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Calculation of Water Drop
Trajectories to and About
Arbitrary Three-Dimensional
Bodies in Potential Airflow

FOR REFERENCE

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Hillyer G. Norment

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Calculation of Water Drop
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CALCULATION OF WATER DROP TRAJECTORIES TO AND ABOUT
ARBITRARY THREE-DIMENSIONAL BODIES IN POTENTIAL AIRFLOW

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SUMMARY

Computer programs are described by which trajectories of water drops can be calculated to and about three-dimensional, non-lifting bodies of arbitrary shape. External potential airflow about the body is computed; flow into (but not through) inlets also can be simulated. Calculations can be done for any atmospheric conditions and for any subsonic airspeed. Experimentally derived relations between Reynolds and Davies numbers for water drops of all sizes, from the smallest cloud droplets to large raindrops, are used to represent effects of aerodynamic drag on the particles during integration of the water drop equations of motion, and effects of gravity settling are included. A variable time step numerical integration method is used.

The surface of the three-dimensional body is approximated by plane quadrilateral panels, over each of which a uniform potential source is assumed to be distributed. Source densities and the resulting potential flow field are calculated by the Hess-Smith method.

The following seven codes are described:

1. A code used to debug and plot the body surface data.
2. A modified version of the Hess-Smith code which processes the body data and yields data required to compute flow velocities at arbitrary points in space.
3. A code that computes flow velocities at arrays of points in three-dimensional space.

4. A code that computes trajectories of water drops toward the body from arrays of initial points in space.
5. A code that computes water drop trajectories and water drop fluxes to arbitrary target points.
6. A code that computes water drop trajectories tangent to the body.
7. A code that produces stereo pair plots that include both the body and trajectories.

Code descriptions include operating instructions, card inputs and printouts for example problems, and listings of the FORTRAN codes.

Various tests of simulation accuracy are discussed, and accuracy is found to be acceptable. Trajectory results for flow around ellipsoids are compared with prior calculations and acceptable agreement is found. Results, again for flow about ellipsoids, are compared with experimental data and are found to be superior to prior calculations.

INTRODUCTION

With the development of practical numerical methods by which potential flow about arbitrary three-dimensional bodies can be calculated, along with development of efficient methods for integration of particle equations of motion, it has become possible to compute trajectories of particles suspended in a fluid to or about a complex body that is in motion relative to the fluid. Past applications have been to the study of mounting sites of hydrometeor measurement instruments on cloud physics research airplanes (refs. 1 - 8). In the future the methods are to be used to study aircraft icing, an application for which they are ideally suited, and it is in preparation for such work that this code documentation is undertaken.

We distinguish two major categories of codes: flow codes and trajectory codes. The flow codes process data that describe the three-dimensional body and compute the fluid flow field around that body.* The trajectory codes use the results of the flow codes to compute trajectories of particles to and about the body. For aircraft icing studies, the body is, of course, an aircraft, the fluid is air and the particles are water drops. Table 1 identifies and briefly describes the executive codes in the two categories, and Table 2 does the same for the subroutine and function codes.

* It is immaterial whether we consider the fluid to be stationary and the body in motion, or vice versa, but it is expedient here to consider the body stationary and the fluid in motion.

TABLE 1
EXECUTIVE CODES

A. FLOW CODES

<u>Code</u>	<u>Description</u>
PBOXC	Processes and plots data which define the three-dimensional body. Used to debug and plot the body data.
BOXC	Processes three-dimensional body data and prepares and stores data to be used by SR FLOVEL to calculate flow velocities as needed during trajectory calculations.
FLOPNT	Computes and prints flow velocities at user-specified arrays of points in space.

B. TRAJECTORY CODES

<u>Code</u>	<u>Description</u>
ARYTRJ	Computes trajectories, which begin at user-specified arrays of points in space, to and/or about the body.
CONFAC	Computes trajectories from the free stream to user-specified points in space. Also computes particle concentration factors at user-specified points in space. (Concentration factor is ratio of particle flux at the target point to free stream particle flux.)
TANTRA	Computes trajectories tangent to the body which are initiated along user-specified lines in the free stream. (Tangent trajectories are those trajectories that barely miss intersection with the body.)
STEREO	Prepares stereo-pair plots of the body along with particle trajectories.

TABLE 2
SUBROUTINE AND FUNCTION CODES

A. FLOW CODES

<u>Code</u>	<u>Called By</u>	<u>Description</u>
AFORM	BOXC	Computes the induced velocity matrix, A_{ij} (ref. 9).
ATAPES	BOXC	Reads A_{ij} matrix from an appropriate tape.
DATPROS	INPUT	Translates, scales and rotates input body data before processing.
FLOVEL	TRAJECT CONFAC ARYTRJ FLOPNT	Returns flow velocity for a given point in space.
FLWS	BOXC	Sets up non-uniform free stream flows.
HEADER	BOXC INPUT AFORM VFORM PRINT1	Writes a printout header.
INPUT	BOXC	Processes input body coordinate data into quadrilaterals. Produces the "first output" (ref. 9, sec. 9.4).
PATPROS	PINPUT	Translates, scales and rotates input body data before processing. Punches the translated, scaled and rotated data if so requested.
PEADER	PINPUT	Writes a printout header.
PICTUR	PBOXC	Plots the body surface data.
PINPUT	PBOXC	Processes input body coordinate data into quadrilaterals. Produces the "first output" (ref. 9, sec. 9.4).
PRINT1	BOXC	Computes and prints on-body velocities, and off-body velocities if so requested. Writes source strengths on unit 14 if so requested. Produces the "second output" (ref. 9., sec. 9.7).
SIGMA	BOXC	Solves linear equation matrix for surface source densities by the Seidel iterative method.
SOLVIT	BOXC	Solves linear equation matrix for surface source densities by the direct method.

TABLE 2, cont.

<u>Code</u>	<u>Called By</u>	<u>Description</u>
UNIFRM	FLWS	Sets up uniform free stream flows.
VFORM	BOXC	Computes velocity components induced at each quadrilateral by all other quadrilaterals.
WTAP14	BOXC	Writes quadrilateral data needed for flow velocity computation onto unit 14 if so requested.

B. TRAJECTORY CODES

<u>Code</u>	<u>Called By</u>	<u>Description</u>
CDRR	PRFUN PARTCL	Given Reynolds number, returns Davies number for a sphere. Used for water drops for which Reynolds number is less than or equal to 200.
DVDQ	TRAJECT	Integrates particle equations of motion for each time step (ref. 11).
FALWAT	PARTCL	Returns still-air, terminal settling speed for a water drop. Uses equations of Beard (ref. 17).
IMPACT	TRAJECT	Used in runs under control of CONFAC to adjust trajectory initial y,z coordinates to avoid impact on the body on the next trajectory after impaction has occurred. This is a problem-specific subroutine.
MAP	CONFAC	Controls the iterative calculation of trajectories to a specified target point.
MATINV	MAP	Linear equation solver.
PARTCL	ARYTRJ CONFAC TANTRA	Reads particle specification data and returns still-air, terminal particle settling speed and other particle data as required for the particular type of particle. This is a particle type-specific code. The version provided here is for water drops.
POLYGON	CONFAC	Calculates area of a plane polygon of N vertices. Provides cross-sectional areas of particle flux tubes which are used to compute concentration factors.
PRFUN	TRAJECT	Given the particle Reynolds number, returns the factor which when multiplied by $\vec{v}_p - \vec{v}_a$ yields the first term on the right side of eq. (1). This is a particle type-specific function. The version provided here is for water drops.

TABLE 2, cont.

<u>Code</u>	<u>Called By</u>	<u>Description</u>
SETFLO	FLOPNT ARYTRJ CONFAC TANTRA	Reads BOXC output data stored on unit 14 that is required by SR FLOVEL for flow velocity calculations. If flow velocities are calculated by other than the Hess-Smith method, this code must be replaced with a dummy.
STRPNT	TANTRA	Specifies a curve in three-dimensional space on which lie the initial points of all trajectories used in computing a tangent trajectory to the body. Also specifies coarse and fine step sizes to be used in traversing the curve in search of the tangent trajectory, and it steps along the curve to define new initial trajectory points under control of TANTRA. The version supplied here uses straight line curves.
TRAJECT	ARYTRJ TANTRA MAP	Computes particle trajectories. (See p. 38)
TRANSFM	CONFAC MAP	Transforms coordinate system from the "flow system" to the "flux tube system", or reverse. (See pp. 44, 45.)
WCRRR	PRFUN PARTCL	Given Reynolds number, returns Davies number for a water drop. Used for case where the Reynolds number is greater than 200.

METHODOLOGY

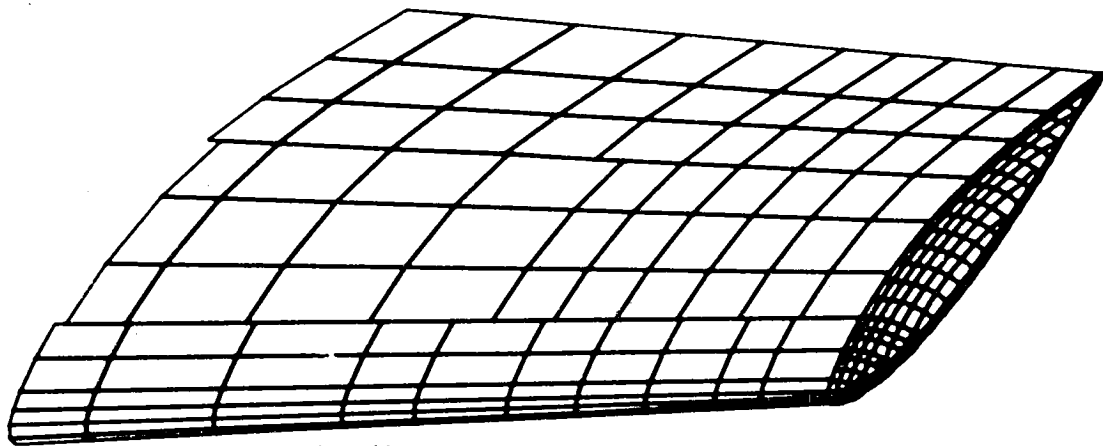
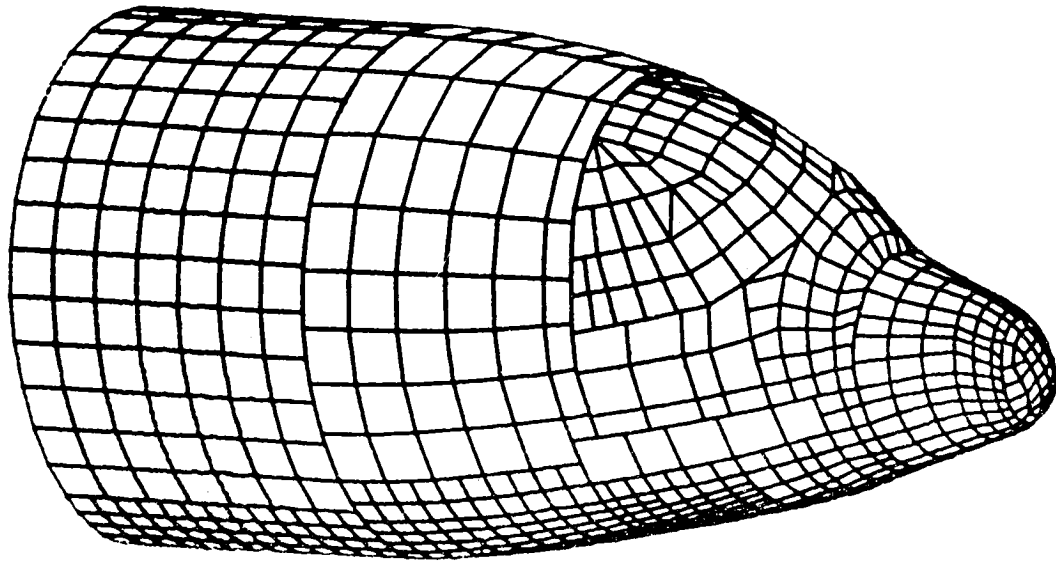
THREE-DIMENSIONAL FLOW

The code of Hess and Smith (refs. 9, 10) for calculation of non-lifting potential flow about arbitrary three-dimensional bodies is used. The code requires input of a digital description of the body surface. This consists of the coordinates of the corner points of a large number of quadrilaterals. (Examples of digital descriptions of portions of a C130 airplane are shown in Fig. 1.) Each quadrilateral panel is taken to be a uniform-distributed source. On the basis of the boundary condition that there be zero flux through the center of each panel, and given the direction of the free-stream flow, the code finds the source strengths of all panels by inversion of a large matrix that includes all possible panel interactions. The matrix is inverted only once for each airplane geometry, provided that the results are stored for future use.

This potential flow method works quite satisfactorily where the local Mach number does not exceed approximately one-half (ref. 10). By making simple adjustments to the calculations the method can be extended to higher Mach numbers as long as there are no supersonic regions in the real flow.

Particle trajectory calculations require flow velocities point-by-point along each trajectory. In calculating each flow velocity, contributions from all panels are summed. There are three algorithms for computing contributions: (1) for panels that are close to the calculation point, a detailed calculation is used that accounts for exact panel shape, (2) for panels at intermediate distances a multipole expansion is used, and (3) for remote panels a point source approximation is used. Mathematical details are found in references 9 and 10.

To perform these calculations, we have developed a subroutine (FLOVEL) that consists of various extracted and modified portions of the Hess-Smith code. This subroutine is generalized such that given geometrical properties, source strength and other data for every quadrilateral,



Leading Edge

Figure 1. Digital descriptions of the forward fuselage and outer wing of a Lockheed C130E airplane.

it will provide the flow velocity for any specified point in space. It also checks each quadrilateral to determine if it has been penetrated by the particle.

Hess and Smith have evaluated the accuracy of their method for a variety of cases and have found excellent agreement with experiment (refs. 9 and 10). We have also done some evaluation studies (ref. 1), and in the Validation section below our prior work is summarized and results of some new studies of tangent trajectories to ellipsoids are presented and compared with prior work.

Of course accuracy also depends on the fineness of resolution of the panel description of the body, and naturally some compromise is called for. The smaller the panels the finer the resolution, and the fewer of them for which the most exacting of the three algorithms must be used. On the other hand, the number of panels increases inversely as the square of their linear size. In past studies on airplanes we have used the following criteria in setting up panel structures: For those parts of the airplane traversed by particle trajectories, we try to keep the panel edges between 6" to 8" in length. Where allowed by simplicity of surface shape, remote panels can be larger. Remote downstream complexities of shape are ignored. The cylindrical portion of a fuselage is extended to approximately five times the length of the nose section, as recommended by Hess and Smith (ref. 10).

For a particular computer, time required for trajectory calculation is largely dependent on the number of velocities required. On the CDC 6600 computer, one velocity calculation requires on the order of 0.15 second for a typical problem. The number of velocities required per trajectory varies from about 60 to 300. A typical number of trajectories required is 25. Thus, computing time, even on a large computer, can be considerable. Computing times required on the UNIVAC 1100 are included here for each of the test problems. (See p. 60.)

Though the flow codes retain additional capabilities, for the calculations described here we require the following:

1. A unit free stream speed in the direction of the positive x axis.
2. All velocities are normalized and scaled to be consistent with the unit free stream speed.
3. All distances are normalized by dividing by a user-specified characteristic dimension of the body.

Body coordinates may be recorded in any convenient units and can be appropriately scaled and translated prior to processing via use of SR's PATPROS and DATPROS. These subroutines also allow rotation of the body about the y axis to adjust angle of attack.

PARTICLE TRAJECTORY CALCULATION

We assume that the bulk air flow is not perturbed by the particles. Moreover, since particle density is large compared to that of air, we can neglect buoyancy and inertial reaction of the fluid to obtain the three-dimensional, normalized equation

$$\frac{d\vec{v}_p}{d\tau} = \frac{1}{N_F} \left[\frac{1}{v_s} (\vec{v}_a - \vec{v}_p) \frac{N_D N_{R,s}}{N_{D,s} N_R} - \vec{k} \right] \quad (1)$$

Non-dimensional quantities are:

\vec{v}_p, \vec{v}_a	particle and air velocities
v_s	still-air, terminal settling speed of the particle
\vec{k}	unit vector in the z (upward) direction
τ	time

$$N_D = C_D N_R^2 \quad \text{Davies number}$$

$$N_F = V^2 / (Lg) \quad \text{Froude number}$$

$$N_R = \frac{\rho \delta}{\eta} |\vec{v}_a - \vec{v}_p| V \quad \text{Reynolds number}$$

Dimensioned quantities are:

δ particle diameter

ρ air density

η air viscosity

g gravity acceleration constant

V free stream airspeed

L a characteristic dimension of the body

Here length is normalized by dividing by L , velocity by V and time by L/V .

$N_{D,s}$ and $N_{R,s}$ are for still-air, terminal particle settling.

We initiate the calculation far enough upstream to be essentially beyond the influence of the body where we can take $\vec{v}_p = -k\vec{v}_s$. We compute \vec{v}_a at the initial point, calculate N_R from these data, calculate N_D from N_R using the relations discussed in the next section, and proceed straightforwardly with a numerical integration of eq. (1). The integration is done via use of the code DVDQ of Krogh (ref. 11). This code uses an Adams-type predictor - corrector algorithm with variable time step. It also tests for computational stability and loss of accuracy via roundoff error. It was tested by Hull, et al., (ref. 12) along with a number of other codes and found to be most efficient in terms of numbers of function evaluations (flow velocities) required.

AERODYNAMIC DRAG OF WATER DROPS

Davies (ref. 13) shows that still-air terminal settling of spheres can be generalized in terms of the dimensionless numbers $N_{R,s}$ and $N_{D,s}$. Over the range from the smallest spheres, which settle under viscous flow conditions and obey Stokes law, to spheres much larger than of interest here, and for any Newtonian fluid, a reproducible single-valued relationship between $N_{R,s}$ and $N_{D,s}$ exists. Furthermore, $N_{D,s}$ is independent of settling speed, being a function of fluid and sphere properties only; thus for given sphere and fluid, $N_{R,s}$ and hence V_s can be calculated. Polynomials by which $N_{R,s}$ can be computed as a function of $N_{D,s}$ were derived by Davies from a composite of many sets of experimental data.

Since the work of Davies it has been found repeatedly that this treatment is applicable to particles of other shapes, providing settling is steady and particle orientation is stable.

For the trajectory calculations required here, the problem must be turned around. In addition to gravity settling, there is a particle velocity component (relative to air) caused by the disturbance of the passing airplane. At any time step in the numerical integration of eq. (1), $\vec{v}_a - \vec{v}_p$ (and hence N_R) is known, and N_D must be determined. For viscous motion (i.e., Stokes flow, where $N_R < 1$) $N_D = 24 N_R$ and eq. (1) can be integrated without question. However, for larger N_R the steady-state drag data determined experimentally for terminal settling must be used to compute accelerative particle motion.

Experimental measurements by Keim (ref. 14) and a theoretical analysis by Crowe, et al. (ref. 15) indicate that if the acceleration modulus,

$$N_A = \delta \left| \frac{dv_p}{dt} \right| / V_p^2 ,$$

is smaller than about 10^{-2} , steady-state drag coefficients can be used without significant error to compute accelerative motion. N_A has never been found to exceed 10^{-2} in our trajectory calculations.

For water drops small enough to be essentially spherical ($N_R \lesssim 200$) we calculate N_D from a polynomial function in N_R derived from Davies data (ref. 13). (Function CDRR) For larger drops ($N_R > 200$), which have a flattened, non-spherical shape, we calculate N_D from polynomials in N_R derived from the water drop data of Gunn and Kinser (ref. 16). (Function WCDRR).

Still-air, terminal settling speeds for water drops are computed via use of Beard's equations (ref. 17). (SR FALWAT)

Water drops of any size, from submicron to the breakup size at about 8000 μm diameter, can be handled by these methods. However, the user should be aware that computation time goes up as droplet diameter goes down, and the time required for drops of diameter 1 μm or less may be large.

We have also developed aerodynamic drag relationships from observed settling data for various forms of ice crystals and have used these to study trajectories of ice to and around various airplanes (refs. 1, 2, 5, 7), though these are not included here.

FLOW CODE DESCRIPTIONS

PROGRAM PBOXC

General Discussion

This program is derived from the Douglas Aircraft Company code BOXC which was developed by Hess and Smith (ref. 9). It processes and produces CALCOMP plots of the three-dimensional body surface description data and is used primarily to debug these data. Processing and printing go as far as the "first output" (ref. 9, sec. 9.4). A secondary use is to store the body surface data such that it can be retrieved later and used by PGM STEREO to plot the body along with trajectories stored by one of the trajectory codes.

The surface of a general three-dimensional body is defined in terms of "rows" and "columns", the so-called m and n lines, of coordinates of points on the surface as described below. The m and n lines of points are combined by the code to form quadrilateral elements, or panels, such that when considered together they represent a reasonable approximation to the surface. (For example see Figs. 1 and 8.) Adjacent panels should be contiguous, or as nearly contiguous as possible. The data for general bodies may be scaled and translated in the three coordinate directions, and rotated about the y axis prior to processing.

The code also has the capability of generating ellipsoids of prolate, oblate or general shape with the only restriction being that their major and minor axes lie on the coordinate axes.

When the user elects to prepare plots of the body, the code automatically prepares a number of plots, each from a unique viewing angle, the number varying according to symmetry. For an asymmetric body fourteen plots are prepared. These consist of the six views from both directions along each coordinate axis, and the eight plots from 45 degree angles in each octant.

For a body with one plane of symmetry nine plots are prepared, for two symmetry planes six plots, and for three planes four plots. The user is urged to make liberal use of the plots to find errors in the body data.

Symmetry Planes

Up to three reflection planes may be specified, though only the first two are used in PBOXC for plotting. The surface descriptions for general bodies and ellipsoids are reflected across these planes. The number of symmetry planes is specified by parameter NSYM which has allowed values of 0, 1, 2, 3. The symmetry planes, in order of their application to the data, are:

<u>Order of Application</u>	<u>Symmetry Plane</u>
1	$y = 0$
2	$z = 0$
3	$x = 0$

For example, if NSYM = 1, for each point with coordinates (x,y,z), another point with coordinates (x, -y, z) is created. If NSYM = 2, for each point with coordinates x, y, z, three additional points with coordinates (x, -y, z), (x, -y, -z) and (x, y, -z) are created. If NSYM = 3, seven additional points are created.

Only the primary data points should be input. If reflected as well as primary data are input, the flow calculations will be in error.

Surface Description Data For General Bodies (IFLAG = 0)

The user must examine the body, or drawings of it, and devise a layout plan for subdividing its surface into sections that are compatible with the requirements of m line, n line surface point input while providing panels of

appropriate size which cover the surface without leaving gaps or introducing unwanted discontinuities. Also a coordinate system must be established, but this can be manipulated at processing time by use of the scaling and translation capability of the code.

The important thing is to understand the requirements of the m and n line input. Here we give a brief summary of the requirements; the user is encouraged to carefully study sec. 9.1 of reference 9 to obtain a thorough understanding of them.

Points which define the corners of the quadrilateral panels are labeled with integers m and n which identify hypothetical "rows" and "columns" on which they lie. The integers m and n are not input to the computer; they are used for data organization and sequencing only.

To ensure a proper computation, the rows and columns must be organized by the following rule: If an observer is located in the flow and is oriented so that locally he sees points on the surface with m values increasing upward, he must also see n values increasing toward the right.

A surface may be subdivided into sections, each of which must be independent. That is, all quadrilaterals in each section must be closed. Where an edge of a section is contiguous with another, the input for each section must define the common edge, though they need not use the same points on the edge.

Figure 2 illustrates a surface description that is subdivided into four sections. Note how the sectioning can be used to change resolution or to deal with structural complexities.

Coordinates are punched into cards, one point per card; also in each card is punched the integer parameter STAT which is used to identify the m,n status of each point. All points in a section are ordered in the sequence (m,n):

(1,1), (2,1), (3,1),..., (1,2), (2,2), (3,2),...(1,3), (2,3), (3,3),...

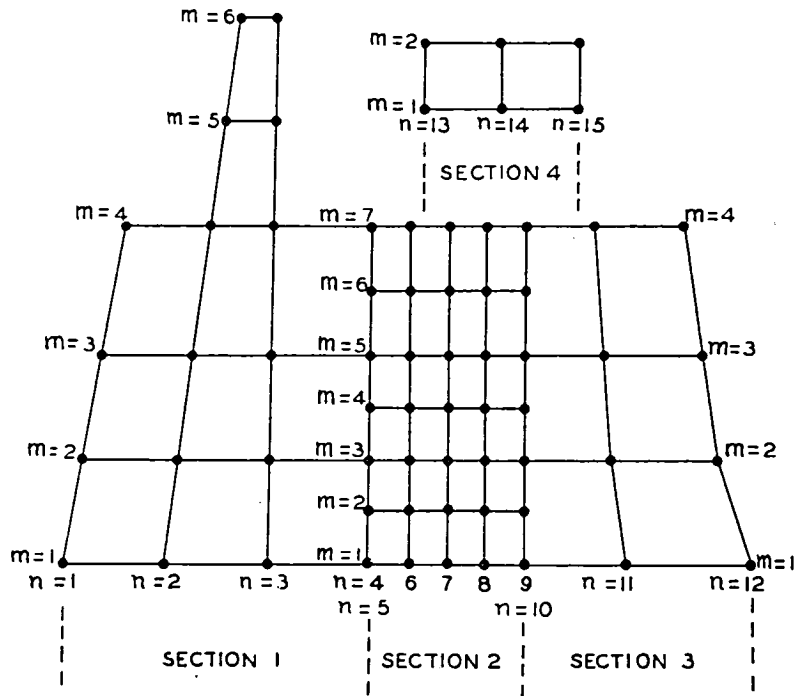


Figure 2. Plan view of the input points on a body divided into sections. (From ref. 9)

The STAT parameters are as follows for each section:

<u>(m,n)</u>	<u>STAT</u>
(1,1)	2
(1,n≠1)	1
all others	0 or blank

For the last card of the last section, STAT = 3.

Input order of sections is immaterial, but within sections, the data must be ordered according to the underlined rule given above.

Surface Description Data for Ellipsoids (IFLAG = 2 or 3)

Ellipsoids are generated by specifying the semi-axis lengths B and C (A = 1 always), and by specifying the numbers of "latitudinal" and "longitudinal" element divisions (Fig. 3), NLM1 and MMIN respectively.

There are two modes for specification:

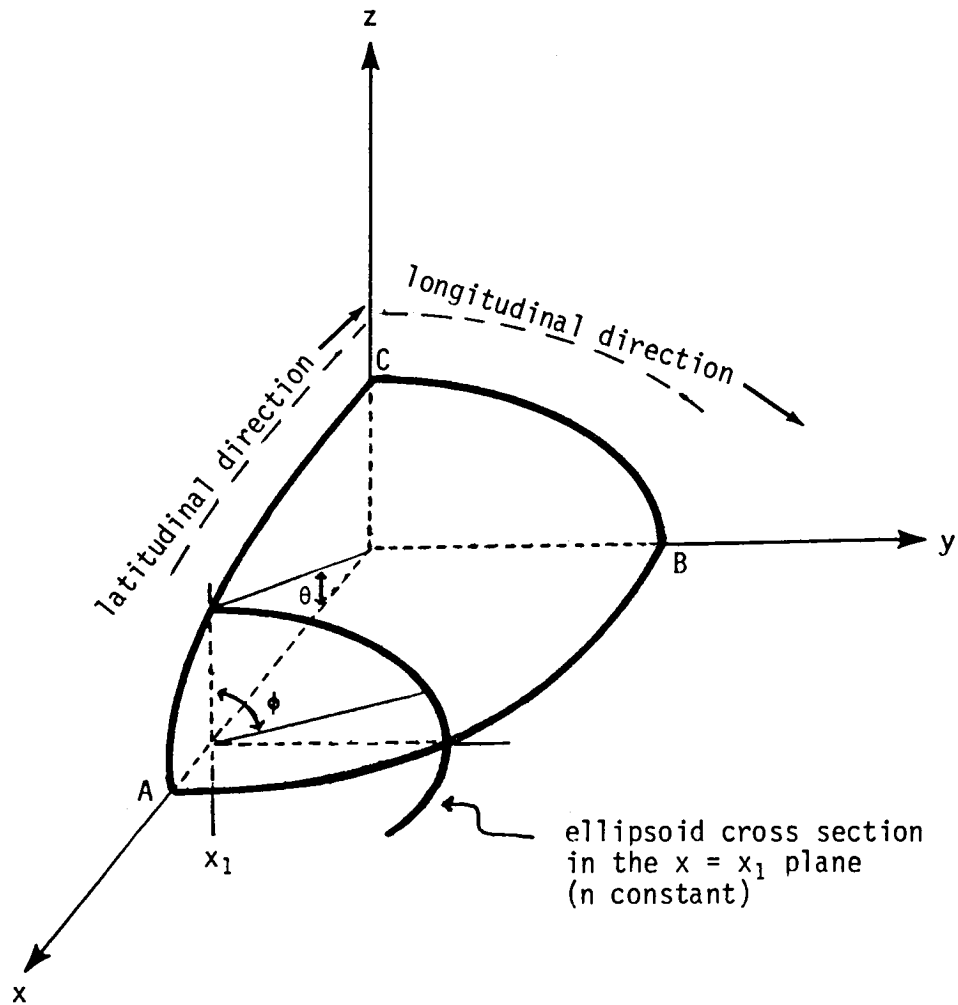
Mode 1. IFLAG = 1, NSYM = 3

All three symmetry planes are used and NLM1 and MMIN are specified for one octant only. Element increments are computed for NLM1 and MMIN equal increments in angles θ and ϕ (Fig. 3).

Mode 2. IFLAG = 2, NSYM = 2

Only two symmetry planes are used, and (x, z) values in the $y = 0$ plane must be input for $-1 \leq x \leq 1$, beginning at (1,0) and proceeding to (-1,0) for either all positive z or all negative z (i.e., for 180° in angle θ). (The code automatically ensures that the "underlined" input rule is obeyed.) Thus, NLM1 must be specified for the entire x axis, but MMIN is for one octant only as for the other option, and element increments in the "longitudinal" direction are created at equal increments of the angle ϕ .

Body surface data for generated ellipsoids cannot be plotted nor can the data be translated, scaled, and rotated by subroutine PATPROS or DATPROS.



θ is in the $y = 0$ plane
 ϕ is in the $x = x_1$ plane

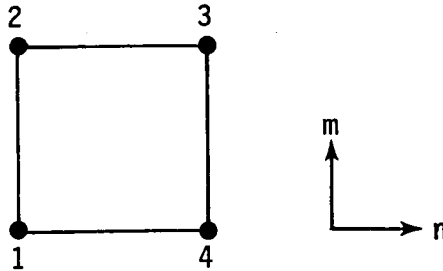
n lines run in the latitudinal direction from $\theta = 0$ to $\theta = \pi$
 m lines run in the longitudinal direction from $\phi = 0$ to $\phi = 2\pi$

Figure 3. Definition of angles θ and ϕ , and m and n line directions used by PBOXC and BOXC for generation of ellipsoids.

Printed Output

The printed output is the result of the first stage of surface data processing (ref. 9, sec. 9.4). For each quadrilateral panel on the surface it consists of:

1. Coordinates (X,Y,Z) of the four points on a quadrilateral in the order



around the quadrilateral.

2. Components (NX,NY,NZ) of the unit normal vector to the plane of the quadrilateral. This vector should point toward the exterior of the body rather than toward its interior. If it points in the wrong direction the data have been input in violation of the "underlined rule" on p. 17, and the data must be reordered.
3. Coordinates (NPX,NPY,NPZ) of the quadrilateral null point (ref. 9., sec. 9.3).
4. The common projection distance (D) of the four input points into the plane of the quadrilateral. (The four points from which a plane quadrilateral is formed do not in general, and need not, lie exactly in a plane.)
5. The maximum diagonal length (T) of the quadrilateral.
6. The area (A) of the quadrilateral.

Additional output appears for certain abnormal quadrilaterals. If the integer 1 or 2 appears at the far right of the page, they indicate the following conditions:

Integer 1. The null point was found to lie outside of the quadrilateral. The coordinates listed are for the quadrilateral centroid.

Integer 2. The iterative procedure used to determine the null point did not converge and thus the null point is only approximate

(ref. 9, sec. 9.3).

Subroutines Required

PINPUT, PICTURE, PEADER, PATPROS, plotting subroutines.

External Storage Units

Units 5 and 6 are the system input and print units respectively.

Unit 8 temporary storage.

Unit 9 storage for surface data to be used later for plotting by PGM STEREO.

PBOXC Card Input

Card No.	Variables and Format	Description
1	HEDR(15), IFLAG, NSYM, KMACH, KASE, (15A4, I1, 10X, I1, 1X, I1, 2X, A4)	<p>HEDR (Cols. 1-60) Hollerith run identification</p> <p>IFLAG (Col. 61) Body surface description input control</p> <p>IFLAG = 0 Input data for a general, three-dimensional body (See pp. 16 ff.)</p> <p>IFLAG = 1 Generate an ellipsoid using the mode 1 option, with three reflection planes. (See p. 19.) Be sure that NSYM = 3.</p> <p>IFLAG = 2 Generate an ellipsoid using the mode 2 option, with two reflection planes, and input x,z coordinates for the ellipsoid via cards no. 5C. (See p. 19.) Be sure that NSYM = 2.</p> <p>NSYM (Col. 72) Number of data reflection planes. Limited to values 0,1,2,3. (See p. 16.)</p> <p>KMACH (Col. 74) A non-zero value indicates that a Mach number is to be read via card no. 2. (See p. 26.)</p> <p>KASE (Cols. 77-80) Hollerith body identification.</p>
2	MACH, (F10.6)	Mach number This card is input only if KMACH \neq 0 on card 1. (See p. 26.)
3	IPROS, IPUNCH, IPRNT, IPICT, ICRT, (5L1)	<p>Logical variables which cause the following if true:</p> <p>IPROS Body surface data for a general body are to be translated, scaled and rotated about the y axis before processing, and card 4 is to be input.</p> <p>IPUNCH Body surface data are copied to the system punch unit after translating, scaling and rotating about the y axis.</p> <p>IPRNT Body surface data are processed and printed up to the "first output". (See p. 21 and ref. 9, sec. 9.4.)</p> <p>IPICT Body surface data for a general body are plotted.</p> <p>ICRT Plotting is via CRT. If ICRT is false, plotting is via pen and ink.</p>
4.	ANGLE, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS, ZTRANS, (7F10.0)	<p>This card is input only if IPROS (card 3) is true.</p> <p>ANGLE Angle (degrees) that the body is rotated about the y axis. A positive value causes a counterclockwise rotation from the aspect of a viewer looking down the positive y axis toward the origin. (Note: For a nose-up airplane angle of attack, ANGLE is negative.)</p> <p>XSCALE, YSCALE, ZSCALE Scale factors to be applied to surface point x, y and z coordinates respectively after translation. Default values are unity.</p> <p>XTRANS, YTRANS, ZTRANS Translations to be applied to surface point x, y and z coordinates before scaling.</p>
5A	X,Y,Z,STAT, XX, YY, ZZ, STATT, (3F10.0, I2/3F10.0,I2)	<p>Cards 5A apply to general bodies (IFLAG = 0, see pp. 16 ff).</p> <p>X,Y,Z and XX, YY, ZZ Are coordinates of points used to define the body surface.</p> <p>STAT Are point status integers. Allowed values are 0, 1, 2, 3. The meanings of these values are:</p> <p>STATT (Col. 32)</p> <p>0 This point is on the same n line as the last point</p> <p>1 This point starts a new n line</p> <p>2 This point starts a new section</p> <p>3 This is the last point in the input.</p>

PBOXC Card Input, cont.

Card No.	Variables and Formats	Description
5A cont.		Note: For the last coordinate card STAT or STATT = 3. A blank card should follow this if there is an odd number of body surface points.
5B	NLM1, MMIN, B, C, (2I5, 2F10.5)	Card 5B applies to generated ellipsoids (IFLAG > 0) NLM1 Number of "latitudinal" element divisions MMIN Number of "longitudinal" element divisions B y semi-axis of the ellipse C z semi-axis of the ellipse (See p. 19 Modes 1 and 2, and Fig. 3.)
5C	x ₁ , z ₁ , x ₂ , z ₂ ,x _{NLM1+1} , z _{NLM1+1} . (8F10.0) . . .	Cards 5C apply to generated ellipsoids for which the x,z coordinates are input (IFLAG = 2, NSYM = 2). (x _i , z _i) are coordinates in the y = 0 plane, beginning at (1,0) and proceeding to (-1,0), that define the "latitudinal" element subdivisions. (See p. 19 Mode 2, and Fig. 3.)
6,7	LINE1, LINE2, (7A6/7A6)	Cards 6 and 7 are read only if ICRT is true (card 3). These are two lines of 42 columns each of Hollerith labeling for a microfiche film.

PROGRAM BOXC

General Discussion

Program BOXC is the Hess-Smith code for calculation of potential flow about arbitrary, three-dimensional, non-lifting bodies as described in ref. 9, with the following exceptions:

1. Overlay, common and subroutine argument structures have been changed to accommodate the code to the CDC 6600 and UNIVAC 1100/42 computers.
2. SR WTAP14 has been added to store on external unit 14 all data needed by the trajectory codes for flow velocity calculations.
3. A provision has been added to allow a group of surface elements to leak inward a specified fraction of the free stream flow. This is used to simulate effects on external flow of air flow into inlet apertures.
4. A provision has been added to scale, translate and rotate surface point coordinates for general bodies before they are processed. (SR DATPROS)

To understand the theory and details of the calculations, the user must study reference 9.

The code has the capability to compute flow about the body for the free stream vector along each of the three axial directions. For nonsymmetrical bodies the capability extends to any free stream direction, and for bodies with one plane of symmetry, which must be the $y = 0$ plane, to any direction in the $y = 0$ plane (ref. 9, sec. 9.56). However, these general capabilities have not been used in the past, and furthermore, the trajectory codes and other important features of the flow calculations which are discussed below assume that the free stream vector is in the direction of the positive x axis. Changes of body orientation and/or location relative to the flow coordinate system are accomplished via use of SR DATPRO, which in its

present form also is designed to allow for arbitrary specification of air-plane angle-of-attack. In any case the free stream flow speed must be unity. The card input instructions below specify unit onset flow in the positive x direction.

Use and application of symmetry planes as well as preparation of body surface description data are the same as for PGM PBOXC.

Up to 1000 quadrilaterals can be accommodated for description of the basic body surface, before multiplication by symmetry plane reflection.

Compressibility Effects

According to Hess and Smith (ref. 10, pp. 7 and 35) their method works satisfactorily where the local Mach number does not exceed approximately one-half. For higher Mach numbers the Gothert transformation (ref. 18) is applied as follows:

1. All distances in the free-stream direction, that is the x direction, are scaled by dividing by $\beta = \sqrt{1 - M^2}$, where M is free stream Mach number.
2. Perturbation velocities computed at the scaled distances are themselves scaled by dividing by β for the y and z components, and by dividing by β^2 for the x component.

If the Gothert transformation is to be applied, the parameter KMACH (card 1) is given a value greater than zero, and the Mach number is input via card 5.

Flow Inlets

We have added a feature to the code (in SR UNIFRM) to allow simulation of flow up to the aperture of a flow inlet. The code cannot handle internal flows.

The aperture is represented by quadrilateral panels in the same manner as the body surface. To illustrate this, Fig. 4 shows the panelling of the orifice in the tip of the intake tube of a cloud water meter, the EWER, which is mounted under the wing of a C130 research airplane (ref. 7). Inlet aperture panel coordinates must be the first in the deck of surface point cards (cards 6A).

Input card no. 4 contains the number of aperture quadrilaterals and also the fraction of the free-stream flow speed that is "leaked" through the apertures. This leakage is taken to be the same for each aperture quadrilateral. If there is no flow inlet, card 4 is blank.

Off-Body Points

The code provides for computation of flow velocities at off-body points. If the parameter NOFF (card 1) is given a value greater than zero, coordinates of the off-body points are input following the surface points via the same format. The only status flag (STAT or STATT) required is 3 for the final point.

Printed Output

The printed output consists of two main parts: the first is the result of preliminary processing of the surface description data which yields "the first output" (ref. 9, sec. 9.4) described above on p. 21. The second output contains the final results and consists of the following for each quadrilateral (ref. 9, sec. 9.7):

1. Null point coordinates (NX, NY, NZ) (ref. 9, sec. 9.3).
2. Velocity magnitude (VT) at the null point.

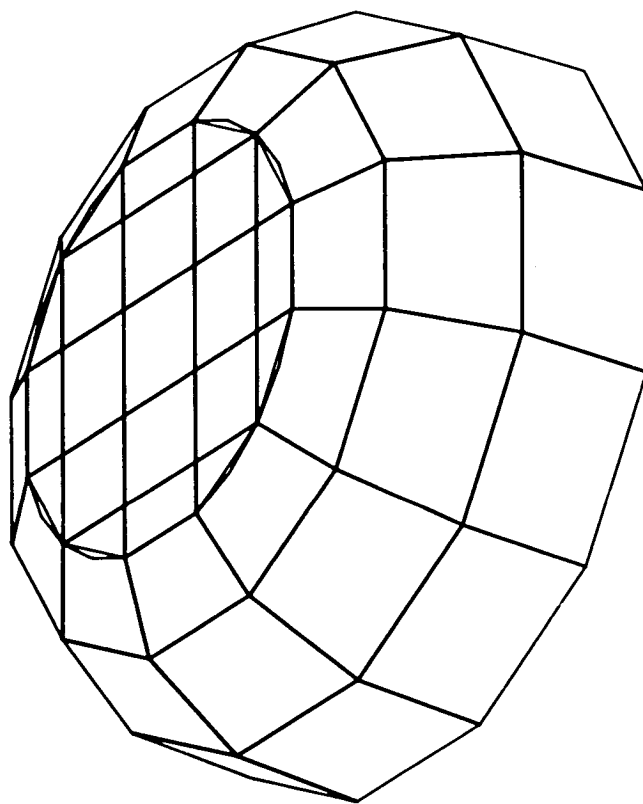


Figure 4. Computer plot of tip and orifice of a EWER cloud water content meter probe (ref. 7).

3. Square of the null point velocity magnitude (VTSO).
4. Pressure coefficient (CP) (ref. 9, eq. (137)).
5. Null point velocity components (VX, VY, VZ).
6. Direction cosines of the null point velocity (DCX, DCY, DCZ).
7. Unit normal vector to the plane of the quadrilateral (NX, NY, NZ).
8. Component of velocity normal to the quadrilateral plane at the null point (VN). (Note: VN should be essentially zero unless the quadrilateral is part of a flow inlet (see p. 26), in which case it should equal the input free-stream flow fraction.)
9. Source strength of the quadrilateral (SIG).

Unit 14 Output

If parameter KTP14 is unity (card 1), the following data are stored on external unit 14 (in binary format) for use later by SR FLOVEL in calculating flow velocities at arbitrary points in space:

Body identification, KASE (see card 1), number of symmetry planes, NSYM, the number of quadrilaterals, NQUAD, in the basic body unit (i.e., before multiplication by symmetry plane reflections), free-stream Mach number, MACH, and $(1 - \text{MACH}^2)^{-\frac{1}{2}}$.

For each quadrilateral is stored the "twenty-eight quantities" (ref. 9, sec. 9.51), plus the distances between quadrilateral points 1 and 2, 2 and 3, 3 and 4, and 4 and 1. (See p. 21.)

Overlay Structure and Subroutines Required

To conserve storage the program is run with the overlay structure shown in Fig. 5, which also identifies the subroutines required.

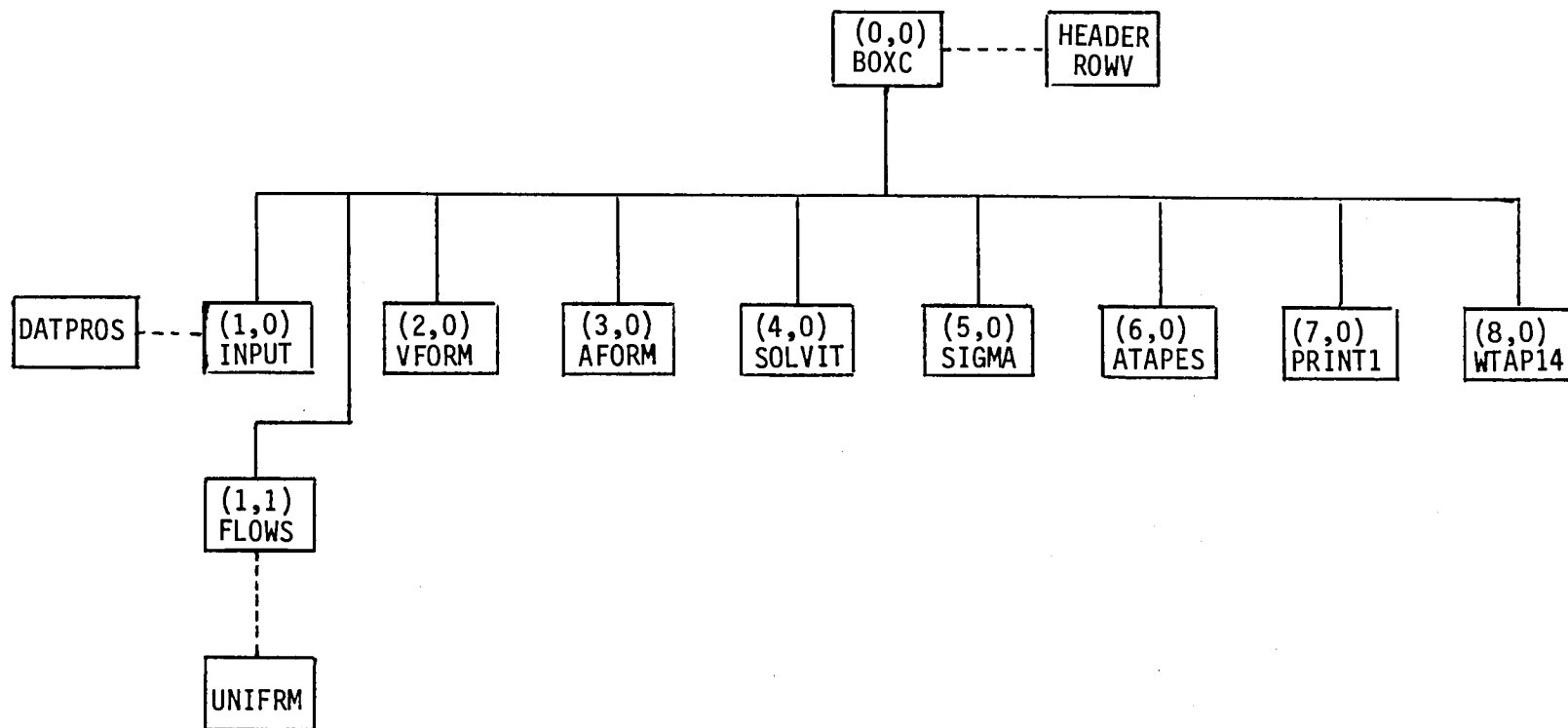


Figure 5. Overlay structure for program BOXC. The integer pairs (i,j) indicate the primary, i , and secondary, j , overlay levels.

External Storage Units

Units 5 and 6 are the system input and print units. Unit 14 contains the data to be used by SR FLOVEL to compute flow velocities at arbitrary points in space. The following units are used for temporary storage: 1, 3, 4, 8, 9, 10, 11, 12, 13.

BOXC Card Input

Card No.	Variables and Format	Description
1	HEDR(15), IFLAG, LIST, AFLOW, BFLOW, CFLOW, ISIG, IPRS, MPR, NCODE, NNON, NSYM, NOFF, KMACH, KTP14, KASE, (15A4, 2I1, 3L1, 4I1, I2, 4I1, 1X, A4)	<p>HEDR (cols. 1-60) Hollerith run identification</p> <p>IFLAG (col. 61) Body surface description input control. Same as for card 1 of PBOXC. (See pp. 16ff.)</p> <p>LIST (col. 62) A value of zero (or blank) causes full execution. Otherwise, calculation is stopped after the "first output". (See p. 21.)</p> <p>AFLOW, BFLOW, CFLOW (Cols. 63, 64, 65) Logical parameters which specify the free-stream flow axis. These parameters should be T,F,F respectively.</p> <p>ISIG (Col. 66) Always zero or blank.</p> <p>IPRS (Col. 67) Always zero or blank.</p> <p>MPR (Col. 68) Normal value is zero or blank. Non-zero values cause printout of the following matrices (ref. 9):</p> <ol style="list-style-type: none"> 1 print V_{ij} 2 print A_{ij} 3 print V_{ij} and A_{ij} (output is voluminous for large cases) <p>NCODE (Col. 69) Always zero or blank.</p> <p>NNON (Cols. 70,71) Always zero or blank.</p> <p>NSYM (Col. 72) Number of symmetry planes. Same as for card 1 of PBOXC. (See p. 16.)</p> <p>NOFF (Col. 73) Number of off-body points for which velocity calculations are to be calculated. (See cards 7)</p> <p>KMACH (Col. 74) A non-zero value indicates that a Mach number is to be read via card 5.</p> <p>KTP14 (Col. 75) If given a value of one, the unit 14 output is prepared. (See p. 29)</p> <p>KASE (Cols. 77-80) Hollerith body identification.</p>
2	IPROS, (L1)	If true, body surface data for a general body (IFLAG = 0) are to be translated, scaled, and rotated about the y axis before processing, and card 3 is to be input.
3	ANGLE, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS, ZTRANS, (7F10.0)	This card is input only if IPROS (card 2) is true. Same as card 4 of PBOXC.
4	LEAK, FRACT, (I4, F10.0)	<p>LEAK Number of quadrilaterals used to define a flow inlet in the body.</p> <p>FRACT Fraction of the free-stream air speed that passes through the null point of each inlet quadrilateral.</p> <p>If there is no flow inlet, input a blank card. (Note: the inlet quadrilateral data (cards 6A) must be the first body data input.) (See p. 26)</p>

BOXC Card Input, cont.

Card No.	Variable and Format	Description
5	MACH, (F10.6)	Free-stream Mach number. This card is input only if parameter KMACH (card 1) is non-zero.
6A	X, Y, Z, STAT, XX, YY, ZZ, STATT, (3F10.0, I2/3F10.0, I2)	Cards 6A apply to general bodies (IFLAG = 0) Coordinates and status flags for points used to describe the body surface. Same as cards 5A of PBOXC. (See pp. 16 ff)
6B	NLM1, MMIN, B, C, (2I5, 2F10.5)	Card 6B applies to generated ellipsoids (IFLAG > 0). Same as card 5B of PBOXC. (See p. 19)
6C	x ₁ , z ₁ , x ₂ , z ₂ , x _{NLM1+1} , z _{NLM1+1} (8F10.0).	Cards 6C apply to generated ellipsoids for which the x,z coordinates are input. (IFLAG = 2, NSYM = 2). Same as cards 5C of PBOXC. (See p. 19)
7	X, Y, Z, STAT, XX, YY, ZZ, STATT, (3F10.0, I2/3F10.0, I2)	Off-body points for which flow velocities are to be calculated. Cards 7 are input only if NOFF (card 1) is greater than zero. STAT or STATT for the last point must be 3. If there are an odd number of points, the deck of off-body point cards should be terminated with a blank card.

SUBROUTINE FLOVEL

Given the coordinates of a point in space (XNPP, YNPP, ZNPP) and the current time step, H, used in the integration of the particle equations of motion, SR FLOVEL returns the flow velocity components (VXPP, VYPP, VZPP) at that point, and an indicator, INBODY, of whether the body surface has been penetrated. INBODY = 0 if the point is exterior to the body, but INBODY = 1 if it is detected to be inside the body.

The discussion to follow assumes that a Hess-Smith (ref. 9) flow field is being considered. However, if the user wishes to compute flow by use of some other method, for example, flow about an ellipsoid via an analytical equation, he may replace FLOVEL by a subroutine of his own design.*

SR FLOVEL is based mainly on the Hess-Smith subroutine VFORM, with modifications required to include the quadrilateral source strengths, and to set the INBODY parameter. Application of the source strengths (i.e., σ values) is straightforward, as indicated by eq. (140) of reference 9, and needs no further discussion. Determination of whether or not the body has been penetrated is discussed next.

FLOVEL calculates and sums velocities induced at the specified point by each quadrilateral. Three modes of induced velocity calculation are used (ref. 9, sec. 9.52): 1. where the distance between the point and the quadrilateral is sufficiently large the quadrilateral is approximated by a simple point source, 2. for intermediate distances the quadrilateral is approximated by a point source plus a point quadrupole, and 3. for short distances an exact calculation is used. For each quadrilateral for which

* In the trajectory codes a call of SR SETFLO precedes the first call of FLOVEL. SETFLO reads the data stored on unit 14 by PGM BOXC (see p. 29), which data are required by FLOVEL for calculation of a Hess-Smith flow velocity, and puts these data into COMMON storage. If a user-designed version of FLOVEL is used, SETFLO must be replaced by a dummy subroutine.

the exact calculation is required the following tests are made in sequence, and if any one is satisfied, penetration is taken not to have occurred:

1. The vector of separation between the point and the center of the quadrilateral is projected onto the normal vector to the quadrilateral, and the sign of the projection is checked to see if the point is on the exterior side of the quadrilateral.
2. If the distance of the point to the center of the quadrilateral is greater than one-half of the maximum quadrilateral diagonal, penetration of the quadrilateral has not occurred.
3. If the absolute value of the projection calculated in test 1 is greater than the time step, H , penetration of the quadrilateral has not occurred.

For test 3 we assume that the maximum particle speed is about unity, so that the maximum distance a particle can travel in one time step is roughly H .

These tests are applicable only during trajectory calculations when the particle is advancing by small steps such that if penetration occurs the particle will be close to the point of penetration when the tests are made. The tests will not give a penetration indication for interior points that are not close to the body surface.

PROGRAM FLOPNT

General Description

This program computes flow velocities at an array of points in three-dimensional space. The array is oriented parallel with the three coordinate axes. Flow velocities are computed by SR FLOVEL, which uses data that, for example, are prepared by program BOXC for flow about an arbitrary three-dimensional body.

Initial coordinates, array increment values along the three coordinate directions and the number of increments desired along each direction (including the initial point) are input. Also input are integers $M(3)$ which control the order of incrementing along three axes. For example, suppose $M(1) = 3$, $M(2) = 1$, $M(3) = 2$:

1. The x and z coordinates are held fixed while y is incremented over its range.
2. y is returned to its initial value, z is incremented once, and y is incremented over its range.
3. This is repeated until z covers its complete range.
4. z is returned to its initial value, x is incremented once, and y is incremented over its complete range.
5. etc.

The printed output is self-explanatory and consists of point coordinates, velocity components and speed.

If data prepared by BOXC are used, SR SETFLO reads these data from unit 14; units 5 and 6 are used for input and printing, respectively.

Subroutines called are: SETFLO, FLOVEL.

FLOPNT Card Input

<u>Card No.</u>	<u>Variables and Format</u>	<u>Description</u>
1	KASE, (A4)	Body identification. Read by SR SETFLO, and must be identical to the identification on card 1 of BOXC.
2	HOLL(18), (18A4)	Run identification.
3	M(3), (3I2)	Coordinate incrementation sequence control. (See discussion above.)
4	X(I), D(I), N(I); I = 1 (2E10.0, I4)	X(1) initial x coordinate } (dimensionless) D(1) x coordinate increment } N(1) number of increments desired in the x direction (including initial value).
5	X(I), D(I), N(I); I = 2	Same as card 4 but for the y axis.
6	X(I), D(I), N(I); I = 3	Same as card 4 but for the z axis.
3'	Cards 3 - 6 are repeated for another array.	
3	Blank card	A blank card 3 terminates the run.

TRAJECTORY CODE DESCRIPTIONS

GENERAL UTILITY CODES

Subroutine PARTCL

Subroutine PARTCL is called by all three of the executive trajectory codes (Table 1B) to input particle specification data and compute still-air, terminal particle settling speed and other data depending on particle type. This is a particle type - specific code, the version used here being for water drops. It calls SR FALWAT.

Subroutine TRAJECT

Trajectories are calculated by SR TRAJECT with the assistance of: SR DVDQ, the numerical integrator code, SR FLOVEL and the functions PRFUN and IMPACT. It also stores trajectory point coordinates at user-specified (normalized) time intervals (TPRINT) in arrays XPLOT(60), YPLOT(60), ZPLOT(60), providing logical parameter IPLOT is specified as true.

Function PRFUN

Function PRFUN is a particle type - specific code which is called by TRAJEC to provide the $N_D - N_R$ relation used in calculating the particle equations of motion (eq. (1)). Actually, through use of the pre-calculated quantity COF ($= N_{D,S} v_s N_{F,R,S}$), PRFUN returns the factor on the first term on the right side of eq. (1) which when multiplied by $\vec{v}_a - \vec{v}_p$ yields the particle equation of motion. The version of PRFUN used here is for water drops, and it calls functions CDRR and WCDRR.

Subroutine IMPACT

Subroutine IMPACT is called by TRAJECT following penetration of a particle into the body. When used with CONFAC, IMPACT adjusts trajectory initial y and z coordinates such as to avoid impaction by the next trajectory (see p. 44); accordingly IMPACT is a problem-specific code. No such adjustment is required for cases run under control of ARYTRJ and TANTRA*, so that a dummy version of IMPACT is used.

Subroutine SETFLO

Subroutine SETFLO reads data prepared by PGM BOXC from external unit 14. These data are required by SR FLOVEL for calculation of flow velocities about a Hess-Smith three-dimensional body. SETFLO reads a four-character Hollerith identification of the body and checks to see if it is identical to the identification obtained from unit 14. If not, a comment is printed and the calculation is stopped.

If flow around the body is calculated by some means other than the Hess-Smith method, SETFLO must be replaced with a dummy subroutine.

Subroutine DVDQ

This is the variable order, ordinary differential equation integrator of Krogh (ref. 11). Operating instructions, which have proven to be quite adequate, are found in the glossary of the DVDQ card listings. The version used here automatically adapts to the word size of the computer used.

* Be very sure that IMPACT does not adjust initial trajectory coordinates during tangent trajectory determination under control of TANTRA.

PROGRAM ARYTRJ

General Description

SR TRAJECT is called to compute particle trajectories initiated at an array of points in three-dimensional space. Particle properties are computed by SR PARTCL and SR PRFUN. Flow velocities are computed by SR FLOVEL, which uses data that, for example, are prepared by program BOXC for flow around an arbitrary three-dimensional body. SR DVDQ integrates the particle equations of motion.

Initial coordinates of the initial point array, array increment values for the three coordinate directions and the number of increments desired along each direction (including the initial point) are input. Also input are integers $M(3)$ which control the order of incrementing along the three axes and a skip parameter NSKIP. For example, suppose $M(1) = 3$, $M(2) = 1$, $M(3) = 2$:

1. The x and z coordinates are held fixed while y is incremented over its range.
2. y is returned to its initial value, z is incremented once, and y is incremented over its range.
3. This is repeated until z covers its complete range.
4. z is returned to its initial value, x is incremented once, and y is incremented over its complete range.
5. etc.

Trajectories are computed to the limiting x coordinate value XLIMIT or until penetration of the body is sensed.

If not every trajectory is desired, the parameter NSKIP is set greater than zero. Then, after the first trajectory, only every $NSKIP + 1$ th trajectory is computed.

Subroutines Required

FLOVEL, SETFLO, PARTCL, FALWAT, TRAJECT, IMPACT (dummy), PRFUN,
DVDQ, WCDRR, CDRR

External Storage Units

Units 5 and 6 are the system input and print units, respectively.

Unit 9 is used for temporary storage.

Unit 10 is used to store trajectory data for plotting by PGM STEREO.

Unit 14 is used by SR SETFLO for input of data prepared by PGM BOXC.

Printed Output

The printed output is largely self-explanatory. For each trajectory are printed at time interval TPRINT: time, point coordinates (X, Y, Z), particle velocity components (VPX, VPY, VPZ), flow velocity components (VX, VY, VZ), time step (H), Reynolds number (R), acceleration modulus (AC) and cumulative number of flow velocity computations (NEVAL). (All dimensionless)

Other quantities are: angle between the projection of the initial flow velocity vector in the $z = 0$ plane and the x axis (ALPHA0), angle between the initial flow velocity vector and its projection in the $z = 0$ plane (BETA0), angle between the projection of the final particle velocity vector in the $z = 0$ plane and the x axis (ALPHAR), angle between the final particle velocity vector and its projection in the $z = 0$ plane (BETAR), direction cosines of the drag vector at the final point, and the angle between the projection of the drag vector in the $z = 0$ plane and the x axis (A), and the angle between the drag vector and the z axis (GAMMA). (All angles are in degrees.)

ARYTRJ Card Input

<u>Card No.</u>	<u>Variables and Format</u>	<u>Description</u>
1	KASE, (A4)	Body identification. Read by SR SETFLO. Must be identical to parameter KASE on card 1 of the BOXC input.
2	HOLL (18), IPLOT, (18A4, 7X, L1)	HOLL 72 columns of Hollerith run identification IPLOT Logical variable: if true, trajectory data are written (col. 80) on unit 10 for plotting by PGM STEREO.
3	V, ELL, RHO, TEMP, XFINAL, (8F10.5)	V Free stream airspeed ($m\ s^{-1}$) ELL Characteristic dimension of the body (m). Corresponds to L as defined for eq. (1). RHO Ambient air density ($kg\ m^{-3}$) TEMP Ambient temperature ($^{\circ}K$) XFINAL x coordinate for trajectory cut off (i.e., maximum x coordinate) (normalized, dimensionless)
4	TPRINT, HI, HMINI, EPSI(3), (8F10.5)	TRRINT Time interval for trajectory point print. Default value = 0.1. HI Initial numerical integration time step. (See SR DVDQ). Default value = 0.1 HMINI Initial numerical integration minimum time step. (See SR DVDQ). Default value = .005. EPSI(3) Parameters used to control numerical integration local error. (See SR DVDQ). Default values = 1.0E-5. All normalized, dimensionless.
5	DIAM, (7F10.0)	Water drop diameter (μm). This card is read by SR PARTCL.
6	M(3), NSKIP, (4I4)	M(3) Array incrementation control NSKIP Array skip parameter (See discussion above.)
7	X(I), D(I), N(I); I = 1 (2F10.0, I4)	X(1) Initial x coordinate } (dimensionless) D(1) x coordinate increment } N(1) Number of increments desired in the x direction (including the initial value)
8	X(I), D(I), N(I); I = 2	Same as card 7, but for the y direction.
9	X(I), D(I), N(I); I = 3	Same as card 7, but for the z direction.
5'	Cards 5 - 9 are repeated for another particle and another array	
.	.	
.	.	
.	.	
5	Blank card	A blank card 5 terminates the run.

PROGRAM CONFAC

General Discussion

Program CONFAC computes trajectories to user-specified target points. It operates in two modes:

1. Single trajectories are calculated to each target point (NW = 0).
2. A central trajectory is computed to the target point, and NW trajectories, evenly spaced about a circle in the target plane of radius RW about the central trajectory, are calculated such as to define a particle flux tube.

Mode 2 is used to calculate concentration factor, C_F , which is the ratio of particle flux at the target point to the free-stream particle flux. It is easy to show that

$$C_F \approx \frac{\text{area of flux tube cross section in the free stream}}{\text{area of flux tube cross section at the target point}}$$

The areas are those of plane polygons of NW vertices as calculated by SR POLYGON. Concentration ratio, C_M , the ratio of particle concentration at the target point to free stream concentration, is obtained via the relation

$$C_M = C_F / |\vec{v}_p| \quad .$$

The desired trajectories are calculated by an iterative method which finds a trajectory that passes within a user-specified distance tolerance (RW*TOL) of the desired target point. To initialize, the user may input four sets of coordinate guesses: two sets of y and z coordinates for the initial and target planes. No special care need be taken in making these guesses since convergence should be rapid as long as the coordinates are in the correct general neighborhood. On default of input, the initial coordinate guesses are supplied by the code.

The trajectory iteration procedure is described in detail in reference 1. (See pp. 13 - 16 and Appendix A.) SR MAP controls the iteration and calls SR TRAJECT to calculate trajectories. If convergence is not achieved after calculating twenty-five trajectories, the calculation proceeds to the next particle or stops. The limiting number of trajectories can be changed by changing the value of ILIM in a DATA statement in SR MAP.

SR IMPACT is a problem-specific code whose purpose is to adjust trajectory initial y and z coordinates when penetration of the body occurs such that penetration will be avoided on the next attempt. After twenty-five penetrations, the calculation proceeds to the next particle or stops. The limiting number of penetrations can be changed by changing the value of JLIM in PGM CONFAC.

Subroutines Required

FLOVEL, MAP, PARTCL, POLYGON, DVDQ, SETFLO, FALWAT, PRFUN, IMPACT, TRAJECT, TRANSFM, MATINV, WCDRR, CDRR.

External Storage Units

Same as for ARYTRJ.

Printed Output

The printed output is largely self-explanatory, and contains all of the data described for PGM ARYTRJ.

Detailed trajectory data are printed only for the final trajectory which is the result of a successful convergence to the desired target point. For

other trajectories, only the initial and final y and z coordinates are printed. Except for the initial coordinate guesses, these coordinates are given in the "flux tube coordinate system", and are so identified and distinguished in the output from the "flow coordinate system". The "flow system" is the coordinate system (normalized) by use of which the body is described and the flow is computed. The "flux tube system" at any point along the trajectory has its origin at the flux tube center and its y and z axis in the plane normal to the central trajectory. Flux tube system coordinates are given in the initial and target planes in the output.

For cases where flux tubes are calculated, a summary of the initial and final coordinates of all $NW + 1$ trajectories are printed, the areas of the polygons with NW vertices in the initial and final planes are printed, and the concentration factor and concentration ratio are printed.

CONFAC Card Input

Card No.	Variables and Format	Description
1	KASE, (A4)	Body identification. Read by SR SETFLO. Must be identical to parameter KASE on card 1 of the BOXC input.
2	HOLL(18), IPLOT, (18A4, 7X, L1)	HOLL 72 columns of Hollerith run identification. IPLOT Logical variable: if true, trajectory data are written (col. 80) on unit 10 for plotting by PGM STEREO.
3	V, ELL, RHO, TEMP, XSTART, (8F10.5)	V Free stream airspeed (m s^{-1}) ELL Characteristic dimension of the body (m). Corresponds to L as defined for eq. (1). RHO Ambient air density (kg m^{-3}). TEMP Ambient temperature ($^{\circ}\text{K}$). XSTART Initial x coordinate of trajectory. (normalized, dimensionless)
4	TPRINT, HI, HMINI, EPSI(3), (8F10.5)	Same as for ARYTRJ.
5	NW, RW, TOL, (I10, 7F10.5)	NW Number of trajectories used to define flux tube peripheries for concentration factor calculation. If NW = 0, single trajectories are calculated to target points defined by cards 9.
6	YE(I), ZE(I), YI(I), Z(I); (I = 2), (8F10.5)	YE, ZE Initial guesses of trajectory y and z coordinates in the target plane.
7	YE(I), ZE(I), YI(I), Z(I); (I = 3), (8F10.5)	YI, ZI Initial guesses of trajectory coordinates in the initial plane. These coordinates are in the coordinate system used to define the body and the flow field (normalized, dimensionless). The data in the two cards can be very approximate, but if not blank, the two cards should not be identical. On input of two blank cards, the code supplies default estimates based on the first target coordinates.
8	DIAM, (7F10.0)	Water drop diameter (μm). This card is input by SR PARTCL.
9	XW, YW, ZW, (8F10.5)	x,y,z coordinates of the target point (normalized, dimensionless).

8'	Cards 8 and 9 are repeated for as many particles as desired.*	
9'	.	
.	.	
.	.	
.	.	

8	Blank card	A blank card 8 terminates the run.

* Previous trajectory y and z coordinates are used as trajectory iteration initialization estimates for each new target point. Thus, if target points are widely spaced, separate runs should be made for each.

PROGRAM TANTRA

General Discussion

The purpose of this code is to compute tangent particle trajectories to a three-dimensional body. The code is designed to be as general and as automatic as practical, but owing to the unlimited number of geometrical possibilities in three dimensions, some compromise is necessary. Since we cannot know a priori what parts of a body the tangents will touch, we do not, in general, have the option of specifying target points on the body or even target planes through the body. Therefore, we specify curves in the free stream well ahead of the body on which all trajectories are initiated for a particular tangent determination.

Given the equation of the starting-point curve and an initial point on the curve, the code computes the trajectory from this point toward the body until penetration of the body occurs or until a specified x-coordinate stop point is reached. If penetration occurs, a specified coarse step is taken along the starting-point curve in direction away from the body, and another trajectory is computed. If penetration does not occur, the coarse step is taken along the starting-point curve in direction toward the body, and another trajectory is calculated. Once penetration occurs for trajectories that initially miss the body, or the reverse for trajectories that initially impact, the initial point is backed up one step along the curve away from the body if necessary, and the process of stepping toward the body is resumed with a fine step size until the tangent trajectory is found. Thus, the tangent trajectory misses the body by no greater than the tolerance implied by the fine step size. Note that this does not imply that the tolerance is the fine step size. Separation of trajectories in the free stream will not be the same as separation of the same trajectories near the body, nor even approximately the same except for very large, heavy particles which have sufficient inertia to essentially ignore the flow around the body. In general, trajectory separations near the body will be less than in the free stream.

Specification of the starting-point curve is done via SR STRPNT, which in the version supplied uses straight line curves. The user provides the coordinates of two points on the line:

Point 1. Initial coordinates of the initial trajectory

Point 2. Coordinates of any other point on the line which is closer to the body than Point 1.

Point 2 must be closer to the body than Point 1 to ensure that stepping along the starting-point curve proceeds in the proper direction. Point 2 need not be, and in general will not be, the initial point of a trajectory. Note that both of these points must be sufficiently far upstream to be essentially in the free stream. Also specified are the coarse and fine stepping distances. All coordinates and distances are normalized. (See eq. (1).)

If so specified (IPLLOT = true), tangent trajectory data are stored on unit 10 for plotting later by PGM STEREO.

Subroutines Required

FLOVEL, SETFLO, PARTCL, FALWAT, STRPNT, TRAJECT, IMPACT*, PRFUN, DVDQ, WCDRR, CDRR.

External Storage Units

Same as for ARYTRJ.

Printed Output

Trajectory data are as described for PGM ARYTRJ and are printed for every trajectory computed regardless of whether or not the trajectory is

*Be sure that IMPACT is a dummy subroutine. Resetting of initial trajectory coordinates by SR IMPACT will ruin a tangent trajectory determination.

accepted as the tangent trajectory. Beyond that, the output is fully labeled and self-explanatory. All input data are printed: including the points used to define the starting-point line, coarse and fine increments, and starting point coordinates. The switching from coarse to fine step size is clearly identified, as are the tangent trajectory data.

TANTRA Card Input

<u>Card No.</u>	<u>Variables and Format</u>	<u>Data Description</u>
1-4		Cards 1 through 4 are the same as for ARYTRJ.
5	DIAM, (7F10.0)	Water drop diameter (μm). This card is read by SR PARTCL.
6	DCORS, DFINE, (8F10.0)	Respectively, the coarse and fine step sizes to be used in stepping along the starting-point line (normalized, dimensionless). Card 6 is read by SR STRPNT.
7	X,Y,Z,X1,Y1,Z1, (8F10.0)	X,Y,Z Coordinates of Point 1, which specifies the initial trajectory coordinates on the starting-point line (normalized, dimensionless). X1,Y1,Z1 Coordinates of Point 2, which is any point on the starting-point line that is closer to the body than Point 1 (normalized, dimensionless). Note that the starting-point line should be far enough upstream of the body to be essentially in the free stream. Card 7 is read by SR STRPNT.
6' 7' . . . 6	Blank card	Cards 6 and 7 are repeated for as many trajectories as desired. A blank card 6 signals end of calculation for this water drop, and another card 5 is read.
5' 6" 7" . . . 6	Blank card	
5	Blank card	A blank card 5 terminates the run.

PROGRAM STEREO

General Discussion

Program STEREO is used to plot results of the trajectory calculations. Both body and trajectories are plotted. The body data are obtained from unit 9, on which the data were stored by SR PINPUT under control of PGM PBOXC, and the trajectory data are obtained from unit 10, on which the data were stored under control of either ARYTRJ, CONFAC or TANTRA.

Plots are prepared in pairs, members of a pair being separated by a specified angle on each side of a specified viewing direction. Proper specification of the angles, which usually requires some trial-and-error-experimentation, may provide plots which can be used for stereo viewing as illustrated by Figure 6.

The viewing direction is defined by specifying two angles, THETA and PSI. The operation of these angles is as follows: We assume a right-handed coordinate system with its positive z axis directed upward and the free-stream flow in the direction of the positive x axis. First rotate the coordinate system about the y axis by angle THETA such that positive THETA tilts the positive x axis upward. Then rotate about the new z axis by angle PSI such that for positive PSI the rotation is clockwise when viewed from above. The view direction separation angle, DELTA is applied to angle PSI such that the members of a stereo pair are actually viewed from angles THETA, PSI-DELTA and THETA, PSI + DELTA, and are plotted in that order.

For a particular case (i.e., body and set of trajectories), the user must specify the number of trajectories and the (upstream) x coordinate at which plotting of the trajectory data is to be begun. This need not have the same value as the initial x coordinates of the data stored on unit 10.

Translating and scaling of the data such that it will properly fit into the plot area is handled automatically by the program.

Only system and plot subroutines are required.

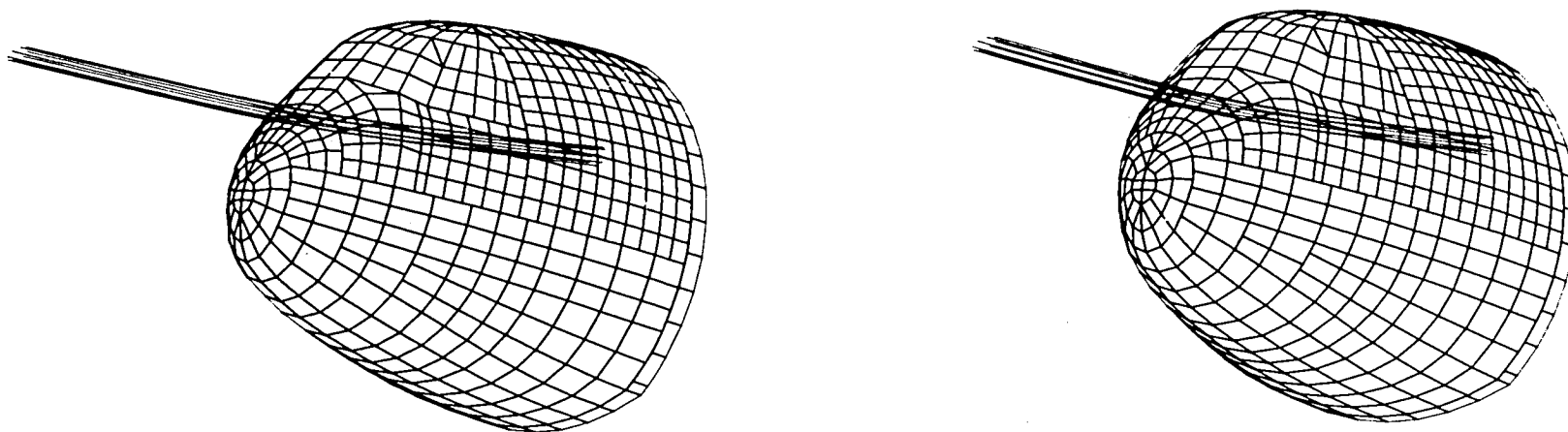


Figure 6. Stereographic plots of an eight-trajectory, 20 μm -diameter water drop flux tube to a particle replicator mounted on the forward fuselage of a Lockheed C130A airplane. The central trajectory is also shown. $C_F = 1.15$. (Ref. 1) Three-dimensional perspective can be attained by staring at the center of the figure and then crossing the eyes such that the two images merge.

External Storage Units

Units 5 and 6 are the system input and print units.

Unit 9 contains the three-dimensional body surface data, plus some scaling information, as stored by SR PINPUT.

Unit 10 contains the trajectory data as stored under control of PGMS ARYTRJ, CONFAC or TANTRA.

Printed Output

The printed output is simple. It consists of a run identification, the input data and some scaling information. For each trajectory is printed:

1. the coordinates (XTRAJ, YTRAJ, ZTRAJ) of each point before translation, scaling and projection onto the plot plane, and
2. the translated, scaled and projected coordinates (XPLOT, YPLOT) of each point plotted.

STEREO Card Input

<u>Card No.</u>	<u>Variables and Format</u>	<u>Description</u>
1	HOLL(18), (18A4)	72 columns of Hollerith run identification.
2	ICRT, NTRJS, XSTART, (L1, I9, F10.0)	ICRT A logical variable which when true causes plotting to be via CRT. Otherwise, plotting is via pen and ink. NTRJS Number of trajectories to be plotted. XSTART x coordinate at which trajectory plotting is to begin. Need not correspond to the initial x coordinates of trajectories stored on unit 10.
3,4	LINE1, LINE2, (7A6/7A6)	Cards 3 and 4 are read only if ICRT is true (card 2). Two lines of 42 columns each of Hollerith labeling for a microfiche film.
5,6	THETA, PSI, DELTA, HLABEL(18), (3F10.2/ 18A4)	THETA Viewing angles and viewing angle PSI separation (degrees). (See DELTA definitions above.) HLABEL 72 columns of Hollerith labeling for the plots.

5',6'	Cards 5 and 6 are repeated for as many additional plot pairs as desired.	

5,6	Blank cards	Blank cards 5 and 6 terminate the run.

VALIDATION

PRIOR WORK

Hess and Smith (refs. 9 and 10) present results of a wide range of studies where flow velocities and pressures calculated by their method are compared with other theory and with experiment. Outstanding agreement with the data from other sources is evident.

In reference 1 we present results of several studies that examine accuracy of the trajectory calculations. To check accuracy of the numerical integrations we computed trajectories of 1 μm diameter water drops in axisymmetric airflow about an ellipsoid of fineness ratio 2 and found the largest deviation from the stream line flow to be 0.006%. Thus very small particles are computed to essentially follow the stream flow as they should do.

To determine differences between trajectories computed by a body constructed from Hess-Smith panels and a body with an analytically defined surface, we computed trajectories of water drops about ellipsoids of fineness ratio 2 of both types in axisymmetric air flow at 5 kft altitude in a standard atmosphere (ref. 1). The Hess-Smith ellipsoid was constructed from 1800 panels, and the length of the semi-major axes of the ellipsoids was taken to be 4.67m. Results are shown in Fig. 7 for comparison of trajectory intersections with the extended minor axis. All of the Hess-Smith points are slightly farther from the ellipsoid surface than the analytical points, but the discrepancies are not large. The largest discrepancy, for 100 μm drops at 31 cm, is very atypical in that this point is on the edge of a shadow zone, where: trajectory distortions are near their maxima, concentration factors become very large, and we expect and find "pathological" computational results caused by trajectories crossing each other in this region of extremely high concentration gradients.

Also in reference 1 we compare our tangent trajectories with those calculated by Dorsch et al. (ref. 19) for axisymmetric flow about an ellipsoid

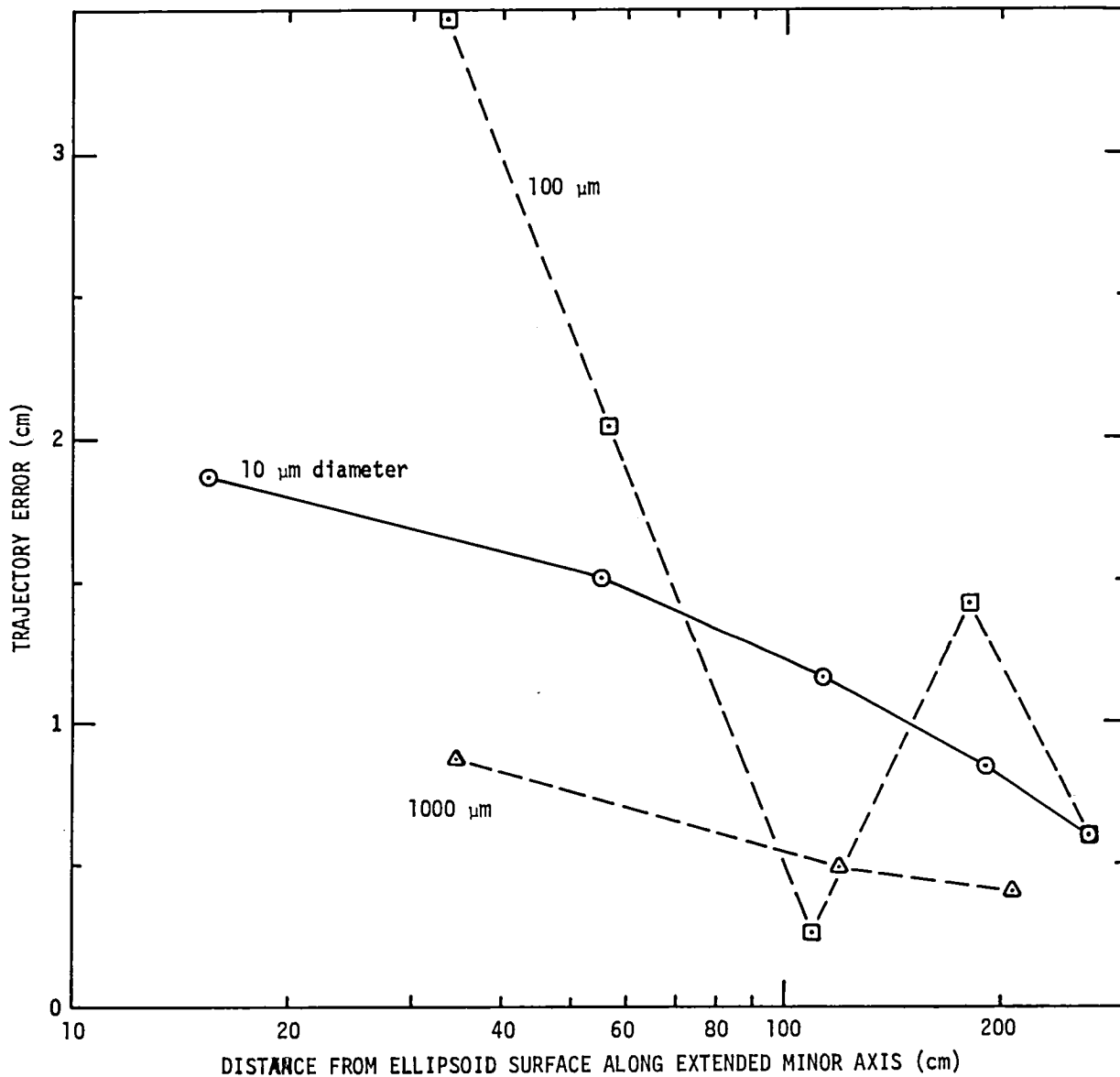


Figure 7. Comparison of water drop trajectories about an ellipsoid of fineness ratio 2 using exact and approximate potential airflow. The ellipsoid semi-minor axis is of length 2.335m. (From ref. 1)

of fineness ratio 5 for the two conditions of flow and particle size given in Figure 4 of reference 19. Particle equations of motion without gravity were used. In terms of the distance of the tangent trajectory from the symmetry axis in the free stream, r_0 , we have

Stokes Number	Free Stream Reynolds Number	r_0	
		Dorsch, et al., ref. 19	Norment and Zalosh, ref. 1
1	4096	.077	.075
1/30	512	.020	.015

Here r_0 is a fraction of the ellipsoid semi-major axis length. Differences in our method of calculation and that of Dorsch et al. are discussed in the next section.

ADDITIONAL VERIFICATION

The work of comparison of calculated tangent trajectories to an ellipsoid of fineness ratio 5 with those calculated by Dorsch et al. (ref. 19) was extended to include cases given in Table 1 of reference 19. Three cases were chosen for study as follows:

Altitude: 5000 ft Temperature: 20°F
 Water droplet diameter: 20 μm
 Ellipsoid semi-major axis length: 5 ft.
 Free stream speeds: 100, 300, 500 mph.

The Dorsch, et al. calculations were done neglecting gravity, with use of very early drag data and the equations of motion were integrated with a mechanical differential analyser. Our calculations included gravity and were done by the codes described herein. In both studies flow about an analytical ellipsoid was used. Our calculations were three-dimensional, but confined to the $y = 0$ plane. To account for effects of gravity (i.e., droplet settling) we calculated

tangent trajectories above and below the ellipsoid and averaged the results. (If r_0 values are adjusted for droplet settling between initial and impact points, the result is the same as the average r_0 values obtained from the above and below tangent trajectories.) Results are:

Free Stream Speed (mph)	r_0			
	Dorsch, et al., Ref. 19	This Study		
		Upper Side	Lower Side	Average
100	.024	.0198	.0174	.019
300	.041	.0373	.0365	.037
500	.054	.0460	.0456	.045

Lewis and Ruggeri (ref. 20) present experimental data obtained in the NACA Lewis wind tunnel used for icing studies. Data were obtained at constant free stream airspeed and atmospheric conditions for axisymmetric flow about an ellipsoid of fineness ratio 2.5. Local impingement efficiencies were measured as a function of s/R (s is the distance measured aftward along the ellipsoid surface from the nose of the ellipsoid, and R is the semi-minor ellipsoid axis) for four narrow distributions of droplet sizes. The relevant datum here is the maximum s/R for each droplet distribution which is produced by the maximum droplet diameter, δ_{max} , in its distribution.

Lewis and Ruggeri give the following flow and dimensional data:

- Free stream speed: 157 kts (80.767 m s^{-1})
- Temperature: 50°F (283.16°K)
- Pressure: 28" Hg (94583 Pa)
- Semi-minor ellipsoid axis: 15 inches (0.381m)

We calculate air density to be 1.1637 kg m^{-3} .

Lewis and Ruggeri also give theoretical s/R results. Our calculations were done as described previously in this section. x, z coordinates of limiting impingement points were converted to $(s/R)_{\max}$ values by a graphical method. Results are as follows:

δ_{\max} (μm)	<u>$(s/R)_{\max}$ From Ref. 20</u>			$(s/R)_{\max}$ This Study	% Error Relative to Exp.	% Error Relative to Ref. 20 Theory
	Exp. Mean from Figs. 10,23	Theor. from Fig. 23	% Error Relative to Exp.			
24	.23	.52	+160	.385	+67	-26
35	.405	.75	+ 88	.648	+60	-14
45	.525	.9	+ 64	.847	+61	- 6
64.5	.745	1.2	+ 60	1.18	+58	-1.7

Note that in all cases our calculations are closer to the experimental values, though for the larger particles our theoretical results differ little from those reported by Lewis and Ruggeri.

EXAMPLE PROBLEMS

GENERAL DISCUSSION

Example card input data are given below and printouts are presented in the microfiche addition included with this report for each of the seven codes listed in Table 1. A special three-dimensional test body, which is described in the next section, was used for the calculations.

All of the codes use less than 65,000 central processor storage words, and most use substantially less. Program BOXC uses the most storage and STEREO uses the least.

Total running times on the UNIVAC 1100/42 computer at NASA Lewis Research center for the example problems are:

<u>Code</u>	<u>Total Running Time (minutes : seconds)</u>
PBOXC	0:54
BOXC	4:23
FLOPNT	0:39
ARYTRJ	1:24
CONFAC	2:44
TANTRA	2:47
STEREO	0:47

THE TEST BODY

A special asymmetric test body was designed and is described in terms of 189 Hess-Smith panels. A listing of the data cards for the body follows the PBOXC card input below, and Fig. 8 shows computer plots of the body.

The structure of the body is as follows:

1. The more pointed end, which faces the free stream flow, is half of a prolate ellipsoid

$$\frac{x^2}{9} + \frac{y^2}{4} + z^2 = 1; -3 \leq x \leq 0.$$

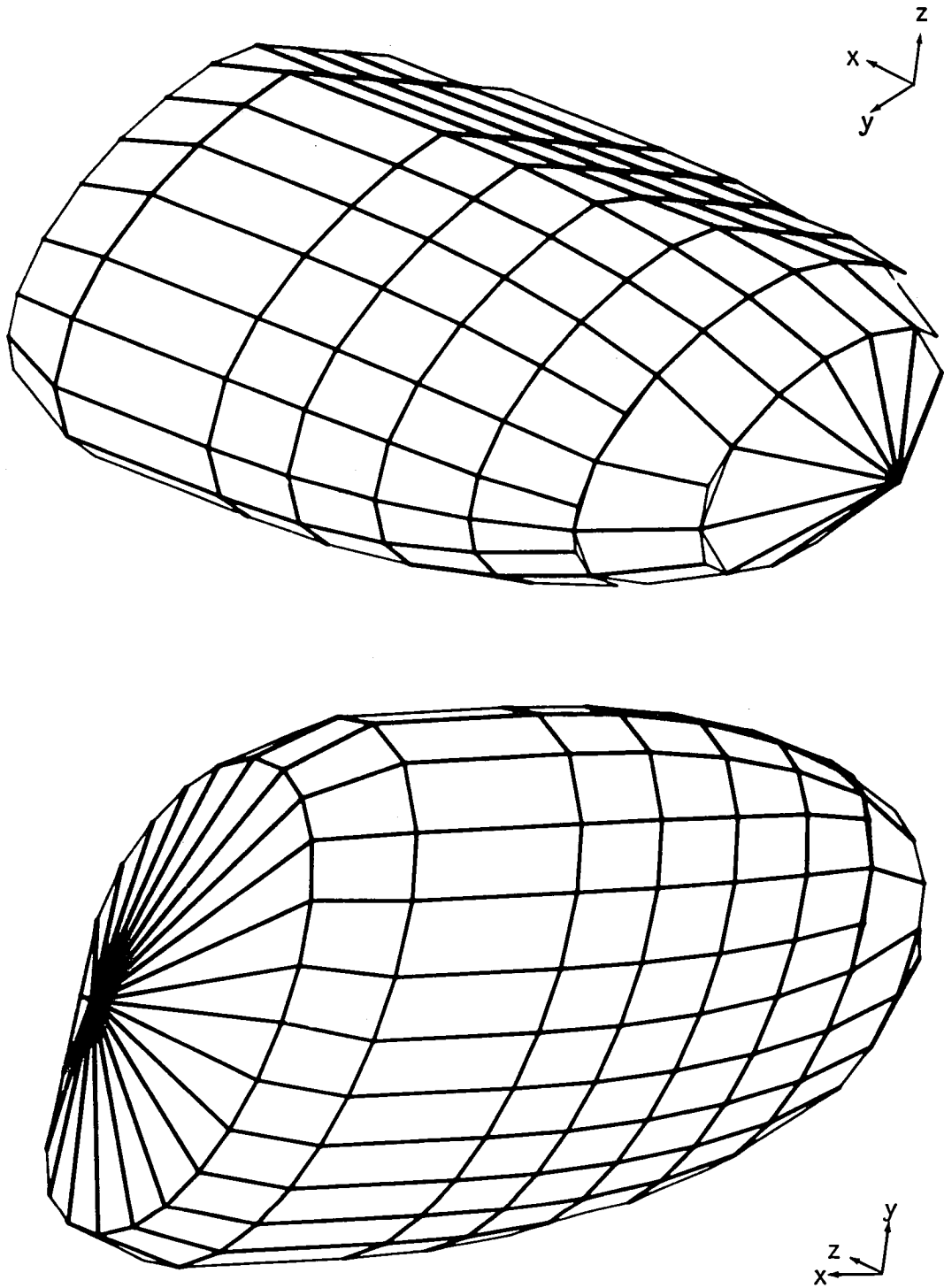


Figure 8. Asymmetric test problem body.

2. The central section is a cylinder

$$\frac{y^2}{4} + z^2 = 1 ; 0 \leq x \leq 1.$$

3. The blunt end is half of an oblate ellipsoid

$$(x - 1)^2 + \frac{y^2}{4} + z^2 = 1 ; 1 \leq x \leq 2.$$

4. The body is truncated by the plane

$$y - 2z = 2.$$

Test Problem Data Cards

Columns:	10	20	30	32			
	↓	↓	↓	↓			
2.0				2	1	1	SMBO 1
2.0					1	2	SMBO 2
2.0					1	3	SMBO 3
2.0					1	4	SMBC 4
2.0					1	5	SMBO 5
2.0					1	6	SMBO 6
2.0					1	7	SMBC 7
2.0					1	8	SMBO 8
2.0					1	9	SMBO 9
2.0					1	10	SMBO 10
2.0					1	11	SMBO 11
2.0					1	12	SMBO 12
2.0					1	13	SMBO 13
2.0					1	14	SMBO 14
2.0					1	15	SMBC 15
2.0					1	16	SMBC 16
2.0					1	17	SMBO 17
2.0					1	18	SMBO 18
2.0					1	19	SMBO 19
2.0					1	20	SMBC 20
2.0					1	21	SMBO 21
2.0					1	22	SMBO 22
2.0					1	23	SMBO 23
2.0					1	24	SMBO 24
1.5	1.7320	0.0		1	2	1	SMBC 25
1.5	1.67	0.2297			2	2	SMBO 26
1.5	1.46	0.4659			2	3	SMBC 27
1.5	1.14	0.6520			2	4	SMBO 28
1.5	0.8	0.7681			2	5	SMBO 29
1.5	0.4	0.8426			2	6	SMBO 30
1.5	0.0	0.8660			2	7	SMBO 31
1.5	-0.4	0.8			2	8	SMBO 32
1.5	-0.8	0.6			2	9	SMBC 33
1.5	-1.2	0.4			2	10	SMBC 34
1.5	-1.6	0.2			2	11	SMBO 35
1.5	-1.7320	0.0			2	12	SMBO 36
1.5	-1.67	-0.2297			2	13	SMBO 37
1.5	-1.46	-0.4659			2	14	SMBC 38
1.5	-1.14	-0.6520			2	15	SMBO 39
1.5	-0.8	-0.7681			2	16	SMBO 40
1.5	-0.4	-0.8426			2	17	SMBC 41
1.5	0.0	-0.8660			2	18	SMBO 42
1.5	0.4	-0.8426			2	19	SMBC 43
1.5	0.8	-0.7681			2	20	SMBO 44
1.5	1.14	-0.6520			2	21	SMBO 45
1.5	1.46	-0.4659			2	22	SMBO 46
1.5	1.67	-0.2297			2	23	SMBC 47
1.5	1.7320	0.0			2	24	SMBO 48
1.0	2.0	0.0		1	3	1	SMBO 49
1.0	1.87	0.3546			3	2	SMBO 50
1.0	1.6	0.6			3	3	SMBC 51
1.0	1.2	0.8			3	4	SMBC 52
1.0	0.8	0.9165			3	5	SMBC 53
1.0	0.4	0.9798			3	6	SMBO 54
1.0	0.0	1.0			3	7	SMBO 55
1.0	-0.4	0.8			3	8	SMBO 56

1.0	-0.8	0.6	3	9	SMBC	57
1.0	-1.2	0.4	3	10	SMBC	58
1.0	-1.6	0.2	3	11	SMBC	59
1.0	-2.0	0.0	3	12	SMBC	60
1.0	-1.87	-0.3546	3	13	SMBC	61
1.0	-1.6	-0.6	3	14	SMBC	62
1.0	-1.2	-0.8	3	15	SMBC	63
1.0	-0.8	-0.9165	3	1	SMBC	64
1.0	-0.4	-0.9798	3	1	SMBC	65
1.0	0.0	-1.0	3	18	SMBC	66
1.0	0.4	-0.9798	3	19	SMBC	67
1.0	0.8	-0.9165	3	20	SMBC	68
1.0	1.2	-0.8	3	21	SMBC	69
1.0	1.6	-0.6	3	22	SMBC	70
1.0	1.87	-0.3546	3	23	SMBC	71
1.0	2.0	0.0	3	24	SMBC	72
0.0	2.0	0.0	1	8	SMBC	73
0.0	1.87	0.3546	8	2	SMBC	74
0.0	1.6	0.6	8	3	SMBC	75
0.0	1.2	0.8	8	4	SMBC	76
0.0	0.8	0.9165	8	5	SMBC	77
0.0	0.4	0.9798	8	6	SMBC	78
0.0	0.0	1.0	8	7	SMBC	79
0.0	-0.4	0.8	8	8	SMBC	80
0.0	-0.8	0.6	8	9	SMBC	81
0.0	-1.2	0.4	8	10	SMBC	82
0.0	-1.6	0.2	8	11	SMBC	83
0.0	-2.0	0.0	8	12	SMBC	84
0.0	-1.87	-0.3546	8	13	SMBC	85
0.0	-1.6	-0.6	8	14	SMBC	86
0.0	-1.2	-0.8	8	15	SMBC	87
0.0	-0.8	-0.9165	8	16	SMBC	88
0.0	-0.4	-0.9798	8	17	SMBC	89
0.0	0.0	-1.0	8	18	SMBC	90
0.0	0.4	-0.9798	8	19	SMBC	91
0.0	0.8	-0.9165	8	20	SMBC	92
0.0	1.2	-0.8	8	21	SMBC	93
0.0	1.6	-0.6	8	22	SMBC	94
0.0	1.87	-0.3546	8	23	SMBC	95
0.0	2.0	0.0	8	24	SMBC	96
-0.5	1.9720	0.0	1	9	SMBC	97
-0.5	1.85	0.3415	9	2	SMBC	98
-0.5	1.585	0.5866	9	3	SMBC	99
-0.5	1.195	0.7844	9	4	SMBC	100
-0.5	0.8	0.9012	9	5	SMBC	101
-0.5	0.4	0.9655	9	6	SMBC	102
-0.5	0.0	0.9860	9	7	SMBC	103
-0.5	-0.4	0.8	9	8	SMBC	104
-0.5	-0.8	0.6	9	9	SMBC	105
-0.5	-1.2	0.4	9	10	SMBC	106
-0.5	-1.6	0.2	9	11	SMBC	107
-0.5	-1.9720	0.0	9	12	SMBC	108
-0.5	-1.85	-0.3415	9	13	SMBC	109
-0.5	-1.585	-0.5866	9	14	SMBC	110
-0.5	-1.195	-0.7844	9	15	SMBC	111
-0.5	-0.8	-0.9012	9	16	SMBC	112

-0.5	-0.4	-0.9655		9	17	SMBC	113
-0.5	0.0	-0.9860		9	18	SMBD	114
-0.5	0.4	-0.9655		9	19	SMBC	115
-0.5	0.8	-0.9012		9	20	SMBD	116
-0.5	1.195	-0.7844		9	21	SMBC	117
-0.5	1.585	-0.5866		9	22	SMBC	118
-0.5	1.85	-0.3415		9	23	SMBD	119
-0.5	1.9720	0.0		9	24	SMBC	120
-1.0	1.8856	0.0	1	10	1	SMBD	121
-1.0	1.785	0.3039		10	2	SMBC	122
-1.0	1.54	0.5440		10	3	SMBD	123
-1.0	1.175	0.7374		10	4	SMBC	124
-1.0	0.8	0.8538		10	5	SMBD	125
-1.0	0.4	0.9214		10	6	SMBD	126
-1.0	0.0	0.9428		10	7	SMBC	127
-1.0	-0.4	0.8		10	8	SMBD	128
-1.0	-0.8	0.6		10	9	SMBD	129
-1.0	-1.2	0.4		10	10	SMBC	130
-1.0	-1.6	0.2		10	11	SMBD	131
-1.0	-1.8856	0.0		10	12	SMBD	132
-1.0	-1.785	-0.3039		10	13	SMBD	133
-1.0	-1.54	-0.5440		10	14	SMBC	134
-1.0	-1.175	-0.7374		10	15	SMBC	135
-1.0	-0.8	-0.8538		10	16	SMBD	136
-1.0	-0.4	-0.9214		10	17	SMBC	137
-1.0	0.0	-0.9428		10	18	SMBD	138
-1.0	0.4	-0.9214		10	19	SMBC	139
-1.0	0.8	-0.8538		10	20	SMBC	140
-1.0	1.175	-0.7374		10	21	SMBC	141
-1.0	1.54	-0.5440		10	22	SMBD	142
-1.0	1.785	-0.3039		10	23	SMBD	143
-1.0	1.8856	0.0		10	24	SMBD	144
-1.5	1.7320	0.0	1	11	1	SMBC	145
-1.5	1.67	0.2297		11	2	SMBD	146
-1.5	1.46	0.4659		11	3	SMBD	147
-1.5	1.14	0.6520		11	4	SMBC	148
-1.5	0.8	0.7681		11	5	SMBD	149
-1.5	0.4	0.8426		11	6	SMBD	150
-1.5	0.0	0.8660		11	7	SMBD	151
-1.5	-0.4	0.8		11	8	SMBD	152
-1.5	-0.8	0.6		11	9	SMBD	153
-1.5	-1.2	0.4		11	10	SMBD	154
-1.5	-1.6	0.2		11	11	SMBC	155
-1.5	-1.7320	0.0		11	12	SMBD	156
-1.5	-1.67	-0.2297		11	13	SMBD	157
-1.5	-1.46	-0.4659		11	14	SMBD	158
-1.5	-1.14	-0.6520		11	15	SMBC	159
-1.5	-0.8	-0.7681		11	16	SMBD	160
-1.5	-0.4	-0.8426		11	17	SMBC	161
-1.5	0.0	-0.8660		11	18	SMBC	162
-1.5	0.4	-0.8426		11	19	SMBD	163
-1.5	0.8	-0.7681		11	20	SMBD	164
-1.5	1.14	-0.6520		11	21	SMBD	165
-1.5	1.46	-0.4659		11	22	SMBC	166
-1.5	1.67	-0.2297		11	23	SMBD	167
-1.5	1.7320	0.0		11	24	SMBD	168

-2.0	1.4907	0.0	1	12	1	SMBO	169
-2.0	1.465	0.1378		12	2	SMBC	170
-2.0	1.322	0.3444		12	3	SMBC	171
-2.0	1.072	0.5179		12	4	SMBO	172
-2.0	0.8	0.6289		12	5	SMBC	173
-2.0	0.4	0.7180		12	6	SMBC	174
-2.0	0.0	0.7454		12	7	SMBO	175
-2.0	-0.4	0.7180		12	8	SMBO	176
-2.0	-0.8	0.6		12	9	SMBO	177
-2.0	-1.2	0.4		12	10	SMBC	178
-2.0	-1.4	0.2560		12	11	SMBO	179
-2.0	-1.4907	0.0		12	12	SMBO	180
-2.0	-1.465	-0.1378		12	13	SMBO	181
-2.0	-1.322	-0.3444		12	14	SMBC	182
-2.0	-1.072	-0.5179		12	15	SMBO	183
-2.0	-0.8	-0.6289		12	16	SMBC	184
-2.0	-0.4	-0.7180		12	17	SMBO	185
-2.0	0.0	-0.7454		12	18	SMBC	186
-2.0	0.4	-0.7180		12	19	SMBO	187
-2.0	0.8	-0.6289		12	20	SMBO	188
-2.0	1.072	-0.5179		12	21	SMBC	189
-2.0	1.322	-0.3444		12	22	SMBO	190
-2.0	1.465	-0.1378		12	23	SMBC	191
-2.0	1.4907	0.0		12	24	SMBO	192
-2.0	1.4907	0.0	2	13	1	SMBO	193
-2.0	1.322	0.3444		13	2	SMBO	194
-2.0	0.8	0.6289		13	3	SMBO	195
-2.0	0.4	0.7180		13	4	SMBO	196
-2.0	0.0	0.7457		13	5	SMBO	197
-2.0	-0.4	0.7180		13	6	SMBC	198
-2.0	-0.8	0.6		13	7	SMBO	199
-2.0	-1.2	0.4		13	8	SMBC	200
-2.0	-1.4907	0.0		13	9	SMBC	201
-2.0	-1.322	-0.3444		13	10	SMBC	202
-2.0	-0.8	-0.6289		13	11	SMBO	203
-2.0	-0.4	-0.7180		13	12	SMBC	204
-2.0	0.0	-0.7454		13	13	SMBC	205
-2.0	0.4	-0.7180		13	14	SMBC	206
-2.0	0.8	-0.6289		13	15	SMBO	207
-2.0	1.322	-0.3444		13	16	SMBC	208
-2.0	1.4907	0.0		13	17	SMBO	209
-2.5	1.055	0.0	1	14	1	SMBC	210
-2.5	1.0	0.2357		14	2	SMBO	211
-2.5	0.8	0.3815		14	3	SMBO	212
-2.5	0.4	0.5153		14	4	SMBO	213
-2.5	0.0	0.5528		14	5	SMBC	214
-2.5	-0.4	0.5153		14	6	SMBC	215
-2.5	-0.8	0.3815		14	7	SMBO	216
-2.5	-1.0	0.2357		14	8	SMBO	217
-2.5	-1.055	0.0		14	9	SMBO	218
-2.5	-1.0	-0.2357		14	10	SMBO	219
-2.5	-0.8	-0.3815		14	11	SMBC	220
-2.5	-0.4	-0.5153		14	12	SMBO	221
-2.5	0.0	-0.5528		14	13	SMBO	222
-2.5	0.4	-0.5153		14	14	SMBO	223
-2.5	0.8	-0.3815		14	15	SMBC	224

-2.5	1.0	-0.2357		14	16	SMBO 225
-2.5	1.055	0.0		14	17	SMBO 226
-2.5	1.055	0.0	2	15	1	SMBO 227
-2.5	0.8	0.3815		15	2	SMBO 228
-2.5	0.4	0.5153		15	3	SMBO 229
-2.5	0.0	0.5528		15	4	SMBO 230
-2.5	-0.4	0.5153		15	5	SMBO 231
-2.5	-0.8	0.3815		15	6	SMBO 232
-2.5	-1.055	0.0		15	7	SMBO 233
-2.5	-0.8	-0.3815		15	8	SMBO 234
-2.5	-0.4	-0.5153		15	9	SMBO 235
-2.5	0.0	-0.5528		15	10	SMBO 236
-2.5	0.4	-0.5153		15	11	SMBO 237
-2.5	0.8	-0.3815		15	12	SMBO 238
-2.5	1.055	0.0		15	13	SMBO 239
-3.0			1	16	1	SMBO 240
-3.0				16	2	SMBO 241
-3.0				16	3	SMBO 242
-3.0				16	4	SMBO 243
-3.0				16	5	SMBO 244
-3.0				16	6	SMBO 245
-3.0				16	7	SMBO 246
-3.0				16	8	SMBO 247
-3.0				16	9	SMBO 248
-3.0				16	10	SMBO 249
-3.0				16	11	SMBO 250
-3.0				16	12	SMBO 251
-3.0			3	16	13	SMBO 252

CONFAC

Card No.

1	1	2	3	4	5	6	7	8	9	8
TEST										
TEST PROBLEM WITH TEST BODY										
90.	1.	.90925	268.659	-5.						
1.										
	4	.00328		.5						
300.										
-1.5	1.1			.8						

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

STEREO

Card
No.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80			
1	PLOT TANGENT TRAJECTORY TO THE TEST BODY																																																																																	
2	T	1 -5.0																																																																																
3	PLOT TANGENT TRAJECTORY TO THE TEST BODY																																																																																	
4	2/14/50																																																																																	
5	0.	160.	3.5																																																																															
6	THETA=0, PSI=160, DELTA=3.5																																																																																	
5	0.	160.	3.0																																																																															
6	THETA=0, PSI=160, DELTA=3.0																																																																																	
5	0.	160.	2.5																																																																															
6	THETA=0, PSI=160, DELTA=2.5																																																																																	
5																																																																																		
6																																																																																		

Figure 9 shows a stereo pair of plots of the test body and the tangent trajectory calculated via the TANTRA test problem.

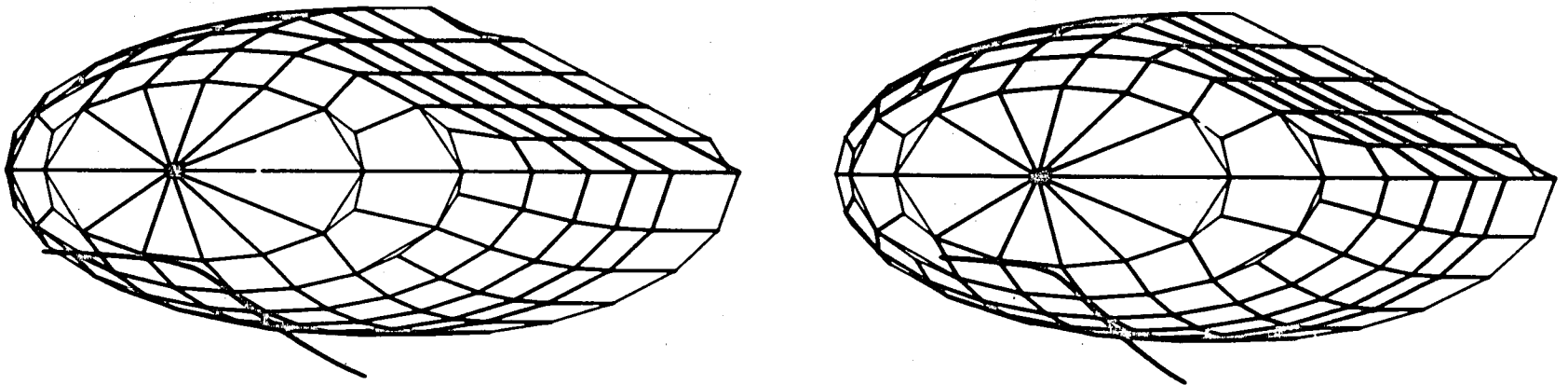


Figure 9. Stereographic plot of the tangent trajectory of a 200 μm diameter water drop to the lower side of the test body in the $y = 0$ plane. Plotted from the results of the TANTRA test problem. Three-dimensional perspective can be attained by staring at the center of the figure and then crossing the eyes such that the two images merge.

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MICROFICHE SUPPLEMENT TO NASA CR-3291

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EXAMPLE PROBLEM PRINTOUT

PBOXC

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

PAGE 1

BODY ID. TEST

TEST BODY

P A R A M E T R I C I N F O R M A T I O N

NO SYMMETRY SPECIFIED

PLOTS ARE PREPARED

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
1	1	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.670000 .229700	1.500000 1.732000 0.000000	.958086 .276584 .074655	1.591395 1.389794 .094899
	2	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.460000 .465900	1.500000 1.670000 .229700	.941794 .251249 .223380	1.598349 1.254020 .292927
	3	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.140000 .652000	1.500000 1.460000 .465900	.915363 .202414 .348052	1.605113 1.019539 .445612
	4	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 .800000 .768100	1.500000 1.140000 .652000	.691771 .146221 .428210	1.609275 .750320 .557494
	5	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 .400000 .842600	1.500000 .800000 .768100	.874522 .088802 .476787	1.620269 .447901 .613081
	6	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 0.000000 .866000	1.500000 .400000 .842600	.865649 .029238 .499797	1.624811 .147089 .641222
	7	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -.400000 .800000	1.500000 0.000000 .866000	.863087 -.082222 .498318	1.626041 -.148316 .623224
	8	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -.800000 .600000	1.500000 -.400000 .800000	.872872 -.218218 .436436	1.627233 -.442846 .524111
	9	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -1.200000 .400000	1.500000 -.600000 .600000	.872872 -.218218 .436436	1.618821 -.751160 .386778
	10	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -1.600000 .200000	1.500000 -1.200000 .400000	.872872 -.218218 .436436	1.607148 -1.065976 .242716
	11	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -1.732000 0.000000	1.500000 -1.600000 .200000	.945063 -.272824 .180064	1.589795 -1.365206 .084464
	12	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -1.670000 -.229700	1.500000 -1.732000 0.000000	.958086 -.276584 -.074655	1.591395 -1.389794 -.094899

3

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
000000	1.500000	.958086	1.591395	0.
070000	1.732000	.276584	1.389794	.1803E+01
229700	0.000000	.074655	.094899	.2076E+00
000000	1.500000	.941794	1.598349	.8882E-15
060000	1.670000	.251249	1.254020	.1758E+01
065900	.229700	.223380	.282927	.2350E+00
000000	1.500000	.915363	1.605113	.2665E-14
140000	1.460000	.202414	1.019539	.1612E+01
652000	.465900	.348052	.445012	.2299E+00
000000	1.500000	.891771	1.609275	.2665E-14
000000	1.140000	.146221	.750320	.1405E+01
768100	.652000	.428210	.557494	.1985E+00
000000	1.500000	.874522	1.620269	.9992E-15
400000	.800000	.088802	.447901	.1217E+01
842600	.768100	.476787	.613081	.2097E+00
000000	1.500000	.865649	1.624811	.2220E-15
000000	.400000	.029238	.147089	.1058E+01
866000	.842600	.499797	.641222	.2001E+00
000000	1.500000	.863087	1.626041	.2220E-15
400000	.000000	-.082222	-.148316	.1025E+01
800000	.866000	.498318	.623224	.2007E+00
000000	1.500000	.872872	1.627233	.8882E-15
000000	-.400000	-.218218	-.442846	.1118E+01
600000	.800000	.436436	.524111	.2291E+00
000000	1.500000	.872872	1.618821	.1776E-14
200000	-.800000	-.218218	-.751160	.1360E+01
400000	.600000	.436436	.386778	.2291E+00
000000	1.500000	.872872	1.607148	.8882E-15
600000	-1.200000	-.218218	-1.085976	.1688E+01
200000	.400000	.436436	.242716	.2291E+00
000000	1.500000	.945063	1.589795	0.
732000	-1.600000	-.272824	-1.365206	.1803E+01
000000	.200000	.180064	.084464	.1833E+00
000000	1.500000	.958086	1.591395	0.
670000	-1.732000	-.276584	-1.389794	.1803E+01
229700	0.000000	-.074655	-.094899	.2076E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z		
1	13	2.000000	2.000000	1.500000	1.500000	.941794	1.598349		
		0.000000	0.000000	-1.460000	-1.670000	-.251249	-1.254020		
		0.000000	0.000000	-.465900	-.229700	-.223380	-.282927		
	14	2.000000	2.000000	1.500000	1.500000	.915363	1.605113		
		0.000000	0.000000	-1.140000	-1.460000	-.202414	-1.019539		
		0.000000	0.000000	-.652000	-.465900	-.348052	-.445612		
	15	2.000000	2.000000	1.500000	1.500000	.891771	1.609275		
		0.000000	0.000000	-.800000	-1.140000	-.146221	-.750320		
		0.000000	0.000000	-.768100	-.652000	-.428210	-.557494		
	16	2.000000	2.000000	1.500000	1.500000	.874522	1.620269		
		0.000000	0.000000	-.400000	-.800000	-.088802	-.447901		
		0.000000	0.000000	-.842600	-.768100	-.476787	-.613081		
	17	2.000000	2.000000	1.500000	1.500000	.865649	1.624811		
		0.000000	0.000000	0.000000	-.400000	-.029238	-.147089		
		0.000000	0.000000	-.866000	-.842600	-.499797	-.641222		
4	18	2.000000	2.000000	1.500000	1.500000	.865649	1.624811		
		0.000000	0.000000	.400000	0.000000	.029238	.147089		
		0.000000	0.000000	-.842600	-.866000	-.499797	-.641222		
	19	2.000000	2.000000	1.500000	1.500000	.874522	1.620269		
		0.000000	0.000000	.800000	.400000	.088802	.447901		
		0.000000	0.000000	-.768100	-.842600	-.476787	-.613081		
	20	2.000000	2.000000	1.500000	1.500000	.891771	1.609275		
		0.000000	0.000000	1.140000	.800000	.146221	.750320		
		0.000000	0.000000	-.652000	-.768100	-.428210	-.557494		
	21	2.000000	2.000000	1.500000	1.500000	.915363	1.605113		
		0.000000	0.000000	1.460000	1.140000	.202414	1.019539		
		0.000000	0.000000	-.465900	-.652000	-.348052	-.445612		
	22	2.000000	2.000000	1.500000	1.500000	.941794	1.598349		
		0.000000	0.000000	1.670000	1.460000	.251249	1.254020		
		0.000000	0.000000	-.229700	-.465900	-.223380	-.282927		
	23	2.000000	2.000000	1.500000	1.500000	.958086	1.591395		
		0.000000	0.000000	1.732000	1.670000	.276584	1.389794		
		0.000000	0.000000	0.000000	-.229700	-.074655	-.094899		
2	1	1.500000	1.500000	1.000000	1.000000	.435365	1.220560		
		1.732000	1.670000	1.870000	2.000000	.655263	1.831729		
		0.000000	.229700	.354600	0.000000	.281038	.149900		

	X	NX	NPX	D
	Y	NY	NPY	T
	Z	NZ	NPZ	A
000	1.500000	.941794	1.598349	.8882E-15
000	-1.670000	-.251249	-1.254020	.1758E+01
000	-.229700	-.223380	-.282927	.2350E+00
000	1.500000	.915363	1.605113	.2665E-14
000	-1.460000	-.202414	-1.019539	.1612E+01
000	-.465900	-.348052	-.445612	.2299E+00
000	1.500000	.891771	1.609275	.2665E-14
000	-1.140000	-.146221	-.750320	.1405E+01
100	-.652000	-.428210	-.557494	.1985E+00
000	1.500000	.874522	1.620269	.9992E-15
000	-.800000	-.088802	-.447901	.1217E+01
500	-.768100	-.476787	-.613381	.2097E+00
000	1.500000	.865649	1.624811	.2220E-15
000	-.400000	-.029238	-.147089	.1058E+01
000	-.842600	-.499797	-.641222	.2001E+00
000	1.500000	.865649	1.624811	.2220E-15
000	0.000000	.029238	.147089	.1058E+01
500	-.866000	-.499797	-.641222	.2001E+00
000	1.500000	.874522	1.620269	.9992E-15
000	.400000	.088802	.447901	.1217E+01
100	-.842600	-.476787	-.613081	.2097E+00
000	1.500000	.891771	1.609275	.2665E-14
000	.800000	.146221	.750320	.1405E+01
000	-.768100	-.428210	-.557494	.1985E+00
000	1.500000	.915363	1.605113	.2665E-14
000	1.140000	.202414	1.019539	.1612E+01
900	-.652000	-.348052	-.445612	.2299E+00
000	1.500000	.941794	1.598349	.8882E-15
000	1.460000	.251249	1.254020	.1758E+01
700	-.465900	-.223380	-.282927	.2350E+00
000	1.500000	.958086	1.591395	0.
000	1.670000	.276584	1.389794	.1803E+01
000	-.229700	-.074655	-.094899	.2076E+00
000	1.000000	.435365	1.220560	.5764E-02
000	2.600000	.655263	1.831729	.6416E+00
500	0.000000	.261038	.149900	.1708E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
2	2	1.500000 1.670000 .229700	1.500000 1.460000 .465900	1.000000 1.600000 .600000	1.000000 1.870000 .354600	.390089 .652170 .650004	1.2417 1.6528 .4146
	3	1.500000 1.460000 .465900	1.500000 1.140000 .652000	1.000000 1.200000 .800000	1.000000 1.600000 .600000	.324553 .447006 .833577	1.2416 1.3516 .6310
	4	1.500000 1.140000 .652000	1.500000 .800000 .768100	1.000000 .800000 .916500	1.000000 1.200000 .800000	.288009 .287154 .913561	1.2429 .9857 .7861
	5	1.500000 .800000 .768100	1.500000 .400000 .842600	1.000000 .400000 .979800	1.000000 .800000 .916500	.270929 .163401 .948629	1.2501 .6000 .8766
	6	1.500000 .400000 .842600	1.500000 0.000000 .666000	1.000000 0.000000 1.000000	1.000000 .400000 .979800	.261384 .052527 .963805	1.2500 .2000 .9220
5	7	1.500000 0.000000 .866000	1.500000 -.400000 .800000	1.000000 -.400000 .800000	1.000000 0.000000 1.000000	.126140 -.312996 .941341	1.2460 -.1995 .8671
	8	1.500000 -.400000 .800000	1.500000 -.800000 .600000	1.000000 -.800000 .600000	1.000000 -.400000 .800000	0.000000 -.447214 .894427	1.2500 -.6000 .7000
	9	1.500000 -.800000 .600000	1.500000 -1.200000 .400000	1.000000 -1.200000 .400000	1.000000 -.800000 .600000	0.000000 -.447214 .894427	1.2500 -1.0000 .5000
	10	1.500000 -1.200000 .400000	1.500000 -1.600000 .200000	1.000000 -1.600000 .200000	1.000000 -1.200000 .400000	0.000000 -.447214 .894427	1.2500 -1.4000 .3000
	11	1.500000 -1.600000 .200000	1.500000 -1.732000 0.000000	1.000000 -2.000000 0.000000	1.000000 -1.600000 .200000	.159008 -.593315 .789109	1.2167 -1.7392 .1020
	12	1.500000 -1.732000 0.000000	1.500000 -1.670000 -.229700	1.000000 -1.870000 -.354600	1.000000 -2.000000 0.000000	.435365 -.855263 -.281038	1.2205 -1.8317 -.1499
	13	1.500000 -1.670000 -.229700	1.500000 -1.460000 -.465900	1.000000 -1.600000 -.600000	1.000000 -1.870000 -.354600	.390089 -.652170 -.650004	1.2417 -1.6528 -.4146

NX	NPX	D
NY	NPY	T
NZ	NPZ	A
.390089	1.241719	.8288E-02
.652170	1.652830	.6561E+00
.650004	.414680	.1846E+00
.324553	1.241630	.6043E-02
.447006	1.351646	.6814E+00
.833577	.631851	.2159E+00
.288009	1.242990	.4216E-02
.287154	.985715	.6600E+00
.913561	.786135	.2025E+00
.270929	1.250180	.2656E-02
.163401	.600088	.6744E+00
.948629	.876683	.2108E+00
.261384	1.250017	.7710E-03
.052527	.200026	.6594E+00
.963805	.922094	.2075E+00
.126140	1.246098	.3153E-01
-.312996	-.199566	.6708E+00
.941341	.867167	.2125E+00
0.000000	1.250000	.3553E-14
-.447214	-.600000	.6708E+00
.894427	.700000	.2236E+00
0.000000	1.250000	.3553E-14
-.447214	-1.000000	.6708E+00
.894427	.500000	.2236E+00
0.000000	1.250000	.6661E-14
-.447214	-1.400000	.6708E+00
.894427	.300000	.2236E+00
.159008	1.216789	.3975E-01
-.593315	-1.739216	.6708E+00
.789109	.102018	.1685E+00
.435365	1.220560	.5764E-02
-.855263	-1.831729	.6416E+00
-.281038	-.149900	.1708E+00
.390089	1.241719	.8288E-02
-.652170	-1.652830	.6561E+00
-.650004	-.414680	.1846E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			NX	NPX		
		X Y Z	X Y Z	X Y Z			NY NPY	NZ NPZ
9	14	1.500000 -1.460000 -.465900	1.500000 -1.140000 -.652000	1.000000 -1.200000 -.800000	1.000000 -1.600000 -.600000	.324553 -.447006 -.833577	1.241630 -1.351646 -.631851	
	15	1.500000 -1.140000 -.652000	1.500000 -.600000 -.768100	1.000000 -.800000 -.916500	1.000000 -1.200000 -.800000	.286009 -.287154 -.913561	1.242990 -.985715 -.786135	
	16	1.500000 -.800000 -.768100	1.500000 -.400000 -.842600	1.000000 -.400000 -.979800	1.000000 -.800000 -.916500	.270929 -.163401 -.948629	1.250180 -.600088 -.876683	
	17	1.500000 -.400000 -.842600	1.500000 0.000000 -.866000	1.000000 0.000000 -1.000000	1.000000 -.400000 -.979800	.261384 -.052527 -.963805	1.250017 -.200026 -.922094	
	18	1.500000 0.000000 -.866000	1.500000 .400000 -.842600	1.000000 .400000 -.979800	1.000000 0.000000 -1.000000	.261384 .052527 -.963805	1.250017 .200026 -.922094	
	19	1.500000 .400000 -.842600	1.500000 .800000 -.768100	1.000000 .800000 -.916500	1.000000 .400000 -.979800	.270929 .163401 -.948629	1.250180 .600088 -.876683	
	20	1.500000 .800000 -.768100	1.500000 1.140000 -.652000	1.000000 1.200000 -.800000	1.000000 .600000 -.916500	.286009 .287154 -.913561	1.242990 .985715 -.786135	
	21	1.500000 1.140000 -.652000	1.500000 1.460000 -.465900	1.000000 1.600000 -.600000	1.000000 1.200000 -.800000	.324553 .447006 -.833577	1.241630 1.351646 -.631851	
	22	1.500000 1.460000 -.465900	1.500000 1.670000 -.229700	1.000000 1.870000 -.354600	1.000000 1.600000 -.600000	.390089 .652170 -.650004	1.241719 1.652830 -.414680	
	23	1.500000 1.670000 -.229700	1.500000 1.732000 0.000000	1.000000 2.000000 0.000000	1.000000 1.870000 -.354600	.435365 .855263 -.281038	1.220560 1.631729 -.149900	
	3	1	1.000000 2.000000 0.000000	1.600000 1.870000 .354600	0.000000 1.870000 .354600	0.000000 2.000000 0.000000	0.000000 .938893 .344208	.500000 1.935000 .177300
		2	1.000000 1.870000 .354600	1.000000 1.600000 .600000	0.000000 1.600000 .600000	0.000000 1.870000 .354600	0.000000 .672591 .740014	.500000 1.735000 .477300

X	NX	NPX	D
Y	NY	NPY	T
Z	NZ	NPZ	A
1.000000	.324553	1.241630	.6043E-02
-1.600000	-.447006	-1.351646	.6814E+00
-.600000	-.833577	-.631851	.2159E+00
1.000000	.286009	1.242990	.4216E-02
-1.200000	-.287154	-.985715	.6600E+00
-.800000	-.913561	-.786135	.2025E+00
1.000000	.270929	1.250180	.2656E-02
-.800000	-.163401	-.600088	.6744E+00
-.916500	-.948629	-.876683	.2108E+00
1.000000	.261384	1.250017	.7710E-03
-.400000	-.052527	-.200026	.6594E+00
-.979800	-.963805	-.922094	.2075E+00
1.000000	.261384	1.250017	.7710E-03
0.000000	.052527	.200026	.6594E+00
-1.000000	-.963805	-.922094	.2075E+00
1.000000	.270929	1.250180	.2656E-02
.400000	.163401	.600088	.6744E+00
-.979800	-.948629	-.876683	.2108E+00
1.000000	.288009	1.242990	.4216E-02
.800000	.287154	.985715	.6600E+00
-.916500	-.913561	-.786135	.2025E+00
1.000000	.324553	1.241630	.6043E-02
1.200000	.447006	1.351646	.6814E+00
-.800000	-.833577	-.631851	.2159E+00
1.000000	.390089	1.241719	.8288E-02
1.600000	.652170	1.652830	.65E1E+00
-.600000	-.650004	-.414680	.1846E+00
1.000000	.435365	1.220560	.5764E-02
1.870000	.855203	1.831729	.6416E+00
-.354600	-.281038	-.149900	.1708E+00
0.000000	0.000000	.500000	0.
2.000000	.938893	1.935000	.1069E+01
J.000000	.344208	.177300	.3777E+00
0.000000	0.000000	.500000	.4885E-14
1.870000	.672591	1.735000	.10E4E+01
.354600	.740014	.477300	.3649E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ		
3	3	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		1.600000	1.200000	1.200000	1.600000	.447214	1.400000	
		.600000	.800000	.800000	.600000	.894427	.700000	
4	4	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		1.200000	.800000	.800000	1.200000	.279631	1.000000	
		.800000	.916500	.916500	.800000	.966107	.858250	
5	5	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		.800000	.400000	.400000	.800000	.156305	.600000	
		.916500	.979800	.979800	.916500	.967709	.948150	
6	6	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		.400000	0.000000	0.000000	.400000	.050436	.200000	
		.979800	1.000000	1.000000	.979800	.998727	.989900	
7	7	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		0.000000	-.400000	-.400000	0.000000	-.447214	-.200000	
		1.000000	.800000	.800000	1.000000	.894427	.900000	
8	8	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-.400000	-.800000	-.800000	-.400000	-.447214	-.600000	
		.800000	.600000	.600000	.800000	.894427	.700000	
9	9	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.000000	
		.600000	.400000	.400000	.600000	.894427	.500000	
10	10	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-1.200000	-1.600000	-1.600000	-1.200000	-.447214	-1.400000	
		.400000	.200000	.200000	.400000	.894427	.300000	
11	11	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-1.600000	-2.000000	-2.000000	-1.600000	-.447214	-1.800000	
		.200000	0.000000	0.000000	.200000	.894427	.100000	
12	12	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-2.000000	-1.870000	-1.870000	-2.000000	-.938893	-1.935000	
		0.000000	-.354600	-.354600	0.000000	-.344208	-.177300	
13	13	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-1.870000	-1.600000	-1.600000	-1.870000	-.672591	-1.735000	
		-.354600	-.600000	-.600000	-.354600	-.740014	-.477300	
14	14	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-1.600000	-1.200000	-1.200000	-1.600000	-.447214	-1.400000	
		-.600000	-.800000	-.800000	-.600000	-.894427	-.700000	

NX	NPX	D
NY	NPY	T
NZ	NPZ	A
0.000000	.500000	.6661E-14
.447214	1.400000	.1095E+01
.894427	.700000	.4472E+00
0.000000	.500000	.2442E-14
.279631	1.000000	.1083E+01
.966107	.858250	.4166E+00
0.000000	.500000	.2442E-14
.156305	.600000	.1079E+01
.967709	.948150	.4050E+00
0.000000	.500000	.5551E-16
.050436	.200000	.1077E+01
.998727	.989900	.4005E+00
0.000000	.500000	.3109E-14
-.447214	-.200000	.1095E+01
.894427	.900000	.4472E+00
0.000000	.500000	.3553E-14
-.447214	-.600000	.1095E+01
.894427	.700000	.4472E+00
0.000000	.500000	.3553E-14
-.447214	-1.000000	.1095E+01
.894427	.500000	.4472E+00
0.000000	.500000	.6661E-14
-.447214	-1.400000	.1095E+01
.894427	.300000	.4472E+00
0.000000	.500000	.4441E-15
-.447214	-1.800000	.1095E+01
.894427	.100000	.4472E+00
0.000000	.500000	0.
-.938893	-1.935000	.1069E+01
-.344208	-.177300	.3777E+00
0.000000	.500000	.4885E-14
-.672591	-1.735000	.1064E+01
-.740014	-.477300	.3649E+00
0.000000	.500000	.6661E-14
-.447214	-1.400000	.1095E+01
-.894427	-.700000	.4472E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
3	15	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.200000	-.800000	-.800000	-1.200000	-.279631	-1.000000		
		-.800000	-.916500	-.916500	-.800000	-.960107	-.858250		
	16	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.800000	-.400000	-.400000	-.800000	-.156305	-.600000		
		-.916500	-.979800	-.979800	-.916500	-.987709	-.948150		
	17	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.400000	0.000000	0.000000	-.400000	-.050436	-.200000		
		-.979800	-1.000000	-1.000000	-.979800	-.998727	-.989900		
	18	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		0.000000	.400000	.400000	0.000000	.050436	.200000		
		-1.000000	-.979800	-.979800	-1.000000	-.998727	-.989900		
	19	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.400000	.800000	.800000	.400000	.156305	.600000		
		-.979800	-.916500	-.916500	-.979800	-.987709	-.948150		
∞	20	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.800000	1.200000	1.200000	.800000	.279631	1.000000		
		-.916500	-.800000	-.800000	-.916500	-.960107	-.858250		
	21	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.200000	1.600000	1.600000	1.200000	.447214	1.400000		
		-.800000	-.600000	-.600000	-.800000	-.894427	-.700000		
	22	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.600000	1.870000	1.870000	1.600000	.672591	1.735000		
		-.600000	-.354600	-.354600	-.600000	-.740014	-.477300		
	23	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.870000	2.000000	2.000000	1.870000	.938893	1.935000		
		-.354600	0.000000	0.000000	-.354600	-.344208	-.177300		
4	1	0.000000	0.000000	-.500000	-.500000	-.049532	-.248068		
		2.000000	1.870000	1.850000	1.972000	.939127	1.923092		
		0.000000	.354600	.341500	0.000000	.339980	.174052		
	2	0.000000	0.000000	-.500000	-.500000	-.043145	-.249477		
		1.870000	1.600000	1.585000	1.850000	.675158	1.726269		
		.354600	.600000	.586600	.341500	.736411	.470688		
	3	0.000000	0.000000	-.500000	-.500000	-.034875	-.249169		
		1.600000	1.200000	1.195000	1.585000	.449471	1.395016		
		.600000	.600000	.784400	.586600	.892614	.692774		

X	NX	NPX	D
Y	NY	NPY	T
Z	NZ	NPZ	A
0.000000	0.000000	.500000	.2442E-14
1.200000	-.279631	-1.000000	.1083E+01
-.800000	-.960107	-.858250	.4166E+00
0.000000	0.000000	.500000	.2442E-14
-.800000	-.156305	-.600000	.1079E+01
-.916500	-.987709	-.948150	.4050E+00
0.000000	0.000000	.500000	.5551E-16
1.400000	-.050436	-.200000	.1077E+01
-.979800	-.998727	-.989900	.4005E+00
0.000000	0.000000	.500000	.3553E-14
0.000000	.050436	.200000	.1077E+01
1.000000	-.998727	-.989900	.4005E+00
0.000000	0.000000	.500000	.2220E-14
.400000	.156305	.600000	.1079E+01
-.979800	-.987709	-.948150	.4050E+00
0.000000	0.000000	.500000	.3109E-14
.800000	.279631	1.000000	.1083E+01
-.916500	-.960107	-.858250	.4166E+00
0.000000	0.000000	.500000	.6661E-14
1.200000	.447214	1.400000	.1095E+01
-.800000	-.894427	-.700000	.4472E+00
0.000000	0.000000	.500000	.6217E-14
1.600000	.672591	1.735000	.1064E+01
-.600000	-.740014	-.477300	.3649E+00
0.000000	0.000000	.500000	.6217E-14
1.870000	.938893	1.935000	.1069E+01
-.354600	-.344208	-.177300	.3777E+00
-.500000	-.049532	-.248068	.7648E-03
1.972000	.939127	1.923092	.6238E+00
0.000000	.339980	.174052	.1853E+00
-.500000	-.043145	-.249477	.7887E-03
1.850000	.675158	1.726269	.6205E+00
.341500	.736411	.470688	.1816E+00
-.500000	-.034875	-.249169	.6327E-03
1.585000	.449471	1.395016	.6693E+00
.586600	.892614	.692774	.2213E+00

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
4	4	0.000000 1.200000 .800000	0.000000 .800000 .916500	-.500000 .800000 .901200	-.500000 1.195000 .784400	-.031043 .281449 .959074	-.249537 .998756 .850538
	5	0.000000 .800000 .916500	0.000000 .400000 .979800	-.500000 .400000 .965500	-.500000 .800000 .901200	-.029218 .157442 .987096	-.250016 .600001 .940749
	6	0.000000 .400000 .979800	0.000000 0.000000 1.000000	-.500000 0.000000 .986000	-.500000 .400000 .965500	-.028252 .050789 .998310	-.250002 .200000 .982825
	7	0.000000 0.000000 1.000000	0.000000 -.400000 .800000	-.500000 -.400000 .800000	-.500000 0.000000 .986000	-.012608 -.434526 .900571	-.249496 -.199997 .896509
	8	0.000000 -.400000 .800000	0.000000 -.800000 .600000	-.500000 -.800000 .600000	-.500000 -.400000 .800000	0.000000 -.447214 .894427	-.250000 -.600000 .700000
6	9	0.000000 -.800000 .600000	0.000000 -1.200000 .400000	-.500000 -1.200000 .400000	-.500000 -.800000 .600000	0.000000 -.447214 .894427	-.250000 -1.000000 .500000
	10	0.000000 -1.200000 .400000	0.000000 -1.600000 .200000	-.500000 -1.600000 .200000	-.500000 -1.200000 .400000	0.000000 -.447214 .894427	-.250000 -1.400000 .300000
	11	0.000000 -1.600000 .200000	0.000000 -2.000000 0.000000	-.500000 -1.972000 0.000000	-.500000 -1.600000 .200000	-.012880 -.460010 .867820	-.247831 -1.793015 .100024
	12	0.000000 -2.000000 0.000000	0.000000 -1.870000 -.354600	-.500000 -1.850000 -.341500	-.500000 -1.972000 0.000000	-.049532 -.939127 -.339980	-.248068 -1.923092 -.174052
	13	0.000000 -1.870000 -.354600	0.000000 -1.600000 -.600000	-.500000 -1.585000 -.586600	-.500000 -1.850000 -.341500	-.043145 -.675158 -.736411	-.249477 -1.726269 -.470688
	14	0.000000 -1.600000 -.600000	0.000000 -1.200000 -.800000	-.500000 -1.195000 -.784400	-.500000 -1.585000 -.586600	-.034875 -.449471 -.892614	-.249169 -1.395016 -.692774
	15	0.000000 -1.200000 -.800000	0.000000 -.800000 -.916500	-.500000 -.800000 -.901200	-.500000 -1.195000 -.784400	-.031043 -.281449 -.959074	-.249537 -.998756 -.850538

NX NY NZ	NPX NPY NPZ	D T A
-.031043 .281449 .959074	-.249537 .998756 .850538	.4237E-03 .6507E+00 .2072E+00
-.029218 .157442 .987096	-.250016 .600001 .940749	.2468E-03 .6451E+00 .2026E+00
-.028252 .050789 .998310	-.250002 .200000 .982825	.7487E-04 .6412E+00 .2003E+00
-.012608 .434526 .900571	-.249496 .199997 .896509	.3152E-02 .6708E+00 .2221E+00
0.000000 .447214 .894427	-.250000 .600000 .700000	.3553E-14 .6708E+00 .2236E+00
0.000000 .447214 .894427	-.250000 -1.000000 .500000	.3553E-14 .6708E+00 .2236E+00
0.000000 .447214 .894427	-.250000 -1.400000 .300000	.6661E-14 .6708E+00 .2236E+00
-.012880 .460010 .867820	-.247831 -1.793015 .100024	.3220E-02 .6708E+00 .2174E+00
-.049532 .939127 .339980	-.248068 -1.923092 .174052	.7648E-03 .6238E+00 .1853E+00
-.043145 .675158 .736411	-.249477 -1.726269 .470688	.7887E-03 .6205E+00 .1816E+00
-.034875 .449471 .892614	-.249169 -1.395016 .692774	.6327E-03 .6693E+00 .2213E+00
-.031043 .281449 .959074	-.249537 .998756 .850538	.4237E-03 .6507E+00 .2072E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ		
10	4	16	0.000000 -0.800000 -0.916500	0.000000 -0.400000 -0.979800	-0.500000 -0.400000 -0.965500	-0.500000 -0.800000 -0.901200	-0.029218 -0.157442 -0.987096	-0.250016 -0.600001 -0.940749
	17	0.000000 -0.400000 -0.979800	0.000000 0.000000 -1.000000	-0.500000 0.000000 -0.986000	-0.500000 -0.400000 -0.965500	-0.028252 -0.050789 -0.998310	-0.250002 -0.200000 -0.982825	
	18	0.000000 0.000000 -1.000000	0.000000 0.400000 -0.979800	-0.500000 -0.400000 -0.965500	-0.500000 0.000000 -0.986000	-0.028252 0.050789 -0.998310	-0.250002 0.200000 -0.982825	
	19	0.000000 0.400000 -0.979800	0.000000 0.800000 -0.916500	-0.500000 0.800000 -0.901200	-0.500000 0.400000 -0.965500	-0.029218 0.157442 -0.987096	-0.250016 0.600001 -0.940749	
	20	0.000000 0.800000 -0.916500	0.000000 1.200000 -0.800000	-0.500000 1.195000 -0.784400	-0.500000 0.800000 -0.901200	-0.031043 0.281449 -0.959074	-0.249537 0.998756 -0.850538	
	21	0.000000 1.200000 -0.800000	0.000000 1.600000 -0.600000	-0.500000 1.585000 -0.586600	-0.500000 1.195000 -0.784400	-0.034875 0.449471 -0.892614	-0.249169 1.395016 -0.692774	
	22	0.000000 1.600000 -0.600000	0.000000 1.870000 -0.354600	-0.500000 1.850000 -0.341500	-0.500000 1.585000 -0.586600	-0.043145 0.675158 -0.736411	-0.249477 1.726269 -0.470608	
	23	0.000000 1.870000 -0.354600	0.000000 2.000000 0.000000	-0.500000 1.972000 0.000000	-0.500000 1.850000 -0.341500	-0.049532 0.939127 -0.339980	-0.248068 1.923092 -0.174052	
	5	1	-0.500000 1.972000 0.000000	-0.500000 1.850000 0.341500	-1.000000 1.785000 0.303900	-1.000000 1.885600 0.000000	-0.153543 0.934141 0.322188	-0.743334 1.874150 0.161626
	2	-0.500000 1.850000 0.341500	-0.500000 1.585000 0.586600	-1.000000 1.540000 0.544000	-1.000000 1.785000 0.303900	-0.132740 0.683173 0.718091	-0.747309 1.690281 0.444215	
	3	-0.500000 1.585000 0.586600	-0.500000 1.195000 0.784400	-1.000000 1.175000 0.737400	-1.000000 1.540000 0.544000	-0.108809 0.457325 0.882618	-0.747752 1.373892 0.663304	
	4	-0.500000 1.195000 0.784400	-0.500000 0.800000 0.901200	-1.000000 0.800000 0.853800	-1.000000 1.175000 0.737400	-0.095703 0.288525 0.952677	-0.747958 0.992572 0.819383	

X Y Z	NX NY NZ	NPX NPY NPZ	D T A
500000	-.029218	-.250016	.2468E-03
800000	-.157442	-.600001	.6451E+00
901200	-.987096	-.940749	.2026E+00
500000	-.028252	-.250002	.7487E-04
400000	-.050789	-.200000	.6412E+00
965500	-.998310	-.982825	.2003E+00
500000	-.028252	-.250002	.7487E-04
000000	.050789	.200000	.6412E+00
986000	-.998310	-.982825	.2003E+00
500000	-.029218	-.250016	.2468E-03
400000	.157442	.600001	.6451E+00
965500	-.987096	-.940749	.2026E+00
500000	-.031043	-.249537	.4237E-03
800000	.281449	.998756	.6507E+00
901200	-.959074	-.850538	.2072E+00
500000	-.034875	-.249169	.6327E-03
195000	.449471	1.395016	.6693E+00
784400	-.892614	-.692774	.2213E+00
500000	-.043145	-.249477	.7887E-03
585000	.675158	1.726269	.6205E+00
586600	-.736411	-.470608	.1816E+00
500000	-.049532	-.248068	.7648E-03
850000	.939127	1.923092	.6238E+00
341500	-.339980	-.174052	.1853E+00
000000	-.153543	-.743334	.1969E-02
885600	.934141	1.874150	.6143E+00
000000	.322188	.161626	.1727E+00
000000	-.132740	-.747309	.2518E-02
785000	.683173	1.690281	.6222E+00
303900	.718091	.444215	.1776E+00
000000	-.108809	-.747752	.1887E-02
540000	.457325	1.373892	.6640E+00
544000	.882618	.663304	.2139E+00
000000	-.095703	-.747958	.1347E-02
175000	.288525	.992572	.6461E+00
737400	.952677	.819383	.2021E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY			NX	NPX	
		X Y Z	X Y Z	X Y Z			
5	5	-0.500000	-0.500000	-1.000000	-1.000000	-0.089915	-0.7500
		.800000	.400000	.400000	.800000	.162020	.6000
		.901200	.965500	.921400	.853800	.982682	.9104
6	6	-0.500000	-0.500000	-1.000000	-1.000000	-0.086851	-0.7500
		.400000	0.000000	0.000000	.400000	.052106	.2000
		.965500	.986000	.942800	.921400	.994858	.9539
7	7	-0.500000	-0.500000	-1.000000	-1.000000	-0.039925	-0.7485
		0.000000	-0.400000	-0.400000	0.000000	-.379842	-.1999
		.986000	.800000	.800000	.942800	.924189	.8822
8	8	-0.500000	-0.500000	-1.000000	-1.000000	0.000000	-0.7500
		-.400000	-.800000	-.800000	-.400000	-.447214	-.6000
		.800000	.600000	.600000	.800000	.894427	.7000
9	9	-0.500000	-0.500000	-1.000000	-1.000000	0.000000	-0.7500
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.0000
		.600000	.400000	.400000	.600000	.894427	.5000
10	10	-0.500000	-0.500000	-1.000000	-1.000000	0.000000	-0.7500
		-1.200000	-1.600000	-1.600000	-1.200000	-.447214	-1.4000
		.400000	.200000	.200000	.400000	.894427	.3000
11	11	-0.500000	-0.500000	-1.000000	-1.000000	-0.044855	-0.7413
		-1.600000	-1.972000	-1.885600	-1.600000	-.519160	-1.7647
		.200000	0.000000	0.000000	.200000	.853499	.1002
12	12	-0.500000	-0.500000	-1.000000	-1.000000	-0.153543	-0.7433
		-1.972000	-1.850000	-1.785000	-1.885600	-.934141	-1.8741
		0.000000	-.341500	-.303900	0.000000	-.322188	-.1616
13	13	-0.500000	-0.500000	-1.000000	-1.000000	-0.132740	-0.7473
		-1.850000	-1.585000	-1.540000	-1.785000	-.683173	-1.6902
		-.341500	-.586600	-.544000	-.303900	-.718091	-.4442
14	14	-0.500000	-0.500000	-1.000000	-1.000000	-0.108809	-0.7477
		-1.585000	-1.195000	-1.175000	-1.540000	-.457325	-1.3738
		-.586600	-.784400	-.737400	-.544000	-.682618	-.6633
15	15	-0.500000	-0.500000	-1.000000	-1.000000	-0.095703	-0.7479
		-1.195000	-.800000	-.800000	-1.175000	-.288525	-.9925
		-.784400	-.901200	-.853800	-.737400	-.952677	-.8193
16	16	-0.500000	-0.500000	-1.000000	-1.000000	-0.089915	-0.7500
		-.800000	-.400000	-.400000	-.800000	-.162020	-.6000
		-.901200	-.965500	-.921400	-.853800	-.982682	-.9104

X	NX	NPX	D
Y	NY	NPY	T
Z	NZ	NPZ	A
000000	-.089915	-.750055	.8107E-03
800000	.162020	.600009	.6500E+00
853800	.982682	.910468	.2035E+00
000000	-.086851	-.750005	.2238E-03
400000	.052106	.200003	.6436E+00
921400	.994858	.953924	.2010E+00
000000	-.039925	-.748551	.9981E-02
000000	-.379842	-.199961	.6688E+00
942800	.924189	.882279	.2164E+00
000000	0.000000	-.750000	.3553E-14
400000	-.447214	-.600000	.6708E+00
800000	.894427	.700000	.2236E+00
000000	0.000000	-.750000	.3553E-14
800000	-.447214	-1.000000	.6708E+00
600000	.894427	.500000	.2236E+00
000000	0.000000	-.750000	.6681E-14
200000	-.447214	-1.400000	.6708E+00
400000	.894427	.300000	.2236E+00
000000	-.044855	-.741375	.1121E-01
600000	-.519160	-1.764760	.6545E+00
200000	.853499	.100234	.1926E+00
000000	-.153543	-.743334	.1969E-02
885600	-.934141	-1.874150	.6143E+00
000000	-.322188	-.161626	.1727E+00
000000	-.132740	-.747389	.2518E-02
785000	-.683173	-1.690281	.6222E+00
303900	-.718091	-.444215	.1776E+00
000000	-.108809	-.747752	.1887E-02
540000	-.457325	-1.373892	.6640E+00
544000	-.882618	-.663304	.2139E+00
000000	-.095703	-.747958	.1347E-02
175000	-.288525	-.992572	.6461E+00
737400	-.952677	-.819383	.2021E+00
000000	-.089915	-.750055	.8107E-03
800000	.162020	.600009	.6500E+00
853800	.982682	.910468	.2035E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			TEST BODY		
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ		
5	17	-.500000	-.500000	-1.000000	-1.000000	-.086851	-.750005			
		-.400000	0.000000	0.000000	-.400000	-.052106	-.200003			
		-.965500	-.986000	-.942800	-.921400	-.994858	-.953924			
18	18	-.500000	-.500000	-1.000000	-1.000000	-.086851	-.750005			
		0.000000	.400000	.400000	0.000000	.052106	.200003			
		-.986000	-.965500	-.921400	-.942800	-.994858	-.953924			
19	19	-.500000	-.500000	-1.000000	-1.000000	-.089915	-.750055			
		.400000	.800000	.800000	.400000	.162020	.600009			
		-.965500	-.901200	-.853800	-.921400	-.982682	-.910468			
20	20	-.500000	-.500000	-1.000000	-1.000000	-.095703	-.747958			
		.800000	1.195000	1.175000	.800000	.288525	.992572			
		-.901200	-.784400	-.737400	-.853800	-.952677	-.819383			
21	21	-.500000	-.500000	-1.000000	-1.000000	-.108809	-.747752			
		1.195000	1.585000	1.540000	1.175000	.457325	1.373892			
		-.784400	-.586600	-.544000	-.737400	-.882618	-.663304			
22	22	-.500000	-.500000	-1.000000	-1.000000	-.132740	-.747389			
		1.585000	1.850000	1.785000	1.540000	.683173	1.690281			
		-.586600	-.341500	-.303900	-.544000	-.718091	-.444215			
23	23	-.500000	-.500000	-1.000000	-1.000000	-.153543	-.743334			
		1.850000	1.972000	1.885600	1.785000	.934141	1.874150			
		-.341500	0.000000	0.000000	-.303900	-.322188	-.161626			
6	1	-1.000000	-1.000000	-1.500000	-1.500000	-.268347	-1.229655			
		1.885600	1.785000	1.670000	1.732000	.921489	1.773614			
		0.000000	.363900	.229700	0.000000	.280799	.134912			
2	2	-1.000000	-1.000000	-1.500000	-1.500000	-.239065	-1.245329			
		1.785000	1.540000	1.460000	1.670000	.702123	1.614691			
		.303900	.544000	.465900	.229700	.670724	.386555			
3	3	-1.000000	-1.000000	-1.500000	-1.500000	-.194936	-1.245068			
		1.540000	1.175000	1.140000	1.460000	.475316	1.329324			
		.544000	.737400	.652000	.465900	.857948	.600627			
4	4	-1.000000	-1.000000	-1.500000	-1.500000	-.170981	-1.245783			
		1.175000	.800000	.800000	1.140000	.304683	.979004			
		.737400	.853800	.768100	.652000	.936981	.753512			
5	5	-1.000000	-1.000000	-1.500000	-1.500000	-.159881	-1.250120			
		.800000	.400000	.400000	.800000	.172638	.600034			
		.853800	.921400	.842600	.768100	.971923	.846449			

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IDY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-1.000000 0.000000 -.942800	-1.000000 -.400000 -.921400	-.086851 -.052106 -.994858	-.750005 -.200003 -.953924	.2238E-03 .6436E+00 .2010E+00
-1.000000 .400000 -.921400	-1.000000 0.000000 -.942800	-.086851 .052106 -.994858	-.750005 .200003 -.953924	.2238E-03 .6436E+00 .2010E+00
-1.000000 .800000 -.853800	-1.000000 .400000 -.921400	-.089915 .162020 -.982682	-.750055 .600009 -.910468	.8107E-03 .6500E+00 .2035E+00
-1.000000 1.175000 -.737400	-1.000000 .800000 -.853800	-.095703 .288525 -.952677	-.747958 .992572 -.819383	.1347E-02 .6461E+00 .2021E+00
-1.000000 1.540000 -.544000	-1.000000 1.175000 -.737400	-.108809 .457325 -.882618	-.747752 1.373892 -.663364	.1887E-02 .6640E+00 .2139E+00
-1.000000 1.785000 -.303900	-1.000000 1.540000 -.544000	-.132740 .683173 -.718091	-.747389 1.690281 -.444215	.2518E-02 .6222E+00 .1776E+00
-1.000000 1.885600 0.000000	-1.000000 1.785000 -.303900	-.153543 .934141 -.322188	-.743334 1.874150 -.161626	.1969E-02 .6143E+00 .1727E+00
-1.500000 1.670000 .229700	-1.500000 1.732000 0.000000	-.268347 .921489 .280799	-1.229655 1.773614 .134912	.3684E-02 .5910E+00 .1448E+00
-1.500000 1.460000 .465900	-1.500000 1.670000 .229700	-.239065 .702123 .670724	-1.245329 1.614691 .386555	.5490E-02 .6180E+00 .1696E+00
-1.500000 1.140000 .652000	-1.500000 1.460000 .465900	-.194936 .475316 .857948	-1.245068 1.329324 .600627	.3782E-02 .6494E+00 .1996E+00
-1.500000 .800000 .768100	-1.500000 1.140000 .652000	-.170981 .304683 .936981	-1.245783 .979004 .753512	.2596E-02 .6374E+00 .1908E+00
-1.500000 .400000 .842600	-1.500000 .800000 .768100	-.159881 .172638 .971923	-1.250120 .600034 .846449	.1677E-02 .6584E+00 .2058E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			NX	NPX	
		X Y Z	X Y Z	X Y Z			NY NZ	NPY NPZ
6	6	-1.000000 .400000 .921400	-1.000000 0.000000 .942800	-1.500000 0.000000 .866000	-1.500000 .400000 .842600	-.153515 -.055250 .986601	-1.250012 .200010 .893198
	7	-1.000000 0.000000 .942800	-1.000000 -.400000 .800000	-1.500000 -.400000 .800000	-1.500000 0.000000 .866000	-.074106 -.251846 .964926	-1.248100 -.199835 .852389
	8	-1.000000 -.400000 .800000	-1.000000 -.800000 .600000	-1.500000 -.800000 .600000	-1.500000 -.400000 .800000	0.000000 -.447214 .894427	-1.250000 -.600000 .700000
	9	-1.000000 -.800000 .600000	-1.000000 -1.200000 .400000	-1.500000 -1.200000 .400000	-1.500000 -.600000 .600000	0.000000 -.447214 .894427	-1.250000 -1.000000 .500000
	10	-1.000000 -1.200000 .400000	-1.000000 -1.600000 .200000	-1.500000 -1.600000 .200000	-1.500000 -1.200000 .400000	0.000000 -.447214 .894427	-1.250000 -1.400000 .300000
	11	-1.000000 -1.600000 .200000	-1.000000 -1.885600 0.000000	-1.500000 -1.732000 0.000000	-1.500000 -1.600000 .200000	-.105654 -.687853 .718119	-1.225923 -1.707445 .100626
	12	-1.000000 -1.885600 0.000000	-1.000000 -1.785000 -.303900	-1.500000 -1.670000 -.229700	-1.500000 -1.732000 0.000000	-.268347 -.921489 -.280799	-1.229655 -1.773614 -.134912
	13	-1.000000 -1.785000 -.303900	-1.000000 -1.540000 -.544000	-1.500000 -1.460000 -.465900	-1.500000 -1.670000 -.229700	-.239065 -.702123 -.676724	-1.245329 -1.614691 -.386555
	14	-1.000000 -1.540000 -.544000	-1.000000 -1.175000 -.737400	-1.500000 -1.140000 -.652000	-1.500000 -1.460000 -.465900	-.194936 -.475316 -.857948	-1.245068 -1.329324 -.600627
	15	-1.000000 -1.175000 -.737400	-1.000000 -.800000 -.853800	-1.500000 -.800000 -.768100	-1.500000 -1.140000 -.652000	-.170981 -.304683 -.936981	-1.245783 -.979004 -.753512
	16	-1.000000 -.800000 -.853800	-1.000000 -.400000 -.921400	-1.500000 -.400000 -.842600	-1.500000 -.800000 -.768100	-.159881 -.172638 -.971923	-1.250120 -.600034 -.846449
	17	-1.000000 -.400000 -.921400	-1.000000 0.000000 -.942800	-1.500000 0.000000 -.866000	-1.500000 -.400000 -.842600	-.153515 -.055250 -.986601	-1.250012 -.200010 -.893198

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ST BODY

	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
00	-1.500000	-1.500000	-.153515	-1.250012	.4933E-03
00	0.000000	.400000	.055250	.200010	.6481E+00
00	.866000	.842600	.986601	.893198	.2027E+00
00	-1.500000	-1.500000	-.074106	-1.248100	.1853E-01
00	-.400000	0.000000	-.251846	-.199835	.6560E+00
00	.800000	.866000	.964926	.852389	.2073E+00
00	-1.500000	-1.500000	0.000000	-1.250000	.3553E-14
00	-.800000	-.400000	-.447214	-.600000	.6708E+00
00	.600000	.800000	.894427	.700000	.2236E+00
00	-1.500000	-1.500000	0.000000	-1.250000	.3553E-14
00	-1.200000	-.800000	-.447214	-1.000000	.6708E+00
00	.400000	.600000	.894427	.500000	.2236E+00
00	-1.500000	-1.500000	0.000000	-1.250000	.6661E-14
00	-1.600000	-1.200000	-.447214	-1.400000	.6708E+00
00	.200000	.400000	.894427	.300000	.2236E+00
00	-1.500000	-1.500000	-.105854	-1.225923	.2641E-01
00	-1.732000	-1.600000	-.687853	-1.707445	.6096E+00
00	0.000000	.200000	.718119	.100626	.1454E+00
00	-1.500000	-1.500000	-.268347	-1.229655	.3684E-02
00	-1.670000	-1.732000	-.921489	-1.773614	.5910E+00
00	-.229700	0.000000	-.260799	-.134912	.1448E+00
00	-1.500000	-1.500000	-.239065	-1.245329	.5490E-02
00	-1.460000	-1.670000	-.702123	-1.614691	.6180E+00
00	-.465900	-.229700	-.670724	-.386555	.1696E+00
00	-1.500000	-1.500000	-.194936	-1.245068	.3782E-02
00	-1.140000	-1.460000	-.475316	-1.329324	.6494E+00
00	-.652000	-.465900	-.857948	-.600627	.1996E+00
00	-1.500000	-1.500000	-.170981	-1.245783	.2596E-02
00	-.800000	-1.140000	-.304683	-.979004	.6374E+00
00	-.768100	-.652000	-.936981	-.753512	.1908E+00
00	-1.500000	-1.500000	-.159881	-1.250120	.1677E-02
00	-.400000	-.800000	-.172638	-.600034	.6584E+00
00	-.842600	-.768100	-.971923	-.846449	.2058E+00
00	-1.500000	-1.500000	-.153515	-1.250012	.4933E-03
00	0.000000	-.400000	-.055250	-.200010	.6481E+00
00	-.866000	-.842600	-.986601	-.893198	.2027E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
6	18	-1.000000	-1.000000	-1.500000	-1.500000	-.153515	-1.250012		
		0.000000	.400000	.400000	.400000	.055250	.200010		
		-.942800	-.921400	-.842600	-.866000	-.986601	-.893198		
19	19	-1.000000	-1.000000	-1.500000	-1.500000	-.159881	-1.250120		
		.400000	.800000	.800000	.400000	.172638	.600034		
		-.921400	-.853800	-.768100	-.842600	-.971923	-.846449		
20	20	-1.000000	-1.000000	-1.500000	-1.500000	-.170981	-1.245783		
		.800000	1.175000	1.140000	.800000	.304683	.979004		
		-.853800	-.737400	-.652000	-.768100	-.936981	-.753512		
21	21	-1.000000	-1.000000	-1.500000	-1.500000	-.194936	-1.245068		
		1.175000	1.540000	1.460000	1.140000	.475316	1.329324		
		-.737400	-.544000	-.465900	-.652000	-.857948	-.600627		
22	22	-1.000000	-1.000000	-1.500000	-1.500000	-.239065	-1.245329		
		1.540000	1.785000	1.670000	1.460000	.702123	1.614691		
		-.544000	-.303900	-.229700	-.465900	-.670724	-.386555		
23	23	-1.000000	-1.000000	-1.500000	-1.500000	-.268347	-1.229655		
		1.785000	1.885600	1.732000	1.670000	.921489	1.773614		
		-.303900	0.000000	0.000000	-.229700	-.280799	-.134912		
7	1	-1.500000	-1.500000	-2.000000	-2.000000	-.414479	-1.699678		
		1.732000	1.670000	1.465000	1.490700	.885202	1.611865		
		0.000000	.229700	.137800	0.000000	.211244	.096576		
2	2	-1.500000	-1.500000	-2.000000	-2.000000	-.372374	-1.733772		
		1.670000	1.460000	1.322000	1.465000	.725701	1.484752		
		.229700	.465900	.344400	.137800	.578529	.297994		
3	3	-1.500000	-1.500000	-2.000000	-2.000000	-.310024	-1.738932		
		1.460000	1.140000	1.072000	1.322000	.507279	1.250730		
		.465900	.652000	.517900	.344400	.804085	.497910		
4	4	-1.500000	-1.500000	-2.000000	-2.000000	-.269527	-1.738266		
		1.140000	.800000	.800000	1.072000	.335023	.954054		
		.652000	.768100	.628900	.517900	.902637	.644837		
5	5	-1.500000	-1.500000	-2.000000	-2.000000	-.250229	-1.750276		
		.800000	.400000	.400000	.800000	.193980	.600104		
		.768100	.842600	.718000	.628900	.948555	.739306		
6	6	-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.750025		
		.400000	0.000000	0.000000	.400000	.061556	.200030		
		.842600	.866000	.745400	.718000	.969388	.792992		

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TEST BODY

	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	O T A
0000	-1.500000	-1.500000	-.153515	-1.250012	.4933E-03
0000	.400000	.400000	.055250	.200010	.6481E+00
1400	-.842600	-.866000	-.986601	-.893198	.2027E+00
0000	-1.500000	-1.500000	-.159881	-1.250120	.1677E-02
0000	.800000	.400000	.172638	.600034	.6584E+00
3800	-.768100	-.842600	-.971923	-.846449	.2056E+00
0000	-1.500000	-1.500000	-.170981	-1.245783	.2596E-02
5000	1.140000	.800000	.304683	.979004	.6374E+00
7400	-.652000	-.768100	-.936981	-.753512	.1908E+00
0000	-1.500000	-1.500000	-.194936	-1.245068	.3782E-02
0000	1.460000	1.140000	.475316	1.329324	.6494E+00
4000	-.465900	-.652000	-.857948	-.600627	.1996E+00
0000	-1.500000	-1.500000	-.239065	-1.245329	.5490E-02
5000	1.670000	1.460000	.702123	1.614691	.6180E+00
8900	-.229700	-.465900	-.670724	-.386555	.1696E+00
0000	-1.500000	-1.500000	-.268347	-1.229655	.3684E-02
5600	1.732000	1.670000	.921489	1.773614	.5910E+00
0000	0.000000	-.229700	-.280799	-.134912	.1448E+00
0000	-2.000000	-2.000000	-.414479	-1.699678	.3180E-02
0000	1.465000	1.490700	.885202	1.611865	.5833E+00
0700	.137800	0.000000	.211244	.096576	.1038E+00
0000	-2.000000	-2.000000	-.372374	-1.733772	.7874E-02
0000	1.322000	1.465000	.725701	1.434752	.6199E+00
9000	.344400	.137800	.578529	.297994	.1525E+00
0000	-2.000000	-2.000000	-.310024	-1.738932	.6345E-02
0000	1.072000	1.322000	.507279	1.250730	.6350E+00
0000	.517900	.344400	.804085	.497910	.1772E+00
0000	-2.000000	-2.000000	-.269527	-1.738266	.4544E-02
0000	.800000	1.072000	.335023	.954054	.6218E+00
1000	.628900	.517900	.902837	.644837	.1695E+00
0000	-2.000000	-2.000000	-.250229	-1.750276	.3482E-02
0000	.400000	.800000	.193980	.600104	.6750E+00
6000	.718000	.628900	.948555	.739306	.2108E+00
0000	-2.000000	-2.000000	-.237694	-1.750025	.9694E-03
0000	0.000000	.400000	.061556	.200030	.6572E+00
0000	.745400	.718000	.969388	.792992	.2063E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY			NX	NPX	
		X Y Z	X Y Z	X Y Z			NY NZ	NPY NPZ
7	7	-1.500000	-1.500000	-2.000000	-2.000000	-.197278	-1.7495
		0.000000	-.400000	-.400000	0.000000	-.113683	-.1997
		.866000	.800000	.718000	.745400	.973734	.7824
8	8	-1.500000	-1.500000	-2.000000	-2.000000	-.075980	-1.7473
		-.400000	-.800000	-.800000	-.400000	-.368319	-.5998
		.800000	.600000	.600000	.718000	.926589	.6797
9	9	-1.500000	-1.500000	-2.000000	-2.000000	0.000000	-1.7500
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.0000
		.600000	.400000	.400000	.600000	.894427	.5000
10	10	-1.500000	-1.500000	-2.000000	-2.000000	-.050829	-1.7204
		-1.200000	-1.600000	-1.400000	-1.200000	-.496741	-1.3528
		.400000	.200000	.256000	.400000	.866409	.3141
11	11	-1.500000	-1.500000	-2.000000	-2.000000	-.348626	-1.7625
		-1.600000	-1.732000	-1.498700	-1.400000	-.842191	-1.5505
		.200000	0.000000	0.000000	.256000	.411307	.1139
15	12	-1.500000	-1.500000	-2.000000	-2.000000	-.414479	-1.6996
		-1.732000	-1.670000	-1.465000	-1.498700	-.885202	-1.6118
		0.000000	-.229700	-.137800	0.000000	-.211244	-.0965
13	13	-1.500000	-1.500000	-2.000000	-2.000000	-.372374	-1.7337
		-1.670000	-1.460000	-1.322000	-1.465000	-.725701	-1.4847
		-.229700	-.465900	-.344400	-.137800	-.578529	-.2979
14	14	-1.500000	-1.500000	-2.000000	-2.000000	-.310024	-1.7389
		-1.460000	-1.140000	-1.072000	-1.322000	-.507279	-1.2507
		-.465900	-.652000	-.517900	-.344400	-.804085	-.4979
15	15	-1.500000	-1.500000	-2.000000	-2.000000	-.269527	-1.7382
		-1.140000	-.800000	-.800000	-1.072000	-.335023	-.9540
		-.652000	-.768100	-.628900	-.517900	-.902837	-.6448
16	16	-1.500000	-1.500000	-2.000000	-2.000000	-.250229	-1.7502
		-.800000	-.400000	-.400000	-.800000	-.193980	-.6001
		-.768100	-.842600	-.718000	-.628900	-.948555	-.7393
17	17	-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.7500
		-.400000	0.000000	0.000000	-.400000	-.061556	-.2000
		-.842600	-.866000	-.745400	-.718000	-.969388	-.7929
18	18	-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.7500
		0.000000	.400000	.400000	0.000000	.061556	.2000
		-.866000	-.842600	-.718000	-.745400	-.969388	-.7929

	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
00000	-2.000000	-.197278	-1.749550	.9397E-02
00000	0.000000	-.113683	-.199759	.6572E+00
18000	.745400	.973734	.782469	.2054E+00
00000	-2.000000	-.075980	-1.747311	.1900E-01
00000	-.400000	-.368319	-.599857	.6708E+00
00000	.718000	.926589	.679777	.2158E+00
00000	-2.000000	0.000000	-1.750000	.3553E-14
00000	-.800000	-.447214	-1.000000	.6708E+00
00000	.600000	.894427	.500000	.2236E+00
00000	-2.000000	-.050829	-1.720409	.1271E-01
00000	-1.200000	-.496741	-1.352829	.6708E+00
56000	.400000	.866409	.314114	.1731E+00
00000	-2.000000	-.348626	-1.762537	.1445E-01
00700	-1.400000	-.842191	-1.550513	.6525E+00
00000	.256000	.411307	.113943	.1354E+00
00000	-2.000000	-.414479	-1.699678	.3180E-02
55000	-1.490700	-.885202	-1.611865	.5833E+00
07800	0.000000	-.211244	-.096576	.1038E+00
00000	-2.000000	-.372374	-1.733772	.7874E-02
2000	-1.465000	-.725701	-1.484752	.6199E+00
4400	-.137800	-.578529	-.297994	.1525E+00
0000	-2.000000	-.310024	-1.738932	.6345E-02
2000	-1.322000	-.507279	-1.250730	.6350E+00
7900	-.344400	-.804085	-.497910	.1772E+00
0000	-2.000000	-.269527	-1.738266	.4544E-02
0000	-1.072000	-.335023	-.954054	.6218E+00
8900	-.517900	-.902837	-.644837	.1695E+00
0000	-2.000000	-.250229	-1.750276	.3462E-02
0000	-.800000	-.193980	-.600104	.6750E+00
8000	-.628900	-.948555	-.739306	.2108E+00
0000	-2.000000	-.237694	-1.750025	.9694E-03
0000	-.400000	-.061556	-.200030	.6572E+00
5400	-.718000	-.969388	-.792992	.2063E+00
0000	-2.000000	-.237694	-1.750025	.9694E-03
0000	0.000000	.061556	.200030	.6572E+00
0000	-.745400	-.969388	-.792992	.2063E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NP NP NP
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
7	19	-1.500000	-1.500000	-2.000000	-2.000000	-.250229	-1.75 .60 -.73		
		.400000	.800000	.800000	.400000	.193980			
		-.842600	-.768100	-.628900	-.718000	-.948555			
20	20	-1.500000	-1.500000	-2.000000	-2.000000	-.269527	-1.73 .95 -.64		
		.800000	1.140000	1.072000	.800000	.335023			
		-.768100	-.652000	-.517900	-.628900	-.902837			
21	21	-1.500000	-1.500000	-2.000000	-2.000000	-.310024	-1.73 1.25 -.49		
		1.140000	1.460000	1.322000	1.072000	.507279			
		-.652000	-.465900	-.344400	-.517900	-.804085			
22	22	-1.500000	-1.500000	-2.000000	-2.000000	-.372374	-1.73 1.48 -.29		
		1.460000	1.670000	1.465900	1.322000	.725701			
		-.465900	-.229700	-.137800	-.344400	-.578529			
23	23	-1.500000	-1.500000	-2.000000	-2.000000	-.414479	-1.69 1.61 -.03		
		1.670000	1.732000	1.490700	1.465000	.885202			
		-.229700	0.000000	0.000000	-.137800	-.211244			

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8	1	-2.000000	-2.000000	-2.500000	-2.500000	-.597981	-2.21 1.24 .14
		1.490700	1.322000	1.000000	1.055000	.747834	
		0.000000	.344400	.235700	0.000000	.288382	
2	2	-2.000000	-2.000000	-2.500000	-2.500000	-.425912	-2.21 .99 .41
		1.322000	.800000	.800000	1.000000	.463200	
		.344400	.628900	.381500	.235700	.777203	
3	3	-2.000000	-2.000000	-2.500000	-2.500000	-.397801	-2.25 .60 .56
		.800000	.400000	.400000	.800000	.246251	
		.628900	.718000	.515300	.381500	.883807	
4	4	-2.000000	-2.000000	-2.500000	-2.500000	-.366809	-2.25 .20 .63
		.400000	0.000000	0.000000	.400000	.075569	
		.718000	.745700	.552800	.515300	.927222	
5	5	-2.000000	-2.000000	-2.500000	-2.500000	-.366809	-2.25 -.20 .63
		0.000000	-.400000	-.400000	0.000000	-.075569	
		.745700	.718000	.515300	.552800	.927222	
6	6	-2.000000	-2.000000	-2.500000	-2.500000	-.372805	-2.25 -.60 .55
		-.400000	-.800000	-.800000	-.400000	-.278586	
		.718000	.600000	.381500	.515300	.885102	

FOLDOUT FROM

TEST BODY

X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
.500000	-2.000000	-2.000000	-.250229	-1.750276	.34E2E-02
.800000	.800000	.400000	.193980	.600104	.6750E+00
.768100	-.628900	-.718000	-.948555	-.739306	.2108E+00
.500000	-2.000000	-2.000000	-.269527	-1.738266	.4544E-02
.140000	1.072000	.800000	.335023	.954054	.6218E+00
.652000	-.517900	-.628900	-.902837	-.644837	.1695E+00
.500000	-2.000000	-2.000000	-.310024	-1.738932	.6345E-02
.460000	1.322000	1.072000	.507279	1.250730	.6350E+00
.465900	-.344400	-.517900	-.804085	-.497910	.1772E+00
.500000	-2.000000	-2.000000	-.372374	-1.733772	.7874E-02
.670000	1.465000	1.322000	.725701	1.464752	.6199E+00
.229700	-.137800	-.344400	-.578529	-.297994	.1525E+00
.500000	-2.000000	-2.000000	-.414479	-1.699678	.3180E-02
.732000	1.490700	1.465000	.885202	1.611865	.5833E+00
.000000	0.000000	-.137800	-.211244	-.096576	.1038E+00
***		*****		*****	
.000000	-2.500000	-2.500000	-.597981	-2.218024	.1342E-01
.322000	1.000000	1.005000	.747834	1.240723	.7391E+00
.344400	.235700	0.000000	.268382	.149617	.1939E+00
.000000	-2.500000	-2.500000	-.425912	-2.214445	.1034E-01
.800000	.800000	1.000000	.463200	.990269	.7238E+00
.628900	.381500	.235700	.777203	.411287	.2322E+00
.000000	-2.500000	-2.500000	-.397801	-2.250969	.9877E-02
.400000	.400000	.800000	.246251	.600392	.7233E+00
.718000	.515300	.381500	.883807	.560379	.22E3E+00
.000000	-2.500000	-2.500000	-.366809	-2.250072	.2272E-02
.000000	0.000000	.400000	.075569	.200101	.6805E+00
.745700	.552800	.515300	.927222	.632913	.2157E+00
.000000	-2.500000	-2.500000	-.366809	-2.250072	.2272E-02
.400000	-.400000	0.000000	-.075569	-.200101	.6805E+00
.718000	.515300	.552800	.927222	.632913	.2157E+00
.000000	-2.500000	-2.500000	-.372805	-2.250383	.3496E-02
.000000	-.800000	-.400000	-.278586	-.600126	.7233E+00
.600000	.381500	.515300	.885102	.553499	.2260E+00

NO OUT FRM. 2

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
8	7	-2.000000 -.800000 .600000	-2.000000 -1.200000 .400000	-2.500000 -1.000000 .235700	-2.500000 -.800000 .381500	-.396212 -.458473 .795499	-2.218355 -.956945 .416059
	8	-2.000000 -1.200000 .400000	-2.000000 -1.490700 0.000000	-2.500000 -1.055000 0.000000	-2.500000 -1.000000 .235700	-.537231 -.740960 .402941	-2.212088 -1.209729 .166619
	9	-2.000000 -1.490700 0.000000	-2.000000 -1.322000 -.344400	-2.500000 -1.000000 -.235700	-2.500000 -1.055000 0.000000	-.597981 -.747834 -.288382	-2.218024 -1.240723 -.149617
	10	-2.000000 -1.322000 -.344400	-2.000000 -.800000 -.628900	-2.500000 -.800000 -.381500	-2.500000 -1.000000 -.235700	-.425912 -.463200 -.777203	-2.214445 -.990269 -.411287
	11	-2.000000 -.800000 -.628900	-2.000000 -.400000 -.718000	-2.500000 -.400000 -.515300	-2.500000 -.800000 -.381500	-.397801 -.246251 -.883807	-2.250969 -.600392 -.560379
	12	-2.000000 -.400000 -.718000	-2.000000 0.000000 -.745400	-2.500000 0.000000 -.552800	-2.500000 -.400000 -.515300	-.366578 -.075231 -.927341	-2.250074 -.200104 -.632837
	13	-2.000000 0.000000 -.745400	-2.000000 .400000 -.718000	-2.500000 .400000 -.515300	-2.500000 0.000000 -.552800	-.366578 .075231 -.927341	-2.250074 .200104 -.632837
	14	-2.000000 .400000 -.718000	-2.000000 .800000 -.628900	-2.500000 .800000 -.381500	-2.500000 .400000 -.515300	-.397801 .246251 -.883807	-2.250969 .600392 -.560379
	15	-2.000000 .800000 -.628900	-2.000000 1.322000 -.344400	-2.500000 1.000000 -.235700	-2.500000 .800000 -.381500	-.425912 .463200 -.777203	-2.214445 .990269 -.411287
	16	-2.000000 1.322000 -.344400	-2.000000 1.490700 0.000000	-2.500000 1.055000 0.000000	-2.500000 1.000000 -.235700	-.597981 .747834 -.288382	-2.218024 1.240723 -.149617

9	1	-2.500000 1.055000 0.000000	-2.500000 .800000 .381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 .275208	-2.626833 .687692 .149145
---	---	-----------------------------------	---------------------------------	-----------------------------------	-----------------------------------	--------------------------------	---------------------------------

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
000000	-2.500000	-.396212	-2.218355	.1214E-01
000000	-.800000	-.458473	-.956945	.6502E+00
35700	.381500	.795499	.416059	.1886E+00
000000	-2.500000	-.537231	-2.212088	.2711E-01
55000	-1.000000	-.740960	-1.209729	.7391E+00
000000	.235700	.402941	.166619	.2145E+00
000000	-2.500000	-.597981	-2.218024	.1342E-01
000000	-1.055000	-.747834	-1.240723	.7391E+00
35700	0.000000	-.288382	-.149617	.1939E+00
000000	-2.500000	-.425912	-2.214445	.1034E-01
000000	-1.000000	-.463200	-.990269	.7238E+00
81500	-.235700	-.777203	-.411287	.2322E+00
000000	-2.500000	-.397801	-2.250969	.9877E-02
000000	-.800000	-.246251	-.600392	.7233E+00
15300	-.381500	-.883807	-.560379	.2263E+00
000000	-2.500000	-.366578	-2.250074	.2342E-02
000000	-.400000	-.075231	-.200104	.6804E+00
52800	-.515300	-.927341	-.632837	.2157E+00
000000	-2.500000	-.366578	-2.250074	.2342E-02
000000	0.000000	.075231	.200104	.6804E+00
15300	-.552800	-.927341	-.632837	.2157E+00
000000	-2.500000	-.397801	-2.250969	.9877E-02
000000	.400000	.246251	.600392	.7233E+00
31500	-.515300	-.883807	-.560379	.2263E+00
000000	-2.500000	-.425912	-2.214445	.1034E-01
000000	.800000	.463200	.990269	.7238E+00
35700	-.381500	-.777203	-.411287	.2322E+00
000000	-2.500000	-.597981	-2.218024	.1342E-01
50000	1.000000	.747834	1.240723	.7391E+00
000000	-.235700	-.288382	-.149617	.1939E+00

000000	-3.000000	-.868756	-2.626833	0.
000000	0.000000	.411733	.697692	.1167E+01
000000	0.000000	.275208	.149145	.2316E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
EEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
9	2	-2.500000 .800000 .381500	-2.500000 .400000 .515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 .597912	-2.629 .434 .336
	3	-2.500000 .400000 .515300	-2.500000 0.000000 .552800	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 .669478	-2.635 .141 .389
	4	-2.500000 0.000000 .552800	-2.500000 -.400000 .515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 -.062764 .669478	-2.635 -.141 .389
	5	-2.500000 -.400000 .515300	-2.500000 -.800000 .381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 -.200002 .597912	-2.629 -.434 .336
	6	-2.500000 -.800000 .381500	-2.500000 -1.055000 0.000000	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 -.411733 .275208	-2.626 -.687 .149
	7	-2.500000 -1.055000 0.000000	-2.500000 -.800000 -.381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 -.411733 -.275208	-2.626 -.687 -.149
	8	-2.500000 -.800000 -.381500	-2.500000 -.400000 -.515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 -.200002 -.597912	-2.629 -.434 -.336
	9	-2.500000 -.400000 -.515300	-2.500000 0.000000 -.552800	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 -.062764 -.669478	-2.635 -.141 -.389
	10	-2.500000 0.000000 -.552800	-2.500000 .400000 -.515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 -.669478	-2.635 .141 -.389
	11	-2.500000 .400000 -.515300	-2.500000 .800000 -.381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 -.597912	-2.629 .434 -.336
	12	-2.500000 .800000 -.381500	-2.500000 1.055000 0.000000	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 -.275208	-2.626 .687 -.149

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FOLDOUT FRAM

189 BASIC ELEMENTS WERE INPUT

X Y Z	NX NY NZ	NPX NPY NPZ	D T A
.000000	-.776209	-2.629150	.1332E-14
.000000	.200002	.434170	.1018E+01
.000000	.597912	.336208	.1672E+00
.000000	-.740175	-2.635472	.2220E-15
.000000	.062764	.141262	.8219E+00
.000000	.669478	.389779	.1494E+00
.000000	-.740175	-2.635472	.3053E-15
.000000	-.062764	-.141262	.8219E+00
.000000	.669478	.389779	.1494E+00
.000000	-.776209	-2.629150	.1110E-14
.000000	-.200002	-.434170	.1018E+01
.000000	.597912	.336208	.1672E+00
.000000	-.868756	-2.626833	.8882E-15
.000000	-.411733	-.687692	.1167E+01
.000000	.275208	.149145	.2316E+00
.000000	-.868756	-2.626833	0.
.000000	-.411733	-.687692	.1167E+01
.000000	-.275208	-.149145	.2316E+00
.000000	-.776209	-2.629150	.1332E-14
.000000	-.200002	-.434170	.1018E+01
.000000	-.597912	-.336208	.1672E+00
.000000	-.740175	-2.635472	.2220E-15
.000000	-.062764	-.141262	.8219E+00
.000000	-.669478	-.389779	.1494E+00
.000000	-.740175	-2.635472	.3053E-15
.000000	.062764	.141262	.8219E+00
.000000	-.669478	-.389779	.1494E+00
.000000	-.776209	-2.629150	.1110E-14
.000000	.200002	.434170	.1018E+01
.000000	-.597912	-.336208	.1672E+00
.000000	-.868756	-2.626833	.8882E-15
.000000	.411733	.687692	.1167E+01
.000000	-.275208	-.149145	.2316E+00

FOR OUT FRM. 2

CRT PLOTS

MINIMUM AND MAXIMUM COORDINATES IN THE SCALED, TRANSLATED, ROTATED SYSTEM -

X AXIS=	-3.00000E+00	2.00000E+00
Y AXIS=	-2.00000E+00	2.00000E+00
Z AXIS=	-1.00000E+00	1.00000E+00

COORDINATE TRANSLATIONS USED TO CENTER THE PLOTS - DELX, DELY, DELZ -
AFTER SCALING, TRANSLATING, ROTATING - 5.00000E-01 0. 0.

VIEW OF BODY LOOKING DOWN THE	-Y	AXIS TOWARD THE ORIGIN
45-DEGREE VIEW FROM THE	+X -Y	+Z SIDE
45-DEGREE VIEW FROM THE	+X -Y	-Z SIDE
45-DEGREE VIEW FROM THE	-X -Y	+Z SIDE
45-DEGREE VIEW FROM THE	-X -Y	-Z SIDE
VIEW OF BODY LOOKING DOWN THE	-Z	AXIS TOWARD THE ORIGIN
45-DEGREE VIEW FROM THE	-X +Y	-Z SIDE
45-DEGREE VIEW FROM THE	+X +Y	-Z SIDE
VIEW OF BODY LOOKING DOWN THE	-X	AXIS TOWARD THE ORIGIN
45-DEGREE VIEW FROM THE	-X +Y	+Z SIDE
VIEW OF BODY LOOKING DOWN THE	+X	AXIS TOWARD THE ORIGIN
VIEW OF BODY LOOKING DOWN THE	+Y	AXIS TOWARD THE ORIGIN
VIEW OF BODY LOOKING DOWN THE	+Z	AXIS TOWARD THE ORIGIN
45-DEGREE VIEW FROM THE	+X +Y	+Z SIDE

BOXC

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

PAGE 1

BODY ID. TEST

TEST BODY

INPUT PARAMETERS-

IFLAG= 0 LIST= 0 ISIG= 0 IPRS= 0 MPR= 0

NCODE= 0 NNON= 0 NOFF= 0 KMACH= 0 KTP14= 1

NUMBER OF LEAKY QUADRALATERALS= 0 FRACTION OF FREE-STREAM VELOCITY LEAKED= 0.

P A R A M E T R I C I N F O R M A T I O N

GENERATED UNIFORM FLOWS

X-FLOW

NO SYMMETRY SPECIFIED

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

PA

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
1	1	2.000000	2.000000	1.500000	1.500000	.958086	1.59139		
		0.000000	0.000000	1.670000	1.732000	.276584	1.38979		
		0.000000	0.000000	.229700	0.000000	.074655	.09489		
2	2	2.000000	2.000000	1.500000	1.500000	.941794	1.59834		
		0.000000	0.000000	1.460000	1.670000	.251249	1.25402		
		0.000000	0.000000	.465900	.229700	.223380	.28292		
3	3	2.000000	2.000000	1.500000	1.500000	.915363	1.60511		
		0.000000	0.000000	1.140000	1.460000	.202414	1.01953		
		0.000000	0.000000	.652000	.465900	.348052	.44561		
4	4	2.000000	2.000000	1.500000	1.500000	.891771	1.60927		
		0.000000	0.000000	.800000	1.140000	.146221	.75032		
		0.000000	0.000000	.768100	.652000	.428210	.55749		
5	5	2.000000	2.000000	1.500000	1.500000	.874522	1.62026		
		0.000000	0.000000	.400000	.800000	.388802	.44790		
		0.000000	0.000000	.842600	.768100	.476787	.61308		
6	6	2.000000	2.000000	1.500000	1.500000	.865649	1.62481		
		0.000000	0.000000	0.000000	.400000	.029238	.14708		
		0.000000	0.000000	.866000	.842600	.499797	.64122		
7	7	2.000000	2.000000	1.500000	1.500000	.863387	1.62604		
		0.000000	0.000000	-.400000	0.000000	-.082222	-.14831		
		0.000000	0.000000	.800000	.866000	.498318	.62322		
8	8	2.000000	2.000000	1.500000	1.500000	.872872	1.62723		
		0.000000	0.000000	-.800000	-.400000	-.218218	-.44284		
		0.000000	0.000000	.600000	.800000	.436436	.52411		
9	9	2.000000	2.000000	1.500000	1.500000	.872872	1.61882		
		0.000000	0.000000	-1.200000	-.800000	-.218218	-.75116		
		0.000000	0.000000	.400000	.600000	.436436	.36677		
10	10	2.000000	2.000000	1.500000	1.500000	.872872	1.60714		
		0.000000	0.000000	-1.600000	-1.200000	-.218218	-1.08597		
		0.000000	0.000000	.200000	.400000	.436436	.24271		
11	11	2.000000	2.000000	1.500000	1.500000	.945063	1.58979		
		0.000000	0.000000	-1.732000	-1.600000	-.272824	-1.36520		
		0.000000	0.000000	0.000000	.200000	.180064	.08446		
12	12	2.000000	2.000000	1.500000	1.500000	.958086	1.59139		
		0.000000	0.000000	-1.670000	-1.732000	-.276584	-1.38979		
		0.000000	0.000000	-.229700	0.000000	-.074655	-.09489		

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BOCY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
1.500000 1.670000 .229700	1.500000 1.732000 0.000000	.956086 .276584 .074655	1.591395 1.389794 .094899	0. .1803E+01 .2076E+00
1.500000 1.460000 .465900	1.500000 1.670000 .229700	.941794 .251249 .223380	1.590349 1.254020 .282927	.8882E-15 .1758E+01 .2350E+00
1.500000 1.140000 .652000	1.500000 1.460000 .465900	.915363 .202414 .348052	1.605113 1.019539 .445612	.2665E-14 .1612E+01 .2299E+00
1.500000 .800000 .768100	1.500000 1.140000 .652000	.891771 .146221 .428210	1.609275 .750320 .557494	.2665E-14 .1405E+01 .1985E+00
1.500000 .400000 .842600	1.500000 .800000 .768100	.874522 .088802 .476787	1.620269 .447901 .613081	.9992E-15 .1217E+01 .2097E+00
1.500000 0.000000 .866000	1.500000 .400000 .842600	.865649 .029238 .499797	1.624811 .147089 .641222	.2220E-15 .1058E+01 .2001E+00
1.500000 -.400000 .800000	1.500000 0.000000 .866000	.863087 -.082222 .498318	1.626041 -.140316 .623224	.2220E-15 .1025E+01 .2007E+00
1.500000 -.800000 .600000	1.500000 -.400000 .800000	.872872 -.218218 .436436	1.627233 -.442846 .524111	.8882E-15 .1118E+01 .2291E+00
1.500000 -1.200000 .400000	1.500000 -.800000 .600000	.872872 -.218218 .436436	1.618821 -.751160 .386778	.1776E-14 .1360E+01 .2291E+00
1.500000 -1.600000 .200000	1.500000 -1.200000 .400000	.872872 -.218218 .436436	1.607148 -1.085976 .242716	.8882E-15 .1688E+01 .2291E+00
1.500000 -1.732000 0.000000	1.500000 -1.600000 .200000	.945063 -.272824 .180164	1.589795 -1.365206 .084464	0. .1803E+01 .1833E+00
1.500000 -1.670000 -.229700	1.500000 -1.732000 0.000000	.956086 -.276584 -.074655	1.591395 -1.389794 -.094899	0. .1803E+01 .2076E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
22	13	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -1.460000 -.465900	1.500000 -1.670000 -.229700	.941794 -.251249 -.223380	1.598 -1.254 -.282		
	14	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -1.140000 -.652000	1.500000 -1.460000 -.465900	.915363 -.202414 -.348052	1.605 -1.019 -.445		
	15	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -.800000 -.768100	1.500000 -1.140000 -.652000	.891771 -.146221 -.428210	1.609 -.750 -.557		
	16	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -.400000 -.842600	1.500000 -.800000 -.768100	.874522 -.068802 -.476787	1.620 -.447 -.613		
	17	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 0.000000 -.866000	1.500000 -.400000 -.842600	.865649 -.029238 -.499797	1.624 -.147 -.641		
	18	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 .400000 -.842600	1.500000 0.000000 -.866000	.865649 .029238 -.499797	1.624 .147 -.641		
	19	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 .800000 -.768100	1.500000 .400000 -.842600	.874522 .068802 -.476787	1.620 .447 -.613		
	20	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.140000 -.652000	1.500000 .800000 -.768100	.891771 .146221 -.428210	1.609 .750 -.557		
	21	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.460000 -.465900	1.500000 1.140000 -.652000	.915363 .202414 -.348052	1.605 1.019 -.445		
	22	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.670000 -.229700	1.500000 1.460000 -.465900	.941794 .251249 -.223380	1.598 1.254 -.282		
23	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.732000 0.000000	1.500000 1.670000 -.229700	.958086 .276584 -.074655	1.591 1.369 -.094			
2	1	1.500000 1.732000 0.000000	1.500000 1.670000 .229700	1.000000 1.870000 .354650	1.000000 2.000000 0.000000	.435365 .655263 .261030	1.220 1.831 .149		

TEST BODY

X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
000000	1.500000	1.500000	.941794	1.598349	.8882E-15
000000	-1.460000	-1.670000	-.251249	-1.254020	.1758E+01
000000	-.465900	-.229700	-.223380	-.282927	.2350E+00
000000	1.500000	1.500000	.915363	1.605113	.2665E-14
000000	-1.140000	-1.460000	-.202414	-1.019539	.1612E+01
000000	-.652000	-.465900	-.348052	-.445612	.2299E+00
000000	1.500000	1.500000	.891771	1.609275	.2665E-14
000000	-.840000	-1.140000	-.146221	-.750320	.1405E+01
000000	-.768100	-.652000	-.428210	-.557494	.1985E+00
000000	1.500000	1.500000	.874522	1.620269	.9992E-15
000000	-.400000	-.800000	-.088802	-.447901	.1217E+01
000000	-.842600	-.768100	-.476787	-.613081	.2097E+00
000000	1.500000	1.500000	.865649	1.624811	.2220E-15
000000	0.000000	-.400000	-.029238	-.147089	.1058E+01
000000	-.866000	-.842600	-.499797	-.641222	.2001E+00
000000	1.500000	1.500000	.865649	1.624811	.2220E-15
000000	.400000	0.000000	.029238	.147089	.1058E+01
000000	-.842600	-.866000	-.499797	-.641222	.2001E+00
000000	1.500000	1.500000	.874522	1.620269	.9992E-15
000000	.800000	.400000	.088802	.447901	.1217E+01
000000	-.768100	-.842600	-.476787	-.613081	.2097E+00
000000	1.500000	1.500000	.891771	1.609275	.2665E-14
000000	1.140000	.800000	.146221	.750320	.1405E+01
000000	-.652000	-.768100	-.428210	-.557494	.1985E+00
000000	1.500000	1.500000	.915363	1.605113	.2665E-14
000000	1.460000	1.140000	.202414	1.019539	.1612E+01
000000	-.465900	-.652000	-.348052	-.445612	.2299E+00
000000	1.500000	1.500000	.941794	1.598349	.8882E-15
000000	1.670000	1.460000	.251249	1.254020	.1758E+01
000000	-.229700	-.465900	-.223380	-.282927	.2350E+00
000000	1.500000	1.500000	.958086	1.591395	0.
000000	1.732000	1.670000	.276584	1.389794	.1803E+01
000000	0.000000	-.229700	-.074655	-.094899	.2076E+00
000000	1.000000	1.000000	.435365	1.220560	.5764E-02
000000	1.870000	2.000000	.655263	1.831729	.6416E+00
000000	.354600	0.000000	.281030	.149900	.1708E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			NX	NPX	
		X Y Z	X Y Z	X Y Z			
2	2	1.500000	1.500000	1.000000	1.000000	.390089	1.241719
		1.670000	1.460000	1.600000	1.870000	.652170	1.652830
		.229700	.465900	.600000	.354600	.650004	.414680
3	3	1.500000	1.500000	1.000000	1.000000	.324553	1.241630
		1.460000	1.140000	1.200000	1.600000	.447006	1.351646
		.465900	.652000	.800000	.600000	.833577	.631851
4	4	1.500000	1.500000	1.000000	1.000000	.288009	1.242990
		1.140000	.800000	.800000	1.200000	.287154	.985715
		.652000	.768100	.916500	.800000	.913561	.786135
5	5	1.500000	1.500000	1.000000	1.000000	.270929	1.250180
		.800000	.460000	.400000	.800000	.163401	.600088
		.768100	.842600	.979800	.916500	.948629	.876683
6	6	1.500000	1.500000	1.000000	1.000000	.261384	1.250017
		.400000	0.000000	0.000000	.400000	.052527	.200026
		.842600	.866000	1.000000	.979800	.963805	.922094
7	7	1.500000	1.500000	1.000000	1.000000	.126140	1.246098
		0.000000	-.400000	-.400000	0.000000	-.312996	-.199566
		.166000	.800000	.800000	1.000000	.941341	.867167
8	8	1.500000	1.500000	1.000000	1.000000	0.000000	1.250000
		-.400000	-.800000	-.800000	-.400000	-.447214	-.600000
		.800000	.600000	.600000	.800000	.894427	.700000
9	9	1.500000	1.500000	1.000000	1.000000	0.000000	1.250000
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.000000
		.600000	.400000	.400000	.600000	.894427	.500000
10	10	1.500000	1.500000	1.000000	1.000000	0.000000	1.250000
		-1.200000	-1.600000	-1.600000	-1.200000	-.447214	-1.400000
		.400000	.200000	.200000	.400000	.894427	.300000
11	11	1.500000	1.500000	1.000000	1.000000	.159008	1.216789
		-1.600000	-1.732000	-2.000000	-1.600000	-.593315	-1.739216
		.200000	0.000000	0.000000	.200000	.789109	.102018
12	12	1.500000	1.500000	1.000000	1.000000	.435365	1.220560
		-1.732000	-1.670000	-1.870000	-2.000000	-.855263	-1.831729
		0.000000	-.229700	-.354600	0.000000	-.281038	-.149900
13	13	1.500000	1.500000	1.000000	1.000000	.390089	1.241719
		-1.670000	-1.460000	-1.600000	-1.870000	-.652170	-1.652830
		-.229700	-.465900	-.600000	-.354600	-.650004	-.414680

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X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	C T A
.000000	1.000000	.390089	1.241719	.8288E-02
.600000	1.870000	.652170	1.652830	.6561E+00
.600000	.354600	.650004	.414660	.1846E+00
.000000	1.000000	.324553	1.241630	.6043E-02
.200000	1.600000	.447006	1.351646	.6814E+00
.800000	.600000	.833577	.631851	.2159E+00
.000000	1.000000	.288009	1.242990	.4216E-02
.800000	1.200000	.287154	.985715	.6600E+00
.916500	.800000	.913561	.786135	.2025E+00
.000000	1.000000	.270929	1.250180	.2656E-02
.400000	.800000	.163401	.600088	.6744E+00
.979800	.916500	.948629	.876683	.2108E+00
.000000	1.000000	.261384	1.250017	.7710E-03
.000000	.400000	.052527	.200026	.6594E+00
.000000	.979800	.963805	.922094	.2075E+00
.000000	1.000000	.126140	1.246098	.3153E-01
.400000	0.000000	-.312996	-.199566	.6708E+00
.800000	1.000000	.941341	.867167	.2125E+00
.000000	1.000000	0.000000	1.250000	.3553E-14
.800000	-.400000	-.447214	-.600000	.6708E+00
.600000	.800000	.894427	.700000	.2236E+00
.000000	1.000000	0.000000	1.250000	.3553E-14
.200000	-.800000	-.447214	-1.000000	.6708E+00
.400000	.600000	.894427	.500000	.2236E+00
.000000	1.000000	0.000000	1.250000	.6661E-14
.600000	-1.200000	-.447214	-1.400000	.6708E+00
.200000	.400000	.894427	.300000	.2236E+00
.000000	1.000000	.159008	1.216789	.3975E-01
.000000	-1.600000	-.593315	-1.739216	.6708E+00
.000000	.200000	.789109	.102018	.1685E+00
.000000	1.000000	.435365	1.220560	.5764E-02
.870000	-2.000000	-.855263	-1.831729	.6416E+00
.354600	0.000000	-.281038	-.149900	.1708E+00
.000000	1.000000	.390089	1.241719	.8288E-02
.600000	-1.870000	-.652170	-1.652830	.6561E+00
.600000	-.354600	-.650004	-.414680	.1846E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
2	14	1.500000	1.500000	1.000000	1.000000	.324553	1.241630		
		-1.460000	-1.140000	-1.200000	-1.600000	-.447006	-1.351646		
		-.465900	-.652000	-.800000	-.600000	-.833577	-.631851		
15	15	1.500000	1.500000	1.000000	1.000000	.288009	1.242990		
		-1.140000	-.800000	-.800000	-1.200000	-.287154	-.985715		
		-.652000	-.768100	-.916500	-.800000	-.913561	-.786135		
16	16	1.500000	1.500000	1.000000	1.000000	.270929	1.250180		
		-.800000	-.400000	-.400000	-.800000	-.163401	-.600088		
		-.768100	-.842600	-.979800	-.916500	-.948629	-.876683		
17	17	1.500000	1.500000	1.000000	1.000000	.261384	1.250017		
		-.400000	0.000000	0.000000	-.400000	-.052527	-.200026		
		-.842600	-.866000	-1.000000	-.979800	-.963805	-.922094		
18	18	1.500000	1.500000	1.000000	1.000000	.261384	1.250017		
		0.000000	.400000	.400000	0.000000	.052527	.200026		
		-.866000	-.842600	-.979800	-1.000000	-.963805	-.922094		
19	19	1.500000	1.500000	1.000000	1.000000	.270929	1.250180		
		.400000	.800000	.800000	.400000	.163401	.600088		
		-.842600	-.768100	-.916500	-.979800	-.948629	-.876683		
20	20	1.500000	1.500000	1.000000	1.000000	.288009	1.242990		
		.800000	1.140000	1.200000	.800000	.287154	.985715		
		-.768100	-.652000	-.800000	-.916500	-.913561	-.786135		
21	21	1.500000	1.500000	1.000000	1.000000	.324553	1.241630		
		1.140000	1.460000	1.600000	1.200000	.447006	1.351646		
		-.652000	-.465900	-.600000	-.800000	-.833577	-.631851		
22	22	1.500000	1.500000	1.000000	1.000000	.390089	1.241719		
		1.460000	1.670000	1.870000	1.600000	.652170	1.652830		
		-.465900	-.229700	-.354600	-.600000	-.650004	-.414680		
23	23	1.500000	1.500000	1.000000	1.000000	.435365	1.220560		
		1.670000	1.732000	2.000000	1.870000	.855263	1.931729		
		-.229700	0.000000	0.000000	-.354600	-.281038	-.149900		
3	1	1.000000	1.000000	0.000000	0.000000	0.000000	.500000		
		2.000000	1.870000	1.870000	2.000000	.938893	1.935000		
		0.300000	.354600	.354600	0.000000	.344208	.177300		
3	2	1.000000	1.000000	0.000000	0.000000	0.000000	.500000		
		1.870000	1.600000	1.600000	1.870000	.672591	1.735000		
		.354600	.600000	.600000	.354600	.740014	.477300		

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NX NY NZ	NPX NPY NPZ	D T A
.324553 -.447006 -.833577	1.241630 -1.351646 -.631851	.6043E-02 .6814E+00 .2159E+00
.268009 -.287154 -.913561	1.242990 -.985715 -.786135	.4216E-02 .6600E+00 .2025E+00
.270929 -.163401 -.948629	1.250180 -.600088 -.876683	.2656E-02 .6744E+00 .2108E+00
.261384 -.052527 -.963805	1.250017 -.200026 -.922094	.7710E-03 .6594E+00 .2075E+00
.261384 .052527 -.963805	1.250017 .200026 -.922094	.7710E-03 .6594E+00 .2075E+00
.270929 .163401 -.948629	1.250180 .600088 -.876683	.2656E-02 .6744E+00 .2108E+00
.268009 .287154 -.913561	1.242990 .985715 -.786135	.4216E-02 .6600E+00 .2025E+00
.324553 .447006 -.833577	1.241630 1.351646 -.631851	.6043E-02 .6814E+00 .2159E+00
.390089 .652170 -.650004	1.241719 1.652830 -.414680	.8288E-02 .6561E+00 .1846E+00
.435365 .855263 -.281038	1.220560 1.831729 -.149960	.5764E-02 .6416E+00 .1708E+00
0.000000 .938893 .344208	.500000 1.935000 .177300	0. .1069E+01 .3777E+00
0.000000 .672591 .740014	.500000 1.735000 .477300	.4885E-14 .1064E+01 .3649E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z		
3	3	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.600000	1.200000	1.200000	1.600000	1.600000	.447214	1.400000	
		.600000	.800000	.800000	.600000	.600000	.894427	.700000	
4	4	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.200000	.800000	.800000	1.200000	1.200000	.279631	1.000000	
		.800000	.916500	.916500	.800000	.800000	.960137	.858250	
5	5	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.800000	.400000	.400000	.800000	.800000	.156305	.600000	
		.916500	.979800	.979800	.916500	.916500	.987709	.948150	
6	6	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.400000	0.600000	0.000000	.400000	.400000	.050436	.200000	
		.979800	1.000000	1.000000	.979800	.979800	.998727	.989900	
7	7	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		0.000000	-.400000	-.400000	0.000000	0.000000	-.447214	-.200000	
		1.200000	.800000	.800000	1.000000	1.000000	.894427	.900000	
8	8	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.400000	-.800000	-.800000	-.400000	-.400000	-.447214	-.600000	
		.800000	.600000	.600000	.800000	.800000	.894427	.700000	
9	9	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.800000	-1.200000	-1.200000	-.800000	-.800000	-.447214	-1.000000	
		.600000	.400000	.400000	.600000	.600000	.894427	.500000	
10	10	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.200000	-1.600000	-1.600000	-1.200000	-1.200000	-.447214	-1.400000	
		.400000	.200000	.200000	.400000	.400000	.894427	.300000	
11	11	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.600000	-2.000000	-2.000000	-1.600000	-1.600000	-.447214	-1.800000	
		.200000	0.000000	0.000000	.200000	.200000	.894427	.100000	
12	12	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-2.000000	-1.870000	-1.870000	-2.000000	-2.000000	-.938893	-1.935000	
		0.000000	-.354600	-.354600	0.000000	0.000000	-.344208	-.177300	
13	13	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.870000	-1.600000	-1.600000	-1.870000	-1.870000	-.672591	-1.735000	
		-.354600	-.600000	-.600000	-.354600	-.354600	-.740014	-.477300	
14	14	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.600000	-1.200000	-1.200000	-1.600000	-1.600000	-.447214	-1.400000	
		-.600000	-.800000	-.800000	-.600000	-.600000	-.894427	-.700000	

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TEST BODY

	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
0000	0.000000	0.000000	0.000000	.500000	.6661E-14
0000	1.200000	1.600000	.447214	1.400000	.1095E+01
0000	.800000	.600000	.894427	.700000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.2442E-14
0000	.800000	1.200000	.279631	1.000000	.1083E+01
6500	.916500	.800000	.960107	.858250	.4166E+00
0000	0.000000	0.000000	0.000000	.500000	.2442E-14
0000	.400000	.800000	.156305	.600000	.1079E+01
9800	.979800	.916500	.987709	.948150	.4050E+00
0000	0.000000	0.000000	0.000000	.500000	.5551E-16
0000	0.000000	.400000	.050436	.200000	.1077E+01
0000	1.000000	.979800	.998727	.989900	.4005E+00
0000	0.000000	0.000000	0.000000	.500000	.3109E-14
0000	-.400000	0.000000	-.447214	-.200000	.1095E+01
0000	.800000	1.200000	.894427	.900000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.3553E-14
0000	-.800000	-.400000	-.447214	-.600000	.1095E+01
0000	.600000	.800000	.894427	.700000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.3553E-14
0000	-1.200000	-.800000	-.447214	-1.000000	.1095E+01
0000	.400000	.600000	.894427	.500000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.6661E-14
0000	-1.600000	-1.200000	-.447214	-1.400000	.1095E+01
0000	.200000	.400000	.894427	.300000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.4441E-15
0000	-2.000000	-1.600000	-.447214	-1.800000	.1095E+01
0000	0.000000	.200000	.894427	.100000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	0.
0000	-.870000	-2.000000	-.938893	-1.935000	.1069E+01
6000	-.354600	0.000000	-.344208	-.177300	.3777E+00
0000	0.000000	0.000000	0.000000	.500000	.4885E-14
0000	-1.600000	-1.870000	-.672591	-1.735000	.1064E+01
0000	-.600000	-.354600	-.740014	-.477300	.3649E+00
0000	0.000000	0.000000	0.000000	.500000	.6661E-14
0000	-1.200000	-1.600000	-.447214	-1.400000	.1095E+01
0000	-.800000	-.600000	-.894427	-.700000	.4472E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
3	15	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.200000	-.800000	-.800000	-1.200000	-.279631	-1.000000		
		-.800000	-.916500	-.916500	-.800000	-.960107	-.858250		
16	16	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.800000	-.400000	-.400000	-.800000	-.156305	-.600000		
		-.916500	-.979800	-.979800	-.916500	-.987709	-.948150		
17	17	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.400000	0.000000	0.000000	-.400000	-.050436	-.200000		
		-.979800	-1.000000	-1.000000	-.979800	-.998727	-.989900		
18	18	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		0.000000	.400000	.400000	0.000000	.050436	.200000		
		-1.000000	-.979800	-.979800	-1.000000	-.998727	-.989900		
19	19	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.400000	.800000	.800000	.400000	.156305	.600000		
		-.979800	-.916500	-.916500	-.979800	-.987709	-.948150		
20	20	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.800000	1.200000	1.200000	.800000	.279631	1.000000		
		-.916500	-.800000	-.800000	-.916500	-.960107	-.858250		
21	21	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.200000	1.600000	1.600000	1.200000	.447214	1.400000		
		-.800000	-.600000	-.600000	-.800000	-.894427	-.700000		
22	22	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.600000	1.870000	1.870000	1.600000	.672591	1.735000		
		-.600000	-.354600	-.354600	-.600000	-.740014	-.477300		
23	23	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.870000	2.000000	2.000000	1.870000	.938893	1.935000		
		-.354600	0.000000	0.000000	-.354600	-.344208	-.177300		
4	1	0.000000	0.000000	-.500000	-.500000	-.049532	-.248068		
		2.000000	1.870000	1.850000	1.972000	.939127	1.923092		
		0.000000	.354600	.341500	0.000000	.339980	.174052		
2	2	0.000000	0.000000	-.500000	-.500000	-.043145	-.249477		
		1.870000	1.600000	1.585000	1.850000	.675158	1.726269		
		.354600	.600000	.586600	.341500	.736411	.476688		
3	3	0.000000	0.000000	-.500000	-.500000	-.034875	-.249169		
		1.600000	1.200000	1.195000	1.585000	.449471	1.395016		
		.600000	.800000	.784400	.586600	.892614	.692774		

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NX	NPX	D
NY	NPY	T
NZ	NPZ	A
0.000000	.500000	.2442E-14
-.279631	-1.000000	.1083E+01
-.960107	-.858250	.4166E+00
0.000000	.500000	.2442E-14
-.156305	-.600000	.1079E+01
-.987709	-.948150	.4050E+00
0.000000	.500000	.5551E-16
-.050436	-.200000	.1077E+01
-.998727	-.989900	.4005E+00
0.000000	.500000	.3553E-14
.050436	.200000	.1077E+01
-.998727	-.989900	.4005E+00
0.000000	.500000	.2220E-14
.156305	.600000	.1079E+01
-.987709	-.948150	.4050E+00
0.000000	.500000	.3109E-14
.279631	1.000000	.1083E+01
-.960107	-.858250	.4166E+00
0.000000	.500000	.6661E-14
.447214	1.400000	.1095E+01
-.894427	-.700000	.4472E+00
0.000000	.500000	.6217E-14
.672591	1.735000	.1064E+01
-.740014	-.477300	.3649E+00
0.000000	.500000	.6217E-14
.938893	1.935000	.1069E+01
-.344206	-.177300	.3777E+00
-.049532	-.248068	.7648E-03
.939127	1.923092	.6238E+00
.339989	.174052	.1853E+00
-.043145	-.249477	.7867E-03
.675158	1.726269	.6205E+00
.736411	.470688	.1816E+00
-.034875	-.249169	.6327E-03
.449471	1.395016	.6693E+00
.892614	.692774	.2213E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

P

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
4	4	0.000000 1.200000 .800000	0.000000 .800000 .916500	-.500000 .800000 .901200	-.500000 1.195000 .784400	-.031343 .281449 .959074	-.249 .998 .850
	5	0.000000 .800000 .16500	0.000000 .400000 .979800	-.500000 .400000 .965500	-.500000 .800000 .901200	-.029218 .157442 .967096	-.250 .600 .940
	6	0.000000 .400000 .979800	0.000000 0.000000 1.000000	-.500000 0.000000 .986000	-.500000 .400000 .965500	-.028252 .050789 .998310	-.250 .200 .982
	7	0.000000 0.000000 1.700000	0.000000 -.400000 .800000	-.500000 -.400000 .800000	-.500000 0.000000 .986000	-.012608 -.434526 .900571	-.249 -.199 .896
	8	0.000000 -.400000 .800000	0.000000 -.800000 .600000	-.500000 -.800000 .600000	-.500000 -.400000 .800000	0.000000 -.447214 .894427	-.250 -.600 .700
	9	0.000000 -.800000 .600000	0.000000 -1.200000 .400000	-.500000 -1.200000 .400000	-.500000 -.800000 .600000	0.000000 -.447214 .894427	-.250 -1.000 .500
	10	0.000000 -1.200000 .400000	0.000000 -1.600000 .200000	-.500000 -1.600000 .200000	-.500000 -1.200000 .400000	0.000000 -.447214 .894427	-.250 -1.400 .300
	11	0.000000 -1.600000 .200000	0.000000 -2.000000 0.000000	-.500000 -1.972000 0.000000	-.500000 -1.600000 .200000	-.012880 -.460010 .887820	-.247 -1.793 .100
	12	0.000000 -2.000000 0.000000	0.000000 -1.870000 -.354600	-.500000 -1.850000 -.341500	-.500000 -1.972000 0.100000	-.049532 -.939127 -.339980	-.248 -1.923 -.174
	13	0.000000 -1.870000 -.354600	0.000000 -1.600000 -.600000	-.500000 -1.585000 -.586600	-.500000 -1.850000 -.341500	-.043145 -.675158 -.736411	-.246 -1.721 -.470
	14	0.000000 -1.600000 -.600000	0.000000 -1.200000 -.800000	-.500000 -1.195000 -.784400	-.500000 -1.585000 -.586600	-.034875 -.449471 -.892614	-.245 -1.391 -.691
	15	0.000000 -1.200000 -.800000	0.000000 -.800000 -.916500	-.500000 -.800000 -.901200	-.500000 -1.195000 -.784400	-.031043 -.281449 -.959074	-.244 -.991 -.850

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X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
00000	-.500000	-.031043	-.249537	.4237E-03
00000	1.195000	.281449	.998756	.6507E+00
01200	.784400	.959074	.850538	.2072E+00
00000	-.500000	-.029218	-.250016	.2468E-03
00000	.800000	.157442	.600001	.6451E+00
55500	.901200	.967096	.940749	.2026E+00
00000	-.500000	-.028252	-.250002	.7487E-04
00000	.400000	.050789	.200000	.6412E+00
06000	.965500	.998310	.962825	.2003E+00
00000	-.500000	-.012608	-.249496	.3152E-02
00000	0.000000	-.434526	-.199997	.6708E+00
00000	.986000	.900571	.896509	.2221E+00
00000	-.500000	0.000000	-.250000	.3553E-14
00000	-.400000	-.447214	-.600000	.6708E+00
00000	.800000	.894427	.700000	.2236E+00
00000	-.500000	0.000000	-.250000	.3553E-14
00000	-.800000	-.447214	-1.000000	.6708E+00
00000	.600000	.894427	.500000	.2236E+00
00000	-.500000	0.000000	-.250000	.6661E-14
00000	-1.200000	-.447214	-1.400000	.6708E+00
00000	.400000	.894427	.300000	.2236E+00
00000	-.500000	-.012880	-.247831	.3220E-02
20000	-1.600000	-.460010	-1.793015	.6708E+00
00000	.200000	.887820	.100024	.2174E+00
00000	-.500000	-.049532	-.248068	.7648E-03
00000	-1.972000	-.939127	-1.923092	.6238E+00
15000	0.000000	-.339980	-.174052	.1853E+00
00000	-.500000	-.043145	-.249477	.7887E-03
50000	-1.850000	-.675158	-1.726269	.6205E+00
66000	-.341500	-.736411	-.470688	.1816E+00
00000	-.500000	-.034875	-.249169	.6327E-03
50000	-1.585000	-.449471	-1.395016	.6693E+00
44000	-.586600	-.892614	-.692774	.2213E+00
00000	-.500000	-.031043	-.249537	.4237E-03
00000	-1.195000	-.281449	-.998756	.6507E+00
12000	-.784400	-.959074	-.850538	.2072E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
4	16	0.000000	0.000000	-0.500000	-0.500000	-0.029218	-0.250016		
		-0.800000	-0.400000	-0.400000	-0.800000	-0.157442	-0.600000		
		-0.916500	-0.979800	-0.965500	-0.901200	-0.987096	-0.940749		
17	17	0.000000	0.000000	-0.500000	-0.500000	-0.028252	-0.250000		
		-0.400000	0.000000	0.000000	-0.400000	-0.050789	-0.200000		
		-0.979800	-1.000000	-0.986000	-0.965500	-0.998310	-0.982825		
18	18	0.000000	0.000000	-0.500000	-0.500000	-0.028252	-0.250000		
		0.000000	0.400000	0.400000	0.000000	0.050789	0.200000		
		-1.000000	-0.979800	-0.965500	-0.986000	-0.998310	-0.982825		
19	19	0.000000	0.000000	-0.500000	-0.500000	-0.029218	-0.250016		
		0.400000	0.800000	0.800000	0.400000	0.157442	0.600000		
		-0.979800	-0.916500	-0.901200	-0.965500	-0.987096	-0.940749		
20	20	0.000000	0.000000	-0.500000	-0.500000	-0.031043	-0.249537		
		0.800000	1.200000	1.195000	0.800000	0.281449	0.998756		
		-0.916500	-0.800000	-0.784400	-0.901200	-0.959074	-0.850538		
21	21	0.000000	0.000000	-0.500000	-0.500000	-0.034875	-0.249169		
		1.200000	1.600000	1.585000	1.195000	0.449471	1.395016		
		-0.800000	-0.600000	-0.586600	-0.784400	-0.892614	-0.692774		
22	22	0.000000	0.000000	-0.500000	-0.500000	-0.043145	-0.249477		
		1.600000	1.870000	1.850000	1.585000	0.675158	1.726269		
		-0.600000	-0.354600	-0.341500	-0.586600	-0.736411	-0.470688		
23	23	0.000000	0.000000	-0.500000	-0.500000	-0.049532	-0.248068		
		1.870000	2.000000	1.972000	1.850000	0.939127	1.923092		
		-0.354600	0.000000	0.000000	-0.341500	-0.339980	-0.174052		
5	1	-0.500000	-0.500000	-1.000000	-1.000000	-0.153543	-0.743334		
		1.972000	1.850000	1.785000	1.685600	0.934141	1.874150		
		0.000000	0.341500	0.303900	0.000000	0.322188	0.161626		
2	2	-0.500000	-0.500000	-1.000000	-1.000000	-0.132740	-0.747389		
		1.850000	1.585000	1.540000	1.785000	0.683173	1.690281		
		0.341500	0.586600	0.544000	0.303900	0.718091	0.442150		
3	3	-0.500000	-0.500000	-1.000000	-1.000000	-0.108809	-0.747752		
		1.585000	1.195000	1.175000	1.540000	0.457325	1.373892		
		0.586600	0.784400	0.737400	0.544000	0.882618	0.663304		
4	4	-0.500000	-0.500000	-1.000000	-1.000000	-0.095703	-0.747950		
		1.195000	0.800000	0.800000	1.175000	0.288525	0.992572		
		0.784400	0.961200	0.853800	0.737400	0.952677	0.819380		

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	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
000	-.500000	-.029218	-.250016	.2468E-03
000	-.800000	-.157442	-.600001	.6451E+00
500	-.901200	-.967096	-.940749	.2026E+00
000	-.500000	-.028252	-.250002	.7487E-04
000	-.400000	-.050789	-.200000	.6412E+00
000	-.965500	-.998310	-.982825	.2003E+00
000	-.500000	-.028252	-.250002	.7487E-04
000	0.070000	.050789	.200000	.6412E+00
500	-.986000	-.998310	-.982825	.2003E+00
000	-.500000	-.029218	-.250016	.2468E-03
000	.400000	.157442	.600001	.6451E+00
200	-.965500	-.967096	-.940749	.2026E+00
000	-.500000	-.031043	-.249537	.4237E-03
000	.800000	.281449	.998756	.6507E+00
000	-.901200	-.959074	-.850538	.2072E+00
000	-.500000	-.034875	-.249169	.6327E-03
000	1.195000	.449471	1.395016	.6693E+00
500	-.784400	-.892614	-.692774	.2213E+00
000	-.500000	-.043145	-.249477	.7887E-03
000	1.585000	.675158	1.726269	.6205E+00
500	-.586600	-.736411	-.470688	.1816E+00
000	-.500000	-.049532	-.248068	.7648E-03
000	1.850000	.939127	1.923092	.6238E+00
000	-.341500	-.339980	-.174052	.1853E+00
000	-1.000000	-.153543	-.743334	.1969E-02
000	1.885600	.934141	1.874150	.6143E+00
000	0.000000	.322188	.161626	.1727E+00
000	-1.000000	-.132740	-.747389	.2518E-02
000	1.785000	.683173	1.690281	.6222E+00
000	.333900	.718091	.444215	.1776E+00
000	-1.000000	-.108809	-.747752	.1887E-02
000	1.540000	.457325	1.373892	.6640E+00
000	.544000	.882618	.663304	.2139E+00
000	-1.000000	-.095703	-.747958	.1347E-02
000	1.175000	.288525	.992572	.6461E+00
000	.737400	.952677	.819383	.2021E+00

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
5	5	-.500000 .800000 .901200	-.500000 .400000 .965500	-1.000000 .400000 .921400	-1.000000 .800000 .853800	-.089915 .162020 .982682	-.750055 .600009 .910468
	6	-.500000 .400000 .965500	-.500000 0.000000 .986000	-1.000000 0.000000 .942800	-1.000000 .400000 .921400	-.086851 .052106 .994858	-.750005 .200003 .953924
	7	-.500000 0.000000 .986000	-.500000 -.400000 .800000	-1.000000 -.400000 .800000	-1.000000 0.000000 .942800	-.039925 -.379842 .924189	-.748551 -.199961 .862279
	8	-.500000 -.400000 .800000	-.500000 -.800000 .600000	-1.000000 -.800000 .600000	-1.000000 -.400000 .800000	0.000000 -.447214 .894427	-.750000 -.600000 .700000
	9	-.500000 -.800000 .600000	-.500000 -1.200000 .400000	-1.000000 -1.200000 .400000	-1.000000 -.800000 .600000	0.000000 -.447214 .894427	-.750000 -1.000000 .500000
29	10	-.500000 -1.200000 .400000	-.500000 -1.600000 .200000	-1.000000 -1.600000 .200000	-1.000000 -1.200000 .400000	0.000000 -.447214 .894427	-.750000 -1.400000 .300000
	11	-.500000 -1.600000 .200000	-.500000 -1.972000 0.000000	-1.000000 -1.885600 0.000000	-1.000000 -1.600000 .200000	-.044855 -.519160 .853499	-.741375 -1.764760 .100234
	12	-.500000 -1.972000 0.000000	-.500000 -1.850000 -.341500	-1.000000 -1.785000 -.303900	-1.000000 -1.885600 0.000000	-.153543 -.934141 -.322188	-.743334 -1.874150 -.161626
	13	-.500000 -1.850000 -.341500	-.500000 -1.585000 -.586600	-1.000000 -1.540000 -.544000	-1.000000 -1.785000 -.303900	-.132740 -.683173 -.718091	-.747389 -1.690281 -.444215
	14	-.500000 -1.585000 -.586600	-.500000 -1.195000 -.784400	-1.000000 -1.175000 -.737400	-1.000000 -1.540000 -.544000	-.108809 -.457325 -.882618	-.747752 -1.373892 -.663304
	15	-.500000 -1.195000 -.784400	-.500000 -.800000 -.901200	-1.000000 -.800000 -.853800	-1.000000 -1.175000 -.737400	-.095703 -.288525 -.952677	-.747958 -.992572 -.819383
	16	-.500000 -.800000 -.901200	-.500000 -.400000 -.965500	-1.000000 -.400000 -.921400	-1.000000 -.800000 -.853800	-.089915 -.162020 -.982682	-.750055 -.600009 -.910468

BODY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	C T A
-1.000000 .400000 .921400	-1.000000 .800000 .853800	-.089915 .162020 .982682	-.750055 .600009 .910468	.8107E-03 .6500E+00 .2035E+00
-1.000000 0.000000 .942800	-1.000000 .400000 .921400	-.086851 .052106 .994858	-.750005 .200003 .953924	.2238E-03 .6436E+00 .2010E+00
-1.000000 -.400000 .800000	-1.000000 0.000000 .942800	-.039925 -.379842 .924189	-.748551 -.199961 .862279	.9981E-02 .6668E+00 .2164E+00
-1.000000 -.800000 .600000	-1.000000 -.400000 .800000	0.000000 -.447214 .894427	-.750000 -.600000 .700000	.3553E-14 .6708E+00 .2236E+00
-1.000000 -1.200000 .400000	-1.000000 -.800000 .600000	0.000000 -.447214 .894427	-.750000 -1.000000 .500000	.3553E-14 .6708E+00 .2236E+00
-1.000000 -1.600000 .200000	-1.000000 -1.200000 .400000	0.000000 -.447214 .894427	-.750000 -1.400000 .300000	.6661E-14 .6708E+00 .2236E+00
-1.000000 -1.885600 0.000000	-1.000000 -1.600000 .200000	-.044855 -.519160 .853499	-.741375 -1.764760 .100234	.1121E-01 .6545E+00 .1926E+00
-1.000000 -1.785000 -.303900	-1.000000 -1.885600 0.000000	-.153543 -.934141 -.322188	-.743334 -1.874150 -.161626	.1969E-02 .6143E+00 .1727E+00
-1.000000 -1.540000 -.544000	-1.000000 -1.785000 -.303900	-.132740 -.683173 -.718091	-.747389 -1.690281 -.444215	.2518E-02 .6222E+00 .1776E+00
-1.000000 -1.175000 -.737400	-1.000000 -1.540000 -.544000	-.108809 -.457325 -.882618	-.747752 -1.373892 -.663304	.1887E-02 .6640E+00 .2139E+00
-1.000000 -.800000 -.853800	-1.000000 -1.175000 -.737400	-.095703 -.288525 -.952677	-.747958 -.992572 -.819383	.1347E-02 .6461E+00 .2021E+00
-1.000000 -.400000 -.921400	-1.000000 -.800000 -.853800	-.089915 -.162020 -.982682	-.750055 -.600009 -.910468	.8107E-03 .6500E+00 .2035E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
5	17	-0.500000	-0.500000	-1.000000	-1.000000	-0.086851	-0.750000		
		-0.400000	0.000000	0.000000	-0.400000	-0.052106	-0.200000		
		-0.965500	-0.986000	-0.942800	-0.921400	-0.994858	-0.953924		
	18	-0.500000	-0.500000	-1.000000	-1.000000	-0.086851	-0.750000		
		0.000000	0.400000	0.400000	0.000000	0.052106	0.200000		
		-0.986000	-0.965500	-0.921400	-0.942800	-0.994858	-0.953924		
	19	-0.500000	-0.500000	-1.000000	-1.000000	-0.089915	-0.750000		
		0.400000	0.800000	0.800000	0.400000	0.162020	0.600000		
		-0.965500	-0.901200	-0.853800	-0.921400	-0.982682	-0.910460		
	20	-0.500000	-0.500000	-1.000000	-1.000000	-0.095703	-0.747950		
		0.800000	1.195000	1.175000	0.800000	0.288525	0.992572		
		-0.901200	-0.784400	-0.737400	-0.853800	-0.952677	-0.819383		
	21	-0.500000	-0.500000	-1.000000	-1.000000	-0.108809	-0.747752		
		1.195000	1.585000	1.540000	1.175000	0.457325	1.373892		
		-0.784400	-0.586600	-0.544000	-0.737400	-0.882618	-0.663304		
	22	-0.500000	-0.500000	-1.000000	-1.000000	-0.132740	-0.747389		
		1.585000	1.850000	1.785000	1.540000	0.683173	1.690281		
		-0.586600	-0.341500	-0.303900	-0.544000	-0.718091	-0.444215		
	23	-0.500000	-0.500000	-1.000000	-1.000000	-0.153543	-0.743334		
		1.850000	1.972000	1.885600	1.785000	0.934141	1.874150		
		-0.341500	0.000000	0.000000	-0.303900	-0.322188	-0.161626		
6	1	-1.000000	-1.000000	-1.500000	-1.500000	-0.268347	-1.229655		
		1.885600	1.785000	1.670000	1.732000	0.921489	1.773614		
		0.000000	0.303900	0.229700	0.000000	0.280799	0.134912		
	2	-1.000000	-1.000000	-1.500000	-1.500000	-0.239065	-1.245329		
		1.785000	1.540000	1.460000	1.670000	0.702123	1.614691		
		0.303900	0.544000	0.465900	0.229700	0.670724	0.386555		
	3	-1.000000	-1.000000	-1.500000	-1.500000	-0.194936	-1.245068		
		1.540000	1.175000	1.140000	1.460000	0.475316	1.329324		
		0.544000	0.737400	0.652000	0.465900	0.857948	0.600627		
	4	-1.000000	-1.000000	-1.500000	-1.500000	-0.170981	-1.245783		
		1.175000	0.800000	0.800000	1.140000	0.304683	0.979004		
		0.737400	0.853800	0.768100	0.652000	0.936981	0.753512		
	5	-1.000000	-1.000000	-1.500000	-1.500000	-0.159881	-1.250120		
		0.800000	0.400000	0.400000	0.800000	0.172638	0.600034		
		0.853800	0.921400	0.842600	0.768100	0.971923	0.846448		

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	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
00	-1.000000	-.086851	-.750005	.2238E-03
00	-.400000	-.052106	-.200003	.6436E+00
00	-.921400	-.994858	-.953924	.2010E+00
00	-1.000000	-.086851	-.750005	.2238E-03
00	0.000000	.052106	.200003	.6436E+00
00	-.942800	-.994858	-.953924	.2010E+00
00	-1.000000	-.089915	-.750055	.8107E-03
00	.400000	.162020	.600009	.6500E+00
00	-.921400	-.982682	-.910468	.2035E+00
00	-1.000000	-.095703	-.747958	.1347E-02
00	.800000	.288525	.992572	.6461E+00
00	-.853800	-.952677	-.819383	.2021E+00
00	-1.000000	-.108809	-.747752	.1887E-02
00	1.175000	.457325	1.373892	.6640E+00
00	-.737400	-.882618	-.663304	.2139E+00
00	-1.000000	-.132740	-.747389	.2518E-02
00	1.540000	.683173	1.690281	.6222E+00
00	-.544000	-.718091	-.444215	.1776E+00
00	-1.000000	-.153543	-.743334	.1969E-02
00	1.785000	.934141	1.874150	.6143E+00
00	-.303900	-.322188	-.161626	.1727E+00
00	-1.500000	-.268347	-1.229655	.3684E-02
00	1.732000	.921489	1.773614	.5916E+00
00	0.000000	.280799	.134912	.1448E+00
00	-1.500000	-.239065	-1.245329	.5490E-02
00	1.670000	.702123	1.614691	.6180E+00
00	.229700	.670724	.386555	.1696E+00
00	-1.500000	-.194936	-1.245068	.3782E-02
00	1.460000	.475316	1.329324	.6494E+00
00	.465900	.857948	.600627	.1996E+00
00	-1.500000	-.170981	-1.245783	.2596E-02
00	1.140000	.304683	.979004	.6374E+00
00	.652000	.936981	.753512	.1908E+00
00	-1.500000	-.159881	-1.250120	.1677E-02
00	.800000	.172638	.600034	.6584E+00
00	.768100	.971923	.846449	.2658E+00

FOR SCOUT FRM. 2

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

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N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NP NP NP
6	6	-1.000000 .400000 .921400	-1.000000 0.000000 .942800	-1.500000 0.000000 .866000	-1.500000 .400000 .842600	-.153515 .055250 .986601	-1.250000 .200000 .890000
7	7	-1.000000 0.000000 .942800	-1.000000 -.400000 .800000	-1.500000 -.400000 .800000	-1.500000 0.000000 .866000	-.074106 -.251846 .964926	-1.240000 -.190000 .850000
8	8	-1.000000 -.400000 .800000	-1.000000 -.800000 .600000	-1.500000 -.800000 .600000	-1.500000 -.400000 .800000	0.000000 -.447214 .894427	-1.250000 -.600000 .700000
9	9	-1.000000 -.800000 .600000	-1.000000 -1.200000 .400000	-1.500000 -1.200000 .400000	-1.500000 -.800000 .600000	0.000000 -.447214 .894427	-1.250000 -1.000000 .500000
10	10	-1.000000 -1.200000 .400000	-1.000000 -1.600000 .200000	-1.500000 -1.600000 .200000	-1.500000 -1.200000 .400000	0.000000 -.447214 .894427	-1.250000 -1.400000 .300000
11	11	-1.000000 -1.600000 .200000	-1.000000 -1.885600 0.000000	-1.500000 -1.732000 0.000000	-1.500000 -1.600000 .200000	-.105654 -.687853 .718119	-1.225000 -1.707000 .100000
12	12	-1.000000 -1.885600 0.000000	-1.000000 -1.785000 -.303900	-1.500000 -1.670000 -.229700	-1.500000 -1.732000 0.000000	-.268347 -.921489 -.280799	-1.229000 -1.773000 -.134000
13	13	-1.000000 -1.785000 -.303900	-1.000000 -1.540000 -.544000	-1.500000 -1.460000 -.465900	-1.500000 -1.670000 -.229700	-.239065 -.702123 -.670724	-1.245000 -1.614000 -.386000
14	14	-1.000000 -1.540000 -.544000	-1.000000 -1.175000 -.737400	-1.500000 -1.140000 -.652000	-1.500000 -1.460000 -.465900	-.194936 -.475316 -.857948	-1.245000 -1.329000 -.600000
15	15	-1.000000 -1.175000 -.737400	-1.000000 -.800000 -.853800	-1.500000 -.800000 -.768100	-1.500000 -1.140000 -.652000	-.170981 -.304683 -.936981	-1.245000 -.979000 -.753000
16	16	-1.000000 -.800000 -.853800	-1.000000 -.400000 -.921400	-1.500000 -.400000 -.842600	-1.500000 -.800000 -.768100	-.159881 -.172638 -.971923	-1.250000 -.600000 -.846000
17	17	-1.000000 -.400000 -.921400	-1.000000 0.000000 -.942800	-1.500000 0.000000 -.866000	-1.500000 -.400000 -.842600	-.153515 -.055250 -.986601	-1.250000 -.200000 -.890000

FOLIOLET FROM

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
.500000	-1.500000	-.153515	-1.250012	.4933E-03
.000000	.400000	.055250	.200010	.6481E+00
.866000	.842600	.986601	.893198	.2027E+00
.500000	-1.500000	-.074106	-1.248100	.1853E-01
.400000	0.000000	-.251846	-.199835	.6560E+00
.800000	.866000	.964926	.852389	.2073E+00
.500000	-1.500000	0.000000	-1.250000	.3553E-14
.800000	-.400000	-.447214	-.600000	.6708E+00
.600000	.800000	.894427	.700000	.2236E+00
.500000	-1.500000	0.000000	-1.250000	.3553E-14
.200000	-.800000	-.447214	-1.000000	.6708E+00
.400000	.600000	.894427	.500000	.2236E+00
.500000	-1.500000	0.000000	-1.250000	.6661E-14
.600000	-1.200000	-.447214	-1.400000	.6708E+00
.200000	.400000	.894427	.300000	.2236E+00
.500000	-1.500000	-.105654	-1.225923	.2641E-01
.732000	-1.600000	-.687853	-1.707445	.6096E+00
.000000	.200000	.718119	.100626	.1454E+00
.500000	-1.500000	-.268347	-1.229655	.3684E-02
.670000	-1.732000	-.921489	-1.773614	.5910E+00
.229700	0.000000	-.280799	-.134912	.1448E+00
.500000	-1.500000	-.239065	-1.245329	.5490E-02
.460000	-1.670000	-.702123	-1.614691	.6180E+00
.465900	-.229700	-.670724	-.386555	.1696E+00
.500000	-1.500000	-.194936	-1.245068	.3782E-02
.140000	-1.460000	-.475316	-1.329324	.6494E+00
.652000	-.465900	-.857948	-.600627	.1996E+00
.500000	-1.500000	-.170981	-1.245783	.2596E-02
.800000	-1.140000	-.304683	-.979004	.6374E+00
.768100	-.652000	-.936981	-.753512	.1908E+00
.500000	-1.500000	-.159881	-1.250120	.1677E-02
.400000	-.800000	-.172638	-.600034	.6584E+00
.842600	-.768100	-.971923	-.846449	.2058E+00
.500000	-1.500000	-.153515	-1.250012	.4933E-03
.000000	-.400000	-.055250	-.200010	.6481E+00
.866000	-.842600	-.986601	-.893198	.2027E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
6	18	-1.000000	-1.000000	-1.500000	-1.500000	-.153515	-1.250012		
		0.000000	.400000	.400000	0.000000	.055253	.200010		
		-.942800	-.921400	-.842600	-.866000	-.986601	-.893198		
19		-1.000000	-1.000000	-1.500000	-1.500000	-.159881	-1.250120		
		.400000	.800000	.800000	.400000	.172638	.600034		
		-.921400	-.853800	-.768100	-.842600	-.971923	-.846449		
20		-1.000000	-1.000000	-1.500000	-1.500000	-.170981	-1.245783		
		.800000	1.175000	1.140000	.800000	.304683	.979004		
		-.853800	-.737400	-.652000	-.768100	-.936981	-.753512		
21		-1.000000	-1.000000	-1.500000	-1.500000	-.194936	-1.245060		
		1.175000	1.540000	1.460000	1.140000	.475316	1.329324		
		-.737400	-.544000	-.465900	-.652000	-.857948	-.600627		
22		-1.000000	-1.000000	-1.500000	-1.500000	-.239865	-1.245329		
		1.540000	1.785000	1.670000	1.460000	.702123	1.614691		
		-.544000	-.303900	-.229700	-.465900	-.670724	-.386555		
23		-1.000000	-1.000000	-1.500000	-1.500000	-.268347	-1.229655		
		1.785000	1.885600	1.732000	1.670000	.921489	1.773614		
		-.303900	0.000000	0.000000	-.229700	-.280799	-.134912		
7	1	-1.500000	-1.500000	-2.000000	-2.000000	-.414479	-1.699678		
		1.732000	1.670000	1.465000	1.490700	.885202	1.611865		
		0.000000	.229700	.137800	0.000000	.211244	.896576		
2		-1.500000	-1.500000	-2.000000	-2.000000	-.372374	-1.733772		
		1.670000	1.460000	1.322000	1.465000	.725701	1.484752		
		.229700	.465900	.344400	.137800	.578529	.297994		
3		-1.500000	-1.500000	-2.000000	-2.000000	-.310024	-1.738932		
		1.460000	1.140000	1.072000	1.322000	.507279	1.250730		
		.465900	.652000	.517900	.344400	.804085	.497910		
4		-1.500000	-1.500000	-2.000000	-2.000000	-.269527	-1.738266		
		1.140000	.800000	.800000	1.072000	.335023	.954054		
		.652000	.768100	.628900	.517900	.902837	.644837		
5		-1.500000	-1.500000	-2.000000	-2.000000	-.250229	-1.750276		
		.800000	.400000	.400000	.800000	.193980	.600104		
		.768100	.842600	.718000	.628900	.948555	.739306		
6		-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.750025		
		.400000	0.000000	0.000000	.400000	.061556	.200030		
		.342600	.866000	.745400	.718000	.969388	.792992		

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BODY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-1.500000 .400000 -.842600	-1.500000 0.000000 -.866000	-.153515 .05525J -.986601	-1.250012 .200010 -.893198	.4933E-03 .6481E+00 .2027E+00
-1.500000 .800000 -.768100	-1.500000 .400000 -.842600	-.159881 .172638 -.971923	-1.250120 .600034 -.846449	.1677E-02 .6584E+00 .2058E+00
-1.500000 1.140000 -.652000	-1.500000 .800000 -.768100	-.170981 .304683 -.936981	-1.245783 .979004 -.753512	.2596E-02 .6374E+00 .1908E+00
-1.500000 1.460000 -.465900	-1.500000 1.140000 -.652000	-.194936 .475316 -.857948	-1.245068 1.329324 -.600627	.3782E-02 .6494E+00 .1996E+00
-1.500000 1.670000 -.229700	-1.500000 1.460000 -.465900	-.239065 .702123 -.670724	-1.245329 1.614691 -.386555	.5490E-02 .6180E+00 .1696E+00
-1.500000 1.732000 0.000000	-1.500000 1.670000 -.229700	-.268347 .921489 -.280799	-1.229655 1.773614 -.134912	.3664E-02 .5910E+00 .1448E+00
-2.000000 1.465000 .137800	-2.000000 1.490700 0.000000	-.414479 .885202 .211244	-1.699678 1.611865 .896576	.3180E-02 .5833E+00 .1038E+00
-2.000000 1.322000 .344400	-2.000000 1.465000 .137800	-.372374 .725701 .578529	-1.733772 1.484752 .297994	.7874E-02 .6199E+00 .1525E+00
-2.000000 1.072000 .517900	-2.000000 1.322000 .344400	-.310024 .507279 .804085	-1.738932 1.250730 .497910	.6345E-02 .6350E+00 .1772E+00
-2.000000 .800000 .628900	-2.000000 1.072000 .517900	-.269527 .335023 .902837	-1.738266 .954054 .644837	.4544E-02 .6218E+00 .1695E+00
-2.000000 .400000 .718000	-2.000000 .800000 .628900	-.250229 .193980 .948555	-1.750276 .600104 .739306	.3482E-02 .6750E+00 .2138E+00
-2.000000 0.000000 .745400	-2.000000 .400000 .718000	-.237694 .061556 .969380	-1.750025 .200030 .792992	.9694E-03 .6572E+00 .2063E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z		
7	7	-1.500000	-1.500000	-2.000000	-2.000000	-.197278	-1.74955		
		0.300000	-.400000	-.400000	0.000000	-.113683	-.19975		
		.866000	.800000	.718000	.745400	.973734	.78246		
8	8	-1.500000	-1.500000	-2.000000	-2.000000	-.075989	-1.74731		
		-.400000	-.800000	-.800000	-.400000	-.368319	-.59985		
		.800000	.600000	.600000	.718000	.926589	.67977		
9	9	-1.500000	-1.500000	-2.000000	-2.000000	0.000000	-1.75000		
		-.800000	-1.200000	-1.200000	-.600000	-.447214	-1.00000		
		.600000	.400000	.400000	.600000	.894427	.50000		
10	10	-1.500000	-1.500000	-2.000000	-2.000000	-.050829	-1.72040		
		-1.200000	-1.600000	-1.400000	-1.200000	-.496741	-1.35282		
		.400000	.200000	.256000	.400000	.866409	.31411		
11	11	-1.500000	-1.500000	-2.000000	-2.000000	-.348626	-1.76253		
		-1.600000	-1.732000	-1.490700	-1.400000	-.842191	-1.55051		
		.200000	0.000000	0.000000	.256000	.411307	.11394		
12	12	-1.500000	-1.500000	-2.000000	-2.000000	-.414479	-1.69967		
		-1.732000	-1.670000	-1.465000	-1.490700	-.885202	-1.61186		
		0.000000	-.229700	-.137800	0.000000	-.211244	-.09657		
13	13	-1.500000	-1.500000	-2.000000	-2.000000	-.372374	-1.73377		
		-1.670000	-1.460000	-1.322000	-1.465000	-.725701	-1.48475		
		-.229700	-.465900	-.344400	-.137800	-.578529	-.29799		
14	14	-1.500000	-1.500000	-2.000000	-2.000000	-.310024	-1.73893		
		-1.460000	-1.140000	-1.072000	-1.322000	-.507279	-1.25073		
		-.465900	-.652000	-.517900	-.344400	-.804085	-.49791		
15	15	-1.500000	-1.500000	-2.000000	-2.000000	-.269527	-1.73826		
		-1.140000	-.800000	-.800000	-1.072000	-.335023	-.95405		
		-.652000	-.768100	-.628900	-.517900	-.902837	-.64483		
16	16	-1.500000	-1.500000	-2.000000	-2.000000	-.250229	-1.75027		
		-.800000	-.400000	-.400000	-.600000	-.193980	-.60010		
		-.768100	-.842600	-.718000	-.628900	-.948555	-.73930		
17	17	-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.75002		
		-.400000	0.000000	0.000000	-.400000	-.061556	-.20003		
		-.842600	-.866000	-.745400	-.718000	-.969388	-.79299		
18	18	-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.75002		
		0.000000	.400000	.400000	0.000000	.061556	.20003		
		-.366000	-.842600	-.718000	-.745400	-.969388	-.79299		

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	X Y Z	NX NY NZ	NPX NPY NPZ	C T A
000	-2.000000	-.197278	-1.749550	.9397E-02
000	0.000000	-.113683	-.199759	.6572E+00
000	.745400	.973734	.782469	.2054E+00
000	-2.000000	-.675989	-1.747311	.1900E-01
000	-.490000	-.368319	-.599857	.6708E+00
000	.718000	.926589	.679777	.2158E+00
000	-2.000000	0.000000	-1.750000	.3553E-14
000	-.600000	-.447214	-1.000000	.6708E+00
000	.600000	.894427	.500000	.2236E+00
000	-2.000000	-.050829	-1.720409	.1271E-01
000	-1.200000	-.496741	-1.352829	.6708E+00
000	.400000	.866409	.314114	.1731E+00
000	-2.000000	-.348626	-1.762537	.1445E-01
700	-1.400000	-.842191	-1.550513	.6525E+00
000	.256000	.411307	.113943	.1354E+00
000	-2.000000	-.414479	-1.699678	.3180E-02
000	-1.490700	-.885202	-1.611805	.5833E+00
800	0.000000	-.211244	-.096576	.1038E+00
000	-2.000000	-.372374	-1.733772	.7874E-02
000	-1.465000	-.725701	-1.484752	.6199E+00
400	-.137800	-.578529	-.297994	.1525E+00
000	-2.000000	-.310024	-1.738932	.6345E-02
000	-1.322000	-.507279	-1.250730	.6350E+00
900	-.344400	-.804085	-.497910	.1772E+00
000	-2.000000	-.269527	-1.736266	.4544E-02
000	-1.072000	-.335023	-.954054	.6218E+00
900	-.517900	-.902837	-.644837	.1695E+00
000	-2.000000	-.250229	-1.750276	.3462E-02
000	-.800000	-.193980	-.600104	.6750E+00
900	-.628900	-.948555	-.739376	.2108E+00
000	-2.000000	-.237694	-1.750025	.9694E-03
000	-.400000	-.061556	-.200030	.6572E+00
400	-.718000	-.969388	-.792992	.2063E+00
000	-2.000000	-.237694	-1.750025	.9694E-03
000	0.000000	.061556	.200030	.6572E+00
000	-.745400	-.969388	-.792992	.2063E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY				NX NY NZ	NP NP NP
		X	X	X	X		
		Y Z	Y Z	Y Z	Y Z		
7	19	-1.500000	-1.500000	-2.000000	-2.000000	-.250229	-1.75
		.400000	.800000	.800000	.400000	.193980	.60
		-.842600	-.768100	-.628900	-.718000	-.948555	-.73
20		-1.500000	-1.500000	-2.000000	-2.000000	-.269527	-1.73
		.800000	1.146000	1.072000	.800000	.335023	.95
		-.768100	-.652000	-.517900	-.628900	-.902837	-.64
21		-1.500000	-1.500000	-2.000000	-2.000000	-.310024	-1.73
		1.140000	1.460000	1.322000	1.072000	.507279	1.25
		-.652000	-.465900	-.344400	-.517900	-.804085	-.49
22		-1.500000	-1.500000	-2.000000	-2.000000	-.372374	-1.73
		1.460000	1.670000	1.465000	1.322000	.725701	1.48
		-.465900	-.229700	-.137800	-.344400	-.578529	-.29
23		-1.500000	-1.500000	-2.000000	-2.000000	-.414479	-1.69
		1.670000	1.732000	1.490700	1.465000	.885202	1.61
		-.229700	0.000000	0.000000	-.137800	-.211244	-.09

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8	1	-2.000000	-2.000000	-2.500000	-2.500000	-.597981	-2.21
		1.490700	1.322000	1.000000	1.055000	.747834	1.24
		0.000000	.344400	.235700	0.000000	.288382	.14
2		-2.000000	-2.000000	-2.500000	-2.500000	-.425912	-2.21
		1.322000	.800000	.800000	1.000000	.463200	.99
		.344400	.628900	.381500	.235700	.777203	.41
3		-2.000000	-2.000000	-2.500000	-2.500000	-.397801	-2.25
		.800000	.400000	.400000	.800000	.246251	.60
		.628900	.718000	.515300	.381500	.883807	.56
4		-2.000000	-2.000000	-2.500000	-2.500000	-.366009	-2.25
		.400000	0.000000	0.000000	.400000	.075569	.20
		.718000	.745700	.552800	.515300	.927222	.63
5		-2.000000	-2.000000	-2.500000	-2.500000	-.366809	-2.25
		0.000000	-.400000	-.400000	0.000000	-.075569	-.20
		.745700	.718000	.515300	.552800	.927222	.63
6		-2.000000	-2.000000	-2.500000	-2.500000	-.372805	-2.25
		-.400000	-.800000	-.800000	-.400000	-.278586	-.60
		.718000	.600000	.381500	.515300	.885102	.55

	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
000	-2.000000	-.250229	-1.750276	.3462E-02
000	.400000	.193980	.600104	.6750E+00
900	-.718000	-.948555	-.739306	.2108E+00
000	-2.000000	-.269527	-1.738266	.4544E-02
000	.800000	.335023	.954054	.6218E+00
900	-.628900	-.902837	-.644837	.1695E+00
000	-2.000000	-.310024	-1.738932	.6345E-02
000	1.072000	.507279	1.250730	.6350E+00
000	-.517900	-.804085	-.497910	.1772E+00
000	-2.000000	-.372374	-1.733772	.7874E-02
000	1.322000	.725701	1.484752	.6199E+00
000	-.344400	-.578529	-.297994	.1525E+00
000	-2.000000	-.414479	-1.699678	.3180E-02
000	1.465000	.885202	1.611865	.5833E+00
000	-.137800	-.211244	-.096576	.1038E+00

000	-2.500000	-.597981	-2.218024	.1342E-01
000	1.055000	.747834	1.240723	.7391E+00
000	0.000000	.288382	.149617	.1939E+00
000	-2.500000	-.425912	-2.214445	.1034E-01
000	1.000000	.463200	.990269	.7238E+00
000	.235700	.777203	.411287	.2322E+00
000	-2.500000	-.397801	-2.250969	.9877E-02
000	.800000	.246251	.600392	.7233E+00
000	.381500	.883807	.566379	.2263E+00
000	-2.500000	-.366009	-2.250072	.2272E-02
000	.400000	.075569	.200101	.6805E+00
000	.515300	.927222	.632913	.2157E+00
000	-2.500000	-.366809	-2.250072	.2272E-02
000	0.000000	-.075569	-.200101	.6805E+00
000	.552800	.927222	.632913	.2157E+00
000	-2.500000	-.372805	-2.250383	.3496E-02
000	-.400000	-.278586	-.600126	.7233E+00
000	.515300	.885102	.553499	.2260E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NP NP NP
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
8	7	-2.000000 -.800000 .600000	-2.000000 -1.200000 .400000	-2.500000 -1.000000 .235700	-2.500000 -.800000 .381500	-.396212 -.458473 .795499	-2.21 -.95 .41		
	8	-2.000000 -1.200000 .400000	-2.000000 -1.490700 0.000000	-2.500000 -1.055000 0.000000	-2.500000 -1.000000 .235700	-.537231 -.740960 .402941	-2.21 -1.20 .16		
	9	-2.000000 -1.490700 0.000000	-2.000000 -1.322000 -.344400	-2.500000 -1.000000 -.235700	-2.500000 -1.055000 0.000000	-.597981 -.747834 -.288382	-2.21 -1.24 -.14		
	10	-2.000000 -1.322000 -.344400	-2.000000 -.600000 -.628900	-2.500000 -.800000 -.381500	-2.500000 -1.000000 -.235700	-.425912 -.463200 -.777203	-2.21 -.99 -.41		
	11	-2.000000 -.800000 -.628900	-2.000000 -.400000 -.718000	-2.500000 -.400000 -.515300	-2.500000 -.800000 -.381500	-.397801 -.246251 -.883807	-2.25 -.60 -.56		
35	12	-2.000000 -.400000 -.718000	-2.000000 0.000000 -.745400	-2.500000 0.000000 -.552800	-2.500000 -.400000 -.515300	-.366578 -.075231 -.927341	-2.25 -.20 -.63		
	13	-2.000000 0.000000 -.745400	-2.000000 .400000 -.718000	-2.500000 .400000 -.515300	-2.500000 0.000000 -.552800	-.366578 .075231 -.927341	-2.25 .20 -.63		
	14	-2.000000 .400000 -.718000	-2.000000 .800000 -.628900	-2.500000 .800000 -.381500	-2.500000 .400000 -.515300	-.397801 .246251 -.883807	-2.25 .60 -.56		
	15	-2.000000 .800000 -.628900	-2.000000 1.322000 -.344400	-2.500000 1.000000 -.235700	-2.500000 .800000 -.381500	-.425912 .463200 -.777203	-2.21 .99 -.41		
	16	-2.000000 1.322000 -.344400	-2.000000 1.490700 0.000000	-2.500000 1.055000 0.000000	-2.500000 1.000000 -.235700	-.597981 .747834 -.288382	-2.21 1.24 -.14		
		*****			*****				
9	1	-2.500000 1.055000 0.000000	-2.500000 .800000 .381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 .275208	-2.62 .68 .14		

T BODY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-2.500000 -1.000000 .235700	-2.500000 -.800000 .381500	-.396212 -.458473 .795499	-2.218355 -.956945 .416059	.1214E-01 .6502E+00 .1886E+00
-2.500000 -1.055000 0.000000	-2.500000 -1.000000 .235700	-.537231 -.740960 .402941	-2.212088 -1.209729 .166619	.2711E-01 .7391E+00 .2145E+00
-2.500000 -1.400000 -.235700	-2.500000 -1.055000 0.000000	-.597981 -.747834 -.288382	-2.218024 -1.240723 -.149617	.1342E-01 .7391E+00 .1939E+00
-2.500000 -.800000 -.381500	-2.500000 -1.000000 -.235700	-.425912 -.463200 -.777203	-2.214445 -.990269 -.411287	.1034E-01 .7238E+00 .2322E+00
-2.500000 -.400000 -.515300	-2.500000 -.800000 -.381500	-.397801 -.246251 -.883807	-2.250969 -.600392 -.560379	.9877E-02 .7233E+00 .2263E+00
-2.500000 0.000000 -.552800	-2.500000 -.400000 -.515300	-.366578 -.075231 -.927341	-2.250074 -.200104 -.632837	.2342E-02 .6804E+00 .2157E+00
-2.500000 .400000 -.515300	-2.500000 0.000000 -.552800	-.366578 .075231 -.927341	-2.250074 .200104 -.632837	.2342E-02 .6804E+00 .2157E+00
-2.500000 .800000 -.381500	-2.500000 .400000 -.515300	-.397801 .246251 -.883807	-2.250969 .600392 -.560379	.9877E-02 .7233E+00 .2263E+00
-2.500000 1.000000 -.235700	-2.500000 .800000 -.381500	-.425912 .463200 -.777203	-2.214445 .990269 -.411287	.1034E-01 .7238E+00 .2322E+00
-2.500000 1.055000 0.000000	-2.500000 1.000000 -.235700	-.597981 .747834 -.288382	-2.218024 1.240723 -.149617	.1342E-01 .7391E+00 .1939E+00

-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 .275208	-2.626833 .687692 .149145	U. .11E7E+01 .2316E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
 BECFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
9	2	-2.500000 .800000 .381500	-2.500000 .400000 .515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 .597912	-2.629 .434 .336
	3	-2.500000 .400000 .515300	-2.500000 0.000000 .552800	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 .669478	-2.635 .141 .389
	4	-2.500000 0.000000 .552800	-2.500000 -.400000 .515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 -.062764 .669478	-2.635 -.141 .389
	5	-2.500000 -.400000 .515300	-2.500000 -.800000 .381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 -.200002 .597912	-2.629 -.434 .336
	6	-2.500000 -.800000 .381500	-2.500000 -1.055000 0.000000	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 -.411733 .275208	-2.626 -.687 .149
	7	-2.500000 -1.055000 0.000000	-2.500000 -.800000 -.381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 -.411733 -.275208	-2.626 -.687 -.149
	8	-2.500000 -.800000 -.381500	-2.500000 -.400000 -.515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 -.200002 -.597912	-2.629 -.434 -.336
	9	-2.500000 -.400000 -.515300	-2.500000 0.000000 -.552800	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 -.062764 -.669478	-2.635 -.141 -.389
	10	-2.500000 0.000000 -.552800	-2.500000 .400000 -.515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 -.669478	-2.635 .141 -.389
	11	-2.500000 .400000 -.515300	-2.500000 .800000 -.381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 -.597912	-2.629 .434 -.336
	12	-2.500000 .800000 -.381500	-2.500000 1.055000 0.000000	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 -.275208	-2.626 .687 -.149

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BODY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 .597912	-2.629150 .434170 .336208	.1332E-14 .1018E+01 .1672E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 .669478	-2.635472 .141262 .389779	.2220E-15 .8219E+00 .1494E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 .669478	-2.635472 .141262 .389779	.3053E-15 .8219E+00 .1494E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 .597912	-2.629150 .434170 .336208	.1110E-14 .1018E+01 .1672E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 .275208	-2.626833 .687692 .149145	.8882E-15 .1167E+01 .2316E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 .275208	-2.626833 .687692 .149145	0. .1167E+01 .2316E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 .597912	-2.629150 .434170 .336208	.1332E-14 .1018E+01 .1672E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 .669478	-2.635472 .141262 .389779	.2220E-15 .8219E+00 .1494E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 .669478	-2.635472 .141262 .389779	.3053E-15 .8219E+00 .1494E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 .597912	-2.629150 .434170 .336208	.1110E-14 .1018E+01 .1672E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 .275208	-2.626833 .687692 .149145	.8882E-15 .1167E+01 .2316E+00

189 BASIC ELEMENTS WERE INPUT
FLOWS HAS SET UP 1 X FLOWS, 0 Y FLOWS, AND 0 Z FLOWS.

NEAR ELEMENTS = 12340

INTERMEDIATE ELEMENTS = 12849

FAR ELEMENTS = 10532

LEAVING VFORM

LEAVING AFORM

THE 189 X 189 MATRIX WITH 1 RIGHT SIDES WAS SOLVED DIRECTLY.

LEAVING ATAPES

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	X-FLOW					
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
1	1	1.591395	.650542	.186355	.286460	.958086	
		1.389794	.423205	-.603774	-.928109	.276584	
		.094899	.576795	-.154717	-.237613	.074655	
2	2	1.598349	.722874	.242954	.336094	.941794	
		1.254020	.522546	-.520217	-.719651	.251249	
		.282927	.477454	-.439138	-.607572	.223380	
3	3	1.605113	.827395	.333118	.402599	.915363	
		1.019539	.684582	-.389638	-.478922	.202414	
		.445612	.315418	-.649454	-.784950	.348052	
4	4	1.609275	.907577	.410662	.452482	.891771	
		.750320	.823696	-.257457	-.283676	.146221	
		.557494	.176304	-.767312	-.845451	.428210	
5	5	1.620269	.940808	.456097	.484793	.874522	
		.447901	.885119	-.124538	-.132373	.088802	
		.613081	.114881	-.813378	-.864553	.476787	
6	6	1.624811	.975755	.487598	.499713	.865649	
		.147089	.952098	.010372	.010630	.029238	
		.641222	.047902	-.845127	-.866126	.499797	
7	7	1.626041	1.022582	.516020	.504625	.863087	
		-.148316	1.045673	.185219	.181129	-.082222	
		.623224	-.045673	-.863186	-.844124	.493318	
8	8	1.627233	1.027046	.501079	.487883	.872872	
		-.442846	1.054824	.385641	.375486	-.218218	
		.524111	-.054824	-.809336	-.788023	.436436	
9	9	1.618821	1.037872	.505633	.487230	.872872	
		-.751160	1.077179	.454951	.436350	-.218218	
		.386778	-.077179	-.783890	-.755286	.436436	
10	10	1.607148	1.045350	.507243	.485237	.872872	
		-1.085976	1.092756	.504246	.482370	-.218218	
		.242716	-.092756	-.762363	-.725290	.436436	
11	11	1.589795	.843584	.275088	.326094	.945063	
		-1.365206	.711633	.631390	.748462	-.272824	
		.084464	.288367	-.487141	-.577466	.180064	
12	12	1.591395	.659238	.182435	.276812	.958086	
		-1.389794	.434594	.633450	.960895	-.276584	
		-.094899	.565406	-.004927	-.007473	-.074655	

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TEST BODY

X-FLOW

VT TSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
50542	.186355	.286460	.958086	.000000
23205	-.603774	-.928109	.276584	-.139050
76795	-.154737	-.237613	.074655	
22874	.242954	.336094	.941794	.000000
22546	-.520217	-.719651	.251249	-.137437
77454	-.439138	-.607572	.223380	
27395	.333138	.402599	.915363	.000000
84582	-.389638	-.470922	.202414	-.133778
15418	-.649454	-.784950	.348052	
07577	.410662	.452482	.891771	.000000
23696	-.257457	-.283676	.146221	-.130613
76304	-.767312	-.845451	.428210	
40808	.456097	.484793	.874522	.000000
35119	-.124538	-.132373	.088802	-.128792
14881	-.813370	-.864553	.476787	
75755	.487598	.499713	.865649	.000000
52098	.010372	.010630	.029238	-.127684
47902	-.845127	-.866126	.499797	
22582	.516020	.504625	.863087	.000000
55673	.185219	.181129	-.082222	-.127758
55673	-.863186	-.844124	.493318	
7046	.501079	.487883	.872872	.000000
4824	.385641	.375486	-.218218	-.134528
4824	-.809336	-.788023	.436436	
7872	.505633	.487230	.872872	.000000
7179	.454951	.436350	-.218218	-.136386
7179	-.783833	-.755286	.436436	
5350	.507243	.485237	.872872	.000000
2756	.504246	.482370	-.218218	-.128897
2756	-.762363	-.729290	.436436	
3584	.275098	.326094	.945063	.000000
1633	.631390	.748462	-.272824	-.140478
8367	-.487141	-.577466	.180064	
9238	.182435	.276812	.958086	.000000
554	.633458	.960895	-.276584	-.143742
5406	-.004927	-.007473	-.074655	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
39	13	1.598349 -1.254020 -.282927	.686910 .471845 .528155	.228408 .545513 .349431	.332515 .794140 .508700	.941794 -.251249 -.223380	
	14	1.605113 -1.019539 -.445612	.794765 .631651 .368349	.319054 .417354 .596382	.401444 .525129 .750388	.915363 -.202414 -.348052	
	15	1.609275 -.750320 -.557494	.683063 .779800 .220200	.399194 .290717 .732075	.452056 .329203 .829018	.891771 -.146221 -.428210	
	16	1.620269 -.447901 -.613081	.918614 .843852 .156148	.445350 .170819 .785065	.484818 .185953 .854619	.874522 -.088802 -.476787	
	17	1.624811 -.147089 -.641222	.938859 .881457 .118543	.469935 .060633 .810495	.500602 .064581 .863265	.865649 -.029238 -.499797	
	18	1.624811 .147089 -.641222	.941987 .887340 .112660	.471601 -.02714 .814314	.500645 -.045345 .864464	.865649 .029238 -.499797	
	19	1.620269 .447901 -.613081	.928862 .862784 .137216	.450482 -.152091 .797947	.484982 -.163739 .859059	.874522 .088802 -.476787	
	20	1.609275 .750320 -.557494	.902372 .814275 .185725	.408274 -.271614 .757505	.452446 -.301000 .839459	.891771 .146221 -.428210	
	21	1.605113 1.019539 -.445612	.824376 .679596 .320404	.331816 -.397026 .641767	.402505 -.481607 .778488	.915363 .202414 -.348052	
	22	1.598349 1.254020 -.282927	.721173 .520099 .479910	.242312 -.523590 .432699	.335997 -.726026 .599994	.941794 .251249 -.223380	
	23	1.591395 1.389794 -.094899	.649987 .422484 .577516	.186167 -.604720 .148733	.286416 -.930356 .228917	.958086 .276584 -.074655	
	2	1	1.220560 1.831729 .149900	1.298463 1.686005 -.686005	1.168799 -.543418 -.156877	.900141 -.418509 -.120818	.435365 .855263 .281038

DCX DCY DLZ	NX NY NZ	VN SIG
.332515	.941794	.000000
.794140	-.251249	-.141206
.508700	-.223380	
.401444	.915363	.000000
.525129	-.202414	-.136358
.750388	-.348052	
.452056	.891771	.000000
.329203	-.146221	-.132383
.829018	-.428210	
.484818	.874522	.000000
.185953	-.088802	-.129915
.854619	-.476787	
.500602	.865649	.000000
.064581	-.029238	-.128441
.863265	-.499797	
.500645	.865649	.000000
-.045345	.029238	-.128168
.864464	-.499797	
.484982	.874522	.000000
-.163739	.088802	-.129054
.859059	-.476767	
.452446	.891771	.000000
-.301000	.146221	-.130873
.839459	-.428210	
.402505	.915363	.000000
-.481607	.202414	-.133979
.778488	-.348052	
.335997	.941794	.000000
-.726026	.251249	-.137551
.599994	-.223380	
.286416	.958086	.000000
-.930356	.276584	-.139085
.228917	-.074655	
.900141	.435365	.000000
-.418509	.855263	-.041547
-.120818	.281038	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
2	2	1.241719	1.342441	1.235652	.920459	.390089	
		1.652830	1.802147	-.395679	-.294746	.652170	
		.414680	-.802147	-.344554	-.256670	.650004	
3	3	1.241630	1.394162	1.318375	.945640	.324553	
		1.351646	1.943687	-.240723	-.172665	.447008	
		.631851	-.943687	-.384222	-.275593	.833577	
4	4	1.242990	1.422806	1.362458	.957585	.288009	
		.985715	2.024378	-.135694	-.095371	.287154	
		.786135	-1.024378	-.386876	-.271910	.913561	
5	5	1.250180	1.439029	1.385168	.962571	.270929	
		.600088	2.070805	-.055319	-.038442	.163401	
		.876683	-1.070805	-.386075	-.268289	.948629	
6	6	1.250017	1.440042	1.388034	.963684	.261384	
		.200026	2.073722	.055597	.038608	.052527	
		.922094	-1.073722	-.379465	-.263509	.963805	
7	7	1.246098	1.454052	1.441656	.991475	.126140	
		-.199566	2.114266	.103242	.071003	-.312996	
		.867167	-1.114266	-.158854	-.109249	.941341	
8	8	1.250000	1.464273	1.463954	.999782	0.000000	
		-.600000	2.144096	.027353	.018687	-.447214	
		.700000	-1.144096	.013631	.009344	.894427	
9	9	1.250000	1.459110	1.458560	.999623	0.000000	
		-1.000000	2.129001	.035829	.024556	-.447214	
		.500000	-1.129001	.017915	.012278	.894427	
10	10	1.250000	1.413037	1.412346	.999511	0.000000	
		-1.400000	1.996674	.039537	.027980	-.447214	
		.300000	-.996674	.019768	.013998	.894427	
11	11	1.216789	1.329756	1.312795	.987245	.159008	
		-1.739216	1.768252	.118463	.089086	-.593315	
		.102018	-.768252	-.175453	-.131951	.789109	
12	12	1.220560	1.240825	1.106576	.891807	.435365	
		-1.831729	1.539647	.561339	.452391	-.855263	
		-.149900	-.539647	.005949	.004795	-.261038	
13	13	1.241719	1.307517	1.201637	.919023	.390089	
		-1.652830	1.709599	.417526	.319327	-.652170	
		-.414680	-.709599	.302225	.231144	-.650004	

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X-FLOW

VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
1.235652 -.395679 -.344554	.920459 -.294746 -.256670	.390089 .652170 .650004	.000000 -.031945
1.318375 -.240723 -.384222	.945640 -.172665 -.275593	.324553 .447006 .833577	.000000 -.019186
1.362458 -.135634 -.386876	.957585 -.095371 -.271910	.288009 .287154 .913561	.000000 -.011885
1.385168 -.055319 -.386075	.962571 -.038442 -.268289	.270929 .163401 .948629	.000000 -.008418
1.388034 .055597 -.379465	.963884 .038608 -.263509	.261384 .052527 .963805	.000000 -.007881
1.441656 .103242 -.158854	.991475 .071603 -.109249	.126140 -.312996 .941341	.000000 .022592
1.463954 .027353 .013631	.999782 .018687 .009344	0.000000 -.447214 .894427	.000000 .051205
1.458560 .035829 .017915	.999623 .024556 .012278	0.000000 -.447214 .894427	.000000 .049986
1.412346 .039537 .019768	.999511 .027980 .013990	0.000000 -.447214 .894427	.000000 .047884
1.312735 .118463 -.175463	.987245 .089086 -.131951	.159008 -.593315 .789109	.000000 .011237
1.106576 .561339 .005949	.891807 .452391 .004795	.435365 -.855263 -.261038	.000000 -.052420
1.201637 .417526 .302225	.919023 .319327 .231144	.390089 -.652170 -.650004	.000000 -.039199

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
2	14	1.241630	1.375733	1.300194	.945091	.324553	
		-1.351646	1.892642	.259936	.186943	-.447006	
		-.631851	-.892642	.366840	.266651	-.833577	
15	15	1.242990	1.414596	1.354205	.957309	.288009	
		-.985715	2.001080	.156928	.110935	-.287154	
		-.786135	-1.001080	.377600	.266931	-.910561	
16	16	1.250180	1.439188	1.385197	.962478	.270929	
		-.600068	2.071262	.088699	.061631	-.163401	
		-.876683	-1.071262	.380331	.264268	-.948629	
17	17	1.250017	1.449715	1.399232	.965212	.261384	
		-.200026	2.101673	.030686	.021167	-.052527	
		-.922094	-1.101673	.377813	.260612	-.963805	
18	18	1.250017	1.451738	1.401268	.965235	.261384	
		.200026	2.107544	-.022042	-.015183	.052527	
		-.922094	-1.107544	.378823	.260944	-.963805	
19	19	1.250180	1.445716	1.391539	.962560	.270929	
		.600068	2.090095	-.079317	-.054863	.163401	
		-.876683	-1.090095	.363776	.265457	-.948629	
20	20	1.242990	1.426664	1.366014	.957488	.288009	
		.985715	2.035371	-.146440	-.102645	.287154	
		-.786135	-1.035371	.384619	.269593	-.913561	
21	21	1.241630	1.396261	1.320233	.945549	.324553	
		1.351646	1.949544	-.245938	-.176183	.447006	
		-.631851	-.949544	.382116	.273671	-.833577	
22	22	1.241719	1.343418	1.236477	.920396	.390089	
		1.652830	1.804772	-.398238	-.296481	.652170	
		-.414680	-.804772	.342426	.254891	-.650004	
23	23	1.220560	1.298765	1.169035	.900112	.435365	
		1.831729	1.686792	-.544235	-.419079	.855263	
		-.149900	-.686792	.154603	.119039	-.281038	
3	1	.500000	1.212633	1.212570	.999948	0.000000	
		1.935000	1.470479	-.004275	-.003526	.938893	
		.177300	-.470479	.011662	.009617	.344208	
2	2	.500000	1.221483	1.221289	.999841	0.000000	
		1.735000	1.492020	-.016038	-.013179	.672591	
		.477300	-.492020	.014632	.011979	.740014	

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DCX DCY DCZ	NX NY NZ	VN SIG
.945091	.324553	.000000
.186943	-.447006	-.024030
.266651	-.833577	
.957309	.288009	.000000
.110935	-.287154	-.014970
.266931	-.913561	
.962478	.270929	.000000
.061631	-.163401	-.010137
.264268	-.948629	
.965212	.261384	.000000
.021167	-.052527	-.007697
.260612	-.963805	
.965235	.261384	.000000
-.015183	.052527	-.007196
.260944	-.963805	
.962560	.270929	.000000
-.054863	.163401	-.008545
.265457	-.948629	
.957488	.288009	.000000
-.102645	.287154	-.012085
.269593	-.913561	
.945549	.324553	.000000
-.176183	.447006	-.019350
.273671	-.833577	
.920396	.390089	.000000
-.296481	.652170	-.032050
.254891	-.650004	
.900112	.435365	.000000
-.419079	.855263	-.041587
.119039	-.281038	
.999948	0.000000	.000000
-.003526	.938893	.009526
.009617	.344208	
.999841	0.000000	.000000
-.013179	.672591	.009772
.011979	.740014	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
3	3	.500000	1.232356	1.232207	.999879	0.000000	
		1.400000	1.518701	-.017153	-.013919	.447214	
		.700000	-.518701	.008577	.006960	.894427	
4	4	.500000	1.237037	1.236932	.999955	0.000000	
		1.000000	1.530261	-.011243	-.009088	.279631	
		.858250	-.530261	.003274	.002647	.960107	
5	5	.500000	1.234013	1.234011	.999998	0.000000	
		.600000	1.522789	-.002482	-.002011	.156305	
		.948150	-.522789	.000393	.000318	.987709	
6	6	.500000	1.220064	1.220020	.999964	0.000000	
		.200000	1.488557	.010370	.008500	.050436	
		.989900	-.488557	-.000524	-.000429	.998727	
7	7	.500000	1.206541	1.206516	.999979	0.000000	
		-.200000	1.455742	-.007029	-.005826	-.447214	
		.900000	-.455742	-.003515	-.002913	.894427	
8	8	.500000	1.196347	1.196331	.999986	0.000000	
		-.600000	1.431247	.005573	.004659	-.447214	
		.700000	-.431247	.002787	.002329	.894427	
9	9	.500000	1.185439	1.185352	.999927	0.000000	
		-1.000000	1.405265	.012836	.010828	-.447214	
		.500000	-.405265	.006418	.005414	.894427	
10	10	.500000	1.175488	1.175297	.999829	0.000000	
		-1.400000	1.381772	.019439	.016537	-.447214	
		.300000	-.381772	.009719	.008268	.894427	
11	11	.500000	1.164000	1.163439	.999519	0.000000	
		-1.800000	1.354895	.032312	.027751	-.447214	
		.100000	-.354895	.016151	.013876	.894427	
12	12	.500000	1.166003	1.167855	.999873	0.000000	
		-1.935000	1.364231	.006398	.005477	-.938893	
		-.177300	-.364231	-.017450	-.014940	-.344208	
13	13	.500000	1.195403	1.195120	.999763	0.000000	
		-1.735000	1.428929	.019253	.016106	-.672591	
		-.477300	-.428929	-.017439	-.014638	-.740014	
14	14	.500000	1.218760	1.218532	.999813	0.000000	
		-1.400000	1.485377	.021080	.017296	-.447214	
		-.700000	-.485377	-.010540	-.008648	-.894427	

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X-FLOW

VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
1.232207 -.017153 .008577	.999879 -.013919 .006960	0.000000 .447214 .894427	.000000 .010857
1.236932 -.011243 .003274	.999955 -.009088 .002647	0.000000 .279631 .960107	.000000 .011576
1.234011 -.002482 .000333	.999998 -.002011 .000318	0.000000 .156305 .987709	.000000 .011805
1.220020 .010370 -.000524	.999964 .008500 -.000429	0.000000 .050436 .998727	.000000 .010980
1.206516 -.007029 -.003515	.999979 -.005826 -.002913	0.000000 -.447214 .894427	.000000 .011147
1.196331 .005573 .002787	.999986 .004659 .002329	0.000000 -.447214 .894427	.000000 .011654
1.185352 .012836 .006418	.999927 .010828 .005414	0.000000 -.447214 .894427	.000000 .010632
1.175237 .019439 .009719	.999829 .016537 .006268	0.000000 -.447214 .894427	.000000 .008609
1.163439 .032332 .016151	.999519 .027751 .013876	0.000000 -.447214 .894427	.000000 .004981
1.167855 .006398 .017450	.999873 .005477 -.014940	0.000000 -.938893 -.344208	.000000 .006411
1.195120 .019253 .017499	.999763 .016106 -.014638	0.000000 -.672591 -.740014	.000000 .007340
1.218532 .021080 .010540	.999813 .017296 -.008648	0.000000 -.447214 -.894427	.000000 .008900

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
3	15	.500000	1.234579	1.234462	.999905	0.000000	
		-1.000000	1.524186	.016316	.013216	-.279631	
		-.858250	-.524186	-.004752	-.003849	-.960107	
	16	.500000	1.244132	1.244037	.999964	0.000000	
		-.600000	1.547863	.010366	.008332	-.156305	
		-.948150	-.547863	-.001640	-.001319	-.987709	
	17	.500000	1.249397	1.249390	.999994	0.000000	
		-.200000	1.563993	.004210	.003369	-.050436	
		-.989900	-.560993	-.000213	-.000170	-.998727	
18	.500000	1.251259	1.251258	.999999	0.000000		
	.200000	1.565650	-.001969	-.001573	.050436		
	-.989900	-.565650	-.000099	-.000079	-.998727		
19	.500000	1.249969	1.249942	.999979	0.000000		
	.600000	1.562422	-.008053	-.006451	.156305		
	-.948150	-.562422	-.001276	-.001021	-.987709		
43	20	.500000	1.245269	1.245195	.999933	0.000000	
		1.000000	1.550694	-.013864	-.011133	.279631	
		-.858250	-.550694	-.004038	-.003242	-.960107	
	21	.500000	1.236471	1.236305	.999866	0.000000	
		1.400000	1.528862	-.018128	-.014661	.447214	
		-.700000	-.528862	-.009064	-.007331	-.894427	
	22	.500000	1.223413	1.223215	.999838	0.000000	
		1.735000	1.496738	-.016278	-.013306	.672591	
		-.477300	-.496738	-.014795	-.012093	-.740014	
23	.500000	1.213215	1.213153	.999949	0.000000		
	1.935000	1.471890	-.004220	-.003478	.938893		
	-.177300	-.471890	-.011510	-.009487	-.344208		
4	1	-.246068	1.156990	1.155568	.998771	-.049532	
		1.923092	1.338626	.053200	.045981	.939127	
		.174052	-.338626	.021401	.018497	.339980	
	2	-.249477	1.161134	1.160040	.999058	-.043145	
		1.726269	1.348232	.029883	.025736	.675151	
		.470688	-.348232	.040568	.034938	.736411	
	3	-.249169	1.165449	1.164708	.999364	-.034875	
		1.395016	1.358272	.010548	.005051	.449471	
		.692774	-.358272	.040195	.034489	.892614	

ODY

X-FLOW

VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
1.234452 .016316 -.004752	.999905 .013216 -.003849	0.000000 -.279631 -.960107	.000000 .010302
1.244037 .010366 -.001640	.999964 .008332 -.001319	0.000000 -.156305 -.987709	.000000 .011310
1.249390 .004210 -.000213	.999994 .003369 -.000170	0.000000 -.050436 -.998727	.000000 .011924
1.251258 -.001969 -.000099	.999999 -.001573 -.000079	0.000000 .050436 -.998727	.000000 .012193
1.249942 -.008053 -.001276	.999979 -.006451 -.001021	0.000000 .156305 -.987709	.000000 .012128
1.245195 -.013864 -.004038	.999933 -.011133 -.003242	0.000000 .279631 -.960107	.000000 .011700
1.236305 -.018128 -.009064	.999866 -.014661 -.007331	0.000000 .447214 -.894427	.000000 .010921
1.223215 -.016278 -.014795	.999838 -.013306 -.012093	0.000000 .672591 -.740014	.000000 .009613
1.213153 -.004220 -.011510	.999949 -.003478 -.009487	0.000000 .938893 -.344208	.000000 .009545
1.155568 .053200 .021401	.998771 .045981 .018497	-.049532 .939127 .339980	.000000 .004922
1.160040 .029883 .040568	.999058 .025736 .034938	-.043145 .675151 .736411	.000000 .004422
1.164708 .010548 .040195	.999364 .005051 .034489	-.034875 .449471 .892614	.000000 .004010

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX NPY NPZ	V1 VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ
4	4	-.249537 .998756 .850538	1.166421 1.360539 -.360539	1.165810 -.000124 .037770	.999476 -.000106 .032381	-.031043 .281449 .959074
	5	-.250016 .600001 .940749	1.163090 1.352777 -.352777	1.162505 -.008797 .035812	.999497 -.007555 .030790	-.029218 .157442 .987096
	6	-.250002 .200000 .982825	1.152040 1.327196 -.327196	1.151345 -.021558 .033690	.999397 -.018722 .029235	-.028252 .050769 .998310
	7	-.249496 -.199997 .896500	1.135124 1.288507 -.288517	1.134800 -.026978 .002870	.999714 -.023767 .002529	-.012608 -.434526 .900571
	8	-.250000 -.600000 .700000	1.119936 1.254256 -.254256	1.119873 -.010588 -.005294	.999944 -.009454 -.004727	0.000000 -.447214 .894427
44	9	-.250000 -1.000000 .500000	1.111342 1.235082 -.235082	1.111342 .001286 .000643	.999999 .001157 .000578	0.000000 -.447214 .894427
	10	-.250000 -1.400000 .300000	1.108832 1.229508 -.229508	1.108740 .012740 .006370	.999917 .011489 .005745	0.000000 -.447214 .894427
	11	-.247831 -1.793015 .100024	1.115217 1.243710 -.243710	1.114799 .017342 .025159	.999625 .015550 .022559	-.012880 -.460010 .887820
	12	-.248068 -1.923092 -.174052	1.128924 1.274468 -.274468	1.126893 -.065545 .016879	.998201 -.058060 .014951	-.049532 -.939127 -.339980
	13	-.249477 -1.726269 -.470688	1.147986 1.317872 -.317872	1.146858 -.042024 -.028665	.999018 -.036607 -.024969	-.043145 -.675158 -.736411
	14	-.249169 -1.395016 -.692774	1.160735 1.347306 -.347306	1.160026 -.020453 -.035024	.999389 -.017620 -.030174	-.034875 -.449471 -.892614
	15	-.249537 -.998756 -.850538	1.169028 1.366627 -.366627	1.168465 -.009974 -.034893	.999518 -.008532 -.029848	-.031043 -.281449 -.959074

DCX DCY DCZ	NX NY NZ	VN SIG
.999476	-.031043	.000000
-.000106	.281449	.004083
.032381	.959074	
.999497	-.029218	.000000
-.007555	.157442	.004254
.030790	.987096	
.999397	-.028252	.000000
-.016722	.050769	.004249
.029235	.998310	
.999714	-.012608	.000000
-.023767	-.434526	.000604
.002529	.900571	
.999944	0.000000	.000000
-.009454	-.447214	-.001173
-.004727	.894427	
.999999	0.000000	.000000
.001157	-.447214	-.001694
.000578	.894427	
.999917	0.000000	.000000
.011489	-.447214	-.002980
.005745	.894427	
.999625	-.012880	.000000
.015550	-.460010	-.003264
.022559	.887820	
.998201	-.049532	.000000
-.058060	-.939127	.007805
.014951	-.339980	
.999018	-.043145	.000000
-.036607	-.675158	.006628
-.024969	-.736411	
.999389	-.034875	.000000
-.017620	-.449471	.005602
-.030174	-.892614	
.999518	-.031043	.000000
-.008532	-.281449	.005201
-.029848	-.959074	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
4	16	-.250016	1.174210	1.173709	.999573	-.029218	
		-.600001	1.378769	-.005058	-.004308	-.157442	
		-.940749	-.378769	-.033935	-.028900	-.987096	
	17	-.250002	1.177071	1.176601	.999601	-.028252	
		-.200000	1.385497	-.002132	-.001854	-.050789	
		-.982825	-.385497	-.033187	-.028194	-.998310	
	18	-.250002	1.177939	1.177467	.999600	-.028252	
		.200000	1.387539	-.000154	-.000131	.050789	
		-.982825	-.387539	-.033330	-.028295	-.998310	
	19	-.250016	1.176983	1.176476	.999569	-.029218	
		.600001	1.385288	.002284	.001940	.157442	
		-.940749	-.385288	-.034459	-.029278	-.987096	
20	-.249537	1.174127	1.173553	.999511	-.031043		
	.998756	1.378574	.006132	.005248	.281449		
	-.850538	-.378574	-.036176	-.030811	-.959074		
21	-.249169	1.169520	1.168800	.999384	-.034875		
	1.395016	1.367777	.014296	.012223	.449471		
	-.692774	-.367777	-.038458	-.032892	-.892614		
22	-.249477	1.163098	1.162013	.999067	-.043145		
	1.726269	1.352797	.032273	.027748	.675158		
	-.470688	-.352797	-.038492	-.033094	-.736411		
23	-.248068	1.157588	1.156167	.998772	-.049532		
	1.923092	1.340010	.054224	.046642	.939127		
	-.174052	-.340010	-.013660	-.016120	-.339980		
5	1	-.743334	1.160425	1.146655	.988142	-.153543	
		1.874150	1.346587	.168493	.145199	.934141	
		.161626	-.346587	.057936	.049927	.322188	
	2	-.747389	1.166631	1.156305	.991149	-.132740	
1.690281		1.361028	.104989	.089994	.683173		
	.444215	-.361028	.113850	.097597	.718091		
3	-.747752	1.171864	1.164881	.994042	-.108809		
	1.373892	1.373264	.051919	.044296	.457325		
	.663304	-.373264	.235710	.099593	.882618		
4	-.747958	1.173024	1.167559	.995350	-.095703		
	.992572	1.375986	.020130	.017212	.288525		
	.819383	-.375986	-.111176	.094777	.952677		

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DCX DCY DCZ	NX NY NZ	VN SIG
.999573	-.029218	.000000
-.004308	-.157442	.005076
-.028900	-.987096	
.999601	-.028252	.000000
-.001854	-.050789	.004937
-.028194	-.998310	
.999600	-.028252	.000000
-.000131	.050789	.004786
-.028295	-.998310	
.999569	-.029218	.000000
.001940	.157442	.004603
-.029278	-.987096	
.999511	-.031043	.000000
.005248	.281449	.004347
-.030811	-.959074	
.999384	-.034875	.000000
.012223	.449471	.004212
-.032892	-.892614	
.999067	-.043145	.000000
.027748	.675158	.004566
-.033094	-.736411	
.998772	-.049532	.000000
.046842	.939127	.004987
-.016120	-.333980	
.988142	-.153543	-.000000
.145199	.934141	.015792
.049927	.322188	
.991149	-.132740	-.000000
.089994	.683173	.013445
.097597	.718091	
.994042	-.108809	-.000000
.044296	.457325	.010893
.099593	.882618	
.995350	-.095703	-.000000
.017212	.288525	.009621
.094777	.952677	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	X-FLOW					
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
5	5	-.750055 .600009 .910468	1.170769 1.370699 -.370699	1.165617 -.004751 .107457	.995771 -.004067 .091784	-.089915 .162020 .982682	
	6	-.750005 .200003 .953924	1.161565 1.349234 -.349234	1.156220 -.041893 .103132	.995398 -.036057 .086787	-.086851 .052106 .994858	
	7	-.748551 -.199961 .882279	1.145511 1.312195 -.312195	1.143638 -.060743 .024440	.998365 -.053027 .021335	-.034925 -.379842 .924189	
	8	-.750000 -.600000 .700000	1.124601 1.264728 -.264728	1.124251 -.025092 -.012546	.999689 -.022312 -.011156	0.000000 -.447214 .894427	
	9	-.750000 -1.000000 .500000	1.114870 1.242934 -.242934	1.114851 -.004028 -.002014	.999992 -.003613 -.001807	0.000000 -.447214 .894427	
	10	-.750000 -1.400000 .300000	1.115443 1.244214 -.244214	1.115255 .018316 .009158	.999831 .016420 .006210	0.000000 -.447214 .894427	
	11	-.741375 -1.764760 .190234	1.132611 1.282807 -.282807	1.130300 .017624 .070123	.997960 .015560 .061913	-.044855 -.519160 .853499	
	12	-.743334 -1.874150 -.161626	1.132236 1.261958 -.261958	1.115714 -.191336 .023044	.985408 -.168990 .020353	-.153543 -.934141 -.322188	
	13	-.747389 -1.690281 -.444215	1.151358 1.325626 -.325626	1.140795 -.126978 -.090072	.990816 -.110286 -.076231	-.132740 -.683173 -.718091	
	14	-.747752 -1.373892 -.663304	1.165286 1.357891 .357891	1.158299 -.009591 -.1067+1	.994004 -.059712 -.091601	-.108869 -.457325 -.882618	
	15	-.747958 -.992572 -.819383	1.173015 1.375964 -.375964	1.167615 -.038301 -.105695	.995397 -.032652 -.090106	-.095703 -.288525 -.952677	
	16	-.750055 -.600009 -.910468	1.177768 1.387138 -.387138	1.172992 -.020972 -.103871	.995944 -.017807 -.086193	-.089915 -.162020 -.982682	

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DCX DCY DCZ	NX NY NZ	VN SIG
95771	-.089915	.000000
84067	.162020	.009344
91784	.982682	
95398	-.086851	-.000000
36057	.052106	.009411
88787	.994858	
98365	-.039925	.000000
53027	-.379842	-.000416
21335	.924189	
99689	0.000000	.000000
22312	-.447214	-.007092
11156	.894427	
99992	0.000000	.000000
03613	-.447214	-.007455
91807	.894427	
99831	0.000000	.000000
16420	-.447214	-.009000
08210	.894427	
97960	-.044355	.000000
5560	-.519160	-.005237
51913	.853499	
95408	-.153543	-.000000
88990	-.934141	.022041
20353	-.322186	
00816	-.132740	-.000000
0286	-.683173	.010214
8231	-.718091	
04004	-.108809	-.000000
9712	-.457325	.014426
01601	-.882618	
5397	-.095703	-.000000
2652	-.288525	.012115
00106	-.952677	
5944	-.089915	.000000
7807	-.162020	.011020
8193	-.982682	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
5	17	-.750005	1.180390	1.175928	.996219	-.086851	
		-.200003	1.393322	-.007814	-.006620	-.052106	
		-.953924	-.393322	-.102249	-.086623	-.994858	
18	18	-.750005	1.181278	1.176812	.996220	-.086851	
		.200003	1.395417	.003321	.002812	.052106	
		-.953924	-.395417	-.102562	-.086823	-.994858	
19	19	-.750055	1.180608	1.175825	.995949	-.086915	
		.600009	1.393835	.015737	.013304	.162020	
		-.910468	-.393835	-.104938	-.088936	-.982682	
20	20	-.747958	1.178349	1.172939	.995409	-.095703	
		.992572	1.388506	.031346	.026601	.288525	
		-.819383	-.388506	-.108337	-.091940	-.952677	
21	21	-.747752	1.174632	1.167657	.994063	-.108809	
		1.373892	1.379760	.058416	.049732	.457325	
		-.663334	-.379760	-.113680	-.096779	-.882618	
22	22	-.747389	1.167891	1.157552	.991148	-.132740	
		1.690281	1.363969	.108970	.093305	.663173	
		-.444215	-.363969	-.110314	-.094447	-.718091	
23	23	-.743334	1.160774	1.146999	.988133	-.153543	
		1.874150	1.347396	.170110	.146548	.934141	
		-.161626	-.347396	-.053408	-.046011	-.322188	
6	1	-1.229655	1.132362	1.090828	.963321	-.268347	
		1.773614	1.282243	.291159	.257134	.921489	
		.134912	-.282243	.086937	.076775	.280799	
	2	2	-1.245329	1.144713	1.111521	.971003	-.239765
			1.614691	1.310369	.197828	.172819	.702123
		.336555	-.310369	.189089	.165185	.670724	
3	3	-1.245068	1.158983	1.136725	.980795	-.194936	
		1.329324	1.343242	.102834	.088779	.475316	
		.600627	-.343242	.201273	.173663	.857948	
4	4	-1.245783	1.165866	1.148618	.985205	-.170981	
		.979004	1.359244	.048514	.041612	.304683	
		.753512	-.359244	.193825	.166250	.936981	
5	5	-1.250120	1.169561	1.154226	.986888	-.159881	
		.600034	1.367873	.006877	.005880	.172638	
		.846449	-.367873	.188649	.161299	.971923	

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DCX DCY DCZ	NX NY NZ	VN SIG
.996219	-.056851	.000000
-.006620	-.052106	.010240
-.086623	-.994858	
.996220	-.086851	.000000
.002812	.052106	.009850
-.086823	-.994858	
.995949	-.089915	.000000
.013304	.162020	.009820
-.088936	-.982682	
.995409	-.095703	-.000000
.026601	.288525	.010025
-.091940	-.952677	
.994063	-.108809	-.000000
.049732	.457325	.011212
-.096779	-.882618	
.991148	-.132740	-.000000
.093305	.683173	.013668
-.094447	-.718091	
.988133	-.153543	-.000000
.146548	.934141	.015888
.046011	-.322188	
.963321	-.268347	-.000000
.257134	.921489	.027232
.076775	.280799	
.971003	-.239765	-.000000
.172819	.702123	.024419
.165185	.670724	
.980795	-.194936	-.000000
.088779	.475316	.019161
.173663	.857948	
.985205	-.170981	-.000000
.041612	.304683	.016512
.166250	.936981	
.986888	-.159881	-.000000
.005880	.172638	.015703
.161299	.971923	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ VP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
6	6	-1.250012	1.170850	1.155253	.986679	-.153515	
		.200010	1.370889	-.053638	-.045811	.055250	
		.893198	-.370889	.102761	.156093	.986601	
7	7	-1.248100	1.174562	1.168791	.995078	-.074106	
		-.199835	1.379597	-.096906	-.082504	-.251846	
		.852389	-.379597	.064470	.054888	.964926	
8	8	-1.250000	1.154940	1.154001	.999187	0.000000	
		-.600000	1.333886	-.041635	-.036050	-.447214	
		.700000	-.333886	-.020818	-.010025	.894427	
9	9	-1.250000	1.138016	1.137954	.999954	0.000000	
		-1.000000	1.295081	-.009750	-.008568	-.447214	
		.500000	-.295081	-.004875	-.004284	.894427	
10	10	-1.250000	1.143892	1.143401	.999571	0.000000	
		-1.400000	1.308488	.029956	.026188	-.447214	
		.300000	-.308488	.014978	.013094	.894427	
11	11	-1.225923	1.161360	1.150415	.990576	-.105654	
		-1.707445	1.348756	-.011041	-.009507	-.687853	
		.100626	-.348756	.158631	.136634	.718119	
12	12	-1.229655	1.118520	1.069961	.956586	-.268347	
		-1.773614	1.251088	-.323600	-.289310	-.921489	
		-.134912	-.251088	.039432	.035254	-.260799	
13	13	-1.245329	1.130909	1.097016	.970030	-.239065	
		-1.614691	1.278956	-.230259	-.203614	-.702123	
		-.386555	-.278956	-.149960	-.132601	-.670724	
14	14	-1.245068	1.151328	1.129039	.980641	-.194936	
		-1.329324	1.325556	-.127799	-.111993	-.475316	
		-.600627	-.325556	-.185734	-.161321	-.857948	
15	15	-1.245783	1.162543	1.145364	.985223	-.170981	
		-.979004	1.351506	-.072753	-.062581	-.314683	
		-.753512	-.351506	-.185350	-.159435	-.936981	
16	16	-1.250120	1.169385	1.154316	.987114	-.159881	
		-.600034	1.367462	-.040457	-.034597	-.172638	
		-.846449	-.367462	-.162639	-.156235	-.971923	
17	17	-1.250012	1.172927	1.159016	.988140	-.153515	
		-.200010	1.375757	-.014301	-.012192	-.055250	
		-.893198	-.375757	-.179542	-.153072	-.986601	

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	NX NY NZ	VN SIG
679	-.153515	-.000000
811	.055250	.015444
093	.986601	
078	-.074106	.000000
504	-.251846	.001059
888	.964926	
187	0.000000	.000000
050	-.447214	-.013633
025	.894427	
954	0.000000	.000000
568	-.447214	-.013916
284	.894427	
571	0.000000	.000000
188	-.447214	-.016569
094	.894427	
576	-.105654	.000000
507	-.687853	-.002403
634	.718119	
586	-.268347	-.000000
310	-.921489	.036006
254	-.280799	
030	-.239065	-.000000
614	-.702123	.031398
601	-.670724	
641	-.194936	-.000000
993	-.475316	.024287
321	-.857948	
223	-.170981	-.000000
581	-.314683	.020145
435	-.936981	
114	-.159881	-.000000
597	-.172638	.018139
235	-.971923	
140	-.153515	-.000000
192	-.055250	.016626
072	-.986601	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
6	18	-1.250012	1.173694	1.159779	.988144	-.153515	
		.200013	1.377557	.007693	.006552	.055250	
		-.893198	-.377557	-.180031	-.153388	-.986601	
19	19	-1.250120	1.171902	1.156827	.987136	-.159881	
		.600034	1.373354	.032555	.027788	.172638	
		-.846449	-.373354	-.184514	-.157448	-.971923	
20	20	-1.245783	1.167332	1.150142	.985274	-.170981	
		.979004	1.362663	.062430	.053481	.304683	
		-.753512	-.362663	-.189579	-.162403	-.936981	
21	21	-1.245768	1.159668	1.137419	.980815	-.194936	
		1.329324	1.344829	.111184	.095876	.475316	
		-.610627	-.344829	-.196837	-.169736	-.857948	
22	22	-1.245329	1.144845	1.111627	.970984	-.239065	
		1.614691	1.310671	.202859	.177193	.702123	
		-.386555	-.310671	-.183850	-.160598	-.670724	
23	23	-1.229655	1.132343	1.090782	.963296	-.268347	
		1.773614	1.282201	.293104	.258848	.921489	
		-.134912	-.282201	-.080540	-.071127	-.280799	
7	1	-1.699678	1.071793	.975394	.910058	-.414479	
		1.611865	1.148740	.431871	.402943	.885202	
		.096576	-.148740	.104095	.097113	.211244	
2	2	-1.733772	1.092781	1.014192	.928083	-.372374	
		1.484752	1.194171	.318158	.291155	.725701	
		.297994	-.194171	.253683	.232145	.578529	
3	3	-1.738932	1.121965	1.066664	.950711	-.310024	
		1.250730	1.258805	.179768	.160226	.507279	
		.497910	-.258805	.297852	.265474	.804085	
4	4	-1.738266	1.142165	1.099857	.962958	-.269527	
		.954054	1.304542	.097975	.085780	.335023	
		.644837	-.304542	.291988	.255644	.902837	
5	5	-1.750276	1.158627	1.121590	.968034	-.250229	
		.600104	1.342417	.037916	.032716	.193980	
		.739306	-.342417	.288124	.248677	.948555	
6	6	-1.750025	1.174333	1.139526	.970360	-.237694	
		.200030	1.379059	-.034967	-.029776	.061556	
		.792992	-.379059	.281632	.239823	.969388	

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DCX DCY DCZ	NX NY NZ	VN SIG
.986144	-.153515	-.000000
.006552	.055250	.016044
-.153388	-.986601	
.987136	-.159881	-.000000
.027788	.172638	.016340
-.157448	-.971923	
.985274	-.170981	-.000000
.053481	.304683	.017048
-.162403	-.936981	
.980815	-.194936	.000000
.095876	.475316	.019582
-.169736	-.857948	
.970984	-.239065	-.000000
.177193	.702123	.024706
-.160598	-.670724	
.963296	-.268347	-.000000
.258848	.921489	.027344
-.071127	-.280799	
.910058	-.414479	-.000000
.402943	.885202	.041810
.097113	.211244	
.928083	-.372374	-.000000
.291155	.725701	.037841
.232145	.578529	
.950711	-.310024	-.000000
.160226	.507279	.030138
.265474	.804085	
.962958	-.269527	-.000000
.085780	.335023	.025359
.255644	.902837	
.968034	-.250229	-.000000
.032716	.193980	.023756
.248677	.948555	
.970360	-.237694	-.000000
.029776	.061556	.022518
.239823	.969388	

BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX NPY NPZ	VT VTSQ CF	VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
7	7	-1.749550 -.199759 .782469	1.205607 1.453488 -.453488	1.178688 -.115921 .225260	.977672 -.096152 .186851	-.197278 -.113683 .973734	.000000 .015226
	8	-1.747311 -.599857 .679777	1.230972 1.515291 -.515291	1.225355 -.100709 .06047	.995437 -.081813 .049105	-.075980 -.368319 .926589	.000000 -.008677
	9	-1.750000 -1.000000 .500000	1.227380 1.506461 -.506461	1.227221 -.017632 -.008816	.999871 -.014365 -.007183	0.000000 -.447214 .894427	.000000 -.024519
	10	-1.720409 -1.352829 .314114	1.218753 1.485359 -.485359	1.215655 .022100 .083999	.997458 .018133 .068914	-.050829 -.496741 .866409	.000000 -.018933
	11	-1.762537 -1.550513 .113943	1.166416 1.360526 -.360526	1.083066 -.292335 .319428	.928542 -.250627 .273854	-.348626 -.842191 .411307	-.000000 .034454
	12	-1.699678 -1.611865 -.096576	1.081512 1.169668 -.169668	.977211 -.462855 .022186	.903560 -.427970 .020514	-.414479 -.685202 -.211244	0.000000 .049582
	13	-1.733772 -1.484752 -.297994	1.086144 1.179709 -.179709	1.006208 -.356337 -.200604	.926404 -.328121 -.184693	-.372374 -.725701 -.576529	-.000000 .045341
	14	-1.738932 -1.250730 -.497910	1.114650 1.242445 -.242445	1.059335 -.210056 -.275918	.950374 -.188450 -.247538	-.310024 -.507279 -.804085	-.000000 .035901
	15	-1.738266 -.954054 -.644837	1.136204 1.290960 -.290960	1.093988 -.125252 -.280114	.962844 -.110237 -.246534	-.269527 -.335023 -.902837	-.000000 .029572
	16	-1.750276 -.600104 -.739306	1.151282 1.325451 -.325451	1.114573 -.071497 -.279403	.968114 -.062102 -.242689	-.250229 -.193980 -.948555	-.000000 .026698
	17	-1.750025 -.200030 -.792992	1.158015 1.340998 -.340998	1.124810 -.023565 -.274307	.971326 -.020350 -.236877	-.237694 -.061556 -.969388	-.000000 .024180
	18	-1.750025 .290030 -.792992	1.158514 1.342154 -.342154	1.125308 .015083 -.274958	.971338 .013019 -.237345	-.237694 .061556 -.969388	-.000000 .023503

BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
7	19	-1.750276 .600104 -.739306	1.152916 1.329215 -.329215	1.113233 .060952 -.281996	.966183 .052876 -.244593	-.250229 .193986 -.948555	-.000000 .024579
	20	-1.738266 .954054 -.644837	1.139416 1.298269 -.298269	1.097239 .111503 -.286196	.962984 .097859 -.251169	-.269527 .335023 -.902837	-.000000 .026002
	21	-1.738932 1.250730 -.497910	1.120131 1.254694 -.254694	1.064935 .188418 -.291729	.950724 .168210 -.260442	-.310024 .507279 -.804085	-.000000 .030634
	22	-1.733772 1.484752 -.297994	1.091523 1.191423 -.191423	1.012990 .323355 -.246391	.928052 .296251 -.225731	-.372374 .725701 -.578529	-.000000 .038158
	23	-1.699678 1.611865 -.096576	1.071357 1.147806 -.147806	.974973 .433696 -.095654	.910036 .404800 -.089283	-.414479 .885202 -.211244	-.000000 .041913
		*****		*****		*****	
8	1	-2.218024 1.240723 .149617	.953089 .908378 .091622	.763560 .521127 .231907	.802143 .546777 .243322	-.597981 .747834 .288382	-.000000 .065691
	2	-2.214445 .990269 .411287	1.078634 1.163451 -.163451	.975937 .237422 .393304	.904762 .220114 .364631	-.425912 .463200 .777203	-.000000 .039168
	3	-2.250969 .670392 .560379	1.127743 1.271805 -.271805	1.034668 .117301 .433021	.917468 .104014 .383971	-.397801 .246251 .883807	-.000000 .136289
	4	-2.250072 .200101 .632913	1.160877 1.347636 -.347636	1.079656 .007608 .426496	.930043 .006554 .367391	-.366809 .075569 .927222	-.000000 .032128
	5	-2.250072 -.200101 .632913	1.187823 1.410923 -.410923	1.104142 -.082736 .430056	.929551 -.069654 .362054	-.366809 -.075569 .927222	-.000000 .032261
	6	-2.250383 -.600126 .553499	1.215486 1.477407 -.477407	1.127098 -.178891 .418424	.927273 -.147176 .344244	-.372805 -.278586 .885102	-.000000 .031772

BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
8	7	-2.218355 -.956945 .416059	1.206050 1.454557 -.454557	1.107315 -.246493 .409454	.918133 -.204380 .339500	-.396212 -.458473 .795499	-.000000 .033983
	8	-2.212088 -1.209729 .166619	1.083768 1.174554 -.174554	.912254 -.477795 .337711	.841752 -.440855 .311608	-.537231 -.740960 .402941	-.000000 .058742
	9	-2.218024 -1.240723 -.149617	.965398 .931993 .068007	.772784 -.555522 .161641	.800483 -.575433 -.167642	-.597981 -.747834 -.288382	-.000000 .069724
	10	-2.214445 -.990269 -.411287	1.074426 1.154391 -.154391	.971412 -.269128 -.371939	.904113 -.250485 -.346175	-.425912 -.463200 -.777203	.000000 .043639
	11	-2.250969 -.600392 -.560379	1.117305 1.248370 -.248370	1.024801 -.145030 -.420854	.917209 -.129804 -.376669	-.397801 -.246251 -.883807	-.000000 .039174
	12	-2.250074 -.200104 -.632837	1.138957 1.297223 -.297223	1.059640 -.042453 -.415432	.930360 -.037274 -.364748	-.366578 -.075231 -.927341	-.000000 .033966
	13	-2.250074 .200104 -.632837	1.139033 1.297395 -.297395	1.059741 .032406 -.416287	.930387 .028451 -.365474	-.366578 .075231 -.927341	-.000000 .033347
	14	-2.250969 .600392 -.560379	1.117486 1.248774 -.248774	1.025191 .131954 -.424672	.917408 .118082 -.380025	-.397801 .246251 -.883807	.000000 .037211
	15	-2.214445 .990269 -.411287	1.073381 1.152146 -.152146	.971068 .246456 -.385268	.904682 .229607 -.358930	-.425912 .463200 -.777203	.000000 .039860
	16	-2.218024 1.240723 -.149617	.950934 .904276 .095724	.762055 .524166 -.220904	.801375 .551212 -.232302	-.597981 .747834 -.288382	-.000000 .065833

9	1	-2.626833 .687692 .149145	.660120 .435759 .564241	.326828 .468030 .331497	.495104 .709007 .502177	-.868756 .411733 .275208	.000000 .104713
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52

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW			VN SIG
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ		
9	2	-2.629150	.835434	.526675	.630421	-.776209	-.000000	
		.434170	.697949	.195323	.233798	.200002	.088646	
		.336208	.302051	.618394	.740208	.597912		
3		-2.635472	.675817	.591517	.672319	-.740175	.000000	
		.141262	.774078	.046040	.052329	.062764	.086147	
		.389779	.225922	.649655	.738410	.669478		
4		-2.635472	.690766	.598838	.672273	-.740175	-.000000	
		-.141262	.793463	-.079632	-.089465	-.062764	.086400	
		.389779	.206537	.654604	.734878	.669478		
5		-2.629150	.869668	.548218	.630376	-.776209	.000000	
		-.434170	.756323	-.228735	-.263014	-.200002	.089524	
		.336208	.243677	.635135	.730376	.597912		
6		-2.626833	.703717	.348373	.495047	-.868756	.000000	
		-.687692	.495218	-.497144	-.706454	-.411733	.106041	
		.149145	.504782	.355953	.505818	.275208		
7		-2.626833	.664268	.328750	.494906	-.868756	.000000	
		-.687692	.441252	-.493026	-.742209	-.411733	.106522	
		-.149145	.558748	-.300168	-.451879	-.275208		
8		-2.629150	.620631	.517297	.630352	-.776209	.000000	
		-.434170	.673435	-.217408	-.264928	-.200002	.090273	
		-.336208	.326565	-.598819	-.729705	-.597912		
9		-2.635472	.857280	.576419	.672381	-.740175	-.000000	
		-.141262	.734930	-.067674	-.078941	-.062764	.187213	
		-.389779	.265070	-.630944	-.735984	-.669478		
10		-2.635472	.856967	.576233	.672410	-.740175	-.000000	
		.141262	.734392	.056429	.065847	.062764	.086864	
		-.389779	.265608	-.631793	-.737244	-.669478		
11		-2.629150	.819951	.516958	.630475	-.776209	.000000	
		.434170	.672319	.203153	.247763	.200002	.089184	
		-.336208	.327681	-.603160	-.735605	-.597912		
12		-2.626833	.653104	.323443	.495240	-.868756	-.000000	
		.687692	.426545	.471156	.721410	.411733	.104895	
		-.149145	.573455	-.316135	-.484050	-.275208		

LEAVING FRINT1

LEAVING MAIN

54

C-2

FLOPNT

BODY IDENTIFIER IS TEST

NUMBER OF SYMMETRY PLANES= 0

NUMBER OF QUADRANTS

55

FOLDOUT FRA. |

0

NUMBER OF QUADRALATERALS= 189

MACH NUMBER= 0.

PERCENT FRAI.

2

FLOPNT RUN ID -
TEST PROBLEM WITH TEST BODY

INPUT DATA -

INITIAL X=-4.5000E+00 INCREMENT= 1.0000E+00 NUMBER OF VALUES= 4
 INITIAL Y= 0. INCREMENT= 0. NUMBER OF VALUES= 1
 INITIAL Z= 1.0000E+00 INCREMENT=-5.0000E-01 NUMBER OF VALUES= 5

X AXIS IS INCREMENTED FIRST
 Y AXIS IS INCREMENTED THIRD
 Z AXIS IS INCREMENTED SECOND

* INDICATES THE POINT IS INSIDE THE BODY

56

X	Y	Z	VX	VY	VZ
-4.5000000	0.0000000	1.0000000	9.4274E-01	-1.8463E-03	3.1225E-02
-3.5000000	0.0000000	1.0000000	8.9363E-01	-5.2665E-03	1.0830E-01
-2.5000000	0.0000000	1.0000000	9.8504E-01	-2.1047E-02	2.8638E-01
-1.5000000	0.0000000	1.0000000	1.1528E+00	-7.7206E-02	1.6956E-01

X	Y	Z	VX	VY	VZ
-4.5000000	0.0000000	.5000000	9.2699E-01	-1.8687E-03	2.0175E-02
-3.5000000	0.0000000	.5000000	8.0239E-01	-5.3770E-03	1.0116E-01
	INSIDE QUAD 179	I2= 1			
	ZNP,ROSQ,TSQ,H=	-8.9149E-02	2.2821E-01	1.0355E+00	1.0000E-01
	INSIDE QUAD 180	I2= 1			
	ZNP,ROSQ,TSQ,H=	-3.5348E-02	6.6282E-02	6.7553E-01	1.0000E-01
	INSIDE QUAD 181	I2= 1			
	ZNP,ROSQ,TSQ,H=	-3.5348E-02	6.6282E-02	6.7553E-01	1.0000E-01
	INSIDE QUAD 182	I2= 1			
	ZNP,ROSQ,TSQ,H=	-8.9149E-02	2.2821E-01	1.0355E+00	1.0000E-01
-2.5000000	0.0000000	.5000000	1.4449E+00	-2.2314E-02	1.2787E-01
-1.5000000	0.0000000	.5000000	1.2122E+00	-6.2494E-02	3.9898E-02

X	Y	Z	VX	VY	VZ
-4.5000000	0.0000000	0.0000000	9.1975E-01	-1.7342E-03	1.5068E-03
-3.5000000	0.0000000	0.0000000	7.3093E-01	-4.4575E-03	4.6059E-03
-2.5000000	0.0000000	0.0000000	1.2744E+00	-1.3880E-02	1.8615E-02
-1.5000000	0.0000000	0.0000000	1.2164E+00	-3.8605E-02	3.3288E-02

X	Y	Z	VX	VY	VZ
-4.5000000	0.0000000	-.5000000	9.2565E-01	-1.4964E-03	-1.7501E-02
-3.5000000	0.0000000	-.5000000	7.9717E-01	-3.3034E-03	-9.4089E-02
	INSIDE QUAD 185	I2= 1			
	ZNP,ROSQ,TSQ,H=	-8.9149E-02	2.2821E-01	1.0355E+00	1.0000E-01
	INSIDE QUAD 186	I2= 1			
	ZNP,ROSQ,TSQ,H=	-3.5348E-02	6.6282E-02	6.7553E-01	1.0000E-01
	INSIDE QUAD 187	I2= 1			
	ZNP,ROSQ,TSQ,H=	-3.5348E-02	6.6282E-02	6.7553E-01	1.0000E-01
	INSIDE QUAD 188	I2= 1			
	ZNP,ROSQ,TSQ,H=	-8.9149E-02	2.2821E-01	1.0355E+00	1.0000E-01
-2.5000000	0.0000000	-.5000000	1.4261E+00	-4.1937E-03	-1.0065E-01
-1.5000000	0.0000000	-.5000000	1.2105E+00	-1.1531E-02	1.9700E-02

+00 NUMBER OF VALUES= 4
 NUMBER OF VALUES= 1
 -01 NUMBER OF VALUES= 5

E THE BODY

	VY	VZ	V
+01	-1.8463E-03	3.1225E-02	9.4326E-01
-01	-5.2865E-03	1.7830E-01	9.0019E-01
-01	-2.1647E-02	2.8638E-01	1.0260E+00
+00	-7.7206E-02	1.6956E-01	1.1678E+00

	VY	VZ	V
-01	-1.8687E-03	2.0175E-02	9.2720E-01
-01	-5.3770E-03	1.0116E-01	8.0876E-01

1.0355E+00 1.0000E-01

6.7553E-01 1.0000E-01

6.7553E-01 1.0000E-01

1.0355E+00 1.0000E-01

+00	-2.2314E-02	1.2787E-01	1.4506E+00 *
+00	-6.2494E-02	3.9898E-02	1.2145E+00

	VY	VZ	V
+01	-1.7342E-03	1.5068E-03	9.1975E-01
+01	-4.4575E-03	4.6059E-03	7.3096E-01
+00	-1.3680E-02	1.8615E-02	1.2746E+00
+00	-3.0605E-02	3.3288E-02	1.2173E+00

	VY	VZ	V
01	-1.4964E-03	-1.7501E-02	9.2582E-01
01	-3.3034E-03	-9.4089E-02	8.0271E-01

1.0355E+00 1.0000E-01

6.7553E-01 1.0000E-01

6.7553E-01 1.0000E-01

1.0355E+00 1.0000E-01

00	-4.1937E-03	-1.0065E-01	1.4297E+00 *
00	-1.1531E-02	1.9700E-02	1.2108E+00

PRINT FRAM. 2

X	Y	Z	VX	VY	VZ	V
-4.5000000	0.0000000	-1.0000000	9.4052E-01	-1.2184E-03	-2.9389E-02	9.4098E-01
-3.5000000	0.0000000	-1.0000000	8.8645E-01	-2.3480E-03	-1.0521E-01	8.9268E-01
-2.5000000	0.0000000	-1.0000000	9.6251E-01	-3.3361E-03	-2.8834E-01	1.0048E+00
-1.5000000	0.0000000	-1.0000000	1.1359E+00	-2.5233E-03	-2.0899E-01	1.1550E+00

* INDICATES THE POINT IS INSIDE THE BODY

ARYTRJ

BODY IDENTIFIER IS TEST

NUMBER OF SYMMETRY PLANES= 0

NUMBER OF QUADRANT

58

FOLDOUT FRA. |

PLANES= 0

NUMBER OF QUADRALATERALS= 189

MACH NUMBER= 0.

FOR OUT FRAM. 2

ARYTRJ RUN ID -
TEST PROBLEM WITH TEST BODY

PHYSICAL INPUT DATA -

AIR SPEED= 9.000000E+01 CHARACTERISTIC DIMENSION OF THE BODY= 1.000000E+00
DENSITY AND TEMPERATURE OF AIR ARE 9.092500E-01 AND 2.686590E+02 AIR VISCOS

NUMERICAL INTEGRATOR INPUTS -

TIME STEP= 1.00000E-01 MINIMUM TIME STEP= 5.00000E-03 PRINT TIME INTERVAL= 1.0

LOCAL ERROR TOLERANCES FOR OVDG - 1.00000E-05 1.00000E-05 1.00000E-05

DIMENSION OF THE BODY= 1.000000E+00
00E-01 AND 2.686590E+02 AIR VISCOSITY IS 1.693764E-05

5.0000E-03 PRINT TIME INTERVAL= 1.0000E+00 X COORD. OF FINAL FLANE= 0.
0E-05 1.0000E-05 1.0000E-05

PRINT OUT FRA!

2

WATER DROP DIAMETER = 3.00000E+02 MICROMETERS

PARTICLE SETTLING SPEED= 1.27827E+00 M/SEC

INITIAL X=-5.00000E+00 INCREMENT= 0. NUMBER OF VALUES= 1
INITIAL Y=-1.00000E+00 INCREMENT= 2.00000E+00 NUMBER OF VALUES= 2
INITIAL Z= 1.00000E+00 INCREMENT=-2.00000E+00 NUMBER OF VALUES= 2

X AXIS IS INCREMENTED THIRD
Y AXIS IS INCREMENTED FIRST
Z AXIS IS INCREMENTED SECOND

***** INITIAL COORDINATES X=-5.00000E+00 Y=-1.00000E+00 Z= 1.00000E+00
IFLAG= 7 FOR KSTEP= 27 NEVAL= 49 HMIN IS SET TO 3.1250E-03

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.00000E+00	-1.00000E+00	1.00000E+00	9.6596E-01	-1.4267E-02
		H= 1.00000E-01	R= 2.0586E+01	AC= 0.	NEVAL= 1	
10	1.00000E+00	-4.0344E+00	-1.0145E+00	1.0021E+00	9.6478E-01	-1.5232E-02
		H= 1.00000E-01	R= 6.8363E+01	AC= 7.6443E-04	NEVAL= 12	
11	1.00000E+00	-4.0344E+00	-1.0145E+00	1.0021E+00	9.6478E-01	-1.5232E-02
		H= 1.00000E-01	R= 7.6138E+01	AC= 6.1633E-04	NEVAL= 13	
21	2.00000E+00	-3.0718E+00	-1.0325E+00	1.0094E+00	9.5991E-01	-2.2680E-02
		H= 1.00000E-01	R= 1.8029E+02	AC= 5.1929E-04	NEVAL= 31	
31	2.3125E+00	-2.7720E+00	-1.0404E+00	1.0151E+00	9.5930E-01	-2.7841E-02
		H= 3.1250E-03	R= 2.0134E+02	AC= 5.1575E-04	NEVAL= 57	
41	2.4000E+00	-2.6881E+00	-1.0429E+00	1.0172E+00	9.5956E-01	-2.9385E-02
		H= 1.2500E-02	R= 2.0860E+02	AC= 5.0905E-04	NEVAL= 77	
51	2.8000E+00	-2.3035E+00	-1.0561E+00	1.0293E+00	9.6440E-01	-3.6556E-02
		H= 1.00000E-01	R= 2.2229E+02	AC= 4.9923E-04	NEVAL= 97	
54	3.0000E+00	-2.1101E+00	-1.0637E+00	1.0373E+00	9.6916E-01	-3.9522E-02
		H= 1.00000E-01	R= 2.0962E+02	AC= 5.3733E-04	NEVAL= 104	
64	3.2500E+00	-1.8670E+00	-1.0739E+00	1.0492E+00	9.7641E-01	-4.2069E-02
		H= 1.2500E-02	R= 1.9778E+02	AC= 5.6993E-04	NEVAL= 130	
74	3.5000E+00	-1.6219E+00	-1.0846E+00	1.0613E+00	9.8411E-01	-4.3370E-02
		H= 5.0000E-02	R= 1.7680E+02	AC= 5.9854E-04	NEVAL= 150	
81	4.0000E+00	-1.1265E+00	-1.1064E+00	1.0860E+00	9.9693E-01	-4.3131E-02
		H= 2.0000E-01	R= 1.4402E+02	AC= 6.9847E-04	NEVAL= 164	
86	5.0000E+00	-1.1968E-01	-1.1471E+00	1.1313E+00	1.0160E+00	-3.7496E-02
		H= 2.0000E-01	R= 1.5173E+02	AC= 6.0353E-04	NEVAL= 175	
86	5.1177E+00	0.	-1.1515E+00	1.1361E+00	1.0181E+00	-3.6517E-02
		H= 2.0000E-01	R= 1.5173E+02	AC= 6.2904E-04	NEVAL= 175	

INITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -

ALPHA0= -0.8462 BETA0= 0.0988
ALPHA1= -2.0542 BETA1= 2.2413

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 0.2179E-01 3.8626E-01 -4.1888E-01 ANGLES A AND GAMMA
AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.10221E+00 1.01954E+00

***** INITIAL COORDINATES X=-5.00000E+00 Y= 1.00000E+00 Z=-1.00000E+00
IFLAG= 7 FOR KSTEP= 28 NEVAL= 60 HMIN IS SET TO 3.1250E-03

ROMETERS

27827E+00 M/SEC

000E+00 NUMBER OF VALUES= 1
 000E+00 NUMBER OF VALUES= 2
 000E+00 NUMBER OF VALUES= 2

E+00 Y=-1.00000E+00 Z= 1.00000E+00
 HMIN IS SET TO 3.1250E-03

Z	VPX	VPY	VPZ	VX	VY	VZ
000E+00	9.6596E-01	-1.4267E-02	1.6667E-03	9.6596E-01	-1.4267E-02	1.5870E-02
	NEVAL=	1				
021E+00	9.6478E-01	-1.5232E-02	3.1541E-03	9.4312E-01	-3.4403E-02	4.0864E-02
443E-04	NEVAL=	12				
021E+00	9.6478E-01	-1.5232E-02	3.1541E-03	9.4151E-01	-3.7761E-02	4.5294E-02
630E-04	NEVAL=	13				
094E+00	9.5991E-01	-2.2680E-02	1.4476E-02	9.4637E-01	-8.7974E-02	1.2261E-01
929E-04	NEVAL=	31				
151E+00	9.5930E-01	-2.7841E-02	2.2740E-02	9.6591E-01	-9.7990E-02	1.4245E-01
575E-04	NEVAL=	57				
172E+00	9.5956E-01	-2.9385E-02	2.5288E-02	9.7691E-01	-1.0088E-01	1.4898E-01
905E-04	NEVAL=	77				
293E+00	9.6440E-01	-3.6556E-02	3.7613E-02	1.0420E+00	-9.9754E-02	1.5379E-01
923E-04	NEVAL=	97				
373E+00	9.6916E-01	-3.9522E-02	4.2861E-02	1.0858E+00	-8.3119E-02	1.2343E-01
730E-04	NEVAL=	104				
492E+00	9.7641E-01	-4.2069E-02	4.7262E-02	1.0977E+00	-7.2147E-02	1.0213E-01
993E-04	NEVAL=	130				
513E+00	9.8411E-01	-4.3370E-02	4.9320E-02	1.1037E+00	-5.4774E-02	7.0318E-02
854E-04	NEVAL=	150				
160E+00	9.9693E-01	-4.3131E-02	4.8716E-02	1.0997E+00	-2.2761E-02	2.4140E-02
847E-04	NEVAL=	164				
113E+00	1.0160E+00	-3.7496E-02	4.1078E-02	1.1046E+00	5.6844E-03	-6.0732E-03
153E-04	NEVAL=	175				
161E+00	1.0181E+00	-3.6517E-02	3.9872E-02	1.1046E+00	5.6844E-03	-6.0732E-03
104E-04	NEVAL=	175				

ANGLES (DEGREES) -
 O= .0988
 R= 2.2413

01 -4.1888E-01 ANGLES A AND GAMMA- 2.5175E+01 1.1476E+02
 ARE 1.10221E+00 1.01954E+00

000 Y= 1.00000E+00 Z=-1.00000E+00
 HMIN IS SET TO 3.1250E-03

PRINT FRAM. 2

KSTEP	T	X	Y	Z	VFX	VPY	
0	0.	-5.0000E+00	1.0000E+00	-1.0000E+00	9.6340E-01	1.2975E-02	-2.
	H=	1.0000E-01	R= 1.5173E+02	AC= 0.	NEVAL=	1	
10	1.0000E+00	-4.0369E+00	1.0132E+00	-1.0295E+00	9.6232E-01	1.3708E-02	-3.
	H=	1.0000E-01	R= 4.5689E+01	AC= 1.2573E-03	NEVAL=	16	
11	1.0000E+00	-4.0369E+00	1.0132E+00	-1.0295E+00	9.6232E-01	1.3708E-02	-3.
	H=	1.0000E-01	R= 5.2997E+01	AC= 9.3450E-04	NEVAL=	18	
21	2.0000E+00	-3.0769E+00	1.0291E+00	-1.0623E+00	9.5692E-01	1.9735E-02	-3.
	H=	1.0000E-01	R= 1.5349E+02	AC= 5.8890E-04	NEVAL=	38	
31	2.7656E+00	-2.3454E+00	1.0485E+00	-1.0983E+00	9.5602E-01	3.1574E-02	-5.
	H=	3.1250E-03	R= 2.0016E+02	AC= 5.4970E-04	NEVAL=	66	
41	2.9000E+00	-2.2168E+00	1.0529E+00	-1.1066E+00	9.5733E-01	3.3578E-02	-6.
	H=	5.0000E-02	R= 2.0280E+02	AC= 5.4600E-04	NEVAL=	86	
44	3.0000E+00	-2.1210E+00	1.0563E+00	-1.1130E+00	9.5864E-01	3.4974E-02	-6.
	H=	5.0000E-02	R= 2.0340E+02	AC= 5.4493E-04	NEVAL=	92	
54	3.3875E+00	-1.7482E+00	1.0707E+00	-1.1405E+00	9.6613E-01	3.9311E-02	-7.
	H=	6.2500E-03	R= 1.9948E+02	AC= 5.8877E-04	NEVAL=	117	
64	3.5500E+00	-1.5909E+00	1.0772E+00	-1.1532E+00	9.7046E-01	4.0630E-02	-8.
	H=	5.0000E-02	R= 1.9617E+02	AC= 5.9103E-04	NEVAL=	137	
71	4.0000E+00	-1.1512E+00	1.0960E+00	-1.1910E+00	9.8418E-01	4.2377E-02	-8.
	H=	1.0000E-01	R= 1.8893E+02	AC= 5.9535E-04	NEVAL=	152	
80	5.0000E+00	-1.5051E-01	1.1371E+00	-1.2786E+00	1.0170E+00	3.8245E-02	-8.
	H=	5.0000E-02	R= 2.0139E+02	AC= 5.5777E-04	NEVAL=	172	
84	5.1477E+00	1.3878E-17	1.1427E+00	-1.2909E+00	1.0214E+00	3.6966E-02	-8.
	H=	2.5000E-02	R= 2.0627E+02	AC= 5.1777E-04	NEVAL=	181	

INITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -

ALPHA0= .7716 BETA0= -1.7363
ALPHAR= 2.0727 BETAR= -4.5852

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.4447E-01 -2.5705E-01 4.6989E-01 ANGLES A AND GAMMA
AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14163E+00 1.02538E+00

Z	VFX	VPY	VPZ	VX	VY	VZ
00E+00	9.6340E-01	1.2975E-02	-2.9207E-02	9.6340E-01	1.2975E-02	-1.5004E-02
	NEVAL=	1				
95E+00	9.6232E-01	1.3708E-02	-3.0100E-02	9.3841E-01	3.1623E-02	-4.0163E-02
73E-03	NEVAL=	16				
95E+00	9.6232E-01	1.3708E-02	-3.0100E-02	9.3552E-01	3.4700E-02	-4.4642E-02
50E-04	NEVAL=	18				
93E+00	9.5692E-01	1.9735E-02	-3.8095E-02	9.2806E-01	7.9368E-02	-1.2368E-01
08E-04	NEVAL=	38				
95E+00	9.5602E-01	3.1574E-02	-5.8414E-02	9.6771E-01	9.4036E-02	-1.7743E-01
79E-04	NEVAL=	66				
96E+00	9.5733E-01	3.3578E-02	-6.2513E-02	1.0045E+00	9.1879E-02	-1.8064E-01
0E-04	NEVAL=	86				
90E+00	9.5864E-01	3.4974E-02	-6.5529E-02	1.0231E+00	8.7796E-02	-1.8064E-01
3E-04	NEVAL=	92				
95E+00	9.6613E-01	3.9311E-02	-7.6149E-02	1.0615E+00	7.4554E-02	-1.6886E-01
7E-04	NEVAL=	117				
92E+00	9.7046E-01	4.0630E-02	-8.0008E-02	1.0775E+00	6.7191E-02	-1.5845E-01
3E-04	NEVAL=	137				
90E+00	9.8418E-01	4.2377E-02	-8.7065E-02	1.1159E+00	4.1874E-02	-1.1020E-01
5E-04	NEVAL=	152				
96E+00	1.0170E+00	3.8245E-02	-8.4091E-02	1.1389E+00	3.9491E-03	-2.2823E-02
7E-04	NEVAL=	172				
99E+00	1.0214E+00	3.6966E-02	-8.1971E-02	1.1416E+00	3.2180E-04	-1.4954E-02
7E-04	NEVAL=	181				

ANGLES (DEGREES) -

= -1.7363
= -4.5852

1 4.6989E-01 ANGLES A AND GAMMA- -1.6930E+01 6.1973E+01
ARE 1.14163E+00 1.02538E+00

FOR ONLY FRAM. 2

CONFAC

BODY IDENTIFIER IS TEST

NUMBER OF SYMMETRY PLANES= 0

NUMBER OF QUADRAL

62

FOLDOUT FRAM. |

ETRY PLANES= 0

NUMBER OF QUADRALATERALS= 189

MACH NUMBER= 0.

PERCENT FRAC.

2

CONFAC RUN ID -
TEST PROBLEM WITH TEST BODY

PHYSICAL INPUT DATA -

AIR SPEED= 9.000000E+01 CHARACTERISTIC DIMENSION OF THE BODY= 1.000000E+01
DENSITY AND TEMPERATURE OF AIR ARE 9.092500E-01 AND 2.686590E+02 AIR VI

NUMERICAL INTEGRATOR INPUTS -

TIME STEP= 1.0000E-0 : MINIMUM TIME STEP= 5.0000E-03 PRINT TIME INTERVAL=

LOCAL ERROR TOLERANCES FOR DVDQ - 1.0000E-05 1.0000E-05 1.0000E-05

PARTICLE FLUX TUBE SPECIFICATIONS -

NUMBER OF TRAJECTORIES ON FLUX TUBE PERIPHERY= 4 FLUX TUBE RADIUS AT TAR

TARGET AND INITIAL COORDINATE ESTIMATES-

JGUESS	YT	ZT	YI	ZI
1	0.00000	0.00000	0.00000	0.00000
2	0.00000	0.00000	0.00000	0.00000

CHARACTERISTIC DIMENSION OF THE BODY= 1.000000E+00
RE 9.092500E-01 AND 2.686590E+02 AIR VISCOSITY IS 1.693764E-05

TIME STEP= 5.0000E-03 PRINT TIME INTERVAL= 1.0000E+00 UPSTREAM START DISTANCE=-5.0000E

1.0000E-05 1.0000E-05 1.0000E-05

FLUX PERIPHERY= 4 FLUX TUBE RADIUS AT TARGET= .00328 TOLERANCE= .5000

ESTIMATES-

ZT	YI	ZI
0.0000	0.00000	0.00000
0.0000	0.00000	0.00000

PRINT OUT FINAL 2

WATER DROP DIAMETER = 3.0000E+02 MICROMETERS

PARTICLE SETTLING SPEED= 1.27927E+00 M/SEC

TARGET COORDINATES X=-1.5000E+00 Y= 1.1000E+00 Z= 8.0000E-02

TRAJECTORY NUMBER 0 TARGET COORDINATES - X*STAR = -1.500000 YPSTAR = 1.000000 YPSTARF= 1.000000

	YFINAL	ZFINAL	ITERATIONS	YINIT	ZINIT	ERROR
	.1209E+01	.8603E+00	1	.1101E+01	.8012E+00	.1352E
	.1210E+01	.8613E+00	2	.1102E+01	.8024E+00	.1367E
	.1097E+01	.8052E+00	3	.9795E+00	.7039E+00	.5981E
	.1102E+01	.7993E+00	4	.9834E+00	.6981E+00	.2112E
	.1099E+01	.7979E+00	5	.9800E+00	.6961E+00	.2383E
	.1100E+01	.7998E+00	6	.9811E+00	.6983E+00	.4269E

KSTEP	T	X	Y	Z	VPX	VPY	
0	0.	-5.0000E+00	9.8110E-01	6.9823E-01	9.6002E-01	1.3571E-02	-1.0000
		H= 1.0000E-01	R= 2.7725E+02	AC= 0.	NEVAL= 1		
10	7.0000E-01	-4.3281E+00	9.9068E-01	6.9725E-01	9.5929E-01	1.3983E-02	-1.0000
		H= 1.0000E-01	R= 5.2057E+01	AC= 8.3495E-04	NEVAL= 13		
14	1.0000E+00	-4.0405E+00	9.9497E-01	6.9705E-01	9.5819E-01	1.4671E-02	-2.0000
		H= 1.0000E-01	R= 8.7152E+01	AC= 5.9459E-04	NEVAL= 17		
24	1.8625E+00	-3.2173E+00	1.0101E+00	6.9995E-01	9.4867E-01	2.2660E-02	9.0000
		H= 6.2500E-03	R= 2.0038E+02	AC= 5.2003E-04	NEVAL= 42		
34	2.0000E+00	-3.0870E+00	1.0134E+00	7.0151E-01	9.4620E-01	2.5388E-02	1.0000
		H= 5.0000E-02	R= 2.2830E+02	AC= 4.9527E-04	NEVAL= 62		
35	2.0000E+00	-3.0870E+00	1.0134E+00	7.0151E-01	9.4620E-01	2.5388E-02	1.0000
		H= 5.0000E-02	R= 2.3878E+02	AC= 4.5273E-04	NEVAL= 64		
45	2.8000E+00	-2.3352E+00	1.0437E+00	7.2664E-01	9.3723E-01	5.2614E-02	5.0000
		H= 5.0000E-02	R= 3.3778E+02	AC= 4.3878E-04	NEVAL= 86		
49	3.0000E+00	-2.1475E+00	1.0549E+00	7.3913E-01	9.4051E-01	5.9150E-02	6.0000
		H= 1.0000E-01	R= 3.2750E+02	AC= 4.4993E-04	NEVAL= 94		
59	3.6804E+00	-1.5000E+00	1.0996E+00	7.9973E-01	9.6535E-01	6.9304E-02	1.0000
		H= 5.0000E-02	R= 2.7658E+02	AC= 4.7412E-04	NEVAL= 117		

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.1247E-01 4.2971E-02 5.8142E-01 ANGLES A AND GAMMA
AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14461E+00 9.73484E-01

INITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -

ALPHA0= .8099 BETA0= -.0973
ALPHAF= 4.1063 BETAF= 6.1774

ORIGINAL PAGE IS OF POOR QUALITY

TRAJECTORY NUMBER 1 TARGET COORDINATES - X*STAR = -1.500352 YPSTAR = 1.000000 YPSTARF= 0.000000

	YFINAL	ZFINAL	ITERATIONS	YINIT	ZINIT	ERROR
	-.3022E-03	.3611E-02	1	.7256E-03	.4269E-02	.4483E-

KSTEP	T	X	Y	Z	VPX	VPY	
0	0.	-5.0000E+00	9.8182E-01	7.0256E-01	9.6008E-01	1.3563E-02	-1.5000
		H= 1.0000E-01	R= 2.7658E+02	AC= 0.	NEVAL= 1		
10	7.0000E-01	-4.3281E+00	9.9140E-01	7.0157E-01	9.5935E-01	1.3974E-02	-1.0000
		H= 1.0000E-01	R= 5.2019E+01	AC= 8.3454E-04	NEVAL= 15		
14	1.0000E+00	-4.0404E+00	9.9568E-01	7.0139E-01	9.5825E-01	1.4660E-02	-1.5000

RS

00 M/SEC

10000E+00

Z= 8.00000E-01

R = -1.500000

YPSTAR = 1.100000

ZPSTAR = .800000 (FLOW SYSTEM)

YPSTARP= 1.100000

ZPSTARP= .800000 (FLUX TUBE SYSTEM)

YINIT	ZINIT	ERROR (FLUX TUBE SYSTEM)
1.101E+01	.8012E+00	.1352E+00
1.102E+01	.8024E+00	.1367E+00
7.95E+00	.7039E+00	.5981E-02
8.34E+00	.6981E+00	.2112E-02
8.00E+00	.5961E+00	.2383E-02
8.11E+00	.6983E+00	.4269E-03

VPX	VPY	VPZ	VX	VY	VZ
9.6002E-01	1.3571E-02	-1.6368E-03	9.6002E-01	1.3571E-02	1.2572E-02
NEVAL= 1					
9.5929E-01	1.3983E-02	-1.0880E-03	9.3821E-01	2.6512E-02	2.5151E-02
NEVAL= 13					
9.5819E-01	1.4671E-02	-2.0919E-04	9.1998E-01	4.0543E-02	3.9618E-02
NEVAL= 17					
9.4867E-01	2.2660E-02	9.6867E-03	8.7914E-01	9.4479E-02	1.0518E-01
NEVAL= 42					
9.4620E-01	2.5388E-02	1.3176E-02	8.7511E-01	1.0894E-01	1.2621E-01
NEVAL= 62					
9.4620E-01	2.5388E-02	1.3176E-02	8.7450E-01	1.1444E-01	1.3473E-01
NEVAL= 64					
9.3723E-01	5.2614E-02	5.5791E-02	9.6531E-01	1.5681E-01	2.6234E-01
NEVAL= 86					
9.4051E-01	5.9150E-02	6.9614E-02	1.0177E+00	1.4009E-01	2.7029E-01
NEVAL= 94					
9.6535E-01	6.9304E-02	1.0475E-01	1.1213E+00	7.7552E-02	2.1635E-01
NEVAL= 117					

8.8142E-01 ANGLES A AND GAMMA- 3.0275E+00 5.4450E+01
 1.14461E+00 9.73484E-01

ES (DEGREES) -

-.0973

6.1774

R = -1.500352

YPSTAR = 1.099975

ZPSTAR = .803261 (FLOW SYSTEM)

YPSTARP= 0.000000

ZPSTARP= .803280 (FLUX TUBE SYSTEM)

YINIT	ZINIT	ERROR (FLUX TUBE SYSTEM)
2.25E-03	.4269E-02	.4483E-03

VPX	VPY	VPZ	VX	VY	VZ
9.6008E-01	1.3563E-02	-1.5749E-03	9.6008E-01	1.3563E-02	1.2628E-02
NEVAL= 1					
9.5935E-01	1.3974E-02	-1.0309E-03	9.3835E-01	2.6478E-02	2.5248E-02
NEVAL= 15					
9.5825E-01	1.4660E-02	-1.5069E-04	9.2023E-01	4.0463E-02	3.9745E-02
NEVAL= 27					

H= 3.0000E-01 R= 0.7050E+01 AC= 3.9984E-04 NEVAL= 20
 24 1.8688E+00 -3.2112E+00 1.0110E+00 7.0439E-01 9.4870E-01 2.2724E-02
 H= 6.2500E-03 R= 2.0090E+02 AC= 5.1944E-04 NEVAL= 48
 34 1.9750E+00 -3.1105E+00 1.0135E+00 7.0557E-01 9.4682E-01 2.4783E-02
 H= 2.5000E-02 R= 2.224E+02 AC= 5.0001E-04 NEVAL= 68
 36 2.0000E+00 -3.0869E+00 1.0141E+00 7.0590E-01 9.4636E-01 2.5322E-02
 H= 2.5000E-02 R= 2.3257E+02 AC= 4.7405E-04 NEVAL= 72
 46 2.4750E+00 -2.6395E+00 1.0293E+00 7.1651E-01 9.3863E-01 3.9867E-02
 H= 5.0000E-02 R= 3.1803E+02 AC= 4.4628E-04 NEVAL= 92
 53 3.0000E+00 -2.1471E+00 1.0554E+00 7.4345E-01 9.4086E-01 5.8707E-02
 H= 2.0000E-01 R= 3.2760E+02 AC= 4.4565E-04 NEVAL= 106
 63 3.6250E+00 -1.5528E+00 1.0959E+00 7.9799E-01 9.6301E-01 6.8579E-02
 H= 5.0000E-02 R= 2.8288E+02 AC= 4.6314E-04 NEVAL= 129
 65 3.6794E+00 -1.5004E+00 1.0997E+00 8.0359E-01 9.6549E-01 6.8798E-02
 H= 5.0000E-02 R= 2.7205E+02 AC= 4.8639E-04 NEVAL= 133

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 0.2736E-01 3.1554E-02 5.6078E-01 ANGLES A AND
 AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14496E+00 9.73520E

TRAJECTORY NUMBER 2 TARGET COORDINATES - XPSTAR = -1.500235 YPSTAR =
 YPSTARF=

YFINAL ZFINAL ITERATIONS YINIT ZINIT E
 .3951E-02 -.1236E-02 1 .4128E-02 -.3891E-03 .14

KSTEP T X Y Z VPX VPY
 0 0. -5.0001E+00 9.8523E-01 6.9791E-01 9.6007E-01 1.3617E-02
 H= 1.0000E-01 R= 2.7205E+02 AC= 0. NEVAL= 1
 10 7.0000E-01 -4.3282E+00 9.9484E-01 6.9686E-01 9.5934E-01 1.4030E-02
 H= 1.0000E-01 R= 5.1988E+01 AC= 8.3522E-04 NEVAL= 15
 14 1.0000E+00 -4.0405E+00 9.9914E-01 6.9664E-01 9.5824E-01 1.4719E-02
 H= 1.0000E-01 R= 8.7042E+01 AC= 5.9501E-04 NEVAL= 23
 24 1.8688E+00 -3.2113E+00 1.0145E+00 6.9955E-01 9.4666E-01 2.2828E-02
 H= 6.2500E-03 R= 2.0108E+02 AC= 5.1932E-04 NEVAL= 48
 34 1.9750E+00 -3.1106E+00 1.0170E+00 7.0074E-01 9.4677E-01 2.4901E-02
 H= 2.5000E-02 R= 2.2250E+02 AC= 4.9985E-04 NEVAL= 68
 36 2.0000E+00 -3.0870E+00 1.0176E+00 7.0105E-01 9.4630E-01 2.5444E-02
 H= 2.5000E-02 R= 2.3288E+02 AC= 4.7383E-04 NEVAL= 72
 46 2.6250E+00 -2.4990E+00 1.0393E+00 7.1739E-01 9.3677E-01 4.6008E-02
 H= 5.0000E-02 R= 3.3341E+02 AC= 4.4043E-04 NEVAL= 93
 52 3.0000E+00 -2.1473E+00 1.0592E+00 7.3850E-01 9.4062E-01 5.9214E-02
 H= 1.0000E-01 R= 3.2871E+02 AC= 4.4545E-04 NEVAL= 105
 62 3.6250E+00 -1.5532E+00 1.1001E+00 7.9309E-01 9.6281E-01 6.9236E-02
 H= 5.0000E-02 R= 2.8409E+02 AC= 4.6253E-04 NEVAL= 128
 64 3.6800E+00 -1.5002E+00 1.1039E+00 7.9877E-01 9.6534E-01 6.9463E-02
 H= 5.0000E-02 R= 2.7313E+02 AC= 4.8587E-04 NEVAL= 132

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 0.2653E-01 3.2372E-02 5.6197E-01 ANGLES A AND
 AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14547E+00 9.73446E

TRAJECTORY NUMBER 3 TARGET COORDINATES - XPSTAR = -1.499648 YPSTAR =
 YPSTARF=

YFINAL ZFINAL ITERATIONS YINIT ZINIT E
 .3971E-03 -.2022E-02 1 .4452E-03 -.1895E-02 .13

KSTEP T X Y Z VPX VPY
 0 0. -5.0000E+00 9.8154E-01 6.9640E-01 9.6000E-01 1.3583E-02
 H= 1.0000E-01 R= 2.7313E+02 AC= 0. NEVAL= 1
 10 7.0000E-01 -4.3282E+00 9.9114E-01 6.9535E-01 9.5927E-01 1.3995E-02
 H= 1.0000E-01 R= 5.2060E+01 AC= 8.3513E-04 NEVAL= 13
 14 1.0000E+00 -4.0405E+00 9.9542E-01 6.9513E-01 9.5817E-01 1.4684E-02
 H= 1.0000E-01 R= 8.7322E+01 AC= 5.9455E-04 NEVAL= 23

FOLDOUT FRAM

65

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23
 0E-01 2.2724E-02 9.8952E-03 8.7962E-01 9.4692E-02 1.0612E-01
 = 48
 2E-01 2.4783E-02 1.2530E-02 8.7645E-01 1.0571E-01 1.2211E-01
 = 68
 6E-01 2.5322E-02 1.3231E-02 8.7562E-01 1.1110E-01 1.3036E-01
 = 72
 3E-01 3.9867E-02 3.3994E-02 9.0337E-01 1.5468E-01 2.1774E-01
 = 92
 6E-01 5.8707E-02 6.9232E-02 1.0128E+00 1.4126E-01 2.6912E-01
 = 106
 1E-01 6.8579E-02 1.0215E-01 1.1111E+00 8.4626E-02 2.2827E-01
 = 129
 9E-01 6.8798E-02 1.0407E-01 1.1229E+00 7.4802E-02 2.1077E-01
 = 133

01 ANGLES A AND GAMMA- 2.1841E+00 5.5890E+01
 96E+00 9.73520E-01

00235 YPSTAR = 1.103272 ZPSTAR = .800000 (FLOW SYSTEM)
 YPSTARF = .003280 ZPSTARF = -.000000 (FLUX TUBE SYSTEM)

ZINIT ERROR (FLUX TUBE SYSTEM)
 -.3891E-03 .1406E-02

VPX	VPY	VPZ	VX	VY	VZ
7E-01	1.3617E-02	-1.6521E-03	9.6007E-01	1.3617E-02	1.2551E-02
= 1					
4E-01	1.4030E-02	-1.1109E-03	9.3831E-01	2.6589E-02	2.5095E-02
= 15					
4E-01	1.4719E-02	-2.3501E-04	9.2016E-01	4.0642E-02	3.9509E-02
= 23					
6E-01	2.2828E-02	9.7640E-03	8.7928E-01	9.5240E-02	1.0563E-01
= 48					
7E-01	2.4901E-02	1.2396E-02	8.7602E-01	1.0636E-01	1.2160E-01
= 68					
0E-01	2.5444E-02	1.3095E-02	8.7515E-01	1.1181E-01	1.2984E-01
= 72					
7E-01	4.6008E-02	4.3395E-02	9.2909E-01	1.6091E-01	2.4252E-01
= 93					
2E-01	5.9214E-02	6.9218E-02	1.0123E+00	1.4274E-01	2.6969E-01
= 105					
1E-01	6.9236E-02	1.0236E-01	1.1112E+00	8.5586E-02	2.2938E-01
= 128					
4E-01	6.9463E-02	1.0433E-01	1.1232E+00	7.5645E-02	2.1166E-01
= 132					

01 ANGLES A AND GAMMA- 2.2429E+00 5.5808E+01
 47E+00 9.73446E-01

99648 YPSTAR = 1.100025 ZPSTAR = .796739 (FLOW SYSTEM)
 YPSTARF = -.000000 ZPSTARF = -.003280 (FLUX TUBE SYSTEM)

ZINIT ERROR (FLUX TUBE SYSTEM)
 -.1895E-02 .1319E-02

VPX	VPY	VPZ	VX	VY	VZ
0E-01	1.3583E-02	-1.6586E-03	9.6000E-01	1.3583E-02	1.2544E-02
= 1					
7E-01	1.3995E-02	-1.1167E-03	9.3816E-01	2.6541E-02	2.5099E-02
= 13					
4E-01	1.4684E-02	-2.3900E-04	9.1991E-01	4.0595E-02	3.9543E-02

	H= 1.0000E-01	R= 0.7222E+01	AC= 5.9455E-04	NEVAL= 17		
24	1.8625E+00	-3.2174E+00	1.0106E+00	6.9800E-01	9.4863E-01	2.2692E-02
	H= 6.2500E-03	R= 2.0058E+02	AC= 5.1985E-04	NEVAL= 42		
34	2.0000E+00	-3.0871E+00	1.0139E+00	6.9955E-01	9.4614E-01	2.5428E-02
	H= 5.0000E-02	R= 2.2856E+02	AC= 4.9509E-04	NEVAL= 62		
35	2.0000E+00	-3.0871E+00	1.0139E+00	6.9955E-01	9.4614E-01	2.5428E-02
	H= 5.0000E-02	R= 2.3908E+02	AC= 4.5250E-04	NEVAL= 64		
45	2.8000E+00	-2.3354E+00	1.0443E+00	7.2468E-01	9.3711E-01	5.2784E-02
	H= 5.0000E-02	R= 3.3842E+02	AC= 4.3855E-04	NEVAL= 86		
49	3.0000E+00	-2.1477E+00	1.0555E+00	7.3724E-01	9.4038E-01	5.9353E-02
	H= 1.0000E-01	R= 3.2808E+02	AC= 4.4975E-04	NEVAL= 94		
59	3.6500E+00	-1.5296E+00	1.0983E+00	7.9477E-01	9.6385E-01	6.9443E-02
	H= 5.0000E-02	R= 2.8269E+02	AC= 4.6343E-04	NEVAL= 117		
60	3.6808E+00	-1.4998E+00	1.1004E+00	7.9799E-01	9.6528E-01	6.9554E-02
	H= 5.0000E-02	R= 2.7710E+02	AC= 4.7361E-04	NEVAL= 119		

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.1238E-01 4.2836E-02 5.8156E-01 ANGLES A AND C
 AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14489E+00 9.73459E-

TRAJECTORY NUMBER 4 TARGET COORDINATES - XPSTAR = -1.499765 YPSTAR =
 YPSTARP=

YFINAL ZFINAL ITERATIONS YINIT ZINIT ER
 -.4310E-02 .7579E-04 1 -.3891E-02 -.3977E-03 .103

99

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-4.9999E+00	9.7721E-01	6.9790E-01	9.5996E-01	1.3530E-02
	H= 1.0000E-01	R= 2.7710E+02	AC= 0.	NEVAL= 1		
10	7.0000E-01	-4.3281E+00	9.8676E-01	6.9687E-01	9.5923E-01	1.3941E-02
	H= 1.0000E-01	R= 5.2125E+01	AC= 8.3479E-04	NEVAL= 13		
14	1.0000E+00	-4.0405E+00	9.9104E-01	6.9667E-01	9.5813E-01	1.4628E-02
	H= 1.0000E-01	R= 8.7353E+01	AC= 5.9414E-04	NEVAL= 17		
24	1.8625E+00	-3.2174E+00	1.0011E+00	6.9959E-01	9.4856E-01	2.2624E-02
	H= 6.2500E-03	R= 2.0095E+02	AC= 5.1945E-04	NEVAL= 42		
34	2.0000E+00	-3.0871E+00	1.0094E+00	7.0115E-01	9.4606E-01	2.5356E-02
	H= 5.0000E-02	R= 2.2900E+02	AC= 4.9474E-04	NEVAL= 62		
35	2.0000E+00	-3.0871E+00	1.0094E+00	7.0115E-01	9.4606E-01	2.5356E-02
	H= 5.0000E-02	R= 2.3953E+02	AC= 4.5213E-04	NEVAL= 64		
45	2.8000E+00	-2.3355E+00	1.0358E+00	7.2645E-01	9.3704E-01	5.2642E-02
	H= 5.0000E-02	R= 3.3867E+02	AC= 4.3847E-04	NEVAL= 86		
49	3.0000E+00	-2.1478E+00	1.0510E+00	7.3908E-01	9.4034E-01	5.9173E-02
	H= 1.0000E-01	R= 3.2816E+02	AC= 4.4983E-04	NEVAL= 94		
59	3.6500E+00	-1.5297E+00	1.0935E+00	7.9682E-01	9.6387E-01	6.9148E-02
	H= 5.0000E-02	R= 2.8240E+02	AC= 4.6359E-04	NEVAL= 116		
60	3.6811E+00	-1.4997E+00	1.0957E+00	8.0009E-01	9.6531E-01	6.9255E-02
	H= 5.0000E-02	R= 2.7685E+02	AC= 4.7364E-04	NEVAL= 118		

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.1378E-01 4.0887E-02 5.7973E-01 ANGLES A AND C
 AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14496E+00 9.73502E-

FOLDOUT FRA.

E-04	NEVAL=	17					
E-01	9.4863E-01	2.2692E-02	9.6505E-03	8.7890E-01	9.4679E-02	1.0508E-01	
E-04	NEVAL=	42					
E-01	9.4614E-01	2.5428E-02	1.3140E-02	8.7412E-01	1.0920E-01	1.2612E-01	
E-04	NEVAL=	62					
E-01	9.4614E-01	2.5428E-02	1.3140E-02	8.7418E-01	1.1472E-01	1.3465E-01	
E-04	NEVAL=	64					
E-01	9.3711E-01	5.2784E-02	5.5842E-02	9.6504E-01	1.5739E-01	2.6271E-01	
E-04	NEVAL=	86					
E-01	9.4038E-01	5.9353E-02	6.9706E-02	1.0176E+00	1.4059E-01	2.7074E-01	
E-04	NEVAL=	94					
E-01	9.6385E-01	6.9443E-02	1.0389E-01	1.1154E+00	8.2849E-02	2.2593E-01	
E-04	NEVAL=	117					
E-01	9.6528E-01	6.9554E-02	1.0497E-01	1.1215E+00	7.7790E-02	2.1679E-01	
E-04	NEVAL=	119					

5.8156E-01 ANGLES A AND GAMMA- 3.0184E+00 5.4440E+01
 1.14489E+00 9.73459E-01

YSTAR = -1.499765 YPSTAR = 1.096728 ZPSTAR = .800000 (FLOW SYSTEM)
 YPSTARP= -.003280 ZPSTARP= .000000 (FLUX TUBE SYSTEM)

YINIT ZINIT ERROR (FLUX TUBE SYSTEM)
 -.3891E-02 -.3977E-03 .1033E-02

	VPX	VPY	VPZ	VX	VY	VZ
E-01	9.5996E-01	1.3530E-02	-1.6213E-03	9.5996E-01	1.3530E-02	1.2582E-02
E-04	NEVAL=	1				
E-01	9.5923E-01	1.3941E-02	-1.0773E-03	9.3808E-01	2.6448E-02	2.5186E-02
E-04	NEVAL=	13				
E-01	9.5813E-01	1.4628E-02	-1.9607E-04	9.1978E-01	4.0466E-02	3.9694E-02
E-04	NEVAL=	17				
E-01	9.4856E-01	2.2624E-02	9.7440E-03	8.7866E-01	9.4430E-02	1.0556E-01
E-04	NEVAL=	42				
E-01	9.4606E-01	2.5356E-02	1.3253E-02	8.7459E-01	1.0891E-01	1.2671E-01
E-04	NEVAL=	62				
E-01	9.4606E-01	2.5356E-02	1.3253E-02	8.7396E-01	1.1442E-01	1.3528E-01
E-04	NEVAL=	64				
E-01	9.3704E-01	5.2642E-02	5.6158E-02	9.6537E-01	1.5667E-01	2.6346E-01
E-04	NEVAL=	86				
E-01	9.4034E-01	5.9173E-02	7.0049E-02	1.0180E+00	1.3981E-01	2.7122E-01
E-04	NEVAL=	94				
E-01	9.6387E-01	6.9148E-02	1.0418E-01	1.1156E+00	8.2154E-02	2.2576E-01
E-04	NEVAL=	116				
E-01	9.6531E-01	6.9255E-02	1.0526E-01	1.1216E+00	7.7109E-02	2.1662E-01
E-04	NEVAL=	118				

5.7973E-01 ANGLES A AND GAMMA- 2.8763E+00 5.4568E+01
 1.14496E+00 9.73502E-01

PRINT FRAM 2

FLUX TUBE CROSS SECTION COORDINATES IN THE -

IP CENTER	INITIAL PLANE			TARGET PLANE	
	XP	YP	ZP	XP	YP
1	-5.0000E+00	9.8110E-01	6.9829E-01	-1.5000E+00	1.1000E+00
2	1.5884E-14	7.2555E-04	4.2635E-03	-5.2934E-15	-3.0215E-04
3	1.1492E-14	4.1278E-03	-3.8912E-04	-1.0963E-15	3.9506E-03
4	2.8054E-14	4.4517E-04	-1.8950E-03	-2.9064E-15	3.9710E-04
4	9.7370E-15	-3.8913E-03	-3.9756E-04	1.6757E-15	-4.3100E-03

FLUX TUBE CROSS SECTION AREA IN THE INITIAL PLANE= 2.47114E-05

CONCENTRATION FACTOR= 1.08337

AT THE POINT (X,Y,Z)= -1.50000 1.10000 .80000
 FOR A PARTICLE OF DIAMETER= 300.00000 WITH DIAMETER TO LENGTH RATIO= 1
 NORMALIZED AIR SPEED AT FINAL POINT= 1.14339
 PARTICLE CONCENTRATION RATIO= 1.11288

CROSS SECTION COORDINATES IN THE -

TARGET PLANE

ZP	XP	YP	ZP
9829E-01	-1.5000E+00	1.1000E+00	8.0000E-01 (FLUX SYSTEM)
2635E-03	-5.2934E-15	-3.0215E-04	3.6111E-03 (FLUX TUBE SYSTEM)
8912E-04	-1.0963E-15	3.9506E-03	-1.2361E-03 (FLUX TUBE SYSTEM)
8950E-03	-2.9064E-15	3.9710E-04	-2.0225E-03 (FLUX TUBE SYSTEM)
9736E-04	1.6757E-15	-4.3100E-03	7.5786E-05 (FLUX TUBE SYSTEM)

THE INITIAL PLANE= 2.47114E-05

IN THE TARGET PLANE= 2.28097E-05

1.10000 .80000
00 WITH DIAMETER TO LENGTH RATIO= 1.00000E+00 AND DENSITY= 1.00000E+03
1.14339
1288

PRINT OUT FROM 2

TANTRA

BODY IDENTIFIER IS TEST

NUMBER OF SYMMETRY PLANES= 0

NUMBER OF QUADRAL

89

FOLDOUT (FRAG) //

MMETRY PLANES= 0 NUMBER OF QUADRALATERALS= 189 MACH NUMBER= 0.

FOR ONLY FRAM. 2

TANGENT TRAJECTORY CODE RUN ID -
TEST PROBLEM WITH TEST BODY

PHYSICAL INPUT DATA -

AIR SPEED= 9.000000E+01 CHARACTERISTIC DIMENSION OF THE BODY= 1.000000
DENSITY AND TEMPERATURE OF AIR ARE 9.092500E-01 AND 2.686590E+02 AIR

NUMERICAL INTEGRATOR INPUTS -

TIME STEP= 1.0000E-01 MINIMUM TIME STEP= 5.0000E-03 PRINT TIME INTER

LOCAL ERROR TOLERANCES FOR DVDQ - 1.0000E-05 1.0000E-05 1.0000E-05

TRAJECTORY DATA ARE WRITTEN ON UNIT 10 FOR PLOTTING

C DIMENSION OF THE BODY= 1.000000E+00
92500E-01 AND 2.686590E+02 AIR VISCOSITY IS 1.193764E-05

EP= 5.0000E-03 PRINT TIME INTERVAL= 1.0000E+00 X COORD. OF FINAL PLANE= 0.
0.0000E-05 1.0000E-05 1.0000E-05

OR PLOTTING

PRINT OUT FRAM. 2

WATER DROP DIAMETER = 2.00000E+02 MICROMETERS

PARTICLE SETTLING SPEED= 7.69093E-01 M/SEC

TRAJECTORIES ARE TO BEGIN ALONG A LINE DEFINED BY THE POINTS (X1,Y1,Z1) AND
(-5.00000E+00 0. -4.50000E-01) AND (-5.00000E+00
WITH DIRECTION COSINES -(COS(ALPHA),COS(BETA),COS(GAMMA)) - 0.

STARTING POINT INCREMENTS ARE - COARSE INCREMENT= 5.00000E-02 FINE INCREMENT=

* * * INITIAL COORDINATES X=-5.00000E+00 Y= 0. Z=-4.50000E-01
IFLAG= 7 FOR KSTEP= 27 NEVAL= 58 HMIN IS SET TO 3.1250E-03
IFLAG= 7 FOR KSTEP= 27 NEVAL= 59 HMIN IS SET TO 1.5625E-03
INSIDE QUAD 185 I2= 1
ZNP,ROSQ,TSQ,H= -5.4665E-03 2.4343E-01 1.0355E+00 2.5000E-02
INSIDE QUAD 188 I2= 1
ZNP,ROSQ,TSQ,H= -7.1977E-03 2.5035E-01 1.0355E+00 2.5000E-02
THE BODY SURFACE IS PENETRATED. PARTICLE COORDINATES ARE (X,Y,Z)-2.5525E-01
TRIAL INITIAL COORDINATES ARE (YINIT,ZINIT) 0. -4.5000E-01

AFTER 0 ATTEMPTS PARTICLE STILL PENETRATES THE BODY.

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KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	0.	-4.5000E-01	9.4971E-01	-1.0353E-03 -1.
		H= 1.0000E-01	R= 8.2573E+00	AC= 1.9004E-17	NEVAL= 1	
10	5.0000E-01	-4.5253E+00	-5.2030E-04	-4.5857E-01	9.4886E-01	-1.0526E-03 -1.
		H= 5.0000E-02	R= 2.1823E+01	AC= 1.6453E-03	NEVAL= 17	
19	1.0000E+00	-4.0517E+00	-1.0637E-03	-4.6742E-01	9.4439E-01	-1.1384E-03 -1.
		H= 1.0000E-01	R= 6.8350E+01	AC= 6.6054E-04	NEVAL= 35	
29	1.8406E+00	-3.2695E+00	-2.2201E-03	-4.8800E-01	9.0566E-01	-1.7706E-03 -3.
		H= 1.5625E-03	R= 2.0070E+02	AC= 4.9963E-04	NEVAL= 63	
39	1.8750E+00	-3.2385E+00	-2.2817E-03	-4.8936E-01	9.0255E-01	-1.8174E-03 -4.
		H= 1.2500E-02	R= 2.1011E+02	AC= 4.9009E-04	NEVAL= 83	
47	2.0000E+00	-3.1264E+00	-2.5204E-03	-4.9505E-01	8.8980E-01	-2.0074E-03 -5.
		H= 5.0000E-02	R= 2.6029E+02	AC= 4.1124E-04	NEVAL= 99	
57	2.5750E+00	-2.6346E+00	-3.9965E-03	-5.5196E-01	8.2481E-01	-3.1898E-03 -1.
		H= 2.5000E-02	R= 3.9701E+02	AC= 3.9796E-04	NEVAL= 121	

* * * INITIAL COORDINATES X=-5.00000E+00 Y= 0. Z=-5.00000E-01
IFLAG= 7 FOR KSTEP= 28 NEVAL= 60 HMIN IS SET TO 3.1250E-03
IFLAG= 7 FOR KSTEP= 29 NEVAL= 63 HMIN IS SET TO 1.5625E-03
IFLAG= 7 FOR KSTEP= 100 NEVAL= 235 HMIN IS SET TO 7.8125E-04

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	0.	-5.0000E-01	9.5022E-01	-1.0211E-03 -1.
		H= 1.0000E-01	R= 3.9701E+02	AC= 8.2209E-21	NEVAL= 1	
10	5.0000E-01	-4.5250E+00	-5.1313E-04	-5.0905E-01	9.4939E-01	-1.0379E-03 -1.
		H= 5.0000E-02	R= 2.1255E+01	AC= 1.6923E-03	NEVAL= 17	
20	1.0000E+00	-4.0512E+00	-1.0485E-03	-5.1842E-01	9.4510E-01	-1.1204E-03 -1.
		H= 1.0000E-01	R= 6.6581E+01	AC= 6.7269E-04	NEVAL= 37	
30	1.8797E+00	-3.2321E+00	-2.2468E-03	-5.4179E-01	9.0617E-01	-1.7668E-03 -4.
		H= 1.5625E-03	R= 1.9997E+02	AC= 5.3975E-04	NEVAL= 65	

(X1,Y1,Z1,) AND (X2,Y2,Z2) -

(-5.00000E+00 0. 0.)
0. 0. 1.00000E+00

2 FINE INCREMENT= 5.00000E-03

Z=-4.50000E-01 FOR TRAJECTORY NUMBER 1

ET TO 3.1250E-03

ET TO 1.5625E-03

2.5000E-02

2.5000E-02

RE (X,Y,Z) -2.55232E+00 -4.32804E-03 -5.70585E-01

-4.5000E-01 ATTEMPT NUMBER 0

DDY.

	VPY	VPZ	VX	VY	VZ
1	-1.0353E-03	-1.7077E-02	9.4971E-01	-1.0353E-03	-8.5312E-03
17	-1.0526E-03	-1.7267E-02	9.2635E-01	-1.5046E-03	-1.5595E-02
35	-1.1384E-03	-1.8462E-02	8.7433E-01	-2.4196E-03	-3.7486E-02
63	-1.7706E-03	-3.8358E-02	7.3501E-01	-4.3441E-03	-1.5675E-01
83	-1.8174E-03	-4.0613E-02	7.2694E-01	-4.4526E-03	-1.6882E-01
99	-2.0074E-03	-5.1080E-02	6.9105E-01	-4.9664E-03	-2.4430E-01
21	-3.1898E-03	-1.6851E-01	7.4570E-01	-6.1109E-03	-5.7168E-01

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OF POOR QUALITY

Z=-5.00000E-01 FOR TRAJECTORY NUMBER 0

ET TO 3.1250E-03

ET TO 1.5625E-03

ET TO 7.8125E-04

	VPY	VPZ	VX	VY	VZ
1	-1.0211E-03	-1.8037E-02	9.5022E-01	-1.0211E-03	-9.4917E-03
17	-1.0379E-03	-1.8253E-02	9.2743E-01	-1.4781E-03	-1.7214E-02
37	-1.1204E-03	-1.9572E-02	8.7764E-01	-2.3594E-03	-4.0720E-02
65	-1.7668E-03	-4.2684E-02	7.4593E-01	-4.2808E-03	-1.7362E-01

PRINTED FROM 2

40	1.9003E+00	-3.2901E+00	-2.2942E-03	-5.4294E-01	9.0593E-01	-1.0010E-03	NEVAL= 85
	H= 6.2500E-03	R= 2.0666E+02	AC= 4.9383E-04				
49	2.0000E+00	-3.1237E+00	-2.4692E-03	-5.4747E-01	8.9545E-01	-1.9350E-03	NEVAL= 103
	H= 2.5000E-02	R= 2.3735E+02	AC= 4.4684E-04				
59	2.5250E+00	-2.6674E+00	-3.7260E-03	-5.9541E-01	8.4667E-01	-2.8990E-03	NEVAL= 124
	H= 5.0000E-02	R= 3.5235E+02	AC= 4.1138E-04				
69	2.7125E+00	-2.5091E+00	-4.3054E-03	-6.2775E-01	8.4692E-01	-3.2768E-03	NEVAL= 147
	H= 1.2500E-02	R= 3.6565E+02	AC= 4.0703E-04				
79	2.8750E+00	-2.3701E+00	-4.8572E-03	-6.6329E-01	8.6379E-01	-3.4910E-03	NEVAL= 167
	H= 2.5000E-02	R= 2.7019E+02	AC= 4.4649E-04				
84	3.0000E+00	-2.2614E+00	-5.3064E-03	-6.9339E-01	8.7616E-01	-3.5962E-03	NEVAL= 178
	H= 2.5000E-02	R= 2.2479E+02	AC= 4.9517E-04				
94	3.2687E+00	-2.0226E+00	-6.2920E-03	-7.6277E-01	9.0165E-01	-3.7829E-03	NEVAL= 202
	H= 6.2500E-03	R= 2.2802E+02	AC= 4.7372E-04				
104	3.3750E+00	-1.9261E+00	-6.6963E-03	-7.9143E-01	9.1405E-01	-3.8160E-03	NEVAL= 222
	H= 2.5000E-02	R= 2.0274E+02	AC= 4.9549E-04				
114	3.3937E+00	-1.9089E+00	-6.7679E-03	-7.9655E-01	9.1668E-01	-3.8177E-03	NEVAL= 247
	H= 1.5625E-03	R= 1.9867E+02	AC= 5.3852E-04				
124	3.4500E+00	-1.8572E+00	-6.9827E-03	-8.1193E-01	9.2214E-01	-3.8205E-03	NEVAL= 267
	H= 1.2500E-02	R= 1.8939E+02	AC= 5.4795E-04				
134	3.8000E+00	-1.5285E+00	-8.3154E-03	-9.0780E-01	9.5632E-01	-3.7791E-03	NEVAL= 288
	H= 5.0000E-02	R= 1.9086E+02	AC= 5.4461E-04				
144	4.0000E+00	-1.3352E+00	-9.0641E-03	-9.6181E-01	9.7643E-01	-3.7025E-03	NEVAL= 311
	H= 5.0000E-02	R= 1.8499E+02	AC= 5.4939E-04				
145	4.0000E+00	-1.3352E+00	-9.0641E-03	-9.6181E-01	9.7643E-01	-3.7025E-03	NEVAL= 314
	H= 2.5000E-02	R= 1.8398E+02	AC= 5.5533E-04				
155	4.3500E+00	-9.8803E-01	-1.0328E-02	-1.0523E+00	1.0069E+00	-3.5092E-03	NEVAL= 335
	H= 2.5000E-02	R= 1.9043E+02	AC= 5.4239E-04				
165	4.7750E+00	-5.5306E-01	-1.1753E-02	-1.1520E+00	1.0387E+00	-3.1772E-03	NEVAL= 356
	H= 5.0000E-02	R= 1.8739E+02	AC= 5.4448E-04				
170	5.0000E+00	-3.1772E-01	-1.2444E-02	-1.1993E+00	1.0528E+00	-2.9619E-03	NEVAL= 367
	H= 5.0000E-02	R= 1.8378E+02	AC= 5.5173E-04				
175	5.2995E+00	1.1102E-16	-1.3284E-02	-1.2559E+00	1.0682E+00	-2.6446E-03	NEVAL= 377
	H= 1.0000E-01	R= 1.7534E+02	AC= 5.5777E-04				

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* * * * * SWITCH TO FINE STEPSIZE * * *

* * * INITIAL COORDINATES X=-5.0000E+00 Y= 0. Z=-4.9500E-01
 IFLAG= 7 FOR KSTEP= 30 NEVAL= 57 HMIN IS SET TO 3.1250E-03
 IFLAG= 7 FOR KSTEP= 30 NEVAL= 58 HMIN IS SET TO 1.5625E-03
 INSIDE QUAD 187 I2= 1
 ZNF,ROSQ,TSQ,H= -3.2026E-04 1.6737E-01 6.7553E-01 2.5003E-02
 THE BODY SURFACE IS PENETRATED. PARTICLE COORDINATES ARE (X,Y,Z)=-2.414
 TRIAL INITIAL COORDINATES ARE (YINIT,ZINIT) 0. -4.9500E-01

AFTER 0 ATTEMPTS PARTICLE STILL PENETRATES THE BODY.

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	0.	-4.9500E-01	9.5017E-01	-1.0226E-03
	H= 1.0000E-01	R= 1.7534E+02	AC= 4.2147E-20		NEVAL= 1	
10	5.0000E-01	-4.5250E+00	-5.1385E-04	-5.0401E-01	9.4934E-01	-1.0394E-03
	H= 5.0000E-02	R= 2.1313E+01	AC= 1.6874E-03		NEVAL= 13	
20	1.0000E+00	-4.0512E+00	-1.0501E-03	-5.1333E-01	9.4502E-01	-1.1222E-03
	H= 1.0000E-01	R= 5.6799E+01	AC= 9.2763E-04		NEVAL= 31	
21	1.0000E+00	-4.0512E+00	-1.0501E-03	-5.1333E-01	9.4502E-01	-1.1222E-03
	H= 1.0000E-01	R= 6.6762E+01	AC= 6.7141E-04		NEVAL= 33	
31	1.8766E+00	-3.2352E+00	-2.2457E-03	-5.3643E-01	9.0602E-01	-1.7688E-03
	H= 1.5625E-03	R= 2.0029E+02	AC= 5.0046E-04		NEVAL= 60	
41	1.9063E+00	-3.2083E+00	-2.2988E-03	-5.3772E-01	9.0350E-01	-1.8081E-03
	H= 6.2500E-03	R= 2.0786E+02	AC= 4.9263E-04		NEVAL= 80	

FOUR FIVE

85	E-01 -1.8018E-03	-4.4579E-02	7.4102E-01	-4.3561E-03	-1.8513E-01
103	E-01 -1.9350E-03	-5.2476E-02	7.2203E-01	-4.6783E-03	-2.3124E-01
124	E-01 -2.8990E-03	-1.4541E-01	7.7503E-01	-5.6161E-03	-5.0306E-01
147	E-01 -3.2768E-03	-2.0033E-01	9.5347E-01	-5.6300E-03	-5.6342E-01
167	E-01 -3.4910E-03	-2.3312E-01	1.0317E+00	-5.0500E-03	-4.5671E-01
178	E-01 -3.5962E-03	-2.4746E-01	1.0474E+00	-4.9247E-03	-4.0973E-01
202	E-01 -3.7829E-03	-2.6766E-01	1.1074E+00	-5.0931E-03	-3.8329E-01
222	E-01 -3.8160E-03	-2.7199E-01	1.1195E+00	-4.0114E-03	-3.1470E-01
247	E-01 -3.8177E-03	-2.7241E-01	1.1183E+00	-3.9671E-03	-3.0931E-01
267	E-01 -3.8205E-03	-2.7338E-01	1.1168E+00	-3.8600E-03	-2.9616E-01
288	E-01 -3.7791E-03	-2.7288E-01	1.1511E+00	-3.2909E-03	-2.4028E-01
311	E-01 -3.7025E-03	-2.6648E-01	1.1507E+00	-2.8540E-03	-1.8720E-01
314	E-01 -3.7025E-03	-2.6648E-01	1.1506E+00	-2.8140E-03	-1.8361E-01
335	E+00 -3.5092E-03	-2.4919E-01	1.1656E+00	-2.2839E-03	-1.3240E-01
356	E+00 -3.1772E-03	-2.1923E-01	1.1649E+00	-1.4809E-03	-7.1961E-02
367	E+00 -2.9619E-03	-2.0115E-01	1.1603E+00	-1.0059E-03	-4.1299E-02
377	E+00 -2.6446E-03	-1.7707E-01	1.1631E+00	-4.1830E-04	-1.9720E-02

0 FINE STEPSIZE * * * * *

Z=-4.9500E-01 FOR TRAJECTORY NUMBER 1
 IS SET TO 3.1250E-03
 IS SET TO 1.5625E-03
 -01 2.5000E-02
 ES ARE (X,Y,Z) -2.41459E+00 -4.70245E-03 -6.47195E-01
 -4.9500E-01 ATTEMPT NUMBER 0

ORIGINAL PAGE IS
 OF POOR QUALITY

THE BODY.

	PX	VPY	VPZ	VX	VY	VZ
1	7E-01	-1.0226E-03	-1.7943E-02	9.5017E-01	-1.0226E-03	-9.3971E-03
13	4E-01	-1.0394E-03	-1.8156E-02	9.2731E-01	-1.4808E-03	-1.7056E-02
31	2E-01	-1.1222E-03	-1.9463E-02	8.8821E-01	-2.1833E-03	-3.4500E-02
33	2E-01	-1.1222E-03	-1.9463E-02	8.7730E-01	-2.3654E-03	-4.0409E-02
60	2E-01	-1.7688E-03	-4.2313E-02	7.4457E-01	-4.2901E-03	-1.7230E-01
80	0E-01	-1.8081E-03	-4.4423E-02	7.3895E-01	-4.3740E-03	-1.8295E-01

2
 FM 0017 FRA:

46	2.0000E+00	-3.1240E+00	-2.4749E-03	-5.4224E-01	8.9490E-01	-1.9429E-03
	H= 2.5000E-02	R= 2.3887E+02	AC= 4.4563E-04		NEVAL= 94	
58	2.4750E+00	-2.7105E+00	-3.5943E-03	-5.8330E-01	8.4764E-01	-2.8141E-03
	H= 5.0000E-02	R= 3.4415E+02	AC= 4.1415E-04		NEVAL= 115	
68	2.7125E+00	-2.5103E+00	-4.3208E-03	-6.2285E-01	8.4491E-01	-3.3024E-03
	H= 1.2500E-02	R= 3.7292E+02	AC= 4.0480E-04		NEVAL= 137	

***** TANGENT TRAJECTORY IS AS FOLLO

* * * INITIAL COORDINATES X=-5.00000E+00 Y= 0. Z=-5.00000E+00

IFLAG= 7 FOR KSTEP= 28	NEVAL= 60	HMIN IS SET TO 3.1250E-03
IFLAG= 7 FOR KSTEP= 29	NEVAL= 63	HMIN IS SET TO 1.5625E-03
IFLAG= 7 FOR KSTEP= 108	NEVAL= 235	HMIN IS SET TO 7.8125E-03

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KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	0.	-5.0000E-01	9.5022E-01	-1.0211E-03
	H= 1.0000E-01	R= 3.7292E+02	AC= 9.3174E-21		NEVAL= 1	
10	5.0000E-01	-4.5250E+00	-5.1313E-04	-5.0905E-01	9.4939E-01	-1.0379E-03
	H= 5.0000E-02	R= 2.1255E+01	AC= 1.6923E-03		NEVAL= 17	
20	1.0000E+00	-4.0512E+00	-1.0485E-03	-5.1842E-01	9.4510E-01	-1.1204E-03
	H= 1.0000E-01	R= 6.6581E+01	AC= 6.7269E-04		NEVAL= 37	
30	1.8797E+00	-3.2321E+00	-2.2468E-03	-5.4179E-01	9.0617E-01	-1.7668E-03
	H= 1.5625E-03	R= 1.9997E+02	AC= 5.3975E-04		NEVAL= 65	
40	1.9063E+00	-3.2081E+00	-2.2942E-03	-5.4294E-01	9.0393E-01	-1.8018E-03
	H= 6.2500E-03	R= 2.0666E+02	AC= 4.9383E-04		NEVAL= 85	
49	2.0000E+00	-3.1237E+00	-2.4692E-03	-5.4747E-01	8.9545E-01	-1.9350E-03
	H= 2.5000E-02	R= 2.3735E+02	AC= 4.4684E-04		NEVAL= 103	
59	2.5250E+00	-2.6674E+00	-3.7260E-03	-5.9541E-01	8.4607E-01	-2.8990E-03
	H= 5.0000E-02	R= 3.5235E+02	AC= 4.1138E-04		NEVAL= 124	
69	2.7125E+00	-2.5091E+00	-4.3054E-03	-6.2775E-01	8.4692E-01	-3.2768E-03
	H= 1.2500E-02	R= 3.6565E+02	AC= 4.0703E-04		NEVAL= 147	
79	2.8750E+00	-2.3701E+00	-4.8572E-03	-6.6329E-01	8.6379E-01	-3.4910E-03
	H= 2.5000E-02	R= 2.7019E+02	AC= 4.4649E-04		NEVAL= 167	
84	3.0000E+00	-2.2614E+00	-5.3004E-03	-6.9339E-01	8.7616E-01	-3.5962E-03
	H= 2.5000E-02	R= 2.2479E+02	AC= 4.9517E-04		NEVAL= 178	
94	3.2687E+00	-2.0226E+00	-6.2920E-03	-7.6277E-01	9.0165E-01	-3.7829E-03
	H= 6.2500E-03	R= 2.2802E+02	AC= 4.7372E-04		NEVAL= 202	
104	3.3750E+00	-1.9261E+00	-6.6963E-03	-7.9149E-01	9.1405E-01	-3.8160E-03
	H= 2.5000E-02	R= 2.0274E+02	AC= 4.9549E-04		NEVAL= 222	
114	3.3937E+00	-1.9089E+00	-6.7679E-03	-7.9659E-01	9.1608E-01	-3.8177E-03
	H= 1.5625E-03	R= 1.9867E+02	AC= 5.3852E-04		NEVAL= 247	
124	3.4500E+00	-1.8572E+00	-6.9827E-03	-8.1193E-01	9.2214E-01	-3.8205E-03
	H= 1.2500E-02	R= 1.8939E+02	AC= 5.4795E-04		NEVAL= 267	
134	3.8000E+00	-1.5285E+00	-8.3154E-03	-9.0780E-01	9.5632E-01	-3.7791E-03
	H= 5.0000E-02	R= 1.9086E+02	AC= 5.4461E-04		NEVAL= 288	
144	4.0000E+00	-1.3352E+00	-9.0641E-03	-9.6181E-01	9.7643E-01	-3.7025E-03
	H= 5.0000E-02	R= 1.8499E+02	AC= 5.4930E-04		NEVAL= 311	
145	4.0000E+00	-1.3352E+00	-9.0641E-03	-9.6181E-01	9.7643E-01	-3.7025E-03
	H= 2.5000E-02	R= 1.8398E+02	AC= 5.5533E-04		NEVAL= 314	
155	4.3500E+00	-9.8803E-01	-1.0328E-02	-1.0523E+00	1.0069E+00	-3.5092E-03
	H= 2.5000E-02	R= 1.9043E+02	AC= 5.4239E-04		NEVAL= 335	
165	4.7750E+00	-5.5306E-01	-1.1753E-02	-1.1520E+00	1.0387E+00	-3.1772E-03
	H= 5.0000E-02	R= 1.8739E+02	AC= 5.4449E-04		NEVAL= 356	
170	5.0000E+00	-3.1772E-01	-1.2444E-02	-1.1993E+00	1.0528E+00	-2.9619E-03
	H= 5.0000E-02	R= 1.8378E+02	AC= 5.5173E-04		NEVAL= 367	
175	5.2995E+00	1.1102E-16	-1.3284E-02	-1.2559E+00	1.0662E+00	-2.6446E-03
	H= 1.0000E-01	R= 1.7534E+02	AC= 5.5777E-04		NEVAL= 377	

94 -1.9425E-03 -5.2555E-02 7.1946E-01 -4.6997E-03 -2.5140E-01
 15 -2.8141E-03 -1.3307E-01 7.4906E-01 -5.5837E-03 -4.7531E-01
 37 -3.3024E-03 -2.0236E-01 9.5275E-01 -5.7009E-03 -5.7291E-01

ORY IS AS FOLLOWS * * * * *

Z=-5.0000E-01 FOR TRAJECTORY NUMBER 0
 T TO 3.1250E-03
 T TO 1.5625E-03
 T TO 7.8125E-04

	VPY	VPZ	VX	VY	VZ
1	-1.0211E-03	-1.8037E-02	9.5022E-01	-1.0211E-03	-9.4917E-03
17	-1.0379E-03	-1.8253E-02	9.2743E-01	-1.4781E-03	-1.7214E-02
37	-1.1204E-03	-1.9572E-02	8.7764E-01	-2.3594E-03	-4.0720E-02
65	-1.7668E-03	-4.2684E-02	7.4593E-01	-4.2808E-03	-1.7362E-01
85	-1.8018E-03	-4.4579E-02	7.4102E-01	-4.3561E-03	-1.8313E-01
03	-1.9350E-03	-5.2476E-02	7.2203E-01	-4.6783E-03	-2.3124E-01
24	-2.8990E-03	-1.4541E-01	7.7503E-01	-5.6161E-03	-5.0306E-01
47	-3.2768E-03	-2.0033E-01	9.5347E-01	-5.6300E-03	-5.6342E-01
67	-3.4910E-03	-2.3312E-01	1.0317E+00	-5.0500E-03	-4.5671E-01
78	-3.5962E-03	-2.4746E-01	1.0474E+00	-4.9247E-03	-4.0973E-01
02	-3.7829E-03	-2.6766E-01	1.1074E+00	-5.0931E-03	-3.8329E-01
22	-3.8160E-03	-2.7199E-01	1.1195E+00	-4.0114E-03	-3.1470E-01
47	-3.8177E-03	-2.7241E-01	1.1183E+00	-3.9671E-03	-3.0931E-01
67	-3.8205E-03	-2.7338E-01	1.1168E+00	-3.8600E-03	-2.9616E-01
88	-3.7791E-03	-2.7286E-01	1.1511E+00	-3.2909E-03	-2.4028E-01
11	-3.7025E-03	-2.6648E-01	1.1507E+00	-2.8540E-03	-1.8720E-01
14	-3.7025E-03	-2.6648E-01	1.1506E+00	-2.8140E-03	-1.8361E-01
35	-3.5092E-03	-2.4919E-01	1.1656E+00	-2.2839E-03	-1.3240E-01
56	-3.1772E-03	-2.1923E-01	1.1649E+00	-1.4809E-03	-7.1961E-02
56	-2.9619E-03	-2.0115E-01	1.1603E+00	-1.0059E-03	-4.1299E-02
57	-2.6446E-03	-1.7707E-01	1.1631E+00	-4.1830E-04	-1.9720E-02
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STEREO

PLOT TANGENT TRAJECTORY TO THE TEST BODY

NUMBER OF SYMMETRY PLANES= 0 NUMBER OF TRAJECTORIES= 1 XSTART

MINIMUM AND MAXIMUM COORDINATES -

X AXIS=	-5.00000E+00	2.00000E+00
Y AXIS=	-2.00000E+00	2.00000E+00
Z AXIS=	-1.25593E+00	1.00000E+00

COORDINATE TRANSLATIONS USED TO CENTER THE PLOTS - DELX, DELY, DELZ -
 -1.50000E+00 1. -1.27964E-01

CRT PLOTS

THETA = 0.00 PSI = 160.00 DELTA = 3.50
 PLOT LABEL - THETA=0, PSI=160, DELTA=3.5
 PEMSF = 1.5466E+00

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.2158E+01	-.5754E+00
-.5000E+01	0.	-.5000E+00	-.2158E+01	-.5754E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1865E+01	-.5894E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1572E+01	-.6039E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.1065E+01	-.6400E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.1050E+01	-.6418E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.9978E+00	-.6488E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.7146E+00	-.7229E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.6162E+00	-.7729E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.5297E+00	-.8279E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.4620E+00	-.8744E+00
-.2023E+01	-.6292E-02	-.7626E+00	-.3133E+00	-.9818E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.2533E+00	-.1026E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.2426E+00	-.1034E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.2104E+00	-.1058E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.5772E-02	-.1206E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1145E+00	-.1290E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1145E+00	-.1290E+01
-.9880E+00	-.1033E-01	-.1052E+01	.3304E+00	-.1429E+01
-.5531E+00	-.1175E-01	-.1152E+01	.6006E+00	-.1584E+01
-.3177E+00	-.1244E-01	-.1199E+01	.7468E+00	-.1657E+01
.1110E-15	-.1328E-01	-.1256E+01	.9439E+00	-.1744E+01

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.1537E+01	-.5754E+00
-.5000E+01	0.	-.5000E+00	-.1537E+01	-.5754E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1328E+01	-.5894E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1119E+01	-.6039E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.7575E+00	-.6400E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.7469E+00	-.6418E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.7096E+00	-.6488E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.5073E+00	-.7229E+00

POLOUT FROM

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1 XSTART=-5.00000E+00

DELY, DELZ -
27964E-01

Y PLOT

-.5754E+00
-.5754E+00
-.5894E+00
-.6039E+00
-.6400E+00
-.6418E+00
-.6488E+00
-.7229E+00
-.7729E+00
-.8279E+00
-.8744E+00
-.9818E+00
-.1026E+01
-.1034E+01
-.1058E+01
-.1206E+01
-.1290E+01
-.1290E+01
-.1429E+01
-.1584E+01
-.1657E+01
-.1744E+01

Y PLOT

-.5754E+00
-.5754E+00
-.5894E+00
-.6039E+00
-.6400E+00
-.6418E+00
-.6488E+00
-.7229E+00

PRINT FRAM. 2

-.2309E+01	-.4305E-02	-.6277E+00	-.4309E+00	-.1729E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.3750E+00	-.8279E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.3266E+00	-.8744E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.2202E+00	-.9818E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.1772E+00	-.1026E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.1696E+00	-.1034E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.1466E+00	-.1058E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.1809E-03	-.1206E+01
-.1335E+01	-.9064E-02	-.9618E+00	.8585E-01	-.1290E+01
-.1335E+01	-.9064E-02	-.9618E+00	.8585E-01	-.1290E+01
-.9880E+00	-.1033E-01	-.1052E+01	.2402E+00	-.1429E+01
-.5531E+00	-.1175E-01	-.1152E+01	.4334E+00	-.1584E+01
-.3177E+00	-.1244E-01	-.1199E+01	.5378E+00	-.1657E+01
.1110E-15	-.1328E-01	-.1256E+01	.6786E+00	-.1744E+01

THETA = 0.00 PSI = 160.00 DELTA = 3.00
PLOT LABEL - THETA=0, PSI=160, DELTA=3.0
PEMSF = 1.5568E+00

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.2129E+01	-.5792E+00
-.5000E+01	0.	-.5000E+00	-.2129E+01	-.5792E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1839E+01	-.5933E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1550E+01	-.6079E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.1050E+01	-.6442E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.1036E+01	-.6460E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.9841E+00	-.6531E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.7048E+00	-.7277E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.6076E+00	-.7780E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.5223E+00	-.8334E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.4555E+00	-.8802E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.3088E+00	-.9882E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.2496E+00	-.1033E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.2390E+00	-.1041E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.2073E+00	-.1065E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.5410E-02	-.1214E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1133E+00	-.1298E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1133E+00	-.1298E+01
-.9880E+00	-.1033E-01	-.1052E+01	.3262E+00	-.1439E+01
-.5531E+00	-.1175E-01	-.1152E+01	.5929E+00	-.1594E+01
-.3177E+00	-.1244E-01	-.1199E+01	.7370E+00	-.1668E+01
.1110E-15	-.1328E-01	-.1256E+01	.9315E+00	-.1756E+01

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.1593E+01	-.5792E+00
-.5000E+01	0.	-.5000E+00	-.1593E+01	-.5792E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1376E+01	-.5933E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1160E+01	-.6079E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.7850E+00	-.6442E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.7740E+00	-.6460E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.7354E+00	-.6531E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.5258E+00	-.7277E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.4529E+00	-.7780E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.3888E+00	-.8334E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.3387E+00	-.8802E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.2285E+00	-.9882E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.1840E+00	-.1033E+01

.1909E+01	-.6700E-02	-.7900E+00	-.1701E+00	-.1041E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.1522E+00	-.1065E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.5852E-03	-.1214E+01
-.1335E+01	-.9064E-02	-.9618E+00	.8853E-01	-.1298E+01
-.1335E+01	-.9064E-02	-.9618E+00	.8853E-01	-.1298E+01
-.9880E+00	-.1033E-01	-.1052E+01	.2464E+00	-.1439E+01
-.5531E+00	-.1175E-01	-.1152E+01	.4485E+00	-.1594E+01
-.3177E+00	-.1244E-01	-.1199E+01	.5566E+00	-.1668E+01
.1110E-15	-.1328E-01	-.1256E+01	.7025E+00	-.1756E+01

THETA = 0.00 PSI = 160.00 DELTA = 2.50
 PLOT LABEL - THETA=0, PSI=160, DELTA=2.5
 PEMSF = 1.5672E+00

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.2099E+01	-.5831E+00
-.5000E+01	0.	-.5000E+00	-.2099E+01	-.5831E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1814E+01	-.5973E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1529E+01	-.6119E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.1036E+01	-.6485E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.1021E+01	-.6504E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.9703E+00	-.6575E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.6948E+00	-.7326E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.5990E+00	-.7833E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.5148E+00	-.8390E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.4490E+00	-.8861E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.3043E+00	-.9949E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.2459E+00	-.1040E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.2355E+00	-.1048E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.2041E+00	-.1072E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.5043E-02	-.1222E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1120E+00	-.1307E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1120E+00	-.1307E+01
-.9880E+00	-.1033E-01	-.1052E+01	.3220E+00	-.1449E+01
-.5531E+00	-.1175E-01	-.1152E+01	.5849E+00	-.1605E+01
-.3177E+00	-.1244E-01	-.1199E+01	.7271E+00	-.1679E+01
.1110E-15	-.1328E-01	-.1256E+01	.9189E+00	-.1768E+01

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.1649E+01	-.5831E+00
-.5000E+01	0.	-.5000E+00	-.1649E+01	-.5831E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1425E+01	-.5973E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1201E+01	-.6119E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.8129E+00	-.6485E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.8015E+00	-.6504E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.7615E+00	-.6575E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.5446E+00	-.7326E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.4691E+00	-.7833E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.4028E+00	-.8390E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.3509E+00	-.8861E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.2369E+00	-.9949E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.1908E+00	-.1040E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.1826E+00	-.1048E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.1579E+00	-.1072E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.9949E-03	-.1222E+01
-.1335E+01	-.9064E-02	-.9618E+00	.9124E-01	-.1307E+01
-.1335E+01	-.9064E-02	-.9618E+00	.9124E-01	-.1307E+01

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ORIGINAL QUALITY

- .9000E+00	- .1000E-01	- .1000E+01	. 2500E+00	- .1449E+01
- .5531E+00	- .1175E-01	- .1152E+01	. 4638E+00	- .1605E+01
- .3177E+00	- .1244E-01	- .1199E+01	. 5758E+00	- .1679E+01
. 1110E-15	- .1328E-01	- .1256E+01	. 7268E+00	- .1768E+01

CODE LISTINGS

PROGRAM PBOXC (INPUT, TAPE6, TAPE5=INPUT, OUTPUT,
1 TAPE8, TAPE9, TAPE39, PUNCH, TAPE1=PUNCH)

C		FBOXC 2
C		FBOXC 3
C		FBOXC 4
C		FBOXC 5
C		FBOXC 6
C		FBOXC 7
C		FBOXC 8
C		FBOXC 9
C		FBOXC 10
C		FBOXC 11
C		FBOXC 12
C		FBOXC 13
C		FBOXC 14
C		FBOXC 15
C		FBOXC 16
C		FBOXC 17
C		FBOXC 18
C		FBOXC 19
C		FBOXC 20
C		FBOXC 21
C		FBOXC 22
C		FBOXC 23
C		FBOXC 24
C		FBOXC 25
C		FBOXC 26
C		FBOXC 27
C		FBOXC 28
C		FBOXC 29
C		FBOXC 30
C		FBOXC 31
C		FBOXC 32
C		FBOXC 33
C		FBOXC 34
C		FBOXC 35
C		FBOXC 36
C		FBOXC 37
C		FBOXC 38
C		FBOXC 39
C		FBOXC 40
C		FBOXC 41
C		FBOXC 42
C		FBOXC 43
C		FBOXC 44
C		FBOXC 45
C		FBOXC 46
C		FBOXC 47
C		FBOXC 48
C		FBOXC 49
C		FBOXC 50
C		FBOXC 51
C		FBOXC 51A
C		FBOXC 52
C		FBOXC 53
C		FBOXC 54
C		FBOXC 55
C		FBOXC 56

M. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979

THIS CODE HAS THREE PRINCIPAL USES -

1. DEBUG HESS-SMITH CODE INPUT DATA.
2. PLCT 3-DIMENSIONAL BODY SURFACE DESCRIPTION.
3. TRANSFER QUADRILATERAL ELEMENT DATA TO UNIT 9 FOR LATER USE BY PROGRAM STEREO.

PERFORMS PRELIMINARY PROCESSING (IPROS=TRUE) (SCALING, TRANSLATING, ROTATING) OF INPUT DATA FOR THE HESS-SMITH NON-LIFTING CODE (RPT. E.S. 40622). PRELIMINARY PROCESSED DATA MAY BE PUNCHED (IPUNCH=TRUE). AFTER PRELIMINARY PROCESSING, DATA ALSO MAY BE PROCESSED INTO QUADRILATERAL ELEMENTS AND THE HESS-SMITH FIRST OUTPUT (E.S. 40622 SEC. 9.4) MAY BE PRINTED (IPRNT=TRUE). DATA ALSO MAY BE PLOTTED (PICT=TRUE). IN ANY CASE THE DATA ARE WRITTEN ON TO UNIT 9, WHICH MAY BE SAVED FOR USE LATER BY SR STEREO WHICH PLOTS THE BODY ALONG WITH TRAJECTORIES.

COMMON HEDR(15), NQUAD, KASE, NSYM, IFLAG, IPROS, IPUNCH, IFRNT,
1 IPICT, ICRT, SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS,
2 ZTRANS
REAL MACH
LOGICAL IPROS, IPUNCH, IPRNT, IPICT, ICRT
COMMON /P/ MACH, BETA, RBETA
READ IN CONTROL DATA
1 READ (5, 9000) (HEDR(I), I=1, 15), IFLAG, NSYM, KMACH, KASE
9000 FORMAT(15A4, 11, 10X, 11, 1X, 11, 2X, A4)
MACH = 0.0
IF(KMACH.NE.0) READ(5,6) MACH
6 FORMAT(F10.6)
BETA = SQRT(1.0 - MACH * MACH)
RBETA = 1.0 / BETA
READ(5,8000) IPROS, IPUNCH, IPRNT, IPICT, ICRT
8000 FORMAT(5L1)
IF(IPROS) READ(5,7000) ANGLE, XSCALE, YSCALE, ZSCALE, XTRANS,
1 YTRANS, ZTRANS
7000 FORMAT(7F10.0)
IF(.NOT. IPROS) GO TO 53
IF(XSCALE.EQ.0.0) XSCALE=1.0
IF(YSCALE.EQ.0.0) YSCALE=1.0
IF(ZSCALE.EQ.0.0) ZSCALE=1.0
COSA = COS(0.0174533 * ANGLE)
SINA = SIN(0.0174533 * ANGLE)
50 REWIND 8
REWIND 9
CALL PINPUT
IF(IPICT) CALL PICTUR
IF(ICRT) CALL FRAME(0.5,0.5)
IF(IPICT.AND..NOT.ICRT) CALL PLOT(15.0, 0.0, -3)
IF(IPICT.AND..NOT.ICRT) CALL ENDCG
IF(IPICT.AND.ICRT) CALL ENDFLT
REWIND 9
STOP
END

*DECK, PEADER			PEAD	1
SUBROUTINE PEADER			PEAD	2
COMMON HEDR(15), NQUAD, KASE, NSYM, IFLAG, IPROS, IPUNCH, IPRNT,			PEAD	3
1	IPICT, ICRT, SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS,		PEAD	4
2	ZTRANS		PEAD	5
LOGICAL IPROS, IPUNCH, IPRNT, IPICT, ICRT			PEAD	6
DATA IPAGE/0/			PEAD	7
1	FORMAT(1H1, 4X, 14H PROGRAM PBOXC, 15X, 30HATMOSPHERIC SCIENCE ASPEAD		PEAD	8
1	SOCIATES/ 38X, 22HBEDFORD, MASSACHUSETTS, 22X, 4HPAGEI5/		PEAD	9
2	7X, 8HBODY ID., 2X, A4/ 30X, 15A4)		PEAD	10
10	IPAGE = IPAGE + 1		PEAD	11
WRITE (6,1) IPAGE, KASE, (HEDR(I),I=1,15)			PEAD	12
RETURN			PEAD	13
END			PEAD	14

*DECK, PATPROS			PATP	1
SUBROUTINE PATPROS(X, Y, Z, XX, YY, ZZ)			PATP	2
C			PATP	3
C			PATP	4
C	THIS IS A SIMPLE SCALING AND ORIGIN TRANSLATION CODE FOR THE		PATP	5
C	DOUGLAS BOXC POTENTIAL FLOW CODE DATA INPUT		PATP	6
C	XTRANS, YTRANS, ZTRANS ARE ORIGIN TRANSLATIONS		PATP	7
C	XSCALE, YSCALE, ZSCALE ARE SCALE FACTORS		PATP	8
C	THE CODE ALSO ALLOWS FOR ROTATION IN THE X - Z PLANE TO ADJUST		PATP	9
C	FOR ARBITRARY ANGLE OF ATTACK		PATP	10
C	SINA, COSA ARE SINE AND COSINE OF ANGLE		PATP	11
C	ANGLE IS THE ANGLE(INPUT IN DEGREES) THAT THE AIRPLANE AXIS		PATP	12
C	MAKES WITH THE NEGATIVE X AXIS (POSITIVE COUNTERCLOCKWISE		PATP	13
C	FROM THE-X AXIS) AFTER SCALING (NOTE - AFTER SCALING THE		PATP	14
C	AIRPLANE NOSE POINTS DOWN THE NEGATIVE X AXIS)		PATP	15
C			PATP	16
C	THIS VERSION FOR USE WITH PBOXC		PATP	17
C			PATP	18
C			PATP	19
C	LOGICAL IPROS, IPUNCH, IPRNT, IPICT, ICRT		PATP	20
C	COMMON HEDR(15), NQLAD, KASE, NSYM, IFLAG, IPROS, IPUNCH, IPRNT,		PATP	21
C	1 IPICT, ICRT, SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS,		PATP	22
C	2 ZTRANS		PATP	23
C	X = (X - XTRANS) * XSCALE		PATP	24
C	Y = (Y - YTRANS) * YSCALE		PATP	25
C	Z = (Z - ZTRANS) * ZSCALE		PATP	26
C	XX= (XX- XTRANS) * XSCALE		PATP	27
C	YY= (YY- YTRANS) * YSCALE		PATP	28
C	ZZ= (ZZ- ZTRANS) * ZSCALE		PATP	29
C	XP = X		PATP	30
C	X = XP * COSA - Z * SINA		PATP	31
C	Z = XP * SINA + Z * COSA		PATP	32
C	XP = XX		PATP	33
C	XX= XP * COSA - ZZ* SINA		PATP	34
C	ZZ= XP * SINA + ZZ* COSA		PATP	35
C	RETURN		PATP	36
C	END		PATP	36

*DECK, PINPUT	PINP	1
SUBROUTINE PINPUT	PINP	2
C	PINP	3
C	PINP	4
C	PINP	5
REAL NX, NY, NZ , MACH	PINP	6
LOGICAL IPROS, IPUNCH, IFRNT, IPICT, ICRT, RFLAG, AFLAG, BFLAG	PINP	7
INTEGER STAT, STATT, CCNV	PINP	8
COMMON HEDR(15), NQLAD, KASE, NSYM, IFLAG, IPROS, IPUNCH, IFRNT,	PINP	9
1 IPICT, ICRT, SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS, YTFANS,	PINP	10
2 ZTRANS	PINP	11
COMMON /M/ MACH, BETA, RBETA	PINP	12
DIMENSION SPH (200), CPH (200), XINP (200), ZINP (200)	PINP	13
DIMENSION LAXIS(8), RAXIS(6), L45(6), L(5)	PINP	14
DIMENSION XA (500), XB (500), YA (500), YB (500),	PINP	15
1 ZA (500), ZB (500), NLINE(500), NLT (500), CFLAG(3),	PINP	16
2 XI (4), ETA (4), XIN (4), YIN (4), ZIN (4),	PINP	17
4 RX (4), R (4), RY (4)	PINP	18
EQUIVALENCE (NULL,NQUAD)	PINP	19
DATA CFLAG / 2H 1, 2H 2, 2H /	PINP	20
DATA PI/3.141593E0/, HAFPI/1.570796E0/, EPS/.0001/	PINP	21
DATA LAXIS / 4HVIEW, 4H CF , 4HBODY, 4H LOO, 4H KING, 4H DOW,	PINP	22
1 4HNT H, 1HE/	PINP	23
DATA RAXIS/ 4H AXI, 4HSTO, 4HWARD,4H THE, 4H ORI, 4HGIN /	PINP	24
DATA L45/ 4H45-D, 4HEGRE, 4HEVI, 4HEWF, 4HROM , 4HTHE /	PINP	25
DATA R45/ 4H SIDE/, L/5*4H /	PINP	26
DATA PLUSX, MINUSX, FLUSY, MINUSY, PLUSZ, MINUSZ	PINP	27
1 / 4H +X , 4H -X , 4H +Y , 4H -Y , 4H +Z , 4H -Z /	PINP	28
1 FORMAT (3E10.0, I2 / 3F10.0, I2)	PINP	29
4002 FORMAT (1H0, 6X 5HN M, 7X, 4 (1HX, 11X), 2HNX, 11X, 3HNFX,	PINP	30
1 11X, 1HD / 19X, 4 (1HY, 11X), 2HNY, 11X, 3HNPY, 11X, 1HT /	PINP	31
2 19X, 4(1HZ, 11X), 2HNZ, 11X, 3NPNZ, 11X, 1HA)	PINP	32
4005 FORMAT (1H0, 7X, I4, 4F12.6, 2F13.6, E14.4,A2/(12X,4F12.6,	PINP	33
1 2F13.6, E14.4))	PINP	34
4010 FORMAT (1H0, 3X, 2I4, 4F12.6, 2F13.6, E14.4,A2/(12X, 4F12.6,	PINP	35
1 2F13.6, E14.4))	PINP	36
4015 FORMAT (1H0, 3 (20X, 12H*****))	PINP	37
	PINP	38
C INPUT -- SECTION 9.1 INPUT SCHEME	PINP	39
KLCT = 0	PINP	40
NULL = 0	PINP	41
NPRT = 13	PINP	42
CALL PEADER	PINP	43
WRITE (6, 40)	PINP	44
40 FORMAT (1H0,16X,44HP A R A M E T R I C I N F O R M A T I O N//)	PINP	45
IF (NSYM - 1) 54, 56, 58	PINP	46
54 WRITE (6, 55)	PINP	47
55 FORMAT (1H0,16X,21HNC SYMMETRY SPECIFIED)	PINP	48
GO TO 61	PINP	49
56 WRITE (6, 57)	PINP	50
57 FORMAT (1H0,16X,30HTHERE IS ONE PLANE OF SYMMETRY)	PINP	51
GO TO 61	PINP	52
58 WRITE (6, 59) NSYM	PINP	53
59 FORMAT (1H0,16X,9HTHERE ARE,I2, 19H PLANES OF SYMMETRY)	PINP	54
61 IF (MACH .NE. 0.0) WRITE (6, 21) MACH	PINP	55
21 FORMAT (1H0,16X,13HMACH NUMBER =,F10.5)	PINP	56
IF (IFLAG .EQ. 0) GO TO 29	PINP	57
READ (5, 20) NLM1, MMIN, B, C	PINP	58
IF (B .EQ. 0.0) B = 1.0	PINP	59
IF (C .EQ. 0.0) C = 1.0	PINP	60

20	FORMAT (2I5, 2F10.5)	PINP	61
4	FORMAT (8F10.0)	PINP	62
	WRITE (6, 62) MLM1, MMIN, B, C	PINP	63
62	FORMAT (1H0,16X,10HGENERATE A,I3, 2H X,I3, 12H SPHERE. B =,F10.5,	PINP	64
1	4X,3HC =,F10.5)	PINP	65
	MLINES = MMIN + 1	PINP	66
	NLINES = MLM1 + 1	PINP	67
	N = 0	PINP	68
	IF (NSYM .EQ. 8) GO TO 2	PINP	69
	IF (NSYM - 2) 3, 5, 6	PINP	70
2	PITH = PI	PINP	71
	PIPHI = PI + PI	PINP	72
	GO TO 7	PINP	73
3	PITH = PI	PINP	74
	PIPHI = PI	PINP	75
	GO TO 7	PINP	76
5	PITH = PI	PINP	77
	PIPHI = HAFPI	PINP	78
	GO TO 7	PINP	79
6	PITH = HAFPI	PINP	80
	PIPHI = PITH	PINP	81
7	SPH (MLINES) = SIN (PIPHI)	PINP	82
	SPH (1) = 0.0	PINP	83
	CPH (MLINES) = COS (PIPHI)	PINP	84
	CPH (1) = 1.0	PINP	85
	EKM = MMIN	PINP	86
	EKN = MLM1	PINP	87
	EMM = 0.0	PINP	88
	DO 8 I = 2, MMIN	PINP	89
	EMM = EMM + 1.0	PINP	90
	PHI = EMM / EKM * PIPHI	PINP	91
	SPH (I) = SIN (PHI)	PINP	92
8	CPH (I) = COS (PHI)	PINP	93
	IF (IFLAG .EQ. 2) GO TO 10	PINP	94
	ENN = 1.0	PINP	95
	DO 9 I = 1, MLINES	PINP	96
	XA (I) = 1.0	PINP	97
	YA (I) = 0.0	PINP	98
9	ZA (I) = 0.0	PINP	99
	GO TO 18	PINP	100
10	READ (5, 4) (XINP (I), ZINP (I), I = 1, NLINES)	PINP	101
	DO 11 I = 1, MLINES	PINP	102
	XA (I) = XINP (1)	PINP	103
	YA (I) = B * ZINP (1) * SPH (I)	PINP	104
	ZA (I) = - C * ZINP (1) * CPH (I)	PINP	105
	XB (I) = XINP (2)	PINP	106
	YB (I) = B * ZINP (2) * SPH (I)	PINP	107
11	ZB (I) = - C * ZINP (2) * CPH (I)	PINP	108
	NLCT = 2	PINP	109
	GO TO 250	PINP	110
12	DO 14 I = 1, MLINES	PINP	111
	XA (I) = XB (I)	PINP	112
	YA (I) = YB (I)	PINP	113
14	ZA (I) = ZB (I)	PINP	114
	IF (IFLAG .EQ. 1) GO TO 16	PINP	115
	NLCT = NLCT + 1	PINP	116
	DO 15 I = 1, MLINES	PINP	117
	XB (I) = XINP (NLCT)	PINP	118
	YB (I) = B * ZINP (NLCT) * SPH (I)	PINP	119
15	ZB (I) = - C * ZINP (NLCT) * CPH (I)	PINP	120

GO TO 250	PINP 121
16 ENN = ENN + 1.0	PINP 122
18 THETA = ENN / EKN * PITH	PINP 123
STH = SIN (THETA)	PINP 124
CTH = COS (THETA)	PINP 125
DO 17 I = 1, MLINES	PINP 126
XB (I) = CTH	PINP 127
YB (I) = B * STH * SPH (I)	PINP 128
17 ZB (I) = - C * STH * CPH (I)	PINP 129
GO TO 250	PINP 130
29 N = -1	PINP 131
IF(IPROS) WRITE(6,101)	PINP 132
IF(IPROS) WRITE(6,102) XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS,	PINP 133
1 ZTRANS, COSA, SINA	PINP 134
IF(IPICT) WRITE(6,103)	PINP 135
IF(IPUNCH) WRITE(6,104)	PINP 136
C	PINP 137
101 FORMAT(1H0, 16X, 61HINPLT DATA ARE PROCESSED BY SCALING, ROTATING	PINP 138
1 AND TRANSLATING)	PINP 139
102 FORMAT(18X, 58HXSCALE, YSCALE, ZSCALE, XTRANS, YTRANS, ZTRANS, COP	PINP 140
1SA, SINA/ 15X, 8(1PE14.4))	PINP 141
103 FORMAT(1H0, 16X, 18HFLOTS ARE PREPARED)	PINP 142
104 FORMAT(1H0, 16X, 16HDATA ARE PUNCHED)	PINP 143
XMIN = 1.0E6	PINP 144
XMAX = -1.0E6	PINP 145
YMIN = 1.0E6	PINP 146
YMAX = -1.0E6	PINP 147
ZMIN = 1.0E6	PINP 148
ZMAX = -1.0E6	PINP 149
GO TO 50	PINP 150
30 IF (RFLAG) GO TO 50	PINP 151
RFLAG = .TRUE.	PINP 152
X = XX	PINP 153
Y = YY	PINP 154
Z = ZZ	PINP 155
STAT = STATT	PINP 156
GO TO 66	PINP 157
50 RFLAG = .FALSE.	PINP 158
51 READ (5, 1) X, Y, Z, STAT, XX, YY, ZZ, STATT	PINP 159
IF (IPROS) CALL PATPROS(X, Y, Z, XX, YY, ZZ)	PINP 160
IF(IPUNCH) WRITE(1,5100) X, Y, Z, STAT, XX, YY, ZZ, STATT	PINP 161
5100 FORMAT(3(F10.7), I2/ 3(F10.7), I2)	PINP 162
WRITE (9) X,Y,Z,STAT,XX,YY,ZZ,STATT	PINP 163
C	PINP 164
64 XMIN = AMIN1(XMIN, X * RBETA)	PINP 165
YMIN = AMIN1(YMIN, Y)	PINP 166
ZMIN = AMIN1(ZMIN, Z)	PINP 167
XMAX = AMAX1(XMAX, X * RBETA)	PINP 168
YMAX = AMAX1(YMAX, Y)	PINP 169
ZMAX = AMAX1(ZMAX, Z)	PINP 170
IF(STAT .EQ. 3) GO TO 164	PINP 171
XMIN = AMIN1(XMIN, XX* RBETA)	PINP 172
YMIN = AMIN1(YMIN, YY)	PINP 173
ZMIN = AMIN1(ZMIN, ZZ)	PINP 174
XMAX = AMAX1(XMAX, XX* RBETA)	PINP 175
YMAX = AMAX1(YMAX, YY)	PINP 176
ZMAX = AMAX1(ZMAX, ZZ)	PINP 177
164 IF(NSYM .EQ. 0) GO TO 65	PINP 178
YMIN = AMIN1(YMIN, -Y)	PINP 179
YMAX = AMAX1(YMAX, -Y)	PINP 180

```

IF(STAT .EQ. 3) GO TO 165
YMIN = AMIN1( YMIN, -YY)
YMAX = AMAX1( YMAX, -YY)
165 IF( NSYM .EQ. 1 ) GO TO 65
ZMIN = AMIN1( ZMIN, -Z)
ZMAX = AMAX1( ZMAX, -Z)
IF(STAT .EQ. 3) GO TO 65
ZMIN = AMIN1( ZMIN, -ZZ)
ZMAX = AMAX1( ZMAX, -ZZ)
65 IF ( N .EQ. (-1))GO TO 80
66 IF (STAT .EQ. 0 .OR. STAT .EQ. 3) GO TO 180
IF ( STAT .EQ. 2 ) GO TO 200
IF ( .NOT. AFLAG ) GC TO 200
MC = M
80 M = 1
IF ( STAT .EQ. 2 ) GO TO 150
IF ( .NOT. BFLAG ) GO TO 84
75 DO 81 J = 1, MC
XA ( J ) = XB ( J )
YA ( J ) = YB ( J )
81 ZA ( J ) = ZB ( J )
83 XB ( 1 ) = X
YB ( 1 ) = Y
ZB ( 1 ) = Z
GO TO 30
84 IF ( AFLAG ) GO TO 85
BFLAG = .TRUE.
GO TO 75
85 AFLAG = .FALSE.
GO TO 83
150 AFLAG = .TRUE.
BFLAG = .FALSE.
IF ( N .EQ. (-1))N = 0
160 XA ( M ) = X
YA ( M ) = Y
ZA ( M ) = Z
GO TO 30
180 M = M + 1
IF ( AFLAG ) GO TO 160
XB ( M ) = X
YB ( M ) = Y
ZB ( M ) = Z
IF ( STAT .NE. 3 ) GO TO 30
200 MMIN = MIN0(M, MC) - 1
MC = M
250 N = N + 1
KLCT = KLCT + 1
IF( .NOT. IPRNT) GO TO 2100

```

C BEGIN COMPUTATION OF NULL PCINTS AND 28 QUANTITIES

```

DO 2000 I = 1, MMIN
NULL = NULL + 1
XIN(1) = XA( I ) * RBETA
XIN(2) = XA(I+1) * RBETA
XIN(3) = XB(I+1) * RBETA
XIN(4) = XB( I ) * RBETA
YIN(1) = YA(I)
YIN(2) = YA(I+1)
YIN(3) = YB(I+1)

```

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YIN(4) = YB(I)	PINP 241
ZIN(1) = ZA(I)	PINP 242
ZIN(2) = ZA(I+1)	PINP 243
ZIN(3) = ZB(I+1)	PINP 244
ZIN(4) = ZB(I)	PINP 245
C FORM DIAGONAL VECTORS	PINP 246
C EQUATION (64)	PINP 247
T1X = XIN(3) - XIN(1)	PINP 248
T2X = XIN(4) - XIN(2)	PINP 249
T1Y = YIN(3) - YIN(1)	PINP 250
T2Y = YIN(4) - YIN(2)	PINP 251
T1Z = ZIN(3) - ZIN(1)	PINP 252
T2Z = ZIN(4) - ZIN(2)	PINP 253
C FORM CROSS PRODUCT N = T2 X T1	PINP 254
C EQUATION (65)	PINP 255
NX = T2Y*T1Z - T1Y*T2Z	PINP 256
NY = T1X*T2Z - T2X*T1Z	PINP 257
NZ = T2X*T1Y - T1X*T2Y	PINP 258
VN = SQRT (NX* NX + NY* NY + NZ* NZ)	PINP 259
C FORM UNIT NORMAL VECTOR	PINP 260
C EQUATION (66)	PINP 261
NX = NX / VN	PINP 262
NY = NY / VN	PINP 263
NZ = NZ / VN	PINP 264
C COMPUTE AVERAGE POINT	PINP 265
C EQUATION (68)	PINP 266
AVX = .25 * (XIN(1) + XIN(2) + XIN(3) + XIN(4))	PINP 267
AVY = .25 * (YIN(1) + YIN(2) + YIN(3) + YIN(4))	PINP 268
AVZ = .25 * (ZIN(1) + ZIN(2) + ZIN(3) + ZIN(4))	PINP 269
C COMPUTE PROJECTION DISTANCE	PINP 270
C EQUATIONS (69) AND (71)	PINP 271
D = NX*(AVX - XIN(1)) + NY*(AVY - YIN(1)) + NZ*(AVZ-ZIN(1))	PINP 272
PD = ABS(D)	PINP 273
C EQUATIONS (73) AND (74)	PINP 274
T = SQRT (T1X*T1X + T1Y*T1Y + T1Z*T1Z)	PINP 275
T1X = T1X / T	PINP 276
T1Y = T1Y / T	PINP 277
T1Z = T1Z / T	PINP 278
C EQUATION (75)	PINP 279
T2X = NY*T1Z - NZ*T1Y	PINP 280
T2Y = NZ*T1X - NX*T1Z	PINP 281
T2Z = NX*T1Y - NY*T1X	PINP 282
C COMPUTE COORDINATES OF CORNER POINTS IN REFERENCE COORD. SYSTEM	PINP 283
C EQUATION (72)	PINP 284
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	PINP 298
	PINP 299
	PINP 300

```

DO 1000 J = 1, 4
XP = XIN(J) + NX * D
YP = YIN(J) + NY * D
ZP = ZIN(J) + NZ * D
D = - D
XDIF = XP - AVX
YDIF = YP - AVY
ZDIF = ZP - AVZ

C TRANSFORM CORNER POINTS TO ELEMENT COORDINATE SYSTEM ( XI, ETA )
C WITH AVERAGE POINT AS ORIGIN
C EQUATION ( 80 )

```

```

XI(J) = T1X*XDIF + T1Y*YDIF + T1Z*ZDIF
1000 ETA(J) = T2X*XDIF + T2Y*YDIF + T2Z*ZDIF

```

```

C COMPUTE CENTROID
C EQUATION ( 81 )

```

```

XIO = .3333333E0 * ( XI ( 4 ) * ( ETA ( 1 ) - ETA ( 2 ) ) + XI ( 2 )
1 * ( ETA ( 4 ) - ETA ( 1 ) ) ) / ( ETA ( 2 ) - ETA ( 4 ) )
ETA0 = -.3333333E0 * ETA(1)

```

```

C OBTAIN CORNER POINTS IN SYSTEM WITH CENTROID AS ORIGIN
C EQUATION ( 82 )

```

```

DO 1020 J = 1, 4
XI(J) = XI(J) - XIO
1020 ETA(J) = ETA(J) - ETA0

```

```

C COMPUTATION AIOS

```

```

ETA2M1 = ETA ( 2 ) - ETA ( 1 )
ETA3M2 = ETA ( 3 ) - ETA ( 2 )
ETA4M3 = ETA ( 4 ) - ETA ( 3 )
ETA1M4 = ETA ( 1 ) - ETA ( 4 )
XI1M2 = XI ( 1 ) - XI ( 2 )
XI2M3 = XI ( 2 ) - XI ( 3 )
XI3M4 = XI ( 3 ) - XI ( 4 )
XI4M1 = XI ( 4 ) - XI ( 1 )
ETA2P4 = ETA ( 2 ) + ETA ( 4 )
XI3M1 = XI ( 3 ) - XI ( 1 )
XI4M2 = XI ( 4 ) - XI ( 2 )
ETA2M4 = ETA ( 2 ) - ETA ( 4 )
XI1234 = XI ( 1 ) + XI ( 2 ) + XI ( 3 ) + XI ( 4 )

```

```

C TRANSFORM CENTROID TO REFERENCE COORDINATE SYSTEM
C EQUATION ( 83 )

```

```

XCENT = AVX + T1X*XIO + T2X*ETA0
YCENT = AVY + T1Y*XIO + T2Y*ETA0
ZCENT = AVZ + T1Z*XIO + T2Z*ETA0

```

```

C COMPUTE LARGER DIAGONAL VECTOR
C EQUATION ( 84 )

```

```

TSQ = AMAX1 ( XI3M1 ** 2, XI4M2 ** 2 + ETA2M4 ** 2 )
T = SQRT ( TSQ )

```

```

C COMPUTE AREA
C EQUATION ( 85 )

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PINP 360

AREA	= .5 * XI3M1 * ETA2M4	PINP 361
C COMPUTE CONSTANTS FOR EQUATIONS (42) AND (43)		PINP 362
C EQUATION (45)		PINP 363
D12SQ = XI1M2 ** 2 + ETA2M1 ** 2		PINP 364
D12 = SQRT (D12SQ)		PINP 365
D23SQ = XI2M3 ** 2 + ETA3M2 ** 2		PINP 366
D23 = SQRT (D23SQ)		PINP 367
D34SQ = XI3M4 ** 2 + ETA4M3 ** 2		PINP 368
D34 = SQRT (D34SQ)		PINP 369
D41SQ = XI4M1 ** 2 + ETA1M4 ** 2		PINP 370
D41 = SQRT (D41SQ)		PINP 371
C1 = 0.0		PINP 372
C2 = 0.0		PINP 373
C3 = 0.0		PINP 374
C4 = 0.0		PINP 375
C5 = 0.0		PINP 376
C6 = 0.0		PINP 377
C7 = 0.0		PINP 378
C8 = 0.0		PINP 379
XNP = 0.0		PINP 380
YNP = 0.0		PINP 381
IF (D12) 1030, 1040, 1030		PINP 382
1030 C1 = ETA2M1 / D12		PINP 383
C5 = XI1M2 / D12		PINP 384
1040 IF (D23) 1050, 1060, 1050		PINP 385
1050 C2 = ETA3M2 / D23		PINP 386
C6 = XI2M3 / D23		PINP 387
1060 IF (D34) 1070, 1080, 1070		PINP 388
1070 C3 = ETA4M3 / D34		PINP 389
C7 = XI3M4 / D34		PINP 390
1080 IF (D41) 1090, 1100, 1090		PINP 391
1090 C4 = ETA1M4 / D41		PINP 392
C8 = XI4M1 / D41		PINP 393
1100 CONV = 3		PINP 394
		PINP 395
		PINP 396
		PINP 397
C BEGIN NULL POINT ITERATION		PINP 398
DO 1590 ITR = 1, 30		PINP 399
DO 1580 K = 1, 4		PINP 400
C EQUATION (47)		PINP 401
R (K) = SQRT ((XNP - XI (K)) ** 2 + (YNP - ETA (K)) ** 2)		PINP 402
RX (K) = (XNP - XI (K)) / R (K)		PINP 403
1580 RY (K) = (YNP - ETA (K)) / R (K)		PINP 404
R1PR2 = R (1) + R (2)		PINP 405
R2PR3 = R (2) + R (3)		PINP 406
R3PR4 = R (3) + R (4)		PINP 407
R4PR1 = R (4) + R (1)		PINP 408
ARG1 = ALOG ((R1PR2 - C12) / (R1PR2 + D12))		PINP 409
ARG2 = ALOG ((R2PR3 - D23) / (R2PR3 + D23))		PINP 410
ARG3 = ALOG ((R3PR4 - D34) / (R3PR4 + C34))		PINP 411
ARG4 = ALOG ((R4PR1 - D41) / (R4PR1 + D41))		PINP 412
		PINP 413
		PINP 414
		PINP 415
C COMPUTE INDUCED VELOCITY COMPONENTS		PINP 416
C EQUATIONS (42) AND (43)		PINP 417
VX = C1 * ARG1 + C2 * ARG2 + C3 * ARG3 + C4 * ARG4		PINP 418
VY = C5 * ARG1 + C6 * ARG2 + C7 * ARG3 + C8 * ARG4		PINP 419
		PINP 420

```

C COMPUTE PARTIAL DERIVATIVES OF INDUCED VELOCITIES
C EQUATION ( 90 ), USING EQUATIONS ( 91 ) - ( 93 )
D12P= ( R1PR2 ** 2 - D12 SQ ) * .5
D23P= ( R2PR3 ** 2 - D23 SQ ) * .5
D34P= ( R3PR4 ** 2 - D34 SQ ) * .5
D41P= ( R4PR1 ** 2 - D41 SQ ) * .5
C1P = ETA2M1 / D12P
C2P = ETA3M2 / D23P
C3P = ETA4M3 / D34P
C4P = ETA1M4 / D41P
C5P = XI1M2 / D12P
C6P = XI2M3 / D23P
C7P = XI3M4 / D34P
C8P = XI4M1 / D41P
R12Y = RY ( 1 ) + RY ( 2 )
R23Y = RY ( 2 ) + RY ( 3 )
R34Y = RY ( 3 ) + RY ( 4 )
R41Y = RY ( 4 ) + RY ( 1 )
VXX = C1P* ( RX ( 1 ) + RX ( 2 ) ) + C2P* ( RX ( 2 ) + RX ( 3 ) ) +
1 C3P* ( RX ( 3 ) + RX ( 4 ) ) + C4P* ( RX ( 4 ) + RX ( 1 ) )
VXY = C1P* R12Y + C2P* R23Y + C3P* R34Y + C4P* R41Y
VYY = C5P* R12Y + C6P* R23Y + C7P* R34Y + C8P* R41Y
C COMPUTE NEW NULL POINT ( XNP, YNP )
C EQUATION ( 94 )
XMP = ( VY * VXY - VX * VYY ) / ( VXX * VYY - VXY ** 2 )
XNP = XMP + XNP
YNP = YNP - ( VX + VXX * XMP ) / VXY
C TEST NULL POINT CONVERGENCE
IF ( ABS ( VX ) .LT. EPS .AND. ABS ( VY ) .LT. EPS ) GO TO 1600
1590 CONTINUE
C NO CONVERGENCE , USE 30TH ITERATION
CONV = 2
C TEST IF THIS POINT IS OUTSIDE THE ELEMENT
1600 IF ( XNP ** 2 + YNP ** 2 .LE. TS2 ) GO TO 1620
C CONVERGES TO POINT AT INFINITY
CONV = 1
XNULL = XCENT
YNULL = YCENT
ZNULL = ZCENT
GO TO 1700
C TRANSFORM NULL POINT TO REFERENCE COORDINATE SYSTEM
C EQUATION ( 79 ) NOTE THAT Z - COORDINATE IS ZERO
1620 XNULL = XCENT + T1X * XN2 + T2X * YNP
YNULL = YCENT + T1Y * XN2 + T2Y * YNP
ZNULL = ZCENT + T1Z * XN2 + T2Z * YNP
C PRINT RESULTS -- SECTION 9.4 THE FIRST OUTPUT
1700 IF ( NPRT .GE. 11 ) GO TO 1750
NPRT = NPRT + 1

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PINP 421
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 PINP 479
 PINP 480

IF (I .EQ. 1) GO TO 1760	PINP 481
WRITE (6, 4005) I, XIN, NX, XNULL , PD, CFLAG (CONV),	PINP 482
1 YIN, NY, YNULL , T, ZIN, NZ, ZNULL , AREA	PINP 483
GO TO 1770	PINP 484
1750 NPRT = 0	PINP 485
CALL PEADER	PINP 486
WRITE (6, 4002)	PINP 487
1760 WRITE (6, 4010) N , I, XIN, NX, XNULL , PD, CFLAG (CONV)	PINP 488
1) , YIN, NY, YNULL , T, ZIN, NZ, ZNULL , AREA	PINP 489
1770 CONTINUE	PINP 490
2000 CONTINUE	PINP 491
2100 NLT (KLCT) = MMIN	PINP 492
NLINE (KLCT) = N	PINP 493
IF (IFLAG .EQ. 0) GO TO 2001	PINP 494
IF (N .LT. NLM1) GO TO 12	PINP 495
IF(IPRNT) WRITE(6,4015)	PINP 496
GO TO 2025	PINP 497
2001 IF (STAT .LT. 2) GO TO 80	PINP 498
NLT(KLCT) = -NLT(KLCT)	PINP 499
NPRT = NPRT + 1	PINP 500
IF(IPRNT) WRITE(6,4015)	PINP 501
	PINP 502
C TEST FOR END OF CASE	PINP 503
2020 IF (STAT .NE. 3) GO TO 80	PINP 504
2025 NN1 = MCD (3 * NQUAD, 255)	PINP 505
NQNN1 = NQUAD	PINP 506
IF (NN1 .LT. 5 .AND. NN1 .GT. 0) NQNN1 = NQUAD + 2	PINP 507
DELX = -0.5 * (XMIN + XMAX)	PINP 508
DELY = -0.5 * (YMIN + YMAX)	PINP 509
DELZ = -0.5 * (ZMIN + ZMAX)	PINP 510
WRITE (9) XMIN, XMAX, YMIN, YMAX, ZMIN, ZMAX, DELX, DELY, DELZ,	PINP 511
1 NSYM	PINP 512
ENDFILE 9	PINP 513
REWIND 9	PINP 514
IF (.NOT. IPICT) GO TO 8500	PINP 515
C SET UP PERSPECTIVE ANGLES FOR PLOTS	PINP 516
WRITE (8) XMIN, XMAX, YMIN, YMAX, ZMIN, ZMAX, DELX, DELY, DELZ	PINP 517
LAST = 0	PINP 518
PHI = 0.0	PINP 519
C THE OPERATION OF ANGLES THETA AND PSI ARE AS FOLLOWS FOR A RIGHT	PINP 520
C HANDED COORDINATE SYSTEM WITH THE Z AXIS DIRECTED UPWARD. FIRST	PINP 521
C ROTATE THE COORDINATE SYSTEM BY ANGLE THETA ABOUT THE Y AXIS SUCH	PINP 522
C THAT FOR POSITIVE THETA THE POSITIVE X AXIS TILTS UPWARD. THEN	PINP 523
C ROTATE BY ANGLE PSI ABOUT THE NEW Z AXIS SUCH THAT FOR POSITIVE	PINP 524
C PSI THE ROTATION IS CLOCKWISE WHEN VIEWED FROM ABOVE.	PINP 525
IF (NSYM .GT. 0) IF (NSYM - 2) 2028, 2029, 2030	PINP 526
2027 PSI = 90.	PINP 527
THETA = 0.0	PINP 528
WRITE (8) PSI, THETA, PHI, LAST, LAXIS, MINUSY, RAXIS	PINP 529
PSI = 45.	PINP 530
THETA = 45.	PINP 531
WRITE (8) PSI, THETA, PHI, LAST, L45, PLUSX, MINUSY, PLUSZ, R45 ,L	PINP 532
THETA = -45.	PINP 533
WRITE (8) PSI, THETA, PHI, LAST, L45, PLUSX, MINUSY, MINUSZ, R45,L	PINP 534
PSI = 135.	PINP 535
WRITE (8) PSI, THETA, PHI, LAST, L45, MINUSX, MINUSY, PLUSZ, R45,L	PINP 536
THETA = 45.	PINP 537
WRITE (8) PSI, THETA, PHI, LAST, L45, MINUSX, MINUSY, MINUSZ,R45,L	PINP 538
2028 PSI = 0.	PINP 539
THETA = -90.	PINP 540

	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, MINUSZ, RAXIS	PINP 541
	THETA= 45.	PINP 542
	PSI=-135.	PINP 543
	WRITE (8) PSI, THETA, PHI, LAST, L45, MINUSX, PLUSY, MINUSZ, R45, L	PINP 544
	THETA=-45.	PINP 545
	PSI=-45.	PINP 546
2029	WRITE (8) PSI, THETA, PHI, LAST, L45, PLUSX, PLUSY, MINUSZ, R45, L	PINP 547
	PSI = 180.	PINP 548
	THETA = 0.	PINP 549
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, MINUSX, RAXIS	PINP 550
	PSI = -135.	PINP 551
	THETA = -45.	PINP 552
2030	WRITE (8) PSI, THETA, PHI, LAST, L45, MINUSX, PLUSY, PLUSZ, R45, L	PINP 553
	THETA = 0.0	PINP 554
	PSI = 0.	PINP 555
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, PLUSX, RAXIS	PINP 556
	THETA = 0.0	PINP 557
	PSI = -90.	PINP 558
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, PLUSY, RAXIS	PINP 559
	THETA = 90.	PINP 560
	PSI = 0.	PINP 561
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, PLUSZ, RAXIS	PINP 562
	THETA = 45.	PINP 563
	PSI = -45.	PINP 564
	LAST = 1	PINP 565
8500	WRITE (8) PSI, THETA, PHI, LAST, L45, PLUSX, PLUSY, PLUSZ, R45, L	PINP 566
C	REWIND 8	PINP 567
		PINP 568
	IF(IPRNT) WRITE(6,9999) NQUAD	PINP 569
9999	FORMAT(1H0, 16X, I5, 26H BASIC ELEMENTS WERE INPUT)	PINP 570
	RETURN	PINP 571
	END	PINP 572

*DECK, PICTURE	PICT	1
SUBROUTINE PICTUR	PICT	2
C	PICT	3
C PLOTS SURFACE ELEMENTS ON A 3-DIMENSIONAL BODY	PICT	4
	PICT	5
LOGICAL IPROS, IPUNCH, IFRNT, IPICT, ICRT, RFLAG, AFLAG, BFLAG	PICT	6
COMMON HEDR(15), NQUAD, KASE, NSYM, IFLAG, IPROS, IPUNCH, IFRNT,	PICT	7
1 IPICT, ICRT, SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS, YTFANS,	PICT	8
2 ZTRANS	PICT	9
DIMENSION XA(250),XB(250),YA(250),YB(250),ZA(250),ZB(250),	PICT	10
1 XIN(4),YIN(4),ZIN(4),HLABEL(15), PROGID(3),	PICT	11
2 YIN2(4),ZIN2(4), YPLTSC(4), ZPLTSC(4),HLINE2(7),	PICT	12
3 HLINE1(7), XM(2), YM(2), ZM(2)	PICT	13
REAL NX,NY,NZ,NXO	PICT	14
INTEGER STAT,STATT	PICT	15
DATA PROGID/ 7HNORMENT, 4H3840, 3HLYC/	PICT	16
DATA ISHAD,IFRAME/0,0/ , XSC,YSC,ZSC/3*1.0/	PICT	17
	PICT	18
FIRST(QX,QY,QZ,Q1,Q2,Q3) = QX*Q1 + QY*Q2 + QZ*Q3	PICT	19
	PICT	20
THIRD(QX,QY,QZ,QPSI,QTHETA,QPHI) = QX*(COS(QTHETA)*COS(QPSI)) +	PICT	21
1 QY*(-SIN(QPSI)*COS(QPHI)+SIN(QTHETA)*COS(QPSI)*SIN(QPHI)) +	PICT	22
2 QZ*(SIN(QPSI)*SIN(QPHI)+SIN(QTHETA)*COS(QPSI)*COS(QPHI))	PICT	23
	PICT	24
IREFL = NSYM	PICT	25
IF(IREFL .GT. 2) IREFL = 2	PICT	26
IPIC = 1	PICT	27
IF(ICRT) GO TO 750	PICT	28
CALL PLOTID	PICT	29
C CALL PLTID3(PROGID, 200.0, 11.0, 1.0)	PICT	30
CALL PLOT(5.0, 0.0, -3)	PICT	31
GO TO 2	PICT	32
750 CALL MICRO(PROGID, 1.0, 14.0)	PICT	33
READ(5,3000) HLINE1, HLINE2	PICT	34
3000 FORMAT(7A6/7A6)	PICT	35
CALL TITL(HLINE1,HLINE2)	PICT	36
WRITE(6, 5201)	PICT	37
5201 FORMAT(1H-, 12H CRT PLOTS)	PICT	38
2 REWIND 9	PICT	39
301 READ (8) XM(1),XM(2),YM(1),YM(2),ZM(1),ZM(2),DELX,DELY,DELZ	PICT	40
WRITE(6,7400) XM(1),XM(2),YM(1),YM(2),ZM(1),ZM(2)	PICT	41
WRITE(6,7500)	PICT	42
WRITE(6,7700) DELX,DELY,DELZ	PICT	43
7400 FORMAT(1H0, 9X, 61HMINIMUM AND MAXIMUM COORDINATES IN THE SCALEPICT	PICT	44
1D, TRANSLATED, ROTATED SYSTEM -/12X, 7HX AXIS=2(1PE15.5)/	PICT	45
2 12X, 7HY AXIS=2(1PE15.5)/ 12X, 7HZ AXIS=2(1PE15.5))	PICT	46
7500 FORMAT(1H0, 9X, 69HCOORDINATE TRANSLATIONS USED TO CENTER THE FLOTPICT	PICT	47
1S - DELX, DELY, DELZ -)	PICT	48
7700 FORMAT(12X,39H AFTER SCALING, TRANSLATING, ROTATING -3(1PE15.5)/)	PICT	49
4 IPIC = IPIC + 1	PICT	50
	PICT	51
C READ PLOTTING INSTRUCTIONS	PICT	52
READ (8) PSI,THETA,PHI,LAST, HLABEL	PICT	53
WRITE(6,5205)HLABEL	PICT	54
5205 FORMAT(5X, 15A4)	PICT	55
	PICT	56
8 IF(IPIC .GT. 2 .AND. .NOT. ICRT) CALL FLOT(10.0, -5.5, -3)	PICT	57
IF(IPIC .GT. 2 .AND. ICRT) CALL FRAME(0.5, 0.5)	PICT	58
	PICT	59
C SET UP STARTING CONSTANTS	PICT	60

	IFADV = 1	PICT 61
	PSI = PSI / 57.29578E0	PICT 62
	THETA = THETA / 57.29578E0	PICT 63
	PHI = PHI / 57.29578E0	PICT 64
	SINTH = SIN(THETA)	PICT 65
	COSTH = COS(THETA)	PICT 66
	SINPSI = SIN(PSI)	PICT 67
	COSPSI = COS(PSI)	PICT 68
	SINPHI = SIN(PHI)	PICT 69
	COSPHI = COS(PHI)	PICT 70
	A1 = COSTH * SINPSI	PICT 71
	A2 = COSPSI * COSPHI + SINTH * SINPSI * SINPHI	PICT 72
	A3 = -COSPSI * SINPHI + SINTH * SINPSI * COSPHI	PICT 73
	A4 = -SINTH	PICT 74
	A5 = COSTH * SINPHI	PICT 75
	A6 = COSTH * COSPHI	PICT 76
	A7 = COSTH * COSPSI	PICT 77
	A8 = -SINPSI * COSPHI + SINTH * COSPSI * SINPHI	PICT 78
	A9 = SINPSI * SINPHI + SINTH * COSPSI * COSPHI	PICT 79
C	SET SCALE FACTOR FOR THE PLOT	PICT 80
	YSM = 1. E50	PICT 81
	ZSM = 1. E50	PICT 82
	YLG = -1. E50	PICT 83
	ZLG = -1. E50	PICT 84
	DO 20 I = 1, 2	PICT 85
	X = XM(I) + DELX	PICT 86
	DO 20 J = 1, 2	PICT 87
	Y = YM(J) + DELY	PICT 88
	DO 20 K = 1, 2	PICT 89
	Z = ZM(K) + DELZ	PICT 90
	YNR = FIRST(X, Y, Z, A1, A2, A3)	PICT 91
	ZNR = FIRST(X, Y, Z, A4, A5, A6)	PICT 92
	YSM = AMIN1(YSM, YNR)	PICT 93
	ZSM = AMIN1(ZSM, ZNR)	PICT 94
	YLG = AMAX1(YLG, YNR)	PICT 95
20	ZLG = AMAX1(ZLG, ZNR)	PICT 96
	PENSF = 9.99 / AMAX1(YLG - YSM, ZLG - ZSM)	PICT 97
	N = -1	PICT 98
	NN = -1	PICT 99
		PICT 100
		PICT 101
C	READ IN SURFACE DATA	PICT 102
29	READ (9) X, Y, Z, STAT, XX, YY, ZZ, STATT	PICT 103
	IF (STAT .EQ. 3 .OR. STATT .EQ. 3) REWIND 9	PICT 104
	RFLAG = .FALSE.	PICT 105
	GO TO 80	PICT 106
30	IF (RFLAG) GO TO 50	PICT 107
	RFLAG = .TRUE.	PICT 108
	X = XX	PICT 109
	Y = YY	PICT 110
	Z = ZZ	PICT 111
	STAT = STATT	PICT 112
	GO TO 60	PICT 113
50	RFLAG = .FALSE.	PICT 114
	READ (9) X, Y, Z, STAT, XX, YY, ZZ, STATT	PICT 115
	IF (STAT .EQ. 3 .OR. STATT .EQ. 3) REWIND 9	PICT 116
60	IF (STAT .EQ. 0 .OR. STAT .EQ. 3) GO TO 180	PICT 117
	IF (STAT .EQ. 2) GO TO 200	PICT 118
70	IF (.NOT. AFLAG) GO TO 200	PICT 119
	MC = M	PICT 120

80	M = 1	PICT 121
	IF (STAT .EQ. 2) GO TO 150	PICT 122
	IF (.NOT. BFLAG) GO TO 84	PICT 123
75	DO 81 J = 1, MC	PICT 124
	XA(J) = XB(J)	PICT 125
	YA(J) = YB(J)	PICT 126
81	ZA(J) = ZB(J)	PICT 127
83	XB(1) = X	PICT 128
	YB(1) = Y	PICT 129
	ZB(1) = Z	PICT 130
	GO TO 30	PICT 131
84	IF (AFLAG) GO TO 85	PICT 132
	BFLAG = .TRUE.	PICT 133
	GO TO 75	PICT 134
85	AFLAG = .FALSE.	PICT 135
	GO TO 83	PICT 136
150	AFLAG = .TRUE.	PICT 137
	BFLAG = .FALSE.	PICT 138
	N = N + 1	PICT 139
160	XA(M) = X	PICT 140
	YA(M) = Y	PICT 141
	ZA(M) = Z	PICT 142
	GO TO 30	PICT 143
180	M = M + 1	PICT 144
	IF (AFLAG) GO TO 160	PICT 145
	XB(M) = X	PICT 146
	YB(M) = Y	PICT 147
	ZB(M) = Z	PICT 148
	IF (STAT .NE. 3) GO TO 30	PICT 149
200	MMIN = MIN0 (M, MC) - 1	PICT 150
	MC = M	PICT 151
250	N = N + 1	PICT 152
	NN = NN + 1	PICT 153
		PICT 154
		PICT 155
		PICT 156
		PICT 157
		PICT 158
		PICT 159
		PICT 160
		PICT 161
		PICT 162
		PICT 163
		PICT 164
		PICT 165
		PICT 166
		PICT 167
		PICT 168
		PICT 169
		PICT 170
		PICT 171
		PICT 172
		PICT 173
		PICT 174
		PICT 175
		PICT 176
		PICT 177
		PICT 178
		PICT 179

C BEGIN COMPUTATION OF SURFACE ELEMENT CHARACTERISTICS

450	DO 2000 I = 1, MMIN	
	XIN(1) = XA(I) * XSC + DELX	
	XIN(2) = XA(I+1) * XSC + DELX	
	XIN(3) = XB(I+1) * XSC + DELX	
	XIN(4) = XB(I) * XSC + DELX	
	YIN(1) = YA(I) * YSC + DELY	
	YIN(2) = YA(I+1) * YSC + DELY	
	YIN(3) = YB(I+1) * YSC + DELY	
	YIN(4) = YB(I) * YSC + DELY	
	ZIN(1) = ZA(I) * ZSC + DELZ	
	ZIN(2) = ZA(I+1) * ZSC + DELZ	
	ZIN(3) = ZB(I+1) * ZSC + DELZ	
	ZIN(4) = ZB(I) * ZSC + DELZ	
	IRFLG = 0	

C FORM DIAGONAL VECTORS - EQUATION (64)

	T1X = XIN(3) - XIN(1)	
	T2X = XIN(4) - XIN(2)	
	T1Y = YIN(3) - YIN(1)	
	T2Y = YIN(4) - YIN(2)	
	T1Z = ZIN(3) - ZIN(1)	
	T2Z = ZIN(4) - ZIN(2)	

C	FORM CROSS PRODUCT N=T2 X T1 - EQUATION (65)	PICT 181
	NX = T2Y*T1Z - T1Y*T2Z	PICT 182
	NY = T1X*T2Z - T2X*T1Z	PICT 183
	NZ = T2X*T1Y - T1X*T2Y	PICT 184
	VN = SQRT (NX*NX + NY*NY + NZ*NZ)	PICT 185
		PICT 186
C	FORM UNIT NORMAL VECTOR - EQUATION (66)	PICT 187
	NX = NX / VN	PICT 188
	NY = NY / VN	PICT 189
	NZ = NZ / VN	PICT 190
		PICT 191
	IF (IFA0V .EQ. 0) GO TO 471	PICT 192
		PICT 193
C	A NEW VIEW OF THE BODY IS TO BE PLOTTED. PLOT THE LEGEND AND	PICT 194
C	INITIALIZE FOR THE BODY PLOT.	PICT 195
	IF(ICRT) GO TO 524	PICT 196
	CALL PLOT(2.5, 0.0, 3)	PICT 197
	CALL SYMBOL(2.5, 0.0, 0.150, HLABEL, 0.0, 60)	PICT 198
	CALL PLOT(7.5, 5.5, -3)	PICT 199
	GO TO 525	PICT 200
524	CALL STBEAM(24)	PICT 201
	CALL SYMBOL(3.0, 0.0, 0.150, HLABEL, 0.0, 60)	PICT 202
	CALL STBEAM(18)	PICT 203
	CALL PLOT(8.0, 5.5, -3)	PICT 204
525	IFA0V = 0	PICT 205
		PICT 206
471	NX0 = THIRD(NX,NY,NZ,PSI,THETA,PHI)	PICT 207
	IF (NX0.LE.0.0 .AND. ISHAD.EQ.0) GO TO 571	PICT 208
		PICT 209
		PICT 210
C	CALCULATE POINTS TO BE PLOTTED	PICT 211
530	Y01 = FIRST(XIN(1),YIN(1),ZIN(1),A1,A2,A3)	PICT 212
	Y02 = FIRST(XIN(2),YIN(2),ZIN(2),A1,A2,A3)	PICT 213
	Y03 = FIRST(XIN(3),YIN(3),ZIN(3),A1,A2,A3)	PICT 214
	Y04 = FIRST(XIN(4),YIN(4),ZIN(4),A1,A2,A3)	PICT 215
	Z01 = FIRST(XIN(1),YIN(1),ZIN(1),A4,A5,A6)	PICT 216
	Z02 = FIRST(XIN(2),YIN(2),ZIN(2),A4,A5,A6)	PICT 217
	Z03 = FIRST(XIN(3),YIN(3),ZIN(3),A4,A5,A6)	PICT 218
	Z04 = FIRST(XIN(4),YIN(4),ZIN(4),A4,A5,A6)	PICT 219
		PICT 220
	YIN2(1) = Y01	PICT 221
	YIN2(2) = Y02	PICT 222
	YIN2(3) = Y03	PICT 223
	YIN2(4) = Y04	PICT 224
	ZIN2(1) = Z01	PICT 225
	ZIN2(2) = Z02	PICT 226
	ZIN2(3) = Z03	PICT 227
	ZIN2(4) = Z04	PICT 228
		PICT 229
C	SCALE AND PLOT A SINGLE QUADRILATERAL	PICT 230
	DO 540 II=1,4	PICT 231
	YPLTSC(II) = YIN2(II) * PENSF	PICT 232
	ZPLTSC(II) = ZIN2(II) * PENSF	PICT 233
	IF(ABS(ZPLTSC(II)) .LE. 5.000)	PICT 234
	1 GO TO 540	PICT 235
	WRITE(6,5000) N, M	PICT 236
5000	FORMAT(1H0, 10X, 21HSCALE TROUBLE FOR N =I4, 3X, 3HM =I4)	PICT 237
	GO TO 2000	PICT 238
540	CONTINUE	PICT 239
	CALL PLOT(YPLTSC(1), ZPLTSC(1), 3)	PICT 240

	DO 550 II=2,4	
	550 CALL PLOT(YPLTSC(II), ZPLTSC(II), 2)	PICT 241
	CALL PLOT(YPLTSC(1), ZPLTSC(1), 2)	PICT 242
		PICT 243
	571 IF (IREFL .EQ. 0 .OR. IRFLG .EQ. 3) GO TO 2000	PICT 244
	IF (IREFL .EQ. 2 .AND. IRFLG .EQ. 1) GO TO 600	PICT 245
	IF (IREFL .EQ. 2 .AND. IRFLG .EQ. 2) GO TO 602	PICT 246
C		PICT 247
C	REFLECT QUADRANT I ELEMENTS TO QUADRANT II	PICT 248
	DO 580 II = 1,4	PICT 249
	580 YIN(II) = -YIN(II)	PICT 250
	NY = -NY	PICT 251
	GO TO 604	PICT 252
C		PICT 253
C	REFLECT QUADRANT II ELEMENTS TO QUADRANT IV	PICT 254
	600 DO 601 II = 1,4	PICT 255
	YIN(II) = -YIN(II)	PICT 256
	601 ZIN(II) = -ZIN(II)	PICT 257
	NY = -NY	PICT 258
	NZ = -NZ	PICT 259
	GO TO 604	PICT 260
C		PICT 261
C	REFLECT QUADRANT IV ELEMENTS TO QUADRANT III	PICT 262
	602 DO 603 II = 1,4	PICT 263
	603 YIN(II) = -YIN(II)	PICT 264
	NY = -NY	PICT 265
C		PICT 266
C		PICT 267
	604 IRFLG = IRFLG + 1	PICT 268
	IF (IREFL .EQ. 1) IRFLG = 3	PICT 269
	GO TO 471	PICT 270
		PICT 271
		PICT 272
	2000 CONTINUE	PICT 273
	2001 IF (STAT .LT. 2) GO TO 480	PICT 274
	NN = NN - 1	PICT 275
	N = - 1	PICT 276
	475 IF (IFRAME .EQ. 2) IFADV = 1	PICT 277
	480 IF (IFRAME .EQ. 1) IFADV = 1	PICT 278
	485 IF (IFADV .EQ. 1) CALL PLOT(10.0,-5.5, -3)	PICT 279
		PICT 280
		PICT 281
C	TEST FOR END OF CASE	PICT 282
	2020 IF (STAT .NE. 3) GO TO 80	PICT 283
	IF (LAST .EQ. 1) RETURN	PICT 284
	GO TO 4	PICT 285
	END	PICT 286
		PICT 287

	OVERLAY(BOXC,0,0)	BOXC	1
	PROGRAM MAIN(INPUT,TAPE6, TAPE5=INPUT, OUTPUT,		
	1 TAPE1, TAPE3, TAPE8, TAPE9, TAPE11, TAPE12, TAPE13,	BOXC	3
	2 TAPE4, TAPE10, TAPE14)	BOXC	4
		BOXC	5
	H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1979	BOXC	6
		BOXC	7
	THIS IS ESSENTIALLY THE NON-LIFTING POTENTIAL FLOW CODE OF HESS	BOXC	8
	AND SMITH AS DESCRIBED IN DOUGLAS AIRCRAFT CO. RPT. E.S. 40622	BOXC	9
	(15 MARCH 1962), AD-282 255. THAT REPORT SHOULD BE CONSULTED FOR	BOXC	10
	DETAILS OF THE METHOD AND COMPUTATION.	BOXC	11
		BOXC	12
	EIGHT OVERLAYS ARE USED. THE FINAL OVERLAY WRITES THE 28	BOXC	13
	QUANTITIES ON UNIT 14 FOR USE BY SR FLOVEL IN CALCULATING FLOW	BOXC	14
	VELOCITIES.	BOXC	15
		BOXC	16
	ALSO REQUIRED, IN ADDITION TO THE SYSTEM INPUT, OUTPUT AND PUNCH	BOXC	17
	UNITS, ARE THE FOLLOWING UNITS - 1,3,8,9,10,11,12,13.	BOXC	18
		BOXC	19
	LOGICAL IPROS	BOXC	20
	COMMON HEDR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,	BOXC	21
	1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	BOXC	22
	REAL MACH	BOXC	23
	COMMON /SPACER/ DUMMY (14000)	BOXC	24
	COMMON /ATAPE/ NATAPE	BOXC	25
	COMMON /M/ MACH, BETA, RBETA	BOXC	26
	LOGICAL AFLOW, BFLOW, CFLOW	BOXC	27
	COMMON /DFLOW/ AFLOW,BFLOW,CFLOW,NMAT,NMATM1,NAFLOW,NBFLOW,NCFLOW	BOXC	28
	COMMON/SOLVE/ N1,N2,N3,KORE,NFL	BOXC	29
	COMMON /INPT/ LIST, IPROS	BOXC	30
	COMMON /PROS/ SINA,COSA, XSCALE, YSCALE, ZSCALE, XTRANS,	BOXC	31
	1 YTRANS, ZTRANS	BOXC	32
	COMMON /FLOWP/ NU,NNON	BOXC	33
	COMMON /SIG/ NFLCOM	BOXC	34
	COMMON /TAPES/ MN	BOXC	35
	COMMON /FRINT0/ KMAT,NSEQ,KTP14	BOXC	36
	COMMON /GLEAK/ LEAK, FRACT	BOXC	37
	6 FORMAT (F10.6)	BOXC	38
	7000 FORMAT (7F10.0)	BOXC	39
	7500 FORMAT (18X, 55HANGLE, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS, ZBOXC	BOXC	40
	1TRANS =/ 16X, 7(1PE13.4))	BOXC	41
		BOXC	42
	8000 FORMAT (L1)	BOXC	43
	9000 FORMAT (15A4,2I1,3L1,4I1,I2,4I1,1X,A4)	BOXC	44
	9300 FORMAT (I4, F10.0)	BOXC	45
	9400 FORMAT (1H0, 17X, 31HNUMBER OF LEAKY QUADRALATERALS=I4, 3X,	BOXC	46
	1 40HFRACTION OF FREE-STREAM VELOCITY LEAKED=1PE11.4)	BOXC	47
	9500 FORMAT (1H0, 17X, 61HINPUT DATA ARE PROCESSED BY SCALING, ROTATINGBOXC	BOXC	48
	1 AND TRANSLATING)	BOXC	49
	DATA KORE /14000/	BOXC	50
	NSEQ = 0	BOXC	51
	READ IN CONTROL DATA	BOXC	52
	1 READ (5, 9000) HEDR, IFLAG, LIST, AFLOW, BFLOW, CFLOW, ISIG,	BOXC	53
	1 IPRS, MPR, NCODE, NNON, NSYM, NOFF, KMACH, KTP14, KASE	BOXC	54
	READ(5,8000) IPROS	BOXC	55
	IF(IPROS) READ(5,7000) ANGLE, XSCALE, YSCALE, ZSCALE,XTRANS,	BOXC	56
	1 YTRANS, ZTRANS	BOXC	57
	IF(.NOT. IPROS) GO TO 2		

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```
IF(XSCALE .EQ. 0.0) XSCALE=1.0
IF(YSCALE .EQ. 0.0) YSCALE=1.0
IF(ZSCALE .EQ. 0.0) ZSCALE=1.0
2 CONTINUE
READ( 5,9300 ) LEAK, FRACT
REWIND 1
REWIND 3
REWIND 8
REWIND 9
REWIND 10
REWIND 11
REWIND 12
REWIND 13
IF (LIST .EQ. 0) REWIND 4
MACH = 0.0
IF (KMACH .LE. 0) GO TO 7
NNON = 0
READ (5, 6) MACH
AFLOW = .TRUE.
BFLOW = .FALSE.
CFLOW = .FALSE.
7 BETA = SQRT(1.0 - MACH * MACH)
RBETA = 1.0 / BETA
NU = 8
CALL HEADER
WRITE(6,9200) IFLAG, LIST, ISIG, IPRS, MPR, NCODE, NNON,
1 NOFF, KMACH, KTP14
9200 FORMAT( 1H0, 17X, 17HINPUT PARAMETERS-// 20X, 6HIFLAG=I2, 5X,
1 5HLIST=I2, 5X, 5HISIG=I3, 6X, 5HIPRS=I2, 7X, 4HMPR=I2//
2 20X, 6HNCODE=I2, 5X, 5HNNON=I2, 5X, 5HNOFF=I3, 5X, 6HKMACH=I2,
3 5X, 6HKTP14=I2)
IF( .NOT. IPRS) GO TO 40
WRITE(6,9500)
WRITE(6,7500) ANGLE, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS, ZTRANS
40 WRITE( 6,9400 ) LEAK, FRACT
IF(.NOT. IFROS) GO TO 5)
COSA = COS( 0.0174533 * ANGLE)
SINA = SIN( 0.0174533 * ANGLE)
50 IF (AFLOW .OR. BFLOW .OR. CFLOW) NU = 1
C CALL INPIT (LIST)
CALL OVERLAY(4HBOXC,1,0)
IF (LIST .NE. 0) GO TO 10
C CALL FLOWS (NU, NNON)
CALL OVERLAY(4HBOXC,1,1)
IF(KTP14 .EQ. 1) CALL OVERLAY(4HBOXC,8,0)
GO TO 1000
10 CONTINUE
GO TO 5000
C
C
C
C
FORM XIJ , YIJ , AND ZIJ MATRICES
C1000 CALL VFORM
1000 CALL OVERLAY(4HBOXC,2,0)
IF (NCODE) 5000, 1500, 2000
1500 NCODE = 1
IF (NQUAD .GT. 500 ) NCODE = 2
2000 IF (NMAT .EQ. 3) NCODE = 2
```

BOXC 58
BOXC 59
BOXC 60
BOXC 61
BOXC 62
BOXC 63
BOXC 64
BOXC 65
BOXC 66
BOXC 67
BOXC 68
BOXC 69
BOXC 70
BOXC 71
BOXC 72
BOXC 73
BOXC 74
BOXC 75
BOXC 76
BOXC 77
BOXC 78
BOXC 79
BOXC 80
BOXC 81
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BOXC 90
BOXC 91
BOXC 92
BOXC 93
BOXC 94
BOXC 95
BOXC 96
BOXC 97
BOXC 98
BOXC 99
BOXC 100
BOXC 101
BOXC 102
BOXC 103
BOXC 104
BOXC 105
BOXC 106
BOXC 107
BOXC 108
BOXC 109
BOXC 110
BOXC 111
BOXC 112
BOXC 113
BOXC 114

C	CALL AFCRM	BOXC 115
	CALL OVERLAY(4HBOXC,3,0)	BOXC 116
	IF (NAFLOW) 2100, 2100, 2050	BOXC 117
2050	KMAT = 1	BOXC 118
	NFL = NAFLOW	BOXC 119
	GO TO 2300	BOXC 120
2100	IF (NBFLOW) 2200, 2200, 2150	BOXC 121
2150	KMAT = 2	BOXC 122
	NFL = NBFLOW	BOXC 123
	GO TO 2300	BOXC 124
2200	IF (NCFLOW) 5000, 5000, 2250	BOXC 125
2250	KMAT = 3	BOXC 126
	NFL = NCFLOW	BOXC 127
2300	NQ = NQUAD + 1	BOXC 128
	MN = 1	BOXC 129
	NM = MOD (NQ, 255)	BOXC 130
	IF (NM .LT. 5 .AND. NM .GT. 3) NQ = NQ + 5	BOXC 131
	NFLCOM = 0	BOXC 132
	NSOL = MING(6000 / NQUAD, 10)	BOXC 133
	IF (NCODE .NE. 1) GO TO 2500	BOXC 134
2400	N1 = 8	BOXC 135
	N2 = 9	BOXC 136
	N3 = 13	BOXC 137
2450	NCFLG = NFL	BOXC 138
C	CALL SCLVIT (DUMMY(1), NQUAD, NFL, KORE, N1, N2, N3, 3, 62475)	BOXC 139
	CALL OVERLAY(4HBOXC,4,0)	BOXC 140
	REWIND 3	BOXC 141
C	IF (MN .EQ. 1) CALL ATAPES (MN)	BOXC 142
	IF (MN .EQ. 1)	BOXC 143
	1CALL OVERLAY(4HBOXC,6,0)	BOXC 144
	GO TO 3300	BOXC 145
C2500	CALL ATAPES (MN)	BOXC 146
2500	CALL OVERLAY(4HBOXC,6,0)	BOXC 147
	NSKIP = 0	BOXC 148
2900	NCFLG = MING (NSOL, NFL - NSKIP)	BOXC 149
C	CALL SIGMA (NFLCOM)	BOXC 150
	CALL OVERLAY(4HBOXC,5,0)	BOXC 151
	ITER = 0	BOXC 152
C3300	CALL PRINT1 (NFLCOM, MN, KMAT, NSEQ)	BOXC 153
3300	CALL OVERLAY(4HBOXC,7,0)	BOXC 154
	NFLCOM = NFLCOM + NCFLG	BOXC 155
	NSKIP = NSKIP + NCFLG	BOXC 156
	IF (NCODE .EQ. 1) GO TO 3700	BOXC 157
	IF (NSKIP .NE. NFL) GO TO 2900	BOXC 158
	MN = MN + 1	BOXC 159
	IF (KMAT - 2) 3500, 3600, 5000	BOXC 160
3500	IF (NBFLOW) 3600, 3600, 3550	BOXC 161
3550	NFL = NBFLOW	BOXC 162
	KMAT = 2	BOXC 163
	GO TO 2500	BOXC 164
3600	IF (NCFLOW) 5000, 5000, 3650	BOXC 165
3650	NFL = NCFLOW	BOXC 166
	KMAT = 3	BOXC 167
	GO TO 2500	BOXC 168
3700	IF (MN .EQ. 2 .OR. NMAT .EQ. 1) GO TO 5000	BOXC 169
	N1 = 10	BOXC 170
	N2 = 13	BOXC 171

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```
N3 = 8
MN = 2
C ** POSITION THE TAPE FOR THE SIGMAS.
JJ = 2
IF (ISIG .NE. 0) JJ = 3
JJ = NFLOW * JJ + NFL
DO 3750 J = 1, JJ
3750 READ (3)
NFL = NFLOW - NFL
      (KMAT - 2) 3800, 3900, 5000
3800 IF (NFLOW) 3900, 3900, 3850
3850 KMAT = 2
      GO TO 2450
3900 KMAT = 3
      GO TO 2450
5000 CONTINUE
WRITE (6, 5100)
5100 FORMAT(1H0, 10X, 12HLEAVING MAIN)
```

```
CALL EXIT
C IF (LIST .NE. 0) STOP
GO TO 1
END
```

```
BOXC 172
BOXC 173
BOXC 174
BOXC 175
BOXC 176
BOXC 177
BOXC 178
BOXC 179
BOXC 180
BOXC 181
BOXC 182
BOXC 183
BOXC 184
BOXC 185
BOXC 186
BOXC 187
BOXC 188
BOXC 189
BOXC 190
BOXC 191
BOXC 192
BOXC 193
BOXC 194
BOXC 195
BOXC 196
```

*DECK, HEADER	HEAD	1
SUBROUTINE HEADER	HEAD	2
COMMON HEDR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,	HEAD	3
1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	HEAD	4
DATA IPAGE/0/	HEAD	5
1 FORMAT(1H1, 5X, 13HPROGRAM BOXC , 15X, 30HATMOSPHERIC SCIENCE ASSHEAD	HEAD	6
1OCIATES/ 38X, 22HBEDFCRD, MASSACUSETTS, 22X, 4HPAGE, 15/	HEAD	7
2 7X, 8HBODY ID., 2X, A4/ 30X, 15A4)	HEAD	8
10 IPAGE = IPAGE + 1	HEAD	9
WRITE (6,1) IPAGE, KASE,HEDR	HEAD	10
RETURN	HEAD	11
END	HEAD	12

*DECK, ROWV	ROWV	1
SUBROUTINE ROWV(XIJ, YIJ, ZIJ, III, KSKIP)	ROWV	2
COMMON HEDR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,	ROWV	3
1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	ROWV	4
LOGICAL AFLOW, BFLOW, CFLOW	ROWV	5
COMMON /DFLOW/ AFLOW,BFLOW,CFLOW,VMAT,NMATM1,NAFLOW,NBFLOW,NCFLOW	ROWV	6
DIMENSION XIJ(1), YIJ(1), ZIJ(1)	ROWV	7
INTEGER CKFLG	ROWV	8
DIMENSION NT(3)	ROWV	9
DATA NT	ROWV	10
/ 1, 11, 12 /	ROWV	10
5 CKFLG = 0	ROWV	11
N1 = 1	ROWV	12
N2 = NQUAD/ 3	ROWV	13
N3 = NQUAD - N2 - N2	ROWV	14
NN = N2	ROWV	15
C READ IN ONE ROW OF THE VX, VY, VZ	ROWV	16
DO 50 I1 = 1, 3	ROWV	17
NTAPE = NT(I1)	ROWV	18
10 READ(NTAPE) (XIJ(I2) , YIJ(I2) , ZIJ(I2) , I2 = N1 , NN)	ROWV	19
N1 = NN + 1	ROWV	20
IF(I1 .EQ. 2) GO TO 35	ROWV	21
NN = NN + N2	ROWV	22
GO TO 50	ROWV	23
35 NN = NN + N3	ROWV	24
50 CONTINUE	ROWV	25
NER = 0	ROWV	26
IF (III .NE. (NQUAD + NOFF)) IF (KSKIP) 80, 80, 100	ROWV	27
REWIND 1	ROWV	28
REWIND 11	ROWV	29
REWIND 12	ROWV	30
80 RETURN	ROWV	31
100 IF (NMATM1 .EQ. 0) RETURN	ROWV	32
DO 110 N1 = 1, NMATM1	ROWV	33
READ (1)	ROWV	34
READ (11)	ROWV	35
110 READ (12)	ROWV	36
RETURN	ROWV	37
END	ROWV	38

*DECK, INPUT	INPU	1
SUBROUTINE INPUT	INPU	2
C SUBROUTINE INPUT (LIST)	INPU	3
LOGICAL IPROS	INPU	4
COMMON /INPT/ LIST, IPROS	INPU	5
REAL NX, NY, NZ, IXX, IXY, IYY, MACH	INPU	6
LOGICAL AFLOW, BFLOW, CFLOW, RFLAG, AFLAG, BFLAG	INPU	7
INTEGER STAT, STATT, CONV	INPU	8
DIMENSION SPH (200), CPH (200), XINP (200), ZINP (200)	INPU	9
DIMENSION XOFF(1000), YOFF (1000), ZOFF (1000)	INPU	10
DIMENSION XA (500), XB (500), YA (500), YB (500),	INPU	11
1 ZA (500), ZB (500), NLINE(500), NLT (500), CFLAG(3),	INPU	12
2 XI (4), ETA (4), XIN (4), YIN (4), ZIN (4), XNULL (1000),	INPU	13
3 YNULL(1000), ZNULL(1000), XNORM(1000),	INPU	14
4 YNORM (1000), ZNORM (1000), RX (4), R (4), RY (4)	INPU	15
COMMON HEDR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,	INPU	16
1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	INPU	17
COMMON /M/ MACH, BETA, RBETA	INPU	18
COMMON /NORMS/ XNORM, YNORM, ZNORM	INPU	19
EQUIVALENCE (XNULL, XOFF), (YNULL, YOFF),	INPU	20
1 (ZNULL, ZOFF), (NULL, NQUAD)	INPU	21
COMMON /DFLOW/ AFLCW,BFLCW,CFLOW,NMAT,NMATM1,NAFLOW,NBFLOW,NCFLOW	INPU	22
DATA CFLAG / 2H 1, 2H 2, 2H /	INPU	23
DATA PI/3.141593E0/, HAFI/1.570796E0/, EPS/.0001/	INPU	24
3030 FORMAT (1H1)	INPU	25
1 FORMAT (3E10.0, I2 / 3F10.0, I2)	INPU	26
4002 FORMAT (1H0, 6X,5HN M, 7X, 4 (1HX, 11X), 2HNX, 11X, 3HNPX,	INPU	27
1 11X, 1HD / 19X, 4 (1HY, 11X), 2HNY, 11X, 3HNPY, 11X, 1HT /	INPU	28
2 19X, 4(1HZ, 11X), 2HNZ, 11X, 3HNpz, 11X, 1HA)	INPU	29
4005 FORMAT (1H0, 7X, I4, 4F12.6, 2F13.6, E14.4,A2/(12X,4F12.6,	INPU	30
1 2F13.6, E14.4))	INPU	31
4010 FORMAT (1H0, 3X, 2I4, 4F12.6, 2F13.6, E14.4,A2/(12X, 4F12.6,	INPU	32
1 2F13.6, E14.4))	INPU	33
4015 FORMAT (1H0, 3 (20), 12H*****))	INPU	34
	INPU	35
C INPUT -- SECTION 9.1 INPUT SCHEME	INPU	36
KLCT = 0	INPU	37
NULL = 0	INPU	38
NPRT = 13	INPU	39
WRITE (6, 40)	INPU	40
40 FORMAT (1H0,16X,44HP A R A M E T R I C I N F O R M A T I O N	INPU	41
1 /// 38X,23HGENERATED UNIFORM FLOWS ///	INPU	42
IF (AFLOW) WRITE (6, 41)	INPU	43
41 FORMAT (46X,6HX-FLOW)	INPU	44
IF (BFLOW) WRITE (6, 42)	INPU	45
42 FORMAT (46X,6HY-FLOW)	INPU	46
IF (CFLOW) WRITE (6, 43)	INPU	47
43 FORMAT (46X,6HZ-FLOW)	INPU	48
IF (IPRS .NE. 0) WRITE (6, 44)	INPU	49
44 FORMAT (1H0,16X,22HPRINT SIGMA ITERATIONS)	INPU	50
IF (MPR .EQ. 0) GO TO 52	INPU	51
IF (MPR - 2) 45, 47, 49	INPU	52
45 WRITE (6, 46)	INPU	53
46 FORMAT (1H0,16X,18HPRINT VIJ MATRICES)	INPU	54
GO TO 52	INPU	55
47 WRITE (6, 48)	INPU	56
48 FORMAT (1H0,16X,18HPRINT AIJ MATRICES)	INPU	57
GO TO 52	INPU	58
49 WRITE (6, 51)	INPU	59
51 FORMAT (1H0,16X,31HPRINT BOTH VIJ AND AIJ MATRICES)	INPU	60

52	IF (ISIG .NE. 0) WRITE (6, 53)	INPU	61
53	FORMAT (1H0,16X,19HINPUT SIGMA GUESSES)	INPU	62
	IF (NSYM - 1) 54, 56, 58	INPU	63
54	WRITE (6, 55)	INPU	64
55	FORMAT (1H0,16X,21HNC SYMMETRY SPECIFIED)	INPU	65
	GO TO 61	INPU	66
56	WRITE (6, 57)	INPU	67
57	FORMAT (1H0,16X,30HTHERE IS ONE PLANE OF SYMMETRY)	INPU	68
	GO TO 61	INPU	69
58	WRITE (6, 59) NSYM	INPU	70
59	FORMAT (1H0,16X,9HTHERE ARE,I2, 19H PLANES OF SYMMETRY)	INPU	71
61	IF (MACH .NE. 0.0) WRITE (6, 21) MACH	INPU	72
21	FORMAT (1H0,16X,13HMACH NUMBER =,F10.5)	INPU	73
	IF (IFLAG .EQ. 0) GO TO 29	INPU	74
	READ (5, 20) NLM1, MMIN, B, C	INPU	75
	IF (B .EQ. 0.0) B = 1.0	INPU	76
	IF (C .EQ. 0.0) C = 1.0	INPU	77
20	FORMAT (2I5, 2F10.5)	INPU	78
4	FORMAT (8F10.0)	INPU	79
	WRITE (6, 62) NLM1, MMIN, B, C	INPU	80
62	FORMAT (1H0,16X,10HGENERATE A,I3, 2H X,I3, 12H SPHERE. B =,F10.5,	INPU	81
1	4X,3HC =,F10.5)	INPU	82
	MLINES = MMIN + 1	INPU	83
	NLINES = NLM1 + 1	INPU	84
	N = 0	INPU	85
	IF (NSYM .EQ. 0) GO TO 2	INPU	86
	IF (NSYM - 2) 3, 5, 6	INPU	87
2	PITH = PI	INPU	88
	PIPHI = PI + PI	INPU	89
	GO TO 7	INPU	90
3	PITH = PI	INPU	91
	PIPHI = PI	INPU	92
	GO TO 7	INPU	93
5	PITH = PI	INPU	94
	PIPHI = HAFPI	INPU	95
	GO TO 7	INPU	96
6	PITH = HAFPI	INPU	97
	PIPHI = PITH	INPU	98
7	SPH (MLINES) = SIN (PIPHI)	INPU	99
	SPH (1) = 0.0	INPU	100
	CPH (MLINES) = CCS (PIPHI)	INPU	101
	CPH (1) = 1.0	INPU	102
	EKM = MMIN	INPU	103
	EKN = NLM1	INPU	104
	EMM = 0.0	INPU	105
	DO 8 I = 2, MMIN	INPU	106
	EMM = EMM + 1.0	INPU	107
	PHI = EMM / EKM * PIPHI	INPU	108
	SPH (I) = SIN (PHI)	INPU	109
8	CPH (I) = COS (PHI)	INPU	110
	IF (IFLAG .EQ. 2) GO TO 10	INPU	111
	ENN = 1.0	INPU	112
	DO 9 I = 1, MLINES	INPU	113
	XA (I) = 1.0	INPU	114
	YA (I) = 0.0	INPU	115
9	ZA (I) = 0.0	INPU	116
	GO TO 18	INPU	117
10	READ (5, 4) (XINP (I), ZINP (I), I = 1, NLINES)	INPU	118
	DO 11 I = 1, MLINES	INPU	119
	XA (I) = XINP (1)	INPU	120

YA (I) = B * ZINP (1) * SPH (I)	INPU 121
ZA (I) = - C * ZINF (1) * CPH (I)	INPU 122
XB (I) = XINP (2)	INPU 123
YB (I) = B * ZINP (2) * SPH (I)	INPU 124
11 ZB (I) = - C * ZINF (2) * CPH (I)	INPU 125
NLCT = 2	INPU 126
GO TO 250	INPU 127
12 DO 14 I = 1, M LINES	INPU 128
XA (I) = XB (I)	INPU 129
YA (I) = YB (I)	INPU 130
14 ZA (I) = ZB (I)	INPU 131
IF (IFLAG .EQ. 1) GO TO 16	INPU 132
NLCT = NLCT + 1	INPU 133
DO 15 I = 1, M LINES	INPU 134
XB (I) = XINP (NLCT)	INPU 135
YB (I) = B * ZINP (NLCT) * SPH (I)	INPU 136
15 ZB (I) = - C * ZINP (NLCT) * CPH (I)	INPU 137
GO TO 250	INPU 138
16 ENN = ENN + 1.0	INPU 139
18 THETA = ENN / EKN * FITH	INPU 140
STH = SIN (THETA)	INPU 141
CTH = COS (THETA)	INPU 142
DO 17 I = 1, M LINES	INPU 143
XB (I) = CTH	INPU 144
YB (I) = B * STH * SPH (I)	INPU 145
17 ZB (I) = - C * STH * CPH (I)	INPU 146
GO TO 250	INPU 147
29 N = -1	INPU 148
IF (LIST .EQ. 0) GO TO 50	INPU 149
WRITE (6, 19)	INPU 150
19 FORMAT (1H0 16X 28HBASIC DATA CALCULATIONS ONLY)	INPU 151
GO TO 50	INPU 152
30 IF (RFLAG) GO TO 50	INPU 153
RFLAG = .TRUE.	INPU 154
X = XX	INPU 155
Y = YY	INPU 156
Z = ZZ	INPU 157
STAT = STATT	INPU 158
IF (LIST) 66, 66, 65	INPU 159
50 RFLAG = .FALSE.	INPU 160
READ (5, 1) X, Y, Z, STAT, XX, YY, ZZ, STATT	INPU 161
IF (IPROS) CALL DATPROS(X, Y, Z, XX, YY, ZZ)	INPU 162
65 IF (N .EQ. (-1)) GO TO 80	INPU 163
66 IF (STAT .EQ. 0 .OR. STAT .EQ. 3) GO TO 180	INPU 164
IF (STAT .EQ. 2) GO TO 200	INPU 165
IF (.NOT. AFLAG) GO TO 200	INPU 166
MC = M	INPU 167
80 M = 1	INPU 168
IF (STAT .EQ. 2) GO TO 150	INPU 169
IF (.NOT. BFLAG) GO TO 84	INPU 170
75 DO 81 J = 1, MC	INPU 171
XA (J) = XB (J)	INPU 172
YA (J) = YB (J)	INPU 173
81 ZA (J) = ZB (J)	INPU 174
83 XB (1) = X	INPU 175
YB (1) = Y	INPU 176
ZB (1) = Z	INPU 177
GO TO 30	INPU 178
84 IF (AFLAG) GO TO 85	INPU 179
BFLAG = .TRUE.	INPU 180

```

GO TO 75
85 AFLAG = .FALSE.
GO TO 83
150 AFLAG = .TRUE.
BFLAG = .FALSE.
IF ( N .EQ. (-1) ) N = 0
160 XA ( M ) = X
YA ( M ) = Y
ZA ( M ) = Z
GO TO 30
180 M = M + 1
IF ( AFLAG ) GO TO 160
XB ( M ) = X
YB ( M ) = Y
ZB ( M ) = Z
IF ( STAT .NE. 3 ) GO TO 30
200 MMIN = MIN0(M, MC) - 1
MC = M
250 N = N + 1
KLCT = KLCT + 1

```

C BEGIN COMPUTATION OF NULL POINTS AND 28 QUANTITIES

```

DO 2000 I = 1, MMIN
NULL = NULL + 1
XIN(1) = XA( I ) * RBETA
XIN(2) = XA(I+1) * RBETA
XIN(3) = XB(I+1) * RBETA
XIN(4) = XB( I ) * REETA
YIN(1) = YA(I)
YIN(2) = YA(I+1)
YIN(3) = YB(I+1)
YIN(4) = YB(I)
ZIN(1) = ZA(I)
ZIN(2) = ZA(I+1)
ZIN(3) = ZB(I+1)
ZIN(4) = ZB(I)

```

C FORM DIAGONAL VECTORS
C EQUATION (64)

```

T1X = XIN(3) - XIN(1)
T2X = XIN(4) - XIN(2)
T1Y = YIN(3) - YIN(1)
T2Y = YIN(4) - YIN(2)
T1Z = ZIN(3) - ZIN(1)
T2Z = ZIN(4) - ZIN(2)

```

C FORM CROSS PRODUCT N = T2 X T1
C EQUATION (65)

```

NX = T2Y*T1Z - T1Y*T2Z
NY = T1X*T2Z - T2X*T1Z
NZ = T2X*T1Y - T1X*T2Y
VN = SQRT ( NX* NX + NY* NY + NZ* NZ )

```

C FORM UNIT NORMAL VECTOR
C EQUATION (66)

```

NX = NX / VN

```

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INPU 240

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NY = NY / VN	INPU 241
NZ = NZ / VN	INPU 242
C COMPUTE AVERAGE POINT	INPU 243
C EQUATION (68)	INPU 244
AVX = .25 * (XIN(1) + XIN(2) + XIN(3) + XIN(4))	INPU 245
AVY = .25 * (YIN(1) + YIN(2) + YIN(3) + YIN(4))	INPU 246
AVZ = .25 * (ZIN(1) + ZIN(2) + ZIN(3) + ZIN(4))	INPU 247
	INPU 248
	INPU 249
	INPU 250
C COMPUTE PROJECTION DISTANCE	INPU 251
C EQUATIONS (69) AND (71)	INPU 252
D = NX*(AVX - XIN(1)) + NY*(AVY - YIN(1)) + NZ*(AVZ-ZIN(1))	INPU 253
PD = ABS(D)	INPU 254
	INPU 255
	INPU 256
C EQUATIONS (73) AND (74)	INPU 257
T = SQRT (T1X*T1X + T1Y*T1Y + T1Z*T1Z)	INPU 258
T1X = T1X / T	INPU 259
T1Y = T1Y / T	INPU 260
T1Z = T1Z / T	INPU 261
	INPU 262
	INPU 263
C EQUATION (75)	INPU 264
T2X = NY*T1Z - NZ*T1Y	INPU 265
T2Y = NZ*T1X - NX*T1Z	INPU 266
T2Z = NX*T1Y - NY*T1X	INPU 267
	INPU 268
	INPU 269
C COMPUTE COORDINATES OF CORNER POINTS IN REFERENCE COORD. SYSTEM	INPU 270
C EQUATION (72)	INPU 271
	INPU 272
DO 1000 J = 1, 4	INPU 273
XP = XIN(J) + NX * D	INPU 274
YP = YIN(J) + NY * D	INPU 275
ZP = ZIN(J) + NZ * D	INPU 276
D = - D	INPU 277
XDIF = XP - AVX	INPU 278
YDIF = YP - AVY	INPU 279
ZDIF = ZP - AVZ	INPU 280
	INPU 281
C TRANSFORM CORNER POINTS TO ELEMENT COORDINATE SYSTEM (XI, ETA)	INPU 282
C WITH AVERAGE POINT AS ORIGIN	INPU 283
C EQUATION (80)	INPU 284
	INPU 285
XI(J) = T1X*XDIF + T1Y*YDIF + T1Z*ZDIF	INPU 286
1000 ETA(J) = T2X*XDIF + T2Y*YDIF + T2Z*ZDIF	INPU 287
	INPU 288
	INPU 289
C COMPUTE CENTROID	INPU 290
C EQUATION (81)	INPU 291
XI0 = .3333333E0 * (XI (4) * (ETA (1) - ETA (2)) + XI (2)	INPU 292
1 * (ETA (4) - ETA (1))) / (ETA (2) - ETA (4))	INPU 293
ETA0 = -.3333333E0 * ETA(1)	INPU 294
	INPU 295
	INPU 296
C OBTAIN CORNER POINTS IN SYSTEM WITH CENTROID AS ORIGIN	INPU 297
C EQUATION (82)	INPU 298
	INPU 299
DO 1020 J = 1, 4	INPU 300

```

      XI(J) = XI(J) - XI0
1020 ETA(J) = ETA(J) - ETA0
C COMPUTATION AIDS
      ETA2M1 = ETA ( 2 ) - ETA ( 1 )
      ETA3M2 = ETA ( 3 ) - ETA ( 2 )
      ETA4M3 = ETA ( 4 ) - ETA ( 3 )
      ETA1M4 = ETA ( 1 ) - ETA ( 4 )
      XI1M2 = XI ( 1 ) - XI ( 2 )
      XI2M3 = XI ( 2 ) - XI ( 3 )
      XI3M4 = XI ( 3 ) - XI ( 4 )
      XI4M1 = XI ( 4 ) - XI ( 1 )
      ETA2P4 = ETA ( 2 ) + ETA ( 4 )
      XI3M1 = XI ( 3 ) - XI ( 1 )
      XI4M2 = XI ( 4 ) - XI ( 2 )
      ETA2M4 = ETA ( 2 ) - ETA ( 4 )
      XI1234 = XI ( 1 ) + XI ( 2 ) + XI ( 3 ) + XI ( 4 )
C TRANSFORM CENTROID TO REFERENCE COORDINATE SYSTEM
C EQUATION ( 83 )
      XCENT = AVX + T1X*XI0 + T2X*ETA0
      YCENT = AVY + T1Y*XI0 + T2Y*ETA0
      ZCENT = AVZ + T1Z*XI0 + T2Z*ETA0
C COMPUTE LARGER DIAGONAL VECTOR
C EQUATION ( 84 )
      TSQ = AMAX1 ( XI3M1 ** 2, XI4M2 ** 2 + ETA2M4 ** 2 )
      T = SQRT ( TSQ )
C COMPUTE AREA
C EQUATION ( 85 )
      AREA = .5 * XI3M1 * ETA2M4
C COMPUTE 2ND MOMENTS IXX, IXY, IYY
C EQUATIONS ( 86 ) - ( 88 )
      IXX =
1      8.333333E-2 * XI3M1 * ( ETA ( 1 ) * XI4M2 *
2      XI1234 + ETA2M4 * ( XI ( 1 ) * ( XI(1) + XI ( 3 ) ) *
3      XI ( 3 ) ** 2 ) + XI ( 2 ) * ETA ( 2 ) * ( XI1234 - XI ( 4 ) )
      - XI ( 4 ) * ETA ( 4 ) * ( XI1234 - XI ( 2 ) ) )
      IXY =
1      4.166667E-2 * XI3M1 * ( 2. * XI ( 4 ) * ( ETA ( 1 )
2      ** 2 - ETA ( 4 ) ** 2 ) - 2. * XI ( 2 ) * ( ETA ( 1 ) ** 2 -
3      ETA ( 2 ) ** 2 ) + ( XI ( 1 ) + XI ( 3 ) ) * ETA2M4 * ( 2. *
      ETA ( 1 ) + ETA2P4 ) )
      IYY =
1      8.333333E-2 * XI3M1 * ETA2M4 * ((ETA ( 1 ) +
      ETA2P4 ) ** 2 - ETA ( 1 ) * ETA2P4 - ETA ( 2 ) * ETA ( 4 ) )
C COMPUTE CONSTANTS FOR EQUATIONS ( 42 ) AND ( 43 )
C EQUATION ( 45 )
      D12SQ = XI1M2 ** 2 + ETA2M1 ** 2
      D12 = SQRT ( D12SQ )
      D23SQ = XI2M3 ** 2 + ETA3M2 ** 2
      D23 = SQRT ( D23SQ )
      D34SQ = XI3M4 ** 2 + ETA4M3 ** 2
      D34 = SQRT ( D34SQ )
      D41SQ = XI4M1 ** 2 + ETA1M4 ** 2
      D41 = SQRT ( D41SQ )
      C1 = 0.0
      C2 = 0.0
      C3 = 0.0

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```

C4 = 0.0
C5 = 0.0
C6 = 0.0
C7 = 0.0
C8 = 0.0
XNP = 0.0
YNP = 0.0
IF ( D12 ) 1030, 1040, 1030
1030 C1 = ETA2M1 / D12
      C5 = XI1M2 / D12
1040 IF ( D23 ) 1050, 1060, 1050
1050 C2 = ETA3M2 / D23
      C6 = XI2M3 / D23
1060 IF ( D34 ) 1070, 1080, 1070
1070 C3 = ETA4M3 / D34
      C7 = XI3M4 / D34
1080 IF ( D41 ) 1090, 1100, 1090
1090 C4 = ETA1M4 / D41
      C8 = XI4M1 / D41
1100 CONV = 3

```

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```

C BEGIN NULL POINT ITERATION

```

DO 1591 ITR = 1, 30
DO 1580 K = 1, 4
C EQUATION ( 47 )
R ( K ) = SQRT ( ( XNP - XI ( K ) ) ** 2 + ( YNP - ETA(K))** 2 )
RX ( K ) = ( XNP - XI ( K ) ) / R ( K )
1580 RY ( K ) = ( YNP - ETA ( K ) ) / R ( K )
R1PR2 = R ( 1 ) + R ( 2 )
R2PR3 = R ( 2 ) + R ( 3 )
R3PR4 = R ( 3 ) + R ( 4 )
R4PR1 = R ( 4 ) + R ( 1 )
ARG1 = ALOG ( ( R1PR2 - D12 ) / ( R1PR2 + D12 ) )
R4PR1 = R ( 4 ) + R ( 1 )
ARG1 = ALOG ( ( R1PR2 - D12 ) / ( R1PR2 + D12 ) )
ARG2 = ALOG ( ( R2PR3 - D23 ) / ( R2PR3 + D23 ) )
ARG3 = ALOG ( ( R3PR4 - D34 ) / ( R3PR4 + D34 ) )
ARG4 = ALOG ( ( R4PR1 - D41 ) / ( R4PR1 + D41 ) )

```

C COMPUTE INDUCED VELOCITY COMPONENTS

```

C EQUATIONS ( 42 ) AND ( 43 )
VX = C1 * ARG1 + C2 * ARG2 + C3 * ARG3 + C4 * ARG 4
VY = C5 * ARG1 + C6 * ARG2 + C7 * ARG 3 + C8 * ARG4

```

C COMPUTE PARTIAL DERIVATIVES OF INDUCED VELOCITIES

C EQUATION (90), USING EQUATIONS (91) - (93)

```

D12P= ( R1PR2 ** 2 - D12 SQ ) * .5
D23P= ( R2PR3 ** 2 - D23 SQ ) * .5
D34P= ( R3PR4 ** 2 - D34 SQ ) * .5
D41P= ( R4PR1 ** 2 - D41 SQ ) * .5
C1P = ETA2M1 / D12P
C2P = ETA3M2 / D23P
C3P = ETA4M3 / D34P
C4P = ETA1M4 / D41P
C5P = XI1M2 / D12P

```

C6P = XI2M3 / D23P	INPU 42
C7P = XI3M4 / D34P	INPU 42
C8P = XI4M1 / D41P	INPU 42
R12Y = RY (1) + RY (2)	INPU 42
R23Y = RY (2) + RY (3)	INPU 42
R34Y = RY (3) + RY (4)	INPU 42
R41Y = RY (4) + RY (1)	INPU 42
VXX = C1P* (RX (1) + RX (2)) + C2P* (RX (2) + RX (3)) +	INPU 42
1 C3P* (RX (3) + RX (4)) + C4P* (RX (4) + RX (1))	INPU 42
VXY = C1P* R12Y + C2P* R23Y + C3P* R34Y + C4P* R41Y	INPU 43
VYY = C5P* R12Y + C6P* R23Y + C7P* R34Y + C8P* R41Y	INPU 43
	INPU 43
C COMPUTE NEW NULL POINT (XNP, YNP)	INPU 43
C EQUATION (94)	INPU 43
	INPU 43
XMP = (VY * VXY - VX * VYY) / (VXX * VYY - VXY ** 2)	INPU 43
XNP = XMP + XNP	INPU 43
YNP = YNP - (VX + VXX * XMP) / VXY	INPU 43
	INPU 44
C TEST NULL POINT CONVERGENCE	INPU 44
1590 IF (ABS (VX) .LT. EPS .AND. ABS (VY) .LT. EPS) GO TO 1600	INPU 44
1591 CONTINUE	INPU 44
C NO CONVERGENCE , USE 30TH ITERATION	INPU 44
CONV = 2	INPU 44
	INPU 44
C TEST IF THIS POINT IS OUTSIDE THE ELEMENT	INPU 44
1600 IF (XNP ** 2 + YNP ** 2 .LE. TSQ) GO TO 1620	INPU 44
	INPU 44
C CONVERGES TO POINT AT INFINITY	INPU 45
CONV = 1	INPU 45
XNULL (NULL) = XCENT	INPU 45
YNULL (NULL) = YCENT	INPU 45
ZNULL (NULL) = ZCENT	INPU 45
GO TO 1700	INPU 45
	INPU 45
C TRANSFORM NULL POINT TO REFERENCE COORDINATE SYSTEM	INPU 45
C EQUATION (79) NOTE THAT Z - COORDINATE IS ZERO	INPU 45
1620 XNULL (NULL) = XCENT + T1X * XNP + T2X * YNP	INPU 45
YNULL (NULL) = YCENT + T1Y * XNP + T2Y * YNP	INPU 46
ZNULL (NULL) = ZCENT + T1Z * XNP + T2Z * YNP	INPU 46
	INPU 46
	INPU 46
C PRINT RESULTS -- SECTION 9.4 THE FIRST OUTPUT	INPU 46
	INPU 46
1700 IF (NPRT .GE. 11) GO TO 1750	INPU 46
NPRT = NPRT + 1	INPU 46
IF (I .EQ. 1) GO TO 1760	INPU 46
WRITE (6, 4005) I, XIN, NX, XNULL (NULL), PD, CFLAG (CONV),	INPU 46
1 YIN, NY, YNULL (NULL), T, ZIN, NZ, ZNULL (NULL), AREA	INPU 47
GO TO 1770	INPU 47
1750 NPRT = 0	INPU 47
CALL HEADER	INPU 47
WRITE (6, 4002)	INPU 47
1760 WRITE (6, 4010) N , I, XIN, NX, XNULL (NULL), PD, CFLAG (CONV)	INPU 47
1 YIN, NY, YNULL (NULL), T, ZIN, NZ, ZNULL (NULL), AREA	INPU 47
1770 XNORM (NULL) = NX	INPU 47
YNORM (NULL) = NY	INPU 47
ZNORM (NULL) = NZ	INPU 47
	INPU 47
	INPU 48

C	WRITE 28 QUANTITIES ON TAPE 4 AS ONE LOGICAL RECORD	INPU 481
		INPU 482
2000	IF (LIST .EQ. 0) WRITE (4) XCENT, YCENT, ZCENT, T1X, T1Y, T1Z,	INPU 483
	1 T2X, T2Y, T2Z, NX, NY, NZ, XI(1), ETA(1), XI(2), ETA(2), XI(3),	INPU 484
	2 XI(4), ETA(4), TSQ, AREA, IXX, IXY, IYY, D12, D23, D34, D41	INPU 485
	NLT (KLCT) = MMIN	INPU 486
	NLINE (KLCT) = N	INPU 487
	IF (IFLAG .EQ. 0) GO TO 2001	INPU 488
	IF (N .LT. NLM1) GO TO 12	INPU 489
	WRITE (6, 4015)	INPU 490
	GO TO 2025	INPU 491
2001	IF (STAT .LT. 2) GO TO 80	INPU 492
	NLT(KLCT) = -NLT(KLCT)	INPU 493
	NPRT = NPRT + 1	INPU 494
	WRITE (6, 4015)	INPU 495
		INPU 496
C	TEST FOR END OF CASE	INPU 497
2020	IF (STAT .NE. 3) GO TO 80	INPU 498
2025	NN1 = MOD (3 * NQUAD, 255)	INPU 499
	NQNN1 = NQUAD	INPU 500
	IF (NN1 .LT. 5 .AND. NN1 .GT. 0) NQNN1 = NQUAD + 2	INPU 501
	IF (LIST.NE. 0) GO TO 8500	INPU 502
C	WRITE UNIT NORMALS ON TAPE 4 AS ONE LOGICAL RECORD	INPU 503
2031	WRITE (4) (XNORM(J), YNORM(J), ZNORM(J), J = 1, NQNN1)	INPU 504
C	WRITE CONTROL TABLES ON TAPE 4 AS ONE LOGICAL RECORD	INPU 505
	WRITE (4) KLCT, (NLINE (J), NLT (J), J = 1, KLCT)	INPU 506
C	** WRITE NULL POINTS AND NORMALS (1 RECORD)	INPU 507
3032	WRITE (4) (XNULL(J), YNULL(J), ZNULL(J), XNORM(J), YNORM(J), ZNORM(J)	INPU 508
	1, J = 1, NQUAD)	INPU 509
	WRITE (6, 3030)	INPU 510
C	WRITE ALL NULL POINTS ON TAPE 8 (1 LOGICAL RECORD / POINT)	INPU 511
	DO 2058 I = 1, NQUAD	INPU 512
2058	WRITE (8) XNULL (I), YNULL (I), ZNULL (I)	INPU 513
		INPU 514
C	READ IN OFF-BODY POINTS	INPU 515
		INPU 516
C		INPU 517
	IF (NOFF .LE. 0) GO TO 8000	INPU 518
	NOFF = 0	INPU 519
5000	NOFF = NOFF + 1	INPU 520
	READ (5, 1) XOFF(NCOFF), YOFF(NOFF), ZOFF(NCOFF), STAT, X, Y, Z, STATT	INPU 521
	IF (STAT .EQ. 3) GO TO 5100	INPU 522
	NOFF = NOFF + 1	INPU 523
	XOFF(NOFF) = X	INPU 524
	YOFF(NOFF) = Y	INPU 525
	ZOFF(NOFF) = Z	INPU 526
	IF (STATT .NE. 3) GO TO 5000	INPU 527
		INPU 528
C	WRITE OFF-BODY POINTS ON 8 (1 RECORD / POINT)	INPU 529
		INPU 530
5100	DO 7020 I = 1, NOFF	INPU 531
	XOFF(I) = XOFF(I) * RBETA	INPU 532
7020	WRITE (8) XOFF (I), YOFF (I), ZOFF (I)	INPU 533
		INPU 534
C	WRITE OFF-BODY POINTS ON 4 (1 RECORD)	INPU 535
		INPU 536
C	WRITE (4) (XOFF(I), YOFF(I), ZOFF(I), I = 1, NOFF)	INPU 537
		INPU 538
	WRITE (6, 63) NOFF	INPU 539
63	FORMAT (1H0,16X,9HTHERE ARE,I4, 16H OFF-BODY POINTS)	INPU 540
8000	REWIND 4	INPU 540

8500 REWIND 8	INPU 541
C	INPU 542
WRITE(6, 9999) NQUAD	INPU 543
9999 FORMAT(1H0 , 5X, I5, 2(H BASIC ELEMENTS WERE INPUT)	INPU 544
C RETURN	INPU 545
C END	INPU 546

*DECK, DATPR	DATP 1
SUBROUTINE DATPROS(X, Y, Z, XX, YY, ZZ)	DATP 2
C	DATP 3
C THIS IS A SIMPLE SCALING AND ORIGIN TRANSLATION CODE FOR THE	DATP 4
C DOUGLAS BOXC POTENTIAL FLOW CODE DATA INPUT	DATP 5
C XTRANS, YTRANS, ZTRANS ARE ORIGIN TRANSLATIONS	DATP 6
C XSCALE, YSCALE, ZSCALE ARE SCALE FACTORS	DATP 7
C THE CODE ALSO ALLOWS FOR ROTATION IN THE X - Z PLANE TO ADJUST	DATP 8
C FOR ARBITRARY ANGLE OF ATTACK	DATP 9
C SINA, COSA ARE SINE AND COSINE OF ANGLE	DATP 10
C ANGLE IS THE ANGLE(INPUT IN DEGREES) THAT THE AIRPLANE AXIS	DATP 11
C MAKES WITH THE NEGATIVE X AXIS (POSITIVE COUNTERCLOCKWISE	DATP 12
C FROM THE -X AXIS) AFTER SCALING (NOTE - AFTER SCALING THE	DATP 13
C AIRPLANE NOSE POINTS DOWN THE NEGATIVE X AXIS)	DATP 14
C	DATP 15
C THIS VERSION FOR USE WITH BOXC	DATP 16
C	DATP 17
C	DATP 18
C	DATP 19
COMMON HEDR(15), MPR, NER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,	DATP 19
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE	DATP 20
COMMON /PROS/ SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS,	DATP 21
1 YTRANS, ZTRANS	DATP 22
X = (X - XTRANS) * XSCALE	DATP 23
Y = (Y - YTRANS) * YSCALE	DATP 24
Z = (Z - ZTRANS) * ZSCALE	DATP 25
XX= (XX- XTRANS) * XSCALE	DATP 26
YY= (YY- YTRANS) * YSCALE	DATP 27
ZZ= (ZZ- ZTRANS) * ZSCALE	DATP 28
XP = X	DATP 29
X = XP * COSA - Z * SINA	DATP 30
Z = XP * SINA + Z * COSA	DATP 31
XP = XX	DATP 32
XX= XP * COSA - ZZ* SINA	DATP 33
ZZ= XP * SINA + ZZ* COSA	DATP 34
RETURN	DATP 35
END	DATP 36

*DECK, FLOWS		FLOW	1
SUBROUTINE FLOWS		FLOW	2
C SUBROUTINE FLOWS (NU, NNON)		FLOW	3
COMMON /FLOWP/ NU, NNCN		FLOW	4
COMMON HEDR(15), MPR, IER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,		FLOW	5
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE		FLOW	6
LOGICAL AFLOW, BFLOW, CFLOW		FLOW	7
COMMON /DFLOW/ AFLCW, BFLOW, CFLOW, NMAT, NMATM1, NAFLOW, NBFLOW, NCFLOW		FLOW	8
COMMON / FLOW / NQ, NL, KFLOW, VX(2000), VY(2000), VZ(2000),		FLOW	9
1 VNC(1000)		FLOW	10
COMMON /NORMS/ XNCRM(1000), YNORM(1000), ZNORM(1000)		FLOW	11
31 FORMAT (3I1)		FLOW	12
40 FORMAT(6F10.8)		FLOW	13
9999 FORMAT (1H0,5X 16H FLOWS HAS SET UP,		FLOW	14
1 I3, 11H X FLOWS, I3, 15H Y FLOWS, AND I3, 11H Z FLOWS.)		FLOW	15
NAFLOW = 0		FLOW	16
NBFLOW = 0		FLOW	17
NCFLOW = 0		FLOW	18
NMAT = 0		FLOW	19
NQ = NQUAD + NOFF		FLOW	20
NL = NQUAD		FLOW	21
NN = MOD(3* NQ , 255)		FLOW	22
IF (NN .LT. 5 .AND. NN .GT. 0) NQ = NQ + 5		FLOW	23
KFLOW = 0		FLOW	24
NN = MOD(NQUAD, 255)		FLOW	25
IF (NN .LT. 5 .AND. NN .GT. 0) NL = NL + 5		FLOW	26
IF (NNON .GT. 0) GC TO 140		FLOW	27
IF (NU .GT. 0) GO TO 50		FLOW	28
WRITE (6, 115)		FLOW	29
115 FORMAT (1H1,6X,24HNO ONSET FLOWS SPECIFIED)		FLOW	30
STOP		FLOW	31
50 IF (.NOT. AFLOW) GC TO 60		FLOW	32
KFLOW = 1		FLOW	33
GO TO 100		FLOW	34
60 IF (.NOT. BFLOW) GC TO 70		FLOW	35
KFLOW = 2		FLOW	36
GO TO 100		FLOW	37
70 IF (CFLOW) GO TO 90		FLOW	38
IF (KFLOW .NE. 0) GO TO 4000		FLOW	39
WRITE (6, 80)		FLOW	40
80 FORMAT (1H1,6X,12HINPUT ERROR.,5X,25HNO FLOW MATRIX SPECIFIED.)		FLOW	41
STOP		FLOW	42
90 KFLOW = 3		FLOW	43
100 CALL UNIFRM		FLOW	44
IF (KFLOW - 2) 60, 70, 4000		FLOW	45
		FLOW	46
C THIS SECTION SETS UP THE NON-UNIFORM ONSET FLOWS		FLOW	47
		FLOW	48
140 DO 3000 N = 1, NNON		FLOW	49
IERR = 0		FLOW	50
		FLOW	51
C - - THE FLAGS READ IN HERE HAVE THE FOLLOWING VALUES...		FLOW	52
		FLOW	53
C		FLOW	54
C		FLOW	55
C		FLOW	56
C		FLOW	57
C		FLOW	58
C		FLOW	59
C		FLOW	60

C
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      KTYPE      . . . .      0 INPJT FLOW VELOCITY COMPONENTS,
                          1 INPUT FLOW NORMAL VELOCITY

      READ ( 5, 31 ) KFL, KUN, KTYPE
      KTEST = KFL - KFLOW
      IF (KTEST) 145, 220, 150
145  WRITE (6, 146) KFLOW, KFL
146  FORMAT (15H1*****NOTE***** / 25HQBAN INFUT FLOW FOR MATRIX,I3,
      1 38H PHYSICALLY PRECEDED A FLOW FOR MATRIX,I3 /
      2 26H0THIS FLOW MUST BE SKIPPED //)
      IERR = 1
      GO TO 220
150  IF (NU) 155, 155, 152
152  IF (KTEST - 2) 170, 153, 160
153  IF (KFL - 2) 145, 160, 161
155  KFLOW = KFL
156  IF (KFLOW - 2) 157, 158, 159
157  AFLOW = .TRUE.
      GO TO 220
158  BFLOW = .TRUE.
      GO TO 220
159  CFLOW = .TRUE.
      GO TO 220
160  IF (.NOT. AFLOW) GC TO 161
      KFLOW = 1
      CALL UNIFRM
161  IF (.NOT. BFLOW) GO TO 162
      KFLOW = 2
      CALL UNIFRM
162  KFLOW = KFL
      IF (KFLOW .EQ. 2) GO TO 158
      IF (CFLOW) GO TO 200
      GO TO 159
170  KFLOW = KFL
      IF (NU .EQ. 0) GO TO 156
      IF (KFLOW - 2) 175, 180, 185
175  IF (AFLOW) GO TO 200
      GO TO 157
180  IF (BFLOW) GO TO 200
      GO TO 158
185  IF (CFLOW) GO TO 200
      GO TO 159
200  CALL UNIFRM
220  NVREAD = NQUAD
      IF (KUN .GT. 0) NVREAD = 1
      IF ( KTYPE .NE. 0 ) GO TO 222
      READ ( 5, 40 ) ( VX(I), VY(I), VZ(I), I = 1, NVREAD )
      GO TO 224
222  READ ( 5, 40 ) ( VNC(I), I = 1, NVREAD )
      DO 223 I = 1, NQUAD
      VX(I) = 0.0
      VY(I) = 0.0
223  VZ(I) = 0.0
224  IF ( IERR .NE. 0 ) GO TO 1200
      NVREAD = NQUAD + NCCF
      IF (KUN .LE. 0) IF (NOFF) 240, 240, 230
      DO 225 NV = 2, NVREAD
      VX(NV) = VX(1)
      VY(NV) = VY(1)

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FLOW 61
FLOW 62
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FLOW 118
FLOW 119
FLOW 120

225	VZ(NV) = VZ(1)	FLOW 121
	GO TO 240	FLOW 122
230	NQP1 = NQUAD + 1	FLOW 123
	DO 235 NV = NQP1, NVREAD	FLOW 124
	VX(NV) = 0.0	FLOW 125
	VY(NV) = 0.0	FLOW 126
235	VZ(NV) = 0.0	FLOW 127
240	IF (KFLOW - 2) 600, 700, 800	FLOW 128
600	NAFLOW = NAFLOW + 1	FLOW 129
	GO TO 900	FLOW 130
700	NBFLOW = NBFLOW + 1	FLOW 131
	GO TO 900	FLOW 132
800	NCFLOW = NCFLOW + 1	FLOW 133
900	IF (KTYPE .NE. 0) GO TO 1075	FLOW 134
	DO 1050 J = 1, NQUAD	FLOW 135
1050	VNC (J) = VX(J)*XNORM(J) + VY(J)*YNORM(J) + VZ(J)*ZNCRM(J)	FLOW 136
1075	WRITE (3) KFLOW, (VX(K), VY(K), VZ(K), K = 1, NQ)	FLOW 137
1100	WRITE (3) (VNC(K), K = 1, NL)	FLOW 138
C	READ IN FIRST GUESSES FOR THE SIGMAS	FLOW 139
1200	IF (ISIG) 3000, 3000, 1600	FLOW 140
1600	READ (5, 40) (VNC(K), K = 1, NQUAD)	FLOW 141
C	WRITE SIGMA GUESSES ON TAPE 3 AS ONE LOGICAL RECORD	FLOW 142
	IF (IERR .EQ. 0) WRITE (3) (VNC(J), J = 1, NL)	FLOW 143
3000	CONTINUE	FLOW 144
	IF (NU .NE. 0) IF (KFLOW - 2) 60, 70, 4000	FLOW 145
4000	REWIND 3	FLOW 146
	IF (AFLOW) NMAT = 1	FLOW 147
	IF (BFLOW) NMAT = NMAT + 1	FLOW 148
	IF (CFLOW) NMAT = NMAT + 1	FLOW 149
	NMATM1 = NMAT - 1	FLOW 150
	NFLOW = NAFLOW + NBFLOW + NCFLOW	FLOW 151
	WRITE(6, 9999) NAFLOW, NBFLOW, NCFLOW	FLOW 152
C	RETURN	FLOW 153
	END	FLOW 154
		FLOW 155
		FLOW 156
		FLOW 157

*DECK, UNIFRM	UNIF	1
SUBROUTINE UNIFRM	UNIF	2
C	UNIF	3
C ***** SPECIAL FOR LEAKY QUADS *****	UNIF	4
C	UNIF	5
COMMON / FLOW / NQ, NL, KFLOW, VX(2000), VY(2000), VZ(2000),	UNIF	6
1 VNC(1000)	UNIF	7
LOGICAL AFLOW, BFLOW, CFLOW	UNIF	8
COMMON /DFLOW/ AFLOW, BFLCH, CFLOW, VMAT, NMATM1, NAFLOW, NBFLOW, NCFLOW	UNIF	9
COMMON /NORMS/ XNORM(1000), YNORM(1000), ZNORM(1000)	UNIF	10
COMMON HEDR(15), MPR, IER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,	UNIF	11
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE	UNIF	12
COMMON /QLEAK/ LEAK, FRACT	UNIF	13
	UNIF	14
C THIS ROUTINE SETS UP THE UNIFORM JNSET FLOWS. FOR THESE FLOWS IT	UNIF	15
C IS ONLY NECESSARY TO HAVE TWO VELOCITY MATRICES, ONE ALL ZERGES	UNIF	16
C AND THE OTHER ALL ONES. WE SHALL FILL VX WITH 0'S AND VY WITH 1'S.	UNIF	17
	UNIF	18
DO 10 I = 1, NQ	UNIF	19
VX(I) = 0.0	UNIF	20
10 VY(I) = 1.0	UNIF	21
	UNIF	22
C NOW WE'LL TEST 'KFLOW' TO DETERMINE WHAT FLOW TO SET UP FOR.	UNIF	23
	UNIF	24
IF (KFLOW - 2) 20, 30, 40	UNIF	25
	UNIF	26
C THIS PORTION SETS UP FOR 'A' FLOW.	UNIF	27
	UNIF	28
20 NAFLOW = 1	UNIF	29
WRITE (3) KFLOW, (VY(I), VX(I), VX(I), I = 1, NQ)	UNIF	30
	UNIF	31
C THIS IS A PATCH TO PROVIDE FOR LEAKY QUADS. THESE MUST BE THE	UNIF	32
C FIRST QUADS IN THE TABLE. THEY LEAK AT A FRACTION FRACT OF THE	UNIF	33
C FREE-STREAM RATE. ONLY THE A FLOW IS PROVIDED FOR HERE.	UNIF	34
	UNIF	35
C LEAK = NO. OF LEAKY QUADS	UNIF	36
	UNIF	37
IF(LEAK .GT. 0) GO TO 21	UNIF	38
WRITE(3) (XNORM(I), I=1, NL)	UNIF	39
GO TO 50	UNIF	40
21 DO 22 I=1, LEAK	UNIF	41
22 VZ(I) = XNORM(I) + FRACT	UNIF	42
IF(LEAK .GE. NL) GO TO 25	UNIF	43
LEAKP = LEAK + 1	UNIF	44
DO 24 I=LEAKP, NL	UNIF	45
24 VZ(I) = XNORM(I)	UNIF	46
25 WRITE(3) (VZ(I), I=1, NL)	UNIF	47
DO 26 I=1, NL	UNIF	48
26 VZ(I) = 0.0	UNIF	49
GO TO 50	UNIF	50
	UNIF	51
C THIS PORTION SETS UP FOR 'B' FLOW.	UNIF	52
	UNIF	53
30 NBFLOW = 1	UNIF	54
WRITE (3) KFLCH, (VX(I), VY(I), VX(I), I = 1, NQ)	UNIF	55
WRITE (3) (YNORM(I), I = 1, NL)	UNIF	56
GO TO 50	UNIF	57
	UNIF	58
C THIS PORTION SETS UP FOR 'C' FLOW.	UNIF	59
	UNIF	60

40	NCFLOW = 1	UNIF	61
	WRITE (3) KFLOW, (VX(I), VX(I), VY(I), I = 1, NQ)	UNIF	62
	WRITE (3) (ZNORM(I), I = 1, NL)	UNIF	63
C	CHECK FOR INPUT SIGMAS.	UNIF	64
		UNIF	65
50	IF (ISIG .EQ. 0) RETURN	UNIF	66
		UNIF	67
C	READ THE SIGMA GUESSES INTO VZ.	UNIF	68
		UNIF	69
	READ (5, 60) (VZ(I), I = 1, NQUAD)	UNIF	70
60	FORMAT (6F10.8)	UNIF	71
		UNIF	72
C	WRITE SIGMAS ON TAPE 3 AS ONE LOGICAL RECORD AND HANG IT UP. *TMR*	UNIF	73
		UNIF	74
	WRITE (3) (VZ(I), I = 1, NL)	UNIF	75
	RETURN	UNIF	76
	END	UNIF	77
		UNIF	78

*DECK, VFORM		VFOR	1
	SUBROUTINE VFORM	VFOR	2
	REAL M12, M23, M34, M41 , IXX, IXY, IYY	VFOR	3
	INTEGER TAPES	VFOR	4
C		VFOR	5
	LOGICAL AFLOW, BFLOW, CFLOW	VFOR	6
	DIMENSION NTAPE(3), G41(335),	VFOR	7
1	XIJ1 (335), XIJ2 (335), XIJ3 (335), YIJ1 (335), YIJ2 (335),	VFOR	8
2	YIJ3 (335), ZIJ1 (335), ZIJ2 (335), ZIJ3 (335), XX1 (1340),	VFOR	9
3	XX2 (1340), XX3(1340), YY1(1340),YY2(1340),YY3(1340),ZZ1(1340),	VFOR	10
4	ZZ2(1340), ZZ3(1340), X(8),Y(8),Z(8), XC(335), YC(335), ZC(335),	VFOR	11
5	A11(335), A12 (335), A13 (335), A21(335), A22(335), A23(335),	VFOR	12
6	A31(335), A32 (335), A33 (335), XI1(335), XI2(335), XI3(335),	VFOR	13
7	XI4(335), ETA1(335),ETA2 (335), ETA4(335),TSQ(335), A (335),	VFOR	14
8	IXX(335), IXY (335), IYY (335), D12 (335), D23(335), D34(335)	VFOR	15
	COMMON HEDR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,	VFOR	16
1	KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	VFOR	17
	EQUIVALENCE (XIJ1, YY1 (1)), (XC, YY1 (336)), (YC,YY1(671)),	VFOR	18
1	(ZC, YY1(1006)), (ETA4, XX1 (1)), (YIJ1, XX1 (336)),	VFOR	19
2	(XIJ2, YY2 (1)), (YIJ2, YY2 (336)), (A11, YY2 (671)),	VFOR	20
3	(A12 , YY2 (1006)), (A13, XX1 (671)), (TSQ, XX1 (1006)),	VFOR	21
4	(A21, YY3 (1)) , (A22, YY3 (336)), (A23, YY3 (671)),	VFOR	22
5	(A , YY3 (1006)), (XIJ3, XX2 (1)), (YIJ3, XX2 (336)),	VFOR	23
6	(ZIJ1, ZZ1 (1)) , (A31 , ZZ1 (336)), (A32 , ZZ1 (671)),	VFOR	24
7	(A33, ZZ1 (1006)), (IXX, XX2 (671)), (D12, XX2 (1006)),	VFOR	25
8	(ZIJ2, ZZ2 (1)) , (XI1, ZZ2 (336)), (XI2, ZZ2 (671)),	VFOR	26
9	(XI3, ZZ2 (1006)), (IXY, XX3 (1)), (D23, XX3 (336)),	VFOR	27
A	(D34, ZZ3 (1)) , (ZIJ3, ZZ3(336)), (XI4, ZZ3 (671)),	VFOR	28
B	(ETA1,ZZ3 (1006)), (ETA2, XX3 (671)), (IYY, XX3 (1006))	VFOR	29
	COMMON /DFLOW/ AFLOW,BFLOW,CFLOW,NMAT,NMATM1,NAFLOW,NBFLOW,NCFLOW	VFOR	30
	DATA RHO1SQ, RHO2SQ / 6.0, 16.0 /	VFOR	31
	DATA NTAPE / 1 , 11 , 12 /	VFOR	32
4004	FORMAT (1H0, 3HROW,I5,5), 6HX-FLJW)	VFOR	33
4005	FORMAT (1H0, 3HROW,I5,5X, 6HY-FLJW)	VFOR	34
4006	FORMAT (1H0, 3HROW,I5,5X, 6HZ-FLJW)	VFOR	35
	INEAR = 0	VFOR	36
	INTERM = 0	VFOR	37

IFAR = 0	VFOR 38
10 IF (NSYM - 1) 58, 52, 54	VFOR 39
52 ASSIGN 2100 TO I29	VFOR 40
ASSIGN 910 TO I19	VFOR 41
GO TO 60	VFOR 42
54 ASSIGN 2200 TO I29	VFOR 43
IF (NSYM .EQ. 3) GO TO 56	VFOR 44
ASSIGN 920 TO I19	VFOR 45
GO TO 60	VFOR 46
56 ASSIGN 930 TO I19	VFOR 47
GO TO 60	VFOR 48
58 ASSIGN 2000 TO I19	VFOR 49
60 LOOP = 2 ** NSYM + 1	VFOR 50
NEL = NQUAD / 3	VFOR 51
NELL = NEL	VFOR 52
NELP = NEL	VFOR 53
NREM = MOD (3 * NEL + 1, 255)	VFOR 54
IF (NREM .LT. 5 .AND. NREM .GT. 0) NELP = NEL + 5	VFOR 55
NON = NQUAD + NOFF	VFOR 56
DO 8000 M = 1, 3	VFOR 57
KROW = 0	VFOR 58
201 NT = NTAPE (M)	VFOR 59
202 IF (M .NE. 3) GO TO 300	VFOR 60
NEL = NQUAD - 2 * NEL	VFOR 61
NELP = NEL	VFOR 62
NREM = MOD (3 * NEL + 1, 255)	VFOR 63
IF (NREM .LT. 5 .AND. NREM .GT. 0) NELP = NEL + 5	VFOR 64
	VFOR 65
	VFOR 66
	VFOR 67
C READ 28 QUANTITIES	VFOR 68
300 DO 500 J = 1, NEL	VFOR 69
500 READ (4) XC(J), YC (J), ZC(J), A11(J), A12(J), A13(J), A21(J),	VFOR 70
1 A22(J), A23(J), A31(J), A32(J), A33(J), XI1(J),ETA1(J),XI2(	VFOR 71
2 J), ETA2(J), XI3(J), XI4(J), ETA4(J), TSQ(J), A (J), IXX (J),	VFOR 72
3 IXY (J), IYY(J), D12(J), D23(J), D34(J), D41(J)	VFOR 73
800 KROW = KROW + 1	VFOR 74
READ (8) XNPP, YNPP, ZNPP	VFOR 75
DO 2300 I1 = 1, NEL	VFOR 76
DO 1700 I2 = 1, LOOP	VFOR 77
IF (I2 .EQ. LOOP) GO TO I19, (2100, 910, 920, 930)	VFOR 78
GO TO (1000, 910, 920, 910, 930, 910, 920, 910), I2	VFOR 79
910 YC (I1) = - YC (I1)	VFOR 80
A12 (I1) = - A12 (I1)	VFOR 81
A22 (I1) = - A22 (I1)	VFOR 82
A31 (I1) = - A31 (I1)	VFOR 83
A33 (I1) = - A33 (I1)	VFOR 84
GO TO 932	VFOR 85
920 ZC (I1) = - ZC (I1)	VFOR 86
A13 (I1) = - A13 (I1)	VFOR 87
A23 (I1) = - A23 (I1)	VFOR 88
A31 (I1) = - A31 (I1)	VFOR 89
A32 (I1) = - A32 (I1)	VFOR 90
GO TO 932	VFOR 91
930 XC (I1) = - XC (I1)	VFOR 92
A11 (I1) = - A11 (I1)	VFOR 93
A21 (I1) = - A21 (I1)	VFOR 94
A32 (I1) = - A32 (I1)	VFOR 95
A33 (I1) = - A33 (I1)	VFOR 96
932 IF (I2 .EQ. LOOP) GO TO I29, (2100, 2200)	VFOR 97
1000 XDIF = XNPP - XC (I1)	

YDIF = YNPP - YC (I1)	VFOR 98
ZDIF = ZNPP - ZC (I1)	VFOR 99
C COMPUTE DISTANCE FROM NULL POINT TO ORIGIN OF J-TH ELEMENT COORDINATE SYSTEM (J CORRESPONDS TO THE INDEX I1)	VFOR 100
C INEQUALITY (98)	VFOR 101
ROSQ = XDIF ** 2 + YDIF ** 2 + ZDIF ** 2	VFOR 102
IF (ROSQ .LT. RHO2SQ * TSQ (I1)) GO TO 1400	VFOR 103
C COMPUTE INDUCED VELOCITY COMPONENTS EQUATION (97)	VFOR 104
IFAR = IFAR + 1	VFOR 105
ARG1 = A (I1) / SQRT (ROSQ) ** 3	VFOR 106
X (I2) = ARG1 * XDIF	VFOR 107
Y (I2) = ARG1 * YDIF	VFOR 108
Z (I2) = ARG1 * ZDIF	VFOR 109
GO TO 1700	VFOR 110
C TRANSFORM NULL POINT TO J - ELEMENT COORDINATE SYSTEM EQUATION (78)	VFOR 111
1400 XNP = A11 (I1) * XDIF + A12 (I1) * YDIF + A13 (I1) * ZDIF	VFOR 112
YNP = A21 (I1) * XDIF + A22 (I1) * YDIF + A23 (I1) * ZDIF	VFOR 113
ZNP = A31 (I1) * XDIF + A32 (I1) * YDIF + A33 (I1) * ZDIF	VFOR 114
C INEQUALITIES (99) AND (100)	VFOR 115
IF (ROSQ .LT. RHO1SQ * TSQ (I1)) GO TO 1410	VFOR 116
C COMPUTE INDUCED VELOCITY COMPONENTS EQUATIONS (57) - (62)	VFOR 117
INTERM = INTERM + 1	VFOR 118
P = YNP ** 2 + ZNP ** 2 - 4.0 * XNP ** 2	VFOR 119
QP = XNP ** 2 + ZNP ** 2 - 4.0 * YNP ** 2	VFOR 120
RO = SQRT (ROSQ)	VFOR 121
ROP = RO ** (- 7)	VFOR 122
WXXX = XNP * (9.0 * P + 30.0 * XNP ** 2) * ROP	VFOR 123
WXXY = 3.0 * P * ROP * YNP	VFOR 124
WXYX = 3.0 * XNP * ROP * QP	VFOR 125
WYYY = YNP * (9.0 * QP + 30.0 * YNP ** 2) * ROP	VFOR 126
WXXZ = 3.0 * ZNP * P * ROP	VFOR 127
WXYZ = - 15.0 * XNP * YNP * ZNP * ROP	VFOR 128
WYYZ = 3.0 * ZNP * QP * ROP	VFOR 129
ROP = - RO ** (- 3)	VFOR 130
WX = ROP * XNP	VFOR 131
WY = ROP * YNP	VFOR 132
WZ = ROP * ZNP	VFOR 133
HIXX = .5 * IXX (I1)	VFOR 134
HIYY = .5 * IYY (I1)	VFOR 135
VX = - WXYX*HIYY - WXXY*IXY (I1) - WXXX*HIXX - WX*A (I1)	VFOR 136
VY = - WYYY*HIYY - WXYX*IXY (I1) - WXXY*HIXX - WY*A (I1)	VFOR 137
VZ = - WYYZ*HIYY - WXYZ*IXY (I1) - WXXZ*HIXX - WZ*A (I1)	VFOR 138
GO TO 1600	VFOR 139
C COMPUTE INDUCED VELOCITY COMPONENTS EQUATIONS (42) - (49)	VFOR 140
	VFOR 141
	VFOR 142
	VFOR 143
	VFOR 144
	VFOR 145
	VFOR 146
	VFOR 147
	VFOR 148
	VFOR 149
	VFOR 150
	VFOR 151
	VFOR 152
	VFOR 153
	VFOR 154
	VFOR 155
	VFOR 156
	VFOR 157

1410	ETA4M3 = ETA4 (I1) - ETA1 (I1)	VFOR 158
	INEAR = INEAR + 1	VFOR 159
	RO = SQRT (ROSQ)	VFOR 160
	ETA2M1 = ETA2 (I1) - ETA1 (I1)	VFOR 161
	XI4M3 = XI4 (I1) - XI3 (I1)	VFOR 162
	XI2M1 = XI2 (I1) - XI1 (I1)	VFOR 163
	XI3M2 = XI3 (I1) - XI2 (I1)	VFOR 164
	XI1M4 = XI1 (I1) - XI4 (I1)	VFOR 165
	XMXI 1 = XNP - XI1 (I1)	VFOR 166
	XMXI2 = XNP - XI2 (I1)	VFOR 167
	XMXI3 = XNP - XI3 (I1)	VFOR 168
	XMXI4 = XNP - XI4 (I1)	VFOR 169
	YMETA1 = YNP - ETA1 (I1)	VFOR 170
	YMETA 2 = YNP - ETA2 (I1)	VFOR 171
	YMETA 4 = YNP - ETA4 (I1)	VFOR 172
	ZNPSQ = ZNP * ZNP	VFOR 173
	IF (ZNPSQ .LT. TSQ (I1) * 1.0E-6) ZNPSQ = 0.0	VFOR 174
	E1 = ZNPSQ + XMXI1 **2	VFOR 175
	E2 = ZNPSQ + XMXI2 **2	VFOR 176
	E3 = ZNPSQ + XMXI3 **2	VFOR 177
	E4 = ZNPSQ + XMXI4 **2	VFOR 178
	H1 = YMETA1 * XMXI1	VFOR 179
	H2 = YMETA2 * XMXI2	VFOR 180
	H3 = YMETA1 * XMXI3	VFOR 181
	H4 = YMETA4 * XMXI4	VFOR 182
	M12 = 0.0	VFOR 183
	IF (XI2M1 .NE. 0.0) M12 = ETA2M1 / XI2M1	VFOR 184
	M23 = 0.0	VFOR 185
	IF (XI3M2 .NE.0.0) M23 = - ETA2M1 / XI3M2	VFOR 186
	M34 = 0.0	VFOR 187
	IF (XI4M3 .NE. 0.0) M34 = ETA4M3 / XI4M3	VFOR 188
	M41 = 0.0	VFOR 189
	IF (XI1M4 .NE. 0.0) M41 = - ETA4M3 / XI1M4	VFOR 190
	ANUM1 = M12 * E1 - H1	VFOR 191
	ANUM2 = M12 * E2 - H2	VFOR 192
	ANUM3 = M23 * E2 - H2	VFOR 193
	ANUM4 = M23 * E3 - H3	VFOR 194
	ANUM5 = M34 * E3 - H3	VFOR 195
	ANUM6 = M34 * E4 - H4	VFOR 196
	ANUM7 = M41 * E4 - H4	VFOR 197
	ANUM8 = M41 * E1 - H1	VFOR 198
	R 1 = SQRT (XMXI1 ** 2 + YMETA1 ** 2 + ZNPSQ)	VFOR 199
	R2 = SQRT (XMXI2 ** 2 + YMETA2 ** 2 + ZNPSQ)	VFOR 200
	R3 = SQRT (XMXI3 ** 2 + YMETA1 ** 2 + ZNPSQ)	VFOR 201
	R4 = SQRT (XMXI4 ** 2 + YMETA4 ** 2 + ZNPSQ)	VFOR 202
	Q25 = D12 (I1)	VFOR 203
	Q26 = D23 (I1)	VFOR 204
	Q27 = D34 (I1)	VFOR 205
	Q28 = D41 (I1)	VFOR 206
	VX = 0.0	VFOR 207
	VY = 0.0	VFOR 208
	VZ = 0.0	VFOR 209
	IF (Q25) 1420, 1430, 1420	VFOR 210
1420	TEMP = R1 + R2	VFOR 211
	TEMP1 = TEMP - Q25	VFOR 212
	TEMP2 = TEMP + Q25	VFOR 213
	ARG1 = 1.0	VFOR 214
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG1=ALOG(TEMP1/TEMP2)	VFOR 215
	TEMP = ARG1 / Q25	VFOR 216
		VFOR 217

	VX = ETA2M1 * TEMP	VFOR 218
	VY = - XI2M1 * TEMP	VFOR 219
1430	IF (Q26) 1435, 1440, 1435	VFOR 220
1435	TEMP = R2 + R3	VFOR 221
	TEMP1 = TEMP - Q26	VFOR 222
	TEMP2 = TEMP + Q26	VFOR 223
	ARG2 = 1.0	VFOR 224
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG2=ALOG(TEMP1/TEMP2)	VFOR 225
	TEMP = ARG2 / Q26	VFOR 226
	VX = VX - ETA2M1 * TEMP	VFOR 227
	VY = VY - XI3M2 * TEMP	VFOR 228
1440	IF (Q27) 1450, 1460, 1450	VFOR 229
1450	TEMP = R3 + R4	VFOR 230
	TEMP1 = TEMP - Q27	VFOR 231
	TEMP2 = TEMP + Q27	VFOR 232
	ARG3 = 1.0	VFOR 233
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG3=ALOG(TEMP1/TEMP2)	VFOR 234
	TEMP = ARG3 / Q27	VFOR 235
	VX = VX + ETA4M3 * TEMP	VFOR 236
	VY = VY - XI4M3 * TEMP	VFOR 237
1460	IF (Q28) 1470, 1480, 1470	VFOR 238
1470	TEMP = R4 + R1	VFOR 239
	TEMP1 = TEMP - Q28	VFOR 240
	TEMP2 = TEMP + Q28	VFOR 241
	ARG4 = 1.0	VFOR 242
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG4=ALOG(TEMP1/TEMP2)	VFOR 243
	TEMP = ARG4 / Q28	VFOR 244
	VX = VX - ETA4M3 * TEMP	VFOR 245
	VY = VY - XI1M4 * TEMP	VFOR 246
1480	IF (ZNPSQ .NE. 0.0) GO TO 1510	VFOR 247
	TEST = SQRT(TSQ(I1)* 1.0E-3)	VFOR 248
	IF(Q25.GT.TEST) IF((XMXI1*ETA2M1-YMETA1*XI2M1)/Q25) 1600,1502,1502	VFOR 249
1502	IF(Q26.GT.TEST) IF((-XMXI2*ETA2M1-YMETA2*XI3M2)/Q26) 1600,1504,1504	VFOR 250
1504	IF(Q27.GT.TEST) IF((XMXI3*ETA4M3-YMETA1*XI4M3)/Q27) 1600,1506,1506	VFOR 251
1506	IF(Q28.GT.TEST) IF((-XMXI4*ETA4M3-YMETA4*XI1M4)/Q28) 1600,1508,1508	VFOR 252
1508	VZ = 6.28318531E0	VFOR 253
	GO TO 1600	VFOR 254
1510	IF (XI2M1 .NE. 0.0) VZ = ATAN(ANUM1/(ZNP*R1))-ATAN(ANUM2/(ZNP*R2))	VFOR 255
	IF (XI3M2 .NE. 0.0) VZ=VZ+ATAN(ANUM3/(ZNP*R2))-ATAN(ANUM4/(ZNP*R3))	VFOR 256
	IF (XI4M3 .NE. 0.0) VZ=VZ+ATAN(ANUM5/(ZNP*R3))-ATAN(ANUM6/(ZNP*R4))	VFOR 257
	IF (XI1M4 .NE. 0.0) VZ=VZ+ATAN(ANUM7/(ZNP*R4))-ATAN(ANUM8/(ZNP*R1))	VFOR 258
C		VFOR 259
C	TRANSFORM INDUCED VELOCITY COMPONENTS TO REFERENCE COORDINATE SYSTEM	VFOR 260
C	EQUATION (79)	VFOR 261
		VFOR 262
1600	X (I2) = A11 (I1) * VX + A21 (I1) * VY + A31 (I1) * VZ	VFOR 263
	Y (I2) = A12 (I1) * VX + A22 (I1) * VY + A32 (I1) * VZ	VFOR 264
	Z (I2) = A13 (I1) * VX + A23 (I1) * VY + A33 (I1) * VZ	VFOR 265
1700	CONTINUE	VFOR 266
		VFOR 267
2000	IF (.NOT. AFLOW) GO TO 2010	VFOR 268
	XIJ1(I1) = X(1)	VFOR 269
	YIJ1(I1) = Y(1)	VFOR 270
	ZIJ1(I1) = Z(1)	VFOR 271
2010	IF (.NOT. BFLOW) GO TO 2020	VFOR 272
	XIJ2(I1) = X(1)	VFOR 273
	YIJ2(I1) = Y(1)	VFOR 274
	ZIJ2(I1) = Z(1)	VFOR 275
2020	IF (.NOT. CFLOW) GO TO 2300	VFOR 276
	XIJ3(I1) = X(1)	VFOR 277

	YIJ3(I1) = Y(1)	VFOR 278
	ZIJ3(I1) = Z(1)	VFOR 279
	GO TO 2300	VFOR 280
2100	IF (.NOT. AFLOW) GO TO 2101	VFOR 281
	XIJ1 (I1) = X (1) + X (2)	VFOR 282
	YIJ1 (I1) = Y (1) + Y (2)	VFOR 283
	ZIJ1 (I1) = Z (1) + Z (2)	VFOR 284
2101	IF (.NOT. BFLOW) GO TO 2102	VFOR 285
	XIJ2 (I1) = X (1) - X (2)	VFOR 286
	YIJ2 (I1) = Y (1) - Y (2)	VFOR 287
	ZIJ2 (I1) = Z (1) - Z (2)	VFOR 288
2102	IF (.NOT. CFLOW) GO TO 2300	VFOR 289
	XIJ3 (I1) = X (1) + X (2)	VFOR 290
	YIJ3 (I1) = Y (1) + Y (2)	VFOR 291
	ZIJ3 (I1) = Z (1) + Z (2)	VFOR 292
	GO TO 2300	VFOR 293
2200	IF (.NOT. AFLOW) GO TO 2201	VFOR 294
	XIJ1 (I1) = X (1) + X (2) + X (3) + X (4)	VFOR 295
	YIJ1 (I1) = Y (1) + Y (2) + Y (3) + Y (4)	VFOR 296
	ZIJ1 (I1) = Z (1) + Z (2) + Z (3) + Z (4)	VFOR 297
2201	IF (.NOT. BFLOW) GO TO 2202	VFOR 298
	XIJ2 (I1) = X (1) - X (2) - X (3) + X (4)	VFOR 299
	YIJ2 (I1) = Y (1) - Y (2) - Y (3) + Y (4)	VFOR 300
	ZIJ2 (I1) = Z (1) - Z (2) - Z (3) + Z (4)	VFOR 301
2202	IF (.NOT. CFLOW) GO TO 2204	VFOR 302
	XIJ3 (I1) = X (1) + X (2) - X (3) - X (4)	VFOR 303
	YIJ3 (I1) = Y (1) + Y (2) - Y (3) - Y (4)	VFOR 304
	ZIJ3 (I1) = Z (1) + Z (2) - Z (3) - Z (4)	VFOR 305
2204	IF (NSYM .EQ. 2) GO TO 2300	VFOR 306
	IF (.NOT. AFLOW) GO TO 2205	VFOR 307
	XIJ1 (I1) = XIJ1 (I1) - X (5) - X (6) - X (7) - X (8)	VFOR 308
	YIJ1 (I1) = YIJ1 (I1) - Y (5) - Y (6) - Y (7) - Y (8)	VFOR 309
	ZIJ1 (I1) = ZIJ1 (I1) - Z (5) - Z (6) - Z (7) - Z (8)	VFOR 310
2205	IF (.NOT. BFLOW) GO TO 2206	VFOR 311
	XIJ2 (I1) = XIJ2 (I1) + X (5) - X (6) - X (7) + X (8)	VFOR 312
	YIJ2 (I1) = YIJ2 (I1) + Y (5) - Y (6) - Y (7) + Y (8)	VFOR 313
	ZIJ2 (I1) = ZIJ2 (I1) + Z (5) - Z (6) - Z (7) + Z (8)	VFOR 314
2206	IF (.NOT. CFLOW) GO TO 2300	VFOR 315
	XIJ3 (I1) = XIJ3 (I1) - X (5) - X (6) + X (7) + X (8)	VFOR 316
	YIJ3 (I1) = YIJ3 (I1) - Y (5) - Y (6) + Y (7) + Y (8)	VFOR 317
	ZIJ3 (I1) = ZIJ3 (I1) - Z (5) - Z (6) + Z (7) + Z (8)	VFOR 318
2300	CONTINUE	VFOR 319
C	WRITE ONE ROW ON TAPE	VFOR 320
C		VFOR 321
	IF(AFLOW)WRITE(NT) (XIJ1(J),YIJ1(J),ZIJ1(J),J=1, NELP)	VFOR 322
	IF(BFLOW) WRITE(NT) (XIJ2(J),YIJ2(J),ZIJ2(J),J=1, NELP)	VFOR 323
	IF(CFLOW)WRITE(NT) (XIJ3(J),YIJ3(J),ZIJ3(J),J=1, NELP)	VFOR 324
		VFOR 325
	IF (KROW .LT. NON) GO TO 800	VFOR 326
	REWIND 8	VFOR 327
8000	REWIND NT	VFOR 328
	42 FORMAT (1H0, 5X, 13#XIJ COMPONENT / (1H, F15.8))	VFOR 329
	43 FORMAT (1H0, 5X, 13#YIJ COMPONENT / (1H, F15.8))	VFOR 330
	44 FORMAT (1H0, 5X, 13#ZIJ COMPONENT / (1H, F15.8))	VFOR 331
	IF (MPR .EQ. 0 .OR. MPR .EQ. 2) GO TO 907	VFOR 332
	CALL HEADER	VFOR 333
	DO 9060 K = 1, KRCW	VFOR 334
	IND1 = 1 - NELL	VFOR 335
	IND2 = 0	VFOR 336
	I = 0	VFOR 337

9003	IND1 = IND1 + NELL	VFOR 338
	IND2 = IND2 + NELL	VFOR 339
9002	I = I + 1	VFOR 340
	NT = NTAPE (I)	VFOR 341
004	IF(AFLOW)READ(NT) (XX1(J), YY1(J), ZZ1(J), J = IND1, INC2)	VFOR 342
	IF(BFLOW) READ(NT) (XX2(J),YY2(J), ZZ2(J),J=IND1,IND2)	VFOR 343
	IF(CFLOW) READ (NT) (XX3(J),YY3(J),ZZ3(J), J=IND1, INC2)	VFOR 344
	IF (I - 2) 9003, 9008, 9050	VFOR 345
9008	IND1 = IND2 + 1	VFOR 346
	IND2 = IND2 + NEL	VFOR 347
	GO TO 9002	VFOR 348
9050	IF (.NOT. AFLOW) GO TO 9051	VFOR 349
	WRITE (6, 4004) K	VFOR 350
	WRITE (6, 42) (XX1 (J), J = 1, NQUAD)	VFOR 351
	WRITE (6, 43) (YY1 (J), J = 1, NQUAD)	VFOR 352
	WRITE (6, 44) (ZZ1 (J), J = 1, NQUAD)	VFOR 353
9051	IF (.NOT. BFLOW) GO TO 9052	VFOR 354
	WRITE (6, 4005) K	VFOR 355
	WRITE (6, 42) (XX2 (J), J = 1, NQUAD)	VFOR 356
	WRITE (6, 43) (YY2 (J), J = 1, NQUAD)	VFOR 357
	WRITE (6, 44) (ZZ2 (J), J = 1, NQUAD)	VFOR 358
9052	IF (.NOT. CFLOW) GO TO 9060	VFOR 359
	WRITE (6, 4006) K	VFOR 360
	WRITE (6, 42) (XX3 (J), J = 1, NQUAD)	VFOR 361
	WRITE (6, 43) (YY3 (J), J = 1, NQUAC)	VFOR 362
	WRITE (6, 44) (ZZ3 (J), J = 1, NQUAD)	VFOR 363
9060	CONTINUE	VFOR 364
9070	REWIND 1	VFOR 365
	REWIND 11	VFOR 366
	REWIND 12	VFOR 367
9075	WRITE (6, 4999) INEAR, INTERM, IFAR	VFOR 368
4999	FORMAT (1H0, //16H0NEAR ELEMENTS =, I7/ 24H0INTERMEDIATE ELEMENTS =	VFOR 369
	1, I7 / 15H0FAR ELEMENTS =, I7)	VFOR 370
	WRITE(6, 9999)	VFOR 371
9999	FORMAT(1H0 , 5X, 13H-LEAVING VFOR4)	VFOR 372
C	RETURN	VFOR 373
	END	VFOR 374

*DECK, AFORM

SUBROUTINE AFORM	AFOR	1
REAL NX , NY , NZ	AFOR	2
LOGICAL AFLCW, BFLOW, CFLOW	AFOR	3
COMMON /DFLOW/ AFLCW, BFLCW, CFLOW, NMAT, NMAT*1, NAFLOW, NBFLOW, NCFLOW	AFOR	4
COMMON HEDR(15), MPR, NER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,	AFOR	5
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE	AFOR	6
DIMENSION C(6000)	AFOR	7
DIMENSION NX(1000), NY(1000), NZ(1000), NTAPE(3)	AFOR	8
DIMENSION A(1000), XIJ(1000), YIJ(1000), ZIJ(1000)	AFOR	9
DATA NTAPE / 9, 10, 13 /	AFOR	10
42 FORMAT (1H0, 5X, 13HXIJ COMPONENT / (1H , 7F15.8))	AFOR	11
43 FORMAT (1H0, 5X, 13HYIJ COMPONENT / (1H , 7F15.8))	AFOR	12
44 FORMAT (1H0, 5X, 13HZIJ COMPONENT / (1H , 7F15.8))	AFOR	13
45 FORMAT (1H0, 3HROW, I6)	AFOR	14
46 FORMAT(1H0, 5X, 3HAIJ / (1H , 7F15.8))	AFOR	15
IF (MPR .NE. 0) CALL HEADER	AFOR	16
NQNN1 = NQUAD + 2	AFOR	17
NQNN = MOD(NQNN1, 255)	AFOR	18
IF (NQNN .LT. 5 .AND. NGNN .GT. 0) NQNN1 = NQUAD + 5	AFOR	19
IF (NCODE .NE. 1) GO TO 20	AFOR	20
IF (NAFLOW) 2, 2, 1	AFOR	21
1 NF1 = NAFLOW	AFOR	22
GO TO 5	AFOR	23
2 IF (NBFLOW) 4, 4, 3	AFOR	24
3 NF1 = NBFLOW	AFOR	25
GO TO 5	AFOR	26
4 NF1 = NCFLOW	AFOR	27
5 NF2 = NFLOW - NF1	AFOR	28
L2 = 0	AFOR	29
DO 6 KK = 1, NF1	AFOR	30
L1 = L2 + 1	AFOR	31
L2 = L2 + NQUAD	AFOR	32
READ (3)	AFOR	33
6 READ (3) (C(K), K = L1, L2)	AFOR	34
LAST1 = L2	AFOR	35
IF (NF2 .EQ. 0) GO TO 8	AFOR	36
DO 7 KK = 1, NF2	AFOR	37
L1 = L2 + 1	AFOR	38
L2 = L2 + NQUAD	AFOR	39
READ (3)	AFOR	40
7 READ (3) (C(K), K = L1, L2)	AFOR	41
8 DO 10 KK = 1, L2	AFOR	42
10 C(KK) = -C(KK)	AFOR	43
C ** READ IN UNIT NORMAL VECTORS	AFOR	44
20 READ(4) (NX(I), NY(I), NZ(I), I = 1, NQUAD)	AFOR	45
C FORM NORMAL VELOCITIES - EQUATION 102	AFOR	46
30 DO 1000 KK = 1, NQUAD	AFOR	47
DO 1000 NM = 1, NMAT	AFOR	48
CALL ROWV (XIJ, YIJ, ZIJ, (KK * NM) / NMAT + NOFF, 0)	AFOR	49
DO 60 K = 1, NQUAD	AFOR	50
60 A (K) = NX(KK)*XIJ(K) + NY(KK)* YIJ(K) + NZ(KK)*ZIJ(K)	AFOR	51
IF(MPR.EQ. 0) GO TO 70	AFOR	52
WRITE(6,45) KK	AFOR	53
IF (MPR .EQ. 2) GO TO 65	AFOR	54
WRITE(6,42) (XIJ(I4), I4 = 1, NQUAD)	AFOR	55
WRITE(6,43) (YIJ(I4), I4 = 1, NQUAD)	AFOR	56
WRITE(6,44) (ZIJ(I4), I4 = 1, NQUAD)	AFOR	57
IF (MPR - 2) 70, 65, 65	AFOR	58
65 WRITE (6, 46) (A(I4), I4 = 1, NQUAD)	AFOR	59
	AFOR	60

70	IF (NCODE .NE. 1) GO TO 500	AFOR	61
	IF (NM .NE. 1) GO TO 100	AFOR	62
	WRITE(8)	AFOR	63
	(A(I),I=1,NQUAD), (C(I),I=KK, LAST1,NQUAD)	AFOR	64
	GO TO 1000	AFOR	65
100	NT = KK + LAST1	AFOR	66
	WRITE (10)	AFOR	67
	(A(I),I=1,NQUAD), (C(I),I=NT,L2,NQUAD)	AFOR	68
	GO TO 1000	AFOR	69
500	NT = NTAPE(NM)	AFOR	70
	IF (NM .EQ. 1) WRITE (8) NQNN1,	AFOR	71
	(A(I), I = 1, NQNN1)	AFOR	72
	WRITE (NT) NQNN1,	AFOR	73
	(A(I), I = 1, NQNN1)	AFOR	74
1000	CONTINUE	AFOR	75
	REWIND 8	AFOR	76
	REWIND 9	AFOR	77
	REWIND 10	AFOR	78
	REWIND 13	AFOR	79
	WRITE(6, 9999)		
9999	FORMAT(1H0 , 5X, 13HLEAVING AFOR4)		
C	RETURN		
	END		

*DECK, SOLVT	SOLV	1
SUBROUTINE SOLVIT	SOLV	2
C SUBROUTINE SOLVIT (A, N[, MD, KD, NI, MM, NO, NW, *)	SOLV	3
COMMON/SOLVE/ NI,MM,NO,KD,MD	SOLV	4
COMMON HEOR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,ND,	SOLV	5
1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	SOLV	6
COMMON /SPACER/ A(14000)	SOLV	7
C	SOLV	8
C	SOLV	9
C	SOLV	10
C	SOLV	11
C	SOLV	12
C	SOLV	13
C	SOLV	14
C	SOLV	15
C	SOLV	16
C	SOLV	17
C	SOLV	18
C *****LANGUAGE	SOLV	19
C	SOLV	20
C	SOLV	21
C	SOLV	22
C *****FUNCTIONAL DESCRIPTION	SOLV	23
C	SOLV	24
C	SOLV	25
C	SOLV	26
C	SOLV	27
C	SOLV	28
C	SOLV	29
C	SOLV	30
C	SOLV	31
C	SOLV	32
C	SOLV	33
C	SOLV	34
C	SOLV	35
C	SOLV	36

DIRECT MATRIX SOLUTION
 WRITTEN BY J. L. HESS * PROGRAMMED BY T. M. RIDDELL
 *****LANGUAGE
 FORTRAN IV
 *****FUNCTIONAL DESCRIPTION
 THIS ROUTINE SOLVES THE REAL MATRIX EQUATION

$$\begin{array}{cccccc}
 \text{--} & \text{--} & \text{--} & \text{--} & \text{--} & \text{--} \\
 \text{I} & \text{A} & \text{I} & * & \text{I} & \text{B} & \text{I} & = & \text{I} & \text{C} & \text{I} \\
 \text{I} & & \text{I} & & \text{I} & & \text{I} & & \text{I} & & \text{I} \\
 \text{--} & \text{--} & \text{--} & \text{--} & \text{--} & \text{--} & \text{--} & & \text{--} & & \text{--}
 \end{array}$$

⁻¹
 FOR 'B' (B = A * C) . IF 'A' IS THE REAL COEFFICIENT MATRIX
 FOR A SET OF SIMULTANEOUS EQUATIONS AND 'C' IS THE MATRIX OF

C		SOLV	37
C	CONSTANTS (RIGHT-SIDES), THEN '3' WILL BE THE SOLUTIONS OF THE	SOLV	38
C		SOLV	39
C	SET OF SIMULTANEOUS EQUATIONS. NOTE THAT IF 'C' IS A UNIT MATRIX,	SOLV	40
C		SOLV	41
C	'B' WILL BE THE INVERSE OF 'A'.	SOLV	42
C		SOLV	43
C	*****CALL STATEMENT	SOLV	44
C		SOLV	45
C	CALL SOLVIT (AREA, N, M, KORE, NT1, NT2, NT3, NOUT, &NNN)	SOLV	46
C		SOLV	47
C	WHERE	SOLV	48
C		SOLV	49
C	'AREA' IS AN ARRAY (DIMENSIONED FOR AT LEAST 'KORE' WORDS)	SOLV	50
C	THAT IS USED BY 'SOLVIT' FOR SCRATCH PURPOSES.	SOLV	51
C	AFTER A NORMAL RETURN FROM 'SOLVIT', THIS ARRAY WILL	SOLV	52
C	CONTAIN THE 'B' MATRIX STORED IN COLUMNAR ORDER.	SOLV	53
C		SOLV	54
C	'N' IS THE ORDER OF THE 'A' MATRIX	SOLV	55
C		SOLV	56
C	'M' IS THE NUMBER OF COLUMNS IN 'B' AND 'C'	SOLV	57
C		SOLV	58
C	'KORE' IS THE DIMENSIONED SIZE OF 'AREA' IN WORDS	SOLV	59
C		SOLV	60
C	'NT1' IS THE LOGICAL FILE NUMBER OF THE INPUT DATA SET	SOLV	61
C	(THIS UNIT IS ALSO USED BY 'SOLVIT' AS A SCRATCH TAPE)	SOLV	62
C	SEE BELOW FOR THE DESCRIPTION OF THE INPUT FORMAT	SOLV	63
C		SOLV	64
C	'NT2' IS THE LOGICAL FILE NUMBER OF AN AVAILABLE SCRATCH UNIT	SOLV	65
C		SOLV	66
C	'NT3' IS THE LOGICAL FILE NUMBER OF AN AVAILABLE SCRATCH UNIT	SOLV	67
C	(NT1, NT2, AND NT3 MUST ALL HAVE DIFFERENT VALUES)	SOLV	68
C		SOLV	69
C	'NOUT' IS THE LOGICAL FILE NUMBER OF THE OUTPUT DATA SET	SOLV	70
C	THE 'B' MATRIX IS WRITTEN ON 'NOUT' IN COLUMNAR ORDER,	SOLV	71
C	ONE LOGICAL RECCRD PER COLUMN	SOLV	72
C	('NOUT' MAY EQUAL NT1, NT2, OR NT3)	SOLV	73
C		SOLV	74
C	'&NNN' IS THE FORTRAN STATEMENT NUMBER WHERE CONTROL IS TO BE	SOLV	75
C	TRANSFERRED IF 'SOLVIT' DETERMINES THAT THE VALUE OF	SOLV	76
C	'KORE' IS TOO SMALL TO ALLOW THE COMPUTATION TO CONTINUE	SOLV	77
C	(A FORTRAN VARIABLE RETURN)	SOLV	78
C		SOLV	79
C	*****OUTPUT	SOLV	80
C		SOLV	81
C	B = A ⁻¹ C WRITTEN IN COLUMNAR ORDER (ONE LOGICAL RECORD	SOLV	82
C	PER COLUMN) ON 'NOUT' AND STORED IN 'AREA'	SOLV	83
C		SOLV	84
C	*****STORAGE REQUIRED	SOLV	85
C		SOLV	86
C	F5E HEXADECIMAL BYTES	SOLV	87
C		SOLV	88
C	*****METHOD	SOLV	89
C		SOLV	90
C	GAUSSIAN ELIMINATION	SOLV	91
C	NOTE...THE ROWS ARE NOT VORMALIZED	SOLV	92
C	THE PIVCT IS ASSUMED TO BE THE DIAGONAL ELEMENT	SOLV	93
C		SOLV	94
C	*****GENERAL NOTES	SOLV	95
C		SOLV	96

C	- - CHECK TO SEE IF WE WERE UNLUCKY ENOUGH TO END UP WITH ONLY ONE ROW	SOLV 157
C		SOLV 158
	IF (K .EQ. 1) GO TO 90	SOLV 159
C		SOLV 160
C	- - 'K' IS GREATER THAN '1' SO WE CAN START THE TRIANGULARIZATION	SOLV 161
C		SOLV 162
	NELP1 = NEL + 1	SOLV 163
	NS = - NEL	SOLV 164
	NELP2 = NELP1 + 1	SOLV 165
C		SOLV 166
C	- - FORM THE 'TRAPEZOICAL' ARRAY (8)	SOLV 167
C		SOLV 168
	DO 50 IB = 2, K	SOLV 169
	NP = NELP2 - IB	SOLV 170
	NS = NS + NELP1	SOLV 171
	NT = NS	SOLV 172
	DO 50 IO = IB, K	SOLV 173
	NT = NT + NEL	SOLV 174
	MN = NT	SOLV 175
	NB = NS	SOLV 176
	A(NT) = (-A(NT)) / A(NS)	SOLV 177
	DO 50 NF = 2, NP	SOLV 178
	MN = MN + 1	SOLV 179
	NB = NB + 1	SOLV 180
	50 A(MN) = A(MN) + A(NT) * A(NB)	SOLV 181
	IF (LAST) GO TO 90	SOLV 182
C		SOLV 183
C	- - WRITE THE 'TRAPEZOICAL' MATRIX ON TAPE	SOLV 184
C		SOLV 185
	NT = 0	SOLV 186
	NP = NEL	SOLV 187
	NS = - NEL	SOLV 188
	DO 60 IO = 1, K	SOLV 189
	NS = NS + NELP1	SOLV 190
	NT = NT + NEL	SOLV 191
	WRITE (MT) NP, (A(IB), IB = NS, NT)	SOLV 192
	60 NP = NP - 1	SOLV 193
	NP = NP - M	SOLV 194
	NS = KORE - NEL + 1	SOLV 195
C		SOLV 196
C	- - READ ANOTHER ROW	SOLV 197
C		SOLV 198
	DO 80 IO = 1, NP	SOLV 199
	READ (NIN) (A(IB), IB = NS, KORE)	SOLV 200
C		SOLV 201
C	- - MODIFY THIS ROW BY THE 'TRAPEZOICAL' ARRAY	SOLV 202
C		SOLV 203
	NT = 1	SOLV 204
	MN = NS	SOLV 205
	DO 70 IB = 1, K	SOLV 206
	NB = NT	SOLV 207
	NF = MN + 1	SOLV 208
	A(MN) = (-A(MN)) / A(NT)	SOLV 209
	DO 65 NN = NF, KORE	SOLV 210
	NB = NB + 1	SOLV 211
	65 A(NN) = A(NN) + A(MN) * A(NB)	SOLV 212
	MN = NF	SOLV 213
	70 NT = NT + NELP1	SOLV 214
C		SOLV 215
C	- - WRITE THE MODIFIED ROW ON TAPE	SOLV 216

C	80 WRITE (NOUT) (A(NT), NT = MN, KORE)	SOLV 217
	REWIND NOUT	SOLV 218
	REWIND NIN	SOLV 219
C	- - SWITCH THE TAPES	SOLV 220
C	NT = NIN	SOLV 221
	NIN = NOUT	SOLV 222
	NOUT = NT	SOLV 223
C	- - RE-CALCULATE ROW LENGTH AND LOOP BACK	SOLV 224
C	NEL = NEL - K	SOLV 225
	NN = NEL - M	SOLV 226
	GO TO 10	SOLV 227
C	- - REWIND ALL TAPES	SOLV 228
C	90 REWIND MT	SOLV 229
	REWIND NIN	SOLV 230
	REWIND NOUT	SOLV 231
C	- - CONDENSE THE MATRIX	SOLV 232
C	NN = NEL	SOLV 233
	NL = NLP1	SOLV 234
	IF (K .EQ. 1) GO TO 105	SOLV 235
	NS = 1	SOLV 236
	NT = NEL	SOLV 237
	DO 100 IB = 2, K	SOLV 238
	NS = NS + NLP1	SOLV 239
	NT = NT + NEL	SOLV 240
	DO 100 IO = NS, NT	SOLV 241
	A(NL) = A(IO)	SOLV 242
	100 NL = NL + 1	SOLV 243
	105 N1 = KORE - K * M + 1	SOLV 244
C	- - THERE, NOW WE CAN START THE BACK-SOLUTION	SOLV 245
C	* * NOTE..THE FIRST AVAILABLE LOCATION FOR THE SOLUTIONS IS A(N1)	SOLV 246
C	NREM = N	SOLV 247
	NEL = NPM	SOLV 248
	LAST = K .EQ. N	SOLV 249
	NPASS = 0	SOLV 250
C	- - SOLVE FOR THE ANSWERS CORRESPONDING TO 'K' ROWS	SOLV 251
C	110 KM1 = K - 1	SOLV 252
	KP1 = K + 1	SOLV 253
	NS = NL - MP1	SOLV 254
	NPASS = NPASS + 1	SOLV 255
	DO 130 MN = 1, M	SOLV 256
	NF = NS + MN	SOLV 257
	A(NF) = A(NF) / A(NS)	SOLV 258
	NT = NS	SOLV 259
	IF (KM1 .EQ. 0) GO TO 130	SOLV 260
	DO 125 IB = 1, KM1	SOLV 261
	NF = NF - IB - M	SOLV 262
	NT = NT - MP1 - IB	SOLV 263
		SOLV 264
		SOLV 265
		SOLV 266
		SOLV 267
		SOLV 268
		SOLV 269
		SOLV 270
		SOLV 271
		SOLV 272
		SOLV 273
		SOLV 274
		SOLV 275
		SOLV 276

SUM = 0.0	SOLV 277
NP = NF	SOLV 278
N2 = MP1 + IB	SOLV 279
DO 120 IO = 1, IB	SOLV 280
NN = NT + IO	SOLV 281
NP = NP + N2 - IO	SOLV 282
120 SUM = SUM + A(NN) * A(NP)	SOLV 283
125 A(NF) = (A(NF) - SUM) / A(NT)	SOLV 284
130 CONTINUE	SOLV 285
C	SOLV 286
C - - MOVE THE SOLUTIONS TO CONTIGUOUS LOCATIONS STARTING AT A(N1)	SOLV 287
C	SOLV 288
N1 = KORE + 1	SOLV 289
DO 140 NN = 1, K	SOLV 290
DO 135 MN = 1, M	SOLV 291
NL = NL - 1	SOLV 292
N1 = N1 - 1	SOLV 293
135 A(N1) = A(NL)	SOLV 294
140 NL = NL - NP	SOLV 295
C	SOLV 296
C - - WRITE THE SOLUTIONS ON TAPE	SOLV 297
C	SOLV 298
WRITE (NIN) K	SOLV 299
NS = N1 - 1	SOLV 300
DO 145 MN = 1, M	SOLV 301
NT = NS + MN	SOLV 302
145 WRITE (NIN) (A(I), IO = NT, KORE, M)	SOLV 303
C	SOLV 304
C - - TEST IF THIS IS THE LAST PASS	SOLV 305
C	SOLV 306
IF (LAST) GO TO 200	SOLV 307
C	SOLV 308
C - - WE MUST NOW MODIFY THE TRIANGULAR MATRIX TO REFLECT THE EFFECT OF	SOLV 309
C THE SOLUTIONS OBTAINED SO FAR (EQ 21)	SOLV 310
C * * NOTE..LOCATIONS A(1) TO A(N1-1) ARE NOW FREE TO USE	SOLV 311
C	SOLV 312
C - - CALCULATE THE NEXT VALUES OF 'NEL' AND 'NREM'	SOLV 313
C	SOLV 314
NELOLD = NEL	SOLV 315
KOLD = K	SOLV 316
NEL = NEL - K	SOLV 317
NREM = NREM - K	SOLV 318
C	SOLV 319
C - - NOW APPLY THE INCREDIBLE FORMULA FOR THE NEW 'K'	SOLV 320
C	SOLV 321
K = (-4 * M - 1) / 2 + IFIX(SQRT(.25 + FLOAT((4 * M + 2) * M +	SOLV 322
1 2 * (KORE - NELOLD)))	SOLV 323
NROW = NREM - K + 1	SOLV 324
IF (K .LT. NREM) GO TO 150	SOLV 325
LAST = .TRUE.	SOLV 326
NROW = 1	SOLV 327
K = NREM	SOLV 328
150 NS = 1	SOLV 329
NT = NELOLD + 1	SOLV 330
C	SOLV 331
C - - READ IN THE ROWS TO BE MODIFIED	SOLV 332
C	SOLV 333
DO 190 IB = 1, NREM	SOLV 334
NT = NT - 1	SOLV 335
IF (IB .LE. NROW) GO TO 160	SOLV 336

	NS = NS + NN	SOLV 337
	NT = NT + NN	SOLV 338
160	READ (MT) NN, (A(IC), IO = NS, NT)	SOLV 339
	NP = N1 - 1	SOLV 340
	NF = NT - M - KM1	SOLV 341
	NN = NN - KOLD	SOLV 342
	DO 170 MN = 1, M	SOLV 343
	N2 = NF	SOLV 344
	NA = NP + MN	SOLV 345
	NB = NA	SOLV 346
	SUM = 0.0	SOLV 347
	DO 165 IO = 1, KOLC	SOLV 348
	SUM = SUM + A(N2) * A(NA)	SOLV 349
	N2 = N2 + 1	SOLV 350
165	NA = NA + M	SOLV 351
	N2 = N2 + MN - 1	SOLV 352
170	A(N2) = A(N2) - SUM	SOLV 353
C		SOLV 354
C	- - WRITE THE MODIFIED ROW ON TAPE OR CONDENSE THE ROW	SOLV 355
C		SOLV 356
	NL = NT - M + 1	SOLV 357
	IF (IB .GE. NROW) GO TO 175	SOLV 358
	NF = NL - KP1	SOLV 359
	WRITE (NOUT) NN, (A(IO), IO = NS, NF), (A(IO), IO = NL, NT)	SOLV 360
	GO TO 190	SOLV 361
175	NF = NL - KOLD	SOLV 362
	DO 180 MN = NL, NT	SOLV 363
	A(NF) = A(MN)	SOLV 364
180	NF = NF + 1	SOLV 365
190	CONTINUE	SOLV 366
	REWIND MT	SOLV 367
	REWIND NOUT	SOLV 368
C		SOLV 369
C	- - SWITCH THE TAPES	SOLV 370
C		SOLV 371
	NT = MT	SOLV 372
	MT = NOUT	SOLV 373
	NOUT = NT	SOLV 374
C		SOLV 375
C	- - LOOP BACK THRU THE SOLUTION	SOLV 376
C		SOLV 377
	NL = NF	SOLV 378
	GO TO 110	SOLV 379
C		SOLV 380
C	- - START TO WRAP IT UP	SOLV 381
C		SOLV 382
200	REWIND NIN	SOLV 383
	N2 = N	SOLV 384
C		SOLV 385
C	* * NOTE.. AT THIS POINT ALL LOCATIONS A(1) THRU A(KORE) ARE FREE	SOLV 386
C		SOLV 387
	DO 220 IB = 1, NPASS	SOLV 388
	READ (NIN) K	SOLV 389
	N1 = N2 - K + 1	SOLV 390
	NS = N1	SOLV 391
	NT = N2	SOLV 392
C		SOLV 393
C	- - READ IN THE SOLUTIONS	SOLV 394
C		SOLV 395
	DO 210 IO = 1, M	SOLV 396

	READ (NIN) (A(NN), NN = NS, NT)	SOLV 397
	NT = NT + N	SOLV 398
210	NS = NS + N	SOLV 399
220	N2 = N1 - 1	SOLV 400
C		SOLV 401
C	- - WRITE THE SOLUTIONS ON TAPE	SOLV 402
C		SOLV 403
	NT = 0	SOLV 404
	DO 230 IO = 1, M	SOLV 405
	NS = NT + 1	SOLV 406
	NT = NT + N	SOLV 407
230	WRITE (NW) (A(NN), NN = NS, NT)	SOLV 408
C		SOLV 409
	WRITE (6, 300) N, N, M	SOLV 410
300	FORMAT (4H0THE,I5, 2H X,I5, 12H MATRIX WITH,I4, 33H RIGHT SIDES WA 1S SOLVED DIRECTLY.)	SOLV 411
C	RETURN	SOLV 412
	END	SOLV 413
		SOLV 414

*DECK, SIGMA		SIGM 1
	SUBROUTINE SIGMA	SIGM 2
C	SUBROUTINE SIGMA (NSKIP)	SIGM 3
	COMMON /SIG/ NSKIP	SIGM 4
	DIMENSION L(100), C(6000), DSIG1(100)	SIGM 5
	DIMENSION A(1000)	SIGM 6
	DIMENSION SIG(6000)	SIGM 7
	COMMON HEDR(15), MPR, MER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,	SIGM 8
	1 KASE, NOFF, NSYM, IFLAG, I FLOW, NCODE	SIGM 9
	COMMON / ATAPE / NCOPY	SIGM 10
	NT = NCOPY + 8	SIGM 11
	NTAPE = NCOPY	SIGM 12
	IF (ISIG .NE. 0) GO TO 1	SIGM 13
	M = 2	SIGM 14
	GO TO 2	SIGM 15
1	M = 3	SIGM 16
2	IF (NSKIP .EQ. 0) GO TO 11	SIGM 17
	N = M * NSKIP	SIGM 18
	DO 3 K = 1, N	SIGM 19
3	READ(3)	SIGM 20
11	N1 = 1	SIGM 21
	N2 = NQUAD	SIGM 22
	DO 5 I = 1, NCFLG	SIGM 23
	READ (3)	SIGM 24
	READ(3) (C(K), K = N1, N2)	SIGM 25
	IF(ISIG .NE. 0) READ (3) (SIG(K), K = N1, N2)	SIGM 26
	N1 = N2 +1	SIGM 27
5	N2 = N2 + NQUAD	SIGM 28
	N = (NFLOW - NSKIP - NCFLG) * M + NSKIP	SIGM 29
	IF (N .EQ. 0) GO TO 67	SIGM 30
	DO 66 K = 1, N	SIGM 31
66	READ (3)	SIGM 32
67	ITER = 0	SIGM 33
	NCONV = 0	SIGM 34
	DO 12 J = 1, NCFLG	SIGM 35
	L(J) = 0	SIGM 36
	JN = NQUAD * (J - 1)	SIGM 37

DO 12 I = 1, NQUAD	SIGM	38
K1 = I + JN	SIGM	39
12 IF(ISIG .EQ. 0) SIG(K1) = 0.0	SIGM	40
20 DO 22 I = 1, NCFLG	SIGM	41
22 DSIG1 (I) = 0.0	SIGM	42
DO 80 I= 1, NQUAD	SIGM	43
READ (NTAPE) NQ, (A(J), J = 1, NQUAD)	SIGM	44
DO 80 J = 1, NCFLG	SIGM	45
IF(L(J) .NE. 0) GO TO 80	SIGM	46
SUM = 0.0	SIGM	47
JN = NQUAD * (J - 1)	SIGM	48
DO 60 K = 1, NQUAD	SIGM	49
K2 = K + JN	SIGM	50
60 SUM = SUM + A(K) * SIG(K2)	SIGM	51
K1 = I + JN	SIGM	52
DSIG2 = (-C(K1) - SUM) / A(I)	SIGM	53
SIG(K1) = SIG(K1) + DSIG2	SIGM	54
DSIG1(J) = AMAX1(ABS(DSIG2), DSIG1(J))	SIGM	55
80 CONTINUE	SIGM	56
ITER = ITER + 1	SIGM	57
REWIND NTAPE	SIGM	58
IF(IPRS .EQ. 0) GO TO 85	SIGM	59
WRITE(6,9998) ITER	SIGM	60
9998 FORMAT(1H , 5X, 17H ITERATION NOS. , I3)	SIGM	61
DO 82 K = 1, NCFLG	SIGM	62
K1 = NQUAD * (K-1) + 1	SIGM	63
K2 = K1 + NQUAD	SIGM	64
82 WRITE(6, 10) K , (SIG(I), I = K1, K2)	SIGM	65
10 FORMAT (1H , 5X, 12H FLCW NUMBER , I4 / (5X, 6F15.8)	SIGM	66
85 DO 400 J = 1 , NCFLG	SIGM	67
IF(L(J) .NE. 0) GO TO 400	SIGM	68
IF(DSIG1(J) .GE. 1.0E-4) GO TO 400	SIGM	69
L (J) = ITER	SIGM	70
NCONV = NCONV + 1	SIGM	71
IF (NCONV .EQ. NCFLG) GO TO 500	SIGM	72
400 CONTINUE	SIGM	73
NTAPE = NT - NTAPE	SIGM	74
IF (ITER - 100) 20, 500, 20	SIGM	75
500 DO 650 J = 1, NCFLG	SIGM	76
IF (L (J) .EQ. 0) GO TO 550	SIGM	77
WRITE (6, 6) L (J)	SIGM	78
6 FORMAT (1H0, 5X, I5, 2X, 35HITERATIONS REQUIRED FOR CONVERGENCE)	SIGM	79
GO TO 650	SIGM	80
550 WRITE (6, 7)	SIGM	81
7 FORMAT (1H0, 8X, 35HNO CONVERGENCE AFTER 100 ITERATIONS)	SIGM	82
K1 = NQUAD * (J-1) + 1	SIGM	83
K2 = K1 + NQUAD	SIGM	84
WRITE(6,8) (SIG(I), I = K1,K2)	SIGM	85
8 FORMAT(1H , 5X, 8F12.7)	SIGM	86
650 CONTINUE	SIGM	87
NN = NQUAD	SIGM	88
M = MOD(NN, 255)	SIGM	89
IF (M .LT. 5 .AND. M .GT. 0) NN = NN + 5	SIGM	90
N1 = 1	SIGM	91
DO 675 J = 1, NCFLG	SIGM	92
WRITE (3) (SIG(K), K = N1, NN)	SIGM	93
N1 = N1 + NQUAD	SIGM	94
675 NN = NN + NQUAD	SIGM	95
REWIND 3	SIGM	96
WRITE(6, 9999)	SIGM	97

C RETURN
ENDSIGM 98
SIGM 99
SIGM 100

*DECK, ATAPS	ATAP	1
SUBROUTINE ATAPES	ATAP	2
C SUBROUTINE ATAPES (KFLOW)	ATAP	3
COMMON /TAPES/ KFLOW	ATAP	4
C- - -DEFINITION OF ARGUMENTS	ATAP	5
	ATAP	6
C NQ NUMBER OF VALUES OF 'A' PER RECORD	ATAP	7
C KFLOW FLOW-FLAG, 1 = A-FLOW, 2 = B-FLCW, 3 = C-FLCW	ATAP	8
C NCOPY TAPE NUMBER TO BE USED BY 'ROWA'	ATAP	9
	ATAP	10
COMMON HEDR(15), MPR, NER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD ,	ATAP	11
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE	ATAP	12
COMMON / ATAPE / NCOPY	ATAP	13
DIMENSION A(1000), NLINE(500), NLT(500), XNULL(1000), YNULL(1000),	ATAP	14
1 ZNULL(1000), XNORM(1000), YNORM(1000), ZNORM(1000), XOFF(1000),	ATAP	15
2 YOFF(1000), ZOFF(1000)	ATAP	16
IF (KFLOW - 2) 100, 200, 300	ATAP	17
100 NCOPY = 9	ATAP	18
GO TO 1000	ATAP	19
200 NCOPY = 10	ATAP	20
GO TO 400	ATAP	21
300 NCOPY = 13	ATAP	22
	ATAP	23
C- - -START OF LOOP	ATAP	24
	ATAP	25
400 DO 900 N = 1, NQUAD	ATAP	26
NTRY = 0	ATAP	27
500 CKSUM = 0.0	ATAP	28
	ATAP	29
C- - -READ THE 'A' MATRIX FROM THE APPROPRIATE TAPE	ATAP	30
	ATAP	31
READ (NCOPY) NQ, (A(I), I = 1, NQ)	ATAP	32
	ATAP	33
900 WRITE (8) NQ, (A(I), I = 1, NQ)	ATAP	34
GO TO 1400	ATAP	35
C- - -THE PURPOSE OF THE FOLLOWING 'MICKEY MOUSE' IS TO RE-POSITION THE	ATAP	36
C CONTROL TABLES, NULL POINTS, AND UNIT NORMALS AT THE BEGINNING OF	ATAP	37
C THE TAPE. THIS ELIMINATES SKIPPING THE '28 QUANTITIES' EACH TIME.	ATAP	38
1000 READ (4) KLCT, (NLINE(J), NLT(J), J = 1, KLCT)	ATAP	39
READ (4) (XNULL(J), YNULL(J), ZNULL(J), XNORM(J), YNORM(J), ZNORM(J),	ATAP	40
1 J = 1, NQUAD)	ATAP	41
IF (NOFF .GT. 0) READ (4) (XOFF(J), YOFF(J), ZOFF(J), J=1, NCFE)	ATAP	42
REWIND 4	ATAP	43
WRITE (4) KLCT, (NLINE(J), NLT(J), J = 1, KLCT)	ATAP	44
DO 1100 J = 1, NQUAD	ATAP	45
1100 WRITE (4) XNULL(J), YNULL(J), ZNULL(J), XNORM(J), YNORM(J), ZNORM(J)	ATAP	46
IF (NOFF .EQ. 0) GO TO 1300	ATAP	47
DO 1200 J = 1, NOFF	ATAP	48
1200 WRITE (4) XOFF(J), YOFF(J), ZOFF(J), XOFF(J), YOFF(J), ZOFF(J)	ATAP	49
1300 REWIND 4	ATAP	50
1400 REWIND 8	ATAP	51
	ATAP	52

```

REWIND NCOPY
WRITE (6, 1500)
1500 FORMAT (1H0, 5X, 14HLEAVING ATAPES)
C RETURN
END

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ATAP 53
ATAP 54
ATAP 55
ATAP 56
ATAP 57

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*DECK, PRINT
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SUBROUTINE PRINT1
C SUBROUTINE PRINT1( NSKIP, MN, KMAT, NSEQ)
COMMON /PRINT0/ KMAT, NSEQ, KTP14
COMMON /TAPES/ MN
COMMON /SIG/ NSKIP
COMMON HEDR(15), MPR, MER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE
REAL NX, NY, NZ, MACH
LOGICAL PUNCHV
COMMON /M/ MACH, BETA, RBETA
DIMENSION FLOWID(3),
1 VX(2000), VY(2000), VZ(2000),
4 NST(500), NCL(500)
DIMENSION SIG(1000), XIJ(1000), YIJ(1000), ZIJ(1000)
DATA FLOWID / 2HX-, 2HY-, 2HZ- /, PROG / 4HBOXC /
PUNCHV = .FALSE.
NTIME = NQUAD + NOFF
LCMAX = 12
C READ IN IDENTIFYING INTEGERS
C
READ(4) INSECT, ( NS1(J), NCL(J), J = 1, INSECT)
DO 2000 L = 1, NCFLG
IF( ISIG .NE. 0) GO TO 1
M = 2
GO TO 2
1 M = 3
2 N = M * (NSKIP + L - 1)
IF (N .EQ. 0) GO TO 4
DO 3 J = 1, N
3 READ (3)
4 READ ( 3) KFLOW, (VX(IJ), VY(IJ), VZ(IJ), IJ = 1, NTIME )
IF ( KFLOW .EQ. KMAT ) GO TO 9
CALL HEADER
WRITE (6, 8) KFLOW, KMAT
8 FORMAT ( 1H0, 6X, 48HAN APPARENT FLOW MIS-MATCH HAS OCCURRED. KFLOW
1=, I2, 7H KMAT =, I2 )
CALL EXIT
9 N = (NFLOW - NSKIP - L + 1) * M + NSKIP + L - 2
DO 5 J = 1, N
5 READ (3)
READ (3) (SIG(J), J = 1, NQUAD)
REWIND 3
IF(KTP14 .EQ. 1) WRITE(14) (SIG(J), J=1,NQUAD)
IF(KTP14 .EQ. 1) ENDFILE 14
REWIND 14
IF (MN .EQ. 1) GO TO 15
NRSKIP = MN - 1
DO 10 JM = 1, NRSKIP
READ (1)

```

```

PRIN 1
PRIN 2
PRIN 3
PRIN 4
PRIN 5
PRIN 6
PRIN 7
PRIN 8
PRIN 9
PRIN 10
PRIN 11
PRIN 12
PRIN 13
PRIN 14
PRIN 15
PRIN 16
PRIN 17
PRIN 18
PRIN 19
PRIN 20
PRIN 21
PRIN 22
PRIN 23
PRIN 24
PRIN 25
PRIN 26
PRIN 27
PRIN 28
PRIN 29
PRIN 30
PRIN 31
PRIN 32
PRIN 33
PRIN 34
PRIN 35
PRIN 36
PRIN 37
PRIN 38
PRIN 39
PRIN 40
PRIN 41
PRIN 42
PRIN 43
PRIN 44
PRIN 45
PRIN 46
PRIN 47
PRIN 48
PRIN 49
PRIN 50

```

	READ (11)	PRIN	51
10	READ (12)	PRIN	52
15	LC = LCMAX	PRIN	53
	INSECT = 1	PRIN	54
	M = 0	PRIN	55
	IF (L .GT. 1) READ (4)	PRIN	56
	DO 1000 IS = 1, NTIME	PRIN	57
	READ(4) XN, YN, ZN, NX, NY, NZ	PRIN	58
	IF (MACH .EQ. 0.0) GO TO 17	PRIN	59
	CORR = 1.0 / SQRT(NX * NX + BETA * BETA * (NY * NY + NZ * NZ))	PRIN	60
	NX = NX * CORR	PRIN	61
	NY = NY * BETA * CCRR	PRIN	62
	NZ = NZ * BETA * CORR	PRIN	63
	XN = XN * BETA	PRIN	64
17	VIX = 0.0	PRIN	65
	VIY = 0.0	PRIN	66
	VIZ = 0.0	PRIN	67
	CALL ROWV(XIJ, YIJ, ZIJ, IS, 1)	PRIN	68
	DO 20 I1 = 1, NQUAD	PRIN	69
C		PRIN	70
C	VELOCITY COMPONENTS EQ. (135) OR EQ. (140)	PRIN	71
C		PRIN	72
	VIX = VIX + XIJ(I1) * SIG(I1)	PRIN	73
	VIY = VIY + YIJ(I1) * SIG(I1)	PRIN	74
20	VIZ = VIZ + ZIJ(I1) * SIG(I1)	PRIN	75
	VIX = VIX * RBETA + RBETA * VX(IS)	PRIN	76
	VIY = VIY * RBETA + VY(IS)	PRIN	77
	VIZ = VIZ * RBETA + VZ(IS)	PRIN	78
C	IF (PUNCHV) GO TO 26	PRIN	79
	IF (IS .EQ. NQUAD .OR. IS .EQ. NTIME) GO TO 22	PRIN	80
	VIXT = VIX	PRIN	81
	VIYT = VIY	PRIN	82
	VIZT = VIZ	PRIN	83
C	PUNCHV = .TRUE.	PRIN	84
	GO TO 30	PRIN	85
22	NSEQ = NSEQ + 1	PRIN	86
	IF(PUNCHV)	PRIN	87
	1WRITE (7, 24) VIX, VIY, VIZ, KASE, PROG, NSEQ	PRIN	88
24	FORMAT (3F10.7, 36X,A4, 2X,A4, I4)	PRIN	89
	GO TO 28	PRIN	90
26	NSEQ = NSEQ + 1	PRIN	91
	WRITE (7, 27) VIXT, VIYT, VIZT, VIX, VIY, VIZ, KASE, PROG, NSEQ	PRIN	92
27	FORMAT (6F10.7, 6X,A4, 2X,A4, I4)	PRIN	93
28	PUNCHV = .FALSE.	PRIN	94
C	TOTAL VELOCITY MAGNITUDE EQ. (136)	PRIN	95
C		PRIN	96
30	VTSQ = VIX * VIX + VIY * VIY + VIZ * VIZ	PRIN	97
	VT = SQRT (VTSQ)	PRIN	98
C		PRIN	99
C	PRESSURE COEFFICIENT EQ. (137)	PRIN	100
C		PRIN	101
	CPI = 1.0 - VTSQ	PRIN	102
C		PRIN	103
C	DIRECTION COSINES OF THE TOTAL VELOCITY VECTOR EQ. (138)	PRIN	104
	GIX = VIX / VT	PRIN	105
	GIY = VIY / VT	PRIN	106
	GIZ = VIZ / VT	PRIN	107
	LC = LC + 1	PRIN	108
	IF (IS .GT. NQUAD) GO TO 50	PRIN	109
C	TOTAL NORMAL VELOCITY EQ. (139)	PRIN	110

C-3

C	VNI = VIX * NX + VIY * NY + VIZ * NZ	PRIN 111
	N = NST (INSECT)	PRIN 112
	MMAX = IABS (NCL (INSECT))	PRIN 113
	M = M + 1	PRIN 114
	IF(LC .LT. LCMAX) IF (M - 1) 40, 35, 40	PRIN 115
	WRITE (6, 3000)	PRIN 116
3000	FORMAT (1H0, 4X,1H.,84X,1H.)	PRIN 117
	CALL HEADER	PRIN 118
	LC = 0	PRIN 119
	WRITE (6, 4030) FLOWID(KFLOW)	PRIN 120
4030	FORMAT (1H0, 45X, A2, 4HFLOW)	PRIN 121
	WRITE(6,4000)	PRIN 122
35	WRITE(6, 4005) N, M, XN, VT, VIX, GIX, NX, VNI	PRIN 123
	GO TO 45	PRIN 124
4015	FORMAT(1H0, 3(17X , 2(6H*****)))	PRIN 125
4000	FORMAT(1H0, 6X ,5HN M,8X, 3HNPX,10X, 2HVT , 12X, 2HVX , 10X ,	PRIN 126
	1 3HDCX, 11X, 2HNX ,10X, 2HVN /	PRIN 127
	21H ,19X, 3HNPY , 9X, 4HVTSQ ,11X, 2HVV ,10X, 3HDCY,11X, 2HNY,10X,	PRIN 128
	33HSIG/	PRIN 129
	41H ,19X, 3HNPZ ,10X, 4HCF , 10X, 2HVZ ,10X, 3HDCZ,11X, 2HNZ	PRIN 130
4005	FORMAT(1H0,3X, 2I4 , 6F13.6)	PRIN 131
4010	FORMAT(1H0,7X, I4 , 6F13.6)	PRIN 132
4020	FORMAT(1H , 11X, 6F13.6)	PRIN 133
40	WRITE(6,4010) M, XN, VT, VIX, GIX, NX, VNI	PRIN 134
45	WRITE(6, 4020) YN, VTSQ, VIY, GIY, NY, SIG(IS), ZN,	PRIN 135
	1 CPI , VIZ, GIZ, NZ	PRIN 136
	IF(M .LT. MMAX) GO TO 1000	PRIN 137
	IF (NCL(INSECT) .GT. 0) GO TO 48	PRIN 138
	WRITE (6, 4015)	PRIN 139
	LC = LC + 1	PRIN 140
48	M = 0	PRIN 141
	INSECT = INSECT + 1	PRIN 142
	GO TO 1000	PRIN 143
50	IF (LC .LT. LCMAX .AND. IS .NE. (NQUAD + 1)) GO TO 60	PRIN 144
	WRITE (6, 3000)	PRIN 145
	CALL HEADER	PRIN 146
	LC = 0	PRIN 147
	WRITE (6, 4030) FLOWID(KFLOW)	PRIN 148
	WRITE (6, 55)	PRIN 149
55	FORMAT (1H0,6X,5HPCINT,13X,2HX ,19X,2HVT,18X,2HVX,17X,3HDCX, /,	PRIN 150
	125X,2HY ,17),4HVTSQ,17X,2HVV,17X,3HDCY, /,	PRIN 151
	225X,2HZ ,18X,2HCP,18X,2HVZ,17X,3HDCZ, //)	PRIN 152
C		PRIN 153
C	WRITE THE OFF-BODY ANSWERS	PRIN 154
C		PRIN 155
60	N = IS - NQUAD	PRIN 156
	WRITE (6,65) N,XN,VT,VIX,GIX,YN,VTSQ,VIY,GIY,ZN,CPI,VIZ,GIZ	PRIN 157
65	FORMAT (1H0, I9, 4F20.6, / (10X, 4F20.6))	PRIN 158
C		PRIN 159
1000	CONTINUE	PRIN 160
	REWIND 4	PRIN 161
	IF (NOFF .GT. 0) WRITE (6, 4015)	PRIN 162
2000	CONTINUE	PRIN 163
	WRITE(6, 9999)	PRIN 164
9999	FORMAT(1H1 , 5X, 14HLEAVING PRINT1)	PRIN 165
C	RETURN	PRIN 166
	END	PRIN 167
		PRIN 168

*DECK, WTAP14	WTAP	1
SUBROUTINE WTAP14	WTAP	2
C	WTAP	3
C	WTAP	4
C	WTAP	5
C	WTAP	6
COMMON HEDR(15),MPF,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,	WTAP	7
1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	WTAP	8
COMMON /SPACER/ DUMMY (14000)	WTAP	9
REAL IXX,IXY,IYY,MACH	WTAP	10
COMMON /M/ MACH, BETA, RBETA	WTAP	11
DIMENSION	WTAP	12
D41(1000), XC(1000),YC(1000),ZC(1000),	WTAP	12
1 A11(1000),A12 (1000),A13 (1000),A21(1000),A22(1000),A23(1000),	WTAP	13
2 A31(1000),A32 (1000),A33 (1000),XI1(1000),XI2(1000),XI3(1000),	WTAP	14
3 XI4(1000),ETA1(1000),ETA2(1000),ETA4(1000),TSQ(1000),A(1000),	WTAP	15
4 IXX(1000),IXY (1000),IYY (1000),D12 (1000),D23(1000),D34(1000)	WTAP	16
EQUIVALENCE (DUMMY(1), D41), (DUMMY(1001), XC), (DUMMY(2001), YC),	WTAP	17
1 (DUMMY(3001), ZC), (DUMMY(4001), A11), (DUMMY(5001), A12),	WTAP	18
2 (DUMMY(6001), A13), (DUMMY(7001), A21), (DUMMY(8001), A22),	WTAP	19
3 (DUMMY(9001), A23), (DUMMY(10001), A31), (DUMMY(11001), A32),	WTAP	20
4 (DUMMY(12001), A33), (DUMMY(13001), XI1)	WTAP	21
C	WTAP	22
REWIND 14	WTAP	23
WRITE(14) KASE,NSYM,NQUAD,RBETA, MACH	WTAP	24
DO 100 J=1,NQUAD	WTAP	25
100 READ (4) XC(J), YC (J), ZC(J), A11(J), A12(J), A13(J), A21(J),	WTAP	26
1 A22(J), A23(J), A31(J), A32(J), A33(J), XI1(J),ETA1(J),XI2(	WTAP	27
2 J), ETA2(J), XI3(J), XI4(J), ETA4(J), TSQ(J), A (J), IXX (J),	WTAP	28
3 IXY (J), IYY(J), D12(J), D23(J), D34(J), D41(J)	WTAP	29
WRITE(14)(XC(J),YC (J), ZC(J), A11(J), A12(J), A13(J), A21(J),	WTAP	30
1 A22(J), A23(J), A31(J), A32(J), A33(J), XI1(J),ETA1(J),XI2(	WTAP	31
2 J), ETA2(J), XI3(J), XI4(J), ETA4(J), TSQ(J), A (J), IXX (J),	WTAP	32
3 IXY (J), IYY(J), D12(J), D23(J), D34(J), D41(J) ,J=1,NQUAD)	WTAP	33
REWIND 4	WTAP	34
END	WTAP	35

PROGRAM FLOPNT(INPUT, TAPE6, TAPE5=INPUT, TAPE14, OUTPUT)

H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979

CALLS FLOVEL TO COMPUTE AND PRINT FLOW VELOCITIES AT SPECIFIED POINTS IN SPACE. INPUT INTEGERS M(3) SPECIFY THE ORDER IN WHICH INCREMENTING IS DONE - ALLOWED VALUES OF M ARE 1,2,3. FOR EXAMPLE SUPPOSE M(1)=2, M(2)=1, M(3)=3, THEN Y IS INCREMENTED FIRST, X IS INCREMENTED SECOND AND Z IS INCREMENTED LAST. OTHER INPUT DATA ARE (IN ORDER OF X AXIS FIRST, Y AXIS SECOND, Z AXIS THIRD)- INITIAL COORDINATE, INCREMENT, NUMBER OF INCREMENTS DESIRED (INCLUDING THE INITIAL COORDINATE VALUE).

NOTE - POINTS THAT ARE INSIDE THE BODY ARE MARKED WITH AN ASTERIX IN THE PRINTOUT.

DIMENSION HOLL(18), X(3), D(3), N(3), M(3), SX(3), SD(3), NS(3), SXI(3), SEQ(6)

DATA SEQ/ 4HFIRS, 4HT , 4HSECO, 4HND , 4HTHIR, 4HD /
DATA STAF, BLNK / 3H *, 3H /

READ(5, 2600) KASE

CALL SETFLO(KASE)

READ(5, 1300) HOLL

WRITE(6, 1400) HOLL

READ(5,1100)M

IF(IABS(M(1))+IABS(M(2))+IABS(M(3)).EQ. 0) STOP

IF(M(1)+M(2)+M(3) .EQ. 6) GO TO 10

WRITE(6,1200)

STOP

DO 20 L=1,3

READ(5,1000) X(L), D(L), N(L)

WRITE(6, 1700)

WRITE(6,2000) X(1), D(1), N(1)

WRITE(6,3000) X(2), D(2), N(2)

WRITE(6,4000) X(3), D(3), N(3)

WRITE(6,9000)

WRITE(6,5000) SEQ(2*M(1)-1), SEQ(2*M(1))

WRITE(6,6000) SEQ(2*M(2)-1), SEQ(2*M(2))

WRITE(6,7000) SEQ(2*M(3)-1), SEQ(2*M(3))

WRITE(6, 1600)

DO 40 L=1,3

L=4-M(L)

D(LL)=D(L)

XI(LL)=X(L)-D(L)

IS(LL)=N(L)

I=NS(1)

J=NS(2)

K=NS(3)

X(1)=SXI(1)

DO 500 I=1,N1

X(1)=SX(1)+SD(1)

X(2)=SXI(2)

DO 500 J=1,N2

WRITE(6,1900)

X(2)=SX(2)+SD(2)

X(3)=SXI(3)

DO 500 K=1,N3

FLCPT 2

FLCPT 3

FLOPT 4

FLOPT 5

FLCPT 6

FLOPT 7

FLCPT 8

FLCPT 9

FLOPT 10

FLCPT 11

FLOPT 12

FLOPT 13

FLOPT 14

FLCPT 15

FLCPT 16

FLOPT 17

FLOPT 18

FLOPT 19

FLOPT 20

FLOPT 21

FLOPT 22

FLOPT 23

FLCPT 24

FLCPT 25

FLOPT 26

FLOPT 27

FLOPT 28

FLCPT 29

FLOPT 30

FLOPT 31

FLOPT 32

FLOPT 33

FLOPT 34

FLOPT 35

FLCPT 36

FLCPT 37

FLOPT 38

FLOPT 39

FLOPT 40

FLOPT 41

FLOPT 42

FLOPT 43

FLCPT 44

FLOPT 45

FLOPT 46

FLOPT 47

FLCPT 48

FLOPT 49

FLOPT 50

FLOPT 51

FLOPT 52

FLOPT 53

FLCPT 54

FLCPT 55

FLOPT 56

FLOPT 57

```

SX(3)=SX(3)+SD(3)
DO 50 L=1,3
LL=4-M(L)
50 X(L)=SX(LL)
CALL FLOVEL( X(1), X(2), X(3), VX, VY, VZ, 0.10, INBDY)
V = SQRT( VX**2 + VY**2 + VZ**2 )
IF( INBDY ) 100, 200, 100
100 WRITE(6,1500) X(1), X(2), X(3), VX, VY, VZ, V, STAR
GO TO 500
200 WRITE(6,1500) X(1), X(2), X(3), VX, VY, VZ, V, BLNK
500 CONTINUE
WRITE( 6, 1600 )
GO TO 5
1000 FORMAT( 2E10.0,I4)
1100 FORMAT(3I2)
1200 FORMAT(///10X, 47HINCREMENTING SEQUENCE IS ERRCNIOUS. TRY AGAIN.)
1300 FORMAT( 18A4)
1400 FORMAT( 1H1, 9X, 15HFLOPNT RUN ID -/ 15X, 18A4//)
1500 FORMAT( 3X, 3F12.7, 2X, 4(1PE13.4),A3)
1600 FORMAT(1H0,20X,40H* INDICATES THE POINT IS INSIDE THE BODY)
1700 FORMAT( 1H0, 5X, 12HINPJT DATA -/)
1900 FORMAT( // 10X, 1HX, 11X, 1HY, 11X, 1HZ, 13X, 2HVX, 11X, 2HVV,
1 11X, 2HVZ, 11X, 1HV)
2600 FORMAT( A4)
2000 FORMAT( 10X, 10HINITIAL X=1PE11.4, 12H INCREMENT=1PE11.4,
1 19H NUMBER OF VALUES=I4)
3000 FORMAT( 10X, 10HINITIAL Y=1PE11.4, 12H INCREMENT=1PE11.4,
1 19H NUMBER OF VALUES=I4)
4000 FORMAT( 10X, 10HINITIAL Z=1PE11.4, 12H INCREMENT=1PE11.4,
1 19H NUMBER OF VALUES=I4)
5000 FORMAT( 10X, 22HX AXIS IS INCREMENTED 2A4)
6000 FORMAT( 10X, 22HY AXIS IS INCREMENTED 2A4)
7000 FORMAT( 10X, 22HZ AXIS IS INCREMENTED 2A4)
9000 FORMAT(1H0)
END

```

```

FLCPT 58
FLOFT 59
FLOFT 60
FLCPT 61
FLOFT 62
FLOFT 63
FLCPT 64
FLOFT 65
FLCPT 66
FLCPT 67
FLCPT 68
FLOFT 69
FLCPT 70
FLOFT 71
FLOFT 72
FLCPT 73
FLOFT 74
FLCPT 75
FLCPT 76
FLOFT 77
FLCPT 78
FLOFT 79
FLCPT 80
FLOFT 81
FLOFT 82
FLCPT 83
FLOFT 84
FLOFT 85
FLCPT 86
FLOFT 87
FLCPT 88
FLOFT 89
FLCPT 90
FLCPT 91
FLCPT 92

```

FUNCTION PRFUN

74/74 OPT=2

FTN 4.7+476

02/28/80 18.34.09

*DECK, PRFUN

C
C
C
C
C
C
C
C
C
C
C

FUNCTION PRFUN(R, DLR, COF)

H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979

RETURNS THE COEFFICIENT WHICH WHEN MULTIPLIED BY FLUID VELOCITY
RELATIVE TO THE PARTICLE YIELDS THE PARTICLE ACCELERATION.

FOR WATER DROPS IN AIR

FOR REYNOLDS NUMBERS LARGER THAN 200 USE CORR VS R DATA OF GUNN
AND KINZER FOR WATER DROPS IN AIR. FOR SMALLER REYNOLDS NUMBERS
USE DATA FOR RIGID SPHERES.

IF R .LE. 200.) GO TO 100

PRFUN = WCORR(R)/R/COF

RETURN

100 PRFUN = CORR(R)/R/COF

RETURN

END

PRFUN 1
PRFUN 2
PRFUN 3
PRFUN 4
PRFUN 5
PRFUN 6
PRFUN 7
PRFUN 8
PRFUN 9
PRFUN 10
PRFUN 11
PRFUN 12
PRFUN 13
PRFUN 14
PRFUN 15
PRFUN 16
PRFUN 17
PRFUN 18
PRFUN 19
PRFUN 20

*DECK, IMPACT

C
C
C
C
C
C
C
C
C
C
C

SUBROUTINE IMPACT(YI, ZI)

H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES APRIL 1979

.....
CALLED BY S.R. TRAJECT AFTER IMPACT ON THE BODY. ADJUSTS INITIAL
Y AND Z COORDINATES OF PARTICLE TRAJECTORY TO AVOID FURTHER IMPACT

THE ADJUSTMENT IS CASE DEPENDENT SO THIS S.R. SHOULD BE REVISED
FOR EACH STUDY.
.....

RETURN

END

IMPAC 1
IMPAC 2
IMPAC 3
IMPAC 4
IMPAC 5
IMPAC 6
IMPAC 7
IMPAC 8
IMPAC 9
IMPAC 10
IMPAC 11
IMPAC 12
IMPAC 13
IMPAC 14
IMPAC 15
IMPAC 16
IMPAC 18
IMPAC 19

```

*DECK, PAPTCL
SUBROUTINE PARTCL(V, ELL, RHO, VIS, TEMP, DIAM, DLR, RHOP, VT, RF, PT, ACC, NI)
C
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979
C
C CALLED BY CONFAC, ARYTRJ OR TANTRA TO READ PARTICLE SPECS. AND
C COMPUTE GRAVITY SETTLING SPEED AND OTHER PARAMETERS. SEE CONFAC
C
C FOR WATER DROPS IN AIR
C
C CALLS FALWAT TO COMPUTE SETTLING SPEED VIA BEARDS EQUATIONS.
C
C REYNOLDS NUMBER(R)-DAVIES NUMBER(CORR) RELATIONS ARE AS FOLLOWS -
C FOR REYNOLDS NUMBERS LARGER THAN 200 USE CORR VS R DATA OF GUNN
C AND KINZER FOR WATER DROPS IN AIR. FOR SMALLER REYNOLDS NUMBERS
C USE DATA FOR RIGID SPHERES.
C
C
C GLOSSARY
C ACC DIAM/ELL - USED TO COMPUTE ACCELERATION MOCULUS
C DIAM DIAMETER OF A WATER DROP
C DLR NOT RELEVANT TO WATER DROPS
C ELL CHARA(TERISTIC DIMENSION OF THE BODY ( METERS )
C PT DRAG COEFFICIENT*ABS(REYNOLDS NUMBER) FOR GRAVITY SETTLING
C OF PARTICLES
C RF FACTOR TO CONVERT VELOCITY DIFFERENCE TO REYNOLDS NUMBER
C RHO AIR DENSITY (SI)
C RHOP PARTICLE DENSITY (SI)
C TEMP AIR TEMPERATURE (DEG. KELVIN)
C V AIR SPEED (SI)
C VIS AIR VISCOSITY (SI)
C VT GRAVITY SETTLING SPEED OF PARTICLE
C
C READ (5, 11(0)) DIAM
C IF(DIAM .NE. 0.0) GO TO 6
C N = 1
C RETURN
6 WRITE (6, 2500) DIAM
C RHOP = 1.0E3
C DLR=1.0
C RF = DIAM*RHO /VIS * 1.0E-6
C ACC = DIAM/ELL * 1.0E-6
C COMPUTE GRAVITY SETTLING SPEED OF PART. AND PARAMETERS DERIVED
C FROM IT
C CALL FALWAT(DIAM*1.0E-6, RHO, VIS, TEMP, 267.04*RHO*TEMP, VT)
C R = RF*VT
C PT = CORR(R)/R
C IF(R .GT. 200.) PT = WDCORR( R )/R
7 WRITE(6, 3000) VT
C VT = VT/V
C RF = RF*V
C RETURN
1100 FORMAT(7F10.0)
2500 FORMAT( 1H1, 9X, 21HWATER DROP DIAMETER =1PE12.5, 12H MICROMETERS/)
3500 FORMAT( 20X, 24HPARTICLE SETTLING SPEED=1PE12.5, 6H M/SEC)
END

```

*DECK, CONFAC		CONF	1
SUBROUTINE CONFAC		CONF	2
C		CONF	3
C	H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979	CONF	4
C		CONF	5
C	EXECUTIVE FOR COMPUTATION OF CONCENTRATION FACTORS FOR PARTICLES	CONF	6
C	IN A FLOW ABOUT A 3-DIMENSIONAL BODY. CROSS SECTIONAL AREAS OF A	CONF	7
C	PARTICLE FLUX TUBE ARE CALCULATED ABOUT THE POINT OF INTEREST AND	CONF	8
C	ABOUT A POINT FAR UPSTREAM. CONCENTRATION FACTOR IS THE RATIO OF	CONF	9
C	THESE AREAS.	CONF	10
C	SINGLE TRAJECTORIES TO A TARGET POINT MAY BE COMPUTED (NW=0)	CONF	11
C	FLOW DATA PREPARED BY THE HESS-SMITH CODE ARE READ FROM UNIT 14	CONF	12
C	VIA SR SETF 10.	CONF	13
C	UNIT 9 IS A SCRATCH UNIT USED FOR TRAJECTORY DATA STORAGE.	CONF	14
C	UNIT 10 IS USED FOR TRAJECTORY DATA OUTPUT FOR PLOTTING.	CONF	15
C	SR PARTCL IS CALLED TO READ, PROCESS AND PRINT PARTICLE DATA.	CONF	16
C	THIS SR CAN BE ONE OF SEVERAL THAT TREATS WATER DROPS OR ONE OF	CONF	17
C	VARIOUS TYPES OF ICE CRYSTALS.	CONF	18
C		CONF	19
C	GLOSSARY	CONF	20
C		CONF	21
C	DISTINGUISH TWO COORDINATE SYSTEMS - 1. THE FLOW SYSTEM IS THE SYSTEM	CONF	22
C	IN WHICH THE AIRCRAFT AND FLOW ARE DEFINED, AND 2. THE FLUX TUBE	CONF	23
C	SYSTEM WHICH HAS ITS Y-Z PLANE IN THE PLANE OF A FLUX TUBE CROSS	CONF	24
C	SECTION WITH CRIGIN AT THE FLUX TUBE CENTER.	CONF	25
C		CONF	26
C	ALL COORDINATES AND TIMES ARE NORMALIZED (DIMENSIONLESS)	CONF	27
C		CONF	28
C	ACC DIAM/ELL - USED TO COMPUTE ACCELERATION MODULUS	CONF	29
C	ALPHA0 ANGLE BETWEEN PROJECTION OF INITIAL VELOCITY VECTOR IN	CONF	30
C	X-Y PLANE AND X AXIS	CONF	31
C	ALPHAR ANGLE BETWEEN PROJECTION OF FINAL VELOCITY VECTOR IN X-Y	CONF	32
C	PLANE AND X AXIS	CONF	33
C	BETA0 ANGLE BETWEEN INITIAL VELOCITY VECTOR AND ITS PROJECTION	CONF	34
C	IN THE X-Y PLANE	CONF	35
C	BETAR ANGLE BETWEEN FINAL VELOCITY VECTOR AND ITS PROJECTION	CONF	36
C	IN THE X-Y PLANE	CONF	37
C	CONRTO RATIO OF PARTICLE CONCENTRATION AT TARGET POINT TO CONC.	CONF	38
C	AT INITIAL POINT	CONF	39
C	DIAM DIAMETER OF A WATER DROP OR ICE AGGREGATE	CONF	40
C	BASE DIAMETER FOR A PLATE OR CYLINDER (MICROMETERS)	CONF	41
C	OLR BASE DIAMETER TO LENGTH (CYLINDER) OR THICKNESS (PLATE)	CONF	42
C	RATIO	CONF	43
C	ELL CHARACTERISTIC DIMENSION OF THE BODY (METERS)	CONF	44
C	EPSI() PARAMETERS USED TO CONTROL LOCAL ERROR IN THE NUMERICAL	CONF	45
C	INTEGRATION (SEE DVDQ GLOSSARY)	CONF	46
C	FN FROUDE NUMBER	CONF	47
C	FNR RECIPROCAL OF THE FROUDE NUMBER	CONF	48
C	HI INITIAL TIME STEP FOR NUMERICAL INTEGRATION (SEE DVDQ)	CONF	49
C	HMAX MAXIMUM TIME STEP (SEE DVJQ)	CONF	50
C	HMIN MINIMUM ALLOWED TIME STEP (SEE DVDQ)	CONF	51
C	IPL0T IF TRUE, TRAJECTORY DATA ARE COPIED TO UNIT 10 FOR PLOTTING	CONF	52
C	NW NUMBER OF TRAJECTORIES USED TO DEFINE THE FLUX TUBE	CONF	53
C	PERIPHERY. IF(NW .EQ. 0) SINGLE TRAJECTORIES ARE COMPUTED	CONF	54
C	P() CURRENT VALUES OF INDEPENDENT VARIABLES -	CONF	55
C	P(1) = X	CONF	56
C	P(2) = DX/DT	CONF	57
C	P(3) = Y	CONF	58
C	P(4) = DY/DT	CONF	59
C	P(5) = Z	CONF	60

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C          P(6) = DZ/DT                                CONF 61
C PACT      (SPARE)                                    CONF 62
C PT        DRAG COEFFICIENT*ABS(REYNOLDS NUMBER) FOR GRAVITY SETTLING CONF 63
C           OF PARTICLES                                CONF 64
C RF        FACTOR TO CONVERT VELOCITY DIFFERENCE TO REYNOLDS NUMBER CONF 65
C RHO       AIR DENSITY (KG/M**3)                     CONF 66
C RHOP      PARTICLE DENSITY (KG/M**3)                CONF 67
C RW        RADIUS OF PARTICLE FLUX TUBE IN TARGET PLANE (NORMALIZED) CONF 68
C TEMP      AIR TEMPERATURE (DEG. KELVIN)             CONF 69
C TOL       TOLERANCE FOR REACHING A POINT ON TARGET PLANE WINDOW CONF 70
C           (FRACTION OF RW)                           CONF 71
C TPRINT    OUTPUT TIME INTERVAL                      CONF 72
C V         AIR SPEED (M/SEC)                          CONF 73
C VIS       AIR VISCOSITY (KG/(M-SEC))                CONF 74
C VPGT      PARTICLE SPEED AT TARGET POINT            CONF 75
C VT        GRAVITY SETTLING SPEED OF PARTICLE        CONF 76
C VTGT      AIR SPEED AT TARGET POINT                 CONF 77
C XI3P, YI3P, ZI3P  INITIAL PLANE FLUX TUBE CENTER COORDINATES IN CONF 78
C           THE FLOW SYSTEM                             CONF 79
C XSTART    TRAJECTORY INITIAL X COORDINATE           CONF 80
C XP, YP, ZP  TARGET POINT COORDINATES IN THE FLUX TUBE SYSTEM CONF 81
C XW, YW, ZW  COORDINATES OF CENTER OF FLUX TUBE AT THE TARGET PLANE CONF 82
C           IN THE FLOW SYSTEM                         CONF 83
C YE( ), ZE( )  TARGET POINT COORDINATES OF THE LAST THREE GUESSES CONF 84
C           (FLOW SYSTEM)                             CONF 85
C YI( ), ZI( )  INITIAL POINT COORDINATES OF THE LAST THREE GUESSES CONF 86
C           (FLOW SYSTEM)                             CONF 87
C YPSTAR, ZPSTAR  TARGET POINT COORDINATES (FLOW SYSTEM) CONF 88
C YPSTARP, ZPSTARP  TARGET POINT COORDINATES (FLUX TUBE SYSTEM) CONF 89
C COMMON XI3, YI3, ZI3, YI3P, EPSI(3), HI, HMINI, VT, PT, COF, FNR, PACT, CONF 90
C 1RF, RE0, R, XPSTAR, YPSTAR, ZPSTAR, P(6), TPRINT, IT, ALPHA0, BETA0, IREC, CONF 91
C 2IPL0T, IPLT, XPLOT(60), YPLOT(60), ZPLOT(60), ALPHAR, BETAR, YPSTARF, CONF 92
C 3ZPSTARP, XI3P, ZI3P, XP, YP, ZP, XWP, XP2, ACC, DLR, JLIM CONF 93
C DIMENSION HOLL(18), XINIT(100), XEXIT(100) CONF 94
C DIMENSION YINIT(100), YINIT(100), YEXIT(100), ZEXIT(100) CONF 95
C DIMENSION YI(3), ZI(3), YE(3), ZE(3) CONF 96
C LOGICAL    IPL0T CONF 97
C DATA PI/3.1415926536/ CONF 98
C NFIN=0 CONF 99
C          READ AND WRITE DATA CONF 100
C READ (5,2600) KASE CONF 101
C CALL SETFLO(KASE) CONF 102
C READ(5,1000)HOLL,          IPL0T CONF 103
C READ(5,1100)V, ELL, RHO, TEMP, XSTART CONF 104
C READ(5,1100) TPRINT, HI, HMINI, EPSI CONF 105
C SET DEFAULT VALUES FOR NUMERICAL INTEGRATION AND PRINT PARAMETERS CONF 106
C IF(TPRINT .EQ. 0.0) TPRINT=0.1 CONF 107
C IF(HI .EQ. 0.0) HI=0.1 CONF 108
C IF(HMINI .EQ. 0.0) HMINI=0.005 CONF 109
C IF(EPSI(1) .EQ. 0.0) EPSI(1)=1.0E-5 CONF 110
C IF(EPSI(2) .EQ. 0.0) EPSI(2)=1.0E-5 CONF 111
C IF(EPSI(3) .EQ. 0.0) EPSI(3)=1.0E-5 CONF 112
C READ (5,1150) NW, RW, TOL CONF 113
C JLIM=25 CONF 114
C IF(NW .EQ. 0) JLIM=0 CONF 115
C DO 3 J=2,3 CONF 116
3 READ (5,1100) YE(J), ZE(J), YI(J), ZI(J) CONF 117
VIS = 145.8E-8 * TEMP**(.30/2.0)/(110.4 + TEMP) CONF 118
WRITE(6,1200) HOLL CONF 119
WRITE(6,1300) V, ELL, RHO, TEMP, VIS CONF 120

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	WRITE(6,1400) HI,HPINI,TFRINT, XSTART	CONF 121
	WRITE(6,1500) EPSI(1), EPSI(2), EPSI(3)	CONF 122
	WRITE(6,1520) MW, RW, TOL	CONF 123
	WRITE(6,1540)	CONF 124
	DO 4 J=2,3	CONF 125
	I=J-1	CONF 126
4	WRITE(6,1550) I, YE(J), ZE(J), YI(J), ZI(J)	CONF 127
C	INITIALIZE	CONF 128
	FN = V**2/(9.8*ELL)	CONF 129
	FNR = 1.0/FN	CONF 130
	IF (.NOT. IPLOT) GO TO 5	CONF 131
	REWIND 10	CONF 132
	WRITE(6,1800)	CONF 133
C	ENTER TRAJECTORY CALCULATION LOOP	CONF 134
5	CALL PARTCL(V,ELL,RHC,VIS,TEMP,DIAM,DLK,RHOP,VT,RF,PT,ACC,NFIN)	CONF 135
	IF(NFIN.EQ.0) GO TO 6	CONF 136
	IF(.NOT.IPLOT) RETURN	CONF 137
	ENDFILE 10	CONF 138
	REWIND 10	CONF 139
	RETURN	CONF 140
6	READ(5,1100) XW, YW, ZW	CONF 141
	WRITE(6,3500) XM, YW, ZW	CONF 142
C	IF NECESSARY SET DEFAULT VALUES FOR INITIAL AND FINAL TRAJECTORY	CONF 143
C	POINT GUESSES	CONF 144
	IF(ABS(YE(2))+ABS(YE(3))+ABS(ZE(2))+ABS(ZE(3))+ABS(YI(2))+	CONF 145
1	ABS(YI(3))+ABS(ZI(2))+ABS(ZI(3)).NE.0.0) GO TO 7	CONF 146
	YE(2) = YW + SIGN(1.5*RW*TOL, YW)	CONF 147
	ZE(2) = ZW + SIGN(1.5*RW*TOL, ZW)	CONF 148
	YE(3) = YW - SIGN(1.5*RW*TOL, YW)	CONF 149
	ZE(3) = ZW - SIGN(1.5*RW*TOL, ZW)	CONF 150
	YI(2) = YW	CONF 151
	ZI(2) = ZW	CONF 152
	YI(3) = YE(2)	CONF 153
	ZI(3) = ZE(2)	CONF 154
7	COF = PT*VT*FN	CONF 155
	R = RF * VT	CONF 156
	XPSTAR = XW	CONF 157
	YPSTAR = YW	CONF 158
	ZPSTAR = ZW	CONF 159
	YPSTARP=YW	CONF 160
	ZPSTARP=ZW	CONF 161
	XI3P = 0.0	CONF 162
	YI3P = 0.0	CONF 163
	ZI3P = 0.0	CONF 164
	XWP=XSTART	CONF 165
	XPP = XW	CONF 166
	XP = 0.0	CONF 167
	YP = 0.0	CONF 168
	ZP = 0.0	CONF 169
	IP = 0	CONF 170
C		CONF 171
C	COMPUTE TRAJECTORY THAT PASSES THROUGH THE CENTER OF THE FLUX TUBE	CONF 172
C		CONF 173
	ALPHA0 = 0.0	CONF 174
	BETA0 = 0.0	CONF 175
	ALPHAR=0.0	CONF 176
	BETAR=0.0	CONF 177
	WRITE(6,2800) IP,XPSTAR,YPSTAR,ZPSTAR,YPSTARP,ZPSTARP	CONF 178
	CALL MAP(YI,ZI,TCL,RW,YE,ZE)	CONF 179
	IF(IT.LT.0) GO TO 5	CONF 180

C	COMPUTE INITIAL AND FINAL TRAJECTORY ANGLES	CONF 181
	CALL FLOVEL(XI3, YI3, ZI3, VX, VY, VZ, 4I, INBODY)	CONF 182
	ALPHA0 = ATAN(VY/VX) * 180./PI	CONF 183
	BETA0 = ATAN((VZ-VT)/SQRT(VX**2 + VY**2)) * 180./PI	CONF 184
	ALPHAR = ATAN(P(4)/P(2))*180./PI	CONF 185
	BETAR = ATAN(P(6)/SQRT(P(2)**2+P(4)**2))*180./PI	CONF 186
	WRITE (6,2000) ALPHA0, BETA0, ALPHAR, BETAR	CONF 187
	IF(NW .EQ. 0) GO TO 5	CONF 188
	ALPHA0 = ALPHA0*PI/180.	CONF 189
	BETA0 = BETA0*PI/180.	CONF 190
	ALPHAR = ALPHAR*PI/180.	CONF 191
	BETAR = BETAR*PI/180.	CONF 192
C	COMPUTE AIR AND PARTICLE SPEEDS AT FINAL PCINT OF TRAJECTORY	CONF 193
	CALL FLOVEL(P(1), P(3), P(5), VX, VY, VZ, HI, INBODY)	CONF 194
	VTGT = SQRT(VX**2 + VY**2 + VZ**2)	CONF 195
	VPGT = SQRT(P(2)**2 + P(4)**2 + P(6)**2)	CONF 196
	XI3P = XI3	CONF 197
	YI3P = YI3	CONF 198
	ZI3P = ZI3	CONF 199
	CALL TRANSFM(0.0, YI(2) - YI3, ZI(2) - ZI3, ALPHA0, BETA0,	CONF 200
	1 XP, YP, ZP, 1)	CONF 201
	YI(2) = YP	CONF 202
	ZI(2) = ZP	CONF 203
	CALL TRANSFM(P(1) - XPSTAR, YE(2) - YPSTAR, ZE(2) - ZPSTAR,	CONF 204
	1 ALPHAR, BETAR, XP, YP, ZP, 1)	CONF 205
	YE(2) = YP	CONF 206
	ZE(2) = ZP	CONF 207
	YI(3) = 0.0	CONF 208
	ZI(3) = 0.0	CONF 209
	CALL TRANSFM(P(1) - XPSTAR, YE(3) - YPSTAR, ZE(3) - ZPSTAR,	CONF 210
	1 ALPHAR, BETAR, XP, YP, ZP, 1)	CONF 211
	YE(3) = YP	CONF 212
	ZE(3) = ZP	CONF 213
	XP = XW	CONF 214
	YP = YW	CONF 215
	ZP = ZW	CONF 216
	XWP=0.0	CONF 217
C	LOOP FOR EACH POINT ON FLUX TUBE PERIPHERY	CONF 218
	DO 500 IP=1,NW	CONF 219
	THETA = FLOAT(IP-1)/FLOAT(NW) *3.1415926536 *2.	CONF 220
C	CALCULATE TARGET COORDINATES IN FLUX TUBE SYSTEM	CONF 221
	YPSTARP = RW * SIN(THETA)	CONF 222
	ZPSTARP = RW * COS(THETA)	CONF 223
	IPSTAR = IP	CONF 224
C	TRANSFORM TARGET COORDINATES TO FLOW SYSTEM	CONF 225
	CALL TRANSFM(0.0, YPSTARP, ZPSTARP, ALPHAR, BETAR, XPSTAR, YPSTAR,	CONF 226
	1 ZPSTAR, -1)	CONF 227
	XPSTAR = XW + XPSTAR	CONF 228
	YPSTAR = YW + YPSTAR	CONF 229
	ZPSTAR = ZW + ZPSTAR	CONF 230
C	GUESS INITIAL COORDINATES AND COMPUTE TRAJECTORY	CONF 231
	WRITE (6,2800) IP, XPSTAR, YPSTAR, ZPSTAR, YPSTARP, ZPSTARP	CONF 232
	CALL MAP (YI, ZI, TOL, RW, YE, ZE)	CONF 233
	IF(IT .LT. 0) GO TO 5	CONF 234
C	TRANSFORM FINAL AND INITIAL COORDINATES TO FLUX TUBE SYS.	CONF 235
	CALL TRANSFM (P(1) - XW , P(3) - YW , P(5) - ZW , ALPHAR, BETAR,	CONF 236
	1 XEXIT(IP), YEXIT(IP), ZEXIT(IP), 1)	CONF 237
	CALL TRANSFM (XI3-XI3P, YI3-YI3P, ZI3-ZI3P, ALPHA0, BETA0, XINIT(IP),	CONF 238
	1 YINIT(IP), ZINIT(IP), 1)	CONF 239
	IF (ABS(XINIT(IP)) . LE . RW * TOL) GO TO 500	CONF 240

	WRITE (6, 2900) XINIT(IP), XI3P	CONF 241
500	CONTINUE	CONF 242
C	COMPUTE FLUX TUBE CROSS SECTION AREAS IN THE INITIAL AND TARGET	CONF 243
C	PLANES, AND COMPUTE CONCENTRATION FACTOR, ETC.	CONF 244
	WRITE (6, 2200) XI3P, YI3P, ZI3P, XW, YW, ZW	CONF 245
	DO 600 IP=1, NW	CONF 246
600	WRITE (6, 2300) IP, XINIT(IP), YINIT(IP), ZINIT(IP), XEXIT(IP),	CONF 247
	1 YEXIT(IP), ZEXIT(IP)	CONF 248
	CALL POLYGON (YINIT, ZINIT, NW, AREA)	CONF 249
	CALL POLYGON (YEXIT, ZEXIT, NW, DENOM)	CONF 250
	CONFAC = AREA/DENOM	CONF 251
	CONRTO = CONFAC / VPGT	CONF 252
	WRITE (6, 3000) AREA, DENOM, CONFAC, XW, YW, ZW, DIAM	CONF 253
	WRITE (6, 3400) DLR, RHOF	CONF 254
	WRITE (6, 3200) VTGT, CONRTO	CONF 255
C		CONF 256
C		CONF 257
C		CONF 258
C		CONF 259
C		CONF 260
	SET UP TRIAL COORDINATES FOR NEXT PARTICLE	CONF 261
	YI(3) = YI3	CONF 262
	ZI(3) = ZI3	CONF 263
	YE(3) = P(3)	CONF 264
	ZE(3) = P(5)	CONF 265
	CALL TRANSFM(0.0, YI(2), ZI(2), ALPHA0, BETA0, XI3, YI3, ZI3, -1)	CONF 266
	YI(2) = YI3 + YI3P	CONF 267
	ZI(2) = ZI3 + ZI3P	CONF 268
	CALL TRANSFM(0.0, YE(2), ZE(2), ALPHAR, BETAR, XI3, YI3, ZI3, -1)	CONF 269
	YE(2) = YI3 + YW	CONF 270
	ZE(2) = ZI3 + ZW	CONF 271
	GO TO 5	CONF 272
1000	FORMAT(18A4, 7X, L1)	CONF 273
1100	FORMAT(8F10.5)	CONF 274
1150	FORMAT (I10, 7F10.5)	CONF 275
1200	FORMAT(1H1, 5X, 15HCNFAC RUN ID -/ 8X, 18A4)	CONF 276
1300	FORMAT(1H0, 5X, 21HPHYSICAL INPUT DATA -/ 7X, 10HAIR SPEED=1PE13.6,	CONF 277
	1 3X, 37HCHARACTERISTIC DIMENSION OF THE BODY=1PE13.6/ 7X, 35HCONF	CONF 278
	2Y AND TEMPERATURE OF AIR ARE 1PE13.6, 5H AND 1PE13.6, 20H AIR VISCONF	CONF 279
	3COSITY IS 1PE13.6)	CONF 280
1400	FORMAT(1H0, 5X, 29HNUMERICAL INTEGRATOR INPUTS -/ 7X, 10HTIME STECONF	CONF 281
	1P=1PE11.4, 3X, 18HMINIMUM TIME STEP=1PE11.4, 3X, 20HPRINT TIME INTCONF	CONF 282
	2ERVAL=1PE11.4, 3X, 24HUPSTREAM START DISTANCE=1PE11.4)	CONF 283
1500	FORMAT(1H0, 6X, 33HLOCAL ERROR TOLERANCES FOR DVDQ -, 3(1PE14.4))	CONF 284
1520	FORMAT(1H0, 5X, 35HFARTICLE FLUX TUBE SPECIFICATIONS -/	CONF 285
	1 7X, 46HNUMBER OF TRAJECTORIES ON FLUX TUBE PERIPHERY=I3, CONF	CONF 286
	2 3X, 27HFLUX TUBE RADIUS AT TARGET=F9.5, 3X, 10HTOLERANCE=F8.4)	CONF 287
1540	FORMAT(1H0, 5X, 40HTARGET AND INITIAL COORDINATE ESTIMATES- / 10X, CONF	CONF 288
	1 6HJGUESS, 9X, 2HYT, 13X, 2HZT, 13X, 2HYI, 13X, 2HZI)	CONF 289
1550	FORMAT(I14, 4(5X, F10.5))	CONF 290
1800	FORMAT(//6X, 51HTRAJECTORY DATA ARE WRITTEN ON UNIT 10 FOR PLOTTCONF	CONF 291
	1ING//)	CONF 292
2000	FORMAT(///20X, 47HINITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -CONF	CONF 293
	1/ 22X, 7HALPHA0=F10.4, 5X, 6HBETA0=F10.4/ 22X, 7HALPHAR=F10.4, 5XCONF	CONF 294
	2, 6HBETAR=F10.4)	CONF 295
2200	FORMAT(1H1, 35X, 44HFLUX TUBE CROSS SECTION COORDINATES IN THE -/CONF	CONF 296
	1/ 28X, 13HINITIAL PLANE, 33X, 12HTARGET PLANE//	CONF 297
	2 8X, 2HIP, 2(9X, 2HXP, 13X, 2HYP, 13X, 2HZP, 4X)/ 4X, 6HCENTECONF	CONF 298
	3R6(1PE15.4), 14H (FLOX SYSTEM))	CONF 299
2300	FORMAT (I10, 6(1PE15.4), 19H (FLUX TUBE SYSTEM))	CONF 300
2600	FORMAT (A4)	CONF 300

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2800 FORMAT( /// 18H TRAJECTORY NUMBER, I3, 5X, 20H TARGET COORDINATES -CONF 301
1, 10H XPSTAR =F10.6, 4X, 8HYPSTAR =F10.6, 5X, 8HZPSTAR =F10.6, CONF 302
2 14H (FLOW SYSTEM)/ 70X, 8HYPSTARP=F10.6, 5X, 8HZPSTARP=F10.6, CONF 303
3 19H (FLUX TUBE SYSTEM)// CONF 304
4 15X, 6HY FINAL, 6X, 6HZFINAL, 6X, 10H ITERATIONS, 5X, 5HYINIT, 7X, CONF 305
5 5HZINIT, 7X, 25HERRCR (FLUX TUBE SYSTEM) CONF 306
2900 FORMAT(// 30X, 49H INITIAL POINT IS NOT IN CORRECT TRANSFORMED PLANE CONF 307
1/ 32X, 6HXINIT=1PE12.5, 5X, 5HXI3P=1PE12.5) CONF 308
3000 FORMAT(// 15X, 50H FLUX TUBE CROSS SECTION AREA IN THE INITIAL PLANE CONF 309
1E=1PE12.5, 6X, 20H IN THE TARGET PLANE=1PE12.5// 15X, 21H CONCENTRACONF 310
TION FACTOR=0PF11.5// CONF 311
3 10X, 21H AT THE POINT (X,Y,Z)=, 3F12.5/10X, 27H FOR A PARTICLE (F DIACONF 312
4 METER=, F12.5) CONF 313
3200 FORMAT( 10X, 36H NORMALIZED AIR SPEED AT FINAL POINT=F12.5/ CONF 314
1 10X, 29H PARTICLE CONCENTRATION RATIO=F12.5) CONF 315
3400 FORMAT( 1H+, 52X, 30H WITH DIAMETER TO LENGTH RATIO=1PE12.5, 3X, CONF 316
1 12H AND DENSITY=1PE12.5) CONF 317
3500 FORMAT( 1H0, 9X, 22H TARGET COORDINATES X=1PE12.5, 5X, 2HY=1PE12. CONF 318
15, 5X, 2HZ=1PE12.5) CONF 319
END CONF 320

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*DECK, MAP

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SUBROUTINE MAP (YI, ZI, YOL, RW, YE, ZE) MAP 1
C MAP 2
C MAP 3
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979 MAP 4
C MAP 5
C MAP GUESSES THE INITIAL COORDINATES OF A TRAJECTORY THAT IS MAP 6
C AIMING FOR A POINT IN THE TARGET PLANE. AFTER THE TRAJECTORY MAP 7
C IS COMPUTED, THE DISTANCE FROM THE TARGET IS COMPARED TO MAP 8
C THE ALLOWABLE TOLERANCE. THE PROCESS IS REPEATED UNTIL DISTANCE MAP 9
C FROM THE TARGET IS BELOW THE TOLERANCE. MAP 10
C ONCE A HISTORY OF GREATER THAN THREE TRAJECTORIES HAS BEEN MAP 11
C COMPUTED, LEAST SQUARES IS USED TO DETERMINE TRIAL INITIAL MAP 12
C COORDINATES MAP 13
C GLOSSARY MAP 14
C A MATRIX OF COEFFICIENTS INVERTED IN MATINV MAP 15
C AA, C INTERMEDIATE STORAGE FOR LEAST SQUARES NORMAL MATRIX TERMS MAP 16
C AC ACCELERATION MODULUS MAP 17
C ANG ANGLE OF DRAG VECTOR PROJECTED IN THE X-Y PLANE RELATIVE MAP 18
C TO THE X AXIS MAP 19
C B ENTERS MATINV AS CONSTANT MATRIX AND RETURNS AS SOLUTION MMAP 20
C COSA, COSB, COSC DIRECTION COSINES OF DRAG VECTOR MAP 21
C CNG ANGLE OF DRAG VECTOR RELATIVE TO Z AXIS MAP 22
C DIST DISTANCE BETWEEN END OF TRAJECTORY AND TARGET POINT MAP 23
C DV VELOCITY OF PARTICLE RELATIVE TO AIR MAP 24
C IT ITERATION NUMBER MAP 25
C VA AIR SPEED AT TARGET POINT MAP 26
C VP PARTICLE SPEED AT TARGET POINT MAP 27
C W LEAST SQUARES SUMMATION WEIGHT MAP 28
C YE ARRAY OF FINAL Y COORD FOR LAST 3 GUESSES MAP 29
C YI ARRAY OF INITIAL Y COORD FOR LAST 3 GUESSES MAP 30
C YI3 NEXT GUESS FOR INITIAL Y COORD (FLOW SYSTEM) MAP 31
C ZE ARRAY OF FINAL Z COORD FOR LAST 3 GUESSES MAP 32
C ZI ARRAY OF INITIAL Z COORD FOR LAST 3 GUESSES MAP 33
C ZI3 NEXT GUESS FOR INITIAL Z COORD (FLOW SYSTEM) MAP 34
C LOGICAL I PLOT MAP 35

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	COMMON XI3, YI3, ZI3, YI3P, EPSI(3), HI, HMINI, VT, PT, COF, FNR, PACT,	MAP	36
	1RF, RE0, R, XPSTAR, YPSTAR, ZFSTAR, P(6), TPRINT, IT, ALPHAU, BETAJ, IREC,	MAP	37
	2IPL0T, IPLT, XPLOT(60), YPLCT(60), ZPLOT(60), ALPHAR, BETAR, YPSTARP,	MAP	38
	3ZPSTARP, XI3P, ZI3P, XP, YF, ZP, XNP, XPD, ACC, DLR, JLIM	MAP	39
	DIMENSION YI(3), ZI(3), A(4,4), B(4), YE(3), ZE(3), DY(3), DZ(3),	MAP	40
	1AA(6), C(3), PSTR(3)	MAP	41
	DATA ILIM/ 25/	MAP	42
	DO 50 J=2,3	MAP	43
	DY(J) = YE(J) - YPSTARP	MAP	44
50	DZ(J) = ZE(J) - ZPSTARP	MAP	45
	IT = 0	MAP	46
	N = 4	MAP	47
C		MAP	48
C	GENERAL ITERATION CALCULATION OF NEXT GUESS	MAP	49
	GENERATE CONSTANT ARRAY (B) FOR MATINV IF IT . LE . 3	MAP	50
100	DO 120 J=2,3	MAP	51
	I = J - 1	MAP	52
	B(2*I-1) = YI(J)	MAP	53
	B(2*I) = ZI(J)	MAP	54
120	CONTINUE	MAP	55
C		MAP	56
	GENERATE COEFFICIENT ARRAY (A) FOR MATINV	MAP	57
	DO 140 J=2,3	MAP	58
	I = J - 1	MAP	59
	JROW = 2*I-1	MAP	60
	JROW2 = 2*I	MAP	61
	A(JROW,1) = 1.	MAP	62
	A(JROW,2) = 0.	MAP	63
	A(JROW,3) = DY(J)	MAP	64
	A(JROW,4) = -DZ(J)	MAP	65
	A(JROW2,1) = 0.	MAP	66
	A(JROW2,2) = 1.	MAP	67
	A(JROW2,3) = DZ(J)	MAP	68
	A(JROW2,4) = DY(J)	MAP	69
140	CONTINUE	MAP	70
	GO TO 280	MAP	71
C		MAP	72
C	IF IT . GE . 3 SOLVE FOR THE NEXT INITIAL COORDINATES GUESS BY	MAP	73
	LEAST SQUARES	MAP	74
200	CONTINUE	MAP	75
C		MAP	76
C		MAP	77
C	INCREMENT LEAST SQUARES NORMAL EQUATIONS	MAP	78
	W = 1.0	MAP	79
	G = DY(3) / DIST**2	MAP	80
	Q = DZ(3) / DIST**2	MAP	81
	S = G * YI(3) + Q * ZI(3)	MAP	82
	AA(1) = AA(1) + G**2 * W	MAP	83
	AA(2) = AA(2) + G * Q * W	MAP	84
	AA(3) = AA(3) + G * W	MAP	85
	AA(4) = AA(4) + Q**2 * W	MAP	86
	AA(5) = AA(5) + Q * W	MAP	87
	AA(6) = AA(6) + W	MAP	88
	C(1) = C(1) + G * S * W	MAP	89
	C(2) = C(2) + Q * S * W	MAP	90
	C(3) = C(3) + S * W	MAP	91
C		MAP	92
C		MAP	93
C	SET-UP LEAST SQUARES NORMAL EQUATIONS	MAP	94
220	A(1,1) = AA(1)	MAP	95
	A(1,2) = AA(2)	MAP	96
	A(1,3) = AA(3)	MAP	97
	A(2,2) = AA(4)	MAP	98

A(2,3) = AA(5)	MAP	96
A(3,3) = AA(6)	MAP	97
DO 250 I=2,3	MAP	98
K = I-1	MAP	99
DO 250 J=I,3	MAP	100
250 A(J,K) = A(K,J)	MAP	101
DO 260 I=1,3	MAP	102
260 B(I) = C(I)	MAP	103
DO 265 I=1,3	MAP	104
A(4,I) = 0.0	MAP	105
265 A(I,4) = 0.0	MAP	106
A(4,4) = 1.0	MAP	107
B(4) = 0.0	MAP	108
C SOLVE MATRIX EQNS TO GET NEXT GUESS	MAP	109
280 CALL MATINV(A,N,B,1,DETERM)	MAP	110
CALL TRANSFM(XWP,B(1),B(2),ALPHA0,BETA0,XI3,YI3,ZI3,-1)	MAP	111
XI3 = XI3 + XI3P	MAP	112
YI3 = YI3 + YI3P	MAP	113
ZI3 = ZI3 + ZI3P	MAP	114
CALL TRAJECT	MAP	115
IF (IT .LT. 0) RETURN	MAP	116
IT = IT + 1	MAP	117
C IF (IT .GT. 3) GO TO 305	MAP	118
C UPDATE ARRAYS OF INITIAL AND FINAL CCORDS.	MAP	119
290 DO 300 J=1,2	MAP	120
YI(J) = YI(J+1)	MAP	121
ZI(J) = ZI(J+1)	MAP	122
DY(J) = DY(J+1)	MAP	123
DZ(J) = DZ(J+1)	MAP	124
YE(J) = YE(J+1)	MAP	125
ZE(J) = ZE(J+1)	MAP	126
PSTR(J) = PSTR(J+1)	MAP	127
300 CONTINUE	MAP	128
305 CONTINUE	MAP	129
YI(3) = B(1)	MAP	130
ZI(3) = B(2)	MAP	131
CALL TRANSFM(P(1) - XP , P(3) - YP , P(5) - ZP , ALPHAR, BETAR,	MAP	132
1XDUM, YE(3), ZE(3), 1)	MAP	133
IF (ABS(XP) .EQ. 0.0) XDUM = XDUM - XPP	MAP	134
IF (ABS(XDUM) .GT. RW * TOL) WRITE(6, 3000)	MAP	135
DY(3) = YE(3) - YPSTARF	MAP	136
DZ(3) = ZE(3) - ZPSTARF	MAP	137
DIST = SQRT(DY(3)**2 + DZ(3)**2)	MAP	138
PSTR(3) = DIST	MAP	139
C GUESS AGAIN OR GO ON TO NEXT POINT ON WINDOW?	MAP	140
WRITE (6,2700) YE(3),ZE(3),IT,YI(3),ZI(3),DIST	MAP	141
IF (DIST .LE. RW*TOL) GO TO 490	MAP	142
IF(IT .LE. ILIM)IF(IT - 3) 100,310,200	MAP	143
WRITE (6,2900) ILIM	MAP	144
IT = -ILIM	MAP	145
RETURN	MAP	146
C INITIALIZE FOR LEAST SQUARES	MAP	147
C	MAP	148
C	MAP	149
310 DO 320 I=1,3	MAP	150
320 C(I) = 0.0	MAP	151
DO 325 I=1,6	MAP	152
325 AA(I) = 0.0	MAP	153
DO 330 I = 1,3	MAP	154
W = 1.0	MAP	155

	G = DY(I) / PSTR(I)**2	MAP	156
	Q = DZ(I) / PSTR(I)**2	MAP	157
	S = G * YI(I) + Q * ZI(I)	MAP	158
	AA(1) = AA(1) + G**2 * W	MAP	159
	AA(2) = AA(2) + G * Q * W	MAP	160
	AA(3) = AA(3) + G * W	MAP	161
	AA(4) = AA(4) + Q**2 * W	MAP	162
	AA(5) = AA(5) + Q * W	MAP	163
	AA(6) = AA(6) + W	MAP	164
	C(1) = C(1) + G * S * W	MAP	165
	C(2) = C(2) + Q * S * W	MAP	166
330	C(3) = C(3) + S * W	MAP	167
	GO TO 100	MAP	168
C	PRINT TRAJECTORY OUTPUT	MAP	169
490	REWIND 9	MAP	170
	WRITE (6,1700)	MAP	171
	DO 494 IWRITE = 1,IREC	MAP	172
	READ (9)NEVAL,KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY,	MAP	173
2	VZ, H, R,AC	MAP	174
	WRITE(6,1600) KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY,	MAP	175
2	VZ, H, R, AC, NEVAL	MAP	176
494	CONTINUE	MAP	177
C	COMPUTE AND PRINT DRAG VECTOR AT TARGET POINT	MAP	178
	DV = SQRT((VX - P(2))**2 + (VY - P(4))**2 + (VZ - P(6))**2)	MAP	179
	COSA = (VX - P(2))/DV	MAP	180
	COSB = (VY - P(4))/DV	MAP	181
	COSC = (VZ - P(6))/DV	MAP	182
	ANG = ATAN(COSB/COSA) * 57.29577951	MAP	183
	CNG = ACOS(COSC) * 57.29577951	MAP	184
	WRITE(6, 3100) COSA, COSB, COSC, ANG, CNG	MAP	185
C	COMPUTE AND PRINT AIR AND PARTICLE SPEEDS AT TARGET POINT	MAP	186
	VA = SQRT(VX**2 + VY**2 + VZ**2)	MAP	187
	VP = SQRT(P(2)**2 + P(4)**2 + P(6)**2)	MAP	188
	WRITE(6, 3200) VA, VP	MAP	189
	IF (IPLT) WRITE (10) IFLT, (XPLT(J),YPLT(J),ZPLT(J),J=1,IPLT)	MAP	190
	RETURN	MAP	191
1600	FORMAT(I6, 10(1X,1PE11.4)/10X, 24H=1PE11.4,4H R=1PE11.4, 5H AC=	MAP	192
	11PE11.4, 8H NEVAL=I6)	MAP	193
1700	FORMAT(6HOKSTEP, 7X, 1HT, 11X, 1HX, 11X, 1HY, 11X, 1HZ, 10X,	MAP	194
1	3HV PX, 9X, 3HV PY, 9X, 3HV PZ, 10X, 2HVX, 10X, 2HVV, 10X, 2HVZ)	MAP	195
2700	FORMAT (10X, 2E12.4,7X,13,5X,3E12.4)	MAP	196
2900	FORMAT(///20X, 20HTOLERANCE NOT SATISFIED IN I4, 58H TRAJECTORY I	MAP	197
	1TERATIONS. GIVE UP AND TRY THE NEXT PARTICLE)	MAP	198
3000	FORMAT(///20X, 57HFINAL FARTICLE POSITION IS NOT IN THE ROTATED TAMA)	MAP	199
	1GET PLANE)	MAP	200
3100	FORMAT(5X, 20HORAG VECTOR AT FINAL POINT -/ 6X, 18HDIRECTION COS	MAP	201
	1INES-3(1PE13.4), 7X, 19HANGLES A AND GAMMA-2(1PE13.4))	MAP	202
3200	FORMAT(5X, 47HAIR AND FARTICLE SPEEDS AT THE FINAL FOINT ARE2(1PE	MAP	203
	115.5))	MAP	204
	END	MAP	205

*DECK, TRAJECT	TRAJ	1
SUBROUTINE TRAJECT	TRAJ	2
C	TRAJ	3
C	TRAJ	4
C	TRAJ	5
C	TRAJ	6
C	TRAJ	7
C	TRAJ	8
C	TRAJ	9
C	TRAJ	10
C	TRAJ	11
C	TRAJ	12
C	TRAJ	13
C	TRAJ	14
C	TRAJ	15
C	TRAJ	16
C	TRAJ	17
C	TRAJ	18
C	TRAJ	19
C	TRAJ	20
C	TRAJ	21
C	TRAJ	22
C	TRAJ	23
C	TRAJ	24
C	TRAJ	25
C	TRAJ	26
C	TRAJ	27
C	TRAJ	28
C	TRAJ	29
C	TRAJ	30
C	TRAJ	31
C	TRAJ	32
C	TRAJ	33
C	TRAJ	34
C	TRAJ	35
C	TRAJ	36
C	TRAJ	37
C	TRAJ	38
C	TRAJ	39
C	TRAJ	40
C	TRAJ	41
C	TRAJ	42
DIMENSION F(3),EPS(3),KD(3),PN(6),KQ(3), DT(20,3)	TRAJ	43
LOGICAL IPLIT	TRAJ	44
COMMON XI3,YI3,ZI3,YI3P, EPSI(3),HI,HMINI,VT,PT,COF,FNR,PACT,	TRAJ	45
1RF,RED,R,XPSTAR,YPSTAR,ZPSTAR,P(6),TPRINT,IT,ALPHA0,BETA0,IREC,	TRAJ	46
2IPLIT,IPLT,XPLOT(60),YPLCT(60),ZPLOT(60),ALPHAR,BETAR,YPSTARP,	TRAJ	47
3ZPSTARP,XI3P,ZI3F,XP,YP,ZP,XWP,XP0,ACC,DLR,JLIM	TRAJ	48
DATA MXSTEP,NEQ,NG,NGE/10,3,1,0/, KD/3*2/	TRAJ	49
INITIALIZE FOR THE NUMERICAL INTEGRATOR	TRAJ	50
JT = 0	TRAJ	51
100 IFLAG = 0	TRAJ	52
TFINAL = (XPSTAR-XI3)*%.0	TRAJ	53
HMAX = TFINAL	TRAJ	54
A11 = COS(ALPHAR) * COS(BETAR)	TRAJ	55
A12 = SIN(ALPHAR) * COS(BETAR)	TRAJ	56
A13 = SIN(BETAR)	TRAJ	57
T = 0.0	TRAJ	58
EPS(1) = EPSI(1)	TRAJ	59
EPS(2) = EPSI(2)	TRAJ	60

EPS(3) = EPSI(3)	TRAJ 61
H = HI	TRAJ 62
HMIN = HMINI	TRAJ 63
XPLOT(1) = XI3	TRAJ 64
YPLOT(1) = YI3	TRAJ 65
ZPLOT(1) = ZI3	TRAJ 66
IPL7 = 1	TRAJ 67
C COMPUTE INITIAL AIR FLOW VELOCITIES	TRAJ 68
110 CALL FLOVEL(XI3,YI3,ZI3,VX,VY,VZ,H,INBODY)	TRAJ 69
P(1) = XI3	TRAJ 70
P(2) = VX	TRAJ 71
P(3) = YI3	TRAJ 72
P(4) = VY	TRAJ 73
P(5) = ZI3	TRAJ 74
P(6) = VZ - VT	TRAJ 75
120 F(1) = 0.0	TRAJ 76
F(2) = 0.0	TRAJ 77
F(3) = VT*PT/COF - FNR	TRAJ 78
G = A11*(P(1) - XPP) + A12 * (P(3) - YP) + A13 * (P(5) - ZP)	TRAJ 79
CALL DVDQ(NEQ,T,P,F,KD,EPS,IFLAG,H,HMIN,	TRAJ 80
* HMAX,TPRINT,TFINAL,MXSTEP,KSTEP,KEMAX,EMAX,	TRAJ 81
* KQ,PN,DT,NEVAL,NG,NGE,NSTOP,G,GT)	TRAJ 82
C COMPUTE THE TRAJECTORY	TRAJ 83
REWIND 9	TRAJ 84
IREC = 0	TRAJ 85
GO TO 200	TRAJ 86
150 AC = ACC * SQRT(F(1)**2 + F(2)**2 + F(3)**2) * (RF/R)**2	TRAJ 87
WRITE(9)NEVAL,KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY,	TRAJ 88
2 VZ, H, R, AC	TRAJ 89
IREC = IREC + 1	TRAJ 90
IF (.NOT. IPLOT .AND. IFLAG .LE. 10) GO TO 200	TRAJ 91
IPLT = IPLT + 1	TRAJ 92
XPLOT(IPLT) = P(1)	TRAJ 93
YPLOT(IPLT) = P(3)	TRAJ 94
ZPLOT(IPLT) = P(5)	TRAJ 95
IF(IFLAG .GT. 10) RETURN	TRAJ 96
200 CALL DVDQ(NEQ,T,P,F,KD,EPS,IFLAG,H,HMIN,	TRAJ 97
* HMAX,TPRINT,TFINAL,MXSTEP,KSTEP,KEMAX,EMAX,	TRAJ 98
* KQ,PN,DT,NEVAL,NG,NGE,NSTOP,G,GT)	TRAJ 99
GO TO(210, 210, 150, 250, 150, 220, 230, 250, 260, 260, 150,	TRAJ 100
1 150), IFLAG	TRAJ 101
210 CALL FLOVEL(P(1),P(3),P(5),VX,VY,VZ,H,INBODY)	TRAJ 102
IF (INBODY .EQ. 0) GO TO 215	TRAJ 103
WRITE (6,2200) P(1), P(3), P(5), YI3, ZI3, JT	TRAJ 104
CALL IMPACT(YI3,ZI3)	TRAJ 105
JT = JT + 1	TRAJ 106
IF(JT.LT. JLIM) GO TO 100	TRAJ 107
WRITE (6,2500) JLIM	TRAJ 108
IT=-JLIM	TRAJ 109
RETURN	TRAJ 110
215 R = RF*SQRT((VX - P(2))**2 + (VY - P(4))**2 + (VZ - P(6))**2)	TRAJ 111
PR = PRFUN(R, DLR, COF)	TRAJ 112
F(1) = (VX - P(2))*PR	TRAJ 113
F(2) = (VY - P(4))*PR	TRAJ 114
F(3) = (VZ - P(6))*PR - FNR	TRAJ 115
GO TO 200	TRAJ 116
220 EPS(KEMAX) = 32.*EMAX*EPS(KEMAX)	TRAJ 117
WRITE(6,1900) IFLAG, KSTEP,NEVAL	TRAJ 118
WRITE(6,2000) EPS(KEMAX), KEMAX	TRAJ 119
GO TO 210	TRAJ 120

230	HMIN = H	TRAJ 121
	WRITE(6,1900) IFLAG, KSTEP, NEVAL	TRAJ 122
	WRITE(6,2100) HMIN	TRAJ 123
	GO TO 200	TRAJ 124
260	G = A11*(P(1) - XPP) + A12 * (P(3) - YP) + A13 * (P(5) - ZP)	TRAJ 125
	GO TO 200	TRAJ 126
250	WRITE(6,1900) IFLAG, KSTEP, NEVAL	TRAJ 127
	AC = ACC * SQRT(F(1)**2 + F(2)**2 + F(3)**2) * (RF/R)**2	TRAJ 128
	WRITE(6,1600) KSTEP, T, F(1), P(3), P(5), P(2), P(4), P(6), VX, VY,	TRAJ 129
1	VZ, H, R, AC	TRAJ 130
	RETURN	TRAJ 131
C		TRAJ 132
C		TRAJ 133
1600	FORMAT(I6, 10(1X,1PE11.4)/ 10X, 24H=1PE11.4, 4H R=1PE11.4, 5H AC	TRAJ 134
	1=1PE11.4)	TRAJ 135
1900	FORMAT(5X, 6HIFLAG=I2, 11H FOR KSTEP=I6, 6H NEVAL=I6)	TRAJ 136
2000	FORMAT(1H+, 55X, 23HEPS HAS BEEN CHANGED TO1PE11.4, 11H FOR KEMAX	TRAJ 137
	1=I2)	TRAJ 138
2100	FORMAT(1H+, 55X, 14HHMIN IS SET TO1PE11.4)	TRAJ 139
2200	FORMAT(10X, 65HTHE BODY SURFACE IS PENETRATED. PARTICLE COORDINAT	TRAJ 140
	1TES ARE (X,Y,Z),3(1PE12.5)/ 10X, 43HTRIAL INITIAL COORDINATES ARE	TRAJ 141
	2(YINIT,ZINIT)2(1PE12.4), 5X, 14HATTEMPT NUMBERI4)	TRAJ 142
2500	FORMAT(/ 15X, 5HAFTERI4, 45H ATTEMPTS PARTICLE STILL PENETRATES	TRAJ 143
	1 THE BODY.)	TRAJ 144
	END	TRAJ 145

*DECK,	POLYGON	POLY 1
	SUBROUTINE POLYGON(XIN,YIN,N,AREA)	POLY 2
C		POLY 3
C	COMPUTES AREA OF A PLANE POLYGON WITH N VERTICES	POLY 4
C		POLY 5
	DIMENSION XIN(N), YIN(N)	POLY 6
	DIMENSION X(100), Y(100)	POLY 7
	DATA PI/3.1415926536/	POLY 8
C	CALCULATE CENTER OF POLYGON	POLY 9
	XSUM = 0.	POLY 10
	YSUM = 0.	POLY 11
	DO 2 I=1,N	POLY 12
	XSUM = XSUM + XIN(I)	POLY 13
	YSUM = YSUM + YIN(I)	POLY 14
2	CONTINUE	POLY 15
	XCEN = XSUM/FLOAT(N)	POLY 16
	YCEN = YSUM/FLOAT(N)	POLY 17
C	REORDER POINTS IN ASCENDING VALUES OF THETA	POLY 18
	TPIM1 = 0.	POLY 19
	DO 8 IP=1,N	POLY 20
	THETAP = 2.*PI	POLY 21
	DO 4 I=1,N	POLY 22
	THETA = ATAN2(YIN(I)-YCEN, XIN(I)-XCEN)	POLY 23
	IF (THETA .LT. 0.) THETA = 2.*PI + THETA	POLY 24
	IF (THETA .LE. TPIM1 .OR. THETA .GT. THETAP) GO TO 4	POLY 25
	THETAP = THETA	POLY 26
	X(IP) = XIN(I)	POLY 27
	Y(IP) = YIN(I)	POLY 28
4	CONTINUE	POLY 29
	TPIM1 = THETAP	POLY 30

8	CONTINUE	POLY	31
	ASUM = 0.	POLY	32
	DO 40 IN=1,N	POLY	33
	INM1 = IN - 1	POLY	34
	IF (IN.EQ.1) INM1 = N	POLY	35
	BASE = SQRT((X(IN)-X(INM1))**2 +(Y(IN)-Y(INM1))**2)	POLY	36
	DENOM = X(IN) - X(INM1)	POLY	37
	IF (ABS(DENOM) .GT. 1.E-10) GO TO 31	POLY	38
	ALT = ABS(XCEN-X(INM1))	POLY	39
	GO TO 32	POLY	40
31	SLOPE = (Y(IN)-Y(INM1))/(X(IN)-X(INM1))	POLY	41
	ALT = ABS(YCEN-Y(INM1)-SLOPE*(XCEN-X(INM1)))/SQRT(1.+SLOPE**2)	POLY	42
32	ASUM = ASUM + ALT*BASE/2.	POLY	43
40	CONTINUE	POLY	44
200	AREA = ASUM	POLY	45
	RETURN	POLY	46
	END	POLY	47

*DECK, TRANSFM		TRAN	1
	SUBROUTINE TRANSFM (X,Y,Z,ALPHA,BETA,XT,YT,ZT,IGO)	TRAN	2
C		TRAN	3
C	TRANSFORMS COORDINATES FROM THE FLOW SYSTEM TO THE PARTICLE FLUX	TRAN	4
C	TUBE CROSS SECTION SYSTEM, OR VISE VERSA.	TRAN	5
C	IF(IGO .GT. 0) TRANSFORM FROM FLOW TO FLUX TUBE SYSTEM	TRAN	6
C	IF(IGO .LT. 0) TRANSFORM FROM FLUX TUBE TO FLOW SYSTEM	TRAN	7
C		TRAN	8
	COSA = COS(ALPHA)	TRAN	9
	SINA = SIN(ALPHA)	TRAN	10
	COSB = COS(BETA)	TRAN	11
	SINB = SIN(BETA)	TRAN	12
	IF (IGO .LT. 0) GO TO 20	TRAN	13
	A11 = COSA*COSB	TRAN	14
	A12 = SINA*COSB	TRAN	15
	A13 = SINB	TRAN	16
	A21 = -SINA	TRAN	17
	A22 = COSA	TRAN	18
	A23 = 0.	TRAN	19
	A31 = -COSA*SINB	TRAN	20
	A32 = -SINB*SINA	TRAN	21
	A33 = COSB	TRAN	22
	GO TO 30	TRAN	23
C	GOING THE OTHER WAY	TRAN	24
20	A11= COSA*COSB	TRAN	25
	A12 = -SINA	TRAN	26
	A13 = -COSA*SINB	TRAN	27
	A21 = SINA*COSB	TRAN	28
	A22 = COSA	TRAN	29
	A23 = -SINA*SINB	TRAN	30
	A31 = SINB	TRAN	31
	A32 = 0.	TRAN	32
	A33=COSB	TRAN	33
30	XT = A11*X + A12*Y + A13*Z	TRAN	34
	YT = A21*X + A22*Y + A23*Z	TRAN	35
	ZT = A31*X + A32*Y + A33*Z	TRAN	36
	RETURN	TRAN	37
	END	TRAN	38

*DECK, MATINV	MATI	1
SUBROUTINE MATINV(A,N,B,M,DETERM)	MATI	2
C	MATI	3
C	MATI	4
MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS	MATI	5
C	MATI	6
THIS CODE SOLVES THE MATRIX EQUATION	MATI	7
$A \cdot X = B$	MATI	8
C	MATI	9
FOR X. A IS AN N*N INPUT MATRIX. B IS AN N*1 INPUT VECTOR.	MATI	10
C	MATI	11
A IS REPLACED BY ITS INVERSE. B IS REPLACED BY THE VECTOR X.	MATI	12
C	MATI	13
THE CODE CAN BE USED FOR MATRIX INVERSION ALONE. IN THIS MODE	MATI	14
C	MATI	15
SET M=0 IN THE INPUT. FOR MATRIX INVERSION PLUS LINEAR EQUATION	MATI	16
C	MATI	17
SOLUTION, SET M=1 IN THE INPUT. THE VALUE OF THE DETERMINANT	MATI	18
C	MATI	19
OF A, DETERM, IS RETURNED FROM BOTH MODES.	MATI	20
C	MATI	21
DIMENSION IPIVOT(30), A(N, N), B(N,1), INDEX(30,2), PIVOT(30)	MATI	22
C	MATI	23
EQUIVALENCE (IROW,JROW), (ICOLUJ,JCOLUM), (AMAX, T, SWAP)	MATI	24
C	MATI	25
INITIALIZATION	MATI	26
C	MATI	27
10 DETERM=1.0	MATI	28
C	MATI	29
15 DO 20 J=1,N	MATI	30
C	MATI	31
20 IPIVOT(J)=0	MATI	32
C	MATI	33
30 DO 550 I=1,N	MATI	34
C	MATI	35
SEARCH FOR PIVOT ELEMENT	MATI	36
C	MATI	37
40 AMAX=0.0	MATI	38
C	MATI	39
45 DO 105 J=1,N	MATI	40
C	MATI	41
50 IF (IPIVOT(J)-1) 60, 105, 60	MATI	42
C	MATI	43
60 DO 100 K=1,N	MATI	44
C	MATI	45
70 IF (IPIVOT(K)-1) 80, 100, 740	MATI	46
C	MATI	47
80 IF (ABS (AMAX)-ABS (A(J,K))) 85, 100, 100	MATI	48
C	MATI	49
85 IROW=J	MATI	50
C	MATI	51
90 ICOLUM=K	MATI	52
C	MATI	53
95 AMAX=A(J,K)	MATI	54
C	MATI	55
100 CONTINUE	MATI	56
C	MATI	57
105 CONTINUE	MATI	58
C	MATI	59
110 IPIVOT(ICOLUM)=IPIVOT(ICOLUM)+1	MATI	60
C	MATI	
INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL	MATI	
C	MATI	
130 IF (IROW-ICOLUM) 140, 260, 140	MATI	
C	MATI	
140 DETERM=-DETERM	MATI	
C	MATI	
150 DO 200 L=1,N	MATI	
C	MATI	
160 SWAP=A(IROW,L)	MATI	
C	MATI	
170 A(IROW,L)=A(ICOLUM,L)	MATI	
C	MATI	
200 A(ICOLUM,L)=SWAP	MATI	
C	MATI	
205 IF(M) 260, 260, 210	MATI	
C	MATI	
210 DO 250 L=1, M	MATI	
C	MATI	
220 SWAP=B(IROW,L)	MATI	
C	MATI	
230 B(IROW,L)=B(ICOLUM,L)	MATI	
C	MATI	
250 B(ICOLUM,L)=SWAP	MATI	
C	MATI	
260 INDEX(I,1)=IROW	MATI	
C	MATI	
270 INDEX(I,2)=ICOLUM	MATI	
C	MATI	
310 PIVOT(I)=A(ICOLUM,ICOLUM)	MATI	
C	MATI	
320 DETERM=DETERM*PIVOT(I)	MATI	
C	MATI	
DIVIDE PIVOT ROW BY PIVOT ELEMENT	MATI	
C	MATI	
330 A(ICOLUM,ICOLUM)=1.0	MATI	

340	DO 350 L=1,N	MATI	61
350	A(ICOLUM,L)=A(ICOLUM,L)/PIVOT(I)	MATI	62
355	IF(M) 380, 380, 360	MATI	63
360	DO 370 L=1,M	MATI	64
370	B(ICOLUM,L)=B(ICOLUM,L)/PIVOT(I)	MATI	65
C		MATI	66
C	REDUCE NON-PIVOT RCWS	MATI	67
C		MATI	68
380	DO 550 L1=1,N	MATI	69
390	IF(L1-ICOLUM) 400, 550, 400	MATI	70
400	T=A(L1,ICOLUM)	MATI	71
420	A(L1,ICOLUM)=0.0	MATI	72
430	DO 450 L=1,N	MATI	73
450	A(L1,L)=A(L1,L)-A(ICOLUM,L)*T	MATI	74
455	IF(M) 550, 550, 460	MATI	75
480	DO 500 L=1,M	MATI	76
500	B(L1,L)=B(L1,L)-B(ICOLUM,L)*T	MATI	77
550	CONTINUE	MATI	78
C		MATI	79
C	INTERCHANGE COLUMNS	MATI	80
C		MATI	81
600	DO 710 I=1,N	MATI	82
610	L=N+1-I	MATI	83
620	IF (INDEX(L,1)-INDEX(L,2)) 630, 710, 630	MATI	84
630	JROW=INDEX(L,1)	MATI	85
640	JCOLUM=INDEX(L,2)	MATI	86
650	DO 705 K=1,N	MATI	87
660	SWAP=A(K,JROW)	MATI	88
670	A(K,JROW)=A(K,JCOLUM)	MATI	89
700	A(K,JCOLUM)=SWAP	MATI	90
705	CONTINUE	MATI	91
710	CONTINUE	MATI	92
740	RETURN	MATI	93
	END	MATI	94

*DECK,SETFLO	SETF	1
SUBROUTINE SETFLO(KASE)	SETF	2
C INITIALIZES FOR FLOVEL CALCULATION BY READING IN DATA PREPARED	SETF	3
REAL IXX, IXY, IYY, MACH	SETF	4
COMMON /VELDAT/ NSYM, NQUAD, I19, I29, LOOP, RBETA	SETF	5
COMMON/COM29/ SIG(1000), D41(1000), XC(1000),YC(1000),ZC(1000),	SETF	6
1 A11(1000),A12 (1000),A13 (1000),A21(1000),A22(1000),A23(1000),	SETF	7
2 A31(1000),A32 (1000),A33 (1000),XI1(1000),XI2(1000),XI3(1000),	SETF	8
3 XI4(1000),ETA1(1000),ETA2(1000),ETA4(1000),TSQ(1000),A(1000),	SETF	9
4 IXX(1000),IXY (1000),IYY (1000),J12 (1000),D23(1000),D34(1000)	SETF	10
REWIND 14	SETF	11
READ(14) KASETP, NSYM, NQUAD, RBETA, MACH	SETF	12
WRITE(6,3000) KASE ,NSYM, NQUAD, MACH	SETF	13
IF(KASE .EQ. KASETP) GO TO 100	SETF	14
REWIND 14	SETF	15
WRITE(6,2000) KASE, KASETP	SETF	16
STOP	SETF	17
100 READ (14)(XC(J),YC (J), ZC(J), A11(J), A12(J), A13(J), A21(J),	SETF	18
1 A22(J), A23(J), A31(J), A32(J), A33(J), XI1(J),ETA1(J),XI2(	SETF	19
2 J), ETA2(J), XI3(J), XI4(J), ETA4(J), TSQ(J), A (J), IXX (J),	SETF	20
3 IXY (J), IYY(J), D12(J), D23(J), D34(J), D41(J) ,J=1,NQUAD)	SETF	21
READ(14)(SIG(I), I=1,NQUAD)	SETF	22
REWIND 14	SETF	23
10 IF (NSYM - 1) 58, 52, 54	SETF	24
52 I29 = 1	SETF	25
I19 = 2	SETF	26
GO TO 60	SETF	27
54 I29 = 2	SETF	28
IF (NSYM .EQ. 3) GO TO 56	SETF	29
I19 = 3	SETF	30
GO TO 60	SETF	31
56 I19 = 4	SETF	32
GO TO 60	SETF	33
58 I19 = 1	SETF	34
60 LOOP = 2 ** NSYM + 1	SETF	35
RETURN	SETF	36
2000 FORMAT(1H-, 5X, 50HTAPE AND CARD IDENTIFIERS DO NOT MATCH. TRY A	SETF	37
1GAIN/ 10X, 9HCARD ID= A4, 5X,9HTAPE ID= A4)	SETF	38
3000 FORMAT(1H1, 19HBODY IDENTIFIER IS A4, 5X, 26HNUMBER OF SYMME	SETF	39
1TRY PLANES=I3, 5X, 25HNUMBER OF QJADRALATERALS=I5, 5X, 12HMACH NUM	SETF	40
2BER=E12.5)	SETF	41
END	SETF	42

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*DECK, FLOVEL
SUBROUTINE FLOVEL( XNPP, YNPP, ZNPP, VXPP, VYPP, VZPP, H, INBODY)
REVISED 5/11/79

GIVEN SPACE COORDINATES, XNPP, YNPP, ZNPP, POTENTIAL FLOW VELOCITY
COMPONENTS, VXPP, VYPP, VZPP, ARE COMPUTED AND RETURNED.
THE HESS-SMITH METHOD IS USED. THE 28 QUANTITIES PLUS THE
SOURCE STRENGTHS, SIG(), ARE STORED IN COMMON/COM29/.
CONTRIBUTIONS FROM NQUAD SURFACE ELEMENTS ARE SUMMED.
UP TO THREE PLANES OF SYMMETRY CAN BE ACCCOMODATED.

REAL M12, M23, M34, M41, IXX, IXY, IYY
COMMON /VELOAT/ NSYM, NQUAD, I19, I29, LOOP, RBETA
DIMENSION X(8), Y(8), Z(8)
COMMON/COM29/ SIG(1000), D41(1000), XC(1000), YC(1000), ZC(1000),
1 A11(1000), A12 (1000), A13 (1000), A21(1000), A22(1000), A23(1000),
2 A31(1000), A32 (1000), A33 (1000), XI1(1000), XI2(1000), XI3(1000),
3 XI4(1000), ETA1(1000), ETA2(1000), ETA4(1000), TSQ(1000), A(1000),
4 IXX(1000), IXY (1000), IYY (1000), D12 (1000), D23(1000), D34(1000)
DATA RHO1SQ, RHO2SQ/ 6.0, 16.0 /
VXPP=0.0
VYPP=0.0
VZPP=0.0
INBODY = 0
DO 2300 I1 = 1, NQUAD
DO 1700 I2 = 1, LOOP
IF ( I2 .EQ. LOOP ) GO TO ( 2000, 910, 920, 930 ), I19
GO TO (1000, 910, 920, 910, 930, 910, 920, 910 ), I2
910 YC ( I1 ) = - YC ( I1 )
A12 ( I1 ) = - A12 ( I1 )
A22 ( I1 ) = - A22 ( I1 )
A31 ( I1 ) = - A31 ( I1 )
A33 ( I1 ) = - A33 ( I1 )
GO TO 932
920 ZC ( I1 ) = - ZC ( I1 )
A13 ( I1 ) = - A13 ( I1 )
A23 ( I1 ) = - A23 ( I1 )
A31 ( I1 ) = - A31 ( I1 )
A32 ( I1 ) = - A32 ( I1 )
GO TO 932
930 XC ( I1 ) = - XC ( I1 )
A11 ( I1 ) = - A11 ( I1 )
A21 ( I1 ) = - A21 ( I1 )
A32 ( I1 ) = - A32 ( I1 )
A33 ( I1 ) = - A33 ( I1 )
932 IF ( I2 .EQ. LOOP ) GO TO ( 2100, 2200 ) , I29
1000 XDIF = XNPP- XC ( I1 )
YDIF = YNPP- YC ( I1 )
ZDIF = ZNPP- ZC ( I1 )

C COMPUTE DISTANCE FROM NULL POINT TO ORIGIN OF J-TH ELEMENT COORDINATE
C SYSTEM ( J CORRESPONDS TO THE INDEX I1 )
C INEQUALITY ( 98 )
ROSQ = XDIF ** 2 + YDIF ** 2 + ZDIF ** 2
IF ( ROSQ .LT. RHO2SQ * TSQ ( I1 ) ) GO TO 1400

C COMPUTE INDUCED VELOCITY COMPONENTS
C EQUATION ( 97 )

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FLOV 1
FLOV 2
FLOV 3
FLOV 4
FLOV 5
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FLOV 57
FLOV 58
FLOV 59
FLOV 60

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ARG1 = A (I1) / SQRT (ROSQ) ** 3	FLOW 61
X (I2) = ARG1 * XDIF	FLOW 62
Y (I2) = ARG1 * YDIF	FLOW 63
Z (I2) = ARG1 * ZDIF	FLOW 64
GO TO 1700	FLOW 65
	FLOW 66
	FLOW 67
C TRANSFORM NULL POINT TO J - ELEMENT COORDINATE SYSTEM	FLOW 68
C EQUATION (78)	FLOW 69
	FLOW 70
	FLOW 71
1400 XNP = A11 (I1) * XCIF + A12 (I1) * YDIF + A13 (I1) * ZCIF	FLOW 72
YNP = A21 (I1) * XDIF + A22 (I1) * YDIF + A23 (I1) * ZCIF	FLOW 73
ZNP = A31 (I1) * XCIF + A32 (I1) * YDIF + A33 (I1) * ZCIF	FLOW 74
	FLOW 75
C INEQUALITIES (99) AND (100)	FLOW 76
IF (ROSQ .LT. RH01SQ * TSQ (I1)) GO TO 1410	FLOW 77
	FLOW 78
C COMPUTE INDUCED VELOCITY COMPONENTS	FLOW 79
C EQUATIONS (57) - (62)	FLOW 80
	FLOW 81
P = YNP **2 + ZNP ** 2 - 4.0 * XNP ** 2	FLOW 82
QP = XNP **2 + ZNP ** 2 - 4.0 * YNP ** 2	FLOW 83
RO = SQRT (ROSQ)	FLOW 84
ROP = RO ** (- 7)	FLOW 85
WXXX = XNP * (9.0 * P + 30.0 * XNP ** 2) * ROP	FLOW 86
WXXY = 3.0 * P * ROP * YNP	FLOW 87
WXYX = 3.0 * XNP * ROP * YNP	FLOW 88
WYYY = YNP * (9.0 * QP + 30.0 * YNP ** 2) * ROP	FLOW 89
WXXZ = 3.0 * ZNP * P * ROP	FLOW 90
WXYZ = - 15.0 * XNP * YNP * ZNP * ROP	FLOW 91
WYYZ = 3.0 * ZNP * QP * ROP	FLOW 92
ROP = - RO ** (- 3)	FLOW 93
WX = ROP * XNP	FLOW 94
WY = ROP * YNP	FLOW 95
WZ = ROP * ZNP	FLOW 96
HIXX = .5 * IXX (I1)	FLOW 97
HIYY = .5 * IYY (I1)	FLOW 98
VX = - WXYX*HIYY - WXXY*IXY (I1) - WXXX*HIXX - WX*A (I1)	FLOW 99
VY = - WYYY*HIYY - WXYX*IXY (I1) - WXXX*HIXX - WY*A (I1)	FLOW 100
VZ = - WYYZ*HIYY - WXYZ*IXY (I1) - WXXZ*HIXX - WZ*A (I1)	FLOW 101
GO TO 1600	FLOW 102
	FLOW 103
	FLOW 104
C COMPUTE INDUCED VELOCITY COMPONENTS	FLOW 104
C EQUATIONS (42) - (49)	FLOW 105
	FLOW 106
	FLOW 107
C CHECK TO SEE IF POINT IS INSIDE BODY	FLOW 107
1410 GO TO (1300, 1310, 1300, 1310, 1300, 1310, 1300, 1310), I2	FLOW 108
1300 IF(ZNP .GT. 0.0 .OR. ROSQ .GT. 0.25*TSQ(I1) .OR. ABS(ZNP) .GT. H)	FLOW 109
1 GO TO 1411	FLOW 110
WRITE (6,5000) I1, I2, ZNP, ROSQ, TSQ(I1), H	FLOW 111
5000 FORMAT(19X,11HINSIDE QUADIS,5X,3HI2=I3/10X,15HZNP,ROSQ,TSQ,H=4(1PE	FLOW 112
113.4))	FLOW 113
INBODY = 1	FLOW 114
GO TO 1411	FLOW 115
1310 IF(ZNP .LT. 0.0 .OR. ROSQ .GT. 0.25*TSQ(I1) .OR. ABS(ZNP) .GT. H)	FLOW 116
1 GO TO 1411	FLOW 117
WRITE (6,5000) I1, I2, ZNP, ROSQ, TSQ(I1), H	FLOW 118
INBODY = 1	FLOW 119
1411 ETA4M3 = ETA4 (I1) - ETA1 (I1)	FLOW 120

RO = SQRT (ROSQ)	FLOV 121
ETA2M1 = ETA2 (I1) - ETA1 (I1)	FLOV 122
XI4M3 = XI4 (I1) - XI 3 (I1)	FLOV 123
XI2M1 = XI2 (I1) - XI1 (I1)	FLOV 124
XI3M2 = XI3 (I1) - XI2 (I1)	FLOV 125
XI1M4 = XI1 (I1) - XI4 (I1)	FLOV 126
XMXI 1 = XNP - XI1 (I1)	FLOV 127
XMXI2 = XNP - XI2 (I1)	FLOV 128
XMXI3 = XNP - XI3 (I1)	FLOV 129
XMXI4 = XNP - XI4 (I1)	FLOV 130
YMETA1= YNP - ETA1 (I1)	FLOV 131
YMETA 2 = YNP - ETA2 (I1)	FLOV 132
YMETA 4 = YNP - ETA4 (I1)	FLOV 133
ZNPSQ = ZNP * ZNP	FLOV 134
IF (ZNPSQ .LT. TSQ (I1) * 1.0E-6) ZNPSQ = 0.0	FLOV 135
E1 = ZNPSQ + XMXI1 **2	FLOV 136
E2 = ZNPSQ + XMXI2 **2	FLOV 137
E3 = ZNPSQ + XMXI3 **2	FLOV 138
E4 = ZNPSQ + XMXI4 **2	FLOV 139
H1 = YMETA1 * XMXI1	FLOV 140
H2 = YMETA2 * XMXI2	FLOV 141
H3 = YMETA1 * XMXI3	FLOV 142
H4 = YMETA4 * XMXI4	FLOV 143
M12 = 0.0	FLOV 144
IF (XI2M1 .NE. 0.0) M12 = ETA2M1 / XI2M1	FLOV 145
M23 = 0.0	FLOV 146
IF (XI3M2 .NE.0.0) M23 = - ETA2M1 / XI3M2	FLOV 147
M34 = 0.0	FLOV 148
IF (XI4M3 .NE. 0.0) M34 = ETA4M3 / XI4M3	FLOV 149
M41 = 0.0	FLOV 150
IF (XI1M4 .NE. 0.0) M41 = - ETA4M3 / XI1M4	FLOV 151
ANUM1 = M12 * E1 - H1	FLOV 152
ANUM2 = M12 * E2 - H2	FLOV 153
ANUM3 = M23 * E2 - H2	FLOV 154
ANUM4 = M23 * E3 - H3	FLOV 155
ANUM5 = M34 * E3 - H3	FLOV 156
ANUM6 = M34 * E4 - H4	FLOV 157
ANUM7 = M41 * E4 - H4	FLOV 158
ANUM8 = M41 * E1 - H1	FLOV 159
R 1 = SQRT (XMXI1 ** 2 + YMETA1 ** 2 + ZNPSQ)	FLOV 160
R2 = SQRT (XMXI2 ** 2 + YMETA2 ** 2 + ZNPSQ)	FLOV 161
R3 = SQRT (XMXI3 ** 2 + YMETA1 ** 2 + ZNPSQ)	FLOV 162
R4 = SQRT (XMXI4 ** 2 + YMETA4 ** 2 + ZNPSQ)	FLOV 163
Q25 = D12 (I1)	FLOV 164
Q26 = D23 (I1)	FLOV 165
Q27 = D34 (I1)	FLOV 166
Q28 = D41 (I1)	FLOV 167
VX = 0.0	FLOV 168
VY = 0.0	FLOV 169
VZ = 0.0	FLOV 170
IF (Q25) 1420, 1430, 1420	FLOV 171
1420 TEMP = R1 + R2	FLOV 172
TEMP1 = TEMP - Q25	FLOV 173
TEMP2 = TEMP + Q25	FLOV 174
ARG1 = 1.0	FLOV 175
IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG1=ALOG(TEMP1/TEMP2)	FLOV 176
TEMP = ARG1 / Q25	FLOV 177
VX = ETA2M1 * TEMP	FLOV 178
VY = - XI2M1 * TEMP	FLOV 179
1430 IF (Q26) 1435, 1440, 1435	FLOV 180

1435	TEMP = R2 + R3	FLOV	181
	TEMP1 = TEMP - Q26	FLOV	182
	TEMP2 = TEMP + Q26	FLOV	183
	ARG2 = 1.0	FLOV	184
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG2=ALOG(TEMP1/TEMP2)	FLOV	185
	TEMP = ARG2 / Q26	FLOV	186
	VX = VX - ETA2M1 * TEMP	FLOV	187
	VY = VY - XI3M2 * TEMP	FLOV	188
1440	IF (Q27) 1450, 1460, 1450	FLOV	189
1450	TEMP = R3 + R4	FLOV	190
	TEMP1 = TEMP - Q27	FLOV	191
	TEMP2 = TEMP + Q27	FLOV	192
	ARG3 = 1.0	FLOV	193
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG3=ALOG(TEMP1/TEMP2)	FLOV	194
	TEMP = ARG3 / Q27	FLOV	195
	VX = VX + ETA4M3 * TEMP	FLOV	196
	VY = VY - XI4M3 * TEMP	FLOV	197
1460	IF (Q28) 1470, 1480, 1470	FLOV	198
1470	TEMP = R4 + R1	FLOV	199
	TEMP1 = TEMP - Q28	FLOV	200
	TEMP2 = TEMP + Q28	FLOV	201
	ARG4 = 1.0	FLOV	202
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG4=ALOG(TEMP1/TEMP2)	FLOV	203
	TEMP = ARG4 / Q28	FLOV	204
	VX = VX - ETA4M3 * TEMP	FLOV	205
	VY = VY - XI1M4 * TEMP	FLOV	206
1480	IF (ZNPSQ .NE. 0.0) GO TO 1510	FLOV	207
	TEST = SQRT(TSQ(I1)* 1.0E-3)	FLOV	208
	IF(Q25.GT.TEST) IF((XMXI1*ETA2M1-YMETA1*XI2M1)/Q25) 1600,1502,1502	FLOV	209
1502	IF(Q26.GT.TEST) IF((-XMXI2*ETA2M1-YMETA2*XI3M2)/Q26) 1600,1504,1504	FLOV	210
1504	IF(Q27.GT.TEST) IF((XMXI3*ETA4M3-YMETA1*XI4M3)/Q27) 1600,1506,1506	FLOV	211
1506	IF(Q28.GT.TEST) IF((-XMXI4*ETA4M3-YMETA4*XI1M4)/Q28) 1600,1508,1508	FLOV	212
1508	VZ = 6.28318531E0	FLOV	213
	GO TO 1600	FLOV	214
1510	IF (XI2M1 .NE. 0.0) VZ = ATAN(ANUM1/(ZNF*R1))-ATAN(ANUM2/(ZNF*R2))	FLOV	215
	IF (XI3M2 .NE. 0.0) VZ=VZ+ATAN(ANUM3/(ZNF*R2))-ATAN(ANUM4/(ZNF*R3))	FLOV	216
	IF (XI4M3 .NE. 0.0) VZ=VZ+ATAN(ANUM5/(ZNF*R3))-ATAN(ANUM6/(ZNF*R4))	FLOV	217
	IF (XI1M4 .NE. 0.0) VZ=VZ+ATAN(ANUM7/(ZNF*R4))-ATAN(ANUM8/(ZNF*R1))	FLOV	218
C		FLOV	219
C	TRANSFORM INDUCED VELOCITY COMPONENTS TO REFERENCE COORDINATE SYSTEM	FLOV	220
C	EQUATION (79)	FLOV	221
		FLOV	222
1600	X (I2) = A11 (I1) * VX + A21 (I1) * VY + A31 (I1) * VZ	FLOV	223
	Y (I2) = A12 (I1) * VX + A22 (I1) * VY + A32 (I1) * VZ	FLOV	224
	Z (I2) = A13 (I1) * VX + A23 (I1) * VY + A33 (I1) * VZ	FLOV	225
1700	CONTINUE	FLOV	226
		FLOV	227
2000	VXPP = VXPP + SIG(I1) * X(1)	FLOV	228
	VYPP = VYPP + SIG(I1) * Y(1)	FLOV	229
	VZPP = VZPP + SIG(I1) * Z(1)	FLOV	230
	GO TO 2300	FLOV	231
2100	VXPP = VXPP + SIG(I1) * (X(1) + X(2))	FLOV	232
	VYPP = VYPP + SIG(I1) * (Y(1) + Y(2))	FLOV	233
	VZPP = VZPP + SIG(I1) * (Z(1) + Z(2))	FLOV	234
	GO TO 2300	FLOV	235
2200	VXPP = VXPP + SIG(I1) * (X(1) + X(2) + X(3) + X(4))	FLOV	236
	VYPP = VYPP + SIG(I1) * (Y(1) + Y(2) + Y(3) + Y(4))	FLOV	237
	VZPP = VZPP + SIG(I1) * (Z(1) + Z(2) + Z(3) + Z(4))	FLOV	238
2204	IF (NSYM .EQ. 2) GO TO 2300	FLOV	239
	VXPP = VXPP - SIG(I1) * (X(5) + X(6) + X(7) + X(8))	FLOV	240

VYPP = VYPP - SIG(I1) * (Y(5) + Y(6) + Y(7) + Y(8))	FLOV 241
VZPP = VZPP - SIG(I1) * (Z(5) + Z(6) + Z(7) + Z(8))	FLOV 242
2300 CONTINUE	FLOV 243
VXPP = VXPP * RBETA**2 + 1.0	FLOV 244
VYPP = VYPP * RBETA	FLOV 245
VZPP = VZPP * RBETA	FLOV 246
RETURN	FLOV 247
END	FLOV 248

*DECK, FLOAIR

SUBROUTINE FLOAIR(X, Z, ECC, VX, VZ, PSI, IFLAG)	FLOA 1
C THIS CODE RETURNS AIRFLOW VELOCITY (VX, VZ) FOR A GIVEN POINT	FLOA 2
C (X, Z) EXTERIOR TO AN ELLIPSOID OF REVOLUTION IN AN AIRSTREAM.	FLOA 3
C THE ELLIPSOID IS PROLATE WITH MAJOR AXIS PARALLEL WITH THE FREE	FLOA 4
C STREAM FLOW. FLOW IS TOWARD THE POSITIVE X AXIS. PSI IS THE	FLOA 5
C STREAM FUNCTION VALUE AT X,Z. ECC IS THE ELLIPSOID ECCENTRICITY.	FLOA 6
IF(IFLAG)100,100,200	FLOA 7
C INITIALIZE	FLOA 8
100 E2 = ECC**2	FLOA 9
OME2 = 1.0 - E2	FLOA 10
TEC = 2.0 * ECC	FLOA 11
CX = -ECC/(ALOG((1.0 + ECC)/(1.0 - ECC)) - TEC/OME2)	FLOA 12
CZ = TEC*CX	FLOA 13
CPSI = ECC*CX	FLOA 14
C COMPUTE FLOW VELOCITIES AND STREAMFUNCTION VALUE	FLOA 15
200 SQRM = SQRT((X + ECC)**2 + Z**2)	FLOA 16
SQRN = SQRT((X - ECC)**2 + Z**2)	FLOA 17
VX = CX*(ALOG((SGRM + SQRN + TEC)/ (SQRM + SQRN - TEC))/ECC	FLOA 18
1 - 1.0/SQRM - 1.0/SQRN) + 1.0	FLOA 19
VZ = CZ*Z*(1.0/SQRM - 1.0/SQRN)/ (X**2 + Z**2 + SGRM*SQRN - E2)	FLOA 20
COSH = (SQRM + SQRN)/TEC	FLOA 21
COS = (SQRM - SQRN)/TEC	FLOA 22
PSI = CPSI*(COSH + 0.5*(COSH**2 - 1.0)*	FLOA 23
1 ALOG((COSH - 1.0)/(COSH + 1.0))) * (1.0 - COS**2) - Z**2/2.0	FLOA 24
RETURN	FLOA 25
END	FLOA 26
	FLOA 27

*DECK, ARYTRJ	ARYT	1
SUBROUTINE ARYTRJ	ARYT	2
C	ARYT	3
C	ARYT	4
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C	ARYT	60

C	NSKIP	NUMBER OF ARRAY POINTS SKIPPED BETWEEN TRAJECTORIES	ARYT	61
C	P()	CURRENT VALUES OF INDEPENDENT VARIABLES -	ARYT	62
C		P(1) = X	ARYT	63
C		P(2) = DX/DT	ARYT	64
C		P(3) = Y	ARYT	65
C		P(4) = DY/DT	ARYT	66
C		P(5) = Z	ARYT	67
C		P(6) = DZ/DT	ARYT	68
C	PT	DRAG COEFFICIENT*ABS(REYNOLDS NUMBER) FOR GRAVITY SETTLING	ARYT	69
C		OF PARTICLES	ARYT	70
C	RF	FACTOR TO CONVERT VELOCITY DIFFERENCE TO REYNOLDS NUMBER	ARYT	71
C	RHO	AIR DENSITY (KG/M**3)	ARYT	72
C	RHOP	PARTICLE DENSITY (KG/M**3)	ARYT	73
C	TEMP	AIR TEMPERATURE (DEG. KELVIN)	ARYT	74
C	TPRINT	OUTPUT TIME INTERVAL	ARYT	75
C	V	AIR SPEED (M/SEC)	ARYT	76
C	VIS	AIR VISCOSITY (KG/(M-SEC))	ARYT	77
C	VPGT	PARTICLE SPEED AT TARGET POINT	ARYT	78
C	VT	GRAVITY SETTLING SPEED OF PARTICLE	ARYT	79
C	VTGT	AIR SPEED AT TARGET POINT	ARYT	80
C	X	INITIAL COORDINATE ARRAY	ARYT	81
C	XFINAL	X COORDINATE OF THE FINAL PLANE	ARYT	82
C	XI3,YI3,ZI3	INITIAL COORDINATES PASSED TO TRAJECT	ARYT	83
C			ARYT	84
C			ARYT	85
C	COMMON	XI3,YI3,ZI3,YI3P,EPSI(3),HI,HMINI,VT,PT,COF,FNR,PACT,	ARYT	86
C	1RF,REQ,R,XPSTAR,YPSTAR,ZPSTAR,P(6),TPRINT,IT,ALPHA0,BETA0,IREC,		ARYT	87
C	2IPLT,IPLT,XPLOT(60),YPLCT(60),ZPLOT(60),ALPHAR,BETAR,YPSTARP,		ARYT	88
C	3ZPSTARP,XI3P,ZI3P,XP,YP,ZP,XWP,XP2,ACC,DLR,JLIM		ARYT	89
C	DIMENSION	HOLL(18), X(3), D(3), N(3), M(3), SX(3), SD(3), NS(3),	ARYT	90
C	1 SXI(3), SEQ(6)		ARYT	91
C	LOGICAL	IPLT	ARYT	92
C	DATA SEQ/ 4HFIRS, 4HT	, 4HSECO, 4HND , 4HTHIR, 4HD /	ARYT	93
C	DATA STAR, BLNK / 3H *	, 3H / , PI/3.1415926536/	ARYT	94
C	JLIM=0		ARYT	95
C	NFIN=0		ARYT	96
C		READ AND WRITE DATA	ARYT	97
C	READ (5,2600) KASE		ARYT	98
C	CALL SETFLO(KASE)		ARYT	99
C	READ(5,1000)HOLL,	IPLT	ARYT	100
C	READ(5,1100)V, ELL, RHO, TEMP, XFINAL		ARYT	101
C	READ(5,1100) TPRINT, HI, HMINI, EPSI		ARYT	102
C	SET DEFAULT VALUES FOR NUMERICAL INTEGRATION AND PRINT PARAMETERS		ARYT	103
C	IF(TPRINT .EQ. 0.0) TPRINT=0.1		ARYT	104
C	IF(HI .EQ. 0.0) HI=0.1		ARYT	105
C	IF(HMINI .EQ. 0.0) HMINI=0.005		ARYT	106
C	IF(EPSI(1) .EQ. 0.0) EPSI(1)=1.0E-5		ARYT	107
C	IF(EPSI(2) .EQ. 0.0) EPSI(2)=1.0E-5		ARYT	108
C	IF(EPSI(3) .EQ. 0.0) EPSI(3)=1.0E-5		ARYT	109
C	VIS = 145.8E-8 * TEMP**(3.0/2.0)/(110.4 + TEMP)		ARYT	110
C	WRITE(6,1200) HOLL		ARYT	111
C	WRITE(6,1300) V, ELL, RHO, TEMP, VIS		ARYT	112
C	WRITE(6,1400) HI,HMINI,TPRINT,XFINAL		ARYT	113
C	WRITE(6,1500) EPSI(1), EPSI(2), EPSI(3)		ARYT	114
C	INITIALIZE		ARYT	115
C	FN = V**2/(9.8*ELL)		ARYT	116
C	FNR = 1.0/FN		ARYT	117
C	IF (.NOT. IPLT) GO TO 5		ARYT	118
C	REWIND 10		ARYT	119
C	WRITE (6,1800)		ARYT	120

C	ENTER PARTICLE LOOP	ARYT 121
5	CALL PARTCL(V,ELL,RHG,VIS,TEMP,DIAM,DLR,RHOP,VT,RF,PT,ACC,NFIN)	ARYT 122
	IF(NFIN.EQ.0) GO TO 6	ARYT 123
	IF(.NOT.IPLOT) RETURN	ARYT 124
	ENDFILE 10	ARYT 125
	REWIND 10	ARYT 126
	RETURN	ARYT 127
6	COF = PT*VT*FN	ARYT 128
	R = RF * VT	ARYT 129
	READ(5,8100)M, NSKIP	ARYT 130
	IF(M(1)+M(2)+M(3).EQ.6) GO TO 10	ARYT 131
	WRITE(6,8200)	ARYT 132
	STOP	ARYT 133
10	DO 20 L=1,3	ARYT 134
20	READ(5,8000) X(L), D(L), N(L)	ARYT 135
	WRITE(6,2000) X(1), D(1), N(1)	ARYT 136
	WRITE(6,3000) X(2), D(2), N(2)	ARYT 137
	WRITE(6,4000) X(3), D(3), N(3)	ARYT 138
	WRITE(6,9000)	ARYT 139
	WRITE(6,5000) SEQ(2*M(1)-1), SEQ(2*M(1))	ARYT 140
	WRITE(6,6000) SEQ(2*M(2)-1), SEQ(2*M(2))	ARYT 141
	WRITE(6,7000) SEQ(2*M(3)-1), SEQ(2*M(3))	ARYT 142
	DO 40 L=1,3	ARYT 143
	LL=4-M(L)	ARYT 144
	SD(LL)=D(L)	ARYT 145
	SXI(LL)=X(L)-D(L)	ARYT 146
40	NS(LL)=N(L)	ARYT 147
	N1=NS(1)	ARYT 148
	N2=NS(2)	ARYT 149
	N3=NS(3)	ARYT 150
	NPOINT=0	ARYT 151
	SX(1)=SXI(1)	ARYT 152
	DO 500 I=1,N1	ARYT 153
	SX(1)=SX(1)+SD(1)	ARYT 154
	SX(2)=SXI(2)	ARYT 155
	DO 500 J=1,N2	ARYT 156
	SX(2)=SX(2)+SD(2)	ARYT 157
	SX(3)=SXI(3)	ARYT 158
	DO 500 K=1,N3	ARYT 159
	SX(3)=SX(3)+SD(3)	ARYT 160
	NPOINT=NPOINT+1	ARYT 161
	IF(MOD(NPOINT, NSKIP+1).NE.1) GO TO 500	ARYT 162
	DO 50 L=1,3	ARYT 163
	LL=4-M(L)	ARYT 164
50	X(L)=SX(LL)	ARYT 165
C	INITIALIZE FOR TRAJECT	ARYT 166
	XI3=X(1)	ARYT 167
	YI3=X(2)	ARYT 168
	ZI3=X(3)	ARYT 169
	XPSTAR=XFINAL	ARYT 170
	XPP = XFINAL	ARYT 171
	ALPHAR=0.0	ARYT 172
	BETAR=0.0	ARYT 173
	YP = 0.0	ARYT 174
	ZP = 0.0	ARYT 175
	WRITE(6,1600) XI3, YI3, ZI3	ARYT 176
	CALL TRAJECT	ARYT 177
C	PRINT TRAJECTORY OUTPUT	ARYT 178
	REWIND 9	ARYT 179
	WRITE (6,8700)	ARYT 180

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DO 494 IWRITE = 1,IREC                                ARYT 181
READ (9)NEVAL,KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY, ARYT 182
2 VZ, H, R, AC                                        ARYT 183
WRITE(6,8600) KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY, ARYT 184
2 VZ, H, R, AC, NEVAL                                ARYT 185
494 CONTINUE                                          ARYT 186
C              COMPUTE INITIAL AND FINAL TRAJECTORY ANGLES ARYT 187
CALL FLOVEL(XI3,YI3,ZI3,VX,VY,VZ,HI,INBODY)          ARYT 188
ALPHA0 = ATAN(VY/VX) * 180./PI                       ARYT 189
BETA0 = ATAN((VZ-VT)/SQRT(VX**2 + VY**2)) * 180./PI ARYT 190
ALPHAR = ATAN(P(4)/P(2))*180./PI                    ARYT 191
BETAR = ATAN(P(6)/SQRT(P(2)**2+P(4)**2))*180./PI    ARYT 192
WRITE (6,8800) ALPHA0, BETA0, ALPHAR, BETAR        ARYT 193
C              COMPUTE AND PRINT DRAG VECTOR AT FINAL POINT ARYT 194
CALL FLOVEL(P(1), P(3), P(5), VX, VY, VZ, HI, INBODY) ARYT 195
DV = SQRT( (VX - P(2))**2 + (VY - P(4))**2 + (VZ - P(6))**2 ) ARYT 196
COSA = (VX - P(2))/DV                                ARYT 197
COSB = (VY - P(4))/DV                                ARYT 198
COSC = (VZ - P(6))/DV                                ARYT 199
ANG = ATAN( COSB/COSA ) * 57.29577951              ARYT 200
CNG = ACOS( COSC ) * 57.29577951                   ARYT 201
WRITE( 6, 3100 ) COSA, CCSB, COSC, ANG, CNG        ARYT 202
C              COMPUTE AND PRINT AIF AND PARTICLE SPEEDS AT FINAL POINT ARYT 203
VA = SQRT( VX**2 + VY**2 + VZ**2 )                 ARYT 204
VP = SQRT(P(2)**2 + P(4)**2 + P(6)**2)             ARYT 205
WRITE(6, 3200) VA, VP                               ARYT 206
IF (IPL0T) WRITE (10) IFLT, (XPL0T(L),YFLOT(L),ZPL0T(L),L=1,IPLT) ARYT 207
C                                                    ARYT 208
500 CONTINUE                                         ARYT 209
GO TO 5                                              ARYT 210
1000 FORMAT(18A4, 7X,L1)                             ARYT 211
1100 FORMAT(8F10.5)                                  ARYT 212
1200 FORMAT(1H1,5X, 15HARYTRJ RUN ID -/ 8X, 18A4)   ARYT 213
1300 FORMAT(1H0, 5X, 21HPHYSICAL INPUT DATA -/7X,10HAI R SPEED=1PE13.6, ARYT 214
1 3X, 37HCHARACTERISTIC DIMENSION OF THE BODY=1PE13.6/ 7X,35HCENSITARYT 215
2Y AND TEMPERATURE OF AIR ARE 1PE13.6, 5H AND 1PE13.6.20H AIR VISARYT 216
3COSITY IS 1PE13.6)                                  ARYT 217
1400 FORMAT( 1H0, 5X, 25HNUMERICAL INTEGRATOR INPUTS -/ 7X, 10HTIME STEARYT 218
1P=1PE11.4, 3X, 18HMINIMUM TIME STEP=1PE11.4, 3X, 20HPRINT TIME INTARYT 219
2ERVAL=1PE11.4, 3X, 24HX COORD. OF FINAL FLANE=1PE11.4) ARYT 220
1500 FORMAT( 1H0, 6X, 33HLOCAL ERROR TOLERANCES FOR DVDQ -, 3(1PE14.4)) ARYT 221
1600 FORMAT(//1H0, 38H* * * * * INITIAL COORDINATES X=1PE12.5, ARYT 222
2 3X, 2HY=1PE12.5, 3X, 2HZ=1PE12.5)                ARYT 223
1800 FORMAT( //6X, 52HTRAJECTORY DATA ARE WRITTEN ON UNIT 10 FOR PLOT\ARYT 224
1TING//)                                             ARYT 225
2000 FORMAT( 10X, 10HINITIAL X=1PE11.4, 12H INCREMENT=1PE11.4, ARYT 226
1 19H NUMBER OF VALUES=I4)                         ARYT 227
2600 FORMAT (A4)                                     ARYT 228
3000 FORMAT( 10X, 10HINITIAL Y=1PE11.4, 12H INCREMENT=1PE11.4, ARYT 229
1 19H NUMBER OF VALUES=I4)                         ARYT 230
3100 FORMAT(/5X, 29HDRAG VECTOR AT FINAL POINT -/ 6X, 18HDIRECTION COSARYT 231
1INES-3(1PE13.4), 3X, 19HANGLES A AND GAMMA-2(1PE13.4)) ARYT 232
3200 FORMAT(5X, 47HAI R AND PARTICLE SPEEDS AT THE FINAL PCINT ARE2(1PEARYT 233
115.5))                                             ARYT 234
4000 FORMAT( 10X, 10HINITIAL Z=1PE11.4, 12H INCREMENT=1PE11.4, ARYT 235
1 19H NUMBER OF VALUES=I4)                         ARYT 236
5000 FORMAT( 10X, 22HX AXIS IS INCREMENTED 2A4)    ARYT 237
6000 FORMAT( 10X, 22HY AXIS IS INCREMENTED 2A4)    ARYT 238
7000 FORMAT( 10X, 22HZ AXIS IS INCREMENTED 2A4)    ARYT 239
8000 FORMAT( 2F10.0, I4)                            ARYT 240

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8100	FORMAT(4I4)	ARYT	241
8200	FORMAT(///10X, 47HINCREMENTING SEQUENCE IS ERRONIOUS. TRY AGAIN.)	ARYT	242
8600	FORMAT(I6, 10(1X,1PE11.4)/10X, 2HH=1PE11.4,4H R=1PE11.4, 5F AC=	ARYT	243
	11PE11.4, 8H NEVAL=I6)	ARYT	244
8700	FORMAT(/6HOKSTEP, 7X, 1HT, 11X, 1HX, 11X, 1HY, 11X, 1HZ, 10X,	ARYT	245
	1 3HVPX, 9X, 3HVPY, 9X, 3HVPZ, 10X, 2HVX, 10X, 2HVV, 10X, 2HVZ)	ARYT	246
8800	FORMAT(/20X, 47HINITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -	ARYT	247
	1/ 22X, 7HALPHA0=F10.4, 5X, 6HBETA0=F10.4/ 22X, 7HALPHAR=F10.4, 5X	ARYT	248
	2, 6HBETAR=F10.4)	ARYT	249
9000	FORMAT(1H0)	ARYT	250
	END	ARYT	251

*DECK, TANTRA	TANT	1
SUBROUTINE TANTRA	TANT	2
C	TANT	3
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979	TANT	4
C	TANT	5
C DETERMINES TANGENT PARTICLE TRAJECTORIES TO AN ARBITRARY	TANT	6
C 3-DIMENSIONAL BODY.	TANT	7
C	TANT	8
C CALLS TRAJECT TO COMPUTE TRAJECTORIES OF PARTICLES TO OR ABOUT	TANT	9
C AN ARBITRARY 3-DIMENSIONAL BODY. TRAJECTORIES BEGIN AT POINTS	TANT	10
C ON A CURVE AS SPECIFIED BY SR, STRPNT, AND THE INITIAL POINTS ARE	TANT	11
C STEPPED TOWARD THE BCDY USING FIRST A COARSE STEP SIZE UNTIL	TANT	12
C IMPACTION OCCURS. THEN INITIAL COORDINATES ARE BACKED-UP ONE	TANT	13
C STEP, AND A FINE STEP SIZE IS USED UNTIL IMPACTION REOCCURS.	TANT	14
C THE TANGENT TRAJECTORY IS TAKEN TO BE THE ONE CALCULATED	TANT	15
C IMMEDIATELY PRIOR TO THE SECOND IMPACTION. POINTS ON THE TANGENT	TANT	16
C TRAJECTORY ONLY ARE STORED FOR PLOTTING LATER IF DESIRED.	TANT	17
C ALL TRAJECTORIES ARE PRINTED.	TANT	18
C	TANT	19
C SR PARTCL IS CALLED TO READ, PROCESS AND PRINT PARTICLE DATA.	TANT	20
C THIS SR CAN BE ONE OF SEVERAL THAT TREATS WATER DROPS OR ONE OF	TANT	21
C VARIOUS TYPES OF ICE CRYSTALS.	TANT	22
C	TANT	23
C UNIT 9 IS A SCRATCH UNIT USED FOR TRAJECTORY DATA STORAGE.	TANT	24
C UNIT 10 IS USED FOR TRAJECTORY DATA OUTPUT FOR PLOTTING.	TANT	25
C	TANT	26
C FLOW DATA PREPARED BY THE HESS-SMITH CODE ARE READ FROM UNIT 14	TANT	27
C VIA SR SETFLO.	TANT	28
C	TANT	29
C ALL COORDINATES AND TIMES ARE NORMALIZED (DIMENSIONLESS)	TANT	30
C	TANT	31
C GLOSSARY	TANT	32
C ACC DIAM/ELL - USED TO COMPUTE ACCELERATION MODULUS	TANT	33
C ALPHA ANGLE BETWEEN PROJECTION OF FINAL VELOCITY VECTOR IN X-Y	TANT	34
C PLANE AND X AXIS	TANT	35
C BETAR ANGLE BETWEEN FINAL VELOCITY VECTOR AND ITS PROJECTION	TANT	36
C IN THE X-Y PLANE	TANT	37
C DCORS COARSE VALUE OF DEL USED FOR ROUGH DETERMINATION OF	TANT	38
C TANGENT TRAJECTORY	TANT	39
C DEL CURRENT VALUE OF STEP SIZE USED IN INCREMENTING INITIAL	TANT	40
C COORDINATES TOWARD THE BODY	TANT	41
C DFINE FINE VALUE OF DEL USED FOR PRECISE DETERMINATION OF	TANT	42
C TANGENT TRAJECTORY	TANT	43
C DIAM DIAMETER OF A WATER DROP OR ICE AGGREGATE	TANT	44

C		BASE DIAMETER FOR A PLATE OR CYLINDER (MICROMETERS)	TANT	45
C	DLR	BASE DIAMETER TO LENGTH (CYLINDER) OR THICKNESS (PLATE)	TANT	46
C		RATIO	TANT	47
C	ELL	CHARACTERISTIC DIMENSION OF THE BODY (METERS)	TANT	48
C	EPSI()	PARAMETERS USED TO CONTROL LOCAL ERROR IN THE NUMERICAL	TANT	49
C		INTEGRATION (SEE DVDQ GLOSSARY)	TANT	50
C	FN	FROUDE NUMBER	TANT	51
C	FNR	RECIPROCAL OF THE FROUDE NUMBER	TANT	52
C	HI	INITIAL TIME STEP FOR NUMERICAL INTEGRATION (SEE DVDQ)	TANT	53
C	HMAX	MAXIMUM TIME STEP (SEE DVDQ)	TANT	54
C	HMIN	MINIMUM ALLOWED TIME STEP (SEE DVDQ)	TANT	55
C	IPLLOT	IF TRUE, TRAJECTORY DATA ARE COPIED TO UNIT 18 FOR PLOTTING	TANT	56
C	IT	WHEN RETURNED FROM TRAJECT	TANT	57
C		WITH A VALUE OF ZERO, INDICATES IMPACTION HAS OCCURED.	TANT	58
C	KT	TRAJECTORY TALLY	TANT	59
C	P()	CURRENT VALUES OF INDEPENJENT VARIABLES -	TANT	60
C		P(1) = X	TANT	61
C		P(2) = DX/DT	TANT	62
C		P(3) = Y	TANT	63
C		P(4) = DY/DT	TANT	64
C		P(5) = Z	TANT	65
C		P(6) = DZ/DT	TANT	66
C	PT	DRAG COEFFICIENT*ABS(REYNOLDS NUMBER) FOR GRAVITY SETTLING	TANT	67
C		OF PARTICLES	TANT	68
C	RF	FACTOR TO CONVERT VELOCITY DIFFERENCE TO REYNOLDS NUMBER	TANT	69
C	RHO	AIR DENSITY (KG/M**3)	TANT	70
C	RHOP	PARTICLE DENSITY (KG/M**3)	TANT	71
C	TEMP	AIR TEMPERATURE (DEG. KELVIN)	TANT	72
C	TPRINT	OUTPUT TIME INTERVAL	TANT	73
C	V	AIR SPEED (M/SEC)	TANT	74
C	VIS	AIR VISCOSITY (KG/(M-SEC))	TANT	75
C	VT	GRAVITY SETTLING SPEED OF PARTICLE	TANT	76
C	XFINAL	X COORDINATE OF THE FINAL PLANE	TANT	77
C	XI3,YI3,ZI3	INITIAL COORDINATES PASSED TO TRAJECT	TANT	78
C			TANT	79
		COMMON XI3,YI3,ZI3,YI3P, EPSI(3),HI,HMINI,VT,PT,COF,FNR,PACT,	TANT	80
		1RF,RE0,R,XPSTAR,YPSTAR,ZFSTAR,P(6),TPRINT,IT,ALPHA0,BETA0,IREC,	TANT	81
		2IPLLOT,IPLT,XPLOT(60),YPLOT(60),ZPLOT(60),ALPHAR,BETAR,YPSTARF,	TANT	82
		3ZPSTARP,XI3P,ZI3F,XP,YP,ZP,XWP,XPP,ACC,DLR,JLIM	TANT	83
		DIMENSION HOLL(18)	TANT	84
		LOGICAL IPLLOT	TANT	85
		DATA SIGNAL/999999./, KTLIM/ 25/	TANT	86
		JLIM=0	TANT	87
		NFIN=0	TANT	88
C		READ AND WRITE DATA	TANT	89
		READ (5,2600) KASE	TANT	90
		CALL SETFLO(KASE)	TANT	91
		READ(5,1000)HOLL, IPLLOT	TANT	92
		READ(5,1100)V, ELL, RHO, TEMP, XFINAL	TANT	93
		READ(5,1100) TPRINT, HI, HMINI, EPSI	TANT	94
C		SET DEFAULT VALUES FOR NUMERICAL INTEGRATION AND PRINT PARAMETERS	TANT	95
		IF(TPRINT .EQ. 0.0) TPRINT=0.1	TANT	96
		IF(HI .EQ. 0.0) HI=0.1	TANT	97
		IF(HMINI .EQ. 0.0) HMINI=0.005	TANT	98
		IF(EPSI(1) .EQ. 0.0) EPSI(1)=1.0E-5	TANT	99
		IF(EPSI(2) .EQ. 0.0) EPSI(2)=1.0E-5	TANT	100
		IF(EPSI(3) .EQ. 0.0) EPSI(3)=1.0E-5	TANT	101
		VIS = 145.8E-8 * TEMP**(3.0/2.0)/(110.4 + TEMP)	TANT	102
		WRITE(6,1200) HOLL	TANT	103
		WRITE(6,1300) V, ELL, RHC, TEMP, VIS	TANT	104

	WRITE(6,1400) HI,HMINI,TPRINT,XFINAL	TANT 105
	WRITE(6,1500) EPSI(1), EPSI(2), EPSI(3)	TANT 106
C	INITIALIZE	TANT 107
	FN = V**2/(9.8*ELL)	TANT 108
	FNR = 1.0/FN	TANT 109
	IF (.NOT. IPLOT) GO TO 5	TANT 110
	REWIND 10	TANT 111
	WRITE (6,1800)	TANT 112
C	ENTER PARTICLE LCOP	TANT 113
5	CALL PARTCL(V,ELL,RHO,VIS,TEMP,DIAM,DLR,RHOP,VT,RF,PT,ACC,NFIN)	TANT 114
	IF(NFIN .EQ. 0) GO TO 6	TANT 115
	IF(.NOT. IPLOT) RETURN	TANT 116
	ENDFILE 10	TANT 117
	REWIND 10	TANT 118
	RETURN	TANT 119
6	COF = PT*VT*FN	TANT 120
	R = RF * VT	TANT 121
	MFIN=0	TANT 122
C	SET INITIAL COORDINATES	TANT 123
10	DFINE=SIGNAL	TANT 124
	IT=1	TANT 125
	KT=0	TANT 126
20	CALL STRPNT(XI3, YI3, ZI3, DEL, DCORS, DFINE, MFIN)	TANT 127
	IF(MFIN .GT. 0) GO TO 5	TANT 128
	KT=KT+1	TANT 129
	IF(KT .GT. KTLIM) GO TO 60	TANT 130
	XPSTAR=XFINAL	TANT 131
	XPP = XFINAL	TANT 132
	ALPHAR=0.0	TANT 133
	BETAR=0.0	TANT 134
	YP = 0.0	TANT 135
	ZP = 0.0	TANT 136
	WRITE(6,1600) XI3, YI3, ZI3, KT	TANT 137
	CALL TRAJECT	TANT 138
C	PRINT TRAJECTORY OUTPUT	TANT 139
	REWIND 9	TANT 140
	WRITE (6,8700)	TANT 141
	DO 30 IWRITE = 1,IREC	TANT 142
	READ (9)NEVAL,KSTEP, T, P(1), P(3), P(5), F(2), P(4), P(6),VX, VY,	TANT 143
2	VZ, H, R, AC	TANT 144
	WRITE(6,8600) KSTEP, T, P(1), P(3), P(5), F(2), P(4), P(6),VX, VY,	TANT 145
2	VZ, H, R, AC, NEVAL	TANT 146
30	CONTINUE	TANT 147
C	CHECK FOR IMPACTION AND ADJUST DEL IF NECESSARY	TANT 148
	IF(IT .LE. 0) GO TO 40	TANT 149
	IF(DEL .EQ. -DFINE) GO TO 50	TANT 150
	IF(DEL .NE. -DCORS) GO TO 20	TANT 151
	DEL=DFINE	TANT 152
	WRITE(6,3000)	TANT 153
	GO TO 20	TANT 154
C	IMPACTION HAS OCCURED	TANT 155
40	IT=1	TANT 156
	IF(DEL .EQ. -DCORS) GO TO 20	TANT 157
	IF(DEL .EQ. DFINE) WRITE(6,4000)	TANT 158
	KT=KT-2	TANT 159
	DEL=-DEL	TANT 160
	GO TO 20	TANT 161
50	IF(.NOT. IPLOT) GO TO 10	TANT 162
	IF (IPLOT) WRITE (10) IFLT, (XPLOT(L),YFLOT(L),ZPLOT(L),L=1,IFLT)	TANT 163
	GO TO 10	TANT 164

*DECK, STRPNT	STRP	1
SUBROUTINE STRPNT(X, Y, Z, D, DCORS, DFINE, M)	STRP	2
C	STRP	3
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1979	STRP	4
C	STRP	5
C CALLED BY TANTRA TO DEFINE TRAJECTORY STARTING COORDINATES FOR	STRP	6
C DETERMINATION OF TANGENT TRAJECTORIES OF PARTICLES TO A THREE-	STRP	7
C DIMENSIONAL BODY. THIS VERSION STARTS ALL TRAJECTORIES ON A	STRP	8
C POINTS ARE STEPPED ALONG THE LINE TOWARD THE BODY USING	STRP	9
C FIRST A COARSE STEP SIZE, AND AFTER IMPACTION AND BACK-UP A FINE	STRP	10
C STEP SIZE UNTIL IMPACTION REOCCURS.	STRP	11
C	STRP	12
C GLOSSARY	STRP	13
C COSA,COSB,COSG DIRECTION COSINES OF THE STARTING POINT LINE	STRP	14
C D CURRENT VALUE OF STEP SIZE USED IN INCREMENTING INITIAL	STRP	15
C COORDINATES TOWARD THE BODY	STRP	16
C DCORS COARSE VALUE OF D USED FOR ROUGH DETERMINATION OF	STRP	17
C TANGENT TRAJECTORY	STRP	18
C DFINE FINE VALUE OF D USED FOR PRECISE DETERMINATION OF	STRP	19
C TANGENT TRAJECTORY	STRP	20
C X,Y,Z STARTING COORDINATES	STRP	21
C X1,Y1,Z1 POINT USED, ALONG WITH FIRST STARTING POINT, TO DEFINE	STRP	22
C THE STARTING POINT LINE	STRP	23
C	STRP	24
C DATA SIGNAL/999999./	STRP	25
C IF(DFINE .LT. SIGNAL) GO TO 200	STRP	26
COPY IN STEP SIZE INCREMENTS AND INITIALIZE FOR A NEW TANGENT LOCATION	STRP	27
READ(5,1100) DCORS, CFINE	STRP	28
CHECK IF TRAJECTORIES FOR THIS PARTICLE SIZE ARE FINISHED	STRP	29
M=0	STRP	30
IF(ABS(DCORS) + ABS(DFINE) .NE. 0.0) GO TO 100	STRP	31
M=1	STRP	32
RETURN	STRP	33
COPY IN A PAIR OF POINT COORDINATES TO DEFINE THE STARTING POINT LINE.	STRP	34
C THE FIRST COORDINATES SPECIFY THE START POINT FOR THE FIRST	STRP	35
C TRAJECTORY, AND THE SECOND COORDINATES ARE FOR ANY POINT ON THE	STRP	36
C LINE WHICH IS CLOSER TOWARD THE BODY.	STRP	37
100 READ(5,1100) X, Y, Z, X1, Y1, Z1	STRP	38
COMPUTE DIRECTION COSINES OF THE STARTING POINT LINE	STRP	39
R = SQRT((X1-X)**2 + (Y1-Y)**2 + (Z1-Z)**2)	STRP	40
COSA = (X1-X)/R	STRP	41
COSB = (Y1-Y)/R	STRP	42
COSG = (Z1-Z)/R	STRP	43
D = DCORS	STRP	44
WRITE(6,1000) X, Y, Z, X1, Y1, Z1	STRP	45
WRITE(6,1200) COSA, COSB, COSG	STRP	46
WRITE(6,1300) DCORS, DFINE	STRP	47
RETURN	STRP	48
COMPUTE NEXT SET OF STARTING COORDINATES	STRP	49
200 X = X + D*COSA	STRP	50
Y = Y + D*COSB	STRP	51
Z = Z + D*COSG	STRP	52
RETURN	STRP	53
1000 FORMAT(/////5X,89HTRAJECTORIES ARE TO BEGIN ALONG A LINE DEFINED B	STRP	54
1Y THE POINTS (X1,Y1,Z1,) AND (X2,Y2,Z2) -/ 9X,2H(,3(1PE15.5),	STRP	55
2 13H) AND (, 3(1PE15.5), 2H)	STRP	56
1100 FORMAT(3F10.0)	STRP	57
1200 FORMAT(5X, 60HWITH DIRECTION COSINES -(COS(ALPHA),COS(BETA),COS(GA	STRP	58
1MMA)) - 3(1PE15.5)/)	STRP	59
1300 FORMAT(5X, 49HSTARTING POINT INCREMENTS ARE - COARSE INCREMENT=1P	STRP	60

1E12.5, 3X, 15HFINE INCREMENT=1PE12.5)
END

STRP 61
STRP 62

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*DECK, FALWAT
SUBROUTINE FALWAT(D, RHO, ETA, T, P, V)
C
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C
C COMPUTES STILL-AIR, TERMINAL SETTLING SPEED OF WATER DROPS
C ACCORDING TO THE EQUATIONS OF BEARD (JAS 33, 852 (1976))
C
C GLOSSARY (SI UNITS)
C C 4.0*G/3.0 WHERE G IS ACCELERATION OF GRAVITY (9.8)
C CDRR DAVIES NUMBER
C D DROP DIAMETER
C ETA VISCOSITY
C P PRESSURE
C PN PHYSICAL PROPERTY NUMBER TO 1/6 POWER
C RHO FLUID DENSITY
C RHOP WATER DENSITY
C SIG WATER SURFACE TENSION
C T TEMPERATURE
C V SETTLING SPEED
C
C DATA C/13.066667/, RHOP/1000./, EX/D.1E666666667/
C
C COMPUTE DAVIES NUMBER
CDRR = C*(RHOP-RHO)*RHO* [**3/ETA**2
CHECK DAVIES NUMBER VALUE FOR ROUTING
IF(CDRR .GT. 0.3261) IF(CDRR-58243.) 100,100,200
COMPUTE VIA STOKES-LAW EQUATION
V = CDRR*ETA/(24.0*RHO*D)
GO TO 300
COMPUTE VIA BEARDS EQUATION FOR MEDIUM SIZE DROPS
100 Y = ALOG(CDRR)
V = ETA/(RHO*D)*EXP(-3.1{657 + Y*(0.992696 + Y*(-0.153193E-2
1+Y*(-0.987059E-3 + Y*(-0.578878E-3 + Y*(0.855176E-4
2-Y*0.327815E-5))))))
GO TO 300
COMPUTE VIA BEARDS EQUATION FOR LARGE DROPS
200 SIG = 7.570E-2 - 1.535E-4*(T - 273.0)
PN = (SIG**3 * RHO**2/(9.8 * (RHOP-RHO) * ETA**4))**EX
Y = ALOG(PN*C*(RHOP- RHC) * D**2/SIG)
V = ETA*PN/(RHO*D) * EXP(-5.00015 + Y*(5.23778 + Y*(-2.04914 +
1 Y*(0.475294 + Y*(-0.0542819 + Y*0.00238449))))
RETURN
CORRECT SETTLING SPEED FOR SLIF
300 V = V*(1.0 + 54.088*ETA*SQRT(T)/P/D)
RETURN
END
```

FALW 1
FALW 2
FALW 3
FALW 4
FALW 5
FALW 6
FALW 7
FALW 8
FALW 9
FALW 10
FALW 11
FALW 12
FALW 13
FALW 14
FALW 15
FALW 16
FALW 17
FALW 18
FALW 19
FALW 20
FALW 21
FALW 22
FALW 23
FALW 24
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FALW 26
FALW 27
FALW 28
FALW 29
FALW 30
FALW 31
FALW 32
FALW 33
FALW 34
FALW 35
FALW 36
FALW 37
FALW 38
FALW 39
FALW 40
FALW 41
FALW 42
FALW 43
FALW 44
FALW 45
FALW 46
FALW 47

*DECK, WCDRR	WCDR	1
FUNCTION WCDRR(R)	WCDR	2
C	WCDR	3
C	WCDR	4
C	WCDR	5
C	WCDR	6
C	WCDR	7
C	WCDR	8
C	WCDR	9
IF(R .GT. 200.) GO TO 100	WCDR	10
WCDRR = -1.0E20	WCDR	11
RETURN	WCDR	12
100 ALGR = ALOG10(R)	WCDR	13
WCDRR = 10.0** (21.38446 + ALGR * (-28.81245 + ALGR * (	WCDR	14
1 16.83269 + ALGR * (-4.152207 + ALGR * 0.3672735)))	WCDR	15
RETURN	WCDR	16
END	WCDR	17

*DECK, CDORR	CDORR	1
FUNCTION CDORR(R)	CDORR	2
C	CDORR	3
C	CDORR	4
C	CDORR	5
C	CDORR	6
C	CDORR	7
IF(R .GT. 0.05) IF(R-3.) 100,100,200	CDORR	8
CDORR = 24. * R	CDORR	9
RETURN	CDORR	10
100 CDORR = R*(24.167 + R*(3.254 - R*0.23564))	CDORR	11
RETURN	CDORR	12
200 IF(R .GT. 330.) GO TO 300	CDORR	13
CDORR = -28.339 + R*(38.969 + R * (0.73204 - R * 0.56084E-3))	CDORR	14
RETURN	CDORR	15
300 CDORR = R * (93.462 + R * 0.37576)	CDORR	16
RETURN	CDORR	17
END	CDORR	18

*DECK, DVDQ

SUBROUTINE DVDQ(NEQ,T,Y,F,KD,EPS,IFLAG,H,HMIN,
* HMAX,TPRINT,TFINAL,MXSTEP,KSTEP,KEMAX,EMAX,
* KQ,YN,DT,NEVAL,NG,NGE,NSTOP,G,GT)

VARIABLE ORDER INTEGRATION SUBROUTINE
FOR THE SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS.

ANALYSIS AND CODING BY FRED T. KRUGH, JET PROPULSION
LABORATORY, PASADENA, CALIF. APRIL 1, 1969.
MODIFIED BY CLEVE MOLER, UNIV. NEW MEXICCO, OCT. 1972

VARIABLES IN THE CALLING SEQUENCE HAVE THE FOLLOWING
DIMENSIONS WHERE N=NEQ AND K=KD(1)+KD(2)+...+KD(N)
Y(K),F(N),KD(N),EPS(N),KQ(N),YN(K),
DT(20,N),G(NG),GT(NG)

PARAMETERS WHICH MUST BE ASSIGNED VALUES BEFORE THE INITIAL
ENTRY ARE IFLAG, NG, NEQ, T, Y, KD, H, HMIN, HMAX,
TPRINT, TFINAL, MXSTEP, AND (USUALLY) EPS.

THE USER MUST ALSO PROVIDE CODE WHICH ASSIGNS
VALUES TO F (ONCE PER STEP INITIALLY, AND TWICE PER STEP
AFTER GETTING STARTED) AND EPS (EITHER INITIALLY, OR DURING
THE INTEGRATION IF A RELATIVE ERROR TEST IS USED).

THE FOLLOWING PARAMETERS GIVE ADDITIONAL INFORMATION ABOUT THE
INTEGRATION AND ARE USED FOR STORAGE. THEY SHOULD NOT BE
CHANGED BY THE USER. IFLAG,KSTEP,KEMAX,EMAX,KQ,YN, AND DT.

THE USAGE OF THE VARIABLES IS GIVEN BELOW.

NEQ=NUMBER OF EQUATIONS (INPUT)

T=INDEPENDENT VARIABLE (INITIAL VALUE SUPPLIED BY THE USER)

Y(J)=CURRENT VALUE OF A DEPENDENT VARIABLE OR DERIVATIVE.
THE INITIAL VALUE MUST BE SPECIFIED BY THE USER BEFORE
THE FIRST ENTRY. THE DIMENSION OF Y MUST BE
AT LEAST AS GREAT AS THE SUM OF THE ORDERS OF

DVDQ 1
DVDQ 2
DVDQ 3
DVDQ 4
DVDQ 5
DVDQ 6
DVDQ 7
DVDQ 8
DVDQ 9
DVDQ 10
DVDQ 11
DVDQ 12
DVDQ 13
DVDQ 14
DVDQ 15
DVDQ 16
DVDQ 17
DVDQ 18
DVDQ 19
DVDQ 20
DVDQ 21
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DVDQ 31
DVDQ 32
DVDQ 33
DVDQ 34
DVDQ 35
DVDQ 36
DVDQ 37
DVDQ 38
DVDQ 39
DVDQ 40
DVDQ 41
DVDQ 42
DVDQ 43

C	THE DIFFERENTIAL EQUATIONS WHICH ARE BEING	DVDQ	44
C	INTEGRATED.	DVDQ	45
C	THE J-TH DERIVATIVE OF THE I-TH DEPENDENT VARIABLE IS	DVDQ	46
C	STORED IN Y(K+J+1) WHERE K=K(1)+...+KD(I-1),	DVDQ	47
C	I=1,...,NEQ, J=0,...,KD(I)-1.	DVDQ	48
C	(FOR EXAMPLE, FOR THE SYSTEM F(1)=UPP, F(2)=VPP, WHERE P	DVDQ	49
C	DENOTES A PRIME, Y(1)=U, Y(2)=UP, Y(3)=V, Y(4)=VP.)	DVDQ	50
C		DVDQ	51
C	F(I)=KD(I)-TH DERIVATIVE OF THE I-TH COMPONENT WITH RESPECT	DVDQ	52
C	TO T, I=1,2,...,NEQ. THE USER MUST PROVIDE	DVDQ	53
C	THE CODE WHICH COMPUTES F GIVEN Y AND T.	DVDQ	54
C		DVDQ	55
C	KD(I)=THE ORDER OF THE I-TH DIFFERENTIAL EQUATION IN	DVDQ	56
C	THE SYSTEM. KD(I) MUST BE LESS THAN OR EQUAL TO 4.	DVDQ	57
C		DVDQ	58
C	EPS(I) IS A PARAMETER USED TO CONTROL THE LOCAL ERROR.	DVDQ	59
C	THE ESTIMATED LOCAL ERROR IS KEPT LESS THAN EPS(I) IN	DVDQ	60
C	THE (KD(I)-1)-ST DERIVATIVE OF THE I-TH COMPONENT. THUS	DVDQ	61
C	FOR EQUATIONS WITH ORDER GREATER THAN ONE, THE ERROR	DVDQ	62
C	IN A DERIVATIVE IS ESTIMATED. IN THIS CASE THE VALUE OF	DVDQ	63
C	EPS(I) REQUIRED TO OBTAIN A GIVEN ACCURACY IN THE DEPENDENT	DVDQ	64
C	VARIABLE DEPENDS ON THE SCALING.	DVDQ	65
C	IF ONE WANTS A RELATIVE ERROR TEST THEN ONE SHOULD SET EPS(I)	DVDQ	66
C	WHEN IFLAG=1.	DVDQ	67
C	IF EPS(I)=0 AND HMAX.NE.0, IFLAG IS SET EQUAL 8.	DVDQ	68
C	IF EPS(I)=0 AND HMAX=0, NO ERROR TESTS ARE PERFORMED	DVDQ	69
C	AND THE ORDER(S) AND STEPSIZE ARE NOT CHANGED.	DVDQ	70
C	THIS OPTION SHOULD NOT BE USED IF KD(I)=1 FOR ANY I.	DVDQ	71
C		DVDQ	72
C	IFLAG IS USED FOR COMMUNICATION BETWEEN THE INTEGRATOR	DVDQ	73
C	AND THE PROGRAM WHICH CALLS IT. TO BEGIN THE INTEGRATION THE	DVDQ	74
C	USER SHOULD SET IFLAG=0 AND CALL DVDQ. THIS WILL CAUSE	DVDQ	75
C	INITIALIZATION OF INTERNAL VARIABLES AND A RETURN WITH	DVDQ	76
C	IFLAG=1. AFTER THIS INITIAL ENTRY THE VALUE OF IFLAG	DVDQ	77
C	SHOULD NOT BE CHANGED BY THE USER.	DVDQ	78
C		DVDQ	79
C	THE FOLLOWING VALUES OF IFLAG HAVE THE FOLLOWING MEANINGS.	DVDQ	80
C	=0 USED TO INITIALIZE THE INTEGRATOR.	DVDQ	81
C	=1 THE VALUE OF Y FOR THE CURRENT STEP HAS BEEN	DVDQ	82
C	PREDICTED. THE USER SHOULD COMPUTE F AND CALL DVDQ AGAIN.	DVDQ	83
C	IF A RELATIVE ERROR TEST IS USED THE NEW VALUE	DVDQ	84
C	OF EPS SHOULD ALSO BE COMPUTED HERE.	DVDQ	85
C	=2 THE VALUE OF Y FOR THE CURRENT STEP HAS BEEN	DVDQ	86
C	CORRECTED. THE USER SHOULD COMPUTE F AND CALL DVDQ.	DVDQ	87
C	=3 AN OUTPUT POINT HAS BEEN REACHED (SEE DESCRIPTION	DVDQ	88
C	OF TPRINT), PRINT RESULTS AND CALL DVDQ.	DVDQ	89
C	=4 T=TFINAL IF DVDQ IS CALLED WITH T=TFINAL AND	DVDQ	90
C	IFLAG=4, IFLAG IS SET EQUAL TO 8. IF THE VALUE OF	DVDQ	91
C	TFINAL IS CHANGED THE INTEGRATION WILL CONTINUE.	DVDQ	92
C	=5 KSTEP=KSOUT (SEE THE DESCRIPTION OF MXSTEP).	DVDQ	93
C	=6 EMAX.GT..1 AND IT APPEARS TO THE SUBROUTINE THAT	DVDQ	94
C	REDUCING H WILL NOT HELP BECAUSE OF ROUND-OFF ERROR.	DVDQ	95
C	IF THIS OCCURS A LARGER VALUE OF EPS(KEMAX) SHOULD	DVDQ	96
C	PROBABLY BE USED. IF EPS(KEMAX) IS NOT INCREASED, TOO	DVDQ	97
C	SMALL A STEPSIZE IS LIABLE TO BE USED. (WE HAVE FOUND THAT	DVDQ	98
C	REPLACING EPS(KEMAX) WITH 32.*EMAX*EPS(KEMAX) WORKS WELL.)	DVDQ	99
C	INCREASING EPS IN THIS WAY WILL NOT DEGRADE THE ACCURACY,	DVDQ	100
C	HOWEVER IF THE NATURE OF THE PROBLEM CHANGES IT MAY PAY TO	DVDQ	101
C	USE A SMALLER VALUE OF EPS LATER IN THE INTEGRATION.	DVDQ	102
C	=7 ABS(H).LT.HMIN. TO CONTINUE WITH THE CURRENT	DVDQ	103

C	VALUE OF H, SET HMIN.LE.ABS(H) AND CALL CVDQ.	DVDQ 104
C	IF THE INTEGRATOR HAS JUST HALVED H ONE MAY CONTINUE	DVDQ 105
C	WITH TWICE THE STEPSIZE BY SIMPLY CALLING DVDQ. (SUCH	DVDQ 106
C	AN ACTION IS RISKY WITHOUT A CAREFUL ANALYSIS OF THE	DVDQ 107
C	SITUATION.) IF THE STEPSIZE HAS NOT JUST BEEN HALVED	DVDQ 108
C	(ABS(H).LT.HMIN MAY BE DUE TO THE USER INCREASING THE	DVDQ 109
C	VALUE OF HMIN OR TO HAVING TOO SMALL AN H AT THE END	DVDQ 110
C	OF THE STARTING PHASE.) THE INTEGRATION WILL CONTINUE	DVDQ 111
C	WITH THE CURRENT VALUE OF H AND A RETURN TO THE USER WITH	DVDQ 112
C	IFLAG=7 WILL BE MADE ON EVERY STEP UNTIL ABS(H).GE.HMIN.	DVDQ 113
C	=8 ILLEGAL PARAMETER IN THE CALLING SEQUENCE. IF DVDQ	DVDQ 114
C	IS CALLED WITH IFLAG=8 THE PROGRAM IS STOPPED.	DVDQ 115
C		DVDQ 116
C	H=CURRENT VALUE OF THE STEPSIZE; IN SELECTING THE INITIAL	DVDQ 117
C	VALUE FOR H, THE USER SHOULD REMEMBER THE FOLLOWING--	DVDQ 118
C	1. THE INTEGRATOR IS CAPABLE OF CHANGING H QUITE QUICKLY AND	DVDQ 119
C	THUS THE INITIAL CHOICE IS NOT CRITICAL.	DVDQ 120
C	2. IF IT DOES NOT LEAD TO PROBLEMS IN COMPUTING THE DERIVATIVES	DVDQ 121
C	(E.G. BECAUSE OF OVERFLOW OR TRYING TO EXTRACT THE SQUARE	DVDQ 122
C	ROOT OF A NEGATIVE NUMBER), IT IS BETTER TO CHOOSE H MUCH	DVDQ 123
C	TOO LARGE THAN MUCH TOO SMALL.	DVDQ 124
C	3. IF H*TPRINT.LE.0 INITIALLY, AN IMMEDIATE RETURN IS MADE	DVDQ 125
C	WITH IFLAG=8. THE SIGN OF H IS WHAT DETERMINES THE	DVDQ 126
C	DIRECTION OF INTEGRATION.	DVDQ 127
C	4. IF TPRINT=H*(2**K) K A NONNEGATIVE INTEGER THEN OUTPUT	DVDQ 128
C	VALUES WILL BE OBTAINED WITHOUT DOING AN INTERPOLATION.	DVDQ 129
C		DVDQ 130
C	HMIN AFTER GETTING STARTED, AND WHENEVER H	DVDQ 131
C	IS HALVED, ABS(H) IS COMPARED WITH HMIN.	DVDQ 132
C	IF ABS(H).LT.HMIN CONTROL IS RETURNED TO	DVDQ 133
C	THE USER WITH IFLAG=7.	DVDQ 134
C		DVDQ 135
C	HMAX THE STEPSIZE IS NOT DOUBLED IF	DVDQ 136
C	DOING SO WOULD MAKE ABS(H).GT.HMAX	DVDQ 137
C		DVDQ 138
C	TPRINT ENABLES THE USER TO SPECIFY THE POINTS WHERE	DVDQ 139
C	OUTPUT IS DESIRED. LET TOUT=TPRINT + THE VALUE OF T THE LAST	DVDQ 140
C	TIME CONTROL WAS RETURNED TO THE USER WITH IFLAG=3. (INITIALLY	DVDQ 141
C	TOUT=THE INITIAL VALUE OF T.) CONTROL IS RETURNED TO THE	DVDQ 142
C	USER WITH IFLAG=3 WHENEVER T=TOUT. IF TOUT DOES NOT FALL	DVDQ 143
C	ON AN INTEGRATION STEP, OUTPUT VALUES ARE OBTAINED BY	DVDQ 144
C	INTERPOLATION ON THE FIRST STEP THAT (T-TOUT)*H.GT.0.	DVDQ 145
C	INTERPOLATED VALUES FOR BOTH Y AND F ARE COMPUTED.	DVDQ 146
C	(NOTE THAT A RETURN WITH IFLAG=3 IS ALWAYS MADE	DVDQ 147
C	BEFORE TAKING THE FIRST STEP.)	DVDQ 148
C		DVDQ 149
C	TFINAL CONTROL IS RETURNED TO THE USER WITH IFLAG=4 WHEN	DVDQ 150
C	T REACHES TFINAL. IF TFINAL DOES NOT FALL ON AN INTEGRATION	DVDQ 151
C	STEP VALUES AT TFINAL ARE OBTAINED BY EXTRAPOLATION.	DVDQ 152
C		DVDQ 153
C	MXSTEP ON THE INITIAL ENTRY, AND ON ENTRIES	DVDQ 154
C	WITH 2.LT.IFLAG.LT.6 KSOUT IS SET EQUAL TO	DVDQ 155
C	KSTEP+MXSTEP. AT THE END OF EACH STEP KSTEP IS INCREMENTED	DVDQ 156
C	AND COMPARED WITH KSOUT. IF KSTEP.GE.KSOUT CONTROL IS	DVDQ 157
C	RETURNED TO THE USER WITH IFLAG=5. (THUS IF TPRINT IS	DVDQ 158
C	SUFFICIENTLY LARGE, CONTROL WILL BE RETURNED TO THE USER	DVDQ 159
C	WITH IFLAG=5 EVERY MXSTEP STEPS.)	DVDQ 160
C		DVDQ 161
C	KSTEP=NUMBER OF INTEGRATION STEPS TAKEN (COMPUTED	DVDQ 162
C	BY THE INTEGRATOR.)	DVDQ 163

KEMAX=INDEX OF COMPONENT RESPONSIBLE FOR THE
VALUE OF EMAX (SEE BELOW).

EMAX=LARGEST VALUE IN ANY COMPONENT OF (ESTIMATED ERROR)/EPS (I)
ORDINARILY THE STEPSIZE IS HALVED IF EMAX.GT..1. WITH A
RECENT HISTORY OF LOCAL ROUND-OFF PROBLEMS VALUES OF EMAX AS
LARGE AS 1 ARE PERMITTED. THE STEPSIZE IS NOT HALVED ON ANY
STEP THAT ROUND OFF ERROR APPEARS TO BE LIMITING THE PRECISION.

KQ(I)=HIGHEST ORDER DIFFERENCE USED IN INTEGRATING
THE I-TH EQUATION. (COMPUTED BY THE INTEGRATOR)

YN=A VECTOR WITH THE DIMENSION OF Y USED TO STORE
THE VALUE OF Y AT THE END OF EACH INTEGRATION STEP.

DT=AN ARRAY WITH DIMENSION DT(20,NEQ) USED TO
STORE THE DIFFERENCE TABLE.

NEVAL=NUMBER OF TIMES F IS EVALUATED (= NUMBER OF
RETURNS MADE WITH IFLAG=1 OR 2). (COMPUTED BY DVDQ.)

NG MUST BE SET = 0 BY THE USER IF THE GSTOP FEATURE IS
NOT USED. OTHERWISE SEE BELOW.

A GSTOP IS DEFINED AS A RETURN WHICH IS MADE TO THE USER WHEN A
USER SPECIFIED FUNCTION G PASSES THROUGH ZERO. THE USER MAY
SPECIFY ANY NUMBER OF FUNCTIONS G OF TWO TYPES. ZEROS OF THE FIRST
TYPE ARE LOCATED WITHOUT REQUIRING A DERIVATIVE EVALUATION
BEYOND THE ZERO. THIS TYPE OF GSTOP REQUIRES THAT G BE EVALUATED
BEFORE EACH DERIVATIVE EVALUATION. ZEROS OF THE SECOND TYPE ARE
LOCATED USING INTERPOLATION, WHICH IS MORE ACCURATE THAN THE
EXTRAPOLATION USED IN THE PRECEDING CASE AND ONLY REQUIRES ONE
EVALUATION OF G PER STEP. THUS ONE SHOULD USE THE SECOND TYPE OF
GSTOP IF POSSIBLE. USERS NOT USING THE GSTOP FEATURE NEED READ
NO FURTHER.

THE GSTOP FEATURE IS INVCKED BY USING A NONZERO VALUE OF NG .
IT IS TURNED OFF BY SETTING NG=0 . IT IS NOT NECESSARY TO
MAKE SEPARATE CALLS TO DVDQ TO DO THIS.

NG= THE NUMBER OF COMPONENTS IN G TO BE EXAMINED FOR A ZERO.

NGE=THE NUMBER OF COMPONENTS OF G THAT MUST BE EXAMINED FOR
A ZERO BEFORE COMPUTING THE DERIVATIVES (FIRST TYPE OF
GSTOP). IF NGE.LT.0 OR NGE.GT.NG, IFLAG IS SET
EQUAL 8 AND AN IMMEDIATE RETURN IS MADE. IF NGE.GT.0,
G(1),G(2),...,G(NGE) ARE EXAMINED FOR A ZERO BEFORE EACH
DERIVATIVE EVALUATION, THE REMAINING COMPONENTS (IF ANY)
ARE EXAMINED AT THE END OF EACH STEP.

NSTOP= THE COMPONENT OF G RESPONSIBLE FOR A GSTOP (COMPUTED BY
THE INTEGRATOR).

G= A VECTOR CONTAINING THE CURRENT VALUES OF THE FUNCTIONS
WHOSE ZEROS ARE TO BE DETERMINED.

GT= A VECTOR WITH THE SAME DIMENSION AS G USED BY THE
SUBROUTINE FOR TEMPORARY STORAGE.

DVDQ 164
DVDQ 165
DVDQ 166
DVDQ 167
DVDQ 168
DVDQ 169
DVDQ 170
DVDQ 171
DVDQ 172
DVDQ 173
DVDQ 174
DVDQ 175
DVDQ 176
DVDQ 177
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DVDQ 216
DVDQ 217
DVDQ 218
DVDQ 219
DVDQ 220
DVDQ 221
DVDQ 222
DVDQ 223

C		DVDQ 224
C	RETURNS FROM CALLING DVDQ WITH IFLAG.GT.8 SHOULD BE INTERPETED	DVDQ 225
C	AS FOLLOWS.	DVDQ 226
C	IFLAG	DVDQ 227
C	= 9 COMPUTE G(NGE+1),...,G(NG) (THE COMPONENTS OF G WITH	DVDQ 228
C	ZEROS TO BE LOCATED USING INTERPOLATION). THEN CALL DVDQ.	DVDQ 229
C	NO RETURN IS MADE WITH IFLAG=9 IF NGE=NG.	DVDQ 230
C	=10 COMPUTE G(1),G(2),...,G(NGE) (THE COMPONENTS OF G WITH	DVDQ 231
C	ZEROS TO BE LOCATED USING EXTRAPOLATION). THEN CALL DVDQ.	DVDQ 232
C	NO RETURN IS MADE WITH IFLAG=10 IF NGE=0.	DVDQ 233
C	=11 A GSTOP HAS BEEN FOUND. G(NSTOP)=0. PRINT RESULTS. IF THEIR	DVDQ 234
C	ARE NO DISCONTINUITIES CALL DVDQ TO CONTINUE THE INTEGRATION.	DVDQ 235
C	=12 G(NSTOP) CHANGES SIGN, BUT THERE IS DIFFICULTY IN CONVERGING	DVDQ 236
C	TO A ZERO. THE USER MAY WISH TO MAKE A SPECIAL CHECK TO BE	DVDQ 237
C	CERTAIN THAT EVERYTHING IS ALL RIGHT. TO CONTINUE THE	DVDQ 238
C	INTEGRATION CALL DVDQ.	DVDQ 239
C		DVDQ 240
C		DVDQ 241
C	SUBROUTINE DVDQ(NEQ,T,Y,F,KD,EPS,IFLAG,H,HMIN,	DVDQ 242
C	* HMAX,TPRINT,TFINAL,MXSTEP,KSTEP,KEMAX,EMAX,	DVDQ 243
C	* KQ,YN,DT,NEVAL,NG,NGE,NSTOP,G,GT)	DVDQ 244
C	INTEGER NEQ,KD,IFLAG,MXSTEP,KSTEP,KEMAX,KQ,NEVAL,NG,NGE,NSTOP	DVDQ 245
C	REAL T,Y,F,EPS,H,HMIN,HMAX,TPRINT,TFINAL,EMAX,	DVDQ 246
C	2 YN,DT,G,GT	DVDQ 247
C	DIMENSION Y(1),F(1),YN(1),DT(20,1),KD(1),KQ(1),EPS(1),G(1),GT(1)	DVDQ 248
C	INTEGER IB,IFL,IFLG,IFLS,IFLGS,IGK,IGKM,KBIT2,KOMAX,KDD,KDC,	DVDQ 249
C	2 LDOUB,LFD,LGSS,LGSC,LGSE,NE,NGA,IM1,KK,JM2,KMAXO,KM,KMD,KM1,	DVDQ 250
C	3 KQMAX,KQM,KQQ,KQ1,KQQ2,LRND,JS,KSOUT,LSC,LSTC,NV,I,J,K,L	DVDQ 251
C	REAL FAC,GAM,GAS,DD,EIGHTH,GI,HR,EPSSGS,ERRMX,ERND,	DVDQ 252
C	2 TWO,FRND,RG,ETA,TG,ONEP1,RND,RNDC,RQMAX,TL,E2HAVE,	DVDQ 253
C	3 E2HMAX,E2HFAC,E2F,TOLT,PT,TP,PTS1,PTS2,PTS3,PTS4,PTS5,TPS1,	DVDQ 254
C	4 TPD,TPD1,TPS3,TPS5,TPS4,TPS2,TPS6,TPD2,D,P01,P075,E,P1,	DVDQ 255
C	5 P25,P5,P75,S,ABS,AMCI,AMIN1,AMAX1,SIGN	DVDQ 256
C	DIMENSION GAM(20,4),GAS(20),ETA(19,18)	DVDQ 257
C	DIMENSION DD(26),D(25),PT(21),FAC(3),GI(2),RG(3)	DVDQ 258
C	EQUIVALENCE (DD(2),D(1))	DVDQ 259
C	DATA KBIT2 /0/	DVDQ 260
C		DVDQ 261
C		DVDQ 262
C	CHECK IFLAG	DVDQ 263
C		DVDQ 264
C	IF (IFLAG) 1190, 10, 60	DVDQ 265
C		DVDQ 266
C	CHECK TO INITIALIZE CONSTANTS	DVDQ 267
C		DVDQ 268
C	10 IF (KBIT2) 50,12,50	DVDQ 269
C		DVDQ 270
C	DETERMINE MACHINE PRECISION	DVDQ 271
C		DVDQ 272
C	12 RND=1.	DVDQ 273
C	14 RND=RND/2.	DVDQ 274
C	KBIT2=KBIT2+1	DVDQ 275
C	IF(1.+RND .GT. 1.) GO TO 14	DVDQ 276
C	RND=8.*RND	DVDQ 277
C	KQMAX=0.3*FLOAT(KBIT2+1)	DVDQ 278
C	IF(KQMAX.GT.19) KQMAX=19	DVDQ 279
C	KBIT2=2*KBIT2+2	DVDQ 280
C		DVDQ 281
C	KQMAX GIVES THE MAXIMUM ORDER OF POLYNOMIAL APPROXIMATION USED.	DVDQ 282
C	THERE IS LITTLE POINT IN HAVING KQMAX MUCH BIGGER THAN THE NUMBER	DVDQ 283

<pre> 24 CONTINUE GAM(I,1)=D(1) DO 26 J=2,KMAXO GAM(I,J)=D(J)*FAC(J-1) 26 CONTINUE GAS(1)=1. DO 28 I=2,KM GAS(I)=GAM(I,1)-GAM(I-1,1) 28 CONTINUE GENERATE ETA ETA(I,J), I=1,2,...,J IS USED IN THE FIRST MODIFICATION OF THE I-TH DIFFERENCE OF A J-TH ORDER METHOD AFTER THE STEPSIZE IS HALVED. ETA(I,J), J=1,2,...,I-1 IS USED IN THE SECOND MODIFICATION OF THE (J+1)-ST DIFFERENCE OF AN I-TH ORDER METHOD K=KQMAX-1 EIGHTH=FAC(2)*FAC(2)*FAC(2) ETA(1,1)=EIGHTH ETA(2,1)=EIGHTH TP=FAC(2)*FAC(2) DO 33 J=2,K TP=TP/2. ETA(J,J)=(TP+ETA(J-1,J-1))/2. IF(J.EQ.2) GO TO 32 JM2=J-2 DO 30 IB=1,JM2 I=J-IB ETA(I,J)=(ETA(I+1,J)+ETA(I-1,J-1))/2. 30 CONTINUE 32 ETA(1,J)=ETA(2,J)/2. 33 CONTINUE DO 34 I=1,K TP=0. DO 34 J=1,I TP=TP+ETA(J,I) ETA(I+1,J)=TP 34 CONTINUE TP=FAC(2) DO 36 J=1,K TP=TP/2. D(J)=ETA(J+1,J)+TP 36 CONTINUE DO 38 J=1,K DO 38 I=1,J ETA(I,J)=ETA(I,J)/D(J) 38 CONTINUE KM1=K-1 DO 40 J=1,KM1 D(J)=D(J+1)/D(J) 40 CONTINUE DO 42 I=2,KM1 DO 42 J=1,I ETA(I+1,J)=-ETA(I+2,J)+ETA(I+1,J)*D(I) 42 CONTINUE TP=EIGHTH DO 46 I=2,KM1 TP=TP/2. </pre>	<pre> DVDQ 344 DVDQ 345 DVDQ 346 DVDQ 347 DVDQ 348 DVDQ 349 DVDQ 350 DVDQ 351 DVDQ 352 DVDQ 353 DVDQ 354 DVDQ 355 DVDQ 356 DVDQ 357 DVDQ 358 DVDQ 359 DVDQ 360 DVDQ 361 DVDQ 362 DVDQ 363 DVDQ 364 DVDQ 365 DVDQ 366 DVDQ 367 DVDQ 368 DVDQ 369 DVDQ 370 DVDQ 371 DVDQ 372 DVDQ 373 DVDQ 374 DVDQ 375 DVDQ 376 DVDQ 377 DVDQ 378 DVDQ 379 DVDQ 380 DVDQ 381 DVDQ 382 DVDQ 383 DVDQ 384 DVDQ 385 DVDQ 386 DVDQ 387 DVDQ 388 DVDQ 389 DVDQ 390 DVDQ 391 DVDQ 392 DVDQ 393 DVDQ 394 DVDQ 395 DVDQ 396 DVDQ 397 DVDQ 398 DVDQ 399 DVDQ 400 DVDQ 401 DVDQ 402 DVDQ 403 </pre>
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	S=TP	DVDQ 404
	DO 44 J=1,I	DVDQ 405
	S=S+ETA(I+1,J)	DVDQ 406
44	CONTINUE	DVDQ 407
	IM1=I-1	DVDQ 408
	DO 46 J=1,IM1	DVDQ 409
	ETA(I,J)=ETA(I+1,J)/S	DVDQ 410
46	CONTINUE	DVDQ 411
C		DVDQ 412
C	INITIALIZE VARIABLES	DVDQ 413
C		DVDQ 414
50	PTS1=PT(1)	DVDQ 415
	PTS2=PT(2)	DVDQ 416
	PTS3=PT(3)	DVDQ 417
	PTS4=PT(4)	DVDQ 418
	PTS5=PT(5)	DVDQ 419
	LGSS=0	DVDQ 420
	LGSD=0	DVDQ 421
	LGSE=0	DVDQ 422
	LF0=0	DVDQ 423
	E2HAVE=0.	DVDQ 424
	E2HMAX=0.	DVDQ 425
	DO 52 I=1,KMD	DVDQ 426
	DD(I)=0.	DVDQ 427
52	CONTINUE	DVDQ 428
	KSTEP=-1	DVDQ 429
	NE=NEQ	DVDQ 430
	IF (NE.LE.0) GO TO 1190	DVDQ 431
	HH=H	DVDQ 432
	NV=0	DVDQ 433
	KDMAX=0	DVDQ 434
	DO 56 J=1,NE	DVDQ 435
	KQ(J)=1	DVDQ 436
	DO 54 I=1,KQMAX	DVDQ 437
	DT(I,J)=0.	DVDQ 438
54	CONTINUE	DVDQ 439
	KDD=KQ(J)	DVDQ 440
	IF ((KDD.EQ.0).OR.(KDD.GT.KMAX0)) HH=0.	DVDQ 441
	IF (KDD.GT.KDMAX) KDMAX=KDD	DVDQ 442
	NV=NV+KDD	DVDQ 443
56	CONTINUE	DVDQ 444
C		DVDQ 445
	IF ((TPRINT*HH).LE.0.) GO TO 1190	DVDQ 446
	ERRMX=P1	DVDQ 447
	ERND=0.	DVDQ 448
	EMAX=ERND	DVDQ 449
	RNDC=RND*P25	DVDQ 450
	LDOUB=0	DVDQ 451
	E2HFAC=P25	DVDQ 452
	LSC=8	DVDQ 453
	LSTC=4	DVDQ 454
C	LSC AND LSTC ARE USED IN COMBINATION AS FOLLOWS	DVDQ 455
C	LSTC=4, LSC=4	DVDQ 456
C	LSTC=3, LSC=4	DVDQ 457
C	FIRST TIME THROUGH THE FIRST STEP	DVDQ 458
C	SECOND TIME THROUGH THE FIRST STEP	DVDQ 459
C	(NECESSARY TO CHECK STABILITY)	DVDQ 460
C	LSTC=2, LSC=4	DVDQ 461
C	THIRD TIME THROUGH THE FIRST STEP	DVDQ 462
C	(ONLY OCCURS IF INSTABILITY POSSIBLE)	DVDQ 463
C	LSTC=2, LSC=2	DVDQ 464
C	SECOND STEP (IF KQ(I)=2, I=1,...,NEQ)	DVDQ 465
C	LSTC=1, LSC=0	DVDQ 466
C	STARTING, ONE DERIVATIVE EVAL. PER STEP.	DVDQ 467
C	LSTC=1, LSC.GT.0	DVDQ 468
	SET WHEN STARTING TWO DERIV. EVAL. PER STEP	DVDQ 469

C	LSTC=-1 LSC.LT.0 SET WHEN HALVING THE STEPSIZE	DVDQ 464
C	IN THE LAST TWO CASES LSC IS SET EQUAL TO LSTC*(MAXIMUM KQ(I)	DVDQ 465
C	+1). AT THE END OF EACH STEP IF LSC.NE.0 IT IS REPLACED BY	DVDQ 466
C	LSC-LSTC UNTIL LSC=0, AT WHICH TIME LSTC IS SET EQUAL TO 0.	DVDQ 467
C	WHEN DOUBLING H, LSTC IS SET EQUAL TO -1 AND LSC TO -3.	DVDQ 468
C	UNDER CERTAIN CONDITIONS WHEN KQ(I)=1, LSTC IS SET =-1 AND LSC=-5	DVDQ 469
C		DVDQ 470
	KSOUT=MXSTEP	DVDQ 471
	TOUT=T	DVDQ 472
	IFL=13	DVDQ 473
	IFLAG=1	DVDQ 474
	NGA=0	DVDQ 475
	NEVAL=0	DVDQ 476
	IF(NG.NE.0) GO TO 1420	DVDQ 477
	GO TO 315	DVDQ 478
	END OF INITIALIZATION	DVDQ 479
C		DVDQ 480
C		DVDQ 481
C	ENTRY WITH IFLAG.GT.0	DVDQ 482
C		DVDQ 483
C	CHECK FOR GSTOPS	DVDQ 484
C		DVDQ 485
	60 IF(NG.EQ.NGA) GO TO 65	DVDQ 486
	IF(NG.LT.0) GO TO 1190	DVDQ 487
	NGA=NG	DVDQ 488
	LGSS=-NGA	DVDQ 489
	LGSD=0	DVDQ 490
	LGSE=0	DVDQ 491
	IFLG=-20	DVDQ 492
C		DVDQ 493
C		DVDQ 494
	65 IF (IFL.LT.2) GO TO 320	DVDQ 495
	IF (IFL.EQ.2) GO TO 80	DVDQ 496
	IF (IFL.GT.5) GO TO 1180	DVDQ 497
C		DVDQ 498
C	SET STEP STOP	DVDQ 499
	KSOUT=KSTEP+MXSTEP	DVDQ 500
	IF (IFL.EQ.5) GO TO 210	DVDQ 501
	IF (IFL.EQ.4) GO TO 1210	DVDQ 502
C		DVDQ 503
C	SET PRINT STOP	DVDQ 504
	70 TOUT=T+TPRINT	DVDQ 505
C		DVDQ 506
	75 TPS1=ABS(AMOD((TOUT-T)/HH,TWO)-PTS1)	DVDQ 507
	LFD=-1	DVDQ 508
	IF (TPS1.GE.P5) LFD=1	DVDQ 509
C		DVDQ 510
C	LFD IS USED TO INDICATE WHETHER DOUBLING H IS PERMITTED.	DVDQ 511
C	IF LFD.LT.0 AT THE END OF A STEP THEN DOUBLING H IS	DVDQ 512
C	NOT PERMITTED. THE SIGN OF LFD IS CHANGED JUST BEFORE THE	DVDQ 513
C	END OF EACH STEP. IF TPRINT=H*(POWER OF 2) THEN	DVDQ 514
C	OUTPUT VALUES WILL BE OBTAINED WITHOUT INTERPOLATION.	DVDQ 515
C		DVDQ 516
	GO TO 200	DVDQ 517
C		DVDQ 518
C		DVDQ 519
C	ENTRY WITH IFLAG=2	DVDQ 520
C		DVDQ 521
C	UPDATE DIFFERENCE TABLE	DVDQ 522
C	AND COMPUTE KQM=MAXIMUM VALUE OF <Q(I), I=1,2,...,NEQ.	DVDQ 523

C		DVDQ	524
	80 KQM=0	DVDQ	525
	DO 90 I=1,NE	DVDQ	526
	KQQ=KQ(I)	DVDQ	527
	IF (KQQ.GT.KQM) KQM=KQQ	DVDQ	528
	D(1)=F(I)	DVDQ	529
	DO 85 K=1,KQQ	DVDQ	530
	D(K+1)=D(K)-DT(K,I)	DVDQ	531
	DT(K,I)=D(K)	DVDQ	532
	85 CONTINUE	DVDQ	533
	DT(KQQ+1,I)=D(KQQ+1)	DVDQ	534
	90 CONTINUE	DVDQ	535
C	END OF UPDATING DIFFERENCE TABLE	DVDQ	536
C		DVDQ	537
C	STORE Y(J) IN YN(J)	DVDQ	538
C	DO 95 J=1,NV	DVDQ	539
	YN(J)=Y(J)	DVDQ	540
	95 CONTINUE	DVDQ	541
C		DVDQ	542
	LFD=-LFD	DVDQ	543
	TL=T	DVDQ	544
	KSTEP=KSTEP+1	DVDQ	545
C		DVDQ	546
	IF (LGSS) 1430,110,1510	DVDQ	547
100	IFLAG=2	DVDQ	548
110	IF (LSC.EQ.0) GO TO 140	DVDQ	549
	LSC=LSC-LSTC	DVDQ	550
	IF (LSC.EQ.0) GO TO 130	DVDQ	551
	IF (LSTC.NE.(-1)) GO TO 140	DVDQ	552
	IF (LDOUB.LT.0) RNCC=RND*P1	DVDQ	553
120	E2HAVE=E2HM IX	DVDQ	554
	TPS1=PTS1	DVDQ	555
	GO TO 190	DVDQ	556
130	IF (ABS(HH).L.HMIN) GO TO 1000	DVDQ	557
	LSTC=0	DVDQ	558
140	IF (LDOUB.NE.1) GO TO 150	DVDQ	559
	IF ((LFD.GT.0).AND.(ABS(HH+HH).LE.HMAX)) GO TO 1030	DVDQ	560
	GO TO 200	DVDQ	561
150	RQMAX=PTS1/FLOAT(KQM+3)	DVDQ	562
	IF ((LSTC.NE.0).OR.(E2HAVE.EQ.0)) GO TO 120	DVDQ	563
	TPS1=E2HMAX/E2HAVE	DVDQ	564
	IF (TPS1-PTS1) 160,190,170	DVDQ	565
160	E2HFAC=AMIN1(P075,E2HFAC-RQMAX,E2HFAC*TPS1)	DVDQ	566
	GO TO 180	DVDQ	567
170	TPS1=TPS1*TPS1	DVDQ	568
	E2HFAC=AMIN1(PTS1,E2HFAC*TPS1)	DVDQ	569
180	RNDC=(ONEP1-E2HFAC)*RND	DVDQ	570
	E2HAVE=P5*(E2HMAX+E2HAVE)	DVDQ	571
190	ERRMX=AMAX1(P1,ERRMX-RQMAX*TPS1)	DVDQ	572
C	E2HFAC IS A FACTOR WHICH IS TAKEN TIMES AN INITIAL ESTIMATE OF	DVDQ	573
C	E2H TO GET A FINAL VALUE OF E2H. (E2H=ESTIMATE OF WHAT	DVDQ	574
C	(ESTIMATE ERROR)/(REQUESTED ERROR) WOULD BE IF H WERE	DVDQ	575
C	DOUBLED.)	DVDQ	576
C	E2HMAX IS THE MAXIMUM VALUE OF THE INITIAL ESTIMATE OF E2H OVER	DVDQ	577
C	ALL COMPONENTS WITH KQ(I).GT.1.	DVDQ	578
C	E2HAVE IS A WEIGHTED AVERAGE OF PAST VALUES OF E2HMAX.	DVDQ	579
C	THE VALUE OF E2HFAC TENDS TO BE SMALLER WHEN E2HMAX IS	DVDQ	580
C	CONSISTANTLY SMALLER THAN E2HAVE.	DVDQ	581
C		DVDQ	582
C		DVDQ	583

C	CHECK FOR PRINT STCP AND FOR T REACHING TFINAL	DVDQ	584
200	TPD=(TOUT-TL)/HH	DVDQ	585
	TPD1=(TFINAL-TL)/HH	DVDQ	586
C		DVDQ	587
	IF (LGSE.LT.0) GO TO 1780	DVDQ	588
	IF (TPD1.LT.FAC(1)) GO TO 1220	DVDQ	589
	IF (TPD.LE.0.) GO TO 1280	DVDQ	590
C		DVDQ	591
C	CHECK FOR STEP STOP	DVDQ	592
	IF (KSOUT.GT.KSTEP) GO TO 210	DVDQ	593
C		DVDQ	594
	IFL=5	DVDQ	595
	GO TO 310	DVDQ	596
C		DVDQ	597
C	CHECK TO SEE IF ROUND-OFF ERROR IS PROMINENT	DVDQ	598
210	IF (EMAX.EQ.ERND) GO TO 220	DVDQ	599
C	IT IS	DVDQ	600
	IFL=6	DVDQ	601
	IF (EMAX.GE.P1) GO TO 310	DVDQ	602
	IF ((LSTC.GE.0).OR.(LDOUB.EQ.1)) ERRMX=PTS1	DVDQ	603
C		DVDQ	604
220	IFL=1	DVDQ	605
230	T=TL+HH	DVDQ	606
C		DVDQ	607
C	START A NEW STEP	DVDQ	608
C		DVDQ	609
C	PREDICT	DVDQ	610
240	J=0	DVDQ	611
	DO 290 I=1,NE	DVDQ	612
	KDD=KD(I)	DVDQ	613
	KDC=KDD	DVDQ	614
250	KQQ=KQ(I)	DVDQ	615
	TPD=0.	DVDQ	616
	K=KDC	DVDQ	617
260	TPD=TPD+DT(KQQ,I)*GAM(KQQ,KDC)	DVDQ	618
	KQQ=KQQ-1	DVDQ	619
	IF (KQQ.GT.0) GO TO 260	DVDQ	620
270	K=K-1	DVDQ	621
	IF (K.LE.0) GO TO 280	DVDQ	622
	L=J+K	DVDQ	623
	TPD=YN(L+1)*FAC(K)+HH*TPD	DVDQ	624
	GO TO 270	DVDQ	625
280	J=J+1	DVDQ	626
	Y(J)=YN(J)+HH*TPD	DVDQ	627
	KDC=KDC-1	DVDQ	628
	IF (KDC.GT.0) GO TO 250	DVDQ	629
290	CONTINUE	DVDQ	630
C	END OF PREDICT	DVDQ	631
C		DVDQ	632
	IF (IFL) 1240,320,300	DVDQ	633
300	IF (LGSD.NE.0) GO TO 1520	DVDQ	634
C		DVDQ	635
310	IFLAG=IFL	DVDQ	636
315	IF (IFLAG.LE.2) NEVAL=NEVAL+1	DVDQ	637
C		DVDQ	638
	RETURN	DVDQ	639
C		DVDQ	640
C		DVDQ	641
C	ENTRY WITH IFLAG=1	DVDQ	642
320	ERND=0.	DVDQ	643

	IF (LSTC-2) 420,380,380	DVDQ 704
370	IF (TPS5.EQ.0.) GO TO 360	DVDQ 705
	IF (DT(6,I).EQ.0.) GO TO 400	DVDQ 706
	TPS2=DT(5,I)-DT(1,I)	DVDQ 707
380	TPS4=DT(4,I)	DVDQ 708
	TPS1=ABS(TPS4)	DVDQ 709
	TPS4=TPS2*SIGN(PTS2,TPS4)-TPS5*TPS1	DVDQ 710
	IF (TPS4.GT.(-TPS1)) GO TO 410	DVDQ 711
390	TPS6=-PTS1	DVDQ 712
	GO TO 450	DVDQ 713
C	FIRST STEP AFTER THE STEPSIZE HAS BEEN CHANGED	DVDQ 714
400	DT(6,I)=PT(1)	DVDQ 715
	TPS6=0.	DVDQ 716
	GO TO 450	DVDQ 717
410	IF (TPS4.LT.TPS1) GO TO 440	DVDQ 718
	IF (TPS1.EQ.0.) GO TO 390	DVDQ 719
420	TPS6=PTS1	DVDQ 720
	GO TO 450	DVDQ 721
430	KQ(I)=2	DVDQ 722
	IF (2-LSTC) 510,510,520	DVDQ 723
440	TPS6=TPS4/TPS1	DVDQ 724
450	TPS4=TPS5+TPS6	DVDQ 725
	IF (TPS4.LT.P25) GO TO 430	DVDQ 726
C	INCREASE E2H IF (-S).GT..25	DVDQ 727
	E2H=PTS4*TPS4	DVDQ 728
	IF (2-LSTC) 460,470,480	DVDQ 729
460	LSC=0	DVDQ 730
	GO TO 510	DVDQ 731
470	IF (TPS5-P25) 430,460,460	DVDQ 732
480	IF (TPS4.GT.PTS2) GO TO 490	DVDQ 733
	IF (TPS4.GT.P5) D(2)=D(2)*GAM(2,1)	DVDQ 734
	GO TO 510	DVDQ 735
490	IF (TPS4.LT.PTS4) GO TO 500	DVDQ 736
	TPS4=PTS4	DVDQ 737
	D(2)=D(2)/PT(3)	DVDQ 738
C	THE ESTIMATE OF E (AND HENCE OF E2H) IS INCREASED IF (-S).GE.8.	DVDQ 739
	TPS3=TPS3*DT(7,I)	DVDQ 740
	GO TO 510	DVDQ 741
500	D(2)=D(2)*((PTS2*(TPS4-PTS1))/(TPS4*TPS4))	DVDQ 742
	IF (TPS4.GE.3.) E2H=E2H*DT(7,I)	DVDQ 743
C	STORE D(1)=PREDICTED DERIVATIVE AND D(2)=2*(CORRECTED Y -	DVDQ 744
C	PREDICTED Y)/H D(1) AND D(2) ARE USED TO COMPUTE (-S) ON	DVDQ 745
C	THE NEXT STEP.	DVDQ 746
510	DT(5,I)=D(1)	DVDQ 747
	DT(4,I)=D(2)	DVDQ 748
	D(4)=TPS4	DVDQ 749
C	STORE D(4)= CURRENT ESTIMATE OF (-S). (-S).GT.3 IS AN INDICATION	DVDQ 750
C	THAT THE STEPSIZE SHOULD BE LIMITED BECAUSE OF STABILITY PROBLEMS.	DVDQ 751
C	S=H*(ESTIMATE OF EIGENVALUE OF F)=H*(DIFFERENCE BETWEEN PREDICTED	DVDQ 752
C	AND CORRECTED DERIVATIVE VALUES)/(DIFFERENCE BETWEEN PREDICTED	DVDQ 753
C	AND CORRECTED INTEGRALS OF THE DERIVATIVE VALUES)	DVDQ 754
C	THE TREATMENT OF THE CASE KQ(I)=1 COULD BE IMPROVED BY USING A	DVDQ 755
C	SPECIAL METHOD FOR STIFF EQUATIONS WHEN (-S).GT.3 (MAYBE).	DVDQ 756
C	(THE ENTIRE TREATMENT OF THE CASE KQ(I)=1 IS FAR FROM IDEAL.)	DVDQ 757
	DT(3,I)=D(4)	DVDQ 758
C		DVDQ 759
C	CORRECT	DVDQ 760
520	KDC=0	DVDQ 761
	TPD=0(KQ1)	DVDQ 762
	J=J+KDD	DVDQ 763

	K=J	DVDQ 764
530	TPD=HH*TPD	DVDQ 765
	KDC=KDC+1	DVDQ 766
	Y(K)=Y(K)+GAM(KQQ+1,KDC)*TPD	DVDQ 767
	K=K-1	DVDQ 768
	IF (KDC.LT.KDD) GO TO 530	DVDQ 769
C	END OF CORRECT	DVDQ 770
C		DVDQ 771
	IF (EPS(I),NE.0.) GO TO 560	DVDQ 772
550	IF (HMAX) 1190,780,1190	DVDQ 773
560	TPS4=ABS(D(KQQ+2))	DVDQ 774
	TPS2=ABS(D(KQQ))	DVDQ 775
	TPS6=HH/EPS(I)	DVDQ 776
C		DVDQ 777
	E=ABS(GAS(KQQ+1)*TPS3*TPS6)	DVDQ 778
C	E GIVES ABS((ESTIMATED ERROR)/EPS(I))	DVDQ 779
C		DVDQ 780
	LRND=1	DVDQ 781
C		DVDQ 782
C	LRND= 1 MEANS NO ROUND-OFF ERROR	DVDQ 783
C	= 0 MEANS SCME ROUND-OFF ERROR	DVDQ 784
C	=-1 MEANS EXTREME ROUND-OFF ERROR	DVDQ 785
C		DVDQ 786
	FRND=RNDC*ABS(PT(KQQ+2)*D(1))	DVDQ 787
C	CHECK TO SEE IF ROUND OFF ERROR IS DOMINANT	DVDQ 788
	IF ((TPS3+TPS4).GT.FRND) GO TO 570	DVDQ 789
	LRND=0	DVDQ 790
	IF ((TPS4*TPS2).LT.FRND) LRND=-1	DVDQ 791
C		DVDQ 792
570	IF (E.LE.ERND) GO TO 580	DVDQ 793
	IF (E.LE.EMAX) GO TO 580	DVDQ 794
	EMAX=E	DVDQ 795
	KEMAX=I	DVDQ 796
580	IF (LRND.LE.0) GO TO 590	DVDQ 797
	ERND=E	DVDQ 798
	IF (ERND.GT.ERRMX) LDOUB=0	DVDQ 799
590	IF (LDOUB.LE.0) GO TO 780	DVDQ 800
	TPS1=ABS(D(KQQ))	DVDQ 801
	TPS5=TPS1	DVDQ 802
	IF (KQQ-2) 600,610,620	DVDQ 803
600	E2H=E*E2H	DVDQ 804
	IF (E2H.LT.P01) GO TO 780	DVDQ 805
	IF (D(4).LT.3.) GO TO 770	DVDQ 806
	LSTC=-1	DVDQ 807
	LSC=-5	DVDQ 808
	GO TO 770	DVDQ 809
610	TPS1=TPS2	DVDQ 810
	IF (LSTC.NE.2) GO TO 620	DVDQ 811
	KQ(I)=3	DVDQ 812
	TPS2=0.	DVDQ 813
	TPS4=0.	DVDQ 814
	LRND=0	DVDQ 815
620	E2H=TPS2+TPS3+TPS4	DVDQ 816
	E2H=ABS(GAS(KQQ-1)*PT(KQQ+1)*E2H*TPS6)	DVDQ 817
C	E2H IS USED AS AN ESTIMATE OF WHAT THE VALUE OF E WOULD BE	DVDQ 818
C	IF H WERE DOUBLED. THE ESTIMATE IS CONSERVATIVELY LARGE.	DVDQ 819
	IF (E2H.GT.E2HMAX) E2HMAX=E2H	DVDQ 820
C		DVDQ 821
	IF (LRND) 630,640,660	DVDQ 822
C	EXTREME ROUND-OFF ERROR--REDUCE E2H	DVDQ 823

630	K=(KBIT2/KQQ)-4	DVDQ 824
	IF (K.LE.3) GO TO 640	DVDQ 825
	IF (K.GT.KQMAX) K=KQMA	DVDQ 826
	E2H=E2H/PT(K+1)	DVDQ 827
	GO TO 650	DVDQ 828
640	E2H=AMIN1(E2H,E2H*3.*E2HFAC)	DVDQ 829
650	E2H=E2H*P1	DVDQ 830
	TPS6=PTS4	DVDQ 831
	GO TO 670	DVDQ 832
C		DVDQ 833
660	E2H=E2H*E2HFAC	DVDQ 834
	TPS6=KQQ+2	DVDQ 835
C	TEST TO SEE IF DIFFERENCES DECREASE MORE RAPIDLY THAN NECESSARY	DVDQ 836
C		DVDQ 837
670	IF (TPS5.LT.(TPS3*TPS6)) GO TO 680	DVDQ 838
	IF (TPS2.LE.(TPS4*TPS6)) GO TO 760	DVDQ 839
C	THEY DO INCREASE KQ(I)	DVDQ 840
	IF (KQQ.NE.KQMAX) KQ(I)=KQ1	DVDQ 841
	GO TO 760	DVDQ 842
C		DVDQ 843
C	TEST TO SEE IF DIFFERENCES DECREASE TOO SLOWLY	DVDQ 844
680	TPS6=TPS6*P25	DVDQ 845
	IF ((TPS1.GT.(TPS3*TPS6)).OR.(TPS2.GT.(TPS4*TPS6))) GO TO 760	DVDQ 846
C	THEY DO	DVDQ 847
	IF (LSTC.LE.0) GO TO 750	DVDQ 848
	IF (E2H.LT.P01) GO TO 750	DVDQ 849
	IF (LSC-LSTC) 690,750,770	DVDQ 850
690	IF (KSTEP-4) 750,700,710	DVDQ 851
700	KQ1=LSTC	DVDQ 852
710	LSC=KQ1	DVDQ 853
C	END OF ONE DERIVATIVE EVALUATION PER STEP	DVDQ 854
	GO TO 770	DVDQ 855
C		DVDQ 856
C	AFTER HALVING H. REDUCE KQ(I) IF A DISCONTINUITY HAS OCCURRED.	DVDQ 857
720	IF (LDOUB.EQ.(-2)) GO TO 340	DVDQ 858
	DT(KQQ+1,I)=D(KQQ+1)	DVDQ 859
	IF (LDOUB.EQ.(-1)) DT(KQQ+1,I)=D(KQQ+2)	DVDQ 860
	K=KQQ	DVDQ 861
730	IF (K.EQ.1) GO TO 740	DVDQ 862
	IF ((ABS(D(K-1)).GT.(PT(2)*ABS(D(K+1))))).OR.	DVDQ 863
1	(ABS(D(K)).GT.(PT(2)*ABS(D(K+2)))) GO TO 740	DVDQ 864
	K=K-1	DVDQ 865
	GO TO 730	DVDQ 866
740	IF ((K+K).GE.KQQ) GO TO 780	DVDQ 867
	LDOUB=-4	DVDQ 868
	E2H=0.	DVDQ 869
	KQQ=K+1	DVDQ 870
C		DVDQ 871
C		DVDQ 872
C	DIFFERENCES DECREASE TOO SLOWLY REDUCE KQ(I).	DVDQ 873
750	KQ(I)=KQQ-1	DVDQ 874
	IF (KQQ.EQ.2) DT(3,I)=0.	DVDQ 875
760	IF (E2H.LT.P01) GO TO 780	DVDQ 876
770	LDOUB=2	DVDQ 877
780	CONTINUE	DVDQ 878
C		DVDQ 879
C		DVDQ 880
790	CONTINUE	DVDQ 881
C		DVDQ 882
C	END OF LOOP FOR CORRECTING, ESTIMATING THE ERROR, ETC.	DVDQ 883

C		DVDQ 884
C		DVDQ 885
	IF (IFL.LT.0) GO TO 1250	DVDQ 886
C	TEST FOR HALVING H	DVDQ 887
	IF (LDOUB) 860,950,870	DVDQ 888
800	LDOUB=LDOUB+1	DVDQ 889
	IF (LDOUB+1) 810,870,820	DVDQ 890
810	IF (LDOUB.EQ.(-2)) GO TO 820	DVDQ 891
C	ORDER IN AT LEAST ONE COMPONENT HAS BEEN GREATLY REDUCED	DVDQ 892
	LDOUB=0	DVDQ 893
	GO TO 220	DVDQ 894
820	DO 860 I=1,NE	DVDQ 895
	KQQ=KQ(I)	DVDQ 896
	TP=DT(KQQ+1,I)	DVDQ 897
	IF (KQQ.LE.3) GO TO 860	DVDQ 898
	IF (LDOUB.NE.0) GO TO 840	DVDQ 899
	DO 830 K=3,KQQ	DVDQ 900
C	SECOND MODIFICATION OF DIFFERENCE TABLE AFTER HALVING H	DVDQ 901
	DT(K,I)=DT(K,I)+ETA(KQQ-1,K-2)*TP	DVDQ 902
830	CONTINUE	DVDQ 903
	GO TO 860	DVDQ 904
840	DO 850 K=2,KQQ	DVDQ 905
C	FIRST MODIFICATION OF DIFFERENCE TABLE AFTER HALVING H	DVDQ 906
	DT(K,I)=DT(K,I)+ETA(K-1,KQQ-1)*TP	DVDQ 907
850	CONTINUE	DVDQ 908
860	CONTINUE	DVDQ 909
	IFL=0	DVDQ 910
	GO TO 240	DVDQ 911
C		DVDQ 912
870	IFL=2	DVDQ 913
	IF (LSTC.LE.0) GO TO 300	DVDQ 914
	IF (2-LSTC) 880,900,940	DVDQ 915
880	LSTC=LSTC-1	DVDQ 916
	IF (LSTC.EQ.3) GO TO 890	DVDQ 917
	IF (LSC) 920,960,920	DVDQ 918
890	IFL=1	DVDQ 919
	GO TO 300	DVDQ 920
900	IF (LSC-2) 910,930,920	DVDQ 921
910	LSTC=0	DVDQ 922
920	LDOUB=2	DVDQ 923
	GO TO 80	DVDQ 924
930	LSTC=1	DVDQ 925
	LSC=0	DVDQ 926
	GO TO 80	DVDQ 927
940	IF (LSC) 300,80,300	DVDQ 928
C		DVDQ 929
C	HALVE H	DVDQ 930
950	HH=FAC(2)*HH	DVDQ 931
	IF (LSTC.LT.2) GO TO 990	DVDQ 932
	ERND=P25*ERND	DVDQ 933
C	IN LOOP TO FIND A NEW INITIAL STEPSIZE	DVDQ 934
	IF (ERND.GE.P1) GO TO 950	DVDQ 935
	LSTC=4	DVDQ 936
960	LSC=4	DVDQ 937
	DO 970 I=1,NE	DVDQ 938
	KQ(I)=1	DVDQ 939
970	CONTINUE	DVDQ 940
	IF (LSTC-3) 890,890,1170	DVDQ 941
C		DVDQ 942
C	ENTRY AFTER IFLAG=7	DVDQ 943

980	IF (LDOUB.EQ.0) GO TO 990	DVDQ 944
	LSC=1	DVDQ 945
	LSTC=1	DVDQ 946
	GO TO 140	DVDQ 947
C	TEST TO SEE IF H IS TOO SMALL FOR HALVING	DVDQ 948
990	IF (ABS(HH).GE.HMIN) GO TO 1040	DVDQ 949
	IF (IFL.EQ.7) GO TO 1010	DVDQ 950
1000	IFL=7	DVDQ 951
	GO TO 1020	DVDQ 952
C		DVDQ 953
1010	HH=HH+HH	DVDQ 954
	IFL=2	DVDQ 955
1020	H=HH	DVDQ 956
	GO TO 310	DVDQ 957
C		DVDQ 958
C		DVDQ 959
C	ERROR CRITERIA PERMIT DOUBLING	DVDQ 960
1030	HH=HH+HH	DVDQ 961
	IF (LSTC.EQ.1) GO TO 1050	DVDQ 962
	LSC=-3	DVDQ 963
1040	LSTC=-1	DVDQ 964
C		DVDQ 965
C	CHANGE THE STEPSIZE	DVDQ 966
1050	DO 1160 I=1,NE	DVDQ 967
	KQQ=KQ(I)	DVDQ 968
	IF (KQQ.NE.1) GO TO 1070	DVDQ 969
	DT(6,I)=0.	DVDQ 970
	D(3)=DT(3,I)*PT(2)	DVDQ 971
	IF (D(3).GT.PT(3)) LSC=-6	DVDQ 972
	IF (LDOUB.NE.0) GO TO 1060	DVDQ 973
	KQM=8	DVDQ 974
	IF (D(3).GE.PT(5)) DT(7,I)=DT(7,I)*PT(2)	DVDQ 975
	D(3)=D(3)/PT(3)	DVDQ 976
1060	DT(3,I)=D(3)	DVDQ 977
	GO TO 1160	DVDQ 978
C		DVDQ 979
C	BEGINNING OF LOOP FOR CHANGING DIFFERENCE TABLE TO	DVDQ 980
C	CORRESPOND TO NEW VALUE OF H	DVDQ 981
1070	DO 1080 K=1,KQQ	DVDQ 982
	D(K)=DT(K,I)/PT(K)	DVDQ 983
	IF (LDOUB.EQ.0) D(K)=D(K)/PT(K)	DVDQ 984
1080	CONTINUE	DVDQ 985
	KQQ2=KQQ-2	DVDQ 986
	IF (KQQ2) 1160,1140,1090	DVDQ 987
1090	DO 1130 J=1,KQQ2	DVDQ 988
	IF (LDOUB.NE.0) GO TO 1110	DVDQ 989
C		DVDQ 990
C	HALVE	DVDQ 991
	K=KQQ	DVDQ 992
1100	D(K-1)=D(K-1)+D(K)	DVDQ 993
	K=K-1	DVDQ 994
	IF (K+J-KQQ) 1130,1130,1100	DVDQ 995
C		DVDQ 996
C	DOUBLE	DVDQ 997
1110	DO 1120 K=J,KQQ2	DVDQ 998
	D(K+1)=D(K+1)-D(K+2)	DVDQ 999
1120	CONTINUE	DVDQ 1000
1130	CONTINUE	DVDQ 1001
C		DVDQ 1002
1140	DO 1150 K=2,KQQ	DVDQ 1003

	IF (LDOUB.NE.0) D(K)=D(K)*PT(K)	DVDQ1004
	DT(K,I)=D(K)*PT(K)	DVDQ1005
1150	CONTINUE	DVDQ1006
C	DIFFERENCE TABLE NOW CORRESPONDS TO NEW VALUE OF H	DVDQ1007
C		DVDQ1008
1160	CONTINUE	DVDQ1009
1170	H=HH	DVDQ1010
	IF (LDOUB.NE.0) GO TO 75	DVDQ1011
	LFD=1	DVDQ1012
	IF (LSTC.GE.0) GO TO 220	DVDQ1013
	LDOUB=-3	DVDQ1014
	LSC=LSTC-KQM	DVDQ1015
	GO TO 220	DVDQ1016
C	END OF CHANGING STEPSIZE	DVDQ1017
C		DVDQ1018
C		DVDQ1019
1180	K=IFL-5	DVDQ1020
	GO TO (220,980,1200,1570,1570,1720,1720,80,1480,1450,1630,1570), K	DVDQ1021
C		DVDQ1022
C	ILLEGAL VALUE OF PARAMETER INTEGRATION CAN NOT PROCEED	DVDQ1023
1190	IFL=8	DVDQ1024
	GO TO 310	DVDQ1025
1200	WRITE (6,4000)	DVDQ1026
4000	FORMAT (26HOIFLAG=8 IN CALL TO DVJQ1.)	DVDQ1027
	STOP	DVDQ1028
C		DVDQ1029
C		DVDQ1030
1210	IF (T-TFINAL) 200,1190,200	DVDQ1031
C		DVDQ1032
C		DVDQ1033
1220	IFL=4	DVDQ1034
	IF (KSTEP.NE.0) GO TO 1270	DVDQ1035
	TPD2=TPD	DVDQ1036
C	ESTIMATE ERROR WHEN EXTRAPOLATION FROM INITIAL POINT IS REQUESTED	DVDQ1037
1230	HH=HH*TPD1*P75	DVDQ1038
C		DVDQ1039
	IFLS=IFL	DVDQ1040
	IFL=-1	DVDQ1041
	GO TO 230	DVDQ1042
C		DVDQ1043
1240	IF ((LGSD.EQ.0).OR.(IFLS.NE.4)) GO TO 60	DVDQ1044
	LGSE=-1	DVDQ1045
	TPD=FAC(1)	DVDQ1046
	GO TO 1820	DVDQ1047
1250	HH=H	DVDQ1048
	IF (EMAX.LT.P01) GO TO 1260	DVDQ1049
C	ERROR IS TOO LARGE, REDUCE H AND REPEAT THE FIRST STEP	DVDQ1050
	IF (TPD1.LT.0.) GO TO 1190	DVDQ1051
	LDOUB=1	DVDQ1052
	ERND=FAC(1)/TPD1	DVDQ1053
	ERND=ERND*ERND*P25	DVDQ1054
	GO TO 950	DVDQ1055
C		DVDQ1056
1260	IFL=IFLS	DVDQ1057
	IF (IFL.NE.4) GO TO 1790	DVDQ1058
	TPD=TPD2	DVDQ1059
	IFLAG=3	DVDQ1060
1270	IF (TPD1.GT.TPD) GO TO 1280	DVDQ1061
	T=TFINAL	DVDQ1062
	TPD=TPD1	DVDQ1063

GO TO 1290	DVDQ1064
1280 T=TOUT	DVDQ1065
IFL=3	DVDQ1066
1290 IF ((TPD.EQ.0.).AND.(IFLAG.LE.2)) GO TO 310	DVDQ1067
C	DVDQ1068
C INTERPOLATE FOR OUTPUT	DVDQ1069
1300 TP=TPD	DVDQ1070
D(2)=TP	DVDQ1071
KQQ2=0	DVDQ1072
KDC=0	DVDQ1073
D(1)=PT(1)	DVDQ1074
DD(1)=PT(1)	DVDQ1075
DO 1310 K=2,KQM	DVDQ1076
DD(1)=DD(1)+PT(1)	DVDQ1077
TP=TP+PT(1)	DVDQ1078
D(K+1)=(D(K)*TP)/DD(1)	DVDQ1079
1310 CONTINUE	DVDQ1080
GO TO 1350	DVDQ1081
C	DVDQ1082
C COMPUTE THE INTERPOLATING INTEGRATION COEFFICIENTS	DVDQ1083
1320 KQQ2=1	DVDQ1084
L=KQM-KDC	DVDQ1085
KDC=KDC+1	DVDQ1086
1330 IF (L.LE.0) GO TO 1350	DVDQ1087
TP=0.	DVDQ1088
K=L	DVDQ1089
J=L+KDC	DVDQ1090
1340 JS=J-K	DVDQ1091
TP=TP+GAS(K)*D(JS+1)	DVDQ1092
K=K-1	DVDQ1093
IF (K.GT.0) GO TO 1340	DVDQ1094
D(J)=TP	DVDQ1095
C	DVDQ1096
C D(J) IS THE INTEGRATION COEFFICIENT FOR THE INTERPOLATION WHICH	DVDQ1097
C CORRESPONDS TO GAM(J-KDC,KDC).	DVDQ1098
C	DVDQ1099
L=L-1	DVDQ1100
GO TO 1330	DVDQ1101
C	DVDQ1102
C END OF COMPUTING INTEGRATION COEFFICIENTS	DVDQ1103
C	DVDQ1104
C PERFORM THE PARTIAL STEP INTEGRATION	DVDQ1105
1350 J=0	DVDQ1106
DO 1415 I=1,NE	DVDQ1107
KDD=KD(I)	DVDQ1108
IF (KDC.GT.KDD) GO TO 1410	DVDQ1109
TP=0.	DVDQ1110
KQQ=KQ(I)+KQQ2	DVDQ1111
1360 L=KQQ-KDC	DVDQ1112
IF (L.LE.0) GO TO 1370	DVDQ1113
TP=TP+D(KQQ)*DT(L,I)	DVDQ1114
KQQ=KQQ-1	DVDQ1115
IF (KQQ) 1390,1390,1360	DVDQ1116
1370 K=J+KDD	DVDQ1117
L=KDC	DVDQ1118
1380 L=L-1	DVDQ1119
IF (L.EQ.0) GO TO 1400	DVDQ1120
TP=TP*HH+YN(K)*FAC(L)*TPD	DVDQ1121
K=K-1	DVDQ1122
GO TO 1380	DVDQ1123
1390 F(I)=TP	

1400	Y(K)=YN(K)+HH*TP	DVDQ1124
1410	J=J+KDD	DVDQ1125
1415	CONTINUE	DVDQ1126
	IF (KDC.NE.KDMAX) GO TO 1320	DVDQ1127
C	END OF PARTIAL STEP INTEGRATION	DVDQ1128
	IF (LGSE) 1800,310,1810	DVDQ1129
C		DVDQ1130
C	INITIALIZE FOR GSTOPS	DVDQ1131
1420	NGA=IABS(NG)	DVDQ1132
	LGSS=-NGA	DVDQ1133
	LGSD=0	DVDQ1134
	LGSE=0	DVDQ1135
	IFLG=-20	DVDQ1136
	IF (NG) 1425,315,315	DVDQ1137
1425	IFLG=-IFL	DVDQ1138
	IFLG=-IFL	DVDQ1139
1430	LGSD=NGE	DVDQ1140
	IF (LGSD) 1190,1450,1440	DVDQ1141
1440	IFL=15	DVDQ1142
	GO TO 1470	DVDQ1143
C	ENTRY WITH IFL=15	DVDQ1144
1450	LGSS=0	DVDQ1145
	IF (LGSD-NGA) 1460,1480,1190	DVDQ1146
1460	LGSS=LGSD+1	DVDQ1147
	IFL=14	DVDQ1148
1470	IFLAG=IFL-5	DVDQ1149
	GO TO 315	DVDQ1150
C	ENTRY WITH IFL=14	DVDQ1151
1480	DO 1490 I=1,NGA	DVDQ1152
	GT(I)=G(I)	DVDQ1153
1490	CONTINUE	DVDQ1154
	GO TO 1730	DVDQ1155
C	END OF INITIALIZATION FOR GSTOPS	DVDQ1156
C		DVDQ1157
C	ENTRY TO EVALUATE G AT THE END OF THE STEP	DVDQ1158
1500	LGSE=1	DVDQ1159
1510	IGK=LGSS	DVDQ1160
	IFLG=0	DVDQ1161
	IFL=9	DVDQ1162
	GO TO 310	DVDQ1163
C	ENTRY TO EVALUATE G BEFORE EVALUATING THE DERIVATIVES	DVDQ1164
1520	IFLG=IFL	DVDQ1165
	IFL=10	DVDQ1166
1530	IFLAG=10	DVDQ1167
	IGKM=LGSD	DVDQ1168
1540	IGK=1	DVDQ1169
1550	GO TO 315	DVDQ1170
1560	IGK=IGK+1	DVDQ1171
	IF (IGK.GT.IGKM) GO TO 1650	DVDQ1172
C	ENTRY WITH IFL=9,10, AND 17	DVDQ1173
C	TEST FOR G CHANGING SIGN	DVDQ1174
1570	IF (G(IGK)*GT(IGK)) 1600,1580,1590	DVDQ1175
1580	IF (GT(IGK).NE.0.) GO TO 1600	DVDQ1176
	IF (TL.EQ.TG) GO TO 1560	DVDQ1177
1590	IF (LGSE.GT.0) GT(IGK)=G(IGK)	DVDQ1178
	GO TO 1560	DVDQ1179
C	G CHANGES SIGN -- PREPARE FOR ITERATION TO FIND ZERO	DVDQ1180
1600	NSTOP=IGK	DVDQ1181
	IFLGS=IFL	DVDQ1182
		DVDQ1183

C	COMPUTE INITIAL VALUE FOR RG (=RATIO OF PARTIAL STEPSIZE WHERE	DVDQ1184
C	G IS KNOWN/THE INTEGRATION STEPSIZE)	DVDQ1185
	IF (IFLG.EQ.0) GO TO 1610	DVDQ1186
	RG(3)=FAC(1)	DVDQ1187
	RG(2)=0.	DVDQ1188
	IF ((IFLG.EQ.2).AND.(IGK.LT.LGSS)) RG(2)=FAC(1)	DVDQ1189
	GO TO 1620	DVDQ1190
1610	RG(3)=0.	DVDQ1191
	RG(2)=-FAC(1)	DVDQ1192
1620	IF (LGSE.LT.0) RG(3)=TPD	DVDQ1193
	LGSE=-3	DVDQ1194
	GI(2)=GT(IGK)	DVDQ1195
	EPSGS=RND	DVDQ1196
	IFL=16	DVDQ1197
	K=1	DVDQ1198
	GO TO 1640	DVDQ1199
C	END OF PREPARATION TO BEGIN THE ITERATION	DVDQ1200
C		DVDQ1201
C	ENTRY WITH IFL=16	DVDQ1202
C	ITERATE TO FIND GSTOP	DVDQ1203
1630	K=1	DVDQ1204
	IF ((GI(2)*G(IGK)).GT.0.) K=2	DVDQ1205
	IF (ABS(GI(K)).GT.ABS(G(IGK))) GO TO 1640	DVDQ1206
C	CONVERGENCE PROBLEMS	DVDQ1207
	LGSE=LGSE-1	DVDQ1208
	IF (LGSE.EQ.(-5)) EPSGS=PTS1	DVDQ1209
	EPSGS=EPSGS*PTS4	DVDQ1210
1640	GI(K)=G(IGK)	DVDQ1211
	RG(K)=RG(3)	DVDQ1212
C	SECANT ITERATION (GIVES NEW PARTIAL STEPSIZE/H)	DVDQ1213
	TPD=RG(1)-(GI(1)*(RG(2)-RG(1)))/(GI(2)-GI(1))	DVDQ1214
	T=TL+TPD*HH	DVDQ1215
C	TEST FOR CONVERGENCE OF ITERATION	DVDQ1216
	IF (ABS(TPD-RG(3)).LE.EPSGS) GO TO 1560	DVDQ1217
	RG(3)=TPD	DVDQ1218
	GO TO 1300	DVDQ1219
1650	IF (10-IFL) 1660,1700,100	DVDQ1220
1660	IF (IGKM.NE.NGA) GO TO 1710	DVDQ1221
	IF (LGSE.GT.(-3)) GO TO 1690	DVDQ1222
	IF (LSTC.NE.4) GO TO 1670	DVDQ1223
C	ESTIMATE ERROR -- GSTOP IS THE RESULT OF EXTRAPOLATING FROM	DVDQ1224
C	THE INITIAL POINT	DVDQ1225
	TPD1=TPD	DVDQ1226
	RG(3)=TPD	DVDQ1227
	GO TO 1230	DVDQ1228
1670	IFL=11	DVDQ1229
	IF (LGSE.LT.(-4)) IFL=12	DVDQ1230
1680	IFLAG=IFL	DVDQ1231
C	TEST TO SEE IF GSTOP IS PRECEDED BY ANOTHER STOP	DVDQ1232
	IF ((HH*(T-TOUT).LE.0.).AND.(HH*(T-TFINAL).LE.0.)) GO TO 1300	DVDQ1233
C	IT IS	DVDQ1234
	RG(3)=TPD	DVDQ1235
	IFL=IFL	DVDQ1236
	GO TO 200	DVDQ1237
1690	LGSE=1	DVDQ1238
	IFL=IFLG	DVDQ1239
	IF (IFL.LT.0) GO TO 60	DVDQ1240
1700	IGKM=NGA	DVDQ1241
	IFL=IFLG	DVDQ1242
	GO TO 310	DVDQ1243

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1710 IFL=17
      IFLAG=9
      IGKM=NGA
      GO TO 315
C     ENTRY WITH IFL=11 AND 12
C     SET PARAMETERS TO INDICATE A GSTO3 HAS BEEN FOUND
1720 GT(NSTOP)=0.
1730 LGSE=1
      IGKM=NGA
      TG=TL
      IF (IFLG) 1740,1760,1770
1740 IF (IFL.LT.13) GO TO 1750
      IF (IFLG.EQ.(-20)) GO TO 100
      IFL=-IFLG
      GO TO 310
1750 HH=H
      GO TO 200
1760 TPD=0.
      T=TL
      LGSE=-2
      GO TO 1300
1770 IF (IFLG-3) 220,200,200
1780 IF (LGSE.EQ.(-1)) GO TO 1790
      LGSE=-1
      GO TO 1220
1790 TPD=RG(3)
      T=TL+TPD*HH
      IF (LGSE.NE.(-1)) GO TO 1670
      IFL=IFLS
      LGSE=-3
      GO TO 1680
1800 IF (LGSE+2) 1550,1500,310
1810 IF (TPD.LE.0.) GO TO 310
      LGSE=-2
1820 IFLG=IFL
      IFL=17
      IFLAG=9
      IF (LGSD .GT. 0) GO TO 1530
      GO TO 1540
      END

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DVDQ1244
DVDQ1245
DVDQ1246
DVDQ1247
DVDQ1248
DVDQ1249
DVDQ1250
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DVDQ1281
DVDQ1282
DVDQ1283

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		15. Supplementary Notes Final report. Project Manager, Robert J. Shaw, Propulsion Systems Division, NASA Lewis Research Center, Cleveland, Ohio 44135. The microfiche supplement at the back of this report contains an example problem printout and code listings.	
16. Abstract Calculations can be performed for any atmospheric conditions and for all water drop sizes, from the smallest cloud droplet to large raindrops. Any subsonic, external, non-lifting flow can be accommodated; flow into, but not through, inlets also can be simulated. Experimental water drop drag relations are used in the water drop equations of motion and effects of gravity settling are included. Seven codes are described: 1. a code used to debug and plot body surface description data, 2. a code that processes the body surface data to yield the potential flow field, 3. a code that computes flow velocities at arrays of points in space, 4. a code that computes water drop trajectories from an array of points in space, 5. a code that computes water drop trajectories and fluxes to arbitrary target points, 6. a code that computes water drop trajectories tangent to the body, 7. a code that produces stereo pair plots which include both the body and trajectories. Code descriptions include operating instructions, card inputs and printouts for example problems, and listings of the FORTRAN codes. Accuracy of the calculations is discussed, and trajectory calculation results are compared with prior calculations and with experimental data.			
17. Key Words (Suggested by Author(s)) Water drop trajectories; Three-dimensional potential flow; Computer programs; Tangent trajectories; Water drop fluxes; Aircraft icing		18. Distribution Statement Unclassified - Unlimited Subject Category 02	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 82	22. Price* A05

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EXAMPLE PROBLEM PRINTOUT

PBOXC

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

PAGE 1

BODY ID. TEST

TEST BODY

P A R A M E T R I C I N F O R M A T I O N

NO SYMMETRY SPECIFIED

PLOTS ARE PREPARED

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z		
1	1	2.000000	2.000000	1.500000	1.500000	.958086	1.591395		
		0.000000	0.000000	1.670000	1.732000	.276584	1.389794		
		0.000000	0.000000	.229700	0.000000	.074655	.094899		
2	2	2.000000	2.000000	1.500000	1.500000	.941794	1.598349		
		0.000000	0.000000	1.460000	1.670000	.251249	1.254020		
		0.000000	0.000000	.465900	.229700	.223380	.282927		
3	3	2.000000	2.000000	1.500000	1.500000	.915363	1.605113		
		0.000000	0.000000	1.140000	1.460000	.202414	1.019539		
		0.000000	0.000000	.652000	.465900	.348052	.445612		
4	4	2.000000	2.000000	1.500000	1.500000	.891771	1.609275		
		0.000000	0.000000	.800000	1.140000	.146221	.750320		
		0.000000	0.000000	.768100	.652000	.428210	.557494		
5	5	2.000000	2.000000	1.500000	1.500000	.874522	1.620269		
		0.000000	0.000000	.400000	.800000	.088802	.447901		
		0.000000	0.000000	.842600	.768100	.476787	.613081		
6	6	2.000000	2.000000	1.500000	1.500000	.865649	1.624811		
		0.000000	0.000000	0.000000	.400000	.029238	.147089		
		0.000000	0.000000	.866000	.842600	.499797	.641222		
7	7	2.000000	2.000000	1.500000	1.500000	.863087	1.626041		
		0.000000	0.000000	-.400000	0.000000	-.082222	-.148316		
		0.000000	0.000000	.800000	.866000	.498318	.623224		
8	8	2.000000	2.000000	1.500000	1.500000	.872872	1.627233		
		0.000000	0.000000	-.800000	-.400000	-.218218	-.442846		
		0.000000	0.000000	.600000	.800000	.436436	.524111		
9	9	2.000000	2.000000	1.500000	1.500000	.872872	1.618821		
		0.000000	0.000000	-1.200000	-.800000	-.218218	-.751160		
		0.000000	0.000000	.400000	.600000	.436436	.386778		
10	10	2.000000	2.000000	1.500000	1.500000	.872872	1.607148		
		0.000000	0.000000	-1.600000	-1.200000	-.218218	-1.085976		
		0.000000	0.000000	.200000	.400000	.436436	.242716		
11	11	2.000000	2.000000	1.500000	1.500000	.945063	1.589795		
		0.000000	0.000000	-1.732000	-1.600000	-.272824	-1.365206		
		0.000000	0.000000	0.000000	.200000	.180064	.084464		
12	12	2.000000	2.000000	1.500000	1.500000	.958086	1.591395		
		0.000000	0.000000	-1.670000	-1.732000	-.276584	-1.389794		
		0.000000	0.000000	-.229700	0.000000	-.074655	-.094899		

3

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
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70000	1.732000	.276584	1.389794	.1803E+01
29700	0.000000	.074655	.094899	.2076E+00
500000	1.500000	.941794	1.598349	.8882E-15
60000	1.670000	.251249	1.254020	.1758E+01
65900	.229700	.223380	.282927	.2350E+00
500000	1.500000	.915363	1.605113	.2665E-14
140000	1.460000	.202414	1.019539	.1612E+01
652000	.465900	.348052	.445612	.2299E+00
500000	1.500000	.891771	1.609275	.2665E-14
800000	1.140000	.146221	.750320	.1405E+01
768100	.652000	.428210	.557494	.1985E+00
500000	1.500000	.874522	1.620269	.9992E-15
400000	.800000	.088802	.447901	.1217E+01
842600	.768100	.476787	.613081	.2097E+00
500000	1.500000	.865649	1.624811	.2220E-15
000000	.400000	.029238	.147089	.1058E+01
866000	.842600	.499797	.641222	.2001E+00
500000	1.500000	.863087	1.626041	.2220E-15
400000	0.000000	-.082222	-.148316	.1025E+01
800000	.866000	.498318	.623224	.2007E+00
500000	1.500000	.872872	1.627233	.8882E-15
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600000	.800000	.436436	.524111	.2291E+00
500000	1.500000	.872872	1.618821	.1776E-14
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400000	.600000	.436436	.386778	.2291E+00
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200000	.400000	.436436	.242716	.2291E+00
500000	1.500000	.945063	1.589795	0.
732000	-1.600000	-.272824	-1.365206	.1803E+01
000000	.200000	.180064	.084464	.1833E+00
500000	1.500000	.958086	1.591395	0.
670000	-1.732000	-.276584	-1.389794	.1803E+01
229700	0.000000	-.074655	-.094899	.2076E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
1	13	2.000000	2.000000	1.500000	1.500000	.941794	1.598349		
		0.000000	0.000000	-1.460000	-1.670000	-.251249	-1.254020		
		0.000000	0.000000	-.465900	-.229700	-.223380	-.282927		
14	14	2.000000	2.000000	1.500000	1.500000	.915363	1.605113		
		0.000000	0.000000	-1.140000	-1.460000	-.202414	-1.019539		
		0.000000	0.000000	-.652000	-.465900	-.348052	-.445612		
15	15	2.000000	2.000000	1.500000	1.500000	.891771	1.609275		
		0.000000	0.000000	-.800000	-1.140000	-.146221	-.750320		
		0.000000	0.000000	-.768100	-.652000	-.428210	-.557494		
16	16	2.000000	2.000000	1.500000	1.500000	.874522	1.620269		
		0.000000	0.000000	-.400000	-.800000	-.088802	-.447901		
		0.000000	0.000000	-.842600	-.768100	-.476787	-.613081		
17	17	2.000000	2.000000	1.500000	1.500000	.865649	1.624811		
		0.000000	0.000000	0.000000	-.400000	-.029238	-.147089		
		0.000000	0.000000	-.866000	-.842600	-.499797	-.641222		
4	18	2.000000	2.000000	1.500000	1.500000	.865649	1.624811		
		0.000000	0.000000	.400000	0.000000	.029238	.147089		
		0.000000	0.000000	-.842600	-.866000	-.499797	-.641222		
19	19	2.000000	2.000000	1.500000	1.500000	.874522	1.620269		
		0.000000	0.000000	.800000	.400000	.088802	.447901		
		0.000000	0.000000	-.768100	-.842600	-.476787	-.613081		
20	20	2.000000	2.000000	1.500000	1.500000	.891771	1.609275		
		0.000000	0.000000	1.140000	.800000	.146221	.750320		
		0.000000	0.000000	-.652000	-.768100	-.428210	-.557494		
21	21	2.000000	2.000000	1.500000	1.500000	.915363	1.605113		
		0.000000	0.000000	1.460000	1.140000	.202414	1.019539		
		0.000000	0.000000	-.465900	-.652000	-.348052	-.445612		
22	22	2.000000	2.000000	1.500000	1.500000	.941794	1.598349		
		0.000000	0.000000	1.670000	1.460000	.251249	1.254020		
		0.000000	0.000000	-.229700	-.465900	-.223380	-.282927		
23	23	2.000000	2.000000	1.500000	1.500000	.958086	1.591395		
		0.000000	0.000000	1.732000	1.670000	.276584	1.389794		
		0.000000	0.000000	0.000000	-.229700	-.074655	-.094899		
2	1	1.500000	1.500000	1.000000	1.000000	.435365	1.220560		
		1.732000	1.670000	1.870000	2.000000	.855263	1.831729		
		0.000000	.229700	.354600	0.000000	.281038	.149900		

	X	NX	NPX	D
	Y	NY	NPY	T
	Z	NZ	NPZ	A
000	1.500000	.941794	1.598349	.8882E-15
000	-1.670000	-.251249	-1.254020	.1758E+01
000	-.229700	-.223380	-.282927	.2350E+00
000	1.500000	.915363	1.605113	.2665E-14
000	-1.460000	-.202414	-1.019539	.1612E+01
000	-.465900	-.348052	-.445612	.2299E+00
000	1.500000	.891771	1.609275	.2665E-14
000	-1.140000	-.146221	-.750320	.1405E+01
000	-.652000	-.428210	-.557494	.1985E+00
000	1.500000	.874522	1.620269	.9992E-15
000	-.800000	-.088802	-.447901	.1217E+01
000	-.768100	-.476787	-.613081	.2097E+00
000	1.500000	.865649	1.624811	.2220E-15
000	-.400000	-.029238	-.147089	.1058E+01
000	-.842600	-.499797	-.641222	.2001E+00
000	1.500000	.865649	1.624811	.2220E-15
000	0.000000	.029238	.147089	.1058E+01
000	-.866000	-.499797	-.641222	.2001E+00
000	1.500000	.874522	1.620269	.9992E-15
000	.400000	.088802	.447901	.1217E+01
000	-.842600	-.476787	-.613081	.2097E+00
000	1.500000	.891771	1.609275	.2665E-14
000	.800000	.146221	.750320	.1405E+01
000	-.768100	-.428210	-.557494	.1985E+00
000	1.500000	.915363	1.605113	.2665E-14
000	1.140000	.202414	1.019539	.1612E+01
000	-.652000	-.348052	-.445612	.2299E+00
000	1.500000	.941794	1.598349	.8882E-15
000	1.460000	.251249	1.254020	.1758E+01
700	-.465900	-.223380	-.282927	.2350E+00
000	1.500000	.958086	1.591395	0.
000	1.670000	.276584	1.389794	.1803E+01
000	-.229700	-.074655	-.094899	.2076E+00
000	1.000000	.435365	1.220560	.5764E-02
000	2.000000	.855263	1.831729	.6416E+00
000	0.000000	.261038	.149900	.1708E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

PA

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z		
2	2	1.500000	1.500000	1.000000	1.000000	.390089	1.2417		
		1.670000	1.460000	1.600000	1.870000	.652170	1.6528		
		.229700	.465900	.600000	.354600	.650004	.4146		
3	3	1.500000	1.500000	1.000000	1.000000	.324553	1.2416		
		1.460000	1.140000	1.200000	1.600000	.447006	1.3516		
		.465900	.652000	.800000	.600000	.833577	.6318		
4	4	1.500000	1.500000	1.000000	1.000000	.288009	1.2429		
		1.140000	.800000	.800000	1.200000	.287154	.9857		
		.652000	.768100	.916500	.800000	.913561	.7861		
5	5	1.500000	1.500000	1.000000	1.000000	.270929	1.2501		
		.800000	.400000	.400000	.800000	.163401	.6000		
		.768100	.842600	.979800	.916500	.948629	.8766		
6	6	1.500000	1.500000	1.000000	1.000000	.261384	1.2500		
		.400000	0.000000	0.000000	.400000	.052527	.2000		
		.842600	.866000	1.000000	.979800	.963805	.9220		
7	7	1.500000	1.500000	1.000000	1.000000	.126140	1.2460		
		0.000000	-.400000	-.400000	0.000000	-.312996	-.1995		
		.866000	.800000	.800000	1.000000	.941341	.8671		
8	8	1.500000	1.500000	1.000000	1.000000	0.000000	1.2500		
		-.400000	-.800000	-.800000	-.400000	-.447214	-.6000		
		.800000	.600000	.600000	.800000	.894427	.7000		
9	9	1.500000	1.500000	1.000000	1.000000	0.000000	1.2500		
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.0000		
		.600000	.400000	.400000	.600000	.894427	.5000		
10	10	1.500000	1.500000	1.000000	1.000000	0.000000	1.2500		
		-1.200000	-1.600000	-1.600000	-1.200000	-.447214	-1.4000		
		.400000	.200000	.200000	.400000	.894427	.3000		
11	11	1.500000	1.500000	1.000000	1.000000	.159008	1.2167		
		-1.600000	-1.732000	-2.000000	-1.600000	-.593315	-1.7392		
		.200000	0.000000	0.000000	.200000	.789109	.1020		
12	12	1.500000	1.500000	1.000000	1.000000	.435365	1.2205		
		-1.732000	-1.670000	-1.870000	-2.000000	-.855263	-1.8317		
		0.000000	-.229700	-.354600	0.000000	-.281038	-.1499		
13	13	1.500000	1.500000	1.000000	1.000000	.390089	1.2417		
		-1.670000	-1.460000	-1.600000	-1.870000	-.652170	-1.6528		
		-.229700	-.465900	-.600000	-.354600	-.650004	-.4146		

FOLDOUT FROM

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NY	NPY	T
NZ	NPZ	A
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.650004	.414680	.1846E+00
.324553	1.241630	.6043E-02
.447006	1.351646	.6814E+00
.833577	.631851	.2159E+00
.288009	1.242990	.4216E-02
.287154	.985715	.6600E+00
.913561	.786135	.2025E+00
.270929	1.250180	.2656E-02
.163401	.600088	.6744E+00
.948629	.876683	.2108E+00
.261384	1.250317	.7710E-03
.052527	.200026	.6594E+00
.963805	.922094	.2075E+00
.126140	1.246098	.3153E-01
-.312996	-.199566	.6708E+00
.941341	.867167	.2125E+00
0.000000	1.250000	.3553E-14
-.447214	-.600000	.6708E+00
.894427	.700000	.2236E+00
0.000000	1.250000	.3553E-14
-.447214	-1.000000	.6708E+00
.894427	.500000	.2236E+00
0.000000	1.250000	.6661E-14
-.447214	-1.400000	.6708E+00
.894427	.300000	.2236E+00
.159008	1.216789	.3975E-01
-.593315	-1.739216	.6708E+00
.789109	.102018	.1685E+00
.435365	1.220560	.5764E-02
-.855263	-1.831729	.6416E+00
-.281038	-.149900	.1708E+00
.390089	1.241719	.8288E-02
-.652170	-1.652830	.6561E+00
-.650004	-.414680	.1846E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NPX
		X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPY NPZ	
2	14	1.500000	1.500000	1.000000	1.000000	.324553	1.241630	
		-1.460000	-1.140000	-1.200000	-1.600000	-.447006	-1.351646	
		-.465900	-.652000	-.800000	-.600000	-.833577	-.631851	
	15	1.500000	1.500000	1.000000	1.000000	.288009	1.242990	
		-1.140000	-.800000	-.800000	-1.200000	-.287154	-.985715	
		-.652000	-.768100	-.916500	-.800000	-.913561	-.786135	
	16	1.500000	1.500000	1.000000	1.000000	.270929	1.250180	
		-.800000	-.400000	-.400000	-.800000	-.163401	-.600088	
-.768100		-.842600	-.979800	-.916500	-.948629	-.876683		
17	1.500000	1.500000	1.000000	1.000000	.261384	1.250017		
	-.400000	0.000000	0.000000	-.400000	-.052527	-.200026		
	-.842600	-.866000	-1.000000	-.979800	-.963805	-.922094		
18	1.500000	1.500000	1.000000	1.000000	.261384	1.250017		
	0.000000	.400000	.400000	0.000000	.052527	.200026		
	-.866000	-.842600	-.979800	-1.000000	-.963805	-.922094		
19	1.500000	1.500000	1.000000	1.000000	.270929	1.250180		
	.400000	.800000	.800000	.400000	.163401	.600088		
	-.842600	-.768100	-.916500	-.979800	-.948629	-.876683		
20	1.500000	1.500000	1.000000	1.000000	.288009	1.242990		
	.800000	1.140000	1.200000	.800000	.287154	.985715		
	-.768100	-.652000	-.800000	-.916500	-.913561	-.786135		
21	1.500000	1.500000	1.000000	1.000000	.324553	1.241630		
	1.140000	1.460000	1.600000	1.200000	.447006	1.351646		
	-.652000	-.465900	-.600000	-.800000	-.833577	-.631851		
22	1.500000	1.500000	1.000000	1.000000	.390089	1.241719		
	1.460000	1.670000	1.870000	1.600000	.652170	1.652830		
	-.465900	-.229700	-.354600	-.600000	-.650004	-.414680		
23	1.500000	1.500000	1.000000	1.000000	.435365	1.220560		
	1.670000	1.732000	2.000000	1.870000	.855263	1.831729		
	-.229700	0.000000	0.000000	-.354600	-.281038	-.149900		
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		2.000000	1.870000	1.870000	2.000000	.938893	1.935000	
		0.000000	.354600	.354600	0.000000	.344208	.177300	
	2	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		1.870000	1.600000	1.600000	1.870000	.672591	1.735000	
		.354600	.600000	.600000	.354600	.740014	.477300	

X	NX	NPX	D
Y	NY	NPY	T
Z	NZ	NPZ	A
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-.600000	-.833577	-.631851	.2159E+00
1.000000	.288009	1.242990	.4216E-02
-1.200000	-.287154	-.985715	.6600E+00
-.800000	-.913561	-.786135	.2025E+00
1.000000	.270929	1.250180	.2656E-02
-.800000	-.163401	-.600088	.6744E+00
-.916500	-.948629	-.876683	.2108E+00
1.000000	.261384	1.250017	.7710E-03
-.400000	-.052527	-.200026	.6594E+00
-.979800	-.963805	-.922094	.2075E+00
1.000000	.261384	1.250017	.7710E-03
0.000000	.052527	.200026	.6594E+00
-1.000000	-.963805	-.922094	.2075E+00
1.000000	.270929	1.250180	.2656E-02
.400000	.163401	.600088	.6744E+00
-.979800	-.948629	-.876683	.2108E+00
1.000000	.288009	1.242990	.4216E-02
.800000	.287154	.985715	.6600E+00
-.916500	-.913561	-.786135	.2025E+00
1.000000	.324553	1.241630	.6043E-02
1.200000	.447006	1.351646	.6814E+00
-.800000	-.833577	-.631851	.2159E+00
1.000000	.390089	1.241719	.8288E-02
1.600000	.652170	1.652830	.6561E+00
-.600000	-.650004	-.414680	.1846E+00
1.000000	.435365	1.220560	.5764E-02
1.870000	.855263	1.831729	.6416E+00
-.354600	-.281038	-.149900	.1708E+00
0.000000	0.000000	.500000	0.
2.000000	.938893	1.935000	.1069E+01
0.000000	.344208	.177300	.3777E+00
0.000000	0.000000	.500000	.4885E-14
1.870000	.672591	1.735000	.1064E+01
.354600	.740014	.477300	.3649E+00

BODY ID. TEST

TEST BODY

N	M	X	X	X	X	NX	NPX
		Y	Y	Y	Y		
		Z	Z	Z	Z	NY	NPY
						NZ	NPZ
3	3	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		1.600000	1.200000	1.200000	1.600000	.447214	1.400000
		.600000	.800000	.800000	.600000	.894427	.700000
4	4	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		1.200000	.800000	.800000	1.200000	.279631	1.000000
		.800000	.916500	.916500	.800000	.960107	.858250
5	5	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		.800000	.400000	.400000	.800000	.156305	.600000
		.916500	.979800	.979800	.916500	.967709	.948150
6	6	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		.400000	0.000000	0.000000	.400000	.050436	.200000
		.979800	1.000000	1.000000	.979800	.998727	.989900
7	7	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		0.000000	-.400000	-.400000	0.000000	-.447214	-.200000
		1.000000	.800000	.800000	1.000000	.894427	.900000
8	8	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		-.400000	-.800000	-.800000	-.400000	-.447214	-.600000
		.800000	.600000	.600000	.800000	.894427	.700000
9	9	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.000000
		.600000	.400000	.400000	.600000	.894427	.500000
10	10	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		-1.200000	-1.600000	-1.600000	-1.200000	-.447214	-1.400000
		.400000	.200000	.200000	.400000	.894427	.300000
11	11	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		-1.600000	-2.000000	-2.000000	-1.600000	-.447214	-1.800000
		.200000	0.000000	0.000000	.200000	.894427	.100000
12	12	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		-2.000000	-1.870000	-1.870000	-2.000000	-.938893	-1.935000
		0.000000	-.354600	-.354600	0.000000	-.344208	-.177300
13	13	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		-1.870000	-1.600000	-1.600000	-1.870000	-.672591	-1.735000
		-.354600	-.600000	-.600000	-.354600	-.740014	-.477300
14	14	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		-1.600000	-1.200000	-1.200000	-1.600000	-.447214	-1.400000
		-.600000	-.800000	-.800000	-.600000	-.894427	-.700000

NX	NPX	D
NY	NPY	T
NZ	NPZ	A
0.000000	.500000	.6661E-14
.447214	1.400000	.1095E+01
.894427	.700000	.4472E+00
0.000000	.500000	.2442E-14
.279631	1.000000	.1083E+01
.960107	.858250	.4166E+00
0.000000	.500000	.2442E-14
.156305	.600000	.1079E+01
.987709	.948150	.4050E+00
0.000000	.500000	.5551E-16
.050436	.200000	.1077E+01
.998727	.989900	.4005E+00
0.000000	.500000	.3109E-14
-.447214	-.200000	.1095E+01
.894427	.900000	.4472E+00
0.000000	.500000	.3553E-14
-.447214	-.600000	.1095E+01
.894427	.700000	.4472E+00
0.000000	.500000	.3553E-14
-.447214	-1.000000	.1095E+01
.894427	.500000	.4472E+00
0.000000	.500000	.6661E-14
-.447214	-1.400000	.1095E+01
.894427	.300000	.4472E+00
0.000000	.500000	.4441E-15
-.447214	-1.800000	.1095E+01
.894427	.100000	.4472E+00
0.000000	.500000	0.
-.938893	-1.935000	.1069E+01
-.344208	-.177300	.3777E+00
0.000000	.500000	.4885E-14
-.672591	-1.735000	.1064E+01
-.740014	-.477300	.3649E+00
0.000000	.500000	.6661E-14
-.447214	-1.400000	.1095E+01
-.894427	-.700000	.4472E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
3	15	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.200000	-.800000	-.800000	-1.200000	-.279631	-1.000000		
		-.800000	-.916500	-.916500	-.800000	-.960107	-.858250		
	16	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.800000	-.400000	-.400000	-.800000	-.156305	-.600000		
		-.916500	-.979800	-.979800	-.916500	-.987709	-.948150		
	17	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.400000	0.000000	0.000000	-.400000	-.050436	-.200000		
		-.979800	-1.000000	-1.000000	-.979800	-.998727	-.989900		
	18	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		0.000000	.400000	.400000	0.000000	.050436	.200000		
		-1.000000	-.979800	-.979800	-1.000000	-.998727	-.989900		
	19	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.400000	.800000	.800000	.400000	.156305	.600000		
		-.979800	-.916500	-.916500	-.979800	-.987709	-.948150		
∞	20	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.800000	1.200000	1.200000	.800000	.279631	1.000000		
		-.916500	-.800000	-.800000	-.916500	-.960107	-.858250		
	21	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.200000	1.600000	1.600000	1.200000	.447214	1.400000		
		-.800000	-.600000	-.600000	-.800000	-.894427	-.700000		
	22	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.600000	1.870000	1.870000	1.600000	.672591	1.735000		
		-.600000	-.354600	-.354600	-.600000	-.740014	-.477300		
	23	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.870000	2.000000	2.000000	1.870000	.938893	1.935000		
		-.354600	0.000000	0.000000	-.354600	-.344208	-.177300		
4	1	0.000000	0.000000	-.500000	-.500000	-.049532	-.248068		
		2.000000	1.870000	1.850000	1.972000	.939127	1.923092		
		0.000000	.354600	.341500	0.000000	.339980	.174052		
	2	0.000000	0.000000	-.500000	-.500000	-.043145	-.249477		
		1.870000	1.600000	1.585000	1.850000	.675158	1.726269		
		.354600	.600000	.586600	.341500	.736411	.470688		
	3	0.000000	0.000000	-.500000	-.500000	-.034875	-.249169		
		1.600000	1.200000	1.195000	1.585000	.449471	1.395016		
		.600000	.800000	.784400	.586600	.892614	.692774		

X Y Z	NX NY NZ	NPX NPY NPZ	D T A
0.000000	0.000000	.500000	.2442E-14
1.200000	-.279631	-1.000000	.1083E+01
-.800000	-.960107	-.858250	.4166E+00
0.000000	0.000000	.500000	.2442E-14
-.800000	-.156305	-.600000	.1079E+01
-.916500	-.987709	-.948150	.4050E+00
0.000000	0.000000	.500000	.5551E-16
-.400000	-.050436	-.200000	.1077E+01
-.979800	-.998727	-.989900	.4005E+00
0.000000	0.000000	.500000	.3553E-14
0.000000	.050436	.200000	.1077E+01
1.000000	-.998727	-.989900	.4005E+00
0.000000	0.000000	.500000	.2220E-14
.400000	.156305	.600000	.1079E+01
-.979800	-.987709	-.948150	.4050E+00
0.000000	0.000000	.500000	.3109E-14
.800000	.279631	1.000000	.1083E+01
-.916500	-.960107	-.858250	.4166E+00
0.000000	0.000000	.500000	.6661E-14
1.200000	.447214	1.400000	.1095E+01
-.800000	-.894427	-.700000	.4472E+00
0.000000	0.000000	.500000	.6217E-14
1.600000	.672591	1.735000	.1064E+01
-.600000	-.740014	-.477300	.3649E+00
0.000000	0.000000	.500000	.6217E-14
1.870000	.938893	1.935000	.1069E+01
-.354600	-.344208	-.177300	.3777E+00
-.500000	-.049532	-.248068	.7648E-03
1.972000	.939127	1.923092	.6238E+00
0.000000	.339980	.174052	.1853E+00
-.500000	-.043145	-.249477	.7887E-03
1.850000	.675158	1.726269	.6205E+00
.341500	.736411	.470688	.1816E+00
-.500000	-.034875	-.249169	.6327E-03
1.585000	.449471	1.395016	.6693E+00
.586600	.892614	.692774	.2213E+00

FOR OUT FILE 2

BODY ID. TEST		TEST BODY							
N	M	X	X	X	X	NX	NPX		
		Y	Y	Y	Y	NY	NPY		
		Z	Z	Z	Z	NZ	NPZ		
4	4	0.000000 1.200000 .800000	0.000000 .800000 .916500	-.500000 .800000 .901200	-.500000 1.200000 .784400	-.031043 .281449 .959074	-.249537 .998756 .850538		
	5	0.000000 .800000 .916500	0.000000 .400000 .979800	-.500000 .400000 .965500	-.500000 .800000 .901200	-.029218 .157442 .987096	-.250016 .600001 .940749		
	6	0.000000 .400000 .979800	0.000000 0.000000 1.000000	-.500000 0.000000 .986000	-.500000 .400000 .965500	-.028252 .050789 .998310	-.250002 .200000 .982825		
	7	0.000000 0.000000 1.000000	0.000000 -.400000 .800000	-.500000 -.400000 .800000	-.500000 0.000000 .986000	-.012608 -.434526 .900571	-.249496 -.199997 .896509		
	8	0.000000 -.400000 .800000	0.000000 -.800000 .600000	-.500000 -.800000 .600000	-.500000 -.400000 .800000	0.000000 -.447214 .894427	-.250000 -.600000 .700000		
6	9	0.000000 -.800000 .600000	0.000000 -1.200000 .400000	-.500000 -1.200000 .400000	-.500000 -.800000 .600000	0.000000 -.447214 .894427	-.250000 -1.000000 .500000		
	10	0.000000 -1.200000 .400000	0.000000 -1.600000 .200000	-.500000 -1.600000 .200000	-.500000 -1.200000 .400000	0.000000 -.447214 .894427	-.250000 -1.400000 .300000		
	11	0.000000 -1.600000 .200000	0.000000 -2.000000 0.000000	-.500000 -1.972000 0.000000	-.500000 -1.600000 .200000	-.012608 -.460010 .867820	-.247831 -1.793015 .100024		
	12	0.000000 -2.000000 0.000000	0.000000 -1.870000 -.354600	-.500000 -1.850000 -.341500	-.500000 -1.972000 0.000000	-.049532 -.939127 -.339980	-.248068 -1.923092 -.174052		
	13	0.000000 -1.870000 -.354600	0.000000 -1.600000 -.600000	-.500000 -1.585000 -.586600	-.500000 -1.850000 -.341500	-.043145 -.675158 -.736411	-.249477 -1.726269 -.470688		
	14	0.000000 -1.600000 -.600000	0.000000 -1.200000 -.800000	-.500000 -1.195000 -.784400	-.500000 -1.585000 -.586600	-.034875 -.449471 -.892614	-.249169 -1.395016 -.692774		
	15	0.000000 -1.200000 -.800000	0.000000 -.800000 -.916500	-.500000 -.800000 -.901200	-.500000 -1.195000 -.784400	-.031043 -.281449 -.959074	-.249537 -.998756 -.850538		

NX	NPX	D
NY	NPY	T
NZ	NPZ	A
-.031043	-.249537	.4237E-03
.281449	.998756	.6507E+00
.959074	.850538	.2072E+00
-.029218	-.250016	.2468E-03
.157442	.600001	.6451E+00
.987096	.940749	.2026E+00
-.028252	-.250002	.7487E-04
.050789	.200000	.6412E+00
.998310	.982825	.2003E+00
-.012608	-.249496	.3152E-02
-.434526	-.199997	.6708E+00
.900571	.896509	.2221E+00
0.000000	-.250000	.3553E-14
-.447214	-.600000	.6708E+00
.894427	.700000	.2236E+00
0.000000	-.250000	.3553E-14
-.447214	-1.000000	.6708E+00
.894427	.500000	.2236E+00
0.000000	-.250000	.6661E-14
-.447214	-1.400000	.6708E+00
.894427	.300000	.2236E+00
-.012880	-.247831	.3220E-02
-.460010	-1.793015	.6708E+00
.867820	.100024	.2174E+00
-.049532	-.248068	.7648E-03
-.939127	-1.923092	.6238E+00
-.339980	-.174052	.1853E+00
-.043145	-.249477	.7887E-03
-.675158	-1.726269	.6205E+00
-.736411	-.470688	.1816E+00
-.034875	-.249169	.6327E-03
-.449471	-1.395016	.6693E+00
-.892614	-.692774	.2213E+00
-.031043	-.249537	.4237E-03
-.281449	-.998756	.6507E+00
-.959074	-.850538	.2072E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			TEST BODY		
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ		
4	16	0.000000	0.000000	-.500000	-.500000	-.029218	-.250016			
		-.800000	-.400000	-.400000	-.800000	-.157442	-.600001			
		-.916500	-.979800	-.965500	-.901200	-.987096	-.940749			
	17	0.000000	0.000000	-.500000	-.500000	-.028252	-.250002			
		-.400000	0.000000	0.000000	-.400000	-.050789	-.200000			
		-.979800	-1.000000	-.986000	-.965500	-.998310	-.982825			
	18	0.000000	0.000000	-.500000	-.500000	-.028252	-.250002			
		0.000000	.400000	.400000	0.000000	.050789	.200000			
		-1.000000	-.979800	-.965500	-.986000	-.998310	-.982825			
	19	0.000000	0.000000	-.500000	-.500000	-.029218	-.250016			
		.400000	.800000	.800000	.400000	.157442	.600001			
		-.979800	-.916500	-.901200	-.965500	-.987096	-.940749			
20	0.000000	0.000000	-.500000	-.500000	-.031043	-.249537				
	.800000	1.200000	1.195000	.800000	.281449	.998756				
	-.916500	-.800000	-.784400	-.901200	-.959074	-.850538				
21	0.000000	0.000000	-.500000	-.500000	-.034875	-.249169				
	1.200000	1.600000	1.585000	1.195000	.449471	1.395016				
	-.800000	-.600000	-.586600	-.784400	-.892614	-.692774				
22	0.000000	0.000000	-.500000	-.500000	-.043145	-.249477				
	1.600000	1.870000	1.850000	1.585000	.675158	1.726269				
	-.600000	-.354600	-.341500	-.586600	-.736411	-.470668				
23	0.000000	0.000000	-.500000	-.500000	-.049532	-.248068				
	1.870000	2.000000	1.972000	1.850000	.939127	1.923092				
	-.354600	0.000000	0.000000	-.341500	-.339980	-.174052				
5	1	-.500000	-.500000	-1.000000	-1.000000	-.153543	-.743334			
		1.972000	1.850000	1.785000	1.885600	.934141	1.874150			
		0.000000	.341500	.303900	0.000000	.322188	.161626			
	2	-.500000	-.500000	-1.000000	-1.000000	-.132740	-.747369			
1.850000		1.585000	1.540000	1.785000	.683173	1.690281				
.341500		.586600	.544000	.303900	.718091	.444215				
3	-.500000	-.500000	-1.000000	-1.000000	-.108809	-.747752				
	1.585000	1.195000	1.175000	1.540000	.457325	1.373892				
	.586600	.784400	.737400	.544000	.882618	.663304				
4	-.500000	-.500000	-1.000000	-1.000000	-.095703	-.747958				
	1.195000	.800000	.800000	1.175000	.288525	.992572				
	.784400	.901200	.853800	.737400	.952677	.819383				

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X	NX	NPX	D
Y	NY	NPY	T
Z	NZ	NPZ	A
500000	-.029218	-.250016	.2468E-03
800000	-.157442	-.600001	.6451E+00
901200	-.987096	-.940749	.2026E+00
500000	-.028252	-.250002	.7487E-04
400000	-.050789	-.200000	.6412E+00
965500	-.998310	-.982825	.2003E+00
500000	-.028252	-.250002	.7487E-04
000000	.050789	.200000	.6412E+00
986000	-.998310	-.982825	.2003E+00
500000	-.029218	-.250016	.2468E-03
400000	.157442	.600001	.6451E+00
965500	-.987096	-.940749	.2026E+00
500000	-.031043	-.249537	.4237E-03
800000	.281449	.998756	.6507E+00
901200	-.959074	-.850538	.2072E+00
500000	-.034875	-.249169	.6327E-03
195000	.449471	1.395016	.6693E+00
784400	-.892614	-.692774	.2213E+00
500000	-.043145	-.249477	.7887E-03
585000	.675158	1.726269	.6205E+00
586600	-.736411	-.470688	.1816E+00
500000	-.049532	-.248068	.7648E-03
850000	.939127	1.923092	.6238E+00
341500	-.339980	-.174052	.1853E+00
000000	-.153543	-.743334	.1969E-02
885600	.934141	1.874150	.6143E+00
000000	.322188	.161626	.1727E+00
000000	-.132740	-.747389	.2518E-02
785000	.683173	1.690281	.6222E+00
303900	.718091	.444215	.1776E+00
000000	-.108809	-.747752	.1887E-02
540000	.457325	1.373892	.6640E+00
544000	.882618	.663304	.2139E+00
000000	-.095703	-.747958	.1347E-02
175000	.288525	.992572	.6461E+00
737400	.952677	.819383	.2021E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY				TEST BODY		
		X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	
II	5	-.500000 .800000 .901200	-.500000 .400000 .965500	-1.000000 .400000 .921400	-1.000000 .800000 .853800	-.089915 .162020 .982682	-.7500 .6000 .9104	
	6	-.500000 .400000 .965500	-.500000 0.000000 .986000	-1.000000 0.000000 .942800	-1.000000 .400000 .921400	-.086851 .05210E .994858	-.7500 .2000 .9539	
	7	-.500000 0.000000 .986000	-.500000 -.400000 .800000	-1.000000 -.400000 .800000	-1.000000 0.000000 .942800	-.039925 -.379842 .924189	-.7485 -.1999 .8822	
	8	-.500000 -.400000 .800000	-.500000 -.800000 .600000	-1.000000 -.800000 .600000	-1.000000 -.400000 .800000	0.000000 -.447214 .894427	-.7500 -.6000 .7000	
	9	-.500000 -.800000 .600000	-.500000 -1.200000 .400000	-1.000000 -1.200000 .400000	-1.000000 -.800000 .600000	0.000000 -.447214 .894427	-.7500 -1.0000 .5000	
	10	-.500000 -1.200000 .400000	-.500000 -1.600000 .200000	-1.000000 -1.600000 .200000	-1.000000 -1.200000 .400000	0.000000 -.447214 .894427	-.7500 -1.4000 .3000	
	11	-.500000 -1.600000 .200000	-.500000 -1.972000 0.000000	-1.000000 -1.885600 0.000000	-1.000000 -1.600000 .200000	-.044855 -.519160 .853499	-.7413 -1.7647 .1002	
	12	-.500000 -1.972000 0.000000	-.500000 -1.850000 -.341500	-1.000000 -1.785000 -.303900	-1.000000 -1.885600 0.000000	-.153543 -.934141 -.322188	-.7433 -1.8741 -.1616	
	13	-.500000 -1.850000 -.341500	-.500000 -1.585000 -.586600	-1.000000 -1.540000 -.544000	-1.000000 -1.785000 -.303900	-.132740 -.683173 -.718091	-.7473 -1.6902 -.4442	
	14	-.500000 -1.585000 -.586600	-.500000 -1.195000 -.784400	-1.000000 -1.175000 -.737400	-1.000000 -1.540000 -.544000	-.108809 -.457325 -.862618	-.7477 -1.3738 -.6633	
	15	-.500000 -1.195000 -.784400	-.500000 -.800000 -.901200	-1.000000 -.800000 -.853800	-1.000000 -1.175000 -.737400	-.095703 -.288525 -.952677	-.7479 -.9925 -.8193	
	16	-.500000 -.800000 -.901200	-.500000 -.400000 -.965500	-1.000000 -.400000 -.921400	-1.000000 -.800000 -.853800	-.089915 -.162020 -.982682	-.7500 -.6000 -.9104	

X	NX	NPX	D
Y	NY	NPY	T
Z	NZ	NPZ	A
000000	-.089915	-.750055	.8107E-03
000000	.162020	.600009	.6500E+00
853800	.982682	.910468	.2035E+00
000000	-.086851	-.750005	.2238E-03
400000	.052106	.200003	.6436E+00
921400	.994858	.953924	.2010E+00
000000	-.039925	-.748551	.9981E-02
000000	-.379842	-.199961	.6668E+00
942800	.924189	.882279	.2164E+00
000000	0.000000	-.750000	.3553E-14
400000	-.447214	-.600000	.6708E+00
800000	.894427	.700000	.2236E+00
000000	0.000000	-.750000	.3553E-14
800000	-.447214	-1.000000	.6708E+00
600000	.894427	.500000	.2236E+00
000000	0.000000	-.750000	.6661E-14
200000	-.447214	-1.400000	.6708E+00
400000	.894427	.300000	.2236E+00
000000	-.044855	-.741375	.1121E-01
600000	-.519160	-1.764760	.6545E+00
200000	.853499	.100234	.1926E+00
000000	-.153543	-.743334	.1969E-02
885600	-.934141	-1.874150	.6143E+00
000000	-.322188	-.161626	.1727E+00
000000	-.132740	-.747389	.2518E-02
785000	-.683173	-1.690281	.6222E+00
303900	-.718091	-.444215	.1776E+00
000000	-.108809	-.747752	.1887E-02
540000	-.457325	-1.373892	.6640E+00
544000	-.882618	-.663304	.2139E+00
000000	-.095703	-.747958	.1347E-02
175000	-.288525	-.992572	.6461E+00
737400	-.952677	-.819383	.2021E+00
000000	-.089915	-.750055	.8107E-03
000000	-.162020	-.600009	.6500E+00
53800	-.982682	-.910468	.2035E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X	X	X	X	X	X		
		Y Z	Y Z	Y Z	Y Z	Y Z	Y Z		
5	17	-.500000	-.500000	-1.000000	-1.000000	-.086851	-.750005		
		-.400000	0.000000	0.000000	-.400000	-.052106	-.200003		
		-.965500	-.986000	-.942800	-.921400	-.994858	-.953924		
	18	-.500000	-.500000	-1.000000	-1.000000	-.086851	-.750005		
		0.000000	.400000	.400000	0.000000	.052106	.200003		
		-.986000	-.965500	-.921400	-.942800	-.994858	-.953924		
	19	-.500000	-.500000	-1.000000	-1.000000	-.089915	-.750055		
		.400000	.800000	.800000	.400000	.162020	.600009		
		-.965500	-.901200	-.853800	-.921400	-.982682	-.910468		
	20	-.500000	-.500000	-1.000000	-1.000000	-.095703	-.747958		
		.800000	1.195000	1.175000	.800000	.288525	.992572		
		-.901200	-.784400	-.737400	-.853800	-.952677	-.819383		
	21	-.500000	-.500000	-1.000000	-1.000000	-.108809	-.747752		
		1.195000	1.585000	1.540000	1.175000	.457325	1.373892		
		-.784400	-.586600	-.544000	-.737400	-.882618	-.663304		
12	22	-.500000	-.500000	-1.000000	-1.000000	-.132740	-.747389		
		1.585000	1.850000	1.785000	1.540000	.683173	1.690281		
		-.586600	-.341500	-.303900	-.544000	-.718091	-.444215		
	23	-.500000	-.500000	-1.000000	-1.000000	-.153543	-.743334		
		1.850000	1.972000	1.885600	1.785000	.934141	1.874150		
		-.341500	0.000000	0.000000	-.303900	-.322188	-.161626		
6	1	-1.000000	-1.000000	-1.500000	-1.500000	-.268347	-1.229655		
		1.885600	1.785000	1.670000	1.732000	.921489	1.773614		
		0.000000	.303900	.229700	0.000000	.280799	.134912		
	2	-1.000000	-1.000000	-1.500000	-1.500000	-.239065	-1.245329		
		1.785000	1.540000	1.460000	1.670000	.702123	1.614691		
		.303900	.544000	.465900	.229700	.670724	.386555		
	3	-1.000000	-1.000000	-1.500000	-1.500000	-.194936	-1.245068		
		1.540000	1.175000	1.140000	1.460000	.475316	1.329324		
		.544000	.737400	.652000	.465900	.857948	.600627		
	4	-1.000000	-1.000000	-1.500000	-1.500000	-.170981	-1.245783		
		1.175000	.800000	.800000	1.140000	.304683	.979004		
		.737400	.853800	.768100	.652000	.936981	.753512		
	5	-1.000000	-1.000000	-1.500000	-1.500000	-.159881	-1.250120		
		.800000	.400000	.400000	.800000	.172638	.600034		
		.853800	.921400	.842600	.768100	.971923	.846449		

DDY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-1.000000 0.000000 -.942800	-1.000000 -.400000 -.921400	-.086851 -.052106 -.994858	-.750005 -.200003 -.953924	.2238E-03 .6436E+00 .2010E+00
-1.000000 .400000 -.921400	-1.000000 0.000000 -.942800	-.086851 .052106 -.994858	-.750005 .200003 -.953924	.2238E-03 .6436E+00 .2010E+00
-1.000000 .800000 -.853800	-1.000000 .400000 -.921400	-.089915 .162020 -.982682	-.750055 .600009 -.910468	.8107E-03 .6500E+00 .2035E+00
-1.000000 1.175000 -.737400	-1.000000 .800000 -.853800	-.095703 .288525 -.952677	-.747958 .992572 -.819383	.1347E-02 .6461E+00 .2021E+00
-1.000000 1.540000 -.544000	-1.000000 1.175000 -.737400	-.108809 .457325 -.882618	-.747752 1.373892 -.663304	.1887E-02 .6640E+00 .2139E+00
-1.000000 1.785000 -.303900	-1.000000 1.540000 -.544000	-.132740 .683173 -.718091	-.747389 1.690281 -.444215	.2518E-02 .6222E+00 .1776E+00
-1.000000 1.885600 0.000000	-1.000000 1.785000 -.303900	-.153543 .934141 -.322188	-.743334 1.874150 -.161626	.1969E-02 .6143E+00 .1727E+00
-1.500000 1.670000 .229700	-1.500000 1.732000 0.000000	-.268347 .921489 .280799	-1.229655 1.773614 .134912	.3684E-02 .5910E+00 .1448E+00
-1.500000 1.460000 .465900	-1.500000 1.670000 .229700	-.239065 .702123 .670724	-1.245329 1.614691 .386555	.5490E-02 .6180E+00 .1696E+00
-1.500000 1.140000 .652000	-1.500000 1.460000 .465900	-.194936 .475316 .857948	-1.245068 1.329324 .600627	.3782E-02 .6494E+00 .1996E+00
-1.500000 .800000 .768100	-1.500000 1.140000 .652000	-.170981 .304683 .936981	-1.245783 .979004 .753512	.2596E-02 .6374E+00 .1908E+00
-1.500000 .400000 .842600	-1.500000 .800000 .768100	-.159881 .172638 .971923	-1.250120 .600034 .846449	.1677E-02 .6584E+00 .2058E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
6	6	-1.000000 .400000 .921400	-1.000000 0.000000 .942800	-1.500000 0.000000 .866000	-1.500000 .400000 .842600	-.153515 .055250 .986601	-1.250012 .200010 .893198		
	7	-1.000000 0.000000 .942800	-1.000000 -.400000 .800000	-1.500000 -.400000 .800000	-1.500000 0.000000 .866000	-.074106 -.251846 .964926	-1.248100 -.199835 .852389		
	8	-1.000000 -.400000 .800000	-1.000000 -.800000 .600000	-1.500000 -.800000 .600000	-1.500000 -.400000 .800000	0.000000 -.447214 .894427	-1.250000 -.600000 .700000		
	9	-1.000000 -.800000 .600000	-1.000000 -1.200000 .400000	-1.500000 -1.200000 .400000	-1.500000 -.600000 .600000	0.000000 -.447214 .894427	-1.250000 -1.000000 .500000		
	10	-1.000000 -1.200000 .400000	-1.000000 -1.600000 .200000	-1.500000 -1.600000 .200000	-1.500000 -1.200000 .400000	0.000000 -.447214 .894427	-1.250000 -1.400000 .300000		
	11	-1.000000 -1.600000 .200000	-1.000000 -1.885600 0.000000	-1.500000 -1.732000 0.000000	-1.500000 -1.600000 .200000	-.105654 -.687853 .718119	-1.225923 -1.707445 .100626		
	12	-1.000000 -1.885600 0.000000	-1.000000 -1.785000 -.303900	-1.500000 -1.670000 -.229700	-1.500000 -1.732000 0.000000	-.268347 -.921489 -.280799	-1.229655 -1.773614 -.134912		
	13	-1.000000 -1.785000 -.303900	-1.000000 -1.540000 -.544000	-1.500000 -1.460000 -.465900	-1.500000 -1.670000 -.229700	-.239065 -.702123 -.670724	-1.245329 -1.614691 -.386555		
	14	-1.000000 -1.540000 -.544000	-1.000000 -1.175000 -.737400	-1.500000 -1.140000 -.652000	-1.500000 -1.460000 -.465900	-.194936 -.475316 -.857948	-1.245068 -1.329324 -.600627		
	15	-1.000000 -1.175000 -.737400	-1.000000 -.800000 -.853800	-1.500000 -.800000 -.768100	-1.500000 -1.140000 -.652000	-.170981 -.304683 -.936981	-1.245783 -.979004 -.753512		
	16	-1.000000 -.800000 -.853800	-1.000000 -.400000 -.921400	-1.500000 -.400000 -.842600	-1.500000 -.800000 -.768100	-.159881 -.172638 -.971923	-1.250120 -.600034 -.846449		
	17	-1.000000 -.400000 -.921400	-1.000000 0.000000 -.942800	-1.500000 0.000000 -.866000	-1.500000 -.400000 -.842600	-.153515 -.055250 -.986601	-1.250012 -.200010 -.893198		

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FOLDOUT FROM

TEST BODY

	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
000	-1.500000	-1.500000	-.153515	-1.250012	.4933E-03
000	0.000000	.400000	.055250	.200010	.6481E+00
000	.866000	.842600	.986601	.893198	.2027E+00
000	-1.500000	-1.500000	-.074106	-1.248100	.1853E-01
000	-.400000	0.000000	-.251846	-.199835	.6560E+00
000	.800000	.866000	.964926	.852389	.2073E+00
000	-1.500000	-1.500000	0.000000	-1.250000	.3553E-14
000	-.800000	-.400000	-.447214	-.600000	.6708E+00
000	.600000	.800000	.894427	.700000	.2236E+00
000	-1.500000	-1.500000	0.000000	-1.250000	.3553E-14
000	-1.200000	-.800000	-.447214	-1.000000	.6708E+00
000	.400000	.600000	.894427	.500000	.2236E+00
000	-1.500000	-1.500000	0.000000	-1.250000	.6661E-14
000	-1.600000	-1.200000	-.447214	-1.400000	.6708E+00
000	.200000	.400000	.894427	.300000	.2236E+00
000	-1.500000	-1.500000	-.105654	-1.225923	.2641E-01
000	-1.732000	-1.600000	-.687853	-1.707445	.6096E+00
000	0.000000	.200000	.718119	.100626	.1454E+00
000	-1.500000	-1.500000	-.268347	-1.229655	.3684E-02
000	-1.670000	-1.732000	-.921489	-1.773614	.5910E+00
000	-.229700	0.000000	-.280799	-.134912	.1448E+00
000	-1.500000	-1.500000	-.239065	-1.245329	.5490E-02
000	-1.460000	-1.670000	-.702123	-1.614691	.6180E+00
000	-.465900	-.229700	-.670724	-.386555	.1696E+00
000	-1.500000	-1.500000	-.194936	-1.245063	.3782E-02
000	-1.140000	-1.460000	-.475316	-1.329324	.6494E+00
000	-.652000	-.465900	-.857948	-.600627	.1996E+00
000	-1.500000	-1.500000	-.170981	-1.245783	.2596E-02
000	-.800000	-1.140000	-.304683	-.979004	.6374E+00
000	-.768100	-.652000	-.936981	-.753512	.1908E+00
000	-1.500000	-1.500000	-.159881	-1.250120	.1677E-02
000	-.400000	-.800000	-.172638	-.600034	.6584E+00
000	-.842600	-.768100	-.971923	-.846449	.2058E+00
000	-1.500000	-1.500000	-.153515	-1.250012	.4933E-03
000	0.000000	-.400000	-.055250	-.200010	.6481E+00
000	-.866000	-.842600	-.986601	-.893198	.2027E+00

PRINT FROM 2

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
6	18	-1.000000	-1.000000	-1.500000	-1.500000	-.153515	-1.250012		
		0.000000	.400000	.400000	0.000000	.055250	.200010		
		-.942800	-.921400	-.842600	-.866000	-.986601	-.893198		
19		-1.000000	-1.000000	-1.500000	-1.500000	-.159881	-1.250120		
		.400000	.800000	.800000	.400000	.172638	.600034		
		-.921400	-.853800	-.768100	-.842600	-.971923	-.846449		
20		-1.000000	-1.000000	-1.500000	-1.500000	-.170981	-1.245783		
		.800000	1.175000	1.140000	.800000	.304683	.979004		
		-.853800	-.737400	-.652000	-.768100	-.936981	-.753512		
21		-1.000000	-1.000000	-1.500000	-1.500000	-.194936	-1.245068		
		1.175000	1.540000	1.460000	1.140000	.475316	1.329324		
		-.737400	-.544000	-.465900	-.652000	-.857948	-.600627		
22		-1.000000	-1.000000	-1.500000	-1.500000	-.239065	-1.245329		
		1.540000	1.785000	1.670000	1.460000	.702123	1.614691		
		-.544000	-.303900	-.229700	-.465900	-.670724	-.386555		
23		-1.000000	-1.000000	-1.500000	-1.500000	-.268347	-1.229655		
		1.785000	1.885600	1.732000	1.670000	.921489	1.773614		
		-.303900	0.000000	0.000000	-.229700	-.280799	-.134912		
7	1	-1.500000	-1.500000	-2.000000	-2.000000	-.414479	-1.699678		
		1.732000	1.670000	1.465000	1.490700	.885202	1.611865		
		0.000000	.229700	.137800	0.000000	.211244	.096576		
2		-1.500000	-1.500000	-2.000000	-2.000000	-.372374	-1.733772		
		1.670000	1.460000	1.322000	1.465000	.725701	1.484752		
		.229700	.465900	.344400	.137800	.578529	.297994		
3		-1.500000	-1.500000	-2.000000	-2.000000	-.310024	-1.738932		
		1.460000	1.140000	1.072000	1.322000	.507279	1.250730		
		.465900	.652000	.517900	.344400	.804085	.497910		
4		-1.500000	-1.500000	-2.000000	-2.000000	-.269527	-1.738266		
		1.140000	.800000	.800000	1.072000	.335023	.954054		
		.652000	.768100	.628900	.517900	.902837	.644837		
5		-1.500000	-1.500000	-2.000000	-2.000000	-.250229	-1.750276		
		.800000	.400000	.400000	.800000	.193980	.600104		
		.768100	.842600	.718000	.628900	.948555	.739306		
6		-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.750025		
		.400000	0.000000	0.000000	.400000	.061556	.200030		
		.842600	.866000	.745400	.718000	.969388	.792992		

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TEST BODY

	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
0000	-1.500000	-1.500000	-.153515	-1.250012	.4933E-03
0000	.400000	0.000000	.055250	.200010	.6481E+00
1400	-.842600	-.866000	-.986601	-.893198	.2027E+00
0000	-1.500000	-1.500000	-.159881	-1.250120	.1677E-02
0000	.800000	.400000	.172638	.600034	.6584E+00
8800	-.768100	-.842600	-.971923	-.846449	.2058E+00
0000	-1.500000	-1.500000	-.170981	-1.245783	.2596E-02
5000	1.140000	.800000	.304683	.979004	.6374E+00
7400	-.652000	-.768100	-.936981	-.753512	.1908E+00
0000	-1.500000	-1.500000	-.194936	-1.245068	.3782E-02
0000	1.460000	1.140000	.475316	1.329324	.6494E+00
0000	-.465900	-.652000	-.857948	-.600627	.1996E+00
0000	-1.500000	-1.500000	-.239065	-1.245329	.5490E-02
5000	1.670000	1.460000	.702123	1.614691	.6180E+00
8900	-.229700	-.465900	-.670724	-.386555	.1696E+00
0000	-1.500000	-1.500000	-.268347	-1.229655	.3684E-02
5600	1.732000	1.670000	.921489	1.773614	.5910E+00
0000	0.000000	-.229700	-.280799	-.134912	.1448E+00
0000	-2.000000	-2.000000	-.414479	-1.699678	.3180E-02
0000	1.465000	1.490700	.885202	1.611865	.5833E+00
0700	.137800	0.000000	.211244	.096576	.1038E+00
0000	-2.000000	-2.000000	-.372374	-1.733772	.7874E-02
0000	1.322000	1.465000	.725701	1.484752	.6199E+00
5900	.344400	.137800	.578529	.297994	.1525E+00
0000	-2.000000	-2.000000	-.310024	-1.738932	.6345E-02
0000	1.072000	1.322000	.507279	1.250730	.6350E+00
0000	.517900	.344400	.864085	.497910	.1772E+00
0000	-2.000000	-2.000000	-.269527	-1.738266	.4544E-02
0000	.800000	1.072000	.335023	.954054	.6218E+00
1100	.628900	.517900	.902837	.644837	.1695E+00
0000	-2.000000	-2.000000	-.250229	-1.750276	.3462E-02
0000	.400000	.800000	.193980	.600104	.6750E+00
6000	.718000	.628900	.948555	.739306	.2108E+00
0000	-2.000000	-2.000000	-.237694	-1.750025	.9694E-03
0000	0.000000	.400000	.061556	.200030	.6572E+00
0000	.745400	.718000	.969388	.792992	.2063E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

PA

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
7	7	-1.500000 0.000000 .866000	-1.500000 -.400000 .800000	-2.000000 -.400000 .718000	-2.000000 0.000000 .745400	-.197278 -.113683 .973734	-1.7495 -.1997 .7824
	8	-1.500000 -.400000 .800000	-1.500000 -.800000 .600000	-2.000000 -.800000 .600000	-2.000000 -.400000 .718000	-.075980 -.368319 .926589	-1.7473 -.5998 .6797
	9	-1.500000 -.800000 .600000	-1.500000 -1.200000 .400000	-2.000000 -1.200000 .400000	-2.000000 -.800000 .600000	0.000000 -.447214 .894427	-1.7500 -1.0000 .5000
	10	-1.500000 -1.200000 .400000	-1.500000 -1.600000 .200000	-2.000000 -1.400000 .256000	-2.000000 -1.200000 .400000	-.050829 -.496741 .866409	-1.7204 -1.3528 .3141
	11	-1.500000 -1.600000 .200000	-1.500000 -1.732000 0.000000	-2.000000 -1.490700 0.000000	-2.000000 -1.400000 .256000	-.348626 -.842191 .411307	-1.7625 -1.5505 .1139
15	12	-1.500000 -1.732000 0.000000	-1.500000 -1.670000 -.229700	-2.000000 -1.465000 -.137800	-2.000000 -1.496700 0.000000	-.414479 -.885202 -.211244	-1.6996 -1.6118 -.0965
	13	-1.500000 -1.670000 -.229700	-1.500000 -1.460000 -.465900	-2.000000 -1.322900 -.344400	-2.000000 -1.465000 -.137800	-.372374 -.725701 -.578529	-1.7337 -1.4847 -.2979
	14	-1.500000 -1.460000 -.465900	-1.500000 -1.140000 -.652000	-2.000000 -1.072000 -.517900	-2.000000 -1.322000 -.344400	-.310024 -.507279 -.864085	-1.7389 -1.2507 -.4979
	15	-1.500000 -1.140000 -.652000	-1.500000 -.800000 -.768100	-2.000000 -.800000 -.628900	-2.000000 -1.072000 -.517900	-.269527 -.335023 -.902837	-1.7382 -.9540 -.6448
	16	-1.500000 -.800000 -.768100	-1.500000 -.400000 -.842600	-2.000000 -.400000 -.718000	-2.000000 -.800000 -.628900	-.250229 -.193980 -.948555	-1.7502 -.6001 -.7390
	17	-1.500000 -.400000 -.842600	-1.500000 0.000000 -.866000	-2.000000 0.000000 -.745400	-2.000000 -.400000 -.718000	-.237694 -.061556 -.969388	-1.7500 -.2000 -.7929
	18	-1.500000 0.000000 -.866000	-1.500000 .400000 -.842600	-2.000000 .400000 -.718000	-2.000000 0.000000 -.745400	-.237694 .061556 -.969388	-1.7500 .2000 -.7929

FOLDOUT FRAM

X	X	NX	NPX	D
Y	Y	NY	NPY	T
Z	Z	NZ	NPZ	A
00000	-2.000000	-.197278	-1.749550	.9397E-02
00000	0.000000	-.113683	-.199759	.6572E+00
18000	.745400	.973734	.782469	.2054E+00
00000	-2.000000	-.075980	-1.747311	.1900E-01
00000	-.400000	-.368319	-.599857	.6708E+00
00000	.718000	.926589	.679777	.2158E+00
00000	-2.000000	0.000000	-1.750000	.3553E-14
00000	-.800000	-.447214	-1.000000	.6708E+00
00000	.600000	.894427	.500000	.2236E+00
00000	-2.000000	-.050829	-1.720409	.1271E-01
00000	-1.200000	-.496741	-1.352829	.6708E+00
56000	.400000	.866409	.314114	.1731E+00
00000	-2.000000	-.348626	-1.762537	.1445E-01
90700	-1.400000	-.842191	-1.550513	.6525E+00
00000	.250000	.411307	.113943	.1354E+00
00000	-2.000000	-.414479	-1.699678	.3180E-02
65000	-1.490700	-.885202	-1.611865	.5033E+00
37800	0.000000	-.211244	-.096576	.1038E+00
00000	-2.000000	-.372374	-1.733772	.7874E-02
22000	-1.465000	-.725701	-1.484752	.6199E+00
44400	-.137800	-.578529	-.297994	.1525E+00
00000	-2.000000	-.310024	-1.738932	.6345E-02
72000	-1.322000	-.507279	-1.250730	.6350E+00
17900	-.344400	-.804085	-.497910	.1772E+00
00000	-2.000000	-.269527	-1.738266	.4544E-02
00000	-1.072000	-.335023	-.954054	.6218E+00
89000	-.517900	-.902837	-.644837	.1695E+00
00000	-2.000000	-.250229	-1.750276	.3462E-02
00000	-.800000	-.193980	-.600104	.6750E+00
80000	-.628900	-.948555	-.739306	.2108E+00
00000	-2.000000	-.237694	-1.750025	.9694E-03
00000	-.400000	-.061556	-.200030	.6572E+00
54000	-.718000	-.969388	-.792992	.2063E+00
00000	-2.000000	-.237694	-1.750025	.9694E-03
00000	0.000000	.061556	.200030	.6572E+00
80000	-.745400	-.969388	-.792992	.2063E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	X	X	X	X	NX	NP
		Y	Y	Y	Y	NY	NP
		Z	Z	Z	Z	NZ	NP
7	19	-1.500000 .400000 -.842600	-1.500000 .800000 -.768100	-2.000000 .800000 -.628900	-2.000000 .400000 -.718000	-.250229 .193980 -.948555	-1.750000 .600000 -.730000
	20	-1.500000 .800000 -.768100	-1.500000 1.140000 -.652000	-2.000000 1.072000 -.517900	-2.000000 .800000 -.628900	-.269527 .335023 -.902837	-1.730000 .950000 -.640000
	21	-1.500000 1.140000 -.652000	-1.500000 1.460000 -.465900	-2.000000 1.322000 -.344400	-2.000000 1.072000 -.517900	-.310024 .507279 -.804085	-1.730000 1.250000 -.497000
	22	-1.500000 1.460000 -.465900	-1.500000 1.670000 -.229700	-2.000000 1.465000 -.137800	-2.000000 1.322000 -.344400	-.372374 .725701 -.578529	-1.733000 1.484000 -.297000
	23	-1.500000 1.670000 -.229700	-1.500000 1.732000 0.000000	-2.000000 1.490700 0.000000	-2.000000 1.465000 -.137800	-.414479 .885202 -.211244	-1.699000 1.611000 -.096000
		*****				*****	
16	8	-2.000000 1.490700 0.000000	-2.000000 1.322000 .344400	-2.500000 1.000000 .235700	-2.500000 1.055000 0.000000	-.597981 .747834 .288382	-2.218000 1.240000 .149000
	2	-2.000000 1.322000 .344400	-2.000000 .800000 .628900	-2.500000 .800000 .381500	-2.500000 1.000000 .235700	-.425912 .463200 .777203	-2.214000 .990200 .411200
	3	-2.000000 .800000 .628900	-2.000000 .400000 .718000	-2.500000 .400000 .515300	-2.500000 .800000 .381500	-.397801 .246251 .883807	-2.250000 .600300 .560300
	4	-2.000000 .400000 .718000	-2.000000 0.000000 .745700	-2.500000 0.000000 .552800	-2.500000 .400000 .515300	-.366809 .075569 .927222	-2.250000 .200100 .632900
	5	-2.000000 0.000000 .745700	-2.000000 -.400000 .718000	-2.500000 -.400000 .515300	-2.500000 0.000000 .552800	-.366809 -.075569 .927222	-2.250000 -.200100 .632900
	6	-2.000000 -.400000 .718000	-2.000000 -.800000 .600000	-2.500000 -.800000 .381500	-2.500000 -.400000 .515300	-.372805 -.278586 .885102	-2.250300 -.600100 .553400

FOLDOUT FRAM

TEST BODY

X Y Z	X Y Z	X Y Z	NX NY NZ	NFX NPY NPZ	D T A
.500000	-2.000000	-2.000000	-.250229	-1.750276	.3462E-02
.800000	.800000	.400000	.193980	.600104	.6750E+00
.768100	-.628900	-.718000	-.948555	-.739306	.2108E+00
.500000	-2.000000	-2.000000	-.269527	-1.738266	.4544E-02
.140000	1.072000	.800000	.335023	.954054	.6218E+00
.652000	-.517900	-.628900	-.902837	-.644837	.1695E+00
.500000	-2.000000	-2.000000	-.310024	-1.738932	.6345E-02
.460000	1.322000	1.072000	.507279	1.250730	.6350E+00
.465900	-.344400	-.517900	-.804085	-.497910	.1772E+00
.500000	-2.000000	-2.000000	-.372374	-1.733772	.7874E-02
.670000	1.465000	1.322000	.725701	1.484752	.6199E+00
.229700	-.137800	-.344400	-.578529	-.297994	.1525E+00
.500000	-2.000000	-2.000000	-.414479	-1.699678	.3180E-02
.732000	1.490700	1.465000	.885202	1.611865	.5833E+00
.000000	0.000000	-.137800	-.211244	-.096576	.1038E+00
****		*****		*****	
.000000	-2.500000	-2.500000	-.597981	-2.218024	.1342E-01
.322000	1.000000	1.055000	.747834	1.240723	.7391E+00
.344400	.235700	0.000000	.288382	.149617	.1939E+00
.000000	-2.500000	-2.500000	-.425912	-2.214445	.1034E-01
.800000	.800000	1.000000	.463200	.990269	.7238E+00
.628900	.381500	.235700	.777203	.411287	.2322E+00
.000000	-2.500000	-2.500000	-.397801	-2.250969	.9877E-02
.400000	.400000	.800000	.246251	.600392	.7233E+00
.718000	.515300	.381500	.883807	.560379	.2263E+00
.000000	-2.500000	-2.500000	-.366809	-2.250072	.2272E-02
.000000	0.000000	.400000	.075569	.200101	.6805E+00
.745700	.552800	.515300	.927222	.632913	.2157E+00
.000000	-2.500000	-2.500000	-.366809	-2.250072	.2272E-02
.400000	-.400000	0.000000	-.075569	-.200101	.6805E+00
.718000	.515300	.552800	.927222	.632913	.2157E+00
.000000	-2.500000	-2.500000	-.372805	-2.250383	.3496E-02
.800000	-.800000	-.400000	-.278586	-.600126	.7233E+00
.600000	.381500	.515300	.885102	.553499	.2260E+00

FOR DOLT FRM. 2

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			TEST BODY		
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ		
8	7	-2.000000 -.800000 .600000	-2.900000 -1.200000 .400000	-2.500000 -1.000000 .235700	-2.500000 -.800000 .381500	-.396212 -.458473 .795499	-2.218355 -.956945 .416059			
	8	-2.000000 -1.200000 .400000	-2.000000 -1.490700 0.000000	-2.500000 -1.055000 0.000000	-2.500000 -1.000000 .235700	-.537231 -.740960 .402941	-2.212088 -1.209729 .166619			
	9	-2.000000 -1.490700 0.000000	-2.000000 -1.322000 -.344400	-2.500000 -1.000000 -.235700	-2.500000 -1.055000 0.000000	-.597981 -.747834 -.288382	-2.218024 -1.240723 -.149617			
	10	-2.000000 -1.322000 -.344400	-2.000000 -.800000 -.628900	-2.500000 -.800000 -.381500	-2.500000 -1.000000 -.235700	-.425912 -.463200 -.777203	-2.214445 -.990269 -.411287			
	11	-2.000000 -.800000 -.628900	-2.000000 -.400000 -.718000	-2.500000 -.400000 -.515300	-2.500000 -.800000 -.381500	-.397801 -.246251 -.883807	-2.250969 -.600392 -.560379			
	12	-2.000000 -.400000 -.718000	-2.000000 0.000000 -.745400	-2.500000 0.000000 -.552800	-2.500000 -.400000 -.515300	-.366578 -.075231 -.927341	-2.250074 -.200104 -.632837			
	13	-2.000000 0.000000 -.745400	-2.000000 .400000 -.718000	-2.500000 .400000 -.515300	-2.500000 0.000000 -.552800	-.366578 .075231 -.927341	-2.250074 .200104 -.632837			
	14	-2.000000 .400000 -.718000	-2.000000 .800000 -.628900	-2.500000 .800000 -.381500	-2.500000 .400000 -.515300	-.397801 .246251 -.883807	-2.250969 .600392 -.560379			
	15	-2.000000 .800000 -.628900	-2.000000 1.322000 -.344400	-2.500000 1.000000 -.235700	-2.500000 .800000 -.381500	-.425912 .463200 -.777203	-2.214445 .990269 -.411287			
	16	-2.000000 1.322000 -.344400	-2.000000 1.490700 0.000000	-2.500000 1.055000 0.000000	-2.500000 1.000000 -.235700	-.597981 .747834 -.288382	-2.218024 1.240723 -.149617			
		*****			*****			*****		
9	1	-2.500000 1.355000 0.000000	-2.500000 .800000 .381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 .275208	-2.626833 .687692 .149145	0.		

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
00000	-2.500000	-.396212	-2.218355	.1214E-01
00000	-.800000	-.458473	-.956945	.6502E+00
35700	.381500	.795499	.416059	.1686E+00
00000	-2.500000	-.537231	-2.212088	.2711E-01
55000	-1.000000	-.740960	-1.209729	.7391E+00
00000	.235700	.402941	.166619	.2145E+00
00000	-2.500000	-.597981	-2.218024	.1342E-01
00000	-1.055000	-.747834	-1.240723	.7391E+00
35700	0.000000	-.288382	-.149617	.1939E+00
00000	-2.500000	-.425912	-2.214445	.1034E-01
00000	-1.000000	-.463200	-.990269	.7238E+00
81500	-.235700	-.777203	-.411287	.2322E+00
00000	-2.500000	-.397801	-2.250969	.9877E-02
00000	-.800000	-.246251	-.600392	.7233E+00
15300	-.381500	-.883807	-.560379	.2263E+00
00000	-2.500000	-.366578	-2.250074	.2342E-02
00000	-.400000	-.075231	-.200104	.6804E+00
52800	-.515300	-.927341	-.632837	.2157E+00
00000	-2.500000	-.366578	-2.250074	.2342E-02
00000	0.000000	.075231	.200104	.6804E+00
15300	-.552800	-.927341	-.632837	.2157E+00
00000	-2.500000	-.397801	-2.250969	.9877E-02
00000	.400000	.246251	.600392	.7233E+00
01500	-.515300	-.883807	-.560379	.2263E+00
00000	-2.500000	-.425912	-2.214445	.1034E-01
00000	.800000	.463200	.990269	.7238E+00
55700	-.381500	-.777203	-.411287	.2322E+00
00000	-2.500000	-.597981	-2.218024	.1342E-01
55000	1.000000	.747834	1.240723	.7391E+00
00000	-.235700	-.288382	-.149617	.1939E+00

00000	-3.000000	-.868756	-2.626833	0.
00000	0.000000	.411733	.637692	.1167E+01
00000	0.000000	.275208	.149145	.2316E+00

PROGRAM PBOXC

ATMOSPHERIC SCIENCE ASSOCIATES
EEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
9	2	-2.500000 .800000 .381500	-2.500000 .400000 .515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 .597912	-2.629 .434 .336
	3	-2.500000 .400000 .515300	-2.500000 0.000000 .552800	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 .669478	-2.635 .141 .389
	4	-2.500000 0.000000 .552800	-2.500000 -.400000 .515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 -.062764 .669478	-2.635 -.141 .389
	5	-2.500000 -.400000 .515300	-2.500000 -.600000 .381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 -.200002 .597912	-2.629 -.434 .336
	6	-2.500000 -.800000 .381500	-2.500000 -1.055000 0.000000	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 -.411733 .275208	-2.626 -.687 .149
	7	-2.500000 -1.055000 0.000000	-2.500000 -.800000 -.381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 -.411733 -.275208	-2.626 -.687 -.149
	8	-2.500000 -.800000 -.381500	-2.500000 -.400000 -.515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 -.200002 -.597912	-2.629 -.434 -.336
	9	-2.500000 -.400000 -.515300	-2.500000 0.000000 -.552800	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 -.062764 -.669478	-2.635 -.141 -.389
	10	-2.500000 0.000000 -.552800	-2.500000 .400000 -.515300	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 -.669478	-2.635 .141 -.389
	11	-2.500000 .400000 -.515300	-2.500000 .800000 -.381500	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 -.597912	-2.629 .434 -.336
	12	-2.500000 .800000 -.381500	-2.500000 1.055000 0.000000	-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 -.275208	-2.626 .687 -.149

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FOLDCUT FRAM

189 BASIC ELEMENTS WERE INPUT

X	NX	NPX	D
Y	NY	NPY	T
Z	NZ	NPZ	A
.000000	-.776209	-2.629150	.1332E-14
.000000	.200002	.434170	.1018E+01
.000000	.597912	.336208	.1672E+00
.000000	-.740175	-2.635472	.2220E-15
.000000	.062764	.141262	.8219E+00
.000000	.669478	.389779	.1494E+00
.000000	-.740175	-2.635472	.3053E-15
.000000	-.062764	-.141262	.8219E+00
.000000	.669478	.389779	.1494E+00
.000000	-.776209	-2.629150	.1110E-14
.000000	-.200002	-.434170	.1018E+01
.000000	.597912	.336208	.1672E+00
.000000	-.868756	-2.626833	.8882E-15
.000000	-.411733	-.687692	.1167E+01
.000000	.275208	.149145	.2316E+00
.000000	-.868756	-2.626833	0.
.000000	-.411733	-.687692	.1167E+01
.000000	-.275208	-.149145	.2316E+00
.000000	-.776209	-2.629150	.1332E-14
.000000	-.200002	-.434170	.1018E+01
.000000	-.597912	-.336208	.1672E+00
.000000	-.740175	-2.635472	.2220E-15
.000000	-.062764	-.141262	.8219E+00
.000000	-.669478	-.389779	.1494E+00
.000000	-.740175	-2.635472	.3053E-15
.000000	.062764	.141262	.8219E+00
.000000	-.669478	-.389779	.1494E+00
.000000	-.776209	-2.629150	.1110E-14
.000000	.200002	.434170	.1018E+01
.000000	-.597912	-.336208	.1672E+00
.000000	-.868756	-2.626833	.8882E-15
.000000	.411733	.687692	.1167E+01
.000000	-.275208	-.149145	.2316E+00

FOR OUT FRM 2

CRT PLOTS

MINIMUM AND MAXIMUM COORDINATES IN THE SCALED, TRANSLATED, ROTATED SYSTEM -
X AXIS= -3.00000E+00 2.00000E+00
Y AXIS= -2.00000E+00 2.00000E+00
Z AXIS= -1.00000E+00 1.00000E+00

COORDINATE TRANSLATIONS USED TO CENTER THE PLOTS - DELX, DELY, DELZ -
AFTER SCALING, TRANSLATING, ROTATING - 5.00000E-01 0. 0.

VIEW OF BODY LOOKING DOWN THE -Y AXIS TOWARD THE ORIGIN
45-DEGREE VIEW FROM THE +X -Y +Z SIDE
45-DEGREE VIEW FROM THE +X -Y -Z SIDE
45-DEGREE VIEW FROM THE -X -Y +Z SIDE
45-DEGREE VIEW FROM THE -X -Y -Z SIDE
VIEW OF BODY LOOKING DOWN THE -Z AXIS TOWARD THE ORIGIN
45-DEGREE VIEW FROM THE -X +Y -Z SIDE
45-DEGREE VIEW FROM THE +X +Y -Z SIDE
VIEW OF BODY LOOKING DOWN THE -X AXIS TOWARD THE ORIGIN
45-DEGREE VIEW FROM THE -X +Y +Z SIDE
VIEW OF BODY LOOKING DOWN THE +X AXIS TOWARD THE ORIGIN
VIEW OF BODY LOOKING DOWN THE +Y AXIS TOWARD THE ORIGIN
VIEW OF BODY LOOKING DOWN THE +Z AXIS TOWARD THE ORIGIN
45-DEGREE VIEW FROM THE +X +Y +Z SIDE

BOXC

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

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BODY ID. TEST

TEST BODY

INPUT PARAMETERS-

IFLAG= 0 LIST= 0 ISIG= 0 IPRS= 0 MPR= 0

NCODE= 0 NNON= 0 NOFF= 0 KMACH= 0 KTP14= 1

NUMBER OF LEAKY QUADRILATERALS= 0 FRACTION OF FREE-STREAM VELOCITY LEAKED= 0.

P A R A M E T R I C I N F O R M A T I O N

GENERATED UNIFORM FLOWS

X-FLOW

NO SYMMETRY SPECIFIED

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BEDFORD, MASSACHUSETTS

PAGE

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
1	1	2.000000	2.000000	1.500000	1.500000	.958086	1.59139		
		0.000000	0.000000	1.670000	1.732000	.276584	1.38979		
		0.000000	0.000000	.229700	0.000000	.074655	.09489		
2	2	2.000000	2.000000	1.500000	1.500000	.941794	1.59834		
		0.000000	0.000000	1.460000	1.670000	.251249	1.25402		
		0.000000	0.000000	.465900	.229700	.223380	.28292		
3	3	2.000000	2.000000	1.500000	1.500000	.915363	1.60511		
		0.000000	0.000000	1.140000	1.460000	.202414	1.01953		
		0.000000	0.000000	.652000	.465900	.348052	.44561		
4	4	2.000000	2.000000	1.500000	1.500000	.891771	1.60927		
		0.000000	0.000000	.800000	1.140000	.146221	.75032		
		0.000000	0.000000	.768100	.652000	.428210	.55749		
5	5	2.000000	2.000000	1.500000	1.500000	.874522	1.62026		
		0.000000	0.000000	.400000	.800000	.088802	.44790		
		0.000000	0.000000	.842600	.768100	.476787	.61308		
6	6	2.000000	2.000000	1.500000	1.500000	.865649	1.62481		
		0.000000	0.000000	0.000000	.400000	.029238	.14708		
		0.000000	0.000000	.866000	.842600	.499797	.64122		
7	7	2.000000	2.000000	1.500000	1.500000	.863087	1.62604		
		0.000000	0.000000	-.400000	0.000000	-.082222	-.14831		
		0.000000	0.000000	.800000	.866000	.498318	.62322		
8	8	2.000000	2.000000	1.500000	1.500000	.872872	1.62723		
		0.000000	0.000000	-.800000	-.400000	-.218218	-.44284		
		0.000000	0.000000	.600000	.800000	.436436	.52411		
9	9	2.000000	2.000000	1.500000	1.500000	.872872	1.61882		
		0.000000	0.000000	-1.200000	-.800000	-.218218	-.75116		
		0.000000	0.000000	.400000	.600000	.436436	.38677		
10	10	2.000000	2.000000	1.500000	1.500000	.872872	1.60714		
		0.000000	0.000000	-1.600000	-1.200000	-.218218	-1.08597		
		0.000000	0.000000	.200000	.400000	.436436	.24271		
11	11	2.000000	2.000000	1.500000	1.500000	.945063	1.58979		
		0.000000	0.000000	-1.732000	-1.600000	-.272824	-1.36520		
		0.000000	0.000000	0.000000	.200000	.180564	.08446		
12	12	2.000000	2.000000	1.500000	1.500000	.958086	1.59139		
		0.000000	0.000000	-1.670000	-1.732000	-.276584	-1.38979		
		0.000000	0.000000	-.229700	0.000000	-.074655	-.09489		

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BODY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
1.500000	1.500000	.958086	1.591395	0.
1.670000	1.732000	.276584	1.389794	.1803E+01
.229700	0.000000	.074655	.094899	.2076E+00
1.500000	1.500000	.941794	1.598349	.8882E-15
1.460000	1.670000	.251249	1.254020	.1758E+01
.465900	.229700	.223380	.282927	.2350E+10
1.500000	1.500000	.915363	1.605113	.2665E-14
1.140000	1.460000	.202414	1.019539	.1612E+01
.652000	.465900	.348052	.445612	.2299E+00
1.500000	1.500000	.891771	1.609275	.2665E-14
.800000	1.140000	.146221	.750320	.1405E+01
.768100	.652000	.428210	.557494	.1985E+00
1.500000	1.500000	.874522	1.620269	.9992E-15
.400000	.800000	.088802	.447901	.1217E+01
.842600	.768100	.476787	.613081	.2097E+00
1.500000	1.500000	.865649	1.624811	.2220E-15
0.000000	.400000	.029238	.147089	.1058E+01
.866000	.842600	.499797	.641222	.2001E+00
1.500000	1.500000	.863087	1.626041	.2220E-15
-.400000	0.000000	-.082222	-.148316	.1025E+01
.800000	.866000	.498318	.623224	.2007E+00
1.500000	1.500000	.872872	1.627233	.8882E-15
-.800000	-.400000	-.218218	-.442846	.1118E+01
.600000	.800000	.436436	.524111	.2291E+00
1.500000	1.500000	.872872	1.618821	.1776E-14
-1.200000	-.800000	-.218218	-.751160	.1360E+01
.400000	.600000	.436436	.386778	.2291E+00
1.500000	1.500000	.872872	1.607148	.8882E-15
-1.600000	-1.200000	-.218218	-1.085976	.1688E+01
.200000	.400000	.436436	.242716	.2291E+00
1.500000	1.500000	.945063	1.589795	0.
-1.732000	-1.600000	-.272824	-1.365206	.1803E+01
0.000000	.200000	.180064	.084464	.1833E+00
1.500000	1.500000	.958086	1.591395	0.
-1.670000	-1.732000	-.276584	-1.389794	.1803E+01
-.229700	0.000000	-.074655	-.094899	.2076E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

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N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
1	13	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -1.460000 -.465900	1.500000 -1.670000 -.229700	.941794 -.251249 -.223380	1.598 -1.254 -.282
	14	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -1.140000 -.652000	1.500000 -1.460000 -.465900	.915363 -.202414 -.348052	1.605 -1.019 -.445
	15	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -.800000 -.768100	1.500000 -1.140000 -.652000	.891771 -.146221 -.428210	1.609 -.750 -.557
	16	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 -.400000 -.842600	1.500000 -.800000 -.768100	.874522 -.088802 -.476787	1.620 -.447 -.613
	17	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 0.000000 -.866000	1.500000 -.400000 -.842600	.865649 -.029238 -.499797	1.624 -.147 -.641
	18	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 .400000 -.842600	1.500000 0.000000 -.866000	.865649 .029238 -.499797	1.624 .147 -.641
	19	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 .800000 -.768100	1.500000 .400000 -.842600	.874522 .088802 -.476787	1.620 .447 -.613
	20	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.140000 -.652000	1.500000 .800000 -.768100	.891771 .146221 -.428210	1.609 .750 -.557
	21	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.460000 -.465900	1.500000 1.140000 -.652000	.915363 .202414 -.348052	1.605 1.019 -.445
	22	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.670000 -.229700	1.500000 1.460000 -.465900	.941794 .251249 -.223380	1.598 1.254 -.282
	23	2.000000 0.000000 0.000000	2.000000 0.000000 0.000000	1.500000 1.732000 0.000000	1.500000 1.670000 -.229700	.958086 .276584 -.074655	1.591 1.389 -.094
2	1	1.500000 1.732000 0.000000	1.500000 1.670000 .229700	1.000000 1.870000 .354600	1.000000 2.000000 0.000000	.435365 .855263 .251038	1.220 1.831 .149

TEST BODY

	X	X	NX	NPX	D
	Y	Y	NY	NPY	T
	Z	Z	NZ	NPZ	A
00000	1.500000	1.500000	.941794	1.598349	.8882E-15
00000	-1.460000	-1.670000	-.251249	-1.254020	.1758E+01
00000	-.465900	-.229700	-.223380	-.282927	.2350E+00
00000	1.500000	1.500000	.915363	1.605113	.2665E-14
00000	-1.140000	-1.460000	-.202414	-1.019539	.1612E+01
00000	-.652000	-.465900	-.348052	-.445612	.2299E+00
00000	1.500000	1.500000	.891771	1.609275	.2665E-14
00000	-.800000	-1.140000	-.146221	-.750320	.1405E+01
00000	-.768100	-.652000	-.428210	-.557494	.1985E+00
00000	1.500000	1.500000	.874522	1.620269	.9992E-15
00000	-.400000	-.800000	-.088802	-.447901	.1217E+01
00000	-.842600	-.768100	-.476787	-.613081	.2097E+00
00000	1.500000	1.500000	.865649	1.624811	.2220E-15
00000	0.000000	-.400000	-.029238	-.147089	.1058E+01
00000	-.866000	-.842600	-.499797	-.641222	.2001E+00
00000	1.500000	1.500000	.865649	1.624811	.2220E-15
00000	.400000	0.000000	.029238	.147089	.1058E+01
00000	-.842600	-.866000	-.499797	-.641222	.2001E+00
00000	1.500000	1.500000	.874522	1.620269	.9992E-15
00000	.800000	.400000	.088802	.447901	.1217E+01
00000	-.768100	-.842600	-.476787	-.613081	.2097E+00
00000	1.500000	1.500000	.891771	1.609275	.2665E-14
00000	1.140000	.800000	.146221	.750320	.1405E+01
00000	-.652000	-.768100	-.428210	-.557494	.1985E+00
00000	1.500000	1.500000	.915363	1.605113	.2665E-14
00000	1.460000	1.140000	.202414	1.019539	.1612E+01
00000	-.465900	-.652000	-.348052	-.445612	.2299E+00
00000	1.500000	1.500000	.941794	1.598349	.8882E-15
00000	1.670000	1.460000	.251249	1.254020	.1758E+01
00000	-.229700	-.465900	-.223380	-.282927	.2350E+00
00000	1.500000	1.500000	.958086	1.591395	0.
00000	1.732000	1.670000	.276584	1.389794	.1803E+01
00000	0.000000	-.229700	-.074655	-.094899	.2076E+00
00000	1.000000	1.000000	.435365	1.220560	.5764E-02
00000	1.870000	2.000000	.855263	1.831729	.6416E+00
700	.354600	0.000000	.281038	.149900	.1708E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z		
2	2	1.500000	1.500000	1.000000	1.000000	.390089	1.241719		
		1.670000	1.460000	1.600000	1.870000	.652170	1.652830		
		.229700	.465900	.600000	.354600	.650004	.414680		
3	3	1.500000	1.500000	1.000000	1.000000	.324553	1.241630		
		1.460000	1.140000	1.200000	1.600000	.447006	1.351646		
		.465900	.652000	.800000	.600000	.833577	.631851		
4	4	1.500000	1.500000	1.000000	1.000000	.288009	1.242990		
		1.140000	.800000	.800000	1.200000	.287154	.985715		
		.652000	.768100	.916500	.800000	.913561	.786135		
5	5	1.500000	1.500000	1.000000	1.000000	.270929	1.250180		
		.800000	.400000	.400000	.800000	.163401	.600088		
		.768100	.842600	.979800	.916500	.948629	.876683		
6	6	1.500000	1.500000	1.000000	1.000000	.261384	1.250017		
		.400000	0.000000	0.000000	.400000	.052527	.200026		
		.842600	.866000	1.000000	.979800	.963805	.922094		
7	7	1.500000	1.500000	1.000000	1.000000	.126140	1.246098		
		0.000000	-.400000	-.400000	0.000000	-.312996	-.199566		
		.166000	.800000	.800000	1.000000	.941341	.867167		
8	8	1.500000	1.500000	1.000000	1.000000	0.000000	1.250000		
		-.400000	-.800000	-.800000	-.400000	-.447214	-.600000		
		.800000	.600000	.600000	.800000	.894427	.700000		
9	9	1.500000	1.500000	1.000000	1.000000	0.000000	1.250000		
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.000000		
		.600000	.400000	.400000	.600000	.894427	.500000		
10	10	1.500000	1.500000	1.000000	1.000000	0.000000	1.250000		
		-1.200000	-1.600000	-1.600000	-1.200000	-.447214	-1.400000		
		.400000	.200000	.200000	.400000	.894427	.300000		
11	11	1.500000	1.500000	1.000000	1.000000	.159008	1.216789		
		-1.600000	-1.732000	-2.000000	-1.600000	-.593315	-1.739216		
		.200000	0.000000	0.000000	.200000	.789109	.102018		
12	12	1.500000	1.500000	1.000000	1.000000	.435365	1.220560		
		-1.732000	-1.670000	-1.870000	-2.000000	-.855263	-1.831729		
		0.000000	-.229700	-.354600	0.000000	-.281038	-.149900		
13	13	1.500000	1.500000	1.000000	1.000000	.390089	1.241719		
		-1.670000	-1.460000	-1.600000	-1.870000	-.652170	-1.652830		
		-.229700	-.465900	-.600000	-.354600	-.650004	-.414680		

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X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	C T A
.000000	1.000000	.390089	1.241719	.8288E-02
.600000	1.870000	.652170	1.652830	.6561E+00
.600000	.354600	.650004	.414660	.1846E+00
.000000	1.000000	.324553	1.241630	.6043E-02
.200000	1.600000	.447006	1.351646	.6814E+00
.800000	.600000	.833577	.631851	.2159E+00
.000000	1.000000	.288009	1.242990	.4216E-02
.800000	1.200000	.287154	.985715	.6600E+00
.916500	.800000	.913561	.786135	.2025E+00
.000000	1.000000	.270929	1.250180	.2656E-02
.400000	.800000	.163401	.600088	.6744E+00
.979800	.916500	.948629	.876683	.2108E+00
.000000	1.000000	.261384	1.250017	.7710E-03
.000000	.400000	.052527	.200026	.6594E+00
.000000	.979800	.963805	.922094	.2075E+00
.000000	1.000000	.126140	1.246098	.3153E-01
.400000	0.000000	-.312996	-.199566	.6708E+00
.600000	1.000000	.941341	.867167	.2125E+00
.000000	1.000000	0.000000	1.250000	.3553E-14
.800000	-.400000	-.447214	-.600000	.6708E+00
.600000	.800000	.894427	.700000	.2236E+00
.000000	1.000000	0.000000	1.250000	.3553E-14
.200000	-.800000	-.447214	-1.000000	.6708E+00
.400000	.600000	.894427	.500000	.2236E+00
.000000	1.000000	0.000000	1.250000	.6661E-14
.600000	-1.200000	-.447214	-1.400000	.6708E+00
.200000	.400000	.894427	.300000	.2236E+00
.000000	1.000000	.159008	1.216789	.3975E-01
.200000	-1.600000	-.593315	-1.739216	.6708E+00
.000000	.200000	.789109	.102018	.1685E+00
.000000	1.000000	.435365	1.220560	.5764E-02
.870000	-2.000000	-.855263	-1.831729	.6416E+00
.354600	0.000000	-.281038	-.149900	.1708E+00
.000000	1.000000	.390089	1.241719	.8288E-02
.600000	-1.870000	-.652170	-1.652830	.6561E+00
.600000	-.354600	-.650004	-.414660	.1846E+00

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
2	14	1.500000	1.500000	1.000000	1.000000	.324553	1.241630
		-1.460000	-1.140000	-1.200000	-1.600000	-.447006	-1.351646
		-.465900	-.652000	-.800000	-.600000	-.833577	-.631851
	15	1.500000	1.500000	1.000000	1.000000	.288009	1.242990
		-1.140000	-.800000	-.800000	-1.200000	-.287154	-.985715
		-.652000	-.768100	-.916500	-.800000	-.913561	-.786135
	16	1.500000	1.500000	1.000000	1.000000	.270929	1.250180
		-.800000	-.400000	-.400000	-.800000	-.163401	-.600088
		-.768100	-.842600	-.979800	-.916500	-.948629	-.876683
	17	1.500000	1.500000	1.000000	1.000000	.261384	1.250017
		-.400000	0.000000	0.000000	-.400000	-.052527	-.200026
		-.842600	-.866000	-1.000000	-.979800	-.963805	-.922094
	18	1.500000	1.500000	1.000000	1.000000	.261384	1.250017
		0.000000	.400000	.400000	0.000000	.052527	.200026
		-.866000	-.842600	-.979800	-1.000000	-.963805	-.922094
24	19	1.500000	1.500000	1.000000	1.000000	.270929	1.250180
		.400000	.800000	.800000	.400000	.163401	.600088
		-.842600	-.768100	-.916500	-.979800	-.948629	-.876683
	20	1.500000	1.500000	1.000000	1.000000	.288009	1.242990
		.800000	1.140000	1.200000	.800000	.287154	.985715
		-.768100	-.652000	-.800000	-.916500	-.913561	-.786135
	21	1.500000	1.500000	1.000000	1.000000	.324553	1.241630
		1.140000	1.460000	1.600000	1.200000	.447006	1.351646
		-.652000	-.465900	-.600000	-.800000	-.833577	-.631851
	22	1.500000	1.500000	1.000000	1.000000	.390089	1.241719
		1.460000	1.670000	1.870000	1.600000	.652170	1.652830
		-.465900	-.229700	-.354600	-.600000	-.650004	-.414680
	23	1.500000	1.500000	1.000000	1.000000	.435365	1.220560
		1.670000	1.732000	2.000000	1.870000	.855263	1.331729
		-.229700	0.000000	0.000000	-.354600	-.281038	-.149900
3	1	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		2.000000	1.870000	1.870000	2.000000	.936893	1.335000
		0.300000	.354600	.354600	0.000000	.344208	.177300
	2	1.000000	1.000000	0.000000	0.000000	0.000000	.500000
		1.870000	1.600000	1.600000	1.870000	.672591	1.735000
		.354600	.600000	.600000	.354600	.740014	.477300

NX	NPX	D
NY	NPY	T
NZ	NPZ	A
.324553	1.241630	.6043E-02
-.447006	-1.351646	.6814E+00
-.833577	-.631851	.2159E+00
.288009	1.242990	.4216E-02
-.287154	-.985715	.6600E+00
-.913561	-.786135	.2025E+00
.270929	1.250180	.2656E-02
-.163401	-.600088	.6744E+00
-.948629	-.876683	.2108E+00
.261384	1.250017	.7710E-03
-.052527	-.200026	.6594E+00
-.963805	-.922094	.2075E+00
.261384	1.250017	.7710E-03
.052527	.200026	.6594E+00
-.963805	-.922094	.2075E+00
.270929	1.250180	.2656E-02
.163401	.600088	.6744E+00
-.948629	-.876683	.2108E+00
.288009	1.242990	.4216E-02
.287154	.985715	.6600E+00
-.913561	-.786135	.2025E+00
.324553	1.241630	.6043E-02
.447006	1.351646	.6814E+00
-.833577	-.631851	.2159E+00
.390089	1.241719	.8288E-02
.652170	1.652830	.6561E+00
-.650004	-.414680	.1846E+00
.435365	1.220560	.5764E-02
.855263	1.831729	.6416E+00
-.281038	-.149900	.1708E+00
0.000000	.500000	0.
.938893	1.935000	.1069E+01
.344208	.177300	.3777E+00
0.000000	.500000	.4885E-14
.672591	1.735000	.1064E+01
.740014	.477300	.3649E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

PAGE

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
3	3	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.600000	1.200000	1.200000	1.600000	.447214	1.400000		
		.600000	.800000	.800000	.600000	.894427	.700000		
4	4	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		1.200000	.800000	.800000	1.200000	.279631	1.000000		
		.800000	.916500	.916500	.800000	.960107	.858250		
5	5	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.800000	.400000	.400000	.800000	.156305	.600000		
		.916500	.979800	.979800	.916500	.987709	.948150		
6	6	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		.400000	0.000000	0.000000	.400000	.050436	.200000		
		.979800	1.000000	1.000000	.979800	.998727	.989900		
7	7	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		0.000000	-.400000	-.400000	0.000000	-.447214	-.200000		
		1.000000	.800000	.800000	1.000000	.894427	.900000		
8	8	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.400000	-.800000	-.800000	-.400000	-.447214	-.600000		
		.800000	.600000	.600000	.800000	.894427	.700000		
9	9	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.000000		
		.600000	.400000	.400000	.600000	.894427	.500000		
10	10	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.200000	-1.600000	-1.600000	-1.200000	-.447214	-1.400000		
		.400000	.200000	.200000	.400000	.894427	.300000		
11	11	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.600000	-2.000000	-2.000000	-1.600000	-.447214	-1.800000		
		.200000	0.000000	0.000000	.200000	.894427	.100000		
12	12	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-2.000000	-1.870000	-1.870000	-2.000000	-.938893	-1.935000		
		0.000000	-.354600	-.354600	0.000000	-.344208	-.177300		
13	13	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.870000	-1.600000	-1.600000	-1.870000	-.672591	-1.735000		
		-.354600	-.600000	-.600000	-.354600	-.740014	-.477300		
14	14	1.000000	1.000000	0.000000	0.000000	0.000000	0.000000	.500000	
		-1.600000	-1.200000	-1.200000	-1.600000	-.447214	-1.400000		
		-.600000	-.800000	-.800000	-.600000	-.894427	-.700000		

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TEST BODY

	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
0000	0.000000	0.000000	0.000000	.500000	.66E1E-14
0000	1.200000	1.600000	.447214	1.400000	.1095E+01
0000	.800000	.600000	.894427	.700000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.2442E-14
0000	.800000	1.200000	.279631	1.000000	.1083E+01
6500	.916500	.800000	.960107	.858250	.4166E+00
0000	0.000000	0.000000	0.000000	.500000	.2442E-14
0000	.400000	.800000	.156305	.600000	.1079E+01
9800	.979800	.916500	.987709	.948150	.4050E+00
0000	0.000000	0.000000	0.000000	.500000	.5551E-16
0000	0.000000	.400000	.050436	.200000	.1077E+01
0000	1.000000	.979800	.998727	.989900	.4005E+00
0000	0.000000	0.000000	0.000000	.500000	.3109E-14
0000	-.400000	0.000000	-.447214	-.200000	.1095E+01
0000	.800000	1.000000	.894427	.900000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.3553E-14
0000	-.800000	-.400000	-.447214	-.600000	.1095E+01
0000	.600000	.800000	.894427	.700000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.3553E-14
0000	-1.200000	-.800000	-.447214	-1.000000	.1095E+01
0000	.400000	.600000	.894427	.500000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.66E1E-14
0000	-1.600000	-1.200000	-.447214	-1.400000	.1095E+01
0000	.200000	.400000	.894427	.300000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	.4441E-15
0000	-2.000000	-1.600000	-.447214	-1.800000	.1095E+01
0000	0.000000	.200000	.894427	.100000	.4472E+00
0000	0.000000	0.000000	0.000000	.500000	0.
0000	-1.870000	-2.000000	-.938893	-1.935000	.1069E+01
6000	-.354600	0.000000	-.344208	-.177300	.3777E+00
0000	0.000000	0.000000	0.000000	.500000	.4885E-14
0000	-1.600000	-1.870000	-.672591	-1.735000	.1064E+01
0000	-.600000	-.354600	-.740014	-.477300	.3649E+00
0000	0.000000	0.000000	0.000000	.500000	.66E1E-14
0000	-1.200000	-1.600000	-.447214	-1.400000	.1095E+01
0000	-.800000	-.600000	-.894427	-.700000	.4472E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ		
3	15	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-1.200000	-.800000	-.800000	-1.200000	-.279631	-1.000000	
		-.800000	-.916500	-.916500	-.800000	-.960107	-.858250	
	16	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-.800000	-.400000	-.400000	-.800000	-.156305	-.600000	
		-.916500	-.979800	-.979800	-.916500	-.987709	-.948150	
	17	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		-.400000	0.000000	0.000000	-.400000	-.050436	-.200000	
		-.379800	-1.000000	-1.000000	-.979800	-.998727	-.989900	
	18	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		0.000000	.400000	.400000	0.000000	.050436	.200000	
		-1.000000	-.979800	-.979800	-1.000000	-.998727	-.989900	
	19	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		.400000	.800000	.800000	.400000	.156305	.600000	
		-.979800	-.916500	-.916500	-.979800	-.987709	-.948150	
26	20	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		.800000	1.200000	1.200000	.800000	.279631	1.000000	
		-.916500	-.800000	-.800000	-.916500	-.960107	-.858250	
	21	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		1.200000	1.600000	1.600000	1.200000	.447214	1.400000	
		-.800000	-.600000	-.600000	-.800000	-.894427	-.700000	
	22	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		1.600000	1.870000	1.870000	1.600000	.672591	1.735000	
		-.600000	-.354600	-.354600	-.600000	-.740014	-.477300	
	23	1.000000	1.000000	0.000000	0.000000	0.000000	.500000	
		1.870000	2.000000	2.000000	1.870000	.938893	1.935000	
		-.354600	0.000000	0.000000	-.354600	-.344208	-.177300	
4	1	0.000000	0.000000	-.500000	-.500000	-.049532	-.248068	
		2.000000	1.870000	1.850000	1.972000	.939127	1.923092	
		0.000000	.354600	.341500	0.000000	.339980	.174052	
	2	0.000000	0.000000	-.500000	-.500000	-.043145	-.249477	
		1.870000	1.600000	1.585000	1.850000	.675158	1.726269	
		.354600	.600000	.586600	.341500	.736411	.470688	
	3	0.000000	0.000000	-.500000	-.500000	-.034875	-.249169	
		1.600000	1.200000	1.195000	1.585000	.449471	1.395016	
		.600000	.800000	.784400	.586600	.892614	.692774	

NX	NPX	D
NY	NPY	T
NZ	NPZ	A
0.000000	.500000	.2442E-14
-.279631	-1.000000	.1083E+01
-.960107	-.858250	.4166E+00
0.000000	.500000	.2442E-14
-.156305	-.600000	.1079E+01
-.987709	-.948150	.4050E+00
0.000000	.500000	.5551E-16
-.050436	-.200000	.1077E+01
-.998727	-.989900	.4005E+00
0.000000	.500000	.3553E-14
.050436	.200000	.1077E+01
-.998727	-.989900	.4005E+00
0.000000	.500000	.2220E-14
.156305	.600000	.1079E+01
-.987709	-.948150	.4050E+00
0.000000	.500000	.3109E-14
.279631	1.000000	.1083E+01
-.960107	-.858250	.4166E+00
0.000000	.500000	.6661E-14
.447214	1.400000	.1095E+01
-.894427	-.700000	.4472E+00
0.000000	.500000	.6217E-14
.672591	1.735000	.1064E+01
-.740014	-.477300	.3649E+00
0.000000	.500000	.6217E-14
.938893	1.935000	.1069E+01
-.344208	-.177300	.3777E+00
-.049532	-.248068	.7648E-03
.939127	1.923092	.6238E+00
.339980	.174052	.1853E+00
-.043145	-.249477	.7887E-03
.675158	1.726269	.6205E+00
.736411	.470688	.1816E+00
-.034875	-.249169	.6327E-03
.449471	1.395016	.6693E+00
.892614	.692774	.2213E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

FA

BODY ID. TEST

TEST BCDY

N	M	TEST			TEST BCDY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
4	4	0.000000 1.200000 .800000	0.000000 .800000 .916500	-.500000 .800000 .901200	-.500000 1.195000 .784400	-.031043 .281449 .959074	-.2495 .9987 .8509		
	5	0.000000 .800000 .716500	0.000000 .400000 .979800	-.500000 .400000 .965500	-.500000 .800000 .901200	-.029218 .157442 .967096	-.2500 .6000 .9400		
	6	0.000000 .400000 .979800	0.000000 0.000000 1.000000	-.500000 0.000000 .986000	-.500000 .400000 .965500	-.028252 .050789 .998310	-.2500 .2000 .9820		
	7	0.000000 0.000000 1.000000	0.000000 -.400000 .800000	-.500000 -.400000 .800000	-.500000 0.000000 .986000	-.012608 -.434526 .900571	-.2495 -.1995 .8960		
	8	0.000000 -.400000 .800000	0.000000 -.800000 .600000	-.500000 -.800000 .600000	-.500000 -.400000 .800000	0.000000 -.447214 .894427	-.2500 -.6000 .7000		
	9	0.000000 -.800000 .600000	0.000000 -1.200000 .400000	-.500000 -1.200000 .400000	-.500000 -.800000 .600000	0.000000 -.447214 .894427	-.2500 -1.0000 .5000		
	10	0.000000 -1.200000 .400000	0.000000 -1.600000 .200000	-.500000 -1.600000 .200000	-.500000 -1.200000 .400000	0.000000 -.447214 .894427	-.2500 -1.4000 .3000		
	11	0.000000 -1.600000 .200000	0.000000 -2.000000 0.000000	-.500000 -1.972000 0.000000	-.500000 -1.600000 .200000	-.012880 -.460910 .887820	-.2470 -1.7930 .1000		
	12	0.000000 -2.000000 0.000000	0.000000 -1.870000 -.354600	-.500000 -1.850000 -.341500	-.500000 -1.972000 0.000000	-.049532 -.939127 -.339980	-.2480 -1.9230 -.1740		
	13	0.000000 -1.870000 -.354600	0.000000 -1.600000 -.600000	-.500000 -1.585000 -.586600	-.500000 -1.850000 -.341500	-.043145 -.675158 -.736411	-.2490 -1.7200 -.4780		
	14	0.000000 -1.600000 -.600000	0.000000 -1.200000 -.800000	-.500000 -1.195000 -.784400	-.500000 -1.585000 -.586600	-.034875 -.449471 -.892614	-.2490 -1.3300 -.6900		
	15	0.000000 -1.200000 -.800000	0.000000 -.800000 -.916500	-.500000 -.800000 -.901200	-.500000 -1.195000 -.784400	-.031043 -.281449 -.959074	-.2495 -.9987 -.8509		

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	X	NX	NPX	D
	Y	NY	NPY	T
	Z	NZ	NPZ	A
00000	-.500000	-.031043	-.249537	.4237E-03
00000	1.195000	.281449	.998756	.6507E+00
01200	.784400	.959074	.850538	.2072E+00
00000	-.500000	-.029218	-.250016	.2468E-03
00000	.800000	.157442	.600001	.6451E+00
55500	.901200	.967096	.940749	.2026E+00
00000	-.500000	-.028252	-.250002	.7487E-04
00000	.400000	.050789	.200000	.6412E+00
66000	.965500	.998310	.982825	.2003E+00
00000	-.500000	-.012608	-.249496	.3152E-02
00000	0.000000	-.434526	-.199997	.6708E+00
00000	.986000	.900571	.896509	.2221E+00
00000	-.500000	0.000000	-.250000	.3553E-14
00000	-.400000	-.447214	-.600000	.6708E+00
00000	.800000	.894427	.700000	.2236E+00
00000	-.500000	0.000000	-.250000	.3553E-14
00000	-.800000	-.447214	-1.000000	.6708E+00
00000	.600000	.894427	.500000	.2236E+00
00000	-.500000	0.000000	-.250000	.6661E-14
00000	-1.200000	-.447214	-1.400000	.6708E+00
00000	.400000	.894427	.300000	.2236E+00
00000	-.500000	-.012880	-.247831	.3220E-02
72000	-1.600000	-.460010	-1.793015	.6708E+00
00000	.200000	.887820	.100024	.2174E+00
00000	-.500000	-.049532	-.248068	.7648E-03
00000	-1.972000	-.939127	-1.923092	.6238E+00
1500	0.000000	-.339980	-.174052	.1853E+00
00000	-.500000	-.043145	-.249477	.7887E-03
5000	-1.850000	-.675158	-1.726269	.6205E+00
6600	-.341500	-.736411	-.470688	.1816E+00
00000	-.500000	-.034875	-.249169	.6327E-03
5000	-1.585000	-.449471	-1.395016	.6693E+00
4400	-.586600	-.892614	-.692774	.2213E+00
00000	-.500000	-.031043	-.249537	.4237E-03
00000	-1.195000	-.281449	-.998756	.6507E+00
1200	-.784400	-.959074	-.850538	.2072E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
4	16	0.000000	0.000000	-0.500000	-0.500000	-0.029218	-0.250016		
		-0.800000	-0.400000	-0.400000	-0.800000	-0.157442	-0.600001		
		-0.916500	-0.979800	-0.965500	-0.901200	-0.987096	-0.940749		
	17	0.000000	0.000000	-0.500000	-0.500000	-0.028252	-0.250002		
		-0.400000	0.000000	0.000000	-0.400000	-0.050789	-0.200000		
		-0.979800	-1.000000	-0.986000	-0.965500	-0.998310	-0.982825		
	18	0.000000	0.000000	-0.500000	-0.500000	-0.028252	-0.250002		
		0.000000	0.400000	0.400000	0.000000	0.050789	0.200000		
		-1.000000	-0.979800	-0.965500	-0.986000	-0.998310	-0.982825		
	19	0.000000	0.000000	-0.500000	-0.500000	-0.029218	-0.250016		
		0.400000	0.800000	0.800000	0.400000	0.157442	0.600001		
		-0.979800	-0.916500	-0.901200	-0.965500	-0.987096	-0.940749		
	20	0.000000	0.000000	-0.500000	-0.500000	-0.031043	-0.249537		
		0.800000	1.200000	1.195000	0.800000	0.281449	0.998756		
		-0.916500	-0.800000	-0.784400	-0.901200	-0.959074	-0.850538		
28	21	0.000000	0.000000	-0.500000	-0.500000	-0.034875	-0.249169		
		1.200000	1.600000	1.585000	1.195000	0.449471	1.395016		
		-0.800000	-0.600000	-0.586600	-0.784400	-0.892614	-0.692774		
	22	0.000000	0.000000	-0.500000	-0.500000	-0.043145	-0.249477		
		1.600000	1.870000	1.850000	1.585000	0.675158	1.726269		
		-0.600000	-0.354600	-0.341500	-0.586600	-0.736411	-0.470688		
	23	0.000000	0.000000	-0.500000	-0.500000	-0.049532	-0.248068		
		1.870000	2.000000	1.972000	1.850000	0.939127	1.923092		
		-0.354600	0.000000	0.000000	-0.341500	-0.339980	-0.174052		
5	1	-0.500000	-0.500000	-1.000000	-1.000000	-0.153543	-0.743334		
		1.972000	1.850000	1.785000	1.885600	0.934141	1.874150		
		0.000000	0.341500	0.303900	0.000000	0.322188	0.161626		
	2	-0.500000	-0.500000	-1.000000	-1.000000	-0.132740	-0.747389		
		1.850000	1.585000	1.540000	1.785000	0.683173	1.690281		
		0.341500	0.586600	0.544000	0.303900	0.718091	0.444215		
	3	-0.500000	-0.500000	-1.000000	-1.000000	-0.108809	-0.747752		
		1.585000	1.195000	1.175000	1.540000	0.457325	1.373892		
		0.586600	0.784400	0.737400	0.544000	0.882618	0.663304		
	4	-0.500000	-0.500000	-1.000000	-1.000000	-0.095703	-0.747958		
		1.195000	0.800000	0.800000	1.175000	0.288525	0.992572		
		0.784400	0.901200	0.853800	0.737400	0.952677	0.819383		

	X	NX	NPX	D
	Y	NY	NPY	T
	Z	NZ	NPZ	A
000	-.500000	-.029218	-.250016	.2468E-03
000	-.800000	-.157442	-.600001	.6451E+00
500	-.901200	-.987096	-.940749	.2026E+00
000	-.500000	-.028252	-.250002	.7487E-04
000	-.400000	-.050789	-.200000	.6412E+00
000	-.965500	-.998310	-.982825	.2003E+00
000	-.500000	-.028252	-.250002	.7487E-04
000	0.000000	.050789	.200000	.6412E+00
500	-.986000	-.998310	-.982825	.2003E+00
000	-.500000	-.029218	-.250016	.2468E-03
000	.400000	.157442	.600001	.6451E+00
200	-.965500	-.987096	-.940749	.2026E+00
000	-.500000	-.031043	-.249537	.4237E-03
000	.800000	.281449	.998756	.6507E+00
400	-.901200	-.959074	-.850538	.2072E+00
000	-.500000	-.034875	-.249169	.6327E-03
000	1.195000	.449471	1.395016	.6693E+00
600	-.784400	-.892614	-.692774	.2213E+00
000	-.500000	-.043145	-.249477	.7887E-03
000	1.585000	.675158	1.726269	.6205E+00
500	-.586600	-.736411	-.470688	.1816E+00
000	-.500000	-.049532	-.248068	.7648E-03
000	1.850000	.939127	1.923092	.6238E+00
000	-.341500	-.339980	-.174052	.1853E+00
000	-1.000000	-.153543	-.743334	.1969E-02
000	1.885600	.934141	1.874150	.6143E+00
000	0.000000	.322188	.161626	.1727E+00
000	-1.000000	-.132740	-.747389	.2518E-02
000	1.785000	.683173	1.690281	.6222E+00
000	.303900	.718091	.444215	.1776E+00
000	-1.000000	-.108809	-.747752	.1887E-02
000	1.540000	.457325	1.373892	.6640E+00
000	.544000	.882618	.663304	.2139E+00
000	-1.000000	-.095703	-.747958	.1347E-02
000	1.175000	.288525	.992572	.6461E+00
000	.737400	.952677	.819383	.2021E+00

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ
5	5	-.500000 .800000 .901200	-.500000 .400000 .965500	-1.000000 .400000 .921400	-1.000000 .800000 .853800	-.089915 .162020 .982682	-.750055 .600009 .910468
	6	-.500000 .400000 .965500	-.500000 0.000000 .986000	-1.000000 0.000000 .942800	-1.000000 .400000 .921400	-.088651 .052106 .994858	-.750005 .200003 .953924
	7	-.500000 0.000000 .986000	-.500000 -.400000 .800000	-1.000000 -.400000 .800000	-1.000000 0.000000 .942800	-.039925 -.379842 .924189	-.748551 -.199961 .862279
	8	-.500000 -.400000 .800000	-.500000 -.800000 .600000	-1.000000 -.800000 .600000	-1.000000 -.400000 .800000	0.000000 -.447214 .894427	-.750000 -.600000 .700000
	9	-.500000 -.800000 .600000	-.500000 -1.200000 .400000	-1.000000 -1.200000 .400000	-1.000000 -.800000 .600000	0.000000 -.447214 .894427	-.750000 -1.000000 .500000
29	10	-.500000 -1.200000 .400000	-.500000 -1.600000 .200000	-1.000000 -1.600000 .200000	-1.000000 -1.200000 .400000	0.000000 -.447214 .894427	-.750000 -1.400000 .300000
	11	-.500000 -1.600000 .200000	-.500000 -1.972000 0.000000	-1.000000 -1.885600 0.000000	-1.000000 -1.600000 .200000	-.044855 -.519160 .853499	-.741375 -1.764760 .100234
	12	-.500000 -1.972000 0.000000	-.500000 -1.850000 -.341500	-1.000000 -1.785000 -.303900	-1.000000 -1.885600 0.000000	-.153543 -.934141 -.322188	-.743334 -1.874150 -.161626
	13	-.500000 -1.850000 -.341500	-.500000 -1.585000 -.586600	-1.000000 -1.540000 -.544000	-1.000000 -1.785000 -.303900	-.132740 -.683173 -.718091	-.747389 -1.690281 -.444215
	14	-.500000 -1.585000 -.586600	-.500000 -1.195000 -.784400	-1.000000 -1.175000 -.737400	-1.000000 -1.540000 -.544000	-.108809 -.457325 -.882618	-.747752 -1.373892 -.663304
	15	-.500000 -1.195000 -.784400	-.500000 -.800000 -.901200	-1.000000 -.800000 -.853800	-1.000000 -1.175000 -.737400	-.095703 -.288525 -.952677	-.747958 -.992572 -.819383
	16	-.500000 -.800000 -.901200	-.500000 -.400000 -.965500	-1.000000 -.400000 -.921400	-1.000000 -.800000 -.853800	-.089915 -.162020 -.982682	-.750055 -.600009 -.910468

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X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-1.000000 .400000 .921400	-1.000000 .800000 .853800	-.089915 .162020 .982682	-.750055 .600009 .910468	.8107E-03 .6500E+00 .2035E+00
-1.000000 0.000000 .942800	-1.000000 .400000 .921400	-.086851 .052106 .994858	-.750005 .200003 .953924	.2238E-03 .6436E+00 .2010E+00
-1.000000 -.400000 .800000	-1.000000 0.000000 .942800	-.039925 -.379842 .924189	-.748551 -.199961 .882279	.9981E-02 .6668E+00 .2164E+00
-1.000000 -.800000 .600000	-1.000000 -.400000 .800000	0.000000 -.447214 .894427	-.750000 -.600000 .700000	.3553E-14 .6708E+00 .2236E+00
-1.000000 -1.200000 .400000	-1.000000 -.800000 .600000	0.000000 -.447214 .894427	-.750000 -1.000000 .500000	.3553E-14 .6708E+00 .2236E+00
-1.000000 -1.600000 .200000	-1.000000 -1.200000 .400000	0.000000 -.447214 .894427	-.750000 -1.400000 .300000	.6661E-14 .6708E+00 .2236E+00
-1.000000 -1.885600 0.000000	-1.000000 -1.600000 .200000	-.044855 -.519160 .853499	-.741375 -1.764760 .100234	.1121E-01 .6545E+00 .1926E+00
-1.000000 -1.785000 -.303900	-1.000000 -1.885600 0.000000	-.153543 -.934141 -.322188	-.743334 -1.874150 -.161626	.1969E-02 .6143E+00 .1727E+00
-1.000000 -1.540000 -.544000	-1.000000 -1.785000 -.303900	-.132740 -.683173 -.718091	-.747389 -1.690281 -.444215	.2518E-02 .6222E+00 .1776E+00
-1.000000 -1.175000 -.737400	-1.000000 -1.540000 -.544000	-.108809 -.457325 -.882618	-.747752 -1.373892 -.663304	.1887E-02 .6640E+00 .2139E+00
-1.000000 -.800000 -.853800	-1.000000 -1.175000 -.737400	-.095703 -.288525 -.952677	-.747958 -.992572 -.819383	.1347E-02 .6461E+00 .2021E+00
-1.000000 -.400000 -.921400	-1.000000 -.800000 -.853800	-.089915 -.162020 -.982682	-.750055 -.600009 -.910468	.8107E-03 .6500E+00 .2035E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
5	17	-.500000	-.500000	-1.000000	-1.000000	-.086851	-.750005		
		-.400000	0.000000	0.000000	-.400000	-.052106	-.200003		
		-.965500	-.986000	-.942800	-.921400	-.994858	-.953924		
18		-.500000	-.500000	-1.000000	-1.000000	-.086851	-.750005		
		0.000000	.400000	.400000	0.000000	.052106	.200003		
		-.986000	-.965500	-.921400	-.942800	-.994858	-.953924		
19		-.500000	-.500000	-1.000000	-1.000000	-.089915	-.750055		
		.400000	.800000	.800000	.400000	.162020	.600009		
		-.965500	-.901200	-.853800	-.921400	-.982682	-.910468		
20		-.500000	-.500000	-1.000000	-1.000000	-.095703	-.747958		
		.800000	1.195000	1.175000	.800000	.288525	.992572		
		-.901200	-.784400	-.737400	-.853800	-.952677	-.819383		
21		-.500000	-.500000	-1.000000	-1.000000	-.108809	-.747752		
		1.195000	1.585000	1.540000	1.175000	.457325	1.373892		
		-.784400	-.586600	-.544000	-.737400	-.882618	-.663304		
22		-.500000	-.500000	-1.000000	-1.000000	-.132740	-.747389		
		1.585000	1.850000	1.785000	1.540000	.683173	1.690281		
		-.586600	-.341500	-.303900	-.544000	-.718091	-.444215		
23		-.500000	-.500000	-1.000000	-1.000000	-.153543	-.743334		
		1.850000	1.972000	1.885600	1.785000	.934141	1.874150		
		-.341500	0.000000	0.000000	-.303900	-.322188	-.161626		
6	1	-1.000000	-1.000000	-1.500000	-1.500000	-.268347	-1.229655		
		1.885600	1.785000	1.670000	1.732000	.921489	1.773614		
		0.000000	.303900	.229700	0.000000	.280799	.134912		
2		-1.000000	-1.000000	-1.500000	-1.500000	-.239165	-1.245329		
		1.785000	1.540000	1.460000	1.670000	.701123	1.614691		
		.303900	.544000	.465900	.229700	.670724	.386555		
3		-1.000000	-1.000000	-1.500000	-1.500000	-.194936	-1.245068		
		1.540000	1.175000	1.140000	1.460000	.475316	1.329324		
		.544000	.737400	.652000	.465900	.857948	.600627		
4		-1.000000	-1.000000	-1.500000	-1.500000	-.170981	-1.245783		
		1.175000	.800000	.800000	1.140000	.304683	.979004		
		.737400	.853800	.768100	.652000	.936981	.753512		
5		-1.000000	-1.000000	-1.500000	-1.500000	-.159881	-1.250120		
		.800000	.400000	.400000	.800000	.172638	.600034		
		.853800	.921400	.842600	.768100	.971923	.846449		

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	X	NX	N ² X	D
	Y	NY	NPY	T
	Z	NZ	N ² Z	A
00	-1.000000	-.086851	-.750005	.2238E-03
00	-.400000	-.052106	-.200003	.6436E+00
00	-.921400	-.994858	-.953924	.2010E+00
00	-1.000000	-.086851	-.750005	.2238E-03
00	0.000000	.052106	.200003	.6436E+00
00	-.942800	-.994858	-.953924	.2010E+00
00	-1.000000	-.089915	-.750055	.8107E-03
00	.400000	.162020	.600009	.6500E+00
00	-.921400	-.982682	-.910468	.2035E+00
00	-1.000000	-.095703	-.747958	.1347E-02
00	.800000	.288525	.992572	.6461E+00
00	-.853800	-.952677	-.819383	.2021E+00
00	-1.000000	-.108809	-.747752	.1887E-02
00	1.175000	.457325	1.373892	.6640E+00
00	-.737400	-.882618	-.663304	.2139E+00
00	-1.000000	-.132740	-.747389	.2518E-02
00	1.540000	.683173	1.690281	.6222E+00
00	-.544000	-.718091	-.444215	.1776E+00
00	-1.000000	-.153543	-.743334	.1969E-02
00	1.785000	.934141	1.874150	.6143E+00
00	-.303900	-.322188	-.161626	.1727E+00
00	-1.500000	-.268347	-1.229655	.3684E-02
00	1.732000	.921489	1.773614	.5910E+00
00	0.000000	.280799	.134912	.1448E+00
00	-1.500000	-.239065	-1.245329	.5490E-02
00	1.670000	.702123	1.614691	.6180E+00
00	.229700	.670724	.386555	.1696E+00
00	-1.500000	-.194936	-1.245068	.3782E-02
00	1.460000	.475316	1.329324	.6494E+00
00	.465900	.857948	.600627	.1996E+00
00	-1.500000	-.170981	-1.245783	.2596E-02
00	1.140000	.304683	.979004	.6374E+00
00	.652000	.936981	.753512	.1908E+00
00	-1.500000	-.159881	-1.250120	.1677E-02
00	.800000	.172638	.600034	.6584E+00
00	.768100	.971923	.846449	.2058E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NPX	NPY	NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ				
6	6	-1.000000	-1.000000	-1.500000	-1.500000	-.153515	-1.2500			
		.400000	0.000000	0.000000	.400000	.055250	.2000			
		.921400	.942800	.866000	.842600	.986601	.8930			
7	7	-1.000000	-1.000000	-1.500000	-1.500000	-.074106	-1.2480			
		0.000000	-.400000	-.400000	0.000000	-.251846	-.1990			
		.942800	.800000	.800000	.866000	.964926	.8520			
8	8	-1.000000	-1.000000	-1.500000	-1.500000	0.000000	-1.2500			
		-.400000	-.800000	-.800000	-.400000	-.447214	-.6000			
		.300000	.600000	.600000	.800000	.894427	.7000			
9	9	-1.000000	-1.000000	-1.500000	-1.500000	0.000000	-1.2500			
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.0000			
		.600000	.400000	.400000	.600000	.694427	.5000			
10	10	-1.000000	-1.000000	-1.500000	-1.500000	0.000000	-1.2500			
		-1.200000	-1.600000	-1.600000	-1.200000	-.447214	-1.4000			
		.400000	.200000	.200000	.400000	.894427	.3000			
11	11	-1.000000	-1.000000	-1.500000	-1.500000	-.105654	-1.2250			
		-1.600000	-1.885600	-1.732000	-1.600000	-.687853	-1.7070			
		.200000	0.000000	0.000000	.200000	.718119	.1000			
12	12	-1.000000	-1.000000	-1.500000	-1.500000	-.268347	-1.2290			
		-1.885600	-1.785000	-1.670000	-1.732000	-.921489	-1.7730			
		0.000000	-.303900	-.229700	0.000000	-.280799	-.1340			
13	13	-1.000000	-1.000000	-1.500000	-1.500000	-.239065	-1.2450			
		-1.785000	-1.540000	-1.460000	-1.670000	-.702123	-1.6140			
		-.303900	-.544000	-.465900	-.229700	-.670724	-.3860			
14	14	-1.000000	-1.000000	-1.500000	-1.500000	-.194936	-1.2450			
		-1.540000	-1.175000	-1.140000	-1.460000	-.475316	-1.3290			
		-.544000	-.737400	-.652000	-.465900	-.857948	-.6000			
15	15	-1.000000	-1.000000	-1.500000	-1.500000	-.170981	-1.2450			
		-1.175000	-.800000	-.800000	-1.140000	-.304683	-.9790			
		-.737400	-.853800	-.766100	-.652000	-.936981	-.7530			
16	16	-1.000000	-1.000000	-1.500000	-1.500000	-.159881	-1.2500			
		-.800000	-.400000	-.400000	-.800000	-.172638	-.6000			
		-.853800	-.921400	-.842600	-.766100	-.971923	-.8460			
17	17	-1.000000	-1.000000	-1.500000	-1.500000	-.153515	-1.2500			
		-.400000	0.000000	0.000000	-.400000	-.055250	-.2000			
		-.921400	-.942800	-.866000	-.842600	-.986601	-.8930			

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FOLDOUT FRAM

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
.500000 .000000 .866000	-1.500000 .400000 .842600	-.153515 .055250 .986601	-1.250012 .200010 .893198	.4933E-03 .6481E+00 .2027E+00
.500000 .400000 .800000	-1.500000 0.000000 .866000	-.074106 -.251846 .964926	-1.248100 -.199835 .852389	.1853E-01 .6560E+00 .2073E+00
.500000 .800000 .600000	-1.500000 -.400000 .800000	0.000000 -.447214 .894427	-1.250000 -.600000 .700000	.3553E-14 .6708E+00 .2236E+00
.500000 .200000 .400000	-1.500000 -.800000 .600000	0.000000 -.447214 .694427	-1.250000 -1.000000 .500000	.3553E-14 .6708E+00 .2236E+00
.500000 .600000 .200000	-1.500000 -1.200000 .400000	0.000000 -.447214 .694427	-1.250000 -1.400000 .300000	.6661E-14 .6708E+00 .2236E+00
.500000 .732000 .000000	-1.500000 -1.600000 .200000	-.105654 -.687853 .718119	-1.225923 -1.707445 .100626	.2641E-01 .6096E+00 .1454E+00
.500000 .670000 .229700	-1.500000 -1.732000 0.000000	-.268347 -.921489 -.280799	-1.229655 -1.773614 -.134912	.3684E-02 .5910E+00 .1448E+00
.500000 .460000 .465900	-1.500000 -1.670000 -.229700	-.239065 -.702123 -.670724	-1.245329 -1.614691 -.386555	.5490E-02 .6180E+00 .1696E+00
.500000 .140000 .652000	-1.500000 -1.460000 -.465900	-.194936 -.475316 -.857948	-1.245068 -1.329324 -.600627	.3782E-02 .6494E+00 .1996E+00
.500000 .800000 .768100	-1.500000 -1.140000 -.652000	-.170981 -.304683 -.936981	-1.245783 -.979004 -.753512	.2596E-02 .6374E+00 .1908E+00
.500000 .400000 .842600	-1.500000 -.800000 -.768100	-.159881 -.172638 -.971923	-1.250120 -.600034 -.846449	.1677E-02 .6584E+00 .2058E+00
.500000 .000000 .866000	-1.500000 -.400000 -.842600	-.153515 -.055250 -.986601	-1.250012 -.200010 -.893198	.4933E-03 .6481E+00 .2027E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NPX NPY NPZ
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z			
6	18	-1.000000	-1.000000	-1.500000	-1.500000	-0.153515	-1.250012		
		0.000000	.400000	.400000	0.000000	.055253	.200010		
		-.942800	-.921400	-.842600	-.866000	-.986601	-.893198		
19	19	-1.000000	-1.000000	-1.500000	-1.500000	-0.159881	-1.250120		
		.400000	.800000	.800000	.400000	.172638	.600034		
		-.921400	-.853800	-.768100	-.842600	-.971923	-.846449		
20	20	-1.000000	-1.000000	-1.500000	-1.500000	-0.170981	-1.245783		
		.800000	1.175000	1.140000	.800000	.304683	.979004		
		-.853800	-.737400	-.652000	-.768100	-.936981	-.753512		
21	21	-1.000000	-1.000000	-1.500000	-1.500000	-0.194936	-1.245068		
		1.175000	1.540000	1.460000	1.140000	.475316	1.329324		
		-.737400	-.544000	-.465900	-.652000	-.857948	-.600627		
22	22	-1.000000	-1.000000	-1.500000	-1.500000	-0.239065	-1.245329		
		1.540000	1.785000	1.670000	1.460000	.702123	1.614691		
		-.544000	-.303900	-.229700	-.465900	-.670724	-.386555		
23	23	-1.000000	-1.000000	-1.500000	-1.500000	-0.268347	-1.229655		
		1.785000	1.885600	1.732000	1.670000	.921489	1.773614		
		-.303900	0.000000	0.000000	-.229700	-.280799	-.134912		
7	1	-1.500000	-1.500000	-2.000000	-2.000000	-0.414479	-1.699678		
		1.732000	1.670000	1.465000	1.490700	.885202	1.611865		
		0.000000	.229700	.137800	0.000000	.211244	.096576		
2	2	-1.500000	-1.500000	-2.000000	-2.000000	-0.372374	-1.733772		
		1.670000	1.460000	1.322000	1.465000	.725701	1.484752		
		.229700	.465900	.344400	.137800	.578529	.297994		
3	3	-1.500000	-1.500000	-2.000000	-2.000000	-0.310024	-1.738932		
		1.460000	1.140000	1.072000	1.322000	.507279	1.250730		
		.465900	.652000	.517900	.344400	.804085	.497910		
4	4	-1.500000	-1.500000	-2.000000	-2.000000	-0.269527	-1.738266		
		1.140000	.800000	.800000	1.072000	.335023	.954054		
		.652000	.768100	.628900	.517900	.902837	.644837		
5	5	-1.500000	-1.500000	-2.000000	-2.000000	-0.250229	-1.750276		
		.800000	.400000	.400000	.800000	.193980	.600104		
		.768100	.842600	.718900	.628900	.948555	.739306		
6	6	-1.500000	-1.500000	-2.000000	-2.000000	-0.237694	-1.750025		
		.400000	0.000000	0.000000	.400000	.061556	.200030		
		.842600	.866000	.745400	.718900	.969388	.792992		

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BODY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-1.500000 .400000 -.842600	-1.500000 0.000000 -.866000	-.153515 .055253 -.986601	-1.250012 .200010 -.893198	.4933E-03 .6481E+00 .2027E+00
-1.500000 .800000 -.768100	-1.500000 .400000 -.842600	-.159881 .172638 -.971923	-1.250120 .600034 -.846449	.1677E-02 .6584E+00 .2058E+00
-1.500000 1.140000 -.652000	-1.500000 .800000 -.768100	-.170981 .304683 -.936981	-1.245783 .979004 -.753512	.2596E-02 .6374E+00 .1908E+00
-1.500000 1.460000 -.465900	-1.500000 1.140000 -.652000	-.194936 .475316 -.857948	-1.245068 1.329324 -.600627	.3782E-02 .6494E+00 .1996E+00
-1.500000 1.670000 -.229700	-1.500000 1.460000 -.465900	-.239065 .702123 -.670724	-1.245329 1.614691 -.386555	.5490E-02 .6180E+00 .1696E+00
-1.500000 1.732000 0.000000	-1.500000 1.670000 -.229700	-.268347 .921489 -.280799	-1.229655 1.773614 -.134912	.3664E-02 .5910E+00 .1448E+00
-2.000000 1.465000 .137800	-2.000000 1.490700 0.000000	-.414479 .885202 .211244	-1.699678 1.611865 .096576	.3180E-02 .5833E+00 .1038E+00
-2.000000 1.322000 .344400	-2.000000 1.465000 .137800	-.372374 .725701 .578529	-1.733772 1.484752 .297994	.7874E-02 .6199E+00 .1525E+00
-2.000000 1.072000 .517900	-2.000000 1.322000 .344400	-.310024 .507279 .804085	-1.738932 1.250730 .497910	.6345E-02 .6350E+00 .1772E+00
-2.000000 .800000 .628900	-2.000000 1.072000 .517900	-.269527 .335023 .902837	-1.738266 .954054 .644837	.4544E-02 .6218E+00 .1695E+00
-2.000000 .400000 .718000	-2.000000 .800000 .628900	-.250229 .193980 .948555	-1.750276 .600104 .739306	.3482E-02 .6750E+00 .2108E+00
-2.000000 0.000000 .745400	-2.000000 .400000 .718000	-.237694 .061556 .969388	-1.750025 .200030 .792992	.9694E-03 .6572E+00 .2063E+00

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX	NPX
		X Y Z	X Y Z	X Y Z	X Y Z	NY NZ	NPY NPZ		
7	7	-1.500000	-1.500000	-2.000000	-2.000000	-.197278	-1.74955		
		0.000000	-.400000	-.400000	0.000000	-.113683	-.19975		
		.866000	.800000	.718000	.745400	.973734	.78246		
8	8	-1.500000	-1.500000	-2.000000	-2.000000	-.075980	-1.74731		
		-.400000	-.800000	-.800000	-.400000	-.368319	-.59985		
		.800000	.600000	.600000	.718000	.926589	.67977		
9	9	-1.500000	-1.500000	-2.000000	-2.000000	0.000000	-1.75000		
		-.800000	-1.200000	-1.200000	-.800000	-.447214	-1.00000		
		.600000	.400000	.400000	.600000	.894427	.50000		
10	10	-1.500000	-1.500000	-2.000000	-2.000000	-.050829	-1.72040		
		-1.200000	-1.600000	-1.400000	-1.200000	-.496741	-1.35282		
		.400000	.200000	.256000	.400000	.866409	.31411		
11	11	-1.500000	-1.500000	-2.000000	-2.000000	-.348626	-1.76253		
		-1.600000	-1.732000	-1.490700	-1.400000	-.842191	-1.55051		
		.200000	0.000000	0.000000	.256000	.411307	.11394		
12	12	-1.500000	-1.500000	-2.000000	-2.000000	-.414479	-1.69967		
		-1.732000	-1.670000	-1.465000	-1.490700	-.885202	-1.61186		
		0.000000	-.229700	-.137800	0.000000	-.211244	-.09657		
13	13	-1.500000	-1.500000	-2.000000	-2.000000	-.372374	-1.73377		
		-1.670000	-1.460000	-1.322000	-1.465000	-.725701	-1.48475		
		-.229700	-.465900	-.344400	-.137800	-.578529	-.29799		
14	14	-1.500000	-1.500000	-2.000000	-2.000000	-.310024	-1.73893		
		-1.460000	-1.140000	-1.072000	-1.322000	-.507279	-1.25073		
		-.465900	-.652000	-.517900	-.344400	-.804085	-.49791		
15	15	-1.500000	-1.500000	-2.000000	-2.000000	-.269527	-1.73826		
		-1.140000	-.800000	-.800000	-1.072000	-.335023	-.95405		
		-.652000	-.768100	-.628900	-.517900	-.902837	-.64483		
16	16	-1.500000	-1.500000	-2.000000	-2.000000	-.250229	-1.75027		
		-.800000	-.400000	-.400000	-.800000	-.193980	-.60010		
		-.768100	-.842600	-.718000	-.628900	-.948555	-.73930		
17	17	-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.75002		
		-.400000	0.000000	0.000000	-.400000	-.061556	-.20003		
		-.842600	-.866000	-.745400	-.718000	-.969388	-.79299		
18	18	-1.500000	-1.500000	-2.000000	-2.000000	-.237694	-1.75002		
		0.000000	.400000	.400000	0.000000	.061556	.20003		
		-.866000	-.842600	-.718000	-.745400	-.969388	-.79299		

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	X	NX	NPX	C
	Y	NY	NPY	T
	Z	NZ	NPZ	A
000	-2.000000	-.197278	-1.749550	.9397E-02
000	0.000000	-.113683	-.199759	.6572E+00
000	.745400	.973734	.782469	.2054E+00
000	-2.000000	-.075980	-1.747311	.1900E-01
000	-.400000	-.368319	-.599857	.6708E+00
000	.718000	.926589	.679777	.2158E+00
000	-2.000000	0.000000	-1.750000	.3553E-14
000	-.600000	-.447214	-1.000000	.6708E+00
000	.600000	.894427	.500000	.2236E+00
000	-2.000000	-.050829	-1.724409	.1271E-01
000	-1.200000	-.496741	-1.352829	.6708E+00
000	.400000	.866409	.314114	.1731E+00
000	-2.000000	-.348626	-1.762537	.1445E-01
700	-1.400000	-.842191	-1.550513	.6525E+00
000	.256000	.411307	.113943	.1354E+00
000	-2.000000	-.414479	-1.699678	.3180E-02
000	-1.490700	-.885202	-1.611865	.5833E+00
800	0.000000	-.211244	-.096576	.1038E+00
000	-2.000000	-.372374	-1.733772	.7874E-02
000	-1.465000	-.725701	-1.484752	.6199E+00
400	-.137800	-.578529	-.297994	.1525E+00
000	-2.000000	-.310024	-1.738932	.6345E-02
000	-1.322000	-.507279	-1.251730	.6350E+00
7900	-.344400	-.804085	-.497910	.1772E+00
000	-2.000000	-.269527	-1.738266	.4544E-02
000	-1.072000	-.335023	-.954054	.6218E+00
900	-.517900	-.902837	-.644837	.1695E+00
000	-2.000000	-.250229	-1.750276	.3462E-02
000	-.600000	-.193980	-.600104	.6750E+00
3900	-.628900	-.948555	-.739306	.2108E+00
000	-2.000000	-.237694	-1.750025	.9694E-03
000	-.400000	-.061556	-.200030	.6572E+00
400	-.718000	-.969388	-.792992	.2063E+00
000	-2.000000	-.237694	-1.750025	.9694E-03
000	0.000000	.061556	.200030	.6572E+00
000	-.745400	-.969388	-.792992	.2063E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	X Y Z	X Y Z	X Y Z	X Y Z	NX NY NZ	NP NP NP
7	19	-1.500000 .400000 -.842600	-1.500000 .800000 -.768100	-2.000000 .800000 -.628900	-2.000000 .400000 -.718000	-.250229 .193980 -.948555	-1.750000 .600000 -.730000
	20	-1.500000 .800000 -.768100	-1.500000 1.140000 -.652000	-2.000000 1.072000 -.517900	-2.000000 .800000 -.628900	-.269527 .335023 -.902837	-1.730000 .950000 -.640000
	21	-1.500000 1.140000 -.652000	-1.500000 1.460000 -.465900	-2.000000 1.322000 -.344400	-2.000000 1.072000 -.517900	-.310024 .507279 -.804085	-1.730000 1.250000 -.490000
	22	-1.500000 1.460000 -.465900	-1.500000 1.670000 -.229700	-2.000000 1.465000 -.137800	-2.000000 1.322000 -.344400	-.372374 .725701 -.578529	-1.730000 1.480000 -.290000
	23	-1.500000 1.670000 -.229700	-1.500000 1.732000 0.000000	-2.000000 1.490700 0.000000	-2.000000 1.465000 -.137800	-.414479 .885202 -.211244	-1.690000 1.610000 -.090000
		*****			*****		
8	1	-2.000000 1.490700 0.000000	-2.000000 1.322000 .344400	-2.500000 1.000000 .235700	-2.500000 1.055000 0.000000	-.597981 .747834 .288382	-2.210000 1.240000 .149000
	2	-2.000000 1.322000 .344400	-2.000000 .800000 .628900	-2.500000 .800000 .381500	-2.500000 1.000000 .235700	-.425912 .463200 .777203	-2.210000 .990000 .411000
	3	-2.000000 .800000 .628900	-2.000000 .400000 .718000	-2.500000 .400000 .515300	-2.500000 .600000 .381500	-.397801 .246251 .883807	-2.250000 .600000 .560000
	4	-2.000000 .400000 .718000	-2.000000 0.000000 .745700	-2.500000 0.000000 .552800	-2.500000 .400000 .515300	-.366809 .075569 .927222	-2.250000 .200000 .632000
	5	-2.000000 0.000000 .745700	-2.000000 -.400000 .718000	-2.500000 -.400000 .515300	-2.500000 0.000000 .552800	-.366809 -.075569 .927222	-2.250000 -.200000 .632000
	6	-2.000000 -.400000 .718000	-2.000000 -.800000 .600000	-2.500000 -.800000 .381500	-2.500000 -.400000 .515300	-.372805 -.278586 .885102	-2.250000 -.600000 .553000

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	X	NX	NPX	D
	Y	NY	NPY	T
	Z	NZ	NPZ	A
000	-2.000000	-.250229	-1.750276	.3462E-02
000	.400000	.193980	.600104	.6750E+00
000	-.718000	-.948555	-.739306	.2108E+00
000	-2.000000	-.269527	-1.738266	.4544E-02
000	.800000	.335023	.954054	.6218E+00
000	-.628900	-.902837	-.644837	.1695E+00
000	-2.000000	-.310024	-1.738932	.6345E-02
000	1.072000	.507279	1.250730	.6350E+00
000	-.517900	-.804085	-.497910	.1772E+00
000	-2.000000	-.372374	-1.733772	.7874E-02
000	1.322000	.725701	1.484752	.6199E+00
000	-.344400	-.578529	-.297994	.1525E+00
000	-2.000000	-.414479	-1.699678	.3180E-02
000	1.465000	.885202	1.611865	.5833E+00
000	-.137800	-.211244	-.096576	.1038E+00

000	-2.500000	-.597981	-2.218024	.1342E-01
000	1.055000	.747834	1.240723	.7391E+00
000	0.000000	.288382	.149617	.1939E+00
000	-2.500000	-.425912	-2.214445	.1034E-01
000	1.000000	.463200	.990269	.7238E+00
000	.235700	.777203	.411287	.2322E+00
000	-2.500000	-.397801	-2.250969	.9877E-02
000	.800000	.246251	.600392	.7233E+00
000	.381500	.883807	.560379	.2263E+00
000	-2.500000	-.366809	-2.250072	.2272E-02
000	.400000	.075569	.200101	.6805E+00
000	.515300	.927222	.632913	.2157E+00
000	-2.500000	-.366809	-2.250072	.2272E-02
000	0.000000	-.075569	-.200101	.6805E+00
000	.552800	.927222	.632913	.2157E+00
000	-2.500000	-.372805	-2.250383	.3496E-02
000	-.400000	-.278586	-.600126	.7233E+00
000	.515300	.885102	.553499	.2260E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

N	M	TEST BODY			TEST BODY			NX NY NZ	NP NP NP
		X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z		
8	7	-2.000000	-2.000000	-2.500000	-2.500000	-.396212	-2.210000		
		-.800000	-1.200000	-1.000000	-.800000	-.458473	-.950000		
		.600000	.400000	.235700	.381500	.795499	.410000		
8	8	-2.000000	-2.000000	-2.500000	-2.500000	-.537231	-2.210000		
		-1.200000	-1.490700	-1.055000	-1.000000	-.740960	-1.200000		
		.400000	0.000000	0.000000	.235700	.402941	.160000		
9	9	-2.000000	-2.000000	-2.500000	-2.500000	-.597981	-2.210000		
		-1.490700	-1.322000	-1.000000	-1.055000	-.747834	-1.240000		
		0.000000	-.344400	-.235700	0.000000	-.288382	-.149000		
10	10	-2.000000	-2.000000	-2.500000	-2.500000	-.425912	-2.210000		
		-1.322000	-.800000	-.800000	-1.000000	-.463200	-.990000		
		-.344400	-.628900	-.381500	-.235700	-.777203	-.410000		
11	11	-2.000000	-2.000000	-2.500000	-2.500000	-.397801	-2.250000		
		-.800000	-.400000	-.400000	-.800000	-.246251	-.600000		
		-.628900	-.718000	-.515300	-.381500	-.883807	-.560000		
12	12	-2.000000	-2.000000	-2.500000	-2.500000	-.366578	-2.250000		
		-.400000	0.000000	0.000000	-.400000	-.075231	-.200000		
		-.718000	-.745400	-.552800	-.515300	-.927341	-.632000		
13	13	-2.000000	-2.000000	-2.500000	-2.500000	-.366578	-2.250000		
		0.000000	.400000	.400000	0.000000	.075231	.200000		
		-.745400	-.718000	-.515300	-.552800	-.927341	-.632000		
14	14	-2.000000	-2.000000	-2.500000	-2.500000	-.397801	-2.250000		
		.400000	.800000	.800000	.400000	.246251	.600000		
		-.718000	-.628900	-.381500	-.515300	-.883807	-.560000		
15	15	-2.000000	-2.000000	-2.500000	-2.500000	-.425912	-2.210000		
		.800000	1.322000	1.000000	.800000	.463200	.990000		
		-.628900	-.344400	-.235700	-.381500	-.777203	-.410000		
16	16	-2.000000	-2.000000	-2.500000	-2.500000	-.597981	-2.210000		
		1.322000	1.490700	1.055000	1.000000	.747834	1.240000		
		-.344400	0.000000	0.000000	-.235700	-.288382	-.149000		
		*****			*****				
9	1	-2.500000	-2.500000	-3.000000	-3.000000	-.868756	-2.620000		
		1.055000	.800000	0.000000	0.000000	.411733	.687000		
		0.000000	.381500	0.000000	0.000000	.275208	.149000		

BODY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-2.500000 -1.000000 .235700	-2.500000 -.800000 .381500	-.396212 -.458473 .795499	-2.218355 -.956945 .416059	.1214E-01 .6502E+00 .1886E+00
-2.500000 -1.055000 0.000000	-2.500000 -1.000000 .235700	-.537231 -.740960 .402941	-2.212088 -1.209729 .166619	.2711E-01 .7391E+00 .2145E+00
-2.500000 -1.000000 -.235700	-2.500000 -1.055000 0.000000	-.597981 -.747834 -.288382	-2.218024 -1.240723 -.149617	.1342E-01 .7391E+00 .1939E+00
-2.500000 -.800000 -.381500	-2.500000 -1.000000 -.235700	-.425912 -.463200 -.777203	-2.214445 -.990269 -.411287	.1034E-01 .7238E+00 .2322E+00
-2.500000 -.400000 -.515300	-2.500000 -.800000 -.381500	-.397801 -.246251 -.883807	-2.250969 -.600392 -.560379	.9877E-02 .7233E+00 .2263E+00
-2.500000 0.000000 -.552800	-2.500000 -.400000 -.515300	-.366578 -.075231 -.927341	-2.250074 -.200104 -.632837	.2342E-02 .6804E+00 .2157E+00
-2.500000 .400000 -.515300	-2.500000 0.000000 -.552800	-.366578 .075231 -.927341	-2.250074 .200104 -.632837	.2342E-02 .6804E+00 .2157E+00
-2.500000 .800000 -.381500	-2.500000 .400000 -.515300	-.397801 .246251 -.883807	-2.250969 .600392 -.560379	.9877E-02 .7233E+00 .2263E+00
-2.500000 1.000000 -.235700	-2.500000 .800000 -.381500	-.425912 .463200 -.777203	-2.214445 .990269 -.411287	.1034E-01 .7238E+00 .2322E+00
-2.500000 1.055000 0.000000	-2.500000 1.000000 -.235700	-.597981 .747834 -.288382	-2.218024 1.240723 -.149617	.1342E-01 .7391E+00 .1939E+00

-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 .275208	-2.626833 .687692 .149145	0. .1167E+01 .2316E+00

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
 BECFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

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N	M	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	NX	NY	NZ	NPX	NPY	NPZ
9	2	-2.500000	.800000	.381500	-2.500000	.400000	.515300	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.776209	.200002	.597912	-2.629	.434	.336
	3	-2.500000	.400000	.515300	-2.500000	0.000000	.552800	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.740175	.062764	.669478	-2.635	.141	.389
	4	-2.500000	0.000000	.552800	-2.500000	-.400000	.515300	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.740175	-.062764	.669478	-2.635	-.141	.389
	5	-2.500000	-.400000	.515300	-2.500000	-.800000	.381500	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.776209	-.200002	.597912	-2.629	-.434	.336
	6	-2.500000	-.800000	.381500	-2.500000	-1.055000	0.000000	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.868756	-.411733	.275208	-2.626	-.687	.149
	7	-2.500000	-1.055000	0.000000	-2.500000	-.800000	-.381500	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.868756	-.411733	-.275208	-2.626	-.687	-.149
	8	-2.500000	-.800000	-.381500	-2.500000	-.400000	-.515300	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.776209	-.200002	-.597912	-2.629	-.434	-.336
	9	-2.500000	-.400000	-.515300	-2.500000	0.000000	-.552800	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.740175	-.062764	-.669478	-2.635	-.141	-.389
	10	-2.500000	0.000000	-.552800	-2.500000	.400000	-.515300	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.740175	.062764	-.669478	-2.635	.141	-.389
	11	-2.500000	.400000	-.515300	-2.500000	.800000	-.381500	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.776209	.200002	-.597912	-2.629	.434	-.336
	12	-2.500000	.800000	-.381500	-2.500000	1.055000	0.000000	-3.000000	0.000000	0.000000	-3.000000	0.000000	0.000000	-.868756	.411733	-.275208	-2.626	.687	-.149

BODY

X Y Z	X Y Z	NX NY NZ	NPX NPY NPZ	D T A
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 .597912	-2.629150 .434170 .336208	.1332E-14 .1018E+01 .1672E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 .669478	-2.635472 .141262 .389779	.2220E-15 .8219E+00 .1494E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 -.062764 .669478	-2.635472 -.141262 .389779	.3053E-15 .8219E+00 .1494E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 -.200002 .597912	-2.629150 -.434170 .336208	.1110E-14 .1018E+01 .1672E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 -.411733 .275208	-2.626833 -.687692 .149145	.8882E-15 .1167E+01 .2316E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 -.411733 -.275208	-2.626833 -.687692 -.149145	0. .1167E+01 .2316E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 -.200002 -.597912	-2.629150 -.434170 -.336208	.1332E-14 .1018E+01 .1672E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 -.062764 -.669478	-2.635472 -.141262 -.389779	.2220E-15 .8219E+00 .1494E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.740175 .062764 -.669478	-2.635472 .141262 -.389779	.3053E-15 .8219E+00 .1494E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.776209 .200002 -.597912	-2.629150 .434170 -.336208	.1110E-14 .1018E+01 .1672E+00
-3.000000 0.000000 0.000000	-3.000000 0.000000 0.000000	-.868756 .411733 -.275208	-2.626833 .687692 -.149145	.8882E-15 .1167E+01 .2316E+00

FOR OUT FRAM. 2

189 BASIC ELEMENTS WERE INPUT
FLOWS HAS SET UP 1 X FLOWS, 0 Y FLOWS, AND 0 Z FLOWS.

NEAR ELEMENTS = 12340

INTERMEDIATE ELEMENTS = 12849

FAR ELEMENTS = 10532

LEAVING VFORM

LEAVING AFORM

THE 189 X 189 MATRIX WITH 1 RIGHT SIDES WAS SOLVED DIRECTLY.

LEAVING ATAPES

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PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
1	1	1.591395	.650542	.186355	.286460	.958086	
		1.389794	.423205	-.683774	-.928109	.276584	
		.094899	.576795	-.154717	-.237613	.074655	
2	2	1.598349	.722874	.242954	.336094	.941794	
		1.254020	.522546	-.520217	-.719651	.251249	
		.282927	.477454	-.439138	-.607572	.223380	
3	3	1.605113	.827395	.333118	.402599	.915363	
		1.019539	.684582	-.389636	-.476922	.202414	
		.445612	.315418	-.649454	-.784950	.348052	
4	4	1.609275	.907577	.410652	.452482	.891771	
		.750320	.823696	-.257457	-.283676	.146221	
		.557494	.176304	-.767312	-.845451	.428210	
5	5	1.620269	.940808	.456097	.484793	.874522	
		.447901	.885119	-.124536	-.132373	.088802	
		.613081	.114881	-.813376	-.864553	.476787	
6	6	1.624811	.975755	.487598	.499713	.865649	
		.147089	.952098	.010372	.010630	.029238	
		.641222	.047902	-.845127	-.866126	.499797	
7	7	1.626941	1.022582	.516020	.504625	.863087	
		-.146316	1.045673	.185219	.181129	-.082222	
		.623224	-.045673	-.863186	-.844124	.493318	
8	8	1.627233	1.027046	.501079	.487683	.872872	
		-.442846	1.054824	.385641	.375486	-.218218	
		.524111	-.054824	-.809336	-.788023	.436436	
9	9	1.618821	1.037872	.505633	.487230	.872872	
		-.751160	1.077179	.454951	.436350	-.218218	
		.366778	-.077179	-.783899	-.755286	.436436	
10	10	1.607148	1.045350	.507243	.485237	.872872	
		-1.085976	1.092756	.504246	.482370	-.218218	
		.242716	-.092756	-.762363	-.724290	.436436	
11	11	1.589795	.843584	.275098	.326094	.945063	
		-1.365206	.711633	.631390	.748462	-.272824	
		.034464	.288367	-.487141	-.577466	.180064	
12	12	1.591395	.659238	.182435	.276812	.958086	
		-1.389794	.434594	.633458	.960095	-.276584	
		-.094899	.565406	-.004927	-.007473	-.074655	

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TEST BODY

X-FLOW

VT TTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
50542	.186355	.286460	.958086	.000000
23205	-.603774	-.928109	.276584	-.139050
76795	-.154717	-.237613	.074655	
22874	.242954	.336094	.941794	.000000
22546	-.520217	-.719651	.251249	-.137437
77454	-.439138	-.607572	.223380	
27395	.333118	.402599	.915363	.000000
84582	-.389636	-.470922	.202414	-.133778
15418	-.649434	-.784950	.348052	
07577	.410662	.452482	.891771	.000000
23696	-.257457	-.283676	.146221	-.130613
76304	-.767312	-.845451	.428210	
40808	.456097	.484793	.874522	.000000
85119	-.124535	-.132373	.068902	-.123792
14881	-.813370	-.864553	.476787	
75755	.487598	.499713	.865649	.000000
52098	.010372	.610630	.029238	-.127684
47902	-.845127	-.866126	.499797	
22582	.516020	.504625	.863087	.000000
45673	.185219	.181129	-.082222	-.127758
45673	-.863186	-.844124	.493318	
27046	.501079	.487683	.872072	.000000
54824	.385641	.375486	-.218218	-.134528
54824	-.809336	-.788023	.436436	
37872	.505633	.487230	.872872	.000000
77179	.454951	.436350	-.218218	-.136366
77179	-.783830	-.755286	.436436	
55350	.507243	.485237	.872872	.000000
92756	.504246	.482370	-.218218	-.128897
92756	-.762363	-.729290	.436436	
3584	.275088	.326094	.945063	.000000
11633	.631390	.748462	-.272824	-.146478
8367	-.487141	-.577466	.180064	
59238	.182435	.276812	.958086	.000000
4594	.633450	.960895	-.276584	-.143742
5406	-.004927	-.007473	-.074655	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
1	13	1.598349	.686910	.228408	.332515	.941794	
		-1.254020	.471645	.545533	.794140	-.251249	
		-.282927	.528155	.349431	.508700	-.223380	
	14	1.605113	.794765	.319054	.401444	.915363	
		-1.019539	.631651	.417354	.525129	-.202414	
		-.445612	.368349	.596392	.750386	-.348052	
	15	1.609275	.883063	.399134	.452056	.891771	
		-.750320	.779800	.290717	.329203	-.146221	
		-.557494	.220200	.732075	.829018	-.428210	
	16	1.620269	.918614	.445350	.484818	.874522	
		-.447901	.843852	.170819	.185953	-.088802	
		-.613081	.156148	.785065	.854619	-.476787	
	17	1.624811	.938859	.469935	.500602	.865649	
		-.147089	.881457	.060633	.064581	-.029238	
		-.641222	.118543	.810495	.863265	-.499797	
39	18	1.624811	.941987	.471601	.500645	.865649	
		.147089	.887340	-.022714	-.045345	.029238	
		-.641222	.112660	.814314	.864464	-.499797	
	19	1.620269	.928862	.450482	.484982	.874522	
		.447901	.862784	-.152091	-.163739	.088802	
		-.613081	.137216	.797947	.859059	-.476787	
	20	1.609275	.902372	.408274	.452446	.891771	
		.750320	.814275	-.271614	-.301000	.146221	
		-.557494	.185725	.757505	.839459	-.428210	
	21	1.605113	.824376	.331816	.402505	.915363	
		1.019539	.679596	-.397026	-.481607	.202414	
		-.445612	.320404	.641767	.776488	-.348052	
	22	1.598349	.721173	.242312	.335997	.941794	
		1.254020	.520090	-.523530	-.726026	.251249	
		-.282927	.479910	.432699	.599994	-.223380	
	23	1.591395	.649987	.186167	.286416	.958086	
		1.389794	.422484	-.604720	-.930356	.276584	
		-.094899	.577516	.148733	.228917	-.074655	
2	1	1.220560	1.298463	1.168799	.900141	.435365	
		1.831729	1.686005	-.543418	-.418509	.855263	
		.149900	-.686005	-.156877	-.120818	.281038	

DCX DCY DLZ	NX NY NZ	VN SIG
.332515	.941794	.000000
.794140	-.251249	-.141206
.508700	-.223380	
.401444	.915363	.000000
.525129	-.202414	-.136358
.750388	-.348052	
.452056	.891771	.000000
.329203	-.146221	-.132383
.829018	-.428210	
.484818	.874522	.000000
.185953	-.088802	-.129915
.854619	-.476787	
.500602	.865649	.000000
.064581	-.029238	-.128441
.863265	-.499797	
.500645	.865649	.000000
-.045345	.029238	-.128168
.864464	-.499797	
.484982	.874522	.000000
-.163739	.088802	-.129054
.859059	-.476787	
.452446	.891771	.000000
-.301000	.146221	-.130873
.839459	-.428210	
.402505	.915363	.000000
-.481607	.202414	-.133979
.778488	-.348052	
.335997	.941794	.000000
-.726026	.251249	-.137551
.599994	-.223380	
.286416	.958086	.000000
-.930356	.276584	-.139085
.228917	-.074655	
.900141	.435365	.000000
-.418509	.855263	-.041547
-.120818	.281038	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ
2	2	1.241719 1.652830 .414680	1.342441 1.802147 -.802147	1.235652 -.395679 -.344554	.920459 -.294746 -.256670	.390089 .652170 .650004
	3	1.241630 1.351646 .631851	1.394162 1.943687 -.943687	1.318375 -.240723 -.384222	.945640 -.172665 -.275593	.324553 .447006 .833577
	4	1.242993 .985715 .786135	1.422806 2.024378 -1.024378	1.362458 -.135694 -.386876	.957585 -.095371 -.271910	.288009 .287154 .913561
	5	1.250180 .600088 .876683	1.439029 2.070805 -1.070805	1.385168 -.055319 -.386075	.962571 -.038442 -.268289	.270929 .163401 .948629
	6	1.250017 .200026 .922094	1.440042 2.073722 -1.073722	1.388034 .055597 -.379465	.963884 .038608 -.263509	.261384 .052527 .963805
	7	1.246098 -.199566 .867167	1.454052 2.114266 -1.114266	1.441656 .103242 -.158854	.991475 .071003 -.109249	.126140 -.312996 .941341
	8	1.250000 -.600000 .700000	1.464273 2.144096 -1.144096	1.463954 .027353 .013631	.999782 .018687 .009344	0.000000 -.447214 .894427
	9	1.250000 -1.000000 .500000	1.459110 2.129001 -1.129001	1.458560 .035829 .017915	.999623 .024556 .012278	0.000000 -.447214 .894427
	10	1.250000 -1.400000 .300000	1.413037 1.996674 -.996674	1.412346 .039537 .019758	.999511 .027980 .013990	0.000000 -.447214 .894427
	11	1.216789 -1.739216 .102018	1.329756 1.768252 -.768252	1.312795 .118463 -.175463	.987245 .089086 -.131951	.159008 -.593315 .789109
	12	1.220560 -1.831729 -.149900	1.246825 1.539647 -.539647	1.106576 .561339 .005949	.891807 .452391 .004795	.435365 -.855263 -.201038
	13	1.241719 -1.652830 -.414680	1.307517 1.709599 -.709599	1.201637 .417526 .302225	.919023 .319327 .231144	.390089 -.652170 -.650004

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X-FLOW

VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
1.235652	.920459	.390089	.000000
-.395679	-.294746	.652170	-.031945
-.344534	-.256670	.650004	
1.318375	.945640	.324553	.000000
-.240723	-.172665	.447006	-.019186
-.384222	-.275593	.833577	
1.362458	.957585	.288009	.000000
-.135694	-.095371	.287154	-.011885
-.386876	-.271910	.913561	
1.385168	.962571	.270929	.000000
-.055319	-.038442	.163401	-.008418
-.386075	-.268289	.948629	
1.368034	.963684	.261384	.000000
.055597	.038608	.052527	-.007881
-.379465	-.263509	.963805	
1.441656	.991475	.126140	.000000
.103242	.071603	-.312996	.022592
-.158854	-.109249	.941341	
1.463954	.999782	0.000000	.000000
.027353	.018687	-.447214	.051235
.013631	.009344	.894427	
1.458563	.999623	0.000000	.000000
.035829	.024556	-.447214	.049986
.017915	.012278	.894427	
1.412346	.999511	0.000000	.000000
.039537	.027980	-.447214	.047884
.019753	.013990	.894427	
1.312795	.987245	.159008	.000000
.118453	.089086	-.593315	.011237
-.175453	-.131951	.789109	
1.106576	.891807	.435365	.000000
.561339	.452391	-.855263	-.052420
.005949	.004795	-.201038	
1.201637	.919023	.390089	.000000
.417526	.319327	-.652170	-.039199
.302225	.231144	-.650004	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
2	14	1.241630	1.375733	1.300194	.945091	.324553	
		-1.351646	1.892642	.259936	.188943	-.447006	
		-.631851	-.892642	.366843	.266651	-.833577	
15	15	1.242990	1.414596	1.354205	.957309	.288009	
		-.985715	2.001080	.156928	.110935	-.287154	
		-.786135	-1.001080	.377600	.266931	-.915561	
16	16	1.250180	1.439188	1.385197	.962478	.270929	
		-.600088	2.071262	.088699	.061631	-.163401	
		-.876683	-1.071262	.380331	.264268	-.948629	
17	17	1.250017	1.449715	1.399292	.965212	.261384	
		-.200026	2.101673	.030686	.021167	-.052527	
		-.922094	-1.101673	.377813	.260612	-.963805	
18	18	1.250017	1.451738	1.401268	.965235	.261384	
		.200026	2.107544	-.022042	-.015183	.052527	
		-.922094	-1.107544	.378823	.260944	-.963805	
19	19	1.250180	1.445716	1.391599	.962560	.270929	
		.600088	2.090095	-.079317	-.054863	.163401	
		-.876683	-1.090095	.383776	.265457	-.948629	
20	20	1.242990	1.426664	1.366014	.957488	.288009	
		.985715	2.035371	-.146440	-.102645	.287154	
		-.786135	-1.035371	.384619	.269593	-.913561	
21	21	1.241630	1.396261	1.320233	.945549	.324553	
		1.351646	1.949544	-.245998	-.176183	.447006	
		-.631851	-.949544	.382116	.273671	-.833577	
22	22	1.241719	1.343418	1.236477	.920396	.390089	
		1.652830	1.804772	-.398298	-.296481	.652170	
		-.414680	-.804772	.342426	.254891	-.650004	
23	23	1.220560	1.298765	1.169035	.900112	.435365	
		1.831729	1.686792	-.544295	-.419079	.855263	
		-.149900	-.686792	.154633	.119039	-.281038	
3	1	.500000	1.212633	1.212570	.999948	0.000000	
		1.935000	1.470479	-.004275	-.003526	.938893	
		.177300	-.470479	.011662	.009617	.344208	
2	2	.500000	1.221483	1.221289	.999841	0.000000	
		1.735000	1.492020	-.016098	-.013179	.672591	
		.477300	-.492020	.014632	.011979	.740014	

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DCX DCY DCZ	NX NY NZ	VN SIG
.945091	.324553	.000000
.186943	-.447006	-.024030
.266651	-.833577	
.957309	.288009	.000000
.110935	-.287154	-.014970
.266931	-.913561	
.962478	.270929	.000000
.061631	-.163401	-.010137
.264268	-.948629	
.965212	.261384	.000000
.021167	-.052527	-.007697
.260612	-.963805	
.965235	.261384	.000000
-.015183	.052527	-.007196
.260944	-.963805	
.962560	.270929	.000000
-.054863	.163401	-.008545
.265457	-.948629	
.957488	.288009	.000000
-.102645	.287154	-.012085
.269593	-.913561	
.945549	.324553	.000000
-.176183	.447006	-.019350
.273671	-.833577	
.920396	.390089	.000000
-.296481	.652170	-.032050
.254891	-.650004	
.900112	.435365	.000000
-.419079	.855263	-.041587
.119039	-.281038	
.999948	0.000000	.000000
-.003526	.938893	.009526
.009617	.344208	
.999841	0.000000	.000000
-.013179	.672591	.009772
.011979	.740014	

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
3	3	.500000	1.232356	1.232207	.999879	0.000000	
		1.400000	1.518701	-.017153	-.013919	.447214	
		.700000	-.518701	.008577	.006960	.894427	
4	4	.500000	1.237037	1.236932	.999955	0.000000	
		1.000000	1.530261	-.011243	-.009088	.279631	
		.858250	-.530261	.003274	.002647	.960107	
5	5	.500000	1.234013	1.234011	.999998	0.000000	
		.600000	1.522789	-.002482	-.002011	.156305	
		.948150	-.522789	.000333	.000318	.987709	
6	6	.500000	1.220064	1.220020	.999964	0.000000	
		.200000	1.488557	.010370	.008500	.050436	
		.989900	-.488557	-.000524	-.000429	.998727	
7	7	.500000	1.206541	1.206516	.999979	0.000000	
		-.200000	1.455742	-.007029	-.005826	-.447214	
		.900000	-.455742	-.003515	-.002913	.894427	
8	8	.500000	1.196347	1.196331	.999986	0.000000	
		-.600000	1.431247	.005573	.004659	-.447214	
		.700000	-.431247	.002787	.002329	.894427	
9	9	.500000	1.185439	1.185352	.999927	0.000000	
		-1.000000	1.405265	.012836	.010828	-.447214	
		.500000	-.405265	.006418	.005414	.894427	
10	10	.500000	1.175488	1.175237	.999829	0.000000	
		-1.400000	1.381772	.019439	.016537	-.447214	
		.300000	-.381772	.009719	.006268	.894427	
11	11	.500000	1.164000	1.163439	.999519	0.000000	
		-1.800000	1.354895	.032312	.027751	-.447214	
		.100000	-.354895	.016151	.013876	.894427	
12	12	.500000	1.164003	1.167855	.999873	0.000000	
		-1.935000	1.364231	.006398	.005477	-.938893	
		-.177300	-.364231	-.017450	-.014940	-.344208	
13	13	.500000	1.195403	1.195120	.999763	0.000000	
		-1.735000	1.428989	.019253	.016106	-.672591	
		-.477300	-.428989	-.017499	-.014638	-.740014	
14	14	.500000	1.218760	1.218532	.999813	0.000000	
		-1.400000	1.485377	.021080	.017296	-.447214	
		-.700000	-.485377	-.010540	-.008648	-.894427	

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X-FLOW

VX	DCX	NX	VN
VY	DCY	NY	SIG
VZ	DCZ	NZ	
1.232207	.999879	0.000000	.000000
-.017153	-.013919	.447214	.010857
.008577	.006960	.894427	
1.236932	.999955	0.000000	.000000
-.011243	-.009088	.279631	.011576
.003274	.002647	.960107	
1.234011	.999998	0.000000	.000000
-.002482	-.002011	.156305	.011805
.000393	.000318	.987709	
1.220020	.999964	0.000000	.000000
.010370	.008500	.050436	.010980
-.000524	-.000429	.998727	
1.206516	.999979	0.000000	.000000
-.007029	-.005826	-.447214	.011147
-.003515	-.002913	.894427	
1.196331	.999986	0.000000	.000000
.005573	.004659	-.447214	.011654
.002787	.002329	.894427	
1.185352	.999927	0.000000	.000000
.012836	.010828	-.447214	.010632
.006418	.005414	.894427	
1.175297	.999829	0.000000	.000000
.019439	.016537	-.447214	.008609
.009719	.006268	.894427	
1.163439	.999519	0.000000	.000000
.032332	.027751	-.447214	.004981
.016151	.013876	.894427	
1.167855	.999873	0.000000	.000000
.006398	.005477	-.938893	.006411
-.017450	-.014940	-.344208	
1.195120	.999763	0.000000	.000000
.019253	.016106	-.672591	.007340
-.017499	-.014638	-.743014	
.218532	.999813	0.000000	.000000
.021080	.017296	-.447214	.008900
.010540	-.008648	-.894427	

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
3	15	.500000	1.234579	1.234452	.999905	0.000000	
		-1.000000	1.524186	.016316	.013216	-.279631	
		-.858250	-.524186	-.004752	-.003849	-.960107	
	16	.500000	1.244132	1.244037	.999964	0.000000	
		-.600000	1.547863	.010366	.008332	-.156305	
		-.948150	-.547863	-.001640	-.001319	-.987709	
	17	.500000	1.249397	1.249390	.999994	0.000000	
		-.200000	1.560993	.004210	.003369	-.050436	
		-.989900	-.560993	-.000213	-.000170	-.998727	
	18	.500000	1.251259	1.251258	.999999	0.000000	
		.200000	1.565650	-.001969	-.001573	.050436	
		-.989900	-.565650	-.000039	-.000079	-.998727	
	19	.500000	1.249969	1.249942	.999979	0.000000	
		.600000	1.562422	-.008053	-.006451	.156305	
		-.948150	-.562422	-.001276	-.001021	-.987709	
43	20	.500000	1.245269	1.245195	.999933	0.000000	
		1.000000	1.550694	-.013864	-.011133	.279631	
		-.858250	-.550694	-.004038	-.003242	-.960107	
	21	.500000	1.236471	1.236305	.999866	0.000000	
		1.400000	1.528862	-.018128	-.014661	.447214	
		-.700000	-.528862	-.009064	-.007331	-.894427	
	22	.500000	1.223413	1.223215	.999838	0.000000	
		1.735000	1.496738	-.016278	-.013306	.672591	
		-.477300	-.496738	-.014795	-.012093	-.740014	
	23	.500000	1.213215	1.213153	.999949	0.000000	
		1.935000	1.471890	-.004220	-.003478	.938893	
		-.177300	-.471890	-.011510	-.009487	-.344208	
4	1	-.248068	1.156990	1.155568	.998771	-.049532	
		1.923092	1.338626	.053200	.045981	.939127	
		.174052	-.338626	.021401	.018497	.339980	
	2	-.249477	1.161134	1.160040	.999058	-.043145	
		1.726269	1.348232	.029883	.025736	.675151	
		.470680	-.348232	.040558	.034938	.736411	
	3	-.249169	1.165449	1.164708	.999364	-.034875	
		1.395016	1.358272	.010548	.005051	.449471	
		.692774	-.358272	.040195	.034489	.892614	

DDY

X-FLOW

VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
1.234452 .016316 -.004752	.999905 .013216 -.003849	0.000000 -.279631 -.960107	.000000 .010302
1.244037 .010356 -.001640	.999964 .008332 -.001319	0.000000 -.156305 -.987709	.000000 .011310
1.249390 .004210 -.000213	.999994 .003369 -.000170	0.000000 -.050436 -.998727	.000000 .011924
1.251258 -.001969 -.000099	.999999 -.001573 -.000079	0.000000 .050436 -.998727	.000000 .012193
1.249942 -.008053 -.001276	.999979 -.006451 -.001021	0.000000 .156305 -.987709	.000000 .012128
1.245195 -.013854 -.004038	.999933 -.011133 -.003242	0.000000 .279631 -.960107	.000000 .011700
1.236305 -.018128 -.009064	.999866 -.014661 -.007331	0.000000 .447214 -.894427	.000000 .010921
1.223215 -.016278 -.014795	.999838 -.013306 -.012093	0.000000 .672591 -.740014	.000000 .009813
1.213153 -.004220 -.011510	.999949 -.003478 -.009487	0.000000 .938893 -.344208	.000000 .009545
1.155568 .053200 .021401	.998771 .045981 .018497	-.049532 .939127 .339980	.000000 .004922
1.160040 .029883 .040558	.999058 .025736 .034938	-.043145 .675151 .736411	.000000 .004422
1.164708 .010548 .040195	.999364 .005051 .034489	-.034875 .449471 .892614	.000000 .004010

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	V1 VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
4	4	-.249537	1.166421	1.165810	.999476	-.031043	
		.998756	1.360539	-.000124	-.000106	.281449	
		.850538	-.360539	.037770	.032381	.959074	
5	5	-.250016	1.163090	1.162505	.999497	-.029218	
		.600001	1.352777	-.008797	-.007555	.157442	
		.940749	-.352777	.035812	.030790	.987096	
6	6	-.250002	1.152040	1.151345	.999397	-.028252	
		.200000	1.327196	-.021558	-.016722	.050769	
		.982825	-.327196	.033693	.029235	.998310	
7	7	-.249496	1.135124	1.134830	.999714	-.012608	
		-.199997	1.288507	-.026978	-.023767	-.434526	
		.896509	-.288517	.002870	.002529	.900571	
8	8	-.250000	1.119936	1.119873	.999944	0.000000	
		-.600000	1.254256	-.010588	-.009454	-.447214	
		.700000	-.254256	-.005294	-.004727	.894427	
44	9	-.250000	1.111342	1.111342	.999999	0.000000	
		-1.000000	1.235082	.001286	.001157	-.447214	
		.500000	-.235082	.000643	.000578	.894427	
10	10	-.250000	1.108832	1.108740	.999917	0.000000	
		-1.400000	1.229508	.012740	.011489	-.447214	
		.300000	-.229508	.006370	.005745	.894427	
11	11	-.247831	1.115217	1.114799	.999625	-.012880	
		-1.793015	1.243710	.017342	.015550	-.460010	
		.100024	-.243710	.025159	.022559	.887820	
12	12	-.248068	1.128924	1.126893	.998201	-.049532	
		-1.923092	1.274468	-.065545	-.058060	-.939127	
		-.174052	-.274468	.016879	.014951	-.339980	
13	13	-.249477	1.147986	1.146858	.999018	-.043145	
		-1.726269	1.317872	-.042024	-.036607	-.675158	
		-.470688	-.317872	-.028665	-.024969	-.736411	
14	14	-.249169	1.160735	1.160026	.999389	-.034875	
		-1.395016	1.347306	-.020453	-.017620	-.449471	
		-.692774	-.347306	-.035024	-.030174	-.892614	
15	15	-.249537	1.169028	1.168465	.999518	-.031043	
		-.998756	1.366627	-.009974	-.008532	-.281449	
		-.850538	-.366627	-.034893	-.029848	-.959074	

W

DCX DCY DCZ	NX NY NZ	VN SIG
.999476	-.031043	.000000
-.000106	.281449	.004083
.032381	.959074	
.999497	-.029218	.000000
-.007555	.157442	.004254
.030790	.987096	
.999397	-.028252	.000000
-.018722	.050769	.004249
.029235	.998310	
.999714	-.012608	.000000
-.023767	-.434526	.000604
.002529	.900571	
.999944	0.000000	.000000
-.009454	-.447214	-.001173
-.004727	.894427	
.999999	0.000000	.000000
.001157	-.447214	-.001694
.000578	.894427	
.999917	0.000000	.000000
.011489	-.447214	-.002980
.005745	.894427	
.999625	-.012880	.000000
.015550	-.460010	-.003264
.022559	.887820	
.998201	-.049532	.000000
-.058060	-.939127	.007805
.014951	-.339980	
.999018	-.043145	.000000
-.036607	-.675158	.006628
-.024969	-.736411	
.999389	-.034875	.000000
-.017620	-.449471	.005602
-.030174	-.892614	
.999518	-.031043	.000000
-.008532	-.281449	.005201
-.029848	-.959074	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VI VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
45	16	-.250016	1.174210	1.173709	.999573	-.029218	
		-.600001	1.378769	-.005058	-.004308	-.157442	
		-.940749	-.378769	-.033935	-.028900	-.987096	
	17	-.250002	1.177071	1.176601	.999601	-.028252	
		-.200003	1.385497	-.002132	-.001854	-.050789	
		-.982825	-.385497	-.033157	-.028194	-.998310	
	18	-.250002	1.177939	1.177467	.999600	-.028252	
		.200003	1.387539	-.000154	-.000131	.050789	
		-.982825	-.387539	-.033330	-.028295	-.998310	
	19	-.250016	1.176983	1.176476	.999569	-.029218	
		.600001	1.385288	.002234	.001940	.157442	
		-.940749	-.385288	-.034459	-.029278	-.987096	
20	-.249537	1.174127	1.173553	.999511	-.031043		
	.998756	1.378574	.006152	.005248	.281449		
	-.850538	-.378574	-.036176	-.030811	-.959074		
21	-.249169	1.169520	1.168800	.999384	-.034675		
	1.395016	1.367777	.014296	.012223	.449471		
	-.692774	-.367777	-.038458	-.032892	-.892614		
22	-.249477	1.163098	1.162013	.999067	-.043145		
	1.726269	1.352797	.032273	.027748	.675158		
	-.470688	-.352797	-.038492	-.033094	-.736411		
23	-.248068	1.157588	1.156167	.998772	-.049532		
	1.923092	1.340010	.054224	.046642	.939127		
	-.174052	-.340010	-.010660	-.016120	-.333980		
5	1	-.743334	1.160425	1.146655	.988142	-.153543	
		1.874150	1.346587	.168493	.145199	.934141	
		.161626	-.346587	.057936	.049927	.322188	
	2	-.747389	1.166631	1.156305	.991149	-.132740	
1.690281		1.361028	.104989	.089994	.683173		
.444215		-.361028	.113850	.097597	.710091		
3	-.747752	1.171864	1.164831	.994042	-.108809		
	1.373892	1.373264	.051909	.044296	.457325		
	.663304	-.373264	.116710	.099593	.882618		
4	-.747958	1.173024	1.167569	.995350	-.095703		
	.992572	1.375986	.020130	.017212	.288525		
	.819383	-.375986	.111176	.094777	.952677		

DCX DCY DCZ	NX NY NZ	VN SIG
.999573	-.029218	.000000
-.004308	-.157442	.005076
-.028900	-.987096	
.999601	-.028252	.000000
-.001854	-.050789	.004937
-.028194	-.998310	
.999600	-.028252	.000000
-.000131	.050789	.004786
-.028295	-.998310	
.999569	-.029218	.000000
.001940	.157442	.004603
-.029278	-.987096	
.999511	-.031043	.000000
.005248	.281449	.004347
-.030811	-.959074	
.999384	-.034875	.000000
.012223	.449471	.004212
-.032892	-.892614	
.999067	-.043145	.000000
.027748	.675158	.004566
-.033094	-.736411	
.998772	-.049532	.000000
.046842	.939127	.004987
-.016120	-.333980	
.988142	-.153543	-.000000
.145199	.934141	.015792
.049927	.322188	
.991149	-.132740	-.000000
.089994	.683173	.013415
.097597	.710091	
.994042	-.108809	-.000000
.044296	.457325	.010893
.099593	.882618	
.995350	-.095703	-.000000
.017212	.288525	.009621
.094777	.952677	

BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ
5	5	-.750055 .630009 .910468	1.170769 1.370699 -.370699	1.165817 -.904751 .107457	.995771 -.004067 .091784	-.089915 .162020 .982682
	6	-.750005 .200003 .953924	1.161565 1.349234 -.349234	1.156220 -.041893 .103132	.995398 -.036057 .088787	-.086851 .052106 .994858
	7	-.748551 -.199961 .882279	1.145511 1.312195 -.312195	1.143638 -.060743 .024440	.998365 -.053027 .021335	-.039925 -.379842 .924189
	8	-.750000 -.600000 .700000	1.124601 1.264728 -.264728	1.124251 -.025032 -.012546	.999689 -.022312 -.011156	0.000000 -.447214 .894427
	9	-.750000 -1.000000 .500000	1.114870 1.242934 -.242934	1.114851 -.004028 -.002014	.999992 -.003613 -.001807	0.000000 -.447214 .894427
	10	-.750000 -1.400000 .300000	1.115443 1.244214 -.244214	1.115255 .018316 .009158	.999831 .016420 .008210	0.000000 -.447214 .894427
	11	-.741375 -1.764760 .100234	1.132611 1.282807 -.282807	1.130300 .017624 .070123	.997960 .015560 .061913	-.044855 -.519160 .853499
	12	-.743334 -1.874150 -.161626	1.132236 1.281958 -.281958	1.115714 -.191336 .023044	.985408 -.168990 .020353	-.153543 -.934141 -.322188
	13	-.747389 -1.690281 -.444215	1.151358 1.325626 -.325626	1.140795 -.126978 -.090072	.990816 -.110286 -.078231	-.132740 -.683173 -.718091
	14	-.747752 -1.373892 -.663304	1.165286 1.357891 -.357891	1.158299 -.069581 -.1067+1	.994004 -.059712 -.091601	-.108869 -.457325 -.882618
	15	-.747958 -.992572 -.819383	1.173015 1.375964 -.375964	1.167615 -.038301 -.105695	.995397 -.032652 -.090106	-.095703 -.288525 -.952677
	16	-.750055 -.600009 -.910468	1.177768 1.387138 -.387138	1.172992 -.020972 -.103871	.995944 -.017807 -.086193	-.089915 -.162020 -.982682

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OCX OCY OCZ	NX NY NZ	VN SIG
95771	-.089915	.000000
84067	.162020	.009344
91784	.982682	
95398	-.086851	-.000000
36057	.052106	.009411
88787	.994858	
98365	-.039925	.000000
53027	-.379842	-.000416
21335	.924189	
99689	0.000000	.000000
22312	-.447214	-.007092
11156	.894427	
99992	0.000000	.000000
03613	-.447214	-.007455
01807	.894427	
99831	0.000000	.000000
16420	-.447214	-.009000
08210	.894427	
97960	-.044855	.000000
15560	-.519160	-.005237
61913	.853499	
05408	-.153543	-.000000
68990	-.934141	.022041
20353	-.322188	
90816	-.132740	-.000000
10286	-.683173	.018214
76231	-.718091	
94004	-.108809	-.000000
59712	-.457325	.014426
91601	-.882618	
95397	-.095703	-.000000
32652	-.288525	.012115
90106	-.952677	
95944	-.089915	.000000
17807	-.162020	.011020
88193	-.982682	

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
47	5	17	-0.750005	1.180390	1.175928	.996219	-0.086851
			-0.200003	1.393322	-0.097814	-0.006620	-0.052106
			-0.953924	-0.393322	-0.102249	-0.086623	-0.994858
	18		-0.750005	1.181278	1.176812	.996220	-0.086851
			.200003	1.395417	.003321	.002812	.052106
			-0.953924	-0.395417	-0.102552	-0.086823	-0.994858
	19		-0.750055	1.180608	1.175825	.995949	-0.089915
			.600009	1.393835	.015777	.013304	.162020
			-0.916468	-0.393835	-0.104998	-0.088936	-0.982682
	20		-0.747958	1.178349	1.172939	.995409	-0.095703
			.992572	1.388506	.031346	.026601	.288525
			-0.819383	-0.388506	-0.108337	-0.091940	-0.952677
21		-0.747752	1.174632	1.167657	.994063	-0.108809	
		1.373892	1.379760	.058416	.049732	.457325	
		-0.663304	-0.379760	-0.113680	-0.096779	-0.882618	
22		-0.747389	1.167891	1.157552	.991148	-0.132740	
		1.690281	1.363969	.108970	.093305	.683173	
		-0.444215	-0.363969	-0.110314	-0.094447	-0.718091	
23		-0.743334	1.160774	1.146999	.988133	-0.153543	
		1.874150	1.347396	.170110	.146548	.934141	
		-0.161626	-0.347396	-0.053408	-0.046011	-0.322188	
6	1		-1.229655	1.132362	1.090828	.963321	-0.268347
			1.773614	1.282243	.291169	.257134	.921489
			.134912	-0.282243	.086937	.076775	.280799
	2		-1.245329	1.144713	1.111521	.971003	-0.239765
			1.614691	1.310369	.197828	.172819	.702123
			.336555	-0.310369	.189089	.165185	.670724
	3		-1.245068	1.158983	1.136725	.980795	-0.194936
			1.329324	1.343242	.102894	.088779	.475316
			.600627	-0.343242	.201273	.173663	.857948
	4		-1.245783	1.165866	1.148618	.985205	-0.170981
			.979004	1.359244	.048514	.041612	.304683
			.753512	-0.359244	.193825	.166250	.936981
	5		-1.250120	1.169561	1.154226	.986888	-0.159881
			.600034	1.367873	.006877	.005880	.172638
			.846449	-0.367873	.188649	.161299	.971923

DCX DCY DCZ	NX NY NZ	VN SIG
.996219	-.086851	.000000
-.006620	-.052106	.510240
-.086623	-.994858	
.996220	-.086851	.000000
.002812	.052106	.009850
-.086823	-.994858	
.995949	-.089915	.000000
.013304	.162020	.009820
-.088936	-.982682	
.995409	-.095703	-.000000
.026601	.288525	.00025
-.091940	-.952677	
.994063	-.108809	-.000000
.049732	.457325	.011212
-.096779	-.882618	
.991148	-.132740	-.000000
.093305	.683173	.013668
-.094447	-.718091	
.988133	-.153543	-.000000
.146548	.934141	.015888
-.046011	-.322188	
.963321	-.268347	-.000000
.257134	.921489	.027232
.076775	.280799	
.971003	-.239065	-.000000
.172819	.702123	.024419
.165185	.670724	
.980795	-.194936	-.000000
.088779	.475316	.019161
.173663	.857948	
.985205	-.170981	-.000000
.041612	.304683	.016512
.166250	.936981	
.986888	-.159881	-.000000
.005880	.172638	.015703
.161299	.971923	

FOR OUT FRAM 2

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
6	6	-1.250012	1.170850	1.155253	.986679	-.153515	
		.200010	1.370889	-.053638	-.045811	.055250	
		.893198	-.370889	.182761	.156093	.986601	
7	7	-1.248100	1.174562	1.168791	.995078	-.074106	
		-.199835	1.379597	-.096906	-.082504	-.251846	
		.852389	-.379597	.064470	.054888	.964926	
8	8	-1.250000	1.154940	1.154001	.999187	0.000000	
		-.600000	1.333886	-.041635	-.036050	-.447214	
		.700000	-.333886	-.020818	-.018025	.894427	
9	9	-1.250000	1.138016	1.137954	.999954	0.000000	
		-1.000000	1.295081	-.009750	-.008568	-.447214	
		.500000	-.295081	-.004875	-.004284	.894427	
10	10	-1.250000	1.143892	1.143401	.999571	0.000000	
		-1.400000	1.308488	.029956	.026188	-.447214	
		.300000	-.308488	.014978	.013094	.894427	
11	11	-1.225923	1.161360	1.150415	.990576	-.105654	
		-1.707445	1.348756	-.011041	-.009507	-.687853	
		.100626	-.348756	.158631	.136634	.718119	
12	12	-1.229655	1.118520	1.069951	.956586	-.268347	
		-1.773614	1.251088	-.323600	-.289310	-.921489	
		-.134912	-.251088	.039432	.035254	-.280799	
13	13	-1.245329	1.130909	1.097016	.970030	-.239065	
		-1.614691	1.278956	-.230259	-.203614	-.702123	
		-.386555	-.278956	-.149950	-.132601	-.670724	
14	14	-1.245068	1.151328	1.129039	.980641	-.194936	
		-1.329324	1.325556	-.127799	-.110993	-.475316	
		-.600627	-.325556	-.185734	-.161321	-.857948	
15	15	-1.245783	1.162543	1.145354	.985223	-.170981	
		-.979004	1.351506	-.072753	-.062581	-.314683	
		-.753512	-.351506	-.185350	-.159435	-.936981	
16	16	-1.250120	1.169385	1.154316	.987114	-.159881	
		-.600034	1.367462	-.040457	-.034597	-.172638	
		-.846449	-.367462	-.182699	-.156235	-.971923	
17	17	-1.250012	1.172927	1.159016	.988140	-.153515	
		-.200010	1.375757	-.014301	-.012192	-.055250	
		-.893198	-.375757	-.179542	-.153072	-.986601	

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	NX NY NZ	VN SIG
6679	-.153515	-.000000
5811	.055250	.015444
6093	.986601	
5078	-.074106	.000000
2504	-.251846	.000059
4888	.964926	
9187	0.000000	.000000
6050	-.447214	-.013633
8025	.894427	
9954	0.000000	.000000
8568	-.447214	-.013916
4284	.894427	
9571	0.000000	.000000
6188	-.447214	-.016569
3094	.894427	
0576	-.105654	.000000
9507	-.687853	-.002403
6634	.718119	
6586	-.268347	-.000000
9310	-.921489	.036006
5254	-.280799	
0030	-.239065	-.000000
3614	-.702123	.031398
2601	-.670724	
0641	-.194936	-.000000
0993	-.475316	.024287
1321	-.857948	
5223	-.170981	-.000000
2581	-.304683	.020145
9435	-.936981	
7114	-.159881	-.000000
4597	-.172638	.018139
6235	-.971923	
0140	-.153515	-.000000
2192	-.055250	.016626
0072	-.986601	

PROGRAM BOXC

ATMOSPHERIC SCIENCE ASSOCIATES
BEDFORD, MASSACHUSETTS

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW		
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	
6	18	-1.250012	1.173694	1.159779	.986144	-.153515	
		.200010	1.377557	.007690	.006552	.055250	
		-.893198	-.377557	-.180031	-.153388	-.986601	
	19	-1.250120	1.171902	1.156827	.987136	-.159881	
		.600034	1.373354	.032555	.027788	.172638	
		-.846449	-.373354	-.184514	-.157448	-.971923	
	20	-1.245783	1.167332	1.150142	.985274	-.170981	
		.979004	1.362663	.062430	.053481	.304683	
		-.753512	-.362663	-.189579	-.162403	-.936981	
	21	-1.245068	1.155668	1.137419	.980815	-.194936	
		1.329324	1.344829	.111184	.095876	.475316	
		-.690627	-.344829	-.196837	-.169736	-.857948	
22	-1.245329	1.144845	1.111627	.970984	-.239065		
	1.614691	1.310671	.202859	.177193	.702123		
	-.386555	-.310671	-.183850	-.160598	-.670724		
23	-1.229655	1.132343	1.090792	.963296	-.268347		
	1.773614	1.282201	.293104	.258848	.921489		
	-.134912	-.282201	-.080540	-.071127	-.280799		
7	1	-1.699678	1.071793	.975394	.910058	-.414479	
		1.611865	1.148740	.431871	.402943	.885202	
		.096576	-.148740	.104085	.097113	.211244	
	2	-1.733772	1.092781	1.014192	.928083	-.372374	
		1.484752	1.194171	.318158	.291155	.725701	
		.297994	-.194171	.253683	.232145	.578529	
	3	-1.738932	1.121965	1.066664	.950711	-.310024	
		1.250730	1.258805	.179768	.160226	.507279	
		.497910	-.258805	.297852	.265474	.804085	
	4	-1.738266	1.142165	1.099857	.962958	-.269527	
		.954054	1.304542	.097975	.085780	.335023	
		.644837	-.304542	.291988	.255644	.902837	
5	-1.750276	1.158627	1.121090	.966034	-.250229		
	.600104	1.342417	.037916	.032716	.193980		
	.739306	-.342417	.288124	.248677	.948555		
6	-1.750025	1.174333	1.139526	.970360	-.237694		
	.200030	1.379059	-.034967	-.029776	.061556		
	.792992	-.379059	.201632	.239823	.969388		

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DCX DCY DCZ	NX NY NZ	VN SIG
.986144	-.153515	-.000000
.006552	.055250	.016044
-.153388	-.986601	
.987136	-.159881	-.000000
.027788	.172638	.016340
-.157448	-.971923	
.985274	-.170981	-.000000
.053481	.304683	.017048
-.162403	-.936981	
.980815	-.194936	.000000
.095876	.475316	.019582
-.169736	-.857948	
.970984	-.239065	-.000000
.177193	.702123	.024706
-.160598	-.670724	
.963296	-.268347	-.000000
.258848	.921489	.027344
-.071127	-.280799	
.910058	-.414479	-.000000
.402943	.885202	.041810
.097113	.211244	
.928083	-.372374	-.000000
.291155	.725701	.037841
.232145	.578529	
.950711	-.310024	-.000000
.160226	.507279	.030138
.265474	.804085	
.962958	-.269527	-.000000
.085780	.335023	.025359
.255644	.902837	
.968034	-.250229	-.000000
.032716	.193980	.023756
.248677	.948555	
.970360	-.237694	-.000000
.029776	.061556	.022518
.239823	.969388	

BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX NPY NPZ	VT VTSQ CF	VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
7	7	-1.749550 -.199759 .782469	1.205607 1.453488 -.453488	1.178688 -.115921 .225268	.977672 -.096152 .186851	-.197278 -.113683 .973734	.000000 .015226
	8	-1.747311 -.599857 .679777	1.230972 1.515291 -.515291	1.225355 -.100709 .060447	.995437 -.081813 .049105	-.075980 -.368319 .926589	.000000 -.008877
	9	-1.750000 -1.000000 .500000	1.227360 1.506461 -.506461	1.227221 -.017632 -.008816	.999871 -.014365 -.007183	0.000000 -.447214 .894427	.000000 -.024519
	10	-1.720409 -1.352829 .314114	1.218753 1.485359 -.485359	1.215655 .022100 .083999	.997458 .018133 .068914	-.050829 -.496741 .866409	.000000 -.018933
	11	-1.762537 -1.550513 .113943	1.166416 1.360526 -.360526	1.083060 -.292335 .319428	.928542 -.250627 .273854	-.348626 -.842191 .411307	-.000000 .034454
	12	-1.699678 -1.611865 -.096576	1.081512 1.169668 -.169668	.977211 -.462855 .022186	.903560 -.427970 .020514	-.414479 -.885202 -.211244	0.000000 .049582
	13	-1.733772 -1.484752 -.297994	1.086144 1.179709 -.179709	1.006208 -.356337 -.280604	.926404 -.328121 -.184693	-.372374 -.725701 -.578529	-.000000 .045341
	14	-1.738932 -1.250730 -.497910	1.114650 1.242445 -.242445	1.059335 -.210056 -.275918	.950374 -.188450 -.247538	-.310024 -.507279 -.804085	-.000000 .035901
	15	-1.738266 -.954054 -.644837	1.136204 1.290960 -.290960	1.093988 -.125252 -.280114	.962844 -.110237 -.246534	-.269527 -.335023 -.912837	-.000000 .029572
	16	-1.750276 -.600104 -.739306	1.151282 1.325451 -.325451	1.114573 -.071497 -.279403	.968114 -.062102 -.242689	-.250229 -.193980 -.948555	-.000000 .026698
	17	-1.750025 -.200030 -.792992	1.158015 1.340998 -.340998	1.124810 -.023565 -.274307	.971326 -.020350 -.236877	-.237694 -.061556 -.969388	-.000000 .024180
	18	-1.750025 .200030 -.792992	1.158514 1.342154 -.342154	1.125308 .015093 -.274968	.971338 .013019 -.237345	-.237694 .061556 -.969388	-.000000 .023503

BODY ID. TEST

TEST BODY

X-FLOW

N	M	TEST BODY			X-FLOW			VN SIG
		NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ		
7	19	-1.750276	1.152916	1.116233	.966183	-.250229	-.000000	
		.600104	1.329215	.060962	.052876	.193980	.024579	
		-.739306	-.329215	-.281996	-.244593	-.948555		
20		-1.738266	1.139416	1.097239	.962984	-.269527	-.000000	
		.954054	1.298269	.111503	.097859	.335023	.026002	
		-.644837	-.298269	-.286196	-.251169	-.902837		
21		-1.738932	1.120131	1.064935	.950724	-.310024	-.000000	
		1.250730	1.254694	.188418	.168210	.507279	.030634	
		-.497910	-.254694	-.291729	-.260442	-.834085		
22		-1.733772	1.091523	1.012990	.928052	-.372374	-.000000	
		1.484752	1.191423	.323355	.296251	.725701	.038158	
		-.297994	-.191423	-.246391	-.225731	-.578529		
23		-1.699678	1.071357	.974973	.910036	-.414479	-.000000	
		1.611865	1.147806	.433696	.404800	.885202	.041913	
		-.096576	-.147806	-.095654	-.089283	-.211244		
		*****		*****		*****		
8	1	-2.218024	.953089	.763560	.801143	-.597981	-.000000	
		1.240723	.908378	.521127	.546777	.747834	.065691	
		.149617	.091622	.231907	.243322	.288382		
2		-2.214445	1.078634	.975917	.904762	-.425912	-.000000	
		.990269	1.163451	.237422	.220114	.463200	.039168	
		.411287	-.163451	.393304	.364631	.777203		
3		-2.250969	1.127743	1.034668	.917468	-.397801	-.000000	
		.600392	1.271805	.117301	.104014	.246251	.036289	
		.560379	-.271805	.433021	.383971	.883807		
4		-2.250072	1.160877	1.079656	.930043	-.366809	-.000000	
		.200101	1.347636	.007608	.006554	.075569	.032128	
		.632913	-.347636	.426436	.367391	.927222		
5		-2.250072	1.187823	1.104142	.929551	-.366809	-.000000	
		-.200101	1.410923	-.082736	-.069654	-.075569	.032261	
		.632913	-.410923	.430056	.362054	.927222		
6		-2.250383	1.215486	1.127098	.927273	-.372805	-.000000	
		-.600126	1.477407	-.178891	-.147176	-.278586	.031772	
		.553499	-.477407	.418424	.344244	.885102		

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BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX	VT	VX	DCX	NX	VN
		NPY	VTSQ	VY	DCY	NY	SIG
		NPZ	CP	VZ	DCZ	NZ	
8	7	-2.218355	1.206050	1.107315	.918133	-.396212	-.000000
		-.956945	1.454557	-.246493	-.204380	-.458473	.033963
		.416059	-.454557	.409454	.339500	.795499	
8	8	-2.212088	1.083768	.912254	.841752	-.537231	-.000000
		-1.209729	1.174554	-.477735	-.440855	-.740960	.058742
		.166619	-.174554	.337711	.311608	.402941	
9	9	-2.218024	.965398	.772784	.800483	-.597981	-.000000
		-1.240723	.931993	-.555522	-.575433	-.747834	.069724
		-.149617	.068007	-.161841	-.167642	-.288382	
10	10	-2.214445	1.074426	.971402	.904113	-.425912	.000000
		-.990269	1.154391	-.269128	-.250485	-.463200	.043639
		-.411287	-.154391	-.371939	-.346175	-.777203	
11	11	-2.250969	1.117305	1.024801	.917209	-.397801	-.000000
		-.600392	1.248370	-.145030	-.129804	-.246251	.039174
		-.560379	-.248370	-.420854	-.376669	-.883807	
12	12	-2.250074	1.138957	1.059640	.930360	-.366578	-.000000
		-.200104	1.297223	-.042453	-.037274	-.075231	.033966
		-.632837	-.297223	-.415432	-.364748	-.927341	
13	13	-2.250074	1.139033	1.059741	.930387	-.366578	-.000000
		.200104	1.297395	.032406	.028451	.075231	.033347
		-.632837	-.297395	-.416287	-.365474	-.927341	
14	14	-2.250969	1.117486	1.025131	.917408	-.397801	.000000
		.600392	1.248774	.131954	.118082	.246251	.037211
		-.560379	-.248774	-.424672	-.380025	-.883807	
15	15	-2.214445	1.073381	.971068	.904682	-.425912	.000000
		.990269	1.152146	.246456	.229607	.463200	.039860
		-.411287	-.152146	-.385268	-.358930	-.777203	
16	16	-2.218024	.950934	.762055	.801375	-.597981	-.000000
		1.240723	.904276	.524166	.551212	.747834	.065833
		-.149617	.095724	-.220904	-.232302	-.288382	
		*****		*****		*****	
9	1	-2.626833	.660120	.326828	.495104	-.868756	.000000
		.687692	.435759	.468030	.709007	.411733	.104713
		.149145	.564241	.331497	.502177	.275208	

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BODY ID. TEST

TEST BODY

X-FLOW

N	M	NPX NPY NPZ	VT VTSQ CP	VX VY VZ	DCX DCY DCZ	NX NY NZ	VN SIG
9	2	-2.629150 .434170 .336208	.835434 .697949 .302051	.526675 .195323 .618394	.630421 .233798 .740208	-.776209 .200002 .597912	-.000000 .088646
	3	-2.635472 .141262 .389779	.679817 .774078 .225922	.591517 .046040 .649665	.672319 .052329 .738410	-.740175 .062764 .669478	.000000 .086147
	4	-2.635472 -.141262 .389779	.890766 .793463 .206537	.598838 -.079632 .654604	.672273 -.089465 .734878	-.740175 -.062764 .669478	-.000000 .086400
	5	-2.629150 -.434170 .336208	.869668 .756323 .243677	.548218 -.228735 .635135	.630376 -.263014 .730376	-.776209 -.200002 .597912	.000000 .089504
	6	-2.626833 -.687692 .149145	.703717 .495218 .504782	.348373 -.497144 .355953	.495047 -.706454 .505818	-.868756 -.411733 .275208	.000000 .106041
	7	-2.626933 -.687692 -.149145	.664268 .441252 .558748	.328750 -.493026 -.300168	.494906 -.742209 -.451879	-.868756 -.411733 -.275208	.000000 .106522
	8	-2.629150 -.434170 -.336208	.820631 .673435 .326565	.517297 -.217408 -.598819	.630352 -.264928 -.729705	-.776209 -.200002 -.597912	.000000 .090273
	9	-2.635472 -.141262 -.389779	.857280 .734930 .265070	.576419 -.067674 -.630944	.672381 -.078941 -.735984	-.740175 -.062764 -.669478	-.000000 .087213
	10	-2.635472 .141262 -.389779	.856967 .734392 .265608	.576233 .056429 -.631733	.672410 .065847 -.737244	-.740175 .062764 -.669478	-.000000 .086864
	11	-2.629150 .434170 -.336208	.819951 .672319 .327681	.516958 .203153 -.603160	.630475 .247763 -.735605	-.776209 .200002 -.597912	.000000 .089184
	12	-2.626833 .687692 -.149145	.653104 .426545 .573455	.323443 .471156 -.316135	.495240 .721410 -.484050	-.868756 .411733 -.275208	-.000000 .104895

LEAVING FRINT1

LEAVING MAIN

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C-2

FLOPNT

BODY IDENTIFIER IS TEST NUMBER OF SYMMETRY PLANES= 0 NUMBER OF QUADRANT

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FOLDOUT FRAM |

= 0 NUMBER OF QUADRALATERALS= 189 MACH NUMBER= 0.

FOR OUT FRAM 2

FLOPNT RUN ID -
 TEST PROBLEM WITH TEST 8CDY

INPUT DATA -

INITIAL X=-4.5000E+00 INCREMENT= 1.0000E+00 NUMBER OF VALUES= 4
 INITIAL Y= 0. INCREMENT= 0. NUMBER OF VALUES= 1
 INITIAL Z= 1.0000E+00 INCREMENT=-5.0000E-01 NUMBER OF VALUES= 5

X AXIS IS INCREMENTED FIRST
 Y AXIS IS INCREMENTED THIRD
 Z AXIS IS INCREMENTED SECOND

* INDICATES THE POINT IS INSIDE THE BODY

X	Y	Z	VX	VY	VZ
-4.5000000	0.0000000	1.0000000	9.4274E-01	-1.8463E-03	3.1225E-02
-3.5000000	0.0000000	1.0000000	8.9363E-01	-5.2865E-03	1.0830E-01
-2.5000000	0.0000000	1.0000000	9.8504E-01	-2.1047E-02	2.8638E-01
-1.5000000	0.0000000	1.0000000	1.1528E+00	-7.7206E-02	1.6956E-01

X	Y	Z	VX	VY	VZ
-4.5000000	0.0000000	.5000000	9.2698E-01	-1.8687E-03	2.0175E-02
-3.5000000	0.0000000	.5000000	8.0239E-01	-5.3770E-03	1.0116E-01
INSIDE QUAD 179		I2= 1			
ZNP,RO SQ,TSQ,H=	-8.9149E-02		2.2821E-01	1.0355E+00	1.0000E-01
INSIDE QUAD 180		I2= 1			
ZNP,RO SQ,TSQ,H=	-3.5348E-02		6.6282E-02	6.7553E-01	1.0000E-01
INSIDE QUAD 181		I2= 1			
ZNP,RO SQ,TSQ,H=	-3.5348E-02		6.6282E-02	6.7553E-01	1.0000E-01
INSIDE QUAD 182		I2= 1			
ZNP,RO SQ,TSQ,H=	-8.9149E-02		2.2821E-01	1.0355E+00	1.0000E-01
-2.5000000	0.0000000	.5000000	1.4448E+00	-2.2314E-02	1.2787E-01
-1.5000000	0.0000000	.5000000	1.2122E+00	-6.2494E-02	3.9898E-02

X	Y	Z	VX	VY	VZ
-4.5000000	0.0000000	0.0000000	9.1975E-01	-1.7342E-03	1.5068E-03
-3.5000000	0.0000000	0.0000000	7.3093E-01	-4.4575E-03	4.6059E-03
-2.5000000	0.0000000	0.0000000	1.2744E+00	-1.3880E-02	1.8615E-02
-1.5000000	0.0000000	0.0000000	1.2164E+00	-3.0605E-02	3.3288E-02

X	Y	Z	VX	VY	VZ
-4.5000000	0.0000000	-.5000000	9.2565E-01	-1.4964E-03	-1.7501E-02
-3.5000000	0.0000000	-.5000000	7.9717E-01	-3.3034E-03	-9.4089E-02
INSIDE QUAD 185		I2= 1			
ZNP,RO SQ,TSQ,H=	-8.9149E-02		2.2821E-01	1.0355E+00	1.0000E-01
INSIDE QUAD 186		I2= 1			
ZNP,RO SQ,TSQ,H=	-3.5348E-02		6.6282E-02	6.7553E-01	1.0000E-01
INSIDE QUAD 187		I2= 1			
ZNP,RO SQ,TSQ,H=	-3.5348E-02		6.6282E-02	6.7553E-01	1.0000E-01
INSIDE QUAD 188		I2= 1			
ZNP,RO SQ,TSQ,H=	-8.9149E-02		2.2821E-01	1.0355E+00	1.0000E-01
-2.5000000	0.0000000	-.5000000	1.4261E+00	-4.1937E-03	-1.0065E-01
-1.5000000	0.0000000	-.5000000	1.2105E+00	-1.1531E-02	1.9700E-02

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+00 NUMBER OF VALUES= 4
 NUMBER OF VALUES= 1
 -01 NUMBER OF VALUES= 5

THE BODY

	VY	VZ	V
-01	-1.8463E-03	3.1225E-02	9.4326E-01
-01	-5.2865E-03	1.0830E-01	9.0019E-01
-01	-2.1047E-02	2.8638E-01	1.0260E+00
+00	-7.7206E-02	1.6956E-01	1.1678E+00

	VY	VZ	V
-01	-1.8687E-03	2.0175E-02	9.2720E-01
-01	-5.3770E-03	1.0116E-01	8.0876E-01

1.0355E+00 1.0000E-01

6.7553E-01 1.0000E-01

6.7553E-01 1.0000E-01

1.0355E+00 1.0000E-01

+00 -2.2314E-02 1.2787E-01 1.4506E+00 *

+00 -6.2494E-02 3.9898E-02 1.2145E+00

	VY	VZ	V
-01	-1.7342E-03	1.5068E-03	9.1975E-01
-01	-4.4575E-03	4.6059E-03	7.3096E-01
+00	-1.3880E-02	1.8615E-02	1.2746E+00
+00	-3.0605E-02	3.3288E-02	1.2173E+00

	VY	VZ	V
-01	-1.4964E-03	-1.7501E-02	9.2582E-01
-01	-3.3034E-03	-9.4089E-02	8.0271E-01

1.0355E+00 1.0000E-01

6.7553E-01 1.0000E-01

6.7553E-01 1.0000E-01

1.0355E+00 1.0000E-01

+00 -4.1937E-03 -1.0065E-01 1.4297E+00 *

+00 -1.1531E-02 1.9700E-02 1.2108E+00

X	Y	Z	VX	VY	VZ	V
-4.5000000	0.0000000	-1.0000000	9.4052E-01	-1.2184E-03	-2.9389E-02	9.4098E-01
-3.5000000	0.0000000	-1.0000000	8.8645E-01	-2.3480E-03	-1.0521E-01	8.9268E-01
-2.5000000	0.0000000	-1.0000000	9.6251E-01	-3.3361E-03	-2.8834E-01	1.0048E+00
-1.5000000	0.0000000	-1.0000000	1.1359E+00	-2.5233E-03	-2.0899E-01	1.1550E+00

* INDICATES THE POINT IS INSIDE THE BODY

ARYTRJ

BODY IDENTIFIER IS TEST NUMBER OF SYMMETRY PLANES= 0 NUMBER OF QUADRAL

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FOLDOUT FRAMES

PLANES= 0 NUMBER OF QUADRALATERALS= 189 MACH NUMBER= 0.

FOR OUT FRAM 2

ARYTRJ RUN ID -
TEST PROBLEM WITH TEST BODY

PHYSICAL INPUT DATA -

AIR SPEED= 9.000000E+01 CHARACTERISTIC DIMENSION OF THE BODY= 1.000000E+00
DENSITY AND TEMPERATURE OF AIR ARE 9.092500E-01 AND 2.686590E+02 AIR VISCOS

NUMERICAL INTEGRATOR INPUTS -

TIME STEP= 1.0000E-01 MINIMUM TIME STEP= 5.0000E-03 PRINT TIME INTERVAL= 1.0

LOCAL ERROR TOLERANCES FOR DV00 - 1.0001E-05 1.0000E-05 1.0000E-05

DIMENSION OF THE BODY= 1.000000E+00
00E-01 AND 2.686590E+02 AIR VISCOSITY IS 1.693764E-05

5.0000E-03 PRINT TIME INTERVAL= 1.0000E+00 X COORD. OF FINAL PLANE= 0.
0E-05 1.0000E-05 1.0000E-05

FOR OUT FRAM. 2

WATER DROP DIAMETER = 3.00000E+02 MICROMETERS

PARTICLE SETTLING SPEED= 1.27827E+00 M/SEC

INITIAL X=-5.0000E+00 INCREMENT= 0. NUMBER OF VALUES= 1
INITIAL Y=-1.0000E+00 INCREMENT= 2.0000E+00 NUMBER OF VALUES= 2
INITIAL Z= 1.0000E+00 INCREMENT=-2.0000E+00 NUMBER OF VALUES= 2

X AXIS IS INCREMENTED THIRD
Y AXIS IS INCREMENTED FIRST
Z AXIS IS INCREMENTED SECOND

* * * * * INITIAL COORDINATES X=-5.00000E+00 Y=-1.00000E+00 Z= 1.00000E+00
IFLAG= 7 FOR KSTEP= 27 NEVAL= 49 HMIN IS SET TO 3.1250E-03

KSTEP	T	X	Y	Z	VPX	VPY	
0	0.	-5.0000E+00	-1.0000E+00	1.0000E+00	9.6596E-01	-1.4267E-02	1.
	H= 1.0000E-01	R= 2.0586E+01	AC= 0.		NEVAL= 1		
10	1.0000E+00	-4.0344E+00	-1.0145E+00	1.0021E+00	9.6478E-01	-1.5232E-02	3.
	H= 1.0000E-01	R= 6.8363E+01	AC= 7.6445E-04		NEVAL= 12		
11	1.0000E+00	-4.0344E+00	-1.0145E+00	1.0021E+00	9.6478E-01	-1.5232E-02	3.
	H= 1.0000E-01	R= 7.6138E+01	AC= 6.1639E-04		NEVAL= 13		
21	2.0000E+00	-3.0718E+00	-1.0325E+00	1.0094E+00	9.5991E-01	-2.2680E-02	1.
	H= 1.0000E-01	R= 1.8029E+02	AC= 5.1923E-04		NEVAL= 31		
31	2.3125E+00	-2.7720E+00	-1.0404E+00	1.0151E+00	9.5930E-01	-2.7841E-02	2.
	H= 3.1250E-03	R= 2.0134E+02	AC= 5.1576E-04		NEVAL= 57		
41	2.4000E+00	-2.6881E+00	-1.0429E+00	1.0172E+00	9.5956E-01	-2.9385E-02	2.
	H= 1.2500E-02	R= 2.0860E+02	AC= 5.0906E-04		NEVAL= 77		
51	2.8000E+00	-2.3035E+00	-1.0561E+00	1.0293E+00	9.6440E-01	-3.6556E-02	3.
	H= 1.0000E-01	R= 2.2229E+02	AC= 4.9929E-04		NEVAL= 97		
54	3.0000E+00	-2.1101E+00	-1.0637E+00	1.0379E+00	9.6916E-01	-3.9522E-02	4.
	H= 1.0000E-01	R= 2.0962E+02	AC= 5.3739E-04		NEVAL= 104		
64	3.2500E+00	-1.8670E+00	-1.0739E+00	1.0492E+00	9.7641E-01	-4.2069E-02	4.
	H= 1.2500E-02	R= 1.9778E+02	AC= 5.6999E-04		NEVAL= 130		
74	3.5000E+00	-1.6219E+00	-1.0846E+00	1.0613E+00	9.8411E-01	-4.3370E-02	4.
	H= 5.0000E-02	R= 1.7680E+02	AC= 5.9854E-04		NEVAL= 150		
81	4.0000E+00	-1.1265E+00	-1.1064E+00	1.0860E+00	9.9693E-01	-4.3131E-02	4.
	H= 2.0000E-01	R= 1.4402E+02	AC= 6.9847E-04		NEVAL= 164		
86	5.0000E+00	-1.1968E-01	-1.1471E+00	1.1313E+00	1.0160E+00	-3.7496E-02	4.
	H= 2.0000E-01	R= 1.5173E+02	AC= 6.0359E-04		NEVAL= 175		
86	5.1177E+00	0.	-1.1515E+00	1.1361E+00	1.0181E+00	-3.6517E-02	3.
	H= 2.0000E-01	R= 1.5173E+02	AC= 6.2904E-04		NEVAL= 175		

INITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -

ALPHA0= -.8462 BETA0= .0988
ALPHA R= -2.0542 BETA R= 2.2413

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.2179E-01 3.8626E-01 -4.1888E-01 ANGLES A AND GAMMA
AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.10221E+00 1.01954E+00

* * * * * INITIAL COORDINATES X=-5.00000E+00 Y= 1.00000E+00 Z=-1.00000E+00
IFLAG= 7 FOR KSTEP= 28 NEVAL= 60 HMIN IS SET TO 3.1250E-03

ROMETERS

27827E+00 M/SEC

000E+00 NUMBER OF VALUES= 1
000E+00 NUMBER OF VALUES= 2
000E+00 NUMBER OF VALUES= 2

E+00 Y=-1.00000E+00 Z= 1.00000E+00
HMIN IS SET TO 3.1250E-03

Z	VPX	VPY	VPZ	VX	VY	VZ
000E+00	9.6596E-01	-1.4267E-02	1.6667E-03	9.6596E-01	-1.4267E-02	1.5870E-02
	NEVAL=	1				
021E+00	9.6478E-01	-1.5232E-02	3.1541E-03	9.4312E-01	-3.4403E-02	4.0864E-02
445E-04	NEVAL=	12				
021E+00	9.6478E-01	-1.5232E-02	3.1541E-03	9.4151E-01	-3.7761E-02	4.5294E-02
630E-04	NEVAL=	13				
094E+00	9.5991E-01	-2.2680E-02	1.4476E-02	9.4637E-01	-8.7974E-02	1.2281E-01
928E-04	NEVAL=	31				
151E+00	9.5930E-01	-2.7841E-02	2.2740E-02	9.6591E-01	-9.7990E-02	1.4245E-01
576E-04	NEVAL=	57				
172E+00	9.5956E-01	-2.9385E-02	2.5288E-02	9.7691E-01	-1.0088E-01	1.4898E-01
906E-04	NEVAL=	77				
293E+00	9.6440E-01	-3.6556E-02	3.7613E-02	1.0420E+00	-9.9754E-02	1.5379E-01
929E-04	NEVAL=	97				
379E+00	9.6916E-01	-3.9522E-02	4.2861E-02	1.0858E+00	-8.3119E-02	1.2343E-01
730E-04	NEVAL=	104				
492E+00	9.7641E-01	-4.2069E-02	4.7262E-02	1.0977E+00	-7.2147E-02	1.0213E-01
999E-04	NEVAL=	130				
613E+00	9.8411E-01	-4.3370E-02	4.9320E-02	1.1037E+00	-5.4774E-02	7.0318E-02
854E-04	NEVAL=	150				
860E+00	9.9693E-01	-4.3131E-02	4.8716E-02	1.0997E+00	-2.2761E-02	2.4140E-02
847E-04	NEVAL=	164				
313E+00	1.0160E+00	-3.7496E-02	4.1078E-02	1.1046E+00	5.6844E-03	-6.0732E-03
359E-04	NEVAL=	175				
361E+00	1.0181E+00	-3.6517E-02	3.9872E-02	1.1046E+00	5.6844E-03	-6.0732E-03
904E-04	NEVAL=	175				

Y ANGLES (DEGREES) -

AO= .0988
AR= 2.2413

01 -4.1888E-01 ANGLES A AND GAMMA- 2.5175E+01 1.1476E+02
ARE 1.10221E+00 1.01954E+00

+00 Y= 1.00000E+00 Z=-1.00000E+00
HMIN IS SET TO 3.1250E-03

FOR SCOUT FROM 2

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	1.0000E+00	-1.0000E+00	9.6340E-01	1.2975E-02 -2.
	H=	1.0000E-01	R= 1.5173E+02	AC= 0.	NEVAL=	1
10	1.0000E+00	-4.0369E+00	1.0132E+00	-1.0295E+00	9.6232E-01	1.3708E-02 -3.
	H=	1.0000E-01	R= 4.5689E+01	AC= 1.2573E-03	NEVAL=	16
11	1.0000E+00	-4.0369E+00	1.0132E+00	-1.0295E+00	9.6232E-01	1.3708E-02 -3.
	H=	1.0000E-01	R= 5.2997E+01	AC= 9.3450E-04	NEVAL=	18
21	2.0000E+00	-3.0769E+00	1.0291E+00	-1.0623E+00	9.5692E-01	1.9735E-02 -3.
	H=	1.0000E-01	R= 1.5349E+02	AC= 5.8890E-04	NEVAL=	38
31	2.7656E+00	-2.3454E+00	1.0485E+00	-1.0985E+00	9.5602E-01	3.1574E-02 -5.
	H=	3.1250E-03	R= 2.0016E+02	AC= 5.4970E-04	NEVAL=	66
41	2.9000E+00	-2.2168E+00	1.0529E+00	-1.1066E+00	9.5733E-01	3.3578E-02 -6.
	H=	5.0000E-02	R= 2.0280E+02	AC= 5.4600E-04	NEVAL=	86
44	3.0000E+00	-2.1210E+00	1.0563E+00	-1.1130E+00	9.5864E-01	3.4974E-02 -6.
	H=	5.0000E-02	R= 2.0340E+02	AC= 5.4490E-04	NEVAL=	92
54	3.3875E+00	-1.7482E+00	1.0707E+00	-1.1405E+00	9.6613E-01	3.9311E-02 -7.
	H=	6.2500E-03	R= 1.9948E+02	AC= 5.8877E-04	NEVAL=	117
64	3.5500E+00	-1.5909E+00	1.0772E+00	-1.1532E+00	9.7046E-01	4.0630E-02 -8.
	H=	5.0000E-02	R= 1.9617E+02	AC= 5.9103E-04	NEVAL=	137
71	4.0000E+00	-1.1512E+00	1.0960E+00	-1.1910E+00	9.8418E-01	4.2377E-02 -8.
	H=	1.0000E-01	R= 1.8893E+02	AC= 5.9535E-04	NEVAL=	152
80	5.0000E+00	-1.5051E-01	1.1371E+00	-1.2785E+00	1.0170E+00	3.8245E-02 -8.
	H=	5.0000E-02	R= 2.0139E+02	AC= 5.5777E-04	NEVAL=	172
84	5.1477E+00	1.3878E-17	1.1427E+00	-1.2909E+00	1.0214E+00	3.6966E-02 -8.
	H=	2.5000E-02	R= 2.0627E+02	AC= 5.1777E-04	NEVAL=	181

INITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -

ALPHA0=	.7716	BETA0=	-1.7363
ALPHA R=	2.0727	BETA R=	-4.5852

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.4447E-01 -2.5705E-01 4.6989E-01 ANGLES A AND GAMMA
AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14163E+00 1.02538E+00

Z	VPX	VPY	VPZ	VX	VY	VZ
00E+00	9.6340E-01	1.2975E-02	-2.9207E-02	9.6340E-01	1.2975E-02	-1.5004E-02
	NEVAL=	1				
95E+00	9.6232E-01	1.3708E-02	-3.0100E-02	9.3841E-01	3.1623E-02	-4.0163E-02
73E-03	NEVAL=	16				
95E+00	9.6232E-01	1.3708E-02	-3.0100E-02	9.3552E-01	3.4700E-02	-4.4642E-02
50E-04	NEVAL=	18				
23E+00	9.5692E-01	1.9735E-02	-3.8095E-02	9.2806E-01	7.9368E-02	-1.2368E-01
90E-04	NEVAL=	38				
35E+00	9.5602E-01	3.1574E-02	-5.8414E-02	9.6771E-01	9.4036E-02	-1.7743E-01
79E-04	NEVAL=	66				
66E+00	9.5733E-01	3.3578E-02	-6.2513E-02	1.0045E+00	9.1879E-02	-1.8064E-01
10E-04	NEVAL=	86				
30E+00	9.5864E-01	3.4974E-02	-6.5529E-02	1.0231E+00	8.7798E-02	-1.8064E-01
99E-04	NEVAL=	92				
95E+00	9.6613E-01	3.9311E-02	-7.6149E-02	1.0615E+00	7.4554E-02	-1.6886E-01
77E-04	NEVAL=	117				
32E+00	9.7046E-01	4.0630E-02	-8.0008E-02	1.0775E+00	6.7191E-02	-1.5845E-01
03E-04	NEVAL=	137				
10E+00	9.8418E-01	4.2377E-02	-8.7065E-02	1.1159E+00	4.1874E-02	-1.1020E-01
35E-04	NEVAL=	152				
86E+00	1.0170E+00	3.8245E-02	-8.4091E-02	1.1389E+00	3.9491E-03	-2.2823E-02
77E-04	NEVAL=	172				
99E+00	1.0214E+00	3.6966E-02	-8.1971E-02	1.1416E+00	3.2180E-04	-1.4954E-02
77E-04	NEVAL=	181				

ANGLES (DEGREES) -

1= -1.7363
2= -4.5852

01 4.6989E-01 ANGLES A AND GAMMA- -1.6930E+01 6.1973E+01
ARE 1.14163E+00 1.02538E+00

CONFAC

BODY IDENTIFIER IS TEST NUMBER OF SYMMETRY PLANES= 0 NUMBER OF QUADRALA

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FOLDOUT FRA: |

METRY PLANES= 0 NUMBER OF QUADRALATERALS= 189 MACH NUMBER= 0.

FOR OUT FRAM. 2

CONFAC RUN ID -
TEST PROBLEM WITH TEST BODY

PHYSICAL INPUT DATA -

AIR SPEED= 9.000000E+01 CHARACTERISTIC DIMENSION OF THE BODY= 1.000000E+00
DENSITY AND TEMPERATURE OF AIR ARE 9.092500E-01 AND 2.686590E+02 AIR VIS

NUMERICAL INTEGRATOR INPUTS -

TIME STEP= 1.00000E-01 MINIMUM TIME STEP= 5.00000E-03 PRINT TIME INTERVAL=

LOCAL ERROR TOLERANCES FOR DVOQ - 1.00000E-05 1.00000E-05 1.00000E-05

PARTICLE FLUX TUBE SPECIFICATIONS -

NUMBER OF TRAJECTORIES ON FLUX TUBE PERIPHERY= 4 FLUX TUBE RADIUS AT TARG

TARGET AND INITIAL COORDINATE ESTIMATES-

JGUESS	YT	ZT	YI	ZI
1	0.00000	0.00000	0.00000	0.00000
2	0.00000	0.00000	0.00000	0.00000

CHARACTERISTIC DIMENSION OF THE BODY= 1.000000E+00
RE 9.092500E-01 AND 2.686590E+02 AIR VISCOSITY IS 1.693764E-05

TIME STEP= 5.0000E-03 PRINT TIME INTERVAL= 1.0000E+00 UPSTREAM START DISTANCE=-5.0000E+00
- 1.0000E-05 1.0000E-05 1.0000E-05

TUBE PERIPHERY= 4 FLUX TUBE RADIUS AT TARGET= .00328 TOLERANCE= .5000

ESTIMATES-

ZT	YI	ZI
0.0000	0.00000	0.00000
0.0000	0.00000	0.00000

FOR BOUT FRAM. 2

WATER DROP DIAMETER = 3.00000E+02 MICROMETERS

PARTICLE SETTLING SPEED= 1.27327E+00 M/SEC

TARGET COORDINATES X=-1.50000E+00 Y= 1.10000E+00 Z= 8.00000E-01

TRAJECTORY NUMBER 0 TARGET COORDINATES - X*STAR = -1.500000 YPSTAR = 1.000000 YPSTARP= 1.000000

YFINAL	ZFINAL	ITERATIONS	YINIT	ZINIT	ERROR
.1209E+01	.8603E+00	1	.1101E+01	.8012E+00	.1352E+01
.1210E+01	.8813E+00	2	.1102E+01	.8024E+00	.1367E+01
.1097E+01	.8052E+00	3	.9795E+00	.7039E+00	.5981E+00
.1102E+01	.7993E+00	4	.9834E+00	.6981E+00	.2112E+00
.1099E+01	.7979E+00	5	.9800E+00	.6961E+00	.2383E+00
.1100E+01	.7998E+00	6	.9811E+00	.6983E+00	.4269E+00

KSTEP	T	X	Y	Z	VPX	VPY	ERROR
0	0.	-5.0000E+00	9.8110E-01	6.9829E-01	9.6002E-01	1.3571E-02	-1.6000
		H= 1.0000E-01	R= 2.7725E+02	AC= 0.	NEVAL= 1		
10	7.0000E-01	-4.3281E+00	9.9068E-01	6.9726E-01	9.5929E-01	1.3983E-02	-1.0000
		H= 1.0000E-01	R= 5.2057E+01	AC= 8.3495E-04	NEVAL= 13		
14	1.0000E+00	-4.0405E+00	9.9497E-01	6.9705E-01	9.5819E-01	1.4671E-02	-2.0000
		H= 1.0000E-01	R= 8.7192E+01	AC= 5.9458E-04	NEVAL= 17		
24	1.8625E+00	-3.2173E+00	1.0101E+00	6.9995E-01	9.4867E-01	2.2660E-02	9.6000
		H= 6.2500E-03	R= 2.0038E+02	AC= 5.2003E-04	NEVAL= 42		
34	2.0000E+00	-3.0870E+00	1.0134E+00	7.0151E-01	9.4620E-01	2.5388E-02	1.3000
		H= 5.0000E-02	R= 2.2830E+02	AC= 4.9527E-04	NEVAL= 62		
35	2.0000E+00	-3.0870E+00	1.0134E+00	7.0151E-01	9.4620E-01	2.5388E-02	1.3000
		H= 5.0000E-02	R= 2.3878E+02	AC= 4.5273E-04	NEVAL= 64		
45	2.8000E+00	-2.3352E+00	1.0437E+00	7.2664E-01	9.3723E-01	5.2614E-02	5.5000
		H= 5.0000E-02	R= 3.3778E+02	AC= 4.3878E-04	NEVAL= 86		
49	3.0000E+00	-2.1475E+00	1.0549E+00	7.3919E-01	9.4051E-01	5.9150E-02	6.9000
		H= 1.0000E-01	R= 3.2750E+02	AC= 4.4993E-04	NEVAL= 94		
59	3.6804E+00	-1.5000E+00	1.0996E+00	7.9979E-01	9.6535E-01	6.9304E-02	1.0000
		H= 5.0000E-02	R= 2.7658E+02	AC= 4.7412E-04	NEVAL= 117		

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.1247E-01 4.2971E-02 5.8142E-01 ANGLES A AND GAMMA
AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14461E+00 9.73484E-01

INITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -

ALPHA0= .8099 BETA0= -.0973
ALPHAR= 4.1063 BETAR= 6.1774

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TRAJECTORY NUMBER 1 TARGET COORDINATES - X*STAR = -1.500352 YPSTAR = 1.000000 YPSTARP= 0.000000

YFINAL	ZFINAL	ITERATIONS	YINIT	ZINIT	ERROR
-.3022E-03	.3611E-02	1	.7256E-03	.4269E-02	.4483E-03

KSTEP	T	X	Y	Z	VPX	VPY	ERROR
0	0.	-5.0000E+00	9.8182E-01	7.0256E-01	9.6008E-01	1.3563E-02	-1.5000
		H= 1.0000E-01	R= 2.7658E+02	AC= 0.	NEVAL= 1		
10	7.0000E-01	-4.3281E+00	9.9140E-01	7.0157E-01	9.5935E-01	1.3974E-02	-1.0000
		H= 1.0000E-01	R= 5.2019E+01	AC= 8.3454E-04	NEVAL= 15		
14	1.0000E+00	-4.0404E+00	9.9568E-01	7.0133E-01	9.5825E-01	1.4660E-02	-1.5000

RS

00 M/SEC

10000E+00

Z= 8.00000E-01

R = -1.500000

YPSTAR = 1.100000

ZPSTAR = .800000 (FLOW SYSTEM)

YPSTARP= 1.100000

ZPSTARP= .800000 (FLUX TUBE SYSTEM)

YINIT	ZINIT	ERROR (FLUX TUBE SYSTEM)
1101E+01	.8012E+00	.1352E+00
1102E+01	.8024E+00	.1367E+00
9795E+00	.7039E+00	.5981E-02
9834E+00	.6981E+00	.2112E-02
9800E+00	.6961E+00	.2383E-02
9811E+00	.6983E+00	.4269E-03

	VPX	VPY	VPZ	VX	VY	VZ
1	9.6002E-01	1.3571E-02	-1.6308E-03	9.6002E-01	1.3571E-02	1.2572E-02
4	NEVAL=	1				
1	9.5929E-01	1.3983E-02	-1.0880E-03	9.3821E-01	2.6512E-02	2.5131E-02
4	NEVAL=	13				
1	9.5819E-01	1.4671E-02	-2.0919E-04	9.1998E-01	4.0543E-02	3.9618E-02
4	NEVAL=	17				
1	9.4867E-01	2.2660E-02	9.6867E-03	8.7914E-01	9.4479E-02	1.0518E-01
4	NEVAL=	42				
1	9.4620E-01	2.5388E-02	1.3176E-02	8.7511E-01	1.0894E-01	1.2621E-01
4	NEVAL=	62				
1	9.4620E-01	2.5388E-02	1.3176E-02	8.7450E-01	1.1444E-01	1.3473E-01
4	NEVAL=	64				
1	9.3723E-01	5.2614E-02	5.5791E-02	9.6531E-01	1.5681E-01	2.6234E-01
4	NEVAL=	86				
1	9.4051E-01	5.9150E-02	6.9614E-02	1.0177E+00	1.4009E-01	2.7029E-01
4	NEVAL=	94				
1	9.6535E-01	6.9304E-02	1.0475E-01	1.1213E+00	7.7552E-02	2.1635E-01
4	NEVAL=	117				

5.8142E-01 ANGLES A AND GAMMA- 3.0275E+00 5.4450E+01
 1.14461E+00 9.73484E-01

ES (DEGREES) -
 -.0973
 6.1774

R = -1.500352

YPSTAR = 1.099975

ZPSTAR = .803261 (FLOW SYSTEM)

YPSTARP= 0.000000

ZPSTARP= .003280 (FLUX TUBE SYSTEM)

YINIT	ZINIT	ERROR (FLUX TUBE SYSTEM)
725E-03	.4269E-02	.4483E-03

	VPX	VPY	VPZ	VX	VY	VZ
1	9.6008E-01	1.3563E-02	-1.5749E-03	9.6008E-01	1.3563E-02	1.2628E-02
4	NEVAL=	1				
1	9.5935E-01	1.3974E-02	-1.0309E-03	9.3835E-01	2.6478E-02	2.5248E-02
4	NEVAL=	15				
1	9.5825E-01	1.4660E-02	-1.5069E-04	9.2023E-01	4.0463E-02	3.9745E-02
4	NEVAL=	27				

H= 1.0000E-01 K= 0.7050E+01 AC= 2.9404E-04 NEVAL= 23
 24 1.8688E+00 -3.2112E+00 1.0110E+00 7.0439E-01 9.4870E-01 2.2724E-02
 H= 6.2500E-03 R= 2.0090E+02 AC= 5.1944E-04 NEVAL= 48
 34 1.9750E+00 -3.1105E+00 1.0135E+00 7.0557E-01 9.4682E-01 2.4783E-02
 H= 2.5000E-02 R= 2.2224E+02 AC= 5.0001E-04 NEVAL= 68
 36 2.0000E+00 -3.0869E+00 1.0141E+00 7.0590E-01 9.4636E-01 2.5322E-02
 H= 2.5000E-02 R= 2.3257E+02 AC= 4.7405E-04 NEVAL= 72
 46 2.4750E+00 -2.6395E+00 1.0293E+00 7.1651E-01 9.3803E-01 3.9867E-02
 H= 5.0000E-02 R= 3.1803E+02 AC= 4.4628E-04 NEVAL= 92
 53 3.0000E+00 -2.1471E+00 1.0554E+00 7.4345E-01 9.4086E-01 5.8707E-02
 H= 2.0000E-01 R= 3.2760E+02 AC= 4.4585E-04 NEVAL= 106
 63 3.6250E+00 -1.5528E+00 1.0959E+00 7.9799E-01 9.6301E-01 6.8579E-02
 H= 5.0000E-02 R= 2.8288E+02 AC= 4.6314E-04 NEVAL= 129
 65 3.6794E+00 -1.5004E+00 1.0997E+00 8.0359E-01 9.6549E-01 6.8798E-02
 H= 5.0000E-02 R= 2.7205E+02 AC= 4.8639E-04 NEVAL= 133

DRAG VECTOR AT FINAL POINT -
 DIRECTION COSINES- 8.2736E-01 3.1554E-02 5.6078E-01 ANGLES A AND
 AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14496E+00 9.73520E-

TRAJECTORY NUMBER 2 TARGET COORDINATES - XPSTAR = -1.500235 YPSTAR =
 YPSTARF=

YFINAL ZFINAL ITERATIONS YINIT ZINIT ER
 .3951E-02 -.1236E-02 1 .4128E-02 -.3891E-03 .140

KSTEP T X Y Z VPX VPY
 0 0. -5.0001E+00 9.8523E-01 6.9791E-01 9.6007E-01 1.3617E-02
 H= 1.0000E-01 R= 2.7205E+02 AC= 0. NEVAL= 1
 10 7.0000E-01 -4.3282E+00 9.9484E-01 6.9686E-01 9.5934E-01 1.4030E-02
 H= 1.0000E-01 R= 5.1988E+01 AC= 8.3522E-04 NEVAL= 15
 14 1.0000E+00 -4.0405E+00 9.9914E-01 6.9664E-01 9.5824E-01 1.4719E-02
 H= 1.0000E-01 R= 8.7042E+01 AC= 5.9501E-04 NEVAL= 23
 24 1.8688E+00 -3.2113E+00 1.0145E+00 6.9955E-01 9.4866E-01 2.2828E-02
 H= 6.2500E-03 R= 2.0108E+02 AC= 5.1932E-04 NEVAL= 48
 34 1.9750E+00 -3.1106E+00 1.0170E+00 7.0074E-01 9.4677E-01 2.4901E-02
 H= 2.5000E-02 R= 2.2250E+02 AC= 4.9985E-04 NEVAL= 68
 36 2.0000E+00 -3.0870E+00 1.0176E+00 7.0105E-01 9.4630E-01 2.5444E-02
 H= 2.5000E-02 R= 2.3288E+02 AC= 4.7383E-04 NEVAL= 72
 46 2.6250E+00 -2.4990E+00 1.0393E+00 7.1738E-01 9.3677E-01 4.6008E-02
 H= 5.0000E-02 R= 3.3341E+02 AC= 4.4043E-04 NEVAL= 93
 52 3.0000E+00 -2.1473E+00 1.0592E+00 7.3850E-01 9.4062E-01 5.9214E-02
 H= 1.0000E-01 R= 3.2871E+02 AC= 4.4545E-04 NEVAL= 105
 62 3.6250E+00 -1.5532E+00 1.1001E+00 7.9303E-01 9.6281E-01 6.9236E-02
 H= 5.0000E-02 R= 2.8409E+02 AC= 4.6253E-04 NEVAL= 128
 64 3.6800E+00 -1.5002E+00 1.1039E+00 7.9877E-01 9.6534E-01 6.9463E-02
 H= 5.0000E-02 R= 2.7313E+02 AC= 4.8587E-04 NEVAL= 132

DRAG VECTOR AT FINAL POINT -
 DIRECTION COSINES- 8.2653E-01 3.2372E-02 5.6197E-01 ANGLES A AND G
 AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14547E+00 9.73446E-

TRAJECTORY NUMBER 3 TARGET COORDINATES - XPSTAR = -1.499648 YPSTAR =
 YPSTARF=

YFINAL ZFINAL ITERATIONS YINIT ZINIT ER
 .3971E-03 -.2022E-02 1 .4452E-03 -.1895E-02 .131

KSTEP T X Y Z VPX VPY
 0 0. -5.0000E+00 9.8154E-01 6.9640E-01 9.6000E-01 1.3583E-02
 H= 1.0000E-01 R= 2.7313E+02 AC= 0. NEVAL= 1
 10 7.0000E-01 -4.3282E+00 9.9114E-01 6.9535E-01 9.5927E-01 1.3995E-02
 H= 1.0000E-01 R= 5.2060E+01 AC= 8.3513E-04 NEVAL= 13
 14 1.0000E+00 -4.0405E+00 9.9542E-01 6.9513E-01 9.5817E-01 1.4684E-02
 H= 1.0000E-01 R= 8.7322E+01 AC= 5.9455E-04 NEVAL= 17

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25
 01 2.2724E-02 9.8902E-03 8.7962E-01 9.4692E-02 1.0612E-01
 = 48
 01 2.4783E-02 1.2530E-02 8.7645E-01 1.0571E-01 1.2211E-01
 = 68
 01 2.5322E-02 1.3231E-02 8.7562E-01 1.1110E-01 1.3036E-01
 = 72
 01 3.9867E-02 3.3994E-02 9.0337E-01 1.5468E-01 2.1774E-01
 = 92
 01 5.8707E-02 6.9232E-02 1.0128E+00 1.4126E-01 2.6912E-01
 = 106
 01 6.8579E-02 1.0215E-01 1.1111E+00 8.4626E-02 2.2827E-01
 = 129
 01 6.8798E-02 1.0407E-01 1.1229E+00 7.4802E-02 2.1077E-01
 = 133

01 ANGLES A AND GAMMA- 2.1841E+00 5.5890E+01
 496E+00 9.73520E-01

00235 YPSTAR = 1.103272 ZPSTAR = .800000 (FLOW SYSTEM)
 YPSTARF= .003280 ZPSTARF= -.000000 (FLUX TUBE SYSTEM)

ZINIT ERROR (FLUX TUBE SYSTEM)
 2 -.3891E-03 .1406E-02

	VPX	VPY	VPZ	VX	VY	VZ
01	1.3617E-02	-1.6521E-03	9.6007E-01	1.3617E-02	1.2551E-02	
= 1						
01	1.4030E-02	-1.1109E-03	9.3831E-01	2.6589E-02	2.5095E-02	
= 15						
01	1.4719E-02	-2.3501E-04	9.2016E-01	4.0642E-02	3.9509E-02	
= 23						
01	2.2828E-02	9.7640E-03	8.7928E-01	9.5240E-02	1.0563E-01	
= 48						
01	2.4901E-02	1.2396E-02	8.7602E-01	1.0636E-01	1.2160E-01	
= 68						
01	2.5444E-02	1.3095E-02	8.7515E-01	1.1181E-01	1.2984E-01	
= 72						
01	4.6008E-02	4.3395E-02	9.2909E-01	1.6091E-01	2.4252E-01	
= 93						
01	5.9214E-02	6.9218E-02	1.0123E+00	1.4274E-01	2.6969E-01	
= 105						
01	6.9236E-02	1.0236E-01	1.1112E+00	8.5586E-02	2.2938E-01	
= 128						
01	6.9463E-02	1.0433E-01	1.1232E+00	7.5645E-02	2.1166E-01	
= 132						

01 ANGLES A AND GAMMA- 2.2429E+00 5.5808E+01
 47E+00 9.73446E-01

99648 YPSTAR = 1.100025 ZPSTAR = .796739 (FLOW SYSTEM)
 YPSTARF= -.000000 ZPSTARF= -.003280 (FLUX TUBE SYSTEM)

ZINIT ERROR (FLUX TUBE SYSTEM)
 -.1895E-02 .1319E-02

	VPX	VPY	VPZ	VX	VY	VZ
01	1.3583E-02	-1.6586E-03	9.6000E-01	1.3583E-02	1.2544E-02	
= 1						
01	1.3995E-02	-1.1167E-03	9.3816E-01	2.6541E-02	2.5099E-02	
= 13						
01	1.4684E-02	-2.3900E-04	9.1991E-01	4.0595E-02	3.9543E-02	
= 17						

	H= 1.0000E-01	R= 0.7222E+01	AC= 5.9455E-04	NEVAL= 17
24	1.8625E+00 -3.2174E+00 1.0106E+00	6.9800E-01	9.4863E-01	2.2692E-02
	H= 6.2500E-03	R= 2.0058E+02	AC= 5.1985E-04	NEVAL= 42
34	2.0000E+00 -3.0871E+00 1.0139E+00	6.9955E-01	9.4614E-01	2.5428E-02
	H= 5.0000E-02	R= 2.2856E+02	AC= 4.9509E-04	NEVAL= 62
35	2.0000E+00 -3.0871E+00 1.0139E+00	6.9955E-01	9.4614E-01	2.5428E-02
	H= 5.0000E-02	R= 2.3908E+02	AC= 4.5250E-04	NEVAL= 64
45	2.8000E+00 -2.3354E+00 1.0443E+00	7.2469E-01	9.3711E-01	5.2784E-02
	H= 5.0000E-02	R= 3.3842E+02	AC= 4.3855E-04	NEVAL= 86
49	3.0000E+00 -2.1477E+00 1.0555E+00	7.3724E-01	9.4038E-01	5.9353E-02
	H= 1.0000E-01	R= 3.2808E+02	AC= 4.4975E-04	NEVAL= 94
59	3.6500E+00 -1.5296E+00 1.0983E+00	7.9477E-01	9.6385E-01	6.9443E-02
	H= 5.0000E-02	R= 2.8269E+02	AC= 4.6343E-04	NEVAL= 117
60	3.6808E+00 -1.4998E+00 1.1004E+00	7.9793E-01	9.6528E-01	6.9554E-02
	H= 5.0000E-02	R= 2.7710E+02	AC= 4.7361E-04	NEVAL= 119

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.1238E-01 4.2836E-02 5.8156E-01 ANGLES A AND G
 AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14489E+00 9.73459E-01

TRAJECTORY NUMBER 4 TARGET COORDINATES - XPSTAR = -1.499765 YPSTAR =
 YPSTARP=

YFINAL ZFINAL ITERATIONS YINIT ZINIT ERR
 -.4310E-02 .7579E-04 1 -.3891E-02 -.3977E-03 .1033

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-4.9999E+00	9.7721E-01	6.9790E-01	9.5996E-01	1.3530E-02
	H= 1.0000E-01	R= 2.7710E+02	AC= 0.	NEVAL= 1		
10	7.0000E-01	-4.3281E+00	9.8676E-01	6.9687E-01	9.5923E-01	1.3941E-02
	H= 1.0000E-01	R= 5.2125E+01	AC= 8.3479E-04	NEVAL= 13		
14	1.0000E+00	-4.0405E+00	9.9104E-01	6.9667E-01	9.5813E-01	1.4628E-02
	H= 1.0000E-01	R= 8.7353E+01	AC= 5.9414E-04	NEVAL= 17		
24	1.8625E+00	-3.2174E+00	1.0011E+00	6.9959E-01	9.4856E-01	2.2624E-02
	H= 6.2500E-03	R= 2.0095E+02	AC= 5.1945E-04	NEVAL= 42		
34	2.0000E+00	-3.0871E+00	1.0094E+00	7.0116E-01	9.4606E-01	2.5356E-02
	H= 5.0000E-02	R= 2.2900E+02	AC= 4.9474E-04	NEVAL= 62		
35	2.0000E+00	-3.0871E+00	1.0094E+00	7.0116E-01	9.4606E-01	2.5356E-02
	H= 5.0000E-02	R= 2.3953E+02	AC= 4.5218E-04	NEVAL= 64		
45	2.8000E+00	-2.3355E+00	1.0358E+00	7.2645E-01	9.3704E-01	5.2642E-02
	H= 5.0000E-02	R= 3.3867E+02	AC= 4.3847E-04	NEVAL= 86		
49	3.0000E+00	-2.1478E+00	1.0510E+00	7.3908E-01	9.4034E-01	5.9173E-02
	H= 1.0000E-01	R= 3.2816E+02	AC= 4.4983E-04	NEVAL= 94		
59	3.6500E+00	-1.5297E+00	1.0935E+00	7.9682E-01	9.6387E-01	6.9148E-02
	H= 5.0000E-02	R= 2.8240E+02	AC= 4.6359E-04	NEVAL= 116		
60	3.6811E+00	-1.4997E+00	1.0957E+00	8.0009E-01	9.6531E-01	6.9255E-02
	H= 5.0000E-02	R= 2.7685E+02	AC= 4.7364E-04	NEVAL= 118		

DRAG VECTOR AT FINAL POINT -

DIRECTION COSINES- 8.1378E-01 4.0887E-02 5.7973E-01 ANGLES A AND G
 AIR AND PARTICLE SPEEDS AT THE FINAL POINT ARE 1.14496E+00 9.73502E-01

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0E-01	9.4863E-01	2.2692E-02	9.6505E-03	8.7890E-01	9.4679E-02	1.0508E-01
5E-04	NEVAL=	42				
5E-01	9.4614E-01	2.5428E-02	1.3140E-02	8.7412E-01	1.0920E-01	1.2612E-01
9E-04	NEVAL=	62				
5E-01	9.4614E-01	2.5428E-02	1.3140E-02	8.7418E-01	1.1472E-01	1.3465E-01
0E-04	NEVAL=	64				
8E-01	9.3711E-01	5.2784E-02	5.5842E-02	9.6504E-01	1.5739E-01	2.6271E-01
5E-04	NEVAL=	86				
4E-01	9.4038E-01	5.9353E-02	6.9706E-02	1.0176E+00	1.4059E-01	2.7074E-01
5E-04	NEVAL=	94				
7E-01	9.6385E-01	6.9443E-02	1.0389E-01	1.1154E+00	8.2849E-02	2.2593E-01
3E-04	NEVAL=	117				
9E-01	9.6528E-01	6.9554E-02	1.0497E-01	1.1215E+00	7.7790E-02	2.1679E-01
1E-04	NEVAL=	119				

2 5.8156E-01 ANGLES A AND GAMMA- 3.0184E+00 5.4440E+01
 ARE 1.14489E+00 9.73459E-01

YSTAR = -1.499765 YPSTAR = 1.096728 ZPSTAR = .800000 (FLOW SYSTEM)
 YPSTARP = -.803280 ZPSTARP = .000000 (FLUX TUBE SYSTEM)

YINIT ZINIT ERROR (FLUX TUBE SYSTEM)
 -.3891E-02 -.3977E-03 .1033E-02

Z	VPX	VPY	VPZ	VX	VY	VZ
0E-01	9.5996E-01	1.3530E-02	-1.6213E-03	9.5996E-01	1.3530E-02	1.2582E-02
	NEVAL=	1				
7E-01	9.5923E-01	1.3941E-02	-1.0773E-03	9.3808E-01	2.6448E-02	2.5186E-02
3E-04	NEVAL=	13				
7E-01	9.5813E-01	1.4628E-02	-1.9607E-04	9.1978E-01	4.0466E-02	3.9694E-02
4E-04	NEVAL=	17				
9E-01	9.4856E-01	2.2624E-02	9.7440E-03	8.7866E-01	9.4430E-02	1.0556E-01
5E-04	NEVAL=	42				
5E-01	9.4606E-01	2.5356E-02	1.3253E-02	8.7459E-01	1.0891E-01	1.2671E-01
6E-04	NEVAL=	62				
5E-01	9.4606E-01	2.5356E-02	1.3253E-02	8.7396E-01	1.1442E-01	1.3528E-01
3E-04	NEVAL=	64				
5E-01	9.3704E-01	5.2642E-02	5.6158E-02	9.6537E-01	1.5667E-01	2.6346E-01
7E-04	NEVAL=	86				
5E-01	9.4034E-01	5.9173E-02	7.0049E-02	1.0180E+00	1.3981E-01	2.7122E-01
5E-04	NEVAL=	94				
5E-01	9.6387E-01	6.9148E-02	1.0418E-01	1.1156E+00	8.2154E-02	2.2576E-01
5E-04	NEVAL=	116				
5E-01	9.6531E-01	6.9255E-02	1.0526E-01	1.1216E+00	7.7109E-02	2.1662E-01
5E-04	NEVAL=	118				

5.7973E-01 ANGLES A AND GAMMA- 2.8763E+00 5.4568E+01
 RE 1.14496E+00 9.73502E-01

FOR OUT FROM 2

FLUX TUBE CROSS SECTION COORDINATES IN THE -

IP CENTER	INITIAL PLANE			TARGET PLANE	
	XP	YP	ZP	XP	YP
1	-5.0000E+00	9.8110E-01	6.9829E-01	-1.5000E+00	1.1000E+00
2	1.5884E-14	7.2555E-04	4.2635E-03	-5.2934E-15	-3.0215E-04
3	1.1492E-14	4.1278E-03	-3.8912E-04	-1.0963E-15	3.9506E-03
4	2.8054E-14	4.4517E-04	-1.8950E-03	-2.9064E-15	3.9710E-04
	9.7370E-15	-3.8913E-03	-3.9756E-04	1.6757E-15	-4.3100E-03

FLUX TUBE CROSS SECTION AREA IN THE INITIAL PLANE= 2.47114E-05

CONCENTRATION FACTOR= 1.08337

AT THE POINT (X,Y,Z)= -1.50000 1.10000 .80000
 FOR A PARTICLE OF DIAMETER= 300.00000 WITH DIAMETER TO LENGTH RATIO= 1.
 NORMALIZED AIR SPEED AT FINAL POINT= 1.14339
 PARTICLE CONCENTRATION RATIO= 1.11288

CROSS SECTION COORDINATES IN THE -

TARGET PLANE

ZP	XP	YP	ZP
9829E-01	-1.5000E+00	1.1000E+00	8.0000E-01 (FLUX SYSTEM)
2635E-03	-5.2934E-15	-3.0215E-04	3.6111E-03 (FLUX TUBE SYSTEM)
8912E-04	-1.0963E-15	3.9506E-03	-1.2361E-03 (FLUX TUBE SYSTEM)
8950E-03	-2.9064E-15	3.9710E-04	-2.0225E-03 (FLUX TUBE SYSTEM)
9756E-04	1.6757E-15	-4.3100E-03	7.5786E-05 (FLUX TUBE SYSTEM)

THE INITIAL PLANE= 2.47114E-05

IN THE TARGET PLANE= 2.28097E-05

1.10000 .80000
000 WITH DIAMETER TO LENGTH RATIO= 1.00000E+00 AND DENSITY= 1.00000E+03
1.14339
11288

FOR COUT FROM 2

TANTRA

BODY IDENTIFIER IS TEST

NUMBER OF SYMMETRY PLANES= 0

NUMBER OF QUADRANT

89

FOLDOUT FROM

SYMMETRY PLANES= 0 NUMBER OF QUADRALATERALS= 189 MACH NUMBER= 0.

FOR BOUT FRAM. 2

TANGENT TRAJECTORY CODE RUN ID -
TEST PROBLEM WITH TEST BODY

PHYSICAL INPUT DATA -

AIR SPEED= 9.000000E+01 CHARACTERISTIC DIMENSION OF THE BODY= 1.000000E+01
DENSITY AND TEMPERATURE OF AIR ARE 9.092500E-01 AND 2.686590E+02 AIR

NUMERICAL INTEGRATOR INPUTS -

TIME STEP= 1.00000E-01 MINIMUM TIME STEP= 5.00000E-03 PRINT TIME INTERVAL=

LOCAL ERROR TOLERANCES FOR DVDQ - 1.00000E-05 1.00000E-05 1.00000E-05

TRAJECTORY DATA ARE WRITTEN ON UNIT 10 FOR PLOTTING

C DIMENSION OF THE BODY= 1.000000E+00
92500E-01 AND 2.686590E+02 AIR VISCOSITY IS 1.693764E-05

EP= 5.0000E-03 PRINT TIME INTERVAL= 1.0000E+00 X COORD. OF FINAL PLANE= 0.
0.0000E-05 1.0000E-05 1.0000E-05

OR PLOTTING

FOR COUT FRAM. 2

WATER DROP DIAMETER = 2.00000E+02 MICROMETERS

PARTICLE SETTLING SPEED= 7.69093E-01 M/SEC

TRAJECTORIES ARE TO BEGIN ALONG A LINE DEFINED BY THE POINTS (X1,Y1,Z1,) AND
(-5.00000E+00 0. -4.50000E-01) AND (-5.00000E+00
WITH DIRECTION COSINES -(COS(ALPHA),COS(BETA),COS(GAMMA)) - 0.

STARTING POINT INCREMENTS ARE - COARSE INCREMENT= 5.00000E-02 FINE INCREMENT=

* * * * * INITIAL COORDINATES X=-5.00000E+00 Y= 0. Z=-4.50000E-01
IFLAG= 7 FOR KSTEP= 27 NEVAL= 58 HMIN IS SET TO 3.1250E-03
IFLAG= 7 FOR KSTEP= 27 NEVAL= 59 HMIN IS SET TO 1.5625E-03
INSIDE QUAD 185 I2= 1
ZNP,ROSQ,TSQ,H= -5.4665E-03 2.4343E-01 1.0355E+00 2.5000E-02
INSIDE QUAD 188 I2= 1
ZNP,ROSQ,TSQ,H= -7.1977E-03 2.5035E-01 1.0355E+00 2.5000E-02
THE BODY SURFACE IS PENETRATED. PARTICLE COORDINATES ARE (X,Y,Z)-2.5523
TRIAL INITIAL COORDINATES ARE (YINIT,ZINIT) 0. -4.5000E-01

AFTER 0 ATTEMPTS PARTICLE STILL PENETRATES THE BODY.

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	0.	-4.5000E-01	9.4971E-01	-1.0353E-03
		H= 1.0000E-01	R= 8.2573E+00	AC= 1.9004E-17	NEVAL= 1	
10	5.0000E-01	-4.5253E+00	-5.2030E-04	-4.5857E-01	9.4686E-01	-1.0526E-03
		H= 5.0000E-02	R= 2.1823E+01	AC= 1.6453E-03	NEVAL= 17	
19	1.0000E+00	-4.0517E+00	-1.0637E-03	-4.6742E-01	9.4439E-01	-1.1384E-03
		H= 1.0000E-01	R= 6.8350E+01	AC= 6.6054E-04	NEVAL= 35	
29	1.8406E+00	-3.2695E+00	-2.2201E-03	-4.8800E-01	9.0566E-01	-1.7706E-03
		H= 1.5625E-03	R= 2.0070E+02	AC= 4.9963E-04	NEVAL= 63	
39	1.8750E+00	-3.2385E+00	-2.2817E-03	-4.8936E-01	9.0255E-01	-1.8174E-03
		H= 1.2500E-02	R= 2.1011E+02	AC= 4.9009E-04	NEVAL= 83	
47	2.0000E+00	-3.1264E+00	-2.5204E-03	-4.9505E-01	8.8980E-01	-2.0074E-03
		H= 5.0000E-02	R= 2.6029E+02	AC= 4.1124E-04	NEVAL= 99	
57	2.5750E+00	-2.6346E+00	-3.9965E-03	-5.5196E-01	8.2481E-01	-3.1898E-03
		H= 2.5000E-02	R= 3.9701E+02	AC= 3.9796E-04	NEVAL= 121	

* * * * * INITIAL COORDINATES X=-5.00000E+00 Y= 0. Z=-5.00000E-01
IFLAG= 7 FOR KSTEP= 28 NEVAL= 60 HMIN IS SET TO 3.1250E-03
IFLAG= 7 FOR KSTEP= 29 NEVAL= 63 HMIN IS SET TO 1.5625E-03
IFLAG= 7 FOR KSTEP= 108 NEVAL= 235 HMIN IS SET TO 7.8125E-04

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	0.	-5.0000E-01	9.5022E-01	-1.0211E-03
		H= 1.0000E-01	R= 3.9701E+02	AC= 8.2209E-21	NEVAL= 1	
10	5.0000E-01	-4.5250E+00	-5.1313E-04	-5.0905E-01	9.4939E-01	-1.0379E-03
		H= 5.0000E-02	R= 2.1255E+01	AC= 1.6923E-03	NEVAL= 17	
20	1.0000E+00	-4.0512E+00	-1.0485E-03	-5.1842E-01	9.4510E-01	-1.1204E-03
		H= 1.0000E-01	R= 6.6581E+01	AC= 6.7263E-04	NEVAL= 37	
30	1.8797E+00	-3.2321E+00	-2.2468E-03	-5.4173E-01	9.0617E-01	-1.7668E-03
		H= 1.5625E-03	R= 1.9997E+02	AC= 5.3975E-04	NEVAL= 65	

(X1,Y1,Z1,) AND (X2,Y2,Z2) -
(-5.00000E+00 0. 0.)
0. 0. 1.00000E+00

2 FINE INCREMENT= 5.00000E-03

Z=-4.50000E-01 FOR TRAJECTORY NUMBER 1
ET TO 3.1250E-03
ET TO 1.5625E-03

2.5000E-02

2.5000E-02

RE (X,Y,Z)-2.55232E+00-4.32804E-03-5.70585E-01
-4.5000E-01 ATTEMPT NUMBER 0

ODY.

	VPY	VPZ	VX	VY	VZ
1	-1.0353E-03	-1.7077E-02	9.4971E-01	-1.0353E-03	-8.5312E-03
1	-1.0526E-03	-1.7267E-02	9.2635E-01	-1.5046E-03	-1.5595E-02
17	-1.1384E-03	-1.8462E-02	8.7433E-01	-2.4196E-03	-3.7486E-02
35	-1.7706E-03	-3.8358E-02	7.3501E-01	-4.3441E-03	-1.5675E-01
63	-1.8174E-03	-4.0613E-02	7.2694E-01	-4.4526E-03	-1.6882E-01
83	-2.0074E-03	-5.1080E-02	6.9105E-01	-4.9664E-03	-2.4430E-01
99	-3.1898E-03	-1.6851E-01	7.4570E-01	-6.1109E-03	-5.7168E-01
121					

ORIGINAL PAGE IS
OF POOR QUALITY

Z=-5.00000E-01 FOR TRAJECTORY NUMBER 0
ET TO 3.1250E-03
ET TO 1.5625E-03
ET TO 7.8125E-04

	VPY	VPZ	VX	VY	VZ
1	-1.0211E-03	-1.8037E-02	9.5022E-01	-1.0211E-03	-9.4917E-03
17	-1.0379E-03	-1.8253E-02	9.2743E-01	-1.4781E-03	-1.7214E-02
37	-1.1204E-03	-1.9572E-02	8.7764E-01	-2.3594E-03	-4.0720E-02
65	-1.7668E-03	-4.2684E-02	7.4553E-01	-4.2808E-03	-1.7362E-01

PRINT FROM 2

40	1.90000E+00	-3.2901E+00	-2.2942E-03	-5.4294E-01	9.0593E-01	-1.0010E-03	NEVAL=	85
	H= 6.2500E-03	R= 2.0666E+02	AC= 4.9383E-04					
49	2.0000E+00	-3.1237E+00	-2.4692E-03	-5.4747E-01	8.9545E-01	-1.9350E-03	NEVAL=	103
	H= 2.5000E-02	R= 2.3735E+02	AC= 4.4684E-04					
59	2.5250E+00	-2.6674E+00	-3.7260E-03	-5.9541E-01	8.4607E-01	-2.8990E-03	NEVAL=	124
	H= 5.0000E-02	R= 3.5235E+02	AC= 4.1138E-04					
69	2.7125E+00	-2.5091E+00	-4.3054E-03	-6.2775E-01	8.4692E-01	-3.2768E-03	NEVAL=	147
	H= 1.2500E-02	R= 3.6565E+02	AC= 4.0703E-04					
79	2.8750E+00	-2.3701E+00	-4.8572E-03	-6.6329E-01	8.6379E-01	-3.4910E-03	NEVAL=	167
	H= 2.5000E-02	R= 2.7019E+02	AC= 4.4649E-04					
84	3.0000E+00	-2.2614E+00	-5.3064E-03	-6.9338E-01	8.7616E-01	-3.5962E-03	NEVAL=	178
	H= 2.5000E-02	R= 2.2479E+02	AC= 4.9517E-04					
94	3.2687E+00	-2.0226E+00	-6.2920E-03	-7.6277E-01	9.0165E-01	-3.7829E-03	NEVAL=	202
	H= 6.2500E-03	R= 2.2802E+02	AC= 4.7372E-04					
104	3.3750E+00	-1.9261E+00	-6.6963E-03	-7.9143E-01	9.1405E-01	-3.8160E-03	NEVAL=	222
	H= 2.5000E-02	R= 2.0274E+02	AC= 4.9549E-04					
114	3.3937E+00	-1.9089E+00	-6.7679E-03	-7.9658E-01	9.1608E-01	-3.8177E-03	NEVAL=	247
	H= 1.5625E-03	R= 1.9867E+02	AC= 5.3852E-04					
124	3.4500E+00	-1.8572E+00	-6.9827E-03	-8.1193E-01	9.2214E-01	-3.8205E-03	NEVAL=	267
	H= 1.2500E-02	R= 1.8939E+02	AC= 5.4795E-04					
134	3.8000E+00	-1.5285E+00	-8.3154E-03	-9.0780E-01	9.5632E-01	-3.7791E-03	NEVAL=	288
	H= 5.0000E-02	R= 1.9086E+02	AC= 5.4461E-04					
144	4.0000E+00	-1.3352E+00	-9.0641E-03	-9.6181E-01	9.7643E-01	-3.7025E-03	NEVAL=	311
	H= 5.0000E-02	R= 1.8499E+02	AC= 5.4930E-04					
145	4.0000E+00	-1.3352E+00	-9.0641E-03	-9.6181E-01	9.7643E-01	-3.7025E-03	NEVAL=	314
	H= 2.5000E-02	R= 1.8398E+02	AC= 5.5533E-04					
155	4.3500E+00	-9.8803E-01	-1.0328E-02	-1.0523E+00	1.0069E+00	-3.5092E-03	NEVAL=	335
	H= 2.5000E-02	R= 1.9043E+02	AC= 5.4239E-04					
165	4.7750E+00	-5.5306E-01	-1.1753E-02	-1.1520E+00	1.0387E+00	-3.1772E-03	NEVAL=	356
	H= 5.0000E-02	R= 1.8739E+02	AC= 5.4448E-04					
170	5.0000E+00	-3.1772E-01	-1.2444E-02	-1.1993E+00	1.0528E+00	-2.9619E-03	NEVAL=	367
	H= 5.0000E-02	R= 1.8378E+02	AC= 5.5173E-04					
175	5.2995E+00	1.1102E-16	-1.3284E-02	-1.2559E+00	1.0682E+00	-2.6446E-03	NEVAL=	377
	H= 1.0000E-01	R= 1.7534E+02	AC= 5.5777E-04					

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* * * * * SWITCH TO FINE STEPSIZE * *

* * * INITIAL COORDINATES X=-5.00000E+00 Y= 0. Z=-4.95000E-01
 IFLAG= 7 FOR KSTEP= 30 NEVAL= 57 HMIN IS SET TO 3.1250E-03
 IFLAG= 7 FOR KSTEP= 30 NEVAL= 58 HMIN IS SET TO 1.5625E-03
 INSIDE QUAD 187 I2= 1
 ZNF,ROSQ,TSQ,H= -3.2026E-04 1.6737E-01 6.7553E-01 2.5000E-02
 THE BODY SURFACE IS PENETRATED. PARTICLE COORDINATES ARE (X,Y,Z)-2.414
 TRIAL INITIAL COORDINATES ARE (YINIT,ZINIT) 0. -4.9500E-01

AFTER 0 ATTEMPTS PARTICLE STILL PENETRATES THE BODY.

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	0.	-4.9500E-01	9.5017E-01	-1.0226E-03
		H= 1.0000E-01	R= 1.7534E+02	AC= 4.2147E-20	NEVAL=	1
10	5.0000E-01	-4.5250E+00	-5.1385E-04	-5.0401E-01	9.4934E-01	-1.0394E-03
		H= 5.0000E-02	R= 2.1313E+01	AC= 1.6874E-03	NEVAL=	13
20	1.0000E+00	-4.0512E+00	-1.0501E-03	-5.1333E-01	9.4502E-01	-1.1222E-03
		H= 1.0000E-01	R= 5.6799E+01	AC= 9.2763E-04	NEVAL=	31
21	1.0000E+00	-4.0512E+00	-1.0501E-03	-5.1333E-01	9.4502E-01	-1.1222E-03
		H= 1.0000E-01	R= 6.6762E+01	AC= 6.7141E-04	NEVAL=	33
31	1.8766E+00	-3.2352E+00	-2.2457E-03	-5.3643E-01	9.0602E-01	-1.7688E-03
		H= 1.5625E-03	R= 2.0029E+02	AC= 5.0046E-04	NEVAL=	60
41	1.9063E+00	-3.2083E+00	-2.2988E-03	-5.3772E-01	9.0350E-01	-1.8081E-03
		H= 6.2500E-03	R= 2.0786E+02	AC= 4.9261E-04	NEVAL=	80

FOLDOUT FROM

85					
7E-01	-1.9350E-03	-5.2476E-02	7.2203E-01	-4.6783E-03	-2.3124E-01
103					
7E-01	-2.8990E-03	-1.4541E-01	7.7503E-01	-5.6161E-03	-5.0306E-01
124					
2E-01	-3.2768E-03	-2.0033E-01	9.5347E-01	-5.6300E-03	-5.6342E-01
147					
9E-01	-3.4910E-03	-2.3312E-01	1.0317E+00	-5.0500E-03	-4.5671E-01
167					
6E-01	-3.5962E-03	-2.4746E-01	1.0474E+00	-4.9247E-03	-4.0973E-01
178					
5E-01	-3.7829E-03	-2.6766E-01	1.1074E+00	-5.0931E-03	-3.8329E-01
202					
5E-01	-3.8160E-03	-2.7199E-01	1.1195E+00	-4.0114E-03	-3.1470E-01
222					
8E-01	-3.8177E-03	-2.7241E-01	1.1183E+00	-3.9671E-03	-3.0931E-01
247					
4E-01	-3.8205E-03	-2.7338E-01	1.1168E+00	-3.8600E-03	-2.9616E-01
267					
2E-01	-3.7791E-03	-2.7288E-01	1.1511E+00	-3.2909E-03	-2.4028E-01
288					
3E-01	-3.7025E-03	-2.6648E-01	1.1507E+00	-2.8540E-03	-1.8720E-01
311					
3E-01	-3.7025E-03	-2.6648E-01	1.1506E+00	-2.8140E-03	-1.8361E-01
314					
9E+00	-3.5092E-03	-2.4919E-01	1.1656E+00	-2.2839E-03	-1.3240E-01
335					
7E+00	-3.1772E-03	-2.1923E-01	1.1649E+00	-1.4809E-03	-7.1961E-02
356					
8E+00	-2.9619E-03	-2.0115E-01	1.1603E+00	-1.0059E-03	-4.1299E-02
367					
2E+00	-2.6446E-03	-1.7707E-01	1.1631E+00	-4.1830E-04	-1.9720E-02
377					

TO FINE STEPSIZE * * * * *

Z=-4.95000E-01 FOR TRAJECTORY NUMBER 1
 IS SET TO 3.1250E-03
 IS SET TO 1.5625E-03

ORIGINAL PAGE IS
 OF POOR QUALITY

01 2.5000E-02
 ES ARE (X,Y,Z) -2.41459E+00-4.70245E-03-6.47195E-01
 -4.9500E-01 ATTEMPT NUMBER 0

THE BODY.

VPX	VPY	VPZ	VX	VY	VZ
17E-01	-1.0226E-03	-1.7943E-02	9.5017E-01	-1.0226E-03	-9.3971E-03
1					
4E-01	-1.0394E-03	-1.8156E-02	9.2731E-01	-1.4808E-03	-1.7056E-02
13					
2E-01	-1.1222E-03	-1.9463E-02	8.8821E-01	-2.1833E-03	-3.4500E-02
31					
2E-01	-1.1222E-03	-1.9463E-02	8.7730E-01	-2.3654E-03	-4.0409E-02
33					
2E-01	-1.7688E-03	-4.2313E-02	7.4457E-01	-4.2901E-03	-1.7230E-01
60					
0E-01	-1.8081E-03	-4.4423E-02	7.3095E-01	-4.3748E-03	-1.8295E-01
80					

FRONT PAGE 2

48 2.0000E+00 -3.1240E+00 -2.4749E-03 -5.4224E-01 8.9490E-01 -1.9425E-03 -
 H= 2.5000E-02 R= 2.3887E+02 AC= 4.4563E-04 NEVAL= 94
 58 2.4750E+00 -2.7105E+00 -3.5943E-13 -5.8330E-01 8.4764E-01 -2.8141E-03 -
 H= 5.0000E-02 R= 3.4415E+02 AC= 4.1413E-04 NEVAL= 115
 68 2.7125E+00 -2.5103E+00 -4.3208E-03 -6.2286E-01 8.4491E-01 -3.3024E-03 -
 H= 1.2500E-02 R= 3.7292E+02 AC= 4.0480E-04 NEVAL= 137

* * * * * TANGENT TRAJECTORY IS AS FOLLO

* * * * * INITIAL COORDINATES X=-5.00000E+00 Y= 0. Z=-5.00000
 IFLAG= 7 FOR KSTEP= 28 NEVAL= 60 HMIN IS SET TO 3.1250E-03
 IFLAG= 7 FOR KSTEP= 29 NEVAL= 63 HMIN IS SET TO 1.5625E-03
 IFLAG= 7 FOR KSTEP= 108 NEVAL= 235 HMIN IS SET TO 7.8125E-04

KSTEP	T	X	Y	Z	VPX	VPY
0	0.	-5.0000E+00	0.	-5.0000E-01	9.5022E-01	-1.0211E-03
	H=	1.0000E-01	R= 3.7292E+02	AC= 9.3174E-21	NEVAL= 1	
10	5.0000E-01	-4.5250E+00	-5.1313E-04	-5.0905E-01	9.4939E-01	-1.0379E-03
	H=	5.0000E-02	R= 2.1255E+01	AC= 1.6923E-03	NEVAL= 17	
20	1.0000E+00	-4.0512E+00	-1.0485E-03	-5.1842E-01	9.4510E-01	-1.1204E-03
	H=	1.0000E-01	R= 6.6581E+01	AC= 6.7269E-04	NEVAL= 37	
30	1.8797E+00	-3.2321E+00	-2.2468E-03	-5.4179E-01	9.0617E-01	-1.7668E-03
	H=	1.5625E-03	R= 1.9997E+02	AC= 5.3975E-04	NEVAL= 65	
40	1.9063E+00	-3.2081E+00	-2.2942E-03	-5.4294E-01	9.0393E-01	-1.8018E-03
	H=	6.2500E-03	R= 2.0666E+02	AC= 4.9383E-04	NEVAL= 85	
49	2.0000E+00	-3.1237E+00	-2.4692E-03	-5.4747E-01	8.9545E-01	-1.9350E-03
	H=	2.5000E-02	R= 2.3735E+02	AC= 4.4684E-04	NEVAL= 103	
59	2.5250E+00	-2.6674E+00	-3.7260E-03	-5.9541E-01	8.4607E-01	-2.8990E-03
	H=	5.0000E-02	R= 3.5235E+02	AC= 4.1138E-04	NEVAL= 124	
69	2.7125E+00	-2.5091E+00	-4.3054E-03	-6.2775E-01	8.4692E-01	-3.2768E-03
	H=	1.2500E-02	R= 3.6565E+02	AC= 4.0703E-04	NEVAL= 147	
79	2.8750E+00	-2.3701E+00	-4.8572E-03	-6.6329E-01	8.6379E-01	-3.4910E-03
	H=	2.5000E-02	R= 2.7019E+02	AC= 4.4649E-04	NEVAL= 167	
84	3.0000E+00	-2.2614E+00	-5.3004E-03	-6.9339E-01	8.7616E-01	-3.5962E-03
	H=	2.5000E-02	R= 2.2479E+02	AC= 4.9517E-04	NEVAL= 178	
94	3.2687E+00	-2.0226E+00	-6.2920E-03	-7.6277E-01	9.0165E-01	-3.7829E-03
	H=	6.2500E-03	R= 2.2802E+02	AC= 4.7372E-04	NEVAL= 202	
104	3.3750E+00	-1.9261E+00	-6.6963E-03	-7.9148E-01	9.1405E-01	-3.8160E-03
	H=	2.5000E-02	R= 2.0274E+02	AC= 4.9549E-04	NEVAL= 222	
114	3.3937E+00	-1.9089E+00	-6.7679E-03	-7.9658E-01	9.1608E-01	-3.8177E-03
	H=	1.5625E-03	R= 1.9867E+02	AC= 5.3852E-04	NEVAL= 247	
124	3.4500E+00	-1.8572E+00	-6.9827E-03	-8.1193E-01	9.2214E-01	-3.8205E-03
	H=	1.2500E-02	R= 1.8939E+02	AC= 5.4795E-04	NEVAL= 267	
134	3.8000E+00	-1.5285E+00	-8.3154E-03	-9.0780E-01	9.5632E-01	-3.7791E-03
	H=	5.0000E-02	R= 1.9086E+02	AC= 5.4461E-04	NEVAL= 288	
144	4.0000E+00	-1.3352E+00	-9.0641E-03	-9.6181E-01	9.7643E-01	-3.7025E-03
	H=	5.0000E-02	R= 1.8499E+02	AC= 5.4930E-04	NEVAL= 311	
145	4.0000E+00	-1.3352E+00	-9.0641E-03	-9.6181E-01	9.7643E-01	-3.7025E-03
	H=	2.5000E-02	R= 1.8398E+02	AC= 5.5533E-04	NEVAL= 314	
155	4.3500E+00	-9.8803E-01	-1.0328E-02	-1.0523E+00	1.0069E+00	-3.5092E-03
	H=	2.5000E-02	R= 1.9043E+02	AC= 5.4239E-04	NEVAL= 335	
165	4.7750E+00	-5.5306E-01	-1.1753E-02	-1.1520E+00	1.0387E+00	-3.1772E-03
	H=	5.0000E-02	R= 1.8739E+02	AC= 5.4449E-04	NEVAL= 356	
170	5.0000E+00	-3.1772E-01	-1.2444E-02	-1.1993E+00	1.0528E+00	-2.9619E-03
	H=	5.0000E-02	R= 1.8378E+02	AC= 5.5173E-04	NEVAL= 367	
175	5.2995E+00	1.1102E-16	-1.3284E-02	-1.2559E+00	1.0682E+00	-2.6446E-03
	H=	1.0000E-01	R= 1.7534E+02	AC= 5.5777E-04	NEVAL= 377	

72

1 -1.9425E-03 -3.2353E-02 7.1946E-01 -4.6997E-03 -2.3140E-01
 94
 1 -2.8141E-03 -1.3307E-01 7.4906E-01 -5.5837E-03 -4.7531E-01
 115
 1 -3.3024E-03 -2.0236E-01 9.5275E-01 -5.7009E-03 -5.7291E-01
 137

TORY IS AS FOLLOWS * * * * *

Z=-5.00000E-01 FOR TRAJECTORY NUMBER 0
 ET TO 3.1250E-03
 ET TO 1.5625E-03
 ET TO 7.8125E-04

	VPY	VPZ	VX	VY	VZ
1	-1.0211E-03	-1.8037E-02	9.5022E-01	-1.0211E-03	-9.4917E-03
1	-1.0379E-03	-1.8253E-02	9.2743E-01	-1.4781E-03	-1.7214E-02
17	-1.1204E-03	-1.9572E-02	8.7764E-01	-2.3594E-03	-4.0720E-02
37	-1.7668E-03	-4.2684E-02	7.4593E-01	-4.2808E-03	-1.7362E-01
65	-1.8018E-03	-4.4579E-02	7.4102E-01	-4.3561E-03	-1.8313E-01
85	-1.9350E-03	-5.2476E-02	7.2203E-01	-4.6783E-03	-2.3124E-01
103	-2.8990E-03	-1.4541E-01	7.7503E-01	-5.6161E-03	-5.0306E-01
124	-3.2768E-03	-2.0033E-01	9.5347E-01	-5.6300E-03	-5.6342E-01
147	-3.4910E-03	-2.3312E-01	1.0317E+00	-5.0500E-03	-4.5671E-01
167	-3.5962E-03	-2.4746E-01	1.0474E+00	-4.9247E-03	-4.0973E-01
178	-3.7829E-03	-2.6766E-01	1.1074E+00	-5.0931E-03	-3.8329E-01
202	-3.8160E-03	-2.7199E-01	1.1195E+00	-4.0114E-03	-3.1470E-01
222	-3.8177E-03	-2.7241E-01	1.1113E+00	-3.9671E-03	-3.0931E-01
247	-3.8205E-03	-2.7338E-01	1.1168E+00	-3.8600E-03	-2.9616E-01
267	-3.7791E-03	-2.7288E-01	1.1511E+00	-3.2909E-03	-2.4028E-01
288	-3.7025E-03	-2.6648E-01	1.1507E+00	-2.8540E-03	-1.8720E-01
311	-3.7025E-03	-2.6648E-01	1.1506E+00	-2.8140E-03	-1.8361E-01
314	-3.5092E-03	-2.4919E-01	1.1656E+00	-2.2839E-03	-1.3240E-01
335	-3.1772E-03	-2.1923E-01	1.1649E+00	-1.4809E-03	-7.1961E-02
356	-2.9619E-03	-2.0115E-01	1.1603E+00	-1.0059E-03	-4.1299E-02
367	-2.6446E-03	-1.7707E-01	1.1631E+00	-4.1830E-04	-1.9720E-02
377					

STEREO

PLOT TANGENT TRAJECTORY TO THE TEST BODY

NUMBER OF SYMMETRY PLANES= 0 NUMBER OF TRAJECTORIES= 1 XSTART=

MINIMUM AND MAXIMUM COORDINATES -

X AXIS= -5.00000E+00 2.00000E+00
Y AXIS= -2.00000E+00 2.00000E+00
Z AXIS= -1.25593E+00 1.00000E+00

COORDINATE TRANSLATIONS USED TO CENTER THE PLOTS - DELX, DELY, DELZ -
-1.50000E+00 0. -1.27964E-01

CRT PLOTS

THETA = 0.00 PSI = 160.00 DELTA = 3.50
PLOT LABEL - THETA=0, PSI=160, DELTA=3.5
PEMSF = 1.5466E+00

TRAJ. NO. 1 OF 22 POINTS

Table with 5 columns: XTRAJ, YTRAJ, ZTRAJ, XPLOT, YPLOT. Contains 22 rows of trajectory data points.

TRAJ. NO. 1 OF 22 POINTS

Table with 5 columns: XTRAJ, YTRAJ, ZTRAJ, XPLOT, YPLOT. Contains 22 rows of trajectory data points.

FALLOUT TRAJECTORY

73

1 XSTART=-5.00000E+00

DELY, DELZ -
27964E-01

YPLOT

-.5754E+00
-.5754E+00
-.5894E+00
-.6039E+00
-.6400E+00
-.6418E+00
-.6488E+00
-.7229E+00
-.7729E+00
-.8279E+00
-.8744E+00
-.9818E+00
-.1026E+01
-.1034E+01
-.1058E+01
-.1206E+01
-.1290E+01
-.1290E+01
-.1429E+01
-.1584E+01
-.1657E+01
-.1744E+01

YPLOT

-.5754E+00
-.5754E+00
-.5894E+00
-.6039E+00
-.6400E+00
-.6418E+00
-.6488E+00
-.7229E+00

FOR OUT FRAM 2

-.2509E+01	-.4305E-02	-.8277E+00	-.4589E+00	-.7729E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.3750E+00	-.8279E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.3266E+00	-.8744E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.2202E+00	-.9818E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.1772E+00	-.1026E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.1696E+00	-.1034E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.1466E+00	-.1058E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.1809E-03	-.1206E+01
-.1335E+01	-.9064E-02	-.9618E+00	.8585E-01	-.1290E+01
-.1335E+01	-.9064E-02	-.9618E+00	.8585E-01	-.1290E+01
-.9880E+00	-.1033E-01	-.1052E+01	.2402E+00	-.1429E+01
-.5531E+00	-.1175E-01	-.1152E+01	.4334E+00	-.1584E+01
-.3177E+00	-.1244E-01	-.1199E+01	.5378E+00	-.1657E+01
.1110E-15	-.1328E-01	-.1256E+01	.6786E+00	-.1744E+01

THETA = 0.00 PSI = 160.00 DELTA = 3.00
PLOT LABEL - THETA=0, PSI=160, DELTA=3.0
PEMSF = 1.5568E+00

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.2129E+01	-.5792E+00
-.5000E+01	0.	-.5000E+00	-.2129E+01	-.5792E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1839E+01	-.5933E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1550E+01	-.6079E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.1050E+01	-.6442E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.1036E+01	-.6460E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.9841E+00	-.6531E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.7048E+00	-.7277E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.6076E+00	-.7780E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.5223E+00	-.8334E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.4555E+00	-.8802E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.3088E+00	-.9882E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.2496E+00	-.1033E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.2390E+00	-.1041E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.2073E+00	-.1065E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.5410E-02	-.1214E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1133E+00	-.1298E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1133E+00	-.1298E+01
-.9880E+00	-.1033E-01	-.1052E+01	.3262E+00	-.1439E+01
-.5531E+00	-.1175E-01	-.1152E+01	.5928E+00	-.1594E+01
-.3177E+00	-.1244E-01	-.1199E+01	.7370E+00	-.1668E+01
.1110E-15	-.1328E-01	-.1256E+01	.9315E+00	-.1756E+01

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.1593E+01	-.5792E+00
-.5000E+01	0.	-.5000E+00	-.1593E+01	-.5792E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1376E+01	-.5933E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1160E+01	-.6079E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.7850E+00	-.6442E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.7740E+00	-.6460E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.7354E+00	-.6531E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.5258E+00	-.7277E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.4529E+00	-.7780E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.3888E+00	-.8334E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.3387E+00	-.8802E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.2285E+00	-.9882E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.1840E+00	-.1033E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.1725E+00	-.1041E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.1594E+00	-.1065E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.5410E-02	-.1214E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1133E+00	-.1298E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1133E+00	-.1298E+01
-.9880E+00	-.1033E-01	-.1052E+01	.3262E+00	-.1439E+01
-.5531E+00	-.1175E-01	-.1152E+01	.5928E+00	-.1594E+01
-.3177E+00	-.1244E-01	-.1199E+01	.7370E+00	-.1668E+01
.1110E-15	-.1328E-01	-.1256E+01	.9315E+00	-.1756E+01

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-.1909E+01	-.0760E-02	-.7900E+00	-.1701E+00	-.1041E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.1522E+00	-.1065E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.5852E-03	-.1214E+01
-.1335E+01	-.9064E-02	-.9618E+00	.8853E-01	-.1298E+01
-.1335E+01	-.9064E-02	-.9618E+00	.8853E-01	-.1298E+01
-.9880E+00	-.1033E-01	-.1052E+01	.2484E+00	-.1439E+01
-.5531E+00	-.1175E-01	-.1152E+01	.4485E+00	-.1594E+01
-.3177E+00	-.1244E-01	-.1199E+01	.5566E+00	-.1668E+01
.1110E-15	-.1328E-01	-.1256E+01	.7025E+00	-.1756E+01

THETA = 0.00 PSI = 160.00 DELTA = 2.50
PLOT LABEL - THETA=0, PSI=160, DELTA=2.5
PEMSF = 1.5672E+00

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.2099E+01	-.5831E+00
-.5000E+01	0.	-.5000E+00	-.2099E+01	-.5831E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1814E+01	-.5973E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1529E+01	-.6119E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.1036E+01	-.6485E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.1021E+01	-.6504E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.9703E+00	-.6575E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.6948E+00	-.7326E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.5990E+00	-.7833E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.5148E+00	-.8390E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.4490E+00	-.8861E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.3043E+00	-.9949E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.2459E+00	-.1040E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.2355E+00	-.1048E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.2041E+00	-.1072E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.5043E-02	-.1222E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1129E+00	-.1307E+01
-.1335E+01	-.9064E-02	-.9618E+00	.1120E+00	-.1307E+01
-.9880E+00	-.1033E-01	-.1052E+01	.3220E+00	-.1449E+01
-.5531E+00	-.1175E-01	-.1152E+01	.5849E+00	-.1605E+01
-.3177E+00	-.1244E-01	-.1199E+01	.7271E+00	-.1679E+01
.1110E-15	-.1328E-01	-.1256E+01	.9189E+00	-.1768E+01

TRAJ. NO. 1 OF 22 POINTS

XTRAJ	YTRAJ	ZTRAJ	XPLOT	YPLOT
-.5000E+01	0.	-.5000E+00	-.1649E+01	-.5831E+00
-.5000E+01	0.	-.5000E+00	-.1649E+01	-.5831E+00
-.4525E+01	-.5131E-03	-.5091E+00	-.1425E+01	-.5973E+00
-.4051E+01	-.1049E-02	-.5184E+00	-.1201E+01	-.6119E+00
-.3232E+01	-.2247E-02	-.5418E+00	-.8129E+00	-.6485E+00
-.3208E+01	-.2294E-02	-.5429E+00	-.8015E+00	-.6504E+00
-.3124E+01	-.2469E-02	-.5475E+00	-.7615E+00	-.6575E+00
-.2667E+01	-.3726E-02	-.5954E+00	-.5446E+00	-.7326E+00
-.2509E+01	-.4305E-02	-.6277E+00	-.4691E+00	-.7833E+00
-.2370E+01	-.4857E-02	-.6633E+00	-.4028E+00	-.8390E+00
-.2261E+01	-.5300E-02	-.6934E+00	-.3509E+00	-.8861E+00
-.2023E+01	-.6292E-02	-.7628E+00	-.2369E+00	-.9949E+00
-.1926E+01	-.6696E-02	-.7915E+00	-.1908E+00	-.1040E+01
-.1909E+01	-.6768E-02	-.7966E+00	-.1826E+00	-.1048E+01
-.1857E+01	-.6983E-02	-.8119E+00	-.1579E+00	-.1072E+01
-.1528E+01	-.8315E-02	-.9078E+00	-.9949E-03	-.1222E+01
-.1335E+01	-.9064E-02	-.9618E+00	.9124E-01	-.1307E+01
-.1335E+01	-.9064E-02	-.9618E+00	.9124E-01	-.1307E+01

75

ORIGINAL PAGE
NUMBER QUALITY

- .9000E+00	- .1033E-01	- .1052E+01	.2507E+00	- .1449E+01
- .5531E+00	- .1175E-01	- .1152E+01	.4638E+00	- .1605E+01
- .3177E+00	- .1244E-01	- .1199E+01	.5758E+00	- .1679E+01
.1110E-15	- .1328E-01	- .1256E+01	.7268E+00	- .1768E+01

CODE LISTINGS

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PROGRAM PBOXC (INPUT,TAPE6, TAPE5=INPUT, OUTPUT,
1 TAPE8 , TAPE9, TAPE39, PUNCH, TAPE1=PUNCH)
C
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979
C
C THIS CODE HAS THREE PRINCIPAL USES -
C 1. DEBUG HESS-SMITH CODE INPUT DATA.
C 2. PLOT 3-DIMENSIONAL BODY SURFACE DESCRIPTION.
C 3. TRANSFER QUADRILATERAL ELEMENT DATA TO UNIT 9 FOR LATER
C USE BY PROGRAM STEREO.
C
C PERFORMS PRELIMINARY PROCESSING (IPROS=TRUE) (SCALING,
C TRANSLATING, ROTATING) OF INPUT DATA FOR THE HESS-SMITH
C NON-LIFTING CODE (RPT. E.S. 40622). PRELIMINARY PROCESSED DATA
C MAY BE PUNCHED (IPUNCH=TRUE). AFTER PRELIMINARY PROCESSING, DATA
C ALSO MAY BE PROCESSED INTO QUADRILATERAL ELEMENTS AND THE HESS-
C SMITH FIRST OUTPUT (E.S. 40622 SEC. 9.4) MAY BE PRINTED (IPRNT=
C TRUE). DATA ALSO MAY BE PLOTTED (IPICT=TRUE). IN ANY CASE THE
C DATA ARE WRITTEN ON TO UNIT 9, WHICH MAY BE SAVED FOR USE LATER
C BY SR STEREO WHICH PLOTS THE BODY ALONG WITH TRAJECTORIES.
C
COMMON HEDR( 15), NQUAD, KASE, NSYM, IFLAG, IPROS, IPUNCH, IFRNT,
1 IPICT, ICRT, SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS,
2 ZTRANS
REAL MACH
LOGICAL IPROS, IPUNCH, IPRNT, IPICT, ICRT
COMMON /P/ MACH, BETA, RBETA
C READ IN CONTROL DATA
1 READ ( 5, 9000 ) (HEDR(I), I=1,15), IFLAG, NSYM, KMACH, KASE
9000 FORMAT( 15A4, I1, 10X, I1, 1X, 11, 2X, A4)
MACH = 0.0
IF(KMACH .NE. 0) READ(5,6) MACH
6 FORMAT (F10.6)
BETA = SQRT(1.0 - MACH * MACH)
RBETA = 1.0 / BETA
READ(5,8000)IPROS, IPUNCH, IPRNT, IPICT, ICRT
8000 FORMAT(5I1)
IF( IPROS ) READ(5,7000) ANGLE, XSCALE, YSCALE, ZSCALE, XTRANS,
1 YTRANS, ZTRANS
7000 FORMAT( 7F10.0)
IF(.NOT. IPROS) GO TO 53
IF(XSCALE .EQ. 0.0) XSCALE=1.0
IF(YSCALE .EQ. 0.0) YSCALE=1.0
IF(ZSCALE .EQ. 0.0) ZSCALE=1.0
COSA = COS( 0.0174533 * ANGLE)
SINA = SIN( 0.0174533 * ANGLE)
50 REWIND 8
REWIND 9
CALL PINPUT
IF(IPICT ) CALL PICTUR
IF( ICRT ) CALL FRAME(0.5,0.5)
IF(IPICT .AND. .NOT. ICRT) CALL PLOT(15.0, 0.0, -3)
IF(IPICT .AND. .NOT. ICRT) CALL ENDCC
IF(IPICT .AND. ICRT) CALL ENDFLT
REWIND 9
STOP
E ID

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FBOXC 2
FBOXC 3
FBOXC 4
FBOXC 5
FBOXC 6
FBOXC 7
FBOXC 8
FBOXC 9
FBOXC 10
FBOXC 11
FBOXC 12
FBOXC 13
FBOXC 14
FBOXC 15
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FBOXC 48
FBOXC 49
FBOXC 50
FBOXC 51
FBOXC 51A
FBOXC 52
FBOXC 53
FBOXC 54
FBOXC 55
FBOXC 56

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*DECK, PINPUT	PINP	1
SUBROUTINE PINPUT	PINP	2
C	PINP	3
C	PINP	4
PROCESSES THE HESS-SMITH CODE INPUT DATA	PINP	5
C	PINP	6
REAL NX, NY, NZ , MACH	PINP	7
LOGICAL IPROS, IPUNCH, IFRNT, IPICT, ICRT, RFLAG, AFLAG, BFLAG	PINP	8
INTEGER STAT, STATT, CCNV	PINP	9
COMMON HEDR(15), NQUAD, KASE, NSYM, IFLAG, IPROS, IPUNCH, IFRNT,	PINP	10
1 IPICT, ICRT, SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS, YTFANS,	PINP	11
2 ZTRANS	PINP	12
COMMON /M/ MACH, BETA, REETA	PINP	13
DIMENSION SPH (200), CPH (200), XINP (200), ZINP (200)	PINP	14
DIMENSION LAXIS(8), RAXIS(6), L45(6), L(5)	PINP	15
DIMENSION XA (500), XB (500), YA (500), YB (500),	PINP	16
1 ZA (500), ZB (500), NLINE(500), NLT (500), CFLAG(3),	PINP	17
2 XI (4), ETA (4), XIN (4), YIN (4), ZIN (4),	PINP	18
4 RX (4), R (4), RY (4)	PINP	19
EQUIVALENCE (NULL,NQUAD)	PINP	20
DATA CFLAG	PINP	21
DATA PI/3.141593E0/, HAFPI/1.570796E0/, EPS/.0001/	PINP	22
DATA LAXIS / 4HVIEW, 4H CF , 4HBODY, 4H LOO, 4H KING, 4H DOW,	PINP	23
1 4HNT, 1HE/	PINP	24
DATA RAXIS/ 4H AXI, 4HSTO, 4HWARD, 4HTHE, 4H ORI, 4HGIN /	PINP	25
DATA L45/ 4H45-D, 4HEGRE, 4HEVI, 4HEWF, 4HROM , 4HTHE /	PINP	26
DATA R45/ 4H SIDE/, L/5*4H /	PINP	27
DATA PLUSX, MINUSX, FLUSY, MINUSY, PLUSZ, MINUSZ	PINP	28
1 / 4H +X , 4H -X , 4H +Y , 4H -Y , 4H +Z , 4H -Z /	PINP	29
1 FORMAT (3E10.0, I2 / 3F10.0, I2)	PINP	30
4002 FORMAT (1H0, 6X 5HN M, 7X, 4 (1HX, 11X), 2HNX, 11X, 3HNFX,	PINP	31
1 11X, 1HD / 19X, 4 (1HY, 11X), 2HNY, 11X, 3HNPY, 11X, 1HT /	PINP	32
2 19X, 4(1HZ, 11X), 2HNZ, 11X, 3HNZ, 11X, 1HA)	PINP	33
4005 FORMAT (1H0, 7X, I4, 4F12.6, 2F13.6, E14.4, A2/(12X, 4F12.6,	PINP	34
1 2F13.6, E14.4))	PINP	35
4010 FORMAT (1H0, 3X, 2I4, 4F12.6, 2F13.6, E14.4, A2/(12X, 4F12.6,	PINP	36
1 2F13.6, E14.4))	PINP	37
4015 FORMAT (1H0, 3 (20X, 12H*****))	PINP	38
C INPUT -- SECTION 9.1 INPUT SCHEME	PINP	39
KLCT = 0	PINP	40
NULL = 0	PINP	41
NPRT = 13	PINP	42
CALL PEADER	PINP	43
WRITE (6, 40)	PINP	44
40 FORMAT (1H0,16X,44HP A R A M E T R I C I N F O R M A T I O N//)	PINP	45
IF (NSYM - 1) 54, 56, 58	PINP	46
54 WRITE (6, 55)	PINP	47
55 FORMAT (1H0,16X,21HNC SYMMETRY SPECIFIED)	PINP	48
GO TO 61	PINP	49
56 WRITE (6, 57)	PINP	50
57 FORMAT (1H0,16X,30HTHERE IS ONE PLANE OF SYMMETRY)	PINP	51
GO TO 61	PINP	52
58 WRITE (6, 59) NSYM	PINP	53
59 FORMAT (1H0,16X,9HTHERE ARE,I2, 13H PLANES OF SYMMETRY)	PINP	54
61 IF (MACH .NE. 0.0) WRITE (6, 21) MACH	PINP	55
21 FORMAT (1H0,16X,13HMACH NUMBER =,F10.5)	PINP	56
IF (IFLAG .EQ. 0) GO TO 29	PINP	57
READ (5, 20) NLM1, MMIN, B, C	PINP	58
IF (B .EQ. 0.0) B = 1.0	PINP	59
IF (C .EQ. 0.0) C = 1.0	PINP	60

20	FORMAT (2I5, 2F10.5)	PINP 61
4	FORMAT (8F10.0)	PINP 62
	WRITE (6, 62) NLM1, MMIN, B, C	PINP 63
62	FORMAT (1H0,16X,10HGENERATE A,I3, 2H X,I3, 12H SPHERE. B =,F10.5,	PINP 64
1	4X,3HC =,F10.5)	PINP 65
	MLINES = MMIN + 1	PINP 66
	NLINES = NLM1 + 1	PINP 67
	N = 0	PINP 68
	IF (NSYM .EQ. 8) GO TO 2	PINP 69
	IF (NSYM - 2) 3, 5, 6	PINP 70
2	PITH = PI	PINP 71
	PIPHI = PI + PI	PINP 72
	GO TO 7	PINP 73
3	PITH = PI	PINP 74
	PIPHI = PI	PINP 75
	GO TO 7	PINP 76
5	PITH = PI	PINP 77
	PIPHI = HAFPI	PINP 78
	GO TO 7	PINP 79
6	PITH = HAFPI	PINP 80
	PIPHI = PITH	PINP 81
7	SPH (MLINES) = SIN (PIPHI)	PINP 82
	SPH (1) = 0.0	PINP 83
	CPH (MLINES) = COS (PIPHI)	PINP 84
	CPH (1) = 1.0	PINP 85
	EKM = MMIN	PINP 86
	EKN = NLM1	PINP 87
	EMM = 0.0	PINP 88
	DO 8 I = 2, MMIN	PINP 89
	EMM = EMM + 1.0	PINP 90
	PHI = EMM / EKM * PIPHI	PINP 91
	SPH (I) = SIN (PHI)	PINP 92
8	CPH (I) = COS (PHI)	PINP 93
	IF (IFLAG .EQ. 2) GO TO 10	PINP 94
	ENN = 1.0	PINP 95
	DO 9 I = 1, MLINES	PINP 96
	XA (I) = 1.0	PINP 97
	YA (I) = 0.0	PINP 98
9	ZA (I) = 0.0	PINP 99
	GO TO 18	PINP 100
10	READ (5, 4) (XINP (I), ZINP (I), I = 1, NLINES)	PINP 101
	DO 11 I = 1, MLINES	PINP 102
	XA (I) = XINP (1)	PINP 103
	YA (I) = B * ZINP (1) * SPH (I)	PINP 104
	ZA (I) = - C * ZINP (1) * CPH (I)	PINP 105
	XB (I) = XINP (2)	PINP 106
	YB (I) = B * ZINP (2) * SPH (I)	PINP 107
11	ZB (I) = - C * ZINP (2) * CPH (I)	PINP 108
	NLCT = 2	PINP 109
	GO TO 250	PINP 110
12	DO 14 I = 1, MLINES	PINP 111
	XA (I) = XB (I)	PINP 112
	YA (I) = YB (I)	PINP 113
14	ZA (I) = ZB (I)	PINP 114
	IF (IFLAG .EQ. 1) GO TO 16	PINP 115
	NLCT = NLCT + 1	PINP 116
	DO 15 I = 1, MLINES	PINP 117
	XB (I) = XINP (NLCT)	PINP 118
	YB (I) = B * ZINP (NLCT) * SPH (I)	PINP 119
15	ZB (I) = - C * ZINP (NLCT) * CPH (I)	PINP 120

GO TO 250	PINP 121
16 ENN = ENN + 1.0	PINP 122
18 THETA = ENN / EKN * PITH	PINP 123
STH = SIN (THETA)	PINP 124
CTH = COS (THETA)	PINP 125
DO 17 I = 1, MLINES	PINP 126
XB (I) = CTH	PINP 127
YB (I) = B * STH * SPH (I)	PINP 128
17 ZB (I) = - C * STH * CPH (I)	PINP 129
GO TO 250	PINP 130
29 N = -1	PINP 131
IF(IPROS) WRITE(6,101)	PINP 132
IF(IPROS) WRITE(6,102) XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS,	PINP 133
1 ZTRANS, COSA, SINA	PINP 134
IF(IPICT) WRITE(6,103)	PINP 135
IF(IPUNCH) WRITE(6,104)	PINP 136
C	PINP 137
101 FORMAT(1H0, 16X, 61HINPLT DATA ARE PROCESSED BY SCALING, ROTATING	PINP 138
1 AND TRANSLATING)	PINP 139
102 FORMAT(18X, 58HXSCALE, YSCALE, ZSCALE, XTRANS, YTRANS, ZTRANS, GO	PINP 140
1SA, SINA/ 15X, 8(1PE14.4))	PINP 141
103 FORMAT(1H0, 16X,18HFLOTS ARE PREPARED)	PINP 142
104 FORMAT(1H0, 16X, 16HDATA ARE PUNCHED)	PINP 143
XMIN = 1.0E6	PINP 144
XMAX = -1.0E6	PINP 145
YMIN = 1.0E6	PINP 146
YMAX = -1.0E6	PINP 147
ZMIN = 1.0E6	PINP 148
ZMAX = -1.0E6	PINP 149
GO TO 50	PINP 150
30 IF (RFLAG) GO TO 50	PINP 151
RFLAG = .TRUE.	PINP 152
X = XX	PINP 153
Y = YY	PINP 154
Z = ZZ	PINP 155
STAT = STATT	PINP 156
GO TO 66	PINP 157
50 RFLAG = .FALSE.	PINP 158
51 READ (5, 1) X, Y, Z, STAT, XX, YY, ZZ, STATT	PINP 159
IF (IPROS) CALL FATPROS(X, Y, Z, XX, YY, ZZ)	PINP 160
IF(IPUNCH) WRITE(1,5100) X, Y, Z, STAT, XX, YY, ZZ, STATT	PINP 161
5100 FORMAT(3(F10.7), I2/ 3(F10.7), I2)	PINP 162
WRITE (9) X,Y,Z,STAT,XX,YY,ZZ,STATT	PINP 163
C	PINP 164
64 XMIN = AMIN1(XMIN, X * RBETA)	PINP 165
YMIN = AMIN1(YMIN,Y)	PINP 166
ZMIN = AMIN1(ZMIN,Z)	PINP 167
XMAX = AMAX1(XMAX, X * RBETA)	PINP 168
YMAX = AMAX1(YMAX,Y)	PINP 169
ZMAX = AMAX1(ZMAX,Z)	PINP 170
IF(STAT .EQ. 3) GO TO 164	PINP 171
XMIN = AMIN1(XMIN, XX* RBETA)	PINP 172
YMIN = AMIN1(YMIN,YY)	PINP 173
ZMIN = AMIN1(ZMIN,ZZ)	PINP 174
XMAX = AMAX1(XMAX, XX* RBETA)	PINP 175
YMAX = AMAX1(YMAX,YY)	PINP 176
ZMAX = AMAX1(ZMAX,ZZ)	PINP 177
164 IF(NSYM .EQ. 0) GO TO 65	PINP 178
YMIN = AMIN1(YMIN, -Y)	PINP 179
YMAX = AMAX1(YMAX, -Y)	PINP 180

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IF(STAT .EQ. 3) GO TO 165
YMIN = AMIN1( YMIN, -YY)
YMAX = AMAX1( YMAX, -YY)
165 IF( NSYM .EQ. 1 ) GO TO 65
ZMIN = AMIN1( ZMIN, -Z)
ZMAX = AMAX1( ZMAX, -Z)
IF(STAT .EQ. 3) GO TO 65
ZMIN = AMIN1( ZMIN, -ZZ)
ZMAX = AMAX1( ZMAX, -ZZ)
65 IF (N .EQ. (-1))GO TO 80
66 IF (STAT .EQ. 0 .OR. STAT .EQ. 3) GO TO 180
IF ( STAT .EQ. 2 ) GO TO 200
IF ( .NOT. AFLAG ) GO TO 200
MC = M
80 M = 1
IF ( STAT .EQ. 2 ) GO TO 150
IF ( .NOT. BFLAG ) GO TO 84
75 DO 81 J = 1, MC
XA ( J ) = XB ( J )
YA ( J ) = YB ( J )
81 ZA ( J ) = ZB ( J )
83 XB ( 1 ) = X
YB ( 1 ) = Y
ZB ( 1 ) = Z
GO TO 30
84 IF ( AFLAG ) GO TO 85
BFLAG = .TRUE.
GO TO 75
85 AFLAG = .FALSE.
GO TO 83
150 AFLAG = .TRUE.
BFLAG = .FALSE.
IF (N .EQ. (-1))N = 0
160 XA ( M ) = X
YA ( M ) = Y
ZA ( M ) = Z
GO TO 30
180 M = M + 1
IF ( AFLAG ) GO TO 160
XB ( M ) = X
YB ( M ) = Y
ZB ( M ) = Z
IF ( STAT .NE. 3 ) GO TO 30
200 MMIN = MIN0(M, MC) - 1
MC = M
250 N = N + 1
KLCT = KLCT + 1
IF( .NOT. IPRNT) GO TO 2100

```

C BEGIN COMPUTATION OF NULL PCINTS AND 28 QUANTITIES

```

DO 2000 I = 1, MMIN
NULL = NULL + 1
XIN(1) = XA( I ) * RBETA
XIN(2) = XA(I+1) * RBETA
XIN(3) = XB(I+1) * RBETA
XIN(4) = XB( I ) * RBETA
YIN(1) = YA(I)
YIN(2) = YA(I+1)
YIN(3) = YB(I+1)

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YIN(4) = YB(I)	PINP 241
ZIN(1) = ZA(I)	PINP 242
ZIN(2) = ZA(I+1)	PINP 243
ZIN(3) = ZB(I+1)	PINP 244
ZIN(4) = ZB(I)	PINP 245
C FORM DIAGONAL VECTORS	PINP 246
C EQUATION (64)	PINP 247
T1X = XIN(3) - XIN(1)	PINP 248
T2X = XIN(4) - XIN(2)	PINP 249
T1Y = YIN(3) - YIN(1)	PINP 250
T2Y = YIN(4) - YIN(2)	PINP 251
T1Z = ZIN(3) - ZIN(1)	PINP 252
T2Z = ZIN(4) - ZIN(2)	PINP 253
C FORM CROSS PRODUCT N = T2 X T1	PINP 254
C EQUATION (65)	PINP 255
NX = T2Y*T1Z - T1Y*T2Z	PINP 256
NY = T1X*T2Z - T2X*T1Z	PINP 257
NZ = T2X*T1Y - T1X*T2Y	PINP 258
VN = SQRT (NX* NX + NY* NY + NZ* NZ)	PINP 259
C FORM UNIT NORMAL VECTOR	PINP 260
C EQUATION (66)	PINP 261
NX = NX / VN	PINP 262
NY = NY / VN	PINP 263
NZ = NZ / VN	PINP 264
C COMPUTE AVERAGE POINT	PINP 265
C EQUATION (68)	PINP 266
AVX = .25 * (XIN(1) + XIN(2) + XIN(3) + XIN(4))	PINP 267
AVY = .25 * (YIN(1) + YIN(2) + YIN(3) + YIN(4))	PINP 268
AVZ = .25 * (ZIN(1) + ZIN(2) + ZIN(3) + ZIN(4))	PINP 269
C COMPUTE PROJECTION DISTANCE	PINP 270
C EQUATIONS (69) AND (71)	PINP 271
D = NX*(AVX - XIN(1)) + NY*(AVY - YIN(1)) + NZ*(AVZ-ZIN(1))	PINP 272
PD = ABS(D)	PINP 273
C EQUATIONS (73) AND (74)	PINP 274
T = SQRT (T1X*T1X + T1Y*T1Y + T1Z*T1Z)	PINP 275
T1X = T1X / T	PINP 276
T1Y = T1Y / T	PINP 277
T1Z = T1Z / T	PINP 278
C EQUATION (75)	PINP 279
T2X = NY*T1Z - NZ*T1Y	PINP 280
T2Y = NZ*T1X - NX*T1Z	PINP 281
T2Z = NX*T1Y - NY*T1X	PINP 282
C COMPUTE COORDINATES OF CORNER POINTS IN REFERENCE COORD. SYSTEM	PINP 283
C EQUATION (72)	PINP 284
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	PINP 300

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DO 1000 J = 1, 4
XP = XIN(J) + NX * D
YP = YIN(J) + NY * D
ZP = ZIN(J) + NZ * D
D = - D
XDIF = XP - AVX
YDIF = YP - AVY
ZDIF = ZP - AVZ

C TRANSFORM CORNER POINTS TO ELEMENT COORDINATE SYSTEM ( XI, ETA )
C WITH AVERAGE POINT AS ORIGIN
C EQUATION ( 80 )

      XI(J) = T1X*XDIF + T1Y*YDIF + T1Z*ZDIF
1000 ETA(J) = T2X*XDIF + T2Y*YDIF + T2Z*ZDIF

C COMPUTE CENTROID
C EQUATION ( 81 )

      XI0 = .3333333E0 * ( XI ( 4 ) * ( ETA ( 1 ) - ETA ( 2 ) ) + XI ( 2 )
1 * ( ETA ( 4 ) - ETA ( 1 ) ) ) / ( ETA ( 2 ) - ETA ( 4 ) )
      ETA0 = -.3333333E0 * ETA(1)

C OBTAIN CORNER POINTS IN SYSTEM WITH CENTROID AS ORIGIN
C EQUATION ( 82 )

      DO 1020 J = 1, 4
      XI(J) = XI(J) - XI0
1020 ETA(J) = ETA(J) - ETA0

C COMPUTATION AIDS
      ETA2M1 = ETA ( 2 ) - ETA ( 1 )
      ETA3M2 = ETA ( 3 ) - ETA ( 2 )
      ETA4M3 = ETA ( 4 ) - ETA ( 3 )
      ETA1M4 = ETA ( 1 ) - ETA ( 4 )
      XI1M2 = XI ( 1 ) - XI ( 2 )
      XI2M3 = XI ( 2 ) - XI ( 3 )
      XI3M4 = XI ( 3 ) - XI ( 4 )
      XI4M1 = XI ( 4 ) - XI ( 1 )
      ETA2P4 = ETA ( 2 ) + ETA ( 4 )
      XI3M1 = XI ( 3 ) - XI ( 1 )
      XI4M2 = XI ( 4 ) - XI ( 2 )
      ETA2M4 = ETA ( 2 ) - ETA ( 4 )
      XI1234 = XI ( 1 ) + XI ( 2 ) + XI ( 3 ) + XI ( 4 )

C TRANSFORM CENTROID TO REFERENCE COORDINATE SYSTEM
C EQUATION ( 83 )
      XGENT = AVX + T1X*XI0 + T2X*ETA0
      YGENT = AVY + T1Y*XI0 + T2Y*ETA0
      ZGENT = AVZ + T1Z*XI0 + T2Z*ETA0

C COMPUTE LARGER DIAGONAL VECTOR
C EQUATION ( 84 )
      TSQ = AMAX1 ( XI3M1 ** 2, XI4M2 ** 2 + ETA2M4 ** 2 )
      T = SQRT ( TSQ )

C COMPUTE AREA
C EQUATION ( 85 )

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AREA = .5 * XI3M1 * ETA2M4

C COMPUTE CONSTANTS FOR EQUATIONS (42) AND (43)

C EQUATION (45)

D12SQ = XI1M2 ** 2 + ETA2M1 ** 2

D12 = SQRT (D12SQ)

D23SQ = XI2M3 ** 2 + ETA3M2 ** 2

D23 = SQRT (D23SQ)

D34SQ = XI3M4 ** 2 + ETA4M3 ** 2

D34 = SQRT (D34SQ)

D41SQ = XI4M1 ** 2 + ETA1M4 ** 2

D41 = SQRT (D41SQ)

C1 = 0.0

C2 = 0.0

C3 = 0.0

C4 = 0.0

C5 = 0.0

C6 = 0.0

C7 = 0.0

C8 = 0.0

XNP = 0.0

YNP = 0.0

IF (D12) 1030, 1040, 1030

1030 C1 = ETA2M1 / D12

C5 = XI1M2 / D12

1040 IF (D23) 1050, 1060, 1050

1050 C2 = ETA3M2 / D23

C6 = XI2M3 / D23

1060 IF (D34) 1070, 1080, 1070

1070 C3 = ETA4M3 / D34

C7 = XI3M4 / D34

1080 IF (D41) 1090, 1100, 1090

1090 C4 = ETA1M4 / D41

C8 = XI4M1 / D41

1100 CONV = 3

C BEGIN NULL POINT ITERATION

DO 1590 ITR = 1, 30

DO 1580 K = 1, 4

C EQUATION (47)

R (K) = SQRT ((XNP - XI (K)) ** 2 + (YNP - ETA (K)) ** 2)

RX (K) = (XNP - XI (K)) / R (K)

1580 RY (K) = (YNP - ETA (K)) / R (K)

R1PR2 = R (1) + R (2)

R2PR3 = R (2) + R (3)

R3PR4 = R (3) + R (4)

R4PR1 = R (4) + R (1)

ARG1 = ALOG ((R1PR2 - D12) / (R1PR2 + D12))

ARG2 = ALOG ((R2PR3 - D23) / (R2PR3 + D23))

ARG3 = ALOG ((R3PR4 - D34) / (R3PR4 + D34))

ARG4 = ALOG ((R4PR1 - D41) / (R4PR1 + D41))

C COMPUTE INDUCED VELOCITY COMPONENTS

C EQUATIONS (42) AND (43)

VX = C1 * ARG1 + C2 * ARG2 + C3 * ARG3 + C4 * ARG4

VY = C5 * ARG1 + C6 * ARG2 + C7 * ARG3 + C8 * ARG4

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C COMPUTE PARTIAL DERIVATIVES OF INDUCED VELOCITIES
C EQUATION ( 90 ), USING EQUATIONS ( 91 ) - ( 93 )
D12P= ( R1PR2 ** 2 - D12 SQ ) * .5
D23P= ( R2PR3 ** 2 - D23 SQ ) * .5
D34P= ( R3PR4 ** 2 - D34 SQ ) * .5
D41P= ( R4PR1 ** 2 - D41 SQ ) * .5
C1P = ETA2M1 / D12P
C2P = ETA3M2 / D23P
C3P = ETA4M3 / D34P
C4P = ETA1M4 / D41P
C5P = XI1M2 / D12P
C6P = XI2M3 / D23P
C7P = XI3M4 / D34P
C8P = XI4M1 / D41P
R12Y = RY ( 1 ) + RY ( 2 )
R23Y = RY ( 2 ) + RY ( 3 )
R34Y = RY ( 3 ) + RY ( 4 )
R41Y = RY ( 4 ) + RY ( 1 )
VXX = C1P* ( RX ( 1 ) + RX ( 2 ) ) + C2P* ( RX ( 2 ) + RX ( 3 ) ) +
1 C3P* ( RX ( 3 ) + RX ( 4 ) ) + C4P* ( RX ( 4 ) + RX ( 1 ) )
VXY = C1P* R12Y + C2P* R23Y + C3P* R34Y + C4P* R41Y
VYY = C5P* R12Y + C6P* R23Y + C7P* R34Y + C8P* R41Y
C COMPUTE NEW NULL POINT ( XNP, YNP )
C EQUATION ( 94 )
XMP = ( VY * VXY - VX * VYY ) / ( VXX * VYY - VXY ** 2 )
XNP = XMP + XNP
YNP = YNP - ( VX + VXX * XMP ) / VXY
C TEST NULL POINT CONVERGENCE
IF ( ABS ( VX ) .LT. EPS .AND. ABS ( VY ) .LT. EPS ) GO TO 1600
1590 CONTINUE
C NO CONVERGENCE , USE 30TH ITERATION
CONV = 2
C TEST IF THIS POINT IS OUTSIDE THE ELEMENT
1600 IF ( XNP ** 2 + YNP ** 2 .LE. TSQ ) GO TO 1620
C CONVERGES TO POINT AT INFINITY
CONV = 1
XNULL = XCENT
YNULL = YCENT
ZNULL = ZCENT
GO TO 1700
C TRANSFORM NULL POINT TO REFERENCE COORDINATE SYSTEM
C EQUATION ( 79 ) NOTE THAT Z - COORDINATE IS ZERO
1620 XNULL = XCENT + T1X * XNP + T2X * YNP
YNULL = YCENT + T1Y * XNP + T2Y * YNP
ZNULL = ZCENT + T1Z * XNP + T2Z * YNP
C PRINT RESULTS -- SECTION 9.4 THE FIRST OUTPUT
1700 IF ( NPRT .GE. 11 ) GO TO 1750
NPRT = NPRT + 1

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	IF (I .EQ. 1) GO TO 1760	PINP 481
	WRITE (6, 4005) I, XIN, NX, XNULL , PD, CFLAG (CONV),	PINP 482
	1 YIN, NY, YNULL , T, ZIN, NZ, ZNULL , AREA	PINP 483
	GO TO 1770	PINP 484
1750	NPRT = 0	PINP 485
	CALL PEADER	PINP 486
	WRITE (6, 4002)	PINP 487
1760	WRITE (6, 4010) N , I, XIN, NX, XNULL , PD, CFLAG (CONV	PINP 488
	1), YIN, NY, YNULL , T, ZIN, NZ, ZNULL , AREA	PINP 489
1770	CONTINUE	PINP 490
2000	CONTINUE	PINP 491
2100	NLT (KLCT) = MMIN	PINP 492
	NLINE (KLCT) = N	PINP 493
	IF (IFLAG .EQ. 0) GO TO 2001	PINP 494
	IF (N .LT. NLM1) GO TO 12	PINP 495
	IF(IPRNT) WRITE(6,4015)	PINP 496
	GO TO 2025	PINP 497
2001	IF (STAT .LT. 2) GO TO 80	PINP 498
	NLT(KLCT) = -NLT(KLCT)	PINP 499
	NPRT = NPRT + 1	PINP 500
	IF(IPRNT) WRITE(6,4015)	PINP 501
		PINP 502
C	TEST FOR END OF CASE	PINP 503
2020	IF (STAT .NE. 3) GO TO 80	PINP 504
2025	NN1 = MGD (3 * NQUAD, 255)	PINP 505
	NQNN1 = NQUAD	PINP 506
	IF (NN1 .LT. 5 .AND. NN1 .GT. 0) NQNN1 = NQUAD + 2	PINP 507
	DELX = -0.5 * (XMIN + XMAX)	PINP 508
	DELY = -0.5 * (YMIN + YMAX)	PINP 509
	DELZ = -0.5 * (ZMIN + ZMAX)	PINP 510
	WRITE (9) XMIN, XMAX, YMIN, YMAX, ZMIN, ZMAX, DELX, DELY, DELZ,	PINP 511
1	NSYM	PINP 512
	ENDFILE 9	PINP 513
	REWIND 9	PINP 514
	IF (.NOT. IPICT) GO TO 8500	PINP 515
C	SET UP PERSPECTIVE ANGLES FOR PLOTS	PINP 516
	WRITE (8) XMIN, XMAX, YMIN, YMAX, ZMIN, ZMAX, DELX, DELY, DELZ	PINP 517
	LAST = 0	PINP 518
	PHI = 0.0	PINP 519
C	THE OPERATION OF ANGLES THETA AND PSI ARE AS FOLLOWS FOR A RIGHT	PINP 520
C	HANDED COORDINATE SYSTEM WITH THE Z AXIS DIRECTED UPWARD. FIRST	PINP 521
C	ROTATE THE COORDINATE SYSTEM BY ANGLE THETA ABOUT THE Y AXIS SUCH	PINP 522
C	THAT FOR POSITIVE THETA THE POSITIVE X AXIS TILTS UPWARD. THEN	PINP 523
C	ROTATE BY ANGLE PSI ABOUT THE NEW Z AXIS SUCH THAT FOR POSITIVE	PINP 524
C	PSI THE ROTATION IS CLOCKWISE WHEN VIEWED FROM ABOVE.	PINP 525
	IF (NSYM .GT. 0) IF (NSYM - 2) 2028, 2029, 2030	PINP 526
2027	PSI = 90.	PINP 527
	THETA = 0.0	PINP 528
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, MINUSY, RAXIS	PINP 529
	PSI = 45.	PINP 530
	THETA = 45.	PINP 531
	WRITE (8) PSI, THETA, PHI, LAST, L45, PLUSX, MINUSY, PLUSZ, R45 ,L	PINP 532
	THETA = -45.	PINP 533
	WRITE (8) PSI, THETA, PHI, LAST, L45, PLUSX, MINUSY, MINUSZ, R45,L	PINP 534
	PSI = 135.	PINP 535
	WRITE (8) PSI, THETA, PHI, LAST, L45, MINUSX, MINUSY, PLUSZ, R45,L	PINP 536
	THETA = 45.	PINP 537
	WRITE (8) PSI, THETA, PHI, LAST, L45, MINUSX, MINUSY, MINUSZ,R45,L	PINP 538
2028	PSI = 0.	PINP 539
	THETA = -90.	PINP 540

	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, MINUSZ, RAXIS	PINP 541
	THETA= 45.	PINP 542
	PSI=-135.	PINP 543
	WRITE (8) PSI, THETA, PHI, LAST, L45, MINUSX, PLUSY, MINUSZ, R45, L	PINP 544
	THETA=-45.	PINP 545
	PSI=-45.	PINP 546
	WRITE (8) PSI, THETA, PHI, LAST, L45, PLUSX, PLUSY, MINUSZ, R45, L	PINP 547
2029	PSI = 180.	PINP 548
	THETA = 0.	PINP 549
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, MINUSX, RAXIS	PINP 550
	PSI = -135.	PINP 551
	THETA = -45.	PINP 552
	WRITE (8) PSI, THETA, PHI, LAST, L45, MINUSX, PLUSY, PLUSZ, R45, L	PINP 553
2030	THETA = 0.0	PINP 554
	PSI = 0.	PINP 555
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, PLUSX, RAXIS	PINP 556
	THETA = 0.0	PINP 557
	PSI = -90.	PINP 558
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, PLUSY, RAXIS	PINP 559
	THETA = 90.	PINP 560
	PSI = 0.	PINP 561
	WRITE (8) PSI, THETA, PHI, LAST, LAXIS, PLUSZ, RAXIS	PINP 562
	THETA = 45.	PINP 563
	PSI = -45.	PINP 564
	LAST = 1	PINP 565
	WRITE (8) PSI, THETA, PHI, LAST, L45, PLUSX, PLUSY, PLUSZ, R45, L	PINP 566
8500	REWIND 8	PINP 567
C		PINP 568
	IF(IPRNT) WRITE(6,9999) NQUAD	PINP 569
9999	FORMAT(1H0, 16X, I5, 26H BASIC ELEMENTS WERE INPUT)	PINP 570
	RETURN	PINP 571
	END	PINP 572

*DECK, PICTURE	PICT	1
SUBROUTINE PICTUR	PICT	2
C	PICT	3
C PLOTS SURFACE ELEMENTS ON A 3-DIMENSIONAL BODY	PICT	4
LOGICAL IPROS, IPUNCH, IFRNT, IPICT, ICRT, RFLAG, AFLAG, BFLAG	PICT	5
COMMON HEDR(15), NQUAD, KASE, NSYM, IFLAG, IPROS, IPUNCH, IFRNT,	PICT	6
1 IPICT, ICRT, SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS, YTFANS,	PICT	7
2 ZTRANS	PICT	8
DIMENSION XA(250),XB(250),YA(250),YB(250),ZA(250),ZB(250),	PICT	9
1 XIN(4),YIN(4),ZIN(4),HLABEL(15), PROGID(3),	PICT	10
2 YIN2(4),ZIN2(4), YPLTSC(4), ZPLTSC(4),HLINE2(7),	PICT	11
3 HLINE1(7), XM(2), YM(2), ZM(2)	PICT	12
REAL NX,NY,NZ,NXO	PICT	13
INTEGER STAT,STATT	PICT	14
DATA PROGID/ 7HNORMENT, 4H3840, 3HLYC/	PICT	15
DATA ISHAD,IFRAME/0,0/ , XSC,YSC,ZSC/3*1.0/	PICT	16
FIRST(QX,QY,QZ,Q1,Q2,Q3) = QX*Q1 + QY*Q2 + QZ*Q3	PICT	17
THIRD(QX,QY,QZ,QPSI,QTHETA,QPHI) = QX*(COS(QTHETA)*COS(QPSI)) +	PICT	18
1 QY*(-SIN(QPSI)*COS(QPHI)+SIN(QTHETA)*COS(QPSI)*SIN(QPHI)) +	PICT	19
2 QZ*(SIN(QPSI)*SIN(QPHI)+SIN(QTHETA)*COS(QPSI)*COS(QPHI))	PICT	20
IREFL = NSYM	PICT	21
IF(IREFL .GT. 2) IREFL = 2	PICT	22
IPIC = 1	PICT	23
IF(ICRT) GO TO 750	PICT	24
CALL PLOTID	PICT	25
C CALL PLTI03(PROGID, 200.0, 11.0, 1.0)	PICT	26
CALL PLOT(5.0, 0.0, -3)	PICT	27
GO TO 2	PICT	28
750 CALL MICRO(PROGID, 1.0, 14.0)	PICT	29
READ(5,3000) HLINE1, HLINE2	PICT	30
3000 FORMAT(7A6/7A6)	PICT	31
CALL TITL(HLINE1,HLINE2)	PICT	32
WRITE(6, 5201)	PICT	33
5201 FORMAT(1H-, 12H CRT PLOTS)	PICT	34
2 REWIND 9	PICT	35
301 READ (8) XM(1),XM(2),YM(1),YM(2),ZM(1),ZM(2),DELX,DELY,DELZ	PICT	36
WRITE(6,7400) XM(1),XM(2),YM(1),YM(2),ZM(1),ZM(2)	PICT	37
WRITE(6,7500)	PICT	38
WRITE(6,7700) DELX,DELY,DELZ	PICT	39
7400 FORMAT(1H0, 9X, 81HMINIMUM AND MAXIMUM COORDINATES IN THE SCALE	PICT	40
10, TRANSLATED, ROTATED SYSTEM -/12X, 7HX AXIS=2(1PE15.5)/	PICT	41
2 12X, 7HY AXIS=2(1PE15.5)/ 12X, 7HZ AXIS=2(1PE15.5))	PICT	42
7500 FORMAT(1H0, 9X, 69HCOORDINATE TRANSLATIONS USED TO CENTER THE PLOT	PICT	43
1S - DELX, DELY, DELZ -)	PICT	44
7700 FORMAT(12X,39H AFTER SCALING, TRANSLATING, ROTATING -3(1PE15.5)/)	PICT	45
4 IPIC = IPIC + 1	PICT	46
C READ PLOTTING INSTRUCTIONS	PICT	47
READ (8) PSI,THETA,PHI,LAST, HLABEL	PICT	48
WRITE(6,5205)HLABEL	PICT	49
5205 FORMAT(5X, 15A4)	PICT	50
8 IF(IPIC .GT. 2 .AND. .NOT. ICRT) CALL PLOT(10.0, -5.5, -3)	PICT	51
IF(IPIC .GT. 2 .AND. ICRT) CALL FRAME(0.5, 0.5)	PICT	52
C SET UP STARTING CONSTANTS	PICT	53
	PICT	54
	PICT	55
	PICT	56
	PICT	57
	PICT	58
	PICT	59
	PICT	60

	IFADV = 1	PICT 61
	PSI = PSI / 57.29578E0	PICT 62
	THETA = THETA / 57.29578E0	PICT 63
	PHI = PHI / 57.29578E0	PICT 64
	SINTH = SIN(THETA)	PICT 65
	COSTH = COS(THETA)	PICT 66
	SINPSI= SIN(PSI)	PICT 67
	COSPSI= COS(PSI)	PICT 68
	SINPHI= SIN(PHI)	PICT 69
	COSPHI= COS(PHI)	PICT 70
	A1 = COSTH * SINPSI	PICT 71
	A2 = COSPSI*COSPHI + SINTH*SINPSI*SINPHI	PICT 72
	A3 = -COSPSI*SINPHI + SINTH*SINPSI*COSPHI	PICT 73
	A4 = -SINTH	PICT 74
	A5 = COSTH*SINPHI	PICT 75
	A6 = COSTH*COSPHI	PICT 76
	A7 = COSTH*COSPSI	PICT 77
	A8 = -SINPSI*COSPHI + SINTH*COSPSI*SINPHI	PICT 78
	A9 = SINPSI*SINPHI + SINTH*COSPSI*COSPHI	PICT 79
C	SET SCALE FACTOR FOR THE PLOT	PICT 80
	YSM= 1.E50	PICT 81
	ZSM= 1.E50	PICT 82
	YLG=-1.E50	PICT 83
	ZLG=-1.E50	PICT 84
	DO 20 I=1,2	PICT 85
	X=XM(I)+DELX	PICT 86
	DO 20 J=1,2	PICT 87
	Y=YM(J)+DELY	PICT 88
	DO 20 K=1,2	PICT 89
	Z=ZM(K)+DELZ	PICT 90
	YNR=FIRST(X,Y,Z,A1,A2,A3)	PICT 91
	ZNR=FIRST(X,Y,Z,A4,A5,A6)	PICT 92
	YSM=AMIN1(YSM,YNR)	PICT 93
	ZSM=AMIN1(ZSM,ZNR)	PICT 94
	YLG=AMAX1(YLG,YNR)	PICT 95
20	ZLG=AMAX1(ZLG,ZNR)	PICT 96
	PENSF=9.99/AMAX1(YLG-YSM,ZLG-ZSM)	PICT 97
	N = -1	PICT 98
	NN = - 1	PICT 99
		PICT 100
C	READ IN SURFACE DATA	PICT 101
29	READ (9) X,Y,Z,STAT, XX,YY,ZZ,STATT	PICT 102
	IF (STAT .EQ. 3 .OR. STATT .EQ. 3) REWIND 9	PICT 103
	RFLAG = .FALSE.	PICT 104
	GO TO 80	PICT 105
30	IF (RFLAG) GO TO 50	PICT 106
	RFLAG = .TRUE.	PICT 107
	X = XX	PICT 108
	Y = YY	PICT 109
	Z = ZZ	PICT 110
	STAT = STATT	PICT 111
	GO TO 60	PICT 112
50	RFLAG = .FALSE.	PICT 113
	READ (9) X,Y,Z,STAT, XX,YY,ZZ,STATT	PICT 114
	IF (STAT .EQ. 3 .OR. STATT .EQ. 3) REWIND 9	PICT 115
60	IF (STAT .EQ. 0 .OR. STAT .EQ. 3) GO TO 180	PICT 116
	IF (STAT .EQ. 2) GO TO 200	PICT 117
70	IF (.NOT. AFLAG) GO TO 200	PICT 118
	MC = M	PICT 119
		PICT 120

80	M = 1	PICT 121
	IF (STAT .EQ. 2) GO TO 150	PICT 122
	IF (.NOT. BFLAG) GO TO 84	PICT 123
75	DO 81 J = 1, MC	PICT 124
	XA(J) = XB(J)	PICT 125
	YA(J) = YB(J)	PICT 126
81	ZA(J) = ZB(J)	PICT 127
83	XB(1) = X	PICT 128
	YB(1) = Y	PICT 129
	ZB(1) = Z	PICT 130
	GO TO 30	PICT 131
84	IF (AFLAG) GO TO 85	PICT 132
	BFLAG = .TRUE.	PICT 133
	GO TO 75	PICT 134
85	AFLAG = .FALSE.	PICT 135
	GO TO 83	PICT 136
150	AFLAG = .TRUE.	PICT 137
	BFLAG = .FALSE.	PICT 138
	N = N + 1	PICT 139
160	XA(M) = X	PICT 140
	YA(M) = Y	PICT 141
	ZA(M) = Z	PICT 142
	GO TO 30	PICT 143
180	M = M + 1	PICT 144
	IF (AFLAG) GO TO 160	PICT 145
	XB(M) = X	PICT 146
	YB(M) = Y	PICT 147
	ZB(M) = Z	PICT 148
	IF (STAT .NE. 3) GO TO 30	PICT 149
200	MMIN = MIN0 (M, MC) - 1	PICT 150
	MC = M	PICT 151
250	N = N + 1	PICT 152
	NN = NN + 1	PICT 153
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		PICT 294
		PICT 295
		PICT 296
		PICT 297
		PICT 298
		PICT 299
		PICT 300

C	FORM CROSS PRODUCT N=T2 X T1 - EQUATION (65)	PICT 181
	NX = T2Y*T1Z - T1Y*T2Z	PICT 182
	NY = T1X*T2Z - T2X*T1Z	PICT 183
	NZ = T2X*T1Y - T1X*T2Y	PICT 184
	VN = SQRT (NX*NX + NY*NY + NZ*NZ)	PICT 185
C	FORM UNIT NORMAL VECTOR - EQUATION (66)	PICT 186
	NX = NX / VN	PICT 187
	NY = NY / VN	PICT 188
	NZ = NZ / VN	PICT 189
	IF (IFADV .EQ. 0) GO TO 471	PICT 190
C	A NEW VIEW OF THE BODY IS TO BE PLOTTED. PLOT THE LEGEND AND	PICT 191
C	INITIALIZE FOR THE BODY PLOT.	PICT 192
	IF(ICRT) GO TO 524	PICT 193
	CALL PLOT(2.5, 0.0, 3)	PICT 194
	CALL SYMBOL(2.5, 0.0, 0.150, HLABEL, 0.0, 60)	PICT 195
	CALL PLOT(7.5, 5.5, -3)	PICT 196
	GO TO 525	PICT 197
524	CALL STBEAM(24)	PICT 198
	CALL SYMBOL(3.0, 0.0, 0.150, HLABEL, 0.0, 60)	PICT 199
	CALL STBEAM(18)	PICT 200
	CALL PLOT(8.0, 5.5, -3)	PICT 201
525	IFADV = 0	PICT 202
		PICT 203
471	NX0 = THIRD(NX,NY,NZ,PSI,THETA,PHI)	PICT 204
	IF (NX0.LE.0.0 .AND. ISHAD.EQ.0) GO TO 571	PICT 205
		PICT 206
C	CALCULATE POINTS TO BE PLOTTED	PICT 207
530	Y01 = FIRST(XIN(1),YIN(1),ZIN(1),A1,A2,A3)	PICT 208
	Y02 = FIRST(XIN(2),YIN(2),ZIN(2),A1,A2,A3)	PICT 209
	Y03 = FIRST(XIN(3),YIN(3),ZIN(3),A1,A2,A3)	PICT 210
	Y04 = FIRST(XIN(4),YIN(4),ZIN(4),A1,A2,A3)	PICT 211
	Z01 = FIRST(XIN(1),YIN(1),ZIN(1),A4,A5,A6)	PICT 212
	Z02 = FIRST(XIN(2),YIN(2),ZIN(2),A4,A5,A6)	PICT 213
	Z03 = FIRST(XIN(3),YIN(3),ZIN(3),A4,A5,A6)	PICT 214
	Z04 = FIRST(XIN(4),YIN(4),ZIN(4),A4,A5,A6)	PICT 215
		PICT 216
	YIN2(1) = Y01	PICT 217
	YIN2(2) = Y02	PICT 218
	YIN2(3) = Y03	PICT 219
	YIN2(4) = Y04	PICT 220
	ZIN2(1) = Z01	PICT 221
	ZIN2(2) = Z02	PICT 222
	ZIN2(3) = Z03	PICT 223
	ZIN2(4) = Z04	PICT 224
C	SCALE AND PLOT A SINGLE QUADRILATERAL	PICT 225
	DO 540 II=1,4	PICT 226
	YPLTSC(II) = YIN2(II) * PENSF	PICT 227
	ZPLTSC(II) = ZIN2(II) * PENSF	PICT 228
	IF(ABS(ZPLTSC(II)) .LE. 5.000)	PICT 229
1	GO TO 540	PICT 230
	WRITE(6,5000) N, M	PICT 231
5000	FORMAT(1H0, 10X, 21HSCALE TROUBLE FOR N =I4, 3X, 3HM =I4)	PICT 232
	GO TO 2000	PICT 233
540	CONTINUE	PICT 234
	CALL PLOT(YPLTSC(1), ZPLTSC(1), 3)	PICT 235
		PICT 236
		PICT 237
		PICT 238
		PICT 239
		PICT 240

DO 550 II=2,4	PICT 241
550 CALL PLOT(YPLTSC(II), ZPLTSC(II), 2)	PICT 242
CALL PLOT(YPLTSC(1), ZPLTSC(1), 2)	PICT 243
571 IF (IREFL .EQ. 0 .OR. IRFLG .EQ. 3) GO TO 2000	PICT 244
IF (IREFL .EQ. 2 .AND. IRFLG .EQ. 1) GO TO 600	PICT 245
IF (IREFL .EQ. 2 .AND. IRFLG .EQ. 2) GO TO 602	PICT 246
C	PICT 247
C REFLECT QUADRANT I ELEMENTS TO QUADRANT II	PICT 248
DO 580 II = 1,4	PICT 249
580 YIN(II) = -YIN(II)	PICT 250
NY = -NY	PICT 251
GO TO 604	PICT 252
C	PICT 253
C REFLECT QUADRANT II ELEMENTS TO QUADRANT IV	PICT 254
600 DO 601 II = 1,4	PICT 255
YIN(II) = -YIN(II)	PICT 256
601 ZIN(II) = -ZIN(II)	PICT 257
NY = -NY	PICT 258
NZ = -NZ	PICT 259
GO TO 604	PICT 260
C	PICT 261
C REFLECT QUADRANT IV ELEMENTS TO QUADRANT III	PICT 262
602 DO 603 II = 1,4	PICT 263
603 YIN(II) = -YIN(II)	PICT 264
NY = -NY	PICT 265
C	PICT 266
C	PICT 267
604 IRFLG = IRFLG + 1	PICT 268
IF (IREFL .EQ. 1) IRFLG = 3	PICT 269
GO TO 471	PICT 270
	PICT 271
	PICT 272
	PICT 273
2000 CONTINUE	PICT 274
2001 IF (STAT .LT. 2) GO TO 480	PICT 275
NN = NN - 1	PICT 276
N = - 1	PICT 277
475 IF (IFRAME .EQ. 2) IFADV = 1	PICT 278
480 IF (IFRAME .EQ. 1) IFADV = 1	PICT 279
485 IF (IFADV .EQ. 1) CALL PLOT(10.0, -5.5, -3)	PICT 280
	PICT 281
	PICT 282
C TEST FOR END OF CASE	PICT 283
2020 IF (STAT .NE. 3) GO TO 80	PICT 284
IF (LAST .EQ. 1) RETURN	PICT 285
GO TO 4	PICT 286
END	PICT 287

	OVERLAY(BOXC,0,0)	BOXC	1
	PROGRAM MAIN(INPUT,TAPE6, TAPE5=INPUT, OUTPUT,		
	1 TAPE1, TAPE3, TAPE8, TAPE9, TAPE11, TAPE12, TAPE13,	BOXC	3
	2 TAPE4, TAPE10, TAPE14)	BOXC	4
C		BOXC	5
C	H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1979	BOXC	6
C		BOXC	7
C	THIS IS ESSENTIALLY THE NON-LIFTING POTENTIAL FLOW CODE OF HESS	BOXC	8
C	AND SMITH AS DESCRIBED IN DOUGLAS AIRCRAFT CO. RPT. E.S. 40622	BOXC	9
C	(15 MARCH 1962), AD-282 255. THAT REPORT SHOULD BE CONSULTED FOR	BOXC	10
C	DETAILS OF THE METHOD AND COMPUTATION.	BOXC	11
C		BOXC	12
C	EIGHT OVERLAYS ARE USED. THE FINAL OVERLAY WRITES THE 28	BOXC	13
C	QUANTITIES ON UNIT 14 FOR USE BY SR FLOVEL IN CALCULATING FLOW	BOXC	14
C	VELOCITIES.	BOXC	15
C		BOXC	16
C	ALSO REQUIRED, IN ADDITION TO THE SYSTEM INPUT, OUTPUT AND PUNCH	BOXC	17
C	UNITS, ARE THE FOLLOWING UNITS - 1,3,8,9,10,11,12,13.	BOXC	18
C		BOXC	19
	LOGICAL IPROS	BOXC	20
	COMMON HEDR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,	BOXC	21
1	KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	BOXC	22
	REAL MACH	BOXC	23
	COMMON /SPACER/ DUMMY (14000)	BOXC	24
	COMMON /ATAPE / NATAPE	BOXC	25
	COMMON /M/ MACH, BETA, RBETA	BOXC	26
	LOGICAL AFLOW, BFLOW, CFLOW	BOXC	27
	COMMON /DFLOW/ AFLOW,BFLOW,CFLOW,NMAT,NMATM1,NAFLOW,NBFLOW,NCFLOW	BOXC	28
	COMMON/SOLVE/ N1,N2,N3,KORE,NFL	BOXC	29
	COMMON /INPT/ LIST, IPRS	BOXC	30
	COMMON /PROS/ SINA,COSA, XSCALE, YSCALE, ZSCALE, XTRANS,	BOXC	31
1	YTRANS, ZTRANS	BOXC	32
	COMMON /FLOWP/ NU,NNON	BOXC	33
	COMMON /SIG/ NFLCOM	BOXC	34
	COMMON /TAPES/ MN	BOXC	35
	COMMON /FRINTO/ KMAT,NSEQ,KTP14	BOXC	36
	COMMON /GLEAK/ LEAK, FRACT	BOXC	37
6	FORMAT (F10.6)	BOXC	38
7000	FORMAT(7F10.0)	BOXC	39
7500	FORMAT(18X, 55HANGLE, XSCALE, YSCALE, ZSCALE, XTRANS, YTRANS, Z	BOXC	40
	1TRANS =/ 16X, 7(1PE13.4))	BOXC	41
8000	FORMAT(L1)	BOXC	42
9000	FORMAT (15A4,2I1,3L1,4I1,I2,4I1,1X,A4)	BOXC	43
9300	FORMAT(I4, F10.0)	BOXC	44
9400	FORMAT(1H0, 17X, 31HNUMBER OF LEAKY QUADRALATERALS=I4, 3X,	BOXC	45
	1 40HFRACTION OF FREE-STREAM VELOCITY LEAKED=1PE11.4)	BOXC	46
9500	FORMAT(1H0, 17X, 61HINPUT DATA ARE PROCESSED BY SCALING, ROTATING	BOXC	47
	1 AND TRANSLATING)	BOXC	48
	DATA KORE /14000/	BOXC	49
	NSEQ = 0	BOXC	50
C	READ IN CONTROL DATA	BOXC	51
1	READ (5, 9000) HEDR, IFLAG, LIST, AFLOW, BFLOW, CFLOW, ISIG,	BOXC	52
1	IPRS, MPR, NCODE, NNON, NSYM, NOFF, KMACH, KTP14, KASE	BOXC	53
	READ(5,8000) IPROS	BOXC	54
	IF(IPROS) READ(5,7000) ANGLE, XSCALE, YSCALE, ZSCALE,XTRANS,	BOXC	55
1	YTRANS, ZTRANS	BOXC	56
	IF(.NOT. IPROS) GO TO 2	BOXC	57

IF(XSCALE .EQ. 0.0) XSCALE=1.0	BOXC 58
IF(YSCALE .EQ. 0.0) YSCALE=1.0	BOXC 59
IF(ZSCALE .EQ. 0.0) ZSCALE=1.0	BOXC 60
2 CONTINUE	BOXC 61
READ(5,9300) LEAK, FRACT	BOXC 62
REWIND 1	BOXC 63
REWIND 3	BOXC 64
REWIND 8	BOXC 65
REWIND 9	BOXC 66
REWIND 10	BOXC 67
REWIND 11	BOXC 68
REWIND 12	BOXC 69
REWIND 13	BOXC 70
IF (LIST .EQ. 0) REWIND 4	BOXC 71
MACH = 0.0	BOXC 72
IF (KMACH .LE. 0) GO TO 7	BOXC 73
NNON = 0	BOXC 74
READ (5, 6) MACH	BOXC 75
AFLOW = .TRUE.	BOXC 76
BFLOW = .FALSE.	BOXC 77
CFLOW = .FALSE.	BOXC 78
7 BETA = SQRT(1.0 - MACH * MACH)	BOXC 79
RBETA = 1.0 / BETA	BOXC 80
NU = 8	BOXC 81
CALL HEADER	BOXC 82
WRITE(6,9200) IFLAG, LIST, ISIG, IPRS, MPR, NCODE, NNON,	BOXC 83
1 NOFF, KMACH, KTP14	BOXC 84
9200 FORMAT(1H0, 17X, 17HINPUT PARAMETERS-// 20X, 6HIFLAG=I2, 5X,	BOXC 85
1 5HLIST=I2, 5X, 5HISIG=I3, 6X, 5HIPRS=I2, 7X, 4HMPR=I2//	BOXC 86
2 20X, 6HNCODE=I2, 5X, 5HNNON=I2, 5X, 5HNOFF=I3, 5X, 6HKMACH=I2,	BOXC 87
3 5X, 6HKTP14=I2)	BOXC 88
IF(.NCT. IPRS) GO TO 40	BOXC 89
WRITE(6,9500)	BOXC 90
WRITE(6,7500) ANGLE,XSCALE,YSCALE,ZSCALE,XTRANS,YTRANS,ZTRANS	BOXC 91
40 WRITE(6,9400) LEAK, FRACT	BOXC 92
IF(.NOT. IPRS) GO TO 5)	BOXC 93
COSA = COS(0.0174533 * ANGLE)	BOXC 94
SINA = SIN(0.0174533 * ANGLE)	BOXC 95
50 IF (AFLOW .OR. BFLOW .OR. CFLOW) NU = 1	BOXC 96
C CALL INPT (LIST)	BOXC 97
CALL OVERLAY(4HBOXC,1,0)	BOXC 98
IF (LIST .NE. 0) GO TO 10	BOXC 99
C CALL FLOWS (NU, NNON)	BOXC 100
CALL OVERLAY(4HBOXC,1,1)	BOXC 101
IF(KTP14 .EQ. 1) CALL OVERLAY(4HBOXC,8,0)	BOXC 102
GO TO 1000	BOXC 103
10 CONTINUE	BOXC 104
GO TO 5000	BOXC 105
C	BOXC 106
C FORM XIJ , YIJ , AND ZIJ MATRICES	BOXC 107
C	BOXC 108
C1000 CALL VFORM	BOXC 109
1000 CALL OVERLAY(4HBOXC,2,0)	BOXC 110
IF (NCODE) 5000, 1500, 2000	BOXC 111
1500 NCODE = 1	BOXC 112
IF (NQUAD .GT. 500) NCODE = 2	BOXC 113
2000 IF (NMAT .EQ. 3) NCODE = 2	BOXC 114

C	CALL AFGRM	BOXC 115
	CALL OVERLAY(4HB0XC,3,0)	BOXC 116
	IF (NAFLOW) 2100, 2100, 2050	BOXC 117
2050	KMAT = 1	BOXC 118
	NFL = NAFLCW	BOXC 119
	GO TO 2300	BOXC 120
2100	IF (NBFLOW) 2200, 2200, 2150	BOXC 121
2150	KMAT = 2	BOXC 122
	NFL = NBFLOW	BOXC 123
	GO TO 2300	BOXC 124
2200	IF (NCFLOW) 5000, 5000, 2250	BOXC 125
2250	KMAT = 3	BOXC 126
	NFL = NCFLOW	BOXC 127
2300	NQ = NQUAD + 1	BOXC 128
	MN = 1	BOXC 129
	NM = MOD (NQ, 255)	BOXC 130
	IF (NM .LT. 5 .AND. NM .GT. 0) NQ = NQ + 5	BOXC 131
	NFLCOM = 0	BOXC 132
	NSOL = MING(6000 / NQUAD, 100)	BOXC 133
	IF (NCODE .NE. 1) GO TO 2500	BOXC 134
2400	N1 = 8	BOXC 135
	N2 = 9	BOXC 136
	N3 = 13	BOXC 137
2450	NCFLG = NFL	BOXC 138
C	CALL SCLVIT (DUMMY(1), NQUAD, NFL, KORE, N1, N2, N3, 3, &2475)	BOXC 139
	CALL OVERLAY(4HB0XC,4,0)	BOXC 140
	REWIND 3	BOXC 141
C	IF (MN .EQ. 1) CALL ATAPES (MN)	BOXC 142
	IF (MN .EQ. 1)	BOXC 143
	1CALL OVERLAY(4+80XC,6,0)	BOXC 144
	GO TO 3300	BOXC 145
C2500	CALL ATAPES (MN)	BOXC 146
2500	CALL OVERLAY(4HB0XC,6,0)	BOXC 147
	NSKIP = 0	BOXC 148
2900	NCFLG = MING (NSOL, NFL - NSKIP)	BOXC 149
C	CALL SIGMA (NFLCOM)	BOXC 150
	CALL OVERLAY(4HB0XC,5,0)	BOXC 151
	ITER = 0	BOXC 152
C3300	CALL PRINT1 (NFLCOM, MN, KMAT, NSEQ)	BOXC 153
3300	CALL OVERLAY(4HB0XC,7,0)	BOXC 154
	NFLCOM = NFLCOM + NCFLG	BOXC 155
	NSKIP = NSKIP + NCFLG	BOXC 156
	IF (NCODE .EQ. 1) GO TO 3700	BOXC 157
	IF (NSKIP .NE. NFL) GO TO 2900	BOXC 158
	MN = MN + 1	BOXC 159
	IF (KMAT - 2) 3500, 3600, 5000	BOXC 160
3500	IF (NBFLOW) 3600, 3600, 3550	BOXC 161
3550	NFL = NBFLOW	BOXC 162
	KMAT = 2	BOXC 163
	GO TO 2500	BOXC 164
3600	IF (NCFLOW) 5000, 5000, 3650	BOXC 165
3650	NFL = NCFLOW	BOXC 166
	KMAT = 3	BOXC 167
	GO TO 2500	BOXC 168
3700	IF (MN .EQ. 2 .OR. NMAT .EQ. 1) GO TO 5000	BOXC 169
	N1 = 10	BOXC 170
	N2 = 13	BOXC 171

PROGRAM MAIN

74/74 OPT=2

FTN 4.7+476

02/27/80 17.14.35

```
N3 = 8
MN = 2
C ** POSITION THE TAPE FOR THE SIGMAS.
JJ = 2
IF (ISIG .NE. 0) JJ = 3
JJ = NFLOW * JJ + NFL
DO 3750 J = 1, JJ
3750 READ (3)
NFL = NFLOW - NFL
1 (KMAT - 2) 3800, 3900, 5000
3800 IF (NBFLOW) 3900, 3900, 3850
3850 KMAT = 2
GO TO 2450
3900 KMAT = 3
GO TO 2450
5000 CONTINUE
WRITE (6, #100)
5100 FORMAT(1H0, 10X, 12HLEAVING MAIN)

CALL EXIT
C IF (LIST .NE. 0) STOP
GO TO 1
END
```

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BOXC 172
BOXC 173
BOXC 174
BOXC 175
BOXC 176
BOXC 177
BOXC 178
BOXC 179
BOXC 180
BOXC 181
BOXC 182
BOXC 183
BOXC 184
BOXC 185
BOXC 186
BOXC 187
BOXC 188
BOXC 189
BOXC 190
BOXC 191
BOXC 192
BOXC 193
BOXC 194
BOXC 195
BOXC 196
```

*DECK, HEADER		HEAD	1
SUBROUTINE HEADER		HEAD	2
COMMON HEDR(15), MPR, NER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,		HEAD	3
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE		HEAD	4
DATA IPAGE/0/		HEAD	5
1 FORMAT(1H1, 5X, 13HPROGRAM BOXC , 15X, 30HATMOSPHERIC SCIENCE ASSHEAD		HEAD	6
1OCIATES/ 38X, 22HBEDFORD, MASSACUSETTS, 22X, 4HPAGE, 15/		HEAD	7
2 7X, 8HBODY ID., 2X, A4/ 30X, 15A4)		HEAD	8
10 IPAGE = IPAGE + 1		HEAD	9
WRITE (6,1) IPAGE, KASE, HEDR		HEAD	10
RETURN		HEAD	11
END		HEAD	12

*DECK, ROWV		ROWV	1
SUBROUTINE ROWV(XIJ, YIJ, ZIJ, III, KSKIP)		ROWV	2
COMMON HEDR(15), MPR, NER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,		ROWV	3
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE		ROWV	4
LOGICAL AFLOW, BFLOW, CFLOW		ROWV	5
COMMON /DFLOW/ AFLOW, BFLOW, CFLOW, VMAT, NMATM1, NAFLOW, NBFLOW, NCFLOW		ROWV	6
DIMENSION XIJ(1), YIJ(1), ZIJ(1)		ROWV	7
INTEGER CKFLG		ROWV	8
DIMENSION NT(3)		ROWV	9
DATA NT	/ 1, 11, 12 /	ROWV	10
5 CKFLG = 0		ROWV	11
N1 = 1		ROWV	12
N2 = NQUAD / 3		ROWV	13
N3 = NQUAD - N2 - N2		ROWV	14
NN = N2		ROWV	15
C READ IN ONE ROW OF THE VX, VY, VZ		ROWV	16
DO 50 I1 = 1, 3		ROWV	17
NTAPE = NT(I1)		ROWV	18
10 READ(NTAPE)	(XIJ(I2) , YIJ(I2) , ZIJ(I2) , I2 = N1 , NN)	ROWV	19
N1 = NN + 1		ROWV	20
IF(I1 .EQ. 2) GO TO 35		ROWV	21
NN = NN + N2		ROWV	22
GO TO 50		ROWV	23
35 NN = NN + N3		ROWV	24
50 CONTINUE		ROWV	25
NER = 0		ROWV	26
IF (III .NE. (NQUAD + NOFF)) IF (KSKIP) 80, 80, 100		ROWV	27
REWIND 1		ROWV	28
REWIND 11		ROWV	29
REWIND 12		ROWV	30
80 RETURN		ROWV	31
100 IF (NMATM1 .EQ. 0) RETURN		ROWV	32
DO 110 N1 = 1, NMATM1		ROWV	33
READ (1)		ROWV	34
READ (11)		ROWV	35
110 READ (12)		ROWV	36
RETURN		ROWV	37
END		ROWV	38

```

*DECK, INPUT
SUBROUTINE INPUT
C SUBROUTINE INPUT (LIST)
LOGICAL IPROS
COMMON /INPT/ LIST, IPROS
REAL NX, NY, NZ , IXX, IXY, IYY, MACH
LOGICAL AFLOW, BFLOW, CFLOW, RFLAG, AFLAG, BFLAG
INTEGER STAT, STATT, CONV
DIMENSION SPH ( 200 ), CPH ( 200 ), XINP ( 200 ), ZINP ( 200 )
DIMENSION XOFF(1000), YOFF (1000), ZOFF (1000)
DIMENSION XA ( 500 ), XB ( 500 ), YA ( 500 ), YB ( 500 ),
1 ZA ( 500 ), ZB ( 500 ), NLINE(500 ), NLT ( 500 ), CFLAG(3),
2 XI (4), ETA (4), XIN (4), YIN (4), ZIN (4), XNULL (1000),
3 YNULL(1000), ZNULL (1000), XNORM(1000),
4 YNORM ( 100 ), ZNORM (1000), RX (4), R (4), RY (4)
COMMON HEDR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,
1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE
COMMON /M/ MACH, BETA, RBETA
COMMON /NORMS/ XNORM, YNORM, ZNORM
EQUIVALENCE (XNULL, XOFF), ( YNULL, YOFF),
1 (ZNULL, ZOFF), (NULL, NQUAD)
COMMON /DFLOW/ AFLCW,BFLCW,CFLOW,NMAT,NMATM1,NAFLOW,NBFLOW,NCFLOW
DATA CFLAG / 2H 1, 2H 2, 2H /
DATA PI/3.141593E0/, HAFI/1.570796E0/, EPS/.0001/
3030 FORMAT (1H1)
1 FORMAT ( 3E10.0, I2 / 3F10.0, I2)
4002 FORMAT ( 1H0, 6X,5HN M, 7X, 4 ( 1HX, 11X ), 2HNX, 11X, 3HNPX,
1 11X, 1HD / 19X, 4 ( 1HY, 11X ), 2HNY, 11X, 3HNPY, 11X, 1HT /
2 19X, 4(1HZ, 11X ), 2HNZ, 11X, 3HNZ, 11X, 1HA )
4005 FORMAT ( 1H0, 7X, I4, 4F12.6, 2F13.6, E14.4,A2/(12X,4F12.6,
1 2F13.6, E14.4 ) )
4010 FORMAT ( 1H0, 3X, 2I4, 4F12.6, 2F13.6, E14.4,A2/(12X, 4F12.6,
1 2F13.6, E14.4 ) )
4015 FORMAT ( 1H0, 3 ( 20 ), 12H***** )
C INPUT -- SECTION 9.1 INPUT SCHEME
KLCT = 0
NULL = 0
NPRT = 13
WRITE (6, 40)
40 FORMAT (1H0,16X,44HP A R A M E T R I C I N F O R M A T I O N
1 /// 38X,23HGENERATED UNIFORM FLOWS //)
IF ( AFLOW ) WRITE (6, 41)
41 FORMAT (46X,6HX-FLOW)
IF ( BFLOW ) WRITE (6, 42)
42 FORMAT (46X,6HY-FLOW)
IF ( CFLOW ) WRITE (6, 43)
43 FORMAT (46X,6HZ-FLOW)
IF (IPRS .NE. 0) WRITE (6, 44)
44 FORMAT (1H0,16X,22HPRINT SIGMA ITERATIONS )
IF (MPR .EQ. 0) GO TO 52
IF (MPR - 2) 45, 47, 49
45 WRITE (6, 46)
46 FORMAT (1H0,16X,18HPRINT VIJ MATRICES)
GO TO 52
47 WRITE (6, 48)
48 FORMAT (1H0,16X,18HPRINT AIJ MATRICES )
GO TO 52
49 WRITE (6, 51)
51 FORMAT (1H0,16X,31HPRINT BOTH VIJ AND AIJ MATRICES )

```

52	IF (ISIG .NE. 0) WRITE (6, 53)	INPU	61
53	FORMAT (1H0,16X,19HINPUT SIGMA GUESSES)	INPU	62
	IF (NSYM - 1) 54, 56, 58	INPU	63
54	WRITE (6, 55)	INPU	64
55	FORMAT (1H0,16X,21HNC SYMMETRY SPECIFIED)	INPU	65
	GO TO 61	INPU	66
56	WRITE (6, 57)	INPU	67
57	FORMAT (1H0,16X,30HTHERE IS ONE PLANE OF SYMMETRY)	INPU	68
	GO TO 61	INPU	69
58	WRITE (6, 59) NSYM	INPU	70
59	FORMAT (1H0,16X,9HTHERE ARE,I2, 19H PLANES OF SYMMETRY)	INPU	71
61	IF (MACH .NE. 0.0) WRITE (6, 21) MACH	INPU	72
21	FORMAT (1H0,16X,13HMACH NUMBER =,F10.5)	INPU	73
	IF (IFLAG .EQ. 0) GO TO 29	INPU	74
	READ (5, 20) NLM1, MMIN, B, C	INPU	75
	IF (B .EQ. 0.0) B = 1.0	INPU	76
	IF (C .EQ. 0.0) C = 1.0	INPU	77
20	FORMAT (2I5, 2F10.5)	INPU	78
4	FORMAT (8F10.0)	INPU	79
	WRITE (6, 62) NLM1, MMIN, B, C	INPU	80
62	FORMAT (1H0,16X,10HGENERATE A,I3, 2H X,I3, 12H SPHERE. B =,F10.5,	INPU	81
1	4X,3HC =,F10.5)	INPU	82
	MLINES = MMIN + 1	INPU	83
	NLINES = NLM1 + 1	INPU	84
	N = 0	INPU	85
	IF (NSYM .EQ. 0) GO TO 2	INPU	86
	IF (NSYM - 2) 3, 5, 6	INPU	87
2	PITH = PI	INPU	88
	PIPHI = PI + PI	INPU	89
	GO TO 7	INPU	90
3	PITH = PI	INPU	91
	PIPHI = PI	INPU	92
	GO TO 7	INPU	93
5	PITH = PI	INPU	94
	PIPHI = HAFPI	INPU	95
	GO TO 7	INPU	96
6	PITH = HAFPI	INPU	97
	PIPHI = PITH	INPU	98
7	SPH (MLINES) = SIN (PIPHI)	INPU	99
	SPH (1) = 0.0	INPU	100
	CPH (MLINES) = CCS (PIPHI)	INPU	101
	CPH (1) = 1.0	INPU	102
	EKM = MMIN	INPU	103
	EKN = NLM1	INPU	104
	EMM = 0.0	INPU	105
	DO 8 I = 2, MMIN	INPU	106
	EMM = EMM + 1.0	INPU	107
	PHI = EMM / EKM * PIPHI	INPU	108
	SPH (I) = SIN (PHI)	INPU	109
8	CPH (I) = COS (PHI)	INPU	110
	IF (IFLAG .EQ. 2) GO TO 10	INPU	111
	ENN = 1.0	INPU	112
	DO 9 I = 1, MLINES	INPU	113
	XA (I) = 1.0	INPU	114
	YA (I) = 0.0	INPU	115
9	ZA (I) = 0.0	INPU	116
	GO TO 18	INPU	117
10	READ (5, 4) (XINP (I), ZINP (I), I = 1, NLINES)	INPU	118
	DO 11 I = 1, MLINES	INPU	119
	XA (I) = XINP (1)	INPU	120

YA (I) = B * ZINP (1) * SPH (I)	INPU 121
ZA (I) = - C * ZINF (1) * CPH (I)	INPU 122
XB (I) = XINP (2)	INPU 123
YB (I) = B * ZINP (2) * SPH (I)	INPU 124
11 ZB (I) = - C * ZINF (2) * CPH (I)	INPU 125
NLCT = 2	INPU 126
GO TO 250	INPU 127
12 DO 14 I = 1, MLINES	INPU 128
XA (I) = XB (I)	INPU 129
YA (I) = YB (I)	INPU 130
14 ZA (I) = ZB (I)	INPU 131
IF (IFLAG .EQ. 1) GO TO 16	INPU 132
NLCT = NLCT + 1	INPU 133
DO 15 I = 1, MLINES	INPU 134
XB (I) = XINP (NLCT)	INPU 135
YB (I) = B * ZINP (NLCT) * SPH (I)	INPU 136
15 ZB (I) = - C * ZINF (NLCT) * CPH (I)	INPU 137
GO TO 250	INPU 138
16 ENN = ENN + 1.0	INPU 139
18 THETA = ENN / EKN * PITH	INPU 140
STH = SIN (THETA)	INPU 141
CTH = COS (THETA)	INPU 142
DO 17 I = 1, MLINES	INPU 143
XB (I) = CTH	INPU 144
YB (I) = B * STH * SPH (I)	INPU 145
17 ZB (I) = - C * STH * CPH (I)	INPU 146
GO TO 250	INPU 147
29 N = -1	INPU 148
IF (LIST .EQ. 0) GO TO 50	INPU 149
WRITE (6, 19)	INPU 150
19 FORMAT (1H0 16X 28HBASIC DATA CALCULATIONS ONLY)	INPU 151
GO TO 50	INPU 152
30 IF (RFLAG) GO TO 50	INPU 153
RFLAG = .TRUE.	INPU 154
X = XX	INPU 155
Y = YY	INPU 156
Z = ZZ	INPU 157
STAT = STATT	INPU 158
IF (LIST) 66, 66, 65	INPU 159
50 RFLAG = .FALSE.	INPU 160
READ (5, 1) X, Y, Z, STAT, XX, YY, ZZ, STATT	INPU 161
IF (IPROS) CALL DATPROS(X, Y, Z, XX, YY, ZZ)	INPU 162
65 IF (N .EQ. (-1)) GO TO 80	INPU 163
66 IF (STAT .EQ. 0 .OR. STAT .EQ. 3) GO TO 180	INPU 164
IF (STAT .EQ. 2) GO TO 200	INPU 165
IF (.NOT. AFLAG) GO TO 200	INPU 166
MC = M	INPU 167
80 M = 1	INPU 168
IF (STAT .EQ. 2) GO TO 150	INPU 169
IF (.NOT. BFLAG) GO TO 84	INPU 170
75 DO 81 J = 1, MC	INPU 171
XA (J) = XB (J)	INPU 172
YA (J) = YB (J)	INPU 173
81 ZA (J) = ZB (J)	INPU 174
83 XB (1) = X	INPU 175
YB (1) = Y	INPU 176
ZB (1) = Z	INPU 177
GO TO 30	INPU 178
84 IF (AFLAG) GO TO 85	INPU 179
BFLAG = .TRUE.	INPU 180

GO TO 75	INPU 181
85 AFLAG = .FALSE.	INPU 182
GO TO 83	INPU 183
150 AFLAG = .TRUE.	INPU 184
BFLAG = .FALSE.	INPU 185
IF (N .EQ. (-1))N = 0	INPU 186
160 XA (M) = X	INPU 187
YA (M) = Y	INPU 188
ZA (M) = Z	INPU 189
GO TO 30	INPU 190
180 M = M + 1	INPU 191
IF (AFLAG) GO TO 160	INPU 192
XB (M) = X	INPU 193
YB (M) = Y	INPU 194
ZB (M) = Z	INPU 195
IF (STAT .NE. 3) GO TO 30	INPU 196
200 MMIN = MIND(M, MC) - 1	INPU 197
MC = M	INPU 198
250 N = N + 1	INPU 199
KLCT = KLCT + 1	INPU 200
C BEGIN COMPUTATION OF NULL POINTS AND 28 QUANTITIES	INPU 201
DO 2000 I = 1, MMIN	INPU 202
NULL = NULL + 1	INPU 203
XIN(1) = XA(I) * RBETA	INPU 204
XIN(2) = XA(I+1) * RBETA	INPU 205
XIN(3) = XB(I+1) * RBETA	INPU 206
XIN(4) = XB(I) * RBETA	INPU 207
YIN(1) = YA(I)	INPU 208
YIN(2) = YA(I+1)	INPU 209
YIN(3) = YB(I+1)	INPU 210
YIN(4) = YB(I)	INPU 211
ZIN(1) = ZA(I)	INPU 212
ZIN(2) = ZA(I+1)	INPU 213
ZIN(3) = ZB(I+1)	INPU 214
ZIN(4) = ZB(I)	INPU 215
C FORM DIAGONAL VECTORS	INPU 216
C EQUATION (64)	INPU 217
T1X = XIN(3) - XIN(1)	INPU 218
T2X = XIN(4) - XIN(2)	INPU 219
T1Y = YIN(3) - YIN(1)	INPU 220
T2Y = YIN(4) - YIN(2)	INPU 221
T1Z = ZIN(3) - ZIN(1)	INPU 222
T2Z = ZIN(4) - ZIN(2)	INPU 223
C FORM CROSS PRODUCT N = T2 X T1	INPU 224
C EQUATION (65)	INPU 225
NX = T2Y*T1Z - T1Y*T2Z	INPU 226
NY = T1X*T2Z - T2X*T1Z	INPU 227
NZ = T2X*T1Y - T1X*T2Y	INPU 228
VN = SQRT (NX* NX + NY* NY + NZ* NZ)	INPU 229
C FORM UNIT NORMAL VECTOR	INPU 230
C EQUATION (66)	INPU 231
NX = NX / VN	INPU 232
	INPU 233
	INPU 234
	INPU 235
	INPU 236
	INPU 237
	INPU 238
	INPU 239
	INPU 240

NY = NY / VN	INPU 241
NZ = NZ / VN	INPU 242
C COMPUTE AVERAGE POINT	INPU 243
C EQUATION (68)	INPU 244
AVX = .25 * (XIN(1) + XIN(2) + XIN(3) + XIN(4))	INPU 245
AVY = .25 * (YIN(1) + YIN(2) + YIN(3) + YIN(4))	INPU 246
AVZ = .25 * (ZIN(1) + ZIN(2) + ZIN(3) + ZIN(4))	INPU 247
C COMPUTE PROJECTION DISTANCE	INPU 248
C EQUATIONS (69) AND (71)	INPU 249
D = NX*(AVX - XIN(1)) + NY*(AVY - YIN(1)) + NZ*(AVZ-ZIN(1))	INPU 250
PD = ABS(D)	INPU 251
C EQUATIONS (73) AND (74)	INPU 252
T = SQRT (T1X*T1X + T1Y*T1Y + T1Z*T1Z)	INPU 253
T1X = T1X / T	INPU 254
T1Y = T1Y / T	INPU 255
T1Z = T1Z / T	INPU 256
C EQUATION (75)	INPU 257
T2X = NY*T1Z - NZ*T1Y	INPU 258
T2Y = NZ*T1X - NX*T1Z	INPU 259
T2Z = NX*T1Y - NY*T1X	INPU 260
C COMPUTE COORDINATES OF CORNER POINTS IN REFERENCE COORD. SYSTEM	INPU 261
C EQUATION (72)	INPU 262
DO 1000 J = 1, 4	INPU 263
XP = XIN(J) + NX * D	INPU 264
YP = YIN(J) + NY * D	INPU 265
ZP = ZIN(J) + NZ * D	INPU 266
D = - D	INPU 267
XDIF = XP - AVX	INPU 268
YDIF = YP - AVY	INPU 269
ZDIF = ZP - AVZ	INPU 270
C TRANSFORM CORNER POINTS TO ELEMENT COORDINATE SYSTEM (XI, ETA)	INPU 271
C WITH AVERAGE POINT AS ORIGIN	INPU 272
C EQUATION (80)	INPU 273
XI(J) = T1X*XDIF + T1Y*YDIF + T1Z*ZDIF	INPU 274
1000 ETA(J) = T2X*XDIF + T2Y*YDIF + T2Z*ZDIF	INPU 275
C COMPUTE CENTROID	INPU 276
C EQUATION (81)	INPU 277
XID = .3333333E0 * (XI (4) * (ETA (1) - ETA (2)) + XI (2)	INPU 278
1 * (ETA (4) - ETA (1))) / (ETA (2) - ETA (4))	INPU 279
ETA0 = -.3333333E0 * ETA(1)	INPU 280
C OBTAIN CORNER POINTS IN SYSTEM WITH CENTROID AS ORIGIN	INPU 281
C EQUATION (82)	INPU 282
DO 1020 J = 1, 4	INPU 283
	INPU 284
	INPU 285
	INPU 286
	INPU 287
	INPU 288
	INPU 289
	INPU 290
	INPU 291
	INPU 292
	INPU 293
	INPU 294
	INPU 295
	INPU 296
	INPU 297
	INPU 298
	INPU 299
	INPU 300

	$XI(J) = XI(J) - XI0$	INPU 301
	$1020 \text{ ETA}(J) = \text{ETA}(J) - \text{ETA0}$	INPU 302
C	COMPUTATION AIDS	INPU 303
	$\text{ETA2M1} = \text{ETA} (2) - \text{ETA} (1)$	INPU 304
	$\text{ETA3M2} = \text{ETA} (3) - \text{ETA} (2)$	INPU 305
	$\text{ETA4M3} = \text{ETA} (4) - \text{ETA} (3)$	INPU 306
	$\text{ETA1M4} = \text{ETA} (1) - \text{ETA} (4)$	INPU 307
	$XI1M2 = XI (1) - XI (2)$	INPU 308
	$XI2M3 = XI (2) - XI (3)$	INPU 309
	$XI3M4 = XI (3) - XI (4)$	INPU 310
	$XI4M1 = XI (4) - XI (1)$	INPU 311
	$\text{ETA2P4} = \text{ETA} (2) + \text{ETA} (4)$	INPU 312
	$XI3M1 = XI (3) - XI (1)$	INPU 313
	$XI4M2 = XI (4) - XI (2)$	INPU 314
	$\text{ETA2M4} = \text{ETA} (2) - \text{ETA} (4)$	INPU 315
	$XI1234 = XI (1) + XI (2) + XI (3) + XI (4)$	INPU 316
		INPU 317
		INPU 318
C	TRANSFORM CENTROID TO REFERENCE COORDINATE SYSTEM	INPU 319
C	EQUATION (83)	INPU 320
	$\text{XCENT} = \text{AVX} + \text{T1X} * \text{XI0} + \text{T2X} * \text{ETA0}$	INPU 321
	$\text{YCENT} = \text{AVY} + \text{T1Y} * \text{XI0} + \text{T2Y} * \text{ETA0}$	INPU 322
	$\text{ZCENT} = \text{AVZ} + \text{T1Z} * \text{XI0} + \text{T2Z} * \text{ETA0}$	INPU 323
		INPU 324
C	COMPUTE LARGER DIAGONAL VECTOR	INPU 325
C	EQUATION (84)	INPU 326
	$\text{TSQ} = \text{AMAX1} (\text{XI3M1} ** 2, \text{XI4M2} ** 2 + \text{ETA2M4} ** 2)$	INPU 327
	$\text{T} = \text{SQRT} (\text{TSQ})$	INPU 328
		INPU 329
		INPU 330
C	COMPUTE AREA	INPU 331
C	EQUATION (85)	INPU 332
	$\text{AREA} = .5 * \text{XI3M1} * \text{ETA2M4}$	INPU 333
		INPU 334
C	COMPUTE 2ND MOMENTS IXX, IXY, IYY	INPU 335
C	EQUATIONS (86) - (88)	INPU 336
	$\text{IXX} = 8.333333\text{E-2} * \text{XI3M1} * (\text{ETA} (1) * \text{XI4M2} +$	INPU 337
	1 $\text{XI1234} + \text{ETA2M4} * (\text{XI} (1) * (\text{XI} (1) + \text{XI} (3)) +$	INPU 338
	2 $\text{XI} (3) ** 2) + \text{XI} (2) * \text{ETA} (2) * (\text{XI1234} - \text{XI} (4))$	INPU 339
	3 $- \text{XI} (4) * \text{ETA} (4) * (\text{XI1234} - \text{XI} (2)))$	INPU 340
	$\text{IXY} = 4.166667\text{E-2} * \text{XI3M1} * (2. * \text{XI} (4) * (\text{ETA} (1)$	INPU 341
	1 $** 2 - \text{ETA} (4) ** 2) - 2. * \text{XI} (2) * (\text{ETA} (1) ** 2 -$	INPU 342
	2 $\text{ETA} (2) ** 2) + (\text{XI} (1) + \text{XI} (3)) * \text{ETA2M4} * (2. *$	INPU 343
	3 $\text{ETA} (1) + \text{ETA2P4}))$	INPU 344
	$\text{IYY} = 6.333333\text{E-2} * \text{XI3M1} * \text{ETA2M4} * (\text{ETA} (1) +$	INPU 345
	1 $\text{ETA2P4}) ** 2 - \text{ETA} (1) * \text{ETA2P4} - \text{ETA} (2) * \text{ETA} (4))$	INPU 346
		INPU 347
C	COMPUTE CONSTANTS FOR EQUATIONS (42) AND (43)	INPU 348
C	EQUATION (45)	INPU 349
	$\text{D12SQ} = \text{XI1M2} ** 2 + \text{ETA2M1} ** 2$	INPU 350
	$\text{D12} = \text{SQRT} (\text{D12SQ})$	INPU 351
	$\text{D23SQ} = \text{XI2M3} ** 2 + \text{ETA3M2} ** 2$	INPU 352
	$\text{D23} = \text{SQRT} (\text{D23SQ})$	INPU 353
	$\text{D34SQ} = \text{XI3M4} ** 2 + \text{ETA4M3} ** 2$	INPU 354
	$\text{D34} = \text{SQRT} (\text{D34SQ})$	INPU 355
	$\text{D41SQ} = \text{XI4M1} ** 2 + \text{ETA1M4} ** 2$	INPU 356
	$\text{D41} = \text{SQRT} (\text{D41SQ})$	INPU 357
	$\text{C1} = 0.0$	INPU 358
	$\text{C2} = 0.0$	INPU 359
	$\text{C3} = 0.0$	INPU 360

```

C4 = 0.0
C5 = 0.0
C6 = 0.0
C7 = 0.0
C8 = 0.0
XNP = 0.0
YNP = 0.0
IF ( D12 ) 1030, 1040, 1030
1030 C1 = ETA2M1 / D12
      C5 = XI1M2 / D12
1040 IF ( D23 ) 1050, 1060, 1050
1050 C2 = ETA3M2 / D23
      C6 = XI2M3 / D23
1060 IF ( D34 ) 1070, 1080, 1070
1070 C3 = ETA4M3 / D34
      C7 = XI3M4 / D34
1080 IF ( D41 ) 1090, 1100, 1090
1090 C4 = ETA1M4 / D41
      C8 = XI4M1 / D41
1100 CONV = 3

```

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INPU 361
INPU 362
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INPU 420

```

C BEGIN NULL POINT ITERATION

```

DO 1591 ITR = 1, 30
DO 1580 K = 1, 4
C EQUATION ( 47 )
R ( K ) = SQRT ( ( XNP - XI ( K ) ) ** 2 + ( YNP - ETA(K))** 2 )
RX ( K ) = ( XNP - XI ( K ) ) / R ( K )
1580 RY ( K ) = ( YNP - ETA ( K ) ) / R ( K )
R1PR2 = R ( 1 ) + R ( 2 )
R2PR3 = R ( 2 ) + R ( 3 )
R3PR4 = R ( 3 ) + R ( 4 )
R4PR1 = R ( 4 ) + R ( 1 )
ARG1 = ALOG ( ( R1PR2 - D12 ) / ( R1PR2 + D12 ) )
R4PR1 = R ( 4 ) + R ( 1 )
ARG1 = ALOG ( ( R1PR2 - D12 ) / ( R1PR2 + D12 ) )
ARG2 = ALOG ( ( R2PR3 - D23 ) / ( R2PR3 + D23 ) )
ARG3 = ALOG ( ( R3PR4 - D34 ) / ( R3PR4 + D34 ) )
ARG4 = ALOG ( ( R4PR1 - D41 ) / ( R4PR1 + D41 ) )

```

C COMPUTE INDUCED VELOCITY COMPONENTS

```

C EQUATIONS ( 42 ) AND ( 43 )
VX = C1 * ARG1 + C2 * ARG2 + C3 * ARG3 + C4 * ARG 4
VY = C5 * ARG1 + C6 * ARG2 + C7 * ARG 3 + C8 * ARG4

```

C COMPUTE PARTIAL DERIVATIVES OF INDUCED VELOCITIES

C EQUATION (90), USING EQUATIONS (91) - (93)

```

D12P= ( R1PR2 ** 2 - D12 SQ ) * .5
D23P= ( R2PR3 ** 2 - D23 SQ ) * .5
D34P= ( R3PR4 ** 2 - D34 SQ ) * .5
D41P= ( R4PR1 ** 2 - D41 SQ ) * .5
C1P = ETA2M1 / D12P
C2P = ETA3M2 / D23P
C3P = ETA4M3 / D34P
C4P = ETA1M4 / D41P
C5P = XI1M2 / D12P

```

C6P = XI2M3 / D23P	INPU 42
C7P = XI3M4 / D34P	INPU 42
C8P = XI4M1 / D41P	INPU 42
R12Y = RY (1) + RY (2)	INPU 42
R23Y = RY (2) + RY (3)	INPU 42
R34Y = RY (3) + RY (4)	INPU 42
R41Y = RY (4) + RY (1)	INPU 42
VXX = C1P* (RX (1) + RX (2)) + C2P* (RX (2) + RX (3)) +	INPU 42
1 C3P* (RX (3) + RX (4)) + C4P* (RX (4) + RX (1))	INPU 42
VXY = C1P* R12Y + C2P* R23Y + C3P* R34Y + C4P* R41Y	INPU 43
VYY = C5P* R12Y + C6P* R23Y + C7P* R34Y + C8P* R41Y	INPU 43
	INPU 432
	INPU 433
C COMPUTE NEW NULL POINT (XNP, YNP)	INPU 434
C EQUATION (94)	INPU 435
	INPU 436
XMXP = (VY * VXY - VX * VYY) / (VXX * VYY - VXY ** 2)	INPU 437
XNP = XMXP + XNP	INPU 438
YNP = YNP - (VX + VXX * XMXP) / VXY	INPU 439
	INPU 440
C TEST NULL POINT CONVERGENCE	INPU 441
1590 IF (ABS (VX) .LT. EPS .AND. ABS (VY) .LT. EPS) GO TO 1600	INPU 442
1591 CONTINUE	INPU 443
C NO CONVERGENCE , USE 30TH ITERATION	INPU 444
CONV = 2	INPU 445
	INPU 446
C TEST IF THIS POINT IS OUTSIDE THE ELEMENT	INPU 447
1600 IF (XNP ** 2 + YNP ** 2 .LE. TSQ) GO TO 1620	INPU 448
	INPU 449
C CONVERGES TO POINT AT INFINITY	INPU 450
CONV = 1	INPU 451
XNULL (NULL) = XCENT	INPU 452
YNULL (NULL) = YCENT	INPU 453
ZNULL (NULL) = ZCENT	INPU 454
GO TO 1700	INPU 455
	INPU 456
C TRANSFORM NULL POINT TO REFERENCE COORDINATE SYSTEM	INPU 457
C EQUATION (79) NOTE THAT Z - COORDINATE IS ZERO	INPU 458
1620 XNULL (NULL) = XCENT + T1X * XNP + T2X * YNP	INPU 459
YNULL (NULL) = YCENT + T1Y * XNP + T2Y * YNP	INPU 460
ZNULL (NULL) = ZCENT + T1Z * XNP + T2Z * YNP	INPU 461
	INPU 462
	INPU 463
C PRINT RESULTS -- SECTION 9.4 THE FIRST OUTPUT	INPU 464
	INPU 465
1700 IF (NPRT .GE. 11) GO TO 1750	INPU 466
NPRT = NPRT + 1	INPU 467
IF (I .EQ. 1) GO TO 1760	INPU 468
WRITE (6, 4005) I, XIN, NX, XNULL (NULL), PD, CFLAG (CONV),	INPU 469
1 YIN, NY, YNULL (NULL), T, ZIN, NZ, ZNULL (NULL), AREA	INPU 470
GO TO 1770	INPU 471
1750 NPRT = 0	INPU 472
CALL HEADER	INPU 473
WRITE (6, 4002)	INPU 474
1760 WRITE (6, 4010) N , I, XIN, NX, XNULL (NULL), PD, CFLAG (CONV	INPU 475
1), YIN, NY, YNULL (NULL), T, ZIN, NZ, ZNULL (NULL), AREA	INPU 476
1770 XNORM (NULL) = NX	INPU 477
YNORM (NULL) = NY	INPU 478
ZNORM (NULL) = NZ	INPU 479
	INPU 480

C	WRITE 28 QUANTITIES ON TAPE 4 AS ONE LOGICAL RECORD	INPU 481
		INPU 482
2000	IF (LIST .EQ. 0) WRITE (4) XCENT, YCENT, ZCENT, T1X, T1Y, T1Z,	INPU 483
	1 T2X, T2Y, T2Z, NX, NY, NZ, XI(1), ETA(1), XI(2), ETA(2), XI(3),	INPU 484
	2 XI(4), ETA(4), TSQ, AREA, IXX, IXY, IYY, D12, D23, D34, D41	INPU 485
	NLT (KLCT) = MMIA	INPU 486
	NLINE (KLCT) = N	INPU 487
	IF (IFLAG .EQ. 0) GO TO 2001	INPU 488
	IF (N .LT. NLM1) GO TO 12	INPU 489
	WRITE (6, 4015)	INPU 490
	GO TO 2025	INPU 491
2001	IF (STAT .LT. 2) GO TO 80	INPU 492
	NLT(KLCT) = -NLT(KLCT)	INPU 493
	NPRT = NPRT + 1	INPU 494
	WRITE (6, 4015)	INPU 495
		INPU 496
C	TEST FOR END OF CASE	INPU 497
2020	IF (STAT .NE. 3) GO TO 80	INPU 498
2025	NN1 = MOD (3 * NQUAD, 255)	INPU 499
	NQNN1 = NQUAD	INPU 500
	IF (NN1 .LT. 5 .AND. NN1 .GT. 0) NQNN1 = NQUAD + 2	INPU 501
	IF (LIST.NE. 0) GO TO 8500	INPU 502
C	WRITE UNIT NORMALS ON TAPE 4 AS ONE LOGICAL RECORD	INPU 503
2031	WRITE (4) (XNORM(J), YNORM(J), ZNORM(J), J = 1, NQNN1)	INPU 504
C	WRITE CONTROL TABLES ON TAPE 4 AS ONE LOGICAL RECORD	INPU 505
	WRITE (4) KLCT, (NLINE (J), NLT(J), J = 1, KLCT)	INPU 506
C	** WRITE NULL POINTS AND NORMALS (1 RECORD)	INPU 507
3032	WRITE (4)(XNULL(J), YNULL(J), ZNULL(J), XNORM(J), YNORM(J), ZNORM(J)	INPU 508
	1 , J = 1, NQUAD)	INPU 509
	WRITE (6, 3030)	INPU 510
C	WRITE ALL NULL POINTS ON TAPE 8 (1 LOGICAL RECORD / POINT)	INPU 511
	DO 2058 I = 1, NQUAD	INPU 512
2058	WRITE (8) XNULL (I), YNULL(I), ZNULL(I)	INPU 513
C		INPU 514
C	READ IN OFF-BODY POINTS	INPU 515
C		INPU 516
	IF (NOFF .LE. 0) GO TO 8000	INPU 517
	NOFF = 0	INPU 518
5000	NOFF = NOFF + 1	INPU 519
	READ (5, 1) XOFF(NCFF), YOFF(NOFF), ZOFF(NCFF), STAT, X, Y, Z, STATT	INPU 520
	IF (STAT .EQ. 3) GO TO 5100	INPU 521
	NOFF = NOFF + 1	INPU 522
	XOFF(NOFF) = X	INPU 523
	YOFF(NOFF) = Y	INPU 524
	ZOFF(NOFF) = Z	INPU 525
	IF (STATT .NE. 3) GO TO 5000	INPU 526
		INPU 527
C	WRITE OFF-BODY POINTS ON 8 (1 RECORD / POINT)	INPU 528
		INPU 529
5100	DO 7020 I = 1, NOFF	INPU 530
	XOFF(I) = XOFF(I) * RBETA	INPU 531
7020	WRITE (8) XOFF(I), YOFF(I), ZOFF(I)	INPU 532
		INPU 533
C	WRITE OFF-BODY POINTS ON 4 (1 RECORD)	INPU 534
C		INPU 535
	WRITE (4)(XOFF(I), YOFF(I), ZOFF(I), I = 1, NOFF)	INPU 536
		INPU 537
	WRITE (6, 63) NOFF	INPU 538
63	FORMAT (1H0,16X,9HTHERE ARE,I4, 16H OFF-BODY POINTS)	INPU 539
8000	REWIND 4	INPU 540

8500	REWIND 8	INPU	541
C		IN-U	542
	WRITE(6, 9999) NQUAD	INPU	543
9999	FORMAT(1H0 , 5X, 15, 2(4H BASIC ELEMENTS WERE INPUT)	INPU	544
C	RETURN	INPU	545
	END	INPU	546

*DECK, DATPR	DATP	1
SUBROUTINE DATPROS(X, Y, Z, XX, YY, ZZ)	DATP	2
C	DATP	3
C THIS IS A SIMPLE SCALING AND ORIGIN TRANSLATION CODE FOR THE	DATP	4
C DOUGLAS BOXC POTENTIAL FLOW CODE DATA INPUT	DATP	5
C XTRANS, YTRANS, ZTRANS ARE ORIGIN TRANSLATIONS	DATP	6
C XSCALE, YSCALE, ZSCALE ARE SCALE FACTORS	DATP	7
C THE CODE ALSO ALLOWS FOR ROTATION IN THE X - Z PLANE TO ADJUST	DATP	8
C FOR ARBITRARY ANGLE OF ATTACK	DATP	9
C SINA, COSA ARE SINE AND COSINE OF ANGLE	DATP	10
C ANGLE IS THE ANGLE(INPUT IN DEGREES) THAT THE AIRPLANE AXIS	DATP	11
C MAKES WITH THE NEGATIVE X AXIS (POSITIVE COUNTERCLOCKWISE	DATP	12
C FROM THE -X AXIS) AFTER SCALING (NOTE - AFTER SCALING THE	DATP	13
C AIRPLANE NOSE POINTS DOWN THE NEGATIVE X AXIS)	DATP	14
C	DATP	15
C THIS VERSION FOR USE WITH BOXC	DATP	16
C	DATP	17
C	DATP	18
COMMON HEDR(15), MPR, MER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,	DATP	19
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE	DATP	20
COMMON /PROS/ SINA, COSA, XSCALE, YSCALE, ZSCALE, XTRANS,	DATP	21
1 YTRANS, ZTRANS	DATP	22
X = (X - XTRANS) * XSCALE	DATP	23
Y = (Y - YTRANS) * YSCALE	DATP	24
Z = (Z - ZTRANS) * ZSCALE	DATP	25
XX= (XX- XTRANS) * XSCALE	DATP	26
YY= (YY- YTRANS) * YSCALE	DATP	27
ZZ= (ZZ- ZTRANS) * ZSCALE	DATP	28
XP = X	DATP	29
X = XP * COSA - Z * SINA	DATP	30
Z = XP * SINA + Z * COSA	DATP	31
XP = XX	DATP	32
XX= XP * COSA - ZZ* SINA	DATP	33
ZZ= XP * SINA + ZZ* COSA	DATP	34
RETURN	DATP	35
END	DATP	36

```

*DECK, FLOWS
SUBROUTINE FLOWS
C SUBROUTINE FLOWS (NU, NNON )
COMMON /FLOWP/ NU, NNCN
COMMON HEDR(15), MPR, IER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NMODE
LOGICAL AFLOW, BFLOW, CFLOW
COMMON /DFLOW/ AFLOW, BFLOW, CFLOW, NMAT, NMATM1, NAFLOW, NBFLOW, NCFLOW
COMMON / FLOW / NQ, NL, KFLOW, VX(2000), VY(2000), VZ(2000),
1 VNC(1000)
COMMON /NORMS/ XNCRM(1000), YNORM(1000), ZNORM(1000)
31 FORMAT ( 3I1 )
40 FORMAT( 6F10.8 )
9999 FORMAT (1H0,5X 16H FLOWS HAS SET UP,
1 I3, 11H X FLOWS, I3, 15H Y FLOWS, AND I3, 11H Z FLOWS. )
NAFLOW = 0
NBFLOW = 0
NCFLOW = 0
NMAT = 0
NQ = NQUAD + NOFF
NL = NQUAD
NN = MOD(3* NQ , 255)
IF ( NN .LT. 5 .AND. NN .GT. 0 ) NQ = NQ + 5
KFLOW = 0
NN = MOD( NQUAD, 255)
IF ( NN .LT. 5 .AND. NN .GT. 0 ) NL = NL + 5
IF (NNON .GT. 0) GO TO 140
IF (NU .GT. 0) GO TO 50
WRITE (6, 115)
115 FORMAT (1H1,6X,24HNO ONSET FLOWS SPECIFIED )
STOP
50 IF ( .NOT. AFLOW ) GO TO 60
KFLOW = 1
GO TO 100
60 IF ( .NOT. BFLOW ) GO TO 70
KFLOW = 2
GO TO 100
70 IF ( CFLOW ) GO TO 90
IF (KFLOW .NE. 0) GO TO 4000
WRITE ( 6, 80 )
80 FORMAT ( 1H1,6X,12HINPUT ERROR.,5X,25HNO FLOW MATRIX SPECIFIED. )
STOP
90 KFLOW = 3
100 CALL UNIFRM
IF (KFLOW - 2) 60, 70, 4000

C THIS SECTION SETS UP THE NON-UNIFORM ONSET FLOWS
140 DO 3000 N = 1, NNON
IERR = 0

C
C - - THE FLAGS READ IN HERE HAVE THE FOLLOWING VALUES...
C
C FLAG MEANING
C -----
C KFL . . . . FLOW MATRIX-ASSOCIATION FLAG
C 1 X-FLOW, 2 Y-FLOW, 3 Z-FLOW
C
C KUN . . . . 0 NON-UNIFORM FLOW, 1 UNIFORM FLOW

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C
C
C
C

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      KTYPE      . . . .      0 INPJT FLOW VELOCITY COMPONENTS,  
                                1 INPUT FLOW NORMAL VELOCITY  
  
      READ ( 5, 31 ) KFL, KUN, KTYPE  
      KTEST = KFL - KFLOW  
      IF (KTEST) 145, 220, 150  
145 WRITE (6, 146) KFLOW, KFL  
146 FORMAT (15H1*****NOTE***** / 25HCAN INPUT FLOW FOR MATRIX,I3,  
      1 38H PHYSICALLY PRECEDED A FLOW FOR MATRIX,I3 /  
      2 26H0THIS FLOW MUST BE SKIPPED //)  
      IERR = 1  
      GO TO 220  
150 IF (NU) 155, 155, 152  
152 IF (KTEST - 2) 170, 153, 160  
153 IF (KFL - 2) 145, 160, 161  
155 KFLOW = KFL  
156 IF (KFLOW - 2) 157, 158, 159  
157 AFLOW = .TRUE.  
      GO TO 220  
158 BFLOW = .TRUE.  
      GO TO 220  
159 CFLOW = .TRUE.  
      GO TO 220  
160 IF (.NOT. AFLOW) GO TO 161  
      KFLOW = 1  
      CALL UNIFRM  
161 IF (.NOT. BFLOW) GO TO 162  
      KFLOW = 2  
      CALL UNIFRM  
162 KFLOW = KFL  
      IF (KFLOW .EQ. 2) GO TO 158  
      IF (CFLOW) GO TO 200  
      GO TO 159  
170 KFLOW = KFL  
      IF (NU .EQ. 0) GO TO 156  
      IF (KFLOW - 2) 175, 180, 185  
175 IF (AFLOW) GO TO 200  
      GO TO 157  
180 IF (BFLOW) GO TO 200  
      GO TO 158  
185 IF (CFLOW) GO TO 200  
      GO TO 159  
200 CALL UNIFRM  
220 NVREAD = NQUAD  
      IF (KUN .GT. 0) NVREAD = 1  
      IF ( KTYPE .NE. 0 ) GO TO 222  
      READ ( 5, 40 ) ( VX(I), VY(I), VZ(I), I = 1, NVREAD )  
      GO TO 224  
222 READ ( 5, 40 ) ( VNC(I), I = 1, NVREAD )  
      DO 223 I = 1, NQUAD  
      VX(I) = 0.0  
      VY(I) = 0.0  
223 VZ(I) = 0.0  
224 IF ( IERR .NE. 0 ) GO TO 1200  
      NVREAD = NQUAD + NCOFF  
      IF (KUN .LE. 0) IF (NOFF) 240, 240, 230  
      DO 225 NV = 2, NVREAD  
      VX(NV) = VX(1)  
      VY(NV) = VY(1)
```

FLOW 61
FLOW 62
FLOW 63
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FLOW 118
FLOW 119
FLOW 120

225	VZ(NV) = VZ(1)	FLOW 121
	GO TO 240	FLOW 122
230	NQP1 = NQUAD + 1	FLOW 123
	DO 235 NV = NQP1, NVREAD	FLOW 124
	VX(NV) = 0.0	FLOW 125
	VY(NV) = 0.0	FLOW 126
235	VZ(NV) = 0.0	FLOW 127
240	IF (KFLOW - 2) 600, 700, 800	FLOW 128
600	NAFLOW = NAFLOW + 1	FLOW 129
	GO TO 900	FLOW 130
700	NBFLOW = NBFLOW + 1	FLOW 131
	GO TO 900	FLOW 132
800	NCFLOW = NCFLOW + 1	FLOW 133
900	IF (KTYPE .NE. 0) GO TO 1075	FLOW 134
	DO 1050 J = 1, NQUAD	FLOW 135
1050	VNC (J) = VX(J)*XNORM(J) + VY(J)*YNORM(J) + VZ(J)*ZNCRM(J)	FLOW 136
1075	WRITE (3) KFLOW, (VX(K), VY(K), VZ(K), K = 1, NQ)	FLOW 137
1100	WRITE (3) (VNC(K), K = 1, NL)	FLOW 138
		FLOW 139
C	READ IN FIRST GUESSES FOR THE SIGMAS	FLOW 140
1200	IF (ISIG) 3000, 3000, 1600	FLOW 141
1600	READ (5, 40) (VNC(K), K = 1, NQUAD)	FLOW 142
		FLOW 143
C	WRITE SIGMA GUESSES ON TAPE 3 AS ONE LOGICAL RECORD	FLOW 144
	IF (IERR .EQ. 0) WRITE (3) (VNC(J), J = 1, NL)	FLOW 145
3000	CONTINUE	FLOW 146
	IF (NU .NE. 0) IF (KFLOW - 2) 60, 70, 4000	FLOW 147
4000	REWIND 3	FLOW 148
	IF (AFLOW) NMAT = 1	FLOW 149
	IF (BFLOW) NMAT = NMAT + 1	FLOW 150
	IF (CFLOW) NMAT = NMAT + 1	FLOW 151
	NMATM1 = NMAT - 1	FLOW 152
	NFLOW = NAFLOW + NBFLOW + NCFLOW	FLOW 153
	WRITE(6, 9999) NAFLOW, NBFLOW, NCFLOW	FLOW 154
		FLOW 155
C	RETURN	FLOW 156
	END	FLOW 157

*DECK, UNIFRM	UNIF	1
SUBROUTINE UNIFRM	UNIF	2
C	UNIF	3
C ***** SPECIAL FOR LEAKY QUADS *****	UNIF	4
C	UNIF	5
COMMON / FLOW / NQ, NL, KFLOW, VX(2000), VY(2000), VZ(2000),	UNIF	6
1 VNC(1000)	UNIF	7
LOGICAL AFLOW, BFLOW, CFLOW	UNIF	8
COMMON /DFLOW/ AFLOW, BFLCW, CFLOW, VMAT, NMATM1, NAFLOW, NBFLOW, NCFLOW	UNIF	9
COMMON /NORMS/ XNORM(1000), YNORM(1000), ZNORM(1000)	UNIF	10
COMMON HEDR(15), MPR, PER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,	UNIF	11
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE	UNIF	12
COMMON /QLEAK/ LEAK, FRACT	UNIF	13
	UNIF	14
C	UNIF	15
C THIS ROUTINE SETS UP THE UNIFORM ONSET FLOWS. FOR THESE FLOWS IT	UNIF	16
C IS ONLY NECESSARY TO HAVE TWO VELOCITY MATRICES, ONE ALL ZERGES	UNIF	17
C AND THE OTHER ALL ONES. WE SHALL FILL VX WITH 0'S AND VY WITH 1'S.	UNIF	18
	UNIF	19
DO 10 I = 1, NQ	UNIF	20
VX(I) = 0.0	UNIF	21
10 VY(I) = 1.0	UNIF	22
	UNIF	23
C	UNIF	24
C NOW WE'LL TEST 'KFLOW' TO DETERMINE WHAT FLOW TO SET UP FOR.	UNIF	25
	UNIF	26
IF (KFLOW - 2) 20, 30, 40	UNIF	27
	UNIF	28
C	UNIF	29
C THIS PORTION SETS UP FOR 'A' FLOW.	UNIF	30
	UNIF	31
20 NAFLOW = 1	UNIF	32
WRITE (3) KFLOW, (VY(I), VX(I), VX(I), I = 1, NQ)	UNIF	33
	UNIF	34
C	UNIF	35
C THIS IS A PATCH TO PROVIDE FOR LEAKY QUADS. THESE MUST BE THE	UNIF	36
C FIRST QUADS IN THE TABLE. THEY LEAK AT A FRACTION FRACT OF THE	UNIF	37
C FREE-STREAM RATE. ONLY THE A FLOW IS PROVIDED FOR HERE.	UNIF	38
	UNIF	39
C	UNIF	40
C LEAK = NO. OF LEAKY QUADS	UNIF	41
	UNIF	42
IF(LEAK .GT. 0) GO TO 21	UNIF	43
WRITE(3) (XNORM(I), I=1,NL)	UNIF	44
GO TO 50	UNIF	45
21 DO 22 I=1,LEAK	UNIF	46
22 VZ(I) = XNORM(I) + FRACT	UNIF	47
IF(LEAK .GE. NL) GO TO 25	UNIF	48
LEAKP = LEAK + 1	UNIF	49
DO 24 I=LEAKP,NL	UNIF	50
24 VZ(I) = XNORM(I)	UNIF	51
25 WRITE(3) (VZ(I), I=1,NL)	UNIF	52
DO 26 I=1,NL	UNIF	53
26 VZ(I) = 0.0	UNIF	54
GO TO 50	UNIF	55
	UNIF	56
C	UNIF	57
C THIS PORTION SETS UP FOR 'B' FLOW.	UNIF	58
	UNIF	59
30 NBFLOW = 1	UNIF	60
WRITE (3) KFLCW, (VX(I), VY(I), VX(I), I = 1, NQ)	UNIF	
WRITE (3) (YNORM(I), I = 1, NL)	UNIF	
GO TO 50	UNIF	
	UNIF	
C	UNIF	
C THIS PORTION SETS UP FOR 'C' FLOW.	UNIF	

40	NCFLOW = 1	UNIF	61
	WRITE (3) KFLOW, (VX(I), VY(I), I = 1, NQ)	UNIF	62
	WRITE (3) (ZNORM(I), I = 1, NL)	UNIF	63
C	CHECK FOR INPUT SIGMAS.	UNIF	64
		UNIF	65
50	IF (ISIG .EQ. 0) RETURN	UNIF	66
		UNIF	67
C	READ THE SIGMA GUESSES INTO VZ.	UNIF	68
		UNIF	69
	READ (5, 60) (VZ(I), I = 1, NQJAD)	UNIF	70
60	FORMAT (6F10.8)	UNIF	71
		UNIF	72
C	WRITE SIGMAS ON TAPE 3 AS ONE LOGICAL RECORD AND HANG IT UP. *TMR*	UNIF	74
		UNIF	75
	WRITE (3) (VZ(I), I = 1, NL)	UNIF	76
	RETURN	UNIF	77
	END	UNIF	78

*DECK, VFORM		VFOR	1
SUBROUTINE VFORM		VFOR	2
REAL M12, M23, M34, M41, IXX, IXY, IYY		VFOR	3
INTEGER TAPES		VFOR	4
C		VFOR	5
LOGICAL AFLOW, BFLOW, CFLOW		VFOR	6
DIMENSION NTAPE(3), G41(335),		VFOR	7
1 XIJ1 (335), XIJ2 (335), XIJ3 (335), YIJ1 (335), YIJ2 (335),		VFOR	8
2 YIJ3 (335), ZIJ1 (335), ZIJ2 (335), ZIJ3 (335), XX1 (1340),		VFOR	9
3 XX2 (1340), XX3(1340), YY1(1340), YY2(1340), YY3(1340), ZZ1(1340),		VFOR	10
4 ZZ2(1340), ZZ3(1340), X(8), Y(8), Z(8), XC(335), YC(335), ZC(335),		VFOR	11
5 A11(335), A12 (335), A13 (335), A21(335), A22(335), A23(335),		VFOR	12
6 A31(335), A32 (335), A33 (335), XI1(335), XI2(335), XI3(335),		VFOR	13
7 XI4(335), ETA1(335), ETA2 (335), ETA4(335), TSQ(335), A (335),		VFOR	14
8 IXX(335), IXY (335), IYY (335), D12 (335), D23(335), D34(335)		VFOR	15
COMMON HEDR(15), MPR, NER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,		VFOR	16
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE		VFOR	17
EQUIVALENCE (XIJ1, YY1 (1)), (XC, YY1 (336)), (YC, YY1 (671)),		VFOR	18
1 (ZC, YY1(1006)), (ETA4, XX1 (1)), (YIJ1, XX1 (336)),		VFOR	19
2 (XIJ2, YY2 (1)), (YIJ2, YY2 (336)), (A11, YY2 (671)),		VFOR	20
3 (A12, YY2 (1006)), (A13, XX1 (671)), (TSQ, XX1 (1006)),		VFOR	21
4 (A21, YY3 (1)) , (A22, YY3 (336)), (A23, YY3 (671)),		VFOR	22
5 (A , YY3 (1006)), (XIJ3, XX2 (1)), (YIJ3, XX2 (336)),		VFOR	23
6 (ZIJ1, ZZ1 (1)) , (A31, ZZ1 (336)), (A32, ZZ1 (671)),		VFOR	24
7 (A33, ZZ1 (1006)), (IXX, XX2 (671)), (D12, XX2 (1006)),		VFOR	25
8 (ZIJ2, ZZ2 (1)) , (XI1, ZZ2 (336)), (XI2, ZZ2 (671)),		VFOR	26
9 (XI3, ZZ2 (1006)), (IXY, XX3 (1)), (D23, XX3 (336)),		VFOR	27
A (D34, ZZ3 (1)) , (ZIJ3, ZZ3(336)), (XI4, ZZ3 (671)),		VFOR	28
B (ETA1, ZZ3 (1006)), (ETA2, XX3 (671)), (IYY, XX3 (1006))		VFOR	29
COMMON /DFLOW/ AFLOW, BFLCW, CFLOW, NMAT, NMATM1, NAFLOW, NBFLCW, NCFLOW		VFOR	30
DATA RHO1SQ, RHO2SQ / 6.0, 16.0 /		VFOR	31
DATA NTAPE / 1, 11, 12 /		VFOR	32
4004 FORMAT (1H0, 3HROW, I5, 5X, 6HX-FLW)		VFOR	33
4005 FORMAT (1H0, 3HROW, I5, 5X, 6HY-FLW)		VFOR	34
4006 FORMAT (1H0, 3HROW, I5, 5X, 6HZ-FLW)		VFOR	35
INEAR = 0		VFOR	36
INTERM = 0		VFOR	37

IFAR = 0	VFOR 38
10 IF (NSYM - 1) 58, 52, 54	VFOR 39
52 ASSIGN 2100 TO I29	VFOR 40
ASSIGN 910 TO I19	VFOR 41
GO TO 60	VFOR 42
54 ASSIGN 2200 TO I29	VFOR 43
IF (NSYM .EQ. 3) GO TO 56	VFOR 44
ASSIGN 920 TO I19	VFOR 45
GO TO 60	VFOR 46
56 ASSIGN 930 TO I19	VFOR 47
GO TO 60	VFOR 48
58 ASSIGN 2000 TO I19	VFOR 49
60 LOOP = 2 ** NSYM + 1	VFOR 50
NEL = NQUAD / 3	VFOR 51
NELL = NEL	VFOR 52
NELP = NEL	VFOR 53
NREM = MOD (3 * NEL + 1, 255)	VFOR 54
IF (NREM .LT. 5 .AND. NREM .GT. 0) NELP = NEL + 5	VFOR 55
NON = NQUAD + NOFF	VFOR 56
DO 8000 M = 1, 3	VFOR 57
KROW = 0	VFOR 58
201 NT = NTAPE (M)	VFOR 59
202 IF (M .NE. 3) GO TO 300	VFOR 60
NEL = NQUAD - 2 * NEL	VFOR 61
NELP = NEL	VFOR 62
NREM = MOD (3 * NEL + 1, 255)	VFOR 63
IF (NREM .LT. 5 .AND. NREM .GT. 0) NELP = NEL + 5	VFOR 64
	VFOR 65
C READ 28 QUANTITIES	VFOR 66
	VFOR 67
300 DO 500 J = 1, NEL	VFOR 68
500 READ (4) XC(J), YC (J), ZC(J), A11(J), A12(J), A13(J), A21(J),	VFOR 69
1 A22(J), A23(J), A31(J), A32(J), A33(J), XI1(J),ETA1(J),XI2(	VFOR 70
2 J), ETA2(J), XI3(J), XI4(J), ETA4(J), TSQ(J), A (J), IXX (J),	VFOR 71
3 IXY (J), IYY(J), D12(J), D23(J), D34(J), D41(J)	VFOR 72
800 KROW = KROW + 1	VFOR 73
READ (8) XNPP, YNPP, ZNPP	VFOR 74
DO 2300 I1 = 1, NEL	VFOR 75
DO 1700 I2 = 1, LOOP	VFOR 76
IF (I2 .EQ. LOOP) GO TO I19, (2300, 910, 920, 930)	VFOR 77
GO TO (1000, 910, 920, 910, 930, 910, 920, 910), I2	VFOR 78
910 YC (I1) = - YC (I1)	VFOR 79
A12 (I1) = - A12 (I1)	VFOR 80
A22 (I1) = - A22 (I1)	VFOR 81
A31 (I1) = - A31 (I1)	VFOR 82
A33 (I1) = - A33 (I1)	VFOR 83
GO TO 932	VFOR 84
920 ZC (I1) = - ZC (I1)	VFOR 85
A13 (I1) = - A13 (I1)	VFOR 86
A23 (I1) = - A23 (I1)	VFOR 87
A31 (I1) = - A31 (I1)	VFOR 88
A32 (I1) = - A32 (I1)	VFOR 89
GO TO 932	VFOR 90
930 XC (I1) = - XC (I1)	VFOR 91
A11 (I1) = - A11 (I1)	VFOR 92
A21 (I1) = - A21 (I1)	VFOR 93
A32 (I1) = - A32 (I1)	VFOR 94
A33 (I1) = - A33 (I1)	VFOR 95
932 IF (I2 .EQ. LOOP) GO TO I29, (2100, 2200)	VFOR 96
1000 XDIF = XNPP - XC (I1)	VFOR 97

YDIF = YNPP- YC (I1)	VFOR 98
ZDIF = ZNPP- ZC (I1)	VFOR 99
C COMPUTE DISTANCE FROM NULL POINT TO ORIGIN OF J-TH ELEMENT COORDINATE	VFOR 100
C SYSTEM (J CORRESPONDS TO THE INDEX I1)	VFOR 101
	VFOR 102
C INEQUALITY (98)	VFOR 103
	VFOR 104
ROSQ = XDIF ** 2 + YDIF ** 2 + ZDIF ** 2	VFOR 105
IF (ROSQ .LT. RHO2SQ * TSQ (I1)) GO TO 1400	VFOR 106
	VFOR 107
C COMPUTE INDUCED VELOCITY COMPONENTS	VFOR 108
C EQUATION (97)	VFOR 109
	VFOR 110
IFAR = IFAR + 1	VFOR 111
ARG1 = A (I1) / SQRT (ROSQ) ** 3	VFOR 112
X (I2) = ARG1 * XDIF	VFOR 113
Y (I2) = ARG1 * YDIF	VFOR 114
Z (I2) = ARG1 * ZDIF	VFOR 115
GO TO 1700	VFOR 116
	VFOR 117
	VFOR 118
C TRANSFORM NULL POINT TO J - ELEMENT COORDINATE SYSTEM	VFOR 119
C EQUATION (78)	VFOR 120
	VFOR 121
	VFOR 122
1400 XNP = A11 (I1) * XDIF + A12 (I1) * YDIF + A13 (I1) * ZDIF	VFOR 123
YNP = A21 (I1) * XDIF + A22 (I1) * YDIF + A23 (I1) * ZDIF	VFOR 124
ZNP = A31 (I1) * XDIF + A32 (I1) * YDIF + A33 (I1) * ZDIF	VFOR 125
	VFOR 126
C INEQUALITIES (99) AND (100)	VFOR 127
IF (ROSQ .LT. RHO1SQ * TSQ (I1)) GO TO 1410	VFOR 128
	VFOR 129
C COMPUTE INDUCED VELOCITY COMPONENTS	VFOR 130
C EQUATIONS (57) - (62)	VFOR 131
	VFOR 132
INTERM = INTERM + 1	VFOR 133
P = YNP ** 2 + ZNP ** 2 - 4.0 * XNP ** 2	VFOR 134
QP = XNP ** 2 + ZNP ** 2 - 4.0 * YNP ** 2	VFOR 135
RO = SQRT (ROSQ)	VFOR 136
ROP = RO ** (- 7)	VFOR 137
WXXX = XNP * (9.0 * P + 30.0 * XNP ** 2) * ROP	VFOR 138
WXXY = 3.0 * P * RCP * YNP	VFOR 139
WXYX = 3.0 * XNP * QP * ROP	VFOR 140
WYYY = YNP * (9.0 * QP + 30.0 * YNP ** 2) * ROP	VFOR 141
WXXZ = 3.0 * ZNP * P * ROP	VFOR 142
WXYZ = - 15.0 * XNP * YNP * ZNP * ROP	VFOR 143
WYYZ = 3.0 * ZNP * QP * ROP	VFOR 144
ROP = - RO ** (- 3)	VFOR 145
WX = ROP * XNP	VFOR 146
WY = ROP * YNP	VFOR 147
WZ = ROP * ZNP	VFOR 148
HIXX = .5 * IXX (I1)	VFOR 149
HIYY = .5 * IYY (I1)	VFOR 150
VX = - WXYX*HIYY - WXXY*IXY (I1) - WXXX*HIXX - WX*A (I1)	VFOR 151
VY = - WYYY*HIYY - WXYX*IXY (I1) - WXXY*HIXX - WY*A (I1)	VFOR 152
VZ = - WYYZ*HIYY - WXYZ*IXY (I1) - WXXZ*HIXX - WZ*A (I1)	VFOR 153
GO TO 1600	VFOR 154
	VFOR 155
C COMPUTE INDUCED VELOCITY COMPONENTS	VFOR 156
C EQUATIONS (42) - (49)	VFOR 157

1410	ETA4M3 = ETA4 (I1) - ETA1 (I1)	VFOR 158
	INEAR = INEAR + 1	VFOR 159
	RO = SQRT (ROSQ)	VFOR 160
	ETA2M1 = ETA2 (I1) - ETA1 (I1)	VFOR 161
	XI4M3 = XI4 (I1) - XI3 (I1)	VFOR 162
	XI2M1 = XI2 (I1) - XI1 (I1)	VFOR 163
	XI3M2 = XI3 (I1) - XI2 (I1)	VFOR 164
	XI1M4 = XI1 (I1) - XI4 (I1)	VFOR 165
	XMXI 1 = XNP - XI1 (I1)	VFOR 166
	XMXI2 = XNP - XI2 (I1)	VFOR 167
	XMXI3 = XNP - XI3 (I1)	VFOR 168
	XMXI4 = XNP - XI4 (I1)	VFOR 169
	YMETA1 = YNP - ETA1 (I1)	VFOR 170
	YMETA 2 = YNP - ETA2 (I1)	VFOR 171
	YMETA 4 = YNP - ETA4 (I1)	VFOR 172
	ZNPSQ = ZNP * ZNP	VFOR 173
	IF (ZNPSQ .LT. TSQ (I1) * 1.0E-6) ZNPSQ = 0.0	VFOR 174
	E1 = ZNPSQ + XMXI1 **2	VFOR 175
	E2 = ZNPSQ + XMXI2 **2	VFOR 176
	E3 = ZNPSQ + XMXI3 **2	VFOR 177
	E4 = ZNPSQ + XMXI4 **2	VFOR 178
	H1 = YMETA1 * XMXI1	VFOR 179
	H2 = YMETA2 * XMXI2	VFOR 180
	H3 = YMETA1 * XMXI3	VFOR 181
	H4 = YMETA4 * XMXI4	VFOR 182
	M12 = 0.0	VFOR 183
	IF (XI2M1 .NE. 0.0) M12 = ETA2M1 / XI2M1	VFOR 184
	M23 = 0.0	VFOR 185
	IF (XI3M2 .NE.0.0) M23 = - ETA2M1 / XI3M2	VFOR 186
	M34 = 0.0	VFOR 187
	IF (XI4M3 .NE. 0.0) M34 = ETA4M3 / XI4M3	VFOR 188
	M41 = 0.0	VFOR 189
	IF (XI1M4 .NE. 0.0) M41 = - ETA4M3 / XI1M4	VFOR 190
	ANUM1 = M12 * E1 - H1	VFOR 191
	ANUM2 = M12 * E2 - H2	VFOR 192
	ANUM3 = M23 * E2 - H2	VFOR 193
	ANUM4 = M23 * E3 - H3	VFOR 194
	ANUM5 = M34 * E3 - H3	VFOR 195
	ANUM6 = M34 * E4 - H4	VFOR 196
	ANUM7 = M41 * E4 - H4	VFOR 197
	ANUM8 = M41 * E1 - H1	VFOR 198
	R 1 = SQRT (XMXI1 ** 2 + YMETA1 ** 2 + ZNPSQ)	VFOR 199
	R2 = SQRT (XMXI2 ** 2 + YMETA2 ** 2 + ZNPSQ)	VFOR 200
	R3 = SQRT (XMXI3 ** 2 + YMETA1 ** 2 + ZNPSQ)	VFOR 201
	R4 = SQRT (XMXI4 ** 2 + YMETA4 ** 2 + ZNPSQ)	VFOR 202
	Q25 = D12 (I1)	VFOR 203
	Q26 = D23 (I1)	VFOR 204
	Q27 = D34 (I1)	VFOR 205
	Q28 = D41 (I1)	VFOR 206
	VX = 0.0	VFOR 207
	VY = 0.0	VFOR 208
	VZ = 0.0	VFOR 209
	IF (Q25) 1420, 1430, 1420	VFOR 210
1420	TEMP = R1 + R2	VFOR 211
	TEMP1 = TEMP - Q25	VFOR 212
	TEMP2 = TEMP + Q25	VFOR 213
	ARG1 = 1.0	VFOR 214
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG1=ALOG(TEMP1/TEMP2)	VFOR 215
	TEMP = ARG1 / Q25	VFOR 216
		VFOR 217

	VX = ETA2M1 * TEMP	VFOR 218
	VY = - XI2M1 * TEMP	VFOR 219
1430	IF (Q26) 1435, 1440, 1435	VFOR 220
1435	TEMP = R2 + R3	VFOR 221
	TEMP1 = TEMP - Q26	VFOR 222
	TEMP2 = TEMP + Q26	VFOR 223
	ARG2 = 1.0	VFOR 224
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG2=ALOG(TEMP1/TEMP2)	VFOR 225
	TEMP = ARG2 / Q26	VFOR 226
	VX = VX - ETA2M1 * TEMP	VFOR 227
	VY = VY - XI3M2 * TEMP	VFOR 228
1440	IF (Q27) 1450, 1460, 1450	VFOR 229
1450	TEMP = R3 + R4	VFOR 230
	TEMP1 = TEMP - Q27	VFOR 231
	TEMP2 = TEMP + Q27	VFOR 232
	ARG3 = 1.0	VFOR 233
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG3=ALOG(TEMP1/TEMP2)	VFOR 234
	TEMP = ARG3 / Q27	VFOR 235
	VX = VX + ETA4M3 * TEMP	VFOR 236
	VY = VY - XI4M3 * TEMP	VFOR 237
1460	IF (Q28) 1470, 1480, 1470	VFOR 238
1470	TEMP = R4 + R1	VFOR 239
	TEMP1 = TEMP - Q28	VFOR 240
	TEMP2 = TEMP + Q28	VFOR 241
	ARG4 = 1.0	VFOR 242
	IF (TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0) ARG4=ALOG(TEMP1/TEMP2)	VFOR 243
	TEMP = ARG4 / Q28	VFOR 244
	VX = VX - ETA4M3 * TEMP	VFOR 245
	VY = VY - XI1M4 * TEMP	VFOR 246
1480	IF (ZNPSQ .NE. 0.0) GO TO 1510	VFOR 247
	TEST = SQRT(TSQ(I1)* 1.0E-3)	VFOR 248
	IF(Q25.GT.TEST) IF((XMXI1*ETA2M1-YMETA1*XI2M1)/Q25) 1600,1502,1502	VFOR 249
1502	IF(Q26.GT.TEST) IF((-XMXI2*ETA2M1-YMETA2*XI3M2)/Q26) 1600,1504,1504	VFOR 250
1504	IF(Q27.GT.TEST) IF((XMXI3*ETA4M3-YMETA1*XI4M3)/Q27) 1600,1506,1506	VFOR 251
1506	IF(Q28.GT.TEST) IF((-XMXI4*ETA4M3-YMETA4*XI1M4)/Q28) 1600,1508,1508	VFOR 252
1508	VZ = 6.28318531E0	VFOR 253
	GO TO 1600	VFOR 254
1510	IF (XI2M1 .NE. 0.0) VZ = ATAN(ANUM1/(ZNP*R1))-ATAN(ANUM2/(ZNP*R2))	VFOR 255
	IF (XI3M2 .NE. 0.0) VZ=VZ+ATAN(ANUM3/(ZNP*R2))-ATAN(ANUM4/(ZNP*R3))	VFOR 256
	IF (XI4M3 .NE. 0.0) VZ=VZ+ATAN(ANUM5/(ZNP*R3))-ATAN(ANUM6/(ZNP*R4))	VFOR 257
	IF (XI1M4 .NE. 0.0) VZ=VZ+ATAN(ANUM7/(ZNP*R4))-ATAN(ANUM8/(ZNP*R1))	VFOR 258
C		VFOR 259
C	TRANSFORM INDUCED VELOCITY COMPONENTS TO REFERENCE COORDINATE SYSTEM	VFOR 260
C	EQUATION (79)	VFOR 261
		VFOR 262
1600	X (I2) = A11 (I1) * VX + A21 (I1) * VY + A31 (I1) * VZ	VFOR 263
	Y (I2) = A12 (I1) * VX + A22 (I1) * VY + A32 (I1) * VZ	VFOR 264
	Z (I2) = A13 (I1) * VX + A23 (I1) * VY + A33 (I1) * VZ	VFOR 265
1700	CONTINUE	VFOR 266
		VFOR 267
2000	IF (.NOT. AFLOW) GO TO 2010	VFOR 268
	XIJ1(I1) = X(1)	VFOR 269
	YIJ1(I1) = Y(1)	VFOR 270
	ZIJ1(I1) = Z(1)	VFOR 271
2010	IF (.NOT. BFLOW) GO TO 2020	VFOR 272
	XIJ2(I1) = X(1)	VFOR 273
	YIJ2(I1) = Y(1)	VFOR 274
	ZIJ2(I1) = Z(1)	VFOR 275
2020	IF (.NOT. CFLOW) GO TO 2300	VFOR 276
	XIJ3(I1) = X(1)	VFOR 277

YIJ3(I1) = Y(1)	VFOR 278
ZIJ3(I1) = Z(1)	VFOR 279
GO TO 2300	VFOR 280
2100 IF (.NOT. AFLOW) GO TO 2101	VFOR 281
XIJ1 (I1) = X (1) + X (2)	VFOR 282
YIJ1 (I1) = Y (1) + Y (2)	VFOR 283
ZIJ1 (I1) = Z (1) + Z (2)	VFOR 284
2101 IF (.NOT. BFLOW) GO TO 2102	VFOR 285
XIJ2 (I1) = X (1) - X (2)	VFOR 286
YIJ2 (I1) = Y (1) - Y (2)	VFOR 287
ZIJ2 (I1) = Z (1) - Z (2)	VFOR 288
2102 IF (.NOT. CFLOW) GO TO 2300	VFOR 289
XIJ3 (I1) = X (1) + X (2)	VFOR 290
YIJ3 (I1) = Y (1) + Y (2)	VFOR 291
ZIJ3 (I1) = Z (1) + Z (2)	VFOR 292
GO TO 2300	VFOR 293
2200 IF (.NOT. AFLOW) GO TO 2201	VFOR 294
XIJ1 (I1) = X (1) + X (2) + X (3) + X (4)	VFOR 295
YIJ1 (I1) = Y (1) + Y (2) + Y (3) + Y (4)	VFOR 296
ZIJ1 (I1) = Z (1) + Z (2) + Z (3) + Z (4)	VFOR 297
2201 IF (.NOT. BFLOW) GO TO 2202	VFOR 298
XIJ2 (I1) = X (1) - X (2) - X (3) + X (4)	VFOR 299
YIJ2 (I1) = Y (1) - Y (2) - Y (3) + Y (4)	VFOR 300
ZIJ2 (I1) = Z (1) - Z (2) - Z (3) + Z (4)	VFOR 301
2202 IF (.NOT. CFLOW) GO TO 2204	VFOR 302
XIJ3 (I1) = X (1) + X (2) - X (3) - X (4)	VFOR 303
YIJ3 (I1) = Y (1) + Y (2) - Y (3) - Y (4)	VFOR 304
ZIJ3 (I1) = Z (1) + Z (2) - Z (3) - Z (4)	VFOR 305
2204 IF (NSYM .EQ. 2) GC TO 2300	VFOR 306
IF (.NOT. AFLOW) GO TO 2205	VFOR 307
XIJ1 (I1) = XIJ1 (I1) - X (5) - X (6) - X (7) - X (8)	VFOR 308
YIJ1 (I1) = YIJ1 (I1) - Y (5) - Y (6) - Y (7) - Y (8)	VFOR 309
ZIJ1 (I1) = ZIJ1 (I1) - Z (5) - Z (6) - Z (7) - Z (8)	VFOR 310
2205 IF (.NOT. BFLOW) GO TO 2206	VFOR 311
XIJ2 (I1) = XIJ2 (I1) + X (5) - X (6) - X (7) + X (8)	VFOR 312
YIJ2 (I1) = YIJ2 (I1) + Y (5) - Y (6) - Y (7) + Y (8)	VFOR 313
ZIJ2 (I1) = ZIJ2 (I1) + Z (5) - Z (6) - Z (7) + Z (8)	VFOR 314
2206 IF (.NOT. CFLOW) GO TO 2300	VFOR 315
XIJ3 (I1) = XIJ3 (I1) - X (5) - X (6) + X (7) + X (8)	VFOR 316
YIJ3 (I1) = YIJ3 (I1) - Y (5) - Y (6) + Y (7) + Y (8)	VFOR 317
ZIJ3 (I1) = ZIJ3 (I1) - Z (5) - Z (6) + Z (7) + Z (8)	VFOR 318
2300 CONTINUE	VFOR 319
C WRITE ONE ROW ON TAPE	VFOR 320
C	VFOR 321
IF(AFLOW)WRITE(NT) (XIJ1(J),YIJ1(J),ZIJ1(J),J=1, NELP)	VFOR 322
IF(BFLOW) WRITE(NT) (XIJ2(J),YIJ2(J),ZIJ2(J),J=1,NELP)	VFOR 323
IF(CFLOW)WRITE(NT) (XIJ3(J),YIJ3(J),ZIJ3(J),J=1, NELP)	VFOR 324
	VFOR 325
IF (KROW .LT. NON) GC TO 800	VFOR 326
REWIND A	VFOR 327
8000 REWIND NT	VFOR 328
42 FORMAT (1H0, 5X, 13+XIJ COMPONENT / (1H , 7F15.8))	VFOR 329
43 FORMAT (1H0, 5X, 13HYIJ COMPONENT / (1H , 7F15.8))	VFOR 330
44 FORMAT (1H0, 5X, 13+ZIJ COMPONENT / (1H , 7F15.8))	VFOR 331
IF (MPR .EQ. 0 .OR. MPR .EQ. 2) GO TO 9075	VFOR 332
CALL HEADER	VFOR 333
DO 9060 K = 1, KRCW	VFOR 334
IND1 = 1 - NELL	VFOR 335
IND2 = 0	VFOR 336
I = 0	VFOR 337

9003	IND1 = IND1 + NELL	VFOR 338
	IND2 = IND2 + NELL	VFOR 339
9002	I = I + 1	VFOR 340
	NT = NTAPE (I)	VFOR 341
004	IF(AFLOW) READ(NT) (XX1(J), YY1(J), ZZ1(J), J = IND1, INC2)	VFOR 342
	IF(BFLOW) READ(NT) (XX2(J), YY2(J), ZZ2(J), J=IND1, IND2)	VFOR 343
	IF(CFLOW) READ (NT) (XX3(J), YY3(J), ZZ3(J), J=IND1, INC2)	VFOR 344
	IF (I - 2) 9003, 9008, 9050	VFOR 345
9008	IND1 = IND2 + 1	VFOR 346
	IND2 = IND2 + NEL	VFOR 347
	GO TO 9002	VFOR 348
9050	IF (.NOT. AFLOW) GO TO 9051	VFOR 349
	WRITE (6, 4004) K	VFOR 350
	WRITE (6, 42) (XX1 (J), J = 1, NQUAD)	VFOR 351
	WRITE (6, 43) (YY1 (J), J = 1, NQUAD)	VFOR 352
	WRITE (6, 44) (ZZ1 (J), J = 1, NQUAD)	VFOR 353
9051	IF (.NOT. BFLOW) GO TO 9052	VFOR 354
	WRITE (6, 4005) K	VFOR 355
	WRITE (6, 42) (XX2 (J), J = 1, NQUAD)	VFOR 356
	WRITE (6, 43) (YY2 (J), J = 1, NQUAD)	VFOR 357
	WRITE (6, 44) (ZZ2 (J), J = 1, NQUAD)	VFOR 358
9052	IF (.NOT. CFLOW) GO TO 9060	VFOR 359
	WRITE (6, 4006) K	VFOR 360
	WRITE (6, 42) (XX3 (J), J = 1, NQUAD)	VFOR 361
	WRITE (6, 43) (YY3 (J), J = 1, NQUAD)	VFOR 362
	WRITE (6, 44) (ZZ3 (J), J = 1, NQUAD)	VFOR 363
9060	CONTINUE	VFOR 364
9070	REWIND 1	VFOR 365
	REWIND 11	VFOR 366
	REWIND 12	VFOR 367
9075	WRITE (6, 4999) INEAR, INTERM, IFAR	VFOR 368
4999	FORMAT (1H0, //16H0NEAR ELEMENTS =, I7/ 24H0INTERMEDIATE ELEMENTS =	VFOR 369
	1, I7 / 15H0IFAR ELEMENTS =, I7)	VFOR 370
	WRITE(6, 9999)	VFOR 371
9999	FORMAT(1H0 , 5X, 13HLEAVING VFOR4)	VFOR 372
C	RETURN	VFOR 373
	END	VFOR 374

*DECK, AFORM		AFOR	1
SUBROUTINE AFORM		AFOR	2
REAL NX , NY , NZ		AFOR	3
LOGICAL AFLCW, BFLOW, CFLOW		AFOR	4
COMMON /DFLOW/ AFLCW, BFLOW, CFLOW, NMAT, NMAT*1, NAFLOW, NBFLOW, NCFLOW		AFOR	5
COMMON HEDR(15), MPR, NER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,		AFOR	6
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE		AFOR	7
DIMENSION C(6000)		AFOR	8
DIMENSION NX(1000), NY(1000), NZ(1000), NTAPE(3)		AFOR	9
DIMENSION A(1000), XIJ(1000), YIJ(1000), ZIJ(1000)		AFOR	10
DATA NTAPE / 9, 10, 13 /		AFOR	11
42 FORMAT (1H0, 5X, 13HXIJ COMPONENT / (1H , 7F15.8))		AFOR	12
43 FORMAT (1H0, 5X, 13HYIJ COMPONENT / (1H , 7F15.8))		AFOR	13
44 FORMAT (1H0, 5X, 13HZIJ COMPONENT / (1H , 7F15.8))		AFOR	14
45 FORMAT (1H0, 3HROW, I6)		AFOR	15
46 FORMAT(1H0, 5X, 3HAIJ / (1H , 7F15.8))		AFOR	16
IF (MPR .NE. 0) CALL HEADER		AFOR	17
NQNN1 = NQUAD + 2		AFOR	18
NQNN = MOD(NQNN1, 255)		AFOR	19
IF (NQNN .LT. 5 .AND. NQNN .GT. 0) NQNN1 = NQUAD + 5		AFOR	20
IF (NCODE .NE. 1) GO TO 20		AFOR	21
IF (NAFLOW) 2, 2, 1		AFOR	22
1 NF1 = NAFLOW		AFOR	23
GO TO 5		AFOR	24
2 IF (NBFLOW) 4, 4, 3		AFOR	25
3 NF1 = NBFLOW		AFOR	26
GO TO 5		AFOR	27
4 NF1 = NCFLOW		AFOR	28
5 NF2 = NFLOW - NF1		AFOR	29
L2 = 0		AFOR	30
DO 6 KK = 1, NF1		AFOR	31
L1 = L2 + 1		AFOR	32
L2 = L2 + NQUAD		AFOR	33
READ (3)		AFOR	34
6 READ (3) (C(K), K = L1, L2)		AFOR	35
LAST1 = L2		AFOR	36
IF (NF2 .EQ. 0) GO TO 8		AFOR	37
DO 7 KK = 1, NF2		AFOR	38
L1 = L2 + 1		AFOR	39
L2 = L2 + NQUAD		AFOR	40
READ (3)		AFOR	41
7 READ (3) (C(K), K = L1, L2)		AFOR	42
8 DO 10 KK = 1, L2		AFOR	43
10 C(KK) = -C(KK)		AFOR	44
C ** READ IN UNIT NORMAL VECTORS		AFOR	45
20 READ(4) (NX(I), NY(I), NZ(I), I = 1, NQUAD)		AFOR	46
C FORM NORMAL VELOCITIES - EQUATION 102		AFOR	47
30 DO 1000 KK = 1, NQUAD		AFOR	48
DO 1000 NM = 1, NMAT		AFOR	49
CALL ROWV (XIJ, YIJ, ZIJ, (KK * NM) / NMAT + NOFF, 0)		AFOR	50
DO 60 K= 1, NQUAD		AFOR	51
60 A (K) = NX(KK)*XIJ(K) + NY(KK)* YIJ(K) + NZ(KK)*ZIJ(K)		AFOR	52
IF(MPR.EQ. 0) GO TO 70		AFOR	53
WRITE(6,45) KK		AFOR	54
IF (MPR .EQ. 2) GO TO 65		AFOR	55
WRITE(6,42) (XIJ(I4), I4 = 1, NQUAD)		AFOR	56
WRITE(6,43) (YIJ(I4), I4 = 1, NQUAD)		AFOR	57
WRITE(6,44) (ZIJ(I4), I4 = 1, NQUAD)		AFOR	58
IF (MPR - 2) 70, 65, 65		AFOR	59
70 WRITE (6, 46) (A(I4), I4 = 1, NQUAD)		AFOR	60

70	IF (NCODE .NE. 1) GO TO 500	AFOR	61
	IF (NM .NE. 1) GO TO 100	AFOR	62
	WRITE(8) (A(I),I=1,NQUAD), (C(I),I=KK, LAST1,NQUAD)	AFOR	63
	GO TO 1000	AFOR	64
100	NT = KK + LAST1	AFOR	65
	WRITE (10) (A(I),I=1,NQUAD), (C(I),I=NT,L2,NQUAD)	AFOR	66
	GO TO 1000	AFOR	67
500	NT = NTAPE(NM)	AFOR	68
	IF (NM .EQ. 1) WRITE (8) NQNN1, (A(I), I = 1, NQNN1)	AFOR	69
	WRITE (NT) NQNN1, (A(I), I = 1, NQNN1)	AFOR	70
1000	CONTINUE	AFOR	71
	REWIND 8	AFOR	72
	REWIND 9	AFOR	73
	REWIND 10	AFOR	74
	REWIND 13	AFOR	75
	WRITE(6, 9999)	AFOR	76
9999	FORMAT(1H0 , 5X, 13HLEAVING AFOR)	AFOR	77
C	RETURN	AFOR	78
	END	AFOR	79

*DECK, SOLVT		SOLV	1
	SUBROUTINE SOLVIT	SOLV	2
C	SUBROUTINE SOLVIT (A, NI, MD, KD, NI, MM, NO, NW, *)	SOLV	3
	COMMON/SOLVE/ NI,MM,NO,KD,MD	SOLV	4
	COMMON HEOR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,ND,	SOLV	5
	1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	SOLV	6
	COMMON /SPACER/ A(14000)	SOLV	7
C		SOLV	8
C		SOLV	9
C	***** ***/ ***** ***/ *	SOLV	10
C	* * * / * * * * * * * / * * * * *	SOLV	11
C	**** **** * / * * * * * * / * * * * *	SOLV	12
C	* * / * * * * * * / * * * * *	SOLV	13
C	* / *** * * * * * / *** * *	SOLV	14
C		SOLV	15
C	DIRECT MATRIX SOLUTION	SOLV	16
C		SOLV	17
C	WRITTEN BY J. L. HESS * PROGRAMMED BY T. M. RIDDELL	SOLV	18
C	*****LANGUAGE	SOLV	19
C		SOLV	20
C	FORTRAN IV	SOLV	21
C		SOLV	22
C	*****FUNCTIONAL DESCRIPTION	SOLV	23
C		SOLV	24
C	THIS ROUTINE SOLVES THE REAL MATRIX EQUATION	SOLV	25
C		SOLV	26
C	-- -- -- -- -- --	SOLV	27
C	I I I I I I	SOLV	28
C	I A I * I B I = I C I	SOLV	29
C	I I I I I I	SOLV	30
C	-- -- -- -- -- --	SOLV	31
C		SOLV	32
C	-1	SOLV	33
C	FOR 'B' (B = A * C) . IF 'A' IS THE REAL COEFFICIENT MATRIX	SOLV	34
C		SOLV	35
C	FOR A SET OF SIMULTANEOUS EQUATIONS AND 'C' IS THE MATRIX OF	SOLV	36

C		SOLV	37
C	CONSTANTS (RIGHT-SIDES), THEN '3' WILL BE THE SOLUTIONS OF THE	SOLV	38
C		SOLV	39
C	SET OF SIMULTANEOUS EQUATIONS. NOTE THAT IF 'C' IS A UNIT MATRIX,	SOLV	40
C		SOLV	41
C	'B' WILL BE THE INVERSE OF 'A'.	SOLV	42
C		SOLV	43
C	C*****CALL STATEMENT	SOLV	44
C		SOLV	45
C	CALL SOLVIT (AREA, N, M, KORE, NT1, NT2, NT3, NOUT, &NNN)	SOLV	46
C		SOLV	47
C	WHERE	SOLV	48
C		SOLV	49
C	'AREA' IS AN ARRAY (DIMENSIONED FOR AT LEAST 'KORE' WORDS)	SOLV	50
C	THAT IS USED BY 'SOLVIT' FOR SCRATCH PURPOSES.	SOLV	51
C	AFTER A NORMAL RETURN FROM 'SOLVIT', THIS ARRAY WILL	SOLV	52
C	CONTAIN THE 'B' MATRIX STORED IN COLUMNAR ORDER.	SOLV	53
C		SOLV	54
C	'N' IS THE ORDER OF THE 'A' MATRIX	SOLV	55
C		SOLV	56
C	'M' IS THE NUMBER OF COLUMNS IN 'B' AND 'C'	SOLV	57
C		SOLV	58
C	'KORE' IS THE DIMENSIONED SIZE OF 'AREA' IN WORDS	SOLV	59
C		SOLV	60
C	'NT1' IS THE LOGICAL FILE NUMBER OF THE INPUT DATA SET	SOLV	61
C	(THIS UNIT IS ALSO USED BY 'SOLVIT' AS A SCRATCH TAPE)	SOLV	62
C	SEE BELOW FOR THE DESCRIPTION OF THE INPUT FORMAT	SOLV	63
C		SOLV	64
C	'NT2' IS THE LOGICAL FILE NUMBER OF AN AVAILABLE SCRATCH UNIT	SOLV	65
C		SOLV	66
C	'NT3' IS THE LOGICAL FILE NUMBER OF AN AVAILABLE SCRATCH UNIT	SOLV	67
C	(NT1, NT2, AND NT3 MUST ALL HAVE DIFFERENT VALUES)	SOLV	68
C		SOLV	69
C	'NOUT' IS THE LOGICAL FILE NUMBER OF THE OUTPUT DATA SET	SOLV	70
C	THE 'B' MATRIX IS WRITTEN ON 'NOUT' IN COLUMNAR ORDER,	SOLV	71
C	ONE LOGICAL RECCRD PER COLUMN	SOLV	72
C	('NOUT' MAY EQUAL NT1, NT2, OR NT3)	SOLV	73
C		SOLV	74
C	'&NNN' IS THE FORTRAN STATEMENT NUMBER WHERE CONTROL IS TO BE	SOLV	75
C	TRANSFERRED IF 'SOLVIT' DETERMINES THAT THE VALUE OF	SOLV	76
C	'KORE' IS TOO SMALL TO ALLOW THE COMPUTATION TO CONTINUE	SOLV	77
C	(A FORTRAN VARIABLE RETURN)	SOLV	78
C		SOLV	79
C	C*****OUTPUT	SOLV	80
C		SOLV	81
C	-1	SOLV	81
C	B = A C WRITTEN IN COLUMNAR ORDER (ONE LOGICAL RECORD	SOLV	82
C	PER COLUMN) ON 'NOUT' AND STORED IN 'AREA'	SOLV	83
C		SOLV	84
C	C*****STORAGE REQUIRED	SOLV	85
C		SOLV	86
C	F5E HEXADECIMAL BYTES	SOLV	87
C		SOLV	88
C	C*****METHOD	SOLV	89
C		SOLV	90
C	GAUSSIAN ELIMINATION	SOLV	91
C	NOTE...THE ROWS ARE NOT NORMALIZED	SOLV	92
C	THE PIVCT IS ASSUMED TO BE THE DIAGONAL ELEMENT	SOLV	93
C		SOLV	94
C	C*****GENERAL NOTES	SOLV	95
C		SOLV	96

C	THE VALUE OF 'KORE' MUST BE SUFFICIENT TO STORE	SOLV 97
C	MAX0 (3 * (N + M), N * M) REAL VALUES	SOLV 98
C		SOLV 99
C	THE 'A' AND 'C' MATRICES MUST BE INPUT IN ROW ORDER	SOLV 100
C	ONE LOGICAL RECCRD PER ROW OF THE 'A' AND 'C' MATRICES	SOLV 101
C	I.E.,	SOLV 102
C		SOLV 103
C	•	SOLV 104
C	• 1 ROW OF THE 'A' MATRIX • 1 ROW OF THE 'C' MATRIX •	SOLV 105
C	•••••	SOLV 106
C	• ('N' REAL VALUES) • ('M' REAL VALUES) •	SOLV 107
C	*	SOLV 108
C	*****	SOLV 109
C	* ONE LOGICAL RECORD *	SOLV 110
C	* ('N' + 'M' REAL VALUES) *	SOLV 111
C		SOLV 112
C		SOLV 113
C	'NOUT' IS NOT POSITIONED PRIOR TO THE WRITING OF 'B'	SOLV 114
C		SOLV 115
C		SOLV 116
C	DIMENSION A (KD)	SOLV 117
C		SOLV 118
C	LOGICAL LAST	SOLV 119
C		SOLV 120
C	NW=3	SOLV 121
C	N = ND	SOLV 122
C	M = MD	SOLV 123
C	KORE = KD	SOLV 124
C	NPM = N + M	SOLV 125
C	IF (MAX0(3 * NPM, M * N) .LE. KORE) GO TO 5	SOLV 126
C	2475 WRITE (6, 2480) NQUAD, MD , KORE	SOLV 127
C	2480 FORMAT (4H1THE,I4, 2H X,I3, 15H MATRIX EXCEEDS,I6, 7H WORDS.)	SOLV 128
C	CALL EXIT	SOLV 129
C	5 MT = MM	SOLV 130
C	REWIND MT	SOLV 131
C	NIN = NI	SOLV 132
C	REWIND NIN	SOLV 133
C	NOUT = NO	SOLV 134
C	REWIND NOUT	SOLV 135
C	MP1 = M + 1	SOLV 136
C	NN = N	SOLV 137
C	NEL = NPM	SOLV 138
C		SOLV 139
C	- - CALCULATE THE MAXIMUM NO. OF ROWS, 'K'	SOLV 140
C		SOLV 141
C	10 K = (KORE - NEL) / NEL	SOLV 142
C		SOLV 143
C	- - TEST TO SEE IF THE REST OF THE MATRIX WILL FIT IN CORE	SOLV 144
C		SOLV 145
C	LAST = K .GE. NN	SOLV 146
C	IF (LAST) K = NN	SOLV 147
C		SOLV 148
C	- - READ 'K' ROWS OF THE AUGMENTED 'A' MATRIX	SOLV 149
C		SOLV 150
C	30 NT = 0	SOLV 151
C	DO 40 IB = 1, K	SOLV 152
C	NS = NT + 1	SOLV 153
C	NT = NT + NEL	SOLV 154
C	40 READ (NIN) (A(IO), IO = NS, NT)	SOLV 155
C		SOLV 156

C	- - CHECK TO SEE IF WE WERE UNLUCKY ENOUGH TO END UP WITH ONLY ONE ROW	SOLV 157
C		SOLV 158
	IF (K .EQ. 1) GO TO 90	SOLV 159
C		SOLV 160
C	- - 'K' IS GREATER THAN '1' SO WE CAN START THE TRIANGULARIZATION	SOLV 161
C		SOLV 162
	NELP1 = NEL + 1	SOLV 163
	NS = - NEL	SOLV 164
	NELP2 = NELP1 + 1	SOLV 165
C		SOLV 166
C	- - FORM THE 'TRAPEZOICAL' ARRAY (8)	SOLV 167
C		SOLV 168
	DO 50 IB = 2, K	SOLV 169
	NP = NELP2 - IB	SOLV 170
	NS = NS + NELP1	SOLV 171
	NT = NS	SOLV 172
	DO 50 IO = IB, K	SOLV 173
	NT = NT + NEL	SOLV 174
	MN = NT	SOLV 175
	NB = NS	SOLV 176
	A(NT) = (-A(NT)) / A(NS)	SOLV 177
	DO 50 NF = 2, NP	SOLV 178
	MN = MN + 1	SOLV 179
	NB = NB + 1	SOLV 180
	50 A(MN) = A(MN) + A(NT) * A(NB)	SOLV 181
	IF (LAST) GO TO 90	SOLV 182
C		SOLV 183
C	- - WRITE THE 'TRAPEZOIDAL' MATRIX ON TAPE	SOLV 184
C		SOLV 185
	NT = 0	SOLV 186
	NP = NEL	SOLV 187
	NS = - NEL	SOLV 188
	DO 60 IO = 1, K	SOLV 189
	NS = NS + NELP1	SOLV 190
	NT = NT + NEL	SOLV 191
	WRITE (MT) NP, (A(IB), IB = NS, NT)	SOLV 192
	60 NP = NP - 1	SOLV 193
	NP = NP - M	SOLV 194
	NS = KORE - NEL + 1	SOLV 195
C		SOLV 196
C	- - READ ANOTHER ROW	SOLV 197
C		SOLV 198
	DO 80 IO = 1, NP	SOLV 199
	READ (NIN) (A(IB), IB = NS, KORE)	SOLV 200
C		SOLV 201
C	- - MODIFY THIS ROW BY THE 'TRAPEZOIDAL' ARRAY	SOLV 202
C		SOLV 203
	NT = 1	SOLV 204
	MN = NS	SOLV 205
	DO 70 IB = 1, K	SOLV 206
	NB = NT	SOLV 207
	NF = MN + 1	SOLV 208
	A(MN) = (-A(MN)) / A(NT)	SOLV 209
	DO 65 NN = NF, KORE	SOLV 210
	NB = NB + 1	SOLV 211
	65 A(NN) = A(NN) + A(MN) * A(NB)	SOLV 212
	MN = NF	SOLV 213
	70 NT = NT + NELP1	SOLV 214
C		SOLV 215
C	- - WRITE THE MODIFIED ROW ON TAPE	SOLV 216

C	80 WRITE (NOUT) (A(NT), NT = MN, KORE)	SOLV 217
	REWIND NOUT	SOLV 218
	REWIND NIN	SOLV 219
C	- - SWITCH THE TAPES	SOLV 220
C		SOLV 221
	NT = NIN	SOLV 222
	NIN = NOUT	SOLV 223
	NOUT = NT	SOLV 224
C	- - RE-CALCULATE ROW LENGTH AND LOOP BACK	SOLV 225
C		SOLV 226
	NEL = NEL - K	SOLV 227
	NN = NEL - M	SOLV 228
	GO TO 10	SOLV 229
C	- - REWIND ALL TAPES	SOLV 230
C		SOLV 231
	90 REWIND MT	SOLV 232
	REWIND NIN	SOLV 233
	REWIND NOUT	SOLV 234
C	- - CONDENSE THE MATRIX	SOLV 235
C		SOLV 236
	NN = NEL	SOLV 237
	NL = NELP1	SOLV 238
	IF (K .EQ. 1) GO TO 105	SOLV 239
	NS = 1	SOLV 240
	NT = NEL	SOLV 241
	DO 100 IB = 2, K	SOLV 242
	NS = NS + NELP1	SOLV 243
	NT = NT + NEL	SOLV 244
	DO 100 IO = NS, NT	SOLV 245
	A(NL) = A(IO)	SOLV 246
	100 NL = NL + 1	SOLV 247
	105 N1 = KORE - K * M + 1	SOLV 248
C	- - THERE, NOW WE CAN START THE BACK-SOLUTION	SOLV 249
C	* * NOTE..THE FIRST AVAILABLE LOCATION FOR THE SOLUTIONS IS A(N1)	SOLV 250
C		SOLV 251
	NREM = N	SOLV 252
	NEL = NPM	SOLV 253
	LAST = K .EQ. N	SOLV 254
	NPASS = 0	SOLV 255
C	- - SOLVE FOR THE ANSWERS CORRESPONDING TO 'K' ROWS	SOLV 256
C		SOLV 257
	110 KM1 = K - 1	SOLV 258
	KP1 = K + 1	SOLV 259
	NS = NL - MP1	SOLV 260
	NPASS = NPASS + 1	SOLV 261
	DO 130 MN = 1, M	SOLV 262
	NF = NS + MN	SOLV 263
	A(NF) = A(NF) / A(NS)	SOLV 264
	NT = NS	SOLV 265
	IF (KM1 .EQ. 0) GO TO 130	SOLV 266
	DO 125 IB = 1, KM1	SOLV 267
	NF = NF - IB - M	SOLV 268
	NT = NT - MP1 - IB	SOLV 269
		SOLV 270
		SOLV 271
		SOLV 272
		SOLV 273
		SOLV 274
		SOLV 275
		SOLV 276

SUM = 0.0	SOLV 277
NP = NF	SOLV 278
N2 = MP1 + IB	SOLV 279
GO 120 IO = 1, IB	SOLV 280
NN = NT + IO	SOLV 281
NP = NP + N2 - IO	SOLV 282
120 SUM = SUM + A(NN) * A(NP)	SOLV 283
125 A(NF) = (A(NF) - SUM) / A(NT)	SOLV 284
130 CONTINUE	SOLV 285
C	SOLV 286
C - - MOVE THE SOLUTIONS TO CONTIGUOUS LOCATIONS STARTING AT A(N1)	SOLV 287
C	SOLV 288
N1 = KORE + 1	SOLV 289
DO 140 NN = 1, K	SOLV 290
DO 135 MN = 1, M	SOLV 291
NL = NL - 1	SOLV 292
N1 = N1 - 1	SOLV 293
135 A(N1) = A(NL)	SOLV 294
140 NL = NL - NP	SOLV 295
C	SOLV 296
C - - WRITE THE SOLUTIONS ON TAPE	SOLV 297
C	SOLV 298
WRITE (NIN) K	SOLV 299
NS = N1 - 1	SOLV 300
DO 145 MN = 1, M	SOLV 301
NT = NS + MN	SOLV 302
145 WRITE (NIN) (A(I), IO = NT, KORE, M)	SOLV 303
C	SOLV 304
C - - TEST IF THIS IS THE LAST PASS	SOLV 305
C	SOLV 306
IF (LAST) GO TO 200	SOLV 307
C	SOLV 308
C - - WE MUST NOW MODIFY THE TRIANGULAR MATRIX TO REFLECT THE EFFECT OF	SOLV 309
C THE SOLUTIONS OBTAINED SO FAR (EQ 21)	SOLV 310
C * * NOTE..LOCATIONS A(1) TO A(N1-1) ARE NOW FREE TO USE	SOLV 311
C	SOLV 312
C - - CALCULATE THE NEXT VALUES OF 'NEL' AND 'NREM'	SOLV 313
C	SOLV 314
NELOLD = NEL	SOLV 315
KOLD = K	SOLV 316
NEL = NEL - K	SOLV 317
NREM = NREM - K	SOLV 318
C	SOLV 319
C - - NOW APPLY THE INCREDIBLE FORMULA FOR THE NEW 'K'	SOLV 320
C	SOLV 321
K = (-4 * M - 1) / 2 + IFIX(SQRT(.25 + FLOAT((4 * M + 2) * M +	SOLV 322
1 2 * (KORE - NELOLD))))	SOLV 323
NROW = NREM - K + 1	SOLV 324
IF (K .LT. NREM) GO TO 150	SOLV 325
LAST = .TRUE.	SOLV 326
NROW = 1	SOLV 327
K = NREM	SOLV 328
150 NS = 1	SOLV 329
NT = NELOLD + 1	SOLV 330
C	SOLV 331
C - - READ IN THE ROWS TO BE MODIFIED	SOLV 332
C	SOLV 333
DO 190 IB = 1, NREM	SOLV 334
NT = NT - 1	SOLV 335
IF (IB .LE. NROW) GO TO 160	SOLV 336

	NS = NS + NN	SOLV 337
	NT = NT + NN	SOLV 338
160	READ (MT) NN, (A(IC), IO = NS, NT)	SOLV 339
	NP = N1 - 1	SOLV 340
	NF = NT - M - KM1	SOLV 341
	NN = NN - KOLD	SOLV 342
	DO 170 MN = 1, M	SOLV 343
	N2 = NF	SOLV 344
	NA = NP + MN	SOLV 345
	NB = NA	SOLV 346
	SUM = 0.0	SOLV 347
	DO 165 IO = 1, KOLC	SOLV 348
	SUM = SUM + A(N2) * A(NA)	SOLV 349
	N2 = N2 + 1	SOLV 350
165	NA = NA + M	SOLV 351
	N2 = N2 + MN - 1	SOLV 352
170	A(N2) = A(N2) - SUM	SOLV 353
C		SOLV 354
C	- - WRITE THE MODIFIED ROW ON TAPE OR CONDENSE THE ROW	SOLV 355
C		SOLV 356
	NL = NT - M + 1	SOLV 357
	IF (IB .GE. NROW) GO TO 175	SOLV 358
	NF = NL - KP1	SOLV 359
	WRITE (NOUT) NN, (A(IO), IO = NS, NF), (A(IO), IO = NL, NT)	SOLV 360
	GO TO 190	SOLV 361
175	NF = NL - KOLD	SOLV 362
	DO 180 MN = NL, NT	SOLV 363
	A(NF) = A(MN)	SOLV 364
180	NF = NF + 1	SOLV 365
190	CONTINUE	SOLV 366
	REWIND MT	SOLV 367
	REWIND NOUT	SOLV 368
C		SOLV 369
C	- - SWITCH THE TAPES	SOLV 370
C		SOLV 371
	NT = MT	SOLV 372
	MT = NOUT	SOLV 373
	NOUT = NT	SOLV 374
C		SOLV 375
C	- - LOOP BACK THRU THE SOLUTION	SOLV 376
C		SOLV 377
	NL = NF	SOLV 378
	GO TO 110	SOLV 379
C		SOLV 380
C	- - START TO WRAP IT UP	SOLV 381
C		SOLV 382
200	REWIND NIN	SOLV 383
	N2 = N	SOLV 384
C		SOLV 385
C	* * NOTE.. AT THIS POINT ALL LOCATIONS A(1) THRU A(KORE) ARE FREE	SOLV 386
C		SOLV 387
	DO 220 IB = 1, NPASS	SOLV 388
	READ (NIN) K	SOLV 389
	N1 = N2 - K + 1	SOLV 390
	NS = N1	SOLV 391
	NT = N2	SOLV 392
C		SOLV 393
C	- - READ IN THE SOLUTIONS	SOLV 394
C		SOLV 395
	DO 210 IO = 1, M	SOLV 396

	READ (NIN) (A(NN), NN = NS, NT)	SOLV 397
	NT = NT + N	SOLV 398
210	NS = NS + N	SOLV 399
220	N2 = N1 - 1	SOLV 400
C		SOLV 401
C	- - WRITE THE SOLUTIONS ON TAPE	SOLV 402
C		SOLV 403
	NT = 0	SOLV 404
	DO 230 IO = 1, M	SOLV 405
	NS = NT + 1	SOLV 406
	NT = NT + N	SOLV 407
230	WRITE (NW) (A(NN), NA = NS, NT)	SOLV 408
C		SOLV 409
	WRITE (6, 300) N, N, M	SOLV 410
300	FORMAT (4H0THE,I5, 2H X,I5, 12H MATRIX WITH,I4, 33H RIGHT SIDES WA	SOLV 411
	1S SOLVED DIRECTLY.)	SOLV 412
C	RETURN	SOLV 413
	END	SOLV 414

*DECK, SIGMA		SIGM 1
	SUBROUTINE SIGMA	SIGM 2
C	SUBROUTINE SIGMA (NSKIP)	SIGM 3
	COMMON /SIG/ NSKIP	SIGM 4
	DIMENSION L(100), C(6000), DSIG1(100)	SIGM 5
	DIMENSION A(1000)	SIGM 6
	DIMENSION SIG(6000)	SIGM 7
	COMMON HEDR(15), MPR, MER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,	SIGM 8
	1 KASE, NOFF, NSYM, IFLAG, I FLOW, NCODE	SIGM 9
	COMMON / ATAPE / NCOPY	SIGM 10
	NT = NCOPY + 8	SIGM 11
	NTAPE = NCOPY	SIGM 12
	IF (ISIG .NE. 0) GO TO 1	SIGM 13
	M = 2	SIGM 14
	GO TO 2	SIGM 15
1	M = 3	SIGM 16
2	IF (NSKIP .EQ. 0) GO TO 11	SIGM 17
	N = M * NSKIP	SIGM 18
	DO 3 K = 1, N	SIGM 19
3	READ(3)	SIGM 20
11	N1 = 1	SIGM 21
	N2 = NQUAD	SIGM 22
	DO 5 I = 1, NCFLG	SIGM 23
	READ (3)	SIGM 24
	READ(3) (C(K), K = N1, N2)	SIGM 25
	IF(ISIG .NE. 0) READ (3) (SIG(K), K = N1, N2)	SIGM 26
	N1 = N2 +1	SIGM 27
5	N2 = N2 + NQUAD	SIGM 28
	N = (NFLOW - NSKIP - NCFLG) * M + NSKIP	SIGM 29
	IF (N .EQ. 0) GO TO 67	SIGM 30
	DO 66 K = 1, N	SIGM 31
66	READ (3)	SIGM 32
67	ITER = 0	SIGM 33
	NCONV = 0	SIGM 34
	DO 12 J = 1, NCFLG	SIGM 35
	L(J) = 0	SIGM 36
	JN = NQUAD * (J - 1)	SIGM 37

DO 12 I = 1, NQUAD	SIGM	38
K1 = I + JN	SIGM	39
12 IF(ISIG .EQ. 0) SIG(K1) = 0.0	SIGM	40
20 DO 22 I = 1, NCFLG	SIGM	41
22 DSIG1 (I) = 0.0	SIGM	42
DO 80 I= 1, NQUAD	SIGM	43
READ (NTAPE) NQ, (A(J), J = 1, NQUAD)	SIGM	44
DO 80 J = 1, NCFLG	SIGM	45
IF(L(J) .NE. 0) GO TO 80	SIGM	46
SUM = 0.0	SIGM	47
JN = NQUAD * (J - 1)	SIGM	48
DO 60 K = 1, NQUAD	SIGM	49
K2 = K + JN	SIGM	50
60 SUM = SUM + A(K) * SIG(K2)	SIGM	51
K1 = I + JN	SIGM	52
DSIG2 = (-C(K1) - SUM) / A(I)	SIGM	53
SIG(K1) = SIG(K1) + DSIG2	SIGM	54
DSIG1(J) = AMAX1(ABS(DSIG2), DSIG1(J))	SIGM	55
80 CONTINUE	SIGM	56
ITER = ITER + 1	SIGM	57
REWIND NTAPE	SIGM	58
IF(IPRS .EQ. 0) GO TO 85	SIGM	59
WRITE(6,9998) ITER	SIGM	60
9998 FORMAT(1H , 5X, 17H ITERATION NOS. , I3)	SIGM	61
DO 82 K = 1, NCFLG	SIGM	62
K1 = NQUAD * (K-1) + 1	SIGM	63
K2 = K1 + NQUAD	SIGM	64
82 WRITE(6, 10) K , (SIG(I), I = K1, K2)	SIGM	65
10 FORMAT (1H , 5X, 12H FLCW NUMBER , I4 / (5X, 6F15.8))	SIGM	66
85 DO 400 J = 1 , NCFLG	SIGM	67
IF(L(J) .NE. 0) GO TO 400	SIGM	68
IF(DSIG1(J) .GE. 1.0E-4) GO TO 400	SIGM	69
L (J) = ITER	SIGM	70
NCONV = NCONV + 1	SIGM	71
IF (NCONV .EQ. NCFLG) GO TO 500	SIGM	72
400 CONTINUE	SIGM	73
NTAPE = NT - NTAPE	SIGM	74
IF (ITER - 100) 20, 500, 20	SIGM	75
500 DO 650 J = 1, NCFLG	SIGM	76
IF (L (J) .EQ. 0) GO TO 550	SIGM	77
WRITE (6, 6) L (J)	SIGM	78
6 FORMAT (1H0, 5X, I5, 2X, 35HITERATIONS REQUIRED FOR CONVERGENCE)	SIGM	79
GO TO 650	SIGM	80
550 WRITE (6, 7)	SIGM	81
7 FORMAT (1H0, 8X, 35HNO CONVERGENCE AFTER 100 ITERATIONS)	SIGM	82
K1 = NQUAD * (J-1) + 1	SIGM	83
K2 = K1 + NQUAD	SIGM	84
WRITE(6,8) (SIG(I), I = K1,K2)	SIGM	85
8 FORMAT(1H , 5X, 8F12.7)	SIGM	86
650 CONTINUE	SIGM	87
NN = NQUAD	SIGM	88
M = MOD(NN, 255)	SIGM	89
IF (M .LT. 5 .AND. M .GT. 0) NN = NN + 5	SIGM	90
N1 = 1	SIGM	91
DO 675 J = 1, NCFLG	SIGM	92
WRITE (3) (SIG(K), K = N1, NN)	SIGM	93
N1 = N1 + NQUAD	SIGM	94
675 NN = NN + NQUAD	SIGM	95
REWIND 3	SIGM	96
WRITE(6, 9999)	SIGM	97

9999 FORMAT(1H0 , 5X, 13HLEAVING SIGMA)
 C RETURN
 END

SIGM 98
 SIGM 99
 SIGM 100

*DECK, ATAPS	ATAP	1
SUBROUTINE ATAPES	ATAP	2
C SUBROUTINE ATAPES (KFLOW)	ATAP	3
COMMON /TAPES/ KFLOW	ATAP	4
C- - -DEFINITION OF ARGUMENTS	ATAP	5
C NQ NUMBER OF VALUES OF 'A' PER RECORD	ATAP	6
C KFLOW FLOW-FLAG, 1 = A-FLOW, 2 = B-FLCH, 3 = C-FLCH	ATAP	7
C NCOPY TAPE NUMBER TO BE USED BY 'ROWA'	ATAP	8
COMMON HEDR(15), MPR, NER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,	ATAP	9
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE	ATAP	10
COMMON / ATAPE / NCOPY	ATAP	11
DIMENSION A(1000), NLINE(500), NLT(500), XNULL(1000), YNULL(1000),	ATAP	12
1 ZNULL(1000), XNORM(1000), YNORM(1000), ZNORM(1000), XOFF(1000),	ATAP	13
2 YOFF(1000), ZOFF(1000)	ATAP	14
IF (KFLOW - 2) 100, 200, 300	ATAP	15
100 NCOPY = 9	ATAP	16
GO TO 1000	ATAP	17
200 NCOPY = 10	ATAP	18
GO TO 400	ATAP	19
300 NCOPY = 13	ATAP	20
C- - -START OF LOOP	ATAP	21
400 DO 900 N = 1, NQUAD	ATAP	22
NTRY = 0	ATAP	23
500 CKSUM = 0.0	ATAP	24
C- - -READ THE 'A' MATRIX FROM THE APPROPRIATE TAPE	ATAP	25
READ (NCOPY) NQ, (A(I), I = 1, NQ)	ATAP	26
900 WRITE (8) NQ, (A(I), I = 1, NQ)	ATAP	27
GO TO 1400	ATAP	28
C- - -THE PURPOSE OF THE FOLLOWING 'MICKEY MOUSE' IS TO RE-POSITION THE	ATAP	29
C CONTROL TABLES, NULL POINTS, AND UNIT NORMALS AT THE BEGINNING OF	ATAP	30
C THE TAPE. THIS ELIMINATES SKIPPING THE '20 QUANTITIES' EACH TIME.	ATAP	31
1000 READ (4) KLCT, (NLINE(J), NLT(J), J = 1, KLCT)	ATAP	32
READ (4) (XNULL(J), YNULL(J), ZNULL(J), XNORM(J), YNORM(J), ZNORM(J),	ATAP	33
1 J = 1, NQUAD)	ATAP	34
IF (NOFF .GT. 0) READ (4) (XOFF(J), YOFF(J), ZOFF(J), J=1, NCF)	ATAP	35
REWIND 4	ATAP	36
WRITE (4) KLCT, (NLINE(J), NLT(J), J = 1, KLCT)	ATAP	37
DO 1100 J = 1, NQUAD	ATAP	38
1100 WRITE (4) XNULL(J), YNULL(J), ZNULL(J), XNORM(J), YNORM(J), ZNORM(J)	ATAP	39
IF (NOFF .EQ. 0) GO TO 1300	ATAP	40
DO 1200 J = 1, NOFF	ATAP	41
1200 WRITE (4) XOFF(J), YOFF(J), ZOFF(J), XOFF(J), YOFF(J), ZOFF(J)	ATAP	42
1300 REWIND 4	ATAP	43
1400 REWIND 8	ATAP	44

```

REWIND NCOPY
WRITE (6, 1500)
1500 FORMAT (1H0, 5X, 14HLEAVING ATAPES)
C RETURN
END

```

```

ATAP 53
ATAP 54
ATAP 55
ATAP 56
ATAP 57

```

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*DECK, PRINT
SUBROUTINE PRINT1
C SUBROUTINE PRINT1( NSKIP, MN, KMAT, NSEQ)
COMMON /PRINT0/ KMAT,NSEQ,KTP14
COMMON /TAPES/ MN
COMMON /SIG/ NSKIP
COMMON HEDR(15), MPR, MER, IPRS, ISIG, ITER, NCFLG, NFLOW, NQUAD,
1 KASE, NOFF, NSYM, IFLAG, IFLOW, NCODE
REAL NX, NY, NZ, MACH
LOGICAL PUNCHV
COMMON /M/ MACH, BETA, RBETA
DIMENSION FLOWID(3),
1 VX(2000), VY(2000), VZ(2000),
4 NST(500), NCL(500)
DIMENSION SIG(1000), XIJ(1000), YIJ(1000), ZIJ(1000)
DATA FLOWID / 2HX-, 2HY-, 2HZ- /, PROG / 4HBCXC /
PUNCHV = .FALSE.
NTIME = NQUAD + NOFF
LCMAX = 12
C READ IN IDENTIFYING INTEGERS
C
READ(4) INSECT, ( NST(J), NCL(J), J = 1, INSECT)
DO 2000 L = 1, NCFLG
IF( ISIG .NE. 0) GO TO 1
M = 2
GO TO 2
1 M = 3
2 N = M * (NSKIP + L - 1)
IF (N .EQ. 0) GO TO 4
DO 3 J = 1, N
3 READ (3)
4 READ ( 3) KFLOW, (VX(IJ), VY(IJ), VZ(IJ), IJ = 1, NTIME )
IF ( KFLOW .EQ. KMAT ) GO TO 9
CALL HEADER
WRITE (6, 8) KFLOW, KMAT
8 FORMAT ( 1H0, 6X, 48HAN APPARENT FLOW MIS-MATCH HAS OCCURRED. KFLOW
1=, I2, 7H KMAT =, I2 )
CALL EXIT
9 N = (NFLOW - NSKIP - L + 1) * M + NSKIP + L - 2
DO 5 J = 1, N
5 READ (3)
READ (3) (SIG(J), J = 1, NQUAD)
REWIND 3
IF(KTP14 .EQ. 1) WRITE(14) (SIG(J), J=1,NQUAD)
IF(KTP14 .EQ. 1) ENDFILE 14
REWIND 14
IF (MN .EQ. 1) GO TO 15
NRSKIP = MN - 1
DO 10 JM = 1, NRSKIP
READ (1)

```

```

PRIN 1
PRIN 2
PRIN 3
PRIN 4
PRIN 5
PRIN 6
PRIN 7
PRIN 8
PRIN 9
PRIN 10
PRIN 11
PRIN 12
PRIN 13
PRIN 14
PRIN 15
PRIN 16
PRIN 17
PRIN 18
PRIN 19
PRIN 20
PRIN 21
PRIN 22
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PRIN 35
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PRIN 37
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PRIN 39
PRIN 40
PRIN 41
PRIN 42
PRIN 43
PRIN 44
PRIN 45
PRIN 46
PRIN 47
PRIN 48
PRIN 49
PRIN 50

```

	READ (11)	PRIN	51
10	READ (12)	PRIN	52
15	LC = LCMAX	PRIN	53
	INSECT = 1	PRIN	54
	M = 0	PRIN	55
	IF (L .GT. 1) READ (4)	PRIN	56
	DO 1000 IS = 1, NTIME	PRIN	57
	READ(4) XN, YN, ZN, NX, NY, NZ	PRIN	58
	IF (MACH .EQ. 0.0) GO TO 17	PRIN	59
	CORR = 1.0 / SQRT(NX * NX + BETA * BETA * (NY * NY + NZ * NZ))	PRIN	60
	NX = NX * CORR	PRIN	61
	NY = NY * BETA * CCRR	PRIN	62
	NZ = NZ * BETA * CORR	PRIN	63
	XN = XN * BETA	PRIN	64
17	VIX = 0.0	PRIN	65
	VIY = 6.0	PRIN	66
	VIZ = 0.0	PRIN	67
	CALL ROWV(XIJ, YIJ, ZIJ, IS, 1)	PRIN	68
	DO 20 I1 = 1, NQUAD	PRIN	69
C		PRIN	70
C	VELOCITY COMPONENTS EQ. (135) OR EQ. (140)	PRIN	71
C		PRIN	72
	VIX = VIX + XIJ(I1) * SIG(I1)	PRIN	73
	VIY = VIY + YIJ(I1) * SIG(I1)	PRIN	74
20	VIZ = VIZ + ZIJ(I1) * SIG(I1)	PRIN	75
	VIX = VIX * RBETA * RBETA + VX(IS)	PRIN	76
	VIY = VIY * RBETA + VY(IS)	PRIN	77
	VIZ = VIZ * RBETA + VZ(IS)	PRIN	78
C	IF (PUNCHV) GO TO 26	PRIN	79
	IF (IS .EQ. NQUAD .OR. IS .EQ. NTIME) GO TO 22	PRIN	80
	VIXT = VIX	PRIN	81
	VIYT = VIY	PRIN	82
	VIZT = VIZ	PRIN	83
C	PUNCHV = .TRUE.	PRIN	84
	GO TO 30	PRIN	85
22	NSEQ = NSEQ + 1	PRIN	86
	IF(PUNCHV)	PRIN	87
	1WRITE (7, 24) VIX, VIY, VIZ, KASE, PROG, NSEQ	PRIN	88
24	FORMAT (3F10.7, 36X,A4, 2X,A4, I4)	PRIN	89
	GO TO 28	PRIN	90
26	NSEQ = NSEQ + 1	PRIN	91
	WRITE (7, 27) VIXT, VIYT, VIZT, VIX, VIY, VIZ, KASE, PROG, NSEQ	PRIN	92
27	FORMAT (6F10.7, 6X,A4, 2X,A4, I4)	PRIN	93
28	PUNCHV = .FALSE.	PRIN	94
C	TOTAL VELOCITY MAGNITUDE EQ. (136)	PRIN	95
C		PRIN	96
30	VTSQ = VIX * VIX + VIY * VIY + VIZ * VIZ	PRIN	97
	VT = SQRT (VTSQ)	PRIN	98
C		PRIN	99
C	PRESSURE COEFFICIENT EQ. (137)	PRIN	100
C		PRIN	101
	CPI = 1.0 - VTSQ	PRIN	102
C		PRIN	103
C	DIRECTION COSINES OF THE TOTAL VELOCITY VECTOR EQ. (138)	PRIN	104
	GIX = VIX / VT	PRIN	105
	GIY = VIY / VT	PRIN	106
	GIZ = VIZ / VT	PRIN	107
	LC = LC +1	PRIN	108
	IF (IS .GT. NQUAD) GO TO 50	PRIN	109
C	TOTAL NORMAL VELOCITY EQ. (139)	PRIN	110

C-3

	VNI = VIX * NX + VIY * NY + VIZ * NZ	PRIN 111
	N = NST (INSECT)	PRIN 112
	MMAX = IABS (NCL (INSECT))	PRIN 113
	M = M + 1	PRIN 114
	IF(LC .LT. LCMAX) IF (M - 1) 40, 35, 40	PRIN 115
	WRITE (6, 3000)	PRIN 116
3000	FORMAT (1H0, 4X,1H.,84X,1H.)	PRIN 117
	CALL HEADER	PRIN 118
	LC = 0	PRIN 119
	WRITE (6, 4030) FLOWID(KFLOW)	PRIN 120
4030	FORMAT (1H0, 45X, A2, 4HFLOW)	PRIN 121
	WRITE(6,4000)	PRIN 122
35	WRITE(6, 4005) N, M, XN, VT, VIX, GIX, NX, VNI	PRIN 123
	GO TO 45	PRIN 124
4015	FORMAT(1H0, 3(17X , 2(6H*****)))	PRIN 125
4000	FORMAT(1H0, 6X ,5HN M,8X, 3HNPX,10X, 2HVT , 12X, 2HVX , 10X ,	PRIN 126
	1 3HDCX, 11X, 2HNX ,10X, 2HVN /	PRIN 127
	21H ,19X, 3HNPY , 9X, 4HVTSQ ,11X, 2HVV ,10X, 3HDCY,11X, 2HNY,10X,	PRIN 128
	3HHSIG/	PRIN 129
	41H ,19X, 3HNPZ ,10X, 4HCF , 10X, 2HVZ ,10X, 3HDCZ,11X, 2HNZ)	PRIN 130
4005	FORMAT(1H0,3X, 2I4 , 6F13.6)	PRIN 131
4010	FORMAT(1H0,7X, I4 , 6F13.6)	PRIN 132
4020	FORMAT(1H , 11X, 6F13.6)	PRIN 133
40	WRITE(6,4010) M, XN, VT, VIX, GIX, NX, VNI	PRIN 134
45	WRITE(6, 4020) YN, VTSQ, VIY, GIY, NY, SIG(IS), ZN,	PRIN 135
	1 CPI , VIZ, GIZ, NZ	PRIN 136
	IF(M .LT. MMAX) GO TO 1000	PRIN 137
	IF (NCL(INSECT) .GT. 0) GO TO 48	PRIN 138
	WRITE (6, 4015)	PRIN 139
	LC = LC + 1	PRIN 140
48	M = 0	PRIN 141
	INSECT = INSECT + 1	PRIN 142
	GO TO 1000	PRIN 143
50	IF (LC .LT. LCMAX .AND. IS .NE. (NQUAD + 1)) GO TO 60	PRIN 144
	WRITE (6, 3000)	PRIN 145
	CALL HEADER	PRIN 146
	LC = 0	PRIN 147
	WRITE (6, 4030) FLOWID(KFLOW)	PRIN 148
	WRITE (6, 55)	PRIN 149
55	FORMAT (1H0,6X,5HPCINT,13X,2HX ,19X,2HVT,18X,2HVX,17X,3HDCX, /,	PRIN 150
	125X,2HY ,17),4HVTSQ,17X,2HVV,17X,3HDCY, /,	PRIN 151
	225X,2HZ ,18X,2HCP,18X,2HVZ,17X,3HDCZ, //)	PRIN 152
		PRIN 153
C		PRIN 154
C	WRITE THE OFF-BODY ANSWERS	PRIN 155
C		PRIN 156
60	N = IS - NQUAD	PRIN 157
	WRITE (6,65) N,XN,VT,VIX,GIX,YN,VTSQ,VIY,GIY,ZN,CPI,VIZ,GIZ	PRIN 158
65	FORMAT (1H0, I9, 4F20.6, / (10X, 4F20.6))	PRIN 159
		PRIN 160
C		PRIN 161
1000	CONTINUE	PRIN 162
	REWIND 4	PRIN 163
	IF (NOFF .GT. 0) WRITE (6, 4015)	PRIN 164
2000	CONTINUE	PRIN 165
	WRITE(6, 9999)	PRIN 166
9999	FORMAT(1H1 , 5X, 14HLEAVING PRINT1)	PRIN 167
C	RETURN	PRIN 168
	END	

*DECK,WTAP14	WTAP	1
SUBRCUTINE WTAP14	WTAP	2
C	WTAP	3
C	WTAP	4
C	WTAP	5
C	WTAP	6
COMMON HEDR(15),MPR,NER,IPRS,ISIG,ITER,NCFLG,NFLOW,NQUAD,	WTAP	7
1 KASE,NOFF,NSYM,IFLAG,IFLOW,NCODE	WTAP	8
COMMON /SPACER/ DUMMY (14000)	WTAP	9
REAL IXX,IXY,IYY,MACH	WTAP	10
COMMON /M/ MACH, BETA, RBETA	WTAP	11
DIMENSION	WTAP	12
D41(1000), XC(1000),YC(1000),ZC(1000),	WTAP	12
1 A11(1000),A12 (1000),A13 (1000),A21(1000),A22(1000),A23(1000),	WTAP	13
2 A31(1000),A32 (1000),A33 (1000),XI1(1000),XI2(1000),XI3(1000),	WTAP	14
3 XI4(1000),ETA1(1000),ETA2(1000),ETA4(1000),TSQ(1000),A(1000),	WTAP	15
4 IXX(1000),IXY (1000),IYY (1000),D12 (1000),D23(1000),D34(1000)	WTAP	16
EQUIVALENCE (DUMMY(1), D41), (DUMMY(1001), XC), (DUMMY(2001), YC),	WTAP	17
1 (DUMMY(3001), ZC), (DUMMY(4001), A11), (DUMMY(5001), A12),	WTAP	18
2 (DUMMY(6001), A13), (DUMMY(7001), A21), (DUMMY(8001), A22),	WTAP	19
3 (DUMMY(9001), A23), (DUMMY(10001), A31), (DUMMY(11001), A32),	WTAP	20
4 (DUMMY(12001), A33), (DUMMY(13001), XI1)	WTAP	21
C	WTAP	22
REWIND 14	WTAP	23
WRITE(14) KASE,NSYM,NQUAD,RBETA, MACH	WTAP	24
DO 100 J=1,NQUAD	WTAP	25
100 READ (4) XC(J), YC (J), ZC(J), A11(J), A12(J), A13(J), A21(J),	WTAP	26
1 A22(J), A23(J), A31(J), A32(J), A33(J), XI1(J),ETA1(J),XI2(J)	WTAP	27
2 J), ETA2(J), XI3(J), XI4(J), ETA4(J), TSQ(J), A (J), IXX (J),	WTAP	28
3 IXY (J), IYY(J), D12(J), D23(J), D34(J), D41(J)	WTAP	29
WRITE(14)(XC(J),YC (J), ZC(J), A11(J), A12(J), A13(J), A21(J),	WTAP	30
1 A22(J), A23(J), A31(J), A32(J), A33(J), XI1(J),ETA1(J),XI2(J)	WTAP	31
2 J), ETA2(J), XI3(J), XI4(J), ETA4(J), TSQ(J), A (J), IXX (J),	WTAP	32
3 IXY (J), IYY(J), D12(J), D23(J), D34(J), D41(J) ,J=1,NQUAD)	WTAP	33
REWIND 4	WTAP	34
END	WTAP	35

```

PROGRAM FLOPNT( INPUT, TAPE6, TAPE5=INPUT, TAPE14, OUTPUT)
C
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979
C
C CALLS FLOVEL TO COMPUTE AND PRINT FLOW VELOCITIES AT SPECIFIED
C POINTS IN SPACE. INPUT INTEGERS M(3) SPECIFY THE ORDER IN WHICH
C INCREMENTING IS DONE - ALLOWED VALUES OF M ARE 1,2,3. FOR EXAMPLE
C SUPPOSE M(1)=2, M(2)=1, M(3)=3, THEN Y IS INCREMENTED FIRST, X IS
C INCREMENTED SECOND AND Z IS INCREMENTED LAST.
C OTHER INPUT DATA ARE (IN ORDER OF X AXIS FIRST, Y AXIS SECOND,
C Z AXIS THIRD)- INITIAL COORDINATE, INCREMENT, NUMBER OF INCREMENTS
C DESIRED (INCLUDING THE INITIAL COORDINATE VALUE).
C
C NOTE - POINTS THAT ARE INSIDE THE BODY ARE MARKED WITH AN ASTERIX
C IN THE PRINTOUT.
C
C DIMENSION HOLL(18), X(3), D(3), N(3), M(3), SX(3), SD(3), NS(3),
1 SXI(3), SEQ(6)
DATA SEQ/ 4HFIRS, 4HT , 4HSECO, 4HND , 4HTHIR, 4HD /
DATA STAF, BLNK / 3H *, 3H /
READ( 5, 2600) KASE
CALL SETFLO( KASE )
READ( 5, 1300 ) HOLL
WRITE( 6, 1400) HOLL
5 READ(5,1100)M
IF(IABS(M(1))+IABS(M(2))+IABS(M(3)).EQ. 0) STOP
IF(M(1)+M(2)+M(3) .EQ. 6) GO TO 10
WRITE(6,1200)
STOP
10 DO 20 L=1,3
20 READ(5,1000) X(L), D(L), N(L)
WRITE( 6, 1700)
WRITE(6,2000) X(1), D(1), N(1)
WRITE(6,3000) X(2), D(2), N(2)
WRITE(6,4000) X(3), D(3), N(3)
WRITE(6,9000)
WRITE(6,5000) SEQ(2*M(1)-1), SEQ(2*M(1))
WRITE(6,6000) SEQ(2*M(2)-1), SEQ(2*M(2))
WRITE(6,7000) SEQ(2*M(3)-1), SEQ(2*M(3))
WRITE( 6, 1600 )
DO 40 L=1,3
LL=4-M(L)
SD(LL)=D(L)
SXI(LL)=X(L)-D(L)
40 NS(LL)=N(L)
N1=NS(1)
N2=NS(2)
N3=NS(3)
SX(1)=SXI(1)
DO 500 I=1,N1
SX(1)=SX(1)+SD(1)
SX(2)=SXI(2)
DO 500 J=1,N2
WRITE( 6,1900)
SX(2)=SX(2)+SD(2)
SX(3)=SXI(3)
DO 500 K=1,N3

```

FALLOUT FROM

PROGRAM FLOPNT(INPUT, TAPE6, TAPE5=INPUT, TAPE14, OUTPUT)

H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979

CALLS FLOVEL TO COMPUTE AND PRINT FLOW VELOCITIES AT SPECIFIED
POINTS IN SPACE. INPUT INTEGERS M(3) SPECIFY THE ORDER IN WHICH
INCREMENTING IS DONE - ALLOWED VALUES OF M ARE 1,2,3. FOR EXAMPLE
SUPPOSE M(1)=2, M(2)=1, M(3)=3, THEN Y IS INCREMENTED FIRST, X IS
INCREMENTED SECOND AND Z IS INCREMENTED LAST.
OTHER INPUT DATA ARE (IN ORDER OF X AXIS FIRST, Y AXIS SECOND,
Z AXIS THIRD)- INITIAL COORDINATE, INCREMENT, NUMBER OF INCREMENTS
DESIRED (INCLUDING THE INITIAL COORDINATE VALUE).

NOTE - POINTS THAT ARE INSIDE THE BODY ARE MARKED WITH AN ASTERIX
IN THE PRINTOUT.

DIMENSION HOLL(18), X(3), D(3), N(3), M(3), SX(3), SD(3), NS(3),
SXI(3), SEQ(6)

DATA SEQ/ 4HFIRS, 4HT , 4HSECO, 4HND , 4HTHIR, 4HD /
DATA STAF, BLNK / 3H *, 3H /

READ(5, 2600) KASE

CALL SETFLO(KASE)

READ(5, 1300) HOLL

WRITE(6, 1400) HOLL

READ(5,1100)M

IF(IABS(M(1))+IABS(M(2))+IABS(M(3)).EQ. 0) STOP

IF(M(1)+M(2)+M(3) .EQ. 6) GO TO 10

WRITE(6,1200)

STOP

DO 20 L=1,3

READ(5,1000) X(L), D(L), N(L)

WRITE(6, 1700)

WRITE(6,2000) X(1), D(1), N(1)

WRITE(6,3000) X(2), D(2), N(2)

WRITE(6,4000) X(3), D(3), N(3)

WRITE(6,9000)

WRITE(6,5000) SEQ(2*M(1)-1), SEQ(2*M(1))

WRITE(6,6000) SEQ(2*M(2)-1), SEQ(2*M(2))

WRITE(6,7000) SEQ(2*M(3)-1), SEQ(2*M(3))

WRITE(6, 1600)

DO 40 L=1,3

LL=4-M(L)

SD(LL)=D(L)

SXI(LL)=X(L)-D(L)

NS(LL)=N(L)

N1=NS(1)

N2=NS(2)

N3=NS(3)

SX(1)=SXI(1)

DO 500 I=1,N1

SX(1)=SX(1)+SD(1)

SX(2)=SXI(2)

DO 500 J=1,N2

WRITE(6,1900)

SX(2)=SX(2)+SD(2)

SX(3)=SXI(3)

DO 500 K=1,N3

FLCPT 2
FLCPT 3
FLOPT 4
FLOPT 5
FLCPT 6
FLCPT 7
FLOPT 8
FLCPT 9
FLOPT 10
FLCPT 11
FLOPT 12
FLOPT 13
FLOPT 14
FLOPT 15
FLCPT 16
FLOPT 17
FLOPT 18
FLOPT 19
FLOPT 20
FLOPT 21
FLOPT 22
FLOPT 23
FLOPT 24
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FLOPT 27
FLOPT 28
FLOPT 29
FLOPT 30
FLOPT 31
FLOPT 32
FLOPT 33
FLOPT 34
FLOPT 35
FLCPT 36
FLCPT 37
FLOPT 38
FLOPT 39
FLOPT 40
FLOPT 41
FLOPT 42
FLOPT 43
FLOPT 44
FLOPT 45
FLOPT 46
FLOPT 47
FLOPT 48
FLOPT 49
FLOPT 50
FLOPT 51
FLOPT 52
FLOPT 53
FLOPT 54
FLOPT 55
FLOPT 56
FLOPT 57

PRINT FRA. 2

```

SX(3)=SX(3)+SD(3)
DO 50 L=1,3
LL=4-M(L)
50 X(L)=SX(LL)
CALL FLOVEL( X(1), X(2), X(3), VX, VY, VZ, 0.10, INBDY)
V = SQRT( VX**2 + VY**2 + VZ**2 )
IF( INBDY ) 100, 200, 100
100 WRITE(6,1500) X(1), X(2), X(3), VX, VY, VZ, V, STAR
GO TO 500
200 WRITE(6,1500) X(1), X(2), X(3), VX, VY, VZ, V, BLNK
500 CONTINUE
WRITE( 6, 1600 )
GO TO 5
1000 FORMAT( 2E10.0,I4)
1100 FORMAT(3I2)
1200 FORMAT(///10X, 47HINCREMENTING SEQUENCE IS ERRCNIOUS. TRY AGAIN.)
1300 FORMAT( 18A4)
1400 FORMAT( 1H1, 9X, 15HFLOPNT RUN ID -/ 15X, 18A4//)
1500 FORMAT( 3X, 3F12.7, 2X, 4(1PE13.4),A3)
1600 FORMAT(1H0,20X,40H* INDICATES THE POINT IS INSIDE THE BODY)
1700 FORMAT( 1H0, 5X, 12HINPUT DATA -/)
1900 FORMAT( // 10X, 1HX, 11X, 1HY, 11X, 1HZ, 13X, 2HVX, 11X, 2HVV,
1 11X, 2HVZ, 11X, 1HV)
2600 FORMAT( A4)
2000 FORMAT( 10X, 10HINITIAL X=1PE11.4, 12H INCREMENT=1PE11.4,
1 19H NUMBER OF VALUES=I4)
3000 FORMAT( 10X, 10HINITIAL Y=1PE11.4, 12H INCREMENT=1PE11.4,
1 19H NUMBER OF VALUES=I4)
4000 FORMAT( 10X, 10HINITIAL Z=1PE11.4, 12H INCREMENT=1PE11.4,
1 19H NUMBER OF VALUES=I4)
5000 FORMAT( 10X, 22HX AXIS IS INCREMENTED 2A4)
6000 FORMAT( 10X, 22HY AXIS IS INCREMENTED 2A4)
7000 FORMAT( 10X, 22HZ AXIS IS INCREMENTED 2A4)
9000 FORMAT(1H0)
END

```

```

FLCPT 58
FLOPT 59
FLOPT 60
FLCPT 61
FLOPT 62
FLOPT 63
FLOPT 64
FLOPT 65
FLCPT 66
FLCPT 67
FLOPT 68
FLOPT 69
FLCPT 70
FLCPT 71
FLOPT 72
FLCPT 73
FLCPT 74
FLOPT 75
FLCPT 76
FLOPT 77
FLCPT 78
FLOPT 79
FLCPT 80
FLOPT 81
FLOPT 82
FLCPT 83
FLOPT 84
FLOPT 85
FLCPT 86
FLOPT 87
FLCPT 88
FLOPT 89
FLOPT 90
FLCPT 91
FLCPT 92

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*DECK,PRFUN
FUNCTION PRFUN(R, DLR, COF)
C
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979
C
C RETURNS THE COEFFICIENT WHICH WHEN MULTIPLIED BY FLUID VELOCITY
C RELATIVE TO THE PARTICLE YIELDS THE PARTICLE ACCELERATION.
C
C FOR WATER DROPS IN AIR
C
C FOR REYNOLDS NUMBERS LARGER THAN 200 USE CORR VS R DATA OF GUNN
C AND KINZER FOR WATER DROPS IN AIR. FOR SMALLER REYNOLDS NUMBERS
C USE DATA FOR RIGID SPHERES.
C
C IF( R .LE. 200. ) GO TO 100
PRFUN = WCERR(R)/R/COF
RETURN
100 PRFUN = CORR(R)/R/COF
RETURN
END

```

```

PRFUN 1
PRFUN 2
PRFUN 3
PRFUN 4
PRFUN 5
PRFUN 6
PRFUN 7
PRFUN 8
PRFUN 9
PRFUN 10
PRFUN 11
PRFUN 12
PRFUN 13
PRFUN 14
PRFUN 15
PRFUN 16
PRFUN 17
PRFUN 18
PRFUN 19
PRFUN 20

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```

*DECK,IMPACT
SUBROUTINE IMPACT(YI,ZI)
C
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES APRIL 1979
C
C *****
C CALLED BY S.R. TRAJECT AFTER IMPACT ON THE BODY. ADJUSTS INITIAL
C Y AND Z CO(ORDINATES OF PARTICLE TRAJECTORY TO AVOID FURTHER IMPACT
C
C THE ADJUSTMENT IS CASE DEPENDENT SO THIS S.R. SHOULD BE REVISED
C FOR EACH STUDY.
C
C *****
C
C RETURN
END

```

```

IMPAC 1
IMPAC 2
IMPAC 3
IMPAC 4
IMPAC 5
IMPAC 6
IMPAC 7
IMPAC 8
IMPAC 9
IMPAC 10
IMPAC 11
IMPAC 12
IMPAC 13
IMPAC 14
IMPAC 15
IMPAC 18
IMPAC 19

```

```

*DECK, PARTCL                                PARTC 1
SUBROUTINE PARTCL(V,ELL,RHO,VIS,TEMP,DIAM,DLR,RHOP,VT,RF,PT,ACC,N) PARTC 1
C                                             PARTC 2
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979 PARTC 3
C                                             PARTC 4
C CALLED BY CONFAC, ARYTRJ OR TANTRA TO READ PARTICLE SPECS. AND PARTC 5
C COMPUTE GRAVITY SETTLING SPEED AND OTHER PARAMETERS. SEE CONFAC PARTC 6
C                                             PARTC 7
C FOR WATER DROPS IN AIR PARTC 8
C                                             PARTC 9
C CALLS FALWAT TO COMPUTE SETTLING SPEED VIA BEARDS EQUATIONS. PARTC 10
C                                             PARTC 11
C REYNOLDS NUMBER(R)-DAVIES NUMBER(CORR) RELATIONS ARE AS FOLLOWS - PARTC 12
C FOR REYNOLDS NUMBERS LARGER THAN 200 USE CORR VS R DATA OF GUNN PARTC 13
C AND KINZER FOR WATER DROPS IN AIR. FOR SMALLER REYNOLDS NUMBERS PARTC 14
C USE DATA FOR RIGID SPHERES. PARTC 15
C                                             PARTC 16
C                                     GLOSSARY PARTC 17
C ACC DIAM/ELL - USED TO COMPUTE ACCELERATION MODULUS PARTC 18
C DIAM DIAMETER OF A WATER DROP PARTC 19
C DLR NOT RELEVANT TO WATER DROPS PARTC 20
C ELL CHARACTERISTIC DIMENSION OF THE BODY ( METERS ) PARTC 21
C PT DRAG COEFFICIENT*ABS(REYNOLDS NUMBER) FOR GRAVITY SETTLING PARTC 22
C OF PARTICLES PARTC 23
C RF FACTOR TO CONVERT VELOCITY DIFFERENCE TO REYNOLDS NUMBER PARTC 24
C RHO AIR DENSITY (SI) PARTC 25
C RHOP PARTICLE DENSITY (SI) PARTC 26
C TEMP AIR TEMPERATURE (DEG. KELVIN) PARTC 27
C V AIR SPEED (SI) PARTC 28
C VIS AIR VISCOSITY (SI) PARTC 29
C VT GRAVITY SETTLING SPEED OF PARTICLE PARTC 30
C PARTC 31
READ (5,11(0)) DIAM PARTC 32
IF(DIAM .NE. 0.0) GO TO 6 PARTC 33
N = 1 PARTC 34
RETURN PARTC 35
6 WRITE (6,2500) DIAM PARTC 36
RHOP = 1.0E3 PARTC 37
DLR=1.0 PARTC 38
RF = DIAM*RHO /VIS * 1.0E-6 PARTC 39
ACC = DIAM/ELL * 1.0E-6 PARTC 40
C COMPUTE GRAVITY SETTLING SPEED OF PART.AND PARAMETERS DERIVED PARTC 41
C FROM IT PARTC 42
CALL FALWAT(DIAM*1.0E-6,RHO,VIS,TEMP,287.04*RHO*TEMP,VT) PARTC 43
R = RF*VT PARTC 44
PT = CORR(R)/R PARTC 45
IF(R .GT. 200.) PT = KCORR( R )/R PARTC 46
7 WRITE(6, 3500) VT PARTC 47
VT = VT/V PARTC 48
RF = RF*V PARTC 49
RETURN PARTC 50
1100 FORMAT(7F10.0) PARTC 51
2500 FORMAT( 1H1, 9X, 21HWATER DROP DIAMETER =1PE12.5,12H MICROMETERS,) PARTC 52
3500 FORMAT( 20X, 24HPARTICLE SETTLING SPEED=1PE12.5, 6H M/SEC) PARTC 53
END PARTC 54

```

*DECK, CONFAC	CONF	1
SUBROUTINE CONFAC	CONF	2
C	CONF	3
C	CONF	4
C	CONF	5
C	CONF	6
C	CONF	7
C	CONF	8
C	CONF	9
C	CONF	10
C	CONF	11
C	CONF	12
C	CONF	13
C	CONF	14
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C	CONF	49
C	CONF	50
C	CONF	51
C	CONF	52
C	CONF	53
C	CONF	54
C	CONF	55
C	CONF	56
C	CONF	57
C	CONF	58
C	CONF	59
C	CONF	60

C		P(6) = DZ/DT	CONF	61
C	PACT	(SPARE)	CONF	62
C	PT	DRAG COEFFICIENT*ABS(REYNOLDS NUMBER) FOR GRAVITY SETTLING	CONF	63
C		OF PARTICLES	CONF	64
C	RF	FACTOR TO CONVERT VELOCITY DIFFERENCE TO REYNOLDS NUMBER	CONF	65
C	RHO	AIR DENSITY (KG/M**3)	CONF	66
C	RHOP	PARTICLE DENSITY (KG/M**3)	CONF	67
C	RW	RADIUS OF PARTICLE FLUX TUBE IN TARGET PLANE (NORMALIZED)	CONF	68
C	TEMP	AIR TEMPERATURE (DEG. KELVIN)	CONF	69
C	TOL	TOLERANCE FOR REACHING A POINT ON TARGET PLANE WINDOW	CONF	70
C		(FRACTION OF RW)	CONF	71
C	TPRINT	OUTPUT TIME INTERVAL	CONF	72
C	V	AIR SPEED (M/SEC)	CONF	73
C	VIS	AIR VISCOSITY (KG/(M-SEC))	CONF	74
C	VPGT	PARTICLE SPEED AT TARGET POINT	CONF	75
C	VT	GRAVITY SETTLING SPEED OF PARTICLE	CONF	76
C	VTGT	AIR SPEED AT TARGET POINT	CONF	77
C	XI3P,YI3P,ZI3P	INITIAL PLANE FLUX TUBE CENTER COORDINATES IN	CONF	78
C		THE FLOW SYSTEM	CONF	79
C	XSTART	TRAJECTORY INITIAL X COORDINATE	CONF	80
C	XP,YP,ZP	TARGET POINT COORDINATES IN THE FLUX TUBE SYSTEM	CONF	81
C	XW,YW,ZW	COORDINATES OF CENTER OF FLUX TUBE AT THE TARGET PLANE	CONF	82
C		IN THE FLOW SYSTEM	CONF	83
C	YE(),ZE()	TARGET POINT COORDINATES OF THE LAST THREE GUESSES	CONF	84
C		(FLOW SYSTEM)	CONF	85
C	YI(),ZI()	INITIAL POINT COORDINATES OF THE LAST THREE GUESSES	CONF	86
C		(FLOW SYSTEM)	CONF	87
C	YPSTAR, ZPSTAR	TARGET POINT COORDINATES (FLOW SYSTEM)	CONF	88
C	YPSTARP, ZPSTARP	TARGET POINT COORDINATES (FLUX TUBE SYSTEM)	CONF	89
C	COMMON XI3,YI3,ZI3,YI3P,EPSI(3),HI,HMINI,VT,PT,COF,FNR,PACT,		CONF	90
C	1RF,REQ,R,XPSTAR,YPSTAR,ZPSTAR,P(6),TPRINT,IT,ALPHA0,BETA0,IREC,		CONF	91
C	2IPL0T,IPLT,XPLOT(60),YPLOT(60),ZPLOT(60),ALPHAR,BETAR,YPSTARF,		CONF	92
C	3ZPSTARP,XI3P,ZI3P,XP,YP,ZP,XWP,XP2,ACC,DLR,JLIM		CONF	93
C	DIMENSION HOLL(18),XINIT(100), XEXIT(100)		CONF	94
C	DIMENSION YINIT(100), ZINIT(100),YEXIT(100),ZEXIT(100)		CONF	95
C	DIMENSION YI(3), ZI(3), YE(3), ZE(3)		CONF	96
C	LOGICAL IPL0T		CONF	97
C	DATA PI/3.1415926536/		CONF	98
C	NFIN=0		CONF	99
C		READ AND WRITE DATA	CONF	100
C	READ (5,2600) KASE		CONF	101
C	CALL SETFLO(KASE)		CONF	102
C	READ(5,1000)HOLL, IPL0T		CONF	103
C	READ(5,1100)V, ELL, RHO, TEMP, XSTART		CONF	104
C	READ(5,1100) TPRINT, HI, HMINI, EPSI		CONF	105
C	SET DEFAULT VALUES FOR NUMERICAL INTEGRATION AND PRINT PARAMETERS		CONF	106
C	IF(TPRINT .EQ. 0.0) TPRINT=0.1		CONF	107
C	IF(HI .EQ. 0.0) HI=0.1		CONF	108
C	IF(HMINI .EQ. 0.0) HMINI=0.005		CONF	109
C	IF(EPSI(1) .EQ. 0.0) EPSI(1)=1.0E-5		CONF	110
C	IF(EPSI(2) .EQ. 0.0) EPSI(2)=1.0E-5		CONF	111
C	IF(EPSI(3) .EQ. 0.0) EPSI(3)=1.0E-5		CONF	112
C	READ (5,1150) NW, RW, TOL		CONF	113
C	JLIM=25		CONF	114
C	IF(NW .EQ. 0) JLIM=0		CONF	115
C	DO 3 J=2,3		CONF	116
3	READ (5,1100) YE(J), ZE(J), YI(J), ZI(J)		CONF	117
	VIS = 145.8E-8 * TEMP**((3.0/2.0)/(110.4 + TEMP))		CONF	118
	WRITE(6,1200) HOLL		CONF	119
	WRITE(6,1300) V, ELL, RHC, TEMP, VIS		CONF	120

	WRITE(6,1400) HI,HMINI,TFRINT, XSTART	CONF 121
	WRITE(6,1500) EPSI(1), EPSI(2), EPSI(3)	CONF 122
	WRITE(6,1520) MW, RW, TOL	CONF 123
	WRITE(6,1540)	CONF 124
	DO 4 J=2,3	CONF 125
	I=J-1	CONF 126
4	WRITE(6,1550) I, YE(J), ZE(J), YI(J), ZI(J)	CONF 127
C	INITIALIZE	CONF 128
	FN = V**2/(9.8*ELL)	CONF 129
	FNR = 1.0/FN	CONF 130
	IF (.NOT. IPLOT) GO TO 5	CONF 131
	REWIND 10	CONF 132
	WRITE(6,1800)	CONF 133
C	ENTER TRAJECTORY CALCULATION LOOP	CONF 134
5	CALL PARTCL(V,ELL,RHC,VIS,TEMP,DIAM,DLR,RHOP,VT,RF,PT,ACC,NFIN)	CONF 135
	IF(NFIN .EQ. 0) GO TO 6	CONF 136
	IF(.NOT. IPLOT) RETURN	CONF 137
	ENDFILE 10	CONF 138
	REWIND 10	CONF 139
	RETURN	CONF 140
6	READ(5,1100) XW, YW, ZW	CONF 141
	WRITE(6,3500) XW, YW, ZW	CONF 142
C	IF NECESSARY SET DEFAULT VALUES FOR INITIAL AND FINAL TRAJECTORY	CONF 143
C	POINT GUESSES	CONF 144
	IF (ABS(YE(2))+ABS(YE(3))+ABS(ZE(2))+ABS(ZE(3))+ABS(YI(2))+	CONF 145
1	ABS(YI(3))+ABS(ZI(2))+ABS(ZI(3)) .NE. 0.0) GO TO 7	CONF 146
	YE(2) = YW + SIGN(1.5*RW*TOL, YW)	CONF 147
	ZE(2) = ZW + SIGN(1.5*RW*TOL, ZW)	CONF 148
	YE(3) = YW - SIGN(1.5*RW*TOL, YW)	CONF 149
	ZE(3) = ZW - SIGN(1.5*RW*TOL, ZW)	CONF 150
	YI(2) = YW	CONF 151
	ZI(2) = ZW	CONF 152
	YI(3) = YE(2)	CONF 153
	ZI(3) = ZE(2)	CONF 154
7	COF = PT*VT*FN	CONF 155
	R = RF * VT	CONF 156
	XPSTAR = XW	CONF 157
	YPSTAR = YW	CONF 158
	ZPSTAR = ZW	CONF 159
	YPSTARP=YW	CONF 160
	ZPSTARP=ZW	CONF 161
	XI3P = 0.0	CONF 162
	YI3P = 0.0	CONF 163
	ZI3P = 0.0	CONF 164
	XWP=XSTART	CONF 165
	XPP = XW	CONF 166
	XP = 0.0	CONF 167
	YP = 0.0	CONF 168
	ZP = 0.0	CONF 169
	IP = 0	CONF 170
C		CONF 171
C	COMPUTE TRAJECTORY THAT PASSES THROUGH THE CENTER OF THE FLUX TUBE	CONF 172
C		CONF 173
	ALPHA0 = 0.0	CONF 174
	BETA0 = 0.0	CONF 175
	ALPHAR=0.0	CONF 176
	BETAR=0.0	CONF 177
	WRITE(6,2800) IP,XPSTAR,YPSTAR, ZPSTAR, YPSTARP, ZPSTARP	CONF 178
	CALL MAP (YI,ZI,TCL,RW,YE,ZE)	CONF 179
	IF(IT .LT. 0) GO TO 5	CONF 180

C	COMPUTE INITIAL AND FINAL TRAJECTORY ANGLES	CONF 181
	CALL FLOVEL(XI3,YI3,ZI3,VX,VY,VZ,HI,INBODY)	CONF 182
	ALPHA0 = ATAN(VY/VX) * 180./PI	CONF 183
	BETA0 = ATAN((VZ-VT)/SQRT(VX**2 + VY**2)) * 180./PI	CONF 184
	ALPHAR = ATAN(P(4)/P(2))*180./PI	CONF 185
	BETAR = ATAN(P(6)/SQRT(P(2)**2+P(4)**2))*180./PI	CONF 186
	WRITE (6,2000) ALPHA0, BETA0, ALPHAR, BETAR	CONF 187
	IF(NW .EQ. 0) GO TO 5	CONF 188
	ALPHA0 = ALPHA0*PI/180.	CONF 189
	BETA0 = BETA0*PI/180.	CONF 190
	ALPHAR = ALPHAR*PI/180.	CONF 191
	BETAR = BETAR*PI/180.	CONF 192
C	COMPUTE AIR AND PARTICLE SPEEDS AT FINAL POINT OF TRAJECTORY	CONF 193
	CALL FLOVEL(P(1), P(3), P(5), VX, VY, VZ, HI, INBODY)	CONF 194
	VTGT = SQRT(VX**2 + VY**2 + VZ**2)	CONF 195
	VPGT = SQRT(P(2)**2 + P(4)**2 + P(6)**2)	CONF 196
	XI3P = XI3	CONF 197
	YI3P = YI3	CONF 198
	ZI3P = ZI3	CONF 199
	CALL TRANSFM(0.0, YI(2) - YI3, ZI(2) - ZI3, ALPHA0, BETA0,	CONF 200
	1 XP, YP, ZP, 1)	CONF 201
	YI(2) = YP	CONF 202
	ZI(2) = ZP	CONF 203
	CALL TRANSFM(P(1) - XPSTAR, YE(2) - YPSTAR, ZE(2) - ZPSTAR,	CONF 204
	1 ALPHAR, BETAR, XP, YP, ZP, 1)	CONF 205
	YE(2) = YP	CONF 206
	ZE(2) = ZP	CONF 207
	YI(3) = 0.0	CONF 208
	ZI(3) = 0.0	CONF 209
	CALL TRANSFM(P(1) - XPSTAR, YE(3) - YPSTAR, ZE(3) - ZPSTAR,	CONF 210
	1 ALPHAR, BETAR, XP, YP, ZP, 1)	CONF 211
	YE(3) = YP	CONF 212
	ZE(3) = ZP	CONF 213
	XP = XW	CONF 214
	YP = YW	CONF 215
	ZP = ZW	CONF 216
	XWP=0.0	CONF 217
C	LOOP FOR EACH POINT ON FLUX TUBE PERIPHERY	CONF 218
	DO 500 IP=1,NW	CONF 219
	THETA = FLOAT(IP-1)/FLOAT(NW) *3.1415926536 *2.	CONF 220
C	CALCULATE TARGET COORDINATES IN FLUX TUBE SYSTEM	CONF 221
	YPSTARP = RW * SIN(THETA)	CONF 222
	ZPSTARP = RW * COS(THETA)	CONF 223
	IPSTAR = IP	CONF 224
C	TRANSFORM TARGET COORDINATES TO FLOW SYSTEM	CONF 225
	CALL TRANSFM(0.0,YPSTARP, ZPSTARP, ALPHAR, BETAR,XPSTAR,YPSTAR,	CONF 226
	1 ZPSTAR,-1)	CONF 227
	XPSTAR = XW + XPSTAR	CONF 228
	YPSTAR = YW + YPSTAR	CONF 229
	ZPSTAR = ZW + ZPSTAR	CONF 230
C	GUESS INITIAL COORDINATES AND COMPUTE TRAJECTORY	CONF 231
	WRITE (6,2800) IP,XPSTAR,YPSTAR, ZPSTAR, YPSTARP, ZPSTARP	CONF 232
	CALL MAP (YI,ZI,TOL,RW,YE,ZE)	CONF 233
	IF(IT .LT. 0) GO TO 5	CONF 234
C	TRANSFORM FINAL AND INITIAL COORDINATES TO FLUX TUBE SYS.	CONF 235
	CALL TRANSFM (P(1) - XW , P(3) - YW ,P(5) - ZW ,ALPHAR,BETAR,	CONF 236
	1XEXIT(IP),YEXIT(IP),ZEXIT(IP),1)	CONF 237
	CALL TRANSFM (XI3-XI3P,YI3-YI3P,ZI3-ZI3P,ALPHA0,BETA0,XINIT(IP),	CONF 238
	1YINIT(IP),ZINIT(IP),1)	CONF 239
	IF (ABS(XINIT(IP)) . LE . RW * TOL) GO TO 500	CONF 240

	WRITE (6, 2000) XINIT(IP), XI3P	CONF 241
500	CONTINUE	CONF 242
C	COMPUTE FLUX TUBE CROSS SECTION AREAS IN THE INITIAL AND TARGET	CONF 243
C	PLANES, AND COMPUTE CONCENTRATION FACTOR, ETC.	CONF 244
	WRITE (6, 2200) XI3P, YI3P, ZI3P, XW, YW, ZW	CONF 245
	DO 600 IP=1, NW	CONF 246
600	WRITE (6, 2300) IP, XINIT(IP), YINIT(IP), ZINIT(IP), XEXIT(IP),	CONF 247
	1 YEXIT(IP), ZEXIT(IP)	CONF 248
	CALL POLYGON (YINIT, ZINIT, NW, AREA)	CONF 249
	CALL POLYGON (YEXIT, ZEXIT, NW, DENOM)	CONF 250
	CONFAK = AREA/DENOM	CONF 251
	CONRTO = CONFAK / VPGT	CONF 252
	WRITE (6, 3000) AREA, DENOM, CONFAK, XW, YW, ZW, DIAM	CONF 253
	WRITE(6, 3400) DLR, RHOF	CONF 254
	WRITE(6, 3200) VTGT, CONRTO	CONF 255
C		CONF 256
C		CONF 257
C		CONF 258
C	SET UP TRIAL COORDINATES FOR NEXT PARTICLE	CONF 259
C		CONF 260
	YI(3) = YI3	CONF 261
	ZI(3) = ZI3	CONF 262
	YE(3) = P(3)	CONF 263
	ZE(3) = P(5)	CONF 264
	CALL TRANSFM(0.0, YI(2), ZI(2), ALPHA0, BETA0, XI3, YI3, ZI3, -1)	CONF 265
	YI(2) = YI3 + YI3P	CONF 266
	ZI(2) = ZI3 + ZI3P	CONF 267
	CALL TRANSFM(0.0, YE(2), ZE(2), ALPHAR, BETAR, XI3, YI3, ZI3, -1)	CONF 268
	YE(2) = YI3 + YW	CONF 269
	ZE(2) = ZI3 + ZW	CONF 270
	GO TO 5	CONF 271
1000	FORMAT(18A4, 7X, L1)	CONF 272
1100	FORMAT(8F10.5)	CONF 273
1150	FORMAT (I10, 7F10.5)	CONF 274
1200	FORMAT(1H1, 5X, 15HC CNFAC RUN ID -/ 8X, 18A4)	CONF 275
1300	FORMAT(1H0, 5X, 21HPHYSICAL INPUT DATA -/ 7X, 10HAIR SPEED=1PE13.6,	CONF 276
	1 3X, 37HCHARACTERISTIC DIMENSION OF THE BODY=1PE13.6/ 7X, 35HCONF	CONF 277
	2Y AND TEMPERATURE OF AIR ARE 1PE13.6, 5H AND 1PE13.6, 20H AIR VISCONF	CONF 278
	3COSITY IS 1PE13.6)	CONF 279
1400	FORMAT(1H0, 5X, 29HNUMERICAL INTEGRATOR INPUTS -/ 7X, 10HTIME STECONF	CONF 280
	1P=1PE11.4, 3X, 18HMINIMUM TIME STEP=1PE11.4, 3X, 20HPRINT TIME INTCONF	CONF 281
	2ERVAL=1PE11.4, 3X, 24HUPSTREAM START DISTANCE=1PE11.4)	CONF 282
1500	FORMAT(1H0, 6X, 33HLOCAL ERROR TOLERANCES FOR DVDQ -, 3(1PE14.4))	CONF 283
1520	FORMAT(1H0, 5X, 35HPARTICLE FLUX TUBE SPECIFICATIONS -/	CONF 284
	1 7X, 46HNUMBER OF TRAJECTORIES ON FLUX TUBE PERIPHERY=I3, CONF	CONF 285
	2 3X, 27HFLUX TUBE RADIUS AT TARGET=F9.5, 3X, 10HTOLERANCE=F8.4)	CONF 286
1540	FORMAT(1H0, 5X, 40HTARGET AND INITIAL COORDINATE ESTIMATES-/ 10X, CONF	CONF 287
	1 6HJGUESS, 9X, 2HYT, 13X, 2HZT, 13X, 2HYI, 13X, 2HZI)	CONF 288
1550	FORMAT(I14, 4(5X, F10.5))	CONF 289
1800	FORMAT(//6X, 51HTRAJECTORY DATA ARE WRITTEN ON UNIT 10 FOR PLOTCONF	CONF 290
	1ING//)	CONF 291
2000	FORMAT(///20X, 47HINITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -CONF	CONF 292
	1/ 22X, 7HALPHA0=F10.4, 5X, 6HBETA0=F10.4/ 22X, 7HALPHAR=F10.4, 5XCONF	CONF 293
	2, 6HBETAR=F10.4)	CONF 294
2200	FORMAT(1H1, 35X, 44HFLUX TUBE CROSS SECTION COORDINATES IN THE -/CONF	CONF 295
	1/ 28X, 13HINITIAL PLANE, 33X, 12HTARGET PLANE//	CONF 296
	2 8X, 2HIP, 2(9X, 2HXP, 13X, 2HYP, 13X, 2HZP, 4X)/ 4X, 6HCENTECONF	CONF 297
	3R6(1PE15.4), 14H (FLOW SYSTEM))	CONF 298
2300	FORMAT (I10, 6(1PE15.4), 19H (FLUX TUBE SYSTEM))	CONF 299
2600	FORMAT (A4)	CONF 300

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2800 FORMAT( /// 18H TRAJECTORY NUMBER,I3,5X,20HTARGET COORDINATES -CONF 301
1,10H XPSTAR =F10.6, 4X, 8HYPSTAR =F10.6,5X, 8HZPSTAR =F10.6, CONF 302
2 14H (FLOW SYSTEM)/ 70X, 8HYPSTARP=F10.6, 5X, 8HZPSTARP=F10.6, CONF 303
3 19H (FLUX TUBE SYSTEM)// CONF 304
4 15X, 6HY FINAL, 6X, 6HZFINAL,6X,10HITERATIONS,5X, 5HYINIT, 7X, CONF 305
5 5HZINIT, 7X, 25HERRCR (FLUX TUBE SYSTEM) CONF 306
2900 FORMAT(// 30X,49HINITIAL POINT IS NOT IN CORRECT TRANSFORMED PLANECONF 307
1/ 32X, 6HXINIT=1PE12.5, 5X, 5HXI3P=1PE12.5) CONF 308
3000 FORMAT(// 15X, 50HFLUX TUBE CROSS SECTION AREA IN THE INITIAL PLANCONF 309
1E=1PE12.5, 8X, 20HIN THE TARGET PLANE=1PE12.5// 15X, 21HCONCENTRACONF 310
2TION FACTOR=0PF11.5// CONF 311
3 10X, 21HAT THE POINT (X,Y,Z)=,3F12.5/10X,27HFOR A PARTICLE (F DIACONF 312
4METER=,F12.5) CONF 313
3200 FORMAT( 10X, 36HNORMALIZED AIR SPEED AT FINAL POINT=F12.5/ CONF 314
1 10X, 29HPARTICLE GCNCENTRATION RATIO=F12.5) CONF 315
3400 FORMAT( 1H+, 52X, 30HWITH DIAMETER TO LENGTH RATIO=1PE12.5, 3X, CONF 316
1 12HAND DENSITY=1PE12.5) CONF 317
3500 FORMAT( 1H0, 9X, 22HTARGET COORDINATES X=1PE12.5, 5X, 2HY=1PE12. CONF 318
15, 5X, 2HZ=1PE12.5) CONF 319
END CONF 320

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*DECK, MAP MAP 1
SUBROUTINE MAP (YI,ZI,TOL,RW,YE,ZE) MAP 2
C MAP 3
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979 MAP 4
C MAP 5
C MAP GUESSES THE INITIAL COORDINATES OF A TRAJECTORY THAT IS MAP 6
C AIMING FOR A POINT IN THE TARGET PLANE. AFTER THE TRAJECTORY MAP 7
C IS COMPUTED, THE DISTANCE FROM THE TARGET IS COMPARED TO MAP 8
C THE ALLOWABLE TOLERANCE. THE PROCESS IS REPEATED UNTIL DISTANC MAP 9
C FROM THE TARGET IS BELOW THE TOLERANCE. MAP 10
C ONCE A HISTORY OF GREATER THAN THREE TRAJECTORIES HAS BEEN MAP 11
C COMPUTED, LEAST SQUARES IS USED TO DETERMINE TRIAL INITIAL MAP 12
C COORDINATES MAP 13
C GLOSSARY MAP 14
C A MATRIX OF COEFFICIENTS INVERTED IN MATINV MAP 15
C AA,C INTERMEDIATE STORAGE FOR LEAST SQUARES NORMAL MATRIX TERMSMAP 16
C AC ACCELERATION MODULUS MAP 17
C ANG ANGLE OF DRAG VECTOR PROJECTED IN THE X-Y PLANE RELATIVE MAP 18
C TO THE X AXIS MAP 19
C B ENTERS MATINV AS CONSTANT MATRIX AND RETURNS AS SOLUTION MMAP 20
C COSA,COSB,COSC DIRECTION COSINES OF DRAG VECTOR MAP 21
C CNG ANGLE OF DRAG VECTOR RELATIVE TO Z AXIS MAP 22
C DIST DISTANCE BETWEEN END OF TRAJECTORY AND TARGET POINT MAP 23
C DV VELOCITY OF FARTICLE RELATIVE TO AIR MAP 24
C IT ITERATION NUMBER MAP 25
C VA AIR SPEED AT TARGET POINT MAP 26
C VP PARTICLE SPEED AT TARGET POINT MAP 27
C W LEAST SQUARES SUMMAND WEIGHT MAP 28
C YE ARRAY OF FINAL Y COORD FOR LAST 3 GUESSES MAP 29
C YI ARRAY OF INITIAL Y COORD FOR LAST 3 GUESSES MAP 30
C YI3 NEXT GUESS FOR INITIAL Y COORD (FLOW SYSTEM) MAP 31
C ZE ARRAY OF FINAL Z COORD FOR LAST 3 GUESSES MAP 32
C ZI ARRAY OF INITIAL Z COORD FOR LAST 3 GUESSES MAP 33
C ZI3 NEXT GUESS FOR INITIAL Z COORD (FLOW SYSTEM) MAP 34
LOGICAL I PLOT MAP 35

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	COMMON XI3,YI3,ZI3,YI3P,EPSI(3),HI,HMINI,VT,PT,COF,FNR,PACT,	MAP	36
	1RF,RE0,R,XPSTAR,YPSTAR,ZFSTAR,P(6),TPRINT,IT,ALPHA0,BETA0,IREC,	MAP	37
	2IPL0T,IPLT,XPLOT(60),YPLCT(60),ZPLOT(60),ALPHAR,BETAR,YPSTARP,	MAP	38
	3ZPSTARP,XI3P,ZI3F,XP,YF,ZP,XHP,XPP,ACC,DLR,JLIM	MAP	39
	DIMENSION YI(3), ZI(3), A(4,4), B(4), YE(3), ZE(3), DY(3), DZ(3),	MAP	40
	1AA(6), C(3), PSTR(3)	MAP	41
	DATA ILIM/ 25/	MAP	42
	DO 50 J=2,3	MAP	43
	DY(J) = YE(J) - YPSTARP	MAP	44
50	DZ(J) = ZE(J) - ZPSTARP	MAP	45
	IT = 0	MAP	46
	N = 4	MAP	47
C	GENERAL ITERATION CALCULATION OF NEXT GUESS	MAP	48
C	GENERATE CONSTANT ARRAY (B) FOR MATINV IF IT . LE . 3	MAP	49
100	DO 120 J=2,3	MAP	50
	I = J - 1	MAP	51
	B(2*I-1) = YI(J)	MAP	52
	B(2*I) = ZI(J)	MAP	53
120	CONTINUE	MAP	54
C	GENERATE COEFFICIENT ARRAY (A) FOR MATINV	MAP	55
	DO 140 J=2,3	MAP	56
	I = J - 1	MAP	57
	JROW = 2*I-1	MAP	58
	JROW2 = 2*I	MAP	59
	A(JROW,1) = 1.	MAP	60
	A(JROW,2) = 0.	MAP	61
	A(JROW,3) = DY(J)	MAP	62
	A(JROW,4) = -DZ(J)	MAP	63
	A(JROW2,1) = 0.	MAP	64
	A(JROW2,2) = 1.	MAP	65
	A(JROW2,3) = DZ(J)	MAP	66
	A(JROW2,4) = DY(J)	MAP	67
140	CONTINUE	MAP	68
	GO TO 280	MAP	69
C	IF IT . GE . 3 SOLVE FOR THE NEXT INITIAL COORDINATES GUESS BY	MAP	70
C	LEAST SQUARES	MAP	71
200	CONTINUE	MAP	72
C		MAP	73
C	INCREMENT LEAST SQUARES NORMAL EQUATIONS	MAP	74
C		MAP	75
	W = 1.0	MAP	76
	G = DY(3) / DIST**2	MAP	77
	Q = DZ(3) / DIST**2	MAP	78
	S = G * YI(3) + Q * ZI(3)	MAP	79
	AA(1) = AA(1) + G**2 * W	MAP	80
	AA(2) = AA(2) + G * Q * W	MAP	81
	AA(3) = AA(3) + G * W	MAP	82
	AA(4) = AA(4) + Q**2 * W	MAP	83
	AA(5) = AA(5) + Q * W	MAP	84
	AA(6) = AA(6) + W	MAP	85
	C(1) = C(1) + G * S * W	MAP	86
	C(2) = C(2) + Q * S * W	MAP	87
	C(3) = C(3) + S * W	MAP	88
C		MAP	89
C	SET-UP LEAST SQUARES NORMAL EQUATIONS	MAP	90
C		MAP	91
220	A(1,1) = AA(1)	MAP	92
	A(1,2) = AA(2)	MAP	93
	A(1,3) = AA(3)	MAP	94
	A(2,2) = AA(4)	MAP	95

A(2,3) = AA(5)	MAP	96
A(3,3) = AA(6)	MAP	97
DO 250 I=2,3	MAP	98
K = I-1	MAP	99
DO 250 J=I,3	MAP	100
250 A(J,K) = A(K,J)	MAP	101
DO 260 I=1,3	MAP	102
260 B(I) = C(I)	MAP	103
DO 265 I=1,3	MAP	104
A(4,I) = 0.0	MAP	105
265 A(I,4) = 0.0	MAP	106
A(4,4) = 1.0	MAP	107
B(4) = 0.0	MAP	108
C SOLVE MATRIX EQNS TO GET NEXT GUESS	MAP	109
280 CALL MATINV(A,N,B,1,DETERM)	MAP	110
CALL TRANSFM(XWP,B(1),B(2),ALPHA0,BETA0,XI3,YI3,ZI3,-1)	MAP	111
XI3 = XI3 + XI3P	MAP	112
YI3 = YI3 + YI3P	MAP	113
ZI3 = ZI3 + ZI3P	MAP	114
CALL TRAJECT	MAP	115
IF (IT .LT. 0) RETURN	MAP	116
IT = IT + 1	MAP	117
C IF (IT .GT. 3) GO TO 305	MAP	118
C UPDATE ARRAYS OF INITIAL AND FINAL CCORDS.	MAP	119
290 DO 300 J=1,2	MAP	120
YI(J) = YI(J+1)	MAP	121
ZI(J) = ZI(J+1)	MAP	122
DY(J) = DY(J+1)	MAP	123
DZ(J) = DZ(J+1)	MAP	124
YE(J) = YE(J+1)	MAP	125
ZE(J) = ZE(J+1)	MAP	126
PSTR(J) = PSTR(J+1)	MAP	127
300 CONTINUE	MAP	128
305 CONTINUE	MAP	129
YI(3) = B(1)	MAP	130
ZI(3) = B(2)	MAP	131
CALL TRANSFM(P(1) - XP , P(3) - YP , P(5) - ZP , ALPHAR, BETAR,	MAP	132
1XDUM, YE(3), ZE(3), 1)	MAP	133
IF (ABS(XP) .EQ. 0.0) XDUM = XDUM - XPP	MAP	134
IF (ABS (XDUM) .GT. RW * TOL) WRITE(6, 3000)	MAP	135
DY(3) = YE(3)-YPSTARP	MAP	136
DZ(3) = ZE(3)-ZPSTARP	MAP	137
DIST = SQRT(DY(3)**2 + DZ(3)**2)	MAP	138
PSTR(3) = DIST	MAP	139
C GUESS AGAIN OR GO ON TO NEXT POINT ON WINDOW?	MAP	140
WRITE (6,2700) YE(3),ZE(3),IT,YI(3),ZI(3),DIST	MAP	141
IF (DIST .LE. RW*TOL) GO TO 490	MAP	142
IF(IT .LE. ILIM)IF(IT - 3) 100,310,200	MAP	143
WRITE (6,2900) ILIM	MAP	144
IT = -ILIM	MAP	145
RETURN	MAP	146
C INITIALIZE FOR LEAST SQUARES	MAP	147
C	MAP	148
C	MAP	149
310 DO 320 I=1,3	MAP	150
320 C(I) = 0.0	MAP	151
DO 325 I=1,6	MAP	152
325 AA(I) = 0.0	MAP	153
DO 330 I = 1,3	MAP	154
W = 1.0	MAP	155

	G = DY(I) / PSTR(I)**2	MAP	156
	Q = DZ(I) / PSTR(I)**2	MAP	157
	S = G * YI(I) + Q * ZI(I)	MAP	158
	AA(1) = AA(1) + G**2 * W	MAP	159
	AA(2) = AA(2) + G * Q * W	MAP	160
	AA(3) = AA(3) + G * W	MAP	161
	AA(4) = AA(4) + Q**2 * W	MAP	162
	AA(5) = AA(5) + Q * W	MAP	163
	AA(6) = AA(6) + W	MAP	164
	C(1) = C(1) + G * S * W	MAP	165
	C(2) = C(2) + Q * S * W	MAP	166
330	C(3) = C(3) + S * W	MAP	167
	GO TO 100	MAP	168
C	PRINT TRAJECTORY OUTPUT	MAP	169
490	REWIND 9	MAP	170
	WRITE (6,1700)	MAP	171
	DO 494 IWRITE = 1,IREC	MAP	172
	READ (9)NEVAL,KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY,	MAP	173
	2 VZ, H, R, AC	MAP	174
	WRITE(6,1600) KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY,	MAP	175
	2 VZ, H, R, AC, NEVAL	MAP	176
494	CONTINUE	MAP	177
C	COMPUTE AND PRINT DRAG VECTOR AT TARGET POINT	MAP	178
	DV = SQRT((VX - P(2))**2 + (VY - P(4))**2 + (VZ - P(6))**2)	MAP	179
	COSA = (VX - P(2))/DV	MAP	180
	COSB = (VY - P(4))/DV	MAP	181
	COSC = (VZ - P(6))/DV	MAP	182
	ANG = ATAN(COSB/COSA) * 57.29577951	MAP	183
	CNG = ACOS(COSC) * 57.29577951	MAP	184
	WRITE(6, 3100) COSA, COSB, COSC, ANG, CNG	MAP	185
C	COMPUTE AND PRINT AIR AND PARTICLE SPEEDS AT TARGET POINT	MAP	186
	VA = SQRT(VX**2 + VY**2 + VZ**2)	MAP	187
	VP = SQRT(P(2)**2 + P(4)**2 + P(6)**2)	MAP	188
	WRITE(6, 3200) VA, VP	MAP	189
	IF (IPLT) WRITE (10) IFLT, (XPLT(J),YPLT(J),ZPLT(J),J=1,IPLT)	MAP	190
	RETURN	MAP	191
1600	FORMAT(I6, 10(1X,1PE11.4)/10X, 24H=1PE11.4,4H R=1PE11.4, 5H AC=	MAP	192
	11PE11.4, 8H NEVAL=I6)	MAP	193
1700	FORMAT(6H0KSTEP, 7X, 1HT, 11X, 1HX, 11X, 1HY, 11X, 1HZ, 10X,	MAP	194
	1 3HVPX, 9X, 3HVPLY, 9X, 3HVPZ, 10X, 2HVX, 10X, 2HVV, 10X, 2HVZ)	MAP	195
2700	FORMAT (10X, 2E12.4,7X,I3,5X,3E12.4)	MAP	196
2900	FORMAT(///20X, 28HTOLERANCE NOT SATISFIED IN I4, 58H TRAJECTORY I	MAP	197
	1TERATIONS. GIVE UP AND TRY THE NEXT PARTICLE)	MAP	198
3000	FORMAT(///20X, 57HFINAL FARTICLE POSITION IS NOT IN THE ROTATED T	MAP	199
	1GET PLANE)	MAP	200
3100	FORMAT(5X, 28HORAG VECTOR AT FINAL POINT -/ 6X, 18HDIRECTION COS	MAP	201
	1INES-3(1PE13.4), 3X, 19HANGLES A AND GAMMA-2(1PE13.4))	MAP	202
3200	FORMAT(5X, 47HAIR AND FARTICLE SPEEDS AT THE FINAL POINT ARE2(1PE	MAP	203
	115.5))	MAP	204
	END	MAP	205

*DECK, TRAJECT		TRAJ	1
SUBROUTINE TRAJECT		TRAJ	2
C		TRAJ	3
C	H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1975	TRAJ	4
C		TRAJ	5
C	TRAJECT CALCULATES 3-D PARTICLE TRAJECTORIES	TRAJ	6
C	EMBEDDED IN A FLOW FIELD DETERMINED BY FLOVEL.	TRAJ	7
C	THE PREDICTOR-CORRECTOR SUBROUTINE DVDQ IS USED	TRAJ	8
C	TO INTEGRATE THE EQUATIONS OF MOTION. OUTPUT AT TIME	TRAJ	9
C	INTERVAL TPRINT IS WRITTEN ON UNIT 9.	TRAJ	10
C	DRAG PARAMETERS ARE CALCULATED BY FUNCTION PRFUN WHICH IS PARTICLE	TRAJ	11
C	TYPE-SPECIFIC. S.R.IMPACT IS A PROBLEM-SPECIFIC CODE THAT, AFTER	TRAJ	12
C	PARTICLE IMPACT ON THE BODY, ADJUSTS INITIAL PARTICLE COORDINATES	TRAJ	13
C	SUCH THAT ON THE NEXT TRIAL IMPACTION SHOULD NOT OCCUR.	TRAJ	14
C		TRAJ	15
C	GLOSSARY	TRAJ	16
C	AC ACCELERATION MODULUS	TRAJ	17
C	DT() STORAGE FOR DVDQ	TRAJ	18
C	EPS() LOCAL ERROR TOLERANCE FOR THE NUMERICAL INTEGRATION	TRAJ	19
C	F() EQUATION OF MOTION OF THE PARTICLE -	TRAJ	20
C	F(1) - X DIRECTION	TRAJ	21
C	F(2) - Y DIRECTION	TRAJ	22
C	F(3) - Z DIRECTION	TRAJ	23
C	G GSTOP FUNCTION (SEE DVDQ GLOSSARY)	TRAJ	24
C	H TIME STEP	TRAJ	25
C	IFLAG DVDQ STATUS FLAG (SEE DVDQ GLOSSARY)	TRAJ	26
C	INBODY FLAG TO INDICATE WHEN TRAJECTORY HAS	TRAJ	27
C	PENETRATED THE BODY	TRAJ	28
C	KD(I) ORDER OF THE ITH DIFFERENTIAL EQUATION	TRAJ	29
C	KQ(I) THE HIGHEST ORDER DIFFERENCE USED IN THE INTEGRATION OF	TRAJ	30
C	THE ITH EQUATION	TRAJ	31
C	NEQ NUMBER OF EQUATIONS	TRAJ	32
C	NG NUMBER OF GSTOP FUNCTIONS (SEE DVDQ GLOSSARY)	TRAJ	33
C	NGE SEE DVDQ GLOSSARY	TRAJ	34
C	P() CURRENT VALUE OF THE DEPENDENT VARIABLES (SEE CONFAC)	TRAJ	35
C	PN() STORAGE FOR DVDQ	TRAJ	36
C	R REYNOLDS NUMBER	TRAJ	37
C	T TIME	TRAJ	38
C	TFINAL INTEGRATION CUT-OFF TIME	TRAJ	39
C	VX AIR VELOCITY IN X DIRECTION	TRAJ	40
C	VY AIR VELOCITY IN Y DIRECTION	TRAJ	41
C	VZ AIR VELOCITY IN Z DIRECTION	TRAJ	42
C	DIMENSION F(3),EPS(3),KD(3),PN(6),KQ(3), DT(20,3)	TRAJ	43
C	LOGICAL IFLAG	TRAJ	44
C	COMMON XI3,YI3,ZI3,YI3P, EPSI(3),HI,HMINI,VT,PT,COF,FNR,PACT,	TRAJ	45
C	1RF,REQ,R,XPSTAR,YPSTAR,ZPSTAR,P(6),TPRINT,IT,ALPHA0,BETA0,IREC,	TRAJ	46
C	2IPL0T,IPLT,XPLOT(60),YPLCT(60),ZPLOT(60),ALPHAR,BETAR,YPSTARP,	TRAJ	47
C	3ZPSTARP,XI3P,ZI3F,XP,YP,ZP,XNP,XPP,ACC,DLR,JLIM	TRAJ	48
C	DATA MXSTEP,NEQ,NG,NGE/10,3,1,0/, KD/3*2/	TRAJ	49
C	INITIALIZE FOR THE NUMERICAL INTEGRATOR	TRAJ	50
C	JT = 0	TRAJ	51
100	IFLAG = 0	TRAJ	52
	TFINAL = (XPSTAR-XI3)*2.0	TRAJ	53
	HMAX = TFINAL	TRAJ	54
	A11 = COS(ALPHAR) * COS(BETAR)	TRAJ	55
	A12 = SIN(ALPHAR) * COS(BETAR)	TRAJ	56
	A13 = SIN(BETAR)	TRAJ	57
	T = 0.0	TRAJ	58
	EPS(1) = EPSI(1)	TRAJ	59
	EPS(2) = EPSI(2)	TRAJ	60

EPS(3) = EPSI(3)	TRAJ	61
H = HI	TRAJ	62
HMIN = HMINI	TRAJ	63
XPLOT(1) = XI3	TRAJ	64
YPLOT(1) = YI3	TRAJ	65
ZPLOT(1) = ZI3	TRAJ	66
IPLT = 1	TRAJ	67
C COMPUTE INITIAL AIR FLOW VELOCITIES	TRAJ	68
110 CALL FLOVEL(XI3, YI3, ZI3, VX, VY, VZ, H, INBODY)	TRAJ	69
P(1) = XI3	TRAJ	70
P(2) = VX	TRAJ	71
P(3) = YI3	TRAJ	72
P(4) = VY	TRAJ	73
P(5) = ZI3	TRAJ	74
P(6) = VZ - VT	TRAJ	75
120 F(1) = 0.0	TRAJ	76
F(2) = 0.0	TRAJ	77
F(3) = VT*PT/COF - FNR	TRAJ	78
G = A11*(P(1) - XPP) + A12 * (P(3) - YP) + A13 * (P(5) - ZP)	TRAJ	79
CALL DVDQ(NEQ, T, P, F, KD, EPS, IFLAG, H, HMIN,	TRAJ	80
* HMAX, TPRINT, TFINAL, MXSTEP, KSTEP, KEMAX, EMAX,	TRAJ	81
* KQ, PN, DT, NEVAL, NG, NGE, NSTOP, G, GT)	TRAJ	82
C COMPUTE THE TRAJECTORY	TRAJ	83
REWIND 9	TRAJ	84
IREC = 0	TRAJ	85
GO TO 200	TRAJ	86
150 AC = ACC * SQRT(F(1)**2 + F(2)**2 + F(3)**2) * (RF/R)**2	TRAJ	87
WRITE(9)NEVAL, KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6), VX, VY,	TRAJ	88
2 VZ, H, R, AC	TRAJ	89
IREC = IREC + 1	TRAJ	90
IF (.NOT. IPLT .AND. IFLAG .LE. 10) GO TO 200	TRAJ	91
IPLT = IPLT + 1	TRAJ	92
XPLOT(IPLT) = P(1)	TRAJ	93
YPLOT(IPLT) = P(3)	TRAJ	94
ZPLOT(IPLT) = P(5)	TRAJ	95
IF(IFLAG .GT. 10) RETURN	TRAJ	96
200 CALL DVDQ(NEQ, T, P, F, KD, EPS, IFLAG, H, HMIN,	TRAJ	97
* HMAX, TPRINT, TFINAL, MXSTEP, KSTEP, KEMAX, EMAX,	TRAJ	98
* KQ, PN, DT, NEVAL, NG, NGE, NSTOP, G, GT)	TRAJ	99
GO TO(210, 210, 150, 250, 150, 220, 230, 250, 260, 260, 150,	TRAJ	100
1 150), IFLAG	TRAJ	101
210 CALL FLOVEL(P(1), P(3), P(5), VX, VY, VZ, H, INBODY)	TRAJ	102
IF (INBODY .EQ. 0) GO TO 215	TRAJ	103
WRITE (6,2200) P(1), P(3), P(5), YI3, ZI3, JT	TRAJ	104
CALL IMPACT(YI3, ZI3)	TRAJ	105
JT = JT + 1	TRAJ	106
IF(JT.LT. JLIM) GO TO 100	TRAJ	107
WRITE (6,2500) JLIM	TRAJ	108
IT=-JLIM	TRAJ	109
RETURN	TRAJ	110
215 R = RF*SQRT((VX - P(2))**2 + (VY - P(4))**2 + (VZ - P(6))**2)	TRAJ	111
PR = PRFUN(R, DLR, COF)	TRAJ	112
F(1) = (VX - P(2))*PR	TRAJ	113
F(2) = (VY - P(4))*PR	TRAJ	114
F(3) = (VZ - P(6))*PR - FNR	TRAJ	115
GO TO 200	TRAJ	116
220 EPS(KEMAX) = 32.*EMAX*EPS(KEMAX)	TRAJ	117
WRITE(6,1900) IFLAG, KSTEP, NEVAL	TRAJ	118
WRITE(6,2000) EPS(KEMAX), KEMAX	TRAJ	119
GO TO 210	TRAJ	120

230	HMIN = H	TRAJ 121
	WRITE(6,1900) IFLAG, KSTEP,NEVAL	TRAJ 122
	WRITE(6,2100) HMIN	TRAJ 123
	GO TO 200	TRAJ 124
260	G = A11*(P(1) - XPP) + A12 * (P(3) - YP) + A13 * (P(5) - ZP)	TRAJ 125
	GO TO 200	TRAJ 126
250	WRITE(6,1900) IFLAG, KSTEP,NEVAL	TRAJ 127
	AC = ACC * SQRT(F(1)**2 + F(2)**2 + F(3)**2) * (RF/R)**2	TRAJ 128
	WRITE(6,1600) KSTEP, T, F(1), P(3), P(5), P(2), P(4), P(6),VX, VY,	TRAJ 129
1	VZ, H, R, AC	TRAJ 130
	RETURN	TRAJ 131
C		TRAJ 132
C		TRAJ 133
1600	FORMAT(I6, 10(1X,1PE11.4)/ 10X, 24H=1PE11.4, 4H R=1PE11.4, 5H AC	TRAJ 134
	1=1PE11.4)	TRAJ 135
1900	FORMAT(5X, 6HIFLAG=I2, 11H FOR KSTEP=I6, 8H NEVAL=I6)	TRAJ 136
2000	FORMAT(1H+, 55X, 23HEPS HAS BEEN CHANGED TO1PE11.4, 11H FOR KEMAX	TRAJ 137
	1=I2)	TRAJ 138
2100	FORMAT(1H+, 55X, 14HHMIN IS SET TO1PE11.4)	TRAJ 139
2200	FORMAT(10X, 65HTHE BODY SURFACE IS PENETRATED. PARTICLE COORDINAT	TRAJ 140
	1TES ARE (X,Y,Z),3(1PE12.5)/ 10X, 43HTRIAL INITIAL COORDINATES ARE	TRAJ 141
	2(YINIT,ZINIT)2(1PE12.4), 5X, 14HATTEMPT NUMBERI4)	TRAJ 142
2500	FORMAT(/ 15X, 5HAFTERI4, 45H ATTEMPTS PARTICLE STILL PENETRATES	TRAJ 143
	1 THE BODY.)	TRAJ 144
	END	TRAJ 145

*DECK, POLYGON	POLY 1
SUBROUTINE POLYGON(XIN,YIN,N,AREA)	POLY 2
C	POLY 3
C	POLY 4
C	POLY 5
	POLY 6
	POLY 7
	POLY 8
C	POLY 9
	POLY 10
	POLY 11
	POLY 12
	POLY 13
	POLY 14
2	POLY 15
	POLY 16
	POLY 17
C	POLY 18
	POLY 19
	POLY 20
	POLY 21
	POLY 22
	POLY 23
	POLY 24
	POLY 25
	POLY 26
	POLY 27
	POLY 28
4	POLY 29
	POLY 30

8	CONTINUE	POLY	31
	ASUM = 0.	POLY	32
	DO 40 IN=1,N	POLY	33
	INM1 = IN - 1	POLY	34
	IF (IN.EQ.1) INM1 = N	POLY	35
	BASE = SQRT((X(IN)-X(INM1))**2 +(Y(IN)-Y(INM1))**2)	POLY	36
	DENOM = X(IN) - X(INM1)	POLY	37
	IF (ABS(DENOM) .GT. 1.E-10) GO TO 31	POLY	38
	ALT = ABS(XGEN-X(INM1))	POLY	39
	GO TO 32	POLY	40
31	SLOPE = (Y(IN)-Y(INM1))/(X(IN)-X(INM1))	POLY	41
	ALT = ABS(YGEN-Y(INM1)-SLOPE*(XGEN-X(INM1)))/SQRT(1.+SLOPE**2)	POLY	42
32	ASUM = ASUM + ALT*BASE/2.	POLY	43
40	CONTINUE	POLY	44
200	AREA = ASUM	POLY	45
	RETURN	POLY	46
	END	POLY	47

*DECK, TRANSFM		TRAN	1
	SUBROUTINE TRANSFM (X,Y,Z, ALPHA, BETA, XT, YT, ZT, IGO)	TRAN	2
C		TRAN	3
C	TRANSFORMS COORDINATES FROM THE FLOW SYSTEM TO THE PARTICLE FLUX	TRAN	4
C	TUBE CROSS SECTION SYSTEM, OR VISE VERSA.	TRAN	5
C	IF(IGO .GT. 0) TRANSFORM FROM FLOW TO FLUX TUBE SYSTEM	TRAN	6
C	IF(IGO .LT. 0) TRANSFORM FROM FLUX TUBE TO FLOW SYSTEM	TRAN	7
C		TRAN	8
	COSA = COS(ALPHA)	TRAN	9
	SINA = SIN(ALPHA)	TRAN	10
	COSB = COS(BETA)	TRAN	11
	SINB = SIN(BETA)	TRAN	12
	IF (IGO .LT. 0) GO TO 20	TRAN	13
	A11 = COSA*COSB	TRAN	14
	A12 = SINA*COSB	TRAN	15
	A13 = SINB	TRAN	16
	A21 = -SINA	TRAN	17
	A22 = COSA	TRAN	18
	A23 = 0.	TRAN	19
	A31 = -COSA*SINB	TRAN	20
	A32 = -SINB*SINA	TRAN	21
	A33 = COSB	TRAN	22
	GO TO 30	TRAN	23
C	GOING THE OTHER WAY	TRAN	24
20	A11= COSA*COSB	TRAN	25
	A12 = -SINA	TRAN	26
	A13 = -COSA*SINB	TRAN	27
	A21 = SINA*COSB	TRAN	28
	A22 = COSA	TRAN	29
	A23 = -SINA*SINB	TRAN	30
	A31 = SINB	TRAN	31
	A32 = 0.	TRAN	32
	A33=COSB	TRAN	33
30	XT = A11*X + A12*Y + A13*Z	TRAN	34
	YT = A21*X + A22*Y + A23*Z	TRAN	35
	ZT = A31*X + A32*Y + A33*Z	TRAN	36
	RETURN	TRAN	37
	END	TRAN	38

*DECK, MATINV	MATI	1
SUBROUTINE MATINV(A,N,B,M,DETERM)	MATI	2
C	MATI	3
C	MATI	4
MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS	MATI	4
C	MATI	5
THIS CODE SOLVES THE MATRIX EQUATION	MATI	6
C	MATI	7
A*X=B	MATI	7
C	MATI	8
FOR X. A IS AN N*N INPUT MATRIX. B IS AN N*1 INPUT VECTOR.	MATI	8
C	MATI	9
A IS REPLACED BY ITS INVERSE. B IS REPLACED BY THE VECTOR X.	MATI	9
C	MATI	10
THE CODE CAN BE USED FOR MATRIX INVERSION ALONE. IN THIS MODE	MATI	10
C	MATI	11
SET M=0 IN THE INPUT. FOR MATRIX INVERSION PLUS LINEAR EQUATION	MATI	11
C	MATI	12
SOLUTION, SET M=1 IN THE INPUT. THE VALUE OF THE DETERMINANT	MATI	12
C	MATI	13
OF A, DETERM, IS RETURNED FROM BOTH MODES.	MATI	13
C	MATI	14
DIMENSION IPIVOT(30), A(N, N), B(N,1), INDEX(30,2), PIVOT(30)	MATI	15
EQUIVALENCE (IROW,JRCW), (ICOLUJ,JCOLUJ), (AMAX, T, SWAP)	MATI	16
C	MATI	17
INITIALIZATION	MATI	18
C	MATI	19
10 DETERM=1.0	MATI	20
15 DO 20 J=1,N	MATI	21
20 IPIVOT(J)=0	MATI	22
30 DO 550 I=1,N	MATI	23
C	MATI	24
SEARCH FOR PIVOT ELEMENT	MATI	25
C	MATI	26
40 AMAX=0.0	MATI	27
45 DO 105 J=1,N	MATI	28
50 IF (IPIVOT(J)-1) 60, 105, 60	MATI	29
60 DO 100 K=1,N	MATI	30
70 IF (IPIVOT(K)-1) 80, 100, 740	MATI	31
80 IF (ABS (AMAX)-ABS (A(J,K))) 85, 100, 100	MATI	32
85 IROW=J	MATI	33
90 ICOLUJ=K	MATI	34
95 AMAX=A(J,K)	MATI	35
100 CONTINUE	MATI	36
105 CONTINUE	MATI	37
110 IPIVOT(ICOLUJ)=IPIVOT(ICOLUJ)+1	MATI	38
C	MATI	39
INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL	MATI	40
C	MATI	41
130 IF (IROW-ICOLUJ) 140, 260, 140	MATI	42
140 DETERM=-DETERM	MATI	43
150 DO 200 L=1,N	MATI	44
160 SWAP=A(IROW,L)	MATI	45
170 A(IROW,L)=A(ICOLUJ,L)	MATI	46
200 A(ICOLUJ,L)=SWAP	MATI	47
205 IF(M) 260, 260, 210	MATI	48
210 DO 250 L=1, M	MATI	49
220 SWAP=B(IROW,L)	MATI	50
230 B(IROW,L)=B(ICOLUJ,L)	MATI	51
250 B(ICOLUJ,L)=SWAP	MATI	52
260 INDEX(I,1)=IROW	MATI	53
270 INDEX(I,2)=ICOLUJ	MATI	54
310 PIVOT(I)=A(ICOLUJ, ICOLUJ)	MATI	55
320 DETERM=DETERM*PIVOT(I)	MATI	56
C	MATI	57
DIVIDE PIVOT ROW BY PIVOT ELEMENT	MATI	58
C	MATI	59
330 A(ICOLUJ,ICOLUJ)=1.0	MATI	60

340	DO 350 L=1,N	MATI	61
350	A(ICOLUM,L)=A(ICOLUM,L)/PIVOT(I)	MATI	62
355	IF(M) 380, 380, 360	MATI	63
360	DO 370 L=1,M	MATI	64
370	B(ICOLUM,L)=B(ICOLUM,L)/PIVOT(I)	MATI	65
C		MATI	66
C	REDUCE NON-PIVOT RCWS	MATI	67
C		MATI	68
380	DO 550 L1=1,N	MATI	69
390	IF(L1-ICOLUM) 400, 550, 400	MATI	70
400	T=A(L1,ICOLUM)	MATI	71
420	A(L1,ICOLUM)=0.0	MATI	72
430	DO 450 L=1,N	MATI	73
450	A(L1,L)=A(L1,L)-A(ICOLUM,L)*T	MATI	74
455	IF(M) 550, 550, 460	MATI	75
460	DO 500 L=1,M	MATI	76
500	B(L1,L)=B(L1,L)-B(ICOLUM,L)*T	MATI	77
550	CONTINUE	MATI	78
C		MATI	79
C	INTERCHANGE COLUMNS	MATI	80
C		MATI	81
600	DO 710 I=1,N	MATI	82
610	L=N+1-I	MATI	83
620	IF (INDEX(L,1)-INDEX(L,2)) 630, 710, 630	MATI	84
630	JROW=INDEX(L,1)	MATI	85
640	JCOLUM=INDEX(L,2)	MATI	86
650	DO 705 K=1,N	MATI	87
660	SWAP=A(K,JROW)	MATI	88
670	A(K,JROW)=A(K,JCOLUM)	MATI	89
700	A(K,JCOLUM)=SWAP	MATI	90
705	CONTINUE	MATI	91
710	CONTINUE	MATI	92
740	RETURN	MATI	93
	END	MATI	94

*DECK, SETFLO	SETF	1
SUBROUTINE SETFLO(KASE)	SETF	2
C INITIALIZES FOR FLOVEL CALCULATION BY READING IN DATA PREPARED	SETF	3
REAL IXX, IXY, IYY, MACH	SETF	4
COMMON /VELDAT/ NSYM, NQUAD, I19, I29, LOOP, RBETA	SETF	5
COMMON/COM29/ SIG(1000), D41(1000), XC(1000), YC(1000), ZC(1000),	SETF	6
1 A11(1000), A12 (1000), A13 (1000), A21(1000), A22(1000), A23(1000),	SETF	7
2 A31(1000), A32 (1000), A33 (1000), XI1(1000), XI2(1000), XI3(1000),	SETF	8
3 XI4(1000), ETA1(1000), ETA2(1000), ETA4(1000), TSQ(1000), A(1000),	SETF	9
4 IXX(1000), IXY (1000), IYY (1000), D12 (1000), D23(1000), D34(1000)	SETF	10
REWIND 14	SETF	11
READ(14) KASETP, NSYM, NQUAD, RBETA, MACH	SETF	12
WRITE(6,3000) KASE ,NSYM, NQUAD, MACH	SETF	13
IF(KASE .EQ. KASETP) GO TO 100	SETF	14
REWIND 14	SETF	15
WRITE(6,2000) KASE, KASETP	SETF	16
STOP	SETF	17
100 READ (14)(XC(J), YC (J), ZC(J), A11(J), A12(J), A13(J), A21(J),	SETF	18
1 A22(J), A23(J), A31(J), A32(J), A33(J), XI1(J), ETA1(J), XI2(	SETF	19
2 J), ETA2(J), XI3(J), XI4(J), ETA4(J), TSQ(J), A (J), IXX (J),	SETF	20
3 IXY (J), IYY(J), D12(J), D23(J), D34(J), D41(J) ,J=1,NQUAD)	SETF	21
READ(14)(SIG(I), I=1,NQUAD)	SETF	22
REWIND 14	SETF	23
10 IF (NSYM - 1) 58, 52, 54	SETF	24
52 I29 = 1	SETF	25
I19 = 2	SETF	26
GO TO 60	SETF	27
54 I29 = 2	SETF	28
IF (NSYM .EQ. 3) GO TO 56	SETF	29
I19 = 3	SETF	30
GO TO 60	SETF	31
56 I19 = 4	SETF	32
GO TO 60	SETF	33
58 I19 = 1	SETF	34
60 LOOP = 2 ** NSYM + 1	SETF	35
RETURN	SETF	36
2000 FORMAT(1H-, 5X, 50HTAPE AND CARD IDENTIFIERS DO NOT MATCH. TRY A	SETF	37
1GAIN/ 10X, 9HCARD ID= A4, 5X, 9HTAPE ID= A4)	SETF	38
3000 FORMAT(1H1, 19HBODY IDENTIFIER IS A4, 5X, 26HNUMBER OF SYMME	SETF	39
1TRY PLANES=13, 5X, 25HNUMBER OF QJADRALATERALS=15, 5X, 12HMACH NUM	SETF	40
2BER=E12.5)	SETF	41
END	SETF	42

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*DECK, FLOVEL                                FLOW 1
SUBROUTINE FLOVEL( XNPP, YNPP, ZNPP, VXPP, VYPP, VZPP, H, INBODY) FLOW 2
C                                               FLOW 3
C                                               FLOW 4
C   GIVEN SPACE COORDINATES, XNPP, YNPP, ZNPP, POTENTIAL FLOW VELOCITY FLOW 5
C   COMPONENTS, WXPP, VYPP, VZPP, ARE COMPUTED AND RETURNED. FLOW 6
C   THE HESS-SMITH METHOD IS USED. THE 28 QUANTITIES PLUS THE FLOW 7
C   SOURCE STRENGTHS, SIG(), ARE STORED IN COMMON/COM29/. FLOW 8
C   CONTRIBUTIONS FROM NQUAD SURFACE ELEMENTS ARE SUMMED. FLOW 9
C   UP TO THREE PLANES OF SYMMETRY CAN BE ACCCOMODATED. FLOW 10
C                                               FLOW 11
REAL M12, M23, M34, M41, IXX, IXY, IYY FLOW 12
COMMON /VELDAT/ NSYM, NQUAD, I19, I29, LOOP, RBETA FLOW 13
DIMENSION X(8), Y(8), Z(8) FLOW 14
COMMON/COM29/ SIG(1000), D41(1000), XC(1000), YC(1000), ZC(1000), FLOW 15
1 A11(1000), A12 (1000), A13 (1000), A21(1000), A22(1000), A23(1000), FLOW 16
2 A31(1000), A32 (1000), A33 (1000), XI1(1000), XI2(1000), XI3(1000), FLOW 17
3 XI4(1000), ETA1(1000), ETA2(1000), ETA4(1000), TSQ(1000), A(1000), FLOW 18
4 IXX(1000), IXY (1000), IYY (1000), D12 (1000), D23(1000), D34(1000) FLOW 19
DATA RHO1SQ, RHO2SQ/ 6.0, 16.0 / FLOW 20
VXPP=0.0 FLOW 21
VYPP=0.0 FLOW 22
VZPP=0.0 FLOW 23
INBODY = 0 FLOW 24
DO 2300 I1 = 1, NQUAD FLOW 25
DO 1700 I2 = 1, LOOP FLOW 26
IF ( I2 .EQ. LOOP ) GO TO ( 2000, 910, 920, 930 ), I19 FLOW 27
GO TO (1000, 910, 920, 910, 930, 910, 920, 910 ), I2 FLOW 28
910 YC ( I1 ) = - YC ( I1 ) FLOW 29
A12 ( I1 ) = - A12 ( I1 ) FLOW 30
A22 ( I1 ) = - A22 ( I1 ) FLOW 31
A31 ( I1 ) = - A31 ( I1 ) FLOW 32
A33 ( I1 ) = - A33 ( I1 ) FLOW 33
GO TO 932 FLOW 34
920 ZC ( I1 ) = - ZC ( I1 ) FLOW 35
A13 ( I1 ) = - A13 ( I1 ) FLOW 36
A23 ( I1 ) = - A23 ( I1 ) FLOW 37
A31 ( I1 ) = - A31 ( I1 ) FLOW 38
A32 ( I1 ) = - A32 ( I1 ) FLOW 39
GO TO 932 FLOW 40
930 XC ( I1 ) = - XC ( I1 ) FLOW 41
A11 ( I1 ) = - A11 ( I1 ) FLOW 42
A21 ( I1 ) = - A21 ( I1 ) FLOW 43
A32 ( I1 ) = - A32 ( I1 ) FLOW 44
A33 ( I1 ) = - A33 ( I1 ) FLOW 45
932 IF ( I2 .EQ. LOOP ) GO TO ( 2100, 2200 ) , I29 FLOW 46
1000 XDIF = XNPP- XC ( I1 ) FLOW 47
YDIF = YNPP- YC ( I1 ) FLOW 48
ZDIF = ZNPP- ZC ( I1 ) FLOW 49
C                                               FLOW 50
C   COMPUTE DISTANCE FROM NULL POINT TO ORIGIN OF J-TH ELEMENT COORDINATE FLOW 51
C   SYSTEM ( J CORRESPONDS TO THE INDEX I1 ) FLOW 52
C                                               FLOW 53
C   INEQUALITY ( 98 ) FLOW 54
C                                               FLOW 55
ROSQ = XDIF ** 2 + YDIF ** 2 + ZDIF ** 2 FLOW 56
IF ( ROSQ .LT. RHO2SQ * TSQ ( I1 ) ) GO TO 1400 FLOW 57
C                                               FLOW 58
C   COMPUTE INDUCED VELOCITY COMPONENTS FLOW 59
C   EQUATION ( 97 ) FLOW 60

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ARG1 = A (I1) / SQRT (ROSQ) ** 3	FLOV 61
X (I2) = ARG1 * XDIF	FLOV 62
Y (I2) = ARG1 * YDIF	FLOV 63
Z (I2) = ARG1 * ZDIF	FLOV 64
GO TO 1700	FLOV 65
C TRANSFORM NULL POINT TO J - ELEMENT COORDINATE SYSTEM	FLOV 66
C EQUATION (78)	FLOV 67
1400 XNP = A11 (I1) * XEIF + A12 (I1) * YDIF + A13 (I1) * ZCIF	FLOV 68
YNP = A21 (I1) * XDIF + A22 (I1) * YDIF + A23 (I1) * ZDIF	FLOV 69
ZNP = A31 (I1) * XDIF + A32 (I1) * YDIF + A33 (I1) * ZDIF	FLOV 70
C INEQUALITIES (99) AND (100)	FLOV 71
IF (ROSQ .LT. RHO1SQ * TSQ (I1)) GO TO 1410	FLOV 72
C COMPUTE INDUCED VELOCITY COMPONENTS	FLOV 73
C EQUATIONS (57) - (62)	FLOV 74
P = YNP **2 + ZNP ** 2 - 4.0 * XNP ** 2	FLOV 75
QP = XNP **2 + ZNP ** 2 - 4.0 * YNP ** 2	FLOV 76
RO = SQRT (ROSQ)	FLOV 77
ROP = RO ** (- 7)	FLOV 78
WXXX = XNP * (9.0 * P + 30.0 * XNP ** 2) * ROP	FLOV 79
WXXY = 3.0 * P * ROP * YNP	FLOV 80
WXYX = 3.0 * XNP * QP * ROP	FLOV 81
WYYY = YNP * (9.0 * QP + 30.0 * YNP ** 2) * ROP	FLOV 82
WXXZ = 3.0 * ZNP * XNP * ROP	FLOV 83
WXYZ = - 15.0 * XNP * YNP * ZNP * ROP	FLOV 84
WYYZ = 3.0 * ZNP * QP * ROP	FLOV 85
ROP = - RO ** (- 3)	FLOV 86
WX = ROP * XNP	FLOV 87
WY = ROP * YNP	FLOV 88
WZ = ROP * ZNP	FLOV 89
HIXX = .5 * IXX (I1)	FLOV 90
HIYY = .5 * IYY (I1)	FLOV 91
VX = - WXYX*HIYY - WXXY*IXY (I1) - WXXX*HIXX - WX*A (I1)	FLOV 92
VY = - WYYY*HIYY - WXYX*IXY (I1) - WXXY*HIXX - WY*A (I1)	FLOV 93
VZ = - WYYZ*HIYY - WXYZ*IXY (I1) - WXXZ*HIXX - WZ*A (I1)	FLOV 94
GO TO 1600	FLOV 95
C COMPUTE INDUCED VELOCITY COMPONENTS	FLOV 96
C EQUATIONS (42) - (49)	FLOV 97
C CHECK TO SEE IF POINT IS INSIDE BODY	FLOV 98
1410 GO TO (1300, 1310, 1300, 1310, 1300, 1310, 1300, 1310), I2	FLOV 99
1300 IF(ZNP .GT. 0.0 .OR. ROSQ .GT. 0.25*TSQ(I1) .OR. ABS(ZNP) .GT. H)	FLOV 100
1 GO TO 1411	FLOV 101
WRITE (6,5000) I1, I2, ZNP, ROSQ, TSQ(I1), H	FLOV 102
5000 FORMAT(10X,11HINSIDE QUADIS,5X,3HI2=I3/10X,15HZNP,ROSQ,TSQ,H=4(1PE	FLOV 103
113.4))	FLOV 104
INBODY = 1	FLOV 105
GO TO 1411	FLOV 106
1310 IF(ZNP .LT. 0.0 .OR. ROSQ .GT. 0.25*TSQ(I1) .OR. ABS(ZNP) .GT. H)	FLOV 107
1 GO TO 1411	FLOV 108
WRITE (6,5000) I1, I2, ZNP, ROSQ, TSQ(I1), H	FLOV 109
INBODY = 1	FLOV 110
1411 ETA4M3 = ETA4 (I1) - ETA1 (I1)	FLOV 111
	FLOV 112
	FLOV 113
	FLOV 114
	FLOV 115
	FLOV 116
	FLOV 117
	FLOV 118
	FLOV 119
	FLOV 120

RO = SQRT (ROSQ)	FLOV 121
ETA2M1 = ETA2 (I1) - ETA1 (I1)	FLOV 122
XI4M3 = XI4 (I1) - XI 3 (I1)	FLOV 123
XI2M1 = XI2 (I1) - XI1 (I1)	FLOV 124
XI3M2 = XI3 (I1) - XI2 (I1)	FLOV 125
XI1M4 = XI1 (I1) - XI4 (I1)	FLOV 126
XMXI 1 = XNP - XI1 (I1)	FLOV 127
XMXI2 = XNP - XI2 (I1)	FLOV 128
XMXI3 = XNP - XI3 (I1)	FLOV 129
XMXI4 = XNP - XI4 (I1)	FLOV 130
YMETA1= YNP - ETA1 (I1)	FLOV 131
YMETA 2 = YNP - ETA2 (I1)	FLOV 132
YMETA 4 = YNP - ETA4 (I1)	FLOV 133
ZNPSQ = ZNP * ZNP	FLOV 134
IF (ZNPSQ .LT. TSQ (I1) * 1.0E-6) ZNPSQ = 0.0	FLOV 135
E1 = ZNPSQ + XMXI1 **2	FLOV 136
E2 = ZNPSQ + XMXI2 **2	FLOV 137
E3 = ZNPSQ + XMXI3 **2	FLOV 138
E4 = ZNPSQ + XMXI4 **2	FLOV 139
H1 = YMETA1 * XMXI1	FLOV 140
H2 = YMETA2 * XMXI2	FLOV 141
H3 = YMETA1 * XMXI3	FLOV 142
H4 = YMETA4 * XMXI4	FLOV 143
M12 = 0.0	FLOV 144
IF (XI2M1 .NE. 0.0) M12 = ETA2M1 / XI2M1	FLOV 145
M23 = 0.0	FLOV 146
IF (XI3M2 .NE.0.0) M23 = - ETA2M1 / XI3M2	FLOV 147
M34 = 0.0	FLOV 148
IF (XI4M3 .NE. 0.0) M34 = ETA4M3 / XI4M3	FLOV 149
M41 = 0.0	FLOV 150
IF (XI1M4 .NE. 0.0) M41 = - ETA4M3 / XI1M4	FLOV 151
ANUM1 = M12 * E1 - H1	FLOV 152
ANUM2 = M12 * E2 - H2	FLOV 153
ANUM3 = M23 * E2 - H2	FLOV 154
ANUM4 = M23 * E3 - H3	FLOV 155
ANUM5 = M34 * E3 - H3	FLOV 156
ANUM6 = M34 * E4 - H4	FLOV 157
ANUM7 = M41 * E4 - H4	FLOV 158
ANUM8 = M41 * E1 - H1	FLOV 159
R 1 = SQRT (XMXI1 ** 2 + YMETA1 ** 2 + ZNPSQ)	FLOV 160
R2 = SQRT (XMXI2 ** 2 + YMETA2 ** 2 + ZNPSQ)	FLOV 161
R3 = SQRT (XMXI3 ** 2 + YMETA1 ** 2 + ZNPSQ)	FLOV 162
R4 = SQRT (XMXI4 ** 2 + YMETA4 ** 2 + ZNPSQ)	FLOV 163
Q25 = D12 (I1)	FLOV 164
Q26 = D23 (I1)	FLOV 165
Q27 = D34 (I1)	FLOV 166
Q28 = D41 (I1)	FLOV 167
VX = 0.0	FLOV 168
VY = 0.0	FLOV 169
VZ = 0.0	FLOV 170
IF (Q25) 1420, 1430, 1420	FLOV 171
1420 TEMP = R1 + R2	FLOV 172
TEMP1 = TEMP - Q25	FLOV 173
TEMP2 = TEMP + Q25	FLOV 174
ARG1 = 1.0	FLOV 175
IF (TEMP1 .NE. 0.0 .AND. TEMP2 .VE. 0.0) ARG1=ALOG(TEMP1/TEMP2)	FLOV 176
TEMP = ARG1 / Q25	FLOV 177
VX = ETA2M1 * TEMP	FLOV 178
VY = - XI2M1 * TEMP	FLOV 179
1430 IF (Q26) 1435, 1440, 1435	FLOV 180

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1435 TEMP = R2 + R3                                FLOV 181
    TEMP1 = TEMP - Q26                              FLOV 182
    TEMP2 = TEMP + Q26                              FLOV 183
    ARG2 = 1.0                                       FLOV 184
    IF ( TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0 ) ARG2=ALOG(TEMP1/TEMP2) FLOV 185
    TEMP = ARG2 / Q26                                FLOV 186
    VX = VX - ETA2M1 * TEMP                          FLOV 187
    VY = VY - XI3M2 * TEMP                          FLOV 188
1440 IF ( Q27 ) 1450, 1460, 1450                    FLOV 189
1450 TEMP = R3 + R4                                FLOV 190
    TEMP1 = TEMP - Q27                              FLOV 191
    TEMP2 = TEMP + Q27                              FLOV 192
    ARG3 = 1.0                                       FLOV 193
    IF ( TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0 ) ARG3=ALOG(TEMP1/TEMP2) FLOV 194
    TEMP = ARG3 / Q27                                FLOV 195
    VX = VX + ETA4M3 * TEMP                          FLOV 196
    VY = VY - XI4M3 * TEMP                          FLOV 197
1460 IF ( Q28 ) 1470, 1480, 1470                    FLOV 198
1470 TEMP = R4 + R1                                FLOV 199
    TEMP1 = TEMP - Q28                              FLOV 200
    TEMP2 = TEMP + Q28                              FLOV 201
    ARG4 = 1.0                                       FLOV 202
    IF ( TEMP1 .NE. 0.0 .AND. TEMP2 .NE. 0.0 ) ARG4=ALOG(TEMP1/TEMP2) FLOV 203
    TEMP = ARG4 / Q28                                FLOV 204
    VX = VX - ETA4M3 * TEMP                          FLOV 205
    VY = VY - XI1M4 * TEMP                          FLOV 206
1480 IF ( ZNPSQ .NE. 0.0 ) GO TO 1510                FLOV 207
    TEST = SQRT(TSQ(I1))* 1.0E-3                      FLOV 208
    IF(Q25.GT.TEST) IF((XMXI1*ETA2M1-YMETA1*XI2M1)/Q25) 1600,1502,1502 FLOV 209
1502 IF(Q26.GT.TEST) IF((-XMXI2*ETA2M1-YMETA2*XI3M2)/Q26) 1600,1504,1504 FLOV 210
1504 IF(Q27.GT.TEST) IF((XMXI3*ETA4M3-YMETA1*XI4M3)/Q27) 1600,1506,1506 FLOV 211
1506 IF(Q28.GT.TEST) IF((-XMXI4*ETA4M3-YMETA4*XI1M4)/Q28) 1600,1508,1508 FLOV 212
1508 VZ = 6.28318531E0                                FLOV 213
    GO TO 1600                                        FLOV 214
1510 IF (XI2M1 .NE. 0.0) VZ = ATAN(ANUM1/(ZNP*R1))-ATAN(ANUM2/(ZNP*R2)) FLOV 215
    IF (XI3M2 .NE. 0.0) VZ=VZ+ATAN(ANUM3/(ZNP*R2))-ATAN(ANUM4/(ZNP*R3)) FLOV 216
    IF (XI4M3 .NE. 0.0) VZ=VZ+ATAN(ANUM5/(ZNP*R3))-ATAN(ANUM6/(ZNP*R4)) FLOV 217
    IF (XI1M4 .NE. 0.0) VZ=VZ+ATAN(ANUM7/(ZNP*R4))-ATAN(ANUM8/(ZNP*R1)) FLOV 218
C                                                    FLOV 219
C TRANSFORM INDUCED VELOCITY COMPONENTS TO REFERENCE COORDINATE SYSTEM FLOV 220
C EQUATION ( 79 )                                    FLOV 221
                                                    FLOV 222
1600 X ( I2) = A11 (I1) * VX + A21 (I1) * VY + A31 (I1) * VZ FLOV 223
    Y ( I2) = A12 (I1) * VX + A22 (I1) * VY + A32 (I1) * VZ FLOV 224
    Z ( I2) = A13 (I1) * VX + A23 (I1) * VY + A33 (I1) * VZ FLOV 225
1700 CONTINUE                                        FLOV 226
                                                    FLOV 227
2000 VXPP = VXPP + SIG(I1) * X(1)                   FLOV 228
    VYPP = VYPP + SIG(I1) * Y(1)                   FLOV 229
    VZPP = VZPP + SIG(I1) * Z(1)                   FLOV 230
    GO TO 2300                                       FLOV 231
2100 VXPP = VXPP + SIG(I1) * (X(1) + X(2))         FLOV 232
    VYPP = VYPP + SIG(I1) * (Y(1) + Y(2))         FLOV 233
    VZPP = VZPP + SIG(I1) * (Z(1) + Z(2))         FLOV 234
    GO TO 2300                                       FLOV 235
2200 VXPP = VXPP + SIG(I1) * (X(1) + X(2) + X(3) + X(4)) FLOV 236
    VYPP = VYPP + SIG(I1) * (Y(1) + Y(2) + Y(3) + Y(4)) FLOV 237
    VZPP = VZPP + SIG(I1) * (Z(1) + Z(2) + Z(3) + Z(4)) FLOV 238
2204 IF ( NSYM .EQ. 2 ) GO TO 2300                 FLOV 239
    VXPP = VXPP - SIG(I1) * (X(5) + X(6) + X(7) + X(8)) FLOV 240

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	VYPP = VYPP - SIG(I1) * (Y(5) + Y(6) + Y(7) + Y(8))	FLOW 241
	VZPP = VZPP - SIG(I1) * (Z(5) + Z(6) + Z(7) + Z(8))	FLOW 242
2300	CONTINUE	FLOW 243
	VXPP = VXPP * RBETA**2 + 1.0	FLOW 244
	VYPP = VYPP * RBETA	FLOW 245
	VZPP = VZPP * RBETA	FLOW 246
	RETURN	FLOW 247
	END	FLOW 248

*DECK,	FLOAIR	FLOA 1
	SUBROUTINE FLOAIR(X, Z, ECC, VX, VZ, PSI, IFLAG)	FLOA 2
C	THIS CODE RETURNS AIRFLOW VELOCITY (VX, VZ) FOR A GIVEN POINT	FLOA 3
C	(X, Z) EXTERIOR TO AN ELLIPSOID OF REVOLUTION IN AN AIRSTREAM.	FLOA 4
C	THE ELLIPSOID IS PROLATE WITH MAJOR AXIS PARALLEL WITH THE FREE	FLOA 5
C	STREAM FLOW. FLOW IS TOWARD THE POSITIVE X AXIS. PSI IS THE	FLOA 6
C	STREAM FUNCTION VALUE AT X,Z. ECC IS THE ELLIPSOID ECCENTRICITY.	FLOA 7
	IF(IFLAG)100,100,200	FLOA 8
C	INITIALIZE	FLOA 9
100	E2 = ECC**2	FLOA 10
	OME2 = 1.0 - E2	FLOA 11
	TEC = 2.0 * ECC	FLOA 12
	CX = -ECC / (ALOG((1.0 + ECC)/(1.0 - ECC)) - TEC/OME2)	FLOA 13
	CZ = TEC * CX	FLOA 14
	CPSI = ECC * CX	FLOA 15
C	COMPUTE FLOW VELOCITIES AND STREAMFUNCTION VALUE	FLOA 16
200	SQRM = SQRT((X + ECC)**2 + Z**2)	FLOA 17
	SQRN = SQRT((X - ECC)**2 + Z**2)	FLOA 18
	VX = CX * (ALOG((SQRM + SQRN + TEC) / (SQRM + SQRN - TEC)) / ECC	FLOA 19
1	- 1.0/SQRM - 1.0/SQRN) + 1.0	FLOA 20
	VZ = CZ * Z * (1.0/SQRM - 1.0/SQRN) / (X**2 + Z**2 + SQRM*SQRN - E2)	FLOA 21
	COSH = (SQRM + SQRN) / TEC	FLOA 22
	COS = (SQRM - SQRN) / TEC	FLOA 23
	PSI = CPSI * (COSH + 0.5 * (COSH**2 - 1.0) *	FLOA 24
1	ALOG((COSH - 1.0)/(COSH + 1.0))) * (1.0 - COS**2) - Z**2/2.0	FLOA 25
	RETURN	FLOA 26
	END	FLOA 27

*DECK, ARYTRJ	ARYT	1
SUBROUTINE ARYTRJ	ARYT	2
C	ARYT	3
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - NOVEMBER 1979	ARYT	4
C	ARYT	5
C CALLS TRAJECT TO COMPUTE TRAJECTORIES OF PARTICLES TO OR ABOUT	ARYT	6
C AN ARBITRARY 3-DIMENSIONAL BODY. TRAJECTORIES BEGIN AT AN ARRAY	ARYT	7
C OF POINTS IN SPACE. THE ARRAY POINTS, AND CORRESPONDING	ARYT	8
C TRAJECTORIES, ARE DEFINED BY SPECIFYING AN INITIAL POINT, INCREMENTARY	ARYT	9
C VALUES IN THE THREE COORDINATE DIRECTIONS, AND THE ORDER OF	ARYT	10
C INCREMENTING. INPUT INTEGERS M(3) SPECIFY THE ORDER IN WHICH	ARYT	11
C INCREMENTING IS DONE - ALLOWED VALUES OF M ARE 1,2,3. FOR EXAMPLE	ARYT	12
C SUPPOSE M(1)=2, M(2)=1, M(3)=3, THEN Y IS INCREMENTED FIRST, X IS	ARYT	13
C INCREMENTED SECOND AND Z IS INCREMENTED LAST.	ARYT	14
C IF TRAJECTORIES ARE NOT DESIRED FROM ALL OF THE ARRAY POINTS, THE	ARYT	15
C PARAMETER NSKIP CAN BE SET GREATER THAN ZERO, AND AFTER THE FIRST	ARYT	16
C TRAJECTORY ONLY EVERY NSKIP+1 TH TRAJECTORY IS COMPUTED.	ARYT	17
C ALSO REQUIRED ARE - (IN ORDER OF X AXIS FIRST, Y AXIS SECOND,	ARYT	18
C Z AXIS THIRD)- INITIAL COORDINATE, INCREMENT, NUMBER OF INCREMENTS	ARYT	19
C DESIRED (INCLUDING THE INITIAL COORDINATE VALUE).	ARYT	20
C	ARYT	21
C SR PARTCL IS CALLED TO READ, PROCESS AND PRINT PARTICLE DATA.	ARYT	22
C THIS SR CAN BE ONE OF SEVERAL THAT TREATS WATER DROPS OR ONE OF	ARYT	23
C VARIOUS TYPES OF ICE CRYSTALS.	ARYT	24
C	ARYT	25
C UNIT 9 IS A SCRATCH UNIT USED FOR TRAJECTORY DATA STORAGE.	ARYT	26
C UNIT 10 IS USED FOR TRAJECTORY DATA OUTPUT FOR PLOTTING.	ARYT	27
C	ARYT	28
C FLOW DATA PREPARED BY THE HESS-SMITH CODE ARE READ FROM UNIT 14	ARYT	29
C VIA SR SETFLO.	ARYT	30
C	ARYT	31
C ALL COORDINATES AND TIMES ARE NORMALIZED (DIMENSIONLESS)	ARYT	32
C	ARYT	33
C GLOSSARY	ARYT	34
C ACC DIAM/ELL - USED TO COMPUTE ACCELERATION MODULUS	ARYT	35
C ALPHA0 ANGLE BETWEEN PROJECTION OF INITIAL VELOCITY VECTOR IN	ARYT	36
C X-Y PLANE AND X AXIS	ARYT	37
C ALPHA ANGLE BETWEEN PROJECTION OF FINAL VELOCITY VECTOR IN X-Y	ARYT	38
C PLANE AND X AXIS	ARYT	39
C BETA0 ANGLE BETWEEN INITIAL VELOCITY VECTOR AND ITS PROJECTION	ARYT	40
C IN THE X-Y PLANE	ARYT	41
C BETA ANGLE BETWEEN FINAL VELOCITY VECTOR AND ITS PROJECTION	ARYT	42
C IN THE X-Y PLANE	ARYT	43
C D COORDINATE INCREMENT ARRAY	ARYT	44
C DIAM DIAMETER OF A WATER DROP OR ICE AGGREGATE	ARYT	45
C BASE DIAMETER FOR A PLATE OR CYLINDER (MICROMETERS)	ARYT	46
C DLR BASE DIAMETER TO LENGTH (CYLINDER) OR THICKNESS (PLATE)	ARYT	47
C RATIO	ARYT	48
C ELL CHARACTERISTIC DIMENSION OF THE BODY (METERS)	ARYT	49
C EPSI() PARAMETERS USED TO CONTROL LOCAL ERROR IN THE NUMERICAL	ARYT	50
C INTEGRATION (SEE DVDQ GLOSSARY)	ARYT	51
C FN FROUDE NUMBER	ARYT	52
C FNR RECIPROCAL OF THE FROUDE NUMBER	ARYT	53
C HI INITIAL TIME STEP FOR NUMERICAL INTEGRATION (SEE DVDQ)	ARYT	54
C HMAX MAXIMUM TIME STEP (SEE DVDQ)	ARYT	55
C HMIN MINIMUM ALLOWED TIME STEP (SEE DVDQ)	ARYT	56
C IPLT IF TRUE, TRAJECTORY DATA ARE COPIED TO UNIT 10 FOR PLOTTING	ARYT	57
C N NUMBER OF COORDINATE INCREMENT STEPS ARRAY (INCLUDING THE	ARYT	58
C FIRST COORDINATE VALUE)	ARYT	59
C NPOINT ARRAY POINT TALLY	ARYT	60

C	NSKIP	NUMBER OF ARRAY POINTS SKIPPED BETWEEN TRAJECTORIES	ARYT	61
C	P()	CURRENT VALUES OF INDEPENDENT VARIABLES -	ARYT	62
C		P(1) = X	ARYT	63
C		P(2) = DX/DT	ARYT	64
C		P(3) = Y	ARYT	65
C		P(4) = DY/DT	ARYT	66
C		P(5) = Z	ARYT	67
C		P(6) = DZ/DT	ARYT	68
C	PT	DRAG COEFFICIENT*ABS(REYNOLDS NUMBER) FOR GRAVITY SETTLING	ARYT	69
C		OF PARTICLES	ARYT	70
C	RF	FACTOR TO CONVERT VELOCITY DIFFERENCE TO REYNOLDS NUMBER	ARYT	71
C	RHO	AIR DENSITY (KG/M**3)	ARYT	72
C	RHOP	PARTICLE DENSITY (KG/M**3)	ARYT	73
C	TEMP	AIR TEMPERATURE (DEG. KELVIN)	ARYT	74
C	TPRINT	OUTPUT TIME INTERVAL	ARYT	75
C	V	AIR SPEED (M/SEC)	ARYT	76
C	VIS	AIR VISCOSITY (KG/(M-SEC))	ARYT	77
C	VPGT	PARTICLE SPEED AT TARGET POINT	ARYT	78
C	VT	GRAVITY SETTLING SPEED OF PARTICLE	ARYT	79
C	VTGT	AIR SPEED AT TARGET POINT	ARYT	80
C	X	INITIAL COORDINATE ARRAY	ARYT	81
C	XFINAL	X COORDINATE OF THE FINAL PLANE	ARYT	82
C	XI3,YI3,ZI3	INITIAL COORDINATES PASSED TO TRAJECT	ARYT	83
C			ARYT	84
C			ARYT	85
C		COMMON XI3,YI3,ZI3,YI3P,EPSI(3),HI,HMINI,VT,PT,COF,FNR,PACT,	ARYT	86
C		1RF,REQ,R,XPSTAR,YPSTAR,ZPSTAR,P(6),TPRINT,IT,ALPHA0,BETA0,IREC,	ARYT	87
C		2IPLT,IPLT,XPLOT(60),YPLCT(60),ZPLOT(60),ALPHAR,BETAR,YPSTARP,	ARYT	88
C		3ZPSTARP,XI3P,ZI3P,XP,YP,ZP,XWP,XPP,ACC,DLR,JLIM	ARYT	89
C		DIMENSION HOLL(18), X(3), D(3), N(3), M(3), SX(3), SD(3), NS(3),	ARYT	90
C		1 SXI(3), SEQ(6)	ARYT	91
C		LOGICAL IPLOT	ARYT	92
C		DATA SEQ/ 4HFIRS, 4HT , 4HSECO, 4HND , 4HTHR, 4HD /	ARYT	93
C		DATA STAR, BLNK / 3H *, 3H / , PI/3.1415926536/	ARYT	94
C		JLIM=0	ARYT	95
C		NFIN=0	ARYT	96
C		READ AND WRITE DATA	ARYT	97
C		READ (5,2600) KASE	ARYT	98
C		CALL SETFLO(KASE)	ARYT	99
C		READ(5,1000)HOLL, IPLOT	ARYT	100
C		READ(5,1100)V, ELL, RHO, TEMP, XFINAL	ARYT	101
C		READ(5,1100) TPRINT, HI, HMINI, EPSI	ARYT	102
C		SET DEFAULT VALUES FOR NUMERICAL INTEGRATION AND PRINT PARAMETERS	ARYT	103
C		IF(TPRINT .EQ. 0.0) TPRINT=0.1	ARYT	104
C		IF(HI .EQ. 0.0) HI=0.1	ARYT	105
C		IF(HMINI .EQ. 0.0) HMINI=0.005	ARYT	106
C		IF(EPSI(1) .EQ. 0.0) EPSI(1)=1.0E-5	ARYT	107
C		IF(EPSI(2) .EQ. 0.0) EPSI(2)=1.0E-5	ARYT	108
C		IF(EPSI(3) .EQ. 0.0) EPSI(3)=1.0E-5	ARYT	109
C		VIS = 145.8E-8 * TEMP** (3.0/2.0)/(110.4 + TEMP)	ARYT	110
C		WRITE(6,1200) HOLL	ARYT	111
C		WRITE(6,1300) V, ELL, RHC, TEMP, VIS	ARYT	112
C		WRITE(6,1400) HI,HMINI,TPRINT,XFINAL	ARYT	113
C		WRITE(6,1500) EPSI(1), EPSI(2), EPSI(3)	ARYT	114
C		INITIALIZE	ARYT	115
C		FN = V**2/(9.8*ELL)	ARYT	116
C		FNR = 1.0/FN	ARYT	117
C		IF (.NOT. IPLOT) GO TO 5	ARYT	118
C		REWIND 10	ARYT	119
C		WRITE (6,1800)	ARYT	120

C	ENTER PARTICLE LOOP	ARYT 121
5	CALL PARTCL(V, ELL, RHO, VIS, TEMP, DIAM, DLR, RHOP, VT, RF, PT, ACC, NFIN)	ARYT 122
	IF(NFIN .EQ. 0) GO TO 6	ARYT 123
	IF(.NOT. IPLOT) RETURN	ARYT 124
	ENDFILE 10	ARYT 125
	REWIND 10	ARYT 126
	RETURN	ARYT 127
6	COF = PT*VT*FN	ARYT 128
	R = RF * VT	ARYT 129
	READ(5, 8100)M, NSKIP	ARYT 130
	IF(M(1)+M(2)+M(3) .EQ. 6) GO TO 10	ARYT 131
	WRITE(6, 8200)	ARYT 132
	STOP	ARYT 133
10	DO 20 L=1,3	ARYT 134
20	READ(5, 8000) X(L), D(L), N(L)	ARYT 135
	WRITE(6, 2000) X(1), D(1), N(1)	ARYT 136
	WRITE(6, 3000) X(2), D(2), N(2)	ARYT 137
	WRITE(6, 4000) X(3), D(3), N(3)	ARYT 138
	WRITE(6, 9000)	ARYT 139
	WRITE(6, 5000) SEQ(2*M(1)-1), SEQ(2*M(1))	ARYT 140
	WRITE(6, 6000) SEQ(2*M(2)-1), SEQ(2*M(2))	ARYT 141
	WRITE(6, 7000) SEQ(2*M(3)-1), SEQ(2*M(3))	ARYT 142
	DO 40 L=1,3	ARYT 143
	LL=4-M(L)	ARYT 144
	SD(LL)=D(L)	ARYT 145
	SXI(LL)=X(L)-D(L)	ARYT 146
40	NS(LL)=N(L)	ARYT 147
	N1=NS(1)	ARYT 148
	N2=NS(2)	ARYT 149
	N3=NS(3)	ARYT 150
	NPOINT=0	ARYT 151
	SX(1)=SXI(1)	ARYT 152
	DO 500 I=1, N1	ARYT 153
	SX(1)=SX(1)+SD(1)	ARYT 154
	SX(2)=SXI(2)	ARYT 155
	DO 500 J=1, N2	ARYT 156
	SX(2)=SX(2)+SD(2)	ARYT 157
	SX(3)=SXI(3)	ARYT 158
	DO 500 K=1, N3	ARYT 159
	SX(3)=SX(3)+SD(3)	ARYT 160
	NPOINT=NPOINT+1	ARYT 161
	IF(MOD(NPOINT, NSKIP+1) .NE. 1) GO TO 500	ARYT 162
	DO 50 L=1,3	ARYT 163
	LL=4-M(L)	ARYT 164
50	X(L)=SX(LL)	ARYT 165
C	INITIALIZE FOR TRAJECT	ARYT 166
	XI3=X(1)	ARYT 167
	YI3=X(2)	ARYT 168
	ZI3=X(3)	ARYT 169
	XPSTAR=XFINAL	ARYT 170
	XPP = XFINAL	ARYT 171
	ALPHAR=0.0	ARYT 172
	BETAR=0.0	ARYT 173
	YP = 0.0	ARYT 174
	ZP = 0.0	ARYT 175
	WRITE(6, 1600) XI3, YI3, ZI3	ARYT 176
	CALL TRAJECT	ARYT 177
C	PRINT TRAJECTORY OUTPUT	ARYT 178
	REWIND 9	ARYT 179
	WRITE (6, 8700)	ARYT 180

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DO 494 IWRITE = 1, IREC
READ (9) NEVAL, KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6), VX, VY, ARYT 181
2 VZ, H, R, AC ARYT 182
WRITE(6,8600) KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6), VX, VY, ARYT 184
2 VZ, H, R, AC, NEVAL ARYT 185
494 CONTINUE ARYT 186
C COMPUTE INITIAL AND FINAL TRAJECTORY ANGLES ARYT 187
CALL FLOVEL(XI3, YI3, ZI3, VX, VY, VZ, HI, INBODY) ARYT 188
ALPHA0 = ATAN(VY/VX) * 180./PI ARYT 189
BETA0 = ATAN((VZ-VT)/SQRT(VX**2 + VY**2)) * 180./PI ARYT 190
ALPHAR = ATAN(P(4)/P(2))*180./PI ARYT 191
BETAR = ATAN(P(6)/SQRT(P(2)**2+P(4)**2))*180./PI ARYT 192
WRITE (6,8800) ALPHA0, BETA0, ALPHAR, BETAR ARYT 193
C COMPUTE AND PRINT DRAG VECTOR AT FINAL POINT ARYT 194
CALL FLOVEL(P(1), P(3), P(5), VX, VY, VZ, HI, INBODY) ARYT 195
DV = SQRT( (VX - P(2))**2 + (VY - P(4))**2 + (VZ - P(6))**2 ) ARYT 196
COSA = (VX - P(2))/DV ARYT 197
COSB = (VY - P(4))/DV ARYT 198
COSC = (VZ - P(6))/DV ARYT 199
ANG = ATAN( COSB/COSA ) * 57.29577951 ARYT 200
CNG = ACOS( COSC ) * 57.29577951 ARYT 201
WRITE( 6, 3100 ) COSA, CCSB, COSC, ANG, CNG ARYT 202
C COMPUTE AND PRINT AIF AND PARTICLE SPEEDS AT FINAL POINT ARYT 203
VA = SQRT( VX**2 + VY**2 + VZ**2 ) ARYT 204
VP = SQRT(P(2)**2 + P(4)**2 + P(6)**2) ARYT 205
WRITE(6, 3200) VA, VP ARYT 206
IF (IPL0T) WRITE (10) IFLT, (XPL0T(L), YFLOT(L), ZPLOT(L), L=1, IPLT) ARYT 207
C ARYT 208
500 CONTINUE ARYT 209
GO TO 5 ARYT 210
1000 FORMAT(18A4, 7X, L1) ARYT 211
1100 FORMAT(8F10.5) ARYT 212
1200 FORMAT(1H1, 5X, 15HARYTRJ RUN ID -/ 8X, 18A4) ARYT 213
1300 FORMAT(1H0, 5X, 21HPHYSICAL INPUT DATA -/7X, 10HAI R SPEED=1PE13.6, ARYT 214
1 3X, 37HCHARACTERISTIC DIMENSION OF THE BODY=1PE13.6/ 7X, 35HCENSITARYT 215
2Y AND TEMPERATURE OF AIR ARE 1PE13.6, 5H AND 1PE13.6, 20H AIR VISARYT 216
3COSITY IS 1PE13.6) ARYT 217
1400 FORMAT( 1H0, 5X, 29HNUMERICAL INTEGRATOR INPUTS -/ 7X, 10HTIME STEARYT 218
1P=1PE11.4, 3X, 18HMINIMUM TIME STEP=1PE11.4, 3X, 20HPRINT TIME INTARYT 219
2ERVAL=1PE11.4, 3X, 24HX COORD. OF FINAL FLANE=1PE11.4) ARYT 220
1500 FORMAT( 1H0, 6X, 33HLOCAL ERROR TOLERANCES FOR DVDQ -, 3(1PE14.4)) ARYT 221
1600 FORMAT(//1H0, 38H* * * * * INITIAL COORDINATES X=1PE12.5, ARYT 222
2 3X, 2HY=1PE12.5, 3X, 2HZ=1PE12.5) ARYT 223
1800 FORMAT( ///6X, 52HTRAJECTORY DATA ARE WRITTEN ON UNIT 10 FOR PLOT\ARYT 224
1TING//) ARYT 225
2000 FORMAT( 10X, 10HINITIAL X=1PE11.4, 12H INCREMENT=1PE11.4, ARYT 226
1 19H NUMBER OF VALUES=I4) ARYT 227
2600 FORMAT (A4) ARYT 228
3000 FORMAT( 10X, 10HINITIAL Y=1PE11.4, 12H INCREMENT=1PE11.4, ARYT 229
1 19H NUMBER OF VALUES=I4) ARYT 230
3100 FORMAT(/5X, 29HDRAG VECTOR AT FINAL POINT -/ 6X, 18HDIRECTION COS ARYT 231
1INES-3(1PE13.4), 3X, 19HANGLES A AND GAMMA-2(1PE13.4)) ARYT 232
3200 FORMAT(5X, 47HAI R AND PARTICLE SPEEDS AT THE FINAL POINT ARE2(1PEARYT 233
115.5)) ARYT 234
4000 FORMAT( 10X, 10HINITIAL Z=1PE11.4, 12H INCREMENT=1PE11.4, ARYT 235
1 19H NUMBER OF VALUES=I4) ARYT 236
5000 FORMAT( 10X, 22HX AXIS IS INCREMENTED 2A4) ARYT 237
6000 FORMAT( 10X, 22HY AXIS IS INCREMENTED 2A4) ARYT 238
7000 FORMAT( 10X, 22HZ AXIS IS INCREMENTED 2A4) ARYT 239
8000 FORMAT( 2F10.0, I4) ARYT 240

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8100	FORMAT(4I4)	ARYT 241
8200	FORMAT(///10X, 47HINCREMENTING SEQUENCE IS ERRONIOUS. TRY AGAIN.)	ARYT 242
8600	FORMAT(I6, 10(1X,1PE11.4)/10X, 2HH=1PE11.4,4H R=1PE11.4, 5F AC=	ARYT 243
	11PE11.4, 8H NEVAL=I6)	ARYT 244
8700	FORMAT(/6H0KSTEP, 7X, 1HT, 11X, 1HX, 11X, 1HY, 11X, 1HZ, 10X,	ARYT 245
	1 3HVPX, 9X, 3HVPY, 9X, 3HVPZ, 10X, 2HVX, 10X, 2HVV, 10X, 2HVZ)	ARYT 246
8800	FORMAT(/20X, 47HINITIAL AND FINAL TRAJECTORY ANGLES (DEGREES) -	ARYT 247
	1/ 22X, 7HALPHA0=F10.4, 5X, 6HBETA0=F10.4/ 22X, 7HALPHAR=F10.4, 5X	ARYT 248
	2, 6HBETAR=F10.4)	ARYT 249
9000	FORMAT(1H0)	ARYT 250
	END	ARYT 251

*DECK, TANTRA	TANT 1
SUBROUTINE TANTRA	TANT 2
C	TANT 3
C	TANT 4
C	TANT 5
C	TANT 6
C	TANT 7
C	TANT 8
C	TANT 9
C	TANT 10
C	TANT 11
C	TANT 12
C	TANT 13
C	TANT 14
C	TANT 15
C	TANT 16
C	TANT 17
C	TANT 18
C	TANT 19
C	TANT 20
C	TANT 21
C	TANT 22
C	TANT 23
C	TANT 24
C	TANT 25
C	TANT 26
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C	TANT 28
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C	TANT 30
C	TANT 31
C	TANT 32
C	TANT 33
C	TANT 34
C	TANT 35
C	TANT 36
C	TANT 37
C	TANT 38
C	TANT 39
C	TANT 40
C	TANT 41
C	TANT 42
C	TANT 43
C	TANT 44

C		BASE DIAMETER FOR A PLATE OR CYLINDER (MICROMETERS)	TANT	45
C	DLR	BASE DIAMETER TO LENGTH (CYLINDER) OR THICKNESS (PLATE)	TANT	46
C		RATIO	TANT	47
C	ELL	CHARACTERISTIC DIMENSION OF THE BODY (METERS)	TANT	48
C	EPSI()	PARAMETERS USED TO CONTROL LOCAL ERROR IN THE NUMERICAL	TANT	49
C		INTEGRATION (SEE DVDQ GLOSSARY)	TANT	50
C	FN	FROUDE NUMBER	TANT	51
C	FNR	RECIPROCAL OF THE FROUDE NUMBER	TANT	52
C	HI	INITIAL TIME STEP FOR NUMERICAL INTEGRATION (SEE DVDG)	TANT	53
C	HMAX	MAXIMUM TIME STEP (SEE DVDQ)	TANT	54
C	HMIN	MINIMUM ALLOWED TIME STEP (SEE DVDQ)	TANT	55
C	IPLLOT	IF TRUE, TRAJECTORY DATA ARE COPIED TO UNIT 10 FOR PLOTTING	TANT	56
C	IT	WHEN RETURNED FROM TRAJECT	TANT	57
C		WITH A VALUE OF ZERO, INDICATES IMPACTION HAS OCCURED.	TANT	58
C	KT	TRAJECTORY TALLY	TANT	59
C	P()	CURRENT VALUES OF INDEPENJENT VARIABLES -	TANT	60
C		P(1) = X	TANT	61
C		P(2) = DX/DT	TANT	62
C		P(3) = Y	TANT	63
C		P(4) = DY/DT	TANT	64
C		P(5) = Z	TANT	65
C		P(6) = DZ/DT	TANT	66
C	PT	DRAG COEFFICIENT*ABS(REYNOLDS NUMBER) FOR GRAVITY SETTLING	TANT	67
C		OF PARTICLES	TANT	68
C	RF	FACTOR TO CONVERT VELOCITY DIFFERENCE TO REYNOLDS NUMBER	TANT	69
C	RHO	AIR DENSITY (KG/M**3)	TANT	70
C	RHOP	PARTICLE DENSITY (KG/M**3)	TANT	71
C	TEMP	AIR TEMPERATURE (DEG. KELVIN)	TANT	72
C	TPRINT	OUTPUT TIME INTERVAL	TANT	73
C	V	AIR SPEED (M/SEC)	TANT	74
C	VIS	AIR VISCOSITY (KG/(M-SEC))	TANT	75
C	VT	GRAVITY SETTLING SPEED OF PARTICLE	TANT	76
C	XFINAL	X COORDINATE OF THE FINAL PLANE	TANT	77
C	XI3,YI3,ZI3	INITIAL COORDINATES PASSED TO TRAJECT	TANT	78
C			TANT	79
C		COMMON XI3,YI3,ZI3,YI3P, EPSI(3),HI,HMINI,VT,PT,COF,FNR,PACT,	TANT	80
C		1RF,REQ,R,XPSTAR,YPSTAR,ZPSTAR,P(6),TPRINT,IT,ALPHA0,BETA0,IREC,	TANT	81
C		2IPLLOT,IPLT,XPLOT(60),YPLOT(60),ZPLOT(60),ALPHAR,BETAR,YPSTARF,	TANT	82
C		3ZPSTARP,XI3P,ZI3F,XP,YP,ZP,XWP,XP,ACC,DLR,JLIM	TANT	83
C		DIMENSION HOLL(18)	TANT	84
C		LOGICAL IPLLOT	TANT	85
C		DATA SIGNAL/999999./, KTLIM/ 25/	TANT	86
C		JLIM=0	TANT	87
C		NFIN=0	TANT	88
C		READ AND WRITE DATA	TANT	89
C		READ (5,2600) KASE	TANT	90
C		CALL SETFLO(KASE)	TANT	91
C		READ(5,1000)HOLL, IPLLOT	TANT	92
C		READ(5,1100)V, ELL, RHO, TEMP, XFINAL	TANT	93
C		READ(5,1100) TPRINT, HI, HMINI, EPSI	TANT	94
C		SET DEFAULT VALUES FOR NUMERICAL INTEGRATION AND PRINT PARAMETERS	TANT	95
C		IF(TPRINT .EQ. 0.0) TPRINT=0.1	TANT	96
C		IF(HI .EQ. 0.0) HI=0.1	TANT	97
C		IF(HMINI .EQ. 0.0) HMINI=0.005	TANT	98
C		IF(EPSI(1) .EQ. 0.0) EPSI(1)=1.0E-5	TANT	99
C		IF(EPSI(2) .EQ. 0.0) EPSI(2)=1.0E-5	TANT	100
C		IF(EPSI(3) .EQ. 0.0) EPSI(3)=1.0E-5	TANT	101
C		VIS = 145.8E-8 * TEMP**(3.0/2.0)/(110.4 + TEMP)	TANT	102
C		WRITE(6,1200) HOLL	TANT	103
C		WRITE(6,1300) V, ELL, RHO, TEMP, VIS	TANT	104

	WRITE(6,1400) HI,HMINI,TPRINT,XFINAL	TANT 105
	WRITE(6,1500) EPSI(1), EPSI(2), EPSI(3)	TANT 106
C	INITIALIZE	TANT 107
	FN = V**2/(9.8*ELL)	TANT 108
	FNR = 1.0/FN	TANT 109
	IF (.NOT. IPLOT) GO TO 5	TANT 110
	REWIND 10	TANT 111
	WRITE (6,1800)	TANT 112
C	ENTER PARTICLE LCOP	TANT 113
5	CALL PARTCL(V,ELL,RHO,VIS,TEMP,DIAM,DLR,RHOP,VT,RF,PT,ACC,NFIN)	TANT 114
	IF(NFIN .EQ. 0) GO TO 6	TANT 115
	IF(.NOT. IPLOT) RETURN	TANT 116
	ENDFILE 10	TANT 117
	REWIND 10	TANT 118
	RETURN	TANT 119
6	COF = PT*VT*FN	TANT 120
	R = RF * VT	TANT 121
	MFIN=0	TANT 122
C	SET INITIAL COORDINATES	TANT 123
10	DFINE=SIGNAL	TANT 124
	IT=1	TANT 125
	KT=0	TANT 126
20	CALL STRPNT(XI3, YI3, ZI3, DEL, DCORS, DFINE, MFIN)	TANT 127
	IF(MFIN .GT. 0) GO TO 5	TANT 128
	KT=KT+1	TANT 129
	IF(KT .GT. KTLIM) GO TO 60	TANT 130
	XPSTAR=XFINAL	TANT 131
	XPP = XFINAL	TANT 132
	ALPHAR=0.0	TANT 133
	BETAR=0.0	TANT 134
	YP = 0.0	TANT 135
	ZP = 0.0	TANT 136
	WRITE(6,1600) XI3, YI3, ZI3, KT	TANT 137
	CALL TRAJECT	TANT 138
C	PRINT TRAJECTORY OUTPUT	TANT 139
	REWIND 9	TANT 140
	WRITE (6,8700)	TANT 141
	DO 30 IWRITE = 1,IREC	TANT 142
	READ (9)NEVAL,KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY,	TANT 143
2	VZ, H, R, AC	TANT 144
	WRITE(6,8600) KSTEP, T, P(1), P(3), P(5), P(2), P(4), P(6),VX, VY,	TANT 145
2	VZ, H, R, AC, NEVAL	TANT 146
30	CONTINUE	TANT 147
C	CHECK FOR IMPACTION AND ADJUST DEL IF NECESSARY	TANT 148
	IF(IT .LE. 0) GO TO 40	TANT 149
	IF(DEL .EQ. -DFINE) GO TO 50	TANT 150
	IF(DEL .NE. -DCORS) GO TO 20	TANT 151
	DEL=DFINE	TANT 152
	WRITE(6,3000)	TANT 153
	GO TO 20	TANT 154
C	IMPACTION HAS OCCURED	TANT 155
40	IT=1	TANT 156
	IF(DEL .EQ. -DCORS) GO TO 20	TANT 157
	IF(DEL .EQ. DFINE) WRITE(6,4000)	TANT 158
	KT=KT-2	TANT 159
	DEL=-DEL	TANT 160
	GO TO 20	TANT 161
50	IF(.NOT. IPLOT) GO TO 10	TANT 162
	IF (IPLOT) WRITE (10) IFLT, (XPLOT(L),YFLOT(L),ZPLOT(L),L=1,IPLT)	TANT 163
	GO TO 10	TANT 164

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60 WRITE(6,2000) ITLIM                                TANT 165
GO TO 10                                              TANT 166
C                                                     TANT 167
1000 FORMAT(18A4, 7X,L1)                              TANT 168
1100 FORMAT(8F10.5)                                   TANT 169
1200 FORMAT( 1H1, 5X, 32HTANGENT TRAJECTORY CODE RUN ID -/ 8X, 18A4) TANT 170
1300 FORMAT(1H0, 5X, 21HPHYSICAL INPUT DATA -/7X,10HAIR SPEED=1PE13.6, TANT 171
1 3X, 37HCHARACTERISTIC DIMENSION OF THE BODY=1PE13.6/ 7X,35HDENSITTANT 172
2Y AND TEMPERATURE OF AIR ARE 1PE13.6, 5H AND 1PE13.6,20H AIR VISTANT 173
3COSITY IS 1PE13.6)                                  TANT 174
1400 FORMAT( 1H0, 5X, 29HNUMERICAL INTEGRATOR INPUTS -/ 7X, 10HTIME STETANT 175
1P=1PE11.4, 3X, 18HMINIMUM TIME STEP=1PE11.4, 3X, 20HPRINT TIME INTTANT 176
2ERVAL=1PE11.4, 3X, 24HX COORD. OF FINAL FLANE=1PE11.4) TANT 177
1500 FORMAT( 1H0, 6X, 33HLOCAL ERROR TOLERANCES FOR DVDQ -, 3(1PE14.4))TANT 178
1600 FORMAT(//1H0, 38H* * * * * INITIAL COORDINATES X=1PE12.5, TANT 179
1 3X, 2HY=1PE12.5, 3X, 2HZ=1PE12.5, 3X, 21HFOR TRAJECTORY NUMBER, TANT 180
2 I4)                                                 TANT 181
1800 FORMAT( ///6X, 51HTRAJECTORY DATA ARE WRITTEN ON UNIT 10 FOR PLOTTTANT 182
1ING//)                                              TANT 183
2000 FORMAT(///5X, I4, 66H TRAJECTORIES HAVE BEEN COMPUTED. GIVE UP ATANT 184
1ND TRY THE NEXT CASE.//)                           TANT 185
2600 FORMAT (A4)                                     TANT 186
3000 FORMAT( //128H0* * * * * * * * * * * * * * * * * * * * * * * * * * *TANT 187
1 SWITCH TO FINE STEPSIZE * * * * * * * * * * * * * * * * * * * * * * * *TANT 188
2 * * * * * //)                                     TANT 189
8 600 FORMAT(I6, 10(1X,1PE11.4)/10X, 24H=1PE11.4,4H R=1PE11.4, 5H AC=TANT 190
11PE11.4, 8H NEVAL=I6)                              TANT 191
8 700 FORMAT(/6H0KSTEP, 7X, 1HT, 11X, 1HX, 11X, 1HY, 11X, 1HZ, 10X, TANT 192
1 3HVPX, 9X, 3HVPY, 9X, 3HVPZ, 10X, 2HVX, 10X, 2HVV, 10X, 2HVZ) TANT 193
4000 FORMAT( /// 129H * * * * * * * * * * * * * * * * * * * * * * * * * * *TANT 194
1 TANGENT TRAJECTORY IS AS FOLLOWS * * * * * * * * * * * * * * * * * * * *TANT 195
2 * * * * * //)                                     TANT 196
END                                                  TANT 197

```

*DECK, STRPNT	STRP	1
SUBROUTINE STRPNT(X, Y, Z, D, DCORS, DFINE, M)	STRP	2
C	STRP	3
C	STRP	4
C	STRP	5
C	STRP	6
C	STRP	7
C	STRP	8
C	STRP	9
C	STRP	10
C	STRP	11
C	STRP	12
C	STRP	13
C	STRP	14
C	STRP	15
C	STRP	16
C	STRP	17
C	STRP	18
C	STRP	19
C	STRP	20
C	STRP	21
C	STRP	22
C	STRP	23
C	STRP	24
C	STRP	25
C	STRP	26
COPY IN STEP SIZE INCREMENTS AND INITIALIZE FOR A NEW TANGENT LOCATION	STRP	27
READ(5,1100) DCORS, DFINE	STRP	28
CHECK IF TRAJECTORIES FOR THIS PARTICLE SIZE ARE FINISHED	STRP	29
M=0	STRP	30
IF(ABS(DCORS) + ABS(DFINE) .NE. 0.0) GO TO 100	STRP	31
M=1	STRP	32
RETURN	STRP	33
COPY IN A PAIR OF POINT COORDINATES TO DEFINE THE STARTING POINT LINE.	STRP	34
C	STRP	35
C	STRP	36
C	STRP	37
100 READ(5,1100) X, Y, Z, X1, Y1, Z1	STRP	38
COMPUTE DIRECTION COSINES OF THE STARTING POINT LINE	STRP	39
R = SQRT((X1-X)**2 + (Y1-Y)**2 + (Z1-Z)**2)	STRP	40
COSA = (X1-X)/R	STRP	41
COSB = (Y1-Y)/R	STRP	42
COSG = (Z1-Z)/R	STRP	43
D = DCORS	STRP	44
WRITE(6,1000) X, Y, Z, X1, Y1, Z1	STRP	45
WRITE(6,1200) COSA, COSB, COSG	STRP	46
WRITE(6,1300) DCORS, DFINE	STRP	47
RETURN	STRP	48
COMPUTE NEXT SET OF STARTING COORDINATES	STRP	49
200 X = X + D*COSA	STRP	50
Y = Y + D*COSB	STRP	51
Z = Z + D*COSG	STRP	52
RETURN	STRP	53
1000 FORMAT(/////5X,89HTRAJECTORIES ARE TO BEGIN ALONG A LINE DEFINED B	STRP	54
1Y THE POINTS (X1,Y1,Z1,) AND (X2,Y2,Z2) -/ 9X,2H(,3(1PE15.5),	STRP	55
2 13H) AND (, 3(1PE15.5), 2H)	STRP	56
1100 FORMAT(8F10.0)	STRP	57
1200 FORMAT(5X, 60HWITH DIRECTION COSINES -(COS(ALPHA),COS(BETA),COS(GA	STRP	58
1MMA)) - 3(1PE15.5)/)	STRP	59
1300 FORMAT(5X, 49HSTARTING POINT INCREMENTS ARE - COARSE INCREMENT=1P	STRP	60

1E12.5, 3X, 15HFINE INCREMENT=1PE12.5)
END

STRP 61
STRP 62

```
*DECK, FALWAT
SUBROUTINE FALWAT(D, RHO, ETA, T, P, V)
C
C H. G. NORMENT, ATMOSPHERIC SCIENCE ASSOCIATES - DECEMBER 1979
C
C COMPUTES STILL-AIR, TERMINAL SETTLING SPEED OF WATER DROPS
C ACCORDING TO THE EQUATIONS OF BEARD (JAS 33, 852(1976))
C
C GLOSSARY (SI UNITS)
C C 4.0*G/3.0 WHERE G IS ACCELERATION OF GRAVITY (9.8)
C CDRR DAVIES NUMBER
C D DROP DIAMETER
C ETA VISCOSITY
C P PRESSURE
C PN PHYSICAL PROPERTY NUMBER TO 1/6 POWER
C RHO FLUID DENSITY
C RHOP WATER DENSITY
C SIG WATER SURFACE TENSION
C T TEMPERATURE
C V SETTLING SPEED
C
C DATA C/13.066667/, RHOP/1000./, EX/0.16666666667/
C
C COMPUTE DAVIES NUMBER
C CDRR = C*(RHOP-RHO)*RHO*[(**3/ETA)**2
CHECK DAVIES NUMBER VALUE FOR ROUTING
IF(CDRR .GT. 0.3261) IF(CDRR-58243.) 100,100,200
C COMPUTE VIA STOKES-LAW EQUATION
V = CDRR*ETA/(24.0*RHO*D)
GO TO 300
C COMPUTE VIA BEARDS EQUATION FOR MEDIUM SIZE DROPS
100 Y = ALOG(CDRR)
V = ETA/(RHO*D)*EXP(-3.1657 + Y*(0.992696 + Y*(-0.153193E-2
1+Y*(-0.987059E-3 + Y*(-0.578878E-3 + Y*(0.855176E-4
2-Y*0.327815E-5))))))
GO TO 300
C COMPUTE VIA BEARDS EQUATION FOR LARGE DROPS
200 SIG = 7.570E-2 - 1.535E-4*(T - 273.0)
PN = (SIG**3 * RHO**2/(9.8 * (RHOP-RHO) * ETA**4))**EX
Y = ALOG(PN*C*(RHOP- RHO) * D**2/SIG)
V = ETA*PN/(RHO*D) * EXP(-5.00015 + Y*(5.23778 + Y*(-2.04914 +
1 Y*(0.475294 + Y*(-0.0542819 + Y*0.00238449))))))
RETURN
CORRECT SETTLING SPEED FOR SLIF
300 V = V*(1.0 + 54.088*ETA*SQRT(T)/P/D)
RETURN
END
```

FALW 1
FALW 2
FALW 3
FALW 4
FALW 5
FALW 6
FALW 7
FALW 8
FALW 9
FALW 10
FALW 11
FALW 12
FALW 13
FALW 14
FALW 15
FALW 16
FALW 17
FALW 18
FALW 19
FALW 20
FALW 21
FALW 22
FALW 23
FALW 24
FALW 25
FALW 26
FALW 27
FALW 28
FALW 29
FALW 30
FALW 31
FALW 32
FALW 33
FALW 34
FALW 35
FALW 36
FALW 37
FALW 38
FALW 39
FALW 40
FALW 41
FALW 42
FALW 43
FALW 44
FALW 45
FALW 46
FALW 47

*DECK, WCDRR		WCDR	1
FUNCTION WCDRR(R)		WCDR	2
C		WCDR	3
C	GIVEN THE REYNOLDS NUMBER, R, THE PRODUCT OF THE DRAG COEFFICIENT	WCDR	4
C	AND THE THE SQUARE OF THE REYNOLDS NUMBER IS RETURNED FOR A WATER	WCDR	5
C	DROP IN AIR. THIS FUNCTION SHOULD BE USED ONLY FOR R .GT. 200.	WCDR	6
C	(SEE BEARD AND PRUPPACHER, JAS 25, 1066(1969)).	WCDR	7
C	THE DATA OF GUNN AND KINZER, J. METEOR. 6, 243(1949), ARE USED.	WCDR	8
C		WCDR	9
	IF(R .GT. 200.) GO TO 100	WCDR	10
	WCDRR = -1.0E20	WCDR	11
	RETURN	WCDR	12
100	ALGR = ALOG10(R)	WCDR	13
	WCDRR = 10.0** (21.38446 + ALGR * (-28.81245 + ALGR * (	WCDR	14
1	16.83269 + ALGR * (-4.152207 + ALGR * 0.3672735)))	WCDR	15
	RETURN	WCDR	16
	END	WCDR	17

*DECK, CDORR		CDORR	1
FUNCTION CDORR(R)		CDORR	2
C		CDORR	3
C	GIVEN THE REYNOLDS NUMBER, R, THE PRODUCT OF THE DRAG COEFFICIENT	CDORR	4
C	AND THE SQUARE OF R IS RETURNED FOR A SPHERE. SEE NCRMENT, TO-8	CDORR	5
C	64-102 (1 NOV. 1964).	CDORR	6
C		CDORR	7
	IF(R .GT. 0.05) IF(R-3.) 100,100,200	CDORR	8
	CDORR = 24. * R	CDORR	9
	RETURN	CDORR	10
100	CDORR = R*(24.167 + R*(3.254 - R*0.23564))	CDORR	11
	RETURN	CDORR	12
200	IF(R .GT. 330.) GO TO 300	CDORR	13
	CDORR = -28.339 + R*(38.969 + R * (0.73204 - R * 0.56084E-3))	CDORR	14
	RETURN	CDORR	15
300	CDORR = R * (93.462 + F * 0.37576)	CDORR	16
	RETURN	CDORR	17
	END	CDORR	18

C	THE DIFFERENTIAL EQUATIONS WHICH ARE BEING	DVDQ	44
C	INTEGRATED.	DVDQ	45
C	THE J-TH DERIVATIVE OF THE I-TH DEPENDENT VARIABLE IS	DVDQ	46
C	STORED IN Y(K+J+1) WHERE K=KJ(1)+...+KD(I-1),	DVDQ	47
C	I=1,...,NEQ, J=0,...,KD(I)-1.	DVDQ	48
C	(FOR EXAMPLE, FOR THE SYSTEM F(1)=UPP, F(2)=VPP, WHERE P	DVDQ	49
C	DENOTES A PRIME, Y(1)=U, Y(2)=UP, Y(3)=V, Y(4)=VP.)	DVDQ	50
C		DVDQ	51
C	F(I)=KD(I)-TH DERIVATIVE OF THE I-TH COMPONENT WITH RESPECT	DVDQ	52
C	TO T, I=1,2,...,NEQ. THE USER MUST PROVIDE	DVDQ	53
C	THE CODE WHICH COMPUTES F GIVEN Y AND T.	DVDQ	54
C		DVDQ	55
C	KD(I)=THE ORDER OF THE I-TH DIFFERENTIAL EQUATION IN	DVDQ	56
C	THE SYSTEM. KD(I) MUST BE LESS THAN OR EQUAL TO 4.	DVDQ	57
C		DVDQ	58
C	EPS(I) IS A PARAMETER USED TO CONTROL THE LOCAL ERROR.	DVDQ	59
C	THE ESTIMATED LOCAL ERROR IS KEPT LESS THAN EPS(I) IN	DVDQ	60
C	THE (KD(I)-1)-ST DERIVATIVE OF THE I-TH COMPONENT. THUS	DVDQ	61
C	FOR EQUATIONS WITH ORDER GREATER THAN ONE, THE ERROR	DVDQ	62
C	IN A DERIVATIVE IS ESTIMATED. IN THIS CASE THE VALUE OF	DVDQ	63
C	EPS(I) REQUIRED TO OBTAIN A GIVEN ACCURACY IN THE DEPENDENT	DVDQ	64
C	VARIABLE DEPENDS ON THE SCALING.	DVDQ	65
C	IF ONE WANTS A RELATIVE ERROR TEST THEN ONE SHOULD SET EPS(I)	DVDQ	66
C	WHEN IFLAG=1.	DVDQ	67
C	IF EPS(I)=0 AND HMAX.NE.0, IFLAG IS SET EQUAL 8.	DVDQ	68
C	IF EPS(I)=0 AND HMAX=0, NO ERROR TESTS ARE PERFORMED	DVDQ	69
C	AND THE ORDER(S) AND STEPSIZE ARE NOT CHANGED.	DVDQ	70
C	THIS OPTION SHOULD NOT BE USED IF KD(I)=1 FOR ANY I.	DVDQ	71
C		DVDQ	72
C	IFLAG IS USED FOR COMMUNICATION BETWEEN THE INTEGRATOR	DVDQ	73
C	AND THE PROGRAM WHICH CALLS IT. TO BEGIN THE INTEGRATION THE	DVDQ	74
C	USER SHOULD SET IFLAG=0 AND CALL DVDQ. THIS WILL CAUSE	DVDQ	75
C	INITIALIZATION OF INTERNAL VARIABLES AND A RETURN WITH	DVDQ	76
C	IFLAG=1. AFTER THIS INITIAL ENTRY THE VALUE OF IFLAG	DVDQ	77
C	SHOULD NOT BE CHANGED BY THE USER.	DVDQ	78
C		DVDQ	79
C	THE FOLLOWING VALUES OF IFLAG HAVE THE FOLLOWING MEANINGS.	DVDQ	80
C	=0 USED TO INITIALIZE THE INTEGRATOR.	DVDQ	81
C	=1 THE VALUE OF Y FOR THE CURRENT STEP HAS BEEN	DVDQ	82
C	PREDICTED. THE USER SHOULD COMPUTE F AND CALL DVDQ AGAIN.	DVDQ	83
C	IF A RELATIVE ERROR TEST IS USED THE NEW VALUE	DVDQ	84
C	OF EPS SHOULD ALSO BE COMPUTED HERE.	DVDQ	85
C	=2 THE VALUE OF Y FOR THE CURRENT STEP HAS BEEN	DVDQ	86
C	CORRECTED. THE USER SHOULD COMPUTE F AND CALL DVDQ.	DVDQ	87
C	=3 AN OUTPUT POINT HAS BEEN REACHED (SEE DESCRIPTION	DVDQ	88
C	OF TPRINT), PRINT RESULTS AND CALL DVDQ.	DVDQ	89
C	=4 T=TFINAL IF DVDQ IS CALLED WITH T=TFINAL AND	DVDQ	90
C	IFLAG=4, IFLAG IS SET EQUAL TO 8. IF THE VALUE OF	DVDQ	91
C	TFINAL IS CHANGED THE INTEGRATION WILL CONTINUE.	DVDQ	92
C	=5 KSTEP=KSOUT (SEE THE DESCRIPTION OF MXSTEP).	DVDQ	93
C	=6 EMAX.GT..1 AND IT APPEARS TO THE SUBROUTINE THAT	DVDQ	94
C	REDUCING H WILL NOT HELP BECAUSE OF ROUND-OFF ERROR.	DVDQ	95
C	IF THIS OCCURS A LARGER VALUE OF EPS(KEMAX) SHOULD	DVDQ	96
C	PROBABLY BE USED. IF EPS(KEMAX) IS NOT INCREASED, TOO	DVDQ	97
C	SMALL A STEPSIZE IS LIABLE TO BE USED. (WE HAVE FOUND THAT	DVDQ	98
C	REPLACING EPS(KEMAX) WITH 32.*EMAX*EPS(KEMAX) WORKS WELL.)	DVDQ	99
C	INCREASING EPS IN THIS WAY WILL NOT DEGRADE THE ACCURACY,	DVDQ	100
C	HOWEVER IF THE NATURE OF THE PROBLEM CHANGES IT MAY PAY TO	DVDQ	101
C	USE A SMALLER VALUE OF EPS LATER IN THE INTEGRATION.	DVDQ	102
C	=7 ABS(H).LT.HMIN. TO CONTINUE WITH THE CURRENT	DVDQ	103

C	VALUE OF H, SET HMIN.LE.ABS(H) AND CALL DVDQ.	DVDQ 104
C	IF THE INTEGRATOR HAS JUST HALVED H ONE MAY CONTINUE	DVDQ 105
C	WITH TWICE THE STEPSIZE BY SIMPLY CALLING DVDQ. (SUCH	DVDQ 106
C	AN ACTION IS RISKY WITHOUT A CAREFUL ANALYSIS OF THE	DVDQ 107
C	SITUATION.) IF THE STEPSIZE HAS NOT JUST BEEN HALVED	DVDQ 108
C	(ABS(H).LT.HMIN MAY BE DUE TO THE USER INCREASING THE	DVDQ 109
C	VALUE OF HMIN OR TO HAVING TOO SMALL AN H AT THE END	DVDQ 110
C	OF THE STARTING PHASE.) THE INTEGRATION WILL CONTINUE	DVDQ 111
C	WITH THE CURRENT VALUE OF H AND A RETURN TO THE USER WITH	DVDQ 112
C	IFLAG=7 WILL BE MADE ON EVERY STEP UNTIL ABS(H).GE.HMIN.	DVDQ 113
C	=8 ILLEGAL PARAMETER IN THE CALLING SEQUENCE. IF DVDQ	DVDQ 114
C	IS CALLED WITH IFLAG=8 THE PROGRAM IS STOPPED.	DVDQ 115
C		DVDQ 116
C	H=CURRENT VALUE OF THE STEPSIZE; IN SELECTING THE INITIAL	DVDQ 117
C	VALUE FOR H, THE USER SHOULD REMEMBER THE FOLLOWING--	DVDQ 118
C	1. THE INTEGRATOR IS CAPABLE OF CHANGING H QUITE QUICKLY AND	DVDQ 119
C	THUS THE INITIAL CHOICE IS NOT CRITICAL.	DVDQ 120
C	2. IF IT DOES NOT LEAD TO PROBLEMS IN COMPUTING THE DERIVATIVES	DVDQ 121
C	(E.G. BECAUSE OF OVERFLOW OR TRYING TO EXTRACT THE SQUARE.	DVDQ 122
C	ROOT OF A NEGATIVE NUMBER), IT IS BETTER TO CHOOSE H MUCH	DVDQ 123
C	TOO LARGE THAN MUCH TOO SMALL.	DVDQ 124
C	3. IF H*TPRINT.LE.0 INITIALLY, AN IMMEDIATE RETURN IS MADE	DVDQ 125
C	WITH IFLAG=8. THE SIGN OF H IS WHAT DETERMINES THE	DVDQ 126
C	DIRECTION OF INTEGRATION.	DVDQ 127
C	4. IF TPRINT=H*(2**K) K A NONNEGATIVE INTEGER THEN OUTPUT	DVDQ 128
C	VALUES WILL BE OBTAINED WITHOUT DOING AN INTERPOLATION.	DVDQ 129
C		DVDQ 130
C	HMIN AFTER GETTING STARTED, AND WHENEVER H	DVDQ 131
C	IS HALVED, ABS(H) IS COMPARED WITH HMIN.	DVDQ 132
C	IF ABS(H).LT.HMIN CONTROL IS RETURNED TO	DVDQ 133
C	THE USER WITH IFLAG=7.	DVDQ 134
C		DVDQ 135
C	HMAX THE STEPSIZE IS NOT DOUBLED IF	DVDQ 136
C	DOING SO WOULD MAKE ABS(H).GT.HMAX	DVDQ 137
C		DVDQ 138
C	TPRINT ENABLES THE USER TO SPECIFY THE PCINTS WHERE	DVDQ 139
C	OUTPUT IS DESIRED. LET TOUT=TPRINT + THE VALUE OF T THE LAST	DVDQ 140
C	TIME CONTROL WAS RETURNED TO THE USER WITH IFLAG=3. (INITIALLY	DVDQ 141
C	TOUT=THE INITIAL VALUE OF T.) CONTROL IS RETURNED TO THE	DVDQ 142
C	USER WITH IFLAG=3 WHENEVER T=TOUT. IF TOUT DOES NOT FALL	DVDQ 143
C	ON AN INTEGRATION STEP, OUTPUT VALUES ARE OBTAINED BY	DVDQ 144
C	INTERPOLATION ON THE FIRST STEP THAT (T-TOUT)*H.GT.0.	DVDQ 145
C	INTERPOLATED VALUES FOR BOTH Y AND F ARE COMPUTED.	DVDQ 146
C	(NOTE THAT A RETURN WITH IFLAG=3 IS ALWAYS MADE	DVDQ 147
C	BEFORE TAKING THE FIRST STEP.)	DVDQ 148
C		DVDQ 149
C	TFINAL CONTROL IS RETURNED TO THE USER WITH IFLAG=4 WHEN	DVDQ 150
C	T REACHES TFINAL. IF TFINAL DOES NOT FALL ON AN INTEGRATION	DVDQ 151
C	STEP VALUES AT TFINAL ARE OBTAINED BY EXTRAPOLATION.	DVDQ 152
C		DVDQ 153
C	MXSTEP ON THE INITIAL ENTRY, AND ON ENTRIES	DVDQ 154
C	WITH 2.LT.IFLAG.LT.6 KSOUT IS SET EQUAL TO	DVDQ 155
C	KSTEP+MXSTEP. AT THE END OF EACH STEP KSTEP IS INCREMENTED	DVDQ 156
C	AND COMPARED WITH KSOUT. IF KSTEP.GE.KSOUT CONTROL IS	DVDQ 157
C	RETURNED TO THE USER WITH IFLAG=5. (THUS IF TPRINT IS	DVDQ 158
C	SUFFICIENTLY LARGE, CONTROL WILL BE RETURNED TO THE USER	DVDQ 159
C	WITH IFLAG=5 EVERY MXSTEP STEPS.)	DVDQ 160
C		DVDQ 161
C	KSTEP=NUMBER OF INTEGRATION STEPS TAKEN (COMPUTED	DVDQ 162
C	BY THE INTEGRATOR.)	DVDQ 163

C		DVDQ 164
C	KEMAX=INDEX OF COMPONENT RESPONSIBLE FOR THE	DVDQ 165
C	VALUE OF EMAX (SEE BELOW).	DVDQ 166
C		DVDQ 167
C	EMAX=LARGEST VALUE IN ANY COMPONENT OF (ESTIMATED ERROR)/EPS (I)	DVDQ 168
C	ORDINARILY THE STEPSIZE IS HALVED IF EMAX.GT..1. WITH A	DVDQ 169
C	RECENT HISTORY OF LOCAL ROUND-OFF PROBLEMS VALUES OF EMAX AS	DVDQ 170
C	LARGE AS 1 ARE PERMITTED. THE STEPSIZE IS NOT HALVED ON ANY	DVDQ 171
C	STEP THAT ROUND OFF ERROR APPEARS TO BE LIMITING THE PRECISION.	DVDQ 172
C		DVDQ 173
C	KQ(I)=HIGHEST ORDER DIFFERENCE USED IN INTEGRATING	DVDQ 174
C	THE I-TH EQUATION. (COMPUTED BY THE INTEGRATOR)	DVDQ 175
C		DVDQ 176
C	YN=A VECTOR WITH THE DIMENSION OF Y USED TO STORE	DVDQ 177
C	THE VALUE OF Y AT THE END OF EACH INTEGRATION STEP.	DVDQ 178
C		DVDQ 179
C	DT=AN ARRAY WITH DIMENSION DT(20,NEQ) USED TO	DVDQ 180
C	STORE THE DIFFERENCE TABLE.	DVDQ 181
C		DVDQ 182
C	NEVAL=NUMBER OF TIMES F IS EVALUATED (= NUMBER OF	DVDQ 183
C	RETURNS MADE WITH IFLAG=1 OR 2). (COMPUTED BY DVDQ.)	DVDQ 184
C		DVDQ 185
C	NG MUST BE SET = 0 BY THE USER IF THE GSTOP FEATURE IS	DVDQ 186
C	NOT USED. OTHERWISE SEE BELOW.	DVDQ 187
C		DVDQ 188
C		DVDQ 189
C	A GSTOP IS DEFINED AS A RETURN WHICH IS MADE TO THE USER WHEN A	DVDQ 190
C	USER SPECIFIED FUNCTION G PASSES THROUGH ZERO. THE USER MAY	DVDQ 191
C	SPECIFY ANY NUMBER OF FUNCTIONS G OF TWO TYPES. ZEROS OF THE FIRST	DVDQ 192
C	TYPE ARE LOCATED WITHOUT REQUIRING A DERIVATIVE EVALUATION	DVDQ 193
C	BEYOND THE ZERO. THIS TYPE OF GSTOP REQUIRES THAT G BE EVALUATED	DVDQ 194
C	BEFORE EACH DERIVATIVE EVALUATION. ZEROS OF THE SECOND TYPE ARE	DVDQ 195
C	LOCATED USING INTERPOLATION, WHICH IS MORE ACCURATE THAN THE	DVDQ 196
C	EXTRAPOLATION USED IN THE PRECEDING CASE AND ONLY REQUIRES ONE	DVDQ 197
C	EVALUATION OF G PER STEP. THUS ONE SHOULD USE THE SECOND TYPE OF	DVDQ 198
C	GSTOP IF POSSIBLE. USERS NOT USING THE GSTOP FEATURE NEED READ	DVDQ 199
C	NO FURTHER.	DVDQ 200
C		DVDQ 201
C	THE GSTOP FEATURE IS INVOKED BY USING A NONZERO VALUE OF NG .	DVDQ 202
C	IT IS TURNED OFF BY SETTING NG=0 . IT IS NOT NECESSARY TO	DVDQ 203
C	MAKE SEPARATE CALLS TO DVDQ TO DO THIS.	DVDQ 204
C		DVDQ 205
C	NG= THE NUMBER OF COMPONENTS IN G TO BE EXAMINED FOR A ZERO.	DVDQ 206
C		DVDQ 207
C	NGE=THE NUMBER OF COMPONENTS OF G THAT MUST BE EXAMINED FOR	DVDQ 208
C	A ZERO BEFORE COMPUTING THE DERIVATIVES (FIRST TYPE OF	DVDQ 209
C	GSTOP). IF NGE.LT.0 OR NGE.GT.NG, IFLAG IS SET	DVDQ 210
C	EQUAL 8 AND AN IMMEDIATE RETURN IS MADE. IF NGE.GT.0,	DVDQ 211
C	G(1),G(2),...,G(NGE) ARE EXAMINED FOR A ZERO BEFORE EACH	DVDQ 212
C	DERIVATIVE EVALUATION, THE REMAINING COMPONENTS (IF ANY)	DVDQ 213
C	ARE EXAMINED AT THE END OF EACH STEP.	DVDQ 214.
C		DVDQ 215
C	NSTOP= THE COMPONENT OF G RESPONSIBLE FOR A GSTOP (COMPUTED BY	DVDQ 216
C	THE INTEGRATOR).	DVDQ 217
C		DVDQ 218
C	G= A VECTOR CONTAINING THE CURRENT VALUES OF THE FUNCTIONS	DVDQ 219
C	WHOSE ZEROS ARE TO BE DETERMINED.	DVDQ 220
C		DVDQ 221
C	GT= A VECTOR WITH THE SAME DIMENSION AS G USED BY THE	DVDQ 222
C	SUBROUTINE FOR TEMPORARY STORAGE.	DVDQ 223

C		DVDQ 224
C	RETURNS FROM CALLING DVDQ WITH IFLAG.GT.8 SHOULD BE INTERPETED	DVDQ 225
C	AS FOLLOWS.	DVDQ 226
C	IFLAG	DVDQ 227
C	= 9 COMPUTE G(NGE+1),...,G(NG) (THE COMPONENTS OF G WITH	DVDQ 228
C	ZEROS TO BE LOCATED USING INTERPOLATION). THEN CALL DVDQ.	DVDQ 229
C	NO RETURN IS MADE WITH IFLAG=9 IF NGE=NG.	DVDQ 230
C	=10 COMPUTE G(1),G(2),...,G(NGE) (THE COMPONENTS OF G WITH	DVDQ 231
C	ZEROS TO BE LOCATED USING EXTRAPOLATION). THEN CALL DVDQ.	DVDQ 232
C	NO RETURN IS MADE WITH IFLAG=10 IF NGE=0.	DVDQ 233
C	=11 A GSTOP HAS BEEN FOUND. G(NSTOP)=0. PRINT RESULTS. IF THEIR	DVDQ 234
C	ARE NO DISCONTINUITIES CALL DVDQ TO CONTINUE THE INTEGRATION.	DVDQ 235
C	=12 G(NSTOP) CHANGES SIGN, BUT THERE IS DIFFICULTY IN CONVERGING	DVDQ 236
C	TO A ZERO. THE USER MAY WISH TO MAKE A SPECIAL CHECK TO BE	DVDQ 237
C	CERTAIN THAT EVERYTHING IS ALL RIGHT. TO CONTINUE THE	DVDQ 238
C	INTEGRATION CALL DVDQ.	DVDQ 239
C		DVDQ 240
C		DVDQ 241
C	SUBROUTINE DVDQ(NEQ,T,Y,F,KD,EPS,IFLAG,H,HMIN,	DVDQ 242
C	* HMAX,TPRINT,TFINAL,MXSTEP,KSTEP,KEMAX,EMAX,	DVDQ 243
C	* KQ,YN,DT,NEVAL,NG,NGE,NSTOP,G,GT)	DVDQ 244
C	INTEGER NEQ,KD,IFLAG,MXSTEP,KSTEP,KEMAX,KQ,NEVAL,NG,NGE,NSTOP	DVDQ 245
C	REAL T,Y,F,EPS,H,HMIN,HMAX,TPRINT,TFINAL,EMAX,	DVDQ 246
C	2 YN,DT,G,GT	DVDQ 247
C	DIMENSION Y(1),F(1),YN(1),DT(20,1),KD(1),KQ(1),EPS(1),G(1),GT(1)	DVDQ 248
C	INTEGER IB,IFL,IFLG,IFLS,IFLGS,IGK,IGKM,KBIT2,KDMAX,KDD,KDC,	DVDQ 249
C	2 LDOUB,LFD,LGSS,LGSE,NE,NGA,IM1,KK,JM2,KMAX0,KM,KMD,KM1,	DVDQ 250
C	3 KQMAX,KQM,KQQ,KQ1,KQQ2,LRND,JS,KSOUT,LSC,LSTC,NV,I,J,K,L	DVDQ 251
C	REAL FAC,GAM,GAS,DD,EIGHTH,GI,HH,EPSSGS,EARMX,ERND,	DVDQ 252
C	2 TWO,FRND,RG,ETA,TG,ONEP1,RND,RNDC,RQMAX,TL,E2HAVE,	DVDQ 253
C	3 E2HMAX,E2HFAC,E2T,TOLT,PT,TP,PTS1,PTS2,PTS3,PTS4,PTS5,TPS1,	DVDQ 254
C	4 TPD,TPD1,TPS3,TPS5,TPS4,TPS2,TPS6,TPD2,D,P01,P075,E,P1,	DVDQ 255
C	5 P25,P5,P75,S,ABS,AMOL,AMIN1,AMAX1,SIGN	DVDQ 256
C	DIMENSION GAM(20,4),GAS(20),ETA(19,18)	DVDQ 257
C	DIMENSION DD(26),D(25),PT(21),FAC(3),GI(2),RG(3)	DVDQ 258
C	EQUIVALENCE (DD(2),D(1))	DVDQ 259
C	DATA KBIT2 /0/	DVDQ 260
C		DVDQ 261
C		DVDQ 262
C	CHECK IFLAG	DVDQ 263
C		DVDQ 264
C	IF (IFLAG) 1190, 10, 60	DVDQ 265
C		DVDQ 266
C	CHECK TO INITIALIZE CONSTANTS	DVDQ 267
C		DVDQ 268
C	10 IF (KBIT2) 50,12,50	DVDQ 269
C		DVDQ 270
C	DETERMINE MACHINE PRECISION	DVDQ 271
C		DVDQ 272
C	12 RND=1.	DVDQ 273
C	14 RND=RND/2.	DVDQ 274
C	KBIT2=KBIT2+1	DVDQ 275
C	IF(1.+RND .GT. 1.) GO TO 14	DVDQ 276
C	RND=8.*RND	DVDQ 277
C	KQMAX=0.3*FLOAT(KBIT2+1)	DVDQ 278
C	IF(KQMAX.GT.19) KQMAX=19	DVDQ 279
C	KBIT2=2*KBIT2+2	DVDQ 280
C		DVDQ 281
C	KQMAX GIVES THE MAXIMUM CRDER OF POLYNOMIAL APPROXIMATION USED.	DVDQ 282
C	THERE IS LITTLE POINT IN HAVING KQMAX MUCH BIGGER THAN THE NUMBER	DVDQ 283

C	OF DECIMAL DIGITS IN THE MANTISSA.	DVDQ 284
C		DVDQ 285
C	RND IS APPROXIMATELY $2^{*(3-B)}$ WHERE B IS	DVDQ 286
C	THE NUMBER OF BITS IN THE MANTISSA.	DVDQ 287
C	KBIT2= $2*B+2$ WHERE B IS THE NUMBER OF BITS IN THE MANTISSA.	DVDQ 288
C	IF THE DERIVATIVES ARE NOT COMPUTED TO THE ACCURACY EXPECTED	DVDQ 289
C	FROM THE WORD LENGTH OF THE COMPUTER (FOR EXAMPLE BECAUSE OF	DVDQ 290
C	CANCELLATION PROBLEMS OR TABULAR DATA), THEN THESE CONSTANTS	DVDQ 291
C	CAN BE CHANGED TO REFLECT THE NUMBER OF BITS WHICH ARE	DVDQ 292
C	SIGNIFICANT IN THE COMPUTED DERIVATIVES. (THIS IS NOT NECESSARY,	DVDQ 293
C	BUT IS WISE IF THE ACCURACY REQUESTED IS DIFFICULT TO OBTAIN	DVDQ 294
C	BECAUSE THE DERIVATIVES HAVE SO FEW SIGNIFICANT DIGITS.)	DVDQ 295
C		DVDQ 296
C	ON IBM360, KQMAX WILL = 16, RND = $8.88D-16$, KBIT2 = 108	DVDQ 297
C	ON CDC6600, KQMAX WILL = 14, RND = $2.84E-14$, KBIT2 = 98	DVDQ 298
C	ON UNIVAC 1108, KQMAX WILL = 18, RND = $6.94D-18$, KBIT2 = 122	DVDQ 299
C		DVDQ 300
C		DVDQ 301
C	KMAXO=4	DVDQ 302
C	KMAXO IS THE MAXIMUM ORDER DIFFERENTIAL EQUATION THIS	DVDQ 303
C	IMPLEMENTATION WILL INTEGRATE.	DVDQ 304
C		DVDQ 305
	FAC(1)=1.	DVDQ 306
	FAC(2)=FAC(1)/2.	DVDQ 307
	FAC(3)=FAC(2)/3.	DVDQ 308
	TWO=2.	DVDQ 309
	P1=.1	DVDQ 310
	P01=.01	DVDQ 311
	P25=.25	DVDQ 312
	P5=.5	DVDQ 313
	P75=.75	DVDQ 314
	P075=.075	DVDQ 315
	ONEP1=1.1	DVDQ 316
	PT(1)=1.	DVDQ 317
	KM=KQMAX+1	DVDQ 318
	DO 16 I=1, KM	DVDQ 319
	PT(I+1)=2.*PT(I)	DVDQ 320
16	CONTINUE	DVDQ 321
		DVDQ 322
C	COMPUTE GAS AND GAM	DVDQ 323
C		DVDQ 324
C	GAS(I) IS THE I-TH ADAMS-MOULTON CORRECTOR COEFFICIENT AND	DVDQ 325
C	GAM(I,J) IS THE I-TH ADAMS-FALKNER PREDICTOR COEFFICIENT	DVDQ 326
C	FOR INTEGRATING J-TH ORDER DIFFERENTIAL EQUATIONS,	DVDQ 327
C	I = 1,2,...,KQMAX+1, J = 1,2,...,KMAXO.	DVDQ 328
C		DVDQ 329
	KMD=KM+KMAXO	DVDQ 330
	DO 20 K=1, KMD	DVDQ 331
	S=K	DVDQ 332
	D(K)=1./S	DVDQ 333
20	CONTINUE	DVDQ 334
	GAM(1,1)=D(1)	DVDQ 335
	DO 22 J=2, KMAXO	DVDQ 336
	GAM(1,J)=D(J)*FAC(J-1)	DVDQ 337
22	CONTINUE	DVDQ 338
	DO 26 I=2, KM	DVDQ 339
	KK=KMD+1-I	DVDQ 340
	DO 24 K=1, KK	DVDQ 341
	S=I-1	DVDQ 342
	D(K)=D(K)-D(K+1)/S	DVDQ 343

24	CONTINUE	DVDQ 344
	GAM(I,1)=D(1)	DVDQ 345
	DO 26 J=2,KMAXO	DVDQ 346
	GAM(I,J)=D(J)*FAC(J-1)	DVDQ 347
26	CONTINUE	DVDQ 348
	GAS(1)=1.	DVDQ 349
	DO 28 I=2,KM	DVDQ 350
	GAS(I)=GAM(I,1)-GAM(I-1,1)	DVDQ 351
28	CONTINUE	DVDQ 352
C		DVDQ 353
C	GENERATE ETA	DVDQ 354
C		DVDQ 355
C	ETA(I,J), I=1,2,...,J IS USED IN THE FIRST MODIFICATION OF THE	DVDQ 356
C	I-TH DIFFERENCE OF A J-TH ORDER METHOD AFTER THE STEPSIZE IS	DVDQ 357
C	HALVED.	DVDQ 358
C	ETA(I,J), J=1,2,...,I-1 IS USED IN THE SECOND MODIFICATION OF	DVDQ 359
C	THE (J+1)-ST DIFFERENCE OF AN I-TH ORDER METHOD	DVDQ 360
C		DVDQ 361
	K=KQMAX-1	DVDQ 362
	EIGHTH=FAC(2)*FAC(2)*FAC(2)	DVDQ 363
	ETA(1,1)=EIGHTH	DVDQ 364
	ETA(2,1)=EIGHTH	DVDQ 365
	TP=FAC(2)*FAC(2)	DVDQ 366
	DO 33 J=2,K	DVDQ 367
	TP=TP/2.	DVDQ 368
	ETA(J,J)=(TP+ETA(J-1,J-1))/2.	DVDQ 369
	IF(J.EQ.2) GO TO 32	DVDQ 370
	JM2=J-2	DVDQ 371
	DO 38 IB=1,JM2	DVDQ 372
	I=J-IB	DVDQ 373
	ETA(I,J)=(ETA(I+1,J)+ETA(I-1,J-1))/2.	DVDQ 374
30	CONTINUE	DVDQ 375
32	ETA(1,J)=ETA(2,J)/2.	DVDQ 376
33	CONTINUE	DVDQ 377
	DO 34 I=1,K	DVDQ 378
	TP=0.	DVDQ 379
	DO 34 J=1,I	DVDQ 380
	TP=TP+ETA(J,I)	DVDQ 381
	ETA(I+1,J)=TP	DVDQ 382
34	CONTINUE	DVDQ 383
	TP=FAC(2)	DVDQ 384
	DO 36 J=1,K	DVDQ 385
	TP=TP/2.	DVDQ 386
	D(J)=ETA(J+1,J)+TP	DVDQ 387
36	CONTINUE	DVDQ 388
	DO 38 J=1,K	DVDQ 389
	DO 38 I=1,J	DVDQ 390
	ETA(I,J)=ETA(I,J)/D(J)	DVDQ 391
38	CONTINUE	DVDQ 392
	KM1=K-1	DVDQ 393
	DO 40 J=1,KM1	DVDQ 394
	D(J)=D(J+1)/D(J)	DVDQ 395
40	CONTINUE	DVDQ 396
	DO 42 I=2,KM1	DVDQ 397
	DO 42 J=1,I	DVDQ 398
	ETA(I+1,J)=-ETA(I+2,J)+ETA(I+1,J)*D(I)	DVDQ 399
42	CONTINUE	DVDQ 400
	TP=EIGHTH	DVDQ 401
	DO 46 I=2,KM1	DVDQ 402
	TP=TP/2.	DVDQ 403

	S=TP	DVDQ 404
	DO 44 J=1,I	DVDQ 405
	S=S+ETA(I+1,J)	DVDQ 406
44	CONTINUE	DVDQ 407
	IM1=I-1	DVDQ 408
	DO 46 J=1,IM1	DVDQ 409
	ETA(I,J)=ETA(I+1,J)/S	DVDQ 410
46	CONTINUE	DVDQ 411
C		DVDQ 412
C	INITIALIZE VARIABLES	DVDQ 413
C		DVDQ 414
50	PTS1=PT(1)	DVDQ 415
	PTS2=PT(2)	DVDQ 416
	PTS3=PT(3)	DVDQ 417
	PTS4=PT(4)	DVDQ 418
	PTS5=PT(5)	DVDQ 419
	LGSS=0	DVDQ 420
	LGSD=0	DVDQ 421
	LGSE=0	DVDQ 422
	LFD=0	DVDQ 423
	E2HAVE=0.	DVDQ 424
	E2HMAX=0.	DVDQ 425
	DO 52 I=1,KMD	DVDQ 426
	DD(I)=0.	DVDQ 427
52	CONTINUE	DVDQ 428
	KSTEP=-1	DVDQ 429
	NE=NEQ	DVDQ 430
	IF (NE.LE.0) GO TO 1190	DVDQ 431
	HH=H	DVDQ 432
	NV=0	DVDQ 433
	KDMAX=0	DVDQ 434
	DO 56 J=1,NE	DVDQ 435
	KQ(J)=1	DVDQ 436
	DO 54 I=1,KQMAX	DVDQ 437
	DT(I,J)=0.	DVDQ 438
54	CONTINUE	DVDQ 439
	KDD=KD(J)	DVDQ 440
	IF ((KDD.EQ.0).OR.(KDD.GT.KMAX0)) HH=0.	DVDQ 441
	IF (KDD.GT.KDMAX) KDMAX=KDD	DVDQ 442
	NV=NV+KDD	DVDQ 443
56	CONTINUE	DVDQ 444
C		DVDQ 445
	IF ((TPRINT*HH).LE.0.) GO TO 1190	DVDQ 446
	ERRMX=P1	DVDQ 447
	ERND=0.	DVDQ 448
	EMAX=ERND	DVDQ 449
	RNDC=RND*P25	DVDQ 450
	LDOUB=0	DVDQ 451
	E2HFAC=P25	DVDQ 452
	LSC=8	DVDQ 453
	LSTC=4	DVDQ 454
C	LSC AND LSTC ARE USED IN COMBINATION AS FOLLOWS	DVDQ 455
C	LSTC=4, LSC=4	DVDQ 456
C	FIRST TIME THROUGH THE FIRST STEP	DVDQ 457
C	LSTC=3, LSC=4	DVDQ 458
C	SECCND TIME THROUGH THE FIRST STEP	DVDQ 459
C	(NECESSARY TO CHECK STABILITY)	DVDQ 460
C	LSTC=2, LSC=4	DVDQ 461
C	THIRD TIME THROUGH THE FIRST STEP	DVDQ 462
C	(ONLY OCCURS IF INSTABILITY POSSIBLE)	DVDQ 463
C	LSTC=2, LSC=2	DVDQ 464
C	SECCND STEP (IF KQ(I)=2, I=1,...,NEQ)	DVDQ 465
C	LSTC=1, LSC=0	DVDQ 466
C	STARTING, ONE DERIVATIVE EVAL. PER STEP.	DVDQ 467
C	LSTC=1, LSC.GT.0	DVDQ 468
C	SET WHEN STARTING TWO DERIV. EVAL. PER STEP	DVDQ 469

C	LSTC=-1 LSC.LT.0 SET WHEN HALVING THE STEPSIZE	DVDQ 464
C	IN THE LAST TWO CASES LSC IS SET EQUAL TO LSTC*(MAXIMUM KQ(I)	DVDQ 465
C	+1). AT THE END OF EACH STEP IF LSC.NE.0 IT IS REPLACED BY	DVDQ 466
C	LSC-LSTC UNTIL LSC=0, AT WHICH TIME LSTC IS SET EQUAL TO 0.	DVDQ 467
C	WHEN DOUBLING H, LSTC IS SET EQUAL TO -1 AND LSC TO -3.	DVDQ 468
C	UNDER CERTAIN CONDITIONS WHEN KQ(I)=1, LSTC IS SET =-1 AND LSC=-5	DVDQ 469
C		DVDQ 470
	KSOUT=MXSTEP	DVDQ 471
	TOUT=T	DVDQ 472
	IFL=13	DVDQ 473
	IFLAG=1	DVDQ 474
	NGA=0	DVDQ 475
	NEVAL=0	DVDQ 476
	IF(NG.NE.0) GO TO 1420	DVDQ 477
	GO TO 315	DVDQ 478
C	END OF INITIALIZATION	DVDQ 479
C		DVDQ 480
C		DVDQ 481
C	ENTRY WITH IFLAG.GT.0	DVDQ 482
C		DVDQ 483
C	CHECK FOR GSTOPS	DVDQ 484
C		DVDQ 485
	60 IF(NG.EQ.NGA) GO TO 65	DVDQ 486
	IF(NG.LT.0) GO TO 1190	DVDQ 487
	NGA=NG	DVDQ 488
	LGSS=-NGA	DVDQ 489
	LGSD=0	DVDQ 490
	LGSE=0	DVDQ 491
	IFLG=-20	DVDQ 492
C		DVDQ 493
C		DVDQ 494
	65 IF (IFL.LT.2) GO TO 320	DVDQ 495
	IF (IFL.EQ.2) GO TO 80	DVDQ 496
	IF (IFL.GT.5) GO TO 1180	DVDQ 497
C		DVDQ 498
C	SET STEP STOP	DVDQ 499
	KSOUT=KSTEP+MXSTEP	DVDQ 500
	IF (IFL.EQ.5) GO TO 210	DVDQ 501
	IF (IFL.EQ.4) GO TO 1210	DVDQ 502
C		DVDQ 503
C	SET PRINT STOP	DVDQ 504
	70 TOUT=T+TPRI #T	DVDQ 505
C		DVDQ 506
	75 TPS1=ABS(AMOD((TOUT-T)/MH,TWO)-PTS1)	DVDQ 507
	LFD=-1	DVDQ 508
	IF (TPS1.GE.P5) LFD=1	DVDQ 509
C		DVDQ 510
C	LFD IS USED TO INDICATE WHETHER DOUBLING H IS PERMITTED.	DVDQ 511
C	IF LFD.LT.0 AT THE END OF A STEP THEN DOUBLING H IS	DVDQ 512
C	NOT PERMITTED. THE SIGN OF LFD IS CHANGED JUST BEFORE THE	DVDQ 513
C	END OF EACH STEP. IF TPRINT=H*(POWER OF 2) THEN	DVDQ 514
C	OUTPUT VALUES WILL BE OBTAINED WITHOUT INTERPOLATION.	DVDQ 515
C		DVDQ 516
	GO TO 200	DVDQ 517
C		DVDQ 518
C		DVDQ 519
C	ENTRY WITH IFLAG=2	DVDQ 520
C		DVDQ 521
C	UPDATE DIFFERENCE TABLE	DVDQ 522
C	AND COMPUTE KQM=MAXIMUM VALUE OF <Q(I), I=1,2,...,NEQ.	DVDQ 523

C		DVDQ 524
	80 KQM=0	DVDQ 525
	DO 90 I=1,NE	DVDQ 526
	KQQ=KQ(I)	DVDQ 527
	IF (KQQ.GT.KQM) KQM=KQQ	DVDQ 528
	D(1)=F(I)	DVDQ 529
	DO 85 K=1,KQQ	DVDQ 530
	D(K+1)=D(K)-DT(K,I)	DVDQ 531
	DT(K,I)=D(K)	DVDQ 532
	85 CONTINUE	DVDQ 533
	DT(KQQ+1,I)=D(KQQ+1)	DVDQ 534
	90 CONTINUE	DVDQ 535
C	END OF UPDATING DIFFERENCE TABLE	DVDQ 536
C		DVDQ 537
C	STORE Y(J) IN YN(J)	DVDQ 538
	DO 95 J=1,NV	DVDQ 539
	YN(J)=Y(J)	DVDQ 540
	95 CONTINUE	DVDQ 541
C		DVDQ 542
	LFD=-LFD	DVDQ 543
	TL=T	DVDQ 544
	KSTEP=KSTEP+1	DVDQ 545
C		DVDQ 546
	IF (LGSS) 1430,110,1510	DVDQ 547
100	IFLAG=2	DVDQ 548
110	IF (LSC.EQ.0) GO TO 140	DVDQ 549
	LSC=LSC-LSTC	DVDQ 550
	IF (LSC.EQ.0) GO TO 130	DVDQ 551
	IF (LSTC.NE.(-1)) GO TO 140	DVDQ 552
	IF (LDOUB.LT.0) RNCC=RND*P1	DVDQ 553
120	E2HAVE=E2HM /X	DVDQ 554
	TPS1=PTS1	DVDQ 555
	GO TO 190	DVDQ 556
130	IF (ABS(HH).LT.HMIN) GO TO 1000	DVDQ 557
	LSTC=0	DVDQ 558
140	IF (LDOUB.NE.1) GO TO 150	DVDQ 559
	IF ((LFD.GT.0).AND.(ABS(HH+HH).LE.HMAX)) GO TO 1030	DVDQ 560
	GO TO 200	DVDQ 561
150	RQMAX=PTS1/FLOAT(KQM+3)	DVDQ 562
	IF ((LSTC.NE.0).OR.(E2HAVE.EQ.0.)) GO TO 120	DVDQ 563
	TPS1=E2HMAX/E2HAVE	DVDQ 564
	IF (TPS1-PTS1) 160,190,170	DVDQ 565
160	E2HFAC=AMIN1(P075,E2HFAC-RQMAX,E2HFAC*TPS1)	DVDQ 566
	GO TO 180	DVDQ 567
170	TPS1=TPS1*TPS1	DVDQ 568
	E2HFAC=AMIN1(PTS1,E2HFAC*TPS1)	DVDQ 569
180	RNDC=(ONEP1-E2HFAC)*RND	DVDQ 570
	E2HAVE=P5*(E2HMAX+E2HAVE)	DVDQ 571
190	ERRMX=AMAX1(P1,ERRMX-RQMAX*TPS1)	DVDQ 572
C	E2HFAC IS A FACTOR WHICH IS TAKEN TIMES AN INITIAL ESTIMATE OF	DVDQ 573
C	E2H TO GET A FINAL VALUE OF E2H. (E2H=ESTIMATE OF WHAT	DVDQ 574
C	(ESTIMATED ERROR)/(REQUESTED ERROR) WOULD BE IF H WERE	DVDQ 575
C	DOUBLED.)	DVDQ 576
C	E2HMAX IS THE MAXIMUM VALUE OF THE INITIAL ESTIMATE OF E2H OVER	DVDQ 577
C	ALL COMPONENTS WITH KQ(I).GT.1.	DVDQ 578
C	E2HAVE IS A WEIGHTED AVERAGE OF PAST VALUES OF E2HMAX.	DVDQ 579
C	THE VALUE OF E2HFAC TENDS TO BE SMALLER WHEN E2HMAX IS	DVDQ 580
C	CONSISTANTLY SMALLER THAN E2HAVE.	DVDQ 581
C		DVDQ 582
C		DVDQ 583

C	CHECK FOR PRINT STCP AND FOR T REACHING TFINAL	DVDQ 584
200	TPD=(TOUT-TL)/HH	DVDQ 585
	TPD1=(TFINAL-TL)/HH	DVDQ 586
C		DVDQ 587
	IF (LGSE.LT.0) GO TO 1780	DVDQ 588
	IF (TPD1.LT.FAC(1)) GO TO 1220	DVDQ 589
	IF (TPD.LE.0.) GO TO 1280	DVDQ 590
C		DVDQ 591
C	CHECK FOR STEP STOP	DVDQ 592
	IF (KSOUT.GT.KSTEP) GO TO 210	DVDQ 593
C		DVDQ 594
	IFL=5	DVDQ 595
	GO TO 310	DVDQ 596
C		DVDQ 597
C	CHECK TO SEE IF ROUND-OFF ERROR IS PROMINENT	DVDQ 598
210	IF (EMAX.EQ.ERND) GO TO 220	DVDQ 599
C	IT IS	DVDQ 600
	IFL=6	DVDQ 601
	IF (EMAX.GE.P1) GO TO 310	DVDQ 602
	IF ((LSTC.GE.0).OR.(LDOUB.EQ.1)) ERRMX=PTS1	DVDQ 603
C		DVDQ 604
220	IFL=1	DVDQ 605
230	T=TL+HH	DVDQ 606
C		DVDQ 607
C	START A NEW STEP	DVDQ 608
C		DVDQ 609
C	PREDICT	DVDQ 610
240	J=0	DVDQ 611
	DO 290 I=1,NE	DVDQ 612
	KDD=KD(I)	DVDQ 613
	KDC=KDD	DVDQ 614
250	KQQ=KQ(I)	DVDQ 615
	TPD=0.	DVDQ 616
	K=KDC	DVDQ 617
260	TPD=TPD+DT(KQQ,I)*GAM(KQQ,KDC)	DVDQ 618
	KQQ=KQQ-1	DVDQ 619
	IF (KQQ.GT.0) GO TO 260	DVDQ 620
270	K=K-1	DVDQ 621
	IF (K.LE.0) GO TO 280	DVDQ 622
	L=J+K	DVDQ 623
	TPD=YN(L+1)*FAC(K)+HH*TPD	DVDQ 624
	GO TO 270	DVDQ 625
280	J=J+1	DVDQ 626
	Y(J)=YN(J)+HH*TPD	DVDQ 627
	KDC=KDC-1	DVDQ 628
	IF (KDC.GT.0) GO TO 250	DVDQ 629
290	CONTINUE	DVDQ 630
C	END OF PREDICT	DVDQ 631
C		DVDQ 632
	IF (IFL) 1240,320,300	DVDQ 633
300	IF (LGSD.NE.0) GO TO 1520	DVDQ 634
C		DVDQ 635
310	IFLAG=IFL	DVDQ 636
315	IF (IFLAG.LE.2) NEVAL=NEVAL+1	DVDQ 637
C		DVDQ 638
	RETURN	DVDQ 639
C		DVDQ 640
C		DVDQ 641
C	ENTRY WITH IFLAG=1	DVDQ 642
320	ERND=0.	DVDQ 643

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EMAX=0.
E2HMAX=0.
J=0
IF (LDOUB.GE.0) LDOUB=1
C
C   LDOUB IS SET IN THE LOOP BELOW AS FOLLOWS
C   LDOUB=0   HALVE
C   LDOUB=1   DOUBLE
C   LDOUB=2   DO NOT DOUBLE
C
C   LDOUB.LT.0 AT THE BEGINNING OF THE LOOP INDICATES THE FOLLOWING
C   --3  STEPSIZE HAS JUST BEEN HALVED. IF A DISCONTINUITY IS
C       NOT INDICATED MODIFY THE DIFFERENCE TABLE AND REPEAT
C       THE STEP.
C   --2  STEP AFTER LDOUB=-3. PROCEED AS USUAL (ORDER IS NOT
C       CHANGED)
C   --1  STEP AFTER LDOUB=-2. MODIFY THE DIFFERENCE TABLE ONCE
C       AGAIN AND REPEAT THE STEP.
C   IF LDOUB IS SET EQUAL TO -4 THE ORDER IN AT LEAST ONE COMPONENT
C   HAS BEEN GREATLY REDUCED AND THE STEP IS REPEATED.
C
C   BEGINNING OF LOOP FOR CORRECTING, ESTIMATING THE ERROR,
C   AND ADJUSTING THE NUMBER OF DIFFERENCES USED
C
DO 790 I=1,NE
  KDD=KD(I)
  KQQ=KQ(I)
  C   KQQ GIVES THE ORDER OF THE PREDICTOR FORMULA AND KQQ+1 THE
  C   ORDER OF THE CORRECTOR FORMULA.
  C
  KQ1=KQQ+1
  D(1)=F(I)
  C   FORM THE DIFFERENCE TABLE FROM PREDICTED DERIVATIVE VALUES.
  DO 330 K=1,KQ1
    D(K+1)=D(K)-DT(K,I)
  330 CONTINUE
  C   D(K) GIVES THE (K-1)-ST DIFFERENCE FORMED FROM PREDICTED
  C   DERIVATIVE VALUES
  TPS3=ABS(D(KQQ+1))
  IF (LDOUB.LT.0) GO TO 720
  C
  340 IF (KQQ.NE.1) GO TO 520
  C
  KQ(I)=1 IS TREATED AS A SPECIAL CASE
  E2H=PTS2
  TPS5=DT(3,I)
  IF (LSTC.LT.2) GO TO 370
  C   FIRST STEP OF INTEGRATION
  IF (LSTC.NE.4) GO TO 350
  TPS4=0.
  IF (KDD.GT.1) TPS3=AMAX1(TPS3,ABS(HH*D(1)))
  TPS3=TPS3*P1
  GO TO 510
  350 DT(2,I)=D(2)
    D(2)=D(1)-DT(5,I)
    TPS2=-D(2)
    TPS3=PTS5*ABS(TPS2)
  C   FIRST STEP THAT KQ(I)=1
  360 DT(7,I)=PT(4)

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DVDQ 644
DVDQ 645
DVDQ 646
DVDQ 647
DVDQ 648
DVDQ 649
DVDQ 650
DVDQ 651
DVDQ 652
DVDQ 653
DVDQ 654
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DVDQ 696
DVDQ 697
DVDQ 698
DVDQ 699
DVDQ 700
DVDQ 701
DVDQ 702
DVDQ 703

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	IF (LSTC-2) 420,380,380	DVDQ 704
370	IF (TPS5.EQ.0.) GO TO 360	DVDQ 705
	IF (DT(6,I).EQ.0.) GO TO 400	DVDQ 706
	TPS2=DT(5,I)-DT(1,I)	DVDQ 707
380	TPS4=DT(4,I)	DVDQ 708
	TPS1=ABS(TPS4)	DVDQ 709
	TPS4=TPS2*SIGN(PTS2,TPS4)-TPS5*TPS1	DVDQ 710
	IF (TPS4.GT.(-TPS1)) GO TO 410	DVDQ 711
390	TPS6=-PTS1	DVDQ 712
	GO TO 450	DVDQ 713
C	FIRST STEP AFTER THE STEPSIZE HAS BEEN CHANGED	DVDQ 714
400	DT(6,I)=PT(1)	DVDQ 715
	TPS6=0.	DVDQ 716
	GO TO 450	DVDQ 717
410	IF (TPS4.LT.TPS1) GO TO 440	DVDQ 718
	IF (TPS1.EQ.0.) GO TO 390	DVDQ 719
420	TPS6=PTS1	DVDQ 720
	GO TO 450	DVDQ 721
430	KQ(I)=2	DVDQ 722
	IF (2-LSTC) 510,510,520	DVDQ 723
440	TPS6=TPS4/TPS1	DVDQ 724
450	TPS4=TPS5+TPS6	DVDQ 725
	IF (TPS4.LT.P25) GO TO 430	DVDQ 726
C	INCREASE E2H IF (-S).GT..25	DVDQ 727
	E2H=PTS4*TPS4	DVDQ 728
	IF (2-LSTC) 460,470,480	DVDQ 729
460	LSC=0	DVDQ 730
	GO TO 510	DVDQ 731
470	IF (TPS5-P25) 430,460,460	DVDQ 732
480	IF (TPS4.GT.PTS2) GO TO 490	DVDQ 733
	IF (TPS4.GT.P5) D(2)=D(2)*GAM(2,1)	DVDQ 734
	GO TO 510	DVDQ 735
490	IF (TPS4.LT.PTS4) GO TO 500	DVDQ 736
	TPS4=PTS4	DVDQ 737
	D(2)=D(2)/PT(3)	DVDQ 738
C	THE ESTIMATE OF E (AND HENCE OF E2H) IS INCREASED IF (-S).GE.8.	DVDQ 739
	TPS3=TPS3*DT(7,I)	DVDQ 740
	GO TO 510	DVDQ 741
500	D(2)=D(2)*(PTS2+(TPS4-PTS1)/(TPS4*TPS4))	DVDQ 742
	IF (TPS4.GE.3.) E2H=E2H*DT(7,I)	DVDQ 743
C	STORE D(1)=PREDICTED DERIVATIVE AND D(2)=2*(CORRECTED Y -	DVDQ 744
C	PREDICTED Y)/H D(1) AND D(2) ARE USED TO COMPUTE (-S) ON	DVDQ 745
C	THE NEXT STEP.	DVDQ 746
510	DT(5,I)=D(1)	DVDQ 747
	DT(4,I)=D(2)	DVDQ 748
	D(4)=TPS4	DVDQ 749
C	STORE D(4)= CURRENT ESTIMATE OF (-S). (-S).GT.3 IS AN INDICATION	DVDQ 750
C	THAT THE STEPSIZE SHOULD BE LIMITED BECAUSE OF STABILITY PROBLEMS.	DVDQ 751
C	S=H*(ESTIMATE OF EIGENVALUE OF F)=H*(DIFFERENCE BETWEEN PREDICTED	DVDQ 752
C	AND CORRECTED DERIVATIVE VALUES)/(DIFFERENCE BETWEEN PREDICTED	DVDQ 753
C	AND CORRECTED INTEGRALS OF THE DERIVATIVE VALUES)	DVDQ 754
C	THE TREATMENT OF THE CASE KQ(I)=1 COULD BE IMPROVED BY USING A	DVDQ 755
C	SPECIAL METHOD FOR STIFF EQUATIONS WHEN (-S).GT.3 (MAYBE).	DVDQ 756
C	(THE ENTIRE TREATMENT OF THE CASE KQ(I)=1 IS FAR FROM IDEAL.)	DVDQ 757
	DT(3,I)=D(4)	DVDQ 758
C		DVDQ 759
C	CORRECT	DVDQ 760
520	KDC=0	DVDQ 761
	TPD=D(KQ1)	DVDQ 762
	J=J+KDD	DVDQ 763

	K=J	DVDQ 764
530	TPD=HH*TPD	DVDQ 765
	KDC=KDC+1	DVDQ 766
	Y(K)=Y(K)+GAM(KQQ+1,KDC)*TPD	DVDQ 767
	K=K-1	DVDQ 768
	IF (KDC.LT.KDD) GO TO 530	DVDQ 769
C	END OF CORRECT	DVDQ 770
C		DVDQ 771
	IF (EPS(I).NE.0.) GO TO 560	DVDQ 772
550	IF (HMAX) 1190,780,1190	DVDQ 773
560	TPS4=ABS(D(KQQ+2))	DVDQ 774
	TPS2=ABS(D(KQQ))	DVDQ 775
	TPS6=HH/EPS(I)	DVDQ 776
C		DVDQ 777
	E=ABS(GAS(KQQ+1)*TPS3*TPS6)	DVDQ 778
C	E GIVES ABS((ESTIMATED ERROR)/EPS(I))	DVDQ 779
C		DVDQ 780
	LRND=1	DVDQ 781
C		DVDQ 782
C	LRND= 1 MEANS NO ROUND-OFF ERROR	DVDQ 783
C	= 0 MEANS SCME ROUND-OFF ERROR	DVDQ 784
C	=-1 MEANS EXTREME ROUND-OFF ERROR	DVDQ 785
C		DVDQ 786
	FRND=RNDC*ABS(PT(KQQ+2)*D(1))	DVDQ 787
C	CHECK TO SEE IF ROUND OFF ERROR IS DOMINANT	DVDQ 788
	IF ((TPS3+TPS4).GT.FRND) GO TO 570	DVDQ 789
	LRND=0	DVDQ 790
	IF ((TPS4*TPS2).LT.FRND) LRND=-1	DVDQ 791
C		DVDQ 792
570	IF (E.LE.ERND) GO TO 590	DVDQ 793
	IF (E.LE.EMAX) GO TO 580	DVDQ 794
	EMAX=E	DVDQ 795
	KEMAX=I	DVDQ 796
580	IF (LRND.LE.0) GO TO 590	DVDQ 797
	ERND=E	DVDQ 798
	IF (ERND.GT.ERRMX) LDOUB=0	DVDQ 799
590	IF (LDOUB.LE.0) GO TO 780	DVDQ 800
	TPS1=ABS(D(KQQ))	DVDQ 801
	TPS5=TPS1	DVDQ 802
	IF (KQQ-2) 600,610,620	DVDQ 803
600	E2H=E*E2H	DVDQ 804
	IF (E2H.LT.P01) GO TO 780	DVDQ 805
	IF (D(4).LT.3.) GO TO 770	DVDQ 806
	LSTC=-1	DVDQ 807
	LSC=-5	DVDQ 808
	GO TO 770	DVDQ 809
610	TPS1=TPS2	DVDQ 810
	IF (LSTC.NE.2) GO TO 620	DVDQ 811
	KQ(I)=3	DVDQ 812
	TPS2=0.	DVDQ 813
	TPS4=0.	DVDQ 814
	LRND=0	DVDQ 815
620	E2H=TPS2+TPS3+TPS4	DVDQ 816
	E2H=ABS(GAS(KQQ-1)*PT(KQQ+1)*E2H*TPS6)	DVDQ 817
C	E2H IS USED AS AN ESTIMATE OF WHAT THE VALUE OF E WOULD BE	DVDQ 818
C	IF H WERE DOUBLED. THE ESTIMATE IS CONSERVATIVELY LARGE.	DVDQ 819
	IF (E2H.GT.E2HMAX) E2HMAX=E2H	DVDQ 820
C		DVDQ 821
	IF (LRND) 630,640,660	DVDQ 822
C	EXTREME ROUND-OFF ERROR--REDUCE E2H	DVDQ 823

630	K=(KBIT2/KQQ)-4	DVDQ 824
	IF (K.LE.3) GO TO 640	DVDQ 825
	IF (K.GT.KQMAX) K=KQMA	DVDQ 826
	E2H=E2H/PT(K+1)	DVDQ 827
	GO TO 650	DVDQ 828
640	E2H=AMIN1(E2H,E2H*3.*E2HFAC)	DVDQ 829
650	E2H=E2H*P1	DVDQ 830
	TPS6=PTS4	DVDQ 831
	GO TO 670	DVDQ 832
C		DVDQ 833
660	E2H=E2H*E2HFAC	DVDQ 834
	TPS6=KQQ+2	DVDQ 835
C	TEST TO SEE IF DIFFERENCES DECREASE MORE RAPIDLY THAN NECESSARY	DVDQ 836
C		DVDQ 837
670	IF (TPS5.LT.(TPS3*TPS6)) GO TO 680	DVDQ 838
	IF (TPS2.LE.(TPS4*TPS6)) GO TO 760	DVDQ 839
C	THEY DO INCREASE KQ(I)	DVDQ 840
	IF (KQQ.NE.KQMAX) KQ(I)=KQ1	DVDQ 841
	GO TO 760	DVDQ 842
C		DVDQ 843
C	TEST TO SEE IF DIFFERENCES DECREASE TOO SLOWLY	DVDQ 844
680	TPS6=TPS6*P25	DVDQ 845
	IF ((TPS1.GT.(TPS3*TPS6)).OR.(TPS2.GT.(TPS4*TPS6))) GO TO 760	DVDQ 846
C	THEY DO	DVDQ 847
	IF (LSTC.LE.0) GO TO 750	DVDQ 848
	IF (E2H.LT.P01) GO TO 750	DVDQ 849
	IF (LSC-LSTC) 690,750,770	DVDQ 850
690	IF (KSTEP-4) 750,700,710	DVDQ 851
700	KQ1=LSTC	DVDQ 852
710	LSC=KQ1	DVDQ 853
C	END OF ONE DERIVATIVE EVALUATION PER STEP	DVDQ 854
	GO TO 770	DVDQ 855
C		DVDQ 856
C	AFTER HALVING H. REDUCE KQ(I) IF A DISCONTINUITY HAS OCCURRED.	DVDQ 857
720	IF (LDOUB.EQ.(-2)) GO TO 340	DVDQ 858
	DT(KQQ+1,I)=D(KQQ+1)	DVDQ 859
	IF (LDOUB.EQ.(-1)) DT(KQQ+1,I)=D(KQQ+2)	DVDQ 860
	K=KQQ	DVDQ 861
730	IF (K.EQ.1) GO TO 740	DVDQ 862
	IF ((ABS(D(K-1)).GT.(PT(2)*ABS(D(K+1))))).OR.	DVDQ 863
1	(ABS(D(K)).GT.(PT(2)*ABS(D(K+2)))) GO TO 740	DVDQ 864
	K=K-1	DVDQ 865
	GO TO 730	DVDQ 866
740	IF ((K+K).GE.KQQ) GO TO 780	DVDQ 867
	LDOUB=-4	DVDQ 868
	E2H=0.	DVDQ 869
	KQQ=K+1	DVDQ 870
C		DVDQ 871
C		DVDQ 872
C	DIFFERENCES DECREASE TOO SLOWLY REDUCE KQ(I).	DVDQ 873
750	KQ(I)=KQQ-1	DVDQ 874
	IF (KQQ.EQ.2) DT(3,I)=0.	DVDQ 875
760	IF (E2H.LT.P01) GO TO 780	DVDQ 876
770	LDOUB=2	DVDQ 877
780	CONTINUE	DVDQ 878
C		DVDQ 879
C		DVDQ 880
790	CONTINUE	DVDQ 881
C		DVDQ 882
C	END OF LOOP FOR CORRECTING, ESTIMATING THE ERROR, ETC.	DVDQ 883

C		DVDQ 884
C		DVDQ 885
	IF (IFL.LT.0) GO TO 1250	DVDQ 886
C	TEST FOR HALVING H	DVDQ 887
	IF (LDOUB) 800,950,870	DVDQ 888
800	LDOUB=LDOUB+1	DVDQ 889
	IF (LDOUB+1) 810,870,820	DVDQ 890
810	IF (LDOUB.EQ.(-2)) GO TO 820	DVDQ 891
C	ORDER IN AT LEAST ONE COMPONENT HAS BEEN GREATLY REDUCED	DVDQ 892
	LDOUB=0	DVDQ 893
	GO TO 220	DVDQ 894
820	DO 860 I=1,NE	DVDQ 895
	KQQ=KQ(I)	DVDQ 896
	TP=DT(KQQ+1,I)	DVDQ 897
	IF (KQQ.LE.3) GO TO 860	DVDQ 898
	IF (LDOUB.NE.0) GO TO 840	DVDQ 899
	DO 830 K=3,KQQ	DVDQ 900
C	SECOND MODIFICATION OF DIFFERENCE TABLE AFTER HALVING H	DVDQ 901
	DT(K,I)=DT(K,I)+ETA(KQQ-1,K-2)*TP	DVDQ 902
830	CONTINUE	DVDQ 903
	GO TO 860	DVDQ 904
840	DO 850 K=2,KQQ	DVDQ 905
C	FIRST MODIFICATION OF DIFFERENCE TABLE AFTER HALVING H	DVDQ 906
	DT(K,I)=DT(K,I)+ETA(K-1,KQQ-1)*TP	DVDQ 907
850	CONTINUE	DVDQ 908
860	CONTINUE	DVDQ 909
	IFL=0	DVDQ 910
	GO TO 240	DVDQ 911
C		DVDQ 912
870	IFL=2	DVDQ 913
	IF (LSTC.LE.0) GO TO 300	DVDQ 914
	IF (2-LSTC) 880,900,940	DVDQ 915
880	LSTC=LSTC-1	DVDQ 916
	IF (LSTC.EQ.3) GO TO 890	DVDQ 917
	IF (LSC) 920,960,920	DVDQ 918
890	IFL=1	DVDQ 919
	GO TO 300	DVDQ 920
900	IF (LSC-2) 910,930,920	DVDQ 921
910	LSTC=0	DVDQ 922
920	LDOUB=2	DVDQ 923
	GO TO 80	DVDQ 924
930	LSTC=1	DVDQ 925
	LSC=0	DVDQ 926
	GO TO 80	DVDQ 927
940	IF (LSC) 300,80,300	DVDQ 928
C		DVDQ 929
C	HALVE H	DVDQ 930
950	HH=FAC(2)*HH	DVDQ 931
	IF (LSTC.LT.2) GO TO 990	DVDQ 932
	ERND=P25*ERND	DVDQ 933
C	IN LOOP TO FIND A NEW INITIAL STEPSIZE	DVDQ 934
	IF (ERND.GE.P1) GO TO 950	DVDQ 935
	LSTC=4	DVDQ 936
960	LSC=4	DVDQ 937
	DO 970 I=1,NE	DVDQ 938
	KQ(I)=1	DVDQ 939
970	CONTINUE	DVDQ 940
	IF (LSTC-3) 890,890,1170	DVDQ 941
C		DVDQ 942
C	ENTRY AFTER IFLAG=7	DVDQ 943

980	IF (LDOUB.EQ.0) GO TO 990	DVDQ 944
	LSC=1	DVDQ 945
	LSTC=1	DVDQ 946
	GC TO 140	DVDQ 947
C	TEST TO SEE IF H IS TOO SMALL FOR HALVING	DVDQ 948
990	IF (ABS(HH).GE.HMIN) GO TO 1040	DVDQ 949
	IF (IFL.EQ.7) GO TO 1010	DVDQ 950
1000	IFL=7	DVDQ 951
	GO TO 1020	DVDQ 952
C		DVDQ 953
1010	HH=HH+HH	DVDQ 954
	IFL=2	DVDQ 955
1020	H=HH	DVDQ 956
	GO TO 310	DVDQ 957
C		DVDQ 958
C		DVDQ 959
C	ERROR CRITERIA PERMIT DOUBLING	DVDQ 960
1030	HH=HH+HH	DVDQ 961
	IF (LSTC.EQ.1) GO TO 1050	DVDQ 962
	LSC=-3	DVDQ 963
1040	LSTC=-1	DVDQ 964
C		DVDQ 965
C	CHANGE THE STEPSIZE	DVDQ 966
1050	DO 1160 I=1,NE	DVDQ 967
	KQQ=KQ(I)	DVDQ 968
	IF (KQQ.NE.1) GO TO 1070	DVDQ 969
	DT(6,I)=0.	DVDQ 970
	D(3)=DT(3,I)*PT(2)	DVDQ 971
	IF (D(3).GT.PT(3)) LSC=-6	DVDQ 972
	IF (LDOUB.NE.0) GO TO 1060	DVDQ 973
	KQM=8	DVDQ 974
	IF (D(3).GE.PT(5)) DT(7,I)=DT(7,I)*PT(2)	DVDQ 975
	D(3)=D(3)/PT(3)	DVDQ 976
1060	DT(3,I)=D(3)	DVDQ 977
	GO TO 1160	DVDQ 978
C		DVDQ 979
C	BEGINNING OF LOOP FOR CHANGING DIFFERENCE TABLE TO	DVDQ 980
C	CORRESPOND TO NEW VALUE OF H	DVDQ 981
1070	DO 1080 K=1,KQQ	DVDQ 982
	D(K)=DT(K,I)/PT(K)	DVDQ 983
	IF (LDOUB.EQ.0) D(K)=D(K)/PT(K)	DVDQ 984
1080	CONTINUE	DVDQ 985
	KQQ2=KQQ-2	DVDQ 986
	IF (KQQ2) 1160,1140,1090	DVDQ 987
1090	DO 1130 J=1,KQQ2	DVDQ 988
	IF (LDOUB.NE.0) GO TO 1110	DVDQ 989
C		DVDQ 990
C	HALVE	DVDQ 991
	K=KQQ	DVDQ 992
1100	D(K-1)=D(K-1)+D(K)	DVDQ 993
	K=K-1	DVDQ 994
	IF (K+J-KQQ) 1130,1130,1100	DVDQ 995
C		DVDQ 996
C	DOUBLE	DVDQ 997
1110	DO 1120 K=J,KQQ2	DVDQ 998
	D(K+1)=D(K+1)-D(K+2)	DVDQ 999
1120	CONTINUE	DVDQ 1000
1130	CONTINUE	DVDQ 1001
C		DVDQ 1002
1140	DO 1150 K=2,KQQ	DVDQ 1003

	IF (LDOUB.NE.0) D(K)=D(K)*PT(K)	DVDQ1004
	DT(K,I)=D(K)*PT(K)	DVDQ1005
1150	CONTINUE	DVDQ1006
C	DIFFERENCE TABLE NOW CORRESPONDS TO NEW VALUE OF H	DVDQ1007
C		DVDQ1008
1160	CONTINUE	DVDQ1009
1170	H=HH	DVDQ1010
	IF (LDOUB.NE.0) GO TO 75	DVDQ1011
	LFD=1	DVDQ1012
	IF (LSTC.GE.0) GO TO 220	DVDQ1013
	LDOUB=-3	DVDQ1014
	LSC=LSTC-KQM	DVDQ1015
	GO TO 220	DVDQ1016
C	END OF CHANGING STEPSIZE	DVDQ1017
C		DVDQ1018
C		DVDQ1019
1180	K=IFL-5	DVDQ1020
	GO TO (220,980,1200,1570,1570,1720,1720,80,1480,1450,1630,1570), K	DVDQ1021
C		DVDQ1022
C	ILLEGAL VALUE OF PARAMETER INTEGRATION CAN NOT PROCEED	DVDQ1023
1190	IFL=8	DVDQ1024
	GO TO 310	DVDQ1025
1200	WRITE (6,4000)	DVDQ1026
4000	FORMAT (26HOIFLAG=8 IN CALL TO DVJQ1.)	DVDQ1027
	STOP	DVDQ1028
C		DVDQ1029
C		DVDQ1030
1210	IF (T-TFINAL) 200,1190,200	DVDQ1031
C		DVDQ1032
C		DVDQ1033
1220	IFL=4	DVDQ1034
	IF (KSTEP.NE.0) GO TO 1270	DVDQ1035
	TPD2=TPD	DVDQ1036
C	ESTIMATE ERROR WHEN EXTRAPOLATION FROM INITIAL POINT IS REQUESTED	DVDQ1037
1230	HH=HH*TPD1*P75	DVDQ1038
C		DVDQ1039
	IFLS=IFL	DVDQ1040
	IFL=-1	DVDQ1041
	GO TO 230	DVDQ1042
C		DVDQ1043
1240	IF ((LGSD.EQ.0).OR.(IFLS.NE.4)) GO TO 60	DVDQ1044
	LGSE=-1	DVDQ1045
	TPD=FAC(1)	DVDQ1046
	GO TO 1820	DVDQ1047
1250	HH=H	DVDQ1048
	IF (EMAX.LT.P01) GO TO 1260	DVDQ1049
C	ERROR IS TOO LARGE, REDUCE H AND REPEAT THE FIRST STEP	DVDQ1050
	IF (TPD1.LT.0.) GO TO 1190	DVDQ1051
	LDOUB=1	DVDQ1052
	ERND=FAC(1)/TPD1	DVDQ1053
	ERND=ERND*ERND*P25	DVDQ1054
	GO TO 950	DVDQ1055
C		DVDQ1056
1260	IFL=IFLS	DVDQ1057
	IF (IFL.NE.4) GO TO 1790	DVDQ1058
	TPD=TPD2	DVDQ1059
	IFLAG=3	DVDQ1060
1270	IF (TPD1.GT.TPD) GO TO 1280	DVDQ1061
	T=TFINAL	DVDQ1062
	TPD=TPD1	DVDQ1063

GO TO 1290	DVDQ1064
1280 T=TOUT	DVDQ1065
IFL=3	DVDQ1066
1290 IF ((TPD.EQ.0.).AND.(IFLAG.LE.2)) GO TO 310	DVDQ1067
C	DVDQ1068
C INTERPOLATE FOR CUTPUT	DVDQ1069
1300 TP=TPD	DVDQ1070
D(2)=TP	DVDQ1071
KQQ2=0	DVDQ1072
KDC=0	DVDQ1073
D(1)=PT(1)	DVDQ1074
DD(1)=PT(1)	DVDQ1075
DO 1310 K=2,KQM	DVDQ1076
DD(1)=DD(1)+PT(1)	DVDQ1077
TP=TP+PT(1)	DVDQ1078
D(K+1)=(D(K)*TP)/DD(1)	DVDQ1079
1310 CONTINUE	DVDQ1080
GO TO 1350	DVDQ1081
C	DVDQ1082
C COMPUTE THE INTERPOLATING INTEGRATION COEFFICIENTS	DVDQ1083
1320 KQQ2=1	DVDQ1084
L=KQM-KDC	DVDQ1085
KDC=KDC+1	DVDQ1086
1330 IF (L.LE.0) GO TO 1350	DVDQ1087
TP=0.	DVDQ1088
K=L	DVDQ1089
J=L+KDC	DVDQ1090
1340 JS=J-K	DVDQ1091
TP=TP+GAS(K)*D(JS+1)	DVDQ1092
K=K-1	DVDQ1093
IF (K.GT.0) GO TO 1340	DVDQ1094
D(J)=TP	DVDQ1095
C	DVDQ1096
C D(J) IS THE INTEGRATION COEFFICIENT FOR THE INTERPOLATION WHICH	DVDQ1097
C CORRESPONDS TO GAM(J-KDC,KDC).	DVDQ1098
C	DVDQ1099
L=L-1	DVDQ1100
GO TO 1330	DVDQ1101
C	DVDQ1102
C END OF COMPUTING INTEGRATION COEFFICIENTS	DVDQ1103
C	DVDQ1104
C PERFORM THE PARTIAL STEP INTEGRATION	DVDQ1105
1350 J=0	DVDQ1106
DO 1415 I=1,NE	DVDQ1107
KDD=KD(I)	DVDQ1108
IF (KDC.GT.KDD) GO TO 1410	DVDQ1109
TP=0.	DVDQ1110
KQQ=KQ(I)+KQQ2	DVDQ1111
1360 L=KQQ-KDC	DVDQ1112
IF (L.LE.0) GO TO 1370	DVDQ1113
TP=TP+D(KQQ)*DT(L,I)	DVDQ1114
KQQ=KQQ-1	DVDQ1115
IF (KQQ) 1390,1390,1360	DVDQ1116
1370 K=J+KDD	DVDQ1117
L=KDC	DVDQ1118
1380 L=L-1	DVDQ1119
IF (L.EQ.0) GO TO 1400	DVDQ1120
TP=TP*HH+YN(K)*FAC(L)*TPD	DVDQ1121
K=K-1	DVDQ1122
GO TO 1380	DVDQ1123
1390 F(I)=TP	

	GO TO 1415	DVDQ1124
1400	Y(K)=YN(K)+HH*TP	DVDQ1125
1410	J=J+KDD	DVDQ1126
1415	CONTINUE	DVDQ1127
	IF (KDC.NE.KDMAX) GO TO 1320	DVDQ1128
C	END OF PARTIAL STEP INTEGRATION	DVDQ1129
	IF (LGSE) 1800,310,1810	DVDQ1130
C		DVDQ1131
C	INITIALIZE FOR GSTOPS	DVDQ1132
1420	NGA=IABS(NG)	DVDQ1133
	LGSS=-NGA	DVDQ1134
	LGSD=0	DVDQ1135
	LGSE=0	DVDQ1136
	IFLG=-20	DVDQ1137
	IF (NG) 1425,315,315	DVDQ1138
1425	IFLG=-IFL	DVDQ1139
	IFLG=-IFL	DVDQ1140
1430	LGSD=NGE	DVDQ1141
	IF (LGSD) 1190,1450,1440	DVDQ1142
1440	IFL=15	DVDQ1143
	GO TO 1470	DVDQ1144
C	ENTRY WITH IFL=15	DVDQ1145
1450	LGSS=0	DVDQ1146
	IF (LGSD-NGA) 1460,1480,1190	DVDQ1147
1460	LGSS=LGSD+1	DVDQ1148
	IFL=14	DVDQ1149
1470	IFLAG=IFL-5	DVDQ1150
	GO TO 315	DVDQ1151
C	ENTRY WITH IFL=14	DVDQ1152
1480	DO 1490 I=1,NGA	DVDQ1153
	GT(I)=G(I)	DVDQ1154
1490	CONTINUE	DVDQ1155
	GO TO 1730	DVDQ1156
C	END OF INITIALIZATION FOR GSTOPS	DVDQ1157
C		DVDQ1158
C	ENTRY TO EVALUATE G AT THE END OF THE STEP	DVDQ1159
1500	LGSE=1	DVDQ1160
1510	IGK=LGSS	DVDQ1161
	IFLG=0	DVDQ1162
	IFL=9	DVDQ1163
	GO TO 310	DVDQ1164
C	ENTRY TO EVALUATE G BEFORE EVALUATING THE DERIVATIVES	DVDQ1165
1520	IFLG=IFL	DVDQ1166
	IFL=10	DVDQ1167
1530	IFLAG=10	DVDQ1168
	IGKM=LGSD	DVDQ1169
1540	IGK=1	DVDQ1170
1550	GO TO 315	DVDQ1171
1560	IGK=IGK+1	DVDQ1172
	IF (IGK.GT.IGKM) GO TO 1650	DVDQ1173
C	ENTRY WITH IFL=9,10, AND 17	DVDQ1174
C	TEST FOR G CHANGING SIGN	DVDQ1175
1570	IF (G(IGK)*GT(IGK)) 1600,1580,1590	DVDQ1176
1580	IF (GT(IGK).NE.0.) GO TO 1600	DVDQ1177
	IF (TL.EQ.TG) GO TO 1560	DVDQ1178
1590	IF (LGSE.GT.0) GT(IGK)=G(IGK)	DVDQ1179
	GO TO 1560	DVDQ1180
C	G CHANGES SIGN -- PREPARE FOR ITERATION TO FIND ZERO	DVDQ1181
1600	NSTOP=IGK	DVDQ1182
	IFLGS=IFL	DVDQ1183

C	COMPUTE INITIAL VALUE FOR RG (=RATIO OF PARTIAL STEPSIZE WHERE	DVDQ1184
C	G IS KNOWN/THE INTEGRATION STEPSIZE)	DVDQ1185
	IF (IFLG.EQ.0) GO TO 1610	DVDQ1186
	RG(3)=FAC(1)	DVDQ1187
	RG(2)=0.	DVDQ1188
	IF ((IFLG.EQ.2).AND.(IGK.LT.LGSS)) RG(2)=FAC(1)	DVDQ1189
	GO TO 1620	DVDQ1190
1610	RG(3)=0.	DVDQ1191
	RG(2)=-FAC(1)	DVDQ1192
1620	IF (LGSE.LT.0) RG(3)=TPD	DVDQ1193
	LGSE=-3	DVDQ1194
	GI(2)=GT(IGK)	DVDQ1195
	EPSGS=RND	DVDQ1196
	IFL=16	DVDQ1197
	K=1	DVDQ1198
	GO TO 1640	DVDQ1199
C	END OF PREPARATION TO BEGIN THE ITERATION	DVDQ1200
C		DVDQ1201
C	ENTRY WITH IFL=16	DVDQ1202
C	ITERATE TO FIND GSTOP	DVDQ1203
1630	K=1	DVDQ1204
	IF ((GI(2)*G(IGK)).GT.0.) K=2	DVDQ1205
	IF (ABS(GI(K)).GT.ABS(G(IGK))) GO TO 1640	DVDQ1206
C	CONVERGENCE PROBLEMS	DVDQ1207
	LGSE=LGSE-1	DVDQ1208
	IF (LGSE.EQ.(-5)) EPSGS=PTS1	DVDQ1209
	EPSGS=EPSGS*PTS4	DVDQ1210
1640	GI(K)=G(IGK)	DVDQ1211
	RG(K)=RG(3)	DVDQ1212
C	SECANT ITERATION (GIVES NEW PARTIAL STEPSIZE/H)	DVDQ1213
	TPD=RG(1)-(GI(1)*(RG(2)-RG(1)))/(GI(2)-GI(1))	DVDQ1214
	T=TL+TPD*HH	DVDQ1215
C	TEST FOR CONVERGENCE OF ITERATION	DVDQ1216
	IF (ABS(TPD-RG(3)).LE.EPSGS) GO TO 1560	DVDQ1217
	RG(3)=TPD	DVDQ1218
	GO TO 1300	DVDQ1219
1650	IF (10-IFL) 1660,1700,100	DVDQ1220
1660	IF (IGKM.NE.NGA) GO TO 1710	DVDQ1221
	IF (LGSE.GT.(-3)) GO TO 1690	DVDQ1222
	IF (LSTC.NE.4) GO TO 1670	DVDQ1223
C	ESTIMATE ERROR -- GSTOP IS THE RESULT OF EXTRAPOLATING FROM	DVDQ1224
C	THE INITIAL POINT	DVDQ1225
	TPD1=TPD	DVDQ1226
	RG(3)=TPD	DVDQ1227
	GO TO 1230	DVDQ1228
1670	IFL=11	DVDQ1229
	IF (LGSE.LT.(-4)) IFL=12	DVDQ1230
1680	IFLAG=IFL	DVDQ1231
C	TEST TO SEE IF GSTOP IS PRECEDED BY ANOTHER STOP	DVDQ1232
	IF ((HH*(T-TOUT).LE.0.).AND.(HH*(T-TFINAL).LE.0.)) GO TO 1300	DVDQ1233
C	IT IS	DVDQ1234
	RG(3)=TPD	DVDQ1235
	IFLS=IFL	DVDQ1236
	GO TO 200	DVDQ1237
1690	LGSE=1	DVDQ1238
	IFL=IFLG	DVDQ1239
	IF (IFL.LT.0) GO TO 60	DVDQ1240
1700	IGKM=NGA	DVDQ1241
	IFL=IFLG	DVDQ1242
	GO TO 310	DVDQ1243

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1710 IFL=17
      IFLAG=9
      IGKM=NGA
      GO TO 315
C     ENTRY WITH IFL=11 AND 12
C     SET PARAMETERS TO INDICATE A GSTOP HAS BEEN FOUND
1720 GT(NSTOP)=0.
1730 LGSE=1
      IGKM=NGA
      TG=TL
      IF (IFLG) 1740,1760,1770
1740 IF (IFL.LT.13) GO TO 1750
      IF (IFLG.EQ.(-20)) GO TO 100
      IFL=-IFLG
      GO TO 310
1750 HH=H
      GO TO 200
1760 TPD=).
      T=TL
      LGSE=-2
      GO TO 1300
1770 IF (IFLG-3) 220,200,200
1780 IF (LGSE.EQ.(-1)) GO TO 1790
      LGSE=-1
      GO TO 1220
1790 TPD=RG(3)
      T=TL+TPD*HH
      IF (LGSE.NE.(-1)) GO TO 1670
      IFL=IFLS
      LGSE=-3
      GO TO 1680
1800 IF (LGSE+2) 1550,1500,310
1810 IF (TPD.LE.0.) GO TO 310
      LGSE=-2
1820 IFLG=IFL
      IFL=17
      IFLAG=9
      IF (LGSD .GT. 0) GO TO 1530
      GO TO 1540
      END

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DVDQ1244
DVDQ1245
DVDQ1246
DVDQ1247
DVDQ1248
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