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SUPPLEMENT TO NASA TECHNICAL NOTE D-4427

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

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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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.

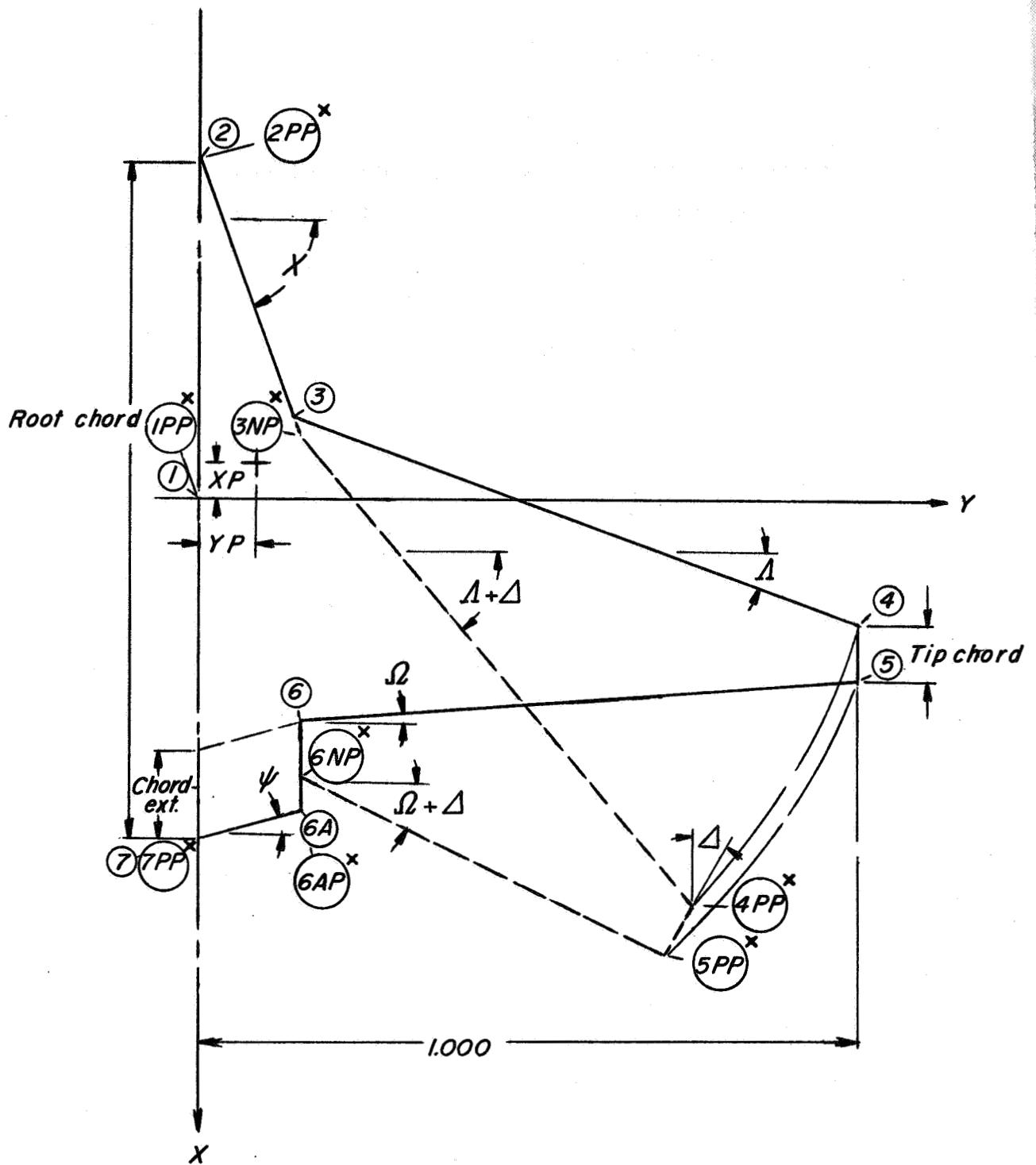


Figure 1.- General planform for which lifting surface program is applicable. The \times means that in the listing of geometry data the x- and y-locations of these points are found by dividing by the ratio of initial to final outer panel semispan.

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 streamwise 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 streamwise 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 | | |
| (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) | | Tip streamwise at DELT = 0 |
| (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

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

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 $\cot \frac{\theta}{2}$ and ending with $\sin(CSTA - 1)\theta$) 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

$$\left(\frac{c_l c}{c_{av}} \right)_{\text{basic}}$$

SPAN LOAD TOTAL AT CLDESG

$$\left(\frac{c_l c}{c_{av}} \right)_{\text{at } C_L, \text{desired}}$$

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 $C_{m\alpha}$ 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 camber but also twist and angle of attack.

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 $(-C_{l_p})$.

To find C_{m_q} :

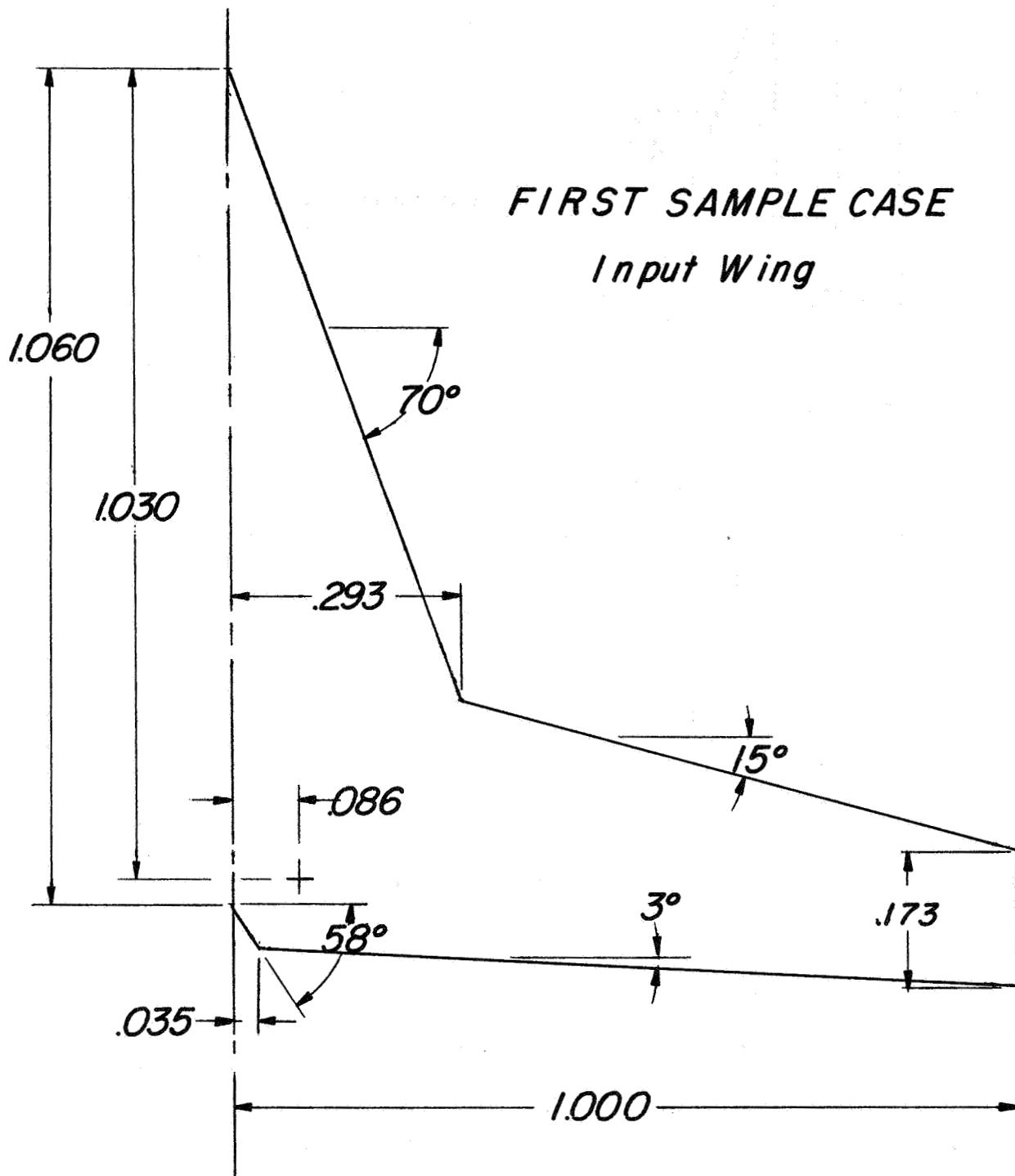
(a) Set SYM = 1.0. and TWADCM = 0.

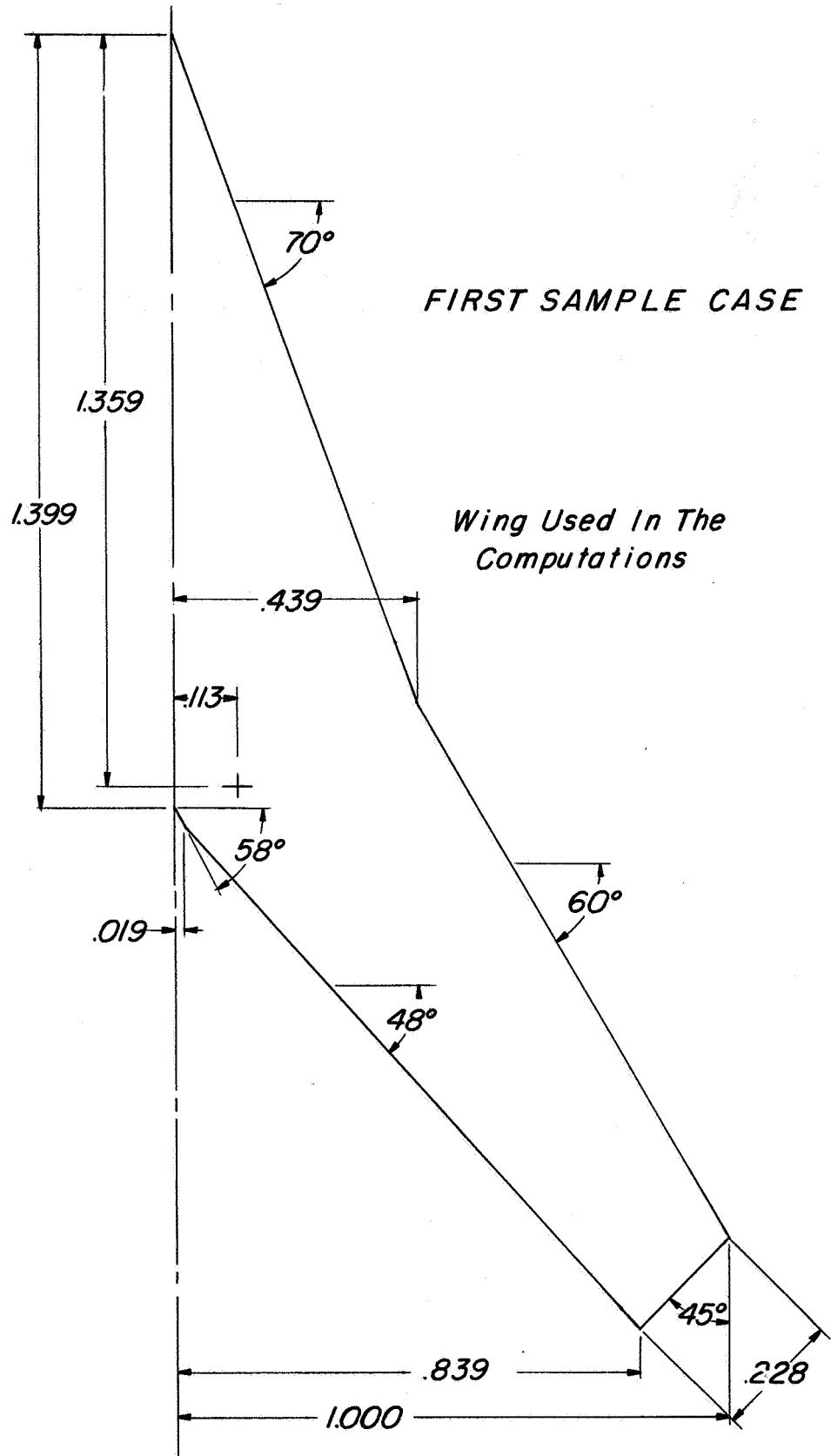
- (b) Same as in (b) for C_{l_p} .
- (c) Read in four times the linear camber in radians. This camber distribution is chosen to represent the variation in local angle of attack across the wing chord which occurs due to a pitching velocity. A positive normal velocity is attained when the nose is pitching 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 $(2/C_{REF})$. The resulting number is $(-C_{m_q})$.

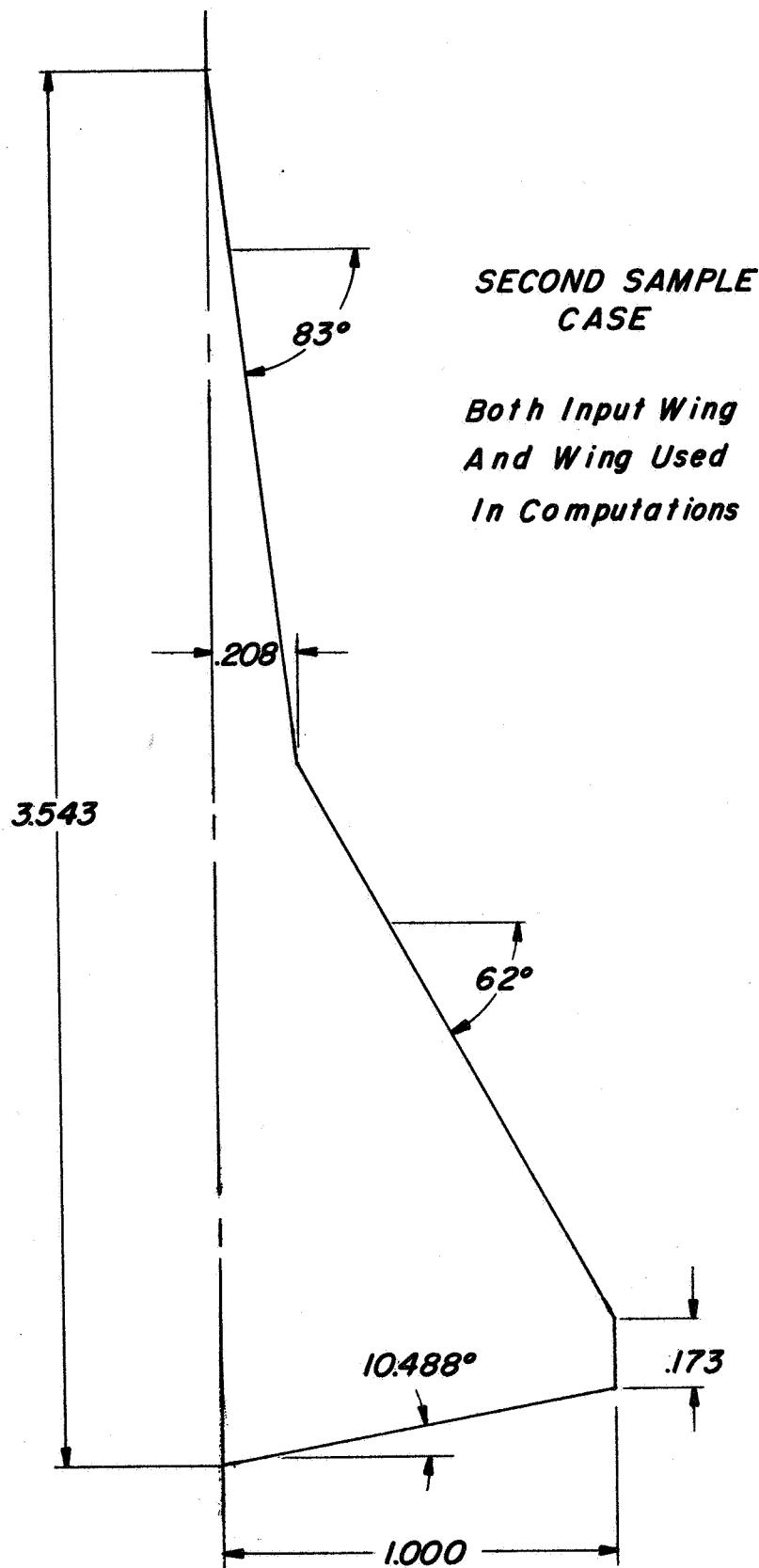
LOAD DISTRIBUTION PROGRAM A0313

Sample Input Data

5.17849	70.0	15.0	58.0	0.29279	0.03504	First sample case		
0.16325	45.0	0.50019	0.08575	0.0	0.60			
5.1.	8.	1.	1.0	0.				
1.49080	83.	62.	0.	.20833	0.			
0.04874	0.	0.	0.	0.	0.			
200.	1.	4.	20.	1.	22	1.		
-0.6116	-0.6800	-.07481	-.08152	-.08813	-.09456	-.10079	-10678	
-1.1250	-1.1789	-.12294	-.12762	-.13187	-.13570	-.13907	-14196	
-1.1435	-1.1622	-.14756	-.14838	-.01396	-.02080	-.02761	-03432	
-0.04093	-0.04736	-.05359	-.05958	-.06530	-.07069	-.07574	-08042	
-0.08467	-0.08850	-.09187	-.09476	-.09715	-.09902	-.10036	-10118	
+0.03987	+0.03303	+.02622	+.01951	+.01290	+.00647	+.00024	-00599	
-0.01171	-0.01710	-.02215	-.02683	-.03108	-.03491	-.03828	-04117	
-0.04356	-0.04543	-.04677	-.04759	+.07519	+.06835	+.06154	+05483	
0.04822	0.04179	.03556	.02957	.02385	.01846	.01341	.00873	
.000448	.00065	-.00272	-.00561	-.00800	-.00987	-.01121	-.01203	







Program Listing

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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),CHLD(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
1TOTAL,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 ANISYMMETRICAL)
515 FORMAT(8F9.5)
516 FORMAT(55X,42HCHORDAL LOAD FACTORS,Q,FOR ADDITIONAL LOAD)
517 FORMAT(1X4HSPAN2X,4H2Y/83X,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

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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
2IDCHO)
539 FORMAT(25X5H STA.,5X,I4,5X,I4,5X,I4,5X,I4,5X,I4,5X,I4,5X,I4,
15X,I4,5X,I4)

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540 FORMAT(50X,5HX6 AP=,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
    GLE=,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
    GLE 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,122HTDTAL WING PLANFORM MEAN GEOMETRIC CHORD AND ITS LOC
    IATION 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(SEMISPAAN AT FINAL OUTBOARD SWEEP,37H/SEMISPAAN 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
C

INPUT DATA

C
C IF THE WING DOES NOT HAVE A LEADING EDGE BREAK SET B1RAT AND CHI
C EQUAL TO ZERO
C
C IF THE WING DOES NOT HAVE TRAILING EDGE BREAK SET B2RAT AND PSI
C EQUAL TO ZERO
C
C IF THE WING DOES NOT HAVE A VARIABLE SWEEP OUTER PANEL SET DELT,
C XP AND YP EQUAL TO ZERO
C
C IF THE SPAN LOADING IS TO BE SYMMETRICAL SET THE SYM CODE EQUAL TO
C ONE, IF ANTISSYMMETRICAL SET THE SYM CODE EQUAL TO TWO
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 SET CLDESG EQUAL TO ONE UNLESS A PARTICULAR VALUE OF THE LIFT
C COEFFICIENT WOULD BE USEFUL IN SCALING THE LOADING DISTRIBUTION
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
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 VARIABLE 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
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
DELT=DELT/RAD
SIGMA=SIGM/RAD
RHO=RHH/RAD
TANC=TAN(CHI)
TANL=TAN(ALAMD)
TANP=TAN(PSI)
TANDE=TAN(PI/2.+DELT)
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)
EOME=OMEGA+DELTA
ALAME=ALAMD+DELTA
TANE=TAN(EOME)
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)*
2*TANLP+(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*
2*TANOP)+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*
4*TANOP)*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 THE FLAT PLATE ANGLE OF ATTACK,CONST(JK,1),IS SET EQAUL TO ONE
C RADIANT
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
  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)
  TANOBB=TAN(OMEGB)
  TANLCB=TANLB-TANCB
  TANLPB=TANLB-TANPB
  TANPCB=TANPB-TANCB
  TANOCCB=TANOBB-TANCB
  TANOLB=TANOBB-TANLB
  TANOPB=TANOBB-TANPB
  ETA(ISSST)=0.0
  Y(ISSST)=0.0
  DO 7 NP=NNI,I,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.)
1 CHDSUB=CHDEXX*(1.-(Y6NP-ETA(NP))/0.10)/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)*(TANLB-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*TANLB-CHDSUB
    DATY4=X4PP/BETA+CATY4/2.
    C(NP)=.5*(CATY4-CATY4*(ETA(NP)-YMIN)/(YMAX-YMIN))
    D(NP)=DATY4+(X4PP/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*TANLB-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
CHI I=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

```
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 MAIN PROGRAM

C

```
401 DO 3 NTR=1,41
VE (NTR)=0.0
B (NTR)=0.0
CHLD (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)=4.0/(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
C

CHORDAL INTEGRATION SUBROUTINE
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 CHLDL(NP)=PI*(Q(1,NP)+.5*Q(2,NP))
GAMMA(NP)= CHLDL(NP)/(4.0*QBAR*YMAX)
CLL(NP)=2.0*YMAX*GAMMA(NP)/C(NP)
CHULD(T(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(1
     1,N)+.25*Q(3,N)))
        AMYT=AMYT-RU*PI*((D(N)-XCBAR-CBAR/4.)*(QT(1,N)+.5*QT(2,N))-C(N)*(.5*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)/2.0)*(((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.
ZICTP(NP)=ZICP(NP)
ZICTP(NP)=D(NP)
201 CHDLTO(NP)=CHDLDT(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)=-((CHDL D(NP)-PI/2.*(Q(1,NP)+.5*Q(3,NP)))/(QBAR*4.*C(NP)))
AMUT(NP)=-((CHDL DT(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*CHDL DT(NP)
715 ETACP=ETACP+RU*SLC(NP)
CMRDOT=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(ETA(N)))*CHI
IF(ABS(ETA(N)).GT.Y3NP.AND.ABS(ETA(N)).LE.YMIN) OMICRN=(ETA(N)/ABS(ETA(N)))*ALAME
IF(ABS(ETA(N)).GT.YMIN.AND.DELTA.GE.0.) OMICRN=(ETA(N)/ABS(ETA(N)))*ALAME
IF(ABS(ETA(N)).GT.YMIN.AND.DELTA.LT.0.) OMICRN=(ETA(N)/ABS(ETA(N)))*(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
     ILTOT(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)
               .71CTPT(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

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```

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), (ICOLUMN,JCOLUMN), (AMAX, T, SWAP)
C
C      INITIAL ZATION
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 ICOLUMN=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(ICOLUMN)=IPIVOT(ICOLUMN)+1
C
C      INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL
C
130 IF (IROW-ICOLUMN) 140, 260, 140
140 DETERM=-DETERM
150 DO 200 L=1,N
160 SWAP=A(IROW,L)
170 A(IROW,L)=A(ICOLUMN,L)
200 A(ICOLUMN,L)=SWAP

```

```

205 IF(M) 260, 260, 210
210 DO 250 L=1, M
220 SWAP=B(IROW,L)
230 B(IROW,L)=B(ICOLUMN,L)
250 B(ICOLUMN,L)=SWAP
260 INDEX(I,1)=IROW
270 INDEX(I,2)=ICOLUMN
310 PIVOT=A(ICOLUMN,ICOLUMN)

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(ICOLUMN,ICOLUMN)=1.0

```

```

340 DO 350 L=1,N
350 A(ICOLUMN,L)=A(ICOLUMN,L)/PIVOT
355 IF(M) 380, 380, 360
360 DO 370 L=1,M
370 B(ICOLUMN,L)=B(ICOLUMN,L)/PIVOT
C
C      REDUCE NON-PIVOT ROWS
C
380 DO 550 L1=1,N
390 IF(L1-ICOLUMN) 400, 550, 400
400 T=A(L1,ICOLUMN)
420 A(L1,ICOLUMN)=0.0
430 DO 450 L=1,N
450 A(L1,L)=A(L1,L)-A(ICOLUMN,L)*T
455 IF(M) 550, 550, 460
460 DO 500 L=1,M
500 B(L1,L)=B(L1,L)-B(ICOLUMN,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 JCOLUMN=INDEX(L,2)
650 DO 705 K=1,N
660 SWAP=A(K,JROW)
670 A(K,JROW)=A(K,JCOLUMN)
680 A(K,JCOLUMN)=SWAP
690 CONTINUE
705 CONTINUE
710 CONTINUE
740 RETURN
END

```

Sample Output Listing

L-4760

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 SYMETRICAL, OTHER THAN 1, IT IS ANISYMMETRICAL

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

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

LOCATION OF PERIMETER POINTS FOR PLANFORM TO BE USED IN THE COMPUTATIONS
 WHEN NONDIMENSIONALIZED BY THE SEMISSPAN 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 GEOMETRIC 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 SWEET 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,SRREF=	1.44392	MOMENT REF POINT=	*.43970	REF CHORD,CREF=	*.88932	X LE REF=	*.21738
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AERODYNAMIC DATA

ANGLE FOR ZERO LIFT, ALPHA ZERO= -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= -.00947 CDI/CLA**2= .11701 CDI/CLAD**2= .11322

CHORDWISE LOCATION OF CENTER OF PRESSURE=
 SPANWISE LOCATION OF CENTER OF PRESSURE=

FOR THE ADDITIONAL LOADING
 A.C. IN FRACTION OF CREF MEASURED FROM LEADING EDGE OF CREF= .46993

SPAN STA.	2Y/B	LOCAL CIRCU ADD	LOCAL CIRCU BASIC	LOCAL CIRCU TOTAL	LOCAL LIFT COEFF	LOCAL LIFT COEFF	LOCAL LIFT COEFF	LOCAL PITCH COEFF,LE	LOCAL PITCH COEFF,LE	LOCAL PITCH COEFF,LE	LOCAL PITCH COEFF,LE	LOCAL HALF CHORD	LOCAL HALF CHORD	
7	0.00000	*511121	0.00000	*20711	1.52620	0.00000	*611831	-.60999	-0.00000	-.24713	*66991	*07233		
8	.22252	*52233	0.00000	*21161	2.00091	0.00000	*81053	-.61084	-0.00000	-.24747	*52210	*43400		
9	.43388	*50558	0.00000	*20483	2.89639	0.00000	1.17362	-.70295	-0.00000	-.28479	*34911	*84173		
10	.62349	*46390	0.00000	*18794	3.22815	0.00000	*71783	-.74668	-0.00000	-.30250	*28741	1.11140		
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									
7	1		0.00000				*02447	4.63332						
7	2		0.00000				*09549	1.30339	0.00000	0.00000	1.87710			
7	3		0.00000				*20611	*67970	0.00000	0.00000	*52804			
7	4		0.00000				*34549	1.69226	0.00000	0.00000	*27537			
7	5		0.00000				*50000	1.76327	0.00000	0.00000	*68559			
7	6		0.00000				*65451	1.25414	0.00000	0.00000	*71436			
7	7		0.00000				*79389	1.18565	0.00000	0.00000	*58089			
7	8		0.00000				*90451	1.00023	0.00000	0.00000	*48034			
7	9		0.00000				*97553	*49802	0.00000	0.00000	*40522			
7	10		0.00000				1.00000	*00000	0.00000	0.00000	*20176			
8	1		*22252		*02447		8.76028	0.00000	0.00000	0.00000	*56906			
8	2		*22252		*09549		3.65150	0.00000	0.00000	0.00000	1.47934			
8	3		*22252		*20611		1.23557	0.00000	0.00000	0.00000	*50057			
a	4		*22252		*93569		-.93569	0.00000	0.00000	0.00000	*37AR2			

4	5	222252	• 50000	1.56414	0.00000	• 63368
6	6	222252	• 65451	1.66119	0.00000	• 67300
8	7	222252	• 79389	1.23422	0.00000	• 5002
8	8	222252	• 90451	74884	0.00000	• 30388
8	9	222252	• 97553	• 32285	0.00000	• 13080
8	10	222252	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
11	11	78183	• 90097	21.48663	0.00000	8.70611
11	12	78183	• 90097	12.02506	0.00000	4.87172
12	1	90097	• 09549	4.96115	0.00000	2.01235
12	2	90097	• 20611	2.43122	0.00000	• 98496
12	3	90097	• 34549	• 12936	0.00000	• 80048
12	4	90097	• 50000	1.97385	0.00000	• 55670
12	5	90097	• 65451	1.37413	0.00000	• 32397
12	6	90097	• 02447	• 79967	0.00000	• 15401
12	7	90097	• 79389	• 38015	0.00000	• 05241
12	8	90097	• 90451	• 12936	0.00000	• 00000
12	9	90097	• 97553	• 00000	0.00000	13.93081
12	10	90097	1.00000	3.4-38594	0.00000	9.96863
13	1	97493	• 02447	24.60594	0.00000	5.67773
13	2	97493	• 09549	14.01654	0.00000	2.84157
13	3	97493	• 20611	7.01396	0.00000	1.40047
13	4	97493	• 34549	• 50000	0.00000	• 00000
13	5	97493	• 65451	3.45682	0.00000	• 00000

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	*.41192	*.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.	CHORD LOAD ADD	CHORD LOAD BASIC	CHORD LOAD TOTAL	CENTER PRESS ADD	CENTER PRESS BASIC	CENTER PRESS TOTAL	LOCAL PRESS ADD	LOCAL PRESS BASIC	LOCAL PRESS TOTAL	SPAN STA.	CHORD LOAD ADD	CHORD LOAD BASIC	CHORD LOAD TOTAL	SPAN STA.	CHORD LOAD ADD	CHORD LOAD BASIC	CHORD LOAD TOTAL	SPAN STA.	CHORD LOAD ADD	CHORD LOAD BASIC	CHORD LOAD TOTAL	SPAN STA.	CHORD LOAD ADD	CHORD LOAD BASIC	CHORD LOAD TOTAL																																																																																					
7	0.00000	2.04482	0.00000	*.82842	-.06208	7.233E-02	-.06208	*.39968	5.000E-01	*.39968	1.14746	0.00000	1.14746	0.00000	8	*.22252	2.08933	*.84645	*.23068	4.340E-01	*.23068	*.30528	*.30528	1.17244	1.17244	1.17244	0.00000	0.00000	0.00000	0.00000	9	*.43388	2.02231	*.81930	*.66207	*.8417E-01	*.66207	*.24270	*.24270	1.13483	1.13483	1.13483	0.00000	0.00000	0.00000	0.00000	10	*.62349	1.85559	*.75176	*.95955	1.114E-01	*.95955	*.23130	*.23130	1.04128	1.04128	1.04128	0.00000	0.00000	0.00000	0.00000	11	*.78183	1.59154	*.64478	1.20009	1.339E-01	1.20009	*.20830	*.20830	*.89310	*.89310	*.89310	0.00000	0.00000	0.00000	0.00000	12	*.90097	1.13234	*.64478	1.35861	1.442E-01	1.35861	*.19001	*.19001	*.63542	*.63542	*.63542	0.00000	0.00000	0.00000	0.00000	13	*.97493	.56439	*.22865	1.44829	1.470E-01	1.44829	*.18963	*.18963	*.31671	*.31671	*.31671	0.00000	0.00000	0.00000	0.00000

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 ANISYMMETRICAL.
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=	-0.07502	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

(SEMISSPAN AT FINAL OUTBOARD SWEEP/SEMISSPAN AT INITIAL OUTBOARD SWEET)= 1.00000

LOCATION OF PERIMETER POINTS FOR PLANFORM TO BE USED IN THE COMPUTATIONS
WHEN NONDIMENSIONALIZED BY THE SEMISSPAN 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=	-0.07502	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
		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

AERODYNAMIC DATA

ANGLE FOR ZERO LIFT, ALPHA ZERO = -98285
 ROOT BENDING MOMENT COEFFICIENT AT ZERO LIFT, BMROOT = -.00541
 CL, TWIST AND CAMBER = .03172 CM, TWIST AND CAMBER = -.03091 CL, DESIGN = .22000
 CLA = 1.849112 CMA = -.37985 CROLL = .00000 CLA/A**2 = .021360 CDI/CLAI**2 = .21815
 CLA PER DEGREE = .02227 CMA PER DEGREE = -.00663 CDI/CLAI**2 = .021360

CASE NUMBER = 200

PITCHING MOMENT COEFF. AT ZERO LIFT, CM ZERO = -.02440

CL=A = .00000 CROLL = .00000 CL, TWIST AND CAMBER = .03172 CM, TWIST AND CAMBER = -.03091 CL, DESIGN = .22000
 CLA/A**2 = .00156 CDI/CLAI**2 = .021360

CHORDWISE LOCATION OF CENTER OF PRESSURE = .69739
 SPANWISE LOCATION OF CENTER OF PRESSURE = .42084

FOR THE ADDITIONAL LOADING
 A.C. IN FRACTION OF CREF MEASURED FROM LEADING EDGE OF CREF = .45542

SPAN STA.	2Y/B	LOCAL CIRCU ADD	LOCAL CIRCU BASIC	LOCAL LIFT COEFF	LOCAL LIFT COEFF, ADD	LOCAL LIFT COEFF, TOTAL	LOCAL PITCH COEFF, LE COEFF, TOTAL	LOCAL PITCH COEFF, LE COEFF, BASIC	LOCAL PITCH COEFF, TOTAL	LOCAL PITCH COEFF, LE COEFF, TOTAL	LOCAL PITCH COEFF, LE COEFF, BASIC	LOCAL PITCH COEFF, TOTAL	LOCAL CHORD	LOCAL CHORD	LOCAL CHORD	LOCAL CHORD
20	0.00000	.80171	.01136	.10674	.93371	.01323	.12432	-.49542	-.06011	-.11906	1.71727	.05204				
21	.07846	.79757	.01049	.1.10393	.01452	.01452	.14586	-.51815	-.06060	-.12225	1.44497	.31224				
22	.15643	.78855	.00871	.1.0253	.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	.65030	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	.05889	.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	-.08558	.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	.0907	1.48981				
39	.99692	.06091	-.00156	.00569	.1.36043	-.03479	.12707	-.10752	-.03084	-.04363	.08954	1.49763				

N	L	S	2Y/B	X/C	DELTA CP ADD	DELTA CP ADD	DELTA CP BASIC	DELTA CP TOTAL
0.00000	0.00000	0.00000	0.00000	0.00000	.52418	.52418	-.01682	-.01682

20	2	0.00000	*.09549	-.01648	.02917
20	3	0.00000	*.20611	*.63071	-.02750
20	4	0.00000	*.34549	1.00656	-.03870
20	5	0.00000	*.50000	1.28777	-.02027
20	6	0.00000	*.65451	1.32537	.03232
20	7	0.00000	*.79389	1.11167	*.19001
20	8	0.00000	*.90451	-.75177	.09140
20	9	0.00000	*.97553	*.36476	-.08010
20	10	0.00000	1.00000	*.00000	.00000
21	1	*.07846	*.02447	1.19878	-.09083
21	2	*.07846	*.09549	*.82118	-.04563
21	3	*.07846	*.20611	*.96808	*.04041
21	4	*.07846	*.34549	1.23866	-.03294
21	5	*.07846	*.50000	1.40455	-.00167
21	6	*.07846	*.65451	1.33986	.05250
21	7	*.07846	*.79389	1.06014	-.10402
21	8	*.07846	*.90451	-.68127	.11877
21	9	*.07846	*.97553	-.31732	-.07925
21	10	*.07846	1.00000	*.00000	.00000
22	1	*.15643	*.02447	2.58932	-.17101
22	2	*.15643	*.09549	1.82729	-.10133
22	3	*.15643	*.20611	1.70242	-.06470
22	4	*.15643	*.34549	1.62609	-.01972
22	5	*.15643	*.50000	1.47350	.03559
22	6	*.15643	*.65451	1.26665	.08864
22	7	*.15643	*.79389	*.91721	.12033
22	8	*.15643	*.90451	*.59262	.11509
22	9	*.15643	*.97553	*.28593	-.07031
22	10	*.15643	1.00000	*.00000	.00000
23	1	*.23345	*.02447	5.92399	-.36757
23	2	*.23345	*.09549	2.95542	-.14316
23	3	*.23345	*.20611	2.05085	-.04590
23	4	*.23345	*.34549	1.65967	.02207
23	5	*.23345	*.50000	1.40003	.07600
23	6	*.23345	*.65451	1.12413	.11367
23	7	*.23345	*.79389	*.80761	.12713
23	8	*.23345	*.90451	*.49309	.11012
23	9	*.23345	*.97553	*.22435	.06403
23	10	*.23345	1.00000	*.00000	.00000
24	1	*.30902	*.02447	6.37664	-.41633
24	2	*.30902	*.09549	3.29614	.13003
24	3	*.30902	*.20611	2.32074	-.05530
24	4	*.30902	*.34549	1.83087	.02382
24	5	*.30902	*.50000	1.46985	.03386
24	6	*.30902	*.65451	1.12254	.12120
24	7	*.30902	*.79389	*.77654	.25475
24	8	*.30902	*.90451	*.46365	.22242
24	9	*.30902	*.97553	*.20900	.06160
24	10	*.30902	1.00000	*.00000	.00000
25	1	*.38268	*.02447	6.*97969	-.46632
25	2	*.38268	*.09549	3.44219	.36410
25	3	*.38268	1.00000	*.00000	.00000

3	38268	2.55299	-0.06329
25	*38268	*34549	1.96655
25	*38268	*50000	1.52680
25	5	1.13149	1.13149
25	6	*65451	1.2545
25	7	*79389	1.3253
25	8	*90451	1.3253
25	9	*38268	1.63449
25	10	*38268	1.00000
25	11	*45399	0.02447
26	1	*45399	0.09549
26	2	*45399	*20611
26	3	*45399	*97553
26	4	*45399	*34549
26	5	*45399	*50000
26	6	*45399	*65451
26	7	*45399	*79389
26	8	*45399	*90451
26	9	*45399	*97553
26	10	*45399	1.00000
27	1	*52250	0.02447
27	2	*52250	*09549
27	3	*52250	*20611
27	4	*52250	*34549
27	5	*52250	*50000
27	6	*52250	*65451
27	7	*52250	*79389
27	8	*52250	*90451
27	9	*52250	*97553
27	10	*52250	1.00000
28	1	*58779	*02447
28	2	*58779	*09549
28	3	*58779	*20611
28	4	*58779	*34549
28	5	*58779	*50000
28	6	*58779	*65451
28	7	*58779	*79389
28	8	*58779	*90451
28	9	*58779	*97553
28	10	*58779	1.00000
29	1	*64945	*02447
29	2	*64945	*09549
29	3	*64945	*20611
29	4	*64945	*34549
29	5	*64945	*50000
29	6	*64945	*65451
29	7	*64945	*79389
29	8	*64945	*90451
29	9	*64945	*97553
29	10	*64945	1.00000
30	1	*70711	*02447
30	2	*70711	*09549
30	3	*70711	*20611

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	-3.28884	*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	*33393
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
				2.85190	-.00711	*34220

35	5	*92388	.50000	*.68253	.08783				
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			
35	1	*95106	.02447	18.4305	-1.18761	1.00536			
36	2	*95106	.09549	8.35188	-.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	*20662			
37	6	*97237	.65451	*.41350	.12539	*17459			
37	7	*97237	.79389	*.28675	.11927	*15339			
37	8	*97237	.90451	*.23597	*.09240	*12647			
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	*08991			
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	*06446			
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				

CHORDAL LOAD FACTORS, Q, FOR ADDITIONAL LOAD

SPAN
CTA

	* 14917	1.74321	-.54818	-.31907
20	* 25791	1.51519	-.26696	-.25644
21	* 38740	1.23324	.16649	-.03001
22	* 82369	.32407	-.05527	-.08167
23	* 79308	.33727	.04368	-.04566
24	* 78078	.30203	.08268	-.02259
25	* 76755	.05694	-.09002	-.00732
26	* 75048	.20847	.10283	.00225
27	* 72862	.15927	.09857	.00719
28	* 70294	.10829	.08786	.00817
29	* 67341	.05656	.07307	.00649
30	* 64019	.00472	.05628	.00356
31	* 60268	-.04513	.04017	.00129
32	* 56044	-.09125	.02686	.00164
33	* 51304	-.13213	.01726	.00634
34	* 46123	-.16873	.00838	.01491
35	* 40827	-.20725	-.01102	.02020
36	* 36101	-.26105	-.06174	.00476
37	* 31338	-.31760	-.14113	-.03972
38	* 19368	-.23226	-.12619	-.04731
39				

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

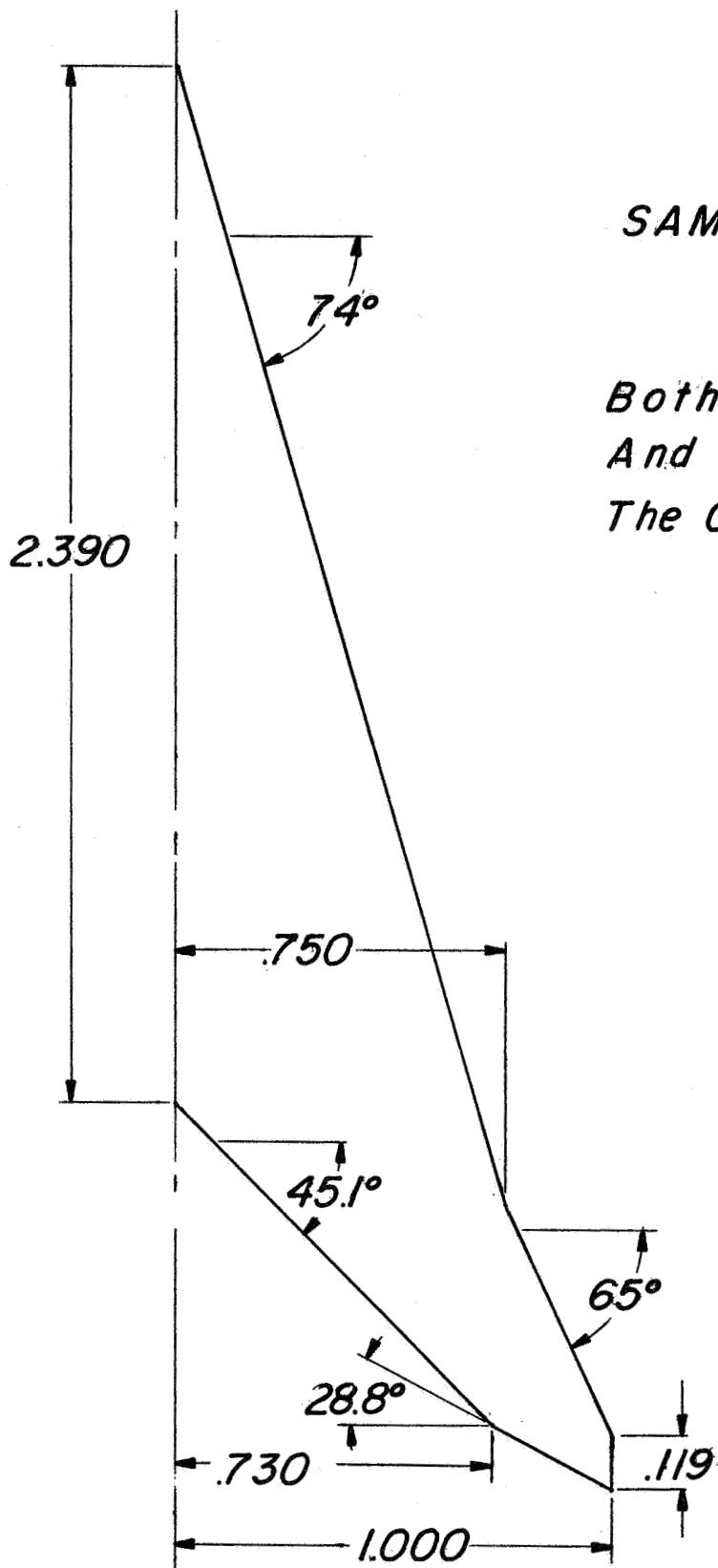
SPAN STA.	0	1	2	3	CHORDAL LOAD FACTORS, QT, FOR THE LOAD DUE TO TWIST AND CAMBER					
					LOCAL A.C. RATIO	LOCAL A.C. RATIO	LOCAL A.C. RATIO	LOCAL A.C. RATIO	SPAN LOAD NO 1 FT	SPAN LOAD NO 1 FT
20	-.01448	.09290	-.10373	.07530						
21	-.01779	.09713	-.09732	.04694						
22	-.02041	.09743	-.08545	.00884						
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	-.00132	.00313						
39	-.00938	.01746	.00634	.00302						

		NO LIFT	AT CLDESG	NO LIFT	AT CLDESG	NO LIFT	AT CLDESG	NO LIFT	AT CLDESG	NO LIFT	AT CLDESG
20	0.00000	3.20685	* 04543	* 42697	* 15712	3.864E+00	* 53059	1.610E+00	* 64543	1.29272	* 03387
21	* 07846	3.19029	* 04196	* 42153	* 22371	4.022E+00	* 60183	* 46937	1.784E+00	* 60021	1.28604
22	* 15643	3.15422	* 03483	* 41010	* 35999	4.220E+00	* 68781	* 38281	2.106E+00	* 52913	1.27150
23	* 23345	3.05675	* 02644	* 39488	* 49578	4.683E+00	* 77611	* 29810	2.682E+00	* 45772	1.24834
24	* 30902	3.02132	* 01145	* 37691	* 57545	6.184E+00	* 83507	* 28816	3.793E+00	* 45041	1.21793
25	* 38268	2.92731	* 00841	* 35669	* 65750	1.069E+01	* 89418	* 27943	7.211E+00	* 64288	1.18003
26	* 45399	2.81492	-* 00039	* 33452	* 74083	-1.821E+02	* 95357	* 27203	-1.403E+02	* 43560	1.13473
27	* 52250	2.68516	-* 00858	* 31089	* 82354	-6.018E+00	1.01229	* 26545	-5.637E+00	* 42828	1.08242
28	* 58779	2.53919	-* 01586	* 28624	* 90432	-2.080E+00	1.06970	* 25939	-2.654E+00	* 42085	1.02358
29	* 64945	2.37846	-* 02197	* 26101	* 98185	-7.194E-01	1.12507	* 25337	-1.643E+00	* 41305	* 95879
30	* 70711	2.20442	-* 02672	* 23555	1.05520	-2.572E-02	* 1.17784	* 24706	-1.143E+00	* 40473	* 88863
31	* 76041	2.01862	-* 02998	* 21018	1.12351	3.952E-01	* 1.22740	* 23997	-8.508E-01	* 39557	* 81373
32	* 80902	1.82248	-* 03168	* 18516	1.18609	6.766E-01	* 1.27326	* 23162	-6.666E-01	* 38529	* 73466
33	* 85264	1.61734	-* 03179	* 16063	1.24235	8.756E-01	* 1.31494	* 22132	5.474E-01	* 37345	* 65197
34	* 89101	1.40422	-* 03037	* 13670	1.29175	1.021E+00	* 1.35199	* 20822	-4.733E-01	* 35961	* 56606
35	* 92388	1.18394	-* 02751	* 11335	1.33384	1.127E+00	* 1.38398	* 19126	-4.350E-01	* 34322	* 47726
36	* 95106	* 95706	-* 02338	* 09049	1.36825	1.205E+00	* 1.40054	* 16949	-4.282E-01	* 32392	* 38580
37	* 97237	* 72409	-* 01823	* 06791	1.39454	1.258E+00	* 1.43122	* 14191	-4.526E-01	* 30153	* 29189
38	* 98769	* 48564	-* 01239	* 04539	1.41200	1.290E+00	* 1.44441	* 10731	-5.104E-01	* 27594	* 19577
39	* 99692	* 24362	-* 00623	* 02276	1.42225	1.307E+00	* 1.45385	* 07903	-5.655E-01	* 25551	* 09821
											* 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	KEMP 1
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	KEMP 2
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	KEMP 3
0.00000	0.00000	0.00000	0.00000	0.94790	0.93910	0.92460
0.9043	0.8784	0.8473	0.8107	0.7693	0.7230	0.6723
0.5589	0.4969	0.4317	0.3638	0.2937	0.2218	0.1487
0.0000	0.2711	0.5154	0.7230	0.8826	0.9824	1.0113
0.9232	0.8676	0.8068	0.7336	0.6260	0.5148	0.3984
0.1807	0.0927	0.0324	0.0045	-0.3169	-0.1352	0.0306
0.2870	0.3623	0.3814	0.3783	0.3590	0.3374	0.3138
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*

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,13HGEOOMETRY 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/C9X3
1HX/C9X3HX/C)
514 FORMAT(15X,9HIF SYMMETRY CODE IS EQUAL TO 1,THE SPAN LOADING IS S
1YMMETRICAL/OTHER THAN 1,IT IS ANTI SYMMETRICAL)
515 FORMAT(///52X,17HMEAN CAMBER SHAPE//)
516 FORMAT(4XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF7.5,5XF
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(SEMISPAWN AT FINAL OUTBOARD SWEEP,37H/SEMISPAWN AT IN
 1ITIAL OUTBOARD SWEEP)=,F9.5)

```

559 FORMAT(31X69HPOLYNOMIAL COEFFICIENTS OF (X/C),IN ORDER OF INCREASING 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 EQUAL TO ZERO
C
C
C IF THE WING DOES NOT HAVE TRAILING EDGE BREAK SET B2RAT AND PSI EQUAL TO ZERO
C
C
C IF THE WING DOES NOT HAVE A VARIABLE SWEEP OUTER PANEL SET DELT, XP AND YP EQUAL TO ZERO
C
C
C IF THE SPAN LOADING IS TO BE SYMMETRICAL SET THE SYM CODE EQUAL TO ONE, IF ANTISSYMMETRICAL SET THE SYM CODE EQUAL TO TWO
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 VARIABLE 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
NNI I=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

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```

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
IFI((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)

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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
IFI(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
IFI ABS(ALAME-CHI).GE.0.000174) GO TO 765
X3NP=X2PP
Y3NP=Y2PP

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```

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=0.000000
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

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```

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

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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)*TANUC**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
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.)
1     CHDSUB=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)*TANCB-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
CHI I=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
C
C

MAIN PROGRAM

```

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
C
C

CHORDAL INTEGRATION SUBROUTINE
SOLVES FOR THE CHORDAL INFLUENCE FUNCTION VALUES

```
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)=0.0000000
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
S)**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
C      DIMENSION IPIVOT(N),A(NMAX,N),B(NMAX,M),INDEX(NMAX,2)
C      EQUIVALENCE (IROW,JROW), (ICOLUMN,JCOLUMN), (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 ICOLUMN=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(ICOLUMN)=IPIVOT(ICOLUMN)+1
C
C      INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL
C
130 IF (IROW-ICOLUMN) 140, 260, 140
140 DETERM=-DETERM
150 DO 200 L=1,N
160 SWAP=A(IROW,L)

```

```

170 A(IROW,L)=A(ICOLUMN,L)
200 A(ICOLUMN,L)=SWAP
205 IF(M) 260, 260, 210
210 DO 250 L=1, M
220 SWAP=B(IROW,L)
230 B(IROW,L)=B(ICOLUMN,L)
250 B(ICOLUMN,L)=SWAP
260 INDEX(I,1)=IROW
270 INDEX(I,2)=ICOLUMN
310 PIVOT=A(ICOLUMN,ICOLUMN)

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(ICOLUMN,ICOLUMN)=1.0
340 DO 350 L=1,N
350 A(ICOLUMN,L)=A(ICOLUMN,L)/PIVOT
355 IF(M) 380, 380, 360
360 DO 370 L=1,M
370 B(ICOLUMN,L)=B(ICOLUMN,L)/PIVOT
C
C      REDUCE NON-PIVOT ROWS
C
380 DO 550 L1=1,N
390 IF(L1-ICOLUMN) 400, 550, 400
400 T=A(L1,ICOLUMN)
420 A(L1,ICOLUMN)=0.0
430 DO 450 L=1,N
450 A(L1,L)=A(L1,L)-A(ICOLUMN,L)*T
455 IF(M) 550, 550, 460
460 DO 500 L=1,M
500 B(L1,L)=B(L1,L)-B(ICOLUMN,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 JCOLUMN=INDEX(L,2)
650 DO 705 K=1,N
660 SWAP=A(K,JROW)
670 A(K,JROW)=A(K,JCOLUMN)
680 A(K,JCOLUMN)=SWAP
695 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/0377777777777/
DIMENSION C(M)
IF(M-1)10,11,12
12 N=M-1
    POLYE1=C(1)
    DO20 I=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

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

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

{SEMISSPAN AT FINAL OUTBOARD SWEEP/SEMISSPAN AT INITIAL OUTBOARD SWEEP)= 1.00000

LOCATION OF PERIMETER POINTS FOR PLANFORM TO BE USED IN THE COMPUTATIONS
 WHEN NONDIMENSIONALIZED BY THE SEMISSPAN 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 SWEET ANGLE= 74.00000 LE INITIAL OUTBOARD SWEET ANGLE= 65.00000 LE FINAL OUTBOARD SWEET ANGLE= 55.00000
TE INBOARD SWEET ANGLE= 45.10000 TE INITIAL OUTBOARD SWEET ANGLE= 28.80664 TE FINAL OUTBOARD SWEET ANGLE= 28.80664

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

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

A1 -.18558	A2 1.89784	A3 -6.58681	A4 4.38619	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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						
.41318	.11698	.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
X/C	X/C	X/C	X/C	X/C	X/C	X/C	X/C
•.13556 •.41318	-.68371 •.75000	-.55631 •.96985	-.48703 •.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= 1.80068

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

CON.PT.1 -•04879 X/C •11698	CON.PT.2 -•89142 X/C •41318	CON.PT.3 -•57234 X/C •75000	CON.PT.4 -•47086 X/C •96985	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C
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POLYNOMIAL COEFFICIENTS OF (X/C), IN ORDER OF INCREASING POWERS OF X/C

A1 .86522	A2 -9.60926	A3 16.29197	A4 -8.04705	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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 •10929 X/C •11698	CON.PT.2 -1.09992 X/C •41318	CON.PT.3 -.61739 X/C •75000	CON.PT.4 -.46052 X/C •96985	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C

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

A1 1.43314	A2 -13.93225	A3 23.72839	A4 -11.72992	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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 •31317	CON.PT.2 -1.29999	CON.PT.3 -.66694	CON.PT.4 -.44867	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C
X/C •11698	X/C •41313	X/C •75000	X/C •96985						

POLYNOMIAL COEFFICIENTS OF (x/c), IN ORDER OF INCREASING POWERS OF x/c

A1 2.06916	A2 -18.46539	A3 31.33376	A4 -15.43656	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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 •59741 X/C •11698	CON.PT.2 -1.40606 X/C .41318	CON.PT.3 -.75231 X/C •75000	CON.PT.4 -4.5405 X/C •76985	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C

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

A ₁ 2.68234	A ₂ -21.79319	A ₃ 35.96703	A ₄ -17.35400	A ₅ 0.00000	A ₆ 0.00000	A ₇ 0.00000	A ₈ 0.00000	A ₉ 0.00000	A ₁₀ 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
-1.40040	-74011	-44656	-44656	X/C	X/C	X/C	X/C	X/C	X/C
.88132	X/C	X/C	X/C						
X/C									
.41318		.75000	.96985						
.11698									

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
*100000	*69421
*200000	*73618
*300000	*66997
*400000	*56446
*500000	*40501
*600000	*27348
*700000	*16816
*800000	*09387
*900000	*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 1.05785 X/C .11696	CON.PT.2 -1.49188 X/C .41318	CON.PT.3 -.77266 X/C .75000	CON.PT.4 -.44693 X/C .96985	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C
--------------------------------------	---------------------------------------	--------------------------------------	--------------------------------------	-----------------	-----------------	-----------------	-----------------	-----------------	------------------

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

A1 3.73155	A2 -27.45380	A3 44.74261	A4 -21.52669	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 0.00003
---------------	-----------------	----------------	-----------------	---------------	---------------	---------------	---------------	---------------	----------------

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

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

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

MEAN CAMBER SHAPE

X/C	Z/C
0.00000	.48212
.10000	.74660
.20000	.81580
.30000	.74616
.40000	.60342
.50000	.43829
.60000	.23648
.70000	.16859
.80000	.09030
.90000	.04219
1.00000	0.00000

STATION NUMBER= 3.0 SPANWISE LOCATION= •70711 CHORD= •63314

SLOPES, (W/U), AT CONTROL POINTS, FROM FRONT TO REAR					
CON.PT.1 1.48433 X/C •11698	CON.PT.2 -1.66119 X/C •41318	CON.PT.3 -.78881 X/C •75000	CON.PT.4 -.43674 X/C •96985	CON.PT.5 X/C	CON.PT.6 X/C

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

A1 4.69759	A2 -33.52258	A3 54.85557	A4 -26.54988	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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 1.66139 X/C •11698	CON. PT.2 -1.27286 X/C •41318	CON. PT.3 -.79623 X/C •75000	CON. PT.4 -.44646 X/C •96985	CON. PT.5 X/C	CON. PT.6 X/C	CON. PT.7 X/C	CON. PT.8 X/C	CON. PT.9 X/C	CON. PT.10 X/C

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 1.46585 X/C •11698	CON.PT.2 -1.21739 X/C •41318	CON.PT.3 -•79576 X/C •75000	CON.PT.4 -•46194 X/C •96985	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C
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POLYNOMIAL COEFFICIENTS OF (X/C), IN ORDER OF INCREASING POWERS OF X/C

A1 3.98473	A2 -25.96050	A3 40.01774	A4 -18.53651	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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 1.63229 X/C .11698	CON.PT.2 -1.08919 X/C .41318	CON.PT.3 -.81893 X/C .75000	CON.PT.4 -.48537 X/C .96985	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C
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POLYNOMIAL COEFFICIENTS OF (X/C), IN ORDER OF INCREASING POWERS OF X/C

A1 4.08608	A2 -25.13564	A3 37.54345	A4 -16.99902	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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 1.82352 X/C .11698	CON.PT.2 -.84126 X/C .41318	CON.PT.3 -.81772 X/C .75000	CON.PT.4 -.51011 X/C .96985	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C

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

A1 4.07543	A2 -22.83015	A3 32.23638	A4 -13.99347	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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= •923.88 CHORD= •24026

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

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

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

A ₁ 3.94156	A ₂ -19.15975	A ₃ 24.42134	A ₄ -9.71651	A ₅ 0.00000	A ₆ 0.00000	A ₇ 0.00000	A ₈ 0.00000	A ₉ 0.00000	A ₁₀ 0.00000
---------------------------	-----------------------------	----------------------------	----------------------------	---------------------------	---------------------------	---------------------------	---------------------------	---------------------------	----------------------------

MEAN CAMBER SHAPE

X/C 0.00000	Z/C -.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									
.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	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 2.39527 X/C .11698	CON.PT.2 •65710 X/C .41318	CON.PT.3 -.51304 X/C .75000	CON.PT.4 -.53800 X/C .96985	CON.PT.5 X/C	CON.PT.6 X/C	CON.PT.7 X/C	CON.PT.8 X/C	CON.PT.9 X/C	CON.PT.10 X/C

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

A1 3.16870	A2 -6.69450	A3 .39800	A4 2.64357	A5 0.00000	A6 0.00000	A7 0.00000	A8 0.00000	A9 0.00000	A10 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= 3.8 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

A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀
2.508C3	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	-.699830
*20000	-.457770
*30000	-.247119
*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 2.41508 X/C .11698	CON. PT. 2 1.96292 X/C .41318	CON. PT. 3 .04329 X/C .75000	CON. PT. 4 -.50167 X/C .96985	CON. PT. 5 X/C	CON. PT. 6 X/C	CON. PT. 7 X/C	CON. PT. 8 X/C	CON. PT. 9 X/C	CON. PT. 10 X/C
--	--	---------------------------------------	--	-------------------	-------------------	-------------------	-------------------	-------------------	--------------------

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

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

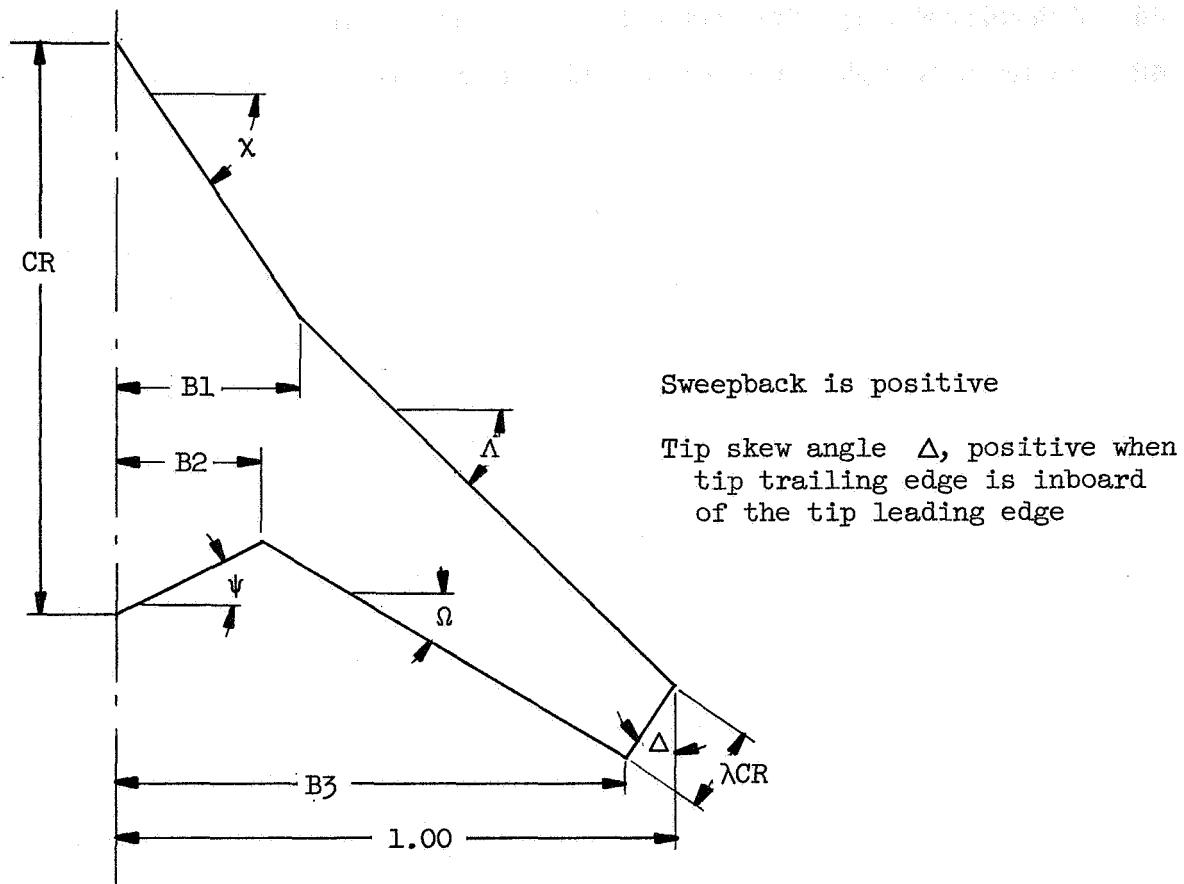


Figure 2.- General planform used in aspect ratio program.

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 $\Delta = 45^\circ$ and $M = 0.60$.

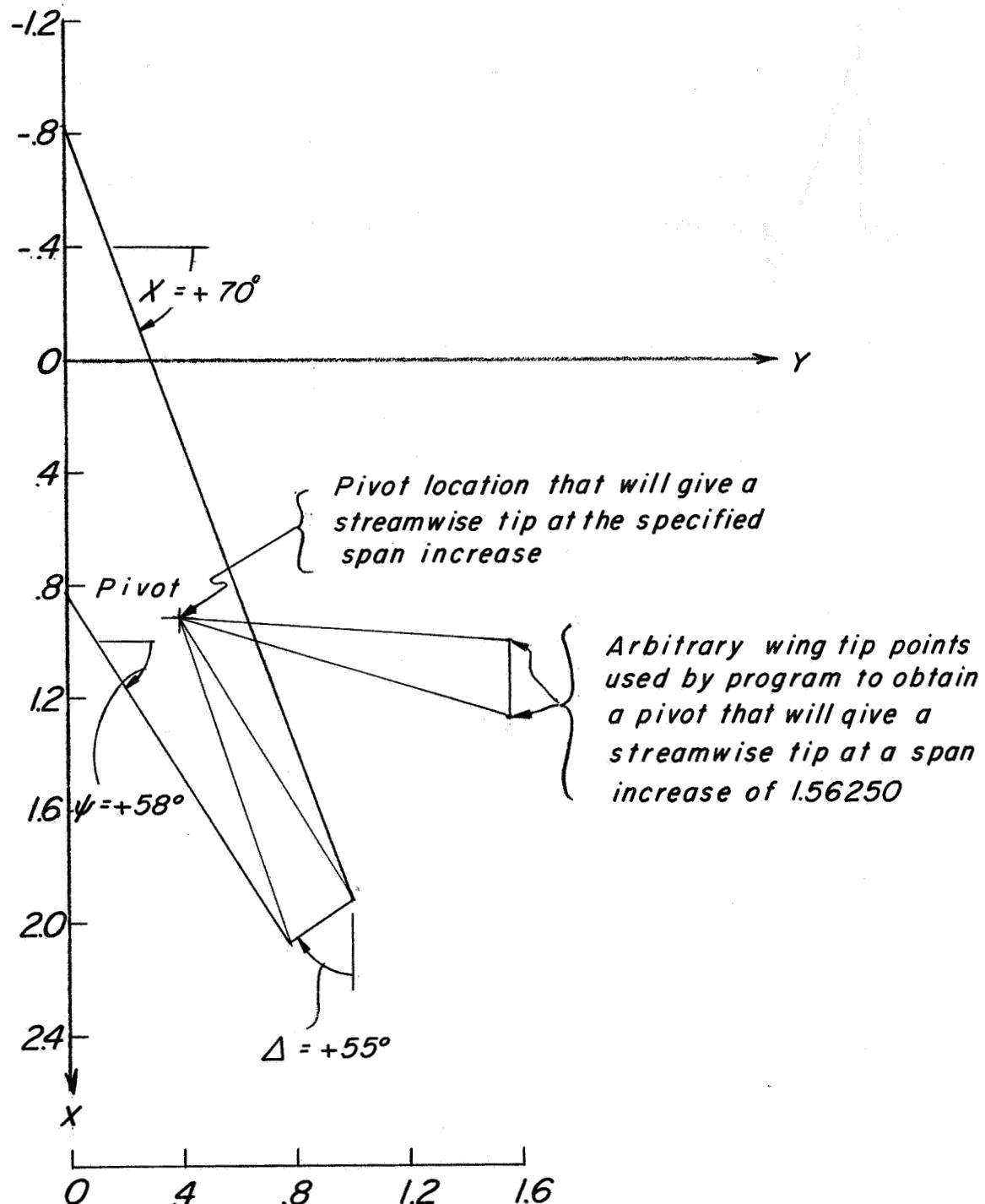


Figure 3.- Arrow planform in original high sweep position.

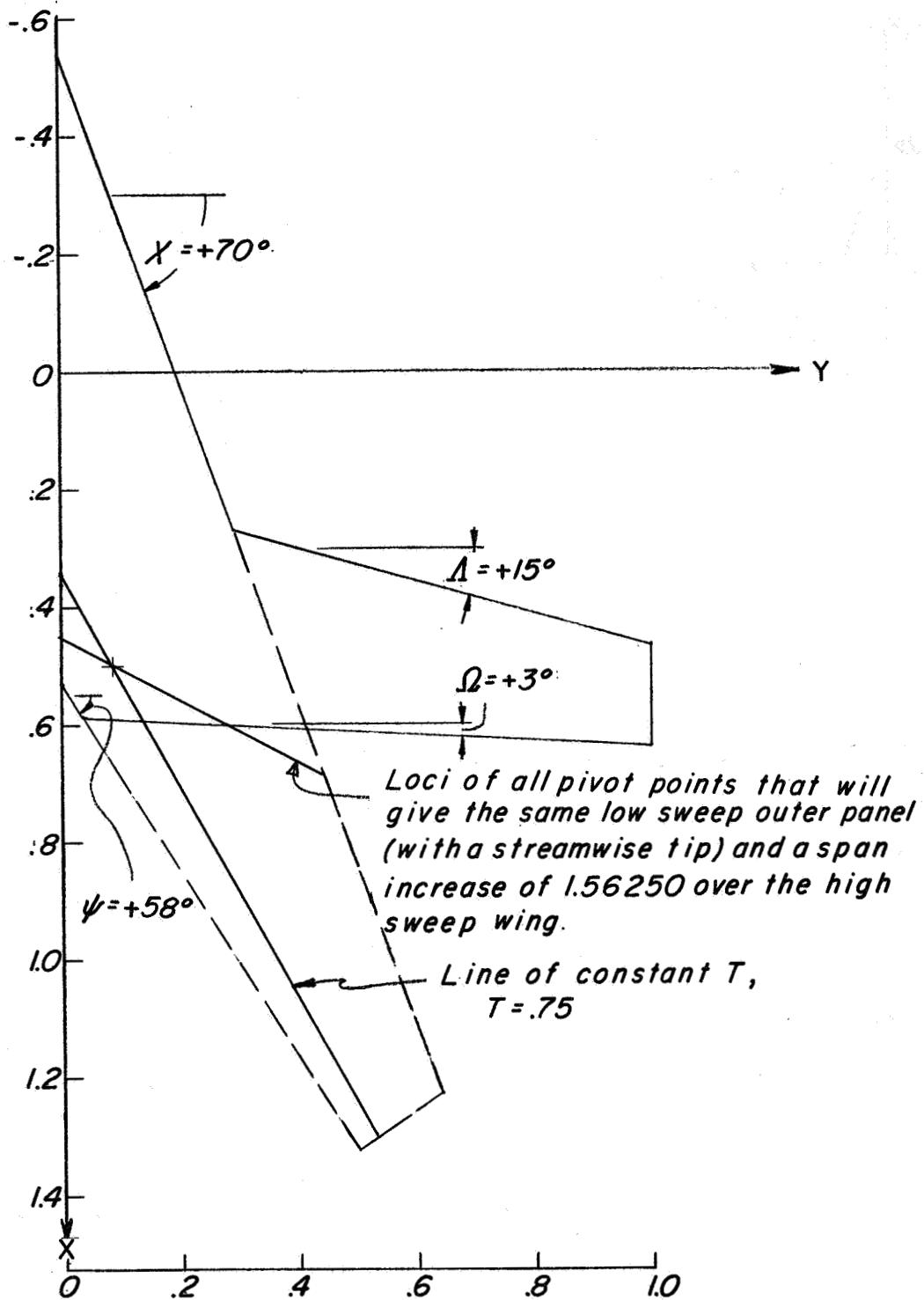


Figure 4.- Low sweep position.

ASPECT RATIO PROGRAM A1590

Sample Input Data

		Sample case		
		First	Second	Third
		0.256	0.00	0.00
56.5	44.00	-26.00	30.00	0.320
0.154	36.5	0.0		
0.00	75.00	-35.00	-35.00	0.00
0.15	50.00	1.0		
83.00	62.00	0.0	-10.48842	0.20833
0.04874	0.	0.0		
0.00	70.00	0.00	58.00	0.00
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(1H1,4X2HAR6X3HCHI4X6HLAMBDA6X3HPST3X5HOMEWA7X2HB17X
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*(1
      TANO-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-
      TANC)-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=CMEGA-9.
PSI=PSI-9.
ITEST=2
GO TO 3
6 OMEGA=CMEGA+1.
PSI=PSI+1.
GO TO 3
7 OMEGA=CMEGA-0.9
PSI=PSI-0.9
ITEST=3
GO TO 3
8 OMEGA=CMEGA+0.1
PSI=PSI+0.1
GO TO 3
9 OMEGA=CMEGA-0.09
PSI=PSI-0.09
ITEST=4
GO TO 3
10 OMEGA=CMEGA+0.01
PSI=PSI+0.01
GO TO 3
11 OMEGA=CMEGA-0.009
PSI=PSI-0.009
ITEST=5
GO TO 3
12 OMEGA=CMEGA+0.001
PSI=PSI+0.001
GO TO 3
13 OMEGA=CMEGA-0.0009
PSI=PSI-0.0009
ITEST=6
GO TO 3
14 OMEGA=CMEGA+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,R2,TAPER,DELTA,CR,B3
GO TO 1
21 STOP
END

```

Sample Output Data

	Sample											
	AR	CHI	LAMBDA	PSI	OMEGA	B1	R2	TAPER	DELTA	CR	B3	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	• 77843	3d	
1.94775	0.00000	70.00000	0.00000 58.00000	0.00000	0.00000	• 16325	55.00000	1.65687			4th	

PIVOT DETERMINING PROGRAM A1591

Sample Input Data

<u>1.94775</u>	<u>70.00000</u>	<u>58.00000</u>	<u>0.16325</u>	<u>55.00000</u>	<u>1.65687</u>
<u>1.56250</u>	<u>5.00000</u>				
<u>0.75</u>	<u>0.77</u>	<u>0.80</u>	<u>0.82</u>	<u>0.85</u>	

Program Listing

```

PROGRAM PIVOT      (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
DIMENSION XCR(100),TANL0(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,6HDELT=,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
    ITS THAT WILL SWEEP)
557 FORMAT(20X,68HTHE HIGH SWEEP WING OUTER PANEL INTO THE SAME LOW SW
    IEEP AND SEMISPA//)
558 FORMAT(47X,8HX PIVOT=,F9.5/47X,8HY PIVOT=,F9.5/49X,6HSLOPE=,F9.5//)
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 SEMISPA 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,31HSEMISPA 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 SEMISPA//)
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)
TAND=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
      TANL0(I)=SIN((LAMBDA-OMEGA)*T(I))/COS((LAMBDA-OMEGA)*T(I))
      XCR(I)=(T(I)*COS(LAMBDA)+SIN(LAMBDA)*TANL0(I))*CR/(COS(LAMBDA)
      1+SIN(LAMBDA)*TANL0(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,CRI,BOT,CHDEXT
WRITE(6,566)
WRITE(6,565) XP1,YP1
WRITE(6,568)
4 CONTINUE
GO TO 1
5 STOP
END
```

INPUT DATA

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

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 SEMISSPAN

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

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 SWEET POSITION
ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISSPAN 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 SEMSPLAN OF WING IN HIGH SWEET= .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 SWEET POSITION
ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISPAH 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 SEMISPAH OF WING IN HIGH SWEET= .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 SWEET POSITION
ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISSPAN 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= 1.776032

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 SEMISPA OF WING IN HIGH SWEET= .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 SWEET POSITION
ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISSPAN 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*

X 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= .00741	CR= .16325	SEMSPLAN OF WING IN HIGH SWEET= .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 SWEET POSITION
ALL OF THESE DIMENSIONS ARE SCALED FOR A UNIT SEMISSPAN 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 CHT= 70.0000 LAMBDA= 15.00000 PSI= 58.00000 OMEGA= 3.00000 Y LE BREAK= .26793
Y TE BREAK=.00010 TAPER=.16442 CR= 1.05284 SEMISPA OF WING IN HIGH SWEET= .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