	0.00000	0.00000	0.00000
0.00000	20	29	NORM. YAW CONTROL	0.00000	0.00000	0.00000
0.00000	20	30	NORM. PITCH CONTROL	0.00000	0.00000	0.00000
-.13563	3	27	TH1, TH2 (THRUST DEFLECTION PITCH ANGLES) -DEG	2.03604	57.29578	57.29578
2.03604	3	25	PSI1, PSI2 (THRUST DEFLECTION PITCH ANGLES) -DEG	-.00000	57.29578	57.29578
-.00000	3	19	LEFT ELEVON DEFLECTION -DEG	57.29578	57.29578	57.29578
3.30022	3	20	RIGHT ELEVON DEFLECTION -DEG	57.29578	57.29578	57.29578
3.30022	20	50	ELEVATOR COMMAND DEFLECTION -DEG	57.29578	57.29578	57.29578
3.30022	20	51	AILERON COMMAND DEFLECTION -DEG	0.00000	0.00000	0.00000
-.00000	3	29	DRCS1, DRCS2 (ROLL RCS NORM. DEFLECTION)	0.00000	0.00000	0.00000
-.00000	20	58	TCMD (THRUST COMMAND) -POUNDS	4.44000	4.44000	4.44000
3070.07640	20	58	TCMD (THRUST COMMAND) -NEWTONS	0.00000	0.00000	0.00000
17214.10018	23	10	TCOR1, TCOR2 (THRUST APPL. TO A/C) -P LBS	4.44000	4.44000	4.44000
1926.09909	23	10	TCOR1, TCOR2 (THRUST APPL. TO A/C) -NEWTONS	57.29578	57.29578	57.29578
0567.20873	3	21	RUDDER DEFLECTION -DEG	0.00000	0.00000	0.00000
-.00000	26	20	TRCS (THRUST LOSS DUE TO RCS BLEED) -POUNDS	4.44000	4.44000	4.44000
413.82487	26	20	TRCS (THRUST LOSS DUE TO RCS BLEED) -NEWTONS	0.00000	0.00000	0.00000
1840.69302	26	2	MDOT1, MDOT2 (ENGINE INLET MASS FLOWS) -LBM/SEC	0.00000	0.00000	0.00000
80.04479	26	80.04479				

P-45

26	1	26	2	MOOT1,MOOT2(ENGINE INLET MASS FLOWS)-KG/SEC	0.45400	
36.34033	3	16.14033	3	3	0.00000	
3.5000	26	7	7	MDAVL	0.00000	
31.43929	27	72	72	BLO(ACTUAL RCS BLEED)-PER CENT	0.00000	
3.50000	3	39	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	0.00000	
0.00000	3	3	3	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	4.44000	
0.00000	11	7	11	7	7	57.29570
0.00000	19	44	19	46	MM,MM(ROLL,YAW MOMENTS)-FT-LB	0.00000
-9653.47017	19	44	19	46	MM,MM(ROLL,YAW MOMENTS)-NEWTON-M	1.35500
-13000.45200	19	37	19	38	XW1,XW2(WING X FORCE)-POUNDS	0.00000
543.36429	19	37	19	38	XW1,XW2(WING X FORCE)-NEWTONS	4.44000
2416.00430	19	39	19	40	ZW1,ZW2(WING Z FORCE)-POUNDS	0.00000
-6633.13700	19	39	19	40	ZW1,ZW2(WING Z FORCE)-NEWTONS	4.44000
-29504.19330	19	19	19	20	CLM1,CLM2(WING LIFT COEFFICIENT)	0.00000
.60247	3	40	3	40	DFLAP(CANARD LE FLAP DEFLECTION)-DEG	57.29570
5.20702	3	49	3	49	DFLAP(WING LE FLAP DEFLECTION)-DEG	57.29570
29.92434	19	1	19	3	DXM,DYM,DZM(WING AERO FORCES)-POUNDS	0.00000
1000.72059	19	1	19	3	DXM,DYM,DZM(WING AERO FORCES)-NEWTONS	4.44000
4033.76076	19	4	19	6	DLX,DMX,DMY(WING AERO MOMENTS)-FT-POUNDS	0.00000
0.00000	19	4	19	6	DLX,DMX,DMY(WING AERO MOMENTS)-NEWTON-M	1.35500
0.00000	20	1	20	3	DXM,DYM,DZM(CANARD AERO FORCES)-POUNDS	0.00000
-37.99326	20	1	20	3	DXM,DYM,DZM(CANARD AERO FORCES)-NEWTONS	4.44000
-160.99400	20	4	20	6	DLX,DMX,DMY(CANARD AERO MOMENTS)-FT-POUNDS	0.00000
0.00000	20	4	20	6	DLX,DMX,DMY(CANARD AERO MOMENTS)-NEWTON-M	1.35500
0.00000	21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	4.44000
-60.24926	21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	0.00000
-15.34301	21	4	21	6	DLX,DMX,DMY(VERT TAIL AERO MOMENTS)-FT-POUNDS	0.00000
-0.00000	21	4	21	6	DLX,DMX,DMY(VERT TAIL AERO MOMENTS)-NEWTON-M	1.35500
-0.00000	22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS	0.00000

-85.61916	.00000	-1833.00964				
22	3	UXE, DZF (FUSELAGE AERO FORCES) - NEWTONS				3.44000
-380.83401	.00000	-8153.22686				
22	6	DLF, DMF (FUSELAGE AERO MOMENTS) - FT-POUNDS				0.00000
0.00000	50376.23394	.00000				
22	6	DLF, DMF (FUSELAGE AERO MOMENTS) - NEWTON-M				1.35500
0.00000	68259.87829	.00000				
29	20	22 XAERO, YAERO, ZAERO (TOTAL AERO FORCES) - POUNDS				0.00000
947.77237	.00000	-15493.17440				
29	20	22 XAERO, YAERO, ZAERO (TOTAL AERO FORCES) - NEWTONS				0.00000
4215.69148	.00000	-68913.63971				
29	23	25 LAERO, MAERO, NAERO (TOTAL AERO MOMENTS) - FT-POUNDS				0.00000
.00000	-1790.79201	.00000				
29	23	25 LAERO, MAERO, NAERO (TOTAL AERO MOMENTS) - NEWTON-M				1.35500
.00000	-2426.52317	.00000				
23	1	3 DXT, DYT, DZT (DIRECT THRUST FORCES) - POUNDS				0.00000
3849.76619	.00000	-136.86131				
23	1	3 DXT, DYT, DZT (DIRECT THRUST FORCES) - NEWTONS				0.00000
17123.76882	.00000	-608.75911				
23	4	6 DLT, DMT, DNT (DIRECT THRUST MOMENTS) - FT-POUNDS				0.00000
.00000	-2025.79654	.00000				
23	4	6 DLT, DMT, DNT (DIRECT THRUST MOMENTS) - NEWTON-M				1.35500
.00000	-2744.95445	.00000				
26	23	26 24 HEL, HE2 (ENGINE ANGULAR MOMENTUM) - SLUG-FT*2/SEC				0.00000
1001.11129	1801.11129					
26	23	26 24 HEL, HE2 (ENGINE ANGULAR MOMENTUM) - KG-M*2/SEC				1.35500
1356.50508	1356.50508					
24	1	3 DXR, DYR, DZR (RAM FORCES) - POUNDS				0.00000
-1128.98139	.00000	-328.73378				
24	1	3 DXR, DYR, DZR (RAM FORCES) - NEWTONS				0.00000
-5021.70923	.00000	-1462.20783				
24	4	6 DLR, DMR, DMR (RAM MOMENTS) - FT-POUNDS				0.00000
.00000	3816.75484	.00000				
24	4	6 DLR, DMR, DMR (RAM MOMENTS) - NEWTON-M				1.35500
.00000	5171.70280	.00000				
26	3	4 RPM1, RPM2 (ENGINE ROT. SPEED) - RPM				0.00000
3844.69424	3844.69424					
27	1	3 DXRCS, DYRCS, DZRC (RCS FORCES) - POUNDS				0.00000
.00000	.00000	.00000				
27	1	3 DXRCS, DYRCS, DZRC (RCS FORCES) - NEWTONS				0.00000
.00000	.00000	.00000				
27	4	6 DLRC, DMRCS, DMRCS (RCS MOMENTS) - FT-POUNDS				0.00000
.00000	.00000	.00000				
27	4	6 DLRC, DMRCS, DMRCS (RCS MOMENTS) - NEWTON-M				1.35500
.00000	.00000	.00000				
25	1	3 DXCOR, DYC (CORIOLIS FORCES) - POUNDS				0.00000
0.00000	.00000	.00000				
25	1	3 DXCOR, DYC (CORIOLIS FORCES) - NEWTONS				0.00000
0.00000	.00000	.00000				
25	4	6 DLCCOR, DMCCOR, DMCCOR (CORIOLIS FORCES) - FT-POUNDS				0.00000
.00000	.00000	.00000				
25	4	6 DLCCOR, DMCCOR, DMCCOR (CORIOLIS FORCES) - NEWTON-M				1.35500
.00000	.00000	.00000				
29	26	29 24 SUMFX, SUMFY, SUMFZ (TOTAL FORCES) - POUNDS				0.00000
3668.55717	.00000	-15958.76348				
29	26	29 26 SUMFX, SUMFY, SUMFZ (TOTAL FORCES) - NEWTONS				0.00000
16317.74228	.00000	-70984.60666				

29	29	29	31	SUML	SUMM	SUMM(TOTAL	MOMENTS)	-FT-POUNDS	0.00000
.00000			.16619			.00000			
29	29	29	31	SUML	SUMM	SUMM(TOTAL	MOMENTS)	-NEWTON-M	1.35500
.00000			.22510			.00000			
29	51	29	53	GYROL	GYRON	GYRON(GYROSCOPIC	MOMENTS)	-FT-POUNDS	0.00000
0.00000			-.00000			.00000			
29	51	29	53	GYROL	GYRON	GYRON(GYROSCOPIC	MOMENTS)	-NEWTON-M	1.35500
0.00000			-.00000			.00000			

EXAMPLE 1 - TRANSITION TRIM RUN

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR. STAB.	VERT. STAB.	FUSELAGE	TOT. AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	-.6482E-02	-.789E-02	-.2618E-03	-.1461E-02	-.9993E-02	0.	-.1043E-01	0.	.4783E-22	-.2043E-01
Z/U	-.1073E+00	.3465E-02	0.	-.2838E-02	-.1066E+00	0.	-.1773E-03	.4469E-19	.1971E-18	-.1068E+00
M/U	-.5868E-02	.8959E-04	.1224E-04	.1855E-02	-.3111E-02	0.	.2696E-04	-.1153E-20	.1695E-19	-.3084E-02
X/W	.1889E+00	.4967E-02	0.	-.8935E-16	.1139E+00	0.	-.1047E-02	0.	.5042E-22	.1149E+00
Z/W	-.5176E+00	-.4438E-01	0.	-.1199E+00	-.6819E+00	0.	-.1214E-01	.1646E-19	.1971E-18	-.6941E+00
M/W	-.1885E-01	.3024E-02	0.	.2757E-01	-.1174E-01	0.	.1333E-02	.4247E-21	.2106E-19	.1307E-01
X/Q	.3492E+00	-.7338E-01	.1265E-02	0.	.2772E+00	0.	.2543E-01	0.	.5169E-21	.3026E+00
Z/Q	-.1562E+01	.5506E+00	0.	0.	-.1012E+01	0.	.3552E+01	-.5454E+00	.1744E-17	.1994E+01
M/Q	-.6057E-01	-.4424E-01	-.5916E-04	0.	-.3104E+00	0.	-.3680E+00	-.1488E-01	.1663E-18	.5069E+00
X/OE	-.7549E+01	-.2800E+00	0.	0.	-.7829E+01	0.	0.	0.	0.	-.7829E+01
Z/OE	-.3715E+02	.2351E+01	0.	0.	-.3440E+02	0.	0.	0.	0.	-.3440E+02
M/OE	-.3361E+01	-.1563E+00	0.	0.	-.3517E+01	0.	0.	0.	0.	-.3517E+01
X/FLAP	-.2671E+00	-.1385E-01	0.	0.	-.2809E+00	0.	0.	0.	0.	-.2809E+00
Z/FLAP	-.1613E+01	.1163E+00	0.	0.	-.1696E+01	0.	0.	0.	0.	-.1696E+01
M/FLAP	-.1763E+00	-.7732E-02	0.	0.	-.1860E+00	0.	0.	0.	0.	-.1860E+00
X/FLAP	0.	-.1100E+01	0.	0.	-.1100E+01	0.	0.	0.	0.	-.1100E+01
Z/FLAP	0.	-.1628E+01	0.	0.	-.1628E+01	0.	0.	0.	0.	-.1628E+01
M/FLAP	0.	.5095E+00	0.	0.	.5095E+00	0.	0.	0.	0.	.5095E+00
X/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/T01	0.	0.	0.	0.	-.1766E-02	0.	-.1146E-03	0.	.7617E-22	.1651E-02
Z/T01	0.	0.	0.	0.	-.6277E-04	0.	-.3316E-04	.1252E-19	.2970E-18	-.9613E-04
M/T01	0.	0.	0.	0.	-.8989E-05	0.	.3747E-05	.3230E-21	.2746E-19	-.5241E-05
X/T02	0.	0.	0.	0.	-.1766E-02	0.	-.1146E-03	0.	.7617E-22	.1651E-02
Z/T02	0.	0.	0.	0.	-.6277E-04	0.	-.3316E-04	.1252E-19	.2970E-18	-.9613E-04
M/T02	0.	0.	0.	0.	-.8989E-05	0.	.3747E-05	.3230E-21	.2746E-19	-.5241E-05
X/TMT1	0.	0.	0.	0.	-.6283E+00	0.	0.	0.	0.	-.6283E+00
Z/TMT1	0.	0.	0.	0.	-.3764E+01	0.	0.	0.	0.	-.3764E+01
M/TMT1	0.	0.	0.	0.	-.4532E+00	0.	0.	0.	0.	-.4532E+00
X/TMT2	0.	0.	0.	0.	-.6283E+00	0.	0.	0.	0.	-.6283E+00
Z/TMT2	0.	0.	0.	0.	-.3764E+01	0.	0.	0.	0.	-.3764E+01
M/TMT2	0.	0.	0.	0.	-.4532E+00	0.	0.	0.	0.	-.4532E+00

X/V	.2859E-14	.6254E-15	.7748E-03	.1787E-15	.7748E-03	0.	.5357E-04	0.	--.2480E-32	.8275E-03
Z/V	.2287E-13	-.4289E-14	0.	0.	0.	0.	.4859E-05	.1015E-16	--.5879E-29	.4059E-05
M/V	.8851E-15	.2213E-15	-.3619E-04	0.	-.3619E-04	0.	--.3102E-06	.2618E-18	--.7062E-38	--.3650E-04
X/P	.1430E-12	.3127E-13	.3633E-03	0.	.3633E-03	0.	.7606E-04	0.	--.5189E-22	.4482E-03
Z/P	.1144E-11	-.2144E-12	0.	0.	0.	0.	.2238E-04	.5073E-15	--.1724E-18	.2238E-04
M/P	.4426E-13	.1186E-13	-.1699E-04	0.	-.1699E-04	0.	--.2514E-05	.1309E-16	--.1042E-19	--.1958E-04
X/R	.1430E-12	.3127E-13	.1952E-02	0.	.1952E-02	0.	.1430E-12	0.	--.1240E-38	.1952E-02
Z/R	.1144E-11	-.2144E-12	0.	0.	0.	0.	.3574E-13	.5073E-15	--.2539E-27	0.
M/R	.4426E-13	.1106E-13	-.9129E-04	0.	-.9129E-04	0.	--.5532E-14	.1309E-16	--.3931E-28	--.9129E-04
X/DR	.8193E-12	.1792E-12	-.4842E-01	0.	-.4842E-01	0.	.8193E-12	0.	--.7106E-38	--.4842E-01
Z/DR	.6554E-11	-.1229E-11	0.	0.	0.	0.	.2048E-12	.2907E-14	--.1455E-26	0.
M/DR	.2536E-12	.6341E-13	.2264E-02	0.	.2264E-02	0.	--.3170E-13	.7500E-16	--.2253E-27	.2264E-02
X/DA	-.1835E-08	.3090E-03	0.	0.	.1032E+00	0.	.8193E-12	0.	--.7106E-38	.1032E+00
Z/DA	.1528E-01	-.2595E-02	0.	0.	.1269E-01	0.	.2048E-12	.2907E-14	--.1455E-26	.1269E-01
M/DA	.5275E-03	.1726E-03	0.	0.	.7001E-03	0.	--.3170E-13	.7500E-16	--.2253E-27	.7001E-03
X/DRCSR	.2859E-12	.6254E-13	0.	0.	.2859E-12	0.	.2859E-12	0.	.4879E-03	.4879E-03
Z/DRCSR	.2287E-11	-.4289E-12	0.	0.	.1269E-01	0.	.7148E-13	.1015E-14	.1646E+01	.1646E+01
M/DRCSR	.8851E-13	.2213E-13	0.	0.	.1770E-12	0.	--.1106E-13	.2617E-16	.1759E+08	.1759E+08
X/DRCSS	.2859E-12	.6254E-13	0.	0.	.2859E-12	0.	.2859E-12	0.	--.1328E-17	.2287E-11
Z/DRCSS	.2287E-11	-.4289E-12	0.	0.	.1269E-01	0.	.7148E-13	.1015E-14	--.4481E-14	0.
M/DRCSS	.8851E-13	.2213E-13	0.	0.	.1770E-12	0.	--.1106E-13	.2617E-16	--.4786E-15	.1668E-12
X/PSI1	.8193E-12	.1792E-12	0.	0.	.8193E-12	-.1477E+08	.8193E-12	0.	--.3805E-17	--.1477E+08
Z/PSI1	.6554E-11	-.1229E-11	0.	0.	.4077E-02	.6104E-03	.2048E-12	.2907E-14	--.1284E-13	.4077E-02
M/PSI1	.2536E-12	.6341E-13	0.	0.	.5072E-12	.6104E-03	-.3170E-13	.7500E-16	--.1371E-14	.6104E-03
X/PSI2	.8193E-12	.1792E-12	0.	0.	.8193E-12	-.1477E+08	.8193E-12	0.	--.3805E-17	--.1477E+08
Z/PSI2	.6554E-11	-.1229E-11	0.	0.	.4077E-02	.6104E-03	.2048E-12	.2907E-14	--.1284E-13	.4077E-02
M/PSI2	.2536E-12	.6341E-13	0.	0.	.5072E-12	.6104E-03	-.3170E-13	.7500E-16	--.1371E-14	.6104E-03

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S

LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR. STAB.	VERT. STAB.	FUSELAGE	TOT. AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	-.6963E-17 0.		-.2747E-16	.1070E-16	-.2174E-16 0.		.6071E-10	-.3105E-19 0.		-.2136E-16
L/U	0.		-.8490E-17 0.		-.8490E-17 0.		.1223E-19	-.1655E-21	.1353E-10	-.8343E-17
N/U	0.		.2686E-17	.1504E-17	.4190E-17 0.		.3066E-19	.7224E-21	-.5471E-23	.4221E-17
Y/M	.4416E-16 0.		0.	0.	.4416E-16 0.		.5949E-20	-.1144E-19 0.		.4416E-16
L/M	-.5851E-14 0.		0.	0.	.5851E-14 0.		.4503E-20	-.6095E-22	.1601E-10	-.5851E-14
N/M	.9970E-16 0.		0.	0.	.9970E-16 0.		.6368E-20	.2661E-21	-.6795E-21	.9970E-16
Y/Q	.1421E-15 0.		.1328E-15 0.		.2748E-15 0.		.5661E-18	-.4668E-19 0.		.2753E-15
L/Q	0.		.4103E-16 0.		.4103E-16 0.		.1714E-14	.1428E-15	.1487E-17	.1699E-14
N/Q	-.1247E-14 0.		-.1298E-16 0.		-.1260E-14 0.		-.1203E-17	.1006E-20	-.6012E-22	-.1261E-14
Y/OE	.3203E-14 0.		0.	0.	.3203E-14 0.		0.	0.	0.	.3203E-14
L/OE	-.8382E-12 0.		0.	0.	-.8382E-12 0.		0.	0.	0.	-.8382E-12
N/OE	0.		0.	0.	0.		0.	0.	0.	0.
Y/FLAPH	.1584E-15 0.		0.	0.	.1584E-15 0.		0.	0.	0.	.1584E-15
L/FLAPH	0.		0.	0.	0.		0.	0.	0.	0.
N/FLAPH	0.		0.	0.	0.		0.	0.	0.	0.
Y/DRCSN	0.		0.	0.	0.		0.	0.	0.	0.
L/DRCSN	0.		0.	0.	0.		0.	0.	0.	0.
N/DRCSN	0.		0.	0.	0.		0.	0.	0.	0.
Y/DRCSN	0.		0.	0.	0.		0.	0.	0.	0.
L/DRCSN	0.		0.	0.	0.		0.	0.	0.	0.
N/DRCSN	0.		0.	0.	0.		0.	0.	0.	0.
Y/T01	0.		0.	0.	0.		.6235E-10	.8342E-19	-.6079E-20 0.	-.5470E-10
L/T01	0.		0.	0.	0.		.7426E-05	.5867E-05	-.2236E-28	.2191E-10
N/T01	0.		0.	0.	0.		.2050E-04	-.2749E-05	.1600E-21	-.8860E-23
Y/T02	0.		0.	0.	0.		-.6235E-10	.8342E-19	-.6079E-20 0.	-.5470E-10
L/T02	0.		0.	0.	0.		-.7426E-05	.5867E-05	.2165E-20	.2191E-10
N/T02	0.		0.	0.	0.		-.2850E-04	-.2749E-05	.1600E-21	-.8860E-23
Y/THT1	0.		0.	0.	0.		.2219E-15 0.	0.	0.	.2219E-15
L/THT1	0.		0.	0.	0.		.4453E+00 0.	0.	0.	.4453E+00
N/THT1	0.		0.	0.	0.		-.1014E-01 0.	0.	0.	-.1014E-01
Y/THT2	0.		0.	0.	0.		.2219E-15 0.	0.	0.	.2219E-15
L/THT2	0.		0.	0.	0.		-.4453E+00 0.	0.	0.	-.4453E+00
N/THT2	0.		0.	0.	0.		.1014E-01 0.	0.	0.	.1014E-01

Y/Y	-.1979E-01 0.	-.0493E-01	-.4061E-01	-.1453E+00 0.	-.1220E-01	-.4614E-22 0.	-.1575E+00
L/Y	-.4197E-01 0.	-.2625E-01 0.	-.6822E-01 0.	-.6501E-04	-.2459E-24	.1470E-20	-.6829E-01
M/Y	-.2913E-02 0.	.0300E-02	-.5708E-02	-.3211E-03 0.	-.1205E-02	.1073E-23	-.5943E-25
Y/P	0.	-.4047E+00 0.	-.4047E+00 0.	-.4047E+00 0.	-.2621E-01	.2307E-20 0.	-.4309E+00
L/P	-.1810E+01 0.	-.1251E+00 0.	-.1135E+01 0.	-.1135E+01 0.	-.1522E+00	.1229E-22	-.7350E-19
M/P	-.4086E-01 0.	.3957E-01 0.	-.4905E-03 0.	-.4905E-03 0.	-.2582E-02	.5367E-22	.2972E-23
Y/R	0.	.9405E+00 0.	.9405E+00 0.	.9405E+00 0.	-.3552E+01	.5458E+00 0.	-.2065E+01
L/R	.6510E+00 0.	.2907E+00 0.	.9417E+00 0.	.9417E+00 0.	-.1693E-01	.2909E-02 0.	.9257E+00
M/R	-.4068E-01 0.	-.9195E-01 0.	-.1406E+00 0.	-.1406E+00 0.	-.3706E+00	-.1270E-01 0.	-.5239E+00
Y/DR	0.	.9675E+01 0.	.9675E+01 0.	.9675E+01 0.	0.	0.	.9675E+01
L/DR	0.	.2990E+01 0.	.2990E+01 0.	.2990E+01 0.	0.	0.	.2990E+01
M/DR	0.	-.9450E+00 0.	-.9450E+00 0.	-.9450E+00 0.	0.	0.	-.9450E+00
Y/DA	.5427E-27 0.	0.	.6858E-27 0.	.6858E-27 0.	0.	0.	.7060E-27
L/DA	-.1386E+02 0.	0.	-.1386E+02 0.	-.1386E+02 0.	0.	0.	-.1306E+02
M/DA	.3862E+00 0.	0.	.3862E+00 0.	.3862E+00 0.	0.	0.	.3842E+00
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.
L/DRCSR	0.	0.	0.	0.	0.	0.	0.
M/DRCSR	0.	0.	0.	0.	0.	0.	0.
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.
L/DRCSY	0.	0.	0.	0.	0.	0.	0.
M/DRCSY	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.
L/DRCSS	0.	0.	0.	0.	0.	0.	0.
M/DRCSS	0.	0.	0.	0.	0.	0.	0.
Y/PSI11	0.	0.	0.	0.	.3780E+01 0.	0.	.3780E+01
L/PSI11	0.	0.	0.	0.	.2014E-01 0.	0.	.2014E-01
M/PSI11	0.	0.	0.	0.	-.4108E+00 0.	0.	-.4108E+00
Y/PSI12	0.	0.	0.	0.	.3780E+01 0.	0.	.3780E+01
L/PSI12	0.	0.	0.	0.	.2014E-01 0.	0.	.2014E-01
M/PSI12	0.	0.	0.	0.	-.4108E+00 0.	0.	-.4108E+00

D-52

NOPT=7 READ VARIABLE OUTPUT FORMATS

- (4X,F8.0,2X,10F10.2)
- (4X,F8.0,2X,10F10.2)
- (4X,F8.0,2X,10F10.2)
- (4X,F8.0,2X,10F10.2)
- (4X,F8.0,2X,10F10.2)
- (4X,F8.0,2X,10F10.2)
- (4X,F8.0,2X,10E10.3)
- (4X,F8.0,2X,10E10.3)
- (4X,F8.0,2X,10E10.3)
- (4X,F8.0,2X,10E10.3)
- (4X,F8.0,2X,10E10.3)

NOPT-12 PRINT DATA SUMMARY FROM TRIN

D-53

EXAMPLE 1 - TRANSITION TRIM RUN

AI/PSPEED	UDOT	VOOT	MOOT	U	W	M	P-D/S	Q-D/S	R-D/S	ALPHA-DG
200.	.00	.00	.00	334.11	.00	48.39	.00	.00	.00	8.24
180.	.00	.00	.00	299.65	.00	50.31	.00	.00	.00	9.53
160.	.00	.00	.00	265.10	.00	51.62	.00	.00	.00	11.02
140.	.00	.00	.00	230.31	.00	52.94	.00	.00	.00	12.95

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPED	BETA-DG	XE20-F/S2	YE20-F/S2	ZE20-F/S2	ZE20-F/S2XEDOT-F/S	YEDOT-F/S	ZEDOT-F/S	THE10-D/S	PH10-D/S	PS10-D/S
200.	-0.00	0.00	0.00	0.00	337.60	-0.00	0.00	0.00	0.00	0.00
180.	-0.00	0.00	0.00	0.00	303.84	-0.00	0.00	0.00	0.00	0.00
160.	-0.00	0.00	0.00	0.00	270.00	-0.00	0.00	0.00	0.00	0.00
140.	-0.00	0.00	0.00	0.00	236.32	-0.00	0.00	0.00	0.00	0.00

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	THETA-DEG	PHI-DEG	PSI-DEG	DA-DEG	DE-DEG	DR-DEG	DROLL	DPITCH	QVAN	PSIT(L)
200.	9.24	0.00	0.00	0.00	-0.01	-0.00	-0.00	.03	.00	-0.00
180.	9.53	0.00	0.00	.7	-0.43	-0.00	-0.00	.02	.00	-0.00
160.	11.02	0.00	0.00	-0.60	.94	-0.00	.00	-0.04	.00	-0.00
140.	12.95	0.00	0.00	-0.00	3.39	-0.00	.00	-0.15	.00	-0.00

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPED	TMT(1)	L.ELEV-DG	R.ELEV-DG	FACS1-LB	FACS2-LB	BLOREQ	BLDAVL	DRSC1	DRSC2	TCHD-LB
200.	-.49	-.81	-.81	.00	0.00	3.58	31.69	.00	-.08	3770.75
180.	-.26	-.43	-.43	.00	0.00	3.58	31.84	.00	-.00	3617.00
160.	-.56	.94	.94	0.00	.00	3.50	31.69	-.00	.00	3540.99
140.	2.84	3.39	3.39	0.00	.00	3.50	31.44	-.00	.00	3670.98

EXAMPLE 1 - TRANSITION_TAIN_RUN

AIRSPED	T01-LB	T02-LB	TREQ1-LB	TREQ2-LB	TAST1-LB	TAST2-LB	TCOR1-LB	TCOR2-LB	RPM1	RPM2
200.	2091.41	2091.41	2091.41	2091.41	1009.30	1009.30	1007.30	1007.30	2923.29	2923.29
180.	2002.32	2002.32	2002.32	2002.32	1000.90	1000.90	1007.03	1007.03	2049.02	2049.02
160.	1959.01	1959.01	1959.01	1959.01	1770.49	1770.49	1760.23	1760.23	2010.07	2010.07
140.	2141.95	2141.95	2141.95	2141.95	1935.04	1935.04	1926.10	1926.10	3044.09	3044.09

EXAMPLE 1 - TRANSITION TRIM RUN

AIR SPEED	M00T1	M00T2	K/U	Z/U	M/U	X/M	Z/M	M/M	K/Q	Z/Q
200.	80.78	80.78	-.227E-01	-.590E-01	-.147E-02	.103E+00	-.095E+00	.905E-02	.293E+00	-.137E+01
180.	79.66	79.66	-.211E-01	-.708E-01	-.149E-02	.108E+00	-.029E+00	.708E-02	.296E+00	-.151E+01
160.	78.92	78.92	-.188E-01	-.902E-01	-.155E-02	.112E+00	-.747E+00	.743E-02	.295E+00	-.170E+01
140.	80.04	80.04	-.204E-01	-.107E+00	-.308E-02	.115E+00	-.695E+00	.131E-01	.303E+00	-.199E+01

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPED	M/Q	X/DE	Z/DE	M/DE	X/FLAPH	Z/FLAPH	M/FLAPH	X/FLAPC	Z/FLAPC	M/FLAPC
200.	-.533E+00	.136E+02	-.732E+02	-.712E+01	-.529E+00	.139E+00	-.220E+00	.283E+01	-.279E+01	.941E+00
180.	-.522E+00	.611E+01	-.584E+02	-.978E+01	-.617E+00	-.600E+00	-.215E+00	.229E+01	-.224E+01	.760E+00
160.	-.511E+00	-.886E+01	-.465E+02	-.460E+01	-.332E+00	-.322E+01	-.201E+00	.179E+01	-.179E+01	.601E+00
140.	-.507E+00	-.783E+01	-.348E+02	-.352E+01	-.261E+00	-.170E+01	-.106E+00	-.111E+01	-.163E+01	.509E+00

EXAMPLE 1 - TRANSITION TRIM RUN

AIPSPEED	X/T01	Z/T01	M/T01	X/T02	Z/T02	M/T02	X/TMT1	Z/TMT1	M/TMT1	X/TMT2
200.	.161E-02	-.153E-04	.303E-05	.161E-02	-.153E-04	.303E-05	.265E+00	-.370E+01	-.446E+00	.265E+00
160.	.162E-02	-.235E-04	.312E-05	.162E-02	-.235E-04	.312E-05	.136E+00	-.355E+01	-.427E+00	.136E+00
160.	.164E-02	-.499E-04	.132E-06	.164E-02	-.499E-04	.132E-06	.209E+00	-.347E+01	-.410E+00	.209E+00
140.	.165E-02	-.961E-04	-.524E-05	.165E-02	-.961E-04	-.524E-05	.628E+00	-.376E+01	-.453E+00	.628E+00

ORIGINAL PAGE IS
OF POOR QUALITY

EXAMPLE 1 - TRANSITION TRIM RUN

AIR SPEED	Z/TMT2	M/TMT2	Y/V	L/V	N/V	Y/P	L/P	M/P	Y/R	L/R
200.	-.370E+01	-.446E+00	-.202E+00	-.717E-01	.120E-02	-.613E+00	-.166E+01	.152E-01	-.167E+01	.822E+00
180.	-.355E+01	-.427E+00	-.185E+00	-.705E-01	.476E-03	-.552E+00	-.153E+01	.789E-02	-.177E+01	.836E+00
160.	-.347E+01	-.418E+00	-.171E+00	-.695E-01	-.493E-03	-.492E+00	-.140E+01	.168E-02	-.188E+01	.870E+00
140.	-.376E+01	-.453E+00	-.158E+00	-.683E-01	-.153E-02	-.431E+00	-.129E+01	-.307E-02	-.207E+01	.926E+00

EXAMPLE 1 - TRANSITION TAIM RUN

AIR SPEED	M/R	Y/DR	L/DR	N/DR	Y/DA	L/DA	X/DA	Y/DRCR	L/DRCR	M/DRCR
200.	-.541E+00	.204E+02	.629E+01	-.199E+01 0.		-.287E+02	-.709E+00 0.	.139E+01	-.561E-04	
180.	-.527E+00	.164E+02	.506E+01	-.160E+01 0.		-.231E+02	-.329E+00 0.	.138E+01	-.557E-04	
160.	-.510E+00	.128E+02	.396E+01	-.125E+01 0.		-.184E+02	-.624E+00 0.	.137E+01	-.556E-04	
140.	-.524E+00	.967E+01	.299E+01	-.946E+00	.707E-27	-.139E+02	.384E+00 0.	.140E+01	-.567E-04	

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPED	V/PSIT1	L/PSIT1	M/PSIT1	V/PSIT2	L/PSIT2	M/PSIT2
200.	.370E+01	.197E-01	-.402E+00	.370E+01	.197E-01	-.402E+00
180.	.355E+01	.189E-01	-.385E+00	.355E+01	.189E-01	-.385E+00
160.	.347E+01	.185E-01	-.377E+00	.347E+01	.185E-01	-.377E+00
140.	.370E+01	.201E-01	-.411E+00	.370E+01	.201E-01	-.411E+00

APPENDIX E
EXAMPLE 2 (STATIONKEEPING TIME
HISTORY) OUTPUT

69 NEQS

5 0 NTAP,NTAPW

DIVISION OF R-ARRAY

I	NR(I)	LENGTH(I)
1	8	7
2	7	69
3	76	69
4	145	17
5	162	19
6	181	91
7	272	29
8	301	18
9	319	34
10	353	27
11	380	19
12	399	15
13	414	1
14	415	17
15	432	286
16	638	225
17	863	148
18	1011	6
19	1017	54
20	1071	33
21	1104	21
22	1125	28
23	1153	31
24	1184	44
25	1228	11
26	1239	35
27	1274	73
28	1347	76
29	1423	67
30	1490	133
31	1623	12
32	1635	72
33	1707	250
34	1957	250
35	2207	250
36	2457	250
37	2707	250
38	2957	250
39	3207	26
40	3233	50
41	3263	10
42	3293	28
43	3321	161
44	3482	103
45	3585	170

OUTPUT SPECIFICATIONS

1	1	1.00000	TIME-SEC
3	1	1.00000	U-FY/SEC
3	2	1.00000	V-FY/SEC
3	3	1.00000	W-FY/SEC
3	4	57.29580	P-DEG/SEC
3	5	57.29580	Q-DEG/SEC
3	6	57.29580	R-DEG/SEC
29	46	57.29580	RS-DEG/SEC
29	47	57.29580	PS-DEG/SEC
2	16	1.00000	XEDT-FY/S
2	17	1.00000	YEDT-FY/S
2	18	1.00000	ZEDT-FY/S
3	16	1.00000	XE-FI
3	17	1.00000	YE-FI
3	18	1.00000	ZE-FI
3	64	57.29580	JMETA-DEG
3	65	57.29580	PHI-DEG
3	66	57.29580	PSI-DEG
29	32	1.00000	D11
29	33	1.00000	D12
29	34	1.00000	D13
29	35	1.00000	D21
29	36	1.00000	D22
29	37	1.00000	D23
29	38	1.00000	D31
29	39	1.00000	D32
29	40	1.00000	D33
28	50	57.29580	DEC-DEG
28	52	57.29580	QAC-DEG
3	19	57.29580	L-ELEV-DEG
3	20	57.29580	R-ELEV-DEG
3	21	57.29580	UR-DEG
3	24	57.29580	PSIT-DEG
3	26	57.29580	JHTY-DEG
3	28	1.00000	RCS NORM.
3	40	57.29580	CAN.FLP-0G
3	49	57.29580	WNG.FLP-0G
29	9	59200	VA-KT
29	13	57.29580	ALPHA-DEG
29	14	57.29580	BETA-DEG
29	54	1.00000	NXCG-G
29	55	1.00000	NYCG-G
29	56	1.00000	NZCG-G
28	20	1.00000	DROLL
28	29	1.00000	DYAN
28	38	1.00000	DPITCH
28	58	1.00000	TCMD-LB
26	34	1.00000	TOUT-LB
26	1	1.00000	MDOI-LB/S
26	3	1.00000	RFH-RAD/S
26	7	1.00000	BLDAVL
27	19	1.00000	BLOREQ
3	52	57.29580	PHTRM-DEG
3	53	57.29580	P-INTE-DEG
3	54	1.00000	P-ERR-INT
3	55	57.29580	PSITRM-DEG

3	56	57.29580	R. INTE-DEG
3	57	1.00000	R. ERR. INT.
3	58	57.29580	PSITRNBUT
3	59	57.29580	THETRM-DEG
3	60	57.29580	Q. INTE-DEG
3	61	1.00000	O. ERR. INT.
3	62	57.29580	THETRBUT
3	63	1.00000	ZL. ERR. INT.
20	19	57.29580	P. ERR. DG/S
20	26	57.29580	R. ERR. DG/S
20	35	57.29580	D. ERR. DG/S
20	40	1.00000	ZE. ERR. F/S
20	12	1.00000	ROLLCMD
20	21	1.00000	YAWCMD
20	11	1.00000	COM. SYS. SW
20	13	57.29580	DLATSTK-DG
20	22	57.29580	DPED-DG/S
20	31	57.29580	LMG. STK.
20	39	1.00000	ZEDT. CMD.
20	43	1.00000	THROTTLE
20	1	1.00000	ZE. ERR. FT
20	3	1.00000	VE. ERR. FT
20	8	1.00000	XBODY. ER-F
20	9	1.00000	YBODY. ER-F
20	10	1.00000	ZBODY. ER-F
20	20	1.00000	IRCS
0	0	0.00000	BLANK CARD-END TIME HISTORY OUTPUT SPECIFICATIONS
M	0	0	
N	0	82	

STORE FIXED TABLES ETC.

4	1	4	5 MT, IX, IZ, IXZ	0.00000			
4	6	4	7959.00000	52609.00000	58337.00000	-202.40000	
4	5	5	0.00000	99.00000			0.00353
4	1	1	50000	50000	1.00000	1.00000	.50000
4	2	2	10000	10000	.02000	.02000	.50000
4	3	3	0.00000	0.00000	0.00000	0.00000	0.00000
4	4	4	70 AAERO. AEROLI. JI-AERO LIFT-0.5 CONSTANTS				
4	5	5	2.30000	2.14000	350.00000	217.20000	.70900
4	6	6	.59300	6.04500	.00194	.25300	.63000
4	7	7	.09100	-.00590	.30400	.00602	.97400
4	8	8	.99600	115.00000	51.10000	.93400	.52500
4	9	9	.51500	.00281	.44200	.10650	.25000
4	10	10	0.00000	0.00000	0.00000	0.00000	.08650
4	11	11	2.00000	60.00000	.78500	.92500	.52500
4	12	12	6.04500	-.00431	0.00000	0.00000	.30000
4	13	13	0.00000	0.00000	0.00000	0.00000	1.03000
4	14	14	.57100	.17500	0.00000	0.00000	0.00000
4	15	15	.97600	.73400	.49500	.72700	0.00000
4	16	16	79 SURFCPLI. JI				.74900
4	17	17	4 FSM. BLM1, BLM2, MLM				0.00000
4	18	18	70.00000	70.00000	99.00000		.08333
4	19	19	CM. BM, EK0A1, EK0A2, EIM				0.00000

14.50000	28.36000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7 10	7 13	CLBOM,CLBCLM,CLRCLM,CLPLM					0.00000
0.00000	-.23500	.27500	-.19200				
7 14	7 19	CN80M,CN8CL2M,CN8CL2M,CNFCOM,CN8PCLM,CN8PCDAW					0.00000
0.00000	-.13200	-.16600	-.45300				0.00000
7 20	7 21	CN0M,CN0FM					0.00000
0.00000	-.01910						0.00000
7 22	7 22	AEKEL					0.00000
7 23	7 23	CY8CL2M					0.00000
-.30000							0.00000
312.50000	0.00000	115.00000					0.00000
0 1	3	FSM,8LM,MLM					0.00000
0 4	0 8	CH,BH,EKAD,EIH,EOCLM					0.00000
6.42000	16.13000	0.00000	-.06730				0.00000
0 9	0 10	CN0FM,CN0M					0.00000
-.05730	0.00000						0.00000
9 1	3	FSV,8LV,MLV					0.00000
536.00000	0.00000	157.00000					0.00000
0 4	9 9	CV,8V,EKADR,EIV,EKV,CN0V					0.00000
0 9	7 75000	0.00000	0.00000				0.00000
0 10	9 10	AEKRUD					0.00000
7.00000							0.00000
9 11	9 20	TALFA(I)					0.01745
-190.00000	20.00000	30.00000	40.00000	50.00000	130.00000	140.00000	150.00000
160.00000	160.00000						0.00000
10.00000	9 21	AALFA					0.00000
5 22	9 31	JVTEFFIL					0.00000
1.00000	1.00000	.70000	.25000	0.00000	0.00000	.25000	.70000
1.00000	10 1	FSF,8LF,MLF					0.00000
174.00000	0.00000	99.00000					0.00000
10 4	10 10	AQQ8,SOQX,MFOQM,MOQX1,MOQX2,MOQX1,MOQX2					0.00000
1.44300	367.00000	367.00000	532.00000	532.00000	532.00000	532.00000	532.00000
10 11	10 13	AOF,AIF,A2F					0.01765
2.00000	00.00000	90.00000					0.00000
10 14	10 20	EN1,EN2,EN3,EN4,EN5,EN6,ENZ					0.00000
2.00000	1.06700	1.52200	.00000	1.00000	.00000	1.00000	0.00000
17.00000	10 21	DFSF0					0.00000
10 22	10 23	ADFSF1,ADFSF2					0.00000
.26200	.00300						0.00000
10 24	10 24	KYF					0.00000
0.00000							0.00000
551.00000	11 6	FSSM1,FSSM2,8LSM1,8LSM2,WLSM1,WLSM2					0.00000
11 7	11 11	SIGY,ELN,KAF1,KAF2,AENG					0.00000
0.00000	4.26000	-.13000	1.00000	2.00000			0.00000
266.00000	12 6	FSIN1,FSIN2,8LIN1,8LIN2,MLIN1,MLIN2					0.00000
12 7	12 9	RINLET,AVOVI,AA TURN					0.00000
1.31000	13 1	ELDUCT					0.00000
335.00000	14 5	AMACH,KBT1,KBT2,KM1,KM2					0.00000
4.00000	14 14	-.02760	1.00000	.56500	.43500		0.00000

14	6	14	0	OMEGHX,RPMX,RCS	0.0000
1063.0000	10159.0000	1.0000			
14	9	14	10	AFRAT,JENG	0.0000
6.00000	3.14000				
14	11	14	14	AFRAC,TAUAB,ABACCEL,ABDECEL	0.00000
6.00000	0.05000	20.00000		-20.00000	
14	15	14	16	TABON,TABOFF	0.00000
-10000	-00100				
15	1	15	3	ARCSJET,ABLDR,BLDRREF,	0.00000
2.00000	6.00000	3.50000			
15	4	15	3	FRCSMX1,FRCSMX2	0.00000
1500.00000	1500.00000				
15	14	15	15	DEMAND1,DEMAND2	0.00000
1.00000	1.00000				
15	24	15	25	BLOMORA,BLDMORZ	0.00000
1.00000	1.00000				
15	34	15	35	RGSL(1,1),RGSL(2,1)	0.00000
-1.00000	1.00000				
15	84	15	85	FSRCS1,FSRCS2	0.0333
534.00000	534.00000				
15	94	15	95	BLRCS1,BLRCS2	0.0333
-160.00000	160.00000				
15	104	15	105	MLRCS1,MLRCS2	0.0333
100.00000	100.00000				
15	114	15	115	TMRCS1,TMRCS2	0.01745
-90.00000	-90.00000				
15	124	15	125	PSIRCS1,PSIRCS2	0.01745
0.00000	0.00000				
16	13	16	13	CSY	0.00000
.20600					
16	14	16	14	VASH	1.00000
60.00000					
16	66	16	69	PELIM,AKDVR,KTHTR,KOA	0.00000
1.00000	0.00000			--.43600	
16	110	16	113	RELIM,AKYTR,KPS II,KDR	0.00000
1.00000	34900			--.43600	
16	114	16	119	TAKAY(I)-LAT.ACCEL,FDBACK TABLE	0.00000
0.00000	0.00000			.10500	
16	122	16	122	KTY	0.00000
0.00000					
16	163	16	167	DELIM,AKPIRM,OSTK,KDE,KTHIP	0.00000
1.00000	34900			--.43600	
16	164	16	164	AKTHROT	0.00000
30000.00000				--.26200	
16	165	16	165	ZELIM	0.00000
30000.00000					
16	186	16	188	ELEVRAF,PSITRFLIN	0.00000
0.00000	0.00000				
16	189	16	192	KHFLAP1,KHFLAP2	0.00000
5.56000	-1.16480			4.17000	
16	193	16	193	AQBAR	0.00000
7.00000					
16	194	16	199	TQBAR(I)-DYNAMIC PRESSURE TABLE	0.00000
0.00000	9.95000			10.00000	
17	1	17	4	LEURATL,LELRATL,LEUPOS1,LELPOS1	127.00000
35.00000	-35.00000			60.00000	
17	5	17	5	TLEL	0.00000
0.00000					
46.00000					
127.00000					
0.01745					
0.00000					

.05000	17	6	17	9	REURATL,REL,RATL,REUPOS,REL,POS	.01745
35.00000	17	10	17	10	TREL	0.00000
.05000	17	11	17	14	ORURATL,ORL,RATL,DRUPOS,DRL,POS	.01745
100.00000	17	15	17	15	TDR	0.00000
.05000	17	16	17	19	HFURATL,HFL,RATL,HFL,APMX,HFL,APM	.01745
10.00000	17	20	17	20	TMF	0.00000
.00000	17	21	17	24	MFURATL,MFL,RATL,MFL,APMX,MFL,APM	.01745
10.00000	17	25	17	25	TMF	0.00000
10.00000	17	26	17	33	TMURL(2),TML,RL(2),TML,PL(2),TML,PL(2)	.01745
50.00000	17	34	17	35	TMURL(2)	15.00000
.05000	17	36	17	43	PSIURL(2),PSI,URL(2),PSI,URL(2),PSI,URL(2)	.01745
50.00000	17	44	17	45	TPSIT(2)	15.00000
.05000	17	46	17	47	RCURL(2)	0.00000
10.00000	17	56	17	57	RCURL(2)	0.00000
-10.00000	17	66	17	67	RCSURL(2)	0.00000
1.00000	17	76	17	77	RCSURL(2)	0.00000
-1.00000	17	86	17	87	TAURCS(2)	0.00000
.05000	17	96	17	97	FRCSURL(2)	0.00000
1500.00000	17	106	17	107	FRCSURL(2)	0.00000
-1500.00000	17	116	17	117	FRCSURL(2)	0.00000
1500.00000	17	126	17	127	FRCSURL(2)	0.00000
-1500.00000	17	136	17	137	TAURCS(2)	0.00000
.05000	17	146	17	148	DELIM,DELIM,ORL,IM	.01745
25.00000	30	1	30	5	VOVIT(I)-VOVI TABLE FOR RAM F + M	0.00000
0.00000	30	6	30	11	ATURN(I,J)-ATURN TABLE FOR RAM F + M	.01745
0.00000	30	14	30	43	ELRAMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	.00333
0.00000	30	54	30	83	DATURN(I,J)-DELTA ATURN TABLE FOR RAM F + M	.01745
.23400						.97300
3.43300						1.04200
3.56400						4.08400
						3.61000
						3.56400
						1.78800
						1.04200
						4.08400
						3.61000
						3.56400

64	27	44	26	TKPS	0.00000	0.00000
1.00000						
44	32	44	33	TKQINT	0.00000	0.00000
0.00000						
44	37	44	38	IKTHEIA	0.00000	0.00000
1.00000						
44	42	44	43	TKRINT	0.00000	0.00000
0.00000						
44	47	44	48	TKPSI	0.00000	0.00000
0.00000						
44	52	44	53	TKRB	0.00000	0.00000
0.00000						
44	57	44	58	TAKPCI	0.00000	0.00000
1.00000						
44	62	44	63	TAKPEI	0.00000	0.00000
1.00000						
44	67	44	68	TAKRCI	0.00000	0.00000
0.00000						
44	72	44	73	TAKREI	0.00000	0.00000
1.00000						
44	77	44	78	TAKQCI	0.00000	0.00000
1.00000						
44	82	44	83	TAKQEI	0.00000	0.00000
1.00000						
44	87	44	88	TKRS	0.00000	0.00000
1.00000						
44	92	44	92	AKPHIRS	0.00000	0.00000
1.00000						
45	1	45	1	MELGAIN	0.00000	0.00000
1.00000						
45	2	45	2	AVEL	0.00000	0.00000
6.00000						
45	3	45	8	TVEL	1.60000	1.60000
0.00000						
45	11	45	16	VAKPC	60.00000	120.00000
3.0000						
45	19	45	24	VKPCII	30000	50000
1.00000						
45	27	45	32	VKFEI1	1.00000	1.00000
0.0000						
45	35	45	40	VKP	20000	20000
50000						
45	43	45	48	VAKPE	50000	50000
6.00000						
45	51	45	56	VAKRC	2.00000	4.00000
1.00000						
45	59	45	64	VKRCII	1.00000	1.00000
0.00000						
45	67	45	72	VKREI1	0.00000	0.00000
80000						
45	75	45	80	VKR	20000	20000
50000						
45	83	45	88	VAKRE	1.00000	1.00000
13.00000						
45	91	45	96	VAKOC	30000	1.10000
1.00000						
45	99	45	104	VKOCII	30000	30000

W J

0.00000	1.00000	1.00000	1.00000	1.00000	1.00000
45 107	45 112	VKQEI1			
.20000	.20000	.20000	.20000	.20000	.20000
45 115	45 120	VKQ			
.50000	.50000	.50000	.50000	.50000	.50000
45 123	45 128	VAKQE			
10.00000	10.00000	15.00000	15.00000	15.00000	15.00000
45 131	45 136	VAKZE			
-500.00000	-500.00000	0.00000	0.00000	0.00000	0.00000
45 139	45 144	VKZEI1			
.20000	.20000	0.00000	0.00000	0.00000	0.00000
45 147	45 152	VTPITCH			
.25000	.25000	0.00000	0.00000	0.00000	0.00000
45 155	45 160	VTROLL			
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
45 163	45 168	VTYAM			
.25000	.25000	0.00000	0.00000	0.00000	0.00000
0	0	0	0	0	0
BLANK CARD-END OF BASIC LOAD					

NOPT=1 STORE READ/WRITE INFO

NTAP= 2

4	1	4	1	WEIGHT-POUNDS	0.00000
4	1	4	1	WEIGHT-NEWTONS	4.44800
4	2	4	5	IX, IY, IZ (AIRCRAFT INERTIAS) - SLUG-FT**2	0.00000
4	2	4	5	IX, IY, IZ (AIRCRAFT INERTIAS) - KG-M**2	1.35500
14	10	14	10	JENG (ENGINE INERTIA) - SLUG-FT**2	0.00000
14	10	14	10	JENG (ENGINE INERTIA) - KG-M**2	1.35500
29	45	29	45	ALTITUDE-FT	0.00000
29	45	29	45	ALTITUDE-METERS	.30480
29	10	29	10	TRUE AIRSPEED-KNOTS	0.00000
29	9	29	9	TRUE AIRSPEED-FT/SEC	0.00000
29	9	29	9	TRUE AIRSPEED-M/SEC	.30480
29	12	29	12	OBAR (DYNAMIC PRESSURE) - POUNDS/FT**2	0.00000
29	11	29	11	MACH NUMBER	0.00000
29	12	29	12	OBAR (DYNAMIC PRESSURE) - NEWTONS/M**2	47.88000
29	4	29	4	RHO (AIR DENSITY) - SLUGS/FT**3	0.00000
29	4	29	4	RHO (AIR DENSITY) - KG/M**3	515.38000
29	57	29	59	XOM, YOM, ZOM (AMB. WIND COMPONENTS-EARTH AXES) FT	.59020
29	57	29	59	XOM, YOM, ZOM (AMB. WIND COMPONENTS-EARTH AXES) FT/S	0.00000
29	57	29	59	XOM, YOM, ZOM (AMB. WIND COMPONENTS-EARTH AXES) M/S	.30480
2	16	2	18	XE00T, YE00T, ZE00T (FT/S)	0.00000
2	16	2	18	XE00T, YE00T, ZE00T (M/S)	.30480
41	4	41	6	XE20, YE20, ZE20 - FT/SEC**2	0.00000
41	4	41	6	XE20, YE20, ZE20 - G	.03106
41	4	41	6	XE20, YE20, ZE20 - M/SEC**2	.30480
2	1	2	3	UD0T, VD0T, WD0T - FT/SEC**2	0.00000
2	1	2	3	UD0T, VD0T, WD0T - G	.03106
2	1	2	3	UD0T, VD0T, WD0T - M/SEC**2	.30480
3	1	3	3	U,V,W (INER. SPEED COMPONENTS) FT/SEC	0.00000
3	1	3	3	U,V,W (INER. SPEED COMPONENTS) M/SEC	.30480
29	1	29	3	UAS, VAS, WAS (AIRSPEED COMPONENTS) FT/SEC	0.00000
29	1	29	3	UAS, VAS, WAS (AIRSPEED COMPONENTS) M/SEC	.30480
29	54	29	56	NXCG, NYCG, NZCG (BODY AXIS ACCEL.) - GEES	0.00000

3	4	3	6	P,Q,R(BODY AXIS RATES)-DEG/SEC	57.29578
3	64	3	66	THETA,PHI,PSI(EULER ANGLES)-DEG	57.29578
29	13	29	14	ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG	57.29578
2	10	2	16	ZD(RATE OF SINK)-FT/MIN	60.00000
2	18	2	18	ZD(RATE OF SINK)-FT/SEC	8.00000
2	18	2	18	ZD(RATE OF SINK)-M/SEC	.30480
28	20	28	20	NORM. ROLL CONTROL	0.00000
28	29	28	29	NORM. YAW CONTROL	0.00000
28	38	28	38	NORM. PITCH CONTROL	0.00000
3	26	3	27	TH1,TH2(THRUST DEFLECTION PITCH ANGLES)-DEG	57.29578
3	24	3	25	PSI1,PSI2(THRUST DEFLECTION PITCH ANGLES)-DEG	57.29578
3	19	3	19	LEFT ELEVON DEFLECTION-DEG	57.29578
3	20	3	20	RIGHT ELEVON DEFLECTION-DEG	57.29578
28	50	28	50	ELEVATOR COMMAND DEFLECTION-DEG	57.29578
28	51	28	51	AILERON COMMAND DEFLECTION-DEG	57.29578
3	28	3	29	DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)	0.00000
28	58	28	58	TCHD(THRUST COMMAND)-POUNDS	0.00000
28	58	28	58	TCHD(THRUST COMMAND)-NEWTONS	4.44800
23	9	23	10	TCOR1,TCOR2(THRUST APPL. TO A/G)-POUNDS	0.00000
23	9	23	10	TCOR1,TCOR2(THRUST APPL. TO A/G)-NEWTONS	4.44800
3	21	3	21	RUDDER DEFLECTION-DEG	57.29578
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS	0.00000
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS	4.44800
26	1	26	2	MDO1,MDO2(ENGINE INLET MASS FLOWS)-LBH/SEC	0.00000
26	1	26	2	MDO1,MDO2(ENGINE INLET MASS FLOWS)-KG/SEC	.45400
15	3	15	3	BLDREF(REFERENCE RCS BLEED)-PER CENT	0.00000
26	7	26	7	BLDAVL	0.00000
27	72	27	72	BLD(ACTUAL RCS BLEED)-PER CENT	0.00000
3	38	3	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	8.00000
3	38	3	39	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	4.44800
11	7	11	7	SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG	57.29578
19	44	19	46	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-FI-LB	0.00000
19	44	19	46	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M	1.35500
19	37	19	38	XW1,XW2(WING X FORCE)-POUNDS	0.00000
19	37	19	38	XW1,XW2(WING X FORCE)-NEWTONS	4.44800
19	39	19	40	ZW1,ZW2(WING Z FORCE)-POUNDS	0.00000
19	39	19	40	ZW1,ZW2(WING Z FORCE)-NEWTONS	4.44800
19	19	19	20	GLW1,CLW2(WING LIFT COEFFICIENT)	0.00000
3	48	3	48	DFLAPH(CANARD TE FLAP DEFLECTION)-DEG	57.29578
3	49	3	49	DFLAPH(WING LE FLAP DEFLECTION)-DEG	57.29578
19	1	19	3	DXH,DYH,DZH(WING AERO FORCES)-POUNDS	0.00000
19	1	19	3	DXH,DYH,DZH(WING AERO FORCES)-NEWTONS	4.44800
19	4	19	6	OLW,OLH,OLN(WING AERO MOMENTS)-FT-POUNDS	0.00000
19	4	19	6	OLW,OLH,OLN(WING AERO MOMENTS)-NEWTON-M	1.35500
20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS	0.00000
20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS	4.44800
20	4	20	6	DLH,DLH,DLN(CANARD AERO MOMENTS)-FT-POUNDS	0.00000
20	4	20	6	DLH,DLH,DLN(CANARD AERO MOMENTS)-NEWTON-M	1.35500
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	4.44800
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	0.00000
21	4	21	6	OLV,OLV,OLN(VERT. TAIL AERO MOMENTS)-FT POU DS	0.00000
21	4	21	6	OLV,OLV,OLN(VERT. TAIL AERO MOMENTS)-NEWTON-M	1.35500
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS	0.00000
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS	4.44800
22	4	22	6	OLF,OLF,OLN(FUSELAGE AERO MOMENTS)-FT-POUNDS	0.00000
22	4	22	6	OLF,OLF,OLN(FUSELAGE AERO MOMENTS)-NEWTON-M	1.35500
29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS	0.00000

29	20	29	22	XAERO, YAERO, ZAERO (TOTAL AERO FORCES) - NEWTONS	4.44800
29	23	29	25	LAERO, MAERO, NAERO (TOTAL AERO MOMENTS) - FT-POUNDS	0.00000
29	23	29	25	LAERO, MAERO, NAERO (TOTAL AERO MOMENTS) - NEWTON-M	1.35500
23	1	23	3	DXT, DYT, DZT (DIRECT THRUST FORCES) - POUNDS	0.00000
23	1	23	3	DXT, DYT, DZT (DIRECT THRUST FORCES) - NEWTONS	4.44800
23	4	23	6	DLT, DMT, DNT (DIRECT THRUST MOMENTS) - FT-POUNDS	0.00000
23	4	23	6	DLT, DMT, DNT (DIRECT THRUST MOMENTS) - NEWTON-M	1.35500
26	23	26	24	HE1, HE2 (ENGINE ANGULAR MOMENTUM) - SLUG-FT**2/SEC	0.00000
26	23	26	24	HE1, HE2 (ENGINE ANGULAR MOMENTUM) - KG-M**2/SEC	1.35500
24	1	24	3	OXR, DYR, DZR (RAM FORCES) - POUNDS	0.00000
24	1	24	3	OXR, DYR, DZR (RAM FORCES) - NEWTONS	4.44800
24	4	24	6	DLR, DMR, DNR (RAM MOMENTS) - FT-POUNDS	0.00000
24	4	24	6	DLR, DMR, DNR (RAM MOMENTS) - NEWTON-M	1.35500
26	3	26	4	RPM1, RPM2 (ENGINE ROT. SPEED) - RPM	0.00000
27	1	27	3	DXRCS, DYRCS, DZRCS (RCS FORCES) - POUNDS	0.00000
27	1	27	3	DXRCS, DYRCS, DZRCS (RCS FORCES) - NEWTONS	4.44800
27	4	27	6	DLRCS, DMRCS, DNRCS (RCS MOMENTS) - FT-POUNDS	0.00000
27	4	27	6	DLRCS, DMRCS, DNRCS (RCS MOMENTS) - NEWTON-M	1.35500
25	1	25	3	DXCOR, DYCOR, DZCOR (CORIOLIS FORCES) - POUNDS	0.00000
25	1	25	3	DXCOR, DYCOR, DZCOR (CORIOLIS FORCES) - NEWTONS	4.44800
25	4	25	6	DLCOR, DMCOR, DNCOR (CORIOLIS FORCES) - FT-POUNDS	0.00000
25	4	25	6	DLCOR, DMCOR, DNCOR (CORIOLIS FORCES) - NEWTON-M	1.35500
29	26	29	28	SUMFX, SUMFY, SUMFZ (TOTAL FORCES) - POUNDS	0.00000
29	26	29	28	SUMFX, SUMFY, SUMFZ (TOTAL FORCES) - NEWTONS	4.44800
29	29	29	31	SUML, SUMM, SUMN (TOTAL MOMENTS) - FT-POUNDS	0.00000
29	29	29	31	SUML, SUMM, SUMN (TOTAL MOMENTS) - NEWTON-M	1.35500
29	51	29	53	GYROL, GYROM, GYRON (GYROSCOPIC MOMENTS) - FT-POUNDS	0.00000
29	51	29	53	GYROL, GYROM, GYRON (GYROSCOPIC MOMENTS) - NEWTON-M	1.35500
0	0	0	0	BLANK CARD - END OF OPTION 1 LOAD	0.00000

NOPT=9 DIMENSIONAL DERIVATIVES

PERIURBATION VARIABLES

29	1	1	1		
29	3	3	2		
3	5	3			
28	50	4			
3	49	5			
3	48	6			
28	54	7			
28	57	8			
26	34	9			
26	35	10			
3	26	11			
3	27	12			
29	2	13			
3	4	14			
3	6	15			
3	21	16			
28	52	17			
28	53	18			
8	55	19			
28	56	20			
3	24	21			

3 25 22
0 0 0

NOPT=6 SET UP IRIM UNKNOWN

NEOU=15

3 1 3 3 U.V.M 2.00000 2.00000
3 3 6 P.O.R .10000 .10000
20 20 20 20 DROLL
.05000
20 29 20 29 DYAM
.05000
20 30 20 30 DPITCH
.05000
3 66 3 66 PSI
.01745
29 54 29 56 NXCG,NYCG,NZCG
.10000 .10000 .10000
3 64 3 64 THETA
.01745
20 50 20 50 ICHD
10.00000

NOPT=2 READ R

NTAP= 5

41 4 41 5 YE20,YE20 32.20000
0.00000 41 6 41 6 ZE20 32.20000
0.00000 2 16 2 17 XEDOT,YEDOT 0.00000
2 18 2 18 ZEDOT 0.00000
0.00000 3 18 3 18 ZE 0.00000
-100.00000 2 65 2 66 PH10,PS10 0.00000
0.00000 3 65 3 66PHI,PSI .01745
0.00000 3 64 3 64 THETA .01745
20.00000 20 20 20 20 DROLL 0.00000
0.00000 20 29 20 29 DYAM 0.00000
0.00000 20 30 20 30 DPITCH 0.00000
-10000 29 54 29 56 NXCG,NYCG,NZCG 0.00000
.98000 .19500
20 50 20 50 ICHD 0.00000
15900.00000

29	9	29	9	VA					1.68900
35.00000									
29	13	29	13	ALPH					.01745
78.00000									
1	1	7	DT,IMAX,DTPRINI,DIPLOT,II						0.00000
.02500									
41	1	41	1	AWIND					0.00000
1.00000									
41	2	41	2	VWIND					1.68900
35.00000									
41	7	41	7	JRMTURN					0.00000
0.00000									
41	10	41	10	TURNRAD					0.00000
2640.00000									
41	6	41	9	GAMMA,VADOT					0.00000
0.00000									
43	7	43	-3.22000	ASKEEP					0.00000
1.00000									
16	7	16	12	AKU,AKW,AKX,AKYES,AKZES					0.00000
0.00000									
43	129	43	129	ATRANS					0.00000
0.00000									
43	6	43	6	ALINE					0.00000
0.00000									
43	132	43	139	THROTT(10)					0.00000
.54600									
43	142	43	149	VAT(10)					1.68900
0.00000									
43	152	43	159	THETCI(10)					0.00000
102.00000									
43	1	43	5	ACMD(I)					0.00000
3.00000									
43	9	43	16	CMOT1(I)-DANGSTK INPUT TABLE					.01745
0.00000									
43	29	43	36	CMOT2(I)-DLATSTK INPUT TABLE					.01745
0.00000									
43	49	43	56	CMOT3(I)-DPED INFUT TABLE					.01745
0.00000									
43	69	43	76	CMOT4(I)-ZEDTC INPUT TABLE					0.00000
0.00000									
43	89	43	96	CMOT5(I)-THROTTLE INPUT TABLE					0.00000
0.00000									
43	109	43	116	THMET(I)-INPUT CONTROL TIME TABLE					0.00000
0.00000									

NOPT=1 STORE READ/WRITE INFO

NIAP=1

41 3 41 3 PSIKIND .01745
0 0 0 0 BLANK CARD -- END OF OPTION 1 LOAD 0.00000

NOPT=8 LONGIUDINAL TRIM

NTAPE(1)= 1
NTAPE(2)= 2
NTAPE(3)= 0
NTAPE(4)= 0
NCASES= 1 NTAPO= 9 NPUNCH= 0
IMRITE= 0

EXAMPLE 2 - STATIONKEEPING TIME HISTORY

CASE INPUT (READ FROM FILE 1)

41	3	41	3	PSIMIND	.01745
100.00000					

RESULTS OF FRIM

4	1	4	1	WEIGHT-POUNDS	0.00000	
16375.00000	4	1	4	1	WEIGHT-NEWTONS	4.44800
72036.00000	2	4	5	IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2	0.00000	
7959.00000	2	4	5	IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2	1.35500	
10784.44500	14	10	10	JENG(ENGINE INERTIA)-SLUG-FT**2	0.00000	
3.14000	14	10	10	JENG(ENGINE INERTIA)-KG-M**2	1.35500	
4.25470	29	45	29	45	ALTITUDE-FT	8.00000
100.00000	29	45	29	45	ALTITUDE-METERS	.30480
30.48000	29	10	29	10	TRUE AIRSPEED-KNOTS	0.00000
35.00207	29	9	29	9	TRUE AIRSPEED-FT/SEC	0.00000
59.11500	29	9	29	9	TRUE AIRSPEED-M/SEC	.30480
18.01825	29	12	29	12	QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2	0.00000
3.90897	29	11	29	11	MACH NUMBER	0.00000
.05146	29	12	29	12	QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2	47.88000
187.16169	29	4	29	4	RHO(AIR DENSITY)-SLUGS/FT**3	0.00000
.00224	29	4	29	4	RHO(AIR DENSITY)-KG/M**3	515.30000
1.15299	29	57	29	59	XDM,YDM,ZDM(AMB.WIND COMPONENTS-EARTH AXES)KT	.59020
-34.08967	29	57	29	59	XDM,YDM,ZDM(AMB.WIND COMPONENTS-EARTH AXES)FT/S	0.00000
-59.11499	29	57	29	59	XDM,YDM,ZDM(AMB.WIND COMPONENTS-EARTH AXES)M/S	.30480
-18.01825	2	16	2	18	XEDOT,YEDOT,ZEDOT(FT/S)	0.00000
0.00000	2	16	2	18	XEDOT,YEDOT,ZEDOT(M/S)	.30480
0.00000	41	4	41	6	XE20,YE20,ZE20-FT/SEC**2	0.00000
0.00000	41	4	41	6	XE20,YE20,ZE20-G	.03106
0.00000	41	4	41	6	XE20,YE20,ZE20-M/SEC**2	.30480
0.00000	2	1	2	3	UDDOT,VDDOT,WDDOT-FT/SEC**2	0.00000
0.00000	2	1	2	3	UDDOT,VDDOT,WDDOT-G	.03106
0.00000	2	1	2	3	UDDOT,VDDOT,WDDOT-M/SEC**2	.30480
0.00000	3	1	3	3	U,V,W (INER. SPEED COMPONENTS)FT/SEC	0.00000

3	3	U,V,W LINER. SPEED COMPONENTS)M/SEC	-.00000	-.00000	-.00000	30.480
29	1	UAS,VAS,WAS(AIRSPEED COMPONENTS) FT/SEC	-.00000	-.00000	0.00000	0.00000
13	29	UAS,VAS,WAS(AIRSPEED COMPONENTS) M/SEC	-.00000	57.6000	0.00000	0.00000
4	29	UAS,VAS,WAS(AIRSPEED COMPONENTS) M/SEC	-.02441	17.5139	0.00000	0.00000
29	54	56 NXGG,NYGG,NZGG(BODY AXIS ACCEL.)-GEES	-.00014	.23493	57.29578	57.29578
3	3	6 P,Q,R(BODY AXIS RATES)-DEG/SEC	-.00000	-.00000	57.29578	57.29578
3	64	66 THETA,PHI,PSI(EULER ANGLES)-DEG	-.83493	.06971	57.29578	57.29578
29	13	14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG	-.07762		60.00000	60.00000
2	18	2 18 ZD(RATE OF SINK)-FT/MIN			0.00000	0.00000
2	18	2 18 ZD(RATE OF SINK)-FT/SEC			0.00000	0.00000
2	18	2 18 ZD(RATE OF SINK)-M/SEC			30.480	30.480
0	0	0.00000			0.00000	0.00000
28	20	20 NORM. ROLL CONTROL			0.00000	0.00000
28	29	29 NORM. YAW CONTROL			0.00000	0.00000
28	30	30 NORM. PITCH CONTROL			0.00000	0.00000
3	19	19 LEFT ELEVON DEFLECTION-DEG	-.11461		57.29578	57.29578
3	26	27 TMT1,TH12(THRUST DEFLECTION PITCH ANGLES)-DEG	1.72049		57.29578	57.29578
3	24	25 PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG	.00463		57.29578	57.29578
3	19	19 LEFT ELEVON DEFLECTION-DEG			57.29578	57.29578
2	20	20 RIGHT ELEVON DEFLECTION-DEG			57.29578	57.29578
2	50	50 ELEVATOR COMMAND DEFLECTION-DEG			57.29578	57.29578
2	51	51AILERON COMMAND DEFLECTION-DEG			57.29578	57.29578
3	28	29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)	.00771		0.00000	0.00000
3	28	29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)	.00003		0.00000	0.00000
28	50	50 THRUST COMMAND)-POUNDS			0.00000	0.00000
15001	11556	58 TCMO(THRUST COMMAND)-NEWTONS			0.00000	0.00000
70283	36202	58 TCMO(THRUST COMMAND)-NEWTONS			0.00000	0.00000
23	9	10 TCR1,TCOR2(THRUST APPL. TO A/C)-POUNDS	7869.71646		0.00000	0.00000
7869	71646	10 TCR1,TCOR2(THRUST APPL. TO A/C)-POUNDS	35004.49883		4.44800	4.44800
23	9	10 TCR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS			57.29578	57.29578
35004	49883	21 RUDDER DEFLECTION-DEG			0.00000	0.00000
3	21	21 RUDDER DEFLECTION-DEG			0.00000	0.00000
26	20	20 TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS			4.44800	4.44800
1609	60346	20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS			0.00000	0.00000
26	20	20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS			0.00000	0.00000
7515	35614	2 MDO11,MDO12(ENGINE INLET MASS FLOWS)-LBM/SEC			0.00000	0.00000
26	1	2 MDO11,MDO12(ENGINE INLET MASS FLOWS)-LBM/SEC			0.00000	0.00000
133	62788	133.62788				

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26	1	26	2	MOOT1,MOOT2(ENGINE INLET MASS FLOWS)-KG/SEC	0.45400
60.66706	3	15	3	BLORREF(REFERENCE RCS BLEED)-PER CENT	0.00000
3.90000	26	7	26	7	BLDAYL
15.87426	27	72	72	8LD(ACTUAL RCS BLEED)-PER CENT	0.00000
3.53085	3	39	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	0.00000
0.03676	3	38	3	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	4.44800
0.16351	11	7	11	7	SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG
0.00000	19	46	19	46	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-FT-LB
-51.83341	19	44	19	44	30988
-70.23428	19	44	19	44	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M
40.93089	19	37	19	36	XW1,XW2(WING X FORCE)-POUNDS
182.06062	19	37	19	36	XW1,XW2(WING X FORCE)-NEWTONS
-513.41214	19	39	19	40	ZW1,ZW2(WING Z FORCE)-POUNDS
-2283.65718	19	39	19	40	ZW1,ZW2(WING Z FORCE)-NEWTONS
0.23448	19	19	20	CLW1,CLW2(WING LIFT COEFFICIENT)	
24.99528	3	48	3	48	OFLAPH(CANARD TE FLAP DEFLECTION)-DEG
29.99436	3	49	3	49	OFLAPH(WING LE FLAP DEFLECTION)-DEG
81.86286	19	1	19	3	DXH,DYH,DZH(WING AERO FORCES)-POUNDS
364.12601	19	4	19	3	DXH,DYH,DZH(WING AERO FORCES)-NEWTONS
0.30515	19	4	19	6	DLH,DMH,DMH(WING AERO MOMENTS)-FT-POUNDS
41348	20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS
1.85516	20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS
84377	20	4	20	6	OLH,OMH,ONH(CANARD AERO MOMENTS)-FT-POUNDS
0.00000	20	4	20	6	OLH,OMH,ONH(CANARD AERO MOMENTS)-NEWTON-M
0.00000	21	1	21	3	DXV,DYV,DZV(TAIL AERO FORCES)-NEWTONS
0.00000	21	1	21	3	DXV,DYV,DZV(TAIL AERO FORCES)-POUNDS
0.00000	21	4	21	6	DLV,DMV,DMV(TAIL AERO MOMENTS)-FT-POUNDS
0.00000	21	4	21	6	DLV,DMV,DMV(TAIL AERO MOMENTS)-NEWTON-M
0.00000	22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS
0.00000	22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS

-31132	.09979	-1356.01908			
22	3 DXF, DYF, DZF (FUSELAGE AERO FORCES) - NEWTONS				4.44800
-1.38475	.49366	-6040.46867			
22	6 DLF, DMF, DMF (FUSELAGE AERO MOMENTS) - FT-POUNDS				0.00000
0.00000	2591.64413	1.60776			
22	6 DLF, DMF, DMF (FUSELAGE AERO MOMENTS) - NEWTON-M				1.35500
0.00000	3511.67760	2.17851			
29	22 XAERO, YAERO, ZAERO (TOTAL AERO FORCES) - POUNDS				0.00000
187.48671	.13836	-2696.04498			
29	22 XAERO, YAERO, ZAERO (TOTAL AERO FORCES) - NEWTONS				4.44800
833.58582	.57985	-11992.00009			
29	25 LAERO, MAERO, NAERO (TOTAL AERO MOMENTS) - FT-POUNDS				0.00000
30515	-1038.09956	4.35553			
29	25 LAERO, MAERO, NAERO (TOTAL AERO MOMENTS) - NEWTON-M				1.35500
41348	-1407.78890	5.90174			
23	3 DXT, DYT, DZT (DIRECT THRUST FORCES) - POUNDS				0.00000
15732.33231	1.27174	-472.55684			
23	3 DXT, DYT, DZT (DIRECT THRUST FORCES) - NEWTONS				4.44800
69977.43637	5.65669	-2101.93281			
23	6 DLT, DMT, DNT (DIRECT THRUST MOMENTS) - FT-POUNDS				0.00000
10597	-7198.01077	-15.84311			
23	6 DLT, DMT, DNT (DIRECT THRUST MOMENTS) - NEWTON-M				1.35500
14359	-9753.38460	-21.46741			
26	24 HE1, HE2 (ENGINE ANGULAR MOMENTUM) - SLUG-FT**2/SEC				0.00000
3145.83622	3145.83622				
26	24 HE1, HE2 (ENGINE ANGULAR MOMENTUM) - KG-M**2/SEC				1.35500
4262.60803	4262.60808				
24	3 DXR, D YR, DZR (RAM FORCES) - POUNDS				0.00000
-3.04237	.94560	-678.43762			
24	3 DXR, D YR, DZR (RAM FORCES) - NEWTONS				4.44800
-13.53245	4.20684	-3017.69052			
24	6 DLR, DMR, DMR (RAM MOMENTS) - FT-POUNDS				0.00000
07888	8236.36120	11.47945			
24	6 DLR, DMR, DMR (RAM MOMENTS) - NEWTON-M				1.35500
10627	1168.26943	15.55466			
26	4 RPM1, RPM2 (ENGINE ROT. SPEED) - RPM				0.00000
9567.47719	9567.47719				
27	3 DXRCS, DYRCS, DZCRS (RCS FORCES) - POUNDS				0.00000
.00001	0.00000	.03676			
27	3 DXRCS, DYRCS, DZCRS (RCS FORCES) - NEWTONS				4.44800
.00005	0.00000	.16351			
27	6 DXRCS, DMRCS, DMRCS (RCS MOMENTS) - FT-POUNDS				0.00000
49041	.40567	.00015			
27	6 DXRCS, DMRCS, DMRCS (RCS MOMENTS) - NEWTON-M				1.35500
.66410	.54996	.00020			
25	3 DXCOR, DYCOR, DZCOR (CORIOLIS FORCES) - POUNDS				0.00000
0.00000	.00000	.00000			
25	3 DXCOR, DYCOR, DZCOR (CORIOLIS FORCES) - NEWTONS				4.44800
0.00000	.00000	.00000			
25	6 DLCOR, DMCOR, DMCOR (CORIOLIS FORCES) - FT-POUNDS				0.00000
.00000	.00000	.00000			
25	6 DLCOR, DMCOR, DMCOR (CORIOLIS FORCES) - NEWTON-M				1.35500
.00000	.00000	.00000			
29	28 SUMFX, SUMFY, SUMFZ (TOTAL FORCES) - POUNDS				0.00000
15916.70166	2.34770	-3847.1268			
29	28 SUMFX, SUMFY, SUMFZ (TOTAL FORCES) - NEWTONS				4.44800
70797.48899	10.44259	-17111.46791			

29	29	31	SUHL,SUMM,SUMM(TOTAL MOMENTS)-FT-POUNDS	0.00000
-00019	29	31	SUHL,SUMM,SUMM(TOTAL MOMENTS)-NEWTON-M	1.35580
-00025	29	51	53 GYROL,GYROM,GYRON(CYROSCOPIC MOMENTS)-FI-POUNDS	0.00000
0.00000	29	51	53 GYROL,GYROM,GYRON(CYROSCOPIC MOMENTS)-NEWTON-M	1.35580
0.00000	29	51	53 GYROL,GYROM,GYRON(CYROSCOPIC MOMENTS)-NEWTON-M	0.00000

EXAMPLE 2 - STATIONKEEPING TIME HISTORY

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR. STAB.	VERT. STAB.	FUSELAGE	TOT. AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	.9524E-02	.7206E-02	0.	-.6009E-04	.1604E-01	0.	-.1404E-01	0.	.2492E-12	.2596E-02
Z/U	-.1563E-01	-.2065E-01	0.	-.2551E-02	-.3983E-01	0.	-.3913E-02	.8590E-20	.8411E-09	-.4374E-01
M/U	-.1562E-03	.1010E-02	0.	.1379E-02	.2233E-02	0.	.3864E-03	.2286E-21	.8985E-10	.2620E-02
X/W	.3294E-02	.5461E-02	0.	0.	.8754E-02	0.	.2286E-02	0.	.1062E-11	.1204E-01
Z/W	-.6513E-01	-.1621E-01	0.	-.9225E-01	-.1746E+00	0.	-.2248E-01	.3577E-19	.3595E-08	-.1971E+00
M/W	-.3396E-02	.7873E-03	0.	.1384E-02	-.1225E-02	0.	.2621E-02	.9226E-21	.3829E-09	.1396E-02
X/Q	.1037E-01	-.5121E-01	0.	0.	-.4064E-01	0.	.4375E-01	0.	.4413E-10	.3114E-02
Z/Q	-.2122E+00	.1507E+00	0.	0.	-.6143E-01	0.	.5920E+01	-.9114E+00	.1489E-06	.4955E+01
M/Q	-.1089E-01	-.7332E-02	0.	0.	-.1823E-01	0.	-.6673E+00	-.2351E-01	.1591E-07	-.6892E+00
X/DE	.1895E+00	.3980E-02	0.	0.	.1935E+00	0.	0.	0.	0.	.1935E+00
Z/DE	-.1432E+00	-.1126E-01	0.	0.	-.1945E+00	0.	0.	0.	0.	-.1945E+00
M/DE	-.2666E-01	.5516E-03	0.	0.	-.2611E-01	0.	0.	0.	0.	-.2611E-01
X/FLAPM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/FLAPM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/FLAPM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSM	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/TOT1	0.	0.	0.	0.	0.	.1767E-02	-.1869E-06	0.	.6693E-12	.1767E-02
Z/TOT1	0.	0.	0.	0.	0.	-.5308E-04	-.4168E-04	.1265E-19	.2259E-08	-.7477E-04
M/TOT1	0.	0.	0.	0.	0.	-.7822E-05	.4962E-05	.3264E-21	.2412E-09	-.2860E-05
X/TOT2	0.	0.	0.	0.	0.	.1767E-02	-.1869E-06	0.	.6693E-12	.1767E-02
Z/TOT2	0.	0.	0.	0.	0.	-.5308E-04	-.4168E-04	.1265E-19	.2259E-08	-.9477E-04
M/TOT2	0.	0.	0.	0.	0.	-.7822E-05	.4962E-05	.3264E-21	.2412E-09	-.2860E-05
X/THT1	0.	0.	0.	0.	0.	-.2481E+01	0.	0.	0.	-.2481E+01
Z/THT1	0.	0.	0.	0.	0.	-.1539E+02	0.	0.	0.	-.1539E+02
M/THT1	0.	0.	0.	0.	0.	-.1853E+01	0.	0.	0.	-.1853E+01
X/THT2	0.	0.	0.	0.	0.	-.2481E+01	0.	0.	0.	-.2481E+01
Z/THT2	0.	0.	0.	0.	0.	-.1539E+02	0.	0.	0.	-.1539E+02
M/THT2	0.	0.	0.	0.	0.	-.1853E+01	0.	0.	0.	-.1853E+01

X/V	0.	-.7140E-15	0.	.4886E-17	-.7140E-15	0.	.1302E-03	0.	.1302E-03
Z/V	0.	.7140E-15	0.	-.2859E-14	.7140E-15	.3266E-04	.3761E-16	0.	.3266E-04
M/V	0.	-.5532E-16	0.	-.1106E-15	-.2213E-15	-.4644E-05	.9702E-18	0.	-.4644E-05
X/P	0.	-.3574E-13	0.	.4537E-15	-.3574E-13	0.	-.3963E-11	0.	.1107E-05
Z/P	0.	.3574E-13	0.	-.1430E-12	.3574E-13	.2468E-03	.1880E-14	-.1337E-07	.2468E-03
M/P	0.	-.2766E-14	0.	-.5532E-14	-.1106E-13	.5532E-14	.4651E-16	-.1429E-08	-.2939E-04
X/R	0.	-.3574E-13	0.	.4537E-15	-.3574E-13	0.	-.4467E-14	0.	0.
Z/R	0.	.3574E-13	0.	-.1430E-12	.3574E-13	0.	.1880E-14	0.	0.
M/R	0.	-.2766E-14	0.	-.5532E-14	-.1106E-13	.5532E-14	.4851E-16	0.	.4851E-16
X/DR	0.	-.2048E-12	0.	.2600E-14	-.2048E-12	0.	0.	0.	0.
Z/DR	0.	.2048E-12	0.	-.8193E-12	.2048E-12	0.	.1078E-13	0.	0.
M/DR	0.	-.1585E-13	0.	-.3170E-13	-.6341E-13	.3170E-13	.2780E-15	0.	.2780E-15
X/DA	0.	-.504E-04	0.	.2600E-14	-.4556E-04	0.	0.	0.	0.
Z/DA	0.	.6603E-04	0.	-.8193E-12	.6456E-04	.2048E-12	.1078E-13	0.	.1078E-13
M/DA	0.	-.3200E-05	0.	-.3170E-13	-.3271E-05	.3170E-13	.2780E-15	0.	.2780E-15
X/DRCS	0.	-.7140E-13	0.	.9075E-15	-.7140E-13	0.	.6377E-03	.6377E-03	.6377E-03
Z/DRCS	0.	.7140E-13	0.	-.2859E-12	.7140E-13	0.	.3761E-14	.2827E+01	.2827E+01
M/DRCS	0.	-.5532E-14	0.	-.1106E-13	-.2213E-13	.1106E-13	.9702E-16	.3019E+00	.3019E+00
X/DRCSV	0.	-.7140E-13	0.	.9075E-15	-.7140E-13	0.	0.	.8819E-18	0.
Z/DRCSV	0.	.7140E-13	0.	-.2859E-12	.7140E-13	0.	.3761E-14	.2975E-14	0.
M/DRCSV	0.	-.5532E-14	0.	-.1106E-13	-.2213E-13	.1106E-13	.9702E-16	.3174E-15	.9724E-16
X/DRCSS	0.	-.7140E-13	0.	.9075E-15	-.7140E-13	0.	0.	.8819E-18	0.
Z/DRCSS	0.	.7140E-13	0.	-.2859E-12	.7140E-13	0.	.3761E-14	.2975E-14	0.
M/DRCSS	0.	-.5532E-14	0.	-.1106E-13	-.2213E-13	.1106E-13	.9702E-16	.3174E-15	.9724E-16
X/PSIT1	0.	-.2048E-12	0.	.2600E-14	-.2048E-12	-.6841E+00	0.	.2527E-17	-.6841E+00
Z/PSIT1	0.	.2048E-12	0.	-.8193E-12	.2048E-12	0.	.1078E-13	.8526E-14	.1646E-01
M/PSIT1	0.	-.1585E-13	0.	-.3170E-13	-.6341E-13	.2535E-02	.2780E-15	.9094E-15	.2535E-02
X/PSIT2	0.	-.2048E-12	0.	.2600E-14	-.2048E-12	-.6841E+00	0.	.2527E-17	-.6841E+00
Z/PSIT2	0.	.2048E-12	0.	-.8193E-12	.2048E-12	0.	.1078E-13	.8526E-14	.1646E-01
M/PSIT2	0.	-.1585E-13	0.	-.3170E-13	-.6341E-13	.2535E-02	.2780E-15	.9094E-15	.2535E-02

LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	MOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	TRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	.7642E-05	0.	0.	.1412E-04	.2176E-04	0.	.5454E-05	-.1778E-20	0.	.2721E-04
L/U	-.5372E-05	0.	0.	0.	.5572E-05	0.	.2907E-07	-.9472E-23	-.2171E-03	.5688E-03
N/U	.3819E-05	0.	0.	.1984E-05	.5003E-05	0.	.4715E-06	.4135E-22	.2899E-13	.5475E-05
Y/W	-.8497E-06	0.	0.	0.	-.8497E-06	0.	-.1014E-05	-.7436E-20	0.	-.1064E-05
L/W	-.6963E-06	0.	0.	0.	-.6963E-06	0.	-.5405E-08	-.3962E-22	-.3056E-06	-.7048E-06
N/W	.8769E-07	0.	0.	0.	.8769E-07	0.	-.1280E-06	.1730E-21	.1236E-12	-.4030E-07
Y/Q	-.2723E-05	0.	0.	0.	-.2723E-05	0.	.3631E-05	-.9286E-19	0.	.1108E-05
L/Q	-.2217E-05	0.	0.	0.	-.2217E-05	0.	.2041E-07	.1428E-15	-.1270E-06	-.2323E-05
N/Q	-.2780E-06	0.	0.	0.	-.2780E-06	0.	.4113E-08	.2160E-20	.5133E-11	.6893E-06
Y/DE	.4152E-04	0.	0.	0.	.4152E-04	0.	0.	0.	0.	.4152E-04
L/DE	-.2689E-05	0.	0.	0.	-.2689E-05	0.	0.	0.	0.	-.2689E-05
N/DE	-.1594E-04	0.	0.	0.	-.1594E-04	0.	0.	0.	0.	-.1594E-04
Y/FLAP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/FLAP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/T01	0.	0.	0.	0.	0.	.1429E-06	.5810E-07	-.1408E-20	0.	.2018E-06
L/T01	0.	0.	0.	0.	0.	.6281E-05	.7330E-05	-.2233E-20	-.1926E-08	.1361E-04
N/T01	0.	0.	0.	0.	0.	.2851E-04	.1733E-08	.3276E-22	.7785E-13	.2851E-04
Y/T02	0.	0.	0.	0.	0.	.1429E-06	.5810E-07	-.1408E-20	0.	.2018E-06
L/T02	0.	0.	0.	0.	0.	.6279E-05	.7330E-05	-.2218E-20	-.1926E-08	.1361E-04
N/T02	0.	0.	0.	0.	0.	.2851E-04	.1072E-07	.3276E-22	.7785E-13	.2851E-04
Y/THT1	0.	0.	0.	0.	0.	-.2005E-03	0.	0.	0.	-.2005E-03
L/THT1	0.	0.	0.	0.	0.	.1821E+01	0.	0.	0.	.1821E+01
N/THT1	0.	0.	0.	0.	0.	-.4002E-01	0.	0.	0.	-.4002E-01
Y/THT2	0.	0.	0.	0.	0.	-.2005E-03	0.	0.	0.	-.2005E-03
L/THT2	0.	0.	0.	0.	0.	.1821E+01	0.	0.	0.	.1821E+01
N/THT2	0.	0.	0.	0.	0.	-.4002E-01	0.	0.	0.	-.4002E-01

Y/V	-0.7483E-03	0.	-0.4669E-02	-0.5417E-02	0.	-0.2320E-01	-0.7100E-22	0.	-0.2861E-01
L/V	-0.4850E-03	0.	-0.3101E-03	-0.4850E-03	0.	-0.1236E-03	-0.3783E-24	-0.1078E-09	-0.6886E-03
N/V	-0.5881E-03	0.	-0.3101E-03	-0.8981E-03	0.	-0.2457E-02	.1652E-23	.4324E-14	-0.3355E-02
Y/P	0.	0.	0.	0.	0.	-0.4376E-01	.4170E-20	0.	-0.4376E-01
L/P	-0.3946E+00	0.	0.	-0.3946E+00	0.	-0.2542E+00	.2222E-22	.5701E-08	-0.6487E+00
N/P	-0.4705E-02	0.	0.	-0.4705E-02	0.	-0.4310E-02	-0.9700E-22	-0.2305E-12	-0.9015E-02
Y/R	0.	0.	0.	0.	0.	-0.5929E+01	.9112E+00	0.	-0.5018E+01
L/R	-0.5749E-01	0.	0.	-0.5749E-01	0.	-0.3159E-01	.4856E-02	0.	.3075E-01
N/R	-0.3008E-01	0.	0.	-0.3008E-01	0.	-0.6187E+00	-0.2120E-01	0.	-0.6700E+00
Y/DR	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DR	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DR	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DA	-0.6864E-11	0.	0.	-0.6864E-11	0.	0.	0.	0.	-0.6864E-11
L/DA	-0.5343E-01	0.	0.	-0.5343E-01	0.	0.	0.	0.	-0.5343E-01
N/DA	-0.9642E-02	0.	0.	-0.9642E-02	0.	0.	0.	0.	-0.9642E-02
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSR	0.	0.	0.	0.	0.	0.	0.	.2413E+01	.2413E+01
N/DRCSR	0.	0.	0.	0.	0.	0.	0.	-0.9754E-04	-0.9754E-04
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	0.	0.	0.	0.	0.	.1545E+02
L/PSIT1	0.	0.	0.	0.	0.	.1545E+02	0.	0.	.8229E-01
N/PSIT1	0.	0.	0.	0.	0.	-0.1679E+01	0.	0.	-0.1679E+01
Y/PSIT2	0.	0.	0.	0.	0.	0.	0.	0.	.1545E+02
L/PSIT2	0.	0.	0.	0.	0.	.1545E+02	0.	0.	.8232E-01
N/PSIT2	0.	0.	0.	0.	0.	-0.1679E+01	0.	0.	-0.1679E+01

NOPT=4 TIME HISTORY

EXAMPLE 2 - STATIONKEEPING TIME HISTORY

NTAPE(1)= 5

NTAPE(2)= 5

NTAPE(3)= 4

ITRIM=

(7X,11(245))

(5X,11F10.3)

(5X,11F10.3)

EXAMPLE 2 - STATIONKEEPING TIME HISTORY

TIME-SEC	U-FT/SEC	V-FT/SEC	W-FT/SEC	P-DEG/SEC	Q-DEG/SEC	R-DEG/SEC	RS-DEG/SECPS	DEG/SECXEQ	FT/S	VEDY-FT/S
0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
0.100	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
0.200	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
0.300	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
0.400	-0.444	0.000	0.000	2.220	0.368	-0.006	-2.163	0.499	-0.047	0.000
0.500	-1.546	0.004	0.004	9.559	1.326	-0.030	-9.357	1.955	-0.142	0.001
0.600	-2.260	0.019	0.019	17.070	1.694	-0.075	-16.764	3.221	-0.217	0.009
0.700	-2.257	0.048	0.048	21.502	0.953	-0.119	-21.128	3.996	-0.295	0.033
0.800	-1.985	0.069	0.069	22.459	-0.243	-0.153	-22.352	4.259	-0.402	0.085
0.900	-1.659	0.143	0.143	21.364	-1.254	-0.205	-20.954	4.169	-0.488	0.162
1.000	-1.314	0.213	0.213	19.685	-1.824	-0.306	-19.468	3.966	-0.507	0.257
1.100	-0.980	0.303	0.303	18.937	-1.951	-0.469	-18.616	3.814	-0.452	0.363
1.200	-0.665	0.411	0.411	18.867	-1.703	-0.688	-18.502	3.757	-0.329	0.472
1.300	-0.364	0.535	0.535	19.195	-1.240	-0.948	-18.848	3.756	-0.153	0.580
1.400	-0.070	0.673	0.673	19.607	-0.707	-1.231	-19.286	3.743	0.054	0.685
1.500	0.214	0.821	0.821	19.860	-0.191	-1.522	-19.596	3.677	0.278	0.787
1.600	0.483	0.975	0.975	19.968	0.264	-1.903	-19.731	3.557	0.507	0.883
1.700	0.729	1.129	1.129	19.939	0.646	-2.062	-19.753	3.410	0.732	0.969
1.800	0.944	1.280	1.280	19.878	0.949	-2.284	-19.739	3.272	0.947	1.044
1.900	1.129	1.423	1.423	19.842	1.169	-2.457	-19.740	3.173	1.148	1.104
2.000	1.291	1.553	1.553	19.844	1.303	-2.572	-19.763	3.131	1.331	1.149
2.100	1.427	1.566	1.566	19.801	1.356	-2.626	-19.794	3.149	1.493	1.177
2.200	1.532	1.762	1.762	19.511	1.337	-2.617	-19.812	3.225	1.632	1.187
2.300	1.604	1.837	1.837	19.926	1.259	-2.547	-19.806	3.356	1.746	1.180
2.400	1.643	1.591	1.591	19.942	1.136	-2.420	-19.774	3.540	1.938	1.155
2.500	1.648	1.925	1.925	19.953	0.986	-2.243	-19.721	3.774	1.908	1.113
2.600	1.672	1.938	1.938	19.963	0.822	-2.013	-19.651	4.056	1.950	1.054
2.700	1.565	1.934	1.934	19.974	0.660	-1.770	-19.569	4.378	1.991	0.978
2.800	1.482	1.915	1.915	19.987	0.510	-1.494	-19.476	4.734	2.011	0.886
2.900	1.376	1.884	1.884	20.002	0.382	-1.207	-19.375	5.115	2.020	0.779
3.000	1.250	1.845	1.845	20.016	0.284	-0.920	-19.265	5.512	2.023	0.659
3.100	1.110	1.802	1.802	20.030	0.221	-0.645	-19.147	5.916	2.022	0.525
3.200	0.959	1.759	1.759	20.041	0.196	-0.393	-19.023	6.321	2.020	0.379
3.300	0.802	1.720	1.720	20.051	0.210	-0.173	-18.893	6.718	2.020	0.223
3.400	0.643	1.589	1.589	20.059	0.261	0.007	-18.759	7.104	2.024	0.059
3.500	0.487	1.569	1.569	20.065	0.345	0.139	-18.620	7.477	2.035	-0.114
3.600	0.336	1.562	1.562	20.069	0.459	0.220	-18.477	7.836	2.054	-0.292
3.700	0.194	1.670	1.670	20.072	0.594	0.247	-18.329	8.185	2.080	-0.475
3.800	0.065	1.695	1.695	20.072	0.743	0.220	-18.171	8.530	2.115	-0.660
3.900	-0.049	1.736	1.736	20.071	0.898	0.141	-17.999	8.882	2.158	-0.845
4.000	-0.147	1.793	1.793	20.068	1.049	0.017	-17.806	9.256	2.208	-1.030
4.100	-0.226	1.865	1.865	20.064	1.186	-0.147	-17.578	9.674	2.262	-1.211
4.200	-0.286	1.949	1.949	20.059	1.303	-0.342	-17.300	10.159	2.319	-1.387
4.300	-0.327	2.040	2.040	20.054	1.389	-0.556	-16.943	10.743	2.377	-1.556
4.400	-0.348	2.139	2.139	20.047	1.440	-0.781	-16.467	11.459	2.433	-1.714
4.500	-0.350	2.239	2.239	20.033	1.450	-1.005	-15.812	12.341	2.483	-1.861
4.600	-0.334	2.314	2.314	19.932	1.417	-1.191	-14.821	13.381	2.522	-1.994
4.700	-0.303	2.415	2.415	19.713	1.350	-1.319	-13.371	14.545	2.543	-2.112
4.800	-0.263	2.473	2.473	19.328	1.254	-1.354	-11.322	15.723	2.538	-2.215
4.900	-0.222	2.509	2.509	18.913	1.143	-1.277	-8.681	16.852	2.508	-2.303

ORIGINAL PAGE IS
OF POOR QUALITY

5.000	-1.182	2.534	2.390	18.757	1.029	-1.159	-5.570	17.948	2.466	-2.388
5.100	-1.139	2.566	2.368	19.103	.903	-1.111	-2.038	19.026	2.428	-2.442
5.200	-.082	2.506	2.325	19.721	.726	-1.110	1.936	19.657	2.398	-2.486
5.300	.008	2.642	2.255	20.272	.462	-1.176	5.962	19.417	2.376	-2.506
5.400	.115	2.692	2.258	20.529	.112	-1.283	9.368	18.313	2.368	-2.502
5.500	.229	2.729	2.243	20.476	-.206	-1.395	11.899	16.723	2.344	-2.479
5.600	.339	2.757	1.917	20.261	-.675	-1.478	13.639	15.056	2.326	-2.445
5.700	.440	2.774	1.671	20.053	-1.022	-1.524	14.858	13.553	2.298	-2.488
5.800	.531	2.770	1.675	19.937	-1.311	-1.525	15.798	12.267	2.258	-2.375
5.900	.612	2.753	1.574	19.917	-1.534	-1.474	16.562	11.161	2.201	-2.351
6.000	.682	2.721	1.491	19.952	-1.688	-1.373	17.216	10.177	2.125	-2.337
6.100	.741	2.675	1.429	19.999	-1.776	-1.227	17.759	9.278	2.031	-2.336
6.200	.789	2.620	1.391	20.034	-1.798	-1.047	18.197	8.445	1.919	-2.348
6.300	.824	2.559	1.380	20.053	-1.755	-.848	18.544	7.679	1.791	-2.377
6.400	.846	2.499	1.396	20.063	-1.647	-.647	18.819	6.986	1.648	-2.423
6.500	.855	2.443	1.441	20.072	-1.478	-.460	19.038	6.373	1.492	-2.490
6.600	.851	2.398	1.515	20.082	-1.255	-.302	19.215	5.847	1.326	-2.577
6.700	.833	2.367	1.614	20.096	-.986	-.185	19.355	5.410	1.153	-2.685
6.800	.803	2.356	1.738	20.110	-.692	-.120	19.462	5.065	.973	-2.813
6.900	.762	2.367	1.881	20.123	-.355	-.111	19.539	4.811	.798	-2.962
7.000	.709	2.402	2.041	20.132	-.016	-.152	19.589	4.644	.604	-3.128
7.100	.646	2.462	2.213	20.137	.321	-.271	19.616	4.559	.417	-3.311
7.200	.574	2.547	2.393	20.139	.648	-.434	19.623	4.547	.238	-3.507
7.300	.493	2.655	2.576	20.138	.953	-.643	19.617	4.598	.042	-3.712
7.400	.405	2.784	2.758	20.136	1.227	-.889	19.600	4.699	-.145	-3.924
7.500	.311	2.931	2.934	20.132	1.464	-1.159	19.577	4.837	-.334	-4.138
7.600	.213	3.091	3.103	20.127	1.657	-1.441	19.556	4.998	-.522	-4.358
7.700	.111	3.260	3.260	20.121	1.803	-1.721	19.522	5.167	-.713	-4.555
7.800	.008	3.433	3.405	20.113	1.901	-1.988	19.496	5.331	-.905	-4.749
7.900	-.096	3.604	3.535	20.105	1.951	-2.228	19.472	5.477	-1.099	-4.928
8.000	-.198	3.770	3.651	20.096	1.956	-2.432	19.454	5.594	-1.297	-5.089
8.100	-.298	3.925	3.752	20.087	1.919	-2.598	19.442	5.674	-1.499	-5.227
8.200	-.394	4.067	3.839	20.077	1.846	-2.696	19.436	5.709	-1.705	-5.340
8.300	-.485	4.191	3.915	20.068	1.744	-2.746	19.438	5.696	-1.916	-5.425
8.400	-.570	4.295	3.981	20.059	1.621	-2.739	19.446	5.632	-2.133	-5.488
8.500	-.648	4.377	4.039	20.051	1.484	-2.675	19.461	5.520	-2.354	-5.506
8.600	-.720	4.437	4.092	20.044	1.342	-2.557	19.482	5.362	-2.581	-5.500
8.700	-.783	4.475	4.143	20.038	1.202	-2.392	19.508	5.164	-2.813	-5.463
8.800	-.839	4.492	4.193	20.032	1.072	-2.187	19.538	4.934	-3.050	-5.397
8.900	-.886	4.489	4.247	20.028	.957	-1.949	19.571	4.688	-3.290	-5.381
9.000	-.926	4.468	4.304	20.024	.862	-1.690	19.605	4.411	-3.534	-5.178
9.100	-.958	4.431	4.367	20.020	.791	-1.418	19.639	4.137	-3.781	-5.038
9.200	-.983	4.382	4.437	20.016	.745	-1.143	19.672	3.868	-4.028	-4.858
9.300	-1.002	4.323	4.514	20.013	.724	-.874	19.703	3.613	-4.276	-4.665
9.400	-1.015	4.256	4.598	20.009	.726	-.618	19.732	3.378	-4.521	-4.453
9.500	-1.024	4.183	4.689	20.004	.749	-.382	19.756	3.169	-4.763	-4.223
9.600	-1.029	4.107	4.785	19.997	.789	-.169	19.772	2.991	-5.000	-3.978
9.700	-1.031	4.030	4.886	19.986	.843	.019	19.782	2.844	-5.229	-3.715
9.800	-1.032	3.952	4.990	19.984	.905	.177	19.797	2.734	-5.449	-3.448
9.900	-1.032	3.877	5.095	19.992	.970	.304	19.817	2.662	-5.658	-3.168
10.000	-1.031	3.806	5.198	20.004	1.031	.402	19.835	2.626	-5.854	-2.882
10.100	-1.031	3.741	5.298	20.007	1.084	.473	19.840	2.621	-6.034	-2.592
10.200	-1.031	3.692	5.393	20.006	1.124	.515	19.837	2.649	-6.197	-2.301
10.300	-1.033	3.633	5.480	20.010	1.148	.528	19.833	2.712	-6.344	-2.012
10.400	-1.036	3.592	5.559	20.021	1.152	.513	19.830	2.808	-6.472	-1.728
10.500	-1.040	3.561	5.626	20.036	1.134	.472	19.826	2.935	-6.581	-1.449
10.600	-1.045	3.540	5.682	20.052	1.092	.408	19.817	3.088	-6.672	-1.178

10.700	-1.052	3.528	5.725	20.065	1.025	.325	19.801	3.265	-6.744	-.917
10.800	-1.059	3.524	5.754	20.076	.935	.224	19.777	3.658	-6.797	-.665
10.900	-1.066	3.527	5.770	20.083	.822	.122	19.747	3.665	-6.833	-.424
11.000	-1.073	3.536	5.773	20.089	.691	.011	19.710	3.860	-6.851	-.193
11.100	-1.080	3.550	5.764	20.093	.545	-.099	19.670	4.100	-6.854	.028
11.200	-1.086	3.567	5.743	20.095	.387	-.203	19.627	4.320	-6.842	.240
11.300	-1.090	3.585	5.712	20.097	.222	-.299	19.581	4.538	-6.817	.463
11.400	-1.093	3.605	5.672	20.098	.054	-.383	19.532	4.752	-6.779	.638
11.500	-1.093	3.624	5.625	20.099	-.112	-.453	19.481	4.963	-6.730	.826
11.600	-1.091	3.643	5.572	20.098	-.273	-.519	19.428	5.170	-6.671	1.008
11.700	-1.086	3.661	5.516	20.097	-.424	-.550	19.372	5.377	-6.604	1.185
11.800	-1.077	3.678	5.459	20.096	-.564	-.577	19.312	5.587	-6.530	1.357
11.900	-1.065	3.694	5.400	20.094	-.688	-.592	19.247	5.804	-6.451	1.526
12.000	-1.050	3.710	5.344	20.092	-.794	-.598	19.173	6.034	-6.368	1.692
12.100	-1.031	3.727	5.290	20.089	-.882	-.597	19.090	6.285	-6.284	1.857
12.200	-1.009	3.745	5.240	20.086	-.949	-.593	18.992	6.565	-.198	2.020
12.300	-.984	3.765	5.195	20.082	-.995	-.588	18.875	6.883	-6.113	2.183
12.400	-.956	3.789	5.157	20.078	-1.020	-.585	18.733	7.249	-6.029	2.346
12.500	-.925	3.817	5.125	20.073	-1.025	-.587	18.557	7.675	-5.949	2.511
12.600	-.893	3.849	5.102	20.067	-1.010	-.577	18.336	8.175	-5.871	2.677
12.700	-.858	3.888	5.086	20.061	-.976	-.615	18.056	8.764	-5.798	2.847
12.800	-.823	3.933	5.079	20.053	-.925	-.643	17.694	9.458	-5.729	3.020
12.900	-.787	3.984	5.081	20.045	-.858	-.682	17.223	10.279	-5.664	3.198
13.000	-.750	4.043	5.091	20.036	-.777	-.730	16.600	11.244	-5.602	3.382
13.100	-.714	4.108	5.110	20.026	-.683	-.781	15.764	12.375	-5.545	3.572
13.200	-.679	4.181	5.139	20.010	-.578	-.852	14.632	13.676	-5.490	3.770
13.300	-.646	4.260	5.178	19.932	-.457	-.921	13.084	15.130	-5.437	3.977
13.400	-.615	4.348	5.229	19.926	-.331	-.993	10.980	16.657	-5.388	4.194
13.500	-.586	4.443	5.291	19.854	-.193	-1.072	8.205	18.111	-5.340	4.423
13.600	-.560	4.544	5.361	19.846	-.042	-1.177	4.747	19.306	-5.290	4.660
13.700	-.539	4.648	5.436	19.943	.117	-1.296	.757	19.971	-5.234	4.904
13.800	-.522	4.755	5.514	20.114	.277	-1.406	-.8405	19.874	-5.169	5.154
13.900	-.512	4.864	5.594	20.271	.434	-1.489	-7.253	18.988	-5.095	5.408
14.000	-.507	4.974	5.673	20.257	.583	-1.526	-10.358	17.476	-5.011	5.664
14.100	-.501	5.077	5.750	19.906	.709	-1.488	-12.457	15.598	-4.908	5.916
14.200	-.489	5.171	5.823	19.377	.787	-1.418	-13.719	13.758	-4.789	6.160
14.300	-.471	5.262	5.890	18.999	.806	-1.374	-14.584	12.253	-4.661	6.394
14.400	-.465	5.355	5.958	18.911	.831	-1.352	-15.365	11.108	-4.529	6.624
14.500	-.468	5.457	6.024	19.080	.878	-1.396	-16.172	10.220	-4.397	6.852
14.600	-.473	5.569	6.080	19.379	.913	-1.479	-16.973	9.468	-4.264	7.072
14.700	-.476	5.691	6.117	19.656	.903	-1.596	-17.666	8.764	-4.131	7.278
14.800	-.474	5.818	6.132	19.831	.830	-1.729	-18.191	8.084	-3.995	7.464
14.900	-.466	5.945	6.125	19.900	.699	-1.859	-18.548	7.446	-3.853	7.630
15.000	-.453	6.064	6.097	19.905	.520	-1.919	-18.782	6.878	-3.704	7.774
15.100	-.435	6.173	6.052	19.899	.310	-2.045	-18.940	6.406	-3.546	7.896
15.200	-.412	6.269	5.991	19.882	.081	-2.077	-19.056	6.039	-3.377	7.996
15.300	-.382	6.348	5.916	19.891	-.158	-2.061	-19.146	5.772	-3.195	8.076
15.400	-.344	6.410	5.830	19.911	-.401	-1.996	-19.212	5.598	-3.501	8.135
15.500	-.299	6.456	5.734	19.934	-.642	-1.887	-19.253	5.500	-2.796	8.175
15.600	-.246	6.485	5.631	19.954	-.876	-1.739	-19.269	5.467	-2.588	8.196
15.700	-.185	6.501	5.523	19.968	-1.096	-1.561	-19.263	5.485	-2.356	8.201
15.800	-.117	6.504	5.413	19.978	-1.299	-1.354	-19.243	5.540	-2.125	8.191
15.900	-.042	6.499	5.301	19.986	-1.480	-1.159	-19.215	5.621	-1.890	8.171
16.000	.039	6.488	5.191	19.994	-1.637	-.956	-19.184	5.714	-1.654	8.142
16.100	.124	6.474	5.083	20.002	-1.768	-.767	-19.155	5.808	-1.417	8.109
16.200	.214	6.462	4.977	20.009	-1.874	-.599	-19.131	5.893	-1.184	8.073
16.300	.305	6.454	4.875	20.015	-1.957	-.462	-19.113	5.960	-.954	8.037

16.400	.398	6.453	4.777	20.020	-2.019	-.359	-19.102	6.004	-.731	8.804
16.500	.491	6.462	4.681	20.023	-2.063	-.295	-19.099	6.020	-.515	7.976
16.600	.583	6.483	4.588	20.025	-2.093	-.270	-19.104	6.007	-.307	7.955
16.700	.672	6.517	4.496	20.025	-2.114	-.265	-19.118	5.965	-.108	7.942
16.800	.758	6.565	4.406	20.024	-2.123	-.338	-19.140	5.896	.083	7.938
16.900	.840	6.628	4.315	20.023	-2.141	-.424	-19.168	5.802	.264	7.944
17.000	.916	6.705	4.223	20.020	-2.155	-.540	-19.203	5.688	.437	7.960
17.100	.987	6.798	4.129	20.018	-2.174	-.680	-19.242	5.553	.602	7.986
17.200	1.052	6.904	4.033	20.015	-2.201	-.839	-19.285	5.420	.759	8.023
17.300	1.110	7.024	3.934	20.012	-2.237	-1.011	-19.330	5.276	.911	8.069
17.400	1.161	7.157	3.831	20.009	-2.282	-1.192	-19.376	5.133	1.058	8.125
17.500	1.206	7.301	3.724	20.006	-2.338	-1.375	-19.422	4.995	1.202	8.191
17.600	1.244	7.457	3.614	20.004	-2.403	-1.559	-19.466	4.865	1.344	8.265
17.700	1.276	7.622	3.502	20.002	-2.476	-1.738	-19.508	4.746	1.486	8.348
17.800	1.303	7.797	3.387	20.000	-2.556	-1.911	-19.548	4.642	1.631	8.440
17.900	1.324	7.982	3.271	19.999	-2.639	-2.077	-19.584	4.552	1.779	8.539
18.000	1.340	8.175	3.155	19.998	-2.724	-2.236	-19.618	4.477	1.935	8.647
18.100	1.352	8.378	3.040	19.998	-2.808	-2.388	-19.650	4.415	2.098	8.764
18.200	1.361	8.589	2.927	19.998	-2.889	-2.534	-19.679	4.367	2.273	8.888
18.300	1.368	8.809	2.817	19.998	-2.963	-2.675	-19.706	4.331	2.462	9.017
18.400	1.373	9.035	2.711	19.998	-3.029	-2.809	-19.729	4.309	2.667	9.151
18.500	1.378	9.266	2.612	19.998	-3.084	-2.933	-19.749	4.302	2.890	9.286
18.600	1.383	9.501	2.520	19.999	-3.127	-3.047	-19.765	4.312	3.133	9.419
18.700	1.391	9.739	2.436	19.999	-3.155	-3.148	-19.775	4.340	3.399	9.548
18.800	1.402	9.978	2.362	20.000	-3.165	-3.234	-19.779	4.388	3.689	9.669
18.900	1.417	10.217	2.299	20.001	-3.157	-3.304	-19.776	4.458	4.003	9.779
19.000	1.439	10.454	2.248	20.002	-3.129	-3.355	-19.765	4.549	4.342	9.875
19.100	1.468	10.690	2.209	20.004	-3.080	-3.389	-19.746	4.664	4.706	9.954
19.200	1.506	10.924	2.182	20.007	-3.011	-3.446	-19.719	4.799	5.095	10.014
19.300	1.554	11.156	2.167	20.009	-2.923	-3.488	-19.683	4.954	5.509	10.052
19.400	1.615	11.386	2.165	20.010	-2.818	-3.397	-19.639	5.127	5.946	10.068
19.500	1.687	11.613	2.176	20.013	-2.696	-3.376	-19.587	5.315	6.405	10.058
19.600	1.773	11.840	2.198	20.015	-2.561	-3.347	-19.529	5.517	6.885	10.022
19.700	1.873	12.066	2.231	20.019	-2.413	-3.315	-19.466	5.728	7.384	9.959
19.800	1.988	12.292	2.275	20.023	-2.255	-3.284	-19.399	5.948	7.902	9.868
19.900	2.117	12.515	2.328	20.027	-2.090	-3.255	-19.328	6.172	8.435	9.749
20.000	2.260	12.748	2.389	20.030	-1.921	-3.234	-19.254	6.399	8.981	9.601
20.100	2.417	12.979	2.457	20.034	-1.750	-3.222	-19.179	6.626	9.540	9.426

TIME-SEC	ZEDI-FY/S	XE-FY	VE-FY	ZE-FY	INHEA-DEG	PHE-DEG	PSI-DEG	D11	D12	D13
0.000	.000	0.000	0.000	-100.000	76.413	-0.335	.010	.235	-.001	.972
.100	.000	-.000	.000	-100.000	76.412	-0.335	.010	.235	-.001	.972
.200	.000	-.000	.000	-100.000	76.412	-0.335	.010	.235	-.001	.972
.300	.000	-.000	.000	-100.000	76.412	-0.335	.010	.235	-.001	.972
.400	.445	-.001	.000	-99.987	76.423	.025	.009	.235	.000	.972
.500	1.556	-.011	.000	-99.867	76.508	.586	.004	.233	.010	.972
.600	2.271	-.029	.000	-99.690	76.668	1.927	-.004	.231	.033	.972
.700	2.249	-.054	.002	-99.459	76.808	3.874	-.017	.228	.066	.971
.800	1.944	-.089	.008	-99.248	76.845	6.050	.064	.228	.104	.968
.900	1.590	-.134	.020	-99.072	76.770	8.134	.185	.229	.141	.963
1.000	1.230	-.185	.041	-98.931	76.618	9.984	-.401	.231	.176	.957
1.100	.897	-.233	.072	-98.825	76.437	11.614	-.717	.235	.208	.950
1.200	.602	-.273	.114	-98.750	76.268	13.108	-1.122	.237	.239	.941
1.300	.333	-.297	.166	-98.703	76.144	14.543	-1.602	.239	.271	.932
1.400	.079	-.302	.229	-98.683	76.078	15.956	-2.145	.240	.303	.922
1.500	-.161	-.286	.303	-98.687	76.075	17.349	-2.746	.240	.335	.911
1.600	-.386	-.246	.387	-98.715	76.131	18.719	-3.398	.239	.367	.899
1.700	-.588	-.184	.479	-98.764	76.238	20.026	-4.098	.237	.399	.886
1.800	-.764	-.100	.580	-98.831	76.390	21.298	-4.838	.234	.430	.872
1.900	-.913	.005	.688	-98.915	76.578	22.533	-5.610	.231	.461	.857
2.000	-1.046	.129	.800	-99.013	76.791	23.744	-6.403	.227	.492	.841
2.100	-1.157	.270	.917	-99.124	77.020	24.947	-7.207	.223	.522	.824
2.200	-1.243	.426	1.035	-99.244	77.256	26.153	-8.010	.218	.551	.806
2.300	-1.300	.595	1.154	-99.371	77.488	27.375	-8.798	.214	.579	.786
2.400	-1.328	.775	1.271	-99.503	77.711	28.626	-9.559	.210	.607	.766
2.500	-1.326	.962	1.384	-99.636	77.918	29.917	-10.278	.206	.635	.745
2.600	-1.294	1.156	1.493	-99.767	78.104	31.253	-10.943	.202	.661	.723
2.700	-1.234	1.353	1.594	-99.894	78.268	32.677	-11.538	.199	.686	.699
2.800	-1.147	1.554	1.688	-100.013	78.406	34.170	-12.054	.197	.711	.675
2.900	-1.037	1.755	1.771	-100.123	78.520	35.752	-12.481	.194	.734	.650
3.000	-.907	1.957	1.843	-100.220	78.610	37.428	-12.812	.193	.757	.624
3.100	-.761	2.160	1.902	-100.304	78.678	39.202	-13.045	.191	.779	.598
3.200	-.603	2.362	1.948	-100.372	78.727	41.174	-13.179	.190	.799	.570
3.300	-.437	2.564	1.978	-100.424	78.760	43.041	-13.217	.190	.819	.542
3.400	-.268	2.766	1.992	-100.459	78.782	45.039	-13.164	.189	.837	.513
3.500	-.098	2.969	1.989	-100.477	78.788	47.241	-13.025	.189	.855	.483
3.600	.067	3.173	1.969	-100.479	78.810	49.461	-12.808	.189	.871	.453
3.700	.224	3.380	1.931	-100.464	78.825	51.749	-12.521	.189	.886	.423
3.800	.369	3.599	1.874	-100.435	78.846	54.399	-12.172	.189	.901	.392
3.900	.499	3.803	1.799	-100.391	78.878	56.582	-11.768	.189	.914	.360
4.000	.613	4.021	1.705	-100.335	78.923	58.952	-11.317	.188	.926	.326
4.100	.707	4.245	1.593	-100.269	78.984	61.440	-10.826	.188	.937	.296
4.200	.781	4.474	1.463	-100.195	79.063	63.980	-10.303	.187	.946	.263
4.300	.832	4.709	1.316	-100.114	79.160	66.505	-9.754	.185	.955	.231
4.400	.861	4.949	1.152	-100.029	79.275	69.057	-9.187	.184	.963	.197
4.500	.867	5.195	.973	-99.942	79.408	71.637	-8.611	.182	.970	.164
4.600	.851	5.445	.781	-99.856	79.556	74.202	-8.036	.179	.975	.131
4.700	.816	5.699	.575	-99.773	79.713	76.746	-7.466	.177	.979	.097
4.800	.765	5.953	.359	-99.694	79.871	79.252	-6.904	.175	.983	.064
4.900	.709	6.206	.133	-99.620	80.022	81.706	-6.353	.172	.985	.032
5.000	.652	6.454	-.102	-99.552	80.156	84.117	-5.814	.170	.985	-.000
5.100	.594	6.699	-.343	-99.490	80.276	86.512	-5.300	.168	.985	-.032

5.200	.523	6.940	-99.434	80.309	88.908	-4.838	.156	.984	-.066
5.300	.421	7.179	-99.386	80.503	91.268	-4.474	.164	.981	-.180
5.400	.303	7.415	-99.350	80.624	93.518	-4.264	.162	.977	-.135
5.500	.178	7.651	-99.326	80.759	95.584	-4.251	.160	.972	-.178
5.600	.059	7.884	-99.314	80.907	97.425	-4.450	.158	.966	-.284
5.700	-.053	8.116	-99.314	81.068	99.044	-4.850	.155	.959	-.238
5.800	-.156	8.343	-99.324	81.239	100.467	-5.433	.152	.950	-.272
5.900	-.250	8.567	-99.345	81.414	101.731	-6.178	.148	.941	-.302
6.000	-.335	8.783	-99.374	81.588	102.870	-7.033	.145	.930	-.338
6.100	-.411	8.991	-99.411	81.755	103.919	-7.992	.142	.918	-.371
6.200	-.475	9.189	-99.456	81.910	104.909	-9.014	.139	.905	-.403
6.300	-.528	9.374	-99.506	82.049	105.872	-10.066	.136	.890	-.435
6.400	-.568	9.546	-99.561	82.169	106.849	-11.105	.134	.875	-.466
6.500	-.594	9.703	-99.619	82.268	107.801	-12.089	.132	.858	-.497
6.600	-.607	9.844	-99.679	82.347	109.014	-12.972	.130	.840	-.527
6.700	-.607	9.968	-99.740	82.408	110.291	-13.709	.128	.821	-.556
6.800	-.594	10.075	-99.800	82.451	111.754	-14.262	.127	.801	-.585
6.900	-.569	10.163	-99.859	82.481	113.434	-14.596	.127	.780	-.613
7.000	-.534	10.232	-99.914	82.501	115.359	-14.685	.126	.758	-.640
7.100	-.489	10.284	-99.965	82.513	117.548	-14.507	.126	.735	-.666
7.200	-.437	10.316	-100.011	82.520	120.014	-14.052	.126	.711	-.691
7.300	-.380	10.330	-100.052	82.524	122.762	-13.311	.127	.687	-.716
7.400	-.318	10.324	-100.087	82.526	125.791	-12.207	.127	.661	-.739
7.500	-.253	10.300	-100.116	82.525	129.095	-10.986	.128	.635	-.762
7.600	-.189	10.258	-100.138	82.520	132.656	-9.424	.128	.608	-.783
7.700	-.125	10.196	-100.153	82.511	136.454	-7.624	.129	.581	-.804
7.800	-.065	10.115	-100.163	82.496	140.457	-5.615	.130	.553	-.823
7.900	-.009	10.015	-100.167	82.471	144.627	-3.437	.131	.524	-.842
8.000	.041	9.895	-100.165	82.435	148.920	-1.135	.132	.495	-.859
8.100	.085	9.755	-100.159	82.386	153.285	1.243	.132	.465	-.875
8.200	.122	9.595	-100.148	82.325	157.671	3.642	.133	.435	-.891
8.300	.153	9.414	-100.134	82.250	162.025	6.010	.134	.404	-.905
8.400	.176	9.212	-100.118	82.163	166.299	8.299	.135	.372	-.918
8.500	.193	8.987	-100.099	82.065	170.446	10.463	.136	.341	-.930
8.600	.203	8.741	-100.080	81.960	174.437	12.466	.137	.309	-.941
8.700	.208	8.471	-100.059	81.849	178.237	14.280	.137	.276	-.951
8.800	.207	8.178	-100.038	81.735	181.830	15.886	.138	.243	-.960
8.900	.201	7.861	-100.018	81.621	185.203	17.271	.139	.218	-.968
9.000	.191	7.520	-99.998	81.510	188.353	18.431	.140	.176	-.974
9.100	.177	7.154	-99.980	81.402	191.282	19.368	.141	.143	-.980
9.200	.160	6.764	-99.963	81.308	193.995	20.087	.142	.109	-.984
9.300	.141	6.348	-99.948	81.202	196.503	20.600	.143	.075	-.987
9.400	.119	5.909	-99.935	81.111	198.820	20.919	.144	.040	-.989
9.500	.095	5.444	-99.924	81.025	200.959	21.068	.146	.006	-.989
9.600	.070	4.956	-99.916	80.944	202.939	21.039	.147	-.029	-.989
9.700	.046	4.445	-99.910	80.866	204.774	20.873	.148	-.063	-.987
9.800	.022	3.910	-99.907	80.792	206.483	20.580	.150	-.097	-.984
9.900	-.001	3.355	-99.906	80.720	208.085	20.178	.151	-.132	-.980
10.000	-.023	2.779	-99.907	80.648	209.601	19.688	.153	-.166	-.974
10.100	-.042	2.185	-99.910	80.571	211.049	19.128	.155	-.200	-.968
10.200	-.059	1.573	-99.915	80.512	212.447	18.517	.156	-.234	-.960
10.300	-.073	.946	-99.922	80.446	213.616	17.876	.158	-.267	-.951
10.400	-.084	.305	-99.930	80.380	215.176	17.226	.160	-.300	-.940
10.500	-.092	-.348	-99.938	80.316	216.549	16.587	.161	-.333	-.929
10.600	-.097	-1.011	-99.948	80.254	217.954	15.979	.163	-.366	-.916
10.700	-.098	-1.581	-99.958	80.194	219.409	15.419	.164	-.398	-.903
10.800	-.097	-2.359	-99.967	80.137	220.928	14.924	.166	-.429	-.888

10.900	-.093	-3.040	-20.226	-99.977	60.083	222.526	10.507	.167	-.460	-.072
11.000	-.086	-3.725	-20.257	-99.986	60.033	224.210	14.17	.168	-.498	-.855
11.100	-.077	-4.410	-20.265	-99.994	79.986	225.988	13.943	.169	-.520	-.837
11.200	-.065	-5.095	-20.252	-100.001	79.943	227.863	13.807	.170	-.549	-.816
11.300	-.053	-5.778	-20.218	-100.007	79.904	229.837	13.771	.170	-.577	-.799
11.400	-.039	-6.458	-20.163	-100.012	79.868	231.908	13.833	.171	-.605	-.778
11.500	-.024	-7.133	-20.090	-100.015	79.836	234.072	13.990	.171	-.632	-.756
11.600	-.009	-7.804	-19.999	-100.016	79.808	236.324	14.235	.172	-.658	-.734
11.700	.005	-8.467	-19.88	-100.017	79.782	238.656	14.563	.172	-.683	-.710
11.800	.018	-9.124	-19.762	-100.016	79.758	241.060	14.964	.172	-.707	-.686
11.900	.030	-9.773	-19.618	-100.013	79.735	243.527	15.429	.172	-.730	-.661
12.000	.040	-10.414	-19.457	-100.010	79.713	246.047	15.948	.172	-.753	-.635
12.100	.048	-11.047	-19.279	-100.005	79.690	248.609	16.510	.172	-.775	-.609
12.200	.054	-11.671	-19.085	-100.000	79.665	251.203	17.105	.171	-.795	-.581
12.300	.057	-12.286	-18.875	-99.995	79.638	253.817	17.720	.171	-.815	-.553
12.400	.057	-12.893	-18.649	-99.989	79.608	256.440	18.345	.171	-.834	-.525
12.500	.056	-13.492	-18.406	-99.983	79.572	259.060	18.968	.171	-.851	-.496
12.600	.051	-14.093	-18.146	-99.978	79.531	261.665	19.577	.171	-.868	-.466
12.700	.045	-14.687	-17.870	-99.973	79.483	264.245	20.159	.171	-.884	-.435
12.800	.036	-15.283	-17.577	-99.969	79.428	266.787	20.705	.172	-.898	-.405
12.900	.026	-15.813	-17.266	-99.966	79.365	269.280	21.202	.172	-.912	-.373
13.000	.015	-16.375	-16.937	-99.964	79.293	271.716	21.641	.173	-.924	-.341
13.100	.003	-16.933	-16.589	-99.963	79.214	274.083	22.012	.174	-.935	-.309
13.200	-.009	-17.485	-16.222	-99.963	79.127	276.375	22.307	.175	-.945	-.276
13.300	-.020	-18.031	-15.835	-99.965	79.035	278.591	22.517	.176	-.954	-.243
13.400	-.030	-18.572	-15.427	-99.967	78.931	280.695	22.637	.177	-.961	-.210
13.500	-.040	-19.109	-14.996	-99.971	78.825	282.709	22.662	.179	-.968	-.177
13.600	-.047	-19.640	-14.542	-99.975	78.713	284.617	22.585	.181	-.973	-.143
13.700	-.050	-20.167	-14.064	-99.980	78.595	286.422	22.399	.183	-.977	-.109
13.800	-.048	-20.697	-13.561	-99.985	78.472	288.135	22.102	.185	-.980	-.075
13.900	-.041	-21.200	-13.033	-99.989	78.346	289.761	21.701	.188	-.981	-.040
14.000	-.029	-21.706	-12.479	-99.993	78.222	291.304	21.204	.190	-.982	-.005
14.100	-.016	-22.202	-11.900	-99.995	78.106	292.757	20.634	.193	-.981	.029
14.200	-.009	-22.687	-11.296	-99.996	78.003	294.122	20.022	.195	-.979	.063
14.300	-.005	-23.159	-10.668	-99.997	77.910	295.424	19.394	.198	-.976	.096
14.400	.010	-23.619	-10.018	-99.997	77.823	296.698	18.760	.200	-.971	.129
14.500	.033	-24.065	-9.364	-99.995	77.740	297.954	18.104	.202	-.966	.161
14.600	.057	-24.498	-8.647	-99.990	77.657	299.200	17.411	.204	-.960	.194
14.700	.076	-24.918	-7.930	-99.984	77.570	300.444	16.686	.206	-.952	.226
14.800	.087	-25.324	-7.193	-99.975	77.472	301.695	15.944	.209	-.943	.259
14.900	.093	-25.717	-6.438	-99.966	77.362	302.951	15.205	.211	-.933	.292
15.000	.093	-26.095	-5.667	-99.957	77.236	304.254	14.490	.214	-.921	.325
15.100	.090	-26.457	-4.884	-99.948	77.095	305.589	13.918	.217	-.909	.357
15.200	.084	-26.804	-4.089	-99.939	76.940	306.978	13.203	.220	-.895	.388
15.300	.075	-27.132	-3.285	-99.931	76.774	308.436	12.659	.223	-.880	.419
15.400	.065	-27.442	-2.474	-99.924	76.599	309.975	12.195	.227	-.864	.451
15.500	.051	-27.732	-1.659	-99.918	76.417	311.602	11.819	.230	-.847	.479
15.600	.036	-28.001	-.840	-99.914	76.232	313.323	11.538	.234	-.830	.507
15.700	.018	-28.248	-.028	-99.911	76.045	315.132	11.352	.236	-.811	.536
15.800	-.001	-28.472	.800	-99.910	75.857	317.047	11.268	.240	-.791	.562
15.900	-.023	-28.673	1.618	-99.912	75.665	319.042	11.257	.243	-.770	.590
16.000	-.046	-28.850	2.434	-99.915	75.481	321.115	11.334	.246	-.749	.615
16.100	-.070	-29.003	3.246	-99.921	75.294	323.255	11.479	.249	-.727	.641
16.200	-.095	-29.133	4.055	-99.929	75.106	325.449	11.679	.252	-.703	.665
16.300	-.121	-29.240	4.861	-99.940	74.917	327.690	11.916	.255	-.680	.688
16.400	-.147	-29.324	5.663	-99.953	74.725	329.933	12.177	.258	-.655	.710
16.500	-.173	-29.387	6.462	-99.969	74.531	332.192	12.443	.260	-.630	.732

16.600	-199	-29.428	7.258	-99.988	74.332	334.440	12.698	.263	-.604	.753
16.700	-224	-29.448	8.051	-100.009	74.130	336.682	12.926	.257	-.572	.772
16.800	-247	-29.450	8.647	-100.032	73.922	338.895	13.114	.270	-.549	.791
16.900	-268	-29.432	9.641	-100.058	73.708	340.978	13.249	.273	-.521	.809
17.000	-286	-29.397	0.436	-100.086	73.489	343.058	13.323	.277	-.492	.825
17.100	-301	-29.345	11.233	-100.115	73.264	345.035	13.326	.280	-.463	.841
17.200	-313	-29.277	12.034	-100.146	73.034	346.988	13.255	.284	-.433	.859
17.300	-320	-29.193	12.838	-100.178	72.798	348.847	13.105	.288	-.402	.881
17.400	-324	-29.095	13.648	-100.210	72.556	350.629	12.876	.292	-.371	.901
17.500	-323	-28.982	14.464	-100.242	72.308	352.337	12.569	.297	-.340	.923
17.600	-318	-28.855	15.286	-100.274	72.056	353.972	12.185	.301	-.308	.948
17.700	-307	-28.713	16.117	-100.306	71.798	355.538	11.728	.306	-.275	.971
17.800	-292	-28.557	16.956	-100.336	71.535	357.037	11.200	.311	-.242	.999
17.900	-272	-28.387	17.805	-100.364	71.268	358.475	10.602	.316	-.209	.928
18.000	-246	-28.201	18.664	-100.390	70.997	359.855	9.952	.321	-.175	.931
18.100	-216	-28.000	19.535	-100.413	70.722	361.182	9.240	.326	-.141	.935
18.200	-181	-27.781	20.417	-100.433	70.445	362.458	8.472	.331	-.107	.937
18.300	-141	-27.545	21.313	-100.449	70.167	363.697	7.654	.336	-.075	.939
18.400	-97	-27.288	22.221	-100.461	69.889	364.873	6.788	.341	-.039	.939
18.500	-48	-27.011	23.143	-100.468	69.611	366.019	5.878	.347	-.004	.936
18.600	004	-26.710	24.078	-100.470	69.337	367.130	4.929	.352	.030	.936
18.700	760	-26.383	25.026	-100.467	69.067	368.211	3.946	.356	.065	.932
18.800	17	-26.029	25.987	-100.458	68.803	369.267	2.934	.361	.099	.927
18.900	177	-25.645	26.960	-100.444	68.547	370.304	1.900	.366	.134	.921
19.000	237	-25.228	27.943	-100.423	68.300	371.328	.850	.370	.168	.914
19.100	298	-24.776	28.934	-100.396	68.066	372.344	-.209	.374	.202	.905
19.200	358	-24.296	29.933	-100.363	67.844	373.359	-1.273	.377	.236	.896
19.300	415	-23.756	30.936	-100.325	67.638	374.378	-2.334	.380	.269	.885
19.400	470	-23.183	31.942	-100.281	67.447	375.404	-3.388	.383	.302	.873
19.500	520	-22.566	32.949	-100.231	67.275	376.443	-4.431	.385	.334	.860
19.600	565	-21.902	33.953	-100.177	67.122	377.497	-5.458	.387	.366	.846
19.700	604	-21.188	34.952	-100.118	66.988	378.569	-6.468	.388	.398	.831
19.800	637	-20.424	35.944	-100.056	66.875	379.660	-7.459	.389	.429	.815
19.900	662	-19.607	36.925	-99.991	66.784	380.770	-8.429	.390	.459	.798
20.000	680	-18.737	37.893	-99.924	66.715	381.900	-9.380	.390	.489	.780
20.100	691	-17.811	38.844	-99.855	66.669	383.048	-10.310	.390	.518	.761

TIME-SEC	D21	D22	D23	D31	D32	D33	DEC-DEC	DAC-DEC	L-ELEV-DESR-ELEV-DEG
0.000	.000	1.000	.001	-.972	-.000	.235	2.063	.001	2.062
0.100	.000	1.000	.001	-.972	-.000	.235	2.063	.001	2.062
0.200	.000	1.000	.001	-.972	-.000	.235	2.063	.001	2.062
0.300	.000	1.000	.001	-.972	-.000	.235	2.063	.001	2.062
0.400	.000	1.000	.000	-.972	-.000	.235	4.002	-10.971	6.216
0.500	.000	1.000	-.010	-.972	.002	.233	7.102	-14.339	9.715
0.600	-.000	.999	-.034	-.973	.008	.230	9.103	-6.032	13.215
0.700	-.000	.998	-.068	-.974	.015	.228	8.017	-1.100	12.216
0.800	-.000	.994	-.106	-.974	.024	.226	7.192	.913	8.717
0.900	-.001	.984	-.145	-.973	.032	.227	5.355	.291	5.020
1.000	-.002	.984	-.180	-.973	.040	.228	3.751	-1.320	5.153
1.100	-.003	.977	-.213	-.972	.047	.230	2.549	-2.608	5.159
1.200	-.005	.969	-.245	-.971	.054	.231	1.808	-3.107	5.001
1.300	-.007	.961	-.277	-.971	.060	.232	1.426	-2.982	4.710
1.400	-.009	.951	-.310	-.971	.066	.231	1.276	-2.617	4.200
1.500	-.012	.940	-.342	-.971	.072	.230	1.273	-2.315	3.807
1.600	-.014	.927	-.375	-.971	.077	.227	1.372	-2.190	3.647
1.700	-.017	.913	-.407	-.971	.081	.224	1.555	-2.213	3.739
1.800	-.020	.899	-.438	-.972	.085	.219	1.806	-2.297	4.006
1.900	-.023	.885	-.469	-.973	.089	.214	2.097	-2.370	4.351
2.000	-.025	.866	-.500	-.974	.092	.209	2.384	-2.402	4.684
2.100	-.028	.848	-.529	-.974	.095	.204	2.649	-2.400	4.969
2.200	-.031	.829	-.558	-.975	.097	.198	2.877	-2.383	5.200
2.300	-.033	.809	-.587	-.976	.100	.192	3.057	-2.365	5.302
2.400	-.035	.788	-.615	-.977	.102	.197	3.182	-2.354	5.516
2.500	-.037	.766	-.642	-.978	.104	.181	3.248	-2.345	5.598
2.600	-.039	.743	-.668	-.979	.107	.176	3.253	-2.335	5.623
2.700	-.041	.719	-.694	-.979	.110	.171	3.200	-2.320	5.586
2.800	-.042	.694	-.719	-.980	.113	.166	3.090	-2.298	5.487
2.900	-.043	.669	-.742	-.980	.116	.162	2.930	-2.270	5.330
3.000	-.044	.642	-.765	-.980	.120	.157	2.727	-2.236	5.121
3.100	-.044	.615	-.787	-.981	.124	.152	2.489	-2.199	4.869
3.200	-.045	.587	-.808	-.981	.128	.147	2.227	-2.158	4.585
3.300	-.045	.558	-.828	-.981	.133	.142	1.950	-2.115	4.278
3.400	-.044	.529	-.847	-.981	.138	.137	1.668	-2.070	3.960
3.500	-.044	.499	-.865	-.981	.143	.132	1.393	-2.024	3.642
3.600	-.043	.469	-.882	-.981	.147	.126	1.134	-1.977	3.333
3.700	-.042	.437	-.898	-.981	.152	.120	.898	-1.928	3.042
3.800	-.041	.406	-.913	-.981	.157	.113	.692	-1.881	2.776
3.900	-.039	.373	-.927	-.981	.161	.106	.522	-1.834	2.544
4.000	-.038	.341	-.939	-.981	.165	.099	.390	-1.789	2.348
4.100	-.036	.308	-.951	-.982	.168	.091	.297	-1.745	2.191
4.200	-.034	.274	-.961	-.982	.170	.083	.240	-1.702	2.070
4.300	-.032	.240	-.970	-.982	.172	.075	.218	-1.661	1.985
4.400	-.030	.206	-.978	-.983	.174	.066	.225	-1.623	1.934
4.500	-.028	.172	-.985	-.983	.174	.058	.257	-1.596	1.914
4.600	-.025	.137	-.990	-.983	.174	.049	.312	-1.699	1.985
4.700	-.023	.103	-.994	-.984	.174	.041	.404	-2.018	2.266
4.800	-.021	.069	-.997	-.984	.173	.033	.521	-2.670	2.648
4.900	-.019	.036	-.999	-.985	.171	.025	.659	-3.510	3.742
5.000	-.017	.003	-1.000	-.985	.170	.018	.823	-4.188	4.657
5.100	-.016	-.030	-.999	-.986	.169	.010	1.013	-4.179	5.133

5.200	-.014	-.064	-.998	-.986	.167	.003	1.193	-3.646	5.023	-2.775
5.300	-.013	-.099	-.995	-.986	.165	-.004	1.295	-2.983	4.555	-2.043
5.400	-.012	-.134	-.991	-.987	.163	-.010	1.279	-2.946	4.041	-1.467
5.500	-.012	-.170	-.985	-.987	.160	-.016	1.153	-2.471	3.714	-1.303
5.600	-.012	-.205	-.979	-.987	.157	-.020	.968	-2.081	3.614	-1.522
5.700	-.013	-.239	-.971	-.988	.153	-.024	.736	-2.900	3.623	-1.943
5.800	-.014	-.273	-.962	-.988	.150	-.028	.457	-3.007	3.584	-2.409
5.900	-.016	-.306	-.952	-.989	.146	-.030	.144	-3.173	3.428	-2.832
6.000	-.018	-.339	-.941	-.989	.143	-.033	-.199	-3.185	3.155	-3.200
6.100	-.020	-.372	-.928	-.990	.139	-.034	-.566	-3.166	2.805	-3.543
6.200	-.02	-.404	-.914	-.990	.136	-.036	-.954	-3.147	2.419	-3.893
6.300	-.024	-.436	-.900	-.990	.133	-.038	-1.352	-3.130	2.023	-4.262
6.400	-.026	-.467	-.884	-.991	.130	-.039	-1.750	-3.135	1.630	-4.644
6.500	-.028	-.498	-.867	-.991	.128	-.041	-2.137	-3.130	1.245	-5.021
6.600	-.030	-.528	-.849	-.991	.126	-.043	-2.501	-3.117	.872	-5.375
6.700	-.031	-.557	-.830	-.991	.124	-.046	-2.832	-3.093	.516	-5.693
6.800	-.032	-.586	-.810	-.991	.122	-.049	-3.123	-3.061	.167	-5.967
6.900	-.033	-.614	-.789	-.991	.120	-.052	-3.368	-3.025	-.107	-6.192
7.000	-.033	-.641	-.766	-.991	.118	-.056	-3.564	-2.986	-.357	-6.368
7.100	-.033	-.668	-.743	-.991	.116	-.060	-3.709	-2.947	-.560	-6.494
7.200	-.032	-.694	-.720	-.991	.113	-.055	-3.802	-2.908	-.713	-6.569
7.300	-.030	-.719	-.695	-.991	.109	-.070	-3.845	-2.869	-.817	-6.595
7.400	-.028	-.743	-.669	-.992	.106	-.076	-3.841	-2.830	-.875	-6.574
7.500	-.025	-.766	-.643	-.992	.101	-.082	-3.797	-2.791	-.890	-6.510
7.600	-.021	-.788	-.616	-.991	.096	-.088	-3.714	-2.752	-.868	-6.410
7.700	-.017	-.809	-.588	-.991	.090	-.094	-3.611	-2.714	-.819	-6.281
7.800	-.013	-.829	-.559	-.991	.083	-.101	-3.486	-2.676	-.739	-6.131
7.900	-.008	-.848	-.529	-.991	.076	-.107	-3.349	-2.644	-.646	-5.958
8.000	-.003	-.866	-.499	-.991	.068	-.113	-3.211	-2.611	-.546	-5.801
8.100	.003	-.883	-.469	-.991	.060	-.118	-3.078	-2.580	-.446	-5.637
8.200	.008	-.899	-.437	-.991	.051	-.124	-2.958	-2.550	-.354	-5.484
8.300	.014	-.914	-.406	-.991	.042	-.128	-2.857	-2.522	-.271	-5.348
8.400	.024	-.928	-.373	-.991	.032	-.132	-2.779	-2.493	-.216	-5.234
8.500	.025	-.940	-.341	-.990	.023	-.136	-2.729	-2.469	-.161	-5.146
8.600	.030	-.951	-.307	-.990	.014	-.139	-2.706	-2.444	-.122	-5.083
8.700	.035	-.961	-.274	-.990	.004	-.142	-2.712	-2.419	-.190	-5.052
8.800	.039	-.970	-.240	-.990	-.005	-.144	-2.744	-2.394	-.233	-5.045
8.900	.043	-.978	-.206	-.989	-.013	-.145	-2.798	-2.369	-.301	-5.063
9.000	.047	-.984	-.172	-.989	-.021	-.146	-2.870	-2.344	-.387	-5.100
9.100	.050	-.989	-.137	-.989	-.029	-.147	-2.955	-2.320	-.489	-5.152
9.200	.052	-.993	-.102	-.988	-.037	-.147	-3.046	-2.295	-.598	-5.214
9.300	.054	-.996	-.067	-.989	-.043	-.147	-3.137	-2.273	-.711	-5.279
9.400	.055	-.998	-.033	-.988	-.050	-.146	-3.222	-2.251	-.820	-5.343
9.500	.056	-.998	.002	-.988	-.056	-.146	-3.298	-2.232	-.919	-5.481
9.600	.057	-.998	.037	-.988	-.061	-.145	-3.358	-2.219	-1.002	-5.492
9.700	.057	-.996	.072	-.987	-.067	-.144	-3.400	-2.213	-1.061	-5.494
9.800	.056	-.993	.107	-.987	-.071	-.143	-3.419	-2.199	-1.101	-5.514
9.900	.056	-.988	.142	-.987	-.076	-.142	-3.413	-2.170	-1.130	-5.499
10.000	.055	-.983	.176	-.987	-.080	-.141	-3.384	-2.153	-1.147	-5.449
10.100	.054	-.976	.210	-.987	-.084	-.140	-3.332	-2.144	-1.142	-5.378
10.200	.052	-.968	.244	-.986	-.088	-.139	-3.258	-2.080	-1.107	-5.292
10.300	.051	-.959	.278	-.986	-.092	-.138	-3.165	-2.049	-1.055	-5.185
10.400	.049	-.949	.312	-.986	-.096	-.137	-3.055	-2.006	-.911	-5.050
10.500	.046	-.937	.345	-.986	-.100	-.135	-2.933	-1.952	-.769	-4.890
10.600	.047	-.925	.377	-.986	-.104	-.133	-2.802	-1.890	-.669	-4.711
10.700	.045	-.911	.410	-.985	-.100	-.132	-2.668	-1.825	-.506	-4.521
10.800	.044	-.896	.441	-.985	-.112	-.129	-2.534	-1.758	-.373	-4.326

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10.900	.043	-.830	.473	-.985	-.116	-.127	-2.405	-1.690	-.685	-4.133
11.000	.042	-.863	.503	-.985	-.121	-.124	-2.283	-1.621	-.635	-3.965
11.100	.042	-.845	.533	-.985	-.125	-.121	-2.174	-1.550	-.594	-3.765
11.200	.042	-.826	.562	-.985	-.129	-.117	-2.077	-1.477	-.567	-3.594
11.300	.042	-.806	.591	-.985	-.134	-.113	-1.993	-1.402	-.534	-3.433
11.400	.042	-.784	.619	-.984	-.138	-.109	-1.924	-1.326	-.507	-3.285
11.500	.043	-.762	.646	-.984	-.143	-.104	-1.871	-1.249	-.476	-3.150
11.600	.044	-.739	.672	-.984	-.147	-.098	-1.831	-1.170	-.450	-3.028
11.700	.045	-.715	.698	-.984	-.152	-.092	-1.806	-1.098	-.428	-2.917
11.800	.046	-.690	.722	-.984	-.156	-.086	-1.792	-1.029	-.410	-2.810
11.900	.047	-.664	.746	-.984	-.160	-.079	-1.790	-.962	-.393	-2.729
12.000	.049	-.637	.769	-.984	-.163	-.073	-1.796	-.894	-.376	-2.648
12.100	.051	-.610	.791	-.984	-.167	-.065	-1.809	-.826	-.360	-2.573
12.200	.053	-.582	.812	-.984	-.170	-.058	-1.827	-.758	-.343	-2.504
12.300	.055	-.553	.831	-.984	-.173	-.050	-1.847	-.694	-.327	-2.437
12.400	.057	-.524	.850	-.984	-.175	-.042	-1.868	-.631	-.311	-2.372
12.500	.059	-.493	.868	-.983	-.178	-.034	-1.888	-.569	-.295	-2.306
12.600	.061	-.463	.884	-.983	-.180	-.026	-1.905	-.509	-.279	-2.239
12.700	.063	-.431	.900	-.983	-.182	-.018	-1.917	-.449	-.263	-2.170
12.800	.065	-.399	.914	-.983	-.183	-.010	-1.923	-.389	-.247	-2.097
12.900	.067	-.367	.928	-.983	-.185	-.002	-1.921	-.329	-.231	-2.019
13.000	.069	-.334	.940	-.983	-.186	.006	-1.911	-.269	-.215	-1.936
13.100	.070	-.301	.951	-.982	-.187	.013	-1.892	-.209	-.200	-1.848
13.200	.072	-.268	.961	-.982	-.187	.021	-1.862	-.149	-.185	-1.758
13.300	.073	-.234	.970	-.982	-.188	.028	-1.819	-.089	-.170	-1.671
13.400	.074	-.200	.977	-.981	-.189	.036	-1.786	-.029	-.155	-1.621
13.500	.075	-.166	.983	-.981	-.189	.043	-1.751	.031	-.140	-1.633
13.600	.075	-.131	.988	-.981	-.189	.049	-1.670	.071	-.125	-1.609
13.700	.075	-.097	.992	-.980	-.190	.056	-1.551	.111	-.110	-1.432
13.800	.075	-.062	.995	-.980	-.190	.062	-1.365	.141	-.095	-1.046
13.900	.075	-.027	.997	-.979	-.190	.068	-1.119	.171	-.080	-.507
14.000	.074	.009	.997	-.979	-.190	.074	-.812	.201	-.065	.034
14.100	.073	.044	.996	-.979	-.190	.080	-.491	.231	-.050	.241
14.200	.071	.078	.994	-.978	-.190	.085	-.146	.261	-.035	.488
14.300	.070	.112	.991	-.978	-.189	.090	.160	.291	-.020	.735
14.400	.069	.145	.987	-.978	-.188	.095	.318	.321	-.005	1.000
14.500	.066	.177	.982	-.977	-.188	.100	.379	.351	.010	1.276
14.600	.064	.210	.976	-.977	-.187	.104	.436	.381	.015	1.576
14.700	.062	.244	.968	-.977	-.186	.109	.491	.401	.020	1.886
14.800	.060	.277	.959	-.976	-.185	.114	.546	.421	.025	2.213
14.900	.057	.310	.949	-.976	-.184	.119	.601	.441	.030	2.526
15.000	.055	.343	.938	-.975	-.183	.124	.656	.461	.035	2.819
15.100	.053	.376	.927	-.975	-.182	.130	.711	.481	.040	3.139
15.200	.052	.408	.917	-.974	-.181	.136	.766	.501	.045	3.496
15.300	.050	.439	.907	-.973	-.179	.142	.821	.521	.050	3.888
15.400	.049	.470	.897	-.973	-.178	.149	.876	.541	.055	4.198
15.500	.048	.501	.884	-.972	-.176	.156	.931	.561	.060	4.466
15.600	.048	.531	.866	-.971	-.173	.163	.986	.581	.065	4.666
15.700	.047	.560	.847	-.970	-.170	.171	1.041	.601	.070	4.866
15.800	.048	.589	.827	-.970	-.167	.179	1.096	.621	.075	5.066
15.900	.048	.617	.806	-.963	-.162	.187	1.151	.641	.080	5.269
16.000	.049	.644	.786	-.963	-.157	.195	1.206	.661	.085	5.362
16.100	.051	.670	.761	-.967	-.152	.203	1.261	.681	.090	5.439
16.200	.052	.696	.741	-.966	-.146	.212	1.316	.701	.095	5.506
16.300	.054	.720	.720	-.966	-.139	.220	1.371	.721	.100	5.567
16.400	.056	.744	.692	-.965	-.132	.228	1.426	.741	.105	5.627
16.500	.057	.767	.639	-.964	-.124	.236	1.481	.761	.110	5.691

16.600	.059	.789	.612	-.963	-.117	.244	3.900	-1.840	5.762	2.112
16.700	0.1	.810	.584	-.962	-.104	.251	3.953	-1.821	5.843	2.132
16.800	.063	.830	.555	-.961	-.100	.258	4.018	-1.903	5.935	2.161
16.900	.064	.849	.525	-.960	-.091	.265	4.095	-1.936	6.039	2.200
17.0	.065	.866	.495	-.959	-.083	.272	4.182	-1.970	6.155	2.248
17.100	.066	.883	.464	-.958	-.074	.278	4.277	-2.005	6.280	2.306
17.200	.067	.899	.433	-.956	-.066	.284	4.380	-2.040	6.415	2.378
17.300	.067	.914	.401	-.955	-.057	.290	4.486	-2.077	6.555	2.438
17.400	.067	.927	.368	-.954	-.049	.296	4.593	-2.114	6.699	2.508
17.500	.066	.940	.336	-.953	-.041	.301	4.698	-2.152	6.842	2.576
17.600	.065	.951	.302	-.951	-.032	.306	4.797	-2.190	6.982	2.640
17.700	.063	.961	.269	-.950	-.024	.311	4.887	-2.228	7.116	2.697
17.800	.062	.970	.235	-.949	-.016	.316	4.966	-2.267	7.240	2.745
17.900	.059	.978	.200	-.947	-.009	.321	5.031	-2.305	7.352	2.780
18.000	.056	.985	.166	-.945	-.001	.326	5.082	-2.343	7.450	2.802
18.100	.053	.990	.131	-.944	0.07	.330	5.116	-2.380	7.532	2.809
18.200	.049	.994	.096	-.942	.014	.334	5.132	-2.417	7.590	2.800
18.300	.045	.997	.061	-.941	.022	.339	5.132	-2.454	7.647	2.775
18.400	.041	.999	.026	-.939	.029	.343	5.118	-2.491	7.678	2.734
18.500	.036	.999	-.009	-.937	.037	.346	5.074	-2.527	7.691	2.673
18.600	.030	.999	-.044	-.936	.044	.350	5.016	-2.563	7.685	2.595
18.700	.025	.997	-.079	-.934	.051	.354	4.940	-2.599	7.661	2.499
18.800	.019	.993	-.114	-.932	.058	.357	4.849	-2.634	7.621	2.382
18.900	.012	.989	-.148	-.931	.065	.360	4.744	-2.669	7.565	2.262
19.000	.005	.983	-.183	-.929	.073	.363	4.629	-2.702	7.497	2.126
19.100	-.001	.976	-.217	-.928	.080	.365	4.507	-2.734	7.420	1.984
19.200	-.008	.968	-.251	-.926	.087	.367	4.381	-2.764	7.336	1.838
19.300	-.015	.959	-.285	-.925	.094	.359	4.251	-2.794	7.247	1.688
19.400	-.023	.948	-.318	-.924	.102	.370	4.117	-2.823	7.154	1.536
19.500	-.030	.936	-.351	-.922	.109	.371	3.984	-2.851	7.058	1.383
19.600	-.037	.923	-.383	-.921	.117	.371	3.851	-2.877	6.960	1.232
19.700	-.044	.909	-.415	-.920	.124	.371	3.720	-2.900	6.862	1.085
19.800	-.051	.894	-.446	-.920	.132	.370	3.594	-2.921	6.765	.944
19.900	-.058	.877	-.477	-.919	.140	.369	3.473	-2.940	6.669	.809
20.000	-.064	.860	-.507	-.919	.147	.367	3.358	-2.957	6.577	.681
20.100	-.071	.841	-.536	-.918	.155	.364	3.249	-2.972	6.489	.560

TIME-SEC JR-DEG PSIT-DEG IHTI-DEG RGS_NORM-CAN.FLP-DGNG.FLP-JG_VA-KT ALPHA-DEG BETA-DEG NXCG-G

0.000	.008	.005	1.720	.000	24.995	29.994	34.996	76.412	-.078	.972
.100	.006	.005	1.720	.000	24.995	29.994	34.996	76.412	-.078	.972
.200	.008	.005	1.720	.000	24.995	29.994	34.996	76.412	-.078	.972
.300	.008	.005	1.720	.000	24.995	29.994	34.996	76.412	-.078	.972
.400	.001	.001	1.974	-.626	24.995	29.994	34.969	76.855	-.018	.668
.500	-.051	-.031	3.373	-.652	24.995	29.994	34.924	78.019	-.536	.652
.600	-.179	-.107	4.936	-.413	24.995	29.994	34.894	78.870	1.069	.876
.700	-.322	-.193	5.383	-.155	24.995	29.994	34.847	78.973	3.818	1.040
.800	-.365	-.219	4.756	-.005	24.995	29.994	34.777	78.678	6.046	1.073
.900	-.291	-.175	3.728	.022	24.995	29.994	34.720	78.199	8.272	1.077
1.000	-.154	-.092	2.723	-.023	24.995	29.994	34.704	77.616	10.374	1.080
1.100	.070	.042	1.897	-.080	24.995	29.994	34.733	77.089	12.362	1.073
1.200	.082	.049	1.333	-.115	24.995	29.994	34.804	76.432	14.384	1.067
1.300	.082	.049	1.009	-.121	24.995	29.994	34.907	75.902	16.257	1.063
1.400	.018	.011	.855	-.111	24.995	29.994	35.030	75.424	18.269	1.061
1.500	-.119	-.072	.811	-.098	24.995	29.994	35.164	74.996	20.273	1.057
1.600	-.325	-.195	.839	-.090	24.995	29.994	35.301	74.622	22.312	1.051
1.700	-.596	-.358	.922	-.088	24.995	29.994	35.436	74.301	24.349	1.044
1.800	-.932	-.560	1.050	-.090	24.995	29.994	35.565	74.034	26.375	1.034
1.900	-1.324	-.795	1.211	-.094	24.995	29.994	35.685	73.811	28.388	1.029
2.000	-1.754	-1.054	1.381	-.096	24.995	29.994	35.795	73.613	30.388	1.022
2.100	-2.207	-1.326	1.543	-.096	24.995	29.994	35.893	73.433	32.376	1.014
2.200	-2.672	-1.616	1.688	-.095	24.995	29.994	35.976	73.264	34.354	1.005
2.300	-3.137	-1.915	1.808	-.095	24.995	29.994	36.045	73.108	36.328	.996
2.400	-3.590	-2.157	1.897	-.094	24.995	29.994	36.099	72.931	38.271	.986
2.500	-4.019	-2.415	1.952	-.094	24.995	29.994	36.140	72.752	40.206	.976
2.600	-4.413	-2.652	1.972	-.094	24.995	29.994	36.168	72.552	42.124	.967
2.700	-4.762	-2.861	1.958	-.093	24.995	29.994	36.187	72.326	44.024	.959
2.800	-5.055	-3.037	1.910	-.092	24.995	29.994	36.196	72.064	45.906	.951
2.900	-5.285	-3.176	1.830	-.091	24.995	29.994	36.200	71.775	47.769	.943
3.000	-5.446	-3.273	1.723	-.090	24.995	29.994	36.200	71.402	49.614	.940
3.100	-5.538	-3.328	1.593	-.089	24.995	29.994	36.197	70.984	51.441	.936
3.200	-5.560	-3.341	1.446	-.087	24.995	29.994	36.194	70.529	53.249	.933
3.300	-5.516	-3.315	1.287	-.086	24.995	29.994	36.193	69.932	55.040	.932
3.400	-5.413	-3.253	1.123	-.084	24.995	29.994	36.195	69.276	56.812	.932
3.500	-5.259	-3.160	.959	-.082	24.995	29.994	36.201	68.519	58.568	.933
3.600	-5.065	-3.044	.801	-.080	24.995	29.994	36.212	67.647	60.307	.936
3.700	-4.844	-2.911	.654	-.078	24.995	29.994	36.229	66.642	62.030	.939
3.800	-4.608	-2.769	.524	-.076	24.995	29.994	36.251	65.602	63.737	.944
3.900	-4.373	-2.628	.412	-.074	24.995	29.994	36.279	64.540	65.427	.949
4.000	-4.152	-2.495	.322	-.073	24.995	29.994	36.310	62.500	67.099	.955
4.100	-3.955	-2.376	.254	-.071	24.995	29.994	36.345	60.754	68.752	.962
4.200	-3.789	-2.277	.208	-.069	24.995	29.994	36.382	58.601	70.382	.968
4.300	-3.664	-2.201	.183	-.067	24.995	29.994	36.419	56.033	71.983	.975
4.400	-3.582	-2.153	.176	-.066	24.995	29.994	36.455	52.937	73.545	.982
4.500	-3.549	-2.133	.184	-.064	24.995	29.994	36.487	49.158	75.055	.989
4.600	-3.542	-2.124	.206	-.066	24.995	29.994	36.512	44.503	76.408	.995
4.700	-3.525	-2.118	.246	-.074	24.995	29.994	36.527	38.762	77.802	.999
4.800	-3.463	-2.091	.304	-.094	24.995	29.994	36.526	31.749	78.948	1.001
4.900	-3.266	-1.963	.377	-.125	24.995	29.994	36.509	23.391	79.866	1.001
5.000	-2.922	-1.756	.465	-.155	24.704	29.994	36.486	13.707	80.509	1.001
5.100	-2.549	-1.532	.568	-.188	23.704	29.429	36.465	2.818	80.831	1.003

MI 108

5.200	-2.227	-1.336	.675	-156	22.704	28.429	36.447	-6.645	80.774	1.012
5.300	-1.979	-1.189	.755	-.132	21.704	27.429	35.435	-20.338	80.291	1.020
5.400	-1.648	-1.111	.774	-.110	20.704	26.429	36.424	-30.668	79.418	1.023
5.500	-1.849	-1.111	.725	-.100	19.705	25.429	36.415	-39.331	78.240	1.024
5.600	-1.938	-1.165	.629	-.103	18.705	24.429	36.403	-46.346	76.858	1.022
5.700	-2.101	-1.263	.505	-.111	17.705	23.430	36.386	-51.976	75.334	1.019
5.800	-2.327	-1.398	.353	-.120	16.705	22.430	36.361	-56.929	73.721	1.016
5.900	-2.587	-1.555	.179	-.125	15.705	21.430	36.327	-60.258	72.000	1.013
6.000	-2.650	-1.713	-.014	-.127	14.706	20.430	36.282	-63.367	70.304	1.010
6.100	-3.086	-1.954	-.222	-.127	13.706	19.430	36.226	-65.928	68.527	1.007
6.200	-3.270	-1.965	-.443	-.126	12.706	18.431	36.161	-68.896	66.720	1.003
6.300	-3.386	-2.035	-.673	-.126	11.706	17.431	36.086	-69.924	64.894	.999
6.400	-3.425	-2.058	-.906	-.126	10.706	16.431	36.002	-71.471	63.059	.995
6.500	-3.384	-2.033	-1.134	-.125	9.707	15.431	35.912	-72.805	61.224	.991
6.600	-3.267	-1.963	-1.353	-.125	8.707	14.431	35.816	-73.917	59.392	.987
6.700	-3.051	-1.851	-1.555	-.124	7.707	13.432	35.717	-74.911	57.569	.983
6.800	-2.837	-1.705	-1.737	-.123	6.707	12.432	35.614	-75.753	55.757	.979
6.900	-2.550	-1.533	-1.893	-.122	5.707	11.432	35.510	-76.464	53.958	.976
7.000	-2.236	-1.344	-2.021	-.120	4.707	10.432	35.405	-77.124	52.172	.973
7.100	-1.912	-1.149	-2.119	-.119	3.708	9.432	35.300	-77.689	50.401	.971
7.200	-1.593	-.958	-2.188	-.117	2.708	8.433	35.196	-78.190	48.643	.969
7.300	-1.297	-.779	-2.227	-.116	1.708	7.433	35.092	-78.640	46.897	.967
7.400	-1.035	-.622	-2.238	-.114	.708	6.433	34.989	-79.046	45.159	.966
7.500	-.819	-.492	-2.223	-.112	-.292	5.433	34.887	-79.415	43.426	.966
7.600	-.656	-.394	-2.187	-.111	-1.291	4.433	34.784	-79.753	41.695	.966
7.700	-.551	-.331	-2.132	-.109	-2.291	3.433	34.681	-80.064	39.962	.966
7.800	-.504	-.303	-2.064	-.106	-3.291	2.434	34.577	-80.350	38.221	.966
7.900	-.513	-.309	-1.987	-.107	-4.291	1.434	34.471	-80.614	36.469	.967
8.000	-.575	-.346	-1.907	-.105	-5.291	.434	34.362	-80.856	34.700	.969
8.100	-.682	-.410	-1.828	-.104	-6.290	0.000	34.251	-81.076	32.912	.970
8.200	-.824	-.495	-1.754	-.103	-7.290	0.000	34.145	-81.260	31.101	.972
8.300	-.991	-.596	-1.690	-.102	-8.290	0.000	34.016	-81.461	29.283	.974
8.400	-1.171	-.704	-1.638	-.100	-9.290	0.000	33.891	-81.622	27.396	.973
8.500	-1.352	-.812	-1.600	-.099	-10.290	0.000	33.762	-81.762	25.468	.977
8.600	-1.521	-.914	-1.579	-.098	-11.290	0.000	33.628	-81.882	23.567	.978
8.700	-1.669	-1.003	-1.575	-.097	-11.998	0.000	33.490	-81.980	21.604	.980
8.800	-1.784	-1.072	-1.586	-.096	-11.998	0.000	33.346	-82.056	19.607	.981
8.900	-1.861	-1.118	-1.612	-.095	-11.998	0.000	33.199	-82.111	17.579	.983
9.000	-1.893	-1.138	-1.649	-.094	-11.998	0.000	33.048	-82.144	15.518	.984
9.100	-1.878	-1.129	-1.635	-.093	-11.998	0.000	32.895	-82.154	13.428	.985
9.200	-1.816	-1.091	-1.746	-.092	-11.998	0.000	32.740	-82.143	11.309	.986
9.300	-1.708	-1.026	-1.800	-.091	-11.998	0.000	32.584	-82.110	9.164	.987
9.400	-1.559	-.937	-1.852	-.091	-11.998	0.000	32.429	-82.055	6.994	.988
9.500	-1.374	-.826	-1.899	-.090	-11.998	0.000	32.275	-81.979	4.802	.989
9.600	-1.161	-.697	-1.939	-.089	-11.998	0.000	32.124	-81.883	2.569	.989
9.700	-.924	-.555	-1.969	-.089	-11.998	0.000	31.978	-81.767	.357	.989
9.800	-.674	-.405	-1.987	-.088	-11.998	0.000	31.837	-81.632	-1.891	.989
9.900	-.415	-.250	-1.992	-.087	-11.998	0.000	31.703	-81.471	-4.153	.989
10.000	-.150	-.090	-1.982	-.086	-11.998	0.000	31.579	-81.308	-6.427	.989
10.100	.125	.075	-1.959	-.085	-11.998	0.000	31.463	-81.121	-8.710	.989
10.200	.407	.245	-1.923	-.084	-11.998	0.000	31.358	-80.918	-10.996	.988
10.300	.693	.416	-1.875	-.083	-11.998	0.000	31.264	-80.702	-13.283	.988
10.400	.976	.586	-1.817	-.081	-11.998	0.000	31.182	-80.473	-15.568	.987
10.500	1.250	.751	-1.750	-.079	-11.998	0.000	31.113	-80.231	-17.848	.987
10.600	1.510	.907	-1.677	-.077	-11.998	0.000	31.055	-79.977	-20.128	.986
10.700	1.752	1.053	-1.600	-.074	-11.998	0.000	31.009	-79.710	-22.383	.986
10.800	1.970	1.184	-1.523	-.072	-11.998	0.000	30.975	-79.431	-24.635	.985

M 19

10.900	2.162	1.299	-1.448	-.369	-11.998	0.000	30.952	-79.138	-26.873	.985
11.000	2.326	1.397	-1.375	-.066	-11.998	0.000	30.940	-78.831	-29.098	.985
11.100	2.461	1.479	-1.310	-.063	-11.998	0.000	30.938	-78.509	-31.308	.985
11.200	2.569	1.544	-1.250	-.061	-11.998	0.000	30.946	-78.167	-33.504	.985
11.300	2.652	1.594	-1.198	-.058	-11.998	0.000	30.962	-77.805	-35.686	.985
11.400	2.713	1.630	-1.155	-.055	-11.998	0.000	30.985	-77.417	-37.855	.985
11.500	2.756	1.656	-1.119	-.052	-11.998	0.000	31.016	-77.000	-40.010	.985
11.600	2.786	1.674	-1.093	-.049	-11.998	0.000	31.052	-76.557	-42.153	.986
11.700	2.806	1.686	-1.074	-.045	-11.998	0.000	31.094	-76.093	-44.283	.986
11.800	2.822	1.696	-1.063	-.042	-11.998	0.000	31.140	-75.510	-46.402	.987
11.900	2.837	1.705	-1.058	-.039	-11.998	0.000	31.190	-74.908	-48.510	.987
12.000	2.854	1.715	-1.059	-.035	-11.998	0.000	31.241	-74.236	-50.606	.988
12.100	2.877	1.729	-1.064	-.032	-11.998	0.000	31.295	-73.479	-52.691	.989
12.200	2.906	1.746	-1.072	-.029	-11.998	0.000	31.349	-72.622	-54.763	.990
12.300	2.943	1.769	-1.082	-.025	-11.998	0.000	31.403	-71.643	-56.822	.990
12.400	2.988	1.795	-1.093	-.022	-11.998	0.000	31.456	-70.515	-58.865	.991
12.500	3.039	1.826	-1.103	-.019	-11.998	0.000	31.509	-69.206	-60.892	.992
12.600	3.096	1.860	-1.112	-.016	-11.998	0.000	31.559	-67.675	-62.897	.992
12.700	3.156	1.897	-1.118	-.012	-11.998	0.000	31.608	-65.866	-64.876	.993
12.800	3.218	1.933	-1.121	-.009	-11.998	0.000	31.654	-63.711	-66.823	.993
12.900	3.278	1.970	-1.120	-.006	-11.998	0.000	31.699	-61.119	-68.728	.993
13.000	3.335	2.004	-1.113	-.003	-11.998	0.000	31.741	-57.974	-70.577	.993
13.100	3.389	2.036	-1.102	-.001	-11.998	0.000	31.783	-54.122	-72.350	.993
13.200	3.438	2.066	-1.084	.002	-11.998	0.000	31.823	-49.371	-74.022	.993
13.300	3.490	2.097	-1.058	.004	-11.998	0.000	31.863	-43.493	-75.553	.992
13.400	3.554	2.136	-1.032	.004	-11.998	0.000	31.902	-36.244	-76.830	.992
13.500	3.630	2.186	-1.009	.002	-11.998	0.000	31.940	-27.464	-77.962	.992
13.600	3.681	2.212	-.973	.000	-11.998	0.000	31.982	-17.210	-78.690	.991
13.700	3.652	2.195	-.911	.003	-11.998	0.000	32.027	-5.888	-79.802	.990
13.800	3.575	2.148	-.815	.012	-11.998	.291	32.079	5.724	-78.856	.988
13.900	3.505	2.109	-.683	.025	-11.348	1.291	32.137	16.703	-78.260	.987
14.000	3.510	2.109	-.515	.036	-10.348	2.291	32.203	26.348	-77.272	.986
14.100	3.670	2.205	-.326	.031	-9.348	3.291	32.279	34.339	-75.992	.988
14.200	3.962	2.381	-.151	.009	-8.349	4.291	32.365	40.732	-74.524	.988
14.300	4.267	2.564	-.025	-.021	-7.349	5.291	32.456	45.830	-72.943	.988
14.400	4.559	2.740	.076	-.045	-6.349	6.290	32.549	50.016	-71.280	.984
14.500	4.831	2.903	.211	-.057	-5.349	7.290	32.644	53.523	-69.536	.983
14.600	5.067	3.033	.390	-.057	-4.349	8.290	32.738	56.482	-67.710	.983
14.700	5.188	3.117	.602	-.052	-3.350	9.290	32.832	58.973	-65.816	.984
14.800	5.241	3.149	.823	-.046	-2.350	10.290	32.926	61.057	-63.871	.986
14.900	5.205	3.128	1.037	-.044	-1.350	11.289	33.023	62.793	-61.899	.987
15.000	5.085	3.056	1.234	-.045	-.350	12.289	33.121	64.237	-59.916	.982
15.100	4.836	2.942	1.411	-.048	.650	13.289	33.224	65.443	-57.933	.989
15.200	4.655	2.797	1.570	-.051	1.650	14.289	33.332	66.454	-55.958	.990
15.300	4.382	2.633	1.711	-.054	2.649	15.289	33.445	67.307	-53.993	.990
15.400	4.098	2.463	1.835	-.056	3.649	16.288	33.564	68.031	-52.042	.991
15.500	3.818	2.294	1.941	-.058	4.649	17.288	33.688	68.649	-50.106	.992
15.600	3.558	2.138	2.031	-.059	5.649	18.288	33.816	69.180	-48.185	.992
15.700	3.328	2.000	2.104	-.061	6.649	19.288	33.947	69.637	-46.280	.993
15.800	3.136	1.885	2.161	-.062	7.648	20.288	34.082	70.033	-44.390	.993
15.900	2.989	1.796	2.205	-.064	8.648	21.288	34.218	70.378	-42.514	.993
16.000	2.886	1.734	2.238	-.066	9.648	22.287	34.354	70.649	-40.649	.993
16.100	2.826	1.698	2.264	-.067	10.648	23.287	34.490	70.939	-38.791	.992
16.200	2.806	1.686	2.284	-.068	11.648	24.287	34.624	71.165	-36.938	.992
16.300	2.818	1.693	2.302	-.069	12.647	25.287	34.756	71.359	-35.085	.991
16.400	2.854	1.715	2.321	-.071	13.647	26.287	34.884	71.524	-33.231	.990
16.500	2.907	1.747	2.341	-.072	14.647	27.286	35.009	71.661	-31.372	.988

16.600	2.968	1.783	2.366	-.073	15.647	28.286	35.129	71.771	-29.505	.987
16.700	3.028	1.819	2.396	-.074	16.647	29.286	35.245	71.855	-27.628	.985
16.800	3.079	1.850	2.432	-.076	17.647	29.994	35.356	71.914	-25.741	.983
16.900	3.115	1.872	2.475	-.077	18.646	29.994	35.463	71.967	-23.841	.981
17.000	3.131	1.881	2.525	-.078	19.646	29.994	35.566	71.956	-21.927	.979
17.100	3.122	1.876	2.580	-.080	20.646	29.994	35.665	71.941	-20.000	.976
17.200	3.086	1.854	2.639	-.081	21.646	29.994	35.760	71.902	-18.058	.974
17.300	3.021	1.816	2.702	-.082	22.646	29.994	35.853	71.840	-16.102	.971
17.400	2.929	1.760	2.766	-.084	23.645	29.994	35.943	71.754	-14.133	.969
17.500	2.809	1.688	2.830	-.085	24.645	29.994	36.035	71.645	-12.150	.966
17.600	2.664	1.601	2.891	-.087	24.995	29.994	36.122	71.513	-10.155	.964
17.700	2.498	1.501	2.948	-.088	24.995	29.994	36.212	71.359	-8.147	.961
17.800	2.315	1.391	3.000	-.090	24.995	29.994	36.304	71.183	-6.128	.959
17.900	2.118	1.273	3.044	-.092	24.995	29.994	36.400	70.985	-4.099	.957
18.000	1.910	1.148	3.080	-.093	24.995	29.994	36.499	70.766	-2.059	.955
18.100	1.696	1.019	3.107	-.095	24.995	29.994	36.605	70.526	-.010	.953
18.200	1.475	.886	3.124	-.096	24.995	29.994	36.718	70.265	2.047	.952
18.300	1.246	.749	3.131	-.098	24.995	29.994	36.839	69.985	4.110	.951
18.400	1.005	.604	3.128	-.099	24.995	29.994	36.971	69.685	6.177	.950
18.500	.750	.451	3.114	-.100	24.995	29.994	37.113	69.367	8.245	.949
18.600	.478	.287	3.089	-.102	24.995	29.994	37.267	69.030	10.310	.949
18.700	.188	.113	3.053	-.103	24.995	29.994	37.434	68.677	12.369	.949
18.800	-.119	-.071	3.007	-.105	24.995	29.994	37.615	68.306	14.418	.950
18.900	-.438	-.263	2.953	-.106	24.995	29.994	37.808	67.918	16.453	.951
19.000	-.766	-.460	2.891	-.108	24.995	29.994	38.016	67.515	18.473	.952
19.103	-1.098	-.660	2.825	-.109	24.995	29.994	38.236	67.095	20.472	.954
19.200	-1.428	-.858	2.756	-.110	24.995	29.994	38.469	66.659	22.450	.956
19.300	-1.750	-1.052	2.695	-.111	24.995	29.994	38.715	66.206	24.402	.959
19.406	-2.062	-1.239	2.611	-.112	24.995	29.994	38.972	65.734	26.328	.962
19.500	-2.358	-1.417	2.536	-.114	24.995	29.994	39.240	65.244	28.226	.965
19.600	-2.634	-1.583	2.462	-.115	24.995	29.994	39.518	64.732	30.094	.969
19.700	-2.888	-1.735	2.388	-.116	24.995	29.994	39.805	64.198	31.932	.973
19.800	-3.118	-1.874	2.316	-.117	24.995	29.994	40.100	63.641	33.748	.977
19.900	-3.323	-1.997	2.247	-.117	24.995	29.994	40.403	63.057	35.517	.981
20.000	-3.505	-2.106	2.181	-.118	24.995	29.994	40.711	62.445	37.264	.985
20.100	-3.665	-2.202	2.118	-.119	24.995	29.994	41.024	61.802	38.982	.990

TIME-SEC	NYCG-G	NZCG-G	DROLL	DYAN	OP1ICH	ICMD-LB	ICUT-LB	MDOT-LB/S	RPM-RAD/S	BLDAYS
0.000	.000	.235	-.000	-.000	-.115	15801.116	8745.360	133.628	9567.477	15.874
.100	.000	.235	-.000	-.000	-.115	15801.118	8745.360	133.628	9567.477	15.874
.200	.000	.235	-.000	-.000	-.115	15801.120	8745.361	133.628	9567.478	15.874
.300	.000	.235	-.000	-.000	-.115	15801.123	8745.361	133.628	9567.479	15.874
.400	.000	.192	.759	.000	-.160	16036.297	8758.684	133.739	9579.401	15.839
.500	-.001	.183	.574	.004	-.284	16702.037	8872.976	134.694	9681.299	15.571
.600	-.003	.229	.273	.013	-.358	17279.599	9366.164	136.335	9856.304	14.405
.700	-.047	.274	.047	.014	-.353	17332.399	9682.313	137.451	9975.406	13.695
.800	-.010	.286	-.037	.013	-.288	17625.341	9770.787	138.127	10047.644	13.440
.900	-.012	.272	-.012	.008	-.214	17659.599	9794.708	138.536	10091.459	13.440
1.000	-.012	.254	.053	.001	-.150	17655.125	9794.551	138.785	10118.034	13.440
1.100	-.013	.232	.104	-.004	-.102	17620.267	9779.386	138.937	10134.153	13.475
1.200	-.014	.215	.124	-.007	-.072	17587.301	9756.673	139.031	10143.930	13.527
1.300	-.017	.203	.119	-.006	-.057	17529.565	9726.779	139.090	10149.859	13.597
1.400	-.020	.197	.105	-.002	-.051	17451.706	9687.577	139.127	10153.456	13.680
1.500	-.024	.192	.093	.005	-.051	17353.268	9637.638	139.151	10155.637	13.805
1.600	-.030	.189	.088	.014	-.055	17236.982	9577.337	139.167	10156.960	13.946
1.700	-.036	.186	.089	.026	-.062	17107.356	9508.527	139.178	10157.763	14.106
1.800	-.043	.183	.092	.041	-.072	16969.134	9433.033	139.180	10157.547	14.283
1.900	-.051	.180	.095	.058	-.084	16824.490	9388.415	138.993	10137.250	14.382
2.000	-.059	.178	.096	.077	-.095	16671.266	9340.627	138.607	10095.746	14.494
2.100	-.068	.174	.096	.096	-.106	16513.145	9278.120	138.087	10040.045	14.640
2.200	-.077	.171	.095	.115	-.115	16354.487	9205.519	137.481	9975.237	14.809
2.300	-.086	.167	.095	.134	-.122	16199.399	9127.066	136.826	9905.232	14.992
2.400	-.095	.162	.094	.152	-.127	16051.773	9046.286	136.151	9833.186	15.180
2.500	-.104	.157	.094	.169	-.130	15915.157	8966.145	135.482	9761.737	15.367
2.600	-.113	.150	.093	.185	-.130	15792.690	8889.173	134.839	9693.139	15.546
2.700	-.120	.143	.093	.198	-.128	15686.931	8817.532	134.240	9629.308	15.713
2.800	-.128	.136	.092	.209	-.124	15539.916	8753.032	133.701	9571.855	15.863
2.900	-.134	.128	.091	.217	-.117	15333.099	8697.154	133.234	9522.092	15.992
3.000	-.140	.120	.090	.222	-.109	15487.377	8651.048	132.849	9481.038	16.100
3.100	-.145	.111	.088	.225	-.100	15463.097	8615.543	132.552	9449.429	16.182
3.200	-.150	.102	.086	.224	-.089	15460.084	8591.159	132.348	9427.722	16.239
3.300	-.153	.093	.085	.221	-.078	15477.671	8578.113	132.239	9416.107	16.269
3.400	-.156	.084	.083	.216	-.067	15514.735	8576.337	132.225	9414.522	16.273
3.500	-.159	.076	.081	.209	-.056	15569.744	8585.496	132.301	9422.665	16.252
3.600	-.160	.067	.079	.200	-.045	15640.805	8605.005	132.464	9440.014	16.207
3.700	-.162	.059	.077	.190	-.036	15725.720	8634.068	132.707	9465.852	16.139
3.800	-.162	.051	.075	.181	-.028	15821.945	8671.653	133.022	9499.280	16.052
3.900	-.163	.044	.073	.171	-.021	15926.787	8716.589	133.397	9539.237	15.948
4.000	-.164	.037	.072	.162	-.016	16037.495	8757.549	133.823	9584.548	15.829
4.100	-.164	.031	.070	.155	-.012	16151.256	8823.121	134.288	9633.958	15.700
4.200	-.165	.025	.068	.149	-.010	16265.257	8881.830	134.779	9686.157	15.564
4.300	-.166	.021	.066	.144	-.009	16376.742	8942.171	135.283	9739.807	15.424
4.400	-.167	.016	.065	.142	-.009	16483.077	9002.642	135.789	9793.574	15.284
4.500	-.168	.013	.064	.141	-.010	16581.798	9061.771	136.283	9846.153	15.146
4.600	-.172	.010	.068	.141	-.012	16670.588	9118.138	136.755	9896.286	15.015
4.700	-.177	.007	.081	.141	-.016	16748.363	9173.483	137.192	9942.861	14.894
4.800	-.194	.004	.107	.137	-.021	16815.391	9217.945	137.589	9985.122	14.783
4.900	-.187	.000	.141	.126	-.026	16875.160	9260.402	137.943	10022.959	14.685
5.000	-.186	-.004	.168	.110	-.033	16930.168	9298.571	138.262	10056.995	14.596
5.100	-.182	-.007	.167	.096	-.041	16979.405	9333.109	138.551	10087.793	14.515

5.200	-.179	-.007	.146	.064	-.440	17012.969	3416.204	130.964	10131.976	14.292
5.300	-.176	-.007	.119	.076	-.051	17023.441	9429.777	139.864	10142.609	14.298
5.400	-.174	-.007	.102	.073	-.051	17023.051	9431.230	139.864	10142.609	14.313
5.500	-.172	-.008	.099	.076	-.046	17000.582	9421.269	139.123	10148.993	14.348
5.600	-.171	-.011	.106	.081	-.039	16967.327	9405.183	139.054	10141.627	14.374
5.700	-.171	-.017	.116	.089	-.029	16925.510	9393.847	139.927	10148.108	14.410
5.800	-.171	-.024	.124	.099	-.018	16876.043	9378.281	136.752	10109.693	14.458
5.900	-.171	-.032	.127	.110	-.006	16819.935	9357.376	130.536	10086.956	14.517
6.000	-.171	-.040	.128	.121	.008	16758.083	9331.722	130.289	10068.641	14.586
6.100	-.171	-.049	.127	.130	.023	16691.551	9302.034	130.013	10031.408	14.662
6.200	-.170	-.058	.126	.136	.038	16621.810	9269.034	130.813	10031.408	14.745
6.300	-.167	-.067	.126	.139	.054	16550.584	9233.523	137.716	9999.941	14.830
6.400	-.164	-.077	.125	.139	.070	16479.623	9196.369	137.404	9967.036	14.918
6.500	-.160	-.087	.125	.136	.086	16410.598	9158.473	137.087	9933.484	15.005
6.600	-.155	-.097	.125	.130	.100	16345.006	9120.733	136.771	9900.800	15.090
6.700	-.148	-.107	.124	.121	.113	16284.142	9083.996	136.463	9867.577	15.171
6.800	-.141	-.116	.123	.110	.125	16229.100	9049.037	136.170	9836.661	15.246
6.900	-.134	-.125	.121	.097	.135	16180.775	9016.543	135.890	9807.943	15.314
7.000	-.125	-.134	.120	.084	.143	16139.866	8987.103	135.651	9781.944	15.373
7.100	-.117	-.142	.118	.070	.146	16106.853	8961.201	135.434	9759.095	15.424
7.200	-.109	-.149	.116	.057	.152	16081.986	8939.211	135.249	9739.727	15.465
7.300	-.101	-.156	.115	.046	.154	16065.269	8921.364	135.108	9724.065	15.496
7.400	-.093	-.162	.113	.036	.154	16056.461	8907.846	134.986	9712.221	15.517
7.500	-.085	-.168	.112	.028	.152	16055.099	8898.592	134.900	9704.192	15.530
7.600	-.078	-.172	.110	.022	.149	16060.523	8893.496	134.864	9699.867	15.524
7.700	-.072	-.177	.109	.019	.145	16071.919	8892.318	134.854	9699.831	15.510
7.800	-.067	-.181	.107	.019	.140	16088.359	8894.719	134.873	9701.306	15.491
7.900	-.062	-.184	.106	.020	.134	16108.895	8900.284	134.919	9706.565	15.466
8.000	-.057	-.188	.105	.024	.129	16132.512	8908.546	135.087	9714.151	15.437
8.100	-.054	-.191	.103	.029	.123	16158.268	8919.008	135.374	9734.777	15.405
8.200	-.051	-.193	.102	.036	.118	16185.283	8931.166	135.758	9759.777	15.371
8.300	-.048	-.196	.101	.044	.114	16212.771	8944.531	136.205	9786.071	15.337
8.400	-.046	-.199	.100	.051	.111	16240.052	8958.654	136.702	9811.203	15.297
8.500	-.044	-.201	.099	.059	.109	16266.544	8973.931	137.256	9833.312	15.259
8.600	-.042	-.204	.098	.066	.108	16291.757	8987.544	137.862	9857.900	15.227
8.700	-.040	-.206	.097	.072	.109	16315.275	9001.626	138.519	9883.312	15.199
8.800	-.038	-.209	.096	.076	.110	16336.741	9015.081	139.226	9909.450	15.154
8.900	-.036	-.211	.095	.079	.112	16355.848	9027.669	139.974	9937.369	15.115
9.000	-.033	-.214	.094	.080	.115	16372.336	9039.184	140.769	9967.900	15.083
9.100	-.031	-.216	.093	.079	.118	16385.995	9049.450	141.606	9999.878	15.051
9.200	-.028	-.217	.092	.075	.122	16396.665	9058.328	142.490	10031.408	15.021
9.300	-.025	-.219	.091	.071	.126	16404.248	9065.678	143.419	10063.373	15.001
9.400	-.021	-.220	.090	.064	.129	16408.714	9071.440	144.384	10099.941	15.001
9.500	-.018	-.221	.089	.056	.132	16410.095	9075.556	145.384	10141.627	15.001
9.600	-.014	-.221	.089	.047	.134	16408.503	9078.011	146.419	10188.108	15.001
9.700	-.011	-.221	.089	.038	.136	16404.276	9078.041	147.490	10239.229	15.001
9.800	-.007	-.219	.088	.027	.137	16397.875	9078.166	148.606	10297.900	15.001
9.900	-.002	-.215	.087	.017	.137	16389.512	9076.133	149.769	10357.900	15.001
10.000	.003	-.215	.085	.006	.135	16379.361	9072.871	150.974	10419.941	15.001
10.100	.007	-.212	.084	-.005	.133	16367.876	9068.516	152.226	10483.312	15.001
10.200	.013	-.208	.083	-.017	.130	16355.597	9063.273	153.519	10547.900	15.113
10.300	.019	-.204	.082	-.028	.127	16342.950	9057.368	154.854	10613.301	15.127
10.400	.025	-.199	.080	-.040	.122	16330.309	9051.027	156.226	10681.627	15.141
10.500	.031	-.194	.078	-.051	.117	16318.006	9044.463	157.634	10751.627	15.156
10.600	.037	-.188	.076	-.061	.112	16306.364	9037.875	159.074	10822.731	15.171
10.700	.043	-.182	.073	-.070	.107	16295.699	9031.455	160.543	10899.941	15.185
10.800	.050	-.175	.070	-.079	.101	16286.315	9025.384	162.043	10979.941	15.199

10.900	.056	-.169	.068	-.086	.096	16278.481	9019.836	135.891	9820.499	15.212
11.000	.061	-.162	.065	-.092	.091	16272.416	9014.975	135.851	9816.188	15.223
11.100	.067	-.155	.062	-.097	.087	16268.269	9010.931	135.817	9812.586	15.233
11.200	.073	-.148	.059	-.101	.083	16266.115	9007.913	135.791	9809.791	15.240
11.300	.078	-.141	.056	-.104	.080	16265.955	9005.694	135.773	9807.868	15.245
11.400	.083	-.134	.053	-.106	.077	16267.717	9004.610	135.764	9806.851	15.248
11.500	.088	-.127	.050	-.107	.075	16271.264	9004.559	135.764	9806.741	15.248
11.600	.093	-.121	.047	-.108	.073	16276.402	9005.504	135.772	9807.507	15.246
11.700	.097	-.114	.044	-.109	.072	16292.883	9007.372	135.788	9809.085	15.242
11.800	.102	-.108	.040	-.110	.072	16290.418	9010.062	135.811	9811.386	15.236
11.900	.106	-.101	.037	-.110	.072	16298.687	9013.443	135.840	9814.296	15.228
12.000	.110	-.095	.034	-.111	.072	16307.345	9017.364	135.873	9817.682	15.219
12.100	.115	-.089	.030	-.112	.072	16316.841	9021.656	135.907	9821.396	15.210
12.200	.119	-.083	.027	-.113	.073	16324.427	9026.141	135.947	9825.288	15.200
12.300	.123	-.078	.024	-.115	.074	16332.169	9030.635	135.985	9829.172	15.190
12.400	.128	-.072	.020	-.117	.075	16338.961	9034.956	136.022	9832.912	15.180
12.500	.132	-.067	.017	-.119	.076	16344.539	9038.932	136.055	9836.346	15.171
12.600	.136	-.062	.014	-.122	.076	16348.693	9042.407	136.085	9839.337	15.163
12.700	.140	-.057	.011	-.125	.077	16351.232	9045.242	136.109	9841.762	15.157
12.800	.143	-.052	.008	-.127	.077	16352.882	9047.328	136.126	9843.523	15.152
12.900	.147	-.047	.005	-.130	.077	16351.183	9048.579	136.137	9844.544	15.149
13.000	.150	-.043	.002	-.132	.076	16348.535	9048.941	136.141	9844.776	15.149
13.100	.153	-.038	.001	-.134	.076	16344.167	9048.383	136.136	9844.191	15.150
13.200	.156	-.035	.000	-.136	.075	16338.437	9046.913	136.124	9842.795	15.154
13.300	.158	-.031	.000	-.139	.073	16332.073	9044.688	136.106	9840.727	15.160
13.400	.161	-.029	.000	-.142	.071	16324.856	9041.853	136.083	9838.118	15.166
13.500	.163	-.026	.001	-.145	.070	16316.881	9038.447	136.054	9834.995	15.174
13.600	.164	-.022	.001	-.146	.067	16309.295	9034.663	136.023	9831.535	15.184
13.700	.164	-.018	.006	-.143	.062	16302.783	9030.811	135.991	9826.009	15.193
13.800	.164	-.014	.018	-.140	.055	16298.467	9027.270	135.962	9824.742	15.201
13.900	.164	-.010	.032	-.138	.045	16297.393	9023.525	135.939	9822.173	15.208
14.000	.162	-.005	.038	-.140	.033	16299.756	9023.017	135.927	9820.690	15.212
14.100	.159	.002	.024	-.150	.020	16303.858	9022.906	135.927	9820.431	15.213
14.200	.157	.009	.006	-.163	.009	16306.372	9023.652	135.934	9820.914	15.211
14.300	.157	.015	.036	-.175	.002	16307.370	9024.362	135.940	9821.354	15.210
14.400	.158	.018	.054	-.186	-.005	16315.241	9025.698	135.952	9822.347	15.208
14.500	.159	.024	.060	-.196	-.015	16329.131	9028.980	135.980	9825.029	15.201
14.600	.160	.031	.056	-.204	-.029	16346.016	9034.325	136.026	9829.638	15.188
14.700	.160	.040	.049	-.208	-.044	16363.012	9041.365	136.085	9835.713	15.173
14.800	.159	.050	.044	-.208	-.059	16378.379	9049.213	136.152	9842.507	15.155
14.900	.156	.060	.043	-.205	-.073	16391.567	9057.112	136.218	9849.343	15.137
15.000	.153	.070	.046	-.198	-.095	16402.720	9064.569	136.282	9855.779	15.120
15.100	.149	.080	.049	-.189	-.097	16412.127	9071.342	136.339	9861.596	15.105
15.200	.144	.090	.053	-.179	-.107	16419.859	9077.350	136.390	9866.704	15.092
15.300	.138	.099	.055	-.167	-.116	16425.761	9082.461	136.433	9871.035	15.081
15.400	.132	.108	.057	-.155	-.124	16429.556	9086.642	136.469	9874.509	15.072
15.500	.126	.117	.059	-.144	-.130	16430.945	9089.753	136.496	9877.017	15.065
15.600	.119	.126	.060	-.134	-.136	16429.678	9091.656	136.513	9878.441	15.061
15.700	.113	.135	.062	-.125	-.140	16425.571	9092.224	136.519	9878.666	15.061
15.800	.108	.143	.063	-.118	-.144	16418.483	9091.343	136.512	9877.595	15.064
15.900	.102	.151	.065	-.113	-.146	16408.295	9088.915	136.493	9875.143	15.070
16.000	.097	.159	.066	-.110	-.148	16394.892	9084.857	136.460	9871.238	15.080
16.100	.093	.166	.068	-.108	-.149	16378.176	9079.094	136.413	9865.816	15.095
16.200	.088	.174	.069	-.108	-.151	16358.894	9071.564	136.351	9858.823	15.113
16.300	.085	.181	.070	-.109	-.152	16334.609	9052.222	136.274	9850.222	15.135
16.400	.081	.188	.071	-.112	-.153	16307.817	9051.045	136.182	9839.995	15.162
16.500	.078	.195	.072	-.114	-.154	16277.856	9038.046	136.074	9828.152	15.193

16.600	.075	.201	.074	-.117	-.156	16244.952	9023.272	135.951	9814.739	15.228
16.700	.072	.208	.075	-.120	-.158	16209.410	9006.812	135.815	9799.833	15.267
16.800	.069	.214	.076	-.122	-.161	16171.599	8988.792	135.665	9783.550	15.310
16.900	.066	.221	.078	-.123	-.164	16131.944	8969.378	135.504	9766.035	15.356
17.000	.063	.227	.079	-.124	-.167	16090.918	8948.770	135.332	9747.466	15.404
17.100	.060	.233	.080	-.124	-.171	16048.032	8927.195	135.153	9728.046	15.455
17.200	.057	.239	.082	-.122	-.175	16006.825	8904.909	134.967	9708.000	15.507
17.300	.053	.244	.083	-.119	-.180	15964.565	8882.186	134.778	9687.572	15.561
17.400	.050	.249	.085	-.115	-.184	15923.733	8859.320	134.587	9667.022	15.614
17.500	.046	.254	.086	-.110	-.188	15884.029	8836.618	134.398	9646.621	15.668
17.600	.042	.258	.088	-.104	-.192	15846.358	8814.398	134.213	9626.651	15.720
17.700	.036	.262	.089	-.097	-.196	15811.335	8792.987	134.035	9607.400	15.770
17.800	.034	.266	.091	-.090	-.199	15779.573	8772.716	133.866	9589.161	15.818
17.900	.030	.269	.092	-.082	-.201	15751.581	8753.922	133.710	9572.232	15.862
18.000	.026	.271	.094	-.074	-.203	15728.258	8736.939	133.569	9556.906	15.902
18.100	.023	.273	.095	-.066	-.205	15709.887	8722.100	133.446	9543.478	15.937
18.200	.019	.274	.097	-.057	-.205	15697.123	8709.730	133.343	9532.236	15.967
18.300	.015	.274	.098	-.043	-.205	15690.471	8700.144	133.264	9523.455	15.989
18.400	.010	.274	.100	-.038	-.205	15690.398	8693.038	133.211	9517.395	16.005
18.500	.005	.274	.101	-.028	-.203	15697.323	8690.487	133.186	9514.361	16.013
18.600	.000	.272	.103	-.017	-.201	15711.540	8690.937	133.190	9514.388	16.013
18.700	-.006	.270	.104	-.005	-.198	15733.245	8695.190	133.227	9517.835	16.004
18.800	-.012	.268	.105	.008	-.194	15762.531	8703.398	133.297	9524.775	15.986
18.900	-.019	.265	.107	.021	-.190	15799.384	8715.663	133.401	9535.298	15.959
19.000	-.026	.261	.108	.034	-.185	15843.677	8732.029	133.540	9549.442	15.922
19.100	-.034	.257	.109	.047	-.180	15895.162	8752.481	133.712	9567.195	15.875
19.200	-.041	.252	.111	.061	-.175	15953.445	8776.943	133.918	9588.486	15.820
19.300	-.049	.248	.112	.073	-.170	16017.804	8805.243	134.157	9613.166	15.755
19.400	-.057	.243	.113	.086	-.165	16087.552	8837.119	134.425	9641.801	15.683
19.500	-.066	.237	.114	.097	-.159	16161.949	8872.257	134.721	9671.711	15.603
19.600	-.074	.231	.115	.108	-.154	16240.156	8910.293	135.040	9704.975	15.516
19.700	-.082	.225	.116	.118	-.149	16321.233	8950.812	135.381	9740.624	15.423
19.800	-.090	.219	.117	.126	-.144	16404.161	8993.348	135.739	9777.644	15.326
19.900	-.098	.213	.118	.134	-.139	16487.855	9037.385	136.109	9816.180	15.225
20.000	-.106	.206	.118	.141	-.134	16571.183	9082.371	136.487	9855.540	15.123
20.100	-.114	.199	.119	.147	-.130	16652.986	9127.717	136.868	9895.203	15.019

ORIGINAL PAGE IS
OF POOR QUALITY

TIME-SEC	BLDREQ	PHIRM-DESP	INTE-DESP	ERR	INI	PSIRM-DEGR	INTE-DEGR	ERR	INI	PSITRIBUT	THEIRM-DEGG	INTE-DEG
0.000	3.500	-0.335	-0.035	-0.000	.010	.010	.010	-0.000	0.000	0.000	76.413	76.413
0.100	3.500	-0.335	-0.035	-0.000	.010	.010	.010	-0.000	0.000	0.000	76.413	76.412
0.200	3.500	-0.335	-0.035	-0.000	.010	.010	.010	-0.000	0.000	0.000	76.413	76.412
0.300	3.500	-0.335	-0.035	-0.000	.010	.010	.010	-0.000	0.000	0.000	76.413	76.412
0.400	13.059	1.001	.026	.053	.010	.010	.010	-0.000	0.000	0.000	76.413	76.423
0.500	14.593	3.031	.591	.102	.010	.010	.008	-0.000	0.000	0.000	76.413	76.500
0.600	0.450	5.001	1.940	.126	.010	.010	.013	-0.000	0.000	0.000	76.413	76.668
0.700	4.104	7.030	3.900	.128	.010	.010	-0.007	-0.001	0.000	0.000	76.413	76.808
0.800	3.522	9.000	6.122	.118	.010	.010	-0.021	-0.002	0.000	0.000	76.413	76.044
0.900	3.596	11.079	8.323	.106	.010	.010	-0.038	-0.003	0.000	0.000	76.413	76.766
1.000	3.602	13.079	10.393	.100	.010	.010	-0.053	-0.003	0.000	0.000	76.413	76.608
1.100	3.053	15.079	12.321	.098	.010	.010	-0.102	-0.003	0.000	0.000	76.413	76.416
1.200	4.005	17.078	14.208	.100	.010	.010	-0.159	-0.003	0.000	0.000	76.413	76.231
1.300	4.035	19.078	16.109	.102	.010	.010	-0.240	-0.002	0.000	0.000	76.413	76.082
1.400	3.992	21.078	18.050	.102	.010	.010	-0.349	-0.002	0.000	0.000	76.413	75.985
1.500	3.934	23.077	20.026	.102	.010	.010	-0.487	-0.003	0.000	0.000	76.413	75.940
1.600	3.098	25.077	22.020	.101	.010	.010	-0.653	-0.003	0.000	0.000	76.413	75.944
1.700	3.089	27.076	24.016	.100	.010	.010	-0.847	-0.004	0.000	0.000	76.413	75.991
1.800	3.099	29.076	26.006	.099	.010	.010	-1.064	-0.007	0.000	0.000	76.413	76.071
1.900	3.912	31.076	27.992	.099	.010	.010	-1.302	-0.010	0.000	0.000	76.413	76.170
2.000	3.921	33.075	29.976	.099	.010	.010	-1.554	-0.015	0.000	0.000	76.413	76.302
2.100	3.924	35.075	31.961	.098	.010	.010	-1.914	-0.021	0.000	0.000	76.413	76.436
2.200	3.922	37.075	33.950	.098	.010	.010	-2.077	-0.027	0.000	0.000	76.413	76.571
2.300	3.919	39.074	35.941	.098	.010	.010	-2.335	-0.035	0.000	0.000	76.413	76.701
2.400	3.917	41.074	37.935	.098	.010	.010	-2.594	-0.043	0.000	0.000	76.413	76.821
2.500	3.915	43.073	39.930	.097	.010	.010	-2.818	-0.052	0.000	0.000	76.413	76.927
2.600	3.913	45.073	41.926	.097	.010	.010	-3.031	-0.062	0.000	0.000	76.413	77.018
2.700	3.911	47.073	43.922	.097	.010	.010	-3.221	-0.072	0.000	0.000	76.413	77.092
2.800	3.908	49.072	45.920	.096	.010	.010	-3.395	-0.082	0.000	0.000	76.413	77.150
2.900	3.903	51.072	47.920	.096	.010	.010	-3.520	-0.092	0.000	0.000	76.413	77.194
3.000	3.898	53.072	49.921	.096	.010	.010	-3.626	-0.102	0.000	0.000	76.413	77.227
3.100	3.892	55.071	51.923	.095	.010	.010	-3.714	-0.111	0.000	0.000	76.413	77.252
3.200	3.885	57.071	53.927	.095	.010	.010	-3.756	-0.119	0.000	0.000	76.413	77.273
3.300	3.877	59.070	55.931	.094	.010	.010	-3.784	-0.127	0.000	0.000	76.413	77.293
3.400	3.869	61.070	57.937	.093	.010	.010	-3.792	-0.134	0.000	0.000	76.413	77.316
3.500	3.861	63.070	59.943	.092	.010	.010	-3.784	-0.140	0.000	0.000	76.413	77.346
3.600	3.853	65.069	61.950	.091	.010	.010	-3.766	-0.145	0.000	0.000	76.413	77.386
3.700	3.845	67.069	63.957	.090	.010	.010	-3.742	-0.149	0.000	0.000	76.413	77.439
3.800	3.836	69.069	65.964	.089	.010	.010	-3.718	-0.151	0.000	0.000	76.413	77.505
3.900	3.828	71.068	67.971	.088	.010	.010	-3.699	-0.153	0.000	0.000	76.413	77.587
4.000	3.820	73.068	69.978	.087	.010	.010	-3.691	-0.154	0.000	0.000	76.413	77.685
4.100	3.812	75.067	71.985	.086	.010	.010	-3.697	-0.154	0.000	0.000	76.413	77.797
4.200	3.804	77.067	73.991	.084	.010	.010	-3.722	-0.154	0.000	0.000	76.413	77.921
4.300	3.797	79.067	75.996	.083	.010	.010	-3.766	-0.154	0.000	0.000	76.413	78.056
4.400	3.790	81.066	78.002	.082	.010	.010	-3.833	-0.153	0.000	0.000	76.413	78.198
4.500	3.784	83.066	80.006	.080	.010	.010	-3.923	-0.152	0.000	0.000	76.413	78.343
4.600	3.790	85.066	82.005	.079	.010	.010	-4.033	-0.151	0.000	0.000	76.413	78.486
4.700	3.828	87.065	83.958	.079	.010	.010	-4.159	-0.150	0.000	0.000	76.413	78.625
4.800	3.914	89.065	85.942	.080	.010	.010	-4.293	-0.150	0.000	0.000	76.413	78.755
4.900	4.150	91.064	87.853	.083	.010	.010	-4.426	-0.149	0.000	0.000	76.413	78.8
5.000	6	93.064	89.732	.089	.010	.010	-4.547	-0.149	0.000	0.000	76.413	78.984
5.100	6	95.064	91.622	.095	.010	.010	-4.660	-0.142	0.000	0.000	76.413	79.089

5.200	4.199	97.863	93.562	.100	.010	-4.770	.138	0.000	76.413	79.163
5.300	4.083	99.363	95.563	.102	.010	-4.884	.134	0.000	76.413	79.223
5.400	3.986	101.863	97.606	.103	.010	-5.006	.129	0.000	76.413	79.252
5.500	3.943	103.862	99.659	.103	.010	-5.140	.125	0.000	76.413	79.244
5.600	3.953	105.362	101.696	.101	.000	-5.294	.121	0.000	76.413	79.195
5.700	3.991	107.861	103.711	.103	.010	-5.435	.118	0.000	76.413	79.110
5.800	4.029	109.361	105.710	.105	.010	-5.598	.116	0.000	76.413	78.993
5.900	4.053	111.861	107.702	.106	.010	-5.738	.115	0.000	76.413	78.850
6.000	4.061	113.860	109.695	.108	.010	-5.881	.115	0.000	76.413	78.688
6.100	4.061	115.860	111.693	.109	.010	-6.011	.116	0.000	76.413	78.515
6.200	4.057	117.860	113.695	.111	.010	-6.125	.117	0.000	76.413	78.336
6.300	4.055	119.859	115.699	.112	.010	-6.220	.119	0.000	76.413	78.157
6.400	4.054	121.859	117.705	.113	.010	-6.295	.120	0.000	76.413	77.987
6.500	4.053	123.858	119.712	.114	.010	-6.350	.121	0.000	76.413	77.830
6.600	4.052	125.858	121.719	.115	.010	-6.388	.122	0.000	76.413	77.693
6.700	4.049	127.858	123.728	.115	.010	-6.412	.122	0.000	76.413	77.580
6.800	4.043	129.857	125.739	.116	.010	-6.426	.122	0.000	76.413	77.497
6.900	4.037	131.857	127.750	.116	.010	-6.431	.120	0.000	76.413	77.445
7.000	4.031	133.857	129.763	.117	.010	-6.426	.118	0.000	76.413	77.426
7.100	4.024	135.856	131.776	.117	.010	-6.412	.115	0.000	76.413	77.441
7.200	4.017	137.856	133.790	.117	.010	-6.387	.111	0.000	76.413	77.490
7.300	4.010	139.855	135.804	.117	.010	-6.350	.106	0.000	76.413	77.570
7.400	4.003	141.855	137.818	.117	.010	-6.307	.101	0.000	76.413	77.679
7.500	3.996	143.855	139.831	.116	.010	-6.259	.096	0.000	76.413	77.814
7.600	3.989	145.854	141.844	.116	.010	-6.207	.090	0.000	76.413	77.971
7.700	3.983	147.854	143.857	.115	.010	-7.027	.085	0.000	76.413	78.144
7.800	3.976	149.854	145.868	.115	.010	-7.213	.080	0.000	76.413	78.330
7.900	3.970	151.853	147.879	.114	.010	-7.424	.076	0.000	76.413	78.523
8.000	3.964	153.853	149.889	.113	.010	-7.557	.072	0.000	76.413	78.718
8.100	3.958	155.852	151.898	.113	.110	-7.908	.068	0.000	76.413	78.912
8.200	3.953	157.852	153.907	.112	.010	-8.173	.065	0.000	76.413	79.101
8.300	3.948	159.852	155.914	.111	.010	-8.446	.063	0.000	76.413	79.281
8.400	3.943	161.851	157.920	.110	.010	-8.720	.062	0.000	76.413	79.449
8.500	3.938	163.851	159.926	.109	.010	-8.992	.062	0.000	76.413	79.604
8.600	3.934	165.850	161.931	.109	.010	-9.254	.062	0.000	76.413	79.746
8.700	3.929	167.850	163.935	.108	.010	-9.501	.062	0.000	76.413	79.873
8.800	3.925	169.850	165.938	.107	.010	-9.731	.063	0.000	76.413	79.986
8.900	3.920	171.849	167.941	.106	.010	-9.938	.064	0.000	76.413	80.087
9.000	3.916	173.849	169.944	.105	.010	-10.120	.065	0.000	76.413	80.178
9.100	3.912	175.849	171.946	.104	.010	-10.275	.065	0.000	76.413	80.261
9.200	3.908	177.848	173.948	.103	.010	-10.403	.066	0.000	76.413	80.337
9.300	3.903	179.848	175.949	.102	.010	-10.504	.066	0.000	76.413	80.410
9.400	3.899	181.847	177.950	.101	.010	-10.579	.066	0.000	76.413	80.483
9.500	3.896	183.847	179.951	.101	.010	-10.628	.065	0.000	76.413	80.556
9.600	3.893	185.847	181.951	.100	.010	-10.656	.064	0.000	76.413	80.633
9.700	3.891	187.846	183.950	.099	.010	-10.663	.062	0.000	76.413	80.715
9.800	3.890	189.846	185.948	.098	.010	-10.653	.059	0.000	76.413	80.802
9.900	3.886	191.846	187.947	.097	.010	-10.629	.056	0.000	76.413	80.896
10.000	3.880	193.845	189.947	.096	.010	-10.593	.052	0.000	76.413	80.996
10.100	3.874	195.845	191.948	.095	.010	-10.550	.048	0.000	76.413	81.102
10.200	3.869	197.844	193.948	.095	.010	-10.500	.043	0.000	76.413	81.212
10.300	3.865	199.844	195.949	.094	.010	-10.448	.037	0.000	76.413	81.326
10.400	3.858	201.844	197.951	.093	.010	-10.395	.032	0.000	76.413	81.441
10.500	3.849	203.843	199.953	.092	.010	-10.346	.025	0.000	76.413	81.555
10.600	3.839	205.843	201.958	.091	.010	-10.302	.019	0.000	76.413	81.667
10.700	3.828	207.843	203.964	.089	.010	-10.265	.012	0.000	76.413	81.773
10.800	3.816	209.842	205.971	.088	.010	-10.237	.005	0.000	76.413	81.871

10.900	3.804	241.642	207.979	.006	.010	-10.220	-.002	0.000	76.413	01.959
11.000	3.792	213.641	209.987	.085	.010	-10.213	-.009	0.000	76.413	02.035
11.100	3.780	215.941	211.736	.093	.010	-10.210	-.016	0.000	76.413	02.097
11.200	3.767	217.641	214.006	.12	.010	-10.233	-.022	0.000	76.413	02.144
11.300	3.754	219.940	216.015	.600	.010	-10.258	-.029	0.000	76.413	02.174
11.400	3.741	221.640	218.025	.076	.010	-10.292	-.035	0.000	76.413	02.188
11.500	3.727	223.840	220.035	.076	.010	-10.334	-.041	0.000	76.413	02.166
11.600	3.713	225.839	222.045	.074	.010	-10.392	-.046	0.000	76.413	02.131
11.700	3.699	227.839	224.055	.071	.010	-10.436	-.051	0.000	76.413	02.081
11.800	3.685	229.838	226.054	.069	.010	-10.492	-.056	0.000	76.413	02.019
11.900	3.671	231.838	228.074	.067	.010	-10.551	-.060	0.000	76.413	02.019
12.000	3.656	233.838	230.083	.064	.010	-10.610	-.064	0.000	76.413	01.944
12.100	3.642	235.837	232.092	.062	.010	-10.670	-.068	0.000	76.413	01.860
12.200	3.627	237.837	234.101	.059	.010	-10.730	-.072	0.000	76.413	01.769
12.300	3.612	239.837	236.109	.057	.010	-10.789	-.074	0.000	76.413	01.671
12.400	3.598	241.836	238.117	.054	.010	-10.847	-.079	0.000	76.413	01.570
12.500	3.583	243.836	240.125	.051	.010	-10.906	-.082	0.000	76.413	01.468
12.600	3.569	245.835	242.132	.049	.010	-10.965	-.085	0.000	76.413	01.366
12.700	3.555	247.835	244.138	.046	.010	-11.026	-.088	0.000	76.413	01.267
12.800	3.541	249.835	246.144	.043	.010	-11.088	-.092	0.000	76.413	01.171
12.900	3.527	251.834	248.149	.040	.010	-11.155	-.095	0.000	76.413	01.082
13.000	3.515	253.834	250.153	.037	.010	-11.225	-.098	0.000	76.413	01.000
13.100	3.503	255.834	252.156	.035	.010	-11.301	-.100	0.000	76.413	00.927
13.200	3.508	257.833	254.159	.032	.010	-11.383	-.103	0.000	76.413	00.864
13.300	3.516	259.833	256.158	.029	.010	-11.472	-.105	0.000	76.413	00.812
13.400	3.517	261.832	258.154	.026	.010	-11.567	-.109	0.000	76.413	00.772
13.500	3.508	263.832	260.142	.024	.010	-11.670	-.112	0.000	76.413	00.746
13.600	3.502	265.832	262.127	.022	.010	-11.783	-.114	0.000	76.413	00.730
13.700	3.515	267.831	264.115	.020	.010	-11.906	-.117	0.000	76.413	00.750
13.800	3.555	269.831	266.118	.017	.010	-12.042	-.119	0.000	76.413	00.793
13.900	3.611	271.831	268.137	.015	.010	-12.187	-.120	0.000	76.413	00.844
14.000	3.657	273.830	270.167	.011	.010	-12.338	-.122	0.000	76.413	00.904
14.100	3.639	275.830	272.177	.007	.010	-12.499	-.124	0.000	76.413	00.909
14.200	3.538	277.829	274.142	.006	.010	-12.635	-.126	0.000	76.413	00.984
14.300	3.594	279.829	276.058	.007	.010	-12.774	-.130	0.000	76.413	01.064
14.400	3.699	281.829	277.951	.010	.010	-12.910	-.134	0.000	76.413	01.146
14.500	3.752	283.824	279.849	.014	.010	-13.048	-.139	0.000	76.413	01.231
14.600	3.753	285.828	281.772	.017	.010	-13.191	-.143	0.000	76.413	01.321
14.700	3.729	287.828	283.724	.020	.010	-13.345	-.148	0.000	76.413	01.412
14.800	3.704	289.827	285.699	.022	.010	-13.511	-.153	0.000	76.413	01.499
14.900	3.693	291.827	287.687	.024	.010	-13.690	-.157	0.000	76.413	01.576
15.000	3.697	293.826	289.677	.025	.010	-13.882	-.161	0.000	76.413	01.638
15.100	3.710	295.826	291.667	.027	.010	-14.083	-.164	0.000	76.413	01.679
15.200	3.725	297.826	293.655	.029	.010	-14.290	-.165	0.000	76.413	01.699
15.300	3.739	299.825	295.644	.031	.010	-14.497	-.166	0.000	76.413	01.695
15.400	3.748	301.825	297.634	.033	.010	-14.700	-.166	0.000	76.413	01.667
15.500	3.756	303.825	299.626	.035	.010	-14.995	-.165	0.000	76.413	01.615
15.600	3.762	305.824	301.621	.037	.010	-15.376	-.163	0.000	76.413	01.539
15.700	3.769	307.824	303.617	.039	.010	-15.241	-.161	0.000	76.413	01.440
15.800	3.776	309.823	305.614	.040	.010	-15.388	-.158	0.000	76.413	01.328
15.900	3.782	311.823	307.612	.042	.010	-15.514	-.155	0.000	76.413	01.181
16.000	3.789	313.823	309.611	.044	.010	-15.620	-.152	0.000	76.413	01.025
16.100	3.795	315.822	311.611	.046	.010	-15.776	-.149	0.000	76.413	00.855
16.200	3.801	317.822	313.612	.047	.010	-15.774	-.146	0.000	76.413	00.672
16.300	3.807	319.821	315.613	.049	.010	-15.827	-.143	0.000	76.413	00.481
16.400	3.812	321.821	317.615	.051	.010	-15.967	-.141	0.000	76.413	00.282
16.500	3.817	323.821	319.617	.052	.010	-15.900	-.139	0.000	76.413	00.077

16.600	3.822	325.820	321.619	.054	.010	-15.928	-.136	0.000	76.413	79.069
16.700	3.828	327.820	323.622	.056	.010	-15.955	-.136	0.000	76.413	79.059
16.800	3.833	329.820	325.624	.057	.010	-15.986	-.135	0.000	76.413	79.047
16.900	3.839	331.819	327.626	.059	.010	-16.024	-.135	0.000	76.413	79.233
17.000	3.845	333.819	329.629	.060	.010	-16.072	-.134	0.000	76.413	79.019
17.100	3.851	335.818	331.631	.062	.010	-16.133	-.133	0.000	76.413	78.982
17.200	3.857	337.818	333.632	.063	.010	-16.208	-.132	0.000	76.413	78.983
17.300	3.864	339.818	335.634	.065	.010	-16.301	-.132	0.000	76.413	78.962
17.400	3.870	341.817	337.635	.066	.010	-16.411	-.130	0.000	76.413	78.936
17.500	3.877	343.817	339.635	.068	.010	-16.539	-.129	0.000	76.413	77.905
17.600	3.883	345.817	341.636	.069	.010	-16.686	-.127	0.000	76.413	77.668
17.700	3.890	347.816	343.636	.071	.010	-16.851	-.125	0.000	76.413	77.424
17.800	3.897	349.816	345.636	.072	.010	-17.033	-.123	0.000	76.413	77.172
17.900	3.904	351.815	347.636	.074	.010	-17.233	-.120	0.000	76.413	76.913
18.000	3.910	353.815	349.636	.075	.010	-17.448	-.116	0.000	76.413	76.645
18.100	3.917	355.815	351.636	.077	.010	-17.680	-.113	0.000	76.413	76.368
18.200	3.924	357.814	353.635	.078	.010	-17.926	-.109	0.000	76.413	76.083
18.300	3.930	359.814	355.635	.080	.010	-18.186	-.104	0.000	76.413	75.790
18.400	3.937	361.814	357.635	.081	.010	-18.461	-.099	0.000	76.413	75.491
18.500	3.943	363.813	359.635	.083	.010	-18.748	-.094	0.000	76.413	75.185
18.600	3.949	365.813	361.635	.084	.010	-19.047	-.088	0.000	76.413	74.874
18.700	3.956	367.812	363.635	.085	.010	-19.357	-.082	0.000	76.413	74.560
18.800	3.962	369.812	365.635	.087	.010	-19.676	-.075	0.000	76.413	74.244
18.900	3.968	371.812	367.635	.088	.010	-20.003	-.068	0.000	76.413	73.927
19.000	3.974	373.811	369.635	.090	.010	-20.336	-.061	0.000	76.413	73.613
19.100	3.980	375.811	371.635	.091	.010	-20.673	-.053	0.000	76.413	73.302
19.200	3.986	377.811	373.636	.093	.010	-21.013	-.044	0.000	76.413	72.997
19.300	3.991	379.810	375.636	.094	.010	-21.354	-.035	0.000	76.413	72.708
19.400	3.996	381.810	377.637	.096	.010	-21.694	-.026	0.000	76.413	72.413
19.500	4.001	383.809	379.633	.097	.010	-22.033	-.017	0.000	76.413	72.137
19.600	4.006	385.809	381.640	.099	.010	-22.369	-.008	0.000	76.413	71.874
19.700	4.010	387.809	383.642	.100	.010	-22.712	-.002	0.000	76.413	71.626
19.800	4.014	389.808	385.644	.101	.010	-23.032	.011	0.000	76.413	71.392
19.900	4.017	391.808	387.646	.102	.010	-23.359	.021	0.000	76.413	71.175
20.000	4.021	393.808	389.649	.103	.010	-23.674	.030	0.000	76.413	70.974
20.100	4.024	395.807	391.652	.105	.010	-24.006	.039	0.000	76.413	70.790

TIME-SEC	Q-ERR	INT-THERM	BUI	ZE-ERR	INTP-ERR	DG/SR-ERR	DG/SQ-ERR	DG/SIZE-ERR	F/SROLL	YAKMND	CON-SYS-SM
0.000	-0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
.100	-0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
.200	-0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
.300	-0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
.400	-0.115	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
.500	-0.117	0.000	0.000	1.063	6.744	0.003	-0.250	-1.779	0.349	0.000	1.000
.600	-0.121	0.000	0.000	11.400	4.509	0.017	-0.959	-2.887	0.349	0.000	1.000
.700	-0.126	0.000	0.000	34.615	1.405	0.042	-1.412	-3.330	0.349	0.000	1.000
.800	-0.130	0.000	0.000	66.431	-0.772	0.057	-1.300	-3.447	0.349	0.001	1.000
.900	-0.132	0.000	0.000	100.656	-1.473	0.047	-0.905	-3.446	0.349	0.002	1.000
1.000	-0.133	0.000	0.000	135.404	-1.126	0.020	-0.470	-3.368	0.349	0.004	1.000
1.100	-0.133	0.000	0.000	169.761	-0.448	-0.011	-0.037	-3.243	0.349	0.007	1.000
1.200	-0.132	0.000	0.000	203.074	0.058	-0.033	0.176	-3.102	0.349	0.010	1.000
1.300	-0.131	0.000	0.000	235.032	0.235	-0.042	0.342	-2.926	0.349	0.013	1.000
1.400	-0.129	0.000	0.000	265.371	0.170	-0.036	0.423	-2.714	0.349	0.017	1.000
1.500	-0.128	0.000	0.000	293.759	0.023	-0.018	0.448	-2.465	0.349	0.022	1.000
1.600	-0.126	0.000	0.000	319.626	-0.090	0.011	0.441	-2.105	0.349	0.026	1.000
1.700	-0.125	0.000	0.000	343.237	-0.128	0.050	0.410	-1.885	0.349	0.031	1.000
1.800	-0.124	0.000	0.000	363.726	-0.107	0.097	0.360	-1.574	0.349	0.036	1.000
1.900	-0.123	0.000	0.000	391.132	-0.070	0.152	0.296	-1.256	0.349	0.041	1.000
2.000	-0.123	0.000	0.000	395.382	-0.038	0.211	0.225	-0.927	0.349	0.049	1.000
2.100	-0.122	0.000	0.000	406.397	-0.023	0.330	0.022	-0.596	0.349	0.053	1.000
2.200	-0.122	0.000	0.000	414.070	-0.027	0.385	0.039	-0.270	0.349	0.056	1.000
2.300	-0.122	0.000	0.000	418.442	-0.031	0.436	-0.003	0.043	0.349	0.058	1.000
2.400	-0.122	0.000	0.000	419.597	-0.033	0.480	-0.031	0.334	0.349	0.060	1.000
2.500	-0.122	0.000	0.000	417.707	-0.034	0.515	-0.045	0.598	0.349	0.061	1.000
2.600	-0.122	0.000	0.000	413.617	-0.035	0.541	-0.045	0.829	0.349	0.062	1.000
2.700	-0.123	0.000	0.000	405.832	-0.038	0.556	-0.032	1.021	0.349	0.063	1.000
2.800	-0.123	0.000	0.000	396.508	-0.043	0.560	-0.006	1.173	0.349	0.062	1.000
2.900	-0.123	0.000	0.000	373.059	-0.050	0.552	-0.030	1.347	0.349	0.062	1.000
3.000	-0.122	0.000	0.000	359.793	-0.059	0.532	0.076	1.347	0.349	0.062	1.000
3.100	-0.122	0.000	0.000	346.088	-0.068	0.502	0.129	1.368	0.349	0.061	1.000
3.200	-0.122	0.000	0.000	332.374	-0.078	0.462	-0.186	1.347	0.349	0.060	1.000
3.300	-0.121	0.000	0.000	319.082	-0.088	0.414	0.245	1.285	0.349	0.060	1.000
3.400	-0.120	0.000	0.000	306.591	-0.097	0.360	0.305	1.186	0.349	0.060	1.000
3.500	-0.119	0.000	0.000	295.263	-0.107	0.302	0.361	1.053	0.349	0.060	1.000
3.600	-0.118	0.000	0.000	285.415	-0.116	0.243	0.413	0.891	0.349	0.060	1.000
3.700	-0.116	0.000	0.000	277.316	-0.125	0.184	0.459	0.705	0.349	0.060	1.000
3.800	-0.114	0.000	0.000	271.163	-0.133	0.126	0.497	0.501	0.349	0.061	1.000
3.900	-0.113	0.000	0.000	267.176	-0.139	0.078	0.526	0.283	0.349	0.062	1.000
4.000	-0.111	0.000	0.000	265.398	-0.145	0.035	0.546	0.058	0.349	0.064	1.000
4.100	-0.103	0.000	0.000	265.895	-0.150	0.001	0.557	-0.168	0.349	0.066	1.000
4.200	-0.107	0.000	0.000	268.655	-0.155	0.025	0.559	-0.391	0.349	0.069	1.000
4.300	-0.105	0.000	0.000	273.610	-0.158	0.042	0.553	-0.604	0.349	0.071	1.000
4.400	-0.103	0.000	0.000	280.642	-0.160	0.049	0.541	-0.803	0.349	0.075	1.000
4.500	-0.102	0.000	0.000	289.582	-0.157	0.047	0.523	-0.982	0.349	0.078	1.000
4.600	-0.100	0.000	0.000	300.219	-0.107	0.044	0.501	-1.139	0.349	0.082	1.000
4.700	-0.098	0.000	0.000	312.306	-0.019	0.044	0.470	-1.270	0.349	0.085	1.000
4.800	-0.097	0.000	0.000	325.594	0.258	-0.056	0.434	-1.377	0.349	0.088	1.000
4.900	-0.095	0.000	0.000	339.870	0.554	-0.098	0.394	-1.461	0.349	0.090	1.000
5.000	-0.094	0.000	0.000	354.997	0.752	-0.157	0.349	-1.518	0.349	0.092	1.000
5.100	-0.093	0.000	0.000	370.865	0.689	-0.206	0.300	-1.615	0.349	0.095	1.000

ORIGINAL PAGE IS
OF POOR QUALITY

5.200	--.092	0.000	387.296	.640	--.240	.253	-1.655	.349	--.097	1.000
5.300	--.091	0.000	403.918	.163	--.256	.225	-1.649	.349	--.100	1.000
5.400	--.090	0.000	420.282	--.010	--.247	.224	-1.603	.349	--.103	1.000
5.500	--.089	0.000	436.032	--.036	--.218	.248	-1.527	.349	--.106	1.000
5.600	--.089	0.000	450.906	.034	--.178	.285	-1.431	.349	--.108	1.000
5.700	--.087	0.000	464.737	.122	--.130	.332	-1.319	.349	--.111	1.000
5.800	--.086	0.000	477.383	.181	--.075	.389	-1.195	.349	--.112	1.000
5.900	--.085	0.000	488.725	.199	--.022	.452	-1.060	.349	--.114	1.000
6.000	--.083	0.000	498.668	.188	.025	.521	--.917	.349	--.114	1.000
6.100	--.081	0.000	507.134	.167	.061	.594	--.767	.349	--.115	1.000
6.200	--.079	0.000	514.074	.147	.084	.671	--.613	.349	--.115	1.000
6.300	--.076	0.000	519.470	.132	.091	.748	--.460	.349	--.115	1.000
6.400	--.074	0.000	523.341	.121	.085	.824	--.310	.349	--.114	1.000
6.500	--.071	0.000	525.738	.110	.065	.896	--.167	.349	--.114	1.000
6.600	--.068	0.000	526.744	.096	.034	.961	--.034	.349	--.114	1.000
6.700	--.064	0.000	526.469	.080	--.007	1.017	.087	.349	--.114	1.000
6.800	--.061	0.000	525.042	.062	--.053	1.063	.194	.349	--.114	1.000
6.900	--.057	0.000	522.612	.044	--.101	1.099	.286	.349	--.115	1.000
7.000	--.053	0.000	519.339	.027	--.150	1.122	.361	.349	--.117	1.000
7.100	--.049	0.000	515.394	.010	--.195	1.133	.419	.349	--.119	1.000
7.200	--.045	0.000	510.949	--.005	--.234	1.132	.460	.349	--.122	1.000
7.300	--.042	0.000	506.177	--.019	--.266	1.120	.484	.349	--.125	1.000
7.400	--.038	0.000	501.246	--.032	--.288	1.091	.492	.349	--.129	1.000
7.500	--.034	0.000	496.312	--.044	--.299	1.066	.485	.349	--.133	1.000
7.600	--.030	0.000	491.517	--.055	--.300	1.027	.464	.349	--.138	1.000
7.700	--.027	0.000	486.986	--.064	--.290	.983	.432	.349	--.143	1.000
7.800	--.024	0.000	482.824	--.073	--.271	.936	.391	.349	--.148	1.000
7.900	--.021	0.000	479.115	--.080	--.243	.887	.343	.349	--.153	1.000
8.000	--.018	0.000	475.922	--.086	--.209	.838	.289	.349	--.159	1.000
8.100	--.015	0.000	471.296	--.090	--.170	.792	.232	.349	--.164	1.000
8.200	--.012	0.000	471.231	--.094	--.129	.749	.174	.349	--.169	1.000
8.300	--.010	0.000	469.762	--.097	--.087	.712	.116	.349	--.173	1.000
8.400	--.008	0.000	468.869	--.100	--.047	.680	.060	.349	--.177	1.000
8.500	--.005	0.000	468.532	--.102	--.011	.656	.006	.349	--.181	1.000
8.600	--.003	0.000	468.717	--.103	--.020	.638	--.044	.349	--.184	1.000
8.700	--.001	0.000	469.386	--.105	.044	.627	--.090	.349	--.186	1.000
8.800	0.000	0.000	470.491	--.106	.060	.622	--.130	.349	--.188	1.000
8.900	0.003	0.000	471.979	--.107	.068	.623	--.166	.349	--.189	1.000
9.000	0.005	0.000	473.793	--.108	.067	.627	--.195	.349	--.190	1.000
9.100	0.008	0.000	475.672	--.108	.058	.634	--.218	.349	--.191	1.000
9.200	0.010	0.000	476.152	--.109	.042	.643	--.235	.349	--.191	1.000
9.300	0.012	0.000	480.570	--.109	.019	.651	--.245	.349	--.191	1.000
9.400	0.014	0.000	493.061	--.109	--.009	.658	--.249	.349	--.190	1.000
9.500	0.016	0.000	495.561	--.107	--.040	.663	--.247	.349	--.190	1.000
9.600	0.010	0.000	488.010	--.104	--.073	.654	--.239	.349	--.189	1.000
9.700	0.021	0.000	490.351	--.098	--.107	.650	--.226	.349	--.188	1.000
9.800	0.023	0.000	492.540	--.096	--.140	.652	--.208	.349	--.187	1.000
9.900	0.025	0.000	494.538	--.099	--.172	.638	--.186	.349	--.186	1.000
10.000	0.027	0.000	496.312	--.105	--.203	.619	--.164	.349	--.185	1.000
10.100	0.029	0.000	497.834	--.107	--.233	.596	--.138	.349	--.184	1.000
10.200	0.031	0.000	499.089	--.108	--.263	.567	--.111	.349	--.184	1.000
10.300	0.033	0.000	500.069	--.111	--.290	.535	--.084	.349	--.183	1.000
10.400	0.035	0.000	500.777	--.118	--.314	.500	--.057	.349	--.183	1.000
10.500	0.037	0.000	501.221	--.129	--.335	.463	--.031	.349	--.182	1.000
10.600	0.038	0.000	501.417	--.142	--.351	.424	--.009	.349	--.183	1.000
10.700	0.039	0.000	501.386	--.155	--.362	.386	--.014	.349	--.183	1.000
10.800	0.041	0.000	501.155	--.168	--.368	.340	--.032	.349	--.183	1.000

10.900	.042	0.000	500.756	-.180	-.370	.312	.047	.349	-.184	1.000
11.000	.043	0.000	500.225	-.191	-.366	.279	.058	.349	-.185	1.000
11.100	.044	0.000	499.602	-.203	-.357	.248	.065	.349	-.186	1.000
11.200	.044	0.000	498.927	-.214	-.345	.222	.068	.349	-.187	1.000
11.300	.045	0.000	498.243	-.225	-.330	.198	.067	.349	-.188	1.000
11.400	.046	0.000	497.587	-.236	-.312	.179	.062	.349	-.189	1.000
11.500	.046	0.000	496.997	-.246	-.293	.163	.054	.349	-.190	1.000
11.600	.047	0.000	496.505	-.256	-.273	.151	.042	.349	-.191	1.000
11.700	.047	0.000	496.138	-.266	-.254	.143	.029	.349	-.192	1.000
11.800	.048	0.000	495.919	-.275	-.236	.137	.013	.349	-.192	1.000
11.900	.048	0.000	495.862	-.284	-.219	.134	-.003	.349	-.193	1.000
12.000	.049	0.000	495.976	-.292	-.205	.133	-.021	.349	-.194	1.000
12.100	.049	0.000	496.261	-.301	-.193	.133	-.037	.349	-.195	1.000
12.200	.050	0.000	496.711	-.304	-.183	.135	-.053	.349	-.196	1.000
12.300	.050	0.000	497.314	-.315	-.175	.137	-.067	.349	-.197	1.000
12.400	.051	0.000	498.052	-.321	-.169	.139	-.080	.349	-.198	1.000
12.500	.051	0.000	498.899	-.327	-.165	.141	-.089	.349	-.199	1.000
12.600	.051	0.000	499.827	-.331	-.162	.142	-.095	.349	-.200	1.000
12.700	.052	0.000	500.805	-.335	-.159	.142	-.099	.349	-.201	1.000
12.800	.052	0.000	501.796	-.337	-.157	.141	-.098	.349	-.202	1.000
12.900	.053	0.000	502.772	-.339	-.155	.138	-.095	.349	-.204	1.000
13.000	.053	0.000	503.692	-.339	-.152	.133	-.087	.349	-.205	1.000
13.100	.054	0.000	504.525	-.337	-.149	.127	-.077	.349	-.207	1.000
13.200	.054	0.000	505.240	-.331	-.146	.118	-.064	.349	-.209	1.000
13.300	.054	0.000	505.820	-.317	-.144	.106	-.050	.349	-.211	1.000
13.400	.055	0.000	506.255	-.285	-.145	.097	-.035	.349	-.213	1.000
13.500	.055	0.000	506.528	-.236	-.148	.087	-.018	.349	-.216	1.000
13.600	.055	0.000	506.638	-.219	-.138	.059	-.003	.349	-.218	1.000
13.700	.055	0.000	506.604	-.256	-.116	.039	-.010	.349	-.221	1.000
13.800	.055	0.000	506.458	-.345	-.091	-.003	.018	.349	-.224	1.000
13.900	.055	0.000	506.257	-.444	-.076	-.020	.020	.349	-.227	1.000
14.000	.055	0.000	506.070	-.466	-.060	-.127	.015	.349	-.230	1.000
14.100	.054	0.000	505.957	-.302	-.114	-.197	.006	.349	-.233	1.000
14.200	.053	0.000	505.919	-.002	-.159	-.252	.001	.349	-.236	1.000
14.300	.052	0.000	505.906	.270	-.197	-.285	-.001	.349	-.239	1.000
14.400	.051	0.000	505.970	.421	-.230	-.319	-.016	.349	-.241	1.000
14.500	.050	0.000	506.248	.438	-.255	-.372	-.044	.349	-.245	1.000
14.600	.048	0.000	506.831	.366	-.267	-.441	-.076	.349	-.248	1.000
14.700	.046	0.000	507.744	.274	-.282	-.517	-.108	.349	-.252	1.000
14.800	.044	0.000	508.965	.211	-.293	-.591	-.137	.349	-.255	1.000
14.900	.042	0.000	510.450	.189	-.209	-.659	-.160	.349	-.259	1.000
15.000	.040	0.000	512.148	.196	-.165	-.718	-.179	.349	-.263	1.000
15.100	.037	0.000	514.018	.214	-.113	-.758	-.194	.349	-.266	1.000
15.200	.034	0.000	516.022	.228	-.058	-.810	-.205	.349	-.269	1.000
15.300	.031	0.000	518.124	.235	-.003	-.844	-.213	.349	-.271	1.000
15.400	.028	0.000	520.281	.234	.048	-.872	-.216	.349	-.273	1.000
15.500	.025	0.000	522.449	.230	.093	-.892	-.215	.349	-.275	1.000
15.600	.022	0.000	524.577	.226	.130	-.905	-.208	.349	-.276	1.000
15.700	.019	0.000	526.612	.222	.158	-.912	-.196	.349	-.277	1.000
15.800	.016	0.000	528.496	.219	.177	-.912	-.178	.349	-.278	1.000
15.900	.012	0.000	530.173	.216	.166	-.908	-.154	.349	-.278	1.000
16.000	.009	0.000	531.594	.213	.187	-.931	-.124	.349	-.278	1.000
16.100	.006	0.000	532.670	.209	.190	-.891	-.089	.349	-.278	1.000
16.200	.003	0.000	533.371	.205	.167	-.890	-.047	.349	-.278	1.000
16.300	-.000	0.000	533.626	.200	.150	-.868	.000	.349	-.278	1.000
16.400	-.003	0.000	533.379	.195	.131	-.858	.053	.349	-.278	1.000
16.500	-.006	0.000	532.574	.191	.110	-.849	.112	.349	-.278	1.000

16.700	-.009	0.000	531.162	.186	.091	-.142	.175	.349	-.279	1.000
17.000	-.017	0.000	529.098	.185	.073	-.037	.242	.349	-.280	1.000
17.300	-.015	0.000	526.348	.182	.059	-.035	.312	.349	-.281	1.000
17.600	-.016	0.000	522.882	.180	.049	-.035	.384	.349	-.283	1.000
17.900	-.021	0.000	518.685	.179	.043	-.038	.459	.349	-.285	1.000
18.200	-.024	0.000	513.746	.178	.042	-.043	.532	.349	-.287	1.000
18.500	-.027	0.000	508.000	.177	.046	-.049	.605	.349	-.290	1.000
18.800	-.030	0.000	501.669	.177	.055	-.057	.676	.349	-.293	1.000
19.100	-.033	0.000	494.569	.177	.067	-.064	.744	.349	-.296	1.000
19.400	-.036	0.000	486.605	.177	.083	-.070	.809	.349	-.299	1.000
19.700	-.039	0.000	478.425	.178	.102	-.075	.866	.349	-.303	1.000
20.000	-.042	0.000	469.488	.178	.122	-.078	.919	.349	-.307	1.000
20.300	-.046	0.000	460.062	.179	.144	-.078	.963	.349	-.312	1.000
20.600	-.049	0.000	450.229	.179	.166	-.075	.999	.349	-.316	1.000
20.900	-.052	0.000	440.079	.179	.187	-.059	1.026	.349	-.321	1.000
21.200	-.055	0.000	429.711	.179	.208	-.059	1.042	.349	-.326	1.000
21.500	-.058	0.000	419.238	.179	.228	-.046	1.046	.349	-.331	1.000
21.800	-.061	0.000	408.776	.179	.249	-.029	1.039	.349	-.337	1.000
22.100	-.064	0.000	398.452	.178	.270	-.007	1.018	.349	-.342	1.000
22.400	-.067	0.000	388.397	.178	.292	-.782	.984	.349	-.348	1.000
22.700	-.069	0.000	378.748	.178	.316	-.753	.937	.349	-.354	1.000
23.000	-.072	0.000	369.644	.177	.341	-.721	.875	.349	-.360	1.000
23.300	-.074	0.000	361.224	.177	.367	-.685	.800	.349	-.365	1.000
23.600	-.077	0.000	353.625	.176	.393	-.648	.711	.349	-.371	1.000
23.900	-.079	0.000	345.980	.174	.418	-.608	.609	.349	-.377	1.000
24.200	-.081	0.000	341.416	.173	.441	-.568	.495	.349	-.383	1.000
24.500	-.083	0.000	337.051	.170	.462	-.527	.369	.349	-.389	1.000
24.800	-.085	0.000	333.990	.168	.479	-.487	.235	.349	-.394	1.000
25.100	-.087	0.000	332.320	.166	.494	-.46	.092	.349	-.400	1.000
25.400	-.089	0.000	332.114	.164	.503	-.406	-.057	.349	-.405	1.000
25.700	-.090	0.000	333.429	.160	.509	-.367	-.211	.349	-.411	1.000
26.000	-.091	0.000	336.300	.157	.510	-.330	-.368	.349	-.416	1.000
26.300	-.093	0.000	340.744	.152	.507	-.293	-.525	.349	-.422	1.000
26.600	-.094	0.000	346.756	.147	.500	-.259	-.680	.349	-.428	1.000
26.900	-.095	0.000	354.310	.142	.489	-.227	-.832	.349	-.433	1.000
27.200	-.096	0.000	363.356	.137	.476	-.197	-.977	.349	-.439	1.000

TIME-SEC	DLATSTK-DGDPED-DG/S	LNQ-STK	ZEDT-CMD	INROT1-E	ZE-EAR-FI	YE-EAR-FI	XBODY-ER-EKBODY-ER-E2BODY-ER-F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.100	-0.000	0.000	-0.000	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.200	-0.000	0.000	-0.000	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.300	-0.000	0.000	-0.000	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.400	-0.000	19.996	-0.065	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.500	-0.000	19.996	-0.201	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.600	-0.02	19.996	-0.309	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.700	-0.19	19.996	-0.420	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.800	-0.60	19.996	-0.596	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.900	-0.131	19.996	-0.744	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.000	-0.237	19.996	-0.813	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.100	-0.379	19.996	-0.794	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.200	-0.555	19.996	-0.691	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.300	-0.761	19.996	-0.520	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.400	-0.993	19.996	-0.333	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.500	-1.247	19.996	-0.127	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.600	-1.515	19.996	0.074	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.700	-1.800	19.996	0.261	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.800	-2.100	19.996	0.429	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.900	-2.375	19.996	0.574	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.000	-2.578	19.996	0.696	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.100	-2.807	19.996	0.793	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.200	-3.009	19.996	0.866	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.300	-3.183	19.996	0.915	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.400	-3.324	19.996	0.946	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.500	-3.434	19.996	0.963	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.600	-3.511	19.996	0.971	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.700	-3.560	19.996	0.977	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.800	-3.581	19.996	0.986	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.900	-3.581	19.996	1.003	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.000	-3.563	19.996	1.033	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.100	-3.534	19.996	1.079	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.200	-3.500	19.996	1.145	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.300	-3.466	19.996	1.231	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.400	-3.430	19.996	1.339	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.500	-3.422	19.996	1.468	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.600	-3.423	19.996	1.616	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.700	-3.444	19.996	1.782	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.800	-3.489	19.996	1.962	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.900	-3.560	19.996	2.150	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.000	-3.657	19.996	2.342	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.100	-3.780	19.996	2.534	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.200	-3.920	19.996	2.719	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.300	-4.096	19.996	2.892	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.400	-4.263	19.996	3.046	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.500	-4.462	19.996	3.178	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.600	-4.682	19.996	3.293	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.700	-4.872	19.996	3.358	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.800	-5.036	19.996	3.404	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.900	-5.171	19.996	3.429	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.000	-5.293	19.996	3.435	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.100	-5.426	19.996	3.419	.527	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

5.200	-5.574	19.996	3.366	-1.133	.527	0.000	0.000	0.000	-19.659	-11.750
5.300	-5.737	19.996	3.266	-1.228	.527	0.000	0.000	0.000	-20.627	-11.401
5.400	-5.904	19.996	3.120	-1.300	.527	0.000	0.000	0.000	-20.610	-10.809
5.500	-6.065	19.996	2.936	-1.348	.527	0.000	0.000	0.000	-21.171	-10.250
5.600	-6.211	19.996	2.731	-1.372	.527	0.000	0.000	0.000	-21.681	-9.531
5.700	-6.336	19.996	2.519	-1.372	.527	0.000	0.000	0.000	-22.116	-8.792
5.800	-6.435	19.996	2.314	-1.351	.527	0.000	0.000	0.000	-22.662	-8.076
5.900	-6.507	19.996	2.123	-1.310	.527	0.000	0.000	0.000	-22.714	-7.411
6.000	-6.552	19.996	1.953	-1.252	.527	0.000	0.000	0.000	-22.872	-6.818
6.100	-6.573	19.996	1.809	-.177	.527	0.000	0.000	0.000	-22.945	-6.314
6.200	-6.575	19.996	1.695	-1.088	.527	0.000	0.000	0.000	-22.950	-5.916
6.300	-6.562	19.996	1.616	-.988	.527	0.000	0.000	0.000	-22.906	-5.639
6.400	-6.543	19.996	1.575	-.878	.527	0.000	0.000	0.000	-22.839	-5.496
6.500	-6.525	19.996	1.574	-.762	.527	0.000	0.000	0.000	-22.775	-5.494
6.600	-6.515	19.996	1.614	-.641	.527	0.000	0.000	0.000	-22.740	-5.432
6.700	-6.520	19.996	1.692	-.520	.527	0.000	0.000	0.000	-22.761	-5.907
6.800	-6.549	19.996	1.807	-.399	.527	0.000	0.000	0.000	-22.859	-6.307
6.900	-6.604	19.996	1.953	-.283	.527	0.000	0.000	0.000	-23.053	-6.819
7.000	-6.691	19.996	2.122	-.172	.527	0.000	0.000	0.000	-23.358	-7.425
7.100	-6.812	19.996	2.322	-.070	.527	0.000	0.000	0.000	-23.780	-8.106
7.200	-6.968	19.996	2.533	.023	.527	0.000	0.000	0.000	-24.323	-8.843
7.300	-7.158	19.996	2.754	.105	.527	0.000	0.000	0.000	-24.984	-9.612
7.400	-7.378	19.996	2.978	.174	.527	0.000	0.000	0.000	-25.755	-10.394
7.500	-7.627	19.996	3.199	.231	.527	0.000	0.000	0.000	-26.623	-11.168
7.600	-7.898	19.996	3.414	.276	.527	0.000	0.000	0.000	-27.571	-11.916
7.700	-8.187	19.996	3.616	.307	.527	0.000	0.000	0.000	-28.579	-12.623
7.800	-8.487	19.996	3.803	.326	.527	0.000	0.000	0.000	-29.624	-13.276
7.900	-8.790	19.996	3.972	.333	.527	0.000	0.000	0.000	-30.684	-13.864
8.000	-9.091	19.996	4.122	.317	.527	0.000	0.000	0.000	-31.753	-14.388
8.100	-9.383	19.996	4.251	.296	.527	0.000	0.000	0.000	-32.754	-14.839
8.200	-9.660	19.996	4.361	.269	.527	0.000	0.000	0.000	-33.719	-15.222
8.300	-9.916	19.996	4.452	.236	.527	0.000	0.000	0.000	-34.612	-15.548
8.400	-10.147	19.996	4.527	.206	.527	0.000	0.000	0.000	-35.418	-15.804
8.500	-10.349	19.996	4.590	.199	.527	0.000	0.000	0.000	-36.126	-16.021
8.600	-10.522	19.996	4.642	.159	.527	0.000	0.000	0.000	-36.728	-16.204
8.700	-10.663	19.996	4.688	.118	.527	0.000	0.000	0.000	-37.222	-16.365
8.800	-10.774	19.996	4.732	.076	.527	0.000	0.000	0.000	-37.607	-16.518
8.900	-10.854	19.996	4.776	.036	.527	0.000	0.000	0.000	-37.889	-16.672
9.000	-10.907	19.996	4.824	-.004	.527	0.000	0.000	0.000	-38.074	-16.839
9.100	-10.936	19.996	4.878	-.041	.527	0.000	0.000	0.000	-38.174	-17.028
9.200	-10.943	19.996	4.940	-.074	.527	0.000	0.000	0.000	-38.198	-17.244
9.300	-10.932	19.996	5.011	-.105	.527	0.000	0.000	0.000	-38.159	-17.492
9.400	-10.906	19.996	5.092	-.131	.527	0.000	0.000	0.000	-38.069	-17.713
9.500	-10.869	19.996	5.181	-.152	.527	0.000	0.000	0.000	-37.940	-18.005
9.600	-10.823	19.996	5.279	-.168	.527	0.000	0.000	0.000	-37.779	-18.427
9.700	-10.771	19.996	5.384	-.180	.527	0.000	0.000	0.000	-37.597	-18.793
9.800	-10.715	19.996	5.494	-.187	.527	0.000	0.000	0.000	-37.402	-19.177
9.900	-10.659	19.996	5.606	-.189	.527	0.000	0.000	0.000	-37.206	-19.570
10.000	-10.605	19.996	5.718	-.186	.527	0.000	0.000	0.000	-37.019	-19.960
10.100	-10.556	19.996	5.827	-.180	.527	0.000	0.000	0.000	-36.848	-20.339
10.200	-10.515	19.996	5.929	-.173	.527	0.000	0.000	0.000	-36.704	-20.696
10.300	-10.483	19.996	6.023	-.157	.527	0.000	0.000	0.000	-36.593	-21.023
10.400	-10.463	19.996	6.105	-.141	.527	0.000	0.000	0.000	-36.521	-21.310
10.500	-10.454	19.996	6.173	-.123	.527	0.000	0.000	0.000	-36.492	-21.568
10.600	-10.456	19.996	6.225	-.104	.527	0.000	0.000	0.000	-36.506	-21.729
10.700	-10.474	19.996	6.259	-.085	.527	0.000	0.000	0.000	-36.562	-21.848
10.800	-10.502	19.996	6.274	-.065	.527	0.000	0.000	0.000	-36.657	-21.901

10.900	-10.538	19.996	6.270	-.046	.527	0.000	0.000	0.000	0.000	-36.706	-21.007
11.000	-10.583	19.996	6.247	-.028	.527	0.000	0.000	0.000	0.000	-36.942	-21.006
11.100	-10.634	19.996	6.205	-.012	.527	0.000	0.000	0.000	0.000	-37.120	-21.661
11.200	-10.689	19.996	6.146	.002	.527	0.000	0.000	0.000	0.000	-37.312	-21.454
11.300	-10.747	19.996	6.071	.014	.527	0.000	0.000	0.000	0.000	-37.514	-21.192
11.400	-10.805	19.996	5.982	.023	.527	0.000	0.000	0.000	0.000	-37.710	-20.800
11.500	-10.863	19.996	5.880	.030	.527	0.000	0.000	0.000	0.000	-37.920	-20.525
11.600	-10.920	19.996	5.768	.033	.527	0.000	0.000	0.000	0.000	-38.118	-20.135
11.700	-10.974	19.996	5.649	.033	.527	0.000	0.000	0.000	0.000	-38.307	-19.717
11.800	-11.026	19.996	5.524	.031	.527	0.000	0.000	0.000	0.000	-38.488	-19.282
11.900	-11.076	19.996	5.396	.026	.527	0.000	0.000	0.000	0.000	-38.662	-18.835
12.000	-11.124	19.996	5.267	.019	.527	0.000	0.000	0.000	0.000	-38.830	-18.386
12.100	-11.171	19.996	5.140	.011	.527	0.000	0.000	0.000	0.000	-38.994	-17.942
12.200	-11.218	19.996	5.016	.000	.527	0.000	0.000	0.000	0.000	-39.159	-17.511
12.300	-11.267	19.996	4.898	-.011	.527	0.000	0.000	0.000	0.000	-39.329	-17.098
12.400	-11.318	19.996	4.787	-.022	.527	0.000	0.000	0.000	0.000	-39.509	-16.709
12.500	-11.374	19.996	4.684	-.034	.527	0.000	0.000	0.000	0.000	-39.702	-16.350
12.600	-11.435	19.996	4.591	-.044	.527	0.000	0.000	0.000	0.000	-39.915	-16.025
12.700	-11.502	19.996	4.508	-.054	.527	0.000	0.000	0.000	0.000	-40.150	-15.737
12.800	-11.577	19.996	4.437	-.062	.527	0.000	0.000	0.000	0.000	-40.411	-15.489
12.900	-11.660	19.996	4.378	-.068	.527	0.000	0.000	0.000	0.000	-40.701	-15.284
13.000	-11.752	19.996	4.332	-.072	.527	0.000	0.000	0.000	0.000	-41.023	-15.123
13.100	-11.853	19.996	4.299	-.074	.527	0.000	0.000	0.000	0.000	-41.376	-15.007
13.200	-11.964	19.996	4.280	-.074	.527	0.000	0.000	0.000	0.000	-41.764	-14.940
13.300	-12.086	19.996	4.277	-.071	.527	0.000	0.000	0.000	0.000	-42.187	-14.920
13.400	-12.219	19.996	4.291	-.066	.527	0.000	0.000	0.000	0.000	-42.651	-14.979
13.500	-12.364	19.996	4.324	-.058	.527	0.000	0.000	0.000	0.000	-43.159	-15.095
13.600	-12.519	19.996	4.370	-.050	.527	0.000	0.000	0.000	0.000	-43.699	-15.254
13.700	-12.680	19.996	4.423	-.040	.527	0.000	0.000	0.000	0.000	-44.261	-15.440
13.800	-12.846	19.996	4.487	-.030	.527	0.000	0.000	0.000	0.000	-44.839	-15.639
13.900	-13.017	19.996	4.539	-.021	.527	0.000	0.000	0.000	0.000	-45.436	-15.844
14.000	-13.191	19.996	4.596	-.014	.527	0.000	0.000	0.000	0.000	-46.044	-16.045
14.100	-13.357	19.996	4.654	-.010	.527	0.000	0.000	0.000	0.000	-46.625	-16.246
14.200	-13.513	19.996	4.713	-.007	.527	0.000	0.000	0.000	0.000	-47.160	-16.451
14.300	-13.667	19.996	4.770	-.006	.527	0.000	0.000	0.000	0.000	-47.708	-16.650
14.400	-13.832	19.996	4.830	-.006	.527	0.000	0.000	0.000	0.000	-48.281	-16.859
14.500	-14.011	19.996	4.886	-.010	.527	0.000	0.000	0.000	0.000	-48.907	-17.055
14.600	-14.207	19.996	4.935	-.019	.527	0.000	0.000	0.000	0.000	-49.591	-17.198
14.700	-14.415	19.996	4.935	-.033	.527	0.000	0.000	0.000	0.000	-50.317	-17.225
14.800	-14.628	19.996	4.911	-.049	.527	0.000	0.000	0.000	0.000	-51.061	-17.142
14.900	-14.839	19.996	4.854	-.067	.527	0.000	0.000	0.000	0.000	-51.798	-16.964
15.000	-15.041	19.996	4.767	-.086	.527	0.000	0.000	0.000	0.000	-52.503	-16.642
15.100	-15.228	19.996	4.654	-.104	.527	0.000	0.000	0.000	0.000	-53.157	-16.246
15.200	-15.396	19.996	4.517	-.122	.527	0.000	0.000	0.000	0.000	-53.741	-15.769
15.300	-15.540	19.996	4.359	-.139	.527	0.000	0.000	0.000	0.000	-54.246	-15.217
15.400	-15.660	19.996	4.183	-.152	.527	0.000	0.000	0.000	0.000	-54.665	-14.600
15.500	-15.755	19.996	3.990	-.163	.527	0.000	0.000	0.000	0.000	-54.995	-13.926
15.600	-15.825	19.996	3.784	-.172	.527	0.000	0.000	0.000	0.000	-55.241	-13.200
15.700	-15.874	19.996	3.568	-.178	.527	0.000	0.000	0.000	0.000	-55.409	-12.455
15.800	-15.903	19.996	3.346	-.179	.527	0.000	0.000	0.000	0.000	-55.511	-11.680
15.900	-15.917	19.996	3.120	-.177	.527	0.000	0.000	0.000	0.000	-55.561	-10.892
16.000	-15.921	19.996	2.894	-.173	.527	0.000	0.000	0.000	0.000	-55.574	-10.100
16.100	-15.919	19.996	2.667	-.159	.527	0.000	0.000	0.000	0.000	-55.567	-9.311
16.200	-15.916	19.996	2.443	-.142	.527	0.000	0.000	0.000	0.000	-55.557	-8.528
16.300	-15.917	19.996	2.221	-.121	.527	0.000	0.000	0.000	0.000	-55.561	-7.754
16.400	-15.926	19.996	2.002	-.094	.527	0.000	0.000	0.000	0.000	-55.592	-6.980
16.500	-15.946	19.996	1.785	-.062	.527	0.000	0.000	0.000	0.000	-55.663	-6.230

16.600	-15.982	19.996	1.569	-.024	.527	0.000	0.000	0.000	0.000	-55.787	-5.476
16.700	-16.034	19.996	1.353	.018	.527	0.000	0.000	0.000	0.000	-55.970	-4.722
16.800	-16.105	19.996	1.135	.065	.527	0.000	0.000	0.000	0.000	-56.219	-3.964
16.900	-16.197	19.996	.915	.116	.527	0.000	0.000	0.000	0.000	-56.537	-3.195
17.000	-16.308	19.996	.690	.172	.527	0.000	0.000	0.000	0.000	-56.926	-2.410
17.100	-16.440	19.996	.459	.231	.527	0.000	0.000	0.000	0.000	-57.386	-1.603
17.200	-16.591	19.996	.221	.292	.527	0.000	0.000	0.000	0.000	-57.914	-.772
17.300	-16.761	19.996	-.026	.355	.527	0.000	0.000	0.000	0.000	-58.508	.089
17.400	-16.945	19.996	-.281	.420	.527	0.000	0.000	0.000	0.000	-59.163	.982
17.500	-17.153	19.996	-.546	.485	.527	0.000	0.000	0.000	0.000	-59.877	1.908
17.600	-17.373	19.996	-.821	.549	.527	0.000	0.000	0.000	0.000	-60.644	2.861
17.700	-17.607	19.996	-1.104	.611	.527	0.000	0.000	0.000	0.000	-61.461	3.855
17.800	-17.855	19.996	-1.396	.671	.527	0.000	0.000	0.000	0.000	-62.325	4.873
17.900	-18.115	19.996	-1.695	.728	.527	0.000	0.000	0.000	0.000	-63.235	5.916
18.000	-18.389	19.996	-1.999	.780	.527	0.000	0.000	0.000	0.000	-64.190	6.979
18.100	-18.676	19.996	-2.308	.826	.527	0.000	0.000	0.000	0.000	-65.190	8.057
18.200	-18.975	19.996	-2.620	.866	.527	0.000	0.000	0.000	0.000	-66.234	9.145
18.300	-19.285	19.996	-2.932	.898	.527	0.000	0.000	0.000	0.000	-67.318	10.235
18.400	-19.605	19.996	-3.244	.922	.527	0.000	0.000	0.000	0.000	-68.434	11.323
18.500	-19.932	19.996	-3.552	.936	.527	0.000	0.000	0.000	0.000	-69.576	12.399
18.600	-20.264	19.996	-3.855	.941	.527	0.000	0.000	0.000	0.000	-70.736	13.457
18.700	-20.600	19.995	-4.151	.934	.527	0.000	0.000	0.000	0.000	-71.906	14.490
18.800	-20.936	19.996	-4.437	.917	.527	0.000	0.000	0.000	0.000	-73.081	15.488
18.900	-21.272	19.996	-4.711	.887	.527	0.000	0.000	0.000	0.000	-74.253	16.446
19.000	-21.606	19.996	-4.972	.846	.527	0.000	0.000	0.000	0.000	-75.418	17.357
19.100	-21.937	19.996	-5.218	.792	.527	0.000	0.000	0.000	0.000	-76.574	18.215
19.200	-22.264	19.996	-5.448	.727	.527	0.000	0.000	0.000	0.000	-77.717	19.016
19.300	-22.588	19.996	-5.660	.650	.527	0.000	0.000	0.000	0.000	-78.848	19.757
19.400	-22.909	19.996	-5.854	.561	.527	0.000	0.000	0.000	0.000	-79.968	20.435
19.500	-23.227	19.996	-6.029	.462	.527	0.000	0.000	0.000	0.000	-81.078	21.047
19.600	-23.544	19.996	-6.186	.353	.527	0.000	0.000	0.000	0.000	-82.183	21.592
19.700	-23.858	19.996	-6.323	.236	.527	0.000	0.000	0.000	0.000	-83.286	22.071
19.800	-24.177	19.996	-6.442	.112	.527	0.000	0.000	0.000	0.000	-84.393	22.485
19.900	-24.497	19.996	-6.542	-.018	.527	0.000	0.000	0.000	0.000	-85.510	22.837
20.000	-24.821	19.996	-6.626	-.152	.527	0.000	0.000	0.000	0.000	-86.642	23.129
20.100	-25.151	19.996	-6.694	-.289	.527	0.000	0.000	0.000	0.000	-87.794	23.367

TIME-SEC IRCS

0.000 1689.629
.100 1689.629
.200 1689.630
.300 1689.630
.400 6701.712
.500 7140.435
.600 4373.392
.700 2235.692
.800 1898.791
.900 1943.157
1.000 1946.304
1.100 2079.196
1.200 2156.396
1.300 2165.939
1.400 2133.973
1.500 2092.276
1.600 2059.965
1.700 2040.089
1.800 2029.641
1.900 2027.521
2.000 2621.833
2.100 2009.584
2.200 1992.986
2.300 1974.509
2.400 1955.797
2.500 1937.612
2.600 1920.197
2.700 1903.656
2.800 1886.161
2.900 1873.987
3.000 1861.449
3.100 1850.824
3.200 1842.311
3.300 1836.010
3.400 1831.947
3.500 1833.097
3.600 1830.344
3.700 1832.506
3.800 1836.412
3.900 1841.928
4.000 1848.789
4.100 1856.667
4.200 1865.31
4.300 1874.97
4.400 1883.571
4.500 1892.761
4.600 1907.593
4.700 1937.663
4.800 1991.287
4.900 2070.236
5.000 2143.540
5.100 2184.170

5.200 2172.871
5.300 2124.737
5.400 2074.983
5.510 2050.188
5.600 2052.444
5.700 2069.635
5.800 2085.795
5.900 2093.308
6.000 2091.903
6.100 2084.932
6.200 2075.902
6.300 2066.761
6.400 2057.954
6.500 2049.126
6.600 2039.841
6.700 2029.967
6.800 2019.710
6.900 2009.455
7.000 1999.609
7.100 1990.472
7.200 1982.201
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7.400 1968.460
7.500 1963.014
7.600 1958.515
7.700 1954.948
7.800 1952.272
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8.000 1949.307
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8.200 1948.841
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8.400 1949.920
8.500 1950.743
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8.700 1952.439
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9.000 1953.981
9.100 1954.037
9.200 1953.825
9.300 1953.343
9.400 1952.603
9.500 1951.663
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10.800 1901.309

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11.100 1080.160
11.200 1073.175
11.300 1066.264
11.400 1059.422
11.500 1052.666
11.600 1046.001
11.700 1039.421
11.800 1032.908
11.900 1026.441
12.000 1020.001
12.100 1013.560
12.200 1007.131
12.300 1000.682
12.400 994.219
12.500 987.766
12.600 981.265
12.700 974.790
12.800 968.332
12.900 961.915
13.000 955.579
13.100 949.436
13.200 943.264
13.300 937.315
13.400 931.349
13.500 925.268
13.600 919.424
13.700 913.002
13.800 907.314
13.900 901.889
14.000 896.639
14.100 891.061
14.200 885.460
14.300 879.844
14.400 874.911
14.500 869.860
14.600 864.813
14.700 859.700
14.800 854.717
14.900 849.749
15.000 844.815
15.100 839.734
15.200 834.613
15.300 829.502
15.400 824.150
15.500 818.562
15.600 813.214
15.700 807.973
15.800 802.770
15.900 797.694
16.000 792.169
16.100 787.072
16.200 781.370
16.300 775.130
16.400 769.407
16.500 764.250

16.600 1903.807
 16.700 1903.030
 16.800 1901.986
 16.900 1900.714
 17.000 1899.257
 17.100 1897.664
 17.200 1895.987
 17.300 1894.276
 17.400 1892.585
 17.500 1890.966
 17.600 1889.474
 17.700 1888.163
 17.800 1887.091
 17.900 1886.316
 18.000 1885.901
 18.100 1885.907
 18.200 1886.403
 18.300 1887.462
 18.400 1889.159
 18.500 1891.566
 18.600 1894.741
 18.700 1898.724
 18.800 1903.539
 18.900 1909.189
 19.000 1915.662
 19.100 1922.930
 19.200 1930.955
 19.300 1939.758
 19.400 1949.326
 19.500 1959.541
 19.600 1970.258
 19.700 1981.348
 19.800 1992.677
 19.900 2004.174
 20.000 2015.734
 20.100 2027.254

ORIGINAL PAGE IS
OF POOR QUALITY

C M

NPTS= 202
 NOUT= 82
 NTAP= 4

APPENDIX F

EXAMPLE 3 (WIF . TUNNEL DATA) OUTPUT

69 NEQS

5 0 NTAP, NTAP4

DIVISION OF R-ARRAY

I NR(I) LENGTH(I)

1	0	7
2	7	69
3	76	69
4	145	17
5	162	19
6	181	91
7	272	29
8	301	18
9	319	34
10	353	27
11	383	19
12	399	15
13	414	1
14	415	17
15	432	206
16	636	225
17	863	186
18	1011	6
19	1017	54
20	1071	33
21	1104	21
22	1125	28
23	1153	31
24	1184	44
25	1228	11
26	1239	35
27	1274	73
28	1347	76
29	1423	67
30	1490	133
31	1623	12
32	1635	72
33	1707	250
34	1957	250
35	2207	250
36	2457	250
37	2707	250
38	2957	250
39	3207	26
40	3233	50
41	3263	10
42	3233	26
43	3321	161
44	3482	103
45	3585	170

ORIGINAL PAGE IS
OF POOR QUALITY

1	1	1.0000	TIME-SEC
3	1	1.0000	U-FT/SEC
3	2	1.0000	V-FT/SEC
3	3	1.0000	W-FT/SEC
3	4	57.29580	P-DFG/SEC
3	5	57.29580	Q-DEG/SEC
3	6	57.29580	R-DFG/SEC
29	66	57.29580	RS-NEG/SEC
29	67	57.29580	PS-DEG/SEC
2	16	1.00000	XEOT-FT/S
2	17	1.00000	YEOT-FT/S
2	18	1.00000	ZEOT-FT/S
3	16	1.00000	XE-FT
3	17	1.00000	YE-FT
3	18	1.00000	ZE-FT
3	64	57.29580	THETA-DEG
3	65	57.29580	PHI-DEG
3	66	57.29580	PSI-DEG
29	32	1.00000	O11
29	33	1.00000	O12
29	34	1.00000	O13
29	35	1.00000	O21
29	36	1.00000	O22
29	37	1.00000	O23
29	38	1.00000	O31
29	39	1.00000	O32
29	40	1.00000	O33
29	50	57.29580	DEC-DEG
29	52	57.29580	DAC-DEG
3	15	57.29580	L-ELEV-DEG
3	20	57.29580	R-ELEV-DEG
3	21	57.29580	OR-DEG
3	24	57.29580	PSIT-DEG
3	26	57.29580	THIT-DEG
3	28	1.00000	RCS NORM.
3	48	57.29580	CAN.FLP-DG
3	49	57.29580	WMS.FLP-DG
29	9	59200	VA-KT
29	13	57.29580	ALPHA-DEG
29	14	57.29580	BETA-DEG
29	54	1.00000	NYCG-G
29	55	1.00000	NYCG-G
29	56	1.00000	NZCG-G
28	20	1.00000	JROLL
28	29	1.00000	DYAM
28	38	1.00000	DPITCH
28	58	1.00000	FCHD-LB
28	34	1.00000	TOW-LB
25	1	1.00000	WGT-LB/S
25	3	1.00000	RPM-RAD/S
25	7	1.00000	BLOAVL
25	19	1.00000	BLOFEQ
3	52	57.29580	PHIT-M-DEG
3	53	57.29580	P-INTE-DEG
3	54	1.00000	P-ERP-INT
3	55	57.29580	PSITRM-DEG

74

3	56	57.29580	R.INTE-DEG						
3	57	1.00000	R.ERR.INT						
3	58	57.29580	PSITRM-BUT						
3	59	57.29580	TMETRM-DEG						
3	60	57.29580	Q.INTE-DEG						
3	61	1.00000	Q.ERR.INT.						
3	62	57.29580	TMETRM-BUT						
3	63	1.00000	ZE.ERR.INT						
28	19	57.29580	P.ERR-DG/S						
28	26	57.29580	R.ERR-DG/S						
28	35	57.29580	Q.ERR-DG/S						
28	40	1.00000	ZE.ERR-F/S						
28	12	1.00000	ROLLCMD						
28	21	1.00000	YAWCMD						
28	11	1.00000	CON.SYS-SM						
28	13	57.29580	OLATSTK-DG						
28	22	57.29580	OPED-DG/S						
28	31	57.29580	LN2-STK.						
28	39	1.00000	ZDET.CMD.						
28	43	1.00000	THROTTLE						
28	1	1.00000	ZE.EPR-FI						
28	3	1.00000	YE.EPR-FI						
28	8	1.00000	XBODY.ER-F						
28	9	1.00000	YBODY.ER-F						
28	10	1.00000	ZBODY.ER-F						
28	20	1.00000	TRCS						
0	0	0.00000	BLANK CARD-END TIME HISTORY OUTPUT SPECIFICATIONS						

V NJUT = 82

STORE FIXED TABLES ETC.

16375.00000	6	5	WT,IX,IY,IZ,IXZ						0.00000
	6	7959.00000	52609.00000	58337.00000	-202.40000				
	6	9	FSCG,BLCJ,MLCC						.00333
401.50000	5	0.00000	99.00000						
	5	19	TOL(I)-TRIM TOLERANCES						
.50000	1	.50000	.50000	1.00000	1.00000				0.00000
.10000		.10000	.02000	.02000	.02000				1.00000
0.00000		0.00000	0.00000						.50000
	1	6	70 AAERO,AERJ(I),J)-AERO LIFT-ORAG CONSTANTS						0.00000
0.00000		2.30000	2.14000	350.00000	217.20000				.78900
1.06000		.59300	5.04500	.00394	.25300				.97400
-.34300		.09180	-.08590	.30400	.00502				-.01910
2.25000		.99600	115.80000	51.10000	.93400				1.04700
.51500		6.04500	.00281	.44200	.10650				.06650
0.00000		0.00000	0.00000	0.00000	0.00000				0.00000
2.00000		60.00000	60.00000	.78500	.92500				.30000
6.04500		.00431	.17900	0.00000	0.00000				0.00000
0.00000		0.00000	0.00000	0.00000	0.00000				0.00000
	5	71	6	73	SJRFOP(I),J)				
.57100		.17500	.73400	.49500	.72700				.60000
.97500									.74900
440.00000	7	1	6	FSM,BLM1,B.W2,MLM					.08 3
	7	-70.00000	70.00000	99.00000					
	7	5	7	9	CH,DM,EKDA1,EKDA2,EIM				0.00000

14.50000	26.30000	0.00000	0.00000	0.00000	0.00000	0.00000
7 10	7 13	CLBOM,CLBCLM,CLRCLA,CLPA				0.00000
0.00000	-23500	-27500	19200			
7 14	7 19	C430M,CNCL2M,CNRCL2M,CNRCOM,CNRCPLM,CNRCJAA				0.00000
0.00000	-13200	-16600	-45300			0.00000
7 20	7 21	C40M,CMDFM				0.00000
0.00000	-01910					0.00000
7 22	7 22	AEKEL				0.00000
7.00000						0.00000
7 23	7 23	CY0CL2M				0.00000
-30000						.00333
312.50000	0.00000	115.00000				0.00000
4 0	0 0	CM,0M,EKAD,EIM,E0CLM				0.00000
6.42000	16.13000	0.00000	.16200			0.00000
0 9	0 10	CMDFM,CMDH				0.00000
-05730	0.00000					.00333
536.00000	0.00000	157.00000				0.00000
9 4	9 9	CV,0V,EKAD0,EIV,EKV,CH0V				0.00000
0.45700	7.75000	.50000	0.00000			0.00000
7.00000	9 10	AEKRUD				0.00000
9 11	9 20	TALFA (I)				.01745
-180.00000	20.00000	30.00000	40.00000	50.00000	100.00000	150.00000
160.00000	180.00000					0.00000
10.00000	9 21	AALFA				0.00000
1.00000	9 31	TVEFF (I)				0.00000
1.00000	1.00000	.70000	.25000	0.00000	.25000	.70000
174.00000	10 3	FSF,0LF,ALF				.00333
10 6	10 10	A0Q0,30Q1X,M0Q0M,M0Q0K1,M0Q0K2				0.00000
1.44300	367.80000	367.80000	532.00000	-110.60000	532.00000	-110.60000
10 11	10 13	A0F,ALF,02F				.01745
2.00000	00.00000	90.00000				0.00000
10 14	10 20	EN1,EN2,EN3,EN4,EN5,EN6,EN7				0.00000
2.00000	1.06700	1.52200	.60000	1.00000	.60000	1.00000
17.00000	10 21	DFSF0				0.00000
10 22	10 23	ADFSF1,ADFSF2				0.00000
.26200	.60300					0.00000
10 24	10 24	XKYF				0.00000
0.00000						0.00000
551.00000	11 6	FSSM1,FSSM2,RLSM1,RLSM2,MLSM1,MLSM2				.00333
11 7	11 11	SIGY ELN,KAF1,KAF2,AFNG				0.00000
0.00000	4.26000	-13000	1.00000	2.00000		
266.00000	6	FSIN1,FSIN2,RLIN1,RLIN2,MLIN1,MLIN2				.00333
12 7	12 9	RINLET,ADVI,TURN				0.00000
4.31000	5.00000	5.00000				0.00000
13 1	13 1	ELDUCT				.00333
335.00000						0.00000
14 1	14 5	AMACH,K0T1,K0T2,K41,K42				0.00000
4.00000	-02760	1.00000	.56500	.43500		

14	6	14	8	OMEGMX,RPMM,RCS	0.00000
1063.90000	10159.00000	1.00000			
14	9	14	10	AFRAT,JENG	0.90000
6.00000	3.14300				
14	11	14	14	AFRAC,TAJAB,ABACCEL,ABDECEL	0.00000
6.00000	0.05000	20.00000	-20.00000		
14	15	14	16	TABON,TA3OFF	0.00000
0.0000	0.00100				
15	1	15	3	ARCSJET,BLDR,BLDREF,	0.00000
2.00000	6.00000	3.50000			
15	4	15	5	FRCSMX1,FRCSMX2	0.00000
1500.00000	1500.00000				
15	14	15	15	DEMANDI,JEMAND2	0.00000
1.00000	1.00000				
15	24	15	25	BDMORI,BDMORZ	0.00000
1.00000	1.00000				
15	34	15	35	KCSL(1,1),PCSL(2,1)	0.00000
-1.00000	1.00000				
15	94	15	95	FRCS1,FRCS2	0.0333
534.00000	534.00000				
15	94	15	95	BLRCS1,BLRCS2	0.0333
-160.00000	160.00000				
15	104	15	105	MLRCS1,M-RCS2	0.0333
100.00000	100.00000				
15	114	15	115	THRCS1,THRCS2	0.1745
-90.00000	-90.00000				
15	124	15	125	PSIRCS1,PSIRCS2	0.1745
0.00000	0.00000				
16	13	16	13	CSV	0.00000
0.26000					
16	14	16	14	VAS4	1.60000
60.00000					
16	66	16	69	PELIM,AKOYDR,KTHTR,KDA	0.00000
1.00000	0.00000	0.00000	-0.43600		
16	110	16	113	PELIM,AKYTRM,KPSIT,KDR	0.00000
1.00000	0.34900	-26200	-0.43600		
16	114	16	119	TAKAY(I)-LAT,ACCEL,FOBACK TABLE	0.00000
0.00000	0.00000	0.0250	0.10500		
16	122	16	122	KTY	0.00000
0.00000					
16	163	16	167	GELIM,AKPTRM,DSTK,KDE,KTHTP	0.00000
1.00000	0.34900	10.00000	-0.43600		
16	194	16	194	AKTHROT	0.00000
30000.00000					
15	185	16	185	ZELIM	0.00000
30000.00000					
15	186	16	188	ELEVNR,PSITRF(I)	0.00000
0.00000	0.00000	0.00000			
15	199	16	192	KMFLAP1,KMFLAP2,KMFLAP1,KMFLAP2	0.00000
5.56000	-1.10400	6.17000	-0.16900		
16	193	16	193	WBAR	0.00000
7.00000					
15	194	16	199	TBAR(I)-DYNAMIC PRESSURE TABLE	0.00000
0.00000	9.95000	10.00000	20.00000	46.00000	127.00000
17	1	17	4	LEJRATL,LELRATL,LEUPOS1,LEUPOS1	0.1745
35.00000	-35.00000	60.00000	-50.00000		
17	5	17	5	IJEL	0.00000

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.05000	17	9	REURATL,RELATL,REUPOS,RELPOS	.01745
35.00000	17	10	TREL	0.00000
.05000	17	11	DRURATL,DRLRATL,DRUPOS,DRLPOS	.01745
100.00000	17	15	TOR	0.00000
.05000	17	16	MFURATL,MFLRATL,MFLAPX,MFLAPH	.01745
10.00000	17	20	TFH	0.00000
.10000	17	21	MFJURATL,MFLRATL,MFLAPX,MFLAPH	.01745
10.00000	17	25	TFH	0.00000
.10000	17	26	33 TMTURL(2),TMTJPL(2),TMTLPL(2)	.01745
50.00000	17	34	35 TMT(2)	15.00000
.05000	17	36	43 PSJURL(2),PSJLRL(2),PSJLPL(2)	0.00000
50.00000	17	44	45 TPSJIT(2)	15.00000
.05000	17	46	RCSURL(2)	0.00000
10.00000	17	56	RCSLRL(2)	0.00000
-10.00000	17	66	RCSURL(2)	0.00000
1.00000	17	76	RCSLPL(2)	0.00000
-1.00000	17	86	TAJRES(2)	0.00000
.05000	17	96	FRCURL(2)	0.00000
1500.00000	17	106	FRCURL(2)	0.00000
-1500.00000	17	116	FRCURL(2)	0.00000
1500.00000	17	126	FRCURL(2)	0.00000
-1500.00000	17	136	TAUFOS(2)	0.00000
.05000	17	146	DELIM,DALIM,ORLIM	.01745
25.00000	30	5	VOVITI(1)-VOVI TABLE FOR RAM F + M	0.00000
0.00000	30	6	11 ATURN(I)-ATURN TABLE FOR RAM F + M	.01745
0.00000	30	14	43 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	100.00000
0.00000	30	16	44 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	.00000
.23400	30	17	45 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	1.70000
3.43300	30	18	46 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	1.04200
3.56400	30	19	47 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	4.07000
	30	20	48 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	3.01000
	30	21	49 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	3.56400
	30	22	50 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	.69300
	30	23	51 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	4.54000
	30	24	52 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	3.56400
	30	25	53 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	26	54 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	27	55 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	28	56 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	29	57 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	30	58 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	31	59 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	32	60 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	33	61 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	34	62 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	35	63 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	36	64 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	37	65 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	38	66 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	39	67 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	40	68 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	41	69 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	42	70 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	43	71 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	44	72 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	45	73 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	46	74 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	47	75 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	48	76 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	49	77 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	50	78 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	51	79 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	52	80 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	53	81 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	54	82 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	
	30	55	83 ELRMT(I,J)-MOMENT ARM TABLE FOR RAM F + M	.01705

0.00000	0.00000	0.00000	8.00000	0.00000	12.91000	12.91000	7.72000
5.00000	5.00000	19.47000	19.47000	12.61000	11.59000	11.59000	15.65000
15.65000	12.11000	11.59000	11.59000	8.64000	8.64000	6.83000	12.59000
12.59000	8.64000	6.83000	6.83000	12.59000	12.59000	0.00000	
30	94	30	123	START(I,J)-PAM EFFIC. FACTOR TABLE			
1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
1.00000	1.00000	1.19500	1.19500	1.12700	1.01600	1.01600	1.37200
1.37200	1.23400	1.09200	1.09200	1.40200	1.40200	1.26300	1.10600
1.10600	1.40200	1.40200	1.40200	1.10600	1.10600		
31	1	31	6	FOCST(I)-AVAIL. RCS FORCE TABLE			
0.00000	0.01000	170.00000	365.00000	500.00000	875.00000	0.00000	
31	7	31	12	BLORT(I)- RCS BLEED TABLE			
0.00000	3.50000	4.50000	10.00000	15.00000	30.00000	8.00000	
32	1	32	6	MNT(I)-MACH TABLE FOR PROPUSSION SYSTEM			
0.00000	0.10000	0.20000	0.30000	0.00000	0.00000	0.00000	
32	5	32	6	TFGMAX(I)-MAX A/B THRUST TABLE			
15416.00000	15705.00000	16162.00000	16705.00000	16705.00000	9.00000	9.00000	
32	9	32	12	TFGMIN(I)-MIN A/B THRUST TABLE			
9323.00000	9431.00000	9772.00000	10105.00000	10105.00000	0.00000	0.00000	
32	13	32	16	JFGIDL(I)-IDLE THRUST TABLE			
629.00000	753.00000	1004.00000	1306.00000	1306.00000	0.00000	0.00000	
32	17	32	20	THOT(I)-MAX, FLOW RATE TABLE			
138.20000	140.10000	143.10000	146.50000	146.50000	0.00000	0.00000	
32	21	32	26	TFRAT(I)- FG/FGMIN TABLE			
0.00000	0.20000	0.40000	0.60000	0.00000	1.00000	1.00000	
32	27	32	32	TRPM(I)- FRAC. RPM TABLE			
0.00000	0.20000	0.40000	0.65000	0.65000	1.00000	1.00000	
32	33	32	38	JFRACT(I)- FRACTIONAL THRUST TABLE			
0.00000	0.13330	0.20000	0.33330	0.66670	1.00000	1.00000	
32	43	32	44	TACCEL(I)-ACCELERATION LIMIT TABLE			
0.00000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
32	53	32	58	TOECEL(I)- DECELERATION LIMIT TABLE			
-0.10000	-0.40000	-0.47500	-0.62500	-1.00000	-1.00000	0.00000	
32	63	32	68	TENG(I)-ENGINE TIME CONSTANT			
1.00000	0.50000	0.40000	0.30000	0.20000	0.20000	0.20000	
39	1	39	23	ADER,DELV(I)			
22.00000	5.00000	5.00000	0.10000	0.1745	0.1745	0.1745	0.65000
0.53000	100.00000	100.00000	0.1745	0.1745	5.00000	0.10000	0.10000
0.1745	0.1745	0.05000	0.05000	0.50000	0.1745	0.1745	
42	1	42	7	ELEV(I)-ELEVON TABLE			
0.00000	10.00000	20.00000	30.00000	40.00000	60.00000	100.00000	
42	8	42	14	EKELET(I)-ELEVON EFFECTIVENESS TABLE			
1.00000	1.00000	0.77000	0.59000	0.53000	0.45000	0.45000	
42	15	42	21	RUDT(I)-RUDDER TABLE			
0.00000	10.00000	20.00000	30.00000	40.00000	60.00000	100.00000	
42	22	42	28	EKRUDT(I)-RUDDER EFFECTIVENESS TABLE			
1.00000	1.00000	0.82000	0.62000	0.55000	0.47000	0.47000	
44	1	44	3	ACSSM,TCSS#1			
2.00000	0.09000	1.00000	1.00000	0.00000	0.00000	0.00000	
44	7	44	8	TAKS			
1.00000	1.00000	1.00000	1.00000	0.00000	0.00000	0.00000	
44	12	44	13	TKPINT			
0.00000	1.00000	1.00000	1.00000	0.00000	0.00000	0.00000	
44	17	44	18	TKPHI			
1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
44	22	44	23	TKPB			
0.00000	1.00000	1.00000	1.00000	0.00000	0.00000	0.00000	

44	27	44	26	TKPS	0.00000	
1.00000	44	32	44	33	TKQINT	0.00000
0.00000	44	37	44	38	TKTHEYA	0.00000
1.00000	44	42	44	43	TKRINT	0.00000
0.00000	44	47	44	48	TKPSI	0.00000
0.00000	44	52	44	53	TKRB	0.00000
0.00000	44	57	44	58	TAKPCI	0.00000
1.00000	44	62	44	63	TAKPEI	0.00000
1.00000	44	67	44	68	TAKRCI	0.00000
0.00000	44	72	44	73	TAKREI	0.00000
1.00000	44	77	44	78	TAKQCI	0.00000
1.00000	44	82	44	83	TAKQEI	0.00000
1.00000	44	87	44	88	TKRS	0.00000
1.00000	44	92	44	92	AKPHRS	0.00000
1.00000	45	1	45	1	VELGAIN	0.00000
1.00000	45	2	45	2	AVEL	0.00000
6.00000	45	3	45	8	TVEL	1.60000
0.00000	45	11	45	16	VAKPC	60.00000
.30000	45	19	45	24	VKPCI1	60.00000
1.00000	45	27	45	32	VKPEI1	120.00000
.60000	45	35	45	40	VKP	200.00000
.50000	45	43	45	45	VAKPE	0.00000
6.00000	45	51	45	56	VAKRC	0.00000
1.00000	45	59	45	64	VKRC	0.00000
0.00000	45	67	45	72	VKREI1	0.00000
.60000	45	75	45	80	VKQ	0.00000
.50000	45	83	45	88	VAKRE	0.00000
13.00000	45	91	45	96	VAKQC	0.00000
1.00000	45	99	45	104	VKQCI1	0.00000

01-4

0.00000	0.00000	1.00000	1.00000	1.00000	1.00000	1.00000
45 107	45 112	VKQEI1				0.00000
.20000	.20000	.20000	.20000	.20000	.20000	0.00000
45 115	45 120	VKQ				0.00000
.50000	.50000	.50000	.50000	.50000	.50000	0.00000
45 123	45 128	VAKQE				0.00000
10.00000	10.00000	15.00000	15.00000	15.00000	15.00000	5.00000
45 131	45 136	VAKZF				0.00000
-500.00000	-500.00000	0.00000	0.00000	0.00000	0.00000	0.00000
45 139	45 144	VKZEI1				0.00000
.20000	.20000	0.00000	0.00000	0.00000	0.00000	0.00000
45 147	45 152	VPITC				0.00000
.25000	.25000	0.00000	0.00000	0.00000	0.00000	0.00000
45 155	45 160	VTROLL				0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
45 163	45 168	VTYAN				0.00000
.25000	.25000	0.00000	0.00000	0.00000	0.00000	0.00000
0	0	0	0	0	0	0.00000

NOPT=7 READ VARIABLE OUTPUT FORMATS

(10X,32HDRAG COEFFICIENT BUILDUP)
(10X,32HSIDE FORCE COEFFICIENT BUILDUP)
(10X,32HLIFT COEFFICIENT BUILDUP)
(10X,32ROLL MOMENT COEFFICIENT BUILDUP)
(10X,32PITCH MOMENT COEFFICIENT BUILDUP)
(10X,32HYAJ MOMENT COEFFICIENT BUILDUP)
(10X,32SUMMARY OF TOTAL COEFFICIENTS)
(14X,5HALPHA,10Y5HBETA,10X5HWING,10X5HH.T,10X5HFUS,10X5HTOTAL)
(5X,7F14.6)
(14X,5HALPHA,10X4HBETA,13X2MCD,13X2MCL,13X2MCR,13X2MCM,13X2MCN)
(5X,8F14.6)
(5X,8F14.6)

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NOPT=2 READ R

NTA= 5

3	48	3	49	DFLAPH,DFLAPH	.01745
25.00000	30.00000				
13	47	19	48	DA1,DA2	.01745
-10.00000					

NOPT=11 SIMULATED WIND TUNNEL RUNS

DRAG COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.00000	0.00000	.045867	.013578	.000739	.004123	.064387
5.00000	0.00000	.037131	.013768	.000730	.005989	.057610
10.00000	0.00000	.050261	.016143	.000706	.014103	.081212
15.00000	0.00000	.086434	.022319	.000666	.031798	.141210
20.00000	0.00000	.135670	.035206	.000613	.063589	.235878
25.00000	0.00000	.184423	.050550	.000467	.109322	.352763
30.00000	0.00000	.227844	.074164	.000336	.168909	.491252
35.00000	0.00000	.273605	.104142	.000193	.241322	.659261
40.00000	0.00000	.319977	.146142	.000083	.324699	.870669
45.00000	0.00000	.360699	.201670	.000033	.416461	1.050052
50.00000	0.00000	.451840	.265543	0.000000	.513455	1.230038
55.00000	0.00000	.521969	.264654	0.000000	.612123	1.398746
60.00000	0.00000	.584472	.256842	0.000000	.708678	1.549991
65.00000	0.00000	.636194	.241733	0.000000	.799299	1.677227
70.00000	0.00000	.678552	.224094	0.000000	.880317	1.782963
75.00000	0.00000	.709985	.206798	0.000000	.948395	1.865157
80.00000	0.00000	.730841	.191171	0.000000	1.000693	1.922805
85.00000	0.00000	.740634	.180622	0.000000	1.035803	1.956265
90.00000	0.00000	.744606	.175800	0.000000	1.069883	1.970369

SLIDE FORCE COEFFICIENT BUILDUP

ALPHA	BETA	MING	M.I.	V.I.	FJS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
15.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
30.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
35.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
40.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
45.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
65.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
70.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
80.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ORIGINAL PAGE IS
OF POOR QUALITY

LIFT COEFFICIENT BUILDUP

ALPHA	BETA	WING	M.T.	V.T.	FUS	TOTAL
0.00000	0.00000	-.213234	-.003731	0.000000	-.014631	-.281995
5.00000	0.00000	.011461	.014511	-.000064	.021513	.047441
10.00000	0.00000	.261195	.030213	-.000124	.056954	.360237
15.00000	0.00000	.504316	.052954	-.000176	.103618	.669301
20.00000	0.00000	.710043	.084614	-.000223	.164864	.950497
25.00000	0.00000	.864622	.125020	-.000218	.226429	1.215053
30.00000	0.00000	.980331	.168531	-.000194	.286874	1.638443
35.00000	0.00000	1.023709	.213602	-.000135	.339020	1.976996
40.00000	0.00000	.813823	.274629	-.000070	.383190	1.471580
45.00000	0.00000	.667108	.277965	-.000033	.413546	1.330506
50.00000	0.00000	.538126	.260199	0.000000	.426516	1.226941
55.00000	0.00000	.464299	.242267	0.000000	.426957	1.133543
60.00000	0.00000	.404705	.224344	0.000000	.407965	1.035105
65.00000	0.00000	.344866	.198078	0.000000	.371907	.915643
70.00000	0.00000	.291322	.170719	0.000000	.319096	.781937
75.00000	0.00000	.234120	.138090	0.000000	.253036	.626846
80.00000	0.00000	.165759	.101548	0.000000	.176323	.463630
85.00000	0.00000	.087817	.063610	0.000000	.090529	.241948
90.00000	0.00000	-.000000	.027921	0.000000	-.000000	.027921

ROLL MOMENT COEFFICIENT BUILDUP									
ALPHA	REYA	WING	M.T.	V.T.	FUS	TOTAL			
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
10.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
15.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
20.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
25.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
30.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
35.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
40.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
45.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
50.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
60.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
65.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
70.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
75.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
80.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			
90.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000			

ORIGINAL PAGE IS
OF POOR QUALITY

PITCH MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	M.T.	V.F.	FUS	TOTAL
0.00000	0.00000	.096775	.026862	.000263	-.020174	.097007
5.00000	0.00000	.066434	.036548	.000243	.042275	.125508
10.00000	0.00000	-.014441	.044530	.000238	.112724	.143891
15.00000	0.00000	-.075421	.055495	.000229	.196636	.177137
20.00000	0.00000	-.125311	.070334	.000216	.264498	.209731
25.00000	0.00000	-.152350	.049106	.000171	.310361	.242368
30.00000	0.00000	-.172619	.110088	.000129	.327877	.265667
35.00000	0.00000	-.173692	.132703	.000078	.312518	.271887
40.00000	0.00000	-.153456	.154275	.000036	.261604	.272459
45.00000	0.00000	-.143388	.166692	.000015	.174162	.197881
50.00000	0.00000	-.149312	.155525	0.000000	.155868	.161833
55.00000	0.00000	-.164482	.142682	0.000000	.157954	.136333
60.00000	0.00000	-.163310	.127701	0.000000	.156755	.101246
65.00000	0.00000	-.222107	.189705	0.000000	.152325	.059923
70.00000	0.00000	-.222837	.093636	0.000000	.144639	.015438
75.00000	0.00000	-.242614	.081280	0.000000	.133648	-.027686
80.00000	0.00000	-.259318	.071297	0.000000	.119148	-.069498
85.00000	0.00000	-.274721	.065245	0.000000	.100163	-.109314
90.00000	0.00000	-.285245	.063332	0.000000	.081898	-.148818

71 MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	MING	H.T.	V.T.	FJS	TOTAL
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
15.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
30.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
35.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
40.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
45.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
65.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
70.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
80.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ORIGINAL PAGE IS
OF POOR QUALITY

SUMMARY OF TOTAL COEFFICIENTS

ALPHA	BETA	CD	CV	CL	CR	CM	CM
0.00000	0.00000	.064307	0.00000	-.231595	0.00000	.095707	0.00000
5.00000	0.00000	.057610	0.00000	.047441	0.00000	.125500	0.00000
10.00000	0.00000	.081212	0.00000	.348237	0.00000	.163851	0.00000
15.00000	0.00000	.141218	0.00000	.660901	0.00000	.177137	0.00000
20.00000	0.00000	.235078	0.00000	.958497	0.00000	.209731	0.00000
25.00000	0.00000	.352753	0.00000	1.219853	0.00000	.243368	0.00000
30.00000	0.00000	.491252	0.00000	1.439843	0.00000	.265667	0.00000
35.00000	0.00000	.659261	0.00000	1.576996	0.00000	.273607	0.00000
40.00000	0.00000	.870669	0.00000	1.471500	0.00000	.272459	0.00000
45.00000	0.00000	1.058852	0.00000	1.338506	0.00000	.197081	0.00000
50.00000	0.00000	1.230839	0.00000	1.226941	0.00000	.161893	0.00000
55.00000	0.00000	1.398746	0.00000	1.133543	0.00000	.136593	0.00000
60.00000	0.00000	1.549991	0.00000	1.035185	0.00000	.101246	0.00000
65.00000	0.00000	1.677227	0.00000	.915643	0.00000	.059923	0.00000
70.00000	0.00000	1.782963	0.00000	.781937	0.00000	.015438	0.00000
75.00000	0.00000	1.865157	0.00000	.626046	0.00000	-.027886	0.00000
80.00000	0.00000	1.922005	0.00000	.443630	0.00000	-.069498	0.00000
85.00000	0.00000	1.956265	0.00000	.241948	0.00000	-.109314	0.00000
90.00000	0.00000	1.970369	-.000000	.027921	.000000	-.160818	-.000000

NOPT=11 SIMULATED WIND TUNNEL RUNS

DRAG COEFFICIENT BUILDUP									
ALPHA	BETA	MING	M.T.	V.T.	FUS	TOTAL			
0.00000	0.00000	.04567	.01378	.000739	.004123	.064307			
0.00000	-5.00000	.045519	.013475	-.000776	.004092	.062309			
0.00000	-10.00000	.044484	.013169	-.005302	.003999	.056349			
0.00000	-15.00000	.042794	.012669	-.013116	.003847	.046191			
0.00000	-20.00000	.040502	.011990	-.024323	.003641	.031809			
0.00000	-25.00000	.037675	.011153	-.038201	.003386	.014014			
0.00000	-30.00000	.034400	.010164	-.032506	.003092	.015168			
0.00000	-35.00000	.030777	.009111	-.011530	.002766	.031124			
0.00000	-40.00000	.026416	.007968	.005172	.002419	.043475			
0.00000	-45.00000	.022933	.006789	.018007	.002061	.049791			
0.00000	-50.00000	.018351	.005610	.024125	.001703	.050390			
0.00000	-55.00000	.015090	.004467	.025738	.001356	.046643			
0.00000	-60.00000	.011467	.003395	.024236	.001031	.040128			
0.00000	-65.00000	.008192	.002425	.020942	.000736	.032296			
0.00000	-70.00000	.005365	.001548	.016878	.000482	.024307			
0.00000	-75.00000	.003073	.000910	.012677	.000276	.016936			
0.00000	-80.00000	.001383	.000409	.008607	.000124	.010524			
0.00000	-85.00000	.000348	.000103	.004520	.000031	.005003			
0.00000	-90.00000	-.000000	-.000000	-.000000	-.000000	-.000000			

SIDE FORCE COEFFICIENT BUILDUP

ALPHA	BETA	MING	M.T.	V.T.	FUS	TOTAL
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	-5.00000	001161	0.00000	0.43253	0.01998	0.64432
0.00000	-10.00000	002379	0.00000	0.86794	0.03998	1.29098
0.00000	-15.00000	003332	0.00000	1.23559	0.06257	2.11166
0.00000	-20.00000	004204	0.00000	1.69100	0.10170	2.95066
0.00000	-25.00000	004889	0.00000	2.15613	0.14669	3.80971
0.00000	-30.00000	005357	0.00000	2.63617	0.20005	4.67859
0.00000	-35.00000	005591	0.00000	3.13154	0.27249	5.13342
0.00000	-40.00000	005588	0.00000	3.64055	0.36675	5.99217
0.00000	-45.00000	005357	0.00000	4.16105	0.48215	6.96626
0.00000	-50.00000	004918	0.00000	4.69363	0.63019	7.97450
0.00000	-55.00000	004308	0.00000	5.23723	0.72694	8.95426
0.00000	-60.00000	003571	0.00000	5.79075	0.83366	9.98682
0.00000	-65.00000	002764	0.00000	6.35732	0.94535	1.06683
0.00000	-70.00000	001943	0.00000	6.93741	1.05639	1.13369
0.00000	-75.00000	001196	0.00000	7.53023	1.16496	1.18673
0.00000	-80.00000	000574	0.00000	8.13485	1.27124	1.225306
0.00000	-85.00000	000154	0.00000	8.75145	1.37404	1.248702
0.00000	-90.00000	000000	0.00000	9.37714	1.47057	1.256571

LIFT COEFFICIENT BUILDUP						
ALPHA	BETA	WING	M.F.	V.T.	FUS	TOTAL
0.00000	0.00000	-213234	-003731	0.00000	-014631	-231595
0.00000	-5.00000	-211614	-003702	0.00000	-014528	-229836
0.00000	-10.00000	-206804	-003618	0.00000	-014190	-224612
0.00000	-15.00000	-198950	-003451	0.00000	-013651	-216881
0.00000	-20.00000	-186290	-003234	0.00000	-012919	-204504
0.00000	-25.00000	-175149	-003064	0.00000	-012018	-190231
0.00000	-30.00000	-159925	-002796	0.00000	-010973	-173696
0.00000	-35.00000	-143042	-002503	0.00000	-009817	-159403
0.00000	-40.00000	-125131	-002189	0.00000	-008586	-135906
0.00000	-45.00000	-106517	-001865	0.00000	-007315	-115798
0.00000	-50.00000	-88103	-001541	0.00000	-006045	-095690
0.00000	-55.00000	-70152	-001227	0.00000	-004813	-076193
0.00000	-60.00000	-53304	-000933	0.00000	-003658	-057899
0.00000	-65.00000	-38085	-000666	0.00000	-002613	-041364
0.00000	-70.00000	-24944	-000436	0.00000	-001711	-027892
0.00000	-75.00000	-14284	-000258	0.00000	-000980	-017514
0.00000	-80.00000	-86430	-000112	0.00000	-000441	-006983
0.00000	-85.00000	-001620	-000028	0.00000	-000111	-001759
0.00000	-90.00000	-000000	-000000	0.00000	-000000	-000000

ORIGINAL PAGE IS
OF POOR QUALITY

ROLL MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	ΔING	H.F.	V.F.	FUS	TOTAL
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	-5.00000	-0.04340	0.00000	0.07366	0.00000	0.03026
0.00000	-10.00000	-0.08682	0.00000	0.14781	0.00000	0.06239
0.00000	-15.00000	-0.12240	0.00000	0.21042	0.00000	0.08802
0.00000	-20.00000	-0.15446	0.00000	0.25392	0.00000	0.09946
0.00000	-25.00000	-0.17954	0.00000	0.28204	0.00000	0.10245
0.00000	-30.00000	-0.19678	0.00000	0.26161	0.00000	0.06683
0.00000	-35.00000	-0.20540	0.00000	0.23076	0.00000	0.02336
0.00000	-40.00000	-0.20224	0.00000	0.22676	0.00000	0.02147
0.00000	-45.00000	-0.19678	0.00000	0.24622	0.00000	0.04344
0.00000	-50.00000	-0.18068	0.00000	0.26160	0.00000	0.08893
0.00000	-55.00000	-0.15825	0.00000	0.26444	0.00000	0.12619
0.00000	-60.00000	-0.13119	0.00000	0.30697	0.00000	0.17378
0.00000	-65.00000	-0.10153	0.00000	0.32141	0.00000	0.21988
0.00000	-70.00000	-0.07161	0.00000	0.33342	0.00000	0.26180
0.00000	-75.00000	-0.04394	0.00000	0.34149	0.00000	0.29755
0.00000	-80.00000	-0.02110	0.00000	0.34654	0.00000	0.32544
0.00000	-85.00000	-0.00565	0.00000	0.34936	0.00000	0.34372
0.00000	-90.00000	0.00000	0.00000	0.35033	0.00000	0.35033

PITCH MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	MING	M.T.	V.T.	FUS	TOTAL
0.00000	0.00000	.096775	.026862	.000245	-.026174	.095707
0.00000	-5.00000	.096040	.026658	-.000257	-.027960	.094480
0.00000	-10.00000	.093857	.026052	-.001758	-.027325	.090826
0.00000	-15.00000	.090292	.025062	-.004349	-.026267	.084719
0.00000	-20.00000	.085454	.023720	-.008063	-.024879	.076233
0.00000	-25.00000	.079490	.022064	-.012663	-.023142	.065749
0.00000	-30.00000	.072561	.020146	-.017076	-.021131	.060821
0.00000	-35.00000	.064937	.018025	-.023622	-.018905	.060234
0.00000	-40.00000	.056790	.015763	.002046	-.016533	.058065
0.00000	-45.00000	.048387	.013431	.005969	-.014067	.053780
0.00000	-50.00000	.039945	.011099	.007997	-.011641	.047440
0.00000	-55.00000	.031838	.008837	.009529	-.009269	.039935
0.00000	-60.00000	.024134	.006715	.008034	-.007044	.031980
0.00000	-65.00000	.017285	.004798	.006942	-.005032	.023992
0.00000	-70.00000	.011321	.003142	.005592	-.003296	.016759
0.00000	-75.00000	.006413	.001799	.004202	-.001867	.010597
0.00000	-80.00000	.002919	.000810	.002653	-.000850	.005732
0.00000	-85.00000	.000735	.000204	.001498	-.000214	.002224
0.00000	-90.00000	.000000	.000000	-.000000	-.000000	-.000000

ORIGINAL PAGE IS
OF POOR QUALITY

YAW MOMENT COEFFICIENT BUILDUP

ALP-4A	BETA	MING	H.T.	V.T.	FUS	TOTAL
0.600000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	-5.000000	.000386	0.000000	-.017013	.011353	-.005274
0.000000	-10.000000	.000755	0.000000	-.033855	.022706	-.010394
0.000000	-15.000000	.001089	0.000000	-.047585	.030766	-.015730
0.000000	-20.000000	.001375	0.000000	-.056441	.037613	-.017453
0.000000	-25.000000	.001594	0.000000	-.061341	.043273	-.016463
0.000000	-30.000000	.001751	0.000000	-.057041	.047741	-.007548
0.000000	-35.000000	.001828	0.000000	-.051348	.050962	.001442
0.000000	-40.000000	.001827	0.000000	-.051473	.052909	.003263
0.000000	-45.000000	.001751	0.000000	-.055503	.053553	-.000233
0.000000	-50.000000	.001608	0.000000	-.061725	.052904	-.007213
0.000000	-55.000000	.001408	0.000000	-.064388	.050954	-.016026
0.000000	-60.000000	.001168	0.000000	-.074688	.047728	-.025792
0.000000	-65.000000	.000904	0.000000	-.080154	.043262	-.035998
0.000000	-70.000000	.000637	0.000000	-.084641	.037592	-.046412
0.000000	-75.000000	.000391	0.000000	-.088221	.030741	-.057009
0.000000	-80.000000	.000188	0.000000	-.091875	.022676	-.068211
0.000000	-85.000000	.000050	0.000000	-.093383	.013166	-.080166
0.000000	-90.000000	-.000000	0.000000	-.095211	-.000007	-.095217

SUMMARY OF TOTAL COEFFICIENTS

ALPHA	BETA	C	CY	CL	CR	CH	CV
0.00000	0.00000	.06437	0.00000	-.23195	0.00000	.095707	0.00000
0.00000	-5.00000	.062309	.064432	-.229036	.003026	.094480	-.005274
0.09000	-10.00000	.056349	.129098	-.224612	.006293	.090826	-.010394
0.00000	-15.00000	.046191	.211148	-.216081	.008002	.084719	-.015730
0.00000	-20.00000	.031809	.295086	-.204504	.009446	.076233	-.017453
0.00000	-25.00000	.014014	.380971	-.190231	.010245	.065749	-.016463
0.00000	-30.00000	.015168	.447059	-.173636	.004483	.060821	-.007548
0.00000	-35.00000	.031124	.513342	-.155403	.002536	.060234	.001442
0.00000	-40.00000	.043475	.599217	-.135906	.002147	.058065	.003263
0.00000	-45.00000	.049791	.696626	-.115738	.004344	.053700	-.000293
0.00000	-50.00000	.050330	.797450	-.095690	.009093	.047440	-.007213
0.00000	-55.00000	.046643	.895426	-.076133	.012619	.039935	-.016026
0.00000	-60.00000	.040128	.966012	-.057899	.017378	.031908	-.025792
0.00000	-65.00000	.032296	1.066031	-.041364	.021988	.023932	-.035988
0.00000	-70.00000	.024307	1.133369	-.027892	.026180	.016759	-.046412
0.00000	-75.00000	.016936	1.186713	-.015514	.029755	.010537	-.057089
0.00000	-80.00000	.010524	1.225306	-.006943	.032544	.005732	-.060211
0.00000	-85.00000	.005033	1.248702	-.001753	.034372	.002224	-.080166
0.00000	-90.00000	-.000000	1.256571	.000000	.035033	-.000000	-.095217

NOPT=2 READ 2

NTAP= 5

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-10.00000 10.00000

W-25

NOPT=11 SIMULATED WIND FUNNEL RUNS

ORIGINAL PAGE IS
OF POOR QUALITY

DRAG COEFFICIENT BUILDJP

ALPHA	BETA	WING	M.A.T.	V.T.	FUS	TOTAL
0.000000	0.000000	.042968	.014010	.000739	.004123	.061848
5.000000	0.000000	.047681	.013634	.000730	.005909	.060035
10.000000	0.000000	.074224	.015511	.000706	.014103	.104543
15.000000	0.000000	.121829	.020502	.000666	.031798	.174795
20.000000	0.000000	.179027	.031736	.000613	.063589	.274965
25.000000	0.000000	.231995	.053286	.000411	.109322	.395861
30.000000	0.000000	.276902	.087509	.000336	.169909	.533736
35.000000	0.000000	.320310	.137013	.000193	.241322	.690846
40.000000	0.000000	.354014	.217040	.000083	.324699	.896648
45.000000	0.000000	.405161	.263752	.000033	.416861	1.005407
50.000000	0.000000	.469816	.267750	0.000000	.513455	1.251038
55.000000	0.000000	.535276	.267008	0.000000	.612123	1.611406
60.000000	0.000000	.594079	.259243	0.000000	.780678	1.562088
65.000000	0.000000	.642663	.243891	0.000000	.799299	1.685853
70.000000	0.000000	.662548	.225533	0.000000	.860317	1.788898
75.000000	0.000000	.712002	.207625	0.000000	.948395	1.868022
80.000000	0.000000	.730667	.191547	0.000000	1.080693	1.922907
85.000000	0.000000	.740634	.180622	0.000000	1.035809	1.956265
90.000000	0.000000	.744686	.175880	0.000000	1.069883	1.970369

SIDE FORCE COEFFICIENT BUILDUP		M.I.		V.I.		TOTAL	
ALPHA	BETA	MING	M.I.	V.I.	US	US	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
15.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
30.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
35.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
40.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
45.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
65.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
70.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
80.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ORIGINAL PAGE IS
OF POOR QUALITY

LIFT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.00000	0.00000	-.044379	-.017539	0.00000	-.014631	-.076746
5.00000	0.00000	.171135	.005702	-.000864	.021513	.190206
10.00000	0.00000	.410325	.020522	-.000124	.156954	.490276
15.00000	0.00000	.643392	.040705	-.000178	.103818	.787729
20.00000	0.00000	.834334	.070453	-.000223	.164064	1.073032
25.00000	0.00000	.987580	.111132	-.000218	.226429	1.319923
30.00000	0.00000	1.088591	.155933	-.000194	.286374	1.538885
35.00000	0.00000	1.122209	.203027	-.000135	.339820	1.664921
40.00000	0.00000	.982435	.265769	-.000070	.383198	1.551352
45.00000	0.00000	.725276	.277408	-.000033	.413566	1.416198
50.00000	0.00000	.605579	.259587	0.000000	.428616	1.293782
55.00000	0.00000	.521154	.241841	0.000000	.426957	1.189952
60.00000	0.00000	.451237	.222334	0.000000	.407965	1.081936
65.00000	0.00000	.381367	.199148	0.000000	.371987	.952422
70.00000	0.00000	.318812	.171194	0.000000	.319896	.809101
75.00000	0.00000	.251131	.136564	0.000000	.253836	.643581
80.00000	0.00000	.173313	.101808	0.000000	.176323	.451644
85.00000	0.00000	.087817	.063610	0.000000	.090528	.241948
90.00000	0.00000	-.000000	.027921	0.000000	-.000000	.027921

ROLL MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.034665	0.000000	0.000000	0.000000	-.034665
5.000000	0.000000	-.032815	0.000000	0.000000	0.000000	-.032815
10.000000	0.000000	-.030775	0.000000	0.000000	0.000000	-.030775
15.000000	0.000000	-.028585	0.000000	0.000000	0.000000	-.028585
20.000000	0.000000	-.026363	0.000000	0.000000	0.000000	-.026363
25.000000	0.000000	-.024245	0.000000	0.000000	0.000000	-.024245
30.000000	0.000000	-.022231	0.000000	0.000000	0.000000	-.022231
35.000000	0.000000	-.020245	0.000000	0.000000	0.000000	-.020245
40.000000	0.000000	-.018213	0.000000	0.000000	0.000000	-.018213
45.000000	0.000000	-.016067	0.000000	0.000000	0.000000	-.016067
50.000000	0.000000	-.013864	0.000000	0.000000	0.000000	-.013864
55.000000	0.000000	-.011686	0.000000	0.000000	0.000000	-.011686
60.000000	0.000000	-.009564	0.000000	0.000000	0.000000	-.009564
65.000000	0.000000	-.007502	0.000000	0.000000	0.000000	-.007502
70.000000	0.000000	-.005686	0.000000	0.000000	0.000000	-.005686
75.000000	0.000000	-.003507	0.000000	0.000000	0.000000	-.003507
80.000000	0.000000	-.001553	0.000000	0.000000	0.000000	-.001553
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PITCH MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	MING	H.T.	V.T.	FJS	TOTAL
0.000000	0.000000	-.000190	.020253	.000245	-.020176	-.007066
5.000000	0.000000	-.050711	.032066	.000243	.042275	.023093
10.000000	0.000000	-.110949	.040027	.000236	.112726	.042048
15.000000	0.000000	-.170558	.050023	.000229	.196834	.076928
20.000000	0.000000	-.218377	.063375	.000216	.264493	.110687
25.000000	0.000000	-.247749	.083503	.000171	.310361	.146886
30.000000	0.000000	-.259781	.106625	.000129	.327877	.173058
35.000000	0.000000	-.256323	.128454	.000078	.312518	.184727
40.000000	0.000000	-.227451	.160535	.000036	.261604	.194725
45.000000	0.000000	-.200967	.168156	.000015	.174182	.133366
50.000000	0.000000	-.205516	.156792	0.000000	.159360	.107224
55.000000	0.000000	-.211423	.144167	0.000000	.157954	.090698
60.000000	0.000000	-.221270	.128990	0.000000	.156755	.064476
65.000000	0.000000	-.231446	.110865	0.000000	.152325	.031743
70.000000	0.000000	-.243771	.094216	0.000000	.144639	-.004916
75.000000	0.000000	-.255546	.081608	0.000000	.133648	-.040238
80.000000	0.000000	-.265382	.071389	0.000000	.119140	-.074853
85.000000	0.000000	-.274721	.065245	0.000000	.100163	-.109314
90.000000	0.000000	-.285245	.063332	0.000000	.081896	-.146018

YAW MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	MING	H.T.	V.T.	YUS	TOTAL
0.000000	0.000000	-.000596	0.000000	0.000000	0.000000	-.000596
5.000000	0.000000	.002169	0.000000	0.000000	0.000000	.002169
10.000000	0.000000	.004925	0.000000	0.000000	0.000000	.004925
15.000000	0.000000	.007275	0.000000	0.000000	0.000000	.007275
20.000000	0.000000	.009211	0.000000	0.000000	0.000000	.009211
25.000000	0.000000	.010976	0.000000	0.000000	0.000000	.010976
30.000000	0.000000	.010063	0.000000	0.000000	0.000000	.010063
35.000000	0.000000	.009601	0.000000	0.000000	0.000000	.009601
40.000000	0.000000	.006997	0.000000	0.000000	0.000000	.006997
45.000000	0.000000	.005030	0.000000	0.000000	0.000000	.005030
50.000000	0.000000	.003695	0.000000	0.000000	0.000000	.003695
55.000000	0.000000	.002735	0.000000	0.000000	0.000000	.002735
60.000000	0.000000	.001975	0.000000	0.000000	0.000000	.001975
65.000000	0.000000	.001330	0.000000	0.000000	0.000000	.001330
70.000000	0.000000	.000821	0.000000	0.000000	0.000000	.000821
75.000000	0.000000	.000419	0.000000	0.000000	0.000000	.000419
80.000000	0.000000	.000129	0.000000	0.000000	0.000000	.000129
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

ORIGINAL PAGE IS
OF POOR QUALITY

SUMMARY OF TOTAL COEFFICIENTS

ALPHA	BETA	CO	CY	CL	CR	CM	CM
0.000000	0.000000	.061940	0.000000	-.076748	-.084665	-.087886	-.089596
5.000000	0.000000	.068035	0.000000	.198286	-.032815	.023893	-.082169
10.000000	0.000000	.184543	0.000000	.789276	-.088775	.062848	.004925
15.000000	0.000000	.174795	0.000000	.787729	-.028585	.076520	.007275
20.000000	0.000000	.274965	0.000000	1.073032	-.026369	.110687	.000911
25.000000	0.000000	.395061	0.000000	1.319923	-.024249	.146886	.009776
30.000000	0.000000	.531736	0.000000	1.530685	-.022231	.173858	.018883
35.000000	0.000000	.698846	0.000000	1.664921	-.020245	.184727	.009601
40.000000	0.000000	.896640	0.000000	1.551352	-.018273	.194725	.006997
45.000000	0.000000	1.095807	0.000000	1.416198	-.016067	.133266	.009838
50.000000	0.000000	1.251070	0.000000	1.293782	-.013864	.187224	.003695
55.000000	0.000000	1.414806	0.000000	1.189952	-.011686	.090698	.002735
60.000000	0.000000	1.562000	0.000000	1.081536	-.009564	.064476	.001975
65.000000	0.000000	1.685753	0.000000	.952422	-.007582	.031743	.001338
70.000000	0.000000	1.788398	0.000000	.809101	-.005406	-.084916	.000821
75.000000	0.000000	1.868022	0.000000	.643581	-.003587	-.040298	.000419
80.000000	0.000000	1.922907	0.000000	.451444	-.001953	-.074853	.000129
85.000000	0.000000	1.956265	0.000000	.241948	0.000000	-.109314	0.000000
90.000000	0.000000	1.970369	-.000000	.027921	.000000	-.148018	-.000000

NOPT=11 SIMULATED WIND TUNNEL RUNS

DRAG COEFFICIENT BUILDUP		M.T.		V.T.		RUS		TOTAL	
ALPHA	BETA	M.T.	V.T.	M.T.	V.T.	RUS	V.T.	RUS	TOTAL
0.000000	0.000000	.014010	.000739	.042968	.004123	.004123	.004123	.004123	.061848
0.000000	-5.000000	.013904	.000776	.042642	.004092	.004092	.004092	.004092	.059861
0.000000	-10.000000	.013588	.005302	.041672	.003999	.003999	.003999	.003999	.053957
0.000000	-15.000000	.013072	.013118	.040090	.003867	.003867	.003867	.003867	.043838
0.000000	-20.000000	.012371	.024323	.037342	.003641	.003641	.003641	.003641	.029631
0.000000	-25.000000	.011508	.034281	.035294	.003386	.003386	.003386	.003386	.011937
0.000000	-30.000000	.010504	.032508	.032226	.003092	.003092	.003092	.003092	.013317
0.000000	-35.000000	.009401	.011538	.028832	.002766	.002766	.002766	.002766	.029669
0.000000	-40.000000	.008221	.006172	.025215	.002419	.002419	.002419	.002419	.042027
0.000000	-45.000000	.007005	.018007	.021464	.002061	.002061	.002061	.002061	.046557
0.000000	-50.000000	.005789	.024125	.017753	.001703	.001703	.001703	.001703	.049371
0.000000	-55.000000	.004609	.025730	.014135	.001356	.001356	.001356	.001356	.045832
0.000000	-60.000000	.003503	.024236	.010742	.001031	.001031	.001031	.001031	.039512
0.000000	-65.000000	.002502	.020942	.007674	.000736	.000736	.000736	.000736	.031855
0.000000	-70.000000	.001639	.016878	.005026	.000482	.000482	.000482	.000482	.024018
0.000000	-75.000000	.000938	.012677	.002878	.000276	.000276	.000276	.000276	.016770
0.000000	-80.000000	.000422	.008607	.001296	.000124	.000124	.000124	.000124	.010450
0.000000	-85.000000	.000106	.004529	.000326	.000031	.000031	.000031	.000031	.004384
0.000000	-98.000000	-.000000	-.000000	-.000000	-.000000	-.000000	-.000000	-.000000	-.000000

ORIGINAL PAGE IS
OF POOR QUALITY

SIDE FORCE COEFFICIENT BUILDUP

ALPHA	TEIA	WING	H.I.	V.I.	FUS	TOTAL
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	-5.00000	0.00052	0.00000	0.03253	0.01998	0.03302
0.00000	-10.00000	0.0101	0.00000	0.06794	0.03995	0.12698
0.00000	-15.00000	0.03146	0.00000	0.12359	0.06257	0.20762
0.00000	-20.00000	0.06184	0.00000	0.19188	0.14178	0.29185
0.00000	-25.00000	0.09214	0.00000	0.26561	0.21849	0.37629
0.00000	-30.00000	0.0234	0.00000	0.15361	0.28805	0.44936
0.00000	-35.00000	0.0244	0.00000	0.13502	0.37224	0.50796
0.00000	-40.00000	0.0234	0.00000	0.13154	0.46075	0.59273
0.00000	-45.00000	0.0234	0.00000	0.14055	0.55821	0.69303
0.00000	-50.00000	0.0215	0.00000	0.15361	0.63019	0.79277
0.00000	-55.00000	0.0186	0.00000	0.16702	0.72489	0.89306
0.00000	-60.00000	0.0156	0.00000	0.17907	0.80366	0.98397
0.00000	-65.00000	0.0121	0.00000	0.18732	0.87453	1.06388
0.00000	-70.00000	0.0085	0.00000	0.19561	0.93563	1.13384
0.00000	-75.00000	0.0052	0.00000	0.20052	0.98494	1.18578
0.00000	-80.00000	0.0025	0.00000	0.20348	1.02124	1.22475
0.00000	-85.00000	0.0007	0.00000	0.20514	1.04348	1.24852
0.00000	-90.00000	0.0000	0.00000	0.20571	1.05885	1.25671

LIFT COEFFICIENT BUILDUP						
ALPHA	BETA	WING	M.T.	V.T.	FUS	TOTAL
0.00000	0.00000	-.044579	-.017539	0.000000	-.014631	-.076748
0.00000	-5.00000	-.044240	-.017405	0.000000	-.014520	-.076165
0.00000	-10.00000	-.043235	-.017010	0.000000	-.014190	-.074434
0.00000	-15.00000	-.041593	-.016364	0.000000	-.013651	-.071607
0.00000	-20.00000	-.039364	-.015487	0.000000	-.012919	-.067771
0.00000	-25.00000	-.036617	-.014406	0.000000	-.012010	-.063041
0.00000	-30.00000	-.033434	-.013154	0.000000	-.010973	-.057561
0.00000	-35.00000	-.029913	-.011769	0.000000	-.009817	-.051499
0.00000	-40.00000	-.026160	-.010292	0.000000	-.008586	-.045038
0.00000	-45.00000	-.022269	-.008769	0.000000	-.007315	-.038374
0.00000	-50.00000	-.018419	-.007247	0.000000	-.006045	-.031711
0.00000	-55.00000	-.014666	-.005770	0.000000	-.004813	-.025249
0.00000	-60.00000	-.011145	-.004305	0.000000	-.003658	-.019187
0.00000	-65.00000	-.007962	-.003133	0.000000	-.002613	-.013708
0.00000	-70.00000	-.005215	-.002052	0.000000	-.001711	-.008978
0.00000	-75.00000	-.002966	-.001175	0.000000	-.000980	-.005141
0.00000	-80.00000	-.001344	-.000529	0.000000	-.000541	-.002314
0.00000	-85.00000	-.000339	-.000133	0.000000	-.000111	-.000503
0.00000	-90.00000	.000000	.000000	0.000000	.000000	.000000

ROLL MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	MING	H.T.	V.T.	FUS	TOTAL
0.00000	0.00000	-.034665	0.00000	0.00000	0.00000	-.034665
0.00000	-5.00000	-.035309	0.00000	.007366	0.00000	-.027943
0.00000	-10.00000	-.035393	0.00000	.014791	0.00000	-.020612
0.00000	-15.00000	-.034901	0.00000	.021042	0.00000	-.013059
0.00000	-20.00000	-.033839	0.00000	.025332	0.00000	-.004047
0.00000	-25.00000	-.032228	0.00000	.026204	0.00000	-.004024
0.00000	-30.00000	-.030112	0.00000	.026161	0.00000	-.003951
0.00000	-35.00000	-.027554	0.00000	.023076	0.00000	-.004470
0.00000	-40.00000	-.024634	0.00000	.022676	0.00000	-.001950
0.00000	-45.00000	-.021446	0.00000	.024022	0.00000	.002576
0.00000	-50.00000	-.018190	0.00000	.026160	0.00000	.008061
0.00000	-55.00000	-.014713	0.00000	.028444	0.00000	.013732
0.00000	-60.00000	-.011409	0.00000	.030497	0.00000	.019088
0.00000	-65.00000	-.008314	0.00000	.032141	0.00000	.023027
0.00000	-70.00000	-.005552	0.00000	.033342	0.00000	.027049
0.00000	-75.00000	-.003241	0.00000	.034149	0.00000	.030909
0.00000	-80.00000	-.001406	0.00000	.034654	0.00000	.033167
0.00000	-85.00000	-.000000	0.00000	.034936	0.00000	.034936
0.00000	-90.00000	.000000	0.00000	.035033	0.00000	.035033

PITCH MOMENT COEFFICIENT BUILDUP

ALP-1A	BETA	HING	H.T.	V.T.	FUS	TOTAL
0.00000	0.00000	.000190	.020253	.000245	-.020174	-.007866
0.00000	-5.00000	-.000188	.020099	-.000257	-.027960	-.000307
0.00000	-10.00000	-.000184	.019642	-.001758	-.027325	-.009624
0.00000	-15.00000	-.000177	.018896	-.004349	-.026267	-.011917
0.00000	-20.00000	-.000167	.017884	-.008063	-.024879	-.015225
0.00000	-25.00000	-.000156	.016635	-.012663	-.023142	-.019326
0.00000	-30.00000	-.000142	.015189	-.010776	-.021131	-.016860
0.00000	-35.00000	-.000127	.013598	-.008822	-.018905	-.009265
0.00000	-40.00000	-.000111	.011805	-.006866	-.016533	-.002714
0.00000	-45.00000	-.000095	.010126	-.005959	-.014087	-.001913
0.00000	-50.00000	-.000078	.008368	-.004997	-.011641	-.004646
0.00000	-55.00000	-.000062	.006663	-.003929	-.009269	-.005861
0.00000	-60.00000	-.000047	.005063	-.002834	-.007044	-.006006
0.00000	-65.00000	-.000034	.003617	-.0016942	-.005032	-.005493
0.00000	-70.00000	-.000022	.002369	-.000592	-.003296	-.004644
0.00000	-75.00000	-.000013	.001357	-.004202	-.001867	-.003659
0.00000	-80.00000	-.000006	.000611	-.002653	-.000850	-.002609
0.00000	-85.00000	-.000001	.000154	-.001498	-.000214	-.001437
0.00000	-90.00000	-.000000	.000000	-.000000	-.000000	-.000000

YAM MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	MING	H.T.	V.T.	FUS	TOTAL
0.00000	0.00000	-.000596	0.00000	0.00000	0.00000	-.000596
0.00000	-5.00000	-.000574	-.017013	-.011353	-.011353	-.006235
0.00000	-10.00000	-.000545	-.033055	-.022706	-.022706	-.011694
0.00000	-15.00000	-.000508	-.047505	-.030766	-.030766	-.017328
0.00000	-20.00000	-.000466	-.056441	-.037613	-.037613	-.019294
0.00000	-25.00000	-.000420	-.061341	-.043279	-.043279	-.018491
0.00000	-30.00000	-.000370	-.057041	-.047741	-.047741	-.009678
0.00000	-35.00000	-.000320	-.051348	-.050962	-.050962	-.000786
0.00000	-40.00000	-.000270	-.051473	-.052909	-.052909	-.001166
0.00000	-45.00000	-.000221	-.055603	-.053559	-.053559	-.002266
0.00000	-50.00000	-.000176	-.061725	-.052904	-.052904	-.006997
0.00000	-55.00000	-.000134	-.060306	-.050954	-.050954	-.017560
0.00000	-60.00000	-.000098	-.074600	-.047720	-.047720	-.027057
0.00000	-65.00000	-.000067	-.080154	-.043262	-.043262	-.036959
0.00000	-70.00000	-.000042	-.084641	-.037592	-.037592	-.047891
0.00000	-75.00000	-.000023	-.088221	-.030741	-.030741	-.057503
0.00000	-80.00000	-.000010	-.091075	-.022676	-.022676	-.068409
0.00000	-85.00000	-.000002	-.093903	-.013166	-.013166	-.080210
0.00000	-90.00000	-.000000	-.095211	-.000000	-.000000	-.095217

SUMMARY OF TOTAL COEFFICIENTS

ALPHA	BETA	CO	CY	CL	CR	CM	CN
0.00000	0.00000	.061840	0.000000	-.076748	-.034665	-.007866	-.000596
0.00000	-5.00000	.059861	.063302	-.076165	-.027943	-.000307	-.006235
0.00000	-10.00000	.053957	.126890	-.074434	-.020612	-.009624	-.011694
0.00000	-15.00000	.043890	.207362	-.071687	-.013859	-.011917	-.017328
0.00000	-20.00000	.029631	.291065	-.067771	-.008447	-.015225	-.019294
0.00000	-25.00000	.011987	.376296	-.063011	-.004024	-.019326	-.016481
0.00000	-30.00000	.013317	.441936	-.057561	-.003951	-.016068	-.009678
0.00000	-35.00000	.029469	.507996	-.051499	-.004478	-.009265	-.000706
0.00000	-40.00000	.042027	.593873	-.045838	-.004958	-.002714	.001166
0.00000	-45.00000	.044557	.691503	-.038374	.002576	.001913	-.002266
0.00000	-50.00000	.049371	.792747	-.031711	.000861	.004646	-.008997
0.00000	-55.00000	.045832	.891306	-.025249	.013732	.005851	-.017568
0.00000	-60.00000	.039512	.982597	-.019187	.019888	.006086	-.027857
0.00000	-65.00000	.031855	1.063308	-.013708	.023827	.005493	-.036959
0.00000	-70.00000	.024818	1.131504	-.008928	.027789	.004644	-.047891
0.00000	-75.00000	.016770	1.185570	-.005151	.030309	.003659	-.057503
0.00000	-80.00000	.010450	1.224757	-.002314	.033167	.002609	-.068489
0.00000	-85.00000	.004984	1.248555	-.000533	.034955	.001437	-.080218
0.00000	-90.00000	-.000000	1.256571	.000000	.035033	-.000000	-.095217

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