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COMPUTER PROGRAMS FOR CALCULATING POTENTIAL FLOW IN PROPULSION SYSTEM INLETS

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INTRODUCTION

In the course of designing inlets at the Lewis Research Center, particularly for VTOL and STOL propulsion systems, a calculational procedure utilizing three computer programs evolved (refs. 1-3). The chief program is the Douglas axisymmetric potential flow program called EOD which calculates the incompressible potential flow about arbitrary axisymmetric bodies. The other two programs, original with Lewis, are called SCIRCL and COMBYN. Program SCIRCL generates input for EOD from various specified analytic shapes for the inlet components. Program COMBYN takes basic solutions output by EOD and combines them into solutions of interest, and applies a compressibility correction.

These programs are still in a state of development and users' manuals for them are not yet available. However, in the interests of making the programs available immediately, it was decided to publish the current versions in the "Quick Release" form with a minimum of write-up. First a brief summary of what each of the three programs does together with references to pertinent literature will be given. This is followed by a description of the input and output of programs SCIRCL and COMBYN. Next, listings of all three programs are given. Finally, a test case for checking-out the programs is presented.

It should be noted that programs SCIRCL and COMBYN were originally written for VTOL inlets and some of the input and output parameters are VTOL oriented.

DESCRIPTION OF PROGRAMS

SCIRCL

The purpose of this program is to supply accurate input to the potential flow program. To this end the inlet surfaces (e.g., hub and shroud) are divided into segments each of which is a portion of an analytical curve as illustrated in figure 1. The curves available are listed in the description of SCIRCL input. SCIRCL distributes points along the inlet surfaces in such a way as to meet the requirements of program EOD. The coordinates of these points are punched on cards for direct input to EOD along with other information required

by EOD. In addition, SCIRCL outputs printed information about the inlet surfaces (coordinates, curvature, slope, etc.).

In addition to the surface points, sets of points spanning the passage, like flow measuring rakes, are needed at axial locations where velocity profiles or streamlines are desired. At least one "rake" must be specified for use as a control station. (The function of the control station is given under COMBYN.) Program SCIRCL generates the coordinates of the rake points and punches them on cards for input to EOD.

EOD

This is the Douglas incompressible potential flow computer program for axisymmetric bodies. Only the bodies must be axisymmetric; the flow itself need not be. The details of the Douglas method are covered extensively in references 4 to 6; the highlights will be outlined herein.

1. Bodies are represented by a distribution of sources and sinks of initially unknown strengths.

2. An integral equation in the unknown source strength is derived from the potential flow equations and boundary conditions.

3. The integral equation is appproximated by a set of linear algebraic equations corresponding to discrete points on the bodies.

4. These equations are solved for the source strength by matrix methods.

5. Velocities are calculated on the surface and at other points of interest (such as rake points) in the flow field from the source distribution obtained in step 4.

The program was originally written for closed bodies in a free stream. To apply the method to inlets, the inlets are idealized by adding artificial extensions to the inlet surfaces as shown in figures 2 and 3. The method of idealizing conventional inlets is given in reference 7 and that for lift fan or lift engine inlets in reference 2.

The Douglas program is used to obtain three basic solutions for the idealized inlet profile and certain free-stream conditions. The basic solutions are ones (e.g., as shown in fig. 4) that provide a convenient basis for generating the combined solutions that represent flow conditions of interest. The three basic solutions and the method of combining them are discussed in reference 2. Program EOD has been modified to output the basic solutions on punched cards for input to program COMBYN. No further description of EOD input or output will be given.

COMBYN

This program combines the basic solutions from EOD into any number of solutions of interest. A solution of interest or combined solution is one having specified values of free stream velocity V_∞ and direction α and control station velocity V_c (as shown in fig. 5 for a VTOL inlet). As an alternative to V_c, the inlet weight flow $\mathring{w}$ may be specified, in which case the program will convert $\mathring{w}$ to V_c. Temperature and pressure must also be specified if other than standard conditions are desired. These and other COMBYN inputs are described later. (Note that COMBYN requires α_F rather than α where $\alpha_F = \alpha - 90.$)

The method of combination of the basic solutions is essentially that given in reference 2 and is summarized in figure 5. The only major difference is in the compressibility correction. The current version of COMBYN uses the compressibility correction method of reference 8. This method is referred to in the COMBYN program listing as Approach 5 compressibility.

One of the "rakes" mentioned under SCIRCL is used as a control station by COMBYN. The control station is the rake at which the average inlet axial velocity V_c of the combined solution is specified. If there are several rakes any one may be used as the control station. It should be noted, however, that the solution is most accurate in the vicinity of the control station. The inaccuracies, which often are not significant, arise from the method of calculating the basic solution for inlets and from the compressibility correction which does not exactly satisfy continuity.

DESCRIPTION OF INPUT AND OUTPUT

SCIRCL INPUT

Card No.	Format	Fortran Name	Description
1	9A6	TITLE	Title card - used for input to EOD
2	2A6,I4	IDENT	Title number or case number
		PROG	=EOD for EOD axisymmetric punched output =22Y for 2-dimensional punched output
		NO6	=1 for basic data only from Douglas program =0 for all solutions in Douglas program
3	5F10.2	ANBDYS	Number of bodies (can handle 3) =1.0 shroud only =2.0 hub and shroud =3.0 hub, flow splitter* and shroud
		DELS	Spacing between points in region of interest
		DELSMX	Maximum spacing far from region of interest
		XRI	Axial distance at which surface distance equals zero
		ANNSD	Number of Noise Suppression Devices or NSD Splitters (acoustic splitters) (fig. 6), can equal zero.
4	I4	NRAKES	Number of axial locations at which data across the passage is desired, must be at least one (for the control station), cannot be greater than 25.
5	3F8.5,I3	XRAK	Axial location of rake ($XRAK_i \leq XRAK_{i+1}$).

*Flow splitter programming not complete through COMBYN. (Flow splitters extend far downstream, acoustic splitters do not.)

Card No.	Format	Fortran Name	Description
		YLO	Y value of first point on the rake at XRAK. If YLO = 0.0, the program will calculate a reasonable value for YLO provided the slope of nearby surface is not $> 45^{\circ}$.
		YHI	Y value of last point on the rake at XRAK. If YHI = 0.0, the program will calculate a reasonable value for YHI provided the slope of nearby surface is not $> 45^{\circ}$.
		NY	Number of points in rake at XRAK. Restriction, Σ NY $\leq$ 200
			$\Delta Y = \left(\frac{YHI-YLO}{NY}\right)$
			Rake points are equally spaced, ΔY, between YHI and YLO.
6	2F10.2	TYPBDY	=1.0 for hub =2.0 for shroud if ANBDYS=2, for flow splitter* if ANBDYS=3 =3.0 for shroud if ANBDYS=3 =0.0 if shroud is to be mirror image of hub
		ANSEG	=Number of segments for the particular body type. If TYPBDY = 0 it is the Y centerline used for mirroring. (Axis of symmetry)
7	F10.2, 10F7.2	ENREED	code indicating type of curve to be fitted through the given points, it is also the exponent for a supercircle when the exponent is to be specified.
			ENREED = 0, SCIRCL program will calculate an exponent. Read in 5 coordinates (XIN and YIN). (fig. 7(a))
			1 < ENREED < 10, superellipse with exponent equal to ENREED. Input coordinates 1,2,4,5. Read in 0.0 for point no. 3. (Point no. 3 is not used, but points 4 and 5 must be in the proper columns.) (fig. 7(b))

*(See note on previous page)

Card No.	Format	Fortran Name	Description
			1001.< ENREED < 1010. The flag 1000. added to the code of desired superellipse is used on the shroud to give finer spacing at the highlight. The superellipse going into the highlight and the one on the topside of the highlight should have this flag.
			ENREED = 1, is a straight line, input 2 coordinates (XIN(1), YIN(1), XIN(2), YIN(2)). (fig. 7(c))
			ENREED = 10, special straight line used for closed bodies (example - airfoils). This straight line starts with large spacing (DELSMX) and ends with the small spacing (DELS). Input 2 coordinates. (fig. 7(d))
			ENREED = -1, fits a lemniscate between a straight line and a point. Input is 3 coordinates. (fig. 7(e))
			ENREED = -2, fits an ellipse between two straight lines. Input 4 coordinates. Restriction, the two straight lines should be at a right angle, therefore superellipse routine can be used. (fig. 7(f))
			ENREED = -3, fits a cubic between 2 straight lines, input 4 coordinates. (fig. 7(g))
		(XIN(I), YIN(I), I=1,5)	Coordinates for the particular configuration.

Should be ANSEG of #7 cards (i.e., there should be one #7 card for every segment). At this point repeat card no. 6 and no. 7 for each body number (ANBDYS).

If ANNSD > 0, read input for the NSD splitters.

8	F10.2	DELS	Spacing between points on the NSD splitter, can be different than DELS on the body.

Card No.	Format	Fortran Name	Description
9	2I5	NSEG	=Number of segments on the NSD splitter. Note: for a thin NSD splitter, segments on the topside should begin and end with the same x values used as the corresponding segments on the lower side.
		NSHIGH	=Number of the segment on the underside of the NSD going into the highlight, equal to 1/2 of NSEG for thin splitters. Set NSHIGH = NSEG for all other splitters.
10	Read in card no. 7, for each segment on the NSD. (i.e., ENREED, (XIN(I), YIN(I), I=1,5))		

REMARKS, Total number of points for all the bodies should not exceed 400.

The first straight line on the shroud must be equal in axial length to the last straight segment on the hub. If the first straight line on the shroud is longer, us two segments.

Total number of off-body points must not exceed 200. If there are acoustic splitters in the area of a rake, specify ANNSD + 1 rakes for axial location of rake.

SCIRCL OUTPUT

PRINTED OUTPUT

Case Number

Number of bodies, DELS, DELSMX, XRI (Input)

Hub, Shroud, Splitter and Acoustic Splitters
Type of Segment, and input coordinates for the segment.

Interation information if it applies (Superellipse, ellipse, lemniscate and cubic)

Other information includes,

Superellipse,
N = exponent of the superellipse

A and B = semi-major and minor axis of the transformed superellipse.
XO and YO = Center of the transformed superellipse
OMEGA = The difference between the slopes (in radians) of the superellipse end points minus $\pi/2.0$.

Cubic

A,B,C, and D are the coefficients for the cubic
$AX^3 + BX^2 + CX + D = 0$

Lemniscate

THETMX CALC = Angle between line 1-3 and line 1-2.
ACALC from equation $R^2 = 2A^2\sin 2\theta$ where θ = THETMX and $R^2 = (XIN(3) - XIN(2))^2 + (YIN(3) - YIN(2))^2$.

Ellipse

A and B semi-major and minor axis of transformed ellipse.
XO and YO, center of the transformed ellipse
PHI angle of rotation
THETMX, theta of break point 3 in rotated system

Body Coordinates

Point number
X - axial distance
Y - radial distance
KAPPA - curvature
DY/DX - slope
S - surface distance measured from the first point (same as SUMDS in EOD output)
S-S(2) - surface distance measured from XRI (Same as S in COMBYN output)
DELTAS - distance between points

Rake Information

XRAK - Axial location of the rake
YLO - Y value of first location on rake (either read in value or computed value)
YHI - Y value of last point on the rake (either read in value or computed value)
NDY - Number of Y points calculated for XRAK.

Area Output

I - point number
XON - axial location
YON - Y value on the shroud
YONH - interpolated Y value on the hub
AREA - Annular area between hub and shroud, (if there is not hub, AREA is the disc area)
Where an NSD is located there are extra values, these are the individual areas between the bodies. The last value is the total area.
DISC AREA - area as if there were no hub.

Punched Output

The punched output from SCIRCL is used directly as input to EOD. DO NOT INCLUDE I.D. CARD.

COMBYN INPUT

English engineering units are used throughout the program.

Length - inches
Velocities - ft/sec
Angles - degrees
Pressures - lb/ft^2
Temperature - degrees R
Densities - $slug/ft^3$
Force - lbs
Weight flow - lbs/sec

Card No.	Format	Fortran Name	Description
1	12A6	TITLE	Title card
2	8I4	NT(1)	Number of on-body points for the closed-end solution.
		NP(1)	Total number of off-body points

Card No.	Format	Fortran Name	Description
		NT(2)	Number of on-body points for the open-end solution (eliminate the last body)
		NP(2)	Total number of off-body points
		NID	Number of I.D. cards from EOD output, (usually 1, unless the closed end and open end case were run separately, then NID=2)
		KSKIP	=0 for 1 case of COMBYN =1 for successive cases using the same EOD output.
		N4SOL	=0 when there are 3 solutions from EOD, (one axisymmetric solution for the closed-end and open-end cases, and one crossflow solution for the open-end case) =1 when there are 4 solutions from EOD (two axisymmetric and two crossflow)
		NSPLT	=number of noise suppression devices, (NSD), can equal zero.
3	20I4	(NSPB(I), NSPE(I), I=1,NSPLT)	If there are not NSD omit this card. NSPB - Number of right most point on the splitter. NSPE - Number of the left most point on the splitter. NOTE - The first splitter is the one closest to the hub and the last splitter is the one closest to the shroud.
4	10F8.5	VC	Average axial velocity at the control station. Based on live flow area, i.e., the flow area minus the area associated with the boundary layer displacement thickness. If VC = 0.0 the program will interpret this as a code and will calculate VC from WDOT. (To run a case with VC actually equal to zero set WDOT = 0.0.)
		VINF	Free-stream velocity

Card No.	Format	Fortran Name	Description
		ALFAF	Angle of attack, 0.0 for free-stream perpendicular to inlet axis. Note that $\alpha_F = \alpha - 90^\circ$.
		TTOTAL	Total temperature, if PSTAT and TSTAT are read in (to be explained later), the program will calculate TTOTAL. If TTOTAL = 0 and PSTAT and TSTAT = 0, then TTOTAL = 518.67.
		ELND	ELND is the arbitrary length used for normalizing - Refer to KND input, card number 6.
		YWING	Upper limit of integration for surface forces (used in subroutine INFRCE*).
		UTIP	Rotor tip speed. Need not be input unless relative rotor inlet quantities are desired. (See COMBYN output)
		VA	Bulk velocity at control station, i.e., average inlet axial velocity based on geometric area. If VA = 0.0, the program will interpret this as a code and set VA = VC.
		PT	Total pressure, if PT = 0.0 the program will set PT = 2116.
5	10F8.5	PSTAT TSTAT	Static pressure Static temperature (If PSTAT and TSTAT are not 0.0, total pressure (PT) and total temperature (TTOTAL) will be calculated using PSTAT and TSTAT.
		WDOT	Weight flow - used only if VC is input as 0.0.
6	10I4	NTHETA	Number of THETAS, where THETA is the circumferential coordinate.
		NCLO	One rake must be chosen as the control station, NCLO is the number of the first point on the rake.

*INFRCE subroutine not included in this version of COMBYN.

Card No.	Format	Fortran Name	Description
		NCHI	NCHI is the number of the last point on the control station rake.
		NX	Set = 0.0 (was used for INFRCE*).
		KND	Flag used for non-dimensionalizing, KND = -1, ELND = YRISHR KND = 0, ELND = 1.0 (no nondimensionalizing) KND = 1, ELND = YRISHR - YRIHUB KND = 2, ELND is the read in value For the above the velocities are normalized by VC. KND = 4 same as KND = -1 but VA is used for normalizing velocities. KND = 5 same as KND = 0, velocities normalized by VA KND = 6 same as KND = 1, velocities normalized by VA
7	10E8.5	(THETA(I), I=1,NTHETA)	Circumferential coordinate in degrees, (Number of THETA'S read in depends on NTHETA)
8	10E8.5	XTEST	Only used for INFRCE* -- axial location of control surface, usually equal to XRI.
9	3E10.5,I4	XRI	Value of X at which the surface distance is zero. Usually equal to the X at the control station.
		YRIHUB	Y on the hub at XRI.
		YRISHR	Y on the shroud at XRI.
		NHUBMX	The number of the last point on the hub (this can be found in the printed output of SCIRCL).

*Same as previous page.

At this point, the binary cards from EOD, including the I. D. card are inserted.

COMBYN OUTPUT

TITLE - COMPRESSIBLE COMBYN APPROACH 5 followed by title on title card.

Based on Basic Data From xx/xx/xx Run No. xxx and xx/xx/xx Run No. xxx -- The data and run number came from the punched I. D. card from EOD punched output.

In the table that follows, several functions of three different velocities are given. The velocities are:

Control; VC, Average axial velocity at the control station. (See Input) (The control station is determined by NCLO and NCHI.)

Bulk; VA, Bulk velocity at the control station. (See Input)

Free stream, V_∞ , Free stream velocity.

The rest of the table is self-explanatory except perhaps the terms INC and COMP. INC means calculated from incompressible flow equations and COMP means calculated from compressible flow equations.

The rest of the output will be defined by the output name:

ALPHAF	Angle of attack of wing containing VTOL Inlet. (i.e., the angle between the free stream velocity and a line perpendicular to the inlet axis)
VINF/VC	V_∞ / V_c
VINF/VA	V_∞ / V_a
VC/VA	V_c / V_a
VSONIC	Critical velocity uncorrected for compressibility
VSONICC	Critical velocity at control station

TSTAT	Free stream static temperature
PSTAT	Free stream incompressible static pressure
PSTATC	Free stream compressible static pressure
ASTAT	Free stream static speed of sound
RHOSTAT	Free stream static density
WDOT	Input mass flow
VIC	Incompressible average velocity at the control station
TTOTAL	Free stream total temperature
PTOT	Free stream total pressure incompressible.
PTOTC	Free stream total pressure compressible
ATOT	Free stream stagnation speed of sound
RHOTOT	Free stream stagnation density
THET	TTOTAL/518.67
DEL	PTOTC/2116.22
XRI	Input - Value of X at which the surface distance is zero. Usually equal to X at the control station.
YRIHUB	Input - Y on the hub at XRI
YRISHR	Input - Y on the shroud at XRI
HUB-TIP RATIO	YRIHUB/YRISHR
LND	Input - arbitrary length used for normalizing

XTEST	Input - used for subroutine INFRCE*
YWING	Input - used for subroutine INFRCE*
NT	1 - number of on-body points for the closed-end solution
	2 - number of on-body points for the open-end solution
NP	1 & 2, total number of off-body rake points
NCLO	Input, number of the first point on the control station rake
NCHI	Input, number of the last point on the control station rake
NHUBMX	Input - the number of the last point on the hub
NX	Input code for INFRCE*
KND	See input
KSKIP	See input
V1	Average axial velocity at the control station of basic solution #1. Closed-end.
V2	Average axial velocity at the control station of basic solution #2. Open-end.
A,B,C	Coefficients of combination. (ref. 2)
VINFP	Input free stream velocity uncorrected for compressibility.
THETA	Input - circumferential coordinate in degrees
WDOTT	Local weight flow at the circumferential station given by THETA
VICT	Local VIC at given THETA

*Same as page 11.

V3 — Local average control station velocity of crossflow basic #3 solution at a given θ

ON-BODY POINTS (hub, shroud and if applicable NSD)

I — The index number of each on-body point

X — Axial distance

Y — Radial distance

VP — Velocity component tangent to body profile in an X,Y plane

VTHETA — Circumferential velocity component

VRES — Resultant velocity $(VP^2 + VTHETA^2)^{1/2}$

VBARI — Average incompressible velocity at a given axial location (X)

BETA — Flow angle

S — Surface distance from XRI

CPC — Pressure coefficient compressible = $\frac{PSOPTC - PSOPTC_\infty}{QCA/PT}$

RB/RT — $\bar{\rho}_c/\rho_t$ at axial location (X)

PSOPTC — Static to total pressure ratio, compressible = $\left[1 - .2\left(\frac{V}{a_t}\right)^2\right]^{3.5}$

OFF-BODY POINTS (RAKES)

I — Number of the off-body point (points without numbers in I column are interpolated points on hub, shroud or splitter surfaces)

X — Axial distance - for each rake

Y — Radial distance

VX	Axial velocity component V_x
VY	Radial velocity component V_y
VZ	Circumferential velocity component V_z

These velocities are obtained from EOD basic data and constants of combination.

VRES	Resultant velocity = $V_x^2 + V_y^2 + V_z^2 = V_{res}$
VM	Meridional velocity component $V_x^2 + V_y^2 = V_m$
VAFT	Velocity component in aft direction = $V_z \sin\theta + V_y \cos\theta$
VSPAN	Velocity component in spanwise direction = $V_y \sin\theta - V_z \cos\theta$
RHOBR	$\bar{\rho}/\rho_t$
PSOPTC	Pressure ratio-compressible
I, X, Y	Same as above
VBRI	Average incompressible velocity at a given axial location X
CPC	Pressure coefficient (compressible) CPC = $\frac{PSOPTC - PSOPTC_\infty}{QCA/PT}$
ALPHA	Meridional flow angle = $\tan^{-1}(V_y/V_x)$, inlet oriented, cylindrical coordinate system.
BETA	Flow angle = $\tan^{-1}(V_z/V_m) = \sin^{-1}(V_z/V_{res}) = \cos^{-1}(V_m/V_{res})$, inlet oriented, cylindrical coordinate system
ETA	Underturning angle = $\tan^{-1}(V_{aft}/V_x)$, wing oriented, rectangular coordinate system for VTOL inlet

ZETA — Spanwise flow angle = $\tan^{-1}(V_{span}/V_x)$, wing oriented, rectangular coordinate system for VTOL inlet

PHI — Swirl angle = $\tan^{-1}(V_z/V_x)$, inlet oriented, cylindrical coordinate system

QFRACT — Stream function

RELATIVE ROTOR INLET DATA

X — Equal to XRI

UTIP — Rotor tip speed

Y — Local radius at X = XRI

U — Local rotor speed = $\frac{\text{UTIP} * Y}{\text{YRISHR}}$ at radius Y

The following quantities relative to a rotor rotating at tip speed = UTIP are calculated at $\Theta = \Theta$

VZPRIME — Circumferential velocity component relative to rotor = SIGN * VZ - U where SIGN = SIGN of $\sin\Theta$

VPRIM — Relative velocity VM/$\cos\beta$'

MPRIME — Relative Mach number = $(V'/a_t)/\left[1.0 - .2\,(V_{res}/a_t)^2\right]^{1/2}$

BETAPR — Relative flow angle = ATAN (V_z'/V_M)

The following are the same as above, but calculated at $\Theta_{ST} = 360. - \Theta$

VZPRST

VPRST

MPRS

BETAPS

RAKE WEIGHT FLOW DATA

I	The number of each rake
X	Axial location of the rake
$\frac{Q(I)-QBAR}{QBAR}$	Weight flow disparity parameter where Q(I) is integrated weight flow at rake #I and QBAR is integrated weight flow at control station
QSTOT	Total weight flow for each rake
QFR	Fraction of weight flow for each rake at a given axial location

STREAMLINES

There are data for streamlines for every axial rake position, X

QSTRM	Value of stream function (increment of .02 is set in program)
YSTRM	Corresponding y value

LISTINGS OF PROGRAMS

SCIRCL

```
$IBFTC SCIRCL
C      PREPARE INPUT DATA FOR DOUGLAS POTENTIAL FLOW PROGRAMS EOD AND 22Y
C
C           SECOND VERSION  -  SPACING SPECIFIED
C
       DIMENSION SD(500), S(500), NY(25)
       COMMON /SUPP/ IFLD
       COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIC2,DELS1,IHUB
       COMMON /SS/ NBDY1,NBDY2,TYPBDY,NBDYS
       COMMON /MWRTE/ IFLAG,NDY4,PROG,TITLE(9),BODIES(4),IDENT,YLO(25),YH
      1I(25),NDY(25),XRAK(25),NBDPTS(5),NO6,NRAKES
       COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XCN(500),YON(500),DYDXO(500
      1),ALPHA(500),CAPPA(500),SON(500),PIO180
       COMMON /SPREP/ KPREP
       COMMON /MNSD/ NNSD,NSDBDY(10)
       COMMON /MHIGH/ NSPHG,NLAST,XLAST(500),YLAST(500)
       PI=3.14159265
       PIO180=PI/180.
       PIC2=PI/2.
C
C      WHEN NO6 = 1, A FLAG IN CARD COLUMN 6 IS PUNCHED FOR 50D
C       ONLY BASIC DATA WILL BE GIVEN IN 50C PROGRAM                    7
C
2      READ (5,84) TITLE
       READ (5,82) IDENT,PROG,NO6
       WRITE (6,94) IDENT
C
C      READ INPUT CARDS FOR SUPERCIRCLE
C          1  -- CASE HEADER CARD -- NO. OF BODIES,CASE NO.,DELS,DELSMX
C       OFF-BODY
C          2 -- NRAKES = NUMBER OF RAKES (TOTAL NUMBER CANNOT EXCEED 25)
C          3 -- X,YLO,YHI, NY (DATA FOR EACH RAKE)
C                X = X OF THE RAKE,
C      YLO = Y OF THE FIRST PT. ON RAKE CLOSEST TO THE HUB - SHOULD BE
C                ABOUT DS GREATER THAN Y ON HUB
C      YHI = Y OF THE LAST PT ON RAKE CLOSEST TO THE SHROUD - SHOULD BE
C                ABOUT DS LESS THAN Y ON SHROUD
C              NY  = NO. OF PTS TO GENERATE FOR THAT RAKE
C       ON-BODY
C           FOR EACH SEGMENT A DESCRIPTION CARD IS NEEDED,
C             THIS CARD DENOTES THE TYPE OF LINE, AND THE
C             COORDINATES OF THE LINE (UP TO 5 SETS)
C
       READ (5,106) ANBDYS,DELS,DELSMX,XRI,ANNSD
       READ (5,80) NRAKES
       READ (5,104) (XRAK(I),YLO(I),YHI(I),NY(I),I=1,NRAKES)
       DEBUG(XRAK(I),YLO(I),YHI(I),NDY(I),I=1,NRAKES)
       WRITE (6,78) ANBDYS,DELS,DELSMX,XRI
       DO 4 I=1,NRAKES
4      NDY(I)=NY(I)-1
```

```
      NLAST=0
      NSPEC=0
      DELS2=DELS
      DELS1=DELS
      NBDYS=ANBDYS
      NNSD=ANNSD
C
C     K = COUNTER FOR THE NUMBER OF ONBODY POINTS GENERATED
C     IHUB = 0, WHEN THERE IS ONLY ONE BODY-- IF THERE IS ONE BODY
C     IT MUST BE THE SHROUD
C     IFLAG = 0, IF THERE IS MORE THAN ONE BODY
C
      K=0
      IHUB=0
      IFLAG=0
C
C     NZ LOOP IS FOR THE NUMBER OF BODIES
C
      DO 26 NZ=1,NBDYS
      IF (NZ.GE.2) IHUB=1
C
C     TYPBDY = 1 FOR HUB ---- TYPBDY = 2 FOR SHROUD
C           OR
C     TYPBDY=1 FOR HUB * TYPBDY=2 FOR FLOW SPLITTER * TYPBDY=3 FOR SHROU
C     *****FLOW SPLITTER PROGRAMMING IS NOT COMPLETE THROUGH COMBYN*****
C     *****FLOW SPLITTER IS NOT THE SAME AS NOISE SUPPRESSION DEVICES
C          (N.S.D.) SPLITTERS*****
C           OR
C     IF THE HUB IS TO BE MIRRORED , SET TYPBDY FOR THE SHROUD = 0.0
C
      READ (5,106) TYPBDY,ANSEG
      NSEG=ANSEG
      IF (NBDYS.EQ.2.AND.NZ.EQ.2.AND.TYPBDY.NE.0.0) TYPBDY=3.0
      IF (NBDYS.EQ.1.AND.TYPBDY.EQ.2.0) IFLAG=1
      IF (TYPBDY.EQ.1.) WRITE (6,120)
      IF (TYPBDY.EQ.3.0.OR.TYPBDY.EQ.0.0.OR.NBDYS.EQ.1) WRITE (6,122)
      IF (TYPBDY.EQ.0.0) GO TO 24
      IF (TYPBDY.EQ.2.0.AND.NBDYS.GT.1) WRITE (6,124)
      K=K+1
      SCN(K)=0.0
C
C     SEGMENT LOOP
C
      DO 22 J=1,NSEG
      READ (5,108) ENREED,(XIN(I),YIN(I),I=1,5)
      KSV=K
      CAPPA(K)=0.0
      IF (ENREED.NE.1.0.AND.ENREED.NE.10.) GO TO 10
      XCN(K)=XIN(1)
      YCN(K)=YIN(1)
      WRITE (6,112) ENREED,(XIN(I),I=1,2),(YIN(I),I=1,2)
      DEBUGXCN(K),YCN(K),TYPBDY,K,ENREAD,NSEG,J,(XIN(I),YIN(I),I=1,5)
      IF (TYPBDY.GE.2.0) GO TO 8
      IF (ENREED.EQ.1.0.AND.J.EQ.NSEG) CALL ENSTRH (K)
      IF (ENREED.EQ.1.0.AND.J.NE.NSEG) CALL STRAIT (K,0.0)
      IF (ENREED.EQ.10.) CALL FRSTSH (K)
```

```
6       DYDXC(KSV)=DYDXO(KSV+1)
        ALPHA(KSV)=ALPHA(KSV+1)
        GO TO 22
8       IF (J.EQ.1) CALL FRSTSH (K)
        IF (J.EQ.NSEG) CALL FNSTRH (K)
        IF (J.NE.1.AND.J.NE.NSEG) CALL STRAIT (K,0.0)
        GO TO 6
10      IF (ENREED.LT.-2.0) GO TO 20
        IF (ENREED.LT.-1.0) GO TO 18
        IF (ENREED.LT.0.0) GO TO 16
C
C       SET-UP SUPER ELLIPSE
C
        KPREP=0
        ENRD=ENREED-1000.
        IF (ENRD.LT.0.0) GO TO 12
        ENREED=ENREED-1000.
        IFLD=IFLD+1
        GO TO 14
12      IFLD=0
14      WRITE (6,114) ENREED,(XIN(I),I=1,5),(YIN(I),I=1,5)
        CALL TEST (5)
        ISTART=K
        K1=K
        CALL SUPERC (XIN,YIN,ENREED,DELS1,ISTART)
        K=I-1
        K2=K
        IDUM=0
        IF (KPREP.EQ.0) GO TO 22
        CALL PRELPS (IDUM,1,5,K1,K2)
        GO TO 22
C
C       SET-UP LEMNISCATE
C
16      WRITE (6,116) ENREED,(XIN(I),I=1,3),(YIN(I),I=1,3)
        CALL LEM (K)
        K=K+1
        GO TO 22
C
C       SET-UP ELLIPSE
C
18      WRITE (6,118) ENREED,(XIN(I),I=1,4),(YIN(I),I=1,4)
        KPREP=0
        CALL TEST (4)
        K1=K
        CALL ELIPSE (K)
        K=K+1
        K2=K
        IDUM=0
        IF (KPREP.EQ.0) GO TO 22
        CALL PRELPS (IDUM,1,4,K1,K2)
        GO TO 22
C
C       SET-UP CUBIC
C
20      WRITE (6,126) ENREED,(XIN(I),I=1,4),(YIN(I),I=1,4)
```

```
      CALL CUBIC (K)
      K=K+1
22    CONTINUE
C
C     END OF SEGMENT LOOP
C
      GO TO 26
24    CALL MIRROR (K,ANSEG)
26    NBDPTS(NZ)=K
      NBDY1=NBDPTS(1)
      NBDY2=NBDPTS(2)
28    CONTINUE
C
C     END OF BODY LOOP
C
      ITOP12=K
C
C     **N.S.D. SPLITTER SUBROUTINE
C
      IF (NNSD.NE.0) CALL SUPRD (K)
      IF (IFLAG.EQ.1) NBDY1=0
      Y4SAVE=YCN(NBDY1)
      Y5SAVE=YCN(NBDY1+1)
      Y6SAVE=YCN(NBODY2)
      Y7SAVE=YCN(NBODY2+1)
      DEBUG(XON(I),YON(I),DYDXO(I),ALPHA(I),CAPPA(I),SON(I),SON(I),SON(I
     1),I=1,K)
C9
C
C     CO-ORDINATES OF POINTS ON DOWNSTREAM CLOSURE
C
C
C     STRAIGHT SECTION BETWEEN HUB AND SHROUD OR SPLITTER
C
C
      IF (NBDY1.EQ.0) GO TO 30
      YNBDY1=YCN(NBDY1)
      GO TO 32
30    YNBDY1=0.0
      Y4SAVE=0.0
32    NDY4=(YON(NBDY1+1)-YNBDY1)*1.5/DELSMX
      ENDY4=NDY4
      NPTS=NDY4+1
      NBDPTS(NBDYS+1)=NPTS+NBDPTS(NBDYS)
      DY4=(YON(NBDY1+1)-YNBDY1)/ENDY4
      DO 34 I=1,NPTS
      AYEM=I-1
      IPN=I+K
      XCN(IPN)=XCN(NBDY1+1)
      YON(IPN)=YNBDY1+AYEM*DY4
34    CONTINUE
      ITOPT4=K+1
      ITOPT5=ITOPT4+NDY4
      IF (NBDYS.LE.2) GO TO 38
C
C
```

```
C     STRAIGHT SECTION BETWEEN FLOW SPLITTER AND SHROUD
C
C
      YNBDY2=Y6SAVE
      NDY5=(Y7SAVE-Y6SAVE)*1.5/DELSMX
      ENDY5=NDY5
      NPTS=NDY5+1
      NBDPTS(NBDYS+2)=NPTS+NBDPTS(NBDYS+1)
      DY5=(Y7SAVE-Y6SAVE)/ENDY5
      DO 36 I=1,NPTS
      AYEM=I-1
      IPN=I+ITDPT5
      XDN(IPN)=XDN(NBDDY2+1)
      YDN(IPN)=YNBDY2+AYEM*DY5
36    CONTINUE
      ITDPT6=ITDPT5+1
      ITDPT7=ITDPT6+NDY5
C
C          CALL SUBROUTINE TO WRITE AND PUNCH CARDS
C
38    CALL WPUNCH
      IF (NBDYS.GT.2) GO TO 40
      NT1=ITOP15-3
      NT2=K-2
      GO TO 42
40    NT1=ITOP17-5
      NT2=ITOP15-4
      NT3=K-3
      NSPLMX=NBDDY2-2
42    NHUBMX=NBDY1-1
      NP=0
      DO 44 I=1,NRAKES
      NP=NP+NDY(I)+1
44    CONTINUE
      NHBMXO=NHUBMX
      IF (NBDYS.LE.2) GO TO 46
      WRITE (6,110) NT1,NT2,NT3,NHUBMX,NSPLMX,NP
      GO TO 48
46    WRITE (6,100) NT1,NT2,NHUBMX,NP
C
C     CALCULATING HUB SURFACE DISTANCE (S-S(2))
C
48    CALL SINTP (XON,SON,NBDY1,XRI,S2)
      WRITE (6,86)
      IF (IFLAG.EQ.1) GO TO 52
      SDEL=0.0
      DO 50 I=1,NBDY1
      IF (I.NE.1) SDEL=SON(I)-SON(I-1)
      SD(I)=SON(I)-S2
50    WRITE (6,92) I,XDN(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),SD(
     1I),SDEL
C
C     CALCULATION SHROUD OR LOWER FLOW SPLITTER SURFACE DISTANCE
C
52    NBP1=NBDY1+1
      IF (IFLAG.EQ.1) NBODY2=ITOP12
```

```
      DO 54 I=NBP1,NBODY2
      JJ=I
      IF (XON(I).LT.XON(I+1)) GO TO 56
54    CONTINUE
56    CALL SINTP (XON(NBP1),SON(NBP1),JJ-NBDY1,XRI,S22)
      IF (IFLAG.EQ.1) GO TO 58
      WRITE (6,88)
58    IF (NBDYS.LE.2) JJ=NBODY2
      SDEL=0.0
      DO 60 I=NBP1,JJ
      IF (I.NE.NBP1) SDEL=SON(I)-SON(I-1)
      S(I)=S22-SON(I)
60    WRITE (6,92) I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
      IF (NBDYS.LE.2) GO TO 70
C
C       CALCULATING FLOW SPLITTER UPPER SURFACE DISTANCE
C
      JJ=JJ+1
      WRITE (6,96)
      CALL SINTP (XON(JJ),SON(JJ),NBODY2-JJ,XRI,S23)
      SDEL=0.0
      DO 62 I=JJ,NBODY2
      IF (I.NE.JJ) SDEL=SON(I)-SON(I-1)
      S(I)=SON(I)-S23
62    WRITE (6,92) I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
C
C       CALCULATING SHROUD SURFACE DISTANCE (IF THERE IS A FLOW SPLITTER)
C
      NBP1=NBODY2+1
      DO 64 I=NBP1,ITOP12
      JJ=I
      IF (XON(I).LT.XON(I+1)) GO TO 66
64    CONTINUE
66    CALL SINTP (XON(NBP1),SON(NBP1),JJ-NBODY2,XRI,S33)
      WRITE (6,98)
      SDEL=0.0
      DO 68 I=NBP1,ITOP12
      IF (I.NE.NBP1) SDEL=SON(I)-SON(I-1)
      S(I)=S33-SON(I)
68    WRITE (6,92) I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
C
C       WRITE OUT N.S.D. SPLITTER POINTS
C
70    NBDSV=NBDYS
      IF (NNSD.EQ.0) GO TO 74
      NS=1
72    IBD=NBDYS+NS
      INSD=I+NSDBDY(NS)
      IBNSD=I+1
      WRITE (6,128) IBD
      WRITE (6,130) (I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),I
     1=IBNSD,INSD)
      NS=NS+1
```

```
      IF (NS.LE.NNSD) GO TO 72
      NBDYS=IBD
C
C     WRITE OUT CLOSURE COORDINATES
C
74    IBD=NBDYS+1
      WRITE (6,90) IBD,(I,XON(I),YCN(I),I=ITOPT4,ITOPT5)
      IF (NBDSV.NE.3) GO TO 76
      IBD=IBD+1
      WRITE (6,90) IBD,(I,XON(I),YCN(I),I=ITOPT6,ITOPT7)
76    WRITE (6,102) (XRAK(I),YLO(I),YHI(I),NY(I),I=1,NRAKES)
      CALL AREA
      GO TO 2
C
C     FORMATS
C
C
78    FORMAT (1HC,10X,16HNO. OF BODIES = ,F2.0,5X,7HDELS = ,F6.3,5X,9HDE
     1LSMX = ,F6.3,5X,6HXRI = ,F10.6)
80    FORMAT (20I4)
82    FORMAT (2A6,I4)
84    FORMAT (9A6)
86    FORMAT (1X/1X23HBODY 1 CO-ORDINATES - X12X1HY10X5HKAPPA10X5HDY/DX1
     10X5HALPHA5X1HS8X6HS-S(2),8X,6HDELTAS/1X)
88    FORMAT (1X/1X23HBODY 2 CO-ORDINATES - X12X1HY10X5HKAPPA10X5HDY/DX1
     10X5HALPHA5X1HS,8X,7HS'(2)-S,8X,6HDELTAS/1X)
90    FORMAT (1X/1X5HBODY I1,17H CO-ORDINATES - X12X1HY/1X/(9X14,3XE12.5
     1,E13.5))
92    FORMAT (9X14,3XE12.5,7E13.5)
94    FORMAT (6H1CASE A6/1X)
96    FORMAT (1HC)
98    FORMAT (1X/1X,23HBODY 3 CO-ORDINATES - X,12X,1HY,10X,5HKAPPA,10X,5
     1HDY/DX,10X,5HALPHA,5X,1HS,8X,6HS-S(3),8X,6HDELTAS/1X)
100   FORMAT (/10X,30H INPUT FOR THE COMBINE PROGRAM,7H NT(1)=,I4,7H NT(
     12)=,I4,8H NHUBMX=,I4,4H NP=,I4/)
102   FORMAT (1X,4HXRAK,10X,3HYLO,11X,3HYHI,16X,3HNDY//,(3E14.5,5X,I3))
104   FORMAT (3E8.5,I3)
106   FORMAT (8F10.2)
108   FORMAT (F10.2,10F7.2)
110   FORMAT (/5X,30H INPUT FOR THE COMBINE PROGRAM,7H NT(1)=,I4,7H NT(2
     11)=,I4,7H NT(3)=,I4,8H NHUBMX=,I4,8H NSPLMX=,I4,4H NP=,I4/)
112   FORMAT (1HC,10X,6HENREED,10X,13HSTRAIGHT LINE/11X,F6.3,5X,1HX,1P2E
     I15.4/22X,1HY,1P2E15.4)
114   FORMAT (1HC,10X,6HENREED,10X,12HSUPERELLIPSE/11X,F6.3,5X,1HX,1P5E1
     15.4/22X,1HY,1P5E15.4)
116   FORMAT (1HC,10X,6HENREED,10X,10HLEMNISCATE/11X,F6.3,5X,1HX,1P3E15.
     14/22X,1HY,1P3E15.4)
118   FORMAT (1HC,10X,6HENREED,10X,7HELLIPSE/11X,F6.3,5X,1HX,1P4E15.4/22
     1X,1HY,1P4E15.4)
120   FORMAT (1HC,2X,18H**** HUB *********)
122   FORMAT (1HC,2X,18H**** SHROUD ******)
124   FORMAT (1HC,2X,18H**** SPLITTER ****)
126   FORMAT (1HC,10X,6HENREED,10X,5HCUBIC/11X,F6.3,5X,1HX,1P4E15.4/22X,
     11HY,1P4E15.4)
128   FORMAT (1X/1X,5HBODY,I2,17H CO-ORDINATES - X,12X,1HY,10X,5HKAPPA,1
     10X,5HDY/DX,10X,5HALPHA,5X,1HS,8X,6HS-S(2),8X,6HDELTAS/1X)
130   FORMAT (9X,I4,3X,E12.5,5E13.5)
      END
```

```
$IBFTC SUPRD.
C       SUBROUTINE TO HANDLE NOISE SUPPRESSION DEVICE SPLITTERS
C
        SUBROUTINE SUPRD (K)
        COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
       1),ALPHA(500),CAPPA(500),SON(500),PI0180
        COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB
        COMMON /NNSD/ NNSD,NSDBDY(10)
        COMMON /SPREP/ KPREP
        COMMON /NHIGH/ NSPHG,NLAST,XLAST(500),YLAST(500)
        COMMON /SUPF/ IFLD
        IFLD=0
        READ (5,20) DELS
        DELS1=DELS
        DO 16 N=1,NNSD
        NSPHG=0
        K=K+1
        WRITE (6,18) N
        KNSD=K
C
C       NSEG = NUMBER OF SEGMENTS ON THE SPLITTER
C       NSHIGH = NSEG/2 FOR THIN SPLITTERS
C              = NSEG  ( FOR ALL OTHER SPLITTERS )
C
        READ (5,22) NSEG,NSHIGH
        DO 14 J=1,NSEG
        READ (5,24) ENREED,(XIN(I),YIN(I),I=1,5)
        IF (J.GT.NSHIGH) NSPHG=1
        KSV=K
        CAPPA(K)=0.0
        IF (ENREED.NE.1.0) GO TO 2
        XON(K)=XIN(1)
        YON(K)=YIN(1)
        NLAST=NLAST-1
        WRITE (6,26) ENREED,(XIN(I),I=1,2),(YIN(I),I=1,2)
        CALL STRAIT (K,0.0)
        DYDXO(KSV)=DYDXO(KSV+1)
        ALPHA(KSV)=ALPHA(KSV+1)
        GO TO 12
2       IF (ENREED.LT.-2.0) GO TO 10
        IF (ENREED.LT.-1.0) GO TO 8
        IF (ENREED.LT.0.0) GO TO 6
C
C       SET-UP SUPERELLIPSE
C
        KPREP=0
        WRITE (6,28) ENREED,(XIN(I),I=1,5),(YIN(I),I=1,5)
        CALL TEST (5)
        ISTART=K
        K1=K
        CALL SUPERC (XIN,YIN,ENREED,DELS1,ISTART)
```

```
      K=I-1
      K2=K
      IDUM=0
      DO 4 KL=K1,K2
      YLAST(KL)=YCN(KL)
4     XLAST(KL)=XCN(KL)
      IF (KPREF.EQ.0) GO TO 12
      CALL PRELPS (IDUM,1,5,K1,K2)
      GO TO 12
C
C     SET-UP LEMNISCATE
C
6     WRITE (6,30) ENREED,(XIN(I),I=1,3),(YIN(I),I=1,3)
      CALL LEM (K)
      K=K+1
      GO TO 12
C
C     SET-UP ELLIPSE
C
8     WRITE (6,32) ENREED,(XIN(I),I=1,4),(YIN(I),I=1,4)
      KPREP=0
      CALL TEST (4)
      K1=K
      CALL ELIPSE (K)
      K=K+1
      K2=K
      IDUM=0
      IF (KPREF.EQ.0) GO TO 12
      CALL PRELPS (IDUM,1,4,K1,K2)
      GO TO 12
C
C     SET - UP CUBIC
C
10    WRITE (6,34) ENREED,(XIN(I),I=1,4),(YIN(I),I=1,4)
      CALL CUBIC (K)
      K=K+1
12    IF (J.EQ.NSHIGH) NLAST=K
14    CONTINUE
C
C     NUMBER OF PTS ON EACH NSD
      NSDBDY(N)=K-KNSD+1
16    CONTINUE
      RETURN
C
C     FORMATS
C
C
18    FORMAT (1HC,2X,23H**** SPLITTER(NSD) NO. ,I2)
20    FORMAT (8F10.2)
22    FORMAT (16I5)
24    FORMAT (F10.2,10F7.2)
26    FORMAT (1HC,10X,6HENREED,10X,13HSTRAIGHT LINE/11X,F6.3,5X,1HX,1P2E
     115.4/22X,1HY,1P2E15.4)
28    FORMAT (1HC,10X,6HENREED,10X,12HSUPERELLIPSE/11X,F6.3,5X,1HX,1P5E1
     15.4/22X,1HY,1P5E15.4)
30    FORMAT (1HC,10X,6HENREED,10X,10HLEMNISCATE/11X,F6.3,5X,1HX,1P3E15.
     14/22X,1HY,1P3E15.4)
32    FORMAT (1HC,10X,6HENREED,10X,7HELLIPSE/11X,F6.3,5X,1HX,1P4E15.4/22
     1X,1HY,1P4E15.4)
34    FORMAT (1HC,10X,6HENREED,10X,5HCUBIC/11X,F6.3,5X,1HX,1P4E15.4/22X,
     11HY,1P4E15.4)
      END
```

```
$IBFTC WPNCH   DEBUG

      SUBROUTINE WPUNCH
      COMMON /SS/ NBDY1,NBDY2,TYPBDY,NBDYS
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI0180
      COMMON /WRTE/ IFLAG,NDY4,PROG,TITLE(9),BODIES(4),IDENT,YLO(25),YH
     1I(25),NDY(25),XRAK(25),NBDPTS(5),NC6,NRAKES
      DIMENSION YOFF(200), XOFF(200), FI(500)
      COMMON /WNSD/ NNSD,NSDBDY(10)
      DATA BODYD/6H-BODY /,IFLAG1/4H 111/,IFLAG2/4H 1 1/,T22Y/6H   22Y/,
     1IFLG2A/1H /,IFLG2B/1H1/
C
C     IF YLO AND YHI ARE READ IN AS ZERO,CALCULATE THEM FOR THAT RAKE
C           (FOR HUB AND SHROUD CASES ONLY)    1/4/73
C
C     FIND HIGHLIGHT ON THE SHROUD
C
      NB=NBDPTS(1)+1
      NE=NBDPTS(2)
      DO 2 I=NE,NE
      IF (XON(I+1).LT.XON(I)) GO TO 2
      JMIN=I
      GO TO 4
2     CONTINUE
4     DO 6 I=1,NE
6     FI(I)=I
      NOFF=0
      DO 16 I=1,NRAKES
      NLO=NOFF+1
      NOFF=NLO+NDY(I)
      ENDY=NDY(I)
      IF (YHI(I).EQ.0.0.OR.YLO(I).EQ.0.0) GO TO 8
      GO TO 12
8     IF (YHI(I).NE.0.0) GO TO 10
      CALL SINTP (XON(NB),YON(NB),JMIN-NB+1,XRAK(I),YH)
      CALL SINTP (XON(NB),FI(NB),JMIN-NB+1,XRAK(I),FII)
      IF=FII
      DS=SQRT((XON(IF)-XON(IF+1))**2+(YON(IF)-YON(IF+1))**2)
      YHI(I)=YH-DS
10    IF (YLO(I).NE.0.0.OR.XRAK(I).LT.XON(1)) GO TO 12
      CALL SINTP (XON,YON,NBDPTS(1),XRAK(I),YL)
      CALL SINTP (XON,FI,NBDPTS(1),XRAK(I),FII)
      IF=FII
      DS=SQRT((XON(IF)-XON(IF+1))**2+(YON(IF)-YON(IF+1))**2)
      YLO(I)=YL+DS
12    DYI=(YHI(I)-YLO(I))/ENDY
      DO 14 J=NLO,NOFF
      DJM=J-NLO
      XOFF(J)=XRAK(I)
      YOFF(J)=YLO(I)+DYI*DJM
14    CONTINUE
```

```
16    CONTINUE
      NTBDY=NBDYS+NNSD+1
      NLOOP=2
      IF (NBDYS.EQ.3) GO TO 18
      GO TO 20
18    NTBDY=NTBDY+1
      NLOOP=3
20    K=0
      DO 32 I=1,NLOOP
      M=NTBDY-I+1
      IFLAGG=IFLAG2
      IF (M.EQ.NTBDY.AND.NBDYS.EQ.2.OR.NBDYS.EQ.3.AND.M.EQ.3) IFLAGG=IFL
     1AG1
      IF (PROG.EQ.T22Y) GO TO 22
      WRITE (6,34) (TITLE(L),L=1,9),M,BODYD,IDENT
      WRITE (6,36) M,IFLAGG,NO6,IDENT
      GO TO 24
22    IFLG22=IFLG2A
      WRITE (6,40) M,IFLG22,(TITLE(L),L=1,7),M,BODYD,IDENT
24    WRITE (6,38) IDENT
      NA=1
      NS=0
      IF (I.NE.1) K=1
      DO 30 J=1,M
      IF (J.GT.NBDYS.AND.NNSD.NE.0) GO TO 26
      NB=NBDPTS(J)
      GO TO 28
26    NS=NS+1
      IF (NS.GT.NNSD) NSDBDY(NS)=NBDPTS(NBDYS+1)-NBDPTS(NBDYS)
      NB=NSDBDY(NS)+NA-1
28    NP=NB-NA+1
      CALL WRTXY (NP,IDENT,J,K,XON,YON,NA,NB,PROG)
      NA=NB+1
30    CONTINUE
      K=0
      NA=1
      NB=NOFF
      J=0
      CALL WRTXY (NOFF,IDENT,J,K,XOFF,YOFF,NA,NB,PROG)
      IF (PROG.NE.T22Y) GO TO 32
      IFLG22=IFLG2B
      WRITE (6,40) M,IFLG22,(TITLE(L),L=1,7),M,BODYD,IDENT
      WRITE (6,42)
32    CONTINUE
      RETURN
C
C     FORMATS
C
C
C
34    FORMAT (1H$,9A6,I1,A6,2X,A6)
36    FORMAT (1H$,I1,A4,I1,56X,A6,11X)
38    FORMAT (1H$,62X,A6,11X)
40    FORMAT (1H$,I1,6H11    ,A1,4X,7A6,I1,A6,1X,A6)
42    FORMAT (1H$,3HC.0,7X,3H0.0,7X,3H90.)
      END
```

```
$IBFTC WRTXY.
      SUBROUTINE WRTXY (NP,IDENT,J,K,X,Y,NA,NB,PROG)
C
C     WRITE X AND Y COORDINATES
C
      DIMENSION X(1), Y(1)
      DATA T22Y/6H   22Y/
      WRITE (6,8) NP,IDENT
      IF (PROG.NE.T22Y) GO TO 4
      IF (J.NE.C) GO TO 2
      WRITE (6,16) J,K,IDENT
      GO TO 6
2     WRITE (6,14) J,K,IDENT
      GO TO 6
4     WRITE (6,10) J,K,IDENT
6     IF (K.EQ.1) RETURN
      WRITE (6,12) (X(L),L=NA,NB)
      WRITE (6,12) (Y(L),L=NA,NB)
      RETURN
C
C     FORMAT STATEMENTS
C
C
C
8     FORMAT (1H$,7X,I3,52X,A6,11X)
10    FORMAT (1H$,9X,I1,9X,I1,42X,A6,11X)
12    FORMAT (1H$,6F10.6)
14    FORMAT (1H$,9X,I1,9X,1H1,9X,I1,32X,A6,11X)
16    FORMAT (1H$,9X,I1,19X,I1,32X,A6,11X)
      END
```

```
$IBFTC STRT

      SUBROUTINE STRAIT (K,ISHR)
C
C       A REGULAR STRAIGHT SEGMENT
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIC2,DELS1,IHUB
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XCN(500),YCN(500),DYDXC(500
     1),ALPHA(500),CAPPA(500),SCN(500),PI0180
      COMMON /SS/ NBDY1,NBCDY2,TYPBDY,NBCYS
      COMMON /FRST/ NFIRST
      COMMON /NEIGH/ NSPHG,NLAST,XLAST(500)
      KFIRST=K
      XTEST=XIN(2)-XIN(1)
      YTEST=YIN(2)-YIN(1)
      IF (XTEST.EQ.0.0) GO TO 2
      DYDXC=YTEST/XTEST
      ALPHAC=ATAN(YTEST/XTEST)
      GO TO 4
2     DYDXC=99999.
      ALPHAC=PIC2
C
C     CALCULATE DELSNW
C
4     STOT=SQRT(XTEST**2+YTEST**2)
      ANDS=STOT/DELS1
      AINDS=AINT(ANDS)
      TEST=ANDS-AINDS
      IF (TEST.GE..5) AINDS=AINDS+1.0
      DELSNW=STOT/AINDS
      DELSNW=ABS(DELSNW)
      DELS1=DELSNW
      IF (YTEST) 6,12,6
6     IF (XTEST.EQ.0.0) GO TO 18
      DYDXC(K+1)=DYDXC
      ALPHA(K+1)=ALPHAC
      SIGN=1.0
      IF (XTEST.LT.0.0) SIGN=-1.0
      YCN(K+1)=YCN(K)+SIGN*DELSNW*SIN(ALPHA(K+1))
      IF (NSPHG.EQ.0) GO TO 8
      XCN(K+1)=XCN(NLAST-1)
      NLAST=NLAST-1
      GO TO 10
8     XCN(K+1)=XCN(K)+SIGN*DELSNW*COS(ALPHA(K+1))
10    SCN(K+1)=SCN(K)+SQRT((XCN(K+1)-XCN(K))**2+(YCN(K+1)-YCN(K))**2)
      CAPPA(K+1)=0.0
      IF (XTEST.LT.0.0.AND.XCN(K+1).LE.XIN(2).OR.XTEST.GT.0.0.AND.XCN(K+
     11).GE.XIN(2)) GO TO 20
      IF (ABS(XCN(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YCN(K+1)-YIN(2)).L
     1E.1.0E-4*DELS) GO TO 20
      K=K+1
      GO TO 6
```

```
12    DYDXC(K+1)=0.0
      ALPHA(K+1)=0.0
      SIGN=1.0
      IF (XTEST.LT.0.0) SIGN=-1.0
      IF (NSPHC.EQ.0) GO TO 14
      XCN(K+1)=XCN(NLAST-1)
      NLAST=NLAST-1
      GO TO 16
14    XCN(K+1)=XCN(K)+SIGN*DELSNW
16    YCN(K+1)=YCN(K)
      SCN(K+1)=SCN(K)+SQRT((XCN(K+1)-XCN(K))**2+(YCN(K+1)-YCN(K))**2)
      CAPPA(K+1)=0.0
      IF (XTEST.LT.0.0.AND.XCN(K+1).LE.XIN(2).OR.XTEST.GT.0.0.AND.XCN(K+
     11).GE.XIN(2)) GO TO 20
      IF (ABS(XCN(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YCN(K+1)-YIN(2)).L
     1E.1.0E-4*DELS) GO TO 20
      K=K+1
      GO TO 12
18    DYDXC(K+1)=99999.
      ALPHA(K+1)=PIO2
      SIGN=1.0
      IF (YTEST.LT.0.0) SIGN=-1.0
      XCN(K+1)=XCN(K)
      YCN(K+1)=YCN(K)+SIGN*DELSNW
      SCN(K+1)=SCN(K)+SQRT((XCN(K+1)-XCN(K))**2+(YCN(K+1)-YCN(K))**2)
      CAPPA(K+1)=0.0
      IF (YTEST.LT.0.0.AND.YCN(K+1).LE.YIN(2).OR.YTEST.GT.0.0.AND.YCN(K+
     11).GE.YIN(2)) GO TO 20
      IF (ABS(XCN(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YCN(K+1)-YIN(2)).L
     1E.1.0E-4*DELS) GO TO 20
      K=K+1
      GO TO 18
20    K=K+1
      DO 22 KAL=KFIRST,K
22    ALPHA(KAL)=ALPHA(KAL)/PIO180
      RETURN
      END
```

```
$IBFTC CUBIC.

      SUBROUTINE CUBIC (K)
C
C     FIT A CUBIC BETWEEN 2 STRAIGHT LINES -- RESTRICTION -- THE STRAIGH
C                 LINES CANNOT BE VERTICAL
C
      DIMENSION AA(4,4), BB(4)
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIC2,DELS1,IHUB
      COMMON /FCRESS/ I,DELS,XBK(20),YBK(20),XCN(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBDY2,TYPBDY,NBDYS
      DELSIN=DELS1
      DELS=DELS1
      KCUNT=0
      K=K-1
      KSTART=K
      X2=XIN(2)
      X3=XIN(3)
      Y2=YIN(2)
      Y3=YIN(3)
      SLOP2=(YIN(4)-Y3)/(XIN(4)-X3)
C
C     SETUP  4  X  4  MATRIX OF COEFFICIENTS
C
      AA(1,1)=1.0
      AA(1,2)=X2
      AA(1,3)=X2*X2
      AA(1,4)=X2**3
      AA(2,1)=0.0
      AA(2,2)=1.0
      AA(2,3)=2.0*X2
      AA(2,4)=3.0*X2**2
      AA(3,1)=1.0
      AA(3,2)=X3
      AA(3,3)=X3**2
      AA(3,4)=X3**3
      AA(4,1)=0.0
      AA(4,2)=1.0
      AA(4,3)=2.0*X3
      AA(4,4)=3.0*X3**2
      DO 2 II=1,4
      DEBUG(AA(II,JJ),JJ=1,4)
2     CONTINUE
C
C     SETUP VECTOR OF ORIGINAL CONSTANTS -- BB
C
      BB(1)=Y2
      BB(2)=(Y2-YIN(1))/(X2-XIN(1))
      BB(3)=Y3
      BB(4)=(YIN(4)-Y3)/(XIN(4)-X3)
      DEBUG(BB(I),I=1,4)
```

```
      NSIM=4
      KSIM=0
      CALL SIMQ (AA,BB,NSIM,KSIM)
      D=BB(1)
      C=BB(2)
      A=BB(4)
      C=BB(2)
      B=BB(3)
4     K=KSTART
      KCUNT=KCUNT+1
      XCN(K+1)=XIN(2)
      YCN(K+1)=YIN(2)
      DYDXC(K+1)=3.0*A*XCN(K+1)**2+2.0*B*XCN(K+1)+C
      CAPPA(K+1)=(6.0*A*XCN(K+1)+2.0*B)/((1.0+DYDXC(K+1)**2)**1.5)
      ALPHA(K+1)=ATAN(DYDXC(K+1))
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(K+1))))
6     K=K+1
      DXKP1=DS/(SQRT(1.0+DYDXC(K)))
      IF (XIN(3).LT.XIN(2)) DXKP1=-DXKP1
      XCN(K+1)=XCN(K)+DXKP1
      YCN(K+1)=A*XCN(K+1)**3+B*XCN(K+1)**2+C*XCN(K+1)+D
      DYDXC(K+1)=3.0*A*XCN(K+1)**2+2.0*B*XCN(K+1)+C
      CAPPA(K+1)=(6.0*A*XCN(K+1)+2.0*B)/((1.0+DYDXC(K+1)**2)**1.5)
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(K+1))))
      ALPHA(K+1)=ATAN(DYDXC(K+1))
      SCN(K+1)=SCN(K)+SQRT((XCN(K+1)-XCN(K))**2+(YCN(K+1)-YCN(K))**2)
      IF (SLOPE.GT.1.0) GO TO 8
      IF (XIN(4).GE.X3.AND.XCN(K+1).GT.X3) GO TO 10
      IF (XIN(4).LT.X3.AND.XCN(K+1).LE.X3) GO TO 10
      GO TO 6
8     IF (YIN(4).GE.Y3.AND.YCN(K+1).GT.Y3) GO TO 10
      IF (YIN(4).LT.Y3.AND.YCN(K+1).LE.Y3) GO TO 10
      GO TO 6
10    IF (KOUNT.GT.100) GO TO 20
      DELSS=DELS
      DSTEST=((XCN(K+1)-XIN(3))**2+(YCN(K+1)-YIN(3))**2)**.5
      IF (ABS(DS-DSTEST).LT..01*DS) GO TO 12
      IF (DSTEST.LT..01*DS) GO TO 14
      IF (DSTEST-.5*DS) 18,16,16
12    K=K-1
14    XCN(K+1)=XIN(3)
      YCN(K+1)=YIN(3)
      GO TO 20
16    DELS=DELS+(DS-DSTEST)/FLOAT(K-1-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 4
18    DELS=DELS-DSTEST/FLOAT(K-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 4
20    DELS1=DS*1.2
      IF (DELS1.GT.DELS) DELS1=DELS
      WRITE (6,24) KOUNT,A,B,C,D
      WRITE (6,26) DELSIN,DELS,DELS1,DSTEST
      KEND=K+1
      KSTART=KSTART+1
      DO 22 I=KSTART,KEND
      ALPHA(I)=ALPHA(I)/PIC180
22    CONTINUE
      RETURN
C
C
24    FORMAT (1HO,2X,I4,2X,10HITERATIONS,2X,4HA = ,1PE12.5,2X,4HB = ,1PE
     112.5,2X,4HC = ,1PE12.5,2X,4HD = ,1PE12.5)
26    FORMAT (3X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
     1F8.5,3X,9HDSTEST = ,F8.5)
      END
```

```
$IBFTC FNSHB
      SUBROUTINE FNSTRH (K)
C
C     FINAL STRAIGHT SEGMENT ON THE HUB AND SHROUD
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XCN(500),YCN(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SCN(500),PI0180
      COMMON /SS/ NBDY1,NBCDY2,TYPBDY,NBCYS
      COMMON /FNST/ NFIRST
      NFIRST=K
      DS=DELS1
      DELSTR=DELSMX
      YTEST=YIN(2)-YIN(1)
      XTEST=XIN(2)-XIN(1)
      ASIGN=1.0
      IF (XTEST.LT.0.0) ASIGN=-1.0
      ISTAR=0
      SSEG=SQRT(XTEST**2+YTEST**2)
      IF (XTEST.EQ.0.0) GO TO 2
      IF (YTEST.EQ.0.0) GO TO 4
      DYDXC=YTEST/XTEST
      ALPHAC=ATAN(YTEST/XTEST)
      SINAL=SIN(ALPHAC)
      COSAL=COS(ALPHAC)
      GO TO 6
2     DYDXC=SIGN(99999.,YTEST)
      ALPHAC=SIGN(PI02,YTEST)
      SINAL=1.0
      COSAL=0.0
      GO TO 6
4     DYDXC=0.0
      ALPHAC=0.0
      SINAL=0.0
      COSAL=1.0
6     DYDXO(K+1)=DYDXC
      ALPHA(K+1)=ALPHAC
      IF (DS.GT.DELSMX) GO TO 8
      GO TO 16
8     IF (ISTAR.NE.0) GO TO 16
      DSLAST=DS
      XCN(K+1)=XCN(K)
      YCN(K+1)=YCN(K)
      ICOUNT=0
10    XSAVE=XCN(K+1)-XIN(1)
      YSAVE=YCN(K+1)-YIN(1)
      SSTAR=SQRT(XSAVE**2+YSAVE**2)
      ASTAR=(SSEG-SSTAR)/DELSTR
      ATEST=ASTAR-FLOAT(IFIX(ASTAR))
      IF (ATEST.GT..5) ASTAR=ASTAR+1.0
      NSTAR=IFIX(ASTAR)
```

```
      DS=(SSEG-SSTAR)/FLOAT(NSTAR)
      ISTAR=1
      IF (DS.GT.DSLAST.OR.NSTAR.EQ.0) GO TO 12
      IF (ICOUNT.GT.0) K=K+1
      GO TO 16
12    K=K-1
      IF (K.GT.NFIRST) GO TO 14
      K=NFIRST
      CALL STRAIT (K,0)
      K=K-1
      GO TO 18
14    DSLAST=SQRT((XON(K-1)-XON(K))**2+(YON(K-1)-YON(K))**2)*1.2
      DELSTR=DSLAST
      ICOUNT=ICOUNT+1
      GO TO 10
16    XON(K+1)=XON(K)+ASIGN*DS*COSAL
      YON(K+1)=YON(K)+ASIGN*DS*SINAL
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      CAPPA(K+1)=0.0
      IF (ABS(XON(K+1)-XIN(2)).LE..001*DS.AND.XTEST.NE.0.0) GO TO 18
      IF (ABS(YON(K+1)-YIN(2)).LE..001*DS.AND.XTEST.EQ.0.0) GO TO 18
      K=K+1
      IF (ISTAR.EQ.0) DS=DS*1.2
      GO TO 6
18    DELS1=DELS
      XON(K+1)=XIN(2)
      YON(K+1)=YIN(2)
      NBCY1=K+1
      K=K+1
      DO 20 KAL=NFIRST,K
20    ALPHA(KAL)=ALPHA(KAL)/PIO180
      RETURN
      END
```

```
$IBFTC FRSTS

      SUBROUTINE FRSTSH (K)
C
C     FIRST STRAIGHT SEGMENT SHROUD
C
C     IF THERE IS NO HUB INTERCHANGE POINTS (X1,Y1) AND (X2,Y2)
C           AND TREAT LIKE FINAL STRAIGHT SECTION ON THE HUB,
C           THEN REVERSE XCN AND YCN ARRAYS
C
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XCN(500),YCN(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SCN(500),PI0180
      COMMON /SS/ NBDY1,NBDY2,TYPBDY,NBDYS
      COMMON /FNST/ NFIRST
      DIMENSION XA(2), YA(2), DSV(500), ASV(500), XSV(500), YSV(500), SS
     1N(500)
      SCN(K)=0.0
      IF (IHUB.EQ.1) GO TO 8
      DO 2 I=1,2
      XA(I)=XIN(I)
2     YA(I)=YIN(I)
      XIN(1)=XA(2)
      XIN(2)=XA(1)
      YIN(1)=YA(2)
      YIN(2)=YA(1)
      NFB2=K
      YCN(K)=YIN(1)
      XCN(K)=XIN(1)
      CALL FNSTRF (K)
      KSV=K
      DO 4 I=NFB2,KSV
      KSR=KSV+1-I
      DSV(KSR)=DYDXO(I)
      ASV(KSR)=ALPHA(I)
      XSV(KSR)=XCN(I)
      YSV(KSR)=YCN(I)
4     SSV(KSR)=SCN(I)
      DO 6 I=NFB2,KSV
      DYDXO(I)=DSV(I)
      ALPHA(I)=ASV(I)
      XCN(I)=XSV(I)
      YCN(I)=YSV(I)
      SCN(I)=SSV(I)
      CAPPA(I)=0.0
6     CONTINUE
      DELS1=ABS(SCN(KSV)-SCN(KSV-1))
      NBDY1=0
      RETURN
C
C     IF THERE IS A HUB, USE X VALUES FROM FINAL STRAIGHT
```

```
C          SECTION ON THE HUB FOR FIRST STRAIGHT SECTION ON
C            SHROUD
C
8       XTEST=XIN(1)-XIN(2)
        YTEST=YIN(1)-YIN(2)
        IF (XTEST.EQ.0.0) GO TO 10
        DYDXC=YTEST/XTEST
        ALPHAC=ATAN2(YTEST,XTEST)
        GO TO 12
10      DYDXC=99999.
        ALPHAC=PIO2
12      K=K-1
        NBOC=NBDY1
        IF (TYPBDY.EQ.3.0.AND.NBDYS.EQ.3) NBOC=NBDY2
        DO 18 I=NFIRST,NBOC
        KEEP=NBOC+NFIRST-I
        XCN(K+1)=XCN(KEEP)
        DYDXC(K+1)=DYDXC
        ALPHA(K+1)=ALPHAC
        IF (I.EQ.NFIRST) GO TO 14
        YCN(K+1)=YCN(K)+(XCN(K+1)-XCN(K))*DYDXC
        SCN(K+1)=SCN(K)+(XCN(K)-XCN(K+1))*COS(ALPHAC)
        GO TO 16
14      YCN(K+1)=YIN(1)+(XCN(K+1)-XIN(1))*DYDXC
16      CAPPA(K+1)=0.0
        ALPHA(K+1)=ALPHA(K+1)/PIO180
        K=K+1
18      CONTINUE
        DELS1=SCN(K)-SCN(K-1)
        RETURN
        END
```

```
$IBFTC LEM1

      SUBROUTINE LEM (K)
C
C     SUBROUTINE TO CALCULATE POINTS ON A LEMNISCATE
C
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XCN(500),YCN(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SCN(500),PI0180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB
      DELSIN=DELS1
      K=K-1
      KSTART=K
      DELS=DELS1
      THETMX=ATAN(ABS((YIN(3)-YIN(2))/(XIN(3)-XIN(2))))
      A=SQRT(((XIN(3)-XIN(2))**2+(YIN(3)-YIN(2))**2)/(2.0*SIN(2.0*THETMX
     1)))
      KOUNT=0
      IF (YIN(1).EQ.YIN(2)) GO TO 10
      IF (XIN(1).EQ.XIN(2)) GO TO 2
      SLOPE=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))
      AROT=-TAN(SLOPE)
      GO TO 4
2     SLOPE=99999.
      AROT=-PI02
4     DO 6 IROT=1,3
      XN=XIN(IROT)
      XIN(IROT)=XN*COS(AROT)-YIN(IROT)*SIN(AROT)
6     YIN(IROT)=XN*SIN(AROT)+YIN(IROT)*COS(AROT)
8     K=KSTART
10    XCN(K+1)=XIN(2)
      YCN(K+1)=YIN(2)
      CAPPA(K+1)=0.0
      DYDXO(K+1)=0.0
      ALPHA(K+1)=0.0
      KOUNT=KOUNT+1
      DSSAVE=DELS
      DS=DELS
      DTHET=DS**2/A**2
      THBT=DTHET*.5
12    R=A*SQRT(2.0*SIN(2.0*THET))
      DSCHEK=R*COS(THET)
      IF (DSCHEK.GT.1.1*DS) GO TO 14
      IF (DSCHEK.LT..9*DS) GO TO 16
      DELS=DS
      GO TO 18
14    THET=THET-.02*DTHET
      GO TO 12
16    THET=THET+.02*DTHET
      GO TO 12
18    K=K+1
20    R=A*SQRT(2.0*SIN(2.0*THET))
```

```
      XCN(K+1)=XIN(2)-R*COS(THET)
      YCN(K+1)=YIN(2)+R*SIN(THET)
      SCN(K+1)=SCN(K)+SQRT((XCN(K+1)-XCN(K))**2+(YCN(K+1)-YCN(K))**2)
      IF (ABS(SCN(K+1)-SCN(K)).GT.1.05*DS) GO TO 22
      IF (ABS(SCN(K+1)-SCN(K)).LT..95*DS) GO TO 24
      GO TO 26
22    THET=THET-.02*DTHET
      GO TO 20
24    THET=THET+.02*DTHET
      GO TO 20
26    DYDXC(K+1)=-TAN(3.0*THET)
      ALPHA(K+1)=-3.0*THET
      CAPPA(K+1)=3.0*SQRT(SIN(2.0*THET)/2.0)/A
      DS=DELS/SQRT(1.0+ABS(CAPPA(K+1)))
      IF (ABS(DS-DSSAVE).GT..25*DSSAVE) DS=DSSAVE+SIGN(.25*DSSAVE,DS-DSS
     1AVE)
      DSSAVE=DS
      DTHET=DS*SQRT(SIN(2.0*THET)/2.0)/A
      THET=THET+DTHET
      IF (THET.LE.THETMX) GO TO 18
      IF (KOUNT.GT.50) GO TO 36
      DSTEST=((XCN(K+1)-XIN(3))**2+(YCN(K+1)-YIN(3))**2)**.5
      IF (DSTEST.GT.DS) GO TO 34
      IF (DSTEST.LT..0001*DS) GO TO 28
      IF (DSTEST-.5*DS) 32,32,30
28    YCN(K+1)=YIN(3)
      XCN(K+1)=XIN(3)
      GO TO 36
30    DELS=DELS-DSTEST/FLOAT(K+1-KSTART)
      GO TO 8
32    DELS=DELS+DSTEST/FLOAT(K+1-KSTART)
      GO TO 8
34    DELS=.8*DELS
      GO TO 8
36    DELS1=DS*1.2
      IF (DELS1.GT.DELS) DELS1=DELS
      WRITE (6,44) KOUNT,THETMX,A
      WRITE (6,46) DELSIN,DELS,DELS1,DSTEST
      KEND=K+1
      KSTART=KSTART+1
      IF (YIN(2).EQ.YIN(1)) GO TO 40
      DO 38 KROT=KSTART,KEND
      XN=XCN(KROT)
      XCN(KROT)=XN*COS(AROT)+YCN(KROT)*SIN(AROT)
      YCN(KROT)=YCN(KROT)*COS(AROT)-XN*SIN(AROT)
      ALPHA(KROT)=ALPHA(KROT)-AROT
      DYDXC(KROT)=TAN(ALPHA(KROT))
38    CONTINUE
40    DO 42 KAL=KSTART,KEND
42    ALPHA(KAL)=ALPHA(KAL)/PIC180
      RETURN
C
C
44    FORMAT (3X,I3,2X,13HITERATIONS---,3X,13HTHETMXCALC = ,F10.5,3X,8HA
     1CALC = ,F10.5)
46    FORMAT (3X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
     1F8.5,3X,9HDSTEST = ,F8.5)
      END
```

```
$IBFTC ELLIPS

      SUBROUTINE ELIPSE (K)
C
C     THIS SUBROUTINE FITS A SEGMENT OF AN ELLIPSE TO TWO ARBITRARILY
C                ORIENTED STRAIGHT LINES NOT MORE THAN 90 DEGREES APART
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBDY2,TYPBDY,NBDYS
C
C     TRANSLATE INPUT BREAK POINTS SO THAT POINT NO. 2 BECOMES
C        THE ORIGIN
C
      DELSIN=DELS1
      KOUNT=0
      DELS=DELS1
      PI=3.141592653
      K=K-1
      KSTART=K
      X2=XIN(2)
      Y2=YIN(2)
      DO 2 I=1,4
      XIN(I)=XIN(I)-X2
2     YIN(I)=YIN(I)-Y2
C
C     ROTATE THE TRANSLATED BREAK POINTS SO THAT THE SLOPE OF THE
C        FIRST STRAIGHT LINE IS ZERO
C
      IF (XIN(2).NE.XIN(1)) GO TO 4
      SLOPE=99999.
      PHI=-PIO2
      IF (YIN(1).GT.YIN(2)) PHI=PIO2
      GO TO 6
4     SLOPE=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))
      PHI=ATAN(SLOPE)
      IF (XIN(1).LT.XIN(2)) PHI=PI+ATAN(SLOPE)
6     DO 8 I=1,4
      XA=XIN(I)
      XIN(I)=XA*COS(PHI)+YIN(I)*SIN(PHI)
8     YIN(I)=-XA*SIN(PHI)+YIN(I)*COS(PHI)
C
C     DETERMINE THE ELLIPSE
C
      IF (XIN(4).NE.XIN(3)) GO TO 10
      B=YIN(3)
      A=ABS(XIN(3))
      PHIAB=PIO2
      GO TO 12
10    SLOP2=(YIN(4)-YIN(3))/(XIN(4)-XIN(3))
      IF (SLOP2.LE.2.0*YIN(3)/XIN(3)) GO TO 52
```

```
      C3=XIN(3)*SLOP2/YIN(3)
      PHIAB=2.0*ATAN(SQRT((C3-2.0)/C3))
      A=-XIN(3)/SIN(PHIAB)
      B=YIN(3)/(1.0-COS(PHIAB))
12    THETMX=PHIAB-PIO2
      THTMXD=THETMX/PIO180
      WRITE (6,54) A,B,XIN(1),YIN(1),PHI,THTMXD
C
C     INITIALIZE THE FIRST POINT ON THE ELLIPSE
C
14    K=KSTART
      XON(K+1)=XIN(2)
      YON(K+1)=YIN(2)
      CAPPA(K+1)=-B/(A**2)
      ALPHA(K+1)=0.0
      DYDXC(K+1)=0.0
      KOUNT=KOUNT+1
      THET=-PIO2
      DSSAVE=DELS
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(1))))
      DTHET=DS/ABS(A)
      THET=THET+DTHET
C
C     GENERATE THE POINTS ON THE ELLIPSE
C
16    K=K+1
18    XON(K+1)=-A*COS(THET)
      YON(K+1)=B*(1.0+SIN(THET))
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      IF (ABS(SON(K+1)-SON(K)).GT.1.05*DS) GO TO 20
      IF (ABS(SON(K+1)-SON(K)).LT..95*DS) GO TO 22
      GO TO 24
20    THET=THET-.02*DTHET
      GO TO 18
22    THET=THET+.02*DTHET
      GO TO 18
24    IF (THET.EQ.0.0) GO TO 26
      DYDXC(K+1)=B*COTAN(THET)/A
      ALPHA(K+1)=ATAN(DYDXC(K+1))
      GO TO 28
26    DYDXC(K+1)=99999.
      ALPHA(K+1)=PIO2
28    CAPPA(K+1)=-A*B/(B*B*COS(THET)**2+A*A*SIN(THET)**2)**1.5
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(1))))
      IF (ABS(DS-DELS).GT..20*DELS) DS=DELS+SIGN(.20*DELS,DS-DELS)
      DSSAVE=DS
30    DTHET=DS/SQRT(B*B*COS(THET)**2+A*A*SIN(THET)**2)
      DTS=DTHET
      THET=THET+DTHET/2.0
      DTHET=DS/SQRT(B*B*COS(THET)**2+A*A*SIN(THET)**2)
      IF (ABS(DTHET-DTS).LT..001*DTS) GO TO 32
      GO TO 30
32    IF (THET.LE.THETMX-DTHET/2.0) GO TO 16
      IF (KOUNT.GT.100) GO TO 44
      DELSS=DELS
      DSTEST=((XON(K+1)-XIN(3))**2+(YON(K+1)-YIN(3))**2)**.5
```

```
      IF (ABS(DS-DSTEST).LT..01*DS) GO TO 34
      IF (DSTEST.GT.DS) GO TO 42
      IF (DSTEST.LT..01*DS) GO TO 36
      IF (DSTEST-.5*DS) 40,34,38
34    K=K+1
36    XCN(K+1)=XIN(3)
      YCN(K+1)=YIN(3)
      GO TO 44
38    DELS=(FLOAT(K+1-KSTART)*DELS+DSTEST)/FLOAT(K+2-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 14
40    DELS=DELS*DSTEST/FLOAT(K+2-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 14
42    DELS=.8*DELS
      GO TO 14
44    DELS1=DS*1.2
      IF (DELS1.GT.DELS) DELS1=DELS
      WRITE (6,56) KOUNT
      WRITE (6,60) DELSIN,DELS,DELS1,DSTEST
      KEND=K+1
      DEBUG(XCN(I),YCN(I),I=KSTART,KEND),PHI
      KSTART=KSTART+1
C
C     ROTATE AND TRANSLATE BACK
C
      DO 50 KROT=KSTART,KEND
      XA=XCN(KROT)
      XCN(KROT)=XA*COS(PHI)-YCN(KROT)*SIN(PHI)+X2
      YCN(KROT)=XA*SIN(PHI)+YCN(KROT)*COS(PHI)+Y2
      ALPHA(KROT)=ALPHA(KROT)+PHI
      IF (ALPHA(KROT).EQ.PIO2) GO TO 46
      DYDXC(KROT)=TAN(ALPHA(KROT))
      GO TO 48
46    DYDXC(KROT)=99999.
48    ALPHA(KROT)=ALPHA(KROT)/PIO180
50    CONTINUE
      RETURN
52    WRITE (6,58) SLOP2,XIN(3),YIN(3)
      STOP
C
C
54    FORMAT (1HC,10X,4HA  =,1PE10.3,5X,4HB = ,1PE10.3,5X,5HXO = ,1PE10.
     13,5X,7HYC   = ,1PE10.3/9X,7HPHI  = ,1PE10.3,5X,9HTHETMX = ,1PE10.3
     2)
56    FORMAT (11X,I3,2X,13HITERATIONS---)
58    FORMAT (1HC,10X,42HCOMBINATION OF SLOPE, X , Y NOT COMPATIBLE/5X,9
     1HSLOPE2 = ,F7.3,3X,9HXIN(3) = ,F7.3,3X,9HYIN(3) = ,F7.3)
60    FORMAT (11X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT =
     1,F8.5,3X,9HDSTEST = ,F8.5)
      END
```

```
$IBFTC PRLPS

      SUBROUTINE PRELPS (KODE,KAT,IA,K1,K2)
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SPREP/ KPREP
      KPREP=1
      IF (KAT.EQ.1) GO TO 20
      KIO=KODE
      X1=XIN(1)
      Y1=YIN(1)
      IF (IA.EQ.5) GO TO 2
      XC=XIN(4)
      YC=YIN(4)
      GO TO 4
2     XC=XIN(5)
      YC=YIN(5)
4     DO 14 IB=1,IA
      GO TO (6,8,10,12,8,12),KODE
6     YIN(IB)=YIN(IA)-(YIN(IB)-YIN(IA))
      GO TO 14
8     XIN(IB)=XIN(1)-(XIN(IB)-XIN(1))
      GO TO 14
10    YIN(IB)=YIN(1)-(YIN(IB)-YIN(1))
      GO TO 14
12    XIN(IB)=XIN(IA)-(XIN(IB)-XIN(IA))
14    CONTINUE
      DEBUG(XIN(I),I=1,IA),(YIN(I),I=1,IA),KODE
      IF (KODE.EQ.5) GO TO 16
      IF (KODE.EQ.6) GO TO 18
      RETURN
16    KODE=1
      GO TO 4
18    KODE=3
      GO TO 4
20    DO 32 IB=K1,K2
      GO TO (22,24,26,28,22,26),KIO
22    YON(IB)=YC-(YON(IB)-YC)
      GO TO 30
24    XON(IB)=X1-(XON(IB)-X1)
      GO TO 30
26    YON(IB)=Y1-(YON(IB)-Y1)
      GO TO 30
28    XON(IB)=XC-(XON(IB)-XC)
30    DYDXO(IB)=-DYDXO(IB)
32    CONTINUE
      DEBUG(XON(I),I=K1,K2),(YON(I),I=K1,K2),KIO,K1,K2
      IF (KIO.EQ.5) GO TO 34
      IF (KIO.EQ.6) GO TO 36
      RETURN
34    KIO=2
      GO TO 20
36    KIO=4
      GO TO 20
      END
```

```
$IBFTC TEST.

      SUBROUTINE TEST (IA)
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XCN(500),YCN(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SCN(500),PIO180
      COMMON /SPREP/ KPREP
      M=IA-1
      IF (XIN(2).EQ.XIN(1)) GO TO 2
      SLP1=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))
      GO TO 4
2     SLP1=99999.
      IF (YIN(2).GT.YIN(M).AND.XIN(2).LT.XIN(M)) GO TO 10
4     IF (XIN(1).EQ.XIN(M)) GO TO 6
      SLP2=(YIN(M)-YIN(1))/(XIN(M)-XIN(1))
      GO TO 8
6     SLP2=99999.
C
C     ROTATION ONLY
C
8     IF (SLP1.GT.SLP2) RETURN
C
C     MIRROR INTO XIN(1)
C
10    CALL PRELPS (2,0,IA)
      RETURN
      END


$IBFTC SMIR    DECK,LIST

      SUBROUTINE MIRROR (K,YCL)
C
C     THIS SUBROUTINE MIRRORS THE HUB TO OBTAIN THE POINTS ON SHROUD
C             USED  FOR  22Y  -  2-D INLETS
C
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XCN(500),YCN(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SCN(500),PIO180
      COMMON /SS/ NBDY1,NBCDY2,TYPBDY,NBCYS
      DO 2 J=1,NBDY1
      K=K+1
      ISTAR=1+2*NBDY1-K
      XCN(K)=XCN(ISTAR)
      YCN(K)=2.0*YCL-YCN(ISTAR)
      CAPPA(K)=-CAPPA(ISTAR)
      DYDXO(K)=-DYDXO(ISTAR)
      ALPHA(K)=-ALPHA(ISTAR)
      SCN(K)=SCN(ISTAR)
2     CONTINUE
      WRITE (6,4) YCL
      RETURN
C
4     FORMAT (33HHUB MIRRORED INTO Y CENTERLINE = ,F8.3)
      END
```

```
$IBFTC SINTP

      SUBROUTINE SINTP (Z,W,N,X1,Y1)
      DIMENSION X(200), Y(200), Z(200), W(200)
      DO 2 I=1,N
      X(I)=Z(I)
2     Y(I)=W(I)
      CALL SORTXY (X,Y,N)
C
      DO 4 I=1,N
      K=I
      IF (X1.GT.X(I)) GO TO 4
      IF (X1.EQ.X(I)) GO TO 6
      IF (X1.LT.X(I)) GO TO 8
4     CONTINUE
6     Y1=Y(K)
      GO TO 10
8     IF (K.EQ.1) GO TO 12
      IF (K.EQ.N) K=N-1
      W1=(X1-X(K))*(X1-X(K+1))/(X(K-1)-X(K))/(X(K-1)-X(K+1))
      W2=(X1-X(K-1))*(X1-X(K+1))/(X(K)-X(K-1))/(X(K)-X(K+1))
      W3=(X1-X(K-1))*(X1-X(K))/(X(K+1)-X(K-1))/(X(K+1)-X(K))
      Y1=Y(K-1)*W1+Y(K)*W2+Y(K+1)*W3
10    RETURN
12    Y1=0.0
      RETURN
      END
```

```
$IBFTC SPRCRC

      SUBROUTINE SUPERC (XBRK,YBRK,ENREED,DELS1,ISTART)
      DIMENSION XBRK(5), YBRK(5), XBK1(12), YBK1(12)
      EQUIVALENCE (N,EN)
      REAL LOGXOA,LOGYOB,N
      COMMON /SUPF/ IFLD
      COMMON /FOR3SS/ I,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SUPN/ XOA,YOB,LOGXOA,LOGYOB
      COMMON /NHIGH/ NSPHG,NLAST,XLAST(500),YLAST(500)
      COMMON /SPREP/ KPREP
      IPI=0
      PI=3.14159265
      IF (IFLD.EQ.1) DELSHL=DELS1
      DELSIN=DELS1
      DELS2=DELS1
      KOUNT=0
2     II=ISTART
      IF (IFLD.GE.1) DS=DELS2
      KOUNT=KOUNT+1
      I=ISTART
      X41=XBRK(4)
      Y41=YBRK(4)
      DO 4 J=1,5
      XBK1(J+7)=XBRK(J)
      YBK1(J+7)=YBRK(J)
4     CONTINUE
      CERUG(XBK1(J),YBK1(J),J=8,12)
      IF (XBK1(9).NE.XBK1(8)) GO TO 8
      IF (YBK1(8).LT.YBK1(9)) GO TO 6
      SLOP=99999.
      SINATD=1.0
      SLOPE=99999.
      ATOYOD=90.
      COSATD=0.0
      GO TO 14
6     SLOP=-99999.
      SINATD=-1.0
      SLOPE=-99999.
      ATOYOD=-90.
      COSATD=0.0
      GO TO 14
8     SLOP=(YBK1(9)-YBK1(8))/(XBK1(9)-XBK1(8))
      SLOPE=ATAN(SLOP)
      ATOYOD=SLOPE/PIO180
      IF (XBK1(8)-XBK1(9)) 10,12,12
10    SLOPE=PI+SLOPE
      ATOYOD=-ATOYOD
      IPI=1
12    SINATD=SIN(SLOPE)
      COSATD=COS(SLOPE)
```

```
14      CONTINUE
        XBK(8)=XBK1(8)
        YBK(8)=YBK1(8)
        DO 16 J=9,12
        XP=XBK1(J)-XBK1(8)
        YP=YBK1(J)-YBK1(8)
        XBK(J)=XBK1(8)+XP*COSATD+YP*SINATD
        YBK(J)=YBK1(8)-XP*SINATD+YP*COSATD
16      CONTINUE
        XBK(5)=XBK(8)
        YBK(5)=YBK(8)
        XBK(6)=XBK(9)
        YBK(6)=YBK(9)
        XBK(9)=XBK(10)
        YBK(9)=YBK(10)
        DELS=DELS1
        DSSAVE=DELS
        XTM=XBK1(9)
        YTM=YBK1(9)
        B=YBK(11)-YBK(6)
        TOMEGA=(XBK(12)-XBK(11))/(YBK(12)-YBK(11))
        IF (ABS(TOMEGA).LE..0001) TOMEGA=0.
        OMEGA=ATAN(TOMEGA)
        XC=XBK(6)+B*TOMEGA
        YC=YBK(11)
        A=XC-XBK(11)
        XI9=XO-XBK(9)
        ETA9=YO-YBK(9)
        Y=ETA9
        X=XI9-ETA9*TOMEGA
        BOA=B/A
        IF (ENREED) 18,18,20
18      XOA=X/A
        YOB=Y/B
        LOGXOA=ALOG(XOA)
        LOGYOB=ALOG(YOB)
        CALL FONISC (EN)
        GO TO 22
20      EN=ENREED
22      BOATEN=BOA**EN
        IF (KOUNT.NE.1) GO TO 24
        WRITE (6,114) EN,A,B,XO,YO,OMEGA
24      I=I
        ILG=I
        XCN(I)=XCN(I1)
        CIEN=1./EN
        BT=B*TOMEGA
        DX1=DELS*COSATD
        XP=XTM-XBK1(8)
        YP=YTM-YBK1(8)
        XIROT=XBK1(8)+XP*COSATD+YP*SINATD
        XI=XC-XIROT
        Y=YC-YBK(6)
        X=XI-Y*TOMEGA
        IF (X.LT.0.0) X=0.0
        DSN=SON(I)-SON(I-1)
```

```
26    XCATCN=(X/A)**N
      YCBTCN=(Y/B)**N
      XNMCAN=X**(N-1.)/A**N
      YNMCBN=Y**(N-1.)/B**N
      FCFY=XCATCN+YCBTCN-1.
      IF (ABS(FCFY).LE.1.0E-5) GO TO 28
      FPCFY=EN*(YNMCBN-XNMCAN*TOMEGA)
      YNEW=Y-FCFY/FPCFY
      GO TO 30
28    YNEW=Y
30    IF (ABS(Y-YNEW)/YNEW-.1E-4) 34,34,32
32    Y=YNEW
      X=XI-Y*TOMEGA
      GO TO 26
34    Y=YNEW
      X=XI-Y*TOMEGA
36    ETA=Y
      DELS=DELS2
      IPN=I
      IF (X.LT.0.0) X=0.0
      XCANM1=(X/A)**(EN-1.)
      YCBNM1=(Y/B)**(EN-1.)
      F1=XCANM1/A
      F2=YCBNM1/B
      F3=TOMEGA*F1
      IF (X.EQ.0.0) GO TO 38
      F1CX=X**(EN-2.)/A**EN
      GO TO 40
38    IF (EN.EQ.2.) F1CX=1.0/(A*A)
      IF (EN.GT.2.) F1CX=0.0
40    IF (Y.EQ.0.0) GO TO 42
      F2CY=Y**(EN-2.)/B**EN
42    DEN=F2-F3
      IF (DEN.NE.0.0) GO TO 44
      DETDXI=99999.
      GO TO 46
44    DETDXI=-F1/DEN
46    DYDXC(IPN)=DETDXI
      C1MEPT=1.-DETDXI*TOMEGA
      IF ((X.EQ.0.0.OR.Y.EQ.0.0).AND.EN.LT.2.) GO TO 48
      G1=(EN-1.)*F1CX*C1MEPT
      SAND1=DEN*G1
      SAND2=F1*((EN-1.)*F2CY*DETDXI-G1*TOMEGA)
      BKT=(1.+DETDXI**2)**1.5
      CAPPA(IPN)=(SAND2-SAND1)/DEN**2/BKT
      GO TO 50
48    CAPPA(IPN)=99999.
50    ALPHA(IPN)=ATAN(DYDXC(IPN))/PI0180
      XCN(IPN)=XC-XI
      YCN(IPN)=YC-ETA
      DY1=DELS*SINATD
      IF (IFLD.GE.1) GO TO 52
      DS=DELS/(1.0+.20*TANH(ABS(CAPPA(I))))
      GO TO 56
52    IF (IFLD.GT.1) GO TO 54
      DS=DS-.05*DS
```

```
      GO TO 58
54    DS=DS
      IF (DS.GT.DELSHL) DS=DELSHL
      GO TO 58
56    IF (ABS(DS-DELS).GT..20*DELS) DS=DELS+SIGN(.20*DELS,DS-DELS)
58    IF (DS.LT..50*DELS2) DS=.50*DELS2
      IF (NSPHG.EQ.0) GO TO 60
      DX1=ABS(XLAST(NLAST)-XLAST(NLAST-1))
      DX11=DX1
      DY1=ABS(YLAST(NLAST)-YLAST(NLAST-1))
      NLAST=NLAST-1
60    IF (ABS(DETDXI)-1.) 70,70,62
62    DY1=DS/SQRT(1.+1./DETDXI**2)
      IF (NSPHG.NE.0) DY1=DX1
64    YTM=YON(I)+DY1
      IF (YTM-YBK(11)) 66,86,86
66    ETA=YO-YTM
      Y=ETA
C
C     STRAIGHT SECTION BETWEEN POINTS 11 AND 12 MUST HAVE SLOPE ABOVE 1
C
C
C     X MAY NOT BE TESTED AGAINST XBK(11)
C
      X=A*(1.-(Y/B)**N)**CION
      XI=X+Y*TOMEGA
      XTM=XO-XI
      DX1=XTM-XON(I)
      DELTAS=SQRT(DY1**2+DX1**2)
      IF (DELTAS.GT.1.02*DS.AND.IPN.NE.1.AND.NSPHG.EQ.0) GO TO 68
      GO TO 86
68    DY1=DS*DY1/DELTAS
      GO TO 64
70    DX1=DS/SQRT(1.+DETDXI**2)
      IF (NSPHG.NE.0) DX1=DY1
      IF (NSPHG.NE.0.AND.IPI.EQ.1) DX1=DX11
72    XTM=XON(I)+SIGN(DX1,DETDXI)
      IF (DETDXI.EQ.0.) XTM=XON(I)-DX1
      XI=XO-XTM
      Y=YO-YON(I)
74    X=XI-Y*TOMEGA
      IF (X.LT.0.0) X=0.0
      XOAION=(X/A)**N
      XNMOAN=X**(N-1.)/A**N
      YNMOBN=Y**(N-1.)/B**N
      YOBION=(Y/B)**N
      FOFY=XOAION+YOBION-1.
      IF (ABS(FOFY).LE.1.0E-5) GO TO 76
      FPOFY=EN*(YNMOBN-XNMOAN*TOMEGA)
      YNEW=Y-FOFY/FPOFY
      GO TO 78
76    YNEW=Y
78    IF (ABS(Y-YNEW)/YNEW-.1E-4) 82,82,80
80    Y=YNEW
      GO TO 74
82    Y=YNEW
```

```
      X=XI-Y*TOMEGA
      YTM=YO-Y
      XI=X+Y*TOMEGA
C     DY1=YTM-YCN(I-1)
      DY1=YTM-YCN(I)
      DELTAS=SQRT(DY1**2+DX1**2)
      IF (DELTAS.GT.1.02*DS.AND.IPN.NE.1.AND.NSPHO.EQ.0) GO TO 84
      GO TO 86
84    DX1=DS*DY1/DELTAS
      GO TO 72
86    SCN(I)=SCN(I-1)+DSM
      DSM=DS
      IF (NSPHO.NE.0) DS=DX1
      IF (ABS(YTM-YBK(11)).LT..001*DS) GO TO 90
      I=I+1
      IF (YTM-YBK(11)) 36,88,88
88    IHI=I-1
      GO TO 92
90    IHI=I
      I=I+1
92    XTM=XBK(11)
      DO 108 J=ILO,IHI
      XP=XCN(J)-XBK1(8)
      YP=YCN(J)-YBK1(8)
      XCN(J)=XBK1(8)+XP*COSATD-YP*SINATD
      YCN(J)=YBK1(8)+XP*SINATD+YP*COSATD
      DEL22=DELS2
      IF (J.NE.IHI) GO TO 104
      DSTEST=((XCN(IHI)-X4T)**2+(YCN(IHI)-Y4T)**2)**.5
      IF (KOUN1.GT.150) GO TO 104
      IF (ABS(DS-DSTEST).LT..1*DS) GO TO 94
      IF (DSTEST.LT..01*DS) GO TO 96
      IF (IHI.EQ.ILO) GO TO 102
      IF (ABS(DELS2-DSTEST).LT..001*DS) GO TO 100
      IF (DSTEST.LT..5*DS) GO TO 100
      IF (DSTEST.GT..5*DS) GO TO 98
94    IHI=IHI+1
      I=I+1
      SCN(IHI)=SCN(IHI-1)+DSTEST
96    XCN(IHI)=X4T
      YCN(IHI)=Y4T
      GO TO 104
98    DELS2=(FLOAT(IHI-ILO)*DELS2+DSTEST)/FLOAT(IHI+1-ILO)
      IF (KOUN1.GE.10) DELS2=(DELS2+DEL22)/2.0
      I=ILO-1
      GO TO 2
100   DELS2=DELS2+DSTEST/FLOAT(IHI-ILO)
      IF (KOUN1.GE.10) DELS2=(DELS2+DEL22)/2.0
      I=ILO-1
      GO TO 2
102   DELS2=.8*DELS2
      I=ILO-1
      GO TO 2
104   ALPHA(J)=ALPHA(J)-ATOYOO
      IF (ABS(ABS(ALPHA(J))-90.).LE.1.0E-4) GO TO 106
      DYDXC(J)=TAN(ALPHA(J)*PIO180)
```

```
      GO TO 108
106   DYDXO(J)=SIGN(999.,ALPHA(J))
108   CONTINUE
      IF (KOUNT.GT.150) WRITE (6,116) (XBRK(I),YBRK(I),I=1,5)
      DELS1=DS
      IF (IFLD.EQ.0) DELS1=1.1*DS
      IF (DELS1.GT.DELS2) DELS1=DELS2
      DO 112 J=ILO,IHI
      IF (J.EQ.1) GO TO 110
      SCN(J)=SCN(J-1)+SQRT((XON(J)-XON(J-1))**2+(YON(J)-YON(J-1))**2)
      GO TO 112
110   SCN(J)=0.0
112   CONTINUE
      WRITE (6,118) KOUNT
      WRITE (6,120) DELSIN,DELS2,DELS1,DSTEST
      RETURN
C
C
114   FORMAT (1X/4X4HN = E16.8,4X4HA = E16.8,7X4HB = E16.8/3X5HXO = E16.
     18,3X5HYO = E16.8,3X8HOMEGA = E16.8/1X)
116   FORMAT (1HO,60HTHIS SET OF DATA EXCEEDED 150ITERATIONS CALCULATION
     1S STOPPED/5X,4HXBRK,5X,4HYBRK/5X,1P10E10.3)
118   FORMAT (1X,5X,I3,2X,13HITERATIONS---)
120   FORMAT (6X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
     1F8.5,3X,9HDSTEST = ,F8.5)
      END
```

```
$IBFTC AREAA.

      SUBROUTINE AREAA
      COMMON /SS/ NBDY1,NBDY2,TYPBDY,NBDYS
      COMMON /FCR3SS/ I,DELS,XBK(20),YBK(20),XCN(500),YCN(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SCN(500),PI0180
      COMMON /NNSD/ NNSD,NSDBDY(10)
      DIMENSION JMAX(20), JMIN(20), YLS(20), YHS(20), AREAS(20), YAR(20)
      PI=3.14159265
      NBP1=NBDY1+1
      DO 2 J=NBP1,NBODY2
      JJ=J
      IF (XCN(J).LT.XCN(J+1)) GO TO 4
2     CONTINUE
4     WRITE (6,26)
      IF (NNSD.EQ.0) GO TO 14
C
C     SEARCH FOR MINIMUM AND MAXIMUM X ON EACH NSD (SPLITTER)
C
      NB=NBODY2+1
      NE=NBODY2+NSDBDY(1)
      DO 12 I=1,NNSD
      XMIN=XCN(NB)
      JMIN(I)=NB
      XMAX=XCN(NB)
      JMAX(I)=NB
      NEM1=NE-1
      DO 10 J=NB,NEM1
      IF (XCN(J).GT.XMAX) GO TO 6
      IF (XCN(J).LT.XMIN) GO TO 8
      GO TO 10
6     XMAX=XCN(J)
      JMAX(I)=J
      GO TO 10
8     XMIN=XCN(J)
      JMIN(I)=J
10    CONTINUE
      NB=NE+1
      NE=NE+NSDBDY(I+1)
      WRITE (6,28) XMIN,XMAX,JMIN(I),JMAX(I)
12    CONTINUE
14    DO 24 J=NBP1,JJ
      IA=1
      CALL SINTP (XCN,YCN,NBDY1,XCN(J),YAR(IA))
      IF (NNSD.EQ.0) GO TO 18
      JEND=NBODY2
      DO 16 I=1,NNSD
      JMI=JMIN(I)
      JMA=JMAX(I)
      JEND=NSDBDY(I)+JEND
      IF (XCN(J).GT.XCN(JMA).OR.XCN(J).LT.XCN(JMI)) GO TO 16
      IA=IA+1
```

```
      CALL SINTP (XON(JMA),YON(JMA),JMI-JMA+1,XON(J),YAR(IA))
      IA=IA+1
      CALL SINTP (XON(JMI),YON(JMI),JEND-JMI+1,XON(J),YAR(IA))
16    CONTINUE
18    IA=IA+1
      YAR(IA)=YON(J)
      IS=0
      AREA=0.0
      DO 20 I=1,IA,2
      IS=IS+1
      AREAS(IS)=(YAR(I+1)**2-YAR(I)**2)*PI
      AREA=AREA+AREAS(IS)
20    CONTINUE
      AREAD=AREA+YAR(1)**2*PI
      IF (NNSD.EQ.0) GO TO 22
      WRITE (6,30) (AREAS(I),I=1,IS)
22    WRITE (6,32) J,XON(J),YON(J),YAR(1),AREA,AREAD
      WRITE (6,34)
24    CONTINUE
      RETURN
C
26    FORMAT (1H1//9X,1HI,14X,3HXON,18X,3HYON,19X,4HYONH,17X,4HAREA,14X,
     19HDISC AREA)
28    FORMAT (1HO,5X,7HXMIN = ,1PE14.5,5X,7HXMAX = ,1PE14.5,5X,7HJMIN =
     1,I6,5X,7HJMAX = ,I6)
30    FORMAT (74X,1PE21.4)
32    FORMAT (6X,I3,1P5E21.4)
34    FORMAT (1HO)
      END



$IBFTC NSCRCL

C     FIND N FOR THE SUPERCIRCLE F(N) = (X/A)**N + (Y/B)**N - 1 = 0
C     FROM X,Y,A,B
C
      SUBROUTINE FONISC (N)
      REAL LOGXOA,LOGYOB
      COMMON /SUPN/ XOA,YOB,LOGXOA,LOGYOB
      REAL NM,NMP1,N
      DATA TOL/.1E-6/
      IF (ABS(XOA-.5)-.5) 2,4,4
2     IF (ABS(YOB-.5)-.5) 6,4,4
4     WRITE (6,14) XOA,YOB
6     NM=1.
8     XOATON=XOA**NM
      YOBTON=YOB**NM
      FOFN=XOATON+YOBTON-1.
      FPOFN=XOATON*LOGXOA+YOBTON*LOGYOB
      NMP1=NM-FOFN/FPOFN
      IF (ABS(NM-NMP1)/NM-TOL) 12,10,10
10    NM=NMP1
      GO TO 8
12    N=NMP1
      RETURN
C
14    FORMAT (1X/1X,41HREQUESTED POINT IS OUTSIDE MAGIC TRIANGLE)
      END
```

```
$IBFTC SIMQ.
C     ******************************************************************
C
C        SUBROUTINE SIMQ
C
C        PURPOSE
C           OBTAIN SOLUTION OF A SET OF SIMULTANEOUS LINEAR EQUATIONS,
C           AX=B
C        USAGE
C           CALL SIMQ(A,B,N,KS)
C
C        DESCRIPTION OF PARAMETERS
C           A - MATRIX OF COEFFICIENTS STORED COLUMNWISE.  THESE ARE
C               DESTROYED IN THE COMPUTATION.  THE SIZE OF MATRIX A IS
C               N BY N.
C           B - VECTOR OF ORIGINAL CONSTANTS (LENGTH N). THESE ARE
C               REPLACED BY FINAL SOLUTION VALUES, VECTOR X.
C           N - NUMBER OF EQUATIONS AND VARIABLES. N MUST BE .GT. ONE.
C           KS - OUTPUT DIGIT
C                0 FOR A NORMAL SOLUTION
C                1 FOR A SINGULAR SET OF EQUATIONS
C
C        REMARKS
C           MATRIX A MUST BE GENERAL.
C           IF MATRIX IS SINGULAR , SOLUTION VALUES ARE MEANINGLESS.
C           AN ALTERNATIVE SOLUTION MAY BE OBTAINED BY USING MATRIX
C           INVERSION (MINV) AND MATRIX PRODUCT (GMPRD).
C
C        SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C           NONE
C
C        METHOD
C           METHOD OF SOLUTION IS BY ELIMINATION USING LARGEST PIVOTAL
C           DIVISOR. EACH STAGE OF ELIMINATION CONSISTS OF INTERCHANGING
C           ROWS WHEN NECESSARY TO AVOID DIVISION BY ZERO OR SMALL
C           ELEMENTS.
C           THE FORWARD SOLUTION TO OBTAIN VARIABLE N IS DONE IN
C           N STAGES. THE BACK SOLUTION FOR THE OTHER VARIABLES IS
C           CALCULATED BY SUCCESSIVE SUBSTITUTIONS. FINAL SOLUTION
C           VALUES ARE DEVELOPED IN VECTOR B, WITH VARIABLE 1 IN B(1),
C           VARIABLE 2 IN B(2),.....,VARIABLE N IN B(N).
C           IF NO PIVOT CAN BE FOUND EXCEEDING A TOLERANCE OF 0.0,
C           THE MATRIX IS CONSIDERED SINGULAR AND KS IS SET TO 1. THIS
C           TOLERANCE CAN BE MODIFIED BY REPLACING THE FIRST STATEMENT.
C
C     ******************************************************************
C
      SUBROUTINE SIMQ (A,B,N,KS)
      DIMENSION A(1), B(1)
C
C        FORWARD SOLUTION
```

```
C
      TOL=0.0
      KS=0
      JJ=-N
      DO 16 J=1,N
      JY=J+1
      JJ=JJ+N+1
      BIGA=0
      IT=JJ-J
      DO 4 I=J,N
C
C        SEARCH FOR MAXIMUM COEFFICIENT IN COLUMN
C
      IJ=IT+I
      IF (ABS(BIGA)-ABS(A(IJ))) 2,4,4
2     BIGA=A(IJ)
      IMAX=I
4     CONTINUE
C
C        TEST FOR PIVOT LESS THAN TOLERANCE (SINGULAR MATRIX)
C
      IF (ABS(BIGA)-TOL) 6,6,8
6     KS=1
      RETURN
C
C        INTERCHANGE ROWS IF NECESSARY
C
8     I1=J+N*(J-2)
      IT=IMAX-J
      DO 10 K=J,N
      I1=I1+N
      I2=I1+IT
      SAVE=A(I1)
      A(I1)=A(I2)
      A(I2)=SAVE
C
C        DIVIDE EQUATION BY LEADING COEFFICIENT
C
10    A(I1)=A(I1)/BIGA
      SAVE=B(IMAX)
      B(IMAX)=B(J)
      B(J)=SAVE/BIGA
C
C        ELIMINATE NEXT VARIABLE
C
      IF (J-N) 12,18,12
12    IQS=N*(J-1)
      DO 16 IX=JY,N
      IXJ=IQS+IX
      IT=J-IX
      DO 14 JX=JY,N
      IXJX=N*(JX-1)+IX
      JJX=IXJX+IT
14    A(IXJX)=A(IXJX)-(A(IXJ)*A(JJX))
16    B(IX)=B(IX)-(B(J)*A(IXJ))
C
C        BACK SOLUTION
C
18    NY=N-1
      IT=N*N
      DO 20 J=1,NY
      IA=IT-J
      IB=N-J
      IC=N
      DO 20 K=1,J
      B(IB)=B(IB)-A(IA)*B(IC)
      IA=IA-N
20    IC=IC-1
      RETURN
      END
```

EOD

```
$IBFTC EOD      DECK

C*              ** DOUGLAS NEUMANN POTENTIAL FLOW PROGRAM **
C
C                * CALCULATION OF POTENTIAL FLOW ABOUT BODIES OF
C                  REVOLUTION HAVING FLOWS PARALLEL AND PERPENDICULAR
C                  TO THE AXIS OF REVOLUTION.
C
C                * MAIN PROGRAM
C
       COMMON / NBSAVE / NBCLD, NIN
       NBCLD = 0
       COMMON       HEDR(10)   ,CASE       ,NB         ,NNU
      1             ,FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
      2             ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
      3             ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
      4             ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
      5             ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
       DOUBLE PRECISION  HEDR, CASE
       INTEGER      FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
      1             ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
      2             ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
      3             ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
      4             ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
       COMMON       NT         ,ND(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
      1             ,NER1      ,NER2       ,NMA        ,NSIGA      ,NSIGC
      2             ,NUNC(4)   ,TYPEC(4)   ,NLF(11)
       COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
       COMMON /P/ IPUVEL
       REAL         MN
C
       REWIND 13
   10  REWIND 12
       REWIND 4
       REWIND 3
       REWIND 8
       REWIND 9
       REWIND 10
       REWIND 11
        REWIND 15
        REWIND 16
       CALL PART1
C*** ***PRESCRIBED VORTICITY IMPLIES TRIANGULARIZATION METHOD OF MATRIX
C*** ***SOLUTION (SOLVIT)
       IF(FLG19.GT.0.OR.FLG13.GT.0)GO TO 30
   15  CALL PART2
       GO TO 40
   30  CALL PREP
   40  CALL PART4
       GO TO 10
       END
```

```
$IBFTC PCH1    DECK
      SUBROUTINE PUNCHC(R,J,LOC,CASE)
      DIMENSION R(400)
      RETURN
       END


$IBFTC TIMEX   DECK
      SUBROUTINE TIMEV(T)
      CALL TIME1(T)
      T=T/3600.
      RETURN
      END


$IBFTC PCH     DECK
      SUBROUTINE PUNCHV(AP,J,L,LOC,CASE)
      DIMENSION AP(500,4), T(500)
      RETURN
      END
```

```
$IBFTC PAT1    DECK

      SUBROUTINE PART1
C
C              * CONTROL FOR BASIC DATA AND FORM MATRIX
C
       COMMON / NBSAVE /  NBCLD, NIN
       COMMON      HEDR(10)  ,CASE       ,NB         ,NNU
     1            ,FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2            ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3            ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4            ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5            ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
       DOUBLE PRECISION  HEDR, CASE
       INTEGER     FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1            ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2            ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3            ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4            ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
       COMMON      NT         ,ND(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1            ,NER1      ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2            ,NUNC(4)   ,TYPEC(4)   ,NLF(11)
       COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
       COMMON /P/ IPUVEL
       REAL        MN
C
       COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1               SINA(500),COSA(500),XP(500),  YP(500)
       COMMON /TL/   TX1(500), TY1(500), NG(500),  TG(500),  ALFA(500),
     1               RSDS(500),CALF(500),SEQ1,     SEQ2,     NSEQ,
     2               CHORD,    TEMP(600),TCNST,    DUMMY(4915)
       INTEGER     BDN        ,SUBKS      ,SEQ1       ,SEQ2
       REAL        MX         ,MY         ,NG
C
C              * START
C              * READ INPUT DATA
       NSEQ=0
  100  READ (5,4) HEDR, CASE, SEQ1, NB, NNU, FLG03, FLG04, FLG05, FLG06,
     1            FLG07, FLG08, FLG09, FLG10, FLG11, FLG12, FLG13, FLG14,
     2            FLG15, FLG16, FLG17, FLG18, FLG19, FLG20, FLG21, FLG22,
     3            FLG23, FLG24, FLG25, FLG26, FLG27, IPUVEL, NIN, SEQ2
C*** ***TRIANGULARIZATION OF THE MATRIX (SOLVIT) IS THE DEFAULT SOLUTION
       IF(FLG09.EQ.0.AND.FLG10.EQ.0)FLG13=1
C***    ***FLG22 IS GENERATED (RESEP) BOUNDARY CONDITIONS
C***    ***FLG21 IS EXTRA CROSS FLOW
     1 IF (FLG22.LE.0)GO TO 5
       FLG21 = 1
       FLG03 = 1
       FLG04 = 1
C***    ***IF FLAG 18 IS NOT EQUAL TO FLAG 14 YOU MUST USE DIRECT MATRIX
     5 IF (FLG18.NE.FLG14)GO TO 2
       IF (FLG21.LE.0)GO TO 3
       FLG12 = 1
     2 FLG13 = 1
       FLG09 = 0
       FLG10 = 0
```

```
    3 CONTINUE
      IF( NBOLD .EQ. 0 )        NBOLD = NB
C***  ***CARDS (UNIT 5) ARE THE DEFAULT METHOD OF INPUT
      IF( NIN .EQ. 0 )        NIN = 5
    4 FORMAT ( 10A6, 2X A6, 8X I4/ 28I1, I2, 46X, I4 )
      IF (SEQ2.GE.SEQ1) GO TO 120
  110 WRITE (6,6)
    6 FORMAT (  1HO/38H DATA OUT OF SEQUENCE * SORT ON 77-80 )
      STOP
  120 SEQ1=SEQ2
      READ (5,8) CHORD, MN, TCNST, SEQ2
    8 FORMAT ( 3F10.0, 46X I4 )
C***  ***THE DEFAULT CHORD LENGTH IS 1.0
      IF(CHORD.GT.-1.0E-5.AND.CHORD.LT.1.0E-5)CHORD=1.0
      IF (SEQ2.LT.SEQ1) GO TO 110
      SEQ1=SEQ2
      WRITE (6,12) HEDR, CASE, NB, NNU, CHORD, MN, TCNST
   12 FORMAT ( 1H1 25X, 26HDOUGLAS  AIRCRAFT COMPANY /
     1         28X, 21HLONG  BEACH  DIVISION ///
     2          6X, 43HPROGRAM EODA -- AXISYMMETRIC AND CROSSFLOW //
     3         11X, 29H***** CASE CONTROL DATA ***** ///
     4          6X, 10A6, 4X, 10HCASE NO.  A6 //
     5          6X  9HBODIES  =I3/ 6X 9HNNU     =I3/ 6X 9HCHORD   =F12.7/
     6          6X  9HMACH NO.=F12.8/ 6X 9HTCNST   =F12.7/// )
      IF (FLG03.GT.0) WRITE (6,16)
   16 FORMAT (13X 21HSURFACE OF REVOLUTION )
      IF (FLG04.GT.0) WRITE (6,20)
   20 FORMAT (13X  9HCROSSFLOW)
      IF (FLG05.GT.0) WRITE (6,24)
   24 FORMAT (13X 15HOFF-BODY POINTS )
      IF (FLG06.GT.0) WRITE (6,28)
   28 FORMAT (13X 15HBASIC DATA ONLY )
      IF (FLG07.GT.0) WRITE (6,32)
   32 FORMAT (13X 17HELLIPSE GENERATOR )
      IF (FLG08.GT.0) WRITE (6,36)
   36 FORMAT (13X 14HPRINT MATRICES )
      IF (FLG09.GT.0) WRITE (6,40)
   40 FORMAT (13X 10HOLD SEIDEL )
      IF (FLG10.GT.0) WRITE (6,44)
   44 FORMAT(13X,31HMODIFIED SEIDEL MATRIX SOLUTION)
      IF (FLG11.GT.0) WRITE (6,48)
   48 FORMAT (13X 18HPERTURBATIONS ONLY )
      IF (FLG12.GT.0) WRITE (6,52)
   52 FORMAT (13X 22HSOLVE POTENTIAL MATRIX )
      IF (FLG13.GT.0) WRITE (6,56)
   56 FORMAT (13X 47HMATRIX SOLUTION BY TRIANGULARIZATION   (SOLVIT))
      IF (FLG14.GT.0) WRITE (6,53)
   53 FORMAT ( 13X 30HPRESCRIBED TANGENTIAL VELOCITY )
      IF (FLG18.GT.0) WRITE (6,69)
   69 FORMAT ( 15X 22HWITH SURFACE VORTICITY )
      IF (FLG15.GT.0) WRITE (6,54)
   54 FORMAT (13X 12HSTRIP VORTEX )
      IF (FLG16.GT.0) WRITE (6,64)
   64 FORMAT (13X 40HOMIT AXI-SYMMETRIC UNIFORM FLOW SOLUTION )
      IF (FLG17.GT.0) WRITE (6,68)
   68 FORMAT (13X 36HOMIT CROSSFLOW UNIFORM FLOW SOLUTION )
```

```
      IF (FLG19.GT.0) WRITE (6,72)
   72 FORMAT (13X 20HPRESCRIBED VORTICITY)
      IF (FLG20.GT.0) WRITE (6,78)
   78 FORMAT (13X 15HTOTAL VORTICITY )
      IF (FLG21.GT.0)WRITE(6,77)
   77 FORMAT (13X 16HEXTRA CROSS FLOW)
      IF(FLG22.GT.0) WRITE(6,81)
   81 FORMAT(13X 82HGENERATED BOUNDARY CONDITIONS FOR 3 AXISYMMETRIC, 1
     1CROSS, AND 1 EXTRA CROSS FLOW.)
      IF (FLG19.GT.0) FLG18=1
      IF (FLG22.GT.0.AND.NB.NE.2) GO TO 82
      GO TO 84
   82 WRITE(6,83)
   83 FORMAT (128HO WHEN GENERATED RESEP BOUNDARY CONDITIONS ARE USED,NU
     1MBER OF BODIES MUST BE EXACTLY TWO.   YOU GOOFED.   EXECUTION TERM
     2INATING.)
      STOP
   84 IF (FLG22.GT.0.AND.NNU.GT.0)GO TO 86
      GO TO 88
   86 WRITE (6,87)
   87 FORMAT (S8HO GENERATED RESEP BOUNDARY CONDITIONS CANNOT HAVE NON-U
     1NIFORM FLOW INPUT.   EXECUTION TERMINATING.)
   88 IF (IPUVEL.NE.0)WRITE (6,73)
   73 FORMAT (13X 14HPUNCHED OUTPUT)
       WRITE ( 6,75 )  NIN
      IF (FLG18.LE.0.OR.FLG14.GT.0) GO TO 125
   75   FORMAT( 13X,58HINPUT TAPE NO. FOR COORDINATES AND NON-UNIFORM FLO
     1W ONLY = ,  I5    )
      WRITE (6,70)
   70 FORMAT (1HO//63H FLG14 MUST BE USED WITH FLG18 OR FLG19.  EXECUTIO
     1N TERMINATED. )
      STOP
  125 IF (NNU.LE.0.OR.FLG14.LE.0) GO TO 130
      WRITE (6,60)
   60 FORMAT (1HO// 49H COLUMNS 2 AND 14 OF FLAG CARD ARE BOTH NON-ZERO.
     A           / 43H ILLEGAL COMBINATION. EXECUTION TERMINATED. )
      STOP
C              * READ DATA AND SETUP FOR UNIFORM FLOW
  130 CALL BASIC1
C*** ***NSIGA AND NSIGC ULTIMATELY BECOME THE NUMBER OR RIGHT HAND SIDES
C*** ***IN AXISYMMETRIC FLOW AND CROSS FLOW RESPECTIVELY
  133 NSIGA=0
      IF (FLG03.GT.0.AND.FLG16.LE.0) NSIGA=1
      NSIGC=0
      IF (FLG04.GT.0.AND.FLG17.LE.0) NSIGC=1
      IF (FLG22.GT.0) GO TO 136
      DO 135 I = 1, 4
      NUNA(I) = 123456
  135 TYPEA(I) = 100.
      GO TO 138
C***   ***PREPARE NUNA AND TYPEA FOR NON-UNIFORM AXISYMMETRIC FLOW,GENER
C***   ***(RESEP) BOUNDARY CONDITIONS
  136 DO 137 I = 1,3
      NUNA(I) = I
  137 TYPEA(I) = 100.0
  138 CONTINUE
```

```
C*** ***IF FLG02 (NON-UNIFORM FLOW) IS NOT CHECKED INITIALLY, THE FLOW
C*** ***OF CONTROL WILL NEVER REACH BASIC2
      IF (NNU) 140,150,140
C             * READ DATA AND SETUP FOR NON-UNIFORM FLOW
  140 CALL BASIC2
  150 IF (NSEQ) 160,160,110
  160 REWIND 4
      IF (NSIGA.LE.4) GO TO 180
  170 WRITE (6,74)
   74 FORMAT (1H1 75HAXI-SYMMETRIC OR CROSSFLOW NON-UNIFORM FLOWS EXCEED
     A 4. EXECUTION TERMINATED )
      STOP
  180 IF (NSIGC.GT.4) GO TO 170
      IF (FLG15.LE.0.OR.FLG03.GT.0) GO TO 200
      WRITE (6,190)
  190 FORMAT (64H1STRIP RING VORTEX OPTION MUST USE SURFACE OF REVOLUTIO
     1N OPTION. / 22H EXECUTION TERMINATED. )
      STOP
  200 IF (FLG15.LE.0) GO TO 230
      J = 0
      DO 210 I = 1, NB
  210 IF (NLF(I).LE.0) J=J+1
      IF (NSIGA+J.LE.4) GO TO 230
      WRITE (6,220)
  220 FORMAT (68H1GENERATED STRIP VORTEX ONSET FLOWS (ONE FOR EACH LIFTI
     1NG BODY) PLUS / 34H INPUT NON-UNIFORM FLOWS EXCEED 4. /
     2 22HOEXECUTION TERMINATED. )
      STOP
  230 IF (FLG06.NE.0) GO TO 100
      CALL MATRIX
      RETURN
      END
```

```
$IBFTC BASI    DECK,DEBUG
C
      SUBROUTINE BASIC1
C
C               * READ DATA AND SETUP FOR UNIFORM FLOW
C
       COMMON / NBSAVE / NBOLD, NIN
       COMMON       HEDR(10)   ,CASE       ,NB         ,NNU
     1             ,FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2             ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3             ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4             ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5             ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
       DOUBLE PRECISION  HEDR, CASE
       INTEGER      FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1             ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2             ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3             ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4             ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
       COMMON       NT         ,NO(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1             ,NER1       ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2             ,NUNC(4)    ,TYPEC(4)   ,NLF(11)
       COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
       DIMENSION COSSQR(500), RHS(500)
       REAL         MN
C
       COMMON /CL/    X1(500),   Y1(500),   X2(500),   Y2(500),   DELS(500),
     1                SINA(500),COSA(500),XP(500),    YP(500)
       COMMON /TL/    TX1(500),  TY1(500),  NG(500),   TG(500),   ALFA(500),
     1                RSDS(500),CALF(500),SEQ1,       SEQ2,       NSEQ,
     2                CHORD,     TEMP(600),TCNST,     DUMMY(4915)
       INTEGER      BDN        ,SUBKS      ,SEQ1       ,SEQ2
       REAL         MX         ,MY         ,NG
C
C               * START
       NT=0
       K=0
       K2=NB
        IF( NIN .EQ. 0 )       NIN = 5
       IF (FLG05.NE.0) K2=NB+1
C              * MAJOR LOOP * NO. OF BODIES + OFF BODY POINTS
       DO 1000 L=1,K2
       READ (5,15) NN, MX, MY, THETA, ADDX, ADDY, SEQ2
   15  FORMAT ( 5X I5, 5F10.0, 16X I4)
       IF (SEQ2.LT.SEQ1) NSEQ=1
       SEQ1=SEQ2
       READ (5,16) BDN,SUBKS,NLF(L),XE,YE,SEQ2
   16  FORMAT (3(5X,I5),2F10.0,26X I4)
       IF (SEQ2.LT.SEQ1) NSEQ=1
       SEQ1=SEQ2
C*** ***NO(L) IS THE NUMBER OF POINTS ON BODY L, OR THE NUMBER OF OFF
```

```
C*** ***BODY POINTS FOR L = NB + 1
      ND(L)=NN
      M=NN-1
      IF (SUBKS) 140,150,140
  140  IF( L .NE. K2 )       GO TO 148
       NTIMES = NBOLD - NB
       IF( NTIMES .LE. 0 )       GO TO 148
       DO 145 NSKIPS = 1, NTIMES
  145  READ(13) ( TX1(I),I=1,NN), (TY1(I),I=1,NN )
  148  READ(13) ( TX1(I),I=1,NN), (TY1(I),I=1,NN )
      GO TO 220
  150 IF (BDN.EQ.0) GO TO 200
      IF (FLG07) 160,200,160
C               * ELLIPSE GENERATOR FOR X1 AND Y1
  160 IF (XE.EQ.0.0) XE=1.
      IF (YE.EQ.0.0) YE=1.
      EN=M
      DGAM=3.141593  /EN
      GAM=3.141593
      DO 170 I=1,NN
      TX1(I)=XE*COS(GAM)
      TY1(I)=YE*SIN(GAM)
  170 GAM=GAM-DGAM
      GO TO 210
C               * READ X1 AND Y1 FROM INPUT CARDS
  200 DO 204 I=1,NN,6
      READ(NIN,20)TX1(I),TX1(I+1),TX1(I+2),TX1(I+3),TX1(I+4),TX1(I+5),
     1            SEQ2
   20 FORMAT ( 6F10.0, 16X I4)
      IF (SEQ2.LT.SEQ1) NSEQ=1
  204 SEQ1=SEQ2
      DO 206 I=1,NN,6
      READ(NIN,20)TY1(I),TY1(I+1),TY1(I+2),TY1(I+3),TY1(I+4),TY1(I+5),
     1            SEQ2
      IF (SEQ2.LT.SEQ1) NSEQ=1
  206 SEQ1=SEQ2
C               * SAVE X1 AND Y1 FOR SUBCASE
  210 WRITE (13) (TX1(I),I=1,NN),(TY1(I),I=1,NN)
C               * BASIC DATA CALC. AND PRINT (UNTRANSFORMED COORDINATES)
  220 WRITE (6,24) HEDR, NN, MX, MY, THETA, ADDX, ADDY, XE, YE
   24 FORMAT ( 1H1 25X 26HDOUGLAS  AIRCRAFT  COMPANY /
     1         28X 21HLONG  BEACH  DIVISION /// 5X 10A6 //
     2          8X 4HNN = I4, 15X 4HMX = F13.7, 4X 4HMY = F13.7 /
     3          5X 7HTHETA = F13.7, 4X 6HADDX = F13.7, 2X 6HADDY =F13.7/
     4          8X 4HXE = F13.7, 6X 4HYE = F13.7 )
      IF (BDN) 240,230,240
  230 WRITE (6,28) (I, TX1(I), TY1(I), I=1,NN)
   28 FORMAT ( 1HO 4X 36HOFF-BODY COORDINATES (UNTRANSFORMED) //
     1         10X 5HX-OFF  9X 5HY-OFF // (1H  I3, 2F14.7))
      GO TO 270
  240 SUMS=0.0
      DO 250 I=1,M
      T1=TX1(I+1)-TX1(I)
      T2=TY1(I+1)-TY1(I)
      X2(I)=(TX1(I+1)+TX1(I))/2.
      Y2(I)=(TY1(I+1)+TY1(I))/2.
```

```
      DELS(I)=SQRT(T1*T1+T2*T2)
      SUMS=SUMS+DELS(I)
      RSDS(I)=SUMS
  250 ALFA(I) = ATAN2( T2, T1 )
      MA=M-1
      DO 260 I=1,MA
  260 DALF(I) = ( ALFA(I+1)-ALFA(I) ) * 57.29578
      WRITE (6,36) BDN,TX1(1),TY1(1),X2(1),Y2(1),DELS(1),RSDS(1)
   36 FORMAT ( 1HO 4X 35HON-BODY COORDINATES (UNTRANSFORMED) /
     1          9H BODY NO. I3// 11X 2H X 13X 1HY 11X 7HDELTA S 7X
     2          5HSUMDS 8X 7HD ALPHA //  1H 3H  1,2F14.7 / 4X 4F14.7)
      WRITE (6,40) (I, TX1(I), TY1(I), DALF(I-1), X2(I), Y2(I),
     1            DELS(I), RSDS(I), I=2,M) , NN, TX1(NN), TY1(NN)
   40 FORMAT ( 1H  I3, 2F14.7, 28X F14.7 / 4X 4F14.7)
C               * ADJUST COORDINATES (TRANSFORMED)
  270 IF (MX) 280,300,280
  280 DO 290 I=1,NN
  290 TX1(I)=TX1(I)*MX
  300 IF (MY) 310,330,310
  310 DO 320 I=1,NN
  320 TY1(I)=TY1(I)*MY
  330 IF (THETA) 340,360,340
  340 THETA = THETA / 57.29578
      CSTHT = COS(THETA)
      SNTHT = SIN(THETA)
      DO 350 I=1,NN
      T1=TX1(I)
      TX1(I)=T1*CSTHT+TY1(I)*SNTHT
  350 TY1(I)=TY1(I)*CSTHT-T1*SNTHT
  360 IF (ADDX) 370,390,370
  370 DO 380 I=1,NN
  380 TX1(I)=TX1(I)+ADDX
  390 IF (ADDY) 400,420,400
  400 DO 410 I=1,NN
  410 TY1(I)=TY1(I)+ADDY
  420 IF (CHORD .EQ. 1.0 .OR. CHORD .EQ. 0.0 )GO TO 450
  430 DO 440 I=1,NN
      TX1(I)=TX1(I)/CHORD
  440 TY1(I)=TY1(I)/CHORD
  450 IF (MN) 460,475,460
  460 SRM=SQRT(1.-MN*MN)
      DO 470 I=1,NN
  470 TX1(I)=TX1(I)/SRM
C               * SHIFT X1 AND Y1 TO COMMON /CL/
C*** ***IF BDN = 0.0, OFF BODY POINTS ARE BEING OPERATED ON
  475 IF (BDN) 500,480,500
  480 DO 490 I=1,NN
      XP(I)=TX1(I)
  490 YP(I)=TY1(I)
      WRITE (12) (XP(I),I=1,NN),(YP(I),I=1,NN)
      GO TO 1000
  500 DO 510 I=1,NN
      K=K+1
      X1(K)=TX1(I)
  510 Y1(K)=TY1(I)
      NT=NT+M
```

```
 1000 CONTINUE
      REWIND 13
      IF (FLG14.LE.0) GO TO 2000
      IF (FLG14.LE.NB) GO TO 1050
      WRITE (6,1025)
 1025 FORMAT (45H1VALUE OF FLG14 EXCEEDS NO. OF BODIES.  STOP. )
      STOP
 1050 IF (FLG14.NE.NB) GO TO 1075
      NMA=0
      GO TO 1150
 1075 L = NB-FLG14
      NMA = -L
      DO 1100 I = 1, L
C*** ***NMA BECOMES THE NUMBER OF ELEMENTS ON THE 1ST L BODIES (IE THOSE
C*** ***NOT HAVING AN INPUT VORTICITY OR VELOCITY)
 1100 NMA = NMA + ND(I)
C*** ***NR BECOMES THE NUMBER OF ELEMENTS RECEIVING AN INPUT VORTICITY
C*** ***OR VELOCITY
 1150 NR = NT-NMA
      IF (TCNST.GT.0.)GO TO 2000
      DO 1200 I = 1,NR,6
      READ (5,20) TG(I),TG(I+1),TG(I+2),TG(I+3),TG(I+4),TG(I+5),SEQ2
      IF (SEQ2.LT.SEQ1) NSEC=1
 1200 SEQ1=SEQ2
C                * CALC. PARAMETERS WITH TRANSFORMED COORDINATES AND
C                  MACH NO. ADJUSTMENT
 2000 N1=0
      J1=0
      DO 2500 K=1,NB
      M1=N1+1
      N1=N1+ND(K)-1
      DO 2400 J=M1,N1
      J1=J1+1
      T1=X1(J1+1)-X1(J1)
      T2=Y1(J1+1)-Y1(J1)
      X2(J)=(X1(J1+1)+X1(J1))/2.
      Y2(J)=(Y1(J1+1)+Y1(J1))/2.
      DELS(J)=SQRT(T1*T1+T2*T2)
      COSA(J)=T1/DELS(J)
 2400 SINA(J)=T2/DELS(J)
 2500 J1=J1+1
C                * SAVE PARAMETERS
      WRITE (12) (X1(I),I=1,J1),(Y1(I),I=1,J1),(X2(I),I=1,NT)
     1           ,(Y2(I),I=1,NT),(DELS(I),I=1,NT)
      REWIND 12
C                * SAVE SINA AND COSA ON TAPE 4 FOR CALC. OF MATRIX
C                  SOLUTION (RIGHT HAND MATRIX)
      WRITE (4)  (SINA(I),I=1,NT),(COSA(I),I=1,NT)
      IF ( FLG14) 2600,2600,2550
 2550 IF (TCNST.GT.0.0) WRITE(4) (TCNST,I=1,NR)
      IF (TCNST.LE.0.) WRITE(4) (TG(I), I=1,NR)
 2600 IF (FLG22.LE.0) RETURN
      NPB1 = ND(1) - 1
      DO 2700 I = 1,NPB1
      COSSQR(I) = COSA(I)**2
 2700 RHS(I) = 2.0 * ABS( SINA(I) * COSA(I) )
      WRITE(4) ( COSSQR(I),I=1,NPB1), (RHS(I),I = 1,NPB1)
      RETURN
      END
```

```
$IBFTC BAS2    DECK
C
      SUBROUTINE BASIC2
C
C               * READ DATA AND SETUP FOR NON-UNIFORM FLOWS
C
       COMMON / NBSAVE / NBOLD, NIN
       COMMON       HEDR(10)   ,CASE       ,NB         ,NNU
     1             ,FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2             ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3             ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4             ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5             ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
       DOUBLE PRECISION  HEDR, CASE
       INTEGER      FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1             ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2             ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3             ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4             ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
       COMMON       NT         ,ND(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1             ,NER1       ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2             ,NUNC(4)    ,TYPEC(4)   ,NLF(11)
       COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
       REAL         MN
C
       COMMON /CL/    X1(500),   Y1(500),   X2(500),   Y2(500),   DELS(500),
     1                SINA(500),COSA(500),XP(500),   YP(500)
       COMMON /TL/    TX1(500),  TY1(500),  NG(500),   TG(500),   ALFA(500),
     1                RSDS(500),DALF(500),SEQ1,      SEQ2,      NSEQ,
     2                CHORD,     TEMP(600),TCNST,    DUMMY(4915)
       INTEGER      BDN         ,SEQ1       ,SEQ2
       REAL         MX          ,MY         ,NG
C
C               * START
C               * SETS OF NON-UNIFORM FLOW LOOP
       NSIGEC = 0
       KA=0
       KC=0
       KEC = 0
        IF( NIN .EQ. 0 )        NIN = 5
       DO 1000 L=1,NNU
       READ (5,20) NUN,MSF,TYPE,FG,SEQ2
   20  FORMAT ( 2(5X I5), 2F10.0, 36X I4 )
       IF (SEQ2.LT.SEQ1) NSEQ=1
       SEQ1=SEQ2
       IF (MSF.EQ.1.OR.MSF.EQ.2.OR.MSF.EQ.5) GO TO 30
       KA=KA+1
       NSIGA=NSIGA+1
       NUNA(KA)=NUN
       TYPEA(KA)=TYPE
   30  IF (MSF.EQ.0.OR.MSF.EQ.2.OR.MSF.EQ.4) GO TO 35
```

```
      KC=KC+1
      NSIGC=NSIGC+1
      NUNC(KC)=NUN
      TYPEC(KC)=TYPE
   35 IF (MSF.LT.2.OR.MSF.EQ.3) GO TO 40
      KEC = KEC + 1
      NSIGEC = NSIGEC + 1
      NUNEC(KEC) = NUN
      TYPEEC(KEC) = TYPE
   40 IF (TYPE) 50,70,70
C                 * COMPUTED TYPE
   50 DO 60 I=1,NT
      NG(I)=Y2(I)
   60 TG(I)=FG-X2(I)
      GO TO 110
C                 * (X,Y) OR (N,T) TYPE * READ INPUT
   70 DO 90 I=1,NT,6
      READ(NIN,80)NG(I),NG(I+1),NG(I+2),NG(I+3),NG(I+4),NG(I+5),SEQ2
   80 FORMAT ( 6F10.0, 16X I4)
      IF (SEQ2.LT.SEQ1) NSEQ=1
   90 SEQ1=SEQ2
      DO 100 I=1,NT,6
      READ(NIN,80)TG(I),TG(I+1),TG(I+2),TG(I+3),TG(I+4),TG(I+5),SEQ2
      IF (SEQ2.LT.SEQ1) NSEQ=1
  100 SEQ1=SEQ2
  110 IF (TYPE) 120,140,120
  120 DO 130 I = 1, NT
      T1=NG(I)
      NG(I)= T1*SINA(I)-TG(I)*COSA(I)
  130 TG(I)= T1*COSA(I)+TG(I)*SINA(I)
C                 * WRITE BASIC DATA OUTPUT
  140 WRITE (6,150) HEDR,MSF,TYPE,FG,NUN,(NG(I),I=1,NT)
  150 FORMAT ( 1H1 25X 26HDOUGLAS  AIRCRAFT  COMPANY /
     1         28X, 21HLONG  BEACH  DIVISION /// 5X 10A6 //
     2         6X 5HMSF = I4, 10X 6HTYPE = F10.4, 10X 4HFG = F13.7 /
     3          1HO, 4X, 20HNON-UNIFORM FLOW NO.I6 /
     4          1HO, 4X, 10HLIST OF NG// (1H 6F14.7))
      WRITE (6,160) (TG(I), I = 1, NT)
  160 FORMAT (1HO 4X 10HLIST OF TG // (1H 6F14.7))
      WRITE (4) MSF,(NG(I),I=1,NT),(TG(I),I=1,NT)
 1000 CONTINUE
      RETURN
      END
```

```
$IBFTC MATRX   DECK,DEBUG

C
      SUBROUTINE MATRIX
C
C               * COMPUTE MATRIX A,B,Z OR X,Y,Z
C
      COMMON       HEDR(10)  ,CASE       ,NB         ,NNU
     1            ,FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2            ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3            ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4            ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5            ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER      FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1            ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2            ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3            ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4            ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON       NT        ,NC(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1            ,NER1      ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2            ,NUNC(4)   ,TYPEC(4)   ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      REAL         MN
      LOGICAL  PF
C
      COMMON /ECF/ ECX(500), ECY(500), ECZ(500)
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1             SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TL/   A(500),   B(500),   AX(500),  AY(500),  AZ(500),
     1             CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),
     2             VN(500,4),VT(500,4),BON,      YZERO,    IAC,
     3             I,        J,        J1,       SJ,       DS,
     4             DX,       DY,       NI,       XJ,       YJ,
     5             XK,       EEK,      EKK,      K,        PF
C
C               * START
C               * INITIALIZE
      L1=NT
      BON=0.0
      YZERO=0.0
C***   ***TEST TYPE OF FLOW AND SET INDICATORS IAC AND IEC
C***   ***CROSS FLOW ONLY                          IAC = -1  IEC = -1
C***   ***AXISYMMETRIC FLOW CNLY                   IAC = +1  IEC = -1
C***   ***EXTRA CROSS FLOW CNLY                    IAC =  0  IEC =  0
C***   ***CROSS FLOW AND AXISYMMETRIC FLOW         IAC =  0  IEC = -1
C***   ***CROSS FLOW AND EXTRA CROSS FLOWW         IAC = -1  IEC = +1
C***   ***AXISYMMETRIC AND EXTRA CROSS FLOW IAC = +1  IEC = +1
C***   ***AXISYMMETRIC, CROSS, AND EXTRA CROSS  IAC=0 IEC = +1
      IF(FLG03)30,10,30
   10 IF(FLG04)25,15,25
   15 IAC = 0
```

```
      IEC = 0
      GO TO 55
   25 IAC = -1
      GO TO 45
   30 IF(FLG04)35,40,35
   35 IAC = 0
      GO TO 45
   40 IAC = 1
   45 IF(FLG21)50,53,50
   50 IEC = +1
      GO TO 55
   53 IEC = -1
   55 ASSIGN 110 TO K1
      IF (FLG15.GT.0) ASSIGN 102 TO K1
   60 DO 65 I =1,L1
      DO 65 J = 1, NB
      VN(I,J) = 0.
   65 VT(I,J) = 0.
C               *  I MIDPOINT LOOP
      DO 400 I=1,L1
C               *  J ELEMENT LOOP
C                  J1 IS THE COORDINATE COUNTER
C                  J IS THE ELEMENT COUNTER
      J1=0
      N1=0
      DO 110 K=1,NB
      M1=N1+1
      N1=N1+ND(K)-1
      DO 100 J=M1,N1
      J1=J1+1
      PF = FLG18.GT.0.AND.J.GT.NMA.OR.FLG20.GT.0
C               * COMPUTE X,Y,Z MATRICES
      CALL XYZ
  100 CONTINUE
      GO TO K1, (102,110)
  102 IF (NLF(K).GT.0) GO TO 110
      IF (BON.EQ.0.) GO TO 105
      DO 103 J = M1, N1
      VN(I,K) = VN(I,K)+AXV(J)
  103 VT(I,K) = VT(I,K)+AYV(J)
      GO TO 110
  105 DO 106 J = M1, N1
      VN(I,K) = VN(I,K) +AXV(J)*SINA(I) - AYV(J)*COSA(I)
  106 VT(I,K) = VT(I,K) +AXV(J)*COSA(I) + AYV(J)*SINA(I)
  110 J1=J1+1
      IF (BON) 120,210,120
C               * SAVE X,Y,Z ON TAPE *OFF BODY POINTS
C***    ***SAVE X,Y,Z ON TAPE    *    OFF BODY POINTS
C***    ***AXISYMMETRIC FLOW     *    TAPE 9
C***    ***CROSS FLOW    *    TAPE 10
C***    ***EXTRA CROSS FLOW    *    TAPE 8
  120 IF(IEC.EQ.-1)GO TO 125
  122 WRITE(8) (ECX(J),J=1,NT), (ECY(J),J=1,NT), (ECZ(J),J=1,NT)
      IF (IEC) 125,400,125
  125 IF(IAC) 140,130,130
  130 WRITE (91 (AX(J),J=1,NT),(AY(J),J=1,NT),(AZ(J),J=1,NT)
```

```
      IF (IAC) 400,140,400
  140 WRITE (10)(CX(J),J=1,NT),(CY(J),J=1,NT),(CZ(J),J=1,NT)
      GO TO 400
C***   ***SAVE ON TAPE   *   ON BODY
C***   ***AXISYMMETRIC FLOW   *   TAPE 9
C***   ***CROSS FLOW   *   TAPE 10
C***   ***EXTRA CROSS FLOW   *   TAPE 8
C***   ***IEC = -1 MEANS NO EXTRA CROSS FLOW
  210 IF (IEC.EQ.-1) GO TO 240
  220 DO 230 J = 1,NT
      A(J) = -ECX(J) * SINA(I) + ECY(J) * COSA(I)
  230 B(J) = ECX(J) * COSA(I) + ECY(J) * SINA(I)
      WRITE (8) (A(J),J=1,NT), (B(J),J=1,NT), (ECZ(J),J=1,NT)
      IF ( IEC ) 240,400,240
  240 IF (IAC) 310,250,250
  250 DO 260 J=1,NT
      A(J)=-AX(J)*SINA(I)+AY(J)*COSA(I)
  260 B(J)=AX(J)*COSA(I)+AY(J)*SINA(I)
      WRITE (9) (A(J),J=1,NT),(B(J),J=1,NT),(AZ(J),J=1,NT)
  270 IF (IAC) 400,310,400
  310 DO 320 J=1,NT
      A(J)=-CX(J)*SINA(I)+CY(J)*COSA(I)
  320 B(J)=CX(J)*COSA(I)+CY(J)*SINA(I)
      WRITE (10) (A(J),J=1,NT),(B(J),J=1,NT),(CZ(J),J=1,NT)
  400 CONTINUE
      IF (FLG15.LE.0) GO TO 1400
      IF (BON.NE.0.) GO TO 1200
C*** ***ON BODY
      READ (4)
      IF (NNU.LE.0) GO TO 600
      DO 500 I = 1, NNU
      READ (4) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
  500 WRITE (3) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
      REWIND 3
      REWIND 4
      READ (4)
  600 N=NSIGA-1
      IF (FLG16.GT.1) N=NSIGA
C*** ***N = 0 MEANS 1 RHS ONLY  NO NON-UNIFORM FLOW
      IF (N.EQ.0) GO TO 800
      DO 700 I = 1, N
      READ (3) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
  700 WRITE(4) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
  800 M=0
      DO 900 J = 1, NB
      IF (NLF(J).GT.0) GO TO 900
      NSIGA=NSIGA+1
      NNU=NNU+1
      WRITE (4) M,(VN(I,J),I=1,NT),(VT(I,J),I=1,NT)
  900 CONTINUE
      M=NSIGC-1
      IF (FLG17.GT.0) M=NSIGC
      IF (M.LE.0) GO TO 1100
      DO 1000 I = 1, M
      READ (3) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
 1000 WRITE (4) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
```

```
 1100 REWIND 3
      GO TO 1400
C*** ***OFF BODY
 1200 DO 1300 J = 1, NB
      IF (NLF(J).GT.0) GO TO 1300
      WRITE(4)  (VN(I,J), I = 1,L1), (VT(I,J),I = 1,L1)
 1300 CONTINUE
C                * TEST IF OFF BODY COMPLETED
C                * TEST IF OFF BODY
 1400 IF (FLGO5.EQ.0.OR.BON.NE.0.) GO TO 1600
C                * INITIAL FOR OFF BODY * THEN RE-ENTER I,J LOOPS
      BON=1.
      L1=ND(NB+1)
      DO 1500 I = 1, L1
      X2(I) = XP(I)
 1500 Y2(I) = YP(I)
      GO TO 60
 1600 REWIND 9
      REWIND 8
      REWIND 10
      REWIND 4
      RETURN
      END
```

```
$IBFTC XYZ      CECK,DEBUG
C
      SUBROUTINE XYZ
C
C               * CONTROL FOR X,Y,Z MATRICES COMPUTATION
C
      COMMON      HEDR(10)   ,CASE       ,NB         ,NNU
     1            ,FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2            ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3            ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4            ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5            ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER     FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1            ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2            ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3            ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4            ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON      NT         ,ND(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1            ,NER1      ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2            ,NUNC(4)   ,TYPEC(4)   ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      REAL        MN
      LOGICAL PF
C
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TL/   A(500),   B(500),   AX(500),  AY(500),  AZ(500),
     1              CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),
     2              VN(500,4),VT(500,4),BON,      YZERO,    IAC,
     3              I,        J,        J1,       SJ,       DS,
     4              DX,       DY,       NI,       XJ,       YJ,
     5              XK,       EEK,      EKK,      K,        PF
C
C               * START
      IF (BON) 100,10,100
   10 IF (J-I) 110,20,110
C               * J EQUAL I PATH
   20 T1=.5*DELS(J)
      SJ=T1/Y2(J)
      IF (SJ-.08) 30,30,40
   30 CALL XYZ1
      GO TO 1000
   40 SJ=.08
      CALL XYZ1
      NI=33
      T2=.08*Y2(J)
      DS=(T1-T2)/32.
      DX=DS*COSA(J)
      DY=DS*SINA(J)
      XJ=X2(J)+T2*COSA(J)-DX
```

```
      YJ=Y2(J)+T2*SINA(J)-DY
      CALL XYZ2
      GO TO 300
C                 * INITIAL Y COORDINATE MID-POINT FOR ZERO TEST
  100 YZERO=Y2(I)-.000001
C                 * J NOT EQUAL I PATH
C                 * COMPUTE MINIMUM DISTANCE TO I MIDPOINT
  110 D1=(X2(I)-X1(J1))**2+(Y2(I)-Y1(J1))**2
      D2=(X2(I)-X2(J))**2+(Y2(I)-Y2(J))**2
      D3=(X2(I)-X1(J1+1))**2+(Y2(I)-Y1(J1+1))**2
      IF (D1-D2) 130,130,120
  120 IF (D2-D3) 150,150,140
  130 IF (D1-D3) 160,160,140
  140 DM=SQRT(D3)
      GO TO 170
  150 DM=SQRT(D2)
      GO TO 170
  160 DM=SQRT(D1)
C                 * COMPUTE NO. OF INTERVALS(NI) AND DELTA S (DS)
C                   FOR SIMPSON RULE INTEGRATION
  170 IF (DM.EQ.0.0) GO TO 200
      NI=8.*DELS(J)/DM+0.9
      IF (NI) 180,180,190
  180 NI=3
      DS=DELS(J)/2.
      GO TO 220
  190 NI=NI+NI
      IF (NI-128) 210,200,200
  200 NI=129
      DS=DELS(J)/128.
      GO TO 220
  210 XNI=NI
      DS=DELS(J)/XNI
      NI=NI+1
  220 DX=DS*COSA(J)
      DY=DS*SINA(J)
  300 XJ=X1(J1)-DX
      YJ=Y1(J1)-DY
      CALL XYZ2
 1000 RETURN
      END
```

```
$IBFTC XYZ1    DECK,DEBUG
C
      SUBROUTINE XYZ1
C
C               * COMPUTE X,Y,Z MATRICES FOR SJ LESS THAN OR EQUAL .08
C
      COMMON      HEDR(10)  ,CASE       ,NB         ,NNU
     1           ,FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2           ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3           ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4           ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5           ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COUBLE PRECISICN  HEDR, CASE
      INTEGER     FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1           ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2           ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3           ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4           ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMCN      NT        ,ND(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1           ,NER1      ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2           ,NUNC(4)   ,TYPEC(4)   ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      COMMON /ECF/ ECX(500), ECY(500), ECZ(500)
      REAL         MN
      LOGICAL PF
C
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TL/   A(500),   B(500),   AX(500),  AY(500),  AZ(500),
     1              CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),
     2              VN(500,4),VT(500,4),BON,      YZERO,    IAC,
     3              I,        J,        J1,       SJ,       DS,
     4              DX,       DY,       NI,       XJ,       YJ,
     5              XK,       EEK,      EKK,      K,        PF
C
C               * START
C               * INITIALIZE
      T1=SJ*SJ
      T2=ALOG(SJ/8.)
      T3=SINA(J)*SINA(J)
      T4=T2+T3
      T5=.6666667  *T3
      T6=T5*T3
      T7=SJ+SJ
      T8=T7+T7
       T9=6.283185 *COSA(J)
      T10=6.283185 *SINA(J)
      T11=T1*SJ
      T14 = .3333333 * (16.0 + 6.0 * T3) + 2.0 * T2
      IF (IEC.EQ.-1) GO TO 15
C***   ***EXTRA CROSS FLOW   1ST TERM OF X(I,I), Y(I,I), Z(I,I)
```

```
   10 ECX(J) = 6.283185 * SINA(J) + 2.0 * SINA(J) * COSA(J) * SJ
      ECY(J) =-6.283185 * COSA(J) + SJ * T14
      ECZ(J) = -8.0 * (1.666667 + T2) * SJ
      IF (IEC) 15,1000,15
   15 IF(PF) GO TO 25
      IF (IAC) 30,20,20
C                * AXIS FLOW
   20 AX(J)=T10+SINA(J)*COSA(J)*(T7+(T4+2.166667  )*T11/12.)
      AY(J)=T7*T4-T9-(1.+T2-T3-T6)*T11/8.
      T12=T1+T1
      AZ(J)=Y2(J)*T8*(1.-T2+T1*(2.-T12+3.*T2*(1.+T12))/144.)
   25 IF (IAC) 30,30,100
C                * CROSS FLOW
   30 T13=T1/16.
      CX(J)=T10+2.*SINA(J)*SJ*COSA(J)*(1.-T13*(3.-T5+T2+T2))
      CY(J)=-T9+T7*(2.+T4+T13*(1.-4.777778  *T3+T6+T2*(3.-2.666667  *
     1           T3)))
      CZ(J)=-T8*(1.+T2-T13*(1.111111  *T3+T2*(T5-1.)))
  100 IF (PF) GO TO 200
      IF (FLG15.LE.0.OR.NLF(K).GT.C) GO TO 1000
  200 AXV(J) = T9+T7*(T2-T3)+T11*(T2*(12.*T3-9.)
     1        -9. + 23.*T3 - 6.*T3*T3) / 72.
      AYV(J) = T10 + 2.*COSA(J)*SINA(J)*(SJ-T11*(6.*T2+9.-2.*T3)/48. )
      IF (.NOT.PF) GO TO 1000
      AX(J) = AXV(J)
      AY(J) = AYV(J)
 1000 RETURN
      END
```

```
$IBFTC XYZ2    DEBUG,DECK
C
      SUBROUTINE XYZ2
C
C               * COMPUTE X,Y,Z MATRICES USING SIMPSON RULE INTEGRATION
C
      COMMON      HEDR(10)  ,CASE      ,NB        ,NNU
     1           ,FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07
     2           ,FLG08     ,FLG09     ,FLG10     ,FLG11     ,FLG12
     3           ,FLG13     ,FLG14     ,FLG15     ,FLG16     ,FLG17
     4           ,FLG18     ,FLG19     ,FLG20     ,FLG21     ,FLG22
     5           ,FLG23     ,FLG24     ,FLG25     ,FLG26     ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER     FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07
     1           ,FLG08     ,FLG09     ,FLG10     ,FLG11     ,FLG12
     2           ,FLG13     ,FLG14     ,FLG15     ,FLG16     ,FLG17
     3           ,FLG18     ,FLG19     ,FLG20     ,FLG21     ,FLG22
     4           ,FLG23     ,FLG24     ,FLG25     ,FLG26     ,FLG27
      COMMON      NT        ,ND(11)    ,MN        ,NUNA(4)   ,TYPEA(4)
     1           ,NER1      ,NER2      ,NMA       ,NSIGA     ,NSIGC
     2           ,NUNC(4)   ,TYPEC(4)  ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      COMMON /ECF/ ECX(500), ECY(500), ECZ(500)
      REAL        MN
      LOGICAL PF
C
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TL/   A(500),   B(500),   AX(500),  AY(500),  AZ(500),
     1              CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),
     2              VN(500,4),VT(500,4),BON,      YZERO,    IAC,
     3              I,        J,        J1,       SJ,       DS,
     4              DX,       DY,       NI,       XJ,       YJ,
     5              XK,       EEK,      EKK,      K,        PF
C
C               * START
C               * INITIALIZE
      DEBUG NI,I,DX,DY,YJ,X2(I),XJ,Y2(I)
      ASSIGN 570 TO K1
      IF (FLG15.LE.0.OR.NLF(K).GT.0) GO TO 15
   10 ASSIGN 420 TO K1
   15 S2=.6666667  *DS
      S1 = .3333333 * DS
      S3 = 8.0/3.0 * S1
      S5 = .3333333 * S1
      S4 = S2+S2
      T1=Y2(I)*Y2(I)
      ASSIGN 28 TO K2
      ASSIGN 410 TO K3
      ASSIGN 570 TO K4
      IF (.NOT.PF) GO TO 16
```

```
      ASSIGN 110 TO K2
      ASSIGN 420 TO K3
      ASSIGN 560 TO K4
C               * NO. OF INTERVAL LOOP
   16 DO 1000 IS=1,NI
      XJ=XJ+DX
      YJ=YJ+DY
      T2=YJ*YJ
      T3=X2(I)-XJ
      T4=T3*T3
      T5=(Y2(I)+YJ)**2
      T6=T4+T5
      T7=SQRT(T6)
      T8=T2+T4
      IF(T8.EQ.0.) T8=1.E-6
      T9=(Y2(I)-YJ)**2
      T10=T9+T4
      T21 = SQRT( T1 / T8 )
C               * COMPUTE ELLIPIC INTEGRAL
      XK=4.*YJ*Y2(I)/T6
      CALL ELIP
      IF ( IEC ) 18,575,18
   18 IF (IAC) 200,20,20
C               * AXIS FLOW
   20 T11=YJ/T7
      IF ( T21.LT.0.01) GO TO 24
      T12 = YJ/Y2(I)
      FV2 = (EKK+EEK*(T1-T8)/T10)/T7
      FV3 = Y2(I)/T10 * T3/T7 * EEK
      F1 = FV3*T12
      F2 = FV2*T12
      FV4 = FV2*T3/Y2(I)
      F3=T11*EKK
      GO TO 26
   24 FV2 = 0.
      FV3 = 0.
      FV4 = 0.
C***   ***SMALL Y FORMULAS AXISYMMETRIC FLOW
      T23 = T1 / T8**2
      T24 = 2.0 * T4 - T2
      F1 = ( (   1.570796  * YJ * T3 ) / ( T8**1.5      ) ) *
     1  ( 1.0 + ( .75 * ( 3.0 * T2 - 2.0 * T4 ) * T23 ) )
      F2 = (   1.570796  * YJ * Y2(I) ) * ( T24 / (T8**2.5      ) )
      F3 = 1.570796 * YJ * ( 1.0 + (.25 * T23 * (-T24) ) ) / SQRT(T8 )
   26 CONTINUE
      GO TO K2,(28,110)
C               * SIMPSON RULE INTEGRATION
   28 IF (IS-1) 30,30,40
C               * FIRST PASS
   30 AXS=F1
      AYS=F2
      AZS=F3
      IA=0
      GO TO 110
   40 IF (IS-NI) 50,80,50
   50 IF (IA) 70,60,70
```

```
C                * EVEN PASS
   60 AXS=AXS+4.*F1
      AYS=AYS+4.*F2
      AZS=AZS+4.*F3
      IA=1
      GO TO 110
C                * ODD PASS
   70 AXS=AXS+F1+F1
      AYS=AYS+F2+F2
      AZS=AZS+F3+F3
      IA=0
      GO TO 110
C                * LAST PASS
   80 IF (J-I) 100,90,100
   90 IF (BON.NE.0.0) GO TO 100
      AX(J)=AX(J)-S4*(AXS+F1)
      AY(J)=AY(J)-S2*(AYS+F2)
      AZ(J)=AZ(J)+S4*(AZS+F3)
      GO TO 110
  100 AX(J)=-S4*(AXS+F1)
      AY(J)=-S2*(AYS+F2)
      AZ(J)=S4*(AZS+F3)
  110 IF (IAC) 200,200,400
C                * CROSS FLOW
  200 IF (T21.LT.0.04) GO TO 220
      T12 = T1 + T8
      F1=T3/Y2(I)*(EKK-EEK*T12/T10)/T7
      F2=(EEK*(T8*T8+T1*(T4-T2))/T10-EKK*T8)/T1/T7
      F3=T7*(EKK*T12/T6-EEK)/T1
      GO TO 230
C***   ***SMALL Y FORMULAS    *    CROSS FLOW
  220 T23 = T1 / T8**2
      T29 = ( 1.570796 * T2 ) / ( T8**1.5       )
      T26 = 4.0 * T4 - T2
      T31 = T26 * T23
      F1 = ( (-4.712389) * T2 * T3 * Y2(I) ) / ( T8**2.5        )
      F2 = T29 * ( 1.0 - (1.125 * T31 ) )
      F3 = T29 * ( 1.0 - (.375 * T31) )
C                * SIMPSON RULE INTEGRATION
  230 IF (IS-1) 240,240,250
C                * FIRST PASS
  240 CXS=F1
      CYS=F2
      CZS=F3
      IC=0
      GO TO 400
  250 IF (IS-NI) 260,290,260
  260 IF (IC) 280,270,280
C                * EVEN PASS
  270 CXS=CXS+4.*F1
      CYS=CYS+4.*F2
      CZS=CZS+4.*F3
      IC=1
      GO TO 400
C                * ODD PASS
  280 CXS=CXS+F1+F1
```

```
      CYS=CYS+F2+F2
      CZS=CZS+F3+F3
      IC=0
      GO TO 400
C                 * LAST PASS
  290 IF (J-I) 310,300,310
  300 IF (BON.NE.0.0) GO TO 310
      CX(J)=CX(J)+S2*(CXS+F1)
      CY(J)=CY(J)+S2*(CYS+F2)
      CZ(J)=CZ(J)+S2*(CZS+F3)
      GO TO 400
  310 CX(J)=S2*(CXS+F1)
      CY(J)=S2*(CYS+F2)
      CZ(J)=S2*(CZS+F3)
  400 GO TO K3,(410,420)
  410 GO TO K1, (570,420)
C*** ***FLOW OF CONTROL REACHES HERE FOR (PF=TRUE) OR ( (FLG15 GT 0 AND
C*** ***NLF LE 0 (LIFTING BODY)) AND (I NE J ON BODY OR ANY OFF BODY) )
  420 FV1 = (T2-T1)/T7 * EEK/T10
      IF (IS.GT.1) GO TO 440
C                 * FIRST PASS
      AX1 = FV1
      AX2 = FV2
      AY1 = FV3
      AY2 = FV4
      IV=0
      GO TO 570
  440 IF (IS.EQ.NI) GO TO 500
      IF (IV) 460,450,460
C                 * EVEN PASS
  450 AX1 = AX1+4.*FV1
      AX2 = AX2+4.*FV2
      AY1 = AY1+4.*FV3
      AY2 = AY2+4.*FV4
      IV=1
      GO TO 570
C                 * ODD PASS
  460 AX1 = AX1+FV1+FV1
      AX2 = AX2+FV2+FV2
      AY1 = AY1+FV3+FV3
      AY2 = AY2+FV4+FV4
      IV = 0
      GO TO 570
C                 * LAST PASS
  500 IF (J-I) 540,520,540
  520 IF (BON.NE.0.) GO TO 540
      AXV(J) = AXV(J) - S4*(AX1+FV1) - S2*(AX2+FV2)
      AYV(J) = AYV(J) - S4*(AY1+FV3) + S2*(AY2+FV4)
      GO TO 550
  540 AXV(J) = -S4*(AX1+FV1) -S2*(AX2+FV2)
      AYV(J) = -S4*(AY1+FV3) +S2*(AY2+FV4)
  550 GO TO K4,(560,570)
C*** ***FLOW OF CONTROL REACHES HERE IF PF IS TRUE
  560 AX(J) = AXV(J)
      AY(J) = AYV(J)
  570 IF (IEC.EQ.-1) GO TO 1000
```

```
  575 IF (T21.LT.0.08)GO TO 595
  580 T20 = SQRT( T2 / (T1 + T4) )
      IF (T20.LT.0.01) GO TO 590
      T13 = YJ * Y2(I)**3
      T14 = T1 + T8
      T15 = T2 * T1
      T16 = T14 * T14
      T17 = T1 * YJ
      T18 = T1 * T1
      T19 = T8 * T8
      F3 = ( T7/T13 ) * ( (-T14) * EEK + ( ( (T16 - T15) * EKK) / T6 ) )
      F1 =(T3 / (T17 *T7) ) * ( (EEK / T10 ) * (T16 - 3.0 * T15) -
     1  (T14 * EKK) )
      TEMP1 =((-8.0*T8**3) - (12.0*T1*T19) + (26.0*T15*T8)
     1   + (2.0*T18*(2.0*T1 -5.0*T2) ))* EEK/T10
      TEMP2 = EKK * ( (8.0*T19) + (4.0*T1*T8) - (2.0*T15) - (4.0*T18) )
      F2 = (TEMP1 + TEMP2) / ( T13 * T7)
      GO TO 630
C***   ***SMALL YJ FORMULAS    *    EXTRA CROSS FLOW
  590 T25 = YJ**3
      T30 = T4 + T1
      T27 = T30**3.5
      T28 = T25 * Y2(I)
      F1 = (    2.945243  * T25 * T3 * T1) / T27
      F2 =    7.068584  * T28 * ( 3.0 * T1  -  2.0 * T4 ) / T27
      F3 = 1.767146 * T28 /(T30**2.5      )
      GO TO 630
C***   ***SMALL Y FORMULAS    *    EXTRA CROSS FLOW
  595 T25 =  YJ**3
      F1 = (    2.945243  * T25 * T3 * T1 ) / ( T8**3.5        )
      F2 = ( (-14.13717) * T25 * Y2(I) ) / (T8**2.5)
      F3 = -F2 / 8.0
C***   ***SIMPSON'S RULE
  630 IF (IS - 1) 640,640,650
C***   ***FIRST PASS
  640 ECXS = F1
      ECYS = F2
      ECZS = F3
      IE = 0
      GO TO 1000
  650 IF (IS - NI) 660,690,660
  660 IF ( IE ) 680,670,680
C***   ***EVEN PASS
  670 ECXS = ECXS + 4.0 * F1
      ECYS = ECYS + 4.0 * F2
      ECZS = ECZS + 4.0 * F3
      IE = 1
      GO TO 1000
C***   ***ODD PASS
  680 ECXS = ECXS + F1 + F1
      ECYS = ECYS + F2 + F2
      ECZS = ECZS + F3 + F3
      IE = 0
      GO TO 1000
C***   ***LAST PASS
  690 IF(J - I) 710,700,710
C***   ***I=J      *      ELEMENTS ON MAIN DIAGONAL
  700 IF (BON.NE.0.0) GO TO 710
      ECX(J) = ECX(J) -S4 * ( ECXS + F1 )
      ECY(J) = ECY(J) -S5 * ( ECYS + F2 )
      ECZ(J) = ECZ(J) +S3 * ( ECZS + F3 )
      GO TO 1000
C***   ***OFF MAIN DIAGONAL OR OFF BODY POINTS
  710 ECX(J) = -S4 * ( ECXS + F1 )
      ECY(J) = -S5 * ( ECYS + F2 )
      ECZ(J) =  S3 * ( ECZS + F3 )
 1000 CONTINUE
      RETURN
      END
```

```
$IBFTC ELIP    DECK
C
      SUBROUTINE ELIP
C
C               * HASTINGS APPROXIMATION FOR ELLIPTIC INTERGALS
C
      COMMON       HEDR(10)  ,CASE       ,NB         ,NNU
     1            ,FLG03     ,FLG04     ,FLG05      ,FLG06      ,FLG07
     2            ,FLG08     ,FLG09     ,FLG10      ,FLG11      ,FLG12
     3            ,FLG13     ,FLG14     ,FLG15      ,FLG16      ,FLG17
     4            ,FLG18     ,FLG19     ,FLG20      ,FLG21      ,FLG22
     5            ,FLG23     ,FLG24     ,FLG25      ,FLG26      ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER      FLG03     ,FLG04     ,FLG05      ,FLG06      ,FLG07
     1            ,FLG08     ,FLG09     ,FLG10      ,FLG11      ,FLG12
     2            ,FLG13     ,FLG14     ,FLG15      ,FLG16      ,FLG17
     3            ,FLG18     ,FLG19     ,FLG20      ,FLG21      ,FLG22
     4            ,FLG23     ,FLG24     ,FLG25      ,FLG26      ,FLG27
      COMMON       NT        ,ND(11)    ,MN         ,NUNA(4)    ,TYPEA(4)
     1            ,NER1      ,NER2      ,NMA        ,NSIGA      ,NSIGC
     2            ,NUNC(4)   ,TYPEC(4)  ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      REAL         MN
      LOGICAL PF
C
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TL/   A(500),   B(500),   AX(500),  AY(500),  AZ(500),
     1              CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),
     2              VN(500,4),VT(500,4),BON,      YZERO,    IAC,
     3              I,        J,        J1,       SJ,       DS,
     4              DX,       CY,       NI,       XJ,       YJ,
     5              XK,       EEK,      EKK,      K,        PF
C
C               * START
      ETA = 1. - XK
      IF (ETA) 20,20,40
   20 WRITE (6,30) ETA
   30 FORMAT ( 1H1 36H *** ERROR IN SUBROUTINE ELIP * ETA= F15.8 )
      WRITE(6,800) I,XJ,DX,YJ,DY,X2(I),Y2(I),XK
  800 FORMAT(1H ,I5,7F15.6)
      ETA = 0.000005
   40 ELN=ALOG(ETA)
      EKK = 1.386294E0       + ETA * (.9666344E-1     + ETA *
     1      (.3590092E-1     + ETA * (.3742564E-1     + ETA *
     2      .1451196E-1    ))) - ELN * (.5 + ETA * (.1249859E0      +
     3      ETA * (.6880249E-1     + ETA * (.3328355E-1     + ETA *
     4      .4417870E-2  ))))
      EEK = 1. + ETA * (.4432514E0      + ETA * (.6260601E-1    + ETA *
     1      (.4757384E-1     + ETA * .1736506E-1    ))) - ELN * (ETA *
     2      (.2499837E0     + ETA * (.9200180E-1     + ETA *
     3      (.4069698E-1     + ETA * .5264496E-2  ))))
      RETURN
      END
```

```
$IBFTC PAT2    DECK

      SUBROUTINE PART2
C
C               * COMPUTE SOURCE DENSITY SIGMA BY SIEDEL ITERATION
C
      COMMON       HEDR(10)   ,CASE       ,NB         ,NNU
     1            ,FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2            ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3            ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4            ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5            ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER      FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1            ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2            ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3            ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4            ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON       NT         ,ND(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1            ,NER1       ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2            ,NUNC(4)    ,TYPEC(4)   ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      REAL         MN
C
      COMMON /C2/   A(500),   R(500,4),      NSIG,      IT
C
      DIMENSION     ASIG(500,4),   CSIG(500,4),        T(500)
C
C               * START
      IF (FLG03.EQ.0) GO TO 1000
C               * AXIS FLOW
      L=0
      READ (4) (T(I),I=1,NT)
      IF (FLG16.NE.0) GO TO 200
      L=L+1
      DO 100 I = 1, NT
  100 R(I,L) = T(I)
  200 IF (NNU) 600,600,300
  300 DO 500 J = 1, NNU
C               * READ NON-UNIFORM NO * SKIP TO
      READ (4) MS,(T(I),I=1,NT)
      IF (MS.EQ.1) GO TO 500
      L=L+1
      DO 400 I = 1, NT
  400 R(I,L) = T(I)
  500 CONTINUE
  600 REWIND 4
      IT = 9
      NSIG = NSIGA
C               * SOLVE SIMULTANEOUS EQUATIONS FOR SIGMAS
      CALL MISNA2 (ASIG)
      REWIND 9
      IF (FLG04.GT.0) GO TO 1000
C               * WRITE SIGMAS ON TAPE 3
      DO 700 J = 1, NSIGA
  700 WRITE (3) (ASIG(I,J), I = 1, NT)
```

```
      RETURN
C                 * CROSS FLOW
 1000 L = 0
      READ (4) (T(I),I=1,NT),(T(I),I=1,NT)
      IF (FLG17.NE.0) GO TO 1200
      L = L+1
      DO 1100 I = 1, NT
 1100 R(I,L) = -T(I)
 1200 IF (NNU) 1600,1600,1300
 1300 DO 1500 J = 1, NNU
      READ (4) MS,(T(I),I=1,NT)
      IF (MS.LE.0) GO TO 1500
      L = L+1
      DO 1400 I = 1, NT
 1400 R(I,L) = T(I)
 1500 CONTINUE
 1600 REWIND 4
      IT = 10
      NSIG = NSIGC
C                 * SOLVE SIMULTANEOUS EQUATIONS FOR SIGMAS
      CALL MISNA2 (CSIG)
      REWIND 10
      IF (FLG03.LE.0) GO TO 1675
C                 * WRITE SIGMAS ON TAPE 3
      DO 1650 J = 1, NSIGA
 1650 WRITE (3) (ASIG(I,J),I=1,NT)
 1675 DO 1700 J = 1, NSIGC
 1700 WRITE (3) (CSIG(I,J),I=1,NT)
      RETURN
      END
```

```
$IBFTC MISN    DECK
C
      SUBROUTINE MISNA2 (SIG)
C
C               * SOLVE LINEAR SIMULTANEOUS EQUATIONS BY SEIDEL ITERATION
C
      COMMON      HEDR(10)  ,CASE      ,NB        ,NNU
     1           ,FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07
     2           ,FLG08     ,FLG09     ,FLG10     ,FLG11     ,FLG12
     3           ,FLG13     ,FLG14     ,FLG15     ,FLG16     ,FLG17
     4           ,FLG18     ,FLG19     ,FLG20     ,FLG21     ,FLG22
     5           ,FLG23     ,FLG24     ,FLG25     ,FLG26     ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER     FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07
     1           ,FLG08     ,FLG09     ,FLG10     ,FLG11     ,FLG12
     2           ,FLG13     ,FLG14     ,FLG15     ,FLG16     ,FLG17
     3           ,FLG18     ,FLG19     ,FLG20     ,FLG21     ,FLG22
     4           ,FLG23     ,FLG24     ,FLG25     ,FLG26     ,FLG27
      COMMON      NT        ,ND(11)    ,MN        ,NUNA(4)   ,TYPEA(4)
     1           ,NER1      ,NER2      ,NMA       ,NSIGA     ,NSIGC
     2           ,NUNC(4)   ,TYPEC(4)  ,NLF(11)
      REAL        MN
C
      COMMON /C2/   A(500),   R(500,4),      NSIG,     IT
C
      DIMENSION     SIG(500,4),   KFLAG(4), DSIG1(4), DSIG(500,4)
C
C               * START
C               * INITIALIZE
   10 NTU=0
      ITER=0
      NCONV=0
      DO 20 J=1,NSIG
      KFLAG(J)=0
      DO 20 I=1,NT
   20 SIG(I,J)=0.0
   30 DO 35 I=1,NSIG
   35 DSIG1(I)=0.0
C               * COMPUTE SIGMA AND DELTA SIGMA
      DO 300 I=1,NT
      IF (NTU-3) 40,100,110
   40 IF (FLG12.NE.0) GO TO 60
C               * PLACE A IN LEFT SIDE MATRIX
      IF (IT.EQ.10) GO TO 50
      READ (9) (A(L),L=1,NT)
      GO TO 80
   50 READ (10) (A(L),L=1,NT)
      GO TO 80
C               * PLACE PHI IN LEFT SIDE MATRIX
   60 IF (IT.EQ.10) GO TO 70
      READ (9) (A(L),L=1,NT),(A(L),L=1,NT),(A(L),L=1,NT)
```

```
      GO TO 80
   70 READ (10) (A(L),L=1,NT),(A(L),L=1,NT),(A(L),L=1,NT)
C                 * SAVE LEFT SIDE MATRIX
   80 WRITE (3) (A(L),L=1,NT)
      WRITE (11) (A(L),L=1,NT)
      GO TO 200
C                 * READ LEFT SIDE MATRIX
  100 READ (3) (A(L),L=1,NT)
      GO TO 200
  110 READ (11) (A(L),L=1,NT)
  200 DO 300 J=1,NSIG
      IF (KFLAG(J).NE.0) GO TO 300
      SUM=0.0
      DO 210 L=1,NT
  210 SUM=SUM+A(L)*SIG(L,J)
      DSIG(I,J)=(R(I,J)-SUM)/A(I)
      IF (FLG09.NE.0) GO TO 220
      SIG(I,J)=SIG(I,J)+DSIG(I,J)
  220 IF (ABS(DSIG(I,J)).GT.DSIG1(J)) DSIG1(J)=ABS(DSIG(I,J))
  300 CONTINUE
      IF (FLG09.LE.0) GO TO 320
      DO 310 J=1,NSIG
      DO 310 I=1,NT
  310 SIG(I,J)=SIG(I,J)+DSIG(I,J)
C                 * TEST FOR SOLUTION
  320 REWIND 3
      REWIND 11
      ITER=ITER+1
      DO 400 J=1,NSIG
      IF (KFLAG(J).NE.0) GO TO 400
      IF (DSIG1(J).GE.1.E-6) GO TO 400
      KFLAG(J)=ITER
      NCONV=NCONV+1
      IF (NCONV.EQ.NSIG) GO TO 600
  400 CONTINUE
      IF (ITER.EQ.100) GO TO 600
      IF (NTU.EQ.3) GO TO 500
      NTU=3
      GO TO 30
  500 NTU=11
      GO TO 30
C                 * PRINT NO. OF ITERATIONS
  600 DO 800 J=1,NSIG
      IF (KFLAG(J).NE.0) GO TO 700
      WRITE (6,610)
  610 FORMAT (1HO 7X 36H NO CONVERGENCE AFTER 100 ITERATIONS )
      GO TO 800
  700 WRITE (6,710) KFLAG(J)
  710 FORMAT (1HO 5X I5,1X 36H ITERATIONS REQUIRED FOR CONVERGENCE )
  800 CONTINUE
      RETURN
      END
```

```
$IBFTC PREP    DECK

      SUBROUTINE  PREP
C **            * PREPARE TAPES 3 AND 11 FOR USE BY LINK 5 (MATSOL)
      COMMON/SPACER/WKAREA(16000)
      DIMENSION TEMP(504), Y2(500)
      COMMON      HEDR(10)  ,CASE       ,NB         ,NNU
     1           ,FLG03     ,FLG04     ,FLG05      ,FLG06      ,FLG07
     2           ,FLG08     ,FLG09     ,FLG10      ,FLG11      ,FLG12
     3           ,FLG13     ,FLG14     ,FLG15      ,FLG16      ,FLG17
     4           ,FLG18     ,FLG19     ,FLG20      ,FLG21      ,FLG22
     5           ,FLG23     ,FLG24     ,FLG25      ,FLG26      ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER     FLG03     ,FLG04     ,FLG05      ,FLG06      ,FLG07
     1           ,FLG08     ,FLG09     ,FLG10      ,FLG11      ,FLG12
     2           ,FLG13     ,FLG14     ,FLG15      ,FLG16      ,FLG17
     3           ,FLG18     ,FLG19     ,FLG20      ,FLG21      ,FLG22
     4           ,FLG23     ,FLG24     ,FLG25      ,FLG26      ,FLG27
      COMMON      NT        ,ND(11)    ,MN         ,NUNA(4)    ,TYPEA(4)
     1           ,NER1      ,NER2      ,NMA        ,NSIGA      ,NSIGC
     2           ,NUNC(4)   ,TYPEC(4)  ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      REAL        MN
      DIMENSION COSSQR(500), RHS(500)
      DIMENSION A(504),R(500,4),FF(500),T(500)
      DATA  FOURPI/12.5663706/
C***   ***AXISYMMETRIC FLOW ONLY                    MS = 0
C***   ***CROSS FLOW ONLY                           MS = 1
C***   ***EXTRA CROSS FLOW ONLY                     MS = 2
C***   ***AXISYMMETRIC AND CROSS FLOW               MS = 3
C***   ***AXISYMMETRIC AND EXTRA CROSS FLOW         MS = 4
C***   ***CROSS AND EXTRA CROSS FLOW                MS = 5
C***   ***AXISYMMETRIC,CROSS, AND EXTRA CROSS FLOW  MS = 6
      IF(FLG12.EQ.0.OR.(FLG04.EQ.0.AND.FLG21.EQ.0) ) GO TO 3
      IF (FLG05.EQ.0) GO TO 4
C***   ***SKIP OFF BODY COORDINATES
      READ(12)
    4 NI=NT+NB
      READ(12) (TEMP(I),I = 1,NI),(TEMP(I),I = 1,NI),
     1   (TEMP(I),I = 1,NT), (Y2(I),I = 1,NT)
      REWIND 12
    3 REWIND 3
      IF (FLG03) 5,800,5
C **           * PREPARE AXISYMMETRIC MATRIX TAPE (3)
    5 IF (FLG19.GT.0) GO TO 2000
      IF ( FLG22.GT.0) GO TO 255
      K = 0
      L = NT+NSIGA
      READ (4) (A(I),I=1,NT),(FF(I),I=1,NT)
      IF (FLG16.NE.0) GO TO 20
      K = K+1
      DO 10 I = 1, NT
   10 R(I,K) = A(I)
   20 IF (NNU) 60,60,30
   30 DO 50 J = 1, NNU
      READ (4) MS,(A(I),I=1,NT)
```

```
      IF (MS.EQ.1.OR.MS.EQ.2.OR.MS.EQ.5) GO TO 50
      K = K+1
      DO 40 I = 1, NT
   40 R(I,K) = A(I)
   50 CONTINUE
   60 IF (FLG14.LE.0) GO TO 290
      NR= NMA+1
      READ (4) (R(I,1), I=NR,NT)
      REWIND 4
      DO 220 I = NR, NT
  220 R(I,1) = R(I,1)-FF(I)
      IF (FLG14.EQ.NB) GO TO 245
      DO 240 I = 1, NMA
      READ (9) (A(J),J=1,NT)
      A(NT+1) =  R(I,1)
  240 WRITE (3) (A(J),J=1,L)
  245 DO 250 I = NR, NT
      READ (9) (A(J),J=1,NT),(A(J),J=1,NT)
      A(NT+1) =  R(I,1)
  250 WRITE (3) (A(J),J=1,L)
C  PRESCRIBED TANGENTIAL VELOCITY      INPUT TO SOLVIT ON TAPE 3
C                                      OUTPUT FROM SOLVIT ON TAPE 3
C  TAPES 1 AND 2 ARE SCRATCH TAPES
      CALL SOLVIT(WKAREA,NT,NSIGA,16000,3,1,2,3,+9010)
      REWIND 9
      GO TO 800
C***   ***AXISYMMETRIC FLOW   *   GENERATED (RESEP) BOUNDARY CONDITIONS
C***   ***NPB1 = THE NUMBER OF ELEMENTS ON BODY 1
C***   ***NPB2 = THE NUMBER OF ELEMENTS ON BODY 2
  255 NPB1 = ND(1) - 1
      NPB2 = ND(2) - 1
      NSIGA = 3
      NSIGC = 1
      NSIGEC = 1
      L = NT + NSIGA
C***   ***L IS THE TOTAL  WIDTH OF THE MATRIX FOR AXISYMMETRIC FLOW INCL
C***   ***RIGHT HAND SIDES
      READ (4)
      READ(4) ( COSSQR(I),I = 1,NPB1), (RHS(I),I = 1,NPB1 )
      REWIND 4
      DO 260 I = 1,NPB1
      R(I,1) = 0.0
      R(I,2) = 1.0
  260 R(I,3) = COSSQR(I)
      NBEGIN = NPB1 + 1
      NEND = NPB1 + NPB2
      DO 265 I = NBEGIN,NEND
      R(I,1) = 1.0
      R(I,2) = 0.0
  265 R(I,3) = 0.0
  290 REWIND 4
      ASSIGN 400 TO M
      IF (FLG12.NE.0) ASSIGN 300 TO M
      DO 700 I = 1, NT
      GO TO M, (300,400)
  300 READ (9) (A(J),J=1,NT),(A(J),J=1,NT),(A(J),J=1,NT)
```

```
      GO TO 500
  400 READ (9) (A(J),J=1,NT)
  500 DO 600 J = 1, NSIGA
      K = NT+J
  600 A(K)=  R(I,J)
  700 WRITE (3) (A(J),J=1,L)
C  AXISYMMETRIC FLOW          INPUT TO SOLVIT ON TAPE 3
C                             OUTPUT FROM SOLVIT ON TAPE 3
C  TAPES 1 AND 2 ARE SCRATCH TAPES
      CALL SOLVIT(WKAREA,NT,NSIGA,16000,3,1,2,3,+9020)
      REWIND 9
C **            * PREPARE CROSSFLOW MATRIX TAPE (11)
C **            * SKIP SINA * READ COSA
  800 IF (FLG04.EQ.0) GO TO 1610
      K = 0
      L = NT+NSIGC
      IF (FLG22.GT.0) GO TO 910
      READ (4) (A(I),I=1,NT),(A(I),I=1,NT)
      IF (FLG17.NE.0) GO TO 820
      K = K+1
      DO 810 I = 1, NT
  810 R(I,K) = A(I)
  820 IF (NNU) 900,900,830
  830 DO 850 J = 1, NNU
      READ (4) MS,(A(I),I=1,NT)
      IF ( MS.EQ.0.OR.MS.EQ.2.OR.MS.EQ.4) GO TO 850
      K = K+1
      DO 840 I = 1, NT
  840 R(I,K) = -A(I)
  850 CONTINUE
  900 REWIND 4
      GO TO 1000
C***   ***CROSS FLOW   *   GENERATED (RESEP) BOUNDARY CONDITIONS
  910 DO 920 I = 1,NPB1
  920 R(I,1) = -RHS(I)
      DO 930 I = NBEGIN,NEND
  930 R(I,1) = 0.0
 1000 ASSIGN 1300 TO M
      IF (FLG12.NE.0) ASSIGN 1200 TO M
      DO 1600 I = 1, NT
      GO TO M, (1200,1300)
 1200 READ (10) (A(J),J=1,NT),(A(J),J=1,NT),(A(J),J=1,NT)
C***   ***FORM PHI MATRIX FROM THETA (CROSS FLOW) MATRIX
      DO 1250 J = 1,NT
 1250 A(J) = Y2(I) * A(J)
      GO TO 1400
 1300 READ (10) (A(J),J=1,NT)
 1400 DO 1500 J = 1, NSIGC
      K = NT+J
 1500 A(K) =-R(I,J)
 1600 WRITE (11) (A(J),J=1,L)
C  CROSS FLOW       INPUT TO SOLVIT ON TAPE 11
C                   OUTPUT FROM SOLVIT ON TAPE 3
C  TAPES 1 AND 2 ARE SCRATCH TAPES
      CALL SOLVIT(WKAREA,NT,NSIGC,16000,11,1,2,3,+9030)
      REWIND 10
```

```
 1610 CONTINUE
C***    ***EXTRA CROSS FLOW
      REWIND 11
      IF (FLG21.EQ.0.AND.FLG22.EQ.0)RETURN
      K = 0
      L = NT + NSIGEC
      IF (FLG22.GT.0) GO TO 1800
C***    ***EXTRA CROSS FLOW    *    NON-UNIFORM FLOW ONLY
C***    ***SKIP RECORD WITH SINES AND COSINES
      READ (4)
      DO 1650 J=1,NNU
      READ(4) MS, (A(I),I=1,NT)
      IF (MS.LT.2.OR.MS.EQ.3) GO TO 1650
      K = K+ 1
      DO 1640 I = 1,NT
 1640 R(I,K) = A(I)
 1650 CONTINUE
      GO TO 1900
C***    ***EXTRA CROSS FLOW    *    GENERATED (RESEP) BOUNDARY CONDITIONS
 1800 DO 1820 I = 1,NPB1
 1820 R(I,1) = COSSQR(I)
      DO 1840 I = NBEGIN,NEND
 1840 R(I,1) = 0.0
 1900 REWIND 4
C***    ***M IS 1920    *    SOLVE A MATRIX
      ASSIGN 1920 TO M
C***    ***M IS 1940    *    SOLVE POTENTIAL MATRIX
      IF (FLG12.NE.0)ASSIGN 1940 TO M
      DO 1980 I = 1,NT
      GO TO M, (1920,1940)
C***    ***SOLVE A MATRIX
 1920 READ (8) (A(J),J =1,NT)
      GO TO 1960
 1940 READ (8) (A(J),J=1,NT),(A(J),J=1,NT),(A(J),J=1,NT)
C***    ***FORM PHI MATRIX FROM THETA (EXTRA CROSS FLOW) MATRIX
      DO 1950 J = 1,NT
 1950 A(J) = Y2(I) * A(J) / 2.0
 1960 DO 1970 J = 1,NSIGEC
      K = NT + J
 1970 A(K) = R(I,J)
 1980 WRITE (11) (A(J),J=1,L)
C***    ***EXTRA CROSS FLOW    INPUT TO SOLVIT ON TAPE 11
C***    ***OUTPUT FROM SOLVIT ON TAPE 3
C***    ***TAPES 1 AND 2 ARE SCRATCH TAPES
      CALL SOLVIT (WKAREA,NT,NSIGEC,16000,11,1,2,3,+9040)
      REWIND 8
      REWIND 11
      RETURN
 2000 NR = NT-NMA
      L = NMA+1
      READ (4) (R(I,1),I=1,NMA)
      READ (4) (FF(I),I=1,NR)
      DO 2100 I = 1, NR
 2100 FF(I) = FF(I)/FOURPI
      BACKSPACE 4
      WRITE (4) (FF(I),I=1,NR)
```

```
      REWIND 4
      DO 2300 I = 1, NMA
      READ (9) (A(J),J=1,NMA),(T(J),J=1,NR)
      DO 2200 J = 1, NR
 2200 R(I,1) = R(I,1)- T(J)*FF(J)
      A(L) =  R(I,1)
 2300 WRITE (3) (A(J),J=1,L)
C  PRESCRIBED VORTICITY       INPUT FOR SOLVIT ON TAPE 3
C                             OUTPUT FROM SOLVIT ON TAPE 3
C  TAPES 1 AND 2 ARE SCRATCH TAPES
      CALL SOLVIT(WKAREA,NMA,L - NMA,16000,3,1,2,3,+9000)
      REWIND 9
      GO TO 800
 9000 WRITE(6,9001)
 9001 FORMAT(61H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR PRESCRIBED VORT
     1ICITY)
      GO TO 9080
 9010 WRITE(6,9011)
 9011 FORMAT(71H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR PRESCRIBED TANG
     1ENTIAL VELOCITY)
      GO TO 9080
 9020 WRITE (6,9021)
 9021 FORMAT(58H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR AXISYMMETRIC FL
     1OW)
      GO TO 9080
 9030 WRITE(6,9031)
 9031 FORMAT(51H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR CROSS FLOW)
      GO TO 9080
 9040 WRITE (6,9041)
 9041 FORMAT (57H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR EXTRA CROSS FL
     1OW)
 9080 STOP
      END
```

```
$IBFTC SOLV    DEBUG,DECK

C20X9
      SUBROUTINE  SOLVIT (A, NC, MC, KD, NI, MM, NO, NW, *)
C
C
C            ****    ***/  *******  *****  *       ***/          *
C            *   *  *  /*     *     *      *      *  /*        ******
C      ****  ****   * / *     *     ***    *      * / *  ****     *  *
C            *      */  *     *     *      *      */  *           ***
C            *      /***     *     *      *****  /***             *  *
C
C              D I R E C T   M A T R I X   S O L U T I O N
C
C      WRITTEN BY J. L. HESS * PROGRAMMED BY T. M. RIDDELL
C
      DIMENSION  A ( KD )
C
      LOGICAL  LAST
C
      CALL TIMEV(AA1)
      N = ND
      M = MD
      KORE = KD
      NPM = N + M
      IF (MAXO(3 * NPM, M * N) .GT. KORE) RETURN 1
      MT = MM
      REWIND MT
      NIN = NI
      DEBUG NIN,NI,NO
      REWIND NIN
      NOUT = NO
      REWIND NOUT
      MP1 = M + 1
      NN = N
      NEL = NPM
C
C - - CALCULATE THE MAXIMUM NO. OF ROWS, 'K'
C
   10 K = (KORE - NEL) / NEL
C
C - - TEST TO SEE IF THE REST OF THE MATRIX WILL FIT IN CORE
C
      LAST = K .GE. NN
      IF (LAST) K = NN
C
C - - READ 'K' ROWS OF THE AUGMENTED 'A' MATRIX
C
   30 NT = 0
      DO 40 IB = 1, K
      NS = NT + 1
      NT = NT + NEL
```

```
   40 READ (NIN) (A(IC), IC = NS, NT)
C
C - - CHECK TO SEE IF WE WERE UNLUCKY ENOUGH TO END UP WITH ONLY ONE ROW
C
      IF (K .EQ. 1) GO TO 90
C
C - - 'K' IS GREATER THAN '1' SO WE CAN START THE TRIANGULARIZATION
C
      NELP1 = NEL + 1
      NS = - NEL
      NELP2 = NELP1 + 1
C
C - - FORM THE 'TRAPEZOIDAL' ARRAY  (8)
C
      DO 50 IB = 2, K
      NP = NELP2 - IB
      NS = NS + NELP1
      NT = NS
      DO 50 IC = IB, K
      NT = NT + NEL
      MN = NT
      NB = NS
      A(NT) = (-A(NT)) / A(NS)
      DO 50 NF = 2, NP
      MN = MN + 1
      NB = NB + 1
   50 A(MN) = A(MN) + A(NT) * A(NB)
      IF (LAST) GO TO 90
C
C - - WRITE THE 'TRAPEZOIDAL' MATRIX ON TAPE
C
      NT = 0
      NP = NEL
      NS = - NEL
      DO 60 IC = 1, K
      NS = NS + NELP1
      NT = NT + NEL
      WRITE (MT) NP, (A(IB), IB = NS, NT)
   60 NP = NP - 1
      NP = NP - M
      NS = KORE - NEL + 1
C
C - - READ ANOTHER ROW
C
      DO 80 IC = 1, NP
      READ (NIN) (A(IB), IB = NS, KORE)
C
C - - MODIFY THIS ROW BY THE 'TRAPEZOIDAL' ARRAY
C
      NT = 1
      MN = NS
      DO 70 IB = 1, K
      NB = NT
      NF = MN + 1
      A(MN) = (-A(MN)) / A(NT)
      DO 65 NN = NF, KORE
```

```
      NB = NB + 1
   65 A(NN) = A(NN) + A(MN) * A(NB)
      MN = NF
   70 NT = NT + NELP1
C
C - - WRITE THE MODIFIED ROW ON TAPE
C
   80 WRITE (NOUT)      (A(NT), NT = MN, KORE)
      REWIND NOUT
      REWIND NIN
C
C - - SWITCH THE TAPES
C
      NT = NIN
      NIN = NOUT
      NOUT = NT
C
C - - RE-CALCULATE ROW LENGTH AND LOOP BACK
C
      NEL = NEL - K
      NN = NEL - M
      GO TO 10
C
C - - REWIND ALL TAPES
C
   90 REWIND MT
      REWIND NIN
      REWIND NOUT
C
C - - CONDENSE THE MATRIX
C
      NN = NEL
      NL = NELP1
      IF (K .EQ. 1) GO TO 105
      NS = 1
      NT = NEL
      DO 100 IB = 2, K
      NS = NS + NELP1
      NT = NT + NEL
      DO 100 IC = NS, NT
      A(NL) = A(IC)
  100 NL = NL + 1
  105 N1 = KORE - K * M + 1
C
C - - THERE, NOW WE CAN START THE BACK-SOLUTION
C * * NOTE..THE FIRST AVAILABLE LOCATION FOR THE SOLUTIONS IS A(N1)
C
      NREM = N
      NEL = NPM
      LAST = K .EQ. N
      NPASS = 0
C
C - - SOLVE FOR THE ANSWERS CORRESPONDING TO 'K' ROWS
C
  110 KM1 = K - 1
      KP1 = K + 1
```

```
      NS = NL - MP1
      NPASS = NPASS + 1
      DO 130 MN = 1, M
      NF = NS + MN
      A(NF) = A(NF) / A(NS)
      NT = NS
      IF (KM1 .EQ. 0) GO  TO 130
      DO 125 IB = 1, KM1
      NF = NF - IB - M
      NT = NT - MP1 - IB
      SUM = 0.0
      NP = NF
      N2 = MP1 + IB
      DO 120 IO = 1, IB
      NN = NT + IO
      NP = NP + N2 - IO
  120 SUM = SUM + A(NN) * A(NP)
  125 A(NF) = (A(NF) - SUM) / A(NT)
  130 CONTINUE
C
C - - MOVE THE SOLUTIONS TO CONTIGUOUS LOCATIONS STARTING AT A(N1)
C
      N1 = KORE + 1
      DO 140 NN = 1, K
      DO 135 MN = 1, M
      NL = NL - 1
      N1 = N1 - 1
  135 A(N1) = A(NL)
  140 NL = NL - NN
C
C - - WRITE THE SOLUTIONS ON TAPE
C
      WRITE (NIN) K
      NS = N1 - 1
      DO 145 MN = 1, M
      NT = NS + MN
  145 WRITE ( NIN ) (A(IO), IO = NT, KORE, M)
C
C - - TEST IF THIS IS THE LAST PASS
C
      IF (LAST) GO TO 200
C
C - - WE MUST NOW MODIFY THE TRIANGULAR MATRIX TO REFLECT THE EFFECT OF
C     THE SOLUTIONS OBTAINED SO FAR  (EQ 21)
C * * NOTE..LOCATIONS A(1) TO A(N1-1) ARE NOW FREE TO USE
C
C - - CALCULATE THE NEXT VALUES OF 'NEL' AND 'NREM'
C
      NELOLD = NEL
      KOLD = K
      NEL = NEL - K
      NREM = NREM - K
C
C - - NOW APPLY THE INCREDIBLE FORMULA FOR THE NEW 'K'
C
      K = (-4 * M - 1) / 2 + IFIX(SQRT(0.25 + FLOAT((4 * M + 2) * M +
```

```
     1 2 * (KORE - NELOLD))))
      NROW = NREM - K + 1
      IF (K .LT. NREM) GO TO 150
      LAST = .TRUE.
      NROW = 1
      K = NREM
  150 NS = 1
      NT = NELOLD + 1
C
C - - READ IN THE ROWS TO BE MODIFIED
C
      DO 190 IB = 1, NREM
      NT = NT - 1
      IF (IB .LE. NROW) GO TO 160
      NS = NS + NN
      NT = NT + NN
  160 READ ( MT ) NN, (A(IC), IO = NS, NT)
      NP = N1 - 1
      NF = NT - M - KM1
      NN = NN - KOLD
      DO 170 MN = 1, M
      N2 = NF
      NA = NP + MN
      NB = NA
      SUM = 0.0
      DO 165 IO = 1, KOLD
      SUM = SUM + A(N2) * A(NA)
      N2 = N2 + 1
  165 NA = NA + M
      N2 = N2 + MN - 1
  170 A(N2) = A(N2) - SUM
C
C - - WRITE THE MODIFIED ROW ON TAPE OR CONDENSE THE ROW
C
      NL = NT - M + 1
      IF (IB .GE. NROW) GO TO 175
      NF = NL - KP1
      WRITE (NOUT) NN, (A(IC), IO = NS, NF), (A(IO), IO = NL, NT)
      GO TO 190
  175 NF = NL - KOLD
      DO 180 MN = NL, NT
      A(NF) = A(MN)
  180 NF = NF + 1
  190 CONTINUE
      REWIND MT
      REWIND NOUT
C
C - - SWITCH THE TAPES
C
      NT = MT
      MT = NOUT
      NOUT = NT
C
C - - LOOP BACK THRU THE SOLUTION
C
      NL = NF
```

```
      GO TO 110
C
C - - START TO WRAP IT UP
C
  200 REWIND NIN
      N2 = N
C
C * * NOTE.. AT THIS POINT ALL LOCATIONS A(1) THRU A(KORE) ARE FREE
C
      DO 220 IB = 1, NPASS
      READ (NIN) K
      N1 = N2 - K + 1
      NS = N1
      NT = N2
C
C - - READ IN THE SOLUTIONS
C
      DO 210 IO = 1, M
      READ (NIN) (A(NN), NN = NS, NT)
      NT = NT + N
  210 NS = NS + N
  220 N2 = N1 - 1
C
C  ---  REWIND ALL INPUT TAPES
      REWIND NIN
      REWIND MT
      REWIND NOUT
C - - WRITE THE SOLUTIONS ON TAPE
C
      NT = 0
      DO 230 IO = 1, M
      NS = NT + 1
      NT = NT + N
  230 WRITE (NW) (A(NN), NN = NS, NT)
C
      CALL TIMEV(AA2)
      BB = (AA2 - AA1) / 60.
      WRITE (6, 300) N, N, M, BB
  300 FORMAT (4HOTHE I5, 2H X I5, 12H MATRIX WITH I4, 35H RIGHT SIDES WA
     1S SOLVED DIRECTLY IN F8.3, 9H MINUTES. )
      RETURN
      END
```

```
$IBFTC PAT4     DECK
C
      SUBROUTINE PART4
C
C               * COMPUTE VELOCITY COMPONENTS AND PRINT
C
      COMMON       HEDR(10)  ,CASE       ,NB         ,NNU
     1            ,FLG03     ,FLG04     ,FLG05      ,FLG06      ,FLG07
     2            ,FLG08     ,FLG09     ,FLG10      ,FLG11      ,FLG12
     3            ,FLG13     ,FLG14     ,FLG15      ,FLG16      ,FLG17
     4            ,FLG18     ,FLG19     ,FLG20      ,FLG21      ,FLG22
     5            ,FLG23     ,FLG24     ,FLG25      ,FLG26      ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER      FLG03     ,FLG04     ,FLG05      ,FLG06      ,FLG07
     1            ,FLG08     ,FLG09     ,FLG10      ,FLG11      ,FLG12
     2            ,FLG13     ,FLG14     ,FLG15      ,FLG16      ,FLG17
     3            ,FLG18     ,FLG19     ,FLG20      ,FLG21      ,FLG22
     4            ,FLG23     ,FLG24     ,FLG25      ,FLG26      ,FLG27
      COMMON       NT        ,ND(11)    ,MN         ,NUNA(4)    ,TYPEA(4)
     1            ,NER1      ,NER2      ,NMA        ,NSIGA      ,NSIGC
     2            ,NUNC(4)   ,TYPEC(4)  ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      REAL         MN
C
      COMMON /C4/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TC/   RB(500,8),SIG(500,4),    A(500),   B(500),   Z(500),
     1              PHI(500,4),              XN(500,4),
     2              T(500,4), T3(500,4),     NSIG,     NP,  NI,  SUMV
C
C               * START
      REWIND 3
      IF (FLG05.EQ.0) GO TO 30
C               * READ OFF-BODY XP,YP
      NP=ND(NB+1)
      READ (12) (XP(I),I=1,NP),(YP(I),I=1,NP)
C               * READ X1,Y1,X2,Y2,DELS WITH MACH NO. ADJUSTMENT IF ANY
   30 NI=NT+NB
      READ (12)  (X1(I),I=1,NI),(Y1(I),I=1,NI),(X2(I),I=1,NT)
     1           ,(Y2(I),I=1,NT),(DELS(I),I=1,NT)
C               * READ SINA,COSA,NO,TO..
      READ (4) (A(I),I=1,NT),(B(I),I=1,NT)
      SUMV = 0.0
      DO 100 I = 1, NT
      SINA(I) = A(I)
      COSA(I) = B(I)
  100 SUMV = SUMV + B(I)*DELS(I)*Y2(I)**2
      SUMV = SUMV*3.141593
      IF (FLG03.LE.0) GO TO 1000
      L = 1
      LS = 0
      IF (FLG16.NE.0) GO TO 200
      DO 150 I = 1, NT
      RB(I,L) = A(I)
  150 RB(I,L+1) = B(I)
```

```
  200 IF (NNU) 600,600,300
  300 DO 500 J = 1, NNU
      READ (4) MS,(A(I),I=1,NT),(B(I),I=1,NT)
      IF (MS.EQ.1.OR.MS.EQ.2.OR.MS.EQ.5) GO TO 500
      L = L+2
      LS = LS+1
      IF (LS.EQ.1.AND.FLG16.GT.0) L=L-2
      DO 400 I = 1, NT
      RB(I,L) = A(I)
  400 RB(I,L+1) = B(I)
  500 CONTINUE
  600 REWIND 4
      NSIG = NSIGA
      CALL AXIS
 1000 IF (FLG04.LE.0) GO TO 2000
      IF (FLG03.LE.0) GO TO 1050
      READ (4) (A(I),I=1,NT),(B(I),I=1,NT)
 1050 L = 1
      LS=0
      IF (FLG17.NE.0) GO TO 1200
      DO 1100 I = 1, NT
      RB(I,L) = A(I)
 1100 RB(I,L+1) = B(I)
 1200 IF (NNU) 1600,1600,1300
 1300 DO 1500 J = 1, NNU
      READ (4) MS,(A(I),I=1,NT),(B(I),I=1,NT)
      IF ( MS.EQ.0.OR.MS.EQ.2.OR.MS.EQ.4) GO TO 1500
      L = L+2
      LS=LS+1
      IF (LS.EQ.1.AND.FLG17.GT.0) L=L-2
      DO 1400 I = 1, NT
      RB(I,L) = A(I)
 1400 RB(I,L+1) = B(I)
 1500 CONTINUE
 1600 REWIND 4
      NSIG = NSIGC
      CALL CROSS
 2000 IF (FLG21.LE.0) RETURN
      REWIND 4
      IF(FLG22.GT.0) GO TO 2400
      L = 0
C***   ***IF CONTROL REACHES THIS POINT, THERE IS AT LEAST 1 NNU
C***   ***SKIP RECORD WITH SIN AND COS
      READ (4)
      DO 2200 J = 1,NNU
      READ(4) MS, ( A(I),I=1,NT ), ( B(I),I=1,NT )
      L = L + 1
      DO 2200 I = 1,NT
      RB(I,L) = A(I)
 2200 RB(I,L+1) = B(I)
 2400 REWIND 4
      NSIG = NSIGEC
C***   ***CALL TO EXCROS FOR GENERATED (RESEP) BOUNDARY CONDITIONS
      CALL EXCROS
      RETURN
      END
```

```
$IBFTC AXIS    DECK
C
      SUBROUTINE AXIS
C
C               * COMPUTE AXISYMMETRIC VELOCITY COMPONENTS AND PRINT
C
      COMMON       HEDR(10)  ,CASE       ,NB         ,NNU
     1            ,FLG03     ,FLG04      ,FLG05      ,FLG06     ,FLG07
     2            ,FLG08     ,FLG09      ,FLG10      ,FLG11     ,FLG12
     3            ,FLG13     ,FLG14      ,FLG15      ,FLG16     ,FLG17
     4            ,FLG18     ,FLG19      ,FLG20      ,FLG21     ,FLG22
     5            ,FLG23     ,FLG24      ,FLG25      ,FLG26     ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER      FLG03     ,FLG04      ,FLG05      ,FLG06     ,FLG07
     1            ,FLG08     ,FLG09      ,FLG10      ,FLG11     ,FLG12
     2            ,FLG13     ,FLG14      ,FLG15      ,FLG16     ,FLG17
     3            ,FLG18     ,FLG19      ,FLG20      ,FLG21     ,FLG22
     4            ,FLG23     ,FLG24      ,FLG25      ,FLG26     ,FLG27
      COMMON       NT        ,NC(11)     ,MN         ,NUNA(4)   ,TYPEA(4)
     1            ,NER1      ,NER2       ,NMA        ,NSIGA     ,NSIGC
     2            ,NUNC(4)   ,TYPEC(4)   ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      COMMON /P/ IPUVEL
      REAL         MN
C
      COMMON /C4/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TC/   RB(500,8),SIG(500,4),    A(500),   B(500),   Z(500),
     1              PHI(500,4),              XN(500,4),
     2              T(500,4), T3(500,4),     NSIG,     NP,  NI,  SUMV
     3              ,SUMM(4)
C
      DIMENSION     VX(500,4),VY(500,4),VT(500,4),TH(500,4),CP(500,4),
     1              SUMTDS(4)
C
      EQUIVALENCE  ( VX(1,1) , XN(1,1) ) , (VY(1,1),T(1,1) ) ,
     1  ( VT(1,1), T3(1,1) ), ( TH(1,1),SIG(1,1) ), (CP(1,1),T3(1,1) )
C
      EQUIVALENCE (VY,VYDP),(VT,VTDP),(T,TDP),(VX,VXDP)
      DIMENSION TDP(1),VXDP(1),VYDP(1),VTDP(1)
C               * START
      NC=NT
      IF (FLG19.GT.0) NC=NMA
      IF (FLG08.EQ.0) GO TO 10
C               * TITLE FOR MATRIX PRINT
      WRITE (6,150) HEDR,CASE
      WRITE (6,8)
    8 FORMAT (1H 43H MATRICES A,B,Z BY ROWS * AXISYMMETRIC FLOW //)
C               * READ AXIS SIGMAS
   10 DO 20 N=1,NSIG
      SUMM(N)=0.0
```

```
      SUMTDS(N)=0.0
   20 READ (3) (SIG(I,N),I=1,NC)
      IF (FLG19.LE.0) GO TO 25
      READ (4)
      NR = NMA+1
      READ (4) (SIG(I,1),I=NR,NT)
      REWIND 4
C                * NO. OF MIDPOINTS LOOP
   25 DO 100 I=1,NT
C                * READ MATRICES A,B,Z
      READ (9) (A(J),J=1,NT),(B(J),J=1,NT),(Z(J),J=1,NT)
C                * NO. OF FLOWS LOOP
      N1=0
      DO 70 N=1,NSIG
      N1=N1+2
      SN=0.0
      ST=0.0
      SP=0.0
C                * NO. OF ELEMENTS LOOP
      DO 30 J=1,NT
      SN=SN+A(J)*SIG(J,N)
      ST=ST+B(J)*SIG(J,N)
   30 SP=SP+Z(J)*SIG(J,N)
      IF(FLG22.GT.0) GO TO 68
      IF (FLG12.EQ.0) GO TO 40
      XN(I,N)=SN
      PHI(I,N)=SP-RB(I,N1-1)
      GO TO 50
   40 XN(I,N)=SN-RB(I,N1-1)
      PHI(I,N)=SP
   50 IF (FLG11.EQ.0) GO TO 60
      T(I,N)=ST
      GO TO 65
   60 T(I,N)=ST+RB(I,N1)
   65 SUMM(N)=SUMM(N)+PHI(I,N)*Y2(I)*RB(I,N1-1)*DELS(I)
      CP(I,N)=1.-T(I,N)**2
      GO TO 70
   68 XN(I,N) = SN
      PHI(I,N) = SP
      T(I,N) = ST
      CP(I,N) = 1.0 - T(I,N)**2
   70 CONTINUE
      IF(FLG08.EQ.0) GO TO 100
      WRITE (6,80) I,(A(J),J=1,NT)
   80 FORMAT (1H0 13H MATRIX A ROW I6/ (1H 10F10.5))
      WRITE (6,85) I,(B(J),J=1,NT)
   85 FORMAT (1H0 13H MATRIX B ROW I6/ (1H 10F10.5))
      WRITE (6,90) I,(Z(J),J=1,NT)
   90 FORMAT (1H0 13H MATRIX Z ROW I6/ (1H 10F10.5))
  100 CONTINUE
      IF (MN.EQ.0.0) GO TO 130
C                * MACH NO. ADJUSTMENT
      D1=MN*MN
      D2=1.-D1
      D3=SQRT(D2)
      D4=.7*D1
```

```
      D5=.2*D1
      DO 120 N=1,NSIG
      DO 120 I=1,NT
      TX=(T(I,N)*COSA(I)-1.)/D2+1.
      TY = ( T(I,N) * SINA(I) ) / D3
      T(I,N)=SQRT(TX*TX+TY*TY)
  120 CP(I,N)=((1.+D5*(1.-T(I,N)**2))**3.5-1.)/D4
C               * ELIMINATE MACH NO EFFECT FOR PRINTOUT
      DO 122 I=1,NI
  122 XI(I)=XI(I)*D3
      N=0
      J1=0
      DO 126 K=1,NB
      M=N+1
      N=N+ND(K)-1
      DO 124 J=M,N
      J1=J1+1
      T1=XI(J1+1)-XI(J1)
      T2=YI(J1+1)-YI(J1)
      X2(J)=(XI(J1+1)+XI(J1))/2.
      DELS(J)=SQRT(T1*T1+T2*T2)
      COSA(J)=T1/DELS(J)
  124 SINA(J)=T2/DELS(J)
  126 J1=J1+1
C               * PRINT AXIS FLOW (CN-BODY) OUTPUT
  130 DO 250 L=1,NSIG
      KA = L
      IF (FLG16.LE.0) KA=L-1
      IF (FLG22.GT.0) KA = L
      IF(FLG22.GT.0)GO TO 136
      SUMM(L)=-6.2831853*SUMM(L)
      DO 135 J = 1, NT
  135 SUMTDS(L) = SUMTDS(L) + T(J,L)*DELS(J)
  136 I = 1
      J=1
      M=1
      N=NC(M)
      LCTR=22
  140 WRITE (6,150) HEDR,CASE
  150 FORMAT (1H1 25X, 26HDOUGLAS  AIRCRAFT  COMPANY /
     1        28X, 21HLONG  BEACH  DIVISION ///
     2         6X, 10A6, 4X, 10HCASE NO.  A6 // )
      IF (FLG22.GT.0) GO TO 178
      IF (L.GT.1.OR.FLG16.NE.0) GO TO 170
      WRITE (6,160)
  160 FORMAT (1H 34H ON-BODY UNIFORM AXISYMMETRIC FLOW )
      GO TO 190
  170 IF (TYPEA(KA).GE.0.0) GO TO 175
      WRITE (6,172)
  172 FORMAT (1H 44H FLOW GENERATOR * ROTATING BODY * TYPE ERROR )
  175 IF (NUNA(KA).EQ.123456) WRITE (6,177)
  177 FORMAT (27H  CN-BODY STRIP VORTEX FLOW)
  178 IF (NUNA(KA).NE.123456) WRITE(6,180)NUNA(KA)
  180 FORMAT (1H 42H CN-BODY NON-UNIFORM AXISYMMETRIC FLOW NO. I8)
  190 WRITE (6,200)
  200 FORMAT (1H 5X 24H TRANSFORMED COORDINATES //
```

```
     1         12X 1HX 13X 1HY 13X            2HT1 12X 2HCP  9X 5HSIN A
     2         6X 5HCOS A 7X 5HSIGMA 11X 1HN 13X 3HPHI //)
  210 WRITE (6,220) I,X1(I),Y1(I),X2(J),Y2(J),          T(J,L),CP(J,L),
     1           SINA(J),COSA(J),SIG(J,L),XN(J,L),PHI(J,L)
  220 FORMAT (1H I3,2F14.7/ 4X 4F14.7,2F11.5,3F14.7)
      I=I+1
      J=J+1
      IF (I.EQ.N) GO TO 230
      IF (I.LE.LCTR) GO TO 210
      LCTR=LCTR+22
      GO TO 140
  230 M=M+1
      N=N+ND(M)
      WRITE (6,240) I,X1(I),Y1(I)
  240 FORMAT (1H I3, 2F14.7 //)
      I=I+1
      IF ( J - NT ) 210, 242, 242
  242 IF(FLG22.GT.0) GO TO 250
      WRITE(6,244) SUMM(L), SUMV, SUMTDS(L)
  244 FORMAT (1HC 10X 13H ADDED MASS =F12.7, 4X 9H VOLUME = F12.7,
     A         5X 18HSUM (T)(DELTA S) = F12.7 )
  250 CONTINUE
      CALL BCDUMP(X2(1),X2(NT))
      CALL BCDUMP(Y2(1),Y2(NT))
      CALL BCDUMP(TDP(1),TDP(NT))
       IF (IPUVEL .EQ. 0) GO TO 252
      LOC = 100
      CALL PUNCHC (X2, NT, LOC, CASE )
      LOC = 500
      CALL PUNCHC ( Y2, NT, LOC, CASE )
      LOC = 900
      CALL PUNCHV ( T, NT, NSIG, LOC, CASE )
  252 IF (FLG05.EQ.0) RETURN
C               * OFF-BODY POINT
      IF (FLG15.LE.0) GO TO 258
      M = 0
      DO 254 I = 1, NB
  254 IF (NLF(I) .LE. 0) M = M + 1
      IF ( M .EQ. 0 ) GO TO 258
      MM = NNU + 1
      DO 255 I = 1, MM
  255 READ (4)
      IF (FLG22.GT.0)READ(4)
      DO 256 J = 1, M
  256 READ(4) (RB(I,J),I = 1,NP), (T3(I,J),I = 1,NP)
      REWIND 4
  258 DO 300 I = 1, NP
      L=0
C               * READ MATRICES X,Y,Z
      READ (9) (A(J),J=1,NT),(B(J),J=1,NT),(Z(J),J=1,NT)
C               * NO. OF FLOW
      DO 300 N=1,NSIG
      KA=N
      IF (FLG16.LE.0) KA=N-1
      SX=0.0
      SY=0.0
```

```
      SP=0.0
C                 * NO. OF ELEMENTS LOOP
      DO 260 J=1,NT
      SX=SX+A(J)*SIG(J,N)
      SY=SY+B(J)*SIG(J,N)
  260 SP=SP+Z(J)*SIG(J,N)
      PHI(I,N)=SP
      IF (FLG22.GT.0) GO TO 270
      IF (FLG11.GT.0) GO TO 270
      IF (N.NE.1.OR.FLG16.GT.0) GO TO 262
      VX(I,N) = SX+1.
      GO TO 280
  262 IF (NUNA(KA).NE.123456) GO TO 270
      L=L+1
      VX(I,N)=SX+RB(I,L)
      VY(I,N)=SY+T3(I,L)
      GO TO 300
  270 VX(I,N) = SX
  280 VY(I,N) = SY
  300 CONTINUE
      IF (MN.EQ.0.0) GO TO 330
C                 * MACH NO. ADJUSTMENT
      DO 320 N=1,NSIG
      DO 320 I=1,NP
      VY(I,N)=VY(I,N)/D3
  320 VX(I,N)=(VX(I,N)-1.)/D2+1.
      DO 322 I = 1, NP
  322 XP(I)=XP(I)*D3
C                 * COMPUTE VT AND THETA
  330 DO 335 N=1,NSIG
      DO 335 I=1,NP
      VT(I,N)=SQRT(VX(I,N)**2+VY(I,N)**2)
  335 TH(I,N)=ATAN2(VY(I,N),VX(I,N)) * 57.29578
C                 * PRINT AXIS FLOW (OFF-BODY) OUTPUT
      DO 450 L=1,NSIG
      KA = L
      IF(FLG16.LE.0.AND.FLG22.LE.0) KA = L - 1
      I=1
      LCTR=45
  340 WRITE (6,150) HEDR,CASE
      IF (L.GT.1.OR.FLG16.NE.0) GO TO 370
      IF(FLG22.GT.0) GO TO 378
      WRITE (6,360)
  360 FORMAT (1H 35H OFF-BODY UNIFORM AXISYMMETRIC FLOW )
      GO TO 390
  370 IF (TYPEA(KA).GE.0.) GO TO 375
      WRITE (6,172)
  375 IF (NUNA(KA).EQ.123456) WRITE (6,377)
  377 FORMAT (28H  OFF-BODY STRIP VORTEX FLOW)
  378 IF (NUNA(KA).NE.123456) WRITE (6,380) NUNA(KA)
  380 FORMAT (1H 43H OFF-BODY NON-UNIFORM AXISYMMETRIC FLOW NO. I8)
  390 WRITE (6,400)
  400 FORMAT (1H 5X, 24H TRANSFORMED COORDINATES //
     1         12X 1HX 13X 1HY 13X           2HVX 12X 2HVY 12X 2HVT 10X
     2         5HTHETA 11X 3HPHI //)
  410 WRITE (6,420) I,XP(I),YP(I),          VX(I,L),VY(I,L),VT(I,L),
```

```
   1 TH(I,L), PHI(I,L)
420 FORMAT (1H I3, 7F14.7)
    I=I+1
    IF (I.GT.NP) GO TO 450
    IF (I.LE.LCTR) GO TO 410
    LCTR=LCTR+45
    GO TO 340
450 CONTINUE
    CALL BCDUMP(XP(1),XP(NP))
    CALL BCDUMP(YP(1),YP(NP))
    CALL BCDUMP(VXDP(1),VXDP(NP))
    CALL BCDUMP(VYDP(1),VYDP(NP))
    CALL BCDUMP(VTDP(1),VTDP(NP))
500 IF (IPUVEL .EQ. 0) RETURN
    LOC = 2500
    CALL PUNCHC ( XP, NP, LOC, CASE )
    LOC = 2900
    CALL PUNCHC ( YP, NP, LOC, CASE )
    LOC = 3300
    CALL PUNCHV ( VX, NP, NSIG, LOC, CASE )
    LOC = 4900
    CALL PUNCHV ( VY, NP, NSIG, LOC, CASE )
    RETURN
    END
```

```
$IBFTC CROSS   DECK

      SUBROUTINE CROSS
C
C               * COMPUTE CROSS FLOW VELOCITY COMPONENTS AND PRINT
C
      COMMON       HEDR(10)   ,CASE       ,NB         ,NNU
     1            ,FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2            ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3            ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4            ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5            ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER      FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1            ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2            ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3            ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4            ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON       NT         ,NO(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1            ,NER1       ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2            ,NUNC(4)    ,TYPEC(4)   ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      COMMON /P/ IPUVEL
      REAL         MN
C
      COMMON /C4/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TC/   RB(500,8),SIG(500,4),    A(500),   B(500),   Z(500),
     1              PHI(500,4),              XN(500,4),
     2              T(500,4), T3(500,4),     NSIG,     NP,  NI,  SUMV
     3              ,SUMM(4)
C
      DIMENSION     VX(500,4),VY(500,4),VZ(500,4),T2(500,4)
C
      EQUIVALENCE ( VX(1,1), XN(1,1) ), ( VY(1,1), T(1,1) ),
     1   (VZ(1,1), T3(1,1) ),  (T2(1,1), T(1,1) )
C
      EQUIVALENCE (VZ,VZDP),(VX,VXDP),(VY,VYDP),(T2,T2DP),(T3,T3DP)
      DIMENSION T2DP(1),T3DP(1),VXDP(1),VYDP(1),VZDP(1)
C               * START
      IF (FLG08.EQ.0) GO TO 10
C               * TITLE FOR MATRIX PRINT
      WRITE (6,150) HEDR,CASE
      WRITE (6,8)
    8 FORMAT (1H 36H MATRICES A,B,Z BY ROWS * CROSS FLOW //)
C               * READ CROSS SIGMAS
   10 DO 20 N=1,NSIG
      SUMM(N)=0.0
   20 READ (3) (SIG(I,N),I=1,NT)
C               * NO. OF MIDPOINTS LOOP
      DO 100 I=1,NT
C               * READ MATRICES A,B,Z
```

```
      READ (10) (A(J),J=1,NT),(B(J),J=1,NT),(Z(J),J=1,NT)
C                 * NO. OF FLOWS LOOP
      M=0
      DO 70 N=1,NSIG
      M=M+2
      SA=0.0
      SB=0.0
      SZ=0.0
C                 * NO. OF ELEMENTS LOOP
      DO 30 J=1,NT
      SA=SA+A(J)*SIG(J,N)
      SB=SB+B(J)*SIG(J,N)
   30 SZ=SZ+Z(J)*SIG(J,N)
C                 * INITIALIZE UNIFORM OR NON-UNIFORM PARAMETERS
      IF (FLG21.GT.0) GO TO 38
      IF (N.EQ.1.AND.FLG17.LE.0) GO TO 35
      C1=RB(I,M)
      C2 = -RB(I,M-1)
      C3=0.0
      GO TO 40
   35 C1=SINA(I)
      C2=COSA(I)
      C3=1.
      GO TO 40
   38 C1 = 0.0
      C2 = 0.0
      C3 = 0.0
   40 IF (FLG12.EQ.0) GO TO 45
C                 * OPTION FOR Z (PHI) MATRIX SOLUTION
      XN(I,N) = SA
      PHI(I,N) = Y2(I) * SZ
      GO TO 50
C                 * REGULAR A MATRIX SOLUTION
   45 PHI(I,N)=Y2(I)*SZ
      XN(I,N)=SA+C2
   50 IF (FLG11.EQ.0) GO TO 55
C                 * OPTION PERTURBATIONS
      T2(I,N)=SB
      T3(I,N)=SZ
      GO TO 60
   55 T2(I,N)=SB+C1
      T3(I,N)=SZ+C3
   60 IF(FLG21.GT.0) GO TO 70
      SUMM(N) = SUMM(N) + PHI(I,N) * Y2(I) * C2 * DELS(I)
   70 CONTINUE
      IF (FLG08.EQ.0) GO TO 100
      WRITE (6,80) I,(A(J),J=1,NT)
   80 FORMAT (1HO 13H MATRIX A ROW I6/  (1H 10F10.5))
      WRITE (6,85) I,(B(J),J=1,NT)
   85 FORMAT (1HO 13H MATRIX B ROW I6/ (1H 10F10.5))
      WRITE (6,90) I,(Z(J),J=1,NT)
   90 FORMAT (1HO 13H MATRIX Z ROW I6/ (1H 10F10.5))
  100 CONTINUE
C                 * PRINT CROSS FLOW (ON-BODY) OUTPUT
  130 DO 250 L=1,NSIG
      KC = L
```

```
      IF (FLG17.LE.0) KC=L-1
      IF(FLG21.GT.0) GO TO 138
      SUMM(L) = 3.141593  *SUMM(L)
  138 I = 1
      J=1
      M=1
      N=ND(M)
      LCTR=22
  140 WRITE (6,150) HEDR,CASE
  150 FORMAT (1H1 25X, 26HDOUGLAS  AIRCRAFT  COMPANY /
     1        28X, 21HLONG  BEACH  DIVISION ///
     2         6X, 10A6, 4X, 10HCASE NO.  A6 //)
      IF (FLG22.GT.0) GO TO 175
      IF (L.GT.1.OR.FLG17.NE.0) GO TO 170
      WRITE (6,160)
  160 FORMAT (1H 27H ON-BODY UNIFORM CROSS FLOW )
      GO TO 190
  170 IF (TYPEC(KC).GE.0.) GO TO 175
      WRITE (6,172)
  172 FORMAT (1H 31H FLOW GENERATOR * ROTATING BODY )
  175 WRITE (6,180) NUNC(KC)
  180 FORMAT (1H 35H ON-BODY NON-UNIFORM CROSS FLOW NO. I8)
  190 WRITE (6,200)
  200 FORMAT (1H 5X 24H TRANSFORMED COORDINATES //
     1         12X 1HX 13X 1HY 13X            2HT2 12X 2HT3  9X 5HSIN A
     2         6X 5HCOS A 7X 5HSIGMA 11X 1HN 13X 3HPHI //)
  210 WRITE (6,220) I,X1(I),Y1(I),X2(J),Y2(J),          T2(J,L),T3(J,L),
     1            SINA(J),COSA(J),SIG(J,L),XN(J,L),PHI(J,L)
  220 FORMAT (1H I3,2F14.7/ 4X 4F14.7,2F11.5,3F14.7)
      I=I+1
      J=J+1
      IF (I.EQ.N) GO TO 230
      IF (I.LE.LCTR) GO TO 210
      LCTR=LCTR+22
      GO TO 140
  230 M=M+1
      N=N+ND(M)
      WRITE (6,240) I,X1(I),Y1(I)
  240 FORMAT (1H I3, 2F14.7 //)
      I=I+1
      IF(J.GT.NT)GO TO 242
      GO TO 210
  242 IF(FLG22.GT.0)GO TO 250
      WRITE(6,244) SUMM(L), SUMV
  244 FORMAT (1HO 10X,14H ADDED MASS = F12.7, 4X,10H VOLUME = F12.7)
  250 CONTINUE
      CALL BCDUMP(X2(1),X2(NT))
      CALL BCDUMP(Y2(1),Y2(NT))
      CALL BCDUMP(T2DP(1),T2DP(NT))
      CALL BCDUMP(T3DP(1),T3DP(NT))
       IF (IPUVEL .EQ. 0) GO TO 252
      LOC = 6500
      CALL PUNCHV ( T2, NT, NSIG, LOC, CASE )
      LOC = 6900
      CALL PUNCHV (T3, NT, NSIG, LOC, CASE )
  252 IF (FLG05.EQ.0) RETURN
```

```
C               * OFF-BODY POINT
      DO 300 I=1,NP
C               * READ MATRICES X,Y,Z
      READ (10) (A(J),J=1,NT),(B(J),J=1,NT),(Z(J),J=1,NT)
C               * NO. OF FLOW
      DO 300 N=1,NSIG
      SX=0.0
      SY=0.0
      SP=0.0
C               * NO. OF ELEMENTS LOOP
      DO 260 J=1,NT
      SX=SX+A(J)*SIG(J,N)
      SY=SY+B(J)*SIG(J,N)
  260 SP=SP+Z(J)*SIG(J,N)
      VX(I,N)=SX
      PHI(I,N)=YP(I)*SP
      IF (FLG22.GT.0) GO TO 270
      IF (FLG11.GT.0.OR.N.NE.1.OR.FLG17.GT.0) GO TO 270
      VY(I,N)=SY+1.
      VZ(I,N)=SP+1.
      GO TO 300
C               * PERTURBATION OR NON-UNIFORM VY,VZ
  270 VY(I,N)=SY
      VZ(I,N)=SP
  300 CONTINUE
C               * PRINT CROSS FLOW (OFF-BODY) OUTPUT
  330 DO 450 L=1,NSIG
      KC = L
      IF (FLG17.LE.0) KC=L-1
      I=1
      LCTR=45
  340 WRITE (6,150) HEDR,CASE
      IF (FLG22.GT.0) GO TO 375
      IF (L.GT.1.OR.FLG17.NE.0) GO TO 370
      WRITE (6,360)
  360 FORMAT (1H 28H OFF-BODY UNIFORM CROSS FLOW )
      GO TO 390
  370 IF (TYPEC(KC).GE.0.) GO TO 375
      WRITE (6,172)
  375 WRITE (6,380) NUNC(KC)
  380 FORMAT (1H 36H OFF-BODY NON-UNIFORM CROSS FLOW NO. I8)
  390 WRITE (6,400)
  400 FORMAT (1H 5X, 24H TRANSFORMED COORDINATES //
     1 12X 1HX 13X 1HY 13X 2HVX 12X 2HVY 12X 2HVZ 12X 3HPHI //)
  410 WRITE (6,420) I,XP(I),YP(I),VX(I,L),VY(I,L),VZ(I,L),PHI(I,L)
  420 FORMAT (1H I3, 6F14.7)
      I=I+1
      IF (I.GT.NP) GO TO 450
      IF (I.LE.LCTR) GO TO 410
      LCTR=LCTR+45
      GO TO 340
  450 CONTINUE
      CALL BCDUMP(XP(1),XP(NP))
      CALL BCDUMP(YP(1),YP(NP))
      CALL BCDUMP(VXDP(1),VXDP(NP))
      CALL BCDUMP(VYDP(1),VYDP(NP))
      CALL BCDUMP(VZDP(1),VZDP(NP))
  500 IF ( IPUVEL .EQ. 0 ) RETURN
      LOC = 7300
      CALL PUNCHV ( VX, NP, NSIG, LOC, CASE )
      LOC = 7700
      CALL PUNCHV ( VY, NP, NSIG, LOC, CASE )
      LOC = 8100
      CALL PUNCHV(VZ,NP,NSIG,LOC,CASE)
      RETURN
      END
```

```
$IBFTC EXCR    DECK

      SUBROUTINE EXCROS
C***   ***COMPUTE EXTRA CROSS FLOW VELOCITY COMPONENTS AND PRINT
      COMMON       HEDR(10)  ,CASE       ,NB         ,NNU
     1            ,FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2            ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3            ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4            ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5            ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      DOUBLE PRECISION  HEDR, CASE
      INTEGER      FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1            ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2            ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3            ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4            ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON       NT         ,ND(11)     ,MN         ,NUNA(4)    ,TYPEA(4)
     1            ,NER1       ,NER2       ,NMA        ,NSIGA      ,NSIGC
     2            ,NUNC(4)    ,TYPEC(4)   ,NLF(11)
      COMMON IEC, NSIGEC, TYPEEC(4), NUNEC(4)
      COMMON /P/ IPUVEL
      REAL         MN
C
      COMMON /C4/    X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1               SINA(500),COSA(500),XP(500),  YP(500)
      COMMON /TC/    RB(500,8),SIG(500,4),    A(500),   B(500),    Z(500),
     1               PHI(500,4),              XN(500,4),
     2               T(500,4), T3(500,4),     NSIG,     NP,  NI,  SUMV
     3               ,SUMM(4)
C
      DIMENSION    VX(500,4),VY(500,4),VZ(500,4),T2(500,4)
C
      EQUIVALENCE ( VX(1,1), XN(1,1) ), ( VY(1,1), T(1,1) ),
     1   (VZ(1,1), T3(1,1) ),  (T2(1,1), T(1,1) )
C
      REWIND 8
      IF (FLG08.EQ.0) GO TO 10
C***   ***TITLE FOR MATRIX PRINT
      WRITE (6,150) HEDR,CASE
      WRITE (6,8)
    8 FORMAT (1H 42H MATRICES A,B,Z BY ROWS * EXTRA CROSS FLOW //)
C***   ***READ EXTRA CROSS SIGMAS
   10 DO 20 N = 1,NSIG
   20 READ (3) ( SIG(I,N),I = 1,NT )
C***   ***NO. OF MIDPOINTS LOOP
      DO 100 I = 1,NT
C***   ***READ MATRICES A,B,Z
C***   ***YOU MUST SOLVE POTENTIAL MATRIX FOR EXCROS
      READ (8) ( A(J),J = 1,NT),( B (J),J = 1,NT ), ( Z(J),J = 1,NT )
C***   ***NO. OF FLOWS LOOP
      M = 0
      DO 70 N = 1,NSIG
```

///

```
      M = M + 2
      SA = 0.0
      SB = 0.0
      SZ = 0.0
C***   ***NO. OF ELEMENTS LOOP
      DO 30 J = 1,NT
      SA = SA + A(J) * SIG(J,N)
      SB = SB + B(J) * SIG(J,N)
   30 SZ = SZ + Z(J) * SIG(J,N)
   40 T2(I,N) = SB
      T3(I,N) = SZ
      XN(I,N) = SA
      PHI(I,N) = Y2(I) * SZ / 2.0
   70 CONTINUE
      IF (FLG08.EQ.0) GO TO 100
      WRITE (6,80) I, (A(J),J = 1,NT)
   80 FORMAT (1HO 13H MATRIX A ROW I6/  (1H 10F10.5) )
      WRITE (6,85) I, (B(J),J = 1,NT)
   85 FORMAT (1HO 13H MATRIX B ROW I6/  (1H 10F10.5) )
      WRITE (6,90) I, ( Z(J),J = 1,NT)
   90 FORMAT (1HO 13H MATRIX Z ROW I6/  (1H 10F10.5) )
  100 CONTINUE
C***   ***PRINT EXTRA CROSS FLOW (CN BODY) OUTPUT
  130 DO 250 L = 1,NSIG
      KEC = L
      I = 1
      J = 1
      M = 1
      N = ND(M)
C***   ***M IS THE BODY NUMBER
C***   ***N IS THE NUMBER OF POINTS ON BODY M
      LCTR = 22
  140 WRITE (6,150) HEDR,CASE
  150 FORMAT (1H1 25X, 26HDOUGLAS  AIRCRAFT  COMPANY /
     1        28X, 21HLONG  BEACH  DIVISION ///
     2         6X, 10A6, 4X, 10HCASE NO.  A6 //)
      IF (FLG22.GT.0) GO TO 160
      WRITE (6,155)NUNEC(KEC)
  155 FORMAT(41H CN-BODY NON-UNIFORM EXTRA CROSS FLOW NO. I8)
      GO TO 190
  160 WRITE  (6,162)
  162 FORMAT(68H  ON BODY   GENERATED (RESEP) BOUNDARY CONDITIONS   EXTR
     1A CROSS FLOW)
  190 WRITE (6,200)
  200 FORMAT (1H 5X 24H TRANSFORMED COORDINATES //
     1         12X 1HX 13X 1HY 13X           2HT2 12X 2HT3  9X 5HSIN A
     2         6X 5HCOS A 7X 5HSIGMA 11X 1HN 13X 3HPHI //)
  210 WRITE (6,220) I,X1(I),Y1(I),X2(J),Y2(J),         T2(J,L),T3(J,L),
     1          SINA(J),COSA(J),SIG(J,L),XN(J,L),PHI(J,L)
  220 FORMAT (1H I3,2F14.7/ 4X 4F14.7,2F11.5,3F14.7)
      I = I + 1
      J = J + 1
      IF (I.EQ.N) GO TO 230
      IF (I.LE.LCTR) GO TO 210
      LCTR = LCTR + 22
      GO TO 140
```

```
  230 M = M + 1
      N = N + ND(M)
      WRITE (6,240)I , X1(I), Y1(I)
  240 FORMAT (1H I3,2F14.7 //)
      I = I + 1
      IF (J.GE.NT) GO TO 250
      GO TO 210
  250 CONTINUE
C***   ***THIS IS WHERE THE CALL FOR PUNCHED OUTPUT WILL GO
  252 IF (FLG05.EQ.0) RETURN
C***   ***OFF BODY POINTS
      DO 300 I = 1,NP
C***   ***READ MATRICES X,Y,Z
      READ (8) ( A(J),J=1,NT ),(B(J),J = 1,NT), ( Z(J),J = 1,NT )
      DO 300 N = 1,NSIG
      SX = 0.0
      SY = 0.0
      SP = 0.0
C***   ***NUMBER OF ELEMENTS LOOP
      DO 260 J = 1,NT
      SX = SX + A(J) * SIG (J,N)
      SY = SY + B(J) * SIG (J,N)
  260 SP = SP + Z(J) * SIG(J,N)
      VX(I,N) = SX
      VY(I,N) = SY
      VZ(I,N) = SP
      PHI(I,N) = YP(I) * SP / 2.0
  300 CONTINUE
C***   ***PRINT EXTRA CROSS FLOW (OFF-BODY) OUTPUT
  330 DO 450 L = 1,NSIG
      KEC = L
      I = 1
      LCTR = 45
  340 WRITE (6,150) HEDR,CASE
      IF (FLG22.GT.0) GO TO 355
      WRITE(6,350) NUNEC(KEC)
  350 FORMAT (43H  OFF BODY NON-UNIFORM EXTRA CROSS FLOW NO. I8)
      GO TO 390
  355 WRITE(6,357)
  357 FORMAT(68H OFF BODY   GENERATED (RESEP) BOUNDARY CONDITIONS   EXTR
     1A CROSS FLOW)
  390 WRITE (6,400)
  400 FORMAT (1H 5X, 24H TRANSFORMED COORDINATES //
     1 12X 1HX 13X 1HY 13X 2HVX 12X 2HVY 12X 2HVZ 12X 3HPHI //)
  410 WRITE (6,420) I,XP(I),YP(I),VX(I,L),VY(I,L),VZ(I,L),PHI(I,L)
  420 FORMAT (1H I3, 6F14.7)
      I = I + 1
      IF (I.GT.NP)GO TO 450
      IF (I.LE.LCTR) GO TO 410
      LCTR = LCTR + 45
      GO TO 340
  450 CONTINUE
C***   ***THIS IS WHERE THE CALL TO PUNCHED OUTPUT   OFF BODY WILL GO
      RETURN
      END
```

```
$IBFTC COMBYN  DEBUG,DECK

C      THE MAIN PROGRAM FOR APPROACH 5 COMBYN
C
       COMMON /MONOF/ JJS,JJ
       COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
       COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
      1IN,NSPLT,YWING
       COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZC
      1R(200)
       COMMON /RDOUT3/ VXAX(200,2),VXCR(200)
       COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
       COMMON /COUT1/ QCA,PTC,PSPTCI,PI0180,ATOTAL,GRHO
       COMMON /COUT2/ VINFP,RHOTOT,VIC
       COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10)
       COMMON /GETOUT/ VMAG(3),ALIL,BLIL,CLIL
       COMMON /TOUT1/ SINTH,COSTH,OMEGA
       COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
       COMMON /RSAVE/ XDUM(400),YDUM(400),XAFF(200),YAFF(200)
      1  ,MO,JA,IR,NRUNNO,MO2,JA2,IR2,NRUNO2
2      CALL READS
       VSAVE=VINF
       IF (VINF.EQ.0.0) GO TO 4
       VINF=VINF*(1.0-.2*(VINF/ATOTAL)**2)**2.5
4      VCSAVE=VC
       VC=VIC
       CALL GETABC
       VC=VCSAVE
       VINFP=VINF
       VINF=VSAVE
       WRITE (6,8) VMAG(1),VMAG(2),ALIL,BLIL,CLIL,VINFP
       CALL AVERV
       REWIND 2
       REWIND 3
       DO 6 N=1,NTHETA
       WRITE (6,10) N,NTHETA
       READ (3) WDOTT,VICT
       WRITE (6,12) THETA(N),WDOTT,VICT,VMAG(3)
       THETA(N)=THETA(N)*PI0180
       SINTH=SIN(THETA(N))
       CSINTH=CLIL*SINTH
       COSTH=COS(THETA(N))
       CCOSTH=CLIL*COSTH
       OMEGA=UTIP/YRISHR
       CALL ONOFF
6      CONTINUE
       GO TO 2
C*****
C*** FORMATS
C*****
C
8      FORMAT (97H              V1              V2              A
      1 B              C            VINFP           /5X,1P6E14.3)
10     FORMAT (1H0,4X,I2,4H OF ,I2,7H THETAS/1H0)
12     FORMAT (3X,8HTHETA = ,E12.5,13H     WDOTT = ,1PE12.5,12H     VICT
      1= ,1PE12.5,10H     V3 = ,1PE12.5)
       END
```

```
$IBFTC SINTP.
      SUBROUTINE SINTP (Z,W,N,X1,Y1)
      DIMENSION X(200), Y(200), Z(1), W(1)
      DO 2 I=1,N
      X(I)=Z(I)
2     Y(I)=W(I)
      CALL SORTXY (X,Y,N)
C
      DO 4 I=1,N
      K=I
      IF (X1.GT.X(I)) GO TO 4
      IF (X1.EQ.X(I)) GO TO 6
      IF (X1.LT.X(I)) GO TO 8
4     CONTINUE
6     Y1=Y(K)
      GO TO 10
8     IF (K.EQ.1) GO TO 12
      IF (K.EQ.N) K=N-1
      IF (X(K).EQ.X(K+1)) K=K-1
      W1=(X1-X(K))*(X1-X(K+1))/(X(K-1)-X(K))/(X(K-1)-X(K+1))
      W2=(X1-X(K-1))*(X1-X(K+1))/(X(K)-X(K-1))/(X(K)-X(K+1))
      W3=(X1-X(K-1))*(X1-X(K))/(X(K+1)-X(K-1))/(X(K+1)-X(K))
      Y1=Y(K-1)*W1+Y(K)*W2+Y(K+1)*W3
10    RETURN
12    Y1=0.0
      RETURN
      END
```

```
$IBFTC INTPL.  DEBUG,DECK

      SUBROUTINE INTPOL (L,J,XI,IFLAG,VX,VRES,BETA,ALPH)
C*****
C***  THIS SUBROUTINE INTERPOLATES AND DIFFERENTIATES
C*****
      COMMON /CNOUT/ VRESON(400),VP(400),BETAON(400)
      COMMON /GEABC/ YI
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZC
     1R(200)
      DIMENSION V(400), B(400)
      EPS=1.0E-6
      M=J-1
      N=J+1
      A=1.0
      DO 2 K=M,N
      XDIF=XI-XON(K)
      IF (XDIF.EQ.0.0) XDIF=EPS
      A=A*XDIF
2     CONTINUE
C
C     IF THE REAKE X EQUALS THE ON BODY X THEN SET INTERPOLATED VALUES
C          TO THE VALUES ON BODY
C
      IF (ABS(XI-XON(J)).LE.1.0E-6) GO TO 20
      DO 4 K=M,N
      B(K)=1.0
      DO 4 LL=M,N
      IF (LL.EQ.K) GO TO 4
      B(K)=B(K)*(XON(K)-XON(LL))
4     CONTINUE
      YI=0.0
      DUM=0.0
      VINT=0.0
      DO 12 II=M,N
      XDIF=XI-XON(II)
      IF (XDIF.EQ.0.0) XDIF=EPS
      IF (L.EQ.3) GO TO 6
      IF (IFLAG.GT.1) GO TO 8
      V(II)=T(II,L)
      GO TO 10
6     V(II)=V2(II)
      GO TO 10
8     V(II)=VRESON(II)
10    YI=YI+(A*YON(II))/(XDIF*B(II))
      VINT=VINT+(A*V(II))/(XDIF*B(II))
      IF (IFLAG.EQ.1) GO TO 12
      V(II)=VP(II)
      DUM=DUM+(A*V(II))/(XDIF*B(II))
12    CONTINUE
```

```
      IF (IFLAG.EQ.1) GO TO 16
      BETA=0.0
      PSOP=0.0
      DO 14 II=M,N
      XDIF=XI-XON(II)
      IF (XDIF.EQ.0.0) XDIF=EPS
      BETA=BETA+(A*BETAON(II))/(XDIF*B(II))
14    CONTINUE
16    JK=J
18    AD=XI-XON(JK-1)
      BD=XON(JK)-XI
      PO=AD*(AD+BD)
      P1=-(AD*BD)
      P2=(AD+BD)*BD
      AO=-BD
      A1=AD-BD
      A2=AD
      DY=(AO*YON(JK-1))/PO+(A1*YI)/P1+(A2*YON(JK))/P2
      ALPHA=ATAN(DY)
      ALPH=ALPHA/(3.14159265/180.)
      VX=VINT*COS(ALPHA)
      VRES=VINT
      IF (IFLAG.EQ.2) VX=DUM*COS(ALPHA)
      RETURN
20    IF (L.EQ.3) VINT=V2(J)
      VINT=T(J,L)
      IF (IFLAG.GT.1) VINT=VRESON(J)
      YI=YON(J)
      IF (IFLAG.NE.1) DUM=VP(J)
      BETA=BETAON(J)
      JK=J-1
      GO TO 18
      END
```

```
$IBFTC GTABC.  DEBUG,DECK

      SUBROUTINE GETABC
C*****
C***  COMPUTES V1 , V2 , V3 , A , B , C  FROM INPUT PARAMETERS
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZC
     1R(200)
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /RDOUT3/ VXAX(200,2),VXCR(200)
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
      COMMON /GETOUT/ VMAG(3),ALIL,BLIL,CLIL
      COMMON /GEABC/ YI
      DIMENSION VXAXH(2), VXAXS(2)
      PI0180=3.14159265/180.
      ALFAF=ALFAF*PI0180
      DEBUG((VXAX(I,J),I=1,200),J=1,2)
      DEBUG(VXCR(I),I=1,200)
C*****
C***   COMPUTE V1 , V2 , V3
C*****
      IF (XOFF(NCLO).LT.XON(1)) GO TO 6
C
C     SEARCH ON HUB COUNTING BACKWARDS
C
      J=NHUBMX
2     IF (XON(J).LT.XOFF(NCLO)) GO TO 4
      J=J-1
      GO TO 2
4     J=J+1
      XH=XOFF(NCLO)
      IFLAG=1
      CALL INTPOL (1,J,XH,IFLAG,VX,DUM,DUM,DUM)
      VXAXH(1)=VX
      CALL INTPOL (2,J,XH,IFLAG,VX,DUM,DUM,DUM)
      VXAXH(2)=VX
      CALL INTPOL (3,J,XH,IFLAG,VXCRH,DUM,DUM,DUM)
      YH=YI
      GO TO 8
6     YH=0.0
      VXAXH(1)=0.0
      VXAXH(2)=0.0
      VXCRH=0.0
C*****
C***   SEARCH ON SHROUD COUNTING FORWARDS
C*****
8     K=NHUBMX+1
10    IF (XON(K).LT.XOFF(NCHI)) GO TO 12
      K=K+1
      GO TO 10
12    K=K-1
```

```
      XS=XOFF(NCHI)
      IFLAG=1
      CALL INTPOL (1,K,XS,IFLAG,VX,DUM,DUM,DUM)
      VXAXS(1)=VX
      CALL INTPOL (2,K,XS,IFLAG,VX,DUM,DUM,DUM)
      VXAXS(2)=VX
      CALL INTPOL (3,K,XS,IFLAG,VXCRS,DUM,DUM,DUM)
      YS=YI
      ILOW=NCLO+1
      IHIGH=NCHI-1
C
C     AXIAL COMPONENT VELOCITY *** AXISSYMETRIC SOLUTION
C
      DO 16 L=1,2
      SUM=YH*VXAXH(L)*(YOFF(NCLO)-YH)+VXAX(NCLO,L)*YOFF(NCLO)*(YOFF(NCLO
     1+1)-YH)
      DO 14 I=ILOW,IHIGH
      SUM=SUM+VXAX(I,L)*YOFF(I)*(YOFF(I+1)-YOFF(I-1))
14    CONTINUE
      SUM=SUM+YOFF(NCHI)*VXAX(NCHI,L)*(YS-YOFF(NCHI-1))+(-1.0)*YS*VXAXS(
     1L)*(YS-YOFF(NCHI))
      VMAG(L)=SUM/(YS**2-YH**2)
16    CONTINUE
C
C     AXIAL COMPONENT CROSSFLOW VELOCITY SOLUTION
C
      SUM=YH*VXCRH*(YOFF(NCLO)-YH)+VXCR(NCLO)*YOFF(NCLO)*(YOFF(NCLO+1)-Y
     1H)
      DO 18 I=ILOW,IHIGH
      SUM=SUM+VXCR(I)*YOFF(I)*(YOFF(I+1)-YOFF(I-1))
18    CONTINUE
      SUM=SUM+YOFF(NCHI)*VXCR(NCHI)*(YS-YOFF(NCHI-1))+(-1.0)*YS*VXCRS*(Y
     1S-YOFF(NCHI))
      VMAG(3)=SUM/(YS**2-YH**2)
      CLIL=VINF*COS(ALFAF)
      ALIL=(VC+VINF*SIN(ALFAF)*VMAG(2))/(VMAG(1)-VMAG(2))
      BLIL=(VC+VINF*SIN(ALFAF)*VMAG(1))/(VMAG(2)-VMAG(1))
      ALFAF=ALFAF/PI0180
      RETURN
      END
```

```
$IBFTC VBART   DECK

C       APPROACH 5
C
        SUBROUTINE VBARIT (VBAR,ATOTAL,RHOTOT,RHOBAR)
C
C       TO SOLVE VBAR COMP ITERATIVELY
C
        VCRIT=ATOTAL/SQRT(1.2)
        I=0
        VGUES=VBAR
2       VGUESA=(VGUES/ATOTAL)**2
        A=1.0-.2*VGUESA
        B=A-VGUESA
        VCOMP=(VBAR-A**2.5*VGUES)/(A**1.5*B)+VGUES
        IF (ABS((VCOMP-VGUES)/VCOMP).LT..0001) GO TO 4
        I=I+1
        IF (VCOMP.GE.VCRIT) VCOMP=.5*(VGUES+VCRIT)
        VGUES=VCOMP
        IF (I.GT.20) GO TO 4
        GO TO 2
4       RHOBAR=(1.0-.2*(VCOMP/ATOTAL)**2)**2.5*RHOTOT
        IF (I.GT.20) WRITE (6,6) VBAR,VCOMP,RHOBAR
        RETURN
C
6       FORMAT (1H0,34HI EXCEEDS 20 ITERATIONS FOR RHOBAR,5X,7HVBAR = ,1PE
       110.3,2X,8HVCOMP = ,1PE10.3,2X,9HRHOBAR = ,1PE10.3)
        END
```

```
$IBFTC READS.  DEBUG,DECK

      SUBROUTINE READS
C*****
C***  THIS SUBROUTINE READS ALL INPUT
C*****
      EQUIVALENCE (T,TRD), (VXAX,VXAXRD), (VYAX,VYAXRD)
      DIMENSION TRD(1), VXAXRD(1), VYAXRD(1), EODD(400), TITLE(12)
      COMMON /RSAVE/ XDUM(400),YDUM(400),XAFF(200),YAFF(200)
     1 ,MO,JA,IR,NRUNNO,MO2,JA2,IR2,NRUNO2
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      COMMON /WRT/ KSKIP,NT(2),NP(2)
      COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZC
     1R(200)
      COMMON /RDOUT3/ VXAX(200,2),VXCR(200)
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10)
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
C*****
C     READ NT(1) = NUMBER OF ON-BODY POINTS FOR CLOSED BODY SOLUTION
C          NT(2) = NUMBER OF ON-BODY POINTS FOR OPEN-END SOLUTION
C          NP(1) = NP(2) =  TOTAL NUMBER OF OFF-BODY POINTS
C          NID   = NUMBER OF EOD I.D. CARDS
C          KSKIP = 0  FOR 1 CASE OF COMBYN
C                = 1  FOR SUCCESSIVE CASES USING THE SAME EOD OUTPUT
C          N4SOL = 0  THREE (3) SOLUTIONS FROM EOD
C                     ( 2 FOR STREAMLINES ,1 FOR CROSSFLOW )
C                = 1  FOUR (4) SOLUTIONS FROM EOD
C                     ( 2 FOR STREAMLINES, 2 FOR CROSSFLOW )
C          NSPLT = NUMBER OF SPLITTERS (NOISE SUPPRESSION DEVICES )
C
C
C          NSPB =  RIGHT MOST POINT ON THE SPLITTER
C          NSPE =  LEFT MOST POINT ON THE SPLITTER
C
C          *****   THE FIRST SPLITTER IS THE ONE CLOSEST TO THE HUB
C                   AND THE LAST SPLITTER IS THE ONE CLOSEST TO THE SHRO
C
C*****
      READ (5,30) TITLE
      READ (5,32) (NT(I),NP(I),I=1,2),NID,KSKIP,N4SOL,NSPLT
      NPMIN=NP(1)
      NTMIN=NT(2)
      IF (NSPLT.NE.0) READ (5,32) (NSPB(I),NSPE(I),I=1,NSPLT)
      READ (5,34) VC,VINF,ALFAF,TTOTAL,ELND,YWING,UTIP,VA,PT
      READ (5,34) PSTAT,TSTAT,WDOT
      READ (5,32) NTHETA,NCLO,NCHI,NX,KND
      READ (5,34) (THETA(I),I=1,NTHETA)
      READ (5,34) (XTEST(I),I=1,NX)
      READ (5,36) XRI,YRIHUB,YRISHR,NHUBMX
      DEBUG(NSPB(I),NSPE(I),I=1,NSPLT)
C*****
C***   IF KSKIP = 0 , READ DATA PUNCHED FROM EOD
C*****
```

```
      IF (KSKIP.NE.0) GO TO 20
      READ (5,38) MO,JA,IR,NRUNNO
      DO 18 L=1,2
      ILOON=1+400*(L-1)
      IHION=ILCON+NT(L)-1
      NTL=NT(L)
      ILO=1+200*(L-1)
      IHI=ILO+NP(L)-1
      NPL=NP(L)
      IF (L.EQ.1) GO TO 4
      IF (NID.GT.1) GO TO 2
      MO2=MO
      JA2=JA
      IR2=IR
      NRUNO2=NRUNNO
      GO TO 4
2     READ (5,38) MO2,JA2,IR2,NRUNO2
C*****
C***  READ OUTPUT FROM EOD   (BINARY RECORDS)
C*****
4     CALL BCREAD (XON(1),XON(NTL))
      CALL BCREAD (YON(1),YON(NTL))
      CALL BCREAD (TRD(ILOON),TRD(IHION))
      CALL BCREAD (XOFF(1),XOFF(NPL))
      CALL BCREAD (YOFF(1),YOFF(NPL))
      CALL BCREAD (VXAXRD(ILO),VXAXRD(IHI))
      CALL BCREAD (VYAXRD(ILO),VYAXRD(IHI))
      CALL BCREAD (EODD(1),EODD(NPL))
      IF (L.EQ.2) GO TO 6
      CALL BCREAD (XON(1),XON(NTL))
      CALL BCREAD (YON(1),YON(NTL))
      CALL BCREAD (V2(ILOON),V2(IHION))
      CALL BCREAD (V3(ILOON),V3(IHION))
      CALL BCREAD (XOFF(1),XOFF(NPL))
      CALL BCREAD (YOFF(1),YOFF(NPL))
      CALL BCREAD (VXCR(ILO),VXCR(IHI))
      CALL BCREAD (VYCR(ILO),VYCR(IHI))
      CALL BCREAD (VZCR(ILO),VZCR(IHI))
      GO TO 12
6     IF (N4SOL.EQ.0) GO TO 18
      DO 8 I=1,4
      CALL BCREAD (EODD(1),EODD(NTL))
8     CONTINUE
      DO 10 I=1,5
      CALL BCREAD (EODD(1),EODD(NPL))
10    CONTINUE
12    DO 14 I=1,NTL
      XDUM(I)=XON(I)
14    YDUM(I)=YON(I)
      DO 16 I=1,NPL
      XAFF(I)=XOFF(I)
16    YAFF(I)=YOFF(I)
18    CONTINUE
20    WRITE (6,28) TITLE
      WRITE (6,40) MO,JA,IR,NRUNNO,MO2,JA2,IR2,NRUNO2
      CALL CONST
```

```
      DO 22 I=1,NTMIN
      XON(I)=XDUM(I)/ELND
22    YON(I)=YDUM(I)/ELND
      DO 24 I=1,NPMIN
      XOFF(I)=XAFF(I)/ELND
24    YOFF(I)=YAFF(I)/ELND
      DO 26 I=1,NX
26    XTEST(I)=XTEST(I)/ELND
      RETURN
C
C     FORMATS
C
C
28    FORMAT (1H1,10X,30HCOMPRESSIBLE COMBYN APPROACH 5,10X,12A6)
30    FORMAT (12A6)
32    FORMAT (20I4)
34    FORMAT (10F8.3)
36    FORMAT (3F10.2,I4)
38    FORMAT (42X,3I2,I6)
40    FORMAT (1HO/25H BASED ON BASIC DATA FROM,I3,1H/,I2,1H/,I2,8H RUN N
     10.,I6,4H AND,I3,1H/,I2,1H/,I2,8H RUN NO.,I6/)
      END
```

```
$IBFTC CONST.  DEBUG,DECK

      SUBROUTINE CONST
C
C     THIS SUBROUTINE CALCULATES MOST OF THE CONSTANTS USED IN COMBYN
C
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
      COMMON /COUT1/ QCA,PTC,PSPTCI,PI0180,ATOTAL,GRHO
      COMMON /COUT2/ VINFP,RHOTOT,VIC
      COMMON /WRT/ KSKIP,NT(2),NP(2)
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10)
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      REAL MC,MA,MINF
      PI=3.14159265
      R21568=1715.63
      G=32.174
      PI0180=PI/180.
      IF (PSTAT.NE.0.0.AND.TSTAT.NE.0.0) GO TO 2
      IF (PT.EQ.0.0) PT=2116.22
      IF (TTOTAL.EQ.0.0) TTOTAL=518.67
      ATOTAL=49.*SQRT(TTOTAL)
      CATOT=1.0-.2*(VINF/ATOTAL)**2
      PSTATC=PT*CATOT**3.5
      PTC=PT
      RHOTOT=PT/(R21568*TTOTAL)
      TSTAT=TTOTAL*CATOT
      RHOST=PSTATC/(R21568*TSTAT)
      PSTAT=PT-.5*RHOST*VINF**2
      ASTAT=49.*SQRT(TSTAT)
      GO TO 4
2     ASTAT=49.0*SQRT(TSTAT)
      PSTATC=PSTAT
      RHOST=PSTAT/(R21568*TSTAT)
      AMINF=VINF/ASTAT
      CAMINF=1.0+.2*AMINF**2
      PT=PSTAT+.5*RHOST*VINF**2
      PTC=PSTAT*CAMINF**3.5
      TTOTAL=TSTAT*CAMINF
      RHOTOT=PT/(R21568*TTOTAL)
      ATOTAL=49.*SQRT(TTOTAL)
4     IF (WDOT.EQ.0.0) GO TO 6
      AC=PI*(YRISHR**2-YRIHUB**2)/144.
      VIC=WDOT/(G*RHOTOT*AC)
      VICC=ATOTAL/1.728
C*****
C***  FOR D. BREUNLIN TAKE OUT FOLLOWING THREE(3) CARDS  8/30/71
C*****
C     IF(VIC.LE.VICC) GO TO 25
C     VIC = VICC
```

```
C      WDOT = RHOTOT*VICC*AC*G
       CALL VBARIT (VIC,ATOTAL,RHOTOT,RHOC)
       VC=WDOT/(G*RHOC*AC)
6      IF (VA.EQ.0.0) VA=VC
C*****
C***   TESTS FOR NORMALIZING PARAMETERS (ELND)
C***       IF KND = -1, ELND =YRISHR
C***                 0, SET ELND = 1.0 AND SKIP NONDIMENSIONAL CALCULATIO
C***                 1, ELND = YRISHR - YRIHUB
C***                 2, USE READ IN VALUE OF ELND
C***                 4,5,6 USE VA FOR NONDIMENSIONALIZING VELOCITIES
C*****
       IF (KND.EQ.0) GO TO 8
       VCA=VC
       IF (KND.GE.4) VCA=VA
       WRITE (6,28) VC,VINF,VA,VCA,PT,TTOTAL
       VC=VC/VCA
       VA=VA/VCA
       VINF=VINF/VCA
       PT=1.0
       TTOTAL=TTOTAL/(VCA**2)
8      IF (KND.EQ.-1.OR.KND.EQ.4) ELND=YRISHR
       IF (KND.EQ.1.OR.KND.EQ.6) ELND=YRISHR-YRIHUB
       IF (KND.EQ.0.OR.KND.EQ.5) ELND=1.0
       XRI=XRI/ELND
       YRIHUB=YRIHUB/ELND
       YRISHR=YRISHR/ELND
       RTTOT=R21568*TTOTAL
       GRHO=32.174*PT/RTTOT
       C102RT=.5/RTTOT
       IF (PSTAT.NE.0.0) C102RT=.5*RHOST/PT
       VCOVA=VC/VA
       VIOVA=VINF/VA
       VNFOVC=VINF/VC
       VFOAT=VINF/ATOTAL
       VCOAT=VC/ATOTAL
       VAOAT=VA/ATOTAL
       CON1=1.0-.2*VCOAT**2
       CON2=1.0-.2*VFOAT**2
       CON3=1.0-.2*VAOAT**2
       RSORTF=CON2**2.5
       RSORTA=CON3**2.5
       RSORTC=CON1**2.5
       IF (WDOT.EQ.0.0) VIC = VC*RSORTC
       VSONIC=ATOTAL/1.728
       VSONCC=ATOTAL/SQRT(1.2)
       PSPTC=1.0-C102RT*VC**2
       PSPTIF=1.0-C102RT*VINF**2
       PSPTCI=RSORTF*CON2
       PSPTCC=RSORTC*CON1
       PSPTCA=RSORTA*CON3
       PSPTA=1.0-C102RT*VA**2
       MINF=VFOAT/(CON2**.5)
       MC=VCOAT/(CON1**.5)
       MA=VAOAT/(CON3**.5)
       QINF=PT*(1.0-PSPTIF)
```

```
      QCINF=PTC*(.7*VFOAT**2*RSORTF)
      QC=PT*(1.0-PSPTC)
      QCC=PTC*(.7*VCOAT**2*RSORTC)
      QA=PT*(1.0-PSPTA)
      QCA=PTC*(.7*VAOAT**2*RSORTA)
      THETC=TTOTAL/518.67
      DEL=PTC/2116.22
      HBTPR=YRIHUB/YRISHR
      WRITE (6,10)
      WRITE (6,12) VC,MC,QC,QCC,PSPTC,PSPTCC,RSORTC
      WRITE (6,14) VA,MA,QA,QCA,PSPTA,PSPTCA,RSORTA
      WRITE (6,16) VINF,MINF,QINF,QCINF,PSPTIF,PSPTCI,RSORTF
      WRITE (6,18)
      WRITE (6,20) ALFAF,VNFOVC,VIOVA,VCOVA,VSONIC,VSONCC
      WRITE (6,22)
      WRITE (6,24) TSTAT,PSTAT,PSTATC,ASTAT,RHOST,WDOT,VIC
      WRITE (6,18)
      WRITE (6,26) TTOTAL,PT,PTC,ATOTAL,RHOTOT,THETC,DEL
      WRITE (6,22)
      WRITE (6,18)
      WRITE (6,30) XRI,YRIHUB,YRISHR,HBTPR,ELND
      WRITE (6,18)
      WRITE (6,32) XTEST(1),YWING
      WRITE (6,22)
      WRITE (6,34) NT(1),NP(1),NCLO,NCHI,NHUBMX,NX,KND,KSKIP,NT(2),NP(2)
C
C     FORMATS
C
      RETURN
C
10    FORMAT (1HO,27X,58HMACH            DYNAMIC PRESSURE              PRE
     1SSURE RATIO/107H             VELOCITY          NO            INC.
     2      COMP.          INC.          COMP.      DENSITY RATIO)
12    FORMAT (11H  CONTROL   ,1PE10.3,1P6E14.3)
14    FORMAT (11H  BULK      ,1PE10.3,1P6E14.3)
16    FORMAT (11H  FREE      ,1PE10.3,1P6E14.3/8H  STREAM)
18    FORMAT (1HO)
20    FORMAT (87H            ALFAF         VINF/VC        VINF/VA         VC
     1/VA         VSONIC         VSONICC/5X,1P6E14.3)
22    FORMAT (1HO,110H----------------------------------------------------
     1----------------------------------------------------//)
24    FORMAT (100H             TSTAT          PSTAT          PSTATC
     1 ASTAT         RHOSTAT        WDOT           VIC/9X,1PE10.3,1P6E14.3
     2)
26    FORMAT (101H              TTOT          PTOT           PTOTC
     1 ATOT          RHOTOT          THET           DEL/5X,1P7E14.3)
28    FORMAT (1HO,6E12.5)
30    FORMAT (75H              XRI          YRIHUB         YRISHR      HUB-T
     1IP RATIO         LND/5X,1P5E14.3)
32    FORMAT (31H             XTEST          YWING/5X,1P2E14.3)
34    FORMAT (74H               NT          NP     NCLO     NCHI     NHUBMX
     1 NX     KND     KSKIP/10X,1H1,I4,5X,1H1,I5,4X,I3,5X,I3,6X,I3,6X,I2,4
     2X,I2,6X,I2/10X,1H2,I4,5X,1H2,I5)
      END
```

```
$IBFTC AVERV   DECK,DEBUG

      SUBROUTINE AVEV
C
C     APPROACH 5
C
      COMMON /MONOF/ JJS,JJ
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZC
     1R(200)
      COMMON /RDOUT3/ VXAX(200,2),VXCR(200)
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10)
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
      COMMON /COUT2/ VINFP,RHOTOT,VIC
      COMMON /GETOUT/ VMAG(3),ALIL,BLIL,CLIL
      DIMENSION IBEGIN(25), IEND(25), VBAR(400), A(400), VBAROF(200), RH
     1OBAR(400), RBROFF(200), RBORT(400), RBFORT(200)
      DIMENSION IED(25)
      REWIND 2
      REWIND 3
      PI=3.14159265
      PIO180=PI/180.
      G=32.174
      AC=PI*(YRISHR**2-YRIHUB**2)/144.
      ATOTAL=49.*SQRT(TTOTAL)
      FACTR=(144./G)/RHOTOT
      NSHR=NTMIN-NHUBMX+1
      NBP1=NHUBMX+1
C*****
C*** FIND THE HIGH-LIGHT ON THE SHROUD
C*****
      DO 2 I=NBP1,NTMIN
      JJ=I
      IF (XON(I).LE.XON(I+1)) GO TO 4
2     CONTINUE
C*****
C***  MODIFICATION FOR SPLITTER TO FIND THE LAST POINT ON THE SHROUD
C*****
4     DO 6 I=JJ,NTMIN
      JJS=I
      IF (XON(I).GT.XON(I+1)) GO TO 8
6     CONTINUE
C*****
C***  FIND AREAS FOR POINTS ON THE SHROUD THEN INTERPOLATE FOR ALL
C***     OTHER POINTS
C*****
8     NHUBP1=NHUBMX+1
      IF (NSPLT.EQ.0) GO TO 12
      DO 10 IN=1,NSPLT
      IED(IN)=NSPB(IN+1)-1
10    IF (IN.EQ.NSPLT) IED(IN)=NTMIN
C*****
C***  FIND AREA FOR EVERY POINT ON THE SHROUD
```

```
C*****
12    DO 20 I=NHUBP1,JJS
      YS=YON(I)
      XS=XON(I)
      IF (I.GT.JJ) GO TO 18
      ARS=0.0
      IF (NSPLT.EQ.0) GO TO 16
C*****
C***  IF THERE ARE SPLITTERS, SUBTRACT AREA OF SPLITTERS FROM OVERALL AR
C*****
      DO 14 IN=1,NSPLT
      NSB=NSPB(IN)
      NSE=NSPE(IN)
      IF (XS.LT.XON(NSE).OR.XS.GT.XON(NSB)) GO TO 14
      CALL SINTP (XON(NSB),YON(NSB),NSE-NSB+1,XS,YSP1)
      CALL SINTP (XON(NSE),YON(NSE),IED(IN)-NSE,XS,YSP2)
      ARS=PI*(YSP2**2-YSP1**2)+ARS
14    CONTINUE
16    CALL SINTP (XON,YON,NHUBMX,XS,YH)
      A(I)=PI*(YS**2-YH**2)-ARS
      GO TO 20
18    R=SQRT(YS**2+(XS-XON(JJ))**2)
      A(I)=(1.0+(YS-YON(JJ))/(YON(JJS)-YON(JJ)))*PI*R*(R+XS-XON(JJ))
20    CONTINUE
C*****
C***  INTERPOLATE AREAS FROM THE POINTS ON THE SHROUD TO OBTAIN
C***    REMAINING AREAS
C*****
      NCNTH=0
      DO 24 I=1,NTMIN
      IF (I.GE.NHUBP1.AND.I.LE.JJS) GO TO 24
      IF (XON(I).LT.XON(JJ)) GO TO 22
      XA=XON(I)
      CALL SINTP (XON(NHUBP1),A(NHUBP1),JJ-NHUBMX,XA,AX)
      A(I)=AX
      GO TO 24
22    NCNTH=NCNTH+1
24    CONTINUE
      IF (NCNTH.EQ.0) GO TO 28
      DO 26 I=1,NCNTH
      A(I)=A(NCNTH+1)
26    CONTINUE
28    DO 50 N=1,NTHETA
      THETA(N)=THETA(N)*PIO180
      COSTH=COS(THETA(N))
      CCOSTH=CLIL*COSTH
      SINTH=SIN(THETA(N))
      CSINTH=CLIL*SINTH
      VICT=VIC+CLIL*VMAG(3)*COSTH
      WDOTT=G*RHOTOT*VICT*AC
      FACTOR=FACTR*WDOTT
      WRITE (3) WDOTT,VICT
C*****
C***  CALCULATE VBAR FOR EVERY POINT ON BODY
C*****
      ISTOP=NTMIN
```

```
      SLOPE = (XON(JJS)-XON(JJ))/(YON(JJS)-YON(JJ))
      DO 32 I=1,NTMIN
      IF (I.GT.JJ.AND.I.LE.JJS.AND.SLOPE.GT.1.0) GO TO 30
      VBAR(I)=FACTOR/A(I)
      GO TO 32
30    VBAR(I)=VINFP
      IF (VBAR(I).EQ.0.0) VBAR(I)=1.0
      IF (ISTOP.EQ.NTMIN) ISTOP=I
32    CONTINUE
      DEBUG(VBAR(I),I=1,NTMIN)
C
C     CNBODY RHOBAR AND VRES CALCULATIONS
C
      RRSRTF=RHOTOT*(1.0-.2*(VINF/ATOTAL)**2)**2.5
      RSORTC=(1.0-.2*(VC/ATOTAL)**2)**2.5
      DO 38 I=1,NTMIN
      VP=ALIL*T(I,1)+BLIL*T(I,2)+CCOSTH*V2(I)
      VTH=CSINTH*V3(I)
C
C     ORIGINAL VRESON
C
      VRESON=SQRT(VP**2+VTH**2)
      RESVV=VRESON
C
C     APPROACH 5 VRESON
C
      IF (I.GE.ISTOP.AND.I.LE.JJS) GO TO 34
      CALL VBARIT (VBAR(I),ATOTAL,RHOTOT,RHOBAR(I))
      GO TO 36
34    RHOBAR(I)=RRSRTF
36    RBORT(I)=RHOBAR(I)/RHOTOT
      VRESON=VRESON*(1.0/RBORT(I))**(VRESON/VBAR(I))
      VP=VRESON*VP/RESVV
      VTH=VRESON*VTH/RESVV
      WRITE (3) VRESON,VP,VTH
38    CONTINUE
      WRITE (2) (VBAR(I),RBORT(I),I=1,NTMIN)
C
C     OFF BODY POINTS A AND VBAR
C
      J=1
      IBEGIN(J)=1
      NRAKES=1
      DO 42 I=1,NPMIN
      IF (ABS(XOFF(I+1)-XOFF(I)).GT..01) GO TO 40
      GO TO 42
40    IF (I.EQ.NPMIN) GO TO 42
      J=J+1
      IBEGIN(J)=I+1
      NRAKES=J
42    CONTINUE
      DO 46 I=1,NRAKES
      IB=IBEGIN(I)
C*****
C*** FIND AREA FOR OFF-BODY RAKES
C*****
```

```
      CALL SINTP (XON(NHUBP1),A(NHUBP1),JJ-NHUBMX,XOFF(IB),AR)
      VB=FACTOR/AR
      CALL VBARIT (VB,ATOTAL,RHOTOT,RHB)
      IE=IBEGIN(I+1)-1
      IF (I.EQ.NRAKES) IE=NPMIN
      DO 44 J=IB,IE
      VBAROF(J)=VB
      RBROFF(J)=RHB
44    CONTINUE
46    CONTINUE
      DO 48 I=1,NPMIN
C
C     ORIGINAL VRESOF
C
      VXC=ALIL*VXAX(I,1)+BLIL*VXAX(I,2)+CCOSTH*VXCR(I)
      VYC=ALIL*VYAX(I,1)+BLIL*VYAX(I,2)+CCOSTH*VYCR(I)
      VZC=CSINTH*VZCR(I)
      VRESOF=SQRT(VXC**2+VYC**2+VZC**2)
      RESVV=VRESOF
C
C     APPROACH 5 VRESOF
      RBFORT(I)=RBROFF(I)/RHOTOT
      VRESOF=VRESOF*(1.0/RBFORT(I))**(VRESOF/VBAROF(I))
      VXC=VRESOF*VXC/RESVV
      VYC=VRESOF*VYC/RESVV
      VZC=VRESOF*VZC/RESVV
      WRITE (3) VRESOF,VXC,VYC,VZC
48    CONTINUE
      WRITE (2) (VBAROF(I),RBFORT(I),I=1,NPMIN)
      THETA(N)=THETA(N)/PI0180
50    CONTINUE
      RETURN
      END
```

```
$IBFTC ONOFF.  DECK

      SUBROUTINE ONOFF
      CALL ONBODY
      CALL OFFBDY
      RETURN
      END
```

```
$IBFTC ONBDY.  DECK

      SUBROUTINE ONBODY
C*****
C***  THIS SUBROUTINE CALCULATES ON-BODY VARIABLES
C*****
      COMMON /MONOF/ JJS,JJ
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      COMMON /COUT1/ QCA,PTC,PSPTCI,PI0180,ATOTAL,GRHO
      COMMON /CNOUT/ VRESON(400),VP(400),BETAON(400)
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
      DIMENSION VTH(400), PSOPTC(400), CPCON(400), VBAR(400), RBORT(400)
     1, S(400)
      CALL SRTNE (XON,YON,XRI,YRIHUB,YRISHR,NHUBMX,NTMIN,S)
      DO 10 I=1,NTMIN
C*****
C***  READ FROM TAPE 3   VRESON  ,  VP  ,  VTH
C*****
      READ (3) VRESON(I),VP(I),VTH(I)
      VCONC=.2*(VRESON(I)/ATOTAL)**2
      IF (VCONC.GT.1.0) GO TO 2
      PSOPTC(I)=(1.0-VCONC)**3.5
      GO TO 4
2     PSOPTC(I)=0.0
4     IF (VTH(I).EQ.0.0) GO TO 6
      BETAON(I)=ATAN(VTH(I)/VP(I))/PI0180
      GO TO 8
6     BETAON(I)=0.0
8     CPCON(I)=(PSOPTC(I)-PSPTCI)/(QCA/PTC)
10    CONTINUE
      READ (2) (VBAR(I),RBORT(I),I=1,NTMIN)
C*****
C***  WRITE HUB COORDINATES AND VARIABLES
C*****
      WRITE (6,14)
      WRITE (6,16)
      WRITE (6,18) (I,XON(I),YON(I),VP(I),VTH(I),VRESON(I),VBAR(I),BETAO
     1N(I),S(I),CPCON(I),RBORT(I),PSOPTC(I),I=1,NHUBMX)
C*****
C***   WRITE SHROUD COORDINATES AND VARIABLES
C*****
      WRITE (6,20)
      WRITE (6,16)
      NHUBP1=NHUBMX+1
      WRITE (6,18) (I,XON(I),YON(I),VP(I),VTH(I),VRESON(I),VBAR(I),BETAO
     1N(I),S(I),CPCON(I),RBORT(I),PSOPTC(I),I=NHUBP1,JJS)
C
C     WRITE SPLITTER COORDINATES AND VARIABLES IF IT APPLIES
C
      IF (NSPLT.EQ.0) GO TO 13
      DO 12 IN=1,NSPLT
```

```
      NB=NSPB(IN)
      NE=NSPB(IN+1)-1
      IF (IN.EQ.NSPLT) NE=NTMIN
      WRITE (6,22) IN
      WRITE (6,16)
      WRITE (6,18) (I,XON(I),YON(I),VP(I),VTH(I),VRESON(I),VBAR(I),BETAO
     1N(I),S(I),CPCON(I),RBORT(I),PSOPTC(I),I=NB,NE)
12    CONTINUE
13    CONTINUE
      RETURN
C*****
C***     FORMATS
C*****
C
14    FORMAT (1H0,10X,3HHUB)
16    FORMAT (11X,14HON-BODY POINTS//2X,1HI,6X,1HX,11X,1HY,11X,2HVP,9X,6
     1HVTHETA,7X,4HVRES,7X,5HVBARI,7X,4HBETA,10X,1HS,11X,3HCPC,5X,5HRB/R
     2T,3X,6HPSOPTC)
18    FORMAT (I4,9E12.4,F7.4,F8.4)
20    FORMAT (1H0,10X,6HSHROUD)
22    FORMAT (1H0,10X,8HSPLITTER,I3)
      END
```

```
$IBFTC SSUB    LIST,DECK

      SUBROUTINE SRTNE (XON,YON,XRI,YRIHUB,YRISHR,NHUBMX,NTMIN,S)
      DIMENSION XON(1), YON(1), S(1)
C
C     S  ROUTINE
C
      ISI=0
2     ISI=ISI+1
      IF (XON(ISI)-XRI) 2,4,4
4     S(ISI)=SQRT((XON(ISI)-XRI)**2+(YON(ISI)-YRIHUB)**2)
      IS1=ISI+1
      DO 6 I=IS1,NHUBMX
      S(I)=S(I-1)+SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-1))**2)
6     CONTINUE
      IS2=ISI-1
      S(IS2)=-SQRT((XON(IS2)-XRI)**2+(YON(IS2)-YRIHUB)**2)
      IS3=ISI-2
      DO 8 I=1,IS3
      I39=IS2-I
      S(I39)=S(I39+1)-SQRT((XON(I39)-XON(I39+1))**2+(YON(I39)-YON(I39+1)
     1)**2)
8     CONTINUE
      ISI=NHUBMX
10    ISI=ISI+1
      IF (XON(ISI)-XRI) 12,12,10
12    S(ISI)=-SQRT((XON(ISI)-XRI)**2+(YON(ISI)-YRISHR)**2)
      IS1=ISI+1
      DO 14 I=IS1,NTMIN
      S(I)=S(I-1)-SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-1))**2)
14    CONTINUE
      IS2=ISI-1
      S(IS2)=SQRT((XON(IS2)-XRI)**2+(YON(IS2)-YRISHR)**2)
      ISMIN=NHUBMX+1
      IS3=ISI-2
      DO 16 I=ISMIN,IS3
      I39=IS2-I+NHUBMX
      S(I39)=S(I39+1)+SQRT((XON(I39)-XON(I39+1))**2+(YON(I39)-YON(I39+1)
     1)**2)
16    CONTINUE
C
C     END OF S
C
      RETURN
      END
```

```
$IBFTC OFBDY.  DEBUG,DECK

      SUBROUTINE OFFBDY
C
C     SUBROUTINE TO CALCULATE ALL OFF-BODY VARIABLES
C
      COMMON /MONOF/ JJS,JJ
      COMMON /CNOUT/ VRESON(400),VP(400),BETAON(400)
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /NOUT/ IBEGIN(25),IEND(25),NOEP(50,6),NOS(25),NRAKES
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      COMMON /GEABC/ YI
      COMMON /COUT1/ QCA,PTC,PSPTCI,PI0180,ATOTAL,GRHO
      COMMON /TOUT1/ SINTH,COSTH,OMEGA
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
      COMMON /VOUT1/ PSOPC(100),PHII(100),ZETAI(100),VYI(100),CPC(100),V
     1ZI(100),VMI(100),VAFTI(100),VSPANI(100),ETAI(100)
      COMMON /VOUT2/ UI(100),VZPRI(100),BETAPI(100),VPRI(100),VZPRST(100
     1),BETAPS(100),VPRST(100),MPRST(100),MPRI(100)
      DIMENSION X(100), VRES(100), VX(100), BETA(100), PSOP(100), ALFA(1
     100)
      DIMENSION QLOC(300), IQSJ(50), Q(50), DEV1(50), QFRACT(300), YLOC(
     1300)
      DIMENSION VBRFF(200), RBRTF(200), Y(100), QSTOT(50,6)
      DIMENSION VRESOF(200),   VXC(200),   VYC(200),   VZC(200),
     1          PSOPTC(200),MPRIME(200),MPRIST(200),ALFAOF(200),
     2          BETAOF(200),  VAFT(200), VSPAN(200),   ETA(200),
     3            ZETA(200),   PHI(200),    VM(200),CPCOFF(200),
     4               U(200),VZPRIM(200),BETAPR(200),VPRIME(200),
     5                      VZPRS(200),BETPS(200), VPRIST(200)
      REAL MPRIME,MPRIST,MPRST,MPRI
      PI=3.14159265
      014=1.0/1.4
      GRO44=GRHO/144.
      DO 8 I=1,NPMIN
C
C     READ FROM TAPE 3  VRESOF(I),VXC(I),VYC(I),VZC(I)
C
      READ (3) VRESOF(I),VXC(I),VYC(I),VZC(I)
      VCONA=.2*(VRESOF(I)/ATOTAL)**2
      IF (VCONA.LE.1.0) GO TO 2
      PSOPTC(I)=0.0
      MPRIME(I)=0.0
      MPRIST(I)=0.0
      GO TO 4
2     PSOPTC(I)=(1.0-VCONA)**3.5
4     ALFAOF(I)=ATAN(VYC(I)/VXC(I))/PI0180
      BETAOF(I)=ARSIN(VZC(I)/VRESOF(I))/PI0180
      VAFT(I)=VZC(I)*SINTH+VYC(I)*COSTH
      VSPAN(I)=VYC(I)*SINTH-VZC(I)*COSTH
      ETA(I)=ATAN2(VAFT(I),VXC(I))/PI0180
```

```
      ZETA(I)=ATAN2(VSPAN(I),VXC(I))/PIO180
      PHI(I)=ATAN2(VZC(I),VXC(I))/PIO180
      VM(I)=SQRT(VXC(I)**2+VYC(I)**2)
      CPCOFF(I)=(PSOPTC(I)-PSPTCI)/(QCA/PTC)
C
C     IF THE OFF-BODY X IS NOT AT CONTROL STATION, SKIP FOLLOWING CALCUL
C
      IF (XOFF(I).NE.XRI) GO TO 8
      U(I)=OMEGA*YOFF(I)
      VZPRIM(I)=VZC(I)-U(I)
      BETAPR(I)=ATAN2(VZPRIM(I),VM(I))
      VPRIME(I)=VM(I)/COS(BETAPR(I))
      BETAPR(I)=BETAPR(I)/PIO180
      VCON=VPRIME(I)/ATOTAL
      IF (VCONA.GT.1.0) GO TO 6
      MPRIME(I)=VCON/((1.0-VCONA)**.5)
6     VZPRS(I)=-VZC(I)-U(I)
      BETPS(I)=ATAN2(VZPRS(I),VM(I))
      VPRIST(I)=VM(I)/COS(BETPS(I))
      BETPS(I)=BETPS(I)/PIO180
      VPCON=VPRIST(I)/ATOTAL
      IF (VCONA.GT.1.0) GO TO 8
      MPRIST(I)=VPCON/((1.0-VCONA)**.5)
8     CONTINUE
      CALL NOEPTS
C*****
C***  I = COUNT FOR INTERPOLATED OFF-BODY POINTS
C***  IK  LOOP  FOR NUMBER OF RAKES
C*****
      I=0
      DO 30 IK=1,NRAKES
      NOSI=NOS(IK)
      IB=IBEGIN(IK)
C*****
C***  IS = STARTING POINT TO FIND ON-BODY X VALUE
C***  ISP = STOPPING POINT TO FIND ON-BODY X VALUE
C***  K = COUNT FOR NUMBER OF ENDPOINTS FOR RAKE
C*****
      NS=0
      DO 28 K=1,NOSI
      IF (K.GT.1) GO TO 10
      IS=1
      ISP=NHUBMX
      GO TO 20
10    IF (K.EQ.NOSI) GO TO 18
      IF (MOD(K,2).EQ.0) GO TO 12
      IS=NSPE(NS)
      ISP=NSPB(NS+1)-1
      IF (K.EQ.NOSI-1) ISP=NTMIN
      GO TO 20
12    NS=NS+1
14    IS=NSPB(NS)
      ISP=NSPE(NS)
      IF (XOFF(IB).GT.XON(IS).OR.XOFF(IB).LT.XON(ISP)) GO TO 16
      GO TO 20
16    NS=NS+1
```

```
      GO TO 14
18    IS=NHUBMX+1
      ISP=JJ
C
C     DO LOOP TO SEARCH FOR ON-BODY X VALUES NEAREST TO OFF-BODY X VALUE
C
20    I=I+1
      X(I)=XOFF(IB)
      IFLAG=2
      DO 26 J=IS,ISP
      IF (MOD(K,2).EQ.0) GO TO 22
C
C     SEARCHING FORWARD - TOP-SIDE OF A BODY
C
      IF (X(I).LE.XON(IS)) GO TO 24
      IF (XON(J).LT.X(I)) GO TO 26
      CALL INTPOL (1,J,X(I),IFLAG,VX(I),VRES(I),BETA(I),ALFA(I))
      PSOPC(I)=(1.0-.2*(VRES(I)/ATOTAL)**2)**3.5
      Y(I)=YI
      CALL VAROFF (I,BETA,ALFA,VX,VRES,X,Y)
      GO TO 28
C
C     SEARCHING BACKWARD - UNDERSIDE OF A BODY
C
22    IF (XON(J).GT.X(I)) GO TO 26
      IND=J-1
      CALL INTPOL (1,J,X(I),IFLAG,VX(I),VRES(I),BETA(I),ALFA(I))
      PSOPC(I)=(1.0-.2*(VRES(I)/ATOTAL)**2)**3.5
      Y(I)=YI
      BETA=-BETA(I)
      VX(I)=-VX(I)
      CALL VAROFF (I,BETA,ALFA,VX,VRES,X,Y)
      GO TO 28
24    Y(I)=0.0
      VX(I)=VXC(IB)
      VRES(I)=VRESOF(IB)
      BETA(I)=BETAOF(IB)
      ALFA(I)=ALFAOF(IB)
      PSOPC(I)=PSOPTC(IB)
      GO TO 28
26    CONTINUE
28    CONTINUE
30    CONTINUE
C*****
C***  INTEGRATED WEIGHT FLOW BETWEEN LOWER BOUNDARY(EITHER HUB OR AXIS)
C***        AND LOCAL Y VALUE
C***  NIO   = NUMBER OF INTERPOLATED OFF BODY POINT
C*****
      NIO=0
      IQS=0
      DO 42 J=1,NRAKES
      IQS=IQS+1
      QLOC(IQS)=0.0
      NOSI=NOS(J)
      QST=0.0
      DO 40 NS=1,NOSI,2
```

```
      NIO=NIO+1
      NLOW=NOEP(J,NS)
      NHI=NOEP(J,NS+1)
      NHIM1=NHI-1
      IQS=IQS+1
      QLOC(IQS)=PI*(PSOPTC(NLOW)**.14*(YOFF(NLOW)*VXC(NLOW))+PSOPC(NIO)*
     1*.14*(Y(NIO)*VX(NIO)))*(YOFF(NLOW)-Y(NIO))+QST
      DO 32 I=NLOW,NHIM1
      IQS=IQS+1
      QLOC(IQS)=QLOC(IQS-1)+PI*(PSOPTC(I+1)**.14*(YOFF(I+1)*VXC(I+1))+PS
     1OPTC(I)**.14*(YOFF(I)*VXC(I)))*(YOFF(I+1)-YOFF(I))
32    CONTINUE
      NIO=NIO+1
      IQS=IQS+1
      IF (X(NIO).LT.XON(JJ)) GO TO 34
      QLOC(IQS)=QLOC(IQS-1)+PI*(PSOPC(NIO)**.14*(Y(NIO)*VX(NIO))+PSOPTC(
     1NHI)**.14*(YOFF(NHI)*VXC(NHI)))*(Y(NIO)-YOFF(NHI))
      QST=QLOC(IQS)
      GO TO 36
34    QLOC(IQS)=QLOC(IQS-1)
      QST=QLOC(IQS)
36    IF (NS.EQ.NOSI-1) GO TO 38
      IQS=IQS+1
      QLOC(IQS)=QLOC(IQS-1)
38    QSTOT(J,NS)=QST
40    CONTINUE
      IQSJ(J)=IQS-IQSAVE
      IQSAVE=IQS
      IF (J.EQ.1) IQSJ(J)=IQS
      Q(J)=QST
42    CONTINUE
      DO 44 I=1,IQS
      QLOC(I)=QLOC(I)*GRO44
44    CONTINUE
      SUM=0.0
      DO 46 I=1,NRAKES
      Q(I)=Q(I)*GRO44
      IF (IBEGIN(I).NE.NCLO) GO TO 46
      QBAR=Q(I)
46    CONTINUE
      DO 48 I=1,NRAKES
      DEV1(I)=(Q(I)-QBAR)/QBAR
48    CONTINUE
      IST=1
      IFN=IQSJ(1)
      DO 52 I=1,NRAKES
      DO 50 J=IST,IFN
      QFRACT(J)=QLOC(J)/Q(I)
50    CONTINUE
      IST=IFN+1
      IFN=IFN+IQSJ(I+1)
52    CONTINUE
C
C     WRITE OFF-BODY DATA
C
      READ (2) (VBRFF(I),RBRTF(I),I=1,NPMIN)
```

```
      WRITE (6,82)
      NIO=0
      DO 58 I=1,NRAKES
      NOSI=NOS(I)
      DO 56 NS=1,NOSI,2
      NLOW=NOEP(I,NS)
      NHI=NOEP(I,NS+1)
54    NIO=NIO+1
      WRITE (6,84) X(NIO),Y(NIO),VX(NIO),VYI(NIO),VZI(NIO),VRES(NIO),VMI
     1(NIO),VAFTI(NIO),VSPANI(NIO),PSOPC(NIO)
      IF (MOD(NIO,2).EQ.0) GO TO 56
      WRITE (6,86) (J,XOFF(J),YOFF(J),VXC(J),VYC(J),VZC(J),VRESOF(J),VM(
     1J),VAFT(J),VSPAN(J),RBRTF(J),PSOPTC(J),J=NLOW,NHI)
      GO TO 54
56    CONTINUE
58    CONTINUE
      WRITE (6,88)
      NIO=0
      NQ=0
      DO 66 I=1,NRAKES
      NOSI=NOS(I)
      DO 64 NS=1,NOSI,2
      NLOW=NOEP(I,NS)
      NHI=NOEP(I,NS+1)
60    NIO=NIO+1
      NQ=NQ+1
      YLOC(NQ) = Y(NIO)
      WRITE (6,90) X(NIO),Y(NIO),CPC(NIO),ALFA(NIO),BETA(NIO),ETAI(NIO),
     1ZETAI(NIO),PHII(NIO),QFRACT(NQ)
      IF (MOD(NIO,2).EQ.0) GO TO 64
      DO 62 J=NLOW,NHI
      NQ=NQ+1
      YLOC(NQ) = YOFF(J)
      WRITE (6,92) J,XOFF(J),YOFF(J),VBRFF(J),CPCOFF(J),ALFAOF(J),BETAOF
     1(J),ETA(J),ZETA(J),PHI(J),QFRACT(NQ)
62    CONTINUE
      GO TO 60
64    CONTINUE
66    CONTINUE
C
C     WRITE OFF-BODY DATA AT THE CONTROL STATION
C
      WRITE (6,94) XRI,UTIP
      NIO=0
      DO 74 I=1,NRAKES
      NOSI=NOS(I)
      DO 72 NS=1,NOSI,2
      NLOW=NOEP(I,NS)
      NHI=NOEP(I,NS+1)
68    NIO=NIO+1
      IF (X(NIO).NE.XRI) GO TO 70
      WRITE (6,96) Y(NIO),UI(NIO),VZPRI(NIO),VPRI(NIO),MPRI(NIO),BETAPI(
     1NIO),VZPRST(NIO),VPRST(NIO),MPRST(NIO),BETAPS(NIO)
      IF (MOD(NIO,2).EQ.0) GO TO 72
      WRITE (6,96) (YOFF(J),U(J),VZPRIM(J),VPRIME(J),MPRIME(J),BETAPR(J)
     1,VZPRS(J),VPRIST(J),MPRIST(J),BETPS(J),J=NLOW,NHI)
```

```
      GO TO 68
70    NIO=NIO+1
72    CONTINUE
74    CONTINUE
C
C     WRITE WEIGHT FLOW DATA
C
      WRITE (6,102)
      NIO=0
      DO 80 I=1,NRAKES
      NOSI=NOS(I)
      DO 78 J=1,NOSI,2
      NIO=NIO+2
      QSTOT(I,J)=QSTOT(I,J)*GR044
      QFR=QSTOT(I,J)/Q(I)
      IF (J.GT.1) GO TO 76
      WRITE (6,98) I,X(NIO),DEV1(I),QSTOT(I,J),QFR
      GO TO 78
76    WRITE (6,100) QSTOT(I,J),QFR
78    CONTINUE
80    CONTINUE
      CALL STRML (YLOC,QFRACT,IQSJ,NRAKES,XOFF,NOEP)
      RETURN
C*****
C***        FORMATS
C*****
C
82    FORMAT (1H1,5X,23HOFF-BODY POINTS (RAKES)/
     *        1HO,10X,116HCOORDINATES       *-------------------------
     1------VELOCITIES----------------------------------------*   PRESS.R
     2ATIO/123H     AXIAL       RADIAL       AXIAL        RADIAL     CIRCUMF
     3RNTL  RESULTANT  MERIDIONAL   CHORDWISE   SPANWISE              COMP
     4/129H   I       X            Y          VX           VY          VZ
     5        VRES          VM          VAFT         VSPAN     RHOBR    PSOP
     6TC)
84    FORMAT (5X,1P9E12.4,7X,0PF8.4)
86    FORMAT (I5,1P9E12.4,0PF7.4,0PF8.4)
88    FORMAT (//1HO,112H           COORDINATES                  NEW  CP
     1    *-------------------------ANGLES-------------------------*/1
     209H          AXIAL       RADIAL                                MERIDIONA
     3L      FLOW      UNDERTURNG   SPANWISE      SWIRL/122H   I       X
     4         Y          VBRI          CPC          ALPHA        BETA
     5ETA          ZETA         PHI          QFRACT)
90    FORMAT (5X,1P2E12.4,12X,1P7E12.4)
92    FORMAT (I5,1P10E12.4)
94    FORMAT (1HL 5X,25HRELATIVE ROTOR INLET DATA/
     *        1HO,14H          X = ,F10.4,17H          UTIP = ,F10.4//12
     12H          Y            U         VZPRIME      VPRIM       MPRIME
     2    BETAPR       VZPRST       VPRST         MPRS        BETAPS)
96    FORMAT (5X,1P10E12.4)
98    FORMAT (I8,2X,1PE11.4,5X,1PE11.4,6X,1PE11.4,2X,1PE11.4)
100   FORMAT (43X,1PE11.4,2X,1PE11.4)
102   FORMAT (1HL,5X,21HRAKE WEIGHT FLOW DATA/
     *        1HO,63H      I        X        (Q(I)-QBAR)/QBAR        QS TOT
     1         QFR)
      END
```

```
$IBFTC NOEPT.  DEBUG,DECK

      SUBROUTINE NOEPTS
C*****
C***  THIS SUBROUTINE IS TO FIND THE END POINTS - FOR RAKES NEAR HUB,
C***     SHROUD AND/OR SPLITTERS
C***     NOS = THE NUMBER OF END POINTS FOR EACH RAKE = 2*NO. OF SPLITTE
C***                 + 2  (HUB AND SHROUD)
C***     NOEP = THE INDEX OF THE RAKE ENDPOINTS
C*****
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /NOUT/ IBEGIN(25),IEND(25),NOEP(50,6),NOS(25),NRAKES
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      J=1
      IBEGIN(1)=1
      NPMNM1=NPMIN-1
      DO 4 I=1,NPMNM1
      IF (ABS(XOFF(I+1)-XOFF(I)).GT..01) GO TO 2
      GO TO 4
2     IEND(J)=I
      J=J+1
      IBEGIN(J)=I+1
4     CONTINUE
      NRAKES=J
      IEND(J)=NPMIN
C*****
C***  FIND THE END POINTS OF THE SPLITTER
C*****
      DO 10 I=1,NRAKES
      IB=IBEGIN(I)
      IE=IEND(I)
      IEM1=IE-1
      DYTEST=ABS(YOFF(IB)-YOFF(IB+1))
C*****
C***  NS IS THE COUNTER TO DETERMINE NUMBER OF END POINTS PER RAKE
C***  NOEP IS THE END POINT INDEX.
C*****
      NS=1
      NOEP(I,1)=IB
      IF (NSPLT.EQ.0) GO TO 8
      DO 6 K=IB,IEM1
      IF (ABS(ABS(YOFF(K+1)-YOFF(K))-DYTEST).LE.1.0E-4) GO TO 6
      NS=NS+1
      NOEP(I,NS)=K
      NS=NS+1
      NOEP(I,NS)=K+1
      DYTEST=ABS(YOFF(K+1)-YOFF(K+2))
6     CONTINUE
8     NS=NS+1
      NOEP(I,NS)=IE
      NOS(I)=NS
10    CONTINUE
      RETURN
      END
```

```
$IBFTC VAROF.  DEBUG,DECK

      SUBROUTINE VAROFF (I,BETA,ALFA,VX,VRES,X,Y)
      DIMENSION BETA(1), ALFA(1), VX(1), VRES(1), X(1), Y(1)
      COMMON /TOUT1/ SINTH,COSTH,OMEGA
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /COUT1/ QCA,PTC,PSPTCI,PIO180,ATOTAL,GRHO
      COMMON /VOUT1/ PSOPC(100),PHII(100),ZETAI(100),VYI(100),CPC(100),V
     1ZI(100),VMI(100),VAFTI(100),VSPANI(100),ETAI(100)
      COMMON /VOUT2/ UI(100),VZPRI(100),BETAPI(100),VPRI(100),VZPRST(100
     1),BETAPS(100),VPRST(100),MPRST(100),MPRI(100)
      REAL MPRST,MPRI
      VCAN=.2*(VRES(I)/ATOTAL)**2
      IF (VCAN.LE.1.0) GO TO 2
      PSOPC(I)=0.0
      MPRI(I)=0.0
      MPRST(I)=0.0
      GO TO 4
2     PSOPC(I)=(1.0-VCAN)**3.5
4     VYI(I)=VX(I)*TAN(ALFA(I)*PIO180)
      CPC(I)=(PSOPC(I)-PSPTCI)/(QCA/PTC)
      VZI(I)=VRES(I)*SIN(BETA(I)*PIO180)
      VMI(I)=SQRT(VX(I)**2+VYI(I)**2)
      VAFTI(I)=VZI(I)*SINTH+VYI(I)*COSTH
      VSPANI(I)=VYI(I)*SINTH-VZI(I)*COSTH
      ETAI(I)=ATAN2(VAFTI(I),VX(I))/PIO180
      ZETAI(I)=ATAN2(VSPANI(I),VX(I))/PIO180
      PHII(I)=ATAN2(VZI(I),VX(I))/PIO180
C
C     IF X IS NOT AT THE CONTROL STATION SKIP FOLLOWING CALCULATIONS
C
      IF (X(I).NE.XOFF(NCLO)) RETURN
      UI(I)=OMEGA*Y(I)
      VZPRI(I)=VZI(I)-UI(I)
      BETAPI(I)=ATAN2(VZPRI(I),VMI(I))
      VPRI(I)=VMI(I)/COS(BETAPI(I))
      BETAPI(I)=BETAPI(I)/PIO180
      IF (VCAN.GT.1.0) GO TO 6
      VCON=VPRI(I)/ATOTAL
      MPRI(I)=VCON/((1.0-VCAN)**.5)
6     VZPRST(I)=-VZI(I)-UI(I)
      BETAPS(I)=ATAN2(VZPRST(I),VMI(I))
      VPRST(I)=VMI(I)/COS(BETAPS(I))
      BETAPS(I)=BETAPS(I)/PIO180
      IF (VCAN.GT.1.0) RETURN
      VPCON=VPRST(I)/ATOTAL
      MPRST(I)=VPCON/((1.0-VCAN)**.5)
      RETURN
      END
```

```
$IBFTC STRML.  DEBUG

      SUBROUTINE STRML (Y,Q,IQ,NRAKES,X,N)
      DIMENSION Y(1), Q(1), IQ(1), X(1), N(1,1)
C
C     THIS SUBROUTINE CALCULATES STREAMLINES
C
      WRITE (6,6)
      DELQ=.02
      IST=1
      IFN=IQ(1)
      DO 4 I=1,NRAKES
      NQ=N(I,1)
      QSTRM=DELQ
      WRITE (6,8) X(NQ)
2     CALL SINTP (Q(IST),Y(IST),IFN-IST+1,QSTRM,YSTRM)
      WRITE (6,10) QSTRM,YSTRM
      QSTRM=QSTRM+DELQ
      IF (QSTRM.LE.1.0) GO TO 2
      IST=IFN+1
      IFN=IFN+IQ(I+1)
4     CONTINUE
      RETURN
C
6     FORMAT (1H0,10X,11HSTREAMLINES/)
8     FORMAT (1H0,10X,4HX = ,F7.3/10X,5HQSTRM,10X,5HYSTRM)
10    FORMAT (5X,1PE12.5,6X,1PE12.5)
      END
```

LISTING OF INPUT CARDS FOR TEST CASE

SCIRCL INPUT

```
          TEST CASE
TEST 1
2.0       .25         1.0         6.0
   3
2.0      2.5      5.0       6
4.0      2.75     4.75      9
6.0      2.75     4.75      9
1.0        5.0
1.0        0.0      0.0       0.0      .50
2.5        0.0      0.0       0.0      .50      .25      1.5      2.0      2.0      3.5      2.25
1.0        2.0      2.0       3.5      2.25
0.0        2.0      2.0       3.5      2.25     4.5      2.39     6.0      2.5      12.      2.5
1.0        6.0      2.5       12.      2.5
2.0        5.0
1.0        12.      5.0       6.0      5.0
1.0        6.0      5.0       5.0      5.0
-3.0       6.0      5.0       5.0      5.0      2.0      5.5      0.0      5.5
-1.0       4.0      5.5       2.0      5.5      0.0      6.65     1.699    30.
1.0        0.0      6.65      0.0      20.
```

EOD INPUT

THESE CARDS ARE ALL PUNCHED BY PROGRAM SCIRCL

```
          TEST CASE                                                                  3-BODY   TEST 1
3 1110                                                                                        TEST 1
                                                                                              TEST 1
        41                                                                                    TEST 1
         1          0                                                                         TEST 1
  0.          0.          -0.          0.016758    0.075506    0.177876
  0.316638    0.483249    0.664451     0.863316    1.075317    1.297026
  1.525978    1.760536    2.000000     2.250000    2.500000    2.750000
  3.000000    3.250000    3.500000     3.749816    3.998633    4.248171
  4.498234    4.748669    4.999341     5.250110    5.500776    5.750977
  6.000000    6.254089    6.558996     6.924884    7.363950    7.890829
  8.523084    9.281790   10.192237    11.096118   12.000000
  0.          0.250000    0.500000     0.750708    0.961274    1.151886
  1.319440    1.464105    1.583985     1.687325    1.774846    1.847875
  1.908128    1.957771    2.000000     2.041667    2.083333    2.125000
  2.166667    2.208333    2.250000     2.289805    2.326024    2.359299
  2.389795    2.417534    2.442390     2.464049    2.481898    2.494743
  2.500000    2.500000    2.500000     2.500000    2.500000    2.500000
  2.500000    2.500000    2.500000     2.500000    2.500000
        60                                                                                    TEST 1
         2          0                                                                         TEST 1
 12.000000   11.096118   10.192237    9.281790    8.523084    7.890829
  7.363950    6.924884    6.558996    6.254089    6.000000    5.750000
  5.500000    5.250000    5.000000    4.758758    4.505645    4.240505
  3.963951    3.677557    3.383893    3.089105    2.801122    2.522935
  2.256492    2.000000    1.773871    1.572897    1.379335    1.194856
  1.018986    0.851496    0.694532    0.547348    0.414819    0.296525
  0.194941    0.112475    0.051336    0.013387    0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  5.000000    5.000000    5.000000    5.000000    5.000000    5.000000
  5.000000    5.000000    5.000000    5.000000    5.000000    5.000000
  5.000000    5.000000    5.000000    5.009180    5.036257    5.079913
  5.137711    5.205818    5.278969    5.350155    5.412077    5.459720
  5.489660    5.500000    5.500939    5.506328    5.519450    5.542613
  5.577614    5.625974    5.688220    5.765821    5.857039    5.962749
  6.081901    6.212809    6.353156    6.500028    6.650000    6.832585
  7.051688    7.314611    7.630119    8.008728    8.463059    9.008256
  9.662493   10.447577   11.389678   12.346381   13.303083   14.259785
 15.216488   16.173190   17.129892   18.086594   19.043297   20.000000
         4                                                                                    TEST 1
         3          0                                                                         TEST 1
 12.000000   12.000000   12.000000   12.000000
  2.500000    3.333333    4.166667    5.000000
        24                                                                                    TEST 1
         0          0                                                                         TEST 1
  2.000000    2.000000    2.000000    2.000000    2.000000    2.000000
  4.000000    4.000000    4.000000    4.000000    4.000000    4.000000
  4.000000    4.000000    4.000000    6.000000    6.000000    6.000000
  6.000000    6.000000    6.000000    6.000000    6.000000    6.000000
  2.500000    3.000000    3.500000    4.000000    4.500000    5.000000
  2.750000    3.000000    3.250000    3.500000    3.750000    4.000000
  4.250000    4.500000    4.750000    2.750000    3.000000    3.250000
  3.500000    3.750000    4.000000    4.250000    4.500000    4.750000
```

```
          TEST CASE                                                    2-BODY   TEST 1
2 1 10                                                                          TEST 1
                                                                                TEST 1
        41                                                                      TEST 1
         1          1                                                           TEST 1
        60                                                                      TEST 1
         2          1                                                           TEST 1
        24                                                                      TEST 1
         0          0                                                           TEST 1
  2.000000   2.000000   2.000000   2.000000   2.000000   2.000000
  4.000000   4.000000   4.000000   4.000000   4.000000   4.000000
  4.000000   4.000000   4.000000   6.000000   6.000000   6.000000
  6.000000   6.000000   6.000000   6.000000   6.000000   6.000000
  2.500000   3.000000   3.500000   4.000000   4.500000   5.000000
  2.750000   3.000000   3.250000   3.500000   3.750000   4.000000
  4.250000   4.500000   4.750000   2.750000   3.000000   3.250000
  3.500000   3.750000   4.000000   4.250000   4.500000   4.750000
```

COMBYN INPUT

```
                TEST - 1
 102   24   99   24    1
700.     0.0      0.0      0.0      0.0      0.0      900.
0.0      0.0      0.0
   1   16   24
0.0

6.0         2.5         5.0          40
```

HERE INSERT BINARY RECORD CARDS PUNCHED BY PROGRAM EOD

```
                TEST-1
 102   24   99   24    1    1
700.     100.     0.0      0.0      0.0      0.0      900.
0.0      0.0      0.0
   3   16   24
0.0      90.      180.
0.0
6.0         2.5         5.0          40
```

PRINTED OUTPUT FOR TEST CASE

```
CASE TEST 1

        NO. OF BODIES = 2.     DELS =  0.250     DELSMX =  1.000     XRI =   6.000000

 **** RLB *********

        ENREED          STRAIGHT LINE
         1.000    X     0.              0.
                  Y     0.              5.0000E-01

        ENREED          SUPERELLIPSE
         2.500    X     0.              0.              2.5000E-01      2.0000E+00      3.5000E+00
                  Y     0.              5.0000E-01      1.5000E+00      2.0000E+00      2.2500E+00

  A =   C.25CCCCCCE+01    A =   0.11666667E+01       B =   0.2000000CE+01
 XC =  -C.83333333E+00    YO =  0.20000000E+01   OMEGA =  -0.16514868E+00

     2  ITERATIONS---
   DELS IN =  C.25000   DELS =  C.25071   DELS OUT =  0.25071   DSTEST =  0.24316

        ENREED          STRAIGHT LINE
         1.000    X     2.0000E+00      3.5000E+00
                  Y     2.0000E+00      2.2500E+00

        ENREED          SUPERELLIPSE
         0.       X     2.0000E+00      3.5000E+00      4.5000E+00      6.0000E+00      1.2000E+01
                  Y     2.0000E+00      2.2500E+00      2.3900E+00      2.5000E+00      2.5000E+00

  A =   C.20638183E+01    A =   0.15206905E+01       B =   0.16439900E+00
 XC =  -C.5C7C8462E+00    YO =  0.21643990E+01   OMEGA =  -0.14056477E+01

     2  ITERATIONS---
   DELS IN =  C.25345   DELS =  C.25409   DELS OUT =  0.25409   DSTEST =  0.24908

        ENREED          STRAIGHT LINE
         1.000    X     6.0000E+00      1.2000E+01
                  Y     2.5000E+00      2.5000E+00

 **** SHROUD ******

        ENREED          STRAIGHT LINE
         1.000    X     1.2000E+01      6.0000E+00
                  Y     5.0000E+00      5.0000E+00

        ENREED          STRAIGHT LINE
         1.000    X     6.0000E+00      5.0000E+00
                  Y     5.0000E+00      5.0000E+00

        ENREED          CUBIC
        -3.000    X     6.0000E+00      5.0000E+00      2.0000E+00      0.
                  Y     5.0000E+00      5.0000E+00      5.5000E+00      5.5000E+00

     3  ITERATIONS  A =  3.70370E-02  B = -3.88889E-01  C =  1.11111E+00  D =  4.53704E+00
  DELS IN =  C.25000   DELS =  0.25675   DELS OUT =  0.25675   DSTEST =  0.23895

        ENREED          LEMNISCATE
        -1.000    X     4.0000E+00      2.0000E+00      0.
                  Y     5.5000E+00      5.5000E+00      6.6500E+00
    13  ITERATIONS---   THETMXCALC =    0.52183   ACALC =    1.75478
```

DELS IN = 0.25675 DELS = 0.22174 DELS OUT = 0.18259 DSTEST = 0.00001

ENREGD STRAIGHT LINE
1.000 X 0. 0.
Y 6.6500E+00 2.0000E+01

INPUT FOR THE COMBINE PROGRAM NT(1)= 102 NT(2)= 99 NHUBMX= 40 NP= 24

BODY 1 CO-ORDINATES - X Y KAPPA DY/DX ALPHA S S-S(2) DELTAS

1	C.	0.	0.	0.99999E+05	0.90000E+02	0.	-0.72835E+01	0.
2	C.	0.25000E+00	0.	0.99999E+05	0.90000E+02	0.25000E+00	-0.70335E+01	0.25000E+00
3	-C.	0.50000E+00	-0.12455E-03	0.99900E+03	0.90000E+02	0.50000E+00	-0.67835E+01	0.25000E+00
4	C.16758E-01	0.75071E+00	-0.92797E+00	0.60470E+01	0.80610E+02	0.75127E+00	-0.65322E+01	0.25127E+00
5	C.75506E-01	0.96127E+00	-0.10310E+01	0.24753E+01	0.68001E+02	0.96988E+00	-0.63136E+01	0.21861E+00
6	C.17788E+00	0.11519E+01	-0.91960E+00	0.14690E+01	0.55756E+02	0.11862E+01	-0.60973E+01	0.21636E+00
7	C.31664E+00	0.13194E+01	-0.74713E+00	0.10122E+01	0.45348E+02	0.14038E+01	-0.58797E+01	0.21755E+00
8	C.48325E+00	0.14641E+01	-0.59194E+00	0.75120E+00	0.36914E+02	0.16244E+01	-0.56591E+01	0.22065E+00
9	C.66445E+00	0.15840E+01	-0.47508E+00	0.58445E+00	0.30304E+02	0.18417E+01	-0.54418E+01	0.21727E+00
10	C.86332E+00	0.16873E+01	-0.38556E+00	0.46216E+00	0.24805E+02	0.20658E+01	-0.52177E+01	0.22411E+00
11	C.10753E+01	0.17748E+01	-0.31607E+00	0.36817E+00	0.20212E+02	0.22952E+01	-0.49883E+01	0.22936E+00
12	C.12970E+01	0.18479E+01	-0.25871E+00	0.29390E+00	0.16378E+02	0.25286E+01	-0.47549E+01	0.23343E+00
13	C.1526CE+01	0.19081E+01	-0.20539E+00	0.23510E+00	0.13230E+02	0.27654E+01	-0.45182E+01	0.23675E+00
14	C.17605E+01	0.19578E+01	-0.14462E+00	0.19091E+00	0.10808E+02	0.30051E+01	-0.42784E+01	0.23975E+00
15	C.20000E+01	0.20000E+01	0.	0.16667E+00	0.94623E+01	0.32483E+01	-0.40352E+01	0.24316E+00
16	C.22500E+01	0.20417E+01	0.	0.16667E+00	0.94623E+01	0.35017E+01	-0.37818E+01	0.25345E+00
17	C.25000E+01	0.20833E+01	0.	0.16667E+00	0.94623E+01	0.37552E+01	-0.35283E+01	0.25345E+00
18	C.27500E+01	0.21250E+01	0.	0.16667E+00	0.94623E+01	0.40086E+01	-0.32749E+01	0.25345E+00
19	C.30000E+01	0.21667E+01	0.	0.16667E+00	0.94623E+01	0.42621E+01	-0.30214E+01	0.25345E+00
20	C.32500E+01	0.22083E+01	0.	0.16667E+00	0.94623E+01	0.45155E+01	-0.27680E+01	0.25345E+00
21	C.35000E+01	0.22500E+01	-0.22303E-01	0.16667E+00	0.94623E+01	0.47690E+01	-0.25145E+01	0.25345E+00
22	C.37498E+01	0.22898E+01	-0.53315E-01	0.15214E+00	0.86504E+01	0.50219E+01	-0.22616E+01	0.25297E+00
23	C.39986E+01	0.23260E+01	-0.47420E-01	0.13926E+00	0.79282E+01	0.52734E+01	-0.20101E+01	0.25144E+00
24	C.42482E+01	0.23593E+01	-0.44301E-01	0.12757E+00	0.72698E+01	0.55251E+01	-0.17584E+01	0.25175E+00
25	C.44982E+01	0.23898E+01	-0.43620E-01	0.11638E+00	0.66381E+01	0.57770E+01	-0.15065E+01	0.25192E+00
26	C.47487E+01	0.24175E+01	-0.45329E-01	0.10509E+00	0.59951E+01	0.60290E+01	-0.12545E+01	0.25197E+00
27	C.49993E+01	0.24424E+01	-0.49985E-01	0.93039E-01	0.53154E+01	0.62809E+01	-0.10026E+01	0.25190E+00
28	C.52501E+01	0.24640E+01	-0.59215E-01	0.79320E-01	0.45352E+01	0.65326E+01	-0.75091E+00	0.25170E+00
29	C.55008E+01	0.24819E+01	-0.77234E-01	0.62352E-01	0.35679E+01	0.67839E+01	-0.49961E+00	0.25130E+00
30	C.57510E+01	0.24947E+01	-0.11637E+00	0.38730E-01	0.22179E+01	0.70344E+01	-0.24908E+00	0.25053E+00
31	C.60000E+01	0.25000E+01	0.	0.	0.	0.72835E+01	0.	0.24908E+00
32	C.62541E+01	0.25000E+01	0.	0.	0.	0.75376E+01	0.25409E+00	0.25409E+00
33	C.65590E+01	0.25000E+01	0.	0.	0.	0.78425E+01	0.55900E+00	0.30491E+00
34	C.69249E+01	0.25000E+01	0.	0.	0.	0.82084E+01	0.92488E+00	0.36589E+00
35	C.73640E+01	0.25000E+01	0.	0.	0.	0.86475E+01	0.13639E+01	0.43907E+00
36	C.78908E+01	0.25000E+01	0.	0.	0.	0.91743E+01	0.18908E+01	0.52688E+00
37	C.85231E+01	0.25000E+01	0.	0.	0.	0.98066E+01	0.25231E+01	0.63225E+00
38	C.92816E+01	0.25000E+01	0.	0.	0.	0.10565E+02	0.32818E+01	0.75871E+00
39	C.10192E+02	0.25000E+01	0.	0.	0.	0.11476E+02	0.41922E+01	0.91045E+00
40	C.11096E+02	0.25000E+01	0.	0.	0.	0.12380E+02	0.50961E+01	0.90388E+00
41	C.12000E+02	0.25000E+01	0.	0.	0.	0.13284E+02	0.60000E+01	0.90388E+00

BODY 2 CO-ORDINATES - X Y KAPPA DY/DX ALPHA S S'(2)-S DELTAS

42	C.12000E+02	0.50000E+01	0.	0.	0.	0.	0.60000E+01	0.
43	C.11096E+02	0.50000E+01	0.	0.	0.	0.90388E+00	0.50961E+01	0.90388E+00
44	C.10192E+02	0.50000E+01	0.	0.	0.	0.18078E+01	0.41922E+01	0.90388E+00
45	C.92818E+01	0.50000E+01	0.	0.	0.	0.27182E+01	0.32818E+01	0.91045E+00
46	C.85231E+01	0.50000E+01	0.	0.	0.	0.34769E+01	0.25231E+01	0.75871E+00
47	C.78908E+01	0.50000E+01	0.	0.	0.	0.41092E+01	0.18908E+01	0.63225E+00

48	C.73640E+01	0.50000E+01	0.	0.	0.	C.46360E+01	0.13640E+01	0.52688E+00
49	C.69245E+01	0.50000E+01	0.	0.	0.	C.50751E+01	0.92488E+00	0.43907E+00
50	C.65590E+01	0.50000E+01	0.	0.	0.	C.54410E+01	0.55900E+00	0.36589E+00
51	C.62541E+01	0.50000E+01	0.	0.	0.	C.57459E+01	0.25409E+00	0.30491E+00
52	C.60000E+01	0.50000E+01	0.	0.	0.	C.60000E+01	0.	0.25409E+00
53	C.57500E+01	0.50000E+01	0.	0.	0.	C.62500E+01	-0.25000E+00	0.25000E+00
54	C.55000E+01	0.50000E+01	0.	0.	0.	C.65000E+01	-0.50000E+00	0.25000E+00
55	C.52500E+01	0.50000E+01	0.	0.	0.	C.67500E+01	-0.75000E+00	0.25000E+00
56	C.50000E+01	0.50000E+01	0.33333E+00	-0.29802E-07	-0.17075E-05	C.70000E+01	-0.10000E+01	0.25000E+00
57	C.47588E+01	0.50092E+01	0.27745E+00	-0.73948E-01	-0.42292E+01	C.72414E+01	-0.12414E+01	0.24142E+00
58	C.45056E+01	0.50363E+01	0.21727E+00	-0.13763E+00	-0.78364E+01	C.74960E+01	-0.14960E+01	0.25456E+00
59	C.42405E+01	0.50799E+01	0.15611E+00	-0.18907E+00	-0.10707E+02	C.77647E+01	-0.17647E+01	0.26871E+00
60	C.39640E+01	0.51377E+01	0.95672E-01	-0.22608E+00	-0.12739E+02	C.80472E+01	-0.20472E+01	0.28253E+00
61	C.36776E+01	0.52058E+01	0.36116E-01	-0.24650E+00	-0.13847E+02	C.83416E+01	-0.23416E+01	0.29438E+00
62	C.33839E+01	0.52790E+01	-0.23584E-01	-0.24850E+00	-0.13955E+02	C.86442E+01	-0.26442E+01	0.30264E+00
63	C.30891E+01	0.53502E+01	-0.84447E-01	-0.23124E+00	-0.13020E+02	C.89475E+01	-0.29475E+01	0.30326E+00
64	C.28011E+01	0.54121E+01	-0.14679E+00	-0.19573E+00	-0.11074E+02	C.92421E+01	-0.32421E+01	0.29456E+00
65	C.25229E+01	0.54597E+01	-0.21055E+00	-0.14393E+00	-0.81902E+01	C.95243E+01	-0.35243E+01	0.28224E+00
66	C.22565E+01	0.54897E+01	-0.27382E+00	-0.78188E-01	-0.44707E+01	C.97924E+01	-0.37924E+01	0.26812E+00
67	C.20000E+01	0.55000E+01	0.	0.	0.	C.10046E+02	-0.40465E+01	0.25407E+00
68	C.17739E+01	0.55009E+01	0.11016E+00	-0.12456E-01	-0.71362E+00	C.10273E+02	-0.42726E+01	0.22613E+00
69	C.15729E+01	0.55063E+01	0.20808E+00	-0.44476E-01	-0.25466E+01	C.10474E+02	-0.44737E+01	0.20105E+00
70	C.13793E+01	0.55195E+01	0.30249E+00	-0.94259E-01	-0.53847E+01	C.10668E+02	-0.46677E+01	0.19401E+00
71	C.11949E+01	0.55426E+01	0.39276E+00	-0.15998E+00	-0.90889E+01	C.10854E+02	-0.48536E+01	0.18593E+00
72	C.10190E+01	0.55776E+01	0.47938E+00	-0.24139E+00	-0.13571E+02	C.11033E+02	-0.50329E+01	0.17932E+00
73	C.85150E+00	0.56260E+01	0.56283E+00	-0.34001E+00	-0.18778E+02	C.11207E+02	-0.52072E+01	0.17433E+00
74	C.69452E+00	0.56882E+01	0.64251E+00	-0.45811E+00	-0.24613E+02	C.11376E+02	-0.53761E+01	0.16886E+00
75	C.54735E+00	0.57658E+01	0.71939E+00	-0.60347E+00	-0.31110E+02	C.11542E+02	-0.55425E+01	0.16639E+00
76	C.41482E+00	0.58570E+01	0.79154E+00	-0.78353E+00	-0.38080E+02	C.11703E+02	-0.57034E+01	0.16089E+00
77	C.29653E+00	0.59627E+01	0.85989E+00	-0.10209E+01	-0.45593E+02	C.11862E+02	-0.58620E+01	0.15864E+00
78	C.19494E+00	0.60819E+01	0.92387E+00	-0.13565E+01	-0.53604E+02	C.12019E+02	-0.60186E+01	0.15658E+00
79	C.11248E+00	0.62128E+01	0.98286E+00	-0.18860E+01	-0.62066E+02	C.12173E+02	-0.61733E+01	0.15472E+00
80	C.51336E-01	0.63532E+01	0.10363E+01	-0.26933E+01	-0.70934E+02	C.12326E+02	-0.63264E+01	0.15309E+00
81	C.13387E-01	0.65000E+01	0.10834E+01	-0.57653E+01	-0.80160E+02	C.12478E+02	-0.64781E+01	0.15170E+00
82	C.	0.66500E+01	0.	0.99999E+05	0.90000E+02	C.12629E+02	-0.66287E+01	0.15056E+00
83	C.	0.68326E+01	0.	0.99999E+05	0.90000E+02	C.12811E+02	-0.68112E+01	0.18259E+00
84	C.	0.70517E+01	0.	0.99999E+05	0.90000E+02	C.13030E+02	-0.70303E+01	0.21910E+00
85	C.	0.73146E+01	0.	0.99999E+05	0.90000E+02	C.13293E+02	-0.72933E+01	0.26292E+00
86	C.	0.76301E+01	0.	0.99999E+05	0.90000E+02	C.13609E+02	-0.76088E+01	0.31551E+00
87	C.	0.80087E+01	0.	0.99999E+05	0.90000E+02	C.13987E+02	-0.79874E+01	0.37861E+00
88	C.	0.84631E+01	0.	0.99999E+05	0.90000E+02	C.14442E+02	-0.84417E+01	0.45433E+00
89	C.	0.90083E+01	0.	0.99999E+05	0.90000E+02	C.14987E+02	-0.89869E+01	0.54520E+00
90	C.	0.96625E+01	0.	0.99999E+05	0.90000E+02	C.15641E+02	-0.96411E+01	0.65424E+00
91	C.	0.10448E+02	0.	0.99999E+05	0.90000E+02	C.16426E+02	-0.10426E+02	0.78508E+00
92	C.	0.11390E+02	0.	0.99999E+05	0.90000E+02	C.17368E+02	-0.11368E+02	0.94210E+00
93	C.	0.12346E+02	0.	0.99999E+05	0.90000E+02	C.18325E+02	-0.12325E+02	0.95670E+00
94	C.	0.13303E+02	0.	0.99999E+05	0.90000E+02	C.19282E+02	-0.13282E+02	0.95670E+00
95	C.	0.14260E+02	0.	0.99999E+05	0.90000E+02	C.20238E+02	-0.14238E+02	0.95670E+00
96	C.	0.15216E+02	0.	0.99999E+05	0.90000E+02	C.21195E+02	-0.15195E+02	0.95670E+00
97	C.	0.16173E+02	0.	0.99999E+05	0.90000E+02	C.22152E+02	-0.16152E+02	0.95670E+00
98	C.	0.17130E+02	0.	0.99999E+05	0.90000E+02	C.23109E+02	-0.17109E+02	0.95670E+00
99	C.	0.18087E+02	0.	0.99999E+05	0.90000E+02	C.24065E+02	-0.18065E+02	0.95670E+00
100	C.	0.19043E+02	0.	0.99999E+05	0.90000E+02	C.25022E+02	-0.19022E+02	0.95670E+00
101	C.	0.20000E+02	0.	0.99999E+05	0.90000E+02	C.25979E+02	-0.19979E+02	0.95670E+00

BODY 2 CG-ORDINATES - X Y

102	C.12000E+02	0.25000E+01
103	C.12000E+02	0.33333E+01
104	C.12000E+02	0.41667E+01
105	C.12000E+02	0.50000E+01

XRAD	YLO	YHI	NOY
0.20000E+01	C.25000E+01	0.50000E+01	6
0.40000E+01	C.27500E+01	0.47500E+01	9
0.60000E+01	C.27500E+01	0.47500E+01	9

I	XON	YON	YONH	AREA	DISC AREA
42	1.2000E+01	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
43	1.1096E+01	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
44	1.0192E+01	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
45	9.2818E+00	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
46	8.5231E+00	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
47	7.8908E+00	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
48	7.3640E+00	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
49	6.9249E+00	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
50	6.5590E+00	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
51	6.2541E+00	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
52	6.0000E+00	5.0000E+00	2.5000E+00	5.8905E+01	7.8540E+01
53	5.7500E+00	5.0000E+00	2.4947E+00	5.8988E+01	7.8540E+01
54	5.5000E+00	5.0000E+00	2.4819E+00	5.9189E+01	7.8540E+01
55	5.2500E+00	5.0000E+00	2.4640E+00	5.9466E+01	7.8540E+01
56	5.0000E+00	5.0000E+00	2.4425E+00	5.9798E+01	7.8540E+01
57	4.7588E+00	5.0092E+00	2.4186E+00	6.0451E+01	7.8828E+01
58	4.5056E+00	5.0363E+00	2.3907E+00	6.1728E+01	7.9683E+01
59	4.2405E+00	5.0799E+00	2.3583E+00	6.3598E+01	8.1070E+01
60	3.9640E+00	5.1377E+00	2.3212E+00	6.6000E+01	8.2926E+01

61	3.6776E+00	5.2058E+00	2.2786E+00	6.8827E+01	8.5139E+01
62	3.3839E+00	5.2790E+00	2.2309E+00	7.1913E+01	8.7548E+01
63	3.0891E+00	5.3502E+00	2.1815E+00	7.4975E+01	8.9925E+01
64	2.8011E+00	5.4121E+00	2.1335E+00	7.7719E+01	9.2019E+01
65	2.5229E+00	5.4597E+00	2.0872E+00	7.9961E+01	9.3646E+01
66	2.2565E+00	5.4897E+00	2.0427E+00	8.1567E+01	9.4676E+01
67	2.0000E+00	5.5000E+00	2.0000E+00	8.2467E+01	9.5033E+01
68	1.7739E+00	5.5009E+00	1.9602E+00	8.2995E+01	9.5066E+01
69	1.5729E+00	5.5063E+00	1.9187E+00	8.3686E+01	9.5252E+01
70	1.3793E+00	5.5195E+00	1.8709E+00	8.4710E+01	9.5707E+01
71	1.1949E+00	5.5426E+00	1.8160E+00	8.6151E+01	9.6511E+01
72	1.0190E+00	5.5776E+00	1.7533E+00	8.8077E+01	9.7734E+01
73	8.5150E-01	5.6260E+00	1.6818E+00	9.0551E+01	9.9436E+01
74	6.9453E-01	5.6882E+00	1.6009E+00	9.3597E+01	1.0165E+02
75	5.4735E-01	5.7658E+00	1.5093E+00	9.7285E+01	1.0444E+02
76	4.1482E-01	5.8570E+00	1.4087E+00	1.0154E+02	1.0777E+02
77	2.9653E-01	5.9627E+00	1.2978E+00	1.0641E+02	1.1170E+02
78	1.9494E-01	6.0819E+00	1.1748E+00	1.1187E+02	1.1621E+02
79	1.1248E-01	6.2128E+00	1.0367E+00	1.1789E+02	1.2126E+02
80	5.1336E-02	6.3532E+00	8.8358E-01	1.2435E+02	1.2680E+02

81	1.3387E-02	6.5000E+00	7.0708E-01	1.3116E+02	1.3273E+02
82	0.	6.6500E+00	0.	1.3893E+02	1.3893E+02
83	0.	6.8326E+00	0.	1.4666E+02	1.4666E+02
84	0.	7.0517E+00	0.	1.5622E+02	1.5622E+02
85	0.	7.3146E+00	0.	1.6809E+02	1.6809E+02
86	0.	7.6301E+00	0.	1.8290E+02	1.8290E+02
87	0.	8.0087E+00	0.	2.0150E+02	2.0150E+02
88	0.	8.4631E+00	0.	2.2501E+02	2.2501E+02
89	0.	9.0083E+00	0.	2.5494E+02	2.5494E+02
90	0.	9.6625E+00	0.	2.9331E+02	2.9331E+02
91	0.	1.0448E+01	0.	3.4291E+02	3.4291E+02
92	0.	1.1390E+01	0.	4.0754E+02	4.0754E+02
93	0.	1.2346E+01	0.	4.7888E+02	4.7888E+02
94	0.	1.3303E+01	0.	5.5597E+02	5.5597E+02
95	0.	1.4260E+01	0.	6.3882E+02	6.3882E+02
96	0.	1.5216E+01	0.	7.2741E+02	7.2741E+02
97	0.	1.6173E+01	0.	8.2175E+02	8.2175E+02
98	0.	1.7130E+01	0.	9.2185E+02	9.2185E+02
99	0.	1.8087E+01	0.	1.0277E+03	1.0277E+03
100	0.	1.9043E+01	0.	1.1393E+03	1.1393E+03
101	0.	2.0000E+01	0.	1.2566E+03	1.2566E+03

C1 UNITCS, ECF.

REC= 00000 FIL= 00002

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                    DOUGLAS  AIRCRAFT COMPANY
                      LONG  BEACH  DIVISION

PROGRAM EODA -- AXISYMMETRIC AND CROSSFLOW

     ***** CASE CONTROL DATA *****


          TEST CASE                                        3-BODY    CASE NO.   TEST

BODIES  =  3
NNU     = -0
CHORD   =   1.0000000
MACH NO.= -0.
TCNST   =  -0.

       SURFACE OF REVOLUTION
       CROSSFLOW
       OFF-BODY POINTS
       MATRIX SOLUTION BY TRIANGULARIZATION   (SOLVIT)
       INPUT TAPE NO. FOR COORDINATES AND NON-UNIFORM FLOW ONLY =     5
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DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY

NN = 41 MX = -0. MY = -0.
THETA = -0. ADDX = -0. ADDY = -0.
XE = -0. YE = -0.

CN-BODY COORDINATES (UNTRANSFORMED)
BODY NO. 1

	X	Y	DELTA S	SUMDS	D ALPHA
1	0.	0.			
	0.	0.1250000	0.2500000	0.2500000	
2	0.	0.2500000			0.
	-0.	0.3750000	0.2500000	0.5000000	
3	-0.	0.5000000			-3.8241162
	0.0083790	0.6253540	0.2512674	0.7512674	
4	0.0167580	0.7507080			-11.7650077
	0.0461320	0.8559910	0.2186078	0.9698752	
5	0.0755060	0.9612740			-12.6493235
	0.1266910	1.0565800	0.2163621	1.1862373	
6	0.1778760	1.1518860			-11.3918442
	0.2472570	1.2356630	0.2175528	1.4037901	
7	0.3166380	1.3194400			-9.4025823
	0.3999435	1.3917725	0.2206517	1.6244419	
8	0.4832490	1.4641050			-7.4792177
	0.5738500	1.5240450	0.2172680	1.8417099	
9	0.6644510	1.5839850			-6.0293090
	0.7638835	1.6356550	0.2241126	2.0658224	
10	0.8633160	1.6873250			-5.0261505
	0.9693165	1.7310855	0.2293564	2.2951787	
11	1.0753170	1.7748460			-4.2010204
	1.1861715	1.8113605	0.2334269	2.5286056	
12	1.2970260	1.8478750			-3.4872889
	1.4115020	1.8780015	0.2367476	2.7653532	
13	1.5259780	1.9081280			-2.7941246
	1.6432570	1.9329495	0.2397538	3.0051070	
14	1.7605360	1.9577710			-1.9488477
	1.8802680	1.9788855	0.2431590	3.2482660	
15	2.0000000	2.0000000			-0.5387681
	2.1250000	2.0208335	0.2534485	3.5017145	
16	2.2500000	2.0416670			-0.0002325
	2.3750000	2.0625000	0.2534483	3.7551628	
17	2.5000000	2.0833330			0.0002325
	2.6250000	2.1041665	0.2534485	4.0086113	
18	2.7500000	2.1250000			0.
	2.8750000	2.1458335	0.2534485	4.2620597	
19	3.0000000	2.1666670			-0.0002325
	3.1250000	2.1875000	0.2534483	4.5155081	
20	3.2500000	2.2083330			0.0002325
	3.3750000	2.2291665	0.2534485	4.7689565	
21	3.5000000	2.2500000			-0.4091516
	3.6249080	2.2699025	0.2529673	5.0219238	
22	3.7498160	2.2898050			-0.7711682
	3.8742245	2.3079145	0.2514393	5.2733631	
23	3.9986330	2.3260240			-0.6866971

	4.1234019	2.3426615	0.2517468	5.5251098	
24	4.2481710	2.3592990			-0.6423096
	4.3732024	2.3745470	0.2519157	5.7770255	
25	4.4982340	2.3897950			-0.6325730
	4.6234515	2.4036645	0.2519666	6.0289921	
26	4.7486690	2.4175340			-0.6577064
	4.8740050	2.4299620	0.2519013	6.2808933	
27	4.9993410	2.4423900			-0.7263850
	5.1247255	2.4532195	0.2517026	6.5325959	
28	5.2501100	2.4640490			-0.8634634
	5.3754430	2.4729735	0.2513007	6.7838966	
29	5.5007760	2.4818980			-1.1340381
	5.6258765	2.4883205	0.2505305	7.0344270	
30	5.7509770	2.4947430			-1.7295423
	5.8754885	2.4973715	0.2490785	7.2835055	
31	6.0000000	2.5000000			-1.2093652
	6.1270445	2.5000000	0.2540890	7.5375945	
32	6.2540890	2.5000000			0.
	6.4065425	2.5000000	0.3049070	7.8425015	
33	6.5589960	2.5000000			0.
	6.7419400	2.5000000	0.3658880	8.2083895	
34	6.9248840	2.5000000			0.
	7.1444170	2.5000000	0.4390660	8.6474555	
35	7.3639500	2.5000000			0.
	7.6273895	2.5000000	0.5268790	9.1743344	
36	7.8908290	2.5000000			0.
	8.2069565	2.5000000	0.6322550	9.8065894	
37	8.5230840	2.5000000			0.
	8.9024370	2.5000000	0.7587060	10.5652952	
38	9.2817900	2.5000000			0.
	9.7370135	2.5000000	0.9104470	11.4757422	
39	10.1922370	2.5000000			0.
	10.6441774	2.5000000	0.9038810	12.3796232	
40	11.0961180	2.5000000			0.
	11.5480590	2.5000000	0.9038820	13.2835052	
41	12.0000000	2.5000000			

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY

NN = 60 MX = -0. MY = -0.
THETA = -0. ACCX = -0. ADDY = -0.
XE = -0. YE = -0.

CN-BODY COORDINATES (UNTRANSFORMED)
BODY NO. 2

	X	Y	DELTA S	SUMDS	D ALPHA
1	12.0000000	5.0000000			
	11.5480590	5.0000000	0.9038820	0.9038820	
2	11.0961180	5.0000000			0.
	10.6441774	5.0000000	0.9038810	1.8077630	
3	10.1922370	5.0000000			0.
	9.7370135	5.0000000	0.9104470	2.7182100	
4	9.2817900	5.0000000			0.
	8.9024370	5.0000000	0.7587060	3.4769159	
5	8.5230840	5.0000000			0.
	8.2069565	5.0000000	0.6322550	4.1091709	
6	7.8908290	5.0000000			0.
	7.6273895	5.0000000	0.5268790	4.6360499	
7	7.3639500	5.0000000			0.
	7.1444170	5.0000000	0.4390660	5.0751159	
8	6.9248840	5.0000000			0.
	6.7419400	5.0000000	0.3658880	5.4410039	
9	6.5589960	5.0000000			0.
	6.4065425	5.0000000	0.3049070	5.7459109	
10	6.2540890	5.0000000			0.
	6.1270445	5.0000000	0.2540890	5.9999999	
11	6.0000000	5.0000000			0.
	5.8750000	5.0000000	0.2500000	6.2499999	
12	5.7500000	5.0000000			0.
	5.6250000	5.0000000	0.2500000	6.4999999	
13	5.5000000	5.0000000			0.
	5.3750000	5.0000000	0.2500000	6.7499999	
14	5.2500000	5.0000000			0.
	5.1250000	5.0000000	0.2500000	6.9999999	
15	5.0000000	5.0000000			-2.1792316
	4.8793790	5.0045900	0.2414166	7.2414165	
16	4.7587580	5.0091800			-3.9268209
	4.6322015	5.0227185	0.2545572	7.4959737	
17	4.5056450	5.0362570			-3.2439557
	4.3730749	5.0580850	0.2687100	7.7646837	
18	4.2405050	5.0799130			-2.4545241
	4.1022280	5.1088120	0.2825291	8.0472127	
19	3.9639510	5.1377110			-1.5724325
	3.8207540	5.1717645	0.2943809	8.3415935	
20	3.6775570	5.2058180			-0.6106070
	3.5307250	5.2423935	0.3026377	8.6442312	
21	3.3838930	5.2789690			0.4115753
	3.2364990	5.3145620	0.3032613	8.9474925	
22	3.0891050	5.3501550			1.4410384
	2.9451135	5.3811160	0.2945650	9.2420574	
23	2.8011220	5.4120770			2.4166217

	2.6620285	5.4358985	0.2822372	9.5242946	
24	2.5229350	5.4597200			3.3069454
	2.3897135	5.4746900	0.2681199	9.7924144	
25	2.2564920	5.4896600			4.1028724
	2.1282460	5.4948300	0.2567003	10.0491147	
26	2.0000000	5.5000000			2.0705958
	1.8869355	5.5004695	0.2261309	10.2752455	
27	1.7738710	5.5009390			-1.2980553
	1.6733840	5.5036335	0.2010462	10.4762918	
28	1.5728970	5.5063280			-2.3423041
	1.4761160	5.5128890	0.1940063	10.6702980	
29	1.3793350	5.5194500			-3.2782757
	1.2870955	5.5310315	0.1859275	10.8562254	
30	1.1948560	5.5426130			-4.0991654
	1.1069210	5.5601135	0.1793191	11.0355444	
31	1.0189860	5.5776140			-4.8494838
	0.9352410	5.6017940	0.1743318	11.2098762	
32	0.8514960	5.6259740			-5.5262105
	0.7730140	5.6570970	0.1688557	11.3787318	
33	0.6945320	5.6882200			-6.1684719
	0.6209400	5.7270205	0.1663882	11.5451200	
34	0.5473480	5.7658210			-6.7392436
	0.4810835	5.8114300	0.1608871	11.7060070	
35	0.4148190	5.8570390			-7.2455193
	0.3556720	5.9098940	0.1586445	11.8646514	
36	0.2965250	5.9627490			-7.7658312
	0.2457330	6.0223250	0.1565775	12.0212289	
37	0.1949410	6.0819010			-8.2404850
	0.1537080	6.1473550	0.1547176	12.1759465	
38	0.1124750	6.2128090			-8.6697624
	0.0819055	6.2829825	0.1530857	12.3290322	
39	0.0513360	6.3531560			-9.0519558
	0.0323615	6.4265920	0.1516955	12.4807277	
40	0.0133870	6.5000280			-9.3864200
	0.0066935	6.5750140	0.1505683	12.6312959	
41	0.	6.6500000			-5.1008937
	0.	6.7412925	0.1825850	12.8138809	
42	0.	6.8325850			0.
	0.	6.9421365	0.2191030	13.0329839	
43	0.	7.0516880			0.
	0.	7.1831495	0.2629230	13.2959069	
44	0.	7.3146110			0.
	0.	7.4723650	0.3155080	13.6114149	
45	0.	7.6301190			0.
	0.	7.8194235	0.3786090	13.9900239	
46	0.	8.0087280			0.
	0.	8.2358935	0.4543309	14.4443548	
47	0.	8.4630589			0.
	0.	8.7356575	0.5451970	14.9895518	
48	0.	9.0082560			0.
	0.	9.3353745	0.6542370	15.6437888	
49	0.	9.6624930			0.
	0.	10.0553350	0.7850840	16.4288726	
50	0.	10.4475770			0.
	0.	10.9186275	0.9421010	17.3709736	
51	0.	11.3896780			0.
	0.	11.8680295	0.9567029	18.3276765	
52	0.	12.3463809			0.
	0.	12.8247319	0.9567020	19.2843785	
53	0.	13.3030829			0.

	0.	13.7814339	0.9567021	20.2410805	
54	0.	14.2597851			0.
	0.	14.7381365	0.9567029	21.1977835	
55	0.	15.2164880			0.
	0.	15.6948390	0.9567021	22.1544855	
56	0.	16.1731901			0.
	0.	16.6515410	0.9567020	23.1111875	
57	0.	17.1298921			0.
	0.	17.6082430	0.9567020	24.0678895	
58	0.	18.0865941			0.
	0.	18.5649455	0.9567029	25.0245924	
59	0.	19.0432971			0.
	0.	19.5216484	0.9567029	25.9812953	
60	0.	20.0000000			

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY

NN =	4	MX =	-0.	MY =	-0.
THETA =	-0.	ACCX =	-0.	ADDY =	-0.
XE =	-0.	YE =	-0.		

CN-BODY COORDINATES (UNTRANSFORMED)
BODY NO. 3

	X	Y	DELTA S	SUMDS	D ALPHA
1	12.0000000	2.5000000			
	12.0000000	2.9166665	0.8333330	0.8333330	
2	12.0000000	3.3333330			0.
	12.0000000	3.7500000	0.8333340	1.6666670	
3	12.0000000	4.1666670			0.
	12.0000000	4.5833335	0.8333330	2.5000000	
4	12.0000000	5.0000000			

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY

NN =	24	MX =	-0.	MY =	-0.
THETA =	-0.	ADDX =	-0.	ADDY =	-0.
XE =	-0.	YE =	-0.		

OFF-BODY COORDINATES (UNTRANSFORMED)

	X-OFF	Y-OFF
1	2.0000000	2.5000000
2	2.0000000	3.0000000
3	2.0000000	3.5000000
4	2.0000000	4.0000000
5	2.0000000	4.5000000
6	2.0000000	5.0000000
7	4.0000000	2.7500000
8	4.0000000	3.0000000
9	4.0000000	3.2500000
10	4.0000000	3.5000000
11	4.0000000	3.7500000
12	4.0000000	4.0000000
13	4.0000000	4.2500000
14	4.0000000	4.5000000
15	4.0000000	4.7500000
16	6.0000000	2.7500000
17	6.0000000	3.0000000
18	6.0000000	3.2500000
19	6.0000000	3.5000000
20	6.0000000	3.7500000
21	6.0000000	4.0000000
22	6.0000000	4.2500000
23	6.0000000	4.5000000
24	6.0000000	4.7500000

THE 102 X 102 MATRIX WITH 1 RIGHT SIDES WAS SOLVED DIRECTLY IN 0.005 MINUTES.

THE 102 X 102 MATRIX WITH 1 RIGHT SIDES WAS SOLVED DIRECTLY IN 0.005 MINUTES.

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY CASE NO. TEST

CN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
1	0.	0.							
	0.	0.1250000	0.0131311	0.9998276	1.00000	0.	-0.0342820	-0.0000001	-19.9221981
2	0.	0.2500000							
	-0.	0.3750000	0.0396814	0.9984254	1.00000	-0.	-0.0333696	-0.0000001	-19.9153388
3	-0.	0.5000000							
	0.0083790	0.6252540	0.0809950	0.9934398	0.99777	0.06669	-0.0310698	-0.0000000	-19.9078133
4	0.0167580	0.7507080							
	0.0461120	0.8555910	0.1436507	0.9793645	0.96321	0.26874	-0.0267064	-0.0000000	-19.9178820
5	0.0755060	0.9612740							
	0.1266910	1.0565800	0.1942429	0.9622697	0.88099	0.47314	-0.0224692	-0.0000001	-19.9603941
6	0.1778760	1.1518860							
	0.2472570	1.2356630	0.2310025	0.9466379	0.77018	0.63783	-0.0184587	-0.0000001	-20.0335832
7	0.3166380	1.3194400							
	0.3999435	1.3917725	0.2548887	0.9350317	0.65563	0.75509	-0.0150457	-0.0000001	-20.1319773
8	0.4832490	1.4641050							
	0.5738500	1.5240450	0.2698558	0.9271778	0.55176	0.83400	-0.0122794	-0.0000001	-20.2476029
9	0.6644510	1.5839850							
	0.7638835	1.6356550	0.2789624	0.9221800	0.46111	0.88734	-0.0100747	-0.0000001	-20.3764017
10	0.8633160	1.6873250							
	0.9693165	1.7310855	0.2848752	0.9188461	0.38159	0.92433	-0.0082269	-0.0000000	-20.5173342
11	1.0753170	1.7748460							
	1.1861715	1.8113605	0.2884461	0.9167988	0.31286	0.94980	-0.0066774	-0.0000001	-20.6673591
12	1.2970260	1.8478750							
	1.4115020	1.8780015	0.2901116	0.9158353	0.25450	0.96707	-0.0053966	-0.0000000	-20.8242595
13	1.5259780	1.9081280							
	1.6432570	1.9329495	0.2899924	0.9159044	0.20706	0.97833	-0.0044130	-0.0000000	-20.9865668
14	1.7605360	1.9577710							
	1.8802680	1.9788855	0.2882581	0.9169073	0.17367	0.98480	-0.0038844	-0.0000000	-21.1535707
15	2.0000000	2.0000000							
	2.1250000	2.0208335	0.2871253	0.9175591	0.16440	0.98639	-0.0042788	-0.0000000	-21.3270819
16	2.2500000	2.0416670							
	2.3750000	2.0625000	0.2889896	0.9164850	0.16440	0.98639	-0.0049329	-0.0000000	-21.5043774
17	2.5000000	2.0833330							
	2.6250000	2.1041665	0.2932947	0.9139782	0.16440	0.98639	-0.0054755	-0.0000000	-21.6808147
18	2.7500000	2.1250000							
	2.8750000	2.1458335	0.2990876	0.9105466	0.16440	0.98639	-0.0059514	-0.0000000	-21.8559356
19	3.0000000	2.1666670							
	3.1250000	2.1875000	0.3061728	0.9062582	0.16440	0.98639	-0.0063818	-0.0000000	-22.0294168
20	3.2500000	2.2083330							
	3.3750000	2.2291665	0.3148567	0.9008653	0.16440	0.98639	-0.0067743	-0.0000000	-22.2009008
21	3.5000000	2.2500000							
	3.6249080	2.2699025	0.3248776	0.8944546	0.15735	0.98754	-0.0067836	-0.0000000	-22.3698225
22	3.7498160	2.2898050							
	3.8742245	2.3079145	0.3345165	0.8880987	0.14405	0.98957	-0.0064461	-0.0000000	-22.5358374

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY CASE NO. TEST

CN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
23	3.9986330	2.3260240							
	4.1234019	2.3426615	0.3431688	0.8822351	0.13218	0.99123	-0.0061479	-0.0000000	-22.6996534
24	4.2481710	2.3592990							
	4.3732024	2.3745470	0.3514930	0.8764527	0.12106	0.99265	-0.0058415	-0.0000000	-22.8618746
25	4.4982340	2.3897950							
	4.6234515	2.4036645	0.3595760	0.8707051	0.11009	0.99392	-0.0054958	-0.0000000	-23.0224252
26	4.7486690	2.4175340							
	4.8740050	2.4299620	0.3673881	0.8650260	0.09867	0.99512	-0.0050836	-0.0000000	-23.1812561
27	4.9993410	2.4423900							
	5.1247255	2.4532195	0.3748600	0.8594799	0.08605	0.99629	-0.0045707	-0.0000000	-23.3383412
28	5.2501100	2.4640490							
	5.3754430	2.4729735	0.3818584	0.8541842	0.07103	0.99747	-0.0038981	-0.0000000	-23.4936559
29	5.5007760	2.4818980							
	5.6258765	2.4883205	0.3879084	0.8495270	0.05127	0.99868	-0.0029364	-0.0000000	-23.6471574
30	5.7509770	2.4994430							
	5.8754885	2.4973715	0.3901714	0.8477663	0.02111	0.99978	-0.0013439	-0.0000000	-23.7988913
31	6.0000000	2.5000000							
	6.1270445	2.5000000	0.3870687	0.8501778	0.	1.00000	-0.0002873	-0.0000000	-23.9522195
32	6.2540890	2.5000000							
	6.4065425	2.5000000	0.3836582	0.8528064	0.	1.00000	-0.0004877	-0.0000000	-24.1241920
33	6.5589960	2.5000000							
	6.7419400	2.5000000	0.3825168	0.8536809	0.	1.00000	-0.0007144	-0.0000000	-24.3312447
34	6.9248840	2.5000000							
	7.1444170	2.5000000	0.3822255	0.8539037	0.	1.00000	-0.0010486	-0.0000000	-24.5800261
35	7.3639500	2.5000000							
	7.6273895	2.5000000	0.3823803	0.8537853	0.	1.00000	-0.0016351	0.0000000	-24.8787391
36	7.8908290	2.5000000							
	8.2069565	2.5000000	0.3827307	0.8535172	0.	1.00000	-0.0028104	-0.0000000	-25.2374685
37	8.5230840	2.5000000							
	8.9024370	2.5000000	0.3829474	0.8533513	0.	1.00000	-0.0055094	-0.0000000	-25.6690440
38	9.2817900	2.5000000							
	9.7370135	2.5000000	0.3849852	0.8517864	0.	1.00000	-0.0129652	-0.0000000	-26.1911981
39	10.1922370	2.5000000							
	10.6441774	2.5000000	0.3984247	0.8412577	0.	1.00000	-0.0361597	-0.0000001	-26.7731020
40	11.0961180	2.5000000							
	11.5480590	2.5000000	0.8433571	0.2887488	0.	1.00000	-0.1301989	-0.0000004	-27.3090472
41	12.0000000	2.5000000							
42	12.0000000	5.0000000							
	11.5480590	5.0000000	-1.4339074	-1.0560904	0.	-1.00000	-0.4456426	-0.0000006	-26.9859664
43	11.0961180	5.0000000							
	10.6441774	5.0000000	-0.5730430	0.6716217	0.	-1.00000	-0.3023874	-0.0000003	-26.6804409
44	10.1922370	5.0000000							
	9.7370135	5.0000000	-0.4676190	0.7813325	0.	-1.00000	-0.2453889	-0.0000002	-26.1649947

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY CASE NO. TEST

CN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
45	9.2817900	5.0000000							
	8.9024370	5.0000000	-0.4248608	0.8194933	0.	-1.00000	-0.2122278	-0.0000002	-25.6633532
46	8.5230840	5.0000000							
	8.2069565	5.0000000	-0.4089034	0.8327980	0.	-1.00000	-0.1906611	-0.0000002	-25.2371342
47	7.8908290	5.0000000							
	7.6273895	5.0000000	-0.4006856	0.8394510	0.	-1.00000	-0.1750244	-0.0000001	-24.8797667
48	7.3639500	5.0000000							
	7.1444170	5.0000000	-0.3956957	0.8434249	0.	-1.00000	-0.1630011	-0.0000001	-24.5811722
49	6.9248840	5.0000000							
	6.7419400	5.0000000	-0.3923964	0.8460251	0.	-1.00000	-0.1534174	-0.0000001	-24.3320181
50	6.5589960	5.0000000							
	6.4065425	5.0000000	-0.3901432	0.8477883	0.	-1.00000	-0.1455890	-0.0000001	-24.1242630
51	6.2540890	5.0000000							
	6.1270445	5.0000000	-0.3884452	0.8491103	0.	-1.00000	-0.1390766	-0.0000001	-23.9510939
52	6.0000000	5.0000000							
	5.8750000	5.0000000	-0.3899826	0.8479136	0.	-1.00000	-0.1331225	-0.0000001	-23.7950759
53	5.7500000	5.0000000							
	5.6250000	5.0000000	-0.3924860	0.8459547	0.	-1.00000	-0.1270145	-0.0000001	-23.6407433
54	5.5000000	5.0000000							
	5.3750000	5.0000000	-0.3974568	0.8420281	0.	-1.00000	-0.1204525	-0.0000000	-23.4871421
55	5.2500000	5.0000000							
	5.1250000	5.0000000	-0.4129395	0.8294809	0.	-1.00000	-0.1125981	-0.0000000	-23.3353105
56	5.0000000	5.0000000							
	4.8793790	5.0045900	-0.4158710	0.8270513	0.03803	-0.99928	-0.1071958	-0.0000001	-23.1894159
57	4.7587580	5.0091800							
	4.6322015	5.0227185	-0.3998640	0.8401088	0.10637	-0.99433	-0.1067106	-0.0000000	-23.0433102
58	4.5056450	5.0362570							
	4.3730749	5.0588850	-0.3795565	0.8559369	0.16247	-0.98671	-0.1078417	-0.0000000	-22.8867433
59	4.2405050	5.0799130							
	4.1022280	5.1088120	-0.3555353	0.8735947	0.20457	-0.97885	-0.1090011	-0.0000001	-22.7178323
60	3.9639510	5.1377110							
	3.8207540	5.1717645	-0.3306140	0.8906944	0.23136	-0.97287	-0.1094069	-0.0000001	-22.5356865
61	3.6775570	5.2058180							
	3.5307250	5.2423935	-0.3073139	0.9055582	0.24171	-0.97035	-0.1084799	-0.0000001	-22.3407023
62	3.3838930	5.2786690							
	3.2364990	5.3145620	-0.2877171	0.9172188	0.23473	-0.97206	-0.1057404	-0.0000001	-22.1356509
63	3.0891050	5.3501550							
	2.9451135	5.3811160	-0.2732043	0.9253594	0.21022	-0.97766	-0.1008595	-0.0000000	-21.9261956
64	2.8011220	5.4120770							
	2.6620285	5.4358985	-0.2648462	0.9298565	0.16880	-0.98565	-0.0936006	-0.0000000	-21.7178130
65	2.5229350	5.4597200							
	2.3897135	5.4746900	-0.2638481	0.9303842	0.11167	-0.99375	-0.0837641	-0.0000000	-21.5143833
66	2.2564920	5.4896600							
	2.1282460	5.4948300	-0.2769832	0.9232803	0.04028	-0.99919	-0.0708376	0.0000000	-21.3187256

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE

3-BODY CASE NO. TEST

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
67	2.0000000	5.5000000							
	1.8869355	5.5004695	-0.2884185	0.9168148	0.00415	-0.99999	-0.0585021	0.0000001	-21.1409991
68	1.7738710	5.5009390							
	1.6733840	5.5036335	-0.2933960	0.9139188	0.02680	-0.99964	-0.0505095	0.0000000	-20.9871237
69	1.5728970	5.5062280							
	1.4761160	5.5128890	-0.2992317	0.9104604	0.06764	-0.99771	-0.0453209	0.0000001	-20.8469472
70	1.3793350	5.5194500							
	1.2870955	5.5310315	-0.3014130	0.9091502	0.12458	-0.99221	-0.0419254	0.0000000	-20.7140911
71	1.1948560	5.5426130							
	1.1069210	5.5601135	-0.2991797	0.9104915	0.19519	-0.98077	-0.0399776	0.0000000	-20.5882916
72	1.0189860	5.5776140							
	0.9352410	5.6017940	-0.2914714	0.9150444	0.27740	-0.96075	-0.0391646	-0.0000000	-20.4686667
73	0.8514960	5.6259740							
	0.7730140	5.6570970	-0.2775320	0.9229760	0.36863	-0.92957	-0.0391932	0.0000000	-20.3553135
74	0.6945320	5.6882200							
	0.6209400	5.7270205	-0.2567207	0.9340945	0.46638	-0.88458	-0.0398612	-0.0000001	-20.2482080
75	0.5473480	5.7658210							
	0.4810835	5.8114300	-0.2291283	0.9475002	0.56697	-0.82374	-0.0408578	-0.0000001	-20.1483808
76	0.4148190	5.8570390							
	0.3556720	5.9098940	-0.1952145	0.9618913	0.66633	-0.74565	-0.0420641	-0.0000001	-20.0571594
77	0.2965250	5.9627490							
	0.2457330	6.0223250	-0.1555722	0.9757973	0.76098	-0.64878	-0.0432812	-0.0000001	-19.9751430
78	0.1949410	6.0819010							
	0.1537080	6.1473550	-0.1117835	0.9875044	0.84611	-0.53301	-0.0444124	-0.0000001	-19.9041631
79	0.1124750	6.2128090							
	0.0819055	6.2829825	-0.0659875	0.9956456	0.91679	-0.39938	-0.0454803	-0.0000001	-19.8462391
80	0.0513360	6.3531560							
	0.0323615	6.4265920	-0.0206061	0.9995754	0.96820	-0.25017	-0.0467678	-0.0000001	-19.8035123
81	0.0133870	6.5000280							
	0.0066935	6.5750140	0.0253722	0.9993562	0.99604	-0.08891	-0.0494296	-0.0000001	-19.7780633
82	0.	6.6500000							
	0.	6.7412925	0.0584650	0.9965818	1.00000	0.	-0.0550653	-0.0000000	-19.7656555
83	0.	6.8325850							
	0.	6.9421365	0.0726749	0.9947184	1.00000	0.	-0.0617072	-0.0000000	-19.7544489
84	0.	7.0516880							
	0.	7.1831495	0.0921014	0.9915173	1.00000	0.	-0.0675260	-0.0000000	-19.7364702
85	0.	7.3146110							
	0.	7.4723650	0.1127936	0.9872776	1.00000	0.	-0.0733233	-0.0000000	-19.7090740
86	0.	7.6301190							
	0.	7.8194235	0.1346782	0.9818618	1.00000	0.	-0.0793238	-0.0000000	-19.6689107
87	0.	8.0087280							
	0.	8.2358935	0.1580671	0.9750148	1.00000	0.	-0.0856098	-0.0000000	-19.6114573
88	0.	8.4630589							
	0.	8.7356575	0.1834670	0.9663399	1.00000	0.	-0.0921941	0.	-19.5305371

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY CASE NO. TEST

CN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
89	0.	9.0082560							
	0.	9.3353745	0.2116146	0.9552192	1.00000	0.	-0.0990431	-0.0000000	-19.4176202
90	0.	9.6624930							
	0.	10.0550350	0.2436064	0.9406559	1.00000	0.	-0.1060840	-0.0000000	-19.2607155
91	0.	10.4475770							
	0.	10.9186275	0.2813443	0.9208454	1.00000	0.	-0.1132069	0.0000000	-19.0425532
92	0.	11.3896780							
	0.	11.8680295	0.3204983	0.8972809	1.00000	0.	-0.1197264	0.0000000	-18.7656510
93	0.	12.3463809							
	0.	12.8247319	0.3626853	0.8684594	1.00000	0.	-0.1251944	0.	-18.4463592
94	0.	13.3030829							
	0.	13.7814339	0.4090451	0.8326821	1.00000	0.	-0.1297728	0.0000000	-18.0836513
95	0.	14.2597851							
	0.	14.7381365	0.4614128	0.7870982	1.00000	0.	-0.1336261	0.0000000	-17.6729352
96	0.	15.2164880							
	0.	15.6948390	0.5226561	0.7268306	1.00000	0.	-0.1368830	0.0000000	-17.2073767
97	0.	16.1731901							
	0.	16.6515410	0.5977251	0.6427247	1.00000	0.	-0.1396468	0.0000000	-16.6764889
98	0.	17.1298921							
	0.	17.6082430	0.6965811	0.5147747	1.00000	0.	-0.1420009	0.0000001	-16.0630064
99	0.	18.0865941							
	0.	18.5649455	0.8450034	0.2859693	1.00000	0.	-0.1440136	0.0000000	-15.3341706
100	0.	19.0432971							
	0.	19.5216484	1.1631805	-0.3529889	1.00000	0.	-0.1457406	0.0000000	-14.4032063
101	0.	20.0000000							
102	12.0000000	2.5000000							
	12.0000000	2.9166665	-0.4855867	0.7642056	1.00000	0.	-0.3836764	0.0000003	-27.7096057
103	12.0000000	3.3333330							
	12.0000000	3.7500000	0.2290280	0.9475462	1.00000	0.	-0.3935302	0.0000002	-27.7708983
104	12.0000000	4.1666670							
	12.0000000	4.5833335	1.3318560	-0.7738403	1.00000	0.	-0.5074222	0.0000007	-27.3689723
105	12.0000000	5.0000000							

ADDED MASS =2713.9387207 VOLUME =-811.6679382 SUM (T)(DELTA S) = 6.2187432

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE

3-BODY CASE NO. TEST

OFF-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
1	2.0000000	2.5000000	0.2783720	0.0336532	0.2803988	6.8932023	-21.2176995
2	2.0000000	3.0000000	0.2754318	0.0177211	0.2760013	3.6812993	-21.2049010
3	2.0000000	3.5000000	0.2730569	0.0034169	0.2730783	0.7169349	-21.1996984
4	2.0000000	4.0000000	0.2708232	-0.0086427	0.2709610	-1.8278427	-21.2011127
5	2.0000000	4.5000000	0.2688064	-0.0172767	0.2693611	-3.6774445	-21.2077827
6	2.0000000	5.0000000	0.2672812	-0.0188682	0.2679464	-4.0379831	-21.2172489
7	4.0000000	2.7500000	0.3352026	0.0256516	0.3361827	4.3760748	-22.6035929
8	4.0000000	3.0000000	0.3350338	0.0153103	0.3353835	2.6164717	-22.5984983
9	4.0000000	3.2500000	0.3350651	0.0059770	0.3351184	1.0219521	-22.5958533
10	4.0000000	3.5000000	0.3353166	-0.0027746	0.3353280	-0.4740918	-22.5954611
11	4.0000000	3.7500000	0.3358158	-0.0113375	0.3360071	-1.9336242	-22.5972252
12	4.0000000	4.0000000	0.3365780	-0.0201211	0.3371789	-3.4211542	-22.6011481
13	4.0000000	4.2500000	0.3375773	-0.0296086	0.3388733	-5.0125377	-22.6073432
14	4.0000000	4.5000000	0.3386874	-0.0404200	0.3410908	-6.8056579	-22.6160617
15	4.0000000	4.7500000	0.3395517	-0.0533587	0.3437186	-8.9306852	-22.6277306
16	6.0000000	2.7500000	0.3845217	0.0052223	0.3845571	0.7780958	-23.8734667
17	6.0000000	3.0000000	0.3812172	0.0043775	0.3812424	0.6578988	-23.8722413
18	6.0000000	3.2500000	0.3794156	0.0028392	0.3794262	0.4287352	-23.8713326
19	6.0000000	3.5000000	0.3786132	0.0012065	0.3786151	0.1825759	-23.8708274
20	6.0000000	3.7500000	0.3785338	-0.0002416	0.3785338	-0.0365754	-23.8707125
21	6.0000000	4.0000000	0.3789717	-0.0013260	0.3789741	-0.2004746	-23.8709183
22	6.0000000	4.2500000	0.3797150	-0.0019088	0.3797198	-0.2880234	-23.8713338
23	6.0000000	4.5000000	0.3804967	-0.0018985	0.3805015	-0.2858757	-23.8718228
24	6.0000000	4.7500000	0.3809523	-0.0012780	0.3809544	-0.1922116	-23.8722317

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE

3-BODY CASE NO. TEST

CN-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
1	0.	0.							
	0.	0.1250000	0.8839548	0.8798248	1.00000	0.	-0.0013069	-0.0000000	-0.0150219
2	0.	0.2500000							
	-0.	0.3750000	0.9093438	0.8861830	1.00000	-0.	-0.0044923	-0.0000000	-0.0426814
3	-0.	0.5000000							
	0.0083790	0.6253540	0.9545615	0.9066597	0.99777	0.06669	-0.0001076	0.0000000	-0.0583707
4	0.0167580	0.7507080							
	0.0461320	0.8559910	0.9528734	0.9343072	0.96321	0.26874	0.0219439	0.0000001	-0.0562325
5	0.0755060	0.9612740							
	0.1266910	1.0565800	0.8496185	0.9492967	0.88099	0.47314	0.0434816	0.0000002	-0.0535721
6	0.1778760	1.1518860							
	0.2472570	1.2356630	0.6925106	0.9509996	0.77018	0.63783	0.0590396	0.0000002	-0.0605480
7	0.3166380	1.3194400							
	0.3999435	1.3917725	0.5244932	0.9419854	0.65563	0.75509	0.0682725	0.0000002	-0.0807431
8	0.4832490	1.4641050							
	0.5738500	1.5240450	0.3717635	0.9253253	0.55176	0.83400	0.0726383	0.0000003	-0.1138076
9	0.6644510	1.5839850							
	0.7638835	1.6356550	0.2396997	0.9034732	0.46111	0.88734	0.0740767	0.0000002	-0.1578846
10	0.8633160	1.6872250							
	0.9693165	1.7310855	0.1273974	0.8773892	0.38159	0.92433	0.0734779	0.0000002	-0.2122497
11	1.0753170	1.7748460							
	1.1861715	1.8113605	0.0352671	0.8483738	0.31286	0.94980	0.0715738	0.0000003	-0.2746496
12	1.2970260	1.8478750							
	1.4115020	1.8780015	-0.0376076	0.8175012	0.25450	0.96707	0.0689167	0.0000002	-0.3427331
13	1.5259780	1.9081280							
	1.6432570	1.9329495	-0.0926393	0.7855970	0.20706	0.97833	0.0659617	0.0000002	-0.4144301
14	1.7605360	1.9577710							
	1.8802680	1.9788855	-0.1314020	0.7531158	0.17367	0.98480	0.0631034	0.0000001	-0.4885556
15	2.0000000	2.0000000							
	2.1250000	2.0208335	-0.1541155	0.7194394	0.16440	0.98639	0.0604147	0.0000002	-0.5669662
16	2.2500000	2.0416670							
	2.3750000	2.0625000	-0.1697662	0.6844537	0.16440	0.98639	0.0574256	0.0000001	-0.6508143
17	2.5000000	2.0833330							
	2.6250000	2.1041665	-0.1812836	0.6491799	0.16440	0.98639	0.0542236	0.0000001	-0.7381838
18	2.7500000	2.1250000							
	2.8750000	2.1458335	-0.1890568	0.6141450	0.16440	0.98639	0.0510144	0.0000001	-0.8279805
19	3.0000000	2.1666670							
	3.1250000	2.1875000	-0.1939094	0.5797300	0.16440	0.98639	0.0478577	0.0000001	-0.9193407
20	3.2500000	2.2083330							
	3.3750000	2.2291665	-0.1964849	0.5461897	0.16440	0.98639	0.0447342	0.0000001	-1.0116186
21	3.5000000	2.2500000							
	3.6249080	2.2699025	-0.1984572	0.5138301	0.15735	0.98754	0.0415148	0.0000001	-1.1035583
22	3.7498160	2.2898050							
	3.8742245	2.3079145	-0.1987656	0.4831613	0.14405	0.98957	0.0384110	0.0000001	-1.1928155

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY CASE NO. TEST

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
23	3.9986330	2.3260240							
	4.1234019	2.3426615	-0.1959838	0.4543702	0.13218	0.99123	0.0356482	0.0000001	-1.2782260
24	4.2481710	2.3592990							
	4.3732024	2.3745470	-0.1913419	0.4273429	0.12106	0.99265	0.0331015	0.0000001	-1.3598012
25	4.4982340	2.3897950							
	4.6234515	2.4036645	-0.1852776	0.4020731	0.11009	0.99392	0.0307326	0.0000001	-1.4372156
26	4.7486690	2.4175340							
	4.8740050	2.4299620	-0.1780925	0.3785578	0.09867	0.99512	0.0285211	0.0000002	-1.5100809
27	4.9993410	2.4423900							
	5.1247255	2.4532195	-0.1700288	0.3567997	0.08605	0.99629	0.0264508	0.0000001	-1.5779116
28	5.2501100	2.4640490							
	5.3754430	2.4729735	-0.1612794	0.3368188	0.07103	0.99747	0.0245040	0.0000001	-1.6400296
29	5.5007760	2.4818980							
	5.6258765	2.4883205	-0.1519486	0.3186784	0.05127	0.99868	0.0226608	0.0000001	-1.6953466
30	5.7509770	2.4947430							
	5.8754885	2.4973715	-0.1421024	0.3025579	0.02111	0.99978	0.0209543	0.0000001	-1.7417720
31	6.0000000	2.5000000							
	6.1270445	2.5000000	-0.1296604	0.2884135	0.	1.00000	0.0198461	0.0000001	-1.7789663
32	6.2540890	2.5000000							
	6.4065425	2.5000000	-0.1141936	0.2747074	0.	1.00000	0.0191568	0.0000001	-1.8132315
33	6.5589960	2.5000000							
	6.7419400	2.5000000	-0.0979210	0.2603280	0.	1.00000	0.0182641	0.0000001	-1.8491759
34	6.9248840	2.5000000							
	7.1444170	2.5000000	-0.0797128	0.2458317	0.	1.00000	0.0173047	0.0000001	-1.8854207
35	7.3639500	2.5000000							
	7.6273895	2.5000000	-0.0592687	0.2321834	0.	1.00000	0.0163875	0.0000001	-1.9195414
36	7.8908290	2.5000000							
	8.2069565	2.5000000	-0.0365228	0.2208774	0.	1.00000	0.0156552	0.0000000	-1.9478064
37	8.5230840	2.5000000							
	8.9024370	2.5000000	-0.0119181	0.2140739	0.	1.00000	0.0153181	0.0000000	-1.9648152
38	9.2817900	2.5000000							
	9.7370135	2.5000000	0.0119846	0.2144477	0.	1.00000	0.0156503	0.0000001	-1.9638808
39	10.1922370	2.5000000							
	10.6441774	2.5000000	0.0265113	0.2223098	0.	1.00000	0.0162867	0.0000000	-1.9442255
40	11.0961180	2.5000000							
	11.5480590	2.5000000	0.0450105	0.2322860	0.	1.00000	0.0119990	0.0000001	-1.9192849
41	12.0000000	2.5000000							
42	12.0000000	5.0000000							
	11.5480590	5.0000000	-0.5060347	0.1665020	0.	-1.00000	-0.2326855	-0.0000005	-4.1674898
43	11.0961180	5.0000000							
	10.6441774	5.0000000	-0.1278910	0.1287015	0.	-1.00000	-0.1958089	-0.0000005	-4.3564924
44	10.1922370	5.0000000							
	9.7370135	5.0000000	-0.0457658	0.1163904	0.	-1.00000	-0.1852531	-0.0000005	-4.4180477

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE

3-BODY CASE NO. TEST

CN-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
45	9.2817900	5.0000000							
	8.9024370	5.0000000	0.0016361	0.1138977	0.	-1.00000	-0.1806564	-0.0000004	-4.4305115
46	8.5230840	5.0000000							
	8.2069565	5.0000000	0.0346369	0.1169007	0.	-1.00000	-0.1781795	-0.0000003	-4.4154966
47	7.8908290	5.0000000							
	7.6273895	5.0000000	0.0615492	0.1227353	0.	-1.00000	-0.1764823	-0.0000003	-4.3863234
48	7.3639500	5.0000000							
	7.1444170	5.0000000	0.0847648	0.1299740	0.	-1.00000	-0.1750985	-0.0000003	-4.3501298
49	6.9248840	5.0000000							
	6.7419400	5.0000000	0.1052461	0.1377517	0.	-1.00000	-0.1738356	-0.0000003	-4.3112414
50	6.5589960	5.0000000							
	6.4065425	5.0000000	0.1234927	0.1455297	0.	-1.00000	-0.1726019	-0.0000003	-4.2723515
51	6.2540890	5.0000000							
	6.1270445	5.0000000	0.1398704	0.1529802	0.	-1.00000	-0.1713523	-0.0000003	-4.2350988
52	6.0000000	5.0000000							
	5.8750000	5.0000000	0.1551398	0.1605088	0.	-1.00000	-0.1699436	-0.0000002	-4.1974560
53	5.7500000	5.0000000							
	5.6250000	5.0000000	0.1713148	0.1687915	0.	-1.00000	-0.1681101	-0.0000002	-4.1560426
54	5.5000000	5.0000000							
	5.3750000	5.0000000	0.1884145	0.1779608	0.	-1.00000	-0.1654807	-0.0000002	-4.1101958
55	5.2500000	5.0000000							
	5.1250000	5.0000000	0.2017302	0.1880715	0.	-1.00000	-0.1608369	-0.0000002	-4.0596423
56	5.0000000	5.0000000							
	4.8793790	5.0045900	0.2373048	0.1992169	0.03803	-0.99928	-0.1543143	-0.0000002	-4.0075912
57	4.7587580	5.0091800							
	4.6322015	5.0227185	0.2817408	0.2116849	0.10637	-0.99433	-0.1502851	-0.0000002	-3.9594849
58	4.5056450	5.0362570							
	4.3730745	5.0580850	0.3107114	0.2255229	0.16247	-0.98671	-0.1503696	-0.0000003	-3.9173708
59	4.2405050	5.0799130							
	4.1022280	5.1088120	0.3345502	0.2404658	0.20457	-0.97885	-0.1530061	-0.0000003	-3.8803173
60	3.9639510	5.1377110							
	3.8207540	5.1717645	0.3556180	0.2563748	0.23136	-0.97287	-0.1576521	-0.0000003	-3.8458544
61	3.6775570	5.2058180							
	3.5307250	5.2423935	0.3752538	0.2731549	0.24171	-0.97035	-0.1639631	-0.0000003	-3.8104078
62	3.3838930	5.2789690							
	3.2364990	5.3145620	0.3942142	0.2906831	0.23473	-0.97206	-0.1715592	-0.0000003	-3.7697085
63	3.0891050	5.3501550							
	2.9451135	5.3811160	0.4133580	0.3087802	0.21022	-0.97766	-0.1798953	-0.0000003	-3.7195339
64	2.8011220	5.4120770							
	2.6620285	5.4358985	0.4347328	0.3274676	0.16880	-0.98565	-0.1881493	-0.0000003	-3.6558178
65	2.5229350	5.4597200							
	2.3897135	5.4746900	0.4611279	0.3470860	0.11167	-0.99375	-0.1951165	-0.0000002	-3.5745018
66	2.2564920	5.4896600							
	2.1282460	5.4948300	0.4925189	0.3683239	0.04028	-0.99919	-0.1980338	-0.0000002	-3.4709530

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE

3-BODY CASE NO. TEST

CN-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
67	2.0000000	5.5000000							
	1.8869355	5.5004695	0.5696822	0.3916020	0.00415	-0.99999	-0.1934799	-0.0000001	-3.3464746
68	1.7738710	5.5009390							
	1.6733840	5.5036335	0.6922586	0.4164471	0.02680	-0.99964	-0.1837712	-0.0000002	-3.2116611
69	1.5728970	5.5063280							
	1.4761160	5.5128890	0.8114604	0.4431232	0.06764	-0.99771	-0.1749310	-0.0000002	-3.0699999
70	1.3793350	5.5194500							
	1.2870955	5.5310315	0.9414069	0.4721985	0.12458	-0.99221	-0.1655381	-0.0000002	-2.9192867
71	1.1948560	5.5426130							
	1.1069210	5.5601135	1.0799738	0.5033654	0.19519	-0.98077	-0.1552723	-0.0000002	-2.7613446
72	1.0189860	5.5776140							
	0.9352410	5.6017940	1.2251820	0.5364781	0.27740	-0.96075	-0.1437517	-0.0000002	-2.5965540
73	0.8514960	5.6259740							
	0.7730140	5.6570970	1.3734992	0.5711673	0.36863	-0.92957	-0.1305619	-0.0000001	-2.4259481
74	0.6945320	5.6882200							
	0.6209400	5.7270205	1.5198023	0.6071239	0.46638	-0.88458	-0.1154487	-0.0000001	-2.2500096
75	0.5473480	5.7658210							
	0.4810835	5.8114300	1.6589674	0.6437109	0.56697	-0.82374	-0.0979654	-0.0000001	-2.0705491
76	0.4148190	5.8570390							
	0.3556720	5.9098940	1.7813848	0.6802114	0.66633	-0.74565	-0.0781858	-0.0000002	-1.8899169
77	0.2965250	5.9627490							
	0.2457330	6.0223250	1.8807712	0.7162368	0.76098	-0.64878	-0.0557357	-0.0000002	-1.7089142
78	0.1949410	6.0819010							
	0.1537080	6.1473550	1.9467971	0.7510047	0.84611	-0.53301	-0.0306205	-0.0000002	-1.5306624
79	0.1124750	6.2128090							
	0.0819055	6.2829825	1.9674952	0.7836877	0.91679	-0.39938	-0.0029158	-0.0000001	-1.3590862
80	0.0513360	6.3531560							
	0.0323615	6.4265920	1.9264472	0.8133826	0.96820	-0.25017	0.0273381	-0.0000001	-1.1993136
81	0.0133870	6.5000280							
	0.0066935	6.5750140	1.7830468	0.8389030	0.99604	-0.08891	0.0607916	-0.0000000	-1.0592153
82	0.	6.6500000							
	0.	6.7412925	1.5729730	0.8601151	1.00000	0.	0.0751876	-0.0000000	-0.9430052
83	0.	6.8325850							
	0.	6.9421365	1.4282942	0.8780714	1.00000	0.	0.0674265	-0.0000000	-0.8464448
84	0.	7.0516880							
	0.	7.1831495	1.3348176	0.8944654	1.00000	0.	0.0595343	-0.0000000	-0.7580705
85	0.	7.3146110							
	0.	7.4723650	1.2649974	0.9096543	1.00000	0.	0.0519221	-0.0000000	-0.6750962
86	0.	7.6301190							
	0.	7.8194235	1.2098988	0.9236789	1.00000	0.	0.0446786	-0.0000000	-0.5967867
87	0.	8.0087280							
	0.	8.2358935	1.1653509	0.9364801	1.00000	0.	0.0378780	-0.0000000	-0.5231430
88	0.	8.4630589							
	0.	8.7356575	1.1290117	0.9479727	1.00000	0.	0.0315930	-0.0000000	-0.4544929

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 3-BODY CASE NO. TEST

GN-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
89	0.	9.0082560							
	0.	9.3353745	1.0993863	0.9580846	1.00000	0.	0.0258844	-0.0000000	-0.3912956
90	0.	9.6624930							
	0.	10.0550350	1.0754161	0.9667812	1.00000	0.	0.0207938	-0.0000000	-0.3340164
91	0.	10.4475770							
	0.	10.9186275	1.0563795	0.9740811	1.00000	0.	0.0163409	-0.0000000	-0.2829989
92	0.	11.3896780							
	0.	11.8680295	1.0409711	0.9796125	1.00000	0.	0.0127984	-0.0000000	-0.2419592
93	0.	12.3463809							
	0.	12.8247319	1.0304283	0.9835025	1.00000	0.	0.0101733	-0.0000000	-0.2115760
94	0.	13.3030829							
	0.	13.7814339	1.0229304	0.9862966	1.00000	0.	0.0081949	-0.0000000	-0.1888524
95	0.	14.2597851							
	0.	14.7381365	1.0173456	0.9883488	1.00000	0.	0.0066744	-0.0000000	-0.1717163
96	0.	15.2164880							
	0.	15.6948390	1.0129941	0.9898788	1.00000	0.	0.0054877	-0.0000000	-0.1588497
97	0.	16.1731901							
	0.	16.6515410	1.0094112	0.9910268	1.00000	0.	0.0045497	-0.0000000	-0.1494180
98	0.	17.1298921							
	0.	17.6082430	1.0062029	0.9918814	1.00000	0.	0.0038003	-0.0000000	-0.1429536
99	0.	18.0865941							
	0.	18.5649455	1.0028322	0.9924921	1.00000	0.	0.0031960	-0.0000000	-0.1393844
100	0.	19.0432971							
	0.	19.5216484	0.9973935	0.9928516	1.00000	0.	0.0027047	-0.0000000	-0.1395481
101	0.	20.0000000							
102	12.0000000	2.5000000							
	12.0000000	2.9166665	0.0733774	0.2037793	1.00000	0.	-0.0505576	0.0000002	-2.3223103
103	12.0000000	3.3333330							
	12.0000000	3.7500000	0.1788418	0.1752846	1.00000	0.	-0.0861733	0.0000003	-3.0926827
104	12.0000000	4.1666670							
	12.0000000	4.5833335	0.6107001	0.1853266	1.00000	0.	-0.1601152	0.0000004	-3.7339197
105	12.0000000	5.0000000							

ADDED MASS = 622.7799301 VOLUME = -811.6679382

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE

3-BODY CASE NO. TEST

OFF-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VZ	PHI
1	2.0000000	2.5000000	-0.1997469	0.1386537	0.6026236	-0.9934410
2	2.0000000	3.0000000	-0.2656179	0.2163255	0.5326011	-1.4021966
3	2.0000000	3.5000000	-0.3351830	0.2473314	0.4900668	-1.7847660
4	2.0000000	4.0000000	-0.4067216	0.2461933	0.4599611	-2.1601555
5	2.0000000	4.5000000	-0.4772017	0.2143952	0.4347488	-2.5436304
6	2.0000000	5.0000000	-0.5349454	0.1437170	0.4095616	-2.9521919
7	4.0000000	2.7500000	-0.2103406	0.0343569	0.3971312	-1.6578893
8	4.0000000	3.0000000	-0.2195174	0.0560405	0.3678649	-1.8964053
9	4.0000000	3.2500000	-0.2299844	0.0700522	0.3444597	-2.1305059
10	4.0000000	3.5000000	-0.2413607	0.0782452	0.3251820	-2.3618630
11	4.0000000	3.7500000	-0.2533831	0.0819387	0.3088646	-2.5917577
12	4.0000000	4.0000000	-0.2658909	0.0821508	0.2947040	-2.8211838
13	4.0000000	4.2500000	-0.2788359	0.0797659	0.2821414	-3.0508990
14	4.0000000	4.5000000	-0.2922953	0.0756843	0.2707905	-3.2814425
15	4.0000000	4.7500000	-0.3064387	0.0709865	0.2603980	-3.5131096
16	6.0000000	2.7500000	-0.1356797	0.0118466	0.2688950	-2.0105387
17	6.0000000	3.0000000	-0.1357801	0.0207792	0.2478768	-2.2563695
18	6.0000000	3.2500000	-0.1370509	0.0258182	0.2306238	-2.5004726
19	6.0000000	3.5000000	-0.1390031	0.0277524	0.2160805	-2.7437181
20	6.0000000	3.7500000	-0.1413020	0.0271705	0.2035185	-2.9868057
21	6.0000000	4.0000000	-0.1436737	0.0245176	0.1924236	-3.2303058
22	6.0000000	4.2500000	-0.1458733	0.0201519	0.1824260	-3.4746896
23	6.0000000	4.5000000	-0.1476750	0.0143963	0.1732566	-3.7203452
24	6.0000000	4.7500000	-0.1488967	0.0075804	0.1647201	-3.9675793

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

PROGRAM EOCA -- AXISYMMETRIC AND CROSSFLOW

***** CASE CONTROL DATA *****

TEST CASE 1-6-72 2-BODY CASE NO. TEST

```
BODIES  =  2
NNU     = -0
CHORD   =   1.0000000
MACH NO.= -0.
TCNST   =  -0.
```

SURFACE OF REVOLUTION
OFF-BODY POINTS
MATRIX SOLUTION BY TRIANGULARIZATION (SOLVIT)
INPUT TAPE NO. FOR COORDINATES AND NON-UNIFORM FLOW ONLY = 5

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY

NN = 41 MX = -0. MY = -0.
THETA = -0. ADDX = -0. ADDY = -0.
XE = -0. YE = -0.

CN-BODY COORDINATES (UNTRANSFORMED)
BODY NO. 1

	X	Y	DELTA S	SUMDS	D ALPHA
1	0.	0.			
	0.	0.1250000	0.2500000	0.2500000	
2	0.	0.2500000			0.
	-0.	0.3750000	0.2500000	0.5000000	
3	-0.	0.5000000			-3.8241162
	0.0083790	0.6253540	0.2512674	0.7512674	
4	0.0167580	0.7507080			-11.7650077
	0.0461320	0.8559910	0.2186078	0.9698752	
5	0.0755060	0.9612740			-12.6493235
	0.1266910	1.0565800	0.2163621	1.1862373	
6	0.1778760	1.1518860			-11.3918442
	0.2472570	1.2356630	0.2175528	1.4037901	
7	0.3166380	1.3194400			-9.4025823
	0.3999435	1.3917725	0.2206517	1.6244419	
8	0.4832490	1.4641050			-7.4792177
	0.5738500	1.5240450	0.2172680	1.8417099	
9	0.6644510	1.5839850			-6.0293090
	0.7638835	1.6356550	0.2241126	2.0658224	
10	0.8633160	1.6873250			-5.0261505
	0.9693165	1.7310855	0.2293564	2.2951787	
11	1.0753170	1.7748460			-4.2010204
	1.1861715	1.8113605	0.2334269	2.5286056	
12	1.2970260	1.8478750			-3.4872889
	1.4115020	1.8780015	0.2367476	2.7653532	
13	1.5259780	1.9081280			-2.7941246
	1.6432570	1.9329495	0.2397538	3.0051070	
14	1.7605360	1.9577710			-1.9488477
	1.8802680	1.9788855	0.2431590	3.2482660	
15	2.0000000	2.0000000			-0.5387681
	2.1250000	2.0208335	0.2534485	3.5017145	
16	2.2500000	2.0416670			-0.0002325
	2.3750000	2.0625000	0.2534483	3.7551628	
17	2.5000000	2.0833330			0.0002325
	2.6250000	2.1041665	0.2534485	4.0086113	
18	2.7500000	2.1250000			0.
	2.8750000	2.1458335	0.2534485	4.2620597	
19	3.0000000	2.1666670			-0.0002325
	3.1250000	2.1875000	0.2534483	4.5155081	
20	3.2500000	2.2083330			0.0002325
	3.3750000	2.2291665	0.2534485	4.7689565	
21	3.5000000	2.2500000			-0.4091516
	3.6249080	2.2699025	0.2529673	5.0219238	
22	3.7498160	2.2898050			-0.7711682
	3.8742245	2.3079145	0.2514393	5.2733631	
23	3.9986330	2.3260240			-0.6866971

	4.1234019	2.3426615	0.2517468	5.5251098	
24	4.2481710	2.3592990			-0.6423096
	4.3732024	2.3745470	0.2519157	5.7770255	
25	4.4982340	2.3897950			-0.6325730
	4.6234515	2.4036645	0.2519666	6.0289921	
26	4.7486690	2.4175340			-0.6577064
	4.8740050	2.4299620	0.2519013	6.2808933	
27	4.9993410	2.4423900			-0.7263850
	5.1247255	2.4532195	0.2517026	6.5325959	
28	5.2501100	2.4640490			-0.8634634
	5.3754430	2.4729735	0.2513007	6.7838966	
29	5.5007760	2.4818980			-1.1340381
	5.6258765	2.4883205	0.2505305	7.0344270	
30	5.7509770	2.4947430			-1.7295423
	5.8754885	2.4973715	0.2490785	7.2835055	
31	6.0000000	2.5000000			-1.2093652
	6.1270445	2.5000000	0.2540890	7.5375945	
32	6.2540890	2.5000000			0.
	6.4065425	2.5000000	0.3049070	7.8425015	
33	6.5589960	2.5000000			0.
	6.7419400	2.5000000	0.3658880	8.2083895	
34	6.9248840	2.5000000			0.
	7.1444170	2.5000000	0.4390660	8.6474555	
35	7.3639500	2.5000000			0.
	7.6273895	2.5000000	0.5268790	9.1743344	
36	7.8908290	2.5000000			0.
	8.2069565	2.5000000	0.6322550	9.8065894	
37	8.5230840	2.5000000			0.
	8.9024370	2.5000000	0.7587060	10.5652952	
38	9.2817900	2.5000000			0.
	9.7370135	2.5000000	0.9104470	11.4757422	
39	10.1922370	2.5000000			0.
	10.6441774	2.5000000	0.9038810	12.3796232	
40	11.0961180	2.5000000			0.
	11.5480590	2.5000000	0.9038820	13.2835052	
41	12.0000000	2.5000000			

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY

NN = 60 MX = -0. MY = -0.
THETA = -0. ADDX = -0. ADDY = -0.
XE = -0. YE = -0.

CN-BODY COORDINATES (UNTRANSFORMED)
BODY NO. 2

	X	Y	DELTA S	SUMDS	D ALPHA
1	12.0000000	5.0000000			
	11.5480590	5.0000000	0.9038820	0.9038820	
2	11.0961180	5.0000000			0.
	10.6441774	5.0000000	0.9038810	1.8077630	
3	10.1922370	5.0000000			0.
	9.7370135	5.0000000	0.9104470	2.7182100	
4	9.2817900	5.0000000			0.
	8.9024370	5.0000000	0.7587060	3.4769159	
5	8.5230840	5.0000000			0.
	8.2069565	5.0000000	0.6322550	4.1091709	
6	7.8908290	5.0000000			0.
	7.6273895	5.0000000	0.5268790	4.6360499	
7	7.3639500	5.0000000			0.
	7.1444170	5.0000000	0.4390660	5.0751159	
8	6.9248840	5.0000000			0.
	6.7419400	5.0000000	0.3658880	5.4410039	
9	6.5589960	5.0000000			0.
	6.4065425	5.0000000	0.3049070	5.7459109	
10	6.2540890	5.0000000			0.
	6.1270445	5.0000000	0.2540890	5.9999999	
11	6.0000000	5.0000000			0.
	5.8750000	5.0000000	0.2500000	6.2499999	
12	5.7500000	5.0000000			0.
	5.6250000	5.0000000	0.2500000	6.4999999	
13	5.5000000	5.0000000			0.
	5.3750000	5.0000000	0.2500000	6.7499999	
14	5.2500000	5.0000000			0.
	5.1250000	5.0000000	0.2500000	6.9999999	
15	5.0000000	5.0000000			-2.1792316
	4.8793790	5.0045900	0.2414166	7.2414165	
16	4.7587580	5.0091800			-3.9268209
	4.6322015	5.0227185	0.2545572	7.4959737	
17	4.5056450	5.0362570			-3.2439557
	4.3730749	5.0580850	0.2687100	7.7646837	
18	4.2405050	5.0799130			-2.4545241
	4.1022280	5.1088120	0.2825291	8.0472127	
19	3.9639510	5.1377110			-1.5724325
	3.8207540	5.1717645	0.2943809	8.3415935	
20	3.6775570	5.2058180			-0.6106070
	3.5307250	5.2423935	0.3026377	8.6442312	
21	3.3838930	5.2789690			0.4115753
	3.2364990	5.3145620	0.3032613	8.9474925	
22	3.0891050	5.3501550			1.4410384
	2.9451135	5.3811160	0.2945650	9.2420574	
23	2.8011220	5.4120770			2.4166217

	2.6620285	5.4358985	0.2822372	9.5242946	
24	2.5229350	5.4597200			3.3069454
	2.3897135	5.4746900	0.2681199	9.7924144	
25	2.2564920	5.4896600			4.1028724
	2.1282460	5.4948300	0.2567003	10.0491147	
26	2.0000000	5.5000000			2.0705958
	1.8869355	5.5004695	0.2261309	10.2752455	
27	1.7738710	5.5009390			-1.2980553
	1.6733840	5.5036335	0.2010462	10.4762918	
28	1.5728970	5.5063280			-2.3423041
	1.4761160	5.5128890	0.1940063	10.6702980	
29	1.3793350	5.5194500			-3.2782757
	1.2870955	5.5310315	0.1859275	10.8562254	
30	1.1948560	5.5426130			-4.0991654
	1.1069210	5.5601135	0.1793191	11.0355444	
31	1.0189860	5.5776140			-4.8494838
	0.9352410	5.6017940	0.1743318	11.2098762	
32	0.8514960	5.6259740			-5.5262105
	0.7730140	5.6570970	0.1688557	11.3787318	
33	0.6945320	5.6882200			-6.1684719
	0.6209400	5.7270205	0.1663882	11.5451200	
34	0.5473480	5.7658210			-6.7392436
	0.4810835	5.8114300	0.1608871	11.7060070	
35	0.4148190	5.8570390			-7.2455193
	0.3556720	5.9098940	0.1586445	11.8646514	
36	0.2965250	5.9627490			-7.7658312
	0.2457330	6.0222250	0.1565775	12.0212289	
37	0.1949410	6.0819010			-8.2404850
	0.1537080	6.1473550	0.1547176	12.1759465	
38	0.1124750	6.2128090			-8.6697624
	0.0819055	6.2829825	0.1530857	12.3290322	
39	0.0513360	6.3531560			-9.0519558
	0.0323615	6.4265920	0.1516955	12.4807277	
40	0.0133870	6.5000280			-9.3864200
	0.0066935	6.5750140	0.1505683	12.6312959	
41	0.	6.6500000			-5.1008937
	0.	6.7412925	0.1825850	12.8138809	
42	0.	6.8325850			0.
	0.	6.9421365	0.2191030	13.0329839	
43	0.	7.0516880			0.
	0.	7.1831495	0.2629230	13.2959069	
44	0.	7.3146110			0.
	0.	7.4723650	0.3155080	13.6114149	
45	0.	7.6301190			0.
	0.	7.8194235	0.3786090	13.9900239	
46	0.	8.0087280			0.
	0.	8.2358935	0.4543309	14.4443548	
47	0.	8.4630585			0.
	0.	8.7356575	0.5451970	14.9895518	
48	0.	9.0082560			0.
	0.	9.3353745	0.6542370	15.6437888	
49	0.	9.6624930			0.
	0.	10.0553350	0.7850840	16.4288726	
50	0.	10.4475770			0.
	0.	10.9186275	0.9421010	17.3709736	
51	0.	11.3896780			0.
	0.	11.8680295	0.9567029	18.3276765	
52	0.	12.3463809			0.
	0.	12.8247315	0.9567020	19.2843785	
53	0.	13.3030829			0.

	0.	13.7814339	0.9567021	20.2410805	
54	0.	14.2597851			0.
	0.	14.7381365	0.9567029	21.1977835	
55	0.	15.2164880			0.
	0.	15.6948390	0.9567021	22.1544855	
56	0.	16.1731901			0.
	0.	16.6515410	0.9567020	23.1111875	
57	0.	17.1298921			0.
	0.	17.6082430	0.9567020	24.0678895	
58	0.	18.0865941			0.
	0.	18.5649455	0.9567029	25.0245924	
59	0.	19.0432971			0.
	0.	19.5216484	0.9567029	25.9812953	
60	0.	20.0000000			

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY

NN =	24	MX =	-0.	MY =	-0.
THETA =	-0.	ADDX =	-0.	ADDY =	-0.
XE =	-0.	YE =	-0.		

OFF-BODY COORDINATES (UNTRANSFORMED)

	X-OFF	Y-OFF
1	2.0000000	2.5000000
2	2.0000000	3.0000000
3	2.0000000	3.5000000
4	2.0000000	4.0000000
5	2.0000000	4.5000000
6	2.0000000	5.0000000
7	4.0000000	2.7500000
8	4.0000000	3.0000000
9	4.0000000	3.2500000
10	4.0000000	3.5000000
11	4.0000000	3.7500000
12	4.0000000	4.0000000
13	4.0000000	4.2500000
14	4.0000000	4.5000000
15	4.0000000	4.7500000
16	6.0000000	2.7500000
17	6.0000000	3.0000000
18	6.0000000	3.2500000
19	6.0000000	3.5000000
20	6.0000000	3.7500000
21	6.0000000	4.0000000
22	6.0000000	4.2500000
23	6.0000000	4.5000000
24	6.0000000	4.7500000

THE 99 X 99 MATRIX WITH 1 RIGHT SIDES WAS SOLVED DIRECTLY IN 0.005 MINUTES.

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY CASE NO. TEST

CN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
1	0.	0.							
	0.	0.1250000	0.0368556	0.9986417	1.00000	0.	-0.1115199	-0.0000002	-16.2307770
2	0.	0.2500000							
	-0.	0.3750000	0.1107042	0.9877446	1.00000	-0.	-0.1084210	-0.0000002	-16.2114217
3	-0.	0.5000000							
	0.0083790	0.6253540	0.2311244	0.9465815	0.99777	0.06669	-0.1010254	-0.0000002	-16.1744015
4	0.0167580	0.7507080							
	0.0461320	0.8559910	0.4241823	0.8200694	0.96321	0.26874	-0.0881396	-0.0000002	-16.1315036
5	0.0755060	0.9612740							
	0.1266910	1.0565800	0.5894228	0.6525808	0.88099	0.47314	-0.0764615	-0.0000002	-16.0984416
6	0.1778760	1.1518860							
	0.2472570	1.2356630	0.7220999	0.4785718	0.77018	0.63783	-0.0655820	-0.0000003	-16.0735321
7	0.3166380	1.3194400							
	0.3999435	1.3917725	0.8223597	0.3237245	0.65563	0.75509	-0.0562167	-0.0000003	-16.0542390
8	0.4832490	1.4641050							
	0.5738500	1.5240450	0.8983284	0.1930060	0.55176	0.83400	-0.0483404	-0.0000003	-16.0374880
9	0.6644510	1.5839850							
	0.7638835	1.6356550	0.9570601	0.0840360	0.46111	0.88734	-0.0417518	-0.0000003	-16.0207942
10	0.8633160	1.6873250							
	0.9693165	1.7310855	1.0054000	-0.0108292	0.38159	0.92433	-0.0358470	-0.0000001	-16.0018842
11	1.0753170	1.7748460							
	1.1861715	1.8113605	1.0443714	-0.0907116	0.31286	0.94980	-0.0305269	-0.0000001	-15.9798419
12	1.2970260	1.8478750							
	1.4115020	1.8780015	1.0741802	-0.1538631	0.25450	0.96707	-0.0258086	-0.0000001	-15.9545302
13	1.5259780	1.9081280							
	1.6432570	1.9326495	1.0944336	-0.1977849	0.20706	0.97833	-0.0219283	-0.0000001	-15.9265398
14	1.7605360	1.9577710							
	1.8802680	1.9788855	1.1053718	-0.2218468	0.17367	0.98480	-0.0196115	-0.0000001	-15.8970640
15	2.0000000	2.0000000							
	2.1250000	2.0208335	1.1155474	-0.2444461	0.16440	0.98639	-0.0207712	-0.0000001	-15.8667105
16	2.2500000	2.0416670							
	2.3750000	2.0625000	1.1350309	-0.2882950	0.16440	0.98639	-0.0229412	-0.0000001	-15.8325100
17	2.5000000	2.0833330							
	2.6250000	2.1041665	1.1620884	-0.3504495	0.16440	0.98639	-0.0247087	-0.0000001	-15.7921332
18	2.7500000	2.1250000							
	2.8750000	2.1458335	1.1933895	-0.4241786	0.16440	0.98639	-0.0262469	-0.0000001	-15.7442549
19	3.0000000	2.1666670							
	3.1250000	2.1875000	1.2284557	-0.5091033	0.16440	0.98639	-0.0276340	-0.0000001	-15.6879194
20	3.2500000	2.2083330							
	3.3750000	2.2291665	1.2687418	-0.6097057	0.16440	0.98639	-0.0288922	-0.0000001	-15.6220624
21	3.5000000	2.2500000							
	3.6249080	2.2699025	1.3134119	-0.7250508	0.15735	0.98754	-0.0286244	-0.0000001	-15.5449587
22	3.7498160	2.2898050							
	3.8742245	2.3079145	1.3555952	-0.8376385	0.14405	0.98957	-0.0269675	-0.0000001	-15.4569756

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY CASE NO. TEST

CN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
23	3.9986330	2.3260240							
	4.1234019	2.3426615	1.3928830	-0.9401229	0.13218	0.99123	-0.0254793	-0.0000001	-15.3598396
24	4.2481710	2.3592990							
	4.3732024	2.3745470	1.4280763	-1.0394019	0.12106	0.99265	-0.0239671	-0.0000001	-15.2538805
25	4.4982340	2.3897950							
	4.6234515	2.4036645	1.4616471	-1.1364123	0.11009	0.99392	-0.0223051	-0.0000001	-15.1395010
26	4.7486690	2.4175340							
	4.8740050	2.4295620	1.4936022	-1.2308476	0.09867	0.99512	-0.0203810	-0.0000001	-15.0170884
27	4.9993410	2.4423900							
	5.1247255	2.4532195	1.5237888	-1.3219323	0.08605	0.99629	-0.0180527	-0.0000001	-14.8870699
28	5.2501100	2.4640490							
	5.3754430	2.4729735	1.5517787	-1.4080172	0.07103	0.99747	-0.0150735	-0.0000001	-14.7499491
29	5.5007760	2.4818980							
	5.6258765	2.4883205	1.5757380	-1.4829502	0.05127	0.99868	-0.0109081	-0.0000001	-14.6064602
30	5.7509770	2.4947430							
	5.8754885	2.4973715	1.5841553	-1.5095479	0.02111	0.99978	-0.0041475	-0.0000000	-14.4584720
31	6.0000000	2.5000000							
	6.1270445	2.5000000	1.5707382	-1.4672185	0.	1.00000	0.0005090	-0.0000000	-14.3111918
32	6.2540890	2.5000000							
	6.4065425	2.5000000	1.5559135	-1.4208667	0.	1.00000	0.0002075	-0.0000000	-14.1542984
33	6.5589960	2.5000000							
	6.7419400	2.5000000	1.5500170	-1.4025528	0.	1.00000	0.0000781	-0.0000000	-13.9690509
34	6.9248840	2.5000000							
	7.1444170	2.5000000	1.5472057	-1.3938453	0.	1.00000	0.0000446	-0.0000000	-13.7483491
35	7.3639500	2.5000000							
	7.6273895	2.5000000	1.5457722	-1.3894116	0.	1.00000	0.0000719	-0.0000000	-13.4844381
36	7.8908290	2.5000000							
	8.2069565	2.5000000	1.5448672	-1.3866147	0.	1.00000	0.0001496	-0.0000000	-13.1683471
37	8.5230840	2.5000000							
	8.9024370	2.5000000	1.5438080	-1.3833432	0.	1.00000	0.0003049	-0.0000000	-12.7896081
38	9.2817900	2.5000000							
	9.7370135	2.5000000	1.5412707	-1.3755152	0.	1.00000	0.0006430	-0.0000000	-12.3362961
39	10.1922370	2.5000000							
	10.6441774	2.5000000	1.5345076	-1.3547136	0.	1.00000	0.0013419	-0.0000000	-11.8469679
40	11.0961180	2.5000000							
	11.5480590	2.5000000	1.5157102	-1.2973773	0.	1.00000	0.0025366	0.0000000	-11.3693341
41	12.0000000	2.5000000							
42	12.0000000	5.0000000							
	11.5480590	5.0000000	-1.5710313	-1.4681394	0.	-1.00000	-0.0207993	-0.0000000	-11.3278660
43	11.0961180	5.0000000							
	10.6441774	5.0000000	-1.5492320	-1.4001197	0.	-1.00000	-0.0230825	-0.0000000	-11.8341868
44	10.1922370	5.0000000							
	9.7370135	5.0000000	-1.5446047	-1.3858038	0.	-1.00000	-0.0248907	-0.0000000	-12.3321306

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY CASE NO. TEST

CN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
45	9.2817900	5.0000000							
	8.9024370	5.0000000	-1.5442578	-1.3847322	0.	-1.00000	-0.0261733	-0.0000000	-12.7878705
46	8.5230840	5.0000000							
	8.2069565	5.0000000	-1.5444015	-1.3851761	0.	-1.00000	-0.0269431	-0.0000000	-13.1671507
47	7.8908290	5.0000000							
	7.6273895	5.0000000	-1.5445436	-1.3856151	0.	-1.00000	-0.0273490	-0.0000000	-13.4830229
48	7.3639500	5.0000000							
	7.1444170	5.0000000	-1.5446845	-1.3860503	0.	-1.00000	-0.0274908	-0.0000000	-13.7461405
49	6.9248840	5.0000000							
	6.7419400	5.0000000	-1.5450199	-1.3870863	0.	-1.00000	-0.0274330	-0.0000000	-13.9653823
50	6.5589960	5.0000000							
	6.4065425	5.0000000	-1.5458399	-1.3896211	0.	-1.00000	-0.0272197	-0.0000000	-14.1481954
51	6.2540890	5.0000000							
	6.1270445	5.0000000	-1.5474401	-1.3945710	0.	-1.00000	-0.0268846	-0.0000000	-14.3008221
52	6.0000000	5.0000000							
	5.8750000	5.0000000	-1.5506541	-1.4045280	0.	-1.00000	-0.0264140	-0.0000000	-14.4389983
53	5.7500000	5.0000000							
	5.6250000	5.0000000	-1.5569644	-1.4241381	0.	-1.00000	-0.0257242	-0.0000000	-14.5771244
54	5.5000000	5.0000000							
	5.3750000	5.0000000	-1.5699865	-1.4648576	0.	-1.00000	-0.0246909	0.0000000	-14.7174332
55	5.2500000	5.0000000							
	5.1250000	5.0000000	-1.6036117	-1.5715704	0.	-1.00000	-0.0229665	0.0000000	-14.8627469
56	5.0000000	5.0000000							
	4.8793790	5.0045900	-1.6394832	-1.6879051	0.03803	-0.99928	-0.0304354	-0.0000000	-15.0184156
57	4.7587580	5.0091800							
	4.6322015	5.0227185	-1.6250398	-1.6407544	0.10637	-0.99433	-0.0461289	-0.0000000	-15.1826950
58	4.5056450	5.0362570							
	4.3730749	5.0580850	-1.5630248	-1.4430465	0.16247	-0.98671	-0.0588651	-0.0000000	-15.3458402
59	4.2405050	5.0799130							
	4.1022280	5.1068120	-1.4771779	-1.1820547	0.20457	-0.97885	-0.0678013	-0.0000001	-15.4976983
60	3.9639510	5.1377110							
	3.8207540	5.1717645	-1.3817395	-0.9092039	0.23136	-0.97287	-0.0724580	-0.0000001	-15.6305587
61	3.6775570	5.2058180							
	3.5307250	5.2423935	-1.2874888	-0.6576273	0.24171	-0.97035	-0.0725212	-0.0000001	-15.7389437
62	3.3838930	5.2789690							
	3.2364990	5.3145620	-1.2029944	-0.4471955	0.23473	-0.97206	-0.0678099	-0.0000001	-15.8198332
63	3.0891050	5.3501550							
	2.9451135	5.3811160	-1.1346654	-0.2874656	0.21022	-0.97766	-0.0584032	-0.0000000	-15.8736186
64	2.8011220	5.4120770							
	2.6620285	5.4358985	-1.0874014	-0.1824419	0.16880	-0.98565	-0.0445982	-0.0000000	-15.9049556
65	2.5229350	5.4597200							
	2.3897135	5.4746900	-1.0660751	-0.1365161	0.11167	-0.99375	-0.0268290	0.0000000	-15.9214442
66	2.2564920	5.4896600							
	2.1282460	5.4948300	-1.0850452	-0.1773231	0.04028	-0.99919	-0.0056734	0.0000001	-15.9331512

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY CASE NO. TEST

CN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
67	2.0000000	5.5000000							
	1.8869355	5.5004695	-1.1398952	-0.2993612	0.00415	-0.99999	0.0089669	0.0000001	-15.9546909
68	1.7738710	5.5009390							
	1.6733840	5.5036335	-1.2070558	-0.4569836	0.02680	-0.99964	0.0116082	0.0000001	-15.9912541
69	1.5728970	5.5063280							
	1.4761160	5.5128890	-1.2618782	-0.5923366	0.06764	-0.99771	0.0101827	0.0000001	-16.0383403
70	1.3793350	5.5194500							
	1.2870955	5.5310315	-1.3059200	-0.7054269	0.12458	-0.99221	0.0056303	0.0000001	-16.0945370
71	1.1948560	5.5426130							
	1.1069210	5.5601135	-1.3361031	-0.7851714	0.19519	-0.98077	-0.0014069	0.0000000	-16.1575143
72	1.0189860	5.5776140							
	0.9352410	5.6017940	-1.3495324	-0.8212376	0.27740	-0.96075	-0.0103935	0.0000000	-16.2256000
73	0.8514960	5.6259740							
	0.7730140	5.6570970	-1.3441836	-0.8068296	0.36863	-0.92957	-0.0207996	0.0000000	-16.2970641
74	0.6945320	5.6882200							
	0.6209400	5.7270205	-1.3176214	-0.7361262	0.46638	-0.88458	-0.0322180	-0.0000001	-16.3708076
75	0.5473480	5.7658210							
	0.4810835	5.8114300	-1.2705157	-0.6142102	0.56697	-0.82374	-0.0441028	-0.0000001	-16.4454610
76	0.4148190	5.8573390							
	0.3556720	5.9098940	-1.2022244	-0.4453436	0.66633	-0.74565	-0.0561202	-0.0000001	-16.5202377
77	0.2965250	5.9627490							
	0.2457330	6.0223250	-1.1140614	-0.2411328	0.76098	-0.64878	-0.0680253	-0.0000001	-16.5953908
78	0.1949410	6.0819010							
	0.1537080	6.1473550	-1.0080538	-0.0161724	0.84611	-0.53301	-0.0796486	-0.0000001	-16.6709387
79	0.1124750	6.2128090							
	0.0819055	6.2829825	-0.8865950	0.2139493	0.91679	-0.39938	-0.0910778	-0.0000001	-16.7472491
80	0.0513360	6.3531560							
	0.0323615	6.4265920	-0.7506861	0.4364704	0.96820	-0.25017	-0.1029392	-0.0000000	-16.8248591
81	0.0133870	6.5000280							
	0.0066935	6.5750140	-0.5858928	0.6567297	0.99604	-0.08891	-0.1177322	-0.0000000	-16.9036355
82	0.	6.6500000							
	0.	6.7412925	-0.4328423	0.8126475	1.00000	0.	-0.1303247	0.0000000	-16.9843843
83	0.	6.8325850							
	0.	6.9421365	-0.3431347	0.8822586	1.00000	0.	-0.1359790	0.0000000	-17.0633900
84	0.	7.0516880							
	0.	7.1831495	-0.2640104	0.9302985	1.00000	0.	-0.1391819	0.0000000	-17.1371088
85	0.	7.3146110							
	0.	7.4723650	-0.1931200	0.9627047	1.00000	0.	-0.1416185	0.	-17.2037122
86	0.	7.6301190							
	0.	7.8194235	-0.1275582	0.9837289	1.00000	0.	-0.1437301	0.0000000	-17.2599022
87	0.	8.0087280							
	0.	8.2358935	-0.0655747	0.9956999	1.00000	0.	-0.1456896	0.0000000	-17.3007567
88	0.	8.4630589							
	0.	8.7356575	-0.0058820	0.9999654	1.00000	0.	-0.1475605	0.000000	-17.3193846

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY CASE NO. TEST

GN-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
89	0.	9.0082560							
	0.	9.3353745	0.0527286	0.9972197	1.00000	0.	-0.1493496	0.0000C00	-17.3062739
90	0.	9.6624930							
	0.	10.0550350	0.1116719	0.9875294	1.00000	0.	-0.1510347	0.000CC00	-17.2482390
91	0.	10.4475770							
	0.	10.9186275	0.1729392	0.9700920	1.00000	0.	-0.1525834	0.000CC0C	-17.1266842
92	0.	11.3896780							
	0.	11.8680295	0.2334948	0.9454802	1.00000	0.	-0.1538652	0.000CC01	-16.9351134
93	0.	12.3463809							
	0.	12.8247319	0.2922462	0.9145922	1.00000	0.	-0.1548430	0.000CC00	-16.6848519
94	0.	13.3030829							
	0.	13.7814339	0.3518597	0.8761947	1.00000	0.	-0.1555961	0.000CC0?	-16.3779094
95	0.	14.2597851							
	0.	14.7381365	0.4153347	0.8274971	1.00000	0.	-0.1561854	0.000CC01	-16.0121262
96	0.	15.2164880							
	0.	15.6948390	0.4863692	0.7634450	1.00000	0.	-0.1566530	0.000CC00	-15.5821936
97	0.	16.1731901							
	0.	16.6515410	0.5706610	0.6743460	1.00000	0.	-0.1570286	0.000CC0?	-15.0784303
98	0.	17.1298921							
	0.	17.6082430	0.6791185	0.5387981	1.00000	0.	-0.1573336	0.000CC01	-14.4836129
99	0.	18.0865941							
	0.	18.5649455	0.8394643	0.2952997	1.00000	0.	-0.1575836	0.0000C00	-13.7637696
100	0.	19.0432971							
	0.	19.5216484	1.1804616	-0.3934896	1.00000	0.	-0.1577905	0.000CC01	-12.8270314
101	0.	20.0000000							

ADDED MASS =8747.2006836 VOLUME =-811.6679382 SUM (T)(DELTA S) = 3.9540037

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE 1-6-72 2-BODY CASE NO. TEST

OFF-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
1	2.0000000	2.5000000	1.0874072	0.1080623	1.0927635	5.6752004	-15.8084060
2	2.0000000	3.0000000	1.0907982	0.0328161	1.0912917	1.7231947	-15.7736236
3	2.0000000	3.5000000	1.0976801	-0.0306208	1.0981071	-1.5979064	-15.7736020
4	2.0000000	4.0000000	1.1057853	-0.0802595	1.1086941	-4.1513335	-15.8019654
5	2.0000000	4.5000000	1.1135746	-0.1104439	1.1190381	-5.6640478	-15.8506728
6	2.0000000	5.0000000	1.1165079	-0.1049762	1.1214321	-5.3712682	-15.9065968
7	4.0000000	2.7500000	1.3617957	0.1013846	1.3655645	4.2577699	-15.3480530
8	4.0000000	3.0000000	1.3628482	0.0585420	1.3641050	2.4596659	-15.3281778
9	4.0000000	3.2500000	1.3651172	0.0202888	1.3652680	0.8514839	-15.3184004
10	4.0000000	3.5000000	1.3686509	-0.0151041	1.3687342	-0.6322766	-15.3177953
11	4.0000000	3.7500000	1.3735757	-0.0492233	1.3744574	-2.0523678	-15.3258458
12	4.0000000	4.0000000	1.3800259	-0.0837204	1.3825631	-3.4716417	-15.3424374
13	4.0000000	4.2500000	1.3880660	-0.1205628	1.3932920	-4.9640644	-15.3678998
14	4.0000000	4.5000000	1.3974867	-0.1623469	1.4068850	-6.6263836	-15.4031280
15	4.0000000	4.7500000	1.4072733	-0.2126055	1.4232424	-8.5910592	-15.4497768
16	6.0000000	2.7500000	1.5612726	0.0217843	1.5614245	0.7993904	-14.3801399
17	6.0000000	3.0000000	1.5477889	0.0189751	1.5479052	0.7023809	-14.3749424
18	6.0000000	3.2500000	1.5404025	0.0133399	1.5404602	0.4961691	-14.3708774
19	6.0000000	3.5000000	1.5370586	0.0073103	1.5370760	0.2725000	-14.3683017
20	6.0000000	3.7500000	1.5366338	0.0019824	1.5366351	0.0739162	-14.3671628
21	6.0000000	4.0000000	1.5382992	-0.0019941	1.5383005	-0.0742733	-14.3671976
22	6.0000000	4.2500000	1.5412512	-0.0041784	1.5412569	-0.1553299	-14.3680094
23	6.0000000	4.5000000	1.5445618	-0.0043532	1.5445680	-0.1614816	-14.3691180
24	6.0000000	4.7500000	1.5471676	-0.0026951	1.5471699	-0.0998078	-14.3700316

01 UNIT05, EOF. REC= 00000 FIL= 00002

COMPRESSIBLE COMBYN APPROACH 5 TEST - 1

BASED ON BASIC DATA FROM 6/13/73 RUN NO. 189 AND 6/13/73 RUN NO. 189

	VELOCITY	MACH NO	DYNAMIC PRESSURE INC.	DYNAMIC PRESSURE COMP.	PRESSURE RATIO INC.	PRESSURE RATIO COMP.	DENSITY RATIO
CONTROL	7.000E+02	6.535E-01	5.827E+02	4.749E+02	7.247E-01	7.506E-01	8.147E-01
BULK	7.000E+02	6.535E-01	5.827E+02	4.749E+02	7.247E-01	7.506E-01	8.147E-01
FREE STREAM	0.	0.	0.	0.	1.000E+00	1.000E+00	1.000E+00

ALFAF	VINF/VC	VINF/VA	VC/VA	VSONIC	VSONICC
0.	0.	0.	1.000E+00	6.458E+02	1.019E+03

TSTAT	PSTAT	PSTATC	ASTAT	RHOSTAT	WDOT	VIC
5.187E+02	2.116E+03	2.116E+03	1.116E+03	2.378E-03	0.	5.703E+02

TTOT	PTOT	PTOTC	ATOT	RHOTOT	THET	DEL
5.187E+02	2.116E+03	2.116E+03	1.116E+03	2.378E-03	1.000E+00	1.000E+00

XRI	YRIHUB	YRISHR	HUB-TIP RATIO	LND
6.000E+00	2.500E+00	5.000E+00	5.000E-01	1.000E+00

XTEST	YWING
-0.	0.

	NT		NP	NCLO	NCHI	NHUBMX	NX	KND	KSKIP
1	102	1	24	16	24	40	-0	-0	-0
2	99	2	24						

V1	V2	A	B	C	VINFP
3.810E-01	1.545E+00	-4.900E+02	4.900E+02	0.	0.

1 OF 1 THETAS

THETA = 0. WDOTT = 1.78504E+01 VICT = 5.70305E+02 V3 = -1.42602E-01

HUB
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	CPC	RB/RT	PSOPTC
1	0.	0.1250E+00	0.1164E+02	0.	0.1164E+02	0.2354E+03	0.	-0.7153E+01	-0.3393E-03	0.9769	0.9999
2	-0.	0.3750E+00	0.3492E+02	0.	0.3492E+02	0.2354E+03	0.	-0.6903E+01	-0.3054E-02	0.9769	0.9993
3	0.8379E-02	0.6254E+00	0.7415E+02	0.	0.7415E+02	0.2503E+03	0.	-0.6652E+01	-0.1376E-01	0.9737	0.9969
4	0.4613E-01	0.8560E+00	0.1397E+03	0.	0.1397E+03	0.2671E+03	0.	-0.6418E+01	-0.4866E-01	0.9698	0.9891
5	0.1267E+00	0.1057E+01	0.1984E+03	0.	0.1984E+03	0.2869E+03	0.	-0.6202E+01	-0.9780E-01	0.9649	0.9781
6	0.2473E+00	0.1236E+01	0.2486E+03	0.	0.2486E+03	0.3080E+03	0.	-0.5986E+01	-0.1529E+00	0.9591	0.9657
7	0.3999E+00	0.1392E+01	0.2896E+03	0.	0.2896E+03	0.3285E+03	0.	-0.5768E+01	-0.2066E+00	0.9530	0.9536

8	0.5738E+00	0.1524E+01	0.3232E+03	0.	0.3232E+03	0.3474E+03	0.	-0.5549E+01	-0.2563E+00	0.9468	0.9425
9	0.7639E+00	0.1636E+01	0.3513E+03	0.	0.3513E+03	0.3641E+03	0.	-0.5329E+01	-0.3015E+00	0.9410	0.9323
10	0.9693E+00	0.1731E+01	0.3757E+03	0.	0.3757E+03	0.3781E+03	0.	-0.5103E+01	-0.3436E+00	0.9357	0.9229
11	0.1186E+01	0.1811E+01	0.3964E+03	0.	0.3964E+03	0.3892E+03	0.	-0.4871E+01	-0.3813E+00	0.9314	0.9144
12	0.1412E+01	0.1878E+01	0.4130E+03	0.	0.4130E+03	0.3972E+03	0.	-0.4636E+01	-0.4128E+00	0.9281	0.9074
13	0.1643E+01	0.1933E+01	0.4251E+03	0.	0.4251E+03	0.4025E+03	0.	-0.4398E+01	-0.4365E+00	0.9258	0.9021
14	0.1880E+01	0.1979E+01	0.4327E+03	0.	0.4327E+03	0.4060E+03	0.	-0.4157E+01	-0.4516E+00	0.9243	0.8987
15	0.2125E+01	0.2021E+01	0.4396E+03	0.	0.4396E+03	0.4095E+03	0.	-0.3908E+01	-0.4656E+00	0.9228	0.8955
16	0.2375E+01	0.2063E+01	0.4505E+03	0.	0.4505E+03	0.4155E+03	0.	-0.3655E+01	-0.4880E+00	0.9201	0.8905
17	0.2625E+01	0.2104E+01	0.4649E+03	0.	0.4649E+03	0.4245E+03	0.	-0.3402E+01	-0.5183E+00	0.9160	0.8837
18	0.2875E+01	0.2146E+01	0.4816E+03	0.	0.4816E+03	0.4363E+03	0.	-0.3148E+01	-0.5545E+00	0.9103	0.8756
19	0.3125E+01	0.2188E+01	0.5006E+03	0.	0.5006E+03	0.4505E+03	0.	-0.2895E+01	-0.5968E+00	0.9031	0.8661
20	0.3375E+01	0.2229E+01	0.5228E+03	0.	0.5228E+03	0.4667E+03	0.	-0.2641E+01	-0.6479E+00	0.8942	0.8546
21	0.3625E+01	0.2270E+01	0.5481E+03	0.	0.5481E+03	0.4842E+03	0.	-0.2388E+01	-0.7082E+00	0.8838	0.8411
22	0.3874E+01	0.2308E+01	0.5734E+03	0.	0.5734E+03	0.5023E+03	0.	-0.2136E+01	-0.7707E+00	0.8721	0.8270
23	0.4123E+01	0.2343E+01	0.5975E+03	0.	0.5975E+03	0.5199E+03	0.	-0.1884E+01	-0.8320E+00	0.8595	0.8133
24	0.4373E+01	0.2375E+01	0.6214E+03	0.	0.6214E+03	0.5361E+03	0.	-0.1632E+01	-0.8945E+00	0.8467	0.7993
25	0.4623E+01	0.2404E+01	0.6446E+03	0.	0.6446E+03	0.5495E+03	0.	-0.1380E+01	-0.9570E+00	0.8351	0.7853
26	0.4874E+01	0.2430E+01	0.6661E+03	0.	0.6661E+03	0.5586E+03	0.	-0.1129E+01	-0.1016E+01	0.8266	0.7720
27	0.5125E+01	0.2453E+01	0.6849E+03	0.	0.6849E+03	0.5633E+03	0.	-0.8767E+00	-0.1068E+01	0.8219	0.7602
28	0.5375E+01	0.2473E+01	0.7017E+03	0.	0.7017E+03	0.5662E+03	0.	-0.6252E+00	-0.1116E+01	0.8190	0.7495
29	0.5626E+01	0.2488E+01	0.7162E+03	0.	0.7162E+03	0.5685E+03	0.	-0.3743E+00	-0.1158E+01	0.8166	0.7401
30	0.5875E+01	0.2497E+01	0.7217E+03	0.	0.7217E+03	0.5699E+03	0.	-0.1245E+00	-0.1174E+01	0.8151	0.7366
31	0.6127E+01	0.2500E+01	0.7144E+03	0.	0.7144E+03	0.5703E+03	0.	0.1270E+00	-0.1153E+01	0.8147	0.7413
32	0.6407E+01	0.2500E+01	0.7061E+03	0.	0.7061E+03	0.5703E+03	0.	0.4065E+00	-0.1129E+01	0.8147	0.7467
33	0.6742E+01	0.2500E+01	0.7026E+03	0.	0.7026E+03	0.5703E+03	0.	0.7419E+00	-0.1119E+01	0.8147	0.7489
34	0.7144E+01	0.2500E+01	0.7008E+03	0.	0.7008E+03	0.5703E+03	0.	0.1144E+01	-0.1114E+01	0.8147	0.7501
35	0.7627E+01	0.2500E+01	0.6997E+03	0.	0.6997E+03	0.5703E+03	0.	0.1627E+01	-0.1110E+01	0.8147	0.7508
36	0.8207E+01	0.2500E+01	0.6988E+03	0.	0.6988E+03	0.5703E+03	0.	0.2207E+01	-0.1108E+01	0.8147	0.7514
37	0.8902E+01	0.2500E+01	0.6978E+03	0.	0.6978E+03	0.5703E+03	0.	0.2902E+01	-0.1105E+01	0.8147	0.7520
38	0.9737E+01	0.2500E+01	0.6945E+03	0.	0.6945E+03	0.5703E+03	0.	0.3737E+01	-0.1096E+01	0.8147	0.7541
39	0.1064E+02	0.2500E+01	0.6800E+03	0.	0.6800E+03	0.5703E+03	0.	0.4644E+01	-0.1055E+01	0.8147	0.7633
40	0.1155E+02	0.2500E+01	0.3709E+03	0.	0.3709E+03	0.5703E+03	0.	0.5548E+01	-0.3351E+00	0.8147	0.9248

SHROUD
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	CPC	RB/RT	PSOPTC
41	0.1155E+02	0.5000E+01	-0.6884E+02	0.	0.6884E+02	0.5703E+03	0.	0.5548E+01	-0.1186E-01	0.8147	0.9973
42	0.1064E+02	0.5000E+01	-0.5681E+03	0.	0.5681E+03	0.5703E+03	0.	0.4644E+01	-0.7573E+00	0.8147	0.8301
43	0.9737E+01	0.5000E+01	-0.6379E+03	0.	0.6379E+03	0.5703E+03	0.	0.3737E+01	-0.9388E+00	0.8147	0.7893
44	0.8902E+01	0.5000E+01	-0.6680E+03	0.	0.6680E+03	0.5703E+03	0.	0.2902E+01	-0.1021E+01	0.8147	0.7708
45	0.8207E+01	0.5000E+01	-0.6795E+03	0.	0.6795E+03	0.5703E+03	0.	0.2207E+01	-0.1053E+01	0.8147	0.7636
46	0.7627E+01	0.5000E+01	-0.6856E+03	0.	0.6856E+03	0.5703E+03	0.	0.1627E+01	-0.1076E+01	0.8147	0.7598
47	0.7144E+01	0.5000E+01	-0.6893E+03	0.	0.6893E+03	0.5703E+03	0.	0.1144E+01	-0.1081E+01	0.8147	0.7575
48	0.6742E+01	0.5000E+01	-0.6919E+03	0.	0.6919E+03	0.5703E+03	0.	0.7419E+00	-0.1088E+01	0.8147	0.7558
49	0.6407E+01	0.5000E+01	-0.6941E+03	0.	0.6941E+03	0.5703E+03	0.	0.4065E+00	-0.1095E+01	0.8147	0.7544
50	0.6127E+01	0.5000E+01	-0.6965E+03	0.	0.6965E+03	0.5703E+03	0.	0.1270E+00	-0.1101E+01	0.8147	0.7529
51	0.5875E+01	0.5000E+01	-0.6974E+03	0.	0.6974E+03	0.5699E+03	0.	-0.1250E+00	-0.1104E+01	0.8151	0.7523
52	0.5625E+01	0.5000E+01	-0.6993E+03	0.	0.6993E+03	0.5685E+03	0.	-0.3750E+00	-0.1109E+01	0.8166	0.7511
53	0.5375E+01	0.5000E+01	-0.7036E+03	0.	0.7036E+03	0.5662E+03	0.	-0.6250E+00	-0.1122E+01	0.8190	0.7483
54	0.5125E+01	0.5000E+01	-0.7148E+03	0.	0.7148E+03	0.5633E+03	0.	-0.8750E+00	-0.1154E+01	0.8219	0.7410
55	0.4879E+01	0.5005E+01	-0.7357E+03	0.	0.7357E+03	0.5587E+03	0.	-0.1121E+01	-0.1215E+01	0.8265	0.7274
56	0.4632E+01	0.5023E+01	-0.7312E+03	0.	0.7312E+03	0.5499E+03	0.	-0.1369E+01	-0.1202E+01	0.8348	0.7303
57	0.4373E+01	0.5058E+01	-0.6943E+03	0.	0.6943E+03	0.5361E+03	0.	-0.1630E+01	-0.1095E+01	0.8467	0.7543
58	0.4102E+01	0.5109E+01	-0.6445E+03	0.	0.6445E+03	0.5185E+03	0.	-0.1906E+01	-0.9565E+00	0.8606	0.7854
59	0.3821E+01	0.5172E+01	-0.5915E+03	0.	0.5915E+03	0.4984E+03	0.	-0.2194E+01	-0.8165E+00	0.8747	0.8168
60	0.3531E+01	0.5242E+01	-0.5413E+03	0.	0.5413E+03	0.4774E+03	0.	-0.2493E+01	-0.6918E+00	0.8879	0.8448
61	0.3236E+01	0.5315E+01	-0.4977E+03	0.	0.4977E+03	0.4574E+03	0.	-0.2795E+01	-0.5902E+00	0.8994	0.8676
62	0.2945E+01	0.5381E+01	-0.4629E+03	0.	0.4629E+03	0.4400E+03	0.	-0.3094E+01	-0.5140E+00	0.9084	0.8847

63	0.2662E+01	0.5436E+01	-0.4383E+03	0.	0.4383E+03	0.4261E+03	0.	-0.3383E+01	-0.4629E+00	0.9152	0.8961
64	0.2390E+01	0.5475E+01	-0.4254E+03	0.	0.4254E+03	0.4159E+03	0.	-0.3658E+01	-0.4370E+00	0.9199	0.9019
65	0.2128E+01	0.5495E+01	-0.4280E+03	0.	0.4280E+03	0.4096E+03	0.	-0.3920E+01	-0.4422E+00	0.9228	0.9008
66	0.1887E+01	0.5500E+01	-0.4524E+03	0.	0.4524E+03	0.4061E+03	0.	-0.4161E+01	-0.4919E+00	0.9243	0.8896
67	0.1673E+01	0.5504E+01	-0.4879E+03	0.	0.4879E+03	0.4031E+03	0.	-0.4375E+01	-0.5682E+00	0.9256	0.8725
68	0.1476E+01	0.5513E+01	-0.5157E+03	0.	0.5157E+03	0.3989E+03	0.	-0.4572E+01	-0.6314E+00	0.9273	0.8583
69	0.1287E+01	0.5531E+01	-0.5392E+03	0.	0.5392E+03	0.3932E+03	0.	-0.4762E+01	-0.6868E+00	0.9297	0.8459
70	0.1107E+01	0.5560E+01	-0.5569E+03	0.	0.5569E+03	0.3856E+03	0.	-0.4945E+01	-0.7297E+00	0.9328	0.8363
71	0.9352E+00	0.5602E+01	-0.5675E+03	0.	0.5675E+03	0.3761E+03	0.	-0.5122E+01	-0.7560E+00	0.9365	0.8304
72	0.7730E+00	0.5657E+01	-0.5705E+03	0.	0.5705E+03	0.3648E+03	0.	-0.5293E+01	-0.7634E+00	0.9407	0.8287
73	0.6209E+00	0.5727E+01	-0.5649E+03	0.	0.5649E+03	0.3519E+03	0.	-0.5460E+01	-0.7495E+00	0.9453	0.8318
74	0.4811E+00	0.5811E+01	-0.5514E+03	0.	0.5514E+03	0.3379E+03	0.	-0.5624E+01	-0.7163E+00	0.9500	0.8393
75	0.3557E+00	0.5910E+01	-0.5297E+03	0.	0.5297E+03	0.3230E+03	0.	-0.5783E+01	-0.6641E+00	0.9547	0.8510
76	0.2457E+00	0.6022E+01	-0.5005E+03	0.	0.5005E+03	0.3078E+03	0.	-0.5940E+01	-0.5966E+00	0.9592	0.8661
77	0.1537E+00	0.6147E+01	-0.4645E+03	0.	0.4645E+03	0.2923E+03	0.	-0.6096E+01	-0.5174E+00	0.9634	0.8839
78	0.8191E-01	0.6283E+01	-0.4219E+03	0.	0.4219E+03	0.2773E+03	0.	-0.6249E+01	-0.4303E+00	0.9673	0.9034
79	0.3236E-01	0.6427E+01	-0.3725E+03	0.	0.3725E+03	0.2628E+03	0.	-0.6401E+01	-0.3379E+00	0.9708	0.9242
80	0.6693E-02	0.6575E+01	-0.3092E+03	0.	0.3092E+03	0.2493E+03	0.	-0.6552E+01	-0.2349E+00	0.9739	0.9473
81	0.	0.6741E+01	-0.2466E+03	0.	0.2466E+03	0.2354E+03	0.	-0.6718E+01	-0.1505E+00	0.9769	0.9662
82	0.	0.6942E+01	-0.2076E+03	0.	0.2076E+03	0.2184E+03	0.	-0.6919E+01	-0.1070E+00	0.9802	0.9760
83	0.	0.7183E+01	-0.1771E+03	0.	0.1771E+03	0.2003E+03	0.	-0.7160E+01	-0.7804E-01	0.9834	0.9825
84	0.	0.7472E+01	-0.1516E+03	0.	0.1516E+03	0.1811E+03	0.	-0.7449E+01	-0.5730E-01	0.9865	0.9871
85	0.	0.7819E+01	-0.1296E+03	0.	0.1296E+03	0.1613E+03	0.	-0.7796E+01	-0.4193E-01	0.9894	0.9906
86	0.	0.8236E+01	-0.1103E+03	0.	0.1103E+03	0.1411E+03	0.	-0.8213E+01	-0.3039E-01	0.9919	0.9932
87	0.	0.8736E+01	-0.9321E+02	0.	0.9321E+02	0.1212E+03	0.	-0.8712E+01	-0.2173E-01	0.9940	0.9951
88	0.	0.9335E+01	-0.7811E+02	0.	0.7811E+02	0.1020E+03	0.	-0.9312E+01	-0.1526E-01	0.9958	0.9966
89	0.	0.1006E+02	-0.6479E+02	0.	0.6479E+02	0.8399E+02	0.	-0.1003E+02	-0.1051E-01	0.9972	0.9976
90	0.	0.1092E+02	-0.5320E+02	0.	0.5320E+02	0.6760E+02	0.	-0.1090E+02	-0.7085E-02	0.9982	0.9984
91	0.	0.1187E+02	-0.4267E+02	0.	0.4267E+02	0.5418E+02	0.	-0.1184E+02	-0.4560E-02	0.9988	0.9990
92	0.	0.1282E+02	-0.3454E+02	0.	0.3454E+02	0.4405E+02	0.	-0.1280E+02	-0.2987E-02	0.9992	0.9993
93	0.	0.1378E+02	-0.2803E+02	0.	0.2803E+02	0.3630E+02	0.	-0.1376E+02	-0.1968E-02	0.9995	0.9996
94	0.	0.1474E+02	-0.2259E+02	0.	0.2259E+02	0.3028E+02	0.	-0.1471E+02	-0.1278E-02	0.9996	0.9997
95	0.	0.1569E+02	-0.1778E+02	0.	0.1778E+02	0.2553E+02	0.	-0.1567E+02	-0.7922E-03	0.9997	0.9998
96	0.	0.1665E+02	-0.1326E+02	0.	0.1326E+02	0.2172E+02	0.	-0.1663E+02	-0.4408E-03	0.9998	0.9999
97	0.	0.1761E+02	-0.8558E+01	0.	0.8558E+01	0.1864E+02	0.	-0.1758E+02	-0.1835E-03	0.9999	1.0000
98	0.	0.1856E+02	-0.2714E+01	0.	0.2714E+01	0.1612E+02	0.	-0.1854E+02	-0.1846E-04	0.9999	1.0000
99	0.	0.1952E+02	0.8468E+01	0.	0.8468E+01	0.1403E+02	0.	-0.1950E+02	-0.1796E-03	1.0000	1.0000

OFF-BODY POINTS (RAKES)

I	COORDINATES AXIAL X	RADIAL Y	VELOCITIES AXIAL VX	RADIAL VY	CIRCUMFRNTL VZ	RESULTANT VRES	MERIDIONAL VM	CHORDWISE VAFT	SPANWISE VSPAN	PRESS.RATIO COMP RHOBR	PSOPTC
	2.0000E+00	1.9996E+00	4.2935E+02	7.3613E+01	-0.	4.3561E+02	4.3561E+02	7.3613E+01	0.		0.8973
1	2.0000E+00	2.5000E+00	4.2841E+02	3.9402E+01	0.	4.3022E+02	4.3022E+02	3.9402E+01	0.	0.9237	0.8998
2	2.0000E+00	3.0000E+00	4.3189E+02	7.9956E+00	0.	4.3196E+02	4.3196E+02	7.9956E+00	0.	0.9237	0.8990
3	2.0000E+00	3.5000E+00	4.3720E+02	-1.8046E+01	0.	4.3757E+02	4.3757E+02	-1.8046E+01	-0.	0.9237	0.8964
4	2.0000E+00	4.0000E+00	4.4322E+02	-3.8016E+01	0.	4.4485E+02	4.4485E+02	-3.8016E+01	-0.	0.9237	0.8931
5	2.0000E+00	4.5000E+00	4.4893E+02	-4.9511E+01	0.	4.5165E+02	4.5165E+02	-4.9511E+01	-0.	0.9237	0.8900
6	2.0000E+00	5.0000E+00	4.5146E+02	-4.5776E+01	0.	4.5377E+02	4.5377E+02	-4.5776E+01	-0.	0.9237	0.8890
	2.0000E+00	5.4981E+00	4.3876E+02	-1.0129E+01	-0.	4.3887E+02	4.3887E+02	-1.0129E+01	-0.		0.8959
	4.0000E+00	2.3258E+00	5.8001E+02	8.0848E+01	-0.	5.8562E+02	5.8562E+02	8.0848E+01	0.		0.8201
7	4.0000E+00	2.7500E+00	5.7990E+02	4.2780E+01	0.	5.8148E+02	5.8148E+02	4.2780E+01	0.	0.8658	0.8225
8	4.0000E+00	3.0000E+00	5.8054E+02	2.4419E+01	0.	5.8105E+02	5.8105E+02	2.4419E+01	0.	0.8658	0.8227
9	4.0000E+00	3.2500E+00	5.8192E+02	8.0853E+00	0.	5.8198E+02	5.8198E+02	8.0853E+00	0.	0.8658	0.8222
10	4.0000E+00	3.5000E+00	5.8404E+02	-6.9686E+00	0.	5.8408E+02	5.8408E+02	-6.9686E+00	-0.	0.8658	0.8210
11	4.0000E+00	3.7500E+00	5.8695E+02	-2.1428E+01	0.	5.8734E+02	5.8734E+02	-2.1428E+01	-0.	0.8658	0.8192
12	4.0000E+00	4.0000E+00	5.9073E+02	-3.6006E+01	0.	5.9182E+02	5.9182E+02	-3.6006E+01	-0.	0.8658	0.8166
13	4.0000E+00	4.2500E+00	5.9546E+02	-5.1556E+01	0.	5.9768E+02	5.9768E+02	-5.1556E+01	-0.	0.8658	0.8132
14	4.0000E+00	4.5000E+00	6.0111E+02	-6.9222E+01	0.	6.0508E+02	6.0508E+02	-6.9222E+01	-0.	0.8658	0.8089
15	4.0000E+00	4.7500E+00	6.0733E+02	-9.0581E+01	0.	6.1405E+02	6.1405E+02	-9.0581E+01	-0.	0.8658	0.8036
	4.0000E+00	5.1310E+00	6.1001E+02	-1.3480E+02	-0.	6.2473E+02	6.2473E+02	-1.3480E+02	-0.		0.7973
	6.0000E+00	2.4990E+00	7.1806E+02	7.5389E+00	-0.	7.1810E+02	7.1810E+02	7.5389E+00	0.		0.7389
16	6.0000E+00	2.7500E+00	7.0928E+02	9.9827E+00	0.	7.0935E+02	7.0935E+02	9.9827E+00	0.	0.8149	0.7446
17	6.0000E+00	3.0000E+00	7.0188E+02	8.7828E+00	0.	7.0194E+02	7.0194E+02	8.7828E+00	0.	0.8149	0.7494
18	6.0000E+00	3.2500E+00	6.9783E+02	6.3117E+00	0.	6.9786E+02	6.9786E+02	6.3117E+00	0.	0.8149	0.7520
19	6.0000E+00	3.5000E+00	6.9599E+02	3.6672E+00	0.	6.9600E+02	6.9600E+02	3.6672E+00	0.	0.8149	0.7532
20	6.0000E+00	3.7500E+00	6.9574E+02	1.3361E+00	0.	6.9574E+02	6.9574E+02	1.3361E+00	0.	0.8149	0.7533
21	6.0000E+00	4.0000E+00	6.9663E+02	-4.0146E-01	0.	6.9663E+02	6.9663E+02	-4.0146E-01	-0.	0.8149	0.7528
22	6.0000E+00	4.2500E+00	6.9822E+02	-1.3643E+00	0.	6.9823E+02	6.9823E+02	-1.3643E+00	-0.	0.8149	0.7517
23	6.0000E+00	4.5000E+00	7.0006E+02	-1.4762E+00	0.	7.0006E+02	7.0006E+02	-1.4762E+00	-0.	0.8149	0.7506
24	6.0000E+00	4.7500E+00	7.0161E+02	-8.5257E-01	0.	7.0161E+02	7.0161E+02	-8.5257E-01	-0.	0.8149	0.7496
	6.0000E+00	5.0000E+00	6.9685E+02	0.	-0.	6.9685E+02	6.9685E+02	-0.	0.		0.7526

I	COORDINATES AXIAL X	RADIAL Y	NEW CP VBRI	CPC	ANGLES MERIDIONAL ALPHA	FLOW BETA	UNDERTURNG ETA	SPANWISE ZETA	SWIRL PHI	QFRACT
	2.0000E+00	1.9996E+00		-4.5750E-01	9.7290E+00	0.	9.7290E+00	0.	-0.	0.
1	2.0000E+00	2.5000E+00	4.0744E+02	-4.4665E-01	5.2549E+00	0.	5.2549E+00	0.	0.	8.3744E-02
2	2.0000E+00	3.0000E+00	4.0744E+02	-4.5015E-01	1.0606E+00	0.	1.0606E+00	0.	0.	1.8642E-01
3	2.0000E+00	3.5000E+00	4.0744E+02	-4.6146E-01	-2.3636E+00	0.	-2.3636E+00	-0.	0.	3.0886E-01
4	2.0000E+00	4.0000E+00	4.0744E+02	-4.7631E-01	-4.9024E+00	0.	-4.9024E+00	-0.	0.	4.5163E-01
5	2.0000E+00	4.5000E+00	4.0744E+02	-4.9040E-01	-6.2936E+00	0.	-6.2936E+00	-0.	0.	6.1515E-01
6	2.0000E+00	5.0000E+00	4.0744E+02	-4.9482E-01	-5.7898E+00	0.	-5.7898E+00	-0.	0.	7.9927E-01
	2.0000E+00	5.4981E+00		-4.6411E-01	-1.3224E+00	-0.	-1.3224E+00	-0.	-0.	1.0000E+00
	4.0000E+00	2.3258E+00		-8.0153E-01	7.9354E+00	-0.	7.9354E+00	0.	-0.	0.
7	4.0000E+00	2.7500E+00	5.1133E+02	-7.9102E-01	4.2191E+00	0.	4.2191E+00	0.	0.	1.0139E-01
8	4.0000E+00	3.0000E+00	5.1133E+02	-7.8994E-01	2.4085E+00	0.	2.4085E+00	0.	0.	1.6918E-01
9	4.0000E+00	3.2500E+00	5.1133E+02	-7.9228E-01	7.9603E-01	0.	7.9603E-01	0.	0.	2.4299E-01
10	4.0000E+00	3.5000E+00	5.1133E+02	-7.9761E-01	-6.8361E-01	0.	-6.8361E-01	-0.	0.	3.2289E-01
11	4.0000E+00	3.7500E+00	5.1133E+02	-8.0592E-01	-2.0908E+00	0.	-2.0908E+00	-0.	0.	4.0895E-01
12	4.0000E+00	4.0000E+00	5.1133E+02	-8.1740E-01	-3.4879E+00	0.	-3.4879E+00	-0.	0.	5.0131E-01
13	4.0000E+00	4.2500E+00	5.1133E+02	-8.3248E-01	-4.9485E+00	0.	-4.9485E+00	-0.	0.	6.0007E-01
14	4.0000E+00	4.5000E+00	5.1133E+02	-8.5168E-01	-6.5690E+00	0.	-6.5690E+00	-0.	0.	7.0538E-01
15	4.0000E+00	4.7500E+00	5.1133E+02	-8.7514E-01	-8.4829E+00	0.	-8.4829E+00	-0.	0.	8.1734E-01
	4.0000E+00	5.1310E+00		-9.0342E-01	-1.2461E+01	-0.	-1.2461E+01	-0.	-0.	1.0000E+00

	6.0000E+00	2.4990E+00		-1.1635E+00	6.0152E-01	-0.	6.0152E-01	0.	-0.	0.	
16	6.0000E+00	2.7500E+00	5.7015E+02	-1.1382E+00	8.0635E-01	0.	8.0635E-01	0.	0.	7.1016E-02	
17	6.0000E+00	3.0000E+00	5.7015E+02	-1.1169E+00	7.1692E-01	0.	7.1692E-01	0.	0.	1.4800E-01	
18	6.0000E+00	3.2500E+00	5.7015E+02	-1.1053E+00	5.1821E-01	0.	5.1821E-01	0.	0.	2.3131E-01	
19	6.0000E+00	3.5000E+00	5.7015E+02	-1.1000E+00	3.0189E-01	0.	3.0189E-01	0.	0.	3.2106E-01	
20	6.0000E+00	3.7500E+00	5.7015E+02	-1.0992E+00	1.1003E-01	0.	1.1003E-01	0.	0.	4.1739E-01	
21	6.0000E+00	4.0000E+00	5.7015E+02	-1.1018E+00	-3.3019E-02	0.	-3.3019E-02	-0.	0.	5.2038E-01	
22	6.0000E+00	4.2500E+00	5.7015E+02	-1.1063E+00	-1.1195E-01	0.	-1.1195E-01	-0.	0.	6.3014E-01	
23	6.0000E+00	4.5000E+00	5.7015E+02	-1.1115E+00	-1.2082E-01	0.	-1.2082E-01	-0.	0.	7.4671E-01	
24	6.0000E+00	4.7500E+00	5.7015E+02	-1.1160E+00	-6.9623E-02	0.	-6.9623E-02	-0.	0.	8.7011E-01	
	6.0000E+00	5.0000E+00		-1.1024E+00	0.	-0.	-0.	0.	-0.	1.0000E+00	

RELATIVE ROTOR INLET DATA

X = 6.0000 UTIP = 900.0000

Y	U	VZPRIME	VPRIM	MPRIME	BETAPR	VZPRST	VPRST	MPRS	BETAPS
2.4990E+00	4.4982E+02	-4.4982E+02	8.4735E+02	7.9286E-01	-3.2063E+01	-4.4982E+02	8.4735E+02	7.9286E-01	-3.2063E+01
2.7500E+00	4.9500E+02	-4.9500E+02	8.6499E+02	8.0847E-01	-3.4908E+01	-4.9500E+02	8.6499E+02	8.0847E-01	-3.4908E+01
3.0000E+00	5.4000E+02	-5.4000E+02	8.8562E+02	8.2700E-01	-3.7571E+01	-5.4000E+02	8.8562E+02	8.2700E-01	-3.7571E+01
3.2500E+00	5.8500E+02	-5.8500E+02	9.1062E+02	8.4993E-01	-3.9972E+01	-5.8500E+02	9.1062E+02	8.4993E-01	-3.9972E+01
3.5000E+00	6.3000E+02	-6.3000E+02	9.3878E+02	8.7601E-01	-4.2151E+01	-6.3000E+02	9.3878E+02	8.7601E-01	-4.2151E+01
3.7500E+00	6.7500E+02	-6.7500E+02	9.6937E+02	9.0453E-01	-4.4133E+01	-6.7500E+02	9.6937E+02	9.0453E-01	-4.4133E+01
4.0000E+00	7.2000E+02	-7.2000E+02	1.0018E+03	9.3493E-01	-4.5945E+01	-7.2000E+02	1.0018E+03	9.3493E-01	-4.5945E+01
4.2500E+00	7.6500E+02	-7.6500E+02	1.0357E+03	9.6674E-01	-4.7613E+01	-7.6500E+02	1.0357E+03	9.6674E-01	-4.7613E+01
4.5000E+00	8.1000E+02	-8.1000E+02	1.0706E+03	9.9951E-01	-4.9164E+01	-8.1000E+02	1.0706E+03	9.9951E-01	-4.9164E+01
4.7500E+00	8.5500E+02	-8.5500E+02	1.1060E+03	1.0328E+00	-5.0628E+01	-8.5500E+02	1.1060E+03	1.0328E+00	-5.0628E+01
5.0000E+00	9.0000E+02	-9.0000E+02	1.1382E+03	1.0622E+00	-5.2250E+01	-9.0000E+02	1.1382E+03	1.0622E+00	-5.2250E+01

RAKE WEIGHT FLOW DATA

I	X	(Q(I)-QBAR)/QBAR	QS TOT	QFR
1	2.0000E+00	-1.0433E-03	1.7834E+01	1.0000E+00
2	4.0000E+00	6.3221E-04	1.7864E+01	1.0000E+00
3	6.0000E+00	0.	1.7853E+01	1.0000E+00

STREAMLINES

X = 2.000

QSTRM	YSTRM
2.00000E-02	2.12664E+00
4.00000E-02	2.24897E+00
6.00000E-02	2.36656E+00
8.00000E-02	2.47940E+00
1.00000E-01	2.58406E+00
1.20000E-01	2.68495E+00
1.40000E-01	2.78305E+00
1.60000E-01	2.87836E+00
1.80000E-01	2.97088E+00
2.00000E-01	3.05869E+00
2.20000E-01	3.14367E+00
2.40000E-01	3.22689E+00
2.60000E-01	3.30836E+00
2.80000E-01	3.38808E+00
3.00000E-01	3.46604E+00
3.20000E-01	3.54116E+00
3.40000E-01	3.61412E+00
3.60000E-01	3.68591E+00

3.80000E-01	3.75655E+00
4.00000E-01	3.82603E+00
4.20000E-01	3.89434E+00
4.40000E-01	3.96149E+00
4.60000E-01	4.02688E+00
4.80000E-01	4.09053E+00
5.00000E-01	4.15338E+00
5.20000E-01	4.21546E+00
5.40000E-01	4.27674E+00
5.60000E-01	4.33724E+00
5.80000E-01	4.39695E+00
6.00000E-01	4.45588E+00
6.20000E-01	4.51369E+00
6.40000E-01	4.56988E+00
6.60000E-01	4.62559E+00
6.80000E-01	4.68081E+00
7.00000E-01	4.73554E+00
7.20000E-01	4.78978E+00
7.40000E-01	4.84354E+00
7.60000E-01	4.89681E+00
7.80000E-01	4.94960E+00
8.00000E-01	5.00190E+00
8.20000E-01	5.05371E+00
8.40000E-01	5.10503E+00
8.60000E-01	5.15587E+00
8.80000E-01	5.20622E+00
9.00000E-01	5.25608E+00
9.20000E-01	5.30546E+00
9.40000E-01	5.35435E+00
9.60000E-01	5.40275E+00
9.80000E-01	5.45067E+00
1.00000E+00	5.49810E+00

X = 4.000

QSTRM	YSTRM
2.00000E-02	2.41427E+00
4.00000E-02	2.50038E+00
6.00000E-02	2.58413E+00
8.00000E-02	2.66554E+00
1.00000E-01	2.74461E+00
1.20000E-01	2.82059E+00
1.40000E-01	2.89479E+00
1.60000E-01	2.96729E+00
1.80000E-01	3.03779E+00
2.00000E-01	3.10661E+00
2.20000E-01	3.17409E+00
2.40000E-01	3.24023E+00
2.60000E-01	3.30467E+00
2.80000E-01	3.36795E+00
3.00000E-01	3.43015E+00
3.20000E-01	3.49127E+00
3.40000E-01	3.55102E+00
3.60000E-01	3.60982E+00
3.80000E-01	3.66773E+00
4.00000E-01	3.72476E+00
4.20000E-01	3.78073E+00
4.40000E-01	3.83579E+00
4.60000E-01	3.89012E+00
4.80000E-01	3.94371E+00
5.00000E-01	3.99657E+00

5.20000E-01	4.04847E+00
5.40000E-01	4.09973E+00
5.60000E-01	4.15038E+00
5.80000E-01	4.20041E+00
6.00000E-01	4.24983E+00
6.20000E-01	4.29841E+00
6.40000E-01	4.34648E+00
6.60000E-01	4.39403E+00
6.80000E-01	4.44106E+00
7.00000E-01	4.48757E+00
7.20000E-01	4.53335E+00
7.40000E-01	4.57864E+00
7.60000E-01	4.62352E+00
7.80000E-01	4.66801E+00
8.00000E-01	4.71210E+00
8.20000E-01	4.75579E+00
8.40000E-01	4.79908E+00
8.60000E-01	4.84197E+00
8.80000E-01	4.88446E+00
9.00000E-01	4.92656E+00
9.20000E-01	4.96825E+00
9.40000E-01	5.00955E+00
9.60000E-01	5.05044E+00
9.80000E-01	5.09094E+00
1.00000E+00	5.13104E+00

X = 6.000

QSTRM	YSTRM
2.00000E-02	2.57166E+00
4.00000E-02	2.64278E+00
6.00000E-02	2.71235E+00
8.00000E-02	2.78011E+00
1.00000E-01	2.84625E+00
1.20000E-01	2.91117E+00
1.40000E-01	2.97485E+00
1.60000E-01	3.03706E+00
1.80000E-01	3.09807E+00
2.00000E-01	3.15807E+00
2.20000E-01	3.21708E+00
2.40000E-01	3.27493E+00
2.60000E-01	3.33170E+00
2.80000E-01	3.38766E+00
3.00000E-01	3.44281E+00
3.20000E-01	3.49713E+00
3.40000E-01	3.55038E+00
3.60000E-01	3.60294E+00
3.80000E-01	3.65482E+00
4.00000E-01	3.70603E+00
4.20000E-01	3.75653E+00
4.40000E-01	3.80617E+00
4.60000E-01	3.85524E+00
4.80000E-01	3.90376E+00
5.00000E-01	3.95171E+00
5.20000E-01	3.99910E+00
5.40000E-01	4.04573E+00
5.60000E-01	4.09188E+00
5.80000E-01	4.13756E+00
6.00000E-01	4.18277E+00
6.20000E-01	4.22751E+00
6.40000E-01	4.27168E+00

6.60000E-01	4.31533E+00
6.80000E-01	4.35859E+00
7.00000E-01	4.40145E+00
7.20000E-01	4.44391E+00
7.40000E-01	4.48598E+00
7.60000E-01	4.52752E+00
7.80000E-01	4.56865E+00
8.00000E-01	4.60946E+00
8.20000E-01	4.64995E+00
8.40000E-01	4.69013E+00
8.60000E-01	4.72998E+00
8.80000E-01	4.76951E+00
9.00000E-01	4.80873E+00
9.20000E-01	4.84762E+00
9.40000E-01	4.88620E+00
9.60000E-01	4.92445E+00
9.80000E-01	4.96238E+00
1.00000E+00	5.00000E+00

COMPRESSIBLE COMBYN APPROACH 5 TEST-1

BASED ON BASIC DATA FROM 6/13/73 RUN NO. 189 AND 6/13/73 RUN NO. 189

	VELOCITY	MACH NO	DYNAMIC PRESSURE INC.	DYNAMIC PRESSURE COMP.	PRESSURE RATIO INC.	PRESSURE RATIO COMP.	DENSITY RATIO
CONTROL	7.000E+02	6.535E-01	5.803E+02	4.749E+02	7.258E-01	7.506E-01	8.147E-01
BULK	7.000E+02	6.535E-01	5.803E+02	4.749E+02	7.258E-01	7.506E-01	8.147E-01
FREE STREAM	1.000E+02	8.968E-02	1.184E+01	1.185E+01	9.944E-01	9.944E-01	9.960E-01

ALFAF	VINF/VC	VINF/VA	VC/VA	VSONIC	VSONICC
0.	1.429E-01	1.429E-01	1.000E+00	6.458E+02	1.019E+03

TSTAT	PSTAT	PSTATC	ASTAT	RHOSTAT	WDOT	VIC
5.178E+02	2.104E+03	2.104E+03	1.115E+03	2.369E-03	0.	5.703E+02

TTOT	PTOT	PTOTC	ATOT	RHOTOT	THET	DEL
5.187E+02	2.116E+03	2.116E+03	1.116E+03	2.378E-03	1.000E+00	1.000E+00

XRI	YRIHUB	YRISHR	HUB-TIP RATIO	LND
6.000E+00	2.500E+00	5.000E+00	5.000E-01	1.000E+00

XTEST	YWING
0.	0.

	NT		NP	NCLO	NCHI	NHUBMX	NX	KND	KSKIP
1	102	1	24	16	24	40	-0	-0	1
2	99	2	24						

V1	V2	A	B	C	VINFP
3.810E-01	1.545E+00	-4.900E+02	4.900E+02	9.960E+01	9.960E+01

1 OF 3 THETAS

THETA = 0. WDOTT = 1.74058E+01 VICT = 5.56102E+02 V3 = -1.42602E-01

HUB
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	CPC	RB/RT	PSOPTC
1	0.	0.1250E+00	0.1006E+03	0.	0.1006E+03	0.2295E+03	0.	-0.7153E+01	-0.3164E-03	0.9780	0.9943
2	-0.	0.3750E+00	0.1269E+03	0.	0.1269E+03	0.2295E+03	0.	-0.6903E+01	-0.1521E-01	0.9780	0.9910
3	0.8379E-02	0.6254E+00	0.1716E+03	0.	0.1716E+03	0.2440E+03	0.	-0.6652E+01	-0.4834E-01	0.9750	0.9835
4	0.4613E-01	0.8560E+00	0.2385E+03	0.	0.2385E+03	0.2604E+03	0.	-0.6418E+01	-0.1158E+00	0.9714	0.9684
5	0.1267E+00	0.1057E+01	0.2878E+03	0.	0.2878E+03	0.2798E+03	0.	-0.6202E+01	-0.1790E+00	0.9667	0.9542
6	0.2473E+00	0.1236E+01	0.3225E+03	0.	0.3225E+03	0.3003E+03	0.	-0.5986E+01	-0.2301E+00	0.9613	0.9428
7	0.3999E+00	0.1392E+01	0.3462E+03	0.	0.3462E+03	0.3203E+03	0.	-0.5768E+01	-0.2681E+00	0.9555	0.9342

8	0.5738E+00	0.1524E+01	0.3636E+03	0.	0.3636E+03	0.3387E+03	0.	-0.5549E+01	-0.2975E+00	0.9497	0.9276	
9	0.7639E+00	0.1636E+01	0.3773E+03	0.	0.3773E+03	0.3550E+03	0.	-0.5329E+01	-0.3215E+00	0.9442	0.9223	
10	0.9693E+00	0.1731E+01	0.3892E+03	0.	0.3892E+03	0.3687E+03	0.	-0.5103E+01	-0.3431E+00	0.9393	0.9174	
11	0.1186E+01	0.1811E+01	0.3994E+03	0.	0.3994E+03	0.3795E+03	0.	-0.4871E+01	-0.3620E+00	0.9352	0.9131	
12	0.1412E+01	0.1878E+01	0.4077E+03	0.	0.4077E+03	0.3873E+03	0.	-0.4636E+01	-0.3776E+00	0.9321	0.9097	
13	0.1643E+01	0.1933E+01	0.4134E+03	0.	0.4134E+03	0.3925E+03	0.	-0.4398E+01	-0.3885E+00	0.9300	0.9072	
14	0.1880E+01	0.1979E+01	0.4164E+03	0.	0.4164E+03	0.3958E+03	0.	-0.4157E+01	-0.3944E+00	0.9286	0.9059	
15	0.2125E+01	0.2021E+01	0.4206E+03	0.	0.4206E+03	0.3993E+03	0.	-0.3908E+01	-0.4026E+00	0.9272	0.9041	
16	0.2375E+01	0.2063E+01	0.4294E+03	0.	0.4294E+03	0.4052E+03	0.	-0.3655E+01	-0.4201E+00	0.9247	0.9001	
17	0.2625E+01	0.2104E+01	0.4422E+03	0.	0.4422E+03	0.4140E+03	0.	-0.3402E+01	-0.4456E+00	0.9208	0.8943	
18	0.2875E+01	0.2146E+01	0.4575E+03	0.	0.4575E+03	0.4255E+03	0.	-0.3148E+01	-0.4777E+00	0.9155	0.8872	
19	0.3125E+01	0.2188E+01	0.4753E+03	0.	0.4753E+03	0.4393E+03	0.	-0.2895E+01	-0.5158E+00	0.9088	0.8787	
20	0.3375E+01	0.2229E+01	0.4964E+03	0.	0.4964E+03	0.4551E+03	0.	-0.2641E+01	-0.5624E+00	0.9006	0.8682	
21	0.3625E+01	0.2270E+01	0.5205E+03	0.	0.5205E+03	0.4722E+03	0.	-0.2388E+01	-0.6175E+00	0.8910	0.8558	
22	0.3874E+01	0.2308E+01	0.5446E+03	0.	0.5446E+03	0.4898E+03	0.	-0.2136E+01	-0.6747E+00	0.8803	0.8430	
23	0.4123E+01	0.2343E+01	0.5676E+03	0.	0.5676E+03	0.5070E+03	0.	-0.1884E+01	-0.7313E+00	0.8688	0.8303	
24	0.4373E+01	0.2375E+01	0.5906E+03	0.	0.5906E+03	0.5228E+03	0.	-0.1632E+01	-0.7893E+00	0.8573	0.8173	
25	0.4623E+01	0.2404E+01	0.6131E+03	0.	0.6131E+03	0.5358E+03	0.	-0.1380E+01	-0.8477E+00	0.8470	0.8042	
26	0.4874E+01	0.2430E+01	0.6341E+03	0.	0.6341E+03	0.5447E+03	0.	-0.1129E+01	-0.9036E+00	0.8394	0.7916	
27	0.5125E+01	0.2453E+01	0.6530E+03	0.	0.6530E+03	0.5493E+03	0.	-0.8767E+00	-0.9549E+00	0.8353	0.7801	
28	0.5375E+01	0.2473E+01	0.6703E+03	0.	0.6703E+03	0.5521E+03	0.	-0.6252E+00	-0.1003E+01	0.8327	0.7694	
29	0.5626E+01	0.2488E+01	0.6854E+03	0.	0.6854E+03	0.5544E+03	0.	-0.3743E+00	-0.1045E+01	0.8306	0.7599	
30	0.5875E+01	0.2497E+01	0.6919E+03	0.	0.6919E+03	0.5557E+03	0.	-0.1245E+00	-0.1063E+01	0.8294	0.7558	
31	0.6127E+01	0.2500E+01	0.6866E+03	0.	0.6866E+03	0.5561E+03	0.	0.1270E+00	-0.1048E+01	0.8290	0.7591	
32	0.6407E+01	0.2500E+01	0.6808E+03	0.	0.6808E+03	0.5561E+03	0.	0.4065E+00	-0.1032E+01	0.8290	0.7628	
33	0.6742E+01	0.2500E+01	0.6798E+03	0.	0.6798E+03	0.5561E+03	0.	0.7419E+00	-0.1029E+01	0.8290	0.7635	
34	0.7144E+01	0.2500E+01	0.6806E+03	0.	0.6806E+03	0.5561E+03	0.	0.1144E+01	-0.1031E+01	0.8290	0.7629	
35	0.7627E+01	0.2500E+01	0.6824E+03	0.	0.6824E+03	0.5561E+03	0.	0.1627E+01	-0.1036E+01	0.8290	0.7618	
36	0.8207E+01	0.2500E+01	0.6848E+03	0.	0.6848E+03	0.5561E+03	0.	0.2207E+01	-0.1043E+01	0.8290	0.7603	
37	0.8902E+01	0.2500E+01	0.6874E+03	0.	0.6874E+03	0.5561E+03	0.	0.2902E+01	-0.1051E+01	0.8290	0.7586	
38	0.9737E+01	0.2500E+01	0.6876E+03	0.	0.6876E+03	0.5561E+03	0.	0.3737E+01	-0.1051E+01	0.8290	0.7585	
39	0.1064E+02	0.2500E+01	0.6755E+03	0.	0.6755E+03	0.5561E+03	0.	0.4644E+01	-0.1017E+01	0.8290	0.7662	
40	0.1155E+02	0.2500E+01	0.3738E+03	0.	0.3738E+03	0.5561E+03	0.	0.5548E+01	-0.3152E+00	0.8290	0.9237	

SHROUD
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	CPC	RB/RT	PSOPTC
41	0.1155E+02	0.5000E+01	-0.1224E+03	0.	0.1224E+03	0.5561E+03	0.	0.5548E+01	-0.1239E-01	0.8290	0.9916
42	0.1064E+02	0.5000E+01	-0.5795E+03	0.	0.5795E+03	0.5561E+03	0.	0.4644E+01	-0.7611E+00	0.8290	0.8236
43	0.9737E+01	0.5000E+01	-0.6370E+03	0.	0.6370E+03	0.5561E+03	0.	0.3737E+01	-0.9112E+00	0.8290	0.7899
44	0.8902E+01	0.5000E+01	-0.6597E+03	0.	0.6597E+03	0.5561E+03	0.	0.2902E+01	-0.9733E+00	0.8290	0.7760
45	0.8207E+01	0.5000E+01	-0.6663E+03	0.	0.6663E+03	0.5561E+03	0.	0.2207E+01	-0.9915E+00	0.8290	0.7719
46	0.7627E+01	0.5000E+01	-0.6683E+03	0.	0.6683E+03	0.5561E+03	0.	0.1627E+01	-0.9971E+00	0.8290	0.7706
47	0.7144E+01	0.5000E+01	-0.6686E+03	0.	0.6686E+03	0.5561E+03	0.	0.1144E+01	-0.9979E+00	0.8290	0.7705
48	0.6742E+01	0.5000E+01	-0.6683E+03	0.	0.6683E+03	0.5561E+03	0.	0.7419E+00	-0.9969E+00	0.8290	0.7707
49	0.6407E+01	0.5000E+01	-0.6678E+03	0.	0.6678E+03	0.5561E+03	0.	0.4065E+00	-0.9957E+00	0.8290	0.7710
50	0.6127E+01	0.5000E+01	-0.6678E+03	0.	0.6678E+03	0.5561E+03	0.	0.1270E+00	-0.9956E+00	0.8290	0.7710
51	0.5875E+01	0.5000E+01	-0.6666E+03	0.	0.6666E+03	0.5557E+03	0.	-0.1250E+00	-0.9923E+00	0.8294	0.7717
52	0.5625E+01	0.5000E+01	-0.6662E+03	0.	0.6662E+03	0.5544E+03	0.	-0.3750E+00	-0.9913E+00	0.8306	0.7719
53	0.5375E+01	0.5000E+01	-0.6683E+03	0.	0.6683E+03	0.5521E+03	0.	-0.6250E+00	-0.9969E+00	0.8327	0.7707
54	0.5125E+01	0.5000E+01	-0.6775E+03	0.	0.6775E+03	0.5493E+03	0.	-0.8750E+00	-0.1023E+01	0.8353	0.7649
55	0.4879E+01	0.5005E+01	-0.6931E+03	0.	0.6931E+03	0.5448E+03	0.	-0.1121E+01	-0.1067E+01	0.8393	0.7550
56	0.4632E+01	0.5023E+01	-0.6836E+03	0.	0.6836E+03	0.5362E+03	0.	-0.1369E+01	-0.1040E+01	0.8466	0.7611
57	0.4373E+01	0.5058E+01	-0.6453E+03	0.	0.6453E+03	0.5228E+03	0.	-0.1630E+01	-0.9337E+00	0.8573	0.7849
58	0.4102E+01	0.5109E+01	-0.5953E+03	0.	0.5953E+03	0.5055E+03	0.	-0.1906E+01	-0.8014E+00	0.8699	0.8146
59	0.3821E+01	0.5172E+01	-0.5425E+03	0.	0.5425E+03	0.4859E+03	0.	-0.2194E+01	-0.6697E+00	0.8827	0.8441
60	0.3531E+01	0.5242E+01	-0.4923E+03	0.	0.4923E+03	0.4655E+03	0.	-0.2493E+01	-0.5531E+00	0.8949	0.8703
61	0.3236E+01	0.5315E+01	-0.4483E+03	0.	0.4483E+03	0.4460E+03	0.	-0.2795E+01	-0.4585E+00	0.9054	0.8915
62	0.2945E+01	0.5381E+01	-0.4127E+03	0.	0.4127E+03	0.4291E+03	0.	-0.3094E+01	-0.3872E+00	0.9138	0.9075

63	0.2662E+01	0.5436E+01	-0.3867E+03	0.	0.3867E+03	0.4155E+03	0.	-0.3383E+01	-0.3384E+00	0.9201	0.9185
64	0.2390E+01	0.5475E+01	-0.3713E+03	0.	0.3713E+03	0.4056E+03	0.	-0.3658E+01	-0.3105E+00	0.9245	0.9246
65	0.2128E+01	0.5495E+01	-0.3705E+03	0.	0.3705E+03	0.3994E+03	0.	-0.3920E+01	-0.3094E+00	0.9272	0.9250
66	0.1887E+01	0.5500E+01	-0.3857E+03	0.	0.3857E+03	0.3959E+03	0.	-0.4161E+01	-0.3366E+00	0.9286	0.9189
67	0.1673E+01	0.5504E+01	-0.4063E+03	0.	0.4063E+03	0.3930E+03	0.	-0.4375E+01	-0.3750E+00	0.9298	0.9102
68	0.1476E+01	0.5513E+01	-0.4198E+03	0.	0.4198E+03	0.3890E+03	0.	-0.4572E+01	-0.4011E+00	0.9314	0.9044
69	0.1287E+01	0.5531E+01	-0.4279E+03	0.	0.4279E+03	0.3834E+03	0.	-0.4762E+01	-0.4171E+00	0.9337	0.9008
70	0.1107E+01	0.5560E+01	-0.4295E+03	0.	0.4295E+03	0.3760E+03	0.	-0.4945E+01	-0.4203E+00	0.9365	0.9001
71	0.9352E+00	0.5602E+01	-0.4239E+03	0.	0.4239E+03	0.3667E+03	0.	-0.5122E+01	-0.4090E+00	0.9400	0.9026
72	0.7730E+00	0.5657E+01	-0.4108E+03	0.	0.4108E+03	0.3557E+03	0.	-0.5293E+01	-0.3836E+00	0.9440	0.9083
73	0.6209E+00	0.5727E+01	-0.3901E+03	0.	0.3901E+03	0.3432E+03	0.	-0.5460E+01	-0.3447E+00	0.9482	0.9170
74	0.4811E+00	0.5811E+01	-0.3630E+03	0.	0.3630E+03	0.3294E+03	0.	-0.5624E+01	-0.2965E+00	0.9527	0.9279
75	0.3557E+00	0.5910E+01	-0.3302E+03	0.	0.3302E+03	0.3150E+03	0.	-0.5783E+01	-0.2423E+00	0.9571	0.9400
76	0.2457E+00	0.6022E+01	-0.2930E+03	0.	0.2930E+03	0.3001E+03	0.	-0.5940E+01	-0.1864E+00	0.9613	0.9526
77	0.1537E+00	0.6147E+01	-0.2528E+03	0.	0.2528E+03	0.2851E+03	0.	-0.6096E+01	-0.1331E+00	0.9654	0.9645
78	0.8191E-01	0.6283E+01	-0.2112E+03	0.	0.2112E+03	0.2704E+03	0.	-0.6249E+01	-0.8569E-01	0.9690	0.9752
79	0.3236E-01	0.6427E+01	-0.1689E+03	0.	0.1689E+03	0.2563E+03	0.	-0.6401E+01	-0.4607E-01	0.9723	0.9841
80	0.6693E-02	0.6575E+01	-0.1235E+03	0.	0.1235E+03	0.2431E+03	0.	-0.6552E+01	-0.1308E-01	0.9752	0.9915
81	0.	0.6741E+01	-0.8477E+02	0.	0.8477E+02	0.2295E+03	0.	-0.6718E+01	0.7025E-02	0.9780	0.9960
82	0.	0.6942E+01	-0.6184E+02	0.	0.6184E+02	0.2130E+03	0.	-0.6919E+01	0.1543E-01	0.9812	0.9979
83	0.	0.7183E+01	-0.4170E+02	0.	0.4170E+02	0.1953E+03	0.	-0.7160E+01	0.2065E-01	0.9843	0.9990
84	0.	0.7472E+01	-0.2395E+02	0.	0.2395E+02	0.1766E+03	0.	-0.7449E+01	0.2356E-01	0.9872	0.9997
85	0.	0.7819E+01	-0.8000E+01	0.	0.8000E+01	0.1573E+03	0.	-0.7796E+01	0.2484E-01	0.9899	1.0000
86	0.	0.8236E+01	0.6482E+01	0.	0.6482E+01	0.1376E+03	0.	-0.8213E+01	0.2489E-01	0.9923	1.0000
87	0.	0.8736E+01	0.1968E+02	0.	0.1968E+02	0.1182E+03	0.	-0.8712E+01	0.2403E-01	0.9943	0.9998
88	0.	0.9335E+01	0.3168E+02	0.	0.3168E+02	0.9946E+02	0.	-0.9312E+01	0.2249E-01	0.9960	0.9994
89	0.	0.1006E+02	0.4252E+02	0.	0.4252E+02	0.8190E+02	0.	-0.1003E+02	0.2047E-01	0.9973	0.9990
90	0.	0.1092E+02	0.5217E+02	0.	0.5217E+02	0.6592E+02	0.	-0.1090E+02	0.1819E-01	0.9983	0.9985
91	0.	0.1187E+02	0.6113E+02	0.	0.6113E+02	0.5283E+02	0.	-0.1184E+02	0.1565E-01	0.9989	0.9979
92	0.	0.1282E+02	0.6819E+02	0.	0.6819E+02	0.4295E+02	0.	-0.1280E+02	0.1336E-01	0.9993	0.9974
93	0.	0.1378E+02	0.7394E+02	0.	0.7394E+02	0.3540E+02	0.	-0.1376E+02	0.1132E-01	0.9995	0.9969
94	0.	0.1474E+02	0.7882E+02	0.	0.7882E+02	0.2953E+02	0.	-0.1471E+02	0.9456E-02	0.9996	0.9965
95	0.	0.1569E+02	0.8318E+02	0.	0.8318E+02	0.2489E+02	0.	-0.1567E+02	0.7691E-02	0.9998	0.9961
96	0.	0.1665E+02	0.8734E+02	0.	0.8734E+02	0.2118E+02	0.	-0.1663E+02	0.5926E-02	0.9998	0.9957
97	0.	0.1761E+02	0.9172E+02	0.	0.9172E+02	0.1818E+02	0.	-0.1758E+02	0.3961E-02	0.9999	0.9953
98	0.	0.1856E+02	0.9723E+02	0.	0.9723E+02	0.1571E+02	0.	-0.1854E+02	0.1365E-02	0.9999	0.9947
99	0.	0.1952E+02	0.1113E+03	0.	0.1113E+03	0.1368E+02	0.	-0.1950E+02	-0.5941E-02	0.9960	0.9931

OFF-BODY POINTS (RAKES)

I	COORDINATES AXIAL X	COORDINATES RADIAL Y	VELOCITIES AXIAL VX	VELOCITIES RADIAL VY	VELOCITIES CIRCUMFRNTL VZ	VELOCITIES RESULTANT VRES	VELOCITIES MERIDIONAL VM	VELOCITIES CHORDWISE VAFT	VELOCITIES SPANWISE VSPAN	PRESS.RATIO COMP RHOBR	PRESS.RATIO COMP PSOPTC
	2.0000E+00	1.9996E+00	4.1188E+02	7.0619E+01	-0.	4.1789E+02	4.1789E+02	7.0619E+01	0.		0.9052
1	2.0000E+00	2.5000E+00	4.0442E+02	5.3993E+01	0.	4.0801E+02	4.0801E+02	5.3993E+01	0.	0.9280	0.9095
2	2.0000E+00	3.0000E+00	4.0028E+02	3.1052E+01	0.	4.0148E+02	4.0148E+02	3.1052E+01	0.	0.9280	0.9123
3	2.0000E+00	3.5000E+00	3.9746E+02	8.5291E+00	0.	3.9755E+02	3.9755E+02	8.5291E+00	0.	0.9280	0.9139
4	2.0000E+00	4.0000E+00	3.9510E+02	-1.1332E+01	0.	3.9526E+02	3.9526E+02	-1.1332E+01	-0.	0.9280	0.9149
5	2.0000E+00	4.5000E+00	3.9261E+02	-2.6037E+01	0.	3.9348E+02	3.9348E+02	-2.6037E+01	-0.	0.9280	0.9156
6	2.0000E+00	5.0000E+00	3.8855E+02	-2.9855E+01	0.	3.8970E+02	3.8970E+02	-2.9855E+01	-0.	0.9280	0.9172
	2.0000E+00	5.4981E+00	3.7736E+02	-8.7115E+00	-0.	3.7746E+02	3.7746E+02	-8.7115E+00	-0.		0.9222
	4.0000E+00	2.3258E+00	5.5091E+02	7.6792E+01	-0.	5.5624E+02	5.5624E+02	7.6792E+01	0.		0.8366
7	4.0000E+00	2.7500E+00	5.4905E+02	4.6162E+01	0.	5.5099E+02	5.5099E+02	4.6162E+01	0.	0.8746	0.8395
8	4.0000E+00	3.0000E+00	5.4851E+02	3.0473E+01	0.	5.4935E+02	5.4935E+02	3.0473E+01	0.	0.8746	0.8404
9	4.0000E+00	3.2500E+00	5.4850E+02	1.5926E+01	0.	5.4873E+02	5.4873E+02	1.5926E+01	0.	0.8746	0.8407
10	4.0000E+00	3.5000E+00	5.4908E+02	1.9939E+00	0.	5.4908E+02	5.4908E+02	1.9939E+00	0.	0.8746	0.8405
11	4.0000E+00	3.7500E+00	5.5034E+02	-1.1847E+01	0.	5.5047E+02	5.5047E+02	-1.1847E+01	-0.	0.8746	0.8398
12	4.0000E+00	4.0000E+00	5.5239E+02	-2.6186E+01	0.	5.5301E+02	5.5301E+02	-2.6186E+01	-0.	0.8746	0.8384
13	4.0000E+00	4.2500E+00	5.5530E+02	-4.1762E+01	0.	5.5687E+02	5.5687E+02	-4.1762E+01	-0.	0.8746	0.8363
14	4.0000E+00	4.5000E+00	5.5904E+02	-5.9598E+01	0.	5.6220E+02	5.6220E+02	-5.9598E+01	-0.	0.8746	0.8333
15	4.0000E+00	4.7500E+00	5.6322E+02	-8.1123E+01	0.	5.6903E+02	5.6903E+02	-8.1123E+01	-0.	0.8746	0.8295
	4.0000E+00	5.1310E+00	5.6211E+02	-1.2421E+02	-0.	5.7567E+02	5.7567E+02	-1.2421E+02	-0.		0.8258
	6.0000E+00	2.4990E+00	6.8925E+02	7.2363E+00	-0.	6.8929E+02	6.8929E+02	7.2363E+00	0.		0.7574
16	6.0000E+00	2.7500E+00	6.8081E+02	1.1238E+01	0.	6.8090E+02	6.8090E+02	1.1238E+01	0.	0.8291	0.7628
17	6.0000E+00	3.0000E+00	6.7363E+02	1.1131E+01	0.	6.7372E+02	6.7372E+02	1.1131E+01	0.	0.8291	0.7673
18	6.0000E+00	3.2500E+00	6.6952E+02	9.3051E+00	0.	6.6959E+02	6.6959E+02	9.3051E+00	0.	0.8291	0.7699
19	6.0000E+00	3.5000E+00	6.6746E+02	6.9361E+00	0.	6.6749E+02	6.6749E+02	6.9361E+00	0.	0.8291	0.7712
20	6.0000E+00	3.7500E+00	6.6688E+02	4.5743E+00	0.	6.6690E+02	6.6690E+02	4.5743E+00	0.	0.8291	0.7715
21	6.0000E+00	4.0000E+00	6.6740E+02	2.5484E+00	0.	6.6741E+02	6.6741E+02	2.5484E+00	0.	0.8291	0.7712
22	6.0000E+00	4.2500E+00	6.6864E+02	1.0789E+00	0.	6.6864E+02	6.6864E+02	1.0789E+00	0.	0.8291	0.7704
23	6.0000E+00	4.5000E+00	6.7015E+02	2.7859E-01	0.	6.7016E+02	6.7015E+02	2.7859E-01	0.	0.8291	0.7695
24	6.0000E+00	4.7500E+00	6.7149E+02	7.3076E-02	0.	6.7149E+02	6.7149E+02	7.3076E-02	0.	0.8291	0.7687
	6.0000E+00	5.0000E+00	6.6708E+02	0.	-0.	6.6708E+02	6.6708E+02	-0.	0.		0.7714

I	COORDINATES AXIAL X	COORDINATES RADIAL Y	NEW CP VBRI	NEW CP CPC	ANGLES MERIDIONAL ALPHA	ANGLES FLOW BETA	ANGLES UNDERTURNG ETA	ANGLES SPANWISE ZETA	ANGLES SWIRL PHI	QFRACT
	2.0000E+00	1.9996E+00		-3.9732E-01	9.7290E+00	0.	9.7290E+00	0.	-0.	0.
1	2.0000E+00	2.5000E+00	3.9729E+02	-3.7825E-01	7.6044E+00	0.	7.6044E+00	0.	0.	8.8332E-02
2	2.0000E+00	3.0000E+00	3.9729E+02	-3.6587E-01	4.4359E+00	0.	4.4359E+00	0.	0.	1.9502E-01
3	2.0000E+00	3.5000E+00	3.9729E+02	-3.5849E-01	1.2293E+00	0.	1.2293E+00	0.	0.	3.2025E-01
4	2.0000E+00	4.0000E+00	3.9729E+02	-3.5423E-01	-1.6429E+00	0.	-1.6429E+00	-0.	0.	4.6396E-01
5	2.0000E+00	4.5000E+00	3.9729E+02	-3.5092E-01	-3.7941E+00	0.	-3.7941E+00	-0.	0.	6.2595E-01
6	2.0000E+00	5.0000E+00	3.9729E+02	-3.4395E-01	-4.3937E+00	0.	-4.3937E+00	-0.	0.	8.0563E-01
	2.0000E+00	5.4981E+00		-3.2181E-01	-1.3224E+00	-0.	-1.3224E+00	-0.	-0.	1.0000E+00
	4.0000E+00	2.3258E+00		-7.0308E-01	7.9354E+00	-0.	7.9354E+00	0.	-0.	0.
7	4.0000E+00	2.7500E+00	4.9860E+02	-6.9025E-01	4.8058E+00	0.	4.8058E+00	0.	0.	1.0229E-01
8	4.0000E+00	3.0000E+00	4.9860E+02	-6.8626E-01	3.1798E+00	0.	3.1798E+00	0.	0.	1.7055E-01
9	4.0000E+00	3.2500E+00	4.9860E+02	-6.8475E-01	1.6631E+00	0.	1.6631E+00	0.	0.	2.4475E-01
10	4.0000E+00	3.5000E+00	4.9860E+02	-6.8561E-01	2.0806E-01	0.	2.0806E-01	0.	0.	3.2493E-01
11	4.0000E+00	3.7500E+00	4.9860E+02	-6.8899E-01	-1.2332E+00	0.	-1.2332E+00	-0.	0.	4.1116E-01
12	4.0000E+00	4.0000E+00	4.9860E+02	-6.9518E-01	-2.7140E+00	0.	-2.7140E+00	-0.	0.	5.0353E-01
13	4.0000E+00	4.2500E+00	4.9860E+02	-7.0463E-01	-4.3009E+00	0.	-4.3009E+00	-0.	0.	6.0216E-01
14	4.0000E+00	4.5000E+00	4.9860E+02	-7.1777E-01	-6.0853E+00	0.	-6.0853E+00	-0.	0.	7.0716E-01
15	4.0000E+00	4.7500E+00	4.9860E+02	-7.3472E-01	-8.1962E+00	0.	-8.1962E+00	-0.	0.	8.1863E-01
	4.0000E+00	5.1310E+00		-7.5134E-01	-1.2461E+01	-0.	-1.2461E+01	-0.	-0.	1.0000E+00

	6.0000E+00	2.4990E+00		-1.0559E+00	6.0152E-01	-0.	6.0152E-01	0.	-0.	0.
16	6.0000E+00	2.7500E+00	5.5595E+02	-1.0322E+00	9.4572E-01	0.	9.4572E-01	0.	0.	7.1136E-02
17	6.0000E+00	3.0000E+00	5.5595E+02	-1.0121E+00	9.4670E-01	0.	9.4670E-01	0.	0.	1.4822E-01
18	6.0000E+00	3.2500E+00	5.5595E+02	-1.0006E+00	7.9625E-01	0.	7.9625E-01	0.	0.	2.3159E-01
19	6.0000E+00	3.5000E+00	5.5595E+02	-9.9478E-01	5.9538E-01	0.	5.9538E-01	0.	0.	3.2138E-01
20	6.0000E+00	3.7500E+00	5.5595E+02	-9.9313E-01	3.9299E-01	0.	3.9299E-01	0.	0.	4.1771E-01
21	6.0000E+00	4.0000E+00	5.5595E+02	-9.9454E-01	2.1878E-01	0.	2.1878E-01	0.	0.	5.2068E-01
22	6.0000E+00	4.2500E+00	5.5595E+02	-9.9796E-01	9.2455E-02	0.	9.2455E-02	0.	0.	6.3039E-01
23	6.0000E+00	4.5000E+00	5.5595E+02	-1.0022E+00	2.3819E-02	0.	2.3819E-02	0.	0.	7.4689E-01
24	6.0000E+00	4.7500E+00	5.5595E+02	-1.0059E+00	6.2353E-03	0.	6.2353E-03	0.	0.	8.7021E-01
	6.0000E+00	5.0000E+00		-9.9362E-01	0.	-0.	-0.	0.	-0.	1.0000E+00

RELATIVE ROTOR INLET DATA

X = 6.0000 UTIP = 900.0000

Y	U	VZPRIME	VPRIM	MPRIME	BETAPR	VZPRST	VPRST	MPRS	BETAPS
2.4990E+00	4.4982E+02	-4.4982E+02	8.2307E+02	7.6742E-01	-3.3128E+01	-4.4982E+02	8.2307E+02	7.6742E-01	-3.3128E+01
2.7500E+00	4.9500E+02	-4.9500E+02	8.4181E+02	7.8411E-01	-3.6016E+01	-4.9500E+02	8.4181E+02	7.8411E-01	-3.6016E+01
3.0000E+00	5.4000E+02	-5.4000E+02	8.6342E+02	8.0356E-01	-3.8713E+01	-5.4000E+02	8.6342E+02	8.0356E-01	-3.8713E+01
3.2500E+00	5.8500E+02	-5.8500E+02	8.8914E+02	8.2710E-01	-4.1143E+01	-5.8500E+02	8.8914E+02	8.2710E-01	-4.1143E+01
3.5000E+00	6.3000E+02	-6.3000E+02	9.1785E+02	8.5359E-01	-4.3345E+01	-6.3000E+02	9.1785E+02	8.5359E-01	-4.3345E+01
3.7500E+00	6.7500E+02	-6.7500E+02	9.4888E+02	8.8240E-01	-4.5346E+01	-6.7500E+02	9.4888E+02	8.8240E-01	-4.5346E+01
4.0000E+00	7.2000E+02	-7.2000E+02	9.8175E+02	9.1301E-01	-4.7171E+01	-7.2000E+02	9.8175E+02	9.1301E-01	-4.7171E+01
4.2500E+00	7.6500E+02	-7.6500E+02	1.0160E+03	9.4502E-01	-4.8845E+01	-7.6500E+02	1.0160E+03	9.4502E-01	-4.8845E+01
4.5000E+00	8.1000E+02	-8.1000E+02	1.0513E+03	9.7799E-01	-5.0397E+01	-8.1000E+02	1.0513E+03	9.7799E-01	-5.0397E+01
4.7500E+00	8.5500E+02	-8.5500E+02	1.0872E+03	1.0115E+00	-5.1855E+01	-8.5500E+02	1.0872E+03	1.0115E+00	-5.1855E+01
5.0000E+00	9.0000E+02	-9.0000E+02	1.1203E+03	1.0418E+00	-5.3454E+01	-9.0000E+02	1.1203E+03	1.0418E+00	-5.3454E+01

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RAKE WEIGHT FLOW DATA

I	X	(Q(I)-QBAR)/QBAR	QS TOT	QFR
1	2.0000E+00	-6.9979E-02	1.6190E+01	1.0000E+00
2	4.0000E+00	-2.1595E-02	1.7032E+01	1.0000E+00
3	6.0000E+00	0.	1.7408E+01	1.0000E+00

STREAMLINES

X = 2.000

QSTRM	YSTRM
2.00000E-02	2.11972E+00
4.00000E-02	2.23588E+00
6.00000E-02	2.34802E+00
8.00000E-02	2.45614E+00
1.00000E-01	2.55800E+00
1.20000E-01	2.65552E+00
1.40000E-01	2.75065E+00
1.60000E-01	2.84339E+00
1.80000E-01	2.93373E+00
2.00000E-01	3.02103E+00
2.20000E-01	3.10452E+00
2.40000E-01	3.18648E+00
2.60000E-01	3.26692E+00
2.80000E-01	3.34583E+00
3.00000E-01	3.42321E+00
3.20000E-01	3.49906E+00
3.40000E-01	3.57186E+00
3.60000E-01	3.64361E+00

3.80000E-01	3.71432E+00
4.00000E-01	3.78402E+00
4.20000E-01	3.85268E+00
4.40000E-01	3.92032E+00
4.60000E-01	3.98693E+00
4.80000E-01	4.05159E+00
5.00000E-01	4.11528E+00
5.20000E-01	4.17826E+00
5.40000E-01	4.24052E+00
5.60000E-01	4.30208E+00
5.80000E-01	4.36292E+00
6.00000E-01	4.42305E+00
6.20000E-01	4.48247E+00
6.40000E-01	4.54047E+00
6.60000E-01	4.59767E+00
6.80000E-01	4.65440E+00
7.00000E-01	4.71066E+00
7.20000E-01	4.76645E+00
7.40000E-01	4.82177E+00
7.60000E-01	4.87662E+00
7.80000E-01	4.93099E+00
8.00000E-01	4.98490E+00
8.20000E-01	5.03834E+00
8.40000E-01	5.09130E+00
8.60000E-01	5.14380E+00
8.80000E-01	5.19583E+00
9.00000E-01	5.24738E+00
9.20000E-01	5.29846E+00
9.40000E-01	5.34908E+00
9.60000E-01	5.39922E+00
9.80000E-01	5.44890E+00
1.00000E+00	5.49810E+00

X = 4.000

QSTRM	YSTRM
2.00000E-02	2.41343E+00
4.00000E-02	2.49876E+00
6.00000E-02	2.58183E+00
8.00000E-02	2.66262E+00
1.00000E-01	2.74114E+00
1.20000E-01	2.81669E+00
1.40000E-01	2.89047E+00
1.60000E-01	2.96260E+00
1.80000E-01	3.03283E+00
2.00000E-01	3.10137E+00
2.20000E-01	3.16860E+00
2.40000E-01	3.23453E+00
2.60000E-01	3.29885E+00
2.80000E-01	3.36199E+00
3.00000E-01	3.42408E+00
3.20000E-01	3.48512E+00
3.40000E-01	3.54485E+00
3.60000E-01	3.60361E+00
3.80000E-01	3.66151E+00
4.00000E-01	3.71855E+00
4.20000E-01	3.77459E+00
4.40000E-01	3.82970E+00
4.60000E-01	3.88409E+00
4.80000E-01	3.93777E+00
5.00000E-01	3.99072E+00

5.20000E-01	4.04277E+00
5.40000E-01	4.09415E+00
5.60000E-01	4.14494E+00
5.80000E-01	4.19511E+00
6.00000E-01	4.24468E+00
6.20000E-01	4.29347E+00
6.40000E-01	4.34172E+00
6.60000E-01	4.38945E+00
6.80000E-01	4.43668E+00
7.00000E-01	4.48339E+00
7.20000E-01	4.52940E+00
7.40000E-01	4.57490E+00
7.60000E-01	4.62000E+00
7.80000E-01	4.66472E+00
8.00000E-01	4.70905E+00
8.20000E-01	4.75299E+00
8.40000E-01	4.79655E+00
8.60000E-01	4.83971E+00
8.80000E-01	4.88249E+00
9.00000E-01	4.92489E+00
9.20000E-01	4.96689E+00
9.40000E-01	5.00851E+00
9.60000E-01	5.04974E+00
9.80000E-01	5.09058E+00
1.00000E+00	5.13104E+00

X = 6.000

QSTRM	YSTRM
2.00000E-02	2.57153E+00
4.00000E-02	2.64253E+00
6.00000E-02	2.71199E+00
8.00000E-02	2.77967E+00
1.00000E-01	2.84573E+00
1.20000E-01	2.91058E+00
1.40000E-01	2.97421E+00
1.60000E-01	3.03637E+00
1.80000E-01	3.09733E+00
2.00000E-01	3.15730E+00
2.20000E-01	3.21628E+00
2.40000E-01	3.27412E+00
2.60000E-01	3.33088E+00
2.80000E-01	3.38682E+00
3.00000E-01	3.44196E+00
3.20000E-01	3.49628E+00
3.40000E-01	3.54954E+00
3.60000E-01	3.60210E+00
3.80000E-01	3.65399E+00
4.00000E-01	3.70521E+00
4.20000E-01	3.75573E+00
4.40000E-01	3.80538E+00
4.60000E-01	3.85448E+00
4.80000E-01	3.90301E+00
5.00000E-01	3.95098E+00
5.20000E-01	3.99840E+00
5.40000E-01	4.04505E+00
5.60000E-01	4.09123E+00
5.80000E-01	4.13694E+00
6.00000E-01	4.18217E+00
6.20000E-01	4.22694E+00
6.40000E-01	4.27114E+00

6.60000E-01	4.31482E+00
6.80000E-01	4.35811E+00
7.00000E-01	4.40100E+00
7.20000E-01	4.44349E+00
7.40000E-01	4.48559E+00
7.60000E-01	4.52716E+00
7.80000E-01	4.56832E+00
8.00000E-01	4.60916E+00
8.20000E-01	4.64968E+00
8.40000E-01	4.68989E+00
8.60000E-01	4.72977E+00
8.80000E-01	4.76933E+00
9.00000E-01	4.80858E+00
9.20000E-01	4.84750E+00
9.40000E-01	4.88610E+00
9.60000E-01	4.92439E+00
9.80000E-01	4.96235E+00
1.00000E+00	5.00000E+00

2 OF 3 THETAS

THETA = 0.90000E+02 WDOTT = 1.78504E+01 VICT = 5.70305E+02 V3 = -1.42602E-01

HUB
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	CPC	RB/RT	PSOPTC
1	0.	0.1250E+00	0.1173E+02	0.8840E+02	0.8918E+02	0.2354E+03	0.8244E+02	-0.7153E+01	0.511CE-02	0.9769	0.9955
2	-0.	0.3750E+00	0.3513E+02	0.8910E+02	0.9578E+02	0.2354E+03	0.6848E+02	-0.6903E+01	0.2063E-02	0.9769	0.9949
3	0.8379E-02	0.6254E+00	0.7448E+02	0.9143E+02	0.1179E+03	0.2503E+03	0.5083E+02	-0.6652E+01	-0.9741E-02	0.9737	0.9922
4	0.4613E-01	0.8560E+00	0.1401E+03	0.9484E+02	0.1692E+03	0.2671E+03	0.3410E+02	-0.6418E+01	-0.463CE-01	0.9698	0.9840
5	0.1267E+00	0.1057E+01	0.1989E+03	0.9712E+02	0.2214E+03	0.2869E+03	0.2602E+02	-0.6202E+01	-0.9654E-01	0.9649	0.9727
6	0.2473E+00	0.1236E+01	0.2492E+03	0.9810E+02	0.2678E+03	0.3080E+03	0.2148E+02	-0.5986E+01	-0.1521E+00	0.9591	0.9603
7	0.3999E+00	0.1392E+01	0.2903E+03	0.9795E+02	0.3064E+03	0.3285E+03	0.1864E+02	-0.5768E+01	-0.2057E+00	0.9530	0.9482
8	0.5738E+00	0.1524E+01	0.3239E+03	0.9694E+02	0.3381E+03	0.3474E+03	0.1666E+02	-0.5549E+01	-0.2549E+00	0.9468	0.9372
9	0.7639E+00	0.1636E+01	0.3520E+03	0.9531E+02	0.3646E+03	0.3641E+03	0.1515E+02	-0.5329E+01	-0.2993E+00	0.9410	0.9272
10	0.9693E+00	0.1731E+01	0.3764E+03	0.9315E+02	0.3877E+03	0.3781E+03	0.1390E+02	-0.5103E+01	-0.3403E+00	0.9357	0.9180
11	0.1186E+01	0.1811E+01	0.3970E+03	0.9057E+02	0.4072E+03	0.3892E+03	0.1285E+02	-0.4871E+01	-0.3768E+00	0.9314	0.9098
12	0.1412E+01	0.1878E+01	0.4136E+03	0.8766E+02	0.4228E+03	0.3972E+03	0.1197E+02	-0.4636E+01	-0.407CE+00	0.9281	0.9031
13	0.1643E+01	0.1933E+01	0.4257E+03	0.8450E+02	0.4340E+03	0.4025E+03	0.1123E+02	-0.4398E+01	-0.4293E+00	0.9258	0.8981
14	0.1880E+01	0.1979E+01	0.4333E+03	0.8117E+02	0.4408E+03	0.4060E+03	0.1061E+02	-0.4157E+01	-0.4431E+00	0.9243	0.8950
15	0.2125E+01	0.2021E+01	0.4401E+03	0.7769E+02	0.4469E+03	0.4095E+03	0.1001E+02	-0.3908E+01	-0.4556E+00	0.9228	0.8921
16	0.2375E+01	0.2063E+01	0.4510E+03	0.7416E+02	0.4570E+03	0.4155E+03	0.9338E+01	-0.3655E+01	-0.4767E+00	0.9201	0.8874
17	0.2625E+01	0.2104E+01	0.4654E+03	0.7068E+02	0.4707E+03	0.4245E+03	0.8636E+01	-0.3402E+01	-0.5057E+00	0.9160	0.8809
18	0.2875E+01	0.2146E+01	0.4820E+03	0.6729E+02	0.4867E+03	0.4363E+03	0.7946E+01	-0.3148E+01	-0.5407E+00	0.9103	0.8731
19	0.3125E+01	0.2188E+01	0.5010E+03	0.6401E+02	0.5051E+03	0.4505E+03	0.7281E+01	-0.2895E+01	-0.5820E+00	0.9031	0.8638
20	0.3375E+01	0.2229E+01	0.5232E+03	0.6089E+02	0.5267E+03	0.4667E+03	0.6638E+01	-0.2641E+01	-0.6322E+00	0.8942	0.8525
21	0.3625E+01	0.2270E+01	0.5485E+03	0.5795E+02	0.5515E+03	0.4842E+03	0.6031E+01	-0.2388E+01	-0.6916E+00	0.8838	0.8392
22	0.3874E+01	0.2308E+01	0.5738E+03	0.5519E+02	0.5764E+03	0.5023E+03	0.5494E+01	-0.2136E+01	-0.7533E+00	0.8721	0.8254
23	0.4123E+01	0.2343E+01	0.5979E+03	0.5260E+02	0.6002E+03	0.5199E+03	0.5028E+01	-0.1884E+01	-0.8139E+00	0.8595	0.8118
24	0.4373E+01	0.2375E+01	0.6217E+03	0.5016E+02	0.6237E+03	0.5361E+03	0.4613E+01	-0.1632E+01	-0.8758E+00	0.8467	0.7979
25	0.4623E+01	0.2404E+01	0.6450E+03	0.4783E+02	0.6467E+03	0.5495E+03	0.4241E+01	-0.1380E+01	-0.9377E+00	0.8351	0.7840
26	0.4874E+01	0.2430E+01	0.6664E+03	0.4553E+02	0.6679E+03	0.5586E+03	0.3908E+01	-0.1129E+01	-0.996CE+00	0.8266	0.7709
27	0.5125E+01	0.2453E+01	0.6852E+03	0.4325E+02	0.6865E+03	0.5633E+03	0.3612E+01	-0.8767E+00	-0.1048E+01	0.8219	0.7592
28	0.5375E+01	0.2473E+01	0.7020E+03	0.4108E+02	0.7032E+03	0.5662E+03	0.3349E+01	-0.6252E+00	-0.1095E+01	0.8190	0.7486
29	0.5626E+01	0.2488E+01	0.7165E+03	0.3907E+02	0.7175E+03	0.5685E+03	0.3121E+01	-0.3743E+00	-0.1137E+01	0.8166	0.7393
30	0.5875E+01	0.2497E+01	0.7219E+03	0.3718E+02	0.7228E+03	0.5699E+03	0.2948E+01	-0.1245E+00	-0.1152E+01	0.8151	0.7358
31	0.6127E+01	0.2500E+01	0.7146E+03	0.3539E+02	0.7155E+03	0.5703E+03	0.2835E+01	0.1270E+00	-0.1131E+01	0.8147	0.7406
32	0.6407E+01	0.2500E+01	0.7063E+03	0.3364E+02	0.7071E+03	0.5703E+03	0.2727E+01	0.4065E+00	-0.1107E+01	0.8147	0.7461

33	0.6742E+01	0.2500E+01	0.7028E+03	0.3185E+02	0.7035E+03	0.5703E+03	0.2595E+01	0.7419E+00	-0.1096E+01	0.8147	0.7483
34	0.7144E+01	0.2500E+01	0.7010E+03	0.3006E+02	0.7016E+03	0.5703E+03	0.2456E+01	0.1144E+01	-0.1091E+01	0.8147	0.7496
35	0.7627E+01	0.2500E+01	0.6998E+03	0.2839E+02	0.7004E+03	0.5703E+03	0.2323E+01	0.1627E+01	-0.1087E+01	0.8147	0.7504
36	0.8207E+01	0.2500E+01	0.6989E+03	0.2700E+02	0.6994E+03	0.5703E+03	0.2212E+01	0.2207E+01	-0.1085E+01	0.8147	0.7510
37	0.8902E+01	0.2500E+01	0.6979E+03	0.2616E+02	0.6984E+03	0.5703E+03	0.2147E+01	0.2902E+01	-0.1082E+01	0.8147	0.7516
38	0.9737E+01	0.2500E+01	0.6946E+03	0.2618E+02	0.6951E+03	0.5703E+03	0.2159E+01	0.3737E+01	-0.1072E+01	0.8147	0.7537
39	0.1064E+02	0.2500E+01	0.6801E+03	0.2705E+02	0.6806E+03	0.5703E+03	0.2278E+01	0.4644E+01	-0.1031E+01	0.8147	0.7629
40	0.1155E+02	0.2500E+01	0.3710E+03	0.2605E+02	0.3719E+03	0.5703E+03	0.4017E+01	0.5548E+01	-0.3119E+00	0.8147	0.9244

SHROUD
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	CFC	RB/RT	PSOPTC
41	0.1155E+02	0.5000E+01	-0.6888E+02	0.1700E+02	0.7095E+02	0.5703E+03	-0.1386E+02	0.5548E+01	0.1240E-01	0.8147	0.9972
42	0.1064E+02	0.5000E+01	-0.5681E+03	0.1522E+02	0.5683E+03	0.5703E+03	-0.1535E+01	0.4644E+01	-0.7329E+00	0.8147	0.8299
43	0.9737E+01	0.5000E+01	-0.6380E+03	0.1401E+02	0.6381E+03	0.5703E+03	-0.1258E+01	0.3737E+01	-0.9143E+00	0.8147	0.7892
44	0.8902E+01	0.5000E+01	-0.6680E+03	0.1382E+02	0.6682E+03	0.5703E+03	-0.1185E+01	0.2902E+01	-0.9967E+00	0.8147	0.7707
45	0.8207E+01	0.5000E+01	-0.6796E+03	0.1422E+02	0.6797E+03	0.5703E+03	-0.1199E+01	0.2207E+01	-0.1029E+01	0.8147	0.7635
46	0.7627E+01	0.5000E+01	-0.6856E+03	0.1495E+02	0.6858E+03	0.5703E+03	-0.1249E+01	0.1627E+01	-0.1046E+01	0.8147	0.7597
47	0.7144E+01	0.5000E+01	-0.6893E+03	0.1585E+02	0.6895E+03	0.5703E+03	-0.1317E+01	0.1144E+01	-0.1056E+01	0.8147	0.7573
48	0.6742E+01	0.5000E+01	-0.6919E+03	0.1681E+02	0.6921E+03	0.5703E+03	-0.1392E+01	0.7419E+00	-0.1064E+01	0.8147	0.7556
49	0.6407E+01	0.5000E+01	-0.6941E+03	0.1777E+02	0.6944E+03	0.5703E+03	-0.1466E+01	0.4065E+00	-0.1070E+01	0.8147	0.7542
50	0.6127E+01	0.5000E+01	-0.6965E+03	0.1869E+02	0.6968E+03	0.5703E+03	-0.1537E+01	0.1270E+00	-0.1077E+01	0.8147	0.7527
51	0.5875E+01	0.5000E+01	-0.6975E+03	0.1961E+02	0.6978E+03	0.5699E+03	-0.1610E+01	-0.1250E+00	-0.1080E+01	0.8151	0.7520
52	0.5625E+01	0.5000E+01	-0.6994E+03	0.2060E+02	0.6997E+03	0.5685E+03	-0.1688E+01	-0.3750E+00	-0.1085E+01	0.8166	0.7508
53	0.5375E+01	0.5000E+01	-0.7037E+03	0.2171E+02	0.7040E+03	0.5662E+03	-0.1767E+01	-0.6250E+00	-0.1098E+01	0.8190	0.7480
54	0.5125E+01	0.5000E+01	-0.7149E+03	0.2295E+02	0.7153E+03	0.5633E+03	-0.1839E+01	-0.8750E+00	-0.1130E+01	0.8219	0.7407
55	0.4879E+01	0.5005E+01	-0.7357E+03	0.2435E+02	0.7361E+03	0.5587E+03	-0.1895E+01	-0.1121E+01	-0.1191E+01	0.8265	0.7271
56	0.4632E+01	0.5023E+01	-0.7313E+03	0.2568E+02	0.7318E+03	0.5499E+03	-0.2011E+01	-0.1369E+01	-0.1178E+01	0.8348	0.7300
57	0.4373E+01	0.5058E+01	-0.6944E+03	0.2689E+02	0.6949E+03	0.5361E+03	-0.2218E+01	-0.1630E+01	-0.1072E+01	0.8467	0.7539
58	0.4102E+01	0.5109E+01	-0.6445E+03	0.2809E+02	0.6452E+03	0.5185E+03	-0.2495E+01	-0.1906E+01	-0.9334E+00	0.8606	0.7849
59	0.3821E+01	0.5172E+01	-0.5916E+03	0.2933E+02	0.5923E+03	0.4984E+03	-0.2838E+01	-0.2194E+01	-0.7936E+00	0.8747	0.8163
60	0.3531E+01	0.5242E+01	-0.5414E+03	0.3067E+02	0.5423E+03	0.4774E+03	-0.3242E+01	-0.2493E+01	-0.6691E+00	0.8879	0.8442
61	0.3236E+01	0.5315E+01	-0.4978E+03	0.3213E+02	0.4988E+03	0.4574E+03	-0.3693E+01	-0.2795E+01	-0.5677E+00	0.8994	0.8670
62	0.2945E+01	0.5381E+01	-0.4630E+03	0.3373E+02	0.4642E+03	0.4400E+03	-0.4167E+01	-0.3094E+01	-0.4918E+00	0.9084	0.8840
63	0.2662E+01	0.5436E+01	-0.4384E+03	0.3548E+02	0.4398E+03	0.4261E+03	-0.4626E+01	-0.3383E+01	-0.4411E+00	0.9152	0.8954
64	0.2390E+01	0.5475E+01	-0.4255E+03	0.3742E+02	0.4271E+03	0.4159E+03	-0.5026E+01	-0.3658E+01	-0.4155E+00	0.9199	0.9011
65	0.2128E+01	0.5495E+01	-0.4281E+03	0.3966E+02	0.4299E+03	0.4096E+03	-0.5293E+01	-0.3920E+01	-0.4211E+00	0.9228	0.8999
66	0.1887E+01	0.5500E+01	-0.4525E+03	0.4230E+02	0.4545E+03	0.4061E+03	-0.5340E+01	-0.4161E+01	-0.4714E+00	0.9243	0.8886
67	0.1673E+01	0.5504E+01	-0.4880E+03	0.4521E+02	0.4901E+03	0.4031E+03	-0.5293E+01	-0.4375E+01	-0.5483E+00	0.9256	0.8714
68	0.1476E+01	0.5513E+01	-0.5159E+03	0.4827E+02	0.5182E+03	0.3989E+03	-0.5345E+01	-0.4572E+01	-0.6121E+00	0.9273	0.8570
69	0.1287E+01	0.5531E+01	-0.5395E+03	0.5154E+02	0.5419E+03	0.3932E+03	-0.5458E+01	-0.4762E+01	-0.6683E+00	0.9297	0.8444
70	0.1107E+01	0.5560E+01	-0.5571E+03	0.5497E+02	0.5598E+03	0.3856E+03	-0.5635E+01	-0.4945E+01	-0.7119E+00	0.9328	0.8346
71	0.9352E+00	0.5602E+01	-0.5678E+03	0.5852E+02	0.5708E+03	0.3761E+03	-0.5884E+01	-0.5122E+01	-0.7392E+00	0.9365	0.8285
72	0.7730E+00	0.5657E+01	-0.5708E+03	0.6213E+02	0.5742E+03	0.3648E+03	-0.6212E+01	-0.5293E+01	-0.7476E+00	0.9407	0.8266
73	0.6209E+00	0.5727E+01	-0.5652E+03	0.6575E+02	0.5691E+03	0.3519E+03	-0.6635E+01	-0.5460E+01	-0.7348E+00	0.9453	0.8295
74	0.4811E+00	0.5811E+01	-0.5518E+03	0.6932E+02	0.5561E+03	0.3379E+03	-0.7161E+01	-0.5624E+01	-0.7027E+00	0.9500	0.8367
75	0.3557E+00	0.5910E+01	-0.5300E+03	0.7277E+02	0.5350E+03	0.3230E+03	-0.7818E+01	-0.5783E+01	-0.6518E+00	0.9547	0.8481
76	0.2457E+00	0.6022E+01	-0.5009E+03	0.7608E+02	0.5066E+03	0.3078E+03	-0.8636E+01	-0.5940E+01	-0.5855E+00	0.9592	0.8630
77	0.1537E+00	0.6147E+01	-0.4648E+03	0.7917E+02	0.4715E+03	0.2923E+03	-0.9665E+01	-0.6096E+01	-0.5075E+00	0.9634	0.8805
78	0.8191E-01	0.6283E+01	-0.4223E+03	0.8198E+02	0.4302E+03	0.2773E+03	-0.1099E+02	-0.6249E+01	-0.4216E+00	0.9673	0.8998
79	0.3236E-01	0.6427E+01	-0.3728E+03	0.8443E+02	0.3823E+03	0.2628E+03	-0.1276E+02	-0.6401E+01	-0.3305E+00	0.9708	0.9202
80	0.6693E-02	0.6575E+01	-0.3096E+03	0.8636E+02	0.3214E+03	0.2493E+03	-0.1559E+02	-0.6552E+01	-0.2284E+00	0.9739	0.9431
81	0.	0.6741E+01	-0.2469E+03	0.8787E+02	0.2621E+03	0.2354E+03	-0.1959E+02	-0.6718E+01	-0.1447E+00	0.9769	0.9619
82	0.	0.6942E+01	-0.2079E+03	0.8925E+02	0.2263E+03	0.2184E+03	-0.2323E+02	-0.6919E+01	-0.1019E+00	0.9802	0.9715
83	0.	0.7183E+01	-0.1774E+03	0.9056E+02	0.1992E+03	0.2003E+03	-0.2705E+02	-0.7160E+01	-0.7357E-01	0.9834	0.9779
84	0.	0.7472E+01	-0.1519E+03	0.9180E+02	0.1775E+03	0.1811E+03	-0.3115E+02	-0.7449E+01	-0.5340E-01	0.9865	0.9824
85	0.	0.7819E+01	-0.1299E+03	0.9297E+02	0.1597E+03	0.1613E+03	-0.3560E+02	-0.7796E+01	-0.3856E-01	0.9894	0.9857
86	0.	0.8236E+01	-0.1105E+03	0.9405E+02	0.1451E+03	0.1411E+03	-0.4040E+02	-0.8213E+01	-0.2752E-01	0.9919	0.9882
87	0.	0.8736E+01	-0.9339E+02	0.9504E+02	0.1332E+03	0.1212E+03	-0.4550E+02	-0.8712E+01	-0.1931E-01	0.9940	0.9901

88	0.	0.9335E+01	-0.7825E+02	0.9591E+02	0.1238E+03	0.1020E+03	-0.5079E+02	-0.9312E+01	-0.1327E-01	0.9958	0.9914
89	0.	0.1006E+02	-0.6491E+02	0.9667E+02	0.1164E+03	0.8399E+02	-0.5612E+02	-0.1003E+02	-0.8870E-02	0.9972	0.9924
90	0.	0.1092E+02	-0.5328E+02	0.9731E+02	0.1109E+03	0.6760E+02	-0.6130E+02	-0.1090E+02	-0.5756E-02	0.9982	0.9931
91	0.	0.1187E+02	-0.4273E+02	0.9780E+02	0.1067E+03	0.5418E+02	-0.6640E+02	-0.1184E+02	-0.3467E-02	0.9988	0.9936
92	0.	0.1282E+02	-0.3458E+02	0.9814E+02	0.1041E+03	0.4405E+02	-0.7059E+02	-0.1280E+02	-0.2062E-02	0.9992	0.9939
93	0.	0.1378E+02	-0.2806E+02	0.9838E+02	0.1023E+03	0.3630E+02	-0.7408E+02	-0.1376E+02	-0.1163E-02	0.9995	0.9941
94	0.	0.1474E+02	-0.2261E+02	0.9856E+02	0.1011E+03	0.3028E+02	-0.7708E+02	-0.1471E+02	-0.5614E-03	0.9996	0.9943
95	0.	0.1569E+02	-0.1780E+02	0.9869E+02	0.1003E+03	0.2553E+02	-0.7978E+02	-0.1567E+02	-0.1421E-03	0.9997	0.9944
96	0.	0.1665E+02	-0.1327E+02	0.9879E+02	0.9968E+02	0.2172E+02	-0.8235E+02	-0.1663E+02	0.1601E-03	0.9998	0.9944
97	0.	0.1761E+02	-0.8563E+01	0.9886E+02	0.9923E+02	0.1864E+02	-0.8505E+02	-0.1758E+02	0.3808E-03	0.9999	0.9945
98	0.	0.1856E+02	-0.2716E+01	0.9891E+02	0.9895E+02	0.1612E+02	-0.8843E+02	-0.1854E+02	0.5204E-03	0.9999	0.9945
99	0.	0.1952E+02	0.8712E+01	0.1017E+03	0.1021E+03	0.1403E+02	0.8511E+02	-0.1950E+02	-0.1064E-02	0.9960	0.9942

OFF-BODY POINTS (RAKES)

I	COORDINATES AXIAL X	COORDINATES RADIAL Y	VELOCITIES AXIAL VX	VELOCITIES RADIAL VY	VELOCITIES CIRCUMFRNTL VZ	VELOCITIES RESULTANT VRES	VELOCITIES MERIDIONAL VM	VELOCITIES CHORDWISE VAFT	VELOCITIES SPANWISE VSPAN	PRESS.RATIO COMP RHOBR	PRESS.RATIO COMP PSOPTC
	2.0000E+00	1.9996E+00	4.2990E+02	7.3708E+01	7.9457E+01	4.4335E+02	4.3617E+02	7.9457E+01	7.3708E+01		0.8938
1	2.0000E+00	2.5000E+00	4.2878E+02	3.9436E+01	6.4917E+01	4.3546E+02	4.3059E+02	6.4917E+01	3.9436E+01	0.9237	0.8974
2	2.0000E+00	3.0000E+00	4.3218E+02	8.0010E+00	5.7380E+01	4.3605E+02	4.3226E+02	5.7380E+01	8.0010E+00	0.9237	0.8971
3	2.0000E+00	3.5000E+00	4.3745E+02	-1.8056E+01	5.2841E+01	4.4100E+02	4.3782E+02	5.2841E+01	-1.8056E+01	0.9237	0.8949
4	2.0000E+00	4.0000E+00	4.4344E+02	-3.8035E+01	4.9651E+01	4.4783E+02	4.4507E+02	4.9651E+01	-3.8035E+01	0.9237	0.8917
5	2.0000E+00	4.5000E+00	4.4913E+02	-4.9533E+01	4.6980E+01	4.5429E+02	4.5185E+02	4.6980E+01	-4.9533E+01	0.9237	0.8887
6	2.0000E+00	5.0000E+00	4.5163E+02	-4.5794E+01	4.4272E+01	4.5610E+02	4.5395E+02	4.4272E+01	-4.5794E+01	0.9237	0.8879
	2.0000E+00	5.4981E+00	4.3891E+02	-1.0132E+01	-4.0972E+01	4.4093E+02	4.3903E+02	-4.0972E+01	-1.0132E+01		0.8949
	4.0000E+00	2.3258E+00	5.8036E+02	8.0897E+01	5.3865E+01	5.8844E+02	5.8597E+02	5.3865E+01	8.0897E+01		0.8185
7	4.0000E+00	2.7500E+00	5.8016E+02	4.2799E+01	4.5617E+01	5.8352E+02	5.8173E+02	4.5617E+01	4.2799E+01	0.8658	0.8213
8	4.0000E+00	3.0000E+00	5.8076E+02	2.4428E+01	4.2249E+01	5.8280E+02	5.8127E+02	4.2249E+01	2.4428E+01	0.8658	0.8217
9	4.0000E+00	3.2500E+00	5.8211E+02	8.0880E+00	3.9567E+01	5.8351E+02	5.8217E+02	3.9567E+01	8.0880E+00	0.8658	0.8213
10	4.0000E+00	3.5000E+00	5.8421E+02	-6.9706E+00	3.7368E+01	5.8544E+02	5.8425E+02	3.7368E+01	-6.9706E+00	0.8658	0.8202
11	4.0000E+00	3.7500E+00	5.8710E+02	-2.1433E+01	3.5516E+01	5.8856E+02	5.8749E+02	3.5516E+01	-2.1433E+01	0.8658	0.8185
12	4.0000E+00	4.0000E+00	5.9087E+02	-3.6014E+01	3.3919E+01	5.9294E+02	5.9197E+02	3.3919E+01	-3.6014E+01	0.8658	0.8159
13	4.0000E+00	4.2500E+00	5.9559E+02	-5.1567E+01	3.2513E+01	5.9870E+02	5.9781E+02	3.2513E+01	-5.1567E+01	0.8658	0.8126
14	4.0000E+00	4.5000E+00	6.0123E+02	-6.9235E+01	3.1254E+01	6.0601E+02	6.0520E+02	3.1254E+01	-6.9235E+01	0.8658	0.8083
15	4.0000E+00	4.7500E+00	6.0744E+02	-9.0597E+01	3.0111E+01	6.1489E+02	6.1416E+02	3.0111E+01	-9.0597E+01	0.8658	0.8031
	4.0000E+00	5.1310E+00	6.1011E+02	-1.3482E+02	-2.8527E+01	6.2548E+02	6.2483E+02	-2.8528E+01	-1.3482E+02		0.7968
	6.0000E+00	2.4990E+00	7.1825E+02	7.5409E+00	3.6269E+01	7.1921E+02	7.1829E+02	3.6269E+01	7.5409E+00		0.7382
16	6.0000E+00	2.7500E+00	7.0944E+02	9.9849E+00	3.2950E+01	7.1027E+02	7.0951E+02	3.2950E+01	9.9849E+00	0.8149	0.7440
17	6.0000E+00	3.0000E+00	7.0202E+02	8.7845E+00	3.0319E+01	7.0273E+02	7.0207E+02	3.0319E+01	8.7845E+00	0.8149	0.7489
18	6.0000E+00	3.2500E+00	6.9795E+02	6.3127E+00	2.8180E+01	6.9855E+02	6.9798E+02	2.8180E+01	6.3127E+00	0.8149	0.7515
19	6.0000E+00	3.5000E+00	6.9609E+02	3.6677E+00	2.6391E+01	6.9660E+02	6.9610E+02	2.6391E+01	3.6677E+00	0.8149	0.7528
20	6.0000E+00	3.7500E+00	6.9583E+02	1.3363E+00	2.4854E+01	6.9627E+02	6.9583E+02	2.4854E+01	1.3363E+00	0.8149	0.7530
21	6.0000E+00	4.0000E+00	6.9671E+02	-4.0151E-01	2.3504E+01	6.9710E+02	6.9671E+02	2.3504E+01	-4.0151E-01	0.8149	0.7525
22	6.0000E+00	4.2500E+00	6.9830E+02	-1.3644E+00	2.2291E+01	6.9865E+02	6.9830E+02	2.2291E+01	-1.3644E+00	0.8149	0.7515
23	6.0000E+00	4.5000E+00	7.0012E+02	-1.4764E+00	2.1180E+01	7.0044E+02	7.0012E+02	2.1180E+01	-1.4764E+00	0.8149	0.7503
24	6.0000E+00	4.7500E+00	7.0167E+02	-8.5264E-01	2.0144E+01	7.0196E+02	7.0167E+02	2.0144E+01	-8.5264E-01	0.8149	0.7493
	6.0000E+00	5.0000E+00	6.9690E+02	0.	-1.9139E+01	6.9717E+02	6.9690E+02	-1.9139E+01	5.8932E-07		0.7524

I	COORDINATES AXIAL X	COORDINATES RADIAL Y	NEW CP VBRI	NEW CP CPC	ANGLES MERIDIONAL ALPHA	ANGLES FLOW BETA	ANGLES UNDERTURNG ETA	ANGLES SPANWISE ZETA	ANGLES SWIRL PHI	QFRACT
	2.0000E+00	1.9996E+00		-4.4825E-01	9.7290E+00	1.5731E+00	1.0472E+01	9.7290E+00	1.0472E+01	0.
1	2.0000E+00	2.5000E+00	4.0744E+02	-4.3219E-01	5.2549E+00	8.5735E+00	8.6091E+00	5.2549E+00	8.6091E+00	8.3696E-02
2	2.0000E+00	3.0000E+00	4.0744E+02	-4.3338E-01	1.0606E+00	7.5615E+00	7.5628E+00	1.0606E+00	7.5628E+00	1.8635E-01
3	2.0000E+00	3.5000E+00	4.0744E+02	-4.4344E-01	-2.3636E+00	6.8818E+00	6.8876E+00	-2.3636E+00	6.8876E+00	3.0877E-01
4	2.0000E+00	4.0000E+00	4.0744E+02	-4.5746E-01	-4.9024E+00	6.3656E+00	6.3887E+00	-4.9024E+00	6.3887E+00	4.5155E-01
5	2.0000E+00	4.5000E+00	4.0744E+02	-4.7089E-01	-6.2936E+00	5.9359E+00	5.9716E+00	-6.2936E+00	5.9716E+00	6.1509E-01
6	2.0000E+00	5.0000E+00	4.0744E+02	-4.7470E-01	-5.7898E+00	5.5702E+00	5.5986E+00	-5.7898E+00	5.5986E+00	7.9923E-01
	2.0000E+00	5.4981E+00		-4.4330E-01	-1.3224E+00	-5.3316E+00	-5.3330E+00	-1.3224E+00	-5.3330E+00	1.0000E+00
	4.0000E+00	2.3258E+00		-7.8374E-01	7.9354E+00	5.2521E+00	5.3026E+00	7.9354E+00	5.3026E+00	0.
7	4.0000E+00	2.7500E+00	5.1133E+02	-7.7120E-01	4.2191E+00	4.4837E+00	4.4958E+00	4.2191E+00	4.4958E+00	1.0135E-01
8	4.0000E+00	3.0000E+00	5.1133E+02	-7.6938E-01	2.4085E+00	4.1571E+00	4.1608E+00	2.4085E+00	4.1608E+00	1.6914E-01
9	4.0000E+00	3.2500E+00	5.1133E+02	-7.7117E-01	7.9603E-01	3.8881E+00	3.8885E+00	7.9603E-01	3.8885E+00	2.4294E-01
10	4.0000E+00	3.5000E+00	5.1133E+02	-7.7609E-01	-6.8361E-01	3.6596E+00	3.6598E+00	-6.8361E-01	3.6598E+00	3.2283E-01
11	4.0000E+00	3.7500E+00	5.1133E+02	-7.8405E-01	-2.0908E+00	3.4596E+00	3.4618E+00	-2.0908E+00	3.4618E+00	4.0890E-01
12	4.0000E+00	4.0000E+00	5.1133E+02	-7.9525E-01	-3.4879E+00	3.2795E+00	3.2855E+00	-3.4879E+00	3.2855E+00	5.0126E-01
13	4.0000E+00	4.2500E+00	5.1133E+02	-8.1010E-01	-4.9485E+00	3.1131E+00	3.1247E+00	-4.9485E+00	3.1247E+00	6.0003E-01
14	4.0000E+00	4.5000E+00	5.1133E+02	-8.2909E-01	-6.5690E+00	2.9562E+00	2.9757E+00	-6.5690E+00	2.9757E+00	7.0535E-01
15	4.0000E+00	4.7500E+00	5.1133E+02	-8.5238E-01	-8.4829E+00	2.8069E+00	2.8379E+00	-8.4829E+00	2.8379E+00	8.1732E-01
	4.0000E+00	5.1310E+00		-8.8042E-01	-1.2461E+01	-2.6141E+00	-2.6771E+00	-1.2461E+01	-2.6771E+00	1.0000E+00

	6.0000E+00	2.4990E+00		-1.1417E+00	6.0152E-01	2.8906E+00	2.8907E+00	6.0152E-01	2.8907E+00	0.	
16	6.0000E+00	2.7500E+00	5.7015E+02	-1.1159E+00	8.0635E-01	2.6589E+00	2.6592E+00	8.0635E-01	2.6592E+00	7.1003E-02	
17	6.0000E+00	3.0000E+00	5.7015E+02	-1.0942E+00	7.1692E-01	2.4728E+00	2.4730E+00	7.1692E-01	2.4730E+00	1.4798E-01	
18	6.0000E+00	3.2500E+00	5.7015E+02	-1.0822E+00	5.1821E-01	2.3120E+00	2.3121E+00	5.1821E-01	2.3121E+00	2.3128E-01	
19	6.0000E+00	3.5000E+00	5.7015E+02	-1.0767E+00	3.0189E-01	2.1712E+00	2.1712E+00	3.0189E-01	2.1712E+00	3.2103E-01	
20	6.0000E+00	3.7500E+00	5.7015E+02	-1.0757E+00	1.1003E-01	2.0457E+00	2.0457E+00	1.1003E-01	2.0457E+00	4.1736E-01	
21	6.0000E+00	4.0000E+00	5.7015E+02	-1.0781E+00	-3.3019E-02	1.9322E+00	1.9322E+00	-3.3019E-02	1.9322E+00	5.2035E-01	
22	6.0000E+00	4.2500E+00	5.7015E+02	-1.0825E+00	-1.1195E-01	1.8284E+00	1.8284E+00	-1.1195E-01	1.8284E+00	6.3011E-01	
23	6.0000E+00	4.5000E+00	5.7015E+02	-1.0876E+00	-1.2082E-01	1.7328E+00	1.7328E+00	-1.2082E-01	1.7328E+00	7.4669E-01	
24	6.0000E+00	4.7500E+00	5.7015E+02	-1.0920E+00	-6.9623E-02	1.6444E+00	1.6444E+00	-6.9623E-02	1.6444E+00	8.7010E-01	
	6.0000E+00	5.0000E+00		-1.0783E+00	0.	-1.5731E+00	-1.5731E+00	4.8451E-08	-1.5731E+00	1.0000E+00	

RELATIVE ROTOR INLET DATA

X = 6.0000 UTIP = 900.0000

Y	U	VZPRIME	VPRIM	MPRIME	BETAPR	VZPRST	VPRST	MPRS	BETAPS
2.4990E+00	4.4982E+02	-4.1355E+02	8.2884E+02	7.7564E-01	-2.9931E+01	-4.8609E+02	8.6731E+02	8.1164E-01	-3.4087E+01
2.7500E+00	4.9500E+02	-4.6205E+02	8.4670E+02	7.9147E-01	-3.3073E+01	-5.2795E+02	8.8438E+02	8.2670E-01	-3.6653E+01
3.0000E+00	5.4000E+02	-5.0968E+02	8.6757E+02	8.1023E-01	-3.5978E+01	-5.7032E+02	9.0453E+02	8.4474E-01	-3.9088E+01
3.2500E+00	5.8500E+02	-5.5682E+02	8.9287E+02	8.3343E-01	-3.8582E+01	-6.1318E+02	9.2906E+02	8.6721E-01	-4.1300E+01
3.5000E+00	6.3000E+02	-6.0361E+02	9.2136E+02	8.5982E-01	-4.0930E+01	-6.5639E+02	9.5677E+02	8.9286E-01	-4.3318E+01
3.7500E+00	6.7500E+02	-6.5015E+02	9.5230E+02	8.8865E-01	-4.3056E+01	-6.9985E+02	9.8690E+02	9.2094E-01	-4.5165E+01
4.0000E+00	7.2000E+02	-6.9650E+02	9.8514E+02	9.1940E-01	-4.4991E+01	-7.4350E+02	1.0189E+03	9.5092E-01	-4.6861E+01
4.2500E+00	7.6500E+02	-7.4271E+02	1.0194E+03	9.5157E-01	-4.6765E+01	-7.8729E+02	1.0524E+03	9.8231E-01	-4.8428E+01
4.5000E+00	8.1000E+02	-7.8882E+02	1.0547E+03	9.8472E-01	-4.8409E+01	-8.3118E+02	1.0868E+03	1.0146E+00	-4.9892E+01
4.7500E+00	8.5500E+02	-8.3486E+02	1.0906E+03	1.0184E+00	-4.9954E+01	-8.7514E+02	1.1217E+03	1.0475E+00	-5.1278E+01
5.0000E+00	9.0000E+02	-9.1914E+02	1.1535E+03	1.0765E+00	-5.2830E+01	-8.8086E+02	1.1232E+03	1.0483E+00	-5.1650E+01

RAKE WEIGHT FLOW DATA

I	X	(Q(I)-QBAR)/QBAR	QS TOT	QFR
1	2.0000E+00	-1.4958E-03	1.7823E+01	1.0000E+00
2	4.0000E+00	4.6178E-04	1.7858E+01	1.0000E+00
3	6.0000E+00	0.	1.7849E+01	1.0000E+00

STREAMLINES

X = 2.000

QSTRM	YSTRM
2.00000E-02	2.12672E+00
4.00000E-02	2.24913E+00
6.00000E-02	2.36677E+00
8.00000E-02	2.47966E+00
1.00000E-01	2.58433E+00
1.20000E-01	2.68524E+00
1.40000E-01	2.78336E+00
1.60000E-01	2.87868E+00
1.80000E-01	2.97120E+00
2.00000E-01	3.05900E+00
2.20000E-01	3.14398E+00
2.40000E-01	3.22721E+00
2.60000E-01	3.30868E+00
2.80000E-01	3.38839E+00
3.00000E-01	3.46635E+00
3.20000E-01	3.54146E+00
3.40000E-01	3.61441E+00
3.60000E-01	3.68620E+00

3.80000E-01	3.75683E+00
4.00000E-01	3.82630E+00
4.20000E-01	3.89461E+00
4.40000E-01	3.96176E+00
4.60000E-01	4.02713E+00
4.80000E-01	4.09077E+00
5.00000E-01	4.15362E+00
5.20000E-01	4.21568E+00
5.40000E-01	4.27696E+00
5.60000E-01	4.33745E+00
5.80000E-01	4.39716E+00
6.00000E-01	4.45607E+00
6.20000E-01	4.51387E+00
6.40000E-01	4.57006E+00
6.60000E-01	4.62576E+00
6.80000E-01	4.68097E+00
7.00000E-01	4.73569E+00
7.20000E-01	4.78993E+00
7.40000E-01	4.84368E+00
7.60000E-01	4.89694E+00
7.80000E-01	4.94972E+00
8.00000E-01	5.00200E+00
8.20000E-01	5.05381E+00
8.40000E-01	5.10512E+00
8.60000E-01	5.15595E+00
8.80000E-01	5.20629E+00
9.00000E-01	5.25614E+00
9.20000E-01	5.30551E+00
9.40000E-01	5.35439E+00
9.60000E-01	5.40278E+00
9.80000E-01	5.45068E+00
1.00000E+00	5.49810E+00

X = 4.000

QSTRM	YSTRM
2.00000E-02	2.41430E+00
4.00000E-02	2.50044E+00
6.00000E-02	2.58422E+00
8.00000E-02	2.66565E+00
1.00000E-01	2.74473E+00
1.20000E-01	2.82071E+00
1.40000E-01	2.89492E+00
1.60000E-01	2.96743E+00
1.80000E-01	3.03794E+00
2.00000E-01	3.10677E+00
2.20000E-01	3.17425E+00
2.40000E-01	3.24038E+00
2.60000E-01	3.30483E+00
2.80000E-01	3.36811E+00
3.00000E-01	3.43031E+00
3.20000E-01	3.49143E+00
3.40000E-01	3.55117E+00
3.60000E-01	3.60997E+00
3.80000E-01	3.66788E+00
4.00000E-01	3.72490E+00
4.20000E-01	3.78087E+00
4.40000E-01	3.83593E+00
4.60000E-01	3.89025E+00
4.80000E-01	3.94384E+00
5.00000E-01	3.99670E+00

5.20000E-01	4.04859E+00
5.40000E-01	4.09985E+00
5.60000E-01	4.15049E+00
5.80000E-01	4.20052E+00
6.00000E-01	4.24993E+00
6.20000E-01	4.29851E+00
6.40000E-01	4.34657E+00
6.60000E-01	4.39412E+00
6.80000E-01	4.44114E+00
7.00000E-01	4.48765E+00
7.20000E-01	4.53342E+00
7.40000E-01	4.57870E+00
7.60000E-01	4.62359E+00
7.80000E-01	4.66807E+00
8.00000E-01	4.71215E+00
8.20000E-01	4.75584E+00
8.40000E-01	4.79912E+00
8.60000E-01	4.84201E+00
8.80000E-01	4.88450E+00
9.00000E-01	4.92658E+00
9.20000E-01	4.96827E+00
9.40000E-01	5.00956E+00
9.60000E-01	5.05045E+00
9.80000E-01	5.09095E+00
1.00000E+00	5.13104E+00

X = 6.000

QSTRM	YSTRM
2.00000E-02	2.57167E+00
4.00000E-02	2.64281E+00
6.00000E-02	2.71239E+00
8.00000E-02	2.78016E+00
1.00000E-01	2.84631E+00
1.20000E-01	2.91123E+00
1.40000E-01	2.97492E+00
1.60000E-01	3.03714E+00
1.80000E-01	3.09814E+00
2.00000E-01	3.15815E+00
2.20000E-01	3.21716E+00
2.40000E-01	3.27501E+00
2.60000E-01	3.33179E+00
2.80000E-01	3.38775E+00
3.00000E-01	3.44289E+00
3.20000E-01	3.49722E+00
3.40000E-01	3.55047E+00
3.60000E-01	3.60302E+00
3.80000E-01	3.65490E+00
4.00000E-01	3.70611E+00
4.20000E-01	3.75660E+00
4.40000E-01	3.80624E+00
4.60000E-01	3.85532E+00
4.80000E-01	3.90383E+00
5.00000E-01	3.95178E+00
5.20000E-01	3.99917E+00
5.40000E-01	4.04579E+00
5.60000E-01	4.09194E+00
5.80000E-01	4.13762E+00
6.00000E-01	4.18283E+00
6.20000E-01	4.22756E+00
6.40000E-01	4.27173E+00

6.60000E-01	4.31538E+00
6.80000E-01	4.35863E+00
7.00000E-01	4.40149E+00
7.20000E-01	4.44396E+00
7.40000E-01	4.48602E+00
7.60000E-01	4.52755E+00
7.80000E-01	4.56868E+00
8.00000E-01	4.60949E+00
8.20000E-01	4.64998E+00
8.40000E-01	4.69015E+00
8.60000E-01	4.73000E+00
8.80000E-01	4.76953E+00
9.00000E-01	4.80874E+00
9.20000E-01	4.84763E+00
9.40000E-01	4.88621E+00
9.60000E-01	4.92446E+00
9.80000E-01	4.96239E+00
1.00000E+00	5.00000E+00

3 OF 3 THETAS

THETA = 0.18000E+03 WDOTT = 1.82949E+01 VICT = 5.84508E+02 V3 = -1.42602E-01

HUB
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	CPC	RB/RT	PSOPTC
1	0.	0.1250E+00	-0.7702E+02	0.2807E-05	0.7702E+02	0.2412E+03	-0.2088E-05	-0.7153E+01	0.1016E-01	0.9756	0.9967
2	-0.	0.3750E+00	-0.5609E+02	0.2821E-05	0.5609E+02	0.2412E+03	-0.2882E-05	-0.6903E+01	0.1712E-01	0.9756	0.9982
3	0.8379E-02	0.6254E+00	-0.2156E+02	0.2877E-05	0.2156E+02	0.2565E+03	-0.7646E-05	-0.6652E+01	0.2384E-01	0.9723	0.9997
4	0.4613E-01	0.8560E+00	0.4277E+02	0.2972E-05	0.4277E+02	0.2737E+03	0.3981E-05	-0.6418E+01	0.2042E-01	0.9682	0.9990
5	0.1267E+00	0.1057E+01	0.1106E+03	0.3047E-05	0.1106E+03	0.2941E+03	0.1579E-05	-0.6202E+01	-0.5545E-02	0.9630	0.9931
6	0.2473E+00	0.1236E+01	0.1758E+03	0.3083E-05	0.1758E+03	0.3156E+03	0.1005E-05	-0.5986E+01	-0.5197E-01	0.9569	0.9827
7	0.3999E+00	0.1392E+01	0.2337E+03	0.3085E-05	0.2337E+03	0.3366E+03	0.7565E-06	-0.5768E+01	-0.1103E+00	0.9504	0.9696
8	0.5738E+00	0.1524E+01	0.2831E+03	0.3061E-05	0.2831E+03	0.3561E+03	0.6194E-06	-0.5549E+01	-0.1726E+00	0.9438	0.9557
9	0.7639E+00	0.1636E+01	0.3253E+03	0.3016E-05	0.3253E+03	0.3732E+03	0.5313E-06	-0.5329E+01	-0.2344E+00	0.9376	0.9418
10	0.9693E+00	0.1731E+01	0.3621E+03	0.2954E-05	0.3621E+03	0.3875E+03	0.4675E-06	-0.5103E+01	-0.2949E+00	0.9320	0.9282
11	0.1186E+01	0.1811E+01	0.3933E+03	0.2878E-05	0.3933E+03	0.3989E+03	0.4194E-06	-0.4871E+01	-0.3505E+00	0.9274	0.9157
12	0.1412E+01	0.1878E+01	0.4184E+03	0.2791E-05	0.4184E+03	0.4071E+03	0.3822E-06	-0.4636E+01	-0.3982E+00	0.9239	0.9050
13	0.1643E+01	0.1933E+01	0.4370E+03	0.2694E-05	0.4370E+03	0.4125E+03	0.3532E-06	-0.4398E+01	-0.4353E+00	0.9215	0.8967
14	0.1880E+01	0.1979E+01	0.4493E+03	0.2590E-05	0.4493E+03	0.4161E+03	0.3303E-06	-0.4157E+01	-0.4605E+00	0.9199	0.8911
15	0.2125E+01	0.2021E+01	0.4590E+03	0.2481E-05	0.4590E+03	0.4197E+03	0.3097E-06	-0.3908E+01	-0.4807E+00	0.9182	0.8865
16	0.2375E+01	0.2063E+01	0.4719E+03	0.2370E-05	0.4719E+03	0.4259E+03	0.2877E-06	-0.3655E+01	-0.5084E+00	0.9154	0.8803
17	0.2625E+01	0.2104E+01	0.4881E+03	0.2260E-05	0.4881E+03	0.4351E+03	0.2653E-06	-0.3402E+01	-0.5438E+00	0.9109	0.8724
18	0.2875E+01	0.2146E+01	0.5063E+03	0.2153E-05	0.5063E+03	0.4472E+03	0.2437E-06	-0.3148E+01	-0.5847E+00	0.9048	0.8632
19	0.3125E+01	0.2188E+01	0.5265E+03	0.2050E-05	0.5265E+03	0.4617E+03	0.2231E-06	-0.2895E+01	-0.6317E+00	0.8970	0.8526
20	0.3375E+01	0.2229E+01	0.5500E+03	0.1952E-05	0.5500E+03	0.4783E+03	0.2034E-06	-0.2641E+01	-0.6878E+00	0.8874	0.8401
21	0.3625E+01	0.2270E+01	0.5767E+03	0.1860E-05	0.5767E+03	0.4963E+03	0.1848E-06	-0.2388E+01	-0.7539E+00	0.8761	0.8252
22	0.3874E+01	0.2308E+01	0.6034E+03	0.1774E-05	0.6034E+03	0.5148E+03	0.1685E-06	-0.2136E+01	-0.8224E+00	0.8633	0.8098
23	0.4123E+01	0.2343E+01	0.6288E+03	0.1694E-05	0.6288E+03	0.5329E+03	0.1543E-06	-0.1884E+01	-0.8892E+00	0.8494	0.7949
24	0.4373E+01	0.2375E+01	0.6539E+03	0.1618E-05	0.6539E+03	0.5495E+03	0.1418E-06	-0.1632E+01	-0.9572E+00	0.8352	0.7796
25	0.4623E+01	0.2404E+01	0.6783E+03	0.1546E-05	0.6783E+03	0.5632E+03	0.1306E-06	-0.1380E+01	-0.1025E+01	0.8221	0.7644
26	0.4874E+01	0.2430E+01	0.7004E+03	0.1473E-05	0.7004E+03	0.5725E+03	0.1205E-06	-0.1129E+01	-0.1088E+01	0.8124	0.7503
27	0.5125E+01	0.2453E+01	0.7193E+03	0.1401E-05	0.7193E+03	0.5774E+03	0.1116E-06	-0.8767E+00	-0.1142E+01	0.8070	0.7381
28	0.5375E+01	0.2473E+01	0.7359E+03	0.1331E-05	0.7359E+03	0.5803E+03	0.1037E-06	-0.6252E+00	-0.1196E+01	0.8035	0.7272
29	0.5626E+01	0.2488E+01	0.7499E+03	0.1267E-05	0.7499E+03	0.5827E+03	0.9678E-07	-0.3743E+00	-0.1232E+01	0.8008	0.7180
30	0.5875E+01	0.2497E+01	0.7543E+03	0.1206E-05	0.7543E+03	0.5841E+03	0.9157E-07	-0.1245E+00	-0.1245E+01	0.7991	0.7151
31	0.6127E+01	0.2500E+01	0.7449E+03	0.1147E-05	0.7449E+03	0.5845E+03	0.8822E-07	0.1270E+00	-0.1217E+01	0.7986	0.7213
32	0.6407E+01	0.2500E+01	0.7339E+03	0.1089E-05	0.7339E+03	0.5845E+03	0.8505E-07	0.4065E+00	-0.1185E+01	0.7986	0.7286

33	0.6742E+01	0.2500E+01	0.7279E+03	0.1031E-05	0.7279E+03	0.5845E+03	0.8114E-07	0.7419E+00	-0.1167E+01	0.7986	0.7326
34	0.7144E+01	0.2500E+01	0.7232E+03	0.9723E-06	0.7232E+03	0.5845E+03	0.7703E-07	0.1144E+01	-0.1153E+01	0.7986	0.7356
35	0.7627E+01	0.2500E+01	0.7189E+03	0.9173E-06	0.7189E+03	0.5845E+03	0.7311E-07	0.1627E+01	-0.1141E+01	0.7986	0.7384
36	0.8207E+01	0.2500E+01	0.7145E+03	0.8717E-06	0.7145E+03	0.5845E+03	0.6990E-07	0.2207E+01	-0.1128E+01	0.7986	0.7413
37	0.8902E+01	0.2500E+01	0.7098E+03	0.8438E-06	0.7098E+03	0.5845E+03	0.6811E-07	0.2902E+01	-0.1115E+01	0.7986	0.7443
38	0.9737E+01	0.2500E+01	0.7028E+03	0.8438E-06	0.7028E+03	0.5845E+03	0.6879E-07	0.3737E+01	-0.1094E+01	0.7986	0.7488
39	0.1064E+02	0.2500E+01	0.6857E+03	0.8709E-06	0.6857E+03	0.5845E+03	0.7277E-07	0.4644E+01	-0.1046E+01	0.7986	0.7597
40	0.1155E+02	0.2500E+01	0.3683E+03	0.8332E-06	0.3683E+03	0.5845E+03	0.1296E-06	0.5548E+01	-0.3056E+00	0.7986	0.9258

SHROUD
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	CPC	RB/RT	PSOPTC
41	0.1155E+02	0.5000E+01	-0.1690E+02	0.5305E-06	0.1690E+02	0.5845E+03	-0.1798E-05	0.5548E+01	0.2428E-01	0.7986	0.9998
42	0.1064E+02	0.5000E+01	-0.5570E+03	0.4873E-06	0.5570E+03	0.5845E+03	-0.5013E-07	0.4644E+01	-0.7049E+00	0.7986	0.8362
43	0.9737E+01	0.5000E+01	-0.6399E+03	0.4506E-06	0.6399E+03	0.5845E+03	-0.4035E-07	0.3737E+01	-0.9190E+00	0.7986	0.7882
44	0.8902E+01	0.5000E+01	-0.6777E+03	0.4453E-06	0.6777E+03	0.5845E+03	-0.3765E-07	0.2902E+01	-0.1023E+01	0.7986	0.7648
45	0.8207E+01	0.5000E+01	-0.6945E+03	0.4590E-06	0.6945E+03	0.5845E+03	-0.3787E-07	0.2207E+01	-0.1071E+01	0.7986	0.7542
46	0.7627E+01	0.5000E+01	-0.7047E+03	0.4832E-06	0.7047E+03	0.5845E+03	-0.3928E-07	0.1627E+01	-0.1100E+01	0.7986	0.7476
47	0.7144E+01	0.5000E+01	-0.7120E+03	0.5126E-06	0.7120E+03	0.5845E+03	-0.4125E-07	0.1144E+01	-0.1121E+01	0.7986	0.7429
48	0.6742E+01	0.5000E+01	-0.7178E+03	0.5441E-06	0.7178E+03	0.5845E+03	-0.4343E-07	0.7419E+00	-0.1138E+01	0.7986	0.7391
49	0.6407E+01	0.5000E+01	-0.7229E+03	0.5755E-06	0.7229E+03	0.5845E+03	-0.4562E-07	0.4065E+00	-0.1152E+01	0.7986	0.7358
50	0.6127E+01	0.5000E+01	-0.7279E+03	0.6058E-06	0.7279E+03	0.5845E+03	-0.4768E-07	0.1270E+00	-0.1167E+01	0.7986	0.7325
51	0.5875E+01	0.5000E+01	-0.7311E+03	0.6358E-06	0.7311E+03	0.5841E+03	-0.4983E-07	-0.1250E+00	-0.1176E+01	0.7991	0.7304
52	0.5625E+01	0.5000E+01	-0.7353E+03	0.6685E-06	0.7353E+03	0.5827E+03	-0.5209E-07	-0.3750E+00	-0.1189E+01	0.8008	0.7277
53	0.5375E+01	0.5000E+01	-0.7420E+03	0.7045E-06	0.7420E+03	0.5803E+03	-0.5440E-07	-0.6250E+00	-0.1208E+01	0.8035	0.7232
54	0.5125E+01	0.5000E+01	-0.7552E+03	0.7449E-06	0.7552E+03	0.5774E+03	-0.5652E-07	-0.8750E+00	-0.1248E+01	0.8070	0.7144
55	0.4879E+01	0.5005E+01	-0.7816E+03	0.7908E-06	0.7816E+03	0.5726E+03	-0.5797E-07	-0.1121E+01	-0.1327E+01	0.8122	0.6967
56	0.4632E+01	0.5023E+01	-0.7823E+03	0.8341E-06	0.7823E+03	0.5636E+03	-0.6109E-07	-0.1369E+01	-0.1329E+01	0.8217	0.6962
57	0.4373E+01	0.5058E+01	-0.7463E+03	0.8721E-06	0.7463E+03	0.5495E+03	-0.6696E-07	-0.1630E+01	-0.1221E+01	0.8352	0.7204
58	0.4102E+01	0.5109E+01	-0.6962E+03	0.9090E-06	0.6962E+03	0.5314E+03	-0.7481E-07	-0.1906E+01	-0.1075E+01	0.8506	0.7531
59	0.3821E+01	0.5172E+01	-0.6427E+03	0.9474E-06	0.6427E+03	0.5108E+03	-0.8447E-07	-0.2194E+01	-0.9266E+00	0.8662	0.7865
60	0.3531E+01	0.5242E+01	-0.5922E+03	0.9891E-06	0.5922E+03	0.4893E+03	-0.9570E-07	-0.2493E+01	-0.7934E+00	0.8806	0.8164
61	0.3236E+01	0.5315E+01	-0.5487E+03	0.1035E-05	0.5487E+03	0.4688E+03	-0.1081E-06	-0.2795E+01	-0.6847E+00	0.8930	0.8407
62	0.2945E+01	0.5381E+01	-0.5146E+03	0.1086E-05	0.5146E+03	0.4510E+03	-0.1209E-06	-0.3094E+01	-0.6039E+00	0.9028	0.8589
63	0.2662E+01	0.5436E+01	-0.4915E+03	0.1141E-05	0.4915E+03	0.4367E+03	-0.1331E-06	-0.3383E+01	-0.5513E+00	0.9101	0.8707
64	0.2390E+01	0.5475E+01	-0.4810E+03	0.1204E-05	0.4810E+03	0.4263E+03	-0.1434E-06	-0.3658E+01	-0.5282E+00	0.9151	0.8759
65	0.2128E+01	0.5495E+01	-0.4872E+03	0.1276E-05	0.4872E+03	0.4198E+03	-0.1501E-06	-0.3920E+01	-0.5417E+00	0.9182	0.8728
66	0.1887E+01	0.5500E+01	-0.5213E+03	0.1363E-05	0.5213E+03	0.4162E+03	-0.1498E-06	-0.4161E+01	-0.6194E+00	0.9198	0.8554
67	0.1673E+01	0.5504E+01	-0.5725E+03	0.1461E-05	0.5725E+03	0.4131E+03	-0.1462E-06	-0.4375E+01	-0.7434E+00	0.9212	0.8276
68	0.1476E+01	0.5513E+01	-0.6157E+03	0.1563E-05	0.6157E+03	0.4089E+03	-0.1455E-06	-0.4572E+01	-0.8544E+00	0.9231	0.8027
69	0.1287E+01	0.5531E+01	-0.6557E+03	0.1672E-05	0.6557E+03	0.4030E+03	-0.1461E-06	-0.4762E+01	-0.9622E+00	0.9256	0.7785
70	0.1107E+01	0.5560E+01	-0.6906E+03	0.1787E-05	0.6906E+03	0.3952E+03	-0.1483E-06	-0.4945E+01	-0.1066E+01	0.9289	0.7566
71	0.9352E+00	0.5602E+01	-0.7189E+03	0.1906E-05	0.7189E+03	0.3854E+03	-0.1519E-06	-0.5122E+01	-0.1141E+01	0.9329	0.7384
72	0.7730E+00	0.5657E+01	-0.7392E+03	0.2027E-05	0.7392E+03	0.3739E+03	-0.1571E-06	-0.5293E+01	-0.1200E+01	0.9373	0.7251
73	0.6209E+00	0.5727E+01	-0.7499E+03	0.2147E-05	0.7499E+03	0.3607E+03	-0.1640E-06	-0.5460E+01	-0.1232E+01	0.9422	0.7180
74	0.4811E+00	0.5811E+01	-0.7509E+03	0.2265E-05	0.7509E+03	0.3463E+03	-0.1728E-06	-0.5624E+01	-0.1235E+01	0.9472	0.7173
75	0.3557E+00	0.5910E+01	-0.7409E+03	0.2378E-05	0.7409E+03	0.3311E+03	-0.1839E-06	-0.5783E+01	-0.1205E+01	0.9522	0.7239
76	0.2457E+00	0.6022E+01	-0.7201E+03	0.2485E-05	0.7201E+03	0.3154E+03	-0.1977E-06	-0.5940E+01	-0.1144E+01	0.9570	0.7376
77	0.1537E+00	0.6147E+01	-0.6879E+03	0.2583E-05	0.6879E+03	0.2996E+03	-0.2151E-06	-0.6096E+01	-0.1052E+01	0.9615	0.7583
78	0.8191E-01	0.6283E+01	-0.6438E+03	0.2670E-05	0.6438E+03	0.2842E+03	-0.2377E-06	-0.6249E+01	-0.9297E+00	0.9656	0.7858
79	0.3236E-01	0.6427E+01	-0.5858E+03	0.2744E-05	0.5858E+03	0.2693E+03	-0.2684E-06	-0.6401E+01	-0.7769E+00	0.9693	0.8201
80	0.6693E-02	0.6575E+01	-0.5026E+03	0.2797E-05	0.5026E+03	0.2555E+03	-0.3189E-06	-0.6552E+01	-0.5763E+00	0.9725	0.8651
81	0.	0.6741E+01	-0.4139E+03	0.2836E-05	0.4139E+03	0.2412E+03	-0.3925E-06	-0.6718E+01	-0.3896E+00	0.9756	0.9070
82	0.	0.6942E+01	-0.3575E+03	0.2871E-05	0.3575E+03	0.2239E+03	-0.4602E-06	-0.6919E+01	-0.2870E+00	0.9791	0.9300
83	0.	0.7183E+01	-0.3157E+03	0.2907E-05	0.3157E+03	0.2053E+03	-0.5276E-06	-0.7160E+01	-0.2196E+00	0.9826	0.9451
84	0.	0.7472E+01	-0.2818E+03	0.2941E-05	0.2818E+03	0.1857E+03	-0.5980E-06	-0.7449E+01	-0.1708E+00	0.9858	0.9561
85	0.	0.7819E+01	-0.2533E+03	0.2974E-05	0.2533E+03	0.1653E+03	-0.6728E-06	-0.7796E+01	-0.1336E+00	0.9888	0.9644
86	0.	0.8236E+01	-0.2287E+03	0.3004E-05	0.2287E+03	0.1447E+03	-0.7527E-06	-0.8213E+01	-0.1046E+00	0.9915	0.9709
87	0.	0.8736E+01	-0.2074E+03	0.3032E-05	0.2074E+03	0.1242E+03	-0.8377E-06	-0.8712E+01	-0.8180E-01	0.9937	0.9760

88	0.	0.9335E+01	-0.1888E+03	0.3057E-05	0.1888E+03	0.1045E+03	-0.9274E-06	-0.9312E+01	-0.6370E-01	0.9956	0.9801
89	0.	0.1006E+02	-0.1728E+03	0.3079E-05	0.1728E+03	0.8608E+02	-0.1021E-05	-0.1003E+02	-0.4934E-01	0.9970	0.9833
90	0.	0.1092E+02	-0.1590E+03	0.3097E-05	0.1590E+03	0.6928E+02	-0.1116E-05	-0.1090E+02	-0.3804E-01	0.9981	0.9859
91	0.	0.1187E+02	-0.1468E+03	0.3111E-05	0.1468E+03	0.5553E+02	-0.1214E-05	-0.1184E+02	-0.2874E-01	0.9988	0.9879
92	0.	0.1282E+02	-0.1375E+03	0.3121E-05	0.1375E+03	0.4514E+02	-0.1301E-05	-0.1280E+02	-0.2217E-01	0.9992	0.9894
93	0.	0.1378E+02	-0.1302E+03	0.3128E-05	0.1302E+03	0.3721E+02	-0.1377E-05	-0.1376E+02	-0.1729E-01	0.9994	0.9905
94	0.	0.1474E+02	-0.1241E+03	0.3133E-05	0.1241E+03	0.3104E+02	-0.1447E-05	-0.1471E+02	-0.1346E-01	0.9996	0.9914
95	0.	0.1569E+02	-0.1188E+03	0.3137E-05	0.1188E+03	0.2616E+02	-0.1513E-05	-0.1567E+02	-0.1027E-01	0.9997	0.9921
96	0.	0.1665E+02	-0.1139E+03	0.3140E-05	0.1139E+03	0.2226E+02	-0.1579E-05	-0.1663E+02	-0.7421E-02	0.9998	0.9927
97	0.	0.1761E+02	-0.1089E+03	0.3142E-05	0.1089E+03	0.1910E+02	-0.1654E-05	-0.1758E+02	-0.4618E-02	0.9999	0.9934
98	0.	0.1856E+02	-0.1027E+03	0.3144E-05	0.1027E+03	0.1652E+02	-0.1754E-05	-0.1854E+02	-0.1347E-02	0.9999	0.9941
99	0.	0.1952E+02	-0.9321E+02	0.3224E-05	0.9321E+02	0.1438E+02	-0.1982E-05	-0.1950E+02	0.3275E-02	0.9960	0.9951

OFF-BODY POINTS (RAKES)

I	COORDINATES AXIAL X	COORDINATES RADIAL Y	VELOCITIES AXIAL VX	VELOCITIES RADIAL VY	VELOCITIES CIRCUMFRNTL VZ	VELOCITIES RESULTANT VRES	VELOCITIES MERIDIONAL VM	VELOCITIES CHORDWISE VAFT	VELOCITIES SPANWISE VSPAN	PRESS. RATIO COMP RHOBR	PRESS. RATIO COMP PSOPTC
	2.0000E+00	1.9996E+00	4.4712E+02	7.6661E+01	2.5365E-06	4.5364E+02	4.5364E+02	-7.6661E+01	7.2575E-06		0.8890
1	2.0000E+00	2.5000E+00	4.5288E+02	2.4641E+01	2.0750E-06	4.5355E+02	4.5355E+02	-2.4641E+01	3.5924E-06	0.9192	0.8891
2	2.0000E+00	3.0000E+00	4.6426E+02	-1.5420E+01	1.8373E-06	4.6452E+02	4.6452E+02	1.5420E+01	8.8771E-07	0.9192	0.8839
3	2.0000E+00	3.5000E+00	4.7803E+02	-4.5144E+01	1.6951E-06	4.8015E+02	4.8015E+02	4.5144E+01	-1.0850E-06	0.9192	0.8763
4	2.0000E+00	4.0000E+00	4.9276E+02	-6.5329E+01	1.5955E-06	4.9707E+02	4.9707E+02	6.5329E+01	-2.4277E-06	0.9192	0.8679
5	2.0000E+00	4.5000E+00	5.0702E+02	-7.3619E+01	1.5119E-06	5.1233E+02	5.1233E+02	7.3619E+01	-3.0218E-06	0.9192	0.8601
6	2.0000E+00	5.0000E+00	5.1641E+02	-6.2166E+01	1.4262E-06	5.2014E+02	5.2014E+02	6.2166E+01	-2.4022E-06	0.9192	0.8560
	2.0000E+00	5.4981E+00	5.0205E+02	-1.1590E+01	-1.3189E-06	5.0218E+02	5.0218E+02	1.1590E+01	-2.0326E-06		0.8653
	4.0000E+00	2.3258E+00	6.1036E+02	8.5079E+01	1.7332E-06	6.1626E+02	6.1626E+02	-8.5079E+01	6.9727E-06		0.8023
7	4.0000E+00	2.7500E+00	6.1209E+02	3.9352E+01	1.4684E-06	6.1335E+02	6.1335E+02	-3.9352E+01	3.8918E-06	0.8563	0.8040
8	4.0000E+00	3.0000E+00	6.1397E+02	1.8229E+01	1.3605E-06	6.1424E+02	6.1424E+02	-1.8229E+01	2.4831E-06	0.8563	0.8035
9	4.0000E+00	3.2500E+00	6.1682E+02	4.1962E-02	1.2746E-06	6.1682E+02	6.1682E+02	-4.1962E-02	1.2772E-06	0.8563	0.8020
10	4.0000E+00	3.5000E+00	6.2056E+02	-1.6187E+01	1.2043E-06	6.2077E+02	6.2077E+02	1.6187E+01	2.0748E-07	0.8563	0.7996
11	4.0000E+00	3.7500E+00	6.2521E+02	-3.1305E+01	1.1452E-06	6.2599E+02	6.2599E+02	3.1305E+01	-7.8268E-07	0.8563	0.7965
12	4.0000E+00	4.0000E+00	6.3083E+02	-4.6154E+01	1.0942E-06	6.3252E+02	6.3252E+02	4.6154E+01	-1.7481E-06	0.8563	0.7926
13	4.0000E+00	4.2500E+00	6.3749E+02	-6.1705E+01	1.0494E-06	6.4047E+02	6.4047E+02	6.1705E+01	-2.7506E-06	0.8563	0.7878
14	4.0000E+00	4.5000E+00	6.4518E+02	-7.9225E+01	1.0093E-06	6.5003E+02	6.5003E+02	7.9225E+01	-3.8697E-06	0.8563	0.7820
15	4.0000E+00	4.7500E+00	6.5357E+02	-1.0045E+02	9.7289E-07	6.6124E+02	6.6124E+02	1.0045E+02	-5.2132E-06	0.8563	0.7750
	4.0000E+00	5.1310E+00	6.6030E+02	-1.4591E+02	-9.2267E-07	6.7623E+02	6.7623E+02	1.4591E+02	-9.9083E-06		0.7657
	6.0000E+00	2.4990E+00	7.4964E+02	7.8704E+00	1.1757E-06	7.4968E+02	7.4968E+02	-7.8704E+00	1.6604E-06		0.7181
16	6.0000E+00	2.7500E+00	7.4046E+02	8.7025E+00	1.0680E-06	7.4052E+02	7.4052E+02	-8.7025E+00	1.6039E-06	0.7988	0.7242
17	6.0000E+00	3.0000E+00	7.3281E+02	6.3661E+00	9.8260E-07	7.3284E+02	7.3284E+02	-6.3661E+00	1.3746E-06	0.7988	0.7293
18	6.0000E+00	3.2500E+00	7.2880E+02	3.2203E+00	9.1329E-07	7.2881E+02	7.2881E+02	-3.2203E+00	1.1116E-06	0.7988	0.7319
19	6.0000E+00	3.5000E+00	7.2719E+02	2.8373E-01	8.5535E-07	7.2719E+02	7.2719E+02	-2.8373E-01	8.7282E-07	0.7988	0.7330
20	6.0000E+00	3.7500E+00	7.2729E+02	-2.0213E+00	8.0564E-07	7.2729E+02	7.2729E+02	2.0213E+00	6.8116E-07	0.7988	0.7329
21	6.0000E+00	4.0000E+00	7.2857E+02	-3.4643E+00	7.6197E-07	7.2858E+02	7.2858E+02	3.4643E+00	5.4862E-07	0.7988	0.7321
22	6.0000E+00	4.2500E+00	7.3056E+02	-3.9040E+00	7.2274E-07	7.3057E+02	7.3057E+02	3.9040E+00	4.8231E-07	0.7988	0.7308
23	6.0000E+00	4.5000E+00	7.3274E+02	-3.3019E+00	6.8679E-07	7.3275E+02	7.3275E+02	3.3019E+00	4.8344E-07	0.7988	0.7293
24	6.0000E+00	4.7500E+00	7.3454E+02	-1.8159E+00	6.5324E-07	7.3454E+02	7.3454E+02	1.8159E+00	5.4141E-07	0.7988	0.7282
	6.0000E+00	5.0000E+00	7.2939E+02	0.	-6.2058E-07	7.2939E+02	7.2939E+02	-3.8217E-14	-6.2058E-07		0.7315

I	COORDINATES AXIAL X	COORDINATES RADIAL Y	NEW CP VBRI	NEW CP CPC	ANGLES MERIDIONAL ALPHA	ANGLES FLOW BETA	ANGLES UNDERTURNG ETA	ANGLES SPANWISE ZETA	ANGLES SWIRL PHI	QFRACT
	2.0000E+00	1.9996E+00		-4.6955E-01	9.7290E+00	4.8748E-08	-9.7290E+00	9.3001E-07	3.2504E-07	0.
1	2.0000E+00	2.5000E+00	4.1759E+02	-4.6936E-01	3.1143E+00	2.6213E-07	-3.1143E+00	4.5449E-07	2.6251E-07	8.0189E-02
2	2.0000E+00	3.0000E+00	4.1759E+02	-4.9250E-01	-1.9023E+00	2.2662E-07	1.9023E+00	1.0955E-07	2.2675E-07	1.7980E-01
3	2.0000E+00	3.5000E+00	4.1759E+02	-5.2627E-01	-5.3949E+00	2.0227E-07	5.3949E+00	-1.3005E-07	2.0317E-07	3.0011E-01
4	2.0000E+00	4.0000E+00	4.1759E+02	-5.6382E-01	-7.5521E+00	1.8391E-07	7.5521E+00	-2.8228E-07	1.8552E-07	4.4219E-01
5	2.0000E+00	4.5000E+00	4.1759E+02	-5.9859E-01	-8.2616E+00	1.6909E-07	8.2616E+00	-3.4148E-07	1.7086E-07	6.0690E-01
6	2.0000E+00	5.0000E+00	4.1759E+02	-6.1668E-01	-6.8643E+00	1.5710E-07	6.8643E+00	-2.6652E-07	1.5824E-07	7.9437E-01
	2.0000E+00	5.4981E+00		-5.7537E-01	-1.3224E+00	-1.5048E-07	1.3224E+00	-2.3197E-07	-1.5052E-07	1.0000E+00
	4.0000E+00	2.3258E+00		-8.5598E-01	7.9354E+00	1.6114E-07	-7.9354E+00	6.5454E-07	1.6270E-07	0.
7	4.0000E+00	2.7500E+00	5.2407E+02	-8.4831E-01	3.6786E+00	1.3717E-07	-3.6786E+00	3.6430E-07	1.3745E-07	1.0067E-01
8	4.0000E+00	3.0000E+00	5.2407E+02	-8.5066E-01	1.7006E+00	1.2690E-07	-1.7006E+00	2.3172E-07	1.2696E-07	1.6810E-01
9	4.0000E+00	3.2500E+00	5.2407E+02	-8.5745E-01	3.8978E-03	1.1840E-07	-3.8978E-03	1.1864E-07	1.1840E-07	2.4162E-01
10	4.0000E+00	3.5000E+00	5.2407E+02	-8.6791E-01	-1.4942E+00	1.1116E-07	1.4942E+00	1.9156E-08	1.1119E-07	3.2131E-01
11	4.0000E+00	3.7500E+00	5.2407E+02	-8.8179E-01	-2.8665E+00	1.0482E-07	2.8665E+00	-7.1727E-08	1.0495E-07	4.0727E-01
12	4.0000E+00	4.0000E+00	5.2407E+02	-8.9924E-01	-4.1845E+00	9.9121E-08	4.1845E+00	-1.5877E-07	9.9386E-08	4.9962E-01
13	4.0000E+00	4.2500E+00	5.2407E+02	-9.2068E-01	-5.5287E+00	9.3879E-08	5.5287E+00	-2.4722E-07	9.4318E-08	5.9850E-01
14	4.0000E+00	4.5000E+00	5.2407E+02	-9.4667E-01	-7.0006E+00	8.8961E-08	7.0006E+00	-3.4365E-07	8.9629E-08	7.0406E-01
15	4.0000E+00	4.7500E+00	5.2407E+02	-9.7747E-01	-8.7376E+00	8.4300E-08	8.7376E+00	-4.5702E-07	8.5289E-08	8.1638E-01
	4.0000E+00	5.1310E+00		-1.0191E+00	-1.2461E+01	-7.8176E-08	1.2461E+01	-8.5977E-07	-8.0062E-08	1.0000E+00

	6.0000E+00	2.4990E+00		-1.2311E+00	6.0152E-01	8.9853E-08	-6.0152E-01	1.2690E-07	8.9858E-08	0.
16	6.0000E+00	2.7500E+00	5.8435E+02	-1.2040E+00	6.7335E-01	8.2632E-08	-6.7335E-01	1.2411E-07	8.2637E-08	7.0899E-02
17	6.0000E+00	3.0000E+00	5.8435E+02	-1.1814E+00	4.9773E-01	7.6823E-08	-4.9773E-01	1.0748E-07	7.6826E-08	1.4780E-01
18	6.0000E+00	3.2500E+00	5.8435E+02	-1.1696E+00	2.5317E-01	7.1798E-08	-2.5317E-01	8.7390E-08	7.1799E-08	2.3105E-01
19	6.0000E+00	3.5000E+00	5.8435E+02	-1.1649E+00	2.2355E-02	6.7393E-08	-2.2355E-02	6.8770E-08	6.7393E-08	3.2078E-01
20	6.0000E+00	3.7500E+00	5.8435E+02	-1.1652E+00	-1.5924E-01	6.3468E-08	1.5924E-01	5.3662E-08	6.3468E-08	4.1710E-01
21	6.0000E+00	4.0000E+00	5.8435E+02	-1.1690E+00	-2.7244E-01	5.9921E-08	2.7244E-01	4.3144E-08	5.9922E-08	5.2012E-01
22	6.0000E+00	4.2500E+00	5.8435E+02	-1.1748E+00	-3.0618E-01	5.6681E-08	3.0618E-01	3.7826E-08	5.6682E-08	6.2992E-01
23	6.0000E+00	4.5000E+00	5.8435E+02	-1.1812E+00	-2.5819E-01	5.3702E-08	2.5819E-01	3.7802E-08	5.3703E-08	7.4655E-01
24	6.0000E+00	4.7500E+00	5.8435E+02	-1.1864E+00	-1.4164E-01	5.0954E-08	1.4164E-01	4.2231E-08	5.0954E-08	8.7002E-01
	6.0000E+00	5.0000E+00		-1.1713E+00	0.	-4.8748E-08	-3.0021E-15	-4.8748E-08	-4.8748E-08	1.0000E+00

RELATIVE ROTOR INLET DATA

X = 6.0000 UTIP = 900.0000

Y	U	VZPRIME	VPRIM	MPRIME	BETAPR	VZPRST	VPRST	MPRS	BETAPS
2.4990E+00	4.4982E+02	-4.4982E+02	8.7428E+02	8.2139E-01	-3.0964E+01	-4.4982E+02	8.7428E+02	8.2139E-01	-3.0964E+01
2.7500E+00	4.9500E+02	-4.9500E+02	8.9072E+02	8.3583E-01	-3.3761E+01	-4.9500E+02	8.9072E+02	8.3583E-01	-3.3761E+01
3.0000E+00	5.4000E+02	-5.4000E+02	9.1030E+02	8.5336E-01	-3.6385E+01	-5.4000E+02	9.1030E+02	8.5336E-01	-3.6385E+01
3.2500E+00	5.8500E+02	-5.8500E+02	9.3455E+02	8.7564E-01	-3.8753E+01	-5.8500E+02	9.3455E+02	8.7564E-01	-3.8753E+01
3.5000E+00	6.3000E+02	-6.3000E+02	9.6214E+02	9.0130E-01	-4.0904E+01	-6.3000E+02	9.6214E+02	9.0130E-01	-4.0904E+01
3.7500E+00	6.7500E+02	-6.7500E+02	9.9226E+02	9.2952E-01	-4.2865E+01	-6.7500E+02	9.9226E+02	9.2952E-01	-4.2865E+01
4.0000E+00	7.2000E+02	-7.2000E+02	1.0243E+03	9.5971E-01	-4.4661E+01	-7.2000E+02	1.0243E+03	9.5971E-01	-4.4661E+01
4.2500E+00	7.6500E+02	-7.6500E+02	1.0578E+03	9.9135E-01	-4.6319E+01	-7.6500E+02	1.0578E+03	9.9135E-01	-4.6319E+01
4.5000E+00	8.1000E+02	-8.1000E+02	1.0923E+03	1.0239E+00	-4.7867E+01	-8.1000E+02	1.0923E+03	1.0239E+00	-4.7867E+01
4.7500E+00	8.5500E+02	-8.5500E+02	1.1272E+03	1.0569E+00	-4.9334E+01	-8.5500E+02	1.1272E+03	1.0569E+00	-4.9334E+01
5.0000E+00	9.0000E+02	-9.0000E+02	1.1584E+03	1.0855E+00	-5.0978E+01	-9.0000E+02	1.1584E+03	1.0855E+00	-5.0978E+01

RAKE WEIGHT FLOW DATA

I	X	(Q(I)-QBAR)/QBAR	QS TOT	QFR
1	2.0000E+00	6.0734E-02	1.9409E+01	1.0000E+00
2	4.0000E+00	2.0013E-02	1.8664E+01	1.0000E+00
3	6.0000E+00	0.	1.8297E+01	1.0000E+00

STREAMLINES

X = 2.000

QSTRM	YSTRM
2.00000E-02	2.13255E+00
4.00000E-02	2.26011E+00
6.00000E-02	2.38223E+00
8.00000E-02	2.49892E+00
1.00000E-01	2.60565E+00
1.20000E-01	2.70919E+00
1.40000E-01	2.80958E+00
1.60000E-01	2.90683E+00
1.80000E-01	3.00090E+00
2.00000E-01	3.08886E+00
2.20000E-01	3.17488E+00
2.40000E-01	3.25896E+00
2.60000E-01	3.34110E+00
2.80000E-01	3.42130E+00
3.00000E-01	3.49956E+00
3.20000E-01	3.57381E+00
3.40000E-01	3.64679E+00
3.60000E-01	3.71851E+00

3.80000E-01	3.78897E+00
4.00000E-01	3.85816E+00
4.20000E-01	3.92610E+00
4.40000E-01	3.99277E+00
4.60000E-01	4.05680E+00
4.80000E-01	4.11980E+00
5.00000E-01	4.18196E+00
5.20000E-01	4.24328E+00
5.40000E-01	4.30377E+00
5.60000E-01	4.36342E+00
5.80000E-01	4.42223E+00
6.00000E-01	4.48020E+00
6.20000E-01	4.53637E+00
6.40000E-01	4.59147E+00
6.60000E-01	4.64608E+00
6.80000E-01	4.70018E+00
7.00000E-01	4.75379E+00
7.20000E-01	4.80689E+00
7.40000E-01	4.85950E+00
7.60000E-01	4.91162E+00
7.80000E-01	4.96323E+00
8.00000E-01	5.01435E+00
8.20000E-01	5.06496E+00
8.40000E-01	5.11508E+00
8.60000E-01	5.16470E+00
8.80000E-01	5.21383E+00
9.00000E-01	5.26245E+00
9.20000E-01	5.31058E+00
9.40000E-01	5.35820E+00
9.60000E-01	5.40533E+00
9.80000E-01	5.45197E+00
1.00000E+00	5.49810E+00

X = 4.000

QSTRM	YSTRM
2.00000E-02	2.41496E+00
4.00000E-02	2.50168E+00
6.00000E-02	2.58599E+00
8.00000E-02	2.66790E+00
1.00000E-01	2.74739E+00
1.20000E-01	2.82370E+00
1.40000E-01	2.89822E+00
1.60000E-01	2.97101E+00
1.80000E-01	3.04172E+00
2.00000E-01	3.11075E+00
2.20000E-01	3.17841E+00
2.40000E-01	3.24469E+00
2.60000E-01	3.30922E+00
2.80000E-01	3.37260E+00
3.00000E-01	3.43488E+00
3.20000E-01	3.49605E+00
3.40000E-01	3.55579E+00
3.60000E-01	3.61460E+00
3.80000E-01	3.67251E+00
4.00000E-01	3.72952E+00
4.20000E-01	3.78542E+00
4.40000E-01	3.84044E+00
4.60000E-01	3.89470E+00
4.80000E-01	3.94822E+00
5.00000E-01	4.00099E+00

5.20000E-01	4.05278E+00
5.40000E-01	4.10394E+00
5.60000E-01	4.15447E+00
5.80000E-01	4.20438E+00
6.00000E-01	4.25365E+00
6.20000E-01	4.30210E+00
6.40000E-01	4.35002E+00
6.60000E-01	4.39743E+00
6.80000E-01	4.44431E+00
7.00000E-01	4.49066E+00
7.20000E-01	4.53626E+00
7.40000E-01	4.58139E+00
7.60000E-01	4.62611E+00
7.80000E-01	4.67043E+00
8.00000E-01	4.71434E+00
8.20000E-01	4.75784E+00
8.40000E-01	4.80093E+00
8.60000E-01	4.84362E+00
8.80000E-01	4.88590E+00
9.00000E-01	4.92777E+00
9.20000E-01	4.96924E+00
9.40000E-01	5.01030E+00
9.60000E-01	5.05095E+00
9.80000E-01	5.09120E+00
1.00000E+00	5.13104E+00

X = 6.000

QSTRM	YSTRM
2.00000E-02	2.57179E+00
4.00000E-02	2.64302E+00
6.00000E-02	2.71269E+00
8.00000E-02	2.78054E+00
1.00000E-01	2.84675E+00
1.20000E-01	2.91173E+00
1.40000E-01	2.97547E+00
1.60000E-01	3.03772E+00
1.80000E-01	3.09875E+00
2.00000E-01	3.15878E+00
2.20000E-01	3.21781E+00
2.40000E-01	3.27568E+00
2.60000E-01	3.33246E+00
2.80000E-01	3.38843E+00
3.00000E-01	3.44357E+00
3.20000E-01	3.49790E+00
3.40000E-01	3.55114E+00
3.60000E-01	3.60369E+00
3.80000E-01	3.65556E+00
4.00000E-01	3.70676E+00
4.20000E-01	3.75723E+00
4.40000E-01	3.80686E+00
4.60000E-01	3.85591E+00
4.80000E-01	3.90441E+00
5.00000E-01	3.95234E+00
5.20000E-01	3.99971E+00
5.40000E-01	4.04631E+00
5.60000E-01	4.09244E+00
5.80000E-01	4.13809E+00
6.00000E-01	4.18328E+00
6.20000E-01	4.22799E+00
6.40000E-01	4.27214E+00

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 6.60000E-01     4.31576E+00
 6.80000E-01     4.35899E+00
 7.00000E-01     4.40183E+00
 7.20000E-01     4.44427E+00
 7.40000E-01     4.48631E+00
 7.60000E-01     4.52782E+00
 7.80000E-01     4.56893E+00
 8.00000E-01     4.60972E+00
 8.20000E-01     4.65019E+00
 8.40000E-01     4.69034E+00
 8.60000E-01     4.73016E+00
 8.80000E-01     4.76967E+00
 9.00000E-01     4.80886E+00
 9.20000E-01     4.84773E+00
 9.40000E-01     4.88628E+00
 9.60000E-01     4.92450E+00
 9.80000E-01     4.96241E+00
 1.00000E+00     5.00000E+00

*01* UNIT05, EOF.                                    REC=  00000 FIL=  00002
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8. Lieblein, S.; and Stockman, N. O.: Compressibility Correction for Internal Flow Solutions. J. Aircraft, vol. 9, no. 4, Apr. 1972, pp. 312-313.

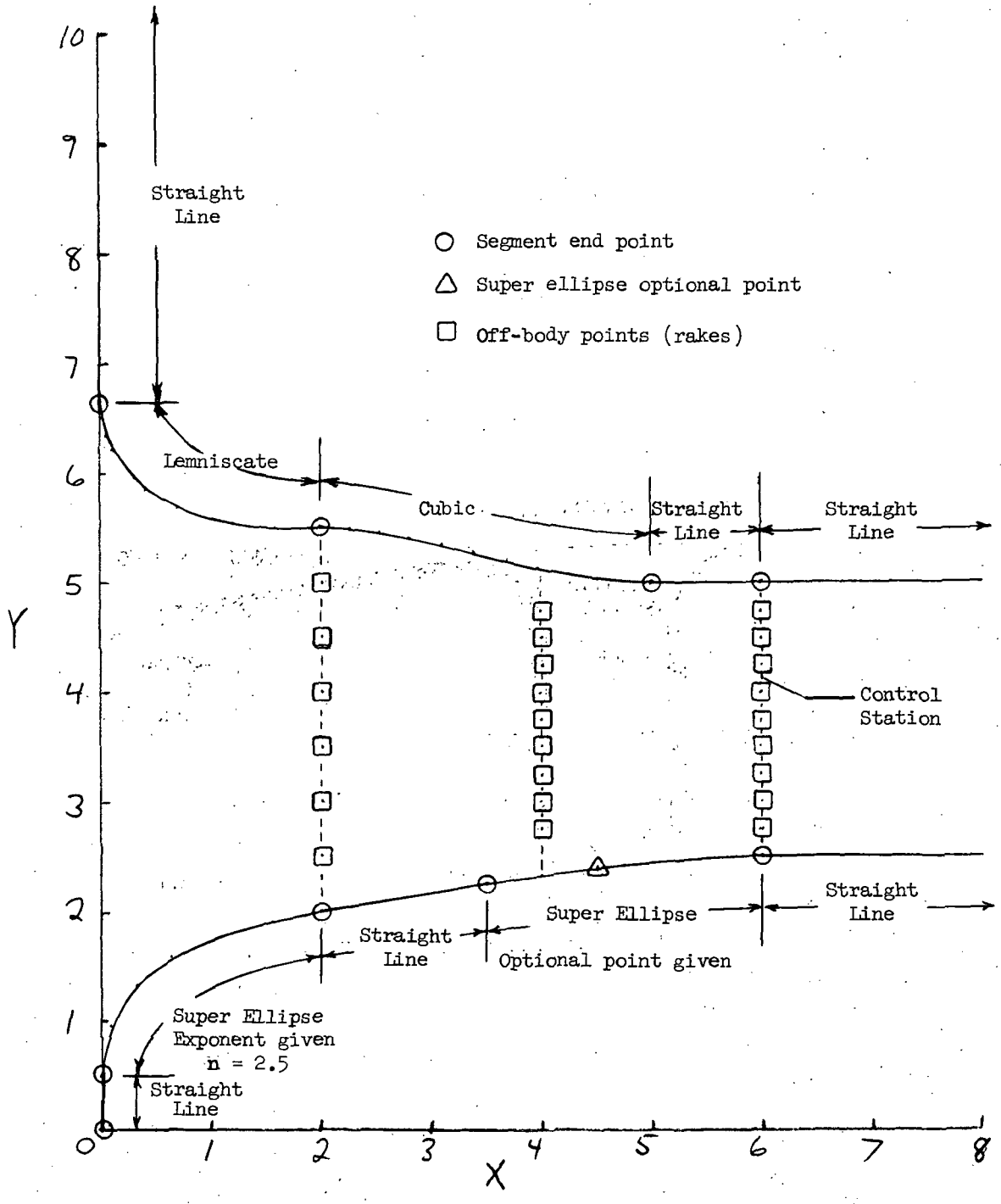


Figure 1. Test case showing segmentation of inlet surfaces.

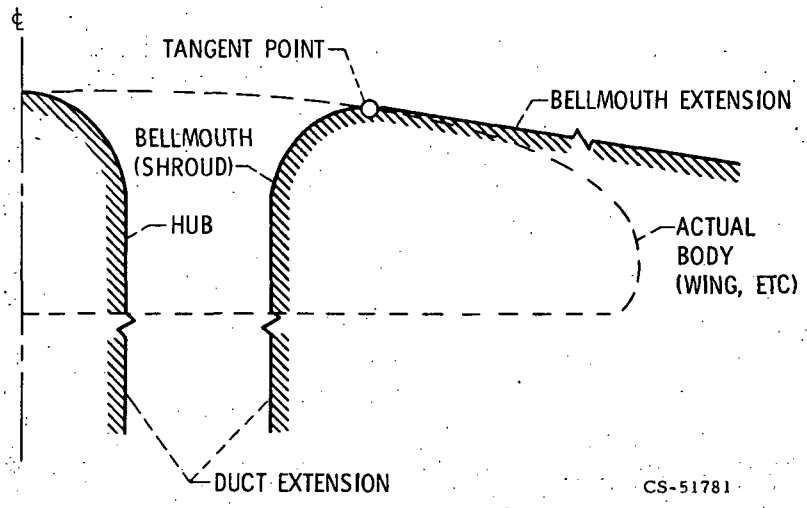


Figure 2. - Idealized profile of VTOL inlet.

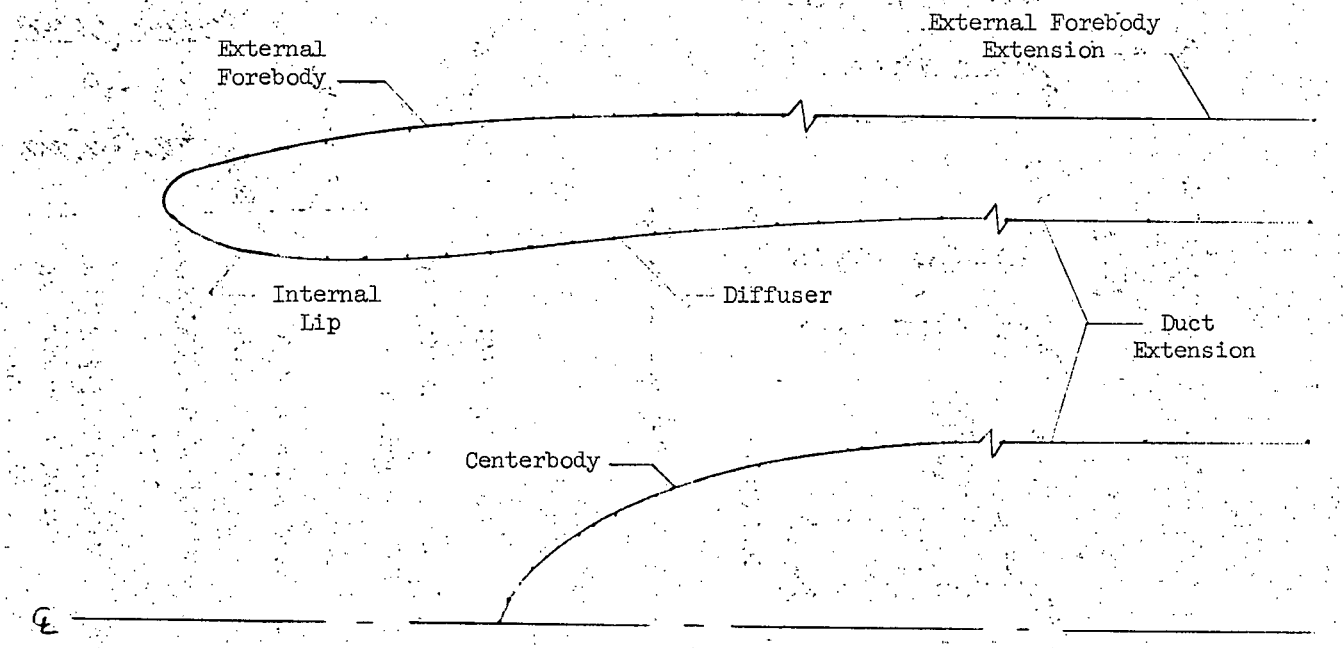


Figure 3. Idealized profile of conventional inlet.

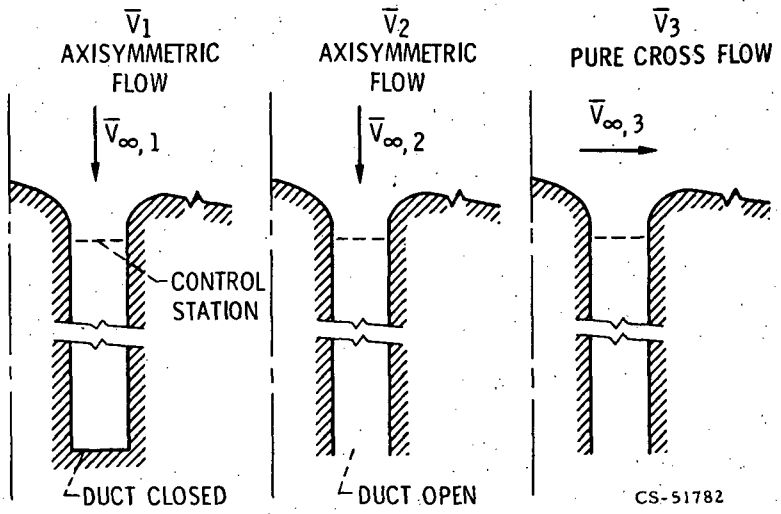


Figure 4. - Basic solutions, $\bar{V}_1$.

AT ANY POINT, $\bar{V} = A\bar{V}_1 + B\bar{V}_2 + C\bar{V}_3$

A, B, AND C ARE DETERMINED BY SPECIFYING VALUES OF:

V_c AVERAGE AXIAL VELOCITY AT CONTROL STATION

V_∞ MAGNITUDE OF FREE STREAM VELOCITY

α DIRECTION OF FREE STREAM VELOCITY RELATIVE TO THE INLET AXIS

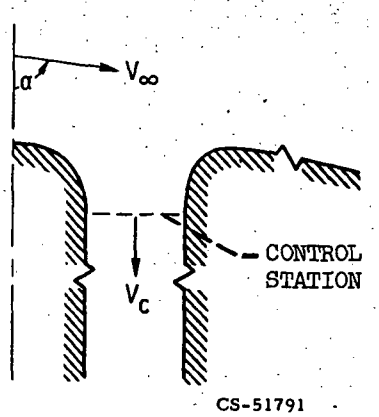


Figure 5. - Combined solution, $\bar{V}$.

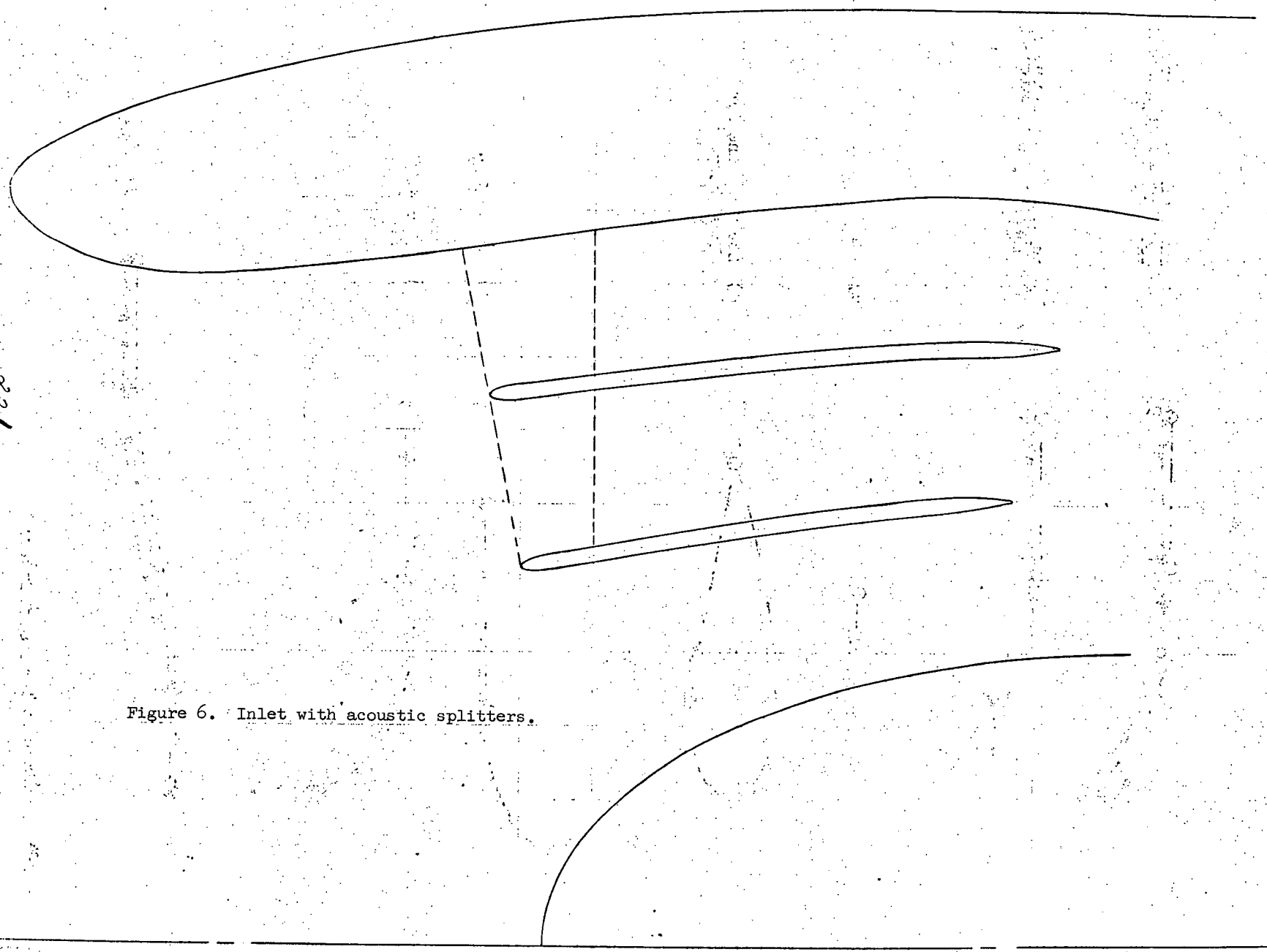
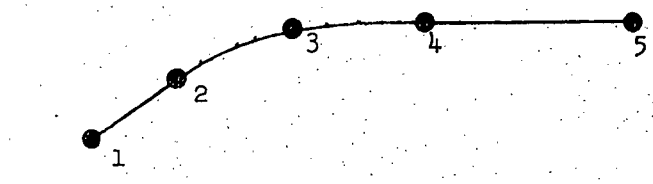
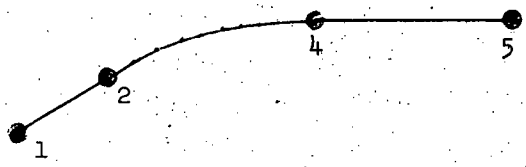


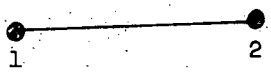
Figure 6. Inlet with acoustic splitters.



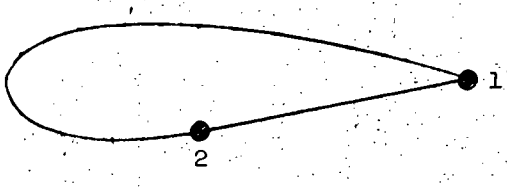
a) Super ellipse; optional point 3 specified.



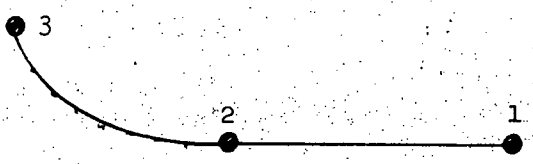
b) Super ellipse; exponent specified.



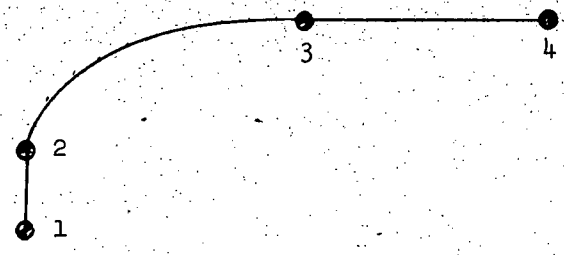
c) Straight line.



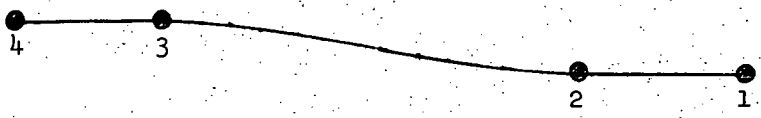
d) Straight line for closed body.



e) Lemniscate.



f) Ellipse.



g) Cubic.

Figure 7. Sketches for SCIRCL input.