SUPPLEMENT TO NASA TECHNICAL NOTE D-4427

A MODIFIED MULTHOPP APPROACH FOR PREDICTING LIFTING PRESSURES AND CAMBER SHAPE FOR COMPOSITE PLANFORMS IN SUBSONIC FLOW

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INTRODUCTION

This supplement contains information about the two main computer programs (Langley computer program A0313, loading program, and Langley computer program A0457, mean camber program) used to obtain the results presented in NASA Technical Note D-4427 along with two supplementary programs (Langley computer program A1590, aspect ratio program, and Langley computer program A1591, pivot determining program) used in obtaining input data for them.

In part I of this supplement, the input and some output variables for each of the two main programs (A0313 and A0457) are presented and pertinent comments made. Further, sample listings of input and output data are shown and the entire computer program listings provided.

In part II of this supplement, a discussion of the two supplementary programs (A1590 and A1591) is presented with a list of input data required, and sample input and output listings as well as program listings are given.

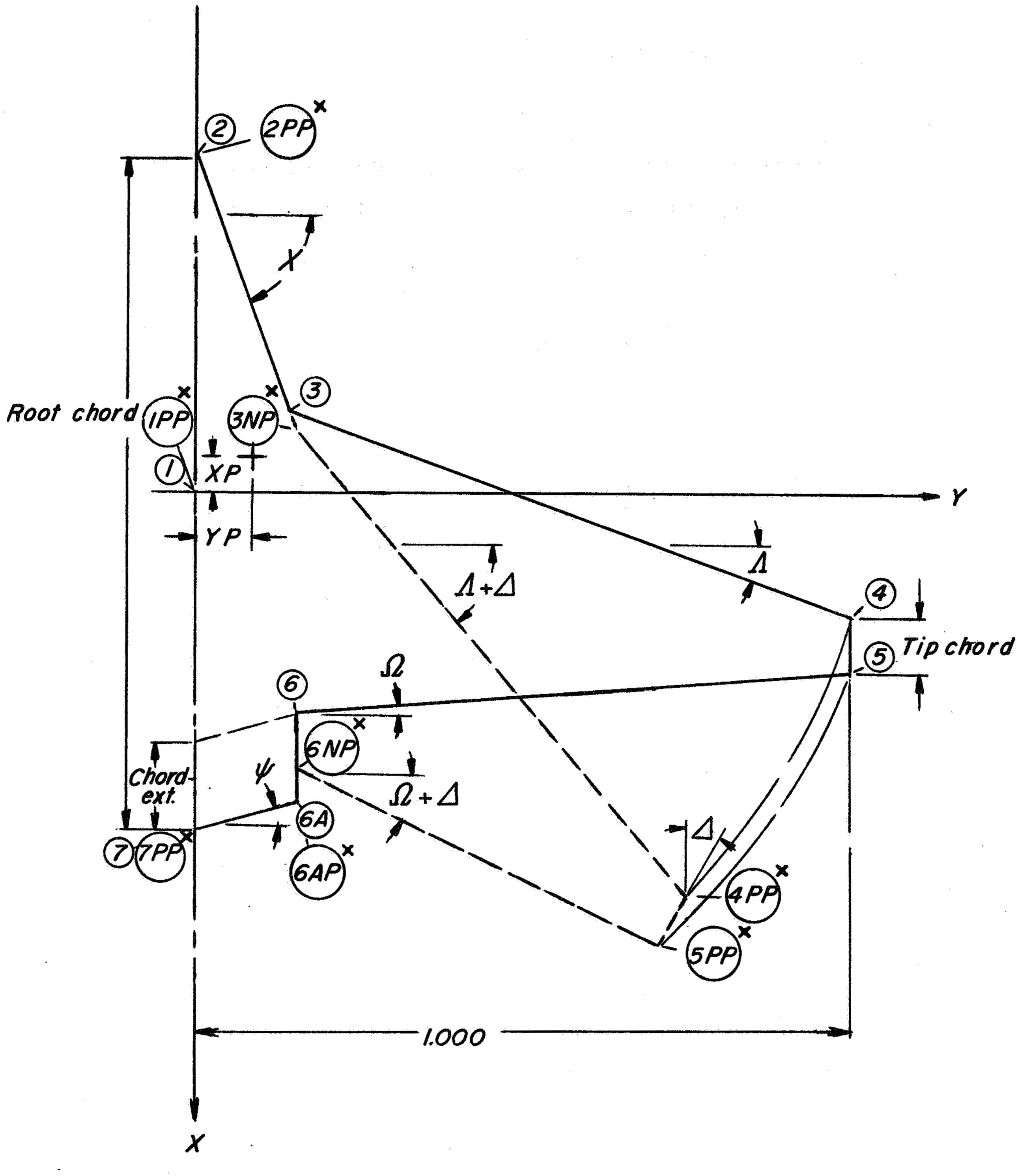


Figure 1.- General planform for which lifting surface program is applicable. The × means that in the listing of geometry data the x- and y-locations of these points are found by dividing by the ratio of initial to final outer panel semispan.

I. MAIN PROGRAMS (A0313 AND A0457)

LOAD DISTRIBUTION PROGRAM A0313

Symbols for Input Data

First card format: 6F12.5:

(a) AR	$\frac{b^2}{\text{overall area}}$ (overall area excludes the rhombus containing chord-extension)	Tip stream-wise at DELT = 0
(b) CHI	leading-edge inboard sweep, positive for sweepback, degrees	
(c) ALAMD	leading-edge outboard sweep, positive for sweepback, degrees	
(d) PSI	trailing-edge inboard sweep, positive for sweepback, degrees	
(e) B1RAT	leading-edge break (distance from plane of symmetry to leading-edge break divided by semispan)	
(f) B2RAT	trailing-edge break (distance from plane of symmetry to trailing-edge break divided by semispan)	

Second card format: 6F12.5:

(g) TAPER	(overall) $\frac{\text{tip chord}}{\text{root chord}}$ (root chord excludes chord-extension)	Tip stream-wise at DELT = 0
(h) DELT	change in the variable-sweep wing outer-panel sweep angle, positive if wing is swept rearward (zero for fixed wings), degrees	
(i) XP	x-location of the pivot point from the half root chord divided by the semispan when the tip is streamwise, includes the effect of the chord-extension	Tip stream-wise at DELT = 0
(j) YP	y-location of the pivot point from the plane of symmetry divided by the semispan	
(k) CHDEXT	chord-extension (distance from rhombus leading-edge intersection with the plane of symmetry to the rhombus trailing edge divided by semispan) – if chord-extension is not 0, use only AJTEST = 2; however, if chord-extension is 0, values of AJTEST of 1 or 2 may be used (see fig. 1)	
(l) MACH	Mach number, must be less than 1 and should in practice be kept less than 0.9	

Third card format: 5F6.0, F6.2, F6.0:

(m) CASE — case number

(n) SYM — symmetry code for loadings – if code is 1, the loadings are symmetrical about the plane of symmetry; if code is 2, the loadings are antisymmetrical

(o) CSTA — number of chordwise pressure modes and chordwise control points (a maximum number of 10 can be used)

(p) SSSTA — number of spanwise stations on a panel where the chordwise pressure modes are specified to act, includes the station at the plane of symmetry (a maximum number of 21 can be used); an equation which can be used as a guide in the determination of SSSTA is

$$\mathrm{SSSTA} = \frac{(4\text{ to }5)\beta A\left(\frac{\mathrm{CSTA}}{4}\right) + 1}{2}$$

Maximum combination value of CSTA and SSSTA are given in the following table:

CSTA	SSSTA
1	21
2	21
3	21
4	21
5	20
6	16
7	14
8	12
9	11
10	10

(q) AJTEST — if AJTEST = 1, the reference chord and reference area will be based on the total wing planform; if AJTEST = 2, the reference area and reference chord will be based on a wing planform which is determined by extending the leading and trailing edge of the outboard panel to the plane of symmetry; if AJTEST = 2 and a variable-sweep wing is used with DELT other than 0, the reference wing will be obtained from that outboard panel when DELT is 0; note that AJTEST is not chosen indiscriminately, but should be chosen in connection with the value of the chord-extension as discussed earlier

(r) CLDESG desired lift coefficient at which the local loadings are to be calculated

(s) TWADCM twist and camber code – set equal to 0 if the wing is flat and equal to 1 if the wing is warped; if set equal to 1, the local slopes of the control points when the root is at an angle of attack of 0 must be provided as input data; they are to be determined in the following manner:

$$\alpha_l \approx -\left(\frac{dz}{dx}\right)_{\text{due to camber}} + \alpha_{\text{twist}}$$

and become the program terms CONST(JK,2); these terms, each of which is associated with a control point, are read in along each constant (x/c) row of control points starting nearest the leading edge and from root to right wing tip; the format for these numbers is 8F9.5

MEAN CAMBER SURFACE PROGRAM A0457

The geometric input data for this program is the same as for the program A0313 except that the items AJTEST, CLDESG, and TWADCM are not used. The coefficients of the chordal loading function QP(J,N) are read in after the geometry items for each chordwise pressure mode (starting with the $\cot\frac{\vartheta}{2}$ and ending with $\sin(\text{CSTA} - 1)\vartheta$) from the plane of symmetry to the right wing tip. The format for QP(J,N) is 8F9.5.

COMMENTS ON INPUTS FOR PROGRAMS A0313 AND A0457

The input data are based on the planform in a streamwise tip position with no inboard trailing-edge chord-extension. If the planform is of a fixed wing with unbroken leading and trailing edges and a skewed tip, in order to use these programs it is necessary to (a) determine its aspect ratio, (b) use the pivot program to find a pivot location for which in a lower sweep position the tip will be streamwise, and (c) put the required geometric input data in with DELT set equal to the tip skew angle. This will result in the original fixed wing.

A variable-sweep wing with trailing-edge chord-extension may with increasing sweep angle completely cover up the extension and intersect the fixed portion of the trailing edge, inboard of the chord-extension. If this is foreseen before that case is run, compute another wing for input whose aspect ratio and trailing-edge break are found by extending (spanwise) the fixed inboard trailing edge until it intersects the trailing edge of the outboard panel when the tip is streamwise. This new wing will therefore have no trailing-edge chord-extension, a different area, aspect ratio, and trailing-edge break value.

DEFINITIONS AND COMMENTS ON OUTPUT LISTINGS

Some of the items of the output listings are not fully self-explanatory; therefore they are defined here. Also, some general comments are included where necessary.

Geometry data:

Perimeter points	see figure 1
X LE REF	location of the leading edge of the reference chord with respect to the overall half root chord

Aerodynamic data (for A0313):

CDI/CLA**2	due to additional loading only
CDII/CLA**2	this has a sweep correction presented by Garner (ref. 13 of TN), also due to additional loading only
LOCAL CIRCU	$\gamma = \left(\frac{c_l c}{2b}\right)_{\alpha=1 \text{ rad}}$
SPAN LOAD ADD	$\left(\frac{c_l c}{C_L c_{av}}\right)_{\alpha=1 \text{ rad}}$
BASIC LOAD NO LIFT	$\left(\frac{c_l c}{c_{av}}\right)_{basic}$
SPAN LOAD TOTAL AT CLDESG	$\left(\frac{c_l c}{c_{av}}\right)_{\text{at } C_{L,desired}}$

The terms CENTER/PRESS-ADD, BASIC, and TOTAL refer to the chordwise location of the centroid of the various combinations of pressure loadings from the half root chord; the terms LOCAL/A.C.-ADD, BASIC, and TOTAL, which are obtained from the CENTER/PRESS terms, represent the distance from the centroid of the loadings to the local leading edge divided by the local chord and are listed in fractions of the local chord. Note that the local chords used are based on the "rounded" planform whose half-chords are given in the aerodynamic section of the listing of program answers.

COMMENTS ON AERODYNAMIC DATA FOR PROGRAM A0313

For variable-sweep wings, if the reference dimensions are taken to be those of the outer panel extended to the root, they are scaled internally to be in the same proportions to the wing in its new sweep position when divided by its new semispan as it was before the sweep change was made. These dimensions are used internally as scaled quantities, but are listed out in terms of the wing when the tip was streamwise. This means that the overall coefficients presented are based on the reference dimensions as listed, and the aerodynamic center is scaled appropriately so that it may be used directly with aerodynamic-center values at other sweep positions in forming plots of aerodynamic center as a function of sweep angle. However, if one desires to compute C_{m_α} from the chordwise location of the center of pressure, the reference chord value listed out and the moment reference point must be divided by the ratio of new-to-old semispan to bring the necessary quantities to the same scaling. Also, if one wants to compute the span load coefficient from the chord loading, the reference area must be divided by the square of the ratio of the two semispans when used in conjunction with the given lift coefficient as shown in the following equation:

$$\frac{c_l c}{C_L c_{av}} = \frac{2(\text{chord load})}{C_L S_{ref}}\left(\frac{b_{\Delta=0}}{b_{\Delta=?}}\right)^2$$

COMMENT FOR THE MEAN CAMBER SURFACE DATA OF PROGRAM A0457

Note that the z/c terms in program A0457 contain the effects not only of <u>camber</u> but also <u>twist</u> and <u>angle of attack</u>.

ADDITIONAL COMMENTS FOR POSSIBLE USE OF PROGRAM A0313

Program A0313 can also be used to find the stability derivatives C_{l_p} and C_{m_q}.

To find C_{l_p}:

(a) Set SYM = 2. and TWADCM = 0.

(b) Replace
```
      DO 2 JK = 1, JKMAX
    2 CONST(JK,1) = 4.0
```
With
```
      DO 2 JK = 1, JKMAX, 8
    2 READ (5,515) CONST(JK,1), CONST(JK+1,1), . . . CONST(JK+7,1)
```

(c) Read in four times the linear twist in radians. This twist distribution is chosen to represent the variation of local angle of attack across the wing span which occurs due to a rolling velocity. A positive normal velocity is attained when the right wing tip is rolling up.

(d) Take the number that appears at CROLL and divide by the rolling rate specified in terms of radians/second. The resulting number is $\left(-C_{l_p}\right)$.

To find C_{m_q}:

(a) Set SYM = 1.0. and TWADCM = 0.

(b) Same as in (b) for C_{l_p}.

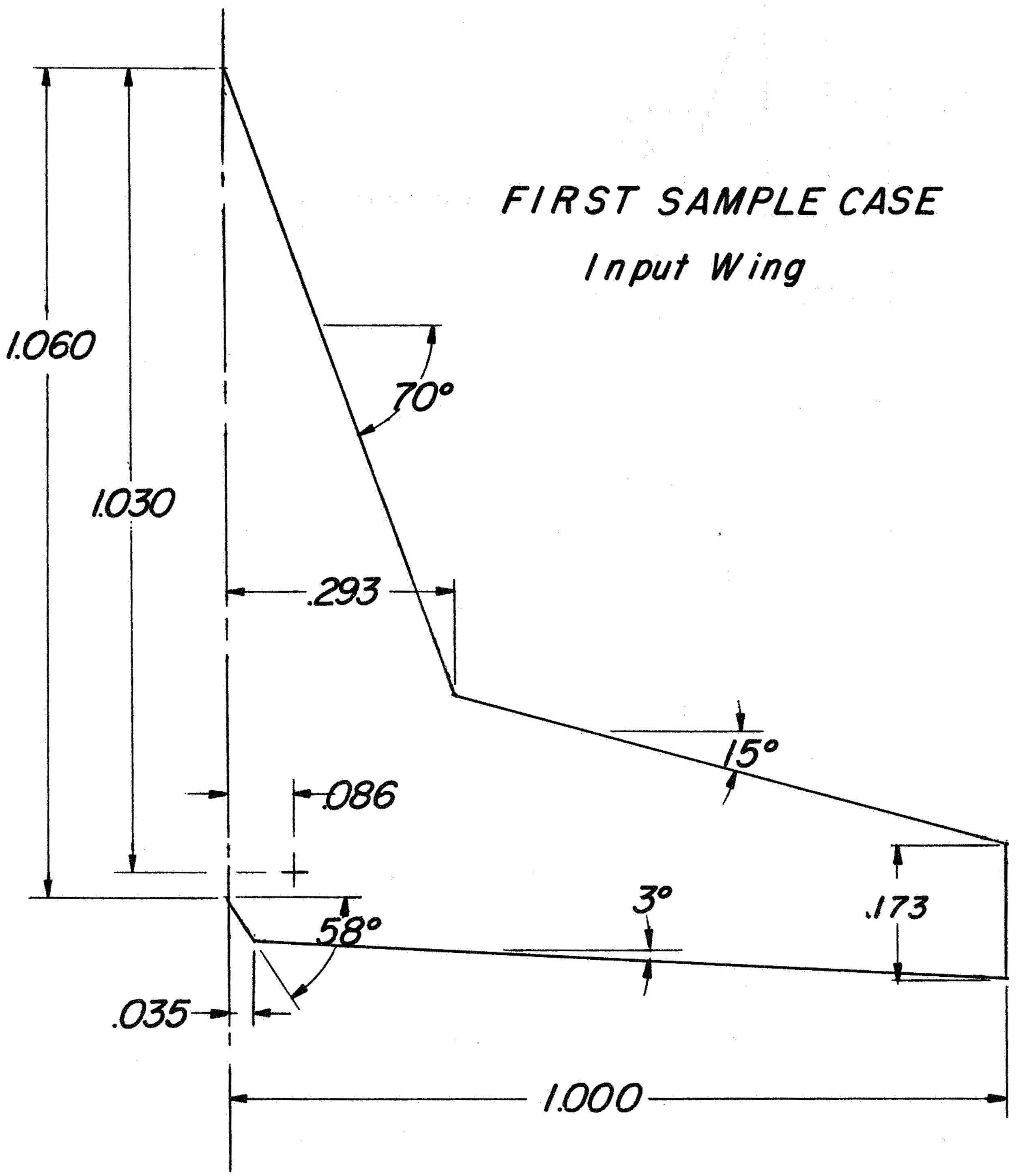
(c) Read in four times the linear camber in radians. This camber distribution is chosen to represent the variation in local angle of attack across the wing chord which occurs due to a pitching velocity. A positive normal velocity is attained when the nose is pitching up and a zero normal velocity occurs at either the center of gravity or $\bar{c}/4$, whichever is selected for the wing to pitch about.

(d) Take the number that appears at CMA and divide by the pitching rate specified in terms of radians/second and multiply by (2/CREF). The resulting number is $\left(-C_{m_q}\right)$.

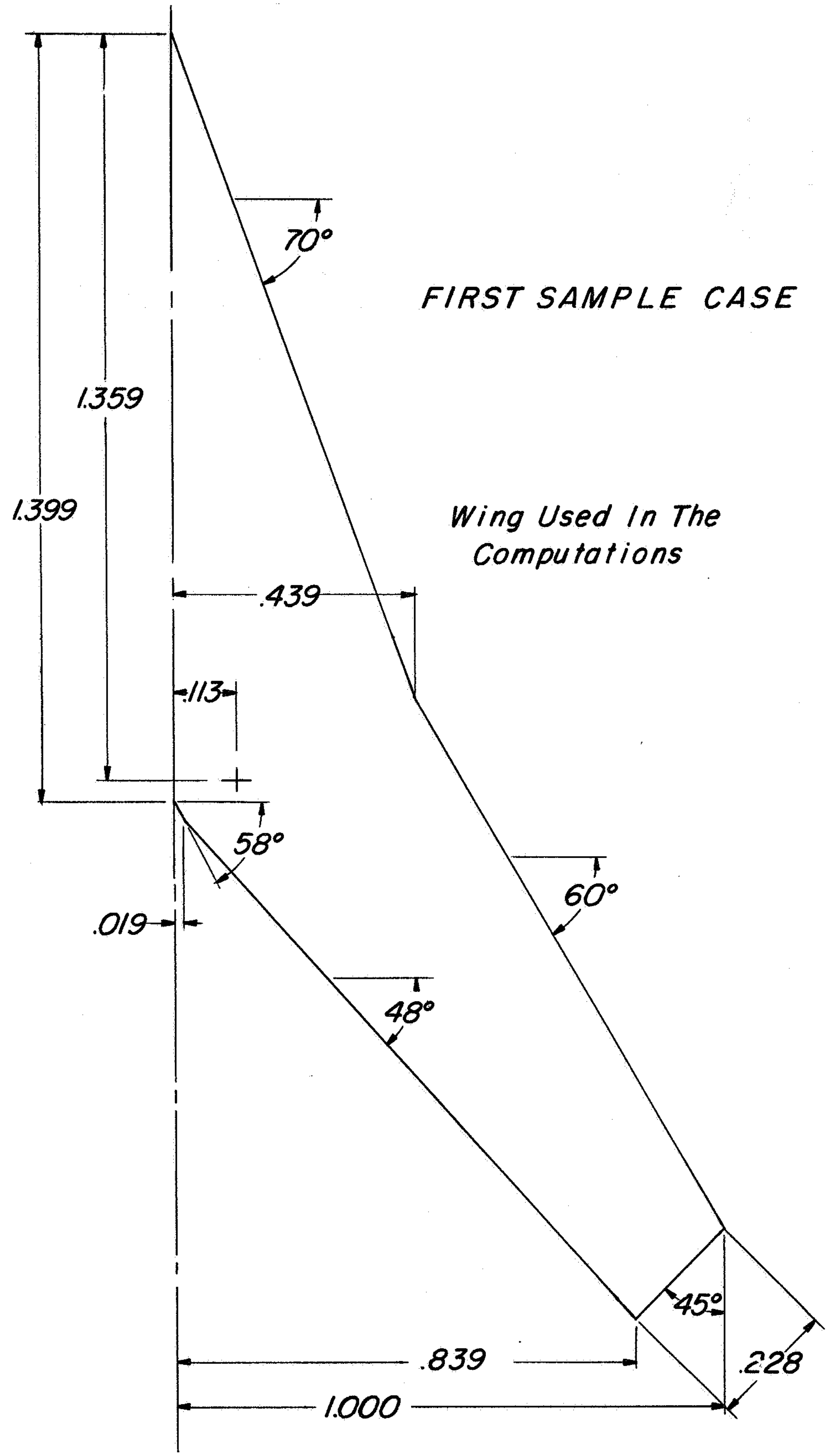
LOAD DISTRIBUTION PROGRAM A0313

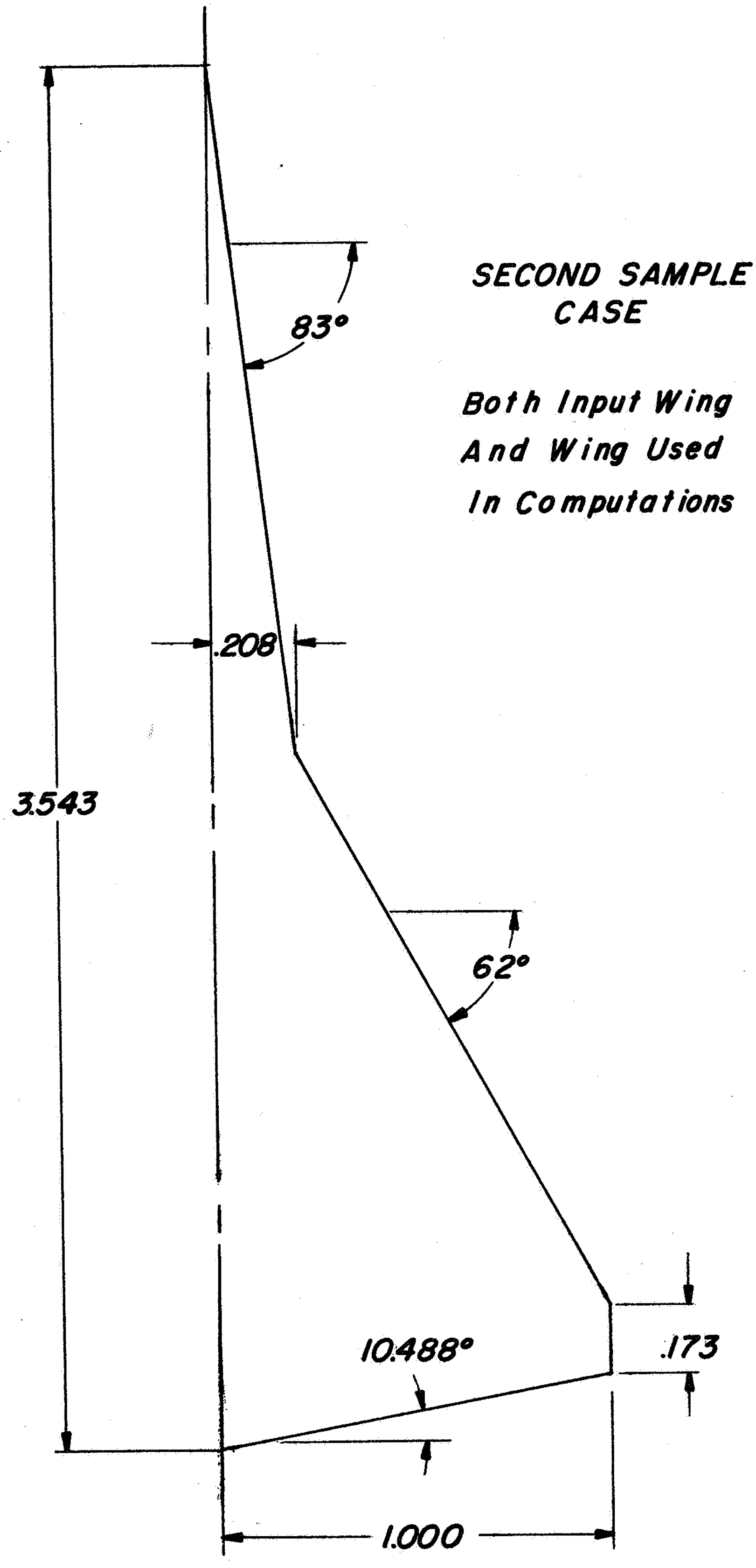
Sample Input Data

```
  5.17849    70.0          15.0         58.0           0.29279      0.03504   First
  0.16325    45.0           0.50019      0.08575       0.0          0.60      sample
5.     1.    8.      7.    1.  1.0      0.                                    case
---------------------------------------------------------------------------
  1.49080    83.           62.          0.             .20833      0.
   .04874     0.            0.          0.            0.           0.
200.     1.    4.     20.    1.    .22    1.
-.06116  -.06800  -.07481  -.08152  -.08813  -.09456  -.10079  -.10678
-.11250  -.11789  -.12294  -.12762  -.13187  -.13570  -.13907  -.14196
-.14435  -.14622  -.14756  -.14838  -.01396  -.02080  -.02761  -.03432
-.04093  -.04736  -.05359  -.05958  -.06530  -.07069  -.07574  -.08042   Second
-.08467  -.08850  -.09187  -.09476  -.09715  -.09902  -.10036  -.10118   sample
+.03987  +.03303  +.02622  +.01951  +.01290  +.00647  +.00024  -.00599   case
-.01171  -.01710  -.02215  -.02683  -.03108  -.03491  -.03828  -.04117
-.04356  -.04543  -.04677  -.04759  +.07519  +.06835  +.06154  +.05483
 .04822   .04179   .03556   .02957   .02385   .01846   .01341   .00873
 .00448   .00065  -.00272  -.00561  -.00800  -.00987  -.01121  -.01203
```



FIRST SAMPLE CASE
Input Wing
1.060
1.030
70°
.293
15°
.086
.173
3°
58°
.035
1.000


FIRST SAMPLE CASE
Wing Used In The Computations
70°
1.359
1.399
.439
.113
58°
.019
60°
48°
45°
.839
.228
1.000


SECOND SAMPLE
CASE
Both Input Wing
And Wing Used
In Computations
83°
.208
3.543
62°
10.488°
.173
1.000

Program Listing

```
      PROGRAM LIFSURF   (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
C     MODIFIED LIFTING SURFACE THEORY
C             FOR VARIABLE SWEEP PLANFORMS
C
C
      DIMENSION Y(41),ETA(41),C(41),D(41),B(41),IPIVO(100),SUML(100,100)
     1,PHI(10),VE(41),CONST(100,2),DF(10),AL(10,41),SA(41,41),Q(10,41),Q
     2T(10,41),CHDLD(41),CHDLDT(41),CHDLTO(41),CLL(41),CLB(41),CLLTOT(41
     3),GAMMA(41),GAMMAT(41),GAMTMA(41),AMU(41),AMUT(41),AMUTOT(41),ZICP
     4(41),ZICTP(41),ZICTPT(41),SLC(41),BLDT(41),BSPLDT(41),TAW(10),JJJ(
     510),INDEX(100,2),ALPHAI(41)
      REAL MACH,LOAC(41),LOACTO(41),LOACT(41)
      EXTERNAL FOFT1,FOFT2,FOFT3,FOFT4,FOFT5,FOFT6,FOFT7,FOFT8,FOFT9,FOF
     1T10
      COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
  500 FORMAT(6F12.5)
  501 FORMAT(1H1,58X,13HGEOMETRY DATA///)
  502 FORMAT(1H1,57X,16HAERODYNAMIC DATA///)
  503 FORMAT(50X,5HX2PP=,F9.5,5X,5HY2PP=,F9.5)
  504 FORMAT(50X,5HX3NP=,F9.5,5X,5HY3NP=,F9.5)
  505 FORMAT(50X,5HX4PP=,F9.5,5X,5HY4PP=,F9.5)
  506 FORMAT(50X,5HX5PP=,F9.5,5X,5HY5PP=,F9.5)
  507 FORMAT(50X,5HX6NP=,F9.5,5X,5HY6NP=,F9.5)
  508 FORMAT(50X,5HX7PP=,F9.5,5X,5HY7PP=,F9.5)
  509 FORMAT(40X12HCASE NUMBER=,F6.0,5X,14HSYMMETRY CODE=,F5.0,5X,12HMAC
     1H NUMBER=,F9.5)
  510 FORMAT(1H0)
  511 FORMAT(1X,I2,10F9.5,10X,2F9.5)
  512 FORMAT(14X,3HADD,6X,5HBASIC,4X5HTOTAL,4X,3HADD,6X, 5HBASIC,4X, 5HT
     1OTAL,4X,3HADD,6X,5HBASIC ,4X,5HTOTAL,5X,3HADD,5X,7HNO LIFT,2X,5HTO
     2TAL)
  513 FORMAT(23X,7HNO LIFT,1X,9HAT CLDESG,10X,7HNO LIFT,1X,9HAT CLDESG,1
     10X,7HNO LIFT,1X,9HAT CLDESG,18X,9HAT CLDESG)
  514 FORMAT(15X,97HIF SYMMETRY CODE IS EQUAL TO 1,THE SPAN LOADING IS S
     1YMMETRICAL,OTHER THAN 1,IT IS ANTISYMMETRICAL)
  515 FORMAT(8F9.5)
  516 FORMAT(55X,42HCHORDAL LOAD FACTORS,Q,FOR ADDITIONAL LOAD)
  517 FORMAT(1X4HSPAN2X,4H2Y/B3X,5HCHORD,4X,5HCHORD,4X,5HCHORD,4X,6HCENT
     1ER,3X,6HCENTER,3X,6HCENTER,3X,5HLOCAL,4X,5HLOCAL,4X,5HLOCAL,5X,4HS
     2PAN,4X,5HBASIC,4X,4HSPAN)
  518 FORMAT(1X,4HSTA.,9X,4HLOAD,5X,4HLOAD,5X,4HLOAD,5X,5HPRESS,4X,5HPRE
     1SS,4X,5HPRESS,4X,4HA.C.,5X,4HA.C.,5X,4HA.C.,6X,4HLOAD,4X,4HLOAD,5X
```

```
   2,4HLOAD)
519 FORMAT(26X,4HSPAN)
520 FORMAT(1X,4HSPAN2X,4H2Y/B3X,5HLOCAL,4X,5HLOCAL,4X,5HLOCAL,4X,5HLOC
   1AL,4X,5HLOCAL,4X,5HLOCAL,4X,5HLOCAL,4X,5HLOCAL,4X,5HLOCAL,14X,5HLO
   2CAL4X,5HLOCAL)
521 FORMAT(1X,4HSTA.,9X,5HCIRCU,4X,5HCIRCU,4X,5HCIRCU,4X,4HLIFT,5X,4HL
   1IFT,5X,4HLIFT,5X,5HPITCH,4X,5HPITCH.4X,5HPITCH,14X,4HHALF,5X,6HLOC
   2ATN)
522 FORMAT(30X13HASPECT RATIO=,F9.5,5X,14HPLANFORM AREA=,F9.5,5X,14HAV
   1ERAGE CHORD=,F9.5//10X21HMEAN GEOMETRIC CHORD=,F9.5,5X,59HX LOCATI
   2ON OF THE LEADING EDGE OF THE MEAN GEOMETRIC CHORD=,F9.5/ 30X39HY
   3LOCATION OF THE MEAN GEOMETRIC CHORD=,F9.5//)
523 FORMAT(///50X,60HCHORDAL LOAD FACTORS,QT,FOR THE LOAD DUE TO TWIST
   1 AND CAMBER)
524 FORMAT(15X,11HROOT CHORD=,F9.5,5X,10HTIP CHORD=,F9.5,5X,15HFOREWIN
   1G CHORD=,F9.5,5X,20HOVERALL TAPER RATIO=,F9.5//45X11HY LE BREAK=,F
   29.5,5X,11HY TE BREAK=,F9.5//25X17HX PIVOT LOCATION=,F9.5,5X17HY PI
   3VOT LOCATION=,F9.5,5X,17HZ PIVOT LOCATION=,F9.5//55X,19HTE CHORD E
   4XTENSION=,F9.5)
525 FORMAT(5F6.0,F6.2,F6.0)
526 FORMAT(////40X59HLOCATION OF PERIMETER POINTS FOR THE PLANFORM USE
   1D AS INPUT)
527 FORMAT(//5X35HNUMBER OF CHORDWISE PRESSURE MODES=,F5.0,5X72HNUMBER
   1 OF STATIONS SPANWISE ON A PANEL WHERE PRESSURE MODES ARE DEFINED=
   2,F5.0)
528 FORMAT(5X,41HCHORDWISE LOCATION OF CENTER OF PRESSURE=,F9.5,5X,60H
   1A.C. IN FRACTION OF CREF MEASURED FROM LEADING EDGE OF CREF=,F9.5/
   26X,40HSPANWISE LOCATION OF CENTER OF PRESSURE=,F9.5)
529 FORMAT(50X,9HX1PP=  0.10X,9HY1PP=  0.)
530 FORMAT(57X,12HCASE NUMBER=,F6.0)
531 FORMAT(10X,15HCLA PER DEGREE=,F9.5,5X,15HCMA PER DEGREE=,F9.5,5X,1
   11HCDI/CLA**2=,F9.5,5X,12HCDII/CLA**2=,F9.5///)
532 FORMAT(52X,7HX1=  0.,10X,7HY1=  0.)
533 FORMAT(1X,I2,4F9.5,F8.5,E11.3,F8.5,F7.5,E11.3,4F9.5)
534 FORMAT(26X,I4,2X,10F9.5)
535 FORMAT(52X,3HX2=,F9.5,5X,3HY2=,F9.5)
536 FORMAT(52X,3HX3=,F9.5,5X,3HY3=,F9.5)
537 FORMAT(52X,3HX4=,F9.5,5X,3HY4=,F9.5)
538 FORMAT(14X,3HADD,6X,5HBASIC,4X,5HTOTAL,4X,5HCOEFF,4X,5HCOEFF,4X,5H
   1COEFF,3X,8HCOEFF,LE,1X,8HCOEFF,LE,1X,8HCOEFF,LE,12X,5HCHORD,4X,6HM
   2IDCHD)
539 FORMAT(25X5H STA.,5X,I4,5X,I4,5X,I4,5X,I4,5X,I4,5X,I4,5X,I4,5X,I4,
   15X,I4,5X,I4)
```

```
 540 FORMAT(50X,5HX6AP=,F9.5,5X,5HY6AP=,F9.5)
 541 FORMAT(5X7HREF AR=,F9.5,2X,14HREF AREA,SREF=,F9.5,2X,17HMOMENT REF
    1 POINT=,F9.5,2X15HREF CHORD,CREF=,F9.5,2X,9HX LE REF=,F9.5)
 542 FORMAT(31X,1HN,6X,2HLS,9X,4H2Y/B10X,3HX/C,7X,8HDELTA CP,5X,8HDELTA
    1 CP5X,8HDELTA CP/76X,3HADD,9X,5HBASIC,8X,5HTOTAL/87X,7HNO LIFT,5X,
    29HAT CLDESG)
 543 FORMAT(28X,I4,3X,I4,6X,F9.5,5X,F9.5,4X,F9.5,4X,F9.5,4X,F9.5)
 544 FORMAT(2E16.8)
 545 FORMAT(52X,3HX5=,F9.5,5X,3HY5=,F9.5)
 546 FORMAT(2X,4HCLA=,F9.5,2X,4HCMA=,F9.5,2X,6HCROLL=,F9.5,3X,20HCL,TWI
    1ST AND CAMBER=,F9.5,2X,20HCM,TWIST AND CAMBER=,F9.5,2X,10HCL,DESIG
    2N=,F9.5)
 547 FORMAT(23X,7HNO LIFT,1X,9HAT CLDESG,1X,3HADD,6X,5HBASIC,4X,5HTOTAL
    1,4X,3HADD,6X,5HBASIC,4X,5HTOTAL/50X,7HNO LIFT,1X,9HAT CLDESG,10X,7
    2HNO LIFT,1X,9HAT CLDESG)
 548 FORMAT(5X,23HLE INBOARD SWEEP ANGLE=,F9.5,5X,32HLE INITIAL OUTBOAR
    1D SWEEP ANGLE=,F9.5,5X,30HLE FINAL OUTBOARD SWEEP ANGLE=,F9.5/5X,
    223HTE INBOARD SWEEP ANGLE=,F9.5,5X,32HTE INITIAL OUTBOARD SWEEP AN
    3GLE=,F9.5,5X,30HTE FINAL OUTBOARD SWEEP ANGLE=,F9.5//5X,40
    4HCHANGE IN OUTER PANEL SWEEP ANGLE,DELTA=,F9.5,4X,26HPIVOT CANT AN
    5GLE IN PITCH=,F3.0,4X,25HPIVOT CANT ANGLE IN ROLL=,F3.0//)
 549 FORMAT(51X,4HX6A=,F9.5,4X,4HY6A=,F9.5)
 550 FORMAT(52X,3HX6=,F9.5,5X,3HY6=,F9.5)
 551 FORMAT(2X,122HTOTAL WING PLANFORM(MEAN GEOMETRIC CHORD AND ITS LOC
    1ATION ARE INVALID IF THE PLANFORM HAS A TRAILING EDGE CHORD EXTENS
    2ION)///)
 552 FORMAT(///55X,20HREFERENCE DIMENSIONS//)
 553 FORMAT(///33X,72HLOCATION OF PERIMETER POINTS FOR PLANFORM TO BE U
    1SED IN THE COMPUTATIONS/40X,57HWHEN NONDIMENSIONALIZED BY THE SEMI
    2SPAN RATIO GIVEN ABOVE)
 554 FORMAT(//50X,26HFOR THE ADDITIONAL LOADING)
 555 FORMAT(40X,57HWHERE THE ORIGIN IS AT THE HALF ROOT CHORD,POSITIVE
    1X AFT//)
 556 FORMAT(52X,3HX7=,F9.5,5X,3HY7=,F9.5)
 557 FORMAT(4E16.8)
 558 FORMAT(25X,33H(SEMISPAN AT FINAL OUTBOARD SWEEP,37H/SEMISPAN AT IN
    1ITIAL OUTBOARD SWEEP)=,F9.5)
 559 FORMAT(10X,31HANGLE FOR ZERO LIFT,ALPHA ZERO=,F9.5,15X,44HPITCHING
    1 MOMENT COEFF. AT ZERO LIFT,CM ZERO=,F9.5/30X,53HROOT BENDING MOME
    2NT COEFFICIENT AT ZERO LIFT,CBMROOT=,F9.5)
C
C      INPUT DATA
C
```

```
C
C     IF THE WING DOES NOT HAVE A LEADING EDGE BREAK SET B1RAT AND CHI
C     EQUAL TO ZERO
C
C
C     IF THE WING DOES NOT HAVE TRAILING EDGE BREAK SET B2RAT AND PSI
C     EQUAL TO ZERO
C
C
C     IF THE WING DOES NOT HAVE A VARIABLE SWEEP OUTER PANEL SET DELT,
C     XP AND YP EQUAL TO ZERO
C
C
C     IF THE SPAN LOADING IS TO BE SYMMETRICAL SET THE SYM CODE EQUAL TO
C     ONE, IF ANTISYMMETRICAL SET THE SYM CODE EQUAL TO TWO
C
C
C     IF THE WING HAS A TRAILING CHORD EXTENSION SET AJTEST EQUAL TO
C     TWO.  THIS WILL BASE ALL OF THE AERODYNAMIC COEFFICIENTS ON THE
C     PLANFORM OF THE OUTER PANEL EXTENDED TO THE ROOT
C
C
C     SET CLDESG EQUAL TO ONE UNLESS A PARTICULAR VALUE OF THE LIFT
C     COEFFICIENT WOULD BE USEFUL IN SCALING THE LOADING DISTRIBUTION
C
C
C     IF THE WING HAS TWIST AND/OR CAMBER SET THE TWADCM CODE EQUAL TO
C     ONE. OTHERWISE SET IT EQUAL TO ZERO
C
C
C
    1 READ(5,500) AR,CHI,ALAMD,PSI,B1RAT,B2RAT
      IF(EOF,5) 10,5
    5 READ(5,500) TAPER,DELT,XP,YP,CHDEXT,MACH
      READ(5,525)  CASE,SYM,CSTA,SSSTA,AJTEST,CLDESG,TWADCM
C
C
C     VARIBLE SWEEP GEOMETRY PROGRAM
C
C
      PI=3.14159265
      RAD=180./PI
      QBAR=1.00
```

```
      BO=1.0
      YMIN=1.0
      YMAX=1.0
      YMAX1=1.0
      SIGM=0.
      RHH=0.
      ZP=0.
C
      CHDEXX=CHDEXT
      BETA=SQRT(1.-MACH**2)
      ISYM=SYM
      JMAX=CSTA
      ISSST=SSSTA
      NMAX=2*ISSST-1
      NNII=ISSST+1
      JKMAX=JMAX*ISSST
      JTEST=AJTEST
      NTWACM=TWADCM+1.
C
      ITTU=1
C
      CHI=CHI/RAD
      ALAMD=ALAMD/RAD
      PSI=PSI/RAD
      DELTA=DELT/RAD
      SIGMA=SIGM/RAD
      RHO=RHH/RAD
      TANC=TAN(CHI)
      TANL=TAN(ALAMD)
      TANP=TAN(PSI)
      TANDE=TAN(PI/2.+DELTA)
      B1=B1RAT*BO
      B2=B2RAT*BO
      CR=BO*(4./AR-B2RAT*TANP-TANC*(B1RAT*(B1RAT-B2RAT-1.))-TANL*
     1(B1RAT*(B2RAT-B1RAT+1.)-B2RAT))*(1./(B2RAT*(1.-TAPER)+(1.+TAPER)))
      OMEGA=ATAN ((1./(1.-B2RAT))*((TAPER-1.)*(CR/BO)+B1RAT*(TANC-TANL)
     1-B2RAT*TANP+TANL))
      TANO=TAN(OMEGA)
      EOMEG=OMEGA+DELTA
      ALAME=ALAMD+DELTA
      TANE=TAN(EOMEG)
      TANA=TAN(ALAME)
      CR=CR+CHDEXT
```

```
 X2=-CR/2.
 Y2=0.00
 Z2=0.00
 X3=-CR/2.+B1*TANC
 Y3=B1
 Z3=0.00
 X4=-CR/2.+B1*(TANC-TANL)+B0*TANL
 Y4=B0
 Z4=0.00
 X5=CR/2.+B2*(TANP-TANO)+B0*TANO-CHDEXT
 Y5=B0
 Z5=0.00
 X6A=CR/2.+B2*TANP
 Y6A=B2
 Z6A=0.00
 X6=X6A-CHDEXT
 Y6=Y6A
 Z6=0.00
 X7=CR/2.
 Y7=0.00
 Z7=0.00
 X2PP=X2
 Y2PP=Y2
 Z2PP=Z2
 X6AP=X6A
 Y6AP=Y6A
 Z6AP=Z6A
 X7PP=X7
 Y7PP=Y7
 Z7PP=Z7
 IF(DELTA.EQ.0.) GO TO 360
 X3PP=XP+(X3-XP)*COS(SIGMA)*COS(DELTA)+(Y3-YP)*COS(RHO)*SIN(DELTA)
1+(Z3-ZP)*(COS(SIGMA)*SIN(RHO)*SIN(DELTA)-SIN(SIGMA)*COS(RHO))
 Y3PP=YP-(X3-XP)*COS(SIGMA)*SIN(DELTA)+(Y3-YP)*COS(RHO)*COS(DELTA)
1+(Z3-ZP)*(COS(SIGMA)* SIN(RHO)*COS(DELTA)+SIN(SIGMA)*SIN(DELTA))
 Z3PP=(X3-XP)*SIN(SIGMA)*COS(RHO)-(Y3-YP)*SIN(RHO)
1+(Z3-ZP)*COS(SIGMA)*COS(RHO)+ZP
 X4PP=XP+(X4-XP)*COS(SIGMA)*COS(DELTA)+(Y4-YP)*COS(RHO)*SIN(DELTA)
1+(Z4-ZP)*(COS(SIGMA)*SIN(RHO)*SIN(DELTA)-SIN(SIGMA)*COS(RHO))
 Y4PP=YP-(X4-XP)*COS(SIGMA)*SIN(DELTA)+(Y4-YP)*COS(RHO)*COS(DELTA)
1+(Z4-ZP)*(COS(SIGMA)* SIN(RHO)*COS(DELTA)+SIN(SIGMA)*SIN(DELTA))
 Z4PP=(X4-XP)*SIN(SIGMA)*COS(RHO)-(Y4-YP)*SIN(RHO)
1+(Z4-ZP)*COS(SIGMA)*COS(RHO)+ZP
```

```
      X5PP=XP+(X5-XP)*COS(SIGMA)*COS(DELTA)+(Y5-YP)*COS(RHO)*SIN(DELTA)
     1+(Z5-ZP)*(COS(SIGMA)*SIN(RHO)*SIN(DELTA)-SIN(SIGMA)*COS(RHO))
      Y5PP=YP-(X5-XP)*COS(SIGMA)*SIN(DELTA)+(Y5-YP)*COS(RHO)*COS(DELTA)
     1+(Z5-ZP)*(COS(SIGMA)* SIN(RHO)*COS(DELTA)+SIN(SIGMA)*SIN(DELTA))
      Z5PP=(X5-XP)*SIN(SIGMA)*COS(RHO)-(Y5-YP)*SIN(RHO)
     1+(Z5-ZP)*COS(SIGMA)*COS(RHO)+ZP
      X6PP=XP+(X6-XP)*COS(SIGMA)*COS(DELTA)+(Y6-YP)*COS(RHO)*SIN(DELTA)
     1+(Z6-ZP)*(COS(SIGMA)*SIN(RHO)*SIN(DELTA)-SIN(SIGMA)*COS(RHO))
      Y6PP=YP-(X6-XP)*COS(SIGMA)*SIN(DELTA)+(Y6-YP)*COS(RHO)*COS(DELTA)
     1+(Z6-ZP)*(COS(SIGMA)* SIN(RHO)*COS(DELTA)+SIN(SIGMA)*SIN(DELTA))
      Z6PP=(X6-XP)*SIN(SIGMA)*COS(RHO)-(Y6-YP)*SIN(RHO)
     1+(Z6-ZP)*COS(SIGMA)*COS(RHO)+ZP
      IF((Y3-Y2PP).EQ.0.) GO TO 208
      A2PP=(X3  -X2PP)/(Y3  -Y2PP)
      GO TO 209
  208 A2PP=0.
  209 IF((Y6-Y7PP).EQ.0.) GO TO 210
      A6PP=(X6  -X7PP)/(Y6  -Y7PP)
      GO TO 211
  210 A6PP=0.
  211 IF((Y4PP-Y3PP).EQ.0.) GO TO 212
      A3PP=(X4PP-X3PP)/(Y4PP-Y3PP)
      GO TO 213
  212 A3PP=0.
  213 IF((Y5PP-Y6PP).EQ.0.) GO TO 214
      A5PP=(X5PP-X6PP)/(Y5PP-Y6PP)
      GO TO 215
  214 A5PP=0.
  215 IF(((X3-X2PP)**2+(Y3-Y2PP)**2).EQ.0.) GO TO 216
      G2PP=(Z3  -Z2PP)/((X3  -X2PP)**2+(Y3  -Y2PP)**2)**.5
      GO TO 217
  216 G2PP=0.
  217 IF(((X7PP-X6)**2+(Y7PP-Y6)**2).EQ.0.) GO TO 218
      G6PP=(Z6  -Z7PP)/((X7PP-X6  )**2+(Y7PP-Y6  )**2)**.5
      GO TO 219
  218 G6PP=0.
  219 IF((A3PP-A2PP).EQ.0.) GO TO 220
      X3NP= (A3PP*X2PP-A2PP*X4PP+A2PP*A3PP*(Y4PP-Y2PP))/(A3PP-A2PP)
      Y3NP= (X2PP-X4PP+A3PP*Y4PP-A2PP*Y2PP)/(A3PP-A2PP)
      GO TO 221
  220 X3NP=X2PP
      Y3NP=Y2PP
  221 Z3NP=((X3NP-X2PP)**2+(Y3NP-Y2PP)**2)**.5*G2PP+Z2PP
```

```
      IF((A6PP-A5PP).EQ.0.) GO TO 222
      X6NP= (A6PP*X5PP-A5PP*X7PP+A5PP*A6PP*(Y7PP-Y5PP))/(A6PP-A5PP)
      Y6NP=(X5PP-X7PP+A6PP*Y7PP-A5PP*Y5PP)/(A6PP-A5PP)
      GO TO 223
  222 X6NP=X7PP
      Y6NP=Y7PP
  223 Z6NP=((X6NP-X7PP)**2+(Y6NP-Y7PP)**2)**.5*G6PP+Z7PP
      IF(CHDEXT.EQ.0.) GO TO 342
      X6NP=X6PP+(Y6-Y6PP)*A5PP
      Y6NP=Y6
      Z6NP=(X6AP-X6NP)*(Z6A-Z6)/(X6A-X6)+Z6AP
  342 IF(Y4PP.GE.Y5PP) GO TO 411
      IF(Y4PP.LT.Y5PP) YMAX=Y5PP
      YMAX1=YMAX
      GO TO 410
  411 YMAX=Y4PP
      YMAX1=YMAX
  410 X2PP=X2PP/YMAX
      Y2PP=Y2PP/YMAX
      Z2PP=Z2PP/YMAX
      X3NP=X3NP/YMAX
      Y3NP=Y3NP/YMAX
      Z3NP=Z3NP/YMAX
      X4PP=X4PP/YMAX
      Z4PP=Z4PP/YMAX
      X5PP=X5PP/YMAX
      Z5PP=Z5PP/YMAX
      X6AP=X6AP/YMAX
      Y6AP=Y6AP/YMAX
      Z6AP=Z6AP/YMAX
      X6NP=X6NP/YMAX
      Y6NP=Y6NP/YMAX
      Z6NP=Z6NP/YMAX
      X7PP=X7PP/YMAX
      Y7PP=Y7PP/YMAX
      Z7PP=Z7PP/YMAX
      XP=XP/YMAX
      YP=YP/YMAX
      ZP=ZP/YMAX
      CR=CR/YMAX
      Y4PP=Y4PP/YMAX
      Y5PP=Y5PP/YMAX
      CHDEXT=CHDEXT/YMAX
```

```
      IF(ABS(ALAME-CHI).GE.0.000174) GO TO 765
      X3NP=X2PP
      Y3NP=Y2PP
      Z3NP=Z2PP
  765 IF(ABS(EOMEG-PSI).GE.0.000174.OR.CHDEXT.NE.0.0) GO TO 767
      X6NP=X7PP
      Y6NP=Y7PP
      Z6NP=Z7PP
      X6AP=X7PP
      Y6AP=Y7PP
      Z6AP=Z7PP
  767 IF(CHDEXT.NE.0.0) GO TO 766
      X6AP=X7PP
      Y6AP=Y7PP
      Z6AP=Z7PP
  766 IF(Y6AP.EQ.Y6NP) GO TO 1050
      CHDEXX=0.0
      GO TO 1051
 1050 CHDEXX=X6AP-X6NP
 1051 SADD=CHDEXX*Y6NP
      YMAX=1.00
      YMIN=AMIN1(Y4PP,Y5PP)
      B1RAP=Y3NP
      B2RAP=Y6NP
      IF(Y6NP-Y7PP) 362,361,361
  362 X6NP1=X6NP
      Y6NP1=Y6NP
      Z6NP1=Z6NP
      X6NP=X6NP1-Y6NP1*TANE
      Y6NP=0.0000000
      TANU=(Z6NP1-Z5PP)/((X6NP1-X5PP)**2+(Y6NP1-Y5PP)**2)**.5
      Z6NP= Z6NP1-((X6NP-X6NP1)**2+(Y6NP-Y6NP1)**2)**.5*TANU
      CR=X6NP-X2PP
      ORIGNN=(X6NP-X7PP)/2.
      X2PP=X2PP-ORIGNN
      X3NP=X3NP-ORIGNN
      X4PP=X4PP-ORIGNN
      X5PP=X5PP-ORIGNN
      X6NP=X6NP-ORIGNN
      X6AP=X6AP-ORIGNN
      X7PP=0.00
      B2RAP=0.00
      TANP=0.000000
```

```
      GO TO 361
  360 X3NP=X3
      Y3NP=Y3
      Z3NP=Z3
      X4PP=X4
      Y4PP=Y4
      Z4PP=Z4
      X5PP=X5
      Y5PP=Y5
      Z5PP=Z5
      X6NP=X6
      Y6NP=Y6
      Z6NP=Z6
      SADD=CHDEXX*Y6NP
      B1RAP=Y3NP
      B2RAP=Y6NP
  361 TANOP=TANE-TANP
      TANOL=TANE-TANA
      TANOC=TANE-TANC
      TANLC=TANA-TANC
      TANLP=TANA-TANP
      TANPC=TANP-TANC
      IF(Y4PP.GE.Y5PP)  XCBLEM=
     1(CR+Y3NP*TANLC-Y6NP*TANOP+Y5PP*TANOL)*(Y4PP*(-CR/2.-Y3NP*TANLC)
     2+(Y4PP+Y5PP)/2.*(Y4PP*TANA-(-CR/2.-Y3NP*TANLC))-(Y4PP**2
     3+Y4PP*Y5PP+Y5PP**2)*TANA/3.)
      IF(Y4PP.LT.Y5PP) XCBLEM=
     1(CR+Y3NP*TANLC-Y6NP*TANOP+Y4PP*TANOL)*(Y5PP*(-CR/2.-Y3NP*TANLC
     2+Y4PP*(TANA-TANDE))+(Y5PP+Y4PP)/2.*(Y5PP*TANDE-(-CR/2.-Y3NP*TANLC
     3+Y4PP*(TANA-TANDE)))-1./3.*(Y5PP**2+Y5PP*Y4PP+Y4PP**2)*TANDE)
      CR=CR-CHDEXX
      S=2.*(-Y3NP**2*TANLC/2.+Y6NP**2*TANOP/2.+YMIN*(CR+Y3NP*TANLC
     1-Y6NP*TANOP+YMIN*TANOL/2.)+     SADD     +
     2(YMAX-YMIN)/2.*(CR+Y3NP*TANLC-Y6NP*TANOP+YMIN*TANOL))
      CR=CR+CHDEXX
C
C      CBAR,XCBAR,AND YCBAR ARE NOT VALID FOR A DISCONTINUOUS TRAILING EDGE
C
C
      YCBAR= 2./S*(CR/2.* YMIN **2+Y6NP **3*TANOP/6.-Y3NP**3*TANLC/6.
     1+YMIN**2*(YMIN/3.*TANOL+Y3NP/2.*TANLC-Y6NP/2.*TANOP)
     2+(YMAX+2.*YMIN)*(YMAX-YMIN)/6.*(CR+Y3NP*TANLC-Y6NP*TANOP
```

```
     3+YMIN*TANOL))
      CAV=S/(2.*YMAX)
      IF(B1RAP-B2RAP) 303,304,304
  303 CBAR=2./S*(CR**2*Y3NP+CR*Y3NP**2*TANPC+Y3NP**3*TANPC**2/3. +
     1(CR+Y3NP*TANLC)**2*(Y6NP-Y3NP)-(Y6NP**2-Y3NP**2)*(CR+Y3NP*TANLC)*
     2TANLP+(Y6NP**3-Y3NP**3)*TANLP**2/3.  +
     3(CR+Y3NP*TANLC-Y6NP*TANOP)**2*(YMIN-Y6NP)+(YMIN**2-Y6NP**2)*TANOL*
     4(CR+Y3NP*TANLC-Y6NP*TANOP)+(YMIN**3-Y6NP**3)*TANOL**2/3.+
     5(YMAX-YMIN)/3.*(CR+Y3NP*TANLC-Y6NP*TANOP+YMIN*TANOL)**2)
      XCBAR=2./S*(-YMIN/2.*CR**2+CR/2.*(1.5*Y3NP**2*TANLC-Y6NP**2*TANOP
     1/2.+YMIN**2*(3.*TANA-TANE)/2.-3.0*YMIN*Y3NP*TANLC+YMIN*Y6NP*
     2TANOP)+Y3NP**3*TANLC*(2.*TANA-4.*TANC+TANP)/6.+Y6NP**3*TANA*TANOP/
     36.+YMIN**3*TANA*TANOL/3.-Y3NP**2*YMIN*TANLC**2+(YMIN*Y3NP*Y6NP
     4-Y3NP/2.*Y6NP**2)*TANOP*TANLC+Y3NP/2.*YMIN**2*TANLC*(2.*TANA-TANE)
     5-Y6NP/2.*YMIN**2*TANA*TANOP+
     6XCBLEM )
      GO TO 301
  304 CBAR=2./S*(CR**2*Y6NP+CR*Y6NP**2*TANPC+Y6NP**3*TANPC**2/3.  +(CR
     1-Y6NP*TANOP)**2*(Y3NP-Y6NP)+(CR-Y6NP*TANOP)*(Y3NP**2-Y6NP**2)
     2*TANOC+(Y3NP**3-Y6NP**3)*TANOC**2/3.  +
     3(CR+Y3NP*TANLC-Y6NP*TANOP)**2*(YMIN-Y3NP) +(CR+Y3NP*TANLC-Y6NP*
     4TANOP)*TANOL*(YMIN**2-Y3NP**2) +(YMIN**3-Y3NP**3)*TANOL**2/3. +
     5(YMAX-YMIN)/3.*(CR+Y3NP*TANLC-Y6NP*TANOP+YMIN*TANOL)**2)
      XCBAR=2./S*(-Y6NP/2.*CR**2+Y6NP**2/2.*(CR*TANC-CR/2.*TANPC)+Y6NP**
     13/3.*TANC*TANPC-       (Y3NP-Y6NP)*CR/2.*(CR-Y6NP*TANOP)+(Y3NP**2-
     2Y6NP**2)/2.*(-CR*TANOC/2.+TANC*(CR-Y6NP*TANOP))+(Y3NP**3-Y6NP**3)/
     33.*(TANC*TANOC)+     (YMIN-Y3NP)*((CR+Y3NP*TANLC-Y6NP*TANOP)*(-CR/2
     4.-Y3NP*TANLC))+(YMIN**2-Y3NP**2)/2.*(TANA*(CR+Y3NP*TANLC-Y6NP*TANO
     5P)+TANOL*(-CR/2.-Y3NP*TANLC))+(YMIN**3-Y3NP**3)/3.*TANA*TANOL+
     6XCBLEM )
  301 ARN=4.*YMAX**2/S
      ARB=ARN*BETA
      CR=CR/BETA
C
C
C
C
C     THE FLAT PLATE ANGLE OF ATTACK,CONST(JK,1),IS SET EQAUL TO ONE
C     RADIAN
C
C
      DO 2 JK=1,JKMAX
    2 CONST(JK,1)=4.00000000
```

```
C
C
C     THE LOCAL ANGLE OF ATTACK DUE TO TWIST AND/OR CAMBER,CONST(JK,2),
C     ARE EITHER READ IN OR ASSIGNED A ZERO VALUE HERE DEPENDING ON THE
C     VALUE OF THE TWADCM CODE
C
C
      IF(NTWACM.EQ.1) GO TO 1002
      READ(5,515) (CONST(JK,2),JK=1,JKMAX)
      DO 8 I=1,JKMAX
    8 CONST(I,2)=4.*CONST(I,2)
      GO TO 1004
 1002 DO 1003 JK=1,JKMAX
 1003 CONST(JK,2)=0.0
C
 1004 CHIB=ATAN(TANC/BETA)
      ALAMB=ATAN(TANA/BETA)
      PSIB=ATAN(TANP/BETA)
      OMEGB=ATAN(TANE/BETA)
      TANCB=TAN(CHIB)
      TANLB=TAN(ALAMB)
      TANPB=TAN(PSIB)
      TANOB=TAN(OMEGB)
      TANLCB=TANLB-TANCB
      TANLPB=TANLB-TANPB
      TANPCB=TANPB-TANCB
      TANOCB=TANOB-TANCB
      TANOLB=TANOB-TANLB
      TANOPB=TANOB-TANPB
      ETA(ISSST)=0.0
      Y(ISSST)=0.0
      DO 7 NP=NNII,NMAX
      ANP=NP
      ETA(NP)=SIN((ANP-SSSTA)*PI /(2.0*SSSTA))
      Y(NP)=ETA(NP)
      CHDSUB=0.
      IF(ETA(NP).GT.(Y6NP-0.10).AND.ETA(NP).LE.Y6NP.AND.CHDEXX.NE.0.)
     1CHDSUB=CHDEXX*(1.-(Y6NP-ETA(NP))/.10)/BETA
      IF(ETA(NP).GT.Y6NP.AND.CHDEXX.NE.0.) CHDSUB=CHDEXX/BETA
      IF(Y3NP.GE.Y6NP) GO TO 307
      IF(ETA(NP).GE.Y3NP) GO TO 309
      C(NP)=(CR+ETA(NP)*TANPCB-CHDSUB)/2.0
      D(NP)=ETA(NP)*(TANPB+TANCB)/2.0-CHDSUB/2.0
```

```
      DIFF3=ETA(NP)-0.
  312 IF(ITTU.NE.2) GO TO 314
      IUSX=NP-1
      IUST=NP-2
      C(IUSX)=(10.*C(IUSX)+2.*C(IUST))/12.
      D(IUSX)=(10.*D(IUSX)+2.*D(IUST))/12.
      ITTU=1
  314 IF(DIFF3.LT.0..OR.DIFF3.GT..01) GO TO 323
      ITTU=2
  323 IF(NP-NNII) 7,6,7
  309 IF(ETA(NP).GE.Y6NP) GO TO 327
      C(NP)=(CR+Y3NP*TANLCB-ETA(NP)*TANLPB-CHDSUB)/2.0
      D(NP)=(-Y3NP*TANLCB+ETA(NP)*(TANPB+TANLB)-CHDSUB)/2.0
      DIFF3=ETA(NP)-Y3NP
      GO TO 312
  327 IF(ETA(NP).GE.YMIN) GO TO 331
      C(NP)=(CR+Y3NP*TANLCB-Y6NP*TANOPB+ETA(NP)*TANOLB-CHDSUB)/2.0
      D(NP)=(-Y3NP*TANLCB-Y6NP*TANOPB+ETA(NP)*(TANOB+TANLB)-CHDSUB)/2.0
      DIFF3=ETA(NP)-Y6NP
      GO TO 312
  331 IF(YMIN.EQ.Y5PP) GO TO 340
      CATY4=CR+Y3NP*TANLCB-Y6NP*TANOPB+Y4PP*TANOLB-CHDSUB
      DATY4=X4PP/BETA+CATY4/2.
      C(NP)=.5*(CATY4-CATY4*(ETA(NP)-YMIN)/(YMAX-YMIN))
      D(NP)=DATY4+(X5PP/BETA-DATY4)*(ETA(NP)-YMIN)/(YMAX-YMIN)
      DIFF3=ETA(NP)-YMIN
      GO TO 312
  340 C(NP)=(Y4PP-ETA(NP))/(2.0*(Y4PP-Y5PP)) *(CR+Y3NP*TANLCB-Y6NP
     1*TANOPB+Y5PP*TANOLB-CHDSUB)
      DATY5=(-Y3NP*TANLCB-Y6NP*TANOPB+Y5PP*(TANLB+TANOB)-CHDSUB)/2.0
      D(NP)=DATY5+(X4PP/BETA-DATY5)*(ETA(NP)-YMIN)/(YMAX-YMIN)
      DIFF3=ETA(NP)-YMIN
      GO TO 312
  307 IF(ETA(NP).GE.Y6NP) GO TO 311
      C(NP)=(CR+ETA(NP)*TANPCB-CHDSUB)/2.0
      D(NP)=ETA(NP)*(TANPB+TANCB)/2.0-CHDSUB/2.0
      DIFF6=ETA(NP)-0.
  313 IF(ITTU.NE.2) GO TO 316
      IUSX=NP-1
      IUST=NP-2
      C(IUSX)=(10.*C(IUSX)+2.*C(IUST))/12.
      D(IUSX)=(10.*D(IUSX)+2.*D(IUST))/12.
      ITTU=1
```

```
316 IF(DIFF6.LT.0..OR.DIFF6.GT..01) GO TO 325
    ITTU=2
325 IF(NP-NNII) 7,6,7
311 IF(ETA(NP).GE.Y3NP) GO TO 329
    C(NP)=(CR-Y6NP*TANOPB+ETA(NP)*TANOCB-CHDSUB)/2.0
    D(NP)=(-Y6NP*TANOPB+ETA(NP)*(TANOB+TANCB)-CHDSUB)/2.0
    DIFF6=ETA(NP)-Y6NP
    GO TO 313
329 IF(ETA(NP).GE.YMIN) GO TO 333
    C(NP)=(CR+Y3NP*TANLCB-Y6NP*TANOPB+ETA(NP)*(TANOLB)-CHDSUB)/2.0
    D(NP)=(-Y3NP*TANLCB-Y6NP*TANOPB+ETA(NP)*(TANOB+TANLB)-CHDSUB)/2.0
    DIFF6=ETA(NP)-Y3NP
    GO TO 313
333 IF(YMIN.EQ.Y5PP) GO TO 346
    CATY4=CR+Y3NP*TANLCB-Y6NP*TANOPB+Y4PP*TANOLB-CHDSUB
    DATY4=X4PP/BETA+CATY4/2.
    C(NP)=.5*(CATY4-CATY4*(ETA(NP)-YMIN)/(YMAX-YMIN))
    D(NP)=DATY4+(X5PP/BETA-DATY4)*(ETA(NP)-YMIN)/(YMAX-YMIN)
    DIFF6=ETA(NP)-YMIN
    GO TO 313
346 C(NP)=(Y4PP-ETA(NP))/(2.0*(Y4PP-Y5PP)) *(CR+Y3NP*TANLCB-Y6NP
   1*TANOPB+Y5PP*TANOLB-CHDSUB)
    DATY5=(-Y3NP*TANLCB-Y6NP*TANOPB+Y5PP*(TANLB+TANOB)-CHDSUB)/2.0
    D(NP)=DATY5+(X4PP/BETA-DATY5)*(ETA(NP)-YMIN)/(YMAX-YMIN)
    DIFF6=ETA(NP)-YMIN
    GO TO 313
  6 C(ISSST)=(5.*CR+2.*C(NNII))/12.
    D(ISSST)=D(NNII)/6.
  7 CONTINUE
    DO 187 N=NNII,NMAX
    KSU=NMAX+1-N
    ETA(KSU)=-ETA(N)
    Y(KSU)=-Y(N)
    C(KSU)=C(N)
    D(KSU)=D(N)
187 CONTINUE
    CHII=RAD*CHI
    ALAM=RAD*ALAMD
    ALADL=RAD*ALAME
    PSIBB=RAD*PSI
    OMEG=RAD*OMEGA
    EOMG=RAD*EOMEG
    CR=CR*BETA
```

```
      CTB=(X5-X4)/YMAX1
      TAPER=CTB/CR
      CFB=Y3NP*TANC
C
C
C     WRITE INPUT DATA
C
C
      WRITE (6,501)
      WRITE(6,509) CASE,SYM,MACH
      WRITE(6,514)
      WRITE (6,527) CSTA,SSSTA
      WRITE(6,510)
      WRITE(6,526)
      WRITE(6,555)
      WRITE(6,532)
      WRITE(6,535) X2,Y2
      WRITE(6,536) X3,Y3
      WRITE(6,537) X4,Y4
      WRITE(6,545) X5,Y5
      WRITE(6,550) X6,Y6
      WRITE(6,549) X6A,Y6A
      WRITE(6,556) X7,Y7
      WRITE(6,510)
      WRITE(6,558) YMAX1
      WRITE(6,510)
      WRITE(6,553)
      WRITE(6,555)
      WRITE(6,529)
      WRITE(6,503) X2PP,Y2PP
      WRITE(6,504) X3NP,Y3NP
      WRITE(6,505) X4PP,Y4PP
      WRITE(6,506) X5PP,Y5PP
      WRITE(6,507) X6NP,Y6NP
      WRITE(6,540) X6AP,Y6AP
      WRITE(6,508) X7PP,Y7PP
      WRITE(6,510)
      WRITE(6,551)
      WRITE(6,522) ARN,S,CAV,CBAR,XCBAR,YCBAR
      WRITE(6,548) CHII,ALAM,ALADL,PSIBB,OMEG,EOMG,DELT,SIGM,RHH
      WRITE(6,524) CR,CTB,CFB,TAPER,B1RAP,B2RAP,XP,YP,ZP,CHDEXX
C
C
```

```
C      TO DETERMINE WHAT REFERENCE DIMENSIONS TO USE
C
C
       IF(JTEST.NE.1)  GO TO 400
       CREF=CBAR
       YREF=YMAX
       SREF=S
       XLREF=XCBAR
       REFPT=XCBAR+CBAR/4.
       ARNN=ARN
       GO TO 401
   400 CRSW=CTB-(TANO-TANL)/YMAX1
       TAPRSW=CTB/CRSW
       CREF=(2.*CRSW/3.)*(1.+TAPRSW+TAPRSW**2)/(1.+TAPRSW)
       YREF=1./YMAX1
       SREF=(CTB+CRSW)/YMAX1
       XLREF=2./SREF*(-CRSW**2/(2.*YMAX1)-CRSW/(2.*YMAX1**2)*((TANO-TANL
      1)/2.-TANL)+TANL/(3.*YMAX1**3)*(TANO-TANL)) +(X4-Y4*TANL)/YMAX1
      2+CRSW/2.
       REFPT=XLREF+CREF/4.
       ARNN=(2./YMAX1)**2/SREF
C
C
C
C
C
C
C      MAIN PROGRAM
C
C
   401 DO 3 NTR=1,41
       VE    (NTR)=0.0
       B     (NTR)=0.0
       CHDLD (NTR)=0.0
       GAMMA (NTR)=0.0
       CLL   (NTR)=0.0
       CHDLDT(NTR)=0.0
       ZICP  (NTR)=0.0
       LOAC  (NTR)=0.0
       SLC   (NTR)=0.0
       BLDT  (NTR)=0.0
       BSPLDT(NTR)=0.0
       CLB   (NTR)=0.0
```

```
      CHDLTO(NTR)=0.0
      CLLTOT(NTR)=0.0
      GAMMAT(NTR)=0.0
      GAMTMA(NTR)=0.0
      ZICTP (NTR)=0.0
      LOACT (NTR)=0.0
      ZICTPT(NTR)=0.0
      LOACTO(NTR)=0.0
      AMU   (NTR)=0.0
      AMUT  (NTR)=0.0
      AMUTOT(NTR)=0.0
      ALPHAI(NTR)=0.0
    3 CONTINUE
      DO 590 NIR=1,41
      DO 590 NTR=1,41
  590 SA(NIR,NTR)=0.0
      DO 78 KS=1,JMAX
      PKS=KS
      PHI(KS)=(2.0*PKS*PI)/(2.0*CSTA+1.0)
      DO 78 NU=ISSST,NMAX
      JK=(KS-2)*ISSST+NU+1
      ANU=NU
      DO 14 N=1,NMAX
      AN=N
      VE(N)=COS(((AN-SSSTA)*PI)/(2.0*SSSTA))
      SA(N,N)=4./(2.*SSSTA)*VE(N)
      NNUD=IABS(N-NU)
      IF(NNUD.NE.0) GO TO 9
      B(N)=(2.0*SSSTA)/(4.0*COS(((ANU-SSSTA)*PI)/(2.0*SSSTA)))
      GO TO 14
    9 IF(MOD(NNUD,2).EQ.0) GO TO 12
      B(N)=VE(N)/((2.0*SSSTA)*(ETA(N)-Y(NU))**2)
      GO TO 14
   12 B(N)=0.0
   14 CONTINUE
      DO 589 NP=ISSST,NMAX
      NPNUD=IABS(NP-NU)
      IF(NPNUD.EQ.0) GO TO 589
      IF(MOD(NPNUD,2).EQ.0) GO TO 589
      SA(NU,NP)=2.0*B(NP)/SSSTA*COS((ANU-SSSTA)*PI/(2.0*SSSTA))
      IT=NMAX+1-NU
      ITT=NMAX+1-NP
      SA(NU,ITT)=2.0*B(ITT)/SSSTA*COS((ANU-SSSTA)*PI/(2.0*SSSTA))
```

```
      SA(IT,NP)=SA(NU,ITT)
      SA(IT,ITT)=SA(NU,NP)
      SA(NP,NU)=SA(NU,NP)
      SA(ITT,IT)=SA(NU,NP)
  589 CONTINUE
      DO 78 J=1,JMAX
      AJ=J
      DO 30 N=1,NMAX
      AK=0.0
      AN=N
      IF(N.NE.NU) GO TO 16
      IF(J.EQ.1) GO TO 18
      IF(J-2) 20,19,20
   18 AK=2.0*PHI(KS)+2.0* SIN(PHI(KS))
      GO TO 21
   19 AK=PHI(KS)-.5* SIN(2.0*PHI(KS))
      GO TO 21
   20 GA= (SIN((AJ-2.0)*(PHI(KS))))/(AJ-2.0)
      AK=GA- (SIN((AJ)*(PHI(KS))))/AJ
   21 PARTL=B(N)*AK
      A=0.0
      DO 25 NUP=1,NMAX
      NUPNU=IABS(NUP-NU)
      IF(NUPNU.EQ.0) GO TO 25
      IF(MOD(NUPNU,2).EQ.0) GO TO 25
      SSND=ABS(Y(NU)-ETA(NUP))
      IF(SSND.EQ.0.) GO TO 25
      ANUP=NUP
      UURR=ANUP-SSSTA
      A=A+((COS((UURR*PI)/(2.0*SSSTA)))**2)*ALOG(SSND)
   25 CONTINUE
      IF(J.NE.1) GO TO 28
      DF(1)=-1.0/(2.0*(SIN((PHI(KS))/2.0))*(SIN((PHI(KS))/2.0)))
      GO TO 29
   28 DF(J)=(AJ-1.0)*(COS((AJ-1.0)*(PHI(KS))))
   29 VL      =1.0/((((C(N))**2 )*2.0*SSSTA*VE(N)*SIN(PHI(KS)))
      AL(J,N)=VL*DF(J)*((.25*SSSTA)*(1.0-2.0*(VE(N)**2)-ALOG(4.0))-A)+PA
     1RTL
      GO TO 30
C
C
C     CHORDAL INTEGRATION SUBROUTINE
C                SOLVES FOR THE CHORDAL INFLUENCE FUNCTION VALUES
```

```
C
C
   16 XSUB=-C(NU)*COS(PHI(KS))+D(NU)
      YSUB=Y(NU)
      ETASUB=ETA(N)
      CSUB=C(N)
      DSUB=D(N)
      GO TO (351,352,353,354,356,357,358,359,1070,1071),J
 1071 CALL GAUSS(0.,PI,3,SUM10,FOFT10)
      AK=SUM10
      GO TO 355
 1070 CALL GAUSS(0.,PI,3,SUM9,FOFT9)
      AK=SUM9
      GO TO 355
  359 CALL GAUSS(0.,PI,3,SUM8,FOFT8)
      AK=SUM8
      GO TO 355
  358 CALL GAUSS(0.,PI,3,SUM7,FOFT7)
      AK=SUM7
      GO TO 355
  357 CALL GAUSS(0.,PI,2,SUM6,FOFT6)
      AK=SUM6
      GO TO 355
  356 CALL GAUSS(0.,PI,2,SUM5,FOFT5)
      AK=SUM5
      GO TO 355
  354 CALL GAUSS(0.,PI,2,SUM4,FOFT4)
      AK=SUM4
      GO TO 355
  353 CALL GAUSS(0.,PI,2,SUM3,FOFT3)
      AK=SUM3
      GO TO 355
  352 CALL GAUSS(0.,PI,2,SUM2,FOFT2)
      AK=SUM2
      GO TO 355
  351 CALL GAUSS(0.,PI,2,SUM1,FOFT1)
      AK=SUM1
C
C
  355 AL(J,N)=-B(N)*AK
   30 CONTINUE
      DO 78 NP=ISSST,NMAX
      I=(J-2)*ISSST+NP+1
```

```
      IF(NP.EQ.ISSST) GO TO 73
      NR=NMAX+1-NP
      IF(ISYM.NE.1) GO TO 77
      SUML(JK,I)=AL(J,NP)+AL(J,NR)
      GO TO 78
   77 SUML(JK,I)=AL(J,NP)-AL(J,NR)
      GO TO 78
   73 IF(ISYM.NE.1) GO TO 75
      SUML(JK,I)=AL(J,NP)
      GO TO 78
   75 SUML(JK,I)=0.00000000
   78 CONTINUE
C
C     MATRIX SOLUTION SUBPROGRAM
C              SOLVES FOR CHORDAL LOAD MODIFICATION FACTORS Q AND QT
C
C
      CALL MATINV (SUML,JKMAX,CONST,2,DETERM,IPIVO,INDEX,100,ISCALE)
C
C
      DO 821 J=1,JMAX
      DO 821 NP=ISSST,NMAX
      IXX=(J-2)*ISSST+NP+1
      QT(J,NP)=CONST(IXX,2)*QBAR
  821 Q(J,NP) =CONST(IXX,1)*QBAR
C
C
      DO 760 N=1,NMAX
      C(N)=C(N)*BETA
  760 D(N)=D(N)*BETA
      DO 439 J=1,JMAX
      DO 150 NP=ISSST,NMAX
      IF(JMAX.GE.2) GO TO 751
      Q(2,NP)=0.0
      QT(2,NP)=0.0
  751 CHDLD(NP)=PI*(Q(1,NP)+.5*Q(2,NP))
      GAMMA(NP)= CHDLD(NP)/(4.0*QBAR*YMAX)
      CLL(NP)=2.0*YMAX*GAMMA(NP)/C(NP)
      CHDLDT(NP)=PI*(QT(1,NP)+.5*QT(2,NP))
  150 CONTINUE
      DO 439 NP=NNII,NMAX
      NR=NMAX+1-NP
      IF(ISYM.NE.1) GO TO 152
```

```
      Q(J,NR)=Q(J,NP)
      QT(J,NR)=QT(J,NP)
      GO TO 439
  152 Q(J,NR)=-Q(J,NP)
      QT(J,NR)=QT(J,NP)
  439 CONTINUE
C
C
      DO 650 NP=NNII,NMAX
      NR=NMAX+1-NP
      IF(ISYM.NE.1) GO TO 649
      GAMMA(NR)=GAMMA(NP)
      CHDLD(NR)=CHDLD(NP)
      CHDLDT(NR)=CHDLDT(NP)
      GO TO 650
  649 GAMMA(NR)=-GAMMA(NP)
      CHDLD(NR)=-CHDLD(NP)
      CHDLDT(NR)= CHDLDT(NP)
  650 CONTINUE
C
C
      BL=0.0
      AMX=0.0
      AMY=0.0
      BLT=0.0
      AMYT=0.0
      DO 154 N=1,NMAX
      IF(JMAX.GE.2) GO TO 754
      Q(2,N)=0.0
      QT(2,N)=0.0
  754 RU=PI*VE(N)/(2.*SSSTA)
      BL=BL+RU*CHDLD(N)
      AMX=AMX+RU*ETA(N)*CHDLD(N)
      BLT=BLT+RU*CHDLDT(N)
      IF(JMAX.GE.3) GO TO 877
      Q(3,N)=0.0
      QT(3,N)=0.0
  877 AMY=AMY-RU*PI*((D(N)-XCBAR-CBAR/4.)*(Q(1,N)+.5*Q(2,N))-C(N)*(.5*Q(
     11,N)+.25*Q(3,N)))
      AMYT=AMYT-RU*PI*((D(N)-XCBAR-CBAR/4.)*(QT(1,N)+.5*QT(2,N))-C(N)*(.
     15*QT(1,N)+.25*QT(3,N)))
  154 CONTINUE
      DO 155 NP=ISSST,NMAX
```

```
      IF(ISYM.EQ.2.AND.NP.EQ.ISSST) ZICP(ISSST)=D(NP)
      IF(ISYM.EQ.2.AND.NP.EQ.ISSST) GO TO 11
      ZICP(NP)=(-C(NP)/2.0)*((Q(1,NP)+.5*Q(3,NP))/(Q(1,NP)+.5*Q(2,NP)))
     1+D(NP)
   11 LOAC(NP)= (ZICP(NP)-(D(NP)-C(NP)))/(2.0*C(NP))
      SLC(NP)=PI*(Q(1,NP)+.5*Q(2,NP))/(BL/(2.*YMAX))
      IF(NTWACM.EQ.1) GO TO 4
      BLDT(NP)=CHDLDT(NP)/(BLT/(2.*YMAX))
      GO TO 155
    4 BLDT(NP)=0.
  155 CONTINUE
      AMYP=AMY-BL*((XCBAR+CBAR/4.)-REFPT)
      AMYPT=AMYT-BLT*((XCBAR+CBAR/4.)-REFPT)
      CM=AMYP/(QBAR*SREF*CREF)
      CMT=CM/RAD
      CLT=BL/(QBAR*SREF)
      CLTT=CLT/RAD
      CLTWST=BLT/(QBAR*SREF)
      CMTAC=AMYPT/(QBAR*SREF*CREF)
      ALPHZO=-CLTWST/CLTT
      CMZERO=CMTAC+CMT*ALPHZO
      CRL=AMX/(QBAR*SREF*2.*YREF)
      ZICPT=-AMYP/BL+REFPT
      TOAC=(ZICPT-XLREF)/CREF
C
C
      RATO=CLTWST/CLT
      RTTO=RATO-CLDESG/CLT
      DO 1000 NP=ISSST,NMAX
      BSPLDT(NP)=(BLDT(NP)-SLC(NP))*CLTWST*SREF/S
      BLDT(NP)=BSPLDT(NP)+SLC(NP)*CLDESG*SREF/S
      CLB(NP)=BSPLDT(NP)*CAV/(2.*C(NP))
      IF(NTWACM.EQ.1) GO TO 200
      CHDLDT(NP)=CLB(NP)*2.*C(NP)*QBAR
      ZICTP(NP)=(-C(NP)/2.0)*(((QT(1,NP)+.5*QT(3,NP))-(Q(1,NP)+.5*Q(3,NP
     1))*RATO)/((QT(1,NP)+.5*QT(2,NP))-(Q(1,NP)+.5*Q(2,NP))*RATO))+D(NP)
      ZICTPT(NP)=(-C(NP)/2.)*(((QT(1,NP)+.5*QT(3,NP))-(Q(1,NP)+.5*Q(3,NP
     1))*RTTO)/((QT(1,NP)+.5*QT(2,NP))-(Q(1,NP)+.5*Q(2,NP))*RTTO))+D(NP)
      GO TO 201
  200 CHDLDT(NP)=0.
      ZICTPT(NP)=ZICP(NP)
      ZICTP(NP)=D(NP)
  201 CHDLTO(NP)=CHDLD(NP)*CLDESG/CLT+CHDLDT(NP)
      CLLTOT(NP)=CLL(NP)*CLDESG/CLT+CLB(NP)
      GAMMAT(NP)=CHDLDT(NP)/(4.0*QBAR*YMAX)
```

```
      GAMTMA(NP)=GAMMA(NP)*CLDESG/CLT+GAMMAT(NP)
      LOACT(NP)=(ZICTP(NP)-(D(NP)-C(NP)))/(2.0*C(NP))
      LOACTO(NP)=(ZICTPT(NP)-(D(NP)-C(NP)))/(2.0*C(NP))
      AMU(NP)=-((CHDLD(NP)-PI/2.*(Q(1,NP)+.5*Q(3,NP)))/(QBAR*4.*C(NP)))
      AMUT(NP)=- (CHDLDT(NP)-PI/2.*((QT(1,NP)+.5*QT(3,NP))-(Q(1,NP)+.5*Q
     1(3,NP))*RATO)/(QBAR*4.*C(NP)))
      AMUTOT(NP)=AMU(NP)*CLDESG/CLT+AMUT(NP)
 1000 CONTINUE
C
C
      AMXB=0.
      ETACP=0.
      DO 715 NP=ISSST,NMAX
      RU=PI*ETA(NP)*VE(NP)/(2.*SSSTA)
      AMXB=AMXB+RU*CHDLDT(NP)
  715 ETACP=ETACP+RU*SLC(NP)
      CMROOT=2.*YREF*AMXB/(QBAR*SREF)
C
C
      CSUCT=0.0
      DO 714 N=1,NMAX
      RU=YMAX*VE(N)*PI**2/(8.*SSSTA*SREF)
      IF(ETA(N).EQ.0.) OMICRN=0.
      IF(ABS(ETA(N)).GT.0..AND.ABS(ETA(N)).LE.Y3NP) OMICRN=(ETA(N)/ABS(E
     1TA(N)))*CHI
      IF(ABS(ETA(N)).GT.Y3NP.AND.ABS(ETA(N)).LE.YMIN) OMICRN=(ETA(N)/ABS
     1(ETA(N)))*ALAME
      IF(ABS(ETA(N)).GT.YMIN.AND.DELTA.GE.0.) OMICRN=(ETA(N)/ABS(ETA(N))
     1)*ALAME
      IF(ABS(ETA(N)).GT.YMIN.AND.DELTA.LT.0.) OMICRN=(ETA(N)/ABS(ETA(N))
     1)*(PI/2.-DELTA)
  714 CSUCT=CSUCT+RU*BETA*(Q(1,N)/QBAR)**2/(C(N)*COS(OMICRN))
      CDII=CLT-CSUCT
  489 CCC=0.0
      DO 421 N=1,NMAX
      CCC=CCC+GAMMA(N)**2
  421 CONTINUE
      CCD=0.0
      DO 91 NUP=1,NMAX
      ALPHAI(NUP)=GAMMA(NUP)/SA(NUP,NUP)
      DO 91 N=1,NMAX
      IF(N.EQ.NUP) GO TO 91
      ALPHAI(NUP)=ALPHAI(NUP)-SA(NUP,N)*GAMMA(N)/SA(NUP,NUP)
```

```
      NUST=IABS(NUP-ISSST)
      IF(MOD(NUST,2).EQ.0) GO TO 91
      NPST=IABS(N -ISSST+1)
      IF(MOD(NPST,2).EQ.0) GO TO 91
      CCD=CCD-2.0*SA(NUP,N)*(GAMMA(NUP)*GAMMA(N))
   91 CONTINUE
      CDI=PI*(CCC+CCD)/SREF
      DIOL=CDI/CLT**2
      DIIOL=CDII/CLT**2
C
C
C
      IF(JTEST.NE.1)GO TO 1010
      GO TO 1011
 1010 XLREF=XLREF*YMAX1
      CREF=CREF*YMAX1
      REFPT=REFPT*YMAX1
      SREF=SREF*YMAX1**2
 1011 WRITE(6,552)
      WRITE(6,541) ARNN,SREF,REFPT,CREF,XLREF
C
C     WRITE OUTPUT DATA
C
      WRITE(6,510)
      WRITE(6,502)
      WRITE (6,530) CASE
      WRITE(6,559) ALPHZO,CMZERO,CMROOT
      WRITE(6,546) CLT,CM,CRL,CLTWST,CMTAC,CLDESG
      WRITE(6,531) CLTT,CMT,DIOL,DIIOL
      WRITE(6,554)
      WRITE(6,528) ZICPT,TOAC,ETACP
      WRITE(6,510)
      WRITE(6,520)
      WRITE(6,521)
      WRITE(6,538)
      WRITE(6,547)
      DO 850 N=ISSST,NMAX
  850 WRITE(6,511)N,ETA(N),GAMMA(N),GAMMAT(N),GAMTMA(N),CLL(N),CLB(N),CL
     1LTOT(N),AMU(N),AMUT(N),AMUTOT(N),C(N),D(N)
      WRITE(6,510)
      WRITE (6,542)
C
      DO 188 N=ISSST,NMAX
```

```
      DO 188 LS=1,10
      ALS=LS
      TAW(LS)=ALS*PI/10.0
      ZI=(1.-COS(TAW(LS)))/2.
      TAT=0.0
      TATWST=0.
      DO 185 J=2,JMAX
      AJ=J
      TAT = TAT+Q(J,N)*SIN((AJ-1.0)*TAW(LS))
      TATWST=TATWST+(QT(J,N)-Q(J,N)*RATO)*SIN((AJ-1.0)*TAW(LS))
  185 CONTINUE
      PAU=COS(TAW(LS)/2.0)/SIN(TAW(LS)/2.0)
      DELTP=1./C(N)*(Q(1,N)*PAU+TAT)
      DELPTW=1./C(N)*((QT(1,N)-Q(1,N)*RATO)*PAU+TATWST)
      DLPTWC=DELTP*CLDESG/CLT+DELPTW
      WRITE(6,543) N,LS,ETA(N),ZI,DELTP,DELPTW,DLPTWC
  188 CONTINUE
C
      WRITE(6,510)
      DO 1060 K=1,JMAX
 1060 JJJ(K)=K-1
      WRITE(6,516)
      WRITE(6,519)
      WRITE(6,539)(JJJ(I),I=1,JMAX)
      DO 1030 N=ISSST,NMAX
 1030 WRITE(6,534) N,(Q(I,N),I=1,JMAX)
      WRITE(6,523)
      WRITE(6,519)
      WRITE(6,539)(JJJ(I),I=1,JMAX)
      DO 1031 N=ISSST,NMAX
 1031 WRITE(6,534) N,(QT(I,N),I=1,JMAX)
  383 WRITE(6,510)
      WRITE(6,517)
      WRITE(6,518)
      WRITE(6,512)
      WRITE(6,513)
      DO 378 N=ISSST,NMAX
  378 WRITE(6,533) N,ETA(N),CHDLD(N),CHDLDT(N),CHDLTO(N),ZICP(N),ZICTP(N
     1),ZICTPT(N),LOAC(N),LOACT(N),LOACTO(N),SLC(N),BSPLDT(N),BLDT(N)

      GO TO 1
   10 STOP
      END
```

```
      FUNCTION FOFT1(THETA)
      COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
      XI=-CSUB*COS(THETA)+DSUB
      BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
      FOFT1=BK*(1.0+COS(THETA))
      RETURN
      END


      FUNCTION FOFT2(THETA)
      COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
      XI=-CSUB*COS(THETA)+DSUB
      BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
      FOFT2=BK*SIN(THETA)**2
      RETURN
      END


      FUNCTION FOFT3(THETA)
      COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
      XI=-CSUB*COS(THETA)+DSUB
      BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
      FOFT3=BK*SIN(THETA)*SIN(2.0*THETA)
      RETURN
      END


      FUNCTION FOFT4(THETA)
      COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
      XI=-CSUB*COS(THETA)+DSUB
      BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
      FOFT4=BK*SIN(THETA)*SIN(3.0*THETA)
      RETURN
      END


      FUNCTION FOFT5(THETA)
      COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
      XI=-CSUB*COS(THETA)+DSUB
      BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
      FOFT5=BK*SIN(THETA)*SIN(4.0*THETA)
      RETURN
      END
```

```
FUNCTION FOFT6(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT6=BK*SIN(THETA)*SIN(5.0*THETA)
RETURN
END


FUNCTION FOFT7(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT7=BK*SIN(THETA)*SIN(6.0*THETA)
RETURN
END


FUNCTION FOFT8(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT8=BK*SIN(THETA)*SIN(7.0*THETA)
RETURN
END


FUNCTION FOFT9(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT9=BK*SIN(THETA)*SIN(8.0*THETA)
RETURN
END


FUNCTION FOFT10(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT10=BK*SIN(THETA)*SIN(9.0*THETA)
RETURN
END
```

```
      SUBROUTINE GAUSS (A,B,N,SUM,FOFX)
C
C     REFERENCE SCARBOROUGH NUM. MATH. ANAL. PAGE 147
C     HOWEVER THIS SUBROUTINE INTEGRATES FROM  ZERO TO ONE
C
      DIMENSION  U(5),R(5)
      U(1)=.425562830509184
      U(2)=.283302302935376
      U(3)=.160295215850488
      U(4)=.067468316655508
      U(5)=.013046735741414
      R(1)=.147762112357376
      R(2)=.134633359654998
      R(3)=.109543181257991
      R(4)=.074725674575290
      R(5)=.033335672154344
      SUM=0.0
      IF(A.EQ.B) RETURN
      FINE=N
      DELTA=FINE/(B-A)
      DO 3 K=1,N
      XI=K-1
      FINE=A+XI/DELTA
      DO 2 II= 1,5
      UU=U(II)/DELTA+FINE
    2   SUM=R(II)*FOFX(UU)+SUM
      DO 3 L=1,5
      UU=(1.0-U(L))/DELTA+FINE
    3 SUM=R(L)*FOFX(UU)+SUM
      SUM=SUM/DELTA
      RETURN
      END
C     MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS
C
```

```
      SUBROUTINE MATINV(A,N,B,M,DETERM,IPIVOT,INDEX,NMAX,ISCALE)
C
      DIMENSION IPIVOT(N),A(NMAX,N),B(NMAX,M),INDEX(NMAX,2)
      EQUIVALENCE (IROW,JROW), (ICOLUM,JCOLUM), (AMAX, T, SWAP)
C
C     INITIALIZATION
C
    5 ISCALE=0
    6 R1=10.0**18
    7 R2=1.0/R1
   10 DETERM=1.0
   15 DO 20 J=1,N
   20 IPIVOT(J)=0
   30 DO 550 I=1,N
C
C     SEARCH FOR PIVOT ELEMENT
C
   40 AMAX=0.0
   45 DO 105 J=1,N
   50 IF (IPIVOT(J)-1) 60, 105, 60
   60 DO 100 K=1,N
   70 IF (IPIVOT(K)-1) 80, 100, 740
   80 IF (ABS(AMAX)-ABS(A(J,K)))85,100,100
   85 IROW=J
   90 ICOLUM=K
   95 AMAX=A(J,K)
  100 CONTINUE
  105 CONTINUE
      IF (AMAX) 110,106,110
  106 DETERM=0.0
      ISCALE=0
      GO TO 740
  110 IPIVOT(ICOLUM)=IPIVOT(ICOLUM)+1
C
C     INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL
C
  130 IF (IROW-ICOLUM) 140, 260, 140
  140 DETERM=-DETERM
  150 DO 200 L=1,N
  160 SWAP=A(IROW,L)
  170 A(IROW,L)=A(ICOLUM,L)
  200 A(ICOLUM,L)=SWAP
```

```
  205 IF(M) 260, 260, 210
  210 DO 250 L=1, M
  220 SWAP=B(IROW,L)
  230 B(IROW,L)=B(ICOLUM,L)
  250 B(ICOLUM,L)=SWAP
  260 INDEX(I,1)=IROW
  270 INDEX(I,2)=ICOLUM
  310 PIVOT=A(ICOLUM,ICOLUM)
C
C     SCALE THE DETERMINANT
C
 1000 PIVOTI=PIVOT
 1005 IF(ABS(DETERM)-R1)1030,1010,1010
 1010 DETERM=DETERM/R1
      ISCALE=ISCALE+1
      IF(ABS(DETERM)-R1)1060,1020,1020
 1020 DETERM=DETERM/R1
      ISCALE=ISCALE+1
      GO TO 1060
 1030 IF(ABS(DETERM)-R2)1040,1040,1060
 1040 DETERM=DETERM*R1
      ISCALE=ISCALE-1
      IF(ABS(DETERM)-R2)1050,1050,1060
 1050 DETERM=DETERM*R1
      ISCALE=ISCALE-1
 1060 IF(ABS(PIVOTI)-R1)1090,1070,1070
 1070 PIVOTI=PIVOTI/R1
      ISCALE=ISCALE+1
      IF(ABS(PIVOTI)-R1)320,1080,1080
 1080 PIVOTI=PIVOTI/R1
      ISCALE=ISCALE+1
      GO TO 320
 1090 IF(ABS(PIVOTI)-R2)2000,2000,320
 2000 PIVOTI=PIVOTI*R1
      ISCALE=ISCALE-1
      IF(ABS(PIVOTI)-R2)2010,2010,320
 2010 PIVOTI=PIVOTI*R1
      ISCALE=ISCALE-1
  320 DETERM=DETERM*PIVOTI
C
C     DIVIDE PIVOT ROW BY PIVOT ELEMENT
C
  330 A(ICOLUM,ICOLUM)=1.0
```

```
  340 DO 350 L=1,N
  350 A(ICOLUM,L)=A(ICOLUM,L)/PIVOT
  355 IF(M) 380, 380, 360
  360 DO 370 L=1,M
  370 B(ICOLUM,L)=B(ICOLUM,L)/PIVOT
C
C     REDUCE NON-PIVOT ROWS
C
  380 DO 550 L1=1,N
  390 IF(L1-ICOLUM) 400, 550, 400
  400 T=A(L1,ICOLUM)
  420 A(L1,ICOLUM)=0.0
  430 DO 450 L=1,N
  450 A(L1,L)=A(L1,L)-A(ICOLUM,L)*T
  455 IF(M) 550, 550, 460
  460 DO 500 L=1,M
  500 B(L1,L)=B(L1,L)-B(ICOLUM,L)*T
  550 CONTINUE
C
C     INTERCHANGE COLUMNS
C
  600 DO 710 I=1,N
  610 L=N+1-I
  620 IF (INDEX(L,1)-INDEX(L,2)) 630, 710, 630
  630 JROW=INDEX(L,1)
  640 JCOLUM=INDEX(L,2)
  650 DO 705 K=1,N
  660 SWAP=A(K,JROW)
  670 A(K,JROW)=A(K,JCOLUM)
  700 A(K,JCOLUM)=SWAP
  705 CONTINUE
  710 CONTINUE
  740 RETURN
      END
```

Sample Output Listing

First sample case

GEOMETRY DATA

```
                CASE NUMBER=     5     SYMMETRY CODE=    1     MACH NUMBER=   .60000
IF SYMMETRY CODE IS EQUAL TO 1,THE SPAN LOADING IS SYMMETRICAL,OTHER THAN 1,IT IS ANTISYMMETRICAL

NUMBER OF CHORDWISE PRESSURE MODES=    8     NUMBER OF STATIONS SPANWISE ON A PANEL WHERE PRESSURE MODES ARE DEFINED=    7
```

LOCATION OF PERIMETER POINTS FOR THE PLANFORM USED AS INPUT
WHERE THE ORIGIN IS AT THE HALF ROOT CHORD,POSITIVE X AFT

X1=	0.	Y1=	0.
X2=	-.53020	Y2=	0.00000
X3=	.27423	Y3=	.29279
X4=	.46373	Y4=	1.00000
X5=	.63684	Y5=	1.00000
X6=	.58627	Y6=	.03504
X6A=	.58627	Y6A=	.03504
X7=	.53020	Y7=	0.00000

(SEMISPAN AT FINAL OUTBOARD SWEEP/SEMISPAN AT INITIAL OUTBOARD SWEEP)=   .75800

LOCATION OF PERIMETER POINTS FOR PLANFORM TO BE USED IN THE COMPUTATIONS
WHEN NONDIMENSIONALIZED BY THE SEMISPAN RATIO GIVEN ABOVE
WHERE THE ORIGIN IS AT THE HALF ROOT CHORD,POSITIVE X AFT

X1PP=	0.	Y1PP=	0.
X2PP=	-.69947	Y2PP=	0.00000
X3NP=	.50769	Y3NP=	.43937
X4PP=	1.47873	Y4PP=	1.00000
X5PP=	1.64022	Y5PP=	.83851
X6NP=	.73050	Y6NP=	.01939
X6AP=	.69947	Y6AP=	0.00000
X7PP=	.69947	Y7PP=	0.00000

```
TOTAL WING PLANFORM(MEAN GEOMETRIC CHORD AND ITS LOCATION ARE INVALID IF THE PLANFORM HAS A TRAILING EDGE CHORD EXTENSION)

                    ASPECT RATIO=  2.77024     PLANFORM AREA=  1.44392     AVERAGE CHORD=   .72196

     MEAN GECMETRIC CHORD=   .88932     X LOCATION OF THE LEADING EDGE OF THE MEAN GEOMETRIC CHORD=   .21738
                    Y LOCATION OF THE MEAN GEOMETRIC CHORD=   .36333

  LE INBOARD SWEEP ANGLE= 70.00000     LE INITIAL OUTBOARD SWEEP ANGLE= 15.00000     LE FINAL OUTBOARD SWEEP ANGLE= 60.00000
  TE INBOARD SWEEP ANGLE= 58.00000     TE INITIAL OUTBOARD SWEEP ANGLE=  2.99971     TE FINAL OUTBOARD SWEEP ANGLE= 47.99971

  CHANGE IN OUTER PANEL SWEEP ANGLE,DELTA= 45.00000    PIVOT CANT ANGLE IN PITCH=  0    PIVOT CANT ANGLE IN ROLL=  0

        ROOT CHORD=  1.39894     TIP CHORD=   .22838     FOREWING CHORD=  1.20716     OVERALL TAPER RATIO=   .16325
                              Y LE BREAK=   .43937     Y TE BREAK=   .01939
                 X PIVOT LOCATION=   .65988     Y PIVOT LOCATION=   .11313     Z PIVOT LOCATION=  0.00000
                                    TE CHORD EXTENSION=  0.00000

                                    REFERENCE DIMENSIONS

  REF AR=  2.77024  REF AREA,SREF=  1.44392  MOMENT REF POINT=   .43970  REF CHORD,CREF=   .88932  X LE REF=   .21738
```

AERODYNAMIC DATA

CASE NUMBER= 5

ANGLE FOR ZERO LIFT,ALPHA ZERO= -0.00000 PITCHING MOMENT COEFF. AT ZERO LIFT,CM ZERO= 0.00000

ROOT BENDING MOMENT COEFFICIENT AT ZERO LIFT,CBMROOT= 0.00000

CLA= 2.46834 CMA= -.54285 CROLL= .00000 CL,TWIST AND CAMBER= 0.00000 CM,TWIST AND CAMBER= 0.00000 CL,DESIGN= 1.00000

CLA PER DEGREE= .04308 CMA PER DEGREE= -.00947 CDI/CLA**2= .11701 CDII/CLA**2= .11322

FOR THE ADDITIONAL LOADING

CHORDWISE LOCATION OF CENTER OF PRESSURE= .63529 A.C. IN FRACTION OF CREF MEASURED FROM LEADING EDGE OF CREF= .46993

SPANWISE LOCATION OF CENTER OF PRESSURE= .43938

SPAN STA.	2Y/B	LOCAL CIRCU ADD	LOCAL CIRCU BASIC NO LIFT	LOCAL CIRCU TOTAL AT CLDESG	LOCAL LIFT COEFF ADD	LOCAL LIFT COEFF BASIC NO LIFT	LOCAL LIFT COEFF TOTAL AT CLDESG	LOCAL PITCH COEFF,LE ADD	LOCAL PITCH COEFF,LE BASIC NO LIFT	LOCAL PITCH COEFF,LE TOTAL AT CLDESG	LOCAL HALF CHORD	LOCAL LOCATN MIDCHD
7	0.00000	.51121	0.00000	.20711	1.52620	0.00000	.61831	-.60999	-0.00000	-.24713	.66991	.07233
8	.22252	.52233	0.00000	.21161	2.00091	0.00000	.81063	-.61084	-0.00000	-.24747	.52210	.43400
9	.43388	.50558	0.00000	.20483	2.89639	0.00000	1.17342	-.70295	-0.00000	-.28479	.34911	.84173
10	.62349	.46390	0.00000	.18794	3.22815	0.00000	1.30783	-.74668	-0.00000	-.30250	.28741	1.11400
11	.78183	.39789	0.00000	.16120	3.34067	0.00000	1.35341	-.69587	-0.00000	-.28192	.23821	1.33906
12	.90097	.28309	0.00000	.11469	4.18521	0.00000	1.69556	-.79522	-0.00000	-.32217	.13528	1.44248
13	.97493	.14110	0.00000	.05716	8.23945	0.00000	3.33806	-1.56243	-0.00000	-.63299	.03425	1.46955

N	LS	2Y/B	X/C	DELTA CP ADD	DELTA CP BASIC NO LIFT	DELTA CP TOTAL AT CLDESG
7	1	0.00000	.02447	4.63332	0.00000	1.87710
7	2	0.00000	.09549	1.30339	0.00000	.52804
7	3	0.00000	.20611	.67970	0.00000	.27537
7	4	0.00000	.34549	1.69226	0.00000	.68559
7	5	0.00000	.50000	1.76327	0.00000	.71436
7	6	0.00000	.65451	1.25414	0.00000	.50809
7	7	0.00000	.79389	1.18565	0.00000	.48034
7	8	0.00000	.90451	1.00023	0.00000	.40522
7	9	0.00000	.97553	.49802	0.00000	.20176
7	10	0.00000	1.00000	.00000	0.00000	.00000
8	1	.22252	.02447	8.76028	0.00000	3.54906
8	2	.22252	.09549	3.65150	0.00000	1.47934
8	3	.22252	.20611	1.23557	0.00000	.50057
8	4	.22252	.34549	.93505	0.00000	.37882

8	4	.22252	.34549	[illegible]	0.00000	[illegible]
8	5	.22252	.50000	1.56414	0.00000	.63368
8	6	.22252	.65451	1.66119	0.00000	.67300
8	7	.22252	.79389	1.23422	0.00000	.50002
8	8	.22252	.90451	.74884	0.00000	.30338
8	9	.22252	.97553	.32285	0.00000	.13080
8	10	.22252	1.00000	.00000	0.00000	.00000
9	1	.43388	.02447	13.83273	0.00000	5.60407
9	2	.43388	.09549	7.01069	0.00000	2.84025
9	3	.43388	.20611	2.68901	0.00000	1.08940
9	4	.43388	.34549	1.63065	0.00000	.66063
9	5	.43388	.50000	1.79843	0.00000	.72860
9	6	.43388	.65451	1.53572	0.00000	.62217
9	7	.43388	.79389	1.10213	0.00000	.44651
9	8	.43388	.90451	.66264	0.00000	.26846
9	9	.43388	.97553	.25703	0.00000	.10413
9	10	.43388	1.00000	.00000	0.00000	.00000
10	1	.62349	.02447	15.68410	0.00000	6.35412
10	2	.62349	.09549	8.17450	0.00000	3.31174
10	3	.62349	.20611	3.18490	0.00000	1.29030
10	4	.62349	.34549	1.80692	0.00000	.73204
10	5	.62349	.50000	1.87490	0.00000	.75958
10	6	.62349	.65451	1.57326	0.00000	.63738
10	7	.62349	.79389	1.11458	0.00000	.45155
10	8	.62349	.90451	.64873	0.00000	.26282
10	9	.62349	.97553	.24475	0.00000	.09916
10	10	.62349	1.00000	.00000	0.00000	.00000
11	1	.78183	.02447	17.24961	0.00000	6.98835
11	2	.78183	.09549	8.69370	0.00000	3.52209
11	3	.78183	.20611	3.29995	0.00000	1.33691
11	4	.78183	.34549	1.96890	0.00000	.79766
11	5	.78183	.50000	1.92118	0.00000	.77833
11	6	.78183	.65451	1.37732	0.00000	.55800
11	7	.78183	.79389	.82461	0.00000	.33407
11	8	.78183	.90451	.41902	0.00000	.16976
11	9	.78183	.97553	.14638	0.00000	.05930
11	10	.78183	1.00000	.00000	0.00000	.00000
12	1	.90097	.02447	21.48963	0.00000	8.70611
12	2	.90097	.09549	12.02506	0.00000	4.87172
12	3	.90097	.20611	4.96715	0.00000	2.01235
12	4	.90097	.34549	2.43122	0.00000	.98496
12	5	.90097	.50000	1.97585	0.00000	.80048
12	6	.90097	.65451	1.37413	0.00000	.55670
12	7	.90097	.79389	.79967	0.00000	.32397
12	8	.90097	.90451	.38015	0.00000	.15401
12	9	.90097	.97553	.12936	0.00000	.05241
12	10	.90097	1.00000	.00000	0.00000	.00000
13	1	.97493	.02447	34.38594	0.00000	13.93081
13	2	.97493	.09549	24.60594	0.00000	9.96863
13	3	.97493	.20611	14.01454	0.00000	5.67773
13	4	.97493	.34549	7.01396	0.00000	2.84157
13	5	.97493	.50000	3.45682	0.00000	1.40047

13	5	.97493	[illegible]	[illegible]	[illegible]	[illegible]
13	6	.97493	.65451	1.70721	0.00000	.69164
13	7	.97493	.79389	.94267	0.00000	.38190
13	8	.97493	.90451	.42304	0.00000	.17139
13	9	.97493	.97553	.14138	0.00000	.05728
13	10	.97493	1.00000	.00000	0.00000	.00000

CHORDAL LOAD FACTORS,Q,FOR ADDITIONAL LOAD

SPAN STA.	0	1	2	3	4	5	6	7
7	.47016	.36147	-.41792	-.19953	-.02936	.20367	.22261	.05359
8	.68575	-.04139	-.33552	.00128	.26520	.16814	.03896	-.00541
9	.59273	.10199	.13960	.30189	.37931	.25191	.10796	.01689
10	.53878	.10375	.19209	.32320	.36905	.23747	.10157	.01793
11	.49902	.01516	.18415	.26024	.31171	.22478	.10150	.02108
12	.32619	.06849	.24148	.26999	.24992	.15616	.06442	.01356
13	.11032	.13867	.22543	.17282	.10087	.04741	.01941	.00519

CHORDAL LOAD FACTORS,QT,FOR THE LOAD DUE TO TWIST AND CAMBER

SPAN STA.	0	1	2	3	4	5	6	7
7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

SPAN STA.	2Y/B	CHORD LOAD ADD	CHORD LOAD BASIC NO LIFT	CHORD LOAD TOTAL AT CLDESG	CENTER PRESS ADD	CENTER PRESS BASIC NO LIFT	CENTER PRESS TOTAL AT CLDESG	LOCAL A.C. ADD	LOCAL A.C. BASIC NO LIFT	LOCAL A.C. TOTAL AT CLDESG	SPAN LOAD ADD	BASIC LOAD NO LIFT	SPAN LOAD TOTAL AT CLDESG
7	0.00000	2.04482	0.00000	.82842	-.06208	7.233E-02	-.06208	.39968	5.000E-01	.39968	1.14746	0.00000	1.14746
8	.22252	2.08933	0.00000	.84645	.23068	4.340E-01	.23068	.30528	5.000E-01	.30528	1.17244	0.00000	1.17244
9	.43388	2.02231	0.00000	.81930	.66207	8.417E-01	.66207	.24270	5.000E-01	.24270	1.13483	0.00000	1.13483
10	.62349	1.85559	0.00000	.75176	.95955	1.114E+00	.95955	.23130	5.000E-01	.23130	1.04128	0.00000	1.04128
11	.78183	1.59154	0.00000	.64478	1.20009	1.339E+00	1.20009	.20830	5.000E-01	.20830	.89310	0.00000	.89310
12	.90097	1.13234	0.00000	.45875	1.35861	1.442E+00	1.35861	.19001	5.000E-01	.19001	.63542	0.00000	.63542
13	.97493	.56439	0.00000	.22865	1.44829	1.470E+00	1.44829	.18963	5.000E-01	.18963	.31671	0.00000	.31671

Second sample case

GEOMETRY DATA

CASE NUMBER= 200 SYMMETRY CODE= 1 MACH NUMBER= 0.00000
IF SYMMETRY CODE IS EQUAL TO 1,THE SPAN LOADING IS SYMMETRICAL,OTHER THAN 1,IT IS ANTISYMMETRICAL

NUMBER OF CHORDWISE PRESSURE MODES= 4 NUMBER OF STATIONS SPANWISE ON A PANEL WHERE PRESSURE MODES ARE DEFINED= 20

LOCATION OF PERIMETER POINTS FOR THE PLANFORM USED AS INPUT
WHERE THE ORIGIN IS AT THE HALF ROOT CHORD,POSITIVE X AFT

X1=	0.	Y1=	0.
X2=	-1.77173	Y2=	0.00000
X3=	-.07502	Y3=	.20833
X4=	1.41389	Y4=	1.00000
X5=	1.58660	Y5=	1.00000
X6=	1.77173	Y6=	0.00000
X6A=	1.77173	Y6A=	0.00000
X7=	1.77173	Y7=	0.00000

(SEMISPAN AT FINAL OUTBOARD SWEEP/SEMISPAN AT INITIAL OUTBOARD SWEEP)= 1.00000

LOCATION OF PERIMETER POINTS FOR PLANFORM TO BE USED IN THE COMPUTATIONS
WHEN NONDIMENSIONALIZED BY THE SEMISPAN RATIO GIVEN ABOVE
WHERE THE ORIGIN IS AT THE HALF ROOT CHORD,POSITIVE X AFT

X1PP=	0.	Y1PP=	0.
X2PP=	-1.77173	Y2PP=	0.00000
X3NP=	-.07502	Y3NP=	.20833
X4PP=	1.41389	Y4PP=	1.00000
X5PP=	1.58660	Y5PP=	1.00000
X6NP=	1.77173	Y6NP=	0.00000
X6AP=	1.77173	Y6AP=	0.00000
X7PP=	1.77173	Y7PP=	0.00000

```
TOTAL WING PLANFORM(MEAN GEOMETRIC CHORD AND ITS LOCATION ARE INVALID IF THE PLANFORM HAS A TRAILING EDGE CHORD EXTENSION)

              ASPECT RATIO=  1.49080     PLANFORM AREA=  2.68312     AVERAGE CHORD=  1.34156

    MEAN GEOMETRIC CHORD=  1.86127     X LOCATION OF THE LEADING EDGE OF THE MEAN GEOMETRIC CHORD=  -.15027
              Y LOCATION OF THE MEAN GEOMETRIC CHORD=   .32805

LE INBOARD SWEEP ANGLE= 83.00000     LE INITIAL OUTBOARD SWEEP ANGLE= 62.00000     LE FINAL OUTBOARD SWEEP ANGLE= 62.00000
TE INBOARD SWEEP ANGLE=  0.00000     TE INITIAL OUTBOARD SWEEP ANGLE=-10.48842     TE FINAL OUTBOARD SWEEP ANGLE=-10.48842

CHANGE IN OUTER PANEL SWEEP ANGLE,DELTA=  0.00000    PIVOT CANT ANGLE IN PITCH=  0    PIVOT CANT ANGLE IN ROLL=  0

      ROOT CHORD=  3.54346     TIP CHORD=   .17271     FOREWING CHORD=  1.69671     OVERALL TAPER RATIO=   .04874

                         Y LE BREAK=   .20833     Y TE BREAK=  0.00000

           X PIVOT LOCATION=  0.00000     Y PIVOT LOCATION=  0.00000     Z PIVOT LOCATION=  0.00000

                              TE CHORD EXTENSION=  0.00000


                              REFERENCE DIMENSIONS

REF AR=  1.49080  REF AREA,SREF=  2.68312  MOMENT REF POINT=   .31505  REF CHORD,CREF=  1.86127  X LE REF=  -.15027
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AERODYNAMIC DATA

CASE NUMBER= 200

ANGLE FOR ZERO LIFT,ALPHA ZERO= -.98285 PITCHING MOMENT COEFF. AT ZERO LIFT,CM ZERO= -.02440

ROOT BENDING MOMENT COEFFICIENT AT ZERO LIFT,CBMROOT= -.00541

CLA= 1.84912 CMA= -.37985 CROLL= .00000 CL,TWIST AND CAMBER= .03172 CM,TWIST AND CAMBER= -.03091 CL,DESIGN= .22000

CLA PER DEGREE= .03227 CMA PER DEGREE= -.00663 CDI/CLA**2= .21360 CDII/CLA**2= .21815

FOR THE ADDITIONAL LOADING

CHORDWISE LOCATION OF CENTER OF PRESSURE= .69739 A.C. IN FRACTION OF CREF MEASURED FROM LEADING EDGE OF CREF= .45542

SPANWISE LOCATION OF CENTER OF PRESSURE= .42084

SPAN STA.	2Y/B	LOCAL CIRCU ADD	LOCAL CIRCU BASIC NO LIFT	LOCAL CIRCU TOTAL AT CLDESG	LOCAL LIFT COEFF ADD	LOCAL LIFT COEFF BASIC NO LIFT	LOCAL LIFT COEFF TOTAL AT CLDESG	LOCAL PITCH COEFF,LE ADD	LOCAL PITCH COEFF,LE BASIC NO LIFT	LOCAL PITCH COEFF,LE TOTAL AT CLDESG	LOCAL HALF CHORD	LOCAL LOCATN MIDCHD
20	0.00000	.80171	.01136	.10674	.93371	.01323	.12432	-.49542	-.06011	-.11906	1.71727	.05204
21	.07846	.79757	.01049	.10538	1.10393	.01452	.14586	-.51815	-.06060	-.12225	1.44497	.31224
22	.15643	.78855	.00871	.10253	1.40785	.01554	.18304	-.53894	-.05979	-.12391	1.12022	.62255
23	.23345	.77419	.00661	.09872	1.76322	.01505	.22483	-.52563	-.05929	-.12182	.87815	.85036
24	.30902	.75533	.00436	.09423	1.88811	.01090	.23554	-.54408	-.05335	-.11809	.80009	.91443
25	.38268	.73183	.00210	.08917	2.02163	.00581	.24633	-.56490	-.04739	-.11460	.72400	.97689
26	.45399	.70373	-.00010	.08363	2.16418	-.00030	.25719	-.58872	-.04175	-.11179	.65034	1.03734
27	.52250	.67129	-.00214	.07772	2.31647	-.00740	.26821	-.61491	-.03683	-.10999	.57958	1.09542
28	.58779	.63480	-.00397	.07156	2.47899	-.01549	.27945	-.64302	-.03299	-.10949	.51214	1.15077
29	.64945	.59462	-.00549	.06525	2.65188	-.02450	.29101	-.67192	-.03054	-.11048	.44845	1.20305
30	.70711	.55110	-.00668	.C5889	2.83423	-.03436	.30285	-.70022	-.02972	-.11303	.38889	1.25193
31	.76041	.50465	-.00750	.05255	3.02336	-.04491	.31480	-.72552	-.03068	-.11700	.33384	1.29712
32	.80902	.45562	-.00792	.04629	3.21282	-.05584	.32641	-.74415	-.03347	-.12200	.28363	1.33833
33	.85264	.40433	-.00795	.04016	3.38970	-.06663	.33667	-.75021	-.03799	-.12725	.23857	1.37532
34	.89101	.35105	-.00759	.03418	3.52931	-.07632	.34358	-.73488	-.04392	-.13135	.19894	1.40784
35	.92388	.29599	-.00688	.02834	3.58811	-.08336	.34354	-.68625	-.05044	-.13208	.16498	1.43571
36	.95106	.23927	-.00584	.02262	3.49525	-.08538	.33047	-.59239	-.05588	-.12636	.13691	1.45875
37	.97237	.18102	-.00456	.01698	3.15110	-.07935	.29555	-.44718	-.05736	-.11056	.11489	1.47682
38	.98769	.12141	-.00310	.01135	2.45096	-.06254	.22907	-.26300	-.05080	-.08209	.09907	1.48981
39	.99692	.06091	-.00156	.00569	1.36043	-.03479	.12707	-.10752	-.03084	-.04363	.08954	1.49763

N	LS	2Y/B	X/C	DELTA CP ADD	DELTA CP BASIC NO LIFT	DELTA CP TOTAL AT CLDESG
20	1	0.00000	.02447	.52418	-.04554	-.01682

20	1	0.00000	.02447	[illegible]	[illegible]	[illegible]
20	2	0.00000	.09549	.38371	-.01648	.02917
20	3	0.00000	.20611	.63071	-.02750	.04754
20	4	0.00000	.34549	1.00656	-.03870	.08106
20	5	0.00000	.50000	1.28777	-.02027	.13294
20	6	0.00000	.65451	1.32537	.03232	.19001
20	7	0.00000	.79389	1.11167	.09140	.22366
20	8	0.00000	.90451	.75177	.11531	.20476
20	9	0.00000	.97553	.36476	.08010	.12350
20	10	0.00000	1.00000	.00000	.00000	.00000
21	1	.07846	.02447	1.19878	-.09083	.05179
21	2	.07846	.09549	.82118	-.04563	.05207
21	3	.07846	.20611	.96808	-.04041	.07477
21	4	.07846	.34549	1.23866	-.03294	.11443
21	5	.07846	.50000	1.40455	-.00167	.16544
21	6	.07846	.65451	1.33986	.05250	.21191
21	7	.07846	.79389	1.06014	.10402	.23015
21	8	.07846	.90451	.68127	.11877	.19983
21	9	.07846	.97553	.31732	.07925	.11700
21	10	.07846	1.00000	.00000	.00000	.00000
22	1	.15643	.02447	2.58932	-.17101	.13706
22	2	.15643	.09549	1.82729	-.10133	.11608
22	3	.15643	.20611	1.70242	-.06470	.13785
22	4	.15643	.34549	1.62609	-.01972	.17374
22	5	.15643	.50000	1.47350	.03559	.21090
22	6	.15643	.65451	1.22665	.08864	.23458
22	7	.15643	.79389	.91721	.12033	.22946
22	8	.15643	.90451	.59262	.11509	.18560
22	9	.15643	.97553	.28593	.07031	.10433
22	10	.15643	1.00000	.00000	.00000	.00000
23	1	.23345	.02447	5.92399	-.36757	.33724
23	2	.23345	.09549	2.95542	-.14316	.20846
23	3	.23345	.20611	2.05085	-.04590	.19811
23	4	.23345	.34549	1.65967	.02207	.21953
23	5	.23345	.50000	1.40003	.07600	.24257
23	6	.23345	.65451	1.12413	.11367	.24742
23	7	.23345	.79389	.80761	.12713	.22321
23	8	.23345	.90451	.49309	.11012	.16879
23	9	.23345	.97553	.22435	.06403	.09072
23	10	.23345	1.00000	.00000	.00000	.00000
24	1	.30902	.02447	6.37464	-.41633	.34210
24	2	.30902	.09549	3.29614	-.16658	.22558
24	3	.30902	.20611	2.32074	-.05530	.22082
24	4	.30902	.34549	1.83087	.02382	.24164
24	5	.30902	.50000	1.46985	.08386	.25874
24	6	.30902	.65451	1.12254	.12120	.25475
24	7	.30902	.79389	.77654	.13003	.22242
24	8	.30902	.90451	.46365	.10858	.16375
24	9	.30902	.97553	.20900	.06160	.08646
24	10	.30902	1.00000	.00000	.00000	.00000
25	1	.38268	.02447	6.97969	-.46632	.36410
25	2	.38268	.09549	3.64319	-.18725	.24620

25	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	3	.38268	.20611	2.55299	-.06329	.24045
25	4	.38268	.34549	1.96655	.02361	.25758
25	5	.38268	.50000	1.52680	.08764	.26930
25	6	.38268	.65451	1.13149	.12545	.26007
25	7	.38268	.79389	.76873	.13253	.22399
25	8	.38268	.90451	.45732	.10908	.16349
25	9	.38268	.97553	.20735	.06126	.08593
25	10	.38268	1.00000	.00000	.00000	.00000
26	1	.45399	.02447	7.65409	-.51680	.39386
26	2	.45399	.09549	3.99867	-.20774	.26801
26	3	.45399	.20611	2.77726	-.07194	.25849
26	4	.45399	.34549	2.09628	.02152	.27092
26	5	.45399	.50000	1.58655	.08897	.27774
26	6	.45399	.65451	1.15035	.12789	.26475
26	7	.45399	.79389	.77270	.13461	.22654
26	8	.45399	.90451	.46020	.11027	.16502
26	9	.45399	.97553	.21042	.06171	.08674
26	10	.45399	1.00000	.00000	.00000	.00000
27	1	.52250	.02447	8.39404	-.56881	.42988
27	2	.52250	.09549	4.36904	-.22890	.29091
27	3	.52250	.20611	3.00225	-.08152	.27567
27	4	.52250	.34549	2.22632	.01796	.28284
27	5	.52250	.50000	1.65067	.08866	.28504
27	6	.52250	.65451	1.17629	.12909	.26904
27	7	.52250	.79389	.78323	.13623	.22941
27	8	.52250	.90451	.46711	.11164	.16722
27	9	.52250	.97553	.21510	.06247	.08806
27	10	.52250	1.00000	.00000	.00000	.00000
28	1	.58779	.02447	9.20304	-.62379	.47115
28	2	.58779	.09549	4.75775	-.25145	.31460
28	3	.58779	.20611	3.23115	-.09211	.29231
28	4	.58779	.34549	2.35880	.01344	.29408
28	5	.58779	.50000	1.71963	.08740	.29199
28	6	.58779	.65451	1.20802	.12949	.27322
28	7	.58779	.79389	.79777	.13731	.23222
28	8	.58779	.90451	.47534	.11273	.16928
28	9	.58779	.97553	.21965	.06313	.08926
28	10	.58779	1.00000	.00000	.00000	.00000
29	1	.64945	.02447	10.10129	-.68328	.51852
29	2	.64945	.09549	5.16985	-.27555	.33954
29	3	.64945	.20611	3.46370	-.10339	.30870
29	4	.64945	.34549	2.49158	.00838	.30482
29	5	.64945	.50000	1.79076	.08555	.29860
29	6	.64945	.65451	1.24265	.12930	.27715
29	7	.64945	.79389	.81335	.13793	.23470
29	8	.64945	.90451	.48225	.11357	.17094
29	9	.64945	.97553	.22247	.06370	.09017
29	10	.64945	1.00000	.00000	.00000	.00000
30	1	.70711	.02447	11.10183	-.74846	.57239
30	2	.70711	.09549	5.60940	-.30134	.36604
30	3	.70711	.20611	3.69999	-.11514	.32507

30	3	.70711	.20611	[illegible]	[illegible]	[illegible]
30	4	.70711	.34549	2.62231	.00313	.31512
30	5	.70711	.50000	1.86036	.08340	.30474
30	6	.70711	.65451	1.27615	.12874	.28057
30	7	.70711	.79389	.82642	.13823	.23655
30	8	.70711	.90451	.48529	.11421	.17195
30	9	.70711	.97553	.22226	.06419	.09064
30	10	.70711	1.00000	.00000	.00000	.00000
31	1	.76041	.02447	12.21968	-.81986	.63399
31	2	.76041	.09549	6.08071	-.32884	.39461
31	3	.76041	.20611	3.93867	-.12711	.34150
31	4	.76041	.34549	2.74570	-.00196	.32471
31	5	.76041	.50000	1.92114	.08135	.30992
31	6	.76041	.65451	1.30136	.12809	.28292
31	7	.76041	.79389	.83151	.13835	.23728
31	8	.76041	.90451	.48122	.11471	.17196
31	9	.76041	.97553	.21764	.06461	.09051
31	10	.76041	1.00000	.00000	.00000	.00000
32	1	.80902	.02447	13.45388	-.89710	.70358
32	2	.80902	.09549	6.58528	-.35791	.42557
32	3	.80902	.20611	4.17774	-.13907	.35798
32	4	.80902	.34549	2.85393	-.00647	.33307
32	5	.80902	.50000	1.96124	.07987	.31321
32	6	.80902	.65451	1.30658	.12776	.28321
32	7	.80902	.79389	.82066	.13851	.23615
32	8	.80902	.90451	.46651	.11507	.17058
32	9	.80902	.97553	.20780	.06490	.08963
32	10	.80902	1.00000	.00000	.00000	.00000
33	1	.85264	.02447	14.78581	-.97841	.78074
33	2	.85264	.09549	7.11887	-.38801	.45896
33	3	.85264	.20611	4.41031	-.15061	.37411
33	4	.85264	.34549	2.93176	-.00978	.33903
33	5	.85264	.50000	1.95983	.07973	.31290
33	6	.85264	.65451	1.27280	.12831	.27974
33	7	.85264	.79389	.78256	.13886	.23197
33	8	.85264	.90451	.43791	.11514	.16724
33	9	.85264	.97553	.19325	.06487	.08786
33	10	.85264	1.00000	.00000	.00000	.00000
34	1	.89101	.02447	16.15416	-1.05973	.86222
34	2	.89101	.09549	7.65953	-.41761	.49369
34	3	.89101	.20611	4.61646	-.16066	.38859
34	4	.89101	.34549	2.95019	-.01073	.34027
34	5	.89101	.50000	1.88288	.08201	.30603
34	6	.89101	.65451	1.17229	.13037	.26985
34	7	.89101	.79389	.70401	.13933	.22309
34	8	.89101	.90451	.39532	.11435	.16139
34	9	.89101	.97553	.17799	.06400	.08517
34	10	.89101	1.00000	.00000	.00000	.00000
35	1	.92388	.02447	17.43781	-1.13342	.94126
35	2	.92388	.09549	8.13714	-.44234	.52578
35	3	.92388	.20611	4.73553	-.16604	.39737
35	4	.92388	.34549	2.85190	-.00711	.33220

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
35	5	.92388	.50000	1.68253	.08783	.28801
35	6	.92388	.65451	.97551	.13388	.24994
35	7	.92388	.79389	.57668	.13896	.20757
35	8	.92388	.90451	.34487	.11144	.15248
35	9	.92388	.97553	.17001	.06142	.08165
35	10	.92388	1.00000	.00000	.00000	.00000
36	1	.95106	.02447	18.43205	-1.18761	1.00536
36	2	.95106	.09549	8.35168	-.45054	.54311
36	3	.95106	.20611	4.59689	-.15765	.38927
36	4	.95106	.34549	2.53069	.00523	.30632
36	5	.95106	.50000	1.32074	.09648	.25362
36	6	.95106	.65451	.68751	.13557	.21736
36	7	.95106	.79389	.41691	.13450	.18410
36	8	.95106	.90451	.29601	.10452	.13974
36	9	.95106	.97553	.17119	.05649	.07686
36	10	.95106	1.00000	.00000	.00000	.00000
37	1	.97237	.02447	18.85386	-1.20580	1.03735
37	2	.97237	.09549	7.86318	-.41775	.51778
37	3	.97237	.20611	3.83026	-.11631	.33940
37	4	.97237	.34549	1.82360	.03223	.24919
37	5	.97237	.50000	.82856	.10204	.20062
37	6	.97237	.65451	.41350	.12539	.17459
37	7	.97237	.79389	.28675	.11927	.15339
37	8	.97237	.90451	.23597	.09240	.12047
37	9	.97237	.97553	.14497	.05044	.06768
37	10	.97237	1.00000	.00000	.00000	.00000
38	1	.98769	.02447	17.81941	-1.13210	.98798
38	2	.98769	.09549	6.11492	-.31626	.41126
38	3	.98769	.20611	2.13590	-.03142	.22270
38	4	.98769	.34549	.70325	.06986	.15353
38	5	.98769	.50000	.35838	.09194	.13458
38	6	.98769	.65451	.32235	.09081	.12916
38	7	.98769	.79389	.24917	.08683	.11648
38	8	.98769	.90451	.11703	.07499	.08891
38	9	.98769	.97553	.02335	.04530	.04808
38	10	.98769	1.00000	.00000	.00000	.00000
39	1	.99692	.02447	11.59949	-.73154	.64852
39	2	.99692	.09549	3.28956	-.16493	.22645
39	3	.99692	.20611	.64299	.01886	.09536
39	4	.99692	.34549	-.00764	.06321	.06230
39	5	.99692	.50000	.09751	.05486	.06646
39	6	.99692	.65451	.24356	.04371	.07269
39	7	.99692	.79389	.18071	.04431	.06581
39	8	.99692	.90451	.01600	.04496	.04687
39	9	.99692	.97553	-.05805	.03027	.02337
39	10	.99692	1.00000	-.00000	.00000	.00000

CHORDAL LOAD FACTORS,Q,FOR ADDITIONAL LOAD

SPAN
STA 0 1 2 3

SPAN STA.	0	1	2	3
20	.14917	1.74321	-.54818	-.31907
21	.25791	1.51519	-.26696	-.25644
22	.38740	1.23324	.16649	-.03001
23	.82369	.32407	-.05527	-.08167
24	.79308	.33727	.04368	-.04566
25	.78078	.30203	.08268	-.02259
26	.76755	.25694	.09902	-.00732
27	.75048	.20847	.10283	.00225
28	.72862	.15927	.09857	.00719
29	.70294	.10829	.08786	.00817
30	.67341	.05656	.07307	.00649
31	.64019	.00472	.05628	.00356
32	.60268	-.04513	.04017	.00129
33	.56044	-.09125	.02686	.00164
34	.51304	-.13213	.01726	.00634
35	.46123	-.16873	.00838	.01491
36	.40827	-.20725	-.01102	.02020
37	.36101	-.26105	-.06174	.00476
38	.31338	-.31760	-.14113	-.03972
39	.19368	-.23226	-.12619	-.04731

CHORDAL LOAD FACTORS,QT,FOR THE LOAD DUE TO TWIST AND CAMBER

SPAN STA.	0	1	2	3
20	-.01448	.09290	-.10373	.07530
21	-.01779	.09713	-.09732	.04694
22	-.02041	.09743	-.08545	.00884
23	-.04010	.13085	-.03940	.00292
24	-.04170	.12750	-.03496	-.00147
25	-.04259	.12251	-.03035	-.00250
26	-.04260	.11570	-.02632	-.00247
27	-.04188	.10763	-.02275	-.00205
28	-.04061	.09884	-.01951	-.00163
29	-.03894	.08986	-.01643	-.00122
30	-.03698	.08102	-.01347	-.00081
31	-.03476	.07248	-.01068	-.00044
32	-.03231	.06435	-.00812	-.00015
33	-.02961	.05664	-.00588	-.00001
34	-.02671	.04941	-.00396	-.00003
35	-.02367	.04276	-.00219	-.00017
36	-.02069	.03695	-.00006	-.00005
37	-.01808	.03246	.00325	.00102
38	-.01543	.02828	.00732	.00313
39	-.00938	.01746	.00634	.00302

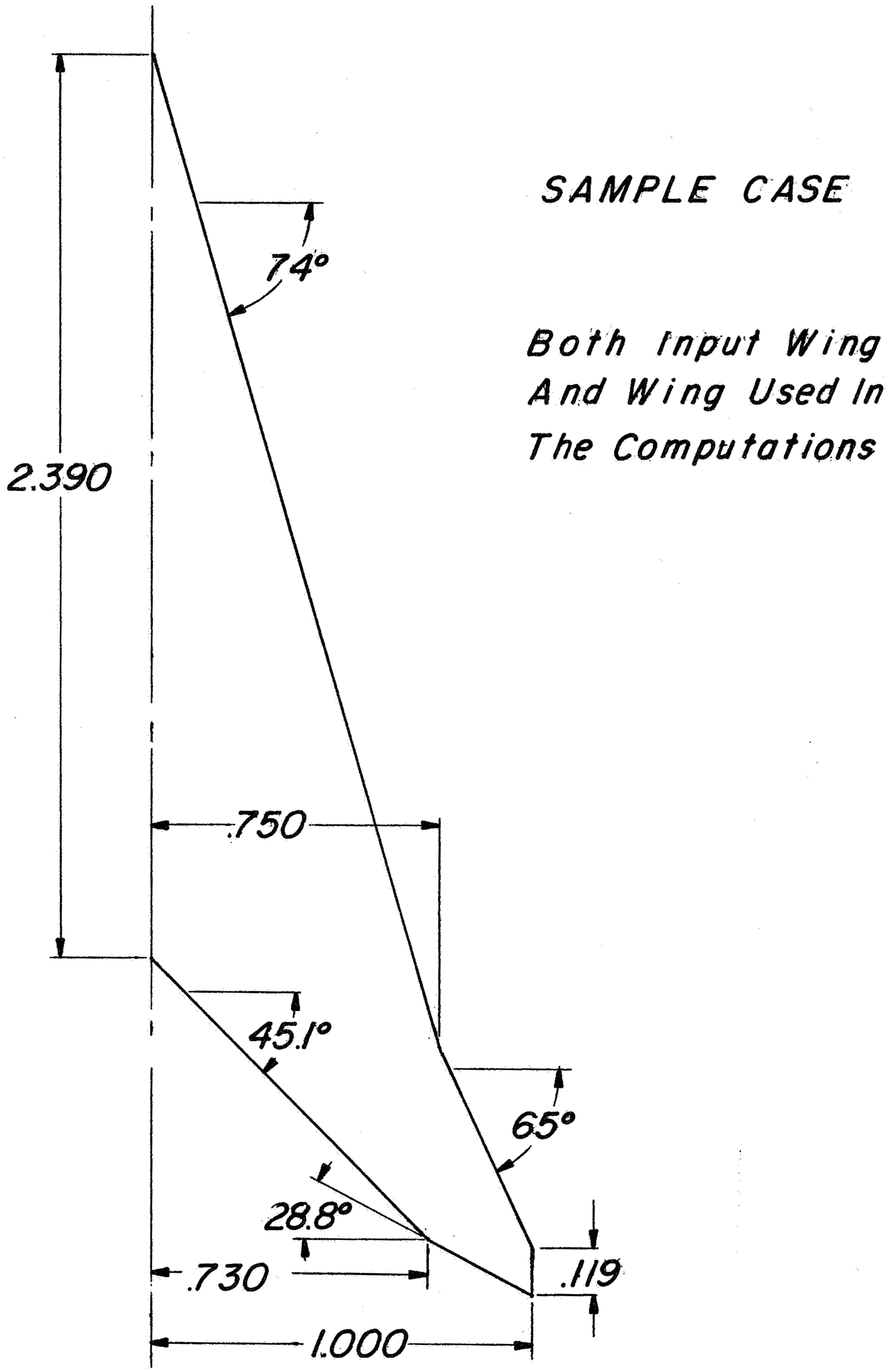
SPAN STA.	2Y/B	CHORD LOAD ADD	CHORD LOAD BASIC	CHORD LOAD TOTAL	CENTER PRESS ADD	CENTER PRESS BASIC	CENTER PRESS TOTAL	LOCAL A.C. ADD	LOCAL A.C. BASIC	LOCAL A.C. TOTAL	SPAN LOAD ADD	BASIC LOAD NO LIFT	SPAN LOAD TOTAL

		ADD	BASIC NO LIFT	TOTAL AT CLDESG	ADD	BASIC NO LIFT	TOTAL AT CLDESG	ADD	BASIC NO LIFT	TOTAL AT CLDESG	ADD	NO LIFT	TOTAL AT CLDESG
20	0.00000	3.20685	.04543	.42697	.15712	3.864E+00	.55154	.53059	1.610E+00	.64543	1.29272	.03387	.31826
21	.07846	3.19029	.04196	.42153	.22371	4.022E+00	.60183	.46937	1.784E+00	.60021	1.28604	.03128	.31421
22	.15643	3.15422	.03483	.41010	.35999	4.220E+00	.68781	.38281	2.106E+00	.52913	1.27150	.02596	.30569
23	.23345	3.09675	.02644	.39488	.49578	4.683E+00	.77611	.29810	2.682E+00	.45772	1.24834	.01971	.29434
24	.30902	3.02132	.01745	.37691	.57545	6.184E+00	.83507	.28816	3.793E+00	.45041	1.21793	.01301	.28095
25	.38268	2.92731	.00841	.35669	.65750	1.069E+01	.89418	.27943	7.211E+00	.44288	1.18003	.00627	.26588
26	.45399	2.81492	-.00039	.33452	.74083	-1.821E+02	.95357	.27203	-1.403E+02	.43560	1.13473	-.00029	.24935
27	.52250	2.68516	-.00858	.31089	.82354	-6.018E+00	1.01229	.26545	-5.637E+00	.42828	1.08242	-.00639	.23174
28	.58779	2.53919	-.01586	.28624	.90432	-2.080E+00	1.06970	.25939	-2.654E+00	.42085	1.02358	-.01182	.21336
29	.64945	2.37846	-.02197	.26101	.98185	-7.194E-01	1.12507	.25337	-1.643E+00	.41305	.95879	-.01638	.19456
30	.70711	2.20442	-.02672	.23555	1.05520	-2.572E-02	1.17784	.24706	-1.143E+00	.40473	.88863	-.01992	.17558
31	.76041	2.01862	-.02998	.21018	1.12351	3.952E-01	1.22740	.23997	-8.508E-01	.39557	.81373	-.02235	.15667
32	.80902	1.82248	-.03168	.18516	1.18609	6.766E-01	1.27326	.23162	-6.666E-01	.38529	.73466	-.02361	.13801
33	.85264	1.61734	-.03179	.16063	1.24235	8.756E-01	1.31494	.22132	-5.474E-01	.37345	.65197	-.02370	.11974
34	.89101	1.40422	-.03037	.13670	1.29175	1.021E+00	1.35199	.20822	-4.733E-01	.35961	.56606	-.02264	.10190
35	.92388	1.18394	-.02751	.11335	1.33384	1.127E+00	1.38398	.19126	-4.350E-01	.34322	.47726	-.02050	.08449
36	.95106	.95706	-.02338	.09049	1.36825	1.205E+00	1.41054	.16949	-4.282E-01	.32392	.38580	-.01743	.06745
37	.97237	.72409	-.01823	.06791	1.39454	1.258E+00	1.43122	.14191	-4.526E-01	.30153	.29189	-.01359	.05062
38	.98769	.48564	-.01239	.04539	1.41200	1.290E+00	1.44541	.10731	-5.104E-01	.27594	.19577	-.00924	.03383
39	.99692	.24362	-.00623	.02276	1.42225	1.307E+00	1.45385	.07903	-5.655E-01	.25551	.09821	-.00464	.01696

MEAN CAMBER SURFACE PROGRAM A0457

Sample Input Data

```
   1.70501     74.00         65.00         45.10          0.7500        0.7300  KEMP 1A
   0.04975      0.00          0.00          0.00          0.00          0.30    KEMP 2A
400.      1.      4.    20.                                                     KEMP 3A
0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000 KEMP 1
0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000 KEMP 2
0.00000  0.00000  0.00000  0.00000  0.95080  0.94790  0.93910  0.92460 KEMP 3
0.9043   0.8784   0.8473   0.8107   0.7693   0.7230   0.6723   0.6175  KEMP 4
0.5589   0.4969   0.4317   0.3638   0.2937   0.2218   0.1487   0.0749  KEMP 5
0.0000   0.2711   0.5154   0.7230   0.8826   0.9824   1.0113   0.9728  KEMP 6
0.9232   0.8676   0.8068   0.7336   0.6260   0.5148   0.3984   0.2857  KEMP 7
0.1807   0.0927   0.0324   0.0045  -0.3169  -0.1352   0.0306   0.1748  KEMP 8
0.2870   0.3623   0.3814   0.3783   0.3590   0.3374   0.3138   0.2832  KEMP 9
0.2310   0.1776   0.1217   0.0692   0.0226  -0.0121  -0.0280  -0.0220  KEMP 10
```


SAMPLE CASE
Both Input Wing
And Wing Used In
The Computations
74°
2.390
.750
45.1°
65°
28.8°
.730
.119
1.000

Program Listing

```
      PROGRAM MNCAMBR   (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
      TO SOLVE FOR THE MEAN CAMBER SURFACE REQUIRED TO SUPPORT A GIVEN
         PRESSURE LOADING ON A VARIABLE SWEEP PLANFORM,(Z/C) VS. (X/C)


      DIMENSION Y(41),ETA(41),C(41),D(41),QP(110,1),PHI(10),VE(41),B(41)
     1,AL(10,41),DF(10),SUML(110,110),YUT(10,41),W(10),RESID(10,41),SUMS
     2T(41),AST(10,10),CUT(10,10),CONST(110,1)
      REAL MACH
      COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
      EXTERNAL FOFT1,FOFT2,FOFT3,FOFT4,FOFT5,FOFT6,FOFT7,FOFT8,FOFT9,FOF
     1T10,WU
  500 FORMAT(6F12.5)
  501 FORMAT(1H1,58X,13HGEOMETRY DATA///)
  502 FORMAT(1H1,57X,16HMEAN CAMBER DATA///)
  503 FORMAT(50X,5HX2PP=,F9.5,5X,5HY2PP=,F9.5)
  504 FORMAT(50X,5HX3NP=,F9.5,5X,5HY3NP=,F9.5)
  505 FORMAT(50X,5HX4PP=,F9.5,5X,5HY4PP=,F9.5)
  506 FORMAT(50X,5HX5PP=,F9.5,5X,5HY5PP=,F9.5)
  507 FORMAT(50X,5HX6NP=,F9.5,5X,5HY6NP=,F9.5)
  508 FORMAT(50X,5HX7PP=,F9.5,5X,5HY7PP=,F9.5)
  509 FORMAT(40X12HCASE NUMBER=,F6.0,5X,14HSYMMETRY CODE=,F5.0,5X,12HMAC
     1H NUMBER=,F9.5)
  510 FORMAT(1H0)
  511 FORMAT(8F9.5)
  512 FORMAT(1H1)
  513 FORMAT(6X3HX/C9X3HX/C9X3HX/C9X3HX/C9X3HX/C9X3HX/C9X3HX/C9X3HX/C9X3
     1HX/C9X3HX/C)
  514 FORMAT(15X,97HIF SYMMETRY CODE IS EQUAL TO 1,THE SPAN LOADING IS S
     1YMMETRICAL/OTHER THAN 1,IT IS ANTISYMMETRICAL)
  515 FORMAT(////52X,17HMEAN CAMBER SHAPE//)
  516 FORMAT(4XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF
     17.5,5XF7.5)
  517 FORMAT(55X,3HX/C,6X,3HZ/C)
  518 FORMAT(20X,15HSTATION NUMBER=,I4,10X,18HSPANWISE LOCATION=,F9.5,10
     1X,6HCHORD=,F9.5)
  519 FORMAT(10F12.5)
  520 FORMAT( 7X,2HA1,10X,2HA2,10X,2HA3,10X,2HA4,10X,2HA5,10X,2HA6,10X2H
     1A7,10X,2HA8,10X,2HA9,10X,3HA10)
  521 FORMAT(4X,8HCON.PT.1,4X,8HCON.PT.2,4X,8HCON.PT.3,4X,8HCON.PT.4,4X,
     18HCON.PT.5,4X,8HCON.PT.6,4X,8HCON.PT.7,4X,8HCON.PT.8,4X,8HCON.PT.9
     2,4X,9HCON.PT.10)
```

```
522 FORMAT(30X13HASPECT RATIO=,F9.5,5X,14HPLANFORM AREA=,F9.5,5X,14HAV
   1ERAGE CHORD=,F9.5//10X21HMEAN GEOMETRIC CHORD=,F9.5,5X,59HX LOCATI
   2ON OF THE LEADING EDGE OF THE MEAN GEOMETRIC CHORD=,F9.5/ 30X39HY
   3LOCATION OF THE MEAN GEOMETRIC CHORD=,F9.5//)
524 FORMAT(15X,11HROOT CHORD=,F9.5,5X,10HTIP CHORD=,F9.5,5X,15HFOREWIN
   1G CHORD=,F9.5,5X,20HOVERALL TAPER RATIO=,F9.5//45X11HY LE BREAK=,F
   29.5,5X,11HY TE BREAK=,F9.5//25X17HX PIVOT LOCATION=,F9.5,5X17HY PI
   3VOT LOCATION=,F9.5,5X,17HZ PIVOT LOCATION=,F9.5//55X,19HTE CHORD E
   4XTENSION=,F9.5)
525 FORMAT(4F6.0)
526 FORMAT(////40X59HLOCATION OF PERIMETER POINTS FOR THE PLANFORM USE
   1D AS INPUT)
527 FORMAT(//5X35HNUMBER OF CHORDWISE PRESSURE MODES=,F5.0,5X72HNUMBER
   1 OF STATIONS SPANWISE ON A PANEL WHERE PRESSURE MODES ARE DEFINED=
   2,F5.0)
528 FORMAT(40X,49HSLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR//)
529 FORMAT(50X,9HX1PP=  0.10X,9HY1PP=  0.)
530 FORMAT(57X,12HCASE NUMBER=,F6.0)
532 FORMAT(52X,7HX1=  0.,10X,7HY1=  0.)
535 FORMAT(52X,3HX2=,F9.5,5X,3HY2=,F9.5)
536 FORMAT(52X,3HX3=,F9.5,5X,3HY3=,F9.5)
537 FORMAT(52X,3HX4=,F9.5,5X,3HY4=,F9.5)
540 FORMAT(50X,5HX6AP=,F9.5,5X,5HY6AP=,F9.5)
545 FORMAT(52X,3HX5=,F9.5,5X,3HY5=,F9.5)
548 FORMAT(5X,23HLE INBOARD SWEEP ANGLE=,F9.5,5X,32HLE INITIAL OUTBOAR
   1D SWEEP ANGLE=,F9.5,5X,30HLE FINAL OUTBOARD SWEEP ANGLE=,F9.5/5X,
   223HTE INBOARD SWEEP ANGLE=,F9.5,5X,32HTE INITIAL OUTBOARD SWEEP AN
   3GLE=,F9.5,5X,30HTE FINAL OUTBOARD SWEEP ANGLE=,F9.5//5X,40
   4HCHANGE IN OUTER PANEL SWEEP ANGLE,DELTA=,F9.5,4X,26HPIVOT CANT AN
   5GLE IN PITCH=,F3.0,4X,25HPIVOT CANT ANGLE IN ROLL=,F3.0//)
549 FORMAT(51X,4HX6A=,F9.5,4X,4HY6A=,F9.5)
550 FORMAT(52X,3HX6=,F9.5,5X,3HY6=,F9.5)
551 FORMAT(2X,122HTOTAL WING PLANFORM(MEAN GEOMETRIC CHORD AND ITS LOC
   1ATION ARE INVALID IF THE PLANFORM HAS A TRAILING EDGE CHORD EXTENS
   2ION)///)
553 FORMAT(///33X,72HLOCATION OF PERIMETER POINTS FOR PLANFORM TO BE U
   1SED IN THE COMPUTATIONS/40X,57HWHEN NONDIMENSIONALIZED BY THE SEMI
   2SPAN RATIO GIVEN ABOVE)
555 FORMAT(40X,57HWHERE THE ORIGIN IS AT THE HALF ROOT CHORD,POSITIVE
   1X AFT//)
556 FORMAT(52X,3HX7=,F9.5,5X,3HY7=,F9.5)
558 FORMAT(25X,33H(SEMISPAN AT FINAL OUTBOARD SWEEP,37H/SEMISPAN AT IN
   1ITIAL OUTBOARD SWEEP)=,F9.5)
```

```
  559 FORMAT(31X69HPOLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASI
     1NG POWERS OF X/C//)
  560 FORMAT(51X,2F9.5)
C
C     INPUT DATA
C
C
C     IF THE WING DOES NOT HAVE A LEADING EDGE BREAK SET B1RAT AND CHI
C     EQUAL TO ZERO
C
C
C     IF THE WING DOES NOT HAVE TRAILING EDGE BREAK SET B2RAT AND PSI
C     EQUAL TO ZERO
C
C
C     IF THE WING DOES NOT HAVE A VARIABLE SWEEP OUTER PANEL SET DELT,
C     XP AND YP EQUAL TO ZERO
C
C
C     IF THE SPAN LOADING IS TO BE SYMMETRICAL SET THE SYM CODE EQUAL TO
C     ONE, IF ANTISYMMETRICAL SET THE SYM CODE EQUAL TO TWO
C
C
C
C
    1 READ(5,500) AR,CHI,ALAMD,PSI,B1RAT,B2RAT
      IF(EOF,5) 3,4
    4 READ(5,500) TAPER,DELT,XP,YP,CHDEXT,MACH
      READ(5,525)  CASE,SYM,CSTA,SSSTA
C
C
C     VARIBLE SWEEP GEOMETRY PROGRAM
C
C
      PI=3.14159265
      RAD=180./PI
      QBAR=1.00
      B0=1.0
      YMIN=1.0
      YMAX=1.0
      YMAX1=1.0
      SIGM=0.
      RHH=0.
```

```
      ZP=0.
C
      CHDEXX=CHDEXT
      BETA=SQRT(1.-MACH**2)
      ISYM=SYM
      JMAX=CSTA
      MS=CSTA
      NS=CSTA
      ISSST=SSSTA
      NMAX=2*ISSST-1
      NNII=ISSST+1
      JKMAX=JMAX*ISSST
      MSMAX=10
      NSMAX=10
      LS=1
C
      ITTU=1
C
      CHI=CHI/RAD
      ALAMD=ALAMD/RAD
      PSI=PSI/RAD
      DELTA=DELT/RAD
      SIGMA=SIGM/RAD
      RHO=RHH/RAD
      TANC=TAN(CHI)
      TANL=TAN(ALAMD)
      TANP=TAN(PSI)
      TANDE=TAN(PI/2.+DELTA)
      B1=B1RAT*B0
      B2=B2RAT*B0
      CR=B0*(4./AR-B2RAT*TANP-TANC*(B1RAT*(B1RAT-B2RAT-1.))-TANL*
     1(B1RAT*(B2RAT-B1RAT+1.)-B2RAT))*(1./(B2RAT*(1.-TAPER)+(1.+TAPER)))
      OMEGA=ATAN ((1./(1.-B2RAT))*((TAPER-1.)*(CR/B0)+B1RAT*(TANC-TANL)
     1-B2RAT*TANP+TANL))
      TANO=TAN(OMEGA)
      EOMEG=OMEGA+DELTA
      ALAME=ALAMD+DELTA
      TANE=TAN(EOMEG)
      TANA=TAN(ALAME)
      CR=CR+CHDEXT
      X2=-CR/2.
      Y2=0.00
      Z2=0.00
```

```
      X3=-CR/2.+B1*TANC
      Y3=B1
      Z3=0.00
      X4=-CR/2.+B1*(TANC-TANL)+B0*TANL
      Y4=B0
      Z4=0.00
      X5=CR/2.+B2*(TANP-TANO)+B0*TANO-CHDEXT
      Y5=B0
      Z5=0.00
      X6A=CR/2.+B2*TANP
      Y6A=B2
      Z6A=0.00
      X6=X6A-CHDEXT
      Y6=Y6A
      Z6=0.00
      X7=CR/2.
      Y7=0.00
      Z7=0.00
      X2PP=X2
      Y2PP=Y2
      Z2PP=Z2
      X6AP=X6A
      Y6AP=Y6A
      Z6AP=Z6A
      X7PP=X7
      Y7PP=Y7
      Z7PP=Z7
      IF(DELTA.EQ.0.) GO TO 360
      X3PP=XP+(X3-XP)*COS(SIGMA)*COS(DELTA)+(Y3-YP)*COS(RHO)*SIN(DELTA)
     1+(Z3-ZP)*(COS(SIGMA)*SIN(RHO)*SIN(DELTA)-SIN(SIGMA)*COS(RHO))
      Y3PP=YP-(X3-XP)*COS(SIGMA)*SIN(DELTA)+(Y3-YP)*COS(RHO)*COS(DELTA)
     1+(Z3-ZP)*(COS(SIGMA)* SIN(RHO)*COS(DELTA)+SIN(SIGMA)*SIN(DELTA))
      Z3PP=(X3-XP)*SIN(SIGMA)*COS(RHO)-(Y3-YP)*SIN(RHO)
     1+(Z3-ZP)*COS(SIGMA)*COS(RHO)+ZP
      X4PP=XP+(X4-XP)*COS(SIGMA)*COS(DELTA)+(Y4-YP)*COS(RHO)*SIN(DELTA)
     1+(Z4-ZP)*(COS(SIGMA)*SIN(RHO)*SIN(DELTA)-SIN(SIGMA)*COS(RHO))
      Y4PP=YP-(X4-XP)*COS(SIGMA)*SIN(DELTA)+(Y4-YP)*COS(RHO)*COS(DELTA)
     1+(Z4-ZP)*(COS(SIGMA)* SIN(RHO)*COS(DELTA)+SIN(SIGMA)*SIN(DELTA))
      Z4PP=(X4-XP)*SIN(SIGMA)*COS(RHO)-(Y4-YP)*SIN(RHO)
     1+(Z4-ZP)*COS(SIGMA)*COS(RHO)+ZP
      X5PP=XP+(X5-XP)*COS(SIGMA)*COS(DELTA)+(Y5-YP)*COS(RHO)*SIN(DELTA)
     1+(Z5-ZP)*(COS(SIGMA)*SIN(RHO)*SIN(DELTA)-SIN(SIGMA)*COS(RHO))
      Y5PP=YP-(X5-XP)*COS(SIGMA)*SIN(DELTA)+(Y5-YP)*COS(RHO)*COS(DELTA)
```

```
     1+(Z5-ZP)*(COS(SIGMA)* SIN(RHO)*COS(DELTA)+SIN(SIGMA)*SIN(DELTA))
      Z5PP=(X5-XP)*SIN(SIGMA)*COS(RHO)-(Y5-YP)*SIN(RHO)
     1+(Z5-ZP)*COS(SIGMA)*COS(RHO)+ZP
      X6PP=XP+(X6-XP)*COS(SIGMA)*COS(DELTA)+(Y6-YP)*COS(RHO)*SIN(DELTA)
     1+(Z6-ZP)*(COS(SIGMA)*SIN(RHO)*SIN(DELTA)-SIN(SIGMA)*COS(RHO))
      Y6PP=YP-(X6-XP)*COS(SIGMA)*SIN(DELTA)+(Y6-YP)*COS(RHO)*COS(DELTA)
     1+(Z6-ZP)*(COS(SIGMA)* SIN(RHO)*COS(DELTA)+SIN(SIGMA)*SIN(DELTA))
      Z6PP=(X6-XP)*SIN(SIGMA)*COS(RHO)-(Y6-YP)*SIN(RHO)
     1+(Z6-ZP)*COS(SIGMA)*COS(RHO)+ZP
      IF((Y3-Y2PP).EQ.0.) GO TO 208
      A2PP=(X3  -X2PP)/(Y3  -Y2PP)
      GO TO 209
 208  A2PP=0.
 209  IF((Y6-Y7PP).EQ.0.) GO TO 210
      A6PP=(X6  -X7PP)/(Y6  -Y7PP)
      GO TO 211
 210  A6PP=0.
 211  IF((Y4PP-Y3PP).EQ.0.) GO TO 212
      A3PP=(X4PP-X3PP)/(Y4PP-Y3PP)
      GO TO 213
 212  A3PP=0.
 213  IF((Y5PP-Y6PP).EQ.0.) GO TO 214
      A5PP=(X5PP-X6PP)/(Y5PP-Y6PP)
      GO TO 215
 214  A5PP=0.
 215  IF(((X3-X2PP)**2+(Y3-Y2PP)**2).EQ.0.) GO TO 216
      G2PP=(Z3  -Z2PP)/((X3  -X2PP)**2+(Y3  -Y2PP)**2)**.5
      GO TO 217
 216  G2PP=0.
 217  IF(((X7PP-X6)**2+(Y7PP-Y6)**2).EQ.0.) GO TO 218
      G6PP=(Z6  -Z7PP)/((X7PP-X6  )**2+(Y7PP-Y6  )**2)**.5
      GO TO 219
 218  G6PP=0.
 219  IF((A3PP-A2PP).EQ.0.) GO TO 220
      X3NP= (A3PP*X2PP-A2PP*X4PP+A2PP*A3PP*(Y4PP-Y2PP))/(A3PP-A2PP)
      Y3NP= (X2PP-X4PP+A3PP*Y4PP-A2PP*Y2PP)/(A3PP-A2PP)
      GO TO 221
 220  X3NP=X2PP
      Y3NP=Y2PP
 221  Z3NP=((X3NP-X2PP)**2+(Y3NP-Y2PP)**2)**.5*G2PP+Z2PP
      IF((A6PP-A5PP).EQ.0.) GO TO 222
      X6NP= (A6PP*X5PP-A5PP*X7PP+A5PP*A6PP*(Y7PP-Y5PP))/(A6PP-A5PP)
      Y6NP=(X5PP-X7PP+A6PP*Y7PP-A5PP*Y5PP)/(A6PP-A5PP)
```

```
      GO TO 223
222   X6NP=X7PP
      Y6NP=Y7PP
223   Z6NP=((X6NP-X7PP)**2+(Y6NP-Y7PP)**2)**.5*G6PP+Z7PP
      IF(CHDEXT.EQ.0.) GO TO 342
      X6NP=X6PP+(Y6-Y6PP)*A5PP
      Y6NP=Y6
      Z6NP=(X6AP-X6NP)*(Z6A-Z6)/(X6A-X6)+Z6AP
342   IF(Y4PP.GE.Y5PP) GO TO 411
      IF(Y4PP.LT.Y5PP) YMAX=Y5PP
      YMAX1=YMAX
      GO TO 410
411   YMAX=Y4PP
      YMAX1=YMAX
410   X2PP=X2PP/YMAX
      Y2PP=Y2PP/YMAX
      Z2PP=Z2PP/YMAX
      X3NP=X3NP/YMAX
      Y3NP=Y3NP/YMAX
      Z3NP=Z3NP/YMAX
      X4PP=X4PP/YMAX
      Z4PP=Z4PP/YMAX
      X5PP=X5PP/YMAX
      Z5PP=Z5PP/YMAX
      X6AP=X6AP/YMAX
      Y6AP=Y6AP/YMAX
      Z6AP=Z6AP/YMAX
      X6NP=X6NP/YMAX
      Y6NP=Y6NP/YMAX
      Z6NP=Z6NP/YMAX
      X7PP=X7PP/YMAX
      Y7PP=Y7PP/YMAX
      Z7PP=Z7PP/YMAX
      XP=XP/YMAX
      YP=YP/YMAX
      ZP=ZP/YMAX
      CR=CR/YMAX
      Y4PP=Y4PP/YMAX
      Y5PP=Y5PP/YMAX
      CHDEXT=CHDEXT/YMAX
      IF(ABS(ALAME-CHI).GE.0.000174) GO TO 765
      X3NP=X2PP
      Y3NP=Y2PP
```

```
      Z3NP=Z2PP
  765 IF(ABS(EOMEG-PSI).GE.0.000174.OR.CHDEXT.NE.0.0) GO TO 767
      X6NP=X7PP
      Y6NP=Y7PP
      Z6NP=Z7PP
      X6AP=X7PP
      Y6AP=Y7PP
      Z6AP=Z7PP
  767 IF(CHDEXT.NE.0.0) GO TO 766
      X6AP=X7PP
      Y6AP=Y7PP
      Z6AP=Z7PP
  766 IF(Y6AP.EQ.Y6NP) GO TO 1050
      CHDEXX=0.0
      GO TO 1051
 1050 CHDEXX=X6AP-X6NP
 1051 SADD=CHDEXX*Y6NP
      YMAX=1.00
      YMIN=AMIN1(Y4PP,Y5PP)
      B1RAP=Y3NP
      B2RAP=Y6NP
      IF(Y6NP-Y7PP) 362,361,361
  362 X6NP1=X6NP
      Y6NP1=Y6NP
      Z6NP1=Z6NP
      X6NP=X6NP1-Y6NP1*TANE
      Y6NP=0.0000000
      TANU=(Z6NP1-Z5PP)/((X6NP1-X5PP)**2+(Y6NP1-Y5PP)**2)**.5
      Z6NP= Z6NP1-((X6NP-X6NP1)**2+(Y6NP-Y6NP1)**2)**.5*TANU
      CR=X6NP-X2PP
      ORIGNN=(X6NP-X7PP)/2.
      X2PP=X2PP-ORIGNN
      X3NP=X3NP-ORIGNN
      X4PP=X4PP-ORIGNN
      X5PP=X5PP-ORIGNN
      X6NP=X6NP-ORIGNN
      X6AP=X6AP-ORIGNN
      X7PP=0.00
      B2RAP=0.00
      TANP=0.000000
      GO TO 361
  360 X3NP=X3
      Y3NP=Y3
```

```
      Z3NP=Z3
      X4PP=X4
      Y4PP=Y4
      Z4PP=Z4
      X5PP=X5
      Y5PP=Y5
      Z5PP=Z5
      X6NP=X6
      Y6NP=Y6
      Z6NP=Z6
      SADD=CHDEXX*Y6NP
      B1RAP=Y3NP
      B2RAP=Y6NP
  361 TANOP=TANE-TANP
      TANOL=TANE-TANA
      TANOC=TANE-TANC
      TANLC=TANA-TANC
      TANLP=TANA-TANP
      TANPC=TANP-TANC
      IF(Y4PP.GE.Y5PP)  XCBLEM=
     1(CR+Y3NP*TANLC-Y6NP*TANOP+Y5PP*TANOL)*(Y4PP*(-CR/2.-Y3NP*TANLC)
     2+(Y4PP+Y5PP)/2.*(Y4PP*TANA-(-CR/2.-Y3NP*TANLC))-(Y4PP**2
     3+Y4PP*Y5PP+Y5PP**2)*TANA/3.)
      IF(Y4PP.LT.Y5PP) XCBLEM=
     1(CR+Y3NP*TANLC-Y6NP*TANOP+Y4PP*TANOL)*(Y5PP*(-CR/2.-Y3NP*TANLC
     2+Y4PP*(TANA-TANDE))+(Y5PP+Y4PP)/2.*(Y5PP*TANDE-(-CR/2.-Y3NP*TANLC
     3+Y4PP*(TANA-TANDE)))-1./3.*(Y5PP**2+Y5PP*Y4PP+Y4PP**2)*TANDE)
      CR=CR-CHDEXX
      S=2.*(-Y3NP**2*TANLC/2.+Y6NP**2*TANOP/2.+YMIN*(CR+Y3NP*TANLC
     1-Y6NP*TANOP+YMIN*TANOL/2.)+     SADD     +
     2(YMAX-YMIN)/2.*(CR+Y3NP*TANLC-Y6NP*TANOP+YMIN*TANOL))
      CR=CR+CHDEXX
C
C     CBAR,XCBAR,AND YCBAR ARE NOT VALID FOR A DISCONTINUOUS TRAILING EDGE
C
C
      YCBAR= 2./S*(CR/2.* YMIN **2+Y6NP **3*TANOP/6.-Y3NP**3*TANLC/6.
     1+YMIN**2*(YMIN/3.*TANOL+Y3NP/2.*TANLC-Y6NP/2.*TANOP)
     2+(YMAX+2.*YMIN)*(YMAX-YMIN)/6.*(CR+Y3NP*TANLC-Y6NP*TANOP
     3+YMIN*TANOL))
      CAV=S/(2.*YMAX)
      IF(B1RAP-B2RAP) 303,304,304
```

```
  303 CBAR=2./S*(CR**2*Y3NP+CR*Y3NP**2*TANPC+Y3NP**3*TANPC**2/3. +
     1(CR+Y3NP*TANLC)**2*(Y6NP-Y3NP)-(Y6NP**2-Y3NP**2)*(CR+Y3NP*TANLC)*
     2TANLP+(Y6NP**3-Y3NP**3)*TANLP**2/3.   +
     3(CR+Y3NP*TANLC-Y6NP*TANOP)**2*(YMIN-Y6NP)+(YMIN**2-Y6NP**2)*TANOL*
     4(CR+Y3NP*TANLC-Y6NP*TANOP)+(YMIN**3-Y6NP**3)*TANOL**2/3.+
     5(YMAX-YMIN)/3.*(CR+Y3NP*TANLC-Y6NP*TANOP+YMIN*TANOL)**2)
      XCBAR=2./S*(-YMIN/2.*CR**2+CR/2.*(1.5*Y3NP**2*TANLC-Y6NP**2*TANOP
     1/2.+YMIN**2*(3.*TANA-TANE)/2.-3.0*YMIN*Y3NP*TANLC+YMIN*Y6NP*
     2TANOP)+Y3NP**3*TANLC*(2.*TANA-4.*TANC+TANP)/6.+Y6NP**3*TANA*TANOP/
     36.+YMIN**3*TANA*TANOL/3.-Y3NP**2*YMIN*TANLC**2+(YMIN*Y3NP*Y6NP
     4-Y3NP/2.*Y6NP**2)*TANOP*TANLC+Y3NP/2.*YMIN**2*TANLC*(2.*TANA-TANE)
     5-Y6NP/2.*YMIN**2*TANA*TANOP+
     6XCBLEM )
      GO TO 301
  304 CBAR=2./S*(CR**2*Y6NP+CR*Y6NP**2*TANPC+Y6NP**3*TANPC**2/3.   +(CR
     1-Y6NP*TANOP)**2*(Y3NP-Y6NP)+(CR-Y6NP*TANOP)*(Y3NP**2-Y6NP**2)
     2*TANOC+(Y3NP**3-Y6NP**3)*TANOC**2/3.   +
     3(CR+Y3NP*TANLC-Y6NP*TANOP)**2*(YMIN-Y3NP) +(CR+Y3NP*TANLC-Y6NP*
     4TANOP)*TANOL*(YMIN**2-Y3NP**2) +(YMIN**3-Y3NP**3)*TANOL**2/3. +
     5(YMAX-YMIN)/3.*(CR+Y3NP*TANLC-Y6NP*TANOP+YMIN*TANOL)**2)
      XCBAR=2./S*(-Y6NP/2.*CR**2+Y6NP**2/2.*(CR*TANC-CR/2.*TANPC)+Y6NP**
     13/3.*TANC*TANPC-        (Y3NP-Y6NP)*CR/2.*(CR-Y6NP*TANOP)+(Y3NP**2-
     2Y6NP**2)/2.*(-CR*TANOC/2.+TANC*(CR-Y6NP*TANOP))+(Y3NP**3-Y6NP**3)/
     33.*(TANC*TANOC)+     (YMIN-Y3NP)*((CR+Y3NP*TANLC-Y6NP*TANOP)*(-CR/2
     4.-Y3NP*TANLC))+(YMIN**2-Y3NP**2)/2.*(TANA*(CR+Y3NP*TANLC-Y6NP*TANO
     5P)+TANOL*(-CR/2.-Y3NP*TANLC))+(YMIN**3-Y3NP**3)/3.*TANA*TANOL+
     6XCBLEM )
  301 ARN=4.*YMAX**2/S
      ARB=ARN*BETA
      CR=CR/BETA
C
C
C
C
      DO 2 I=1,NSMAX
    2 W(I)=1.
      DO 1301  IN=1,10
 1301 BS(IN,1)=0.
C
C
C     READ IN THE VALUES OF THE COEFFICIENTS OF THE LOADING FUNCTIONS
C        THEY ARE THE QP(JZ,1)
C
```

```
      READ(5,511)(QP(JZ,1),JZ=1,JKMAX)
C
C
      CHIB=ATAN(TANC/BETA)
      ALAMB=ATAN(TANA/BETA)
      PSIB=ATAN(TANP/BETA)
      OMEGB=ATAN(TANE/BETA)
      TANCB=TAN(CHIB)
      TANLB=TAN(ALAMB)
      TANPB=TAN(PSIB)
      TANOB=TAN(OMEGB)
      TANLCB=TANLB-TANCB
      TANLPB=TANLB-TANPB
      TANPCB=TANPB-TANCB
      TANOCB=TANOB-TANCB
      TANOLB=TANOB-TANLB
      TANOPB=TANOB-TANPB
      ETA(ISSST)=0.0
      Y(ISSST)=0.0
      DO 7 NP=NNII,NMAX
      ANP=NP
      ETA(NP)=SIN((ANP-SSSTA)*PI /(2.0*SSSTA))
      Y(NP)=ETA(NP)
      CHDSUB=0.
      IF(ETA(NP).GT.(Y6NP-0.10).AND.ETA(NP).LE.Y6NP.AND.CHDEXX.NE.0.)
     1CHDSUB=CHDEXX*(1.-(Y6NP-ETA(NP))/.10)/BETA
      IF(ETA(NP).GT.Y6NP.AND.CHDEXX.NE.0.) CHDSUB=CHDEXX/BETA
      IF(Y3NP.GE.Y6NP) GO TO 307
      IF(ETA(NP).GE.Y3NP) GO TO 309
      C(NP)=(CR+ETA(NP)*TANPCB-CHDSUB)/2.0
      D(NP)=ETA(NP)*(TANPB+TANCB)/2.0-CHDSUB/2.0
      DIFF3=ETA(NP)-0.
  312 IF(ITTU.NE.2) GO TO 314
      IUSX=NP-1
      IUST=NP-2
      C(IUSX)=(10.0*C(IUSX)+2.0*C(IUST))/12.
      D(IUSX)=(10.0*D(IUSX)+2.0*D(IUST))/12.
      ITTU=1
  314 IF(DIFF3.LT.0..OR.DIFF3.GT..01) GO TO 323
      ITTU=2
  323 IF(NP-NNII) 7,6,7
  309 IF(ETA(NP).GE.Y6NP) GO TO 327
      C(NP)=(CR+Y3NP*TANLCB-ETA(NP)*TANLPB-CHDSUB)/2.0
```

```
      D(NP)=(-Y3NP*TANLCB+ETA(NP)*(TANPB+TANLB)-CHDSUB)/2.0
      DIFF3=ETA(NP)-Y3NP
      GO TO 312
  327 IF(ETA(NP).GE.YMIN) GO TO 331
      C(NP)=(CR+Y3NP*TANLCB-Y6NP*TANOPB+ETA(NP)*TANOLB-CHDSUB)/2.0
      D(NP)=(-Y3NP*TANLCB-Y6NP*TANOPB+ETA(NP)*(TANOB+TANLB)-CHDSUB)/2.0
      DIFF3=ETA(NP)-Y6NP
      GO TO 312
  331 IF(YMIN.EQ.Y5PP) GO TO 340
      CATY4=CR+Y3NP*TANLCB-Y6NP*TANOPB+Y4PP*TANOLB-CHDSUB
      DATY4=X4PP/BETA+CATY4/2.
      C(NP)=.5*(CATY4-CATY4*(ETA(NP)-YMIN)/(YMAX-YMIN))
      D(NP)=DATY4+(X5PP/BETA-DATY4)*(ETA(NP)-YMIN)/(YMAX-YMIN)
      DIFF3=ETA(NP)-YMIN
      GO TO 312
  340 C(NP)=(Y4PP-ETA(NP))/(2.0*(Y4PP-Y5PP)) *(CR+Y3NP*TANLCB-Y6NP
     1*TANOPB+Y5PP*TANOLB-CHDSUB)
      DATY5=(-Y3NP*TANLCB-Y6NP*TANOPB+Y5PP*(TANLB+TANOB)-CHDSUB)/2.0
      D(NP)=DATY5+(X4PP/BETA-DATY5)*(ETA(NP)-YMIN)/(YMAX-YMIN)
      DIFF3=ETA(NP)-YMIN
      GO TO 312
  307 IF(ETA(NP).GE.Y6NP) GO TO 311
      C(NP)=(CR+ETA(NP)*TANPCB-CHDSUB)/2.0
      D(NP)=ETA(NP)*(TANPB+TANCB)/2.0-CHDSUB/2.0
      DIFF6=ETA(NP)-0.
  313 IF(ITTU.NE.2) GO TO 316
      IUSX=NP-1
      IUST=NP-2
      C(IUSX)=(10.0*C(IUSX)+2.0*C(IUST))/12.
      D(IUSX)=(10.0*D(IUSX)+2.0*D(IUST))/12.
      ITTU=1
  316 IF(DIFF6.LT.0..OR.DIFF6.GT..01) GO TO 325
      ITTU=2
  325 IF(NP-NNII) 7,6,7
  311 IF(ETA(NP).GE.Y3NP) GO TO 329
      C(NP)=(CR-Y6NP*TANOPB+ETA(NP)*TANOCB-CHDSUB)/2.0
      D(NP)=(-Y6NP*TANOPB+ETA(NP)*(TANOB+TANCB)-CHDSUB)/2.0
      DIFF6=ETA(NP)-Y6NP
      GO TO 313
  329 IF(ETA(NP).GE.YMIN) GO TO 333
      C(NP)=(CR+Y3NP*TANLCB-Y6NP*TANOPB+ETA(NP)*(TANOLB)-CHDSUB)/2.0
      D(NP)=(-Y3NP*TANLCB-Y6NP*TANOPB+ETA(NP)*(TANOB+TANLB)-CHDSUB)/2.0
      DIFF6=ETA(NP)-Y3NP
```

```
      GO TO 313
  333 IF(YMIN.EQ.Y5PP) GO TO 346
      CATY4=CR+Y3NP*TANLCB-Y6NP*TANOPB+Y4PP*TANOLB-CHDSUB
      DATY4=X4PP/BETA+CATY4/2.
      C(NP)=.5*(CATY4-CATY4*(ETA(NP)-YMIN)/(YMAX-YMIN))
      D(NP)=DATY4+(X5PP/BETA-DATY4)*(ETA(NP)-YMIN)/(YMAX-YMIN)
      DIFF6=ETA(NP)-YMIN
      GO TO 313
  346 C(NP)=(Y4PP-ETA(NP))/(2.0*(Y4PP-Y5PP)) *(CR+Y3NP*TANLCB-Y6NP
     1*TANOPB+Y5PP*TANOLB-CHDSUB)
      DATY5=(-Y3NP*TANLCB-Y6NP*TANOPB+Y5PP*(TANLB+TANOB)-CHDSUB)/2.0
      D(NP)=DATY5+(X4PP/BETA-DATY5)*(ETA(NP)-YMIN)/(YMAX-YMIN)
      DIFF6=ETA(NP)-YMIN
      GO TO 313
    6 C(ISSST)=(5.*CR+2.*C(NNII))/12.
      D(ISSST)=D(NNII)/6.
    7 CONTINUE
      DO 187 N=NNII,NMAX
      KSU=NMAX+1-N
      ETA(KSU)=-ETA(N)
      Y(KSU)=-Y(N)
      C(KSU)=C(N)
      D(KSU)=D(N)
  187 CONTINUE
      CHII=RAD*CHI
      ALAM=RAD*ALAMD
      ALADL=RAD*ALAME
      OMEG=RAD*OMEGA
      EOMG=RAD*EOMEG
      PSIBB=RAD*PSI
      CR=CR*BETA
      CTB=(X5-X4)/YMAX1
      TAPER=CTB/CR
      CFB=Y3NP*TANC
C
C
C     WRITE INPUT DATA
C
C
      WRITE (6,501)
      WRITE(6,509) CASE,SYM,MACH
      WRITE(6,514)
      WRITE (6,527) CSTA,SSSTA
```

```
      WRITE(6,510)
      WRITE(6,526)
      WRITE(6,555)
      WRITE(6,532)
      WRITE(6,535) X2,Y2
      WRITE(6,536) X3,Y3
      WRITE(6,537) X4,Y4
      WRITE(6,545) X5,Y5
      WRITE(6,550) X6,Y6
      WRITE(6,549) X6A,Y6A
      WRITE(6,556) X7,Y7
      WRITE(6,510)
      WRITE(6,558) YMAX1
      WRITE(6,510)
      WRITE(6,553)
      WRITE(6,555)
      WRITE(6,529)
      WRITE(6,503) X2PP,Y2PP
      WRITE(6,504) X3NP,Y3NP
      WRITE(6,505) X4PP,Y4PP
      WRITE(6,506) X5PP,Y5PP
      WRITE(6,507) X6NP,Y6NP
      WRITE(6,540) X6AP,Y6AP
      WRITE(6,508) X7PP,Y7PP
      WRITE(6,510)
      WRITE(6,551)
      WRITE(6,522) ARN,S,CAV,CBAR,XCBAR,YCBAR
      WRITE(6,548) CHII,ALAM,ALADL,PSIBB,OMEG,EOMG,DELT,SIGM,RHH
      WRITE(6,524) CR,CTB,CFB,TAPER,B1RAP,B2RAP,XP,YP,ZP,CHDEXX
      WRITE(6,502)
C
C
C     MAIN PROGRAM
C
C
      DO 79 KS=1,JMAX
      PKS=KS
      PHI(KS)=(2.0*PKS*PI)/(2.0*CSTA+1.0)
      X(KS)=(1.-COS(PHI(KS)))/2.
      DO 79 NU=ISSST,NMAX
      CANST=0.0
      JK=(KS-2)*ISSST+NU+1
      ANU=NU
```

```
      DO 14 N=1,NMAX
      AN=N
      VE(N)=COS(((AN-SSSTA)*PI)/(2.0*SSSTA))
      NNUD=IABS(N-NU)
      IF(NNUD.NE.0) GO TO 9
      B(N)=(2.0*SSSTA)/(4.0*COS(((ANU-SSSTA)*PI)/(2.0*SSSTA)))
      GO TO 14
    9 IF(MOD(NNUD,2).EQ.0) GO TO 12
      B(N)=VE(N)/((2.0*SSSTA)*(ETA(N)-Y(NU))**2)
      GO TO 14
   12 B(N)=0.0
   14 CONTINUE
      DO 79 J=1,JMAX
      AJ=J
      DO 30 N=1,NMAX
      AK=0.0
      AN=N
      IF(N.NE.NU) GO TO 16
      IF(J.EQ.1) GO TO 18
      IF(J-2) 20,19,20
   18 AK=2.0*PHI(KS)+2.0* SIN(PHI(KS))
      GO TO 21
   19 AK=PHI(KS)-.5* SIN(2.0*PHI(KS))
      GO TO 21
   20 GA=  (SIN((AJ-2.0)*(PHI(KS))))/(AJ-2.0)
      AK=GA-  (SIN((AJ)*(PHI(KS))))/AJ
   21 PARTL=B(N)*AK
      A=0.0
      DO 25 NUP=1,NMAX
      NUPNU=IABS(NUP-NU)
      IF(NUPNU.EQ.0) GO TO 25
      IF(MOD(NUPNU,2).EQ.0) GO TO 25
      SSND=ABS(Y(NU)-ETA(NUP))
      IF(SSND.EQ.0.) GO TO 25
      ANUP=NUP
      UURR=ANUP-SSSTA
      A=A+((COS((UURR*PI)/(2.0*SSSTA)))**2)*ALOG(SSND)
   25 CONTINUE
      IF(J.NE.1) GO TO 28
      DF(1)=-1.0/(2.0*(SIN((PHI(KS))/2.0))*(SIN((PHI(KS))/2.0)))
      GO TO 29
   28 DF(J)=(AJ-1.0)*(COS((AJ-1.0)*(PHI(KS))))
   29 VL      =1.0/(((C(N))**2  )*2.0*SSSTA*VE(N)*SIN(PHI(KS)))
```

```
      AL(J,N)=VL*DF(J)*((.25*SSSTA)*(1.0-2.0*(VE(N)**2)-ALOG(4.0))-A)+PA
     1RTL
      GO TO 30
C
C
C     CHORDAL INTEGRATION SUBROUTINE
C              SOLVES FOR THE CHORDAL INFLUENCE FUNCTION VALUES
C
C
   16 XSUB=-C(NU)*COS(PHI(KS))+D(NU)
      YSUB=Y(NU)
      ETASUB=ETA(N)
      CSUB=C(N)
      DSUB=D(N)
      GO TO (351,352,353,354,356,357,358,359,1070,1071),J
 1071 CALL GAUSS(0.,PI,3,SUM10,FOFT10)
      AK=SUM10
      GO TO 355
 1070 CALL GAUSS(0.,PI,3,SUM9,FOFT9)
      AK=SUM9
      GO TO 355
  359 CALL GAUSS(0.,PI,3,SUM8,FOFT8)
      AK=SUM8
      GO TO 355
  358 CALL GAUSS(0.,PI,3,SUM7,FOFT7)
      AK=SUM7
      GO TO 355
  357 CALL GAUSS(0.,PI,2,SUM6,FOFT6)
      AK=SUM6
      GO TO 355
  356 CALL GAUSS(0.,PI,2,SUM5,FOFT5)
      AK=SUM5
      GO TO 355
  354 CALL GAUSS(0.,PI,2,SUM4,FOFT4)
      AK=SUM4
      GO TO 355
  353 CALL GAUSS(0.,PI,2,SUM3,FOFT3)
      AK=SUM3
      GO TO 355
  352 CALL GAUSS(0.,PI,2,SUM2,FOFT2)
      AK=SUM2
      GO TO 355
  351 CALL GAUSS(0.,PI,2,SUM1,FOFT1)
```

```
      AK=SUM1
C
C
  355 AL(J,N)=-B(N)*AK
   30 CONTINUE
      DO 79 NP=ISSST,NMAX
      I=(J-2)*ISSST+NP+1
      IF(NP.EQ.ISSST) GO TO 73
      NR=NMAX+1-NP
      IF(ISYM.NE.1) GO TO 77
      SUML(JK,I)=AL(J,NP)+AL(J,NR)
      GO TO 78
   77 SUML(JK,I)=AL(J,NP)-AL(J,NR)
      GO TO 78
   73 IF(ISYM.NE.1) GO TO 75
      SUML(JK,I)=AL(J,NP)
      GO TO 78
   75 SUML(JK,I)=0.00000000
   78 CANST=CANST+SUML(JK,I)*QP(I,1)
      IF(I.NE.JKMAX) GO TO 79
      CONST(JK,1)=CANST
      YUT(KS,NU)=-CONST(JK,1)/4.


      IF(KS.NE.JMAX) GO TO 79
      CSP=2.*C(NU)*BETA
      IF(NU.EQ.ISSST) CSP=CR
      WRITE(6,518)NU,ETA(NU),CSP
      WRITE(6,510)
      WRITE(6,510)
      WRITE(6,528)
      WRITE(6,521)
      WRITE(6,519)(YUT(KSUT,NU),KSUT=1,JMAX)
      WRITE(6,513)
      WRITE(6,516)  (X(KS),KS=1,JMAX)
      CALL LSQPOL(X,YUT(1,NU),W,RESID,NS,SUMST,LS,AST,BS,MS,CUT,NSMAX,MS
     1MAX)
      WRITE(6,510)
      WRITE(6,559)
      WRITE(6,520)
      WRITE(6,519)(BS(JMS, 1),JMS=1,10)
      WRITE(6,510)
      WRITE(6,515)
```

```
      WRITE(6,517)
      DO 700 IPT=1,11
      AI=IPT
      XC=(AI-1.)/10.
      CALL GAUSS(1.0,XC,1,ZC,WU)
      WRITE(6,560) XC,ZC
  700 CONTINUE
C
C
      WRITE(6,512)
   79 CONTINUE
      GO TO 1
    3 STOP
      END
```

```
FUNCTION FOFT1(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT1=BK*(1.0+COS(THETA))
RETURN
END


FUNCTION FOFT2(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT2=BK*SIN(THETA)**2
RETURN
END


FUNCTION FOFT3(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT3=BK*SIN(THETA)*SIN(2.0*THETA)
RETURN
END


FUNCTION FOFT4(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT4=BK*SIN(THETA)*SIN(3.0*THETA)
RETURN
END


FUNCTION FOFT5(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT5=BK*SIN(THETA)*SIN(4.0*THETA)
RETURN
END
```

```
FUNCTION FOFT6(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT6=BK*SIN(THETA)*SIN(5.0*THETA)
RETURN
END


FUNCTION FOFT7(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT7=BK*SIN(THETA)*SIN(6.0*THETA)
RETURN
END


FUNCTION FOFT8(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT8=BK*SIN(THETA)*SIN(7.0*THETA)
RETURN
END


FUNCTION FOFT9(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT9=BK*SIN(THETA)*SIN(8.0*THETA)
RETURN
END


FUNCTION FOFT10(THETA)
COMMON XSUB,YSUB,ETASUB,CSUB,DSUB,BS(10,1),X(10),XC,NS
XI=-CSUB*COS(THETA)+DSUB
BK=1.+(XSUB-XI)/SQRT((XSUB-XI)**2+(YSUB-ETASUB)**2)
FOFT10=BK*SIN(THETA)*SIN(9.0*THETA)
RETURN
END
```

```
      FUNCTION WU(XC)
      COMMON XSUB,YSUB,ETASJB,CSUB,DSUB,BS(10,1),X(10),QQ,NS
      WU1=BS(1,1)+BS(2,1)*X(1 )+BS(3,1)*X(1 )**2+BS(4,1)*X(1 )**3+BS(5,1
     1)*X(1 )**4+BS(6,1)*X(1 )**5+BS(7,1)*X(1 )**6+BS(8,1)*X(1 )**7+BS(9
     2,1)*X(1 )**8+BS(10,1)*X(1 )**9
      WUN=BS(1,1)+BS(2,1)*X(NS)+BS(3,1)*X(NS)**2+BS(4,1)*X(NS)**3+BS(5,1
     1)*X(NS)**4+BS(6,1)*X(NS)**5+BS(7,1)*X(NS)**6+BS(8,1)*X(NS)**7+BS(9
     2,1)*X(NS)**8+BS(10,1)*X(NS)**9
      DWU1DX=BS(2,1)+2.*BS(3,1)*X(1 )+3.*BS(4,1)*X(1 )**2+4.*BS(5,1)*X(1
     1 )**3+5.*BS(6,1)*X(1 )**4+6.*BS(7,1)*X(1 )**5+7.*BS(8,1)*X(1 )**6+
     28.*BS(9,1)*X(1 )**7+9.*BS(10,1)*X(1 )**8
      DWUNDX=BS(2,1)+2.*BS(3,1)*X(NS)+3.*BS(4,1)*X(NS)**2+4.*BS(5,1)*X(N
     1S)**3+5.*BS(6,1)*X(NS)**4+6.*BS(7,1)*X(NS)**5+7.*BS(8,1)*X(NS)**6+
     28.*BS(9,1)*X(NS)**7+9.*BS(10,1)*X(NS)**8
      IF(XC.LE.X(1).AND.XC.GE.0.) WU=WU1+DWU1DX*(XC-X(1))
      IF(XC.GT.X(1).AND.XC.LT.X(NS))
     1WU =BS(1,1)+BS(2,1)*XC    +BS(3,1)*XC    **2+BS(4,1)*XC    **3+BS(5,1
     2)*XC    **4+BS(6,1)*XC    **5+BS(7,1)*XC    **6+BS(8,1)*XC    **7+BS(9
     3,1)*XC    **8+BS(10,1)*XC    **9
      IF(XC.GE.X(NS).AND.XC.LE.1.) WU=WUN+DWUNDX*(XC-X(NS))
      RETURN
      END
```

```
      SUBROUTINE MATINV(A,N,B,M,DETERM,IPIVOT,INDEX,NMAX,ISCALE)
C
C     MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS
C
      DIMENSION IPIVOT(N),A(NMAX,N),B(NMAX,M),INDEX(NMAX,2)
      EQUIVALENCE (IROW,JROW), (ICOLUM,JCOLUM), (AMAX, T, SWAP)
C
C     INITIALIZATION
C
    5 ISCALE=0
    6 R1=10.0**100
    7 R2=1.0/R1
   10 DETERM=1.0
   15 DO 20 J=1,N
   20 IPIVOT(J)=0
   30 DO 550 I=1,N
C
C     SEARCH FOR PIVOT ELEMENT
C
   40 AMAX=0.0
   45 DO 105 J=1,N
   50 IF (IPIVOT(J)-1) 60, 105, 60
   60 DO 100 K=1,N
   70 IF (IPIVOT(K)-1) 80, 100, 740
   80 IF (ABS(AMAX)-ABS(A(J,K)))85,100,100
   85 IROW=J
   90 ICOLUM=K
   95 AMAX=A(J,K)
  100 CONTINUE
  105 CONTINUE
      IF (AMAX) 110,106,110
  106 DETERM=0.0
      ISCALE=0
      GO TO 740
  110 IPIVOT(ICOLUM)=IPIVOT(ICOLUM)+1
C
C     INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL
C
  130 IF (IROW-ICOLUM) 140, 260, 140
  140 DETERM=-DETERM
  150 DO 200 L=1,N
  160 SWAP=A(IROW,L)
```

```
  170 A(IROW,L)=A(ICOLUM,L)
  200 A(ICOLUM,L)=SWAP
  205 IF(M) 260, 260, 210
  210 DO 250 L=1, M
  220 SWAP=B(IROW,L)
  230 B(IROW,L)=B(ICOLUM,L)
  250 B(ICOLUM,L)=SWAP
  260 INDEX(I,1)=IROW
  270 INDEX(I,2)=ICOLUM
  310 PIVOT=A(ICOLUM,ICOLUM)
C
C      SCALE THE DETERMINANT
C
 1000 PIVOTI=PIVOT
 1005 IF(ABS(DETERM)-R1)1030,1010,1010
 1010 DETERM=DETERM/R1
      ISCALE=ISCALE+1
      IF(ABS(DETERM)-R1)1060,1020,1020
 1020 DETERM=DETERM/R1
      ISCALE=ISCALE+1
      GO TO 1060
 1030 IF(ABS(DETERM)-R2)1040,1040,1060
 1040 DETERM=DETERM*R1
      ISCALE=ISCALE-1
      IF(ABS(DETERM)-R2)1050,1050,1060
 1050 DETERM=DETERM*R1
      ISCALE=ISCALE-1
 1060 IF(ABS(PIVOTI)-R1)1090,1070,1070
 1070 PIVOTI=PIVOTI/R1
      ISCALE=ISCALE+1
      IF(ABS(PIVOTI)-R1)320,1080,1080
 1080 PIVOTI=PIVOTI/R1
      ISCALE=ISCALE+1
      GO TO 320
 1090 IF(ABS(PIVOTI)-R2)2000,2000,320
 2000 PIVOTI=PIVOTI*R1
      ISCALE=ISCALE-1
      IF(ABS(PIVOTI)-R2)2010,2010,320
 2010 PIVOTI=PIVOTI*R1
      ISCALE=ISCALE-1
  320 DETERM=DETERM*PIVOTI
C
C      DIVIDE PIVOT ROW BY PIVOT ELEMENT
```

```
C
  330 A(ICOLUM,ICOLUM)=1.0
  340 DO 350 L=1,N
  350 A(ICOLUM,L)=A(ICOLUM,L)/PIVOT
  355 IF(M) 380, 380, 360
  360 DO 370 L=1,M
  370 B(ICOLUM,L)=B(ICOLUM,L)/PIVOT
C
C     REDUCE NON-PIVOT ROWS
C
  380 DO 550 L1=1,N
  390 IF(L1-ICOLUM) 400, 550, 400
  400 T=A(L1,ICOLUM)
  420 A(L1,ICOLUM)=0.0
  430 DO 450 L=1,N
  450 A(L1,L)=A(L1,L)-A(ICOLUM,L)*T
  455 IF(M) 550, 550, 460
  460 DO 500 L=1,M
  500 B(L1,L)=B(L1,L)-B(ICOLUM,L)*T
  550 CONTINUE
C
C     INTERCHANGE COLUMNS
C
  600 DO 710 I=1,N
  610 L=N+1-I
  620 IF (INDEX(L,1)-INDEX(L,2)) 630, 710, 630
  630 JROW=INDEX(L,1)
  640 JCOLUM=INDEX(L,2)
  650 DO 705 K=1,N
  660 SWAP=A(K,JROW)
  670 A(K,JROW)=A(K,JCOLUM)
  700 A(K,JCOLUM)=SWAP
  705 CONTINUE
  710 CONTINUE
  740 RETURN
      END
CANE206              JEAN MIGNEAULT
C LEAST SQUARE POLYNOMIAL FIT ANE206
C
```

```
      SUBROUTINE LSQPOL(X,Y,W,RESID,N,SUM,L,A,B,M,C,NMAX,MMAX)
C
      DIMENSION X(NMAX),Y(NMAX,L),RESID(NMAX,L),A(MMAX,MMAX),
     2B(MMAX,L),C(NMAX,M),SUM(L),W(NMAX)
C
   10 DO 20 I=1,N
   20 C(I,1)=1.0
   30 DO 50 J=2,M
   40 DO 50 I=1,N
   50 C(I,J)=C(I,J-1)*X(I)
   60 DO 100 I=1,M
   70 DO 100 J=1,M
   80 A(I,J)=0.0
   90 DO 100 K=1,N
  100 A(I,J)=A(I,J)+C(K,I)*C(K,J)*W(K)
  105 DO 150 J=1,L
  110 DO 150 I=1,M
  120 B(I,J)=0.0
  130 DO 150 K=1,N
  150 B(I,J)=B(I,J)+C(K,I)*Y(K,J)*W(K)
      CALL MATINV (A,M,B,L,DETERM,RESID, C,MMAX,ISCALE)
  180 DO 205 J=1,L
  185 SUM(J)=0.0
      KK=M
  192 DO 195 K=1,M
      C(K,1)=B(KK,J)
  195 KK=KK-1
  198 DO 205 I=1,N
      RESID(I,J)=POLYE1(X(I),M,C)-Y(I,J)
  205 SUM(J)=SUM(J)+RESID(I,J)**2*W(I)
  210 RETURN
      END
```

```
      FUNCTION POLYE1(X,M,C)
      DATA BIG/037777777777/
      DIMENSION C(M)
      IF(M-1)10,11,12
   12 N=M-1
      POLYE1=C(1)
      DO20I=1,N
   20 POLYE1=X*POLYE1+C(I+1)
      RETURN
   10 POLYE1=BIG
      RETURN
   11 POLYE1=C(1)
      RETURN
      END
```

```
      SUBROUTINE GAUSS (A,B,N,SUM,FOFX)
C
C     REFERENCE SCARBOROUGH NUM. MATH. ANAL. PAGE 147
C     HOWEVER THIS SUBROUTINE INTEGRATES FROM  ZERO TO ONE
C
      DIMENSION  U(5),R(5)
      U(1)=.425562830509184
      U(2)=.283302302935376
      U(3)=.160295215850488
      U(4)=.067468316655508
      U(5)=.013046735741414
      R(1)=.147762112357376
      R(2)=.134633359654998
      R(3)=.109543181257991
      R(4)=.074725674575290
      R(5)=.033335672154344
      SUM=0.0
      IF(A.EQ.B) RETURN
      FINE=N
      DELTA=FINE/(B-A)
      DO 3 K=1,N
      XI=K-1
      FINE=A+XI/DELTA
      DO 2 II= 1,5
      UU=U(II)/DELTA+FINE
    2   SUM=R(II)*FOFX(UU)+SUM
      DO 3 L=1,5
      UU=(1.0-U(L))/DELTA+FINE
    3 SUM=R(L)*FOFX(UU)+SUM
      SUM=SUM/DELTA
      RETURN
      END
```

Sample Output Listing

```
                    GEOMETRY DATA

         CASE NUMBER=   400     SYMMETRY CODE=    1      MACH NUMBER=   .30000
IF SYMMETRY CODE IS EQUAL TO 1,THE SPAN LOADING IS SYMMETRICAL/OTHER THAN 1,IT IS ANTISYMMETRICAL

NUMBER OF CHORDWISE PRESSURE MODES=    4     NUMBER OF STATIONS SPANWISE ON A PANEL WHERE PRESSURE MODES ARE DEFINED=   20


         LOCATION OF PERIMETER POINTS FOR THE PLANFORM USED AS INPUT
         WHERE THE ORIGIN IS AT THE HALF ROOT CHORD,POSITIVE X AFT

                X1=  0.            Y1=  0.
                X2= -1.19477       Y2=  0.00000
                X3=  1.42079       Y3=   .75000
                X4=  1.95692       Y4=  1.00000
                X5=  2.07580       Y5=  1.00000
                X6=  1.92732       Y6=   .73000
               X6A=  1.92732      Y6A=   .73000
                X7=  1.19477       Y7=  0.00000

   (SEMISPAN AT FINAL OUTBOARD SWEEP/SEMISPAN AT INITIAL OUTBOARD SWEEP)=  1.00000


      LOCATION OF PERIMETER POINTS FOR PLANFORM TO BE USED IN THE COMPUTATIONS
         WHEN NONDIMENSIONALIZED BY THE SEMISPAN RATIO GIVEN ABOVE
         WHERE THE ORIGIN IS AT THE HALF ROOT CHORD,POSITIVE X AFT

              X1PP=  0.            Y1PP=  0.
              X2PP= -1.19477       Y2PP=  0.00000
              X3NP=  1.42079       Y3NP=   .75000
              X4PP=  1.95692       Y4PP=  1.00000
              X5PP=  2.07580       Y5PP=  1.00000
              X6NP=  1.92732       Y6NP=   .73000
              X6AP=  1.92732       Y6AP=   .73000
              X7PP=  1.19477       Y7PP=  0.00000
```

```
TOTAL WING PLANFORM(MEAN GEOMETRIC CHORD AND ITS LOCATION ARE INVALID IF THE PLANFORM HAS A TRAILING EDGE CHORD EXTENSION)

                    ASPECT RATIO=  1.70501      PLANFORM AREA=  2.34603      AVERAGE CHORD=  1.17301

     MEAN GEOMETRIC CHORD=  1.56854     X LOCATION OF THE LEADING EDGE OF THE MEAN GEOMETRIC CHORD=  -.04364
                                     Y LOCATION OF THE MEAN GEOMETRIC CHORD=    .33267

 LE INBOARD SWEEP ANGLE= 74.00000     LE INITIAL OUTBOARD SWEEP ANGLE= 65.00000     LE FINAL OUTBOARD SWEEP ANGLE= 55.00000
 TE INBOARD SWEEP ANGLE= 45.10000     TE INITIAL OUTBOARD SWEEP ANGLE= 28.80664     TE FINAL OUTBOARD SWEEP ANGLE= 28.80664

 CHANGE IN OUTER PANEL SWEEP ANGLE,DELTA=  0.00000    PIVOT CANT ANGLE IN PITCH=  0    PIVOT CANT ANGLE IN ROLL=  0

          ROOT CHORD=  2.38954     TIP CHORD=   .11888     FOREWING CHORD=  2.61556     OVERALL TAPER RATIO=   .04975

                                Y LE BREAK=   .75000     Y TE BREAK=   .73000

               X PIVOT LOCATION=  0.00000     Y PIVOT LOCATION=  0.00000     Z PIVOT LOCATION=  0.00000

                                        TE CHORD EXTENSION=  0.00000
```

MEAN CAMBER DATA

STATION NUMBER= 20 SPANWISE LOCATION= 0.00000 CHORD= 2.38954

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
-.04709	-.21692	-.61726	-.53968						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
-.18558	1.89784	-6.58681	4.38619	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.33323
.10000	.32498
.20000	.32113
.30000	.31539
.40000	.30117
.50000	.27450
.60000	.23406
.70000	.18115
.80000	.11970
.90000	.05627
1.00000	0.00000

STATION NUMBER= 21   SPANWISE LOCATION= .07846   CHORD= 2.19465

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
-.22068	-.56892	-.59216	-.50804						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
.04118	-2.59259	3.15495	-1.09879	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.47972
.10000	.47034
.20000	.44252
.30000	.40002
.40000	.34750
.50000	.28897
.60000	.22776
.70000	.16656
.80000	.10741
.90000	.05165
1.00000	0.00000

STATION NUMBER= 22 SPANWISE LOCATION= .15643 CHORD= 2.00097

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
-.13556	-.68371	-.55631	-.48703						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
.40557	-5.61762	8.97612	-4.26130	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.48075
.10000	.49185
.20000	.46748
.30000	.41752
.40000	.35353
.50000	.28450
.60000	.21688
.70000	.15456
.80000	.09888
.90000	.04861
1.00000	0.00000

STATION NUMBER= 23 SPANWISE LOCATION= .23345 CHORD= 1.80968

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
-.04879	-.89142	-.57234	-.47086						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
.86522	-9.60926	16.29197	-8.04705	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.52813
.10000	.56416
.20000	.54152
.30000	.47792
.40000	.39385
.50000	.30500
.60000	.22221
.70000	.15152
.80000	.09414
.90000	.04643
1.00000	0.00000

STATION NUMBER= 24 SPANWISE LOCATION= .30902 CHORD= 1.62197

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
.10929	-1.09992	-.61739	-.46052						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
1.43314	-13.93225	23.72839	-11.72992	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.56710
.10000	.63718
.20000	.62246
.30000	.54868
.40000	.44570
.50000	.33634
.60000	.23638
.70000	.15456
.80000	.09260
.90000	.04517
1.00000	0.00000

STATION NUMBER= 25 SPANWISE LOCATION= .38268 CHORD= 1.43899

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
.31317	-1.29999	-.66694	-.44867						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
2.06916	-18.46539	31.33376	-15.43656	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.59275
.10000	.70262
.20000	.69985
.30000	.61850
.40000	.49804
.50000	.36874
.60000	.25158
.70000	.15827
.80000	.09129
.90000	.04384
1.00000	0.00000

STATION NUMBER= 26 SPANWISE LOCATION= .45399 CHORD= 1.26186

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT-8	CON.PT.9	CON.PT.10
.59741	-1.40606	-.75231	-.45405						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
2.68234	-21.79319	35.96703	-17.35400	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.58064
.10000	.73444
.20000	.75316
.30000	.67616
.40000	.54931
.50000	.40810
.60000	.27760
.70000	.17247
.80000	.09698
.90000	.04497
1.00000	0.00000

STATION NUMBER= 27 SPANWISE LOCATION= .52250 CHORD= 1.09170

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
.88132	-1.40040	-.74011	-.44656						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
3.21685	-24.36598	39.86542	-19.21605	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.50041
.10000	.69421
.20000	.73618
.30000	.66997
.40000	.54646
.50000	.40501
.60000	.27348
.70000	.16816
.80000	.09387
.90000	.04386
1.00000	0.00000

STATION NUMBER= 28 SPANWISE LOCATION= .58779 CHORD= .92953

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
1.05785	-1.49188	-.77266	-.44693						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
3.73155	-27.45380	44.74261	-21.52669	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.48385
.10000	.71293
.20000	.77057
.30000	.70577
.40000	.57569
.50000	.42462
.60000	.28391
.70000	.17199
.80000	.09441
.90000	.04380
1.00000	0.00000

STATION NUMBER= 29 SPANWISE LOCATION= .64945 CHORD= .77636

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
1.28533	-1.63561	-.77896	-.43700						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
4.29434	-31.42472	51.67353	-25.05749	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.48212
.10000	.74660
.20000	.81580
.30000	.74616
.40000	.60342
.50000	.43829
.60000	.28648
.70000	.16859
.80000	.09030
.90000	.04219
1.00000	0.00000

STATION NUMBER= 30 SPANWISE LOCATION= .70711 CHORD= .63314

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
1.48433	-1.66119	-.78881	-.43674						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
4.69759	-33.52258	54.85557	-26.54988	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.44173
.10000	.73555
.20000	.82047
.30000	.75644
.40000	.61331
.50000	.44504
.60000	.28965
.70000	.16921
.80000	.08992
.90000	.04202
1.00000	0.00000

STATION NUMBER= 31 SPANWISE LOCATION= .76041 CHORD= .50094

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
1.66139	-1.27286	-.79623	-.44646						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
4.43135	-28.57438	44.25544	-20.59964	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.27486
.10000	.56831
.20000	.67833
.30000	.65392
.40000	.55265
.50000	.41977
.60000	.28818
.70000	.17839
.80000	.09859
.90000	.04460
1.00000	0.00000

STATION NUMBER= 32   SPANWISE LOCATION= .80902   CHORD= .42342

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
1.46585	-1.21739	-.79576	-.46194						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
3.98473	-25.96050	40.01774	-18.53651	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.30933
.10000	.57183
.20000	.66729
.30000	.64007
.40000	.54239
.50000	.41534
.60000	.28892
.70000	.18197
.80000	.10225
.90000	.04638
1.00000	0.00000

STATION NUMBER= 33   SPANWISE LOCATION= .85264   CHORD= .35386

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
1.63229	-1.08919	-.81893	-.48537						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
4.08608	-25.13564	37.54345	-16.99902	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.23484
.10000	.51194
.20000	.62471
.30000	.61508
.40000	.53261
.50000	.41669
.60000	.29650
.70000	.19103
.80000	.10908
.90000	.04923
1.00000	0.00000

STATION NUMBER= 34 SPANWISE LOCATION= .89101 CHORD= .29268

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
1.82352	-.84126	-.81772	-.51011						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
4.07543	-22.83015	32.23638	-13.99347	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.10797
.10000	.39628
.20000	.53132
.30000	.54953
.40000	.49438
.50000	.40096
.60000	.29594
.70000	.19762
.80000	.11591
.90000	.05231
1.00000	0.00000

STATION NUMBER= 35 SPANWISE LOCATION= .92388 CHORD= .24026

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
2.01892	-.49107	-.79040	-.53348						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
3.94156	-19.15975	24.42134	-9.71651	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	-.06118
.10000	.23323
.20000	.39331
.30000	.44735
.40000	.42960
.50000	.36850
.60000	.28666
.70000	.20085
.80000	.12202
.90000	.05530
1.00000	0.00000

STATION NUMBER= 36 SPANWISE LOCATION= .95106 CHORD= .19692

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
2.22207	.01239	-.70159	-.54798						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
3.64587	-13.69658	13.49976	-3.95529	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	-.30190
.10000	-.00814
.20000	.18100
.30000	.28224
.40000	.31664
.50000	.30289
.60000	.25731
.70000	.19384
.80000	.12407
.90000	.05718
1.00000	0.00000

STATION NUMBER= 37 SPANWISE LOCATION= .97237 CHORD= .16294

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
2.39527	.65710	-.51304	-.53800						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
3.16870	-6.69450	.39800	2.64357	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	-.61433
.10000	-.33133
.20000	-.11296
.30000	.04337
.40000	.14240
.50000	.19049
.60000	.19558
.70000	.16719
.80000	.11641
.90000	.05595
1.00000	0.00000

STATION NUMBER= 38   SPANWISE LOCATION= .98769   CHORD= .13851

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
2.47607	1.36595	-.22783	-.50425						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
2.50803	1.15230	-13.25554	9.14053	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	-.95655
.10000	-.69830
.20000	-.45770
.30000	-.24719
.40000	-.07955
.50000	.03789
.60000	.10330
.70000	.12037
.80000	.09820
.90000	.05141
1.00000	0.00000

STATION NUMBER= 39 SPANWISE LOCATION= .99692 CHORD= .12380

SLOPES,(W/U),AT CONTROL POINTS,FROM FRONT TO REAR

CON.PT.1	CON.PT.2	CON.PT.3	CON.PT.4	CON.PT.5	CON.PT.6	CON.PT.7	CON.PT.8	CON.PT.9	CON.PT.10
2.41508	1.96292	.04329	-.50167						
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
.11698	.41318	.75000	.96985						

POLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING POWERS OF X/C

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
1.74901	8.43960	-25.16911	14.51190	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	-1.21849
.10000	-.99785
.20000	-.74962
.30000	-.49955
.40000	-.27620
.50000	-.09943
.60000	.01961
.70000	.07850
.80000	.08345
.90000	.04944
1.00000	0.00000

II. SUPPLEMENTARY PROGRAMS (A1590 AND A1591)

ASPECT RATIO PROGRAM (A1590)

To find the aspect ratio and root chord of a planform that is of the general type shown below (and which does not contain a trailing-edge inboard chord-extension) requires a knowledge of most of the quantities shown in figure 2.

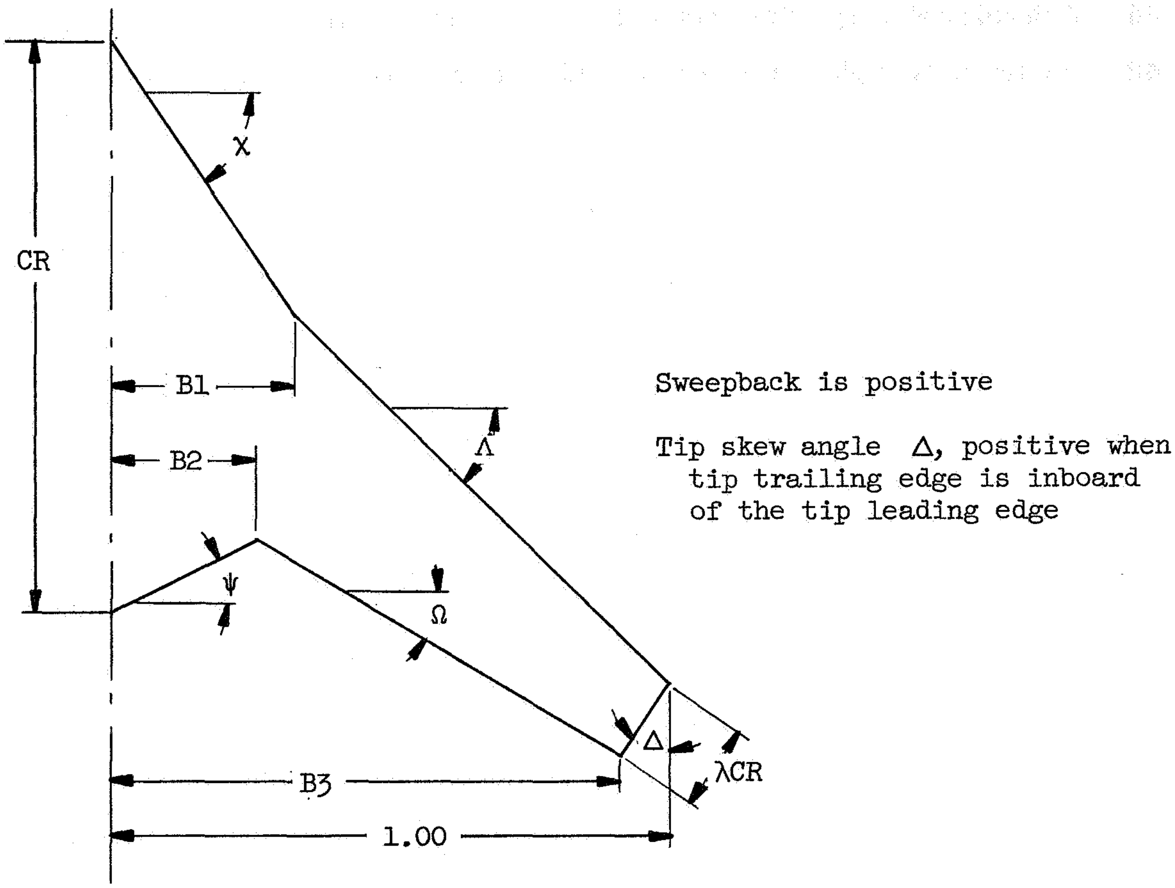


Figure 2.- General planform used in aspect ratio program.

The term ARRATO is set equal to zero unless a particular value of aspect ratio is sought. If set equal to a value other than zero, the program then fixes the leading-edge sweeps, leading- and trailing-edge breaks, overall taper ratio, and tip sweepback of the planform, and iterates on the trailing-edge sweep angles (which have been initially specified to be lower than an assumed final value) until the desired value of aspect ratio is obtained. This procedure works best if both trailing-edge sweeps are the same since they are adjusted together.

The input data are to be read in a 6F12.5 format where the quantities CHI, LAMBDA, PSI, OMEGA, B1, and B2 are on the first card and TAPER, DELT, and ARRATO are on the second card.

The sample cases included are

1st: The planform like that shown in figure 2

2d: A sweptback planform with skewed tip that requires use of the iteration procedure

3d: A double delta type planform with sweptforward trailing edge

4th: An arrow-type planform with skewed tip to be used in the pivot determining program

PIVOT DETERMINING PROGRAM (A1591)

If the high sweep position of a variable-sweep wing is known and its planform has no leading- or trailing-edge break or trailing-edge chord-extension, like the planform shown in figure 3, and its subsonic aerodynamic characteristics or mean camber surface are required at this or lower sweep angles, it is necessary to first know the wing in its outer panel streamwise tip position in order that they may be computed by using Langley computer program A0313 or A0457. There are, however, an infinite number of these outer panel streamwise tip positions that will result in the same high sweep wing given the proper pivot location. They may be thought of as having been generated by a combination of two variables: (1) ratio of low to high sweep semispan, and (2) the fractional location of the pivot along a chord which is normal to the high-sweep leading edge (T). (See fig. 4.)

This program determines the absolute location of the pivot point relative to a new coordinate system and the resulting low sweep streamwise tip planform for the conditions given in the preceding paragraph. (See sample listing.) In case a pivot is selected which would result in the trailing edge inboard and trailing edge outboard not intersecting on the right side of or at the plane of symmetry in the streamwise tip position, the program reduces the root chord by an amount equal to

$$CR(1 - \lambda) + 0.0001(\tan \psi - \tan \Omega) + \tan \Omega - \tan \Lambda - B1(\tan \chi - \tan \Lambda)$$

(symbols are defined in fig. 2) and calls this the amount of trailing-edge chord-extension that must be specified with the streamwise tip position in those programs. The number 0.0001 is assigned to be the new trailing-edge break location, and B2 is the old value. Correspondingly, the taper ratio is changed from being the actual skewed tip length over the root chord in the high sweep position to the same tip length but over the new root chord. The x-location of the pivot, as shown on the output sheets, is relative to the original half root chord but scaled to the new streamwise tip semispan so that it can be used for input to program A0313 or A0457 directly even if the root chord has been reduced by a trailing-edge chord-extension.

The required data to be used for input are associated with the high sweep wing and are punched according to a 6F12.5 format. The first card contains the aspect ratio, leading-edge sweep angle, trailing-edge sweep angle, taper ratio, tip skew angle, and root chord for a unit high sweep semispan. On the second card are the values for span increase and maximum number of pivot locations desired. The last card(s) contains the table of fractional pivot locations whose maximum number has been specified on the second card.

Sample cases are given in the output listings for the planform shown in figures 3 and 4. The $T = 0.75$ case is used in program A0313 as the first sample case with $\Delta = 45^{o}$ and $M = 0.60$.

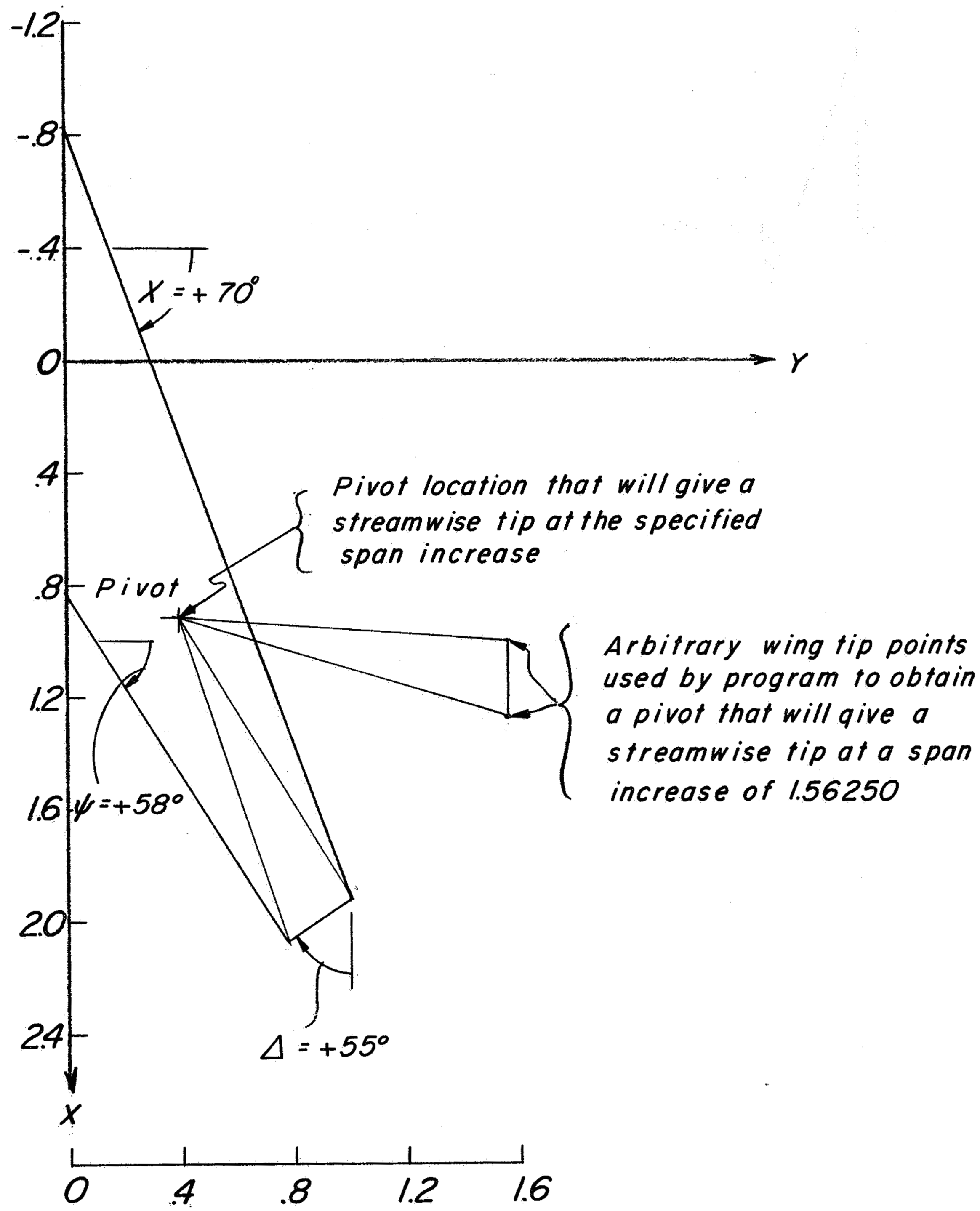


Figure 3.- Arrow planform in original high sweep position.

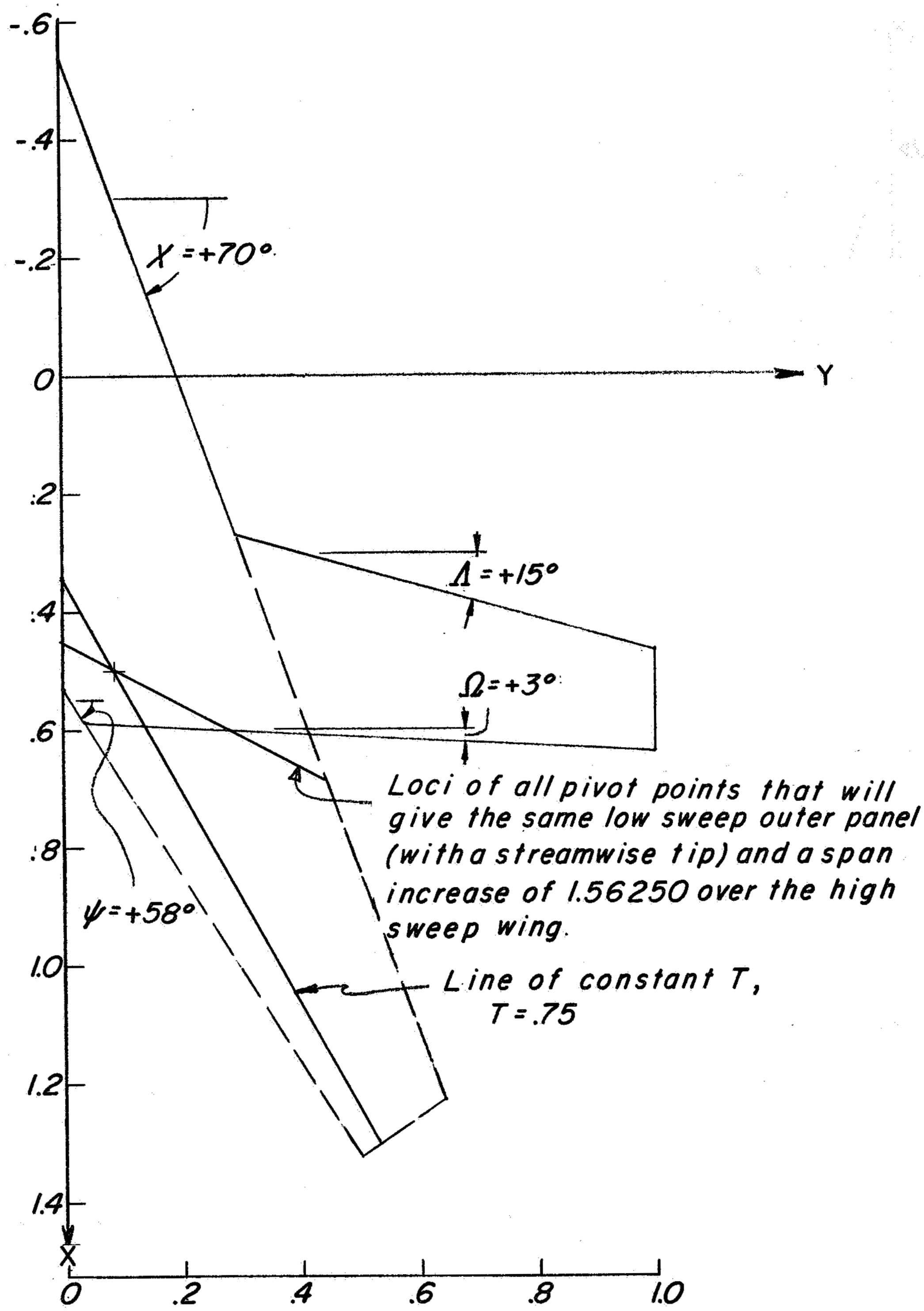


Figure 4.- Low sweep position.

ASPECT RATIO PROGRAM A1590

Sample Input Data

						Sample case
56.5	44.00	-26.00	30.00	0.320	0.256	First
0.154	36.5	0.0				
0.00	75.00	-35.00	-35.00	0.00	0.00	Second
0.15	50.00	1.0				
83.00	62.00	0.0	-10.48842	0.20833	0.0	Third
0.04874	0.	0.0				
0.00	70.00	0.00	58.00	0.00	0.00	Fourth
0.16325	55.00	0.00				

Program Listing

```
      PROGRAM ASPRATO  (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
      REAL LAMBDA
  500 FORMAT(6F12.5)
  501 FORMAT( 11F9.5)
  502 FORMAT( 1H1,4X2HAR6X3HCHI4X6HLAMBDA6X3HPSI3X5HOMEGA7X2HB17X
     1,2HB2,5X,5HTAPER,4X,5HDELTA,6X,2HCR,7X,2HB3)
      WRITE(6,502)
    1 READ(5,500) CHI,LAMBDA,PSI,OMEGA,B1,B2
      IF(EOF,5) 21,20
   20 READ(5,500) TAPER,DELTA,ARRATO
      ITEST=1
      JTEST=1
      CHII=CHI/57.29578
      ALAMB=LAMBDA/57.29578
      DELT=-DELTA/57.29578
      TANC=SIN(CHII)/COS(CHII)
      TANL=SIN(ALAMB)/COS(ALAMB)
      TAN9D=SIN(1.5707963+DELT )/COS(1.5707963+DELT )
    3 IF(PSI.GT.LAMBDA.AND.TAPER.LE.1.00) GO TO 15
      IF(PSI.LE.LAMBDA.AND.TAPER.LE.1.00) JTEST=1
      GO TO 16
   15 JTEST=JTEST+1
      IF(JTEST.GT.2) GO TO 1
   16 PSII=PSI/57.29578
      OMEG=OMEGA/57.29578
      TANP=SIN(PSII)/COS(PSII)
      TANO=SIN(OMEG)/COS(OMEG)
      CR=1./(1.-TAPER*COS(DELT )*(1.+TANO/TAN9D))*(B1*(TANC-TANL)+B2*(
     1TANO-TANP)+TANL-TANO)
      B3=1.-CR*TAPER*COS(DELT )/TAN9D
      S=2.*(-B1**2*(TANL-TANC)/2.+B2**2*(TANO-TANP)/2.+B3*(CR+B1*(TANL-
     1TANC)-B2*(TANO-TANP)+B3*(TANO-TANL)/2.)     +(1.-B3)/2.*(CR+B1*
     2(TANL-TANC)-B2*(TANO-TANP)+B3*(TANO-TANL)))
      AR =4./S
      IF(ARRATO.EQ.0.0) GO TO 2
      IF(ABS(ARRATO-AR).LT.0.00001) GO TO 2
      IF(ARRATO.GT.AR.AND.ITEST.EQ.1) GO TO 4
      IF(ARRATO.LT.AR.AND.ITEST.EQ.1) GO TO 5
      IF(ARRATO.GT.AR.AND.ITEST.EQ.2) GO TO 6
      IF(ARRATO.LT.AR.AND.ITEST.EQ.2) GO TO 7
      IF(ARRATO.GT.AR.AND.ITEST.EQ.3) GO TO 8
      IF(ARRATO.LT.AR.AND.ITEST.EQ.3) GO TO 9
```

```
      IF(ARRATO.GT.AR.AND.ITEST.EQ.4) GO TO 10
      IF(ARRATO.LT.AR.AND.ITEST.EQ.4) GO TO 11
      IF(ARRATO.GT.AR.AND.ITEST.EQ.5) GO TO 12
      IF(ARRATO.LT.AR.AND.ITEST.EQ.5) GO TO 13
      IF(ARRATO.GT.AR.AND.ITEST.EQ.6) GO TO 14
    4 OMEGA=OMEGA+10.
      PSI=PSI+10.
      GO TO 3
    5 OMEGA=OMEGA-9.
      PSI=PSI-9.
      ITEST=2
      GO TO 3
    6 OMEGA=OMEGA+1.
      PSI=PSI+1.
      GO TO 3
    7 OMEGA=OMEGA-0.9
      PSI=PSI-0.9
      ITEST=3
      GO TO 3
    8 OMEGA=OMEGA+0.1
      PSI=PSI+0.1
      GO TO 3
    9 OMEGA=OMEGA-0.09
      PSI=PSI-0.09
      ITEST=4
      GO TO 3
   10 OMEGA=OMEGA+0.01
      PSI=PSI+0.01
      GO TO 3
   11 OMEGA=OMEGA-0.009
      PSI=PSI-0.009
      ITEST=5
      GO TO 3
   12 OMEGA=OMEGA+0.001
      PSI=PSI+0.001
      GO TO 3
   13 OMEGA=OMEGA-0.0009
      PSI=PSI-0.0009
      ITEST=6
      GO TO 3
   14 OMEGA=OMEGA+0.0001
      PSI=PSI+0.0001
      GO TO 3
```

```
    2 IF(B3.LE.0.) GO TO 1
      WRITE(6,501) AR,CHI,LAMBDA,PSI,OMEGA,B1,B2,TAPER,DELTA,CR,B3
      GO TO 1
   21 STOP
      END
```

Sample Output Data

AR	CHI	LAMBDA	PSI	OMEGA	B1	B2	TAPER	DELTA	CR	B3	Sample case
4.67364	56.50000	44.00000	-26.00000	30.00000	.32000	.25600	.15400	36.50000	1.01473	.90705	1st
.99999	0.00000	75.00000	39.37100	39.37100	0.00000	0.00000	.15000	50.00000	3.59757	.58662	2d
1.49080	83.00000	62.00000	0.00000	-10.48842	.20833	0.00000	.04874	0.00000	3.54346	1.00000	3d
1.94775	0.00000	70.00000	0.00000	58.00000	0.00000	0.00000	.16325	55.00000	1.65687	.77843	4th

PIVOT DETERMINING PROGRAM A1591

Sample Input Data

1.94775	70.00000	58.00000	0.16325	55.00000	1.65687
1.56250	5.00000				
0.75	0.77	0.80	0.82	0.85	

Program Listing

```
      PROGRAM PIVOT     (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
      DIMENSION XCR(100),TANLO(100),TANLLO(100),T(100)
      REAL LAMBDA,LAM
  500 FORMAT(6F12.5)
  550 FORMAT(1H1,40X,10HINPUT DATA////)
  551 FORMAT(25X,50HARROW WING WITH CROPPED TIPS (HIGH SWEEP POSITION))
  552 FORMAT(3X,3HAR=,F9.5,1X,4HCHI=,F9.5,1X,4HPSI=,F9.5,1X,6HTAPER=,F9.
     15,1X,6HDELTA=,F9.5,1X,3HCR=,F9.5,1X,18HSPAN INCRSE DESRD=,F9.5)
  553 FORMAT(46X,17HWING TIP LOCATION)
  554 FORMAT(34X,9HX LE TIP=,F9.5,5X,18HY LE TIP=  1.00000/34X,9HX TE TI
     1P=,F9.5,5X,18HY TE TIP=  1.00000////)
  555 FORMAT(34X,9HX LE TIP=,F9.5,5X,9HY LE TIP=,F9.5/34X,9HX TE TIP=,F9
     1.5,5X,9HY TE TIP=,F9.5//)
  556 FORMAT(20X,70HX AND Y LOCATION AND SLOPE OF LOCI OF ALL PIVOT POIN
     1TS THAT WILL SWEEP)
  557 FORMAT(20X,68HTHE HIGH SWEEP WING OUTER PANEL INTO THE SAME LOW SW
     1EEP AND SEMISPAN//)
  558 FORMAT(47X,8HX PIVOT=,F9.5/47X,8HY PIVOT=,F9.5/49X,6HSLOPE=,F9.5//
     1/)
  559 FORMAT(10X, 99H≠T≠,FRACTION OF CHORD NORMAL TO THE LEADING EDGE OF
     1 ARROW WING WHERE THE PIVOT IS SPECIFIED TO ACT,/9X,100HALONG WITH
     2 THE CORRESPONDING X INTERCEPT AT ROOT AND THE SLOPE OF ALL POINTS
     3 WHICH HAVE THE SAME ≠T≠//)
  560 FORMAT(35X,20HT,FRACTION OF CHORD=,F9.5/31X,24HX AT ROOT AFT OF OR
     1IGIN=,F9.5/31X,24HSLOPE THROUGH X AT ROOT=,F9.5///)
  561 FORMAT(1H150X,11HOUTPUT DATA)
  562 FORMAT(/////    45X,26HWING IN LOW SWEEP POSITION/20X,71HALL OF TH
     1ESE DIMENSIONS ARE SCALED FOR A UNIT SEMISPAN IN THIS POSITION////
     2)
  563 FORMAT(2X,3HAR=,F9.5,5X,4HCHI=,F9.5,5X,7HLAMBDA=,F9.5,5X,4HPSI=,F9
     1.5,5X6HOMEGA=,F9.5,5X11HY LE BREAK=,F9.5/2X11HY TE BREAK=,F9.5,5X,
     26HTAPER=,F9.5,5X,3HCR=,F9.5,5X,31HSEMISPAN OF WING IN HIGH SWEEP=,
     3F9.5/50X,16HCHORD EXTENSION=,F9.5)
  564 FORMAT(5X99HALL DIMENSIONS REFERENCED TO COORDINATE ORIGIN AT THE
     1HALF ROOT CHORD AND SCALED ON A UNIT SEMISPAN///)
  565 FORMAT(15X83HPIVOT LOCATION WHICH OCCURS AT THE INTERSECTION OF TH
     1E LOCI OF ALL PIVOT POINTS AND/17X61HTHE LINE WHICH CONTAINS ALL O
     2F THE ≠T≠ FRACTION NORMAL CHORDS/47X,8HX PIVOT=,F9.5/47X,8HY PIVOT
     3=,F9.5/////)
  566 FORMAT(///)
  567 FORMAT(44X,21HIN LOW SWEEP POSITION)
  568 FORMAT(1H1)
```

```
C
C
    1 READ(5,500) AR,CHI,PSI,TAPER,DELTA,CR
      IF(EOF,5) 5,3
    3 READ(5,500)SI,TMAX
      ITMAX=TMAX
      READ(5,500) (T(N),N=1,ITMAX)
C
C
      X4=1.00000
      X5=X4+TAPER*CR
      WRITE(6,550)
      WRITE(6,551)
      WRITE(6,564)
      WRITE(6,552) AR,CHI,PSI,TAPER,DELTA,CR,SI
      LAMBDA=CHI/57.29578
      OMEGA=PSI/57.29578
      DELTA=DELTA/57.29578
      LAM=(LAMBDA-DELTA)*57.29578
      OME=(OMEGA -DELTA)*57.29578
      TANC=SIN(LAMBDA)/COS(LAMBDA)
      TANL=SIN(LAMBDA-DELTA)/COS(LAMBDA-DELTA)
      TANP=SIN(OMEGA)/COS(OMEGA)
      TANO=SIN(OMEGA-DELTA)/COS(OMEGA-DELTA)
      TAND=SIN(DELTA)/COS(DELTA)
      TAND2=SIN(DELTA/2.)/COS(DELTA/2.)
      Y4PP=1.00
      Y5PP=(-CR+Y4PP*(TANC+1./TAND))/(TANP+1./TAND)
      X4PP=-CR/2.+Y4PP*TANC
      X5PP=CR/2.+Y5PP*TANP
      WRITE(6,555) X4PP,Y4PP,X5PP,Y5PP
      A11=X4PP-X4
      A12=Y4PP-SI
      A21=X5PP-X5
      A22=Y5PP-SI
      C1=0.5*(Y4PP**2+X4PP**2-SI**2-X4**2)
      C2=0.5*(Y5PP**2+X5PP**2-SI**2-X5**2)
      DETERM=A11*A22-A12*A21
      XP=(1./DETERM)*(A22*C1-A12*C2)
      YP=(1./DETERM)*(-A21*C1+A11*C2)
      WRITE(6,556)
      WRITE(6,557)
      WRITE(6,558) XP,YP,TAND2
```

```
      WRITE(6,567)
      WRITE(6,555) X4,SI,X5,SI
      WRITE(6,561)
      DO 4 I=1,ITMAX
      TANLO(I)=SIN((LAMBDA-OMEGA)*T(I))/COS((LAMBDA-OMEGA)*T(I))
      XCR(I)=(T(I)*COS(LAMBDA)+SIN(LAMBDA)*TANLO(I))*CR/(COS(LAMBDA)
     1+SIN(LAMBDA)*TANLO(I)) -CR/2.
      TANLLO(I)=SIN(LAMBDA-(LAMBDA-OMEGA)*T(I))/COS(LAMBDA-(LAMBDA-
     1OMEGA)*T(I))
      WRITE(6,562)
      WRITE(6,559)
      XCP=XCR(I)/SI
      WRITE(6,560) T(I),XCP,TANLLO(I)
      DETER1=TANLLO(I)-TAND2
      XP1=(1./DETER1)*(-TAND2*        XCR(I)  +TANLLO(I)*(XP-YP*
     1TAND2))
      YP1=(1./DETER1)*(       -XCR(I)+XP-YP*TAND2)
      X4P=XP1+SQRT((X4PP-XP1)**2+(Y4PP-YP1)**2)*SIN(ATAN((X4PP-XP1)/(Y4P
     1P-YP1))-DELTA)
      X5P=XP1+SQRT((X5PP-XP1)**2 +(Y5PP-YP1)**2)*SIN(ATAN((X5PP-XP1)/(Y5P
     1P-YP1))-DELTA)
      B1  =(X4P-SI*TANL  +CR/2.)/(TANC-TANL  )
      B2  =(X5P-SI*TANO  -CR/2.)/(TANP-TANO  )
      B1=B1/SI
      B2=B2/SI
      B3=1.00
      X4P=X4P/SI
      X5P=X5P/SI
      XP1=XP1/SI
      YP1=YP1/SI
      CR1=CR/SI
      BOT=1./SI
      TAPER1=TAPER
      CHDEXT=0.
      IF(B2.GE.0.) GO TO 2
      CHDEXT=CR1*(1.-TAPER1)+.0001*(TANP-TANO)+TANO-TANL-B1*(TANC-TANL)
      CR1=CR1-CHDEXT
      TAPER1=(X5P-X4P)/CR1
      B2=.0001
    2 S=2.*(-B1**2*(TANL-TANC)/2.+B2**2*(TANO-TANP)/2.+B3*(CR1+B1*(TANL-
     1TANC)-B2*(TANO-TANP)+B3*(TANO-TANL)/2.)      +(1.-B3)/2.*(CR1+B1*
     2(TANL-TANC)-B2*(TANO-TANP)+B3*(TANO-TANL)))
      ARN=4./S
```

```
      WRITE(6,553)
      WRITE(6,554) X4P,X5P
      WRITE(6,563) ARN,CHI,LAM,PSI,OME,B1,B2,TAPER1,CR1,BOT,CHDEXT
      WRITE(6,566)
      WRITE(6,565) XP1,YP1
      WRITE(6,568)
    4 CONTINUE
      GO TO 1
    5 STOP
      END
```

INPUT DATA

ARROW WING WITH CROPPED TIPS (HIGH SWEEP POSITION)
ALL DIMENSIONS REFERENCED TO COORDINATE ORIGIN AT THE HALF ROOT CHORD AND SCALED ON A UNIT SEMISPAN

```
AR=  1.94775 CHI= 70.00000 PSI= 58.00000 TAPER=   .16325 DELTA= 55.00000 CR=  1.65687 SPAN INCRSE DESRD=  1.56250
                               X LE TIP=  1.91904     Y LE TIP=  1.00000
                               X TE TIP=  2.07419     Y TE TIP=   .77843
```

X AND Y LOCATION AND SLOPE OF LOCI OF ALL PIVOT POINTS THAT WILL SWEEP
THE HIGH SWEEP WING OUTER PANEL INTO THE SAME LOW SWEEP AND SEMISPAN

```
X PIVOT=   .91924
Y PIVOT=   .39852
  SLOPE=   .52057
```

IN LOW SWEEP POSITION

```
X LE TIP=  1.00000     Y LE TIP=  1.56250
X TE TIP=  1.27048     Y TE TIP=  1.56250
```

```
                                   OUTPUT DATA


                              WING IN LOW SWEEP POSITION
                 ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISPAN IN THIS POSITION


    ≠T≠,FRACTION OF CHORD NORMAL TO THE LEADING EDGE OF ARROW WING WHERE THE PIVOT IS SPECIFIED TO ACT,
    ALONG WITH THE CORRESPONDING X INTERCEPT AT ROOT AND THE SLOPE OF ALL POINTS WHICH HAVE THE SAME ≠T≠

                    T,FRACTION OF CHORD=    .75000
                  X AT ROOT AFT OF ORIGIN=  .34548
                 SLOPE THROUGH X AT ROOT=  1.80405


                         WING TIP LOCATION
               X LE TIP=   .46374      Y LE TIP=  1.00000
               X TE TIP=   .63685      Y TE TIP=  1.00000


AR=  5.17849    CHI= 70.00000    LAMBDA= 15.00000    PSI= 58.00000    OMEGA=  3.00000    Y LE BREAK=   .29279
Y TE BREAK=   .03504    TAPER=   .16325    CR=  1.06040    SEMISPAN OF WING IN HIGH SWEEP=   .64000
                                      CHORD EXTENSION=  0.00000


          PIVOT LOCATION WHICH OCCURS AT THE INTERSECTION OF THE LOCI OF ALL PIVOT POINTS AND
           THE LINE WHICH CONTAINS ALL OF THE ≠T≠ FRACTION NORMAL CHORDS
                                 X PIVOT=   .50019
                                 Y PIVOT=   .08575
```

```
                    WING IN LOW SWEEP POSITION
       ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISPAN IN THIS POSITION


   ≠T≠,FRACTION OF CHORD NORMAL TO THE LEADING EDGE OF ARROW WING WHERE THE PIVOT IS SPECIFIED TO ACT,
  ALONG WITH THE CORRESPONDING X INTERCEPT AT ROOT AND THE SLOPE OF ALL POINTS WHICH HAVE THE SAME ≠T≠

                 T,FRACTION OF CHORD=    .77000
              X AT ROOT AFT OF ORIGIN=    .36164
              SLOPE THROUGH X AT ROOT=  1.78636


                         WING TIP LOCATION
               X LE TIP=   .45169     Y LE TIP=  1.00000
               X TE TIP=   .62480     Y TE TIP=  1.00000


AR=  5.22071     CHI= 70.00000     LAMBDA= 15.00000     PSI= 58.00000     OMEGA=  3.00000     Y LE BREAK=   .28793
Y TE BREAK=    .02726     TAPER=    .16325     CR=  1.06040     SEMISPAN OF WING IN HIGH SWEEP=   .64000
                                  CHORD EXTENSION=  0.00000


      PIVOT LOCATION WHICH OCCURS AT THE INTERSECTION OF THE LOCI OF ALL PIVOT POINTS AND
       THE LINE WHICH CONTAINS ALL OF THE ≠T≠ FRACTION NORMAL CHORDS
                                 X PIVOT=    .49416
                                 Y PIVOT=    .07418
```

```
                    WING IN LOW SWEEP POSITION
     ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISPAN IN THIS POSITION


 ≠T≠,FRACTION OF CHORD NORMAL TO THE LEADING EDGE OF ARROW WING WHERE THE PIVOT IS SPECIFIED TO ACT,
ALONG WITH THE CORRESPONDING X INTERCEPT AT ROOT AND THE SLOPE OF ALL POINTS WHICH HAVE THE SAME ≠T≠

           T,FRACTION OF CHORD=    .80000
         X AT ROOT AFT OF ORIGIN=    .38540
         SLOPE THROUGH X AT ROOT=  1.76032


                    WING TIP LOCATION
           X LE TIP=   .43336     Y LE TIP=  1.00000
           X TE TIP=   .60647     Y TE TIP=  1.00000


AR=  5.28722     CHI= 70.00000     LAMBDA= 15.00000     PSI= 58.00000     OMEGA=  3.00000     Y LE BREAK=    .28054
Y TE BREAK=    .01542     TAPER=    .16325     CR=  1.06040     SEMISPAN OF WING IN HIGH SWEEP=    .64000
                                              CHORD EXTENSION=  0.00000


     PIVOT LOCATION WHICH OCCURS AT THE INTERSECTION OF THE LOCI OF ALL PIVOT POINTS AND
      THE LINE WHICH CONTAINS ALL OF THE ≠T≠ FRACTION NORMAL CHORDS
                              X PIVOT=    .48500
                              Y PIVOT=    .05658
```

```
                    WING IN LOW SWEEP POSITION
    ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISPAN IN THIS POSITION


 ≠T≠,FRACTION OF CHORD NORMAL TO THE LEADING EDGE OF ARROW WING WHERE THE PIVOT IS SPECIFIED TO ACT,
ALONG WITH THE CORRESPONDING X INTERCEPT AT ROOT AND THE SLOPE OF ALL POINTS WHICH HAVE THE SAME ≠T≠

            T,FRACTION OF CHORD=    .82000
         X AT ROOT AFT OF ORIGIN=    .40093
         SLOPE THROUGH X AT ROOT=  1.74328

                  WING TIP LOCATION
           X LE TIP=   .42096     Y LE TIP=  1.00000
           X TE TIP=   .59407     Y TE TIP=  1.00000

AR=  5.33383    CHI= 70.00000    LAMBDA= 15.00000    PSI= 58.00000    OMEGA=  3.00000    Y LE BREAK=   .27554
Y TE BREAK=   .00741    TAPER=   .16325    CR=  1.06040   SEMISPAN OF WING IN HIGH SWEEP=   .64000
                                            CHORD EXTENSION=  0.00000

      PIVOT LOCATION WHICH OCCURS AT THE INTERSECTION OF THE LOCI OF ALL PIVOT POINTS AND
        THE LINE WHICH CONTAINS ALL OF THE ≠T≠ FRACTION NORMAL CHORDS
                              X PIVOT=    .47880
                              Y PIVOT=    .04467
```

```
                    WING IN LOW SWEEP POSITION
ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISPAN IN THIS POSITION


≠T≠,FRACTION OF CHORD NORMAL TO THE LEADING EDGE OF ARROW WING WHERE THE PIVOT IS SPECIFIED TO ACT,
ALONG WITH THE CORRESPONDING X INTERCEPT AT ROOT AND THE SLOPE OF ALL POINTS WHICH HAVE THE SAME ≠T≠

        T,FRACTION OF CHORD=    .85000
      X AT ROOT AFT OF ORIGIN=   .42376
     SLOPE THROUGH X AT ROOT=  1.71817

                 WING TIP LOCATION
   X LE TIP=   .40209     Y LE TIP=  1.00000
   X TE TIP=   .57520     Y TE TIP=  1.00000

AR=  5.40717    CHI= 70.00000    LAMBDA= 15.00000    PSI= 58.00000    OMEGA=  3.00000    Y LE BREAK=   .26793
Y TE BREAK=   .00010    TAPER=   .16442    CR=  1.05284    SEMISPAN OF WING IN HIGH SWEEP=   .64000
                                    CHORD EXTENSION=   .00756

PIVOT LOCATION WHICH OCCURS AT THE INTERSECTION OF THE LOCI OF ALL PIVOT POINTS AND
 THE LINE WHICH CONTAINS ALL OF THE ≠T≠ FRACTION NORMAL CHORDS
                          X PIVOT=   .46936
                          Y PIVOT=   .02654
```