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A COMPUTER PROGRAM FOR CALCULATING SYMMETRICAL AERODYNAMIC CHARACTERISTICS AND LATERAL-DIRECTIONAL STABILITY DERIVATIVES OF WING-BODY COMBINATIONS WITH BLOWING JETS

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A COMPUTER PROGRAM FOR CALCULATING SYMMETRICAL AERODYNAMIC CHARACTERISTICS AND LATERAL-DIRECTIONAL STABILITY DERIVATIVES OF WING-BODY COMBINATIONS WITH BLOWING JETS

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INTRODUCTION

This document describes in detail the necessary information for using a computer program to calculate the aerodynamic characteristics under symmetrical flight conditions and the lateral-directional stability derivatives of wing-body combinations with upper-surface-blowing (USB) or over-wing-blowing (OWB) jets. This program is an updated version of that described in NASA TM X-73987 (reference 1). In addition to the features and restrictions described in reference 1, the following new features have been added to the program: (1) A fuselage of arbitrary body of revolution has been included. The effect of wing-body interference can now be investigated. (2) All nine lateral-directional stability derivatives can be calculated.

The program is written in Fortran language and runs on CDC Cyber 175 and Honeywell 66/60 computers. It is available from COSMIC of the University of Georgia, Athens, Georgia.

SYMBOLS

A_j	cross sectional area of the jet
C_T	thrust coefficient = thrust/qS_w
M_j	Mach number of the jet
M_∞	Mach number of the freestream
p_{tj}	jet total pressure
p_∞	static pressure
q	freestream dynamic pressure
r(x)	fuselage radius as a function of x
S_w	wing area
T_j	static temperature of the jet in $^\circ R$ or $^\circ K$
T_∞	freestream static temperature in $^\circ R$ or $^\circ K$
V_j	jet velocity
V_∞	freestream velocity
AR	wing aspect ratio
L.E.	leading edge
T.E.	trailing edge

ρ_j	jet density
ρ_∞	freestream density
γ	ratio of specific heats

Description of New Program Features

The program can be run without the fuselage, in exactly the same manner as described in reference 1. Therefore, all instructions concerning the preparation of wing-jet geometry in reference 1 are still applicable. When a fuselage is present, the coordinate origin should be assumed on the fuselage axis, with the positive x-axis coincident with the fuselage axis and pointing downstream. The wing and jet geometry should be defined accordingly. The jet is not allowed to wash the fuselage in the present program. Some restrictions in preparing the fuselage geometry are described below.

(1) The fuselage must be a body of revolution; but otherwise, arbitrary axial distribution of cross-sectional area is allowed. No fuselage camber effect is included. For arbitrary bodies, their equivalent bodies of revolution may be used.

(2) The wing chord along the wing-body juncture is best to be parallel to the freestream. The wing planform as described by the input data should not penetrate into the fuselage.

(3) The fuselage geometry can be described to the program by providing r(x) analytically to the function subprogram FUR(X) and $r\frac{dr}{dx}$ to the function subprogram SLOP(X). Alternatively, the radii at a finite number of stations (restricted to be 21 or less) can be input.

Since the fuselage aft body is greatly influenced by the displaced wake, and since the wake displacement is not accounted for in the program, the fuselage contribution to lift and pitching moment may not be accurate. However,

the fuselage lift is known to be small in most cases and can therefore be neglected.

When the lateral-directional stability derivatives are to be calculated, the program will always start to compute the symmetrical aerodynamic characteristics first, as some of these derivatives depend on the symmetrical flight conditions. Therefore, it is not possible for the program to calculate these derivatives only, without calculating the symmetrical loading at the same time. As has been shown previously (reference 2), the fuselage contribution to forces and moments is very much affected by the viscous effect. More accurate evaluation of the fuselage contribution to the derivatives can be made if some last portion of the fuselage is not included in the force and moment integrations (reference 2). This is done in the present program by providing a value to the input variable "Xl" which is related empirically to the last station to be included in the force and moment integrals. If it is not exactly clear from the geometry of the equivalent body of revolution what value of "Xl" should be input, a value of 0.75 - 0.85 for fuselages with upswept after body and 1.0 for others should provide reasonable results under usual circumstances.

The total number of vortices representing the wing can be determined with the following equation:

$$\text{LPANEL} = [\text{NW}(1) + \text{NW}(2) + \text{NW}(3)] \times \left[\sum_{I=1}^{NC} (\text{M1}(I) - 1) \right]$$

where the input variables appearing on the right hand side are defined in

the section under Input Data Format. Since the wing-body interference is accounted for through the matching of Fourier components of the induced velocities on the fuselage surface, the number of additional unknowns due to the presence of the fuselage is equal to the product of the number of Fourier components "NT" used and the number of stations "NF" at which the body boundary condition is to be satisfied. Therefore, the total number of unknowns to be solved for the wing-body alone without the jet is

$$LWF = LPANEL + NT \times NF$$

LPANEL is limited to 100 and LWF to 130. For good results, NT can be set to 2 and NF to 12-14.

The number of vortex elements used to represent the outside (or inside) of the jet surface can be computed as follows:

Centered Jet

$$JPANEL = \left[\sum_{I=1}^{NNJ} NCJ(I) \right] \times [NSJ-1]$$

Outboard Jet

$$JPANEL = \left[\sum_{I=1}^{NNJ} NCJ(I) \right] \times [NSJ+1]$$

For wing-body configurations, the jet should be considered as non-centered. The number of unknowns to be solved without the fuselage is, again, (reference 1)

$$LTOTAL = LPANEL + 2 \times JPANEL$$

With the fuselage included, the total number of unknowns becomes

$$LWFJ = LWF + 2 \times JPANEL$$

where JPANEL is limited to 100, or such that LPANEL + JPANEL is less than 200. LTOTAL is limited to 300 and LWFJ to 330. LWFJ is the number to be used to calculate the array size for GAMMA(I) to be mentioned later.

INPUT DATA FORMAT

Group 1. Format 13A6 1 card

Any title identifying the cases to be run.

Group 2. Format 3(6X,I4) 1 card

ICASE Number of cases to be run.

NG = 0 if all cases have the same geometry other than the angle of attack.

= 1 if new configurations or different freestream-jet velocity ratios are to be treated.

ISYM = 0 for a centered jet

= 1, otherwise.

LAT = 0 for symmetrical aerodynamic characteristics only.

= 1 for lateral-directional stability derivatives in addition to symmetrical aerodynamic characteristics.

Group 3. Format 8F10.5 1 card

AM1 Mach number of the freestream

AM2 Mach number of the jet flow

VMU Freestream velocity divided by jet velocity.

TEMP Jet static temperature divided by freestream static temperature. Assumed to be the same as ratio of freestream density and jet density.

ALP Angle of attack in degrees.

XEL X-coordinate of the wing L.E. at the jet centerline.

XET X-coordinate of the wing T.E. at the jet centerline.

Note: If the thrust coefficient is given, VMU may be computed as

$$\frac{V_j}{V_\infty} = \frac{1}{2} \left\{1 + \left[1 + \frac{2C_T (S_w/2)}{A_j(\rho_j/\rho_\infty)}\right]^{1/2}\right\}$$

$$VMU = V_\infty/V_j$$

where C_T = thrust coefficient

S_w = wing area used to define C_T.

A_j = jet cross-sectional area

When the thrust coefficient is computed with the static thrust, the following formula for V_j/V_∞ is preferred:

$$\frac{V_j}{V_\infty} = \left[\frac{C_T(S_w/2)}{2A_j(\rho_j/\rho_\infty)}\right]^{1/2}$$

If the nozzle pressure ratio, $p_{t,j}/p_\infty$, is given, the following isentropic relations may be used.

$$M_j^2 = \frac{2}{\gamma-1}\left[\left(\frac{p_{t,j}}{p_\infty}\right)^{\frac{\gamma-1}{\gamma}} - 1\right]$$

$$\frac{T_j}{T_\infty} = \frac{1 + \frac{\gamma-1}{2} M_\infty^2}{1 + \frac{\gamma-1}{2} M_j^2}$$

$$\frac{V_\infty}{V_j} = VMU = \frac{M_\infty}{M_j} \frac{1}{\left(\frac{T_j}{T_\infty}\right)^{1/2}}$$

Group 4. Format 2(6X, I4) 5F10.5

NFP Number of flap sections, including the jet span.
A maximum of five flap sections may be input.

NJP Numerical order of the jet span among the NFP sections.

DF(I) Flap deflection angles in degrees for the flap sections.
I=1, NFP

Group 5. Format 7F10.5 1 card

HALFSW One half of the reference wing area.

CREF Reference chord

TWIST Difference in angles of attack at the tip and the root in deg. Negative for washout.

TWISTR Incidence angle of the root chord in degrees.

XJ, YJ, ZJ X, Y, and Z-coordinates of the midpoint of the jet cross-section at the exit. ZJ is referred to the wing plane.

RJ Jet radius.

Note: The last four variables are needed only for over-wing-blowing applications. They may be any non-zero numbers for USB applications, unless the rectangular jet is not on the wing surface and the entrainment effect is to be accounted for. For the latter case, these variables are used to define the equivalent circular jet.

Group 6. Format 7F10.5 1 card

TEANGL Trailing-edge half angle of the airfoil at the jet centerline in deg. For USB applications, it may be arbitrary.

PTIAL = 0. for clean or full-span flap configuration

= 1. for partial-span flap deflection.

USB = 1. for USB applications

= 0. for OWB applications

CAMLER L.E. camber slope at the root leading edge

CAMLET L.E. camber slope at the tip leading edge.

CAMTER T.E. camber slope at the root trailing edge

CAMTET T.E. camber slope at the tip trailing edge.

Note: For USB applications, TEANGL may be any value. If the camber ordinates are to be read in, the leading edge and trailing edge camber slopes may be arbitrary numbers.

Note: The following card must be omitted for OWB applications.

Group 7 Format 3F10.5 1 card

CMU Jet thrust coefficient

DFJ Jet deflection angle in degrees at the trailing edge relative to the chord line. At small flap angles, it may be taken as

the sum of flap angle and the airfoil trailing edge half angle. At large flap angles, experimental values should be used.

TNJ = 0. if the entrainment is not to be accounted for. Usually this is the case if the jet is on the wing surface.
= 1. if the entrainment due to an equivalent round jet is to be accounted for when a rectangular jet is not on the wing surface.

Group 8 Format 8(6X, I4) 1 card

NC Number of spanwise sections. A natural way of dividing a planform into sections is to follow lines of discontinuity, such as edges of partial-span flap, jet boundaries, wing edge discontinuities, etc. See Figure 1. NC is limited to 8.

M1(I) Number of vortex strips in each spanwise section, plus one.

I=1,NC Minimum value for each is 3. Maximum for each M1(I) is 31. The total number of spanwise strips is limited to 30.

NWING Numerical order of last wing spanwise section.

Group 9 Format 5(6X, I4) 1 card

NJW(I) The numerical order of the flap and jet spans among

I=1,NFP the spanwise sections.

Group 10 Format 5(6X, I4) 1 card

NW(1) Number of chordwise vortex elements in each chordwise section.

NW(2) The planform is divided into chordwise sections according

NW(3) to such lines of discontinuity as jet exit, flap hinge, etc.

If there is only one section, SET NW(2) = NW(3) = 0. For 2 sections, SET NW(3) = 0.

ICAM = 1 if the camber ordinates of the airfoils are to be read in.
= 0, otherwise. In this case, the camber functions $(\frac{dZ_c}{dx})$ in close-form expressions are to be inserted manually into subprograms ZCR(x) and ZCT(X), the root chord and tip chord camber functions, respectively.

IM Number of camber ordinates to be read in. (Limited to eleven). Arbitrary if ICAM = 0.

Note: Group 11 must be deleted if ICAM = 0.

Group 11. Format 8F10.5 4 or 8 cards

XT(1,J), J=1,IM Non-dimensional x-coordinates to define root camber.

ZC(1,J), J=1,IM Non-dimensional camber ordinates of the root chord.

XT(2,J), J=1,IM Non-dimensional x-coordinates to define tip camber.

ZC(2,J), J=1,IM Non-dimensional camber ordinates of the tip chord.

Group 12. Format 6F10.5 1 card for each wing section.

XXL(1) x-coordinate of the leading edge of the inboard boundary chord of a given spanwise section.

XXT(1) x-coordinate of the trailing edge of the inboard boundary chord of the same spanwise section.

YL(1) y-coordinate of the inboard boundary chord.

XXL(2) x-coordinate of the leading edge of the outboard boundary chord of the same spanwise section.

XXT(2) x-coordinate of the trailing edge of the outboard boundary chord

YL(2) y-coordinate of the outboard boundary chord.

ZS z-coordinate of the wing panel relative to the fuselage centerline.

Group 13. Format 6(6X, I4) 1 card

NNJ Number of jet sections.

Note. The jet region above or on the wing must be divided into streamwise sections by following the divided planform pattern. It is important to start the jet sections always from the wing leading edge even if the jet exit is downstream of the leading edge. The only exception is when the jet exit is at the trailing edge. In this case, NNJ=1 and the jet section starts from the trailing edge. NNJ is limited to 4. For the configuration of Figure 1, NNJ=4.

NSJ = Number of jet circumferential strips minus one for a non-centered jet (always use odd numbers).

= Number of jet circumferential strips on the half jet plus one for a centered jet (always use even numbers). See figure 3 of ref. 1.

NCJ(I), I=1,NNJ No. of streamwise vortex elements in each section. There should be NNJ numbers. For those jet sections above the wing, these numbers should agree with the corresponding numbers of wing vortices. See NW(1). NW(2), NW(3) in Group 10.

Note: Group 14 must be deleted for USB applications

Group 14. Format 6F10.5 NNJ cards

XXL(1)

XXT(1)

YL(1)

XXL(2) Coordinates of bounding chords of the jet section

XXT(2) projected on the x-y plane. For definition, see Group 12.

YL(2)

Note. Group 15 is to be deleted for OWB applications.

Group 15. Format 4F10.5 (4xNNJ) cards.

XXL(I) Coordinates of the bounding lines defining the

XXT(I) rectangular jet sections in USB applications.

YL(I) They are the x-coordinates of the leading and

ZL(I) trailing edges, the y-coordinate and the z-

I=1,...,4 coordinate of the bounding line. The 4 stream-wise edges of each section are defined in the order illustrated in figure 2. There are 4 cards for each jet section. The jet section behind the trailing edge, (trailing jet section), should be at least one local chord in length.

Group 16 Format 2(6X, I4) 1 card

NDG Number of sections in which the dihedral is to be defined. It does not have to be the same as NC

defined in Group 8. NDG must be at least 1 and limited to 5.

MDG = 1 if the dihedral angle of any section is not zero.
= 0 if no dihedral exists.

Group 17 Format 8F10.5

SNG(1) Dihedral angle in degrees of the first section. Negative for anhedral.

YG(1) the outboard y-coordinate of the first dihedral section.

Repeated NDG times.

Group 18 Format 6(6X, I4) 1 card

KF = 1 if the fuselage is present
= 0, otherwise

NT Number of Fourier components used to satisfy the fuselage surface boundary condition (excluding the zero-order component). Limited to 5. Normally, NT = 2 should provide good results. If NT of more than 2 is to be used, care should be taken as NT*NF is limited to 30 in the present array dimension specifications

NCUM Number of fuselage circumferential locations at which the pressure loading is to be computed. For midwing configurations, use even numbers. Normally, 7 or 8 should be sufficient. Limited to 10.

NF Number of control stations along the fuselage axis at which the fuselage surface boundary condition is to be satisfied.

Normally, 12~14 should be sufficient. Limited to 20.

KW Set to 1 always.

NKF(I) Set to be equal to NF.

Note. If no fuselage is present, all input variables can be zero in Group 18.

Note: The following input data, Groups 19, 20, and 21 must be omitted if no fuselage is present.

Group 19 Format 6F10.5 1 card

XAS(1) x-coordinate of the fuselage nose.

XAS(2) x-coordinate of the fuselage tail.

FUSIND = 0. if the fuselage geometry (i.e., r(x)) is to be defined analytically in subprograms FUR(X) and SLOP(X), where FUR(X) = r(x) and SLOP(X) = r dr/dx.
= 1. if r(x) is to be defined numerically in Groups 20 and 21.

FUSNO = number of fuselage stations to be input to define r(x) if FUSIND = 1. Limited to 21.
= 0., otherwise

X1 Body station in fraction of body length at which the rate of change of cross-sectional area with body length first reaches maximum negative value. See the section under Description of New Program Features.

XJF = 1. if the lower inboard edge of the USB jet is on the fuselage. Note. This situation should be avoided as much as possible.

= 0., otherwise.

Note. Groups 20 and 21 should be omitted if FUSIND = 0.

Group 20 Format 8F10.5

XFF(I) Fuselage x-stations referred to the coordinate origin to define r(x). Total number of stations is defined by FUSNO.

Group 21 Format 8F10.5

RFF(I) Fuselage radii corresponding to the x-stations XFF(I).

Group 22 Format F10.5 (ICASE-1) cards

ALP angles of attack in degrees. These cards are to be included only if additional angles of attack for the same configuration and VMU (NG=0) are to be run.

Note: The read statements for the input data in group 3 thru group 21 can be seen in subroutine "GEOMTY" of the program listing along with a short definition of the parameters to be read in. The read statements for groups 1, 2, and 22 along with the corresponding parameter definitions can be seen near the beginning of the program listing in the main routine.

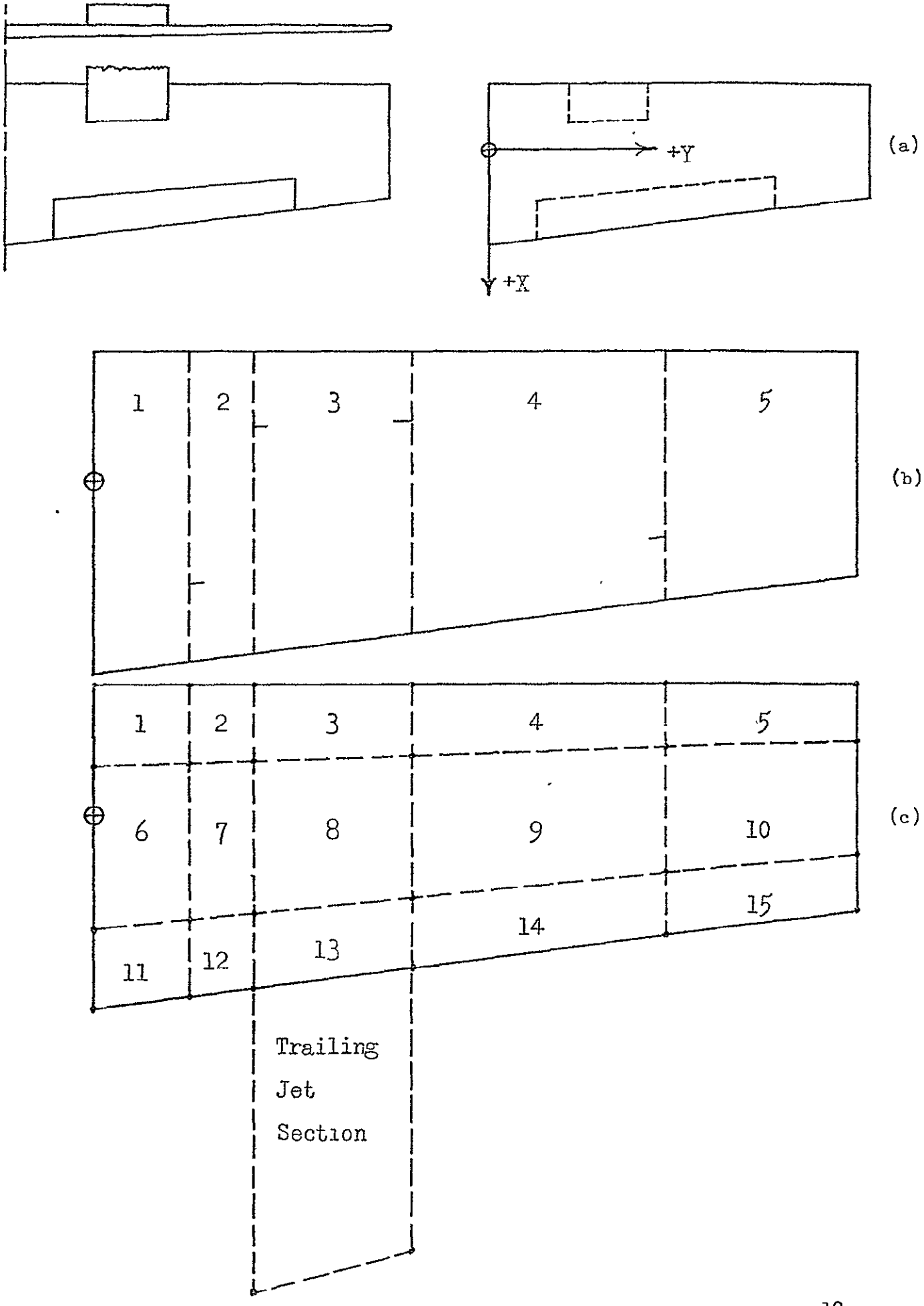
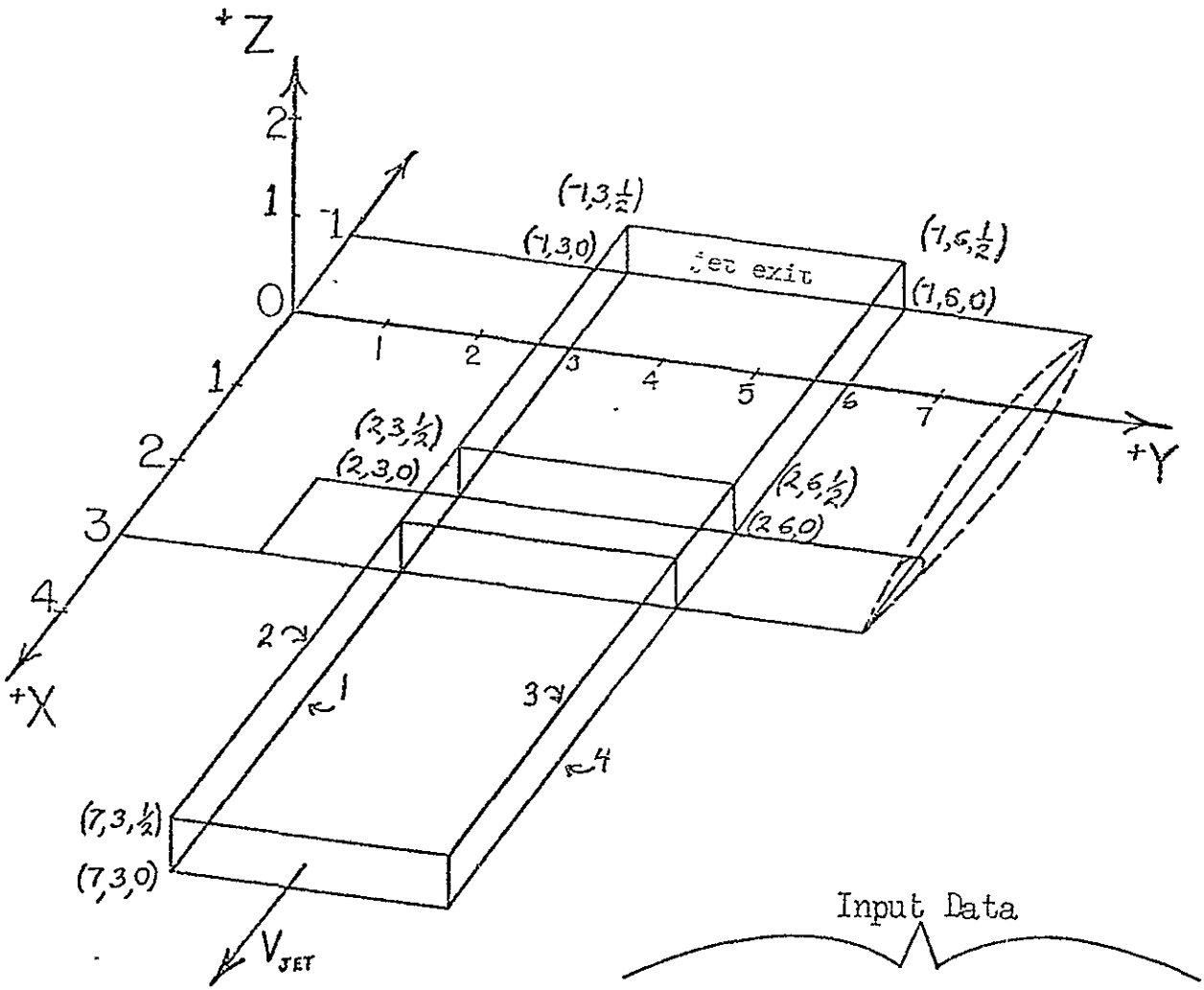


Figure 1 Preparation of the Wing Planform Geometry



Input Data

Card	Jet Section	Edge (I)	XXL(I)	XXT(I)	YL(I)	ZL(I)
1	1st	1	-1	2	3	0
2		2	-1	2	3	.5
3		3	-1	2	6	.5
4		4	-1	2	6	0
5	2nd	1	2	3	3	0
6		2	2	3	3	.5
7		3	2	3	6	.5
8		4	2	3	6	0
9	3rd	1	3	7	3	0
10		2	3	7	3	.5
11		3	3	7	6	.5
12		4	3	7	6	0

Figure 2 Input Coordinates For USB Jet Sections

Pre-Run Check List

Before the program is run, the following checklist should be completed:

(1) The array, GAMMA, defined in the subroutine "SOLUTN", should be dimensioned to have at least $(N+1)^2/4$ elements, where N is the total number of unknowns (=LTOTAL or LWFJ).

(2) For N = 256, the minimum memory needed is 48K (decimal). For any other N, the required memory can be computed accordingly, based on the change in GAMMA array.

(3) The root and tip camber slope functions should be defined manually in the subprograms ZCR(X), ZCT(X) respectively, otherwise the root and tip camber ordinates should be read in. The camber slope function, dz_c/dx, is defined with respect to a unit chord length. Similarly, the fuselage shape r(x) and r dr/dx should be defined manually in the subprograms FUR(X) and SLOP(X), respectively. Otherwise, r(x) should be read in numerically.

(4) Seven temporary files or tapes must be provided, being designated as (01) through (04) and (07) through (09).

(5) Check input data.

OUTPUT DATA FORMAT

First the title of the job and the input data will be printed in the same format as it was input. If the job is an over-wing blowing configuration the computed jet entrainment will be printed after the fourth line of input data as follows:

XJET	Downstream distance of a given cross-section from the jet exit divided by the jet radius at the exit (r_o).
RJET	the radius of the jet cross section divided by the original jet radius (r_o).
$\frac{DM}{DX}$	Values printed are actually the nondimensionalized entrainment function $E(\bar{x})$ (see equation 33 of reference 3)
HALF SW	the reference half-wing area
CREF	the reference chord
LPANEL	the number of wing vortices
JPANEL	the number of outer (or inner) jet vortices
LWFJ	total number of unknowns to be solved.

LWFJ = LPANEL + JPANEL*2 + NT*NF

If the job is an OWB configuration a note will be printed at this time indicating the shape of the equivalent jet cross-section used for the interaction computations along with 3 parameters defined below.

1. x-coordinate where the equivalent jet properties are evaluated.

2. Equivalent Jet Radius: the radius of the jet at the x location listed above

3. $\frac{Vo}{V_j}$ the velocity ratio of the equivalent jet.

Vortex Element Endpoint Coordinates

(X_1,Y_1,Z_1) coordinates for the inboard endpoint of a bound vortex element

(X_2,Y_2,Z_2) coordinates for the corresponding outboard endpoint. Wing elements are listed first and then jet elements. The number of elements listed should equal (LAST).

Control Point Coordinates

2 columns of control point coordinates, one point for each vortex element. Number of points listed should equal LPANEL + JPANEL.

Sectional Pressure and Force Data

XV — Percent chord location

YV — Percent half span location

CP — the total ΔC_p at the given (XV, YV) point due to both wing-body and jet induced circulation

CPW — The ΔC_p that would occur at that same point for the wing-body alone case

Y/SP — the y-coordinate of the chord in question divided by the half-span

CL — The sectional lift coefficient due to circulation (jet on), nondimensionalized with $q_\infty c$.

CM — The sectional pitching moment coefficient about the Y-axis, nondimensionalized with $q_\infty c^2$.

CT — The sectional leading edge thrust coefficient, nondimensionalized with $q_\infty c$.

CDI — The sectional induced drag coefficient, nondimensionalized with $q_\infty c$.

CLW — The sectional lift coefficient for the wing-body alone case

CMW — The sectional pitching moment about the Y-axis for the wing-body alone case

CDW — The sectional induced drag coefficient for the wing-body alone case.

Total Force and Moment Data

The lift Coefficient — - The total circulation lift coefficient due to the wing, wing-jet interaction and entrainment (if any). Fuselage lift is not included.

Total Induced Drag Coefficient — Total induced drag coeff. for the jet on case

Induced drag parameter — $\frac{C_{D_I}}{C_L^2}$ or $\frac{1}{\pi e AR}$

Total Pitching Moment Coefficient — = Pitching moment coefficient due to all circulation forces, about the Y-axis. Nondimensionalized with CREF. Fuselage moment is not included.

Note: In the case of OWB jobs, these coefficients reflect the total jet-on forces and moments, but for USB jobs the Coanda force and moment coefficients must be added to these; see below.

USB Jobs

Coanda Lift Coefficient — - The lift coefficient due to the lift component of the jet reaction force

Coanda Drag Coefficient — - Drag coefficient due to the drag component of the jet reaction. Jet thrust is included.

The Coanda Moment Coeff. — - Pitching moment coefficient due to the pitching moment caused by the jet reaction force (about Y-axis).

O.W.B. Jobs

In the case of O.W.B. jobs the next three coefficients listed have the same definitions as the first three except that the effects of wing-jet interaction have been ommitted from the computation.

All Jobs

The next four coefficients printed are due to aerodynamic forces and moments with jet off.

The fuselage lift and pitching moment coefficients are printed next.

If the lateral-directional stability derivatives are to be computed, they will be printed last, both based on the body axes and the stability axes. It should be noted that additional side force at the engine inlet, and therefore additional yawing moment, would occur due to yawed flow conditions, such as in side slip. These effects are not included in the output. For more details, see ref. 4, for example. The β-derivatives are in per radian.

Example Input and Output

Test Case 1 is for an upper-surface blowing configuration of a wing with zero camber.

Test Case 2 is for the wing-body configuration of ref. 5.

Test Case 3 is for a wing-body configuration of zero camber with over-wing blowing.

Listing of Input Data Cards for Test Case 1

```
Card
 1          *** TEST CASE 1. WING ONLY ***
 2                    1          0          1          1
 3       0.           0.         0.1865     1.         5.         0.028275   0.46827
 4                    1          1  0.
 5       0.455        0.3663     0.         3.         0.22961    0.269      0.         1.
 6       0.           0.         1.         0.         0.         0.         0.
 7       1.8          10.        0.
 8                    3          3          4          9          3
 9                    3
10                    3          4          0          0          0
11      -0.127       0.07462    0.         -0.03405   0.16757    0.161      0.161
12      -0.03405     0.16757    0.161      0.0906     0.29222    0.3769     0.161
13      0.0906       0.29222    0.3769     0.65023    0.81783    1.3462     0.161
14      0.07462      0.381      0.         0.16757    0.43324    0.161      0.161
15      0.16757      0.43324    0.161      0.29222    0.5033     0.3769     0.161
16      0.29222      0.5033     0.3769     0.81783    0.81783    1.3462     0.161
17                   3          7          3          4          4
18      -0.03405     0.16757    0.161      0.161
19      -0.03405     0.16757    0.161      0.227
20      0.0906       0.29222    0.3769     0.227
21      0.0906       0.29222    0.3769     0.161
22      0.16757      0.43324    0.161      0.161
23      0.16757      0.43324    0.161      0.227
24      0.29222      0.5033     0.3769     0.227
25      0.29222      0.5033     0.3769     0.161
26      0.43324      0.90053    0.161      0.161
27      0.43324      0.90053    0.161      0.227
28      0.5033       0.916      0.3769     0.227
29      0.5033       0.916      0.3769     0.161
30                   1          1
31      5.           1.3462
32                   0          0          0          0          0          0
```

Output for Test Case 1

```
**************************************
   *** TEST CASE 1, WING ONLY ***
**************************************
        1         0         1         1

                  XXXXXXXXXXXXXXXXXXXXXXXX

                       CASE NUMBER = 1

                  XXXXXXXXXXXXXXXXXXXXXXXX

INPUT DATA
  0.00000   0.00000    .19650   1.00000   5.00000    .02826    .46827
        1         1  0.00000
   .45500    .36630  0.00000   3.00000    .22961    .26900  0.00000  1.00000
  0.00000   0.00000  1.00000   0.00000   0.00000   0.00000   0.00000
  1.80000  10.00000  0.00000
        3         3         4         9         3
        2
        3         4         0         0         0
 -.12700    .07462  0.00000  -.03405    .16757    .16100    .16100
 -.03405    .16757    .16100    .09060    .29222    .37690    .16100
  .09060    .29222    .37690    .65023    .81783   1.34620    .16100
  .07462    .38100  0.00000    .16757    .43324    .16100    .16100
  .16757    .43324    .16100    .29222    .50330    .37690    .16100
  .29222    .50330    .37690    .81783    .81783   1.34620    .16100
        3         7         3         4         4
 -.03405    .16757    .16100    .16100
 -.03405    .16757    .16100    .22700
  .09060    .29222    .37690    .22700
  .09060    .29222    .37690    .16100
  .16757    .43324    .16100    .16100
  .16757    .43324    .16100    .22700
  .29222    .50330    .37690    .22700
  .29222    .50330    .37690    .16100
  .43324    .90053    .16100    .16100
  .43324    .90053    .16100    .22700
  .50330    .91600    .37690    .22700
  .50330    .91600    .37690    .16100
        1         1
  5.00000   1.34620
        0         0         0         0         0         0
         HALF SW=  .45500E+00          CREF=  .36630E+00

LPANEL,JPANEL,LWFJ=
       91        88       267

VORTEX ELEMENT ENDPOINT COORDINATES=

   X1        X2        Y1        Y2        Z1        Z2
 -.11349   -.06702  0.00000    .08050    .16100    .16100
 -.02619    .02028  0.00000    .08050    .16100    .16100
```

.06111	.10759	0.00000	.08050	.16100	.16100
-.06702	-.02054	.08050	.16100	.16100	.16100
.02028	.06676	.08050	.16100	.16100	.16100
.10759	.15406	.08050	.16100	.16100	.16100
-.02054	.01793	.16100	.22764	.16100	.16100
.06676	.10523	.16100	.22764	.16100	.16100
.15406	.19254	.16100	.22764	.16100	.16100
.01793	.06563	.22764	.31026	.16100	.16100
.10523	.15294	.22764	.31026	.16100	.16100
.19254	.24024	.22764	.31026	.16100	.16100
.06563	.10411	.31026	.37690	.16100	.16100
.15294	.19141	.31026	.37690	.16100	.16100
.24024	.27871	.31026	.37690	.16100	.16100
.10411	.14144	.37690	.44183	.16100	.16100
.19141	.22776	.37690	.44183	.16100	.16100
.27871	.31408	.37690	.44183	.16100	.16100
.14144	.20365	.44183	.55002	.16100	.16100
.22776	.28833	.44183	.55002	.16100	.16100
.31408	.37300	.44183	.55002	.16100	.16100
.20365	.28747	.55002	.69579	.16100	.16100
.28833	.36993	.55002	.69579	.16100	.16100
.37300	.45238	.55002	.69579	.16100	.16100
.28747	.38278	.69579	.86155	.16100	.16100
.36993	.46272	.69579	.86155	.16100	.16100
.45238	.54266	.69579	.86155	.16100	.16100
.38278	.47809	.86155	1.02731	.16100	.16100
.46272	.55551	.86155	1.02731	.16100	.16100
.54266	.63293	.86155	1.02731	.16100	.16100
.47809	.56191	1.02731	1.17308	.16100	.16100
.55551	.63711	1.02731	1.17308	.16100	.16100
.63293	.71232	1.02731	1.17308	.16100	.16100
.56191	.62412	1.17308	1.28127	.16100	.16100
.63711	.69768	1.17308	1.28127	.16100	.16100
.71232	.77124	1.17308	1.28127	.16100	.16100
.62412	.65722	1.28127	1.33884	.16100	.16100
.69768	.72991	1.28127	1.33884	.16100	.16100
.77124	.80259	1.28127	1.33884	.16100	.16100
.08628	.13198	0.00000	.08050	.16100	.16100
.16919	.20938	0.00000	.08050	.16100	.16100
.28643	.31884	0.00000	.08050	.16100	.16100
.36934	.39623	0.00000	.08050	.16100	.16100
.13198	.17768	.08050	.16100	.16100	.16100
.20938	.24957	.08050	.16100	.16100	.16100
.31884	.35124	.08050	.16100	.16100	.16100
.39623	.42313	.08050	.16100	.16100	.16100
.17768	.21551	.16100	.22764	.16100	.16100
.24957	.28284	.16100	.22764	.16100	.16100
.35124	.37806	.16100	.22764	.16100	.16100
.42313	.44539	.16100	.22764	.16100	.16100

.21551	.26242	.22764	.31026	.16100	.16100
.28284	.32410	.22764	.31026	.16100	.16100
.37806	.41132	.22764	.31026	.16100	.16100
.44539	.47300	.22764	.31026	.16100	.16100
.26242	.30025	.31026	.37690	.16100	.16100
.32410	.35737	.31026	.37690	.16100	.16100
.41132	.43815	.31026	.37690	.16100	.16100
.47300	.49527	.31026	.37690	.16100	.16100
.30025	.33492	.37690	.44183	.16100	.16100
.35737	.38822	.37690	.44183	.16100	.16100
.43815	.46358	.37690	.44183	.16100	.16100
.49527	.51687	.37690	.44183	.16100	.16100
.33492	.39270	.44183	.55002	.16100	.16100
.38822	.43961	.44183	.55002	.16100	.16100
.46358	.50596	.44183	.55002	.16100	.16100
.51687	.55288	.44183	.55002	.16100	.16100
.39270	.47053	.55002	.69579	.16100	.16100
.43961	.50886	.55002	.69579	.16100	.16100
.50596	.56306	.55002	.69579	.16100	.16100
.55288	.60139	.55002	.69579	.16100	.16100
.47053	.55904	.69579	.86155	.16100	.16100
.50886	.58760	.69579	.86155	.16100	.16100
.56306	.62799	.69579	.86155	.16100	.16100
.60139	.65655	.69579	.86155	.16100	.16100
.55904	.64755	.86155	1.02731	.16100	.16100
.58760	.66634	.86155	1.02731	.16100	.16100
.62799	.69292	.86155	1.02731	.16100	.16100
.65655	.71171	.86155	1.02731	.16100	.16100
.64755	.72539	1.02731	1.17308	.16100	.16100
.66634	.73559	1.02731	1.17308	.16100	.16100
.69292	.75002	1.02731	1.17308	.16100	.16100
.71171	.76022	1.02731	1.17308	.16100	.16100
.72539	.78316	1.17308	1.28127	.16100	.16100
.73559	.78699	1.17308	1.28127	.16100	.16100
.75002	.79240	1.17308	1.28127	.16100	.16100
.76022	.79622	1.17308	1.28127	.16100	.16100
.78316	.81390	1.28127	1.33884	.16100	.16100
.78699	.81433	1.28127	1.33884	.16100	.16100
.79240	.81495	1.28127	1.33884	.16100	.16100
.79622	.81538	1.28127	1.33894	.16100	.16100
-.02054	-.02054	.16100	.16100	.16100	.22700
.06676	[illegible]	.16100	.16100	.16100	.22700
.15406	.15406	.16100	.16100	.16100	.22700
-.02054	.01793	.16100	.22764	.22700	.22700
.06676	.10523	.16100	.22764	.22700	.22700
.15406	.19254	.16100	.22764	.22700	.22700
.01793	.06563	.22764	.31026	.22700	.22700
.10523	.15294	.22764	.31026	.22700	.22700
.19254	.24024	.22764	.31026	.22700	.22700

.06563	.10411	.31026	.37690	.22700	.22700
.15294	.19141	.31026	.37690	.22700	.22700
.24024	.27871	.31026	.37690	.22700	.22700
.10411	.10411	.37690	.37690	.22700	.16100
.19141	.19141	.37690	.37690	.22700	.16100
.27871	.27871	.37690	.37690	.22700	.16100
-.02054	.01793	.16100	.22764	.16100	.16100
.06676	.10523	.16100	.22764	.16100	.16100
.15406	.19254	.16100	.22764	.16100	.16100
.01793	.06563	.22764	.31026	.16100	.16100
.10523	.15294	.22764	.31026	.16100	.16100
.19254	.24024	.22764	.31026	.16100	.16100
.06563	.10411	.31026	.37690	.16100	.16100
.15294	.19141	.31026	.37690	.16100	.16100
.24024	.27871	.31026	.37690	.16100	.16100
.17768	.17768	.16100	.16100	.16100	.22700
.24957	.24957	.16100	.16100	.16100	.22700
.35124	.35124	.16100	.16100	.16100	.22700
.42313	.42313	.16100	.16100	.16100	.22700
.17768	.21551	.16100	.22764	.22700	.22700
.24957	.28284	.16100	.22764	.22700	.22700
.35124	.37806	.16100	.22764	.22700	.22700
.42313	.44539	.16100	.22764	.22700	.22700
.21551	.26242	.22764	.31026	.22700	.22700
.28284	.32410	.22764	.31026	.22700	.22700
.37806	.41132	.22764	.31026	.22700	.22700
.44539	.47300	.22764	.31026	.22700	.22700
.26242	.30025	.31026	.37690	.22700	.22700
.32410	.35737	.31026	.37690	.22700	.22700
.41132	.43815	.31026	.37690	.22700	.22700
.47300	.49527	.31026	.37690	.22700	.22700
.30025	.30025	.37690	.37690	.22700	.16100
.35737	.35737	.37690	.37690	.22700	.16100
.43815	.43815	.37690	.37690	.22700	.16100
.49527	.49527	.37690	.37690	.22700	.16100
.17768	.21551	.16100	.22764	.16100	.16100
.24957	.28284	.16100	.22764	.16100	.16100
.35124	.37806	.16100	.22764	.16100	.16100
.42313	.44539	.16100	.22764	.16100	.16100
.21551	.26242	.22764	.31026	.16100	.16100
.28284	.32410	.22764	.31026	.16100	.16100
.37806	.41132	.22764	.31026	.16100	.16100
.44539	.47300	.22764	.31026	.16100	.16100
.26242	.30025	.31026	.37690	.16100	.16100
.32410	.35737	.31026	.37690	.16100	.16100
.41132	.43815	.31026	.37690	.16100	.16100
.47300	.49527	.31026	.37690	.16100	.16100
.45103	.45103	.16100	.16100	.16100	.22700
.57747	.57747	.16100	.16100	.16100	.22700

.75630	.75630	.16100	.16100	.16100	.22700
.88274	.88274	.16100	.16100	.16100	.22700
.45103	.47201	.16100	.22764	.22700	.22700
.57747	.59390	.16100	.22764	.22700	.22700
.75630	.76627	.16100	.22764	.22700	.22700
.88274	.88816	.16100	.22764	.22700	.22700
.47201	.49802	.22764	.31026	.22700	.22700
.59390	.61426	.22764	.31026	.22700	.22700
.76627	.77864	.22764	.31026	.22700	.22700
.88816	.89488	.22764	.31026	.22700	.22700
.49802	.51901	.31026	.37690	.22700	.22700
.61426	.63068	.31026	.37690	.22700	.22700
.77864	.78862	.31026	.37690	.22700	.22700
.89488	.90029	.31026	.37690	.22700	.22700
.51901	.51901	.37690	.37690	.22700	.16100
.63068	.63068	.37690	.37690	.22700	.16100
.78862	.78862	.37690	.37690	.22700	.16100
.90029	.90029	.37690	.37690	.22700	.16100
.45103	.47201	.16100	.22764	.16100	.16100
.57747	.59390	.16100	.22764	.16100	.16100
.75630	.76627	.16100	.22764	.16100	.16100
.88274	.88816	.16100	.22764	.16100	.16100
.47201	.49802	.22764	.31026	.16100	.16100
.59390	.61426	.22764	.31026	.16100	.16100
.76627	.77864	.22764	.31026	.16100	.16100
.88816	.89488	.22764	.31026	.16100	.16100
.49802	.51901	.31026	.37690	.16100	.16100
.61426	.63068	.31026	.37690	.16100	.16100
.77864	.78862	.31026	.37690	.16100	.16100
.89488	.90029	.31026	.37690	.16100	.16100

CONTROL POINT COORDINATES=

XCP	YCP	ZCP	XCP	YCP	ZCP
-.05336	.04025	.16100	.04745	.04025	.16100
.09786	.04025	.16100	-.00688	.12075	.16100
.09393	.12075	.16100	.14433	.12075	.16100
.03461	.19262	.16100	.13542	.19262	.16100
.18582	.19262	.16100	.07868	.26895	.16100
.17949	.26895	.16100	.22989	.26895	.16100
.12275	.34528	.16100	.22356	.34528	.16100
.27397	.34528	.16100	.15762	.40613	.16100
.25792	.40613	.16100	.30807	.40613	.16100
.20547	.49029	.16100	.30429	.49029	.16100
.35370	.49029	.16100	.27879	.61922	.16100
.37534	.61922	.16100	.42362	.61922	.16100
.36872	.77739	.16100	.46250	.77739	.16100
.50939	.77739	.16100	.46442	.94571	.16100
.55525	.94571	.16100	.60066	.94571	.16100

.55435	1.10387	.16100	.64240	1.10387	.16100
.68643	1.10387	.16100	.62766	1.23281	.16100
.71345	1.23281	.16100	.75635	1.23281	.16100
.67551	1.31697	.16100	.75982	1.31697	.16100
.80198	1.31697	.16100	.14124	.04025	.16100
.24596	.04025	.16100	.35068	.04025	.16100
.39406	.04025	.16100	.18473	.12075	.16100
.28226	.12075	.16100	.37978	.12075	.16100
.42018	.12075	.16100	.22356	.19262	.16100
.31466	.19262	.16100	.40576	.19262	.16100
.44350	.19262	.16100	.26480	.26895	.16100
.34908	.26895	.16100	.43336	.26895	.16100
.46827	.26895	.16100	.30605	.34528	.16100
.38350	.34528	.16100	.46096	.34528	.16100
.49304	.34528	.16100	.33805	.40613	.16100
.41043	.40613	.16100	.48280	.40613	.16100
.51278	.40613	.16100	.38100	.49029	.16100
.44690	.49029	.16100	.51280	.49029	.16100
.54009	.49029	.16100	.44681	.61922	.16100
.50278	.61922	.16100	.55875	.61922	.16100
.58193	.61922	.16100	.52753	.77739	.16100
.57132	.77739	.16100	.61512	.77739	.16100
.63326	.77739	.16100	.61343	.94571	.16100
.64427	.94571	.16100	.67510	.94571	.16100
.68787	.94571	.16100	.69416	1.10387	.16100
.71281	1.10387	.16100	.73147	1.10387	.16100
.73920	1.10387	.16100	.75996	1.23281	.16100
.76869	1.23281	.16100	.77742	1.23281	.16100
.78104	1.23281	.16100	.80291	1.31697	.16100
.80516	1.31697	.16100	.80741	1.31697	.16100
.80835	1.31697	.16100	.01635	.16100	.19400
.11716	.16100	.19400	.16757	.16100	.19400
.03461	.19262	.22700	.13542	.19262	.22700
.18582	.19262	.22700	.07868	.26895	.22700
.17949	.26895	.22700	.22989	.26895	.22700
.12275	.34528	.22700	.22356	.34528	.22700
.27397	.34528	.22700	.14100	.37690	.19400
.24181	.37690	.19400	.29222	.37690	.19400
.03461	.19262	.16100	.13542	.19262	.16100
.18582	.19262	.16100	.07868	.26895	.16100
.17949	.26895	.16100	.22989	.26895	.16100
.12275	.34528	.16100	.22356	.34528	.16100
.27397	.34528	.16100	.20648	.16100	.19400
.30040	.16100	.19400	.39433	.16100	.19400
.43324	.16100	.19400	.22356	.19262	.22700
.31466	.19262	.22700	.40576	.19262	.22700
.44350	.19262	.22700	.26480	.26895	.22700
.34908	.26895	.22700	.43336	.26895	.22700
.46827	.26895	.22700	.30605	.34528	.22700

.38350	.34528	.22700	.46096	.34528	.22700
.49304	.34528	.22700	.32313	.37690	.19400
.39776	.37690	.19400	.47239	.37690	.19400
.50330	.37690	.19400	.22356	.19262	.16100
.31466	.19262	.16100	.40576	.19262	.16100
.44350	.19262	.16100	.26480	.26895	.16100
.34908	.26895	.16100	.43336	.26895	.16100
.46827	.26895	.16100	.30605	.34528	.16100
.38350	.34528	.16100	.46096	.34528	.16100
.49304	.34528	.16100	.50167	.16100	.19400
.66688	.16100	.19400	.83210	.16100	.19400
.90053	.16100	.19400	.51076	.19262	.22700
.67315	.19262	.22700	.83553	.19262	.22700
.90280	.19262	.22700	.53271	.26895	.22700
.68827	.26895	.22700	.84383	.26895	.22700
.90826	.26895	.22700	.55465	.34528	.22700
.70339	.34528	.22700	.85213	.34528	.22700
.91373	.34528	.22700	.56374	.37690	.19400
.70965	.37690	.19400	.85556	.37690	.19400
.91600	.37690	.19400	.51076	.19262	.16100
.67315	.19262	.16100	.83553	.19262	.16100
.90280	.19262	.16100	.53271	.26895	.16100
.68827	.26895	.16100	.84383	.26895	.16100
.90826	.26895	.16100	.55465	.34528	.16100
.70339	.34528	.16100	.85213	.34528	.16100
.91373	.34528	.16100			

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

ALPHA = 5.000 DEGREES

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

VORTEX	XV	YV	CP	CPW
1	.02713	.02990	1.82867	1.71493
2	.20250	.02990	.72016	.65714
3	.37787	.02990	.49340	.43323
4	.42765	.02990	.43644	.37765
5	.58865	.02990	.40451	.32947
6	.81635	.02990	.27016	.19962
7	.97735	.02990	.09796	.06716
8	.02829	.08970	2.03928	1.90521
9	.21113	.08970	.72887	.66321
10	.39398	.08970	.48966	.42321
11	.44426	.08970	.42926	.35985
12	.60059	.08970	.40638	.31311
13	.82168	.08970	.27184	.18731
14	.97801	.08970	.10743	.06125
15	.02941	.14308	2.09304	1.99767

16	.21949	.14308	.72271	.67424
17	.40957	.14308	.34005	.42083
18	.46033	.14308	1.03031	.34900
19	.61214	.14308	1.14684	.30524
20	.82684	.14308	.74894	.18107
21	.97865	.14308	2.58549	.05894
22	.03070	.19978	2.15486	2.06422
23	.22912	.19978	.72365	.68234
24	.42754	.19978	.33955	.41747
25	.47885	.19978	1.20752	.33739
26	.62545	.19978	1.17653	.29922
27	.83278	.19978	.83687	.17691
28	.97938	.19978	2.84410	.05772
29	.03210	.25649	2.19760	2.10094
30	.23963	.25649	.73448	.68559
31	.44715	.25649	.34729	.41466
32	.49907	.25649	.82231	.32619
33	.63999	.25649	1.03385	.29501
34	.83927	.25649	.72370	.17474
35	.98018	.25649	2.69778	.05705
36	.03315	.30168	2.28225	2.12341
37	.24746	.30168	.75709	.68777
38	.46176	.30168	.49725	.41353
39	.51414	.30168	.39801	.31884
40	.65081	.30168	.41337	.29272
41	.84410	.30168	.31250	.17377
42	.98078	.30168	.13371	.05673
43	.03448	.36420	2.32885	2.15159
44	.25733	.36420	.77401	.69081
45	.48018	.36420	.48895	.41008
46	.53312	.36420	.37450	.30837
47	.66446	.36420	.37020	.29036
48	.85019	.36420	.23657	.17332
49	.98153	.36420	.08003	.05685
50	.03681	.45998	2.34367	2.16761
51	.27476	.45998	.75853	.68688
52	.51271	.45998	.45320	.40028
53	.56667	.45998	.32740	.28752
54	.68856	.45998	.32671	.28348
55	.86096	.45998	.20066	.17167
56	.98285	.45998	.06672	.05666
57	.04034	.57747	2.29861	2.15077
58	.30113	.57747	.72135	.66845
59	.56192	.57747	.41081	.37738
60	.61740	.57747	.27429	.25154
61	.72503	.57747	.29162	.26662
62	.87724	.57747	.18130	.16513
63	.98486	.57747	.06055	.05502
64	.04526	.70250	2.20105	2.08661

65	.33782	.70250	.66596	.62825
66	.63037	.70250	.35479	.33339
67	.68798	.70250	.20940	.19663
68	.77575	.70250	.24752	.23218
69	.89988	.70250	.15850	.14847
70	.98765	.70250	.05355	.05012
71	.05154	.81999	2.04510	1.95818
72	.38472	.81999	.58129	.55478
73	.71789	.81999	.27160	.25849
74	.77821	.81999	.12967	.12336
75	.84060	.81999	.17913	.17032
76	.92883	.81999	.12039	.11439
77	.99122	.81999	.04138	.03930
78	.05856	.91577	1.78441	1.71949
79	.43710	.91577	.43052	.41351
80	.81564	.91577	.15061	.14416
81	.87898	.91577	.04798	.04590
82	.91303	.91577	.08227	.07868
83	.96117	.91577	.06083	.05815
84	.99521	.91577	.02162	.02066
85	.06455	.97829	1.22583	1.18523
86	.48181	.97829	.17224	.16560
87	.89908	.97829	.04424	.04228
88	.96501	.97829	.00548	.00524
89	.97485	.97829	.01201	.01147
90	.98877	.97829	.01070	.01022
91	.99862	.97829	.00413	.00395

Y/SP	CL	CM	CT	CDI	CLW	CMW	CDW
.02990	.59220	-.07638	.04034	.04249	.52105	-.05282	.03686
.08970	.63088	-.14181	.05403	.03410	.54685	-.10411	.02852
.14308	1.13401	-.67387	.06193	.09684	.56844	-.15895	.02431
.19978	1.19648	-.82983	.06942	.09805	.59004	-.22333	.02073
.25649	1.11087	-.84433	.07576	.07962	.60982	-.29312	.01815
.30168	.73380	-.44346	.08049	.02185	.62471	-.35181	.01649
.36420	.73327	-.50984	.08716	.01504	.64387	-.43638	.01425
.45998	.73952	-.63551	.09462	.00839	.66970	-.57211	.01129
.57747	.74968	-.80354	.10039	.00398	.69569	-.74509	.00805
.70250	.75547	-.98261	.10408	.00107	.71338	-.92811	.00491
.81999	.73914	-1.11948	.10363	-.00077	.70601	-1.06974	.00243
.91577	.65436	-1.10122	.09265	-.00160	.62932	-1.05947	.00081
.97829	.41195	-.73218	.05928	-.00196	.39751	-.70674	-.00059

THE LIFT COEFFICIENT = .76694

TOTAL INDUCED DRAG COEFFICIENT = .02816

THE INDUCED DRAG PARAMETER = .04787

TOTAL PITCHING MOMENT COEFFICIENT = -.65297

THE COANDA LIFT COEFFICIENT, CLR = .46587

THE COANDA DRAG COEFFICIENT, CDR = -1.40297

THE COANDA MOMENT COEFFICIENT, CMR = -.39958

THE LIFT COEFFICIENT FOR THE WING ALONE= .60713

THE INDUCED DRAG COEFFICIENT FOR THE WING ALONE= .01435

THE PITCHING MOMENT COEFFICIENT FOR THE WING ALONE= -.49990

THE INDUCED DRAG PARAMETER FOR THE WING ALONE= .03892

LATERAL-DIRECTIONAL STABILITY CHARACTERSTICS WITH JET ON

**STABILITY DERIVATIVES EVALUATED AT ALPHA = 5.000 DEG.
AND AT MACH NO.= 0.000,BASED ON BODY AXES***

CYB =	-.1602586	CLB =	-.1686574	CNB =	.0063876
CYP =	.3305743	CLP =	-.4357465	CNP =	-.2673868
CYR =	.0267657	CLR =	.1535234	CNR =	-.0067337

STABILITY DERIVATIVES BASED ON STABILITY AXES*

CYB =	-.1602586	CLB =	-.1681000	CNB =	.0211058
CYP =	.3329100	CLP =	-.4456830	CNP =	-.2299484
CYR =	-.0020824	CLR =	.1909618	CNR =	.0032027

LATERAL-DIRECTIONAL STABILITY CHARACTERSTICS WITH JET OFF

**STABILITY DERIVATIVES EVALUATED AT ALPHA = 5.000 DEG.
AND AT MACH NO.= 0.000,BASED ON BODY AXES***

CYB =	-.1346015	CLB =	-.1653598	CNB =	.0059699

CYP =	.1397994	CLP =	-.4371177	CNP =	-.1398524
CYR =	.0201641	CLR =	.1430642	CNR =	-.0058492

STABILITY DERIVATIVES BASED ON STABILITY AXES*

CYB =	-.1346015	CLB =	-.1648388	CNB =	.0204002
CYP =	.1415590	CLP =	-.4368374	CNP =	-.1022171
CYR =	.0079643	CLR =	.1806995	CNR =	-.0061295

Listing of Input Data Cards for Test Case 2

```
Card
 1        # NASA TN D-7778 #          HIGH WING DELTAF=44 DEGREES
 2                1          0          1          1
 3       0.         0.        0.14142    1.        5.        -0.127     0.3175
 4                2          1 44.      44.
 5       0.455     0.3663      0.        3.        0.07462    0.269     0.          1.
 6       0.         1.         1.        0.30508   0.30508   -0.02208   -0.02208
 7      3.132      44.         0.
 8                4          3          4          5          5          4
 9                2          3
10                3          2          2          0
11       -0.127    0.07462    0.        -0.127     0.07462    0.161     0.161
12       -0.127    0.07462    0.161     -0.127     0.07462    0.3769    0.161
13      -0.127     0.07462    0.3769    -0.127     0.07462    0.7695    0.161
14       -0.127    0.07462    0.7695    -0.127     0.0406     1.3462    0.161
15       0.07462   0.29073    0.        0.07462    0.25669    0.161     0.161
16       0.07462    0.25669   0.161     0.07462    0.21104    0.3769    0.161
17       0.07462   0.21104    0.3769    0.07462    0.12802    0.7695    0.161
18       0.07462   0.12802    0.7695    0.0406     0.0406     1.3462    0.161
19       0.29073    0.381     0.         0.25669   0.34029    0.161     0.161
20       0.25669   0.34029    0.161      0.21104   0.2857     0.3769    0.161
21       0.21104   0.2857     0.3769     0.12802   0.18642    0.7695    0.161
22       0.12802    0.18642   0.7695     0.0406    0.0406     1.3462    0.161
23                4          7          3          2          2          4
24       -0.127    0.07462    0.161     0.161
25       -0.127    0.07462    0.161     0.227
26       -0.127    0.07462    0.3769    0.227
27       -0.127    0.07462    0.3769    0.161
28       0.07462   0.25669    0.161     0.161
29       0.07462   0.25669    0.161     0.227
30       0.07462   0.21104    0.3769     0.227
31       0.07462   0.21104    0.3769     0.161
32       0.25669   0.34029    0.161      0.161
33       0.25669   0.34029    0.161     0.227
34       0.21104   0.2857     0.3769    0.227
35       0.21104   0.2857     0.3769     0.161
36       0.34029   0.80758     0.161      0.161
37       0.34029   0.80758     0.161     0.227
38       0.2857     0.75299   0.3769    0.227
39       0.2857     0.75299   0.3769    0.161
40                1          1
41       5.         1.3462
42                1          2          7         12          1         12
43       -0.777    1.301       0.         0.        0.8         0.
```

Output for Test Case 2

```
****************************************
 * NASA TN D-7778 *          HIGH WING DELTAF=44 DEGREES
****************************************
        1         0         1         1

                  XXXXXXXXXXXXXXXXXXXXXXXX

                       CASE NUMBER = 1

                  XXXXXXXXXXXXXXXXXXXXXXXX

INPUT DATA
  0.00000   0.00000    .14142   1.00000   5.00000   -.12700    .31750
        2         1  44.00000  44.00000
   .45500    .36630   0.00000   3.00000    .07462    .26900   0.00000   1.00000
  0.00000  1.00000   1.00000    .30508    .30508   -.02208   -.02208
  3.13200 44.00000   0.00000
        4         3         4         5         5         4
        2         3
        3         2         2         0         0
  -.12700    .07462   0.00000  -.12700    .07462    .16100    .16100
  -.12700    .07462    .16100  -.12700    .07462    .37690    .16100
  -.12700    .07462    .37690  -.12700    .07462    .76950    .16100
  -.12700    .07462    .76950  -.12700    .04060   1.34620    .16100
   .07462    .29073   0.00000   .07462    .25669    .16100    .16100
   .07462    .25669    .16100   .07462    .21104    .37690    .16100
   .07462    .21104    .37690   .07462    .12802    .76950    .16100
   .07462    .12802    .76950   .04060    .04060   1.34620    .16100
   .29073    .38100   0.00000   .25669    .34029    .16100    .16100
   .25669    .34029    .16100   .21104    .28570    .37690    .16100
   .21104    .28570    .37690   .12802    .18642    .76950    .16100
   .12802    .18642    .76950   .04060    .04060   1.34620    .16100
        4         7         3         2         2         4
  -.12700    .07462    .16100   .16100
  -.12700    .07462    .16100   .22700
  -.12700    .07462    .37690   .22700
  -.12700    .07462    .37690   .16100
   .07462    .25669    .16100   .16100
   .07462    .25669    .16100   .22700
   .07462    .21104    .37690   .22700
   .07462    .21104    .37690   .16100
   .25669    .34029    .16100   .16100
   .25669    .34029    .16100   .22700
   .21104    .28570    .37690   .22700
   .21104    .28570    .37690   .16100
   .34029    .80758    .16100   .16100
   .34029    .80758    .16100   .22700
   .28570    .75299    .37690   .22700
   .28570    .75299    .37690   .16100
        1         1
  5.00000   1.34620
        1         2         7        12         1        12
```

-.77700	1.30100	0.00000	0.00000	.80000	0.00000

HALF SW= .45500E+00 CREF= .36630E+00

LPANEL, JPANEL, LWFJ=

91 88 291

VORTEX ELEMENT ENDPOINT COORDINATES.

X1	X2	Y1	Y2	Z1	Z2
-.11349	-.11349	0.00000	.08050	.16100	.16100
-.02619	-.02619	0.00000	.08050	.16100	.16100
.06111	.06111	0.00000	.08050	.16100	.16100
-.11349	-.11349	.08050	.16100	.16100	.16100
-.02619	-.02619	.08050	.16100	.16100	.16100
.06111	.06111	.08050	.16100	.16100	.16100
-.11349	-.11349	.16100	.22764	.16100	.16100
-.02619	-.02619	.16100	.22764	.16100	.16100
.06111	.06111	.16100	.22764	.16100	.16100
-.11349	-.11349	.22764	.31026	.16100	.16100
-.02619	-.02619	.22764	.31026	.16100	.16100
.06111	.06111	.22764	.31026	.16100	.16100
-.11349	-.11349	.31026	.37690	.16100	.16100
-.02619	-.02619	.31026	.37690	.16100	.16100
.06111	.06111	.31026	.37690	.16100	.16100
-.11349	-.11349	.37690	.45782	.16100	.16100
-.02619	-.02619	.37690	.45782	.16100	.16100
.06111	.06111	.37690	.45782	.16100	.16100
-.11349	-.11349	.45782	.57320	.16100	.16100
-.02619	-.02619	.45782	.57320	.16100	.16100
.06111	.06111	.45782	.57320	.16100	.16100
-.11349	-.11349	.57320	.68858	.16100	.16100
-.02619	-.02619	.57320	.68858	.16100	.16100
.06111	.06111	.57320	.68858	.16100	.16100
-.11349	-.11349	.68858	.76950	.16100	.16100
-.02619	-.02619	.68858	.76950	.16100	.16100
.06111	.06111	.68858	.76950	.16100	.16100
-.11349	-.11396	.76950	.88836	.16100	.16100
-.02619	-.02970	.76950	.88836	.16100	.16100
.06111	.05457	.76950	.88836	.16100	.16100
-.11396	-.11463	.88836	1.05785	.16100	.16100
-.02970	-.03470	.88836	1.05785	.16100	.16100
.05457	.04524	.88836	1.05785	.16100	.16100
-.11463	-.11530	1.05785	1.22734	.16100	.16100
-.03470	-.03969	1.05785	1.22734	.16100	.16100
.04524	.03592	1.05785	1.22734	.16100	.16100
-.11530	-.11572	1.22734	1.33209	.16100	.16100
-.03969	-.04278	1.22734	1.33209	.16100	.16100
.03592	.03015	1.22734	1.33209	.16100	.16100
.10627	.10378	0.00000	.08050	.16100	.16100

.25908	.24455	0.00000	.08050	.16100	.16100
.10378	.10128	.08050	.16100	.16100	.16100
.24455	.23003	.08050	.16100	.16100	.16100
.10128	.09922	.16100	.22764	.16100	.16100
.23003	.21800	.16100	.22764	.16100	.16100
.09922	.09666	.22764	.31026	.16100	.16100
.21800	.20309	.22764	.31026	.16100	.16100
.09666	.09460	.31026	.37690	.16100	.16100
.20309	.19106	.31026	.37690	.16100	.16100
.09460	.09209	.37690	.45782	.16100	.16100
.19106	.17646	.37690	.45782	.16100	.16100
.09209	.08852	.45782	.57320	.16100	.16100
.17646	.15563	.45782	.57320	.16100	.16100
.08852	.08495	.57320	.68858	.16100	.16100
.15563	.13480	.57320	.68858	.16100	.16100
.08495	.08244	.68858	.76950	.16100	.16100
.13480	.12020	.68858	.76950	.16100	.16100
.08244	.07382	.76950	.88836	.16100	.16100
.12020	.10379	.76950	.88836	.16100	.16100
.07382	.06152	.88836	1.05785	.16100	.16100
.10379	.08040	.88836	1.05785	.16100	.16100
.06152	.04922	1.05785	1.22734	.16100	.16100
.08040	.05701	1.05785	1.22734	.16100	.16100
.04922	.04162	1.22734	1.33209	.16100	.16100
.05701	.04255	1.22734	1.33209	.16100	.16100
.30395	.28644	0.00000	.08050	.16100	.16100
.36778	.34791	0.00000	.08050	.16100	.16100
.28644	.26893	.08050	.16100	.16100	.16100
.34791	.32805	.08050	.16100	.16100	.16100
.26893	.25444	.16100	.22764	.16100	.16100
.32805	.31160	.16100	.22764	.16100	.16100
.25444	.23647	.22764	.31026	.16100	.16100
.31160	.29121	.22764	.31026	.16100	.16100
.23647	.22197	.31026	.37690	.16100	.16100
.29121	.27477	.31026	.37690	.16100	.16100
.22197	.20437	.37690	.45782	.16100	.16100
.27477	.25479	.37690	.45782	.16100	.16100
.20437	.17927	.45782	.57320	.16100	.16100
.25479	.22632	.45782	.57320	.16100	.16100
.17927	.15417	.57320	.68858	.16100	.16100
.22632	.19784	.57320	.68858	.16100	.16100
.15417	.13657	.68858	.76950	.16100	.16100
.19784	.17787	.68858	.76950	.16100	.16100
.13657	.11679	.76950	.88836	.16100	.16100
.17787	.14958	.76950	.88836	.16100	.16100
.11679	.08859	.88836	1.05785	.16100	.16100
.14958	.10923	.88836	1.05785	.16100	.16100
.08859	.06038	1.05785	1.22734	.16100	.16100
.10923	.06889	1.05785	1.22734	.16100	.16100

.06038	.04295	1.22734	1.33209	.16100	.16100
.06889	.04396	1.22734	1.33209	.16100	.16100
-.11349	-.11349	.16100	.16100	.16100	.22700
-.02619	-.02619	.16100	.16100	.16100	.22700
.06111	.06111	.16100	.16100	.16100	.22700
-.11349	-.11349	.16100	.22764	.22700	.22700
-.02619	-.02619	.16100	.22764	.22700	.22700
.06111	.06111	.16100	.22764	.22700	.22700
-.11349	-.11349	.22764	.31026	.22700	.22700
-.02619	-.02619	.22764	.31026	.22700	.22700
.06111	.06111	.22764	.31026	.22700	.22700
-.11349	-.11349	.31026	.37690	.22700	.22700
-.02619	-.02619	.31026	.37690	.22700	.22700
.06111	.06111	.31026	.37690	.22700	.22700
-.11349	-.11349	.37690	.37690	.22700	.16100
-.02619	-.02619	.37690	.37690	.22700	.16100
.06111	.06111	.37690	.37690	.22700	.16100
-.11349	-.11349	.16100	.22764	.16100	.16100
-.02619	-.02619	.16100	.22764	.16100	.16100
.06111	.06111	.16100	.22764	.16100	.16100
-.11349	-.11349	.22764	.31026	.16100	.16100
-.02619	-.02619	.22764	.31026	.16100	.16100
.06111	.06111	.22764	.31026	.16100	.16100
-.11349	-.11349	.31026	.37690	.16100	.16100
-.02619	-.02619	.31026	.37690	.16100	.16100
.06111	.06111	.31026	.37690	.16100	.16100
.10128	.10128	.16100	.16100	.16100	.22700
.23003	.23003	.16100	.16100	.16100	.22700
.10128	.09922	.16100	.22764	.22700	.22700
.23003	.21800	.16100	.22764	.22700	.22700
.09922	.09666	.22764	.31026	.22700	.22700
.21800	.20309	.22764	.31026	.22700	.22700
.09666	.09460	.31026	.37690	.22700	.22700
.20309	.19106	.31026	.37690	.22700	.22700
.09460	.09460	.37690	.37690	.22700	.16100
.19106	.19106	.37690	.37690	.22700	.16100
.10128	.09922	.16100	.22764	.16100	.16100
.23003	.21800	.16100	.22764	.16100	.16100
.09922	.09666	.22764	.31026	.16100	.16100
.21800	.20309	.22764	.31026	.16100	.16100
.09666	.09460	.31026	.37690	.16100	.16100
.20309	.19106	.31026	.37690	.16100	.16100
.26893	.26893	.16100	.16100	.16100	.22700
.32805	.32805	.16100	.16100	.16100	.22700
.26893	.25444	.16100	.22764	.22700	.22700
.32805	.31160	.16100	.22764	.22700	.22700
.25444	.23647	.22764	.31026	.22700	.22700
.31160	.29121	.22764	.31026	.22700	.22700
.23647	.22197	.31026	.37690	.22700	.22700

.29121	.27477	.31026	.37690	.22700	.22700
.22197	.22197	.37690	.37690	.22700	.16100
.27477	.27477	.37690	.37690	.22700	.16100
.26893	.25444	.16100	.22764	.16100	.16100
.32805	.31160	.16100	.22764	.16100	.16100
.25444	.23647	.22764	.31026	.16100	.16100
.31160	.29121	.22764	.31026	.16100	.16100
.23647	.22197	.31026	.37690	.16100	.16100
.29121	.27477	.31026	.37690	.16100	.16100
.35808	.35808	.16100	.16100	.16100	.22700
.48452	.48452	.16100	.16100	.16100	.22700
.66335	.66335	.16100	.16100	.16100	.22700
.78979	.78979	.16100	.16100	.16100	.22700
.35808	.34123	.16100	.22764	.22700	.22700
.48452	.46767	.16100	.22764	.22700	.22700
.66335	.64650	.16100	.22764	.22700	.22700
.78979	.77295	.16100	.22764	.22700	.22700
.34123	.32033	.22764	.31026	.22700	.22700
.46767	.44678	.22764	.31026	.22700	.22700
.64650	.62561	.22764	.31026	.22700	.22700
.77295	.75205	.22764	.31026	.22700	.22700
.32033	.30349	.31026	.37690	.22700	.22700
.44678	.42993	.31026	.37690	.22700	.22700
.62561	.60876	.31026	.37690	.22700	.22700
.75205	.73520	.31026	.37690	.22700	.22700
.30349	.30349	.37690	.37690	.22700	.16100
.42993	.42993	.37690	.37690	.22700	.16100
.60876	.60876	.37690	.37690	.22700	.16100
.73520	.73520	.37690	.37690	.22700	.16100
.35808	.34123	.16100	.22764	.16100	.16100
.48452	.46767	.16100	.22764	.16100	.16100
.66335	.64650	.16100	.22764	.16100	.16100
.78979	.77295	.16100	.22764	.16100	.16100
.34123	.32033	.22764	.31026	.16100	.16100
.46767	.44678	.22764	.31026	.16100	.16100
.64650	.62561	.22764	.31026	.16100	.16100
.77295	.75205	.22764	.31026	.16100	.16100
.32033	.30349	.31026	.37690	.16100	.16100
.44678	.42993	.31026	.37690	.16100	.16100
.62561	.60876	.31026	.37690	.16100	.16100
.75205	.73520	.31026	.37690	.16100	.16100

CONTROL POINT COORDINATES=

XCP	YCP	ZCP	XCP	YCP	ZCP
-.07660	.04025	.16100	.02421	.04025	.16100
.07462	.04025	.16100	-.07660	.12075	.16100
.02421	.12075	.16100	.07462	.12075	.16100
-.07660	.19262	.16100	.02421	.19262	.16100

.07462	.19262	.16100	-.07660	.26895	.16100
.02421	.26895	.16100	.07462	.26895	.16100
-.07660	.34528	.16100	.02421	.34528	.16100
.07462	.34528	.16100	-.07660	.41439	.16100
.02421	.41439	.16100	.07462	.41439	.16100
-.07660	.51254	.16100	.02421	.51254	.16100
.07462	.51254	.16100	-.07660	.63386	.16100
.02421	.63386	.16100	.07462	.63386	.16100
-.07660	.73201	.16100	.02421	.73201	.16100
.07462	.73201	.16100	-.07741	.82457	.16100
.02178	.82457	.16100	.07137	.82457	.16100
-.07953	.96874	.16100	.01540	.96874	.16100
.06287	.96874	.16100	-.08216	1.14696	.16100
.00752	1.14696	.16100	.05235	1.14696	.16100
-.08429	1.29113	.16100	.00114	1.29113	.16100
.04385	1.29113	.16100	.17842	.04025	.16100
.28222	.04025	.16100	.16991	.12075	.16100
.26520	.12075	.16100	.16231	.19262	.16100
.25000	.19262	.16100	.15424	.26895	.16100
.23387	.26895	.16100	.14617	.34528	.16100
.21773	.34528	.16100	.13887	.41439	.16100
.20311	.41439	.16100	.12849	.51254	.16100
.18236	.51254	.16100	.11566	.63386	.16100
.15670	.63386	.16100	.10528	.73201	.16100
.13595	.73201	.16100	.09552	.82457	.16100
.11967	.82457	.16100	.08034	.96874	.16100
.09782	.96874	.16100	.06158	1.14696	.16100
.07080	1.14696	.16100	.04640	1.29113	.16100
.04895	1.29113	.16100	.32652	.04025	.16100
.37082	.04025	.16100	.30783	.12075	.16100
.35047	.12075	.16100	.29115	.19262	.16100
.33230	.19262	.16100	.27343	.26895	.16100
.31300	.26895	.16100	.25571	.34528	.16100
.29369	.34528	.16100	.23967	.41439	.16100
.27622	.41439	.16100	.21688	.51254	.16100
.25140	.51254	.16100	.18871	.63386	.16100
.22072	.63386	.16100	.16592	.73201	.16100
.19590	.73201	.16100	.14608	.82457	.16100
.17250	.82457	.16100	.11693	.96874	.16100
.13604	.96874	.16100	.08089	1.14696	.16100
.09098	1.14696	.16100	.05174	1.29113	.16100
.05452	1.29113	.16100	-.07660	.16100	.19400
.02421	.16100	.19400	.07462	.16100	.19400
-.07660	.19262	.22700	.02421	.19262	.22700
.07462	.19262	.22700	-.07660	.26895	.22700
.02421	.26895	.22700	.07462	.26895	.22700
-.07660	.34528	.22700	.02421	.34528	.22700
.07462	.34528	.22700	-.07660	.37690	.19400
.02421	.37690	.19400	.07462	.37690	.19400

-.07660	.19262	.16100	.02421	.19262	.16100
.07462	.19262	.16100	-.07660	.26895	.16100
.02421	.26895	.16100	.07462	.26895	.16100
-.07660	.34528	.16100	.02421	.34528	.16100
.07462	.34528	.16100	.16565	.16100	.19400
.25669	.16100	.19400	.16231	.19262	.22700
.25000	.19262	.22700	.15424	.26895	.22700
.23387	.26895	.22700	.14617	.34528	.22700
.21773	.34528	.22700	.14283	.37690	.19400
.21104	.37690	.19400	.16231	.19262	.16100
.25000	.19262	.16100	.15424	.26895	.16100
.23387	.26895	.16100	.14617	.34528	.16100
.21773	.34528	.16100	.29849	.16100	.19400
.34029	.16100	.19400	.29115	.19262	.22700
.33230	.19262	.22700	.27343	.26895	.22700
.31300	.26895	.22700	.25571	.34528	.22700
.29369	.34528	.22700	.24837	.37690	.19400
.28570	.37690	.19400	.29115	.19262	.16100
.33230	.19262	.16100	.27343	.26895	.16100
.31300	.26895	.16100	.25571	.34528	.16100
.29369	.34528	.16100	.40872	.16100	.19400
.57393	.16100	.19400	.73915	.16100	.19400
.80758	.16100	.19400	.40073	.19262	.22700
.56594	.19262	.22700	.73115	.19262	.22700
.79959	.19262	.22700	.38143	.26895	.22700
.54664	.26895	.22700	.71185	.26895	.22700
.78029	.26895	.22700	.36213	.34528	.22700
.52734	.34528	.22700	.69255	.34528	.22700
.76098	.34528	.22700	.35413	.37690	.19400
.51934	.37690	.19400	.68456	.37690	.19400
.75299	.37690	.19400	.40073	.19262	.16100
.56594	.19262	.16100	.73115	.19262	.16100
.79959	.19262	.16100	.38143	.26895	.16100
.54664	.26895	.16100	.71185	.26895	.16100
.78029	.26895	.16100	.36213	.34528	.16100
.52734	.34528	.16100	.69255	.34528	.16100
.76098	.34528	.16100			

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

ALPHA = 5.000 DEGREES

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

VORTEX	XV	YV	CP	CPW
1	.02713	.02990	6.45517	5.26487
2	.20250	.02990	2.58683	2.03702
3	.37787	.02990	.21658	-.01165
4	.46607	.02990	-1.04294	-1.16843

5	.76095	.02990	-2.86361	-2.70494
6	.84808	.02990	-1.76723	-1.66788
7	.97394	.02990	-.69773	-.67130
8	.02829	.08970	5.11607	4.30027
9	.21113	.08970	2.26819	1.87297
10	.39398	.08970	.85439	.62040
11	.48072	.08970	.59620	.29744
12	.76296	.08970	-.40015	-.60151
13	.84757	.08970	-.39319	-.54201
14	.97385	.08970	-.17198	-.31581
15	.02941	.14308	4.54496	4.09463
16	.21949	.14308	2.02398	1.79930
17	.40957	.14308	.78674	.92512
18	.49490	.14308	8.80496	.95026
19	.76491	.14308	22.41063	1.41893
20	.84707	.14308	25.90014	1.22816
21	.97376	.14308	-3.17332	.17137
22	.03070	.19978	4.46712	4.11760
23	.22912	.19978	1.95459	1.79600
24	.42754	.19978	.92968	1.12441
25	.51124	.19978	7.46008	1.29494
26	.76715	.19978	31.59883	2.25879
27	.84649	.19978	30.23885	1.90504
28	.97366	.19978	2.71523	.49384
29	.03210	.25649	4.51368	4.18044
30	.23963	.25649	1.96195	1.81741
31	.44715	.25649	1.07803	1.24837
32	.52907	.25649	17.33984	1.44848
33	.76960	.25649	25.82381	2.55575
34	.84586	.25649	27.83594	2.17008
35	.97355	.25649	1.60166	.62556
36	.03350	.30782	4.69317	4.21241
37	.25001	.30782	2.01848	1.82692
38	.46653	.30782	1.45124	1.33375
39	.54669	.30782	1.68675	1.52888
40	.77202	.30782	3.13786	2.69362
41	.84524	.30782	2.69427	2.30851
42	.97345	.30782	.89984	.68278
43	.03569	.38073	4.65012	4.19547
44	.26641	.38073	1.99960	1.80659
45	.49713	.38073	1.57716	1.42301
46	.57452	.38073	1.74567	1.58101
47	.77585	.38073	2.96308	2.79088
48	.84426	.38073	2.57902	2.43865
49	.97328	.38073	.79890	.71982
50	.03884	.47085	4.42174	4.03568
51	.28992	.47085	1.84814	1.69152
52	.54099	.47085	1.56700	1.45320
53	.61440	.47085	1.63813	1.53371

54	.78132	.47085	2.88119	2.79312
55	.84286	.47085	2.60810	2.53644
56	.97304	.47085	.75662	.72061
57	.04183	.54376	4.10537	3.77962
58	.31220	.54376	1.61488	1.48926
59	.58258	.54376	1.37908	1.29320
60	.65222	.54376	1.35050	1.28005
61	.78652	.54376	2.59415	2.53494
62	.84152	.54376	2.47283	2.42160
63	.97281	.54376	.65539	.63140
64	.04437	.61252	3.81114	3.53254
65	.33118	.61252	1.37854	1.27556
66	.61798	.61252	.92115	.85488
67	.68597	.61252	.71192	.66205
68	.80001	.61252	.64592	.60285
69	.84946	.61252	.58585	.54746
70	.97417	.61252	.26522	.24804
71	.04835	.71961	3.34555	3.12974
72	.36091	.71961	1.08003	1.00476
73	.67346	.71961	.59600	.55151
74	.74127	.71961	.39475	.36493
75	.83523	.71961	.35244	.32541
76	.87597	.71961	.31146	.28741
77	.97872	.71961	.13549	.12486
78	.05512	.85199	2.70611	2.55803
79	.41140	.85199	.77597	.72855
80	.76768	.85199	.36141	.33716
81	.83520	.85199	.18410	.17155
82	.89504	.85199	.19106	.17787
83	.92099	.85199	.17182	.15990
84	.98644	.85199	.07619	.07083
85	.06305	.95909	1.78450	1.69932
86	.47059	.95909	.40301	.38045
87	.87814	.95909	.14467	.13550
88	.94530	.95909	.03553	.03324
89	.96516	.95909	.04930	.04611
90	.97378	.95909	.04728	.04422
91	.99550	.95909	.02319	.02168

Y/SP	CL	CM	CT	CDI	CLW	CMW	CDW
.02990	.06521	.97007	.30614	-.45001	-.16356	.89981	-.35711
.08970	1.10815	.25947	.20211	-.14922	.77873	.30056	-.11757
.14308	8.92702	-4.13543	.18140	2.74971	1.54133	-.14046	.11327
.19978	10.79594	-5.16229	.18311	3.77647	1.87790	-.26591	.22670
.25649	10.96797	-4.35972	.19303	3.55123	2.01911	-.26817	.26300
.30782	2.34984	-.28892	.20222	.30453	2.08796	-.24028	.27703
.38073	2.32245	-.18776	.20793	.27663	2.12583	-.18145	.28566
.47085	2.21843	-.08825	.19903	.26979	2.07045	-.09594	.28755
.54376	1.98969	.00128	.17938	.24127	1.86900	-.00997	.25816

.61252	1.46748	.15359	.15888	-.04501	1.36321	.14188	-.02652
.71961	1.21646	.19455	.12553	-.04210	1.13545	.18225	-.02886
.85199	1.00680	.20252	.08248	-.01632	.94933	.19141	-.00891
.95909	.66877	.15751	.02960	.01211	.63512	.14986	.01422

THE LIFT COEFFICIENT = 3.13778

TOTAL INDUCED DRAG COEFFICIENT = .70047

THE INDUCED DRAG PARAMETER = .07114

TOTAL PITCHING MOMENT COEFFICIENT = -.80898

THE COANDA LIFT COEFFICIENT, CLR = 2.36375

THE COANDA DRAG COEFFICIENT, CDR = -1.61185

THE COANDA MOMENT COEFFICIENT, CMR = -1.38906

THE LIFT COEFFICIENT FOR THE WING ALONE= 1.34306

THE INDUCED DRAG COEFFICIENT FOR THE WING ALONE= .08235

THE PITCHING MOMENT COEFFICIENT FOR THE WING ALONE= .05775

THE INDUCED DRAG PARAMETER FOR THE WING ALONE= .04565

FUSELAGE AERODYNAMIC CHARACTERISTICS ARE GIVEN BELOW

JET-ON CONFIGURATION

TOTAL PRESSURE LOADING AT EACH X-STATION, BASED ON LOCAL RADIUS

X/L	RADIUS	LOADING
-.36964	.02653	.21615
-.33586	.07697	.67853
-.27059	.11957	.50266
-.17830	.14928	.47310
-.06526	.16099	-1.49061
.06082	.16100	2.65183
.19135	.15954	-.61928
.31742	.13443	-.39553
.43046	.10702	-.51522
.52276	.07778	.32348
.58802	.04721	-5.22526
.62181	.01583	44.70392

THE FUSELAGE POTENTIAL LIFT COEFFICIENT = .04924

THE FUSELAGE POTENTIAL MOMENT COEFFICIENT = .05072

JET-OFF CONFIGURATION

TOTAL PRESSURE LOADING AT EACH X-STATION, BASED ON LOCAL RADIUS

X/L	RADIUS	LOADING
-.36964	.02653	.20605
-.33586	.07697	.62975
-.27059	.11957	.45483
-.17830	.14928	.42110
-.06526	.16099	-1.27505
.06082	.16100	2.56220
.19135	.15954	-.58646
.31742	.13443	-.45178
.43046	.10702	-.57759
.52276	.07778	.15781
.58802	.04721	-4.78707
.62181	.01583	39.16723

THE FUSELAGE POTENTIAL LIFT COEFFICIENT = .04958

THE FUSELAGE POTENTIAL MOMENT COEFFICIENT = .06851

LATERAL-DIRECTIONAL STABILITY CHARACTERSTICS WITH JET ON

**STABILITY DERIVATIVES EVALUATED AT ALPHA = 5.000 DEG.
AND AT MACH NO.= 0.000, BASED ON BODY AXES***

CYB = -.9966898 CLB = -.1454903 CNB = -.0910089

CYP = -.0713625 CLP = -.4520820 CNP = -.2864078

CYR = .2470868 CLR = .2089370 CNR = -.0132019

STABILITY DERIVATIVES BASED ON STABILITY AXES*

CYB = -.9966898 CLB = -.1534323 CNB = -.0783124

CYP = -.0498001 CLP = -.4588427 CNP = -.2481083

CYR = .2533144 CLR = .2472365 CNR = -.0064413

LATERAL-DIRECTIONAL STABILITY CHARACTERSTICS WITH JET OFF

**STABILITY DERIVATIVES EVALUATED AT ALPHA = 5.000 DEG.
AND AT MACH NO.= 0.000, BASED ON BODY AXES***

CYB =	-.3479661	CLB =	-.1597114	CNB =	-.0846101
CYP =	-.0824657	CLP =	-.4609142	CNP =	-.1630398
CYR =	.0980542	CLR =	.1661150	CNR =	-.0044682

STABILITY DERIVATIVES BASED ON STABILITY AXES*

CYB =	-.3479661	CLB =	-.1670951	CNB =	-.0706726
CYP =	-.0739089	CLP =	-.4606458	CNP =	-.1232073
CYR =	.1052507	CLR =	.2059474	CNR =	-.0047366

Listing of Input Data Cards for Test Case 3

```
Card

 1          *** TEST CASE 3, OVER-WING BLOWING ***
 2                  1           0           1           1
 3       0.4         1.003       0.43026     0.85914     2.          0.01386     3.08396
 4                   1           1  0.
 5       12.9797     2.94        0.          0.         -1.299       2.032       0.381       0.254
 6       3.6         0.          0.          0.          0.          0.          0.
 7                   3           5           3           7           3
 8                   2
 9                   4           0           0           0           0
10       -1.5247     2.472       0.741      -0.28884     2.96356     1.778       0.671
11       -0.28884    2.96356     1.778       0.31657     3.20436     2.286       0.671
12       0.31657     3.20436     2.286       2.855       4.214       4.416       0.671
13                   3           5           3           4           5
14       -1.299     -0.28884     1.778      -1.299       0.31657     2.286
15       -0.28884    2.96356     1.778       0.31657     3.20436     2.286
16       2.96356     6.21596     1.778       3.20436     6.45676     2.286
17                   1           0
18       0.          4.416
19                   1           2           7          12           1          12
20       -7.         9.          1.         12.          1.          0.
21       -7.        -6.2        -5.4       -4.6        -3.         -1.4         0.2         1.8
22       3.4         5.          6.6        9.
23       0.          0.194       0.361      0.528       0.778       0.917       0.993       1.
24       0.944       0.847       0.708      0.444
```

Output for Test Case 3

```
****************************************
   *** TEST CASE 3, OVER-WING BLOWING ***
****************************************
        1         0         1         1

                  XXXXXXXXXXXXXXXXXXXXXXXX

                       CASE NUMBER = 1

                  XXXXXXXXXXXXXXXXXXXXXXXX

INPUT DATA
    .40000   1.00300    .43026    .85914   2.00000    .01386   3.08396
         1         1   0.00000
  12.97970   2.94000   0.00000   0.00000  -1.29900   2.03200    .38100    .25400
   3.60000   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000

    THE COMPUTED JET ENTRAINMENT ARE AS FOLLOWS

     XJET        RJET      DM/DX
  10.76626    2.37532     .03114
  12.01626    2.37532     .03114
  14.51626    2.37905     .03104
  17.01626    2.41896     .03000
  19.51626    2.50324     .02793
  22.01626    2.61298     .02547
  24.51626    2.73386     .02302
  27.01626    2.85818     .02077
  29.51626    2.98203     .01876
  32.01626    3.10350     .01700
  34.51626    3.22167     .01545
  37.01626    3.33617     .01410
  39.51626    3.44692     .01292
  42.01626    3.55396     .01188
  44.51626    3.65744     .01096
  47.01626    3.75751     .01015
  49.51626    3.85436     .00943
  52.01626    3.94818     .00878
  54.51626    4.03915     .00820
  57.01626    4.12742     .00767
  59.51626    4.21317     .00720
  62.01626    4.29654     .00677
  64.51626    4.37767     .00638
  67.01626    4.45669     .00603
  69.51626    4.53372     .00570
  72.01626    4.60886     .00541
  74.51626    4.68222     .00513
  77.01626    4.75355     .00498
  79.51626    4.82394     .00465
  82.01626    4.89216     .00443
  84.51626    4.95926     .00423
         3         5         3         7         3
```

```
        2
        4           0           0           0           0
-1.52470    2.47200     .74100    -.28884    2.96356    1.77800     .67100
 -.28884    2.96356    1.77800     .31657    3.20436    2.28600     .67100
  .31657    3.20436    2.28600    2.85500    4.21400    4.41600     .67100
        3           5           3           4           5
-1.29900    -.28884    1.77800   -1.29900     .31657    2.28600
 -.28884    2.96356    1.77800     .31657    3.20436    2.28600
 2.96356    6.21596    1.77800    3.20436    6.45676    2.28600
        1           0
 0.00000    4.41600
        1           2           7          12           1          12
-7.00000    9.00000    1.00000   12.00000    1.00000    0.00000
-7.00000   -6.20000   -5.40000   -4.60000   -3.00000   -1.40000     .20000    1.80000
 3.40000    5.00000    6.60000    9.00000
 0.00000     .19400     .36100     .52800     .77800     .91700     .99300    1.00000
  .94400     .84700     .70800     .44400
          HALF SW=  .12980E+02          CREF=  .29400E+01

 LPANEL,JPANEL,LWFJ=
        48          72         216

                    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

                    A RECTANGULAR JET WITH LATERAL EXTENT EQUAL
                    TO THE EQUIVALENT JET DIAMETER IS USED FOR
                    INTERACTION COMPUTATION

                    NOTE. CHECK WHETHER THE WING IS IMMERSED IN THE JET

                    XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

 THE EQUIVALENT JET PROPERTIES ARE EVALUATED AT   1.54891

 THE EQUIVALENT JET RADIUS IS     .49329

 THE VELOCITY RATIO OF THE EQUIVALENT JET,VO/VJ,IS     .66254

 VORTEX ELEMENT ENDPOINT COORDINATES=

    X1          X2          Y1          Y2          Z1          Z2
 -1.37258   -1.18113     .74100     .90541     .67100     .67100
  -.29109    -.13157     .74100     .90541     .67100     .67100
  1.23839    1.35274     .74100     .90541     .67100     .67100
  2.31988    2.40231     .74100     .90541     .67100     .67100
 -1.18113    -.90814     .90541    1.13985     .67100     .67100
  -.13157     .09589     .90541    1.13985     .67100     .67100
  1.35274    1.51581     .90541    1.13985     .67100     .67100
  2.40231    2.51984     .90541    1.13985     .67100     .67100
```

-.90814	-.63515	1.13985	1.37429	.67100	.67100
.09589	.32335	1.13985	1.37429	.67100	.67100
1.51581	1.67888	1.13985	1.37429	.67100	.67100
2.51984	2.63738	1.13985	1.37429	.67100	.67100
-.63515	-.44370	1.37429	1.53871	.67100	.67100
.32335	.48287	1.37429	1.53871	.67100	.67100
1.67888	1.79324	1.37429	1.53871	.67100	.67100
2.63738	2.71981	1.37429	1.53871	.67100	.67100
-.44370	.13071	1.53871	2.03200	.67100	.67100
.48287	.96147	1.53871	2.03200	.67100	.67100
1.79324	2.13635	1.53871	2.03200	.67100	.67100
2.71981	2.96711	1.53871	2.03200	.67100	.67100
.13071	.70512	2.03200	2.52529	.67100	.67100
.96147	1.44008	2.03200	2.52529	.67100	.67100
2.13635	2.47946	2.03200	2.52529	.67100	.67100
2.96711	3.21442	2.03200	2.52529	.67100	.67100
.70512	.94528	2.52529	2.73154	.67100	.67100
1.44008	1.64018	2.52529	2.73154	.67100	.67100
2.47946	2.62292	2.52529	2.73154	.67100	.67100
3.21442	3.31781	2.52529	2.73154	.67100	.67100
.94528	1.32830	2.73154	3.06047	.67100	.67100
1.64018	1.95932	2.73154	3.06047	.67100	.67100
2.62292	2.85170	2.73154	3.06047	.67100	.67100
3.31781	3.48272	2.73154	3.06047	.67100	.67100
1.32830	1.80592	3.06047	3.47065	.67100	.67100
1.95932	2.35727	3.06047	3.47065	.67100	.67100
2.85170	3.13700	3.06047	3.47065	.67100	.67100
3.48272	3.68835	3.06047	3.47065	.67100	.67100
1.80592	2.28354	3.47065	3.88082	.67100	.67100
2.35727	2.75523	3.47065	3.88082	.67100	.67100
3.13700	3.42229	3.47065	3.88082	.67100	.67100
3.68835	3.89398	3.47065	3.88082	.67100	.67100
2.28354	2.66656	3.88082	4.20975	.67100	.67100
2.75523	3.07436	3.88082	4.20975	.67100	.67100
3.42229	3.65108	3.88082	4.20975	.67100	.67100
3.89398	4.05888	3.88082	4.20975	.67100	.67100
2.66656	2.87912	4.20975	4.39230	.67100	.67100
3.07436	3.25147	4.20975	4.39230	.67100	.67100
3.65108	3.77805	4.20975	4.39230	.67100	.67100
4.05888	4.15039	4.20975	4.39230	.67100	.67100
-1.25044	-1.25044	1.53871	1.53871	.67100	1.44587
-.93651	-.93651	1.53871	1.53871	.67100	1.44587
-.62258	-.62258	1.53871	1.53871	.67100	1.44587
-1.25044	-1.21105	1.53871	2.03200	1.44587	1.44587
-.93651	-.64257	1.53871	2.03200	1.44587	1.44587
-.62258	-.07408	1.53871	2.03200	1.44587	1.44587
-1.21105	-1.17167	2.03200	2.52529	1.44587	1.44587
-.64257	-.34863	2.03200	2.52529	1.44587	1.44587
-.07408	.47442	2.03200	2.52529	1.44587	1.44587

-1.17167	-1.17167	2.52529	2.52529	1.44587	.67100
-.34863	-.34863	2.52529	2.52529	1.44587	.67100
.47442	.47442	2.52529	2.52529	1.44587	.67100
-1.25044	-1.21105	1.53871	2.03200	.67100	.67100
-.93651	-.64257	1.53871	2.03200	.67100	.67100
-.62258	-.07408	1.53871	2.03200	.67100	.67100
-1.21105	-1.17167	2.03200	2.52529	.67100	.67100
-.64257	-.34863	2.03200	2.52529	.67100	.67100
-.07408	.47442	2.03200	2.52529	.67100	.67100
-.44370	-.44370	1.53871	1.53871	.67100	1.44587
.48287	.48287	1.53871	1.53871	.67100	1.44587
1.79324	1.79324	1.53871	1.53871	.67100	1.44587
2.71981	2.71981	1.53871	1.53871	.67100	1.44587
-.44370	.13071	1.53871	2.03200	1.44587	1.44587
.48287	.96148	1.53871	2.03200	1.44587	1.44587
1.79324	2.13635	1.53871	2.03200	1.44587	1.44587
2.71981	2.96711	1.53871	2.03200	1.44587	1.44587
.13071	.70512	2.03200	2.52529	1.44587	1.44587
.96148	1.44008	2.03200	2.52529	1.44587	1.44587
2.13635	2.47946	2.03200	2.52529	1.44587	1.44587
2.96711	3.21442	2.03200	2.52529	1.44587	1.44587
.70512	.70512	2.52529	2.52529	1.44587	.67100
1.44008	1.44008	2.52529	2.52529	1.44587	.67100
2.47946	2.47946	2.52529	2.52529	1.44587	.67100
3.21442	3.21442	2.52529	2.52529	1.44587	.67100
-.44370	.13071	1.53871	2.03200	.67100	.67100
.48287	.96148	1.53871	2.03200	.67100	.67100
1.79324	2.13635	1.53871	2.03200	.67100	.67100
2.71981	2.96711	1.53871	2.03200	.67100	.67100
.13071	.70512	2.03200	2.52529	.67100	.67100
.96148	1.44008	2.03200	2.52529	.67100	.67100
2.13635	2.47946	2.03200	2.52529	.67100	.67100
2.96711	3.21442	2.03200	2.52529	.67100	.67100
2.92972	2.92972	1.53871	1.53871	.67100	1.44587
3.52047	3.52047	1.53871	1.53871	.67100	1.44587
4.47633	4.47633	1.53871	1.53871	.67100	1.44587
5.43219	5.43219	1.53871	1.53871	.67100	1.44587
6.02294	6.02294	1.53871	1.53871	.67100	1.44587
2.92972	3.16355	1.53871	2.03200	1.44587	1.44587
3.52047	3.75430	1.53871	2.03200	1.44587	1.44587
4.47633	4.71016	1.53871	2.03200	1.44587	1.44587
5.43219	5.66602	1.53871	2.03200	1.44587	1.44587
6.02294	6.25677	1.53871	2.03200	1.44587	1.44587
3.16355	3.39738	2.03200	2.52529	1.44587	1.44587
3.75430	3.98813	2.03200	2.52529	1.44587	1.44587
4.71016	4.94399	2.03200	2.52529	1.44587	1.44587
5.66602	5.89985	2.03200	2.52529	1.44587	1.44587
6.25677	6.49060	2.03200	2.52529	1.44587	1.44587
3.39738	3.39738	2.52529	2.52529	1.44587	.67100

3.98813	3.98813	2.52529	2.52529	1.44587	.67100
4.94399	4.94399	2.52529	2.52529	1.44587	.67100
5.89985	5.89985	2.52529	2.52529	1.44587	.67100
6.49060	6.49060	2.52529	2.52529	1.44587	.67100
2.92972	3.16355	1.53871	2.03200	.67100	.67100
3.52047	3.75430	1.53871	2.03200	.67100	.67100
4.47633	4.71016	1.53871	2.03200	.67100	.67100
5.43219	5.66602	1.53871	2.03200	.67100	.67100
6.02294	6.25677	1.53871	2.03200	.67100	.67100
3.16355	3.39738	2.03200	2.52529	.67100	.67100
3.75430	3.98813	2.03200	2.52529	.67100	.67100
4.71016	4.94399	2.03200	2.52529	.67100	.67100
5.66602	5.89985	2.03200	2.52529	.67100	.67100
6.25677	6.49060	2.03200	2.52529	.67100	.67100

CONTROL POINT COORDINATES=

XCP	YCP	ZCP	XCP	YCP	ZCP
-.85662	.81717	.67100	.53709	.81717	.67100
1.93081	.81717	.67100	2.50811	.81717	.67100
-.63991	1.01660	.67100	.70320	1.01660	.67100
2.04631	1.01660	.67100	2.60264	1.01660	.67100
-.37205	1.26310	.67100	.90851	1.26310	.67100
2.18906	1.26310	.67100	2.71949	1.26310	.67100
-.15534	1.46253	.67100	1.07461	1.46253	.67100
2.30456	1.46253	.67100	2.81402	1.46253	.67100
.19545	1.78535	.67100	1.34348	1.78535	.67100
2.49151	1.78535	.67100	2.96704	1.78535	.67100
.73149	2.27865	.67100	1.75434	2.27865	.67100
2.77719	2.27865	.67100	3.20087	2.27865	.67100
1.10124	2.61891	.67100	2.03774	2.61891	.67100
2.97425	2.61891	.67100	3.36217	2.61891	.67100
1.38628	2.88123	.67100	2.25622	2.88123	.67100
3.12616	2.88123	.67100	3.48651	2.88123	.67100
1.79818	3.26029	.67100	2.57193	3.26029	.67100
3.34568	3.26029	.67100	3.66618	3.26029	.67100
2.25535	3.68101	.67100	2.92234	3.68101	.67100
3.58933	3.68101	.67100	3.86561	3.68101	.67100
2.66725	4.06007	.67100	3.23805	4.06007	.67100
3.80885	4.06007	.67100	4.04528	4.06007	.67100
2.95229	4.32238	.67100	3.45653	4.32238	.67100
3.96076	4.32238	.67100	4.16962	4.32238	.67100
-1.11775	1.53871	1.05843	-.75526	1.53871	1.05843
-.57402	1.53871	1.05843	-1.04427	1.78535	1.44587
-.53481	1.78535	1.44587	-.28008	1.78535	1.44587
-.89730	2.27865	1.44587	-.09389	2.27865	1.44587
.30781	2.27865	1.44587	-.82391	2.52529	1.05843
.12656	2.52529	1.05843	.60175	2.52529	1.05843
-1.04427	1.78535	.67100	-.53481	1.78535	.67100

-.28008	1.78535	.67100	-.89730	2.27865	.67100
-.09389	2.27865	.67100	.30781	2.27865	.67100
-.07256	1.53871	1.05843	1.13806	1.53871	1.05843
2.34868	1.53871	1.05843	2.85013	1.53871	1.05843
.19545	1.78535	1.44587	1.34348	1.78535	1.44587
2.49152	1.78535	1.44587	2.96705	1.78535	1.44587
.73149	2.27865	1.44587	1.75434	2.27865	1.44587
2.77719	2.27865	1.44587	3.20087	2.27865	1.44587
.99950	2.52529	1.05843	1.95977	2.52529	1.05843
2.92003	2.52529	1.05843	3.31779	2.52529	1.05843
.19545	1.78535	.67100	1.34348	1.78535	.67100
2.49152	1.78535	.67100	2.96705	1.78535	.67100
.73149	2.27865	.67100	1.75434	2.27865	.67100
2.77719	2.27865	.67100	3.20087	2.27865	.67100
3.16071	1.53871	1.05843	3.97381	1.53871	1.05843
4.97885	1.53871	1.05843	5.79195	1.53871	1.05843
6.10253	1.53871	1.05843	3.27762	1.78535	1.44587
4.09072	1.78535	1.44587	5.09577	1.78535	1.44587
5.90887	1.78535	1.44587	6.21945	1.78535	1.44587
3.51145	2.27865	1.44587	4.32455	2.27865	1.44587
5.32960	2.27865	1.44587	6.14270	2.27865	1.44587
6.45327	2.27865	1.44587	3.62837	2.52529	1.05843
4.44147	2.52529	1.05843	5.44651	2.52529	1.05843
6.25961	2.52529	1.05843	6.57019	2.52529	1.05843
3.27762	1.78535	.67100	4.09072	1.78535	.67100
5.09577	1.78535	.67100	5.90887	1.78535	.67100
6.21945	1.78535	.67100	3.51145	2.27865	.67100
4.32455	2.27865	.67100	5.32960	2.27865	.67100
6.14270	2.27865	.67100	6.45327	2.27865	.67100

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

ALPHA = 2.000 DEGREES

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

VORTEX	XV	YV	CP	CPW
1	.03806	.18505	.39232	.35731
2	.30866	.18505	.10702	.08549
3	.69134	.18505	.02094	.01441
4	.96194	.18505	-.00583	-.00917
5	.03806	.23021	.40380	.36237
6	.30866	.23021	.11075	.08971
7	.69134	.23021	.02449	.01786
8	.96194	.23021	.00044	-.00464
9	.03806	.28603	.43208	.37121
10	.30866	.28603	.11031	.09250
11	.69134	.28603	.02999	.02307
12	.96194	.28603	.01210	.00075

13	.03806	.33119	.45889	.37454
14	.30866	.33119	.10907	.09526
15	.69134	.33119	.03549	.02769
16	.96194	.33119	.03418	.00424
17	.03806	.40429	.58478	.38462
18	.30866	.40429	.13474	.10114
19	.69134	.40429	.05030	.03352
20	.96194	.40429	.12117	.00777
21	.03806	.51600	.54643	.39921
22	.30866	.51600	.14973	.11052
23	.69134	.51600	.06907	.04075
24	.96194	.51600	.13908	.01061
25	.03806	.59305	.50106	.41432
26	.30866	.59305	.14156	.11578
27	.69134	.59305	.07043	.04378
28	.96194	.59305	.05318	.01148
29	.03806	.65245	.49667	.42164
30	.30866	.65245	.14465	.11829
31	.69134	.65245	.06809	.04500
32	.96194	.65245	.02611	.01164
33	.03806	.73829	.50244	.43349
34	.30866	.73829	.14535	.12074
35	.69134	.73829	.06019	.04397
36	.96194	.73829	.01639	.01080
37	.03806	.83356	.50762	.44337
38	.30866	.83356	.13710	.11625
39	.69134	.83356	.04659	.03646
40	.96194	.83356	.01105	.00823
41	.03806	.91940	.49000	.43229
42	.30866	.91940	.10247	.08811
43	.69134	.91940	.02685	.02145
44	.96194	.91940	.00609	.00467
45	.03806	.97880	.36375	.32314
46	.30866	.97880	.03673	.03138
47	.69134	.97880	.01096	.00871
48	.96194	.97880	.00276	.00210

Y/SP	CL	CM	CT	CDI	CLW	CMW	CDW
.18505	.10449	.02596	.00148	.00217	.08856	.02453	.00176
.23021	.10988	.01764	.00383	.00001	.09285	.01716	-.00005
.28603	.11773	.00643	.00430	-.00019	.09788	.00739	.00004
.33119	.12668	-.00532	.00603	-.00161	.10158	-.00114	.00011
.40429	.17320	-.03712	.00243	.00362	.10788	-.01518	.00025
.51600	.18223	-.07530	.00249	.00387	.11653	-.03816	.00032
.59305	.16032	-.07853	.00613	-.00053	.12195	-.05474	.00020
.65245	.15585	-.08768	.00569	-.00025	.12443	-.06731	.00018
.73829	.15265	-.10386	.00580	-.00047	.12660	-.08482	.00004
.83356	.14471	-.11750	.00596	-.00091	.12319	-.09953	.00453
.91940	.12160	-.11239	.00573	-.00149	.10534	-.09720	.00403

.97880	.07248	-.07203	.00411	-.00158	.06338	-.06295	.00221

THE LIFT COEFFICIENT = .10438

TOTAL INDUCED DRAG COEFFICIENT = .00060

THE INDUCED DRAG PARAMETER = .05465

TOTAL PITCHING MOMENT COEFFICIENT = -.03792

THE LIFT COEFFICIENT WITH JET ENTRAINMENT ALONE = .08615

THE INDUCED DRAG COEFFICIENT WITH JET ENTRAINMENT ALONE = -.00006

THE PITCHING MOMENT COEFFICIENT WITH JET ENTRAINMENT ALONE = -.02854

THE LIFT COEFFICIENT FOR THE WING ALONE= .07892

THE INDUCED DRAG COEFFICIENT FOR THE WING ALONE= .00065

THE PITCHING MOMENT COEFFICIENT FOR THE WING ALONE= -.02624

THE INDUCED DRAG PARAMETER FOR THE WING ALONE= .10407

FUSELAGE AERODYNAMIC CHARACTERISTICS ARE GIVEN BELOW

JET-ON CONFIGURATION

TOTAL PRESSURE LOADING AT EACH X-STATION, BASED ON LOCAL RADIUS

X/L	RADIUS	LOADING
-.43322	.01871	.05259
-.39944	.15172	.08151
-.33418	.37217	.08391
-.24188	.65812	.04907
-.12884	.86934	.01089
-.00276	.98553	.01521
.12776	.99496	.03406
.25384	.90868	.00020
.36688	.77627	-.01669
.45918	.63125	.01137
.52444	.51508	-.02437
.55822	.45209	-.09939

THE FUSELAGE POTENTIAL LIFT COEFFICIENT = .00900

THE FUSELAGE POTENTIAL MOMENT COEFFICIENT = .00829

JET-OFF CONFIGURATION

TOTAL PRESSURE LOADING AT EACH X-STATION, BASED ON LOCAL RADIUS

X/L	RADIUS	LOADING
-.43322	.01871	.06775
-.39944	.15172	.08411
-.33418	.37217	.08451
-.24188	.65812	.06302
-.12884	.86934	.01474
-.00276	.98553	.01145
.12776	.99496	.02494
.25384	.90868	-.00118
.36688	.77627	-.01815
.45918	.63125	-.02539
.52444	.51508	-.02813
.55822	.45208	-.04919

THE FUSELAGE POTENTIAL LIFT COEFFICIENT = .00699

THE FUSELAGE POTENTIAL MOMENT COEFFICIENT = .01236

LATERAL-DIRECTIONAL STABILITY CHARACTERSTICS WITH JET ON

29

**STABILITY DERIVATIVES EVALUATED AT ALPHA = 2.000 DEG.

AND AT MACH NO.= .400, BASED ON BODY AXES***

CYB = -.1352017 CLB = -.0783607 CNB = -.1744832

CYP = .1402299 CLP = -.2498866 CNP = -.0601710

CYR = .1662392 CLR = .0556727 CNR = -.0501926

STABILITY DERIVATIVES BASED ON STABILITY AXES*

CYB = -.1352017 CLB = -.0844513 CNB = -.1717479

CYP = .1460327 CLP = -.2500436 CNP = -.0532004

CYR = .1613442 CLR = .0626434 CNR = -.0500356

LATERAL-DIRECTIONAL STABILITY CHARACTERSTICS WITH JET OFF

**STABILITY DERIVATIVES EVALUATED AT ALPHA = 2.000 DEG.

AND AT MACH NO.= .400, BASED ON BODY AXES***

CYB =	-.1348120	CLB =	-.0769513	CNB =	-.1746655
CYP =	.0862469	CLP =	-.2410532	CNP =	-.0355239
CYR =	.1676378	CLR =	.0525684	CNR =	-.0514798

STABILITY DERIVATIVES BASED ON STABILITY AXES*

CYB =	-.1348120	CLB =	-.0830483	CNB =	-.1719794
CYP =	.0920986	CLP =	-.2404582	CNP =	-.0289065
CYR =	.1646272	CLR =	.0591857	CNR =	-.0520748

References

1. Lan, C. Edward, Fillman, Greg L. and Fox, Charles H., Jr.: Computer Program for Calculating Aerodynamic Characteristics of Upper-Surface-Blowing and Over-Wing-Blowing Configurations. NASA TM X-73987, February 1977.

2. Hopkins, E. J.: A Semiempirical Method for Calculating the Pitching Moment of Bodies of Revolution at Low Mach Numbers. NACA RMA51C14, 1951.

3. Lan, C. Edward: Theoretical Aerodynamics of Over-Wing-Blowing Configurations. NASA CR-144969, 1976.

4. Roskam, Jan: Flight Dynamics of Ridgid and Elastic Airplanes. Part 1, Chapter 4. Published by Roskam Aviation and Engineering Corp., 519 Boulder, Lawrence, KS, 1972.

5. Phelps, A. E.: Wind-Tunnel Investigation of a Twin-Engine Straight-Wing Upper-Surface Blown Jet-Flap Configuration. NASA TN D-7778, 1975.

Computer Program Listing

The following is a listing of the 5,427 separate cards which constitute the computer program.

```
      OVERLAY (WNGJET,0,0)                                                  LDS  10
      PROGRAM WNGJET(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1,TAPE2,TLDS  20
     1APE3,TAPE4,TAPE7,TAPE8,TAPE9)                                         LDS  30
C           AERODYNAMICS OF WING-JET INTERACTION                            LDS  40
C     BY C. EDWARD LAN OF THE UNIVERSITY OF KANSAS                          LDS  50
C                                                                           LDS  60
C    THIS PROGRAM IS APPLICABLE TO BOTH UPPER-SURFACE-BLOWING AND OVER-     LDS  70
C    WING BLOWING CONFIGURATIONS.                                           LDS  80
C                                                                           LDS  90
C    NOTE, ROOT AND TIP CAMBER FUNCTIONS MAY BE DEFINED AS FUNCTION         LDS 100
C    SUBPROGRAMS ZCR(X) AND ZCT(X), RESPECTIVELY.                           LDS 110
C    THE ARRAY DIMENSIONS OF THIS PROGRAM RESTRICT THE NUMBER OF WING       LDS 120
C    VORTICES TO BE 100 MAXIMUM AND THE TOTAL WING AND JET VORTICES TO BELDS 130
C    200 MAXIMUM. ALSO, CHECK THE ARRAY SIZE OF GAMMA IN SUBROUTINE         LDS 140
C    "SOLUTN" BEFORE USING THE PROGRAM.                                     LDS 150
C                                                                           LDS 160
      DIMENSION TITLE(13)                                                   LDS 170
      COMMON /SKODE/ KCODE                                                  LDS 180
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),LDS 190
     1XLL(41)                                                               LDS 200
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTLDS 210
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZLDS 220
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95LDS 230
     3,2),SC(160,5),SI(160,5),LC(3)                                         LDS 240
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)           LDS 250
      COMMON /SOME/ NC,NWING,LAT,NAL,LWF,LWFJ,CHORDT(3),SNG(5),YG(5),YCNLDS 260
     1(6),WKN,RDX,RDG,NDG                                                   LDS 270
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JLDS 280
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                            LDS 290
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                          LDS 300
      COMMON /JET/ PK1,XC,XJT(31),A(31),B(31)                               LDS 310
      COMMON /ADD/ CP(130),CM(30),BREAK(8),SWP(8,15),GAL(30),ISYM,VMU,VULDS 320
     1,TEMP,FCR,CAMLER,CAMLET,CAMTER,CAMTET,XJ,YJ,ZJ,RJ,ALP,CREF,TWISTR LDS 330
      COMMON /COST/ LTOTAL,LPAN1,NJW(5),LPANEL,IEATN,LPAN2,EXIT,PTIAL,TWLDS 340
     1IST,DF(5),NFP                                                         LDS 350
      COMMON /CAMB/ ICAM,IM,XT(2,11),ZC(2,11),AAM(2,10),BBM(2,10),CCM(2,LDS 360
     110),DDM(2,10)                                                         LDS 370
C     IARY - USED IN SYSTEMC                                                LDS 380
      DIMENSION IARY(6)                                                     LDS 390
      DATA IARY/4*(-0),(0),(-0)/                                            LDS 400
C     SYSTEMC SUPPRESSES THE PRINTING OF NON-FATAL ERROR MESSAGES IN        LDS 410
C      THE EVALUATION OF (EXP(A)), WHEN (A) IS LESS THAN (-675.84) ON       LDS 420
C      CYBER-175. THIS CALL MIGHT NOT BE NEEDED FOR OTHER COMPUTING         LDS 430
C      SYSTEMS.                                                             LDS 440
      CALL SYSTEMC (115,IARY)                                               LDS 450
      PI=3.14159265                                                         LDS 460
      READ (5,70) (TITLE(I),I=1,13)                                         LDS 470
      WRITE (6,80)                                                          LDS 480
      WRITE (6,70) (TITLE(I),I=1,13)                                        LDS 490
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      WRITE (6,80)                                                        LDS 500
      NCCN=1                                                              LDS 510
C                                                                         LDS 520
C  ***NUMBER OF CASES TO BE RUN, GEOMETRY CODE (=1 IF GEOMETRY VARIES.    LDS 530
C     IN THIS CASE, ALPHA MAY ALSO BE DIFFERENT. =0 FOR THE SAME GEOME-   LDS 540
C     TRY BUT DIFFERENT ALPHA'S) , AND SYMMETRY CODE (=0 FOR A CENTERED   LDS 550
C     JET, AND=1 OTHERWISE) ***                                           LDS 560
C  ***LATERAL MODE SELECTOR (=0 FOR SYMMETRICAL MODE OF MOTION, AND =1    LDS 570
C     IF LATERAL-DIRECTIONAL DERIVATIVES ARE TO BE COMPUTED) ***          LDS 580
C                                                                         LDS 590
      READ (5,60) ICASE,NG,ISYM,LAT                                       LDS 600
      WRITE (6,60) ICASE,NG,ISYM,LAT                                      LDS 610
10    CONTINUE                                                            LDS 620
      WRITE (6,90)                                                        LDS 630
      WRITE (6,100) NCON                                                  LDS 640
      WRITE (6,90)                                                        LDS 650
      CALL OVERLAY (6HWNGJET,1,0)                                         LDS 660
      J1=LWF+1                                                            LDS 670
      CALL OVERLAY (6HWNGJET,2,0)                                         LDS 680
      CALL OVERLAY (6HWNGJET,3,0)                                         LDS 690
20    CONTINUE                                                            LDS 700
      CALL OVERLAY (6HWNGJET,4,0)                                         LDS 710
      CALL OVERLAY (6HWNGJET,5,0)                                         LDS 720
      NCCN=NCCN+1                                                         LDS 730
      IF (NCCN.GT.ICASE) GO TO 40                                         LDS 740
      IF (NG.EQ.1) GO TO 10                                               LDS 750
C                                                                         LDS 760
C  ***ADDITIONAL ANGLES OF ATTACK IN DEGS, TO BE COMPUTED, TO BE READ IN  LDS 770
C     BEHIND THE GEOMETRY DATA DEFINED IN SUBROUTINE "GEOMTY" ***         LDS 780
C                                                                         LDS 790
      READ (5,50) ALP                                                     LDS 800
      ALP=ALP*PI/180.                                                     LDS 810
      ALPS=SIN(ALP)                                                       LDS 820
      ALPC=COS(ALP)                                                       LDS 830
      ALPT=ALPS/ALPC                                                      LDS 840
      DO 30 I=1,NCS                                                       LDS 850
      XLL(I)=ALP+(TWISTR+TWIST*YLE(I)/HALFB)*PI/180.                      LDS 860
      T=XLL(I)                                                            LDS 870
30    XTT(I)=SIN(T)/COS(T)                                                LDS 880
      WRITE (6,90)                                                        LDS 890
      WRITE (6,100) NCON                                                  LDS 900
      WRITE (6,90)                                                        LDS 910
      GO TO 20                                                            LDS 920
40    CONTINUE                                                            LDS 930
      STOP                                                                LDS 940
C                                                                         LDS 950
50    FORMAT (8F10.5)                                                     LDS 960
60    FORMAT (7(6X,I4))                                                   LDS 970
70    FORMAT (13A6)                                                       LDS 980
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80    FORMAT (40H****************************************)                LDS 990
90    FORMAT (1H0,20X,25HXXXXXXXXXXXXXXXXXXXXXXXXX)                        LDS1000
100   FORMAT (1H0,25X,13HCASE NUMBER =,I2)                                 LDS1010
      END                                                                  LDS1020-
      FUNCTION ZCR (X)                                                     ZCR  10
      COMMON /CAMB/ ICAM,IM,XT(2,11),ZC(2,11),AAM(2,10),BBM(2,10),CCM(2,ZCR  20
     110),DDM(2,10)                                                       ZCR  30
      IF (ICAM.EQ.1) GO TO 10                                              ZCR  40
C                                                                          ZCR  50
C  *** CAMBER FUNCTION FOR THE ROOT SECTION ***                            ZCR  60
C                                                                          ZCR  70
      IF (X.LT.0.2025) ZCR=2.6895*(3.*X**X-1.215*X+0.114715)               ZCR  80
      IF (X.GE.0.2025) ZCR=-0.02208                                        ZCR  90
      GO TO 20                                                             ZCR 100
10    ZCR=ZCAM(1,X)                                                        ZCR 110
20    RETURN                                                               ZCR 120
      END                                                                  ZCR 130-
      FUNCTION ZCT (X)                                                     ZCT  10
      COMMON /CAMB/ ICAM,IM,XT(2,11),ZC(2,11),AAM(2,10),BBM(2,10),CCM(2,ZCT  20
     110),DDM(2,10)                                                       ZCT  30
      IF (ICAM.EQ.1) GO TO 10                                              ZCT  40
C                                                                          ZCT  50
C  *** CAMBER FUNCTION FOR THE TIP SECTION ***                             ZCT  60
C                                                                          ZCT  70
      ZCT=ZCR(X)                                                           ZCT  80
      GO TO 20                                                             ZCT  90
10    ZCT=ZCAM(2,X)                                                        ZCT 100
20    RETURN                                                               ZCT 110
      END                                                                  ZCT 120-
      FUNCTION ZCAM (I,X)                                                  ZCM  10
      COMMON /CAMB/ ICAM,IM,XT(2,11),ZC(2,11),AAM(2,10),BBM(2,10),CCM(2,ZCM  20
     110),DDM(2,10)                                                       ZCM  30
      K=1                                                                  ZCM  40
10    IF (X.GE.XT(I,K).AND.X.LT.XT(I,K+1)) GO TO 20                        ZCM  50
      K=K+1                                                                ZCM  60
      IF (K.GE.IM) GO TO 30                                                ZCM  70
      GO TO 10                                                             ZCM  80
20    SM=X-XT(I,K)                                                         ZCM  90
      ZCAM=3.*AAM(I,K)*SM**2+2.*BBM(I,K)*SM+CCM(I,K)                       ZCM 100
      GO TO 50                                                             ZCM 110
30    IF (X.LT.XT(I,1)) GO TO 40                                           ZCM 120
      K=IM-1                                                               ZCM 130
      GO TO 20                                                             ZCM 140
40    K=1                                                                  ZCM 150
      GO TO 20                                                             ZCM 160
50    RETURN                                                               ZCM 170
      END                                                                  ZCM 180-
      FUNCTION FUR (X)                                                     FUR  10
      COMMON /FUSRAD/ IFR,IFN,XFF(21),RFF(21),AAF(20),BBF(20),CCF(20),DDFUR  20
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      1F(20)                                                                    FUR  30
       IF (IFR.NE.0) GO TO 30                                                   FUR  40
C                                                                               FUR  50
C   * DEFINE THE FUSELAGE RADIUS AS A FUNCTION OF X *                           FUR  60
C                                                                               FUR  70
       IF (X.LT.(-0.127)) GO TO 10                                              FUR  80
       IF (X.GT.0.381) GO TO 20                                                 FUR  90
       FUR=0.161                                                                FUR 100
       GO TO 80                                                                 FUR 110
10     FUR=0.161*SQRT(1.-(1.-(X+0.777)/0.65)**2)                                FUR 120
       GO TO 80                                                                 FUR 130
20     FUR=0.161*SQRT(1.-1.0869565*(X-0.381))                                   FUR 140
       GO TO 80                                                                 FUR 150
30     CONTINUE                                                                 FUR 160
       K=1                                                                      FUR 170
40     IF (X.GE.XFF(K).AND.X.LT.XFF(K+1)) GO TO 50                              FUR 180
       K=K+1                                                                    FUR 190
       IF (K.GE.IFN) GO TO 60                                                   FUR 200
       GO TO 40                                                                 FUR 210
50     SM=X-XFF(K)                                                              FUR 220
       FUR=AAF(K)*SM**3+BBF(K)*SM**2+CCF(K)*SM+DDF(K)                           FUR 230
       GO TO 80                                                                 FUR 240
60     IF (X.LT.XFF(1)) GO TO 70                                                FUR 250
       K=IFN-1                                                                  FUR 260
       GO TO 50                                                                 FUR 270
70     K=1                                                                      FUR 280
       GO TO 50                                                                 FUR 290
80     RETURN                                                                   FUR 300
       END                                                                      FUR 310-
       FUNCTION SLOP (X)                                                        SLP  10
       COMMON /FUSRAD/ IFR,IFN,XFF(21),RFF(21),AAF(20),BBF(20),CCF(20),DDSLP  20
      1F(20)                                                                    SLP  30
       IF (IFR.NE.0) GO TO 30                                                   SLP  40
C                                                                               SLP  50
C   * DEFINE THE DERIVATIVE OF FUSELAGE RADIUS WITH DIMENSIONAL X               SLP  60
C     MULTIPLIED BY RADIUS, OR, =R(DR/DX) . *                                   SLP  70
C                                                                               SLP  80
       IF (X.LT.(-0.127)) GO TO 10                                              SLP  90
       IF (X.GT.0.381) GO TO 20                                                 SLP 100
       SLOP=0.                                                                  SLP 110
       GO TO 80                                                                 SLP 120
10     SLOP=0.0399*(1.-(X+0.777)/0.65)                                          SLP 130
       IF (ABS(X+0.777).LE.0.001) SLOP=0.                                       SLP 140
       GO TO 80                                                                 SLP 150
20     SLOP=-0.014087                                                           SLP 160
       GO TO 80                                                                 SLP 170
30     CONTINUE                                                                 SLP 180
       K=1                                                                      SLP 190
40     IF (X.GE.XFF(K).AND.X.LT.XFF(K+1)) GO TO 50                              SLP 200
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```
      K=K+1                                                              SLP 210
      IF (K.GE.IFN) GO TO 60                                             SLP 220
      GO TO 40                                                           SLP 230
50    SM=X-XFF(K)                                                        SLP 240
      SLOP=3.*AAF(K)*SM**2+2.*BBF(K)*SM+CCF(K)                           SLP 250
      SLOP=SLOP*FUR(X)                                                   SLP 260
      GO TO 80                                                           SLP 270
60    IF (X.LT.XFF(1)) GO TO 70                                          SLP 280
      K=IFN-1                                                            SLP 290
      GO TO 50                                                           SLP 300
70    K=1                                                                SLP 310
      GO TO 50                                                           SLP 320
80    RETURN                                                             SLP 330
      END                                                                SLP 340-
      SUBROUTINE VMSEON (NC1,K,AA,A,CA)                                  VSN  10
C     TO SOLVE THE SIMULTANEOUS EQUATIONS BY PURCELL'S VECTOR METHOD     VSN  20
      DIMENSION AA(1), CA(1), A(1)                                       VSN  30
      NC=K*NC1                                                           VSN  40
      SUM1=0.                                                            VSN  50
      K1=K-1                                                             VSN  60
      JJ=1                                                               VSN  70
      DO 10 J=1,K1                                                       VSN  80
      SUM1=SUM1+AA(J)*A(JJ)                                              VSN  90
10    JJ=JJ+NC1+1                                                        VSN 100
      SUM1=SUM1+AA(K)                                                    VSN 110
      DO 30 I=1,NC1                                                      VSN 120
      SUM2=0.                                                            VSN 130
      JJ=I+1                                                             VSN 140
      DO 20 J=1,K1                                                       VSN 150
      SUM2=SUM2+AA(J)*A(JJ)                                              VSN 160
20    JJ=JJ+NC1+1                                                        VSN 170
      KK=K+I                                                             VSN 180
      SUM2=SUM2+AA(KK)                                                   VSN 190
30    CA(I)=-SUM2/SUM1                                                   VSN 200
      M=1                                                                VSN 210
      L=0                                                                VSN 220
      KNC=(K-1)*NC1                                                      VSN 230
      DO 60 I=1,NC                                                       VSN 240
      IF (I.GT.KNC) GO TO 50                                             VSN 250
      MM=(M-1)*NC1+1                                                     VSN 260
      IF (I.EQ.MM) GO TO 70                                              VSN 270
40    KK=KK+1                                                            VSN 280
      IL=I+L                                                             VSN 290
      A(I)=CA(KK)*BASE+A(IL)                                             VSN 300
      GO TO 60                                                           VSN 310
50    II=I-KNC                                                           VSN 320
      A(I)=CA(II)                                                        VSN 330
60    CONTINUE                                                           VSN 340
      GO TO 80                                                           VSN 350
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70    II=MM+M-1                                                          VSN 360
      BASE=A(II)                                                         VSN 370
      KK=0                                                               VSN 380
      L=L+1                                                              VSN 390
      M=M+1                                                              VSN 400
      GO TO 40                                                           VSN 410
80    CONTINUE                                                           VSN 420
      RETURN                                                             VSN 430
      END                                                                VSN 440-
      SUBROUTINE INTEG (F,NN,LJ,IZ,IJ,B,IR)                              INT  10
C     TO MAKE REFINED INTEGRATION FOR INDUCED TANGENTIAL VELOCITIES      INT  20
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTINT  30
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZINT  40
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95INT  50
     3,2),SC(160,5),SI(160,5),LC(3)                                      INT  60
      PI=3.14159265                                                      INT  70
      J=LJ+1                                                             INT  80
      JJ=NN*16                                                           INT  90
      IF (NN.GT.6) JJ=NN*8                                               INT 100
      FJ=JJ                                                              INT 110
      C1=TX(IZ,1)-EX(IZ,1)                                               INT 120
      C2=TX(IZ,2)-EX(IZ,2)                                               INT 130
      SUM=0.                                                             INT 140
      DO 10 K=1,JJ                                                       INT 150
      XX1=EX(IZ,1)+C1*SC(K,IR)                                           INT 160
      XX2=EX(IZ,2)+C2*SC(K,IR)                                           INT 170
      X1=XX1-XCP(IJ)                                                     INT 180
      X2=XX2-XCP(IJ)                                                     INT 190
      Y1=YN(J,1)-YCP(IJ)                                                 INT 200
      Y2=YN(J,2)-YCP(IJ)                                                 INT 210
      Z1=ZN(J,1)-ZCP(IJ)                                                 INT 220
      Z2=ZN(J,2)-ZCP(IJ)                                                 INT 230
      X12=XX2-XX1                                                        INT 240
      Y12=YN(J,2)-YN(J,1)                                                INT 250
      Z12=ZN(J,2)-ZN(J,1)                                                INT 260
      YZI=Y1*Z12-Z1*Y12                                                  INT 270
      XYK=X1*Y12-Y1*X12                                                  INT 280
      XZJ=X1*Z12-Z1*X12                                                  INT 290
      ALB=XYK*XYK+XZJ*XZJ+B*YZI*YZI                                      INT 300
      R1=SQRT(X1*X1+B*Y1*Y1+B*Z1*Z1)                                     INT 310
      R2=SQRT(X2*X2+B*Y2*Y2+B*Z2*Z2)                                     INT 320
      UU=(X2*X12+B*Y2*Y12+B*Z2*Z12)/R2-(X1*X12+B*Y1*Y12+B*Z1*Z12)/R1     INT 330
10    SUM=SUM+UU*YZI/ALB*SI(K,IR)                                        INT 340
      F=SUM*CH(IZ)/(8.*FJ)                                               INT 350
      RETURN                                                             INT 360
      END                                                                INT 370-
      SUBROUTINE FUSELA (NF,AW,N,I,S,XTEF,XF,XCF,RF,BB,SNP,NKF,KZ)       FSA  10
      DIMENSION AW(1), XF(1), RF(1), XCF(1), SNP(5,20), S(1), NKF(1)     FSA  20
      PI=3.14159265                                                      FSA  30
```

```
      IK=0                                                              FSA  40
      N1=NKF(1)                                                         FSA  50
      N2=1                                                              FSA  60
      HL=(S(2)-S(1))/2.                                                 FSA  70
      ENT=NKF(1)                                                        FSA  80
      A1=XCF(I)-XTEF                                                    FSA  90
      A2=SQRT(A1*A1+BB*BF(I)*BF(I))                                     FSA 100
      DO 40 JJ=1,NF                                                     FSA 110
      M=JJ-IK                                                           FSA 120
      XS=XCF(I)-XF(JJ)                                                  FSA 130
      XSR=SQRT(XS*XS+BB*BF(I)*BF(I))                                    FSA 140
      IF (N.EQ.0) GO TO 20                                              FSA 150
      RFL=1.                                                            FSA 160
      IF (N.GE.2) GO TO 10                                              FSA 170
      IF (I.EQ.NF) RFL=0.                                               FSA 180
      IF (I.NE.NF) RFL=(A1+A2)**N*A1/A2                                 FSA 190
10    CONTINUE                                                          FSA 200
      RFR=(XS+XSR)**N*XS/XSR                                            FSA 210
      GO TO 30                                                          FSA 220
20    IF (I.NE.NF) RFL=A1/A2                                            FSA 230
      IF (I.EQ.NF) RFL=0.                                               FSA 240
      RFR=XS/XSR                                                        FSA 250
30    AW(JJ)=-HL*(RFL-RFR)*SNP(N2,M)/(4.*ENT)                           FSA 260
      IF (JJ.NE.N1) GO TO 40                                            FSA 270
      N2=N2+1                                                           FSA 280
      IK=N1                                                             FSA 290
      N1=N1+NKF(N2)                                                     FSA 300
      HL=(S(N2+1)-S(N2))/2.                                             FSA 310
      ENT=NKF(N2)                                                       FSA 320
40    CONTINUE                                                          FSA 330
      RETURN                                                            FSA 340
      END                                                               FSA 350
      SUBROUTINE UNWF (B,XX,YY,Z,AW,PW,IPHI,KL,WK2,ID)                  UNF  10
      DIMENSION AW(1), PW(1)                                            UNF  20
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),UNF  30
     1XLL(41)                                                           UNF  40
      COMMON /FUS/ XF(20),XCF(20),BF(20),SNP(5,20),XLEF,XTEF,WARC(20),NCUNF  50
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                    UNF  60
      PI=3.14159265                                                     UNF  70
      B=SQRT(YY*YY+Z*Z)                                                 UNF  80
      IF (Z) 10,20,30                                                   UNF  90
10    THETA=PI-ATAN(YY/ABS(Z))                                          UNF 100
      GO TO 40                                                          UNF 110
20    THETA=PI/2.                                                       UNF 120
      GO TO 40                                                          UNF 130
30    THETA=ATAN(YY/ABS(Z))                                             UNF 140
40    A1=XX-XTEF                                                        UNF 150
      A2=SQRT(A1*A1+B*B*B)                                              UNF 160
      ST=SIN(THETA)                                                     UNF 170
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```
      CT=COS(THETA)                                                     UNF 180
      DO 100 N=1,NT                                                     UNF 190
      FNF=NKF(1)                                                        UNF 200
      IK=0                                                              UNF 210
      N1=NKF(1)                                                         UNF 220
      N2=1                                                              UNF 230
      S=XAS(2)-XAS(1)                                                   UNF 240
      FN=N                                                              UNF 250
      FLT=0.                                                            UNF 260
      FLR=0.                                                            UNF 270
      IF (N.GE.2) GO TO 50                                              UNF 280
      A3=((A1+A2)/R)**N                                                 UNF 290
      FLT=-A3/FN                                                        UNF 300
      FLR=A1/R*A3/A2                                                    UNF 310
50    CONTINUE                                                          UNF 320
      DO 90 JJ=1,NF                                                     UNF 330
      M=JJ-IK                                                           UNF 340
      K=JJ+(N-1)*NF                                                     UNF 350
      XS=XX-XF(JJ)                                                      UNF 360
      XSR=SQRT(XS*XS+R*R*R)                                             UNF 370
      XR=((XS+XSR)/R)**N                                                UNF 380
      FTX=-XR/FN                                                        UNF 390
      FRX=XS/R*XR/XSR                                                   UNF 400
      P1=S*(FRX-FLR)*SNP(N2,M)/(R.*FNF)                                 UNF 410
      P2=S*(FTX-FLT)*SNP(N2,M)/(R.*FNF)                                 UNF 420
      Q1=COS(FN*THETA)                                                  UNF 430
      Q2=SIN(FN*THETA)                                                  UNF 440
      UR=Q1*P1                                                          UNF 450
      UT=-FN*Q2*P2                                                      UNF 460
      VR=Q2*P1                                                          UNF 470
      VT=FN*Q1*P2                                                       UNF 480
      VT=VT/R                                                           UNF 490
      UT=UT/R                                                           UNF 500
      IF (JJ.NE.N1) GO TO 60                                            UNF 510
      N2=N2+1                                                           UNF 520
      IK=N1                                                             UNF 530
      N1=N1+NKF(N2)                                                     UNF 540
      S=XAS(N2+1)-XAS(N2)                                               UNF 550
      FNF=NKF(N2)                                                       UNF 560
60    IF (KL.EQ.1) GO TO 80                                             UNF 570
      IF (ID.EQ.2) GO TO 70                                             UNF 580
      RW(K)=VR*CT-VT*ST                                                 UNF 590
      AW(K)=UR*CT-UT*ST                                                 UNF 600
      GO TO 90                                                          UNF 610
70    RW(K)=VR*ST+VT*CT                                                 UNF 620
      GO TO 90                                                          UNF 630
80    RW(K)=(VR*ST+VT*CT)*Y(4,IPHI)+(VR*CT-VT*ST)*Y(3,IPHI)             UNF 640
      AW(K)=(UR*ST+UT*CT)*Y(4,IPHI)+(UR*CT-UT*ST)*Y(3,IPHI)             UNF 650
90    CONTINUE                                                          UNF 660
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100   CONTINUE                                                          UNF 670
      IF (KL.NE.1) GO TO 110                                            UNF 680
      RFL=A1/R*(A1+A2)/R/A2                                             UNF 690
      XP=XX-XLEF                                                        UNF 700
      A6=SQRT(XP*XP+R*R*R)                                              UNF 710
      RF0=XP/R*(XP+A6)/R/A6                                             UNF 720
      UR=-CT*(RFL-RF0)/(4.*PI)                                          UNF 730
      TL=-(A1+A2)/R                                                     UNF 740
      T0=-(XP+A6)/R                                                     UNF 750
      UT=ST*(TL-T0)/(4.*PI)                                             UNF 760
      UT=UT/R                                                           UNF 770
      WK2=(UR*ST+UT*CT)*Y(4,IPHI)+(UR*CT-UT*ST)*Y(3,IPHI)               UNF 780
110   CONTINUE                                                          UNF 790
      RETURN                                                            UNF 800
      END                                                               UNF 810-
      SUBROUTINE FUSVEL (R,X,Y,Z,WN,WK,GRO,L,MZ)                        FSL  10
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARP(20),NCFSL  20
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                    FSL  30
      R=SQRT(Y*Y+Z*Z)                                                   FSL  40
      PI=3.14159265                                                     FSL  50
      IF (Z) 10,20,30                                                   FSL  60
10    THETA=PI-ATAN(Y/ABS(Z))                                           FSL  70
      GO TO 40                                                          FSL  80
20    THETA=PI/2.                                                       FSL  90
      GO TO 40                                                          FSL 100
30    THETA=ATAN(Y/ABS(Z))                                              FSL 110
40    A1=X-XTEF                                                         FSL 120
      A2=SQRT(A1*A1+R*R*R)                                              FSL 130
      RFL=A1/A2/R                                                       FSL 140
      XEF=X-XLEF                                                        FSL 150
      R2=SQRT(XEF*XEF+R*R*R)                                            FSL 160
      RF0=XEF/R/R2                                                      FSL 170
      FT=-(A1+A2)/R+(XEF+R2)/R                                          FSL 180
      FR=(1.+A1/A2)/R*A1/R-(1.+XEF/R2)/R*XEF/R                          FSL 190
      CS=COS(THETA)                                                     FSL 200
      SN=SIN(THETA)                                                     FSL 210
      WN=0.                                                             FSL 220
      IF (MZ.NE.0) GO TO 60                                             FSL 230
      IF (L.EQ.0) GO TO 90                                              FSL 240
      IK=0                                                              FSL 250
      N1=NKF(1)                                                         FSL 260
      N2=1                                                              FSL 270
      ENF=NKF(1)                                                        FSL 280
      S=XAS(2)-XAS(1)                                                   FSL 290
      WN=0.                                                             FSL 300
      DO 50 J=1,NF                                                      FSL 310
      M=J-IK                                                            FSL 320
      XS=X-XF(J)                                                        FSL 330
      XSR=SQRT(XS*XS+R*R*R)                                             FSL 340
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      RFX=XS/XSR/R                                                      FSL 350
      WN=WN+(RFL-RFX)*WARD(J)*SNP(N2,M)*S/FNF                           FSL 360
      IF (J.NE.N1.OR.J.EQ.NF) GO TO 50                                  FSL 370
      N2=N2+1                                                           FSL 380
      IK=N1                                                             FSL 390
      N1=N1+NKF(N2)                                                     FSL 400
      S=XAS(N2+1)-XAS(N2)                                               FSL 410
      FNF=NKF(N2)                                                       FSL 420
50    CONTINUE                                                          FSL 430
      WN=WN*PI/2.                                                       FSL 440
      WN=-(WN+(RFL-RF0)*F0)/(4.*PI)                                     FSL 450
      WN=WN*CS                                                          FSL 460
      FP=F10                                                            FSL 470
      S1=SN                                                             FSL 480
      S2=CS                                                             FSL 490
      GO TO 80                                                          FSL 500
60    FP=GR0                                                            FSL 510
      IF (WK.GT.0.9) GO TO 70                                           FSL 520
      S1=-CS                                                            FSL 530
      S2=SN                                                             FSL 540
      GO TO 80                                                          FSL 550
70    S1=SN                                                             FSL 560
      S2=CS                                                             FSL 570
80    CONTINUE                                                          FSL 580
      WN=WN-SN*S1*FT*FP/R/(4.*PI)-CS*S2*FR*FP/(4.*PI)                   FSL 590
90    CONTINUE                                                          FSL 600
      WK=(-SN*SN*FT/R-CS*CS*FR)/(4.*PI)                                 FSL 610
      RETURN                                                            FSL 620
      END                                                               FSL 630-
      SUBROUTINE FSPEED (R,X,Y,Z,GAM,WK1,WK2)                           FSD  10
      DIMENSION GAM(2,1)                                                FSD  20
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCFSD  30
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                    FSD  40
      PI=3.14159265                                                     FSD  50
      R=SQRT(Y*Y+Z*Z)                                                   FSD  60
      IF (Z) 10,20,30                                                   FSD  70
10    THETA=PI-ATAN(Y/ABS(Z))                                           FSD  80
      GO TO 40                                                          FSD  90
20    THETA=PI/2.                                                       FSD 100
      GO TO 40                                                          FSD 110
30    THETA=ATAN(Y/ABS(Z))                                              FSD 120
40    A1=X-XTEF                                                         FSD 130
      A2=SQRT(A1*A1+R*R*R)                                              FSD 140
      RFL=-(A1+A2)/R/A2                                                 FSD 150
      DO 60 I=1,NT                                                      FSD 160
      FI=I                                                              FSD 170
      CS=COS(FI*THETA)                                                  FSD 180
      SS=SIN(FI*THETA)                                                  FSD 190
      IK=0                                                              FSD 200
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      N1=NKF(1)                                                          FSD 210
      N2=1                                                               FSD 220
      HL=0.5*(XAS(2)-XAS(1))                                             FSD 230
      FNT=NKF(1)                                                         FSD 240
      DO 50 JJ=1,NF                                                      FSD 250
      J=JJ+(I-1)*NF                                                      FSD 260
      M=JJ-IK                                                            FSD 270
      XS=X-XF(JJ)                                                        FSD 280
      XSR=SQRT(XS*XS+B*B*R)                                              FSD 290
      RL=RFL                                                             FSD 300
      IF (I.GE.2) RL=0.                                                  FSD 310
      RX=-((XS+XSR)/R)**I/XSR                                            FSD 320
      GAM(2,J)=HL*CS*(RX-RL)*SNP(N2,M)/(4.*FNT)                          FSD 330
      GAM(1,J)=HL*SS*(RX-RL)*SNP(N2,M)/(4.*FNT)                          FSD 340
      IF (JJ.NE.N1) GO TO 50                                             FSD 350
      N2=N2+1                                                            FSD 360
      IK=N1                                                              FSD 370
      N1=N1+NKF(N2)                                                      FSD 380
      HL=0.5*(XAS(N2+1)-XAS(N2))                                         FSD 390
      FNT=NKF(N2)                                                        FSD 400
50    CONTINUE                                                           FSD 410
60    CONTINUE                                                           FSD 420
      XP=X-XLEF                                                          FSD 430
      A6=SQRT(XP*XP+B*B*R)                                               FSD 440
      RF0=-(XP+A6)/B/A6                                                  FSD 450
      WK2=-COS(THETA)*(RFL-RF0)/(4.*PI)                                  FSD 460
      WK1=-SIN(THETA)*(RFL-RF0)/(4.*PI)                                  FSD 470
      RETURN                                                             FSD 480
      END                                                                FSD 490-
      SUBROUTINE VELFUS (LWF,LPANEL,AW,CW,AM,LPAN1,LPAN2,IL,ISYM)        VFS  10
      DIMENSION AW(1), BW(20), CW(1), SSF(5,10), DW(20)                  VFS  20
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTVFS  30
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZVFS  40
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95VFS  50
     3,2),SC(160,5),SI(160,5),LC(3)                                      VFS  60
      COMMON /CONST/ NCS,NCW,MJ(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JVFS  70
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                         VFS  80
      COMMON /FUS/ XF(20),XCF(20),BF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCVFS  90
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                     VFS 100
      B=1.-AM*AM                                                         VFS 110
      PI=3.14159265                                                      VFS 120
      TH1=SNP(5,20)                                                      VFS 130
      NH1=SNP(5,19)                                                      VFS 140
      NJH=(NSJ+1)/2+1                                                    VFS 150
      IF (ISYM.EQ.0) NJH=NSJ/2                                           VFS 160
      IF (ISYM.EQ.0) NP=NSJ-1                                            VFS 170
      IF (ISYM.NE.0) NP=NSJ+1                                            VFS 180
      KY=0                                                               VFS 190
      IF (IL.EQ.2) KY=1                                                  VFS 200
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      NG=NF                                                                  VFS 210
      LPL=LPANEL                                                             VFS 220
      LPW=LWF                                                                VFS 230
      IF (IL.EQ.2) LPL=LAST                                                  VFS 240
      IF (IL.EQ.2) LPW=LAST+NTL                                              VFS 250
      DO 30 I=1,NT                                                           VFS 260
      FI=I                                                                   VFS 270
      DO 30 K=1,NCLM                                                         VFS 280
      IF (NH1.NE.0.AND.K.LE.NH1) GO TO 10                                    VFS 290
      FK=K-NH1                                                               VFS 300
      FCLM=NCLM-NH1                                                          VFS 310
      PP=PI-TH1                                                              VFS 320
      TP=TH1                                                                 VFS 330
      GO TO 20                                                               VFS 340
10    FK=K                                                                   VFS 350
      FCLM=NH1                                                               VFS 360
      PP=TH1                                                                 VFS 370
      TP=0.                                                                  VFS 380
20    CONTINUE                                                               VFS 390
      TA=(2.*FK-1.)*PP/(2.*FCLM)+TP                                          VFS 400
30    SSF(I,K)=SIN(FI*TA)                                                    VFS 410
      IPHI=1                                                                 VFS 420
      MJ=LPANEL+NCJ(1)                                                       VFS 430
      INN=1                                                                  VFS 440
      JNN=1                                                                  VFS 450
      DO 70 I=1,LPL                                                          VFS 460
      II=I                                                                   VFS 470
      IF (IL.EQ.2) II=I+LPANEL                                               VFS 480
      IF (IL.EQ.2.AND.I.GT.JPANEL) II=I-JPANEL                               VFS 490
      KL=1                                                                   VFS 500
      IF (II.LE.LPANEL) KL=0                                                 VFS 510
      X=XCP(II)                                                              VFS 520
      Y=YCP(II)                                                              VFS 530
      Z=ZCP(II)                                                              VFS 540
      CALL UNWF (P,X,Y,Z,AW,CW,IPHI,KL,WK2,KY)                               VFS 550
      WRITE (01) (CW(K),K=1,NTL)                                             VFS 560
      WRITE (07) (AW(K),K=1,NTL)                                             VFS 570
      IF (IL.NE.2) GO TO 70                                                  VFS 580
      IF (IL.EQ.2.AND.I.GT.JPANEL) GO TO 70                                  VFS 590
      IF (II.LT.MJ.OR.II.EQ.LAST) GO TO 40                                   VFS 600
      IPHI=IPHI+1                                                            VFS 610
      MJ=MJ+NCJ(INN)                                                         VFS 620
40    IF (II.EQ.(MJJ(INN)-1)) GO TO 50                                       VFS 630
      GO TO 60                                                               VFS 640
50    JNN=INN                                                                VFS 650
      INN=INN+1                                                              VFS 660
60    IF (II.EQ.MJJ(JNN)) IPHI=1                                             VFS 670
70    CONTINUE                                                               VFS 680
      CALL UNFW (LAST,LPANEL,P,LPAN1,LPAN2,NW,AW,CW,MJJ,IL,NCJ,NJF,NP)       VFS 690
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      DO 150 I=1,NT                                                          VFS 700
      REWIND 08                                                              VFS 710
      N=I                                                                    VFS 720
      DO 140 J=1,NF                                                          VFS 730
      JJ=J                                                                   VFS 740
      DO 110 K=1,LPL                                                         VFS 750
      KI=K                                                                   VFS 760
      IF (IL.EQ.2.AND.K.LE.LPANFL) KI=K+JPANFL                               VFS 770
      IF (IL.EQ.2.AND.K.GT.LPANFL) KI=K-LPANFL                               VFS 780
      READ (08) (BW(KK),KK=1,NCUM)                                           VFS 790
      READ (08) (DW(KK),KK=1,NCUM)                                           VFS 800
      AN=0.                                                                  VFS 810
      BN=0.                                                                  VFS 820
      DO 100 KK=1,NCUM                                                       VFS 830
      IF (NH1.NE.0.AND.K.LE.NH1) GO TO 80                                    VFS 840
      FCUM=NCUM-NH1                                                          VFS 850
      PP=PI-TH1                                                              VFS 860
      GO TO 90                                                               VFS 870
80    FCUM=NH1                                                               VFS 880
      PP=TH1                                                                 VFS 890
90    CONTINUE                                                               VFS 900
      BN=BN+DW(KK)*CSF(I,KK)*PP/FCUM                                         VFS 910
100   AN=AN+BW(KK)*CSF(I,KK)*PP/FCUM                                         VFS 920
      AN=AN*2./PI                                                            VFS 930
      BN=BN*2./PI                                                            VFS 940
      CW(KI)=BN*RF(J)**(I+1)                                                 VFS 950
110   AW(KI)=AN*RF(J)**(I+1)                                                 VFS 960
      CALL FUSELA (NC,BW,N,JJ,XAS,XTEF,XF,XCF,RF,R,SNP,NKF,KY)               VFS 970
      DO 130 KK=1,NTL                                                        VFS 980
      N1=(I-1)*NF+1                                                          VFS 990
      N2=I*NF                                                                VFS1000
      NB=KK+LPL                                                              VFS1010
      IF (KK.GE.N1.AND.KK.LE.N2) GO TO 120                                   VFS1020
      AW(NB)=0.                                                              VFS1030
      CW(NB)=0.                                                              VFS1040
      GO TO 130                                                              VFS1050
120   NK=KK-N1+1                                                             VFS1060
      AW(NB)=BW(NK)                                                          VFS1070
      CW(NB)=BW(NK)                                                          VFS1080
130   CONTINUE                                                               VFS1090
      WRITE (01) (CW(K),K=1,LPW)                                             VFS1100
140   WRITE (07) (AW(K),K=1,LPW)                                             VFS1110
150   CONTINUE                                                               VFS1120
      RETURN                                                                 VFS1130
      END                                                                    VFS1140-
      SUBROUTINE WING (AW,BW,LPANFL,I,PP,LPAN1,LPAN2,KF)                     WNG  10
      DIMENSION AW(1), BW(1)                                                 WNG  20
      DIMENSION W(4)                                                         WNG  30
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTWNG  40
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     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZWNG  50
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95WNG  60
     3,2),SC(160,5),ST(160,5),LC(3)                                      WNG  70
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)        WNG  80
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JWNG  90
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                         WNG 100
      IP=1                                                               WNG 110
      IZ=1                                                               WNG 120
      IFF=1                                                              WNG 130
      ISN=1                                                              WNG 140
      NL=NW(1)                                                           WNG 150
      NN=NW(1)                                                           WNG 160
      DO 60 J=1,LPANEL                                                   WNG 170
      MI=J-IFF+1                                                         WNG 180
      FN=NL                                                              WNG 190
      IF (J.EQ.(LPAN1+1).OR.J.EQ.(LPAN2+1)) IP=1                         WNG 200
      IF (J.GT.LPAN1.AND.J.LE.LPAN2) ISN=2                               WNG 210
      IF (J.GT.LPAN2.AND.J.LE.LPANEL) ISN=3                              WNG 220
      IF (J.GE.LPAN1.AND.J.LT.LPANEL) GO TO 10                           WNG 230
      GO TO 20                                                           WNG 240
10    NL=NW(2)                                                           WNG 250
      IF (J.GE.LPAN2.AND.J.LT.LPANEL) NL=NW(3)                           WNG 260
20    CONTINUE                                                           WNG 270
      X1=XN(J,1)-XCP(I)                                                  WNG 280
      X2=XN(J,2)-XCP(I)                                                  WNG 290
      X12=XN(J,2)-XN(J,1)                                                WNG 300
      Y12=YN(J,2)-YN(J,1)                                                WNG 310
      Z12=ZN(J,2)-ZN(J,1)                                                WNG 320
      Z1=ZN(J,1)-ZCP(I)                                                  WNG 330
      Z2=ZN(J,2)-ZCP(I)                                                  WNG 340
      X7J=X1*Z12-Z1*X12                                                  WNG 350
      DO 50 II=1,2                                                       WNG 360
      IF (II.EQ.1) GO TO 30                                              WNG 370
      N=1                                                                WNG 380
      GO TO 40                                                           WNG 390
30    N=2                                                                WNG 400
40    CONTINUE                                                           WNG 410
      YC=(-1.)**N*YCP(I)                                                 WNG 420
      Y1=YN(J,1)-YC                                                      WNG 430
      Y2=YN(J,2)-YC                                                      WNG 440
      XYK=X1*Y12-Y1*X12                                                  WNG 450
      Y7I=Y1*Z12-Z1*Y12                                                  WNG 460
      ALB1=XYK*XYK+X7J*X7J+BB*Y7I*Y7I                                    WNG 470
      R1B1=SQRT(X1*X1+BB*Y1*Y1+BB*Z1*Z1)                                 WNG 480
      R2B1=SQRT(X2*X2+BB*Y2*Y2+BB*Z2*Z2)                                 WNG 490
      UUB1=(X2*X12+BB*Y2*Y12+BB*Z2*Z12)/R2B1-(X1*X12+BB*Y1*Y12+BB*Z1*Z12WNG 500
     1)/R1B1                                                             WNG 510
      G1B1=(1.-X1/R1B1)/(Y1*Y1+Z1*Z1)                                    WNG 520
      G2B1=(1.-X2/R2B1)/(Y2*Y2+Z2*Z2)                                    WNG 530
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      F1=UUB1*XYK/ALB1                                                  WNG 540
      F2=-Y2*G2B1+Y1*G1B1                                               WNG 550
      W(II+2)=(F1+F2)*CH(I7)*SN(MI,ISN)/(R.*FN)                         WNG 560
      IF (IP.EQ.1.AND.KF.NE.0) F2=-Y2*G2P1                              WNG 570
50    W(II)=(F1+F2)*CH(I7)*SN(MI,ISN)/(R.*FN)                           WNG 580
      AW(J)=W(1)+W(2)                                                   WNG 590
      BW(J)=W(3)-W(4)                                                   WNG 600
      IF (J.LT.NN.OR.J.EQ.LPANEL) GO TO 60                              WNG 610
      IP=IP+1                                                           WNG 620
      I7=I7+1                                                           WNG 630
      IFF=NN+1                                                          WNG 640
      NN=NN+NL                                                          WNG 650
60    CONTINUE                                                          WNG 660
      RETURN                                                            WNG 670
      END                                                               WNG 680-
      SUBROUTINE UNFW (LAST,LPANEL,R1,LPAN1,LPAN2,NW,AW,BW,MJJ,IL,NCJ,NJUNW  10
     1H,NP)                                                             UNW  20
      DIMENSION SF(10), CF(10), AW(1), W(4), NW(1), BW(1), MJJ(1), NCJ(1UNW  30
     1)                                                                 UNW  40
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCUNW  50
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                    UNW  60
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTUNW  70
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZUNW  80
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFR,SJ(21,8),EX(95,2),TX(95UNW  90
     3,2),SC(160,5),ST(160,5),LC(3)                                     UNW 100
      PI=3.14159265                                                     UNW 110
      REWIND 08                                                         UNW 120
      TH1=SNP(5,20)                                                     UNW 130
      NH1=SNP(5,19)                                                     UNW 140
      JCOT=XTE(50)                                                      UNW 150
      ICON=LPANEL                                                       UNW 160
      IF (IL.EQ.2) ICON=LAST                                            UNW 170
      DO 30 I=1,NCUM                                                    UNW 180
      IF (NH1.NE.0.AND.I.LE.NH1) GO TO 10                               UNW 190
      FI=I-NH1                                                          UNW 200
      FCUM=NCUM-NH1                                                     UNW 210
      PP=PI-TH1                                                         UNW 220
      TP=TH1                                                            UNW 230
      GO TO 20                                                          UNW 240
10    FI=I                                                              UNW 250
      FCUM=NH1                                                          UNW 260
      PP=TH1                                                            UNW 270
      TP=0.                                                             UNW 280
20    CONTINUE                                                          UNW 290
      T=(2.*FI-1.)*PP/(2.*FCUM)+TP                                      UNW 300
      CF(I)=COS(T)                                                      UNW 310
30    SF(I)=SIN(T)                                                      UNW 320
      KCON=NF+1                                                         UNW 330
      KC=NCUM                                                           UNW 340
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      DO 200 I=1,KCON                                                   UNW 350
      IF (I.EQ.KCON) KC=1                                               UNW 360
      IP=1                                                              UNW 370
      IZ=1                                                              UNW 380
      IFF=1                                                             UNW 390
      IND=1                                                             UNW 400
      JKT=1                                                             UNW 410
      L1=LPANEL+1                                                       UNW 420
      LAST1=LAST-1                                                      UNW 430
      ISN=1                                                             UNW 440
      MM=NW(1)                                                          UNW 450
      NN=NW(1)                                                          UNW 460
      DO 190 J=1,ICON                                                   UNW 470
      MI=J-IFF+1                                                        UNW 480
      FN=NN                                                             UNW 490
      IF (J.GT.LPANEL) GO TO 50                                         UNW 500
      IF (J.EQ.(LPAN1+1).OR.J.EQ.(LPAN2+1)) IP=1                        UNW 510
      IF (J.GT.LPAN1.AND.J.LE.LPAN2) ISN=2                              UNW 520
      IF (J.GT.LPAN2.AND.J.LE.LPANEL) ISN=3                             UNW 530
      IF (J.GE.LPAN1.AND.J.LT.LPANEL) GO TO 40                          UNW 540
      GO TO 50                                                          UNW 550
40    NN=NW(2)                                                          UNW 560
      IF (J.GE.LPAN2.AND.J.LT.LPANEL) NN=NW(3)                          UNW 570
50    CONTINUE                                                          UNW 580
      IF (JCOT.EQ.1.AND.J.GT.LPANEL) GO TO 60                           UNW 590
      GO TO 70                                                          UNW 600
60    IF (JKT.EQ.1.OR.JKT.EQ.(NJH+1)) IP=1                              UNW 610
70    CONTINUE                                                          UNW 620
      IF (J.GE.LPANEL.AND.J.LT.MJJ(IND)) NN=NCJ(IND)                    UNW 630
      CHORD=CH(IZ)                                                      UNW 640
      IF (IL.EQ.1) GO TO 100                                            UNW 650
      IF (J.EQ.L1) GO TO 80                                             UNW 660
      GO TO 90                                                          UNW 670
80    ISN=ISN+1                                                         UNW 680
      L1=MJJ(IND)+1                                                     UNW 690
90    NL=MJJ(IND)-1                                                     UNW 700
      IF (NL.EQ.LAST1) GO TO 100                                        UNW 710
      IF (J.EQ.NL) IND=IND+1                                            UNW 720
100   CONTINUE                                                          UNW 730
      DO 160 K=1,KC                                                     UNW 740
      IF (I.EQ.KCON) GO TO 110                                          UNW 750
      X=XCF(I)                                                          UNW 760
      Y=RF(I)*SF(K)                                                     UNW 770
      Z=RF(I)*CF(K)                                                     UNW 780
      GO TO 120                                                         UNW 790
110   X=XLEF                                                            UNW 800
      Y=0.                                                              UNW 810
      Z=0.                                                              UNW 820
120   CONTINUE                                                          UNW 830
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      X1=XN(J,1)-X                                                          UNW 840
      X2=XN(J,2)-X                                                          UNW 850
      X12=XN(J,2)-XN(J,1)                                                   UNW 860
      Y12=YN(J,2)-YN(J,1)                                                   UNW 870
      Z12=ZN(J,2)-ZN(J,1)                                                   UNW 880
      Z1=ZN(J,1)-Z                                                          UNW 890
      Z2=ZN(J,2)-Z                                                          UNW 900
      X7J=X1*Z12-Z1*X12                                                     UNW 910
      DO 150 II=1,2                                                         UNW 920
      FCP=1.                                                                UNW 930
      IF (II.EQ.2) FCP=-1.                                                  UNW 940
      YC=Y*FCP                                                              UNW 950
      Y1=YN(J,1)-YC                                                         UNW 960
      Y2=YN(J,2)-YC                                                         UNW 970
      XYK=X1*Y12-Y1*X12                                                     UNW 980
      YZI=Y1*Z12-Z1*Y12                                                     UNW 990
      ALB1=XYK*XYK+XZJ*XZJ+B1*YZI*YZI                                       UNW1000
      R1B1=SQRT(X1*X1+B1*Y1*Y1+B1*Z1*Z1)                                    UNW1010
      R2B1=SQRT(X2*X2+B1*Y2*Y2+B1*Z2*Z2)                                    UNW1020
      UUB1=(X2*X12+B1*Y2*Y12+B1*Z2*Z12)/R2B1-(X1*X12+B1*Y1*Y12+B1*Z1*Z12UNW1030
     1)/R1B1                                                                UNW1040
      G1B1=(1.-X1/R1B1)/(Y1*Y1+Z1*Z1)                                       UNW1050
      G2B1=(1.-X2/R2B1)/(Y2*Y2+Z2*Z2)                                       UNW1060
      F12=UUB1*XYK/ALB1                                                     UNW1070
      G12=-Y2*G2B1+Y1*G1B1                                                  UNW1080
      IF (I.EQ.KCON) GO TO 130                                              UNW1090
      F13=UUB1*XZJ/ALB1                                                     UNW1100
      G13=Z2*G2B1-Z1*G1B1                                                   UNW1110
      F1=-F13*SF(K)*FCP+F12*CF(K)                                           UNW1120
      F2=G13*SF(K)*FCP+G12*CF(K)                                            UNW1130
      IF (J.LE.LPANEL) GO TO 140                                            UNW1140
      F1=2.*F1                                                              UNW1150
      F2=2.*F2                                                              UNW1160
      GO TO 140                                                             UNW1170
130   F1=F12                                                                UNW1180
      F2=G12                                                                UNW1190
      IF (J.LE.LPANEL) GO TO 140                                            UNW1200
      F1=2.*F1                                                              UNW1210
      F2=2.*F2                                                              UNW1220
140   W(II+2)=(F1+F2)*CHORD*SN(MI,ISN)/(8.*PN)                              UNW1230
      IF (IP.NE.1) GO TO 150                                                UNW1240
      G12=-Y2*G2B1                                                          UNW1250
      G13=Z2*G2B1                                                           UNW1260
      F2=G13*SF(K)*FCP+G12*CF(K)                                            UNW1270
      IF (I.EQ.KCON) F2=G12                                                 UNW1280
      IF (J.LE.LPANEL) GO TO 150                                            UNW1290
      F2=2.*F2                                                              UNW1300
150   W(II)=(F1+F2)*CHORD*SN(MI,ISN)/(8.*PN)                                UNW1310
      IF (I.EQ.KCON) GO TO 160                                              UNW1320
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      AW(K)=W(1)+W(2)                                                    UNW1330
      BW(K)=W(3)-W(4)                                                    UNW1340
160   CONTINUE                                                           UNW1350
      IF (I.EQ.KCON) GO TO 170                                           UNW1360
      WRITE (08) (AW(KK),KK=1,NCUM)                                      UNW1370
      WRITE (08) (BW(KK),KK=1,NCUM)                                      UNW1380
      GO TO 180                                                          UNW1390
170   AW(J)=W(1)+W(2)                                                    UNW1400
180   CONTINUE                                                           UNW1410
      IF (J.LT.MM) GO TO 190                                             UNW1420
      IP=IP+1                                                            UNW1430
      I7=I7+1                                                            UNW1440
      IFF=MM+1                                                           UNW1450
      MM=MM+NN                                                           UNW1460
      IF (J.GT.LPANEL) JKT=JKT+1                                         UNW1470
      IF (JKT.EQ.(NP+1)) JKT=1                                           UNW1480
190   CONTINUE                                                           UNW1490
      IF (I.NE.KCON) GO TO 200                                           UNW1500
      WRITE (08) (AW(KK),KK=1,ICON)                                      UNW1510
200   CONTINUE                                                           UNW1520
      RETURN                                                             UNW1530
C                                                                        UNW1540
      END                                                                UNW1550-
      OVERLAY (WAGJET,1,0)                                               GEO  10
      PROGRAM GEOMTY                                                     GEO  20
C     TO SET UP THE GEOMETRY OF THE VORTEX ELEMENTS AND CONTROL POINTS   GEO  30
      DIMENSION XXL(5), YL(5), XXT(5), ZL(5), CPCWL(31), CPSWL(31)       GEO  40
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),GEO  50
     1XLL(41)                                                            GEO  60
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTGEO  70
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XA(200,2),YA(200,2),ZGEO  80
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95GEO  90
     3,2),SC(160,5),SI(160,5),LC(3)                                      GEO 100
      COMMON /SKODE/ KCODE                                               GEO 110
      COMMON /AERO/ AM1,AM2,P1,P2,CL(30),CT(30),CD(30),GAM(2,130)        GEO 120
      COMMON /SOME/ NC,NWING,LAT,NAL,LWF,LWFJ,CHORDT(3),SNG(5),YG(5),YCAGEO 130
     1(6),WKN,RDX,MDG,NDG                                                GEO 140
      COMMON /FUSRAD/ IFR,IFN,XFF(21),RFF(21),AAF(20),BBF(20),CCF(20),DDGEO 150
     1F(20)                                                              GEO 160
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCGEO 170
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                     GEO 180
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JGEO 190
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                         GEO 200
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                       GEO 210
      COMMON /ADD/ CP(130),CM(30),PREAK(8),SWP(8,15),GAL(30),ISYM,VMU,VUGEO 220
     1,TEMP,FCR,CAMLER,CAMLET,CAMTFR,CAMTFT,XJ,YJ,ZJ,RJ,ALP,CREF,TWISTR GEO 230
      COMMON /COST/ LTOTAL,LPAN1,MJW(5),LPANEL,IEXTN,LPAN2,EXIT,PTIAL,TWGEO 240
     1IST,DF(5),NFP                                                      GEO 250
      COMMON /CAMB/ ICAM,IM,XT(2,11),ZC(2,11),AAM(2,10),BBM(2,10),CCM(2,GEO 260
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     110),DDM(2,10)                                                    GEO 270
      WRITE (6,620)                                                    GEO 280
      PI=3.14159265                                                    GEO 290
      NCS=0                                                            GEO 300
      KL=0                                                             GEO 310
      IPANFL=1                                                         GEO 320
      PT=0.                                                            GEO 330
      DO 10 I=1,5                                                      GEO 340
      YCN(I)=0.                                                        GEO 350
10    DF(I)=0.                                                         GEO 360
C                                                                      GEO 370
C  ***MACH NUMBERS OF FREESTREAM AND JET FLOW, FREESTREAM/JET VELOCITY  GEO 380
C     RATIO,JET/FREESTREAM TEMPERATURE RATIO,ANGLE OF ATTACK IN DEGREE.,GEO 390
C     WING L.E. AND T.E. X-COORDINATES AT THE JET AXIS LOCATION***     GEO 400
C                                                                      GEO 410
      READ (5,570) AM1,AM2,VRL,TEMP,ALP,XEL,XET                        GEO 420
      WRITE (6,570) AM1,AM2,VRL,TEMP,ALP,XEL,XET                       GEO 430
C                                                                      GEO 440
C  ***NUMBER OF FLAP SECTIONS (INCLUDING THE JET SPAN), THE NUMERICAL   GEO 450
C     ORDER OF JET SPAN AND THE CORRESPONDING FLAP DEFLECTION ANGLES IN GEO 460
C     DEGREES ***                                                      GEO 470
C                                                                      GEO 480
      READ (5,610) NFP,NJP,(DF(I),I=1,NFP)                            GEO 490
      WRITE (6,610) NFP,NJP,(DF(I),I=1,NFP)                            GEO 500
C                                                                      GEO 510
C  ***REFERENCE HALF WING AREA, REFERENCE CHORD, TWIST IN DEG., INCIDEN-GEO 520
C     CE OF ROOT CHORD IN DEG., X-, Y- AND Z- COORDINATES OF JET CENTER GEO 530
C     AT EXIT, AND JET RADIUS ***                                      GEO 540
C  * NOTE, FOR USB APPLICATIONS, YJ,ZJ AND RJ MAY BE ANY NON-ZERO VALUESGEO 550
C     ,UNLESS THE RECTANGULAR JET IS NOT ON THE SURFACE AND THE ENTRAIN-GEO 560
C     MENT EFFECT IS TO BE ACCOUNTED FOR.                              GEO 570
C                                                                      GEO 580
      READ (5,570) HALFSW,CREF,TWIST,TWISTR,XJ,YJ,ZJ,RJ                GEO 590
      WRITE (6,570) HALFSW,CREF,TWIST,TWISTR,XJ,YJ,ZJ,RJ               GEO 600
C                                                                      GEO 610
C  ***TRAILING-EDGE ANGLE IN DEG., PARTIAL-SPAN FLAP INDICATOR (=0. FOR GEO 620
C     NO OR FULL-SPAN FLAP, AND =1. OTHERWISE), CONFIGURATION INDICATOR GEO 630
C     (=1. FOR USB, AND =0. FOR OWB), L.E. CAMBER AT THE ROOT AND TIP, GEO 640
C     AND T.E. CAMBER AT THE ROOT AND TIP ***                          GEO 650
C  * NOTE, FOR USB APPLICATIONS, TEANGL MAY BE ANY VALUE *            GEO 660
C                                                                      GEO 670
C  * IF CAMBER ORDINATES ARE TO BE READ IN, THE L.E. AND T.E. CAMBER    GEO 680
C     SLOPES TO BE READ IN BELOW MAY BE ARBITRARY NUMBERS *            GEO 690
C                                                                      GEO 700
      READ (5,570) TEANGL,PTIAL,USB,CAMLER,CAMLET,CAMTER,CAMTET        GEO 710
      WRITE (6,570) TEANGL,PTIAL,USB,CAMLER,CAMLET,CAMTER,CAMTET       GEO 720
      IF (RJ.LE.0.0001) RJ=1.                                          GEO 730
      IUSB=USB                                                         GEO 740
      DFJ=0.                                                           GEO 750
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      CMU=0.                                                            GEO 760
C                                                                       GEO 770
C  * THE FOLLOWING DATA ARE NOT NEEDED FOR OWR APPLICATIONS *           GEO 780
      IF (IUSR.NE.1) GO TO 20                                           GEO 790
C                                                                       GEO 800
C  *** THRUST COEFFICIENT, JET DEFLECTION ANGLE IN DEG, AND ENTRAINMENT GEO 810
C      CODE IF THE RECTANGULAR JET IS NOT ON THE WING SURFACE (=1. IF THEGEO 820
C      ENTRAINMENT DUE TO AN EQUIVALENT ROUND JET IS TO BE INCLUDED, =0. GEO 830
C      OTHERWISE)                                                       GEO 840
C                                                                       GEO 850
      READ (5,570) CMU,DFJ,TNJ                                          GEO 860
      WRITE (6,570) CMU,DFJ,TNJ                                         GEO 870
20    CONTINUE                                                          GEO 880
      DFJ=DFJ*PI/180.                                                   GEO 890
      CDF=DFJ                                                           GEO 900
      DO 30 I=1,5                                                       GEO 910
30    DF(I)=DF(I)*PI/180.                                               GEO 920
      TDF=DF(NJP)                                                       GEO 930
      ALP=ALP*PI/180.                                                   GEO 940
      ALPS=SIN(ALP)                                                     GEO 950
      ALPC=COS(ALP)                                                     GEO 960
      ALPT=ALPS                                                         GEO 970
      DE=TEANGL*PI/180.+TDF                                             GEO 980
      IF (IUSR.EQ.1) CDF=DFJ                                            GEO 990
      EXIT=0.                                                           GEO1000
      IF (XJ.GT.XEL) EXIT=1.                                            GEO1010
      XEL=(XFL-XJ)/RJ                                                   GEO1020
      XET=(XFT-XJ)/RJ                                                   GEO1030
      Z=ZJ/RJ                                                           GEO1040
      TH=0.                                                             GEO1050
      M1(4)=0                                                           GEO1060
      ITN=TNJ                                                           GEO1070
      YCOA(23)=TNJ                                                      GEO1080
      IF (IUSR.EQ.1.AND.ITN.EQ.0) GO TO 40                              GEO1090
      CALL ENTRA (VMU,AM2,TEMP,XM,CU,RT,XEL,XET,Z,KCODE,XJC)            GEO1100
      XEQUI=XM*RJ+XJ                                                    GEO1110
      REQUI=RT*RJ                                                       GEO1120
      RT=REQUI                                                          GEO1130
      IF (IUSR.EQ.1) GO TO 40                                           GEO1140
      IF (XFL.LT.0..AND.ZJ.GE.(2.*RJ)) KCODE=0                          GEO1150
      IF (ZJ.GE.(3.*RJ)) KCODE=0                                        GEO1160
      F1=-29.5428*CU*CU+33.7371*CU-8.9148                               GEO1170
      IF (CU.GT.0.6339) F1=0.6+0.4*(CU-0.6339)/0.3661                   GEO1180
      IF (F1.LT.0..AND.ZJ.GE.(1.9*RJ)) KCODE=0                          GEO1190
      IF (KCODE.EQ.0) GO TO 40                                          GEO1200
      ZR=PI*RT/2.                                                       GEO1210
      TH=ZR                                                             GEO1220
40    CONTINUE                                                          GEO1230
      IF (IUSR.EQ.1) KCODE=1                                            GEO1240
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      IF (IUSP.NE.1.AND.KCODE.EQ.1) GO TO 50                            GE01250
      GO TO 60                                                          GE01260
50    AX=XEL*RJ                                                         GE01270
      DJX=2.*RJ                                                         GE01280
      IF (F1.LT.0.) F1=0.                                               GE01290
      IF (ZJ.LT.(2.*RJ).AND.ZJ.GE.(1.5*RJ)) F1=F1+(1.-F1)*(2.*RJ-ZJ)/(0.GE01300
     15*RJ)                                                             GE01310
      IF (ZJ.LT.(1.5*RJ)) F1=1.                                         GE01320
      IF (F1.GT.1.) F1=1.                                               GE01330
      FACT=F1                                                           GE01340
      CDF=DE*FACT                                                       GE01350
60    CONTINUE                                                          GE01360
      DO 70 I=1,8                                                       GE01370
70    M1(I)=0                                                           GE01380
C                                                                       GE01390
C  *** TOTAL NUMBER OF SPANWISE SECTIONS, AND THE NUMBER OF VORTEX      GE01400
C     STRIPS IN EACH SECTION PLUS 1 ***                                 GE01410
C  *  THE NUMBER OF VORTEX STRIPS IN THE JET REGION SHOULD BE CONSISTENTGE01420
C     WITH THAT OF JET VORTEX STRIPS *                                  GE01430
C   * NWING=THE NUMERICAL ORDER OF LAST WING SPANWISE SECTION *         GE01440
C                                                                       GE01450
      READ (5,580) NC,(M1(I),I=1,NC),NWING                              GE01460
      WRITE (6,580) NC,(M1(I),I=1,NC),NWING                             GE01470
C                                                                       GE01480
C  ***THE NUMERICAL ORDER OF FLAP AND JET SPANS AMONG THE SPANWISE      GE01490
C     SECTIONS ***                                                      GE01500
C                                                                       GE01510
      READ (5,580) (NJW(I),I=1,NFP)                                     GE01520
      WRITE (6,580) (NJW(I),I=1,NFP)                                    GE01530
C                                                                       GE01540
C  *** NUMBER OF CHORDWISE VORTEX ELEMENTS IN CHORDWISE SECTIONS, AND   GE01550
C     CAMBER CODE (=1 IF CAMBER ORDINATES ARE TO BE READ IN, =0 IF      GE01560
C     CAMBER FUNCTIONS ARE DEFINED BY CLOSED-FORM EXPRESSIONS MANUALLY  GE01570
C     IN SUBPROGRAMS ZCR(X) AND ZCT(X)), AND THE NUMBER OF CAMBER ORDI- GE01580
C     NATES TO BE READ IN (ARBITRARY IF ICAM=0) ***                     GE01590
C  * NOTE, THE MAXIMUM NUMBER OF CAMBER ORDINATES ALLOWED IS 11 *       GE01600
C                                                                       GE01610
      READ (5,580) (NW(I),I=1,3),ICAM,IM                                GE01620
      WRITE (6,580) (NW(I),I=1,3),ICAM,IM                               GE01630
      NCW=NW(1)                                                         GE01640
      L=1                                                               GE01650
      IF (ICAM.NE.1) GO TO 110                                          GE01660
C                                                                       GE01670
C  *** IF ICAM=1, READ IN THE X-COORDINATES AND THE CAMBER ORDINATES,   GE01680
C     FIRST FOR THE ROOT SECTION AND THEN FOR THE TIP SECTION ***       GE01690
C                                                                       GE01700
      IM1=IM-1                                                          GE01710
      DO 100 I=1,2                                                      GE01720
      READ (5,570) (XT(I,J),J=1,IM)                                     GE01730
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      READ (5,570) (ZC(I,J),J=1,IM)                                          GE01740
      DO 80 J=1,IM                                                           GE01750
      XFF(J)=XT(I,J)                                                         GE01760
80    RFF(J)=ZC(I,J)                                                         GE01770
      CALL SPLINE (IM,XFF,RFF,AAF,BBF,CCF,DDF)                               GE01780
      DO 90 J=1,IM1                                                          GE01790
      AAM(I,J)=AAF(J)                                                        GE01800
      BBM(I,J)=BBF(J)                                                        GE01810
      CCM(I,J)=CCF(J)                                                        GE01820
90    DDM(I,J)=DDF(J)                                                        GE01830
100   CONTINUE                                                               GE01840
110   CONTINUE                                                               GE01850
120   CONTINUE                                                               GE01860
      LL=1                                                                   GE01870
      FN=NCW                                                                 GE01880
      DO 130 I=1,NCW                                                         GE01890
      FI=I                                                                   GE01900
      CPCWL(I)=0.5*(1.-COS((2.*FI-1.)*PI/(2.*FN)))                           GE01910
      SN(I,L)=2.*SQRT(CPCWL(I)*(1.-CPCWL(I)))                                GE01920
130   CPCWL(I)=CPCWL(I)*100.                                                 GE01930
      DO 250 KK=1,NC                                                         GE01940
C                                                                            GE01950
C   *** COORDINATES OF BREAK CHORDS BOUNDING SPANWISE SECTIONS ***           GE01960
C                                                                            GE01970
      READ (5,570) ((XXL(I),XXT(I),YL(I),I=1,2),7S)                          GE01980
      WRITE (6,570) ((XXL(I),XXT(I),YL(I),I=1,2),7S)                         GE01990
      IF (IUSR.EQ.1) GO TO 210                                               GE02000
      IF (ISYM.EQ.0.AND.KK.EQ.1) GO TO 140                                   GE02010
      IF (KK.EQ.(NJW(NJP)+1)) GO TO 150                                      GE02020
      IF (ISYM.NE.0.AND.KK.EQ.(NJW(NJP)-1)) GO TO 160                        GE02030
      IF (ISYM.NE.0.AND.KK.EQ.NJW(NJP)) GO TO 140                            GE02040
      GO TO 210                                                              GE02050
140   XXL(2)=XXL(1)+(XXL(2)-XXL(1))*(YL(2)-YL(1)+RT-RJ)/(YL(2)-YL(1))        GE02060
      XXT(2)=XXT(1)+(XXT(2)-XXT(1))*(YL(2)-YL(1)+RT-RJ)/(YL(2)-YL(1))        GE02070
      IF (ISYM.EQ.0) GO TO 170                                               GE02080
150   XXL(1)=XL2                                                             GE02090
      XXT(1)=XT2                                                             GE02100
      GO TO 170                                                              GE02110
160   XXL(2)=XXL(1)+(XXL(2)-XXL(1))*(YL(2)-YL(1)-RT+RJ)/(YL(2)-YL(1))        GE02120
      XXT(2)=XXT(1)+(XXT(2)-XXT(1))*(YL(2)-YL(1)-RT+RJ)/(YL(2)-YL(1))        GE02130
170   XL2=XXL(2)                                                             GE02140
      XT2=XXT(2)                                                             GE02150
      IF (ISYM.EQ.0.AND.KK.EQ.1) GO TO 180                                   GE02160
      IF (ISYM.NE.0.AND.KK.EQ.(NJW(NJP)-1)) GO TO 180                        GE02170
      YL(1)=YL2                                                              GE02180
180   IF (ISYM.EQ.0) GO TO 190                                               GE02190
      IF (KK.EQ.(NJW(NJP)+1)) GO TO 210                                      GE02200
      IF (KK.EQ.NJW(NJP)) YL(2)=YL(2)+RT-RJ                                  GE02210
      IF (KK.EQ.(NJW(NJP)-1)) YL(2)=YL(2)-RT+RJ                              GE02220
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      GO TO 200                                                          GE02230
190   IF (KK.EQ.1) YL(2)=YL(2)*RT-RJ                                     GE02240
200   YL2=YL(2)                                                          GE02250
210   CONTINUE                                                           GE02260
      FM=M1(KK)                                                          GE02270
      NSW=M1(KK)                                                         GE02280
      DO 220 J=1,NSW                                                     GE02290
      FJ=J                                                               GE02300
      CPSWL(J)=0.5*(1.-COS((2.*FJ-1.)*PI/(2.*FM)))*100.                  GE02310
      YCON(J)=0.5*(1.-COS(FJ*PI/FM))                                     GE02320
      SJ(J,KK)=SIN(FJ*PI/FM)                                             GE02330
220   CONTINUE                                                           GE02340
      IF (KK.EQ.NC) GO TO 230                                            GE02350
      CPSWL(1)=0.                                                        GE02360
      CPSWL(NSW)=100.                                                    GE02370
      GO TO 240                                                          GE02380
230   CPSWL(1)=0.                                                        GE02390
240   IF (KK.EQ.NJW(LL)) MJW1(L,LL)=IPANEL                               GE02400
      IF (KK.EQ.NJW(NJP)) LC(L)=KL+1                                     GE02410
      LR=(L-1)*NC+KK                                                     GE02420
      CALL PANEL (XXL,YL,XXT,CPCWL,CPSWL,NSW,IPANEL,LPANEL,KL,LR,SWP,7S)GE02430
      IPANEL=LPANEL+1                                                    GE02440
      NCS=NCS+NSW-1                                                      GE02450
      WIDTH(KK)=YL(2)-YL(1)                                              GE02460
      BREAK(KK)=YL(1)                                                    GE02470
      IF (KK.EQ.NJW(LL)) MJW2(L,LL)=LPANEL                               GE02480
      IF (KK.NE.NC) GO TO 250                                            GE02490
      CHORDT(L)=XXT(2)-XXL(2)                                            GE02500
      YCN(L)=XXL(2)                                                      GE02510
      HALFB=YL(2)                                                        GE02520
250   IF (KK.EQ.NJW(LL)) LL=LL+1                                         GE02530
      IF (L.EQ.3) GO TO 300                                              GE02540
      IF (L.EQ.1) LPAN1=LPANEL                                           GE02550
      IF (L.EQ.2) LPAN2=LPANEL                                           GE02560
      IF (NW(2).EQ.0) GO TO 260                                          GE02570
      L=L+1                                                              GE02580
      NCW=NW(L)                                                          GE02590
      IF (L.EQ.3.AND.NW(3).EQ.0) GO TO 280                               GE02600
      GO TO 120                                                          GE02610
260   DO 270 I=2,3                                                       GE02620
      DO 270 J=1,NFP                                                     GE02630
      MJW1(I,J)=0                                                        GE02640
270   MJW2(I,J)=0                                                        GE02650
      LPAN2=LPANEL                                                       GE02660
      NCS=NCS*3                                                          GE02670
      GO TO 300                                                          GE02680
280   DO 290 I=1,NFP                                                     GE02690
      MJW1(3,I)=0                                                        GE02700
290   MJW2(3,I)=0                                                        GE02710
```

```
      L=L-1                                                              GE02720
      NCS=NCS+NCS/2                                                      GE02730
300   CONTINUE                                                           GE02740
      NCS=NCS/3                                                          GE02750
      NCW=NW(1)+NW(2)+NW(3)                                              GE02760
      VU=VMU                                                             GE02770
      IF (IUSP.EQ.1) CU=VMU                                              GE02780
      VMU=CU                                                             GE02790
      RTJ=RJ                                                             GE02800
      ZJT=ZJ+ZS                                                          GE02810
      IF (RT.GT.ABS(ZJ).AND.KCODE.EQ.0) ZJT=RT*ZJ/ABS(ZJ)+ZS             GE02820
      IF (IUSP.EQ.1) GO TO 310                                           GE02830
      AM2=AM1/(VMU*SQRT(TEMP))                                           GE02840
      IF (AM2.GT.0.9) WRITE (6,660) AM2                                  GE02850
      IF (AM2.GT.0.9) AM2=0.9                                            GE02860
310   CONTINUE                                                           GE02870
      LAST=LPANEL                                                        GE02880
C                                                                        GE02890
C  *** TOTAL NUMBER OF STREAMWISE JET SECTIONS, NUMBER OF JET CIRCUM-    GE02900
C      FERENTIAL STRIPS MINUS ONE FOR A NON-CENTERED JET (USE ODD NUMBERSGE02910
C      ) AND PLUS ONE FOR A CENTERED JET (USE EVEN NUMBERS), AND NUMBERS GE02920
C      OF JET VORTEX ELEMENTS ON EACH JET SECTION ***                    GE02930
C                                                                        GE02940
      READ (5,580) NNJ,NSJ,(NCJ(I),I=1,NNJ)                             GE02950
      WRITE (6,580) NNJ,NSJ,(NCJ(I),I=1,NNJ)                            GE02960
      IF (KCODE.EQ.0) CALL CIRCJ (ISYM,NSJ,Y)                           GE02970
      IF (ISYM.EQ.0) NSJJ=NSJ/2                                          GE02980
      IF (ISYM.NE.0) NSJJ=(NSJ+1)/2                                      GE02990
      NSYM=1-ISYM                                                        GE03000
      NSJ1=NSJJ-1                                                        GE03010
      FNJ=NSJJ                                                           GE03020
      CPSWL(1)=0.                                                        GE03030
      CPSWL(NSJJ)=1.                                                     GE03040
      YCON(1)=0.5*(1.-COS(PI/FNJ))                                       GE03050
      DO 320 I=2,NSJ1                                                    GE03060
      FI=I                                                               GE03070
      CPSWL(I)=0.5*(1.-COS((2.*FI-1.)*PI/(2.*FNJ)))                      GE03080
320   YCON(I)=0.5*(1.-COS(FI*PI/FNJ))                                    GE03090
      IFATN=NC                                                           GE03100
      JC=NCS*L                                                           GE03110
      NJ1=NNJ-1                                                          GE03120
      DO 420 JJ=1,NNJ                                                    GE03130
      IF (IUSB.EQ.1) GO TO 370                                           GE03140
C                                                                        GE03150
C   *** COORDINATES OF BOUNDING LINES OF JET SECTIONS PROJECTED ON X-Y   GE03160
C       PLANE ***                                                        GE03170
C                                                                        GE03180
      READ (5,570) (XXL(I),XXT(I),YL(I),I=1,2)                           GE03190
      WRITE (6,570) (XXL(I),XXT(I),YL(I),I=1,2)                          GE03200
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```
      IF (ISYM.EQ.0) GO TO 330                                          GE03210
      XL1=XXL(1)-(XXL(2)-XXL(1))*(RT-RTJ)/(YL(2)-YL(1))                 GE03220
      XT1=XXT(1)-(XXT(2)-XXT(1))*(RT-RTJ)/(YL(2)-YL(1))                 GE03230
330   XL2=XXL(1)+(XXL(2)-XXL(1))*(RT+RTJ)/(YL(2)-YL(1))                 GE03240
      XT2=XXT(1)+(XXT(2)-XXT(1))*(RT+RTJ)/(YL(2)-YL(1))                 GE03250
      IF (ISYM.EQ.0) GO TO 340                                          GE03260
      XXL(1)=XL1                                                        GE03270
      XXT(1)=XT1                                                        GE03280
340   XXL(2)=XL2                                                        GE03290
      XXT(2)=XT2                                                        GE03300
      IF (ISYM.EQ.0) GO TO 350                                          GE03310
      YL(1)=YL(1)-RT+RTJ                                                GE03320
350   YL(2)=YL(2)+RT-RTJ                                                GE03330
      IF (KCODE.EQ.0) GO TO 360                                         GE03340
      XXL(4)=XXL(2)                                                     GE03350
      XXT(4)=XXT(2)                                                     GE03360
      YL(4)=YL(2)                                                       GE03370
      XXL(2)=XXL(1)                                                     GE03380
      XXT(2)=XXT(1)                                                     GE03390
      YL(2)=YL(1)                                                       GE03400
      XXL(3)=XXL(4)                                                     GE03410
      XXT(3)=XXT(4)                                                     GE03420
      YL(3)=YL(4)                                                       GE03430
      ZL(1)=ZS                                                          GE03440
      ZL(2)=ZR+ZS                                                       GE03450
      ZL(3)=ZR+ZS                                                       GE03460
      ZL(4)=ZS                                                          GE03470
360   CONTINUE                                                          GE03480
      GO TO 390                                                         GE03490
C                                                                       GE03500
C  ***COORDINATES OF BREAK POINTS DEFINING RECTANGULAR JET SECTIONS FOR  GE03510
C     USB CONFIGURATIONS***                                             GE03520
C                                                                       GE03530
370   DO 380 I=1,4                                                      GE03540
      READ (5,570) XXL(I),XXT(I),YL(I),ZL(I)                           GE03550
380   WRITE (6,570) XXL(I),XXT(I),YL(I),ZL(I)                          GE03560
390   CONTINUE                                                          GE03570
      II=JJ                                                             GE03580
      JJ1=JJ+L                                                          GE03590
      FNCJ=NCJ(JJ)                                                      GE03600
      NJ=NCJ(JJ)                                                        GE03610
      NMJ=NJ*16                                                         GE03620
      IF (NJ.GT.6) NMJ=NJ*8                                             GE03630
      FNJ=NMJ                                                           GE03640
      DO 400 J=1,NMJ                                                    GE03650
      FJ=J                                                              GE03660
      SC(J,JJ)=0.5*(1.-COS((2.*FJ-1.)*PI/(2.*FNJ)))                     GE03670
400   SI(J,JJ)=SIN((2.*FJ-1.)*PI/(2.*FNJ))                             GE03680
      DO 410 J=1,NJ                                                     GE03690
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      FJ=J                                                              GE03700
      CPCWL(J)=0.5*(1.-COS((2.*FJ-1.)*PI/(2.*FNCJ)))                    GE03710
410   SN(J,JJ1)=2.*SQRT(CPCWL(J)*(1.-CPCWL(J)))                        GE03720
      IF (KCODE.EQ.0) CALL JSHAPE (XXL,XXT,YL,YJ,ZJT,RT,CPCWL,IPANEL,NJ,GE03730
     1JC,ISYM)                                                          GE03740
      IF (KCODE.EQ.1) CALL RESHAP (XXL,XXT,YL,ZL,CPCWL,CPSWL,IPANEL,NJ,JGE03750
     1C,II,NSYM)                                                        GE03760
      MJJ(JJ)=LAST                                                      GE03770
420   IPANEL=LAST+1                                                     GE03780
      SDF=XXT(1)-XXL(1)                                                 GE03790
      IF (IUSR.EQ.1) TH=ZL(3)-ZL(4)                                     GE03800
      YCON(25)=ZL(4)-ZCP(1)                                             GE03810
      YCON(24)=USB                                                      GE03820
      C(I)=CMU                                                          GE03830
      IF (KCODE.EQ.0) YCON(25)=1.                                       GE03840
      IF (KCODE.EQ.1) CALL RECTJ (ISYM,NSJ,Y)                           GE03850
      JPANEL=LAST-LPANEL                                                GE03860
      LTOTAL=LAST+JPANEL                                                GE03870
C                                                                       GE03880
C  ***NUMBER OF SECTIONS IN WHICH THE DIHEDRAL IS TO BE DEFINED ,       GE03890
C     DIHEDRAL IN DEG., AND THE OUTBOARD Y COORDINATE OF THE SECTION .  GE03900
C    * NDG=1 IF THERE IS DIHEDRAL, =0, OTHERWISE *                      GE03910
C                                                                       GE03920
      READ (5,580) NDG,MDG                                              GE03930
      WRITE (6,580) NDG,MDG                                             GE03940
      READ (5,570) (SNG(I),YG(I),I=1,NDG)                               GE03950
      WRITE (6,570) (SNG(I),YG(I),I=1,NDG)                              GE03960
      DO 430 I=1,NDG                                                    GE03970
430   SNG(I)=SIN(SNG(I)*PI/180.)                                        GE03980
      LWF=LPANEL                                                        GE03990
      LWFJ=LTOTAL                                                       GE04000
      NTL=0                                                             GE04010
      KW=0                                                              GE04020
      WKN=0.                                                            GE04030
      ROX=0.                                                            GE04040
C                                                                       GE04050
C  *** KF=1 IF THE FUSELAGE IS PRESENT, =0 OTHERWISE. MT=NUMBER OF      GE04060
C     FOURIER TERMS EXCLUDING THE ZERO-ORDER TERM. NCUM=NUMBER OF CIR-  GE04070
C     CUMFERENTIAL LOCATIONS AT WHICH PRESSURE LOADING IS TO BE COMPUTEDGE04080
C     . NF=NUMBER OF CONTROL STATIONS ALONG THE FUSELAGE AXIS ***       GE04090
C  *  KW=NUMBER OF SEGMENTS INTO WHICH THE FUSELAGE AXIS IS DIVIDED,    GE04100
C     NKF=NUMBER OF SINGULARITY ELEMENTS IN EACH SEGMENT *              GE04110
C  *  FOR MIDWING CONFIGURATIONS, USE EVEN NUMBERS FOR NCUM *           GE04120
C                                                                       GE04130
      DO 440 I=1,5                                                      GE04140
      NKF(I)=0.                                                         GE04150
440   XAS(I)=0.                                                         GE04160
      XAS(6)=0.                                                         GE04170
      READ (5,580) KF,MT,NCUM,NF,KW,(NKF(I),I=1,KW)                     GE04180
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      WRITE (6,580) KF,NT,NCUM,NF,KW,(NKF(I),I=1,KW)                    GE04190
      IF (KF.EQ.0) GO TO 500                                            GE04200
      NTL=NT*NF                                                         GE04210
      KW1=KW+1                                                          GE04220
C                                                                       GE04230
C *** X-COORDINATES DEFINING THE FUSELAGE SEGMENTS,INCLUDING THE NOSE   GE04240
C     AND THE TAIL, FUSIND=0. IF THE FUSELAGE GEOMETRY IS TO BE DEFINED GE04250
C     ANALYTICALLY IN FUNCTIONS FUR(X) AND SLOP(X), =1. OTHERWISE.      GE04260
C     FUSNO=NUMBER OF FUSELAGE STATIONS TO BE INPUT TO DEFINE THE       GE04270
C     SHAPE IF FUSIND=1. , =0. OTHERWISE ***                            GE04280
C  *  X1=BODY STATION IN FRACTION OF BODY LENGTH AT WHICH THE RATE OF   GE04290
C     CHANGE OF CROSS-SECTIONAL AREA WITH BODY LENGTH FIRST REACHES     GE04300
C     MAXIMUM NEGATIVE VALUE. SEE DATCOM *                              GE04310
C  *  XJF=1. IF THE LOWER INBOARD EDGE OF THE USB JET IS ON THE FUSELAGEGE04320
C     , =0. OTHERWISE *                                                 GE04330
C                                                                       GE04340
      READ (5,570) (XAS(I),I=1,KW1),FUSIND,FUSNO,X1,XJF                 GE04350
      WRITE (6,570) (XAS(I),I=1,KW1),FUSIND,FUSNO,X1,XJF                GE04360
      IF (X1.LT.0.01) X1=1.                                             GE04370
      IFR=FUSIND                                                        GE04380
      IFN=FUSNO                                                         GE04390
C  ***IF FUSIND=1., READ IN THE FUSELAGE X-STATIONS AND THE RADII.      GE04400
C     OTHERWISE, SKIP ***                                               GE04410
      IF (IFR.EQ.0) GO TO 450                                           GE04420
      READ (5,570) (XFF(I),I=1,IFN)                                     GE04430
      READ (5,570) (RFF(I),I=1,IFN)                                     GE04440
      WRITE (6,570) (XFF(I),I=1,IFN)                                    GE04450
      WRITE (6,570) (RFF(I),I=1,IFN)                                    GE04460
      CALL SPLINF (IFN,XFF,RFF,AAF,BBF,CCF,DDF)                         GE04470
450   CONTINUE                                                          GE04480
      XLEF=XAS(1)                                                       GE04490
      XTEF=XAS(KW1)                                                     GE04500
      IF (YN(2,1).LE.0.01) GO TO 480                                    GE04510
      IF (ZCP(2).GE.0.) TH1=PI/2.-ATAN(ZCP(2)/YN(2,1))                  GE04520
      IF (ZCP(2).LT.0.) TH1=PI/2.+ATAN(ABS(ZCP(2))/YN(2,1))             GE04530
      IF (ZCP(2).LT.0.) GO TO 460                                       GE04540
      IF (ABS(ZCP(2)).LE.0.001) GO TO 470                               GE04550
      F1=TH1/PI*FLOAT(NCUM)                                             GE04560
      NH1=F1                                                            GE04570
      IF (NH1.LT.2) NH1=2                                               GE04580
      GO TO 490                                                         GE04590
460   TH2=PI-TH1                                                        GE04600
      F2=TH2/PI*FLOAT(NCUM)                                             GE04610
      NH2=F2                                                            GE04620
      IF (NH2.LT.2) NH2=2                                               GE04630
      NH1=NCUM-NH2                                                      GE04640
      GO TO 490                                                         GE04650
470   NH1=NCUM/2                                                        GE04660
      GO TO 490                                                         GE04670
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480   NH1=0                                                          GE04680
      TH1=0.                                                         GE04690
490   CONTINUE                                                       GE04700
      SNP(5,20)=TH1                                                  GE04710
      SNP(5,19)=NH1                                                  GE04720
      XTE(50)=XJF                                                    GE04730
      CALL GEOFUS (RDX)                                              GE04740
      LWF=LPANEL+NTL                                                 GE04750
      LWFJ=LTOTAL+NTL                                                GE04760
      WKN=-8.*PI*RDX                                                 GE04770
500   CONTINUE                                                       GE04780
      WRITE (6,590) HALFSW,CREF                                      GE04790
      WRITE (6,630)                                                  GE04800
      WRITE (6,580) LPANEL,JPANEL,LWFJ                               GE04810
      IF (IUSP.EQ.1) GO TO 510                                       GE04820
      WRITE (6,750)                                                  GE04830
      IF (KCODE.EQ.0) WRITE (6,770)                                  GE04840
      IF (KCODE.EQ.1) WRITE (6,780)                                  GE04850
      IF (KCODE.EQ.1) WRITE (6,790)                                  GE04860
      WRITE (6,750)                                                  GE04870
      WRITE (6,730) XEQUI                                            GE04880
      WRITE (6,740) REQLI                                            GE04890
      WRITE (6,760) VMI                                              GE04900
510   CONTINUE                                                       GE04910
      IF (ICAM.NE.1) GO TO 520                                       GE04920
      WRITE (6,670)                                                  GE04930
      WRITE (6,690) (XT(1,I),I=1,IM)                                 GE04940
      WRITE (6,700) (ZC(1,I),I=1,IM)                                 GE04950
      WRITE (6,680)                                                  GE04960
      WRITE (6,690) (XT(2,I),I=1,IM)                                 GE04970
      WRITE (6,700) (ZC(2,I),I=1,IM)                                 GE04980
      CAMLER=ZCR(0.)                                                 GE04990
      CAMTER=ZCR(1.)                                                 GE05000
      CAMLET=ZCT(0.)                                                 GE05010
      CAMTET=ZCT(1.)                                                 GE05020
520   CONTINUE                                                       GE05030
      WRITE (6,640)                                                  GE05040
      WRITE (6,710)                                                  GE05050
      WRITE (6,600) (XN(I,1),XN(I,2),YN(I,1),YN(I,2),ZN(I,1),ZN(I,2),I=1GE05060
     1,LAST)                                                         GE05070
      WRITE (6,650)                                                  GE05080
      WRITE (6,720)                                                  GE05090
      WRITE (6,600) (XCP(I),YCP(I),ZCP(I),I=1,LAST)                  GE05100
      IF (KCODE.EQ.1) GO TO 540                                      GE05110
      IF (ISYM.EQ.0) GO TO 530                                       GE05120
      FN2=(NSJ-1)/2+1                                                GE05130
      NJH=(NSJ-1)/2+2                                                GE05140
      ANG=PI/(2.*FN2)                                                GE05150
      FAC=(SIN(3.*ANG)-SIN(ANG)/COS(ANG))/(1.-COS(3.*ANG))           GE05160
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      PHI=PI/2.-ATAN(FAC)                                              GE05170
      NJH1=NJH-1                                                       GE05180
      NJH2=NJH+1                                                       GE05190
      Y(3,2)=SIN(PHI)                                                  GE05200
      Y(4,2)=-COS(PHI)                                                 GE05210
      Y(3,NJH1)=Y(3,2)                                                 GE05220
      Y(4,NJH1)=-Y(4,2)                                                GE05230
      Y(3,NJH2)=-Y(3,2)                                                GE05240
      Y(4,NJH2)=Y(4,2)                                                 GE05250
      Y(3,NSJ1)=-Y(3,2)                                                GE05260
      Y(4,NSJ1)=-Y(4,2)                                                GE05270
      GO TO 540                                                        GE05280
530   FN2=NSJ/2                                                        GE05290
      NJH=NSJ/2                                                        GE05300
      ANG1=1.-0.5*(1.-COS(PI/(2.*FN2)))                                GE05310
      ANG3=1.-0.5*(1.-COS(3.*PI/(2.*FN2)))                             GE05320
      ANG1=ATAN(SQRT(1.-ANG1*ANG1)/ANG1)                               GE05330
      ANG3=ATAN(SQRT(1.-ANG3*ANG3)/ANG3)                               GE05340
      FAC=(SIN(ANG3)-SIN(ANG1)/COS(ANG1))/(1.-COS(ANG3))               GE05350
      PHI=PI/2.-ATAN(FAC)                                              GE05360
      NJH1=NJH-1                                                       GE05370
      NJH2=NSJ1                                                        GE05380
      Y(3,NJH1)=SIN(PHI)                                               GE05390
      Y(4,NJH1)=COS(PHI)                                               GE05400
      Y(3,NJH2)=-Y(3,NJH1)                                             GE05410
      Y(4,NJH2)=Y(4,NJH1)                                              GE05420
540   CONTINUE                                                         GE05430
      FNJ=NCJ(NNJ)                                                     GE05440
      NPJ=NCJ(NNJ)                                                     GE05450
      DO 550 J=1,NPJ                                                   GE05460
      FJ=J                                                             GE05470
550   PSI(J)=SIN(FJ*PI/FNJ)                                            GE05480
      BETA1=SQRT(1.-AM1*AM1)                                           GE05490
      BETA2=SQRT(1.-AM2*AM2)                                           GE05500
      B1=BETA1*BETA1                                                   GE05510
      B2=BETA2*BETA2                                                   GE05520
      DO 560 KK=1,NCS                                                  GE05530
      XLL(KK)=ALP+(TWISTR+TWIST*YLE(KK)/HALFB)*PI/180.                 GE05540
      T=XLL(KK)                                                        GE05550
560   XTT(KK)=SIN(T)/COS(T)                                            GE05560
      YCN(6)=X1                                                        GE05570
      ZJ=ZJ+ZS                                                         GE05580
      RETURN                                                           GE05590
C                                                                      GE05600
570   FORMAT (8(F10.5))                                                GE05610
580   FORMAT (8(6X,I4))                                                GE05620
590   FORMAT (10X,8HHALF SW=,E12.5,10X,5HCREF=,F12.5)                  GE05630
600   FORMAT (6(F10.5))                                                GE05640
610   FORMAT (2(6X,I4),7F10.5)                                         GE05650
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620   FORMAT (1H0,10HINPUT DATA)                                          GE05660
630   FORMAT (1H0,19HLPANEL,JPANEL,LWFJ=)                                 GE05670
640   FORMAT (1H0,36HVORTEX ELEMENT ENDPOINT COORDINATES=)                GE05680
650   FORMAT (1H0,26HCONTROL POINT COORDINATES=)                          GE05690
660   FORMAT (1H0,42HWARNING. THE EQUIVALENT JET MACH NUMBER IS,F10.5,41HGE05700
     1HIT HAS BEEN SET TO 0.9 IN THE COMPUTATION)                         GE05710
670   FORMAT (/45H*** CAMBER ORDINATES FOR THE ROOT SECTION ***)          GE05720
680   FORMAT (/44H*** CAMBER ORDINATES FOR THE TIP SECTION ***)           GE05730
690   FORMAT (/7X,3HX/C,11F10.5)                                          GE05740
700   FORMAT (/7X,3HZ/C,11F10.5)                                          GE05750
710   FORMAT (/4X,2HX1,8X,2HX2,8X,2HY1,8X,2HY2,8X,2HZ1,6X,2HZ2)           GE05760
720   FORMAT (/4X,3HXCP,7X,3HYCP,7X,3HZCP,7X,3HXCP,7X,3HYCP,7X,3HZCP)     GE05770
730   FORMAT (1H0,46HTHE EQUIVALENT JET PROPERTIES ARE EVALUATED AT,F10.GE05780
     15)                                                                  GE05790
740   FORMAT (1H0,28HTHE EQUIVALENT JET RADIUS IS,F10.5)                  GE05800
750   FORMAT (/20X,50HXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXGE05810
     1)                                                                   GE05820
760   FORMAT (1H0,49HTHE VELOCITY RATIO OF THE EQUIVALENT JET,V0/VJ,IS,FGE05830
     110.5)                                                               GE05840
770   FORMAT (/20X,38HAN EQUIVALENT CIRCULAR JET IS USED FOR/20X,23HINTEGE05850
     1RACTION COMPUTATION)                                                GE05860
780   FORMAT (/20X,43HA RECTANGULAR JET WITH LATERAL EXTENT EQUAL/20X,42GE05870
     1HTO THE EQUIVALENT JET DIAMETER IS USED FOR/20X,23HINTERACTION COMGE05880
     2PUTATION)                                                           GE05890
790   FORMAT (/20X,51HNOTE. CHECK WHETHER THE WING IS IMMERSED IN THE JEGE05900
     1T)                                                                  GE05910
      END                                                                 GE05920-
      SUBROUTINE GEOFUS (RDX)                                             GEF  10
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCGEF  20
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                      GEF  30
      PI=3.14159265                                                       GEF  40
      S=XTEF-XLEF                                                         GEF  50
      TH1=SNP(5,20)                                                       GEF  60
      NH1=SNP(5,19)                                                       GEF  70
      RDX=SLOP(XLEF)                                                      GEF  80
      NF1=NF+1                                                            GEF  90
      FNT=NT                                                              GEF 100
      DO 30 I=1,NT                                                        GEF 110
      FI=I                                                                GEF 120
      DO 30 K=1,NCUM                                                      GEF 130
      IF (NH1.NE.0.AND.K.LE.NH1) GO TO 10                                 GEF 140
      FK=K-NH1                                                            GEF 150
      FCUM=NCUM-NH1                                                       GEF 160
      PP=PI-TH1                                                           GEF 170
      TP=TH1                                                              GEF 180
      GO TO 20                                                            GEF 190
10    FK=K                                                                GEF 200
      FCUM=NH1                                                            GEF 210
      PP=TH1                                                              GEF 220
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      TP=0.                                                                  GEF 230
20    CONTINUE                                                               GEF 240
      TA=(2.*FK-1.)*PP/(2.*FCUM)+TP                                          GEF 250
30    CSF(I,K)=COS(FI*TA)                                                    GEF 260
      IK=0                                                                   GEF 270
      FNF=NKF(1)                                                             GEF 280
      X0=XAS(1)                                                              GEF 290
      N2=1                                                                   GEF 300
      N1=NKF(1)                                                              GEF 310
      SL=XAS(2)-XAS(1)                                                       GEF 320
      DO 40 I=1,NF                                                           GEF 330
      M=I-IK                                                                 GEF 340
      FI=M                                                                   GEF 350
      XF(I)=X0+0.5*SL*(1.-COS((2.*FI-1.)*PI/(2.*FNF)))                       GEF 360
      XCF(I)=X0+0.5*SL*(1.-COS(FI*PI/FNF))                                   GEF 370
      SNP(N2,M)=SIN((2.*FI-1.)*PI/(2.*FNF))                                  GEF 380
      XC=XCF(I)                                                              GEF 390
      RF(I)=FUR(XC)                                                          GEF 400
      IF (I.NE.N1) GO TO 40                                                  GEF 410
      N2=N2+1                                                                GEF 420
      IK=N1                                                                  GEF 430
      N1=N1+NKF(N2)                                                          GEF 440
      SL=XAS(N2+1)-XAS(N2)                                                   GEF 450
      FNF=NKF(N2)                                                            GEF 460
      X0=XAS(N2)                                                             GEF 470
40    CONTINUE                                                               GEF 480
      RETURN                                                                 GEF 490
      END                                                                    GEF 500-
      SUBROUTINE SPLINE (N,X,Y,A,B,C,D)                                      SPL  10
      DIMENSION S(111), H(21), CA(21)                                        SPL  20
      DIMENSION A(1), B(1), C(1), D(1), X(1), Y(1)                           SPL  30
      NI=N+1                                                                 SPL  40
      N1=N-1                                                                 SPL  50
      H(NI)=0.                                                               SPL  60
      H(1)=X(3)-X(2)                                                         SPL  70
      H(2)=-X(3)+X(1)                                                        SPL  80
      H(3)=X(2)-X(1)                                                         SPL  90
      DO 10 K=4,N                                                            SPL 100
10    H(K)=0.                                                                SPL 110
      DO 20 K=1,N                                                            SPL 120
20    S(K)=-H(K+1)/H(1)                                                      SPL 130
      NJ=N-1                                                                 SPL 140
      DO 70 I=2,N                                                            SPL 150
      IF (I.EQ.N) GO TO 30                                                   SPL 160
      H(NI)=-6.*((Y(I+1)-Y(I))/(X(I+1)-X(I))-(Y(I)-Y(I-1))/(X(I)-X(I-1)))SPL 170
     1)                                                                      SPL 180
      GO TO 40                                                               SPL 190
30    H(NI)=0.                                                               SPL 200
40    DO 60 J=1,N                                                            SPL 210
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      H(J)=0.                                                                SPL 220
      IF (I.EQ.N) GO TO 50                                                   SPL 230
      IF (J.LT.(I-1).OR.J.GT.(I+1)) GO TO 60                                 SPL 240
      H(I-1)=X(I)-X(I-1)                                                     SPL 250
      H(I)=2.*(X(I+1)-X(I-1))                                                SPL 260
      H(I+1)=X(I+1)-X(I)                                                     SPL 270
      GO TO 60                                                               SPL 280
50    H(N-2)=X(N)-X(N-1)                                                     SPL 290
      H(N-1)=-X(N)+X(N-2)                                                    SPL 300
      H(N)=X(N-1)-X(N-2)                                                     SPL 310
60    CONTINUE                                                               SPL 320
      II=I                                                                   SPL 330
      CALL VMSEQN (NJ,II,H,S,CA)                                             SPL 340
      NJ=NJ-1                                                                SPL 350
70    CONTINUE                                                               SPL 360
      DO 80 I=1,N1                                                           SPL 370
      A(I)=(S(I+1)-S(I))/(6.*(X(I+1)-X(I)))                                  SPL 380
      B(I)=S(I)/2.                                                           SPL 390
      C(I)=(Y(I+1)-Y(I))/(X(I+1)-X(I))-(X(I+1)-X(I))*(2.*S(I)+S(I+1))/6.SPL 400
80    D(I)=Y(I)                                                              SPL 410
      RETURN                                                                 SPL 420
      END                                                                    SPL 430-
      SUBROUTINE RESHAP (XXL,XXT,YL,ZL,CPCWL,CPSWL,IPANEL,NJ,JC,JJ,NSYM)RSP  10
C     TO DEFINE THE LOCATIONS OF VORTEX AND CONTROL POINTS ON RECT. JETSRSP  20
      DIMENSION XXL(1), YL(1), XXT(1), ZL(1), CPCWL(1), CPSWL(1)         RSP  30
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),RSP  40
     1XLL(41)                                                            RSP  50
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTRSP  60
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZRSP  70
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95RSP  80
     3,2),SC(160,5),SI(160,5),LC(3)                                      RSP  90
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JRSP 100
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                         RSP 110
      PI=3.14159265                                                       RSP 120
      IF (NSYM.EQ.0) NSJJ=(NSJ+1)/2                                       RSP 130
      IF (NSYM.NE.0) NSJJ=NSJ/2                                           RSP 140
      NSJ1=NSJJ-1                                                         RSP 150
      DO 10 J=1,NJ                                                        RSP 160
      FJ=J                                                                RSP 170
      FNJ=NJ                                                              RSP 180
10    PSI(J)=0.5*(1.-COS(FJ*PI/FNJ))                                      RSP 190
      DO 170 IS=1,4                                                       RSP 200
      IF (NSYM.EQ.1.AND.IS.EQ.1) GO TO 170                                RSP 210
      IF (IS.EQ.4) GO TO 20                                               RSP 220
      K1=IS                                                               RSP 230
      K2=IS+1                                                             RSP 240
      GO TO 30                                                            RSP 250
20    K1=1                                                                RSP 260
      K2=4                                                                RSP 270
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30    CONTINUE                                                          RSP 280
      SPAN=YL(K2)-YL(K1)                                                RSP 290
      XDIF=XXL(K2)-XXL(K1)                                              RSP 300
      DO 40 I=1,2                                                       RSP 310
      II=I+K1-1                                                         RSP 320
      IF (IS.EQ.4.AND.I.EQ.2) II=4                                      RSP 330
      C(I)=XXT(II)-XXL(II)                                              RSP 340
      DO 40 J=1,NJ                                                      RSP 350
40    XL(I,J)=XXL(II)+CPCWL(J)*C(I)                                     RSP 360
      IF (ABS(SPAN).LE.0.001) GO TO 70                                  RSP 370
      DO 50 J=1,NJ                                                      RSP 380
50    SLOPE(J)=(XL(2,J)-XL(1,J))/SPAN                                   RSP 390
      DO 60 K=1,NSJJ                                                    RSP 400
      YK=CPSWL(K)*SPAN                                                  RSP 410
      DO 60 J=1,NJ                                                      RSP 420
      Y(J,K)=YK+YL(K1)                                                  RSP 430
      X(J,K)=XL(1,J)+SLOPE(J)*(Y(J,K)-YL(K1))                           RSP 440
60    CONTINUE                                                          RSP 450
      NS=NSJ1                                                           RSP 460
70    IF (ABS(SPAN).LE.0.001) NS=1                                      RSP 470
      DO 160 K=1,NS                                                     RSP 480
      YC=YCON(K)                                                        RSP 490
      IF (ABS(SPAN).LE.0.001) YC=0.5                                    RSP 500
      KK=JC+K                                                           RSP 510
      CH(KK)=C(1)-(C(1)-C(2))*YC                                        RSP 520
      IF (ABS(SPAN).LE.0.001) GO TO 80                                  RSP 530
      YC1=CPSWL(K)                                                      RSP 540
      YC2=CPSWL(K+1)                                                    RSP 550
      GO TO 90                                                          RSP 560
80    YC1=0.                                                            RSP 570
      YC2=1.                                                            RSP 580
90    CONTINUE                                                          RSP 590
      EX(KK,1)=XXL(K1)+XDIF*YC1                                         RSP 600
      EX(KK,2)=XXL(K1)+XDIF*YC2                                         RSP 610
      TX(KK,1)=XXT(K1)+(XXT(K2)-XXT(K1))*YC1                            RSP 620
      TX(KK,2)=XXT(K1)+(XXT(K2)-XXT(K1))*YC2                            RSP 630
      DO 160 J=1,NJ                                                     RSP 640
      NPANEL=(K-1)*NJ+J-1+IPANFL                                        RSP 650
      NPAN1=NPANEL-1                                                    RSP 660
      DO 130 I=1,2                                                      RSP 670
      KI1=K+I-1                                                         RSP 680
      IF (ABS(SPAN).LE.0.001) GO TO 100                                 RSP 690
      X1=X(J,KI1)                                                       RSP 700
      Y1=Y(J,KI1)                                                       RSP 710
      IF (J.NE.1) GO TO 110                                             RSP 720
      ZZ=ZL(K1)+(ZL(K2)-ZL(K1))*(Y1-YL(K1))/SPAN                        RSP 730
      XX=XDIF*(Y1-YL(K1))/SPAN+XXL(K1)                                  RSP 740
      GO TO 120                                                         RSP 750
100   IZN=K1                                                            RSP 760
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      IF (I.EQ.2) IZN=K2                                                RSP 770
      X1=XL(I,J)                                                        RSP 780
      Y1=YL(K1)                                                         RSP 790
      IF (J.NE.1) GO TO 110                                             RSP 800
      ZZ=ZL(IZN)                                                        RSP 810
      XX=XXL(IZN)                                                       RSP 820
      GO TO 120                                                         RSP 830
110   ZZ=ZN(NPAN1,I)                                                    RSP 840
      XX=XN(NPAN1,I)                                                    RSP 850
120   XN(NPANEL,I)=X1                                                   RSP 860
      YN(NPANEL,I)=Y1                                                   RSP 870
      ZN(NPANEL,I)=ZZ                                                   RSP 880
130   CONTINUE                                                          RSP 890
      XD=XDIF*YC+XXL(K1)                                                RSP 900
      XCP(NPANEL)=XD+CH(KK)*PSI(J)                                      RSP 910
      YCP(NPANEL)=YC*SPAN+YL(K1)                                        RSP 920
      IF (ABS(SPAN).LE.0.001) GO TO 140                                 RSP 930
      ZC=ZN(NPANEL,1)+(ZN(NPANEL,1)-ZN(NPANEL,2))*(YCP(NPANEL)-YN(NPANELRSP 940
     1,1))/(YN(NPANEL,1)-YN(NPANEL,2))                                  RSP 950
      XC=XN(NPANEL,1)+SLOPE(J)*(YCP(NPANEL)-YN(NPANEL,1))               RSP 960
      GO TO 150                                                         RSP 970
140   ZC=0.5*(ZN(NPANEL,1)+ZN(NPANEL,2))                                RSP 980
      XC=0.5*(XN(NPANEL,1)+XN(NPANEL,2))                                RSP 990
150   ZCP(NPANEL)=ZC                                                    RSP1000
      XV(NPANEL)=XC                                                     RSP1010
160   CONTINUE                                                          RSP1020
      IPANEL=NPANEL+1                                                   RSP1030
      LAST=NPANEL                                                       RSP1040
      JC=KK                                                             RSP1050
170   CONTINUE                                                          RSP1060
      RETURN                                                            RSP1070
      END                                                               RSP1080-
      SUBROUTINE PANEL (XXL,YL,XXT,CPCWL,CPSWL,NSW,IPANEL,LPANEL,KK,LR,SPNL  10
     1WP,ZS)                                                            PNL  20
C     TO DEFINE THE LOCATIONS OF VORTEX AND CONTROL POINTS ON THE WING  PNL  30
      DIMENSION XXL(1), YL(1), XXT(1), CPCWL(1), CPSWL(1)               PNL  40
      DIMENSION SWP(8,15)                                               PNL  50
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),PNL  60
     1XLL(41)                                                           PNL  70
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTPNL  80
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZPNL  90
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95PNL 100
     3,2),SC(160,5),SI(160,5),LC(3)                                     PNL 110
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JPNL 120
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                        PNL 130
      PI=3.14159265                                                     PNL 140
      NSW1=NSW-1                                                        PNL 150
      DO 10 I=1,2                                                       PNL 160
      C(I)=XXT(I)-XXL(I)                                                PNL 170
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      DO 10 J=1,NCW                                                          PNL 180
10    XL(I,J)=XXL(I)+CPCWL(J)*C(I)/100.                                      PNL 190
      SPAN=YL(2)-YL(1)                                                       PNL 200
      DO 20 J=1,NCW                                                          PNL 210
      PSI(J)=0.5*(1.-COS(FLOAT(J)*PI/FLOAT(NCW)))                            PNL 220
      SLOPE(J)=(XL(2,J)-XL(1,J))/SPAN                                        PNL 230
20    SWP(J,LR)=ATAN(SLOPE(J))                                               PNL 240
      DO 30 K=1,NSW                                                          PNL 250
      YK=CPSWL(K)*SPAN/100.                                                  PNL 260
      DO 30 J=1,NCW                                                          PNL 270
      Y(J,K)=YK+YL(1)                                                        PNL 280
      X(J,K)=XL(1,J)+SLOPE(J)*(Y(J,K)-YL(1))                                 PNL 290
30    CONTINUE                                                               PNL 300
      XLL(1)=XXL(1)                                                          PNL 310
      XTT(1)=XXT(1)                                                          PNL 320
      DO 40 I=2,NSW                                                          PNL 330
      XLL(I)=XLL(I-1)+(XXL(2)-XXL(1))*(Y(1,I)-Y(1,I-1))/SPAN                 PNL 340
40    XTT(I)=XTT(I-1)+(XXT(2)-XXT(1))*(Y(1,I)-Y(1,I-1))/SPAN                 PNL 350
      DO 60 K=1,NSW1                                                         PNL 360
      KK=NCS+K                                                               PNL 370
      YLE(KK)=YCON(K)*SPAN+YL(1)                                             PNL 380
      XLE(KK)=XLL(K)+(XLL(K+1)-XLL(K))*(YLE(KK)-Y(1,K))/(Y(1,K+1)-Y(1,K))PNL 390
     1)                                                                      PNL 400
      XTE(KK)=XTT(K)+(XTT(K+1)-XTT(K))*(YLE(KK)-Y(1,K))/(Y(1,K+1)-Y(1,K))PNL 410
     1)                                                                      PNL 420
      CH(KK)=XTE(KK)-XLE(KK)                                                 PNL 430
      EX(KK,1)=XXL(1)+(XXL(2)-XXL(1))*CPSWL(K)/100.                          PNL 440
      EX(KK,2)=XXL(1)+(XXL(2)-XXL(1))*CPSWL(K+1)/100.                        PNL 450
      TX(KK,1)=XXT(1)+(XXT(2)-XXT(1))*CPSWL(K)/100.                          PNL 460
      TX(KK,2)=XXT(1)+(XXT(2)-XXT(1))*CPSWL(K+1)/100.                        PNL 470
      TANG=(XXL(2)-XXL(1))/SPAN                                              PNL 480
      SWEEP(KK)=ATAN(TANG)                                                   PNL 490
      DO 60 J=1,NCW                                                          PNL 500
      NPANEL=(K-1)*NCW+J-1+IPANEL                                            PNL 510
      DO 50 I=1,2                                                            PNL 520
      KI1=K+I-1                                                              PNL 530
      XN(NPANEL,I)=X(J,KI1)                                                  PNL 540
      YN(NPANEL,I)=Y(J,KI1)                                                  PNL 550
      ZN(NPANEL,I)=ZS                                                        PNL 560
50    CONTINUE                                                               PNL 570
      XCP(NPANEL)=XLE(KK)+PSI(J)*CH(KK)                                      PNL 580
      YCP(NPANEL)=YLE(KK)                                                    PNL 590
      ZCP(NPANEL)=ZS                                                         PNL 600
      XV(NPANEL)=XLE(KK)+CPCWL(J)*CH(KK)/100.                                PNL 610
      YV(NPANEL)=YLE(KK)                                                     PNL 620
60    CONTINUE                                                               PNL 630
      LPANEL=NPANEL                                                          PNL 640
      RETURN                                                                 PNL 650
      END                                                                    PNL 660-
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      SUBROUTINE ENTRN (U,AMJ,T,XM,CMU,RT,XEL,XET,Z,KCODE,XJC)          ENT  10
C     TO COMPUTE THE JET ENTRAINMENT FUNCTION                           ENT  20
      DIMENSION CSJ(70), SSJ(70)                                        ENT  30
      DIMENSION PU1(31), PU2(31), FU1(31), FU2(31), FU3(31), RR2(31)    ENT  40
      COMMON /JET/ PK1,XC,X(31),A(31),B(31)                             ENT  50
      WRITE (6,260)                                                     ENT  60
      WRITE (6,270)                                                     ENT  70
      PI=3.14159265                                                     ENT  80
      IK=1                                                              ENT  90
      REJ=T                                                             ENT 100
      PK1=0.0185+0.011*U                                                ENT 110
      KCODE=0                                                           ENT 120
      XMID=0.5*(XEL+XET)                                                ENT 130
      XM=XMID                                                           ENT 140
      X0=0.                                                             ENT 150
      R0=1.                                                             ENT 160
      F=2.*PK1*SQRT((1.-U)*REJ)                                         ENT 170
      XC=0.35/F                                                         ENT 180
      XJC=XC                                                            ENT 190
      P1=1.-U                                                           ENT 200
      UA=(1.+2.*U/(1.-U))/(1.+U/(1.-U))                                 ENT 210
      X(1)=XC                                                           ENT 220
      DXX=(3.*XET-XEL)/30.                                              ENT 230
      IDX=DXX                                                           ENT 240
      DXX=IDX                                                           ENT 250
      IF (DXX.GT.3.) GO TO 10                                           ENT 260
      IF (DXX.GE.1..AND.DXX.LE.3.) DXX=2.5                              ENT 270
      IF (DXX.LT.1.) DXX=1.5                                            ENT 280
10    CONTINUE                                                          ENT 290
      X(2)=X(1)+DXX/2.                                                  ENT 300
      DO 20 I=2,30                                                      ENT 310
20    X(I+1)=X(I)+DXX                                                   ENT 320
      DO 30 I=1,70                                                      ENT 330
      FI=I                                                              ENT 340
      CSJ(I)=COS((2.*FI-1.)*PI/140.)                                    ENT 350
30    SSJ(I)=SIN((2.*FI-1.)*PI/140.)                                    ENT 360
      DO 160 I=1,31                                                     ENT 370
      IF (U.LE.0.01) GO TO 80                                           ENT 380
      IF (I.EQ.1.AND.ABS(T-1.).LE.0.01) GO TO 100                       ENT 390
      IF (I.EQ.1) S=(2.*PK1*SQRT(REJ*(1.-U))*XC/0.72-0.35)*SQRT((1.-U)/UENT 400
     1*ALOG(UA))                                                        ENT 410
      IF (I.EQ.2) S=DSX*(X(2)-XC)                                       ENT 420
      IF (I.GT.2) S=SH+DSX*DXX                                          ENT 430
      M=1                                                               ENT 440
      IF (I.EQ.1) M=2                                                   ENT 450
40    CONTINUE                                                          ENT 460
      SUM=0.                                                            ENT 470
      DO 50 J=1,70                                                      ENT 480
      SR=0.5*S*(1.-CSJ(J))                                              ENT 490
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      AP1=(1.-U)*(1.-EXP(-1./(2.*SB)))                                    ENT 500
      AG=ALOG((1.+2.*U/AP1)/(1.+U/AP1))                                   ENT 510
50    SUM=SUM+(1./SQRT(AP1*AG)-SQRT(2.*SB/((1.-U)*0.69314718)))*SSJ(J)    ENT 520
      RES=SUM*PI/70.*0.5*S*SQRT(U)+SQRT(2.*U/(1.-U))*S**1.5/1.0397208     ENT 530
      X1=RES+0.35                                                         ENT 540
      IF (M.NE.1) GO TO 70                                                ENT 550
      XT=X1/(2.*PK1*SQRT((1.-U)*REJ))                                     ENT 560
      P1=(1.-U)*(1.-EXP(-1./(2.*S)))                                      ENT 570
      G1=ALOG((1.+2.*U/P1)/(1.+U/P1))                                     ENT 580
      DSX=2.*PK1*SQRT(REJ*(1.-U)*P1*G1/U)                                 ENT 590
      SH=S                                                                ENT 600
      IF (ABS(X(I)-XT).LE.0.01) GO TO 60                                  ENT 610
      DX=X(I)-XT                                                          ENT 620
      S=S+DX*DSX                                                          ENT 630
      SH=S                                                                ENT 640
      GO TO 40                                                            ENT 650
60    P1=(1.-U)*(1.-EXP(-1./(2.*SH)))                                     ENT 660
70    IF (ABS(T-1.).LE.0.01) GO TO 100                                    ENT 670
      XH=X1*0.72/(2.*PK1*SQRT((1.-U)*REJ))                                ENT 680
      IF (ABS(X(I)-XH).LE.0.01) GO TO 90                                  ENT 690
      AK2=(1.-U)*(1.-EXP(-1./(2.*S)))                                     ENT 700
      AG2=ALOG((1.+2.*U/AK2)/(1.+U/AK2))                                  ENT 710
      DSX1=2.*PK1/0.72*SQRT(REJ*(1.-U)*AK2*AG2/U)                         ENT 720
      DX=X(I)-XH                                                          ENT 730
      S=S+DX*DSX1                                                         ENT 740
      M=M+1                                                               ENT 750
      GO TO 40                                                            ENT 760
80    IF (I.NE.1) SH=2.*PK1*SQRT(REJ)*X(I)-0.35                           ENT 770
      IF (I.NE.1) P1=(1.-U)*(1.-EXP(-1./(2.*SH)))                         ENT 780
      DSX=2.*PK1*SQRT(REJ)                                                ENT 790
      IF (ABS(T-1.).LE.0.01) GO TO 100                                    ENT 800
      S=2.*PK1/0.72*SQRT(REJ)*X(I)-0.35                                   ENT 810
90    IF (I.EQ.1.AND.U.GT.0.01) DSX=2.*PK1*SQRT(REJ*ALOG(UA)/U)*(1.-U)    ENT 820
      H0=1.-EXP(-1./(2.*S))                                               ENT 830
      H0P=-2.*H0**2/0.72                                                  ENT 840
      P1P=-2.*P1*P1/(1.-U)                                                ENT 850
      P2=(T-1.+0.2*(1.-U*U)*AMJ*AMJ*T)*H0-0.2*P1*AMJ*AMJ*T*(P1+2.*U)      ENT 860
      P2P=(T-1.+0.2*(1.-U*U)*AMJ*AMJ*T)*H0P-0.2*P1P*AMJ*AMJ*T*(P1+2.*U)-ENT 870
     10.2*P1*AMJ*AMJ*T*P1P                                                ENT 880
      F1P=-P2P*0.8907*(0.08901-0.04005*P2+0.01792*P2**2-0.00646*P2**3)/(ENT 890
     11.+1.05001*P2)                                                      ENT 900
      F2P=-P2P*0.79335*(0.0527-0.02886*P2+0.01478*P2**2-0.00589*P2**3)/(ENT 910
     11.+1.08869*P2)                                                      ENT 920
      F3P=-P2P*(0.12857-0.04653*P2+0.01820*P2**2-0.00599*P2**3)/(1.+1.02ENT 930
     1272*P2)                                                             ENT 940
      GO TO 110                                                           ENT 950
100   P2=0.                                                               ENT 960
      P2P=0.                                                              ENT 970
      F1P=0.                                                              ENT 980
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      F2P=0.                                                                ENT 990
      F3P=0.                                                                ENT1000
      IF (I.EQ.1.AND.U.GT.0.01) DSX=2.*PK1*SQRT(REJ*ALOG(UA)/U)*(1.-U)      ENT1010
110   P1P=-2.*P1*P1/(1.-U)                                                  ENT1020
      F1=0.8907*(0.12857+0.01617*P2-0.00607*P2**2+0.00192*P2**3)/(1.+0.8ENT1030
     11817*P2)                                                              ENT1040
      F2=0.79335*(0.06676+0.00453*P2-0.00204*P2**2+0.00075*P2**3)/(1.+0.ENT1050
     185716*P2)                                                             ENT1060
      F3=(0.21429+0.04061*P2-0.01249*P2**2+0.00351*P2**3)/(1.+0.78948*P2ENT1070
     1)                                                                     ENT1080
      FU=U*P1*F1+P1*P1*F2                                                   ENT1090
      DMC1=(P1P*F1+P1*F1P-U*P2P*F3-U*P2*F3P)/FU                             ENT1100
      DMC2=(P1*F1-U*P2*F3)*(U*P1P*F1+U*P1*F1P+2.*P1*P1P*F2+P1*P1*F2P)/(FENT1110
     1U*FU)                                                                 ENT1120
      DMX=2.*(1.-U)*(DMC1-DMC2)*DSX/SQRT(REJ)                               ENT1130
      RJ2=0.5*(1.-U)/FU                                                     ENT1140
      RJ1=SQRT(RJ2)                                                         ENT1150
      WRITE (6,250) X(I),RJ1,DMX                                            ENT1160
      IF (Z.LT.0) GO TO 140                                                 ENT1170
      IF (IK.GT.1) GO TO 140                                                ENT1180
      IF (X(I).GE.XEL) GO TO 120                                            ENT1190
      GO TO 140                                                             ENT1200
120   IF (RJ1.LT.Z) GO TO 140                                               ENT1210
      XMJ=X0+(Z-R0)*(X(I)-X0)/(RJ1-R0)                                      ENT1220
      IF (XEL.LT.0) GO TO 130                                               ENT1230
      IF (XMJ.LT.XET) KCODE=1                                               ENT1240
      IK=IK+1                                                               ENT1250
      GO TO 140                                                             ENT1260
130   XM=0.5*XET                                                            ENT1270
      IF (XMJ.LE.XM) KCODE=1                                                ENT1280
      IK=IK+1                                                               ENT1290
140   CONTINUE                                                              ENT1300
      R0=RJ1                                                                ENT1310
      X0=X(I)                                                               ENT1320
      PU1(I)=P1                                                             ENT1330
      PU2(I)=P2                                                             ENT1340
      FU1(I)=F1                                                             ENT1350
      FU2(I)=F2                                                             ENT1360
      FU3(I)=F3                                                             ENT1370
      RR2(I)=RJ2                                                            ENT1380
      IF (I.EQ.1) GO TO 150                                                 ENT1390
      B(I)=(DMX-DMXO)/(X(I+1)-X(I))                                         ENT1400
      A(I)=DMXO-B(I)*X(I)                                                   ENT1410
      GO TO 160                                                             ENT1420
150   A(I)=0.145*DMX/0.32                                                   ENT1430
      B(I)=(DMX-A(I))/XC                                                    ENT1440
160   DMXO=DMX                                                              ENT1450
      K=1                                                                   ENT1460
170   IF (K.GT.30) GO TO 240                                                ENT1470
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      IF (XM.GE.0..AND.XM.LT.XC) GO TO 180                                  ENT1480
      IF (XM.GE.X(K).AND.XM.LT.X(K+1)) GO TO 180                            ENT1490
      K=K+1                                                                 ENT1500
      GO TO 170                                                             ENT1510
180   F11=RR2(K)*(PU1(K)*U*FU1(K)+PU1(K)**2*FU2(K))/(U*U)                   ENT1520
      F12=RR2(K+1)*(PU1(K+1)*U*FU1(K+1)+PU1(K+1)**2*FU2(K+1))/(U*U)         ENT1530
      F21=RR2(K)*(PU1(K)*FU1(K)-U*PU2(K)*FU3(K))/U                          ENT1540
      F22=RR2(K+1)*(PU1(K+1)*FU1(K+1)-U*PU2(K+1)*FU3(K+1))/U                ENT1550
      IF (ABS(T-1.).LE.0.001) GO TO 190                                     ENT1560
      F31=RR2(K)*(9.*PU1(K)/70.-PU1(K)*FU1(K)+U*PU2(K)*FU3(K))/U            ENT1570
      F32=RR2(K+1)*(9.*PU1(K+1)/70.-PU1(K+1)*FU1(K+1)+U*PU2(K+1)*FU3(K+1ENT1580
     1))/U                                                                  ENT1590
      X11=F11/(F21+F31)                                                     ENT1600
      X12=F12/(F22+F32)                                                     ENT1610
      GO TO 200                                                             ENT1620
190   F31=0.                                                                ENT1630
      F32=0.                                                                ENT1640
200   CONTINUE                                                              ENT1650
      X1=X(K)                                                               ENT1660
      X2=X(K+1)                                                             ENT1670
      X21=F11/(F21+F31)+F31*(F11/(F21+F31)-1.)/F21                          ENT1680
      X22=F12/(F22+F32)+F32*(F12/(F22+F32)-1.)/F22                          ENT1690
      X31=2.*F21*(F21+F31)/(F11-F21-F31)                                    ENT1700
      X31=SQRT(X31)                                                         ENT1710
      X32=2.*F22*(F22+F32)/(F12-F22-F32)                                    ENT1720
      X32=SQRT(X32)                                                         ENT1730
      IF (XM.GE.0..AND.XM.LT.XC) GO TO 210                                  ENT1740
      GO TO 220                                                             ENT1750
210   X1=0.                                                                 ENT1760
      X2=XC                                                                 ENT1770
      X22=X21                                                               ENT1780
      X32=X31                                                               ENT1790
      X21=1./U                                                              ENT1800
      X31=1.                                                                ENT1810
      IF (ABS(T-1.).LE.0.001) GO TO 220                                     ENT1820
      X12=X11                                                               ENT1830
      X11=1./(T*U)                                                          ENT1840
220   CMU=X21+(XM-X1)*(X22-X21)/(X2-X1)                                     ENT1850
      RT=X31+(XM-X1)*(X32-X31)/(X2-X1)                                      ENT1860
      CMU=1./CMU                                                            ENT1870
      IF (ABS(T-1.).LE.0.001) GO TO 230                                     ENT1880
      RU=X11+(XM-X1)*(X12-X11)/(X2-X1)                                      ENT1890
      T=1./(CMU*RU)                                                         ENT1900
230   CONTINUE                                                              ENT1910
240   CONTINUE                                                              ENT1920
      RETURN                                                                ENT1930
C                                                                           ENT1940
250   FORMAT (8F10.5)                                                       ENT1950
260   FORMAT (/5X,43HTHE COMPUTED JET ENTRAINMENT ARE AS FOLLOWS)           ENT1960
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270   FORMAT (/5X,4HXJET,8X,4HRJET,5X,5HDM/DX)                    ENT1970
      END                                                         ENT1980-
      SUBROUTINE RECTJ (ISYM,NSJ,Y)                               RCT  10
C     TO DEFINE THE UNIT NORMAL VECTORS TO THE SURFACE OF RECTANGULAR  RCT  20
C     JETS                                                        RCT  30
      DIMENSION Y(10,41)                                          RCT  40
      IF (ISYM.EQ.0) GO TO 10                                     RCT  50
      NSJ1=NSJ+1                                                  RCT  60
      NJH=(NSJ-1)/2+2                                             RCT  70
      GO TO 20                                                    RCT  80
10    NSJ1=NSJ-1                                                  RCT  90
      NJH=NSJ/2                                                   RCT 100
20    DO 50 I=1,NSJ1                                              RCT 110
      IF (I.EQ.1.AND.ISYM.NE.0) GO TO 30                          RCT 120
      IF (I.EQ.NJH) GO TO 40                                      RCT 130
      Y(3,I)=1.                                                   RCT 140
      Y(4,I)=0.                                                   RCT 150
      GO TO 50                                                    RCT 160
30    Y(3,I)=0.                                                   RCT 170
      Y(4,I)=-1.                                                  RCT 180
      GO TO 50                                                    RCT 190
40    Y(3,I)=0.                                                   RCT 200
      Y(4,I)=1.                                                   RCT 210
50    CONTINUE                                                    RCT 220
      RETURN                                                      RCT 230
      END                                                         RCT 240-
      SUBROUTINE CIRCJ (ISYM,NSJ,Y)                               CRJ  10
C     TO DEFINE THE UNIT NORMAL VECTORS TO THE SURFACE OF CIRCULAR JETS CRJ  20
      DIMENSION Y(10,41)                                          CRJ  30
      PI=3.14159265                                               CRJ  40
      IF (ISYM.EQ.0) GO TO 10                                     CRJ  50
      NSJ1=NSJ+1                                                  CRJ  60
      NN=(NSJ-1)/2+1                                              CRJ  70
      FN2=NN                                                      CRJ  80
      NJH=NN+1                                                    CRJ  90
      Y(1,1)=-SIN(PI/(2.*FN2))                                    CRJ 100
      Y(2,1)=-COS(PI/(2.*FN2))                                    CRJ 110
      GO TO 20                                                    CRJ 120
10    Y(1,1)=1.                                                   CRJ 130
      Y(2,1)=0.                                                   CRJ 140
      NSJ1=NSJ-1                                                  CRJ 150
      FN2=NSJ/2                                                   CRJ 160
      NJH=NSJ/2                                                   CRJ 170
20    CONTINUE                                                    CRJ 180
      DO 50 I=1,NSJ1                                              CRJ 190
      K=I                                                         CRJ 200
      KI=I                                                        CRJ 210
      IF (I.GT.NJH.AND.ISYM.NE.0) K=I-NJH+1                       CRJ 220
      IF (I.GT.NJH.AND.ISYM.EQ.0) K=I-NJH                         CRJ 230
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      FI=K                                                                  CRJ 240
      IF (ISYM.NE.0) ANG2=(FI-1.)*PI/FN2                                    CRJ 250
      IF (ISYM.EQ.0) ANG2=FI*PI/FN2                                         CRJ 260
      YP=0.5*(1.-COS(ANG2))                                                 CRJ 270
      IF (ISYM.EQ.0) ANG2=PI-ATAN(SQRT(1.-YP*YP)/YP)                        CRJ 280
      II=I+1                                                                CRJ 290
      KK=I                                                                  CRJ 300
      KII=II                                                                CRJ 310
      IF (I.GT.NJH) KK=II-NJH                                               CRJ 320
      FII=KK                                                                CRJ 330
      IF (I.LE.NJH.AND.ISYM.EQ.0) FII=KK+1                                  CRJ 340
      ANG1=(2.*FII-1.)*PI/(2.*FN2)                                          CRJ 350
      YP=0.5*(1.-COS(ANG1))                                                 CRJ 360
      IF (ANG1.GT.PI) YP=-YP                                                CRJ 370
      IF (ISYM.EQ.0) ANG1=PI-ATAN(SQRT(1.-YP*YP)/YP)                        CRJ 380
      IF (I.GT.NJH) GO TO 30                                                CRJ 390
      GO TO 40                                                              CRJ 400
30    ANG1=-ANG1                                                            CRJ 410
      ANG2=-ANG2                                                            CRJ 420
40    CONTINUE                                                              CRJ 430
      Y(1,KII)=SIN(ANG1)                                                    CRJ 440
      Y(2,KII)=-COS(ANG1)                                                   CRJ 450
      Y(3,KI)=SIN(ANG2)                                                     CRJ 460
      Y(4,KI)=-COS(ANG2)                                                    CRJ 470
50    CONTINUE                                                              CRJ 480
      RETURN                                                                CRJ 490
      END                                                                   CRJ 500-
      SUBROUTINE JSHAPE (XXL,XXT,YL,YJ,ZJ,RJ,CPCWL,IPANEL,NJ,JC,ISYM)       JSP  10
C     TO DEFINE THE LOCATIONS OF VORTEX AND CONTROL POINTS ON CIRCULAR      JSP  20
C     JETS                                                                  JSP  30
      DIMENSION CPCWL(1), XXL(1), XXT(1), YL(1)                             JSP  40
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),JSP  50
     1XLL(41)                                                               JSP  60
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTJSP  70
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZJSP  80
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95JSP  90
     3,2),SC(160,5),SI(160,5),LC(3)                                         JSP 100
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JJSP 110
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                            JSP 120
      PI=3.14159265                                                         JSP 130
      N1=NSJ+1                                                              JSP 140
      IF (ISYM.EQ.0) N1=NSJ-1                                               JSP 150
      N2=N1+1                                                               JSP 160
      IF (ISYM.EQ.0) N2=NSJ                                                 JSP 170
      N12=N1/2+2                                                            JSP 180
      IF (ISYM.EQ.0) N12=NSJ/2+1                                            JSP 190
      DO 10 I=1,2                                                           JSP 200
      C(I)=XXT(I)-XXL(I)                                                    JSP 210
      DO 10 J=1,NJ                                                          JSP 220
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10    XL(I,J)=XXL(I)+CPCWL(J)*C(I)                                          JSP 230
      DO 20 J=1,NJ                                                          JSP 240
      FJ=J                                                                  JSP 250
      FNCJ=NJ                                                               JSP 260
      PSI(J)=0.5*(1.-COS(FJ*PI/FNCJ))                                       JSP 270
20    SLOPE(J)=(XL(2,J)-XL(1,J))/(2.*RJ)                                    JSP 280
      DO 30 K=1,N2                                                          JSP 290
      YY=Y(2,K)                                                             JSP 300
      IF (ISYM.NE.0.AND.K.EQ.1) YY=-1.                                      JSP 310
      IF (ISYM.NE.0.AND.K.EQ.2) YY=-1.                                      JSP 320
      IF (K.EQ.(N12-1).OR.K.EQ.N12) YY=1.                                   JSP 330
      IF (K.EQ.N2) YY=1.                                                    JSP 340
      XTT(K)=YJ+RJ*YY                                                       JSP 350
30    X(J,K)=XL(1,J)+SLOPE(J)*(XTT(K)-YL(1))                                JSP 360
      DO 120 K=1,N1                                                         JSP 370
      KK=JC+K                                                               JSP 380
      L=K                                                                   JSP 390
      IF (K.EQ.N12) L=1                                                     JSP 400
      EX(KK,1)=XXL(1)+(XXL(2)-XXL(1))*(XTT(L)-YL(1))/(2.*RJ)                JSP 410
      EX(KK,2)=XXL(1)+(XXL(2)-XXL(1))*(XTT(K+1)-YL(1))/(2.*RJ)              JSP 420
      TX(KK,1)=XXT(1)+(XXT(2)-XXT(1))*(XTT(L)-YL(1))/(2.*RJ)                JSP 430
      TX(KK,2)=XXT(1)+(XXT(2)-XXT(1))*(XTT(K+1)-YL(1))/(2.*RJ)              JSP 440
      CH(KK)=C(1)-(C(1)-C(2))*0.5*(1.+Y(4,K))                               JSP 450
      DO 120 J=1,NJ                                                         JSP 460
      NPANEL=(K-1)*NJ+J-1+IPANEL                                            JSP 470
      DO 90 I=1,2                                                           JSP 480
      KI1=K+I-1                                                             JSP 490
      SIGN=1.                                                               JSP 500
      IF (K.EQ.N12.AND.I.EQ.1) KI1=1                                        JSP 510
      IF (ISYM.EQ.0) GO TO 40                                               JSP 520
      IF (KI1.EQ.1.OR.KI1.EQ.2) GO TO 60                                    JSP 530
      GO TO 50                                                              JSP 540
40    IF (K.EQ.N12.AND.KI1.EQ.1) SIGN=-1.                                   JSP 550
50    CONTINUE                                                              JSP 560
      IF (KI1.EQ.(N12-1).OR.KI1.EQ.N12) GO TO 70                            JSP 570
      IF (KI1.EQ.N2) GO TO 70                                               JSP 580
      YY=Y(2,KI1)                                                           JSP 590
      ZZ=Y(1,KI1)*SIGN                                                      JSP 600
      GO TO 80                                                              JSP 610
60    YY=-1.                                                                JSP 620
      ZZ=-Y(1,KI1)/Y(2,KI1)                                                 JSP 630
      GO TO 80                                                              JSP 640
70    YY=1.                                                                 JSP 650
      ZZ=Y(1,KI1)/Y(2,KI1)                                                  JSP 660
80    CONTINUE                                                              JSP 670
      XN(NPANEL,I)=X(J,KI1)                                                 JSP 680
      YN(NPANEL,I)=YJ+RJ*YY                                                 JSP 690
90    ZN(NPANEL,I)=ZJ+RJ*ZZ                                                 JSP 700
      YK=0.5*(1.+Y(4,K))                                                    JSP 710
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      IF (ISYM.EQ.0) YK=2.*YK-1.                                        JSP 720
      XCP(NPANEL)=XXL(1)+(XXL(2)-XXL(1))*YK+PSI(J)*CH(KK)               JSP 730
      IF (ABS(YN(NPANEL,2)-YN(NPANEL,1)).LE.0.0001) GO TO 100           JSP 740
      YCP(NPANEL)=YL(1)+YK*(YL(2)-YL(1))                                JSP 750
      ZCP(NPANEL)=ZN(NPANEL,1)+(ZN(NPANEL,2)-ZN(NPANEL,1))*(YCP(NPANEL)-JSP 760
     1YN(NPANEL,1))/(YN(NPANEL,2)-YN(NPANEL,1))                         JSP 770
      GO TO 110                                                         JSP 780
100   ZCP(NPANEL)=ZJ                                                    JSP 790
      YCP(NPANEL)=YN(NPANEL,1)                                          JSP 800
110   CONTINUE                                                          JSP 810
      XV(NPANEL)=XXL(1)+(XXL(2)-XXL(1))*YK+CPCWL(J)*CH(KK)              JSP 820
120   CONTINUE                                                          JSP 830
      JC=JC+N1                                                          JSP 840
      LAST=NPANEL                                                       JSP 850
      RETURN                                                            JSP 860
      END                                                               JSP 870-
      OVERLAY (WNGJET,2,0)                                              JOF  10
      PROGRAM JETOFF                                                    JOF  20
C     TO SET UP THE JETOFF INFLUENCE COEFFICIENT MATRIX AND COMPUTE THE JOF  30
C     CAMBER TERMS                                                      JOF  40
      DIMENSION AW(131), BW(131)                                        JOF  50
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTJOF  60
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZJOF  70
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95JOF  80
     3,2),SC(160,5),SI(160,5),LC(3)                                     JOF  90
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)       JOF 100
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JJOF 110
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                        JOF 120
      COMMON /ADD/ CP(130),CM(30),BREAK(8),SWP(8,15),GAL(30),ISYM,VMU,VUJOF 130
     1,TEMP,FCR,CAMLER,CAMLET,CAMTER,CAMTET,XJ,YJ,ZJ,RJ,ALP,CREF,TWISTR JOF 140
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                      JOF 150
      COMMON /COST/ LTOTAL,LPAN1,NJW(5),LPANEL,IENTN,LPAN2,EXIT,PTIAL,TWJOF 160
     1IST,DF(5),NFP                                                     JOF 170
      COMMON /SOME/ NC,NWING,LAT,NAL,LWF,LWFJ,CHORDT(3),SNG(5),YG(5),YCNJOF 180
     1(6),WKN,RDX,MDG,NDG                                               JOF 190
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCJOF 200
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                    JOF 210
      PI=3.14159265                                                     JOF 220
      J1=LPANEL+1                                                       JOF 230
      B=B1                                                              JOF 240
      AM=AM1                                                            JOF 250
      IC=1                                                              JOF 260
      MG=NW(1)                                                          JOF 270
      NG=NW(1)                                                          JOF 280
      NC=IENTN                                                          JOF 290
      IG=1                                                              JOF 300
      F0=0.                                                             JOF 310
      F10=0.                                                            JOF 320
      GR0=0.                                                            JOF 330
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      REWIND 03                                                          JOF 340
      REWIND 04                                                          JOF 350
      J1=LWF+1                                                           JOF 360
10    CONTINUE                                                           JOF 370
      IF (KF.EQ.0) GO TO 20                                              JOF 380
      REWIND 1                                                           JOF 390
      REWIND 7                                                           JOF 400
C                                                                        JOF 410
C  *  COMPUTE THE INFLUENCE COEFFICIENTS DUE TO THE PRESENCE OF THE      JOF 420
C     FUSELAGE, AND STORE ON FILE (07) *                                 JOF 430
C                                                                        JOF 440
      CALL VELFUS (LWF,LPANEL,AW,BW,AM,LPAN1,LPAN2,1,ISYM)               JOF 450
      REWIND 1                                                           JOF 460
      REWIND 7                                                           JOF 470
      READ (08) (CP(I),I=1,LPANEL)                                       JOF 480
20    CONTINUE                                                           JOF 490
      LL=1                                                               JOF 500
      IF (NW(2).EQ.0) GO TO 40                                           JOF 510
      II=1+NCS                                                           JOF 520
      IF (NW(3).NE.0) GO TO 30                                           JOF 530
      CHORD=CH(1)+CH(II)                                                 JOF 540
      GO TO 50                                                           JOF 550
30    III=II+NCS                                                         JOF 560
      CHORD=CH(1)+CH(II)+CH(III)                                         JOF 570
      GO TO 50                                                           JOF 580
40    CHORD=CH(1)                                                        JOF 590
50    CONTINUE                                                           JOF 600
      CALL WING (AW,BW,LPANEL,1,B,LPAN1,LPAN2,KF)                        JOF 610
      XC=(XCP(1)-XLE(IG))/CHORD                                          JOF 620
      CAM=ZCR(XC)-(ZCR(XC)-ZCT(XC))*YCP(1)/HALFB                         JOF 630
      AW(J1)=-CAM                                                        JOF 640
      BW(J1)=0.                                                          JOF 650
      IF (KF.EQ.0) GO TO 80                                              JOF 660
      READ (07) (GAM(2,LK),LK=1,NTL)                                     JOF 670
      READ (01) (GAM(1,LK),LK=1,NTL)                                     JOF 680
      DO 60 LK=1,NTL                                                     JOF 690
      KK=LPANEL+LK                                                       JOF 700
      BW(KK)=GAM(1,LK)                                                   JOF 710
60    AW(KK)=GAM(2,LK)                                                   JOF 720
      XQ=XCP(1)                                                          JOF 730
      YQ=YCP(1)                                                          JOF 740
      ZQ=ZCP(1)                                                          JOF 750
      WK=0.                                                              JOF 760
      CALL FUSVOL (B,XQ,YQ,ZQ,WN,WK,GP0,0,0)                             JOF 770
      DO 70 KK=1,LPANEL                                                  JOF 780
70    AW(KK)=AW(KK)+WK*WKN*CP(KK)                                        JOF 790
80    CONTINUE                                                           JOF 800
      WRITE (03) (AW(JJ),JJ=1,J1)                                        JOF 810
      WRITE (04) (BW(JJ),JJ=1,J1)                                        JOF 820
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      IJ=2                                                                  JOF 830
      NJ=LPANEL-1                                                           JOF 840
90    CALL WING (AW,BW,LPANEL,IJ,P,LPAN1,LPAN2,KF)                          JOF 850
      IF (NW(2).EQ.0) GO TO 110                                             JOF 860
      II=IG+NCS                                                             JOF 870
      IF (NW(3).NE.0) GO TO 100                                             JOF 880
      CHORD=CH(IG)+CH(II)                                                   JOF 890
      CHFL=CH(IG)                                                           JOF 900
      GO TO 120                                                             JOF 910
100   III=II+NCS                                                            JOF 920
      CHORD=CH(IG)+CH(II)+CH(III)                                           JOF 930
      CHFL=CH(IG)+CH(II)                                                    JOF 940
      GO TO 120                                                             JOF 950
110   CHORD=CH(IG)                                                          JOF 960
      CHFL=CH(IG)                                                           JOF 970
120   CONTINUE                                                              JOF 980
      FCR=CHFL/CHORD                                                        JOF 990
      XC=(XCP(IJ)-XLE(IG))/CHORD                                            JOF1000
      COM=ABS(XC-FCR)                                                       JOF1010
      FCR1=FCR-0.01                                                         JOF1020
      FCR2=FCR+0.01                                                         JOF1030
      CZ=0.                                                                 JOF1040
      IF (ABS(1.-XC).LE.0.01) GO TO 130                                     JOF1050
      ZC1=ZCR(XC)                                                           JOF1060
      ZC2=ZCT(XC)                                                           JOF1070
      CZ=ZC1-(ZC1-ZC2)*YCP(IJ)/HALFB                                        JOF1080
130   CONTINUE                                                              JOF1090
      IF (XC.LT.FCR1) CAM=CZ                                                JOF1100
      IF (COM.LT.0.001) CAM=CZ-0.5*DF(LL)                                   JOF1110
      IF (XC.GT.FCR2.AND.ABS(1.-XC).GT.0.01) CAM=-DF(LL)+CZ                 JOF1120
      IF (ABS(1.-XC).LE.0.01) CAM=-DF(LL)+CAMTER-(CAMTER-CAMTET)*YCP(IJ)    JOF1130
     1/HALFB                                                                JOF1140
      IF (PTIAL.LE.0.01.AND.XC.GT.FCR2) GO TO 180                           JOF1150
      IF (PTIAL.GT.0.01) GO TO 150                                          JOF1160
      IF (DF(LL).GT.0.01.AND.XC.GT.FCR1) GO TO 180                          JOF1170
140   IF (IJ.NE.MG) GO TO 180                                               JOF1180
      IF (ABS(XC-1.).LE.0.01) GO TO 160                                     JOF1190
      JK=1                                                                  JOF1200
      IF (NW(3).NE.0.AND.IJ.GT.LPAN1) JK=2                                  JOF1210
      NCM=IJ+(NCS-IG)*NW(JK)+(IG-1)*NW(JK+1)+1                              JOF1220
      XC1=(XCP(NCM)-XLE(IG))/CHORD                                          JOF1230
      CAM1=ZCR(XC1)-(ZCR(XC1)-ZCT(XC1))*YCP(IJ)/HALFB                       JOF1240
      CAM=(CAM+CAM1)/2.                                                     JOF1250
      GO TO 180                                                             JOF1260
150   IF (IJ.GE.MJW1(1,LL).AND.IJ.LE.MJW2(1,LL)) GO TO 170                  JOF1270
      IF (IJ.GE.MJW1(2,LL).AND.IJ.LE.MJW2(2,LL)) GO TO 180                  JOF1280
      IF (IJ.GE.MJW1(3,LL).AND.IJ.LE.MJW2(3,LL)) GO TO 180                  JOF1290
      CAM=CZ                                                                JOF1300
      GO TO 140                                                             JOF1310
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160   CAM=CAMTER-(CAMTER-CAMTET)*YCP(IJ)/HALFB                          JOF1320
      GO TO 180                                                         JOF1330
170   IF (XC.GT.FCR1) GO TO 180                                         JOF1340
      GO TO 140                                                         JOF1350
180   CONTINUE                                                          JOF1360
      AW(J1)=-CAM                                                       JOF1370
      BW(J1)=0.                                                         JOF1380
      IF (KF.EQ.0) GO TO 210                                            JOF1390
      READ (07) (GAM(2,LK),LK=1,NTL)                                    JOF1400
      READ (01) (GAM(1,LK),LK=1,NTL)                                    JOF1410
      DO 190 LK=1,NTL                                                   JOF1420
      KK=LPANEL+LK                                                      JOF1430
      BW(KK)=GAM(1,LK)                                                  JOF1440
190   AW(KK)=GAM(2,LK)                                                  JOF1450
      XQ=XCP(IJ)                                                        JOF1460
      YQ=YCP(IJ)                                                        JOF1470
      ZQ=ZCP(IJ)                                                        JOF1480
      WK=0.                                                             JOF1490
      CALL FUSVOL (B,XQ,YQ,ZQ,WN,WK,GP0,0.0)                            JOF1500
      DO 200 KK=1,LPANEL                                                JOF1510
200   AW(KK)=AW(KK)+WK*WKN*CP(KK)                                       JOF1520
210   CONTINUE                                                          JOF1530
      WRITE (03) (AW(JJ),JJ=1,J1)                                       JOF1540
      WRITE (04) (BW(JJ),JJ=1,J1)                                       JOF1550
      IF (IJ.GE.LPAN1.AND.IJ.LT.LPAN2) NG=NW(2)                         JOF1560
      IF (IJ.GE.LPAN2.AND.IJ.LT.LPANEL) NG=NW(3)                        JOF1570
      IF (IJ.EQ.MJW2(1,LL).OR.IJ.EQ.MJW2(2,LL)) LL=LL+1                 JOF1580
      IF (IJ.EQ.MJW2(3,LL)) LL=LL+1                                     JOF1590
      IF (LL.GT.NFP) LL=1                                               JOF1600
      IF (IJ.LT.MG) GO TO 220                                           JOF1610
      IG=IG+1                                                           JOF1620
      MG=MG+NG                                                          JOF1630
220   IF (IJ.EQ.LPAN1.OR.IJ.EQ.LPAN2) IG=1                              JOF1640
      IF (IJ.EQ.LPAN1.OR.IJ.EQ.LPAN2) LL=1                              JOF1650
      IJ=IJ+1                                                           JOF1660
      NJ=NJ-1                                                           JOF1670
      IF (IJ.LE.LPANEL) GO TO 90                                        JOF1680
      IF (KF.EQ.0) GO TO 260                                            JOF1690
      DO 250 KJ=1,NTL                                                   JOF1700
      READ (07) (AW(KK),KK=1,LWF)                                       JOF1710
      READ (01) (BW(KK),KK=1,LWF)                                       JOF1720
      AW(J1)=0.                                                         JOF1730
      BW(J1)=0.                                                         JOF1740
      IF (KJ.GT.NF) GO TO 240                                           JOF1750
      KI=KJ                                                             JOF1760
      XS=XCF(KI)-XTEF                                                   JOF1770
      XB=XCF(KI)-XLEF                                                   JOF1780
      IF (KJ.EQ.NF) RFL=0.                                              JOF1790
      IF (KJ.NE.NF) RFL=XS/SQRT(XS*XS+B*BF(KI)*BF(KI))                  JOF1800
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      RF1=XS*(1.+RFL)                                                   JOF1810
      RF0=XB*(1.+XB/SQRT(XB*XB+R*RF(KI)*RF(KI)))                        JOF1820
      WK=-(RF1-RF0)*WKN/(4.*PI)                                         JOF1830
      DO 230 KK=1,LPANEL                                                JOF1840
230   AW(KK)=AW(KK)+WK*CP(KK)                                           JOF1850
240   CONTINUE                                                          JOF1860
      WRITE (03) (AW(JJ),JJ=1,J1)                                       JOF1870
      WRITE (04) (BW(JJ),JJ=1,J1)                                       JOF1880
250   IJ=IJ+1                                                           JOF1890
260   CONTINUE                                                          JOF1900
      IC=IC+1                                                           JOF1910
      B=B2                                                              JOF1920
      AM=AM2                                                            JOF1930
      IG=1                                                              JOF1940
      NG=NW(1)                                                          JOF1950
      MG=NW(1)                                                          JOF1960
      IF (ABS(B1-B2).LE.0.001) GO TO 270                                JOF1970
      IF (IC.LE.2) GO TO 10                                             JOF1980
270   CONTINUE                                                          JOF1990
      RETURN                                                            JOF2000
C                                                                       JOF2010
      END                                                               JOF2020-
      OVERLAY (WNGJET,3,0)                                              JON  10
      PROGRAM JETON                                                     JON  20
C     TO SET UP THE JETON INFLUENCE COEFFICIENT MATRICES                JON  30
      DIMENSION AW(331), BW(331), CG(250)                               JON  40
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTJON  50
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZJON  60
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95JON  70
     3,2),SC(160,5),SI(160,5),LC(3)                                     JON  80
      COMMON /SKODE/ KCODE                                              JON  90
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)       JON 100
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JJON 110
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                        JON 120
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                      JON 130
      COMMON /ADD/ CP(130),CM(30),BREAK(8),SWP(8,15),GAL(30),ISYM,VMU,VUJON 140
     1,TEMP,FCR,CAMLER,CAMLFT,CAMTER,CAMTFT,XJ,YJ,ZJ,RJ,ALP,CREF,TWISTR JON 150
      COMMON /COST/ LTOTAL,LPAN1,NJW(5),LPANEL,IFNTN,LPAN2,EXIT,PTIAL,TWJON 160
     1IST,DF(5),NFP                                                     JON 170
      COMMON /SOME/ NC,NWING,LAT,NAL,LWF,LWFJ,CHORDT(3),SNG(5),YG(5),YCNJON 180
     1(6),WKN,RDX,MDG,NDG                                               JON 190
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCJON 200
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                    JON 210
      REWIND 02                                                         JON 220
      PI=3.14159265                                                     JON 230
      AM=AM1                                                            JON 240
      F0=0.                                                             JON 250
      F10=0.                                                            JON 260
      GB0=0.                                                            JON 270
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      IF (KF.EQ.0) GO TO 10                                              JON 280
      REWIND 1                                                           JON 290
      REWIND 7                                                           JON 300
      CALL VELFUS (LWF,LPANEL,AW,BW,AM,LPAN1,LPAN2,2,ISYM)               JON 310
      REWIND 1                                                           JON 320
      REWIND 7                                                           JON 330
      READ (08) (CG(I),I=1,LAST)                                         JON 340
10    CONTINUE                                                           JON 350
      REWIND 09                                                          JON 360
      J1=LWFJ                                                            JON 370
      LP1=LTOTAL+1                                                       JON 380
      MJ=LPANEL+NCJ(1)                                                   JON 390
      MCON=LAST+NCJ(1)                                                   JON 400
      IPHI=1                                                             JON 410
      JL=LAST+1                                                          JON 420
      INN=1                                                              JON 430
      LN=1                                                               JON 440
      LN1=1                                                              JON 450
      JNN=1                                                              JON 460
      VMUC=VMU*ALPC                                                      JON 470
      MK=1                                                               JON 480
      I=LAST+1                                                           JON 490
      I1=I-JPANEL                                                        JON 500
      CALL MATRIX (AW,BW,LTOTAL,LPANEL,VMUC,I,MCON,MJ,IPHI,INN,LN,LN1,TEJON 510
     1MP,LPAN1,ISYM,KCODE,EXIT,LPAN2,KF)                                 JON 520
      IF (KF.EQ.0) GO TO 50                                              JON 530
      VK=VMUC                                                            JON 540
      TM=TEMP                                                            JON 550
      IF (EXIT.LE.0.001) GO TO 20                                        JON 560
      IF (NNJ.EQ.1) GO TO 20                                             JON 570
      VK=1.                                                              JON 580
      TM=1.                                                              JON 590
20    XQ=XCP(I1)                                                         JON 600
      YQ=YCP(I1)                                                         JON 610
      ZQ=ZCP(I1)                                                         JON 620
      CALL FSPEED (B1,XQ,YQ,ZQ,GAM,WK1,WK2)                              JON 630
      DO 30 KK=1,LAST                                                    JON 640
      IF (KK.LE.LPANEL) KQ=KK+2*JPANEL                                   JON 650
      IF (KK.GT.LPANEL) KQ=KK-LPANEL+JPANEL                              JON 660
30    AW(KQ)=AW(KQ)-WK2*WKN*CG(KK)*TM*VK*VK                              JON 670
      DO 40 LK=1,NTL                                                     JON 680
      KK=LTOTAL+LK                                                       JON 690
      BW(KK)=-GAM(1,LK)*TM*VK*VK                                         JON 700
40    AW(KK)=-GAM(2,LK)*TM*VK*VK                                         JON 710
50    CONTINUE                                                           JON 720
      WRITE (03) (AW(JJ),JJ=1,J1)                                        JON 730
      WRITE (09) (BW(JJ),JJ=1,J1)                                        JON 740
      KI=2                                                               JON 750
      NI=LTOTAL-1                                                        JON 760
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      LI=LAST+2                                                          JON 770
      VMP=VMUC                                                           JON 780
60    KJ=LI                                                              JON 790
      IF (LI.GT.LAST) KJ=LI-JPANEL                                       JON 800
      CALL MATRIX (AW,BW,LTOTAL,LPANEL,VMP,LI,MCON,MJ,IPHI,INN,LN,LN1,TEJON 810
     1MP,LPAN1,ISYM,KCODE,EXIT,LPAN2,KF)                                 JON 820
      IF (KF.EQ.0) GO TO 130                                             JON 830
      XQ=XCP(KJ)                                                         JON 840
      YQ=YCP(KJ)                                                         JON 850
      ZQ=ZCP(KJ)                                                         JON 860
      IF (LI.GT.LAST) GO TO 90                                           JON 870
      READ (07) (GAM(2,LK),LK=1,NTL)                                     JON 880
      READ (01) (GAM(1,LK),LK=1,NTL)                                     JON 890
      DO 70 LK=1,NTL                                                     JON 900
      KK=LTOTAL+LK                                                       JON 910
      BW(KK)=GAM(1,LK)                                                   JON 920
70    AW(KK)=GAM(2,LK)                                                   JON 930
      CALL FUSVOL (B1,XQ,YQ,ZQ,WN,WK,GP0,0,0)                            JON 940
      DO 80 KK=1,LAST                                                    JON 950
      IF (KK.LE.LPANEL) KQ=KK+2*JPANEL                                   JON 960
      IF (KK.GT.LPANEL) KQ=KK-LPANEL+JPANEL                              JON 970
80    AW(KQ)=AW(KQ)+WK*WKN*CG(KK)                                        JON 980
      GO TO 130                                                          JON 990
90    VK=VMUC                                                            JON1000
      TM=TEMP                                                            JON1010
      IF (EXIT.LE.0.001) GO TO 100                                       JON1020
      IF (NNJ.EQ.1) GO TO 100                                            JON1030
      IF (KJ.GT.LPANEL.AND.KJ.LE.MJJ(1)) VK=1.                           JON1040
      IF (KJ.GT.LPANEL.AND.KJ.LE.MJJ(1)) TM=1.                           JON1050
100   CALL FSPEED (B1,XQ,YQ,ZQ,GAM,WK1,WK2)                              JON1060
      DO 110 KK=1,LAST                                                   JON1070
      IF (KK.LE.LPANEL) KQ=KK+2*JPANEL                                   JON1080
      IF (KK.GT.LPANEL) KQ=KK-LPANEL+JPANEL                              JON1090
110   AW(KQ)=AW(KQ)-WK2*WKN*CG(KK)*TM*VK*VK                              JON1100
      DO 120 LK=1,NTL                                                    JON1110
      KK=LTOTAL+LK                                                       JON1120
      BW(KK)=-GAM(1,LK)*TM*VK*VK                                         JON1130
120   AW(KK)=-GAM(2,LK)*TM*VK*VK                                         JON1140
130   CONTINUE                                                           JON1150
      WRITE (03) (AW(JJ),JJ=1,J1)                                        JON1160
      WRITE (09) (BW(JJ),JJ=1,J1)                                        JON1170
      IF (KJ.LT.MJ.OR.KJ.EQ.LAST) GO TO 140                              JON1180
      IPHI=IPHI+1                                                        JON1190
      MJ=MJ+NCJ(INN)                                                     JON1200
140   CONTINUE                                                           JON1210
      MJI=MJJ(INN)-1                                                     JON1220
      IF (KJ.EQ.MJI) GO TO 150                                           JON1230
      GO TO 160                                                          JON1240
150   JNN=INN                                                            JON1250
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      INN=INN+1                                                          JON1260
160   IF (KJ.EQ.MJJ(JNN)) IPHI=1                                         JON1270
      IF (LI.EQ.LTOTAL) GO TO 170                                        JON1280
      GO TO 180                                                          JON1290
170   CONTINUE                                                           JON1300
      IPHI=1                                                             JON1310
      MJ=LPANEL+NCJ(1)                                                   JON1320
      JNN=1                                                              JON1330
      INN=1                                                              JON1340
180   CONTINUE                                                           JON1350
      KI=KI+1                                                            JON1360
      NI=NI-1                                                            JON1370
      IF (LI.EQ.LTOTAL) GO TO 190                                        JON1380
      IF (LI.EQ.LAST) GO TO 200                                          JON1390
      LI=LI+1                                                            JON1400
      GO TO 210                                                          JON1410
190   LI=LPANEL+1                                                        JON1420
      GO TO 210                                                          JON1430
200   LI=1                                                               JON1440
210   CONTINUE                                                           JON1450
      JP=LI-LAST+LPANEL                                                  JON1460
      JP1=JP-1                                                           JON1470
      IF (JP.EQ.MJJ(LN1)) LN1=LN1+1                                      JON1480
      IF (JP1.EQ.MJJ(LN)) LN=LN+1                                        JON1490
      IF (KI.LE.LTOTAL) GO TO 60                                         JON1500
      IF (KF.EQ.0) GO TO 240                                             JON1510
      JQ1=JPANEL+1                                                       JON1520
      DO 220 KJ=1,JPANEL                                                 JON1530
      AW(KJ)=0.                                                          JON1540
220   BW(KJ)=0.                                                          JON1550
      DO 230 KJ=1,NTL                                                    JON1560
      READ (07) (AW(KK),KK=JQ1,LWFJ)                                     JON1570
      READ (01) (BW(KK),KK=JQ1,LWFJ)                                     JON1580
      WRITE (03) (AW(JJ),JJ=1,J1)                                        JON1590
      WRITE (09) (BW(JJ),JJ=1,J1)                                        JON1600
230   IJ=IJ+1                                                            JON1610
240   CONTINUE                                                           JON1620
      RETURN                                                             JON1630
C                                                                        JON1640
      END                                                                JON1650-
      SUBROUTINE MATRIX (AW,BW,LTOTAL,LPANEL,VMU,I,NCON,MJ,IPHI,INN,LN,LMAT  10
     1N1,TEMP,LPAN1,ISYM,KCODE,EXIT,LPAN2,KF)                            MAT  20
C     TO COMPUTE THE JETON INFLUENCE  COEFFICIENT MATRICES               MAT  30
      DIMENSION AW(1), BW(1)                                             MAT  40
      DIMENSION W(4), V(4)                                               MAT  50
      DIMENSION SV(300), SW(300)                                         MAT  60
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTMAT  70
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZMAT  80
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95MAT  90
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     3,2),SC(160,5),SI(160,5),LC(3)                                          MAT 100
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),     MAT 110
     1XLL(41)                                                                MAT 120
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)            MAT 130
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JMAT 140
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                             MAT 150
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                           MAT 160
      EQUIVALENCE (X(1,1),SV(1))                                             MAT 170
      PI=3.14159265                                                          MAT 180
      ZJET=YCON(25)                                                          MAT 190
      IUSB=YCON(24)                                                          MAT 200
      JCOT=XTE(50)                                                           MAT 210
      DFJ=CDF                                                                MAT 220
      VUT=VMU                                                                MAT 230
      TEM=TEMP                                                               MAT 240
      NN2=NNJ-1                                                              MAT 250
      N1=NNJ-1                                                               MAT 260
      N2=NNJ-2                                                               MAT 270
      N3=NNJ-3                                                               MAT 280
      NJH=(NSJ+1)/2+1                                                        MAT 290
      IF (ISYM.EQ.0) NJH=NSJ/2                                               MAT 300
      IF (ISYM.EQ.0) NP=NSJ-1                                                MAT 310
      IF (ISYM.NE.0) NP=NSJ+1                                                MAT 320
      NJT=NJH-1                                                              MAT 330
      IZ=1                                                                   MAT 340
      IP=1                                                                   MAT 350
      IFF=1                                                                  MAT 360
      MM=NW(1)                                                               MAT 370
      NN=NW(1)                                                               MAT 380
      IND=1                                                                  MAT 390
      ISN=1                                                                  MAT 400
      JKT=1                                                                  MAT 410
      L1=LPANEL+1                                                            MAT 420
      LAST1=LAST-1                                                           MAT 430
      IF (I.GT.LAST) GO TO 10                                                MAT 440
      IJ=I                                                                   MAT 450
      GO TO 20                                                               MAT 460
10    IJ=I-JPANEL                                                            MAT 470
20    CONTINUE                                                               MAT 480
      DO 260 J=1,LAST                                                        MAT 490
      MI=J-IFF+1                                                             MAT 500
      FN=NN                                                                  MAT 510
      IF (J.EQ.(LPAN1+1).OR.J.EQ.(LPAN2+1)) IP=1                             MAT 520
      IF (JCOT.EQ.1.AND.J.GT.LPANEL) GO TO 30                                MAT 530
      GO TO 40                                                               MAT 540
30    IF (JKT.EQ.1.OR.JKT.EQ.(NJH+1)) IP=1                                   MAT 550
40    CONTINUE                                                               MAT 560
      IF (J.GT.LPAN1.AND.J.LE.LPAN2) ISN=2                                   MAT 570
      IF (J.GT.LPAN2.AND.J.LE.LPANEL) ISN=3                                  MAT 580
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      IF (J.GE.LPAN1.AND.J.LT.LPANEL) GO TO 50                          MAT 590
      GO TO 60                                                          MAT 600
50    NN=NW(2)                                                          MAT 610
      IF (J.GE.LPAN2.AND.J.LT.LPANEL) NN=NW(3)                          MAT 620
60    CONTINUE                                                          MAT 630
      IF (J.GE.LPANEL.AND.J.LT.MJJ(IND)) NN=NCJ(IND)                    MAT 640
      CHORD=CH(IZ)                                                      MAT 650
      IF (J.EQ.L1) GO TO 70                                             MAT 660
      GO TO 80                                                          MAT 670
70    ISN=ISN+1                                                         MAT 680
      L1=MJJ(IND)+1                                                     MAT 690
80    NL=MJJ(IND)-1                                                     MAT 700
      IF (NL.EQ.LAST1) GO TO 90                                         MAT 710
      IF (J.EQ.NL) IND=IND+1                                            MAT 720
90    CONTINUE                                                          MAT 730
      X1=XN(J,1)-XCP(IJ)                                                MAT 740
      X2=XN(J,2)-XCP(IJ)                                                MAT 750
      X12=XN(J,2)-XN(J,1)                                               MAT 760
      Y12=YN(J,2)-YN(J,1)                                               MAT 770
      Z12=ZN(J,2)-ZN(J,1)                                               MAT 780
      Z1=ZN(J,1)-ZCP(IJ)                                                MAT 790
      Z2=ZN(J,2)-ZCP(IJ)                                                MAT 800
      XZJ=X1*Z12-Z1*X12                                                 MAT 810
      DO 240 II=1,2                                                     MAT 820
      IF (II.EQ.1) GO TO 100                                            MAT 830
      N=1                                                               MAT 840
      GO TO 110                                                         MAT 850
100   N=2                                                               MAT 860
110   CONTINUE                                                          MAT 870
      YC=(-1.)**N*YCP(IJ)                                               MAT 880
      Y1=YN(J,1)-YC                                                     MAT 890
      Y2=YN(J,2)-YC                                                     MAT 900
      XYK=X1*Y12-Y1*X12                                                 MAT 910
      YZI=Y1*Z12-Z1*Y12                                                 MAT 920
      ALB1=XYK*XYK+XZJ*XZJ+B1*YZI*YZI                                   MAT 930
      R1B1=SQRT(X1*X1+B1*Y1*Y1+B1*Z1*Z1)                                MAT 940
      R2B1=SQRT(X2*X2+B1*Y2*Y2+B1*Z2*Z2)                                MAT 950
      UUB1=(X2*X12+B1*Y2*Y12+B1*Z2*Z12)/R2B1-(X1*X12+B1*Y1*Y12+B1*Z1*Z12MAT 960
     1)/R1B1                                                            MAT 970
      G1B1=(1.-X1/R1B1)/(Y1*Y1+Z1*Z1)                                   MAT 980
      G2B1=(1.-X2/R2B1)/(Y2*Y2+Z2*Z2)                                   MAT 990
      IF (I.GT.LPANEL) GO TO 130                                        MAT1000
      F1=UUB1*XYK/ALB1                                                  MAT1010
      F2=-Y2*G2B1+Y1*G1B1                                               MAT1020
      IF (J.GT.LPANEL) GO TO 120                                        MAT1030
      H2=F2                                                             MAT1040
      IF (IP.EQ.1.AND.KF.NE.0) H2=-Y2*G2B1                              MAT1050
      GO TO 220                                                         MAT1060
120   F3=0.                                                             MAT1070
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      F4=0.                                                              MAT1080
      F1=2.*F1                                                           MAT1090
      F2=2.*F2                                                           MAT1100
      H2=F2                                                              MAT1110
      IF (IP.EQ.1.AND.KF.NE.0) H2=-2.*Y2*G2B1                            MAT1120
      GO TO 220                                                          MAT1130
  130 CONTINUE                                                           MAT1140
      IF (J.LE.LPANEL) GO TO 150                                         MAT1150
      IF (ABS(B1-B2).LE.0.001) GO TO 140                                 MAT1160
      ALB2=XYK*XYK+XZJ*XZJ+B2*YZI*YZI                                    MAT1170
      R1B2=SQRT(X1*X1+B2*Y1*Y1+B2*Z1*Z1)                                 MAT1180
      R2B2=SQRT(X2*X2+B2*Y2*Y2+B2*Z2*Z2)                                 MAT1190
      UUB2=(X2*X12+B2*Y2*Y12+B2*Z2*Z12)/R2B2-(X1*X12+B2*Y1*Y12+B2*Z1*Z12MAT1200
     1)/R1B2                                                             MAT1210
      G1B2=(1.-X1/R1B2)/(Y1*Y1+Z1*Z1)                                    MAT1220
      G2B2=(1.-X2/R2B2)/(Y2*Y2+Z2*Z2)                                    MAT1230
      GO TO 150                                                          MAT1240
  140 ALB2=ALB1                                                          MAT1250
      UUB2=UUB1                                                          MAT1260
      G2B2=G2B1                                                          MAT1270
      G1B2=G1B1                                                          MAT1280
  150 CONTINUE                                                           MAT1290
      IF (I.GT.LAST) GO TO 180                                           MAT1300
      F13=UUB1*XZJ/ALB1                                                  MAT1310
      F12=UUB1*XYK/ALB1                                                  MAT1320
      G13=Z2*G2B1-Z1*G1B1                                                MAT1330
      G12=-Y2*G2B1+Y1*G1B1                                               MAT1340
      H13=G13                                                            MAT1350
      H12=G12                                                            MAT1360
      IF (IP.EQ.1.AND.KF.NE.0) H13=Z2*G2B1                               MAT1370
      IF (IP.EQ.1.AND.KF.NE.0) H12=-Y2*G2B1                              MAT1380
      IF (J.LE.LPANEL) GO TO 160                                         MAT1390
      F23=UUB2*XZJ/ALB2                                                  MAT1400
      F22=UUB2*XYK/ALB2                                                  MAT1410
      G23=Z2*G2B2-Z1*G1B2                                                MAT1420
      G22=-Y2*G2B2+Y1*G1B2                                               MAT1430
      GO TO 170                                                          MAT1440
  160 F22=0.                                                             MAT1450
      G22=0.                                                             MAT1460
      F23=0.                                                             MAT1470
      G23=0.                                                             MAT1480
  170 F1=-F13*Y(4,IPHI)*(-1.)**N+F12*Y(3,IPHI)                           MAT1490
      F2=G13*Y(4,IPHI)*(-1.)**N+G12*Y(3,IPHI)                            MAT1500
      F3=-F23*Y(4,IPHI)*(-1.)**N+F22*Y(3,IPHI)                           MAT1510
      F4=G23*Y(4,IPHI)*(-1.)**N+G22*Y(3,IPHI)                            MAT1520
      H2=H13*Y(4,IPHI)*(-1.)**N+H12*Y(3,IPHI)                            MAT1530
      IF (J.LE.LPANEL) GO TO 210                                         MAT1540
      F1=F1*2.                                                           MAT1550
      F2=2.*F2                                                           MAT1560
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      F3=2.*F3                                                          MAT1570
      F4=2.*F4                                                          MAT1580
      H2=2.*H2                                                          MAT1590
      GO TO 210                                                         MAT1600
  180 F1=UUB1*YZI/ALB1                                                  MAT1610
      IF (EXIT.LE.0.001) GO TO 190                                      MAT1620
      IF (NNJ.EQ.1) GO TO 190                                           MAT1630
      IF (IJ.GT.LPANEL.AND.IJ.LE.MJJ(1)) VMU=1.                         MAT1640
      IF (IJ.GT.LPANEL.AND.IJ.LE.MJJ(1)) TEMP=1.                        MAT1650
  190 CONTINUE                                                          MAT1660
      F2=0.                                                             MAT1670
      H2=0.                                                             MAT1680
      IF (J.LE.LPANEL) GO TO 200                                        MAT1690
      F3=UUB2*YZI/ALB2                                                  MAT1700
      F4=0.                                                             MAT1710
      F1=-F1*VMU*VMU*2.*TEMP                                            MAT1720
      F3=-F3*2.                                                         MAT1730
      GO TO 210                                                         MAT1740
  200 F1=-F1*VMU*VMU*TEMP                                               MAT1750
  210 CONTINUE                                                          MAT1760
  220 W(II)=(F1+F2)*CHORD*SN(MI,ISN)/(8.*FN)                            MAT1770
      V(II)=(F1+H2)*CHORD*SN(MI,ISN)/(8.*FN)                            MAT1780
      IF (J.LE.LPANEL) GO TO 230                                        MAT1790
      IF (II.EQ.2) GO TO 230                                            MAT1800
      K2=II+2                                                           MAT1810
      W(K2)=(F3+F4)*CHORD*SN(MI,ISN)/(8.*FN)                            MAT1820
  230 CONTINUE                                                          MAT1830
  240 CONTINUE                                                          MAT1840
      IF (J.LT.MM) GO TO 250                                            MAT1850
      IZ=IZ+1                                                           MAT1860
      IP=IP+1                                                           MAT1870
      IFF=MM+1                                                          MAT1880
      MM=MM+NN                                                          MAT1890
      IF (J.GT.LPANEL) JKT=JKT+1                                        MAT1900
      IF (JKT.EQ.(NP+1)) JKT=1                                          MAT1910
  250 CONTINUE                                                          MAT1920
      IF (J.LE.LPANEL) JA=J+2*JPANEL                                    MAT1930
      IF (J.GT.LPANEL) JA=J-LPANEL+JPANEL                               MAT1940
      AW(JA)=V(1)+V(2)                                                  MAT1950
      BW(JA)=W(1)-W(2)                                                  MAT1960
      SV(JA)=V(1)                                                       MAT1970
      SW(JA)=W(1)                                                       MAT1980
      IF (J.LE.LPANEL) GO TO 260                                        MAT1990
      J1=J-LPANEL                                                       MAT2000
      AW(J1)=W(3)                                                       MAT2010
      BW(J1)=W(3)                                                       MAT2020
      VMU=VUT                                                           MAT2030
      TEMP=TEM                                                          MAT2040
  260 CONTINUE                                                          MAT2050
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      IF (KCODE.EQ.0) GO TO 380                                          MAT2060
      IF (IUSB.EQ.1.AND.ZJET.GT.0.01) GO TO 360                          MAT2070
      IF (DFJ.LE.0.0001) GO TO 360                                       MAT2080
      IF (NNJ.EQ.1.AND.I.LE.LPANEL) GO TO 360                            MAT2090
      IF (NNJ.EQ.1.AND.I.GT.LPANEL) GO TO 270                            MAT2100
      IF (I.LE.MJJ(N1).OR.I.GT.LAST) GO TO 360                           MAT2110
  270 CONTINUE                                                           MAT2120
      IF (I.GT.LAST) GO TO 360                                           MAT2130
      IF (IPHI.EQ.NJH) GO TO 360                                         MAT2140
      IF (ISYM.NE.0.AND.IPHI.EQ.1) GO TO 360                             MAT2150
      IF (IPHI.LT.NJH) IL=IPHI-ISYM                                      MAT2160
      IF (IPHI.GT.NJH) IL=IPHI-NJH                                       MAT2170
      REWIND 2                                                           MAT2180
      IF (NNJ.EQ.1) MJN1=LPANEL                                          MAT2190
      IF (NNJ.NE.1) MJN1=MJJ(N1)                                         MAT2200
      MF=IJ-MJN1-(IPHI-1)*NCJ(NNJ)                                       MAT2210
      FNNJ=NCJ(NNJ)                                                      MAT2220
      DISTJ=SDF                                                          MAT2230
      DLX=DISTJ*0.5*PI/FNNJ                                              MAT2240
      SZX=-(1.-VMU)                                                      MAT2250
      IQ=(IL-1)*NCJ(NNJ)                                                 MAT2260
      CALL SKIP (IQ,JPANEL)                                              MAT2270
      DO 310 JJ=1,MF                                                     MAT2280
      READ (02) (SV(K),K=1,JPANEL)                                       MAT2290
      IF (JJ.EQ.MF) GO TO 280                                            MAT2300
      DXTH=DLX*PSI(JJ)/TH                                                MAT2310
      GO TO 290                                                          MAT2320
  280 DXTH=DLX*PSI(JJ)*0.5/TH                                            MAT2330
  290 CONTINUE                                                           MAT2340
      PROD=SZX*DXTH                                                      MAT2350
      DO 300 K1=1,JPANEL                                                 MAT2360
      KK=K1+JPANEL                                                       MAT2370
  300 AW(KK)=AW(KK)+PROD*SV(K1)                                          MAT2380
  310 CONTINUE                                                           MAT2390
      IQ=NCJ(NNJ)-MF+((NP-1-ISYM)/2-1)*NCJ(NNJ)                          MAT2400
      CALL SKIP (IQ,JPANEL)                                              MAT2410
      DO 350 JJ=1,MF                                                     MAT2420
      READ (02) (SV(K),K=1,JPANEL)                                       MAT2430
      IF (JJ.EQ.MF) GO TO 320                                            MAT2440
      DXTH=DLX*PSI(JJ)/TH                                                MAT2450
      GO TO 330                                                          MAT2460
  320 DXTH=DLX*PSI(JJ)*0.5/TH                                            MAT2470
  330 PROD=SZX*DXTH                                                      MAT2480
      DO 340 K1=1,JPANEL                                                 MAT2490
      KK=K1+JPANEL                                                       MAT2500
  340 AW(KK)=AW(KK)-PROD*SV(K1)                                          MAT2510
  350 CONTINUE                                                           MAT2520
  360 CONTINUE                                                           MAT2530
      IF (EXIT.LE.0.001) GO TO 370                                       MAT2540
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      IF (NNJ.EQ.1) GO TO 370                                          MAT2550
      IF (IJ.GT.LPANEL.AND.IJ.LE.MJJ(1)) VMU=1.                        MAT2560
      IF (IJ.GT.LPANEL.AND.IJ.LE.MJJ(1)) TEMP=1.                       MAT2570
370   CONTINUE                                                         MAT2580
380   IF (I.LE.LAST) GO TO 730                                         MAT2590
      IF (IPHI.EQ.NJH) GO TO 590                                       MAT2600
      IF (ISYM.NE.0.AND.IPHI.EQ.1) GO TO 590                           MAT2610
      IF (NNJ.EQ.1) GO TO 450                                          MAT2620
      IF (IJ.GT.MJJ(N1)) GO TO 450                                     MAT2630
      IF (IPHI.GT.NJH.AND.ZJET.LE.0.01) GO TO 450                      MAT2640
      IF (IPHI.GT.NJH) L1=NJH                                          MAT2650
      IF (ISYM.EQ.0.AND.IPHI.GT.NJH) L1=NJH+1                          MAT2660
      IF (IPHI.LE.NJH) L1=1                                            MAT2670
      NZ=1                                                             MAT2680
      IF (NW(2).NE.0.AND.NW(3).EQ.0) NZ=2                              MAT2690
      IF (NW(3).NE.0) NZ=3                                             MAT2700
      IF (NNJ.LE.3.AND.NW(2).NE.0) IR=N2                               MAT2710
      IF (NNJ.LE.3.AND.NW(2).EQ.0) IR=N1                               MAT2720
      IF (NNJ.GE.4.AND.NW(3).NE.0) IR=N3                               MAT2730
      IF (NNJ.EQ.4.AND.NW(3).EQ.0) IR=N2                               MAT2740
      DO 440 NR=1,NZ                                                   MAT2750
      K1=MJW1(NR,NJP)+(IPHI-L1-ISYM)*NW(NR)-1                          MAT2760
      K2=LC(NR)+IPHI-L1-ISYM                                           MAT2770
      KNW=NW(NR)                                                       MAT2780
      K1=K1-KNW                                                        MAT2790
      K2=K2-1                                                          MAT2800
      MR=3                                                             MAT2810
      IF (K1.GE.0) GO TO 390                                           MAT2820
      K1=K1+KNW                                                        MAT2830
      K2=K2+1                                                          MAT2840
      MR=2                                                             MAT2850
390   DO 430 NQ=1,MR                                                   MAT2860
      SUM=0.                                                           MAT2870
      SUMB=0.                                                          MAT2880
      DO 400 KK=1,KNW                                                  MAT2890
      KL=K1+KK                                                         MAT2900
      JA=KL+2*JPANEL                                                   MAT2910
      SUMB=SUMB+SW(JA)                                                 MAT2920
400   SUM=SUM+SV(JA)                                                   MAT2930
      CALL INTEG (RFS,KNW,K1,K2,IJ,P1,IR)                              MAT2940
      DO 420 KK=1,KNW                                                  MAT2950
      KL=K1+KK                                                         MAT2960
      JA=KL+2*JPANEL                                                   MAT2970
      AA=1.                                                            MAT2980
      DO 410 L=1,KNW                                                   MAT2990
      LL=K1+L                                                          MAT3000
      IF (L.EQ.KK) GO TO 410                                           MAT3010
      AA=AA*(XCP(IJ)-XV(LL))/(XV(KL)-XV(LL))                           MAT3020
410   CONTINUE                                                         MAT3030
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      AW(JA)=AW(JA)-SUM*AA-RES*AA*VMU*VMU*TEMP                          MAT3040
      BW(JA)=BW(JA)-SUMB*AA-RES*AA*VMU*VMU*TEMP                         MAT3050
  420 CONTINUE                                                          MAT3060
      K1=K1+KNW                                                         MAT3070
      K2=K2+1                                                           MAT3080
  430 CONTINUE                                                          MAT3090
      IP=IP+1                                                           MAT3100
  440 CONTINUE                                                          MAT3110
  450 CONTINUE                                                          MAT3120
      IF (KCODE.EQ.0) GO TO 590                                         MAT3130
      IF (NW(2).EQ.0) NSTRIP=NCS                                        MAT3140
      IF (NW(2).NE.0.AND.NW(3).EQ.0) NSTRIP=NCS*2                       MAT3150
      IF (NW(3).NE.0) NSTRIP=NCS*3                                      MAT3160
      IF (IPHI.LT.NJH) IP=NJH+1                                         MAT3170
      IF (IPHI.GT.NJH) IP=ISYM+1                                        MAT3180
      IF (NNJ.EQ.1) GO TO 500                                           MAT3190
      IF (IJ.GT.MJJ(N1)) GO TO 500                                      MAT3200
      IF (NNJ.EQ.2) GO TO 510                                           MAT3210
      IF (IJ.GT.MJJ(N2)) GO TO 510                                      MAT3220
      IF (NNJ.EQ.3) GO TO 490                                           MAT3230
      IF (IJ.GT.MJJ(N3)) GO TO 480                                      MAT3240
      IF (NNJ.EQ.4) GO TO 470                                           MAT3250
      IF (NNJ.EQ.5.AND.IJ.GT.MJJ(NNJ-4)) GO TO 460                      MAT3260
      L1=NNJ-4                                                          MAT3270
      IZ=NSTRIP                                                         MAT3280
      GO TO 520                                                         MAT3290
  460 L1=N3                                                             MAT3300
      IZ=NSTRIP+NP                                                      MAT3310
      GO TO 520                                                         MAT3320
  470 L1=N3                                                             MAT3330
      IZ=NSTRIP                                                         MAT3340
      GO TO 520                                                         MAT3350
  480 L1=N2                                                             MAT3360
      IZ=NSTRIP+(NNJ-3)*NP                                              MAT3370
      GO TO 520                                                         MAT3380
  490 CONTINUE                                                          MAT3390
      L1=N2                                                             MAT3400
      IZ=NSTRIP                                                         MAT3410
      GO TO 520                                                         MAT3420
  500 L1=NNJ                                                            MAT3430
      IZ=NSTRIP+(NNJ-1)*NP                                              MAT3440
      GO TO 520                                                         MAT3450
  510 L1=N1                                                             MAT3460
      IZ=NSTRIP+(NNJ-2)*NP                                              MAT3470
  520 CONTINUE                                                          MAT3480
      IZ=IZ+IP                                                          MAT3490
      NT=NJT                                                            MAT3500
      IF (ISYM.NE.0) NT=NJT-1                                           MAT3510
      KNW=NCJ(L1)                                                       MAT3520
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      DO 580 KP=1,NT                                                    MAT3530
      SUM1=0.                                                           MAT3540
      SUM2=0.                                                           MAT3550
      SUM3=0.                                                           MAT3560
      SUM4=0.                                                           MAT3570
      K1=MJJ(L1)-NP*NCJ(L1)+(KP-1)*NCJ(L1)+(IP-1)*NCJ(L1)               MAT3580
      DO 530 KK=1,KNW                                                   MAT3590
      KL=K1+KK                                                          MAT3600
      KJ=KL+JPANEL                                                      MAT3610
      IA=KL-LPANEL+JPANEL                                               MAT3620
      IB=KJ-LAST                                                        MAT3630
      SUM3=SUM3+SW(IA)                                                  MAT3640
      SUM4=SUM4+BW(IB)                                                  MAT3650
      SUM1=SUM1+SV(IA)                                                  MAT3660
530   SUM2=SUM2+AW(IB)                                                  MAT3670
      CALL INTEG (RES,KNW,K1,I7,IJ,B1,L1)                               MAT3680
      IF (ABS(B1-B2).LE.0.001) GO TO 540                                MAT3690
      CALL INTEG (REF,KNW,K1,I7,IJ,B2,L1)                               MAT3700
      GO TO 550                                                         MAT3710
540   REF=RES                                                           MAT3720
550   DO 570 KK=1,KNW                                                   MAT3730
      KL=K1+KK                                                          MAT3740
      KJ=KL+JPANEL                                                      MAT3750
      IA=KL-LPANEL+JPANEL                                               MAT3760
      IB=KJ-LAST                                                        MAT3770
      AA=1.                                                             MAT3780
      DO 560 L=1,KNW                                                    MAT3790
      LL=K1+L                                                           MAT3800
      IF (L.EQ.KK) GO TO 560                                            MAT3810
      AA=AA*(XCP(IJ)-XV(LL))/(XV(KL)-XV(LL))                            MAT3820
560   CONTINUE                                                          MAT3830
      AW(IA)=AW(IA)-SUM1*AA-RES*AA*VMU*VMU*TEMP*2.                      MAT3840
      AW(IB)=AW(IB)-SUM2*AA-REF*AA*2.                                   MAT3850
      BW(IA)=BW(IA)-SUM3*AA-RES*AA*VMU*VMU*TEMP*2.                      MAT3860
      BW(IB)=BW(IB)-SUM4*AA-REF*AA*2.                                   MAT3870
570   CONTINUE                                                          MAT3880
      IZ=IZ+1                                                           MAT3890
580   CONTINUE                                                          MAT3900
590   CONTINUE                                                          MAT3910
      SK=1.                                                             MAT3920
      IF (IPHI.GT.NJH) SK=-1.                                           MAT3930
      JI=I-LAST+LPANEL                                                  MAT3940
      K=MCON-LAST-NCJ(LN)+LPANEL                                        MAT3950
      JNJ=NCJ(LN)                                                       MAT3960
      DO 610 KK=1,JNJ                                                   MAT3970
      KL=K+KK                                                           MAT3980
      KJ=KL+JPANEL                                                      MAT3990
      IA=KL-LPANEL+JPANEL                                               MAT4000
      IB=KJ-LAST                                                        MAT4010
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      AA=1.                                                              MAT4020
      DO 600 L=1,JNJ                                                     MAT4030
      LL=K+L                                                             MAT4040
      IF (L.EQ.KK) GO TO 600                                             MAT4050
      AA=AA*(XCP(JI)-XV(LL))/(XV(KL)-XV(LL))                             MAT4060
600   CONTINUE                                                           MAT4070
      BW(IA)=BW(IA)-AA*VML*VMU*TEMP*SK                                   MAT4080
      BW(IB)=BW(IB)+AA*SK                                                MAT4090
      AW(IB)=AW(IB)+AA*SK                                                MAT4100
610   AW(IA)=AW(IA)-AA*VMU*VMU*TEMP*SK                                   MAT4110
      IF (I.EQ.MCON.AND.I.LT.LTOTAL) MCON=MCON+NCJ(LN1)                  MAT4120
      IF (KCODE.EQ.0) GO TO 700                                          MAT4130
      IF (IUSB.EQ.1.AND.ZJET.GT.0.01) GO TO 700                          MAT4140
      IF (NNJ.EQ.1) GO TO 700                                            MAT4150
      IF (IJ.GT.MJJ(N1)) GO TO 700                                       MAT4160
      IF (IPHI.LE.NJH) GO TO 700                                         MAT4170
      L1=NJH                                                             MAT4180
      IF (ISYM.EQ.0) L1=NJH+1                                            MAT4190
      IF (NW(2).EQ.0) GO TO 630                                          MAT4200
      IF (NW(3).EQ.0) GO TO 620                                          MAT4210
      IF (IJ.GT.MJJ(N2)) GO TO 660                                       MAT4220
      IF (IJ.GT.MJJ(N3)) GO TO 650                                       MAT4230
      IF (NNJ.EQ.4) GO TO 640                                            MAT4240
      IF (NNJ.EQ.5.AND.IJ.GT.MJJ(NNJ-4)) GO TO 640                       MAT4250
      GO TO 700                                                          MAT4260
620   IF (IJ.GT.MJJ(N2)) GO TO 650                                       MAT4270
      IF (NNJ.EQ.3) GO TO 640                                            MAT4280
      IF (NNJ.EQ.4.AND.IJ.GT.MJJ(N3)) GO TO 640                          MAT4290
      GO TO 700                                                          MAT4300
630   IF (NNJ.EQ.2) GO TO 640                                            MAT4310
      IF (NNJ.EQ.3.AND.IJ.GT.MJJ(N2)) GO TO 640                          MAT4320
      GO TO 700                                                          MAT4330
640   K1=MJW1(1,NJP)+(IPHI-L1-ISYM)*NW(1)-1                              MAT4340
      KNW=NW(1)                                                          MAT4350
      GO TO 670                                                          MAT4360
650   K1=MJW1(2,NJP)+(IPHI-L1-ISYM)*NW(2)-1                              MAT4370
      KNW=NW(2)                                                          MAT4380
      GO TO 670                                                          MAT4390
660   K1=MJW1(3,NJP)+(IPHI-L1-ISYM)*NW(3)-1                              MAT4400
      KNW=NW(3)                                                          MAT4410
670   DO 690 KK=1,KNW                                                    MAT4420
      KL=K1+KK                                                           MAT4430
      JA=KL+2*JPANEL                                                     MAT4440
      AA=1.                                                              MAT4450
      DO 680 L=1,KNW                                                     MAT4460
      LL=K1+L                                                            MAT4470
      IF (L.EQ.KK) GO TO 680                                             MAT4480
      AA=AA*(XCP(IJ)-XV(LL))/(XV(KL)-XV(LL))                             MAT4490
680   CONTINUE                                                           MAT4500
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      PW(JA)=PW(JA)-AA*VMU*VMU*TEMP*0.5                                 MAT4510
690   AW(JA)=AW(JA)-AA*VMU*VMU*TEMP*0.5                                 MAT4520
700   CONTINUE                                                          MAT4530
      IF (KCODE.EQ.0) GO TO 730                                         MAT4540
      IF (ZJET.GT.0.01) GO TO 730                                       MAT4550
      IF (DFJ.LE.0.0001) GO TO 730                                      MAT4560
      IF (NNJ.EQ.1) GO TO 710                                           MAT4570
      IF (IJ.LE.MJJ(N1)) GO TO 730                                      MAT4580
710   CONTINUE                                                          MAT4590
      IF (IPHI.EQ.NJP) GO TO 730                                        MAT4600
      IF (ISYM.NE.0.AND.IPHI.EQ.1) GO TO 730                            MAT4610
      DO 720 J=1,JPANEL                                                 MAT4620
      JJ=J+JPANEL                                                       MAT4630
720   SV(J)=-AW(JJ)                                                     MAT4640
      WRITE (02) (SV(J),J=1,JPANEL)                                     MAT4650
730   CONTINUE                                                          MAT4660
      VMU=VUT                                                           MAT4670
      TEMP=TEM                                                          MAT4680
      RETURN                                                            MAT4690
C                                                                       MAT4700
      END                                                               MAT4710-
      SUBROUTINE SKIP (I,JPANEL)                                        SKP  10
      DIMENSION DUMMY(200)                                              SKP  20
      IF (I.EQ.0) GO TO 20                                              SKP  30
      DO 10 J=1,I                                                       SKP  40
      READ (02) (DUMMY(K),K=1,JPANEL)                                   SKP  50
10    CONTINUE                                                          SKP  60
20    RETURN                                                            SKP  70
      END                                                               SKP  80-
      OVERLAY (WNGJET,4,0)                                              SOL  10
      PROGRAM SOLUTN                                                    SOL  20
C     TO SOLVE THE JET ON AND JET OFF EQUATIONS                         SOL  30
C                                                                       SOL  40
C  *** GAMMA MUST BE DIMENSIONED TO HAVE AT LEAST (N+1)**2/4 ELEMENTS,  SOL  50
C    WHERE N IS THE SIZE OF THE MATRIX ***                              SOL  60
C                                                                       SOL  70
      DIMENSION AW(330), CA(330), GAMMA(25000)                          SOL  80
      DIMENSION GAMVR(330), GAMW(130)                                   SOL  90
      COMMON /SKODE/ KCODE                                              SOL 100
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),SOL 110
     1XLL(41)                                                           SOL 120
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTSOL 130
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZSOL 140
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95SOL 150
     3,2),SC(160,5),SI(160,5),LC(3)                                     SOL 160
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                      SOL 170
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)       SOL 180
      COMMON /ADD/ CP(130),CM(30),BREAK(8),SWP(8,15),CAL(30),ISYM,VMU,VUSOL 190
     1,TEMP,FCP,CAMLEP,CAMLEJ,CAMTEP,CAMTEJ,XJ,YJ,ZJ,RJ,ALP,CREF,TWISTR SOL 200
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      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JSOL 210
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                          SOL 220
      COMMON /COST/ LTOTAL,LPAN1,NJW(5),LPANEL,IENTN,LPAN2,EXIT,PTIAL,TWSOL 230
     1IST,DF(5),NFP                                                       SOL 240
      COMMON /SOME/ NC,NWING,LAT,NAL,LWF,LWFJ,CHORDT(3),SNG(5),YC(5),YCNSOL 250
     1(6),WKN,RDX,MDG,NDG                                                 SOL 260
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCSOL 270
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                      SOL 280
      REWIND 03                                                           SOL 290
      REWIND 08                                                           SOL 300
      IUSB=YCON(24)                                                       SOL 310
      NC=IENTN                                                            SOL 320
      ZZ=YCON(25)                                                         SOL 330
      ITN=YCON(23)                                                        SOL 340
      IC=1                                                                SOL 350
      J1=LWF+1                                                            SOL 360
      LP1=LWFJ+1                                                          SOL 370
      BB=B1                                                               SOL 380
      B=BB                                                                SOL 390
      DFJ=CDF                                                             SOL 400
      PI=3.14159265                                                       SOL 410
      GB0=0.                                                              SOL 420
      SS=SIN(ALP)                                                         SOL 430
      CS=COS(ALP)                                                         SOL 440
      IF (KF.EQ.0) GO TO 10                                               SOL 450
      S=XTEF-XLEF                                                         SOL 460
      F0=4.*PI*CS*RDX                                                     SOL 470
      F10=-8.*PI*SS*RDX                                                   SOL 480
      G10=0.                                                              SOL 490
      GB0=0.                                                              SOL 500
      GR0=0.                                                              SOL 510
      CALL FALONE (B,CS,AW,CA,GAMMA)                                      SOL 520
10    CONTINUE                                                            SOL 530
20    CONTINUE                                                            SOL 540
      IG=1                                                                SOL 550
      MG=NW(1)                                                            SOL 560
      NG=NW(1)                                                            SOL 570
      READ (03) (AW(I),I=1,J1)                                            SOL 580
      XB=XCP(1)                                                           SOL 590
      YB=YCP(1)                                                           SOL 600
      ZB=ZCP(1)                                                           SOL 610
      PHRV=0.                                                             SOL 620
      WN=0.                                                               SOL 630
      IF (IUSB.EQ.1.AND.ITN.EQ.0) GO TO 30                                SOL 640
      CALL INDVEL (XB,YB,ZB,XJ,YJ,ZJ,RJ,PP,PHRV,PHX,TEMP,VU,PHY,ISYM)    SOL 650
30    CONTINUE                                                            SOL 660
      IF (KF.EQ.0) GO TO 40                                               SOL 670
      CALL FUSVOL (B,XB,YB,ZB,WN,WK,GB0,1,0)                              SOL 680
40    CONTINUE                                                            SOL 690
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      AW(J1)=AW(J1)+XTT(IG)+PHRV/(ALPC*VU)+WN                                SOL 700
      DO 50 I=1,LWF                                                         SOL 710
50    GAMMA(I)=-AW(I+1)/AW(1)                                               SOL 720
      NJ=LWF-1                                                              SOL 730
      DO 110 IJ=2,LWF                                                       SOL 740
      READ (03) (AW(K),K=1,J1)                                              SOL 750
      WN=0.                                                                 SOL 760
      XB=XCP(IJ)                                                            SOL 770
      YB=YCP(IJ)                                                            SOL 780
      ZB=ZCP(IJ)                                                            SOL 790
      IF (IUSB.EQ.1.AND.ITN.EQ.0) GO TO 60                                  SOL 800
      CALL INDVEL (XB,YB,ZB,XJ,YJ,ZJ,RJ,BB,PHRV,PHX,TEMP,VU,PHY,ISYM)      SOL 810
60    CONTINUE                                                              SOL 820
      IF (IJ.LE.LPANEL) ALPT=XTT(IG)                                        SOL 830
      IF (IJ.GT.LPANEL) GO TO 70                                            SOL 840
      GO TO 80                                                              SOL 850
70    ALPT=0.                                                               SOL 860
      I=IJ-LPANEL                                                           SOL 870
      IF (I.GT.NF) GO TO 90                                                 SOL 880
      KI=I                                                                  SOL 890
      XS=XCF(KI)-XTEF                                                       SOL 900
      XB=XCF(KI)-XLEF                                                       SOL 910
      IF (KI.EQ.NF) RFL=0.                                                  SOL 920
      IF (KI.NE.NF) RFL=XS/SQRT(XS*XS+B*RF(KI)*RF(KI))                      SOL 930
      RF1=XS*(1.+RFL)                                                       SOL 940
      RF0=XB*(1.+XB/SQRT(XB*XB+B*RF(KI)*RF(KI)))                            SOL 950
      ALPT=SS*RF(KI)*RF(KI)-(RF1-RF0)*F10/(4.*PI)                           SOL 960
      GO TO 90                                                              SOL 970
80    IF (KF.EQ.0) GO TO 90                                                 SOL 980
      CALL FLSVOL (B,XB,YB,ZB,WN,WK,GP0,1,0)                                SOL 990
90    CONTINUE                                                              SOL1000
      AW(J1)=AW(J1)+PHRV/(ALPC*VU)+WN+ALPT                                  SOL1010
      IK=IJ                                                                 SOL1020
      CALL VMSEQN (NJ,IK,AW,GAMMA,CA)                                       SOL1030
      NJ=NJ-1                                                               SOL1040
      IF (IJ.GE.LPAN1.AND.IJ.LT.LPAN2) NG=NW(2)                             SOL1050
      IF (IJ.GE.LPAN2.AND.IJ.LT.LPANFL) NG=NW(3)                            SOL1060
      IF (IJ.LT.MG) GO TO 100                                               SOL1070
      IG=IG+1                                                               SOL1080
      MG=MG+NG                                                              SOL1090
100   IF (IJ.EQ.LPAN1.OR.IJ.EQ.LPAN2) IG=1                                  SOL1100
110   CONTINUE                                                              SOL1110
      DO 120 I=1,LWF                                                        SOL1120
120   GAM(IC,I)=GAMMA(I)                                                    SOL1130
      IF (ABS(B1-B2).LE.0.001) GO TO 130                                    SOL1140
      IC=IC+1                                                               SOL1150
      BB=B2                                                                 SOL1160
      B=BB                                                                  SOL1170
      IF (IC.GT.2) GO TO 130                                                SOL1180
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      GO TO 20                                                          SOL1190
130   CONTINUE                                                          SOL1200
      VMUC=VMU*ALPC                                                     SOL1210
      CALL SOLUJ (VMUC,VMU,TEMP,LPANEL,LPAN1,LPAN2,LWFJ,LTOTAL,LAST,ISYMSOL1220
     1,KCODE,EXIT,NW,NCJ,MJW1,MJJ,NA,NJP,ZZ,CAMTER,CAMTET,YCP,HALFB,DFJ,SOL1230
     2TDF,GAMW,GAMMA,AW,CA,JPANEL,MJW2,0.,0.,0.,0,F10,NTL,KF)           SOL1240
      J7=JPANEL+1                                                       SOL1250
      IA=2*JPANEL                                                       SOL1260
      JPAN1=IA+1                                                        SOL1270
      DO 140 I=1,LWFJ                                                   SOL1280
140   GAMVR(I)=GAMMA(I)                                                 SOL1290
      IF (IUSR.EQ.1.AND.ITN.EQ.0) GO TO 230                             SOL1300
      IG=1                                                              SOL1310
      MG=NW(1)                                                          SOL1320
      NG=NW(1)                                                          SOL1330
      B=B1                                                              SOL1340
      REWIND 03                                                         SOL1350
      READ (03) (AW(I),I=1,J1)                                          SOL1360
      WN=0.                                                             SOL1370
      IF (KF.EQ.0) GO TO 150                                            SOL1380
      XQ=XCP(1)                                                         SOL1390
      YQ=YCP(1)                                                         SOL1400
      ZQ=ZCP(1)                                                         SOL1410
      CALL FUSVOL (B,XC,YQ,ZQ,WN,WK,GP0,1,0)                            SOL1420
150   CONTINUE                                                          SOL1430
      AW(J1)=AW(J1)+XTT(IG)*WN                                          SOL1440
      DO 160 I=1,LWF                                                    SOL1450
160   GAMMA(I)=-AW(I+1)/AW(1)                                           SOL1460
      NJ=LWF-1                                                          SOL1470
      DO 210 IJ=2,LWF                                                   SOL1480
      READ (03) (AW(K),K=1,J1)                                          SOL1490
      WN=0.                                                             SOL1500
      IF (IJ.LE.LPANEL) ALPT=XTT(IG)                                    SOL1510
      IF (IJ.GT.LPANEL) GO TO 170                                       SOL1520
      GO TO 180                                                         SOL1530
170   ALPT=0.                                                           SOL1540
      I=IJ-LPANEL                                                       SOL1550
      IF (I.GT.NF) GO TO 190                                            SOL1560
      KI=I                                                              SOL1570
      XS=XCF(KI)-XTEF                                                   SOL1580
      XB=XCF(KI)-XLEF                                                   SOL1590
      IF (KI.EQ.NF) RFL=0.                                              SOL1600
      IF (KI.NE.NF) RFL=XS/SQRT(XS*XS+B*BF(KI)*BF(KI))                  SOL1610
      RF1=XS*(1.+RFL)                                                   SOL1620
      RF0=XB*(1.+XB/SQRT(XB*XB+B*BF(KI)*BF(KI)))                        SOL1630
      ALPT=SS*BF(KI)*BF(KI)-(RF1-RF0)*F10/(4.*PI)                       SOL1640
      GO TO 190                                                         SOL1650
180   IF (KF.EQ.0) GO TO 190                                            SOL1660
      XQ=XCP(IJ)                                                        SOL1670
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      YQ=YCP(IJ)                                                        SOL1680
      ZQ=ZCP(IJ)                                                        SOL1690
      CALL FUSVOL (P,XQ,YQ,ZQ,WA,WK,GRO,1.0)                            SOL1700
190   CONTINUE                                                          SOL1710
      AW(J1)=AW(J1)+WA+ALPT                                             SOL1720
      IK=IJ                                                             SOL1730
      CALL VNSEQN (NJ,IK,AW,GAMMA,CA)                                   SOL1740
      NJ=NJ-1                                                           SOL1750
      IF (IJ.GE.LPAN1.AND.IJ.LT.LPAN2) NG=NW(2)                         SOL1760
      IF (IJ.GE.LPAN2.AND.IJ.LT.LPANEL) NG=NW(3)                        SOL1770
      IF (IJ.LT.MG) GO TO 200                                           SOL1780
      IG=IG+1                                                           SOL1790
      MG=MG+NG                                                          SOL1800
200   IF (IJ.EQ.LPAN1.OR.IJ.EQ.LPAN2) IG=1                              SOL1810
210   CONTINUE                                                          SOL1820
      DO 220 I=1,LWF                                                    SOL1830
220   GAM(2,I)=GAMMA(I)                                                 SOL1840
CO 3116                                                                 SOL1850
      GO TO 250                                                         SOL1860
230   DO 240 I=1,LWF                                                    SOL1870
240   GAM(2,I)=GAM(1,I)                                                 SOL1880
250   CONTINUE                                                          SOL1890
      CAM=CAMLER                                                        SOL1900
      CAMT=CAMLET                                                       SOL1910
      CALL THRUST (LTOTAL,LPANEL,GAMVR,GAMW,CAM,LPAN1,VU,XJ,YJ,ZJ,RJ,TFMSOL1920
     1P,GAL,ISYM,LPAN2,CAMT,SNG,YG,LWF,LWFJ,AW,CA,CM,0.,0.,0.,1)        SOL1930
      DO 260 I=1,LWF                                                    SOL1940
      IB=I+IA                                                           SOL1950
      IC=1                                                              SOL1960
260   CP(I)=GAMVR(IB)+GAM(IC,I)                                         SOL1970
      IF (LAT.NE.1) GO TO 270                                           SOL1980
      REWIND 02                                                         SOL1990
      REWIND 07                                                         SOL2000
      WRITE (07) (CD(I),I=1,NCS)                                        SOL2010
      WRITE (02) (CM(I),I=1,NCS)                                        SOL2020
      CALL LATDIR (KF,AW,CA,GAMMA,CP,GAMW,VMUC,NA,ZZ,YCP,HALFB,OFJ,TDF,KSOL2030
     1CODE,F10,NTL)                                                     SOL2040
270   CONTINUE                                                          SOL2050
      DO 280 I=1,LWF                                                    SOL2060
      PC=ALPC                                                           SOL2070
      IF (I.GT.LPANEL) PC=1.                                            SOL2080
      IB=I+IA                                                           SOL2090
      CP(I)=CP(I)*ALPC                                                  SOL2100
280   GAMVR(IB)=(GAMVR(IB)+GAM(1,I))*PC                                 SOL2110
      WRITE (08) (GAMVR(I),I=1,LWFJ)                                    SOL2120
      RETURN                                                            SOL2130
C                                                                       SOL2140
      END                                                               SOL2150-
      SUBROUTINE SOLUJ (VMUC,VMU,TEMP,LPANEL,LPAN1,LPAN2,LWFJ,LTOTAL,LASSLJ  10
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     1T,ISYM,KCODE,EXIT,NW,NCJ,MJW1,MJJ,NA,NJP,ZZ,CAMTER,CAMTET,YCP,HALFSLJ  20
     2B,DFJ,TDF,GAMW,GAMMA,AW,CA,JPANEL,MJW2,P,RET,RL,LZ,F10,NTL,KF)     SLJ  30
      DIMENSION NW(1), NCJ(1), MJW1(3,1), MJJ(1), YCP(1), GAMMA(1), AW(1SLJ  40
     1), CA(1), GAMW(1), MJW2(3,1)                                        SLJ  50
      REWIND 09                                                           SLJ  60
      IPHI=1                                                              SLJ  70
      MJ=LPANEL+NCJ(1)                                                    SLJ  80
      LP1=LWFJ+1                                                          SLJ  90
      NA=3                                                                SLJ 100
      IF (NW(2).EQ.0) NA=1                                                SLJ 110
      IF (NW(2).NE.0.AND.NW(3).EQ.0) NA=2                                 SLJ 120
      INN=1                                                               SLJ 130
      JNN=1                                                               SLJ 140
      I=LAST+1                                                            SLJ 150
      IF (LZ.EQ.0) READ (03) (AW(K),K=1,LWFJ)                             SLJ 160
      IF (LZ.NE.0) READ (09) (AW(K),K=1,LWFJ)                             SLJ 170
      CALL STREAM (ALPHA,VMUC,I,IPHI,LPANEL,TEMP,LPAN1,LPAN2,ISYM,KCODE,SLJ 180
     1EXIT,MJ,GAMW,P,RET,RL,LZ,KF,NTL,F10)                                SLJ 190
      AW(LP1)=ALPHA                                                       SLJ 200
      DO 10 I=1,LWFJ                                                      SLJ 210
10    GAMMA(I)=-AW(I+1)/AW(1)                                             SLJ 220
      KI=2                                                                SLJ 230
      NI=LWFJ-1                                                           SLJ 240
      LI=LAST+2                                                           SLJ 250
      IH=NW(NA)+MJW1(NA,NJP)-1                                            SLJ 260
20    KJ=LI                                                               SLJ 270
      IF (LI.GT.LAST) KJ=LI-JPANEL                                        SLJ 280
      IF (LZ.EQ.0) READ (03) (AW(K),K=1,LWFJ)                             SLJ 290
      IF (LZ.NE.0) READ (09) (AW(K),K=1,LWFJ)                             SLJ 300
      ALPHA=0.                                                            SLJ 310
      IF (KI.GT.LTOTAL) GO TO 40                                          SLJ 320
      CALL STREAM (ALPHA,VMUC,LI,IPHI,LPANEL,TEMP,LPAN1,LPAN2,ISYM,KCODESLJ 330
     1,EXIT,MJ,GAMW,P,RET,RL,LZ,KF,NTL,F10)                               SLJ 340
      IF (LZ.NE.0) GO TO 40                                               SLJ 350
      IF (KCODE.EQ.0) GO TO 40                                            SLJ 360
      IF (ZZ.GE.0.01) GO TO 40                                            SLJ 370
C                                                                         SLJ 380
C  ADDITIONAL EXTERNAL FLOW DEFLECTION IS ALLOWED IF THE JET ANGLE IS     SLJ 390
C     GREATER THAN THE FLAP ANGLE BECAUSE OF THE EFFECT OF FINITE TRAI-   SLJ 400
C     LING-EDGE ANGLES. FOR THIN AIRFOILS, THIS CAN BE ELIMINATED BY      SLJ 410
C     INSERTING THE STATEMENT, IF (KCODE.EQ.1) GO TO 63                   SLJ 420
C                                                                         SLJ 430
      IF (LI.GE.MJW1(NA,NJP).AND.LI.LE.MJW2(NA,NJP)) GO TO 30             SLJ 440
      GO TO 40                                                            SLJ 450
30    IF (LI.NE.IH) GO TO 40                                              SLJ 460
      IF ((DFJ-TDF).LT.0.) GO TO 40                                       SLJ 470
      CZT=CAMTER-(CAMTER-CAMTET)*YCP(LI)/HALFB                            SLJ 480
      APA=0.5*(DFJ-TDF+CZT)                                               SLJ 490
      IF (VMU.GT.0.85) APA=APA*(1.-VMU)/0.15                              SLJ 500
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      IF (APA.LT.0.) APA=0.                                                  SLJ 510
      ALPHA=ALPHA+APA                                                        SLJ 520
      IH=IH+NW(NA)                                                           SLJ 530
40    CONTINUE                                                               SLJ 540
      AW(LP1)=ALPHA                                                          SLJ 550
      CALL VMSEQN (NT,KI,AW,GAMMA,CA)                                        SLJ 560
      IF (KJ.LT.MJ.OR.KJ.EQ.LAST) GO TO 50                                   SLJ 570
      IPHI=IPHI+1                                                            SLJ 580
      MJ=MJ+NCJ(INN)                                                         SLJ 590
50    CONTINUE                                                               SLJ 600
      MJI=MJJ(INN)-1                                                         SLJ 610
      IF (KJ.EQ.MJI) GO TO 60                                                SLJ 620
      GO TO 70                                                               SLJ 630
60    JNN=INN                                                                SLJ 640
      INN=INN+1                                                              SLJ 650
70    IF (KJ.EQ.MJJ(JNN)) IPHI=1                                             SLJ 660
      IF (LI.EQ.LTOTAL) GO TO 80                                             SLJ 670
      GO TO 90                                                               SLJ 680
80    CONTINUE                                                               SLJ 690
      IPHI=1                                                                 SLJ 700
      MJ=LPANEL+NCJ(1)                                                       SLJ 710
      JNN=1                                                                  SLJ 720
      INN=1                                                                  SLJ 730
90    CONTINUE                                                               SLJ 740
      KI=KI+1                                                                SLJ 750
      NI=NI-1                                                                SLJ 760
      IF (LI.EQ.LTOTAL) GO TO 100                                            SLJ 770
      IF (LI.EQ.LAST) GO TO 110                                              SLJ 780
      LI=LI+1                                                                SLJ 790
      GO TO 120                                                              SLJ 800
100   LI=LPANEL+1                                                            SLJ 810
      GO TO 120                                                              SLJ 820
110   LI=1                                                                   SLJ 830
120   CONTINUE                                                               SLJ 840
      IF (KI.LE.LWFJ) GO TO 20                                               SLJ 850
      RETURN                                                                 SLJ 860
C                                                                            SLJ 870
      END                                                                    SLJ 880-
      SUBROUTINE LATDIR (KF,AW,CA,GAMMA,GAMVR,GAMW,VMLC,NA,ZZ,YCP,HALFP,LAT  10
     1DFJ,TDF,KCODE,F10,NTL)                                                 LAT  20
      DIMENSION AW(1), CA(1), GAMMA(1), GAMVR(1), GAMW(1), YCP(1)            LAT  30
      COMMON /AERO/ AM1,AM2,R1,R2,CL(30),CT(30),CD(30),GAM(2,130)            LAT  40
      COMMON /SCME/ NC,NWING,LAT,NAL,LWF,LWFJ,CHORDT(3),SNG(5),YG(5),YCNLAT  50
     1(6),WKN,RDX,MDG,NDG                                                    LAT  60
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JLAT  70
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                             LAT  80
      COMMON /ADD/ CP(130),CM(30),BREAK(8),SWP(8,15),GAL(30),ISYM,VMU,VULAT  90
     1,TEMP,FCR,CAMLEP,CAMLET,CAMTER,CAMTET,XJ,YJ,ZJ,RJ,ALP,CREF,TWISTR LAT 100
      COMMON /COST/ LTOTAL,LPAN1,NJW(5),LPANEL,IENTN,LPAN2,EXIT,PTIAL,TWLAT 110
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      1IST,DF(5),NFP                                                        LAT 120
       REWIND 1                                                             LAT 130
       IA=2*JPANEL                                                          LAT 140
       CAM=CAMLER                                                           LAT 150
       CAMT=CAMLET                                                          LAT 160
       DO 10 I=1,LPANEL                                                     LAT 170
10     GAMMA(I)=CAM(2,I)                                                    LAT 180
       CALL GAMAX (AW,CA,LPAN1,LPANEL,GAMMA,NC,BREAK,SWP,CHORDT,LPAN2,NWILAT 190
      1NG,1)                                                                LAT 200
       WRITE (02) (CA(I),I=1,LPANEL)                                        LAT 210
       CALL GAMAX (AW,CA,LPAN1,LPANEL,GAMVR,NC,BREAK,SWP,CHORDT,LPAN2,NWILAT 220
      1NG,0)                                                                LAT 230
       WRITE (07) (CA(I),I=1,LPANEL)                                        LAT 240
       P=1.                                                                 LAT 250
       BET=0.                                                               LAT 260
       RL=0.                                                                LAT 270
       L=1                                                                  LAT 280
       B=B1                                                                 LAT 290
       DO 100 J=1,3                                                         LAT 300
       IF (KF.NE.0) GO TO 20                                                LAT 310
       IF (BET.GT.0..AND.MDG.EQ.0) GO TO 30                                 LAT 320
       IF (RL.GT.0..AND.MDG.EQ.0) GO TO 30                                  LAT 330
20     CONTINUE                                                             LAT 340
       CALL LATERL (GAMMA,AW,CA,LPANEL,LPAN1,LPAN2,LWF,DF,NAL,SNG,YG,B,P,LAT 350
      1BET,RL)                                                              LAT 360
       WRITE (01) (GAMMA(I),I=1,LWF)                                        LAT 370
       GO TO 50                                                             LAT 380
30     DO 40 KK=1,LWF                                                       LAT 390
40     GAMMA(KK)=0.                                                         LAT 400
       WRITE (01) (GAMMA(I),I=1,LWF)                                        LAT 410
50     CONTINUE                                                             LAT 420
       DO 60 I=1,LWF                                                        LAT 430
60     GAMW(I)=GAMMA(I)                                                     LAT 440
       CALL SOLUJ (VMUC,VMU,TEMP,LPANEL,LPAN1,LPAN2,LWFJ,LTOTAL,LAST,ISYMLAT 450
      1,KCODE,EXIT,AW,NCJ,MJW1,MJJ,NA,NJF,ZZ,CAMTER,CAMTET,YCP,HALFB,DFJ,LAT 460
      2TDF,GAMW,GAMMA,AW,CA,JPANEL,MJW2,P,BET,RL,1,F10,NTL,KF)              LAT 470
       DO 70 I=1,LWF                                                        LAT 480
       IB=IA+I                                                              LAT 490
70     GAMMA(IB)=GAMMA(IB)+GAMW(I)                                          LAT 500
       WRITE (08) (GAMMA(I),I=1,LWFJ)                                       LAT 510
       CALL THRUST (LTOTAL,LPANEL,GAMMA,GAMW,CAM,LPAN1,VU,XJ,YJ,ZJ,RJ,TEMLAT 520
      1P,GAL,ISYM,LPAN2,CAMT,SNG,YG,LWF,LWFJ,AW,CA,CM,P,BET,RL,0)           LAT 530
       WRITE (07) (CD(I),I=1,NCS)                                           LAT 540
       WRITE (02) (CM(I),I=1,NCS)                                           LAT 550
       CALL GAMAX (AW,CA,LPAN1,LPANEL,GAMW,NC,BREAK,SWP,CHORDT,LPAN2,NWILAT 560
      1G,1)                                                                 LAT 570
       DO 80 K=1,LPANEL                                                     LAT 580
       IB=K+IA                                                              LAT 590
80     GAMMA(K)=GAMMA(IB)                                                   LAT 600
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      CALL GAMAX (AW,CA,LPAN1,LPANEL,GAMMA,NC,BREAK,SWP,CHORDT,LPAN2,NWILAT 610
     1NG,0)                                                              LAT 620
      IF (J.EQ.2) GO TO 90                                               LAT 630
      IF (J.EQ.3) GO TO 100                                              LAT 640
      BET=1.                                                             LAT 650
      P=0.                                                               LAT 660
      GO TO 100                                                          LAT 670
 90   RL=1.                                                              LAT 680
      BET=0.                                                             LAT 690
100   CONTINUE                                                           LAT 700
      RETURN                                                             LAT 710
C                                                                        LAT 720
      END                                                                LAT 730
      SUBROUTINE STREAM (ALPHA,VMU,I,IPHI,LPANEL,TEMP,LPAN1,LPAN2,ISYM,KSTR  10
     1CODE,EXIT,MJ,GAMW,P,BET,RL,LZ,KF,NTL,F10)                          STR  20
C     TO COMPUTE THE RIGHT HAND SIDE OF THE SIMULTANEOUS EQUATIONS       STR  30
      DIMENSION PHIN(300), GAMW(1)                                       STR  40
      DIMENSION FJS(30), FJA(30), CQP(2,30)                              STR  50
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),STR  60
     1XLL(41)                                                            STR  70
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTSTR  80
     1F(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZSTR  90
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95STR 100
     3,2),SC(160,5),SI(160,5),LC(3)                                      STR 110
      COMMON /AERO/ AM1,AM2,P1,P2,CL(30),CT(30),CD(30),GAM(2,130)        STR 120
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JSTR 130
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                         STR 140
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                       STR 150
      EQUIVALENCE (X(1,1),PHIN(1))                                       STR 160
      PI=3.14159265                                                      STR 170
      IUSB=YCON(24)                                                      STR 180
      ZJET=YCON(25)                                                      STR 190
      BK=5.*PI/180.                                                      STR 200
      N1=NNJ-1                                                           STR 210
      N2=NNJ-2                                                           STR 220
      N3=NNJ-3                                                           STR 230
      IF (NNJ.EQ.1) N1=1                                                 STR 240
      NJH=(NSJ+1)/2+1                                                    STR 250
      IF (ISYM.EQ.0) NJH=NSJ/2                                           STR 260
      NP=NJH-1                                                           STR 270
      IF (ISYM.EQ.0) NP=NJH                                              STR 280
      ALPHA=0.                                                           STR 290
      IF (I.GT.LPANEL) GO TO 10                                          STR 300
      GO TO 310                                                          STR 310
 10   IF (I.GT.LAST) GO TO 110                                           STR 320
      IF (EXIT.LE.0.001) GO TO 20                                        STR 330
      IF (NNJ.EQ.1) GO TO 20                                             STR 340
      IF (I.LE.MJJ(1).AND.I.NE.MJ) GO TO 310                             STR 350
 20   CONTINUE                                                           STR 360
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      IF (LZ.NE.0) GO TO 30                                                  STR 370
      ALPHA=ALPS/ALPC*Y(3,IPHI)*(1.-VMU)                                     STR 380
      IF (KCODE.EQ.0) ALPHA=0.                                               STR 390
      IF (TH.LE.0.001) GO TO 40                                              STR 400
      IF (IPHI.EQ.NJH) GO TO 40                                              STR 410
      IF (ISYM.NE.0.AND.IPHI.EQ.1) GO TO 40                                  STR 420
      IF (NNJ.EQ.1.AND.I.GT.LPANEL) ALPHA=ALPHA+CDF*(1.-VMU)                 STR 430
      IF (NNJ.NE.1.AND.I.GT.MJJ(N1)) ALPHA=ALPHA+CDF*(1.-VMU)                STR 440
      GO TO 40                                                               STR 450
30    ALPHA=(-BET*BK*Y(4,IPHI)+P*YCP(I)/HALFR*Y(3,IPHI)+RL*XCP(I)/HALFB*STR 460
     1Y(4,IPHI))*(1.-VMU)                                                    STR 470
40    CONTINUE                                                               STR 480
      IF (ABS(B1-B2).LE.0.001) GO TO 50                                      STR 490
      IF (LZ.NE.0) GO TO 50                                                  STR 500
      CALL NORSPD (I,ALPH,LPANEL,IPHI,LPAN1,LPAN2,KF,NTL,F10)                STR 510
      ALPHA=ALPHA+ALPH                                                       STR 520
50    IF (KCODE.EQ.0) GO TO 310                                              STR 530
      IF (EXIT.LE.0.001) GO TO 60                                            STR 540
      IF (NNJ.EQ.1) GO TO 60                                                 STR 550
      IF (I.LE.MJJ(1).AND.I.EQ.MJ) ALPHA=ALPHA/2.                            STR 560
60    IF (IPHI.EQ.NJH) GO TO 310                                             STR 570
      IF (LZ.NE.0) GO TO 310                                                 STR 580
      IF (ISYM.NE.0.AND.IPHI.EQ.1) GO TO 310                                 STR 590
      IF (IUSR.EQ.1.AND.ZJET.GT.0.01) GO TO 310                              STR 600
      IF (CDF.LT.0.0001) GO TO 310                                           STR 610
      IF (NNJ.EQ.1) GO TO 70                                                 STR 620
      IF (I.LE.MJJ(N1)) GO TO 310                                            STR 630
70    IF (IPHI.LT.NJH) IL=IPHI+ISYM                                          STR 640
      IF (IPHI.GT.NJH) IL=IPHI-NJH+ISYM                                      STR 650
      IF (NNJ.EQ.1) MJN1=LPANEL                                              STR 660
      IF (NNJ.NE.1) MJN1=MJJ(N1)                                             STR 670
      MF=I-MJN1-(IPHI-1)*NCJ(NNJ)                                            STR 680
      FNNJ=NCJ(NNJ)                                                          STR 690
      DISTJ=SDF                                                              STR 700
      DLX=DISTJ*0.5*PI/FNNJ                                                  STR 710
      SZX=-(1.-VMU)                                                          STR 720
      IQ=(IL-1)*NCJ(NNJ)                                                     STR 730
      IF (NNJ.EQ.1) IP=LPANEL+IQ+1                                           STR 740
      IF (NNJ.NE.1) IP=MJJ(N1)+IQ+1                                          STR 750
      DO 100 JJ=1,MF                                                         STR 760
      IF (JJ.EQ.MF) GO TO 80                                                 STR 770
      DXTH=DLX*PSI(JJ)*TEMP*VML*VMU/TH                                       STR 780
      GO TO 90                                                               STR 790
80    DXTH=DLX*PSI(JJ)*TEMP*0.5*VMU*VMU/TH                                   STR 800
90    JK1=IP+JJ                                                              STR 810
      JK2=JK1-1                                                              STR 820
      PROD=SZX*DXTH                                                          STR 830
      JK3=JK2+NP*NCJ(NNJ)                                                    STR 840
      ALPHA=ALPHA+PROD*(PHIN(JK2)-PHIN(JK3))                                 STR 850
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100   CONTINUE                                                          STR 860
      GO TO 310                                                         STR 870
110   CONTINUE                                                          STR 880
      IJ=I-JPANEL                                                       STR 890
      JZ=1                                                              STR 900
      K3=0                                                              STR 910
      KQ=0                                                              STR 920
      FAC=1.                                                            STR 930
      IF (KCODE.EQ.0) GO TO 290                                         STR 940
      IF (FXIT.LE.0.01) GO TO 120                                       STR 950
      IF (NNJ.EQ.1) GO TO 120                                           STR 960
      IF (IJ.GT.LPANEL.AND.IJ.LE.MJJ(1)) GO TO 310                      STR 970
120   CONTINUE                                                          STR 980
      ADDT=0.                                                           STR 990
      IF (KF.EQ.0) GO TO 170                                            STR1000
      CALL FSPEED (B1,XCP(IJ),YCP(IJ),ZCP(IJ),CQP,WK1,WK2)              STR1010
      AL1=0.                                                            STR1020
      IF (LZ.EQ.0) AL1=F10*WK2                                          STR1030
      DO 130 LK=1,NTL                                                   STR1040
      IF  LZ.EQ.0) FEF=CQP(2,LK)                                        STR1050
      IF (LZ.NE.0) FEF=CQP(1,LK)                                        STR1060
      KK=LPANEL+LK                                                      STR1070
      IF (LZ.EQ.0) GA=GAM(1,KK)                                         STR1080
      IF (LZ.NE.0) GA=GAMW(KK)                                          STR1090
130   AL1=AL1+FEF*GA                                                    STR1100
      IF (ABS(B1-B2).LE.0.001) GO TO 150                                STR1110
      IF (LZ.NE.0) GO TO 150                                            STR1120
      CALL FSPEED (B2,XCP(IJ),YCP(IJ),ZCP(IJ),CQP,WK1,WK2)              STR1130
      AL2=0.                                                            STR1140
      IF (LZ.EQ.0) AL2=F10*WK2                                          STR1150
      DO 140 LK=1,NTL                                                   STR1160
      IF (LZ.EQ.0) FEF=CQP(2,LK)                                        STR1170
      IF (LZ.NE.0) FEF=CQP(1,LK)                                        STR1180
      KK=LPANEL+LK                                                      STR1190
      IF (LZ.EQ.0) GA=GAM(2,KK)                                         STR1200
140   AL2=AL2+FEF*GA                                                    STR1210
      GO TO 160                                                         STR1220
150   AL2=AL1                                                           STR1230
160   ADDT=AL2-TEMP*VNU*VMU*AL1                                         STR1240
170   CONTINUE                                                          STR1250
      IF (IUSR.EQ.1.AND.ZJET.GT.0.01) GO TO 290                         STR1260
      IF (NNJ.EQ.1) GO TO 290                                           STR1270
      IF (IJ.GT.MJJ(N1)) GO TO 290                                      STR1280
      IF (IPHI.LE.NJH) GO TO 290                                        STR1290
      L1=NJH                                                            STR1300
      IF (ISYM.EQ.0) L1=NJH+1                                           STR1310
      IF (NW(2).EQ.0) GO TO 190                                         STR1320
      IF (NW(3).EQ.0) GO TO 180                                         STR1330
      IF (IJ.GT.MJJ(N2)) GO TO 240                                      STR1340
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      IF (IJ.GT.MJJ(N3)) GO TO 220                                      STR1350
      IF (NNJ.EQ.4) GO TO 200                                           STR1360
      IF (NNJ.EQ.5.AND.IJ.GT.MJJ(NNJ-4)) GO TO 200                      STR1370
      GO TO 290                                                         STR1380
  180 IF (IJ.GT.MJJ(N2)) GO TO 220                                      STR1390
      IF (NNJ.EQ.3) GO TO 200                                           STR1400
      IF (NNJ.EQ.4.AND.IJ.GT.MJJ(N3)) GO TO 200                         STR1410
      GO TO 290                                                         STR1420
  190 IF (NNJ.EQ.2) GO TO 200                                           STR1430
      IF (NNJ.EQ.3.AND.IJ.GT.MJJ(N2)) GO TO 200                         STR1440
      GO TO 290                                                         STR1450
  200 K1=MJW1(1,NJP)+(IPHI-L1-ISYM)*NW(1)-1                             STR1460
      K2=LC(1)+IPHI-L1-ISYM                                             STR1470
      KNW=NW(1)                                                         STR1480
      IF (IJ.NE.MJ) GO TO 250                                           STR1490
      IF (EXIT.LE.0.0).AND.NW(2).NE.0) GO TO 210                        STR1500
      GO TO 250                                                         STR1510
  210 JZ=2                                                              STR1520
      K3=LPAN1+(K2-1)*NW(2)                                             STR1530
      KQ=NW(2)                                                          STR1540
      FAC=0.5                                                           STR1550
      GO TO 250                                                         STR1560
  220 K1=MJW1(2,NJP)+(IPHI-L1-ISYM)*NW(2)-1                             STR1570
      K2=LC(2)+IPHI-L1-ISYM                                             STR1580
      KNW=NW(2)                                                         STR1590
      IF (IJ.NE.MJ) GO TO 250                                           STR1600
      IF (ABS(EXIT-1.).LE.0.00).AND.NW(3).NE.0) GO TO 230               STR1610
      GO TO 250                                                         STR1620
  230 JZ=2                                                              STR1630
      K3=LPAN2+(K2-1-NCS)*NW(3)                                         STR1640
      KQ=NW(3)                                                          STR1650
      FAC=0.5                                                           STR1660
      GO TO 250                                                         STR1670
  240 K1=MJW1(3,NJP)+(IPHI-L1-ISYM)*NW(3)-1                             STR1680
      K2=LC(3)+IPHI-L1-ISYM                                             STR1690
      KNW=NW(3)                                                         STR1700
  250 CONTINUE                                                          STR1710
      ALPHA1=0.                                                         STR1720
      ALPHA2=0.                                                         STR1730
      DO 280 JL=1,JZ                                                    STR1740
      DO 270 KK=1,KNW                                                   STR1750
      KL=K1+KK                                                          STR1760
      AA=1.                                                             STR1770
      DO 260 L=1,KNW                                                    STR1780
      LL=K1+L                                                           STR1790
      IF (L.EQ.KK) GO TO 260                                            STR1800
      AA=AA*(XCP(IJ)-XV(LL))/(XV(KL)-XV(LL))                            STR1810
  260 CONTINUE                                                          STR1820
      IF (LZ.EQ.0) GA=GAM(1,KL)                                         STR1830
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      IF (LZ.NE.0) GA=GAMW(KL)                                          STR1840
      ALPHA1=ALPHA1+AA*GA                                               STR1850
      IF (ABS(B1-B2).LE.0.001) GO TO 270                                STR1860
      IF (LZ.EQ.0) GA=GAM(2,KL)                                         STR1870
      IF (LZ.NE.0) GA=GAMW(KL)                                          STR1880
      ALPHA2=ALPHA2+AA*GA                                               STR1890
270   CONTINUE                                                          STR1900
      KNW=KQ                                                            STR1910
280   K1=K3                                                             STR1920
      ALPHA1=ALPHA1*FAC                                                 STR1930
      ALPHA2=ALPHA2*FAC                                                 STR1940
      IF (ABS(B1-B2).LE.0.001) ALPHA2=ALPHA1                            STR1950
      ALPHA=(ALPHA2-TEMP*VMU*VMU*ALPHA1)*0.5+ADDT                       STR1960
      GO TO 310                                                         STR1970
290   CONTINUE                                                          STR1980
      CALL SPEED (VMU,I,ALPHA,LPANEL,TEMP,LPAN1,LPAN2,PHIS,IPHI,ISYM,GAMSTR1990
     1W,LZ)                                                             STR2000
      ALPHA=ALPHA*FAC+ADDT*FAC                                          STR2010
      IF (KCODE.EQ.0) GO TO 310                                         STR2020
      IF (CDF.LT.0.0001) GO TO 310                                      STR2030
      IF (NNJ.EQ.1) GO TO 300                                           STR2040
      IF (IJ.LE.MJJ(N1)) GO TO 310                                      STR2050
300   PHIN(IJ)=PHIS                                                     STR2060
310   CONTINUE                                                          STR2070
      RETURN                                                            STR2080
C                                                                       STR2090
      END                                                               STR2100-
      SUBROUTINE GAMAX (AW,CA,LPAN1,LPANEL,GAMMA,NC,BREAK,SWP,CHORDT,LPAGAM  10
     1N2,NWING,KZ)                                                      GAM  20
      DIMENSION AW(1), CA(1), GAMMA(1), BREAK(1)                        GAM  30
      DIMENSION SWP(8,15)                                               GAM  40
      DIMENSION G(10), CHORDT(1)                                        GAM  50
      DIMENSION A(15), F(15), THETA(15)                                 GAM  60
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)       GAM  70
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTGAM  80
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZGAM  90
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFR,SJ(21,8),EX(95,2),TX(95GAM 100
     3,2),SC(160,5),SI(160,5),LC(3)                                     GAM 110
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JGAM 120
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                        GAM 130
      PI=3.14159265                                                     GAM 140
      DO 80 I=1,NCS                                                     GAM 150
      NA=1                                                              GAM 160
      NK=(I-1)*NW(1)                                                    GAM 170
      SUMI=0.                                                           GAM 180
      NWW=NW(1)                                                         GAM 190
      ISN=1                                                             GAM 200
      FN=NW(1)                                                          GAM 210
10    N1=NWW+1                                                          GAM 220
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      DO 20 J=1,NWW                                                    GAM 230
      KK=NK+J                                                          GAM 240
      FJ=J                                                             GAM 250
      THETA(J)=(2.*FJ-1.)*PI/(2.*FN)                                   GAM 260
      F(J)=GAMMA(KK)*SN(J,ISN)                                         GAM 270
20    CONTINUE                                                         GAM 280
      THETA(N1)=PI                                                     GAM 290
      DO 40 J=1,N1                                                     GAM 300
      A(J)=0.                                                          GAM 310
      FJ=J                                                             GAM 320
      DO 30 K=1,NWW                                                    GAM 330
30    A(J)=A(J)+F(K)*COS((FJ-1.)*THETA(K))                             GAM 340
      IF (J.EQ.1) A(J)=A(J)/FN                                         GAM 350
      IF (J.NE.1) A(J)=A(J)*2./FN                                      GAM 360
40    CONTINUE                                                         GAM 370
      DO 60 K=1,N1                                                     GAM 380
      KK=NK+K                                                          GAM 390
      SUM=A(1)*THETA(K)                                                GAM 400
      DO 50 J=1,NWW                                                    GAM 410
      FJ=J                                                             GAM 420
50    SUM=SUM+A(J+1)*SIN(FJ*THETA(K))/FJ                               GAM 430
      IZ=I                                                             GAM 440
      IF (NA.EQ.2) IZ=I+NCS                                            GAM 450
      IF (NA.EQ.3) IZ=I+2*NCS                                          GAM 460
      SUM=-0.5*CH(IZ)*SUM+SUMI                                         GAM 470
      IF (K.EQ.N1) GO TO 60                                            GAM 480
      AW(KK)=SUM                                                       GAM 490
60    CONTINUE                                                         GAM 500
      IF (NA.EQ.3) GO TO 70                                            GAM 510
      IF ((NA+1).LE.3.AND.NW(NA+1).EQ.0) GO TO 70                      GAM 520
      NA=NA+1                                                          GAM 530
      NWW=NW(NA)                                                       GAM 540
      IF (NA.EQ.2) NK=LPAN1+(I-1)*NW(2)                                GAM 550
      IF (NA.EQ.3) NK=LPAN2+(I-1)*NW(3)                                GAM 560
      ISN=ISN+1                                                        GAM 570
      FN=NWW                                                           GAM 580
      SUMI=SUM                                                         GAM 590
      GO TO 10                                                         GAM 600
70    CONTINUE                                                         GAM 610
80    CONTINUE                                                         GAM 620
      NK1=0                                                            GAM 630
      NK2=LPAN1                                                        GAM 640
      NK3=LPAN2                                                        GAM 650
      DO 250 I=1,NC                                                    GAM 660
      HAF=HALF8                                                        GAM 670
      M=N1(I)                                                          GAM 680
      FM=M                                                             GAM 690
      MM=M-1                                                           GAM 700
      DO 90 J=1,MM                                                     GAM 710
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      FJ=J                                                              GAM 720
      YCON(J)=COS(FJ*PI/FM)                                             GAM 730
      Y=0.5*WIDTH(I)*(1.-YCON(J))+BREAK(I)                              GAM 740
90    PSI(J)=SQRT(1.-(Y/HAB)**2)                                        GAM 750
      DO 230 J=1,NCW                                                    GAM 760
      G(J)=0.                                                           GAM 770
      IF (J.GT.NW(1)) GO TO 100                                         GAM 780
      NK=NK1                                                            GAM 790
      LK=0                                                              GAM 800
      IR1=I                                                             GAM 810
      JJ=J                                                              GAM 820
      MK=NW(1)                                                          GAM 830
      GO TO 120                                                         GAM 840
100   IF (J.GT.(NW(1)+NW(2))) GO TO 110                                 GAM 850
      NK=NK2                                                            GAM 860
      MK=NW(2)                                                          GAM 870
      LK=NW(1)                                                          GAM 880
      IR1=I+NC                                                          GAM 890
      JJ=J-NW(1)                                                        GAM 900
      GO TO 120                                                         GAM 910
110   NK=NK3                                                            GAM 920
      MK=NW(3)                                                          GAM 930
      LK=NW(1)+NW(2)                                                    GAM 940
      IR1=I+2*NC                                                        GAM 950
      JJ=J-NW(1)-NW(2)                                                  GAM 960
120   L1=NK+J-LK                                                        GAM 970
      L2=L1+MK                                                          GAM 980
      L3=L2+MK                                                          GAM 990
      SP=SWP(JJ,IR1)                                                    GAM1000
      CS=COS(SP)                                                        GAM1010
      TAN=SIN(SP)/CS                                                    GAM1020
      SM=0.                                                             GAM1030
      DO 140 LQ=1,MM                                                    GAM1040
      LP=L1+(LQ-1)*MK                                                   GAM1050
      AA=1.                                                             GAM1060
      DO 130 LS=1,MM                                                    GAM1070
      LN=L1+(LS-1)*MK                                                   GAM1080
      IF (LS.EQ.LQ) GO TO 130                                           GAM1090
      AA=AA*(BREAK(I)-YCP(LN))/(YCP(LP)-YCP(LN))                        GAM1100
130   CONTINUE                                                          GAM1110
140   SM=SM+AA*AW(LP)*PSI(LQ)                                           GAM1120
      GAMAO=SM                                                          GAM1130
      IF (I.EQ.NC) GO TO 170                                            GAM1140
      SM=0.                                                             GAM1150
      DO 160 LQ=1,MM                                                    GAM1160
      LP=L1+(LQ-1)*MK                                                   GAM1170
      AA=1.                                                             GAM1180
      DO 150 LS=1,MM                                                    GAM1190
      LN=L1+(LS-1)*MK                                                   GAM1200
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      IF (LS.EQ.LQ) GO TO 150                                                GAM1210
      AA=AA*(BREAK(I+1)-YCP(LN))/(YCP(LP)-YCP(LN))                           GAM1220
150   CONTINUE                                                               GAM1230
160   SM=SM+AA*AW(LP)*PSI(LQ)                                                GAM1240
      GAMAN=SM                                                               GAM1250
      GO TO 180                                                              GAM1260
170   GAMAN=0.                                                               GAM1270
180   DO 210 K=1,MM                                                          GAM1280
      LL=NK+(K-1)*MK+J-LK                                                    GAM1290
      CA(LL)=0.                                                              GAM1300
      DO 200 KK=1,MM                                                         GAM1310
      LI=NK+(KK-1)*MK+J-LK                                                   GAM1320
      IF (KK.EQ.K) GO TO 190                                                 GAM1330
      CA(LL)=CA(LL)+2.*(-1.)**(K+KK)*AW(LI)*PSI(KK)/(WIDTH(I)*(YCON(KK)-GAM1340
     1YCON(K)))                                                              GAM1350
      GO TO 200                                                              GAM1360
190   CA(LL)=CA(LL)+AW(LL)*PSI(K)*YCON(K)/(WIDTH(I)*SJ(K,I)*SJ(K,I))        GAM1370
200   CONTINUE                                                               GAM1380
      CA(LL)=CA(LL)+GAMAC*(-1.)**K/(1.-YCON(K))/WIDTH(I)-GAMAN*(-1.)**(MGAM1390
     1+K)/(1.+YCON(K))/WIDTH(I)+AW(LL)*YCP(LL)/(HAB*HAB*PSI(K))             GAM1400
      CA(LL)=CA(LL)/PSI(K)                                                   GAM1410
      IF (I.NE.NC) GO TO 210                                                 GAM1420
      G(J)=G(J)+AW(LL)*PSI(K)*(-1.)**(K+M)/(1.+YCON(K))                      GAM1430
210   CA(LL)=TAN*GAMMA(LL)+CA(LL)                                            GAM1440
      IF (J.EQ.NW(1)) NK1=LL                                                 GAM1450
      IF (J.EQ.(NW(1)+NW(2))) NK2=LL                                         GAM1460
      IF (I.EQ.NC) GO TO 220                                                 GAM1470
      GO TO 230                                                              GAM1480
220   CONTINUE                                                               GAM1490
      G(J)=2./WIDTH(I)*G(J)+0.5*(-1.)**M*GAMA0/WIDTH(I)                      GAM1500
      G(J)=G(J)*SQRT(HAB)/2.828427124                                        GAM1510
      CL(J)=G(J)                                                             GAM1520
230   CONTINUE                                                               GAM1530
      NK3=LL                                                                 GAM1540
      IF (I.EQ.NC) GO TO 240                                                 GAM1550
      GO TO 250                                                              GAM1560
240   CONTINUE                                                               GAM1570
      IF (KZ.EQ.0) WRITE (07) (CL(JJ),JJ=1,NCW)                              GAM1580
      IF (KZ.NE.0) WRITE (02) (CL(JJ),JJ=1,NCW)                              GAM1590
250   CONTINUE                                                               GAM1600
      RETURN                                                                 GAM1610
C                                                                            GAM1620
      END                                                                    GAM1630-
      SUBROUTINE LATERL (GAMMA,AW,CA,LPANEL,LPAN1,LPAN2,LWF,DF,NAL,SNG,YLRL  10
     1G,P,P,BET,RL)                                                          LRL  20
      DIMENSION GAMMA(1), AW(1), CA(1), DF(1), SNG(1), YG(1)                 LRL  30
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTLRL  40
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZLRL  50
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95LRL  60
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     3,2),SC(160,5),SI(160,5),LC(3)                                          LRL  70
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JLRL  80
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                             LRL  90
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCLRL 100
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                         LRL 110
      L1=LWF+1                                                               LRL 120
      REWIND 04                                                              LRL 130
      PI=3.14159265                                                          LRL 140
      SK=SNG(1)                                                              LRL 150
      BK=5.*PI/180.                                                          LRL 160
      READ (04) (AW(I),I=1,L1)                                               LRL 170
      AW(L1)=P*YCP(1)/HALFB+BK*SK*BET-RL*XCP(1)/HALFB*SK                     LRL 180
      WN=0.                                                                  LRL 190
      IF (KF.EQ.0) GO TO 10                                                  LRL 200
      X=XCP(1)                                                               LRL 210
      Y=YCP(1)                                                               LRL 220
      Z=ZCP(1)                                                               LRL 230
      WK=0.                                                                  LRL 240
      G=0.                                                                   LRL 250
      CALL FUSVOL (B,X,Y,Z,WN,WK,G,1,1)                                      LRL 260
10    AW(L1)=AW(L1)+WN                                                       LRL 270
      DO 20 I=1,LWF                                                          LRL 280
20    GAMMA(I)=-AW(I+1)/AW(1)                                                LRL 290
      NJ=LWF-1                                                               LRL 300
      MM=NW(1)                                                               LRL 310
      NN=NW(1)                                                               LRL 320
      KW=1                                                                   LRL 330
      I7=1                                                                   LRL 340
      DO 60 IJ=2,LWF                                                         LRL 350
      READ (04) (AW(K),K=1,L1)                                               LRL 360
      IF (IJ.LE.LPANEL) GO TO 30                                             LRL 370
      I=IJ-LPANEL                                                            LRL 380
      AW(L1)=0.                                                              LRL 390
      IF (I.GT.NF) GO TO 70                                                  LRL 400
      AW(L1)=(-BK*BET+RL*XCF(I)/HALFB)*RF(I)*RF(I)                           LRL 410
      GO TO 70                                                               LRL 420
30    IF (YCP(IJ).GT.YG(KW)) GO TO 40                                        LRL 430
      GO TO 50                                                               LRL 440
40    KW=KW+1                                                                LRL 450
      SK=SNG(KW)                                                             LRL 460
50    AW(L1)=P*YCP(IJ)/HALFB+BET*BK*SK-RL*XCP(IJ)/HALFB*SK                   LRL 470
      WN=0.                                                                  LRL 480
      IF (KF.EQ.0) GO TO 60                                                  LRL 490
      X=XCP(IJ)                                                              LRL 500
      Y=YCP(IJ)                                                              LRL 510
      Z=ZCP(IJ)                                                              LRL 520
      CALL FUSVOL (B,X,Y,Z,WN,WK,G,1,1)                                      LRL 530
60    AW(L1)=AW(L1)+WN                                                       LRL 540
70    IK=IJ                                                                  LRL 550
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      CALL VMSEQN (NJ,IK,AW,GAMMA,CA)                                   LRL 560
      NJ=NJ-1                                                           LRL 570
      IF (IJ.GE.LPAN1.AND.IJ.LT.LPAN2) NN=NW(2)                         LRL 580
      IF (IJ.GE.LPAN2.AND.IJ.LT.LPANFL) NN=NW(3)                        LRL 590
      IF (IJ.LT.MM) GO TO 80                                            LRL 600
      MM=MM+NN                                                          LRL 610
      IZ=IZ+1                                                           LRL 620
80    IF (IJ.EQ.LPAN1.OR.IJ.EQ.LPAN2) IZ=1                              LRL 630
      IF (IJ.EQ.LPAN1.OR.IJ.EQ.LPAN2) KW=1                              LRL 640
90    CONTINUE                                                          LRL 650
      RETURN                                                            LRL 660
C                                                                       LRL 670
      END                                                               LRL 680-
      SUBROUTINE INDVEL (XD,Y,ZD,XJ,YJ,ZJ,RJ,R2,PHRV,PHX,T,L,PHY,ISYM)  IND  10
C     TO COMPUTE THE INDUCED VELOCITIES DUE TO JET ENTRAINMENT          IND  20
      DIMENSION VZ(2), VX(2), VY(2)                                     IND  30
      COMMON /JET/ PK1,XC,X(31),A(31),B(31)                             IND  40
      REJ=T                                                             IND  50
      VZ(2)=0.                                                          IND  60
      VX(2)=0.                                                          IND  70
      VY(2)=0.                                                          IND  80
      SRJ=SQRT(REJ)                                                     IND  90
      XB=(XD-XJ)/RJ                                                     IND 100
      NCCT=ISYM+1                                                       IND 110
      DO 40 K=1,NCCT                                                    IND 120
      IF (K.EQ.1) FC=1.                                                 IND 130
      IF (K.EQ.2) FC=-1.                                                IND 140
      RR=SQRT((ZD-ZJ)**2+(Y*FC-YJ)**2)/RJ                               IND 150
      F1=SQRT((XB-XC)**2+B2*RR*RR)                                      IND 160
      F2=SQRT(XB**2+B2*RR*RR)                                           IND 170
      G10=(XB-XC)/F1-XB/F2                                              IND 180
      G20=1./F1-1./F2                                                   IND 190
      SUMR=-(A(1)+B(1)*XB)*G10/RR-B2*RR*B(1)*G20                        IND 200
      SUMX=(A(1)+B(1)*XB)*G20-B(1)*G10+B(1)*ALOG((XB-XC+F1)/(XB+F2))    IND 210
      IF (U.LE.0.01) GO TO 20                                           IND 220
      J=2                                                               IND 230
10    SUM1=SUMR                                                         IND 240
      SUM2=SUMX                                                         IND 250
      F1=SQRT((XB-X(J))**2+B2*RR*RR)                                    IND 260
      F2=SQRT((XB-X(J-1))**2+B2*RR*RR)                                  IND 270
      G1=(XB-X(J))/F1-(XB-X(J-1))/F2                                    IND 280
      G2=1./F1-1./F2                                                    IND 290
      SUMR=SUMR-(A(J)+B(J)*XB)*G1/RR-B2*RR*B(J)*G2                      IND 300
      SUMX=SUMX+(A(J)+B(J)*XB)*G2-B(J)*G1+B(J)*ALOG((XB-X(J)+F1)/(XB-X(JIND 310
     1-1)+F2))                                                          IND 320
      IF (J.GE.31) GO TO 30                                             IND 330
      J=J+1                                                             IND 340
      GO TO 10                                                          IND 350
20    SUMR=SUMR+0.32*(1.+(XB-XC)/F1)/RR                                 IND 360
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      SUMX=SUMX-0.32/F1                                                 IND 370
30    PHRV=SRJ*0.25*SUMR*(ZJ-ZC)/(RR*RJ)                                IND 380
      PHY=-SRJ*0.25*SUMR*(Y-YJ*FC)/(RR*RJ)                              IND 390
      PHX=-SRJ*0.25*SUMX                                                IND 400
      VX(K)=PHX/2.                                                      IND 410
      VY(K)=PHY/2.                                                      IND 420
40    VZ(K)=PHRV/2.                                                     IND 430
      PHRV=VZ(1)+VZ(2)                                                  IND 440
      PHX=VX(1)+VX(2)                                                   IND 450
      PHY=VY(1)+VY(2)                                                   IND 460
      RETURN                                                            IND 470
C                                                                       IND 480
      END                                                               IND 490-
      SUBROUTINE SPEED (VMU,I,ALPHA,LPANEL,TEMP,LPAN1,LPAN2,PHIS,IPHI,ISSPD  10
     1YM,GAMW,LZ)                                                       SPD  20
C     TO COMPUTE THE INDUCED TANGENTIAL VELOCITIES DUE  TO WING ALONE   SPD  30
C     VORTICES                                                          SPD  40
      DIMENSION SU(100), GAMW(1)                                        SPD  50
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),SPD  60
     1XLL(41)                                                           SPD  70
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YL (50),XTSPD  80
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZSPD  90
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFR,SJ(21,8),EX(95,2),TX(95SPD 100
     3,2),SC(160,5),SI(160,5),LC(3)                                     SPD 110
      COMMON /AERO/ AM1,AM2,R1,R2,CL(30),CT(30),CD(30),GAM(2,130)       SPD 120
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JSPD 130
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                        SPD 140
      N1=NNJ-1                                                          SPD 150
      N2=NNJ-2                                                          SPD 160
      N3=NNJ-3                                                          SPD 170
      ZJET=YCON(25)                                                     SPD 180
      II=I-JPANEL                                                       SPD 190
      RR=R1                                                             SPD 200
      IC=1                                                              SPD 210
10    CONTINUE                                                          SPD 220
      IZ=1                                                              SPD 230
      MM=0                                                              SPD 240
      ISN=1                                                             SPD 250
      NL=NW(1)                                                          SPD 260
      NM=NW(1)                                                          SPD 270
      R=0.                                                              SPD 280
      DO 70 J=1,LPANEL                                                  SPD 290
      JJ=J-MM                                                           SPD 300
      FN=NL                                                             SPD 310
      IF (J.GT.LPAN1.AND.J.LE.LPAN2) ISN=2                              SPD 320
      IF (J.GT.LPAN2.AND.J.LE.LPANEL) ISN=3                             SPD 330
      IF (J.GE.LPAN1.AND.J.LT.LPANEL) GO TO 20                          SPD 340
      GO TO 30                                                          SPD 350
20    NL=NW(2)                                                          SPD 360
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      IF (J.GE.LPAN2.AND.J.LT.LPANEL) NL=NW(3)                          SPD 370
30    CONTINUE                                                          SPD 380
      X1=XN(J,1)-XCP(II)                                                SPD 390
      X2=XN(J,2)-XCP(II)                                                SPD 400
      X12=XN(J,2)-XN(J,1)                                               SPD 410
      Y12=YN(J,2)-YN(J,1)                                               SPD 420
      Z1=ZN(J,1)-ZCP(II)                                                SPD 430
      Z2=ZN(J,2)-ZCP(II)                                                SPD 440
      Z12=ZN(J,2)-ZN(J,1)                                               SPD 450
      XZJ=X1*Z12-Z1*X12                                                 SPD 460
      DO 60 K=1,2                                                       SPD 470
      IF (K.EQ.1) GO TO 40                                              SPD 480
      N=1                                                               SPD 490
      GO TO 50                                                          SPD 500
40    N=2                                                               SPD 510
50    CONTINUE                                                          SPD 520
      YC=(-1.)**N*YCP(II)                                               SPD 530
      Y1=YN(J,1)-YC                                                     SPD 540
      Y2=YN(J,2)-YC                                                     SPD 550
      XYK=X1*Y12-Y1*X12                                                 SPD 560
      YZI=Y1*Z12-Z1*Y12                                                 SPD 570
      ALB1=XYK*XYK+XZJ*XZJ+BB*YZI*YZI                                   SPD 580
      R1B1=SQRT(X1*X1+BB*Y1*Y1+BB*Z1*Z1)                                SPD 590
      R2B1=SQRT(X2*X2+BB*Y2*Y2+BB*Z2*Z2)                                SPD 600
      UUB1=(X2*X12+BB*Y2*Y12+BB*Z2*Z12)/R2B1-(X1*X12+BB*Y1*Y12+BB*Z1*Z12SPD 610
     1)/R1B1                                                            SPD 620
      F1=UUB1*YZI/ALB1                                                  SPD 630
      IF (LZ.EQ.0) GA=GAM(IC,J)                                         SPD 640
      IF (LZ.NE.0) GA=GAMW(J)                                           SPD 650
      SUM=F1*CH(IZ)*SN(JJ,ISN)*GA/FN                                    SPD 660
      IF (K.EQ.1) SU(J)=F1*CH(IZ)*SN(JJ,ISN)/FN                         SPD 670
60    B=B+SUM                                                           SPD 680
      IF (J.LT.NM) GO TO 70                                             SPD 690
      IZ=IZ+1                                                           SPD 700
      MM=NM                                                             SPD 710
      NM=NM+NL                                                          SPD 720
70    CONTINUE                                                          SPD 730
      NJH=(NSJ+1)/2+1                                                   SPD 740
      IF (ISYM.EQ.0) NJH=NSJ/2                                          SPD 750
      IF (IPHI.EQ.NJH) GO TO 140                                        SPD 760
      IF (ISYM.NE.0.AND.IPHI.EQ.1) GO TO 140                            SPD 770
      IF (NNJ.EQ.1) GO TO 140                                           SPD 780
      IF (II.GT.MJJ(N1)) GO TO 140                                      SPD 790
      IF (IPHI.GT.NJH.AND.ZJET.LE.0.01) GO TO 140                       SPD 800
      IF (IPHI.GT.NJH) L1=NJH                                           SPD 810
      IF (ISYM.EQ.0.AND.IPHI.GT.NJH) L1=NJH+1                           SPD 820
      IF (IPHI.LE.NJH) L1=1                                             SPD 830
      NZ=1                                                              SPD 840
      IF (NW(2).NE.0.AND.NW(3).EQ.0) NZ=2                               SPD 850
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      IF (NW(3).NE.0) NZ=3                                              SPD 860
      IF (NNJ.LE.3.AND.NW(2).NE.0) IR=N2                                SPD 870
      IF (NNJ.LE.3.AND.NW(2).EQ.0) IR=N1                                SPD 880
      IF (NNJ.GE.4.AND.NW(3).NE.0) IR=N3                                SPD 890
      IF (NNJ.EQ.4.AND.NW(3).EQ.0) IR=N2                                SPD 900
      DO 130 MP=1,NZ                                                    SPD 910
      K1=MJW1(MP,NJP)+(IPHI-L1-ISYM)*NW(MP)-1                           SPD 920
      K2=LC(MP)+IPHI-L1-ISYM                                            SPD 930
      KNW=NW(MP)                                                        SPD 940
      K1=K1-KNW                                                         SPD 950
      K2=K2-1                                                           SPD 960
      MR=3                                                              SPD 970
      IF (K1.GE.0) GO TO 80                                             SPD 980
      K1=K1+KNW                                                         SPD 990
      K2=K2+1                                                           SPD1000
      MR=2                                                              SPD1010
80    DO 120 NR=1,MR                                                    SPD1020
      SUM=0.                                                            SPD1030
      DO 90 KK=1,KNW                                                    SPD1040
      KL=K1+KK                                                          SPD1050
90    SUM=SUM+SU(KL)                                                    SPD1060
      CALL INTEG (RES,KNW,K1,K2,II,BP,IR)                               SPD1070
      CORN=0.                                                           SPD1080
      DO 110 KK=1,KNW                                                   SPD1090
      KL=K1+KK                                                          SPD1100
      AA=1.                                                             SPD1110
      DO 100 L=1,KNW                                                    SPD1120
      LL=K1+L                                                           SPD1130
      IF (L.EQ.KK) GO TO 100                                            SPD1140
      AA=AA*(XCP(II)-XV(LL))/(XV(KL)-XV(LL))                            SPD1150
100   CONTINUE                                                          SPD1160
      IF (LZ.EQ.0) GA=GAM(IC,KL)                                        SPD1170
      IF (LZ.NE.0) GA=GAMW(KL)                                          SPD1180
110   CORN=CORN+AA*GA                                                   SPD1190
      B=B-CORN*SUM+CORN*RES*B.                                          SPD1200
      K1=K1+KNW                                                         SPD1210
      K2=K2+1                                                           SPD1220
120   CONTINUE                                                          SPD1230
      IR=IR+1                                                           SPD1240
130   CONTINUE                                                          SPD1250
140   CONTINUE                                                          SPD1260
      IF (IC.EQ.2) GO TO 150                                            SPD1270
      ALPHA1=B/B.                                                       SPD1280
      IC=IC+1                                                           SPD1290
      BB=B2                                                             SPD1300
      IF (ABS(B1-B2).LE.0.001) GO TO 160                                SPD1310
      GO TO 10                                                          SPD1320
150   ALPHA2=B/B.                                                       SPD1330
      GO TO 170                                                         SPD1340
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160    ALPHA2=ALPHA1                                                          SPD1350
170    ALPHA=ALPHA2-TEMP*VMU*VMU*ALPHA1                                       SPD1360
       PHIS=ALPHA2                                                            SPD1370
       RETURN                                                                 SPD1380
C                                                                             SPD1390
       END                                                                    SPD1400-
       SUBROUTINE NORSPD (I,ALPH,LPANEL,IPHI,LPAN1,LPAN2,KF,NTL,F10)          NRD  10
C      TO COMPUTE THE  INDUCED NORMAL VELOCITIES DUE TO WING ALONE            NRD  20
C      VORTICES                                                               NRD  30
       DIMENSION AW(30), BW(30)                                               NRD  40
       COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),NRD  50
      1XLL(41)                                                                NRD  60
       COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTNRD  70
      1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZNRD  80
      2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95NRD  90
      3,2),SC(160,5),SI(160,5),LC(3)                                          NRD 100
       COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)            NRD 110
       COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JNRD 120
      1PANEL,MJJ(5),NW(3),NNJ,NJP                                             NRD 130
       NJP=(NSJ-1)/2                                                          NRD 140
       I7=1                                                                   NRD 150
       IP=1                                                                   NRD 160
       MM=0                                                                   NRD 170
       NM=NW(1)                                                               NRD 180
       ISN=1                                                                  NRD 190
       NL=NW(1)                                                               NRD 200
       A1=0.                                                                  NRD 210
       A2=0.                                                                  NRD 220
       DO 80 J=1,LPANEL                                                       NRD 230
       JJ=J-MM                                                                NRD 240
       FN=NL                                                                  NRD 250
       IF (J.EQ.(LPAN1+1).OR.J.EQ.(LPAN2+1)) IP=1                             NRD 260
       IF (J.GT.LPAN1.AND.J.LE.LPAN2) ISN=2                                   NRD 270
       IF (J.GT.LPAN2.AND.J.LE.LPANEL) ISN=3                                  NRD 280
       IF (J.GE.LPAN1.AND.J.LT.LPANEL) GO TO 10                               NRD 290
       GO TO 20                                                               NRD 300
10     NL=NW(2)                                                               NRD 310
       IF (J.GE.LPAN2.AND.J.LT.LPANEL) NL=NW(3)                               NRD 320
20     CONTINUE                                                               NRD 330
       X1=XN(J,1)-XCP(I)                                                      NRD 340
       X2=XN(J,2)-XCP(I)                                                      NRD 350
       X12=XN(J,2)-XN(J,1)                                                    NRD 360
       Y12=YN(J,2)-YN(J,1)                                                    NRD 370
       Z12=ZN(J,2)-ZN(J,1)                                                    NRD 380
       Z1=ZN(J,1)-ZCP(I)                                                      NRD 390
       Z2=ZN(J,2)-ZCP(I)                                                      NRD 400
       XZJ=X1*Z12-Z1*X12                                                      NRD 410
       DO 70 K=1,2                                                            NRD 420
       IF (K.EQ.1) GO TO 30                                                   NRD 430
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      N=1                                                                    NRD 440
      GO TO 40                                                               NRD 450
30    N=2                                                                    NRD 460
40    CONTINUE                                                               NRD 470
      YC=(-1.)**N*YCP(I)                                                     NRD 480
      Y1=YN(J,1)-YC                                                          NRD 490
      Y2=YN(J,2)-YC                                                          NRD 500
      XYK=X1*Y12-Y1*X12                                                      NRD 510
      YZI=Y1*Z12-Z1*Y12                                                      NRD 520
      ALP1=XYK*XYK+XZJ*XZJ+B1*YZI*YZI                                        NRD 530
      R1B1=SQRT(X1*X1+B1*Y1*Y1+B1*Z1*Z1)                                     NRD 540
      R2B1=SQRT(X2*X2+B1*Y2*Y2+B1*Z2*Z2)                                     NRD 550
      UUB1=(X2*X12+B1*Y2*Y12+B1*Z2*Z12)/R2B1-(X1*X12+B1*Y1*Y12+B1*Z1*Z12NRD 560
     1)/R1B1                                                                 NRD 570
      G1=(1.-X1/R1B1)/(Y1*Y1+Z1*Z1)                                          NRD 580
      G2=(1.-X2/R2B1)/(Y2*Y2+Z2*Z2)                                          NRD 590
      ALP2=XYK*XYK+XZJ*XZJ+B2*YZI*YZI                                        NRD 600
      R1B2=SQRT(X1*X1+B2*Y1*Y1+B2*Z1*Z1)                                     NRD 610
      R2B2=SQRT(X2*X2+B2*Y2*Y2+B2*Z2*Z2)                                     NRD 620
      UUB2=(X2*X12+B2*Y2*Y12+B2*Z2*Z12)/R2B2-(X1*X12+B2*Y1*Y12+B2*Z1*Z12NRD 630
     1)/R1B2                                                                 NRD 640
      G3=(1.-X1/R1B2)/(Y1*Y1+Z1*Z1)                                          NRD 650
      G4=(1.-X2/R2B2)/(Y2*Y2+Z2*Z2)                                          NRD 660
      F13=UUB1*XZJ/ALP1                                                      NRD 670
      F12=UUB1*XYK/ALP1                                                      NRD 680
      G13=Z2*G2-Z1*G1                                                        NRD 690
      G12=-Y2*G2+Y1*G1                                                       NRD 700
      F23=UUB2*XZJ/ALP2                                                      NRD 710
      F22=UUB2*XYK/ALP2                                                      NRD 720
      G23=Z2*G4-Z1*G3                                                        NRD 730
      G22=-Y2*G4+Y1*G3                                                       NRD 740
      IF (IP.EQ.1.AND.KF.NE.0) GO TO 50                                      NRD 750
      GO TO 60                                                               NRD 760
50    G13=Z2*G2                                                              NRD 770
      G12=-Y2*G2                                                             NRD 780
      G23=Z2*G4                                                              NRD 790
      G22=-Y2*G4                                                             NRD 800
60    CONTINUE                                                               NRD 810
      F1=-F13*Y(4,IPHI)*(-1.)**N+F12*Y(3,IPHI)                               NRD 820
      F2=G13*Y(4,IPHI)*(-1.)**N+G12*Y(3,IPHI)                                NRD 830
      F3=-F23*Y(4,IPHI)*(-1.)**N+F22*Y(3,IPHI)                               NRD 840
      F4=G23*Y(4,IPHI)*(-1.)**N+G22*Y(3,IPHI)                                NRD 850
      A1=A1+(F1+F2)*CH(IZ)*SN(JJ,ISN)*GAM(1,J)/FN                            NRD 860
70    A2=A2+(F3+F4)*CH(IZ)*SN(JJ,ISN)*GAM(2,J)/FN                            NRD 870
      IF (J.LT.NM.OR.J.EQ.LPANEL) GO TO 80                                   NRD 880
      IZ=IZ+1                                                                NRD 890
      IP=IP+1                                                                NRD 900
      MM=NM                                                                  NRD 910
      NM=NM+NL                                                               NRD 920
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80    CONTINUE                                                          NRD 930
      IF (KF.EQ.0) GO TO 110                                            NRD 940
      CALL UNWF (B1,XCP(I),YCP(I),ZCP(I),AW,BW,IPHI,1,AL1,0)            NRD 950
      A1=A1+AL1*F10*8.                                                  NRD 960
      DO 90 K=1,NTL                                                     NRD 970
      KK=K+LPANEL                                                       NRD 980
90    A1=A1+AW(K)*GAM(1,KK)*8.                                          NRD 990
      CALL UNWF (B2,XCP(I),YCP(I),ZCP(I),AW,BW,IPHI,1,AL2,0)            NRD1000
      A2=A2+AL2*F10*8.                                                  NRD1010
      DO 100 K=1,NTL                                                    NRD1020
      KK=K+LPANEL                                                       NRD1030
100   A2=A2+AW(K)*GAM(2,KK)*8.                                          NRD1040
110   CONTINUE                                                          NRD1050
      ALPH=(A1-A2)/8.                                                   NRD1060
      RETURN                                                            NRD1070
      END                                                               NRD1080-
      SUBROUTINE FALONE (R,CS,AW,CA,GAMMA)                              FLN  10
      DIMENSION AW(1), CA(1), GAMMA(1)                                  FLN  20
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCFLN  30
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                    FLN  40
      N=0                                                               FLN  50
      PI=3.14159265                                                     FLN  60
      NI=NF                                                             FLN  70
      NF1=NF+1                                                          FLN  80
      S=XTEF-XLEF                                                       FLN  90
      DO 30 I=1,NF                                                      FLN 100
      IJ=I                                                              FLN 110
      XS=XCF(IJ)-XTEF                                                   FLN 120
      IF (I.EQ.NF) RFL=0.                                               FLN 130
      IF (I.NE.NF) RFL=XS/SQRT(XS*XS+R*RF(IJ)*RF(IJ))                   FLN 140
      CALL FUSELA (NI,AW,N,IJ,XAS,XTEF,XF,XCF,RF,R,SNP,NKF)             FLN 150
      XD=XCF(IJ)                                                        FLN 160
      XEF=XCF(IJ)-XLEF                                                  FLN 170
      AW(NF1)=-SLOP(XD)*CS-(RFL-XEF/SQRT(XEF*XEF+R*RF(IJ)*RF(IJ)))*F0/(4FLN 180
     1.*PI)                                                             FLN 190
      IF (I.NE.1) GO TO 20                                              FLN 200
      DO 10 K=1,NF                                                      FLN 210
10    GAMMA(K)=-AW(K+1)/AW(1)                                           FLN 220
      NJ=NF-1                                                           FLN 230
      GO TO 30                                                          FLN 240
20    CALL VMSEQN (NJ,IJ,AW,GAMMA,CA)                                   FLN 250
      NJ=NJ-1                                                           FLN 260
30    CONTINUE                                                          FLN 270
      DO 40 I=1,NF                                                      FLN 280
40    WARD(I)=GAMMA(I)                                                  FLN 290
      RETURN                                                            FLN 300
C                                                                       FLN 310
      END                                                               FLN 320-
      SUBROUTINE THRUST (LTOTAL,LPANEL,GAMMA,GAMW,CAM,LPAN1,VMU,XJ,YJ,ZJTHR  10
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     1,RJ,T,GAL,ISYM,LPAN2,CAMLFT,SNG,YG,LWF,LWFJ,AW,BW,CM,P,BET,RL,KZ)  THR  20
C     TO EVALUATE THE LEADING EDGE THRUST                                THR  30
      DIMENSION GAMMA(1), GAL(1), GAMW(1), SNG(1), YG(1)                 THR  40
      DIMENSION AW(1), BW(1), CM(1)                                      THR  50
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),THR  60
     1XLL(41)                                                            THR  70
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTTHR  80
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZTHR  90
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(2,8),EX(95,2),TX(95THR 100
     3,2),SC(160,5),SI(160,5),LC(3)                                      THR 110
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)         THR 120
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JTHR 130
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                         THR 140
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                       THR 150
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCTHR 160
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                     THR 170
      PI=3.14159265                                                      THR 180
      CAMLER=CAM                                                         THR 190
      CN=NW(1)                                                           THR 200
      KW=1                                                               THR 210
      SK=SNG(1)                                                          THR 220
      BK=5.*PI/180.                                                      THR 230
      IUSP=YCON(24)                                                      THR 240
      ITN=YCON(23)                                                       THR 250
      DO 330 I=1,NCS                                                     THR 260
      FCOS=COS(SWEEP(I))                                                 THR 270
      FTAN=TAN(SWEEP(I))                                                 THR 280
      NK=I*NW(1)                                                         THR 290
      IF (NW(2).EQ.0) GO TO 20                                           THR 300
      II=I+NCS                                                           THR 310
      IF (NW(3).NE.0) GO TO 10                                           THR 320
      CHL=CH(I)+CH(II)                                                   THR 330
      GO TO 30                                                           THR 340
10    III=II+NCS                                                         THR 350
      CHL=CH(I)+CH(II)+CH(III)                                           THR 360
      GO TO 30                                                           THR 370
20    CHL=CH(I)                                                          THR 380
30    CONTINUE                                                           THR 390
      SRT=SQRT(CH(I)/CHL)                                                THR 400
      BR=B1                                                              THR 410
      IC=1                                                               THR 420
      I7=1                                                               THR 430
      IS=1                                                               THR 440
      MM=0                                                               THR 450
      ISN=1                                                              THR 460
      NM=NW(1)                                                           THR 470
      NL=NW(1)                                                           THR 480
      BC=0.                                                              THR 490
      A=0.                                                               THR 500
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      WN=0.                                                              THR 510
      KP=1+(I-1)*NW(1)                                                   THR 520
      IF (KF.EQ.0) GO TO 60                                              THR 530
      XQ=XLE(I)                                                          THR 540
      YQ=YLE(I)                                                          THR 550
      ZQ=ZCP(KP)                                                         THR 560
      IPHI=1                                                             THR 570
      CALL UNWF (B1,XQ,YQ,ZQ,AW,BW,IPHI,0,WK2,0)                         THR 580
      DO 50 IP=1,NTL                                                     THR 590
      IQ=IP+LPANEL                                                       THR 600
      IF (KZ.EQ.0) GO TO 40                                              THR 610
      A=A+AW(IP)*GAM(1,IQ)*8.                                            THR 620
      RC=RC+AW(IP)*GAM(2,IQ)*8.                                          THR 630
      GO TO 50                                                           THR 640
40    RC=RC+BW(IP)*GAMW(IQ)*8.                                           THR 650
50    CONTINUE                                                           THR 660
60    CONTINUE                                                           THR 670
      DO 150 NN=1,LPANEL                                                 THR 680
      L=NN                                                               THR 690
      IF (KZ.EQ.0) GAM=GAMW(NN)                                          THR 700
      IF (KZ.NE.0) GAM=GAM(2,NN)                                         THR 710
      J=NN-MM                                                            THR 720
      FN=NL                                                              THR 730
      IF (NN.EQ.(LPAN1+1).OR.NN.EQ.(LPAN2+1)) IS=1                       THR 740
      IF (NN.GE.LPAN1.AND.NN.LT.LPANEL) GO TO 70                         THR 750
      GO TO 80                                                           THR 760
70    NL=NW(2)                                                           THR 770
      IF (NN.GE.LPAN2.AND.NN.LT.LPANEL) NL=NW(3)                         THR 780
      IF (NN.GT.LPAN1.AND.NN.LE.LPAN2) ISN=2                             THR 790
      IF (NN.GT.LPAN2.AND.NN.LE.LPANEL) ISN=3                            THR 800
80    CONTINUE                                                           THR 810
      X1=XN(NN,1)-XLE(I)                                                 THR 820
      X2=XN(NN,2)-XLE(I)                                                 THR 830
      X12=XN(NN,2)-XN(NN,1)                                              THR 840
      Y12=YN(NN,2)-YN(NN,1)                                              THR 850
      Z12=ZN(L,2)-ZN(L,1)                                                THR 860
      Z1=ZN(L,1)-ZCP(KP)                                                 THR 870
      Z2=ZN(L,2)-ZCP(KP)                                                 THR 880
      X7J=X1*Z12-Z1*X12                                                  THR 890
      FCP=1.                                                             THR 900
      DO 140 K=1,2                                                       THR 910
      IF (KZ.EQ.0.AND.K.EQ.2) FCP=-1.                                    THR 920
      IF (K.EQ.1) GO TO 90                                               THR 930
      N1=1                                                               THR 940
      GO TO 100                                                          THR 950
90    N1=2                                                               THR 960
100   CONTINUE                                                           THR 970
      YC=YLE(I)*(-1.)**N1                                                THR 980
      Y1=YN(NN,1)-YC                                                     THR 990
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      Y2=YN(NN,2)-YC                                                    THR1000
      XYK=X1*Y12-Y1*X12                                                 THR1010
      YZI=Y1*Z12-Z1*Y12                                                 THR1020
      ALB1=XYK*XYK+XZJ*XZJ+B1*YZI*YZI                                   THR1030
      R1B1=SQRT(X1*X1+B1*Y1*Y1+B1*Z1*Z1)                                THR1040
      R2B1=SQRT(X2*X2+B1*Y2*Y2+B1*Z2*Z2)                                THR1050
      UUB1=(X2*X12+B1*Y2*Y12+B1*Z2*Z12)/R2B1-(X1*X12+B1*Y1*Y12+B1*Z1*Z12THR1060
     1)/R1B1                                                            THR1070
      IF (IS.EQ.1.AND.KF.NE.0) GO TO 120                                THR1080
110   CONTINUE                                                          THR1090
      G1B1=(1.-X1/R1B1)/(Y1*Y1+Z1*Z1)                                   THR1100
      GO TO 130                                                         THR1110
120   IF (KZ.EQ.0) GO TO 110                                            THR1120
      G1B1=0.                                                           THR1130
130   CONTINUE                                                          THR1140
      G2B1=(1.-X2/R2B1)/(Y2*Y2+Z2*Z2)                                   THR1150
      F1=UUB1*XYK/ALB1                                                  THR1160
      F2=-Y2*G2B1+Y1*G1B1                                               THR1170
      BC=BC+(F1+F2)*SN(J,ISN)*GAM*CH(I7)/FN*FCP                         THR1180
      IF (KZ.EQ.0) GO TO 140                                            THR1190
      A=A+(F1+F2)*SN(J,ISN)*GAM(IC,NN)*CH(I7)/FN                        THR1200
140   CONTINUE                                                          THR1210
      IF (NN.LT.NM.OR.NN.EQ.IPANEL) GO TO 150                           THR1220
      IS=IS+1                                                           THR1230
      IZ=I7+1                                                           THR1240
      MM=NM                                                             THR1250
      NM=NM+NL                                                          THR1260
150   CONTINUE                                                          THR1270
      IF (KZ.EQ.0) GO TO 160                                            THR1280
      CAMLE=CAMLER-(CAMLER-CAMLET)*YLE(I)/HALFB                         THR1290
      ALPT=XTT(I)                                                       THR1300
160   CONTINUE                                                          THR1310
      IF (KF.EQ.0) GO TO 170                                            THR1320
      WK=0.                                                             THR1330
      G=0.                                                              THR1340
      MP=0                                                              THR1350
      IF (KZ.EQ.0) MP=1                                                 THR1360
      CALL FUSVOL (B1,XG,YG,ZG,WN,WK,G,1,MP)                            THR1370
170   CONTINUE                                                          THR1380
      IF (KZ.EQ.1) GO TO 200                                            THR1390
      CAMLE=0.                                                          THR1400
      IF (YLE(I).GT.YC(KW)) GO TO 180                                   THR1410
      GO TO 190                                                         THR1420
180   KW=KW+1                                                           THR1430
      SK=SNG(KW)                                                        THR1440
190   ALPT=P*YLE(I)/HALFB+BET*RK*SK-PL*XLE(I)/HALFB*SK                  THR1450
      GO TO 220                                                         THR1460
200   CONTINUE                                                          THR1470
      A=A/8.+ALPT-CAMLE+WN                                              THR1480
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      XB=XLE(I)                                                          THR1490
      YB=YLE(I)                                                          THR1500
      ZB=ZCP(KP)                                                         THR1510
      PHRV=0.                                                            THR1520
      IF (IUSB.EQ.1.AND.ITN.EQ.0) GO TO 210                              THR1530
      CALL INDVEL (XB,YB,ZB,XJ,YJ,ZJ,RJ,RI,PHRV,PHX,T,VMU,PHY,ISYM)     THR1540
                                                                         THR1550
210   CONTINUE                                                           THR1560
      A=A+PHRV/(ALPC*VML)                                                THR1570
      A=A*SRT                                                            THR1580
      THRT1=A/(CN*SQRT(FTAN*FTAN+BB))                                    THR1590
      IF (KZ.EQ.0) GO TO 220                                             THR1600
      XTE(I)=(PI/2.)*SQRT(1.-AM1*AM1*FCOS*FCOS)*THRT1*THRT1/FCOS         THR1610
220   CONTINUE                                                           THR1620
      BC=BC/8.+ALPT-CAMLE+WN                                             THR1630
      BC=BC*SRT                                                          THR1640
      THR=BC/(CN*SQRT(FTAN*FTAN+BB))                                     THR1650
      CH(I)=THR                                                          THR1660
      IF (KZ.EQ.0) GO TO 230                                             THR1670
      X(5,I)=(PI/2.)*SQRT(1.-AM1*AM1*FCOS*FCOS)*THR*THR/FCOS             THR1680
230   CONTINUE                                                           THR1690
      IF (KZ.EQ.0) THRT1=THR                                             THR1700
      NN=NW(1)                                                           THR1710
      IND=1                                                              THR1720
      ISN=1                                                              THR1730
      L1=LPANEL+1                                                        THR1740
      IZ=1                                                               THR1750
      MM=0                                                               THR1760
      II=NW(1)                                                           THR1770
      A=0.                                                               THR1780
      FACTOR=1.                                                          THR1790
      AM=AM1                                                             THR1800
      BB=B1                                                              THR1810
      CONV=ALPC                                                          THR1820
      DO 320 NN=1,LAST                                                   THR1830
      IF (NN.GT.LPANEL) NA=NN-LPANEL+JPANEL                              THR1840
      IF (NN.LE.LPANEL) NA=NN+2*JPANEL                                   THR1850
      FN=II                                                              THR1860
      IF (NN.GT.LPAN1.AND.NN.LE.LPAN2) ISN=2                             THR1870
      IF (NN.GT.LPAN2.AND.NN.LE.LPANEL) ISN=3                            THR1880
      IF (NN.GE.LPAN1.AND.NN.LT.LPANEL) GO TO 240                        THR1890
      GO TO 250                                                          THR1900
240   II=NW(2)                                                           THR1910
      IF (NN.GE.LPAN2.AND.NN.LT.LPANEL) II=NW(3)                         THR1920
250   CONTINUE                                                           THR1930
      IF (NN.GE.LPANEL.AND.NN.LT.MJJ(IND)) II=NCJ(IND)                   THR1940
      J=NA-MM                                                            THR1950
      CHORD=CH(IZ)                                                       THR1960
      IF (NN.EQ.L1) GO TO 260                                            THR1970
      GO TO 270
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260   ISN=ISN+1                                                                THR1980
      L1=MJJ(IND)+1                                                            THR1990
270   NL=MJJ(IND)-1                                                            THR2000
      IF (NN.EQ.NL) IND=IND+1                                                  THR2010
      IF (NN.GT.LPANEL) FACTOR=0.5                                             THR2020
      X1=XN(NN,1)-XLE(I)                                                       THR2030
      X2=XN(NN,2)-XLE(I)                                                       THR2040
      X12=XN(NN,2)-XN(NN,1)                                                    THR2050
      Y12=YN(NN,2)-YN(NN,1)                                                    THR2060
      Z12=ZN(NN,2)-ZN(NN,1)                                                    THR2070
      Z1=ZN(NN,1)-ZCP(KP)                                                      THR2080
      Z2=ZN(NN,2)-ZCP(KP)                                                      THR2090
      X2J=X1*Z12-Z1*X12                                                        THR2100
      FCO=1.                                                                   THR2110
      DO 300 K=1,2                                                             THR2120
      IF (K2.EQ.0.AND.K.EQ.2) FCO=-1.                                          THR2130
      IF (K.EQ.1) GO TO 280                                                    THR2140
      N1=1                                                                     THR2150
      GO TO 290                                                                THR2160
280   N1=2                                                                     THR2170
290   CONTINUE                                                                 THR2180
      YC=YLE(I)*(-1.)**N1                                                      THR2190
      Y1=YN(NN,1)-YC                                                           THR2200
      Y2=YN(NN,2)-YC                                                           THR2210
      XYK=X1*Y12-Y1*X12                                                        THR2220
      Y2I=Y1*Z12-Z1*Y12                                                        THR2230
      ALPRIM=XYK*XYP+X2J*X2J+BB*Y2I*Y2I                                        THR2240
      RXY21=SQRT(X1*X1+BB*Y1*Y1+BB*Z1*Z1)                                      THR2250
      RXY22=SQRT(X2*X2+BB*Y2*Y2+BB*Z2*Z2)                                      THR2260
      UU=(Y2*X12+BB*Y2*Y12+BB*Z2*Z12)/RXY22-(X1*X12+BB*Y1*Y12+BB*Z1*Z12)THR2270
     1/RXY21                                                                   THR2280
      GN1=(1.-X1/RXY21)/(Y1*Y1+Z1*Z1)                                          THR2290
      GN2=(1.-X2/RXY22)/(Y2*Y2+Z2*Z2)                                          THR2300
      F1=UU*XYK/ALPRIM                                                         THR2310
      F2=GN1*Y1-GN2*Y2                                                         THR2320
300   A=A+(F1+F2)*SIN(J,ISN)*CHORD*GAMMA(NA)/(8.*PI*FACTOR)*FCO                THR2330
      IF (NN.LT.NM) GO TO 310                                                  THR2340
      I2=I2+1                                                                  THR2350
      MM=NM                                                                    THR2360
      NM=NM+II                                                                 THR2370
310   CONTINUE                                                                 THR2380
320   CONTINUE                                                                 THR2390
      A=A*SRT                                                                  THR2400
      THRT2=A/(CN*SQRT(ETAN*ETAN+BB))                                          THR2410
      THRT=(THRT1+THRT2)*CONV                                                  THR2420
      GAL(I)=2.*THRT/(SRT*CONV)                                                THR2430
      CD(I)=THRT                                                               THR2440
      IF (K2.EQ.0) GO TO 330                                                   THR2450
      CT(I)=(PI/2.)*SQRT(1.-AM*AM*FCOS*FCOS)*THRT*THRT/FCOS                    THR2460
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330   CONTINUE                                                                THR2470
      RETURN                                                                  THR2480
      END                                                                     THR2490=
      OVERLAY (WNGJET,5,0)                                                    LOD  10
      PROGRAM LOAD                                                            LOD  20
C     TO EVALUATE THE AERODYNAMIC CHARACTERISTICS                             LOD  30
      DIMENSION GAMP(330), GAMR(330), GAMR(330), GAMX(150), CPWW(130), SLOD  40
     1ECT(30), CPF(10,30), GAMXW(150)                                         LOD  50
      DIMENSION CQ(330)                                                       LOD  60
      DIMENSION SDWASH(100), AW(5), BW(40)                                    LOD  70
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTLOD  80
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZLOD  90
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95LOD 100
     3,2),SC(160,5),SI(160,5),LC(3)                                           LOD 110
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)             LOD 120
      COMMON /SOME/ NC,NWING,LAT,NAL,LWF,LWFJ,CHORDT(3),SNG(5),YG(5),YCNLOD 130
     1(6),WKN,RDX,RDG,RDG                                                     LOD 140
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JLOD 150
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                              LOD 160
      COMMON /PARAM/ ALPT,ALPC,ALPS,CDF,SDF,TH,TDF                            LOD 170
      COMMON /SCHEME/ C(2),X(10,41),Y(10,41),SLOPE(15),XL(2,15),XTT(41),LOD 180
     1XLL(41)                                                                 LOD 190
      COMMON /ADD/ CP(130),CM(30),BREAK(8),SWP(8,15),GAL(30),ISYM,VMU,VULOD 200
     1,TEMP,FCR,CAMLER,CAMLET,CAMTER,CAMTET,XJ,YJ,ZJ,RJ,ALP,CREF,TWISTR LOD 210
      COMMON /COST/ LTOTAL,LPAN1,MJW(5),LPANEL,IENTA,LPAN2,EXIT,PTIAL,TWLOD 220
     1IST,DF(5),NFP                                                           LOD 230
      COMMON /FUS/ XF(20),XCF(20),RF(20),SNP(5,20),XLEF,XTEF,WARD(20),NCLOD 240
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                          LOD 250
      PI=3.14159265                                                           LOD 260
      IA=2*JPANEL                                                             LOD 270
      RK=5.*PI/180.                                                           LOD 280
      NW2=NW(1)+NW(2)                                                         LOD 290
      NW3=NW(2)+NW(3)                                                         LOD 300
      NJH=(NSJ+1)/2+1                                                         LOD 310
      IF (ISYM.EQ.0) NJH=NSJ/2                                                LOD 320
      IF (ISYM.EQ.0) NP=NSJ-1                                                 LOD 330
      IF (ISYM.NE.0) NP=NSJ+1                                                 LOD 340
      AM=AM1                                                                  LOD 350
      ALPH=ALP*180./PI                                                        LOD 360
      WRITE (6,460)                                                           LOD 370
      WRITE (6,450) ALPH                                                      LOD 380
      WRITE (6,460)                                                           LOD 390
      ZJET=YCON(25)                                                           LOD 400
      IUSB=YCON(24)                                                           LOD 410
      ITA=YCON(23)                                                            LOD 420
      NC=IENTA                                                                LOD 430
      DFJ=CDF                                                                 LOD 440
      CMU=C(1)                                                                LOD 450
      REWIND 01                                                               LOD 460
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      REWIND 02                                                          LOD 470
      REWIND 07                                                          LOD 480
      REWIND 08                                                          LOD 490
      ITAPE=2                                                            LOD 500
      ITAPG=1                                                            LOD 510
      DO 210 I=1,3                                                       LOD 520
      II=I                                                               LOD 530
      IF (I.EQ.2) GO TO 30                                               LOD 540
      IF (I.EQ.3) GO TO 60                                               LOD 550
      IF (IUSB.EQ.1.AND.ITN.EQ.0) GO TO 210                              LOD 560
      DO 10 J=1,LPANEL                                                   LOD 570
10    CPWW(J)=GAM(1,J)*ALPC                                              LOD 580
      DO 20 J=1,NCS                                                      LOD 590
20    SECT(J)=XTE(J)                                                     LOD 600
      GO TO 170                                                          LOD 610
30    DO 40 J=1,LPANEL                                                   LOD 620
40    CPWW(J)=GAM(2,J)*ALPC                                              LOD 630
      DO 50 J=1,NCS                                                      LOD 640
50    SECT(J)=X(5,J)                                                     LOD 650
      GO TO 90                                                           LOD 660
60    DO 70 J=1,LPANEL                                                   LOD 670
70    CPWW(J)=CP(J)                                                      LOD 680
      DO 80 J=1,NCS                                                      LOD 690
80    SECT(J)=CT(J)                                                      LOD 700
90    IF (LAT.NE.1) GO TO 170                                            LOD 710
C                                                                        LOD 720
C     EDGE SINGULARITY PARAMETERS FOR, (1) CPF1(L,F,), CPF2(TIP) FOR     LOD 730
C      SYMMETRICAL LOADING, (2) CPF3(L,F,), CPF4(TIP) FOR P MOTION,      LOD 740
C      (3) CPF5(L,F,), CPF6(TIP) FOR P MOTION, (4) CPF7(L,F,), CPF8(TIP) LOD 750
C      FOR P MOTION                                                      LOD 760
      READ (ITAPE) ((CPF(1,K),K=1,NCS)                                   LOD 770
      READ (ITAPE) ((CPF(2,K),K=1,NCW)                                   LOD 780
      READ (ITAPE) (GAMX(K),K=1,LPANEL)                                  LOD 790
      IF (I.NE.2) GO TO 110                                              LOD 800
      DO 100 K=1,LPANEL                                                  LOD 810
100   GAMXW(K)=GAMX(K)                                                   LOD 820
110   CONTINUE                                                           LOD 830
      K1=1                                                               LOD 840
      DO 120 KK=1,3                                                      LOD 850
      READ (ITAPE) ((CPF(K1+2,K),K=1,NCS)                                LOD 860
      READ (ITAPE) ((CPF(K1+3,K),K=1,NCW)                                LOD 870
      K1=K1+2                                                            LOD 880
120   CONTINUE                                                           LOD 890
      I1=1                                                               LOD 900
      I2=LPANEL                                                          LOD 910
      IF (I.EQ.3) I1=2*JPANEL+1                                          LOD 920
      IF (I.EQ.3) I2=LTOTAL                                              LOD 930
      IPARM=LWF                                                          LOD 940
      IF (I.EQ.3) IPARM=LWFJ                                             LOD 950
```

```
      READ (ITAPG) (GAMP(K),K=1,IPARM)                                  LOD 960
      READ (ITAPG) (GAMP(K),K=1,IPARM)                                  LOD 970
      READ (ITAPG) (GAMR(K),K=1,IPARM)                                  LOD 980
      DO 160 KP=I1,I2                                                   LOD 990
      K=KP-IA                                                           LOD1000
      IF (I.EQ.2) K=KP                                                  LOD1010
      SIDEF=0.                                                          LOD1020
      SIDEJ=0.                                                          LOD1030
      IF (KF.EQ.0) GO TO 140                                            LOD1040
      CALL UNWF (B1,XV(K),YV(K),ZCP(K),AW,BW,1,0,WK2,2)                 LOD1050
      DO 130 J=1,NTL                                                    LOD1060
      KK=J+I2                                                           LOD1070
  130 SIDEF=SIDEF+BW(J)*GAMR(KK)                                        LOD1080
  140 IF (I.EQ.2) GO TO 150                                             LOD1090
      CALL SDWJ (SIDEJ,XV(K),YV(K),ZCP(K),GAMR,LPANEL,ISYM)             LOD1100
  150 CONTINUE                                                          LOD1110
      IF (I.EQ.2) SDWASH(K)=SIDEF                                       LOD1120
      GAMR(KP)=GAMR(KP)-YV(K)/HALFB*CPWW(K)/ALPC-XV(K)/HALFB*GAMX(K)    LOD1130
  160 GAMP(KP)=GAMP(KP)-(SIDEF+SIDEJ-RK)*GAMX(K)                        LOD1140
  170 CALL FORCE (II,AM,CLT,CMT,CDT,SECT,CL,CM,CD,XLL,XTT,CPWW,CPF,GAMP,LOD1150
     1GAMR,GAMR,CAMLFR,CAMLFT,CREF,CYR,CLB,CNR,CLP,CYP,CNP,CYR,CLRR,CNR,LOD1160
     2CT)                                                               LOD1170
      IF (I.EQ.1) GO TO 180                                             LOD1180
      IF (I.EQ.2) GO TO 190                                             LOD1190
      GO TO 210                                                         LOD1200
  180 CLW=CLT                                                           LOD1210
      CMWT=CMT                                                          LOD1220
      CDW=CDT                                                           LOD1230
      GO TO 210                                                         LOD1240
  190 CLWW=CLT                                                          LOD1250
      CMWWT=CMT                                                         LOD1260
      CDWW=CDT                                                          LOD1270
      CYRW=CYR                                                          LOD1280
      CLRW=CLR                                                          LOD1290
      CNBW=CNB                                                          LOD1300
      CLPW=CLP                                                          LOD1310
      CYPW=CYP                                                          LOD1320
      CNPW=CNP                                                          LOD1330
      CYRW=CYR                                                          LOD1340
      CLRRW=CLRR                                                        LOD1350
      CNRW=CNR                                                          LOD1360
      DO 200 K=1,NCS                                                    LOD1370
      X(4,K)=CL(K)                                                      LOD1380
      X(6,K)=CD(K)                                                      LOD1390
  200 X(7,K)=CM(K)                                                      LOD1400
      ITAPE=7                                                           LOD1410
      ITAPG=8                                                           LOD1420
  210 CONTINUE                                                          LOD1430
      READ (08) (CG(IS),IS=1,LWFJ)                                      LOD1440
```

```
      CDCL2=CDT/(CLT*CLT)                                                    LOD1450
      IF (CLWW.LE.0.001) GO TO 220                                           LOD1460
      CDWL2=CDWW/(CLWW*CLWW)                                                 LOD1470
      GO TO 230                                                              LOD1480
220   CDWL2=0.                                                               LOD1490
230   CONTINUE                                                               LOD1500
      WRITE (6,470)                                                          LOD1510
      K1=0                                                                   LOD1520
      JJ1=0                                                                  LOD1530
      DO 310 I=1,NCS                                                         LOD1540
      IF (NW(2).EQ.0) GO TO 250                                              LOD1550
      II=I+NCS                                                               LOD1560
      IF (NW(3).NE.0) GO TO 240                                              LOD1570
      CHORD=CH(I)+CH(II)                                                     LOD1580
      GO TO 260                                                              LOD1590
240   III=II+NCS                                                             LOD1600
      CHORD=CH(I)+CH(II)+CH(III)                                             LOD1610
      GO TO 260                                                              LOD1620
250   CHORD=CH(I)                                                            LOD1630
260   CONTINUE                                                               LOD1640
      DO 300 J=1,NCW                                                         LOD1650
      JJ=JJ1+J                                                               LOD1660
      KK=K1+J                                                                LOD1670
      IF (NW(2).EQ.0) GO TO 280                                              LOD1680
      IF (J.LE.NW(1)) GO TO 280                                              LOD1690
      IF (J.GT.NW2) GO TO 270                                                LOD1700
      LL=LPAN1+NW(2)*(I-1)+J-NW(1)                                           LOD1710
      GO TO 290                                                              LOD1720
270   LL=LPAN2+NW(3)*(I-1)+J-NW2                                             LOD1730
      GO TO 290                                                              LOD1740
280   LL=JJ                                                                  LOD1750
290   CONTINUE                                                               LOD1760
      XI=(XV(LL)-XLE(I))/CHORD                                               LOD1770
      ETA=YV(LL)/HALFB                                                       LOD1780
      CPW=2.*GAM(2,LL)*ALPC                                                  LOD1790
      CPT=CP(LL)*2.                                                          LOD1800
300   WRITE (6,480) KK,XI,ETA,CPT,CPW                                        LOD1810
      JJ1=(NCW-NW3)*I                                                        LOD1820
      K1=K1+NCW                                                              LOD1830
310   CONTINUE                                                               LOD1840
      WRITE (6,490)                                                          LOD1850
      DO 320 I=1,NCS                                                         LOD1860
      YE=YLE(I)/HALFB                                                        LOD1870
320   WRITE (6,500) YE,CL(I),CM(I),CT(I),CD(I),X(4,I),X(7,I),X(6,I)          LOD1880
      WRITE (6,510) CLT                                                      LOD1890
      WRITE (6,520) CDT                                                      LOD1900
      WRITE (6,530) CDCL2                                                    LOD1910
      WRITE (6,540) CMT                                                      LOD1920
      IF (IUSP.NE.1) GO TO 370                                               LOD1930
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      IF (DFJ.LE.0.001) GO TO 370                                          LOD1940
      IF (ZJET.GT.0.01) GO TO 370                                          LOD1950
      SDFJ=SIN(DFJ)                                                        LOD1960
      CDFJ=COS(DFJ)                                                        LOD1970
      CLR=CMU*SIN(DFJ+ALP)                                                 LOD1980
      CDR=CMU*(VMU-COS(DFJ+ALP))                                           LOD1990
      CF=COS(TDF)                                                          LOD2000
      SF=SIN(TDF)                                                          LOD2010
      IF (NNJ.EQ.1) CDR=-CMU*COS(DFJ+ALP)                                  LOD2020
      IJ=(NSJ+1)/2-1                                                       LOD2030
      IF (ISYM.EQ.0) IJ=NSJ/2-1                                            LOD2040
      IF (NW(3).NE.0) GO TO 330                                            LOD2050
      IF (NW(2).EQ.0) GO TO 340                                            LOD2060
      IZ=NCS+(MJW1(2,NJP)-LPAN1-1)/NW(2)+1                                 LOD2070
      KJ=MJW1(2,NJP)                                                       LOD2080
      NN=NW(2)                                                             LOD2090
      GO TO 350                                                            LOD2100
330   IZ=NCS*2+(MJW1(3,NJP)-LPAN2-1)/NW(3)+1                               LOD2110
      KJ=MJW1(3,NJP)                                                       LOD2120
      NN=NW(3)                                                             LOD2130
      GO TO 350                                                            LOD2140
340   IZ=LC(1)                                                             LOD2150
      KJ=MJW1(1,NJP)                                                       LOD2160
      NN=NW(1)                                                             LOD2170
350   CONTINUE                                                             LOD2180
      CM1=0.                                                               LOD2190
      DO 360 I=1,IJ                                                        LOD2200
      YDIF=YN(KJ,2)-YN(KJ,1)                                               LOD2210
      CM1=CM1+YDIF/WIDTH(MJW(NJP))*((XLF(IZ)+CH(IZ)*CF)*SDFJ-CH(IZ)*SF*CLOD2220
     1DFJ)                                                                 LOD2230
      KJ=KJ+NN                                                             LOD2240
360   IZ=IZ+1                                                              LOD2250
      CMR=-CM1*CMU/CREF                                                    LOD2260
      IF (NNJ.NE.1) WRITE (6,550) CLR                                      LOD2270
      IF (NNJ.EQ.1) WRITE (6,560) CLR                                      LOD2280
      IF (NNJ.NE.1) WRITE (6,570) CDR                                      LOD2290
      IF (NNJ.EQ.1) WRITE (6,580) CDR                                      LOD2300
      IF (NNJ.NE.1) WRITE (6,590) CMR                                      LOD2310
      IF (NNJ.EQ.1) WRITE (6,600) CMR                                      LOD2320
370   CONTINUE                                                             LOD2330
      IF (IUSR.EQ.1.AND.ITN.EQ.0) GO TO 380                                LOD2340
      WRITE (6,610) CLW                                                    LOD2350
      WRITE (6,620) CDW                                                    LOD2360
      WRITE (6,630) CMWT                                                   LOD2370
380   CONTINUE                                                             LOD2380
      WRITE (6,640) CLWW                                                   LOD2390
      WRITE (6,650) CDWW                                                   LOD2400
      WRITE (6,660) CMWWT                                                  LOD2410
      WRITE (6,670) CDWL2                                                  LOD2420
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      IF (KF.EQ.0) GO TO 400                                                LOD2430
      WRITE (6,680)                                                         LOD2440
      WRITE (6,690)                                                         LOD2450
      REWIND 07                                                             LOD2460
      REWIND 08                                                             LOD2470
      S=XTEF-XLEF                                                           LOD2480
      SS=SIN(ALP)                                                           LOD2490
      CS=COS(ALP)                                                           LOD2500
      X1=YCN(6)                                                             LOD2510
      CALL CPFUS (NCUM,NT,CQ,CPF,NF,S,XLEF,XF,XAS,LPANEL,LPAN1,NKF,NW,B1LOD2520
     1,AM,SS,CS,SNP,F0,F10,WARD,LAST,LPAN2,CREF,NCJ,MJJ,LAST,0,NJH,NP)  LOD2530
      CALL FUSLFT (CPF,HALFSW,CREF,SS,CS,0,X1)                          LOD2540
      WRITE (6,700)                                                         LOD2550
      DO 390 I=1,LWF                                                        LOD2560
390   CPWW(I)=GAM(2,I)*ALPC                                                 LOD2570
      SS=SIN(ALP)                                                           LOD2580
      CS=COS(ALP)                                                           LOD2590
      CALL CPFUS (NCUM,NT,CPWW,CPF,NF,S,XLEF,XF,XAS,LPANEL,LPAN1,NKF,NW,LOD2600
     1B1,AM,SS,CS,SNP,F0,F10,WARD,0,LPAN2,CREF,NCJ,MJJ,LAST,0,NJH,NP)   LOD2610
      CALL FUSLFT (CPF,HALFSW,CREF,SS,CS,0,X1)                          LOD2620
400   IF (LAT.NE.1) GO TO 440                                               LOD2630
      WRITE (6,710)                                                         LOD2640
      WRITE (6,720) ALPH                                                    LOD2650
      WRITE (6,730) AM1                                                     LOD2660
      JL=LAST                                                               LOD2670
      REWIND 01                                                             LOD2680
      DO 430 I=1,2                                                          LOD2690
      G10=0.                                                                LOD2700
      SS=0.                                                                 LOD2710
      CS=1.                                                                 LOD2720
      IF (KF.EQ.0) GO TO 410                                                LOD2730
      IF (I.EQ.1) REWIND 08                                                 LOD2740
      IF (I.EQ.2) REWIND 07                                                 LOD2750
      CALL CPFUS (NCUM,NT,GAMB,CPF,NF,S,XLEF,XF,XAS,LPANEL,LPAN1,NKF,NW,LOD2760
     1B1,AM,SS,CS,SNP,F0,G10,WARD,JL,LPAN2,CREF,NCJ,MJJ,LAST,2,NJH,NP)  LOD2770
      CALL FUSLFT (CPF,HALFSW,CREF,SS,CS,2,X1)                          LOD2780
      CYB=SS/BK+CYB                                                         LOD2790
      CNB=CS/BK*CREF/(2.*HALFB)+CNB                                         LOD2800
      SS=0.                                                                 LOD2810
      CS=1.                                                                 LOD2820
      IF (I.EQ.1) REWIND 08                                                 LOD2830
      IF (I.EQ.2) REWIND 07                                                 LOD2840
      CALL CPFUS (NCUM,NT,GAMR,CPF,NF,S,XLEF,XF,XAS,LPANEL,LPAN1,NKF,NW,LOD2850
     1P1,AM,SS,CS,SNP,F0,G10,WARD,JL,LPAN2,CREF,NCJ,MJJ,LAST,3,NJH,NP)  LOD2860
      CALL FUSLFT (CPF,HALFSW,CREF,SS,CS,3,X1)                          LOD2870
      CYR=SS+CYR                                                            LOD2880
      CNR=CS*CREF/(2.*HALFB)+CNR                                            LOD2890
410   CONTINUE                                                              LOD2900
      WRITE (6,740) CYB,CLB,CNB                                             LOD2910
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      WRITE (6,750) CYP,CLP,CNP                                          LOD2920
      WRITE (6,760) CYR,CLRR,CNR                                         LOD2930
      WRITE (6,770)                                                      LOD2940
      CYPP=CYB                                                           LOD2950
      CYPP=CYP+CYR*ALP                                                   LOD2960
      CYRP=CYR-CYP*ALP                                                   LOD2970
      CLBP=CLB+CNB*ALP                                                   LOD2980
      CLPP=CLP+(CLRR+CNP)*ALP                                            LOD2990
      CLRP=CLRR-(CLP-CNR)*ALP                                            LOD3000
      CNBP=CNB-CLB*ALP                                                   LOD3010
      CNPP=CNP-(CLP-CNR)*ALP                                             LOD3020
      CNRP=CNR-(CLRR+CNP)*ALP                                            LOD3030
      WRITE (6,740) CYPP,CLBP,CNRP                                       LOD3040
      WRITE (6,750) CYPP,CLPP,CNPP                                       LOD3050
      WRITE (6,760) CYRP,CLRP,CNRP                                       LOD3060
      JL=0                                                               LOD3070
      CYB=CYBW                                                           LOD3080
      CLB=CLBW                                                           LOD3090
      CNB=CNBW                                                           LOD3100
      CLP=CLPW                                                           LOD3110
      CYP=CYPW                                                           LOD3120
      CNP=CNPW                                                           LOD3130
      CYR=CYRW                                                           LOD3140
      CLRR=CLRRW                                                         LOD3150
      CNR=CNRW                                                           LOD3160
      IF (I.EQ.2) GO TO 430                                              LOD3170
      READ (01) (GAMP(K),K=1,LWF)                                        LOD3180
      READ (01) (GAMR(K),K=1,LWF)                                        LOD3190
      READ (01) (GAMB(K),K=1,LWF)                                        LOD3200
      DO 420 K=1,LPANEL                                                  LOD3210
      GAMR(K)=GAMR(K)-YV(K)/HALFB*GAM(2,K)-XV(K)/HALFB*GAMXW(K)          LOD3220
420   GAMP(K)=GAMB(K)-(SDWASH(K)-BK)*GAMXW(K)                            LOD3230
      IF (I.EQ.1) WRITE (6,780)                                          LOD3240
      WRITE (6,720) ALPH                                                 LOD3250
      WRITE (6,730) AM1                                                  LOD3260
430   CONTINUE                                                           LOD3270
440   CONTINUE                                                           LOD3280
      RETURN                                                             LOD3290
C                                                                        LOD3300
450   FORMAT (1H0,26X,7HALPHA =,F10.3,3X,7HDEGREES)                      LOD3310
460   FORMAT (1H0,20X,40HXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX)      LOD3320
470   FORMAT (1H0,3X,6HVORTEX,14X,2HXV,17X,2HYV,19X,2HCP,19X,3HCPW)      LOD3330
480   FORMAT (6X,I3,4(10X,F10.5))                                        LOD3340
490   FORMAT (1H0,9X,4HY/SP,11X,2HCL,13X,2HCM,12X,2HCT,13X,3HCDI,12X,3HCLOD3350
     1LW,12X,3HCMW,12X,3HCDW)                                            LOD3360
500   FORMAT (8(5X,F10.5))                                               LOD3370
510   FORMAT (1H0,22HTHE LIFT COEFFICIENT =,F10.5)                       LOD3380
520   FORMAT (1H0,32HTOTAL INDUCED DRAG COEFFICIENT =,F10.5)             LOD3390
530   FORMAT (1H0,28HTHE INDUCED DRAG PARAMETER =,F10.5)                 LOD3400
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  540   FORMAT (1H0,35HTOTAL PITCHING MOMENT COEFFICIENT =,F10.5)          LOD3410
  550   FORMAT (1H0,34HTHE COANDA LIFT COEFFICIENT, CLR =,F10.5)           LOD3420
  560   FORMAT (1H0,47HTHE LIFT COEFFICIENT DUE TO JET REACTION, CLJ =,F10LOD3430
       1.5)                                                               LOD3440
  570   FORMAT (1H0,34HTHE COANDA DRAG COEFFICIENT, CDR =,F10.5)           LOD3450
  580   FORMAT (1H0,47HTHE DRAG COEFFICIENT DUE TO JET REACTION, CDJ =,F10LOD3460
       1.5)                                                               LOD3470
  590   FORMAT (1H0,36HTHE COANDA MOMENT COEFFICIENT, CMR =,F10.5)         LOD3480
  600   FORMAT (1H0,58HTHE PITCHING MOMENT COEFFICIENT DUE TO JET REACTIONLOD3490
       1, CMJ =,F10.5)                                                    LOD3500
  610   FORMAT (1H0,2X,49HTHE LIFT COEFFICIENT WITH JET ENTRAINMENT ALONE LOD3510
       1=,F10.5)                                                          LOD3520
  620   FORMAT (1H0,2X,57HTHE INDUCED DRAG COEFFICIENT WITH JET ENTRAINMENLOD3530
       1T ALONE =,F10.5)                                                  LOD3540
  630   FORMAT (1H0,2X,60HTHE PITCHING MOMENT COEFFICIENT WITH JET ENTRAINLOD3550
       1MENT ALONE =,F10.5)                                               LOD3560
  640   FORMAT (1H0,40HTHE LIFT COEFFICIENT FOR THE WING ALONE=,F10.5)     LOD3570
  650   FORMAT (1H0,48HTHE INDUCED DRAG COEFFICIENT FOR THE WING ALONE=,F1LOD3580
       10.5)                                                              LOD3590
  660   FORMAT (1H0,51HTHE PITCHING MOMENT COEFFICIENT FOR THE WING ALONE=LOD3600
       1,F10.5)                                                           LOD3610
  670   FORMAT (1H0,46HTHE INDUCED DRAG PARAMETER FOR THE WING ALONE=,F10.LOD3620
       15)                                                                LOD3630
  680   FORMAT (//1X,58H***FUSELAGE AERODYNAMIC CHARACTERISTICS ARE GIVEN LOD3640
       1BELOW***)                                                         LOD3650
  690   FORMAT (/5X,26H***JET-ON CONFIGURATION***)                         LOD3660
  700   FORMAT (/5X,27H***JET-OFF CONFIGURATION***)                        LOD3670
  710   FORMAT (//1X,56HLATERAL-DIRECTIONAL STABILITY CHARACTERSTICS WITH LOD3680
       1JET ON)                                                           LOD3690
  720   FORMAT (//45H***STABILITY DERIVATIVES EVALUATED AT ALPHA =,F8.3,2XLOD3700
       1,4HDEG.)                                                          LOD3710
  730   FORMAT (/3X,16HAND AT MACH NO.=,F8.3,22H,BASED ON BODY AXES***)    LOD3720
  740   FORMAT (/5X,5HCYB =,F12.7,2X,5HCLB =,F12.7,2X,5HCNB =,F12.7)       LOD3730
  750   FORMAT (/5X,5HCYP =,F12.7,2X,5HCLP =,F12.7,2X,5HCNP =,F12.7)       LOD3740
  760   FORMAT (/5X,5HCYR =,F12.7,2X,5HCLR =,F12.7,2X,5HCNR =,F12.7)       LOD3750
  770   FORMAT (//51H***STABILITY DERIVATIVES BASED ON STABILITY AXES***)  LOD3760
  780   FORMAT (//1X,57HLATERAL-DIRECTIONAL STABILITY CHARACTERSTICS WITH  LOD3770
       1JET OFF)                                                          LOD3780
        END                                                               LOD3790-
        SUBROUTINE UTFW (X,Y,Z,SF,CF,LAST,LPANFL,R1,LPAN1,NW,GAMMA,VX,VT,JUTW  10
       1L,LPAN2,NCJ,MJJ,L,NJH,NP)                                         UTW  20
        DIMENSION W(2), NW(1), GAMMA(1), U(2), NCJ(1), MJJ(1)              UTW  30
        COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTUTW  40
       1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZUTW  50
       2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95UTW  60
       3,2),SC(160,5),SI(160,5),LC(3)                                     UTW  70
        PI=3.14159265                                                     UTW  80
        ICON=LPANFL                                                       UTW  90
        IF (JL.EQ.LAST) ICON=LAST                                         UTW 100
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      IA=2*(LAST-LPANEL)                                                UTW 110
      IB=LAST-LPANEL                                                    UTW 120
      JCCT=XTE(50)                                                      UTW 130
      IP=1                                                              UTW 140
      IZ=1                                                              UTW 150
      IFF=1                                                             UTW 160
      ISN=1                                                             UTW 170
      JKT=1                                                             UTW 180
      MM=NW(1)                                                          UTW 190
      NN=NW(1)                                                          UTW 200
      IND=1                                                             UTW 210
      L1=LPANEL+1                                                       UTW 220
      LAST1=LAST-1                                                      UTW 230
      FACTOR=1.                                                         UTW 240
      IF (L.GE.2) FACTOR=-1.                                            UTW 250
      VX=0.                                                             UTW 260
      VT=0.                                                             UTW 270
      DO 130 J=1,ICON                                                   UTW 280
      MI=J-IFF+1                                                        UTW 290
      FN=NN                                                             UTW 300
      IF (J.GT.LPANEL) GO TO 40                                         UTW 310
      IF (J.EQ.(LPAN1+1).OR.J.EQ.(LPAN2+1)) IP=1                        UTW 320
      IF (JCCT.EQ.1.AND.J.GT.LPANEL) GO TO 10                           UTW 330
      GO TO 20                                                          UTW 340
10    IF (JKT.EQ.1.OR.JKT.EQ.(NJH+1)) IP=1                              UTW 350
20    CONTINUE                                                          UTW 360
      IF (J.GT.LPAN1.AND.J.LE.LPAN2) ISN=2                              UTW 370
      IF (J.GT.LPAN2.AND.J.LE.LPANEL) ISN=3                             UTW 380
      IF (J.GE.LPAN1.AND.J.LT.LPANEL) GO TO 30                          UTW 390
      GO TO 40                                                          UTW 400
30    NN=NW(2)                                                          UTW 410
      IF (J.GE.LPAN2.AND.J.LT.LPANEL) NN=NW(3)                          UTW 420
40    CONTINUE                                                          UTW 430
      IF (J.GE.LPANEL.AND.J.LT.MJJ(IND)) NN=NCJ(IND)                    UTW 440
      IF (JL.EQ.0) GO TO 70                                             UTW 450
      IF (J.EQ.L1) GO TO 50                                             UTW 460
      GO TO 60                                                          UTW 470
50    ISN=ISN+1                                                         UTW 480
      L1=MJJ(IND)+1                                                     UTW 490
60    NL=MJJ(IND)-1                                                     UTW 500
      IF (NL.EQ.LAST1) GO TO 70                                         UTW 510
      IF (J.EQ.NL) IND=IND+1                                            UTW 520
70    CONTINUE                                                          UTW 530
      JJ=J                                                              UTW 540
      IF (J.LE.LPANEL.AND.JL.EQ.LAST) JJ=J+IA                           UTW 550
      IF (J.GT.LPANEL.AND.JL.EQ.LAST) JJ=J+IB-LPANEL                    UTW 560
      CHORD=CH(IZ)                                                      UTW 570
      X1=XN(J,1)-X                                                      UTW 580
      X2=XN(J,2)-X                                                      UTW 590
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      X12=XN(J,2)-XN(J,1)                                                    UTW 600
      Y12=YN(J,2)-YN(J,1)                                                    UTW 610
      Z12=ZN(J,2)-ZN(J,1)                                                    UTW 620
      Z1=ZN(J,1)-Z                                                           UTW 630
      Z2=ZN(J,2)-Z                                                           UTW 640
      XZJ=X1*Z12-Z1*X12                                                      UTW 650
      DO 120 II=1,2                                                          UTW 660
      FCP=1.                                                                 UTW 670
      IF (II.EQ.2) FCP=-1.                                                   UTW 680
      YC=Y*FCP                                                               UTW 690
      Y1=YN(J,1)-YC                                                          UTW 700
      Y2=YN(J,2)-YC                                                          UTW 710
      XYK=X1*Y12-Y1*X12                                                      UTW 720
      YZI=Y1*Z12-Z1*Y12                                                      UTW 730
      ALP1=XYK*XYK+XZJ*XZJ+R1*YZI*YZI                                        UTW 740
      R1B1=SQRT(X1*X1+B1*Y1*Y1+B1*Z1*Z1)                                     UTW 750
      R2B1=SQRT(X2*X2+B1*Y2*Y2+B1*Z2*Z2)                                     UTW 760
      UUB1=(X2*X12+B1*Y2*Y12+B1*Z2*Z12)/R2B1-(X1*X12+B1*Y1*Y12+B1*Z1*Z12UTW 770
     1)/R1B1                                                                 UTW 780
      IF (IP.EQ.1) GO TO 90                                                  UTW 790
80    CONTINUE                                                               UTW 800
      G1B1=(1.-X1/R1B1)/(Y1*Y1+Z1*Z1)                                        UTW 810
      GO TO 100                                                              UTW 820
90    IF (L.GE.2) GO TO 80                                                   UTW 830
      G1B1=0.                                                                UTW 840
100   CONTINUE                                                               UTW 850
      G2B1=(1.-X2/R2B1)/(Y2*Y2+Z2*Z2)                                        UTW 860
      F12=UUB1*XYK/ALP1                                                      UTW 870
      G12=-Y2*G2B1+Y1*G1B1                                                   UTW 880
      F13=UUB1*XZJ/ALP1                                                      UTW 890
      G13=Z2*G2B1-Z1*G1B1                                                    UTW 900
      F1=-F13*CF*FCP-F12*SF                                                  UTW 910
      F2=G13*CF*FCP-G12*SF                                                   UTW 920
      F3=UUB1*YZI/ALP1                                                       UTW 930
      IF (J.LE.LPANEL) GO TO 110                                             UTW 940
      F1=2.*F1                                                               UTW 950
      F2=2.*F2                                                               UTW 960
      F3=2.*F3                                                               UTW 970
110   CONTINUE                                                               UTW 980
      U(II)=F3*CHORD*SN(MI,ISN)*GAMMA(JJ)/(8.*PN)                            UTW 990
120   W(II)=(F1+F2)*CHORD*SN(MI,ISN)*GAMMA(JJ)/(8.*PN)                       UTW1000
      VT=W(1)+FACTOR*W(2)+VT                                                 UTW1010
      VX=U(1)+FACTOR*U(2)+VX                                                 UTW1020
      IF (J.LT.MM) GO TO 130                                                 UTW1030
      IP=IP+1                                                                UTW1040
      IZ=IZ+1                                                                UTW1050
      IFF=MM+1                                                               UTW1060
      MM=MM+NN                                                               UTW1070
      IF (J.GT.LPANEL) JKT=JKT+1                                             UTW1080
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      IF (JKT.EQ.(NP+1)) JKT=1                                          UTW1090
130   CONTINUE                                                          UTW1100
      RETURN                                                            UTW1110
      END                                                               UTW1120-
      SUBROUTINE FORCE (ID,AM,CLT,CMT,CDT,SECT,CL,CM,CD,XLL,XTT,CP,CPF,GFRC  10
     1AMP,GAMP,GAMR,CAMLER,CAMLET,CREF,CYR,CLR,CNR,CLP,CYP,CNP,CYR,CLRR,FRC  20
     2CNR,CT)                                                           FRC  30
      DIMENSION SECT(1), CL(1), CM(1), CD(1), XLL(1), XTT(1), CP(1), CPFFRC  40
     1(10,1), GAMP(1), GAMB(1), GAMR(1), CT(1)                          FRC  50
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTFRC  60
     1F(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZFRC  70
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFB,SJ(21,8),EX(95,2),TX(95FRC  80
     3,2),SC(160,5),SI(160,5),LC(3)                                     FRC  90
      COMMON /COST/ LTOTAL,LPAN1,NJW(5),LPANEL,IENTN,LPAN2,EXIT,PTIAL,TWFRC 100
     1IST,DF(5),NFP                                                     FRC 110
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JFRC 120
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                        FRC 130
      COMMON /SOME/ NC,NWING,LAT,NAL,LWF,LWFJ,CHORDT(3),SNG(5),YG(5),YCNFRC 140
     1(6),WKN,RDX,NDG,NDG                                               FRC 150
      PI=3.14159265                                                     FRC 160
      IA=2*JPANEL                                                       FRC 170
      IF (ID.EQ.2) IA=0                                                 FRC 180
      RK=5.*PI/180.                                                     FRC 190
      CLT=0.                                                            FRC 200
      CMT=0.                                                            FRC 210
      CDT=0.                                                            FRC 220
      CYR=0.                                                            FRC 230
      CLR=0.                                                            FRC 240
      CNR=0.                                                            FRC 250
      CLP=0.                                                            FRC 260
      CYP=0.                                                            FRC 270
      CNP=0.                                                            FRC 280
      CYR=0.                                                            FRC 290
      CLRR=0.                                                           FRC 300
      CNR=0.                                                            FRC 310
      KW=1                                                              FRC 320
      SK=SNG(1)                                                         FRC 330
      CK1=SQRT(1.-SK*SK)                                                FRC 340
      KC=1                                                              FRC 350
      NCCL=M1(1)                                                        FRC 360
      KLL=0                                                             FRC 370
      MM=0                                                              FRC 380
      IU=1                                                              FRC 390
      IF (NW(2).NE.0) IU=2                                              FRC 400
      IF (NW(3).NE.0) IL=3                                              FRC 410
      NW2=NW(1)+NW(2)                                                   FRC 420
      NW3=NW(2)+NW(3)                                                   FRC 430
      NCW1=NCW+1                                                        FRC 440
      NL=1                                                              FRC 450
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      DO 180 I=1,NCS                                                    FRC 460
      IF (NW(2).EQ.0) GO TO 20                                          FRC 470
      II=I+NCS                                                          FRC 480
      IF (NW(3).NE.0) GO TO 10                                          FRC 490
      CHORD=CH(I)+CH(II)                                                FRC 500
      GO TO 30                                                          FRC 510
10    III=II+NCS                                                        FRC 520
      CHORD=CH(I)+CH(II)+CH(III)                                        FRC 530
      GO TO 30                                                          FRC 540
20    CHORD=CH(I)                                                       FRC 550
30    CONTINUE                                                          FRC 560
      CML=0.                                                            FRC 570
      CL(I)=0.                                                          FRC 580
      CM(I)=0.                                                          FRC 590
      CD(I)=0.                                                          FRC 600
      CYPS=0.                                                           FRC 610
      CLPS=0.                                                           FRC 620
      CNPS=0.                                                           FRC 630
      CLPS=0.                                                           FRC 640
      CYPS=0.                                                           FRC 650
      CNPS=0.                                                           FRC 660
      CYRS=0.                                                           FRC 670
      CLRS=0.                                                           FRC 680
      CNRS=0.                                                           FRC 690
      IF (YLE(I).GT.YG(KW)) GO TO 40                                    FRC 700
      GO TO 50                                                          FRC 710
40    KW=KW+1                                                           FRC 720
      SK=SNG(KW)                                                        FRC 730
      CK1=SQRT(1.-SK**2)                                                FRC 740
50    CONTINUE                                                          FRC 750
      DO 140 J=1,NCW                                                    FRC 760
      NN=J+MM                                                           FRC 770
      IF (NW(2).EQ.0) GO TO 70                                          FRC 780
      IF (J.LE.NW(1)) GO TO 70                                          FRC 790
      IF (J.GT.NW2) GO TO 60                                            FRC 800
      LL=LPAN1+NW(2)*(I-1)+J-NW(1)                                      FRC 810
      IL=II                                                             FRC 820
      JLL=J-NW(1)                                                       FRC 830
      L=2                                                               FRC 840
      FN=NW(2)                                                          FRC 850
      GO TO 80                                                          FRC 860
60    LL=LPAN2+NW(3)*(I-1)+J-NW2                                        FRC 870
      IL=III                                                            FRC 880
      JLL=J-NW2                                                         FRC 890
      L=3                                                               FRC 900
      FN=NW(3)                                                          FRC 910
      GO TO 80                                                          FRC 920
70    LL=NN                                                             FRC 930
      IL=I                                                              FRC 940
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      JLL=J                                                              FRC 950
      L=1                                                                FRC 960
      FN=NW(1)                                                           FRC 970
80    CONTINUE                                                           FRC 980
      XC=(XV(LL)-XLE(I))/CHORD                                           FRC 990
      AZ=ZCR(XC)                                                         FRC1000
      BZ=ZCT(XC)                                                         FRC1010
      GBS=CP(LL)*SN(JLL,L)*CH(IL)/FN                                     FRC1020
      IF (DF(NL).LE.0.001) GO TO 90                                      FRC1030
      IF (PTIAL.LE.0.1) GO TO 100                                        FRC1040
      IF (NW(3).EQ.0) GO TO 120                                          FRC1050
      IF (LL.GE.MJW1(3,NL).AND.LL.LE.MJW2(3,NL)) GO TO 110               FRC1060
90    CAM=AZ-(AZ-BZ)*YV(LL)/HALFB                                        FRC1070
      EPHA=XLL(I)-ATAN(CAM)                                              FRC1080
      CS=COS(EPHA)                                                       FRC1090
      SS=SIN(EPHA)                                                       FRC1100
      SC1=SIN(EPHA-XLL(I))                                               FRC1110
      CC1=COS(EPHA-XLL(I))                                               FRC1120
      GO TO 130                                                          FRC1130
100   IF (NW(2).NE.0.AND.LL.LE.LPAN1) GO TO 90                           FRC1140
      IF (NW(3).NE.0.AND.LL.LE.LPAN2) GO TO 90                           FRC1150
110   EP=XLL(I)+DF(NL)                                                   FRC1160
      CAM=AZ-(AZ-BZ)*YV(LL)/HALFB                                        FRC1170
      EP=EP-ATAN(CAM)                                                    FRC1180
      CS=COS(EP)                                                         FRC1190
      SS=SIN(EP)                                                         FRC1200
      SC1=SIN(EP-XLL(I))                                                 FRC1210
      CC1=COS(EP-XLL(I))                                                 FRC1220
      GO TO 130                                                          FRC1230
120   IF (LL.GE.MJW1(2,NL).AND.LL.LE.MJW2(2,NL)) GO TO 110               FRC1240
      GO TO 90                                                           FRC1250
130   CONTINUE                                                           FRC1260
      CL(I)=CL(I)+GBS*CS                                                 FRC1270
      CM(I)=CM(I)-GBS*XV(LL)*CS                                          FRC1280
      CD(I)=CD(I)+GBS*SS                                                 FRC1290
      IF (LAT.NE.1.OR.ID.EQ.1) GO TO 140                                 FRC1300
      JJ=LL+IA                                                           FRC1310
      WP=GAMP(JJ)*SN(JLL,L)*CH(IL)/FN                                    FRC1320
      WB=GAMB(JJ)*SN(JLL,L)*CH(IL)/FN                                    FRC1330
      WR=GAMR(JJ)*SN(JLL,L)*CH(IL)/FN                                    FRC1340
      CLBS=CLBS+WB*CK1*CC1                                               FRC1350
      CLPS=CLPS+WP*CK1*CC1                                               FRC1360
      CNPS=CNPS+WP*SC1*YLE(I)+WP*XV(LL)*SK*CC1                           FRC1370
      CLRS=CLRS+WR*CK1*CC1                                               FRC1380
      CNBS=CNBS+WB*SC1*YLE(I)+WR*XV(LL)*SK*CC1                           FRC1390
      CNRS=CNRS+WR*SC1*YLE(I)+WR*XV(LL)*SK*CC1                           FRC1400
      CYRS=CYRS+GBS*SS*XV(LL)/HALFB                                      FRC1410
      CYBS=-CD(I)                                                        FRC1420
140   CONTINUE                                                           FRC1430
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      CAMLE=CAMLER-(CAMLER-CAMLET)*YLF(I)/HALFB                          FRC1440
      EPHA=XLL(I)-ATAN(CAMLE)                                           FRC1450
      CZ=COS(EPHA)                                                      FRC1460
      DZ=SIN(EPHA)                                                      FRC1470
      CL(I)=CL(I)*PI/CHORD+SECT(I)*DZ                                   FRC1480
      CM(I)=CM(I)*PI/(CREF*CHORD)                                       FRC1490
      CD(I)=CD(I)*PI/CHORD-SECT(I)*CZ                                   FRC1500
      IF (LAT.NE.1.OR.ID.EQ.1) GO TO 150                                FRC1510
      FS=COS(SWEEP(I))                                                  FRC1520
      CTH=PI/2.*SQRT(1.-AM*AM*FS*FS)/FS                                 FRC1530
      CLBS=CLBS*PI/CHORD                                                FRC1540
      CLPS=CLPS*PI/CHORD                                                FRC1550
      CNBS=CNBS*PI/CHORD                                                FRC1560
      CNRS=CNRS*PI/CHORD                                                FRC1570
      CYBS=CYBS*BK*PI/CHORD                                             FRC1580
      CYPS=CYPS*PI/CHORD                                                FRC1590
      SSN=SIN(SWEEP(I))                                                 FRC1600
      TAN=SSN/FS                                                        FRC1610
      CTHS=CTH*TAN                                                      FRC1620
      SIDE=CTHS*2.*CPF(1,I)*CPF(3,I)                                    FRC1630
      SIDF2=0.                                                          FRC1640
      SIDF3=0.                                                          FRC1650
      CNPS=CNPS*PI/CHORD-CTH*2.*CPF(1,I)*CPF(3,I)*YLF(I)                FRC1660
      CNPS=CNPS-SIDE*CK1*XLE(I)                                         FRC1670
      CYPS=-CLPS*SK/CK1+SIDE*CK1                                        FRC1680
      CNBS=CNBS-SIDE2*YLE(I)-SIDF2*CK1*XLE(I)*TAN                       FRC1690
      CNRS=CNRS-SIDF3*YLF(I)-SIDE3*CK1*XLF(I)*TAN                       FRC1700
      CYBS=-CLBS*SK/CK1+CYBS                                            FRC1710
      CYRS=-CLRS*SK/CK1+CYRS                                            FRC1720
      CYPS=CYPS+SIDF2*CK1*TAN                                           FRC1730
      CYRS=CYRS+SIDF3*CK1*TAN                                           FRC1740
      CLPS=CLPS*PI/CHORD                                                FRC1750
150   CONTINUE                                                          FRC1760
      IF (I.LT.NCOL) GO TO 160                                          FRC1770
      KLL=NCOL-1                                                        FRC1780
      KC=KC+1                                                           FRC1790
      NCOL=NCOL+M1(KC)-1                                                FRC1800
160   KL=I-KLL                                                          FRC1810
      FM=M1(KC)                                                         FRC1820
      AA=CHORD*SJ(KL,KC)*WIDTH(KC)/FM                                   FRC1830
      CLT=CLT+CL(I)*AA                                                  FRC1840
      CMT=CMT+CM(I)*AA                                                  FRC1850
      CDT=CDT+CD(I)*AA                                                  FRC1860
      IF (LAT.NE.1.OR.ID.EQ.1) GO TO 170                                FRC1870
      CYB=CYB+CYBS*AA                                                   FRC1880
      CLB=CLB+CLBS*AA*YLE(I)                                            FRC1890
      CNB=CNB+CNBS*AA                                                   FRC1900
      CLP=CLP+CLPS*AA*YLE(I)                                            FRC1910
      CYP=CYP+CYPS*AA                                                   FRC1920
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      CNP=CNP+CNPS*AA                                                    FRC1930
      CYR=CYR+CYRS*AA                                                    FRC1940
      CLRR=CLRR+CLRS*AA*YLE(I)                                           FRC1950
      CNR=CNR+CNRS*AA                                                    FRC1960
  170 CONTINUE                                                           FRC1970
      MM=(NCW-NW3)*I                                                     FRC1980
      IF (LL.EQ.MJW2(IU,NL)) NL=NL+1                                     FRC1990
  180 CONTINUE                                                           FRC2000
      IF (LAT.NE.1.OR.ID.EQ.1) GO TO 220                                 FRC2010
      SUM1=0.                                                            FRC2020
      SUM2=0.                                                            FRC2030
      SUM3=0.                                                            FRC2040
      SUM4=0.                                                            FRC2050
      SUM5=0.                                                            FRC2060
      SUM6=0.                                                            FRC2070
      KD=NDG                                                             FRC2080
      ISN=1                                                              FRC2090
      FN=NW(1)                                                           FRC2100
      K1=1                                                               FRC2110
      DO 210 J=1,NCW                                                     FRC2120
      JJ=J                                                               FRC2130
      IF (J.LE.NW(1)) GO TO 200                                          FRC2140
      IF (J.GT.(NW(1)+NW(2))) GO TO 190                                  FRC2150
      ISN=2                                                              FRC2160
      FN=NW(2)                                                           FRC2170
      JJ=J-NW(1)                                                         FRC2180
      K1=2                                                               FRC2190
      GO TO 200                                                          FRC2200
  190 ISN=3                                                              FRC2210
      FN=NW(3)                                                           FRC2220
      JJ=J-NW(1)-NW(2)                                                   FRC2230
      K1=3                                                               FRC2240
  200 FJJ=JJ                                                             FRC2250
      XQ=YCN(K1)+0.5*CHORDT(K1)*(1.-COS((2.*FJJ-1.)*PI/(2.*FN)))         FRC2260
      CK=CHORDT(K1)*2.*CPF(2,J)*CPF(4,J)*SN(JJ,ISN)/FN                   FRC2270
      CK2=CHORDT(K1)*2.*CPF(2,J)*CPF(6,J)*SN(JJ,ISN)/FN                  FRC2280
      CK3=CHORDT(K1)*2.*CPF(2,J)*CPF(8,J)*SN(JJ,ISN)/FN                  FRC2290
      COT=SQRT(1.-SNG(KD)*SNG(KD))                                       FRC2300
      CK=CK*COT                                                          FRC2310
      CK2=CK2*COT                                                        FRC2320
      CK3=CK3*COT                                                        FRC2330
      SUM1=SUM1+CK                                                       FRC2340
      SUM3=SUM3+CK2                                                      FRC2350
      SUM4=SUM4+CK2*XQ                                                   FRC2360
      SUM5=SUM5+CK3                                                      FRC2370
      SUM6=SUM6+CK3*XQ                                                   FRC2380
  210 SUM2=SUM2+CK*XQ                                                    FRC2390
      SUM1=SUM1*PI*2.                                                    FRC2400
      SUM2=SUM2*PI*2.                                                    FRC2410
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      CYP=CYP+SUM1                                                      FRC2420
      CNP=CNP-SUM2                                                      FRC2430
      CYB=CYB+SUM3*PI*2.                                                FRC2440
      CNB=CNB-SUM4*PI*2.                                                FRC2450
      CYR=CYR+SUM5*PI*2.                                                FRC2460
      CNR=CNR-SUM6*PI*2.                                                FRC2470
  220 CONTINUE                                                          FRC2480
      CLT=CLT*PI/(2.*HALFSW)                                            FRC2490
      CMT=CMT*PI/(2.*HALFSW)                                            FRC2500
      CDT=CDT*PI/(2.*HALFSW)                                            FRC2510
      IF (LAT.NE.1.OR.ID.EQ.1) GO TO 230                                FRC2520
      CYP=CYB*PI/(2.*HALFSW)/BK                                         FRC2530
      CLP=-CLB*PI/(4.*HALFSW*HALFB)                                     FRC2540
      CNB=CNP*PI/(4.*HALFSW*HALFB)/BK                                   FRC2550
      CLP=-CLP*PI/(4.*HALFSW*HALFB)                                     FRC2560
      CYP=CYP*PI/(2.*HALFSW)                                            FRC2570
      CNP=CNP*PI/(4.*HALFSW*HALFB)                                      FRC2580
      CYR=CYR*PI/(2.*HALFSW)                                            FRC2590
      CLRR=-CLRR*PI/(4.*HALFSW*HALFP)                                   FRC2600
      CNR=CNR*PI/(4.*HALFSW*HALFB)                                      FRC2610
      CLB=CLP/BK                                                        FRC2620
  230 CONTINUE                                                          FRC2630
      RETURN                                                            FRC2640
      END                                                               FRC2650-
      SUBROUTINE FUSLFT (CPF,HALFSW,CBFF,SS,CS,L,XI)                    FLF  10
      DIMENSION AW(21), CST(15), CTL(20), BP(20), CPF(10,1), CA(20)     FLF  20
      COMMON /FUS/ XF(20),XCF(20),BF(20),SNP(5,20),XLEF,XTEF,WA'D(20),NCFLF  30
     1UM,NF,NT,CSF(5,10),XAS(6),NKF(5),F0,F10,KF,NTL                    FLF  40
      PI=3.14159265                                                     FLF  50
      SLENTH=XTEF-XLEF                                                  FLF  60
      TH1=SNP(5,20)                                                     FLF  70
      NH1=SNP(5,19)                                                     FLF  80
      DO 10 I=1,NF                                                      FLF  90
      XC=XF(I)                                                          FLF 100
   10 BP(I)=FUR(XC)                                                     FLF 110
      IF (L.NE.0) GO TO 20                                              FLF 120
   20 CONTINUE                                                          FLF 130
      CNF=0.                                                            FLF 140
      CAF=0.                                                            FLF 150
      CMF=0.                                                            FLF 160
      DO 50 I=1,NCUM                                                    FLF 170
      IF (NH1.NE.0.AND.I.LE.NH1) GO TO 30                               FLF 180
      FI=I-NH1                                                          FLF 190
      FCUM=NCUM-NH1                                                     FLF 200
      PP=PI-TH1                                                         FLF 210
      TP=TH1                                                            FLF 220
      GO TO 40                                                          FLF 230
   30 FI=I                                                              FLF 240
      FCUM=NH1                                                          FLF 250
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      PP=TH1                                                            FLF 260
      TP=0.                                                             FLF 270
40    CONTINUE                                                          FLF 280
      THETA=(2.*FI-1.)*PP/(2.*FCUM)+TP                                  FLF 290
      IF (L.GE.2) CST(I)=SIN(THETA)                                     FLF 300
50    IF (L.LT.2) CST(I)=COS(THETA)                                     FLF 310
      FNK=NKF(1)                                                        FLF 320
      SL=XAS(2)-XAS(1)                                                  FLF 330
      MM=NKF(1)                                                         FLF 340
      NC=1                                                              FLF 350
      NN=0                                                              FLF 360
      DO 90 I=1,NF                                                      FLF 370
      CPTL=0.                                                           FLF 380
      IP=I-NN                                                           FLF 390
      DO 80 K=1,NCUM                                                    FLF 400
      IF (NH1.NE.0.AND.K.LE.NH1) GO TO 60                               FLF 410
      FCUM=NCUM-NH1                                                     FLF 420
      PP=PI-TH1                                                         FLF 430
      GO TO 70                                                          FLF 440
60    FCUM=NH1                                                          FLF 450
      PP=TH1                                                            FLF 460
70    CONTINUE                                                          FLF 470
80    CPTL=CPTL+CPF(K,I)*CST(K)*PP/FCUM                                 FLF 480
      CTL(I)=-2.*CPTL                                                   FLF 490
      GB=RP(I)*SNP(NC,IP)*CTL(I)*SL/(2.*FNK)                            FLF 500
      CA(I)=GB*FNK/SL                                                   FLF 510
      X=XF(I)                                                           FLF 520
      S=SLENTH                                                          FLF 530
      DRX=SLOP(X)/RP(I)                                                 FLF 540
      CAF=CAF+GB*DRX                                                    FLF 550
      CNF=CNF+GB                                                        FLF 560
      CMF=CMF+GB*XF(I)                                                  FLF 570
      IF (I.LT.MM.OR.I.EQ.NF) GO TO 90                                  FLF 580
      NC=NC+1                                                           FLF 590
      NN=MM                                                             FLF 600
      MM=MM+NKF(NC)                                                     FLF 610
      SL=XAS(NC+1)-XAS(NC)                                              FLF 620
      FNK=NKF(NC)                                                       FLF 630
90    CONTINUE                                                          FLF 640
      ICK=0                                                             FLF 650
      IF (ABS((XAS(2)-XTEF)/SLENTH).GT.0.01) GO TO 130                  FLF 660
      ICK=1                                                             FLF 670
      FNF=NF                                                            FLF 680
      NF1=NF+1                                                          FLF 690
      DO 110 J=1,NF1                                                    FLF 700
      AW(J)=0.                                                          FLF 710
      FJ=J                                                              FLF 720
      DO 100 K=1,NF                                                     FLF 730
      FK=K                                                              FLF 740
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100   AW(J)=AW(J)+CA(K)*COS((FJ-1.)*(2.*FK-1.)*PI/(2.*FNF))                FLF 750
      IF (J.EQ.1) AW(J)=AW(J)/FNF                                           FLF 760
      IF (J.NE.1) AW(J)=AW(J)*2./FNF                                        FLF 770
110   CONTINUE                                                              FLF 780
C                                                                           FLF 790
C  * EMPIRICAL METHOD TO FIND THE STATION AT WHICH THE FLOW CEASES TO REFLF 800
C    POTENTIAL. SEE DATCOM *                                                FLF 810
      X0=0.378+0.527*X1                                                     FLF 820
      TH=ACOS(1.-2.*X0)                                                     FLF 830
      SUM=AW(1)*TH                                                          FLF 840
      SMM=-AW(1)*SIN(TH)-0.5*AW(2)*(TH+0.5*SIN(2.*TH))                      FLF 850
      DO 120 J=1,NF                                                         FLF 860
      FJ=J                                                                  FLF 870
      IF (J.GE.2) SMM=SMM-0.5*AW(J+1)*(SIN((FJ-1.)*TH)/(FJ-1.)+SIN((FJ+1FLF 880
     1.)*TH)/(FJ+1.))                                                       FLF 890
120   SUM=SUM+AW(J+1)*SIN(FJ*TH)/FJ                                         FLF 900
      SMM=SMM+SUM                                                           FLF 910
      SUM=SUM*SLENTH/(2.*HALFSW)                                            FLF 920
      SMM=-SMM*SLENTH**2/(4.*HALFSW*CREF)                                   FLF 930
      SMM=SMM-XLEF/CREF*SUM                                                 FLF 940
130   CONTINUE                                                              FLF 950
      IF (L.NE.0) GO TO 150                                                 FLF 960
      WRITE (6,190)                                                         FLF 970
      WRITE (6,200)                                                         FLF 980
      DO 140 I=1,NF                                                         FLF 990
      XC=XF(I)/SLENTH                                                       FLF1000
140   WRITE (6,180) XC,RP(I),CTL(I)                                         FLF1010
150   CONTINUE                                                              FLF1020
      CLF=CNF*CS+CAF*SS                                                     FLF1030
      CDF=CNF*SS-CAF*CS                                                     FLF1040
      CDF=CDF*PI/(2.*HALFSW)                                                FLF1050
      CLF=CLF*PI/(2.*HALFSW)                                                FLF1060
      CMF=-CMF*PI/(2.*HALFSW*CREF)                                          FLF1070
      SS=CLF                                                                FLF1080
      CS=CMF                                                                FLF1090
      IF (ICK.EQ.0) GO TO 160                                               FLF1100
      CLF=SUM                                                               FLF1110
      SS=CLF                                                                FLF1120
      CS=SMM                                                                FLF1130
160   CONTINUE                                                              FLF1140
      IF (L.NE.0) GO TO 170                                                 FLF1150
      WRITE (6,220) CLF                                                     FLF1160
      WRITE (6,210) CMF                                                     FLF1170
170   CONTINUE                                                              FLF1180
      RETURN                                                                FLF1190
C                                                                           FLF1200
180   FORMAT (11F12.5)                                                      FLF1210
190   FORMAT (/5X,63HTOTAL PRESSURE LOADING AT EACH X-STATION, BASED ON FLF1220
     1LOCAL RADIUS)                                                         FLF1230
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200   FORMAT (/5X,3HX/L,9X,6HRADIUS,6X,7HLOADING)                          FLF1240
210   FORMAT (/5X,43HTHE FUSELAGE PCTENTIAL MOMENT COEFFICIENT =,F10.5) FLF1250
220   FORMAT (/5X,41HTHE FUSELAGE POTENTIAL LIFT COEFFICIENT =,F10.5)   FLF1260
      END                                                                  FLF1270-
      SUBROUTINE CPFUS (NT,N,B,CPF,NF,S,XLEF,XF,XAS,LPANEL,LPAN1,NKF,NW,CPF  10
     1BB,AM,SS,CS,SNP,F0,F10,WARD,JL,LPAN2,CREF,NCJ,MJJ,LAST,L,NJH,NP)  CPF  20
      DIMENSION B(1), XF(1), RF(20), SNP(5,20), WARD(1), NKF(1), NW(1), CPF  30
     1XAS(1)                                                              CPF  40
      DIMENSION CPF(10,1), U(8), V(8), NCJ(1), MJJ(1)                     CPF  50
      PI=3.14159265                                                       CPF  60
      FNT=NF                                                              CPF  70
      TH1=SNP(5,20)                                                       CPF  80
      NH1=SNP(5,19)                                                       CPF  90
      XTEF=XLEF+S                                                         CPF 100
      NF1=NF-1                                                            CPF 110
      NZ=1                                                                CPF 120
      IF (L.NE.0) NZ=2                                                    CPF 130
      FL=0.                                                               CPF 140
      FL1=0.                                                              CPF 150
      FNK=NKF(1)                                                          CPF 160
      SL=XAS(2)-XAS(1)                                                    CPF 170
      MM=NKF(1)                                                           CPF 180
      NC=1                                                                CPF 190
      NN=0                                                                CPF 200
      LTOTAL=JL*2-LPANEL                                                  CPF 210
      IF (JL.EQ.0) LTOTAL=LPANEL                                          CPF 220
      DO 10 I=1,NF                                                        CPF 230
      II=I+LTOTAL                                                         CPF 240
      IP=I-NN                                                             CPF 250
      XC=XF(I)                                                            CPF 260
      RF(I)=FUR(XC)                                                       CPF 270
      FL1=FL1+B(II)*SNP(NC,IP)*SL/FNK                                     CPF 280
      FL=FL+WARD(I)*SNP(NC,IP)*SL/FNK                                     CPF 290
      IF (I.LT.MM.OR.I.EQ.NF) GO TO 10                                    CPF 300
      NC=NC+1                                                             CPF 310
      NN=MM                                                               CPF 320
      MM=MM+NKF(NC)                                                       CPF 330
      SL=XAS(NC+1)-XAS(NC)                                                CPF 340
      FNK=NKF(NC)                                                         CPF 350
10    CONTINUE                                                            CPF 360
      FL=F0+0.5*PI*FL                                                     CPF 370
      FL1=F10+0.5*PI*FL1                                                  CPF 380
      DO 150 I=1,NF                                                       CPF 390
      A1=XF(I)-XTEF                                                       CPF 400
      A2=SQRT(A1*A1+BB*RF(I)*RF(I))                                       CPF 410
      XP=XF(I)-XLEF                                                       CPF 420
      A6=SQRT(XP*XP+BB*RF(I)*RF(I))                                       CPF 430
      RFTL=-(A1+A2)/RF(I)                                                 CPF 440
      RFT0=-(XP+A6)/RF(I)                                                 CPF 450
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      J=0                                                                CPF 460
      IF (L.NE.0) J=1                                                    CPF 470
20    CONTINUE                                                           CPF 480
      II=I+NF*(J-1)+LTOTAL                                               CPF 490
      FNK=NKF(1)                                                         CPF 500
      SL=XAS(2)-XAS(1)                                                   CPF 510
      MM=NKF(1)                                                          CPF 520
      NC=1                                                               CPF 530
      NN=0                                                               CPF 540
      FJ=J                                                               CPF 550
      U(J+1)=0.                                                          CPF 560
      V(J+1)=0.                                                          CPF 570
      IF (J.GT.2.AND.I.EQ.NF) GO TO 70                                   CPF 580
      RFL=-((A1+A2)/RF(I))**J/A2                                         CPF 590
      RF0=-((XP+A6)/RF(I))**J/A6                                         CPF 600
      IF (J.LT.2) GO TO 30                                               CPF 610
      RFTL=0.                                                            CPF 620
      RFT0=0.                                                            CPF 630
30    CONTINUE                                                           CPF 640
      DO 60 KC=1,NF                                                      CPF 650
      IP=KC-NN                                                           CPF 660
      B1=XF(I)-XF(KC)                                                    CPF 670
      B2=SQRT(B1*B1+RR*RF(I)*RF(I))                                      CPF 680
      RFX=-((B1+B2)/RF(I))**J/B2                                         CPF 690
      KK=KC+NF*(J-1)+LTOTAL                                              CPF 700
      IF (J.EQ.0) GO TO 40                                               CPF 710
      U(J+1)=U(J+1)-(P(KK)-P(II))*RFX*SNP(NC,IP)*SL/FNK                  CPF 720
      IF (J.EQ.0) GO TO 50                                               CPF 730
      RFTX=-((B1+B2)/RF(I))**J/FJ                                        CPF 740
      V(J+1)=V(J+1)+P(KK)*SNP(NC,IP)*(RFTX-RFTL)*SL/FNK                  CPF 750
      GO TO 50                                                           CPF 760
40    U(J+1)=U(J+1)-(WARD(KC)-WARD(I))*RFX*SNP(NC,IP)*SL/FNK             CPF 770
50    IF (KC.LT.MM.OR.KC.EQ.NF) GO TO 60                                 CPF 780
      NC=NC+1                                                            CPF 790
      NN=MM                                                              CPF 800
      MM=MM+NKF(NC)                                                      CPF 810
      SL=XAS(NC+1)-XAS(NC)                                               CPF 820
      FNK=NKF(NC)                                                        CPF 830
60    CONTINUE                                                           CPF 840
      IF (J.EQ.1) V(J+1)=(-V(J+1)*0.5*PI+(RFTL-RFT0)*F10)/(4.*PI)        CPF 850
      IF (J.GT.1) V(J+1)=(-V(J+1)*0.5*PI)/(4.*PI)                        CPF 860
      IF (J.EQ.0) U(J+1)=-(FL*RFL-F0*RF0+U(J+1)*0.5*PI-WARD(I)*ALOG((A1+CPF 870
     1A2)/(XP+A6)))/(4.*PI)                                              CPF 880
      IF (J.EQ.1) U(J+1)=-(FL1*RFL-F10*RF0+U(J+1)*0.5*PI+B(II)/FJ*(RFL*ACPF 890
     12-RF0*A6))/(4.*PI)                                                 CPF 900
      IF (J.GT.1) U(J+1)=-(U(J+1)*0.5*PI+B(II)/FJ*(RFL*A2-RF0*A6))/(4.*PCPF 910
     1I)                                                                 CPF 920
      V(J+1)=V(J+1)/RF(I)                                                CPF 930
70    CONTINUE                                                           CPF 940
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      J=J+1                                                              CPF 950
      IF (J.LE.N) GO TO 20                                               CPF 960
      N1=2                                                               CPF 970
      IF (L.NE.0) N1=N+1                                                 CPF 980
      DO 140 K=1,NT                                                      CPF 990
      IF (NH1.NE.0.AND.K.LE.NH1) GO TO 80                                CPF1000
      FK=K-NH1                                                           CPF1010
      FT=NT-NH1                                                          CPF1020
      PP=PI-TH1                                                          CPF1030
      TP=TH1                                                             CPF1040
      GO TO 90                                                           CPF1050
   80 FK=K                                                               CPF1060
      FT=NH1                                                             CPF1070
      PP=TH1                                                             CPF1080
      TP=0.                                                              CPF1090
   90 CONTINUE                                                           CPF1100
      THETA=(2.*FK-1.)*PP/(2.*FT)+TP                                     CPF1110
      SINTA=SIN(THETA)                                                   CPF1120
      COSTA=COS(THETA)                                                   CPF1130
      PHIX=0.                                                            CPF1140
      PHIT=0.                                                            CPF1150
      DO 100 J=NZ,N1                                                     CPF1160
      FJ=J                                                               CPF1170
      IF (L.LE.1) PHIX=PHIX+U(J)*COS((FJ-1.)*THETA)                      CPF1180
      IF (L.GT.1) PHIX=PHIX+U(J)*SIN((FJ-1.)*THETA)                      CPF1190
      IF (L.LE.1) PHIT=PHIT+V(J)*(FJ-1.)*SIN((FJ-1.)*THETA)              CPF1200
  100 IF (L.GT.1) PHIT=PHIT-V(J)*(FJ-1.)*COS((FJ-1.)*THETA)              CPF1210
      X=XF(I)                                                            CPF1220
      Y=RF(I)*SINTA                                                      CPF1230
      Z=RF(I)*COSTA                                                      CPF1240
      CALL UTFW (X,Y,Z,SINTA,COSTA,LAST,LPANEL,BB,LPAN1,NW,B,VX,VT,JL,LPCPF1250
     1AN2,NCJ,MJJ,L,NJP,NP)                                              CPF1260
      PHIX=PHIX+VX                                                       CPF1270
      PHIT=PHIT+VT                                                       CPF1280
      IF (L.NE.0) GO TO 110                                              CPF1290
      DRX=SLOP(X)                                                        CPF1300
      DRX=DRX/RF(I)                                                      CPF1310
      SRX=1./SQRT(1.+DRX*DRX)                                            CPF1320
      DRX=(CS+U(1))*DRX*SRX                                              CPF1330
      UVEL=CS+PHIX                                                       CPF1340
      VDIF=1.-UVEL**2-DRX**2                                             CPF1350
      PHIT=PHIT-SS*SINTA                                                 CPF1360
      IF (JL.EQ.LAST) WRITE (08) PHIX,PHIT                               CPF1370
      IF (JL.EQ.0) WRITE (07) PHIX,PHIT                                  CPF1380
      GO TO 120                                                          CPF1390
  110 IF (JL.EQ.LAST) READ (08) PX,PT                                    CPF1400
      IF (JL.EQ.0) READ (07) PX,PT                                       CPF1410
C     VDIF=-2.*(1.+PX)*PHIX+2.*AM*AM*PX*PHIX                             CPF1420
      VDIF=-2.*PHIX                                                      CPF1430
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120   CONTINUE                                                          CPF1440
      IF (AM.LE.0.1) GO TO 130                                          CPF1450
      IF (L.NE.0) GO TO 130                                             CPF1460
      CPF(K,I)=VDIF+AM*AM*PHIX*PHIX                                     CPF1470
      GO TO 140                                                         CPF1480
130   CPF(K,I)=VDIF                                                     CPF1490
140   CONTINUE                                                          CPF1500
150   CONTINUE                                                          CPF1510
      RETURN                                                            CPF1520
C                                                                       CPF1530
      END                                                               CPF1540-
      SUBROUTINE SDWJ (WK,X,Y,Z,GAMMA,LPANEL,ISYM)                      SDW  10
      DIMENSION GAMMA(1)                                                SDW  20
      COMMON /GEOM/ HALFSW,XCP(200),YCP(200),ZCP(200),XLE(50),YLE(50),XTSDW  30
     1E(50),PSI(20),CH(95),XV(200),YV(100),SN(8,8),XN(200,2),YN(200,2),ZSDW  40
     2N(200,2),WIDTH(8),YCON(25),SWEEP(50),HALFR,SJ(21,8),EX(95,2),TX(95SDW  50
     3,2),SC(160,5),SI(160,5),LC(3)                                     SDW  60
      COMMON /CONST/ NCS,NCW,M1(8),NSJ,NCJ(5),LAST,MJW1(3,5),MJW2(3,5),JSDW  70
     1PANEL,MJJ(5),NW(3),NNJ,NJP                                        SDW  80
      COMMON /AERO/ AM1,AM2,B1,B2,CL(30),CT(30),CD(30),GAM(2,130)       SDW  90
      ISN=1                                                             SDW 100
      IZ=NCS                                                            SDW 110
      IF (NW(2).NE.0) IZ=IZ+NCS                                         SDW 120
      IF (NW(3).NE.0) IZ=IZ+NCS                                         SDW 130
      IZ=IZ+1                                                           SDW 140
      IF (NW(2).NE.0) ISN=ISN+1                                         SDW 150
      IF (NW(3).NE.0) ISN=ISN+1                                         SDW 160
      WK=0.                                                             SDW 170
      IFF=LPANEL                                                        SDW 180
      IND=1                                                             SDW 190
      MM=LPANEL+NCJ(1)                                                  SDW 200
      NN=NCJ(1)                                                         SDW 210
      LAST1=LAST-1                                                      SDW 220
      L1=LPANEL+1                                                       SDW 230
      J1=LPANEL+1                                                       SDW 240
      DO 70 J=J1,LAST                                                   SDW 250
      JJ=J-LPANEL+JPANEL                                                SDW 260
      MI=J-IFF                                                          SDW 270
      FN=NN                                                             SDW 280
      IF (J.LT.MJJ(IND)) NN=NCJ(IND)                                    SDW 290
      CHORD=CH(IZ)                                                      SDW 300
      IF (J.EQ.L1) GO TO 10                                             SDW 310
      GO TO 20                                                          SDW 320
10    ISN=ISN+1                                                         SDW 330
      L1=MJJ(IND)+1                                                     SDW 340
20    NL=MJJ(IND)-1                                                     SDW 350
      IF (NL.EQ.LAST1) GO TO 30                                         SDW 360
      IF (J.EQ.NL) IND=IND+1                                            SDW 370
30    CONTINUE                                                          SDW 380
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      X1=XN(J,1)-X                                                              SDW 390
      X2=XN(J,2)-X                                                              SDW 400
      X12=XN(J,2)-XN(J,1)                                                       SDW 410
      Y12=YN(J,2)-YN(J,1)                                                       SDW 420
      Z12=ZN(J,2)-ZN(J,1)                                                       SDW 430
      Z1=ZN(J,1)-Z                                                              SDW 440
      Z2=ZN(J,2)-Z                                                              SDW 450
      X7J=X1*Z12-Z1*X12                                                         SDW 460
      DO 60 II=1,2                                                              SDW 470
      FCP=1.                                                                    SDW 480
      IF (II.EQ.2) FCP=-1.                                                      SDW 490
      YC=Y*FCP                                                                  SDW 500
      Y1=YN(J,1)-YC                                                             SDW 510
      Y2=YN(J,2)-YC                                                             SDW 520
      XYK=X1*Y12-Y1*X12                                                         SDW 530
      Y7I=Y1*Z12-Z1*Y12                                                         SDW 540
      ALP1=XYK*XYK+X7J*X7J+B1*Y7I*Y7I                                           SDW 550
      R1P1=SQRT(X1*X1+B1*Y1*Y1+B1*Z1*Z1)                                        SDW 560
      R2P1=SQRT(X2*X2+B1*Y2*Y2+B1*Z2*Z2)                                        SDW 570
      UUP1=(X2*X12+B1*Y2*Y12+B1*Z2*Z12)/R2P1-(X1*X12+B1*Y1*Y12+B1*Z1*Z12SDW 580
     1)/R1P1                                                                    SDW 590
      G1P1=(1.-X1/R1P1)/(Y1*Y1+Z1*Z1)                                           SDW 600
      G2P1=(1.-X2/R2P1)/(Y2*Y2+Z2*Z2)                                           SDW 610
      IF (ALP1.LE.1.E-4) GO TO 40                                               SDW 620
      F1=-(UUP1*X7J/ALP1)*2.*FCP                                                SDW 630
      GO TO 50                                                                  SDW 640
40    F1=0.                                                                     SDW 650
50    CONTINUE                                                                  SDW 660
      F2=(Z2*G2P1-Z1*G1P1)*2.*FCP                                               SDW 670
60    WK=WK+(F1+F2)*CHORD*SN(MI,ISN)*GAMMA(JJ)*FCP/(8.*PI)                      SDW 680
      IF (J.LT.MM) GO TO 70                                                     SDW 690
      IZ=IZ+1                                                                   SDW 700
      IFF=MM                                                                    SDW 710
      MM=MM+NN                                                                  SDW 720
70    CONTINUE                                                                  SDW 730
      RETURN                                                                    SDW 740
      END                                                                       SDW 750
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15 Supplementary Notes

16 Abstract

This document describes in detail the necessary information for using a computer program to calculate the aerodynamic characteristics under symmetrical flight conditions and the lateral-directional stability derivatives of wing-body combinations with upper-surface-blowing (USB) or over-wing-blowing (OWB) jets. This program is an updated version of that described in NASA TM X-73987. In addition to the features and restrictions described in NASA TM X-73987, the following new features have been added to the program: (1) a fuselage of arbitrary body of revolution has been included. The effect of wing-body interference can now be investigated, and (2) all nine lateral-directional stability derivatives can be calculated.

The program is written in Fortran language and runs on CDC Cyber 175 and Honeywell 66/60 computers. It is available from COSMIC of the University of Georgia, Athens, Georgia.

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