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PROJECT TECHNICAL REPORT
TASK E&DD-702C

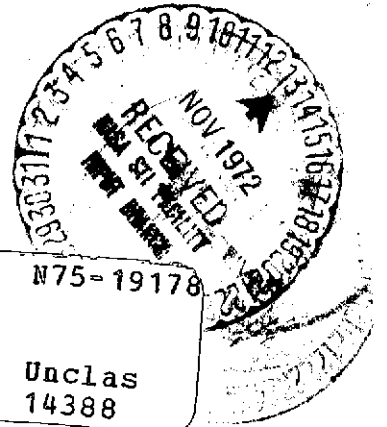
TRW VORTEX-LATTICE METHOD SUBSONIC AERODYNAMIC
ANALYSIS FOR MULTIPLE-LIFTING-SURFACES (N. SURFACE)
TRW PROGRAM NUMBER HA010B

NAS 9-12330

1 SEPTEMBER 1972

Prepared for
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

Prepared by
Applied Mechanics Department



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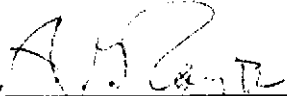
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ABSTRACT

This manual provides a condensed users description and theory for TRW's Vortex-Lattice Method Subsonic Aerodynamic Analysis for Multiple-Lifting-Surfaces (N. Surface) Program HA010B. The program is designed to provide solutions of engineering accuracy for determining the aerodynamic loads on single- or multiple-lifting-surface configurations that represent vehicles in subsonic flight, e.g., wings, wing-tail, wing-canard, lifting bodies, etc. The manual describes the preparation of the input data, associated input arrangement, and the output format for the program data, including specification of the various operational details of the program such as array sizes, tape numbers utilized, and program dumps. As supplementary information, the manual includes a full description of the underlying theory used in the program development and a review of the program qualification tests.

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LIST OF SYMBOLS[†]

AR	aspect ratio
b	span
B(X,Y,Z)	the first of two coordinate points that define the shape and location of a skew-shaped horseshoe vortex filament.
C	chord
\bar{C}	mean geometric chord (MGC), $\bar{C} = \frac{1}{S} \int_{-b/2}^{+b/2} c^2 dy$
C_D	wing drag coefficient
c_d	section drag coefficient
CF	aerodynamic cleanness factor
c_F	force coefficient
c_h	section hinge moment coefficient
C_L	wing lift coefficient
c_ℓ	section lift coefficient
$c_{\ell_{al}}$	additional section lift coefficient
c_{ℓ_b}	basic section lift coefficient
C_M	wing moment coefficient
c_m	section moment coefficient
Cn	n = 1,2,3,..., constants
C_N	wing normal lift coefficient
c_n	section normal lift coefficient
c_p	pressure coefficient, $c_p = (p - p_\infty)/q_\infty$
C_T	wing thrust coefficient

[†]Note: Symbols defined in the text may be omitted from this list.

LIST OF SYMBOLS (Continued)

c_t	section coefficient for thrust
C_X	force coefficient for X direction component
c_x	section coefficient for force acting in the X direction
$D(X,Y,Z)$	the second of two coordinate points that define the shape and location of a skew-shaped horseshoe vortex filament.
F	force
F_n	$n = 1, 2, 3, \dots$, etc., constants
h	height above the ground plane
K	total number of elemental panels
L	lift
l	length increment
M	Mach number
\bar{m}	lift slope
p	pressure
$P(X,Y,Z)$	coordinates of a field point for which the induced-velocity vector is calculated.
q_∞	dynamic pressure, $q_\infty = 1/2 \rho_\infty v_\infty^2$
R	radius
r	distance from the origin
Re	Reynolds number
S	wing area
s	scale
t_1	elapsed time (seconds) measured from the start of the execution of the program
t_2	elapsed time (seconds) for the execution of the last case
V_∞	free stream velocity
W	dummy span defined as the independent variable in the interpolation routine used to calculate the lifting-surfaces span dimensions (see Section 7.4[6]).

LIST OF SYMBOLS (Continued)

X	}	coordinate axes of a right-handed Cartesian coordinate system.
Y		
Z		
\bar{X}	}	X-Y-Z coordinates that locate the 1/4 chord of the mean geometric chord (MGC) location in the general coordinate system.
\bar{Y}		
\bar{Z}		
α	wing angle of attack measured on the X-Z plane relative to the X-coordinate axis and the free stream velocity vector.	
α_{R_0}	wing angle of attack for zero lift ($C_L = 0$)	
β	Prandtl-Glauert compressibility factor, $\beta = \sqrt{1 - M_\infty^2}$	
Γ	circulation strength of a vortex filament	
δ	increment of span	
δ_f	deflection of flap	
δ_{LA}	deflection of left aileron	
δ_{RA}	deflection of right aileron	
δ_{tab}	deflection of trim-tab	
Δ	determinant	
ΔL	increment in lift	
ΔS	increment in area	
ϵ	geometric twist (angle) of chord plane	
Λ	sweepback angle	
π	pi, $\pi = 3.14159$ (as used in the program)	
ρ_∞	free stream density	
ϕ	dihedral angle	
$\vec{\psi}$	influence function coefficient	
ψ	scalar part of the influence function coefficient	
\vec{lAB}	unit vector defined by two field points A(X,Y,Z) and B(X,Y,Z).	
\vec{lN}	unit vector normal to a surface	
\vec{lV}	unit vector for the induced velocity	

LIST OF SYMBOLS (Continued)

\vec{i}_X
 \vec{i}_Y
 \vec{i}_Z

} unit vectors parallel to the X, Y, Z, coordinate axes respectively.

SUBSCRIPTS:

CG center of gravity

CP center of pressure

C/4 one-quarter chord point location

e elemental panel or lifting-surface designation

f flap

g ground

h hinge

I image

i induced

L lower surface

LA left aileron

LE leading edge

M moment

P pitching

R root (geometry) or rolling (moment)

RA right aileron

ref reference dimensions

tab trim-tab

TE trailing-edge

U upper surface

v vortex-lift

Y yawing

LIST OF SYMBOLS (Continued)

SUPERSCRIPTS:

→	vector
'	alternate

ABBREVIATIONS:

A.C.	aerodynamic center
C.G.	center of gravity
C.P.	center of pressure
L.E.	leading edge
MAC	mean aerodynamic chord
MGC	mean geometric chord
NCD	number of chord discontinuities
NCE	number of chord elements
NSE	number of span elements
T.E.	trailing edge

1.0 PROGRAM ABSTRACT

PROGRAM NUMBER: HA010B (N.SURFACE)
PROGRAM TITLE: TRW Vortex-Lattice Method Subsonic Aerodynamic
Analysis for Multiple-Lifting-Surfaces
TAPE NUMBER: T00078 or A10202
STATUS: Production
LANGUAGE: Fortran V
SYSTEM: UNIVAC 1108/CDC 6500 Computer
CORE STORAGE REQUIREMENTS: Approximately 50K words
TYPICAL EXECUTION TIME: 2 to 5 minutes per case (UNIVAC 1108)
DESCRIPTION:

The aerodynamic airload distribution and spatially-integrated force and moment coefficients are calculated for single- or multiple-lifting-surface configurations by an improved vortex-lattice method developed by TRW. In this method, the influence of each surface is represented by a network of concentrated line vortices distributed on the surfaces and behind the surface-trailing-edges. The strength or circulation of these vortices is determined by the requirement that the flow be parallel to each surface at a discrete number of boundary control points or collocation points that is equal to the number of unknown vortex strengths. The treatment of the control point boundary conditions incorporated in the analysis (TRW's) is based on the exact surface geometry, i.e., no linearization or other usual simplifying assumptions are made. This feature makes it possible to perform more accurate calculations for general non-planar lifting surface configurations. The effect of the leading-edge flow separation on the airload coefficients for theoretically sharp leading-edges is evaluated by an approximate technique based on the vortex-lift leading-edge suction analogy. Numerical solutions can be performed including as many as 200 separate vortex filaments or elemental surfaces for symmetric and 100 for unsymmetric aerodynamic loadings respectively. The extension of the incompressible solutions to compressible flows ($0 < M < 1$) is accomplished via the Prandtl-Glauert transformation. Flight over a ground plane is calculated by the method of images as a special option of the program.

The output consists of data presented for ready engineering use such as pressure distributions, section coefficients, and spatially-integrated coefficients. Exact numerical solutions or arrays of solutions extrapolated using the lifting line theory from two or more exact vortex-lattice solutions may be output for multiple- and single-lifting-surfaces respectively. Other program features include: double precision matrix inversion, 4060-microfilm or Calcomp output, short or long print-format output, etc. An outline of the program analysis and execution options is presented in Pages 1-2 through 1-3.

PROGRAM ABSTRACT (Contd.)

ANALYTICAL MODEL FEATURES AND EXECUTION OPTIONS OUTLINE

ANALYSIS

- The aerodynamic airload distributions on single- or multiple-lifting surface configurations are calculated by an improved (TRW's) vortex-lattice method.
- The treatment of the control points is based on the exact geometry of the lifting surfaces, i.e., none of the usual linearization or other simplifying assumptions in the literature are incorporated in the analysis.
- The effect of leading-edge flow separation for theoretical-sharp leading edges (i.e., vortex-lift) is calculated by an approximate technique based on leading-edge suction analogy.
- Compressibility effects are accounted for via the Prandtl-Glauert transformation.
- Ground effects are calculated by the method of images that provides for exact analytical solutions for a flat ground plane of infinite extent, i.e., the boundary conditions of parallel flow at the ground plane are exactly satisfied.
- Arrays of solutions may be extrapolated from two exact vortex-lattice solutions by a method procedure based on the lifting-line theory.

VEHICLE CONFIGURATIONS

(See Table 1.01, Page 1-4)

- Single Surface: (XQT ISURF Option)
A single surface of any configuration, shape, or form with or without severe surface discontinuities may be considered. This includes lifting surface configurations with flaps, ailerons, slots, with or without camber.
- Multiple Surfaces: (XQT NSURF Option)
Up to five separate lifting surfaces of any configuration, shape, or form can be considered simultaneously. In each surface the effect of severe surface discontinuities can be considered in the same manner as outlined above for the single surface analysis. Multiple-lifting-surface configurations that may be analyzed include: wing-tail-fins, canard-wing-fins, thick-wing, lifting-body, and many other configurations. The complexity of the configurations that may be successfully analyzed depends on the maximum number of elemental panels or control points that can be considered simultaneously, i.e., 200 for symmetric and 100 for unsymmetric loadings respectively.

PROGRAM ABSTRACT (Contd.)

OUTPUT OPTIONS

- Printed Output
 - 1) Short-Print: the surface geometry, the airload force and pitching moment section coefficients, and all the force and moment spatially-integration airload coefficients are output for each of the lifting surfaces considered.
 - 2) Long-print: the short-print output, and the details of the lift (pressure coefficient) and vorticity distribution on each of the lifting surfaces considered are output.
 - 3) Debug-Print: the long-print output plus the details of the induced velocities and influence coefficients are output.
- Tape Output
 - 1) The lifting surface vortex-lattice geometry, section aerodynamic coefficients, etc. that are calculated in obtaining solutions are output on magnetic tape in the format required for executing the TRW plotting option, or
 - 2) By executing the plotting option (TRWPLT) included in the program, 4060-microfilm or Calcomp plots output of solutions (#1 above) can be obtained directly.

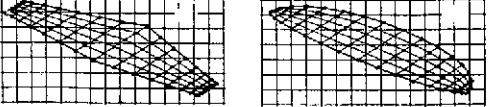
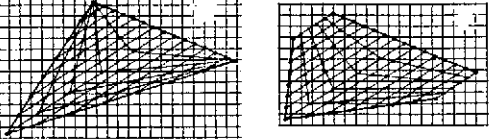
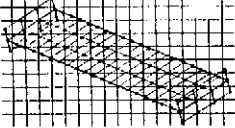
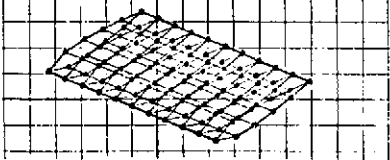
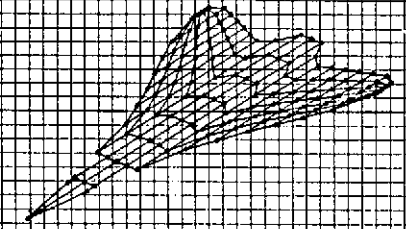
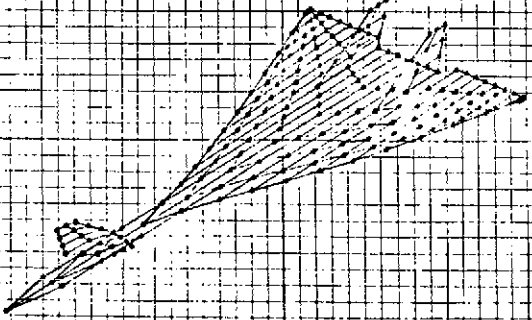
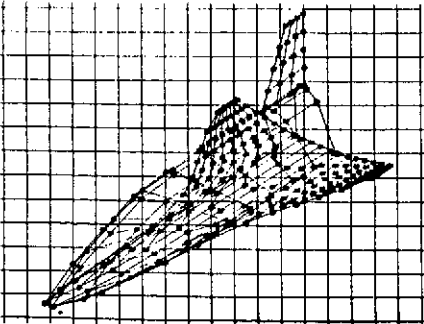
SPECIAL OPTIONS

- Ground effects: flight in the presence of a very near ground plane may be calculated.
- Lifting-Line: arrays of solutions may be obtained by extrapolation from two exact vortex-lattice solutions using a method based on the lifting-line theory. This option at present (HA010B) is available only for single-lifting-surface configurations.

EXECUTION TIME

- Symmetric loadings: about one minute per vortex-lattice solution for 100 elements.
- Unsymmetric loadings: about four minutes per vortex-lattice solution for 100 elements.
- With ground effects: about twice the time required for out-of-ground.
- Lifting-line arrays: about 1/2 minute extra running time.
- Maximum time: about four minutes and eight minutes per vortex-lattice solutions of out-of-ground and in-ground problems. The running times are based on 200 and 100 vortex-lattice elements for symmetric and un-symmetric loadings respectively.

TABLE 1.01 - REPRESENTATIVE LIFTING-SURFACE PROBLEMS OF VARIOUS CONFIGURATIONS THAT CAN BE SUCCESSFULLY SOLVED USING THE TRW VORTEX-LATTICE ANALYSIS PROGRAM NO. HA010B

VORTEX-LATTICE CONFIGURATION	NUMBER OF ELEMENTAL PANELS	EXECUTION TIME PER CASE	EVALUATION OF RESULTS
	80	34 sec	TYPE: THIN-SURFACE PROBLEM: WINGS OF AR = 6 RESULTS: VERY SUCCESSFUL DIFFICULTY: NONE
	70	30 sec	TYPE: THIN-SURFACE PROBLEM: WINGS OF LOW AR RESULTS: VERY SUCCESSFUL DIFFICULTY: NONE
	72	31 sec	TYPE: THIN-SURFACE PROBLEM: WING WITH END PLATES RESULTS: SATISFACTORY DIFFICULTY: SEVERE DISCONTINUITY
	100	42 sec	TYPE: THICK-SURFACE PROBLEM: WING THICKNESS RESULTS: VERY SUCCESSFUL DIFFICULTY: NONE
	112	63 sec	TYPE: THIN-SURFACE PROBLEM: DOUGLAS F5D-1 AIRPLANE RESULTS: VERY SUCCESSFUL DIFFICULTY: NONE
	162	98 sec	TYPE: THIN-SURFACE PROBLEM: NORTH AMERICAN XB-70 RESULTS: VERY SUCCESSFUL DIFFICULTY: NONE
	172	120 sec [vert. fin omitted]	TYPE: LIFTING-BODY PROBLEM: NASA-MSC #040A ORBITER RESULTS: NOT SUCCESSFUL DIFFICULTY: THE NUMBER OF ELEMENTAL PANELS THAT CAN BE CONSIDERED SIMULTANEOUSLY IS INSUFFICIENT TO PROVIDE VALID SOLUTIONS. BY NEGLECTING THE FUSELAGE THICKNESS THE THIN-SURFACE REPRESENTATION WAS APPLIED TO THIS PROBLEM VERY SUCCESSFULLY.

2.0 ANALYSIS

2.1 Analytical Procedures Review

It is a well known fact in aerodynamic theory that any surface, whether part of a body of finite thickness or merely an infinitesimally thin sheet, may be represented by a sheet of vorticity bound on the surface and a trailing vortex sheet shed behind the trailing edge. The velocity at any point in the flow field is the sum of the velocity vector induced by the vortex sheets and the free stream velocity vector. The strength of the vorticity representing the surface is determined by the requirement that the velocity vector computed as the sum of velocity induced by the vortex sheets and the free stream, be parallel to the surface. The strength of the trailing edge vortex sheet is determined from the surface bound vortex sheet strength using the conservation of vorticity laws for steady flow (i.e., Helmholtz vorticity laws) together with the requirement that there be no force exerted on the sheet, which means that the trailing edge vortex sheet must be everywhere parallel to the streamlines of the flow^{(1,2,3)†}.

In the vortex lattice method, the influence of the surface is represented by a network of concentrated line vortices, distributed on the surface and behind the trailing edge^(4,5). The strength of these vortices is determined by the requirement that the flow be parallel to the surface at a number of boundary point or co-location points which are equal to the number of unknown vortex strengths. The location of the trailing vortices must be assumed, and thus may not happen to be exactly parallel to the streamlines. However, the path of the vortex sheet behind the wing may be guessed beforehand with fairly good accuracy, and since, in most instances, the results are not strongly influenced by the assumed path of the trailing vortices, excellent results of high accuracy are usually obtained⁽⁶⁾.

2.2 Vortex-Lattice Equations

The vortex lattice network arrangement used in the present analysis is illustrated in Figure 2.01[‡]. As shown in the figure, the wing surface is divided uniformly into a number of elemental panels of approximately equal size. The vorticity on the upper and lower surfaces of each panel is represented by a

†Superscript in parenthesis denote references listed in Section 8.

‡Figures and Tables of this section are found at the end of the section.

single bound vortex line which is located in accordance with 2-D theory at the 1/4 chord of the panel⁽⁷⁾. The location of the control point or co-location point is arbitrary and is usually selected at the mid point between adjacent vortex lines which corresponds to the 3/4 chord of the panel. Since the vortex filaments cannot be discontinuous, the bound vortices for each panel are bent at both ends forming a pair of trailing vortices which must extend to infinity. In this manner these vortices represent the vorticity in the trailing edge vortex sheet. The bound vortex at the 1/4 chord of the panels and the pair of trailing vortex filaments define a generalized skew-shaped (oblique) horseshoe vortex filament of strength Γ . The number of horseshoe vortex filaments is equal to the number of panels or control points. The velocity at the control points is by definition parallel to the surface, and hence, the corresponding normal velocity components to the surface are exactly equal to zero. This boundary condition when applied to the j th panel is given by

$$\left(\vec{1N}_j \cdot \left(\frac{\vec{v}_\infty}{V_\infty} + \sum_{k=1}^K \frac{\Gamma_k/V_\infty}{4\pi} \vec{\psi}_{k(j)} \right) \right) = 0 \quad (2.2.01)$$

where:

- $\vec{1N}_j$ = the unit vector normal to the surface at the j th control point,
- \vec{v}_∞ = the free stream velocity vector,
- V_∞ = the scalar magnitude of the free stream velocity vector,
- Γ_k = the strength of circulation of the k th panel horseshoe vortex filament,
- $\vec{\psi}_{k(j)}$ = the induced velocity vector influence function of the k th panel horseshoe vortex evaluated at the j th control point,
- K = the total number of panels for all the lifting surfaces considered.

The induced velocity vector and influence vector functions are calculated in accordance with the induced velocity law of Biot and Savart^(2,3). Using the geometry convention for a representative horseshoe vortex shown in Figure 2.02, it follows

$$\frac{\vec{v}_1(j)}{V_\infty} = \sum_{k=1}^K \frac{\Gamma_k/V_\infty}{4\pi} \vec{\psi}_{k(j)} \quad (2.2.02)$$

$$\vec{\psi}_{k(j)} = \oint \frac{d\vec{\ell} \times (\vec{r} - \vec{r}')}{|\vec{r} - \vec{r}'|^3} \quad (2.2.03)$$

The calculation of the vector influence functions $\vec{\psi}(j)$ are somewhat tedious but straightforward. In the present analysis the trailing vortices are assumed to be straight lines which extend to infinity and which are oriented at an angle $\alpha/2$ in the manner shown in Figure 2.02. In this instance the bound vortex and trailing vortices for each panel form a generalized skew-shaped horseshoe vortex of the same configuration analysed in References 8 and 9. Analytical solutions for the vector influence functions are presented in Section 2.3. The number of unknown horseshoe filament circulation strengths Γ_k are equal to the number of boundary condition equations for the control points. Using matrix notation, these boundary conditions which were given in Equation 2.2.01, become

$$[A_j] + \left[\frac{\Gamma_k}{V_\infty} \right] \times [B_{j,k}] = 0 \quad (2.2.04)$$

By inverting the matrix $[B_{j,k}]$, the unknown circulation strengths Γ_k are obtained

$$\left[\frac{\Gamma_k}{V_\infty} \right] = - [A_j] \times \{ [B_{j,k}] \}^{-1} \quad (2.2.05)$$

In the presence of a ground plane, exact analytical solutions are obtainable by the method of images by assuming the ground plane to be perfectly flat and of infinite extent. Under these conditions, the boundary requirement for the flow at the ground plane is exactly satisfied by defining a mirror image of the vortex lattice directly below at a distance equal to twice the altitude from the ground plane. The calculation of the induced velocity (Equation 2.2.02) is modified to include the effect of the image vortex lattice influence coefficients as follows

$$\frac{\vec{V}_1(j)}{V_\infty} = \sum_{k=1}^K \frac{\Gamma_k/V_\infty}{4\pi} \left[\vec{\psi}_{k(j)} - \vec{\psi}_{k(j)}^I \right] \quad (2.2.06)$$

$\vec{\psi}_{k(j)}^I$ = the influence function of the image vortex lattice.

Note that in the present formulation, none of the usual linearization or other simplifying assumptions were made on the boundary conditions at the control points (e.g., References 10 and 11). Therefore, severe variations in lifting surfaces planform such as twist, camber, dihedral, etc. are treated exactly and more accurate solutions may be obtained.

2.3 Influence Coefficients

Consider the straight vortex-filament element of length ΔS that is illustrated in Figure 2.03. In computing the induced velocity vector for the vortex filament at a field point $P(O,Y,Z)$, the influence coefficient is obtained by integrating Equation 2.2.03 within the appropriate boundary conditions described in the figure. It follows

$$\vec{\Delta V} = \frac{\Gamma}{4\pi} \vec{\Delta \psi} \quad (\text{the induced velocity}) \quad (2.3.01)$$

$$\vec{\Delta \psi} = \vec{1V} \Delta \psi \quad (\text{the influence coefficient}) \quad (2.3.02)$$

where $\vec{1V}$ and $\Delta \psi$ are a unit vector and a scalar quantity, respectively. These are given by

$$\vec{1V} = - \vec{1AQ} \times \vec{1QP} = - \frac{Z}{R} \vec{1Y} + \frac{Y}{R} \vec{1Z} \quad (2.3.03)$$

$$\Delta \psi = \frac{1}{R} \left[\frac{h + \Delta S}{\sqrt{(h + \Delta S)^2 + R^2}} - \frac{h}{\sqrt{h^2 + R^2}} \right] \quad (2.3.04)$$

$$R = \sqrt{Y^2 + Z^2} \quad (2.3.05)$$

The above equations can be used to determine the influence coefficient vector for any field point $P(X,Y,Z)$ of any complex-shaped filament if it is assumed that it is composed of a discrete number of rectilinear increments ΔL (illustrated in Figure 2.03) and by performing the appropriate coordinate transformations. For the generalized skew-shaped vortex filament in Figure 2.02,

the calculation of the influence coefficient vector for any flow field $P(X,Y,Z)$ is performed in this manner. Making use of the localized coordinate system in Figure 2.04, the shape of the skew-shaped vortex filament is prescribed by the coordinates of points B-D given by

$$B = B(-c, -a, -d) \quad (2.3.06)$$

$$D = D(c, a, d) \quad (2.3.07)$$

$$c = a \tan(\Lambda) \quad (2.3.08)$$

$$d = a \tan(\phi) \quad (2.3.09)$$

If the vortex filament is broken into three elements, i.e., ∞ -A-B, D-E- ∞ , and B-C-D, the influence coefficient vector for the filament is equal to the sum

$$\vec{\psi} = \sum_{i=1}^3 \vec{1V}_i \Delta\psi_i \quad (2.3.10)$$

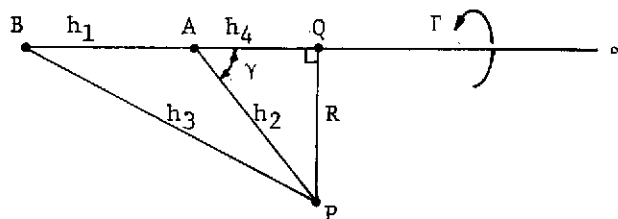
Segment #1 (∞ -A-B)

The contribution of segment #1 for an arbitrary field point $P(X,Y,Z)$ is calculated as follows. The coordinates of point A are given by

$$A = A(X, -a, -d') \quad (2.3.11)$$

$$d' = d + (X + c) \tan(\alpha/2) \quad (2.3.12)$$

and making use of the geometry according to the sketch below,



$$h_1 = \sqrt{(X + c)^2 + (d' - d)^2} \quad (2.3.13a)$$

$$h_2 = \sqrt{(Y + a)^2 + (Z + d)^2} \quad (2.3.13b)$$

$$h_3 = \sqrt{(X + c)^2 + (Y + a)^2 + (Z + d)^2} \quad (2.3.13c)$$

$$\cos (\gamma) = - \frac{h_1^2 + h_2^2 - h_3^2}{2h_1 h_2} \quad (2.3.13d)$$

$$R = h_2 \sqrt{1 - (\cos \gamma)^2} \quad (2.3.13e)$$

$$h_4 = h_2 \cos (\gamma) \quad (2.3.13f)$$

Using Equation 2.3.04, the scalar part of the influence coefficient can now be computed

$$\Delta \psi_1 = \frac{1}{R} \left[1 + \frac{h_1 + h_4}{\sqrt{(h_1 + h_4)^2 + R^2}} \right] \quad (2.3.14)$$

The calculation of the vector part of the influence coefficient will be considered next. The coordinates of point Q shown on the sketch are

$$Q = Q(X_q, Y_q, Z_q) \quad (2.3.15a)$$

$$X_q = -c + (h_1 + h_4) \cos (\alpha/2) \quad (2.3.15b)$$

$$Y_q = -a \quad (2.3.15c)$$

$$Z_q = -d - (h_1 + h_4) \sin (\alpha/2) \quad (2.3.15d)$$

and the unit vectors for the line segments B-Q and Q-P can now be calculated

$$\vec{1BQ} = \vec{1X} \cos (\alpha/2) - \vec{1Z} \sin (\alpha/2) \quad (2.3.16)$$

$$\vec{1QP} = \vec{1X} \left(\frac{X - X_q}{R} \right) + \vec{1Y} \left(\frac{Y - Y_q}{R} \right) + \vec{1Z} \left(\frac{Z - Z_q}{R} \right) \quad (2.3.17)$$

then, the vector part of the influence coefficient, i.e., a unit vector, is given by the vector cross-product

$$\vec{1V}_1 = \vec{1BQ} \times \vec{1QP} \quad (2.3.18)$$

Segment #2 (D-E-∞)

The contribution of segment #2 for the same arbitrary field point P(X,Y,Z) is calculated in the same manner as outlined for segment #1; specifically, Equations 2.3.19 through 2.3.23 are used in place of 2.3.11, 2.3.12, 2.3.13, and 2.3.15 respectively, where

$$E = E(X, a, +d') \quad (2.3.19)$$

$$d' = d - (X - c) \tan(\alpha/2) \quad (2.3.20)$$

$$h_1 = \sqrt{(X - c)^2 + (d - d')^2} \quad (2.3.21a)$$

$$h_2 = \sqrt{(Y - a)^2 + (Z - d)^2} \quad (2.3.21b)$$

$$h_3 = \sqrt{(X - c)^2 + (Y - a)^2 + (Z - d)^2} \quad (2.3.21c)$$

$$X_q = c + (h_1 + h_4) \cos(\alpha/2) \quad (2.3.22a)$$

$$Y_q = a \quad (2.3.22b)$$

$$Z_q = d - (h_1 + h_4) \sin(\alpha/2) \quad (2.3.22c)$$

$$\vec{1V}_2 = -\vec{1DQ} \times \vec{1QP} \quad (2.3.23a)$$

$$\vec{1DQ} = \vec{1BQ} \quad (2.3.23b)$$

Segment #3 (B-C-D)

The contribution of segment #3 for the same arbitrary field point P(X,Y,Z) considered for segments #1 and #2 is calculated in a like manner as outlined in detail for segment #1. For segment #3, the coordinates of points B(-c,-a,-d) and D(c,a,d) are used to determine the solutions for

$$h_1 = 2 \sqrt{c^2 + a^2 + d^2} \quad (2.3.24a)$$

$$h_2 = \sqrt{(X - c)^2 + (Y - a)^2 + (Z - d)^2} \quad (2.3.24b)$$

$$h_3 = \sqrt{(X + c)^2 + (Y + a)^2 + (Z + d)^2} \quad (2.3.24c)$$

$$\cos (\gamma) = - \frac{h_1^2 + h_2^2 - h_3^2}{2h_1 h_2} \quad (2.3.24d)$$

$$h_4 = h_2 \cos (\gamma) \quad (2.3.24e)$$

$$R = h_2 \sqrt{1 - (\cos \gamma)^2} \quad (2.3.24f)$$

and using Equation 2.3.04, the scalar part of the influence coefficient for segment #3 (B-D) can now be computed

$$\Delta\psi_3 = \frac{1}{R} \left[\frac{h_1 + h_4}{\sqrt{(h_1 + h_4)^2 + R^2}} - \frac{h_4}{\sqrt{h_4^2 + R^2}} \right] \quad (2.3.25)$$

Next, to calculate the vector part of the influence coefficient the coordinates of point Q(X_q,Y_q,Z_q) must be calculated first. Accordingly

$$X_q = c + h_4 (2c/h_1) \quad (2.3.26a)$$

$$Y_q = a + h_4 (2a/h_1) \quad (2.3.26b)$$

$$z_q = d + h_4 (2d/h_1) \quad (2.3.26c)$$

The unit vectors $\vec{1BQ}$ and $\vec{1QP}$ are given by

$$\vec{1BQ} = \vec{1X} \left(\frac{2c}{h_1} \right) + \vec{1Y} \left(\frac{2a}{h_1} \right) + \vec{1Z} \left(\frac{2d}{h_1} \right) \quad (2.3.27)$$

$$\vec{1QP} = \vec{1X} \left(\frac{X - X_q}{R} \right) + \vec{1Y} \left(\frac{Y - Y_q}{R} \right) + \vec{1Z} \left(\frac{Z - Z_q}{R} \right) \quad (2.3.28)$$

from which the vector part of the influence coefficient, i.e., the unit vector $\vec{1V}_3$, can be calculated by simply taking the vector cross-product

$$\vec{1V}_3 = - \vec{1BQ} \times \vec{1QP} \quad (2.3.29)$$

2.4 Exact-Theory Aerodynamic Forces and Moments

The net aerodynamic force vector exerted on the jth panel (i.e., jth elemental surface) is calculated using

$$\frac{\vec{F}_j}{\rho_\infty V_\infty^2} = \frac{\left(\frac{\vec{V}_j}{V_\infty} \times \vec{\Delta L}_j \right) \frac{\Gamma_j}{V_\infty}}{\beta} \quad (2.4.01)$$

$$\frac{\vec{V}_j}{V_\infty} = \frac{\vec{V}_\infty}{V_\infty} + \sum_{k=1}^K \frac{\Gamma_k / V_\infty}{4\pi} \vec{\psi}_{k(j)} \quad (2.4.02)$$

where

$\vec{\Delta L}_j$ = the length vector of the bound vortex filament of the panel,

\vec{V}_j = the velocity vector computed as the sum of free stream and induced velocity vectors evaluated at the midpoint of the bound vortex of the jth panel,

β = the Prandtl-Glauert compressibility factor, = $\sqrt{1 - M_\infty^2}$

$\vec{\psi}_k(j)$ = the vector influence function of the kth panel evaluated at midpoint of the jth bound vortex.

The force vector \vec{F}_j is assumed to act at the midpoint of the bound vortex filament of the kth panel. The corresponding section aerodynamic load coefficients and integrated wing force and moment coefficients are obtained by the appropriate summation of the forces \vec{F}_j acting on each panel. In determining these quantities the following relations derived from the exact analysis are used

Force Coefficients for jth Panel

$$c_{F_{X,j}} = 2 \left(\frac{\vec{F}_j / (\rho_\infty v_\infty^2)}{\Delta S_j} \right) \cdot (\vec{1X}) \quad (2.4.03)$$

$$c_{F_{Y,j}} = 2 \left(\frac{\vec{F}_j / (\rho_\infty v_\infty^2)}{\Delta S_j} \right) \cdot (\vec{1Y}) \quad (2.4.04)$$

$$c_{F_{Z,j}} = 2 \left(\frac{\vec{F}_j / (\rho_\infty v_\infty^2)}{\Delta S_j} \right) \cdot (\vec{1Z}) \quad (2.4.05)$$

Differential Pressure Coefficients

$$(c_{P_L} - c_{P_U})_j = 2 \left| \left(\frac{\vec{F}_j / (\rho_\infty v_\infty^2)}{\Delta S_j} \right) \right| \quad (2.4.06)$$

Lifting Surface Section Airload Coefficients

For each lifting surface, by summing up the appropriate force contributions,

$$c_{n(Y)} = - \frac{1}{C} \sum c_{F_{Z,j}} \frac{\Delta S_j}{\Delta Y_j} \Big|_Y \quad (2.4.07)$$

$$c_{t(Y)} = - \frac{1}{C} \sum c_{F_{X,j}} \frac{\Delta S_j}{\Delta Y_j} \Big|_Y \quad (2.4.08)$$

$$c_{m(Y)} = \frac{1}{C^2} \sum \left[c_{F_{Z,j}} \frac{\Delta S_j}{\Delta Y_j} (x_j - x_{(C/4)}) + c_{F_{X,j}} \frac{\Delta S_j}{\Delta Y_j} (z_j - z_{(C/4)}) \right] \Big|_Y \quad (2.4.09)$$

$$c_{l(Y)} = c_{n(Y)} \cos(\alpha) + c_{t(Y)} \sin(\alpha) \quad (2.4.10)$$

$$c_{d_i(Y)} = -c_{t(Y)} \cos(\alpha) + c_{n(Y)} \sin(\alpha) \quad (2.4.11)$$

Lifting Surface Spatially-Integrated Airload Coefficients

$$C_N = -\frac{1}{S} \sum_j c_{F_{Z,j}} \Delta S_j \quad (2.4.12)$$

$$C_T = -\frac{1}{S} \sum_j c_{F_{X,j}} \Delta S_j \quad (2.4.13)$$

$$C_{M_{P(\bar{C}/4)}} = \frac{1}{S \bar{C}} \sum_j \Delta S_j \left(c_{F_{Z,j}} X_{a_j} - c_{F_{X,j}} Z_{a_j} \right) \quad (2.4.14)$$

$$C_{M_{R(\bar{C}/4)}} = \frac{1}{S \bar{C}} \sum_j \Delta S_j \left(c_{F_{Y,j}} Z_{a_j} - c_{F_{Z,j}} Y_{a_j} \right) \quad (2.4.15)$$

$$C_{M_{Y(\bar{C}/4)}} = \frac{1}{S \bar{C}} \sum_j \Delta S_j \left(c_{F_{Y,j}} X_{a_j} - c_{F_{X,j}} Y_{a_j} \right) \quad (2.4.16)$$

$$C_L = C_N \cos(\alpha) + C_T \sin(\alpha) \quad (2.4.17)$$

$$C_{D_i} = -C_T \cos(\alpha) + C_N \sin(\alpha) \quad (2.4.18)$$

$$X_{a_j} = X_j - X_{(\bar{C}/4)} \quad (2.4.19)$$

$$Y_{a_j} = Y_j \quad (2.4.20)$$

$$Z_{a_j} = Z_j - Z_{(\bar{C}/4)} \quad (2.4.21)$$

In equations 2.4.07 through 2.4.16 the summations are performed over the vortex-lattice elemental surfaces that correspond to each lifting surface. To obtain the total force for the sum of N lifting surfaces, the summation is carried out over all the panels (j=1,J) and the reference dimensions for the first lifting surface (n=1) are used.

2.5 Approximate-Theory Aerodynamic Forces and Moments

In the preceding sections the procedure for obtaining exact solutions for the aerodynamic forces and moments by the vortex lattice method were developed. To generate an array of such solutions (for instance by varying the wing angle of attack) would be considered unwise because of the excessive computing time expenditure required. Instead, an array of approximate solutions of sufficient engineering accuracy may be obtained by extrapolation from two exact vortex lattice solutions by using the lifting line theory. Accordingly, for a single lifting surface, given two exact solutions obtained at two different angles of attack α_1 , and α_2 , the extrapolated solutions for any other angle of attack α may be obtained in the following manner.

Wing Lift Coefficient

$$\bar{m} = \frac{C_{L1} - C_{L2}}{\alpha_1 - \alpha_2} \quad (2.5.01)$$

$$\alpha R_o = \alpha_1 - \frac{C_{L1}}{\bar{m}} \quad (2.5.02)$$

$$C_L = \bar{m} (\alpha - \alpha R_o) \quad (2.5.03)$$

Wing Moment Coefficients (Pitching, Rolling, and Yawing) about $\bar{C}/4$

$$C'_M = \frac{C_{M1} - C_{M2}}{C_{L1} - C_{L2}} \quad (2.5.04)$$

$$C_{M_o} = C_{M1} - C'_M C_{L1} \quad (2.5.05)$$

$$C_M = C_{M_o} + C'_M C_L \quad (2.5.06)$$

Wing Section Lift Coefficients

$$c_{\ell a_1(Y)} = \frac{c_{\ell 1(Y)} - c_{\ell 2(Y)}}{C_{L_1} - C_{L_2}} \quad (2.5.07)$$

$$c_{\ell b(Y)} = c_{\ell 1(Y)} - c_{\ell a_1(Y)} C_{L_1} \quad (2.5.08)$$

$$c_{\ell(Y)} = c_{\ell a_1(Y)} C_L + c_{\ell b(Y)} \quad (2.5.09)$$

Wing Section Induced Drag Coefficients

$$c_{d'_i(Y)} = \left(\frac{c_{d_{i_1}} - c_{d_{i_2}}}{c_{\ell_1}^2 - c_{\ell_2}^2} \right) (Y) \quad (2.5.10)$$

$$c_{d_{i_o}(Y)} = c_{d_{i_1}(Y)} - c_{d'_i(Y)} c_{\ell_1(Y)}^2 \quad (2.5.11)$$

$$c_{d_i(Y)} = c_{d_{i_o}} + c_{d'_i(Y)} c_{\ell(Y)}^2 \quad (2.5.12)$$

or using the lifting line theory exact results,

$$c_{d_i(Y)} = \left[\frac{1}{\pi c_{\ell a_1(Y)}} - \frac{1}{2\pi} \right] c_{\ell(Y)}^2 \quad (2.5.13)$$

Equation 2.5.13 is recommended in the analysis of wing planforms of moderate aspect ratio and negligible sweep and dihedral angles.

Wing Induced Drag Coefficient

$$C_{D_i} = \frac{1}{S} \int_{-b/2}^{+b/2} c_{d_i(Y)} C_{\ell(Y)} dY \quad (2.5.14)$$

which when expressed as a function of C_L becomes

$$C_{D_i} = C_{D_{i_o}} + C_{D'_{i_1}} C_L + C_{D'_{i_2}} C_L^2 \quad (2.5.15)$$

The coefficients $C_{D_{i_0}}$, $C_{D_{i_1}}$ and $C_{D_{i_2}}$ are constants which may be evaluated from three separate approximate solutions.

Drag Due to Skin Friction

$$cd_f = 2 CF \quad (\text{CONSTANT}) \quad (2.5.16)$$

$$C_{D_f} = cd_f \quad (2.5.17)$$

where CF is the aerodynamic cleanness factor which is defined as

$$CF = \frac{\text{EQUIVALENT FLAT PLATE AREA}}{\text{WETTED AREA}} = \frac{C_{D_\pi} S_\pi}{2S} \quad (2.5.18)$$

The total drag coefficients are obtained as the sum of induced drag and skin friction drag for the wing section coefficients and the integrated wing coefficients respectively.

2.6 Vortex Lift

Experimental studies of sharp leading edge delta wings have shown that at even relatively low angles of attack the flow separates from the leading edge and rolls up into two vortex sheets or cone shaped cores of rotating fluid particles with the axes of rotation located approximately parallel to the leading edges^(12,13). In general, this vortex flow results in an increase in lift that is called vortex lift or non-linear lift, and an increase in drag resulting from the loss of leading edge suction. Although it is desirable to avoid the formation of the separated flow vortex sheets because of the high drag, it is a phenomenon which is always encountered by low aspect ratio highly swept wings operating near the stalling attitude. Furthermore, the separated vortex flow phenomenon is not restricted to this type of wing planform but is a general characteristic of all sharp leading-edge wings regardless of their leading-edge sweep angle.

The attached flow and separated vortex flow over blunt and sharp leading edge wings respectively are schematically illustrated in Figure 2.05. For the attached flow (blunt leading edges) there exists a net thrust force which is called the leading edge suction. This force may be interpreted to be

exerted by the bound vortex filaments at the leading edge. For sharp leading edges, attached flow cannot exist because of the infinitely large velocity and low pressure required, and therefore, the flow separates locally displacing the leading edge bound vortex filaments into the cavity formed by the separated flow. The vortex filaments in the cavity are not free vortices and therefore they will exert a net force in the normal direction to the wing surface because of the reorientation of the velocity vector.

Exact analytical solutions for sharp leading edge wings with leading edge separated flow are available in the published literature for a very restrictive range of wing geometries^(14,15,16). Usually these solutions are based on the assumption of conical flow, and as a consequence, only perfect delta wing planforms which feature no twist, no camber, and straight trailing edges can be considered. Therefore, in the prediction of the vortex lift for arbitrary sharp leading edge wing planforms, only empirical methods or approximate theory is available. The most successful analytical techniques are based on the vortex-lift leading-edge suction analogy. The method is based on the assumption that the vortex lift vector can be estimated from the leading edge thrust or suction force associated with the flow over the wing planform without separated flow at the leading edge. It follows (see Figure 2.05)

$$\Delta c_{n_v} = \frac{c_t}{\cos(\Delta_{LE})} \left(\frac{\alpha}{|\alpha|} \right) \quad (2.6.01)$$

$$\Delta c_{t_v} = -c_t \quad (2.6.02)$$

$$\Delta c_{m_v(c/4)} = -\Delta c_{n_v} \left(\frac{x_{LE} - x_{(c/4)}}{c} \right) \quad (2.6.03)$$

$$\Delta c_{l_v} = \Delta c_{n_v} \cos(\alpha) + \Delta c_{t_v} \sin(\alpha) \quad (2.6.04)$$

$$\Delta c_{d_v} = -\Delta c_{t_v} \cos(\alpha) + \Delta c_{n_v} \sin(\alpha) \quad (2.6.05)$$

These increments represent the force and moment coefficients due to the vortex lift which must be added to each lifting surface section coefficients in order t

obtain the net forces on the wing corresponding to the case of no leading edge suction. In the derivation of these relations, the vortex lift distribution has been assumed to act at the leading edge and normal to the wing chord plane.

Because of the approximate manner in which the leading edge suction thrust coefficient is calculated the evaluation for the vortex lift effects are only applicable to lifting surface planforms having a flat chord plane. Note that the thrust coefficient is calculated by integration of the forces in chordwise strips acting in all the bound vortices of the vortex-lattice matrix. Such an integration will provide accurate evaluations of the leading edge thrust if the chord plane is flat or if a very large number of chordwise rows are considered. If an infinite number of chordwise rows are considered, the vortex-lattice method will provide solutions equivalent to the potential flow solutions and an exact evaluation of the leading edge suction force will result. In the latter case, the leading edge suction thrust coefficient could be evaluated from the force exerted by a few of the leading edge bound vortices.

The spatially integrated wing coefficient increments due to the leading edge vortex lift are calculated from the wing section coefficient span distributions given in Equations 2.6.01 through 2.6.05, as follows

$$\Delta C_{L_v} = \frac{1}{S} \int_{-b/2}^{+b/2} \Delta c_{l_v} C \, dY \quad (2.6.06)$$

$$\Delta C_{D_v} = \frac{1}{S} \int_{-b/2}^{+b/2} \Delta c_{d_v} C \, dY \quad (2.6.07)$$

$$\Delta C_{M_{P,v}(\bar{C}/4)} = \frac{1}{S C} \int_{-b/2}^{+b/2} \left[- \Delta c_{n_v} \left(X_{LE} - X_{(\bar{C}/4)} \right) + \Delta c_{t_v} \left(Z_{LE} - Z_{(\bar{C}/4)} \right) \right] C \, dY \quad (2.6.08)$$

For obtaining approximate solutions of the vortex lift at selected wing angles of attack from two or more exact vortex lattice solutions, the following assumption is made which yields accurate results

$$\Delta c_{n_v}(Y, \alpha) = c_1(Y) + c_2(Y) \frac{\alpha^3}{|\alpha|} \quad (2.6.09)$$

$$\Delta c_{t_v}(Y, \alpha) = c_3(Y) + c_4(Y) \alpha^2 \quad (2.6.10)$$

The quantities C_1 , C_2 , C_3 , and C_4 are constants which are evaluated from the two vortex lattice solutions obtained at different angles of attack α_1 and α_2 in the manner described in Section 2.5.

2.7 Surface Discontinuities

Surface discontinuities occurring in the wing surface such as those encountered at the aileron-flap juncture cannot be treated exactly by the vortex lattice solution technique. Although by increasing the number of elements or control points the accuracy of the solutions should in principle be improved, sharp discontinuities in the surface may cause local oscillations on the solutions that become more severe as the number of elements are increased. To circumvent this problem, a cosine smoothing option whose effect is illustrated in Figure 2.06 has been adopted. The affected span length δ is prescribed by the program user as an execution input. A value of 1/5 of the semispan is recommended. In addition, various other options for spacing the elements in the spanwise and chordwise directions have been made available. These include constant spacing, cosine spacing, and spacing prescribed as an execution input. For deflected control surfaces, a minimum of four elements of approximate equal size per chordwise row is recommended, the last element corresponding to the deflected surface.

The airload section coefficients for the flapped surfaces are calculated in a similar manner to the wing section coefficients (Section 2.4). By considering only the forces on the bound vortices on the flapped surfaces ($X_j - X_{h,j}$) it follows

$$c_{n_f}(Y) = - \frac{1}{c_f} \sum c_{F_{z,j}} \left. \frac{\Delta S_j}{\Delta Y_j} \right|_{Y, (X_j - X_{h,j})} \quad (2.7.01)$$

$$c_{t_f}(Y) = - \frac{1}{c_f} \sum c_{F_{x,j}} \left. \frac{\Delta S_j}{\Delta Y_j} \right|_{Y, (X_j - X_{h,j})} \quad (2.7.02)$$

$$c_{h_f}(Y) = \frac{1}{c_f} \sum \left[c_{F_{Z,j}} \frac{\Delta S_j}{\Delta Y_j} (x_j - x_{h,j}) + c_{F_{Z,j}} \frac{\Delta S_j}{\Delta Y_j} (z_j - z_{h,j}) \right]_{Y, (x_j - x_{h,j})} \quad (2.7.03)$$

$$c_{l_f}(Y) = c_{n_f}(Y) \cos(\alpha) + c_{t_f}(Y) \sin(\alpha) \quad (2.7.04)$$

$$c_{d_{1,f}}(Y) = -c_{t_f}(Y) \cos(\alpha) + c_{n_f}(Y) \sin(\alpha) \quad (2.7.05)$$

For obtaining approximate solutions (see Section 2.5) the following assumptions are made

$$c_{l_f}(Y, \alpha) = F_1(Y) + F_2(Y) \alpha \quad (2.7.06)$$

$$c_{d_{1,f}}(Y, \alpha) = F_3(Y) + F_4(Y) \left(c_{l_f}(Y, \alpha) \right)^2 \quad (2.7.07)$$

$$c_{h_f}(Y, \alpha) = F_5(Y) + F_6(Y) \alpha^2 \quad (2.7.08)$$

The quantities F_1, F_2, \dots, F_6 are constants which are evaluated from two exact vortex lattice solutions obtained at different angles of attack α_1 and α_2 .

2.8 Lift in the Presence of a Fuselage

Two options for calculating the lift in the presence of a generalized cylindrical-shaped fuselage are possible:

1) Analytical Method - Circular Shaped Fuselage

In this method the effect of a circular shaped fuselage of radius R and of infinite length is analyzed by the method of images. According to the hydrodynamic theory, the boundary conditions of zero normal flow to the fuselage surface due to wing trailing vortices are satisfied by defining a pair of vortex filament images inside the fuselage. Since the free stream velocity vector is neglected in satisfying the boundary conditions on the fuselage, only approximate solutions which are valid at small angles of attack are obtainable (i.e., the fuselage attitude is oriented parallel to the wing trailing vortices). Using cylindrical coordinates with the axis of symmetry located at the center of the fuselage, the location of the pair of images

for a wing trailing vortex filament is determined from

$$\begin{array}{ll} \text{Image \# 1} & \text{Image \# 2}^\dagger \\ X_I = X & X_I = X \end{array} \quad (63)$$

$$\vec{r}_I = \vec{r} \left(\frac{R}{|\vec{r}|} \right)^2 \quad \vec{r}_I = 0 \quad (64)$$

$$\Gamma_I = -\Gamma \quad \Gamma_I = \Gamma \quad (65)$$

where $\left. \begin{array}{l} X \\ r \\ \Gamma \end{array} \right\}$ the coordinates and circulation strength at a point in a wing trailing vortex filament.

The calculation of the induced velocity of the pair of images is performed by integration in the manner outlined in Section 2.3 from which the calculation of the induced velocity vector influence functions follows.

The effect of the presence of a circular shaped fuselage on the wing bound vortices cannot be determined by exact analysis except under very restrictive assumptions for the wing geometry. Therefore, a relatively simple and approximate approach has to be adopted. The effect of the presence of the fuselage on the velocity induced by the bound vortices is assumed to be the same as its effect on a two-dimensional uniform rectilinear flow. Thus, the velocity component induced by the bound vortices at some point P in the flow field is increased by a factor

$$\left[1 + \left(\frac{R}{|\vec{r}_{(P)}|} \right)^2 \right] \quad (2.8.04)$$

which is an exact correction for a straight and infinite bound vortex line intersecting the cylinder axis of symmetry at 90°. The approximation will be valid for wings having small sweepback angles and slender fuselages centered at the wing axis of symmetry.

†The sum of the contribution of images #2 will be zero for symmetric wing loadings.

2) Vortex-Lattice Method - Arbitrary Shaped Fuselage

The effect of the presence of an arbitrary shaped fuselage on the wing lift can be calculated using the vortex lattice method.† The accuracy of the solutions that are obtained depends on the selection of the number of control points and their location on the fuselage surface. For accurate calculation of the fuselage it would probably require an equal or larger number of control points on the fuselage surface than the number used for the wing. The main advantages of using the vortex-lattice method in preference to other analytical methods (e.g., the method of images) are: (1) non-planar wings of arbitrary planform may be analyzed, (2) no restriction is placed on the cross section, length or shape of the fuselage, and (3) the accuracy desired for obtaining solutions can be obtained by increasing the number of panels or by varying the location of the control points at the surface of the fuselage. In the present vortex-lattice program (HA010B), the treatment of exact fuselage-wing vehicle configurations is severely limited by the total number of elemental vortex-filament surfaces (about 100) that can be considered simultaneously. At present, only by an approximate representation of the fuselage (e.g., by defining an equivalent flat surface) can the fuselage-wing configurations be analyzed by the program.

2.9 Program Qualification Tests

The vortex lattice method is suitable for determining accurate solutions for the aerodynamic loads on lifting surfaces of arbitrary planforms. Nevertheless, for conventional wing planforms featuring negligible dihedral and small camber, generally more exact analytical solution methods based on the integral lifting surface⁽⁷⁾ and lifting line theories⁽¹⁶⁾ are available. These solutions and equivalent experimental test results have been used to demonstrate the accuracy of the present vortex-lattice analytical method.⁽⁸⁾ For wing planforms with severe surface discontinuities, only comparisons

†It is a well known fact in hydrodynamic theory that the presence of arbitrary bodies immersed in a steady subsonic or supersonic flow field can be represented by distributions of sources and sinks inside the volume occupied by the bodies. Mathematically, the distributions of sources and sinks may be replaced by distributions of doublets or vortex filaments located on the surface of the bodies. If the vortex filament representation is adopted (i.e., the vortex lattice method), a rectangular vortex ring for each panel in the surface of the bodies is defined with the corresponding control points located at the center of each panel.

against available experimental test results can be performed. In general it should be noted that: (1) the vortex lattice solutions are affected by the number of surface elements, the location of the control points, and the geometric arrangement of the vortex lattice network which are input quantities prescribed by the program users, (2) for conventional wing planforms with moderate aspect ratio and moderate dihedral and sweepback angles, the lifting line methods will provide more accurate solutions, and (3) when the wing surface is placed very near a ground plane, large differences in the span and chord lift distributions in comparison with out-of-ground conditions occur; therefore, ground effects can only be properly analyzed by the integral lifting surface or the vortex lattice method. In the lifting line method the local section aerodynamic characteristics are assumed to depend only on the airfoil section properties for two dimensional flow (i.e., infinite aspect ratio) which are generally determined from wind tunnel tests.^(17, 18) In the presence of a very near ground plane this assumption is not valid.

2.9.1 Vortex-Lattice Geometry and Control Point Locations

The effect of varying the vortex lattice geometric arrangement for a fixed wing planform on the solution of the spatially integrated wing airload coefficients is demonstrated in Table 2.01. Predictions are presented for a delta wing planform of aspect ratio of two. Both constant spacing and cosine spacing of the elements in the spanwise and chordwise directions are considered. Nevertheless, the differences between solutions on the integrated wing coefficients is found to be negligible, i.e., within one percent. On the other hand, the variation of the vortex lattice arrangement due to constant and variable (cosine) spacing of the elements shows a significant effect on the predictions for the spanwise section lift distribution in the region near the wing tip (see Figure 2.07). Based on the results presented, it is concluded that constant span spacing of the elements provides more reasonable solutions than variable spacing for wings of low aspect ratio (~ 2). For moderate to high aspect ratio wings, the opposite is found to be true. As a general rule, accurate solutions are obtained by selecting not less than ten spanwise elements and not less than four chordwise elements. The spacing of the elements should be such that adjacent elements have approximately equal size and equal configuration. Furthermore, the accuracy of the predicted spatially integrated wing coefficients depends primarily on the total number

of elements considered, i.e., errors in the calculated local airload coefficients will cancel out in the integration process.

The effect of varying the control point locations on the wing integrated airload coefficients for a delta wing of aspect ratio of two is presented in Table 2.02. As shown in the table, by moving the control points aft of the 3/4 chord of the panels, an increase in the wing airloads and a forward shift of the center of pressure results. Similar conclusions are drawn for wings of moderate aspect ratio and negligible sweepback angles (see Table 2.03). Although for the low aspect ratio delta wing planforms better agreement between analytical and experimental solutions are obtained with the control point locations aft of the 3/4 chord of the panels, the best control point location which provides accurate results for any wing planform is considered to be at the 77 percent of the elemental chords. (7, 19)

2.9.2 Wings of Moderate Aspect Ratio and Negligible Sweepback

Three different basic wing planforms of aspect ratio of six having no twist and zero sweepback at the 1/4 chord are considered. Solutions for the integrated wing airload coefficients using the present vortex lattice program and the lifting line theory⁽¹⁸⁾ are compared in Table 2.03. The lattice network arrangements and corresponding section lift distributions for the vortex lattice solutions are shown in Figure 2.08. The comparison of the calculated span loadings for the rectangular and the straight tapered wings against lifting line semi-empirical predictions^(20, 21) is presented in Figure 2.09. A qualitative evaluation of results shows that the program predictions are in good agreement with the lifting line exact theory and the lifting line semi-empirical predictions.

2.9.3 Wings of Low Aspect Ratio and Large Sweepback

Wing planforms of low aspect ratio having no twist and large leading edge sweepback angles for which comprehensive wind tunnel test data are available are considered.^(23, 24) The range of wing planforms includes delta, clipped delta, and straight tapered configurations of aspect ratios ranging from two to four and leading edge sweepback angles as large as 60° (see Table 2.04). The airfoil sections are relatively thin (~ 3 percent) with sharp or rounded nose sections. Under these conditions locally separated flow at the wing leading edge with the accompanying vortex lift and loss of leading edge suction force occurs. Analytical solutions for the wing plan-

forms were generated by the program assuming no separated flow and fully separated flow at the leading edges. Analytical predictions for the integrated airload coefficients are compared with the experimental test results in Table 2.04. Comparisons for a range in angle of attack from 0° to 25° are shown for four representative wing planforms in Figures 2.10 through 2.12. Comparisons of the lift distribution on the lifting surface for a delta wing planform are presented in Figure 2.13. The analytical solutions in the table and the figures were calculated assuming a control point location of 77 percent of chord for the elemental panels. An evaluation of the overall results leads to the following conclusions.

- 1) The analytical solutions for the integrated wing lift coefficients are found in excellent agreement with the wind tunnel test results (Figure 2.10). In general, the analytical solutions with and without leading edge suction bound the experimental results.
- 2) Analytical solutions for the wing drag coefficients when compared with the experimental results, although in less agreement, showed the same trends as for the lift (Figure 2.11).
- 3) The analytical solutions for the integrated wing pitching moment coefficients about the $1/4$ of the mean geometric chord are not found to be in good agreement with the wind tunnel test results (Figure 2.12). Differences of the order of 25 percent are encountered for the delta wing planform of aspect ratio of two and somewhat smaller for the other wings. The reasons for the discrepancies encountered for the pitching moment probably arise from two sources. First, the test data for the wings were deduced from tests conducted for wings with a slender fuselage. To obtain the characteristics of wing alone, data for the fuselage alone was subtracted from the wing-fuselage data and, as a result, the wing-fuselage interference effect was neglected. Second, for the delta wing configurations the calculated lift in the tip regions is extremely large while in the real test environment stalling in these regions would surely occur. This would result in a redistribution of the vorticity on the wing upper and lower surfaces which cannot be represented accurately by the vortex lattice theory (see Figure 2.13). In addition, it should be noted that the pitching moment error for the $\bar{C}/4$ location is somewhat

misleading in assessing the accuracy of the vortex lattice method since at this location the magnitude of the pitching moment is of zero order, i.e., more than an order of magnitude smaller than the wing lift coefficient. The error in the pitching moment predictions for the $\bar{C}/4$ location (Figure 2.12) represents a difference of about 2.5 % of \bar{C} on the location of the center of pressure at moderate angles of attack ($\alpha < 5^\circ$) that is equivalent to about 1% of the maximum chord length of the wing. Another point worth noting is that the vortex lift was found to be many times smaller than the wing lift calculated by the vortex lattice method. Therefore, the approximate treatment of the vortex lift by the suction analogy is considered satisfactory in determining the net airload sum for the wing.

2.9.4 Ground Effects

Analytical solutions that include the ground effects are obtainable by the method of images by assuming the ground plane to be perfectly flat and of infinite extent. Under these conditions, the boundary requirements for the flow at the ground plane are exactly satisfied by defining a wing image located directly below the wing at a distance equal to twice the altitude from the ground plane. For altitudes equal or greater than one chord length, the lifting line and the lifting surface analytical techniques provide comparable and accurate solutions to the problem. When the altitude from the ground plane is diminished below the one-chord length, the chordwise distribution of circulation is very strongly affected by the presence of the ground plane. In this range of altitudes, only the lifting surface methods such as the vortex lattice analysis technique can be expected to provide accurate solutions.

The accuracy of the present program for predicting ground effects may be demonstrated by comparing analytical solutions against lifting line predictions^(25, 26) and experimental test results.⁽²⁶⁾ In accomplishing these objectives, ground effects were calculated for three different wing planforms for which comprehensive wind tunnel test and/or flight data are available. A comparison of results is shown in Figure 2.14. In examining the figure, the following observations are made:

- 1) For the rectangular wing planform of aspect ratio of six shown in the figure (Figure 2.14[A]), the program predictions of the ground effects are found to be in perfect agreement with the flight test

data⁽²⁶⁾ for the range of altitudes tested. As expected, the lifting line theory^(25, 26) is inaccurate very near the ground plane ($H/\bar{C} \leq 1$).

- 2) For the straight tapered wing of aspect ratio of ten (Figure 2.14[B]), the program predictions are found in very good agreement with the experimental data obtained in the wind tunnel.⁽²⁷⁾ Again, at distances very near the ground plane, the lifting line theory⁽²⁶⁾ proves to be inaccurate. An illustration of the corresponding variation of the span lift distribution due to the ground effects is also shown in the figure.
- 3) For a delta wing of aspect ratio of 2.309 (Figure 2.14[C]), the present program predictions are compared with semi-empirical results reported by Fox.⁽²⁸⁾ The analytical predictions of the ground effects by the program are found not to be in very good agreement with these results. However, the accuracy of this data is suspected since the wing lift coefficient out-of-ground is found to be about 20 percent larger than reported by other investigators for comparable delta wing planforms operating at the same angle of attack^(23, 24) (see Figure 2.10, Configuration C1).

2.9.5 Wings of Unusual Planforms

Analytical predictions of the aerodynamic characteristics for wings having large sweepback angles and unusual planforms obtained by the present program and the lifting line theory^(29, 30) are compared in Figures 2.15 and 2.16. In the first figure, the span loading distribution predictions for three different wing planforms of aspect ratio of six having continuous and broken sweepback of 45° at the $1/4$ chord are presented. In all three cases good agreement is found between the vortex lattice and the lifting line predictions. Although the larger discrepancies are found at the root region, the small differences encountered in the span loading predictions are probably due to the greater accuracy of the vortex lattice method for representing the real problem. Predictions for the lift slope and the location of the center of pressure on the wing surface also shown in the figure are found to be in good agreement. In the second figure (Figure 2.16), predictions of the effect of varying the sweepback angle on the wing lift slope for straight tapered wings of aspect ratio of six are compared. Again, a comparison between the vortex lattice and lifting line solutions are found to be in good agreement.

2.9.6 Wings With Severe Surface Discontinuities

The accuracy of the present vortex lattice program for analyzing wing planforms having severe surface discontinuities is considered in this section. Such discontinuities arise from two sources: (1) sharp discontinuities in the wing surface such as: abrupt changes in the wing dihedral, the presence of wing-tip end plates, boundary layer flow fences, etc., and (2) trailing edge surface discontinuities arising from large deflections of control devices such as flaps or ailerons. The solutions for one example of each of these types of discontinuities is considered and compared against experimental results or other theoretical solutions.

1) Wing of Aspect Ratio of Four with End Plates

The exact analytical treatment of arbitrary wing planforms with end plates at the tip can only be performed using the exact geometry (no linearization) in prescribing the boundary conditions. The problem presents the most severe test for the analytical method because of the very large velocities induced in the spanwise directions by the end plate bound vortex filaments. Analytical predictions performed by the present program are compared with experimental results⁽³¹⁾ for a rectangular wing of aspect ratio of four with large end plates in Figure 2.17. The analytical results showed a stronger effect of the end plates on the wing lift (about 30 percent larger) than obtained in the wind tunnel experiments. This discrepancy is probably due to the presence of separated flow in the corners of the wing-end plate junctures which would account for the loss of lift.

2) Straight Tapered Wing of Aspect Ratio of Six with Flapped Surfaces

A straight tapered wing of aspect ratio of six having simple trailing edge flapped surface of 25 percent of chord is considered. The flapped surfaces are assumed to be constituted by the wing flaps and the ailerons which extend from the root to the 62.5 percent and from the 62.5 percent wing station to the tip respectively (see Figure 2.18). Analytical solutions were obtained by the program for symmetric and unsymmetric span loadings. Symmetric span loadings were calculated for the wing operating with the flaps extended 30° and the ailerons neutral, and unsymmetric span loadings, by assuming unequal aileron

deflections of 10° down and 15° up for the left and right ailerons respectively. The handling of the flap-aileron junction surface discontinuity was treated using the smoothing procedure described in Section 2.7 using $\delta/(b/2)$ value of 0.20. A summary of the principal results obtained were plotted using the program standard plotting option and are presented in Figure 2.18. A comparison between the results obtained and the lifting line and thin airfoil theory analytical predictions⁽⁹⁾ are presented in Table 2.05. As shown in the table, the vortex lattice method predictions for the airload increments due to the flapped surface deflections are found to be smaller than by the other method. The discrepancies in the results probably are due to the fact that in the present vortex lattice method the exact geometry of the wing section camber distributions are considered while for the other method (thin airfoil theory) approximate geometric boundary conditions (which are valid only at very small flapped surface deflections) are used. The fact that the vortex lattice predictions for the wing airloads increments are smaller is a most revealing result. Note that solutions obtained based on thin airfoil theory usually overestimate the effect of the flapped surfaces by about 20 percent.

2.9.7 Multiple-Surface Configurations

The accuracy of the present vortex-lattice analysis program in obtaining solutions for vehicle configurations that are represented by two or more lifting surfaces is to be evaluated in this section. Typical example configurations under this category are: wing + horizontal tail (2 surfaces), wing + canard control surface (2 surfaces), thick wing (2 surfaces), wing + horizontal tail + vertical tail + fuselage (4 surfaces), lifting body (2 or more surfaces), etc. The significant characteristic of the multiple-surface problem is the mutual influence or interference effect that each surface exerts on all the other surfaces. Such problems can only be properly analyzed by the vortex-lattice and surface-integral⁽⁷⁾ methods. In determining the accuracy of the present analysis, analytical predictions were performed for three representative vehicle configurations for which wind-tunnel or flight data of sufficient quantity and accuracy is available. The results obtained, a comparison between analytical predictions versus experimental data, are presented in Figures 2.19 through 2.21. The vehicle con-

figurations and type of experimental data sources studied were as follows:

1) out-of-ground wind tunnel tests conducted for a wing + canard surface + slender fuselage model in Reference 32, 2) flight test data in and out of ground conducted for the Douglas F5D-1 prototype airplane with a modified ogee wing,⁽³³⁾ and 3) flight test data in- and out-of-ground for the North American XB-70 Airplane.⁽³³⁾ In examining the comparisons presented in the figures, it must be concluded that the present vortex-lattice analysis method is capable of predicting the aerodynamic loads within a few percent (1 percent to 5 percent) of the experimental results. The details of the technical evaluation that led to this conclusion are discussed below.

1) Out-of-Ground Predictions

Analytical predictions for lift, induced drag, and pitching moment for the wing-canard-fuselage model are compared against wind tunnel test results in Figure 2.19. The predictions for the lift coefficient are found to be in remarkable agreement with the test data, i.e., within one percent. This result was obtained notwithstanding of the very strong mutual interference effect that the canard surface exerts on the wing that is predicted by the analysis (see Table 2.06). The induced drag predictions are also found to be in very good agreement with the test data, especially if it is taken into account the fact that the magnitude of the induced drag force is much smaller (by a Factor of ~ 10) in comparison with the lift force. Similarly, comparisons for the pitching moment are given about the C.G. and the trailing-edge of the wing root chord. Although a very large discrepancy is found between the predicted and the test data for the pitching moment when expressed about the C.G., the scale of the pitching moment here is very small and misleading. By expressing the pitching moment about the aftermost location of the wing surface, the trailing-edge of the wing root chord, a more meaningful evaluation of results is possible. This fact can be corroborated by calculating the discrepancy of the location of the center of pressure that reveals the cause for the discrepancy in the pitching moment. Accordingly, the predicted location of the center of pressure when compared against the test data is off by about ten percent of the wing \bar{C} , or, about three percent of the

model length. Since varying the vortex-lattice arrangement or the number of control points showed no significant change on the predictions, it is concluded that the analytical predictions represent an exact solution. Then, the small discrepancy encountered in the pitching moment (Figure 2.19d) or center of pressure location can only be attributed to wind tunnel test measurement errors or to the fact that the exact geometry of the wind tunnel model was only approximately represented by the vortex-lattice arrangement used in carrying out the calculations of analytical predictions.

2) In-Ground-Predictions

Analytical predictions for the lift of full-size vehicles in flight in the presence or absence of a very near ground plane are compared against flight test data⁽³⁴⁾ in Figures 2.20 and 2.21. In general, relative good agreement is found between the analytical predictions and the flight test data. Although better agreement is found for the out-of-ground comparisons, this finding is not surprising when considering the great difficulties encountered in obtaining accurate data very near the ground plane. Corrections on the lift due to varying control surface deflections, jet thrust, etc., that include the ground effect are difficult to assess and are generally ignored.

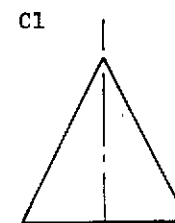
TABLE 2.01 - VORTEX-LATTICE GEOMETRY EFFECT ON THE CALCULATED WING AIRLOADS (PROGRAM HA010B)
 FOR A DELTA WING OF ASPECT RATIO = 2, OPERATING AT $\alpha = 10^\circ$ AND $M = 0.25$

	VORTEX MATRIX GEOMETRY					WITH L. E. SUCTION (BLUNT L. E.)			NO L. E. SUCTION (SHARP L. E.)			EXECUTION TIME
	NO. SPAN ELEMENTS	SPAN SPACING†	NO. CHORD ELEMENTS	CHORD SPACING†	TOTAL NO. ELEMENTS	C_L	C_{D_i}	$C_{M(\bar{c}/4)}$	C_L	C_{D_i}	$C_{M(\bar{c}/4)}$	SECONDS‡
1	14	0	5	0	70	0.3708	0.0476	-0.0825	0.4071	0.0722	-0.0882	39
2	14	1	5	0	70	0.3765	0.0472	-0.0845	0.4149	0.0735	-0.0905	38
3	14	0	5	1	70	0.3717	0.0488	-0.0801	0.4074	0.0729	-0.0860	39
4	14	1	5	1	70	0.3770	0.0478	-0.0830	0.4152	0.0739	-0.0890	39
5	20	0	5	0	100	0.3739	0.0486	-0.0827	0.4098	0.0729	-0.0885	73
6	20	1	5	0	100	0.3765	0.0483	-0.0843	0.4141	0.0734	-0.0904	73
7	20	1	5	1	100	0.3772	0.0495	-0.0818	0.4137	0.0738	-0.0881	74
8	14	1	9	0	136	0.3752	0.0477	-0.0837	0.4127	0.0733	-0.0895	106

†LEGEND

1 = COSINE SPACING
 0 = CONSTANT SPACING

‡EXECUTION TIME INCLUDES
 LINEAR ARRAY SOLUTIONS



AR = 2
 TR = 0
 $\Lambda_{\bar{c}/4} = 56^\circ$

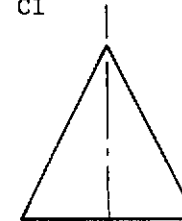
TABLE 2.02 - VORTEX-LATTICE CONTROL POINT LOCATION EFFECT ON THE CALCULATED WING AIRLOADS (PROGRAM HA010B)
FOR A DELTA WING OF ASPECT RATIO = 2, OPERATING AT $\alpha = 10^\circ$ AND $M = 0.25$

LOCATION OF CONTROL POINT % OF ELEMENT CHORD		75%	80%	83%	77%
VORTEX MATRIX GEOMETRY	NO. SPAN ELEMENTS	14	14	14	14
	SPAN SPACING†	1	1	1	0
	NO. CHORD ELEMENTS	5	5	5	5
	CHORD SPACING†	0	0	0	0
WITH L. E. SUCTION (BLUNT L. E.)	C_L	0.3673	0.3908	0.4044	0.3708
	C_{D_i}	0.0462	0.0527	0.0568	0.0476
	$C_{M(\bar{C}/4)}$	-0.0846	-0.0838	-0.0823	-0.0825
NO L. E. SUCTION (SHARP L. E.)	C_L	0.4051	0.4359	0.4602	0.4071
	C_{D_i}	0.0714	0.0769	0.0812	0.0722
	$C_{M(\bar{C}/4)}$	-0.0903	-0.0892	-0.0885	-0.0882

†LEGEND

- 1 = COSINE SPACING
- 0 = CONSTANT SPACING

C1



AR = 2

TR = 0

$\Lambda_{\bar{C}/4} = 56^\circ$

TABLE 2.03 - WING AIRLOAD PREDICTION COMPARISONS FOR WING PLANFORMS OF MODERATE ASPECT RATIO

ANALYSIS	GEOMETRY				AERO COEFFICIENTS AT $\alpha = 10^\circ$, $M = 0$				
	PLANFORM	ASPECT RATIO	TAPER RATIO	SWEEP $\Lambda (\bar{C}/4)$	C_L	$C_{M(\bar{C}/4)}$	C_{D_i}	WING LIFT SLOPE C_L/DEG	WING A. C. $\% \bar{C}$
TRW VORTEX-LATTICE METHOD (PROGRAM HA010B) CONTROL POINT AT 75%	RECTANGULAR	6	1	0	0.7567	0.0004	0.0355	0.07567	24.99
	TAPERED	6	1/3	0	0.7795	0.0031	0.0367	0.07795	24.59
	ELLIPTICAL	6.04	0	0	0.7865	-0.0211	0.0377	0.07865	27.71
NACA REPORT NO. 631 ⁽¹⁸⁾ SECTION LIFT SLOPE $a_o = 2\pi \times 57.3$	RECTANGULAR	6	1	0	0.7870	0	0.0345	0.07870	25.00
	TAPERED	6	1/3	0	0.8195	0	0.0363	0.08195	25.00
	ELLIPTICAL	6	0	0	0.8220	0	0.0358	0.08220	25.00
TRW VORTEX-LATTICE METHOD (PROGRAM HA010B) CONTROL POINT AT 77%	RECTANGULAR	6	1	0	0.7779	0.0068	0.0373	0.07779	24.12
	TAPERED	6	1/3	0	0.8011	0.0097	0.0387	0.08011	23.78
	ELLIPTICAL	6.04	0	0	0.8081	-0.0149	0.0398	0.08081	26.84
NACA REPORT NO. 631 ⁽¹⁸⁾ SECTION LIFT SLOPE $a_o = 9.099$ (NACA0012 AIRFOIL)	RECTANGULAR	6	1	0	0.7286	0.0044	0.0295	0.07286	24.40
	TAPERED	6	1/3	0	0.7564	0.0045	0.0307	0.07564	24.40
	ELLIPTICAL	6	0	0	0.7610	0.0046	0.0307	0.07610	24.40

TABLE 2.04 - WING AIRLOAD PREDICTION COMPARISONS FOR WING PLANFORMS OF MODERATE ASPECT RATIO AT $\alpha = 5^\circ$

CONFIGURATION					TEST CONDITIONS		ANALYSIS [†] (PROGRAM HA010B)		EXPERIMENT	WING AIRLOAD COEFFICIENTS			C. P. LOCATION
PLANFORM	ASPECT RATIO	TAPER RATIO	SWEEP ANGLE $\Lambda(C/4)$	AIRFOIL SECTION	MACH NUMBER	REYNOLDS NUMBER	WITH L. E. SUCTION (BLUNT L. E.)	NO L. E. SUCTION (SHARP L. E.)	NACA RM A53A30	C_L	C_{D_i}	$C_{M(\bar{C}/4)}$	\bar{x}
DELTA	2	0	56.0°	NACA 0003-63	0.25	16.6×10^6	X			0.1849	0.0193	-0.0423	47.87
								X		0.1941	0.0248	-0.0435	47.41
									X	0.1830	0.0165	-0.0333	43.19
DELTA	3	0	45.0°	NACA 0003-63	0.25	10.6×10^6	X			0.2433	0.0210	-0.0412	41.93
								X		0.2547	0.0304	-0.0422	41.56
									X	0.2390	0.0200	-0.0332	38.89
DELTA	4	0	37.0°	3% THICK ROUNDED NOSE SECTION	0.25	9.1×10^6	X			0.2893	0.0215	-0.0384	38.27
								X		0.3029	0.0348	-0.0391	37.90
									X	0.2830	0.0255	-0.0299	35.56
TAPERED	3.08	0.39	11.5°	3% THICK BICONVEX SECTION	0.25	8.3×10^6	X			0.3104	0.0216	-0.0007	25.22
								X		0.3214	0.0362	+0.0023	24.28
									X	0.2860	0.0278	+0.0121	20.76
TAPERED	3	0.40	40.6°	3% THICK BICONVEX SECTION	0.25	8.4×10^6	X			0.2615	0.0213	-0.0203	32.76
								X		0.2722	0.0319	-0.0186	31.83
									X	0.2710	0.0275	-0.0175	31.45
RECTANGULAR	2	1.0	0°	3% THICK BICONVEX SECTION	0.61	4.4×10^6	X			0.3000	0.0254	0.0000	25.00
								X		0.3109	0.0352	+0.0031	24.00
									X	0.2650	0.0271	+0.0150	19.339
CLIPPED DELTA	2	0.33	37.0°	3/8 THICK BICONVEX SECTION	0.61	4.8×10^6	X			0.2800	0.0295	-0.0226	33.07
								X		0.2918	0.0336	-0.0204	31.99
									X	0.2600	0.0310	-0.0161	31.92

[†]COLOCATION POINT LOCATION AT 77% OF ELEMENT CHORD AND $c_{d_0} = 0.007$ WERE USED IN THE ANALYSIS.

TABLE 2.05 - COMPARISON OF CALCULATED AIRLOAD COEFFICIENT INCREMENTS DUE TO FLAP DEFLECTION FOR A 25% OF CHORD FLAPPED SURFACE

	SECTION COEFFICIENT INCREMENTS PER DEGREE OF FLAP DEFLECTION AT $Y/(b/2) = 0.40$			
	$\Delta c_{L}/\delta_f^\circ$	$\Delta c_{m}(C/4)/\delta_f^\circ$	$\Delta c_{n}/\delta_f^\circ$	$\Delta c_{h}/\delta_f^\circ$
VORTEX LATTICE METHOD (PROGRAM HA010B)	0.040	-0.01166	0.0566	-0.0140
LIFTING LINE THEORY (WAKE II PROGRAM ⁽⁹⁾)	0.0672	-0.01138	0.0487	-0.0164

Note: The results presented were calculated for a 25% chord flap deflected 30° with the wing operating at zero angle of attack (See Figure 2.18).

TABLE 2.06 - MULTIPLE-LIFTING-SURFACES INTERFERENCE EFFECT PREDICTIONS (HA0010B) FOR A SELECTED WING-CANARD-FUSELAGE CONFIGURATION (SEE FIGURE 2.19)

COMMENT	WING LIFT COEFFICIENT C_{L_π} BASED ON S_π AND $\alpha = 12.5^\circ$				
	WING $S_\pi = 694.18$	CANARD $S_\pi = 113.04$	CENTER FUS $S_\pi = 17.53$	FUS NOSE $S_\pi = 26.44$	SUM AT C.G. $S_\pi = 694.18$
WING ALONE	0.7091				0.7091
CANARD ALONE		0.5214			0.0849
WING + CANARD	0.6694	0.4129			0.7366
WING + CANARD + FUS	0.6539	0.3982	0.1420	0.1420	0.7318

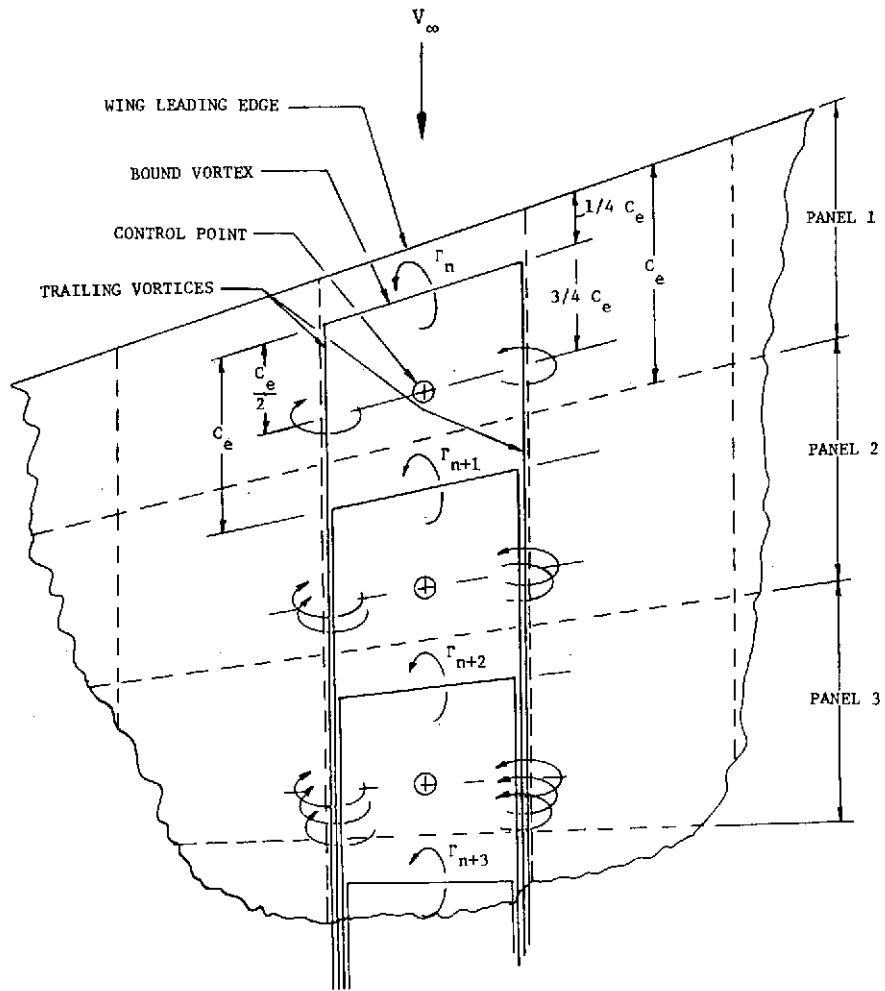


FIGURE 2.01 - SKETCH OF A CHORDWISE ROW OF VORTICES

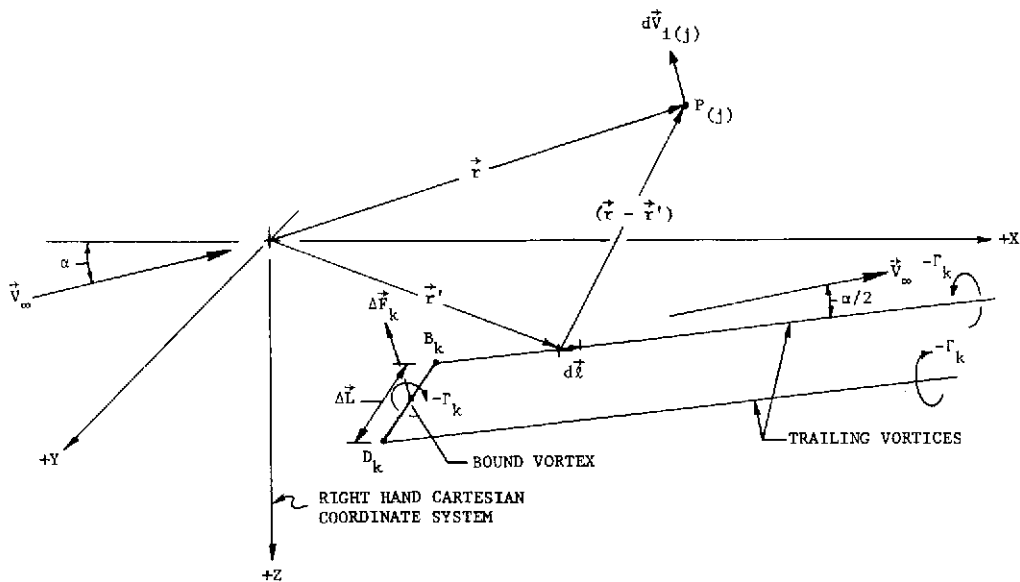


FIGURE 2.02 - GEOMETRY CONVENTION FOR A SKEW-SHAPED HORSESHOE VORTEX FILAMENT IN THE GENERAL COORDINATE SYSTEM

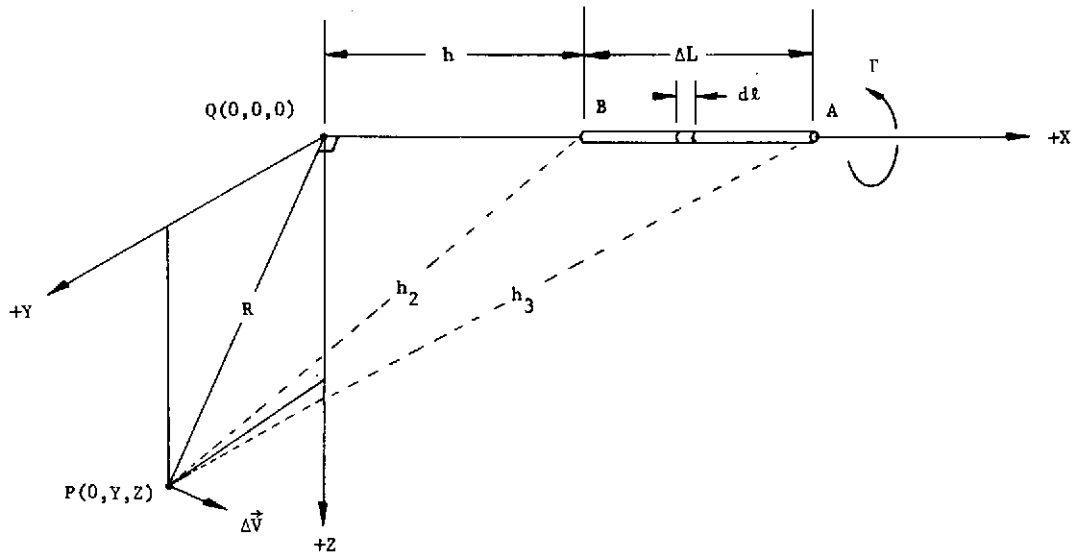


FIGURE 2.03 - VELOCITY INDUCED BY AN ELEMENTAL VORTEX FILAMENT OF LENGTH ΔL DEFINED IN A LOCALIZED COORDINATE SYSTEM

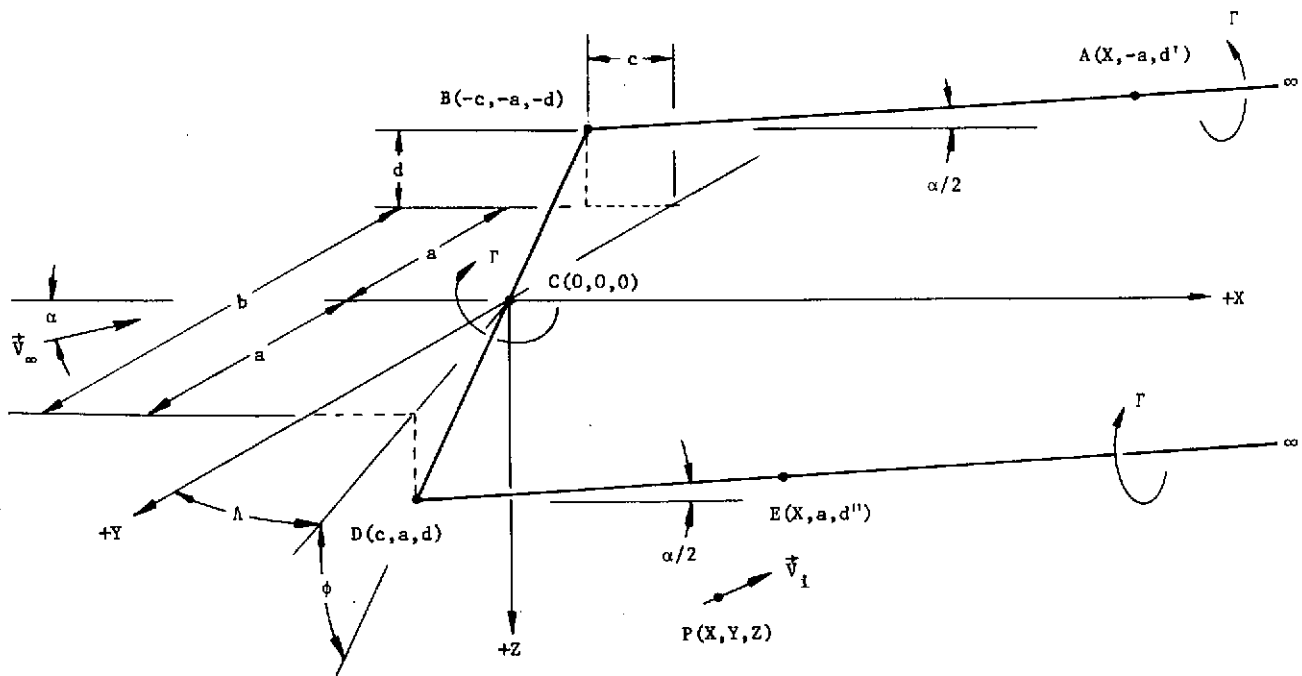
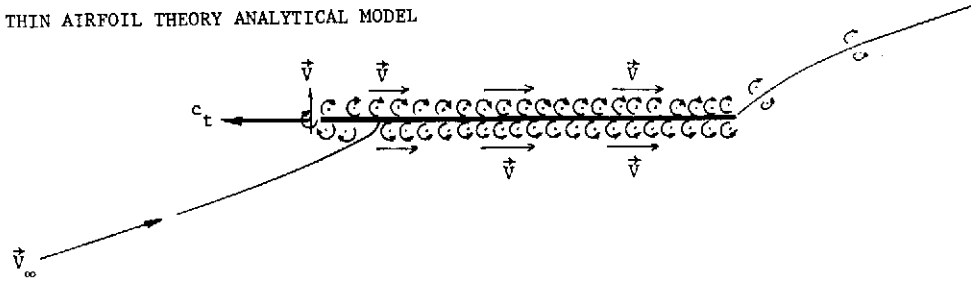


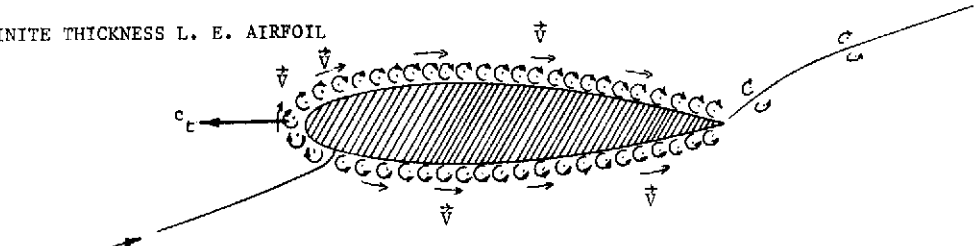
FIGURE 2.04 - GEOMETRY CONVENTION FOR A SKEW-SHAPED HORSESHOE VORTEX FILAMENT DEFINED IN THE LOCAL COORDINATE SYSTEM

WITH L. E. SUCTION
(BLUNT L. E. WING)

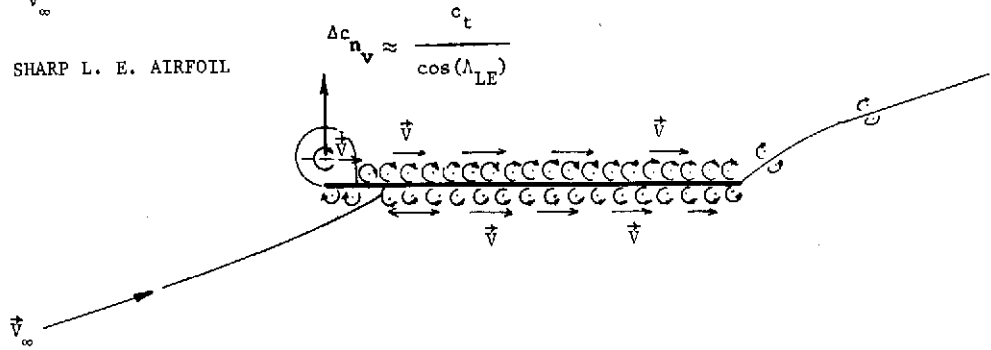
A) THIN AIRFOIL THEORY ANALYTICAL MODEL



B) FINITE THICKNESS L. E. AIRFOIL



C) SHARP L. E. AIRFOIL



NO L. E. SUCTION
(SHARP L. E. WING)

FIGURE 2.05 - ILLUSTRATION OF THE ORIGINS OF THE VORTEX LIFT

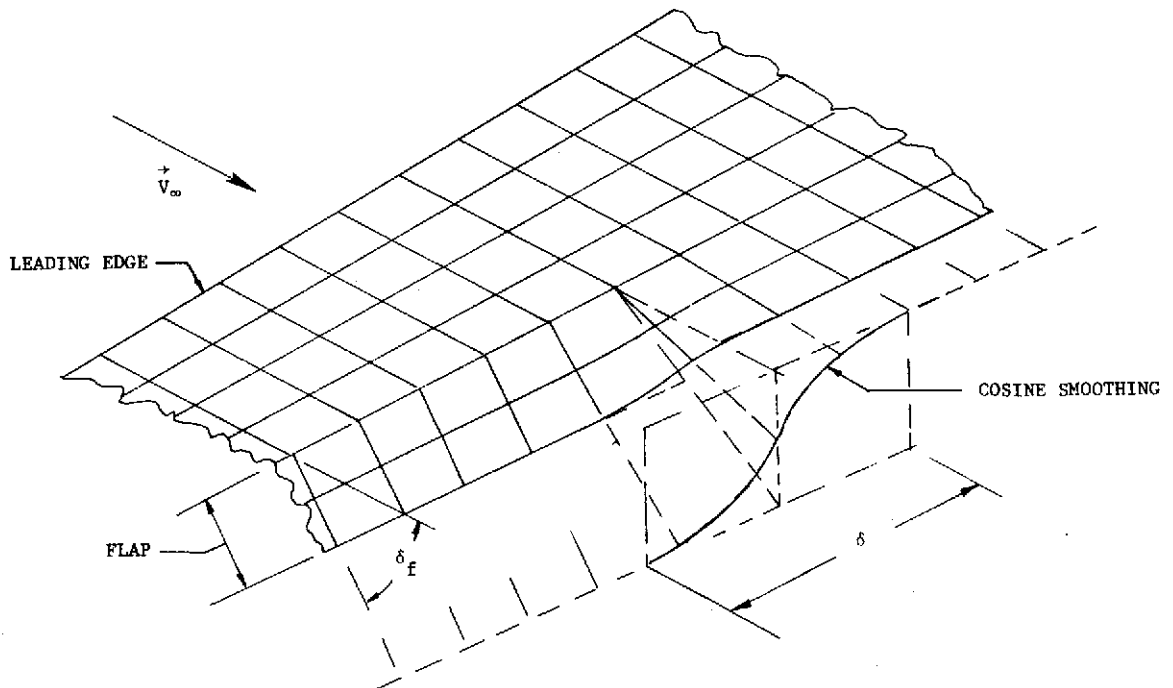


FIGURE 2.06 - COSINE SMOOTHING OF SHARP SURFACE-DISCONTINUITIES

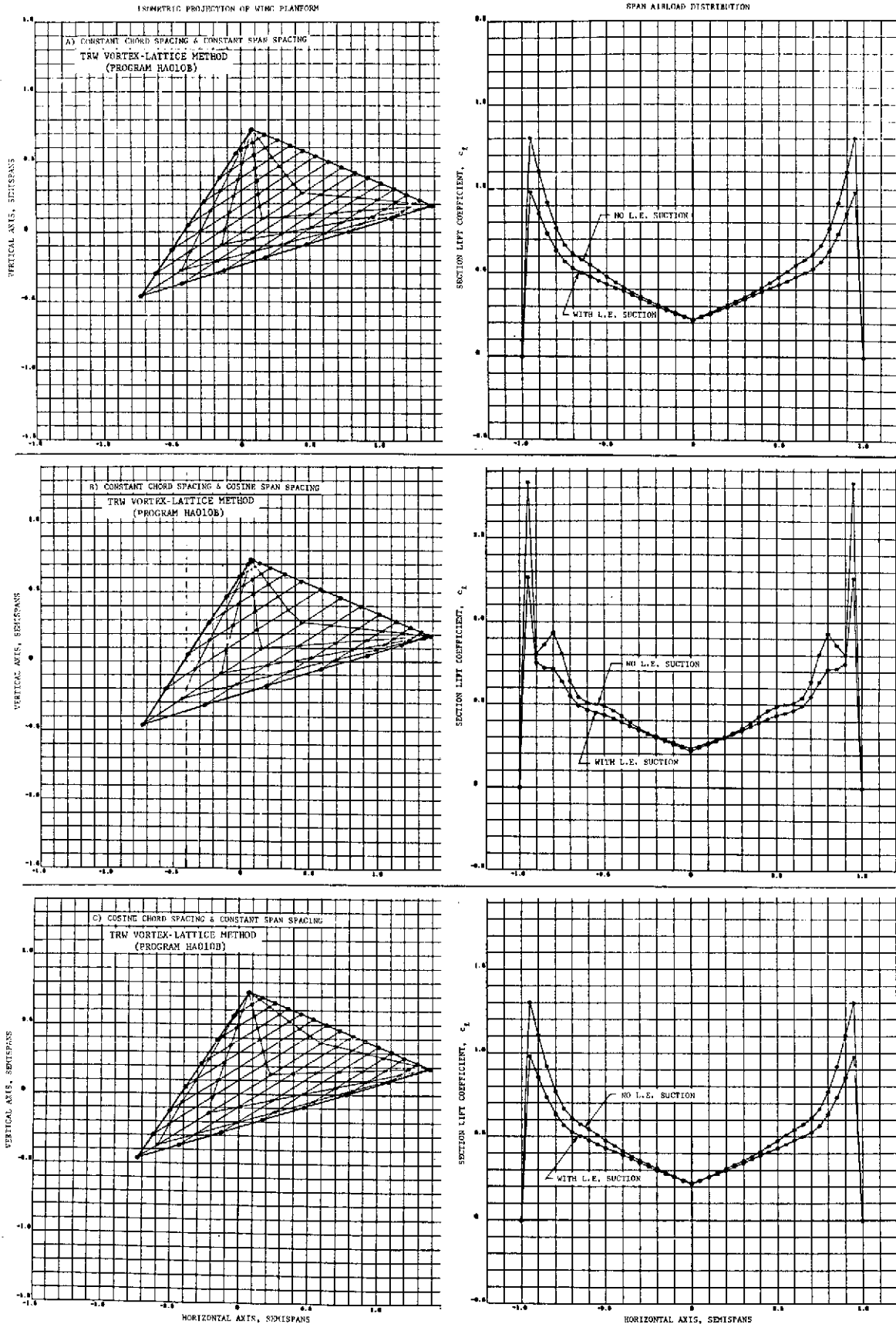


FIGURE 2.07 - VARIATION OF VORTEX-LATTICE ARRANGEMENT EFFECT ON THE SPAN SECTION LIFT DISTRIBUTION FOR A DELTA WING OF ASPECT RATIO = 2 AT AN ANGLE OF ATTACK $\alpha = 10^\circ$

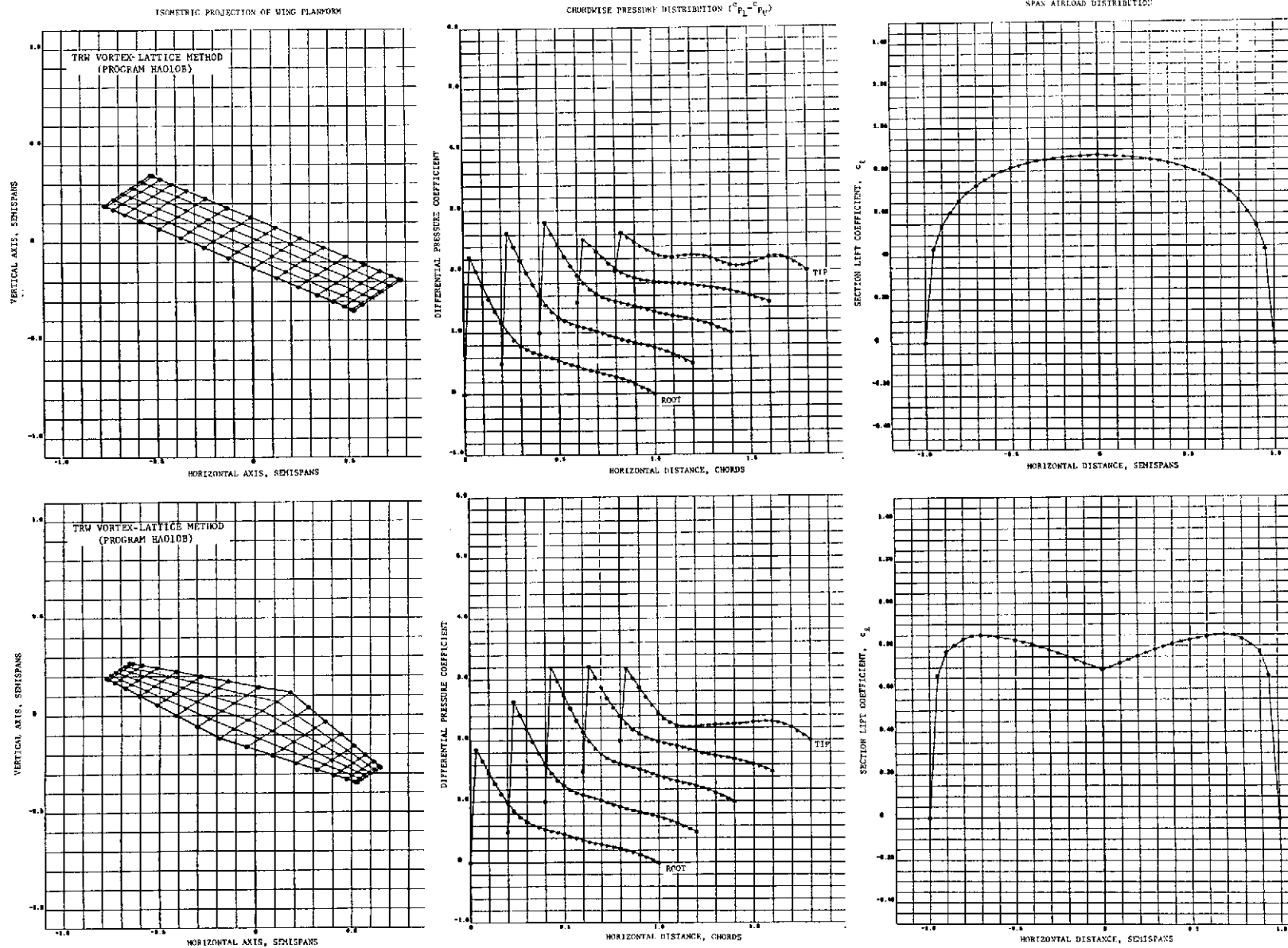


FIGURE 2.08 - LIFT DISTRIBUTION PREDICTIONS (PROGRAM HA010B) FOR FOUR BASIC WING PLANFORMS AT AN ANGLE OF ATTACK $\alpha = 10^\circ$

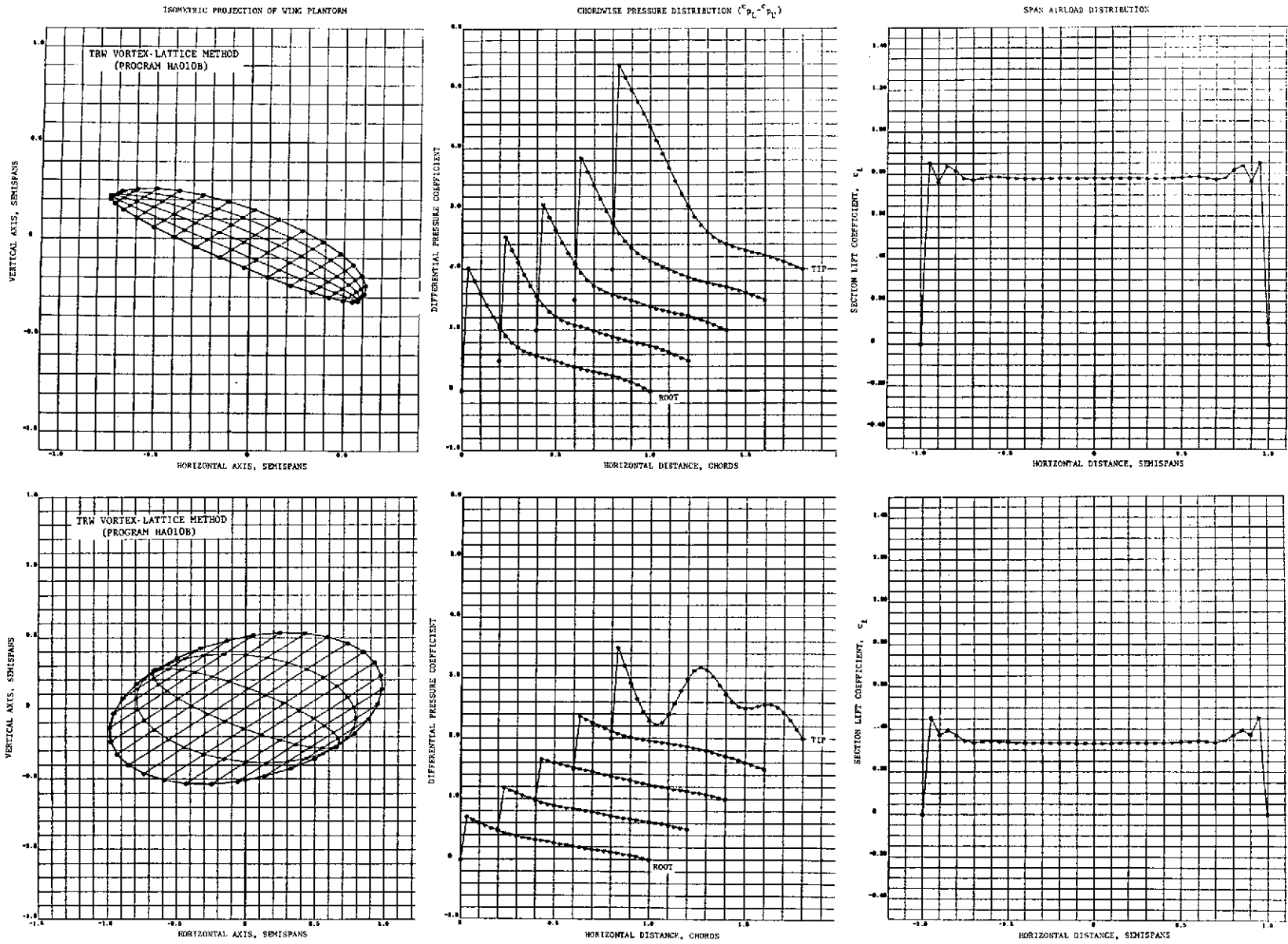


FIGURE 2.08 - LIFT DISTRIBUTION PREDICTIONS (PROGRAM HA010B) FOR FOUR BASIC WING PLANFORMS AT AN ANGLE OF ATTACK $\alpha = 10^\circ$, CONTINUED

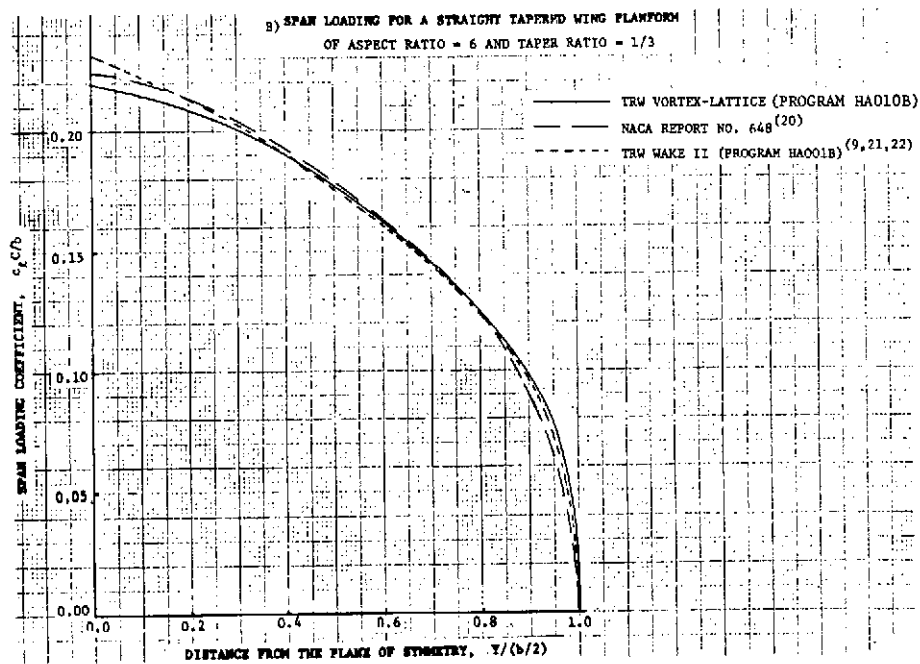
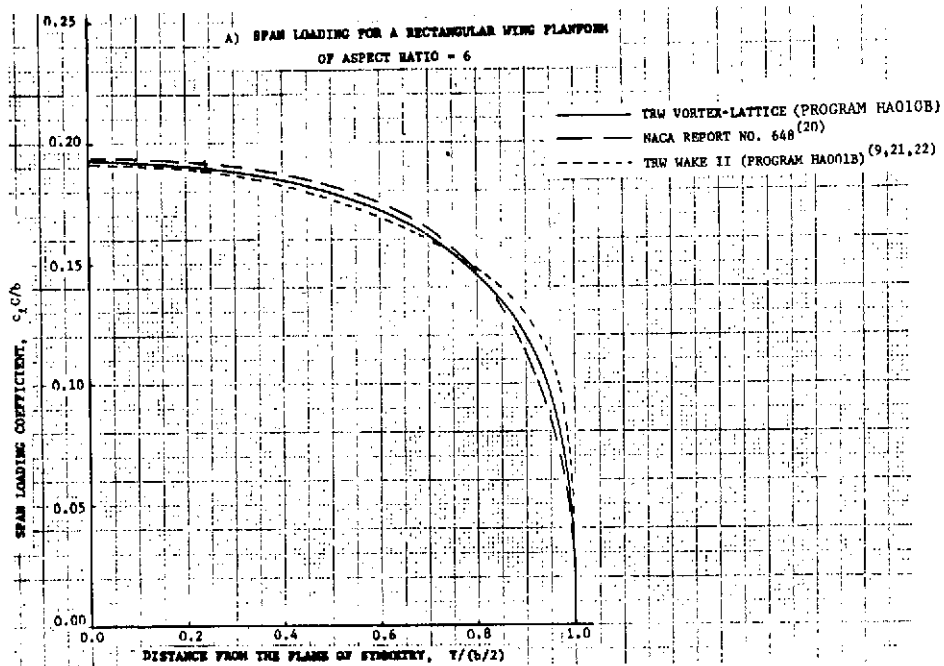


FIGURE 2.09 - SPAN LOADING PREDICTION COMPARISONS FOR TWO BASIC WING PLANFORMS
OF ASPECT RATIO = 2

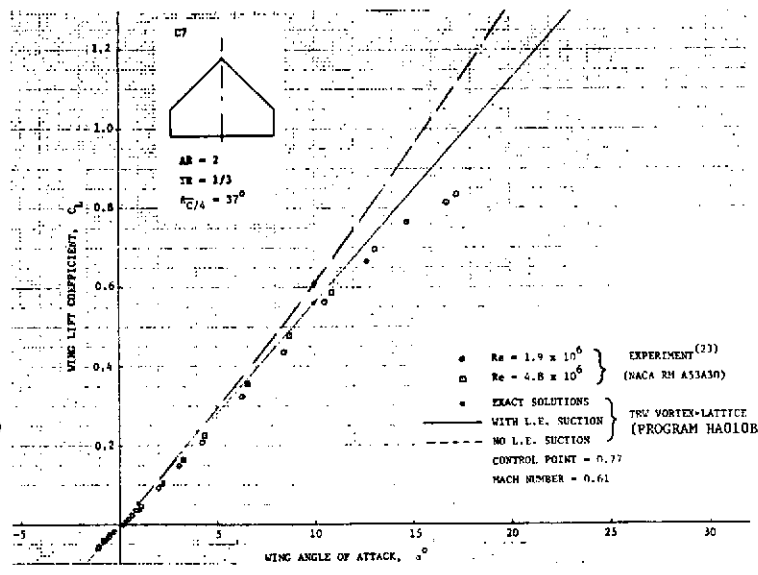
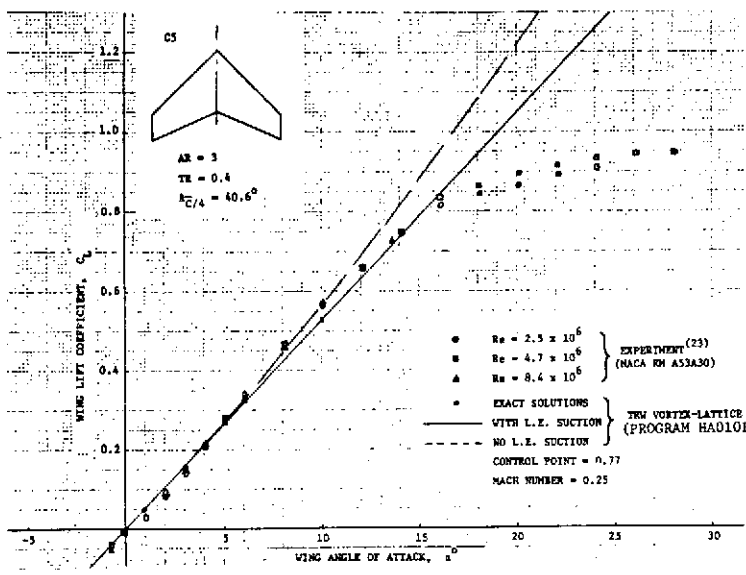
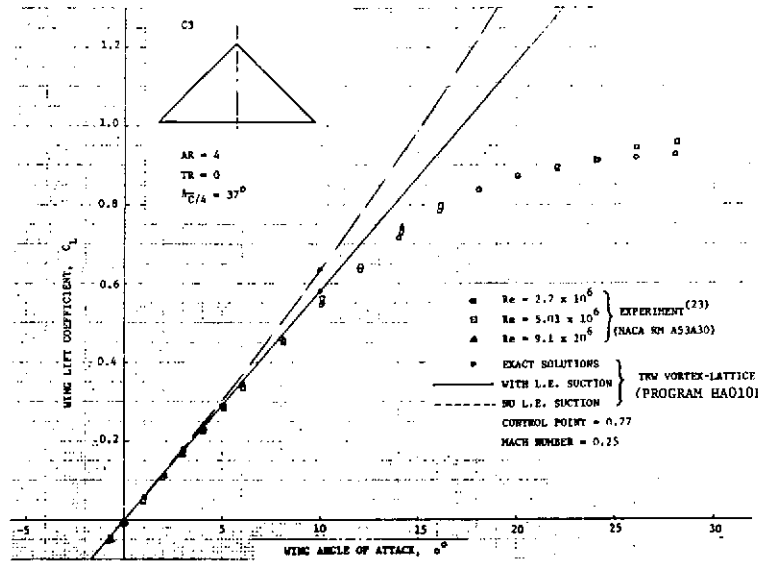
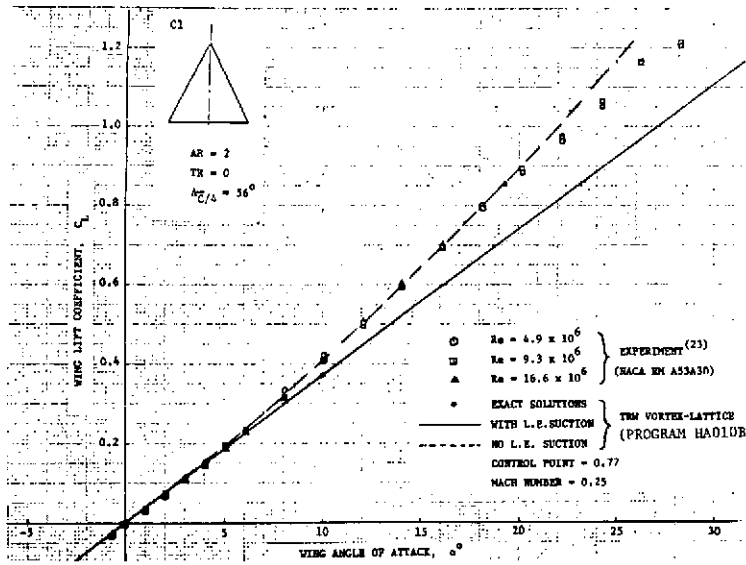


FIGURE 2.10 - WING LIFT PREDICTION COMPARISONS FOR SELECTED LOW ASPECT RATIO WING PLANFORMS

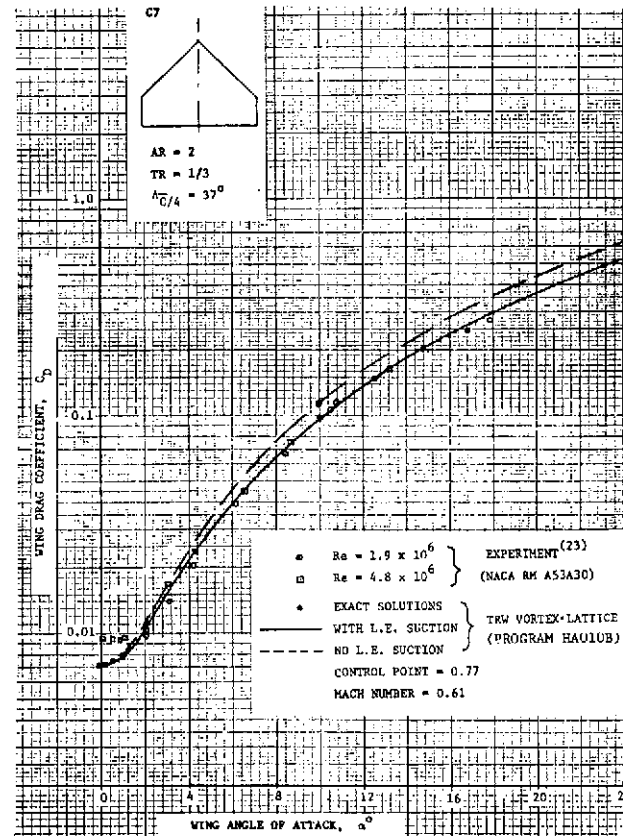
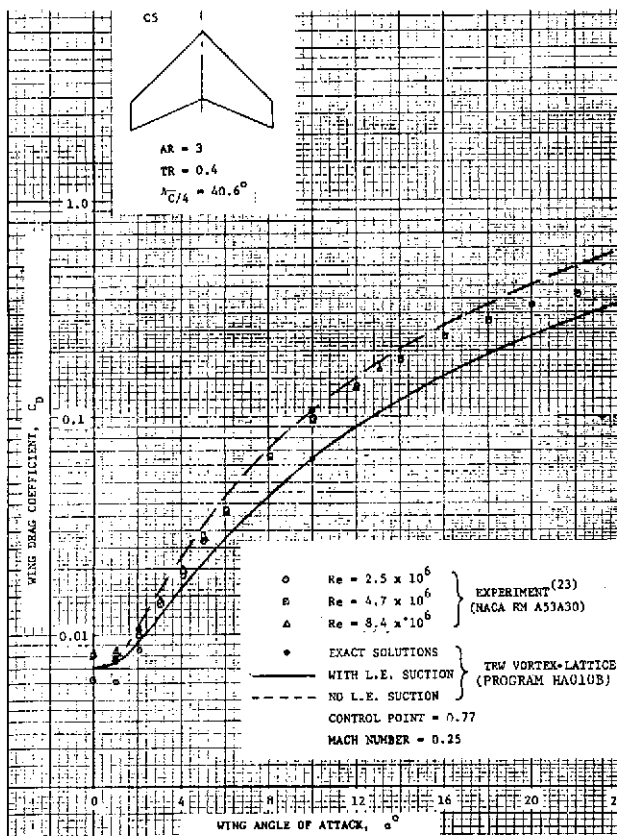
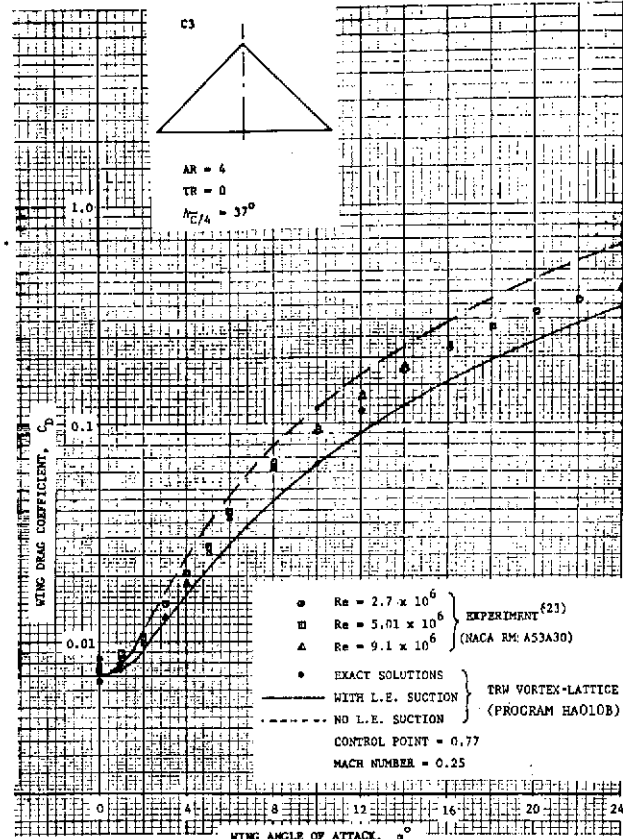
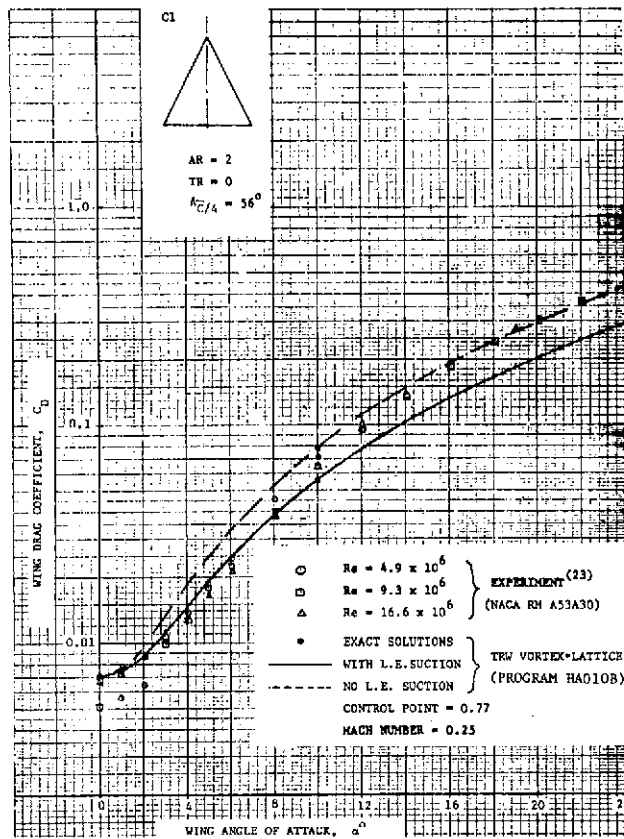


FIGURE 2.11 - INDUCED DRAG PREDICTION COMPARISONS FOR SELECTED LOW ASPECT RATIO WING PLANFORMS

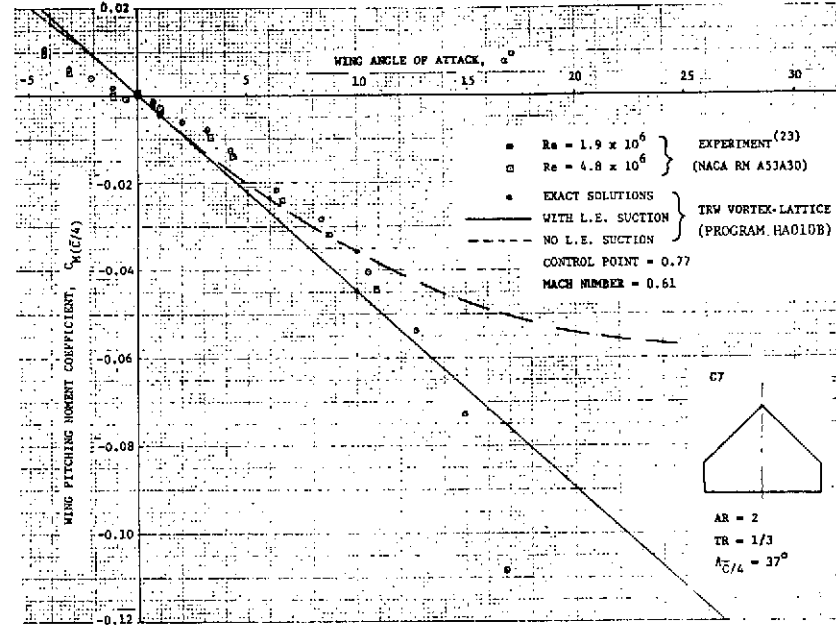
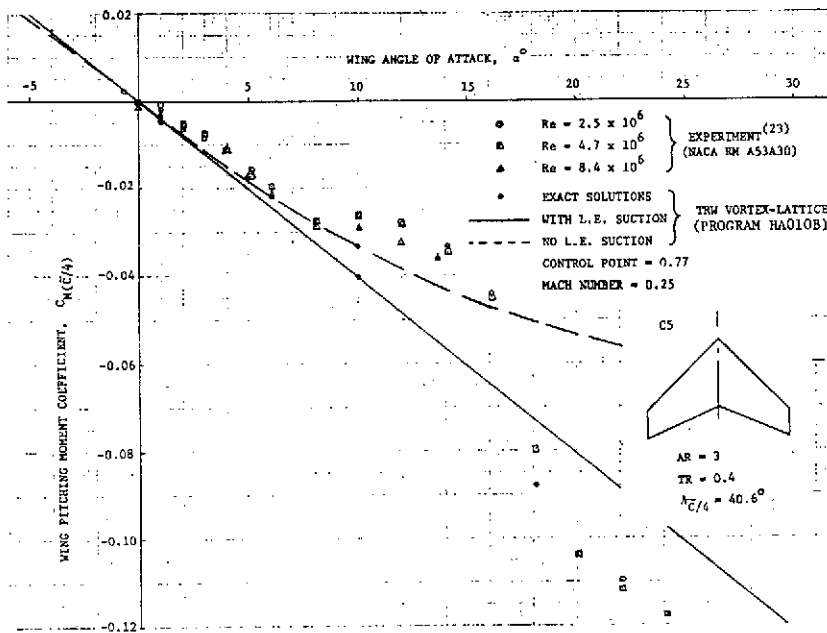
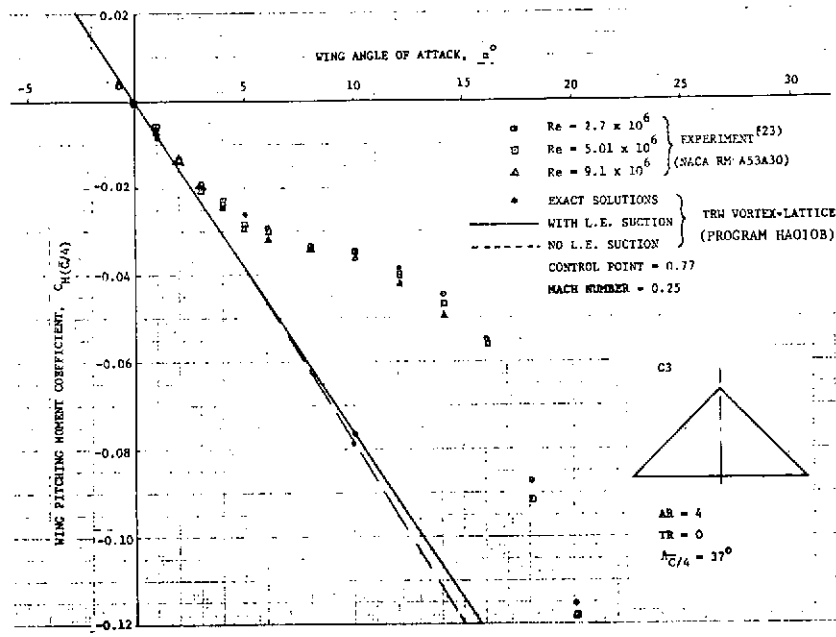
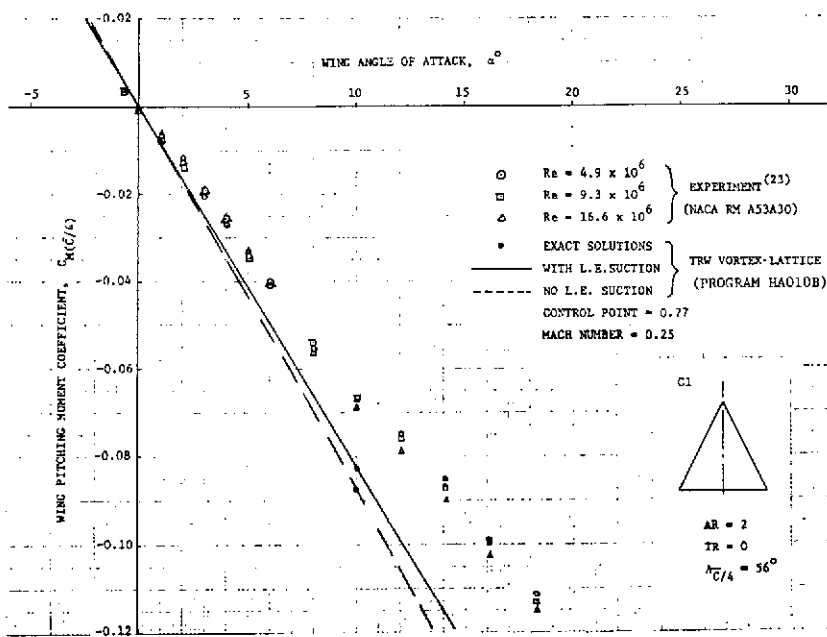


FIGURE 2.12 - PITCHING MOMENT ABOUT $\bar{C}/4$ PREDICTION COMPARISONS FOR SELECTED LOW ASPECT RATIO WING PLATFORMS

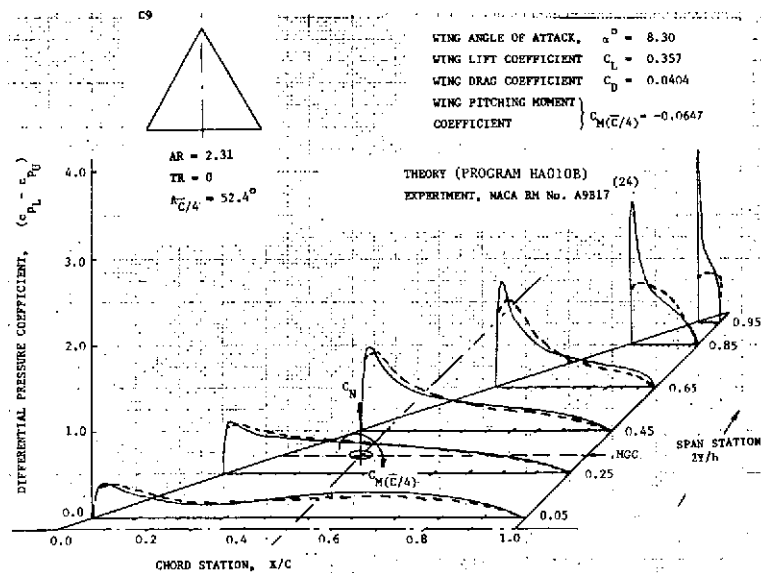
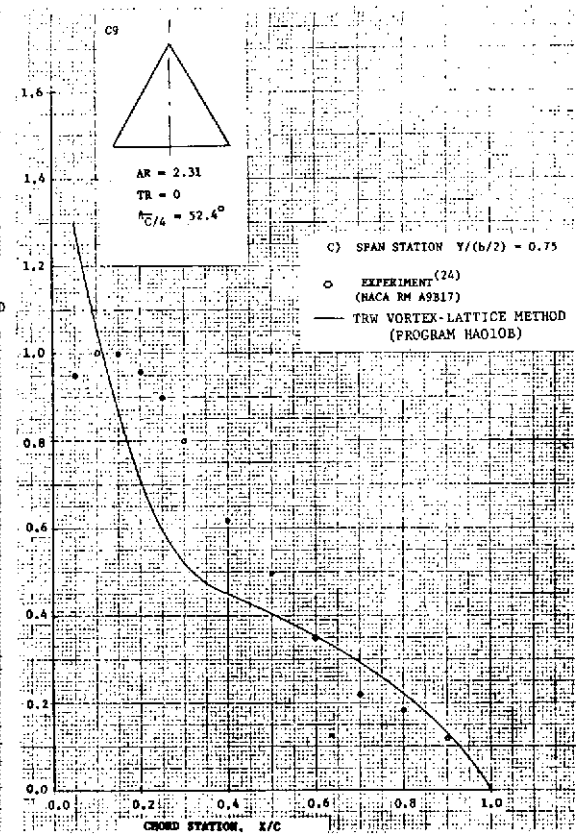
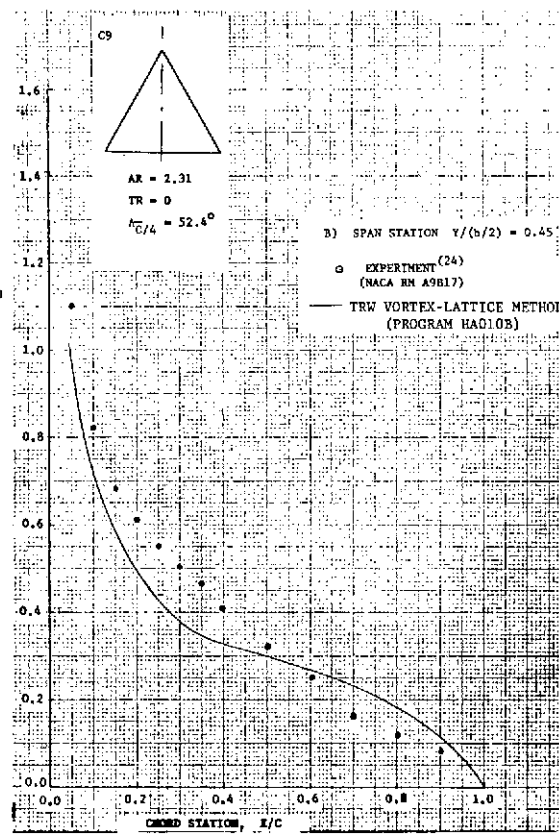
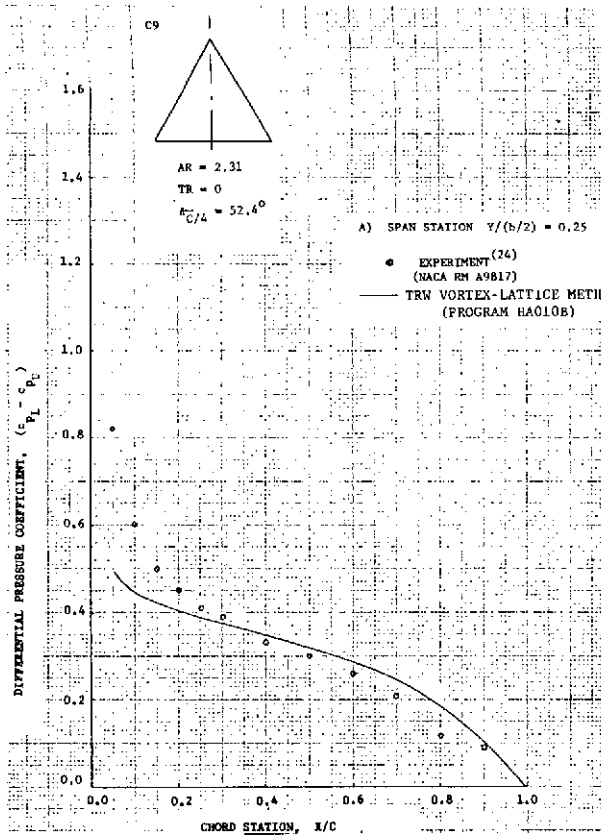


FIGURE 2.13 - LIFT DISTRIBUTION COMPARISONS FOR A DELTA WING OF ASPECT RATIO = 2 OPERATING AT AN ANGLE OF ATTACK $\alpha = 8.30^\circ$

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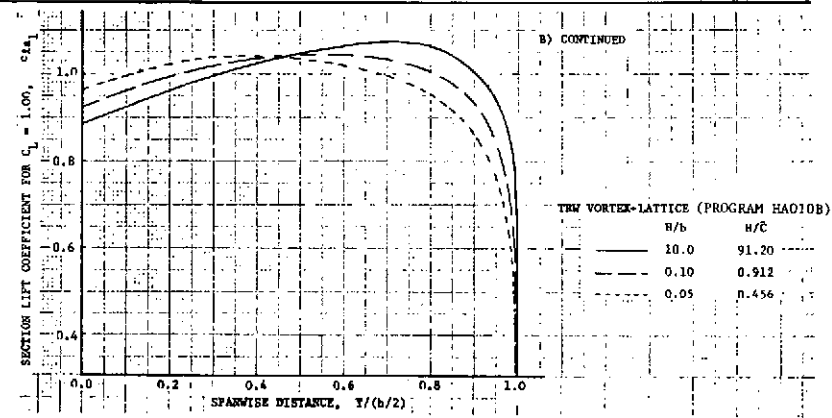
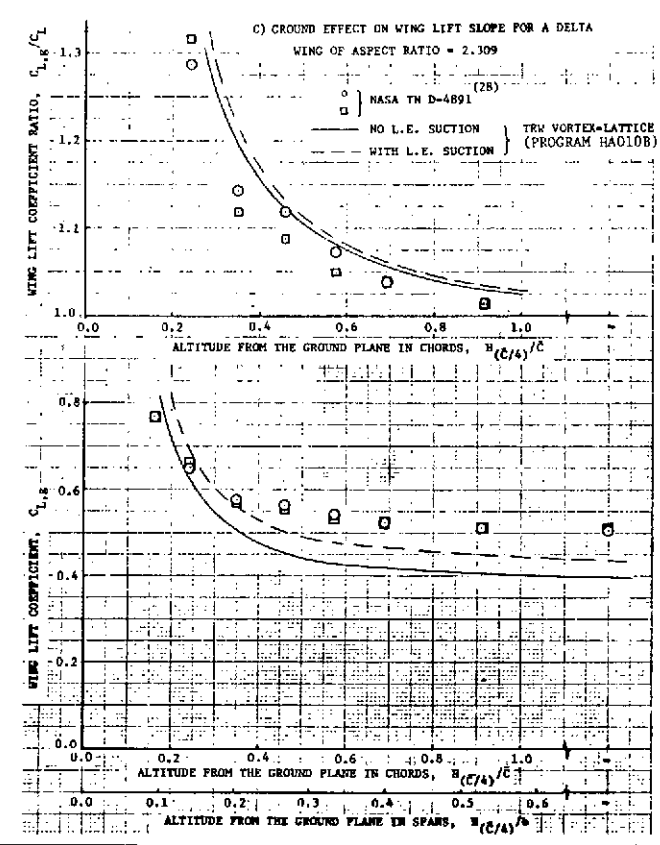
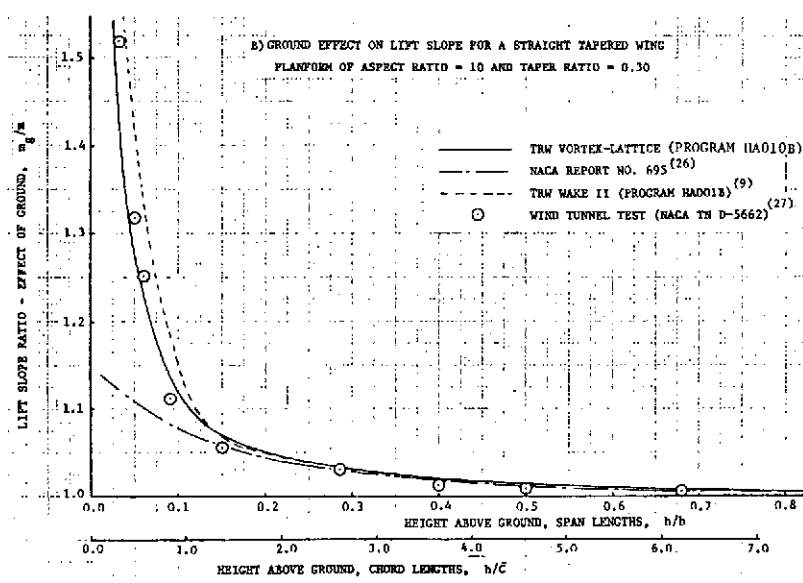
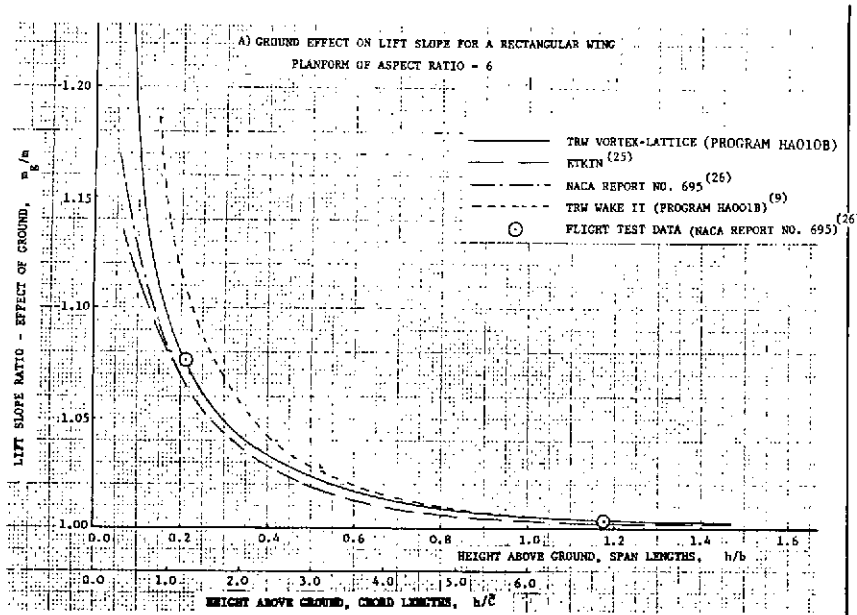
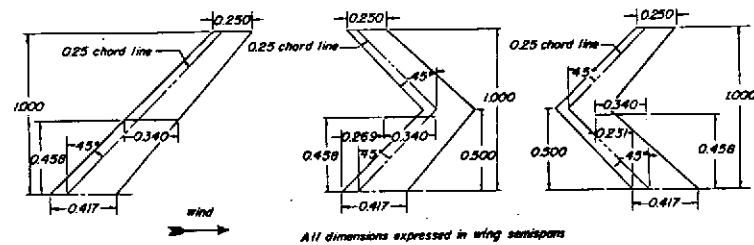
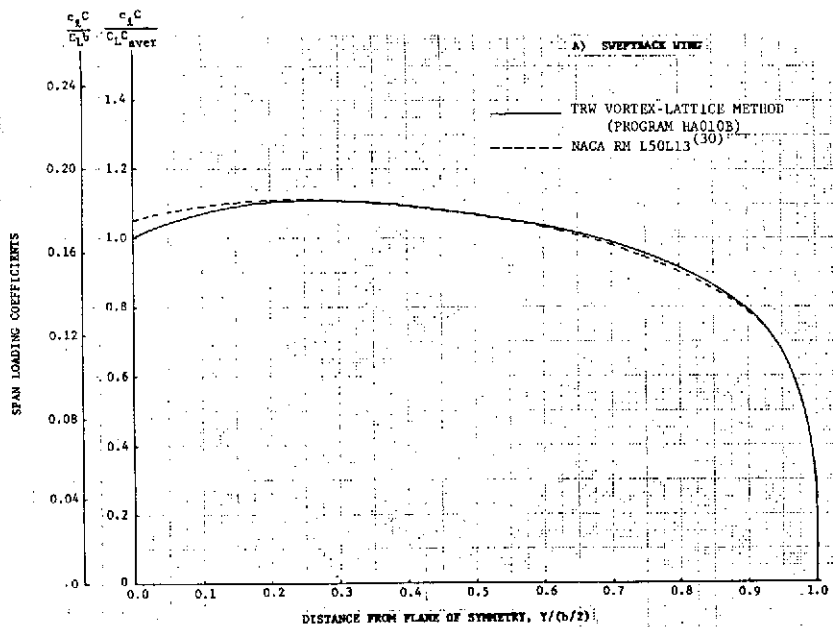


FIGURE 2.14 - WING LIFT PREDICTION COMPARISONS IN THE PRESENCE OF A VERY NEAR GROUND PLANE



Tabulated Wing Data

Sweptback wing

Sweep 45°
Aspect ratio 6
Taper ratio 0.6

W-wing

Sweep of inboard panel 45°
Sweep of outboard panel 45°
Aspect ratio 6
Taper ratio 0.6

M-wing

Sweep of inboard panel 45°
Sweep of outboard panel 45°
Aspect ratio 6
Taper ratio 0.6

ANALYTICAL METHOD	SWEEPBACK WING			W - WING			M - WING		
	LIFT SLOPE C_L /RADIAN	γ C.P. %	A. C. X	LIFT SLOPE C_L /RADIAN	γ C.P. %	A. C. X	LIFT SLOPE C_L /RADIAN	γ C.P. %	A. C. X
TRW VORTEX LATTICE* (PROGRAM HA010B)	3.1503	47.080	30.616	3.6636	45.034	31.917	3.4312	42.808	28.025
NACA RM L50L13(30)	3.48**	46.7	27.5	3.55	43.9	31.4	3.53	43.7	26.4

*CONTROL POINT = 3/4 CHORD OF ELEMENTAL PANELS AND VORTEX MATRIX = 20 x 3 WERE USED.
**PROBABLY PRINTED IN ERROR, SHOULD BE 3.23 ACCORDING TO NACA REPORT No. 921(29)

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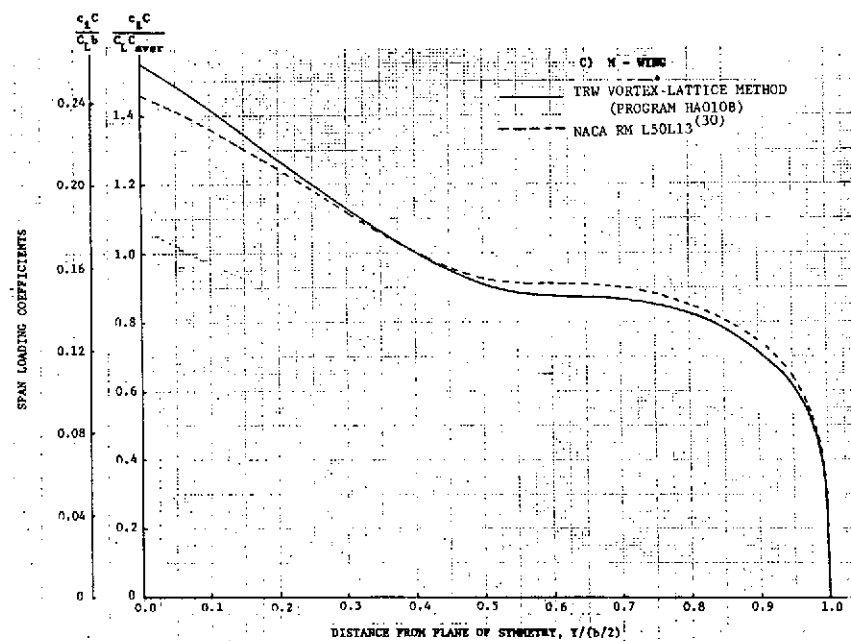
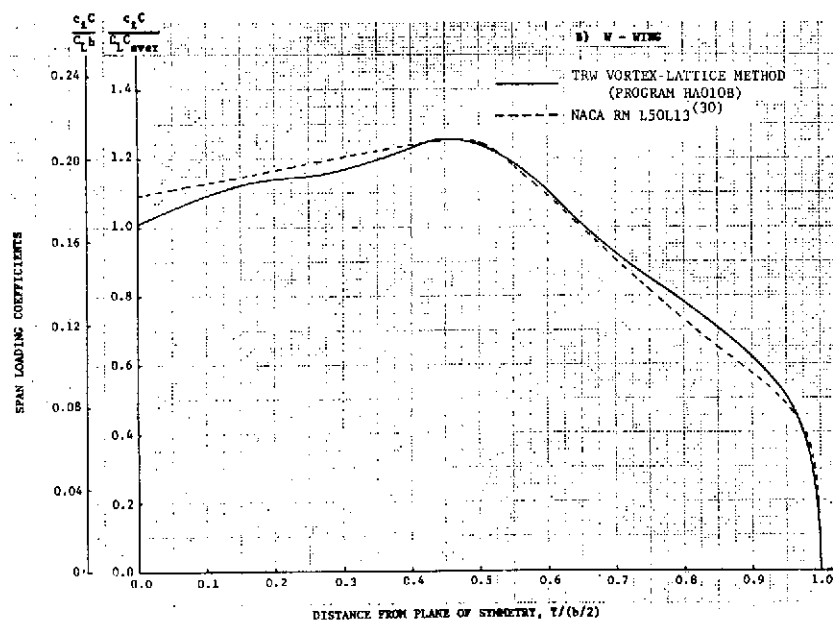


FIGURE 2.15 - LIFT DISTRIBUTION PREDICTION COMPARISONS FOR UNUSUAL WING PLANFORM CONFIGURATIONS

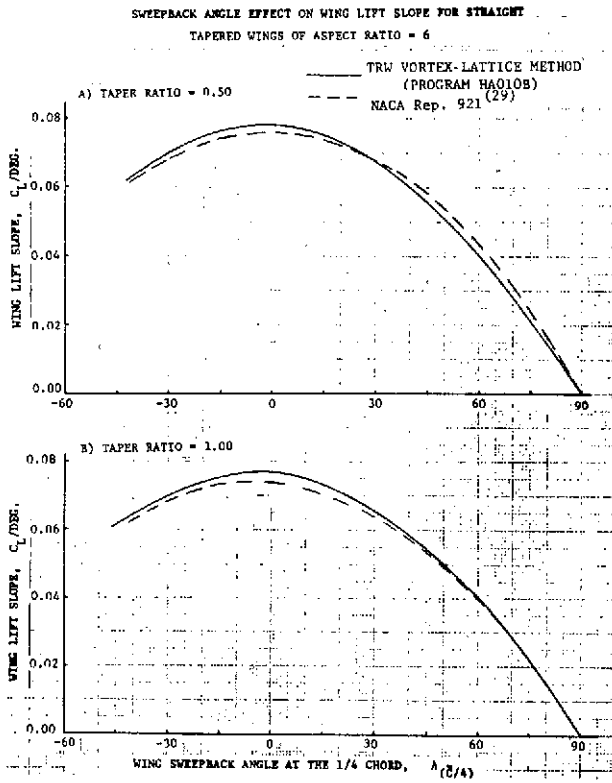


FIGURE 2.16 - SWEEPBACK ANGLE EFFECT ON THE MAGNITUDE OF THE WING-LIFT-SLOPE FOR TAPERED WING PLANFORMS OF ASPECT RATIO = 6

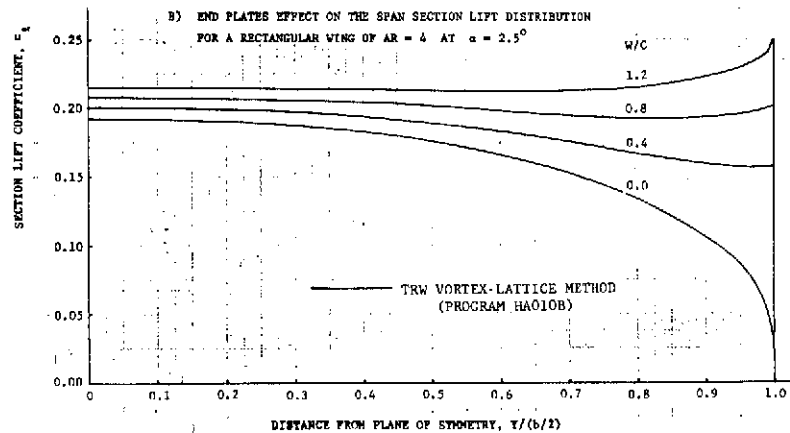
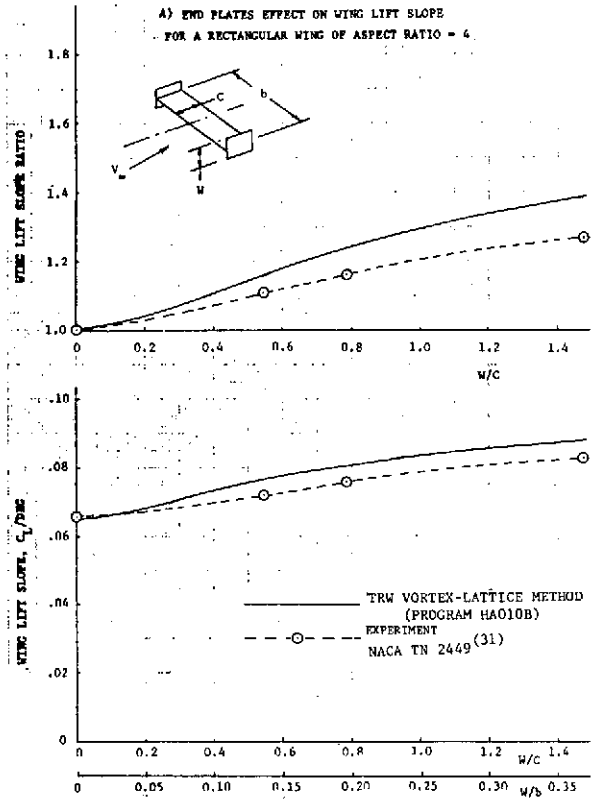


FIGURE 2.17 - WING LIFT PREDICTION COMPARISONS FOR A RECTANGULAR WING OF ASPECT RATIO = 6 WITH END PLATES

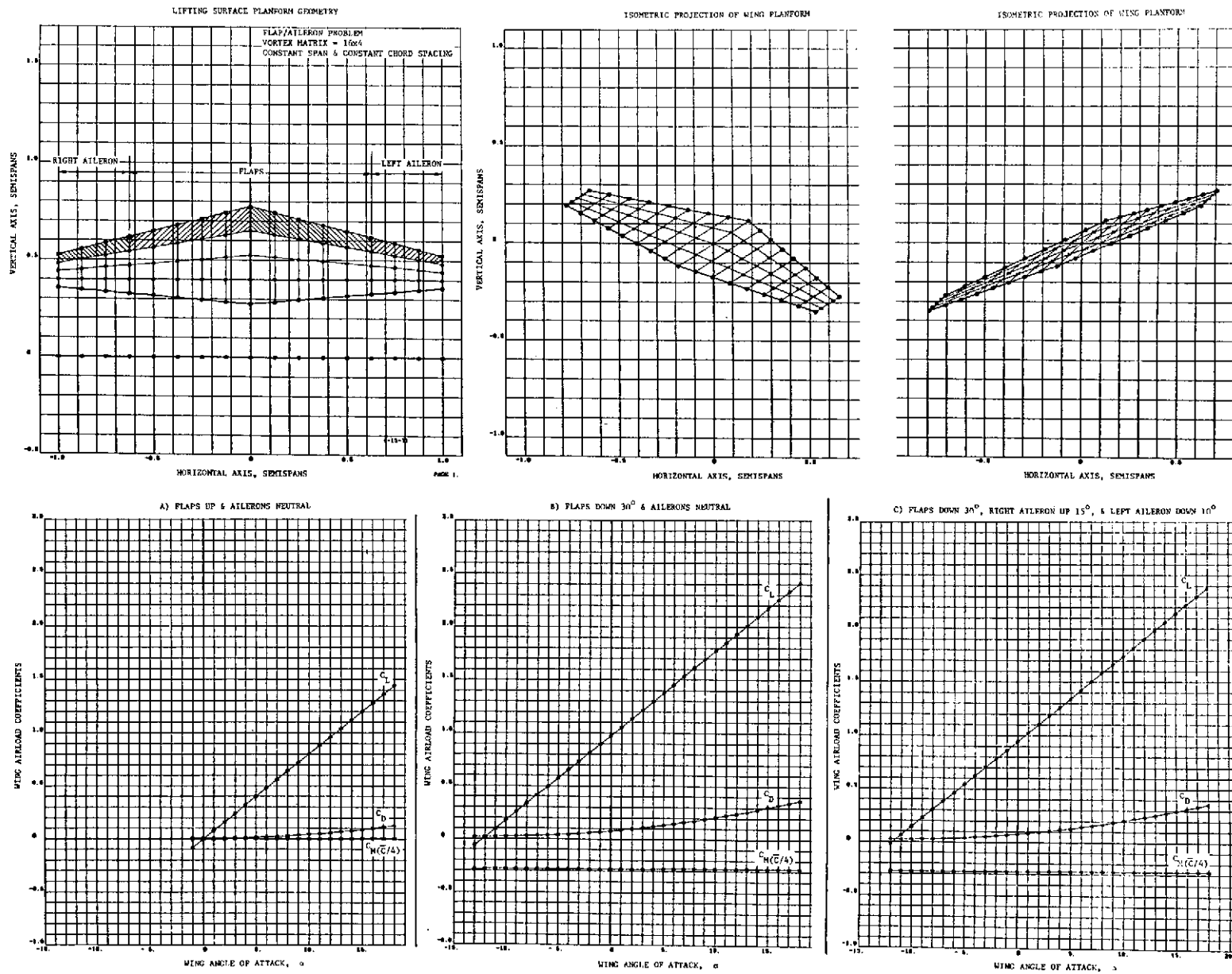


FIGURE 2.18 - AIRLOAD PREDICTIONS (PROGRAM HA010B) FOR A SELECTED STRAIGHT-TAPERED WING PLANFORM
WITH GEOMETRIC TWIST DUE TO CONTROL SURFACE DEFLECTIONS

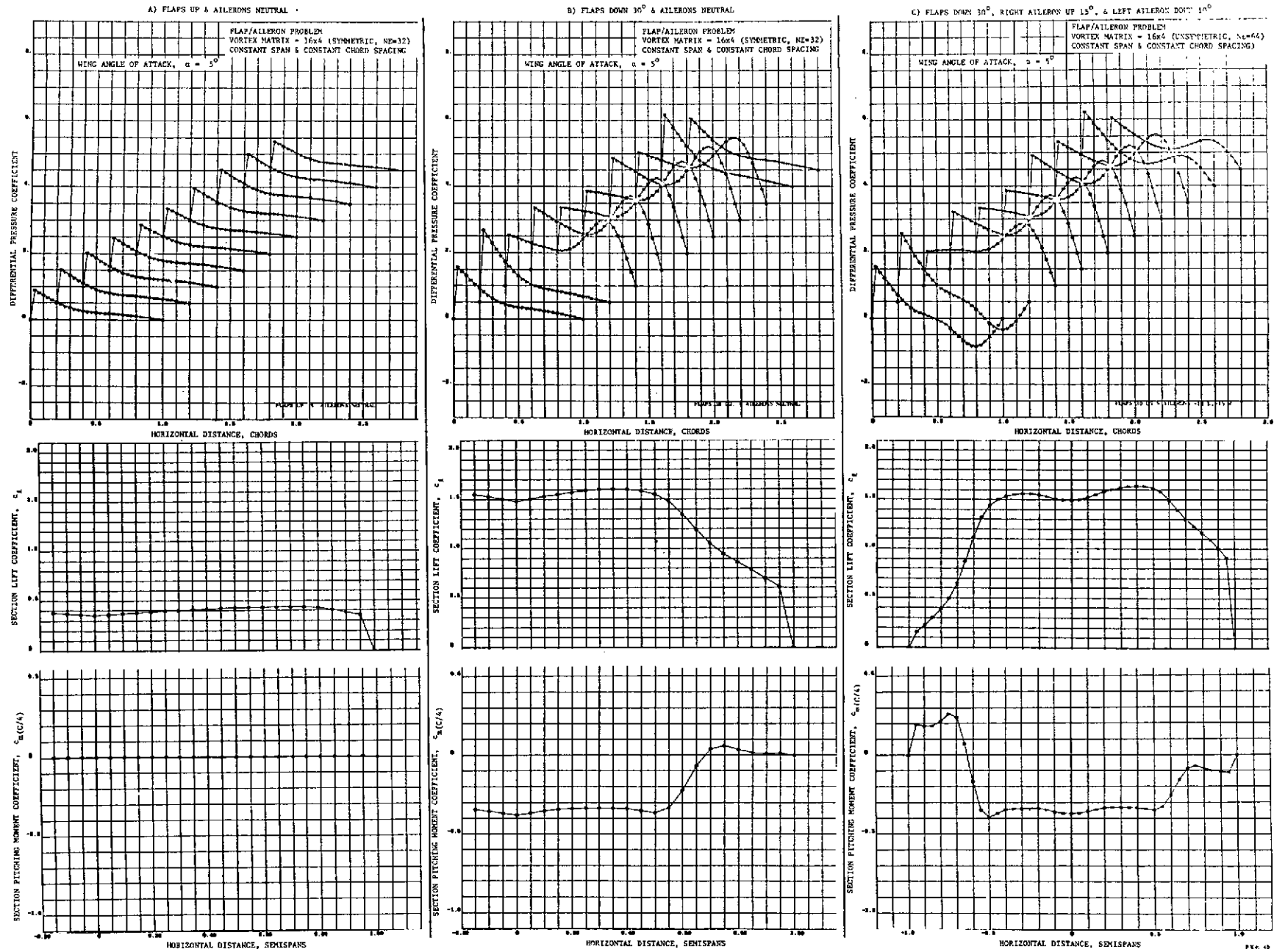


FIGURE 2.18 - AIRLOAD PREDICTIONS (PROGRAM HAUTOB) FOR A SELECTED STRAIGHT-TAPERED WING PLANFORM WITH GEOMETRIC TWIST DUE TO CONTROL SURFACE DEFLECTIONS, CONTINUED.

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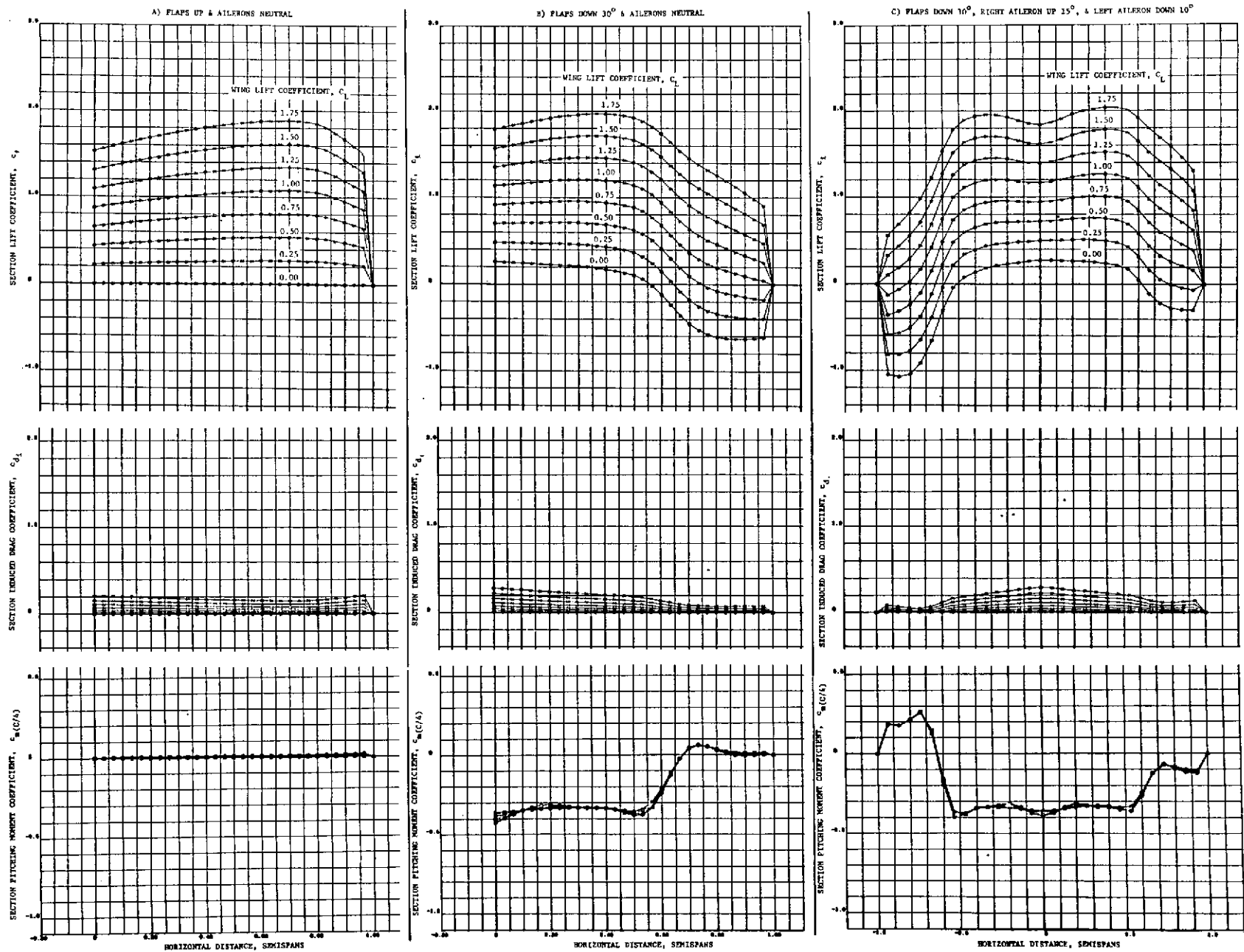


FIGURE 2.18 - AIRLOAD PREDICTIONS (PROGRAM HA010B) FOR A SELECTED STRAIGHT-TAPERED WING PLANFORM WITH GEOMETRIC TWIST DUE TO CONTROL SURFACE DEFLECTIONS, CONTINUED.

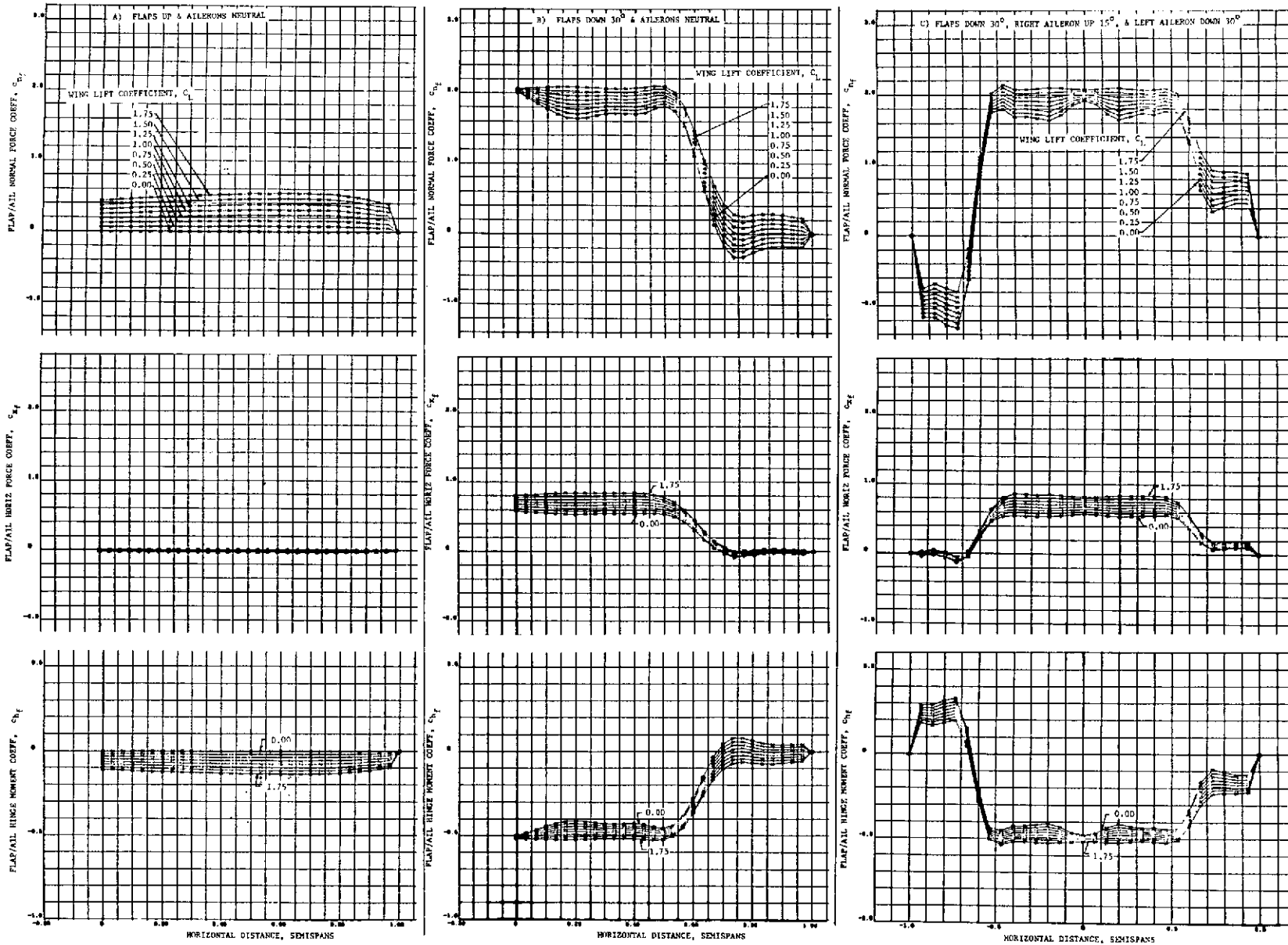
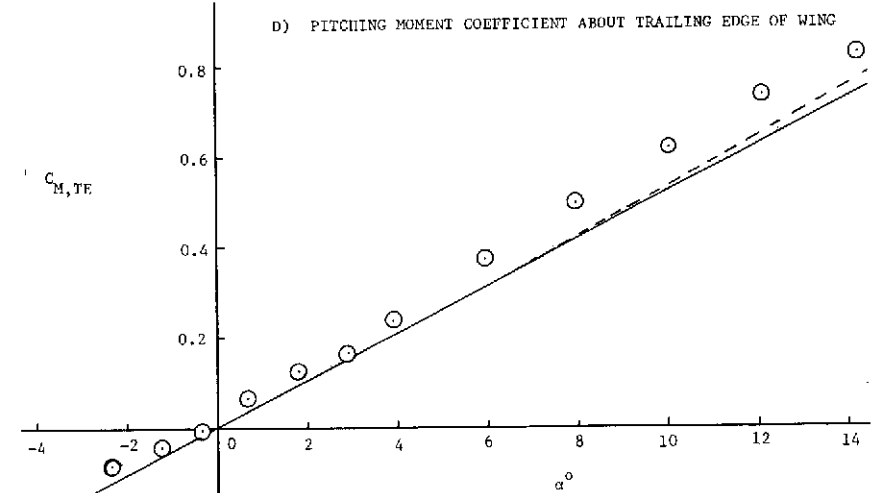
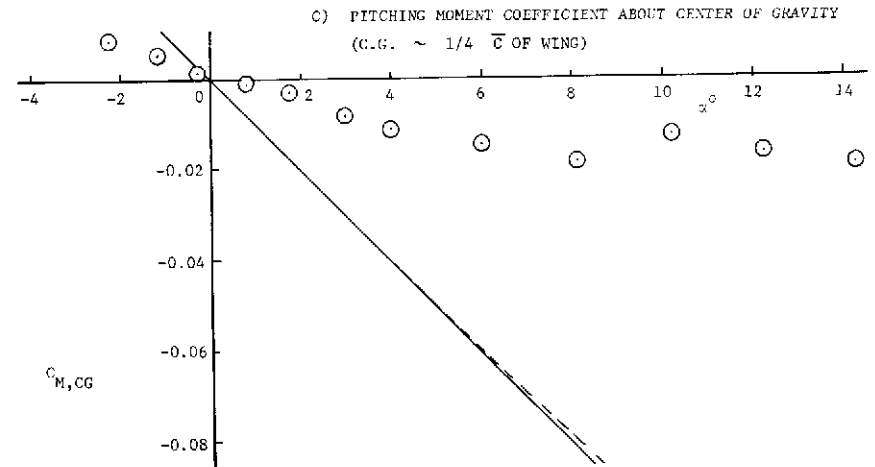
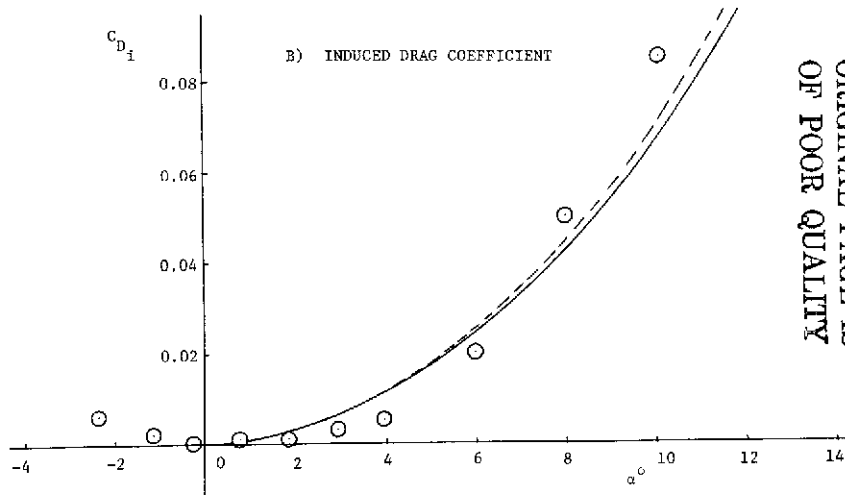
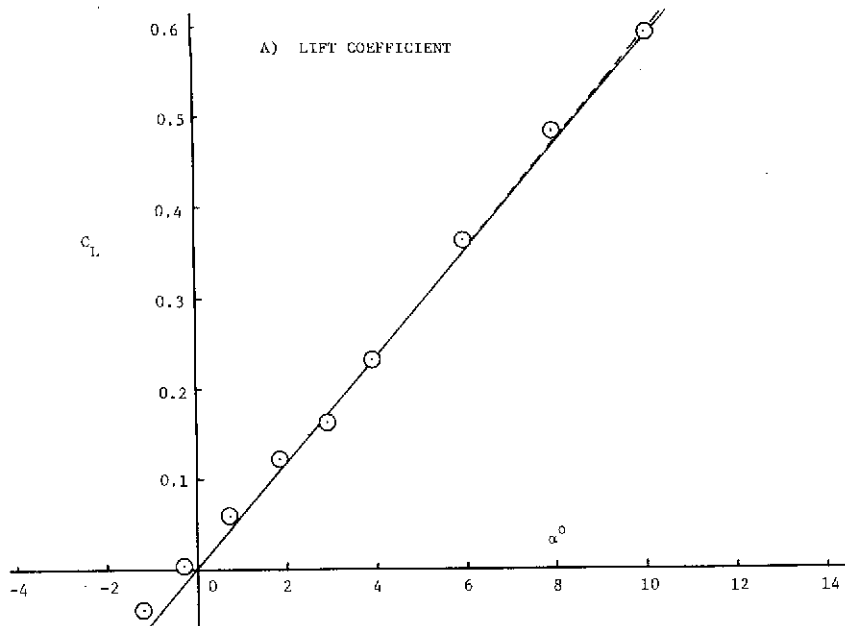


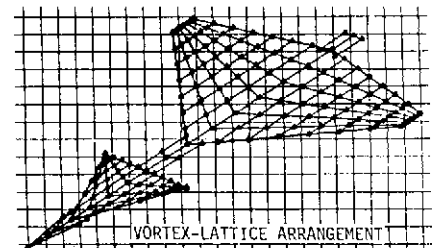
FIGURE 2.18 - AIRLOAD PREDICTIONS (PROGRAM HA010B) FOR A SELECTED STRAIGHT-TAPERED WING PLANFORM WITH GEOMETRIC TWIST DUE TO CONTROL SURFACE DEFLECTIONS, CONTINUED.



○ EXPERIMENT, NASA TM X-120⁽³²⁾
 — WITH L.E. SUCTION } TRW VORTEX-LATTICE METHOD (PROGRAM HAO10B)
 - - - NO L.E. SUCTION }

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FIGURE 2.19 - MULTIPLE-SURFACE CONFIGURATION ANALYTICAL PREDICTIONS (PROGRAM HAO10B) COMPARED AGAINST WIND-TUNNEL TEST DATA



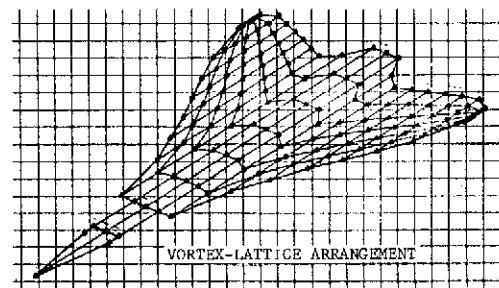
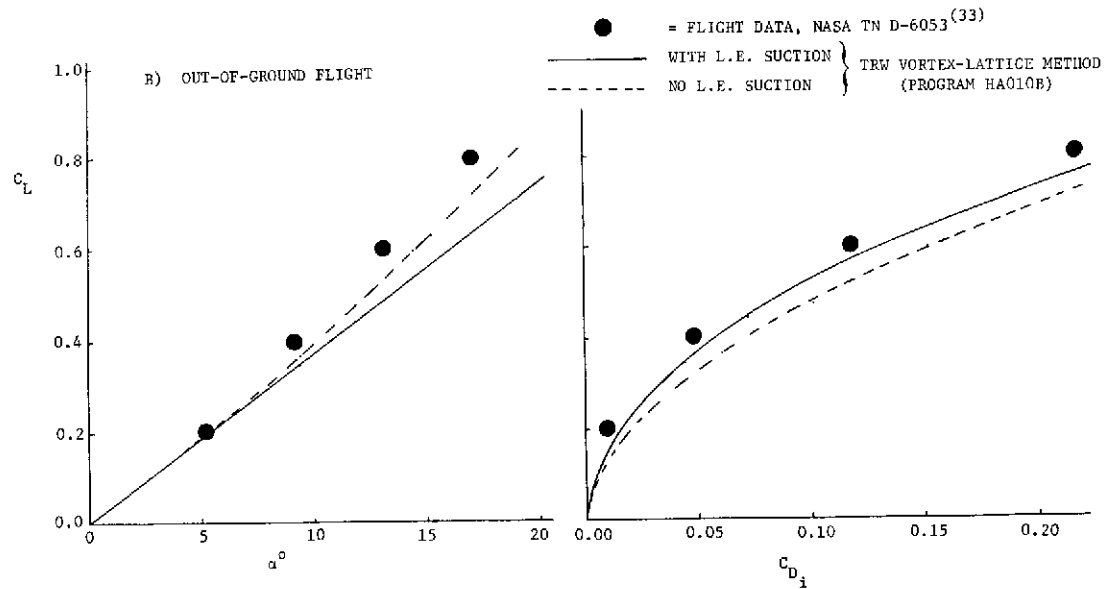
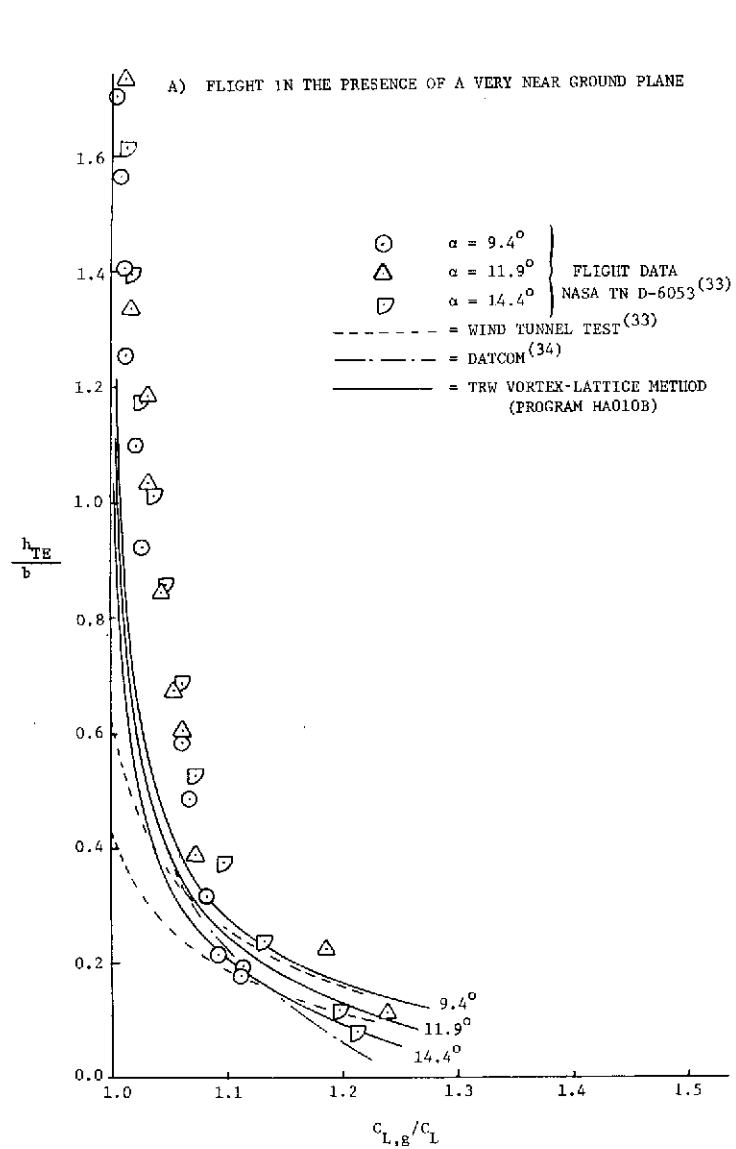


FIGURE 2.20 - MULTIPLE-SURFACE ANALYTICAL PREDICTIONS (PROGRAM HA010B) FOR THE DOUGLAS F5D-1 MODIFIED AIRPLANE WITH AN OGEE WING AND COMPARISONS AGAINST FLIGHT TEST DATA

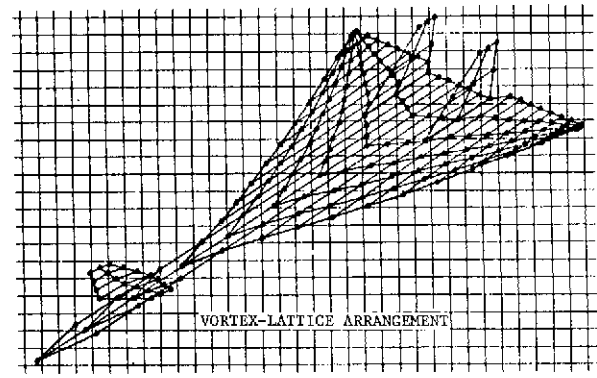
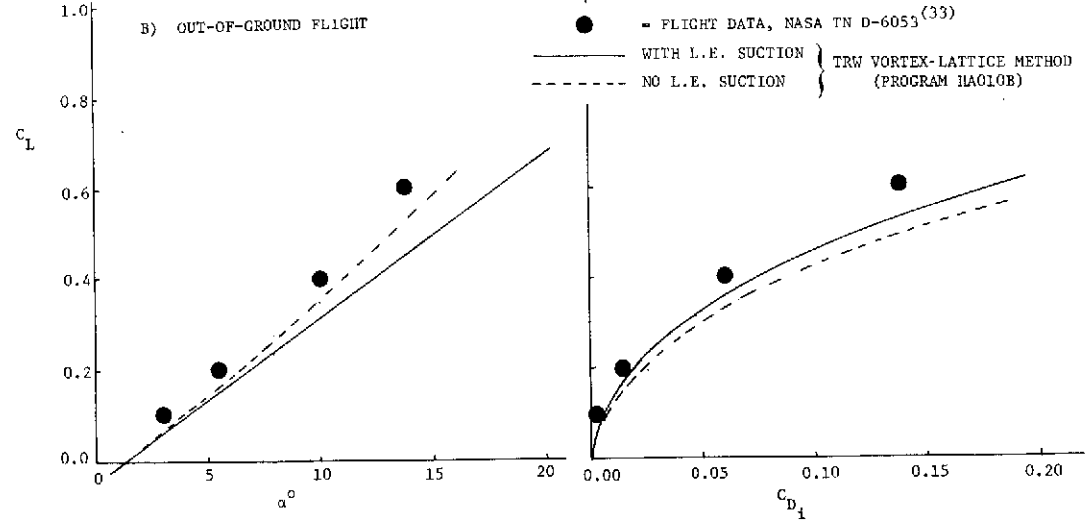
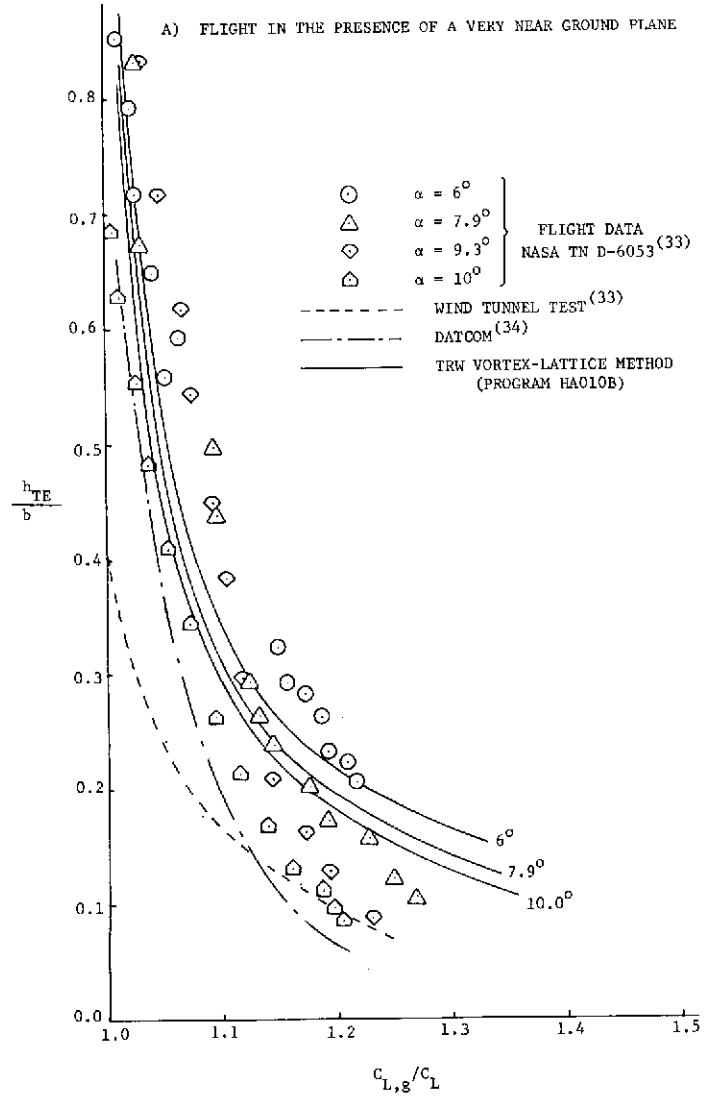


FIGURE 2.21 - MULTIPLE-SURFACE ANALYTICAL PREDICTIONS (PROGRAM HA010B) FOR THE NORTH AMERICAN XB-70 AIRPLANE AND COMPARISONS AGAINST FLIGHT TEST DATA

3.0 INPUT

3.1 General Directions for Program Input

Five separate modes of execution are permitted for the TRW Vortex-Lattice Analysis Program #HA010B (N.SURFACE). These include:

- (1) two main execution modes for solving lifting-surface problems by the vortex-lattice method, i.e., SQT ISURF and NSURF execution,
- (2) two test execution modes for determining the accuracy of the matrix inversion procedure, i.e., XQT ISURFT and NSURFT execution,
- and (3) one auxiliary execution mode used for obtaining Calcomp or 4060-microfilm output, i.e., XQT TRWPLT execution.

1) Main Execution Modes

Two main execution modes are permitted: XQT ISURF and SQT NSURF. These modes are used to analyze single- or multiple- lifting surface configurations respectively. Punched cards are used as the input media. NAMELIST statements and formatted statements are used exclusively. The input data is classified into groups, i.e., Group #1, Group #2, Group #3, and Group #4. A brief description of the information contained in each group and the arrangement order for input is given below:

<u>Group No.</u>	<u>Function</u>	<u>Contents</u>	<u>Type of Input</u>
#1 (START)	Execution Mode Card Mode = ISURF or NSURF	7/8 punch, space, XQT, space, mode	"A" format
#2	Job Identification (title) and Comments	1. Job Title (1 card) 2. Comments (3 cards)	"A" format "A" format
#3	Job execution controls and solution specifications	Namelist \$INPUT	NAMELIST
#4 (END)	Job/Jobs Termination	\$ENDJØBS	"A" format

2) Test Execution Modes

Two test execution modes are permitted: XQT ISURFT and SQT NSURFT. These two modes are used to determine the accuracy of the matrix inversion procedure for the ISURF and NSURF execution modes respectively. Only the execution mode card is required for input for the test execution modes, as follows:

3.1 General Directions for Program Input (Continued)

<u>Group No.</u>	<u>Function</u>	<u>Contents</u>	<u>Type of Input</u>
#1 (ONLY)	Execution Mode Card Mode = ISURFT or NSURFT	7/8 punch, space XQT, space, mode	"A" format

3) Auxiliary Execution Mode

One auxiliary execution mode is permitted: XQT TRWPLT. This execution mode is contained in the second file of the program PCF tape and is used to generate Calcomp or 4060-microfilm output. The required input consists of the TRWPLT input instructions and a data tape. The description of the preparation of the input instructions is presented in Reference 35. The format and contents of the data tape which is generated in the execution of the main execution modes of the program is described under "Tape Output" in Section 5.3.

In preparing the program input (the main execution modes) the following conventions must be observed:

1. The first input card per case should be placed immediately following the XQT MODE card for the first case or behind the last card of the previous case for multiple case input. Blank cards between cases or input data groups should not be included in the input data deck.
2. For each case the arrangement of the input data must be ordered by groups, i.e., Group #1, Group #2, Group #3 and Group #4.
3. The last card of the input data deck is the end of jobs card (Group #4). This card must have \$ENDJØBS on it only (Columns 2-9).
4. For namelist input, the first card must have the namelist on it only (i.e., \$INPUT in columns 2-7).
5. For namelist input, data cards must be punched between columns 2-80. Continuation cards may be freely used by starting on the next line where the previous line left off. Every card must terminate with a comma (,). Variables that are input via NAMELIST must be dimensioned, for example:

NSS(1) = 8,

X(1) = 10, 15, 15, 20, 20, 20, 30,....

3.1 General Directions for Program Input (Continued)

There is no fixed order in which the variables are to be entered. They may be grouped at the user's discretion. The following abbreviations may be used for repeating fields in a table:

X(1) = 10, 2*15, 3*20, 30, is equivalent to
X(1) = 10, 15, 15, 20, 20, 20, 30, or
X(1) = 10, X(4) = 3*20, X(2) = 2*15, ... etc.

6. For namelist input, the last card must have \$END on it only (Columns 2-5).
7. Differentiation between similar looking characters: To avoid confusion due to the similarity in appearance of certain characters, the following rules should be followed:
 - a. The alphabetic I is used as opposed to the numeric 1 (one).
 - b. The alphabetic Z is written Z as opposed to the numeric 2 (two).
 - c. The alphabetic O is written Ø as opposed to the numeric 0 (zero).

The detailed input instructions and definitions of all input quantities for the program are presented in this section in the following sequence: 1) program input setup guide (Pages 3-8, 3-9), 2) program input instructions (Pages 3-10 through 3-17), AND 3) an alphabetical list of all input quantities (Pages 3-18 through 3-20). In addition, the following information that is related to the preparation of the program input is found in the following sections or figures of this report:

- 1) Vehicle Geometry Sign Convention:
see Figure 3.01, Page 3-4.
- 2) Vortex-Lattice Arrangement Restrictions:
see Section 3.2.
- 3) Input Card-Deck-Setup Examples:
see example problems, Section 6.1.
- 4) Control Deck Setup:
see Figure 7.02.
- 5) Execution Time:
see Section 7.2

3.1 General Directions for Program Input (Continued)

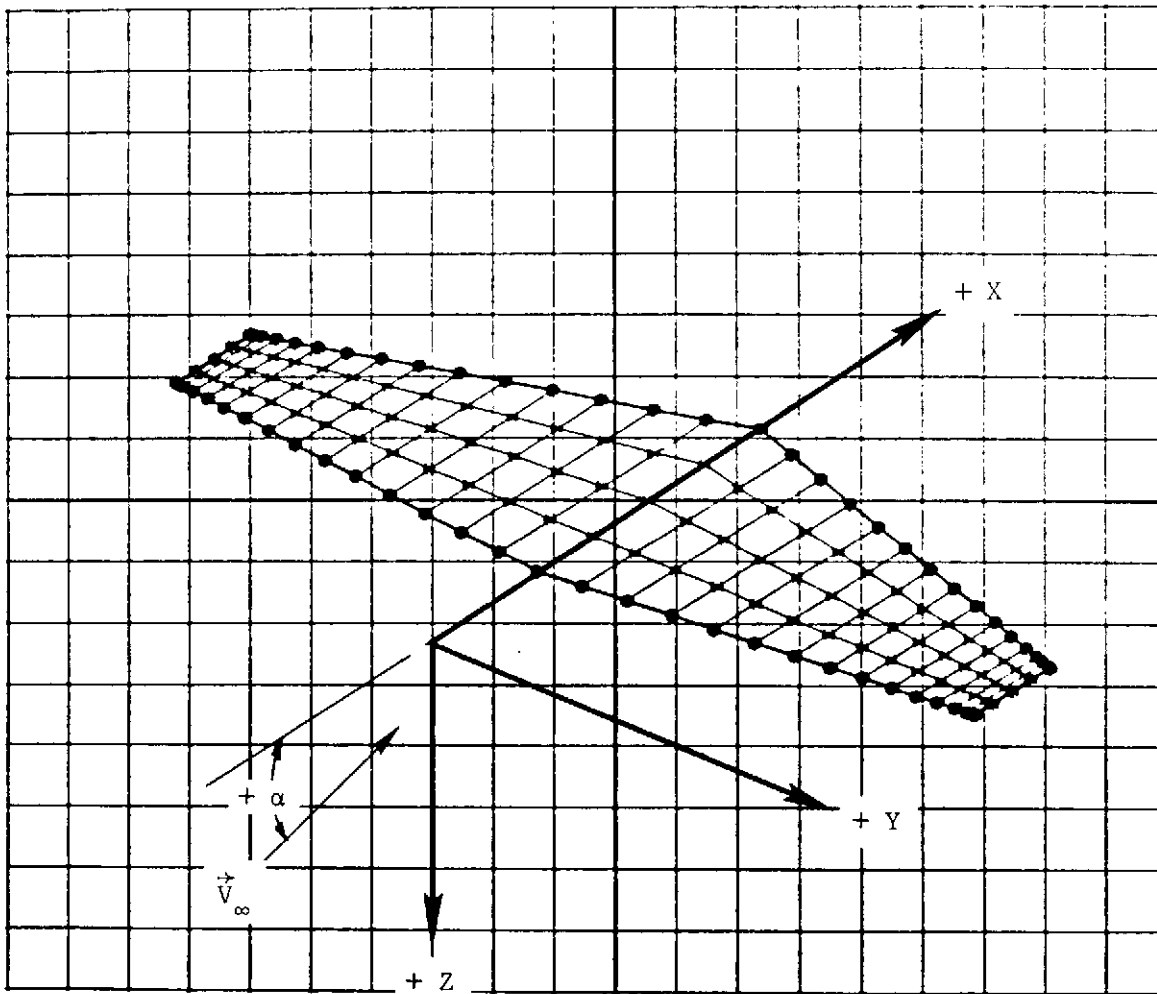


FIGURE 3.01 - LIFTING-SURFACES INPUT GEOMETRY SIGN CONVENTION
(RIGHT HANDED COORDINATE SYSTEM)

3.2 Vortex-Lattice Arrangement Restrictions

The configuration of the vortex-lattice or arrangement of elemental panels that is specified in the input determines the validity of the solutions. In general, bad solutions are obtained when the number of elemental panels that determines the vortex-lattice arrangement is insufficient to properly represent the problem geometry. Other sources that lead to bad solutions are: the presence of sharp discontinuities in the lifting-surfaces geometry, unequal panel dimensions for adjacent elemental panels, and improper spacing of trailing vortices shed from forward surfaces that impinge on rear surfaces. The indicators that warn of the presence of bad solutions are:

1. The drag calculated for the sum of the total number of surfaces considered in a solution is negative. Although, negative drag is not always a good indicator for bad solutions because its magnitude is generally much smaller than the lift and therefore subject to more severe numerical roundoff errors, positive drag is unquestionably always an indicator of a good solution.
2. The calculated lift versus angle of attack curve is not smooth. The source of the errors that led to a bad solution can be determined by examining the magnitude of the calculated circulation for the vortex filaments or the spanwise lift distribution (see Figures 5.3 and 5.8).
3. The calculated values for lift and drag are out of range, i.e., the solution blew.

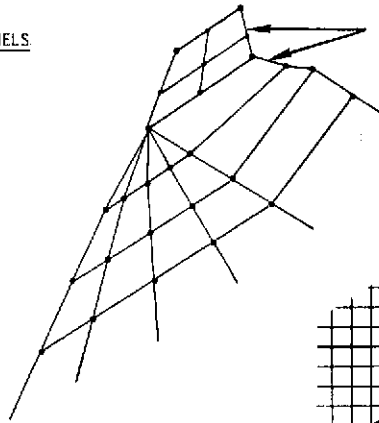
In the opposite side, a solution or a set of solutions may be considered to be good if by increasing the number of elemental panels or rearranging the configuration of the vortex-lattice by a small amount leads to a negligible variation of the magnitude of the calculated airload coefficients. It should be noted that: "there is no shortcut or formula presently available that, if followed, will always guarantee the generation of good solutions." The program user should be aware of this fact and should follow good judgement based on experience in aerodynamics in assessing the validity of the vortex-lattice solutions that he generates.

3.2 Vortex-Lattice Arrangement Restrictions (Continued)

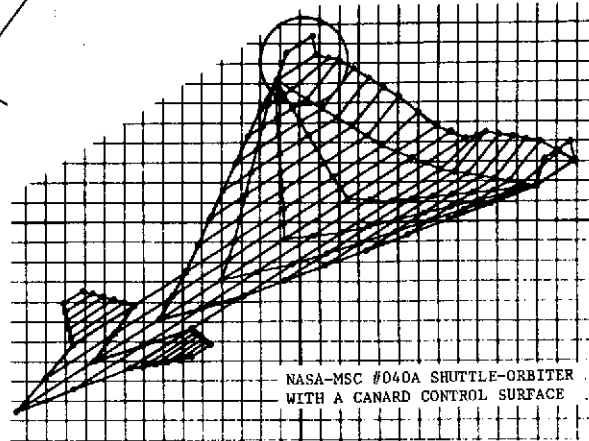
As a guide to engineers using the vortex-lattice analysis method for the first time, the user should adhere to the following general directions:

1. The larger the number of elemental panels used for representing a given lifting-surface configuration, the more accurate will be the solutions that will be obtained.
2. Adjacent panels should be of approximately equal size and should have approximately the same configuration, i.e., the variation in size and configuration between adjacent panels should be as small as possible (Figure 3.02[A]).
3. The width of panels in a column of one or more lifting surfaces should be exactly the same and must line up perfectly (Figure 3.02[B]). This requirement arises because of the approximate representation of the vorticity distribution on the lifting surfaces by discrete-size vortex filaments that are used in the vortex-lattice method. Note that the trailing vortices must lie equidistant to the co-location points in a row of elemental panels downstream. As a special feature of the program (TRW Vortex-Lattice Analysis Program #HA010B), the trailing vortices can be located exactly in line with a column of co-location points (Figure 3.02[C]). In this instance, the velocity induced by these vortices at the co-location points (which may be indefinite) is simply ignored.

A) SIZE OF ADJACENT PANELS

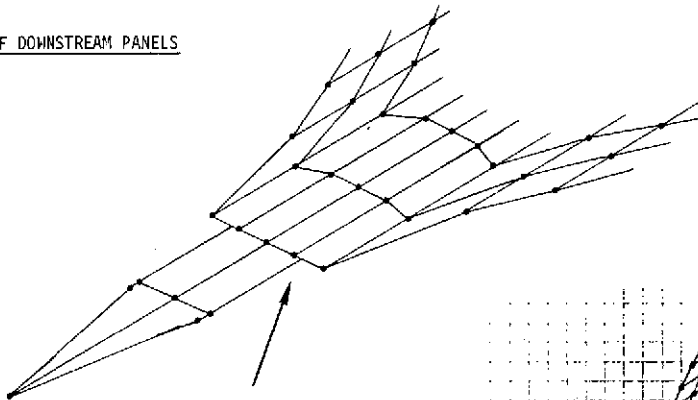


ERROR: THE SIZE OF THE FIN PANELS DOES NOT MATCH THE SIZE OF THE ADJACENT WING PANELS.

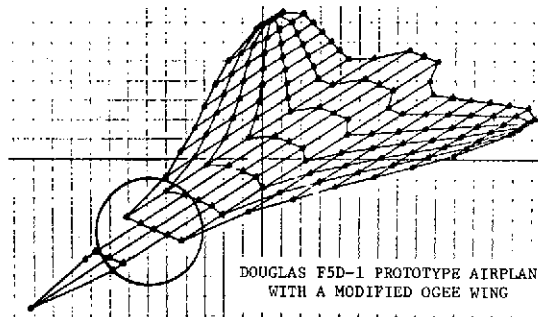


NASA-MSC #D40A SHUTTLE-ORBITER WITH A CANARD CONTROL SURFACE

B) WIDTH OF DOWNSTREAM PANELS

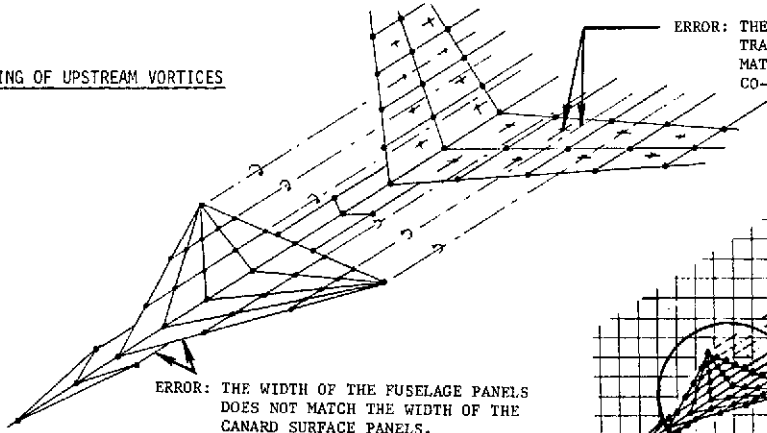


ERROR: THE SIZE OF THE FUSELAGE PANELS DOES NOT MATCH THE WIDTH OF THE WING PANELS



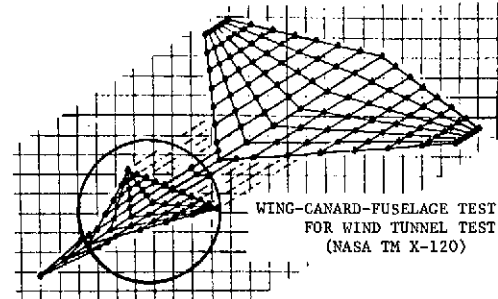
DOUGLAS F5D-1 PROTOTYPE AIRPLANE WITH A MODIFIED OCEE WING

C) SPACING OF UPSTREAM VORTICES



ERROR: THE WIDTH OF THE FUSELAGE PANELS DOES NOT MATCH THE WIDTH OF THE CANARD SURFACE PANELS.

ERROR: THE SPACING OF THE CANARD SURFACE TRAILING-EDGE VORTICES DOES NOT MATCH THE SPACING OF THE WING CO-LOCATION POINTS.



WING-CANARD-FUSELAGE TEST MODEL FOR WIND TUNNEL TEST (NASA TM X-120)

FIGURE 3.02 - ILLUSTRATION OF POOR VORTEX-LATTICE ARRANGEMENT
OVERSIZED INSERTS ARE SHOWN IN ERROR

 3.3 PROGRAM INPUT SETUP GUIDE

```

▽ Z RUN 54589,TRW,0001,3303A,0001,P,3,1
▽ N MSG FILE REQ. TAPE 1 FH432 3 FSTRN 1
▽ ASG X=A10202
▽ ASG F
▽ PLT
▽ XQT CUR
  TRW X
  ERS
  IN X
  PEF X
  TRI X
  TQC
▽ XQT MØDE (MØDE= NSURF OR ISURF)
  JØB TITLE FØR JØB 1 (1 CARD)
  COMMENTS,REQUIRED FØR JØB 1 (3 CARDS)
  $INPUT
  NFLG,IFLG,
  KØUT,KT1,KT2,KT3,LINX,
  NWING,NFUS,NVAIL,
  NSS,X,Y,Z,E,C,XØCR,YSPAN,
  NCS,XØC,ZØC,
  WFLAP1,WFLAP2,WFLAP3,FLAPC,TABC,FLAPDJ,TABDJ,AILDJ,
  XCG,YCG,ZCG,REFS,REFC,REFB,GSCALE,
  NJØB,ALFA,MACHN,HEIGHT,FLAPDJ,AILDJ,NSØLV,
  NJØBL,WCL,
  CØLØCP,WSMØTH,LFLAP,LDRAG,CLEANF,PMECF,CUTØF1,CUTØF2
  $END
  JØB TITLE FØR JØB 2 (1 CARD)
  $INPUT
  NAMELIST DATA
  $END
  $ENDJØBS
▽ XQT TRWPLT
  KUNIT = 8
  ICCØMP= 0
  NTRAN = 0
  IPRINT= 0
  NTYPE = 0
  NØFSCL= 1
  ISCALY = 1,1,1,1,1,1,1,1,1,1
  NXL = 24
  NXR = 24
  NYL = 24
  NYH = 24
  NPØSN1 = 600, 950
  NPØSN2 = 600, 925
  NPØSN3 = 600, 900
  NPØSN4 = 600, 50
  CHARSZ = 1,0,1,0,1,0,1,0
  
```

JOB CARD
MESSAGE CARD
PROGRAM PCF TAPE NO.
REQUIRED IF TRW PLOT
OPTION IS USED
READ-IN PROGRAM CARDS
(LOAD THE PROGRAM)

↓
 (IF PLOT OPTION USED)

↓

EXECUTION MODE CARD
JOB TITLE-START JOB 1
COMMENTS
START NAMELIST \$INPUT
JOB-EXECUTION FLAGS
OUTPUT SPECIFICATIONS
LIFTING SURFACE TYPE
LIFTING SURFACES PLAN
AIRFOIL SECTION
FLAP-TAB-AILERONS
REFERENCE DIMENSIONS
FLIGHT ATTITUDE SPECS
LINEARIZED THEORY
OPTIONAL INPUT CONST.
END NAMELIST \$INPUT
JOB TITLE-START JOB 2
START NAMELIST \$INPUT
DATA FOR JOB 2
END NAMELIST \$INPUT
END OF ALL JOBS
EXECUTE PLOT OPTION
PLOT EXEC. CONSTANTS

↓

▽ = 7/8 PUNCH.

NOTE: THE FOLLOWING CONTROL CARDS ARE OPTIONAL FOR INPUT

▽ N MSG = MESSAGE CARD (REQUIRED FOR NASA-MSC)

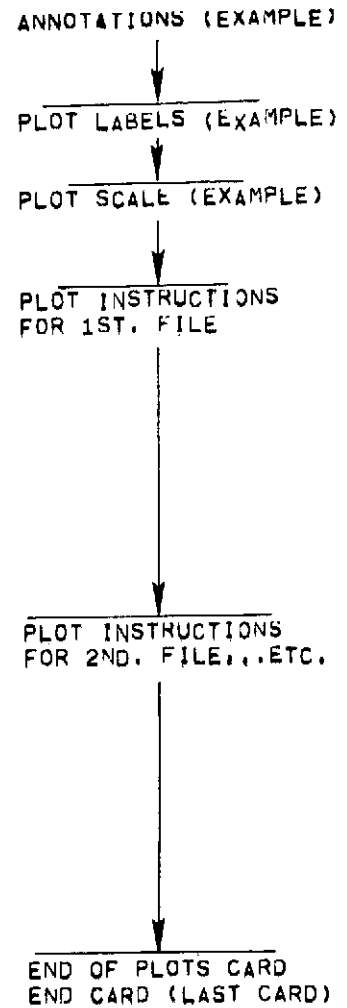
▽ PLT = REQUIRED FOR PLOT OUTPUT

INPUT INSTRUCTIONS FOR THE CALCOMP/4060-MICROFILM PLOT-OUTPUT OPTION,
 XQT TRWPLT, ARE FOUND IN REFERENCE 35. THESE INSTRUCTIONS HAVE BEEN
 OMITTED IN THE PRESENT REPORT.

3.3 PROGRAM INPUT SETUP GUIDE (CONTINUED)

```

ANNØT1 = 10 = EXAMPLE PRØB. 1 - MULTIPLE-SURFACE
ANNØT2 = 10 =   CAPABILITY DEMØNSTRATION RUN
ANNØT3 = 10 =           A.GØMEZ/ 5 JULY 72
ANNØT4 = 10 =
TITLE = 10 = ISØMETRIC PRØJECTION ØF LIFTING SURFACES
XLABEL = 10 = HORIZØNTAL AXIS, SEMISPANS
YLABEL = 10 = VERTICAL AXIS SEMISPANS
XHI= 1.5
XLØ=-1.0
YHI= 1.5
YLØ=-1.0
PLØT = 2,1, 3,1, ENDLST
ENDPLT
ANØTSV = 0
NØADV = 1
PLØT = 5,1, 6,1, ENDLST
ENDPLT
NØADV = 1
PLØT = 2,2, 3,2, ENDLST
ENDPLT
NØADV = 1
PLØT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
NØADV = 1
PLØT = 2,1, 3,1, ENDLST
ENDPLT
NØADV = 1
PLØT = 5,1, 6,1, ENDLST
ENDPLT
NØADV = 1
PLØT = 2,2, 3,2, ENDLST
ENDPLT
NØADV = 1
PLØT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
ENDRUN
VEØF
    
```



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OF POOR QUALITY

3.4 INPUT INSTRUCTIONS

GROUP 1 - EXECUTION MODE CARD.

* FIVE SEPARATE EXECUTION MODES ARE PERMITTED *

-
- (1) ▽ XQT NSURF (COLUMNS 1-11) 1 TO 5 LIFTING SURFACES MAY BE CONSIDERED SIMULTANEOUSLY.
 - (2) ▽ XQT ISURF (COLUMNS 1-11) ONLY 1 LIFTING SURFACE MAY BE CONSIDERED WITH OR WITHOUT LINEARIZED LIFT OPTION.
 - (3) ▽ XQT NSURFT (COLUMNS 1-12) MATRIX INVERSION TEST FOR XQT NSURF MODE.
 - (4) ▽ XQT ISURFT (COLUMNS 1-12) MATRIX INVERSION TEST FOR XQT ISURF MODE.
 - (5) ▽ XQT TRMPLT (COLUMNS 1-12) PLOT OPTION (REFERENCE 35)

GROUP 2 - JOB IDENTIFICATION (TITLE) AND COMMENTS.

* REQUIRED INPUT FOR NSURF AND ISURF EXECUTION MODES *

CARD 1 FORMAT(13A6,A2) (TITLE(I),I=1,14)
CARDS 2,3,4 FORMAT((13A6,A2)) (COMTS(I),I=1,42) (JOB 1 ONLY)

GROUP 3 - VORTEX-LATTICE ANALYTICAL SOLUTION SPECIFICATIONS.

* REQUIRED INPUT FOR NSURF AND ISURF EXECUTION MODES *

** NAMELIST INPUT FORMAT **

NAMELIST/INPUT/ NFLG ,IFLG ,KOUT ,KT1 ,KT2 ,KT3 ,LINX
* ,NWING ,NFUS ,NVTAIL,NSS ,X ,Y ,Z ,E ,C
* ,XOCR ,YSPAN ,NCS ,XOC ,ZOC ,WFLAP1,WFLAP2,WFLAP3,FLAPC
* ,TABC ,FLAPDJ,TABDJ ,AILDJ ,XCG ,YCG ,ZCG ,REFS ,REFC
* ,REFB ,GSCALE,NJOB ,ALFA ,MACHN ,HEIGHT,FLAPDJ,AILDJ ,NSOLV
* ,NJOB1 ,WCL ,CPLQCP,WSMOTH,LFLAP ,LDRAG ,CLEANF,PMECF ,CUTOF1
* ,CUTOF2

** JOB-EXECUTION FLAGS **

(1) NFLAG REQUIRED FOR NSURF EXECUTION MODE.

(NFLG(N),N=1,M) NUMBER OF SPANWISE VORTEX-LATTICE ELEMENTS ASSIGNED
 TO THE N SURFACE, WHERE M.LE.5.

3.4 INPUT INSTRUCTIONS (CONTINUED)

(NFLG(N+5),N=1,M) NUMBER OF CHORDWISE VORTEX-LATTICE ELEMENTS ASSIGNED TO THE N SURFACE.

(NFLG(N+10),N=1,M) NUMBER OF CHORDWISE DISCONTINUITIES ASSIGNED TO THE N SURFACE, WHERE,
 NFLG(N+10).EQ.0 NO FLAPS AND/OR AILERONS,
 NFLG(N+10).GE.1 WITH FLAPS AND/OR AILERONS,
 NFLG(N+10).EQ.2 WITH TAB SURFACE.

NFLG(16) = 0 ZOC(K,J) INPUT IS DIMENSIONLESS (NORMALIZED BY C(J)),
 = 1 ZOC(K,J) INPUT IS DIMENSIONED USING THE SAME UNITS AS THE WING PLANFORM SPECIFICATIONS (E.G., Y(J),X(J),ETC.)

NFLG(17) = 0 NO EFFECT (OUT-OF-GROUND),
 = 1 GROUND EFFECTS, I.E., FLIGHT IN THE PRESENCE OF A GROUND PLANE ARE CALCULATED.

NFLG(18) = 0 NO EFFECT.
 = 1 ARRAYS OF SOLUTIONS USING LIFTING LINE THEORY ARE CALCULATED FROM A PAIR OF EXACT VORTEX-LATTICE SOLUTIONS, THIS OPTION NOT OPERATIONAL AT PRESENT.

NFLG(19) = 0 NO EFFECT,
 = 1 CALCOMP OR MICROFILM PLOT DATA TAPE IS GENERATED.

NFLG(20) = ND PRINT-OUTPUT CONTROL EFFICIENCY FLAG ASSIGNMENT, USED AS FOLLOWS,
 ND.GE.0 = SHORT-PRINT OUTPUT, I.E., NAMELIST \$INPUT, SURFACES GEOMETRY, AIRFOIL MEAN-CAMBER, AND SECTION AND SPATIALLY-INTEGRATED AIRLOAD COEFFICIENTS ARE OUTPUT,
 ND.GE.1 = VORTEX-LATTICE GEOMETRY DETAIL IS OUTPUT.
 ND.GE.2 = VORTEX-LATTICE ELEMENTAL LIFT AND INDUCED VELOCITY ARE OUTPUT
 ND.GE.5 = VORTEX-LATTICE GEOMETRY DETAIL, AND INDUCED VELOCITY INCREMENTS ARE OUTPUT.
 ND.GE.8 = DEBUG OUTPUT FOR PROGRAM CHECK/DEVELOPMENT, I.E., NAMELISTS \$DEBUG1, \$DEBUG2, AND \$DEBUG3 ARE OUTPUT,
 ND.GT.15,AND,NFLG(17).GE.1 = DEBUG OUTPUT FOR PROGRAM CHECK/DEVELOPMENT, I.E., NAMELIST \$REFLEX IS OUTPUT.

(2) IFLAG REQUIRED FOR ISURF EXECUTION MODE.

IFLG(1) = 0 SYMMETRIC LIFT LOADING, NOT REQUIRED FOR INPUT, VALUES
 = 1 UNSYMMETRIC LIFT LOADING, ARE ASSIGNED IN EXECUTION

IFLG(2) = NSD NUMBER OF SPAN DISCONTINUITIES, NSD= 0,1,2,3,OR 4,
 REQUIRED INPUT IF IFLG(4).NE.0.

IFLG(3) = NSE NUMBER OF SPAN VORTEX-LATTICE ELEMENTS, NSE.LE.NSEMAX,
 WHERE NSEMAX=41 AND 21 FOR SYMMETRIC AND UNSYMMETRIC LIFT LOADING RESPECTIVELY.

IFLG(4) = 0 EQUAL SPAN-SPACING FOR VORTEX-LATTICE ELEMENTS.
 = 1 COSINE (VARIABLE) SPAN SPACING OF VORTEX-LATTICE ELEMENTS,
 = 2 SPAN-SPACING OF VORTEX-LATTICE ELEMENTS IS TO BE ASSIGNED IN THE INPUT, (YSPAN(N),N=1,NSE),

3.4 INPUT INSTRUCTIONS (CONTINUED)

IFLG(5) = NCD NUMBER OF CHORD DISCONTINUITIES, WHERE NCD=0 AND NCD=1
MUST BE ASSIGNED TO UNFLAPPED AND FLAPPED WING SURFACES
RESPECTIVELY.

IFLG(6) = NCE NUMBER OF CHORD VORTEX-LATTICE ELEMENTS, NCE,LE,NCMAX,
WHERE NCMAX=9, AND NCE,GE,2 FOR FLAPPED SURFACES.

IFLG(7) = 0 EQUAL CHORD-SPACING FOR VORTEX-LATTICE ELEMENTS,
= 1 COSINE (VARIABLE) CHORD SPACING OF VORTEX-LATTICE
ELEMENTS,

IFLG(8) = 0 NO EFFECT,
= 1 ARRAYS OF SOLUTIONS USING LIFTING LINE THEORY ARE
CALCULATED FROM A PAIR OF EXACT VORTEX-LATTICE
SOLUTIONS.

IFLG(9) = 0 NO EFFECT,
= 1 GROUND EFFECTS, I.E., FLIGHT IN THE PRESENCE OF A GROUND
PLANE ARE CALCULATED.

IFLG(10) = ND PRINT-OUTPUT CONTROL EFFICIENCY FLAG ASSIGNMENT,
USED AS FOLLOWS,

 ND.GE,0 = SHORT-PRINT OUTPUT, I.E., NAMELIST \$INPUT,
 SURFACES GEOMETRY, AIRFOIL MEAN-CAMBER, AND,
 SECTION AND SPATIALLY-INTEGRATED AIRLOAD
 COEFFICIENTS ARE OUTPUT,

 ND.GE,1 = VORTEX-LATTICE GEOMETRY DETAIL IS OUTPUT.

 ND.GE,2 = VORTEX-LATTICE ELEMENTAL LIFT AND INDUCED
 VELOCITY ARE OUTPUT

 ND.GE,5 = VORTEX-LATTICE GEOMETRY DETAIL, AND INDUCED
 VELOCITY INCREMENTS ARE OUTPUT.

 ND.GE,8 = DEBUG OUTPUT FOR PROGRAM CHECK/DEVELOPMENT,
 I.E., NAMELISTS \$DEBUG1, \$DEBUG2, AND \$DEBUG3
 ARE OUTPUT,

 ND.GT,15,AND,IFLG(9).GE,1 = DEBUG OUTPUT FOR PROGRAM
 CHECK/DEVELOPMENT, I.E., NAMELIST \$REFLEX
 IS OUTPUT.

IFLG(11)= 0 NO EFFECT,
= 1 OUTPUT SOLUTIONS FOR CHORDWISE AND SPANWISE SECTION
AIRLOAD COEFFICIENTS,

IFLG(12)= 0 NO EFFECT,
= 1 OUTPUT SURFACE PLANFORM GEOMETRY ON CALCOMP/MICROFILM
PLOT TAPE.

IFLG(13)= 0 NO EFFECT,
= 1 OUTPUT CHORD AND SPAN SECTION AIRLOAD COEFFICIENTS ON
CALCOMP/MICROFILM PLOT TAPE,

IFLG(14)= 0 NO EFFECT,
 OUTPUT LINEARIZED SOLUTION OF AIRLOAD COEFFICIENTS ON
CALCOMP/MICROFILM PLOT TAPE,

IFLG(15) NOT A REQUIRED INPUT, VALUE ASSIGNED IN EXECUTION.

** OUTPUT SPECIFICATIONS **

KOUT (=6 IF OMITTED) PRINT BCD OUTPUT PHYSICAL UNIT ASSIGNMENT,
KT1 (=1 IF OMITTED) SCRATCH/WORK PHYSICAL UNIT ASSIGNMENT.

3.4 INPUT INSTRUCTIONS (CONTINUED)

KT2 (=8, ASG LOGICAL UNIT F, IF OMITTED) CALCOMP/MICROFILM DRUM OR TAPE PHYSICAL UNIT ASSIGNMENT.

KT3 (=3 IF OMITTED) SCRATCH/WORK PHYSICAL UNIT ASSIGNMENT.

LINX (=56 IF OMITTED) MAXIMUM NUMBER OF LINES PER PAGE FOR PRINTED OUTPUT.

** SURFACE TYPE CLASSIFICATIONS **
 * OMIT FOR XGT ISURF EXECUTION MODE *

NWING (=1 IF OMITTED) NUMBER OF SYMMETRIC LIFTING SURFACES, E.G., WING SURFACES, THAT MUST BE ORDERED AS FOLLOWS,

N = 1,2,3,...,NWING, (N,LE,5)

NFUS (=0 IF OMITTED) NUMBER OF ANTISYMMETRIC LIFTING SURFACES, E.G., VERTICAL SURFACE/S ASSIGNED TO REPRESENT A FUSELAGE OR A VERTICAL FIN, THAT MUST BE ORDERED AS FOLLOWS,

N = 1,2,3,...,NWING+NFUS, (N,LE,5)

NVTAIL (=0 IF OMITTED) NUMBER OF ANTISYMMETRIC LIFTING SURFACES, E.G., VERTICAL SURFACE/S ASSIGNED TO REPRESENT A VERTICAL FIN, TWIN FINS, END PLATES, ETC., THAT MUST BE ORDERED AS FOLLOWS,

N = 1,2,3,...,NWING+NFUS+IABS(NVTAIL), (N,LE,5)

NVTAIL MAY BE ENTERED AS A POSITIVE OR A NEGATIVE INTEGER IN ORDER TO SPECIFY SYMMETRY ABOUT THE PLANE $Y=0$, I.E.,

+ INTEGER = ANTISYMMETRIC SURFACE, E.G. A SINGLE FIN,
 - INTEGER = SYMMETRIC SURFACE, E.G. TWIN FINS,

NS (NOT AN INPUT QUANTITY) TOTAL NUMBER OF SURFACES TO BE CONSIDERED THAT IS CALCULATED INTERNALLY USING THE FOLLOWING FORMULA

$NS = NWING + NFUS + IABS(NVTAIL)$ (NS,LE,5)

N (NOT AN INPUT QUANTITY) ORDER NUMBER ASSIGNED TO NTH.SURFACE.

** SURFACE PLANFORM SPECIFICATIONS **
 * NS= 1 FOR XGT ISURF EXECUTION MODE *

(NSS(N),N=1,NS) STORAGE ORDER NUMBER ALLOCATED TO THE LAST SPAN STATION ENTRY FOR THE N LIFTING SURFACE, WHERE,

$NSS(1)$ = NUMBER OF SPAN STATION ENTRIES ALLOCATED TO THE FIRST SURFACE,

$NSS(N)-NSS(M)$ = NUMBER OF SPAN STATION ENTRIES ALLOCATED TO THE N SURFACE, IN ORDER, $N=1,2,...,M,N,...,NS$.

(X(J),J=1,NSS(NS)) LONGITUDINAL COORDINATE OF JTH. POINT OF THE REFERENCE LOFT LINE, E.G., FUSELAGE STATIONS.

(Y(J),J=1,NSS(NS)) SPANWISE COORDINATE OF JTH. POINT OF THE REFERENCE LOFT LINE, E.G., WING STATIONS.

(Z(J),J=1,NSS(NS)) VERTICAL COORDINATE OF JTH. POINT OF THE REFERENCE LOFT LINE, E.G. WATERLINE STATIONS.

(E(J),J=1,NSS(NS)) ANGLE OF TWIST OF CHORD PLANE RELATIVE TO THE LONGITUDINAL COORDINATE FOR THE AIRFOIL SECTION AT THE JTH. POINT OF THE REFERENCE LOFT LINE.

3.4 INPUT INSTRUCTIONS (CONTINUED)

(C(J),J=1,NSS(NS)) CHORD LENGTH DIMENSION OF THE AIRFOIL SECTION AT THE JTH.POINT OF THE REFERENCE LOFT LINE.

(XØCR(J),J=1,NSS(NS)) (OMIT FOR XQT [SURF]) THE RELATIVE LOCATION OF THE REFERENCE LOFT LINE IN CHORDS MEASURED FROM THE LEADING EDGE FOR THE JTH.POINT.

(XØCR(N),N=1) (OMIT FOR XQT NSURF) THE RELATIVE LOCATION OF THE REFERENCE LOFT LINE IN CHORDS MEASURED FROM THE LEADING EDGE ASSUMED CONSTANT FOR THE NTH.SURFACE,

(YSPAN(N),N=1,NSE*1) (REQUIRED IF(IFLG,GE,2)) SPAN STATIONS THAT BOUND THE VORTEX MATRIX ELEMENTS.

**** AIRFOIL SECTION (CAMBER) SPECIFICATIONS ****

(NCS(N),N=1,NS) NUMBER OF CHORD STATIONS ALLOCATED FOR DESCRIBING THE AIRFOIL SECTION MEAN CAMBER LINE FOR THE NTH, LIFTING SURFACE, WHERE,
NCS(N).GE.2, AND/OR NCS(N).LE.10.

((XØC(K,N),K=1,NCS(N)),N=1,NS) CHORD STATION OF AIRFOIL SECTION, I.E., DISTANCE FROM THE LEADING EDGE MEASURED IN CHORDS ALONG THE AIRFOIL SECTION CHORD PLANE.

((ZØC(K,J),K=1,NCS(N)),
J=1,NSS(NS),AND,
N=1,NS) AIRFOIL SECTION MEAN CAMBER SPECIFICATION, I.E., NORMAL DISTANCE TO THE MEAN CAMBER LINE MEASURED IN CHORDS FROM THE AIRFOIL SECTION CHORD PLANE, CORRESPONDING TO THE JTH. POINT OF THE REFERENCE LOFT LINE.

**** CONTROL SURFACE GEOMETRY SPECIFICATIONS ****

(WFLAP1(N),N=1,NS) SPAN DISTANCE FROM PLANE OF SYMMETRY TO THE INNER BOUNDARY OF THE FLAP SURFACE/S, WHERE,
IF(WFLAP1(N).EQ.0,0) FLAP SURFACE IS CONTINUOUS AT THE CENTER SPAN SECTION,
IF(WFLAP1(N).LE.1,0) DISTANCE MEASURED IN SPANS,

(WFLAP2(N),N=1,NS) SPAN DISTANCE FROM PLANE OF SYMMETRY TO THE OUTER BOUNDARY OF THE FLAP OR THE INNER BOUNDARY OF THE AILERON SURFACES, WHERE,
IF(WFLAP2(N).LE.1,0) DISTANCE MEASURED IN SPANS,

(WFLAP3(N),N=1,NS) SPAN DISTANCE FROM PLANE OF SYMMETRY TO THE OUTER BOUNDARY OF THE AILERON SURFACES, WHERE,
IF(WFLAP3(N).LE.1,0) DISTANCE MEASURED IN SPANS,

(FLAPC(J),J=1,NSS(NS)) (OMIT FOR XQT [SURF]) FLAP/S AND/OR AILERONS CHORD LENGTH FOR THE JTH.POINT OF THE REFERENCE LOFT LINE, WHERE,
IF(FLAPC(J).LT.1,0) FLAPC(J) IS NORMALIZED BY C(J),

(FLAPC(N),N=1,NS) (OMIT FOR XQT NSURF) FLAP/S AND/OR AILERONS CHORD LENGTH FOR THE NTH.SURFACE, WHERE,
IF(FLAPC(N).LT.1,0) FLAPC(N) IS NORMALIZED BY C(J),

(TABC(J),J=1,NSS(NS)) (OMIT FOR XQT [SURF]) TAB OR AUXILIARY ELEVONS CHORD LENGTH FOR THE JTH.POINT OF THE REFERENCE LOFT LINE, WHERE,

3.4 INPUT INSTRUCTIONS (CONTINUED)

IF(TABC(J).LT.1) TABC(J) IS NORMALIZED BY C(J).
 (TABC(N),N=1,NS) (OMIT FOR XGT NSURF) TAB OR AUXILIARY ELEVONS CHORD LENGTH FOR THE NTH,SURFACE, WHERE,
 IF(TABC(N).LT.1) TABC(N) IS NORMALIZED BY C(J).
 (FLAPDJ(N),N=1,NS) (OMIT FOR XGT ISURF) FLAP DEFLECTION (DEGREES), WHERE,
 IF(FLAPDJ(N).GT.0) FLAP DEFLECTION IS DOWN,
 IF(FLAPDJ(N).LT.0) FLAP DEFLECTION IS UP.
 (TABDJ(N),N=1,NS) (OMIT FOR XGT ISURF) TAB DEFLECTION (DEGREES), WHERE,
 IF(TABDJ(N).GT.0) TAB DEFLECTION IS DOWN,
 IF(TABDJ(N).LT.0) TAB DEFLECTION IS UP.
 ((AILDJ(L,N),L=1,2), N=1,NS) (OMIT FOR XGT ISURF) AILERON DEFLECTIONS (DEGREES), WHERE, L=1 DENOTES LEFT AILERON AND L=2 DENOTES RIGHT AILERON, AND,
 IF(AILDJ(L,N).GT.0) AILERON DEFLECTION IS DOWN,
 IF(AILDJ(L,N).LT.0) AILERON DEFLECTION IS UP,
 IF(AILDJ(1,N).NE.AILDJ(2,N)) ANTISYMMETRIC LIFT,

** REFERENCE DIMENSIONS **

* OMIT FOR XGT ISURF EXECUTION MODE *

XCG (=0.0 IF OMITTED) LONGITUDINAL LOCATION OF THE CENTER OF GRAVITY MEASURED FROM THE LOFT COORDINATE SYSTEM ORIGIN.
 YCG (=0.0 IF OMITTED) SPANWISE LOCATION OF THE CENTER OF GRAVITY MEASURED FROM THE LOFT COORDINATE SYSTEM ORIGIN.
 ZCG (=0.0 IF OMITTED) VERTICAL LOCATION OF THE CENTER OF GRAVITY MEASURED FROM THE LOFT COORDINATE SYSTEM ORIGIN.
 REFS (=1000.0 IF OMITTED) REFERENCE AREA FOR NORMALIZING THE CENTER AERODYNAMIC FORCE AND MOMENT COEFFICIENTS.
 REFC (=100.0 IF OMITTED) REFERENCE CHORD FOR NORMALIZING THE CENTER AERODYNAMIC FORCE AND MOMENT COEFFICIENTS.
 REFB (=100.0 IF OMITTED) REFERENCE SPAN FOR NORMALIZING THE CENTER AERODYNAMIC FORCE AND MOMENT COEFFICIENTS.
 GSCALE (=1.0 IF OMITTED) GEOMETRY SCALING FACTOR THAT IS USED AS FOLLOWS, ALL DIMENSIONAL PHYSICAL QUANTITIES ARE MULTIPLIED BY GSCALE BEFORE EXECUTION, WITH THE EXCEPTION OF HEIGHT(N), THUS CHANGING THE SCALE OF THE INPUT GEOMETRY TO ANY DESIRED UNITS, AND, GSCALE IS SET EQUAL TO UNITY BEFORE THE NEXT JOB-RUN.

** FLIGHT ATTITUDE AND MULTIPLE-SURFACE SOLUTION SPECIFICATIONS **

NJØB NUMBER OF SEPARATE FLIGHT CONDITIONS OR JOB RUNS TO BE CALCULATED.
 (ALFA(N),N=1,NJØB) FLIGHT ATTITUDE ANGLE OF ATTACK (DEG.), I.E., ANGLE BETWEEN FREE STREAM VELOCITY VECTOR AND THE LOFT COORDINATE SYSTEM LONGITUDINAL AXIS (X=AXIS).
 (MACHN(N),N=1,NJØB) FLIGHT MACH NUMBER BASED ON FREE STREAM SPEED OF SOUND.
 (HEIGHT(N),N=1,NJØB) ALTITUDE MEASURED FROM THE GROUND PLANE TO THE VEHICLE LOFT COORDINATE SYSTEM ORIGIN (X=Y=Z=0),

3.4 INPUT INSTRUCTIONS (CONTINUED)

(FLAPDJ(N),N=1,NJOB) (OMIT FOR XGT NSURF) FLAP DEFLECTION (DEGREES), WHERE,
IF(FLAPDJ(N).GT.0) FLAP DEFLECTION IS DOWN,
IF(FLAPDJ(N).LT.0) FLAP DEFLECTION IS UP,

((AILDJ(L,N),L=1,2), N=1,NJOB) (OMIT FOR XGT NSURF) AILERON DEFLECTIONS (DEGREES),
WHERE, L=1 DENOTES LEFT AILERON AND L=2 DENOTES
RIGHT AILERON, AND,
IF(AILDJ(L,N).GT.0) AILERON DEFLECTION IS DOWN,
IF(AILDJ(L,N).LT.0) AILERON DEFLECTION IS UP,
IF(AILDJ(1,N).NE.AILDJ(2,N)) ANTISYMMETRIC LIFT,

((NSOLV(M,N),M=1,2) N=1,...5) (OMIT FOR XGT NSURF) MULTIPLE SURFACE SOLUTION
SPECIFICATION FLAG, TO BE USED AS ILLUSTRATED IN
THE FOLLOWING EXAMPLE,
NSOLV= 1,1, 2,2, 1,2, 1,3, 2*0,
MULTIPLE-SURFACE INDEPENDENT SOLUTIONS ARE OBTAINED
FOR THE FOLLOWING COMBINATIONS,
SURFACE 1 TO SURFACE 1 = SURFACE 1 ONLY,
SURFACE 2 TO SURFACE 2 = SURFACE 2 ONLY,
SURFACE 1 TO SURFACE 2 = SURFACES 1 AND 2 ONLY
SURFACE 1 TO SURFACE 3 = SURFACES 1 THROUGH 3,

** LINEARIZED THEORY LIFTING-LINE SOLUTIONS OPTION **

* OMIT FOR XGT NSURF EXECUTION OPTION *

NJOBBL (=0 IF OMITTED) NUMBER OF LINEARIZED LIFTING LINE
SOLUTIONS TO BE EXECUTED.

WCL(1) = 0 OR 1 (REQUIRED INPUT IF IFLG(8).GE.1) LINEARIZED SOLUTION
SPECIFICATION THAT IS USED AS FOLLOWS,
IF(WCL(1).EQ.0) ALFA(J),J=1,NJOBBL ARRAY CALCULATED,
IF(WCL(1).EQ.1) WCL(J+1),J=1,NJOBBL ARRAY CALCULATED

(WCL(J+1),J=1,NJOBBL) (REQUIRED INPUT IF(IFLG(8).GE.1,AND,WCL(1).GE.1)
WING LIFT COEFFICIENT

** OPTIONAL-INPUT EXECUTION CONSTANTS **

COLCP (=0.75 IF OMITTED) COLOCATION POINT OR CONTROL POINT LOCATION
SPECIFICATION FOR THE VORTEX LATTICE ELEMENTS, A RANGE OF
0.75-0.83 IS GENERALLY USED.

WSMOTH (=0.10 IF OMITTED) FLAP AND/OR AILERON DISCONTINUITY COSINE-
SMOOTHING OPTION, WHERE,
IF(WSMOTH.LT.1.0) WSMOTH INPUT IN SPAN UNITS,
IF(WSMOTH.GT.1.0) WSMOTH INPUT IN PHYSICAL UNITS,

LFLAP (=0 IF OMITTED) FLAPPED SURFACE BOUNDARY CONDITIONS FLAG, USED
AS FOLLOWS,
IF(LFLAP.EQ.0) EXACT GEOMETRY OF FLAP OR AILERON IS USED IN
EVALUATING BOUNDARY CONDITIONS,
IF(LFLAP.EQ.1) LINEARIZED-FIRST ORDER THEORY IS USED IN
EVALUATING BOUNDARY CONDITIONS FOR THE FLAP
OR AILERON SURFACES.

3.5 ALPHABETICAL LIST OF INPUT QUANTITIES

VARIABLE	DIMENSION	UNITS	RESTRICTION	CLASS	DESCRIPTION AND/OR FUNCTION
AILDJ	REAL(2,5) REAL(2,10)	DEG. DEG.	NSURF ONLY ISURF ONLY	FLAP/AIL, FLAP/AIL.	AILERON-SURFACES DEFLECTION, AILERON-SURFACES DEFLECTION.
ALFA	REAL(10) REAL(20)	DEG. DEG.	NSURF ONLY ISURF ONLY	ATTITUDE ATTITUDE	ANGLE OF ATTACK, ANGLE OF ATTACK,
AW	REAL	L**2	ISURF ONLY	OPT.CONST.	WETTED AREA,
C	REAL(30) REAL(10)	L L	NSURF ONLY ISURF ONLY	SURF.PLAN SURF.PLAN	CHORD LENGTH, CHORD LENGTH,
CLEANF	REAL	NONE	ISURF ONLY	OPT.CONST.	AERODYNAMIC CLEANNESS FACTOR,
CØLØCP	REAL	NONE	NONE	OPT.CONST.	COLOCATION OR CONTROL POINT.
CUTØF1	REAL	L/R	NONE	OPT.CONST.	CUTOFF LIMIT FOR RADIUS VECTOR,
CUTØF2	REAL	RADIAN	NONE	OPT.CONST.	CUTOFF LIMIT FOR SMALL ANGLES,
DELALF	REAL	DEG.	ISURF ONLY	OPT.CONST.	ANGLE OF ATTACK INCREMENT FOR LINEARIZED THEORY.
E	REAL(30) REAL(10)	DEG. DEG.	NSURF ONLY ISURF ONLY	SURF.PLAN SURF.PLAN	CHORD PLANE GEOMETRIC TWIST, CHORD PLANE GEOMETRIC TWIST.
FLAPØJ	REAL(5) REAL(10)	DEG. DEG.	NSURF ONLY ISURF ONLY	FLAP/AIL, FLAP/AIL.	FLAP-SURFACE DEFLECTION, FLAP-SURFACE DEFLECTION,
FLAPC	REAL(30) REAL	L L	NSURF ONLY ISURF ONLY	FLAP/AIL, FLAP/AIL.	FLAP/AILERON CHORD LENGTH, FLAP/AILERON CHORD LENGTH.
GSCALE	REAL	NONE	NSURF ONLY	REF.DIM.	GEOMETRIC SCALING FACTOR,
HEIGHT	REAL(10)	L	NONE	ATTITUDE	ALTITUDE FROM GROUND PLANE,
IFLG	INTG(15)	NONE	ISURF ONLY	FLAG	JOB EXECUTION FLAG FOR ISURF.
KØUT	INTEGER	NONE	NONE	OUTPUT	BCD PRINT-OUTPUT UNIT ASSIG.
KT1	INTEGER	NONE	NONE	OUTPUT	SCRATCH/WORK BCD UNIT ASSIG.
KT2	INTEGER	NONE	NONE	OUTPUT	CALCOMP/FILM BCD UNIT ASSIG.
KT3	INTEGER	NONE	NONE	OUTPUT	SCRATCH/WORK BCD UNIT ASSIG.
L	REAL	L	NONE	NONE	LINEAR DIMENSION, E.G., FEET, INCHES, METERS, ETC.
LDRAG	REAL	NONE	ISURF ONLY	OPT.CONST.	INDUCED DRAG FACTOR.
LFLAP	REAL	NONE	NONE	OPT.CONST.	LINEAR THEORY FACTOR FOR FLAP.
LINX	INTEGER	NONE	NONE	OUTPUT	MAX.NO.LINES PER PRINTED PAGE.
MACHN	REAL(10)	NONE	NONE	ATTITUDE	FLIGHT FREE-STREAM MACH NUMBER.
NCS	INTG(5)	NONE	NONE	AIRFOIL	NO.OF CHORD STATIONS.
NFLG	INTG(20)	NONE	NSURF ONLY	FLAG	JOB EXECUTION FLAG FOR NSURF.
NFUS	INTEGER	NONE	NSURF ONLY	SURF.TYPE	NO,SYMMETRIC FUS. SURFACES,
NJØB	INTEGER	NONE	NONE	ATTITUDE	NO,OF FLIGHT ATTITUDES,

3.5 ALPHABETICAL LIST OF INPUT QUANTITIES (CONTINUED)

VARIABLE	DIMENSION	UNITS	RESTRICTION	CLASS	DESCRIPTION AND/OR FUNCTION
NJOB	INTEGER	NONE	ISURF ONLY	LINEAR OPT	NO. OF SEPARATE FLIGHT ATTITUDES FOR LIFTING-LINE SOLUTIONS,
NSOLV	INTG(12)	NONE	NSURF ONLY	ATTITUDE	MULTIPLE-SURFACE SOLUTION FLAG,
NSS	INTG(5)	NONE	NONE	SURF,PLAN	STORAGE ALLOCATION-ORDER INDEX,
NVTAIL	INTEGER	NONE	NSURF ONLY	SURF,TYPE	NO,VERT,ANTISYMM, SURFACES,
NWING	INTEGER	NONE	NSURF ONLY	SURF,TYPE	NO,SYMMETRIC WING SURFACES,
PMECF	REAL	NONE	ISURF ONLY	OPT,CONS.	PITCHING MOMENT FACTOR,
REFB	REAL	L	NSURF ONLY	REF.DIM.	REFERENCE SPAN LENGTH.
REFC	REAL	L	NSURF ONLY	REF.DIM.	REFERENCE CHORD LENGTH,
REFS	REAL	L**2	NSURF ONLY	REF.DIM.	REFERENCE AREA.
SF	REAL	L**2	ISURF ONLY	OPT,CONS	EQUIVALENT FLAT PLATE AREA,
TABC	REAL(30)	L	NSURF ONLY	FLAP/AIL.	TAB CHORD LENGTH,
TABDJ	REAL(5)	DEG.	NSURF ONLY	FLAP/AIL.	TAB-SURFACE DEFLECTION,
WCL	REAL(21)	NONE	ISURF ONLY	LINEAR OPT	WING LIFT COEFFICIENT FOR LIFTING LINE SOLUTIONS,
WFLAP1	REAL(5)	L	NONE	FLAP/AIL.	FLAP SPAN INNER-EDGE DIM.
WFLAP2	REAL(5)	L	NONE	FLAP/AIL.	AILERON SPAN INNER-EDGE DIM.
WFLAP3	REAL(5)	L	NONE	FLAP/AIL.	AILERON SPAN OUTER-EDGE DIM.
WSMOOTH	REAL	L	NONE	OPT,CONS.	COSINE SMOOTHING SCALE,
XCG	REAL	L	NSURF ONLY	REF.DIM.	LONGITUDINAL LOCATION OF C,G.
X	REAL(30) REAL(10)	L L	NSURF ONLY ISURF ONLY	SURF,PLAN SURF,PLAN	REF.LOFT LINE X-COORDINATE, REF.LOFT LINE X-COORDINATE,
XØC	REAL(10,5) REAL(10)	L/C L/C	NSURF ONLY ISURF ONLY	AIRFOIL AIRFOIL	CHORD STATION FOR AIRFOIL SECT, CHORD STATION FOR AIRFOIL SECT.
XØCR	REAL(30) REAL	L/C L/C	NSURF ONLY NSURF ONLY	SURF,PLAN SURF,PLAN	RELATIVE LOCATION OF REF.LOFT LINE, RELATIVE LOCATION OF REF.LOFT LINE.
Y	REAL(30) REAL(10)	L L	NSURF ONLY ISURF ONLY	SURF,PLAN SURF,PLAN	REF.LOFT LINE Y-COORDINATE, REF.LOFT LINE Y-COORDINATE,
YCG	REAL	L	NSURF ONLY	REF.DIM.	SPANWISE LOCATION OF C,G.
YSPAN	REAL(42)	L	ISURF ONLY	SURF,PLAN	SPAN STATIONS THAT BOUND VORTEX LATTICE ELEMENTS,
Z	REAL(30) REAL(10)	L L	NSURF ONLY ISURF ONLY	SURF,PLAN SURF,PLAN	REF.LOFT LINE Z-COORDINATE, REF.LOFT LINE Z-COORDINATE,
ZCG	REAL	L	NSURF ONLY	REF.DIM.	VERTICAL LOCATION OF C,G.
ZØC	REAL(10,30) REAL(10,10)	L/C L/C	NSURF ONLY ISURF ONLY	AIRFOIL AIRFOIL	MEAN CAMBER FOR AIRFOIL SECT, MEAN CAMBER FOR AIRFOIL SECT.

3.6 LIST OF ABBREVIATIONS FOR INPUT

AIL	AILERON
ASSIG.	ASSIGNMENT
CONS.	CONSTANT
C.G.	CENTER OF GRAVITY
DEG.	DEGREES, ANGULAR MEASURE
DIM.	DIMENSION
.EQ.	EQUAL
E.G.	FOR EXAMPLE
.GE.	GREATER OR EQUAL
.GT.	GREATER THAN
IABS	ABSOLUTE VALUE OF AN INTEGER CONSTANT
INTG	INTEGER
I.E.	EQUIVALENT TO
.LE.	LESS OR EQUAL
.LT.	LESS THAN
OPT.	OPTIONAL
REF	REFERENCE
SURF.	SURFACE
*	MULTIPLICATION
**	EXPONENTIATION

1.0 PROGRAM DATA TABLES

TABLE 4.01 - INITIAL VALUES

VARIABLE	DIMENSION	RESTRICTION	INITIAL VALUE/S
AILDJ	REAL(2,5) REAL(2,10)	NSURF ONLY ISURF ONLY	10*0.0, 20*0.0,
ALFA	REAL(10) REAL(20)	NSURF ONLY ISURF ONLY	10*0.0, 20*0.0,
C	REAL(30) REAL(10)	NSURF ONLY ISURF ONLY	2*100.0,28*0.0, 10*100.0,
CLEANF	REAL	ISURF ONLY	0.0035,
CØLØCP	REAL	NONE	0.75,
CUTØF1	REAL	NONE	0.0001,
CUTØF2	REAL	NONE	0.0029,
DELALF	REAL	ISURF ONLY	1.0,
E	REAL(30) REAL(10)	NSURF ONLY ISURF ONLY	30*0.0, 10*0.0,
FLAPDJ	REAL(5) REAL(10)	NSURF ONLY ISURF ONLY	5*0.0, 10*0.0,
FLAPC	REAL(30) REAL	NSURF ONLY ISURF ONLY	30*0.25, 0.3,
GSCALE	REAL	NSURF ONLY	1.0,
HEIGHT	REAL(10)	NONE	10*1.0E+5,
IFLG	INTG(15)	ISURF ONLY	0,0,10,0,0,1,0,0,0,1,0,0,0,0,0,
KØUT	INTEGER	NONE	6,
KT1	INTEGER	NONE	1,
KT2	INTEGER	NONE	8,
KT3	INTEGER	NONE	3,
LDRAG	INTEGER	ISURF ONLY	0,
LFLAP	INTEGER	NONE	0,
LINX	INTEGER	NONE	56,
MACHN	REAL(10)	NONE	10*0.0,
MCS	INTG(5) INTEGER	NSURF ONLY ISURF ONLY	2,4*0, 2,

TABLE 4.01 - INITIAL VALUES (CONTINUED)

VARIABLE	DIMENSION	RESTRICTION	INITIAL VALUE/S
NFLG	INTG(20)	NSURF ONLY	10,0,0,0,0,4,0,0,0,0,0,0,0,0,0,0,0,0,0,4,
NFUS	INTEGER	NSURF ONLY	0,
NJOB	INTEGER	NONE	1,
NJOBBL	INTEGER	ISURF ONLY	20,
NSOLV	INTG(12)	NSURF ONLY	1,1,10*0,
NSS	INTG(5) INTEGER	NSURF ONLY ISURF ONLY	2,4*0, 2,
NVTAIL	INTEGER	NSURF ONLY	0,
NWING	INTEGER	NSURF ONLY	1,
PMECF	REAL	ISURF ONLY	1,0,
REFB	REAL	NSURF ONLY	100,0,
REFC	REAL	NSURF ONLY	100,0,
REFS	REAL	NSURF ONLY	1000,0,
TABC	REAL(30)	NSURF ONLY	30*0,125,
TABDJ	REAL(5)	NSURF ONLY	5*0,0,
WCL	REAL(21)	ISURF ONLY	+1,0,-0,4,-0,3,-0,2,-0,1,+0,0,+0,1, +0,2,+0,3,+0,4,+0,5,+0,6,+0,7,+0,8, +0,9,+1,0,+1,1,+1,2,+1,3,+1,4,+1,5,
WFLAP1	REAL(5) REAL	NSURF ONLY ISURF ONLY	5*0,0, 0,0,
WFLAP2	REAL(5) REAL	NSURF ONLY ISURF ONLY	5*0,6, 0,6,
WFLAP3	REAL(5) REAL	NSURF ONLY ISURF ONLY	5*1,0, 1,0,
WSMOTH	REAL REAL	NSURF ONLY ISURF ONLY	0,1, 0,2,
XCG	REAL	NSURF ONLY	0,0,
X	REAL(30) REAL(10)	NSURF ONLY ISURF ONLY	30*0,0, 10*0,0,
XDC	REAL(10,5) REAL(10)	NSURF ONLY ISURF ONLY	0,0,1,0,48*0,0, 0,0,1,0,8*0,0,

TABLE 4.01 - INITIAL VALUES (CONTINUED)

VARIABLE	DIMENSION	RESTRICTION	INITIAL VALUE/S
X0CR	REAL(30) REAL	NSURF ONLY ISURF ONLY	30*0.25, 0.25,
Y	REAL(30) REAL(10)	NSURF ONLY ISURF ONLY	30*0.0, 0,0,100,0,8*1000,0,
YCG	REAL	NSURF ONLY	0,0,
YSPAN	REAL(42)	ISURF ONLY	42*0,0,
Z	REAL(30) REAL(10)	NSURF ONLY ISURF ONLY	30*0,0, 10*0,0,
ZCG	REAL	NSURF ONLY	0,0,
Z0C	REAL(10,30) REAL(10,10)	NSURF ONLY ISURF ONLY	300*0,0, 100*0,0,

5.0 OUTPUT

5.1 General Description of Output

The printed-output and tape-output for the main execution modes of the program are organized in the following manner.

1) Raw Data

The input data for all the case studies that are to be executed by the computer which includes punched card data up to and including the \$ENDJØBS card is printed in the first page or pages in the exact form it was read into the computer, i.e., raw data including punched-card errors, etc.

2) Initial Values

For each individual case study to be executed the job-execution flags, geometry data, flight data, etc. are output via NAMELIST statement, i.e., the values of all the input variables are output via \$INPUT.

2) Short-Print Output (NFLG(20) or IFLG(10) = 0)

The following tables are output under the short-print output option:

<u>Table Title & Description</u>	<u>Table # in Section 5.2</u>
Lifting-Surface Geometry (one for each surface)	Table 5.01
Camber for Airfoil Section (one for each surface)	Table 5.02
Section Airload Coefficients (one for each surface)	Table 5.03
Spatially-Integrated Airload Coefficients	Table 5.04
Linearized (Lifting-Line) Solutions (ISURF execution mode only)	Table 5.05
Job/Jobs Termination Output	Table 5.06

4) Long-Print Output (NFLG(20) or IFLG(10) ≥ 2)

The short-print tables and the following tables are output under the long-print option:

<u>Table Title & Description</u>	<u>Table # in Section 5.2</u>
Vortex-Lattice Geometry Detail (one for each surface)	Table 5.07
Lift Distribution Detail (one for each surface)	Table 5.08

5.1 General Description of Output (Continued)

5) Debug-Print Output (NFLG(20) or IFLG(10) \geq 5)

In addition to the short-print and long-print tables, the following tables are output under the debug-print option

<u>Table Title & Description</u>	<u>Table # in Section 5.2</u>
Vortex-Lattice Induced Velocity Matrices Detail (one for each surface)	Table 5.09

6) Program Checkout-Print Output (NFLG(20) or IFLG(10) \geq 16)

Under the program checkout-print option, detail data on the vortex-lattice velocity induced for each individual vortex filament is output via NAMELIST statement, accordingly

<u>Table Title & Description</u>	<u>Table # in Section 5.2</u>
Program Checkout & Debug Print	Table 5.10

7) Tape Output (NFLG(19) or IFLG (11) through IFLG(14) $>$ 1)

A summary of the analytical solutions generated by the program is output on magnetic tape. This output is used by the auxiliary execution mode (TRWPLT) for generating 4060-microfilm or Calcomp output. A detailed description of the format and variables output on tape is presented in Section 5.3.

8) Execution Diagnostics and Job Abort Output

See Section 5.4.

9) Alphabetical List of Output Quantities

See Section 5.5.

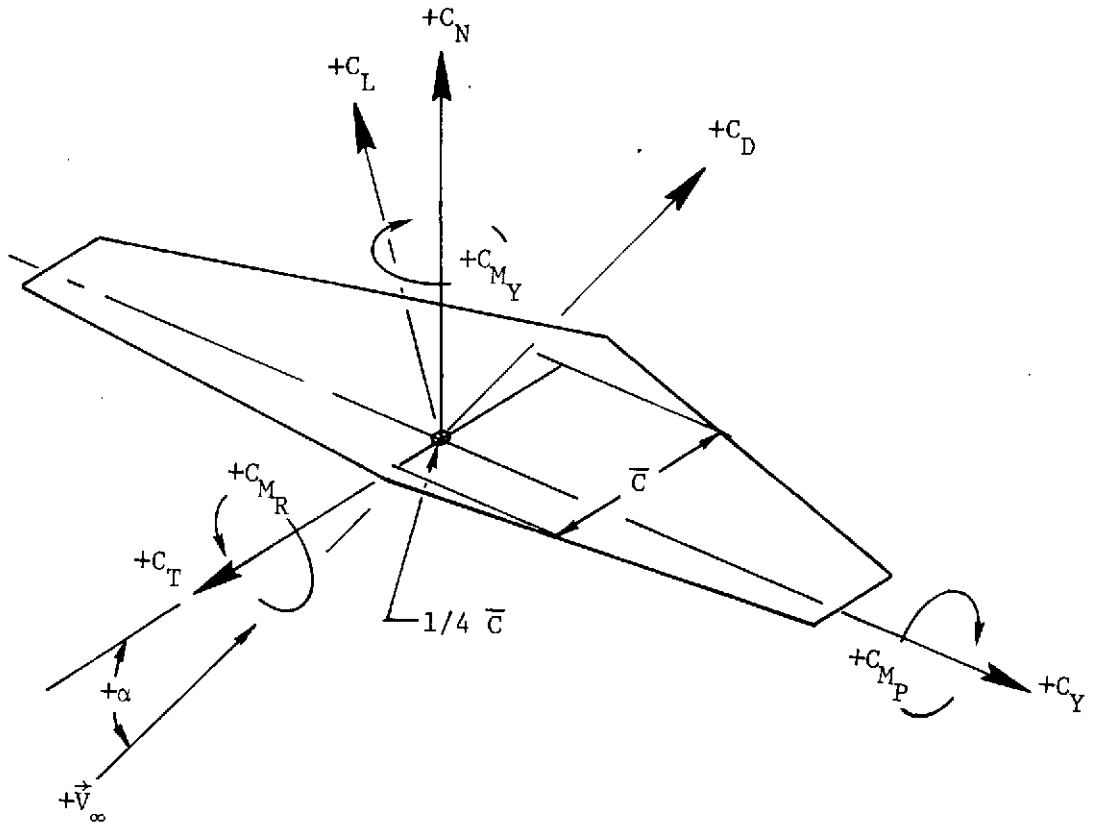
10) List of Abbreviations for Output

See Section 5.6.

11) Sign Conventions for Output

The sign conventions adopted for output purposes are described in Figure 5.01 (Page 5-3).

A) AIRLOAD AND MOMENT COEFFICIENTS



B) LIFTING-SURFACE GEOMETRY

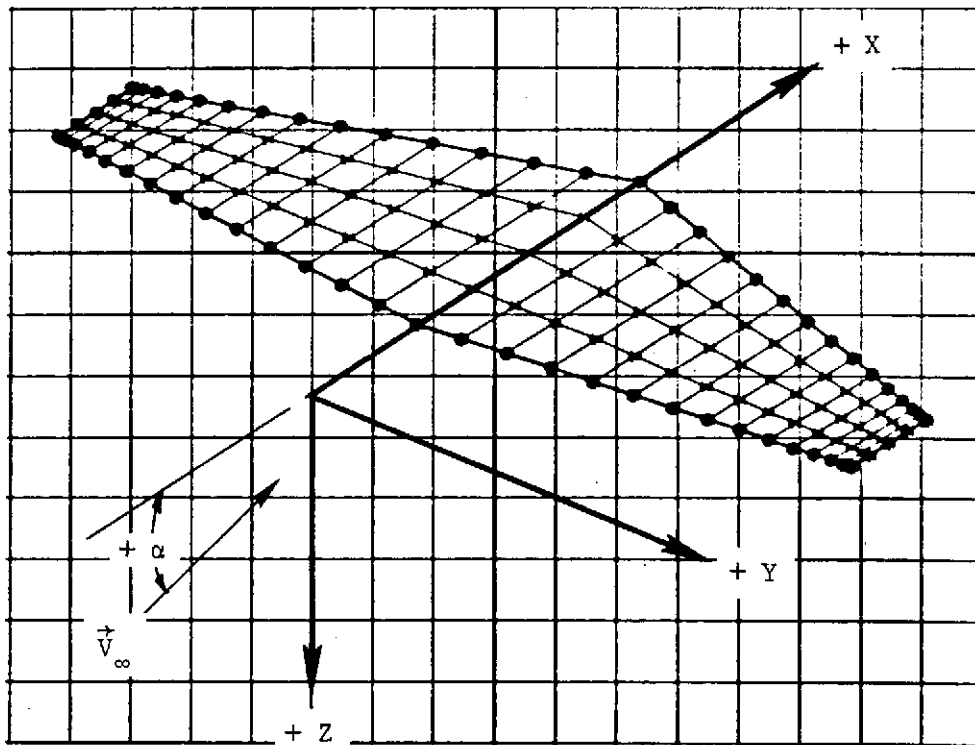


FIGURE 5.01 - LIFTING-SURFACE SOLUTIONS SIGN CONVENTIONS FOR OUTPUT

5.2 Printed-Output Format Summary

1) Short-Print Output

TABLE 5.01 - LIFTING-SURFACE GEOMETRY (One for Each Surface)

LIFTING SURFACE NC= N_j

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MGC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
b	C _R	C _T	ε _R	ε _T	S	AR	C _{mean}	C̄	ȳ	x̄	z̄
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	L.AIL DEFLEC	R.AIL DEFLEC	CIHED. MGC/4	SWEEP MGC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
Y ₁	Y ₂	Y ₃	δ _f	δ _{tab}	δ _{LA}	δ _{RA}	φ(C/4)	Λ(C/4)	NSE	NCE	NCD
			FUS STA X(CG)	WING STA Y(CG)	WL STA Z(CG)	ARFA S(CG)	CHORD C(CG)	SPAN B(CG)			
			X _{ref}	Y _{ref}	Z _{ref}	S _{ref}	C̄ _{ref}	b _{ref}			
WS	Y	Z	X(LF)	X(C/4)	X(TE)	TWIST	D(HC/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
W	Y	Z	X _{LE}	X(C/4)	X _{TE}	ε	φ(C/4)	Λ(C/4)	C	C _f	C _{tab}
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

5-4

ORIGINAL PAGE IS
OF POOR QUALITY

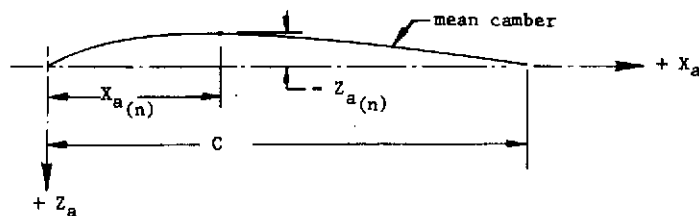
5.2 Printed-Output Format Summary (Continued)

TABLE 5.02 - AIRFOIL-SECTION CAMBER (One for Each Surface)

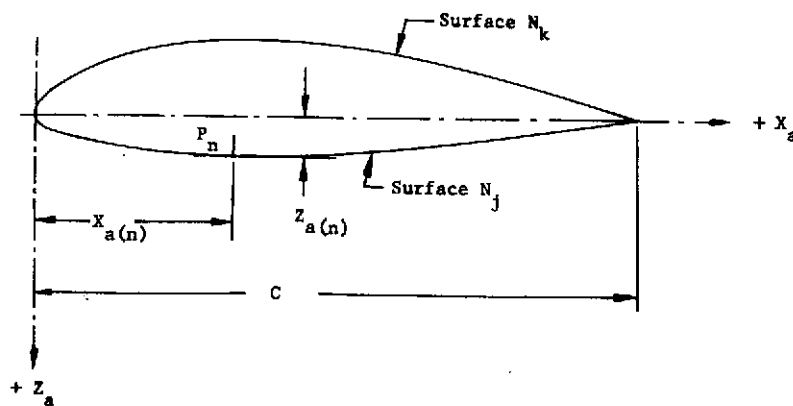
		XA(1)/C	XA(2)/C	XA(3)/C	XA(4)/C	XA(5)/C	XA(6)/C	XA(7)/C	XA(8)/C	XA(9)/C	XA(10)/C
X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C

5-5

[A] Single-Surface Representation



[B] Two-Surface Representation



5.2 Printed-Output Format Summary (Continued)

TABLE 5.03 - SECTION AIRLOAD COEFFICIENTS (One for Each Surface)

[A] NSURF Execution Mode

SECTION AIRLOAD COEFFICIENTS-SURFACE NO. = $N_1 / (N_1 + N_k)$

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	IXL	IYL	IZL
j	Y/b	Y	Z	W	c_n	c_x	c_l	c_d	$c_m(C/4)$	$c_l C/b$	section	airloads	unit vector
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

[B] ISURF Execution Mode

SECTION LIFT COEFFICIENTS

J	ZY/R	Y	C	SCL	SCLC/B	DLIFT	SCMIC/4)	IXL	IYL	IZL
j	Y/(b/2)	Y	C	c_l	$c_l C/b$	$\Delta L/q_\infty$	$c_m(C/4)$	airload	unit	vector
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

5.2 Printed-Output Format Summary (Continued)

TABLE 5.03 [B] - SECTION AIRLOAD COEFFICIENTS (Continued)

CHORDWISE PRESSURE DISTRIBUTION DETAIL

***** CHORD STATION (X-X _{LE})/C *****											
(X - X _{LE})/C →	.00000	.10000	.20000	.30000	.40000	.50000	.60000	.70000	.80000	.90000	1.00000
2Y/P Y/(b/2)	SCL c _l	***** CHORD PRESSURE (CPL - CPU)*17L *****									
		(c _{PL} - c _{PU}) →									
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

SPANWISE SECTION LIFT DISTRIBUTION DETAIL

WITH LF SUCTION					NO LE SUCTION			FLAP/AILERON		
Y	2Y/B	SCL	SCD1	SCM(C/4)	SCL	SCD1	SCM(C/4)	FCN	FCX	FCM
Y	Y/(b/2)	c _l	c _{d1}	c _{m(C/4)}	c _{lv}	c _{d1,v}	c _{mv(C/4)}	c _{nf}	c _{xf}	c _{hf}
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

5.2 Printed-Output Format Summary (Continued)

TABLE 5.04 - SPATIALLY-INTEGRATED AIRLOAD COEFFICIENTS

[A] NSURF Execution Mode

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS. = $N_1 - N_k$

E	FCN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
N_j	C_N	C_X	C_Y	C_L	C_{D_i}	$C_M(\bar{C}/4)$	$C_{M_{roll}}$	$C_{M_{yaw}}$	$\bar{X}(\bar{C}/4)$	$Z(\bar{C}/4)$	S	\bar{C}	b
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
						*** AIRLOAD SUMS ***							
AC	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
CG	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
AC	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
CG	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
						• DETERMINANT= Δ		• SCALE= S					

[B] ISURF Execution Mode

WING AIRLOAD COEFFICIENTS

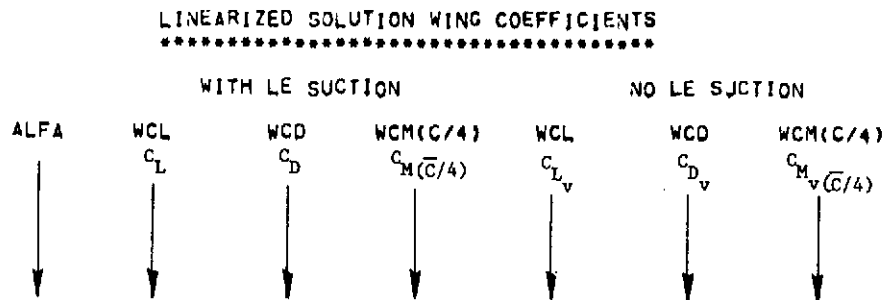
	WCL	WCDI	WCMP	WCMR	WCMY	IXL	IYL	IZL	DELTA	SCALE
	C_L	C_{D_i}	$C_M(\bar{C}/4)$	$C_{M_{roll}}$	$C_{M_{yaw}}$	↓	airload unit vector	↓	Δ	S
WITH LE SUCTION	↓	↓	↓	↓	↓	↓	↓	↓		
NO LE SUCTION	↓	↓	↓	↓	↓	↓	↓	↓		

Note: Starred entries in the table (*) refer to calculated values of vortex-lift increments.

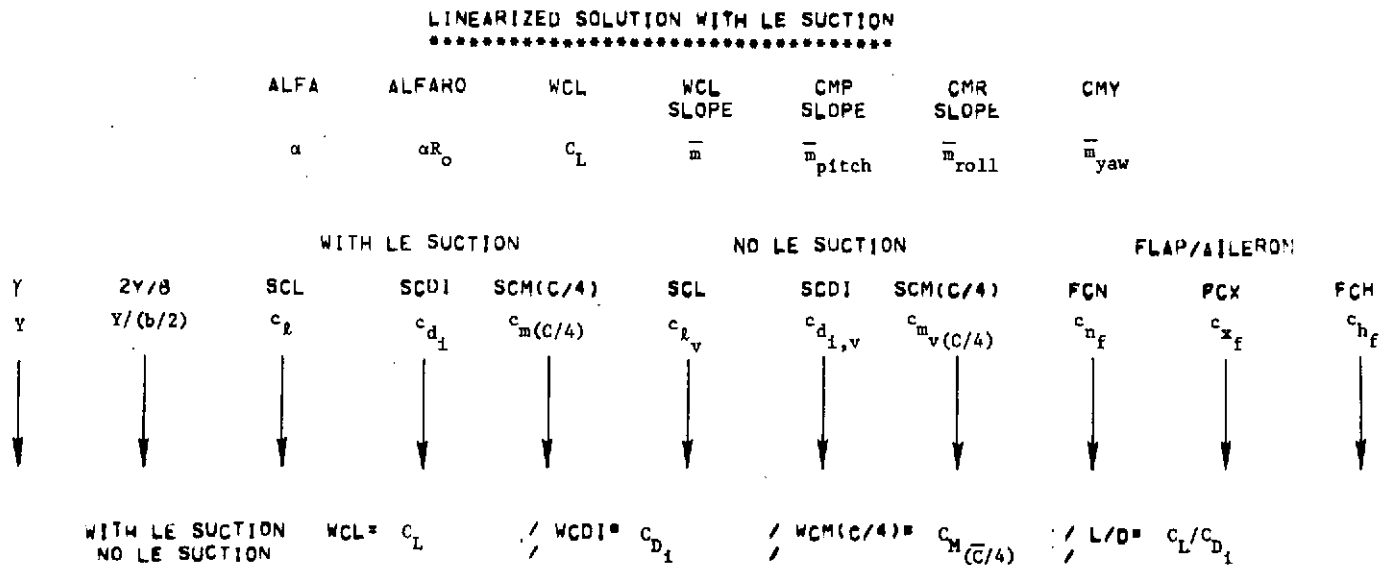
5.2 Printed-Output Format Summary (Continued)

TABLE 5.05 - LINEARIZED (LIFTING-LINE) SOLUTIONS (ISURF Execution Mode Only)

[A] Basic Lift Distribution



[B] Linearized Solutions



5.2 Printed-Output Format Summary (Continued)

TABLE 5.05 - LINEARIZED (LIFTING-LINE) SOLUTIONS (Continued)

[C] Spatially-Integrated Linearized Solutions

LINEARIZED SOLUTION WITH LE SUCTION

ALFA	ALFARD	WCL	WCL SLOPE	CM ⁿ SLOPE	CMR SLOPE	CMY
α	αR_0	C_L	\bar{m}	\bar{m}_{pitch}	\bar{m}_{roll}	\bar{m}_{yaw}
Y	2Y/B	SCLA1	SCLB	SCL	SCM(1/4)	
Y	Y/(b/2)	c_{la1}	c_{lb}	c_{ls}	$c_{m(C/4)}$	
↓	↓	↓	↓	↓	↓	

TABLE 5.06 - JOB/JOBS TERMINATION OUTPUT

[A] NSURF Execution Mode

**** JOB TIME= t₁ / ELAPSED TIME= t₂ / NO,PLOT FILES= n_p / NSURF EXEC. VERSION 6-18-72 ****

[B] ISURF Execution Mode

**** JOB TIME= t₁ / ELAPSED TIME= t₂ / NO,PLOT FILES= n_p / ISURF EXEC. VERSION 6-18-72 ****

5.2 Printed-Output Format Summary (Continued)

2) Long-Print Output

TABLE 5.07 - VORTEX-LATTICE GEOMETRY DETAIL (One for Each Surface)

J	K	Y	Z	WL	EW	DWL	DC	DS
j	k	Y	Z	W	$W - W_0$	ΔW	ΔC	ΔS
↓	↓	↓	↓	↓	↓	↓	↓	↓

J	K	XV	YV	ZV	1XV	1YV	1ZV	XN	YN	ZN	1XN	1YN	1ZN
j	k	Coordinates of B(X,Y,Z)			Unit Vector $\vec{1B}$			Control Point P(X,Y,Z)			Normal Unit Vector $\vec{1N}$		
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

5.2 Printed-Output Format Summary (Continued)

TABLE 5.08 - LIFT DISTRIBUTION DETAIL (One for Each Surface)

LIFT DISTRIBUTION DETAIL-SURFACE NO. = $N_j / (N_i, N_k)$

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	VI(X)	VI(Y)	VI(Z)	GAMA
j	k	Coordinates of C(X,Y,Z)			ΔS	$(c_{PL} - c_{PU})$	Unit Vector \vec{IV}			Induced Velocity Vector \vec{V}_i			$\Gamma_{j,k}$
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

3) Debug-Print Output

TABLE 5.09 - VORTEX-LATTICE INDUCED VELOCITY MATRICES DETAIL (One for Each Surface)

VORTEX LATTICE MATRIX DETAIL-SURFACE NO. = $N_j / (N_i, N_k)$

J	K	NP	NG	VFS(MAT)	VIN(MAT)	P(X)	P(Y)	P(Z)	B(X)	B(Y)	B(Z)	D(X)	D(Y)	D(Z)
j	k	m	n	$\vec{V}_w \cdot \vec{iN}_n$	$\vec{V}_{m,n} \cdot \vec{iN}_n$	Control Point P(X,Y,Z) _n			Coordinates of B(X,Y,Z) _m			Coordinates of D(X,Y,Z) _m		
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

5.2 Printed-Output Format Summary (Continued)

4) Program Checkout and Debug Print Output

TABLE 5.10 - PROGRAM CHECKOUT AND DEBUG PRINT

[A] Induced Velocity Calculation Detail-Print

Origin: Subroutine VØRTEX (A13 or B11)

```
SDEBUGV1
P      = P(X,Y,Z)
B      = B(X,Y,Z)
D      = D(X,Y,Z)
TANA   = Tan( $\alpha$ )
GAMA   =  $\Gamma$ 
PSIF   =  $\psi$ 
VCOS   =  $1\vec{V}_i$ 
SEND
```

} Branch ∞ -A-B

```
SDEBUGV2
PSIF   =  $\psi$ 
VCOS   =  $1\vec{V}_i$ 
SEND
```

} Branch D-E- ∞

```
SDEBUGV3
PSIF   =  $\psi$ 
VCOS   =  $1\vec{V}_i$ 
SEND
```

} Branch B-C-D

[B] Ground Effect Mirror Image Calculation Detail-Print

Origin: Subroutine REFLEC (A10 or B12)

```
SREFLEX
PX      = X of P(X,Y,Z)
PY      = Y of P(X,Y,Z)
X1      = X coordinate for intermediate point
Y1      = Y coordinate for intermediate point
PHI     =  $\phi$ , rotation angle (radians)
ALFAR   =  $\alpha$ , angle of attack (radians)
RX      = X coordinate of mirror-image point
RY      = Y coordinate of mirror-image point
ZL      = Z coordinate to ground plane
COSR    = Cos( $\phi$ )
SEND
```

5.3 Tape-Output Format Summary

In exercising the Calcomp/4060-microfilm plot-option of the program through the execution of XQT TRWPLT, the auxiliary execution mode, a data tape (or an internal unit) has to be provided in addition to the plotting instructions. The data tape is generated in the main execution modes of program, XQT NSURF or XQT ISURF, when the tape output option is specified in the input, i.e., NFLG(19) \neq 0 or IFLG(12), IFLG(13), and IFLG(14) \neq 0. The data in the data-tape is organized into a number of separate files, each file containing a single solution or a separate class of information. The data in each file is organized as illustrated below:

Execution Mode	File No.	Type of Information	Reference
NSURF	#1	Geometry for 1st. Surface	Example #1 (Section 6.2)
	#2	Geometry for 2nd. Surface	
	#3	Geometry for 3rd. Surface	
	#4	Geometry for 4th. Surface	
	#5		
	#6	Geometry for 5th. Surface	
	#7		
ISURF	#1	Geometry for 1st. Surface	Example #2 (Section 6.3)
	#2	Chordwise pressure distribution	
	#3	Spanwise airload distribution	
	#4	Linearized airload solution	

The data record format adopted for each file is given by

```

IREC, N, DATA1, DATA2, ..... , DATAN,
IREC, N, DATA1, DATA2, ..... , DATAN,
" " " " "
" " " " "
END OF FILE

```

where

IREC is the record type or number

N is the number of variables

DATA_i is the ith variable in the record

The definition of the variables that are output in the data-tape is presented in Table 5.11.

TABLE 5.11 - TAPE-OUTPUT FORMAT SUMMARY

File	Execution Mode	Origin Routine No.	Record No. IREC	No. Words N	Data	Function
i	NSURF	A03	1	6	$X_{LE}, Y_{LE}, Z_{LE}, X_{TE}, Y_{TE}, Z_{TE},$	Isometric Projection of the N^{th} Lifting-Surface Geometry
			2	3	$X_{F1}, Y_{F1}, Z_{F1},$	
			3	3	$X_{F2}, Y_{F2}, Z_{F2},$	
j	ISURF	B03	1	7	$Y, X_{LE}, X_{C/4}, X_{TE}, X_{HF}, C_W, C_F,$	Orthographic Projection of the I^{th} Lifting-Surface Geometry
			2	2	$Y_{F1}, X_{F1},$	
			3	2	$Y_{F2}, X_{F2},$	
			4	3	$Y, Z_{LE}, Z_{TE},$	Isometric Projection of the I^{th} Lifting-Surface Geometry
			5	6	$X_{LE}, Y_{LE}, Z_{LE}, X_{TE}, Y_{TE}, Z_{TE},$	
			6	3	$X_{F1}, Y_{F1}, Z_{F1},$	
			7	3	$X_{F2}, Y_{F2}, Z_{F2},$	
k	ISURF	B05	1	2	$X/C, (c_{PU} - c_{PL})$	Chordwise Pressure Distribution
			2	10	$Y/b, c_l, c_d, c_m(C/4), c_{n_f}, c_{x_f}, c_{h_f},$ $c_{l_v}, c_{d_v}, c_{m_v}(C/4),$	Span Distribution of Section Airload Coefficients for Vortex-Lattice Solution
l	ISURF	B06	1	10	$Y/b, c_l, c_d, c_m(C/4), c_{n_f}, c_{x_f}, c_{h_f},$ $c_{l_v}, c_{d_v}, c_{m_v}(C/4)$	Span Distribution of Section Airload Coefficients for Linearized Solutions
			2	7	$\alpha, C_L, C_D, C_M(\bar{C}/4), C_{L_v}, C_{D_v}, C_{M_v}(\bar{C}/4),$	Spatially-Integrated Airload Coefficients

5.4 Execution Diagnostics and Job Abort Output

Aside from the system (the computer) diagnostic error messages that may be output in the normal execution of the program, diagnostic or job termination messages are output when unallowable errors are incurred in the execution. Generally, these errors result because of bad input or because some of the calculated dependent variables fall outside the range of the program. A complete list of the error messages that may be output by the program and the corrective action that should be taken for each individual case is presented below:

1) **JØB ABØRTED BECAUSE, NØ. ØF LIFTING SURFACES = N EXCEEDS FIVE**

Origin: Subroutine LØFT (A03)

Cause: The number of lifting surfaces specified in the input exceeds the maximum number of lifting surfaces allowed in execution.

Correction: The absolute value sum of NWING, NFUS, and NVTAIL must be less than or equal to five. Revise accordingly.

2) **JØB ABØRTED BECAUSE, NØ. ØF SPAN ELEMENTS = NSE EXCEEDS 60**

Origin: Subroutine LØFT (A03)

Cause: The number of spanwise elements of the vortex-lattice geometric configuration exceeds the maximum number of allowable elements.

Correction: Decrease the number of spanwise elements in the vortex-lattice by revising the entries in NFLG(1), NFLG(2), .., NFLG(5).

3) **JØB ABØRTED BECAUSE, NØ. ØF CHØRD ELEMENTS = NCE EXCEEDS TEN**

Origin: Subroutine LØFT (A03)

Cause: The vortex-lattice number of chordwise elements assigned to the Nth surface exceeds the maximum allowable number.

Correction: The value assigned to NFLG(6), NFLG(7), 1, or, NFLG(10) cannot exceed 10. Revise these entries accordingly.

5.4 Execution Diagnostics and Job Abort Output (Continued)

- 4) JOB ABORTED BECAUSE, NO. OF VORTEX-LATTICE ELEMENTS = NVME EXCEEDS 100
- Origin: Subroutine LIFTX (A04)
- Cause: Too many elemental panels are considered simultaneously in obtaining a solution, i.e., the number of elements in the induced-velocity matrix exceeds the maximum allowable number.
- Correction: A smaller number of lifting-surfaces or a smaller number of elemental panels per surface has to be considered in obtaining a solution. To achieve these objectives revise the entries made for NSOLV, and NFLG(1) through NFLG(10).
- 5) JOB ABORTED BECAUSE, MACH NO. = MACHN EXCEEDS 0.90
- Origin: Subroutine MAIN (A01)
- Cause: The free stream Mach Number assigned to a given solution exceeds the maximum allowable limit of the program.
- Correction: Revise the entries made for the MACHN array.
- 6) JOB ABORTED BECAUSE, NO. OF SPAN STATIONS = NSS EXCEEDS 30
- Origin: Subroutine LOFT (A03)
- Cause: Too much data input for the X, Y, Z, E, C, and XOCR arrays.
- Correction: Revise entries for NSS, X, Y, Z, E, C, and XOCR.
- 7) JOB ABORTED BECAUSE, NO. OF CHORD STATIONS = NSC EXCEEDS 10
- Origin: Subroutine LOFT (A03)
- Cause: Too much data input for XOC and ZOC arrays.
- Correction: Revise entries for NCS, XOC, and ZOC.
- 8) JOB ABORTED BECAUSE, NO. OF SPAN ELEMENTS = NSPE NOT PERMITTED
- Origin: Subroutine LOFT (A03)
- Cause: The number of span elements assigned to any lifting surface has to be a positive integer.
- Correction: Revise (increase) entries for NFLG(1), through NFLG(5).

5.4 Execution Diagnostics and Job Abort Output (Continued)

9) JOB ABORTED BECAUSE, NO. OF WING CHORD ELEMENTS = NWCE NOT PERMITTED

Origin: Subroutine LØFT (A03)

Cause: Too few chordwise elements assigned to the Nth lifting surface.

Correction: Revise (increase) entries for NFLG(6) through NFLG(10).

10) JOB ABORTED BECAUSE, INPUT ERROR IN NSS FLAG, NSS(N) = 11.LT.NSS(M)=12

Origin: Subroutine LØFT (A03)

Cause: Input error incurred in the NSS array specification.

Correction: Revise entries for NSS array.

5.5 ALPHABETICAL LIST OF OUTPUT QUANTITIES

* PROGRAM OUTPUT OPTIONS *

- (1) - SHORT-PRINT OUTPUT, NFLG(20),OR,IFLG(10),EQ,0,
 (2) - LONG-PRINT OUTPUT, NFLG(20),OR,IFLG(10),GE,2,
 (3) - DEBUG-PRINT OUTPUT, NFLG(20),OR,IFLG(10),GE,5,
 (4) - PROGRAM-CHECKOUT, NFLG(20),OR,IFLG(10),GE,8,
 (5) - PLOT TAPE OUTPUT, NFLG(19),OR,(IFLG(I),I=11,14),GE,1.

* INPUT-DATA OUTPUT - NAMELIST INPUT *

NAMELIST INPUT, SEE INPUT VARIABLES LIST (SECTION 3.4) FOR DEFINITION
 OF INPUT VARIABLES IN NAMELIST INPUT.

* STANDARD-PRINT OUTPUT - SHORT-PRINT, LONG-PRINT, OR DEBUG-PRINT *

VARIABLE	COMMENT	UNITS †	DEFINITION
AC	INTG,COEFF.		AERODYNAMIC CENTER FOR ELEMENTAL SURFACE NO. 1.
ALFA		DEG.	ANGLE OF ATTACK MEASURED RELATIVE TO THE FREE STREAM VECTOR AND THE X-COORDINATE AXIS.
ALFARØ	ISURF	DEG.	WING ANGLE OF ATTACK FOR CL=0,0.
ALTITUDE		L	ALTITUDE ABOVE THE GROUND PLANE, I.E., THE SHORTEST STRAIGHT-LINE DISTANCE MEASURED FROM THE COORDINATE SYSTEM ORIGIN (X=Y=Z=0) TO THE GROUND PLANE.
AREA	GEOMETRY	L**2	PROJECTED AREA OF LIFTING SURFACE.
AREA	ND.GE,2	L**2	AREA OF AN ELEMENTAL SURFACE.
AREA S(CG)	GEOMETRY	L**2	REFERENCE AREA USED FOR NORMALIZING THE C.G. AERODYNAMIC COEFFICIENTS.
ASPECT RATIO	GEOMETRY		ASPECT RATIO OF LIFTING SURFACE, I.E., EQUAL TO (SPAN**2)/AREA
B(X)	ND.GE,5	L	X-COORDINATE OF POINT B(X,Y,Z) THAT DEFINES THE GEOMETRY OF THE VORTEX FILAMENT B-D.
B(Y)	ND.GE,5	L	Y-COORDINATE OF POINT B(X,Y,Z) THAT DEFINES THE GEOMETRY OF THE VORTEX FILAMENT B-D.
B(Z)	ND.GE,5	L	Z-COORDINATE OF POINT B(X,Y,Z) THAT DEFINES THE GEOMETRY OF THE VORTEX FILAMENT B-D.
C(FLAP)	GEOMETRY	L	CHORD LENGTH OF FLAP AND/OR AILERONS.

†Blank entries denote dimensionless quantities.

5.5 ALPHABETICAL LIST OF OUTPUT QUANTITIES (CONTINUED)

VARIABLE	COMMENT	UNITS	DEFINITION
C(TAB)	GEOMETRY	L	CHORD LENGTH OF TAB OR AUXILIARY FLAP SURFACE,
C(WING)	GEOMETRY	L	CHORD LENGTH OF LIFTING SURFACE CHORD-PLANE,
CG	INTG.COEFF.		CENTER OF GRAVITY LOCATION DEFINED BY REFERENCE DIMENSIONS,
CHØRD C(CG)	GEOMETRY	L	REFERENCE CHORD LENGTH USED FOR NORMALIZING THE C.G. AERODYNAMIC COEFFICIENTS,
CMP SLØPE	ISURF		WING PITCHING MOMENT COEFFICIENT SLOPE, I.E., = D(WCMP)/D(ALFA),
CMR SLØPE	ISURF		WING ROLLING MOMENT COEFFICIENT SLOPE, I.E., = D(WCMR)/D(ALFA),
CMY SLØPE	ISURF		WING YAWING MOMENT COEFFICIENT SLOPE, I.E., = D(WCMY)/D(ALFA),
CPN	ND.GE,2		NORMAL FORCE PRESSURE COEFFICIENT FOR AN ELEMENTAL SURFACE,
D(X)	ND.GE,5	L	X-COORDINATE OF POINT D(X,Y,Z) THAT DEFINES THE GEOMETRY OF THE VORTEX FILAMENT B-D,
D(Y)	ND.GE,5	L	X-COORDINATE OF POINT D(X,Y,Z) THAT DEFINES THE GEOMETRY OF THE VORTEX FILAMENT B-D,
D(Z)	ND.GE,5	L	X-COORDINATE OF POINT D(X,Y,Z) THAT DEFINES THE GEOMETRY OF THE VORTEX FILAMENT B-D,
DC	ND.GE,1	L	CHORD INCREMENT OF A VORTEX-LATTICE ELEMENTAL SURFACE.
*DETERMINANT	INTG.COEFF.		VALUE OF DETERMINANT IN VORTEX-LATTICE MATRIX INVERSION,
DIHED(MGC/4)	GEOMETRY	DEG.	DIHEDRAL ANGLE BASED ON THE 1/4-CHORD LOCATION OF THE MEAN GEOMETRIC CHORD AND ROOT CHORD SPAN STATIONS,
DS	ND.GE,1	L**2	TRUE AREA INCREMENT OF A VORTEX-LATTICE ELEMENTAL SURFACE.
DWL	ND.GE,1	L	TRUE SPAN DIMENSION OF A VORTEX-LATTICE ELEMENTAL SURFACE.
E	INTG.COEFF.		DESIGNATION OF ELEMENTAL SURFACE (NTH SURFACE),
EB	INTG.COEFF.	L	SPAN OF ELEMENTAL SURFACE.
ECD	INTG.COEFF.		INDUCED DRAG COEFFICIENT FOR ELEMENTAL SURFACE,
ECL	INTG.COEFF.		LIFT COEFFICIENT FOR ELEMENTAL SURFACE,
ECMP	INTG.COEFF.		PITCHING MOMENT COEFFICIENT FOR ELEMENTAL SURFACE.
ECMR	INTG.COEFF.		ROLLING MOMENT COEFFICIENT FOR ELEMENTAL SURFACE.
ECMY	INTG.COEFF.		YAWING MOMENT COEFFICIENT FOR ELEMENTAL SURFACE

5.5 ALPHABETICAL LIST OF OUTPUT QUANTITIES (CONTINUED)

VARIABLE	COMMENT	UNITS	DEFINITION
ECN	INTG.COEFF.		NORMAL FORCE COEFFICIENT FOR ELEMENTAL SURFACE.
ECX	INTG.COEFF.		HORIZONTAL FORCE COEFFICIENT FOR ELEMENTAL SURFACE.
ECY	INTG.COEFF.		SIDE FORCE COEFFICIENT FOR ELEMENTAL SURFACE.
ELAPSED TIME	COMMENT		TIME ELAPSED SINCE START OF EXECUTION.
EMGC	INTG.COEFF.	L	MEAN GEOMETRIC CHORD OF ELEMENTAL SURFACE.
ES	INTG.COEFF.	L**2	AREA OF ELEMENTAL SURFACE.
EW	ND.GE,1	L	TRUE SPAN COORDINATE MEASURED AT POINT B OF AN ELEMENTAL SURFACE VORTEX FILAMENT.
EXA	INTG.COEFF.	L	LONGITUDINAL STATION FOR 1/4-CHORD POINT LOCATION OF ELEMENTAL SURFACE MEAN GEOMETRIC CHORD.
EZA	INTG.COEFF.	L	WATERLINE STATION FOR 1/4-CHORD POINT LOCATION OF ELEMENTAL SURFACE MEAN GEOMETRIC CHORD.
FCH	ISURF		HINGE MOMENT SECTION COEFFICIENT FOR FLAP OR AILERON CONTROL SURFACES.
FCN	ISURF		NORMAL FORCE SECTION COEFFICIENT FOR FLAP OR AILERON CONTROL SURFACES.
FCX	ISURF		CHORDWISE FORCE SECTION COEFFICIENT FOR FLAP OR AILERON CONTROL SURFACES.
FLAP DEFLEC	GEOMETRY	DEG.	FLAP DEFLECTION, I.E., + = DOWN.
FLAP SPAN1	GEOMETRY	L OR L/B	SPAN LOCATION OF THE INNER EDGE OF THE FLAP.
FLAP SPAN2	GEOMETRY	L OR L/B	SPAN LOCATION OF THE OUTER EDGE OF THE FLAP OR INNER EDGE OF THE AILERON.
FLAP SPAN3	GEOMETRY	L OR L/B	SPAN LOCATION OF THE OUTER EDGE OF THE AILERON.
FUS STA X(CG)	GEOMETRY	L	LONGITUDINAL STATION (X-COORDINATE) FOR THE LOCATION OF THE CENTER OF GRAVITY.
GAMA	ND.GE,2		STRENGTH OR CONCENTRATED VORTICITY FOR THE VORTEX FILAMENT OF AN ELEMENTAL SURFACE DEFINED BY THE POINTS B(X,Y,Z) AND D(X,Y,Z).
G(X)	ND.GE,2		X-COMPONENT OF THE UNIT VECTOR THAT DEFINES THE LINE OF ACTION OF THE LIFT FORCE ACTING ON AN ELEMENTAL SURFACE.
G(Y)	ND.GE,2		Y-COMPONENT OF THE UNIT VECTOR THAT DEFINES THE LINE OF ACTION OF THE LIFT FORCE ACTING ON AN ELEMENTAL SURFACE.
G(Z)	ND.GE,2		Z-COMPONENT OF THE UNIT VECTOR THAT DEFINES THE LINE OF ACTION OF THE LIFT FORCE ACTING ON AN ELEMENTAL SURFACE.
J			SPAN ARGUMENT OR INDEX.
JOB TIME	COMMENT		TIME ELAPSED FOR EXECUTION OF LAST JOB.

5.5 ALPHABETICAL LIST OF OUTPUT QUANTITIES (CONTINUED)

VARIABLE	COMMENT	UNITS	DEFINITION
K			CHORD ARGUMENT OR INDEX.
L/D	ISURF		LIFT TO DRAG RATIO.
L,AİL DEFLEC	GEOMETRY	DEG.	LEFT AILERON DEFLECTION, I.E., + = DOWN, AND, - = UP.
MACHN			MACH NUMBER OF THE FREE STREAM VELOCITY.
MEAN CHORD	GEOMETRY	L	MEAN CHORD OF LIFTING SURFACE, I.E., EQUAL TO AREA/SPAN
MGC (MAC)	GEOMETRY	L	MEAN GEOMETRIC CHORD THAT IS DEFINED EQUAL TO THE MEAN AERODYNAMIC CHORD.
ND	OUTPUT		VALUE ASSIGNED TO NFLG(20) OR IFLG(10).
NG	ND.GE,5		SECOND ARGUMENT OR INDEX OF VORTEX-LATTICE INFLUENCE COEFFICIENT MATRIX.
NØ,CHORD DISCØN.	GEOMETRY		NUMBER OF CHORD DISCONTINUITIES FOR THE LIFTING SURFACE VORTEX-LATTICE REPRESENTATION.
NØ,CHORD ELEMENTS	GEOMETRY		NUMBER OF CHORD ELEMENTS FOR THE LIFTING-SURFACE VORTEX-LATTICE REPRESENTATION.
NØ,PLØT FILES	COMMENT		NUMBER OF FILES OUTPUT ON UNIT KT2 THAT ARE USED IN THE PROGRAM PLOTTING OPTION.
NØ,SPAN ELEMENTS	GEOMETRY		NUMBER OF SPAN ELEMENTS FOR THE LIFTING-SURFACE VORTEX-LATTICE REPRESENTATION.
NP	ND.GE,5		FIRST ARGUMENT OR INDEX OF VORTEX-LATTICE INFLUENCE COEFFICIENT MATRIX.
P(X)	ND.GE,2	L	X-COORDINATE OF A FIELD POINT ABOUT WHICH THE INDUCED VELOCITY IS CALCULATED.
P(Y)	ND.GE,2	L	Y-COORDINATE OF A FIELD POINT ABOUT WHICH THE INDUCED VELOCITY IS CALCULATED.
P(Z)	ND.GE,2	L	Z-COORDINATE OF A FIELD POINT ABOUT WHICH THE INDUCED VELOCITY IS CALCULATED.
RØØT CHØRD	GEOMETRY	L	CHORD LENGTH OF THE ROOT STATION.
RØØT TWIST	GEOMETRY	DEG.	GEOMETRIC TWIST OF CHORD PLANE AT THE ROOT, STATION (WASHIN), WHERE, + = LEADING EDGE UP, AND - = LEADING EDGE DOWN.
R,AİL DEFLEC	GEOMETRY	DEG.	RIGHT AILERON DEFLECTION, I.E., + = DOWN, AND, - = UP.
*SCALE	INTG.COEFF.		AVERAGE VALUE OF ELEMENTS IN THE VORTEX-LATTICE MATRIX
SCD	SECT.COEFF.		SECTION DRAG COEFFICIENT.
SCDI	ISURF		SECTION COEFFICIENT FOR INDUCED DRAG.
SCL	SECT.COEFF.		SECTION LIFT COEFFICIENT.
SCLA1	ISURF		ADDITIONAL LIFT DISTRIBUTION SECTION LIFT COEFFICIENT.

5.5 ALPHABETICAL LIST OF OUTPUT QUANTITIES (CONTINUED)

VARIABLE	COMMENT	UNITS	DEFINITION
SCLB	ISURF		BASIC LIFT DISTRIBUTION (WCL=0,0) SECTION LIFT COEFFICIENT.
SCLC/B	SECT.COEFF.		SECTION SPAN LOADING COEFFICIENT, I.E., $SCL*(C/B)$.
SCN	SECT.COEFF.		SECTION NORMAL AIRLOAD COEFFICIENT, I.E., ACTING IN THE -Z DIRECTION.
SCX	SECT.COEFF.		SECTION CHORDWISE AIRLOAD COEFFICIENT, I.E., ACTING IN THE +X DIRECTION.
SMP C/4	SECT.COEFF.		SECTION PITCHING-MOMENT COEFFICIENT ABOUT THE LOCAL 1/4-CHORD LOCATION.
SPAN	GEOMETRY	L	SPAN OF LIFTING SURFACE.
SPAN B(CG)	GEOMETRY	L	REFERENCE SPAN LENGTH USED FOR NORMALIZING THE C.G. AERODYNAMIC COEFFICIENTS.
SWEEP(MGC/4)	GEOMETRY	DEG.	SWEEPBACK ANGLE BASED ON THE 1/4-CHORD LOCATION OF THE MEAN GEOMETRIC CHORD AND ROOT CHORD SPAN STATIONS.
TAB DEFLEC	GEOMETRY	DEG.	TAB DEFLECTION, I.E., + = DOWN, AND, - = UP.
TIP CHORD	GEOMETRY	L	CHORD LENGTH OF THE TIP STATION.
TIP TWIST	GEOMETRY	DEG.	GEOMETRIC TWIST OF CHORD PLANE AT THE TIP, STATION (WASHOUT), WHERE, + = LEADING EDGE UP, AND - = LEADING EDGE DOWN.
TWIST	GEOMETRY	DEG.	GEOMETRIC TWIST OF THE CHORD PLANE, WHERE, + = LEADING EDGE UP, AND, - = LEADING EDGE DOWN.
VFS(MAT)	ND.GE,5	V/UFS	FREE STREAM VECTOR VELOCITY COMPONENT NORMAL TO THE ELEMENTAL SURFACE AT THE COLOCATION POINT P(X,Y,Z).
VIN(MAT)	ND.GE,5	V/UFS	INDUCED VELOCITY VECTOR COMPONENT NORMAL TO THE ELEMENTAL SURFACE AT THE COLOCATION POINT P(X,Y,Z) DUE TO THE VORTEX FILAMENT DEFINED BY B(X,Y,Z) AND D(X,Y,Z) POINTS.
VI(X)	ND.GE,2	V/UFS	X-COMPONENT OF THE VELOCITY VECTOR INDUCED BY THE SUM OF ALL ELEMENTAL SURFACE VORTEX FILAMENTS.
VI(Y)	ND.GE,2	V/UFS	Y-COMPONENT OF THE VELOCITY VECTOR INDUCED BY THE SUM OF ALL ELEMENTAL SURFACE VORTEX FILAMENTS.
VI(Z)	ND.GE,2	V/UFS	Z-COMPONENT OF THE VELOCITY VECTOR INDUCED BY THE SUM OF ALL ELEMENTAL SURFACE VORTEX FILAMENTS.
W	SECT.COEFF.	L	CUMULATIVE WETTED-SPAN DIMENSION IN CORE.
WCDI	ISURF		WING INDUCED DRAG COEFFICIENT.
WCL	ISURF		WING LIFT COEFFICIENT.
WCL SLOPE	ISURF		WING LIFT SLOPE, I.E., $WCL/(ALFA-ALFAR0)$

5.5 ALPHABETICAL LIST OF OUTPUT QUANTITIES (CONTINUED)

VARIABLE	COMMENT	UNITS	DEFINITION
WCMP	ISURF		WING PITCHING MOMENT COEFFICIENT ABOUT 1/4 MAC. (MAC= MEAN AERODYNAMIC CHORD)
WCMR	ISURF		WING ROLLING MOMENT COEFFICIENT,
WCMY	ISURF		WING YAWING MOMENT COEFFICIENT,
WING STA Y(CG)	GEOMETRY	L	SPAN STATION (Y-COORDINATE) FOR THE LOCATION OF THE CENTER OF GRAVITY,
WL	ND.GE,1	L	SPAN COORDINATE IN-CORE FOR POINT B OF AN ELEMENTAL SURFACE VORTEX FILAMENT,
WL STA Z(CG)	GEOMETRY		VERTICAL WATER-LINE STATION (Z-COORDINATE) FOR THE LOCATION OF THE CENTER OF GRAVITY,
WS	GEOMETRY	L	WETTED-LENGTH SPAN STATION,
X		L	X-COORDINATE DEFINED FOR A RIGHT-HAND LOFT COORDINATE SYSTEM,
XA(N)/C	CAMBER	L/C	CHORD STATION NORMALIZED BY CHORD LENGTH FOR THE NTH-LOCATION, N=1,2,3,.....,10.
XBAR	GEOMETRY	L	LONGITUDINAL COORDINATE FOR THE 1/4-CHORD LOCATION OF THE MEAN GEOMETRIC CHORD,
X(C/4)	GEOMETRY	L	LONGITUDINAL STATION (X-COORDINATE) OF THE 1/4-CHORD LOCATION OF THE CHORD PLANE,
X(LE)	GEOMETRY	L	LONGITUDINAL STATION (X-COORDINATE) OF THE LEADING EDGE OF THE CHORD PLANE,
XN	ND.GE,1	L	X-COORDINATE OF THE COLOCATION POINT OF AN ELEMENTAL SURFACE,
X(TE)	GEOMETRY	L	LONGITUDINAL STATION (X-COORDINATE) OF THE TRAILING EDGE OF THE CHORD PLANE,
XV	ND.GE,1	L	X-COORDINATE OF POINT B OF AN ELEMENTAL SURFACE VORTEX FILAMENT,
Y		L	Y-COORDINATE DEFINED FOR A RIGHT-HAND LOFT COORDINATE SYSTEM,
Y*	SECT.COEFF,		DIMENSIONLESS SPAN COORDINATE, I.E., Y/SPAN,
YBAR	GEOMETRY	L	SPAN COORDINATE FOR THE 1/4-CHORD LOCATION OF THE MEAN GEOMETRIC CHORD,
YN	ND.GE,1	L	Y-COORDINATE OF THE COLOCATION POINT OF AN ELEMENTAL SURFACE,
YV	ND.GE,1	L	Y-COORDINATE OF POINT B OF AN ELEMENTAL SURFACE VORTEX FILAMENT
Z		L	Z-COORDINATE DEFINED FOR A RIGHT-HAND LOFT COORDINATE SYSTEM,
ZA(N)/C	CAMBER	L/C	VERTICAL LOCATION OF MEAN-CAMBER PLANE RELATIVE TO THE CHORD PLANE AND NORMALIZED BY THE CHORD,
ZBAR	GEOMETRY	L	VERTICAL COORDINATE FOR THE 1/4-CHORD LOCATION OF THE MEAN GEOMETRIC CHORD,

5.5 ALPHABETICAL LIST OF OUTPUT QUANTITIES (CONTINUED)

VARIABLE	COMMENT	UNITS	DEFINITION
ZN	ND.GE,1	L	Z-COORDINATE OF THE COLOCATION POINT OF AN ELEMENTAL SURFACE.
ZV	ND.GE,1	L	Z-COORDINATE OF POINT B OF AN ELEMENTAL SURFACE VORTEX FILAMENT
1XL	SECT.COEFF.		UNIT VECTOR IN THE +X DIRECTION FOR SECTION AIRLOAD.
1XN	ND.GE,1		X-COMPONENT OF THE NORMAL-UNIT-VECTOR AT THE COLOCATION POINT OF AN ELEMENTAL SURFACE.
1XV	ND.GE,1		X-COMPONENT OF THE UNIT VECTOR THAT DEFINES THE SPANWISE ORIENTATION OF THE VORTEX FILAMENT OF AN ELEMENTAL SURFACE.
1YL	SECT.COEFF.		UNIT VECTOR IN THE +Y DIRECTION FOR SECTION AIRLOAD.
1YN	ND.GE,1		Y-COMPONENT OF THE NORMAL-UNIT-VECTOR AT THE COLOCATION POINT OF AN ELEMENTAL SURFACE.
1YV	ND.GE,1		Y-COMPONENT OF THE UNIT VECTOR THAT DEFINES THE SPANWISE ORIENTATION OF THE VORTEX FILAMENT OF AN ELEMENTAL SURFACE.
1ZL	SECT.COEFF.		UNIT VECTOR IN THE +Z DIRECTION FOR SECTION AIRLOAD.
1ZN	ND.GE,1		Z-COMPONENT OF THE NORMAL-UNIT-VECTOR AT THE COLOCATION POINT OF AN ELEMENTAL SURFACE.
1ZV	ND.GE,1		Z-COMPONENT OF THE UNIT VECTOR THAT DEFINES THE SPANWISE ORIENTATION OF THE VORTEX FILAMENT OF AN ELEMENTAL SURFACE.

* PROGRAM-CHECKOUT OUTPUT - NAMELIST DBUGV1, DBUGV2, DBUGV3, OR REFLEX *

VARIABLE	COMMENT	UNITS	DEFINITION
ALFAR	ND.GT,15	RAD.	ANGLE OF ATTACK.
B	ND.GE,5	L	X-Y-Z COORDINATES OF POINT B(X,Y,Z) THAT DEFINES THE LOCATION OF THE ELEMENTAL VORTEX FILAMENT B-D.
COSR	ND.GT,15		COSINE(ALFAR).
D	ND.GE,5	L	X-Y-Z COORDINATES OF POINT D(X,Y,Z) THAT DEFINES THE LOCATION OF THE ELEMENTAL VORTEX FILAMENT B-D.
GAMA	ND.GE,5		STRENGTH OR CONCENTRATED VORTICITY OF THE VORTEX FILAMENT B-D.
P	ND.GE,5	L	X-Y-Z COORDINATES OF THE FIELD POINT P(X,Y,Z).
PHI	ND.GT,15	RAD.	ROTATION ANGLE.

5.5 ALPHABETICAL LIST OF OUTPUT QUANTITIES (CONTINUED)

VARIABLE	COMMENT	UNITS	DEFINITION
PSIF	ND,GE,5		INFLUENCE FUNCTION PSI,
PX	ND,GT,15	L	X-COORDINATE,
PY	ND,GT,15	L	Y-COORDINATE,
RX	ND,GT,15	L	X-COORDINATE FOR IMAGE POINT,
RY	ND,GT,15	L	Y-COORDINATE FOR IMAGE POINT,
TANA	ND,GE,5		TANGENT OF ALPHA,
VCØS	ND,GE,5		X-Y-Z COMPONENTS OF THE INDUCED VELOCITY VECTOR AT POINT P(X,Y,Z) DUE TO THE VORTEX FILAMENT B-D,
X1	ND,GT,15	L	X-COORDINATE FOR INTERMEDIATE POINT,
Y1	ND,GT,15	L	Y-COORDINATE FOR INTERMEDIATE POINT,
ZL	ND,GT,15	L	ALTITUDE,

5.6 LIST OF ABBREVIATIONS FOR OUTPUT

ALFA ANGLE OF ATTACK

AIL AILERON

ASSIG. ASSIGNMENT

CAMBER AIRFOIL SECTION MEAN CAMBER SPECIFICATIONS

CL LIFT COEFFICIENT

CØNS. CONSTANT

C.G. CENTER OF GRAVITY

DEG. ANGLE MEASURED IN DEGREES

DIM. DIMENSION

.EQ. EQUAL

E.G. FOR EXAMPLE

GEØMETRY LIFTING SURFACE GEOMETRY SPECIFICATIONS

.GE. GREATER OR EQUAL

.GT. GREATER THAN

INTG.CØEFF. SPATIALLY-INTEGRATED COEFFICIENTS

I.E. EQUIVALENT TO

5.6 LIST OF ABBREVIATIONS FOR OUTPUT (CONTINUED)

L	LINEAR DIMENSION
.LE.	LESS OR EQUAL
.LT.	LESS THAN
L/B	LINEAR DIMENSION NORMALIZED BY THE SPAN
L/C	LINEAR DIMENSION NORMALIZED BY THE CHORD
L**2	AREA UNITS, I.E., LINEAR UNITS SQUARED
ND,GE,1	NFLAG(20) OR IFLAG(10) GREATER OR EQUAL TO 1
ND,GE,2	NFLAG(20) OR IFLAG(10) GREATER OR EQUAL TO 2
ND,GE,5	NFLAG(20) OR IFLAG(10) GREATER OR EQUAL TO 5
ND,GT,15	NFLAG(20) OR IFLAG(10) GREATER THAN 15
ØPT.	OPTIONAL
RAD.	ANGLE MEASURED IN RADJANS
REF	REFERENCE
SECT,CØEFF.	AIRLOAD SECTION COEFFICIENTS
SURF.	SURFACE
V/UFS	VELOCITY NORMALIZED BY THE FREE STREAM VELOCITY
*	MULTIPLICATION
**	EXPONENTIATION

6.0 EXAMPLE PROBLEMS

6.1 INPUT-DATA LISTINGS

EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION

```

VZ RUN T54589.TRW.1001.3303A.1001.C.5.1          GOMEZ TRW
V PLT
VN MSG      FILE REG.  TAPE 1 FM432 3 FSTRN 1
V ASG X=A10202
V ASG F
V XQT CUR
  TRW X
  ERS
  PEF X
  IN X
  TRI X
V XQT NSURF
EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION
TASK 702, PROJECT 3303A, MJO 147033, AERODYNAMIC ANALYSIS AND DESIGN
SUBSONIC-FLDWF LIFTING SURFACE ANALYSIS, TRW PROGRAM NO. HA0109 (NSURF)
A.V.GOMEZ/ 5 JULY 1972

$INPUT
NWMING=2, NFUS=1, NVTAIL=-2,
MWMING=1,
NNS(1)=3, NCS(1)=2, NFLG(1)=28, NFLG(6)=4, NFLG(11)=1,
X(1)=3*30., Y(1)=0.,40.,140., Z(1)=2*0.,-17.633, E(1)=2*4.,-1., XOCR(1)=3*1.,
C(1)= 2*40.,10., XOC(1,1)=0.,1., FLAPC(1)=3*0.30, TABC(1)=3*0.08,
FLAPDJ(1)= 40., AILDJ(1,1)=-20.,15., WFLAP1(1)=0.,WFLAP2(1)=40.,WFLAP3(1)=140.,
MVTAIL=1,
NNS(2)=5, NCS(2)=2, NFLG(2)=8, NFLG(7)=3, NFLG(12)=1,
X(4)=2*150., Y(4)=0.,40., Z(4)= 2*-20., E(4)=2*-2., XOCR(4)=2*1., C(4)=30.,20.,
XOC(1,2)=0.,1., FLAPC(4)=2*10., TABC(4)=2*3.,
FLAPDJ(2)=30., WFLAP1(2)=0.,WFLAP2(2)=40.,WFLAP3(2)=40.,
MFUSEL=1,
NNS(3)=7, NCS(3)=2, NFLG(3)=2, NFLG(8)=4,
X(6)=2*-50., Y(6)=2*0., Z(6)=0.,-20., E(6)=2*0., XOCR(6)=2*0., C(6)=80.,200.,
XOC(1,3)=0.,1.,
MVTAIL=1,
NNS(4)=9, NCS(4)=2, NFLG(4)=3, NFLG(9)=4, NFLG(14)=1,
X(8)=2*150., Y(8)=2*40., Z(8)=-10.,-40., E(8)=2*0., XOCR(8)=2*1.,
C(8)=25.,10., XOC(1,4)=0.,1., FLAPC(8)=2*0.5, TABC(8)=2*0.10,
FLAPDJ(4)= 30., WFLAP1(4)=0.,WFLAP2(4)=30.,WFLAP3(4)=30.,
NACELE=1,
NNS(5)=12, NCS(5)=2, NFLG(5)=2, NFLG(10)=6,
X(10)=3*-30., Y(10)=3*40., Z(10)=10*0.,-10., E(10)=3*0., XOCR(10)=3*0.,
C(10)=30., 2*40., XOC(1,5)=0.,1.,
XCG=0.0, REFC=32.681, REFB=280.0, REFS=8200.0,
KT2=8, NFLG(19)=1, NJDB=1, ALFA=10., MACHN=0.2, NSOLV=12*0,
$END
EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION
$INPUT
NWMING=2, NFUS=0, NVTAIL=0, NFLG(19)=0, NSOLV=1,1, 1,2, FLAPDJ= 30.,-10.,
NFLG(1)=14,4,
$END
$ENDJOB8
V XQT TRWPLT
  KUNIT = 8
  ICCOMP = 0
  NTRAN = 0
  IPRINT = 0
  NTYPE = 0
  NDFSCL = 1
  ISCALY = 1,1,1,1,1,1,1,1,1
  NXL = 24
  NXR = 24
  NYL = 24
  NYH = 24
  NPOSN1 = 600, 950
  NPOSN2 = 600, 925
  NPOSN3 = 600, 900
  NPOSN4 = 600, 50
  ANNOT1 = 10 = EXAMPLE PROB. 1 - MULTIPLE-SURFACE
  ANNOT2 = 10 = CAPABILITY DEMONSTRATION RUN
  ANNOT3 = 10 = A.GOMEZ/ 5 JULY 72
  ANNOT4 = 10 =
  CHARSZ = 1.0,1.0,1.0,1.0
  TITLE = 10 = ISOMETRIC PROJECTION OF LIFTING SURFACES
  XLABEL = 10 = HORIZONTAL AXIS, SEMISPANS
  YLABEL = 10 = VERTICAL AXIS SEMISPANS
  XHI= 1.5
  XLO=-1.0
  YHI= 1.5
  YLO=-1.0
  PLOT = 2,1, 3,1, ENDLST
ENDPLT
  ANOTSV = 0
  NOADV = 1
  PLDT = 5,1, 6,1, ENDLST
ENDPLT
  NOADV = 1
  PLOT = 2,2, 3,2, ENDLST
ENDPLT
  NOADV = 1
  PLOT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
  NOADV = 1
  PLOT = 2,1, 3,1, ENDLST
ENDPLT
  NOADV = 1
  PLOT = 5,1, 6,1, ENDLST
ENDPLT

```

39 PUNCHED-CARDS INPUT DECK
REQUIRED FOR XQT NSURF

120 PUNCHED-CARDS INPUT DECK
REQUIRED FOR XQT TRWPLT
(PLOT-OPTION)

ORIGINAL PAGE IS
OF POOR QUALITY

- GENERAL NOTES:
1. V = 7/8 PUNCH
 2. COMMENTS ARE PRINTED IN "ITALIC TYPE"
 3. DASHED-LINES INDICATE THE START OF A NEW OUTPUT PAGE (-----)
 4. BROKEN-SOLID-LINES INDICATES OUTPUT HAS BEEN EDITED (-----)

6.1 INPUT-DATA LISTINGS (CONTINUED)

```
NOADV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
NOADV = 1
PLOT = 2,1, 3,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
NOADV = 1
PLOT = 2,1, 3,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
NOADV = 1
PLOT = 2,1, 3,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
NOADV = 1
PLOT = 2,1, 3,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
ENDRUN
VEOF
```

6.1 INPUT-DATA LISTINGS (CONTINUED)

EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION

```

VZ RUN T54589,TRW,1002,3303A,1002,C,5,1          GOMEZ TRW
VN MSC FILE REQ. TAPE 1 FH432 3 FSTRN 1
V ASC X=10202
V ABC F
V PLT
V XQT CUR
  TRW X
  EPS
  PFF X
  IN X
V XQT ISURF
EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION
TASK 702, PROJECT 3303A, MJO 147033, AERODYNAMIC ANALYSIS AND DESIGN
SUBSONIC-FLOW LIFTING SURFACE ANALYSIS, TRW PROGRAM NO. H4010B (NSURF)
A.V.GOMEZ/ 5 JULY 1972

$INPUT
NCS=2, NCS=2, IFLG(2)=0.16,0, IFLG(5)=1.4,0, IFLG(8)=1, IFLG(10)=5,
X=2*0.0, Y=0.0,30.0, Z=2*0.0, E=2*0.0, C=15.0,5.0, XDCR=0.25, XOC=0.0,1.0,
WFLAP1=0., WFLAP2=0.625, WFLAP3=1.0, FLAPC=0.25, WSHDTH=0.25,
PHECF=1, LDRAG=1, CLEANF=0.0035, NJOB=1, MACHN=0.2, ALFA=0, DELALF=-12,
FLAPDJ=30.0, AILDJ=10.0,-15.0,
KT2=8, IFLG(11)=4*1,
NJOBL=9, WCL=1, 0.,0.25,0.5,0.75,1.0,1.25,1.5,1.75,2.0,
$END

V XQT TRMPLT
KUNIT = 8
ICCOMP = 0
NTRAN = 0
IPRINT = 0
NTYPE = 0
NOFSCAL = 1
ISCALY = 1,1,1,1,1,1,1,1,1,1
NXL = 24
NYR = 24
NYL = 24
NYH = 24
NPOSN1 = 600, 950
NPOSN2 = 600, 925
NPOSN3 = 600, 900
NPOSN4 = 600, 875
CHARSZ = 1.0, 1.0, 1.0, 1.0
ANNOT1 = 10 = EXAMPLE PROB, 2 - SINGLE-SURFACE
ANNOT2 = 10 = CAPABILITY DEMONSTRATION RUN
ANNOT3 = 10 = A.GOMEZ/ 5 JULY 72
ANNOT4 = 10 =
TITLE = 10 = LIFTING SURFACE PLANFORM GEOMETRY
XLABEL = 10 = HORIZONTAL AXIS, SEMISPANS
YLABEL = 10 = VERTICAL AXIS SEMISPANS
XLO = -1.1
XHI = 1.1
YLO = -1.5
YHI = 1.7
PLOT = 1,1, 2,1, 4,1, ENDLST
ENDPLT
ANOTSV = 0
NOADV = 1
PLOT = 1,2, 2,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,3, 2,3, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,4, 2,4, 3,4, ENDLST
ENDPLT
TITLE = 10 = ISOMETRIC PROJECTION OF WING PLANFORM
YLO = -1.1
YHI = 1.1
PLOT = 1,5, 2,5, ENDLST
ENDPLT
NOADV = 1
PLOT = 3,5, 4,5, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,6, 2,6, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,7, 2,7, ENDLST
ENDPLT
PLOT = 5,5, 2,5, ENDLST
ENDPLT
NOADV = 1
PLOT = 6,5, 4,5, ENDLST
ENDPLT
NOADV = 1
PLOT = 3,6, 2,6, ENDLST
ENDPLT
NOADV = 1
PLOT = 3,7, 2,7, ENDLST
ENDPLT
ENDFIL
ANNOT1 = 10 = EXAMPLE PROB, 2 - SINGLE-SURFACE
ANNOT2 = 10 = CAPABILITY DEMONSTRATION RUN
ANNOT3 = 10 = A.GOMEZ/ 5 JULY 72
ANNOT4 = 10 =
CHARSZ = 1.0, 1.0, 1.0, 1.0
TITLE = 10 = CHORDWISE PRESSURE DISTRIBUTION (CPL-CPU)
XLABEL = 10 = HORIZONTAL DISTANCE, CHORDS
YLABEL = 10 = DIFFERENTIAL PRESSURE COEFFICIENT
XLO = 0.0
XHI = 3.2
YLO = -3.0
YHI = 9.0
CADD = 0.0, 0.0
PLOT = 1,1, 2,1, ENDLST
ENDPLT
NOADV = 1
CADD = 3,2, 0,5
PLOT = 1,2, 2,2, ENDLST
ENDPLT

```

14 PUNCHED-CARDS INPUT DECK
REQUIRED FOR XQT ISURF

305 PUNCHED-CARDS INPUT DECK
REQUIRED FOR XQT TRMPLT
(13 FIGURES)

FIGURE # 1, PLANFORM VIEW OF WING

FIGURE # 2, ISOMETRIC PROJECTION OF WING

FIGURE # 3, CHORDWISE PRESSURE DISTRIBUTION

6.1 INPUT-DATA LISTINGS (CONTINUED)

```

NOADV = 1
CADD = 0.4, 1.0
PLOT = 1.4, 2.4, ENDLST
ENDPLT
NOADV = 1
CADD = 0.6, 1.9
PLOT = 1.6, 2.6, ENDLST
ENDPLT
NOADV = 1
CADD = 0.8, 2.0
PLOT = 1.8, 2.8, ENDLST
ENDPLT
NOADV = 1
CADD = 1.0, 2.5
PLOT = 1.9, 2.9, ENDLST
ENDPLT
NOADV = 1
CADD = 1.2, 3.0
PLOT = 1.11, 2.11, ENDLST
ENDPLT
NOADV = 1
CADD = 1.4, 3.5
PLOT = 1.13, 2.13, ENDLST
ENDPLT
NOADV = 1
CADD = 1.6, 4.0
PLOT = 1.15, 2.15, ENDLST
ENDPLT
NOADV = 1
CADD = 1.8, 4.5
PLOT = 1.16, 2.16, ENDLST
ENDPLT

```

```

ENDFIL
TITLE = 10 = SPAN AIRLOAD DISTRIBUTION
XLABEL = 10 = HORIZONTAL DISTANCE, SEMISPANS
YLABEL = 10 = SECTION LIFT COEFFICIENT CL
CADD = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0
XLO = -1.2
XHI = 1.2
YHI = 3.0
YLO = -1.0
PLOT = 1.1, 2.1, ENDLST
ENDPLT

```

FIGURE # 4, SECTION LIFT COEFFICIENT

```

YLABEL = 10 = SECTION INDUCED DRAG COEFFICIENT CDI
PLOT = 1.1, 3.1, ENDLST
ENDPLT

```

FIGURE # 5, SECTION INDUCED DRAG COEFFICIENT

```

YLABEL = 10 = SECTION PITCHING MOMENT COEFFICIENT CMAC
YLO = -1.5
YHI = 1.0
PLOT = 1.1, 4.1, ENDLST
ENDPLT

```

FIGURE # 6, SECTION PITCHING MOMENT COEFFICIENT

```

ENDFIL
TITLE = 10 = LINEAR SOLUTION - SPAN AIRLOAD DISTRIBUTION
XLABEL = 10 = HORIZONTAL DISTANCE, SEMISPANS
YLABEL = 10 = SECTION LIFT COEFFICIENT CL
XLO = -1.2
XHI = 1.2
YLO = -1.5
YHI = 3.0
PLOT = 1.1, 2.1, ENDLST
ENDPLT

```

FIGURE # 7, SECTION LIFT COEFFICIENT ARRAY
(LINEAR SOLUTION)

```

NOADV = 1
PLOT = 1.2, 2.2, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.3, 2.3, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.4, 2.4, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.5, 2.5, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.6, 2.6, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.7, 2.7, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.8, 2.8, ENDLST
ENDPLT

```

FIGURE # 8, SECTION INDUCED DRAG COEFFICIENT ARRAY
(LINEAR SOLUTION)

```

YLABEL = 10 = SECTION INDUCED DRAG COEFFICIENT CDI
PLOT = 1.1, 3.1, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.2, 3.2, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.3, 3.3, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.4, 3.4, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.5, 3.5, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.6, 3.6, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.7, 3.7, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.8, 3.8, ENDLST
ENDPLT

```

FIGURE # 9, SECTION PITCHING MOMENT COEFFICIENT ARRAY
(LINEAR SOLUTION)

```

YLABEL = 10 = SECTION PITCHING MOMENT COEFFICIENT CMAC
YLO = -1.5
YHI = 1.0
PLOT = 1.1, 4.1, ENDLST
ENDPLT
NOADV = 1
PLOT = 1.2, 4.2, ENDLST
ENDPLT

```


6.1 INPUT-DATA LISTINGS (CONTINUED)

```

NOADV = 1
PLOT = 1,3, 4,3, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,4, 4,4, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,5, 4,5, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,6, 4,6, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,7, 4,7, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,8, 4,8, ENDLST
ENDPLT

```

```

YLABEL= 10 = FLAP/AIL NORMAL FORCE COEFF CNF
YLO = -2.0
YHI = 4.0
PLOT = 1,1, 5,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,2, 5,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,3, 5,3, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,4, 5,4, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,5, 5,5, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,6, 5,6, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,7, 5,7, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,8, 5,8, ENDLST
ENDPLT

```

FIGURE # 10, FLAP NORMAL FORCE SECTION COEFFICIENT ARRAY
(LINEAR SOLUTION)

```

YLABEL= 10 = FLAP/AIL HORIZ FORCE COEFF CXF
PLOT = 1,1, 6,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,2, 6,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,3, 6,3, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,4, 6,4, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,5, 6,5, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,6, 6,6, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,7, 6,7, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,8, 6,8, ENDLST
ENDPLT

```

FIGURE # 11, FLAP CHORD FORCE SECTION COEFFICIENT ARRAY
(LINEAR SOLUTION)

```

YLABEL= 10 = FLAP/AIL HINGE MOMENT COEFF CHF
YLO = -1.5
YHI = 1.0
PLOT = 1,1, 7,1, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,2, 7,2, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,3, 7,3, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,4, 7,4, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,5, 7,5, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,6, 7,6, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,7, 7,7, ENDLST
ENDPLT
NOADV = 1
PLOT = 1,8, 7,8, ENDLST
ENDPLT

```

FIGURE # 12, FLAP HINGE MOMENT SECTION COEFFICIENT ARRAY
(LINEAR SOLUTION)

```

YLABEL = 10 = WING AIRLOAD COEFFICIENTS
XLABEL = 10 = WING ANGLE OF ATTACK, ALFA
XLO = -15.0
XHI = 25.0
YLO = -1.0
YHI = 3.0
PLOT = 1,9, 2,9, 3,9, 4,9, ENDLST
ENDPLT
ENDFIL
ENDRUN
YEOF

```

FIGURE # 13, WING AIRLOAD COEFFICIENTS
(LINEAR SOLUTION)

6.1 INPUT-DATA LISTINGS (CONTINUED)

```

NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLOT
ENDFIL
NOADV = 1
PLOT = 2,1, 3,1, ENDLST
ENDPLOT
NOADV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLOT
NOADV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLOT
NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLOT
ENDFIL
NOADV = 1
PLOT = 2,1, 3,1, ENDLST
ENDPLOT
NOADV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLOT
NOADV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLOT
NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLOT
ENDFIL
NOADV = 1
PLOT = 2,1, 3,1, ENDLST
ENDPLOT
NOADV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLOT
NOADV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLOT
NOADV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLOT
ENDFIL
ENDRUN
VEQF

```

EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC ANALYSIS


```

WZ RUN T94889,TRW,1004,3303A,1004,C,2,1          GOMEZ TRW
VN MSG FILE REQ, TAPE 1 FH432 3 FSTRN 1
V ASG X=410202
V ASG F
V PLT
V XQT CUR
TRW X
ERS
PEF X
TRW A

```

```

V XQT NSURF
EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC ANALYSIS
TASK 702, PROJECT 3303A, MJO 147033, AERODYNAMIC ANALYSIS AND DESIGN
SUBSONIC-FLOW LIFTING SURFACE ANALYSIS, TRW PROGRAM NO. H4010B (NSURF)
A.V.GOMEZ/ 5 JULY 1972

```

```

$INPUT
NWXING=3, NVTAIL=0, NFUS=0, COLOCP=0,75,
NFLG(1)=3*10, NFLG(6)=3*9, NFLG(19)=1.2,
NCS=2*10,2, NSS=2,4,6,
THICKW= 1,
XOC(1,1)= .00, .05, .10, .15, .20, .30, .40, .60, .80, 1.0,
XOC(1,2)= .00, .05, .10, .15, .20, .30, .40, .60, .80, 1.0,
ZOC(1,1)= .0, .34443, .05853, .06682, .07172, .07502, .07254, .05704, .03279, .0,
ZOC(1,2)= .0, .34443, .05853, .06682, .07172, .07502, .07254, .05704, .03279, .0,
ZOC(1,3)= .0, -.04443, -.05853, -.06682, -.07172, -.07502, -.07254, -.05704, -.03279, .0,
ZOC(1,4)= .0, -.04443, -.05853, -.06682, -.07172, -.07502, -.07254, -.05704, -.03279, .0,
X = 0.0, 0.0,
Y = 0.10, 0.10,
Z = 0.0, 0.0,
C = 1.0, 1.0, 10.10,
E = 0.0, 0.0,
Z = 0.0, 0.0,
FLATP= 1,
XOC(1,3)= .00, 1.0,
ZOC(1,5)= 0, .0,
ZOC(1,6)= 0, .0,
X(5)= 0.0,
Y(5)= 0.10,
Z(5)= 0.0,
C(5)= 10.10,
E(5)= 0.0,
XCC=0.0, REFC=10.0, REFB=20.0, REFS=200.0,
NJOB=1, ALFA=10, MACHN=0.0, NSOLV=1,2,3,3
SEND
SENDJOBS
V XQT TRWPLT
KUNIT = A
ICOMP = 0
NTRAN = 0
IPRINT = 0
NTYPE = 0
NDFSCAL = 1
ISCALY = 1.1,1,1,1,1,1,1,1,1,1
NXL = 24
NXR = 24
NYL = 24
NYH = 24
NPOSN1 = 600, 950

```

35 PUNCHED-CARDS INPUT DECK
 REQUIRED FOR XQT NSURF

82 PUNCHED-CARDS INPUT DECK
 REQUIRED FOR XQT TRWPLT
 (PLOT OPTION)

6.1 INPUT-DATA LISTINGS (CONTINUED)

```

NPOSN2 = 600, 925
NPOSN3 = 600, 900
NPOSN4 = 600, 50
CHARSZ = 1.0, 1.0, 1.0, 1.0
ANNOT2 = 10 * SUBSONIC AERODYNAMIC ANALYSIS
ANNOT3 = 10 * SUBSONIC AERODYNAMIC ANALYSIS
ANNOT4 = 10 * A.GOMEZ/ 5 JULY 72
CHARSZ = 1.0,1.0,1.0,1.0
TITLE = 10 * ISOMETRIC PROJECTION OF LIFTING SURFACES
XLABEL = 10 * HORIZONTAL AXIS, SEMISPANS
YLABEL = 10 * VERTICAL AXIS SEMISPANS
XLO = -1.0
XHI = 2.0
YLO = -1.0
YHI = 2.0
XLO=-2.0
XHI= 3.0
YLO=-2.0
YHI= 3.0
PLOT = 2,1, 3,1, ENDLST
ENDPLT
NADTV = 0
NADTV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLT
NADTV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLT
NADTV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
NADTV = 1
PLOT = 2,1, 3,1, ENDLST
ENDPLT
NADTV = 1
PLOT = 5,1, 6,1, ENDLST
ENDPLT
NADTV = 1
PLOT = 2,2, 3,2, ENDLST
ENDPLT
NADTV = 1
PLOT = 2,3, 3,3, ENDLST
ENDPLT
ENDFIL
ENDRUN
7EOF

```

EXAMPLE PROBLEM NO. 5 - DEBUG-PRINT OUTPUT OPTIONS DEMONSTRATION

```

07 RUN T54589,TRW,1005,3303A,1005,C,1,1          GOMEZ TRW
0N MSG FILE REQ. TAPE 1 FH432 3 PSTRY 0
0 ASC X=10202
0 XQT CUR
  TRW X
  ERS
  IN X
  TRI X
0 XQT NSURF
EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 0
TASK 702, PROJECT 3303A, MJD 147033, AERODYNAMIC ANALYSIS AND DESIGN
SUBSONIC-FLOW LIFTING SURFACE ANALYSIS, TRW PROGRAM NO. HAD10B (NSURF)
A.V.GOMEZ/ 5 JULY 1972

$INPUT
NHING=1,
NSS(1)=2, MCS(1)=2, NFLG(1)=3, NFLG(6)=2, NFLG(11)=1,
X(1)=2*0., Y(1)=0.,10., Z(1)=2*0., E(1)=2*0., C(1)=2*10., XOCR(1)=2*0.25,
XOC(1)=0.,1., FLAPDJ(1)= 10., NJOB=1, ALFA= 5, MACHN= 0., NSOLV=1,1,
NFLG(20)= 0,
$END
EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 1
$INPUT
NFLG(20)= 1,
$END
EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 2
$INPUT
NFLG(20)= 2,
$END
EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 5
$INPUT
NFLG(20)= 5,
$END
EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 8
$INPUT
NFLG(20)= 8,
$END
EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 16
$INPUT
NFLG(20)= 16, NFLG(17)=1,
$END
$ENDJOBS
0 XQT NSURFT
0 XQT ISURFT
7EOF

```

33 PUNCHED-CARDS INPUT DECK
REQUIRED FOR XQT NSURF

ORIGINAL PAGE IS
OF POOR QUALITY

6.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY

SUBSONIC-FLW LIFTING SURFACE ANALYSIS PROGRAM MA010B

TRW SYSTEMS INC., HOUSTON OPERATIONS

HOUSTON, TEXAS (77056)

**** JOBS INPUT LIST ****

7 XQT NSURF
EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION
TASK 702, PROJECT 3303A, MJO 14703, AERODYNAMIC ANALYSIS AND DESIGN
SUBSONIC-FLW LIFTING SURFACE ANALYSIS, TRW PROGRAM NO. MA010B (NSURF)
A.V. GOMEZ / 5 JULY 1972

```
$INPUT
NWHING=2, NFUS=1, NVTAIL=-2,
MWHING=1,
NCS(1)=3, NCS(11)=2, NFLG(1)=28, NFLG(6)=4, NFLG(11)=1,
X(1)=3*30., Y(1)=0., 40., 140., Z(1)=2*0., -17.053, E(1)=2*4., -1., XOCR(1)=3*1.,
C(1)=2*40., 10., XOC(1,1)=0., 1., FLAPC(1)=3*0., 30., TABC(1)=3*0., 08.,
FLAPDJ(1)= 40., ATLJDJ(1)= -20., 15., WFLAP(1)=0., WFLAP2(1)=40., WFLAP3(1)=140.,
MHTAIL=1,
NCS(2)=5, NCS(21)=2, NFLG(2)=8, NFG(7)=3, NFLG(12)=1,
X(4)=2*150., Y(4)=0., 40., Z(4)= 2*-20., C(4)=2*-2., XOCR(4)=2*1., C(4)=30., 20.,
XOC(1,2)=0., 1., FLAPC(4)=2*10., TABC(4)=2*0.,
FLAPDJ(2)= -30., WFLAP(2)=0., WFLAP2(2)=40., WFLAP3(2)=40.,
NFUSEL=1,
NCS(3)=7, NCS(31)=2, NFLG(3)=2, NFLG(6)=4,
X(6)=2*-50., Y(6)=2*0., Z(6)=0., -20., E(6)=2*0., XOCR(6)=2*0., C(6)=80., 200.,
XOC(1,3)=0., 1.,
MVTAIL=1,
NCS(4)=9, NCS(41)=2, NFLG(4)=3, NFLG(7)=4, NFLG(14)=1,
X(8)=2*150., Y(8)=2*40., Z(8)= -10., -40., E(8)=2*0., XOCR(8)=2*1.,
C(8)=25., 10., XOC(1,4)=0., 1., FLAPC(8)=2*0., TABC(8)=2*0., 10.,
FLAPDJ(4)= 30., WFLAP(4)=0., WFLAP2(4)=30., WFLAP3(4)=30.,
NACELE=1,
NCS(5)=12, NCS(51)=2, NFLG(5)=2, NFLG(10)=0,
X(10)=3*-30., Y(10)=3*40., Z(10)=10., 0., -10., E(10)=3*0., XOCR(10)=3*0.,
C(10)=30., 2*60., XOC(1,5)=0., 1.,
XCG=0., REFC=32.681, REFB=280.0, REFD=8200.0,
KT2=8, NFLG(19)=1, NJOB=L, ALFA=10., MACHN=0.2, NSOLV=12*0,
$END
EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION
$INPUT
NWHING=2, NFUS=0, NVTAIL=0, NFLG(19)=0, NSOLV=1, 1, 1, 2, FLAPDJ= 30., -10.,
NFLG(1)=14, 4,
$END
$ENDJOBS
7 XQT NSURF
```

DASHED LINE INDICATES NEW PAGE

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 1

```
$INPUT
KOUT = +6,
KT1 = +1,
KT2 = +1,
KT3 = +3,
LINK = +50,
NWHING = +2,
NVTAIL = -2,
NFUS = +1,
COLGCP = .7500000E+00,
CUTOF1 = .1000000E-03,
CUTOF2 = .2900000E-02,
LFLAP = +0,
GSCALE = .1000000E+01,
NSS = +3, +9, +7, +9,
NCS = +12, +2, +2, +2, +2, +2,
X = .3000000E+02, .3000000E+02, .3000000E+02, .3000000E+02,
.1500000E+03, .1500000E+03, .1500000E+03, .1500000E+03,
.1500000E+03, .1500000E+03, .1500000E+03, .1500000E+03,
-.3000000E+02, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
Y = .0000000E+00, .0000000E+00, .4000000E+02, .1400000E+03,
.0000000E+00, .4000000E+02, .0000000E+00, .0000000E+00,
.4000000E+02, .4000000E+02, .4000000E+02, .4000000E+02,
.4000000E+02, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
Z = .0000000E+00, .0000000E+00, .0000000E+00, .1763300E+02,
-.2000000E+02, -.2000000E+02, .0000000E+00, -.2000000E+02,
-.1000000E+02, -.4000000E+02, .1000000E+02, .0000000E+00,
-.1000000E+02, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
E = .4000000E+01, .4000000E+01, .4000000E+01, .1000000E+01,
-.2000000E+01, -.2000000E+01, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
.0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
C = .4000000E+02, .4000000E+02, .1000000E+02,
.3000000E+02, .2000000E+02, .1000000E+02, .0000000E+00,
.2500000E+02, .1000000E+02, .0000000E+00, .0000000E+00,
.6000000E+02, .0000000E+00, .0000000E+00, .0000000E+00,
```

ORIGINAL PAGE IS OF POOR QUALITY

6.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

J	K	Y	Z	WL	EW	DWL	DC	DS
1	1	-1.350+02	-1.664+01	1.365+02	1.264+02	1.711+01	2.333+00	2.711+01
2	1	-1.251+02	-1.495+01	1.264+02	1.264+02	1.711+01	3.030+00	3.416+01
3	1	-1.151+02	-1.331+01	1.163+02	1.163+02	1.711+01	3.727+00	4.121+01
4	1	-1.052+02	-1.171+01	1.062+02	1.062+02	1.711+01	4.424+00	4.825+01
5	1	-9.520+01	-1.004+01	9.605+01	9.605+01	1.711+01	5.121+00	5.530+01
6	1	-8.524+01	-8.644+00	8.594+01	8.594+01	1.711+01	5.818+00	6.235+01
7	1	-7.528+01	-7.174+00	7.583+01	7.583+01	1.711+01	6.515+00	6.939+01
8	1	-6.533+01	-5.747+00	6.572+01	6.572+01	1.711+01	7.212+00	7.644+01
9	1	-5.537+01	-4.364+00	5.561+01	5.561+01	1.711+01	7.909+00	8.348+01
10	1	-4.541+01	-3.023+00	4.550+01	4.550+01	1.711+01	8.606+00	9.053+01
11	1	-3.538+01	-2.338+00	3.539+01	3.539+01	1.711+01	9.303+00	9.421+01
12	1	-2.528+01	-2.338+00	2.528+01	2.528+01	1.711+01	9.333+00	9.436+01
13	1	-1.517+01	-1.655+00	1.517+01	1.517+01	1.711+01	9.333+00	9.436+01
14	1	-5.055+00	-2.338+00	5.055+00	5.055+00	1.711+01	9.333+00	9.436+01
15	1	5.055+00	-2.338+00	5.055+00	5.055+00	1.711+01	9.333+00	9.436+01
16	1	1.517+01	-2.338+00	1.517+01	1.517+01	1.711+01	9.333+00	9.436+01
17	1	2.528+01	-2.338+00	2.528+01	2.528+01	1.711+01	9.333+00	9.436+01
18	1	3.538+01	-2.338+00	3.539+01	3.539+01	1.711+01	9.333+00	9.421+01
19	1	4.541+01	-2.438+00	4.550+01	4.550+01	1.711+01	9.303+00	9.753+01
20	1	5.537+01	-4.364+00	5.561+01	5.561+01	1.711+01	8.606+00	8.348+01
21	1	6.533+01	-5.747+00	6.572+01	6.572+01	1.711+01	7.909+00	7.644+01
22	1	7.528+01	-7.174+00	7.583+01	7.583+01	1.711+01	7.212+00	6.939+01
23	1	8.524+01	-8.644+00	8.594+01	8.594+01	1.711+01	6.515+00	6.235+01
24	1	9.520+01	-1.004+01	9.605+01	9.605+01	1.711+01	5.818+00	5.530+01
25	1	1.052+02	-1.171+01	1.062+02	1.062+02	1.711+01	5.121+00	4.825+01
26	1	1.151+02	-1.331+01	1.163+02	1.163+02	1.711+01	4.424+00	4.121+01
27	1	1.251+02	-1.495+01	1.264+02	1.264+02	1.711+01	3.727+00	3.416+01
28	1	1.350+02	-1.664+01	1.365+02	1.365+02	1.711+01	3.030+00	2.711+01

1	2	-1.350+02	-1.667+01	1.365+02	1.365+02	1.711+01	2.333+00	2.711+01
2	2	-1.251+02	-1.497+01	1.264+02	1.264+02	1.711+01	3.030+00	3.416+01
3	2	-1.151+02	-1.329+01	1.163+02	1.163+02	1.711+01	3.727+00	4.121+01
4	2	-1.052+02	-1.165+01	1.062+02	1.062+02	1.711+01	4.424+00	4.825+01
5	2	-9.520+01	-1.004+01	9.605+01	9.605+01	1.711+01	5.121+00	5.530+01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 4

J	K	Y	Z	WL	EW	DWL	DC	DS
6	2	-8.524+01	-8.455+00	8.594+01	8.594+01	1.711+01	5.818+00	6.235+01
7	2	-7.528+01	-6.905+00	7.583+01	7.583+01	1.711+01	6.515+00	6.939+01
8	2	-6.533+01	-5.385+00	6.572+01	6.572+01	1.711+01	7.212+00	7.644+01
9	2	-5.537+01	-3.896+00	5.561+01	5.561+01	1.711+01	7.909+00	8.348+01
10	2	-4.541+01	-2.438+00	4.550+01	4.550+01	1.711+01	8.606+00	9.053+01
11	2	-3.538+01	-1.686+00	3.539+01	3.539+01	1.711+01	9.303+00	9.421+01
12	2	-2.528+01	-1.655+00	2.528+01	2.528+01	1.711+01	9.333+00	9.436+01
13	2	-1.517+01	-1.655+00	1.517+01	1.517+01	1.711+01	9.333+00	9.436+01
14	2	-5.055+00	-1.655+00	5.055+00	5.055+00	1.711+01	9.333+00	9.436+01
15	2	5.055+00	-1.655+00	5.055+00	5.055+00	1.711+01	9.333+00	9.436+01
16	2	1.517+01	-1.655+00	1.517+01	1.517+01	1.711+01	9.333+00	9.436+01
17	2	2.528+01	-1.655+00	2.528+01	2.528+01	1.711+01	9.333+00	9.436+01
18	2	3.538+01	-1.686+00	3.539+01	3.539+01	1.711+01	9.333+00	9.421+01
19	2	4.541+01	-2.438+00	4.550+01	4.550+01	1.711+01	9.303+00	9.753+01
20	2	5.537+01	-3.896+00	5.561+01	5.561+01	1.711+01	8.606+00	8.348+01
21	2	6.533+01	-5.385+00	6.572+01	6.572+01	1.711+01	7.909+00	7.644+01
22	2	7.528+01	-6.905+00	7.583+01	7.583+01	1.711+01	7.212+00	6.939+01
23	2	8.524+01	-8.455+00	8.594+01	8.594+01	1.711+01	6.515+00	6.235+01
24	2	9.520+01	-1.004+01	9.605+01	9.605+01	1.711+01	5.818+00	5.530+01
25	2	1.052+02	-1.165+01	1.062+02	1.062+02	1.711+01	5.121+00	4.825+01
26	2	1.151+02	-1.329+01	1.163+02	1.163+02	1.711+01	4.424+00	4.121+01
27	2	1.251+02	-1.497+01	1.264+02	1.264+02	1.711+01	3.727+00	3.416+01
28	2	1.350+02	-1.667+01	1.365+02	1.365+02	1.711+01	3.030+00	2.711+01

1	3	-1.350+02	-1.670+01	1.365+02	1.365+02	1.711+01	2.333+00	2.711+01
2	3	-1.251+02	-1.498+01	1.264+02	1.264+02	1.711+01	3.030+00	3.416+01
3	3	-1.151+02	-1.327+01	1.163+02	1.163+02	1.711+01	3.727+00	4.121+01
4	3	-1.052+02	-1.159+01	1.062+02	1.062+02	1.711+01	4.424+00	4.825+01
5	3	-9.520+01	-9.517+00	9.605+01	9.605+01	1.711+01	5.121+00	5.530+01
6	3	-8.524+01	-8.267+00	8.594+01	8.594+01	1.711+01	5.818+00	6.235+01
7	3	-7.528+01	-6.635+00	7.583+01	7.583+01	1.711+01	6.515+00	6.939+01
8	3	-6.533+01	-5.022+00	6.572+01	6.572+01	1.711+01	7.212+00	7.644+01
9	3	-5.537+01	-3.428+00	5.561+01	5.561+01	1.711+01	7.909+00	8.348+01
10	3	-4.541+01	-1.853+00	4.550+01	4.550+01	1.711+01	8.606+00	9.053+01
11	3	-3.538+01	-1.036+00	3.539+01	3.539+01	1.711+01	9.303+00	9.421+01
12	3	-2.528+01	-1.002+00	2.528+01	2.528+01	1.711+01	9.333+00	9.436+01
13	3	-1.517+01	-1.002+00	1.517+01	1.517+01	1.711+01	9.333+00	9.436+01
14	3	-5.055+00	-1.002+00	5.055+00	5.055+00	1.711+01	9.333+00	9.436+01
15	3	5.055+00	-1.002+00	5.055+00	5.055+00	1.711+01	9.333+00	9.436+01
16	3	1.517+01	-1.002+00	1.517+01	1.517+01	1.711+01	9.333+00	9.436+01
17	3	2.528+01	-1.002+00	2.528+01	2.528+01	1.711+01	9.333+00	9.436+01
18	3	3.538+01	-1.036+00	3.539+01	3.539+01	1.711+01	9.333+00	9.421+01
19	3	4.541+01	-1.853+00	4.550+01	4.550+01	1.711+01	9.303+00	9.753+01
20	3	5.537+01	-3.428+00	5.561+01	5.561+01	1.711+01	8.606+00	8.348+01
21	3	6.533+01	-5.022+00	6.572+01	6.572+01	1.711+01	7.909+00	7.644+01
22	3	7.528+01	-6.635+00	7.583+01	7.583+01	1.711+01	7.212+00	6.939+01
23	3	8.524+01	-8.267+00	8.594+01	8.594+01	1.711+01	6.515+00	6.235+01
24	3	9.520+01	-9.917+00	9.605+01	9.605+01	1.711+01	5.818+00	5.530+01
25	3	1.052+02	-1.151+01	1.062+02	1.062+02	1.711+01	5.121+00	4.825+01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 5

J	K	Y	Z	WL	EW	DWL	DC	DS
26	3	1.151+02	-1.327+01	1.163+02	1.163+02	1.711+01	4.424+00	4.121+01
27	3	1.251+02	-1.498+01	1.264+02	1.264+02	1.711+01	3.727+00	3.416+01
28	3	1.350+02	-1.670+01	1.365+02	1.365+02	1.711+01	3.030+00	2.711+01
1	4	-1.350+02	-1.674+01	1.365+02	1.365+02	1.711+01	3.000+00	3.486+01
2	4	-1.251+02	-1.507+01	1.264+02	1.264+02	1.711+01	3.896+00	4.392+01
3	4	-1.151+02	-1.325+01	1.163+02	1.163+02	1.711+01	4.792+00	5.298+01
4	4	-1.052+02	-1.151+01	1.062+02	1.062+02	1.711+01	5.688+00	6.204+01

6.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

7	3	1.674+01	-8.026+01	-7.559+00	-1.394-01	9.780-01	1.551-01	1.946+01	-7.528+01	-6.635+00	-3.872-02	-1.619-01	9.861-01
8	3	1.532+01	-7.030+01	-5.981+00	-1.394-01	9.784-01	1.527-01	1.839+01	-6.533+01	-5.022+00	-4.727-02	-1.676-01	9.859-01
9	3	1.390+01	-6.035+01	-4.427+00	-1.394-01	9.788-01	1.503-01	1.732+01	-5.537+01	-3.428+00	-5.583-02	-1.593-01	9.856-01
10	3	1.248+01	-5.039+01	-2.898+00	-1.394-01	9.791-01	1.479-01	1.625+01	-4.541+01	-1.853+00	-6.439-02	-1.580-01	9.853-01
11	3	1.106+01	-4.043+01	-1.394+00	-0.162-03	1.000+00	0.000	1.569+01	-3.538+01	-1.036+00	-6.957-02	-6.844-03	9.976-01
12	3	1.100+01	-3.033+01	-1.329+00	0.000	1.000+00	0.000	1.567+01	-2.528+01	-1.002+00	-6.976-02	0.000	9.976-01
13	3	1.100+01	-2.022+01	-1.329+00	0.000	1.000+00	0.000	1.567+01	-1.517+01	-1.002+00	-6.976-02	0.000	9.976-01
14	3	1.100+01	-1.011+01	-1.329+00	0.000	1.000+00	0.000	1.567+01	-0.505+01	-1.002+00	-6.976-02	0.000	9.976-01
15	3	1.100+01	0.000+01	-1.329+00	0.000	1.000+00	0.000	1.567+01	0.505+01	-1.002+00	-6.976-02	0.000	9.976-01
16	3	1.100+01	1.011+01	-1.329+00	0.000	1.000+00	0.000	1.567+01	1.517+01	-1.002+00	-6.976-02	0.000	9.976-01
17	3	1.100+01	2.022+01	-1.329+00	0.000	1.000+00	0.000	1.567+01	2.528+01	-1.002+00	-6.976-02	0.000	9.976-01
18	3	1.100+01	3.033+01	-1.329+00	0.162-03	1.000+00	-6.434-03	1.569+01	3.538+01	-1.036+00	-6.957-02	6.844-03	9.976-01
19	3	1.106+01	4.043+01	-1.394+00	0.000	1.000+00	0.000	1.569+01	4.541+01	-1.853+00	-6.439-02	1.593-01	9.856-01
20	3	1.248+01	5.039+01	-2.898+00	0.000	1.000+00	0.000	1.732+01	5.537+01	-3.428+00	-5.583-02	1.593-01	9.856-01
21	3	1.390+01	6.035+01	-4.427+00	0.000	1.000+00	0.000	1.839+01	6.533+01	-5.022+00	-4.727-02	1.606-01	9.859-01
22	3	1.532+01	7.030+01	-5.981+00	0.000	1.000+00	0.000	1.946+01	7.528+01	-6.635+00	-3.872-02	1.619-01	9.861-01
23	3	1.674+01	8.026+01	-7.559+00	0.000	1.000+00	0.000	2.091+01	8.524+01	-8.267+00	-3.017-02	1.631-01	9.861-01
24	3	1.816+01	9.022+01	-9.581+00	0.000	1.000+00	0.000	2.236+01	9.520+01	-9.917+00	-2.162-02	1.643-01	9.862-01
25	3	1.957+01	1.001+02	-1.079+01	0.000	1.000+00	0.000	2.381+01	1.052+02	-1.159+01	-1.309-02	1.656-01	9.861-01
26	3	2.099+01	1.011+02	-1.244+01	0.000	1.000+00	0.000	2.527+01	1.151+02	-1.327+01	-4.575-03	1.668-01	9.860-01
27	3	2.241+01	1.247+02	-1.412+01	0.000	1.000+00	0.000	2.672+01	1.251+02	-1.498+01	-3.916-03	1.680-01	9.858-01
28	3	2.383+01	1.300+02	-1.582+01	0.000	1.000+00	0.000	2.818+01	1.350+02	-1.670+01	-1.236-02	1.692-01	9.855-01

1	4	2.775+01	-1.400+02	-1.759+01	-0.000-02	9.829-01	1.720-01	2.914+01	-1.350+02	-1.674+01	1.236-02	-1.715-01	9.851-01
2	4	2.708+01	-1.309+02	-1.585+01	-0.000-02	9.831-01	1.708-01	2.891+01	-1.251+02	-1.500+01	3.914-03	-1.710-01	9.853-01
3	4	2.641+01	-1.201+02	-1.412+01	-0.000-02	9.833-01	1.697-01	2.869+01	-1.151+02	-1.325+01	-4.572-03	-1.704-01	9.854-01
4	4	2.573+01	-1.101+02	-1.240+01	-0.000-02	9.834-01	1.686-01	2.847+01	-1.052+02	-1.151+01	-1.308-02	-1.698-01	9.854-01
5	4	2.506+01	-1.002+02	-1.070+01	-0.000-02	9.836-01	1.675-01	2.824+01	-9.520+01	-9.771+00	-2.161-02	-1.692-01	9.853-01
6	4	2.439+01	-9.022+01	-9.001+00	-0.001-02	9.838-01	1.664-01	2.802+01	-8.524+01	-8.038+00	-3.014-02	-1.686-01	9.852-01
7	4	2.372+01	-8.026+01	-7.317+00	-0.000-02	9.840-01	1.652-01	2.779+01	-7.528+01	-6.308+00	-3.868-02	-1.680-01	9.850-01
8	4	2.305+01	-7.030+01	-5.645+00	-0.000-02	9.842-01	1.641-01	2.757+01	-6.533+01	-4.582+00	-4.722-02	-1.674-01	9.848-01
9	4	2.237+01	-6.035+01	-3.985+00	-0.000-02	9.844-01	1.630-01	2.735+01	-5.537+01	-2.860+00	-5.576-02	-1.667-01	9.844-01
10	4	2.170+01	-5.039+01	-2.337+00	-0.000-02	9.846-01	1.618-01	2.712+01	-4.541+01	-1.142+00	-6.431-02	-1.661-01	9.840-01
11	4	2.103+01	-4.043+01	-7.004-01	-0.000-03	1.000+00	7.035-03	2.700+01	-3.538+01	-2.471-01	-6.957-02	-7.219-03	9.976-01
12	4	2.100+01	-3.033+01	-6.293-01	0.000	1.000+00	0.000	2.700+01	-2.528+01	-2.098-01	-6.976-02	0.000	9.976-01
13	4	2.100+01	-2.022+01	-6.293-01	0.000	1.000+00	0.000	2.700+01	-1.517+01	-2.098-01	-6.976-02	0.000	9.976-01
14	4	2.100+01	-1.011+01	-6.293-01	0.000	1.000+00	0.000	2.700+01	-0.505+01	-2.098-01	-6.976-02	0.000	9.976-01
15	4	2.100+01	0.000+01	-6.293-01	0.000	1.000+00	0.000	2.700+01	0.505+01	-2.098-01	-6.976-02	0.000	9.976-01
16	4	2.100+01	1.011+01	-6.293-01	0.000	1.000+00	0.000	2.700+01	1.517+01	-2.098-01	-6.976-02	0.000	9.976-01
17	4	2.100+01	2.022+01	-6.293-01	0.000	1.000+00	0.000	2.700+01	2.528+01	-2.098-01	-6.976-02	0.000	9.976-01
18	4	2.100+01	3.033+01	-6.293-01	0.000	1.000+00	0.000	2.700+01	3.538+01	-2.471-01	-6.957-02	7.219-03	9.976-01
19	4	2.103+01	4.043+01	-7.004-01	0.000-03	9.846-01	-1.618-01	2.712+01	4.541+01	-1.142+00	-6.431-02	1.661-01	9.840-01
20	4	2.170+01	5.039+01	-2.337+00	0.000-02	9.844-01	-1.630-01	2.735+01	5.537+01	-2.860+00	-5.576-02	1.667-01	9.844-01
21	4	2.237+01	6.035+01	-3.985+00	0.000-02	9.842-01	-1.641-01	2.757+01	6.533+01	-4.582+00	-4.722-02	1.674-01	9.848-01
22	4	2.305+01	7.030+01	-5.645+00	0.000-02	9.840-01	-1.652-01	2.779+01	7.528+01	-6.308+00	-3.868-02	1.680-01	9.850-01
23	4	2.372+01	8.026+01	-7.317+00	0.000-02	9.838-01	-1.664-01	2.802+01	8.524+01	-8.038+00	-3.014-02	1.686-01	9.852-01
24	4	2.439+01	9.022+01	-9.001+00	0.000-02	9.836-01	-1.675-01	2.824+01	9.520+01	-9.771+00	-2.161-02	1.692-01	9.853-01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 0 0 1 1 4 ALFA = .00 MACHNO = .0000 ALTITUDE = ***** B

J	K	XV	YV	ZV	LXV	LYV	LZV	XN	YN	ZN	LXN	LYN	LZN
26	4	2.506+01	1.002+02	-1.070+01	0.000-02	9.834-01	-1.686-01	2.847+01	1.052+02	-1.151+01	-1.308-02	1.698-01	9.854-01
25	4	2.573+01	1.101+02	-1.240+01	0.000-02	9.833-01	-1.697-01	2.869+01	1.151+02	-1.325+01	-4.572-03	1.794-01	9.854-01
27	4	2.641+01	1.201+02	-1.412+01	0.000-02	9.831-01	-1.708-01	2.891+01	1.251+02	-1.500+01	3.914-03	1.710-01	9.853-01
28	4	2.708+01	1.300+02	-1.585+01	0.000-02	9.829-01	-1.720-01	2.914+01	1.350+02	-1.674+01	1.236-02	1.715-01	9.851-01

(EQF PLOT FILE 1) FILE # 1 = WING GEOMETRY

SOLID LINE INDICATES THE OUTPUT HAS BEEN EDITED

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 0 0 1 1 4 ALFA = .00 MACHNO = .0000 ALTITUDE = ***** 9

LIFTING SURFACE NO = 2 SURFACE # 2 = HORIZONTAL TAIL

SPAN	ROOT CHORD	TIP CHORD	ROOT AREA	TIP AREA	AREA	ASPECT RATIO	MEAN CHORD	MGC (MAC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)	
87.000	30.000	20.000	-2.0000	-2.0000	2000.00	3.2000	25.000	25.333	18.667	131.000	-19.337	
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DELTA	FLAP DELTA	FLAP DELTA	R.ATL DEFLC	R.ATL DEFLC	GHEED MGC/4	SWEEP MGC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
.000	40.000	40.000	-30.000	.000	.000	.000	.000	.000	10.620	8	3	1
FUS STA X(CG)	FUS STA Y(CG)	FUS STA Z(CG)	HL STA X(CG)	HL STA Y(CG)	HL STA Z(CG)	AREA S(CG)	CHORO C(CG)	SPAN B(CG)				
.000	.000	.000	.000	.000	.000	3200.000	32.681	2800.000				

ORIGINAL PAGE IS OF POOR QUALITY

MS	Y	Z	X(LC)	X(C/4)	X(T)	Twist	DHEIC/4	SWEIP/4	C(WING)	C(FLAP)	C(TAIL)
-40.000	-47.000	-23.000	130.000	100.000	150.000	-2.000	.000	-10.620	20.000	10.000	3.000
-36.000	-36.000	-20.000	120.000	100.250	150.000	-2.000	.000	-10.620	21.000	10.000	3.000
-32.000	-32.000	-20.000	120.000	100.500	150.000	-2.000	.000	-10.620	22.000	10.000	3.000
-28.000	-28.000	-20.000	120.000	102.750	150.000	-2.000	.000	-10.620	23.000	10.000	3.000
-24.000	-24.000	-20.000	120.000	105.000	150.000	-2.000	.000	-10.620	24.000	10.000	3.000
-20.000	-20.000	-20.000	120.000	107.250	150.000	-2.000	.000	-10.620	25.000	10.000	3.000
-16.000	-16.000	-20.000	120.000	109.500	150.000	-2.000	.000	-10.620	26.000	10.000	3.000
-12.000	-12.000	-20.000	120.000	111.750	150.000	-2.000	.000	-10.620	27.000	10.000	3.000
-8.000	-8.000	-20.000	120.000	114.000	150.000	-2.000	.000	-10.620	28.000	10.000	3.000
-4.000	-4.000	-20.000	120.000	116.250	150.000	-2.000	.000	-10.620	29.000	10.000	3.000
.000	.000	-20.000	120.000	118.500	150.000	-2.000	.000	-10.620	30.000	10.000	3.000
4.000	4.000	-20.000	120.000	120.750	150.000	-2.000	.000	-10.620	29.000	10.000	3.000
8.000	8.000	-20.000	120.000	123.000	150.000	-2.000	.000	-10.620	28.000	10.000	3.000
12.000	12.000	-20.000	120.000	125.250	150.000	-2.000	.000	-10.620	27.000	10.000	3.000
16.000	16.000	-20.000	120.000	127.500	150.000	-2.000	.000	-10.620	26.000	10.000	3.000
20.000	20.000	-20.000	120.000	130.000	150.000	-2.000	.000	-10.620	25.000	10.000	3.000
24.000	24.000	-20.000	120.00								

6.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

35 3 1.425+02 1.000+01 -1.974+01 0.000 1.000+00 0.000 1.475+02 1.500+01 -1.991+01 3.490-02 0.000 9.994-01
 36 3 1.425+02 2.000+01 -1.974+01 0.000 1.000+00 0.000 1.475+02 2.500+01 -1.991+01 3.490-02 0.000 9.994-01
 37 3 1.425+02 3.000+01 -1.974+01 0.000 1.000+00 0.000 1.475+02 3.500+01 -1.991+01 3.490-02 0.000 9.994-01

FILE # 2 = HORIZONTAL TAIL GEOMETRY
 (EOF PLOT FILE 2)

* DIVIDE CHECK AT 026642 OK TO IGNORE

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA= .00 MACHNO= .000C ALTITUDE=***** 12

LIFTING SURFACE NO= 3

SPAN ROOT TIP ROOT TIP AREA ASPECT MEAN MGC YBAR XBAR ZBAR
 CHORD CHORD CHORD TWIST TWIST RATIO CHORD (MGC) (MGC) (MGC) (MGC) (MGC)
 .000 80.000 200.000 .0000 .0000 .06 .0000 .000 148.568 .000 -12.858 -11.428
 FLAP FLAP FLAP FLAP TAB L.AIL R.AIL DIHED. SWEEP NO.SPAN NO.CHORD NO.CHORD
 SPAN1 SPAN2 SPAN3 DEFLEC DEFLEC DEFLEC DEFLEC MGC/4 MGC/4 ELEMENTS ELEMENTS DISCONT.
 .000 .600 1.000 .000 .000 .000 .000 89.999 56.310 2 4 0
 FUS STA WING STA WL STA AREA CHORD SPAN
 X(CG) Y(CG) Z(CG) S(CG) C(CG) B(CG)
 .000 .000 .000 8290.000 32.681 280.000

WS Y Z X(L) X(C) X(T) TWIST DIH(C/4) SWEP(C/4) C(WING) C(FLAP) C(TAB)
 -20.000 .000 -20.000 -50.000 .000 150.000 .000 -89.999 -56.310 200.000 50.000 25.000
 -18.000 .000 -18.000 -50.000 -3.000 138.000 .000 -89.999 -56.310 188.000 47.000 22.500
 -16.000 .000 -16.000 -50.000 -6.000 126.000 .000 -89.999 -56.310 176.000 44.000 22.000
 -14.000 .000 -14.000 -50.000 -9.000 114.000 .000 -89.999 -56.310 164.000 41.000 20.500
 -12.000 .000 -12.000 -50.000 -12.000 102.000 .000 -89.999 -56.310 152.000 38.000 19.000
 -10.000 .000 -10.000 -50.000 -15.000 90.000 .000 -89.999 -56.310 140.000 35.000 17.500
 -8.000 .000 -8.000 -50.000 -18.000 78.000 .000 -89.999 -56.310 128.000 32.000 16.000
 -6.000 .000 -6.000 -50.000 -21.000 66.000 .000 -89.999 -56.310 116.000 29.000 14.500
 -4.000 .000 -4.000 -50.000 -24.000 54.000 .000 -89.999 -56.310 104.000 26.000 13.000
 -2.000 .000 -2.000 -50.000 -27.000 42.000 .000 -89.999 -56.310 92.000 23.000 11.500
 .000 .000 .000 -50.000 -30.000 30.000 .000 26.565 -74.835 80.000 20.000 10.000
 2.000 .000 2.000 -50.000 -27.000 42.000 .000 89.999 56.310 92.000 23.000 11.500
 4.000 .000 4.000 -50.000 -24.000 54.000 .000 89.999 56.310 104.000 26.000 13.000
 6.000 .000 6.000 -50.000 -21.000 66.000 .000 89.999 56.310 116.000 29.000 14.500
 8.000 .000 8.000 -50.000 -18.000 78.000 .000 89.999 56.310 128.000 32.000 16.000
 10.000 .000 10.000 -50.000 -15.000 90.000 .000 89.999 56.310 140.000 35.000 17.500
 12.000 .000 12.000 -50.000 -12.000 102.000 .000 89.999 56.310 152.000 38.000 19.000
 14.000 .000 14.000 -50.000 -9.000 114.000 .000 89.999 56.310 164.000 41.000 20.500
 16.000 .000 16.000 -50.000 -6.000 126.000 .000 89.999 56.310 176.000 44.000 22.000
 18.000 .000 18.000 -50.000 -3.000 138.000 .000 89.999 56.310 188.000 47.000 23.500
 20.000 .000 20.000 -50.000 .000 150.000 .000 89.999 56.310 200.000 50.000 25.000

39 4 1.125+02 0.000 -2.000+01 -9.790-01 0.000 2.009-01 8.125+01 0.000 -1.000+01 0.000 -1.000+00 0.000
 40 4 1.500+01 0.000 0.000 9.790-01 0.000 -2.009-01 8.125+01 0.000 -1.000+01 0.000 1.000+00 0.000

FILE # 3 = FUSELAGE GEOMETRY
 (EOF PLOT FILE 3)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA= .00 MACHNO= .000C ALTITUDE=***** 14

LIFTING SURFACE NO= 4

SPAN ROOT TIP ROOT TIP AREA ASPECT MEAN MGC YBAR XBAR ZBAR
 CHORD CHORD CHORD TWIST TWIST RATIO CHORD (MGC) (MGC) (MGC) (MGC) (MGC)
 30.000 25.000 10.000 .0000 .0000 525.00 1.7143 17.500 18.571 40.000 136.072 -22.857
 FLAP FLAP FLAP FLAP TAB L.AIL R.AIL DIHED. SWEEP NO.SPAN NO.CHORD NO.CHORD
 SPAN1 SPAN2 SPAN3 DEFLEC DEFLEC DEFLEC DEFLEC MGC/4 MGC/4 ELEMENTS ELEMENTS DISCONT.
 .000 30.000 30.000 30.000 .000 .000 .000 89.999 20.556 3 4 1
 FUS STA WING STA WL STA AREA CHORD SPAN
 X(CG) Y(CG) Z(CG) S(CG) C(CG) B(CG)
 .000 .000 .000 8290.000 32.681 280.000

WS Y Z X(L) X(C) X(T) TWIST DIH(C/4) SWEP(C/4) C(WING) C(FLAP) C(TAB)
 .000 40.000 -10.000 125.000 131.250 150.000 .000 -14.036 72.560 25.000 12.500 2.500
 1.500 40.000 -11.500 125.750 131.812 150.000 .000 89.999 20.556 24.250 12.125 2.425
 3.000 40.000 -13.000 126.500 132.375 150.000 .000 89.999 20.556 23.500 11.750 2.350
 4.500 40.000 -14.500 127.250 132.937 150.000 .000 89.999 20.556 22.750 11.375 2.275
 6.000 40.000 -16.000 128.000 133.500 150.000 .000 89.999 20.556 22.000 11.000 2.200
 7.500 40.000 -17.500 128.750 134.062 150.000 .000 89.999 20.556 21.250 10.625 2.125
 9.000 40.000 -19.000 129.500 134.625 150.000 .000 89.999 20.556 20.500 10.250 2.050
 10.500 40.000 -20.500 130.250 135.187 150.000 .000 89.999 20.556 19.750 9.875 1.975
 12.000 40.000 -22.000 131.000 135.750 150.000 .000 89.999 20.556 19.000 9.500 1.900
 13.500 40.000 -23.500 131.750 136.312 150.000 .000 89.999 20.556 18.250 9.125 1.825
 15.000 40.000 -25.000 132.500 136.875 150.000 .000 89.999 20.556 17.500 8.750 1.750
 16.500 40.000 -26.500 133.250 137.437 150.000 .000 89.999 20.556 16.750 8.375 1.675
 18.000 40.000 -28.000 134.000 138.000 150.000 .000 89.999 20.556 16.000 8.000 1.600
 19.500 40.000 -29.500 134.750 138.562 150.000 .000 89.999 20.556 15.250 7.625 1.525
 21.000 40.000 -31.000 135.500 139.125 150.000 .000 89.999 20.556 14.500 7.250 1.450
 22.500 40.000 -32.500 136.250 139.687 150.000 .000 89.999 20.556 13.750 6.875 1.375
 24.000 40.000 -34.000 137.000 140.250 150.000 .000 89.999 20.556 13.000 6.500 1.300
 25.500 40.000 -35.500 137.750 140.812 150.000 .000 89.999 20.556 12.250 6.125 1.225
 27.000 40.000 -37.000 138.500 141.375 150.000 .000 89.999 20.556 11.500 5.750 1.150
 28.500 40.000 -38.500 139.250 141.937 150.000 .000 89.999 20.556 10.750 5.375 1.075
 30.000 40.000 -40.000 140.000 142.500 150.000 .000 89.999 20.556 10.000 5.000 1.000

6.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA=.00 MACHNO=.0000 ALTITUDE=***** 15

	XA(1)/C	XA(2)/C	XA(3)/C	XA(4)/C	XA(5)/C	XA(6)/C	XA(7)/C	XA(8)/C	XA(9)/C	XA(10)/C	
	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
150.0000	40.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
150.0000	40.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	

J	K	Y	Z	ML	EM	DWL	DC	DS
42	1	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
43	1	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
44	1	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
42	2	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
43	2	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
44	2	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
42	3	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
43	3	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
44	3	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
42	4	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	1.250+01	1.125+02
43	4	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	1.000+01	8.750+01
44	4	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	7.500+00	6.250+01

INPUT SURFACE

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA=.00 MACHNO=.0000 ALTITUDE=***** 16

J	K	XV	YV	ZV	LXV	LYV	LZV	XN	YN	ZN	LXN	LYN	LZN
44	4	1.444+02	4.000+01	-3.000+01	1.843-01	0.000	-9.829-01	1.484+02	4.000+01	-3.500+01	0.000	1.000+00	0.000

EQF PLOT FILE 4) FILE # 4 = LEFT VERTICAL FIN GEOMETRY

J	K	Y	Z	ML	EM	DWL	DC	DS
42	1	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
43	1	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
44	1	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
46	1	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
47	1	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
48	1	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
42	2	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
43	2	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
44	2	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
46	2	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
47	2	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
48	2	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
42	3	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
43	3	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
44	3	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
46	3	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	4.167+00	3.750+01
47	3	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	3.333+00	2.917+01
48	3	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	2.500+00	2.083+01
42	4	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	1.250+01	1.125+02
43	4	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	1.000+01	8.750+01
44	4	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	7.500+00	6.250+01
46	4	4.000+01	-1.500+01	5.000+00	4.323+02	1.000+01	1.250+01	1.125+02
47	4	4.000+01	-2.500+01	1.500+01	4.423+02	1.000+01	1.000+01	8.750+01
48	4	4.000+01	-3.500+01	2.500+01	4.523+02	1.000+01	7.500+00	6.250+01

INPUT SURFACE + IMAGE SURFACE
(INTERNAL MIRRIS)

J	K	XV	YV	ZV	LXV	LYV	LZV	XN	YN	ZN	LXN	LYN	LZN
42	1	1.200+02	-4.000+01	-1.000+01	4.321-01	0.000	-9.018-01	1.303+02	-4.000+01	-1.500+01	0.000	1.000+00	0.000
43	1	1.308+02	-4.000+01	-2.000+01	4.321-01	0.000	-9.018-01	1.347+02	-4.000+01	-2.500+01	0.000	1.000+00	0.000
44	1	1.356+02	-4.000+01	-3.000+01	4.321-01	0.000	-9.018-01	1.391+02	-4.000+01	-3.500+01	0.000	1.000+00	0.000
46	1	1.200+02	4.000+01	-1.000+01	4.321-01	0.000	-9.018-01	1.303+02	4.000+01	-1.500+01	0.000	1.000+00	0.000
47	1	1.308+02	4.000+01	-2.000+01	4.321-01	0.000	-9.018-01	1.347+02	4.000+01	-2.500+01	0.000	1.000+00	0.000
48	1	1.356+02	4.000+01	-3.000+01	4.321-01	0.000	-9.018-01	1.391+02	4.000+01	-3.500+01	0.000	1.000+00	0.000

44	2	1.381+02	-4.000+01	-3.000+01	4.308-01	0.000	-9.298-01	1.411+02	-4.000+01	-3.500+01	0.000	1.000+00	0.000
46	2	1.302+02	4.000+01	-1.000+01	4.308-01	0.000	-9.298-01	1.341+02	4.000+01	-1.500+01	0.000	1.000+00	0.000
47	2	1.342+02	4.000+01	-2.000+01	4.308-01	0.000	-9.298-01	1.376+02	4.000+01	-2.500+01	0.000	1.000+00	0.000
48	2	1.381+02	4.000+01	-3.000+01	4.308-01	0.000	-9.298-01	1.411+02	4.000+01	-3.500+01	0.000	1.000+00	0.000
42	3	1.344+02	-4.000+01	-1.000+01	4.303-01	0.000	-9.545-01	1.378+02	-4.000+01	-1.500+01	0.000	1.000+00	0.000
43	3	1.375+02	-4.000+01	-2.000+01	4.303-01	0.000	-9.545-01	1.405+02	-4.000+01	-2.500+01	0.000	1.000+00	0.000
44	3	1.406+02	-4.000+01	-3.000+01	4.303-01	0.000	-9.545-01	1.432+02	-4.000+01	-3.500+01	0.000	1.000+00	0.000
46	3	1.344+02	4.000+01	-1.000+01	4.303-01	0.000	-9.545-01	1.378+02	4.000+01	-1.500+01	0.000	1.000+00	0.000
47	3	1.375+02	4.000+01	-2.000+01	4.303-01	0.000	-9.545-01	1.405+02	4.000+01	-2.500+01	0.000	1.000+00	0.000
48	3	1.406+02	4.000+01	-3.000+01	4.303-01	0.000	-9.545-01	1.432+02	4.000+01	-3.500+01	0.000	1.000+00	0.000
42	4	1.476+02	-4.000+01	-1.000+01	1.843-01	0.000	-9.829-01	1.472+02	-4.000+01	-1.500+01	0.000	1.000+00	0.000
43	4	1.425+02	-4.000+01	-2.000+01	1.843-01	0.000	-9.829-01	1.478+02	-4.000+01	-2.500+01	0.000	1.000+00	0.000
44	4	1.444+02	-4.000+01	-3.000+01	1.843-01	0.000	-9.829-01	1.484+02	-4.000+01	-3.500+01	0.000	1.000+00	0.000
46	4	1.406+02	4.000+01	-1.000+01	1.843-01	0.000	-9.829-01	1.472+02	4.000+01	-1.500+01	0.000	1.000+00	0.000
47	4	1.425+02	4.000+01	-2.000+01	1.843-01	0.000	-9.829-01	1.478+02	4.000+01	-2.500+01	0.000	1.000+00	0.000
48	4	1.444+02	4.000+01	-3.000+01	1.843-01	0.000	-9.829-01	1.484+02	4.000+01	-3.500+01	0.000	1.000+00	0.000

EQF PLOT FILE 5) FILE # 5 = RIGHT VERTICAL FIN GEOMETRY (IMAGE)

6.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA= .00 MACHND=.0000 ALTITUDE=***** 18

SURFACE # 5 = ENGINE NACELLES

LIFTING SURFACE NO= 5

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MGC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
20.100	30.000	60.000	.0000	.0000	1050.00	.3817	52.500	54.285	40.000	-16.429	-9.952
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	L.AIL DEFLEC	R.AIL DEFLEC	DIHED. MGC/4	SWEEP MGC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
.000	.600	1.000	.000	.000	.000	.000	89.999	36.870	2	6	0
FUS STA KLOC	WING STA YLOC	HL STA Z(CG)	AREA S(CG)	CHORD C(CG)	SPAN B(CG)						
.000	.000	.000	8200.000	32.681	280.000						

WS	Y	Z	X(L)	X(L/W)	X(T)	TWIST	DIHED(C/4)	SWEEP(C/4)	C(WING)	C(FLAP)	C(TAB)
.000	40.000	10.000	-30.000	-22.500	.000	.000	89.999	-73.142	30.000	7.500	3.750
1.000	40.000	9.000	-30.000	-21.750	3.000	.000	89.999	36.870	33.000	8.250	4.125
2.000	40.000	8.000	-30.000	-21.000	6.000	.000	89.999	36.870	36.000	9.000	4.500
3.000	40.000	7.000	-30.000	-20.250	9.000	.000	89.999	36.870	39.000	9.750	4.875
4.000	40.000	6.000	-30.000	-19.500	12.000	.000	89.999	36.870	42.000	10.500	5.250
5.000	40.000	5.000	-30.000	-18.750	15.000	.000	89.999	36.870	45.000	11.250	5.625
6.000	40.000	4.000	-30.000	-18.000	18.000	.000	89.999	36.870	48.000	12.000	6.000
7.000	40.000	3.000	-30.000	-17.250	21.000	.000	89.999	36.870	51.000	12.750	6.375
8.000	40.000	2.000	-30.000	-16.500	24.000	.000	89.999	36.870	54.000	13.500	6.750
9.000	40.000	1.000	-30.000	-15.750	27.000	.000	89.999	36.870	57.000	14.250	7.125
10.000	40.000	.000	-30.000	-15.000	30.000	.000	89.999	36.870	60.000	15.000	7.500
11.000	40.000	-1.000	-30.000	-14.250	30.000	.000	89.999	.000	60.000	15.000	7.500
12.000	40.000	-2.000	-30.000	-13.500	30.000	.000	89.999	.000	60.000	15.000	7.500
13.000	40.000	-3.000	-30.000	-12.750	30.000	.000	89.999	.000	60.000	15.000	7.500
14.000	40.000	-4.000	-30.000	-12.000	30.000	.000	89.999	.000	60.000	15.000	7.500
15.000	40.000	-5.000	-30.000	-11.250	30.000	.000	89.999	.000	60.000	15.000	7.500
16.000	40.000	-6.000	-30.000	-10.500	30.000	.000	89.999	.000	60.000	15.000	7.500
17.000	40.000	-7.000	-30.000	-9.750	30.000	.000	89.999	.000	60.000	15.000	7.500
18.000	40.000	-8.000	-30.000	-9.000	30.000	.000	89.999	.000	60.000	15.000	7.500
19.000	40.000	-9.000	-30.000	-8.250	30.000	.000	89.999	.000	60.000	15.000	7.500
20.000	40.000	-10.000	-30.000	-7.500	30.000	.000	89.999	.000	60.000	15.000	7.500

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA= .00 MACHND=.0000 ALTITUDE=***** 20

J	K	XV	YV	ZV	LXV	LYV	LZV	XN	YN	ZN	LXN	LYN	LZN
50	5	-8.750+01	4.000+01	1.000+01	9.046-01	0.000	-4.258-01	5.625+00	4.000+01	5.000+00	0.000	1.000+00	0.000
51	5	1.250+01	4.000+01	0.000	0.000	0.000	-1.000+00	1.750+01	4.000+01	-5.000+00	0.000	1.000+00	0.000
50	6	-3.750+00	4.000+01	1.000+01	9.349-01	0.000	-3.560-01	1.312+01	4.000+01	5.000+00	0.000	1.000+00	0.000
51	6	2.250+01	4.000+01	0.000	0.000	0.000	-1.000+00	2.750+01	4.000+01	-5.000+00	0.000	1.000+00	0.000

FILE # 6 = LEFT ENGINE NACELLE GEOMETRY

(EOF PLOT FILE 6)

J	K	Y	Z	ML	CM	DWL	DC	DS
50	1	-4.000+01	5.000+00	5.000+00	9.123+02	1.000+01	5.000+00	7.500+01
51	1	-4.000+01	-5.000+00	1.750+01	9.225+02	1.000+01	1.000+01	1.000+02

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 28 8 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 1 4 ALFA= .00 MACHND=.0000 ALTITUDE=***** 21

J	K	XV	YV	ZV	LXV	LYV	LZV	XN	YN	ZN	LXN	LYN	LZN
53	1	-2.875+01	4.000+01	1.000+01	1.244-01	0.000	-9.923-01	-2.438+01	4.000+01	5.000+00	0.000	1.000+00	0.000
54	1	-2.750+01	4.000+01	0.000	0.000	0.000	-1.000+00	-2.250+01	4.000+01	-5.000+00	0.000	1.000+00	0.000
50	2	-2.375+01	-4.000+01	1.000+01	9.300-01	0.000	-8.480-01	-1.688+01	-4.000+01	5.000+00	0.000	1.000+00	0.000
51	2	-1.750+01	-4.000+01	0.000	0.000	0.000	-1.000+00	-1.250+01	-4.000+01	-5.000+00	0.000	1.000+00	0.000
53	2	-2.375+01	4.000+01	1.000+01	9.300-01	0.000	-8.480-01	-1.688+01	4.000+01	5.000+00	0.000	1.000+00	0.000
54	2	-1.750+01	4.000+01	0.000	0.000	0.000	-1.000+00	-1.250+01	4.000+01	-5.000+00	0.000	1.000+00	0.000
50	3	-1.875+01	-4.000+01	1.000+01	7.474-01	0.000	-6.644-01	-9.375+00	-4.000+01	5.000+00	0.000	1.000+00	0.000
51	3	-7.500+00	-4.000+01	0.000	0.000	0.000	-1.000+00	-2.500+00	-4.000+01	-5.000+00	0.000	1.000+00	0.000
53	3	-1.875+01	4.000+01	1.000+01	7.474-01	0.000	-6.644-01	-9.375+00	4.000+01	5.000+00	0.000	1.000+00	0.000
54	3	-7.500+00	4.000+01	0.000	0.000	0.000	-1.000+00	-2.500+00	4.000+01	-5.000+00	0.000	1.000+00	0.000
50	4	-1.375+01	-4.000+01	1.000+01	9.217-01	0.000	-5.241-01	-1.875+00	-4.000+01	5.000+00	0.000	1.000+00	0.000
51	4	2.500+00	-4.000+01	0.000	0.000	0.000	-1.000+00	7.500+00	-4.000+01	-5.000+00	0.000	1.000+00	0.000
53	4	-1.375+01	4.000+01	1.000+01	9.217-01	0.000	-5.241-01	-1.875+00	4.000+01	5.000+00	0.000	1.000+00	0.000
54	4	2.500+00	4.000+01	0.000	0.000	0.000	-1.000+00	7.500+00	4.000+01	-5.000+00	0.000	1.000+00	0.000
50	5	-8.750+00	-4.000+01	1.000+01	9.046-01	0.000	-4.258-01	5.625+00	-4.000+01	5.000+00	0.000	1.000+00	0.000
51	5	1.250+01	-4.000+01	0.000	0.000	0.000	-1.000+00	1.750+01	-4.000+01	-5.000+00	0.000	1.000+00	0.000
53	5	-8.750+00	4.000+01	1.000+01	9.046-01	0.000	-4.258-01	5.625+00	4.000+01	5.000+00	0.000	1.000+00	0.000
54	5	1.250+01	4.000+01	0.000	0.000	0.000	-1.000+00	1.750+01	4.000+01	-5.000+00	0.000	1.000+00	0.000
50	6	-3.750+00	-4.000+01	1.000+01	9.349-01	0.000	-3.560-01	1.312+01	-4.000+01	5.000+00	0.000	1.000+00	0.000
51	6	-2.250+01	-4.000+01	0.000	0.000	0.000	-1.000+00	2.750+01	-4.000+01	-5.000+00	0.000	1.000+00	0.000
53	6	-3.750+00	4.000+01	1.000+01	9.349-01	0.000	-3.560-01	1.312+01	4.000+01	5.000+00	0.000	1.000+00	0.000
54	6	2.250+01	4.000+01	0.000	0.000	0.000	-1.000+00	2.750+01	4.000+01	-5.000+00	0.000	1.000+00	0.000

FILE # 7 = RIGHT ENGINE NACELLE GEOMETRY (IMAGE)

(NO VORTEX-LATTICE SOLUTIONS THIS TIME BECAUSE NSQV = 12*0)

**** JOB TIME = 40 / ELAPSED TIME = 40 / NO.PLOT FILES = 7 / NSURF EXEC. VERSION 6-1E-72 ****

2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 0 4 ALFA= .00 MACHNO=.000C ALTITUDE=***** 22

\$INPUT
 KUUT = +6,
 KT1 = +1,
 KT2 = +8,
 KT3 = +3,
 LINX = +56,
 NHING = +2,
 NVTAIL = +0, } ONLY SURFACES # 1 AND 2, WING + TAIL ARE CONSIDERED NOW
 NFUS = +0,
 COLOCP = .7500000E+00,
 CUTDF1 = .1000000E-03,
 CUTDF2 = .2900000E-02,
 LFLAP = +0,
 GSCALE = .1000000E+01,
 NSS = +3,
 NCS = +12, +2, +4, +7, +9,
 X = +2, +2, +4, +2, +2,
 .1500000E+03, .1500000E+03, .3000000E+02, .3000000E+02,
 .1500000E+03, .1500000E+03, .3000000E+02, .3000000E+02,
 .3000000E+02, .0000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
 Y = .0000000E+00, .4000000E+00, .0000000E+00, .0000000E+00,
 .4000000E+02, .0000000E+00, .1500000E+02, .0000000E+00,
 .4000000E+02, .0000000E+00, .0000000E+00, .0000000E+00,
 NPLG = +2, +4, +4, +2, +3,
 +4, +6, +1, +0, +4,
 +0, +1, +0, +0, +1,
 NSOLV = +0, +1, +1, +0, +1, +2,
 +0, +0, +0, +0, +0, +0,
 \$END

ORIGINAL PAGE IS OF POOR QUALITY

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 0 4 ALFA= .00 MACHNO=.000C ALTITUDE=***** 23

LIFTING SURFACE NU= 1 SURFACE # 1 = WING

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MAC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
280.000	40.000	10.000	4.0000	-1.0000	8199.59	4.5615	29.284	32.681	56.591	5.489	-5.655
FLAP	FLAP	FLAP	FLAP	TAB	L.ATL	R.ATL	DIHED.	SWEEP	NO.SPAN	NO.CHORD	NO.CHORD
SPAN1	SPAN2	SPAN3	DEFLEC	DEFLEC	DEFLEC	DEFLEC	MGC/4	MGC/4	ELEMENTS	ELEMENTS	DISCONT.
.700	40.000	140.000	30.000	.000	-20.000	15.000	10.000	12.494	14	4	1
FUS STA	WING STA	HL STA	AREA	CHORD	SPAN						
X(CG)	Y(CG)	Z(CG)	S(CG)	C(CG)	B(CG)						
.000	.000	.000	8200.000	32.681	280.000						

MS	Y	Z	X(LE)	X(C/4)	X(TE)	Twist	DIHE(C/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-141.543	-140.000	-17.633	20.000	42.500	30.000	-1.000	-10.000	-12.494	10.000	3.000	.800
-127.388	-126.061	-15.175	15.000	19.364	30.000	-.303	-10.000	-12.494	14.182	4.255	1.135
-113.234	-112.122	-12.717	11.000	16.227	30.000	-.394	-10.000	-12.494	18.364	5.509	1.469

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 0 1 1 0 1 0 0 0 1 0 4 ALFA= .00 MACHNO=.000C ALTITUDE=***** 27

LIFTING SURFACE NU= 2 SURFACE # 2 = HORIZONTAL TAIL

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MAC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
80.000	30.000	20.000	-2.0000	-1.0000	2000.00	3.2000	25.000	25.333	18.667	131.000	-19.337
FLAP	FLAP	FLAP	FLAP	TAB	L.ATL	R.ATL	DIHED.	SWEEP	NO.SPAN	NO.CHORD	NO.CHORD
SPAN1	SPAN2	SPAN3	DEFLEC	DEFLEC	DEFLEC	DEFLEC	MGC/4	MGC/4	ELEMENTS	ELEMENTS	DISCONT.
.700	40.000	40.000	-10.000	.000	.000	.000	.000	10.620	4	3	1
FUS STA	WING STA	HL STA	AREA	CHORD	SPAN						
X(CG)	Y(CG)	Z(CG)	S(CG)	C(CG)	B(CG)						
.000	.000	.000	8200.000	32.681	280.000						

MS	Y	Z	X(LE)	X(C/4)	X(TE)	Twist	DIHE(C/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-40.000	-40.000	-20.000	130.000	130.000	150.000	-2.000	.000	-10.620	20.000	10.000	3.000
-36.000	-36.000	-20.000	120.000	130.250	150.000	-2.000	.000	-10.620	21.000	10.000	3.000
-32.000	-32.000	-20.000	120.000	133.500	150.000	-2.000	.000	-10.620	22.000	10.000	3.000
-28.000	-28.000	-20.000	120.000	137.750	150.000	-2.000	.000	-10.620	23.000	10.000	3.000
-24.000	-24.000	-20.000	120.000	142.000	150.000	-2.000	.000	-10.620	24.000	10.000	3.000
-20.000	-20.000	-20.000	120.000	146.250	150.000	-2.000	.000	-10.620	25.000	10.000	3.000
-16.000	-16.000	-20.000	120.000	150.500	150.000	-2.000	.000	-10.620	26.000	10.000	3.000

6.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 6 1 1 0 1 0 0 0 1 0 4 ALFA= .00 MACHNO=.0000 ALTITUDE=***** 29
 NOTATION = 1/(1,1) INDICATES A SOLUTION FOR SURFACE # 1 IS OUT- OF-RANGE
 CONSIDERING SURFACE # 1 ONLY

LIFT DISTRIBUTION DETAIL-SURFACE NO.= 1/1 1, 1

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	VI(X)	VI(Y)	VI(Z)	GAMA
1	1	17.771	-130.043	-15.795	61.2737	3.3527	.34119	-.06387	.95313	.00681	-.04141	-.17854	-.4900+01
1	2	20.801	-130.043	-15.815	61.2737	1.7490	.05820	-.15014	.95501	.00755	-.01219	-.11125	-.2596+01
1	3	23.831	-130.043	-15.836	61.2737	1.3455	.02500	-.16349	.97011	.01244	-.02245	.14417	-.2020+01
1	4	27.056	-130.011	-15.673	78.7805	1.4206	-.08275	-.19426	.95939	-.00291	-.05451	.24787	-.2750+01
2	1	12.145	-110.130	-12.544	89.4594	3.6325	.36292	-.04957	.96069	.01147	-.04791	-.20024	-.7763+01
2	2	16.569	-110.130	-12.500	89.4594	1.8395	.04458	-.14618	.95622	.00767	-.01218	-.12551	-.3991+01
2	3	20.994	-110.130	-12.456	89.4594	1.3923	.01126	-.16091	.97176	.01373	-.02528	.15789	-.3055+01
2	4	25.685	-110.066	-12.046	115.0192	1.4516	-.09578	-.17580	.95316	-.01031	-.06225	.26009	-.6114+01
3	1	6.520	-90.217	-6.490	117.6450	3.6835	.35231	-.04444	.96960	.01832	.05187	-.18846	-.1037+02
3	2	12.338	-90.217	-6.332	117.6450	1.8443	.02797	-.14298	.95842	.00863	-.01114	-.14300	-.5268+01
3	3	18.156	-90.217	-6.175	117.6450	1.3934	-.00604	-.15867	.97241	.01407	-.02837	.17523	-.4023+01
3	4	24.326	-90.133	-6.530	151.2579	1.4599	-.11189	-.17427	.95098	-.01234	-.07074	.27510	-.5444+01
4	1	.894	-70.304	-6.631	145.8307	3.6994	.34018	-.03982	.98049	.02646	-.05866	-.17482	-.1292+02
4	2	8.106	-70.304	-6.312	145.8307	1.8325	.01275	-.13974	.96273	.01119	-.00709	-.15943	-.6496+01
4	3	15.318	-70.304	-5.993	145.8307	1.3765	-.02220	-.15653	.97496	.01600	-.02896	.19178	-.4930+01
4	4	22.967	-70.200	-6.080	187.4966	1.4587	-.12940	-.17317	.95062	-.01264	-.07727	.29190	-.6745+01
5	1	-4.731	-50.391	-3.969	174.0164	3.7010	.31920	-.03878	1.00180	.03905	.08887	-.14914	-.1544+02
5	2	3.875	-50.391	-3.440	174.0164	1.8743	-.00222	-.13817	.97988	.02102	.02520	-.17798	-.7777+01
5	3	12.481	-50.391	-2.910	174.0164	1.3647	-.04057	-.15699	.99271	.02914	.00085	.21522	-.5837+01
5	4	21.551	-50.237	-1.473	223.7353	1.5111	-.15875	-.18925	.95198	-.00958	-.05840	.32466	-.8291+01
6	1	-7.605	-30.327	-2.661	188.4164	2.9548	.19307	-.00159	1.03889	.05375	.05764	-.01928	-.1377+02
6	2	1.713	-30.327	-2.011	188.4164	1.8781	-.05007	-.00323	1.02343	.03848	.03440	.22382	-.8753+01
6	3	11.031	-30.327	-1.361	188.4164	1.8211	-.07307	-.00357	1.04030	.05547	.01229	.24676	-.8488+01
6	4	20.707	-30.231	.631	242.2497	2.5312	-.27833	-.02616	.96685	-.01725	-.03472	.45125	-.1531+02
7	1	-7.667	-10.110	-2.634	188.7236	3.3639	.24995	.00000	1.03270	.04789	.00121	-.07631	-.1570+02
7	2	1.667	-10.110	-1.981	188.7236	1.9792	-.03493	.00000	1.01830	.03349	.00063	.20857	-.9236+01
7	3	11.000	-10.110	-1.329	188.7236	1.7822	-.06998	.00000	1.04286	.05805	-.00232	.24363	-.8317+01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 6 1 1 0 1 0 0 0 1 0 4 ALFA= 10.00 MACHNO=.2000 ALTITUDE=***** 30
 ALTITUDE = ***** (OUT-OF-RANGE) INDICATES OUT-OF-GROUND SOLUTION

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	VI(X)	VI(Y)	VI(Z)	GAMA
7	4	20.598	-10.110	.871	242.6446	2.5103	-.28709	.00000	.95976	-.02505	-.00408	.46074	-.1506+02
8	1	-7.667	10.110	-2.634	188.7236	3.0956	.21128	.00000	1.03348	.04867	-.00887	-.03764	-.1445+02
8	2	1.667	10.110	-1.981	188.7236	1.9130	-.04119	.00000	1.02066	.03586	.01086	.21483	-.8927+01
8	3	11.000	10.110	-1.329	188.7236	1.7759	-.07342	.00000	1.04517	.06036	.03008	.24707	-.8287+01
8	4	20.598	10.110	.871	242.6447	2.5360	-.28774	.00000	.96247	-.02233	.05741	.46138	-.1522+02
9	1	-7.605	30.327	-2.661	188.4164	1.7018	.00832	.00273	1.04643	.06073	-.15159	.16573	-.7931+01
9	2	1.713	30.327	-2.011	188.4164	1.5863	-.08984	.00343	1.02816	.04292	.05623	.26378	-.7993+01
9	3	11.031	30.327	-1.361	188.4164	1.9069	-.08257	.00356	1.02887	.04394	-.04469	.25636	-.8887+01
9	4	20.812	30.330	.151	242.2497	2.7306	-.27140	.07493	.97250	-.00857	.05019	.44222	-.1630+02
10	1	-4.731	50.391	-3.969	174.0164	4.1886	.46248	-.00276	.99352	.00629	-.17412	-.28819	-.1748+02
10	2	3.875	50.391	-3.440	174.0164	1.2275	.05866	.12210	.95762	-.01324	-.07832	.12412	-.5197+01
10	3	12.481	50.391	-2.910	174.0164	.0575	.01032	.14506	.96198	-.00576	-.02547	.16699	-.2460+00
10	4	21.623	50.327	-2.705	223.7354	-1.0120	.08627	.20403	.96674	.00579	-.00429	.08615	.5596+01
11	1	.894	70.304	-6.631	145.8307	2.7466	.29936	.04758	.95330	.00598	-.03044	-.13597	-.9593+01
11	2	8.106	70.304	-6.312	145.8307	.9028	.02562	.13365	.94006	-.00739	.02986	.14276	-.3200+01
11	3	15.318	70.304	-5.993	145.8307	.1729	.00992	.14861	.95370	-.00249	.05172	.15537	-.6194+00
11	4	22.966	70.166	-6.432	187.4966	-.8072	.14641	.14447	.96873	.00081	.03465	.01952	.3739+01
12	1	6.520	90.217	-6.490	117.6451	2.2243	.25439	.06858	.94589	.00274	-.01894	-.09057	-.6260+01
12	2	12.338	90.217	-6.332	117.6451	.7000	.03237	.13975	.94368	-.00392	.02380	.13648	-.2000+01
12	3	18.156	90.217	-6.175	117.6451	.0548	.02020	.15283	.95951	.00165	.03383	.14750	-.1983+00
12	4	24.277	90.106	-6.636	151.2579	-.9048	.16038	.14584	.96904	-.00002	.01263	.00876	.3380+01
13	1	12.145	110.130	-12.544	89.4594	1.8027	.22442	.08557	.94099	.00103	-.01156	-.06041	-.3852+01
13	2	16.569	110.130	-12.500	89.4594	.5268	.04149	.14521	.94626	-.00069	.02140	.12722	-.1143+01
13	3	20.994	110.130	-12.456	89.4594	-.0457	.03258	.15657	.96396	.00583	.02580	.13597	.1003+00
13	4	25.648	110.046	-12.888	115.0192	-.9786	.17458	.14715	.96912	-.00024	.00293	-.00416	.2779+01
14	1	17.771	130.043	-15.795	61.2737	1.4769	.20591	.09940	.93714	-.00036	-.00721	-.04189	-.2159+01
14	2	20.801	130.043	-15.815	61.2737	.3656	.05347	.14983	.94730	.00105	.01920	.11496	-.5428+00
14	3	23.831	130.043	-15.836	61.2737	-.1681	.04725	.15941	.96484	.00672	.02022	.12175	.2524+00
14	4	27.039	130.000	-16.102	78.7805	-1.0584	.18867	.13981	.96958	-.00095	-.00176	-.01755	.2057+01

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1/1 1, 1

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 6 1 1 0 1 0 0 0 1 0 4 ALFA= 10.00 MACHNO=.2000 ALTITUDE=***** 31

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
1	-.4644	-130.043	-15.805	111.433	1.8747	-.2683	1.8928	.2789	-.1718	.0878	.0830	.1551	-.9844
2	-.3933	-110.130	-12.522	111.212	1.9819	-.2948	2.0030	.2930	-.1848	.1356	.0961	.1349	-.9862

2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

3	-.3222	-90.217	-9.411	50.992	2.0043	-.2704	2.0207	.3011	-.1616	-1.000	-.1117	-.1208	-.9864
4	-.2511	-70.304	-6.472	70.771	2.0121	-.2422	2.0236	.3073	-.1573	.2234	-.1284	.1067	-.9860
5	-.1800	-50.391	-3.704	50.551	2.0607	-.1946	2.0632	.3240	-.1654	.2718	-.1599	.1465	-.9762
6	-.1083	-30.327	-2.336	30.331	2.3410	.1312	2.2827	.4273	-.3828	.3256	.2765	.0260	-.9606
7	-.0361	-10.110	-2.308	10.110	2.4373	.0652	2.3889	.4366	-.3557	.3413	.2866	.0000	-.9581
8	.0361	10.110	-2.308	10.110	2.3674	.1151	2.3115	.4311	-.3721	.3302	.2864	.0000	-.9581
9	.1083	30.327	-2.336	30.331	2.0505	-.2890	1.9692	.4063	-.4763	.2809	.2681	-.0740	-.9606
10	.1800	50.391	-3.704	50.551	.9796	-.4496	1.0428	.0920	.3296	.1374	.0870	.2057	.9747
11	.2511	70.304	-6.472	70.771	.6223	-.1647	.6415	.0775	.2238	.0708	.1478	.1459	.9782
12	.3222	90.217	-9.411	90.992	.4004	-.0955	.4109	.0529	.2246	.0366	.1615	.1469	.9759
13	.3933	110.130	-12.522	111.212	.2207	-.0486	.2258	.0299	.2254	.0153	.1753	.1478	.9734
14	.4644	130.043	-15.805	131.433	.0590	-.0140	.0605	.0078	.2332	.0028	.1891	.1401	.9719

INTEGRATED AIRLOAD COEFFICIENTS--SURFACE NOS.= 1 - 1

E	FCN	ECX	FCY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
1	1.6858	-.0753	.0648	1.6733	.2186	-.1030	-.1375	-.0076	5.49	-5.66	8199.59	32.68	280.00
1	.1404*	.1345*	.0037*	.1149*	.1568*	.0243*	-.0094*	.0092*	5.49*	-5.66*	8199.59*	32.68*	280.00*

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 6 1 1 0 1 0 0 0 1 0 4 ALFA= 10.00 MACHNO= .2000 ALTITUDE=***** 32

*** AIRLOAD SUMS ***

AC	1.6858	-.0753	.0648	1.6733	.2186	-.1030	-.1375	-.0076	5.49	-5.66	8199.59	32.68	280.00
CG	1.6857	-.0753	.0648	1.6732	.2186	-.1030	-.1388	-.0063	.00	.00	8200.00	32.68	280.00
AC	.1404*	.1345*	.0037*	.1149*	.1568*	.0243*	-.0094*	.0092*	5.49*	-5.66*	8199.59*	32.68*	280.00*
CG	.1404*	.1345*	.0037*	.1149*	.1568*	.0240*	-.0095*	.0073*	.00*	.00*	8200.00*	32.68*	280.00*

* DETERMINANT= .1721E+35 * SCALE= .4057E+02 *

THE LIFT COEFFICIENT FOR THE WING ALONE, 1/(1,1), IS $C_L = 1.6733$ WITH L.E. SUCTION (BLUNT L.E.)
 = 1.7881 NO L.E. SUCTION (SHARP L.E.)

NOTATION = 1/(1,2) INDICATES SOLUTION FOR SURFACE # 1 IS OUTPUT

LIFT DISTRIBUTION DETAIL--SURFACE NO.= 1/(1, 2) CONSIDERING SURFACES # 1 AND # 2 SIMULTANEOUSLY.

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	V1(X)	V1(Y)	V1(Z)	GAMA
1	1	17.771	-130.043	-15.795	61.2737	3.1425	.31837	-.07038	.95354	.00802	.03862	-.15499	-.4593+01
1	2	20.801	-130.043	-15.815	51.2737	1.6534	.05411	-.15123	.95632	.00875	-.01141	.11563	-.2456+01
1	3	23.831	-130.043	-15.836	61.2737	1.2875	.02272	-.16403	.97138	.01353	-.02097	.14675	-.1933+01
1	4	27.056	-130.011	-15.673	78.7805	1.3894	-.08469	-.19473	.96119	-.00124	-.05213	.25029	-.2690+01
2	1	12.145	-110.130	-12.544	89.4594	3.3616	.33326	-.05804	.96127	.01295	.04482	-.16955	-.7184+01
2	2	16.569	-110.130	-12.500	99.4594	1.7175	-.04761	-.14686	.95838	.00952	-.01039	.13105	-.4886+01
2	3	20.994	-110.130	-12.456	89.4594	1.3184	.00832	-.16149	.97387	.01546	-.02226	.16141	-.2892+01
2	4	25.645	-110.066	-12.046	115.0192	1.4125	-.09848	-.17652	.95619	-.00756	-.05737	.26371	-.4003+01
3	1	6.520	-90.217	-6.490	117.6450	3.3530	.31651	-.05474	.97087	.02014	.05015	-.15115	-.9436+01
3	2	12.338	-90.217	-6.332	117.6450	1.6965	.02178	-.14486	.96210	.01146	-.00651	.15011	-.4886+01
3	3	18.156	-90.217	-6.175	117.6450	1.3052	-.00967	-.15976	.97597	.01674	-.02159	.18004	-.3769+01
3	4	24.326	-90.133	-6.530	151.2579	1.4156	-.11550	-.17528	.95533	-.00859	-.06081	.28052	-.5278+01
4	1	.894	-70.304	-6.631	145.8307	3.3054	.29793	-.05246	.98561	.02937	.06755	-.12933	-.1155+02
4	2	8.106	-70.304	-6.312	145.8307	1.6594	.00481	-.14261	.97073	.01588	-.00697	.17011	-.5882+01
4	3	15.319	-70.304	-6.993	145.8307	1.2825	-.02760	-.15839	.98190	.02027	-.00915	.20042	-.4594+01
4	4	22.967	-70.200	-5.060	187.4966	1.4233	-.13463	-.17456	.95660	-.00816	-.05378	.30129	-.6581+01
5	1	-4.731	-50.391	-3.969	174.0164	3.0735	-.22600	-.07095	1.03529	.05122	.16994	-.03546	-.1283+02
5	2	3.875	-50.391	-3.440	174.0164	1.7399	-.02271	-.14665	1.00926	.03140	.11899	.21380	-.7367+01
5	3	12.481	-50.391	-2.910	174.0164	1.3955	-.04723	-.16073	1.01103	.03501	.09099	.23575	-.5969+01
5	4	21.551	-50.237	-1.473	223.7353	1.5714	-.15479	-.19029	.95913	-.00789	.01769	.33482	-.8622+01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 6 1 1 0 1 0 0 0 1 0 4 ALFA= 10.00 MACHNO= .2000 ALTITUDE=***** 33

6	1	-7.605	-30.327	-2.661	198.4164	3.9243	-.33613	-.00070	1.03018	.04427	.18413	-.16200	-.1829+02
6	2	1.713	-30.327	-2.011	198.4164	2.1643	-.02451	-.00309	1.01297	.02735	.15993	.19863	-.1009+02
6	3	11.031	-30.327	-1.361	198.4164	1.9240	-.06319	-.00352	1.03328	.04810	.12577	.23724	-.8967+01
6	4	20.707	-30.231	.631	242.2497	2.5434	-.27064	-.02594	.96082	-.02419	.04952	.44557	-.1538+02
7	1	-7.667	-10.110	-2.634	188.7236	4.7329	.42732	.03000	1.02377	.03896	.04678	-.25367	-.2209+02
7	2	1.667	-10.110	-1.981	188.7236	2.4835	-.00090	.00000	1.00259	.01779	.04444	.17455	-.1159+02
7	3	11.000	-10.110	-1.329	188.7236	2.0143	-.05192	.00000	1.03039	.04558	.03885	.22557	-.9399+01
7	4	20.598	-10.110	.871	242.6446	2.5658	-.27347	.00000	.94594	-.03887	.02672	.44712	-.1539+02
8	1	-7.667	10.110	-2.634	188.7236	4.5395	.40490	.00000	1.02298	.03818	-.06000	-.23126	-.2118+02
8	2	1.667	10.110	-1.981	188.7236	2.4184	-.00464	.00000	1.00421	.01940	-.03917	.17828	-.1129+02
8	3	11.000	10.110	-1.329	188.7236	1.9977	-.05550	.00000	1.03261	.04781	-.01502	.22151	-.9322+01
8	4	20.598	10.110	.871	242.6447	2.5856	-.27536	.00000	.94899	-.03581	.02470	.44901	-.1551+02
9	1	-7.605	30.327	-2.661	198.4164	2.4864	-.12055	.00203	1.04000	.05349	-.28414	.05385	-.1159+02
9	2	1.713	30.327	-2.011	198.4164	1.8337	-.06992	.00331	1.01926	.03343	-.22668	.24423	-.8546+01
9	3	11.031	30.327	-1.361	198.4164	2.0084	-.07382	.00351	1.02224	.03495	-.16170	.24799	-.9360+01
9	4	20.812	30.339	.151	242.2497	2.7493	-.25802	.07435	.96841	-.01458	-.03993	.43522	-.1541+02
10	1	-4.731	50.391	-3.969	174.0164	3.6302	-.37807	.02497	1.02369	.01616	-.25100	-.18991	-.1515+02
10	2	3.875	50.391	-3.440	174.0164	1.1086	.04230	.12928	.98401	-.00482	-.16684	.15344	-.4694+01
10	3	12.481	50.391	-2.910	174.0164	.0280	.00593	.14916	.97827	-.00128	-.11083	.18447	-.1199+02

6.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

10	4	21.623	50.327	-2.705	223.7354	-1.0585	.09538	.20498	.97367	.00802	-.08489	.09426	.5853+01
11	1	.894	70.304	-6.631	145.8307	2.3284	.25476	.06073	.95726	-.00868	-.03558	-.08850	-.8133+01
11	2	8.106	70.304	-6.312	145.8307	.7175	.01733	.13650	.94737	-.00280	.01597	.15338	-.2563+01
11	3	15.318	70.304	-6.993	145.8307	.0672	-.00482	-.15045	.96079	.00225	.03417	.16334	-.2408+01
11	4	22.906	70.166	-6.432	187.4966	-.8666	.14342	.14527	.97242	.00329	.01610	.02551	.4014+01
12	1	6.520	90.217	-6.490	117.6451	1.8759	-.21660	.07943	.94703	.00463	-.01646	-.05127	-.5279+01
12	2	12.339	90.217	-6.332	117.6451	.5447	-.02590	.14172	.94753	-.00087	.01943	.13294	-.8681+01
12	3	18.156	90.217	-6.175	117.6451	-.0391	.01649	.15407	.96388	.00515	.02703	.15239	.1128+01
12	4	24.277	90.106	-6.636	151.2579	-.9576	.15765	.14637	.97117	.00164	.00549	.01269	.3577+01
13	1	12.145	110.130	-12.544	89.4594	1.5216	.19363	.07437	.94162	.00261	-.00829	-.02857	-.3252+01
13	2	16.569	110.130	-12.500	89.4594	.4001	.03224	.14672	.94864	.00139	.01956	.13294	-.8681+01
13	3	20.994	110.130	-12.456	89.4594	-.1229	.02957	.15748	.96681	.00829	.02261	.13959	.2697+01
13	4	25.648	110.046	-12.888	115.0192	-1.0216	.17225	.14750	.97028	.00071	-.00023	-.00127	.2901+01
14	1	17.771	130.043	-15.795	61.2737	1.2612	.18248	.10609	.93761	.00093	-.00436	-.01770	-.1843+01
14	2	20.801	130.043	-15.815	61.2737	.2675	.04927	.15097	.94875	.00238	.01835	.11947	-.3971+01
14	3	23.831	130.043	-15.836	61.2737	-.2280	.04493	.15003	.96654	.00823	.01860	.12440	.3423+01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 6 1 1 0 1 0 0 0 1 0 4 ALFA= 10.00 MACHNO= .2000 ALTITUDE=***** 34

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	V(X)	V(Y)	V(Z)	GAMA
14	4	27.039	130.000	-16.102	70.7649	-1.0510	.18681	.14706	.97032	-.00930	-.00338	-.01540	.2121+01

LIFT DISTRIBUTION DETAIL-SURFACE NO.= 2/(1, 2)

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	V(X)	V(Y)	V(Z)	GAMA
16	1	129.962	-30.000	-19.269	145.0000	-2.0648	-.15909	-.04257	1.01734	.02604	.13977	.33758	.6303+01
16	2	135.312	-30.000	-19.487	145.0000	-1.1296	-.00198	-.00352	1.01865	.02474	.14480	.17611	.3514+01
16	3	142.476	-30.000	-20.064	200.0000	-.9998	.07207	.01089	.95773	.01278	.14485	.10001	.4999+01
17	1	124.687	-10.000	-19.110	175.0000	-2.3959	-.20035	-.05144	.99651	.03078	.02060	.37890	.1024+02
17	2	133.437	-10.000	-19.422	175.0000	-1.2065	-.00572	-.00384	1.00975	.02718	.02335	.17946	.5255+01
17	3	142.462	-9.996	-20.172	200.0000	-1.0489	.08261	-.00000	.99736	.01255	.02330	.09104	.5243+01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 6 1 1 0 1 0 0 0 1 0 4 ALFA= 10.00 MACHNO= .2000 ALTITUDE=***** 35

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	LXL	LYL	LZL
8	.0361	10.110	-2.308	10.110	2.8677	-.1868	2.8565	.4655	-.3274	.4081	.2787	.0000	-.9604
9	.1093	30.327	-2.336	30.331	2.3172	-.2074	2.2460	.4384	-.4495	.3203	.2567	-.0740	-.9636
10	.1800	50.351	-3.704	50.551	.8315	-.3056	.8719	.0913	.3204	.1149	.0954	.2051	.9741
11	.2511	70.304	-6.472	70.771	.4477	-.1057	.4593	.0584	.2239	.0507	.1443	.1462	.9787
12	.3222	90.217	-9.411	90.992	.2510	-.0535	.2565	.0343	.2255	.0228	.1585	.1472	.9763
13	.3933	110.130	-12.522	111.212	.0993	-.0188	.1010	.0140	.2262	.0068	.1729	.1480	.9738
14	.4644	130.043	-15.805	131.433	-.0344	.0069	-.0351	-.0048	.2339	-.0016	.1872	.1403	.9722

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 2/(1, 2)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	LXL	LYL	LZL
16	-.3750	-30.000	-19.378	311.563	-1.3465	-.0598	-1.3157	-.2442	.1100	-.3700	.0720	.0109	.9973
17	-.1250	-10.000	-19.269	291.563	-1.5277	-.1234	-1.4831	-.2867	.1088	-.5098	.0825	-.0000	.9966
18	.1250	10.000	-19.269	291.563	-1.5890	-.1398	-1.5406	-.3002	.1024	-.5296	.0806	.0000	.9967
19	.3750	30.000	-19.378	211.563	-1.2446	-.0397	-1.2188	-.2230	.1079	-.3428	.0676	-.0109	.9977

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 1 - 2

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EZA	EZB	ES	EMGC	EB
1	1.7593	-.1156	.0667	1.7526	.1917	-.0474	-.1396	-.0077	5.49	-5.66	8199.59	32.68	280.00
2	.1401*	-.1362*	.0029*	.1143*	.1585*	.0292*	-.0091*	-.0089*	5.49*	-5.66*	8199.59*	32.68*	280.00*
1	-1.4401	-.0948*	-.0002	-1.4018	-.3434	.1023	.0065	-.0012	131.00	-19.34	2000.00	29.33	80.00
2	-.0977*	.0948*	.0000*	-.1127*	.0764*	-.0257*	.0012*	.0012*	131.00*	-19.34*	2000.00*	29.33*	80.00*

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 1 - MULTIPLE SURFACE ANALYSIS CAP PAGE
 VALUE 14 4 2 3 2 4 3 4 4 6 1 1 0 1 0 0 0 1 0 4 ALFA= 10.00 MACHNO= .2000 ALTITUDE=***** 36

*** AIRLOAD SUMS ***

AC	1.4080	-.1387	.0667	1.4107	.1079	1.3113	-.1391	-.0078	5.49	-5.66	8199.59	32.68	280.00
CG	1.4080	-.1387	.0667	1.4107	.1079	1.0508	-.1405	-.0065	.00	.00	8200.00	32.68	280.00
AC	.1163*	-.1593*	.0029*	.0868*	.1771*	.1255*	-.0090*	.0070*	5.49*	-5.66*	8199.59*	32.68*	280.00*
CG	.1163*	-.1593*	.0029*	.0868*	.1771*	.1336*	-.0091*	.0070*	.00*	.00*	8200.00*	32.68*	280.00*

* DETERMINANT= .2376+13 * SCALE= .3941-02 *

END OF XQT NSURF

*** JOB TIME= 68 / ELAPSED TIME= 79 / NO.PLOT FILES= 7 / NSURF EXEC. VERSION 6-18-72 ***

5.2 EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

XQT TRMPLT 31 AUG 72 12*43*37.905

```

KUNIT = 8
ICCOMP = 0
NTRAN = 0
IPRINT = 0
NTYPE = 0
NDFSEL = 1
ISCALY = 1,1,1,1,1,1,1,1,1,1,1
NXL = 24
NXR = 24
NYL = 24
NYH = 24
NPOSN1 = 600, 950
NPOSN2 = 600, 925
NPOSN3 = 600, 900
NPOSN4 = 600, 50
ANNOT1 = 10 = EXAMPLR PRJED. 1 - MULTIPLE-SURFACE
ANNOT2 = 10 = CAPABILITY DEMONSTRATION RUN
ANNOT3 = 10 = AUGUST 5 JULY 72
ANNOT4 = 10 =
CHARSZ = 1.0,1.0,1.0,1.0
TITLE = 10 = ISOMETRIC PROJECTION OF LIFTING SURFACES
XLABEL = 10 = HORIZONTAL AXIS, SEMISPANS
YLABEL = 10 = VERTICAL AXIS, SEMISPANS
XHI = 1.5
XLO = -1.0
YHI = 1.5
YLO = -1.0
PLOT = 2,1, 3,1, ENULST
ENDPLT
NDADV = 0
NOADV = 1
PLOT = 5,1, 6,1, ENULST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENULST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENULST
ENDPLT
ENDFIL

```

START OF XQT TRMPLT (PLOT OPTION)

```

MICROFILM PLOT COMPLETED
NOADV = 1
PLOT = 2,1, 3,1, ENULST
ENDPLT
NOADV = 1
PLOT = 5,1, 6,1, ENULST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENULST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENULST
ENDPLT
ENDFIL

```

```

MICROFILM PLOT COMPLETED
NOADV = 1
PLOT = 2,1, 3,1, ENULST
ENDPLT
NOADV = 1
PLOT = 5,1, 6,1, ENULST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENULST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENULST
ENDPLT
ENDFIL

```

```

MICROFILM PLOT COMPLETED
NOADV = 1
PLOT = 2,1, 3,1, ENULST
ENDPLT
NOADV = 1
PLOT = 5,1, 6,1, ENULST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENULST
ENDPLT
NOADV = 1

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```

NOADV = 1
PLOT = 2,3, 3,3, ENULST
ENDPLT
ENDFIL

```

SOME OF THE OUTPUT OMITTED, SEE INPUT-DATA LISTING ON PAGES 6-1 AND 6-2.

```

MICROFILM PLOT COMPLETED
NOADV = 1
PLOT = 2,1, 3,1, ENULST
ENDPLT
NOADV = 1
PLOT = 5,1, 6,1, ENULST
ENDPLT
NOADV = 1
PLOT = 2,2, 3,2, ENULST
ENDPLT
NOADV = 1
PLOT = 2,3, 3,3, ENULST
ENDPLT
ENDFIL

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MICROFILM PLOT COMPLETED
ENDKLN

```

ORIGINAL PAGE IS
OF POOR QUALITY

6.3 EXAMPLE PROBLEM # 2, SINGLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

1	2	-2.813+01	3.750+00	1.406+00	5.273+00
2	2	-2.437+01	3.750+00	1.719+00	6.445+00
3	2	-2.062+01	3.750+00	2.031+00	7.617+00
4	2	-1.687+01	3.750+00	2.344+00	8.789+00
5	2	-1.312+01	3.750+00	2.656+00	9.961+00
6	2	-9.375+00	3.750+00	2.969+00	1.113+01
7	2	-5.625+00	3.750+00	3.281+00	1.230+01
8	2	-1.875+00	3.750+00	3.594+00	1.346+01
9	2	1.875+00	3.750+00	3.594+00	1.346+01
10	2	5.625+00	3.750+00	3.281+00	1.230+01
11	2	9.375+00	3.750+00	2.969+00	1.113+01
12	2	1.312+01	3.750+00	2.656+00	9.961+00
13	2	1.687+01	3.750+00	2.344+00	8.789+00
14	2	2.062+01	3.750+00	2.031+00	7.617+00
15	2	2.437+01	3.750+00	1.719+00	6.445+00
16	2	2.813+01	3.750+00	1.406+00	5.273+00

1	3	-2.813+01	3.750+00	1.406+00	5.273+00
2	3	-2.437+01	3.750+00	1.719+00	6.445+00
3	3	-2.062+01	3.750+00	2.031+00	7.617+00
4	3	-1.687+01	3.750+00	2.344+00	8.789+00
5	3	-1.312+01	3.750+00	2.656+00	9.961+00
6	3	-9.375+00	3.750+00	2.969+00	1.113+01
7	3	-5.625+00	3.750+00	3.281+00	1.230+01
8	3	-1.875+00	3.750+00	3.594+00	1.346+01
9	3	1.875+00	3.750+00	3.594+00	1.346+01
10	3	5.625+00	3.750+00	3.281+00	1.230+01
11	3	9.375+00	3.750+00	2.969+00	1.113+01
12	3	1.312+01	3.750+00	2.656+00	9.961+00
13	3	1.687+01	3.750+00	2.344+00	8.789+00
14	3	2.062+01	3.750+00	2.031+00	7.617+00

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
 VALUE 1 0 1 0 0 1 4 0 1 0 4 ALTA=***** MACHNO= .0000 FLAPO= .00 AILERNO= .00 .00 ALTITUDE=***** 4

J	K	Y	BY	OC	US
15	3	2.437+01	3.750+00	1.719+00	6.445+00
16	3	2.813+01	3.750+00	1.406+00	5.273+00

1	4	-2.813+01	3.750+00	1.406+00	5.273+00
2	4	-2.437+01	3.750+00	1.719+00	6.445+00
3	4	-2.062+01	3.750+00	2.031+00	7.617+00
4	4	-1.687+01	3.750+00	2.344+00	8.789+00
5	4	-1.312+01	3.750+00	2.656+00	9.961+00
6	4	-9.375+00	3.750+00	2.969+00	1.113+01
7	4	-5.625+00	3.750+00	3.281+00	1.230+01
8	4	-1.875+00	3.750+00	3.594+00	1.346+01
9	4	1.875+00	3.750+00	3.594+00	1.346+01
10	4	5.625+00	3.750+00	3.281+00	1.230+01
11	4	9.375+00	3.750+00	2.969+00	1.113+01
12	4	1.312+01	3.750+00	2.656+00	9.961+00
13	4	1.687+01	3.750+00	2.344+00	8.789+00
14	4	2.062+01	3.750+00	2.031+00	7.617+00
15	4	2.437+01	3.750+00	1.719+00	6.445+00
16	4	2.813+01	3.750+00	1.406+00	5.273+00

J	K	XV	YV	ZV	LXV	LYV	LZV	XN	YN	ZN	LXN	LYN	LZN
1	1	-9.375-01	-3.000+01	0.000	-6.238-02	9.981-01	0.000	-3.516-01	-2.813+01	0.000	0.000	0.000	1.000+00
2	1	-1.172+00	-2.625+01	0.000	-6.238-02	9.981-01	0.000	-4.297-01	-2.437+01	0.000	0.000	0.000	1.000+00
3	1	-1.406+00	-2.250+01	0.000	-6.238-02	9.981-01	0.000	-5.078-01	-2.062+01	0.000	0.000	0.000	1.000+00
4	1	-1.641+00	-1.875+01	0.000	-6.238-02	9.981-01	0.000	-5.859-01	-1.687+01	0.000	0.000	0.000	1.000+00
5	1	-1.875+00	-1.500+01	0.000	-6.238-02	9.981-01	0.000	-6.641-01	-1.312+01	0.000	0.000	0.000	1.000+00
6	1	-2.109+00	-1.125+01	0.000	-6.238-02	9.981-01	0.000	-7.422-01	-9.375+00	0.000	0.000	0.000	1.000+00
7	1	-2.344+00	-7.500+00	0.000	-6.238-02	9.981-01	0.000	-8.203-01	-5.625+00	0.000	0.000	0.000	1.000+00
8	1	-2.578+00	-3.150+00	0.000	-6.238-02	9.981-01	0.000	-8.984-01	-1.875+00	0.000	0.000	0.000	1.000+00
9	1	-2.813+00	0.000	0.000	-6.238-02	9.981-01	0.000	-9.765-01	1.875+00	0.000	0.000	0.000	1.000+00
10	1	-2.578+00	3.750+00	0.000	-6.238-02	9.981-01	0.000	-8.203-01	5.625+00	0.000	0.000	0.000	1.000+00
11	1	-2.344+00	7.500+00	0.000	-6.238-02	9.981-01	0.000	-7.422-01	9.375+00	0.000	0.000	0.000	1.000+00
12	1	-2.109+00	1.125+01	0.000	-6.238-02	9.981-01	0.000	-6.641-01	1.312+01	0.000	0.000	0.000	1.000+00
13	1	-1.875+00	1.500+01	0.000	-6.238-02	9.981-01	0.000	-5.859-01	1.687+01	0.000	0.000	0.000	1.000+00
14	1	-1.641+00	1.875+01	0.000	-6.238-02	9.981-01	0.000	-5.078-01	2.062+01	0.000	0.000	0.000	1.000+00
15	1	-1.406+00	2.250+01	0.000	-6.238-02	9.981-01	0.000	-4.297-01	2.437+01	0.000	0.000	0.000	1.000+00
16	1	-1.172+00	2.625+01	0.000	-6.238-02	9.981-01	0.000	-3.516-01	2.813+01	0.000	0.000	0.000	1.000+00

1	2	3.125-01	-3.000+01	0.000	2.083-02	9.998-01	0.000	1.055+00	-2.813+01	0.000	0.000	0.000	1.000+00
2	2	3.906-01	-2.625+01	0.000	2.083-02	9.998-01	0.000	1.289+00	-2.437+01	0.000	0.000	0.000	1.000+00
3	2	4.688-01	-2.250+01	0.000	2.083-02	9.998-01	0.000	1.523+00	-2.062+01	0.000	0.000	0.000	1.000+00
4	2	5.469-01	-1.875+01	0.000	2.083-02	9.998-01	0.000	1.758+00	-1.687+01	0.000	0.000	0.000	1.000+00
5	2	6.250-01	-1.500+01	0.000	2.083-02	9.998-01	0.000	1.992+00	-1.312+01	0.000	0.000	0.000	1.000+00
6	2	7.031-01	-1.125+01	0.000	2.083-02	9.998-01	0.000	2.227+00	-9.375+00	0.000	0.000	0.000	1.000+00
7	2	7.813-01	-7.500+00	0.000	2.083-02	9.998-01	0.000	2.461+00	-5.625+00	0.000	0.000	0.000	1.000+00
8	2	8.594-01	-3.150+00	0.000	2.083-02	9.998-01	0.000	2.695+00	-1.875+00	0.000	0.000	0.000	1.000+00
9	2	9.375-01	0.000	0.000	2.083-02	9.998-01	0.000	2.929+00	1.875+00	0.000	0.000	0.000	1.000+00

11	2	1.813-01	1.500+00	0.000	-2.083-02	9.998-01	0.000	2.227+00	9.375+00	0.000	0.000	0.000	1.000+00
12	2	7.031-01	1.125+01	0.000	-2.083-02	9.998-01	0.000	1.992+00	1.312+01	0.000	0.000	0.000	1.000+00
13	2	6.250-01	1.500+01	0.000	-2.083-02	9.998-01	0.000	1.758+00	1.687+01	0.000	0.000	0.000	1.000+00
14	2	5.469-01	1.875+01	0.000	-2.083-02	9.998-01	0.000	1.523+00	2.062+01	0.000	0.000	0.000	1.000+00
15	2	4.688-01	2.250+01	0.000	-2.083-02	9.998-01	0.000	1.289+00	2.437+01	0.000	0.000	0.000	1.000+00
16	2	3.906-01	2.625+01	0.000	-2.083-02	9.998-01	0.000	1.055+00	2.813+01	0.000	0.000	0.000	1.000+00

1	3	1.953+00	-3.000+01	0.000	1.033-01	9.946-01	0.000	2.461+00	-2.813+01	0.000	0.000	0.000	1.000+00
2	3	1.953+00	-2.625+01	0.000	1.033-01	9.946-01	0.000	3.008+00	-2.437+01	0.000	0.000	0.000	1.000+00
3	3	1.953+00	-2.250+01	0.000	1.033-01	9.946-01	0.000	3.555+00	-2.062+01	0.000	0.000	0.000	1.000+00
4	3	1.953+00	-1.875+01	0.000	1.033-01	9.946-01	0.000	4.102+00	-1.687+01	0.000	0.000	0.000	1.000+00
5	3	1.953+00	-1.500+01	0.000	1.033-01	9.946-01	0.000	4.648+00	-1.312+01	0.000	0.000	0.000	1.000+00
6	3	1.953+00	-1.125+01	0.000	1.033-01	9.946-01	0.000	5.195+00	-9.375+00	0.000	0.000	0.000	1.000+00
7	3	1.953+00	-7.500+00	0.000	1.033-01	9.946-01	0.000	5.742+00	-5.625+00	0.000	0.000	0.000	1.000+00
8	3	1.953+00	-3.150+00	0.000	1.033-01	9.946-01	0.000	6.289+00	-1.875+00	0.000	0.000	0.000	1.000+00
9	3	1.953+00	0.000	0.000	1.033-01	9.946-01	0.000	6.836+00	1.875+00	0.000	0.000	0.000	1.000+00
10	3	1.953+00	3.150+00	0.000	1.033-01	9.946-01	0.000	5.742+00	5.625+00	0.000	0.000	0.000	1.000+00
11	3	1.953+00	7.500+00	0.000	1.033-01	9.946-01	0.000	5.195+00	9.375+00	0.000	0.000	0.000	1.000+00
12	3	1.953+00	1.125+01	0.000	1.033-01	9.946-01	0.000	4.648+00	1.312+01	0.000	0.000	0.000	1.000+00
13	3	1.953+00	1.500+01	0.000	1.033-01	9.946-01	0.000	4.102+00	1.687+01	0.000	0.000	0.000	1.000+00
14	3	1.953+00	1.875+01	0.000	1.033-01	9.946-01	0.000	3.555+00	2.062+01	0.000	0.000	0.000	1.000+00
15	3	1.953+00	2.250+01	0.000	1.033-01	9.946-01	0.000	3.008+00	2.437+01	0.000	0.000	0.000	1.000+00
16	3	1.953+00	2.625+01	0.000	1.033-01	9.946-01	0.000	2.461+00	2.813+01	0.000	0.000	0.000	1.000+00

6.3 EXAMPLE PROBLEM # 2, SINGLE SURFACE ANALYSIS CAPABILITY (CONTINUED)

1	4	2.813+00	-3.000+01	0.000	1.043+01	9.829+01	0.000	3.867+00	-2.813+01	0.000	0.000	0.000	1.000+00
2	4	3.516+00	-2.625+01	0.000	1.043+01	9.829+01	0.000	4.727+00	-2.437+01	0.000	0.000	0.000	1.000+00
3	4	4.219+00	-2.250+01	0.000	1.043+01	9.829+01	0.000	5.586+00	-2.062+01	0.000	0.000	0.000	1.000+00
4	4	4.922+00	-1.875+01	0.000	1.043+01	9.829+01	0.000	6.445+00	-1.687+01	0.000	0.000	0.000	1.000+00
5	4	5.625+00	-1.500+01	0.000	1.043+01	9.829+01	0.000	7.305+00	-1.312+01	0.000	0.000	0.000	1.000+00
6	4	6.328+00	-1.125+01	0.000	1.043+01	9.829+01	0.000	8.164+00	-9.375+00	0.000	0.000	0.000	1.000+00
7	4	7.031+00	-7.500+00	0.000	1.043+01	9.829+01	0.000	9.023+00	-5.625+00	0.000	0.000	0.000	1.000+00
8	4	7.734+00	-3.150+00	0.000	1.043+01	9.829+01	0.000	9.883+00	-1.875+00	0.000	0.000	0.000	1.000+00
9	4	8.438+00	0.000	0.000	1.043+01	9.829+01	0.000	10.742+00	0.000	0.000	0.000	0.000	1.000+00
10	4	7.734+00	3.150+00	0.000	1.043+01	9.829+01	0.000	9.883+00	1.875+00	0.000	0.000	0.000	1.000+00
11	4	7.031+00	7.500+00	0.000	1.043+01	9.829+01	0.000	9.023+00	5.625+00	0.000	0.000	0.000	1.000+00
12	4	6.328+00	1.125+01	0.000	1.043+01	9.829+01	0.000	7.305+00	1.312+01	0.000	0.000	0.000	1.000+00
13	4	5.625+00	1.500+01	0.000	1.043+01	9.829+01	0.000	6.445+00	1.687+01	0.000	0.000	0.000	1.000+00
14	4	4.922+00	1.875+01	0.000	1.043+01	9.829+01	0.000	5.586+00	2.062+01	0.000	0.000	0.000	1.000+00
15	4	4.219+00	2.250+01	0.000	1.043+01	9.829+01	0.000	4.727+00	2.437+01	0.000	0.000	0.000	1.000+00
16	4	3.516+00	2.625+01	0.000	1.043+01	9.829+01	0.000	3.867+00	2.813+01	0.000	0.000	0.000	1.000+00

(EOF PLOT FILE 1) FILE # 1 = PLANFORM AND ISOMETRIC PROJECTION OF WING GEOMETRY

JOEFLAG 1 2 3 4 5 6 7 8 9 10 SAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA = 5.00 MACHNO = 2.000 FLAPD = 30.00 AILEROND = 10.00-15.00 ALTITUDE = ***** 6

LIFT DISTRIBUTION DETAIL

J	K	P(X)	P(Y)	P(Z)	AREA	CPA	G(X)	G(Y)	G(Z)	V(X)	V(Y)	V(Z)	GAMA
1	1	-1.095	-28.125	0.000	0.2134	1.3278	1.0852	-0.1178	0.9982	-0.0034	-0.0080	-0.0174	-0.9404+00
1	2	0.352	-28.125	0.000	0.2134	0.3212	0.3194	-0.0083	0.9934	-0.0271	-0.0083	0.0474	-0.2273+00
1	3	1.758	-28.125	0.000	0.2134	-0.0419	0.0329	-0.0315	0.9915	-0.0017	-0.0011	0.0367	0.6482+00
1	4	3.153	-28.125	-0.700	0.2134	-0.6745	0.1748	-0.2894	0.9788	-0.0017	-0.0080	-0.0218	0.4762+00
2	1	-1.289	-24.375	0.000	0.4433	1.9113	0.2712	-0.1094	0.9883	-0.0034	-0.0045	-0.1844	-0.1658+01
2	2	0.437	-24.375	0.000	0.4433	0.7334	0.5538	-0.0015	0.9972	-0.0050	-0.0022	0.0172	0.3176
2	3	2.148	-24.375	0.000	0.4433	-0.0975	0.0419	-0.0049	0.9912	-0.0001	-0.0054	0.0467	0.8413+01
2	4	3.853	-24.375	-0.111	0.4433	-0.8292	0.1273	-0.2447	0.9783	-0.0014	-0.0116	-0.0417	0.7159+00
3	1	-1.523	-20.625	0.000	1.0172	2.7622	0.4189	-0.2618	0.9831	-0.0063	-0.0067	-0.3326	-0.2836+01
3	2	0.508	-20.625	0.000	1.0172	0.6154	0.7346	-0.0013	0.9927	-0.0058	-0.0073	0.0393	0.3176
3	3	2.539	-20.625	0.000	1.0172	-0.0922	0.0243	-0.0254	0.9861	-0.0023	-0.0029	0.0129	0.6264
3	4	4.565	-20.625	-0.074	1.0172	-0.5961	0.0549	-0.0506	0.9736	-0.0009	-0.0024	-0.0324	0.9435+00
4	1	-1.798	-16.875	0.000	0.1091	1.0438	0.0318	0.0194	1.00915	-0.0083	0.0015	0.0569	-0.1210+01
4	2	0.580	-16.875	0.000	0.1091	1.0361	-0.0085	0.0016	1.00239	-0.0762	-0.0001	0.0136	-0.1232+01
4	3	2.931	-16.875	0.000	0.1091	1.2399	-0.0119	0.0075	1.00092	-0.1391	0.0021	0.0639	-0.1444+01
4	4	5.225	-16.875	0.233	0.1091	1.7737	-0.1609	-0.0912	0.9791	-0.0008	-0.0211	-0.2320	-0.2084+01
5	1	-1.992	-13.125	0.000	9.9009	1.4015	0.0811	0.0551	1.00628	-0.0040	0.0241	-0.0011	-0.1846+01
5	2	0.664	-13.125	0.000	9.9009	1.1430	-0.0755	0.0007	1.00674	-0.1129	0.0223	0.0970	-0.1508+01
5	3	3.327	-13.125	0.000	9.9009	1.3289	-0.0211	0.0223	1.01154	-0.0737	0.0647	-0.0843	-0.1725+01
5	4	5.888	-13.125	0.332	9.9009	2.1637	-0.2191	-0.0561	0.97864	-0.0011	-0.0307	-0.0900	-0.2886+01
6	1	-2.227	-9.375	0.000	11.1020	1.6906	0.1376	-0.0817	1.00433	-0.0822	0.0296	-0.0438	-0.2435+01
6	2	0.742	-9.375	0.000	11.1020	1.1834	0.0965	-0.0012	1.00690	-0.1128	0.0116	0.0815	-0.1715+01
6	3	3.711	-9.375	0.000	11.1020	1.2826	-0.0204	0.0219	1.01675	-0.0820	0.0125	0.0903	-0.1838+01
6	4	6.589	-9.375	0.371	11.1020	2.1333	-0.2264	-0.0500	0.97573	-0.0101	-0.0435	-0.3119	-0.3190+01
7	1	-2.461	-5.625	0.000	12.3047	1.6194	0.1225	-0.0808	1.00469	-0.0840	0.0329	-0.0424	-0.2639+01
7	2	0.827	-5.625	0.000	12.3047	1.1461	0.0319	-0.0007	1.00723	-0.1175	0.0238	0.0836	-0.1866+01
7	3	4.102	-5.625	0.000	12.3047	1.2558	-0.0213	0.0237	1.01816	-0.0870	0.0185	0.0940	-0.2013+01
7	4	7.273	-5.625	0.410	12.3047	2.1357	-0.2167	-0.0523	0.97394	-0.0095	-0.0277	-0.3107	-0.3538+01
8	1	-2.695	-1.875	0.000	13.4700	1.3190	0.0657	-0.0411	1.00625	-0.1089	0.0180	0.0213	-0.2352+01
8	2	0.898	-1.875	0.000	13.4700	1.1612	0.0027	-0.0001	1.00834	-0.1265	0.0137	0.0888	-0.2069+01
8	3	4.492	-1.875	0.000	13.4700	1.3262	-0.0131	0.0137	1.01672	-0.0985	0.0082	0.0936	-0.2324+01
8	4	7.966	-1.875	0.449	13.4700	2.1704	-0.2137	-0.0509	0.97380	-0.0062	-0.0085	-0.3038	-0.3937+01
9	1	-2.695	1.875	0.000	13.4700	1.3423	0.0691	-0.0432	1.00608	-0.1081	0.0165	0.0192	-0.2393+01
9	2	0.898	1.875	0.000	13.4700	1.1693	0.0079	-0.0002	1.00824	-0.1257	0.0140	0.0863	-0.2083+01
9	3	4.492	1.875	0.000	13.4700	1.3391	-0.0129	0.0135	1.01933	-0.0978	0.0082	0.0901	-0.2332+01
9	4	7.966	1.875	0.449	13.4700	2.1676	-0.2124	-0.0562	0.97198	-0.0070	-0.0163	-0.3034	-0.3939+01

JOEFLAG 1 2 3 4 5 6 7 8 9 10 SAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA = 5.00 MACHNO = 2.000 FLAPD = 30.00 AILEROND = 10.00-15.00 ALTITUDE = ***** 7

J	K	P(X)	P(Y)	P(Z)	AREA	CPA	G(X)	G(Y)	G(Z)	V(X)	V(Y)	V(Z)	GAMA
10	1	-2.461	5.625	0.000	12.3047	1.7339	0.1460	-0.0879	1.00433	-0.0811	-0.0168	-0.2537	-0.2773+01
10	2	0.827	5.625	0.000	12.3047	1.1727	0.0097	-0.0001	1.00692	-0.1146	0.0242	0.0819	-0.1910+01
10	3	4.102	5.625	0.000	12.3047	1.2671	-0.0212	0.0222	1.01754	-0.0845	0.0137	0.0956	-0.2032+01
10	4	7.273	5.625	0.410	12.3047	2.1329	-0.2194	-0.0530	0.97362	-0.0072	-0.0095	-0.3093	-0.3543+01
11	1	-2.227	9.375	0.000	11.1020	1.8117	0.1552	-0.0772	1.00261	-0.0758	0.0275	-0.0275	-0.2703+01
11	2	0.742	9.375	0.000	11.1020	1.2167	0.0106	-0.0021	1.00622	-0.1063	0.0186	0.0709	-0.1795+01
11	3	3.711	9.375	0.000	11.1020	1.2826	-0.0162	0.0194	1.01768	-0.0784	0.0125	0.0908	-0.1861+01
11	4	6.589	9.375	0.371	11.1020	2.1275	-0.2211	-0.0524	0.97122	-0.0122	-0.0254	-0.3097	-0.3193+01
12	1	-1.992	13.125	0.000	9.9009	1.8064	0.1688	-0.0918	1.00410	-0.0775	-0.0380	-0.0091	-0.2385+01
12	2	0.664	13.125	0.000	9.9009	1.2385	0.0073	-0.0017	1.00973	-0.1023	0.0137	0.0722	-0.1635+01
12	3	3.327	13.125	0.000	9.9009	1.3232	-0.0134	0.0181	1.01693	-0.0886	0.0097	0.0959	-0.1719+01
12	4	5.888	13.125	0.332	9.9009	2.1410	-0.2181	-0.0584	0.97340	-0.0152	-0.0302	-0.3097	-0.2972+01
13	1	-1.798	16.875	0.000	0.1091	1.7364	0.1350	-0.0844	1.00483	-0.0730	-0.0286	-0.0410	-0.2722+01
13	2	0.580	16.875	0.000	0.1091	1.2167	0.0079	-0.0017	1.00315	-0.0796	0.0137	0.0863	-0.2121+01
13	3	2.931	16.875	0.000	0.1091	1.2827	-0.0102	0.0115	1.00827	-0.0976	0.0143	0.0934	-0.1482+01
13	4	5.225	16.875	0.267	0.1091	1.9636	-0.1870	-0.0713	0.97411	-0.0092	-0.0273	-0.2766	-0.2321+01
14	1	-1.523	20.625	0.000	1.0172	2.4307	0.2915	-0.1822	0.99539	-0.0146	-0.0416	-0.2769	-0.2480+01
14	2	0.508	20.625	0.000	1.0172	1.0377	0.4128	-0.0086	0.99649	-0.0109	0.0281	0.0480	-0.1957+01
14	3	2.539	20.625	0.000	1.0172	0.6293	-0.0196	0.0020	0.99558	-0.0385	0.0150	0.0850	-0.1736+01
14	4	4.565	20.625	-0.114	1.0172	0.9794	-0.0970	-0.0529	0.97774	-0.0352	-0.0229	-0.1844	-0.1601+01
15	1	-1.289	24.375	0.000	0.4433	2.0224	0.2291	-0.1406	0.99512	-0.0005	-0.0147	-0.1381	-0.1743+01
15	2	0.437	24.375	0.000	0.4433	0.9444	0.3329	-0.0069	0.99626	-0.0038	-0.0087	0.0380	-0.1149+01

6.3 EXAMPLE PROBLEM # 2, SINGLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

15	3	2.148	24.375	.000	0.4453	.6917	-.00864	-.00090	.99439	-.00294	-.00605	-.07847	-.5966+00
15	4	3.861	24.375	.075	0.4453	.8318	-.06429	.02005	.98029	-.00353	.02554	-.15173	-.7167+00
16	1	-1.055	28.125	.000	0.42734	1.4994	-.15883	-.00993	.99632	.00125	-.01310	-.07198	-.1056+01
16	2	.352	28.125	.000	0.42734	.7532	-.02289	.00048	.99731	.00140	-.00333	-.06426	-.5309+00
16	3	1.758	28.125	.000	0.42734	.5929	.07547	.00057	.99454	.00297	.00725	.08165	-.4169+00
16	4	3.160	28.125	.052	0.42734	.7185	-.05405	.02202	.98285	-.00088	.02528	.14133	-.5052+00

SECTION LIFT COEFFICIENTS

J	ZY/H	Y	L	SCL	SCLC/B	DLIFT	SCM(C/4)	IXL	IYL	IZL
1	-.9375	-28.125	0.000	.2257	-.0212	.0079	-.1592	-.2090	-.0035	-.9779
2	-.8125	-24.375	0.000	.1578	-.0436	.0164	-.2064	-.2882	-.0078	-.9575
3	-.6875	-20.625	0.000	.0898	-.0659	.0373	-.2109	-.4021	-.0351	-.9149
4	-.5625	-16.875	0.000	.0218	-.0883	.0750	-.2138	-.0488	-.0319	-.9983
5	-.4375	-13.125	0.000	.0528	-.1107	.1005	-.2363	.0650	.0188	-.9977

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 0.00 MACHNO= .2000 FLAPD= 30.00 AILEROND= 10.00-15.00 ALTITUDE=***** 8

J	ZY/B	Y	L	SCL	SCLC/B	DLIFT	SCM(C/4)	IXL	IYL	IZL
6	-.3125	-9.375	11.000	1.5500	.3980	.1155	-.3400	-.7476	.0167	-.9987
7	-.1875	-5.625	13.125	1.2411	.3371	.1264	-.3403	-.7489	.0171	-.9987
8	-.0625	-1.875	14.250	1.0982	.3590	.1346	-.3652	-.0679	.0199	-.9975
9	.0625	1.875	14.250	1.2059	.3600	.1353	-.3641	.0660	-.0197	-.9976
10	.1875	5.625	13.125	1.2699	.3434	.1288	-.3375	.0422	-.0166	-.9990
11	.3125	9.375	11.000	1.0155	.3197	.1199	-.3326	.0327	-.0156	-.9993
12	.4375	13.125	10.000	1.0286	.2884	.1082	-.3392	.0351	-.0166	-.9993
13	.5625	16.875	9.375	1.0505	.2423	.0909	-.3139	.0239	-.0207	-.9995
14	.6875	20.625	8.125	1.1050	.1767	.0663	-.0965	-.1265	-.0018	-.9920
15	.8125	24.375	6.875	1.1281	.1293	.0485	-.0910	-.0975	.0023	-.9952
16	.9375	28.125	5.625	.0927	.0837	.0314	-.0888	-.0616	-.0005	-.9981

CHORDWISE PRESSURE DISTRIBUTION DETAIL

***** CHORD STATION (X-XLE)/C *****

ZY/B	SCL	CHORD PRESSURE (CPL - CPUI)*IZL
-.93750	-.22394	.00000 1.14720 .07609 .35283 .16668 .03442 -.20002 -.52180 -.67879 -.46203 .00000
-.81250	-.37276	.00000 1.65430 .10120 .51954 .24824 .06495 -.23476 -.63718 -.83396 -.56809 .00000
-.68750	-.69553	.00000 2.38180 .14880 .68589 .26519 .04147 -.19268 -.47385 -.60139 -.40627 .00000
-.56250	1.26758	.00000 1.05079 .10037 .10570 .10333 .09592 .13769 1.76307 1.79813 1.12427 .00000
-.43750	1.49499	.00000 1.36320 .12007 .11563 .10681 .13271 .15192 2.07141 2.17831 1.37405 .00000
-.31250	1.54170	.00000 1.57340 .13710 .11852 .10215 .10780 .14592 2.02268 2.14759 1.35966 .00000
-.18750	1.52661	.00000 1.54480 .13400 .11673 .10216 .10634 .14484 2.01846 2.14869 1.36166 .00000
-.06250	1.47994	.00000 1.30167 .12474 .11723 .10865 .11302 .15157 2.07175 2.18523 1.38017 .00000
.06250	1.48758	.00000 1.32150 .12007 .11812 .10925 .11420 .15187 2.07118 2.18224 1.37772 .00000
.18750	1.55654	.00000 1.61640 .13684 .11958 .10465 .10772 .14576 2.02099 2.14628 1.35896 .00000
.31250	1.60371	.00000 1.73140 .14700 .12427 .10742 .10975 .14693 2.02303 2.14143 1.35431 .00000
.43750	1.61626	.00000 1.71431 .14700 .12627 .10782 .11305 .15082 2.05038 2.15598 1.36099 .00000
.56250	1.54065	.00000 1.65210 .14300 .12384 .10982 .11220 .14427 1.90889 1.98277 1.24683 .00000
.68750	1.30395	.00000 2.19340 .15000 .10873 .07812 .06876 .08758 .98184 .99991 .62768 .00000
.81250	1.12801	.00000 1.83631 .13000 .09328 .07459 .06448 .07445 .86575 .85238 .52803 .00000
.93750	.89240	.00000 1.37000 .10000 .07990 .06149 .06377 .06319 .74796 .73675 .45646 .00000

(EOF PLOT FILE 2) FILE # 2 = CHORDWISE PRESSURE DISTRIBUTION
(VORTEX-LATTICE SOLUTION)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 0.00 MACHNO= .2000 FLAPD= 30.00 AILEROND= 10.00-15.00 ALTITUDE=***** 9

SPANWISE SECTION LIFT DISTRIBUTION DETAIL

WITH LE SUCTION			NO LE SUCTION			FLAP/AILERON				
Y	ZY/B	SCL	SCDI	SCM(C/4)	SCL	SCDI	SCM(C/4)	FCN	FCX	FCY
-30.000	-1.00000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000
-28.500	-.950000	.211350	-.050000	.157820	.255351	.021873	.169923	-.667522	.065703	.166881
-27.000	-.900000	.262320	-.021000	.163420	.304245	.027894	.174946	-.697576	.057773	.174394
-25.500	-.850000	.319920	-.000000	.179243	.379079	.034834	.195508	-.752306	.115413	.188077
-24.000	-.800000	.392975	-.099704	.218600	.513978	.043915	.251866	-.863516	.059693	.215879
-22.500	-.750000	.494723	-.201007	.264024	.712633	.057087	.323933	-.954174	.054842	.238544
-21.000	-.700000	.646929	-.245947	.338232	.919462	.077707	.413158	-.973574	.030169	.263928
-19.500	-.650000	.865756	-.149000	.072602	1.078728	.108538	.513153	-.044270	.073506	-.011067
-18.000	-.600000	1.110079	.047110	-.166264	1.192642	.145766	.614356	-.1411887	.174762	-.277972
-16.500	-.550000	1.309547	.201715	-.342695	1.293113	.182199	.674713	-.347213	.1924660	-.481115
-15.000	-.500000	1.426180	.240300	-.387815	1.394953	.211302	.698460	-.202364	2.202364	-.358997
-13.500	-.450000	1.485347	.230000	-.363598	1.479298	.227870	.665261	2.181211	4.72566	.545303
-12.000	-.400000	1.517628	.217000	-.340768	1.526280	.227974	.633886	2.132749	.527063	-.533187
-10.500	-.350000	1.535604	.211000	-.333073	1.541010	.217465	.603388	2.134788	.489267	-.533697
-9.000	-.300000	1.542580	.200000	-.335356	1.541399	.204129	.576502	2.133996	.486293	-.533499
-7.500	-.250000	1.540784	.200700	-.333684	1.538536	.207580	.550064	2.133683	.486560	-.533421
-6.000	-.200000	1.530501	.200000	-.334714	1.530064	.215817	.524189	2.143509	.484450	-.535877
-4.500	-.150000	1.512358	.200000	-.342043	1.512293	.225626	.492323	2.160066	.479888	-.540017
-3.000	-.100000	1.491912	.200000	-.353280	1.492323	.233037	.462861	2.173242	.475508	-.543310
-1.500	-.050000	1.477241	.200000	-.362533	1.477140	.235250	.435228	2.176532	.473209	-.544133
-.000	-.000000	1.474079	.200000	-.365161	1.473834	.231758	.406501	2.170549	.473377	-.542637
1.500	.050000	1.483564	.231847	-.361480	1.483689	.222633	.351824	2.157114	.476957	-.539278
3.000	.100000	1.505680	.222346	-.343897	1.505925	.215748	.304001	2.141458	.479846	-.535365
4.500	.150000	1.534928	.210325	-.330097	1.535278	.200400	.231449	2.130541	.482603	-.532635
6.000	.200000	1.563015	.200070	-.311385	1.563492	.194469	.194469	2.127422	.483403	-.531856
7.500	.250000	1.584665	.190801	-.288312	1.584392	.193047	.193047	2.127567	.483688	-.531892
9.000	.300000	1.600592	.193710	-.268111	1.599889	.195589	.195589	2.126671	.484741	-.531668
10.500	.350000	1.611695	.192201	-.249900	1.614407	.195589	.195589			

6.3 EXAMPLE PROBLEM # 2, SINGLE SURFACE ANALYSIS CAPABILITY (CONTINUED)

12.000	.400000	1.617052	.193449	-.329650	1.021535	.198772	-.328417	2.130054	.484090	-.532514
13.500	.450000	1.614868	.201376	-.337417	1.011735	.197851	-.338279	2.147656	.477286	-.536914
15.000	.500000	1.599256	.209229	-.344630	1.583082	.196016	-.349077	2.149363	.455048	-.537341
16.500	.550000	1.557017	.186273	-.323676	1.548305	.176166	-.326018	2.027192	.350729	-.506798
18.000	.600000	1.477211	.100703	-.253486	1.520289	.157898	-.238651	1.688015	.253743	-.422704
19.500	.650000	1.375936	.003900	-.152782	1.490794	.138966	-.121422	1.245876	.177199	-.311469
21.000	.700000	1.283082	-.060714	-.084713	1.438798	.124219	-.041903	.927555	.080987	-.230139
22.500	.750000	1.212442	-.050627	-.072367	1.357426	.115552	-.032528	.819186	.051487	-.204797
24.000	.800000	1.146327	-.020610	-.087016	1.255644	.109213	-.056962	.828428	.053268	-.207107
25.500	.850000	1.065549	.007160	-.096447	1.144778	.101167	-.074684	.821118	.054492	-.205280
27.000	.900000	.969372	.010990	-.094144	1.029976	.090884	-.077502	.770329	.047431	-.192580
28.500	.950000	.866540	.023919	-.086750	.913453	.079432	-.073852	.707636	.026763	-.175159
30.000	1.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000

LEOF PLOT FILE 31 FILE # 3 = LIFT, INDUCED DRAG, AND PITCHING MOMENT SECTION COEFFICIENTS
(VORTEX-LATTICE SOLUTION)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 5.00 MACHNO= .2000 FLAPD= 30.00 AILERONU= 10.00-15.00 ALTITUDE=***** 10

WING AIRPLAD COEFFICIENTS

	WCL	WCOI	WCLP	WCMR	WCMY	IXL	IYL	IZL	DELTA	SCALE
WITH LE SUCTION	1.32943	.13547	-.27100	.04225	-.00086	.014089	-.000498	-.599901	.4971+35	.1661-71
NO LE SUCTION	1.39743	.21596	-.25965	.04171	-.003028	.066015	.000000	-.997819		

- * DIVIDE CHECK AT C41425
- * DIVIDE CHECK AT C41425 } OK TO IGNORE

LINEARIZED SOLUTION WITH LE SUCTION

ALFA	ALFARU	WCL	WCL SLOPE	CMR SLOPE	CMY
5.000	-11.000	1.3294	.07886	.00022	.00004

Y	ZY/B	SCLA1	SCLB	SCL	SCM(1/4)
-30.000	-1.00000	.00000	.00000	.00000	.00000
-28.000	-.95533	.91864	-.99078	.23049	.15013
-26.000	-.86667	1.00144	-1.03309	.30184	.16816
-24.000	-.80000	1.06436	-1.01915	.39585	.21579
-22.000	-.75000	1.06552	-.97133	.54179	.25888
-20.000	-.66667	1.07772	-.64592	.70630	.12274
-18.000	-.60000	1.09576	-.29957	1.10305	-.19570
-16.000	-.55533	1.04112	-.03679	1.34531	-.39282
-14.000	-.46667	1.03895	.07693	1.45814	-.37730

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 5.00 MACHNO= .2000 FLAPD= 30.00 AILERONU= 10.00-15.00 ALTITUDE=***** 11

Y	ZY/B	SCLA1	SCLB	SCL	SCM(1/4)
-12.000	-.40000	1.00153	.13490	1.50624	-.33419
-10.000	-.33333	1.01472	.17054	1.52754	-.32886
-8.000	-.20000	.95550	.27737	1.53082	-.31640
-6.000	-.20000	.97205	.22677	1.51904	-.30483
-4.000	-.10000	.93920	.24520	1.49391	-.32932
-2.000	-.00000	.91864	.26150	1.46944	-.36917
.000	.00000	.86622	.27103	1.46249	-.38727
2.000	.00000	.90675	.27261	1.47807	-.37145
4.000	.10000	.95708	.26798	1.51337	-.32912
6.000	.20000	.96977	.26226	1.55150	-.30330
8.000	.20000	.97244	.25959	1.57897	-.31719
10.000	.33333	1.01131	.25239	1.59686	-.33131
12.000	.40000	1.02966	.23658	1.60544	-.32956
14.000	.46667	1.04202	.21469	1.59999	-.34663
16.000	.55533	1.05883	.16639	1.56239	-.35687
18.000	.60000	1.07765	.04786	1.49749	-.26597
20.000	.66667	1.08815	-.11108	1.33554	-.11839
22.000	.75000	1.09264	-.22583	1.22675	-.06490
24.000	.80000	1.07036	-.27817	1.14080	-.09538
26.000	.86667	1.01471	-.30617	1.02952	-.11147
28.000	.95533	.91814	-.32425	.89636	-.10768
30.000	1.00000	.00000	.00000	.00000	.00000

ORIGINAL PAGE IS
OF POOR QUALITY

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 5.00 MACHNO= .2000 FLAPD= 30.00 AILERONU= 10.00-15.00 ALTITUDE=***** 12

LINEARIZED SOLUTION WITH LE SUCTION

ALFA	ALFARU	WCL	WCL SLOPE	CMR SLOPE	CMY
-11.859	-11.859	.0000	.07886	.00022	.00004

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 5.00 MACHNO= .2000 FLAPD= 30.00 AILERONU= 10.00-15.00 ALTITUDE=***** 13

LINEARIZED SOLUTION WITH LE SUCTION

6.3 EXAMPLE PROBLEM # 2, SINGLE-SURFACE ANALYSIS CAPABILITY (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
 VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 3.00 MACHNO= .2000 FLAPD= 30.00 AILEROND= 10.00-15.00 ALTITUDE=***** 16

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
 VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 3.00 MACHNO= .2000 FLAPD= 30.00 AILEROND= 10.00-15.00 ALTITUDE=***** 20

LINEARIZED SOLUTION WITH LE SUCTION

ALFA	ALFAK0	WCL	WCL SLOPE	CMR SLOPE	CMR SLOPE	CMY
13.503	-11.039	2.0000	.07886	.00022	.00004	.00005

WITH LE SUCTION NO LE SUCTION FLAP/AILERON

Y	ZY/B	SCL	SCD	SCM(C/4)	SCL	SCD	SCM(C/4)	FCN	FCX	FCM
-30.000	-1.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000
-28.000	-.933333	.866498	.000000	.161354	.948306	.179898	.189343	-.509958	.021626	.127490
-26.000	-.866667	.975183	.000000	.171091	1.091802	.201369	.203150	-.548887	.056085	.137222
-24.000	-.800000	1.109572	.000000	.181624	1.398895	.400929	.296068	-.662415	.028898	.165604
-22.000	-.733333	1.269711	.072117	.267835	1.861343	.753473	.430532	-.715877	-.039961	.178969
-20.000	-.666667	1.508509	.100000	.451275	2.100056	.783859	.314267	-.110440	.045348	.027610
-18.000	-.600000	1.810541	.100000	.646758	2.000084	.388527	-.093422	1.157260	.358593	-.289315
-16.000	-.533333	2.043458	.223100	-.350218	1.965215	.136478	-.371362	2.039362	.663232	-.509841
-14.000	-.466667	2.154820	.200140	-.364573	2.115320	.205799	-.375333	2.173559	.844779	-.543390
-12.000	-.400000	2.197950	.207004	-.335930	2.219985	.292431	-.329923	2.109684	.908632	-.527421
-10.000	-.333333	2.207985	.207004	-.330483	2.215269	.295625	-.328498	2.106126	.900286	-.526531
-8.000	-.266667	2.198371	.200000	-.335216	2.192240	.298401	-.336887	2.128665	.891915	-.532166
-6.000	-.200000	2.170860	.200000	-.341592	2.169746	.321727	-.341896	2.143098	.853877	-.535774
-4.000	-.133333	2.123763	.200000	-.345769	2.125430	.346816	-.345315	2.126333	.882309	-.531583
-2.000	-.066667	2.078726	.200000	-.346873	2.078827	.364948	-.346845	2.093673	.863209	-.523418
.000	.000000	2.063465	.200000	-.345593	2.062856	.373147	-.345759	2.074288	.852506	-.518572
2.000	.066667	2.086115	.200000	-.344100	2.086180	.369683	-.344082	2.083681	.856071	-.520920
4.000	.133333	2.141754	.200000	-.343153	2.142637	.354385	-.342911	2.119630	.872627	-.529907
6.000	.200000	2.201798	.200000	-.337378	2.201248	.334192	-.337529	2.135381	.864108	-.533845
8.000	.266667	2.244474	.200000	-.325435	2.241490	.318140	-.326255	2.107132	.879660	-.526783
10.000	.333333	2.275009	.200000	-.318168	2.278330	.313152	-.317198	2.084673	.879593	-.521168
12.000	.400000	2.295901	.200000	-.321529	2.306565	.306765	-.318597	2.096136	.877257	-.524034
14.000	.466667	2.298736	.200000	-.323975	2.279881	.258726	-.335214	2.114841	.861008	-.528710
16.000	.533333	2.268093	.200000	-.316765	2.232036	.221972	-.326664	2.041261	.783673	-.510315
18.000	.600000	2.183553	.200000	-.236987	2.285982	.351015	-.207927	1.712967	.585816	-.428242
20.000	.666667	2.765214	.100000	-.122818	2.282999	.566088	-.035451	1.257704	.339441	-.314426
22.000	.733333	1.961440	.100000	-.072108	2.325266	.599061	.027916	1.015716	.212299	-.254929
24.000	.800000	1.856542	.100000	-.079648	2.116473	.474832	-.008186	.985184	.156913	-.246296
26.000	.866667	1.703253	.100000	-.086085	1.874422	.380224	-.039026	.942345	.187646	-.235586
28.000	.933333	1.512038	.100000	-.107000	1.634103	.332212	-.047316	.855400	.161215	-.213950
30.000	1.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000

WITH LE SUCTION WCL= 2.00000 / WCDI= .25831 / WCM(C/4)= -.26917 / L/D= 7.74255
 NO LE SUCTION .210041 / .42297 / -.22422 / 5.15497

JOBFLAG 1 2 3 4 5 6 7 8 9 10 EXAMPLE PROBLEM NO. 2 - SINGLE SURFACE ANALYSIS CAPABILITY DEMONSTRATION PAGE
 VALUE 1 0 16 0 1 4 0 1 0 4 ALPHA= 3.00 MACHNO= .2000 FLAPD= 30.00 AILEROND= 10.00-15.00 ALTITUDE=***** 21

LINEARIZED SOLUTION WING COEFFICIENTS

WITH LE SUCTION NO LE SUCTION

ALFA	WCL	WCD	WCM(C/4)	WCL	WCD	WCM(C/4)
-12.000	-.0112	.0156	-.2749	-.0222	.0299	-.2810
-11.000	-.0077	.0162	-.2747	.0469	.0307	-.2808
-10.000	-.0000	.0175	-.2744	.1266	.0326	-.2803
-9.000	.0034	.0196	-.2742	.2070	.0358	-.2797
-8.000	.0093	.0224	-.2740	.2879	.0402	-.2790
-7.000	.0161	.0260	-.2738	.3695	.0458	-.2780
-6.000	.0240	.0303	-.2735	.4517	.0526	-.2770
-5.000	.0330	.0354	-.2733	.5346	.0607	-.2757
-4.000	.0437	.0412	-.2731	.6181	.0700	-.2743
-3.000	.0560	.0478	-.2729	.7021	.0805	-.2728
-2.000	.0707	.0551	-.2726	.7869	.0922	-.2711
-1.000	.0870	.0632	-.2724	.8722	.1051	-.2692
.000	.0931	.0721	-.2722	.9582	.1193	-.2672
1.000	.1014	.0817	-.2720	1.0448	.1347	-.2650
2.000	.1092	.0920	-.2718	1.1320	.1513	-.2626
3.000	.1174	.1032	-.2715	1.2198	.1691	-.2601
4.000	.1260	.1150	-.2713	1.3083	.1881	-.2575
5.000	.1349	.1276	-.2711	1.3974	.2084	-.2547
6.000	.1440	.1410	-.2709	1.4872	.2299	-.2517
7.000	.1531	.1551	-.2706	1.5775	.2526	-.2485
8.000	.1620	.1700	-.2704	1.6685	.2765	-.2452
9.000	.1707	.1856	-.2702	1.7601	.3016	-.2418
10.000	.1793	.2020	-.2700	1.8523	.3280	-.2382
11.000	.1878	.2191	-.2697	1.9452	.3556	-.2344
12.000	.1961	.2370	-.2695	2.0387	.3844	-.2304
13.000	.2042	.2556	-.2693	2.1328	.4144	-.2263
14.000	.2121	.2750	-.2691	2.2275	.4456	-.2221
15.000	.2198	.2952	-.2688	2.3229	.4781	-.2177
16.000	.2273	.3161	-.2686	2.4189	.5118	-.2131
17.000	.2346	.3377	-.2684	2.5155	.5467	-.2084
18.000	.2417	.3601	-.2682	2.6127	.5828	-.2035

(EOF PLOT FILE 4) FILE # 3 = LINEARIZED SOLUTION ARRAY (EXTRAPOLATED USING LIFTING-LINE THEORY)

**** JOB TIME = 133 / ELAPSED TIME = 133 / NO. PLOT FILES = 4 / ISURF EXEC. VERSION 6-18-72 ****

NO TEMPLATE OUTPUT OMITTED, SEE INPUT LISTINGS (PAGE 6-3 THROUGH 6-5)

6.4 EXAMPLE PROBLEM # 3, NORTH AMERICAN XB-70 AIRPLANE

SUBSONIC-FLOW LIFTING SURFACE ANALYSIS PROGRAM MA010B

TRW SYSTEMS INC., HOUSTON OPERATIONS

HOUSTON, TEXAS (77058)

**** JOBS INPUT LIST ****

7 XGT NSURF
 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AERODYNAMIC ANALYSIS
 TASK 722, PROJECT 3303A, NJO 147033, AERODYNAMIC ANALYSIS AND DESIGN
 SUBSONIC-FLOW LIFTING SURFACE ANALYSIS, TRW PROGRAM NO. MA010B (NSURF)
 A.V.GOMEZ/ 5 JULY 1972

\$INPUT
 NWING=3, NVTAIL=-1, GSCALE=0.083333, COLOCP=0.80,
 MWING=1,
 NCS(1)=7, NCS(2)=2, NFLG(1)=22, NFLG(6)=6, XOC(1,1)=0.0, 1.0,
 X(1)=-50.5, -50.5, -50.5, -50.5, 30.0, 0.0, XOCR(1)=7*1.0,
 Y(1)=0.0, 57.27, 114.54, 171.81, 229.08, 400.69, 629.97,
 Z(1)=20.0, 0.0, 441.0, 882.0, 0.0,
 E(1)=2*0.0, -0.5, -1.0, -1.5, -3.0, -3.0,
 C(1)=1413.0, 1261.518, 1110.496, 984.394, 908.832, 530.647, 26.4,
 MACNR0=1,
 NCS(2)=9, NCS(3)=3, NFLG(2)=6, NFLG(7)=2, XOC(1,2)=0.0, 0.5, 1.0,
 X(8)=-1723.0, -1723.0, XOCR(8)=0.5, 0.31532,
 Y(8)=0.0, 171.81,
 Z(8)=-73.0, -73.0,
 E(8)=2*3.0,
 C(8)=249.5, 96.71,
 ZOC(1,8)=0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
 ZOC(1,9)=0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
 MFUS=1,
 NCS(3)=11, NCS(4)=2, NFLG(3)=2, NFLG(8)=3, XOC(1,3)=0.0, 1.0,
 X(10)=-1463.08, -1312.018, Y(10)=0.0, 57.27, Z(10)=2*0.0, E(10)=2*0.0,
 C(10)=740.0, 640.0, XOCR(10)=1.0, 1.0, XOC(1,3)=0.0, 1.0,
 MFINS=1,
 NCS(4)=13, NCS(5)=2, NFLG(4)=3, NFLG(9)=2, XOC(1,4)=0.0, 1.0, XOCR(12)=2*1.0,
 X(12)=-50.5, 36.0, Y(12)=2*171.81, Z(12)=0.0, 882.0, -171.81, E(12)=-1.0, -1.0,
 C(12)=328.1313, 83.07,
 XCG=-725.9, ZCG=5.5, YCG=0.0, REFS=906883.0, REFC=942.38, REFB=1260.0,
 NJOB=1, ALFA=1, MACMN=0.20, NSOLV=1.1, 1.2, 1.4,
 KT2= 8, NFLG(19)= 1, 3,
 \$END
 \$ENDJOBS
 7 XGT NSURF

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHNO=.0000 ALTITUDE=***** 1

\$INPUT
 KOUT = +6,
 KT1 = +1,
 KT2 = +8,
 KT3 = +3,
 LINK = +56,
 NWING = +3,
 NVTAIL = -1,
 NFUS = +0,
 COLOCP = .8000000E+00,
 CUTOP1 = .1000000E+03,
 CUTOP2 = .7930000E+02,
 LFLAP = +0,
 GSCALE = .1000000E+01,
 NCS = +7,
 NCS = +0, +9, +11, +13,
 NCS = +0, +2, +3,
 X = +0, -42083164E+01, -42083164E+01, +12500000E+00,
 -42083164E+01, 12500000E+00, 12500000E+00,
 -14358276E+00, 14358276E+00, 12500000E+00,
 12500000E+00,
 XCG = .1000000E+00,
 YCG = -60491424E+02,
 ZCG = .1000000E+00,
 REFS = .4583310E+00,
 REFC = .6297748E+04,
 REFB = .7853131E+02,
 NJOB = .10499958E+03,
 ALFA = +1,
 ALFA = .1000000E+02, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
 MACHN = .2000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00,
 HEIGHT = .1000000E+05, .1000000E+05, .1000000E+05,
 .1000000E+05, .1000000E+05, .1000000E+05,
 FLAPOJ = .1000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00,
 TABDJ = .1000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00,
 ALLDJ = .1000000E+00, .0000000E+00, .0000000E+00,
 .0000000E+00, .0000000E+00, .0000000E+00,
 NFLG = +22, +6, +2, +3, +3,
 +2, +0, +0, +0,
 +2, +0, +0, +0,
 +1, +1, +1, +1,
 NSOLV = +1, +1, +1, +1, +2,
 +0, +0, +0, +0,
 \$END

ORIGINAL PAGE IS
 OF POOR QUALITY

6.4 EXAMPLE PROBLEM # 3, NORTH AMERICAN XB-70 AIRPLANE (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHNO=.0000 ALTITUDE=***** 2

LIFTING SURFACE NO# 1

SURFACE # 1 = WING

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MCC (MCC)	YBAR (MCC)	XBAR (MCC)	ZBAR (MCC)
104.995	117.756	2.200	.0000	-3.0000	6196.66	1.7790	59.019	76.777	17.943	-59.772	.970
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	LAIL DEFLEC	RAIL DEFLEC	DIMED. MCC/4	SWEEP MCC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
.000	.600	1.000	.000	.000	.000	.000	.000	58.795	22	6	0
FUS STA X(CG)	WING STA Y(CG)	HL STA Z(CG)	AREA S(CG)	CHORD C(CG)	SPAN B(CG)						
-60.491	.000	.458	6297.748	78.531	105.000						
WS	Y	Z	X(LE)	X(C/4)	X(T)	TWIST	DIHE(C/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-52.498	-52.497	.000	-2.200	-1.650	.000	-3.000	.000	-58.795	2.200	.550	.275
-47.246	-47.247	.000	-13.756	-10.317	.000	-3.000	.000	-58.795	17.756	3.439	1.719
-41.999	-41.998	.000	-25.312	-18.984	.000	-3.000	.000	-58.795	25.312	6.328	3.164
-36.749	-36.748	.000	-36.867	-27.651	.000	-3.000	.000	-58.795	36.867	9.217	4.608
-31.499	-31.498	.000	-48.423	-36.317	.000	-3.000	.000	-58.795	48.423	12.106	6.033
-26.249	-26.248	.000	-59.979	-44.984	.000	-3.000	.000	-58.795	59.979	14.995	7.497
-20.999	-20.998	.000	-71.535	-53.651	.000	-3.000	.000	-58.795	71.535	17.884	8.942
-15.749	-15.748	.000	-83.090	-63.054	-2.946	-1.150	-1.882	-61.878	80.144	20.036	10.018
-10.500	-10.499	.044	-94.645	-72.036	-4.208	-1.800	.441	-58.795	90.437	22.609	11.308
-5.250	-5.250	.004	-106.075	-82.109	-4.208	-1.000	.441	-63.185	103.867	25.967	12.983
.000	.000	.000	-121.965	-92.525	-4.208	.000	.000	-63.260	117.756	29.439	14.720
5.250	5.250	.004	-106.075	-82.109	-4.208	-1.000	-1.441	-63.185	103.867	25.967	12.983
10.500	10.499	.044	-94.645	-72.036	-4.208	-1.800	-1.441	-58.795	90.437	22.609	11.308
15.749	15.748	.051	-83.090	-63.054	-2.946	-1.150	.882	-61.878	80.144	20.036	10.018
20.999	20.998	.000	-71.535	-53.651	.000	-1.700	.000	-58.795	71.535	17.884	8.942
26.249	26.248	.000	-59.979	-44.984	.000	-2.250	.000	-58.795	59.979	14.995	7.497
31.499	31.498	.000	-48.423	-36.317	.000	-2.800	.000	-58.795	48.423	12.106	6.033
36.749	36.748	.000	-36.867	-27.651	.000	-3.000	.000	-58.795	36.867	9.217	4.608
41.999	41.998	.000	-25.312	-18.984	.000	-3.000	.000	-58.795	25.312	6.328	3.164
47.249	47.247	.000	-13.756	-10.317	.000	-3.000	.000	-58.795	13.756	3.439	1.719
52.498	52.497	.000	-2.200	-1.650	.000	-3.000	.000	-58.795	2.200	.550	.275

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHNO=.0000 ALTITUDE=***** 3

X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
-4.2083	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
-4.2083	4.7725	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
-4.2083	9.5450	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
-4.2083	14.3174	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
.0000	19.0899	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
.0000	33.8674	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
.0000	52.4973	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

(EOF PLOT FILE 1) FILE # 1 = WING GEOMETRY

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHNO=.0000 ALTITUDE=***** 4

LIFTING SURFACE NO# 2

SURFACE # 2 = CANARD CONTROL SURFACE

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MCC (MCC)	YBAR (MCC)	XBAR (MCC)	ZBAR (MCC)
28.635	20.792	8.059	3.0000	3.0000	413.07	1.9850	14.425	15.362	6.106	-147.385	-6.256
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	LAIL DEFLEC	RAIL DEFLEC	DIMED. MCC/4	SWEEP MCC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
.000	.600	1.000	.000	.000	.000	.000	.000	21.746	6	2	0
FUS STA X(CG)	WING STA Y(CG)	HL STA Z(CG)	AREA S(CG)	CHORD C(CG)	SPAN B(CG)						
-60.491	.000	.458	6297.748	78.531	105.000						
WS	Y	Z	X(LE)	X(C/4)	X(T)	TWIST	DIHE(C/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-14.317	-14.317	-6.083	-146.124	-144.109	-138.065	3.000	.000	-21.746	8.059	2.015	1.007
-12.886	-12.886	-6.083	-147.013	-144.680	-137.681	3.000	.000	-21.746	9.332	2.333	1.167
-11.454	-11.454	-6.083	-147.903	-145.251	-137.297	3.000	.000	-21.746	10.606	2.651	1.326
-10.022	-10.022	-6.083	-148.792	-145.822	-136.913	3.000	.000	-21.746	11.879	2.970	1.485
-8.590	-8.590	-6.083	-149.682	-146.394	-136.530	3.000	.000	-21.746	13.152	3.288	1.644
-7.159	-7.159	-6.083	-150.571	-146.965	-136.146	3.000	.000	-21.746	14.425	3.606	1.803
-5.727	-5.727	-6.083	-151.460	-147.536	-135.762	3.000	.000	-21.746	15.699	3.925	1.962
-4.295	-4.295	-6.083	-152.350	-148.107	-135.378	3.000	.000	-21.746	16.972	4.243	2.121
-2.863	-2.863	-6.083	-153.239	-148.678	-134.994	3.000	.000	-21.746	18.245	4.561	2.280
-1.432	-1.432	-6.083	-154.129	-149.249	-134.610	3.000	.000	-21.746	19.518	4.880	2.440
.000	.000	-6.083	-155.018	-149.820	-134.227	3.000	-0.610	-70.370	20.792	5.198	2.599
1.432	1.432	-6.083	-154.129	-149.249	-134.610	3.000	.000	21.746	19.518	4.880	2.440
2.863	2.863	-6.083	-153.239	-148.678	-134.994	3.000	.000	21.746	18.245	4.561	2.280
4.295	4.295	-6.083	-152.350	-148.107	-135.378	3.000	.000	21.746	16.972	4.243	2.121

6.4 EXAMPLE PROBLEM # 3, NORTH AMERICAN XB-70 AIRPLANE (CONTINUED)

5.727	5.727	-6.083	-151.460	-147.536	-135.762	3.000	.000	21.746	15.699	3.929	1.982
7.159	7.159	-6.083	-150.571	-146.965	-136.146	3.000	.000	21.746	14.425	3.608	1.803
8.590	8.590	-6.083	-149.682	-146.394	-136.530	3.000	.000	21.746	13.152	3.288	1.644
10.022	10.022	-6.083	-148.792	-145.822	-136.913	3.000	.000	21.746	11.879	2.970	1.485
11.454	11.454	-6.083	-147.903	-145.251	-137.297	3.000	.000	21.746	10.606	2.651	1.326
12.886	12.886	-6.083	-147.013	-144.680	-137.681	3.000	.000	21.746	9.332	2.333	1.167
14.317	14.317	-6.083	-146.124	-144.109	-138.065	3.000	.000	21.746	8.059	2.015	1.007

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 5

XA(1)/C XA(2)/C XA(3)/C XA(4)/C XA(5)/C XA(6)/C XA(7)/C XA(8)/C XA(9)/C XA(10)/C
 .0000 .5000 1.0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000

X Y ZA(1)/C ZA(2)/C ZA(3)/C ZA(4)/C ZA(5)/C ZA(6)/C ZA(7)/C ZA(8)/C ZA(9)/C ZA(10)/C
 -143.5828 .0000 .0000 .0000 .0882 .0000 .0000 .0000 .0000 .0000 .0000
 -143.5828 14.3174 .0000 .0000 .0882 .0000 .0000 .0000 .0000 .0000 .0000

(EOF PLOT FILE 2) FILE # 2 = CANARD CONTROL SURFACE GEOMETRY

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 6

LIFTING SURFACE NO. 3

 SURFACE # 3 = FUSELAGE

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MAC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
9.545	61.666	53.333	.0000	.0000	548.83	.1660	57.500	57.600	2.329	-158.981	.000
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	LAIL DEFLEC	RAIL DEFLEC	DHED. MGC/4	SWEEP MGC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
.500	.600	1.000	.000	.000	.000	.000	.000	75.784	2	3	0
FUS STA X(CG)	WING STA Y(CG)	HL STA Z(CG)	AREA S(CG)	CHORD C(CG)	SPAN B(CG)						
-60.491	.000	.458	6297.748	78.931	105.000						

WS	Y	Z	X(LE)	X(C/4)	X(TE)	TWIST	DHED(C/4)	SWEEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-4.772	-4.772	.000	-162.668	-149.334	-109.334	.000	.000	-75.784	53.333	13.333	6.667
-4.295	-4.295	.000	-164.760	-151.218	-110.593	.000	.000	-75.784	54.166	13.542	6.771
-3.818	-3.818	.000	-166.852	-153.102	-111.852	.000	.000	-75.784	55.000	13.750	6.875
-3.341	-3.341	.000	-168.944	-154.986	-113.111	.000	.000	-75.784	55.833	13.958	6.979
-2.863	-2.863	.000	-171.036	-156.870	-114.370	.000	.000	-75.784	56.666	14.167	7.083
-2.386	-2.386	.000	-173.128	-158.753	-115.629	.000	.000	-75.784	57.500	14.375	7.187
-1.909	-1.909	.000	-175.221	-160.637	-116.887	.000	.000	-75.784	58.333	14.583	7.292
-1.432	-1.432	.000	-177.313	-162.521	-118.146	.000	.000	-75.784	59.166	14.792	7.396
-.954	-.954	.000	-179.405	-164.405	-119.405	.000	.000	-75.784	60.000	15.000	7.500
-.477	-.477	.000	-181.497	-166.289	-120.664	.000	.000	-75.784	60.833	15.208	7.604
.000	.000	.000	-183.589	-168.173	-121.923	.000	.000	-75.784	61.666	15.417	7.708
.477	.477	.000	-181.497	-166.289	-120.664	.000	.000	75.784	60.833	15.208	7.604
.954	.954	.000	-179.405	-164.405	-119.405	.000	.000	75.784	60.000	15.000	7.500
1.432	1.432	.000	-177.313	-162.521	-118.146	.000	.000	75.784	59.166	14.792	7.396
1.909	1.909	.000	-175.221	-160.637	-116.887	.000	.000	75.784	58.333	14.583	7.292
2.386	2.386	.000	-173.128	-158.753	-115.629	.000	.000	75.784	57.500	14.375	7.187
2.863	2.863	.000	-171.036	-156.870	-114.370	.000	.000	75.784	56.666	14.167	7.083
3.341	3.341	.000	-168.944	-154.986	-113.111	.000	.000	75.784	55.833	13.958	6.979
3.818	3.818	.000	-166.852	-153.102	-111.852	.000	.000	75.784	55.000	13.750	6.875
4.295	4.295	.000	-164.760	-151.218	-110.593	.000	.000	75.784	54.166	13.542	6.771
4.772	4.772	.000	-162.668	-149.334	-109.334	.000	.000	75.784	53.333	13.333	6.667

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 7

XA(1)/C XA(2)/C XA(3)/C XA(4)/C XA(5)/C XA(6)/C XA(7)/C XA(8)/C XA(9)/C XA(10)/C
 .0000 1.0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000

X Y ZA(1)/C ZA(2)/C ZA(3)/C ZA(4)/C ZA(5)/C ZA(6)/C ZA(7)/C ZA(8)/C ZA(9)/C ZA(10)/C
 -121.9228 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000
 -109.3344 4.7725 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000

(EOF PLOT FILE 3) FILE # 3 = FUSELAGE GEOMETRY

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 8

LIFTING SURFACE NO. 4

 SURFACE # 4 = VERTICAL FINES

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MAC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
14.391	27.344	6.922	-1.0000	-1.0000	246.56	.8399	17.133	19.162	14.317	-15.691	-5.442

6.4 EXAMPLE PROBLEM # 3, NORTH AMERICAN XB-70 AIRPLANE (CONTINUED)

FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	LAIL DEFLEC	RAIL DEFLEC	DIMED. HCC/4	SWEEP HCC/4	NO. SPAN ELEMENTS	NO. CHORD ELEMENTS	NO. CHORD DISCONT.
.000	.600	1.000	.000	.000	.000	.000	89.999	57.428	3	2	0
			FUS STA X(CG)	WING STA Y(CG)	HL STA Z(CG)	AREA	CHORD C(CG)	SPAN B(CG)			
			-60.491	.000	.458	6297.748	78.531	109.000			

WS	Y	Z	X(LE)	X(C/4)	X(TB)	TWIST	DIME(C/4)	SWEEP(C/4)	C(WING)	C(FLAP)	C(TAB)
.000	14.317	.073	-31.552	-24.716	-4.208	-1.000	-.441	85.620	27.344	6.836	3.418
.720	14.317	-.646	-30.171	-23.590	-3.848	-1.000	89.999	57.428	26.323	6.981	3.290
1.439	14.317	-1.366	-28.789	-22.464	-3.487	-1.000	89.999	57.428	25.302	6.325	3.163
2.159	14.317	-2.085	-27.408	-21.338	-3.127	-1.000	89.999	57.428	24.281	6.070	3.035
2.878	14.317	-2.805	-26.026	-20.212	-2.767	-1.000	89.999	57.428	23.260	5.815	2.907
3.598	14.317	-3.524	-24.645	-19.085	-2.406	-1.000	89.999	57.428	22.239	5.560	2.780
4.317	14.317	-4.244	-23.263	-17.959	-2.046	-1.000	89.999	57.428	21.218	5.304	2.652
5.037	14.317	-4.963	-21.882	-16.833	-1.685	-1.000	89.999	57.428	20.197	5.049	2.525
5.756	14.317	-5.683	-20.500	-15.707	-1.325	-1.000	89.999	57.428	19.176	4.794	2.397
6.476	14.317	-6.402	-19.119	-14.580	-.965	-1.000	89.999	57.428	18.155	4.539	2.269
7.195	14.317	-7.122	-17.737	-13.454	-.604	-1.000	89.999	57.428	17.134	4.283	2.142
7.915	14.317	-7.842	-16.356	-12.328	-.244	-1.000	89.999	57.428	16.112	4.028	2.014
8.635	14.317	-8.561	-14.974	-11.202	.117	-1.000	89.999	57.428	15.091	3.773	1.886
9.354	14.317	-9.281	-13.593	-10.075	.477	-1.000	89.999	57.428	14.070	3.518	1.759
10.074	14.317	-10.000	-12.211	-8.949	.837	-1.000	89.999	57.428	13.049	3.263	1.631
10.793	14.317	-10.720	-10.830	-7.823	1.198	-1.000	89.999	57.428	12.028	3.007	1.503
11.513	14.317	-11.439	-9.448	-6.697	1.558	-1.000	89.999	57.428	11.007	2.752	1.376
12.232	14.317	-12.159	-8.067	-5.571	1.919	-1.000	89.999	57.428	9.986	2.496	1.248
12.952	14.317	-12.878	-6.685	-4.444	2.279	-1.000	89.999	57.428	8.965	2.241	1.121
13.671	14.317	-13.598	-5.304	-3.318	2.640	-1.000	89.999	57.428	7.944	1.986	.993
14.391	14.317	-14.317	-3.922	-2.192	3.000	-1.000	89.999	57.428	6.923	1.731	.866

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 1 1 0 ALFA= .00 MACHND=.0000 ALTITUDE***** 9

		XA(1)/C	XA(2)/C	XA(3)/C	XA(4)/C	XA(5)/C	XA(6)/C	XA(7)/C	XA(8)/C	XA(9)/C	XA(10)/C
		.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
-4.2083	14.3174	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
3.0000	14.3174	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

(EOF PLOT FILE 4) FILE # 4 - LEFT VERTICAL FIN GEOMETRY
 (EOF PLOT FILE 5) FILE # 5 - RIGHT VERTICAL FIN GEOMETRY (IMAGE)

NOTATION = 1/(1,1), INDICATES SOLUTION FOR SURFACE # 1 IS OUTPUT CONSIDERING SURFACE # 1 ALONE.

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1/(1, 1)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
12	.0227	2.386	.000	2.386	.2030	-.0019	.1996	.0356	-.0496	.2118	-.0034	.0011	-1.0000
13	.0682	7.159	.368	7.159	.2600	-.0018	.2564	.0448	-.0431	.2413	-.0081	.0315	-.9995
14	.1136	11.931	1.026	11.931	.2622	-.0052	.2593	.0448	-.0515	.2156	-.0089	.0265	-.9996
15	.1591	16.703	1.817	16.704	.3139	-.0071	.3103	.0533	-.0405	.2332	-.0196	.0395	-.9996
16	.2045	21.476	1.846	21.477	.3283	-.0146	.3289	.0549	-.0241	.2188	-.0354	.0175	-.9992
17	.2500	26.248	2.022	26.249	.3339	-.0271	.3335	.0533	-.0180	.1905	-.0398	.0139	-.9991
18	.2955	31.021	2.040	31.022	.3442	-.0341	.3449	.0538	-.0192	.1625	-.0496	.0118	-.9987
19	.3409	35.793	1.770	35.794	.3752	-.0407	.3766	.0581	-.0239	.1398	-.0557	.0009	-.9984
20	.3864	40.566	1.293	40.567	.4301	-.0493	.4321	.0661	-.0281	.1171	-.0562	.0011	-.9984
21	.4318	45.338	.816	45.339	.5193	-.0655	.5228	.0788	-.0349	.0894	-.0594	.0020	-.9982
22	.4773	50.111	.338	50.112	.7439	-.1086	.7515	.1103	-.0721	.0633	-.0666	.0039	-.9978

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 1 1 0 ALFA= 10.00 MACHND=.2000 ALTITUDE***** 10

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 1 - 1

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EZA	ES	EMGC	EB	
1	.3048	-.0160	-.0000	.3030	.0372	-.0622	-.0000	-.0000	-.59.77	.97	6196.66	76.78	104.99
1	.0396*	.0163*	.0000*	.0361*	.0230*	-.0064*	-.0000*	.0000*	-.59.77*	.97*	6196.66*	76.78*	104.99*
*** AIRLOAD SUMS ***													
AC	.3048	-.0160	-.0000	.3030	.0372	-.0622	-.0000	-.0000	-.59.77	.97	6196.66	76.78	104.99
CG	.2998	-.0157	-.0000	.2981	.0366	-.0624	-.0000	-.0000	-.60.49	.46	6297.75	78.53	105.00
CC	.0396*	.0163*	.0000*	.0361*	.0230*	-.0064*	-.0000*	.0000*	-.59.77*	.97*	6196.66*	76.78*	104.99*
CC	.0389*	.0161*	.0000*	.0356*	.0228*	-.0066*	-.0000*	.0000*	-.60.49*	.46*	6297.75*	78.53*	105.00*

* DETERMINANT= -.1875*13 * SCALE= .1731-01 *

LIFT COEFFICIENT FOR WING ALONE IS $C_L = 0.2881$ WITH L.E. SUCTION (BLUNT L.E.)
 = 0.3337 NO L.E. SUCTION (SHARP L.E.)

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1/(1, 2)

NOTATION = 1/(1,2), INDICATES SOLUTION FOR SURFACE # 1 IS OUTPUT CONSIDERING SURFACES # 1 AND # 2 SIMULTANEOUS

ORIGINAL PAGE IS OF POOR QUALITY

6.4 EXAMPLE PROBLEM # 3, NORTH AMERICAN XB-70 AIRPLANE (CONTINUED)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
12	.0227	2.386	.000	2.386	.1354	.0041	.1327	.0242	-.0409	.1408	-.0027	.0009	-.1000
13	.0682	7.159	.368	7.159	.1749	.0004	.1742	.0308	-.0438	.1640	-.0074	.0313	-.9995
14	.1136	11.931	1.026	11.931	.1944	-.0033	.1920	.0332	-.0495	.1596	-.0091	.0266	-.9996
15	.1591	16.703	1.517	16.704	.2452	-.0049	.2423	.0417	-.0399	.1821	-.0197	.0197	-.9996
16	.2045	21.476	1.846	21.477	.2743	-.0110	.2722	.0456	-.0259	.1827	-.0353	.0174	-.9992
17	.2500	26.248	2.022	26.249	.2932	-.0230	.2928	.0469	-.0196	.1672	-.0397	.0138	-.9991
18	.2955	31.021	2.040	31.022	.3134	-.0304	.3139	.0491	-.0199	.1479	-.0496	.0118	-.9987

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 0 1 1 0 ALFA= 10.00 MACHNO= .2000 ALTITUDE***** 11

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
19	.3400	35.793	1.770	35.794	.3497	-.0374	.3509	.0542	-.0240	.1302	-.0556	.0009	-.9985
20	.3864	40.566	1.293	40.567	.4081	-.0464	.4100	.0628	-.0278	.1111	-.0561	.0010	-.9984
21	.4318	45.338	.816	45.339	.4997	-.0627	.5030	.0759	-.0345	.0860	-.0593	.0019	-.9982
22	.4773	50.111	.338	50.112	.7241	-.1053	.7313	.1074	-.0711	.0519	-.0664	.0039	-.9978

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 2/(1, 2)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
27	.0833	2.386	-6.196	107.733	.9782	.0897	.9478	.1854	-.1495	.6179	.1061	-.0158	-.9942
28	.2900	7.159	-6.112	112.505	1.1336	.0804	1.1024	.2108	-.1194	.9554	.1311	-.0246	-.9911
29	.4167	11.931	-6.063	117.278	1.1479	.0670	1.1189	.2110	-.1132	.3978	.1249	-.0314	-.9917

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 1 - 2

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
1	.2470	-.0132	.0000	.2464	.0300	-.0667	-.0000	-.0000	-59.77	.97	6196.66	76.78	104.99
1	.0338	.0140	.0000	.0308	-.0070	-.0000	-.0000	.0000	-59.77	.97	6196.66	76.78	104.99
2	1.0700	.0813	.0000	1.0396	.2658	-.1462	-.0000	.0000	-147.38	-6.26	413.07	15.36	28.63
2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	-147.38	-6.26	413.07	15.36	28.63

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 0 1 1 0 ALFA= 10.00 MACHNO= .2000 ALTITUDE***** 12

*** AIRLOAD SUMS ***

AC	.3192	-.0078	.0000	.3157	.0478	.0133	-.0000	-.0000	-59.77	.97	6196.66	76.78	104.99
CG	.3141	-.0077	.0000	.3106	.0470	.0099	-.0000	-.0000	-60.49	.46	6297.75	78.53	105.00
AC	.0338	.0140	.0000	.0308	-.0196	-.0070	-.0000	.0000	-59.77	.97	6196.66	76.78	104.99
CG	.0332	.0137	.0000	.0303	-.0193	-.0072	-.0000	.0000	-60.49	.46	6297.75	78.53	105.00

* DETERMINANT= -.1070+22 * SCALE= .1505-01 *

LIPT COEFFICIENT FOR WING +CANARD CONTROL SURFACE IS
 $C_L = 0.3108$ (WITH L.E. SUCTION)

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1/(1, 4)

NOTATION = 1/(1,4), INDICATES SOLUTION FOR SURFACE # 1 IS OUTPUT
 CONSIDERING SURFACES #1, #2, #3, and #4 SIMULTANEOUSLY

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
12	.0227	2.386	.000	2.386	.1155	.0003	.1137	.0201	-.0356	.1207	-.0129	.0043	-.9999
13	.0682	7.159	.368	7.159	.1494	-.0023	.1476	.0256	-.0329	.1389	-.0303	.0388	-.9988
14	.1136	11.931	1.026	11.931	.1832	-.0000	.1805	.0317	-.0271	.1501	-.0833	.0469	-.9954
15	.1591	16.703	1.517	16.704	.2314	-.0024	.2283	.0398	-.0596	.1715	-.0191	-.0209	-.9996
16	.2045	21.476	1.846	21.477	.2616	-.0126	.2598	.0432	-.0402	.1744	-.0264	.0150	-.9995
17	.2500	26.248	2.022	26.249	.2988	-.0148	.2966	.0493	-.0296	.1694	-.0426	.0146	-.9990
18	.2955	31.021	2.040	31.022	.3212	-.0300	.3217	.0505	-.0213	.1516	-.0440	.0108	-.9989
19	.3400	35.793	1.770	35.794	.3511	-.0372	.3523	.0545	-.0240	.1307	-.0555	.0009	-.9985
20	.3864	40.566	1.293	40.567	.4076	-.0455	.4093	.0629	-.0280	.1110	-.0555	.0009	-.9985
21	.4318	45.338	.816	45.339	.4988	-.0615	.5019	.0759	-.0346	.0898	-.0593	.0019	-.9982
22	.4773	50.111	.338	50.112	.7226	-.1047	.7298	.1073	-.0710	.0518	-.0663	.0039	-.9978

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
 VALUE 22 6 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 0 1 1 0 ALFA= 10.00 MACHNO= .2000 ALTITUDE***** 13

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 2/(1, 4)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
27	.0833	2.386	-6.196	107.733	1.0252	.1017	.9920	.1957	-.1451	.6488	.1166	-.0164	-.9930
28	.2900	7.159	-6.112	112.505	1.2074	.0954	1.1734	.2254	-.1308	.9911	.1312	-.0246	-.9911
29	.4167	11.931	-6.063	117.278	1.2471	.0793	1.2144	.2303	-.1267	.4318	.1267	-.0315	-.9914

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 3/(1, 4)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
32	.2900	2.386	.000	137.607	.0288	.0079	.0270	.0064	-.0150	.1626	.0693	-.2129	-.9746

6.4 EXAMPLE PROBLEM # 3, NORTH AMERICAN XB-70 AIRPLANE (CONTINUED)

SECTION AIRLOAD COEFFICIENTS-SURFACE NOS. 4 (1, 4)

SECTION LIFT COEFFICIENTS FOR SURFACE # 4 ARE OUT OF RANGE
SEE NOTE # 1. †

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
38	.9940	14.317	-2.074	151.937	.....	.....	.....	943.53992580	0793	.....	.0748	.9943	.0766
39	.9940	14.317	-6.943	156.7346153	4659	.....	6682.7775	445.7413	796.36737958	2685	.0032	-1.0000	.0033
40	.9940	14.317	-11.811	161.531	75.2273	-93.2598	90.2788	-3.1313	-93.5006	64.7788	-.0162	.9997	-.0165

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS. 1 - 4

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
---	-----	-----	-----	-----	-----	------	------	------	-----	-----	----	------	----

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 3 - XB-70 AIRPLANE SUBSONIC AEROD PAGE
VALUE 22 4 2 3 0 6 2 3 2 0 0 0 0 0 0 0 0 1 1 0 ALFA= 10.00 MACHND= .2000 ALTITUDE***** 14

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS. 1 - 4

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
1	.2368	-.0129	.0000	.2355	.0285	-.0651	-.0000	-.0000	-59.77	.97	6196.66	76.78	104.99
1	.0314	.0129	-.0000	.0286	.0182	-.0070	-.0000	.0000	-59.77	.97	6196.66	76.78	104.99
2	1.1382	.0927	.0000	1.1048	.2689	-.1511	-.0000	.0000	-147.38	-6.26	413.07	16.36	28.63
2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	-147.38	-6.26	413.07	16.36	28.63
3	.0288	.0079	.0000	.0270	.0128	-.0151	.0000	.0000	-158.98	.00	548.83	47.40	9.54
3	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	-158.98	.00	548.83	47.40	9.54
4	.0710	-.0372	.0000	.0764	-.0243	.0324	-.0000	.0000	-15.69	-5.44	493.13	19.16	14.39
4	.....	.0372	-.0000	.....	.....	.....	.0000	.0000	-15.69	-5.44	493.13	19.16	14.39

*** AIRLOAD SUMS ***

AC	.3209	-.0089	.0000	.3176	.0469	.0195	-.0000	-.0000	-59.77	.97	6196.66	76.78	104.99
CG	.3157	-.0088	.0000	.3125	.0462	.0159	-.0000	-.0000	-60.49	.94	6297.75	76.53	105.00
AC	272.7074	.0159	-.0000	268.6418	47.3708	.....	.0000	-.0000	-59.77	.97	6196.66	76.78	104.99
CG	268.3302	.0156	-.0000	264.2510	46.6104	.....	.0000	-.0000	-60.49	.94	6297.75	76.53	105.00

* DETERMINANT= .5384+32 * SCALE= .1409-01 *

VORTEX-LIFT INCREMENTS FOR SURFACE # 4 ARE OUT OF RANGE

SEE NOTE # 2. †

*** JOB TIME= 246 / ELAPSED TIME= 246 / NO. PLOT FILES= 5 / NSURF EXEC. VERSION 6-18-72 ***

XOT TRWELT PRINTED OUTPUT OMITTED
SEE INPUT DATA LISTINGS

- † NOTES: [1] THE SECTION COEFFICIENTS CALCULATED FOR SURFACE # 4, THE VERTICAL FINS, ARE OUT OF RANGE OF THE "F" FORMAT SPECIFICATION USED FOR THE PRINTED OUTPUT. THIS ANOMALY ARISES BECAUSE OF THE MANNER IN WHICH THESE COEFFICIENTS ARE CALCULATED, I.E., THE AIRLOADS OBTAINED IN THE VORTEX-LATTICE SOLUTION ARE NORMALIZED BY (DIVIDED BY) THE PROJECTED AREA OF THE SURFACE ON A HORIZONTAL PLANE WHICH IS OF ZERO ORDER FOR A VERTICAL SURFACE. THIS PROGRAMMING ERROR DOES NOT IN ANY WAY AFFECT THE ACCURACY OF THE VORTEX-LATTICE SOLUTION OR THE SPATIALLY-INTEGRATED AIRLOAD COEFFICIENTS WHICH ARE NORMALIZED BY A DIFFERENT AREA.
- [2] THE VORTEX-LIFT INCREMENTS CALCULATED FOR SURFACE # 4, THE VERTICAL FINS, ARE OUT OF RANGE AND IN ERROR FOR THE SAME REASONS OUTLINED IN NOTE # 1.
- [3] TO DEMONSTRATE THE VERACITY OF THE SOLUTIONS CALCULATED WITH AND WITHOUT VERTICAL FINS A COMPARISON OF THE NET-AIRLOAD COEFFICIENTS ABOUT THE C.G. OBTAINED FOR THE VORTEX-LATTICE SOLUTIONS (WITH L.E. SUCTION) IS GIVEN BELOW

CODE	DESCRIPTION	C _L	C _{D_i}	C _{M_{CG}}
(1,1)	WING ALONE	0.2981	0.0366	-0.0624
(1,2)	WING + CANARD	0.3106	0.0470	+0.0099
(1,4)	WING + CANARD + FUSELAGE + VERT. FINS	0.3125	0.0462	+0.0159

6.5 EXAMPLE PROBLEM # 4, THICK-WING ANALYSIS

SUBSONIC-FLOW LIFTING SURFACE ANALYSIS PROGRAM HAD10B
 TRW SYSTEMS INC., HOUSTON OPERATIONS
 HOUSTON, TEXAS (77058)

**** JOBS INPUT LIST ****

```

7 XQT NSURF
EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC ANALYSIS
TASK 702, PROJECT 33031, MJD 147033, AERODYNAMIC ANALYSIS AND DESIGN
SUBSONIC-FLOW LIFTING SURFACE ANALYSIS, TRW PROGRAM NO. HAD10B (NSURF)
A.V.GOMEZ/ 5 JULY 1972

$INPUT
NWING=3, NVTAIL=0, NFUS=0, COLDEP=.75,
NFLG(1)=3*10, NFLG(6)=3*5, NFLG(19)=1,2,
NCS=2*10,2, NSS=2*4,0,
THICK= 1,
XOC(1,1)=-.00, .05, .10, .15, .20, .30, .40, .60, .80, 1.0,
XOC(1,2)=-.00, .05, .10, .15, .20, .30, .40, .60, .80, 1.0,
ZOC(1,1)=.0, .04443, .05853, .06682, .07172, .07502, .07254, .05704, .03279, .0,
ZOC(1,2)=.0, .04443, .05853, .06682, .07172, .07502, .07254, .05704, .03279, .0,
ZOC(1,3)=.0, -.04443, -.05853, -.06682, -.07172, -.07502, -.07254, -.05704, -.03279, .0,
ZOC(1,4)=.0, -.04443, -.05853, -.06682, -.07172, -.07502, -.07254, -.05704, -.03279, .0,
X = 0,0, 0,0,
Y = 0,10, 0,10,
Z = 0,0, 0,0,
C = 10,10, 10,10,
E = 0,0, 0,0,
Z = 0,0, 0,0,
FLATP= 1,
XOC(1,3)=-.00, 1.0,
ZOC(1,5)=-.0, .0,
ZOC(1,6)=-.0, .0,
X(5)= 0,0,
Y(5)= 0,10,
Z(5)= 0,0,
C(5)= 10,10,
E(5)= 0,0,
XCG=0,0, REFC=10,0, REFB=20,0, REFS=200,0,
NJDB=1, ALFA=10, MACHN=0,0, NSOLV=1,2,3,3
$END
$ENDJOBS
7 XQT NSURF
    
```

JDBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 0 1 1 2 ALFA=.00 MACHN=.0000 ALTITUDE=***** 1

```

$INPUT
KOUT = +6,
KT1 = +1,
KT2 = +8,
KT3 = +3,
LINK = +56,
NWING = +3,
NVTAIL = +0,
NFUS = +0,
COLDEP = .75000000E+00,
CUTOFF1 = .10000000E-03,
CUTOFF2 = .29000000E-02,
FLAP = +0,
GSCALE = .10000000E+01,
NSS = +2, +4, +6, +0,
NCS = +0, +10, +10, +2, +0,
X = .00000000E+00, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .12500000E+00,
.00000000E+00, .12500000E+00,
YCG = .00000000E+00,
ZCG = .00000000E+00,
REFS = .20000000E+03,
REFC = .10000000E+02,
REFB = .20000000E+02,
NJDB = +1,
ALFA = .10000000E+02, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
MACHN = .00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
HEIGHT = .10000000E+05, .10000000E+05, .10000000E+05, .10000000E+05,
.10000000E+05, .10000000E+05, .10000000E+05, .10000000E+05,
FLAPDJ = .00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
TABDJ = .00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
AILDJ = .00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
.00000000E+00, .00000000E+00, .00000000E+00, .00000000E+00,
NFLG = +0, +10, +10, +10, +10, +0,
+0, +5, +5, +5, +5,
+0, +0, +0, +0,
+0, +0, +0, +0,
NSOLV = +1, +1, +2, +3, +3,
+0, +0, +0, +0,
$END
    
```

ORIGINAL PAGE IS
 OF POOR QUALITY

6.5 EXAMPLE PROBLEM # 4, THICK-WING ANALYSIS (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 0 1 1 2 ALPHA=.00 MACHNO=.0000 ALTITUDE=***** 2

LIFTING SURFACE NO= 1 SURFACE # 1 = LOWER SURFACE

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MAC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
20.000	10.000	10.000	.0000	.0000	200.00	2.0000	10.000	10.000	5.000	.000	.734
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	L.AIL DEFLEC	R.AIL DEFLEC	DIHED. MGC/4	SWEEP MGC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
.000	.600	1.000	.000	.000	.000	.000	.000	.000	10	5	0
FUS STA X(CG)	WING STA Y(CG)	HL STA Z(CG)	AREA S(CG)	CHORD C(CG)	SPAN B(CG)						
.000	.000	.000	200.000	10.000	20.000						
WS	Y	Z	X(LE)	X(C/4)	X(TE)	TWIST	DIHE(C/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-10.000	-10.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-9.000	-9.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-8.000	-8.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-7.000	-7.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-6.000	-6.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-5.000	-5.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-4.000	-4.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-3.000	-3.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-2.000	-2.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-1.000	-1.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
.000	.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
1.000	1.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
2.000	2.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
3.000	3.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
4.000	4.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
5.000	5.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
6.000	6.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
7.000	7.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
8.000	8.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
9.000	9.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
10.000	10.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 0 1 1 2 ALPHA=.00 MACHNO=.0000 ALTITUDE=***** 3

KA(1)/C	KA(2)/C	KA(3)/C	KA(4)/C	KA(5)/C	KA(6)/C	KA(7)/C	KA(8)/C	KA(9)/C	KA(10)/C		
.0000	.0500	.1000	.1500	.2000	.3000	.4000	.6000	.8000	1.0000		
X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
.0000	.0000	.0000	.0444	.0585	.0668	.0717	.0750	.0725	.0570	.0328	.0000
.0000	10.0000	.0000	.0444	.0585	.0668	.0717	.0750	.0725	.0570	.0328	.0000

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 0 1 1 2 ALPHA=.00 MACHNO=.0000 ALTITUDE=***** 4

LIFTING SURFACE NO= 2 SURFACE # 2 = UPPER SURFACE

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MAC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
20.000	10.000	10.000	.0000	.0000	200.00	2.0000	10.000	10.000	5.000	.000	-.734
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	L.AIL DEFLEC	R.AIL DEFLEC	DIHED. MGC/4	SWEEP MGC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
.000	.600	1.000	.000	.000	.000	.000	.000	.000	10	5	0
FUS STA X(CG)	WING STA Y(CG)	HL STA Z(CG)	AREA S(CG)	CHORD C(CG)	SPAN B(CG)						
.000	.000	.000	200.000	10.000	20.000						
WS	Y	Z	X(LE)	X(C/4)	X(TE)	TWIST	DIHE(C/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-10.000	-10.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-9.000	-9.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-8.000	-8.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-7.000	-7.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-6.000	-6.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-5.000	-5.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-4.000	-4.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-3.000	-3.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-2.000	-2.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-1.000	-1.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
.000	.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
1.000	1.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
2.000	2.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
3.000	3.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
4.000	4.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
5.000	5.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
6.000	6.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
7.000	7.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
8.000	8.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
9.000	9.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
10.000	10.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250

6.5 EXAMPLE PROBLEM # 4, THICK-WING ANALYSIS (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 1 1 2 ALFA=.00 MACHNO=.0000 ALTITUDE=***** 7

KA(1)/C	KA(2)/C	KA(3)/C	KA(4)/C	KA(5)/C	KA(6)/C	KA(7)/C	KA(8)/C	KA(9)/C	KA(10)/C		
.0000	.0500	.1000	.1500	.2000	.3000	.4000	.6000	.8000	1.0000		
X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
.0000	.0000	.0000	-.0444	-.0585	-.0668	-.0717	-.0750	-.0725	-.0570	-.0328	.0000
.0000	10.0000	.0000	-.0444	-.0585	-.0668	-.0717	-.0750	-.0725	-.0570	-.0328	.0000

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 1 1 2 ALFA=.00 MACHNO=.0000 ALTITUDE=***** 10

LIFTING SURFACE NO= 3 SURFACE # 3 = THIN WING (FLAT PLATE)

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MAC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
20.000	10.000	10.000	.0000	.0000	200.00	2.0000	10.000	10.000	5.000	.000	.000
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	L.AIL DEFLEC	R.AIL DEFLEC	DIMED. MGC/4	SWEEP MGC/4	NO.SPAN ELEMENTS	NO.CHORD ELEMENTS	NO.CHORD DISCONT.
.000	.600	1.000	.000	.000	.000	.000	.000	.000	10	5	0
FUS STA X(CG)	WING STA Y(CG)	HL STA Z(CG)	AREA S(CG)	CHORD C(CG)	SPAN B(CG)						
.000	.000	.000	200.000	10.000	20.000						

MS	Y	Z	X(LE)	X(C/4)	X(TE)	TWIST	DIME(C/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-10.000	-10.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-9.000	-9.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-8.000	-8.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-7.000	-7.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-6.000	-6.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-5.000	-5.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-4.000	-4.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-3.000	-3.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-2.000	-2.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-1.000	-1.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
.000	.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
1.000	1.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
2.000	2.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
3.000	3.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
4.000	4.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
5.000	5.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
6.000	6.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
7.000	7.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
8.000	8.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
9.000	9.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
10.000	10.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 1 1 2 ALFA=.00 MACHNO=.0000 ALTITUDE=***** 11

KA(1)/C	KA(2)/C	KA(3)/C	KA(4)/C	KA(5)/C	KA(6)/C	KA(7)/C	KA(8)/C	KA(9)/C	KA(10)/C		
.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
.0000	10.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 1 1 2 ALFA=.00 MACHNO=.0000 ALTITUDE=***** 13

J	K	XV	YV	ZV	LXV	LYV	LZV	XN	YN	ZN	LXN	LYN	LZN
25	3	2.000+00	-6.000+00	0.000	0.000	1.000+00	0.000	3.000+00	-5.000+00	0.000	0.000	0.000	0.000
26	3	2.000+00	-4.000+00	0.000	0.000	1.000+00	0.000	3.000+00	-3.000+00	0.000	0.000	0.000	1.000+00
27	3	2.000+00	-2.000+00	0.000	0.000	1.000+00	0.000	3.000+00	-1.000+00	0.000	0.000	0.000	1.000+00
28	3	2.000+00	0.000	0.000	0.000	1.000+00	0.000	3.000+00	0.000	0.000	0.000	0.000	1.000+00
29	3	2.000+00	2.000+00	0.000	0.000	1.000+00	0.000	3.000+00	1.000+00	0.000	0.000	0.000	1.000+00
30	3	2.000+00	4.000+00	0.000	0.000	1.000+00	0.000	3.000+00	3.000+00	0.000	0.000	0.000	1.000+00
31	3	2.000+00	6.000+00	0.000	0.000	1.000+00	0.000	3.000+00	5.000+00	0.000	0.000	0.000	1.000+00
32	5	6.000+00	8.000+00	0.000	0.000	1.000+00	0.000	7.000+00	9.000+00	0.000	0.000	0.000	1.000+00

(EOF PLDT FILE 3)

LIFT DISTRIBUTION DETAIL-SURFACE NO.= 1(1, 2)
 ***** LOWER SURFACE *****

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	VI(X)	VI(Y)	VI(Z)	GAMA
1	1	-2.000	-9.000	.444	4.0000	2.7285	.17193	.00000	1.01942	.03461	-1.11482	.00172	-.2729+01
1	2	-1.000	-9.000	.734	4.0000	-1.1951	.04557	.00000	.84616	-.13865	-.95122	1.2807	-1.951+00
1	3	2.000	-9.000	.667	4.0000	-1.1031	.03735	.00000	.81783	-.16698	-.76524	-1.3630	.1103+01

6.5 EXAMPLE PROBLEM # 4, THICK-WING ANALYSIS (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 1 1 2 ALFA= 10.00 MACHNO= .0000 ALTITUDE=***** 17

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1/(1, 2) LOWER SURFACE

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	IXL	IYL	IZL
6	.0500	1.000	-.668	1.000	.9268	.1357	.8892	-.1845	-.7111	.4446	.0574	.0000	-.9984
7	.1500	3.000	-.668	3.000	.9449	.1384	.9085	-.1885	-.6830	.4543	.0616	.0000	-.9981
8	.2500	5.000	-.668	5.000	.9756	.1326	.9377	-.1924	-.5930	.4689	.0690	.0000	-.9976
9	.3500	7.000	-.668	7.000	.9878	.2213	.9344	-.2100	-.4762	.4672	.1006	.0000	-.9949
10	.4500	9.000	-.668	9.000	.6172	-.0015	.6081	.1069	-.0657	.3041	.1225	.0000	-.9925

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 2/(1, 2) UPPER SURFACE

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	IXL	IYL	IZL
17	.0500	1.000	-.668	21.000	-.1651	.0921	-.1786	-.0127	.6512	-.0893	.0459	-.0000	.9989
18	.1500	3.000	-.668	23.000	-.2141	.1103	-.2300	-.0180	.6162	-.1150	.0479	.0000	.9989
19	.2500	5.000	-.668	25.000	-.3032	.1480	-.3243	-.0270	.5209	-.1622	.0670	.0000	.9978
20	.3500	7.000	-.668	27.000	-.4921	.0445	-.4923	-.0777	.3681	-.2462	.0600	.0000	.9977
21	.4500	9.000	-.668	29.000	-.2507	-.2142	-.2841	-.0063	.1903	-.1421	.2801	.0000	.9600

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 1 - 2

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
1	.8909	.1253	.0000	.8556	.2781	-.5014	-.0000	.0000	.00	.73	200.00	10.00	20.00
1	.0003*	.0003*	.0000*	.0002*	.0003*	.0001*	.0000*	.0000*	.00*	.73*	200.00*	10.00*	20.00*
2	-.2850	.1218	.0000	-.3019	.0705	.4645	-.0000	.0000	.00	-.73	200.00	10.00	20.00
2	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.00*	-.73*	200.00*	10.00*	20.00*

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 1 1 2 ALFA= 10.00 MACHNO= .0000 ALTITUDE=***** 18

*** AIRLOAD SUMS ***

VORTEX-LATTICE SOLUTIONS FOR THICK WING (1,2)
 $C_L = 0.5537, C_D = 0.3485, C_{M(C/4)} = -0.0371$

AC	.6058	.2471	.0000	.5537	.3485	-.0190	-.0000	.0000	.00	.73	200.00	10.00	20.00
CG	.6058	.2471	.0000	.5537	.3485	-.0371	-.0000	.0000	.00	.00	200.00	10.00	20.00
AC	.0003*	.0003*	.0000*	.0002*	.0003*	.0001*	.0000*	.0000*	.00*	.73*	200.00*	10.00*	20.00*
CG	.0003*	.0003*	.0000*	.0002*	.0003*	.0001*	.0000*	.0000*	.00*	.00*	200.00*	10.00*	20.00*

* DETERMINANT= .4360+23 * SCALE= .6619-01 *

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE PROBLEM NO. 4 - THICK WING PROBLEM AERODYNAMIC PAGE
 VALUE 10 10 10 0 0 5 5 5 0 0 0 0 0 0 0 0 0 1 1 2 ALFA= 10.00 MACHNO= .0000 ALTITUDE=***** 19

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 3/(3, 3)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	IXL	IYL	IZL
28	.0500	1.000	.000	41.000	.5577	-.0519	.5583	.0878	.0031	.2791	-.0090	.0000	-1.0000
29	.1500	3.000	.000	43.000	.5416	-.0491	.5419	.0855	.0029	.2710	-.0066	.0000	-1.0000
30	.2500	5.000	.000	45.000	.5067	-.0426	.5064	.0804	.0014	.2532	-.0080	.0000	-1.0000
31	.3500	7.000	.000	47.000	.4437	-.0301	.4422	.0718	-.0045	.2211	-.0071	.0000	-1.0000
32	.4500	9.000	.000	49.000	.3261	-.0151	.3238	.0540	-.0191	.1619	-.0152	.0000	-.9999

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 3 - 3

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.00	.73	200.00	10.00	20.00
1	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.00*	.73*	200.00*	10.00*	20.00*
2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.00	-.73	200.00	10.00	20.00
2	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.0000*	.00*	-.73*	200.00*	10.00*	20.00*
3	.4752	-.0378	.0000	.4745	.0453	-.0032	.0000	.0000	.00	.00	200.00	10.00	20.00
3	.0378*	-.0378*	.0000*	.0306*	.0438*	.0094*	.0000*	.0000*	.00*	.00*	200.00*	10.00*	20.00*
AC	.4752	-.0378	.0000	.4745	.0453	-.0060	.0000	.0000	.00	.73	200.00	10.00	20.00
CG	.4752	-.0378	.0000	.4745	.0453	-.0032	.0000	.0000	.00	.00	200.00	10.00	20.00
AC	.0378*	-.0378*	.0000*	.0306*	.0438*	.0122*	.0000*	.0000*	.00*	.73*	200.00*	10.00*	20.00*
CG	.0378*	-.0378*	.0000*	.0306*	.0438*	.0094*	.0000*	.0000*	.00*	.00*	200.00*	10.00*	20.00*

* DETERMINANT= .3470+12 * SCALE= .9800-01 *

VORTEX-LATTICE SOLUTIONS FOR THIN WING (PLAT PLATE)
 $C_L = 0.4745, C_D = 0.0453, C_{M(C/4)} = -0.0032$

**** JOB TIME= 74 / ELAPSED TIME= 74 / NO.PLOT FILES= 3 / NSURF EXEC. VERSION 6-1B-72 ****

NOE TRIPLE OUTPUT OMITTED
 SEE INPUT-DATA LISTINGS

6.6 EXAMPLE PROBLEM # 5, DEBUG-PRINT OUTPUT OPTIONS (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO, 5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20) 0 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 0 ALFA= .00 MACHNO= ,0000 ALTITUDE***** 2

LIFTING SURFACE NO= 1

SPAN	ROOT CHORD	TIP CHORD	ROOT TWIST	TIP TWIST	AREA	ASPECT RATIO	MEAN CHORD	MGC (MGC)	YBAR (MGC)	XBAR (MGC)	ZBAR (MGC)
20.000	10.000	10.000	.0000	.0000	200.00	2.0000	10.000	10.000	5.000	.000	.000
FLAP SPAN1	FLAP SPAN2	FLAP SPAN3	FLAP DEFLEC	TAB DEFLEC	L,AIL DEFLEC	R,AIL DEFLEC	DIMED, MGC/4	SWEEP MGC/4	NO,SPAN ELEMENTS	NO,CHORD ELEMENTS	NO,CHORD DISCONT, 1
.000	.600	1.000	10.000	.000	.000	.000	.000	.000	3	2	1
FUS STA X(CG)	WING STA Y(CG)	HL STA Z(CG)	AREA S(CG)	CHORD C(CG)	SPAN B(CG)						
.000	.000	.000	1000.000	100.000	100.000						
WS	Y	Z	X(LE)	X(C/4)	X(T)	TWIST	DIME(C/4)	SWEP(C/4)	C(WING)	C(FLAP)	C(TAB)
-10.000	-10.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-9.000	-9.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-8.000	-8.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-7.000	-7.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-6.000	-6.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-5.000	-5.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-4.000	-4.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-3.000	-3.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-2.000	-2.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
-1.000	-1.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
.000	.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
1.000	1.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
2.000	2.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
3.000	3.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
4.000	4.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
5.000	5.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
6.000	6.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
7.000	7.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
8.000	8.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
9.000	9.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250
10.000	10.000	.000	-2.500	.000	7.500	.000	.000	.000	10.000	2.500	1.250

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO, 5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20) 0 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 0 ALFA= .00 MACHNO= ,0000 ALTITUDE***** 3

X	Y	Z	XA(1)/C	XA(2)/C	XA(3)/C	XA(4)/C	XA(5)/C	XA(6)/C	XA(7)/C	XA(8)/C	XA(9)/C	XA(10)/C
.0000	10.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
Z	Y	X	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
.0000	10.9900	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

ORIGINAL PAGE IS OF POOR QUALITY

SECTION AIRLOAD COEFFICIENTS-SURFACE NO, # 1/(1, 1)

J	Y.	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
2	-.6000	-.0000	.0000	.0000	.4870	.0062	.4846	.0430	-.1245	.2423	.0103	.0000	-.9999
3	.3333	6.667	.0000	6.667	.3010	-.0247	.3020	.0241	.0141	.1510	.0038	-.0163	-.9999

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS, # 1 - 1

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
1	.3630	-.0144	.0000	.3629	.0173	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
1	.3164	.0164	.0000	.0149	.0178	.0041	-.0000	.0000	.00	.00	200.00	10.00	20.00

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO, 5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20) 0 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 0 ALFA= .5,00 MACHNO= ,0000 ALTITUDE***** 4

*** AIRLOAD SUMS ***

AC	CG	AC	CG
.3630	-.0144	.0000	.3629
.3726	-.0029	.0000	.0726
.3164	.0164	.0000	.0149
.0033	.0033	.0000	.0030

* DETERMINANT= .1073*02 * SCALE= .7042-01 *

**** JOB TIME= 1 / ELAPSED TIME= 1 / NO,PLOT FILES= 0 / NSURF EXEC, VERSION 6-18-72 ****

6.6 EXAMPLE PROBLEM # 5, DEBUG-PRINT OUTPUT OPTIONS (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO,5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 1 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 1 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 7

XA(1)/C XA(2)/C XA(3)/C XA(4)/C XA(5)/C XA(6)/C XA(7)/C XA(8)/C XA(9)/C XA(10)/C
 .0000 1.0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000

X Y ZA(1)/C ZA(2)/C ZA(3)/C ZA(4)/C ZA(5)/C ZA(6)/C ZA(7)/C ZA(8)/C ZA(9)/C ZA(10)/C
 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000
 .0000 10.0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000

J K Y Z WL EW DWL DC DS
 1 1 -6.667+00 0.000 6.667+00 6.667+00 6.667+00 7.500+00 5.000+01
 2 1 -5.960-08 0.000 0.000 0.000 6.667+00 7.500+00 5.000+01
 3 1 6.667+00 0.000 6.667+00 6.667+00 6.667+00 7.500+00 5.000+01
 1 2 -6.667+00 0.000 6.667+00 6.667+00 6.667+00 2.500+00 1.667+01
 2 2 -5.960-08 0.000 0.000 0.000 6.667+00 2.500+00 1.667+01
 3 2 6.667+00 0.000 6.667+00 6.667+00 6.667+00 2.500+00 1.667+01

J K XV YV ZV 1XV 1YV 1ZV XN YN ZN 1XN 1YN 1ZN
 1 1 -6.250-01 -1.000+01 0.000 0.000 1.000+00 0.000 3.125+00 -6.667+00 0.000 0.000 0.000 1.000+00
 2 1 -6.250-01 -3.333+00 0.000 0.000 1.000+00 0.000 3.125+00 -5.960-08 0.000 0.000 0.000 1.000+00
 3 1 -6.250-01 3.333+00 0.000 0.000 1.000+00 0.000 3.125+00 6.667+00 0.000 0.000 0.000 1.000+00
 1 2 5.625+00 -1.000+01 0.000 0.000 1.000+00 0.000 6.875+00 -6.667+00 0.000 0.000 0.000 1.000+00
 2 2 5.625+00 -3.333+00 0.000 0.000 1.000+00 0.000 6.875+00 -5.960-08 0.000 0.000 0.000 1.000+00
 3 2 5.625+00 3.333+00 0.000 0.000 1.000+00 0.000 6.875+00 6.667+00 0.000 0.000 0.000 1.000+00

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1(1, 1)

J Y* Y Z W SCN SCX SCL SCD SMP C/4 SCLC/B 1XL 1YL 1ZL
 2 -.0000 -.0100 .0000 .0000 .4870 .0062 .4846 .0430 -.1245 .2423 .0103 .0000 -.9999
 3 .3333 6.667 .0000 6.667 .3010 -.0247 .3020 .0241 .0141 .1910 .0038 -.0163 -.9999

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO,5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 1 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 1 ALFA= .50 MACHNO= .0000 ALTITUDE=***** 8

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 1 - 1

E ECN ECX ECY ECL ECD ECMP ECMR ECMY EXA EZA ES EMGC EB
 1 .3630 -.0144 .0000 .3629 .0173 -.0321 -.0000 -.0000 .00 .00 200.00 10.00 20.00
 1 .1164* .0164* .0000* .0149* .0178* .0041* -.0000* .0000* .00* .00* 200.00* 10.00* 20.00*
 *** AIRLOAD SUMS ***
 AC .3630 -.0144 .0000 .3629 .0173 -.0321 -.0000 -.0000 .00 .00 200.00 10.00 20.00
 CG .0726 -.0028 .0000 .0726 .0035 -.0006 -.0000 -.0000 .00 .00 100.00 10.00 10.00
 AC .1164* .0164* .0000* .0149* .0178* .0041* -.0000* .0000* .00* .00* 200.00* 10.00* 20.00*
 CG .0333* .0333* .0000* .0030* .0036* .0001* -.0000* .0000* .00* .00* 100.00* 10.00* 10.00*

* DETERMINANT = .1073+02 * SCALE = .7042-01 *

**** JOB TIME= 1 / ELAPSED TIME= 2 / NO.PLOT FILES= 0 / NSURF EXEC, VERSION 6-18-72 ****

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO,5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 2 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 2 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 11

XA(1)/C XA(2)/C XA(3)/C XA(4)/C XA(5)/C XA(6)/C XA(7)/C XA(8)/C XA(9)/C XA(10)/C
 .0000 1.0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000

X Y ZA(1)/C ZA(2)/C ZA(3)/C ZA(4)/C ZA(5)/C ZA(6)/C ZA(7)/C ZA(8)/C ZA(9)/C ZA(10)/C
 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000
 .0000 10.0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000 .0000

J K Y Z WL EW DWL DC DS
 1 1 -6.667+00 0.000 6.667+00 6.667+00 6.667+00 7.500+00 5.000+01
 2 1 -5.960-08 0.000 0.000 0.000 6.667+00 7.500+00 5.000+01
 3 1 6.667+00 0.000 6.667+00 6.667+00 6.667+00 7.500+00 5.000+01

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 OF POOR QUALITY

6.6 EXAMPLE PROBLEM # 5, DEBUG-PRINT OUTPUT OPTIONS (CONTINUED)

1	2	-6.667+00	0.000	6.667+00	6.667+00	6.667+00	2,500+00	1,667+01
2	2	-5.960-08	0.000	0.000	0.000	6.667+00	2,500+00	1,667+01
3	2	6.667+00	0.000	6.667+00	6.667+00	6.667+00	2,500+00	1,667+01

J	K	XV	YV	ZV	IXV	IYV	IZV	XN	YN	ZN	IXN	IYN	IZN
1	1	-6.250-01	-1.000+01	0.000	0.000	1.000+00	0.000	3,125+00	-6.667+00	0.000	0.000	0.000	1.000+00
2	1	-6.250-01	-3.333+00	0.000	0.000	1.000+00	0.000	3,125+00	-5.960-08	0.000	0.000	0.000	1.000+00
3	1	-6.250-01	3.333+00	0.000	0.000	1.000+00	0.000	3,125+00	6.667+00	0.000	0.000	0.000	1.000+00
1	2	5.625+00	-1.000+01	0.000	0.000	1.000+00	0.000	6,875+00	-6.667+00	0.000	0.000	0.000	1.000+00
2	2	5.625+00	-3.333+00	0.000	0.000	1.000+00	0.000	6,875+00	-5.960-08	0.000	0.000	0.000	1.000+00
3	2	5.625+00	3.333+00	0.000	0.000	1.000+00	0.000	6,875+00	6.667+00	0.000	0.000	0.000	1.000+00

LIFT DISTRIBUTION DETAIL-SURFACE NO.= 1/(1, 1)

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	VI(X)	VI(Y)	VI(Z)	GAMA
1	1	-.625	-6.667	.000	50.0000	.3925	.08384	.00000	.99873	.00054	.00568	.00332	-.1472+01
1	2	5.620	-6.667	.054	16.6667	.0302	-.00380	-.01627	.99893	.00287	.00472	.00088	-.1378+01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 2 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 2 ALFA= 5.00 MACHNO= .0000 ALTITUDE=***** 12

2	1	-.625	-.000	.000	50.0000	.3178	-.01821	.00000	1.00160	.00541	.00000	.10236	-.1192+01
2	2	5.616	-.000	.109	16.6667	.9942	-.01031	.00000	.99872	.00253	.00000	.09747	-.1243+01
3	1	-.625	6.667	.000	50.0000	.3925	.08384	.00000	.99873	.00054	.00568	.00332	-.1472+01
3	2	5.620	6.667	.054	16.6667	.0302	-.00380	.01627	.99893	.00287	.00472	.00088	-.1378+01

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1/(1, 1)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	IXL	IYL	IZL
2	-.0000	-.000	.000	.000	.4870	.0062	.4846	.0430	-.1245	.2423	.0103	.0000	-.9999
3	.3333	6.667	.000	6.667	.3010	-.0247	.3020	.0241	.0141	.1310	.0038	-.0163	-.9999

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 1 - 1

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECHY	EXA	EZA	ES	ENGC	EB
1	.3630	-.0144	.0000	.3629	.0173	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
1	.0164	.0164	.0000	.0149	.0178	.0041	-.0000	.0000	.00	.00	200.00	10.00	20.00
*** AIRLOAD SUMS ***													
AC	.3630	-.0144	.0000	.3629	.0173	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
CG	.0726	-.0029	.0000	.0726	.0035	-.0006	-.0000	-.0000	.00	.00	1000.00	100.00	100.00
AC	.0164	.0164	.0000	.0149	.0178	.0041	-.0000	.0000	.00	.00	200.00	10.00	20.00
CG	.0033	.0033	.0000	.0030	.0036	.0001	-.0000	.0000	.00	.00	1000.00	100.00	100.00

* DETERMINANT= .1073+02 * SCALE= .7042-01 *

**** JOB TIME= 1 / ELAPSED TIME= 3 / NO.PLOT FILE= 0 / NSURF EXEC, VERSION 6-18-72 ****

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 5 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 5 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 15

X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
.0000	10.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

J	K	Y	Z	WL	EW	DWL	OC	US
1	1	-6.667+00	0.000	6.667+00	6.667+00	6.667+00	7,500+00	5,000+01
2	1	-5.960-08	0.000	0.000	0.000	6.667+00	7,500+00	5,000+01
3	1	6.667+00	0.000	6.667+00	6.667+00	6.667+00	7,500+00	5,000+01
1	2	-6.667+00	0.000	6.667+00	6.667+00	6.667+00	2,500+00	1,667+01
2	2	-5.960-08	0.000	0.000	0.000	6.667+00	2,500+00	1,667+01
3	2	6.667+00	0.000	6.667+00	6.667+00	6.667+00	2,500+00	1,667+01

6.6 EXAMPLE PROBLEM # 5, DEBUG-PRINT OUTPUT OPTIONS (CONTINUED)

J	K	XV	YV	ZV	1XV	1YV	1ZV	XN	YN	ZN	1XN	1YN	1ZN
1	1	-6.250-01	-1.000+01	0.000	0.000	1.000+00	0.000	3.125+00	-6.667+00	0.000	0.000	0.000	1.000+00
2	1	-6.250-01	-3.333+00	0.000	0.000	1.000+00	0.000	3.125+00	-5.960-08	0.000	0.000	0.000	1.000+00
3	1	-6.250-01	3.333+00	0.000	0.000	1.000+00	0.000	3.125+00	6.667+00	0.000	0.000	0.000	1.000+00
1	2	5.625+00	-1.000+01	0.000	0.000	1.000+00	0.000	6.875+00	-6.667+00	0.000	0.000	0.000	1.000+00
2	2	5.625+00	-3.333+00	0.000	0.000	1.000+00	0.000	6.875+00	-5.960-08	0.000	0.000	0.000	1.000+00
3	2	5.625+00	3.333+00	0.000	0.000	1.000+00	0.000	6.875+00	6.667+00	0.000	0.000	0.000	1.000+00

VORTEX LATTICE MATRIX DETAIL-SURFACE NO.= 1/(1, 1)

J	K	NP	NG	VFS(MAT)	VIN(MAT)	P(X)	P(Y)	P(Z)	B(X)	B(Y)	B(Z)	D(X)	D(Y)	D(Z)
2	1	1	1	-.8716-01	.1113+00	.3125+01	-.5960-07	.0000	-.6250+00	.3333+01	.0000	-.6250+00	.3333+01	.0000
2	1	1	2	-.8716-01	-.5010-01	.3125+01	-.5960-07	.0000	-.6250+00	.3333+01	.0000	-.6250+00	.1000+02	.0000
2	1	1	3	-.8716-01	.2476-01	.3125+01	-.5960-07	.0000	.5616+01	-.3333+01	.1085+00	.5616+01	.3333+01	.1085+00
2	1	1	4	-.8716-01	-.6688-01	.3125+01	-.5960-07	.0000	.5616+01	.3333+01	.1085+00	.5625+01	.1000+02	.0000
3	1	2	1	-.8716-01	-.2505-01	.3125+01	.6667+01	.0000	-.6250+00	.3333+01	.0000	-.6250+00	.3333+01	.0000
3	1	2	2	-.8716-01	.1072+00	.3125+01	.6667+01	.0000	-.6250+00	.3333+01	.0000	-.6250+00	.1000+02	.0000

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)* 5 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 5 ALFA* 5.00 MACHNO* .0000 ALTITUDE***** 16

J	K	NP	NG	VFS(MAT)	VIN(MAT)	P(X)	P(Y)	P(Z)	B(X)	B(Y)	B(Z)	D(X)	D(Y)	D(Z)
3	1	2	3	-.8716-01	-.3346-01	.3125+01	.6667+01	.0000	.5616+01	-.3333+01	.1085+00	.5616+01	.3333+01	.1085+00
3	1	2	4	-.8716-01	.2002-01	.3125+01	.6667+01	.0000	.5616+01	.3333+01	.1085+00	.5625+01	.1000+02	.0000
2	2	3	1	-.2588+00	.9435-01	.6847+01	-.5960-07	.3256+00	-.6250+00	.3333+01	.0000	-.6250+00	.3333+01	.0000
2	2	3	2	-.2588+00	-.5275-01	.6847+01	-.5960-07	.3256+00	-.6250+00	.3333+01	.0000	-.6250+00	.1000+02	.0000
2	2	3	3	-.2588+00	.1814+00	.6847+01	-.5960-07	.3256+00	.5616+01	-.3333+01	.1085+00	.5616+01	.3333+01	.1085+00
2	2	3	4	-.2588+00	-.3772-01	.6847+01	-.5960-07	.3256+00	.5616+01	.3333+01	.1085+00	.5625+01	.1000+02	.0000
3	2	4	1	-.8716-01	-.2831-01	.6875+01	.6667+01	.0000	-.6250+00	-.3333+01	.0000	-.6250+00	.3333+01	.0000
3	2	4	2	-.8716-01	.9421-01	.6875+01	.6667+01	.0000	-.6250+00	.3333+01	.0000	-.6250+00	.1000+02	.0000
3	2	4	3	-.8716-01	-.1977-01	.6875+01	.6667+01	.0000	.5616+01	-.3333+01	.1085+00	.5616+01	.3333+01	.1085+00
3	2	4	4	-.8716-01	.1795+00	.6875+01	.6667+01	.0000	.5616+01	.3333+01	.1085+00	.5625+01	.1000+02	.0000

LIFT DISTRIBUTION DETAIL-SURFACE NO.= 1/(1, 1)

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	VI(X)	VI(Y)	VI(Z)	GAMA
1	1	-.625	-6.667	.000	50.0000	.3925	.08384	.00000	.99673	.00054	.00568	.00332	-.1472+01
1	2	5.620	-6.667	.054	16.6667	.0302	-.00380	-.01627	.99893	.00287	-.00472	.09088	-.3780-01
2	1	-.625	+.000	.000	50.0000	.3178	-.01521	.00000	1.00160	.00541	.00000	.10236	-.1192+01
2	2	5.616	+.000	.109	16.6667	.9942	-.01031	.00000	.99872	.00253	.00000	.09747	-.1243+01
3	1	-.625	6.667	.000	50.0000	.3925	.08384	.00000	.99673	.00054	-.00568	.00332	-.1472+01
3	2	5.620	6.667	.054	16.6667	.0302	-.00380	.01627	.99893	.00287	.00472	.09088	-.3780-01

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1/(1, 1)

J	Y*	Y	Z	W	SCN	SCX	SCL	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
2	-.0000	-.000	.000	.000	.4870	.0062	.4846	.0430	-.1245	.2423	.0103	.0000	-.9999
3	.3333	6.667	.000	6.667	.3010	-.0247	.3020	.0241	.0141	.1510	.0038	-.0163	-.9999

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)* 5 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 1 0 5 ALFA* 5.00 MACHNO* .0000 ALTITUDE***** 17

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 1 - 1

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
1	.3630	-.2144	.0000	.3629	.0175	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
1	.2164*	.3164*	.0000*	.0149*	.0178*	.0041*	-.0000*	.0000*	.00*	.00*	200.00*	10.00*	20.00*
*** AIRLOAD SUMS ***													
AC	.3630	-.2144	.0000	.3629	.0175	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
CG	.2726	-.0020	.0000	.0726	.0035	-.0006	-.0000	-.0000	.00	.00	1000.00	100.00	100.00
AC	.2164*	.3164*	.0000*	.0149*	.0178*	.0041*	-.0000*	.0000*	.00*	.00*	200.00*	10.00*	20.00*
CG	.2033*	.0033*	.0000*	.0030*	.0036*	.0001*	-.0000*	.0000*	.00*	.00*	1000.00*	100.00*	100.00*

* DETERMINANT= .1073+02 * SCALE= .7042-01 *

**** JOB TIME= 1 / ELAPSED TIME= 4 / NO.PLOT FILES= 0 / NSURF EXEC. VERSION 6-18-72 ****

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6.6 EXAMPLE PROBLEM # 5, DEBUG-PRINT OUTPUT OPTIONS (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)= 8 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 1 0 8 ALFA# ,00 MACHNO# ,0000 ALTITUDE***** 20

XA(1)/C XA(2)/C XA(3)/C XA(4)/C XA(5)/C XA(6)/C XA(7)/C XA(8)/C XA(9)/C XA(10)/C
 ,0000 1,0000 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000

X Y ZA(1)/C ZA(2)/C ZA(3)/C ZA(4)/C ZA(5)/C ZA(6)/C ZA(7)/C ZA(8)/C ZA(9)/C ZA(10)/C
 ,0300 ,0000 ,0300 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000
 ,0200 10,0000 ,0300 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000 ,0000

J K Y Z WL EW DWL DC DS
 1 1 -6.667+00 0,000 6,667+00 6,667+00 6,667+00 7,500+00 5,000+01
 2 1 -5.960-08 0,000 0,000 0,000 6,667+00 7,500+00 5,000+01
 3 1 6.667+00 0,000 6,667+00 6,667+00 6,667+00 7,500+00 5,000+01
 1 2 -6.667+00 0,000 6,667+00 6,667+00 6,667+00 2,500+00 1,667+01
 2 2 -5.960-08 0,000 0,000 0,000 6,667+00 2,500+00 1,667+01
 3 2 6.667+00 0,000 6,667+00 6,667+00 6,667+00 2,500+00 1,667+01

J K XV YV ZV 1XV 1YV 1ZV XN YN ZN 1XN 1YN 1ZN
 1 1 -6.250-01 -1,000+01 0,000 0,000 1,000+00 0,000 3,125+00 -6,667+00 0,000 0,000 0,000 1,000+00
 2 1 -6.250-01 -3,333+00 0,000 0,000 1,000+00 0,000 3,125+00 -9,960-08 0,000 0,000 0,000 1,000+00
 3 1 -6.250-01 3,333+00 0,000 0,000 1,000+00 0,000 3,125+00 6,667+00 0,000 0,000 0,000 1,000+00
 1 2 5.625+00 -1,000+01 0,000 0,000 1,000+00 0,000 6,875+00 -6,667+00 0,000 0,000 0,000 1,000+00
 2 2 5.625+00 -3,333+00 0,000 0,000 1,000+00 0,000 6,875+00 -9,960-08 0,000 0,000 0,000 1,000+00
 3 2 5.625+00 3,333+00 0,000 0,000 1,000+00 0,000 6,875+00 6,667+00 0,000 0,000 0,000 1,000+00

\$DEBUG1
 P = ,31250000E+01, -.59604645E-07, ,00000000E+00,
 B = -.62500000E+00, ,33333333E+01, ,00000000E+00,
 D = -.62500000E+00, ,33333333E+01, ,00000000E+00,
 TANA = -.43660927E-01,
 GAMA = ,79577538E-01,
 PSIF = ,34891974E+01,
 VCOS = ,15201368E+00, -.17101539E+00, ,34816869E+01,
 \$SEND
 \$DEBUG2
 PSIF = -.34891974E+01,
 VCOS = ,30402735E+00, ,00000000E+00, ,69633738E+01,
 \$SEND

\$DEBUG3
 PSIF = ,23621825E+01,
 VCOS = ,30402735E+00, ,00000000E+00, ,93255563E+01,
 \$SEND
 VORTEX LATTICE MATRIX DETAIL= SURFACE NO.= 1/(1, 1)

J K NP NG VFS(MAT) VIN(MAT) P(X) P(Y) P(Z) B(X) B(Y) B(Z) D(X) D(Y) D(Z)
 2 1 1 1 -.8716-01 ,1113+00 ,3125+01 -.5960-07 ,0000 -.6250+00 ,3333+01 ,0000 -.6250+00 ,3333+01 ,0000

\$DEBUG1
 P = ,31250000E+01, -.59604645E-07, ,00000000E+00,
 B = -.62500000E+00, ,33333333E+01, ,00000000E+00,
 D = -.62500000E+00, ,99999999E+01, ,00000000E+00,
 TANA = -.43660927E-01,
 GAMA = ,79577538E-01,
 PSIF = ,34891975E+01,
 VCOS = -.15201368E+00, -.17101540E+00, -.34816870E+01,
 \$SEND
 \$DEBUG2
 PSIF = -.90040575E+00,
 VCOS = -.11274380E+00, -.15628919E+00, -.25822586E+01,
 \$SEND
 \$DEBUG3
 PSIF = ,48349399E+00,
 VCOS = -.11274380E+00, -.15628919E+00, -.20987647E+01,
 \$SEND

\$DEBUG1
 P = ,31250000E+01, -.59604645E-07, ,00000000E+00,
 B = -.62500000E+00, -.10000000E+02, ,00000000E+00,
 D = -.62500000E+00, -.33333333E+01, ,00000000E+00,
 TANA = -.43660927E-01,
 GAMA = ,79577538E-01,
 PSIF = ,60046574E+00,
 VCOS = ,39269878E-01, -.14726204E-01, ,89942843E+00,
 \$SEND
 \$DEBUG2
 PSIF = -.34891976E+01,
 VCOS = -.11274381E+00, ,15628920E+00, -.25822587E+01,
 \$SEND
 \$DEBUG3
 PSIF = ,48349399E+00,
 VCOS = -.11274381E+00, ,15628920E+00, -.20987647E+01,
 \$SEND

6.6 EXAMPLE PROBLEM # 5, DEBUG-PRINT OUTPUT OPTIONS (CONTINUED)

```
PSIF = .46490990E-02,
VCOS = -.70147196E-02, -.49002358E-02, -.26632830E+00,
$END
```

```
$DEBUGV1
P = .56202524E+01, .66666664E+01, .54269035E-01,
B = .56159049E+01, .33333332E+01, .10853007E+00,
D = .56159049E+01, .33333332E+01, .10853007E+00,
TANA = -.43660927E-01,
GAMA = .79577538E-01,
PSIF = .66713168E+00,
VCOS = .29099439E-01, .36028789E-02, .66648699E+00,
$END
```

```
$DEBUGV2
PSIF = -.21040093E+01,
VCOS = -.58302713E-01, -.28861600E-01, -.13353522E+01,
$END
$DEBUGV3
PSIF = .14523004E-01,
VCOS = -.43435899E-01, -.28861600E-01, -.13340865E+01,
$END
```

```
$DEBUGV1
P = .56202524E+01, .66666664E+01, .54269035E-01,
B = .56159049E+01, .33333332E+01, .10853007E+00,
D = .56200000E+01, .99999996E+01, .00000000E+00,
TANA = -.43660927E-01,
GAMA = .79577538E-01,
PSIF = .20042719E+01,
VCOS = .47413603E-01, .32468731E-01, .20021014E+01,
$END
$DEBUGV2
PSIF = -.20042719E+01,
VCOS = .17482721E+00, .64937462E-01, .40042028E+01,
$END
$DEBUGV3
PSIF = .00030000E+00,
VCOS = .17482721E+00, .64937462E-01, .40042028E+01,
$END
```

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OF POOR QUALITY

LIFT DISTRIBUTION DETAIL-SURFACE NO.= 1/(1, 1)

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	VI(X)	VI(Y)	VI(Z)	GAMA
1	1	-.625	-8.667	.000	50.0000	.3925	.08384	.00000	.99673	.00054	.00568	.00332	-.1472+01
1	2	5.620	-8.667	.054	16.6667	.0302	-.00380	-.01427	.99893	.00287	-.00472	.09088	-.3780-01

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)* 8 PAGE
VALUE 3 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 8 ALFA= 5.00 MACHNO= .0000 ALTITUDE***** 21

J	K	P(X)	P(Y)	P(Z)	AREA	CPN	G(X)	G(Y)	G(Z)	VI(X)	VI(Y)	VI(Z)	GAMA
2	1	-.625	-.000	.000	50.0000	.3178	-.01521	.00000	1.00160	.00541	.00000	.10236	-.1192+01
2	2	5.616	-.000	.109	16.6667	.9942	-.01031	.00000	.99872	.00253	.00000	.09747	-.1243+01
3	1	-.625	6.667	.000	50.0000	.3925	.08384	.00000	.99673	.00054	-.00568	.00332	-.1472+01
3	2	5.620	6.667	.054	16.6667	.0302	-.00380	.01627	.99893	.00287	.00472	.09088	-.3780-01

SECTION AIRLOAD COEFFICIENTS-SURFACE NO.= 1/(1, 1)

J	Y*	Y	Z	W	SCN	SCX	SCY	SCD	SMP C/4	SCLC/B	1XL	1YL	1ZL
2	-.0000	-.000	.000	.000	.4870	.0062	.4846	.0430	-.1245	.2423	.0103	.0000	-.9999
3	.3333	6.667	.000	6.667	.3010	-.0247	.3020	.0241	.0141	.1510	.0038	-.0163	-.9999

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS.= 1 - 1

E	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EXA	EZA	ES	EMGC	EB
1	.3636	-.0144	.0000	.3629	.0175	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
1	.0164	.0164	.0000	.0149	.0178	.0041	-.0000	.0000	.00	.00	200.00	10.00	20.00

*** AIRLOAD SUMS ***

AC	.3636	-.0144	.0000	.3629	.0175	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
CC	.0726	-.0229	.0000	.0726	.0035	-.0006	-.0000	-.0000	.00	.00	1000.00	100.00	100.00
CC	.0164	.0164	.0000	.0149	.0178	.0041	-.0000	.0000	.00	.00	200.00	10.00	20.00
CC	.0333	.0333	.0000	.0330	.0336	.0081	-.0000	.0000	.00	.00	1000.00	100.00	100.00

* DETERMINANT= .1073*02 * SCALE= .7042-01 *

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO.5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)* 8 PAGE
VALUE 3 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 8 ALFA= 5.00 MACHNO= .0000 ALTITUDE***** 22

*** JOB TIME= 3 / ELAPSED TIME= 7 / NO.PLOT FILES= 0 / NSURF EXEC, VERSION 6-18-72 ***

6.6 EXAMPLE PROBLEM # 5, DEBUG-PRINT OUTPUT OPTIONS (CONTINUED)

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO. 5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)* 16 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 1 1 0 16 ALFA= .00 MACHNO= .0000 ALTITUDE=***** 25

	XA(1)/C	XA(2)/C	XA(3)/C	XA(4)/C	XA(5)/C	XA(6)/C	XA(7)/C	XA(8)/C	XA(9)/C	XA(10)/C
	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

X	Y	ZA(1)/C	ZA(2)/C	ZA(3)/C	ZA(4)/C	ZA(5)/C	ZA(6)/C	ZA(7)/C	ZA(8)/C	ZA(9)/C	ZA(10)/C
.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
.0000	10.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

J	K	Y	Z	WL	EW	DWL	DC	DS
1	1	-6.667+00	0.000	6.667+00	6.667+00	6.667+00	7.500+00	5.000+01
2	1	-5.960-08	0.000	0.000	0.000	6.667+00	7.500+00	5.000+01
3	1	6.667+00	0.000	6.667+00	6.667+00	6.667+00	7.500+00	5.000+01
1	2	-6.667+00	0.000	6.667+00	6.667+00	6.667+00	2.500+00	1.667+01
2	2	-5.960-08	0.000	0.000	0.000	6.667+00	2.500+00	1.667+01
3	2	6.667+00	0.000	6.667+00	6.667+00	6.667+00	2.500+00	1.667+01

J	K	XV	YV	ZV	1XV	1YV	1ZV	XN	YN	ZN	1XN	1YN	1ZN
1	1	-6.250-01	-1.000+01	0.000	0.000	1.000+00	0.000	3.125+00	-6.667+00	0.000	0.000	0.000	1.000+00
2	1	-6.250-01	-3.333+00	0.000	0.000	1.000+00	0.000	3.125+00	-5.960-08	0.000	0.000	0.000	1.000+00
3	1	-6.250-01	3.333+00	0.000	0.000	1.000+00	0.000	3.125+00	6.667+00	0.000	0.000	0.000	1.000+00
1	2	5.625+00	-1.000+01	0.000	0.000	1.000+00	0.000	6.875+00	-6.667+00	0.000	0.000	0.000	1.000+00
2	2	5.625+00	-3.333+00	0.000	0.000	1.000+00	0.000	6.875+00	-5.960-08	0.000	0.000	0.000	1.000+00
3	2	5.625+00	3.333+00	0.000	0.000	1.000+00	0.000	6.875+00	6.667+00	0.000	0.000	0.000	1.000+00

```

$DEBUGV1
P = .31250000E+01, -.59604645E-07, .00000000E+00,
B = -.62500000E+00, -.33333333E+01, .00000000E+00,
D = -.62500000E+00, .33333333E+01, .00000000E+00,
TANA = -.43660927E-01,
GAMA = .79577538E-01,
PSIF = .34891974E+01,
VCOS = .15201348E+00, -.17101539E+00, .34818869E+01,
$END
$DEBUGV2
PSIF = -.34891974E+01,
VCOS = .30402735E+00, .00000000E+00, .69633738E+01,
$END
    
```

```

$DEBUGV3
PSIF = .23621825E+01,
VCOS = .30402735E+00, .00000000E+00, .93255563E+01,
$END
    
```

```

$REFLEX
PX = .00000000E+00,
PY = -.62500000E+00,
X1 = .10038198E+05,
Y1 = .00000000E+00,
PHI = -.87266430E-01,
ALFAR = .87266430E-01,
RX = -.10000052E+05,
RY = .87429012E+03,
ZL = .10000000E+05,
COSR = .99619471E+00,
$END
$REFLEX
PX = .19923998E+05,
PY = -.17425248E+04,
X1 = .10038198E+05,
Y1 = .00000000E+00,
PHI = -.87266430E-01,
ALFAR = .87266430E-01,
RX = .10000052E+05,
RY = .87429012E+03,
ZL = .10000000E+05,
COSR = .99619471E+00,
$END
    
```

ABOUT 50 PAGES OF OUTPUT OMITTED

INTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS. = 1 - 1

	ECN	ECX	ECY	ECL	ECD	ECMP	ECMR	ECMY	EKA	EZA	ES	EMGC	EB
1	.3630	-.0144	.0000	.3629	.0173	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
1	.0164	.0164	.0000	.0149	.0178	.0041	-.0000	.0000	.00	.00	200.00	10.00	20.00
*** AIRLOAD SUMS ***													
AC	.3630	-.0144	.0000	.3629	.0173	-.0321	-.0000	-.0000	.00	.00	200.00	10.00	20.00
CG	.0726	-.0029	.0000	.0726	.0035	-.0006	-.0000	-.0000	.00	.00	1000.00	100.00	100.00
AC	.0164	.0164	.0000	.0149	.0178	.0041	-.0000	.0000	.00	.00	200.00	10.00	20.00
CG	.0333	.0033	.0000	.0030	.0036	.0001	-.0000	.0000	.00	.00	1000.00	100.00	100.00
* DETERMINANT = .1073*02 * SCALE = .7042-01 *													

JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 EXAMPLE NO. 5 - DEBUG-DUMP DEMONSTRATION/ NFLG(20)* 16 PAGE
 VALUE 3 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 1 1 0 16 ALFA= 5.00 MACHNO= .0000 ALTITUDE=***** 27

*** JOB TIME= 6 / ELAPSED TIME= 13 / NO. PLOT FILES= 0 / NSURF EXEC, VERSION 6-18-72 ***

6.6 EXAMPLE PROBLEM # 5, DEBUG-PRINT OUTPUT OPTIONS (CONTINUED)

XQT NSURFT 24 AUG 72 10*20' 3.974

1.032000+00	7.680000+00	3.030000+00	-2.930000+00	-9.780000-02	} TEST MATRIX = [M]
7.865000+00	-6.390000+00	-3.380000+00	5.670000+00	7.103000+00	
3.216000+00	8.900000+00	-1.167000+01	8.323000+00	9.992000+00	
3.031000+00	-1.030000+00	4.180000+00	9.073000+00	9.783000-01	
1.032000+01	5.690000+00	-3.600000+00	3.780000-02	1.514000+01	
3.220950-01	2.931715-01	9.424216-03	-8.727428-02	-1.363442-01	} INVERSE MATRIX = [M] ⁻¹
1.091531-01	1.615780-03	3.541707-02	1.522940-03	-2.353400-02	
-8.700874-02	-1.258476-01	-6.201933-02	1.070551-01	9.249558-02	
-2.496730-02	-1.494837-02	3.317090-02	8.115159-02	-2.028226-02	
-2.808256-01	-2.303324-01	-3.456437-02	8.417013-02	1.896721-01	
1.000000+00	-3.469447-18	4.336809-19	-1.782157-18	3.469447-18	} UNIT MATRIX = [M] × [M] ⁻¹
-8.673617-19	1.000000+00	1.734723-18	-1.029992-18	-8.673617-19	
0.000000	8.673617-19	1.000000+00	-2.463172-18	-1.734723-18	
4.336809-19	9.757820-19	0.000000	1.000000+00	1.301043-18	
3.469447-18	6.938894-18	8.673617-19	-1.565317-18	1.000000+00	

5.870328+04 DETERMINANT

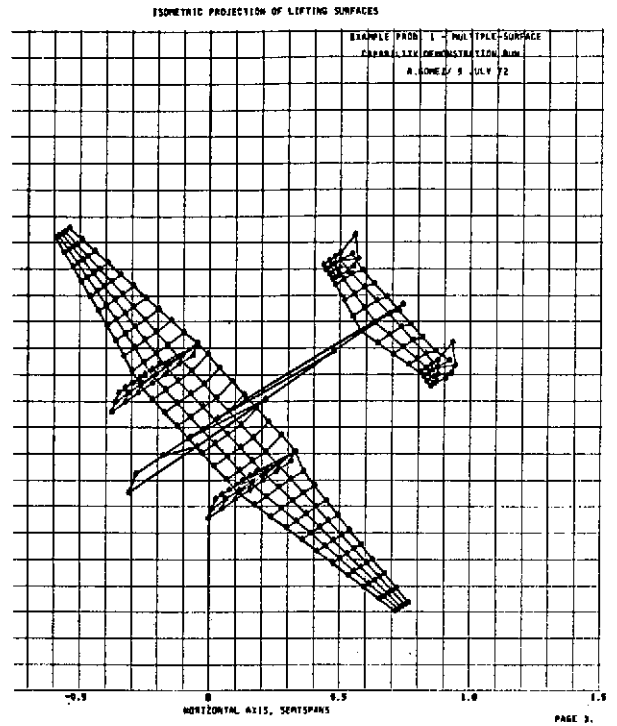
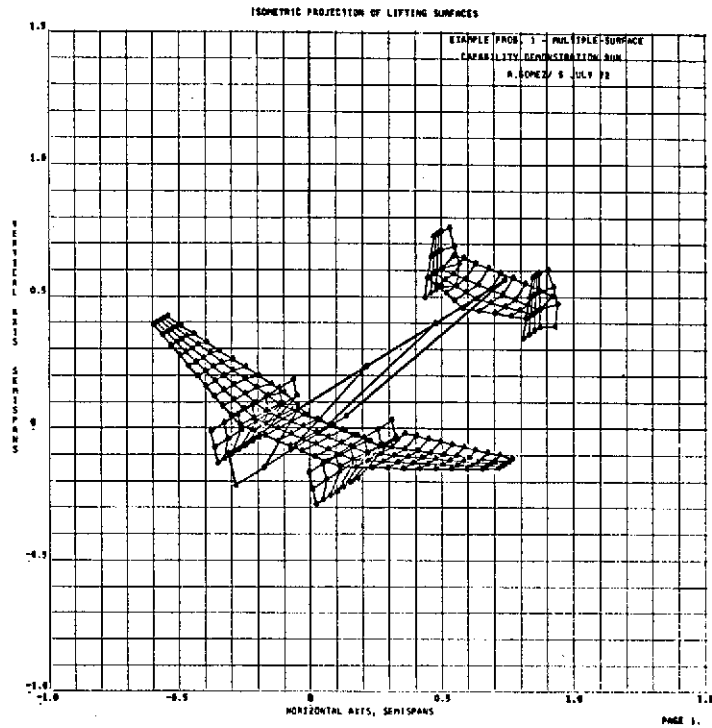
XQT ISURFT 24 AUG 72 10*20' 6.109

1.032000+00	7.680000+00	3.030000+00	-2.930000+00	-9.780000-02	} TEST MATRIX = [M]
7.865000+00	-6.390000+00	-3.380000+00	5.670000+00	7.103000+00	
3.216000+00	8.900000+00	-1.167000+01	8.323000+00	9.992000+00	
3.031000+00	-1.030000+00	4.180000+00	9.073000+00	9.783000-01	
1.032000+01	5.690000+00	-3.600000+00	3.780000-02	1.514000+01	
3.220950-01	2.931715-01	9.424216-03	-8.727428-02	-1.363442-01	} INVERSE MATRIX = [M] ⁻¹
1.091531-01	1.619780-03	3.541707-02	1.522940-03	-2.353400-02	
-8.700874-02	-1.258476-01	-6.201933-02	1.070551-01	9.249558-02	
-2.496730-02	-1.494837-02	3.317090-02	8.115159-02	-2.028226-02	
-2.808256-01	-2.303324-01	-3.456437-02	8.417013-02	1.896721-01	
1.000000+00	-3.469447-18	4.336809-19	-1.782157-18	3.469447-18	} UNIT MATRIX = [M] × [M] ⁻¹
-8.673617-19	1.000000+00	1.734723-18	-1.029992-18	-8.673617-19	
0.000000	8.673617-19	1.000000+00	-2.463172-18	-1.734723-18	
4.336809-19	9.757820-19	0.000000	1.000000+00	1.301043-18	
3.469447-18	6.938894-18	8.673617-19	-1.565317-18	1.000000+00	

5.870328+04 DETERMINANT

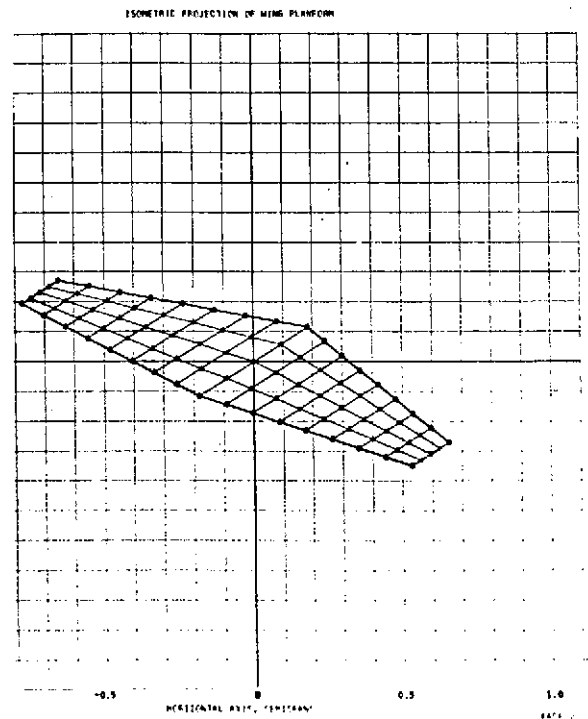
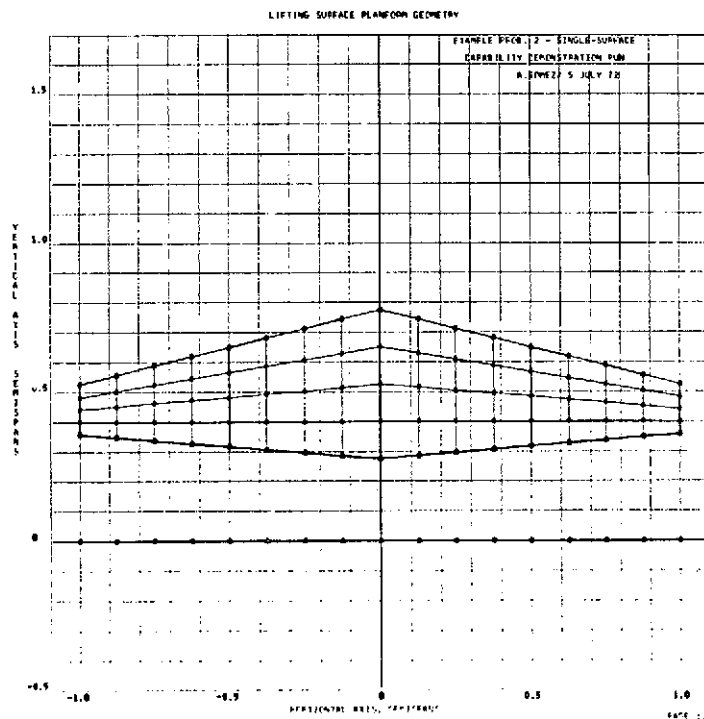
6.7 PLOT-OUTPUT

1) EXAMPLE PROBLEM # 1, MULTIPLE-SURFACE ANALYSIS CAPABILITY



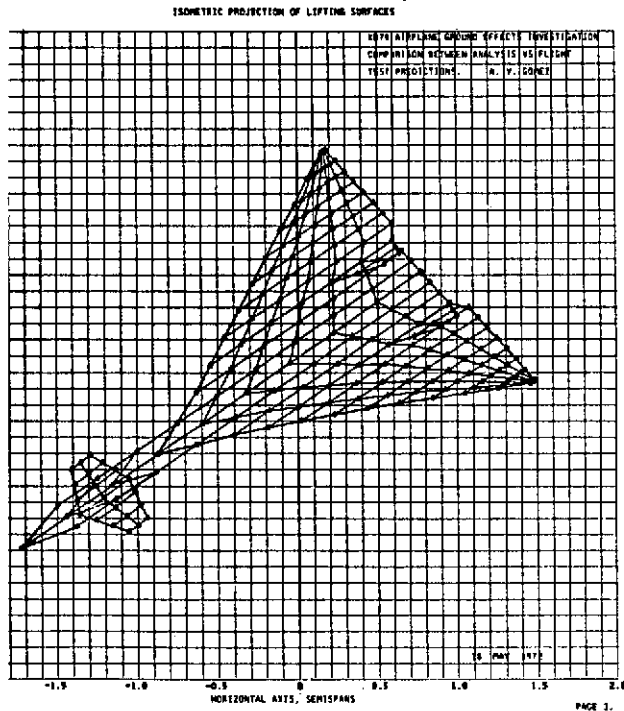
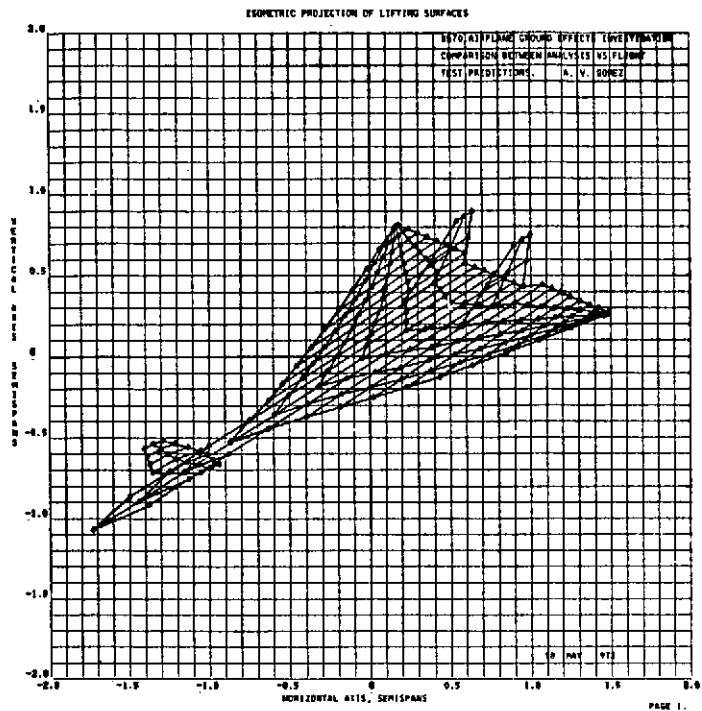
2) EXAMPLE PROBLEM # 2, SINGLE-SURFACE ANALYSIS CAPABILITY

NOTE: THE FIRST TWO PLOTS ARE SHOWN BELOW. THE REMAINDER OF THE PLOT-OUTPUT FOR THIS PROBLEM IS PRESENTED IN FIGURE 2.18[C] (PAGES 2-49 THRU. 2-52)

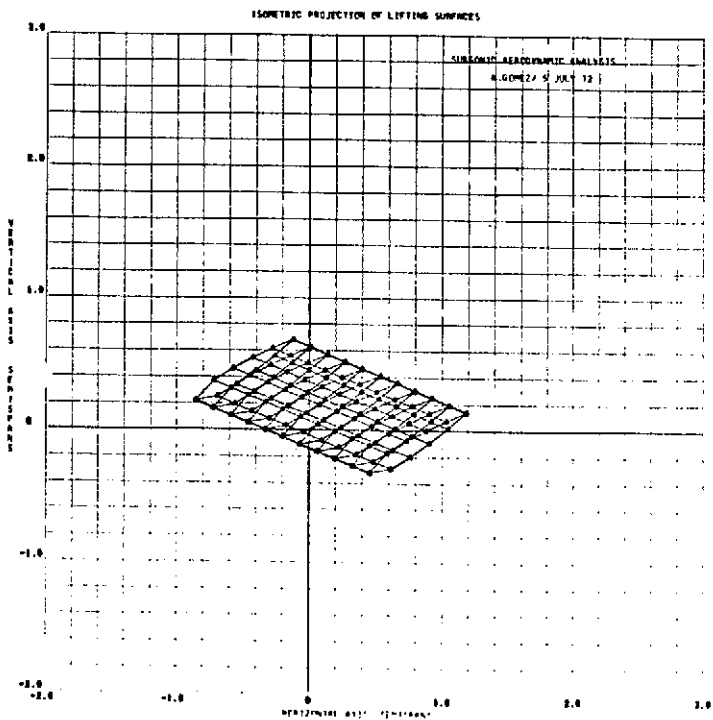


6.7 PLOT-OUTPUT (CONTINUED)

3) EXAMPLE PROBLEM # 3, NORTH AMERICAN XB-70 AIRPLANE



4) EXAMPLE PROBLEM # 4, THICK-WING ANALYSIS



7.0 PROGRAM DESCRIPTION

7.1 Operating Procedures

The "TRW Vortex-Analysis Program #HA010B (N. SURFACE)" is written in Fortran V source language for execution in the UNIVAC 1108 computer, with a 65K core or a computer of similar configuration. Five separate execution modes for the program are permitted:

1) XQT ISURF or XQT NSURF

Two main execution modes for solving lifting-surface problems by the vortex-lattice method are permitted. NAMELIST statements are used exclusively for input of numeric quantities along with "A" formatted read statements for titles and comments. Card input and tabular printed output are on units 5 and 6 respectively. In addition to the program PCF tape, which is assigned to an unused unit, the following units* are also used:

Unit 1 (KT1) Input data is stored in unit 1 for all the cases that are to be executed.

Unit 8 (KT2) Output plot-data tape or drum physical unit assignment that is required as an input for the auxiliary execution mode.

Unit 3 (KT3) Work tape or drum physical unit assignment.

2) XQT ISURFT or NSURFT

Two test execution-modes for determining the accuracy of the matrix inversion procedure are permitted. The test execution-modes require no input data. Tabular printed output is on unit 6.

3) XQT TRWPLT

One auxiliary execution mode that is used for obtaining Calcomp or 4060-microfilm output is permitted. This mode of execution requires two modes of input, a tape or drum file (Unit KT2) containing the plot data accompanied by punched-card input describing the manner in which the data is to be plotted. A generalized input processor is used which compares the input symbols to an internal symbol table and stores the data in the appropriate address. The card format, which is input in unit 5, consists of BCD symbol equivalences to the input data in a free-form mode. Printed output is in unit 6 and plot output on magnetic tape (PLT tape assignment).

*Units, 1, 3, and 3 (KT1, KT2, and KT3) may be reassigned in execution (see input instructions).

VORTEX-LATTICE ANALYSIS PROGRAM (HA010B)

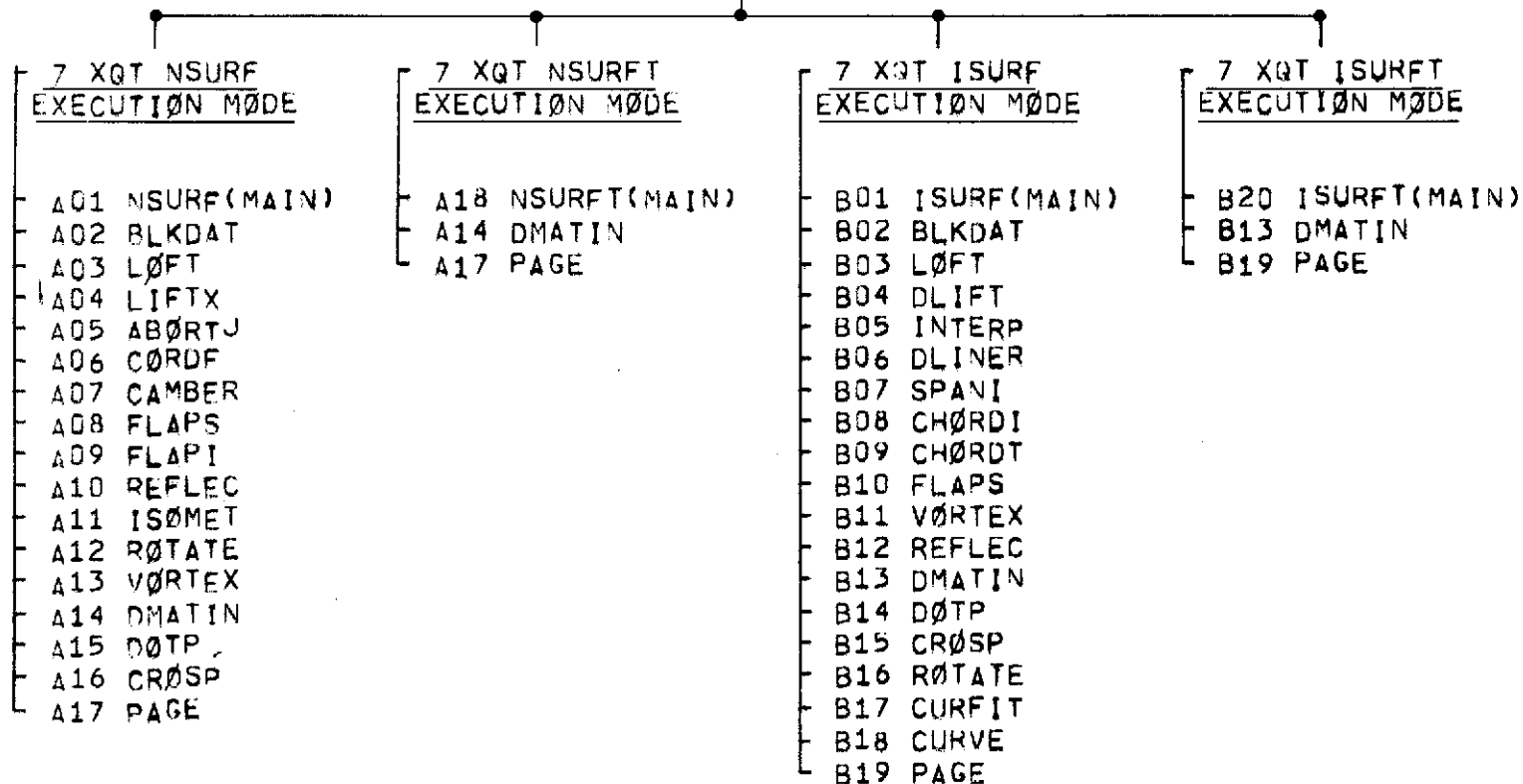


FIGURE 7.01 - TRW VORTEX-LATTICE ANALYSIS PROGRAM OVERLAY STRUCTURE

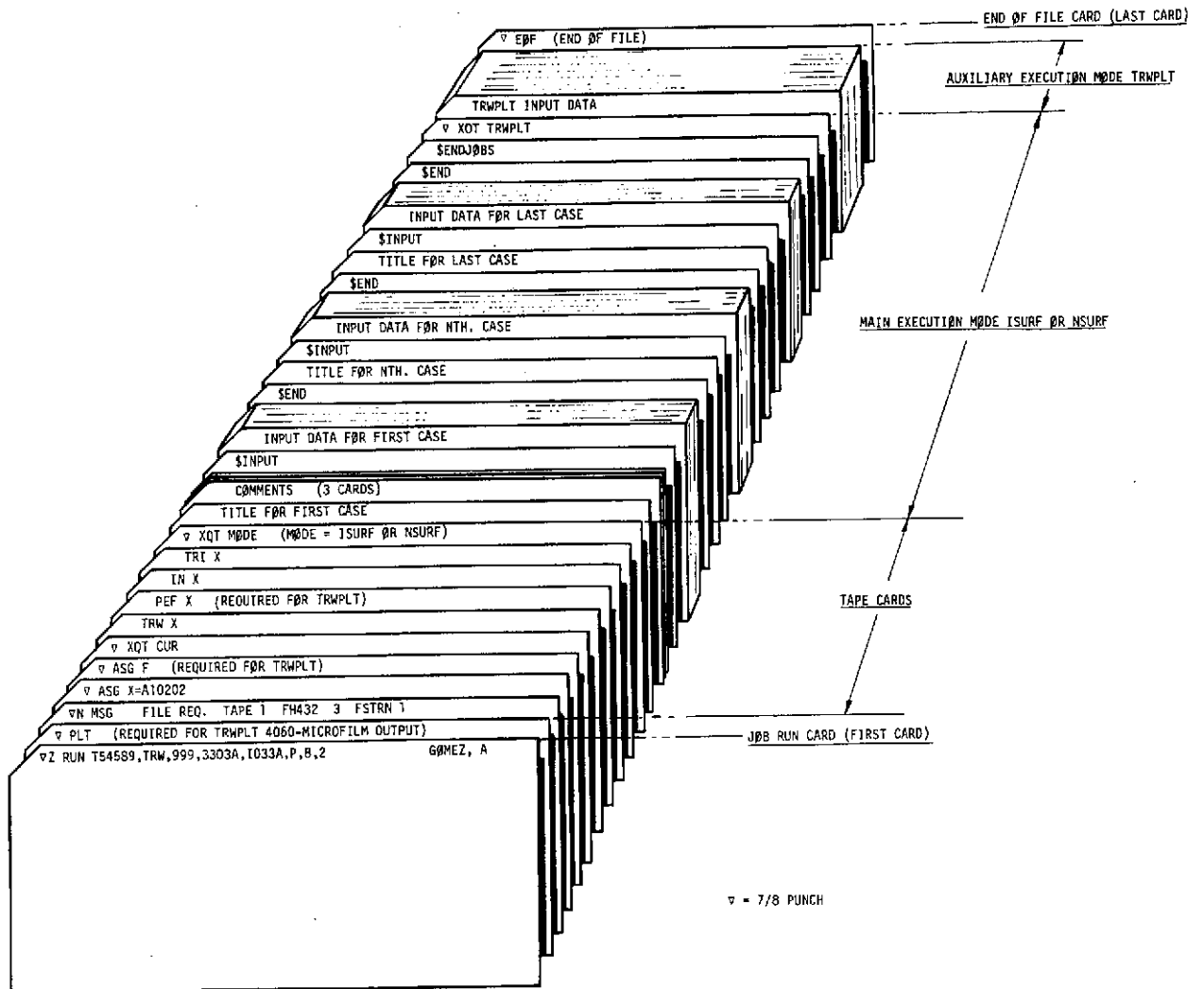


FIGURE 7.02 - CONTROL DECK SETUP

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OF POOR QUALITY

7.1 Operating Procedures (Continued)

The program overlay diagram for the main and test execution modes is presented in Figure 7.01 (Page 7-2). The program control deck setup is illustrated in Figure 7.02 (Page 7-3).

7.2 Execution Time

For the main execution modes of the program, i.e., XQT ISURF or XQT NSURF, the execution time required to complete a single case is primarily dependent on the total number of vortices or elemental surfaces that are considered simultaneously in arriving at a solution. The other factors that affect the execution time are due to the execution of the special options of the program, such as: ground effects, lifting-line extrapolated solutions, tape output, surface discontinuities (flaps or tabs), and the execution of XQT TRWPLT, the auxiliary mode of execution, for obtaining Calcomp or 4060-microfilm plots. A simple but approximate estimate of the total execution time for completing a given job may be determined using:

$$t_{\text{(seconds)}} = \Delta T_1 + N_C \times (N_g \times \Delta T_{2(N_M)}) + N_P \times \Delta T_3 \quad (7.2.01)$$

$$N_M = N_S \times \sum_{n=1}^{\text{No. Surfaces}} N_{e,n} \quad (7.2.02)$$

where: $\Delta T_1 = 20$	Time required (seconds) to load the program.
$\Delta T_2 =$	Time required (seconds) to obtain a single vortex-lattice solution (see Figure 7.03).
$\Delta T_3 = 10$	Time required (seconds per plot) for the XQT TRWPLT execution
$N_C =$	Number of cases to complete job.
$N_g \left\{ \begin{array}{l} = 1 \\ = 2 \end{array} \right.$	$\left. \begin{array}{l} \text{No ground effects.} \\ \text{With ground effects.} \end{array} \right.$
$N_P =$	Number of plots.
$N_M =$	Number of elements in the vortex-lattice matrix.
$N_S \left\{ \begin{array}{l} = 1 \\ = 0.5 \end{array} \right.$	$\left. \begin{array}{l} \text{Unsymmetric loading.} \\ \text{Symmetric loading} \end{array} \right.$
$N_{e,n}$	Number of elemental panels for the nth, surface

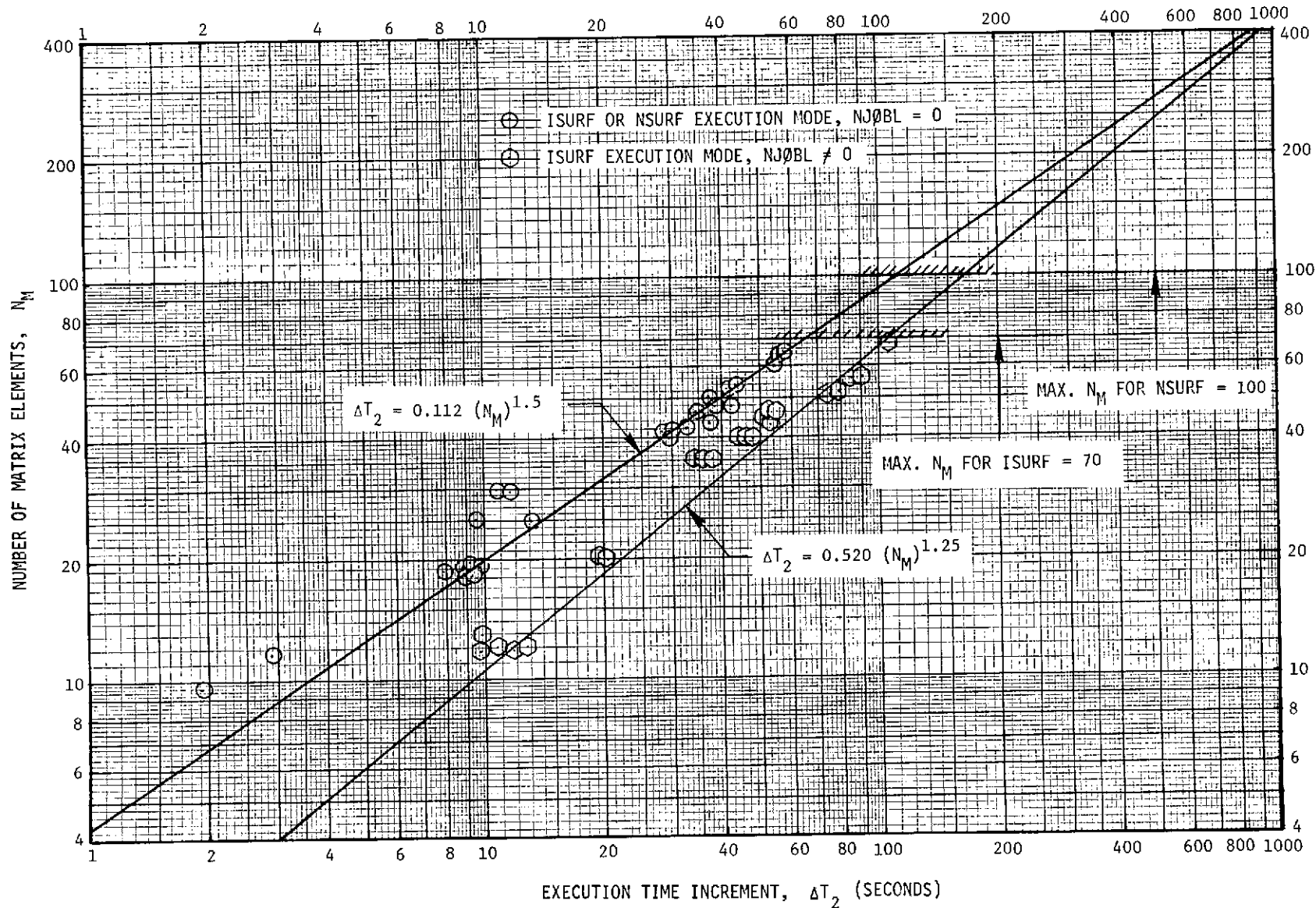


FIGURE 7.03 - EXECUTION TIME INCREMENT ΔT_2

7.3 Program Organization

The present version of the "TRW Vortex-Lattice Analysis Program #HA010B (N.SURFACE)" that is described in this report constitutes an expanded and modified version that was derived from two older prototype programs., i.e., "TRW's Single Surface Vortex-Lattice Analysis Program #HA009A/B (ISURF)," and "TRW's Multiple Surface Vortex-Lattice Analysis Program #HA010A (NSURF)." The prototype programs were developed specifically for analyzing single-surface and multiple-surface configurations respectively. The present version (HA010B) incorporates the same analytical procedures and basically the same source-program code found in the prototype programs and differs only in the input and output format that is used. In addition, the "TRW Generalized Plot Program TRWPLT (Reference 35)" is included in the PCF tape for providing Calcomp and 4060-microfilm plot-output. Five separate modes of execution are permitted (see Section 7.1) that include: (1) two main execution modes for solving lifting-surface problems by the vortex-lattice method, (2) two test execution modes for determining the accuracy of the matrix inversion procedures, and (3) one auxiliary execution mode that is used for obtaining Calcomp or 4060-microfilm output. The source program (absolute and symbolics) in the program PCF tape is arranged in the following form:

<u>1st. File</u>	<u>2nd. File</u>	<u>3rd File</u>
(No Plots)	(With Plots)	(Backup)
NSURF	NSURF	NSURF
ISURF	ISURF	ISURF
NSURFT	NSURFT	NSURFT
ISURFT	ISURFT	ISURFT
-	TRWPLT	TRWPLT

The source program for each of the main execution modes (XQT NSURF or SQT ISURF) is organized in the following manner: one main (driver) routine, one block data (initial values) subroutine, one-vortex-lattice-geometry calculation subroutine, one vortex-lattice-solution calculation subroutine, and a number of special purpose calculation subroutines. The functions performed by each category are as follows:

7.3 Program Organization (Continued)

Main (Driver) Routine

- 1) Read input data (Unit 5) for all cases to be executed and store the input data in a drum file (Unit 1) for later use and initiate calculations by calling the block data subroutine.
- 2) Read data for the first case (or subsequent cases) from the data drum file (Unit 1).
- 3) Call the vortex-lattice-geometry calculation subroutine for determining all the geometric parameters that will be needed.
- 4) Setup angle of attack loop and multiple-surface loop (if applicable) and proceed to obtain the vortex-lattice-solutions by calling the vortex-lattice-solution calculation subroutine.
- 5) Finalize the first case (or subsequent case) by printing the execution elapsed time and the number of plot files created. Go back to #2 and start the execution of the next case.

Block Data (Initial Values) Subroutine

- 1) Stores data for the initial values (built-in Tables, see Section 4).

Vortex-Lattice-Geometry Calculation Subroutine

- 1) Calculate the geometry of the vortex-lattice for all the lifting surfaces that are defined in the input.
- 2) Calculate the geometric parameters that define each lifting surface, e.g., the lifting surface reference dimensions.
- 3) Output the calculated geometry for each lifting surface.
- 4) Output on tape (Unit 8) the geometry for each lifting-surface using the special format required for the plotting option (XQT TRWPLT).

7.3 Program Organization (Continued)

Vortex-Lattice-Solution Calculation Subroutine

- 1) Calculate the influence coefficient matrix.
- 2) Invert the influence coefficient matrix and determine the vorticity or circulation for all the vortex-filaments of the lifting surfaces that are considered simultaneously.
- 3) Calculate the airload distribution on each lifting surface and perform all the required summations.
- 4) Calculate the section-airload coefficients and output same as printed output and on tape (Unit 8) if applicable.
- 5) Finalize the calculations by printing the spatially-integrated airloads for each lifting surface and the net airload summations.

Special Purpose Calculation Subroutines

- 1) Perform calculations directed towards a limited objective.

The program logic flow diagrams for the main (driver) routine and the principal subroutines of the program are presented in Figures 7.04 through 7.09 following Section 7.5. A description of the functions performed by each individual routine are presented in Sections 7.4 and 7.5.

7.4 Program Routines for XQT NSURF

- 1) MAIN ROUTINE (A01) (237 FORTRAN Statements)

This is the main routine or driver routine for the XQT NSURF execution mode of the program that performs solutions for multiple-lifting-surfaces problems by the vortex-lattice method.

- 2) SUBROUTINE BLKDAT (A02) (55 FORTRAN Statements)

This is a block data routine where the initial values (built-in tables) of selected input variables are stored (see Section 4.0).

- 3) SUBROUTINE LØFT (A03) (864 FORTRAN Statements)

Subroutine LØFT constitutes the vortex-lattice geometry calculation routine. In this routine all the geometry calculations are carried out. It includes the setup of the vortex-lattice field point coordinates, unit vectors, areas, etc., and the calculation of the reference dimensions

7,4 Program Routines for XQT NSURF (Continued)

for each lifting surface that is input. Also, as a special option (NFLG(19) \neq 0), the geometry of the vortex-lattice is output on tape or any specified internal unit which is used as the input data-tape in the execution of XQT TRWPLT for generating Calcomp/4060-microfilm plot-output.

4) SUBROUTINE LIFTX (A04) (1,178 FORTRAN Statements)

This is the vortex-lattice-solution calculation subroutine for multiple-surface analysis (XQT NSURF). In this subroutine all the calculations directed towards obtaining a solution for a given vortex-lattice originate, that include: calculate influence coefficients, calculate the circulation strength of the vortex-filaments, etc. In addition, the section airload coefficients, lift distribution, and spatially-integrated sums of airload force and moments are performed.

5) SUBROUTINE ABORTJ (A05) (92 FORTRAN Statements)

All diagnostic and job termination output originates in this subroutine. Tests are performed in this routine for selected key variables during the execution and if unallowable errors are incurred the job execution is aborted.

6) SUBROUTINE CORDF (A06) (60 FORTRAN Statements)

This routine calculates the planform dimensions at a wing station for a lifting surface, e.g., Y , X_{LE} , X_{TE} , C , C_f , C_{tab} , etc., as a function of a function of a dummy argument W .

7) SUBROUTINE CAMBER (A07) (53 FORTRAN Statements)

Subroutine CAMBER determines the normal coordinate of the median camber line of an airfoil, i.e., Z_a/C as a function of X_a/C .

8) SUBROUTINE FLAPS (A08) (169 FORTRAN Statements)

This routine together with Subroutine FLAPI is used to update the coordinate and unit normal vector (no deflection) of a field point on the surface of a lifting-surface due to flap and/or trim-tab deflection.

9) SUBROUTINE FLAPI (A09) (28 FORTRAN Statements)

See Subroutine FLAPS (#8).

7.4 Program Routines for XQT NSURF (Continued)

10) SUBROUTINE REFLEC (A10) (53 FORTRAN Statements)

Subroutine REFLEC calculates the coordinates of a mirror image of a field point using the ground plane as the mirror plane. It is used in the ground effect analysis for determining the coordinates of the image vortex-lattice.

11) SUBROUTINE ISOMET (A11) (27 FORTRAN Statements)

It transforms the coordinates of a given field point $P(X,Y,Z)$ to a new coordinate system $P(X',Y',Z')$ that is used to obtain an isometric projection of the vortex-lattice.

12) SUBROUTINE ROTATE (A12) (45 FORTRAN Statements)

It transforms the coordinates of a given field point $P(X,Y,Z)$ to a new coordinate system $P(X',Y',Z')$ involving a prescribed rotation and translation.

13) SUBROUTINE VORTEX (A13) (189 FORTRAN Statements)

Subroutine VORTEX calculates the induced velocity or influence coefficient $\vec{\psi}$ for a field point $P(X,Y,Z)$ due to a skew-shaped horseshoe vortex filament of circulation strength Γ defined by the field points $B(X,Y,Z)$ and $D(X,Y,Z)$.

14) SUBROUTINE DMATIN (A14) (149 FORTRAN Statements)

Subroutine DMATIN is a double precision, 100 x 100, matrix inversion routine.

15) SUBROUTINE DOTP (A15) (17 FORTRAN Statements)

It calculates the dot-product of two vectors.

16) SUBROUTINE CROSSP (A16) (20 FORTRAN Statements)

It calculates the vector cross-product of two vectors.

17) SUBROUTINE PAGE (A17) (43 FORTRAN Statements)

This subroutine causes a new page to be started and the job title and job execution flags to be printed at the top of the page in the program execution.

7.5 Program Routines for XQT ISURF

18) MAIN ROUTINE (B01) (211 FORTRAN Statements)

Same as #1 (A01) except the solution for a single-lifting-surface is considered exclusively.

19) SUBROUTINE BLKDAT (B02) (55 FORTRAN Statements)

Same as #2 (A02) except the solution for a single-lifting-surface is considered exclusively.

20) SUBROUTINE LOFT (B03) 935 FORTRAN Statements)

Same as #3 (A03) except the solution for a single-lifting-surface is considered exclusively.

21) SUBROUTINE DLIFT (B04) (699 FORTRAN Statements)

Same as #4 (A04) except the solution for a single-lifting-surface is considered exclusively.

22) SUBROUTINE INTERP (B05) (406 FORTRAN Statements)

Subroutine INTERP is used to calculate coefficients from two exact vortex-lattice solutions at different angles of attack. These coefficients are used to generate arrays of approximate solutions that are based on the lifting-line theory linearized analysis technique.

23) SUBROUTINE DLINER (B06) (601 FORTRAN Statements)

Subroutine DLINER calculates arrays of approximate solutions using the coefficients determined by INTERP.

24) SUBROUTINE SPANI (B07) (125 FORTRAN Statements)

This routine is used to calculate constant and variable span spacing of the vortex-lattice elemental panels.

25) SUBROUTINE CHORDI (B08) (77 FORTRAN Statements)

Subroutine CHORDI calculates constant or cosine spacing of the vortex-lattice elemental panels in the chordwise direction.

26) SUBROUTINE CHORDT (B09) (44 FORTRAN Statements)

Same as #6 (A06) except the presence of a trim-tab has been omitted.

7.5 Program Routines for XQT ISURF (Continued)

27) SUBROUTINE FLAPS (B10) (93 FORTRAN Statements)

Same as #8 (A08) except the presence of a trim-tab has been omitted.

28) SUBROUTINE VORTEX (B11) (190 FORTRAN Statements)

Equivalent to #13 (A13).

29) SUBROUTINE REFLEC (B12) (50 FORTRAN Statements)

Equivalent to #10 (A10)

30) SUBROUTINE DMATIN (B13) (149 FORTRAN Statements)

This is a double precision, 70 x 70, matrix inversion routine.

31) SUBROUTINE DOTP (B14) (18 FORTRAN Statements)

Equivalent to #15 (A15).

32) SUBROUTINE CROSP (B15) (21 FORTRAN Statements)

Equivalent to #16 (A16).

33) SUBROUTINE ROTATE (B16) (46 FORTRAN Statements)

Equivalent to #12 (A12).

34) SUBROUTINE CURFIT (B17) (103 FORTRAN Statements)

The CURFIT routine calculates the coefficients of cubics that are used by the CURVE subroutine.

35) SUBROUTINE CURVE (B18) (58 FORTRAN Statements)

Using the coefficients of cubics calculated by the CURFIT subroutine, the subroutine CURVE determines the value and the derivative of a given function at selected values of the independent variable. CURVE together with CURFIT constitute a spline point (cubic), continuous derivative, interpolation procedure used in the program.

36) SUBROUTINE PAGE (B19) (40 FORTRAN Statements)

Same as #17 (A17), except, the title and the job execution flag IFLG used in XQT ISURF are output.

7.6 Program Routines for XQT NSURFT and ISURFT

37) MAIN ROUTINE (A18) (76 FORTRAN Statements)

This routine performs a matrix-inversion test by calculating the inverse-matrix and the unit-matrix using the values of a 5 x 5 built-in matrix.

38) MAIN ROUTINE (B20) (76 FORTRAN Statements)

Equivalent to #37 (A18).

7.7 Program-Logic Flow Diagrams

The program-logic flow diagrams for the main (driver) routines and the most important calculation routines that are used in the main execution modes (XQT NSURF and XQT ISURF) are presented in Figures 7.04 through 7.06 (see Pages 7.14 through 7.19).

A) MAIN ROUTINE (A01)

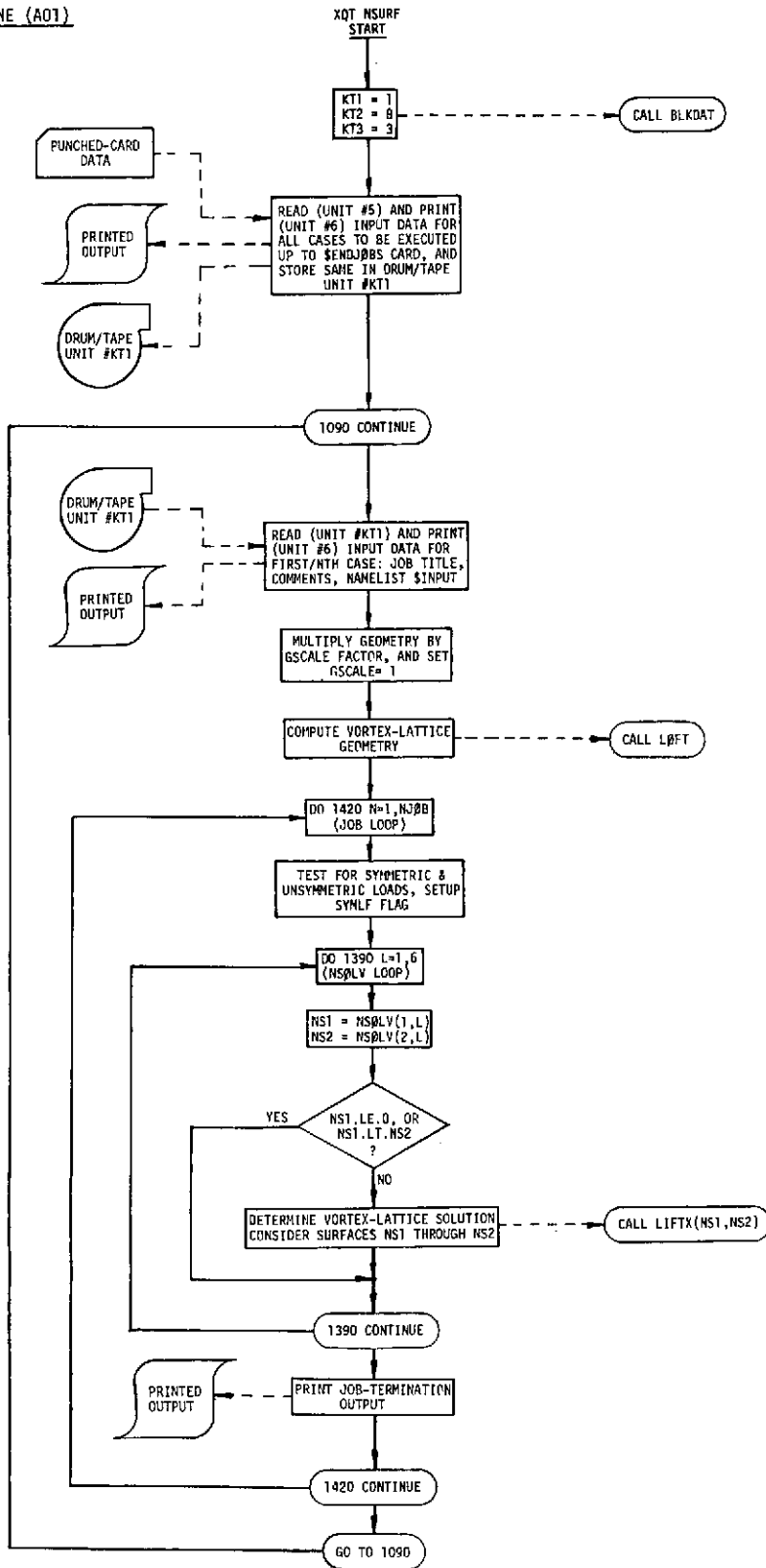
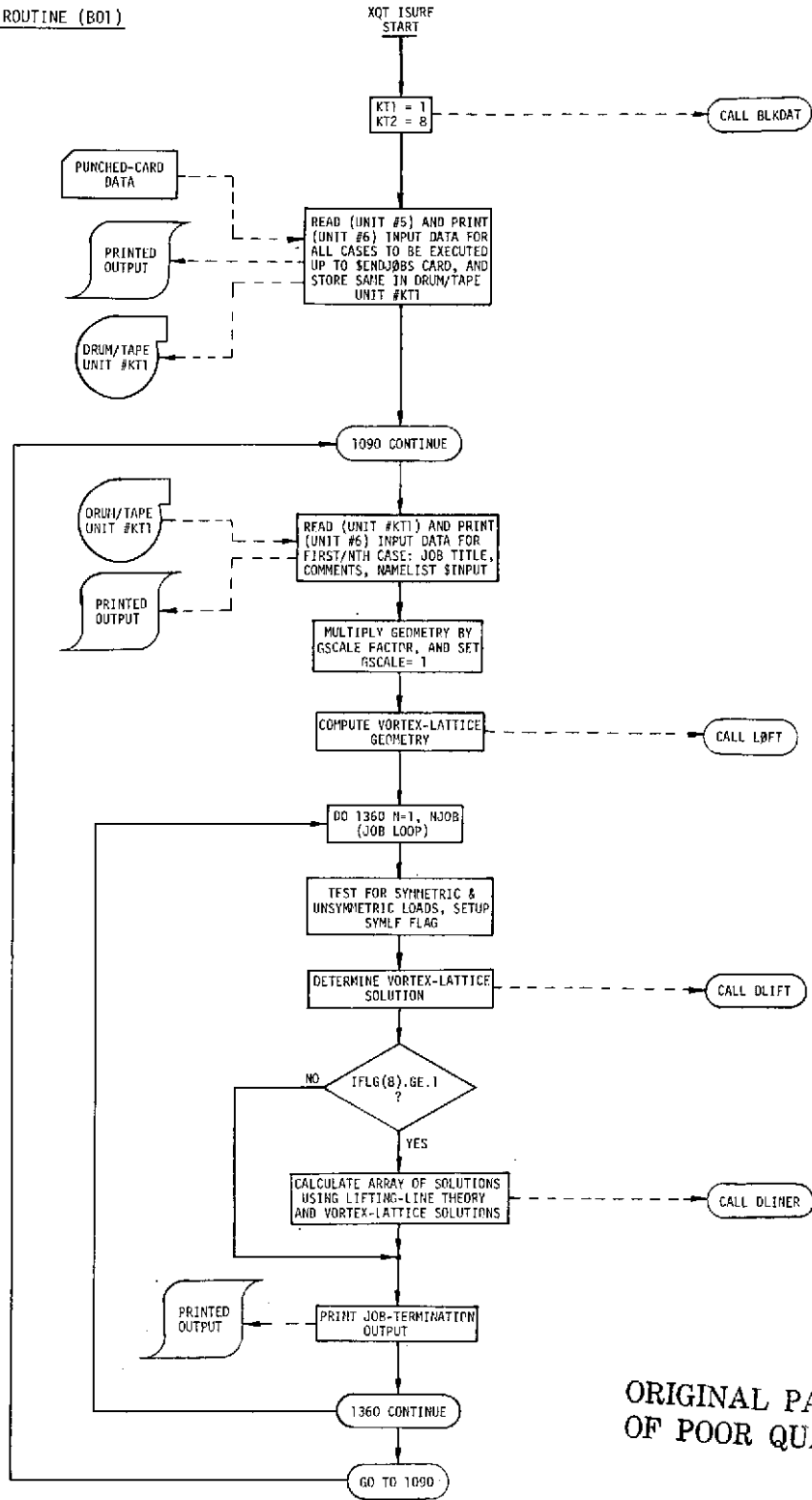


FIGURE 7.04 - LOGIC-FLOW-DIAGRAMS FOR THE MAIN (DRIVER) EXECUTION ROUTINES (PROGRAM HA010B)

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B) MAIN ROUTINE (B01)



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FIGURE 7.04 - LOGIC-FLOW-DIAGRAMS FOR THE MAIN (DRIVER) EXECUTION ROUTINES
(PROGRAM HA070B) [CONTINUED]

A) SUBROUTINE LØFT (A03)

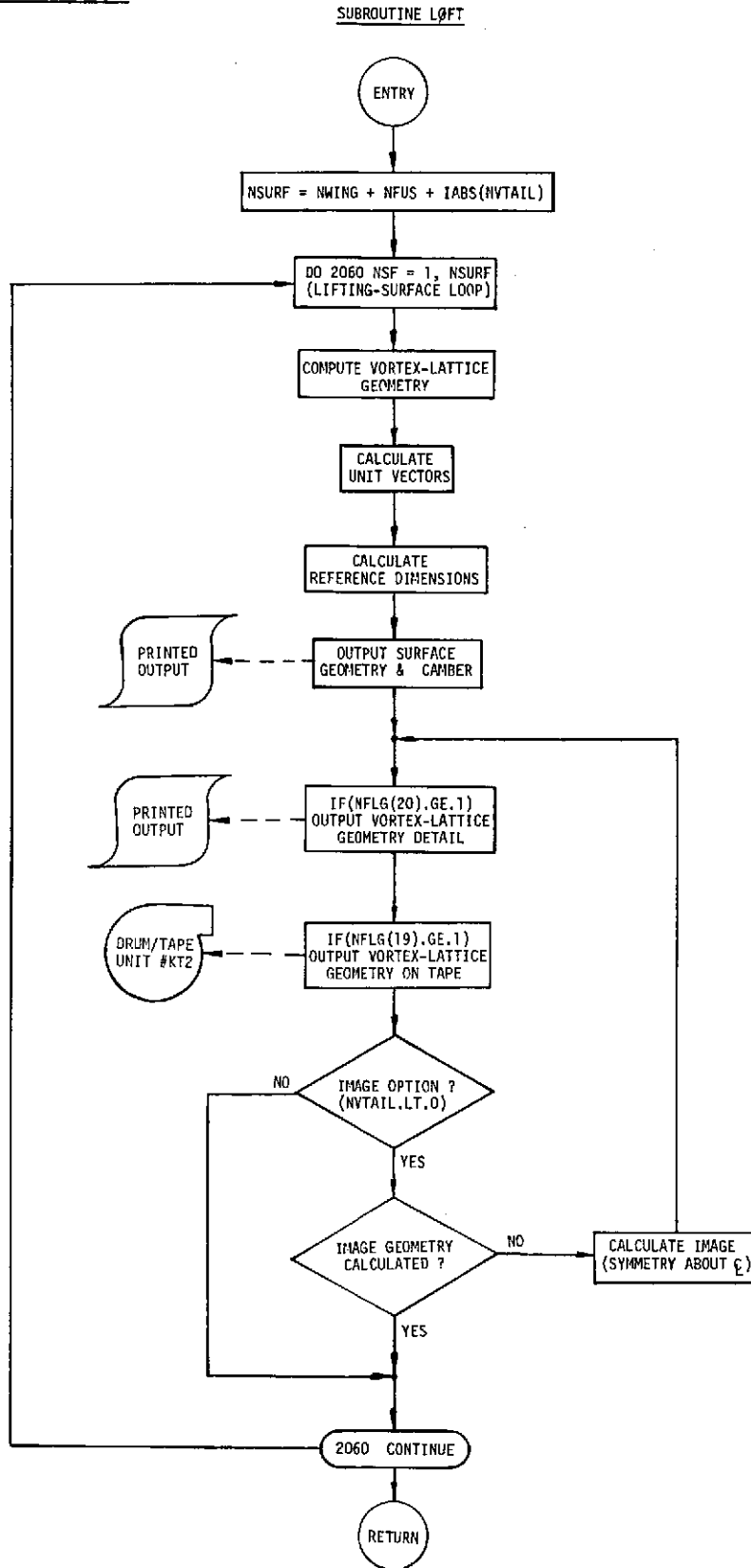


FIGURE 7.05 - LOGIC-FLOW-DIAGRAMS FOR THE VORTEX-LATTICE GEOMETRY CALCULATION ROUTINES (PROGRAM HA010B)

B) SUBROUTINE LOFT (B03)

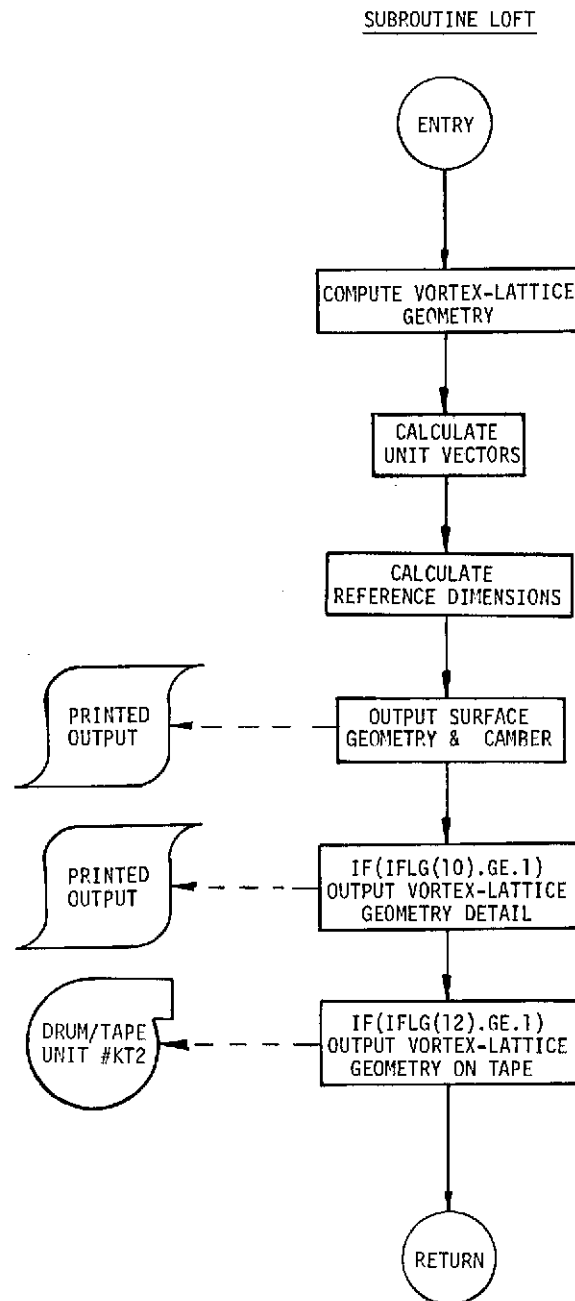
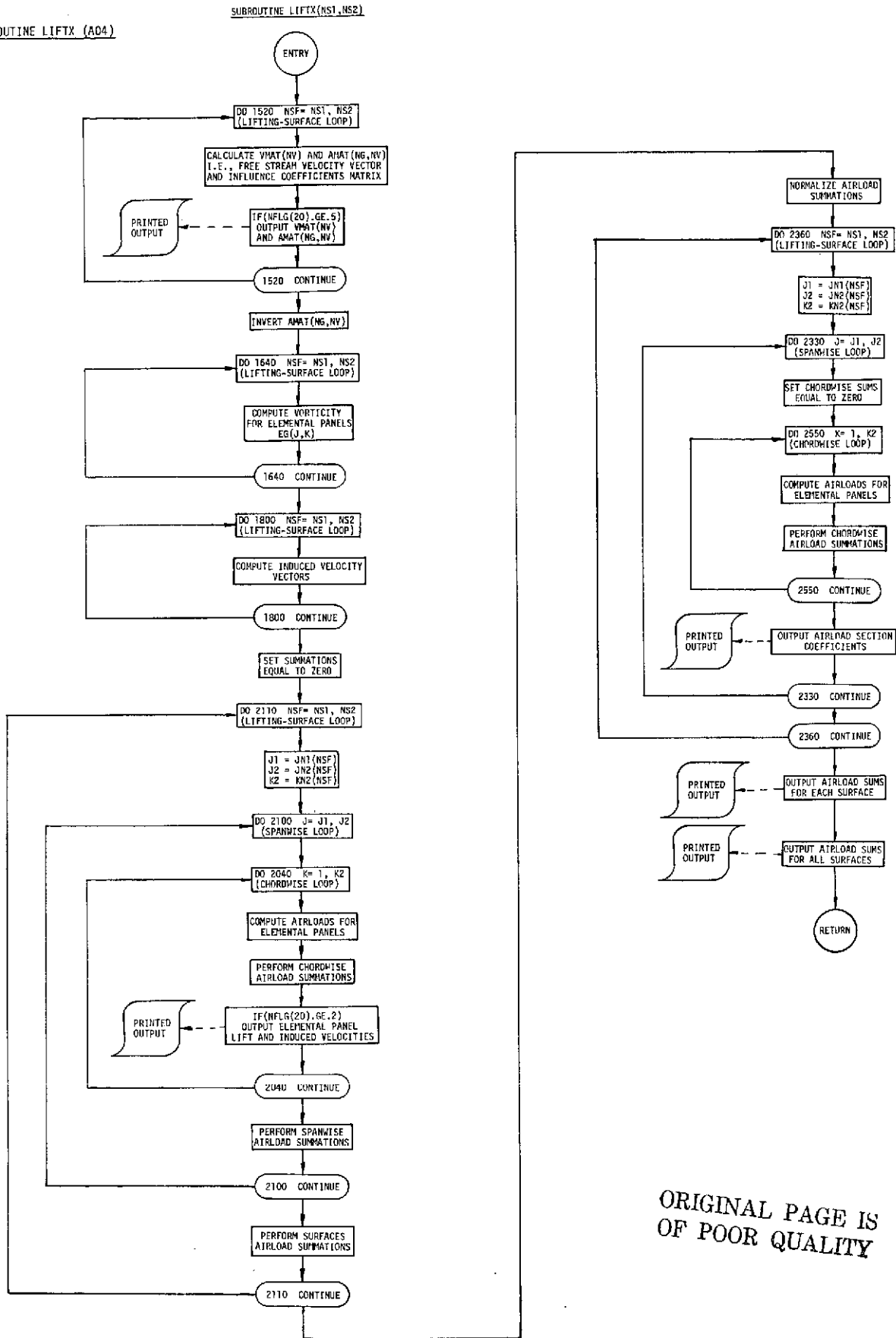


FIGURE 7.05 - LOGIC-FLOW-DIAGRAMS FOR THE VORTEX-LATTICE GEOMETRY CALCULATION ROUTINES (PROGRAM HA010B) [CONTINUED]

4) SUBROUTINE LIFTX (A04)



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FIGURE 7.06 - LOGIC-FLOW-DIAGRAMS FOR THE VORTEX-LATTICE SOLUTION CALCULATION ROUTINES (PROGRAM HAD10B)

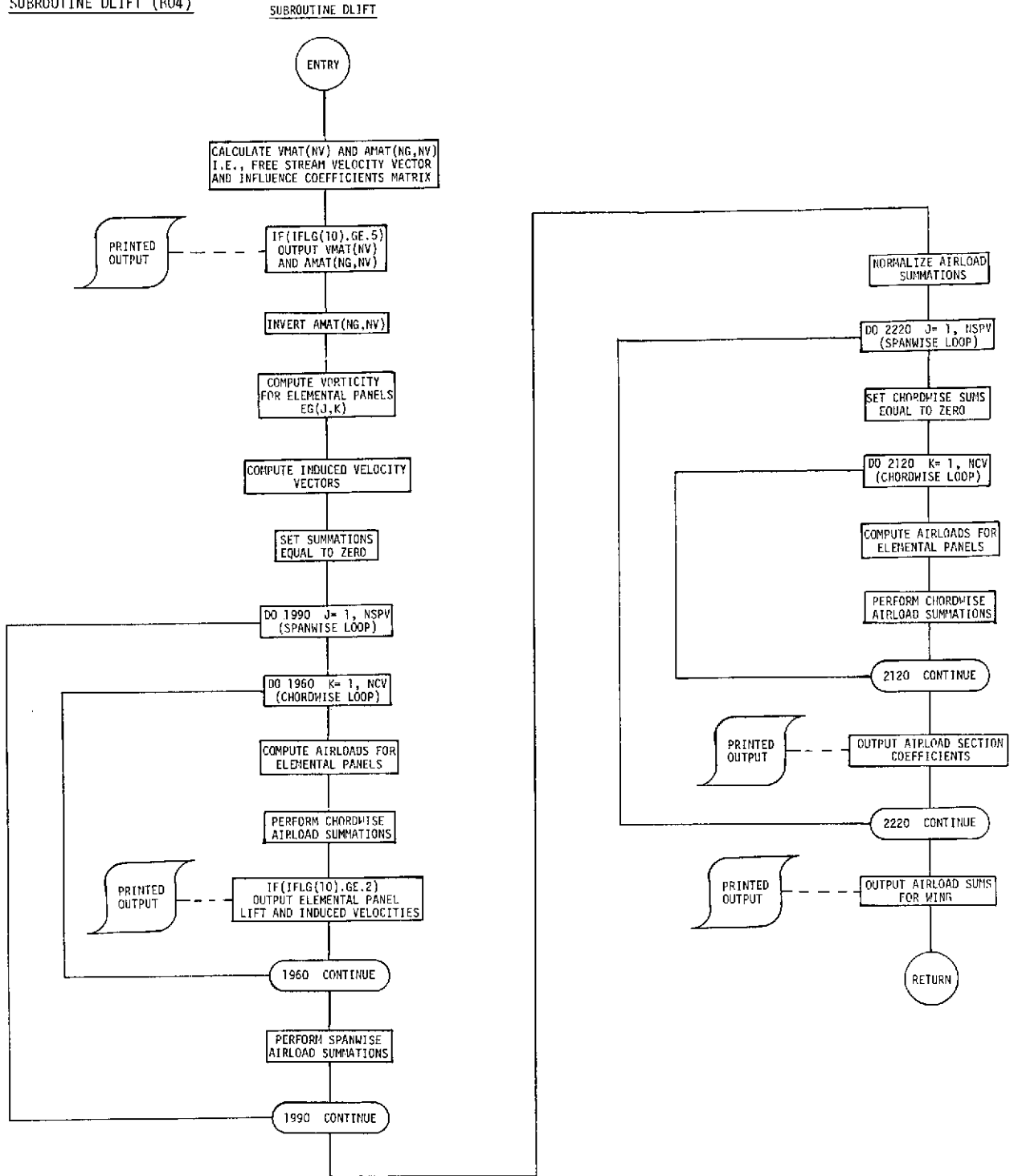


FIGURE 7.06 - LOGIC-FLOW-DIAGRAMS FOR THE VORTEX-LATTICE SOLUTION CALCULATION
ROUTINES (PROGRAM HA010R) [CONTINUED]

8.0 REFERENCES

1. Robinson, A. and J. A. Laurmann, Wing Theory, Cambridge University Press, G. B., 1956, pp. 169-316.
2. Milne-Thompson, L. M., Theoretical Aerodynamics, MacMillan and Company, Ltd., Third Edition 1958, Chapters 9 through 12.
3. Kuethe, A. M. and J. D. Schetzer, Foundations of Aerodynamics, J. Wiley and Sons, New York, Second Edition 1961, Chapters 5 and 6.
4. Landahl, M. T. and V.J.E. Stark, "Numerical Lifting-Surface Theory- Problems and Progress," AIAA Journal, Vol. 6, N. 11, Nov. 1968, pp. 2049-2060.
5. Kalman, T. P., J. P. Giesing, and W. P. Rodden, "Spanwise Distribution of Induced Drag in Subsonic Flow by the Vortex-Lattice Method," J. Aircraft, V. 7, N. 6, Nov.-Dec. 1970, pp. 574-576.
6. James, R. M., "On the Remarkable Accuracy of the Vortex-Lattice Discretization in Thin Wing Theory," McDonnell Douglas Report No. DAC 67211, Feb. 1969.
7. Weissinger, J., "The Lift Distribution of Swept-Back Wings," NACA Technical Memorandum No. 1120, March 1947, pp. 1-7.
8. Gomez, A. V., "Interim Documentation and Qualification Tests for TRW's Vortex-Lattice Method Computer Program HA009A/B - Subsonic Aerodynamic Analysis of Single Wing Lifting Surfaces of Arbitrary Configurations," TRW Systems Rept. 71.4352.30-6, June 1971.
9. Gomez, A. V., "Interim Documentation and Qualification Tests for TRW's Wake II Digital Computer Program HA001B, Subsonic Aerodynamics Wing Wake Analysis Program," TRW Systems Rept. 70.4352.30-3, May 1970.
10. Dulmovits, J., "A Lifting Surface Method for Calculating Load Distributors and the Aerodynamic Influence Coefficients Matrix for Wings in Subsonic Flow," Grumman Report ADR 01-02-64.1, Aug. 1964.
11. Margason, Richard J., and J. E. Lamar, "Vortex-Lattice Fortran Program for Estimating Subsonic Aerodynamic Characteristics of Complex Planforms," NASA TN D-6142, Feb. 1971.
12. Polhamus, Edward C., "Predictions of Vortex-Lift Characteristics by a Leading-Edge Suction Analogy," J. Aircraft, V. 8, N. 4, April 1971, pp. 193-199.
13. Polhamus, Edward C., "A Concept of the Vortex Lift of Sharp-Edge Delta Wings Based on a Leading-Edge-Suction Analogy," NASA TN D-3767, 1966.

14. Mangler, K. W. and J.H.B. Smith, "A Theory of the Flow Past a Slender Delta Wing with Leading Edge Separation," Proc. Roy. Soc. A.251, pp. 200-217, 1959.
15. Legendre, R., "Vortex Sheets Rolling-up Along Leading-Edges of Delta Wings," in Progress in Aeronautical Sciences, Vol. 7. D. Kuchemann, et al., ed., Pergamon Press, New York, 1966.
16. Smith, J.H.B., "Improved Calculations of the Leading-Edge Separation from Slender, Thin, Delta Wings," Proc. Roy. Soc. A. 306, pp. 67-90, 1968.
17. "ANC-1(1), Spanwise Air-Load Distribution," Army-Navy-Commerce Committee on Aircraft Requirements, U. S. Govt. Printing Office, 1938.
18. Jacobs, E. N, and R. V. Rhode, "Airfoil Section Characteristics as Applied to the Prediction of Air Forces and Their Distribution on Wings.," NACA Report No. 631, 1938.
19. Wagner, S., "Some Recent Developments in Subsonic Lifting-Surface Theory, Discussion and Editor's Comments," in Analytical Methods in Aircraft Aerodynamics, NASA SP-228, Oct. 1969, pp. 24-35.
20. Silverstein, A. and S. Katzoff, "Design Charts for Predicting Downwash Angles and Wake Characteristics Behind Plain and Flapped Wings," NACA Report No. 648, 1939.
21. Schrenk, O., "A Simple Approximation Method for Obtaining the Spanwise Lift Distribution," NACA Technical Memorandum No. 948, 1940.
22. "Civil Aeronautics Manual 04," Revised 1 July 1944, U. S. Department of Commerce.
23. Hall, Charles F., "Lift Drag, and Pitching Moment of Low-Aspect-Ratio Wings at Subsonic and Supersonic Speeds," NACA RM A53A30, April 1953.
24. Anderson, Adrien E., "Chordwise and Spanwise Loadings Measured at Low Speed on Large Triangular Wings," NACA RM No. A9B17, April 1949.
25. Etkin, B., Dynamics of Flight, Stability and Control, John Wiley & Sons, Inc., New York, 1959 Edition, Appendix B.
26. Wetmore, J. W. and L. I. Turner, Jr., "Determination of Ground Effect from Tests of a Glider in Towed Flight," NACA Report No. 695.
27. Carter, W. A., "Effects of Ground Proximity on the Longitudinal Aerodynamic Characteristics of an Upswept Aspect-Ratio-10 Wing," NASA TN D-5662, Feb. 1970.
28. Fox, Jr., Charles H., "Prediction of Lift and Drag for Slender Sharp-Edge Delta Wings in Ground Proximity," NASA TN D-4891, Jan. 1969.

29. DeYoung, J. and C. W. Harper, "Theoretical Symmetric Span Loading at Subsonic Speeds for Wings Having Arbitrary Planform," NACA Report No. 921, 1948.
30. Campbell, G. S., "A Finite-Step Method for the Calculation of Span Loadings of Unusual Planforms," NACA RM L50L13, July 1951.
31. Riley, D. R., "Wind-Tunnel Investigation and Analysis of the Effects of End Plates on the Aerodynamic Characteristics of an Unswept Wing," NACA TN 2449, 1951.
32. Scallion, W. I. and Cannon, M. D., "The Low-Speed Static Longitudinal and Lateral Characteristics of a Delta-Wing Model with Fixed and Free-Floating Canard Surfaces," Technical Memorandum X-120, July 1959, NASA,
33. Baker, P. A., W. G. Schweikhard, and W. R. Young, "Flight Evaluation of Ground Effect on Several Low-Aspect-Ratio Airplanes," NASA TN D-6053, Oct. 1970.
34. "USAF Stability and Control DATCOM," Flight Control Division, USAF Flight Dynamics Laboratory, Rev. Sept. 1970.
35. Isherwood, J. K., "Generalized Plot Program TRWPLT User's Manual," TRW Systems Rept. 11176-H594-RO-00, Aug. 1970.

9.0 SOURCE-PROGRAM LISTING

V MAP NSURF, NSURF	NSU	10	1
SEG A01-A02-A03-A04-A05-A06-A07-A08-A09-A10-A11-A12-A13-A14-	NSU	20	2
A15-A16-A17	NSU	30	3
V MAP ISURF, ISURF	ISU	10	4
SEG B01-B02-B03-B04-B05-B06-B07-B08-B09-B10-B11-B12-B13-B14-	ISU	20	5
B15-B16-B17-B18-B19	ISU	30	6
V MAP NSURFT, NSURFT	NSUT	10	7
SEG A10-A14-A17	NSUT	20	8
V MAP ISURFT, ISURFT	ISUT	10	9
SEG B20-B13-B19	ISUT	20	10
V FOR A01, A01	A01	10	11
C	A01	20	12
C	A01	30	13
C	A01	40	14
C	A01	50	15
C	A01	60	16
C	A01	70	17
C	A01	80	18
C	A01	90	19
C	A01	100	20
C	A01	110	21
C	A01	120	22
C	A01	130	23
C	A01	140	24
C	A01	150	25
C	A01	160	26
C	A01	170	27
C	A01	180	28
C	A01	190	29
C	A01	200	30
C	A01	210	31
C	A01	220	32
C	A01	230	33
C	A01	240	34
C	A01	250	35
C	A01	260	36
C	A01	270	37
C	A01	280	38
C	A01	290	39
C	A01	300	40
C	A01	310	41
C	A01	320	42
C	A01	330	43
C	A01	340	44
C	A01	350	45
C	A01	360	46
C	A01	370	47
C	A01	380	48
C	A01	390	49
C	A01	400	50
C	A01	410	51
C	A01	420	52
C	A01	430	53
C	A01	440	54
C	A01	450	55
C	A01	460	56
C	A01	470	57
C	A01	480	58
C	A01	490	59
C	A01	500	60
C	A01	510	61
C	A01	520	62
C	A01	530	63
C	A01	540	64
C	A01	550	65
C	A01	560	66
C	A01	570	67
C	A01	580	68
C	A01	590	69
C	A01	600	70
C	A01	610	71
C	A01	620	72
C	A01	630	73
C	A01	640	74
C	A01	650	75
C	A01	660	76
C	A01	670	77
C	A01	680	78
C	A01	690	79
C	A01	700	80
C	A01	710	81
C	A01	720	82
C	A01	730	83
C	A01	740	84
C	A01	750	85
C	A01	760	86
C	A01	770	87
C	A01	780	88
C	A01	790	89
C	A01	800	90
C	A01	810	91

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WRITE (KOUT,1050)	A01 820	92
WRITE (KJUT,1040)	A01 830	93
LIN=15	A01 840	94
1060 READ (KIN,1000){STORE(I),I=1,14}	A01 850	95
WRITE (KT1,1000){STORE(I),I=1,14}	A01 860	96
IF (L(LIN)-LIN) 1070,1080,1080	A01 870	97
1070 WRITE (KOUT,1020)	A01 880	98
LIN=3	A01 890	99
1080 LIN=LIN+1	A01 900	100
WRITE (KJUT,1030){STORE(I),I=1,14}	A01 910	101
C	A01 920	102
IF (STORE(1),NE.TEST) GO TO 1060	A01 930	103
END FILE KT1	A01 940	104
REWIND KT1	A01 950	105
WRITE (KJUT,1040)	A01 960	106
C	A01 970	107
NCOMT=-1	A01 980	108
NCALCP=-1	A01 990	109
ISUM=0.0	A01 1000	110
GSCALE=1.0	A01 1010	111
C	A01 1020	112
CALL RESET	A01 1030	113
C	A01 1040	114
C	A01 1050	115
1090 READ (KT1,1000){TITLE(I),I=1,14}	A01 1060	116
IF (TITLE(1),EQ.TEST) CALL FXTT	A01 1070	117
IF (NCOMT) 1100,1100,1110	A01 1080	118
1100 READ (KT1,1000){CCMMTS(I),I=1,42}	A01 1090	119
1110 NCOMT=1	A01 1100	120
READ (KT1,INPUT)	A01 1110	121
C	A01 1120	122
IF (NCALCP) 1120,1120,1140	A01 1130	123
1120 NCALCP=1	A01 1140	124
1130 REWIND KT2	A01 1150	125
1140 CONTINUE	A01 1160	126
C	A01 1170	127
NSURF= NWING +NFLS +IARS(INVTAI)	A01 1180	128
NSYM= NWING + NFUS	A01 1190	129
DO 1160 NSF=1,NSLRF	A01 1200	130
SYMLF(NSF) = 0.0	A01 1210	131
IF (NSYM-NSF) 1150,1160,1160	A01 1220	132
1150 SYMLF(NSF) = 1.0	A01 1230	133
1160 CONTINUE	A01 1240	134
C	A01 1250	135
C	A01 1260	136
ALFAD= 0.0	A01 1270	137
ZHO = 10000.0	A01 1280	138
CMAK = 0.0	A01 1290	139
C	A01 1300	140
XCG = GSCALE*XCG	A01 1310	141
YCG = GSCALE*YCG	A01 1320	142
ZCG = GSCALE*ZCG	A01 1330	143
REFC = GSCALE*REFC	A01 1340	144
REFB = GSCALE*REFB	A01 1350	145
REFS = GSCALE*REFS	A01 1360	146
C	A01 1370	147
IF (WSMOTH-1.0) 1180,1180,1170	A01 1380	148
1170 WSMOTH= WSMOTH*GSCALE	A01 1390	149
1180 CONTINUE	A01 1400	150
C	A01 1410	151
DO 1240 N=1,5	A01 1420	152
IF (WFLAP1(N)-1.0) 1200,1200,1190	A01 1430	153
1190 WFLAP1(N) = WFLAP1(N)*GSCALE	A01 1440	154
1200 IF (WFLAP2(N)-1.0) 1220,1220,1210	A01 1450	155
1210 WFLAP2(N) = WFLAP2(N)*GSCALE	A01 1460	156
1220 IF (WFLAP3(N)-1.0) 1240,1240,1230	A01 1470	157
1230 WFLAP3(N) = WFLAP3(N)*GSCALE	A01 1480	158
1240 CONTINUE	A01 1490	159
C	A01 1500	160
JX= NSS(NSURF)	A01 1510	161
DO 1270 K=1,10	A01 1520	162
DO 1260 J=1,JX	A01 1530	163
IF (IFLG(16)) 1250,1260,1250	A01 1540	164
1250 ZOC(K,J) = ZOC(K,J)/C(IJ)	A01 1550	165
1260 CONTINUE	A01 1560	166
1270 CONTINUE	A01 1570	167
C	A01 1580	168
DO 1310 J=1,30	A01 1590	169
X(J) = X(J)*GSCALE	A01 1600	170
Y(J) = Y(J)*GSCALE	A01 1610	171
Z(J) = Z(J)*GSCALE	A01 1620	172
C(J) = C(J)*GSCALE	A01 1630	173
IF (FLAPC(J)-1.0) 1290,1290,1280	A01 1640	174
1280 FLAPC(J) = FLAPC(J)*GSCALE	A01 1650	175
1290 IF (TARC(J)-1.0) 1310,1310,1300	A01 1660	176
1300 TARC(J) = TARC(J)*GSCALE	A01 1670	177
1310 CONTINUE	A01 1680	178
C	A01 1690	179
GSCALE= 1.0	A01 1700	180
C	A01 1710	181
C	A01 1720	182
CALL PAGE	A01 1730	183
WRITE (KJUT,INPUT)	A01 1740	184
C	A01 1750	185
C	A01 1760	186
C	A01 1770	187
CALL LOFT	A01 1780	188
C	A01 1790	189
C	A01 1800	190
C	A01 1810	191
DO 1420 N=1,NJOB	A01 1820	192
ALFAD= ALFA(N)	A01 1830	193
HEIGT= HEIGT(N)	A01 1840	194
ALFAD= ALFAD	A01 1850	195
ZHO = HEIGT	A01 1860	196
CMAK = 0.0	A01 1870	197

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EHECKI11= 1.0
IF (MACHN(N)-0.95) 1320,1320,1330
1320 CMAK = MACHN(N)
C
CALL ABORTJ(5,CMAK,N)
C
EHECKI1)= SQRT(1.0-CMAK**2)
1330 CONTINUE
C
DO 1390 L=1,6
NS1= NSOLV(1,L)
NS2= NSOLV(2,L)
IF (NS2) 1390,1390,1340
1340 CONTINUE
C
TEST = 0.0
DO 1350 M=NS1,NS2
SYMLF(M)= 0.0
1350 TEST= TEST + ABS( AILDJ(1,M) - AILDJ(2,M) ) -0.01
IF (TEST) 1380,1380,1360
1360 CONTINUE
DO 1370 M=NS1,NS2
1370 SYMLF(M)= 1.0
1380 CONTINUE
C
CALL LIFTX(ALFAD,HEIGT,SYMLF,NS1,NS2)
C
1390 CONTINUE
C
CALL TIME(IMS)
IS= IMS/1000
ISJB= IS-ISUM
ISUM= IS
C
LIN= LIN+6
IF (LINX-LIN) 1400,1410,1410
1400 CALL PAGE
1410 WRITE (KOUT,1010115JB,IS,KFILE)
LIN= LIN + LINX
C
1420 CONTINUE
C
GO TO 1090
C
END

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A01 2370

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V FOR A02,A02
C
SUBROUTINE BLKDAT
C
* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72
* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
COMMON/DATA00/ TITLE(14), ALFAD, ZMO, CMAK
C
COMMON/DATA01/ KIN, KOUT, KTL, KT2, KT3, KREC, KFILE, LIN, LINK
1 ,RAD, PIE, CUTOF1, CUTOF2, DELALF, LFLAP, LDRAG, COLDCP
2 ,IFLG(20), EHECK(15)
C
COMMON/DATA02/ NWING, NFUS, NVTAIL, NSS(5), NSSO(5), NCS(5)
1 ,X(30), Y(30), Z(30), E(30), C(30), XDCR(30), FLAPC(30),TABC(30)
2 ,WSMOTH, FWE(30), ELE(30), ETE(30), EHE(30), EHEE(30)
3 ,XCC(10,5), ZCC(10,30)
C
COMMON/DATA03/FLAPDJ(5),TABDJ(5),AILDJ(2,5),DELTF1(5),DELTF2(5)
1 ,WFF1(5), WFF2(5), WFF3(5), WFF4(5), WFF5(5)
2 ,WFLAP1(5), WFLAP2(5), WFLAP3(5)
C
COMMON/DATA04/ WINGD(5,16), JN1(5), JN2(5), KN2(5), SYMGF(5),NSURF
1 ,EW(60,10), EY(60,10), EZ(60,10), ES(60,10), EG(60,10)
2 ,EN(60,10,6), EV(60,10,6), VVINDX(60,10,3)
C
COMMON/DATA05/XCG,YCG,ZCG,REFS,REFC,REFB
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
DATA KIN/5/, KOUT/6/, KTL/1/, KT2/8/, KT3/3/, KREC/0/, KFILE/0/
1,LIN/0/, LINX/56/, RAD/57.2958/, PIE/3.14159/, CUTOF1/0.0001/
2,CUTOF2/0.0029/, DELALF/1.0/, LFLAP/0/, LDRAG/0/, COLDCP/0.75/
3,IFLG/10,0,0,0,0, 4,0,0,0,0, 5*0, 0,0,1,0,4/,EHECK/15*0.0/
C
DATA NWING/1/,NFLS/0/,NVTAIL/0/, NSS/2,4*0/,NSSO/1,4*0/,NCS/2,4*0/
1,X/30*0.0/,Y/0.0,1000,0,28*0.0/,Z/30*0.0/,E/30*0.0/,C/100.0,100.0
2,28*0.0/,XDCR/30*0.25/,FLAPC/30*0.25/,TABC/30*0.125/
3,WSMOTH/0.10/, XCC/0,0,1,0,48*0.0/,ZCC/300*0.0/
C
DATA FLAPDJ/5*0.0/,TABDJ/5*0.0/,AILDJ/10*0.0/
DATA WFLAP1/5*0.0/,WFLAP2/5*0.60/,WFLAP3/5*1.00/
C
DATA XCG/0.0/,YCG/0.0/,ZCG/0.0/,REFS/1000.0/,REFC/100.0/
1 ,REFB/100.0/
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
RETURN
C
XXXXXX

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A02 10
A02 20
A02 30
A02 40
A02 50
A02 60
A02 70
A02 80
A02 90
A02 100
A02 110
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C          A02 540          301
          END          A02 550          302

V FOR A03,A03          A03 10          303
C          A03 20          304
          SUBROUTINE LOFT          A03 30          305
C          A03 40          306
          * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A03 50          307
          * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A03 60          308
C          A03 70          309
          XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A03 80          310
C          A03 90          311
          DIMENSION COS1(3),COS2(3),COS3(3)          A03 100          312
          DIMENSION DUMYF(10)          A03 110          313
C          A03 120          314
          A03 130          315
          COMMON/DATA01/ KIN, KOUT, KT1, KT2, KT3, KREC, KFILE, LIN, LINK          A03 140          316
          1 ,RAD, PIE, CUTOF1, CUTOF2, DELALF, LFLAP, LORAG, COLOCP          A03 150          317
          2 ,IFLG(20), EXECK(15)          A03 160          318
C          A03 170          319
          COMMON/DATA02/ NHING, NFUS, NVTAIL, NSS(5), NSS0(5), NCS(5)          A03 180          320
          1 ,X(30), Y(30), Z(30), E(30), C(30), XOCR(30), FLAPC(30),TABC(30)          A03 190          321
          2 ,MSMTH, EWE(30), ELE(30), ETE(30), EHE(30), EHEE(30)          A03 200          322
          3 ,XOC(10,5), ZOC(10,30)          A03 210          323
          COMMON/DATA22/IMAGF(5),JSINGP(5)          A03 220          324
C          A03 230          325
          COMMON/DATA03/FLAPD(5),TABOJ(5),ALD(2,5),DELTFL(5),DELTFL2(5)          A03 240          326
          1 ,WFF1(5), WFF12(5), WFF2(5), WFF22(5), WFF3(5)          A03 250          327
          2 ,WFLAP1(5), WFLAP2(5), WFLAP3(5)          A03 260          328
C          A03 270          329
          COMMON/DATA04/ WINGD(5,16), JN1(5), JN2(5), KN2(5), SYMGF(5),NSURF          A03 280          330
          1 ,EW(60,10), FY(60,10), EC(60,10), ES(60,10), EG(60,10)          A03 290          331
          2 ,EN(60,10,6), EV(60,10,6), VVINDX(60,10,3)          A03 300          332
C          A03 310          333
          COMMON/DATA05/XCG,YCG,ZCG,REFS,REFC,REFB          A03 320          334
C          A03 330          335
          XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A03 340          336
C          A03 350          337
          1000 FORMAT(1X,/,1X)          A03 360          338
C          A03 370          339
          1010 FORMAT(50X,19HLIFTING SURFACE NO=,12,/,50X,211H*1,/,/,1X,          A03 380          340
          1 60H SPAN ROOT TIP ROOT TIP APEA ,          A03 390          341
          2 59H ASPECT MEAN MGC YBAR XBAR ZBAR,/,          A03 400          342
          361H CHORD CHORD TWIST TWIST ,          A03 410          343
          4 60H RATIO CHORD (MGC) (MGC) (MGC),/          A03 420          344
          5/,1X,3F10.3,2F10.4,F10.2,F10.4,5F10.3,/,/,1X,          A03 430          345
          6 60H FLAP FLAP FLAP FLAP FAB LAIL ,          A03 440          346
          7 60H RAIL DIMED. SWEEP NO.SPAN NO.CHORD NO.CHORD,/          A03 450          347
          8,61H SPAN1 SPAN2 SPAN3 DEFLEC DEFLEC DEFLEC,          A03 460          348
          9 60H DEFLEC MGC/4 MGC/4 ELEMENTS ELEMENTS DISCONT.,          A03 470          349
          */,1X,9F10.3,17,2110,/,/,34X,          A03 480          350
          1 56HFUS STA WING STA WL STA AREA CHORD SPAN ,/          A03 490          351
          234X,56H X(IG) Y(IG) Z(IG) S(IG) C(IG) B(IG),/          A03 500          352
          331X,6F10.3,/,/,1X)          A03 510          353
C          A03 520          354
          1020 FORMAT(1X)          A03 530          355
C          A03 540          356
          1030 FORMAT(1X,          A03 550          357
          1 60H WS Y Z X(LE) X(C/4) X(T) ,          A03 560          358
          2 60H TWIST DIMED(C/4) SWEEP(C/4) C(WING) C(FLAP) C(TAB) ,          A03 570          359
          3 /,1X)          A03 580          360
          1040 FORMAT( 1X, 12F10.3 )          A03 590          361
C          A03 600          362
          1050 FORMAT(21X,50H XA(1)/C XA(2)/C XA(3)/C XA(4)/C XA(5)/C,          A03 610          363
          1 50H XA(6)/C XA(7)/C XA(8)/C XA(9)/C XA(10)/C,/,21X,          A03 620          364
          2 10F10.4,/,/,1X, 40H X Y Z A(1)/C Z A(2)/C,          A03 630          365
          3 60H ZA(3)/C ZA(4)/C ZA(5)/C ZA(6)/C ZA(7)/C ZA(8)/C,          A03 640          366
          4 20H ZA(9)/C ZA(10)/C,/,1X )          A03 650          367
          1060 FORMAT( 1X,12F10.4 )          A03 660          368
C          A03 670          369
          1070 FORMAT(3X,4HJ K, 40H Y Z WL EW ,          A03 680          370
          1,30H DWL DC DS ,/,1X)          A03 690          371
          1080 FORMAT(1X,213,12(1PE10.3) )          A03 700          372
C          A03 710          373
          1090 FORMAT(3X,1HJ,2X,1HK,5X,2HXV,8X,2HYV,8X,2HZV,8X,3H1XV,7X,3H1YV,7X,          A03 720          374
          * 3H1ZV,7X,2HXN,8X,2HYN,8X,2HZN,8X,3H1XN,7X,3H1YN,7X,3H1ZN,/,1X)          A03 730          375
          1100 FORMAT( 1X, 213, 12(1PE10.3) )          A03 740          376
C          A03 750          377
          1110 FORMAT(5X,1HB,9X,2HCP,8X,2HCT,8X,2HER,8X,2HET,8X,1HS,9X,2HAR,8X,          A03 760          378
          * 2HMC,8X,3HMG,6X,4HYMGC,6X,4HZMGC,/,1X)          A03 770          379
          1120 FORMAT(1X,12F10.3 )          A03 780          380
C          A03 790          381
          1130 FORMAT(1X,/,1X,14H(EDF PLOT FILE,13,1H) )          A03 800          382
C          A03 810          383
          XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A03 820          384
C          A03 830          385
          A03 840          386
          A03 850          387
          A03 860          388
          *** INITIALIZE ***          A03 870          389
C          A03 880          390
          XEROX = 0.0          A03 890          391
          ZERDX = 0.0          A03 900          392
          NHING= NHING + NFUS          A03 910          393
          NSURF= NHING + IABS(NVTAIL)          A03 920          394
          MFLAG= 100          A03 930          395
          IF(NVTAIL.LT.0) MFLAG= NHING +1          A03 940          396
          NFUS = 0          A03 950          397
C          A03 960          398
          CALL ABORTJ(1,XEROX,NSUPF)          A03 970          399
C          A03 980          400
          SUMW = 0.0          A03 990          401
C          A03 990          402
          NX= 30          A03 1000          403
          DD 1190 N=1,NX          A03 1010          403

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	EWE(N)= SUMM	A03 1020	404
	ELE(N)= X(N) - C(N)*XOCR(N)	A03 1030	405
	ETE(N)= ELE(N) + C(N)	A03 1040	406
	CFLAP = FLAPC(N)	A03 1050	407
	CTAB = TABC(N)	A03 1060	408
C		A03 1070	409
	IF (CFLAP-1.0) 1140,1150,1150	A03 1080	410
1140	CFLAP = CFLAP*C(N)	A03 1090	411
1150	IF (CTAB-1.0) 1160,1170,1170	A03 1100	412
1160	CTAB = CTAB*C(N)	A03 1110	413
1170	CONTINUE	A03 1120	414
	EHE(N) = ETE(N) - CFLAP	A03 1130	415
	EHEE(N) = ETE(N) - CTAB	A03 1140	416
	IF (N-NX) 1180,1190,1190	A03 1150	417
1180	N1= N+1	A03 1160	418
1190	SUMM = SUMM + SQRT((Z(N)-Z(N1))**2 + (Y(N)-Y(N1))**2)	A03 1170	419
C		A03 1180	420
	NO = 1	A03 1190	421
	J1= 0	A03 1200	422
	DO 1200 N=1,NSURF	A03 1210	423
	J2 = NSS(N)	A03 1220	424
	CALL ABORTJ(10,J2,J1)	A03 1230	425
	J1= J2	A03 1240	426
	NSS(N)= NO	A03 1250	427
1200	NO = NSS(N) +1	A03 1260	428
	J1 = 1	A03 1270	429
C		A03 1280	430
	CALL ABORTJ(6,XEROX,N)	A03 1290	431
C		A03 1300	432
C		A03 1310	433
C	*** N-SURFACE LOOP ***	A03 1320	434
C		A03 1330	435
	DO 2060 NSF=1,NSURF	A03 1340	436
C		A03 1350	437
C		A03 1360	438
C	** CALCULATE WETTED LENGTH **	A03 1370	439
C		A03 1380	440
	NREPET= 0	A03 1390	441
	IF(NSF,GE,MFLAG) NREPET= 1	A03 1400	442
	NSFM1= NSF - 1	A03 1410	443
	NSF5 = NSF + 5	A03 1420	444
	NSF10= NSF + 10	A03 1430	445
	NSPV = IFLG(NSF)	A03 1440	446
	NCV = IFLG(NSF5)	A03 1450	447
	NCDIS= IFLG(NSF10)	A03 1460	448
	NCVM = NCV - NCDIS	A03 1470	449
	NSPV1= NSPV + 1	A03 1480	450
	NCV1 = NCV + 1	A03 1490	451
	NB = NSS(NSF)	A03 1500	452
	NO = NSS(NSF)	A03 1510	453
	NK = NCS(NSF)	A03 1520	454
	OCORD = 1.0/FLOAT(NCVM)	A03 1530	455
	IMAGE(NSF) = NSPV	A03 1540	456
	JSINGP(NSF) = 0	A03 1550	457
C		A03 1560	458
	CALL ABORTJ(3,XEROX,NCV)	A03 1570	459
	CALL ABORTJ(7,XEROX,NK)	A03 1580	460
	CALL ABORTJ(8,XEROX,NSPV)	A03 1590	461
	CALL ABORTJ(9,XEROX,NCVM)	A03 1600	462
C		A03 1610	463
	BOTU = (EWE(NB)-EWE(NO))	A03 1620	464
C		A03 1630	465
	DELTF1(NSF) = WSMOTH	A03 1640	466
	DELTF2(NSF) = WSMOTH	A03 1650	467
C		A03 1660	468
	IF (DELTF1(NSF)-1.0) 1210,1220,1220	A03 1670	469
1210	DELTF1(NSF) = DELTF1(NSF)*BOTU	A03 1680	470
	DELTF2(NSF) = DELTF2(NSF)*BOTU	A03 1690	471
1220	CONTINUE	A03 1700	472
C		A03 1710	473
	WFF1(NSF) = WFLAP1(NSF)	A03 1720	474
	WFF2(NSF) = WFLAP2(NSF)	A03 1730	475
	WFF3(NSF) = WFLAP3(NSF)	A03 1740	476
C		A03 1750	477
	IF (WFF1(NSF)-1.0) 1230,1240,1240	A03 1760	478
1230	WFF1(NSF) = WFF1(NSF)*BOTU	A03 1770	479
1240	IF (WFF2(NSF)-1.0) 1250,1260,1260	A03 1780	480
1250	WFF2(NSF) = WFF2(NSF)*BOTU	A03 1790	481
1260	IF (WFF3(NSF)-1.0) 1270,1280,1280	A03 1800	482
1270	WFF3(NSF) = WFF3(NSF)*BOTU	A03 1810	483
1280	CONTINUE	A03 1820	484
C		A03 1830	485
	WFF1(NSF) = WFF1(NSF) - DELTF1(NSF)/2.0	A03 1840	486
	WFF2(NSF) = WFF2(NSF) - DELTF1(NSF)/2.0	A03 1850	487
	WFF3(NSF) = WFF3(NSF) - DELTF1(NSF)/2.0	A03 1860	488
C		A03 1870	489
	WFF12(NSF) = WFF1(NSF) + DELTF1(NSF)	A03 1880	490
	WFF22(NSF) = WFF2(NSF) + DELTF1(NSF)	A03 1890	491
C		A03 1900	492
C		A03 1910	493
C	** CALCULATE WING PANELS **	A03 1920	494
C		A03 1930	495
	IF (NSF-NWING) 1290,1290,1300	A03 1940	496
1290	CONTINUE	A03 1950	497
	SYMF= 2.0	A03 1960	498
	SPAN = BOTU*2.0	A03 1970	499
	WINGD(NSF,1) = Y(NB)*2.0	A03 1980	500
	GO TO 1310	A03 1990	501
1300	CONTINUE	A03 2000	502
	SYMF= 1.0	A03 2010	503
	SPAN= BOTU	A03 2020	504
	WINGD(NSF,1) = SPAN	A03 2030	505
1310	CONTINUE	A03 2040	506
C		A03 2050	507
	WINGD(NSF,2) = C(N0)	A03 2060	508
	WINGD(NSF,3) = C(NB)	A03 2070	509

	WINGD(NSF,4)= E(N0)	A03 2080	510
	WINGD(NSF,5)= E(NB)	A03 2090	511
C	DSPAN= SPAN/FLOAT(NSPV)	A03 2100	512
C	JN1(NSF) = J1	A03 2110	513
	JN2(NSF) = J1 + NSPV - 1	A03 2120	514
	KN2(NSF) = NCV	A03 2130	515
	J2 = JN2(NSF)	A03 2140	516
	J3 = J2 + 1	A03 2150	517
C	CALL ABORTJ(2,XERCX,J3)	A03 2160	518
		A03 2170	519
		A03 2180	520
		A03 2190	521
C	SYMGF(NSF)= SYMF	A03 2200	522
		A03 2210	523
C		A03 2220	524
C		A03 2230	525
C	** VORTEX LATTICE GEOMETRY **	A03 2240	526
C		A03 2250	527
C	DD 1390 J=J1,J3	A03 2260	528
		A03 2270	529
C	WS= -BOTU*(SYMF-1.0) + DSPAN*FLCAT(J-J1)	A03 2280	530
	WAA= ABS(WS)	A03 2290	531
	WA = WAA + EWF(INC)	A03 2300	532
		A03 2310	533
C	CALL CORDF(WA,YA,XLE,XTF,ZLE,EPS,CW,CF,CTAB,TAND,TANS,RATS,M1,M2)	A03 2320	534
		A03 2330	535
C	SIGN=1.0	A03 2340	536
	TEST= 0.0001-WAA	A03 2350	537
	IF (TEST) 1320,1330,1330	A03 2360	538
1320	SIGN= WS/WAA	A03 2370	539
1330	YB= YA*SIGN	A03 2380	540
	IF (NCDIS-1) 1350,1340,1340	A03 2390	541
1340	CW= CW - CF	A03 2400	542
1350	CONTINUE	A03 2410	543
		A03 2420	544
C	DD 1360 K=1,NCV	A03 2430	545
		A03 2440	546
C	XKM= FLOAT(K-1)	A03 2450	547
		A03 2460	548
C	EY(J,K)= WS	A03 2470	549
	EC(J,K)= CW*DCORD	A03 2480	550
	EW(J,K)= WA	A03 2490	551
		A03 2500	552
C	EVI(J,K,1)= XLE + CW*DCORD*(0.25+XKM)	A03 2510	553
	EVI(J,K,2)= YB	A03 2520	554
	EVI(J,K,3)= ZLE	A03 2530	555
		A03 2540	556
C	ENI(J,K,1)= XLE + CW*DCORD*(COLOCP + XKM)	A03 2550	557
	ENI(J,K,2)= YB	A03 2560	558
	ENI(J,K,3)= ZLE	A03 2570	559
		A03 2580	560
C	1360 CONTINUE	A03 2590	561
		A03 2600	562
C		A03 2610	563
C	IF (NCDIS-1) 1390,1370,1380	A03 2620	564
1370	CONTINUE	A03 2630	565
		A03 2640	566
C	K= NCV	A03 2650	567
	EC(J,K) = CF	A03 2660	568
	EVI(J,K,1)= XTE - CF*0.75	A03 2670	569
	ENI(J,K,1)= XTE - CF*(1.0 - COLOCP)	A03 2680	570
	GO TO 1390	A03 2690	571
		A03 2700	572
C	1380 CONTINUE	A03 2710	573
	K= NCV	A03 2720	574
	EC(J,K)= CTAB	A03 2730	575
	EVI(J,K,1)= XTE - CTAB*0.75	A03 2740	576
	ENI(J,K,1)= XTE - CTAB*(1.0 - COLOCP)	A03 2750	577
	K= K - 1	A03 2760	578
	EC(J,K) = CF - CTAB	A03 2770	579
	EVI(J,K,1)= XTE - CTAB - EC(J,K)*0.75	A03 2780	580
	ENI(J,K,1)= XTE - CTAB - EC(J,K)*(1.0 - COLOCP)	A03 2790	581
		A03 2800	582
C		A03 2810	583
C		A03 2820	584
C	1390 CONTINUE	A03 2830	585
		A03 2840	586
C		A03 2850	587
C	DD 1410 J=J1,J3	A03 2860	588
		A03 2870	589
C	WA= EW(J,1)	A03 2880	590
		A03 2890	591
C	CALL CORDF(WA,YA,XLE,XTF,ZLF,EPS,CW,CF,CTAB,TAND,TANS,RATS,M1,M2)	A03 2900	592
		A03 2910	593
C	DD 1400 K=1,NCV	A03 2920	594
		A03 2930	595
C	XF1= EVI(J,K,1)	A03 2940	596
	ZF1= EVI(J,K,3)	A03 2950	597
		A03 2960	598
C	CALL CAMBER(NSF,NK,M1,M2,RATS,EPS,XLF,CW, XF1,ZF1)	A03 2970	599
		A03 2980	600
C	EVI(J,K,3) = ZF1	A03 2990	601
		A03 3000	602
C	XF1= FN(J,K,1)	A03 3010	603
	ZF1= EN(J,K,3)	A03 3020	604
		A03 3030	605
C	CALL CAMBER(NSF,NK,M1,M2,RATS,EPS,XLF,CW, XF1,ZF1)	A03 3040	606
		A03 3050	607
C	ENI(J,K,3) = ZF1	A03 3060	608
		A03 3070	609
C	1400 CONTINUE	A03 3080	610
	1410 CONTINUE	A03 3090	611
C		A03 3100	612
C		A03 3110	613
C		A03 3120	614
C	DD 1430 J=J1,J2	A03 3130	615

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	J3= J+1	A03 3140	616
C	DD 1420 K=1,NCV	A03 3150	617
C	EY(J,K)= FY(J3,K)-EY(J,K)	A03 3160	618
C	ES(J,K)= 0.5*EY(J,K)*(EC(J,K) +EC(J3,K))	A03 3170	619
C	EN(J,K,1)= 0.5*(EN(J,K,1) + EN(J3,K,1))	A03 3180	620
C	EN(J,K,2)= 0.5*(EN(J,K,2) + EN(J3,K,2))	A03 3190	621
C	EN(J,K,3)= 0.5*(EN(J,K,3) + EN(J3,K,3))	A03 3200	622
C	1420 CONTINUE	A03 3210	623
C	1430 CONTINUE	A03 3220	624
C	** CALCULATE UNIT VECTORS **	A03 3230	625
C	DD 1490 J=J1,J2	A03 3240	626
C	J3= J+1	A03 3250	627
C	DD 1480 K=1,NCV	A03 3260	628
C	SUM1= 0.0	A03 3270	629
C	SUM2= 0.0	A03 3280	630
C	DO 1440 L=1,3	A03 3290	631
C	M= L +3	A03 3300	632
C	EVI(J,K,M)= EV(J3,K,L) - EV(J,K,L)	A03 3310	633
C	ENI(J,K,M)= EN(J,K,L) - 0.5*(EV(J3,K,L)+EV(J,K,L))	A03 3320	634
C	SUM1= SUM1 + EVI(J,K,M)**2	A03 3330	635
C	1440 SUM2= SUM2 + ENI(J,K,M)**2	A03 3340	636
C	SUM1 = SQRT(SUM1)	A03 3350	637
C	SUM2 = SQRT(SUM2)	A03 3360	638
C	DO 1450 L=1,3	A03 3370	639
C	M= L +3	A03 3380	640
C	EVI(J,K,M)= EVI(J,K,M)/SUM1	A03 3390	641
C	ENI(J,K,L)= XTE - CTAB - EC(J,K)*(1.0 - COLOCP)	A03 3400	642
C	1390 CONTINUE	A03 3410	643
C	DD 1410 J=J1,J3	A03 3420	644
C	WA= EW(J,1)	A03 3430	645
C	CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CW, CF, CTAB, TAND, TANS, RATS, M1, M2)	A03 3440	646
C	DO 1400 K=1,NCV	A03 3450	647
C	XF1= EVI(J,K,1)	A03 3460	648
C	ZF1= EVI(J,K,3)	A03 3470	649
C	CALL CAMBER(NSF, NK, M1, M2, RATS, EPS, XLE, CW, XF1, ZF1)	A03 3480	650
C	EV(J,K,3) = ZF1	A03 3490	651
C	XF1= ENI(J,K,1)	A03 3500	652
C	ZF1= ENI(J,K,3)	A03 3510	653
C	CALL CAMBER(NSF, NK, M1, M2, RATS, EPS, XLE, CW, XF1, ZF1)	A03 3520	654
C	EN(J,K,3) = ZF1	A03 3530	655
C	1400 CONTINUE	A03 3540	656
C	1410 CONTINUE	A03 3550	657
C	DO 1430 J=J1,J2	A03 3560	658
C	J3= J+1	A03 3570	659
C	DO 1420 K=1,NCV	A03 3580	660
C	EY(J,K)= EY(J3,K)-EY(J,K)	A03 3590	661
C	ES(J,K)= 0.5*EY(J,K)*(EC(J,K) +EC(J3,K))	A03 3600	662
C	EN(J,K,1)= 0.5*(EN(J,K,1) + EN(J3,K,1))	A03 3610	663
C	EN(J,K,2)= 0.5*(EN(J,K,2) + EN(J3,K,2))	A03 3620	664
C	EN(J,K,3)= 0.5*(EN(J,K,3) + EN(J3,K,3))	A03 3630	665
C	1420 CONTINUE	A03 3640	666
C	1430 CONTINUE	A03 3650	667
C	** CALCULATE UNIT VECTORS **	A03 3660	668
C	DD 1490 J=J1,J2	A03 3670	669
C	J3= J+1	A03 3680	670
C	DD 1480 K=1,NCV	A03 3690	671
C	SUM1= 0.0	A03 3700	672
C	SUM2= 0.0	A03 3710	673
C	DO 1440 L=1,3	A03 3720	674
C	M= L +3	A03 3730	675
C	EVI(J,K,M)= EVI(J3,K,L) - EVI(J,K,L)	A03 3740	676
C	ENI(J,K,M)= ENI(J,K,L) - 0.5*(EVI(J3,K,L)+EVI(J,K,L))	A03 3750	677
C	SUM1= SUM1 + EVI(J,K,M)**2	A03 3760	678
C	1440 SUM2= SUM2 + ENI(J,K,M)**2	A03 3770	679
C	SUM1 = SQRT(SUM1)	A03 3780	680
C	SUM2 = SQRT(SUM2)	A03 3790	681
C	DO 1450 L=1,3	A03 3800	682
C	M= L +3	A03 3810	683
C	EVI(J,K,M)= EVI(J3,K,L) - EVI(J,K,L)	A03 3820	684
C	ENI(J,K,M)= ENI(J,K,L) - 0.5*(EVI(J3,K,L)+EVI(J,K,L))	A03 3830	685
C	SUM1= SUM1 + EVI(J,K,M)**2	A03 3840	686
C	1440 SUM2= SUM2 + ENI(J,K,M)**2	A03 3850	687
C	SUM1 = SQRT(SUM1)	A03 3860	688
C	SUM2 = SQRT(SUM2)	A03 3870	689
C	DO 1450 L=1,3	A03 3880	690
C	M= L +3	A03 3890	691
C	EVI(J,K,M)= EVI(J3,K,L) - EVI(J,K,L)	A03 3900	692
C	ENI(J,K,M)= ENI(J,K,L) - 0.5*(EVI(J3,K,L)+EVI(J,K,L))	A03 3910	693
C	SUM1= SUM1 + EVI(J,K,M)**2	A03 3920	694
C	1440 SUM2= SUM2 + ENI(J,K,M)**2	A03 3930	695
C	SUM1 = SQRT(SUM1)	A03 3940	696
C	SUM2 = SQRT(SUM2)	A03 3950	697
C	DO 1450 L=1,3	A03 3960	698
C	M= L +3	A03 3970	699
C	EVI(J,K,M)= EVI(J3,K,L) - EVI(J,K,L)	A03 3980	700
C	ENI(J,K,M)= ENI(J,K,L) - 0.5*(EVI(J3,K,L)+EVI(J,K,L))	A03 3990	701
C	SUM1= SUM1 + EVI(J,K,M)**2	A03 4000	702
C	1440 SUM2= SUM2 + ENI(J,K,M)**2	A03 4010	703
C	SUM1 = SQRT(SUM1)	A03 4020	704
C	SUM2 = SQRT(SUM2)	A03 4030	705
C	DO 1450 L=1,3	A03 4040	706
C	M= L +3	A03 4050	707
C	EVI(J,K,M)= EVI(J3,K,L) - EVI(J,K,L)	A03 4060	708
C	ENI(J,K,M)= ENI(J,K,L) - 0.5*(EVI(J3,K,L)+EVI(J,K,L))	A03 4070	709
C	SUM1= SUM1 + EVI(J,K,M)**2	A03 4080	710
C	1440 SUM2= SUM2 + ENI(J,K,M)**2	A03 4090	711
C	SUM1 = SQRT(SUM1)	A03 4100	712
C	SUM2 = SQRT(SUM2)	A03 4110	713
C	DO 1450 L=1,3	A03 4120	714
C	M= L +3	A03 4130	715
C	EVI(J,K,M)= EVI(J3,K,L) - EVI(J,K,L)	A03 4140	716
C	ENI(J,K,M)= ENI(J,K,L) - 0.5*(EVI(J3,K,L)+EVI(J,K,L))	A03 4150	717
C	SUM1= SUM1 + EVI(J,K,M)**2	A03 4160	718
C	1440 SUM2= SUM2 + ENI(J,K,M)**2	A03 4170	719
C	SUM1 = SQRT(SUM1)	A03 4180	720
C	SUM2 = SQRT(SUM2)	A03 4190	721
C	DO 1450 L=1,3		

M= L + 3	A03 4200	722
EV(J,K,M)= EV(J,K,M)/SUM1	A03 4210	723
COS1(L)= -EN(J,K,M)/SUM2	A03 4220	724
1450 COS2(L)= -EV(J,K,M)	A03 4230	725
C	A03 4240	726
CALL CROSP(COS1,CCS2,COS3)	A03 4250	727
C	A03 4260	728
SUM2= 0.0	A03 4270	729
DO 1460 L=1,3	A03 4280	730
1460 SUM2= SUM2 + COS3(L)**2	A03 4290	731
C	A03 4300	732
SUM2= SQRT(SUM2)	A03 4310	733
C	A03 4320	734
DO 1470 L=1,3	A03 4330	735
M= L+3	A03 4340	736
1470 EN(J,K,M)= COS3(L)/SUM2	A03 4350	737
C	A03 4360	738
1480 CONTINUE	A03 4370	739
1490 CONTINUE	A03 4380	740
C	A03 4390	741
C	A03 4400	742
C	A03 4410	743
C	A03 4420	744
C	A03 4430	745
C	A03 4440	746
C	A03 4450	747
C	A03 4460	748
C	A03 4470	749
C	A03 4480	750
C	A03 4490	751
C	A03 4500	752
C	A03 4510	753
C	A03 4520	754
C	A03 4530	755
C	A03 4540	756
C	A03 4550	757
C	A03 4560	758
C	A03 4570	759
C	A03 4580	760
C	A03 4590	761
C	A03 4600	762
C	A03 4610	763
C	A03 4620	764
C	A03 4630	765
C	A03 4640	766
C	A03 4650	767
C	A03 4660	768
C	A03 4670	769
C	A03 4680	770
C	A03 4690	771
C	A03 4700	772
C	A03 4710	773
C	A03 4720	774
C	A03 4730	775
C	A03 4740	776
C	A03 4750	777
C	A03 4760	778
C	A03 4770	779
C	A03 4780	780
C	A03 4790	781
C	A03 4800	782
1500 DA= DA/SQRT(1.0 + TAND**2)	A03 4810	783
1520 CONTINUE	A03 4820	784
C	A03 4830	785
C	A03 4840	786
C	A03 4850	787
C	A03 4860	788
C	A03 4870	789
C	A03 4880	790
C	A03 4890	791
C	A03 4900	792
C	A03 4910	793
C	A03 4920	794
C	A03 4930	795
C	A03 4940	796
1530 CONTINUE	A03 4950	797
C	A03 4960	798
C	A03 4970	799
C	A03 4980	800
C	A03 4990	801
C	A03 5000	802
C	A03 5010	803
C	A03 5020	804
C	A03 5030	805
C	A03 5040	806
C	A03 5050	807
C	A03 5060	808
C	A03 5070	809
C	A03 5080	810
C	A03 5090	811
C	A03 5100	812
C	A03 5110	813
C	A03 5120	814
C	A03 5130	815
C	A03 5140	816
C	A03 5150	817
C	A03 5160	818
C	A03 5170	819
C	A03 5180	820
C	A03 5190	821
C	A03 5200	822
C	A03 5210	823
C	A03 5220	824
C	A03 5230	825
C	A03 5240	826
C	A03 5250	827

C		A03 9260	828
	OSPAN= SPAN/20.0	A03 9270	829
	DD 1580 J=1,21	A03 9280	830
C		A03 9290	831
	WS= -BOTU*(SYMF-1.0) + DSPAN*FLOAT(J-1)	A03 9300	832
	WAA = ABS(WS)	A03 9310	833
	WA = WAA + EWE(N0)	A03 9320	834
C		A03 9330	835
	CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CW, CF, CTAB, TAND, TANS, RATS, M1, M2)	A03 9340	836
C		A03 9350	837
	SIGN = 1.0	A03 9360	838
	TEST= 0.0001 - WAA	A03 9370	839
	IF (TEST) 1540,1550,1550	A03 9380	840
1540	SIGN= WS/WAA	A03 9390	841
1550	YB= YA*SIGN	A03 9400	842
	DIHE = SIGN*RAD*ATAN(TAND)	A03 9410	843
	BETA = SIGN*RAD*ATAN(TANS)	A03 9420	844
	XCO4= XLE + CW/4.0	A03 9430	845
C		A03 9440	846
	IF (LINX-LIN) 1560,1570,1570	A03 9450	847
1560	CALL PAGE	A03 9460	848
	WRITE (KOUT,1030)	A03 9470	849
	LIN = LIN + 2	A03 9480	850
1570	WRITE (KOUT,1040)WS,YB,ZLE,XLE,XCO4,XTE,EPS,DIHE,BETA,CW,CF,CTAB	A03 9490	851
	LIN= LIN + 1	A03 9500	852
1580	CONTINUE	A03 9510	853
C		A03 9520	854
C		A03 9530	855
C		A03 9540	856
C	** AIRFOIL SECTION **	A03 9550	857
C		A03 9560	858
	WRITE (KOUT,1000)	A03 9570	859
	LIN= LIN + 3	A03 9580	860
	IF (LINX-LIN) 1590,1600,1600	A03 9590	861
1590	CALL PAGE	A03 9600	862
	LIN= LIN + 7	A03 9610	863
1600	WRITE (KOUT,1050)(XOC(I,NSF),I=1,10)	A03 9620	864
	LIN= LIN + 1	A03 9630	865
C		A03 9640	866
	DD 1650 J=NO,NB	A03 9650	867
	IF (LINX-LIN) 1610,1620,1620	A03 9660	868
1610	CALL PAGE	A03 9670	869
	WRITE (KOUT,1050)(XOC(I,NSF),I=1,10)	A03 9680	870
	LIN= LIN + 7	A03 9690	871
1620	CONTINUE	A03 9700	872
C		A03 9710	873
	DD 1630 K=1,10	A03 9720	874
1630	DUMYFIK)=0.0	A03 9730	875
	K=0	A03 9740	876
	DD 1640 KN=1,NK	A03 9750	877
	K= K+1	A03 9760	878
1640	DUMYFIK)= ZOC(KN,J)	A03 9770	879
	WRITE (KOUT,1060)(X(J),Y(J),(DUMYF(I),I=1,10)	A03 9780	880
	LIN= LIN + 1	A03 9790	881
1650	CONTINUE	A03 9800	882
C		A03 9810	883
	LIN= LIN + 3	A03 9820	884
	IF (LINX-LIN) 1660,1670,1670	A03 9830	885
1660	CALL PAGE	A03 9840	886
	LIN= LIN+3	A03 9850	887
1670	WRITE (KOUT,1000)	A03 9860	888
C		A03 9870	889
C		A03 9880	890
C		A03 9890	891
C	*** DEBUG OUTPUT ***	A03 9900	892
C		A03 9910	893
	J16 = JN1(NSF)	A03 9920	894
	J26 = JN2(NSF)	A03 9930	895
1680	J1 = JN1(NSF)	A03 9940	896
	J2 = JN2(NSF)	A03 9950	897
	K2 = KN2(NSF)	A03 9960	898
	IF (IFLG(20)-1) 1880,1690,1690	A03 9970	899
1690	CONTINUE	A03 9980	900
C		A03 9990	901
	J3 = J2 + 1	A03 6000	902
C		A03 6010	903
	LIN= LIN + 2	A03 6020	904
	IF (LINX-LIN) 1700,1710,1710	A03 6030	905
1700	CALL PAGE	A03 6040	906
	LIN= LIN + 2	A03 6050	907
1710	WRITE (KOUT,1070)	A03 6060	908
C		A03 6070	909
	DD 1770 K=1,K2	A03 6080	910
	LIN= LIN + 1	A03 6090	911
	DD 1760 J=J1,J2	A03 6100	912
	IF (JSING(NSF).EQ.J) GO TO 1760	A03 6110	913
	LIN= LIN + 1	A03 6120	914
	IF (LINX-LIN) 1720,1730,1730	A03 6130	915
1720	CALL PAGE	A03 6140	916
	WRITE (KOUT,1070)	A03 6150	917
	LIN= LIN + 2 + 1	A03 6160	918
1730	JPI = J + 1	A03 6170	919
	WA= EWE(N0)	A03 6180	920
	TEST= ABS(EW(J,K)-EW(JPI,K)) -0.001	A03 6190	921
	IF (TEST) 1750,1750,1740	A03 6200	922
1740	WA= 0.5*(EW(J,K) + EW(JPI,K))	A03 6210	923
1750	WB= WA - EWE(N0)	A03 6220	924
	WRITE (KOUT,1080)J,K,(EN(J,K,1),1=2,3),WB,WA,EY(J,K),EC(J,K),ES(J,	A03 6230	925
	*K)	A03 6240	926
1760	CONTINUE	A03 6250	927
1770	WRITE (KOUT,1020)	A03 6260	928
C		A03 6270	929
	LIN= LIN + 3	A03 6280	930
	IF (LINX-LIN) 1780,1790,1790	A03 6290	931
1780	CALL PAGE	A03 6300	932
		A03 6310	933

	LIN= LIN + 3	A03 6320	934
1790	WRITE (KOUT,1000)	A03 6330	935
	LIN= LIN + 2	A03 6340	936
	IF (LINX-LIN) 1800,1810,1810	A03 6350	937
1800	CALL PAGE	A03 6360	938
	LIN= LIN + 2	A03 6370	939
1810	WRITE (KOUT,1090)	A03 6380	940
C		A03 6390	941
	DO 1850 K=1,K2	A03 6400	942
	LIN= LIN + 1	A03 6410	943
	DO 1840 J=J1,J2	A03 6420	944
	IF (JSINGP(INSF).EQ.J) GO TO 1840	A03 6430	945
	LIN= LIN + 1	A03 6440	946
	IF (LINX-LIN) 1820,1830,1830	A03 6450	947
1820	CALL PAGE	A03 6460	948
	WRITE (KOUT,1090)	A03 6470	949
	LIN= LIN + 2	A03 6480	950
1830	CONTINUE	A03 6490	951
	WRITE (KOUT,1100)J,K,(EV(J,K,I),I=1,5),(EN(J,K,I),I=1,6)	A03 6500	952
1840	CONTINUE	A03 6510	953
1850	WRITE (KOUT,1020)	A03 6520	954
C		A03 6530	955
C		A03 6540	956
	LIN= LIN + 3	A03 6550	957
	IF (LINX-LIN) 1860,1870,1870	A03 6560	958
1860	CALL PAGE	A03 6570	959
	LIN= LIN + 3	A03 6580	960
1870	WRITE (KOUT,1000)	A03 6590	961
C		A03 6600	962
C		A03 6610	963
C		A03 6620	964
C	* WRITE ON CALCOMPLOT TAPE *	A03 6630	965
C		A03 6640	966
1880	IF (IFLG(19)-1) 2020,1890,1890	A03 6650	967
1890	CONTINUE	A03 6660	968
C		A03 6670	969
	KFILE = KFILE + 1	A03 6680	970
	KREC = 1	A03 6690	971
	KWORD = 6	A03 6700	972
C		A03 6710	973
	J1 = J16	A03 6720	974
	J2 = J26	A03 6730	975
	J3 = J26 + 1	A03 6740	976
	REFL = WINGD(1,1)/2.0	A03 6750	977
	XZER = WINGD(1,11)	A03 6760	978
	YZER = 0.0	A03 6770	979
	ZZER = WINGD(1,12)	A03 6780	980
C		A03 6790	981
C	* RECORD 1 - FILE NSURF *	A03 6800	982
C		A03 6810	983
	DO 1900 J=J1,J3	A03 6820	984
C		A03 6830	985
	WA = EW(J,1)	A03 6840	986
C		A03 6850	987
	CALL CORDF(WA,YA,XLE,XTE,ZLE,EPS,CW,CF,CTAB,TAND,TANS,RATS,M1,M2)	A03 6860	988
C		A03 6870	989
	YLE= EV(J,1,2)	A03 6880	990
	YTE= YLE	A03 6890	991
	ZTE= ZLE	A03 6900	992
	XLC= XLE	A03 6910	993
C		A03 6920	994
	CALL CAMBER(INSF,AK,M1,M2,RATS,EPS,XLC,CW,XLE,ZLE)	A03 6930	995
C		A03 6940	996
	SHE= YLE	A03 6950	997
	CALL FLAPI(INSF,WA,SHE,XTE,CF,CTAB,TAND,XLE,YLE,ZLE,COS3)	A03 6960	998
C		A03 6970	999
	CALL CAMBER(INSF,AK,M1,M2,RATS,EPS,XLE,CW,XTE,ZTE)	A03 6980	1000
C		A03 6990	1001
	SHE= YTE	A03 7000	1002
	XLC= XTE	A03 7010	1003
	CALL FLAPI(INSF,WA,SHE,XLC,CF,CTAB,TAND,XTE,YTE,ZTE,COS3)	A03 7020	1004
C		A03 7030	1005
	CALL ISOMET(XLE,YLE,ZLE,REFL,XZER,YZER,ZZER)	A03 7040	1006
	CALL ISOMET(XTE,YTE,ZTE,REFL,XZER,YZER,ZZER)	A03 7050	1007
C		A03 7060	1008
1900	WRITE (KT2)KREC,KWORD,XLE,YLE,ZLE,XTE,YTE,ZTE	A03 7070	1009
C		A03 7080	1010
C		A03 7090	1011
C	* RECORD 2 - FILE NSURF *	A03 7100	1012
C		A03 7110	1013
	KREC= KREC + 1	A03 7120	1014
	KWORD= 3	A03 7130	1015
	ITET= 1	A03 7140	1016
C		A03 7150	1017
	DO 1960 J=J1,J3	A03 7160	1018
C		A03 7170	1019
	WA = EW(J,1)	A03 7180	1020
C		A03 7190	1021
	CALL CORDF(WA,YA,XLE,XTE,ZLE,EPS,CW,CF,CTAB,TAND,TANS,RATS,M1,M2)	A03 7200	1022
C		A03 7210	1023
	ITET = -ITET	A03 7220	1024
	KFW = (ITET + 1)/2	A03 7230	1025
	KFB = (1 - ITET)/2	A03 7240	1026
C		A03 7250	1027
	DO 1950 KX=1,K2	A03 7260	1028
C		A03 7270	1029
	K = KX*KFW + (K2+1-KX)*KFB	A03 7280	1030
	XF1 = EV(J,K,1) - 0.25*EC(J,K)	A03 7290	1031
	YF1 = EV(J,K,2)	A03 7300	1032
	ZF1 = ZLE	A03 7310	1033
C		A03 7320	1034
	XF2 = XF1 + EC(J,K)	A03 7330	1035
	YF2 = YF1	A03 7340	1036
	ZF2 = ZLE	A03 7350	1037
C		A03 7360	1038
	IF (ITET) 1910,1910,1930	A03 7370	1039

1910	CALL CAMBER(NSF,NK,M1,M2,RATS,EPS,XLE,CW, XF2,ZF2)	A03 7380	1040
C	SHE= YF2	A03 7390	1041
	CALL FLAP1(NSF,WA,SHE,XTE,CF,CTAB,TAND, XF2,YF2,ZF2, COS3)	A03 7400	1042
C		A03 7410	1043
	CALL ISOMET(XF2,YF2,ZF2, REFL,XZER,YZER,ZZER)	A03 7420	1044
C		A03 7430	1045
	WRITE (KT2)KREC,KWORD,XF2,YF2,ZF2	A03 7440	1046
C		A03 7450	1047
	IF (K2-KX) 1920,1920,1950	A03 7460	1048
1920	CALL CAMBER(NSF,NK,M1,M2,RATS,EPS,XLE,CW, XF1,ZF1)	A03 7470	1049
C		A03 7480	1050
	SHE= YF1	A03 7490	1051
	CALL FLAP1(NSF,WA,SHE,XTE,CF,CTAB,TAND, XF1,YF1,ZF1, COS3)	A03 7500	1052
C		A03 7510	1053
	CALL ISOMET(XF1,YF1,ZF1, REFL,XZER,YZER,ZZER)	A03 7520	1054
C		A03 7530	1055
	WRITE (KT2)KREC,KWORD,XF1,YF1,ZF1	A03 7540	1056
	GO TO 1950	A03 7550	1057
C		A03 7560	1058
1930	CALL CAMBER(NSF,NK,M1,M2,RATS,EPS,XLE,CW, XF1,ZF1)	A03 7570	1059
C		A03 7580	1060
	SHE= YF1	A03 7590	1061
	CALL FLAP1(NSF,WA,SHE,XTE,CF,CTAB,TAND, XF1,YF1,ZF1, COS3)	A03 7600	1062
C		A03 7610	1063
	CALL ISOMET(XF1,YF1,ZF1, REFL,XZER,YZER,ZZER)	A03 7620	1064
C		A03 7630	1065
	WRITE (KT2)KREC,KWORD,XF1,YF1,ZF1	A03 7640	1066
C		A03 7650	1067
	IF (K2-KX) 1940,1940,1950	A03 7660	1068
1940	CALL CAMBER(NSF,NK,M1,M2,RATS,EPS,XLE,CW, XF2,ZF2)	A03 7670	1069
C		A03 7680	1070
	SHE= YF2	A03 7690	1071
	CALL FLAP1(NSF,WA,SHE,XTE,CF,CTAB,TAND, XF2,YF2,ZF2, COS3)	A03 7700	1072
C		A03 7710	1073
	CALL ISOMET(XF2,YF2,ZF2, REFL,XZER,YZER,ZZER)	A03 7720	1074
C		A03 7730	1075
	WRITE (KT2)KREC,KWORD,XF2,YF2,ZF2	A03 7740	1076
C		A03 7750	1077
	1950 CONTINUE	A03 7760	1078
1960	CONTINUE	A03 7770	1079
C		A03 7780	1080
		A03 7790	1081
C		A03 7800	1082
	* RECORD 3 - FILE NSURF *	A03 7810	1083
C		A03 7820	1084
	KREC= KREC +1	A03 7830	1085
	KWORD= 3	A03 7840	1086
	ITET = -1	A03 7850	1087
C		A03 7860	1088
	DO 2010 K=2,K2	A03 7870	1089
C		A03 7880	1090
	DO 2000 J=J1,J3	A03 7890	1091
C		A03 7900	1092
	IF (ITET) 1970,1970,1980	A03 7910	1093
1970	JR= J	A03 7920	1094
	GO TO 1990	A03 7930	1095
1980	JR= J1+J3 -J	A03 7940	1096
1990	CONTINUE	A03 7950	1097
C		A03 7960	1098
	WA = EW(JR,K)	A03 7970	1099
C		A03 7980	1100
	CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CW, CF, CTAB, TAND, TANS, RATS, M1, M2)	A03 7990	1101
C		A03 8000	1102
	XF1 = EV(JR,K,1) - 0.25*EC(JR,K)	A03 8010	1103
	YF1 = EV(JR,K,2)	A03 8020	1104
	ZF1 = ZLE	A03 8030	1105
C		A03 8040	1106
	CALL CAMBER(NSF,NK,M1,M2,RATS,EPS,XLE,CW, XF1,ZF1)	A03 8050	1107
C		A03 8060	1108
	SHE = YF1	A03 8070	1109
	CALL FLAP1(NSF,WA,SHE,XTE,CF,CTAB,TAND, XF1,YF1,ZF1, COS3)	A03 8080	1110
C		A03 8090	1111
	CALL ISOMET(XF1,YF1,ZF1, REFL,XZER,YZER,ZZER)	A03 8100	1112
C		A03 8110	1113
	2000 WRITE (KT2)KREC,KWORD,XF1,YF1,ZF1	A03 8120	1114
C		A03 8130	1115
		A03 8140	1116
C		A03 8150	1117
	ITET= -ITET	A03 8160	1118
C		A03 8170	1119
2010	CONTINUE	A03 8180	1120
C		A03 8190	1121
	END FILE KT2	A03 8200	1122
	LIN= LIN +2	A03 8210	1123
	WRITE (KOUT,1130)KFILE	A03 8220	1124
C		A03 8230	1125
		A03 8240	1126
C		A03 8250	1127
2020	CONTINUE	A03 8260	1128
C		A03 8270	1129
	*** COMPUTE IMAGE VERTICAL SURFACES ***	A03 8280	1130
C		A03 8290	1131
	IF (NREPET.EQ.0) GO TO 2060	A03 8300	1132
	NREPET= 0	A03 8310	1133
	IMAGE(NSF)= 2*IMAGE(NSF)	A03 8320	1134
	J1 = JN1(NSF)	A03 8330	1135
	J2 = JN2(NSF)	A03 8340	1136
	J3 = J2 +1	A03 8350	1137
	J1= J3	A03 8360	1138
	JSINGP(NSF)= J3	A03 8370	1139
	SYMGF(NSF) = 2.0	A03 8380	1140
	WINGD(NSF,6) = WINGD(NSF,6)*2.0	A03 8390	1141
	WINGD(NSF,10)= 0.0	A03 8400	1142
	DO 2050 J=J1,J3	A03 8410	1143
	J1= J1 +1	A03 8420	1144
	DO 2040 K=1,K2	A03 8430	1145

```

DO 2030 L=1,6
EN(I,J,K,L) = EN(I,J,K,L)
2030 EV(I,J,K,L) = EV(I,J,K,L)
FY(I,J,K) = FY(I,J,K)
ES(I,J,K) = ES(I,J,K)
EW(I,J,K) = EW(I,J,K)
EC(I,J,K) = EC(I,J,K)
EN(I,J,K,2) = -EN(I,J,K,2)
EV(I,J,K,2) = -EV(I,J,K,2)
2040 CONTINUE
2050 CONTINUE
JN2(NSF) = J1 - 1
GO TO 1680
C
C
2060 J1 = JN2(NSF) + 2
C
RETURN
XXXXXX
C
END

```

	A03 8440	1146
	A03 8450	1147
	A03 8460	1148
	A03 8470	1149
	A03 8480	1150
	A03 8490	1151
	A03 8500	1152
	A03 8510	1153
	A03 8520	1154
	A03 8530	1155
	A03 8540	1156
	A03 8550	1157
	A03 8560	1158
	A03 8570	1159
	A03 8580	1160
	A03 8590	1161
	A03 8600	1162
	A03 8610	1163
	A03 8620	1164
	A03 8630	1165
	A03 8640	1166


```

▽ FOR A04,A04
C
C
SUBROUTINE LIFTX(ALFA,ZHEICT,SYMLF,NSURFL,NSURF2)
C
C
* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A04 60
* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A04 70
C
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXA04 90
C
DOUBLE PRECISION SCALE,SUP,DETERM,AMAT(100,100),VMAT(100)
DIMENSION JND(5)
DIMENSION SYMLF(5),SUMSL(4)
DIMENSION P(3),B(3),D(3)
DIMENSION COS1(3),COS2(3),COS3(3)
DIMENSION PW(3),BW(3),DW(3)
DIMENSION SUML(2,5,3),SUMR(2,5,3),SUMP(2,5,3),FACN(5,3)
DIMENSION SUMLG(3),SUMPG(3),FACNG(3)
DIMENSION ZUML(2,5,3),ZUMR(2,5,3),ZUMP(2,5,3)
DIMENSION ZUMLG(3),ZUMPG(3),ZACNG(3),ZUMSL(4)
C
COMMON/DATA01/ KIN, KOUT, KTL, KT2, KT3, KREC, KFILE, LIN, LINK
1 ,RAD, PIE, CUTOFF1, CUTOFF2, DELALF, LFLAP, LDRAG, COLOCP
2 ,IFLG(20), EXECK(15)
C
COMMON/DATA02/ NNING, NFUS, NVTAIL, NSS(5), NSSO(5), NCS(5)
1 ,X(30), Y(30), Z(30), E(30), C(30), XDCR(30), FLAPCI(30),FABC(30)
2 ,WSMOTH, EWF(30), ELE(30), ETE(30), EHE(30), EHEE(30)
3 ,XDC(10,5), ZDC(10,30)
COMMON/DATA22/IMAGEF(5),JSINGP(5)
C
COMMON/DATA03/FLAPDJ(5),TABDJ(5),AILDJ(2,5),DELTF1(5),DELTF2(5)
1 ,WFLAP1(5), WFLAP2(5), WFLAP3(5), WFLAP4(5), WFLAP5(5)
2 ,WFLAP1(5), WFLAP2(5), WFLAP3(5)
C
COMMON/DATA04/ WINGD(5,16), JN1(5), JN2(5), KN2(5), SYMGF(5),NSURF
1 ,EW(60,10), EY(60,10), EC(60,10), ES(60,10), EG(60,10)
2 ,EN(60,10,8), EV(60,10,6), VVINDX(60,10,3)
C
COMMON/DATA05/XCG,YCG,ZCG,REFS,PEFC,REFB
C
C
1000 FORMAT(1X)
1010 FORMAT(1X,/,1X)
C
1020 FFORMAT(34X,41HVORTEX LATTICE MATRIX DETAIL-SURFACE NO. =,I2,2H/(,I2A04 460
1,1H,I2,1H),/,34X,51(1H*),/,1X)
A04 470
1030 FORMAT( 1X,12H J K NP NG, P(Y) P(Z) B(X) , A04 480
2 60F VFS(MAT) VINIMAT) P(X) P(Y) P(Z) B(X) , A04 490
3 50H RIYI B(ZI) D(X) D(Y) D(Z) ,/,1X) A04 500
1040 FORMAT(1X,413,11F10.4) A04 510
C
1050 FORMAT(36X,37HLIFT DISTRIBUTION DETAIL-SURFACE NO. =,I2,2H/(,I2, A04 530
1,1H,I2,1H),/,36X,47(1H*),/,1X) A04 540
1060 FORMAT(3X,4HJ K,5X,40HP(X) P(Y) P(Z) AREA , A04 550
160MCPN G(X) G(Y) G(Z) V(I(X) V(I(Y) , A04 560
215HV(IZ) GAMMA , /,1X) A04 570
1070 FORMAT( 1X, 213, 3F10.3, 2F10.4, 6F10.5, E10.4 ) A04 580
C
1080 FORMAT(34X,41HSECTION AIRLOAD COEFFICIENTS-SURFACE NO. =,I2,2H/(,I2A04 600
1,1H,I2,1H),/,34X,51(1H*),/,1X) A04 610
1090 FFORMAT(3X,52HJ Y* Y Z W SCN SCX, A04 620
1 6X,58HSCX SCD SMP C/4 SCLC/R 1XL W A04 630
2 /,1X ) 1YL IZL , A04 640
1100 FORMAT(1X,I3,F8.4,3F9.4,3F9.4,3F9.4) A04 650
C
1110 FORMAT(///,34X,45HINTEGRATED AIRLOAD COEFFICIENTS-SURFACE NOS. =,I2A04 670
1,2H -I2,/,34X,51(1H*),///, 29H E ECN ECX ECY, A04 680
2 54H FCL ECD ECMP ECMR ECMY EXA, A04 690
3 33H FZA ES EMGC ER,/, 1X) A04 700
1120 FORMAT(1X,I2, 8F9.4, 5F9.2 ) A04 710
C
1130 FORMAT(1X,/,49X,20H*** AIRLOAD SUMS ***,/, A04 730
* 3H AC,8F9.4,5F9.2, /,3H CG,8F9.4,5F9.2, A04 740
*/4H AC ,8(F8.4,1H*),5(F8.2,1H*),/4H CG ,8(F8.4,1H*),5(F8.2,1H*), A04 750
1 /,37X,14H* DETERMINANT =,E10.4,9H * SCALE =,E10.4,2H *,/, 1X) A04 760
1140 FFORMAT(1X,I2,1X,E(F8.4,1H*),5(F8.2,1H*) ) A04 770
C
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXA04 800
C
C
A04 810
C
A04 820

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	A04 10	1167
	A04 20	1168
	A04 30	1169
	A04 40	1170
	A04 50	1171
	*A04 60	1172
	*A04 70	1173
	A04 80	1174
	A04 90	1175
	A04 100	1176
	A04 110	1177
	A04 120	1178
	A04 130	1179
	A04 140	1180
	A04 150	1181
	A04 160	1182
	A04 170	1183
	A04 180	1184
	A04 190	1185
	A04 200	1186
	A04 210	1187
	A04 220	1188
	A04 230	1189
	A04 240	1190
	A04 250	1191
	A04 260	1192
	A04 270	1193
	A04 280	1194
	A04 290	1195
	A04 300	1196
	A04 310	1197
	A04 320	1198
	A04 330	1199
	A04 340	1200
	A04 350	1201
	A04 360	1202
	A04 370	1203
	A04 380	1204
	A04 390	1205
	A04 400	1206
	A04 410	1207
	A04 420	1208
	A04 430	1209
	A04 440	1210
	A04 450	1211
	A04 460	1212
	A04 470	1213
	A04 480	1214
	A04 490	1215
	A04 500	1216
	A04 510	1217
	A04 520	1218
	A04 530	1219
	A04 540	1220
	A04 550	1221
	A04 560	1222
	A04 570	1223
	A04 580	1224
	A04 590	1225
	A04 600	1226
	A04 610	1227
	A04 620	1228
	A04 630	1229
	A04 640	1230
	A04 650	1231
	A04 660	1232
	A04 670	1233
	A04 680	1234
	A04 690	1235
	A04 700	1236
	A04 710	1237
	A04 720	1238
	A04 730	1239
	A04 740	1240
	A04 750	1241
	A04 760	1242
	A04 770	1243
	A04 780	1244
	A04 790	1245
	A04 800	1246
	A04 810	1247
	A04 820	1248

C		A04	830	1249
C	* INITIALIZE *	A04	840	1250
C	ALFAR= ALFA/RAD	A04	850	1251
	TANA = TAN(ALFAR)	A04	860	1252
	COSA = 1.0/SQRT(1.0+TANA**2)	A04	870	1253
	SINA = TANA*COSA	A04	880	1254
	TANV= -TAN(0.5*ALFAR)	A04	890	1255
	TANVG= -TAN(1.5*ALFAR)	A04	900	1256
	UNIT = 0.25/PIE	A04	910	1257
	UNITG= -UNIT	A04	920	1258
C		A04	930	1259
C		A04	940	1260
C	DD 1160 NSF=NSURF1,NSURF2	A04	950	1261
		A04	960	1262
C		A04	970	1263
	NZERO= JN1(NSF)	A04	980	1264
	TEST= SYMLF(NSF)	A04	990	1265
	IF (TEST) 1190,1150,1160	A04	1000	1266
1150	NZERO= IMAGEF(NSF)/2 + NZERO	A04	1010	1267
	IF(JSINGP(NSF).NE.0) NZERO= NZERO +1	A04	1020	1268
1160	JN0(NSF)= NZERO	A04	1030	1269
C		A04	1040	1270
C		A04	1050	1271
C		A04	1060	1272
C	* CALCULATE MATRICES VMAT(NV) & AMAT(NG,NV) *	A04	1070	1273
C		A04	1080	1274
C	NV = 0	A04	1090	1275
C		A04	1100	1276
C		A04	1110	1277
C	DD 1520 NSF=NSURF1,NSURF2	A04	1120	1278
		A04	1130	1279
C		A04	1140	1280
	K= NSF + 5	A04	1150	1281
	J1 = JN1(NSF)	A04	1160	1282
	J2 = JN2(NSF)	A04	1170	1283
	K2 = KN2(NSF)	A04	1180	1284
	NZERO = JN0(NSF)	A04	1190	1285
	NSPV= IMAGEF(NSF)	A04	1200	1286
	NCV = IFLG(K)	A04	1210	1287
	NM = 0	A04	1220	1288
	NOO= NSSO(NSF)	A04	1230	1289
C		A04	1240	1290
C		A04	1250	1291
C		A04	1260	1292
C	DD 1480 KV=1,K2	A04	1270	1293
	DD 1450 JV=NZERO,J2	A04	1280	1294
	IF (JSINGP(NSF).EQ.JV) GO TO 1450	A04	1290	1295
	NV= NV+1	A04	1300	1296
C		A04	1310	1297
	SYMGF2= SYMGF(NSF)-1.0	A04	1320	1298
	SYMGF3=-SYMGF(NSF)*2.0	A04	1330	1299
C		A04	1340	1300
	COS1(1)= COSA	A04	1350	1301
	COS1(2)= 0.0	A04	1360	1302
	COS1(3)= -SINA	A04	1370	1303
C		A04	1380	1304
	DD 1170 L=1,3	A04	1390	1305
	LP3= L +3	A04	1400	1306
	COS2(L)= EN(JV,KV,LP3)	A04	1410	1307
1170	P(L)= EN(JV,KV,L)	A04	1420	1308
C		A04	1430	1309
	JP1= JV +1	A04	1440	1310
	WA = EWE(NO0)	A04	1450	1311
	TEST= ABS(EW(JV,KV) - EW(JP1,KV)) - 0.001	A04	1460	1312
	IF (TEST) 1190,1190,1180	A04	1470	1313
1180	WA = (EW(JV,KV) + EW(JP1,KV))/2.0	A04	1480	1314
1190	CONTINUE	A04	1490	1315
	SHE = EN(JV,KV,2)	A04	1500	1316
C		A04	1510	1317
	CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CM, CF, CTAB, TAND, TANS, RATS, M1, M2)	A04	1520	1318
	CALL FLAPS(NSF, WA, SHE, XTE, CF, CTAB, TAND, P, COS2)	A04	1530	1319
	CALL DOTP(COS1, COS2, VMATOP)	A04	1540	1320
C		A04	1550	1321
C		A04	1560	1322
C	VMAT(NV)= VMATOP	A04	1570	1323
C		A04	1580	1324
C		A04	1590	1325
C	DD 1200 L=1,3	A04	1600	1326
1200	COS1(L)= COS2(L)	A04	1610	1327
C		A04	1620	1328
C		A04	1630	1329
C		A04	1640	1330
C	NG= 0	A04	1650	1331
	DD 1440 NSR=NSURF1,NSURF2	A04	1660	1332
C		A04	1670	1333
	J0 = JN0(NSR)	A04	1680	1334
	J3 = JN1(NSR)	A04	1690	1335
	J4 = JN2(NSR)	A04	1700	1336
	K4 = KN2(NSR)	A04	1710	1337
C		A04	1720	1338
	SYMGF2 = SYMGF(NSR) - 1.0	A04	1730	1339
	SYMGF3 =-SYMGF(NSR) + 2.0	A04	1740	1340
	SYMLDG = SYMLF(NSR)	A04	1750	1341
C		A04	1760	1342
C	DD 1430 KG=1,K4	A04	1770	1343
C		A04	1780	1344
C	NV = 0	A04	1790	1345
C		A04	1800	1346
C		A04	1810	1347
C	DD 1520 NSF=NSURF1,NSURF2	A04	1820	1348
		A04	1830	1349
C		A04	1840	1350
	K= NSF + 5	A04	1850	1351
	J1 = JN1(NSF)	A04	1860	1352
	J2 = JN2(NSF)	A04	1870	1353
	K2 = KN2(NSF)	A04	1880	1354
	NZERO = JN0(NSF)			
	NSPV= IMAGEF(NSF)			

NCV = IFLG(K)	A04 1890	1355
NM = 0	A04 1900	1356
N00= NSSO(NSF)	A04 1910	1357
C	A04 1920	1358
C	A04 1930	1359
C	A04 1940	1360
DO 1480 KV=L,K2	A04 1950	1361
DO 1450 JV=NZERO,J2	A04 1960	1362
IF (JSINGP(NSF),EQ,JV) GO TO 1450	A04 1970	1363
NV= NV+1	A04 1980	1364
C	A04 1990	1365
SYMGF2= SYMGF(NSF)-1.0	A04 2000	1366
SYMGF3=-SYMGF(NSF)+2.0	A04 2010	1367
C	A04 2020	1368
COS1(1)= COSA	A04 2030	1369
COS1(2)= 0.0	A04 2040	1370
COS1(3)= -SINA	A04 2050	1371
C	A04 2060	1372
DO 1170 L=1,3	A04 2070	1373
LP3= L +3	A04 2080	1374
COS2(L)= EN(JV,KV,LP3)	A04 2090	1375
1170 P(L)= EN(JV,KV,L)	A04 2100	1376
C	A04 2110	1377
JPI= JV +1	A04 2120	1378
WA = EWE(INDO)	A04 2130	1379
TEST= ABS(EW(JV,KV) - EW(JPI,KVI)) - 0.001	A04 2140	1380
IF (TEST) 1190,1190,1180	A04 2150	1381
1180 WA = (EW(JV,KV) + EW(JPI,KVI))/2.0	A04 2160	1382
1190 CONTINUE	A04 2170	1383
SHE = EN(JV,KV,2)	A04 2180	1384
C	A04 2190	1385
CALL CORDF(WA, YA, XLF, XTE, ZLE, EPS, CM, CF, CTAB, TAND, TANS, RATS, M1, 42)	A04 2200	1386
CALL FLAPS(NSF, WA, SHE, XTE, CF, CTAB, TAND, P, COS2)	A04 2210	1387
CALL DOTPICOS1, COS2, VMATDP)	A04 2220	1388
C	A04 2230	1389
C	A04 2240	1390
VMAT(INV)= VMATDP	A04 2250	1391
C	A04 2260	1392
C	A04 2270	1393
DO 1200 L=1,3	A04 2280	1394
1200 COS1(L)= COS2(L)	A04 2290	1395
C	A04 2300	1396
C	A04 2310	1397
C	A04 2320	1398
NG= 0	A04 2330	1399
DO 1440 NSR=NSURF1,NSURF2	A04 2340	1400
C	A04 2350	1401
J0 = JNO(NSR)	A04 2360	1402
J3 = JN1(NSR)	A04 2370	1403
J4 = JN2(NSR)	A04 2380	1404
K4 = KN2(NSR)	A04 2390	1405
C	A04 2400	1406
SYMGF2 = SYMGF(NSR) - 1.0	A04 2410	1407
SYMGF3 =-SYMGF(NSR) + 2.0	A04 2420	1408
SYMLDG = SYMLF(NSR)	A04 2430	1409
C	A04 2440	1410
DO 1430 KG=1,K4	A04 2450	1411
DO 1420 JG=J0,J4	A04 2460	1412
IF (JSINGP(NSR),EQ,JG) GO TO 1420	A04 2470	1413
NG= NG+1	A04 2480	1414
C	A04 2490	1415
JPI = JG+1	A04 2500	1416
WA = EW(JG,KG)	A04 2510	1417
C	A04 2520	1418
DO 1210 L=1,3	A04 2530	1419
LP3= L+3	A04 2540	1420
B(L)= EV(JG,KG,L)	A04 2550	1421
1210 D(L)= EV(JPI,KG,L)	A04 2560	1422
C	A04 2570	1423
SHE = B(2)	A04 2580	1424
C	A04 2590	1425
CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CM, CF, CTAB, TAND, TANS, RATS, M1, M2)	A04 2600	1426
CALL FLAPS(NSR, WA, SHE, XTE, CF, CTAB, TAND, B, COS3)	A04 2610	1427
C	A04 2620	1428
WA = EW(JPI,KG)	A04 2630	1429
SHE = D(2)	A04 2640	1430
C	A04 2650	1431
CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CM, CF, CTAB, TAND, TANS, RATS, M1, M2)	A04 2660	1432
CALL FLAPS(NSR, WA, SHE, XTE, CF, CTAB, TAND, D, COS3)	A04 2670	1433
C	A04 2680	1434
DO 1220 L=1,3	A04 2690	1435
PW(L) = P(L)	A04 2700	1436
BW(L) = B(L)	A04 2710	1437
1220 DW(L) = D(L)	A04 2720	1438
C	A04 2730	1439
CALL VORTEX(P,B,D,TANV,UNIT, VI, COS2)	A04 2740	1440
CALL DOTPICOS1, COS2, SUM1)	A04 2750	1441
C	A04 2760	1442
SUM1= SUM1*VI	A04 2770	1443
SUM2 = 0.0	A04 2780	1444
C	A04 2790	1445
IF (IFLG(17)-1) 1240,1230,1230	A04 2800	1446
1230 CONTINUE	A04 2810	1447
C	A04 2820	1448
CALL REFLEC(R,ZHEIGT,ALFAR,COSA)	A04 2830	1449
CALL REFLEC(D,ZHEIGT,ALFAR,COSA)	A04 2840	1450
C	A04 2850	1451
CALL VORTEX(P,B,D,TANVG,UNITG, VI, COS2)	A04 2860	1452
CALL DOTPICOS1, COS2, SUM3)	A04 2870	1453
C	A04 2880	1454
SUM1= SUM1 + SUM3*VI	A04 2890	1455
C	A04 2900	1456
1240 CONTINUE	A04 2910	1457
C	A04 2920	1458
ITEST= J3 -J0	A04 2930	1459
IF (ITEST) 1250,1300,1300	A04 2940	1460

1250	JH = J3 + J4 - JG	A04 2950	1461
	IF (JSINGP(NSR),NE,0) JH= JG-J0+J3	A04 2960	1462
	IF (JH-JG) 1260,1300,1300	A04 2970	1463
1260	CONTINUE	A04 2980	1464
C		A04 2990	1465
	JP1 = JH +1	A04 3000	1466
	WA = EW(JH,KG)	A04 3010	1467
C		A04 3020	1468
	OO 1270 L=1,3	A04 3030	1469
	LP3= L +3	A04 3040	1470
	B(L)= EV(JH,KG,L)	A04 3050	1471
1270	D(L)= EV(JL,KG,L)	A04 3060	1472
C		A04 3070	1473
	SHE = B(2)	A04 3080	1474
C		A04 3090	1475
	CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CW, CF, CTAB, TAND, TANS, RATS, M1, M2)	A04 3100	1476
	CALL FLAPS(NSR, WA, SHE, XTE, CF, CTAB, TAND, B, COS3)	A04 3110	1477
C		A04 3120	1478
	WA = EW(JP1,KG)	A04 3130	1479
	SHE = O(2)	A04 3140	1480
C		A04 3150	1481
	CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CW, CF, CTAB, TAND, TANS, RATS, M1, M2)	A04 3160	1482
	CALL FLAPS(NSR, WA, SHE, XTE, CF, CTAB, TAND, D, COS3)	A04 3170	1483
C		A04 3180	1484
	IF (JSINGP(NSR),LE,JH,DR,JO,LE,J3)	A04 3190	1485
	* CALL VORTEX(P,B,D, TANV,UNIT, VI,COS2)	A04 3200	1486
	IF (JSINGP(NSR),GT,JH,AND,JO,GT,J3)	A04 3210	1487
	* CALL VORTEX(P,D,B, TANV,UNIT, VI,COS2)	A04 3220	1488
	CALL DOTP(COS1,COS2,SUM2)	A04 3230	1489
C		A04 3240	1490
	SUM2= SUM2*VI	A04 3250	1491
C		A04 3260	1492
	IF (IFLG(17)-1) 1290,1280,1280	A04 3270	1493
1280	CONTINUE	A04 3280	1494
C		A04 3290	1495
	CALL REFLEC(B,ZHEIGT,ALFAR,COSA)	A04 3300	1496
	CALL REFLEC(D,ZHEIGT,ALFAR,COSA)	A04 3310	1497
C		A04 3320	1498
	IF (JSINGP(NSR),LE,JH,DR,JO,LE,J3)	A04 3330	1499
	* CALL VORTEX(P,B,D, TANV,UNIT, VI,COS2)	A04 3340	1500
	IF (JSINGP(NSR),GT,JH,AND,JO,GT,J3)	A04 3350	1501
	* CALL VORTEX(P,D,B, TANV,UNIT, VI,COS2)	A04 3360	1502
	CALL DOTP(COS1,COS2,SUM4)	A04 3370	1503
C		A04 3380	1504
	SUM2= SUM2 + SUM4*VI	A04 3390	1505
C		A04 3400	1506
1290	CONTINUE	A04 3410	1507
C		A04 3420	1508
1300	CONTINUE	A04 3430	1509
C		A04 3440	1510
		A04 3450	1511
C		A04 3460	1512
	AMAT(NG,NV) = SUM1 + SUM2	A04 3470	1513
C		A04 3480	1514
	IF (EXECK(15)-1,0) 1310,1410,1410	A04 3490	1515
1310	IF (IFLG(20)-5) 1410,1320,1320	A04 3500	1516
1320	IF (NM-1) 1330,1330,1390	A04 3510	1517
1330	LIN= LIN +4	A04 3520	1518
	NM= 10	A04 3530	1519
	IF (LINK-LIN) 1340,1350,1350	A04 3540	1520
1340	CALL PAGE	A04 3550	1521
	LIN= LIN +4	A04 3560	1522
1350	WRITE (KOUT,1020)NSF,NSURF1,NSURF2	A04 3570	1523
1360	LIN= LIN +2	A04 3580	1524
	IF (LINK-LIN) 1370,1380,1380	A04 3590	1525
1370	CALL PAGE	A04 3600	1526
	LIN= LIN +2	A04 3610	1527
1380	WRITE (KOUT,1030)	A04 3620	1528
1390	LIN= LIN +1	A04 3630	1529
	IF (LINK-LIN) 1370,1400,1400	A04 3640	1530
1400	WRITE (KOUT,1040)JV,KV,NV,NG,VMAT(NV),AMAT(NG,NV), (PW(I),I=1,3), (BA	A04 3650	1531
	1W(I),I=1,3), (DM(I),I=1,3)	A04 3660	1532
1410	CONTINUE	A04 3670	1533
C		A04 3680	1534
		A04 3690	1535
C		A04 3700	1536
1420	CONTINUE	A04 3710	1537
1430	CONTINUE	A04 3720	1538
1440	CONTINUE	A04 3730	1539
C		A04 3740	1540
	CALL ABORTJ(4,SUM1,NG)	A04 3750	1541
C		A04 3760	1542
		A04 3770	1543
C		A04 3780	1544
1450	CONTINUE	A04 3790	1545
C		A04 3800	1546
	IF (EXECK(15)-1,0) 1460,1480,1480	A04 3810	1547
1460	IF (IFLG(20)-5) 1480,1470,1470	A04 3820	1548
1470	WRITE (KOUT,1000)	A04 3830	1549
	LIN= LIN +1	A04 3840	1550
1480	CONTINUE	A04 3850	1551
C		A04 3860	1552
		A04 3870	1553
C		A04 3880	1554
	LIN= LIN +3	A04 3890	1555
	IF (LINK-LIN) 1490,1500,1500	A04 3900	1556
1490	CALL PAGE	A04 3910	1557
	GO TO 1510	A04 3920	1558
1500	WRITE (KOUT,1010)	A04 3930	1559
1510	CONTINUE	A04 3940	1560
C		A04 3950	1561
		A04 3960	1562
C		A04 3970	1563
		A04 3980	1564
C		A04 3990	1565
	* SOLVE FOR GAMA *	A04 4000	1566
C			

NM= 0	A04 4010	1567
SUP= 0.0	A04 4020	1568
DO 1540 J=1,NV	A04 4030	1569
DO 1530 K=1,NG	A04 4040	1570
NM= NM+1	A04 4050	1571
1530 SUP= SUP + DABS(AMAT(K,J))	A04 4060	1572
1540 CONTINUE	A04 4070	1573
C	A04 4080	1574
SCALE = FLDAT(NM)	A04 4090	1575
SCALE = SUP/SCALE	A04 4100	1576
C	A04 4110	1577
DO 1560 J=1,NV	A04 4120	1578
DO 1550 K=1,NG	A04 4130	1579
1550 AMAT(J,K)= AMAT(J,K)/SCALE	A04 4140	1580
1560 CONTINUE	A04 4150	1581
C	A04 4160	1582
C	A04 4170	1583
CALL DMATIN(AMAT,NV,DETERM)	A04 4180	1584
C	A04 4190	1585
C	A04 4200	1586
NG= 0	A04 4210	1587
DO 1640 NSR=NSURF1,NSURF2	A04 4220	1588
C	A04 4230	1589
J0 = JND(NSR)	A04 4240	1590
J3 = JN1(NSR)	A04 4250	1591
J4 = JN2(NSR)	A04 4260	1592
K4 = KNZ(NSR)	A04 4270	1593
C	A04 4280	1594
DO 1630 K=1,K4	A04 4290	1595
DO 1620 J=J0,J4	A04 4300	1596
IF (JSINGP(NSR).EQ.J) GO TO 1620	A04 4310	1597
NG=NG+1	A04 4320	1598
C	A04 4330	1599
SUP= 0.0	A04 4340	1600
NV= 0	A04 4350	1601
DO 1590 NSF=NSURF1,NSURF2	A04 4360	1602
C	A04 4370	1603
NZERO= JND(NSF)	A04 4380	1604
J1 = JN1(NSF)	A04 4390	1605
J2 = JN2(NSF)	A04 4400	1606
K2 = KNZ(NSF)	A04 4410	1607
C	A04 4420	1608
DO 1590 KV=1,K2	A04 4430	1609
DO 1570 JV=NZERO,J2	A04 4440	1610
IF (JSINGP(NSF).EQ.JV) GO TO 1570	A04 4450	1611
NV=NV+1	A04 4460	1612
SUP = SUP - VMAT(NV)*AMAT(NV,NG)	A04 4470	1613
1570 CONTINUE	A04 4480	1614
1580 CONTINUE	A04 4490	1615
1590 CONTINUE	A04 4500	1616
C	A04 4510	1617
SUP = SUP/SCALE	A04 4520	1618
SUM = -SUP	A04 4530	1619
C	A04 4540	1620
EG(J,K)= SUM/FECK(1)	A04 4550	1621
C	A04 4560	1622
ITEST= J3 - J0	A04 4570	1623
IF (ITEST) 1600,1620,1620	A04 4580	1624
1600 JH = J3 + J4 - J	A04 4590	1625
IF(JSINGP(NSR).NE.0) JH= J - J0 +J3	A04 4600	1626
IF (JH-J) 1610,1620,1620	A04 4610	1627
1610 EG(JH,K)= EG(J,K)	A04 4620	1628
1620 CONTINUE	A04 4630	1629
1630 CONTINUE	A04 4640	1630
1640 CONTINUE	A04 4650	1631
C	A04 4660	1632
C	A04 4670	1633
C	A04 4680	1634
C	A04 4690	1635
C * SOLVE FOR INDUCED VELOCITY MATRIX *	A04 4700	1636
C	A04 4710	1637
DO 1800 NSF=NSURF1,NSURF2	A04 4720	1638
C	A04 4730	1639
NZERO= JND(NSF)	A04 4740	1640
J1 = JN1(NSF)	A04 4750	1641
J2 = JN2(NSF)	A04 4760	1642
K2 = KNZ(NSF)	A04 4770	1643
C	A04 4780	1644
DO 1790 K=1,K2	A04 4790	1645
DO 1780 J=NZERO,J2	A04 4800	1646
IF (JSINGP(NSF).EQ.J) GO TO 1780	A04 4810	1647
C	A04 4820	1648
JP1= J +1	A04 4830	1649
WA = EW(J,K)	A04 4840	1650
SYMGF2= SYMGF(NSF) -1.0	A04 4850	1651
SYMGF3=- SYMGF(NSF) +2.0	A04 4860	1652
SYMLDG= SYMLF(NSF)	A04 4870	1653
C	A04 4880	1654
DO 1650 L=1,3	A04 4890	1655
LP3= L +3	A04 4900	1656
SUMSL(L)= 0.0	A04 4910	1657
R(L)= EV(J,K,L)	A04 4920	1658
1650 D(L)= EV(JP1, K,L)	A04 4930	1659
C	A04 4940	1660
SHE = R(2)	A04 4950	1661
C	A04 4960	1662
CALL CORDF(WA,YA,XLE,XTE,ZLE,EPS,CW,CF,CTAB,TAND,TANS,RATS,M1,M2)	A04 4970	1663
CALL FLAPS(NSF,WA,SHE,XTE,CF,CTAB,TAND, B,COS 3)	A04 4980	1664
C	A04 4990	1665
WA = EW(JP1,KG)	A04 5000	1666
SHE = D(2)	A04 5010	1667
C	A04 5020	1668
CALL CORDF(WA,YA,XLE,XTE,ZLE,EPS,CW,CF,CTAB,TAND,TANS,RATS,M1,M2)	A04 5030	1669
CALL FLAPS(NSF,WA,SHE,XTE,CF,CTAB,TAND, D,COS 3)	A04 5040	1670
C	A04 5050	1671
DO 1660 L=1,3	A04 5060	1672

1660 P(L)= 0.5*(B(L)+D(L))	A04 5070	1673
C	A04 5080	1674
C	A04 5090	1675
DO 1740 NSR=NSURF1,NSURF2	A04 5100	1676
C	A04 5110	1677
JO = JNO(NSR)	A04 5120	1678
J3 = JN1(NSR)	A04 5130	1679
J4 = JN2(NSR)	A04 5140	1680
K4 = KN2(NSR)	A04 5150	1681
SYMGF2= SYMGF(NSR) -1.0	A04 5160	1682
SYMGF3=-SYMGF(NSR) +2.0	A04 5170	1683
C	A04 5180	1684
DO 1730 KG=1,K4	A04 5190	1685
DO 1720 JG=J3,J4	A04 5200	1686
IF (JSINGP(NSR).EQ.JG) GO TO 1720	A04 5210	1687
C	A04 5220	1688
JP1= JG +1	A04 5230	1689
WA = EMIJG,KG	A04 5240	1690
C	A04 5250	1691
DO 1670 L=1,3	A04 5260	1692
LP3= L +3	A04 5270	1693
B(L)= EV(JG,KG,L)	A04 5280	1694
1670 D(L)= EV(JP1,KG,L)	A04 5290	1695
C	A04 5300	1696
SHE = B(2)	A04 5310	1697
C	A04 5320	1698
CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CW, CF, CTAB, TAND, TANS, RATS, M1, M2)	A04 5330	1699
CALL FLAPS(NSF, WA, SHE, XTE, CF, CTAB, TAND, B, COS3)	A04 5340	1700
C	A04 5350	1701
WA = EMIJ1,KG	A04 5360	1702
SHE = D(2)	A04 5370	1703
C	A04 5380	1704
CALL CORDF(WA, YA, XLE, XTE, ZLE, EPS, CW, CF, CTAB, TAND, TANS, RATS, M1, M2)	A04 5390	1705
CALL FLAPS(NSF, WA, SHE, XTE, CF, CTAB, TAND, D, COS3)	A04 5400	1706
C	A04 5410	1707
C	A04 5420	1708
CALL VORTEX(P, B, D, TANV, UNIT, VI, COS2)	A04 5430	1709
C	A04 5440	1710
DO 1680 L=1,3	A04 5450	1711
1680 SUMSL(L)= SUMSL(L) - EG(JG,KG)*VI*COS2(L)	A04 5460	1712
C	A04 5470	1713
IF (IFLG(171)-1) 1710,1690,1690	A04 5480	1714
1690 CONTINUE	A04 5490	1715
C	A04 5500	1716
CALL REFLEC(B, ZHEIGT, ALFAR, COSA)	A04 5510	1717
CALL REFLEC(D, ZHEIGT, ALFAR, COSA)	A04 5520	1718
C	A04 5530	1719
CALL VORTEX(P, B, D, TANV, UNIT, VI, COS2)	A04 5540	1720
C	A04 5550	1721
DO 1700 L=1,3	A04 5560	1722
1700 SUMSL(L)= SUMSL(L) - EG(JG,KG)*VI*COS2(L)	A04 5570	1723
1710 CONTINUE	A04 5580	1724
C	A04 5590	1725
1720 CONTINUE	A04 5600	1726
1730 CONTINUE	A04 5610	1727
1740 CONTINUE	A04 5620	1728
C	A04 5630	1729
DO 1750 L=1,3	A04 5640	1730
1750 VVINDX(J,K,L)= SUMSL(L)*EHECK(1)	A04 5650	1731
C	A04 5660	1732
ITEST= J1 - NZERC	A04 5670	1733
IF (ITEST) 1760,1780,1780	A04 5680	1734
1760 JH= J1 *J2 -J	A04 5690	1735
IF(JSINGP(NSF).NE.0) JH= J -NZERO +J1	A04 5700	1736
IF (JH-J) 1770,1780,1780	A04 5710	1737
1770 CONTINUE	A04 5720	1738
C	A04 5730	1739
VVINDX(JH,K,1) = VVINDX(J,K,1)	A04 5740	1740
VVINDX(JH,K,2) = -VVINDX(J,K,2)	A04 5750	1741
VVINDX(JH,K,3) = VVINDX(J,K,3)	A04 5760	1742
C	A04 5770	1743
1780 CONTINUE	A04 5780	1744
1790 CONTINUE	A04 5790	1745
1800 CONTINUE	A04 5800	1746
C	A04 5810	1747
C	A04 5820	1748
C	A04 5830	1749
C	A04 5840	1750
C	A04 5850	1751
C	A04 5860	1752
C	A04 5870	1753
C	A04 5880	1754
DO 1830 L=1,3	A04 5890	1755
ZUMLG(L) = 0.0	A04 5900	1756
ZUMPG(L) = 0.0	A04 5910	1757
ZACNG(L) = 0.0	A04 5920	1758
SUMLG(L) = 0.0	A04 5930	1759
SUMPG(L) = 0.0	A04 5940	1760
FACNG(L) = 0.0	A04 5950	1761
DO 1820 M=1,2	A04 5960	1762
DO 1810 N=1,5	A04 5970	1763
ZUM(L,N,L) = 0.0	A04 5980	1764
ZUMR(L,N,L) = 0.0	A04 5990	1765
ZUMP(L,N,L) = 0.0	A04 6000	1766
SUM(L,N,L) = 0.0	A04 6010	1767
SUMR(L,N,L) = 0.0	A04 6020	1768
1810 SUMP(L,N,L) = 0.0	A04 6030	1769
1820 CONTINUE	A04 6040	1770
1830 CONTINUE	A04 6050	1771
C	A04 6060	1772
DO 1840 N=1,NSURF	A04 6070	1773
FACN(N,1) = 2.0/WINGD(N,6)	A04 6080	1774
FACN(N,2) = FACN(N,1)/WINGD(N,9)	A04 6090	1775
1840 FACN(N,3) = FACN(N,1)/WINGD(N,1)	A04 6100	1776
FACNG(1) = 2.0/REFS	A04 6110	1777
FACNG(2) = FACNG(1)/REFC	A04 6120	1778
FACNG(3) = FACNG(1)/REFB		
C		

C		A04 6130	1779
C		A04 6140	1780
	DD 2110 NSF=NSURF1,NSURF2	A04 6150	1781
		A04 6160	1782
C	NM = 0	A04 6170	1783
	J1 = JN1(NSF)	A04 6180	1784
	J2 = JN2(NSF)	A04 6190	1785
	K2 = KN2(NSF)	A04 6200	1786
	N00 = NSS0(NSF)	A04 6210	1787
		A04 6220	1788
C	SYMGF2 = SYMGF(NSF) -1.0	A04 6230	1789
	SYMGF3 = -SYMGF(NSF) *2.0	A04 6240	1790
		A04 6250	1791
C	DD 2100 J=J1,J2	A04 6260	1792
	IF (JSINGP(NSF).EQ.J) GO TO 2100	A04 6270	1793
		A04 6280	1794
C	JP1 = J +1	A04 6290	1795
	W1 = EW(J,1)	A04 6300	1796
	W2 = EW(JP1,1)	A04 6310	1797
	IF(JSINGP(NSF).GT.J.AND.JNO(NSF).GT.J1) W1= W2	A04 6320	1798
	IF(JSINGP(NSF).GT.J.AND.JNO(NSF).GT.J1) W2= EW(J,1)	A04 6330	1799
	WA = EWF(INOD)	A04 6340	1800
	WB = 2.0*(W1-WA)	A04 6350	1801
	TEST= ABS(W1-W2) -0.1	A04 6360	1802
	IF (TEST) 1860,1860,1850	A04 6370	1803
1850	WA = (W1+W2)/2.0	A04 6380	1804
	WB = ABS(W1-W2)	A04 6390	1805
1860	CONTINUE	A04 6400	1806
		A04 6410	1807
C	CALL CORDF(W1,Y1,XL1,XT1,ZL1,EP1,CW1,CF1,CB1,TAD1,TAS1,RATS,M1,M2)	A04 6420	1808
	CALL CORDF(W2,Y2,XL2,XT2,ZL2,EP2,CW2,CF2,CB2,TAD2,TAS2,RATS,M1,M2)	A04 6430	1809
	CALL CORDF(WA,YA,XLE,XTE,ZLE,EP5,CW,CF,CTAB,TAND,TASD, RATS,M1,M2)	A04 6440	1810
		A04 6450	1811
C	TANLE= (XL2-XL1)/0.0001	A04 6460	1812
	TANDE= (ZL2-ZL1)/0.0001	A04 6470	1813
	FOSLE= ABS(Y2-Y1)/0.0001	A04 6480	1814
	IF(FOSLE.GT.0.0001) TANLE= TANLE/FOSLE	A04 6490	1815
	IF(FOSLE.GT.0.0001) TAND = TAND/FOSLE	A04 6500	1816
	IF(TEST.LT.0.0) TANLF= 0.0	A04 6510	1817
	IF(TEST.LT.0.0) TAND = 0.0	A04 6520	1818
	FOSLE = SQRT(1.0 + TANLE**2)	A04 6530	1819
	XHE = 0.5*(XT1+XT2 -CF1-CF2)	A04 6540	1820
	XHEE = 0.5*(XT1+XT2 -CB1-CB2)	A04 6550	1821
	COSD = 1.0/SQRT(1.0 + TAND**2)	A04 6560	1822
	SIND= 1.0	A04 6570	1823
	IF(TAND.LT.0) SIND= -1.0	A04 6580	1824
	IF(COSD.GT.0.0001) SIND= TAND*COSD	A04 6590	1825
	CW = 0.5*(CW1+CW2)	A04 6600	1826
	DD 1870 L=1,4	A04 6610	1827
1870	ZUMSL(L) = 0.0	A04 6620	1828
		A04 6630	1829
C		A04 6640	1830
	DD 2040 K=1,K2	A04 6650	1831
		A04 6660	1832
C	NM= NM +1	A04 6670	1833
		A04 6680	1834
C	COS1(1)= VVINDX(J,K,1) + COSA	A04 6690	1835
	COS1(2)= VVINDX(J,K,2)	A04 6700	1836
	COS1(3)= VVINDX(J,K,3) - SINA	A04 6710	1837
C		A04 6720	1838
	DD 1890 L=1,3	A04 6730	1839
	B(L)= EV(J,K,L)	A04 6740	1840
1880	D(L)= EV(JP1,K,L)	A04 6750	1841
		A04 6760	1842
C	SH1 = B(2)	A04 6770	1843
	SH2 = D(2)	A04 6780	1844
		A04 6790	1845
C	CALL FLAPS(NSF,W1,SH1,XT1,CF1,CB1,TAD1, B,COS3)	A04 6800	1846
	CALL FLAPS(NSF,W2,SH2,XT2,CF2,CB2,TAD2, D,COS3)	A04 6810	1847
		A04 6820	1848
C	SUMB = 0.0	A04 6830	1849
	DD 1890 L=1,3	A04 6840	1850
	P(L)= 0.5*(B(L) + D(L))	A04 6850	1851
	COS2(L)= D(L)-B(L)	A04 6860	1852
	IF(JSINGP(NSF).GT.J.AND.JNO(NSF).GT.J1) COS2(L)= -COS2(L)	A04 6870	1853
1890	SUMB = SUMB + COS2(L)**2	A04 6880	1854
	SUMB = SQRT(SUMB)	A04 6890	1855
	DD 1900 L=1,3	A04 6900	1856
1900	COS2(L) = COS2(L)/SUMB	A04 6910	1857
		A04 6920	1858
C		A04 6930	1859
	CALL CROSP(COS1,COS2,COS3)	A04 6940	1860
		A04 6950	1861
C	SLIFT= EG(J,K)*SUMB	A04 6960	1862
		A04 6970	1863
C		A04 6980	1864
	DD 1910 L=1,3	A04 6990	1865
	SUMSL(L)= SLIFT*COS3(L)	A04 7000	1866
	ZUMSL(L) = ZUMSL(L) + SUMSL(L)	A04 7010	1867
	SUMLG(L)= SUMLG(L) + SUMSL(L)	A04 7020	1868
	SUML(1,NSF,L)= SUML(1,NSF,L) + SUMSL(L)	A04 7030	1869
1910	SUML(2,NSF,L)= SUML(1,NSF,L)	A04 7040	1870
		A04 7050	1871
C	X1 = P(1) - WINGD(NSF,1)	A04 7060	1872
	X2 = P(2)	A04 7070	1873
	X3 = P(3) - WINGD(NSF,12)	A04 7080	1874
		A04 7090	1875
C	SUMP(1,NSF,1)= SLMP(1,NSF,1) + (X1*SUMSL(3) -X3*SUMSL(1))	A04 7100	1876
	SUMP(1,NSF,2)= SLMP(1,NSF,2) - (X2*SUMSL(3) -X3*SUMSL(2))	A04 7110	1877
	SUMP(1,NSF,3)= SLMP(1,NSF,3) - (X2*SUMSL(1) -X1*SUMSL(2))	A04 7120	1878
		A04 7130	1879
C	X1 = P(1) - WINGD(1,1)	A04 7140	1880
	X2 = P(2)	A04 7150	1881
	X3 = P(3) - WINGD(1,12)	A04 7160	1882
		A04 7170	1883
C	SUMP(2,NSF,1)= SLMP(2,NSF,1) + (X1*SUMSL(3) - X3*SUMSL(1))	A04 7180	1884

	SUMP(2,NSF,2) = SUMP(2,NSF,2) - (X2*SUMSL(3) - X3*SUMSL(2))	A04 7190	1885
	SUMP(2,NSF,3) = SUMP(2,NSF,3) - (X2*SUMSL(1) - X1*SUMSL(2))	A04 7200	1886
C		A04 7210	1887
	X1 = P(1) - XCG	A04 7220	1888
	X2 = P(2) - YCG	A04 7230	1889
	X3 = P(3) - ZCG	A04 7240	1890
C		A04 7250	1891
	SUMPG(1) = SUMP(1) + (X1*SUMSL(3) - X3*SUMSL(1))	A04 7260	1892
	SUMPG(2) = SUMP(2) - (X2*SUMSL(3) - X3*SUMSL(2))	A04 7270	1893
	SUMPG(3) = SUMP(3) - (X2*SUMSL(1) - X1*SUMSL(2))	A04 7280	1894
C		A04 7290	1895
	SUMB = 0.0	A04 7300	1896
	DD 1920 L=1,3	A04 7310	1897
1920	SUMB = SUMB + SUMSL(L)**2	A04 7320	1898
	SUMSL(4) = SQR(T(SUMB))	A04 7330	1899
	DD 1930 L=1,3	A04 7340	1900
1930	SUMSL(L) = SUMSL(L)/SUMSL(4)	A04 7350	1901
C		A04 7360	1902
C		A04 7370	1903
C		A04 7380	1904
	IF (EXECK(15)-1.C) 1940,2030,2030	A04 7390	1905
1940	IF (IFLG(20)-2) 2030,1950,1950	A04 7400	1906
1950	IF (NM-1) 1960,1960,2010	A04 7410	1907
1960	LIN = LIN +4	A04 7420	1908
	NM = 10	A04 7430	1909
	IF (LINX-LIN) 1970,1980,1980	A04 7440	1910
1970	CALL PAGE	A04 7450	1911
	LIN = LIN +4	A04 7460	1912
1980	WRITE (KOUT,1050)NSF,NSURF1,NSURF2	A04 7470	1913
	LIN = LIN +2	A04 7480	1914
	IF (LINX-LIN) 1990,2000,2000	A04 7490	1915
1990	CALL PAGE	A04 7500	1916
	LIN = LIN +2	A04 7510	1917
2000	WRITE (KOUT,1060)	A04 7520	1918
2010	LIN = LIN +1	A04 7530	1919
	IF (LINX-LIN) 1990,2020,2020	A04 7540	1920
2020	CPLIFT = -2.0*SLIFT/FS(J,K)	A04 7550	1921
	WRITE (KOUT,1070)J,K,(P(1),1=1,3),ES(J,K),CPLIFT,(COS3(1),1=1,3),(	A04 7560	1922
	1VVINDX(J,K,1),1=1,3),EG(J,K)	A04 7570	1923
2030	CONTINUE	A04 7580	1924
C		A04 7590	1925
C		A04 7600	1926
2040	CONTINUE	A04 7610	1927
C		A04 7620	1928
	P(1) = XLE	A04 7630	1929
	P(3) = ZLE	A04 7640	1930
C		A04 7650	1931
	SCTS = ZUMSL(1)	A04 7660	1932
	IF(SCTS.GT.0.0) SCTS= 0.0	A04 7670	1933
	SNFC = ABS(FOSLE*SCTS)	A04 7680	1934
	IF(ZUMSL(3).LT.0.0) SNFC = -SNFC	A04 7690	1935
	ZUMSL(1) = -SCTS	A04 7700	1936
	ZUMSL(2) = SCTS*TANLE	A04 7710	1937
	ZUMSL(3) = SNFC	A04 7720	1938
C		A04 7730	1939
	X1 = P(1) - WINGD(NSF,11)	A04 7740	1940
	X2 = P(2)	A04 7750	1941
	X3 = P(3) - WINGD(NSF,12)	A04 7760	1942
C		A04 7770	1943
	ZUMP(1,NSF,1) = ZUMP(1,NSF,1) + (X1*ZUMSL(3) - X3*ZUMSL(1))	A04 7780	1944
	ZUMP(1,NSF,2) = ZUMP(1,NSF,2) - (X2*ZUMSL(3) - X3*ZUMSL(2))	A04 7790	1945
	ZUMP(1,NSF,3) = ZUMP(1,NSF,3) - (X2*ZUMSL(1) - X1*ZUMSL(2))	A04 7800	1946
C		A04 7810	1947
	X1 = P(1) - WINGD(1,11)	A04 7820	1948
	X2 = P(2)	A04 7830	1949
	X3 = P(3) - WINGD(1,12)	A04 7840	1950
C		A04 7850	1951
	ZUMP(2,NSF,1) = ZUMP(2,NSF,1) + (X1*ZUMSL(3) - X3*ZUMSL(1))	A04 7860	1952
	ZUMP(2,NSF,2) = ZUMP(2,NSF,2) - (X2*ZUMSL(3) - X3*ZUMSL(2))	A04 7870	1953
	ZUMP(2,NSF,3) = ZUMP(2,NSF,3) - (X2*ZUMSL(1) - X1*ZUMSL(2))	A04 7880	1954
C		A04 7890	1955
	X1 = P(1) - XCG	A04 7900	1956
	X2 = P(2) - YCG	A04 7910	1957
	X3 = P(3) - ZCG	A04 7920	1958
C		A04 7930	1959
	ZUMPG(1) = ZUMPG(1) + (X1*ZUMSL(3) - X3*ZUMSL(1))	A04 7940	1960
	ZUMPG(2) = ZUMPG(2) - (X2*ZUMSL(3) - X3*ZUMSL(2))	A04 7950	1961
	ZUMPG(3) = ZUMPG(3) - (X2*ZUMSL(1) - X1*ZUMSL(2))	A04 7960	1962
C		A04 7970	1963
	DD 2050 L=1,3	A04 7980	1964
	ZUMLG(L) = ZUMLG(L) + ZUMSL(L)	A04 7990	1965
	ZUML(1,NSF,L) = ZUML(1,NSF,L) + ZUMSL(L)	A04 8000	1966
2050	ZUML(2,NSF,L) = ZUML(1,NSF,L)	A04 8010	1967
C		A04 8020	1968
	IF (EXECK(15)-1.C) 2060,2100,2100	A04 8030	1969
2060	IF (IFLG(20)-2) 2100,2070,2070	A04 8040	1970
2070	LIN = LIN +2	A04 8050	1971
	IF (LINX-LIN) 2080,2090,2090	A04 8060	1972
2080	CALL PAGE	A04 8070	1973
	GO TO 2100	A04 8080	1974
2090	WRITE (KOUT,1000)	A04 8090	1975
	WRITE (KOUT,1000)	A04 8100	1976
2100	CONTINUE	A04 8110	1977
C		A04 8120	1978
C		A04 8130	1979
	SUMR(1,NSF,1) = (SUML(1,NSF,1)*COSA - SUML(1,NSF,3)*SINA)	A04 8140	1980
	SUMR(1,NSF,2) = SUML(1,NSF,2)	A04 8150	1981
	SUMR(1,NSF,3) = (-SUML(1,NSF,3)*COSA - SUML(1,NSF,1)*SINA)	A04 8160	1982
C		A04 8170	1983
	SUMR(2,NSF,1) = SUMR(1,NSF,1)	A04 8180	1984
	SUMR(2,NSF,2) = SUMR(1,NSF,2)	A04 8190	1985
	SUMR(2,NSF,3) = SUMR(1,NSF,3)	A04 8200	1986
C		A04 8210	1987
	SUML(1,NSF,3) = -SUML(1,NSF,3)	A04 8220	1988
C		A04 8230	1989
	SUML(2,NSF,3) = -SUML(1,NSF,3)	A04 8240	1990

ZUMR(1,NSF,1) = (ZUML(1,NSF,1)*COS(A) - ZUML(1,NSF,3)*SIN(A))	A04 8250	1991
ZUMR(1,NSF,2) = ZUML(1,NSF,2)	A04 8260	1992
ZUMR(1,NSF,3) = (-ZUML(1,NSF,3)*COS(A) - ZUML(1,NSF,1)*SIN(A))	A04 8270	1993
C	A04 8280	1994
ZUMR(2,NSF,1) = ZUMR(1,NSF,1)	A04 8290	1995
ZUMR(2,NSF,2) = ZUMR(1,NSF,2)	A04 8300	1996
ZUMR(2,NSF,3) = ZUMR(1,NSF,3)	A04 8310	1997
C	A04 8320	1998
ZUML(1,NSF,3) = -ZUML(1,NSF,3)	A04 8330	1999
ZUML(2,NSF,3) = -ZUML(1,NSF,3)	A04 8340	2000
C	A04 8350	2001
2110 CONTINUE	A04 8360	2002
C	A04 8370	2003
C	A04 8380	2004
C	A04 8390	2005
DO 2130 N=NSURF1,NSURF2	A04 8400	2006
C	A04 8410	2007
DO 2120 L=1,3	A04 8420	2008
ZUML(2,N,L) = ZUML(1,N,L)*FACN(1,1)	A04 8430	2009
ZUMR(2,N,L) = ZUMR(1,N,L)*FACN(1,1)	A04 8440	2010
ZUML(1,N,L) = ZUML(1,N,L)*FACN(N,1)	A04 8450	2011
ZUMR(1,N,L) = ZUMR(1,N,L)*FACN(N,1)	A04 8460	2012
SUML(2,N,L) = SUML(1,N,L)*FACN(1,1)	A04 8470	2013
SUMR(2,N,L) = SUMR(1,N,L)*FACN(1,1)	A04 8480	2014
SUML(1,N,L) = SUML(1,N,L)*FACN(N,1)	A04 8490	2015
2120 SUMR(1,N,L) = SUMR(1,N,L)*FACN(N,1)	A04 8500	2016
C	A04 8510	2017
ZUMP(1,N,1) = ZUMP(1,N,1)*FACN(N,2)	A04 8520	2018
ZUMP(1,N,2) = ZUMP(1,N,2)*FACN(N,3)	A04 8530	2019
ZUMP(1,N,3) = ZUMP(1,N,3)*FACN(N,3)	A04 8540	2020
ZUMP(2,N,1) = ZUMP(2,N,1)*FACN(1,2)	A04 8550	2021
ZUMP(2,N,2) = ZUMP(2,N,2)*FACN(1,3)	A04 8560	2022
ZUMP(2,N,3) = ZUMP(2,N,3)*FACN(1,3)	A04 8570	2023
C	A04 8580	2024
SUMP(1,N,1) = SUMP(1,N,1)*FACN(N,2)	A04 8590	2025
SUMP(1,N,2) = SUMP(1,N,2)*FACN(N,3)	A04 8600	2026
SUMP(1,N,3) = SUMP(1,N,3)*FACN(N,3)	A04 8610	2027
SUMP(2,N,1) = SUMP(2,N,1)*FACN(1,2)	A04 8620	2028
SUMP(2,N,2) = SUMP(2,N,2)*FACN(1,3)	A04 8630	2029
2130 SUMP(2,N,3) = SUMP(2,N,3)*FACN(1,3)	A04 8640	2030
C	A04 8650	2031
C	A04 8660	2032
DO 2150 N=2,NSURF2	A04 8670	2033
DO 2140 L=1,3	A04 8680	2034
ZUML(2,1,L) = ZUML(2,1,L) + ZUML(2,N,L)	A04 8690	2035
ZUMR(2,1,L) = ZUMR(2,1,L) + ZUMR(2,N,L)	A04 8700	2036
ZUMP(2,1,L) = ZUMP(2,1,L) + ZUMP(2,N,L)	A04 8710	2037
SUML(2,1,L) = SUML(2,1,L) + SUML(2,N,L)	A04 8720	2038
SUMR(2,1,L) = SUMR(2,1,L) + SUMR(2,N,L)	A04 8730	2039
2140 SUMP(2,1,L) = SUMP(2,1,L) + SUMP(2,N,L)	A04 8740	2040
2150 CONTINUE	A04 8750	2041
C	A04 8760	2042
ZUML(1,NSF,L) = ZUML(1,NSF,L) + ZUMSL(L)	A04 8770	2043
2050 ZUML(2,NSF,L) = ZUML(1,NSF,L)	A04 8780	2044
C	A04 8790	2045
IF (EXECK(15)-1.C) 2060,2100,2100	A04 8800	2046
2060 IF (IFLG(201-21) 2100,2070,2070	A04 8810	2047
2070 LIN = LIN + 2	A04 8820	2048
IF (LTX-LIN) 2080,2090,2090	A04 8830	2049
2080 CALL PAGE	A04 8840	2050
GO TO 2100	A04 8850	2051
2090 WRITE (KOUT,1000)	A04 8860	2052
WRITE (KOUT,1000)	A04 8870	2053
2100 CONTINUE	A04 8880	2054
C	A04 8890	2055
C	A04 8900	2056
SUMR(1,NSF,1) = (ZUML(1,NSF,1)*COS(A) - SUML(1,NSF,3)*SIN(A))	A04 8910	2057
SUMR(1,NSF,2) = SUML(1,NSF,2)	A04 8920	2058
SUMR(1,NSF,3) = (-SUML(1,NSF,3)*COS(A) - SUML(1,NSF,1)*SIN(A))	A04 8930	2059
C	A04 8940	2060
SUMR(2,NSF,1) = SUMR(1,NSF,1)	A04 8950	2061
SUMR(2,NSF,2) = SUMR(1,NSF,2)	A04 8960	2062
SUMR(2,NSF,3) = SUMR(1,NSF,3)	A04 8970	2063
C	A04 8980	2064
SUML(1,NSF,3) = -SUML(1,NSF,3)	A04 8990	2065
SUML(2,NSF,3) = -SUML(1,NSF,3)	A04 9000	2066
C	A04 9010	2067
ZUMR(1,NSF,1) = (ZUML(1,NSF,1)*COS(A) - ZUML(1,NSF,3)*SIN(A))	A04 9020	2068
ZUMR(1,NSF,2) = ZUML(1,NSF,2)	A04 9030	2069
ZUMR(1,NSF,3) = (-ZUML(1,NSF,3)*COS(A) - ZUML(1,NSF,1)*SIN(A))	A04 9040	2070
C	A04 9050	2071
ZUMR(2,NSF,1) = ZUMR(1,NSF,1)	A04 9060	2072
ZUMR(2,NSF,2) = ZUMR(1,NSF,2)	A04 9070	2073
ZUMR(2,NSF,3) = ZUMR(1,NSF,3)	A04 9080	2074
C	A04 9090	2075
ZUML(1,NSF,3) = -ZUML(1,NSF,3)	A04 9100	2076
ZUML(2,NSF,3) = -ZUML(1,NSF,3)	A04 9110	2077
C	A04 9120	2078
2110 CONTINUE	A04 9130	2079
C	A04 9140	2080
C	A04 9150	2081
C	A04 9160	2082
DO 2130 N=NSURF1,NSURF2	A04 9170	2083
C	A04 9180	2084
DO 2120 L=1,3	A04 9190	2085
ZUML(2,N,L) = ZUML(1,N,L)*FACN(1,1)	A04 9200	2086
ZUMR(2,N,L) = ZUMR(1,N,L)*FACN(1,1)	A04 9210	2087
ZUML(1,N,L) = ZUML(1,N,L)*FACN(N,1)	A04 9220	2088
ZUMR(1,N,L) = ZUMR(1,N,L)*FACN(N,1)	A04 9230	2089
SUML(2,N,L) = SUML(1,N,L)*FACN(1,1)	A04 9240	2090
SUMR(2,N,L) = SUMR(1,N,L)*FACN(1,1)	A04 9250	2091
SUML(1,N,L) = SUML(1,N,L)*FACN(N,1)	A04 9260	2092
2120 SUMR(1,N,L) = SUMR(1,N,L)*FACN(N,1)	A04 9270	2093
C	A04 9280	2094
ZUMP(1,N,1) = ZUMP(1,N,1)*FACN(N,2)	A04 9290	2095
ZUMP(1,N,2) = ZUMP(1,N,2)*FACN(N,3)	A04 9300	2096

ZUMP(1,N,3) = ZUMP(1,N,3)*FACN(N,3)	A04 9310	2097
ZUMP(2,N,1) = ZUMP(2,N,1)*FACN(1,2)	A04 9320	2098
ZUMP(2,N,2) = ZUMP(2,N,2)*FACN(1,3)	A04 9330	2099
ZUMP(2,N,3) = ZUMP(2,N,3)*FACN(1,3)	A04 9340	2100
C	A04 9350	2101
SUMP(1,N,1) = SUMP(1,N,1)*FACN(N,2)	A04 9360	2102
SUMP(1,N,2) = SUMP(1,N,2)*FACN(N,3)	A04 9370	2103
SUMP(1,N,3) = SUMP(1,N,3)*FACN(N,3)	A04 9380	2104
SUMP(2,N,1) = SUMP(2,N,1)*FACN(1,2)	A04 9390	2105
SUMP(2,N,2) = SUMP(2,N,2)*FACN(1,3)	A04 9400	2106
2130 SUMP(2,N,3) = SUMP(2,N,3)*FACN(1,3)	A04 9410	2107
C	A04 9420	2108
C	A04 9430	2109
DO 2150 N=2,NSURF2	A04 9440	2110
DO 2140 L=1,3	A04 9450	2111
ZUML(2,1,L) = ZUML(2,1,L) + ZUML(2,N,L)	A04 9460	2112
ZUMR(2,1,L) = ZUMR(2,1,L) + ZUMR(2,N,L)	A04 9470	2113
ZUMP(2,1,L) = ZUMP(2,1,L) + ZUMP(2,N,L)	A04 9480	2114
SUML(2,1,L) = SUML(2,1,L) + SUML(2,N,L)	A04 9490	2115
SUMR(2,1,L) = SUMR(2,1,L) + SUMR(2,N,L)	A04 9500	2116
2140 SUMP(2,1,L) = SUMP(2,1,L) + SUMP(2,N,L)	A04 9510	2117
2150 CONTINUE	A04 9520	2118
C	A04 9530	2119
DO 2160 L=1,3	A04 9540	2120
ZUMLG(L) = ZUMLG(L)*FACNG(1)	A04 9550	2121
2160 SUMLG(L) = SUMLG(L)*FACNG(1)	A04 9560	2122
ZUMLG(3) = -ZUMLG(3)	A04 9570	2123
SUMLG(3) = -SUMLG(3)	A04 9580	2124
C	A04 9590	2125
ZUMPG(1) = ZUMPG(1)*FACNG(2)	A04 9600	2126
ZUMPG(2) = ZUMPG(2)*FACNG(3)	A04 9610	2127
ZUMPG(3) = ZUMPG(3)*FACNG(3)	A04 9620	2128
C	A04 9630	2129
SUMPG(1) = SUMP(1)*FACNG(2)	A04 9640	2130
SUMPG(2) = SUMP(2)*FACNG(3)	A04 9650	2131
SUMPG(3) = SUMP(3)*FACNG(3)	A04 9660	2132
C	A04 9670	2133
ZACNG(2) = ZUMLG(1)*COSA + ZUMLG(3)*SINA	A04 9680	2134
ZACNG(3) = ZUMLG(2)	A04 9690	2135
ZACNG(1) = ZUMLG(3)*COSA - ZUMLG(1)*SINA	A04 9700	2136
C	A04 9710	2137
FACNG(2) = SUMLG(1)*COSA + SUMLG(3)*SINA	A04 9720	2138
FACNG(3) = SUMLG(2)	A04 9730	2139
FACNG(1) = SUMLG(3)*COSA - SUMLG(1)*SINA	A04 9740	2140
C	A04 9750	2141
C	A04 9760	2142
C	A04 9770	2143
C	A04 9780	2144
** LIFTING SURFACES AIRLOAD SECTION COEFFICIENTS **	A04 9790	2145
C	A04 9800	2146
DO 2360 NSF=NSURF1,NSURF2	A04 9810	2147
C	A04 9820	2148
NM = 0	A04 9830	2149
J1 = JN1(NSF)	A04 9840	2150
J2 = JN2(NSF)	A04 9850	2151
K2 = KN2(NSF)	A04 9860	2152
NZERO = JN0(NSF)	A04 9870	2153
N00 = NSS0(NSF)	A04 9880	2154
C	A04 9890	2155
SYMGF2 = SYMGF(NSF) -1.0	A04 9900	2156
SYMGF3 = -SYMGF(NSF) +2.0	A04 9910	2157
SPAN = WINGD(NSF,1)	A04 9920	2158
C	A04 9930	2159
DO 2330 J=NZERO,J2	A04 9940	2160
IF (JSTINGP(NSF).EQ.J) GO TO 2330	A04 9950	2161
C	A04 9960	2162
JP1= J +1	A04 9970	2163
NM = NM +1	A04 9980	2164
W1 = EW(J,1)	A04 9990	2165
W2 = EW(JP1,1)	A0410000	2166
WA = EWE(N00)	A0410010	2167
WB = 2.0*(W1-WA)	A0410020	2168
TEST = ABS(W1 - W2) - 0.001	A0410030	2169
IF (TEST) 2180,2180,2170	A0410040	2170
2170 WA = (W1+W2)/2.0	A0410050	2171
WB = ABS(W1-W2)	A0410060	2172
2180 CONTINUE	A0410070	2173
RW = WA	A0410080	2174
C	A0410090	2175
CALL CORDF(W1,Y1,XL1,XT1,ZL1,EP1,CW1,CF1,CB1,TAD1,TAS1,RATS,M1,M2)	A0410100	2176
CALL CORDF(W2,Y2,XL2,XT2,ZL2,EP2,CW2,CF2,CB2,TAD2,TAS2,RATS,M1,M2)	A0410110	2177
CALL CORDF(WA,YA,XLE,XTE,ZLE,EPS,CW,CF,CTAB,TAND,TASD, RATS,M1,M2)	A0410120	2178
C	A0410130	2179
TANLE = (ELE(M2)-ELE(M1))/WB	A0410140	2180
FOSLE = SQRT(1.0 + TANLE**2)	A0410150	2181
XHE = 0.5*(XT1+XT2 -CF1-CF2)	A0410160	2182
XHEE = 0.5*(XT1+XT2 -CB1-CB2)	A0410170	2183
COSD = 1.0/SQRT(1.0 + TAND**2)	A0410180	2184
SIND= 1.0	A0410190	2185
IF(TAND.LT.0) SIND= -1.0	A0410200	2186
IF(COSD.GT.0.0001) SIND= TAND*COSD	A0410210	2187
CW = 0.5*(CW1+CW2)	A0410220	2188
AREA= WB*CW*(COSD*SYMGF2 + SIND*SYMGF3)	A0410230	2189
IF(AREA.LT.1.E-6) AREA=WB*CW*(COSD*SYMGF3 + SIND*SYMGF2)	A0410240	2190
XCO4 = 0.5*(XL1+XL2) + 0.25*CW	A0410250	2191
C	A0410260	2192
SCN = 0.0	A0410270	2193
SCX = 0.0	A0410280	2194
SPM = 0.0	A0410290	2195
SCL = 0.0	A0410300	2196
SCD = 0.0	A0410310	2197
C	A0410320	2198
C	A0410330	2199
DO 2250 K=1,K2	A0410340	2200
C	A0410350	2201
COS1(1)= VVINDX(I,K,1) + COSA	A0410360	2202
COS1(2)= VVINDX(I,K,2)		

	COSI(3)= VVINDX(J,K,3) - SINB	AD410370	2203
C		AD410380	2204
	DO 2190 L=1,3	AD410390	2205
	LP3= L +3	AD410400	2206
	B(L)= EV(J,K,L)	AD410410	2207
2190	D(L)= EV(JP1,K,L)	AD410420	2208
C		AD410430	2209
	SH1 = B(2)	AD410440	2210
C		AD410450	2211
	CALL FLAPS(NSF,W1,SH1,XT1,CF1,CB1,TAD1, B,COS3)	AD410460	2212
	CALL FLAPS(NSF,W2,SH2,XT2,CF2,CB2,TAD2, D,COS3)	AD410470	2213
C		AD410480	2214
	SUMB = 0.0	AD410490	2215
	DO 2200 L=1,3	AD410500	2216
	P(L)= 0.5*(B(L) + D(L))	AD410510	2217
	COS2(L)= D(L)-B(L)	AD410520	2218
2200	SUMB= SUMB + COS2(L)**2	AD410530	2219
	SUMB = SQRT(SUMB)	AD410540	2220
	DO 2210 L=1,3	AD410550	2221
2210	COS2(L)= COS2(L)/SUMB	AD410560	2222
C		AD410570	2223
C		AD410580	2224
	CALL CRISP(COS1,COS2,COS3)	AD410590	2225
C		AD410600	2226
	SLIFT= EG(J,K)*SLPB	AD410610	2227
C		AD410620	2228
C		AD410630	2229
	DO 2220 L=1,3	AD410640	2230
2220	SUMSL(L)= SLIFT*COS3(L)	AD410650	2231
C		AD410660	2232
C		AD410670	2233
	DCN = -SUMSL(3)*SYMGF2 + SUMSL(1)*SYMGF3	AD410680	2234
C		AD410690	2235
	SCN = SCN + DCN	AD410700	2236
	SCX = SCX + SUMSL(1)	AD410710	2237
	SPM = SPM - DCN*(P(1)-XC04)/CW	AD410720	2238
C		AD410730	2239
C		AD410740	2240
	SUMB= 0.0	AD410750	2241
	DO 2230 L=1,3	AD410760	2242
2230	SUMB= SUMB + SUMSL(L)**2	AD410770	2243
	SUMSL(4)= SQRT(SUMB)	AD410780	2244
	DO 2240 L=1,3	AD410790	2245
2240	SUMSL(L)= SUMSL(L)/SUMSL(4)	AD410800	2246
C		AD410810	2247
C		AD410820	2248
2250	CONTINUE	AD410830	2249
C		AD410840	2250
C		AD410850	2251
	SCN= SCN*(2.0/AREA)	AD410860	2252
	SCX= SCX*(2.0/AREA)	AD410870	2253
	SPM= SPM*(2.0/AREA)	AD410880	2254
C		AD410890	2255
	SCL= SYMGF2*(SCN*COSA-SCX*SINA)+SYMGF3*(SCN)	AD410900	2256
	SCD= SYMGF2*(SCX*SINA+SCN*SINA)+SYMGF3*(SCX*COSA)	AD410910	2257
C		AD410920	2258
	SCLCOR= SCL*CW/SPAN	AD410930	2259
C		AD410940	2260
	RY = EN(J,1,2)	AD410950	2261
	RZ = EN(J,1,3)	AD410960	2262
C		AD410970	2263
C		AD410980	2264
	IF (NM-1) 2260,2260,2310	AD410990	2265
2260	LIN= LIN +4	AD411000	2266
	IF (LINX-LIN) 2270,2280,2280	AD411010	2267
2270	CALL PAGE	AD411020	2268
	LIN= LIN +4	AD411030	2269
2280	WRITE (KOUT,1080)ASF,NSURF1,NSURF2	AD411040	2270
	LIN= LIN +2	AD411050	2271
	IF (LINX-LIN) 2290,2300,2300	AD411060	2272
2290	CALL PAGE	AD411070	2273
	LIN= LIN +2	AD411080	2274
2300	WRITE (KOUT,1090)	AD411090	2275
2310	LIN= LIN+1	AD411100	2276
	IF (LINX-LIN) 2290,2320,2320	AD411110	2277
2320	YTB= (EN(J,1,2)*SYMGF2 + EN(J2,1,3)-EN(J,1,3)*SYMGF3)/SPAN	AD411120	2278
C		AD411130	2279
C		AD411140	2280
	WRITE (KOUT,1100)J,YOB,RY,RZ,RW,SCN,SCX,SCL,SCD,SPM,SCLCOR,ISUMSL	AD411150	2281
	(I),I=1,3)	AD411160	2282
	LIN= LIN +1	AD411170	2283
C		AD411180	2284
C		AD411190	2285
2330	CONTINUE	AD411200	2286
	LIN= LIN +2	AD411210	2287
	IF (LINX-LIN) 2340,2350,2350	AD411220	2288
2340	CALL PAGE	AD411230	2289
	GO TO 2360	AD411240	2290
2350	WRITE (KOUT,1000)	AD411250	2291
	WRITE (KOUT,1000)	AD411260	2292
2360	CONTINUE	AD411270	2293
C		AD411280	2294
C		AD411290	2295
C		AD411300	2296
C	** LIFTING SURFACES AIRLOAD SUMMARY **	AD411310	2297
C		AD411320	2298
	LIN = LIN + 12	AD411330	2299
C		AD411340	2300
	IF (LINX-LIN) 2370,2380,2380	AD411350	2301
2370	CALL PAGE	AD411360	2302
	LIN = LIN + 12	AD411370	2303
2380	WRITE (KOUT,1110)NSURF1,NSURF2	AD411380	2304
C		AD411390	2305
C		AD411400	2306
	DO 2410 N=1,NSURF2	AD411410	2307
C		AD411420	2308

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      LIN = LIN + 2
      IF (LINX-LIN) 2390,2400,2400
2390 CALL PAGE
      LIN = LIN + 12
      WRITE (KOUT,1110)NSURF1,NSURF2
2400 CONTINUE
C
      WRITE (KOUT,1120)N,SUML(1,N,3),SUML(1,N,1),SUML(1,N,2),SUMR(1,N,3)
      1,SUMR(1,N,1),{SUMP(1,N,I),I=1,3},WINGD(N,11),WINGD(N,12),WINGD(N,6)
      2),WINGD(N,9),WINGD(N,11)
C
      WRITE (KOUT,1140)N,ZUML(1,N,3),ZUML(1,N,1),ZUML(1,N,2),ZUMR(1,N,3)
      1,ZUMR(1,N,1),{ZUMP(1,N,I),I=1,3},WINGD(N,11),WINGD(N,12),WINGD(N,6)
      2),WINGD(N,9),WINGD(N,11)
C
2410 CONTINUE
C
      LIN = LIN + 11
      IF (LINX-LIN) 2420,2430,2430
2420 CALL PAGE
      LIN = LIN + 11
2430 CONTINUE
C
      WRITE (KOUT,1130)SUML(2,1,3),SUML(2,1,1),SUML(2,1,2),SUMR(2,1,3),
      1,UMR(2,1,1),{SUMP(2,1,I),I=1,3},WINGD(1,11),WINGD(1,12),WINGD(1,6),
      2)WINGD(1,9),WINGD(1,11),SUMLG(3),{SUMLG(I),I=1,2},{FACNG(I),I=1,2},
      3SUMP(I),I=1,3},XCG,ZCG,REFS,REFC,REFB,ZUML(2,1,3),ZUML(2,1,1),
      4L(2,1,2),ZUMR(2,1,3),ZUMR(2,1,1),{ZUMP(2,1,I),I=1,3},WINGD(1,11),
      5WINGD(1,12),WINGD(1,6),WINGD(1,9),WINGD(1,11),ZUMLG(3),{ZUMLG(I),I=1,2},
      6,2},{ZACNG(I),I=1,2},{ZUMPG(I),I=1,3},XCG,ZCG,REFS,REFC,REFB,
      7M,SCALE
C
C
      RETURN
C
      END

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A0411430	2309
A0411440	2310
A0411450	2311
A0411460	2312
A0411470	2313
A0411480	2314
A0411490	2315
A0411500	2316
A0411510	2317
A0411520	2318
A0411530	2319
A0411540	2320
A0411550	2321
A0411560	2322
A0411570	2323
A0411580	2324
A0411590	2325
A0411600	2326
A0411610	2327
A0411620	2328
A0411630	2329
A0411640	2330
A0411650	2331
A0411660	2332
A0411670	2333
A0411680	2334
A0411690	2335
A0411700	2336
A0411710	2337
A0411720	2338
A0411730	2339
A0411740	2340
A0411750	2341
A0411760	2342
A0411770	2343
A0411780	2344


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V FOR A05,A05
C
C
      SUBROUTINE ABORTJ(INDGO,TEST,ITEST)
C
C
      * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *
      * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
      COMMON/DATA01/ KIN, KOUT, KT1, KT2, KT3, KREC, KFILE, LIN, LINX
      1 ,RAD, PIE, CUTOF1, CUTOF2, DELALF, LFLAP, LDRAG, COLCOP
      2 ,IFLG(20), EXECK(15)
C
      EQUIVALENCE (D,N)
C
      DATA CMK/0.90/
      DATA I5/5/,I10/10/,I100/100/,I60/60/,I25/30/
C
1000 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      1 23HND.OF LIFTING SURFACE S=,I2,17H EXCEEDS FIVE **/,3X,57(1H*) )
C
1010 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      2 20HND.OF SPAN ELEMENTS=,I2,16H EXCEEDS 60 **/,3X,63(1H*) )
C
1020 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      3 21HND.OF CHORD ELEMENTS=,I2,16H EXCEEDS TEN **/,3X,65(1H*) )
C
1030 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      4 29HND.OF VORTEX MATRIX ELEMENTS=,I2,16H EXCEEDS 100 **/,3X,72(1H*)
      *H*) )
C
1040 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      5 9HMACH NO.=, F6.3, 17H EXCEEDS 0.90 **/,3X,57(1H*) )
C
1050 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      6 17HND.SPAN STATIONS=,I2,15H EXCEEDS 25 **/,3X,59(1H*) )
C
1060 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      7 18HND.CHORD STATIONS=,I2,15H EXCEEDS 10 **/,3X,60(1H*) )
C
1070 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      8 20HND.OF SPAN ELEMENTS=,I2,18H NOT PERMITTED **/,3X,65(1H*) )
C
1080 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      9 26HND.OF WING CHORD ELEMENTS=,I2,18H NOT PERMITTED **/,3X,71(1H*)
      **) )
C
1090 FORMAT(1X,/,3X,25H *** JOB ABORTED BECAUSE ,
      * 32HINPUT ERROR IN NSS FLAG, NSS(N)=I2,11H.LT.NSS (M)=I2,4H **/,
      * /,4X,75(1H*) )
C
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
C
      GO TO (1100,1110,1120,1130,1140,1150,1160,1170,1180,1190),NDGO
1100 IF (I5.LT.ITEST) WRITE (KOUT,1000)ITEST
      IF (I5.LT.ITEST) CALL EXIT
      RETURN
1110 IF (I60.LT.ITEST) WRITE (KOUT,1010)ITEST
      IF (I60.LT.ITEST) CALL EXIT
      RETURN
1120 IF (I10.LT.ITEST) WRITE (KOUT,1020)ITEST
      IF (I10.LT.ITEST) CALL EXIT

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A05 10	2345
A05 20	2346
A05 30	2347
A05 40	2348
A05 50	2349
A05 60	2350
A05 70	2351
A05 80	2352
A05 90	2353
A05 100	2354
A05 110	2355
A05 120	2356
A05 130	2357
A05 140	2358
A05 150	2359
A05 160	2360
A05 170	2361
A05 180	2362
A05 190	2363
A05 200	2364
A05 210	2365
A05 220	2366
A05 230	2367
A05 240	2368
A05 250	2369
A05 260	2370
A05 270	2371
A05 280	2372
A05 290	2373
A05 300	2374
A05 310	2375
A05 320	2376
A05 330	2377
A05 340	2378
A05 350	2379
A05 360	2380
A05 370	2381
A05 380	2382
A05 390	2383
A05 400	2384
A05 410	2385
A05 420	2386
A05 430	2387
A05 440	2388
A05 450	2389
A05 460	2390
A05 470	2391
A05 480	2392
A05 490	2393
A05 500	2394
A05 510	2395
A05 520	2396
A05 530	2397
A05 540	2398
A05 550	2399
A05 560	2400
A05 570	2401
A05 580	2402
A05 590	2403
A05 600	2404
A05 610	2405
A05 620	2406
A05 630	2407
A05 640	2408
A05 650	2409
A05 660	2410
A05 670	2411

ORIGINAL PAGE
OF POOR QUALITY

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RETURN A05 680 2412
1130 IF (I100.LT.ITEST) WRITE (KOUT,1030)ITEST A05 690 2413
IF(I100.LT.ITEST) CALL EXIT A05 700 2414
RETURN A05 710 2415
1140 IF (CMAX.LT.TEST) WRITE (KOUT,1040)ITEST A05 720 2416
IF(CMAX.LT.TEST) CALL EXIT A05 730 2417
RETURN A05 740 2418
1150 IF (I125.LT.ITEST) WRITE (KOUT,1050)ITEST A05 750 2419
IF(I125.LT.ITEST) CALL EXIT A05 760 2420
RETURN A05 770 2421
1160 IF (I110.LT.ITEST) WRITE (KOUT,1060)ITEST A05 780 2422
IF(I110.LT.ITEST) CALL EXIT A05 790 2423
RETURN A05 800 2424
1170 IF (ITEST.LT.0) WRITE (KOUT,1070)ITEST A05 810 2425
IF(ITEST.LT.0) CALL EXIT A05 820 2426
RETURN A05 830 2427
1180 IF (ITEST.LT.0) WRITE (KOUT,1080)ITEST A05 840 2428
IF(ITEST.LT.0) CALL EXIT A05 850 2429
RETURN A05 860 2430
1190 0= TEST A05 870 2431
IF (N.LE.ITEST) WRITE (KOUT,1090)N,ITEST A05 880 2432
IF(N.LE.ITEST) CALL EXIT A05 890 2433
RETURN A05 900 2434
C A05 910 2435
END A05 920 2436

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V FOR A06,A06 A06 10 2437
C A06 20 2438
C A06 30 2439
SUBROUTINE CORDF(WA, YA, XLE, XTE, ZLE, EPS, CW, CF, CTB, TAND, TANS, R, M1, M1) A06 40 2440
C A06 50 2441
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A06 60 2442
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A06 70 2443
C A06 80 2444
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A06 90 2445
C A06 100 2446
COMMON/DATA02/ N,NG, NFUS, NVTAIL, NSS(5), NSS0(5), NCS(5) A06 110 2447
1 ,X(30), Y(30), Z(30), E(30), C(30), XOCR(30), FLAPC(30), TABC(30) A06 120 2448
2 ,WSMOTH, EWE(30), ELE(30), ETE(30), EHE(30), EHEE(30) A06 130 2449
3 ,KOC(10,5), ZOC(10,30) A06 140 2450
C A06 150 2451
C A06 160 2452
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A06 170 2453
C A06 180 2454
C A06 190 2455
C A06 200 2456
M= -1 A06 210 2457
NX= 30 A06 220 2458
DO 1020 L=2,NX A06 230 2459
IF (M) 1000,1000,1020 A06 240 2460
1000 TEST= WA - EWE(L) -0.001 A06 250 2461
IF (TEST) 1010,1010,1020 A06 260 2462
1010 M=L A06 270 2463
1020 CONTINUE A06 280 2464
C A06 290 2465
IF (M-2) 1030,1040,1040 A06 300 2466
1030 M=2 A06 310 2467
1040 M1= M-1 A06 320 2468
C A06 330 2469
RATS=(WA-EWF(M1))/(EWE(M)-EWE(M1)) A06 340 2470
C A06 350 2471
XLE = ELE(M1) + RATS*( ELE(M) - ELE(M1) ) A06 360 2472
XTE = ETE(M1) + RATS*( ETE(M) - ETE(M1) ) A06 370 2473
XHE = EHE(M1) + RATS*( EHE(M) - EHE(M1) ) A06 380 2474
XHEE= EHEE(M1)+ RATS*( EHEE(M) -EHEE(M1) ) A06 390 2475
EPS = E(M1) + RATS*( E(M)-E(M1) ) A06 400 2476
ZLE = Z(M1) + RATS*( Z(M)-Z(M1) ) A06 410 2477
CW = XTE - XLE A06 420 2478
CF = XTE - XHE A06 430 2479
CTB= XTE - XHEE A06 440 2480
R = RATS A06 450 2481
C A06 460 2482
DY = Y(M)-Y(M1) A06 470 2483
DW = EWE(M)-EWE(M1) A06 480 2484
YA = Y(M1) + RATS*DY A06 490 2485
TAND = 100000.0 A06 500 2486
TEST= ABS(DY) -0.001 A06 510 2487
C A06 520 2488
IF (TEST) 1060,1060,1050 A06 530 2489
1050 TAND= (Z(M1)-Z(M))/DY A06 540 2490
1060 TANS= (X(M)+C(M)*(0.25-XOCR(M))-X(M1)-C(M1)*(0.25-XOCR(M1)))/DW A06 550 2491
C A06 560 2492
RETURN A06 570 2493
C A06 580 2494
C A06 590 2495
END A06 600 2496

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V FOR A07,A07 A07 10 2497
C A07 20 2498
C A07 30 2499
SUBROUTINE CAMBRF(NSF,NK,M1,M2,RATS, EPS,XLE,CW, XF,ZF) A07 40 2500
C A07 50 2501
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A07 60 2502
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A07 70 2503
C A07 80 2504
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A07 90 2505
C A07 100 2506
DIMENSION ZOCY(10) A07 110 2507
C A07 120 2508
COMMON/DATA01/ KEN, KOUT, KT1, KT2, KT3, KREC, KFILE, LIN, LINX A07 130 2509
1 ,RAO, PIE, CUTOF1, CUTOF2, DELALF, LFLAP, LDRAG, COLOCP A07 140 2510
2 ,IFLG(20), EXECK(15) A07 150 2511

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C	COMMON/DATA02/ N/WING, NFUS, N/VTAIL, NSS(5), NSSO(5), NCS(5)	A07 160	2512
	1, X(30), Y(30), Z(30), E(30), C(30), XOCR(30), FLAPC(30), TABC(30)	A07 170	2513
	2, WSMOTH, EWE(30), ELE(30), ETE(30), EHE(30), EHEE(30)	A07 180	2514
	3, XDC(10,5), ZOC(10,30)	A07 190	2515
C	XX	A07 200	2516
C		A07 210	2517
C		A07 220	2518
C		A07 230	2519
C		A07 240	2520
C		A07 250	2521
C		A07 260	2522
	IF(CW.LE=1.0E-4) RETURN	A07 270	2523
	DO 1000 L=1,NK	A07 280	2524
1000	ZOCY(L)= ZOC(L,M1) + RATS*(ZOC(L,M2)-ZOC(L,M1))	A07 290	2525
C		A07 300	2526
	XOCREF = XOCR(M1) + RATS*(XOCR(M2)-XOCR(M1))	A07 310	2527
	TANE = TAN(PPS/RAD)	A07 320	2528
	XOCT = (XF-XLE)/CW	A07 330	2529
C		A07 340	2530
	N2 = -1	A07 350	2531
	DO 1030 L=2,NK	A07 360	2532
	IF (N2) 1010,1010,1030	A07 370	2533
1010	TEST= XOCT - XOC(L,NSF) - 0.001	A07 380	2534
	IF (TEST) 1020,1020,1030	A07 390	2535
1020	N2=L	A07 400	2536
1030	CONTINUE	A07 410	2537
	IF (N2-1) 1040,1040,1050	A07 420	2538
1040	N2= 2	A07 430	2539
1050	N1= N2-1	A07 440	2540
C		A07 450	2541
	RAT = (XOCT - XOC(N1,NSF))/(XOC(N2,NSF)-XOC(N1,NSF))	A07 460	2542
	DELZ= CW*(ZOCY(N1) + RAT*(ZOCY(N2)-ZOCY(N1)))	A07 470	2543
C		A07 480	2544
	ZF = ZF + DELZ + TANE*(XF - XLE - CW*XOCREF)	A07 490	2545
C		A07 500	2546
	RETURN	A07 510	2547
C		A07 520	2548
	END	A07 530	2549
▽	FOR A08,A08	A08 10	2550
C		A08 20	2551
C		A08 30	2552
C	SUBROUTINE FLAPS(NSF,WA,SHEK,XTE,CF,CTAB,TAND, P,COSN)	A08 40	2553
		A08 50	2554
C	* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A08	60	2555
C	* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A08	70	2556
C		A08 80	2557
C	XX	A08 90	2558
C		A08 100	2559
	REAL NDA1L,NOGO	A08 110	2560
	DIMENSION P(3), COSN(3)	A08 120	2561
C		A08 130	2562
C		A08 140	2563
	COMMON/DATA01/ KIN, KOUT, KT1, KT2, KT3, KREC, KFILE, LIN, LINK	A08 150	2564
	1, RAD, PIE, CUTOF1, CUTOF2, DELALF, LFLAP, LORAG, COLOCP	A08 160	2565
	2, IFLG(20), EXECK(15)	A08 170	2566
C		A08 180	2567
	COMMON/DATA02/ N/WING, NFUS, N/VTAIL, NSS(5), NSSO(5), NCS(5)	A08 190	2568
	1, X(30), Y(30), Z(30), E(30), C(30), XOCR(30), FLAPC(30), TABC(30)	A08 200	2569
	2, WSMOTH, EWE(30), ELE(30), ETE(30), EHE(30), EHEE(30)	A08 210	2570
	3, XDC(10,5), ZOC(10,30)	A08 220	2571
C		A08 230	2572
	COMMON/DATA03/FLAPDJ(5),TABDJ(5),A1LDJ(2,5),DELTF1(5),DELTF2(5)	A08 240	2573
	1, WFF1(5), WFF2(5), WFF3(5), WFF4(5), WFF5(5)	A08 250	2574
	2, WFLAP1(5), WFLAP2(5), WFLAP3(5)	A08 260	2575
C		A08 270	2576
C	XX	A08 280	2577
C		A08 290	2578
C		A08 300	2579
C		A08 310	2580
	N= NSF	A08 320	2581
	N10= NSF +10	A08 330	2582
	NOFLAP = IFLG(N10)	A08 340	2583
	IF(NOFLAP.LT.1) NOFLAP= 1	A08 350	2584
	NOTAB = NOFLAP - 1	A08 360	2585
C		A08 370	2586
C		A08 380	2587
	IF (NOFLAP) 1310,1310,1000	A08 390	2588
1000	XFLAP = P(1) - (XTE - CF)	A08 400	2589
	XTAB = P(1) - (XTE - CTAB)	A08 410	2590
	IF (XFLAP) 1310,1310,1010	A08 420	2591
1010	CONTINUE	A08 430	2592
C		A08 440	2593
C		A08 450	2594
	COSD = 1.0/SQRT(1.0+TAND**2)	A08 460	2595
	SINC = TAND*COSD	A08 470	2596
C		A08 480	2597
	COSX = COSN(1)	A08 490	2598
	COSY = COSN(2)*CCSD - COSN(3)*SIND	A08 500	2599
	COSZ = COSN(3)*CCSD + COSN(2)*SIND	A08 510	2600
C		A08 520	2601
	FLAPD = FLAPDJ(N)	A08 530	2602
	TABD = TABDJ(N)	A08 540	2603
	A1LD = A1LDJ(1,N)	A08 550	2604
	SIGN = 1.0	A08 560	2605
C		A08 570	2606
	IF (SHEK) 1020,1030,1030	A08 580	2607
1020	SIGN = -1.0	A08 590	2608
	A1LD = A1LDJ(2,N)	A08 600	2609
1030	CONTINUE	A08 610	2610
	NDA1L = ABS(A1LD) - 0.1	A08 620	2611
C		A08 630	2612
C		A08 640	2613
	DFLAP= 0.0	A08 650	2614

DAILD= 0.0	A08 660	2615
DTAB = 0.0	A08 670	2616
C	A08 680	2617
ND = NSSQ(N)	A08 690	2618
YA = WA - EWF(N0)	A08 700	2619
WFF32 = WFF31(N) + WFF22(N)-WFF21(N)	A08 710	2620
C	A08 720	2621
TST11 = YA - WFF11(N)	A08 730	2622
TST12 = YA - WFF12(N)	A08 740	2623
TST21 = YA - WFF21(N)	A08 750	2624
TST22 = YA - WFF22(N)	A08 760	2625
TST31 = YA - WFF31(N)	A08 770	2626
TST32 = YA - WFF32	A08 780	2627
C	A08 790	2628
C	A08 800	2629
IF (NOFLAP) 1120,1120,1040	A08 810	2630
1040 IF (WFLAP1(N)) 1CRD,1080,1050	A08 820	2631
1050 IF (TST11) 1120,1120,1060	A08 830	2632
1060 IF (TST12) 1070,1080,1080	A08 840	2633
1070 SMF = 0.5*(1.0 + SIN(PIE*(TST11/DELTF1(N) -0.5)))	A08 850	2634
DFLAP = SMF*FLAPD	A08 860	2635
DTAB = SMF*TABD	A08 870	2636
GO TO 1120	A08 880	2637
1080 IF (TST21) 1090,1090,1100	A08 890	2638
1090 SMF = 1.0	A08 900	2639
DFLAP = SMF*FLAPC	A08 910	2640
DTAB = SMF*TABD	A08 920	2641
GO TO 1120	A08 930	2642
1100 IF (TST22) 1110,1120,1120	A08 940	2643
1110 SMF = 0.5*(1.0 + SIN(PIE*(TST21/DELTF2(N) +0.5)))	A08 950	2644
DFLAP = SMF*FLAPD	A08 960	2645
DTAB = SMF*TABD	A08 970	2646
C	A08 980	2647
C	A08 990	2648
1120 IF (NOAIL) 1210,1210,1130	A08 1000	2649
1130 SMF = 1.0	A08 1010	2650
DAILD = SMF*AILD	A08 1020	2651
1140 IF (TST21) 1150,1150,1160	A08 1030	2652
1150 SMF = 0.0	A08 1040	2653
DAILD = SMF*AILD	A08 1050	2654
GO TO 1210	A08 1060	2655
1160 IF (TST22) 1170,1180,1180	A08 1070	2656
1170 SMF = 0.5*(1.0 + SIN(PIE*(TST21/DELTF2(N) -0.5)))	A08 1080	2657
DAILD = SMF*AILD	A08 1090	2658
GO TO 1210	A08 1100	2659
1180 IF (TST31) 1210,1190,1190	A08 1110	2660
1190 IF (TST32) 1200,1150,1150	A08 1120	2661
1200 SMF = 0.5*(1.0 + SIN(PIE*(TST31/DELTF2(N) +0.5)))	A08 1130	2662
DAILD = SMF*AILD	A08 1140	2663
C	A08 1150	2664
1210 CONTINUE	A08 1160	2665
C	A08 1170	2666
C	A08 1180	2667
IF (XTAB) 1260,1220,1220	A08 1190	2668
1220 NOGO = ABS(DTAB) -0.1	A08 1200	2669
IF (NOGO) 1260,1230,1230	A08 1210	2670
1230 TANF = TAN(DTAB/RAD)	A08 1220	2671
COSF = 1.0/SQRT(1.0+TANF**2)	A08 1230	2672
SINF = TANF*COSF	A08 1240	2673
DNDR = XTAB*SINF	A08 1250	2674
C	A08 1260	2675
XCOS = COSX*COSF - COSZ*SINF	A08 1270	2676
ZCOS = COSZ*COSF + COSX*SINF	A08 1280	2677
C	A08 1290	2678
COSX = XCOS	A08 1300	2679
COSZ = ZCOS	A08 1310	2680
C	A08 1320	2681
IF (LFLAP) 1240,1240,1250	A08 1330	2682
1240 P(1) = P(1) - XTAB*(1.0-COSF)	A08 1340	2683
P(2) = P(2) + DNDR*SIND	A08 1350	2684
P(3) = P(3) + DNDR*COSD	A08 1360	2685
1250 CONTINUE	A08 1370	2686
C	A08 1380	2687
C	A08 1390	2688
1260 NOGO = ABS(DFLAP + DAILD) - 0.1	A08 1400	2689
IF (NOGO) 1300,1300,1270	A08 1410	2690
1270 TANF = TAN((DFLAP + DAILD)/RAD)	A08 1420	2691
COSF = 1.0/SQRT(1.0+TANF**2)	A08 1430	2692
SINF = TANF*COSF	A08 1440	2693
DNDR = XFLAP*SINF	A08 1450	2694
C	A08 1460	2695
XCOS = COSX*COSF - COSZ*SINF	A08 1470	2696
ZCOS = COSZ*COSF + COSX*SINF	A08 1480	2697
C	A08 1490	2698
COSX = XCOS	A08 1500	2699
COSZ = ZCOS	A08 1510	2700
C	A08 1520	2701
IF (LFLAP) 1280,1280,1290	A08 1530	2702
1280 P(1) = P(1) - XFLAP*(1.0-COSF)	A08 1540	2703
P(2) = P(2) + DNDR*SIND	A08 1550	2704
P(3) = P(3) + DNDR*COSD	A08 1560	2705
1290 CONTINUE	A08 1570	2706
C	A08 1580	2707
C	A08 1590	2708
1300 CONTINUE	A08 1600	2709
C	A08 1610	2710
COSN(1) = COSX	A08 1620	2711
COSN(2) = COSY*COSD + COSZ*SIND	A08 1630	2712
COSN(3) = COSZ*COSD - COSY*SIND	A08 1640	2713
C	A08 1650	2714
C	A08 1660	2715
1310 RETURN	A08 1670	2716
C	A08 1680	2717
END	A08 1690	2718


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CALL ROTATE( XLE,ZLE, ZERC,ZERO, PHI, ZERO,ZERO, XLE,ZLE )      A11 200      2819
CALL ROTATE( YLE,XLE, ZERD,ZERO, PHIP, ZERO,ZERO, YLE,XLE )    A11 210      2820
CALL ROTATE( YLE,ZLE, ZERC,ZERO, PHIQ, ZERO,ZERO, YLE,ZLE )    A11 220      2821
C                                                                    A11 230      2822
RETURN                                                            A11 240      2823
C XXXXXX                                                            A11 250      2824
C                                                                    A11 260      2825
END                                                                A11 270      2826

V FOR A12,A12                                                    A12 10      2827
C                                                                    A12 20      2828
C                                                                    A12 30      2829
SUBROUTINE ROTATE( X,Y, XO,YO, PHI, XF,YF, XT,YT )              A12 40      2830
C                                                                    A12 50      2831
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A12 60      2832
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A12 70      2833
C                                                                    A12 80      2834
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A12 90      2835
C                                                                    A12 100     2836
KS = X-XO                                                         A12 110     2837
YS = Y-YO                                                         A12 120     2838
RHO= SQRT( XS**2 + YS**2)                                         A12 130     2839
ERRQR= 0.0001                                                    A12 140     2840
TESTX= ABS(XS)-ERRQR                                             A12 150     2841
TESTY= ABS(YS)-ERRQR                                             A12 160     2842
IF (TESTX) 1000,1C00,1030                                         A12 170     2843
1000 IF (TESTY) 1010,1010,1020                                     A12 180     2844
1010 ZET= 0.0                                                     A12 190     2845
GO TO 1110                                                         A12 200     2846
1020 ZET= 1.570795*(YS/ABS(YS)) - XS/YS                          A12 210     2847
GO TO 1110                                                         A12 220     2848
1030 ZET= ABS(YS/XS)                                              A12 230     2849
IF (TESTY) 1050,1C50,1040                                         A12 240     2850
1040 ZET=ATAN(ZET)                                               A12 250     2851
1050 CONTINUE                                                    A12 260     2852
IF (XS) 1070,1060,1060                                           A12 270     2853
1060 IF (YS) 1100,1110,1110                                       A12 280     2854
1070 IF (YS) 1090,109C,1080                                       A12 290     2855
1080 ZET= 3.14159 - ZET                                          A12 300     2856
GO TO 1110                                                         A12 310     2857
1090 ZET= 3.14159 + ZET                                          A12 320     2858
GO TO 1110                                                         A12 330     2859
1100 ZET= 6.28318 - ZET                                          A12 340     2860
1110 CONTINUE                                                    A12 350     2861
ZPP= PHI + ZET                                                   A12 360     2862
XR = RHO*COS(ZPP)                                                A12 370     2863
YR = RHO*SIN(ZPP)                                                A12 380     2864
XT= XF + XR                                                       A12 390     2865
YT= YF + YR                                                       A12 400     2866
C                                                                    A12 410     2867
RETURN                                                            A12 420     2868
C XXXXXX                                                            A12 430     2869
C                                                                    A12 440     2870
END                                                                A12 450     2871

V FOR A13,A13                                                    A13 10      2872
C                                                                    A13 20      2873
C                                                                    A13 30      2874
SUBROUTINE VORTEX(P,B,D,TANA,GAMA, VI,VCOS)                    A13 40      2875
C                                                                    A13 50      2876
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A13 60      2877
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A13 70      2878
C                                                                    A13 80      2879
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A13 90      2880
C                                                                    A13 100     2881
DIMENSION P(3),B(3),D(3)                                         A13 110     2882
DIMENSION COS1(3),COS2(3),COS3(3), X(3),A(3),VCOS(3)           A13 120     2883
DIMENSION G(3)                                                    A13 130     2884
C                                                                    A13 140     2885
COMMON/DATA01/ K1N, K0UT, K1I, K2I, K3I, KREC, KFILE, LIN, LINK A13 150     2886
1 ,RAD, PIE, CUTOF1, CUTOF2, DELALF, LFLAP, LDRAG, COLDOP       A13 160     2887
2 ,IFLG(20), EXECK(15)                                          A13 170     2888
C                                                                    A13 180     2889
NAMELIST/DBUGV1/P,B,D,TANA,GAMA,PSIF,VCOS                      A13 190     2890
NAMELIST/DBUGV2/PSIF,VCOS                                       A13 200     2891
NAMELIST/DBUGV3/PSIF,VCOS                                       A13 210     2892
C                                                                    A13 220     2893
1000 FORMAT(IX,/,1X)                                             A13 230     2894
C                                                                    A13 240     2895
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX A13 250     2896
C                                                                    A13 260     2897
C                                                                    A13 270     2898
C                                                                    A13 280     2899
NOTE= IFLG(20) - 8                                              A13 290     2900
TANAS= TANA**2                                                  A13 300     2901
COSA= 1.0 - TANAS/2.0                                           A13 310     2902
IF (TANAS=0.0001) 1020,1010,1010                                 A13 320     2903
1010 COSA= 1.0/SQRT(1+TANAS+1.0)                                  A13 330     2904
1020 SINA= COSA*TANA                                             A13 340     2905
C                                                                    A13 350     2906
SCALE= SQRT((D(1)-B(1))**2+(D(2)-B(2))**2+(D(3)-B(3))**2)     A13 360     2907
DO 1030 K=1,3                                                    A13 370     2908
X(K)= (P(K)-D, 5*(B(K)+D(K)))/SCALE                             A13 380     2909
A(K)= (0.5*(D(K)-B(K)))/SCALE                                    A13 390     2910
1030 VCOS(K)= 0.0                                               A13 400     2911
C                                                                    A13 410     2912
C                                                                    A13 420     2913
C                                                                    A13 430     2914
C * SEGMENT INF-A-B *                                           A13 440     2915
C                                                                    A13 450     2916
H5 = TANA*( X(1)+ A(1))                                         A13 460     2917
C                                                                    A13 470     2918

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	HS1 = (X(1)+A(1))**2 + H5**2	A13 480	2919
	HS2 = (X(2)+A(2))**2 + (X(3)+A(3)-H5)**2	A13 490	2920
	HS3 = (X(1)+A(1))**2 + (X(2)+A(2))**2 + (X(3)+A(3))**2	A13 500	2921
	H1 = SQRT(HS1)	A13 510	2922
	H2 = SQRT(HS2)	A13 520	2923
C		A13 530	2924
	COSG= 0.0	A13 540	2925
	SING= 1.0	A13 550	2926
	TEST = CUTOFL - H1	A13 560	2927
C		A13 570	2928
	IF (TEST) 1040,1050,1050	A13 580	2929
1040	COSG= (HS3-HS1-HS2)/(2.0*H1*H2)	A13 590	2930
	SING= SQRT(ABS(1.0-COSG**2))	A13 600	2931
1050	CONTINUE	A13 610	2932
C		A13 620	2933
	R = H2*SING	A13 630	2934
	H4 = H2*COSG	A13 640	2935
	SH14= H1+H4	A13 650	2936
C		A13 660	2937
	PSIF= (1.0 +SH14/SQRT(SH14**2+R**2))/R	A13 670	2938
C		A13 680	2939
	COS1(1) = COSA	A13 690	2940
	COS1(2) = 0.0	A13 700	2941
	COS1(3) = SINA	A13 710	2942
	COS2(1) = (X(1)+A(1)-SH14*COSA)/R	A13 720	2943
	COS2(2) = (X(2)+A(2))/R	A13 730	2944
	COS2(3) = (X(3)+A(3)-SH14*SINA)/R	A13 740	2945
C		A13 750	2946
	CALL CROSP(COS1,COS2,COS3)	A13 760	2947
C		A13 770	2948
	DO 1060 K=1,3	A13 780	2949
1060	VCOS(K)= PSIF*CCS3(K)	A13 790	2950
C		A13 800	2951
	IF (NOTE) 1080,1070,1070	A13 810	2952
1070	WRITE (KOUT,1000)	A13 820	2953
	WRITE (KOUT,DBUGV1)	A13 830	2954
1080	CONTINUE	A13 840	2955
C		A13 850	2956
C		A13 860	2957
C		A13 870	2958
C	* SEGMENT D-E-INF *	A13 880	2959
C		A13 890	2960
	H5 = TANA*(X(1)-A(1))	A13 900	2961
C		A13 910	2962
	HS1 = (X(1)-A(1))**2 + H5**2	A13 920	2963
	HS2 = (X(2)-A(2))**2 + (X(3)-A(3)-H5)**2	A13 930	2964
	HS3 = (X(1)-A(1))**2 + (X(2)-A(2))**2 + (X(3)-A(3))**2	A13 940	2965
	H1 = SQRT(HS1)	A13 950	2966
	H2 = SQRT(HS2)	A13 960	2967
C		A13 970	2968
	COSG= 0.0	A13 980	2969
	SING= 1.0	A13 990	2970
	TEST = CUTOF1 - H1	A13 1000	2971
C		A13 1010	2972
	IF (TEST) 1090,1100,1100	A13 1020	2973
1090	COSG= (HS3-HS1-HS2)/(2.0*H1+H2)	A13 1030	2974
	SING= SQRT(ABS(1.0-COSG**2))	A13 1040	2975
1100	CONTINUE	A13 1050	2976
C		A13 1060	2977
	R = H2*SING	A13 1070	2978
	H4 = H2*COSG	A13 1080	2979
	SH14= H1+H4	A13 1090	2980
C		A13 1100	2981
	PSIF= (-1.0 -SH14/SQRT(SH14**2+R**2))/R	A13 1110	2982
C		A13 1120	2983
	COS1(1)= COSA	A13 1130	2984
	COS1(2)= 0.0	A13 1140	2985
	COS1(3)= SINA	A13 1150	2986
	COS2(1)= (X(1)-A(1)-SH14*COSA)/R	A13 1160	2987
	COS2(2)= (X(2)-A(2))/R	A13 1170	2988
	COS2(3)= (X(3)-A(3)-SH14*SINA)/R	A13 1180	2989
C		A13 1190	2990
	CALL CROSP(COS1,COS2,COS3)	A13 1200	2991
C		A13 1210	2992
	DO 1110 K=1,3	A13 1220	2993
1110	VCOS(K)= VCOS(K) + PSIF*COS3(K)	A13 1230	2994
C		A13 1240	2995
	IF (NOTE) 1130,1120,1120	A13 1250	2996
1120	WRITE (KOUT,DBUGV2)	A13 1260	2997
1130	CONTINUE	A13 1270	2998
C		A13 1280	2999
C		A13 1290	3000
C		A13 1300	3001
C	* SEGMENT B-C-D *	A13 1310	3002
C		A13 1320	3003
	HS1 = 4.0*(A(1)**2 + A(2)**2 + A(3)**2)	A13 1330	3004
	HS2 = (X(1)-A(1))**2 + (X(2)-A(2))**2 + (X(3)-A(3))**2	A13 1340	3005
	HS3 = (X(1)+A(1))**2 + (X(2)+A(2))**2 + (X(3)+A(3))**2	A13 1350	3006
	H1 = SQRT(HS1)	A13 1360	3007
	H2 = SQRT(HS2)	A13 1370	3008
C		A13 1380	3009
	COSG= (HS3-HS1-HS2)/(2.0*H1*H2)	A13 1390	3010
	SING= SQRT(ABS(1.0-COSG**2))	A13 1400	3011
	PSIF= 0.0	A13 1410	3012
	TEST = ABS(SING) - CUTOF2	A13 1420	3013
C		A13 1430	3014
	IF (TEST) 1170,1170,1140	A13 1440	3015
1140	CONTINUE	A13 1450	3016
C		A13 1460	3017
	R = H2*SING	A13 1470	3018
C		A13 1480	3019
	TEST = R/H1 - 10.0*CUTOF1	A13 1490	3020
	IF (TEST) 1170,1170,1150	A13 1500	3021
1150	CONTINUE	A13 1510	3022
C		A13 1520	3023
	RS = R**2	A13 1530	3024

```

      H4 = H2*CONSG
      SH14= H1+H4
      T1= 1.0 + 2.0*H4/H1
C
      PSIF= (SH14/SQRT(SH14**2+RS) -H4/SQRT(H4**2+PS1))/R
C
      DO 1160 K=1,3
      G(K)= A(K)*T1
      COS1(K)= (G(K)-X(K))/R
1160  CCS2(K)= -2.0*A(K)/H1
C
      CALL CROSP(COS1,CCS2,COS3)
C
1170  CONTINUE
C
      VZ= 0.0
C
      DO 1180 K=1,3
      VCOS(K)= VCOS(K) + PSIF*CCS3(K)
1180  VZ= VZ + VCOS(K)**2
C
      IF (NOTE) 1200,1190,1190
1190  WRITE (KOUT,DEBUG3)
      LTN= LTNX - 10
1200  CONTINUE
C
      V1= SQRT(VZ)
      DO 1210 K=1,3
1210  VCOS(K)= VCOS(K)/V1
C
      VJ= V1*(GAMA/SCALE)
C
      RETURN
C
      XXXXXX
C
      END

```

A13	1540	3025
A13	1550	3026
A13	1560	3027
A13	1570	3028
A13	1580	3029
A13	1590	3030
A13	1600	3031
A13	1610	3032
A13	1620	3033
A13	1630	3034
A13	1640	3035
A13	1650	3036
A13	1660	3037
A13	1670	3038
A13	1680	3039
A13	1690	3040
A13	1700	3041
A13	1710	3042
A13	1720	3043
A13	1730	3044
A13	1740	3045
A13	1750	3046
A13	1760	3047
A13	1770	3048
A13	1780	3049
A13	1790	3050
A13	1800	3051
A13	1810	3052
A13	1820	3053
A13	1830	3054
A13	1840	3055
A13	1850	3056
A13	1860	3057
A13	1870	3058
A13	1880	3059
A13	1890	3060


```

▽ FOR A14,A14
C
C
      SUBROUTINE OMATINIA,N,DETERM)
C
C
      MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS
C
C
      * VERSION 2 ROUTINE (DOUBLE PRECISION-LANGLEY MATINV SUBROUTINE) *
C
C
      * TRM MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *
C
C
      * PROGRAM DEVELOPED BY A.V.GOMEZ (TRM SYSTEMS) ON JUNE-JULY 1971 *
C
C
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
      DOUBLE PRECISION R1,R2,DETERM,AMAX,T,SWAP,PIVOT,PIVOT1
      DOUBLE PRECISION A(100,100), B(1,1)
      DIMENSION IPIVOT(100),INDEX(100,2)
      EQUIVALENCE (IROW,JROW), (ICOLUJ,JCOLUJ), (AMAX, T, SWAP)
      M= 0
C
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
C
C
C
C
C
      INITIALIZATION
C
1000  ISCALE=0
1010  P1 = 1.E36
1020  R2=1.0/R1
1030  DETERM=1.0
1040  DO 1050 J=1,N
1050  IPIVOT(J)=0
1060  DO 1070 I=1,N
C
      SEARCH FOR PIVOT ELEMENT
C
1070  AMAX=0.0
1080  DO 1170 J=1,N
1090  IF (IPIVOT(J)-1) 1100,1170,1100
1100  DO 1160 K=1,N
1110  IF (IPIVOT(K)-1) 1120,1160,1150
1120  IF (DABS(AMAX)-DABS(A(J,K))) 1130,1160,1160
1130  IROW=J
1140  ICOLUJ=K
1150  AMAX=A(J,K)
1160  CONTINUE
1170  CONTINUE
      IF (AMAX) 1190,1180,1190
1180  DETERM=0.0
      ISCALE=0
      GO TO 1750
C
      XXXXXX
C
C
1190  IPIVOT(ICOLUJ)=IPIVOT(ICOLUJ)+1
C
      INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL
C
1200  IF (IROW=ICOLUJ) 1210,1310,1210
1210  DETERM=-DETERM
1220  DO 1250 L=1,N
1230  SWAP=A(IROW,L)
1240  A(IROW,L)=A(ICOLUJ,L)
1250  A(ICOLUJ,L)=SWAP
C
C
1260  IF (M) 1310,1310,1270
1270  DO 1300 L=1,M

```

A14	10	3061
A14	20	3062
A14	30	3063
A14	40	3064
A14	50	3065
A14	60	3066
A14	70	3067
A14	80	3068
A14	90	3069
A14	100	3070
A14	110	3071
A14	120	3072
A14	130	3073
A14	140	3074
A14	150	3075
A14	160	3076
A14	170	3077
A14	180	3078
A14	190	3079
A14	200	3080
A14	210	3081
A14	220	3082
A14	230	3083
A14	240	3084
A14	250	3085
A14	260	3086
A14	270	3087
A14	280	3088
A14	290	3089
A14	300	3090
A14	310	3091
A14	320	3092
A14	330	3093
A14	340	3094
A14	350	3095
A14	360	3096
A14	370	3097
A14	380	3098
A14	390	3099
A14	400	3100
A14	410	3101
A14	420	3102
A14	430	3103
A14	440	3104
A14	450	3105
A14	460	3106
A14	470	3107
A14	480	3108
A14	490	3109
A14	500	3110
A14	510	3111
A14	520	3112
A14	530	3113
A14	540	3114
A14	550	3115
A14	560	3116
A14	570	3117
A14	580	3118
A14	590	3119
A14	600	3120
A14	610	3121
A14	620	3122
A14	630	3123
A14	640	3124
A14	650	3125
A14	660	3126
A14	670	3127

1280	SWAP=B(IROW,L)	A14	680	3128
1290	B(IROW,L)=B(ICOLM,L)	A14	690	3129
1300	B(ICOLM,L)=SWAP	A14	700	3130
1310	INDEX(I,1)=IROW	A14	710	3131
1320	INDEX(I,2)=ICOLM	A14	720	3132
1330	PIVOT=A(ICOLM,ICOLM)	A14	730	3133
	IF (PIVOT) 1340,1180,1340	A14	740	3134
C		A14	750	3135
C	SCALE THE DETERMINANT	A14	760	3136
C		A14	770	3137
1340	PIVOTI=PIVOT	A14	780	3138
1350	IF (DABS(DETERM)-R1) 1380,1360,1360	A14	790	3139
1360	DETERM=DETERM/R1	A14	800	3140
	ISCALE=ISCALE+1	A14	810	3141
	IF (DABS(DETERM)-R1) 1410,1370,1370	A14	820	3142
1370	DETERM=DETERM/R1	A14	830	3143
	ISCALE=ISCALE+1	A14	840	3144
	GO TO 1410	A14	850	3145
1380	IF (DABS(DETERM)-R2) 1390,1390,1410	A14	860	3146
1390	DETERM=DETERM*R1	A14	870	3147
	ISCALE=ISCALE-1	A14	880	3148
	IF (DABS(DETERM)-R2) 1400,1400,1410	A14	890	3149
1400	DETERM=DETERM*R1	A14	900	3150
	ISCALE=ISCALE-1	A14	910	3151
1410	IF (DABS(PIVOTI)-R1) 1440,1420,1420	A14	920	3152
1420	PIVOTI=PIVOTI/R1	A14	930	3153
	ISCALE=ISCALE+1	A14	940	3154
	IF (DABS(PIVOTI)-R1) 1470,1430,1430	A14	950	3155
1430	PIVOTI=PIVOTI/R1	A14	960	3156
	ISCALE=ISCALE+1	A14	970	3157
	GO TO 1470	A14	980	3158
1440	IF (DABS(PIVOTI)-R2) 1450,1450,1470	A14	990	3159
1450	PIVOTI=PIVOTI*R1	A14	1000	3160
	ISCALE=ISCALE-1	A14	1010	3161
	IF (DABS(PIVOTI)-R2) 1460,1460,1470	A14	1020	3162
1460	PIVOTI=PIVOTI*R1	A14	1030	3163
	ISCALE=ISCALE-1	A14	1040	3164
1470	DETERM=DETERM*PIVOTI	A14	1050	3165
C		A14	1060	3166
C	DIVIDE PIVOT ROW BY PIVOT ELEMENT	A14	1070	3167
C		A14	1080	3168
1480	A(ICOLM,ICOLM)=L.O	A14	1090	3169
1490	DO 1500 L=1,N	A14	1100	3170
1500	A(ICOLM,L)=A(ICOLM,L)/PIVOT	A14	1110	3171
C		A14	1120	3172
C		A14	1130	3173
1510	IF (M) 1540,1540,1520	A14	1140	3174
1520	DO 1530 L=1,M	A14	1150	3175
1530	B(ICOLM,L)=B(ICOLM,L)/PIVOT	A14	1160	3176
C		A14	1170	3177
C	REDUCE NON-PIVOT ROWS	A14	1180	3178
C		A14	1190	3179
1540	DO 1630 LI=1,N	A14	1200	3180
1550	IF (LI-ICOLM) 1560,1630,1560	A14	1210	3181
1560	T=A(LI,ICOLM)	A14	1220	3182
1570	A(LI,ICOLM)=D.O	A14	1230	3183
1580	DO 1590 L=1,N	A14	1240	3184
1590	A(LI,L)=A(LI,L)-A(ICOLM,L)*T	A14	1250	3185
C		A14	1260	3186
C		A14	1270	3187
1600	IF (M) 1630,1630,1610	A14	1280	3188
1610	DO 1620 L=1,M	A14	1290	3189
1620	B(LI,L)=B(LI,L)-B(ICOLM,L)*T	A14	1300	3190
1630	CONTINUE	A14	1310	3191
C		A14	1320	3192
C	INTERCHANGE COLUMNS	A14	1330	3193
C		A14	1340	3194
1640	DO 1740 I=1,N	A14	1350	3195
1650	L=N+1-I	A14	1360	3196
1660	IF (INDEX(L,1)-INDEX(L,2)) 1670,1740,1670	A14	1370	3197
1670	JROW=INDEX(L,1)	A14	1380	3198
1680	JCOLM=INDEX(L,2)	A14	1390	3199
1690	DO 1730 K=L,N	A14	1400	3200
1700	SWAP=A(K,JROW)	A14	1410	3201
1710	A(K,JROW)=A(K,JCOLM)	A14	1420	3202
1720	A(K,JCOLM)=SWAP	A14	1430	3203
1730	CONTINUE	A14	1440	3204
1740	CONTINUE	A14	1450	3205
1750	RETURN	A14	1460	3206
C	XXXXXX	A14	1470	3207
C		A14	1480	3208
C	END	A14	1490	3209
∇	FOR A15,A15	A15	10	3210
C		A15	20	3211
C		A15	30	3212
C	SUBROUTINE OOTP(A,B,C)	A15	40	3213
C		A15	50	3214
C	* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A15	A15	60	3215
C	* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A15	A15	70	3216
C		A15	80	3217
C	XX	A15	90	3218
C		A15	100	3219
C	DIMENSION A(3),B(3)	A15	110	3220
C	C= A(1)*B(1)+ A(2)*B(2)+ A(3)*B(3)	A15	120	3221
C		A15	130	3222
C	RETURN	A15	140	3223
C	XXXXXX	A15	150	3224
C		A15	160	3225
C	END	A15	170	3226
∇	FOR A16,A16	A16	10	3227

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C                                     A16 20      3228
C                                     A16 30      3229
C SUBROUTINE CROSP( A,R,C1)           A16 40      3230
C                                     A16 50      3231
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A16 60      3232
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A16 70      3233
C                                     A16 80      3234
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXA16 90      3235
C                                     A16 100     3236
C DIMENSION A(3),B(3),C(3)           A16 110    3237
C                                     A16 120    3238
C C(1)= A(2)*B(3) - A(3)*B(2)       A16 130    3239
C C(2)= A(3)*B(1) - A(1)*B(3)       A16 140    3240
C C(3)= A(1)*B(2) - A(2)*B(1)       A16 150    3241
C                                     A16 160    3242
C RETURN                               A16 170    3243
C XXXXXX                               A16 180    3244
C                                     A16 190    3245
C END                                   A16 200    3246

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P FOR A17,A17                         A17 10      3247
C                                     A17 20      3248
C                                     A17 30      3249
C SUBROUTINE PAGE                       A17 40      3250
C                                     A17 50      3251
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A17 60      3252
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A17 70      3253
C                                     A17 80      3254
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXA17 90      3255
C                                     A17 100     3256
C DIMENSION A(LRDX)(2)                A17 110    3257
C                                     A17 120    3258
C COMMON/DATA00/ TITLE(14), ALFA0, ZHO, CMAK A17 130    3259
C                                     A17 140    3260
C COMMON/DATA01/ K(A, KOUT, KT1, KT2, KT3, KREC, KFILE, LIN, LINK A17 150    3261
C L,RAD, PIE, CUTOF1, CUTOF2, DELALF, LFLAP, LDRAG, COLOCP A17 160    3262
C 2,IFLG(20), EXECK(15)               A17 170    3263
C                                     A17 180    3264
C                                     A17 190    3265
C 1000 FORMAT(70H1JOBFLAG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16A17 200    3266
C 1 17 18 19 20 ,9A6,6H PAGE,/, A17 210    3267
C 2 2X,5HVALUE,LX,20I3, 7X,5HALFA=,F6.2,9H MACHNO=,F6.4,11H ALTITUDEA17 220    3268
C 3F=,F6.2, 7X,I4,/,1X) A17 230    3269
C                                     A17 240    3270
C                                     A17 250    3271
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXA17 260    3272
C                                     A17 270    3273
C                                     A17 280    3274
C IF (NSTU-1971) IC10,1020,1010 A17 290    3275
C 1010 NSTU= 1971 A17 300    3276
C FLAPDX = 0.0 A17 310    3277
C A(LRDX(1))= 0.0 A17 320    3278
C A(LRDX(2))= 0.0 A17 330    3279
C NP= 0 A17 340    3280
C 1020 NP= NP+1 A17 350    3281
C WRITE (KOUT,1000)(TITLE(I),I=1,9), (IFLG(I),I=1,20), ALFA0,CMAK,ZHO, A17 360    3282
C *NP A17 370    3283
C LIN= 5 A17 380    3284
C                                     A17 390    3285
C RETURN                               A17 400    3286
C XXXXXX                               A17 410    3287
C                                     A17 420    3288
C END                                   A17 430    3289

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P FOR A18,A18                         A18 10      3290
C                                     A18 20      3291
C                                     A18 30      3292
C MAIN ROUTINE                          A18 40      3293
C TEST MATRIX INVERSION                 A18 50      3294
C                                     A18 60      3295
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *A18 70      3296
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON JUNE-JULY 1971 *A18 80      3297
C                                     A18 90      3298
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXA18 100    3299
C                                     A18 110    3300
C DOUBLE PRECISION DELTA,AMAT(60,60),CMAT(60,60) A18 120    3301
C DOUBLE PRECISION BMAT(100,100) A18 130    3302
C                                     A18 140    3303
C 1000 FORMAT(10X,I5,2F14.4 ) A18 150    3304
C 1010 FORMAT( 1X,/,1X ) A18 160    3305
C 1020 FORMAT(10X,5(1PE14.6) ) A18 170    3306
C                                     A18 180    3307
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXA18 190    3308
C                                     A18 200    3309
C                                     A18 210    3310
C                                     A18 220    3311
C NDR= 5 A18 230    3312
C                                     A18 240    3313
C AMAT(1,1) = 1.032 A18 250    3314
C AMAT(1,2) = 7.865 A18 260    3315
C AMAT(1,3) = 3.216 A18 270    3316
C AMAT(1,4) = 3.031 A18 280    3317
C AMAT(1,5) = 10.32 A18 290    3318
C AMAT(2,1) = 7.68 A18 300    3319
C AMAT(2,2) = -6.35 A18 310    3320
C AMAT(2,3) = 8.900 A18 320    3321
C AMAT(2,4) = -1.02 A18 330    3322
C AMAT(2,5) = 5.690 A18 340    3323
C AMAT(3,1) = 3.030 A18 350    3324
C AMAT(3,2) = -3.18 A18 360    3325
C AMAT(3,3) = -11.67 A18 370    3326
C AMAT(3,4) = 4.190 A18 380    3327

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AMAT(3,5) = -3.60	A18 390	3328	
AMAT(4,1) = -2.92	A18 400	3329	
AMAT(4,2) = 5.67C	A18 410	3330	
AMAT(4,3) = 8.323	A18 420	3331	
AMAT(4,4) = 9.072	A18 430	3332	
AMAT(4,5) = 0.0378	A18 440	3333	
AMAT(5,1) = -.0578	A18 450	3334	
AMAT(5,2) = 7.103	A18 460	3335	
AMAT(5,3) = 9.992	A18 470	3336	
AMAT(5,4) = 0.57E	A18 480	3337	
AMAT(5,5) = 15.14	A18 490	3338	
C	A18 500	3339	
DO 1040 J=1,NOR	A18 510	3340	
DO 1030 K=1,NOR	A18 520	3341	
1030 BMAT(J,K)= AMAT(J,K)	A18 530	3342	
1040 CONTINUE	A18 540	3343	
C	A18 550	3344	
CALL DMATIN(BMAT,NOR,DELTA)	A18 560	3345	
C	A18 570	3346	
DO 1070 K=1,NOR	A18 580	3347	
DO 1060 J=1,NOR	A18 590	3348	
CMAT(J,K)= 0.0	A18 600	3349	
DO 1050 L=1,NOR	A18 610	3350	
1050 CMAT(J,K)= CMAT(J,K) + AMAT(J,L)*BMAT(L,K)	A18 620	3351	
1060 CONTINUE	A18 630	3352	
1070 CONTINUE	A18 640	3353	
C	A18 650	3354	
CALL PAGE	A18 660	3355	
WRITE (6,1020) ((AMAT(J,K),J=1,NOR),K=1,NOR)	A18 670	3356	
WRITE (6,1010)	A18 680	3357	
WRITE (6,1020) ((BMAT(J,K),J=1,NOR),K=1,NOR)	A18 690	3358	
WRITE (6,1010)	A18 700	3359	
WRITE (6,1020) ((CMAT(J,K),J=1,NOR),K=1,NOR)	A18 710	3360	
WRITE (6,1010)	A18 720	3361	
WRITE (6,1010)	A18 730	3362	
WRITE (6,1020) DELTA	A18 740	3363	
STOP	A18 750	3364	
END	A18 760	3365	
V FOR B01,B01	B01 10	3366	
C	B01 20	3367	
C	B01 30	3368	
C	B01 40	3369	
C	* MAIN ROUTINE WING /WING LIFT PROGRAM HADJOB/REVISED 15 MARCH 71 * B01 50	3370	
C	B01 60	3371	
C	* THEORY AND PROGRAM DEVELOPED BY ANTULIO V. GOMEZ, STAFF ENGINEER * B01 70	3372	
C	* TRW SYSTEMS GROUP, DIVISION OF TRW INC., HOUSTON, TEXAS - 77058 * B01 80	3373	
C	* VERSION 2 ROUTINE (DOUBLE PRECISION-LANGLEY MATINV SUBROUTINE) * B01 90	3374	
C	B01 100	3375	
C	* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 * B01 110	3376	
C	* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 * B01 120	3377	
C	B01 130	3378	
C	XXX B01 140	3379	
C	B01 150	3380	
C	REAL MACHN(10)	B01 160	3381
C	DIMENSION COMMTS(42)	B01 170	3382
C	DIMENSION YSPAN(42)	B01 180	3383
C	DIMENSION WCL(21),ALFA(20),HEIGHT(10)	B01 190	3384
C	DIMENSION FLAPD(10), AILRND(2,10)	B01 200	3385
C	DIMENSION FLAPDJ(10), AILDJ(2,10)	B01 210	3386
C	B01 220	3387	
C	COMMON/DATA00/NSTL ,ALFA0 ,CMAX ,ZHD ,FLAPDX,AILRDX(2)	B01 230	3388
C	* ,TITLE(14) ,STORE(14)	B01 240	3389
C	B01 250	3390	
C	COMMON/DATA01/KIN ,KOUT ,KTL ,KT2 ,LINEX ,LINES	B01 260	3391
C	B01 270	3392	
C	COMMON/DATA02/IFLG(15) ,EXECK(15) ,RAD ,PIE	B01 280	3393
C	B01 290	3394	
C	COMMON/DATA03/NYS ,NCS ,XOCREF,X(10) ,Y(10) ,Z(10) ,E(10)	B01 300	3395
C	* ,C(10) ,ZOC(10) ,XOC(10)	B01 310	3396
C	B01 320	3397	
C	COMMON/DATA04/YFLAP1,YFLAP2,FLAPC	B01 330	3398
C	* ,YALRN,AILRNC,WSMOTH	B01 340	3399
C	B01 350	3400	
C	COMMON/DATA06/YF11,YF12,YF21,YF22,YF31,YF32,DELTF1,DELTF2	B01 360	3401
C	* ,NOFLAP,NOAILR	B01 370	3402
C	B01 380	3403	
C	COMMON/DATA07/LFLAP,LDRAG,CUTOF1,CUTOF2	B01 390	3404
C	B01 400	3405	
C	EQUIVALENCE (LINX,LINFX),(NSS,NYS),(XOCR,XOCREF)	B01 410	3406
C	EQUIVALENCE (WFLAP1,YFLAP1),(WFLAP2,YFLAP2),(WFLAP3,YALRN)	B01 420	3407
C	EQUIVALENCE (FLAPDJ,FLAPD),(AILDJ,AILRND)	B01 430	3408
C	B01 440	3409	
C	B01 450	3410	
C	NAMLIST/INPUT/ KOUT, KTL, KT2, KT3, LINX, COLOCP,	B01 460	3411
C	1 CUTOF1, CUTOF2, LFLAP, LDRAG, PMECF, DELALF,	B01 470	3412
C	2 NSS, NCS, X, Y, Z, E, C, XOC, ZOC, XOCR,	B01 480	3413
C	3 WFLAP1,WFLAP2,WFLAP3,FLAPC, WSMOTH, YSPAN,	B01 490	3414
C	4 NJOB, NJOBL, ALFA, MACHN, HEIGHT, FLAPDJ, AILDJ, WCL, CLEANF,	B01 500	3415
C	5 IFLG	B01 510	3416
C	B01 520	3417	
C	DATA TEST/6H \$ENDJ/	B01 530	3418
C	DATA NJOB/17, NJOBL/20, ALFA/20*0.0/	B01 540	3419
C	DATA WCL/1.0, -0.4,-0.3,-0.2,-0.1,0.0,0.1,0.2,0.3,0.4,0.5,0.6,	B01 550	3420
C	* 0.8,0.9,1.0,1.1,1.2,1.3,1.4,1.5,1.6/	B01 560	3421
C	DATA MACHN/10*0.0/, HEIGHT/10*10000.0/	B01 570	3422
C	DATA AILRND/20*0.0/, FLAPD/10*0.0/	B01 580	3423
C	DATA PMECF/1.0/, COLOCP/0.75/, CLEANF/0.0035/, DELALF/1.0/	B01 590	3424
C	B01 600	3425	
C	B01 610	3426	
C	1000 FORMAT(13A6,A2)	B01 620	3427
C	B01 630	3428	
C	1010 FORMAT(/,15X,14H**** JOB TIME=,14,16H / ELAPSED TIME=,14,	B01 640	3429
C	1 17H / NO.PLOT FILES=,14,35H / ISURF EXEC. VERSION 6-18-72 ****,	B01 650	3430

	2 //,15X,47(2H**1,/,15X,47(2H**1)	801 660	3431
C		801 670	3432
	1020 FORMAT(1H1,10X,35H**** JOBS INPUT LIST-CONTINUED ****,/,1X)	801 680	3433
	1030 FORMAT(1X,13A6,A2)	801 690	3434
	1040 FORMAT(1X,1)H7 ACT ISURF)	801 700	3435
		801 710	3436
C		801 720	3437
	1050 FORMAT(1H1,///,///,29X,	801 730	3438
	1 53HSUBSONIC-FLUX LIFTING SURFACE ANALYSIS PROGRAM MA010B,/,37X,	801 740	3439
	2 36HTRW SYSTEMS INC., HOUSTON OPERATIONS,/,44X,	801 750	3440
	3 22HHOUSTON, TEXAS (77058),/,16X,	801 760	3441
	4 25H**** JOBS INPUT LIST ****,/, 1X)	801 770	3442
C		801 780	3443
C		801 790	3444
C	XX	801 800	3445
C		801 810	3446
	CALL BLKDAT	801 820	3447
	REWIND KTI	801 830	3448
	WRITE (KOUT,1050)	801 840	3449
	WRITE (KOUT,1050)	801 850	3450
	WRITE (KOUT,1040)	801 860	3451
	LINES= 15	801 870	3452
	1060 READ (KIN,1000)(STORE(I),I=1,14)	801 880	3453
	WRITE (KTI,1000)(STORE(I),I=1,14)	801 890	3454
	IF (LINES-LINES1) 1070,1080,1080	801 900	3455
	1070 WRITE (KOUT,1020)	801 910	3456
	LINES= 3	801 920	3457
	1080 LINES= LINES+1	801 930	3458
	WRITE (KOUT,1030)(STORE(I),I=1,14)	801 940	3459
C		801 950	3460
	IF (STORE(1).NE.TEST) GO TO 1060	801 960	3461
	END FILE KTI	801 970	3462
	REWIND KTI	801 980	3463
	WRITE (KOUT,1040)	801 990	3464
C		801 1000	3465
	NCOMT=-1	801 1010	3466
	NCALCP=-1	801 1020	3467
	ISUM = 0.0	801 1030	3468
	CALL RESET	801 1040	3469
C		801 1050	3470
C		801 1060	3471
	1090 READ (KTI,1000)(TITLE(I),I=1,14)	801 1070	3472
	IF (TITLE(1).EQ.TEST) CALL EXIT	801 1080	3473
	IF (NCOMT) 1100,1100,1110	801 1090	3474
	1100 READ (KTI,1000)(COMMENTS(I),I=1,42)	801 1100	3475
	1110 NCOMT= 1	801 1110	3476
	READ (KTI,INPUT)	801 1120	3477
	ALFAD= 1.0E+10	801 1130	3478
	ZHO = 1.0E+10	801 1140	3479
	EXECK(10)= CLEANF	801 1150	3480
	EXECK(11)= COLLOCP	801 1160	3481
	EXECK(12)= DELALF	801 1170	3482
	EXECK(13)= PNECF	801 1180	3483
	IPLOTK= IFLG(12) + IFLG(13) + IFLG(14) - 1	801 1190	3484
C		801 1200	3485
	IF (NCALCP) 1120,1120,1140	801 1210	3486
	1120 NCALCP= 1	801 1220	3487
	IF (IPLOTK) 1140,1130,1130	801 1230	3488
	1130 REWIND KT2	801 1240	3489
	IFLG(15)= 0	801 1250	3490
	1140 CONTINUE	801 1260	3491
C		801 1270	3492
C		801 1280	3493
	CALL PAGE	801 1290	3494
	WRITE (KOUT,INPUT)	801 1300	3495
C		801 1310	3496
	ITEST=70-(IFLG(6)*IFLG(3))/(2-IFLG(1))	801 1320	3497
	IF (ITEST) 1150,1160,1160	801 1330	3498
	1150 IFLG(3)= 70*(2-IFLG(1))/IFLG(6)	801 1340	3499
	1160 IFLGX3= 21*(2/(IFLG(1)+1))	801 1350	3500
	IF (IFLGX3-IFLG(3)) 1170,1180,1180	801 1360	3501
	1170 IFLG(3)= IFLGX3	801 1370	3502
	1180 CONTINUE	801 1380	3503
C		801 1390	3504
	A1LRDX(1) = A1LRND(1,1) + A1LRND(1,2)	801 1400	3505
	A1LRDX(2) = A1LRND(2,1) + A1LRND(2,2)	801 1410	3506
	FLAPDX= FLAPD(1) + FLAPD(2)	801 1420	3507
C		801 1430	3508
	NJATLR = 0	801 1440	3509
	NDFLAP = 0	801 1450	3510
	IFLG(1)= 0	801 1460	3511
	UTEST= ABS(A1LRDX(1) - A1LRDX(2)) - 0.5	801 1470	3512
C		801 1480	3513
	IF (UTEST) 1200,1200,1190	801 1490	3514
	1190 IFLG(1)= 1	801 1500	3515
	NDAILP= 2	801 1510	3516
	1200 IF (FLAPDX) 1210,1220,1210	801 1520	3517
	1210 NDFLAP = 2	801 1530	3518
	1220 NDFLAPX= NJFLAP + NDAILP	801 1540	3519
	IF (NDFLAPX) 1290,1290,1230	801 1550	3520
	1230 IF (IFLG(5)) 1240,1240,1250	801 1560	3521
	1240 IFLG(5)= 1	801 1570	3522
	1250 IF (IFLG(6)-1) 1260,1260,1270	801 1580	3523
	1260 IFLG(6)= 2	801 1590	3524
	1270 IF (IFLG(2)-5) 1290,1280,1290	801 1600	3525
	1280 IFLG(2)= 4	801 1610	3526
	1290 CONTINUE	801 1620	3527
C		801 1630	3528
	A1LRDX(1) = 0.0	801 1640	3529
	A1LRDX(2) = 0.0	801 1650	3530
	FLAPDX= 0.0	801 1660	3531
	NJORBX= NJORB+1	801 1670	3532
C		801 1680	3533
C		801 1690	3534
	CALL LOFT(YSPAN)	801 1700	3535
C		801 1710	3536

C		801 1720	3537
	DD 1360 N=1,NJOB	801 1730	3538
C		801 1740	3539
	ALFAD= ALFA(N)	801 1750	3540
	HEIGT= HFIGHT(N)	801 1760	3541
	ALFAO= ALFAO	801 1770	3542
	ZHO = HEIGT	801 1780	3543
	CMAK = 0.0	801 1790	3544
	EEXECK(1)= 1.0	801 1800	3545
	IF (MACHN(N)-0.95) 1300,1300,1310	801 1810	3546
1300	CMAK = MACHN(N)	801 1820	3547
	EEXECK(1)= SQRT(1.0-CMAK**2)	801 1830	3548
1310	FLAPDX= FLAPD(N)	801 1840	3549
	AILRDX(1)= AILRND(1,N)	801 1850	3550
	AILRDX(2)= AILRND(2,N)	801 1860	3551
C		801 1870	3552
	CALL DLIFT(ALFAD,HEIGT)	801 1880	3553
C		801 1890	3554
C		801 1900	3555
	IF (IFLG(8)-1) 1330,1320,1320	801 1910	3556
1320	CALL DLINER(ALFAC,HEIGT,ALFA,MCL,NJOBX)	801 1920	3557
1330	CONTINUE	801 1930	3558
C		801 1940	3559
	CALL TIME(IMS)	801 1950	3560
	IS= IMS/1000	801 1960	3561
	ISJB= IS-ISUM	801 1970	3562
	ISUM= IS	801 1980	3563
C		801 1990	3564
	LINES= LINES +6	801 2000	3565
	IF (LINEX-LINES) 1340,1350,1350	801 2010	3566
1340	CALL PAGE	801 2020	3567
1350	WRITE (KOUT,1010)ISJB,IS,IFLG(15)	801 2030	3568
	LINES= LINES + LINEX	801 2040	3569
C		801 2050	3570
1360	CONTINUE	801 2060	3571
C		801 2070	3572
	GO TO 1090	801 2080	3573
C		801 2090	3574
C		801 2100	3575
C	END	801 2110	3576
V	FOR 802,802	802 10	3577
C		802 20	3578
C		802 30	3579
C		802 40	3580
	SUBROUTINE BLKDAT	802 50	3581
C		802 60	3582
C	* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *802	802 70	3583
C	* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *802	802 80	3584
C		802 90	3585
C	XX	802 100	3586
C		802 110	3587
	COMMON/DATA00/NSTL ,ALFAO ,CMAK ,ZHO ,FLAPDX,AILRDX(2)	802 120	3588
	* ,TITLE(14) ,STORE(14)	802 130	3589
C		802 140	3590
	COMMON/DATA01/KIN ,KOUT ,KT1 ,KT2 ,LINEX ,LINES	802 150	3591
C		802 160	3592
	COMMON/DATA02/IFLG(15) ,EEXECK(15) ,RAD ,PIE	802 170	3593
C		802 180	3594
	COMMON/DATA03/NYS ,NCS ,XOCREF,X(10) ,Y(10) ,Z(10) ,E(10)	802 190	3595
	* ,C(10) ,ZOC(10) ,10) ,XOC(10)	802 200	3596
C		802 210	3597
	COMMON/DATA04/YFLAP1,YFLAP2,FLAPC	802 220	3598
	* ,YAILRN,AILRNC,WSMCTH	802 230	3599
C		802 240	3600
	COMMON/DATA05/WINGD(15) ,FY(42,10) ,EC(42,10) ,ES(42,10)	802 250	3601
	* ,EYE(10) ,FLE(10) ,EYE(10) ,EHE(10) ,EG(42,10)	802 260	3602
	* ,EN(42,10,6) ,EV(42,10,6) ,VVINDX(42,10,3)	802 270	3603
C		802 280	3604
	COMMON/DATA06/YFF11,YFF12,YFF21,YFF22,YFF31,YFF32,DELTF1,DELTF2	802 290	3605
	* ,NOFLAP,NOAILR	802 300	3606
C		802 310	3607
	COMMON/DATA07/LFLAP,LDRAG,CUTOF1,CUTOF2	802 320	3608
C		802 330	3609
C		802 340	3610
	DATA NSTU/1/, ALFAD/D.0/, CMAK/0.0/, ZHO/10000.0/,FLAPDX/0.0/,	802 350	3611
	* AILRDX/2*0.0/	802 360	3612
C		802 370	3613
	DATA KIN/5/, KOU/6/, KT1/1/, KT2/8/, LINEX/56/, LINES/0/	802 380	3614
C		802 390	3615
	DATA IFLG/0,0,10,0,0,1,0,0,0,1,5*0/, EEXECK/15*0.0/, RAD/57.29578/,	802 400	3616
	* PIE/3.14159/	802 410	3617
C		802 420	3618
	DATA NYS/2/,NCS/2/,XOCREF/0.25/,X/10*0.0/,Y/0.0,100.0,8*1000.0/,	802 430	3619
	* Z/10*0.0/,F/10*0.0/,C/10*100.0/,ZOC/100*0.0/,XDC/0.0,1.0,8*0.0/	802 440	3620
C		802 450	3621
	DATA YFLAP1/0.0/, YFLAP2/0.6/, FLAPC/0.3/, YAILRN/1.3/, AILRNC/.3/	802 460	3622
	* ,WSMCTH/0.20/	802 470	3623
C		802 480	3624
	DATA LFLAP/0/, LDRAG/0/, CUTOF1/0.0001/, CUTOF2/0.0029/	802 490	3625
C		802 500	3626
C	XX	802 510	3627
C		802 520	3628
C	RETURN	802 530	3629
C		802 540	3630
C	END	802 550	3631
V	FOR 803,803	803 10	3632
C		803 20	3633
C		803 30	3634
C		803 40	3635
	SUBROUTINE LOFT(YSpan)	803 50	3636

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C
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *R03 60 3637
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *R03 70 3638
C * *R03 80 3639
C *R03 90 3640
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXR03 100 3641
C
C DIMENSION X(10),XN(10),XC(10) R03 110 3642
C DIMENSION YSPAN(42) R03 120 3643
C DIMENSION COS1(3),COS2(3),COS3(3) R03 130 3644
C DIMENSION ZOCY(10) R03 140 3645
C R03 150 3646
C R03 160 3647
C COMMON/DATA01/KIN ,KOUT ,KT1 ,KT2 ,LINDEX ,LINES R03 170 3648
C R03 180 3649
C COMMON/DATA02/IFLG(15) ,FHECK(15) ,RAD ,PIE R03 190 3650
C R03 200 3651
C COMMON/DATA03/NYS ,NCS ,XOCREF,X(10) ,Y(10) ,Z(10) ,E(10) R03 210 3652
C * ,C(10) ,ZOC(10,10) ,XOC(10) R03 220 3653
C R03 230 3654
C COMMON/DATA04/YFLAP1,YFLAP2,FLAPC R03 240 3655
C * ,YAIRLN,AIRLNC,WSMOTH R03 250 3656
C R03 260 3657
C COMMON/DATA05/WINGD(15) ,FY(42,10) ,EC(42,10) ,ES(42,10) R03 270 3658
C * ,EYF(10) ,ELE(10) ,ETE(10) ,EHE(10) ,FG(42,10) R03 280 3659
C * ,EN(42,10,6) ,EV(42,10,6) ,VVINDX(42,10,3) R03 290 3660
C R03 300 3661
C COMMON/DATA06/YFF11,YFF12,YFF21,YFF22,YFF31,YFF32,DELTF1,DELTF2 R03 310 3662
C * ,NOFLAP,NOAIRL R03 320 3663
C R03 330 3664
C R03 340 3665
C R03 350 3666
C 1000 FORMAT(1X,/,1X) R03 360 3667
C R03 370 3668
C 1010 FORMAT(53X,13HWING GEOMETRY,/,53X,13(1H*),///,1X, R03 380 3669
C 1 60H SPAN ROOT TIP R03 390 3670
C 2 59H ASPFCT MFAN MGC YBAR XBAR ZBAR,/, R03 400 3671
C 361H R03 410 3672
C 4 60H RATEO CHORD CHORD TWIST TWIST R03 420 3673
C 5/,1X,3F10.3,2F10.4,F10.2,F10.4,5F10.3,/,1X, R03 430 3674
C 6 60H FLAP FLAP AIRLN AIRLN AIRLN AIRLN R03 440 3675
C 7 60H DTHED SWEEP NO.SPAN NO.SPAN NO.CHORD, R03 450 3676
C 861H SPAN1 SPAN2 CHORD SPAN1 SPAN2 CHORD, R03 460 3677
C 9 60H 1/4MGC 1/4MGC VORTICES DISCONT VORTICES DISCONT, R03 470 3678
C */ ,1X,2I2F10.3,F10.4,2F10.3,17,3I10,/,/,1X ) R03 480 3679
C R03 490 3680
C 1020 FORMAT(1X) R03 500 3681
C R03 510 3682
C 1030 FORMAT(1X, R03 520 3683
C 1 60H 2Y/H Y XLE X(1/4) XHE XTE , R03 530 3684
C 2 60H Z E SWEEP C/4 DTHED C CF , R03 540 3685
C 3 /,1X) R03 550 3686
C 1040 FORMAT( 1X, 12F10.3 ) R03 560 3687
C R03 570 3688
C 1050 FORMAT(21X,50H XA(1)/C XA(2)/C XA(3)/C XA(4)/C XA(5)/C, R03 580 3689
C 1 50H XA(6)/C XA(7)/C XA(8)/C XA(9)/C XA(10)/C,/,21X, R03 590 3690
C 2 LOF10.4,/,/,1X, 40H Y 2Y/H , ZA(1)/C, ZA(2)/C, R03 600 3691
C 3 60H ZA(3)/C ZA(4)/C ZA(5)/C ZA(6)/C ZA(7)/C ZA(8)/C, R03 610 3692
C 4 20H ZA(9)/C ZA(10)/C,/,1X ) R03 620 3693
C 1060 FORMAT( 1X,12F10.4 ) R03 630 3694
C R03 640 3695
C 1070 FORMAT(3X,1HJ,2X,1HK,5X,1HY,9X,2HDY,8X,2HDC,8X,2HDS,/,1X ) R03 650 3696
C 1080 FORMAT(1X,2I3,12I1PE10.3) ) R03 660 3697
C R03 670 3698
C 1090 FORMAT(3X,1HJ,2X,1HK,5X,2HXV,8X,2HYV,8X,2HZV,8X,3H1XV,7X,3H1YV,7X, R03 680 3699
C * 3H1ZV,7X,2HXN,9X,2HYN,8X,2HZN,8X,3H1KN,7X,3H1YN,7X,3H1ZN,/,1X) R03 690 3700
C 1100 FORMAT( 1X, 2I3, 12I1PE10.3) ) R03 700 3701
C R03 710 3702
C 1110 FORMAT(5X,1HB,9X,2HCR,8X,2HCT,8X,2HCR,8X,2HET,8X,1HS,9X,2HAR,8X, R03 720 3703
C * 2HMC,8X,3HMG,6X,4HMG,6X,4HMG,6X,4HMG,/,1X) R03 730 3704
C 1120 FORMAT(1X,12F10.2 ) R03 740 3705
C R03 750 3706
C 1130 FORMAT(1X,/,1X,14H(EOF PLOT FILE,13,1H) ) R03 760 3707
C R03 770 3708
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXR03 780 3709
C R03 790 3710
C R03 800 3711
C * FILL IN NYS + 1 SPACE * R03 810 3712
C R03 820 3713
C SPAN= 2.0*Y(NYS) R03 830 3714
C WINGDI 1) = SPAN R03 840 3715
C WINGDI 2) = C(1) R03 850 3716
C WINGDI 3) = C(NYS) R03 860 3717
C WINGDI 4) = E(1) R03 870 3718
C WINGDI 5) = E(NYS) R03 880 3719
C R03 890 3720
C R03 900 3721
C BOTU= SPAN/2.0 R03 910 3722
C DELTF1= WSMOTH R03 920 3723
C DELTF2= WSMOTH R03 930 3724
C R03 940 3725
C IF (WSMOTH-1.0) 1140,1150,1150 R03 950 3726
C 1140 DELTF1= BOTU*DELTF1 R03 960 3727
C DELTF2= BOTU*DELTF2 R03 970 3728
C 1150 CONTINUE R03 980 3729
C R03 990 3730
C YFF11 = YFLAP1 R03 1000 3731
C YFF21 = YFLAP2 R03 1010 3732
C YFF31 = YAIRLN R03 1020 3733
C R03 1030 3734
C IF (YFLAP2-1.0) 1160,1170,1170 R03 1040 3735
C 1160 YFF11 = YFF11*BOTU R03 1050 3736
C YFF21 = YFF21*BOTU R03 1060 3737
C YFF31 = YFF31*BOTU R03 1070 3738
C 1170 YFF11 = YFF11 - 0.5*DELTF1 R03 1080 3739
C YFF21 = YFF21 - 0.5*DELTF2 R03 1090 3740
C YFF31 = YFF31 - 0.5*DELTF2 R03 1100 3741
C R03 1110 3742
C YFF12= YFF11 + DELTF1

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YFF22= YFF21 + DELTF2	803 1120	3743
YFF32 = YFF31 + DELTF2	803 1130	3744
C	803 1140	3745
NY1= NYS-1	803 1150	3746
NY2= NYS+1	803 1160	3747
Y(NY2)= Y(NYS) + 0.20*(Y(NYS)-Y(NY1))	803 1170	3748
RAT=(Y(NY2)-Y(NY1))/(Y(NYS)-Y(NY1))	803 1180	3749
X(NY2)= X(NYS) + RAT*(X(NYS) - X(NY1))	803 1190	3750
Z(NY2)= Z(NYS) + RAT*(Z(NYS) - Z(NY1))	803 1200	3751
E(NY2)= E(NYS) + RAT*(E(NYS) - E(NY1))	803 1210	3752
C(NY2)= C(NYS) + RAT*(C(NYS) - C(NY1))	803 1220	3753
DO 1180 L=1,NC3	803 1230	3754
1180 ZOC(L,NY2)= ZOC(L,NYS) + RAT*(ZOC(L,NYS) - ZOC(L,NY1))	803 1240	3755
C	803 1250	3756
L= NCS	803 1260	3757
L1= L-1	803 1270	3758
L2= L+1	803 1280	3759
NCSP1= L2	803 1290	3760
XOC(L2)= XOC(L) + 0.10*(XOC(L)-XOC(L1))	803 1300	3761
RAT= (XOC(L2)-XOC(L))/(XOC(L)-XOC(L1))	803 1310	3762
DO 1190 N=L,NY2	803 1320	3763
1190 ZOC(L2,N)= ZOC(L,N) + RAT*(ZOC(L,N)-ZOC(L1,N))	803 1330	3764
C	803 1340	3765
C	803 1350	3766
C	803 1360	3767
C * CALCULATE SPAN FUNCTIONS *	803 1370	3768
C	803 1380	3769
NSPV= IFLG(3)	803 1390	3770
NSPS= NSPV + 1	803 1400	3771
NDIS= IFLG(2)	803 1410	3772
IFLAG= IFLG(4)	803 1420	3773
C	803 1430	3774
CALL SPANI(IFLAG,NSPS,NDIS,SPAN, YSPAN)	803 1440	3775
C	803 1450	3776
DO 1220 L=1,NY2	803 1460	3777
EYE(L)= Y(L)	803 1470	3778
FLE(L)= X(L) - XOCREF*C(L)	803 1480	3779
ETE(L)= ELE(L) + C(L)	803 1490	3780
CF = FLAPC	803 1500	3781
IF (FLAPC-0.8) 1200,1200,1210	803 1510	3782
1200 CF = CF*C(L)	803 1520	3783
1210 EHE(L)= ETE(L) - CF	803 1530	3784
1220 CONTINUE	803 1540	3785
C	803 1550	3786
C	803 1560	3787
C	803 1570	3788
C * CALCULATE CHORD FUNCTIONS *	803 1580	3789
C	803 1590	3790
IFLAG= IFLG(7)	803 1600	3791
NCV = IFLG(6)	803 1610	3792
NDIS = IFLG(5)	803 1620	3793
NOFLPX = NOFLAP + NOALLR	803 1630	3794
C	803 1640	3795
IF (NOFLPX) 1240,1240,1230	803 1650	3796
1230 NCV = NCV - 1	803 1660	3797
NDIS= NDIS-1	803 1670	3798
1240 CONTINUE	803 1680	3799
C	803 1690	3800
CALL CHORDI(IFLAG,NCV,NDIS, XV,XN,XC)	803 1700	3801
C	803 1710	3802
DO 1280 J=1,NSPS	803 1720	3803
C	803 1730	3804
YF= YSPAN(J)	803 1740	3805
C	803 1750	3806
CALL CHORDT(YF,XLE,XC04,XTE,XHE,CW,CF)	803 1760	3807
C	803 1770	3808
IF (NOFLPX) 1260,1260,1250	803 1780	3809
1250 CW= CW-CF	803 1790	3810
1260 CONTINUE	803 1800	3811
C	803 1810	3812
DO 1270 L=1,NCV	803 1820	3813
EC(J,L)= XLE + XC(L)*CW	803 1830	3814
EY(J,L)= YF	803 1840	3815
EV(J,L,1)= XLE + XV(L)*CW	803 1850	3816
EV(J,L,2)= YF	803 1860	3817
EV(J,L,3)= 0.0	803 1870	3818
EN(J,L,1)= XLE + XN(L)*CW	803 1880	3819
EN(J,L,2)= YF	803 1890	3820
1270 EN(J,L,3)= 0.0	803 1900	3821
C	803 1910	3822
1280 CONTINUE	803 1920	3823
C	803 1930	3824
C	803 1940	3825
IF (NOFLPX) 1310,1310,1290	803 1950	3826
1290 CONTINUE	803 1960	3827
C	803 1970	3828
NCV= NCV + 1	803 1980	3829
C	803 1990	3830
DO 1300 J=1,NSPS	803 2000	3831
YF= YSPAN(J)	803 2010	3832
C	803 2020	3833
CALL CHORDT(YF,XLE,XC04,XTE,XHE,CW,CF)	803 2030	3834
C	803 2040	3835
EY(J,NCV)= YF	803 2050	3836
EC(J,NCV)= XTE	803 2060	3837
EV(J,NCV,1)= XHE + 0.25*CF	803 2070	3838
EV(J,NCV,2)= YF	803 2080	3839
EV(J,NCV,3)= 0.0	803 2090	3840
EN(J,NCV,1)= XHE + 0.75*CF	803 2100	3841
EN(J,NCV,2)= YF	803 2110	3842
1300 EN(J,NCV,3)= 0.0	803 2120	3843
C	803 2130	3844
1310 CONTINUE	803 2140	3845
C	803 2150	3846
C	803 2160	3847
C	803 2170	3848

NCVP1 = NCV + 1	RD3 2180	3849
C	RD3 2190	3850
DD 1370 J=1,NSPS	RD3 2200	3851
J2= J+1	RD3 2210	3852
YF= YSPAN(J)	RD3 2220	3853
C	RD3 2230	3854
CALL CHORDT(YF,XLE,XC04,XTE,XHE,CW,CF)	RD3 2240	3855
C	RD3 2250	3856
IF (J-NSPS) 1320,1340,1340	RD3 2260	3857
1320 CONTINUE	RD3 2270	3858
DD 1330 K=1,NCV	RD3 2280	3859
1330 EY(J,K)= EY(J2,K)-EY(J,K)	RD3 2290	3860
1340 CONTINUE	RD3 2300	3861
C	RD3 2310	3862
EY(J,NCVP1,1) = XTE	RD3 2320	3863
EY(J,NCVP1,2) = YF	RD3 2330	3864
EY(J,NCVP1,3) = 0.0	RD3 2340	3865
EC(J,NCVP1) = 0.0	RD3 2350	3866
C	RD3 2360	3867
DD 1350 K=1,NCV	RD3 2370	3868
1350 EC(J,K)= EC(J,K)-XLE	RD3 2380	3869
DD 1360 L=2,NCV	RD3 2390	3870
K= NCV + 2 - L	RD3 2400	3871
K1= K-1	RD3 2410	3872
1360 FC(J,K)= EC(J,K)-EC(J,K1)	RD3 2420	3873
C	RD3 2430	3874
1370 CONTINUE	RD3 2440	3875
C	RD3 2450	3876
C	RD3 2460	3877
DD 1390 J=1,NSPV	RD3 2470	3878
J2= J+1	RD3 2480	3879
DD 1380 K=1,NCV	RD3 2490	3880
EC(J,K)= 0.5*(EC(J,K)+EC(J2,K))	RD3 2500	3881
1380 EY(J,K)= EC(J,K)*EY(J,K)	RD3 2510	3882
1390 CONTINUE	RD3 2520	3883
C	RD3 2530	3884
C	RD3 2540	3885
C	RD3 2550	3886
C * CALCULATE AIRFOIL SECTION CAMBER *	RD3 2560	3887
C * CALCULATE GEOMETRIC TWIST *	RD3 2570	3888
C	RD3 2580	3889
DD 1580 J=1,NSPS	RD3 2590	3890
C	RD3 2600	3891
YF= YSPAN(J)	RD3 2610	3892
YA= ABS(YF)	RD3 2620	3893
C	RD3 2630	3894
M= -1	RD3 2640	3895
DD 1420 L=2,NYZ	RD3 2650	3896
IF (M) 1400,1400,1420	RD3 2660	3897
1400 TEST= YA - Y(L)	RD3 2670	3898
IF (TEST) 1410,1410,1420	RD3 2680	3899
1410 M= L	RD3 2690	3900
1420 CONTINUE	RD3 2700	3901
M1= M-1	RD3 2710	3902
IF (M1) 1430,1430,1440	RD3 2720	3903
1430 M1= 1	RD3 2730	3904
M= 2	RD3 2740	3905
1440 RAT= (YA-Y(M1))/(Y(M1)-Y(M1))	RD3 2750	3906
C	RD3 2760	3907
TANEPS= E(M1) + RAT*(E(M1)-E(M1))	RD3 2770	3908
TANEPS= TAN(TANEPS/RAD)	RD3 2780	3909
DELTAZ= Z(M1) + RAT*(Z(M1)-Z(M1))	RD3 2790	3910
C	RD3 2800	3911
DD 1450 L=1,NCSP1	RD3 2810	3912
1450 ZOCY(L)= ZOC(L,M1) + RAT*(ZOC(L,M) - ZOC(L,M1))	RD3 2820	3913
C	RD3 2830	3914
CALL CHORDT(YF,XLE,XC04,XTE,XHE,CW,CF)	RD3 2840	3915
C	RD3 2850	3916
XROTAT= XLE + XCREF*CW	RD3 2860	3917
C	RD3 2870	3918
C	RD3 2880	3919
DD 1560 K=1,NCV	RD3 2890	3920
C	RD3 2900	3921
N=-1	RD3 2910	3922
XTEST= EY(J,K,1) - XLE	RD3 2920	3923
DD 1480 L=2,NCSP1	RD3 2930	3924
IF (N) 1460,1460,1480	RD3 2940	3925
1460 TEST= XTEST - XOC(L)*CW	RD3 2950	3926
IF (TEST) 1470,1470,1480	RD3 2960	3927
1470 N= L	RD3 2970	3928
N1=L-1	RD3 2980	3929
1480 CONTINUE	RD3 2990	3930
IF (N1) 1490,1490,1500	RD3 3000	3931
1490 N1=1	RD3 3010	3932
N= 2	RD3 3020	3933
1500 RATS=(XTEST-CW*XOC(N1))/(XOC(N1)-XOC(N1))	RD3 3030	3934
EY(J,K,3)= DELTAZ + CW*ZOCY(N1) + (ZOCY(N1)-ZOCY(N1))*RATS	RD3 3040	3935
C	RD3 3050	3936
N=-1	RD3 3060	3937
XTEST= EY(J,K,1) - XLE	RD3 3070	3938
DD 1530 L=2,NCSP1	RD3 3080	3939
IF (N) 1510,1510,1530	RD3 3090	3940
1510 TEST= XTEST - XOC(L)*CW	RD3 3100	3941
IF (TEST) 1520,1520,1530	RD3 3110	3942
1520 N= L	RD3 3120	3943
N1= L-1	RD3 3130	3944
1530 CONTINUE	RD3 3140	3945
IF (N1) 1540,1540,1550	RD3 3150	3946
1540 N1= 1	RD3 3160	3947
N= 2	RD3 3170	3948
1550 RATS= (XTEST-CW*XOC(N1))/(XOC(N1)-XOC(N1))	RD3 3180	3949
EY(J,K,3)= DELTAZ + CW*ZOCY(N1) + (ZOCY(N1)-ZOCY(N1))*RATS	RD3 3190	3950
C	RD3 3200	3951
1560 CONTINUE	RD3 3210	3952
C	RD3 3220	3953
C	RD3 3230	3954

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DO 1570 K=1,NCV
EV(J,K,3)= EV(J,K,3) + (EV(J,K,1)-XROTAT)*TANEPS
1570 EN(J,K,3)= EN(J,K,3) + (EN(J,K,1)-XROTAT)*TANEPS
C
1580 CONTINUE
C
C
C
C * CALCULATE UNIT VECTORS *
C
DO 1640 J=1,NSPV
J2= J+1
C
DO 1630 K=1,NCV
C
SUM1= 0.0
SUM2= 0.0
DO 1590 L=1,3
M= L+3
EN(J,K,L)= 0.5*( EN(J2,K,L) + EN(J,K,L) )
RAT = 0.5*( EV(J2,K,L) + EV(J,K,L) )
EV(J,K,M)= EV(J2,K,L) - EV(J,K,L)
EN(J,K,M)= RAT - EN(J,K,L)
SUM1= SUM1 + EV(J,K,M)**2
1590 SUM2= SUM2 + EN(J,K,M)**2
SUM1= SQRT( SUM1 )
SUM2= SQRT( SUM2 )
DO 1600 L=1,3
M= L+3
EV(J,K,M)= EV(J,K,M)/SUM1
EN(J,K,M)= EN(J,K,M)/SUM2
COS1(L)= EN(J,K,M)
1600 COS2(L)= -EV(J,K,M)
C
CALL CROSP(COS1,COS2,COS3)
C
SUM1= 0.0
DO 1610 L=1,3
1610 SUM1= SUM1 + COS2(L)**2
SUM1= SQRT( SUM1 )
DO 1620 L=1,3
M= L+3
1620 EN(J,K,M)= COS3(L)/SUM1
C
1630 CONTINUE
C
1640 CONTINUE
C
C
C * WING DATA *
C
WINGD( 1 ) = SPAN
WINGD( 2 ) = ROOT CHORD
WINGD( 3 ) = TIP CHORD
WINGD( 4 ) = ROOT GEOMETRIC TWIST
WINGD( 5 ) = TIP GEOMETRIC TWIST
WINGD( 6 ) = AREA
WINGD( 7 ) = ASPECT RATIO
WINGD( 8 ) = MEAN CHORD
WINGD( 9 ) = MEAN GEOMETRIC CHORD
WINGD(10) = SPAN LOCATION OF MEAN GEOMETRIC CHORD
WINGD(11) = XMGC, HORIZONTAL MOMENT ARM TO 1/4 CHORD OF MGC
WINGD(12) = ZMGC, VERTICAL MOMENT ARM TO 1/4 CHORD OF MGC
WINGD(14) = SWEEP ANGLE OF 1/4 MGC
C
DO 1570 K=1,NCV
EV(J,K,3)= EV(J,K,3) + (EV(J,K,1)-XROTAT)*TANEPS
1570 EN(J,K,3)= EN(J,K,3) + (EN(J,K,1)-XROTAT)*TANEPS
C
1580 CONTINUE
C
C
C
C * CALCULATE UNIT VECTORS *
C
DO 1640 J=1,NSPV
J2= J+1
C
DO 1630 K=1,NCV
C
SUM1= 0.0
SUM2= 0.0
DO 1590 L=1,3
M= L+3
EN(J,K,L)= 0.5*( EN(J2,K,L) + EN(J,K,L) )
RAT = 0.5*( EV(J2,K,L) + EV(J,K,L) )
EV(J,K,M)= EV(J2,K,L) - EV(J,K,L)
EN(J,K,M)= RAT - EN(J,K,L)
SUM1= SUM1 + EV(J,K,M)**2
1590 SUM2= SUM2 + EN(J,K,M)**2
SUM1= SQRT( SUM1 )
SUM2= SQRT( SUM2 )
DO 1600 L=1,3
M= L+3
EV(J,K,M)= EV(J,K,M)/SUM1
EN(J,K,M)= EN(J,K,M)/SUM2
COS1(L)= EN(J,K,M)
1600 COS2(L)= -EV(J,K,M)
C
CALL CROSP(COS1,COS2,COS3)
C
SUM1= 0.0
DO 1610 L=1,3
1610 SUM1= SUM1 + COS2(L)**2

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803 3240 3955
803 3250 3956
803 3260 3957
803 3270 3958
803 3280 3959
803 3290 3960
803 3300 3961
803 3310 3962
803 3320 3963
803 3330 3964
803 3340 3965
803 3350 3966
803 3360 3967
803 3370 3968
803 3380 3969
803 3390 3970
803 3400 3971
803 3410 3972
803 3420 3973
803 3430 3974
803 3440 3975
803 3450 3976
803 3460 3977
803 3470 3978
803 3480 3979
803 3490 3980
803 3500 3981
803 3510 3982
803 3520 3983
803 3530 3984
803 3540 3985
803 3550 3986
803 3560 3987
803 3570 3988
803 3580 3989
803 3590 3990
803 3600 3991
803 3610 3992
803 3620 3993
803 3630 3994
803 3640 3995
803 3650 3996
803 3660 3997
803 3670 3998
803 3680 3999
803 3690 4000
803 3700 4001
803 3710 4002
803 3720 4003
803 3730 4004
803 3740 4005
803 3750 4006
803 3760 4007
803 3770 4008
803 3780 4009
803 3790 4010
803 3800 4011
803 3810 4012
803 3820 4013
803 3830 4014
803 3840 4015
803 3850 4016
803 3860 4017
803 3870 4018
803 3880 4019
803 3890 4020
803 3900 4021
803 3910 4022
803 3920 4023
803 3930 4024
803 3940 4025
803 3950 4026
803 3960 4027
803 3970 4028
803 3980 4029
803 3990 4030
803 4000 4031
803 4010 4032
803 4020 4033
803 4030 4034
803 4040 4035
803 4050 4036
803 4060 4037
803 4070 4038
803 4080 4039
803 4090 4040
803 4100 4041
803 4110 4042
803 4120 4043
803 4130 4044
803 4140 4045
803 4150 4046
803 4160 4047
803 4170 4048
803 4180 4049
803 4190 4050
803 4200 4051
803 4210 4052
803 4220 4053
803 4230 4054
803 4240 4055
803 4250 4056
803 4260 4057
803 4270 4058
803 4280 4059
803 4290 4060

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SUM1= SQRT( SUM1 )
DO 1620 L=1,3
M= L+3
1620 EN(J,K,M)= COS3(L)/SUM1
C
1630 CONTINUE
C
1640 CONTINUE
C
C
C
C * WING DATA *
C
C WINGD( 1) = SPAN
C WINGD( 2) = ROOT CHORD
C WINGD( 3) = TIP CHORD
C WINGD( 4) = ROOT GEOMETRIC TWIST
C WINGD( 5) = TIP GEOMETRIC TWIST
C WINGD( 6) = AREA
C WINGD( 7) = ASPECT RATIO
C WINGD( 8) = MEAN CHORD
C WINGD( 9) = MEAN GEOMETRIC CHORD
C WINGD(10) = SPAN LOCATION OF MEAN GEOMETRIC CHORD
C WINGD(11) = XMGC, HORIZONTAL MOMENT ARM TO 1/4 CHORD OF MGC
C WINGD(12) = ZMGC, VERTICAL MOMENT ARM TO 1/4 CHORD OF MGC
C WINGD(14) = SWEEP ANGLE OF 1/4 MGC
C WINGD(15) = FLAP CHORD
C
SUM1 = 0.0
SUM6 = 0.0
SUM8 = 0.0
SUM9 = 0.0
SUM10 = 0.0
SUM11 = 0.0
SUM12 = 0.0
C
DSPAN= SPAN/200.0
C
DO 1720 J=1,101
C
JM= J-1
YA2= DSPAN*FLOAT(JM)
C
CALL CHORDT(YA2,XLE,XMGC2,XTE,XHE,CW2,CF)
C
M=-1
DO 1670 L=2,NY2
IF (M) 1650,1650,1670
1650 TEST= YA2-Y(L)-0.0001
IF (TEST) 1660,1660,1670
1660 M=L
MI= L-1
1670 CONTINUE
IF (M1) 1680,1690,1690
1680 M1= 1
M = 2
1690 RAT= (YA2-Y(M1))/(Y(M)-Y(M1))
C
TANFPS= F(M1)+(E(M)-F(M1))*RAT
DELTAZ= Z(M1)+(Z(M)-Z(M1))*RAT
DELTA2= DELTAZ + (XMGC2-XLE-XOCREF*CW2)*TANITANFPS/RADI
C
IF (JM) 1710,1710,1700
C
1700 CW = 0.5*(CW2+CW1)
AREA= CW*DSPAN
SUM1 = SUM1 + DSPAN
SUM6 = SUM6 + AREA
SUM8 = SUM8 + AREA
SUM9 = SUM9 + AREA*CW
SUM10 = SUM10 + AREA*(YA2+YA1)*0.5
SUM11 = SUM11 + AREA*(XMGC2+XMGC1)*0.5
SUM12 = SUM12 + AREA*(DELTA2+DELTA1)*0.5
C
1710 DELTA1= DELTA2
XMGC1= XMGC2
CW1 = CW2
YA1 = YA2
C
1720 CONTINUE
C
C
C ZERO = 0.0
C
CALL CHORDT(ZERO,XLE,XC04,XTE,XHE,CW,CF)
C
XROOT= XC04
ZROOT= Z(1)
C
WINGD( 1) = SUM1*2.0
WINGD( 6) = SUM6*2.0
WINGD( 7) = 2.0*(SUM1**2)/SUM6
WINGD( 8) = SUM8/SUM1
WINGD( 9) = SUM9/SUM6
WINGD(10) = SUM10/SUM6
WINGD(11) = SUM11/SUM6
WINGD(12) = SUM12/SUM6
WINGD(13) = RAD*ATAN((WINGD(12)- ZROOT)/WINGD(10))
WINGD(14) = RAD*ATAN((WINGD(11)- XROOT)/WINGD(10))
WINGD(15) = FLAPC
C
C
C CALL PAGE
WRITE (KOUT,1010)(WINGD(I),I=1,12),YFLAP1,YFLAP2,FLAPC,YFLAP2,BOTU
1,FLAPC,WINGD(13),WINGD(14),IFLG(1),IFLG(2),IFLG(5),IFLG(5)

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803 4300 4061
803 4310 4062
803 4320 4063
803 4330 4064
803 4340 4065
803 4350 4066
803 4360 4067
803 4370 4068
803 4380 4069
803 4390 4070
803 4400 4071
803 4410 4072
803 4420 4073
803 4430 4074
803 4440 4075
803 4450 4076
803 4460 4077
803 4470 4078
803 4480 4079
803 4490 4080
803 4500 4081
803 4510 4082
803 4520 4083
803 4530 4084
803 4540 4085
803 4550 4086
803 4560 4087
803 4570 4088
803 4580 4089
803 4590 4090
803 4600 4091
803 4610 4092
803 4620 4093
803 4630 4094
803 4640 4095
803 4650 4096
803 4660 4097
803 4670 4098
803 4680 4099
803 4690 4100
803 4700 4101
803 4710 4102
803 4720 4103
803 4730 4104
803 4740 4105
803 4750 4106
803 4760 4107
803 4770 4108
803 4780 4109
803 4790 4110
803 4800 4111
803 4810 4112
803 4820 4113
803 4830 4114
803 4840 4115
803 4850 4116
803 4860 4117
803 4870 4118
803 4880 4119
803 4890 4120
803 4900 4121
803 4910 4122
803 4920 4123
803 4930 4124
803 4940 4125
803 4950 4126
803 4960 4127
803 4970 4128
803 4980 4129
803 4990 4130
803 5000 4131
803 5010 4132
803 5020 4133
803 5030 4134
803 5040 4135
803 5050 4136
803 5060 4137
803 5070 4138
803 5080 4139
803 5090 4140
803 5100 4141
803 5110 4142
803 5120 4143
803 5130 4144
803 5140 4145
803 5150 4146
803 5160 4147
803 5170 4148
803 5180 4149
803 5190 4150
803 5200 4151
803 5210 4152
803 5220 4153
803 5230 4154
803 5240 4155
803 5250 4156
803 5260 4157
803 5270 4158
803 5280 4159
803 5290 4160
803 5300 4161
803 5310 4162
803 5320 4163
803 5330 4164
803 5340 4165
803 5350 4166

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	LINES= LINES + 15	803 5360	4167
C		803 5370	4168
C	WRITE (KOUT,1030)	803 5380	4169
	LINES= LINES + 3	803 5390	4170
C	DO 1820 J=1,NSPS	803 5400	4171
	YF= YSPAN(J)	803 5410	4172
	YA= ABS(YF)	803 5420	4173
	YDB= YF/ROTU	803 5430	4174
C	CALL CHORDT(YF,XLE,XCO4,XTE,XME,CW,CF)	803 5440	4175
		803 5450	4176
		803 5460	4177
		803 5470	4178
		803 5480	4179
		803 5490	4180
	M= -1	803 5500	4181
	DO 1750 L=2,NY2	803 5510	4182
	IF (M) 1730,1730,1750	803 5520	4183
1730	TEST= YA - Y(L) - 0.0001	803 5530	4184
	IF (TEST) 1740,1740,1750	803 5540	4185
1740	M= L	803 5550	4186
	M1= M-1	803 5560	4187
1750	CONTINUE	803 5570	4188
	IF (M1) 1760,1760,1770	803 5580	4189
1760	M= 2	803 5590	4190
	M1= 1	803 5600	4191
1770	RAT= (YA-Y(M1))/(Y(M)-Y(M1))	803 5610	4192
C		803 5620	4193
	ZY= Z(M1) + RAT*(Z(M) - Z(M1))	803 5630	4194
	EK= E(M1) + RAT*(E(M) - E(M1))	803 5640	4195
C		803 5650	4196
	IF (J-1) 1780,1780,1790	803 5660	4197
1780	YF1= YF - 0.05*SPAN/FLOAT(NSPV)	803 5670	4198
	YA= ABS(YF1)	803 5680	4199
C		803 5690	4200
	CALL CHORDT(YA,XLE1,XCO41,XTE1,XME1,CW1,CF1)	803 5700	4201
	ZY1= Z(M1) + (Z(M)-Z(M1))*(YA-Y(M1))/(Y(M)-Y(M1))	803 5710	4202
C		803 5720	4203
1790	DELTA1= YF-YF1	803 5730	4204
C		803 5740	4205
	BETA= RAD*ATAN1 (XCO4-XCO41)/DELTA1	803 5750	4206
	DIME= RAD*ATAN1 (ZY-ZY1)/DELTA1	803 5760	4207
C		803 5770	4208
	IF (LINEX-LINES) 1800,1810,1810	803 5780	4209
1800	CALL PAGE	803 5790	4210
	WRITE (KOUT,1030)	803 5800	4211
	LINES= LINES+2	803 5810	4212
1810	WRITE (KOUT,1040)YDB,YF,XLE,XCO4,XME,XTE,ZY,EK,BETA,DIME,CW,CF	803 5820	4213
C		803 5830	4214
	LINES= LINES + 1	803 5840	4215
	YF1= YF	803 5850	4216
	ZY1= ZY	803 5860	4217
	XCO41= XCO4	803 5870	4218
1820	CONTINUE	803 5880	4219
C		803 5890	4220
C		803 5900	4221
	WRITE (KOUT,1000)	803 5910	4222
	LINES= LINES + 3	803 5920	4223
	LINES= LINES + 7	803 5930	4224
	IF (LINEX-LINES) 1830,1840,1840	803 5940	4225
1830	CALL PAGE	803 5950	4226
	LINES= LINES + 7	803 5960	4227
1840	WRITE (KOUT,1050)(XOC(I),I=1,10)	803 5970	4228
	LINES= LINES + 1	803 5980	4229
C		803 5990	4230
	DO 1870 J=1,NYS	803 6000	4231
	IF (LINEX-LINES) 1850,1860,1860	803 6010	4232
1850	CALL PAGE	803 6020	4233
	WRITE (KOUT,1050)	803 6030	4234
	LINES= LINES+7	803 6040	4235
1860	CONTINUE	803 6050	4236
	YDB= Y(J)/BOTU	803 6060	4237
	WRITE (KOUT,1060)Y(J),YDB,(ZOC(I,J),I=1,NCS)	803 6070	4238
	LINES= LINES + 1	803 6080	4239
1870	CONTINUE	803 6090	4240
C		803 6100	4241
	LINES= LINES+3	803 6110	4242
	IF (LINEX-LINES) 1880,1890,1890	803 6120	4243
1880	CALL PAGE	803 6130	4244
	LINES= LINES + 3	803 6140	4245
1890	WRITE (KOUT,1000)	803 6150	4246
C		803 6160	4247
C		803 6170	4248
C		803 6180	4249
C	* DEBUG OUTPUT *	803 6190	4250
C		803 6200	4251
	IF (IFLG(10)) 2030,1900,1900	803 6210	4252
1900	IFLG(10)= IFLG(10)-1	803 6220	4253
C		803 6230	4254
C		803 6240	4255
	LINES= LINES+2	803 6250	4256
	IF (LINEX-LINES) 1910,1920,1920	803 6260	4257
1910	CALL PAGE	803 6270	4258
	LINES= LINES+2	803 6280	4259
1920	WRITE (KOUT,1070)	803 6290	4260
C		803 6300	4261
	DO 1950 K=1,NCV	803 6310	4262
	LINES= LINES+1	803 6320	4263
	DO 1940 J=1,NSPV	803 6330	4264
	LINES= LINES+1	803 6340	4265
	IF (LINEX-LINES) 1930,1940,1940	803 6350	4266
1930	CALL PAGE	803 6360	4267
	WRITE (KOUT,1070)	803 6370	4268
	LINES= LINES + 2+1	803 6380	4269
1940	WRITE (KOUT,1080)J,K,EN(J,K,2),EY(J,K),EC(J,K),ES(J,K)	803 6390	4270
1950	WRITE (KOUT,1020)	803 6400	4271
C		803 6410	4272

LINES= LINES+3	B03 6420	4273
IF (LINEX-LINES) 1960,1970,1970	B03 6430	4274
1960 CALL PAGE	B03 6440	4275
LINES= LINES+3	B03 6450	4276
1970 WRITE (KOUT,1000)	B03 6460	4277
C	B03 6470	4278
IF (LINEX-LINES) 1980,1990,1990	B03 6480	4279
1980 CALL PAGE	B03 6490	4280
LINES= LINES + 2	B03 6500	4281
1990 WRITE (KOUT,1090)	B03 6510	4282
C	B03 6520	4283
DO 2020 K=1,NCV	B03 6530	4284
LINES= LINES+1	B03 6540	4285
DO 2010 J=1,NSPV	B03 6550	4286
LINES= LINES+1	B03 6560	4287
IF (LINEX-LINES) 2000,2010,2010	B03 6570	4288
2000 CALL PAGE	B03 6580	4289
WRITE (KOUT,1090)	B03 6590	4290
LINES= LINES + 2	B03 6600	4291
2010 WRITE (KOUT,1100) J,K,(EV(J,K,I),I=1,6),(EN(J,K,I),I=1,6)	B03 6610	4292
2020 WRITE (KOUT,1020)	B03 6620	4293
C	B03 6630	4294
2030 CONTINUE	B03 6640	4295
C	B03 6650	4296
LINES= LINES+3	B03 6660	4297
IF (LINEX-LINES) 2040,2050,2050	B03 6670	4298
2040 CALL PAGE	B03 6680	4299
LINES= LINES+3	B03 6690	4300
2050 WRITE (KOUT,1000)	B03 6700	4301
C	B03 6710	4302
C	B03 6720	4303
C * WRITE ON CALCONPLOT TAPE *	B03 6730	4304
C	B03 6740	4305
IF (ITFLG(12)-1) 2460,2060,2060	B03 6750	4306
2060 IREC1=1	B03 6760	4307
IREC2=7	B03 6770	4308
XZERO = X(1) - 0.4*BOTU	B03 6780	4309
ZZERO = Z(1)	B03 6790	4310
C	B03 6800	4311
DO 2070 J=1,NSPS	B03 6810	4312
YSPN = YSPAN(J)	B03 6820	4313
C	B03 6830	4314
CALL CHORDT(YSPN,XLE,XC04,XTE,XHE,CW,CF)	B03 6840	4315
C	B03 6850	4316
YSPN = YSPN/BOTU	B03 6860	4317
XLE = (XLE - XZERO)/BOTU	B03 6870	4318
XC04 = (XC04 - XZERO)/BOTU	B03 6880	4319
XTE = (XTE - XZERO)/BOTU	B03 6890	4320
XHE = (XHE - XZERO)/BOTU	B03 6900	4321
CW = CW/BOTU	B03 6910	4322
CF = CF/BOTU	B03 6920	4323
2070 WRITE(KT2) IREC1,IREC2,YSPN,XLE,XC04,XTE,XHE,CW,CF	B03 6930	4324
C	B03 6940	4325
C	B03 6950	4326
IREC1= 2	B03 6960	4327
IREC2= 2	B03 6970	4328
K=1	B03 6980	4329
DO 2100 J=1,NSPS	B03 6990	4330
YSPN = EV(J,K,2)	B03 7000	4331
C	B03 7010	4332
CALL CHORDT(YSPN,XLE,XC04,XTE,XHF,CW,CF)	B03 7020	4333
C	B03 7030	4334
YSPN = YSPN/BOTU	B03 7040	4335
XLE = (XLE - XZERO)/BOTU	B03 7050	4336
XTE = (XTE - XZERO)/BOTU	B03 7060	4337
IF (ITET) 2080,2080,2090	B03 7070	4338
2080 ITET = 1	B03 7080	4339
WRITE(KT2) IREC1,IREC2,YSPN,XLE	B03 7090	4340
WRITE(KT2) IREC1,IREC2,YSPN,XTE	B03 7100	4341
GO TO 2100	B03 7110	4342
2090 ITET = -1	B03 7120	4343
WRITE(KT2) IREC1,IREC2,YSPN,XTE	B03 7130	4344
WRITE(KT2) IREC1,IREC2,YSPN,XLE	B03 7140	4345
2100 CONTINUE	B03 7150	4346
C	B03 7160	4347
C	B03 7170	4348
IREC1= 3	B03 7180	4349
IREC2= 2	B03 7190	4350
ITET =-1	B03 7200	4351
DO 2150 K=1,NCV	B03 7210	4352
DO 2140 J=1,NSPS	B03 7220	4353
IF (ITET) 2110,2110,2120	B03 7230	4354
2110 JR = J	B03 7240	4355
GO TO 2130	B03 7250	4356
2120 JR = NSPS +1-J	B03 7260	4357
2130 CONTINUE	B03 7270	4358
YSPN = (EV(JR,K,2))/BOTU	B03 7280	4359
XLE = (FV(JR,K,1) -0.25*EC(JR,K) -XZERO)/BOTU	B03 7290	4360
2140 WRITE(KT2) IREC1,IREC2,YSPN,XLE	B03 7300	4361
ITET = -1*ITET	B03 7310	4362
2150 CONTINUE	B03 7320	4363
C	B03 7330	4364
C	B03 7340	4365
IREC1=4	B03 7350	4366
IREC2=3	B03 7360	4367
C	B03 7370	4368
DO 2210 J=1,NSPS	B03 7380	4369
C	B03 7390	4370
YSPN= EV(J,1,2)	B03 7400	4371
YA = ABS(YSPN)	B03 7410	4372
M=-1	B03 7420	4373
DO 2180 K=1,NY2	B03 7430	4374
IF (M) 2160,2180,2180	B03 7440	4375
2160 TEST= YA-Y(K)	B03 7450	4376
IF (TEST) 2170,2170,2180	B03 7460	4377
2170 M= K	B03 7470	4378

2180	CONTINUE	803 7480	4379
C		803 7490	4380
	M1=M-1	803 7500	4381
	IF (M1) 2190,219C,2200	803 7510	4382
2190	M=2	803 7520	4383
	M1=1	803 7530	4384
2200	RAT= (YA -Y(M1))/(Y(M)-Y(M1))	803 7540	4385
C		803 7550	4386
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	803 7560	4387
C		803 7570	4388
	DELTAZ= Z(M1) + (Z(M)-Z(M1))*RAT	803 7580	4389
	TANEPS=(E(M1) + (E(M)-E(M1))*RAT)/RAD	803 7590	4390
	TANEPS= TAN(TANEPS)	803 7600	4391
	ZLE= (-DELTAZ + TANEPS*CW*(XOCREF))/BOTU	803 7610	4392
	ZTE= (-DELTAZ + TANEPS*CW*(XOCREF-1.0))/BOTU	803 7620	4393
	YSPN= YSPN/BOTU	803 7630	4394
2210	WRITE(KT2)IREC1,IREC2,YSPN,ZLE,ZTE	803 7640	4395
C		803 7650	4396
C		803 7660	4397
	IREC1= 5	803 7670	4398
	IREC2= 6	803 7680	4399
	ZERO= 0.0	803 7690	4400
	XZERO= X(1) + C(1)*(0.5-XOCREF)	803 7700	4401
	YZERO= Y(1)	803 7710	4402
	ZZERO= Z(1)	803 7720	4403
	PHIR= 45.0/RAD	803 7730	4404
	PHIP= -PHIR	803 7740	4405
	PHIQ= 0.5*PHIP	803 7750	4406
C		803 7760	4407
C		803 7770	4408
	DD 2270 J=1,NSPS	803 7780	4409
C		803 7790	4410
	YSPN= YSPAN(J)	803 7800	4411
	YA= ABS(YSPN)	803 7810	4412
C		803 7820	4413
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	803 7830	4414
C		803 7840	4415
	M=-1	803 7850	4416
	DD 2240 K=1,NYS	803 7860	4417
	IF (M) 2220,2240,2240	803 7870	4418
2220	TEST= YA-Y(K)-0.0001	803 7880	4419
	IF (TEST) 2230,2230,2240	803 7890	4420
2230	M=K	803 7900	4421
2240	CONTINUE	803 7910	4422
	IF (M-1) 2250,2250,2260	803 7920	4423
2250	M= 2	803 7930	4424
2260	M1= M-1	803 7940	4425
C		803 7950	4426
	RAT= (YA-Y(M1))/(Y(M)-Y(M1))	803 7960	4427
	DELTAZ= Z(M1) + (Z(M)-Z(M1))*RAT	803 7970	4428
	TANEPS= E(M1) + (E(M)-E(M1))*RAT	803 7980	4429
	TANEPS= TAN(TANEPS/RAD)	803 7990	4430
C		803 8000	4431
	ZLE= (-DELTAZ + TANEPS*CW*(XOCREF) +ZZERO)/BOTU	803 8010	4432
	YLE= YSPN/BOTU	803 8020	4433
	XLE= (XLE -XZERO)/BOTU	803 8030	4434
	ZTE= (-DELTAZ + TANEPS*CW*(XOCREF-1.0)+ZZERO)/BOTU	803 8040	4435
	YTE= YLE	803 8050	4436
	XTE= (XTE -XZERO)/BOTU	803 8060	4437
C		803 8070	4438
	CALL ROTATE(XLE,ZLE, ZERC,ZERO, PHIR, ZERO,ZERO, XLE,ZLE)	803 8080	4439
	CALL ROTATE(YLE,XLE, ZERC,ZERO, PHIP, ZERO,ZERO, YLE,XLE)	803 8090	4440
	CALL ROTATE(YLE,ZLE, ZERC,ZERO, PHIQ, ZERO,ZERO, YLE,ZLE)	803 8100	4441
	CALL ROTATE(XTE,ZTE, ZERC,ZERO, PHIR, ZERO,ZERO, XTE,ZTE)	803 8110	4442
	CALL ROTATE(YTE,XTE, ZERC,ZERO, PHIP, ZERO,ZERO, YTE,XTE)	803 8120	4443
	CALL ROTATE(YTE,ZTE, ZERC,ZERO, PHIQ, ZERO,ZERO, YTE,ZTE)	803 8130	4444
C		803 8140	4445
2270	WRITE(KT2)IREC1,IREC2,YLE,ZLE,YTE,ZTE,XLE,XTE	803 8150	4446
C		803 8160	4447
C		803 8170	4448
	IREC1= 6	803 8180	4449
	IREC2= 3	803 8190	4450
	I=1	803 8200	4451
C		803 8210	4452
	DD 2350 J=1,NSPS	803 8220	4453
C		803 8230	4454
	YSPN= EV(J,I,2)	803 8240	4455
	YA= ABS(YSPN)	803 8250	4456
C		803 8260	4457
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	803 8270	4458
C		803 8280	4459
	M= -1	803 8290	4460
	DD 2300 K=1,NYS	803 8300	4461
	IF (M) 2280,2300,2300	803 8310	4462
2280	TEST= YA-Y(K)-0.0001	803 8320	4463
	IF (TEST) 2290,2290,2300	803 8330	4464
2290	M= K	803 8340	4465
2300	CONTINUE	803 8350	4466
	IF (M-1) 2310,2310,2320	803 8360	4467
2310	M= 2	803 8370	4468
2320	M1= M-1	803 8380	4469
C		803 8390	4470
	RAT= (YA-Y(M1))/(Y(M)-Y(M1))	803 8400	4471
	DELTAZ= Z(M1) + (Z(M)-Z(M1))*RAT	803 8410	4472
	TANEPS= E(M1) + (E(M)-E(M1))*RAT	803 8420	4473
	TANEPS= -TAN(TANEPS/RAD)	803 8430	4474
C		803 8440	4475
	ZLE= (-DELTAZ + TANEPS*CW*(XOCREF) + ZZERO)/BOTU	803 8450	4476
	YLE= YSPN/BOTU	803 8460	4477
	XLE= (XLE -XZERO)/BOTU	803 8470	4478
	ZTE= (-DELTAZ + TANEPS*CW*(XOCREF-1.0) + ZZERO)/BOTU	803 8480	4479
	YTE= YLE	803 8490	4480
	XTE= (XTE -XZERO)/BOTU	803 8500	4481
C		803 8510	4482
	CALL ROTATE(XLE,ZLE, ZERC,ZERO, PHIR, ZERO,ZERO, XLE,ZLE)	803 8520	4483
	CALL ROTATE(YLE,XLE, ZERC,ZERO, PHIP, ZERO,ZERO, YLE,XLE)	803 8530	4484

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CALL ROTATE( YLE,ZLE, ZERC,ZERO, PHIQ, ZERO,ZERO, YLE,ZLE )      803 8540      4485
CALL ROTATE( XTE,ZTE, ZERC,ZERO, PHIR, ZERO,ZERO, XTE,ZTE )      803 8550      4486
CALL ROTATE( YTE,XTE, ZERC,ZERO, PHIP, ZERO,ZERO, YTE,XTE )      803 8560      4487
CALL ROTATE( YTE,ZTE, ZERC,ZERO, PHIQ, ZERO,ZERO, YTE,ZTE )      803 8570      4488
C                                                                    803 8580      4489
IF (ITET) 2330,2320,2340                                          803 8590      4490
2330 ITET = 1                                                    803 8600      4491
WRITE(KT2)IREC1,IREC2,YLE,ZLE,XLE                                803 8610      4492
WRITE(KT2)IREC1,IREC2,YTE,ZTE,XTE                                803 8620      4493
GO TO 2350                                                         803 8630      4494
2340 ITET = -1                                                    803 8640      4495
WRITE(KT2)IREC1,IREC2,YTE,ZTE,XTE                                803 8650      4496
WRITE(KT2)IREC1,IREC2,YLE,ZLE,XLE                                803 8660      4497
C                                                                    803 8670      4498
2350 CONTINUE                                                    803 8680      4499
C                                                                    803 8690      4500
C                                                                    803 8700      4501
      IREC1= 7                                                    803 8710      4502
      IREC2= 3                                                    803 8720      4503
      ITET = -1                                                    803 8730      4504
C                                                                    803 8740      4505
      DO 2450 I=1,NCVPL                                           803 8750      4506
      DO 2440 J=1,NSPSS                                           803 8760      4507
C                                                                    803 8770      4508
IF (ITET) 2360,2360,2370                                          803 8780      4509
2360 JR= J                                                         803 8790      4510
GO TO 2380                                                         803 8800      4511
2370 JR= NSPSS +1-J                                               803 8810      4512
2380 CONTINUE                                                    803 8820      4513
C                                                                    803 8830      4514
      YSPN= EV(JR,I,2)                                           803 8840      4515
      YA = ABS(YSPN)                                             803 8850      4516
C                                                                    803 8860      4517
      CALL CHORDT(YSPN,XLE,XC04,XTE,XHE,CW,CF)                    803 8870      4518
C                                                                    803 8880      4519
      M= -1                                                       803 8890      4520
      DO 2410 K=1,NYS                                             803 8900      4521
      IF (M) 2390,2410,2410                                       803 8910      4522
2390 TEST= YA -Y(K)-0.0001                                         803 8920      4523
      IF (TEST) 2400,2410,2410                                       803 8930      4524
2400 M= K                                                         803 8940      4525
2410 CONTINUE                                                    803 8950      4526
      IF (M-1) 2420,2420,2430                                       803 8960      4527
2420 M= 2                                                         803 8970      4528
2430 M1= M-1                                                      803 8980      4529
C                                                                    803 8990      4530
      RAT= (YA-Y(M1))/(Y(M)-Y(M1))                                  803 9000      4531
      DELTAZ= Z(M1) + ( Z(M)-Z(M1) ) *RAT                        803 9010      4532
      TANEPS= E(M1) + ( E(M)-E(M1) ) *RAT                        803 9020      4533
      TANEPS= TAN(TANEPS/RAD)                                       803 9030      4534
C                                                                    803 9040      4535
      XTE = XLF                                                    803 9050      4536
      XLE = EV(JR,I,1) -0.25*EC(JR,I)                             803 9060      4537
      YLE = YSPN/BDTU                                             803 9070      4538
      ZLE = (-DELTAZ + TANEPS*( XTE + CW*XOCREF - XLE ) + ZZERO )/BDTU 803 9080      4539
      XLE = (XLE-XZERC)/BDTU                                       803 9090      4540
C                                                                    803 9100      4541
      CALL ROTATE( XLE,ZLE, ZERC,ZERO, PHIR, ZERO,ZERO, XLE,ZLE ) 803 9110      4542
      CALL ROTATE( YLE,XLE, ZERO,ZERO, PHIP, ZERO,ZERO, YLE,XLE ) 803 9120      4543
      CALL ROTATE( YLE,ZLE, ZERC,ZERO, PHIQ, ZERO,ZERO, YLE,ZLE ) 803 9130      4544
C                                                                    803 9140      4545
2440 WRITE(KT2)IREC1,IREC2,YLE,ZLF,XLE                            803 9150      4546
C                                                                    803 9160      4547
      ITET= -1*ITFT                                              803 9170      4548
C                                                                    803 9180      4549
2450 CONTINUE                                                    803 9190      4550
C                                                                    803 9200      4551
C                                                                    803 9210      4552
      END FILE KT2                                               803 9220      4553
      IFLG(15)= IFLG(15) + 1                                       803 9230      4554
      LINES= LINES + 2                                           803 9240      4555
      WRITE (KROUT,1130)IFLG(15)                                   803 9250      4556
C                                                                    803 9260      4557
C                                                                    803 9270      4558
2460 CONTINUE                                                    803 9280      4559
C                                                                    803 9290      4560
C                                                                    803 9300      4561
      RETURN                                                    803 9310      4562
C                                                                    803 9320      4563
C                                                                    803 9330      4564
C                                                                    803 9340      4565
      END                                                         803 9350      4566

V FOR R04,B04                                                    804 10      4567
C                                                                    804 20      4568
C                                                                    804 30      4569
C                                                                    804 40      4570
      SUBROUTINE DLIFT(ALFA,ZHEIGT)                                804 50      4571
C                                                                    804 60      4572
      * TRW MULTIPLE-SLRFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *R04 70      4573
      * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *R04 80      4574
C                                                                    804 90      4575
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 804 100      4576
C                                                                    804 110      4577
      DOUBLE PRECISION SCALE,SUP,DETERM,AMAT(71,71),VMAT(71)    804 120      4578
      DIMENSION P(3),B(3),D(3)                                     804 130      4579
      DIMENSION COS1(3),COS2(3),COS3(3)                          804 140      4580
      DIMENSION SUMWL(4),SUMSL(4)                                 804 150      4581
      DIMENSION Pw(3),Rw(3),Dw(3)                                804 160      4582
C                                                                    804 170      4583
      COMMON/DATA01/KIN ,KOUT ,KT1 ,KT2 ,LINEX ,LINES           804 180      4584
C                                                                    804 190      4585
      COMMON/DATA02/IFLG(15) ,FXECK(15) ,RAD ,PIE              804 200      4586
C                                                                    804 210      4587

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COMMON/DATA05/WINGD(15) ,EY(42,10) ,EC(42,10) ,ES(42,10) 804 220 4588
*,EYE(10) ,ELE(10) ,ETE(10) ,EME(10) ,EG(42,10) 804 230 4589
*,EN(42,10,6) ,EV(42,10,6) ,VVINDX(42,10,3) 804 240 4590
C 804 250 4591
C 804 260 4592
1000 FORMAT(1X) 804 270 4593
1010 FORMAT(1X,/,1X) 804 280 4594
C 804 290 4595
1020 FORMAT(47X,28HVORTEX LATTICE MATRIX DETAIL,/,47X,28(1H*),/,1X) 804 300 4596
1030 FORMAT( 1X,12H J K NP NG, 804 310 4597
2 60H VFS(MAT) VIN(MAT) P(X) P(Y) P(Z) B(X) , 804 320 4598
3 50H B(Y) B(Z) D(X) D(Y) D(Z) ,/,1X) 804 330 4599
1040 FORMAT(1X,4I3,11E10.4) 804 340 4600
C 804 350 4601
1050 FORMAT(48X,24HLIFT DISTRIBUTION DETAIL,/,48X,24(1H*),/,1X) 804 360 4602
1060 FORMAT(3X,4HJ K,5X,40HP(X) P(Y) P(Z) AREA , 804 370 4603
160HCPN G(X) G(Y) G(Z) VI(X) VI(Y) , 804 380 4604
215HVI(Z) GAMA , /,1X) 804 390 4605
1070 FORMAT( 1X, 2I3, 3F10.3, 2F10.4, 6F10.5, E10.4 ) 804 400 4606
C 804 410 4607
1080 FORMAT(48X,24HSECTION LIFT COEFFICIENTS,/,48X,24(1H*),/,1X) 804 420 4608
1090 FORMAT( 8X,3H J,99H 2Y/B Y C SCL SCL 804 430 4609
1C/B DLIFT SCMC(4) IXL LYL IZL ,/,1X) 804 440 4610
1100 FORMAT( 8X,13,F10.4,2F10.3,7F10.4) 804 450 4611
C 804 460 4612
1110 FORMAT(///,47X,25HWING AIRLOAD COEFFICIENTS,/,47X,25(1H*),///,18X, 804 470 4613
2 60H WCL WCDI WCMR WCMY IXL , 804 480 4614
3 40H LYL IZL DELTA SCALE ,/, 804 490 4615
4 3X,15HWITH LE SUCTION, 5F10.5,3F10.6, 2E10.4,/, 804 500 4616
5 3X,15H NO LE SUCTION , 5F10.5,3F10.6,/,1X ) 804 510 4617
C 804 520 4618
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 804 530 4619
C 804 540 4620
C 804 550 4621
C 804 560 4622
C 804 570 4623
C * INITIALIZE * 804 580 4624
C 804 590 4625
NSPV = IFLG(3) 804 600 4626
NCV = IFLG(6) 804 610 4627
SPAN = WINGD(1) 804 620 4628
WAREA = WINGD(6) 804 630 4629
WNGC = WINGD(9) 804 640 4630
BOTU = SPAN/2.0 804 650 4631
C 804 660 4632
ALFAR = ALFA/RAD 804 670 4633
TANA = TAN(ALFAR) 804 680 4634
COSA = 1.0/SQRT(1.0+TANA**2) 804 690 4635
SINA = TANA*COSA 804 700 4636
TANV = -TAN(0.5*ALFAR) 804 710 4637
TANVG = -TAN(1.5*ALFAR) 804 720 4638
UNIT = 0.25/PIE 804 730 4639
UNITG = -UNIT 804 740 4640
C 804 750 4641
C 804 760 4642
C * SYMMETRIC OR UNSYMMETRIC TEST * 804 770 4643
C 804 780 4644
NZERO = 1 804 790 4645
IF (IFLG(1)-1) 1120,1130,1130 804 800 4646
1120 CONTINUE 804 810 4647
NSPO2 = NSPV/2 804 820 4648
NTEST = NSPV-NSPO2*2 804 830 4649
NZERO = NSPO2 + 1 804 840 4650
1130 CONTINUE 804 850 4651
C 804 860 4652
C 804 870 4653
C 804 880 4654
C * CALCULATE MATRICES VMAT(NV) & AMAT(NG,NV) * 804 890 4655
C 804 900 4656
NV = 0 804 910 4657
NM = 0 804 920 4658
DO 1420 KV=1,NCV 804 930 4659
DO 1390 JV=NZERO,NSPV 804 940 4660
NV = NV+1 804 950 4661
C 804 960 4662
C 804 970 4663
COS1(1) = COSA 804 980 4664
COS1(2) = 0.0 804 990 4665
COS1(3) = -SINA 804 1000 4666
YSPN = EN(JV,KV,2) 804 1010 4667
C 804 1020 4668
CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF) 804 1030 4669
C 804 1040 4670
DO 1140 L=1,3 804 1050 4671
M = L+3 804 1060 4672
COS2(L) = EN(JV,KV,M) 804 1070 4673
1140 P(L) = EN(JV,KV,L) 804 1080 4674
C 804 1090 4675
CALL FLAPSIYSPN,XHE, P,COS2I 804 1100 4676
C 804 1110 4677
CALL DOTP(COS1,CCS2,VMATDP) 804 1120 4678
C 804 1130 4679
VMAT(NV) = VMATDP 804 1140 4680
C 804 1150 4681
C 804 1160 4682
DO 1150 L=1,3 804 1170 4683
1150 COS1(L) = COS2(L) 804 1180 4684
C 804 1190 4685
NG = 0 804 1200 4686
DO 1380 KG=1,NCV 804 1210 4687
DO 1370 JG=NZERO,NSPV 804 1220 4688
NG = NG+1 804 1230 4689
C 804 1240 4690
I = JG+1 804 1250 4691
DO 1160 L=1,3 804 1260 4692
B(L) = EV(JG,KG,L) 804 1270 4693

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1160	D(L)= FV(I,KG,L)	804	1280	4694
C		804	1290	4695
	YSPN= B(2)	804	1300	4696
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804	1310	4697
	CALL FLAPS(YSPN,XHE,B,COS2)	804	1320	4698
	YSPN= D(2)	804	1330	4699
C		804	1340	4700
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804	1350	4701
	CALL FLAPS(YSPN, XHE,D,COS2)	804	1360	4702
	DD 1170 L=1,3	804	1370	4703
	PW(L) = P(L)	804	1380	4704
	BW(L) = B(L)	804	1390	4705
1170	DW(L) = D(L)	804	1400	4706
C		804	1410	4707
	CALL VORTEX(P,B,D,TANV,UNIT, VI,COS2)	804	1420	4708
	CALL DOTP(COS1,CCS2,SUM1)	804	1430	4709
C		804	1440	4710
	SUM1= SUM1*VI	804	1450	4711
	SUM2= 0.0	804	1460	4712
C		804	1470	4713
	IF (IFLG(9)-1) 1190,1180,1180	804	1480	4714
1180	CONTINUE	804	1490	4715
	CALL REFLEC(B,ZHEIGT,ALFAR,COSA)	804	1500	4716
	CALL REFLEC(D,ZHEIGT,ALFAR,COSA)	804	1510	4717
C		804	1520	4718
	CALL VORTEX(P,B,D,TANV,UNITG, VI,COS2)	804	1530	4719
	CALL DOTP(COS1,CCS2,SUM3)	804	1540	4720
C		804	1550	4721
	SUM1= SUM1 + SUM3*VI	804	1560	4722
1190	CONTINUE	804	1570	4723
C		804	1580	4724
	IF (IFLG(11)-1) 1200,1250,1250	804	1590	4725
1200	JGM= NSPV-JG+1	804	1600	4726
	IF (JGM-JG) 1210,1250,1250	804	1610	4727
	DD 1420 KV=1,NCV	804	1620	4728
	DD 1390 JV=NZERO,NSPV	804	1630	4729
	NV= NV+1	804	1640	4730
C		804	1650	4731
C		804	1660	4732
	COS1(1)= COSA	804	1670	4733
	COS1(2)= 0.0	804	1680	4734
	COS1(3)= -SINA	804	1690	4735
	YSPN= EN(JV,KV,2)	804	1700	4736
C		804	1710	4737
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804	1720	4738
C		804	1730	4739
	DD 1140 L=1,3	804	1740	4740
	M= L+3	804	1750	4741
	COS2(L)= EN(JV,KV,M)	804	1760	4742
1140	P(L)= EN(JV,KV,L)	804	1770	4743
C		804	1780	4744
	CALL FLAPS(YSPN,XHE, P,COS2)	804	1790	4745
C		804	1800	4746
	CALL DOTP(COS1,COS2,VMATDP)	804	1810	4747
C		804	1820	4748
	VMAT(NV)= VMATDP	804	1830	4749
C		804	1840	4750
C		804	1850	4751
	DD 1150 L=1,3	804	1860	4752
1150	COS1(L)= COS2(L)	804	1870	4753
C		804	1880	4754
	NG= 0	804	1890	4755
	DD 1380 KG=1,NCV	804	1900	4756
	DD 1370 JG=NZERO,NSPV	804	1910	4757
	NG= NG+1	804	1920	4758
C		804	1930	4759
	I= JG+1	804	1940	4760
	DD 1160 L=1,3	804	1950	4761
	B(L)= EV(JG,KG,L)	804	1960	4762
1160	D(L)= EV(I,KG,L)	804	1970	4763
C		804	1980	4764
	YSPN= B(2)	804	1990	4765
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804	2000	4766
	CALL FLAPS(YSPN,XHE,B,COS2)	804	2010	4767
	YSPN= D(2)	804	2020	4768
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804	2030	4769
	CALL FLAPS(YSPN, XHE,D,COS2)	804	2040	4770
	DD 1170 L=1,3	804	2050	4771
	PW(L) = P(L)	804	2060	4772
	BW(L) = B(L)	804	2070	4773
1170	DW(L) = D(L)	804	2080	4774
C		804	2090	4775
	CALL VORTEX(P,B,D,TANV,UNIT, VI,COS2)	804	2100	4776
	CALL DOTP(COS1,CCS2,SUM1)	804	2110	4777
C		804	2120	4778
	SUM1= SUM1*VI	804	2130	4779
	SUM2= 0.0	804	2140	4780
C		804	2150	4781
	IF (IFLG(9)-1) 1190,1180,1180	804	2160	4782
1180	CONTINUE	804	2170	4783
	CALL REFLEC(B,ZHEIGT,ALFAR,COSA)	804	2180	4784
	CALL REFLEC(D,ZHEIGT,ALFAR,COSA)	804	2190	4785
C		804	2200	4786
	CALL VORTEX(P,B,D,TANV,UNITG, VI,COS2)	804	2210	4787
	CALL DOTP(COS1,CCS2,SUM3)	804	2220	4788
C		804	2230	4789
	SUM1= SUM1 + SUM3*VI	804	2240	4790
1190	CONTINUE	804	2250	4791
C		804	2260	4792
	IF (IFLG(11)-1) 1200,1250,1250	804	2270	4793
1200	JGM= NSPV-JG+1	804	2280	4794
	IF (JGM-JG) 1210,1250,1250	804	2290	4795
1210	CONTINUE	804	2300	4796
	I = JGM+1	804	2310	4797
	DD 1220 L=1,3	804	2320	4798
	B(L) = EV(JGM,KG,L)	804	2330	4799

1220	D(1) = EV(I,KG,L)	804 2340	4800
C		804 2350	4801
	YSPN= B(2)	804 2360	4802
	CALL CHORNT(YSPN,XLF,XCO4,XTE,XHE,CW,CF)	804 2370	4803
	CALL FLAPS(YSPN,XHE,B,COS2)	804 2380	4804
	YSPN= O(2)	804 2390	4805
	CALL CHORDT(YSPN,XLF,XCO4,XTE,XHE,CW,CF)	804 2400	4806
	CALL FLAPS(YSPN, XHE,D,COS2)	804 2410	4807
C		804 2420	4808
	CALL VORTEX(P,B,D,TANV,UNIT, VI,COS2)	804 2430	4809
	CALL DOTP(COS1,COS2,SUM2)	804 2440	4810
C		804 2450	4811
	SUM2= SUM2*VI	804 2460	4812
C		804 2470	4813
	IF (IFLG(9)-1) 1240,1230,1230	804 2480	4814
1230	CONTINUE	804 2490	4815
	CALL REFLEC(B,ZHEIGT,ALFAR,COSA)	804 2500	4816
	CALL REFLEC(D,ZHEIGT,ALFAR,COSA)	804 2510	4817
C		804 2520	4818
	CALL VORTEX(P,B,D,TANVG,UNITG, VI,COS2)	804 2530	4819
	CALL DOTP(COS1,CCS2,SUM4)	804 2540	4820
C		804 2550	4821
	SUM2= SUM2 + SUM4*VI	804 2560	4822
1240	CONTINUE	804 2570	4823
C		804 2580	4824
1250	CONTINUE	804 2590	4825
C		804 2600	4826
	AMAT(NG,NV)= SUM1+SUM2	804 2610	4827
C		804 2620	4828
C		804 2630	4829
	IF (EXECK(15)-1.0) 1260,1360,1360	804 2640	4830
1260	IF (IFLG(10)-5) 1360,1270,1270	804 2650	4831
1270	IF (NM-1) 1280,1280,1340	804 2660	4832
1280	LINES= LINES+4	804 2670	4833
	NM= 10	804 2680	4834
	IF (LINDEX-LINES) 1290,1300,1300	804 2690	4835
1290	CALL PAGE	804 2700	4836
	LINES= LINES+4	804 2710	4837
1300	WRITE (KOUT,1020)	804 2720	4838
1310	LINES=LINES+2	804 2730	4839
	IF (LINDEX-LINES) 1320,1330,1330	804 2740	4840
1320	CALL PAGE	804 2750	4841
	LINES= LINES+2	804 2760	4842
1330	WRITE (KOUT,1030)	804 2770	4843
1340	LINES=LINES+1	804 2780	4844
	IF (LINDEX-LINES) 1320,1350,1350	804 2790	4845
1350	WRITE (KOUT,1040)JV,KV,NV,NG,VMAT(NV),AMAT(NG,NV), (PM(I),I=1,3), (BM(I),I=1,3), (DM(I),I=1,3)	804 2800	4846
1360	CONTINUE	804 2810	4847
C		804 2820	4848
C		804 2830	4849
C		804 2840	4850
1370	CONTINUE	804 2850	4851
1380	CONTINUE	804 2860	4852
C		804 2870	4853
1390	CONTINUE	804 2880	4854
C		804 2890	4855
	IF (EXECK(15)-1.0) 1400,1420,1420	804 2900	4856
1400	IF (IFLG(10)-5) 1420,1410,1410	804 2910	4857
1410	WRITE (KOUT,1000)	804 2920	4858
	LINES=LINES+1	804 2930	4859
C		804 2940	4860
1420	CONTINUE	804 2950	4861
C		804 2960	4862
C		804 2970	4863
	LINES= LINES+3	804 2980	4864
	IF (LINDEX-LINES) 1430,1440,1440	804 2990	4865
1430	CALL PAGE	804 3000	4866
	GO TO 1450	804 3010	4867
1440	WRITE (KOUT,1010)	804 3020	4868
1450	CONTINUE	804 3030	4869
C		804 3040	4870
C		804 3050	4871
C		804 3060	4872
C		804 3070	4873
C	* SOLVE FOR GAMA *	804 3080	4874
C		804 3090	4875
C		804 3100	4876
	NM= 0	804 3110	4877
	SUP= 0.0	804 3120	4878
	DO 1470 J=1,NV	804 3130	4879
	DO 1460 K=1,NG	804 3140	4880
	NM= NM+1	804 3150	4881
1460	SUP= SUP + DABS(AMAT(K,J))	804 3160	4882
1470	CONTINUE	804 3170	4883
	SCALE = FLOAT(NM)	804 3180	4884
	SCALE = SUP/SCALE	804 3190	4885
	DO 1490 J=1,NV	804 3200	4886
	DO 1480 K=1,NG	804 3210	4887
1480	AMAT(J,K)= AMAT(J,K)/SCALE	804 3220	4888
1490	CONTINUE	804 3230	4889
C		804 3240	4890
	CALL DMAT(AMAT,NV,DETERM)	804 3250	4891
C		804 3260	4892
C		804 3270	4893
	NG= 0	804 3280	4894
	DO 1530 K=1,NCV	804 3290	4895
	DO 1520 J=NZERO,NSPV	804 3300	4896
	NG=NG+1	804 3310	4897
C		804 3320	4898
	SUP= 0.0	804 3330	4899
	NV= 0	804 3340	4900
	DO 1510 KV=1,NCV	804 3350	4901
	DO 1500 JV=NZERO,NSPV	804 3360	4902
	NV=NV+1	804 3370	4903
1500	SUP= SUP - VMAT(NV)*AMAT(NV,NG)	804 3380	4904
1510	CONTINUE	804 3390	4905

C	SUP = SUP/SCALE	804 3400	4906
	SUM = -SUP	804 3410	4907
1520	EG(J,K) = SUM/EHECK(1)	804 3420	4908
1530	CONTINUE	804 3430	4909
C		804 3440	4910
C		804 3450	4911
C		804 3460	4912
C		804 3470	4913
C		804 3480	4914
	IF (IFLG(1)-1) 1540,1570,1570	804 3490	4915
1540	CONTINUE	804 3500	4916
	DD 1560 J=NZERO,NSPV	804 3510	4917
	JM = NSPV+1-J	804 3520	4918
	DD 1550 K=1,NCV	804 3530	4919
1550	EG(JM,K) = FG(J,K)	804 3540	4920
1560	CONTINUE	804 3550	4921
1570	CONTINUE	804 3560	4922
C		804 3570	4923
C		804 3580	4924
C		804 3590	4925
C	* SOLVE FOR INDUCED VELOCITY MATRIX *	804 3600	4926
C		804 3610	4927
	DD 1700 K=1,NCV	804 3620	4928
	DD 1690 J=NZERO,NSPV	804 3630	4929
C		804 3640	4930
	I = J+1	804 3650	4931
	DD 1580 L=1,3	804 3660	4932
	SUMSL(L) = 0.0	804 3670	4933
	B(L) = EV(J,K,L)	804 3680	4934
1580	D(L) = EV(I,K,L)	804 3690	4935
	YSPN = B(2)	804 3700	4936
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804 3710	4937
	CALL FLAPS(YSPN,XHE,B,COS3)	804 3720	4938
	YSPN = D(2)	804 3730	4939
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804 3740	4940
	CALL FLAPS(YSPN,XHE,D,COS3)	804 3750	4941
	DD 1590 L=1,3	804 3760	4942
1590	P(L) = 0.5*(B(L)+D(L))	804 3770	4943
C		804 3780	4944
	DD 1660 KG=L,NCV	804 3790	4945
	DD 1650 JG=1,NSPV	804 3800	4946
C		804 3810	4947
	I = JG+1	804 3820	4948
	DD 1600 L=1,3	804 3830	4949
	B(L) = EV(JG,KG,L)	804 3840	4950
1600	D(L) = EV(I,KG,L)	804 3850	4951
	YSPN = B(2)	804 3860	4952
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804 3870	4953
	CALL FLAPS(YSPN,XHE,B,COS2)	804 3880	4954
	YSPN = D(2)	804 3890	4955
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804 3900	4956
	CALL FLAPS(YSPN,XHE,D,COS2)	804 3910	4957
C		804 3920	4958
	CALL VORTEX(P,B,D,TANV,UNITG,VI,COS2)	804 3930	4959
C		804 3940	4960
	DD 1610 L=1,3	804 3950	4961
1610	SUMSL(L) = SUMSL(L) - EG(JG,KG)*VI*COS2(L)	804 3960	4962
C		804 3970	4963
	IF (IFLG(9)-1) 1640,1620,1620	804 3980	4964
1620	CALL REFLEC(B,ZHEIGT,ALFAR,COSA)	804 3990	4965
	CALL REFLEC(D,ZHEIGT,ALFAR,COSA)	804 4000	4966
C		804 4010	4967
	CALL VORTEX(P,B,D,TANV,UNITG,VI,COS2)	804 4020	4968
C		804 4030	4969
	DD 1630 L=1,3	804 4040	4970
1630	SUMSL(L) = SUMSL(L) - EG(JG,KG)*VI*COS2(L)	804 4050	4971
1640	CONTINUE	804 4060	4972
1650	CONTINUE	804 4070	4973
1660	CONTINUE	804 4080	4974
C		804 4090	4975
	DD 1670 L=1,3	804 4100	4976
1670	VVINDX(J,K,L) = SUMSL(L)*EHECK(1)	804 4110	4977
	IF (NZERO-2) 1690,1680,1680	804 4120	4978
1680	M = NSPV +1 -J	804 4130	4979
	VVINDX(M,K,1) = VVINDX(J,K,1)	804 4140	4980
	VVINDX(M,K,2) = -VVINDX(J,K,2)	804 4150	4981
	VVINDX(M,K,3) = VVINDX(J,K,3)	804 4160	4982
C		804 4170	4983
1690	CONTINUE	804 4180	4984
1700	CONTINUE	804 4190	4985
C		804 4200	4986
C		804 4210	4987
C		804 4220	4988
C	* WING COEFFICIENTS *	804 4230	4989
C		804 4240	4990
	FACT1 = 2.0/WINGD(6)	804 4250	4991
	FACT2 = FACT1/WINGD(9)	804 4260	4992
	FACT3 = FACT1/WINGD(1)	804 4270	4993
	WPMO = 0.0	804 4280	4994
	WRMO = 0.0	804 4290	4995
	WYMO = 0.0	804 4300	4996
	WCLV = 0.0	804 4310	4997
	WCDV = 0.0	804 4320	4998
	WPMV = 0.0	804 4330	4999
	WRMV = 0.0	804 4340	5000
	WYMV = 0.0	804 4350	5001
	NM = 0	804 4360	5002
	DD 1710 L=1,4	804 4370	5003
1710	SUMWL(L) = 0.0	804 4380	5004
C		804 4390	5005
C		804 4400	5006
	DD 1990 J=1,NSPV	804 4410	5007
C		804 4420	5008
	YSPN = EN(J,1,2)	804 4430	5009
	YA = ABS(YSPN)	804 4440	5010
	M = -1	804 4450	5011

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DO 1740 L=2,10
IF (M) 1720,1740,1740
1720 TEST= YA-EYE(L)
IF (TEST) 1730,1740,1740
1730 M= L
1740 CONTINUE
IF (M-2) 1750,1760,1760
1750 M = 2
1760 M1= M-1
C
RATS= (YA-EYE(M1))/(EYE(M)-EYE(M1))
XLE = ELE(M1) + RATS*(ELE(M)-ELE(M1))
XHE = EHE(M1) + RATS*(EHE(M)-EHE(M1))
TANLE= (ELF(M)-ELE(M1))/(EYE(M)-EYE(M1))
COSLE= SQRT(1.0+TANLE**2)
C
C
DO 1960 K=1,NCV
NM= NM+1
C
COSI(1)= VVINDX(J,K,1) + COSA
COSI(2)= VVINDX(J,K,2)
COSI(3)= VVINDX(J,K,3) - SINA
C
I = J+1
DO 1770 L=1,3
B(L)= EV(J,K,L)
D(L)= EV(I,K,L)
1770 P(L)= 0.5*( B(L)+D(L) )
YSPN = B(I)
CALL FLAPS(YSPN,XHE,B,COS3)
YSPN = D(I)
CALL FLAPS(YSPN,XHE,D,COS3)
YSPN = P(I)
SUMB = 0.0
DO 1780 L=1,3
COS2(L)= D(L)-B(L)
1780 SUMB = SUMB + COS2(L)**2
SUMB = SQRT(SUMB)
DO 1790 L=1,3
1790 COS2(L) = COS2(L)/SUMB
C
CALL FLAPS( YSPN,XHE, P,COS3 )
C
CALL CROSP(COS1,COS2,COS3)
C
SLIFT= (EY(J,K)/COS2(2))*EG(J,K)
C
DO 1800 L=1,3
1800 SUMSL(L)= SLIFT*COS3(L)
C
XARM = P(1) - WINGD(11)
YARM = P(2)
ZARM = P(3) - WINGD(12)
WPMO = WPMO + ( XARM*SUMSL(3) + ZARM*SUMSL(1) )*EXECK(13)
WRMO = WRMO - ( YARM*SUMSL(3) + ZARM*SUMSL(2) )
WYMO = WYMO - ( YARM*SUMSL(1) - XARM*SUMSL(2) )
SCTS = -SUMSL(1)
IF (SCTS) 1810,1810,1820
1810 SCTS = 0.0
1820 SNFC = COSLE*SCTS
IF (SUMSL(3)) 1830,1840,1840
1830 SNFC = -SNFC
1840 CONTINUE
WCLV= WCLV + SNFC
WCDV= WCDV + SCTS
XARM = XLE - WINGD(11)
WPMV = WPMV + ( XARM*SNFC + ZARM*SCTS )
WRMV = WRMV - ( YARM*SNFC )
WYMV = WYMV - ( YARM*SCTS )
C
DO 1850 L=1,3
1850 SUMML(L)= SUMML(L) + SUMSL(L)
C
C
IF (EXECK(15)-1.0) 1860,1950,1950
1860 IF (IFLG(10)-2) 1550,1870,1870
1870 IF (NM-1) 1880,1880,1930
1880 LINES= LINES+4
IF (LINEX-LINES) 1890,1900,1900
1890 CALL PAGE
LINES= LINES+4
1900 WRITE (KOUT,1050)
LINES= LINES+2
IF (LINEX-LINES) 1910,1920,1920
1910 CALL PAGE
LINES= LINES+2
1920 WRITE (KOUT,1060)
1930 LINES= LINES+1
IF (LINEX-LINES) 1910,1940,1940
1940 CPLIFT= -2.0*SUMSL(3)/ES(J,K)
WRITE (KOUT,1070)J,K,(P(I),I=1,3),ES(J,K),CPLIFT,(COS3(I),I=1,3),(0.045370
1VVINDX(J,K,I),I=1,3),EG(J,K)
1950 CONTINUE
C
C
1960 CONTINUE
C
IF (EXECK(15)-1.0) 1970,1990,1990
1970 IF (IFLG(10)-2) 1990,1980,1980
1980 WRITE (KOUT,1000)
LINES=LINES+1
1990 CONTINUE
C
SUMML(4)= 0.0
DO 2000 L=1,3

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804 4460 5012
804 4470 5013
804 4480 5014
804 4490 5015
804 4500 5016
804 4510 5017
804 4520 5018
804 4530 5019
804 4540 5020
804 4550 5021
804 4560 5022
804 4570 5023
804 4580 5024
804 4590 5025
804 4600 5026
804 4610 5027
804 4620 5028
804 4630 5029
804 4640 5030
804 4650 5031
804 4660 5032
804 4670 5033
804 4680 5034
804 4690 5035
804 4700 5036
804 4710 5037
804 4720 5038
804 4730 5039
804 4740 5040
804 4750 5041
804 4760 5042
804 4770 5043
804 4780 5044
804 4790 5045
804 4800 5046
804 4810 5047
804 4820 5048
804 4830 5049
804 4840 5050
804 4850 5051
804 4860 5052
804 4870 5053
804 4880 5054
804 4890 5055
804 4900 5056
804 4910 5057
804 4920 5058
804 4930 5059
804 4940 5060
804 4950 5061
804 4960 5062
804 4970 5063
804 4980 5064
804 4990 5065
804 5000 5066
804 5010 5067
804 5020 5068
804 5030 5069
804 5040 5070
804 5050 5071
804 5060 5072
804 5070 5073
804 5080 5074
804 5090 5075
804 5100 5076
804 5110 5077
804 5120 5078
804 5130 5079
804 5140 5080
804 5150 5081
804 5160 5082
804 5170 5083
804 5180 5084
804 5190 5085
804 5200 5086
804 5210 5087
804 5220 5088
804 5230 5089
804 5240 5090
804 5250 5091
804 5260 5092
804 5270 5093
804 5280 5094
804 5290 5095
804 5300 5096
804 5310 5097
804 5320 5098
804 5330 5099
804 5340 5100
804 5350 5101
804 5360 5102
804 5370 5103
804 5380 5104
804 5390 5105
804 5400 5106
804 5410 5107
804 5420 5108
804 5430 5109
804 5440 5110
804 5450 5111
804 5460 5112
804 5470 5113
804 5480 5114
804 5490 5115
804 5500 5116
804 5510 5117

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2000	SUMWL(4)= SUMWL(4) + SUMWL(1)**2	804 5520	5118
	SUMWL(4)= SQR(SUMWL(4))	804 5530	5119
	DO 2010 L=1,3	804 5540	5120
2010	SUMWL(L)= SUMWL(L)/SUMWL(4)	804 5550	5121
C		804 5560	5122
	WCL=-FACT1*SUMWL(4)*(SUMWL(3)*COSA+SUMWL(1)*SINA)	804 5570	5123
	WCD= FACT1*SUMWL(4)*(SUMWL(1)*COSA-SUMWL(3)*SINA)	804 5580	5124
	WPMO= WPMO*FACT2	804 5590	5125
	WRMO= WRMO*FACT3	804 5600	5126
	WYMO= WYMO*FACT3	804 5610	5127
	SNFC= FACT1*(WCLV*COSA + WCDV*SINA)	804 5620	5128
	SCTS= FACT1*(WCDV*COSA - WCLV*SINA)	804 5630	5129
	WPMV = WPMO + FACT2*WPMV	804 5640	5130
	WRMV= WRMO + FACT3*WRMV	804 5650	5131
	WYMV= WYMO + FACT3*WYMV	804 5660	5132
	WCLV= WCL - SNFC	804 5670	5133
	WCDV= WCD + SCTS	804 5680	5134
C		804 5690	5135
	IF (EXECK(15)-1.C) 2020,2050,2050	804 5700	5136
2020	LINES= LINES+3	804 5710	5137
	IF (LINEX=LINES) 2030,2040,2040	804 5720	5138
2030	CALL PAGE	804 5730	5139
	GO TO 2050	804 5740	5140
2040	WRITE (KOUT,1010)	804 5750	5141
2050	CONTINUE	804 5760	5142
C		804 5770	5143
	EXECK(2)= WCL	804 5780	5144
	EXECK(3)= WPMO	804 5790	5145
	EXECK(4)= WRMO	804 5800	5146
	EXECK(5)= WYMO	804 5810	5147
	EXECK(6)=(WCLV-WCL)	804 5820	5148
	EXECK(7)=(WPMV-WPMO)	804 5830	5149
	EXECK(8)=(WCDV-WCD)	804 5840	5150
	EXECK(9)= WCD	804 5850	5151
C		804 5860	5152
	IF (EXECK(15)-1.C) 2060,2250,2250	804 5870	5153
2060	CONTINUE	804 5880	5154
C		804 5890	5155
C		804 5900	5156
E		804 5910	5157
C	* SECTION COEFFICIENTS *	804 5920	5158
C		804 5930	5159
	NJ= 0	804 5940	5160
C		804 5950	5161
	DO 2220 J=NZERO,ASPV	804 5960	5162
C		804 5970	5163
	NJ=NJ+1	804 5980	5164
C		804 5990	5165
	SPMO= 0.0	804 6000	5166
	YSPN= EN(J,L,2)	804 6010	5167
C		804 6020	5168
	CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	804 6030	5169
C		804 6040	5170
	CDRD= CW**2	804 6050	5171
C		804 6060	5172
	DO 2070 L=1,4	804 6070	5173
2070	SUMSL(L)= 0.0	804 6080	5174
C		804 6090	5175
	DO 2120 K=1,NCV	804 6100	5176
C		804 6110	5177
	COS1(1)= VVINDX(J,K,1) + COSA	804 6120	5178
	COS1(2)= VVINDX(J,K,2)	804 6130	5179
	COS1(3)= VVINDX(J,K,3) - SINA	804 6140	5180
C		804 6150	5181
	I = J+1	804 6160	5182
	DO 2080 L=1,3	804 6170	5183
	R(L)= EV(J,K,L)	804 6180	5184
	D(L)= EV(I,K,L)	804 6190	5185
2080	P(L)= 0.5*(B(L)+D(L))	804 6200	5186
	YSPN = B(2)	804 6210	5187
	CALL FLAPS(YSPN,XHE,B,COS3)	804 6220	5188
	YSPN = D(2)	804 6230	5189
	CALL FLAPS(YSPN,XHE,D,COS3)	804 6240	5190
	YSPN = P(2)	804 6250	5191
	SUMR = 0.0	804 6260	5192
	DO 2090 L=1,3	804 6270	5193
	COS2(L)= R(L)-B(L)	804 6280	5194
2090	SUMR = SUMR + COS2(L)**2	804 6290	5195
	SUMR = SQR(SUMR)	804 6300	5196
	DO 2100 L=1,3	804 6310	5197
2100	COS2(L) = COS2(L)/SUMR	804 6320	5198
	CALL FLAPS(YSPN,XHE,P,COS3)	804 6330	5199
C		804 6340	5200
	CALL CROSP(COS1,COS2,COS3)	804 6350	5201
C		804 6360	5202
	SLIFT= EG(J,K)/COS2(2)	804 6370	5203
C		804 6380	5204
	DO 2110 L=1,3	804 6390	5205
2110	SUMSL(L)= SUMSL(L) + SLIFT*COS3(L)	804 6400	5206
C		804 6410	5207
	XARM= EV(J,K,1) + 0.5*EV(J,K)*EV(J,K,4)/EV(J,K,5) -XCO4	804 6420	5208
	SPMO= SPMO + SLIFT*COS3(3)*XARM	804 6430	5209
C		804 6440	5210
2120	CONTINUE	804 6450	5211
C		804 6460	5212
	DO 2130 L=1,3	804 6470	5213
2130	SUMSL(4)= SUMSL(4) + SUMSL(L)**2	804 6480	5214
	SUMSL(4)= SQR(SUMSL(4))	804 6490	5215
	DO 2140 L=1,3	804 6500	5216
2140	SUMSL(L)= SUMSL(L)/SUMSL(4)	804 6510	5217
C		804 6520	5218
	SCL= SUMSL(4)*2.0/CW	804 6530	5219
	SPMO= SPMO*2.0/CDRD	804 6540	5220
C		804 6550	5221
	IF (NJ=1) 2150,2150,2200	804 6560	5222
2150	LINES= LINES+4	804 6570	5223

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IF (LINEX-LINES) 2160,2170,2170      804 6580      5224
2160 CALL PAGE                        804 6590      5225
      LINES= LINES+4                  804 6600      5226
2170 WRITE (KOUT,1080)                804 6610      5227
      LINES=LINES+2                  804 6620      5228
      IF (LINEX-LINES) 2180,2190,2190 804 6630      5229
2180 CALL PAGE                        804 6640      5230
      LINES= LINES+2                  804 6650      5231
2190 WRITE (KOUT,1090)                804 6660      5232
2200 LINES= LINES+1                  804 6670      5233
      IF (LINEX-LINES) 2180,2210,2210 804 6680      5234
2210 YOB= EN(J,1,2)/BOTU              804 6690      5235
      SPL = 0.5*SCL*CW/BOTU           804 6700      5236
      SLIFT= SCL*CW*EY(J,1)/WINGD(4) 804 6710      5237
      WRITE (KOUT,1100)J,YOB,EN(J,1,2),CW,SCL,SPL,SLIFT,SPMO,(SUMSL(I),I=1,3) 804 6720      5238
      L=1,3)                          804 6730      5239
C                                     804 6740      5240
2220 CONTINUE                         804 6750      5241
C                                     804 6760      5242
C                                     804 6770      5243
      CALL INTERP(ALFA,ZHEIGT,WCL,WCD) 804 6780      5244
C                                     804 6790      5245
C                                     804 6800      5246
      RATS= SQRT( WCDV**2 + WCLV**2 ) 804 6810      5247
      COS3(1)= ( WCDV*COSA - WCLV*SINA )/RATS 804 6820      5248
      COS3(2)= 0.0                    804 6830      5249
      COS3(3)= (-WCLV*COSA - WCDV*SINA )/RATS 804 6840      5250
C                                     804 6850      5251
      LINES=LINES+11                  804 6860      5252
      IF (LINEX-LINES) 2230,2240,2240 804 6870      5253
2230 CALL PAGE                        804 6880      5254
      LINES= LINES + 11               804 6890      5255
2240 WRITE (KOUT,1110)WCL,WCD,WPMO,WRMO,WYMO,(SUMWL(I),I=1,3),DETERM,SCBO4 804 6900      5256
      LALE,WCLV,WCDV,WPMV,WRMV,WYMV,(COS3(I),I=1,3) 804 6910      5257
      LINES=LINES+10                 804 6920      5258
C                                     804 6930      5259
C                                     804 6940      5260
2250 RETURN                           804 6950      5261
C XXXXXX                              804 6960      5262
C                                     804 6970      5263
C                                     804 6980      5264
      END                             804 6990      5265

V FOR B05,B05                          805 10      5266
C                                     805 20      5267
C                                     805 30      5268
C                                     805 40      5269
      SURROUTINE INTERP(ALFA,ZHEIGT,WCLCF,WCDGFI) 805 50      5270
C                                     805 60      5271
C * TRM MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *805 70      5272
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRM SYSTEMS) ON MARCH-MAY 1971 *805 80      5273
C                                     805 90      5274
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 805 100      5275
C                                     805 110      5276
      DIMENSION XFUN(11), CPFUN(11)   805 120      5277
      DIMENSION YSPAN(22), XCORD(22), SPRES(22) 805 130      5278
      DIMENSION SLIFT(22),SDRAG(22),CMOMT(22) 805 140      5279
      DIMENSION ALIFT(42),ADRAG(42),AMOMT(42) 805 150      5280
      DIMENSION FLAPN(22),FLAPX(22),AFLPN(42),AFLPX(42) 805 160      5281
      DIMENSION SCLV(22),SPMV(22),SCDV(22),ACLV(42),APMV(42),ACDV(42) 805 170      5282
C                                     805 180      5283
      DIMENSION COS1(3),COS2(3),COS3(3) 805 190      5284
      DIMENSION SUMSL(4),B(3),D(3),P(3) 805 200      5285
C                                     805 210      5286
      COMMON/DATA01/KIN ,KOUT ,KT1 ,KT2 ,LINEX ,LINES 805 220      5287
      COMMON/DATA02/IFLG(15) ,EXECK(15) ,RAD ,PIE 805 230      5288
      COMMON/DATA05/WINGD(15) ,EY(42,10) ,EC(42,10) ,ES(42,10) 805 240      5289
      *EYE(10) ,ELE(10) ,ETE(10) ,EHE(10) ,EG(42,10) 805 250      5290
      *ENI(42,10,6) ,EV(42,10,6) ,VVINDX(42,10,3) 805 260      5291
      COMMON/DATA06/YFF11,YFF12,YFF21,YFF22,YFF31,YFF32,DELTF1,DELTF2 805 270      5292
      * ,NOFLAP,NOAILR 805 280      5293
C                                     805 290      5294
      DATA XFUN/ 0.0,0.1,0.2,0.3,0.4,0.5,0.6,0.7,0.8,0.9,1.0/ 805 300      5295
C                                     805 310      5296
C                                     805 320      5297
1000 FORMAT(1X)                       805 330      5298
1010 FORMAT(1X,/,1X)                  805 340      5299
C                                     805 350      5300
1020 FORMAT(41X,3RHCHORDWISE PRESSURE DISTRIBUTION DETAIL,/,41X,38(1H*) 805 360      5301
      1,/,19X,19(2H* ),29HCHORD STATION (X-XLE)/C,19(2H* ),/,19X, 805 370      5302
      2 11F9.5,/,19H 2Y/B SCL ,18(2H* ),29HCHORD PRESSURE (CPL 805 380      5303
      3-CPU)*12L,17(2H* ),/,1X ) 805 390      5304
1030 FORMAT(1X,13F9.5 )              805 400      5305
C                                     805 410      5306
1040 FORMAT(41X,41HSPANWISE SECTION LIFT DISTRIBUTION DETAIL,/,41X,41(1805 420      5307
      1H*)/,/,33X,15HWITH LE SUCTION,16X,13HNO LE SUCTION,17X,12HFLAP/AIL 805 430      5308
      2ERON,/,5X,20H Y 2Y/B ,2(30H SCL SCDF SCMI)805 440      5309
      3C/4)), 30H FCN FCX FCH ,/,1X) 805 450      5310
1050 FORMAT(5X,F10.3,10F10.6 )       805 460      5311
C                                     805 470      5312
1060 FDRMAT(1X,/,1X,14H(EOF PLOT FILE,13,1H) ) 805 480      5313
C                                     805 490      5314
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 805 500      5315
C                                     805 510      5316
C                                     805 520      5317
C                                     805 530      5318
C                                     805 540      5319
C * INITIALIZE *                      805 550      5320
C                                     805 560      5321
      IF (IFLG(11)-1) 1630,1070,1070 805 570      5322
1070 CONTINUE                         805 580      5323
C                                     805 590      5324
      ZERO = 0.0                     805 600      5325
      ZERO1= 0.0                     805 610      5326

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	ZERO2= 0.0	805 620	5327
C		805 630	5328
	NO= 0	805 640	5329
	N1= 1	805 650	5330
	N2= 2	805 660	5331
	NSPV = IFLG(3)	805 670	5332
	NCV = IFLG(6)	805 680	5333
C		805 690	5334
	IREC4 = 1	805 700	5335
	IWORD1= 2	805 710	5336
	IWORD2= 10	805 720	5337
C		805 730	5338
	SPAN = WINGD(1)	805 740	5339
	WAREA= WINGD(6)	805 750	5340
	WMGC = WINGD(9)	805 760	5341
	BOTU = SPAN/2.0	805 770	5342
C		805 780	5343
	BETAM= EXECK(1)	805 790	5344
	WCL = EXECK(2)	805 800	5345
	WPMO = EXECK(3)	805 810	5346
	WRMO = EXECK(4)	805 820	5347
	WYMO = EXECK(5)	805 830	5348
C		805 840	5349
	FACT1= 2.0/WINGD(6)	805 850	5350
	FACT2= FACT1/WINGD(9)	805 860	5351
	FACT3= FACT1/WINGD(1)	805 870	5352
C		805 880	5353
	ALFAR= ALFA/RAD	805 890	5354
	TANA = TAN(ALFAR)	805 900	5355
	COSA = 1.0/SQRT(1.0+TANA**2)	805 910	5356
	SINA = TANA*COSA	805 920	5357
C		805 930	5358
	NZERO= 1	805 940	5359
	IF (IFLG(1)-1) 1080,1090,1090	805 950	5360
1080	CONTINUE	805 960	5361
	NSPD2= NSPV/2	805 970	5362
	NTEST= NSPV-NSPD2*2	805 980	5363
	NZERO= NSPD2 + 1	805 990	5364
1090	CONTINUE	805 1000	5365
C		805 1010	5366
	LINES= LINES + 3	805 1020	5367
	IF (LINEX-LINES) 1100,1110,1110	805 1030	5368
1100	CALL PAGE	805 1040	5369
	LINES= LINES + 3	805 1050	5370
1110	WRITE (KOUT,1010)	805 1060	5371
C		805 1070	5372
C		805 1080	5373
C		805 1090	5374
C	* SECTION COEFFICIENTS *	805 1100	5375
C		805 1110	5376
	NJ= 0	805 1120	5377
C		805 1130	5378
C		805 1140	5379
	NSPAN = 0	805 1150	5380
C		805 1160	5381
C		805 1170	5382
	DO 1390 J=NZERO,NSPV	805 1180	5383
C		805 1190	5384
	J2= J+1	805 1200	5385
	NJ=NJ+1	805 1210	5386
	NSPAN = NSPAN+1	805 1220	5387
C		805 1230	5388
	YSPN= EM(J,1,2)	805 1240	5389
C		805 1250	5390
	YA= ABS(YSPN)	805 1260	5391
	M= -1	805 1270	5392
	DO 1140 L=2,10	805 1280	5393
	IF (M) 1120,1140,1140	805 1290	5394
1120	TEST= YA-EYE(L)	805 1300	5395
	IF (TEST) 1130,1130,1140	805 1310	5396
1130	M= L	805 1320	5397
1140	CONTINUE	805 1330	5398
	IF (M-2) 1150,1160,1160	805 1340	5399
1150	M= 2	805 1350	5400
1160	M= M-1	805 1360	5401
C		805 1370	5402
	RATS= (YA-EYE(M1))/(EYE(M1)-EYE(M2))	805 1380	5403
	XLE = ELE(M1) + RATS*(ELE(M1)-ELE(M2))	805 1390	5404
	XTE = ETE(M1) + RATS*(ETE(M1)-ETE(M2))	805 1400	5405
	XME = EME(M1) + RATS*(EME(M1)-EME(M2))	805 1410	5406
	CW = XTE-XLE	805 1420	5407
	CF = XTE-XME	805 1430	5408
	XCO4= XLF + CW*0.25	805 1440	5409
	TANLF = (ELE(M1)-ELE(M2))/(EYE(M1)-EYE(M2))	805 1450	5410
	COSLE = SQRT(1.0 + TANLF**2)	805 1460	5411
C		805 1470	5412
	CORD= CW**2	805 1480	5413
C		805 1490	5414
C		805 1500	5415
C	* SECTION LIFT LOOP *	805 1510	5416
C		805 1520	5417
	NX = 0	805 1530	5418
C		805 1540	5419
	SPMO= 0.0	805 1550	5420
C		805 1560	5421
	DO 1170 L=1,4	805 1570	5422
1170	SUMSL(L)= 0.0	805 1580	5423
C		805 1590	5424
	DO 1220 K=1,NCV	805 1600	5425
C		805 1610	5426
	NX= NX+1	805 1620	5427
C		805 1630	5428
	COS1(1)= VVINDX(J,K,1) + COSA	805 1640	5429
	COS1(2)= VVINDX(J,K,2)	805 1650	5430
	COS1(3)= VVINDX(J,K,3) - SINA	805 1660	5431
C		805 1670	5432

I = J+1	805 1680	5433
DO 1180 L=1,3	805 1690	5434
B(L)= EV(J,K,L)	805 1700	5435
D(L)= EV(I,K,L)	805 1710	5436
1180 P(L)= 0.5*(B(L)+D(L))	805 1720	5437
YSPN = B(2)	805 1730	5438
CALL FLAPS(YSPN,XME,R,COS3)	805 1740	5439
YSPN = D(2)	805 1750	5440
CALL FLAPS(YSPN,XME,D,COS3)	805 1760	5441
YSPN = P(2)	805 1770	5442
SUM8 = 0.0	805 1780	5443
DO 1190 L=1,3	805 1790	5444
COS2(L)= D(L)-B(L)	805 1800	5445
1190 SUM8 = SUM8 + COS2(L)**2	805 1810	5446
SUM8 = SQRT(SUM8)	805 1820	5447
DO 1200 L=1,3	805 1830	5448
1200 COS2(L) = COS2(L)/SUM8	805 1840	5449
C	805 1850	5450
CALL FLAPS(YSPN,XME,P,COS3)	805 1860	5451
C	805 1870	5452
CALL CROSP(COS1,COS2,COS3)	805 1880	5453
C	805 1890	5454
ZLIFT= EG(J,K)/COS2(2)	805 1900	5455
C	805 1910	5456
SPRES(NX)= 2.0*ZLIFT*COS3(3)/EC(J,K)	805 1920	5457
XCORD(NX)= (P(1)-XLE)/CW	805 1930	5458
C	805 1940	5459
DO 1210 L=1,3	805 1950	5460
1210 SUMSL(L)= SUMSL(L) + ZLIFT*COS3(L)	805 1960	5461
C	805 1970	5462
XARM= P(1)-XCD4	805 1980	5463
SPM0= SPM0 + ZLIFT*COS3(3)*XARM	805 1990	5464
C	805 2000	5465
1220 CONTINUE	805 2010	5466
C	805 2020	5467
C	805 2030	5468
FLAPN(NSPAN) = -2.0*ZLIFT*COS3(3)/EC(J,NGV)	805 2040	5469
FLAPX(NSPAN) = 2.0*ZLIFT*COS3(1)/EC(J,NGV)	805 2050	5470
C	805 2060	5471
DO 1230 L=1,3	805 2070	5472
1230 SUMSL(4)= SUMSL(4) + SUMSL(L)**2	805 2080	5473
SUMSL(4)= SQRT(SUMSL(4))	805 2090	5474
DO 1240 L=1,3	805 2100	5475
1240 SUMSL(L)= SUMSL(L)/SUMSL(4)	805 2110	5476
SUMSL(4)= 2.0*SUMSL(4)/CW	805 2120	5477
C	805 2130	5478
C	805 2140	5479
NX= NX+1	805 2150	5480
SPRES(NX)= 0.0	805 2160	5481
XCORD(NX)= 1.0	805 2170	5482
C	805 2180	5483
CALL CURFIT(XCORD,SPRES,ALIFT, NX,ZERO1,ZERO2,N2,N2)	805 2190	5484
C	805 2200	5485
YSPAN(NSPAN)= YSPN/ROTU	805 2210	5486
SLIFT(NSPAN)= -SUMSL(4)*(SUMSL(3)*COSA + SUMSL(1)*SINA)	805 2220	5487
SDRAG(NSPAN)= SUMSL(4)*(SUMSL(1)*COSA - SUMSL(3)*SINA)	805 2230	5488
CMOMT(NSPAN)= 2.0*SPM0/CORD	805 2240	5489
SCTS = -SUMSL(4)*SUMSL(1)	805 2250	5490
IF (SCTS) 1250,1250,1260	805 2260	5491
1250 SCTS = 0.0	805 2270	5492
1260 SNFC = COSLE*SCTS	805 2280	5493
IF (SUMSL(3)) 1270,1280,1280	805 2290	5494
1270 SNFC= -SNFC	805 2300	5495
1280 CONTINUE	805 2310	5496
SCLV(NSPAN) = SLIFT(NSPAN) - SNFC*COSA - SCTS*SINA	805 2320	5497
SCDV(NSPAN) = SDRAG(NSPAN) +SCTS*COSA - SNFC*SINA	805 2330	5498
SPMV(NSPAN) = CMOMT(NSPAN) - SNFC*(XCD4-XLE)/CW	805 2340	5499
C	805 2350	5500
C	805 2360	5501
C	805 2370	5502
OXARG= XCORD(NX)/30.0	805 2380	5503
C	805 2390	5504
DO 1300 K=1,31	805 2400	5505
C	805 2410	5506
XARG = OXARG*FLOAT(K-1)	805 2420	5507
YARG = 0.0	805 2430	5508
C	805 2440	5509
IF (K-1) 1300,1300,1290	805 2450	5510
1290 CONTINUE	805 2460	5511
C	805 2470	5512
C	805 2480	5513
CALL CURVE(XCORD,SPRES,ALIFT, XARG,YARG,DUMYK,NX,NL)	805 2490	5514
C	805 2500	5515
1300 CPFUN(K)= -YARG	805 2510	5516
C	805 2520	5517
C	805 2530	5518
IF (J-NZER0) 1310,1310,1340	805 2540	5519
1310 LINES= LINES + 9	805 2550	5520
IF (LINEX-LINES) 1320,1330,1330	805 2560	5521
1320 CALL PAGE	805 2570	5522
LINES= LINES +9	805 2580	5523
1330 WRITE (KOUT,1020)(XFUN(I),I=1,11)	805 2590	5524
1340 IF (LINEX-LINES) 1320,1350,1350	805 2600	5525
1350 LINES= LINES+1	805 2610	5526
WRITE (KJUT,1030)YSPAN(NSPAN),SLIFT(NSPAN),(CPFUN(I),I=1,31,31)	805 2620	5527
C	805 2630	5528
C	805 2640	5529
IF (IFLG(13)-1) 1390,1360,1360	805 2650	5530
1360 CONTINUE	805 2660	5531
C	805 2670	5532
DO 1370 K=1,31	805 2680	5533
XARG = OXARG*FLOAT(K-1)	805 2690	5534
1370 WRITE(KT2)IREC4,WORD1,XARG,CPFUN(K)	805 2700	5535
IREC4 = IREC4 + 1	805 2710	5536
IF (J-NSPV) 1390,1380,1380	805 2720	5537
1380 END FILE KT2	805 2730	5538

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IREC4= 1
LINES= LINES +2
IFLG(15)= IFLG(15) +1
WRITE (KOUT,1060)IFLG(15)
C
C
1390 CONTINUE
C
C
LINES= LINES+3
IF (LINEX-LINES) 1400,1410,1410
1400 CALL PAGE
LINES= LINES+3
GO TO 1420
1410 WRITE (KOUT,1010)
1420 CONTINUE
C
C
CALL CURFIT(YSPAN, SLIFT,ALIFT, NSPAN,ZERO1,ZERO2,N2,N2)
CALL CURFIT(YSPAN, SDRAG,ADRAG, NSPAN,ZERO1,ZERO2,N2,N2)
CALL CURFIT(YSPAN, CMOMT,AMOMT, NSPAN,ZERO1,ZERO2,N2,N2)
CALL CURFIT(YSPAN, FLAPN,AFLPN, NSPAN,ZERO1,ZERO2,N2,N2)
CALL CURFIT(YSPAN, FLAPX,AFLPX, NSPAN,ZERO1,ZERO2,N2,N2)
CALL CURFIT(YSPAN, SCLV, ACLV, NSPAN,ZERO1,ZERO2,N2,N2)
CALL CURFIT(YSPAN, SCDV, ACDV, NSPAN,ZERO1,ZERO2,N2,N2)
CALL CURFIT(YSPAN, SPMV, APMV, NSPAN,ZERO1,ZERO2,N2,N2)
C
C
C
DELTAB = 1.0/20.0
WCLCF = 0.0
WCDCF = 0.0
SUMSS = 0.0
C
DO 1580 J=1,+1
C
YOB= DELTAB*FLOAT(J-1) - 1.0
YORO= YOB
YSPN= YORO+BOTU
C
IF (NZERO-1) 144C,1440,1430
1430 YOB= ABS(YOB)
1440 CONTINUE
C
CL = 0.0
CD = 0.0
CM = 0.0
CLV = 0.0
CDV = 0.0
CPV = 0.0
FCN = 0.0
FCX = 0.0
C
TEST= ABS(YOB) - 0.999
IF (TEST) 1450,1460,1460
1450 CONTINUE
C
CALL CURVE(YSPAN,SLIFT,ALIFT, YOB,CL, DUMYK,NSPAN,N1)
CALL CURVE(YSPAN,SDRAG,ADRAG, YOB,CD, DUMYK,NSPAN,N1)
CALL CURVE(YSPAN,CMOMT,AMOMT, YOB,CM, DUMYK,NSPAN,N1)
CALL CURVE(YSPAN,FLAPN,AFLPN, YOB,FCN,DUMYK,NSPAN,N1)
CALL CURVE(YSPAN,FLAPX,AFLPX, YOB,FCX,DUMYK,NSPAN,N1)
CALL CURVE(YSPAN,SCLV, ACLV, YOB,CLV,DUMYK,NSPAN,N1)
CALL CURVE(YSPAN,SCDV, ACDV, YOB,CDV,DUMYK,NSPAN,N1)
CALL CURVE(YSPAN,SPMV, APMV, YOB,CPV,DUMYK,NSPAN,N1)
C
1460 CONTINUE
C
CALL CHORDT(YSPN,XLE,XCD4,XTE,XHE,CW,CF)
C
FCM = -FCN/4.0
C
CLC1 = CL*CW
CDC1 = CD*CW
CWC1 = CW
C
IF (J-1) 1480,1480,1470
1470 WCLCF = WCLCF + DELTAB*(CLC1+CLC2)
WCDCF = WCDCF + DELTAB*(CDC1+CDC2)
SUMSS = SUMSS + DELTAB*(CWC1+CWC2)
1480 CLC2 = CLC1
CDC2 = CDC1
CWC2 = CWC1
C
C
IF (J-1) 1490,1490,1520
1490 LINES= LINES+7
IF (LINEX-LINES) 1500,1510,1510
1500 CALL PAGE
LINES= LINES+7
1510 WRITE (KOUT,1040)
1520 IF (LINEX-LINES) 1500,1530,1530
1530 LINES= LINES +1
NOFLPX= NOFLAP + NMAILR
IF (NOFLPX) 1540,1540,1550
1540 WRITE (KOUT,1050)YSPN,YORO,CL,CD,CM,CLV,CDV,CPV
GO TO 1560
1550 WRITE (KOUT,1050)YSPN,YORO,CL,CD,CM,CLV,CDV,CPV,FCN,FCX,FCM
1560 CONTINUE
C
IF (IFLG(14)-1) 1580,1570,1570
1570 WRITE(KT2)IREC4,IWORD2,YORO,CL,CD,CM,FCN,FCX,FCM,CLV,CDV,CPV
C
C

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805 2740 5539
805 2750 5540
805 2760 5541
805 2770 5542
805 2780 5543
805 2790 5544
805 2800 5545
805 2810 5546
805 2820 5547
805 2830 5548
805 2840 5549
805 2850 5550
805 2860 5551
805 2870 5552
805 2880 5553
805 2890 5554
805 2900 5555
805 2910 5556
805 2920 5557
805 2930 5558
805 2940 5559
805 2950 5560
805 2960 5561
805 2970 5562
805 2980 5563
805 2990 5564
805 3000 5565
805 3010 5566
805 3020 5567
805 3030 5568
805 3040 5569
805 3050 5570
805 3060 5571
805 3070 5572
805 3080 5573
805 3090 5574
805 3100 5575
805 3110 5576
805 3120 5577
805 3130 5578
805 3140 5579
805 3150 5580
805 3160 5581
805 3170 5582
805 3180 5583
805 3190 5584
805 3200 5585
805 3210 5586
805 3220 5587
805 3230 5588
805 3240 5589
805 3250 5590
805 3260 5591
805 3270 5592
805 3280 5593
805 3290 5594
805 3300 5595
805 3310 5596
805 3320 5597
805 3330 5598
805 3340 5599
805 3350 5600
805 3360 5601
805 3370 5602
805 3380 5603
805 3390 5604
805 3400 5605
805 3410 5606
805 3420 5607
805 3430 5608
805 3440 5609
805 3450 5610
805 3460 5611
805 3470 5612
805 3480 5613
805 3490 5614
805 3500 5615
805 3510 5616
805 3520 5617
805 3530 5618
805 3540 5619
805 3550 5620
805 3560 5621
805 3570 5622
805 3580 5623
805 3590 5624
805 3600 5625
805 3610 5626
805 3620 5627
805 3630 5628
805 3640 5629
805 3650 5630
805 3660 5631
805 3670 5632
805 3680 5633
805 3690 5634
805 3700 5635
805 3710 5636
805 3720 5637
805 3730 5638
805 3740 5639
805 3750 5640
805 3760 5641
805 3770 5642
805 3780 5643
805 3790 5644

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OF POOR QUALITY

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1580 CONTINUE                                805 3800      5645
C                                             805 3810      5646
C                                             805 3820      5647
      WCLGF = WCL                             805 3830      5648
      WCOCF = WCOCF/SUMSS                     805 3840      5649
C                                             805 3850      5650
C                                             805 3860      5651
      LINES= LINES+3                          805 3870      5652
      IF (LINDEX-LINES) 1590,1600,1600       805 3880      5653
1590 CALL PAGE                                805 3890      5654
      LINES= LINES+3                          805 3900      5655
1600 WRITE (KOUT,1010)                       805 3910      5656
C                                             805 3920      5657
      IF (IFLG(14)-1) 1620,1610,1610        805 3930      5658
1610 END FILE KT2                            805 3940      5659
      LINES= LINES +2                         805 3950      5660
      IFLG(15)= IFLG(15) +1                 805 3960      5661
      WRITE (KOUT,1060)IFLG(15)              805 3970      5662
1620 CONTINUE                                805 3980      5663
C                                             805 3990      5664
C                                             805 4000      5665
C                                             805 4010      5666
C                                             805 4020      5667
1630 RETURN                                  805 4030      5668
C      XXXXXX                                805 4040      5669
C                                             805 4050      5670
C                                             805 4060      5671

V FOR B06,B06                                806 10        5672
C                                             806 20        5673
C                                             806 30        5674
C                                             806 40        5675
C                                             806 50        5676
SUBROUTINE OLINER(ALFA,ZHEIGT,ALFAL,WINGCL,NJOBL) 806 60        5677
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *806 70        5678
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *806 80        5679
C                                             806 90        5680
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX806 100       5681
C                                             806 110       5682
DIMENSION YSPAN(22)                          806 120       5683
DIMENSION ALFAL(20), WINGCL(21)             806 130       5684
DIMENSION CLA1(32),CLB(32),RCL(2,32),RCH(2,32),RYSpan(32) 806 140       5685
DIMENSION SCLV(22),SPMV(22),SCDV(22),ACLV(42),APMV(42),ACDV(42) 806 150       5686
DIMENSION RCD(2,32),RCLV(2,32),RCDV(2,32),RPMV(2,32) 806 160       5687
DIMENSION WCLV(2),WCDV(2),WCPV(2), WCPDS(2),WCDIS(2) 806 170       5688
DIMENSION SLIFT(22),SDRAG(22),CMOHT(22)     806 180       5689
DIMENSION ALIFT(42),ADRAG(42),AMOHT(42)     806 190       5690
DIMENSION FLAPN(22),FLAPX(22),AFLPN(42),AFLPX(42) 806 200       5691
DIMENSION RCFL(2,32),RCFD(2,32)            806 210       5692
C                                             806 220       5693
DIMENSION COS1(3),COS2(3),COS3(3)          806 230       5694
DIMENSION SUMSL(4),R(3),D(3),P(3)          806 240       5695
DIMENSION WCD3(3),WCL3(3),WCL4(3)         806 250       5696
C                                             806 260       5697
COMMON/DATA01/KIN ,KOUT ,KT1 ,KT2 ,LINDEX ,LINES 806 270       5698
COMMON/DATA02/IFLG(15) ,EHECK(15) ,RAD ,PIE 806 280       5699
COMMON/DATA05/WINGD(15) ,EY(42,10) ,EC(42,10) ,ES(42,10) 806 290       5700
*,EYE(10) ,ELF(10) ,ETE(10) ,EME(10) ,EG(42,10) 806 300       5701
*,ENI(42,10,6) ,EVI(42,10,6) ,VVINDX(42,10,3) 806 310       5702
COMMON/DATA06/YFF11,YFF12,YFF21,YFF22,YFF31,YFF32,DELTF1,DELTF2 806 320       5703
*,NDFLAP,NDAILR 806 330       5704
COMMON/DATA07/LFLAP,LDRAG 806 340       5705
C                                             806 350       5706
C                                             806 360       5707
C                                             806 370       5708
1000 FORMAT(1X)                              806 380       5709
1010 FORMAT(1X,/,1X)                        806 390       5710
C                                             806 400       5711
1020 FORMAT(42X,35HLINEARIZED SOLUTION WITH LE SUCTION/42X35(1H*/ /25X, 806 410       5712
1 60H ALFA ALFARO WCL WCL CMP CMR , 806 420       5713
2 10H CMY ,/,45X,40H SLOPE SLOPE SLOPE//806 430       5714
3,25X,2F10.3,F10.4,4F10.5,/,/,1X) 806 440       5715
C                                             806 450       5716
1030 FORMAT(30X,50H Y 2Y/B SCLA1 SCLB SCL , 806 460       5717
1 10H SCM(1/4),/,1X ) 806 470       5718
C                                             806 480       5719
C                                             806 490       5720
1040 FORMAT(30X, F10.3, 5F10.5 ) 806 500       5721
C                                             806 510       5722
1050 FORMAT(34X,15HWITH LE SUCTION,16X,13HNO LE SUCTION,17X,12HFLAP/AIL 806 510       5722
1ERON,/,5X,20H Y 2Y/B ,2(30H SCL SCD1 SCM 806 520       5723
2C(4)), 30H FCN FCX FCH ,/,1X) 806 530       5724
1060 FORMAT(5X,F10.3,10F10.6) 806 540       5725
C                                             806 550       5726
1070 FORMAT(1X,/,17X,18HWITH LE SUCTION ,4HWCL=,F10.5,8H / WCDI=,F10.8 806 560       5727
15,12H / WCM(C/4)=,F10.5, 7H / L/D=,F10.5,/,18X,13HNO LE SUCTION,4X 806 570       5728
2, 4X,F10.5,2H /,6X,F10.5,2H /,10X,F10.5,2H /,5X,F10.5 ) 806 580       5729
C                                             806 590       5730
1080 FORMAT(41X,37HLINEARIZED SOLUTION WING COEFFICIENTS,/,41X,37(1H*), 806 600       5731
1 /,44X,15HWITH LE SUCTION,17X,13HNO LE SUCTION,/, 806 610       5732
2 30X,5HALFA , 2(30H WCL WCD WCM(C/4)),/,1X) 806 620       5733
1090 FORMAT( 25X, F10.3, 6F10.4 ) 806 630       5734
C                                             806 640       5735
1100 FORMAT(1X,/,1X,14H(EOF PLOT FILE,(3,1H) ) 806 650       5736
C                                             806 660       5737
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX806 670       5738
C                                             806 680       5739
C                                             806 690       5740
C                                             806 700       5741
C                                             806 710       5742
C * INITIALIZE * 806 720       5743
C                                             806 730       5744
C N0= 0 806 740       5745
C N1= 1 806 750       5746
C N2= 2 806 760       5747

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NSPV = IFLG(3)	806	770	5748
NCV = IFLG(4)	806	780	5749
NCLFLG= 1	806	790	5750
C	806	800	5751
ZERO = 0.0	806	810	5752
ZERO1= 0.0	806	820	5753
ZERO2= 0.0	806	830	5754
C	806	840	5755
SPAN = WINGD(1)	806	850	5756
WAREA= WINGD(6)	806	860	5757
WMGC = WINGD(9)	806	870	5758
BOTU = SPAN/2.0	806	880	5759
C	806	890	5760
FACT1= 2.0/WINGD(4)	806	900	5761
FACT2= FAC T1/WINGD(9)	806	910	5762
FACT3= FAC T1/WINGD(1)	806	920	5763
SK INFC= EXECK(10)*2.0	806	930	5764
DELALF= EXECK(12)	806	940	5765
EXECK(15) = 2.0	806	950	5766
C	806	960	5767
NZERO= 1	806	970	5768
IF (IFLG(1)-1) 1110,1120,1120	806	980	5769
1110 CONTINUE	806	990	5770
NSPO2= NSPV/2	806	1000	5771
NTEST= NSPV-NSPO2*2	806	1010	5772
NZERO= NSPO2 + 1	806	1020	5773
1120 CONTINUE	806	1030	5774
C	806	1040	5775
C	806	1050	5776
C	806	1060	5777
C	806	1070	5778
C * LINEARIZED LIFT TWO PASS LOOP *	806	1080	5779
C	806	1090	5780
DO 1420 NCLC=1,2	806	1100	5781
C	806	1110	5782
IF (NCLFLG) 1130,1140,1140	806	1120	5783
1130 ALFA= ALFA + DELALF	806	1130	5784
C	806	1140	5785
CALL DLIFT(ALFA,ZHEIGT)	806	1150	5786
C	806	1160	5787
GO TO 1150	806	1170	5788
1140 NCLFLG= -1	806	1180	5789
C	806	1190	5790
BETAM= EXECK(1)	806	1200	5791
WCL = EXECK(2)	806	1210	5792
WPMO = EXECK(3)	806	1220	5793
WRMO = EXECK(4)	806	1230	5794
WYMO = EXECK(5)	806	1240	5795
C	806	1250	5796
1150 CONTINUE	806	1260	5797
C	806	1270	5798
C	806	1280	5799
ALFAR= ALFA/RAO	806	1290	5800
TANA = TAN(ALFAR)	806	1300	5801
COSA = 1.0/SQRT(1.0+TANA**2)	806	1310	5802
SINA = TANA*COSA	806	1320	5803
WCPDS(NCLC)= EXECK(13)	806	1330	5804
WCLVS(NCLC)= EXECK(16)	806	1340	5805
WCDVS(NCLC)= EXECK(18)	806	1350	5806
WCPVS(NCLC)= EXECK(17)	806	1360	5807
WCDIS(NCLC)= EXECK(19)	806	1370	5808
C	806	1380	5809
C	806	1390	5810
C	806	1400	5811
C	806	1410	5812
C * SECTION COEFFICIENTS *	806	1420	5813
C	806	1430	5814
NJ= 0	806	1440	5815
C	806	1450	5816
C	806	1460	5817
NSPAN = 0	806	1470	5818
C	806	1480	5819
C	806	1490	5820
ON 1330 J=NZERO,NSPV	806	1500	5821
C	806	1510	5822
J2= J+1	806	1520	5823
NJ=NJ+1	806	1530	5824
NSPAN = NSPAN+1	806	1540	5825
C	806	1550	5826
YSPN= FN(J,1,2)	806	1560	5827
C	806	1570	5828
YA= ABS(YSPN)	806	1580	5829
M = -1	806	1590	5830
C	806	1600	5831
DO 1180 L=2,10	806	1610	5832
IF (M) 1160,1180,1180	806	1620	5833
1160 TEST= YA-EYE(L)	806	1630	5834
IF (TEST) 1170,1170,1180	806	1640	5835
1170 M= L	806	1650	5836
1180 CONTINUE	806	1660	5837
IF (M-2) 1190,1200,1200	806	1670	5838
1190 M= 2	806	1680	5839
1200 M1= M-1	806	1690	5840
C	806	1700	5841
RATS= (YA-EYE(M1))/(EYE(M)-EYE(M1))	806	1710	5842
XLE = FLE(M1) + RATS*(ELE(M)-ELE(M1))	806	1720	5843
XTE = ETE(M1) + RATS*(ETE(M)-ETE(M1))	806	1730	5844
XHE = EHE(M1) + RATS*(EHE(M)-EHE(M1))	806	1740	5845
CW = XTE-XLE	806	1750	5846
CF = XTE-XHE	806	1760	5847
XCO4= XLE + C#*C.25	806	1770	5848
TANLE = (ELE(M)-ELE(M1))/(EYE(M)-EYE(M1))	806	1780	5849
COSLE = SQRT(1.0+TANLE**2)	806	1790	5850
C	806	1800	5851
CORD= CW**2	806	1810	5852
C	806	1820	5853

C		806 1830	5854
C	* SECTION LIFT LOOP *	806 1840	5855
C		806 1850	5856
C		806 1860	5857
C	SPMO= 0.0	806 1870	5858
C		806 1880	5859
C	DO 1210 L=1,4	806 1890	5860
C	1210 SUMSL(L)= 0.0	806 1900	5861
C		806 1910	5862
C	DO 1260 K=1,NCV	806 1920	5863
C		806 1930	5864
C		806 1940	5865
C		806 1950	5866
C	COS1(1)= VVINDX(J,K,1) + COSA	806 1960	5867
C	COS1(2)= VVINDX(J,K,2)	806 1970	5868
C	COS1(3)= VVINDX(J,K,3) - SINA	806 1980	5869
C		806 1990	5870
C	I = J+1	806 2000	5871
C	DO 1220 L=1,3	806 2010	5872
C	R(L)= EV(J,K,L)	806 2020	5873
C	D(L)= EV(I,K,L)	806 2030	5874
C	1220 P(L)= 0.5*(B(L)+D(L))	806 2040	5875
C	YSPN = B(2)	806 2050	5876
C	CALL FLAPS(YSPN,XHE,B,COS3)	806 2060	5877
C	YSPN = D(2)	806 2070	5878
C	CALL FLAPS(YSPN,XHE,D,COS3)	806 2080	5879
C	YSPN = P(2)	806 2090	5880
C	SUMB = 0.0	806 2100	5881
C	DO 1230 L=1,3	806 2110	5882
C	COS2(L)= D(L)-B(L)	806 2120	5883
C	1230 SUMB = SUMB + COS2(L)**2	806 2130	5884
C	SUMB = SQRT(SUMB)	806 2140	5885
C	DO 1240 L=1,3	806 2150	5886
C	1240 COS2(L) = COS2(L)/SUMB	806 2160	5887
C		806 2170	5888
C	CALL FLAPS(YSPN,XHE,P,COS3)	806 2180	5889
C		806 2190	5890
C	CALL CROSP(COS1,COS2,COS3)	806 2200	5891
C		806 2210	5892
C	ZLIFT= EG(J,K)	806 2220	5893
C		806 2230	5894
C	DO 1250 L=1,3	806 2240	5895
C	1250 SUMSL(L)= SUMSL(L) + ZLIFT*COS3(L)	806 2250	5896
C		806 2260	5897
C	XARM= P(1)-XCO4	806 2270	5898
C	SPMO= SPMO + ZLIFT*COS3(3)*XARM	806 2280	5899
C		806 2290	5900
C	1260 CONTINUE	806 2300	5901
C		806 2310	5902
C		806 2320	5903
C	FLAPN(NSPAN) = -2.0*ZLIFT*COS3(3)/EC(J,NCV)	806 2330	5904
C	FLAPX(NSPAN) = 2.0*ZLIFT*COS3(1)/EC(J,NCV)	806 2340	5905
C		806 2350	5906
C	DO 1270 L=1,3	806 2360	5907
C	1270 SUMSL(4)= SUMSL(4) + SUMSL(L)**2	806 2370	5908
C	SUMSL(4)= SQRT(SUMSL(4))	806 2380	5909
C	DO 1280 L=1,3	806 2390	5910
C	1280 SUMSL(L)= SUMSL(L)/SUMSL(4)	806 2400	5911
C	SUMSL(4)= 2.0*SUMSL(4)/CW	806 2410	5912
C		806 2420	5913
C		806 2430	5914
C	YSPAN(NSPAN)= YSPN/BOTU	806 2440	5915
C	S LIFT(NSPAN)=SUMSL(4)*(SUMSL(3)*COSA + SUMSL(1)*SINA)	806 2450	5916
C	SDRAG(NSPAN)= SUMSL(4)*(SUMSL(1)*COSA - SUMSL(3)*SINA)	806 2460	5917
C	CMOMT(NSPAN)= 2.0*SPMO/CORD	806 2470	5918
C	SCTS = -SUMSL(4)*SUMSL(1)	806 2480	5919
C	IF (SCTS) 1290,1290,1300	806 2490	5920
C	1290 SCT5 = 0.0	806 2500	5921
C	1300 SNFC = COSLE*SCTS	806 2510	5922
C	IF (SUMSL(3)) 1310,1320,1320	806 2520	5923
C	1310 SNFC= -SNFC	806 2530	5924
C	1320 CONTINUE	806 2540	5925
C	SCLV(NSPAN)= -SNFC*COSA - SCT5*SINA	806 2550	5926
C	SCDV(NSPAN)= SCT5*COSA - SNFC*SINA	806 2560	5927
C	SPMV(NSPAN)= SNFC*(XLE-XCO4)/CW	806 2570	5928
C		806 2580	5929
C		806 2590	5930
C	1330 CONTINUE	806 2600	5931
C		806 2610	5932
C		806 2620	5933
C	LINES= LINES+3	806 2630	5934
C	IF (LINES-LINES) 1340,1350,1350	806 2640	5935
C	1340 CALL PAGE	806 2650	5936
C	LINES= LINES+3	806 2660	5937
C	GO TO 1360	806 2670	5938
C	1350 WRITE (KOUT,1010)	806 2680	5939
C	1360 CONTINUE	806 2690	5940
C		806 2700	5941
C		806 2710	5942
C		806 2720	5943
C	CALL CURFIT(YSPAN, SLIFT,ALIFT, NSPAN,ZERO1,ZERO2,N2,N2)	806 2730	5944
C	CALL CURFIT(YSPAN, SDRAG,ADRAG, NSPAN,ZERO1,ZERO2,N2,N2)	806 2740	5945
C	CALL CURFIT(YSPAN, CMOMT,AMOMT, NSPAN,ZERO1,ZERO2,N2,N2)	806 2750	5946
C	CALL CURFIT(YSPAN, FLAPN,AFLPN, NSPAN,ZERO1,ZERO2,N2,N2)	806 2760	5947
C	CALL CURFIT(YSPAN, FLAPX,AFLPX, NSPAN,ZERO1,ZERO2,N2,N2)	806 2770	5948
C	CALL CURFIT(YSPAN, SCLV, ACLV, NSPAN,ZERO1,ZERO2,N2,N2)	806 2780	5949
C	CALL CURFIT(YSPAN, SCDV, ACDV, NSPAN,ZERO1,ZERO2,N2,N2)	806 2790	5950
C	CALL CURFIT(YSPAN, SPMV, APMV, NSPAN,ZERO1,ZERO2,N2,N2)	806 2800	5951
C		806 2810	5952
C		806 2820	5953
C		806 2830	5954
C	DELTA8= 2.0/30.0	806 2840	5955
C	YSPANO= -1.0	806 2850	5956
C	IF (IFLG(11)-1) 1370,1380,1380	806 2860	5957
C	1370 DELTA8= 1.0/30.0	806 2870	5958
C	YSPANO= 0.0	806 2880	5959
C	1380 CONTINUE		

C		806 2890	5960
	DD 1410 J=1,31	806 2900	5961
C		806 2910	5962
	YOB= DELTAB*FLOAT(J-1) + YSPAN0	806 2920	5963
	YSPN= YOB*BNTU	806 2930	5964
C		806 2940	5965
	CL = 0.0	806 2950	5966
	CD = 0.0	806 2960	5967
	CM = 0.0	806 2970	5968
	CLV = 0.0	806 2980	5969
	CDV = 0.0	806 2990	5970
	CPV = 0.0	806 3000	5971
	FCN = 0.0	806 3010	5972
	FCX = 0.0	806 3020	5973
C		806 3030	5974
	TEST= ABS(YOB) - 0.999	806 3040	5975
	IF (TEST) 1390,1400,1400	806 3050	5976
	1390 CONTINUE	806 3060	5977
C		806 3070	5978
	CALL CURVE(YSPAN,SLIFT,ALIFT, YOB,CL, DUMYK,NSPAN,N1)	806 3080	5979
	CALL CURVE(YSPAN,SDRAG,ADRAG, YOB,CD, DUMYK,NSPAN,N1)	806 3090	5980
	CALL CURVE(YSPAN,CMOMT,AMOMT, YOB,CM, DUMYK,NSPAN,N1)	806 3100	5981
	CALL CURVE(YSPAN,FLAPN,AFLPN, YOB,FCN,DUMYK,NSPAN,N1)	806 3110	5982
	CALL CURVE(YSPAN,FLAPX,AFLPX, YOB,FCX,DUMYK,NSPAN,N1)	806 3120	5983
	CALL CURVE(YSPAN,SCLV, ACLV, YOB,CLV,DUMYK,NSPAN,N1)	806 3130	5984
	CALL CURVE(YSPAN,SCDV, ACDV, YOB,CDV,DUMYK,NSPAN,N1)	806 3140	5985
	CALL CURVE(YSPAN,SPHV, APHV, YOB,CPV,DUMYK,NSPAN,N1)	806 3150	5986
C		806 3160	5987
	1400 CONTINUE	806 3170	5988
C		806 3180	5989
C		806 3190	5990
C		806 3200	5991
	RCL(INCLC,J) = CL	806 3210	5992
	PCD(INCLC,J) = CD	806 3220	5993
	RCM(INCLC,J) = CM	806 3230	5994
	RCLV(INCLC,J) = CLV	806 3240	5995
	RCDV(INCLC,J) = CDV	806 3250	5996
	RPMV(INCLC,J) = CPV	806 3260	5997
	RCFL(INCLC,J) = FCN*COSA - FCX*SINA	806 3270	5998
	RCFD(INCLC,J) = FCX*COSA + FCX*SINA	806 3280	5999
	RYSPAN(J) = YOB	806 3290	6000
C		806 3300	6001
C		806 3310	6002
	1410 CONTINUE	806 3320	6003
C		806 3330	6004
C		806 3340	6005
	1420 CONTINUE	806 3350	6006
C		806 3360	6007
	DELCL = EXECK(2)-WCL	806 3370	6008
	EXECK(15) = 0.0	806 3380	6009
	SCL1 = WCL**2	806 3390	6010
	SCL2 = SCL1 - EXECK(2)**2	806 3400	6011
	WCLVS(2) = (WCLVS(1) - WCLVS(2)) / SCL2	806 3410	6012
	WCLVS(1) = WCLVS(1) - WCLVS(2)*SCL1	806 3420	6013
	WCDVS(2) = (WCDVS(1) - WCDVS(2)) / SCL2	806 3430	6014
	WCDVS(1) = WCDVS(1) - WCDVS(2)*SCL1	806 3440	6015
	WCPVS(2) = (WCPVS(1) - WCPVS(2)) / SCL2	806 3450	6016
	WCPVS(1) = WCPVS(1) - WCPVS(2)*SCL1	806 3460	6017
	WCPOS(2) = (WCPOS(1) - WCPOS(2)) / DELCL	806 3470	6018
	WCPOS(1) = WCPOS(1) - WCPOS(2)*WCL	806 3480	6019
	WCDIS(2) = (WCDIS(1) - WCDIS(2)) / SCL2	806 3490	6020
	WCDIS(1) = 0.0	806 3500	6021
C		806 3510	6022
	DD 1460 J=1,31	806 3520	6023
	CFNS = RCFL(1,J)**2	806 3530	6024
C		806 3540	6025
	TEST = CFNS - RCFL(2,J)**2	806 3550	6026
	ATEST = ABS(TEST) - 0.001	806 3560	6027
	IF (ATEST) 1430,1430,1440	806 3570	6028
	1430 RCFD(2,J) = 0.0	806 3580	6029
	GO TO 1450	806 3590	6030
	1440 RCFD(2,J) = (RCFD(1,J)-RCFD(2,J))/TEST	806 3600	6031
	1450 RCFD(1,J) = RCFD(1,J) - RCFD(2,J)*CFNS	806 3610	6032
	RCFL(2,J) = (RCFL(2,J)-RCFL(1,J))/DELCL	806 3620	6033
	RCFL(1,J) = RCFL(1,J) - RCFL(2,J)*WCL	806 3630	6034
	RCM(2,J) = (RCM(2,J)-RCM(1,J))/DELCL	806 3640	6035
	RCM(1,J) = RCM(1,J) - RCM(2,J)*WCL	806 3650	6036
C		806 3660	6037
	SCL1 = WCL**2	806 3670	6038
	SCL2 = SCL1 - EXECK(2)**2	806 3680	6039
	RCLV(2,J) = (RCLV(1,J)-RCLV(2,J))/SCL2	806 3690	6040
	RCLV(1,J) = RCLV(1,J) - RCLV(2,J)*SCL1	806 3700	6041
	RCDV(2,J) = (RCDV(1,J)-RCDV(2,J))/SCL2	806 3710	6042
	RCDV(1,J) = RCDV(1,J) - RCDV(2,J)*SCL1	806 3720	6043
	RPMV(2,J) = (RPMV(1,J)-RPMV(2,J))/SCL2	806 3730	6044
	RPMV(1,J) = RPMV(1,J) - RPMV(2,J)*SCL1	806 3740	6045
C		806 3750	6046
	SCL1 = RCL(1,J)**2	806 3760	6047
	SCL2 = SCL1 - RCL(2,J)**2	806 3770	6048
	RCD(2,J) = (RCD(1,J) - RCD(2,J)) / SCL2	806 3780	6049
	RCD(1,J) = RCD(1,J) - RCD(2,J)*SCL1	806 3790	6050
	CLA1(J) = (RCL(2,J)-RCL(1,J))/DELCL	806 3800	6051
	1460 CLA(J) = RCL(1,J) - CLA1(J)*WCL	806 3810	6052
C		806 3820	6053
C		806 3830	6054
	WLIFTS = DELCL/DELALF	806 3840	6055
	WPMOSL = (EXECK(3)-WPMO)/DELALF	806 3850	6056
	WRMOSL = (EXECK(4)-WRMO)/DELALF	806 3860	6057
	WYMOSL = (EXECK(5)-WYMO)/DELALF	806 3870	6058
C		806 3880	6059
	ALFA = ALFA - DELALF	806 3890	6060
C		806 3900	6061
	ALFARO = ALFA - WCL/WLIFTS	806 3910	6062
C		806 3920	6063
C		806 3930	6064
	LINES = LINES+10	806 3940	6065

IF (LINEX-LINES) 1470,1480,1480	806 3950	6066
1470 CALL PAGE	806 3960	6067
LINES= LINES+10	806 3970	6068
1480 WRITE (KOUT,1020)ALFA,ALFARO,WCL,WLIFTS,WPMOSL,WRMOSL,WYMO SL	806 3980	6069
C	806 3990	6070
DD 1540 J=1,31	806 4000	6071
IF (J-1) 1490,1490,1520	806 4010	6072
1490 LINES= LINES+ 2	806 4020	6073
IF (LINEX-LINES) 1500,1510,1510	806 4030	6074
1500 CALL PAGE	806 4040	6075
LINES= LINES+2	806 4050	6076
1510 WRITE (KOUT,1030)	806 4060	6077
1520 LINES= LINES+1	806 4070	6078
IF (LINEX-LINES) 1500,1530,1530	806 4080	6079
1530 CONTINUE	806 4090	6080
YSPN= RYSPAN(J)*BOTU	806 4100	6081
WRITE (KOUT,1040)YSPN,RYSPAN(J),CLA1(J),CLB(J),RCL(1,J),RCM(1,J)	806 4110	6082
1540 CONTINUE	806 4120	6083
C	806 4130	6084
C	806 4140	6085
C	806 4150	6086
C * LINEARIZED SOLUTION ARRAY *	806 4160	6087
C	806 4170	6088
IF (WINGCL(1)-1) 1550,1570,1570	806 4180	6089
1550 CONTINUE	806 4190	6090
DD 1560 N=2,NJOB1	806 4200	6091
M= N-1	806 4210	6092
1560 WINGCL(N)= WLIFTS*(ALFAL(N)-ALFARO)	806 4220	6093
1570 CONTINUE	806 4230	6094
SLOPE0 = 0.5/PIE	806 4240	6095
SLOPEW = 1.0/(WLIFTS*RAD)	806 4250	6096
TREC N= 0	806 4260	6097
TWORD=10	806 4270	6098
C	806 4280	6099
C	806 4290	6100
DD 1830 N=2,NJOB1	806 4300	6101
C	806 4310	6102
C	806 4320	6103
WCL= WINGCL(N)	806 4330	6104
ALFA= WCL/WLIFTS + ALFARO	806 4340	6105
SIGNL= 1.0	806 4350	6106
IF (WCL) 1580,1590,1590	806 4360	6107
1580 SIGNL= -1.0	806 4370	6108
1590 CONTINUE	806 4380	6109
TREC N= TREC N +1	806 4390	6110
C	806 4400	6111
LINES= LINES + LINEX	806 4410	6112
IF (LINEX-LINES) 1600,1610,1610	806 4420	6113
1600 CALL PAGE	806 4430	6114
LINES= LINES +10	806 4440	6115
1610 WRITE (KOUT,1020)ALFA,ALFARO,WCL,WLIFTS,WPMOSL,WRMOSL,WYMO SL	806 4450	6116
C	806 4460	6117
DD 1770 J=1,31	806 4470	6118
C	806 4480	6119
YSPN= RYSPAN(J)*BOTU	806 4490	6120
RCL(1,J)= CLA1(J)*WCL + CLB(J)	806 4500	6121
C	806 4510	6122
CALL CHORDT(YSPN,XLE,XCO4,XTE,XHE,CW,CF)	806 4520	6123
C	806 4530	6124
SCL1= RCL(1,J)**2	806 4540	6125
SCL2= WCL**2	806 4550	6126
RCL(2,J)= RCD(1,J) + RCD(2,J)*SCL1	806 4560	6127
IF (LDRAG-1) 1640,1620,1620	806 4570	6128
1620 RCL(2,J)= 0.0	806 4580	6129
IF (CLA1(J)) 1640,1640,1630	806 4590	6130
1630 RCL(2,J)= (SLOPEW/CLA1(J)-SLOPE0)*SCL1	806 4600	6131
1640 CMAC= RCM(1,J) + RCM(2,J)*WCL	806 4610	6132
C	806 4620	6133
CLV = (RCLV(1,J) + RCLV(2,J)*SCL2)*SIGNL + RCL(1,J)	806 4630	6134
CPV = (RPMV(1,J) + RPMV(2,J)*SCL2)*SIGNL + CMAC	806 4640	6135
CDV = (RCDV(1,J) + RCDV(2,J)*SCL2)	806 4650	6136
+ RCL(2,J)	806 4660	6137
CMLFT= (WINGD(1)-XCO4)*(RCL(1,J)*COSA + RCL(2,J)*SINA)	806 4670	6138
FCN = RCFL(1,J) + RCFL(2,J)*WCL	806 4680	6139
FCX = RCFD(1,J) + RCFD(2,J)*FCN**2	806 4690	6140
CFNS= FCN*COSA + FCX*SINA	806 4700	6141
FCX = FCX*COSA - FCN*SINA	806 4710	6142
FCN = CFNS	806 4720	6143
FCM = -FCN/4.0	806 4730	6144
C	806 4740	6145
IF (J-1) 1650,1650,1680	806 4750	6146
1650 LINES= LINES + 4	806 4760	6147
IF (LINEX-LINES) 1660,1660,1670	806 4770	6148
1660 CALL PAGE	806 4780	6149
LINES= LINES + 4	806 4790	6150
1670 WRITE (KOUT,1050)	806 4800	6151
1680 LINES= LINES + 1	806 4810	6152
IF (LINEX-LINES) 1660,1690,1690	806 4820	6153
1690 CONTINUE	806 4830	6154
C	806 4840	6155
NOFLPX= NOFLAP + AOAILR	806 4850	6156
IF (NOFLPX) 1700,1700,1710	806 4860	6157
1700 WRITE (KOUT,1060)YSPN,RYSPAN(J),RCL(1,J),RCL(2,J),CMAC,CLV,CDV,CPV	806 4870	6158
GO TO 1720	806 4880	6159
1710 WRITE (KOUT,1060)YSPN,RYSPAN(J),RCL(1,J),RCL(2,J),CMAC,CLV,CDV,CPV	806 4890	6160
I,FCN,FCX,FCM	806 4900	6161
1720 CONTINUE	806 4910	6162
C	806 4920	6163
IF (J-1) 1730,1730,1740	806 4930	6164
1730 CONTINUE	806 4940	6165
SUMS= 0.0	806 4950	6166
SUMC= 0.0	806 4960	6167
SUML= 0.0	806 4970	6168
SUMD= 0.0	806 4980	6169
SUMP= 0.0	806 4990	6170
GO TO 1750	806 5000	6171
1740 DELTAS= 0.25*(YSPN-YSPNP)*(CW*CF)		

SUMS= SUMS + 2.0*DELTA	806 5010	6172
SUMC= SUMC + DELTA*(CW+CFW)	806 5020	6173
SUML= SUML + DELTA*(RCL(1,J)+RCL1)	806 5030	6174
SUMD= SUMD + DELTA*(RCL(2,J)+RCL2)	806 5040	6175
SUMP= SUMP + DELTA*(C*RCM(1,J)+CFW*RCM+CMLFT+CMLFT1)	806 5050	6176
1750 CONTINUE	806 5060	6177
C	806 5070	6178
CFW= CW	806 5080	6179
YSPNP= YSPN	806 5090	6180
RCL1= RCL(1,J)	806 5100	6181
RCL2= RCL(2,J)	806 5110	6182
RCM1= RCM(1,J)	806 5120	6183
CMLFT1= CMLFT	806 5130	6184
C	806 5140	6185
IF (IFLG(14)-1) 1770,1760,1760	806 5150	6186
1760 WRITE(KT2)IPECN,IWORD,RYSpan(J),RCL(1,J),RCL(2,J),CMAC,	806 5160	6187
1 FCN,FCX,FCM, CLV,CDV,CPV	806 5170	6188
1770 CONTINUE	806 5180	6189
C	806 5190	6190
C	806 5200	6191
WCD= SUMD/SUMS	806 5210	6192
WCMAC= WCPDS(1) + WCPDS(2)*WCL	806 5220	6193
WLOD= WCL/WCD	806 5230	6194
C	806 5240	6195
SCL2 = WCL**2	806 5250	6196
WCLV = (WCLVS(1) + WCLVS(2)*SCL2)*SIGNL + WCL	806 5260	6197
WPMV = (WCPVS(1) + WCPVS(2)*SCL2)*SIGNL + WCMAC	806 5270	6198
WCDV = (WCDVS(1) + WCDVS(2)*SCL2) + WCD	806 5280	6199
WLODV= WCLV/WCDV	806 5290	6200
C	806 5300	6201
IF (N-4) 1780,1760,1800	806 5310	6202
1780 M=N-1	806 5320	6203
WCD3(M)= WCD	806 5330	6204
WCL3(M)= WCL	806 5340	6205
WCL4(M)= WCL**2	806 5350	6206
C	806 5360	6207
IF (N-4) 1800,1790,1800	806 5370	6208
1790 WCD3(3) = (WCD3(2) - WCD3(1))/(WCL3(2) - WCL3(1))	806 5380	6209
WCD3(2) = (WCD3(1) - WCD3(2))/(WCL3(1) - WCL3(2))	806 5390	6210
WCL3(3) = (WCL4(2) - WCL4(1))/(WCL3(2) - WCL3(1))	806 5400	6211
WCL3(2) = (WCL4(1) - WCL4(2))/(WCL3(1) - WCL3(2))	806 5410	6212
WCDIS(2)= (WCD3(2)-WCD3(3))/(WCL3(2) - WCL3(3))	806 5420	6213
WCDIS(1)= WCD3(2) - WCDIS(2)*WCL3(2)	806 5430	6214
SKINFC = SKINFC + WCD3(1) - WCDIS(1)*WCL3(1) - WCDIS(2)*WCL4(1)	806 5440	6215
1800 CONTINUE	806 5450	6216
C	806 5460	6217
LINES= LINES+3	806 5470	6218
IF (LINDEX-LINES) 1810,1820,1820	806 5480	6219
1810 CALL PAGE	806 5490	6220
LINES= LINES+3	806 5500	6221
1820 WRITE (KOUT,1070)WCL,WCD,WCMAC,WLOD,WCLV,WCDV,WPMV,WLODV	806 5510	6222
C	806 5520	6223
1830 CONTINUE	806 5530	6224
C	806 5540	6225
C	806 5550	6226
CALL PAGE	806 5560	6227
WRITE (KOUT,1080)	806 5570	6228
KALFA= IFIX(ALFARO - 2.0)	806 5580	6229
LINES= LINES + 9	806 5590	6230
IPECN= IPECN +1	806 5600	6231
IWORD= 7	806 5610	6232
C	806 5620	6233
NIMAX= 20.0 -ALFARO	806 5630	6234
DO 1870 N=1,NIMAX	806 5640	6235
ALFA= FLOAT(N + KALFA)	806 5650	6236
WCL = WLIFTS*(ALFA-ALFARO)	806 5660	6237
SCL2 = WCL**2	806 5670	6238
WCD = SKINFC + WCDIS(1)*WCL + WCDIS(2)*SCL2	806 5680	6239
WCMAC= WCPDS(1) + WCPDS(2)*WCL	806 5690	6240
WCLV = WCLVS(1) + WCLVS(2)*SCL2	806 5700	6241
WCDV = WCDVS(1) + WCDVS(2)*SCL2	806 5710	6242
WPMV = WCPVS(1) + WCPVS(2)*SCL2	806 5720	6243
C	806 5730	6244
IF (WCL) 1840,1850,1850	806 5740	6245
1840 WCLV = WCLVS(1) + WCLVS(1) -WCLV	806 5750	6246
WPMV = WCPVS(1) + WCPVS(1) - WPMV	806 5760	6247
1850 WCLV = WCLV + WCL	806 5770	6248
WCDV = WCDV + WCD	806 5780	6249
WPMV = WPMV + WCMAC	806 5790	6250
C	806 5800	6251
WRITE (KOUT,1090)ALFA,WCL,WCD,WCMAC,WCLV,WCDV,WPMV	806 5810	6252
C	806 5820	6253
IF (IFLG(14)-1) 1870,1860,1860	806 5830	6254
1860 CONTINUE	806 5840	6255
WRITE(KT2)IPECN,IWORD,ALFA,WCL,WCD,WCMAC,WCLV,WCDV,WPMV	806 5850	6256
1870 CONTINUE	806 5860	6257
C	806 5870	6258
C	806 5880	6259
IF (IFLG(14)-1) 1890,1880,1880	806 5890	6260
1880 LINES= LINES +2	806 5900	6261
IFLG(15)= IFLG(15) +1	806 5910	6262
END FILE KT2	806 5920	6263
WRITE (KOUT,1100)IFLG(15)	806 5930	6264
1890 CONTINUE	806 5940	6265
C	806 5950	6266
C	806 5960	6267
1900 RETURN	806 5970	6268
C	806 5980	6269
C	806 5990	6270
C	806 6000	6271
END	806 6010	6272
FOR 807,807	807 10	6273
C	807 20	6274


```

C
C
C SUBROUTINE SPANI(IFLAG,NSPS,NDIS,SPAN, YSPAN)
C
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *
C
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
C DIMENSION YSPAN(42)
C COMMON/DATAQ2/IFLG(15) ,EXECK(15) ,RAD ,PIE
C COMMON/DATAQ4/YFLAP1,YFLAP2,FLAPC
C * ,YATLRN,AILRNC,WSMOTH
C
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
C IF (IFLAG-1) 100C,1020,1250
C
C * FIXED SPACING *
C
1000 CONTINUE
C
C DELTA= SPAN/FLOAT(NSPS-1)
C BOTU= SPAN/2.0 + DELTA
C
C DO 1010 K=1,NSPS
1010 YSPAN(K)=-BOTU + DELTA*FLOAT(K)
C
C RETURN
C
C *****
C
C * VARIABLE SPACING *
C
1020 CONTINUE
C
C PHI= PIE*( 1.0 + FLOAT(NDIS) )
C DPHI= PHI/FLOAT(NSPS-1)
C ROTU= SPAN/2.0
C DBO = 0.5*SPAN/FLOAT(NDIS+1)
C
C
C
C P1EF= PIE
C P1EM= 1.0
C
C DO 1040 N=1,NSPS
C PHI= DPHI*FLOAT(N-1)
C IF (PHI-P1EF) 1040,1040,1030
1030 P1EF= PIE + P1EF
C P1EM= P1EM + 2.0
1040 YSPAN(N)= -BOTU + DBO*(P1EM - COS(PHI+PIE-P1EF))
C
C
C IF (YFLAP2) 1250,1250,1050
1050 YF1= YFLAP1
C YF2= YFLAP2
C TEST= YFLAP1-1.0
C IF (TEST) 1060,1060,1070
1060 YF1= YF1*BOTU
C YF2= YF2*BOTU
1070 CONTINUE
C
C IF (NDIS-1) 1250,1250,1080
1080 IF (NDIS-3) 1090,1090,1150
1090 Y1 = DBO*FLOAT(NDIS-1)
C
C
C * NDIS=2 OR 3 *
C
C
C RAT1= YF2/Y1
C RAT2= (BOTU-YF2)/(BOTU-Y1)
C DO 1140 N=1,NSPS
C T1 = YSPAN(N) + Y1
C T2 = YSPAN(N) - Y1
C IF (T1) 1100,1100,1110
1100 YSPAN(N)= -YF2 + (YSPAN(N)+Y1)*RAT2
C GO TO 1140
1110 IF (T2) 1120,1120,1130
1120 YSPAN(N)= YSPAN(N)*RAT1
C GO TO 1140
1130 YSPAN(N)= YF2 + (YSPAN(N)-Y1)*RAT2
1140 CONTINUE
C GO TO 1250
C
C
C * NDIS= 4 *
C
C
1150 Y1= DBO
C Y2= 3.0*Y1
C RATO = YF1/Y1
C RAT1 = (YF2-YF1)/(Y2-Y1)
C RAT2 = (BOTU-YF2)/(BOTU-Y2)
C DO 1240 N=1,NSPS
C T1 = YSPAN(N) + Y2
C T2 = YSPAN(N) + Y1
C T3 = YSPAN(N) - Y1
C T4 = YSPAN(N) - Y2
C IF (T1) 1160,1160,1170
1160 YSPAN(N)= -YF2 +(YSPAN(N)+Y2)*RAT2
C GO TO 1240
1170 IF (T2) 1180,1180,1190

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1180 YSPAN(N)= -YF1 + (YSPAN(N)+Y1)*RAT1      807 1090      6381
      GO TO 1240                               807 1100      6382
1190 IF (T3) 120C,120C,1210                 807 1110      6383
1200 YSPAN(N)= YSPAN(N)*RATO                 807 1120      6384
      GO TO 1240                               807 1130      6385
1210 IF (T4) 1220,1220,1230                 807 1140      6386
1220 YSPAN(N)= YF1 + (YSPAN(N)-Y1)*RAT1     807 1150      6387
      GO TO 1240                               807 1160      6388
1230 YSPAN(N)= YF2 + (YSPAN(N)-Y2)*RAT2     807 1170      6389
1240 CONTINUE                               807 1180      6390
C                                             807 1190      6391
C                                             807 1200      6392
1250 RETURN                                  807 1210      6393
C      XXXXXX                                  807 1220      6394
C                                             807 1230      6395
C                                             807 1240      6396
      END                                       807 1250      6397

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V FOR 808,808                                808 10         6398
C                                             808 20         6399
C                                             808 30         6400
C                                             808 40         6401
      SUBROUTINE CHORDI( IFLAG,NCV,NDIS,  XV,XN,XC) 808 50         6402
C                                             808 60         6403
C      * TRM MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *808 70         6404
C      * PROGRAM DEVELOPED BY A.V.GOMEZ (TRM SYSTEMS) DN MARCH-MAY 1971 *808 80         6405
C                                             808 90         6406
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX808 100        6407
C                                             808 110        6408
      DIMENSION XV(10),XN(10),XC(11)           808 120        6409
      COMMON/DATA02/IFLG(15) ,EXECK(15) ,RAD ,PIE 808 130        6410
C                                             808 140        6411
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX808 150        6412
C                                             808 160        6413
C                                             808 170        6414
C                                             808 180        6415
      COLOCP= EXECK(11) - 1.0                  808 190        6416
      IF (IFLAG-1) 100C,1020,1020             808 200        6417
C                                             808 210        6418
C                                             808 220        6419
C                                             808 230        6420
C      * FIXED SPACING *                       808 240        6421
C                                             808 250        6422
1000 CONTINUE                                  808 260        6423
      NP1= NCV+1                               808 270        6424
      XC(NP1)=1.0                              808 280        6425
      DELTA= 1.0/FLOAT(NCV)                   808 290        6426
      DELTA1 = -0.75*DELTA                    808 300        6427
      DELTA2 = COLOCP*DELTA                   808 310        6428
      X = 0.0                                  808 320        6429
C                                             808 330        6430
      DO 1010 N=1,NCV                          808 340        6431
      X= X + DELTA                             808 350        6432
      XC(N)= X                                 808 360        6433
      XV(N)= X + DELTA1                       808 370        6434
1010 XN(N)= X + DELTA2                       808 380        6435
C                                             808 390        6436
      RETURN                                    808 400        6437
C      XXXXXX                                  808 410        6438
C                                             808 420        6439
C                                             808 430        6440
C                                             808 440        6441
C      * VARIABLE SPACING *                   808 450        6442
C                                             808 460        6443
1020 CONTINUE                                  808 470        6444
C                                             808 480        6445
      NP1= NCV+1                               808 490        6446
      PHI= PIE*(1.0 + FLOAT(NDIS))            808 500        6447
      DPHI= PHI/FLOAT(NCV)                   808 510        6448
      DCO= 0.5/FLOAT(NDIS+1)                 808 520        6449
C                                             808 530        6450
      PIEF= PIE                                 808 540        6451
      PIEM= 1.0                               808 550        6452
      XX= 0.0                                  808 560        6453
C                                             808 570        6454
      DO 1050 N=2,NP1                          808 580        6455
      M= N-1                                  808 590        6456
      PHI= DPHI*FLOAT(M)                     808 600        6457
      IF (PHI-PIEF) 1040,1040,1030           808 610        6458
1030 PIEF= PIEF + PIE                         808 620        6459
      PIEM= PIEM + 2.0                        808 630        6460
1040 PHIX= PHI+PIEF-PIEF                     808 640        6461
      XC(M)= DCO*(PIEM-COS(PHIX))            808 650        6462
      DELTA= XC(M)-XX                         808 660        6463
      XX = XC(M)                              808 670        6464
      XV(M)= XX-0.75*DELTA                   808 680        6465
      XN(M)= XX +COLOCP*DELTA                808 690        6466
1050 CONTINUE                                  808 700        6467
C                                             808 710        6468
      RETURN                                    808 720        6469
C      XXXXXX                                  808 730        6470
C                                             808 740        6471
C                                             808 750        6472
      END                                       808 760        6473
C                                             808 770        6474

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V FOR 809,809                                809 10         6475
C                                             809 20         6476
C                                             809 30         6477
C                                             809 40         6478
      SUBROUTINE CHORDT(Y,  XLE,XC04,XTE,XHE,CW,CF)809 50         6479
C                                             809 60         6480

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C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B09 70 6481
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B09 80 6482
C B09 90 6483
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B09 100 6484
C B09 110 6485
COMMON/DATA05/WINGD(15) ,EY(42,10) ,EC(42,10) ,ES(42,10) B09 120 6486
*,EYE(10) ,ELE(10) ,ETE(10) ,EME(10) ,EG(42,10) B09 130 6487
*,EN(42,10,6) ,EV(42,10,6) ,VVINDX(42,10,3) B09 140 6488
C B09 150 6489
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B09 160 6490
C B09 170 6491
C B09 180 6492
C B09 190 6493
C B09 200 6494
C B09 210 6495
C B09 220 6496
C B09 230 6497
C B09 240 6498
1000 TEST= YA-EYE(L)+0.00L B09 250 6499
C B09 260 6500
1010 M= L B09 270 6501
C B09 280 6502
1020 CONTINUE B09 290 6503
C B09 300 6504
1030 M=2 B09 310 6505
1040 M1= M-1 B09 320 6506
C B09 330 6507
RAT= (YA-EYE(M1))/(EYE(M1)-EYE(M1)) B09 340 6508
XLE = ELE(M1) + RAT*( ELE(M1)-ELE(M1) ) B09 350 6509
XTE = ETE(M1) + RAT*( ETE(M1)-ETE(M1) ) B09 360 6510
XME = EME(M1) + RAT*( EME(M1)-EME(M1) ) B09 370 6511
CW = XTE - XLE B09 380 6512
CF = XTE - XME B09 390 6513
XCO4= XLE + 0.25*CW B09 400 6514
C B09 410 6515
C B09 420 6516
C B09 430 6517
C B09 440 6518

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C B10 10 6519
C B10 20 6520
C B10 30 6521
C B10 40 6522
C B10 50 6523
C B10 60 6524
C B10 70 6525
* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B10 80 6526
* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B10 90 6527
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B10 100 6528
C B10 110 6529
C B10 120 6530
C B10 130 6531
COMMON/DATA00/NSTL ,ALFA0 ,CMAX ,ZHD ,FLAPDX ,AILRDX(2) B10 140 6532
*,TITLE(14) ,STORE(14) B10 150 6533
COMMON/DATA02/IFLG(15) ,EXECK(15) ,RAD ,PIE B10 160 6534
COMMON/DATA04/YFLAP1,YFLAP2,FLAPC B10 170 6535
*,YAILRN,AILRNC,WSMOHT B10 180 6536
COMMON/DATA06/YFF11,YFF12,YFF21,YFF22,YFF31,YFF32,DELTF1,DELTF2 B10 190 6537
*,NOFLAP,NOAILR B10 200 6538
COMMON/DATA07/LFLAP,LDRAG,CUTOF1,CUTOF2 B10 210 6539
C B10 220 6540
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B10 230 6541
C B10 240 6542
C B10 250 6543
C B10 260 6544
C B10 270 6545
C B10 280 6546
C B10 290 6547
C B10 300 6548
1000 IF (NDNO) 1010,1010,1020 B10 310 6549
1010 RETURN B10 320 6550
C B10 330 6551
C B10 340 6552
C B10 350 6553
C B10 360 6554
C B10 370 6555
C B10 380 6556
C B10 390 6557
C B10 400 6558
C B10 410 6559
C B10 420 6560
C B10 430 6561
C B10 440 6562
C B10 450 6563
C B10 460 6564
C B10 470 6565
C B10 480 6566
C B10 490 6567
C B10 500 6568
C B10 510 6569
1030 IF (YFLAP1) 1070,1070,1040 B10 520 6570
1040 IF (TST11) 1110,1110,1050 B10 530 6571
1050 IF (TST12) 1060,1070,1070 B10 540 6572
1060 FLAPD = 0.5*FLAPDX*(1.0+SIN(PIE*(TST11/DELTF1-0.5))) B10 550 6573
GO TO 1110 B10 560 6574
1070 IF (TST21) 1080,1080,1090 B10 570 6575
1080 FLAPD = FLAPDX B10 580 6576
GO TO 1110 B10 590 6577
1090 IF (TST22) 1100,1110,1110 B10 600 6578
1100 FLAPD = 0.5*FLAPDX*(1.0+SIN(PIE*(TST21/DELTF2+0.5))) B10 610 6579
C B10 620 6580
C B10 630 6581
1110 IF (NOAILR) 1210,1120,1120 B10 640 6582
1120 AILD = AILRDX(1) B10 650 6583
IF (YF) 1130,114C,1140 B10 650 6583

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1130 AILD = AILROX(2)
1140 IF (TST21) 1150,1150,1160
1150 AILD = 0.0
      GO TO 1210
1160 IF (TST22) 1170,1180,1180
1170 AILD = 0.5*AILD*(1.0 + SIN(PIE*(TST21/DELTF2 -0.5)))
      GO TO 1210
1180 IF (TST31) 1210,1190,1190
1190 IF (TST32) 1200,1150,1150
1200 AILD = 0.5*AILD*(1.0 + SIN(PIE*(TST31/DELTF2+0.5)))
1210 TAND = TAN( (AILD+FLAPD)/RAD)
C
C      COSD = 1.0/SQRT( 1.0 + TAND**2 )
      SIND = TAND*COSD
C
C      COSF(1) = COSX*COSD - COSZ*SIND
      COSF(3) = COSZ*COSD + COSX*SIND
C
      IF (FLAP-1) 1220,1230,1230
1220 P(1) = P(1) - DELTX*(1.0-COSD)
      P(3) = P(3) + DELTX*SIND
1230 CONTINUE
C
      RETURN
C      XXXXXX
C
C      FND
C
V FOR B11,B11
C
C      SUBROUTINE VORTEX(P,B,D,TANA,GAMA, VI,VCOS)
C
C      * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *
C      * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
C      DIMENSION P(3),B(3),D(3)
      DIMENSION COS1(3),COS2(3),COS3(3), X(3),A(3),VCOS(3)
      DIMENSION G(3)
C
      COMMON/DATA01/KIN ,KOUT ,KT1 ,KT2 ,LINEX ,LINES
      COMMON/DATA02/IFLG(15) ,EXEC(15) ,RAD ,PIE
      COMMON/DATA07/LFLAP,LDRAG,CUTOF1,CUTOF2
C
      NAMELIST/DBUGV1/P,B,D,TANA,GAMA,PSIF,VCOS
      NAMELIST/DBUGV2/PSIF,VCOS
      NAMELIST/DBUGV3/PSIF,VCOS
C
1000 FORMAT(1X,/,1X)
C
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
C
C      NOTE= IFLG(10)-8
      TANAS= TANA**2
      COSA = 1.0 - TANAS/2.0
      IF (TANAS-0.0001) 1020,1010,1010
1010 COSA = 1.0/SQRT(TANAS+1.0)
1020 SINA = COSA*TANA
C
      SCALE = SQRT((D(1)-B(1))**2+(D(2)-B(2))**2+(D(3)-B(3))**2)
      DO 1030 K=1,3
      X(K) = (P(K)-0.5*(B(K)+D(K)))/SCALE
      A(K) = (0.5*(D(K)-B(K)))/SCALE
1030 VCOS(K) = 0.0
C
C
C
C      * SEGMENT INF-A-B *
C
      H5 = TANA*( X(1)+ A(1))
C
      HS1 = (X(1)+A(1))**2 + H5**2
      HS2 = (X(2)+A(2))**2 + (X(3)+A(3)-H5)**2
      HS3 = (X(1)+A(1))**2 + (X(2)+A(2))**2 + (X(3)+A(3))**2
      H1 = SQRT(HS1)
      H2 = SQRT(HS2)
C
      COSG = 0.0
      SING = 1.0
      TEST = CUTOF1 - H1
C
      IF (TEST) 1040,1050,1050
1040 COSG = (HS3-HS1-HS2)/(2.0*H1*H2)
      SING = SQRT(ABS(1.0-COSG**2))
1050 CONTINUE
C
      R = H2*SING
      H4 = H2*COSG
      SH14 = H1+H4
C
      PSIF = ( 1.0 +SH14/SQRT(SH14**2+R**2) )/R
C
      COS1(1) = COSA
      COS1(2) = 0.0
      COS1(3) = SINA
      COS2(1) = ( X(1)+A(1)-SH14*COSA )/R
      COS2(2) = ( X(2)+A(2) )/R

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	COS2(3) = (X(3)+A(3)-SH14*SINA)/R	811 750	6687
C	CALL CROSP(COS1,COS2,COS3)	811 760	6688
		811 770	6689
C	DO 1060 K=1,3	811 780	6690
	1060 VCOS(K)= PSIF*CCS3(K)	811 790	6691
		811 800	6692
C	IF (NOTE) 1080,1070,1070	811 810	6693
	1070 WRITE (KOUT,1000)	811 820	6694
	WRITE (KOUT,DEBUG1)	811 830	6695
	1080 CONTINUE	811 840	6696
		811 850	6697
C		811 860	6698
C		811 870	6699
C	* SEGMENT D-E-INF *	811 880	6700
C		811 890	6701
	H5 = TANA*(X(1)-A(1))	811 900	6702
		811 910	6703
C		811 920	6704
	HS1 = (X(1)-A(1))**2 + H5**2	811 930	6705
	HS2 = (X(2)-A(2))**2 + (X(3)-A(3)-H5)**2	811 940	6706
	HS3 = (X(1)-A(1))**2 + (X(2)-A(2))**2 + (X(3)-A(3))**2	811 950	6707
	H1 = SQR(THS1)	811 960	6708
	H2 = SQR(THS2)	811 970	6709
C		811 980	6710
	COSG= 0.0	811 990	6711
	SING= 1.0	811 1000	6712
	TEST = CUTOF1 - H1	811 1010	6713
C		811 1020	6714
	IF (TEST) 1090,1100,1100	811 1030	6715
	1090 COSG= (HS3-HS1-HS2)/(2.0*H1*H2)	811 1040	6716
	SING= SQR(TABS(1.0-COSG**2))	811 1050	6717
	1100 CONTINUE	811 1060	6718
C		811 1070	6719
	R = H2*SING	811 1080	6720
	H4 = H2*COSG	811 1090	6721
	SH14= H1+H4	811 1100	6722
C		811 1110	6723
	PSIF= (-1.0 -SH14/SQR(TSH14**2+R**2)) /R	811 1120	6724
C		811 1130	6725
	COS1(1)= COSA	811 1140	6726
	COS1(2)= 0.0	811 1150	6727
	COS1(3)= SINA	811 1160	6728
	COS2(1)= (X(1)-A(1)-SH14*COSA)/R	811 1170	6729
	COS2(2)= (X(2)-A(2))/R	811 1180	6730
	COS2(3)= (X(3)-A(3)-SH14*SINA)/R	811 1190	6731
C		811 1200	6732
	CALL CROSP(COS1,CCS2,COS3)	811 1210	6733
C		811 1220	6734
	DO 1110 K=1,3	811 1230	6735
	1110 VCOS(K)= VCOS(K) + PSIF*CCS3(K)	811 1240	6736
C		811 1250	6737
	IF (NOTE) 1130,1120,1120	811 1260	6738
	1120 WRITE (KOUT,DEBUG2)	811 1270	6739
	1130 CONTINUE	811 1280	6740
		811 1290	6741
C		811 1300	6742
C		811 1310	6743
C	* SEGMENT B-C-D *	811 1320	6744
C		811 1330	6745
	HS1 = 4.0*(A(1)**2 + A(2)**2 + A(3)**2)	811 1340	6746
	HS2 = (X(1)-A(1))**2 + (X(2)-A(2))**2 + (X(3)-A(3))**2	811 1350	6747
	HS3 = (X(1)+A(1))**2 + (X(2)+A(2))**2 + (X(3)+A(3))**2	811 1360	6748
	H1 = SQR(THS1)	811 1370	6749
	H2 = SQR(THS2)	811 1380	6750
C		811 1390	6751
	COSG= (HS3-HS1-HS2)/(2.0*H1*H2)	811 1400	6752
	SING= SQR(TABS(1.0-COSG**2))	811 1410	6753
	PSIF= 0.0	811 1420	6754
	TEST = ABS(SING) - CUTOF2	811 1430	6755
C		811 1440	6756
	IF (TEST) 1170,1170,1140	811 1450	6757
	1140 CONTINUE	811 1460	6758
C		811 1470	6759
	R = H2*SING	811 1480	6760
C		811 1490	6761
	TEST = R/H1 - 10.0*CUTOF1	811 1500	6762
	IF (TEST) 1170,1170,1150	811 1510	6763
	1150 CONTINUE	811 1520	6764
C		811 1530	6765
	RS = R**2	811 1540	6766
	H4 = H2*COSG	811 1550	6767
	SH14= H1+H4	811 1560	6768
	T1= 1.0 + 2.0*H4/H1	811 1570	6769
C		811 1580	6770
	PSIF= (SH14/SQR(TSH14**2+RS) -H4/SQR(TH4**2+RS))/R	811 1590	6771
C		811 1600	6772
	DO 1160 K=1,3	811 1610	6773
	G(K)= A(K)*T1	811 1620	6774
	COS1(K)= (G(K)-X(K))/R	811 1630	6775
	1160 COS2(K)= -2.0*A(K)/H1	811 1640	6776
C		811 1650	6777
	CALL CROSP(COS1,COS2,COS3)	811 1660	6778
C		811 1670	6779
	1170 CONTINUE	811 1680	6780
C		811 1690	6781
	V2= 0.0	811 1700	6782
C		811 1710	6783
	DO 1180 K=1,3	811 1720	6784
	VCOS(K)= VCOS(K) + PSIF*CCS3(K)	811 1730	6785
	1180 V2= V2 + VCOS(K)**2	811 1740	6786
C		811 1750	6787
	IF (NOTE) 1200,1190,1190	811 1760	6788
	1190 WRITE (KOUT,DEBUG3)	811 1770	6789
	LINES= LINEX - 10	811 1780	6790
	1200 CONTINUE	811 1790	6791
C		811 1800	6792

```

VI= SQRT(V21
00 1210 K=1,3
1210 VCOS(K)= VCOS(KI)/VI
C
VI= VI*(GAMA/SCALE)
C
RETURN
C
XXXXXX
C
END
811 1810 6793
811 1820 6794
811 1830 6795
811 1840 6796
811 1850 6797
811 1860 6798
811 1870 6799
811 1880 6800
811 1890 6801
811 1900 6802

V FOR B12,B12
C
C
C
SUBROUTINE REFLEC(P,ZL,ALFAR,COSR)
C
* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B12 70
* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B12 80
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B12 90
C
DIMENSION P(3)
COMMON/DATA01/KIN ,KOUT ,KT1 ,KT2 ,LINEX ,LINES
COMMON/DATA02/IFLG(15) ,EXECK(15) ,RAD ,PIE
NAMELIST/REFLEX/PX,PY,X1,Y1,PHI,ALFAR,RX,RY,ZL,COSR
DATA X2/0.0/, Y2/0.0/
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B12 100
C
PX= P(3)
PY= P(1)
X1= ZL/COSR
Y1= 0.0
PHI= -ALFAR
NOTE= IFLG(10)-15
C
CALL ROTATE(PX,PY,X1,Y1,PHI,X2,Y2,RX,RY)
C
IF (NOTE) 1010,1010,1000
1000 WRITE (KOUT,REFLEX)
1010 CONTINUE
C
RX=-RX
C
CALL ROTATE(RX,RY,X2,Y2,ALFAR,X1,Y1,PX,PY)
C
IF (NOTE) 1030,1030,1020
1020 WRITE (KOUT,REFLEX)
LINES= LINES+24
1030 CONTINUE
C
P(3)= PX
P(1)= PY
C
RETURN
C
XXXXXX
C
END
812 10 6803
812 20 6804
812 30 6805
812 40 6806
812 50 6807
812 60 6808
812 70 6809
812 80 6810
812 90 6811
812 100 6812
812 110 6813
812 120 6814
812 130 6815
812 140 6816
812 150 6817
812 160 6818
812 170 6819
812 180 6820
812 190 6821
812 200 6822
812 210 6823
812 220 6824
812 230 6825
812 240 6826
812 250 6827
812 260 6828
812 270 6829
812 280 6830
812 290 6831
812 300 6832
812 310 6833
812 320 6834
812 330 6835
812 340 6836
812 350 6837
812 360 6838
812 370 6839
812 380 6840
812 390 6841
812 400 6842
812 410 6843
812 420 6844
812 430 6845
812 440 6846
812 450 6847
812 460 6848
812 470 6849
812 480 6850
812 490 6851
812 500 6852

V FOR B13,B13
C
C
C
SUBROUTINE DMATIA(N,DETERM)
C
MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS
* VERSION 2 ROUTINE (DOUBLE PRECISION-LANGLEY MATINV SUBROUTINE) * B13 80
C
* TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B13 90
* PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B13 100
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B13 110
C
DOUBLE PRECISION R1,R2,DETERM,AMAX,T,SWAP,PIVOT,PIVOT1
DOUBLE PRECISION IPIVOT(71),A(71,71),B(1,1),INDEX(71,2)
EQUIVALENCE (IRCW,JROW), (ICOLM,JCOLUMN), (AMAX, T, SWAP)
M= 0
C
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B13 120
C
INITIALIZATION
C
1000 ISCALE=0
1010 R1 = 1.E36
1020 R2=1.0/PI
1030 DETERM=L.O
1040 DO 1050 J=1,N
1050 IPIVOT(J)=0
1060 DO 1630 I=1,N
C
SEARCH FOR PIVOT ELEMENT
C
1070 AMAX=0.0
1080 DO 1170 J=1,N
1090 IF (IPIVOT(J)-1) 1100,1170,1100
1100 DO 1160 K=1,N
1110 IF (IPIVOT(K)-1) 1120,1160,1150
B13 130 6853
B13 20 6854
B13 30 6855
B13 40 6856
B13 50 6857
B13 60 6858
B13 70 6859
B13 80 6860
B13 90 6861
B13 100 6862
B13 110 6863
B13 120 6864
B13 130 6865
B13 140 6866
B13 150 6867
B13 160 6868
B13 170 6869
B13 180 6870
B13 190 6871
B13 200 6872
B13 210 6873
B13 220 6874
B13 230 6875
B13 240 6876
B13 250 6877
B13 260 6878
B13 270 6879
B13 280 6880
B13 290 6881
B13 300 6882
B13 310 6883
B13 320 6884
B13 330 6885
B13 340 6886
B13 350 6887
B13 360 6888
B13 370 6889
B13 380 6890
B13 390 6891
B13 400 6892

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1120 IF (DABS(AMAX)-DABS(A(J,K)))	1130,1160,1160	813 410	6893
1130 IROW=J		813 420	6894
1140 ICOLUM=K		813 430	6895
1150 AMAX=A(J,K)		813 440	6896
1160 CONTINUE		813 450	6897
1170 CONTINUE		813 460	6898
IF (AMAX) 1190,1180,1190		813 470	6899
1180 DETERM=0.0		813 480	6900
ISCALE=0		813 490	6901
GO TO 1750		813 500	6902
C	XXXXXX	813 510	6903
C		813 520	6904
C		813 530	6905
1190 IPIVOT(ICOLUM)=IPIVOT(ICOLUM)+1		813 540	6906
C		813 550	6907
C	INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL	813 560	6908
C		813 570	6909
1200 IF (IROW-ICOLUM) 1210,1310,1210		813 580	6910
1210 DETERM=-DETERM		813 590	6911
1220 DO 1250 L=1,N		813 600	6912
1230 SWAP=A(IROW,L)		813 610	6913
1240 A(IROW,L)=A(ICOLUM,L)		813 620	6914
1250 A(ICOLUM,L)=SWAP		813 630	6915
C		813 640	6916
C		813 650	6917
1260 IF (M) 1310,1310,1270		813 660	6918
1270 DO 1300 L=1,M		813 670	6919
1280 SWAP=B(IROW,L)		813 680	6920
1290 B(IROW,L)=B(ICOLUM,L)		813 690	6921
1300 B(ICOLUM,L)=SWAP		813 700	6922
1310 INDEX(1,1)=IROW		813 710	6923
1320 INDEX(1,2)=ICOLUM		813 720	6924
1330 PIVOT=A(ICOLUM,ICOLUM)		813 730	6925
IF (PIVOT) 1340,1180,1340		813 740	6926
C		813 750	6927
C	SCALE THE DETERMINANT	813 760	6928
C		813 770	6929
1340 PIVOTI=PIVOT		813 780	6930
1350 IF (DABS(DETERM)-R1) 1380,1360,1360		813 790	6931
1360 DETERM=DETERM/R1		813 800	6932
ISCALE=ISCALE+1		813 810	6933
IF (DABS(DETERM)-R1) 1410,1370,1370		813 820	6934
1370 DETERM=DETERM/R1		813 830	6935
ISCALE=ISCALE+1		813 840	6936
GO TO 1410		813 850	6937
1380 IF (DABS(DETERM)-R2) 1390,1390,1410		813 860	6938
1390 DETERM=DETERM*R1		813 870	6939
ISCALE=ISCALE-1		813 880	6940
IF (DABS(DETERM)-R2) 1400,1400,1410		813 890	6941
1400 DETERM=DETERM*R1		813 900	6942
ISCALE=ISCALE-1		813 910	6943
1410 IF (DABS(PIVOTI)-R1) 1440,1420,1420		813 920	6944
1420 PIVOTI=PIVOTI/R1		813 930	6945
ISCALE=ISCALE+1		813 940	6946
IF (DABS(PIVOTI)-R1) 1470,1430,1430		813 950	6947
1430 PIVOTI=PIVOTI/R1		813 960	6948
ISCALE=ISCALE+1		813 970	6949
GO TO 1470		813 980	6950
1440 IF (DABS(PIVOTI)-R2) 1450,1450,1470		813 990	6951
1450 PIVOTI=PIVOTI*R1		813 1000	6952
ISCALE=ISCALE-1		813 1010	6953
IF (DABS(PIVOTI)-R2) 1460,1460,1470		813 1020	6954
1460 PIVOTI=PIVOTI*R1		813 1030	6955
ISCALE=ISCALE-1		813 1040	6956
1470 DETERM=DETERM*PIVOTI		813 1050	6957
C		813 1060	6958
C	DIVIDE PIVOT ROW BY PIVOT ELEMENT	813 1070	6959
C		813 1080	6960
1480 A(ICOLUM,ICOLUM)=1.0		813 1090	6961
1490 DO 1500 L=1,N		813 1100	6962
1500 A(ICOLUM,L)=A(ICOLUM,L)/PIVOT		813 1110	6963
C		813 1120	6964
C		813 1130	6965
1510 IF (M) 1540,1540,1520		813 1140	6966
1520 DO 1530 L=1,M		813 1150	6967
1530 B(ICOLUM,L)=B(ICOLUM,L)/PIVOT		813 1160	6968
C		813 1170	6969
C	REDUCE NON-PIVOT ROWS	813 1180	6970
C		813 1190	6971
1540 DO 1630 LI=1,N		813 1200	6972
1550 IF (LI-ICOLUM) 1560,1630,1560		813 1210	6973
1560 T=A(LI,ICOLUM)		813 1220	6974
1570 A(LI,ICOLUM)=0.0		813 1230	6975
1580 DO 1590 L=1,N		813 1240	6976
1590 A(LI,L)=A(LI,L)-A(ICOLUM,L)*T		813 1250	6977
C		813 1260	6978
C		813 1270	6979
1600 IF (M) 1630,1630,1610		813 1280	6980
1610 DO 1620 L=1,M		813 1290	6981
1620 B(LI,L)=B(LI,L)-B(ICOLUM,L)*T		813 1300	6982
1630 CONTINUE		813 1310	6983
C		813 1320	6984
C	INTERCHANGE COLUMNS	813 1330	6985
C		813 1340	6986
1640 DO 1740 I=1,N		813 1350	6987
1650 L=N+1-I		813 1360	6988
1660 IF (INDEX(L,1)-INDEX(L,2)) 1670,1740,1670		813 1370	6989
1670 JROW=INDEX(L,1)		813 1380	6990
1680 JCOLUM=INDEX(L,2)		813 1390	6991
1690 DO 1730 K=1,N		813 1400	6992
1700 SWAP=A(K,JROW)		813 1410	6993
1710 A(K,JROW)=A(K,JCOLUM)		813 1420	6994
1720 A(K,JCOLUM)=SWAP		813 1430	6995
1730 CONTINUE		813 1440	6996
1740 CONTINUE		813 1450	6997
1750 RETURN		813 1460	6998

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C      XXXXXX                               B13 1470           6999
C      END                                  B13 1480           7000
                                           B13 1490           7001

V FOR B14,B14                               B14 10             7002
C                                           B14 20             7003
C                                           B14 30             7004
C                                           B14 40             7005
C      SUBROUTINE DOTP(A,B,C)                B14 50             7006
C                                           B14 60             7007
C      * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B14 70             7008
C      * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B14 80             7009
C                                           B14 90             7010
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B14 100            7011
C                                           B14 110            7012
C      DIMENSION A(3),B(3)                  B14 120            7013
C      C= A(1)*B(1)+ A(2)*B(2)+ A(3)*B(3)    B14 130            7014
C                                           B14 140            7015
C      RETURN                                B14 150            7016
C      XXXXXX                                B14 160            7017
C                                           B14 170            7018
C      END                                  B14 180            7019

V FOR B15,B15                               B15 10             7020
C                                           B15 20             7021
C                                           B15 30             7022
C                                           B15 40             7023
C      SUBROUTINE CROSP( A,B,C)              B15 50             7024
C                                           B15 60             7025
C      * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B15 70             7026
C      * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B15 80             7027
C                                           B15 90             7028
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B15 100            7029
C                                           B15 110            7030
C      DIMENSION A(3),B(3),C(3)             B15 120            7031
C                                           B15 130            7032
C      C(1)= A(2)*B(3) - A(3)*B(2)          B15 140            7033
C      C(2)= A(3)*B(1) - A(1)*B(3)          B15 150            7034
C      C(3)= A(1)*B(2) - A(2)*B(1)          B15 160            7035
C                                           B15 170            7036
C      RETURN                                B15 180            7037
C      XXXXXX                                B15 190            7038
C                                           B15 200            7039
C      END                                  B15 210            7040

V FOR B16,B16                               B16 10             7041
C                                           B16 20             7042
C                                           B16 30             7043
C                                           B16 40             7044
C      SUBROUTINE ROTATE( X,Y, XG,YG, PHI,   XF,YF, XT,YT ) B16 50             7045
C                                           B16 60             7046
C      * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B16 70             7047
C      * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B16 80             7048
C                                           B16 90             7049
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B16 100            7050
C                                           B16 110            7051
C      XS = X-XG                               B16 120            7052
C      YS = Y-YG                               B16 130            7053
C      RHM= SQRT( XS**2 + YS**2)                B16 140            7054
C      ERRDR= 0.0001                            B16 150            7055
C      TESTX= ABS(XS)-ERRDR                      B16 160            7056
C      TESTY= ABS(YS)-ERRDR                      B16 170            7057
C      IF (TESTX) 1000,1000,1030                 B16 180            7058
C      1000 IF (TESTY) 1010,1010,1020             B16 190            7059
C      1010 ZET= 0.0                               B16 200            7060
C      GO TO 1110                                 B16 210            7061
C      1020 ZET= 1.570795*(YS/ABS(YS)) - XS/YS    B16 220            7062
C      GO TO 1110                                 B16 230            7063
C      1030 ZET= ABS(YS/XS)                       B16 240            7064
C      IF (TESTY) 1050,1050,1040                 B16 250            7065
C      1040 ZET=ATAN(ZET)                         B16 260            7066
C      1050 CONTINUE                             B16 270            7067
C      IF (XS) 1070,106C,1060                    B16 280            7068
C      1060 IF (YS) 1100,111C,1110                B16 290            7069
C      1070 IF (YS) 1090,109C,1080                B16 300            7070
C      1080 ZET= 3.14159 - ZET                     B16 310            7071
C      GO TO 1110                                 B16 320            7072
C      1090 ZET= 3.14159 + ZET                     B16 330            7073
C      GO TO 1110                                 B16 340            7074
C      1100 ZET= 6.28318 - ZET                     B16 350            7075
C      1110 CONTINUE                             B16 360            7076
C      ZPP= PHI + ZET                             B16 370            7077
C      XR = RHM*COS(ZPP)                          B16 380            7078
C      YR = RHM*SIN(ZPP)                          B16 390            7079
C      XT= XF + XR                                B16 400            7080
C      YT= YF + YR                                B16 410            7081
C                                           B16 420            7082
C      RETURN                                    B16 430            7083
C      XXXXXX                                    B16 440            7084
C                                           B16 450            7085
C      END                                      B16 460            7086

V FOR B17,B17                               B17 10             7087
C                                           B17 20             7088
C                                           B17 30             7089
C                                           B17 40             7090
C      SUBROUTINE CURFIT(X,Y,A, N, DY1,OY2, K1,K2) B17 50             7091
C                                           B17 60             7092

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C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG-72 *B17 70 7093
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B17 80 7094
C * * * * * B17 90 7095
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B17 100 7096
C * * * * * B17 110 7097
C DIMENSION X(22),Y(22),A(42),B(42),C(1) B17 120 7098
C ***** B17 130 7099
C * * * * * B17 140 7100
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B17 150 7101
C * * * * * B17 160 7102
C ..... FOR THE WHOLE TABULATED TABLE B17 170 7103
C X(I) = INDEPENDENT VARIABLE.....I=1,N (GIVEN) B17 180 7104
C Y(I) = DEPENDENT VARIABLE.....I=1,N (GIVEN) B17 190 7105
C N = LENGTH OF Y-VS-X TABLE (GIVEN) B17 200 7106
C DY1 = 1ST OR 2ND DERIVATIVE AT LOWER END OF TABLE B17 210 7107
C DY2 = 1ST OR 2ND DERIVATIVE AT UPPER END OF TABLE B17 220 7108
C K1 = 1 .....DY1 = 1ST DERIVATIVE (GIVEN) B17 230 7109
C K1 = 2 .....DY1 = 2ND DERIVATIVE (GIVEN) B17 240 7110
C K2 = 1 .....DY2 = 1ST DERIVATIVE (GIVEN) B17 250 7111
C K2 = 2 .....DY2 = 2ND DERIVATIVE (GIVEN) B17 260 7112
C * * * * * B17 270 7113
C THE DIMENSION C(1) MUST FOLLOW THE DIMENSION OF B B17 280 7114
C MINIMUM DIMENSION OF B IS.....(2*N-2) B17 290 7115
C DIMENSION OF A IS SAME AS B, BUT GIVEN IN MAIN PROGRAM B17 300 7116
C * * * * * B17 310 7117
C * * * * * B17 320 7118
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B17 330 7119
C * * * * * B17 340 7120
C * * * * * B17 350 7121
C * * * * * B17 360 7122
C * * * * * B17 370 7123
C C(1)=0.0 B17 380 7124
C NRNG= 100 B17 390 7125
C * * * * * B17 400 7126
C N1 = N-2 B17 410 7127
C C1 = X(2)-X(1) B17 420 7128
C IF (C1) 1170,1170,1000 B17 430 7129
1000 GO TO (1010,1020),K1 B17 440 7130
1010 B(1) = 0.0 B17 450 7131
A(1) = (DY1-(Y(2)-Y(1))/C1)/C1 B17 460 7132
GO TO 1030 B17 470 7133
1020 B(1) = -C1 B17 480 7134
A(1) = -DY1/2.0 B17 490 7135
1030 J = 1 B17 500 7136
C * * * * * B17 510 7137
C IF (N1) 1150,1090,1040 B17 520 7138
1040 IF (NRNG-N) 1150,1050,1050 B17 530 7139
C * * * * * B17 540 7140
1050 DO 1060 I=1,N1 B17 550 7141
K = I+1 B17 560 7142
J = J+1 B17 570 7143
C1 = X(K)-X(I) B17 580 7144
C2 = X(K+1)-X(K) B17 590 7145
C3 = Y(K)-Y(I) B17 600 7146
C4 = Y(K+1)-Y(K) B17 610 7147
C5 = C3/C1-C4/C2 B17 620 7148
C6 = C1/C2 B17 630 7149
C7 = C1*C2 B17 640 7150
B(J) = 1.0/(C6*(C1-B(J)-1)) B17 650 7151
A(J) = (C5/C2-C6*A(J-1))*B(J) B17 660 7152
J = J+1 B17 670 7153
B(J) = 1.0/((-C1-C2)/C7-C6*B(J-1)) B17 680 7154
A(J) = (-C5/C7-C6*A(J-1))*B(J) B17 690 7155
1060 CONTINUE B17 700 7156
C * * * * * B17 710 7157
GO TO (1070,1080),K2 B17 720 7158
1070 A(J+1) = (DY2-C4/C2+C2*A(J))/(C2*(B(J)-C2)) B17 730 7159
GO TO 1120 B17 740 7160
1080 A(J+1) = (DY2/2.+A(J))/(-2.*C2+B(J)) B17 750 7161
GO TO 1120 B17 760 7162
C * * * * * B17 770 7163
C STATEMENTS 42 TO 44 ARE FOR N=2 ONLY B17 780 7164
C * * * * * B17 790 7165
1090 C3 = K1 B17 800 7166
C2 = 1.0/C3 B17 810 7167
GO TO (1100,1110),K2 B17 820 7168
1100 A(J+1) = ((Y(2)-Y(1))/C1-A(J)*C1-DY2)/(C1*C1)*C2 B17 830 7169
GO TO 1120 B17 840 7170
1110 A(J+1) = C3*((DY2+2.0*A(1))/14.0*C1) B17 850 7171
C * * * * * B17 860 7172
1120 J = 2*(N-1) B17 870 7173
C * * * * * B17 880 7174
1130 J = J-1 B17 890 7175
IF (J) 1170,1170,1140 B17 900 7176
1140 A(J) = A(J)-B(J)*A(J+1) B17 910 7177
GO TO 1130 B17 920 7178
C * * * * * B17 930 7179
C * * * * * B17 940 7180
1150 WRITE (6,1160)N,NRNG B17 950 7181
C CALL EXIT B17 960 7182
1160 FORMAT(40H =15,3X9H IN CURFIT/31H .....N MUST BE IN THE RANGE B17 970 7183
1 13HBETWEEN 2 AND15/39H0*INCREASE DIMENSION OF B IN CURFIT B17 980 7184
2 19HIF N IS TOO LARGE /12HOB = 2*(N-1) ) B17 990 7185
1170 RETURN B17 1000 7186
C * * * * * B17 1010 7187
C * * * * * B17 1020 7188
C * * * * * B17 1030 7189
C * * * * * B17 1030 7189
V FOR 818,819 B18 10 7190
C * * * * * B18 20 7191
C * * * * * B18 30 7192
C * * * * * B18 40 7193
C * * * * * B18 50 7194
C SUBROUTINE CURVE(X,Y,A, XP,YP,DYP,N,IT) B18 60 7195
C * * * * * B19 60 7195

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C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B18 70 7196
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B18 80 7197
C 818 90 7198
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B18 100 7199
C 818 110 7200
C DIMENSION X(22),Y(22),A(42) 818 120 7201
C ***** 818 130 7202
C 818 140 7203
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B18 150 7204
C 818 160 7205
C.....USING A(I) COMPUTED IN CURFIT SUBROUTINE 818 170 7206
C XP = A PARTICULAR VALUE OF -X- (GIVEN) 818 180 7207
C YP = A PARTICULAR VALUE OF -Y- 818 190 7208
C DYP = DY/DX AT -XP- 818 200 7209
C IT = EFFICIENCY CONTROL INDEX (GIVEN) 818 210 7210
C IT = 1 .....ONLY YP IS COMPUTED 818 220 7211
C IT = 2 .....ONLY DYP IS COMPUTED 818 230 7212
C IT = 3.....BOTH YP AND DYP ARE COMPUTED 818 240 7213
C 818 250 7214
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B18 260 7215
C 818 270 7216
C 818 280 7217
C 818 290 7218
C 818 300 7219
C 1000 C1 = X(2)-X(1) 818 310 7220
C DYP = (Y(2)-Y(1))/C1+A(1)*C1 818 320 7221
C GO TO (1010,1100,1010),IT 818 330 7222
C 1010 YP = Y(1)+DYP*(XP-X(1)) 818 340 7223
C GO TO 1100 818 350 7224
C 1020 N = N 818 360 7225
C IF (XP-X(N)) 1050,1030,1030 818 370 7226
C 1030 N2 = 2*(N-1) 818 380 7227
C C1 = X(N)-X(N-1) 818 390 7228
C DYP = (Y(N)-Y(N-1))/C1-A(N2-1)*C1-A(N2)*C1*C1 818 400 7229
C GO TO (1040,1100,1040),IT 818 410 7230
C 1040 YP = Y(N)+DYP*(XP-X(N)) 818 420 7231
C GO TO 1100 818 430 7232
C 1050 I = 1 818 440 7233
C 1060 I = I+1 818 450 7234
C IF (X(I)-XP) 1060,1070,1070 818 460 7235
C 1070 K = 2*I-3 818 470 7236
C C1 = XP-X(I-1) 818 480 7237
C C2 = X(I)-XP 818 490 7238
C SLOPE = (Y(I)-Y(I-1))/(X(I)-X(I-1)) 818 500 7239
C GO TO (1080,1090,1080),IT 818 510 7240
C 1080 YP = Y(I-1)+(SLOPE+A(K)*C2+A(K+1)*C1*C2)*C1 818 520 7241
C GO TO (1100,1090,1090),IT 818 530 7242
C 1090 DYP = SLOPE +A(K)*(C2-C1)+ A(K+1)*(2.*C2-C1)*C1 818 540 7243
C 1100 RETURN 818 550 7244
C XXXXXX 818 560 7245
C 818 570 7246
C END 818 580 7247

V FOR B19,B19 819 10 7248
C 819 20 7249
C 819 30 7250
C 819 40 7251
C SUBROUTINE PAGE 819 50 7252
C 819 60 7253
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B19 70 7254
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B19 80 7255
C 819 90 7256
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B19 100 7257
C COMMON/DATA00/NSFL ,ALFAC ,CMAK ,ZHO ,FLAPDX ,AILRDX(2) 819 110 7258
C * ,TITLE(14) ,STORE(14) 819 120 7259
C 819 130 7260
C 819 140 7261
C COMMON/DATA01/KIN ,KOUT ,KT1 ,KT2 ,LINEX ,LINES 819 150 7262
C 819 160 7263
C COMMON/DATA02/IFLG(15) ,EXECK(15) ,RAD ,PIE 819 170 7264
C 819 180 7265
C 819 190 7266
C 1000 FORMAT(30H1JOBFLAG 1 2 3 4 5 6 7 8 9 10,2X,13A6,A2,3X, 819 200 7267
C 1 4HPAGE,/,2X,5HVALUE,1X,10I3,2X, 819 210 7268
C 2 5HALFA=,F6.2,2X,7HMACHNO=,F6.4,2X,6HFLAPD=,F6.2,2X,9HAILEROND=, 819 220 7269
C 3 2F6.2,2X,9HALTITUDE=,F6.2,2X,14,/,1X) 819 230 7270
C 819 240 7271
C 819 250 7272
C XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX B19 260 7273
C 819 270 7274
C 819 280 7275
C IF (NSTU-1971) IC10,1020,1010 819 290 7276
C 1010 NSTU= 1971 819 300 7277
C NP= 0 819 310 7278
C 1020 NP= NP+1 819 320 7279
C WRITE (KOUT,1000)(TITLE(I),I=1,14),(IFLG(I),I=1,10),ALFAC,CMAK,FLA 819 330 7280
C IPDX,(AILRDX(I),I=1,2),ZHO,NP 819 340 7281
C LINES= 5 819 350 7282
C 819 360 7283
C RETURN 819 370 7284
C XXXXXX 819 380 7285
C 819 390 7286
C END 819 400 7287

V FOR B20,B20 820 10 7288
C 820 20 7289
C 820 30 7290
C 820 40 7291
C MAIN ROUTINE 820 50 7292
C TEST MATRIX INVERSION 820 60 7293
C 820 70 7294
C * TRW MULTIPLE-SURFACE VORTEX-LATTICE PROGRAM - REVISED 8 AUG.72 *B20 80 7295
C * PROGRAM DEVELOPED BY A.V.GOMEZ (TRW SYSTEMS) ON MARCH-MAY 1971 *B20 90 7296
C 820 100 7297

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C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 820 110      7298
C      DOUBLE PRECISION DELTA,AMAT(71,71),BMAT(71,71),CMAT(71,71)      820 120      7299
1000  FORMAT(10X,15,2F14.4 )      820 130      7300
1010  FORMAT(1X,/,1X )      820 140      7301
1020  FORMAT(10X,5(1PF14.6) )      820 150      7302
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 820 160      7303
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 820 170      7304
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 820 180      7305
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 820 190      7306
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 820 200      7307
C      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX 820 210      7308
C      NOR= 5      820 220      7309
C      AMAT(1,1) = 1.032      820 230      7310
C      AMAT(1,2) = 7.865      820 240      7311
C      AMAT(1,3) = 3.216      820 250      7312
C      AMAT(1,4) = 3.031      820 260      7313
C      AMAT(1,5) = 10.32      820 270      7314
C      AMAT(2,1) = 7.68      820 280      7315
C      AMAT(2,2) = -6.39      820 290      7316
C      AMAT(2,3) = 8.900      820 300      7317
C      AMAT(2,4) = -1.02      820 310      7318
C      AMAT(2,5) = 5.690      820 320      7319
C      AMAT(3,1) = 3.030      820 330      7320
C      AMAT(3,2) = -3.38      820 340      7321
C      AMAT(3,3) = -11.67      820 350      7322
C      AMAT(3,4) = 4.180      820 360      7323
C      AMAT(3,5) = -3.60      820 370      7324
C      AMAT(4,1) = -2.93      820 380      7325
C      AMAT(4,2) = 5.670      820 390      7326
C      AMAT(4,3) = 8.323      820 400      7327
C      AMAT(4,4) = 9.072      820 410      7328
C      AMAT(4,5) = 0.0378      820 420      7329
C      AMAT(5,1) = -1.0578      820 430      7330
C      AMAT(5,2) = 7.102      820 440      7331
C      AMAT(5,3) = 9.992      820 450      7332
C      AMAT(5,4) = 0.97E      820 460      7333
C      AMAT(5,5) = 15.14      820 470      7334
C      AMAT(5,5) = 15.14      820 480      7335
C      AMAT(5,5) = 15.14      820 490      7336
C      DO 1040 J=1,NOR      820 500      7337
C      DO 1030 K=1,NOR      820 510      7338
1030  BMAT(J,K)= AMAT(J,K)      820 520      7339
1040  CONTINUE      820 530      7340
C      CALL DMATIN(BMAT,NOR,DELTA)      820 540      7341
C      CALL DMATIN(BMAT,NOR,DELTA)      820 550      7342
C      CALL DMATIN(BMAT,NOR,DELTA)      820 560      7343
C      DO 1070 K=1,NOR      820 570      7344
C      DO 1060 J=1,NOR      820 580      7345
C      CMAT(J,K)= 0.0      820 590      7346
C      DO 1050 L=1,NOR      820 600      7347
1050  CMAT(J,K)= CMAT(J,K) + AMAT(J,L)*BMAT(L,K)      820 610      7348
1060  CONTINUE      820 620      7349
1070  CONTINUE      820 630      7350
C      CALL PAGE      820 640      7351
C      WRITE (6,1020)((AMAT(J,K),J=1,NOR),K=1,NOR)      820 650      7352
C      WRITE (6,1010)      820 660      7353
C      WRITE (6,1020)((BMAT(J,K),J=1,NOR),K=1,NOR)      820 670      7354
C      WRITE (6,1010)      820 680      7355
C      WRITE (6,1020)((CMAT(J,K),J=1,NOR),K=1,NOR)      820 690      7356
C      WRITE (6,1010)      820 700      7357
C      WRITE (6,1010)      820 710      7358
C      WRITE (6,1010)      820 720      7359
C      WRITE (6,1020)DELTA      820 730      7360
C      STOP      820 740      7361
C      END      820 750      7362

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