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COMPUTER PROGRAM FOR CALCULATING SUPERSONIC FLOW ABOUT CIRCULAR, ELLIPTIC, AND BIELLIPTIC CONES BY THE METHOD OF LINES

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16. Abstract

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SUMMARY

This paper is a user's manual for a computer program which calculates the supersonic flow about circular, elliptic, and bielliptic cones at incidence and elliptic cones at yaw by the method of lines. The program is automated to compute a case from a known or easily calculated solution by changing the parameters through a sequence of steps. It provides information including the shock shape, flow field, isentropic surface properties, entropy layer, and force coefficients. A description of the program operation, sample computations, and a FORTRAN IV listing are presented.

INTRODUCTION

In reference 1 the so-called method of lines was developed for obtaining numerical solutions of general conical flow problems, that is, those gas dynamic problems in which the fluid properties do not vary along rays emanating from a common point in the flow. The method was applied to circular and elliptic cones and to the compression side of conical delta wings with shock attached at the sharp leading edges.

This paper describes a computer program which uses the method of reference 1 and which is specially designed for circular- and elliptic-cone problems. The program provides information including the shock shape, flow field, isentropic surface properties, entropy layer, and force coefficients. A program for the delta-wing problems is described in reference 2.

The present program has a built-in capability for three different, but related, cross sections: circular, elliptic, and "bielliptic." The bielliptic cross section is one composed of two ellipses with different axis ratios on the windward and leeward sides of the body.

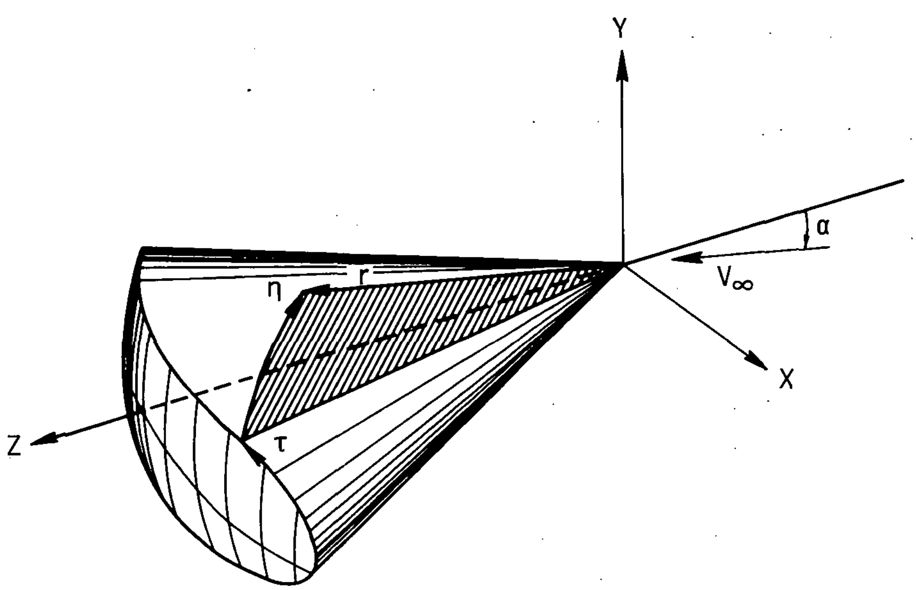
The mathematical method and coordinates are described very briefly, and the operation of the program is described in detail. A listing of the computer program is given in appendix A together with a list of the subroutines and a flow chart. Appendix B presents sample computations.

METHOD OF LINES

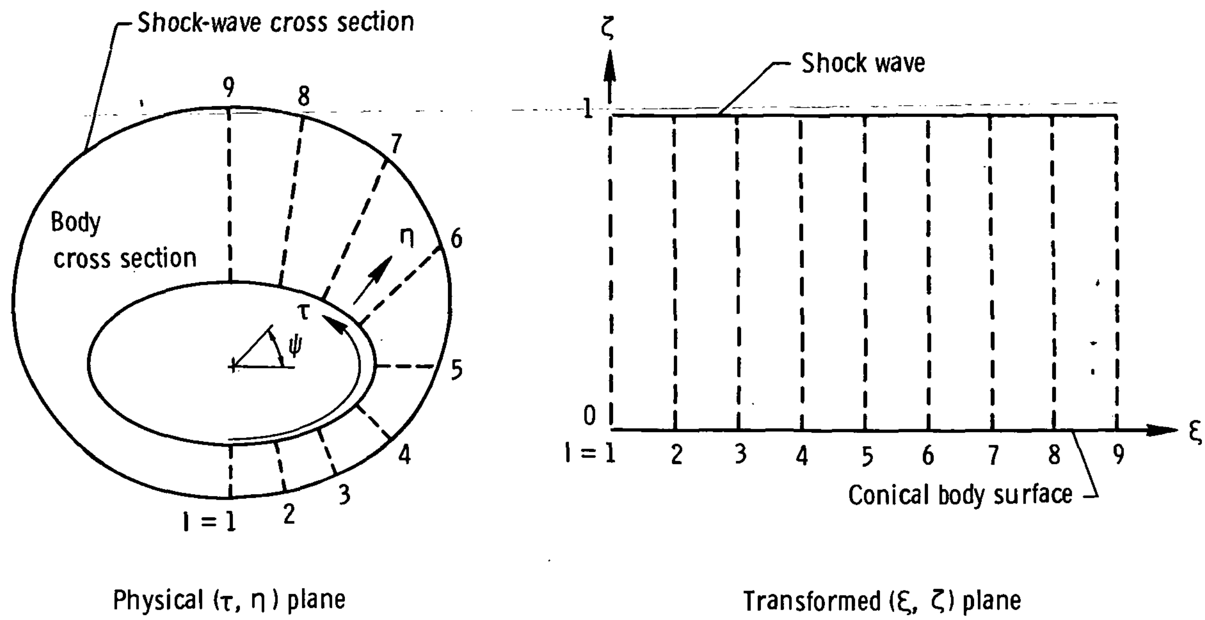
The flow equations are initially written in a body-oriented, orthogonal, conical coordinate system (r,η,τ) shown in sketch (a) where r is the distance along a conical ray, η is the angle measured from the body surface to the ray in a plane τ = Constant, and τ is a measure of the arc length along the intersection of the body surface with a sphere of radius r centered at the body apex. Specifically, τ is determined by numerical integration on the unit sphere. The stream velocity vector V_∞ lies in the YZ-plane of symmetry, and the origin of the arc length τ is taken in the windward plane of symmetry. All computations are made in the right half-plane. The integration of the system of equations is facilitated by a coordinate transformation which maps the region bounded by the shock and the body into a rectangular domain as shown in sketch (b). The transformed variables are

$$\zeta = \frac{\eta}{\eta_s} \qquad \xi = \xi(\tau)$$

where $\eta = \eta_s(\tau)$ is the shock surface. Thus, $\zeta = 0$ on the body and $\zeta = 1$ on the shock. Also shown in sketch (b) is the cylindrical polar angle ψ; in the windward symmetry plane $\psi = -\frac{\pi}{2}$, in the leeward symmetry plane $\psi = \frac{\pi}{2}$. For the elliptic cone at incidence the major axis lies in the XZ-plane and α is the angle of incidence, and for the elliptic cone at yaw the major axis lies in the YZ-plane and α is the angle of yaw.



Sketch (a)



Sketch (b)

The $\xi\zeta$-plane is divided by N lines parallel to the ζ-axis; the line I = 1 is taken in the windward plane of symmetry and the line I = N is in the leeward plane of symmetry. At each line the system of differential equations is reduced to a set of ordinary differential-difference equations by replacing the derivatives $\partial/\partial\xi$ by finite differences. The derivative of the Lagrange interpolation polynomial is used in this program with an equal number of lines on either side of the line at which $\partial/\partial\xi$ is computed; therefore, central differencing is obtained when the line spacing is equal. The system of equations is integrated simultaneously along each line I = 1, . . ., N. The differential equations along any line are coupled to those along the other lines through the finite-difference approximations for the cross derivatives $\partial/\partial\xi$. The equations are integrated by a fourth-order Runge-Kutta method. The accuracy of this method allows the use of relatively large integration steps. The integration step can generally be taken in increments of -0.1 from the shock to $\zeta = 0.1$ and in increments of -0.05 and -0.025 thereafter except in calculations where resolution of the entropy layer is sought.

The initial values for the system of equations are determined from the shock relations once the shock shape is specified, and the equations are integrated numerically from the shock to the body. An iterative process based on the Newton method is utilized to adjust the shock shape to satisfy the conditions of flow tangency on the body. Usually a very good estimate of the shock shape is required for a successful calculation. The exception is the circular cone at moderate incidence (relative to the cone semiapex angle); a tangent-cone approximation suffices for an initial estimate of the shock shape for this case. In order to obtain a good initial estimate of the shock shape for the elliptic cone provision is made to proceed by a series of steps from a simpler case or a known solution. The procedure is completely automated for incrementing any one of the five parameters: free-stream Mach number, cone angle, angle of incidence, axis ratio, or ratio of specific heats.

PROGRAM OPERATION

Considerable flexibility has been built into the computer program in order to obtain converged solutions in a wide variety of cases. The solutions in many instances are very sensitive to the shock shape; consequently, they must be developed in incremental steps from a simpler or known solution. Instabilities can arise in some cases, and a change in some of the parameters involved will sometimes yield converged solutions. A number of parameters can be adjusted which can affect the convergence and computing time. Some discussion of these parameters is given with general recommendations for their values.

Incrementation of a Parameter

A good estimate of the shock shape is required for successful convergence for all cases other than the circular cone at small relative incidence, $\frac{\alpha}{\theta_0} < 0.5$, where θ_0 is the cone semiapex angle in the YZ-plane of symmetry. The built-in approximate shock (NREAD = 0) is satisfactory only for starting the computation of circular or nearly circular cones at small incidence. The elliptic-cone solutions and the circular-cone solutions at relatively large incidence can be constructed by changing the input parameters through a sequence of steps from a known or easily calculated solution, a new converged shock shape being obtained with each change of the input parameters[1] (T, α, θ, M_∞, γ). An extrapolation routine is used to predict a new shock shape for the new input parameters.

The converged values of $\eta_{s,i}$ (where the subscript i is the line index) for the initial value of the parameter (PARAM) are used as the input values corresponding to a small variation (DPRAM1) of the input parameter. Thus, the input parameter is changed from its initial value (PARAM) to PARAM + DPRAM1. Typically, DPRAM1 is taken as 0.05 or 0.1 of the initial value of PARAM. Once the converged solution for this value of the parameter is obtained, the $\eta_{s,i}$ for a new value of the parameter, corresponding to the sum of the initial value of PARAM and DPRAM (where DPRAM is the regular increment), are computed by linear extrapolation. After three sets of converged $\eta_{s,i}$

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[1]The variables discussed in this section are further described in the section entitled "Input Description."

have been obtained corresponding to three values of the input parameter, a quadratic extrapolation is employed. The computations continue in increments of DPRAM up to the final value of PARAM (PARAMF) unless some difficulty is encountered which can cause the value of DPRAM to be halved. Some of these difficulties are discussed in the section entitled "Limitations." The computation is then restarted from the last converged value of PARAM once DPRAM has been halved. If DPRAM becomes less than DPRMIN the computation is terminated.

A convenient method for computing an elliptic cone is to increment T (INCRMT = 1) with the value of θ corresponding to the desired value for the elliptic cone. The computation for a circular cone would start with $\alpha = 0^\circ$ and NREAD = 0. Typical values of the increments would be DPRAM1 = -0.05 and DPRAM = -0.1 or -0.2. Once the computation has attained the final value of T, a second computation could be made for increasing angles of attack. In this computation the last converged $\eta_{s,i}$ values corresponding to $\alpha = 0^\circ$ would be read in (NREAD = 1 and NCNVRGB = 0). The incrementation would then be made on α; thus, INCRMT = 2. Typical values of the α-increments might be DPRAM1 = 0.1 and DPRAM = 1.0 or 2.0.

It is possible, through a simple modification of the program, to increment two (or more) parameters simultaneously by establishing a functional relation between them. This procedure is followed in cases where only the final combination of values of parameters is of interest. For example, to compute an elliptic-cone flow field with T = 0.6 and $\alpha = 4.0^\circ$ one could take

T = 1., ALPHAD = 0., NREAD = 0, INCRMT = 1, NCNVRGB = 0,

PARAM = 1., PARAMF = .6, DPRAM1 = -.05, DPRAM = -.1

and set

ALPHAD = 4.*(1.-PARAM)/(1.-PARAMF)

after card A1490 of the MAIN program.

Nonuniform Line Spacing

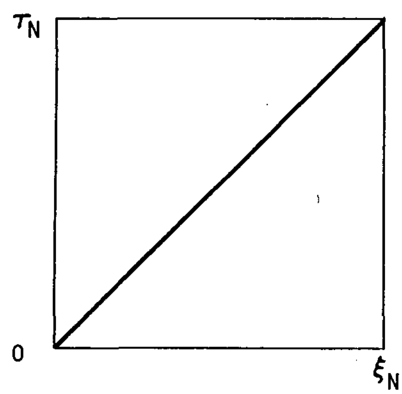
Included in the program are several options for obtaining a nonuniform line spacing. One option allows the user to select three regions around the right half-body so that in each region the physical line spacing is constant (equal $\Delta\tau$) but can differ from the spacing in the other two regions. This option is called when NSPACE = 2 and is described in the section entitled "Input Description."

The other options are continuous transformations between the physical arc length τ and the computational coordinate ξ. In these options the computations are carried out with equal increments $\Delta\xi$, whereas the physical spacing $\Delta\tau$ is stretched in various regions according to the option triggered by KTRANSF and the slope control parameter SLOPE (see section "Input Description"). The basic transformation is the following cubic polynomial relating τ to ξ:

$$\tau = \tau_0 + (\xi - \xi_0)\left[a + b(\xi - \xi_0)^2\right]$$

where a is the slope control parameter $d\tau/d\xi$ at $\xi = \xi_0$ and has the FORTRAN name SLOPE and b and ξ_0 are constants which depend on the choice of a and τ_0. There are three options, described as follows:

(1) KTRANSF = 1, identity transformation. This option gives $\tau = \xi$, that is, uniform line spacing in both the physical and computational planes (sketch (c)). With SLOPE = 1.0 as input, the program automatically uses $\tau_0 = \xi_0 = b = 0$. This option is the one which has been generally successful for most body shapes, as explained in reference 1.



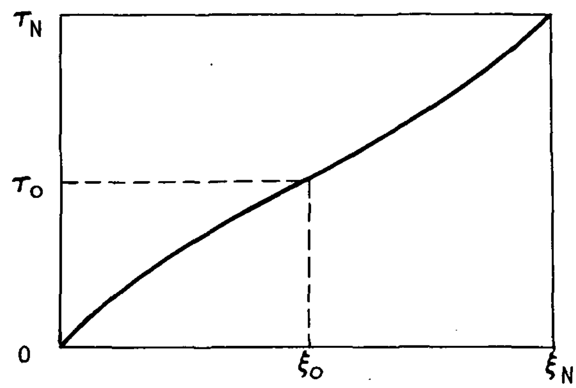
Sketch (c)

(2) KTRANSF = 2, high or low density of lines at $\psi = 0^\circ$. In this transformation option, τ_0 is the value of τ at $\psi = 0^\circ$, that is, $\tau_N/2$. Then ξ_0 and b are given by

$$\xi_0 = \frac{3\tau_0}{2a + 1}$$

$$b = \frac{1 - a}{3\xi_0^2}$$

which give $\frac{d\tau}{d\xi} = 1.0$ at both $\xi = 0$ and $\xi = \xi_N$. When a = SLOPE is less than or greater than 1, the physical line spacing is more or less dense, respectively, near $\psi = 0^o$ than it is near the symmetry planes. Sketch (d) illustrates the transformation when SLOPE < 1.0. The user may typically employ SLOPE < 1.0 when calculating the flow over an elliptic cone with T < 1.0 in order to place relatively more lines in the region of large curvature. For the same reasons, SLOPE > 1.0 may be used for the elliptic cone with T > 1.0. Practical values of SLOPE range between 0.5 and 1.5.



Sketch (d)

(3) KTRANSF = 3, high or low density of lines at $\psi = 90^o$. In this option, the line spacing can be made more or less dense near the leeward symmetry plane, $\psi = 90^o$, by choosing a = SLOPE less than or greater than 1, respectively. The parameters of the cubic polynomial are

$$\tau_o = \xi_o = 0$$

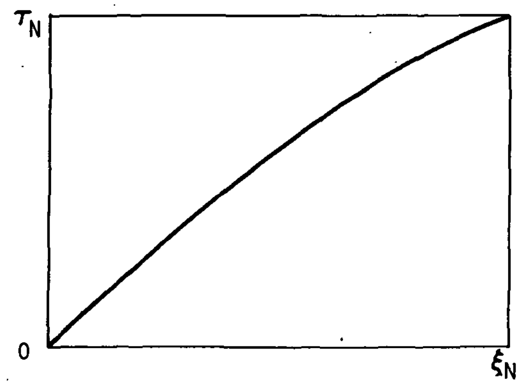
$$\frac{d\tau}{d\xi} = 1.0 \qquad (\xi = 0)$$

$$b = \frac{a - 1}{3\xi_N^2}$$

where

$$\xi_N = \frac{3\tau_N}{2 + a}$$

This transformation is illustrated in sketch (e) for SLOPE < 1.0.



Sketch (e)

Input Description

The following list contains the program input variables, which are arranged according to order of presentation in the program.

Input card	FORTRAN variable	Description
1	STMACH	Free-stream Mach number, M_∞
	GAMMA	Ratio of specific heats, γ
	T	Semiaxis ratio of the elliptic cone, b/a, where b is the semiaxis of the elliptic body in the YZ-plane of symmetry (which contains the velocity vector, sketch (a)) and a is the semiaxis in the XZ-plane of symmetry
	THETAD	The cone semiangle in the XZ symmetry plane, θ, degrees
	ALPHAD	Angle of attack, α, degrees
2	N	Number of lines. Line 1 is in the windward symmetry plane and line N is in the leeward symmetry plane. Must be an odd number to obtain force coefficients. Maximum allowed value is N = 20.

Input card	FORTRAN variable	Description
2	M	Body selection trigger M = 0 for zero-incidence circular-cone solution M = 2 for circular, elliptic, and bielliptic cones
	NREAD	Trigger for reading in shock shape NREAD = 0 if the built-in approximate shock shape is to be used. This shock shape is satisfactory only for nearly circular cones at small incidence. NREAD = 1 when input shock shape is to be read in
	NSPACE	Line space trigger NSPACE = 1 for equal line spacing in the computational plane (equal $\Delta\xi$). The line spacing in the physical plane ($\Delta\tau$) can be made nonuniform by selection of the parameters KTRANSF and SLOPE. NSPACE = 2 gives piecewise constant line spacing in three segments with NA lines in the first segment, (NB-NA) lines in the second segment, and (N-NB) lines in the third segment. Set KTRANSF = 1 and SLOPE = 1.0. This option is not recommended. See input card 8 for further description.
	INCRMT	Trigger denoting which parameter on card 1 is to be incremented INCRMT = 1 increment T INCRMT = 2 increment ALPHAD INCRMT = 3 increment THETAD INCRMT = 4 increment STMACH INCRMT = 5 increment GAMMA
	IPRINT	Print trigger IPRINT = 1 full print including basic information for each trial shock shape, output heading, and zeta print blocks (flow-field data for each value of zeta) for intermediate and final computations

Input card	FORTRAN variable	Description
2		IPRINT = 2 prints only ZETA = 0 block for all but the final (PARAMF) case in a series and full print for PARAMF
	NCNVRGB	Start selection trigger NCNVRGB = 0 η_s values are found from the built-in approximate shock shape (with NREAD = 0) or are read in (NREAD = 1). See input card 9. NCNVRGB = 1 one set of converged η_s values are read in which correspond to PARAM1. The program uses those η_s values to start the calculation for PARAM. NCNVRGB = 2 two sets of converged η_s values are read in which correspond to PARAM1 and PARAM2. The program extrapolates these η_s values linearly to obtain η_s values to start the computation for PARAM. NCNVRGB = 3 three sets of converged η_s values are read in which correspond to PARAM1, PARAM2, and PARAM3. The program extrapolates these quadratically to obtain η_s values to start the computations for PARAM.
	KTRANSF	Continuous line spacing transformation trigger. (See section entitled "Nonuniform Line Spacing.") KTRANSF = 1 identity transformation in conjunction with SLOPE = 1 (see input card 4). Required for NSPACE = 2. The computational coordinate ξ is equal to the arc length τ. KTRANSF = 2 If SLOPE < 1 the lines will be more dense in the region $\psi = 0^{\circ}$. If SLOPE > 1 the lines will be more dense in the windward and leeward symmetry planes.

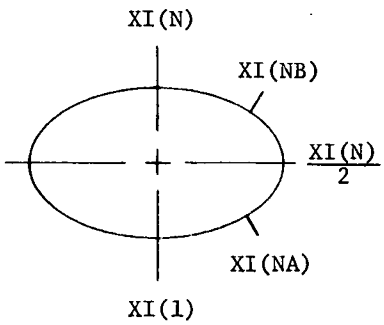
Input card	FORTRAN variable	Description
2		KTRANSF = 3 If SLOPE < 1 the lines will be more dense in the leeward symmetry plane. If SLOPE > 1 the lines will be more dense in the windward symmetry plane.
	NPLOT	Punched card output to be used for plotting. (See section on "Output." NPLOT = 0 no punched card output for plots NPLOT = 1 punched card output for plots
	NPUNCH	Punched card output for η_s NPUNCH = 0 no punched card output of η_s values NPUNCH = 1 punched card output of η_s values for each pivotal shock shape
3	PARAM	First value of STMACH, GAMMA, T, THETAD, or ALPHAD to be computed in a series, with the others held constant. (See definition of INCRMT.)
	PARAMF	Final value of PARAM to be computed
	DPRAM1	First small increment used with NCNVRGB = 0 or 1 to perturb the results obtained with PARAM. Program uses η_s values converged for PARAM to start the computations for PARAM = PARAM + DPRAM1. Successful convergence for this new value of PARAM gives the information needed for linear extrapolation to the next value of PARAM which is the sum of the original value of PARAM and DPRAM. If NCNVRGB $\neq$ 0 or 1, DPRAM1 is a dummy input.
	DPRAM	Incremental value of parameter used after first increment DPRAM1. The magnitude of DPRAM must be greater than the magnitude of DPRAM1.

Input card	FORTRAN variable	Description
3	DPRMIN	Minimum value allowed for DPRAM. If the program runs into trouble during a series of parameter incrementations, DPRAM is halved, possibly many times. DPRMIN prevents wasted machine time in hopeless cases.
4	SLOPE	Continuous line spacing transformation parameter. (See section "Nonuniform Line Spacing.")

SLOPE	KTRANSF	Denser lines at
1.0	1	
<1.0	2	$\psi = 0^{\circ}$
>1.0	2	$\psi = -90^{\circ}$ and $+90^{\circ}$
<1.0	3	$\psi = +90^{\circ}$
>1.0	3	$\psi = -90^{\circ}$

Input card	FORTRAN variable	Description
5	VTEST	Accuracy criterion on maximum normal velocity component at cone surface. Usually 10^{-3} suffices for three figures in shock shape and pressure distribution.
	VTEST1	When the maximum magnitude of the normal velocity component on the surface VMAX lies between VTEST and VTEST1, a modified Newton method is incorporated, where the old Jacobian matrix of influence coefficients is used (ref. 1).
6	M2E	Trigger for bielliptic cone computation M2E = 0 for circular or elliptic cones M2E = 1 for bielliptic cone. It is necessary to set NSPACE = 1, KTRANSF = 1, and SLOPE = 1 for M2E = 1.
7	TU	$\frac{b}{a}$, where b is the semiaxis in the leeward YZ (vertical) plane of symmetry and a is the semiaxis in the XZ (horizontal) plane of symmetry. TU is the axis ratio for the upper half of the bielliptic cone, and T is the axis ratio for the lower half. This card is read in only for M2E = 1.

Input card	FORTRAN variable	Description
8		This card is read in only when NSPACE = 2.
	NA	Number of lines equally spaced in first segment; must be an odd number to obtain force coefficients (sketch (f))
	NB	Line number at end of second segment; must be an odd number to obtain force coefficients
	ANA	$\frac{XI(NA)}{XI(N)/2}$
	BNB	$\frac{XI(NB)}{XI(N)/2}$



XI is arc length along contour.

Sketch (f)

Input card	FORTRAN variable	Description
9		This card is read in only if NREAD = 1 and NCNVRGB = 0.
	ETAS(I) (I = 1, . . ., N)	Values of η_s which are used to start the computations for PARAM. See input card 2 description for NCNVRGB = 0.

The use of previously converged results for starting a series of related computations provides an economical method of using the program. Input cards 10 to 18 are used for this purpose: input cards 10 and 11 are used when one converged case is read in (NCNVRGB = 1); input cards 12 to 14 are used with two converged cases (NCNVRGB = 2), and input cards 15 to 18 are used with three converged cases (NCNVRGB = 3). Thus, if one had previously converged elliptic-cone cases for T = 0.8, 0.7, and 0.6, one could use those three sets of η_s values with NCNVRGB = 3 to predict the starting shock shape for some other value of T, say 0.5. Hence the input would include INCRMT = 1, PARAM = 0.5, PARAM1 = 0.8, PARAM2 = 0.7, and PARAM3 = 0.6.

Input card	FORTRAN variable		Description
10			This card and input card 11 are read in only if NCNVRGB = 1. See input card 2 description for NCNVRGB = 1.
	PARAM1		Value of PARAM corresponding to ETAS1(I)
11	ETAS1(I)	(I = 1, . . ., N)	Values of η_s corresponding to PARAM1
12			This card and input cards 13 and 14 are read in when NCNVRGB = 2. See input card 2 description for NCNVRGB = 2.
	PARAM1		Value of PARAM corresponding to ETAS1(I)
	PARAM2		Value of PARAM corresponding to ETAS2(I)
13	ETAS1(I)	(I = 1, . . ., N)	Values of η_s corresponding to PARAM1
14	ETAS2(I)	(I = 1, . . ., N)	Values of η_s corresponding to PARAM2
15			This card and input cards 16, 17, and 18 are read in only when NCNVRGB = 3. See input card 2 description for NCNVRGB = 3.
	PARAM1		Value of PARAM corresponding to ETAS1(I)
	PARAM2		Value of PARAM corresponding to ETAS2(I)
	PARAM3		Value of PARAM corresponding to ETAS3(I)
16	ETAS1(I)	(I = 1, . . ., N)	Values of η_s corresponding to PARAM1
17	ETAS2(I)	(I = 1, . . ., N)	Values of η_s corresponding to PARAM2
18	ETAS3(I)	(I = 1, . . ., N)	Values of η_s corresponding to PARAM3

Output

Among the first items printed are some of the input parameters (see section entitled "Input Description") and, in addition, some preliminary computed quantities and control parameters (described in the sections entitled "Auxiliary Definitions" and "Secondary Parameters") which are not input data but which can be readily changed within the program. Two sample computations are presented in appendix B.

Each pivotal (trial) shock shape and the resulting normal velocity components at the cone surface are printed out regardless of the print option. (The N-variations of the pivotal shock shape are not printed.) The following information is printed: ETAS(I), ETASP(I), CP(I) at shock, CP(I) at body, and V(I) at body for I = 1, . . ., N from left to right. (CP is pressure coefficient and V is normal velocity component.) After the print of V(I) at the body, the quantities KCOUNT, VMAX, EPSIG, SPACER, VMXTEST, and DETERM are printed followed by DETA(I).

If IPRINT = 1 and a case has been converged (i.e., VMAX < VTEST), the full results are printed, starting on a new page, with much of the preliminary information repeated in an orderly fashion. This allows the printing for the preliminary iterations to be separated and discarded if desired. If IPRINT = 2, only the final converged case in a series is printed in full. For an explanation of full print, see sections "Summary Print Block" and "ZETA Print Blocks."

The arc length TAU(I) and the transformed coordinate XI(I) are printed between the summary print block and the zeta print blocks together with the body coordinates XO(I), YO(I) and the shock quantities ETAS(I) and ETASP(I).

Windward- and leeward-line zeta limits.- Following the ZETA = 0 print block are the limiting values of certain flow properties which are dependent upon the direction of approach to the nodal-point singularity as described in reference 1. For the elliptic cone with T < 1, a nodal point lies on the surface in both the windward and leeward symmetry planes. The values printed in the ZETA = 0 print block are the limits obtained by approaching the symmetry planes along the surface. The limits corresponding to an approach in the symmetry plane are tabulated under the headings "WINDWARD LINE ZETA LIMIT" and "LEEWARD LINE ZETA LIMIT." For the circular cone and the elliptic cone with T > 1, the windward stagnation point is a saddle point and all variables are continuous there, hence the values printed in WINDWARD LINE ZETA LIMIT and the ZETA = 0 print block are the same. For the elliptic cone with T > 1, a saddle point or a nodal point may lie on the surface in the leeward symmetry plane, depending upon the geometry and flow conditions. (The entropy function SBAR is printed under the heading labeled "S.")

Force coefficients.- After the windward-line and leeward-line zeta limits, the aerodynamic force and moment coefficients are printed as well as the center-of-pressure location. The quantities printed are coefficients of axial force (CZ), normal force (CY), drag (CD), lift (CL), moment about X-axis (CM), and the coordinates of the center of pressure (YBAR and ZBAR). The reference area for the force and moment coefficients is the base area.

Plots.- The program has a plot option trigger, NPLOT, which can be used to obtain punched card output for use in another program which, in turn, rearranges the cards in an order suitable for plotting cross-flow streamlines and the cross sections of the body and shock, as well as surface and shock pressure coefficients and surface quantities U, W, RHO, and CROSSM as functions of ψ. This second program is not included, however, because each different computer system has its own variations in plotting routines and requirements. It is hoped that the user can adapt the punched card output for these plots to his specific requirements.

Appropriate labels for the cards are punched at cards A1600 and A1610, and the body coordinates, polar angle ψ, and surface quantities are punched at cards A6020 to A6100 of MAIN program. The quantity NZETA punched at card A6020 in the MAIN program (computed at card L760 in subroutine PRINT) is a counter of the number of integration steps from the shock which is used in the plotting program. In subroutine PRINT, the polar angle and shock pressure coefficient are punched at cards L550 and L560. The coordinates of the shock and cross-flow streamlines are punched at cards L810 and L820.

Auxiliary Definitions

Several quantities appear in the printout of the preliminary iterations; some of these quantities can be useful in evaluating the sequence of iterations. Those quantities which have not been defined elsewhere are defined as follows:

FORTRAN variable	Description
AAST	Ratio of critical speed to free-stream speed
DETA	The correction applied to each value of η_s, $\Delta\eta$
DETERM	The determinant of the Jacobian, or influence coefficient, matrix. (This matrix is normalized so that the sum of squares of the elements of each row is 1.)
EPSIGMX	Maximum value allowed for EPSIG. This parameter has been used at times with EPSIG (see section "Secondary Parameters") computed within the program as some fraction of VMAX. This procedure is not recommended. Set in card A2080 of MAIN program.
EPSIGOM	Parameter for controlling step size during the numerical integration of the body geometry. Used in cards C540 and C550 in subroutine RUNKUT and set in card A580 in the MAIN program.

FORTRAN variable	Description
EPSIVAR	Perturbation parameter. Changes η_s to $(1 + \text{EPSIVAR})\eta_s$ for each perturbation integration. Set in card A2090 of MAIN program and used in cards A8280, A8350, and A8370 of MAIN program.
ETASP	Derivative of the quantity η_s with respect to the arc length τ, $d\eta_s/d\tau$
INTCNT	Number of integration steps used to determine $\xi(N)/2$ in body geometry computation
KCOUNT	Total number of pivotal and variational integrations (see NCYCLE)
NCYCLE	Number of iteration cycles. The first cycle always consists of one pivotal (trial) and N variational integrations to generate the Jacobian matrix. Subsequent cycles may or may not include the N perturbation integrations. No perturbation runs are made when VMAX < VTEST1 (modified Newton computation) and the old Jacobian matrix is used to obtain the corrections $\Delta\eta$; in this case a cycle is one integration. When VMAX > VTEST1 one cycle consists of the pivotal integration and the N perturbation integrations required to generate a new Jacobian matrix.
PTINF	Free-stream total pressure referenced to product of free-stream density and square of free-stream velocity
RANGLE	Relative angle of incidence, α/θ_o, where θ_o is the cone semiapex angle in the vertical (YZ) plane of symmetry
VMAX	Maximum magnitude of normal velocity component on body surface
VMXTEST	Velocity test parameter, computed in cards A2600 and A2610 of the MAIN program and used in card A7860. If VMAX > VMXTEST occurs during a parametric incrementation series, the increment is automatically halved. VMXTEST is computed as 0.5 of the minimum magnitude of the velocity component normal to the shock wave. This factor can be altered in card A2590 of the MAIN program as required.

FORTRAN variable	Description
XI	Computational coordinate, ξ. The computational coordinate is related to the physical arc-length coordinate τ through the function $\xi = \xi(\tau)$. The function can be chosen to alter the line spacing in the arc-length variable τ. See KTRANSF and SLOPE in section entitled "Input Description."

Secondary Parameters

A number of parameters have been built into the program which control various computations. Those related to the size of the integration steps are as follows:

FORTRAN variable	Description
EPSIG	Control parameter for triggering the extrapolation to the surface. When the G-function in the denominator of the equations for the zeta derivatives becomes smaller than EPSIG, the program extrapolates to obtain values of the normal velocity component at the surface. Used in cards J920 and J940 of subroutine EQNS and set in card A2060 of the MAIN program. Normal value is 10^{-3}. This parameter must be reduced in value when small integration steps are used near the body.
EPSINT, DSMAX, DSMIN	Parameters used when integration step size is automatically varied. This option is not recommended. The program uses a preselected step variation by setting DSMIN= DSMAX at card K350 of subroutine RUNKUT2. The value of EPSINT is set in card A2100 of MAIN program and is used in cards K1300 and K1430 of subroutine RUNKUT2.
SPACER	Sets the minimum distance between points to be used in the formula for extrapolation to body surface. Used in card K530 of subroutine RUNKUT2 and set in card A2070 of MAIN program. Recommended value is SPACER=EPSIG.

Summary Print Block

The notation used in the summary print block is as follows:

FORTRAN variable	Symbol	Description
I		Line number
PSID		Arc tan $\left(y_o/x_o\right)$, degrees
PSISD		Arc tan $\left(y_s/x_s\right)$, degrees
XO, YO	x_o, y_o	Cartesian coordinates of body in plane Z = 1
XOBAR, YOBAR	$\bar{x}_o, \bar{y}_o$	Cartesian coordinates of body referenced to $x_{o,max}$
XS, YS	x_s, y_s	Cartesian coordinates of shock in plane Z = 1
XSBAR, YSBAR	$\bar{x}_s, \bar{y}_s$	Cartesian coordinates of shock referenced to $x_{o,max}$
ETAS	η_s	Value of η at shock, radians (see section on "Zeta Print Blocks" for description of η)
BETAD	β	Angle between free-stream velocity vector and tangent plane to shock, degrees
XI	ξ	Computational coordinate (see section on "Auxiliary Definitions")
CPSHOCK		Pressure coefficient at shock wave
CPBODY		Pressure coefficient at body surface

Zeta Print Blocks

The notation used in the zeta print blocks is as follows:

FORTRAN variable	Description
ZETA	Independent variable, η/η_s; $\zeta = 1$ at shock and $\zeta = 0$ on body surface.

FORTRAN variable	Description
P	Pressure p referenced to product of free-stream density and square of free-stream velocity
P/ROASTSQ	Pressure referenced to product of free-stream density and square of critical speed
P/PTINF	Pressure referenced to free-stream total pressure
P/PINF	Pressure referenced to free-stream pressure
RHO	Density ρ referenced to free-stream density
U,V,W	u-, v-, w-components of velocity in r-, η-, τ-directions, respectively, referenced to critical speed
UC,VC,WC	Quasi-cylindrical velocity components in Z-direction, and directions normal and tangential to body contour in plane Z = 1, respectively, referenced to critical speed
VCC,WCC	Circular cylindrical velocity components normal and tangential to a circle in plane Z = 1, referenced to critical speed. UCC is same as UC.
VX,VY,VZ	Cartesian velocity components, referenced to critical speed
PSINOR	Arc tan (VX/VZ), degrees
THETNOR	Arc cos $VY/\sqrt{(VX)^2 + (VY)^2 + (VZ)^2}$, degrees
XBAR, YBAR	Cartesian coordinates referenced to $x_{o,max}$
XBHLD, YBHLD	Cartesian coordinates of cross-flow streamline (isentrope) that intersects the shock at line I, referenced to $x_{o,max}$
ETA	Angle measured in a plane normal to the body from a ray on surface to ray in field, η, radians
G	Function that appears as a factor in the denominator of most of the equations for the ζ-derivatives and which vanishes at the body (g in ref. 1, p. 12)

FORTRAN variable	Description
DEQNS	Function which is a factor in the denominator of the equations for the ζ-derivatives (D in ref. 1, p. 13). It vanishes when a line ζ = Constant becomes tangent to a conical characteristic. This tangency can occur only when regions of supersonic cross flow (CROSSM $\geqq$ 1) appear.
AM	Local Mach number, $\frac{\sqrt{U^2 + V^2 + W^2}}{a}$, where a is the speed of sound.
CROSSM	Cross-flow Mach number, $\frac{\sqrt{V^2 + W^2}}{a}$
SBAR	Entropy function, $\bar{S} = \log\left[(P/PINF)\rho^{\gamma}\right]$
POROGAM	P/ρ^{γ}
PT/PTINF	Ratio of total pressure to free-stream total pressure
PT	Total pressure referenced to product of free-stream density and square of free-stream velocity
BERNOUL	Error in Bernoulli equation, $1 - \left(\frac{2\gamma}{\gamma - 1}\frac{p}{\rho} + u^2 + v^2 + w^2\right)\bigg/\frac{\gamma + 1}{\gamma - 1}$
DPDZ, DUDZ, DVDZ, DWDZ, DSBDZ	$\frac{dp}{d\zeta}$, $\frac{du}{d\zeta}$, $\frac{dv}{d\zeta}$, $\frac{dw}{d\zeta}$, $\frac{d\bar{S}}{d\zeta}$, respectively
PP, UP, VP, WP, SBARP	Finite-difference approximations for $\frac{\partial p}{\partial \tau}$, $\frac{\partial u}{\partial \tau}$, $\frac{\partial v}{\partial \tau}$, $\frac{\partial w}{\partial \tau}$, $\frac{\partial \bar{S}}{\partial \tau}$, respectively

Accuracy Control Parameters

The accuracy of the computations improves with increasing number of lines N and with increasing number of points NP in the cross-derivative approximation formula only within certain limitations. Instabilities arise for computations at low free-stream Mach numbers or for very flat (small T) elliptic cones, and the instabilities are accentuated for the larger values of N. The integration step size, particularly near the body surface, can also influence the accuracy of the final results. Recommended values for computations to engineering accuracy (three to four figures) are given for the principal parameters.

FORTRAN variable	Description
DS	Integration step size from shock to body. Set in cards K420, K430, K440, and K450 of subroutine RUNKUT2. Recommended values are DS = -0.1 for $0.1 < \text{ZETA} \leqq 1.0$ DS = -0.05 for $0.05 < \text{ZETA} \leqq 0.1$ DS = -0.025 for $0.025 < \text{ZETA} \leqq 0.05$ DS = -0.0125 for $0 < \text{ZETA} \leqq 0.025$
N	Number of lines For circular cones at small incidence (RANGLE < 0.5) or elliptic cones of moderate axis ratio ($1. \geqq T \gtrsim 0.7$) and small incidence, N = 5 to 11. For circular cones at large incidence (RANGLE $\geqq$ 0.5) and elliptic cones at any incidence, N = 13 to 19.
NP	Number of points used in computation of cross derivatives. Set in card A620 in MAIN program. NP = 3 for computations where computing time is a prime consideration NP = 5 for most computations. Larger values increase the computing time substantially with little change in the overall results. The accuracy with NP = 5 is noticeably better than with NP = 3.
VTEST	Convergence criterion on the maximum normal velocity component at the body surface VTEST = 10^{-3} to 10^{-4} for most cases VTEST = 5×10^{-3} for relatively flat elliptic cones ($T \lesssim 0.25$) where convergence is difficult

FORTRAN variable	Description
VTEST1	Parameter for selection of regular or modified Newton method. The modified Newton method is used after all the normal velocity components on the body are less than VTEST1 VTEST1 = 0.01 to 0.05 for most cases VTEST1 = 0.001 for relatively flat ($T \lesssim 0.25$) elliptic cones

The quantity DPRAM, which is the increment in the parameter being varied in the computations, can have a significant influence on the overall computing time. Values of this parameter can only be established on the basis of experience. For example, if the incrementation parameter is the angle of attack, DPRAM = 2.5 may suffice for circular cones at Mach numbers larger than 3, whereas the value of DPRAM required for an elliptic cone may be considerably smaller. The automatic incrementation routine has a built-in provision for reducing the size of the increment as required. See section on "Incrementation of a Parameter."

Entropy-Layer Computations

The values of some of the parameters must be changed in order for computations to be carried into the entropy layer. These computations have to be carried out in a sequence of steps by using the converged shock shape from one sequence as the input values for the next sequence of computations. The magnitudes of the quantities VTEST, EPSIG, SPACER, and DS must be reduced in stages. Setting SPACER=EPSIG is recommended for all computations. One satisfactory procedure has made use of a systematic step-size reduction (for example, a halving mode for DS) for values of ZETA less than 0.1 with EPSIG = 10.*VTEST. The quantity VTEST was then reduced in a sequence of computations, the first with VTEST = 10^{-4}, the second with VTEST = 10^{-6}, and so forth. The computation was continued in stages until VTEST was 10^{-10}.

Limitations

The computations may become very sensitive to the accuracy of the shock description, or fail completely, for the following conditions:

(1) Angle of attack equal to or greater than the body apex half-angle in the vertical (YZ) plane of symmetry. Three factors contribute to the difficulty in obtaining a solution: (a) the shock wave on the leeward side approaches tangency with the free-stream Mach cone which is a singularity of the equations, (b) the cross flow becomes locally supersonic which signals the onset of embedded shock waves, and (c) the computed pressures in the

flow field or on the body become very small. The computations can often be continued to larger angles of attack by reducing the number of lines. Use can also be made of the option of altering the body shape on the leeward side to avoid some of the computational difficulties for cases where the flow on the windward side is of primary interest. For this option set M2E = 1 and $TU > T$ in the input. See section "Input Description."

(2) Very flat elliptic cone. The pressure gradients in the cross-flow direction became large as the axis ratio T becomes small, thus dictating a relatively large number of lines to construct the solution to good accuracy. However, instabilities arise for a large number of lines (ref. 1) and it becomes necessary to use fewer lines than would otherwise be desirable. Some roughness in the computed results will generally be evident when $T \lessapprox \frac{1}{3}$ but this is dependent on the angle of attack. Computations for smaller T can be made for small angles of attack but the results will be more irregular. The maximum number of lines recommended is $N = 19$.

(3) Low Mach number. The computations become very sensitive to the accuracy of the shock shape at the low supersonic Mach numbers. If difficulty is encountered for $M_\infty < 2$, say, the solution can sometimes be obtained by reducing the number of lines. In general, the method fails for slender cones at low supersonic Mach numbers, a condition which produces a weak shock.

Special System Features

The program is written in FORTRAN IV for the Control Data 6000 series computer system. Some changes may be required for other systems. The word length of this computer is 60 bits, so double precision should be used on systems with 32- or 36-bit word lengths. Some seven-character variable names have been used in the program which may not be acceptable to other systems. At card A1330 a test is made on the input values of T and α. If they are exactly 1.0 and 0., respectively, the zero-incidence circular-cone solution (using only one line) is triggered. Some computers may not store an exact 1.0 or 0., even though they are inputs, hence an appropriate test would need to be substituted. The program requires a field length of 70 K_8 to compile and execute on the CDC 6000 series computer system at Langley Research Center.

Langley Research Center,
National Aeronautics and Space Administration,
Hampton, Va., December 30, 1971.

APPENDIX A

PROGRAM LISTING, LIST OF SUBROUTINES, AND FLOW CHART

The computational program listing is given in this appendix together with a list of the subroutines and a flow chart.

Program Listing

The computational program listing is as follows:

```
      PROGRAM MAIN(INPUT,OUTPUT,TAPE5=INPUT,PUNCH)
C
C     CONICAL FLOW ABOUT ELLIPTIC CONES BY THE METHOD OF LINES WITH
C        INCREMENTATION OF A PARAMETER
C
      COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
      COMMON FUN(20,6),DFUN(20,6),FUNC(20,6),DFUNC(20,6),B1(20,6),B2(20,
     16),B3(20,6),B4(20,6)
      COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
     14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
     20),A7(20),A8(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
     3(20),ETAS(20),ETASP(20),BETAD(20),RHO(20),R(20),P(20),U(20),V(20),
     4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
     5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1(20),ZETA2(20),ZETA3(20),ZETA4
     6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
     70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSID(20),DP1(20),DP2(20),
     8DP3(20),DP4(20),DEQNS(20),CROSSM(20),POROGAM(20),Q(20),QP(20),PSIS
     9D(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
      COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2B(20),DPDZE
     1X(20)
      COMMON KTRANSF,SLOPE
      COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
     1A,DX1,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
     2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
     3EPSIGOM,EPSINT,DEQ,XIN1,SIGNP1
      COMMON /BLOCKN/ DWDX1,WP1,WP2,WP3,WP4
      COMMON /ERROR/ ER(12),ERR(12),BLK(12)
      COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
     1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
     2POPTI(20),PTOPTI(20),PT(20),POASTSQ(20),POPINF(20),CPBODY(20)
      DIMENSION DHOLD(20,20)
      COMMON /BLOCK1/ ISTL,NCYCLE,NCOUNT,ISIGN
      COMMON /BLOCK2/ NA,NB,ANA,BNB,M2E,TU
      COMMON /BLOCK6/ NEGP
C
C       COMMON BLOCK1  NEEDED IN  MP,LGRANGE,DERIV2
C       COMMON BLOCK2  NEEDED IN  MP,BG
C
      DATA (ER(I),I=1,12)/3HER1,3HER2,3HER3,3HER4,3HER5,3HER6,3HER7,3HER
     18,3HER9,4HER10,4HER11,4HER12/
      DATA (ERR(I),I=1,12)/4HERR1,4HERR2,4HERR3,4HERR4,4HERR5,4HERR6,4HE
     1RR7,4HERR8,4HERR9,5HERR10,5HERR11,5HERR12/
      DATA (BLK(I),I=1,12)/4HBLK1,4HBLK2,4HBLK3,4HBLK4,4HBLK5,4HBLK6,4HB
     1LK7,4HBLK8,4HBLK9,5HBLK10,5HBLK11,5HBLK12/
      DIMENSION ETASO(20), VO(20), D(20,20), B(20,1), IPIVOT(20), DETA(2
     10), XREAL(20), YREAL(20), X(20), Y(20), ETAS1(20), ETAS2(20), ETAS
     23(20), FI(20), FIB(20), DFIDU(20,20), IDATE(2)
      EQUIVALENCE (D,DFIDU)
      CALL DAYTIM (IDATE)
      PRINT 139, IDATE
      PRINT 138
      PRINT 139, IDATE
      PRINT 172
      PRINT 173
      PRINT 174
      RAD=57.2957795I
      PI=3.1415926536
      EPSIGOM=.001
      PGAM=1.0
      NDEBUG=1
      ISTL=1
      NP=5
      NPHLD=NP
      MHLD=0
C
C      M=0 - ZERO-INCIDENCE CIRCULAR CONE
C      M=2 - CIRCULAR,ELLIPTIC,AND BI-ELLIPTIC CONES
C       INCRMT=1   INCREMENT T
C       INCRMT=2   INCREMENT ALPHAD
C       INCRMT=3   INCREMENT THETAD
C       INCRMT=4   INCREMENT STMACH
C       INCRMT=5   INCREMENT GAMMA
C      IPRINT=1 PRINTS CONVERGED VALUES FOR EACH PARAMETER
C      IPRINT=2 PRINTS CONVERGED VALUES ONLY FOR FINAL PARAMETER
C      (A) IDENTITY TRANSFORMATION. KTRANSF=1, SLOPE=1
C      (B) HIGH DENSITY OF LINES AT LEADING EDGE. KTRANSF=2, SLOPE LT 1.
C      (C) HIGH DENSITY OF LINES AT NODAL POINT.  KTRANSF=3, SLOPE LT 1.
C
    1 READ (5,134) STMACH,GAMMA,T,THETAD,ALPHAD
      IF (ENDFILE 5) 133,2
    2 CONTINUE
      AAST=SQRT((GAMMA-1.)/(GAMMA+1.)+2./((GAMMA+1.)*STMACH**2))
      AASTSQ=AAST**2
      READ (5,135) N,M,NREAD,NSPACE,INCRMT,IPRINT,NCNVRGB,KTRANSF,NPLOT,
     1NPUNCH
      READ (5,134) PARAM,PARAMF,DPRAM1,DPRAM,DPRMIN
      READ (5,134) SLOPE
      READ (5,134) VTEST,VTEST1
C
C       IF  M2E=0  USE REGULAR   M=2  SOLUTION
C       IF  M2E=1  USE  M=2 BODY WITH TWO ELLIPSES
C        WHEN  M2E=1, NSPACE MUST EQUAL ONE, KTRANSF=1,SLOPE=1
C
      READ (5,135) M2E
      IF (M2E.EQ.1) READ (5,134) TU
      KCOUNT=0
      NLINEP1=N+1
      NA=1
      ANA=0.
      NB=1
      BNB=0.
      NM1=N-1
      NP1=N+1
      IF (NSPACE.EQ.2) READ (5,144) NA,NB,ANA,BNB
      NCNVRG=NCNVRGB
      PRINT 137, N,M,NREAD,NSPACE,NP,NCNVRG
      PRINT 145, NA,ANA,NB,BNB
      PRINT 156, VTEST,VTEST1
      PRINT 160, SLOPE,KTRANSF
      IF (M2E.EQ.0) PRINT 180, M2E
      IF (M2E.EQ.1) PRINT 179, M2E,TU
      IF (NCNVRG.EQ.0.AND.NREAD.EQ.0) GO TO 8
      IF (NCNVRG.EQ.0.AND.NREAD.EQ.1) GO TO 3
      IF (NCNVRG.EQ.1) GO TO 4
      IF (NCNVRG.EQ.2) GO TO 6
      IF (NCNVRG.EQ.3) GO TO 7
    3 READ (5,152) (ETAS(I),I=1,N)
      GO TO 8
    4 READ (5,134) PARAM1
      READ (5,152) (ETAS1(I),I=1,N)
      DO 5 I=1,N
    5 ETAS(I)=ETAS1(I)
      GO TO 8
    6 READ (5,134) PARAM1,PARAM2
      READ (5,152) (ETAS1(I),I=1,N)
      READ (5,152) (ETAS2(I),I=1,N)
      GO TO 8
    7 READ (5,134) PARAM1,PARAM2,PARAM3
      READ (5,152) (ETAS1(I),I=1,N)
      READ (5,152) (ETAS2(I),I=1,N)
      READ (5,152) (ETAS3(I),I=1,N)
    8 DO 132 L1=1,100
      IF (MHLD.EQ.0.AND.M.EQ.2.AND.T.EQ.1..AND.ALPHAD.EQ.0.) GO TO 9
      GO TO 10
    9 MHLD=2
      NHLD=N
      M=0
      N=1
   10 IF (DPRAM.LT.0.0.AND.PARAM.LT.PARAMF) PARAM=PARAMF
      IF (DPRAM.GT.0.0.AND.PARAM.GT.PARAMF) PARAM=PARAMF
      IF (PARAM.EQ.PARAMF.AND.NCNVRG.EQ.1) DPRAM1=PARAMF-PARAM1
      IF (PARAM.EQ.PARAMF.AND.NCNVRG.EQ.2) DPRAM=PARAMF-PARAM2
      IF (PARAM.EQ.PARAMF.AND.NCNVRG.GE.3) DPRAM=PARAMF-PARAM3
      PRINT 138
C
C     SELECT REAL PARAMETER
C
      GO TO (11,12,13,14,15), INCRMT
   11 T=PARAM
      GO TO 16
   12 ALPHAD=PARAM
      GO TO 16
   13 THETAD=PARAM
      GO TO 16
   14 STMACH=PARAM
      GO TO 16
   15 GAMMA=PARAM
   16 CONTINUE
      PRINT 136, STMACH,GAMMA,T,THETAD,ALPHAD
      IF (NPLOT.EQ.1) PUNCH 152, STMACH,GAMMA,T,THETAD,ALPHAD,SLOPE
      IF (NPLOT.EQ.1) PUNCH 135, N,M,KTRANSF
      PRINT 141, EPSIGOM
      PRINT 154, AAST
      PRINT 156, VTEST,VTEST1
      IF (M2E.EQ.0) PRINT 180, M2E
      IF (M2E.EQ.1) PRINT 179, M2E,TU
      PRINT 160, SLOPE,KTRANSF
      THETAR=THETAD/RAD
      ALPHAR=ALPHAD/RAD
```

```
      RANGLE=ALPHAR/ATAN(T*TAN(THETAR))
      PRINT 167, RANGLE
      A=PI*T*TAN(THETAR)**2
      IF (M2E.EQ.1) A=PI/2.*TAN(THETAR)**2*(TU+T)
      GAMX=1./GAMMA
      AA=1./(GAMMA*STMACH**2)
      PTINF=AA*(1.+(GAMMA-1.)/2.*STMACH**2)**(GAMMA/(GAMMA-1.))
      SINALP=SIN(ALPHAR)
      COSALP=COS(ALPHAR)
C     SELECTION OF BODY GEOMETRY  M=0 - ZERO-INCIDENCE CIRCULAR CONE.
C        M=2 CIRCULAR AND ELLIPTIC CONES
      IF (L1.EQ.1.AND.M.EQ.2) THOLD=T
      IF (L1.EQ.1.AND.M.EQ.2) THETHLD=THETAR
      IF (L1.EQ.1.AND.M.EQ.2) EPSIHLD=EPSIGOM
      IF (M.EQ.0) GO TO 18
      IF (M.EQ.2.AND.L1.EQ.1) GO TO 19
      IF (M.EQ.2.AND.L1.NE.1) GO TO 17
   17 IF (ABS(THOLD-T).GT.1.E-05.OR.ABS(THETHLD-THETAR).GT.1.E-05) GO TO
     1 18
      GO TO 20
   18 CALL BG
      IF (NCNVRG.EQ.0.AND.NREAD.EQ.0.AND.L1.EQ.1) GO TO 19
      GO TO 20
   19 CALL APPROX
C
C     INITIAL VALUES OF INTEGRATION PARAMETERS
C
   20 J=0
      DEQ=1.0
      NEGP=1
      NCOUNT=0
      NCYCLE=1
      NPIV=0
      NPRINT=1
      ISIGN=500
      ISIGNH=500
      EPSIG=1.E-03
      SPACER=EPSIG
      EPSIGMX=.001
      EPSIVAR=1.E-08
      EPSINT=.025
      NMAX=20
      INTSTEP=0
      NLINES=N
      PRINT 165, EPSIG,EPSIGMX,SPACER,EPSIVAR,EPSINT
      IF (NCNVRGB.EQ.1.AND.L1.EQ.1) GO TO 132
      IF (NCNVRGB.EQ.2.AND.L1.EQ.1) GO TO 87
      IF (NCNVRGB.EQ.3.AND.L1.EQ.1) GO TO 98
C
C     COMPUTE INITIAL VALUES FOR INTEGRATION
C
   21 CONTINUE
      IF (NCOUNT.EQ.0.AND.NPIV.LE.1) NSKIP=0
      IF (N.NE.1) DXI=XI(2)-XI(1)
      IF (NPRINT.EQ.1.AND.NPIV.EQ.0) GO TO 22
      GO TO 23
   22 CALL DAYTIM (IDATE)
      PRINT 168, NCYCLE,IDATE
      PRINT 151, (ETAS(I),I=1,N)
   23 IF (NCOUNT.EQ.0.AND.NPIV.EQ.0.AND.NPUNCH.EQ.1) PUNCH 155, PARAM,M,
     1INCRMT,NCYCLE
      IF (NCOUNT.EQ.0.AND.NPIV.EQ.0.AND.NPUNCH.EQ.1) PUNCH 152, (ETAS(I)
     1,I=1,N)
      DO 24 I=1,N
      IF (ETAS(I).LT.0.0) STOP 0177
   24 CONTINUE
      DO 26 I=1,N
      XZERO=XI(I)
      ISTL=7
      IF (M.NE.0) CALL LGRANGE (I,NP,NLINES,NDEBUG,XZERO,XI,ETAS,X,Y,DYD
     1X)
      IF (M.NE.0) ETASP(I)=S2B(I)*DYDX
      IF (M.EQ.0) ETASP(I)=0.
      ZETA=1.0
      ETA(I)=ZETA*ETAS(I)
      CON1=SIN(ETA(I))
      CON2=COS(ETA(I))
      H=CON2-AKB(I)*CON1
      HK=CON1+AKB(I)*CON2
      IF (ABS(H).GE.1.E-07) GO TO 25
      PRINT 142, ER(I),I,ZETA,ETAS(I),ETA(I),CON1,CON2,AKB(I),H,HK
      STOP
   25 TANSIG=-ETASP(I)/H
      SIGMA=ATAN(TANSIG)
      SIGMAD=SIGMA*RAD
      IF (NDEBUG.EQ.0) PRINT 142, BLK(1),I,ZETA,ETA(I),CON1,CON2,ETAS(I)
     1,AKB(I),H,HK,TANSIG,SIGMA,SIGMAD
      CALL DIRCOS (I)
      CALL SHOCK (I)
      UNORHO=ABS(V(I)*COS(SIGMA)+W(I)*SIN(SIGMA))*.5
      IF (I.EQ.1) VMXTEST=UNORHO
      IF (I.GT.1.AND.UNORHO.LT.VMXTEST) VMXTEST=UNORHO
      CP(I)=2.*(P(I)-1./(GAMMA*STMACH**2))
      IF (CP(I).LT.0) GO TO 105
      CPSHOCK(I)=CP(I)
   26 CONTINUE
      IF (T.LT.1.0) GO TO 27
      GO TO 32
   27 DO 29 I=1,N
      IM1=I-1
      IM2=I-2
      IF (I.EQ.1) IM1=2
      IF (I.EQ.1) IM2=3
      IF (I.EQ.2) IM1=1
      IF (I.EQ.2) IM2=2
      IF (SBAR(I).LT.SBAR(IM1).AND.SBAR(IM1).GT.SBAR(IM2)) GO TO 28
      GO TO 29
   28 JJ=I
      JJM1=IM1
      JJM2=IM2
   29 CONTINUE
      DENOM=(XI(JJ)-XI(JJM1))*SBAR(JJM2)-(XI(JJ)-XI(JJM2))*SBAR(JJM1)+(X
     1I(JJM1)-XI(JJM2))*SBAR(JJ)
      ANUM=-(XI(JJM1)**2-XI(JJ)**2)*SBAR(JJM2)-(XI(JJ)**2-XI(JJM2)**2)*S
     1BAR(JJM1)+(XI(JJM1)**2-XI(JJM2)**2)*SBAR(JJ)
      XIST=.5*ANUM/DENOM
      IF (JJ.NE.2) GO TO 30
      XIST=0.
      SBARMX=SBAR(JJ)
      GO TO 31
   30 CONTINUE
      TERM1=(XIST-XI(JJM1))*(XIST-XI(JJ))*SBAR(JJM2)/((XI(JJM2)-XI(JJM1)
     1)*(XI(JJM2)-XI(JJ)))
      TERM2=(XIST-XI(JJM2))*(XIST-XI(JJ))*SBAR(JJM1)/((XI(JJM1)-XI(JJM2)
     1)*(XI(JJM1)-XI(JJ)))
      TERM3=(XIST-XI(JJM2))*(XIST-XI(JJM1))*SBAR(JJ)/((XI(JJ)-XI(JJM2))*
     1(XI(JJ)-XI(JJM1)))
      SBARMX=TERM1+TERM2+TERM3
   31 PGAM=AA*EXP(SBARMX)
   32 IF (NPRINT.EQ.1.AND.NPIV.EQ.0) GO TO 33
      GO TO 34
   33 PRINT 157, (ETASP(I),I=1,N)
      PRINT 158, (CP(I),I=1,N)
   34 IF (NDEBUG.EQ.0) PRINT 143, (I,U(I),P(I),V(I),W(I),I=1,N)
C
C     DUMMY INITIALIZATION OF EXTRAPOLATION PARAMETERS
C
      DO 35 I=1,N
      ZETA1(I)=1.0
      ZETA2(I)=1.0
      ZETA3(I)=1.0
      ZETA4(I)=1.0
      DU1(I)=1.0
      DU2(I)=1.0
      DU3(I)=1.0
      DU4(I)=1.0
      DP1(I)=1.0
      DP2(I)=1.0
      DP3(I)=1.0
      DP4(I)=1.0
      DV1(I)=1.0
      DV2(I)=1.0
      DV3(I)=1.0
      DV4(I)=1.0
      DW1(I)=1.0
      DW2(I)=1.0
      DW3(I)=1.0
      DW4(I)=1.0
      DSB1(I)=1.0
      DSB2(I)=1.0
      DSB3(I)=1.0
      DSB4(I)=1.0
   35 CONTINUE
      WP1=1.
      WP2=1.
      WP3=1.
      WP4=1.
      NE=6
      ZETA=1.0
      DZETA=-.1
      DO 36 I=1,N
      FUN(I,1)=ZETA
      FUN(I,2)=U(I)
      FUN(I,3)=P(I)
      FUN(I,4)=V(I)
      FUN(I,5)=W(I)
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      FUN(I,6)=SBAR(I)
      DFUN(I,1)=DZETA
      FUNC(I,2)=U(I)
   36 CONTINUE
C
C     INTEGRATE EQUATIONS FROM ZETA=1 TO ZETA=0
C
      DO 68 INTCNT=1,100000
      CALL DERIV2 (DZETA,NP)
      IF (DEQ.EQ.0.0) GO TO 105
      IF (NEGP.EQ.0) GO TO 105
   37 IF (NPRINT.NE.2) GO TO 66
      NSB=1
      EPSISB=.01
      SBTEST=1.E-08
      NSBCNT=0
      SBRCON=SBARMX
      DO 38 I=1,N
      ZETA=FUN(I,1)
      U(I)=FUN(I,2)
      P(I)=FUN(I,3)
      V(I)=FUN(I,4)
      W(I)=FUN(I,5)
      SBAR(I)=FUN(I,6)
      DZETA=DFUN(I,1)
      DUDZ(I)=DFUN(I,2)
      DPDZ(I)=DFUN(I,3)
      IF (ZETA.NE.0.0) DVDZ(I)=DFUN(I,4)
      DWDZ(I)=DFUN(I,5)
      DSBDZ(I)=DFUN(I,6)
   38 CONTINUE
      UW=U(1)
      RHOW=RHO(1)
      SW=SBAR(1)
      PORGAMW=POROGAM(1)
      UL=U(N)
      RHOL=RHO(N)
      SL=SBAR(N)
      PORGAML=POROGAM(N)
      IF (T.EQ.1.) PGAM=PORGAMW
      W(1)=0.
      W(N)=W(1)
      NTIMES=1
      IF (ZETA.NE.0.0) GO TO 62
      IF (M.EQ.0) GO TO 62
      IF (M2E.EQ.1) GO TO 62
C
C     CORRECT SURFACE QUANTITIES AT  ZETA=0
C
      EPSISEN=1.E-06
      TERM1=(1.+2./((GAMMA-1.)*STMACH**2))/AASTSO
      FAC=(2.*GAMMA)/((GAMMA-1.)*AASTSO)
      IF (M.EQ.2.AND.T.GT.1.) GO TO 39
      ISIGN=500
      ISIGNP1=ISIGN+1
      LMT1=1
      LMT=N
      GO TO 42
   39 DO 40 I=1,NM1
      IF (W(I).GE.0..AND.W(I+1).LT.0.0) GO TO 41
   40 CONTINUE
      ISIGN=500
      ISIGNP1=ISIGN+1
      LMT1=1
      LMT=N
      GO TO 42
   41 ISIGN=I
      ISIGNP1=ISIGN+1
      LMT1=1
      LMT=ISIGN
      ISIGNH=ISIGN
   42 NP=NPHLD
      ISIGNH=ISIGN
      DO 43 I=LMT1,LMT
      IF (T.LT.1.) RHO(I)=(P(I)/PGAM)**GAMX
      IF (T.EQ.1.) RHO(I)=(P(I)/PORGAMW)**GAMX
      IF (T.GT.1..AND.ISIGN.EQ.500) RHO(I)=(P(I)/PORGAMW)**GAMX
      IF (T.GT.1..AND.ISIGN.NE.500.AND.I.GE.1.AND.I.LE.ISIGN) RHO(I)=(P(
     1I)/PORGAMW)**GAMX
      IF (T.GT.1..AND.ISIGN.NE.500.AND.I.GE.ISIGNP1.AND.I.LE.N) RHO(I)=(
     1P(I)/PORGAML)**GAMX
      U(I)=SQRT(TERM1-FAC*P(I)/RHO(I)-W(I)**2)
   43 CONTINUE
      EPSIU=1.E-08
      NSTOP=0
      ISTL=2
      GO TO 52
   44 DO 45 I=LMT1,LMT
      FIB(I)=TERM1-FAC*P(I)/RHO(I)-U(I)**2-UP(I)**2
      UISEN(I)=U(I)
   45 CONTINUE
      JTEMP=0
      DO 48 J=LMT1,LMT
      I=LMT1
      ITEMP=1
      JTEMP=JTEMP+1
   46 U(J)=(1.+EPSIU)*UISEN(J)
      NP=NPHLD
      IF (ISIGN.NE.500.AND.NTIMES.EQ.1.AND.I.EQ.ISIGN) NP=3
      IF (ISIGN.NE.500.AND.NTIMES.EQ.2.AND.I.EQ.ISIGN+1) NP=3
      CALL LGRANGE (I,NP,NLINES,NDEBUG,XI(I),XI,U,X,Y,DYDX)
      UP(I)=G2B(I)*DYDX
      FI(I)=TERM1-FAC*P(I)/RHO(I)-U(I)**2-UP(I)**2
      DFIDU(I,J)=(FI(I)-FIB(I))/(EPSIU*UISEN(J))
      DFIDU(ITEMP,JTEMP)=DFIDU(I,J)
      IF (I.EQ.LMT) GO TO 47
      I=I+1
      ITEMP=ITEMP+1
      GO TO 46
   47 U(J)=UISEN(J)
   48 CONTINUE
      IF (ISIGN.EQ.500) NXYZ=N
      IF (ISIGN.NE.500.AND.NTIMES.EQ.1) NXYZ=ISIGN
      IF (ISIGN.NE.500.AND.NTIMES.EQ.2) NXYZ=N-ISIGN
      ITEMP=0
      DO 49 I=LMT1,LMT
      ITEMP=ITEMP+1
   49 B(ITEMP,1)=-FIB(I)
      CALL SIMEQ (DFIDU,NXYZ,2,1,DETERM,IPIVOT,NMAX,ISCALE)
      ITEMP=0
      DO 50 I=LMT1,LMT
      ITEMP=ITEMP+1
   50 U(I)=UISEN(I)+B(ITEMP,1)
      ITEMP=0
      DO 51 I=LMT1,LMT
      ITEMP=ITEMP+1
      IF (ABS(B(ITEMP,1)).GT.EPSISEN) GO TO 52
   51 CONTINUE
      GO TO 59
   52 DO 53 I=LMT1,LMT
      NP=NPHLD
      IF (ISIGN.NE.500.AND.NTIMES.EQ.1.AND.I.EQ.ISIGN) NP=3
      IF (ISIGN.NE.500.AND.NTIMES.EQ.2.AND.I.EQ.ISIGN+1) NP=3
      CALL LGRANGE (I,NP,NLINES,NDEBUG,XI(I),XI,U,X,Y,DYDX)
   53 UP(I)=G2B(I)*DYDX
      IF (ISIGN.NE.500.AND.NTIMES.EQ.1) GO TO 54
      GO TO 58
   54 DO 55 I=LMT1,LMT
      IF (UP(I).GE.0..AND.UP(I+1).LT.0.0) GO TO 56
   55 CONTINUE
   56 ISIGN=I
      ISIGNP1=ISIGN+1
      IF (ISIGN-ISIGNH) 57,58,57
   57 LMT1=1
      LMT=ISIGN
      NTIMES=1
      GO TO 42
   58 UP(1)=0.0
      NSTOP=NSTOP+1
      IF (NSTOP.GT.25) PRINT 166, NSTOP
      IF (NSTOP.GT.25) GO TO 59
      GO TO 44
   59 DO 60 I=LMT1,LMT
      W(I)=UP(I)
      POROGAM(I)=P(I)/RHO(I)**GAMMA
      SBAR(I)=ALOG(GAMMA*STMACH**2*POROGAM(I))
      DENOM=SQRT(GAMMA*P(I)/RHO(I))
      CROSSM(I)=ABS(W(I))/DENOM*AAST
      ASQ=GAMMA*FUN(I,3)/RHO(I)
      BUSQ=U(I)**2+V(I)**2+W(I)**2
      AM(I)=SQRT(AAST**2*BUSQ/ASQ)
      DENOM=1.+2./((GAMMA-1.)*STMACH**2)
      BERNOUL(I)=1.-(2.*GAMMA*FUN(I,3)/(RHO(I)*(GAMMA-1.))+BUSQ*AAST**2)
     1/DENOM
      ASQ=GAMMA*FUN(I,3)/RHO(I)
      AISQ=ASQ/AASTSQ
      WOA=W(I)**2/AISQ
      DVDZ(I)=-ETAS(I)*((1.-WOA)*WP(I)+U(I)*(2.-WOA))
      DPDZ(I)=-ETAS(I)*RHO(I)*W(I)**2*AASTSQ*AKP(I)
   60 CONTINUE
      IF (LMT.EQ.N) ISIGN=500
      IF (LMT.EQ.N) GO TO 61
      LMT1=ISIGNP1
      LMT=N
      IF (ISIGN.EQ.NM1.OR.ISIGN.EQ.N) GO TO 61
      NTIMES=2
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      GO TO 42
   61 NP=NPHLD
      ISIGN=500
C
C     COMPUTE SPECIAL QUANTITIES FOR PRINTOUT
C
   62 DO 65 I=1,N
      IF (ZETA.EQ.0.0) ETA(I)=0.0
      CON1=SIN(ETA(I))
      CON2=COS(ETA(I))
      CALL DIRCOS (I)
      UC(I)=A13*V(I)+A23*W(I)+A33*U(I)
      VC(I)=B11*V(I)+B12*W(I)+B13*U(I)
      WC(I)=B21*V(I)+B22*W(I)+B23*U(I)
      XBAR(I)=A31/(A33*AB)
      YBAR(I)=A32/(A33*AB)
      BUSQ=U(I)**2+V(I)**2+W(I)**2
      VX(I)=A11*V(I)+A21*W(I)+A31*U(I)
      VY(I)=A12*V(I)+A22*W(I)+A32*U(I)
      RBAR=SQRT(XBAR(I)**2+YBAR(I)**2)
      VCC(I)=(XBAR(I)*VX(I)+YBAR(I)*VY(I))/RBAR
      WCC(I)=(-YBAR(I)*VX(I)+XBAR(I)*VY(I))/RBAR
      THETNOR(I)=ACOS(ABS(VY(I))/SQRT(BUSQ))*RAD
      PSINOR(I)=ATAN2(VX(I),UC(I))*RAD
      POPTI(I)=P(I)/PTINF
      PTOPTI(I)=(POROGAM(I)/AA)**(-1./(GAMMA-1.))
      PT(I)=PTOPTI(I)*PTINF
      POASTSQ(I)=P(I)/AASTSQ
      POPINF(I)=P(I)*GAMMA*SIMACH**2
      IF (I.NE.1.AND.I.NE.N) GO TO 65
      IF (I.EQ.1) GO TO 63
      IF (I.EQ.N) GO TO 64
   63 UCW=A33*UW
      VCW=B13*UW
      WCW=B23*UW
      VXW=A31*UW
      VYW=A32*UW
      VZW=A33*UW
      PTOPTIW=(PORGAMW/AA)**(-1./(GAMMA-1.))
      GO TO 65
   64 UCL=A33*UL
      VCL=B13*UL
      WCL=B23*UL
      VXL=A31*UL
      VYL=A32*UL
      VZL=A33*UL
      PTOPTIL=(PORGAML/AA)**(-1./(GAMMA-1.))
   65 CONTINUE
C     PRINT OUT - NPRINT =2
      IF (M2F.EQ.1) PRINT 171
      PRINT 147, ZETA
      LPRINT=1
C
C     MAIN PRINTOUT
C
      CALL PRINT (NLINEP1,LPRINT,ZETA,DZETA,NP,NPLOT,NZETA)
      IF (ZETA.LE.0.0.AND.IPRINT.EQ.2.AND.PARAM.NE.PARAMF) GO TO 69
   66 IF (FUN(1,1).LE.0.) GO TO 69
      CALL RUNKUT2 (DZETA,NP)
      IF (DEQ.EQ.0.0) GO TO 105
      IF (NEGP.EQ.0) GO TO 105
      IF (NDEBUG.EQ.0) PRINT 146, INTCNT,NEXTRAP
      IF (FUN(1,1).EQ.0.0.AND.NEXTRAP.EQ.1) GO TO 37
      IF ((FUN(1,1)+DFUN(1,1)).GE.0.) GO TO 68
      DZETA=-FUN(1,1)
      DO 67 I=1,N
   67 DFUN(I,1)=DZETA
   68 CONTINUE
C
C     COMPUTE PRESSURE COEFFICIENT AT SURFACE
C
   69 DO 70 I=1,N
      CP(I)=2.*(FUN(I,3)-1./(GAMMA*SIMACH**2))
      CPBODY(I)=CP(I)
   70 CONTINUE
      IF (NPRINT.NE.2) GO TO 72
      IF (NPLOT.EQ.0) GO TO 71
C
C     IF THIS IS A PRINT RUN AND PLOTTING IS DESIRED - PUNCH CARDS
C
      PUNCH 135, NZETA
      PUNCH 152, (XBAR(I),I=1,N)
      PUNCH 152, (YBAR(I),I=1,N)
      PUNCH 152, (PSID(I),I=1,N)
      PUNCH 152, (CPBODY(I),I=1,N)
      PUNCH 152, (U(I),I=1,N)
      PUNCH 152, (W(I),I=1,N)
      PUNCH 152, (RHO(I),I=1,N)
      PUNCH 152, (CROSSM(I),I=1,N)
   71 PRINT 162
      PRINT 161
      PRINT 164, UW,RHOW,SW,PORGAMW,UCW,VCW,WCW,VXW,VYW,VZW,PTOPTIW
      PRINT 163
      PRINT 161
      PRINT 164, UL,RHOL,SL,PORGAML,UCL,VCL,WCL,VXL,VYL,VZL,PTOPTIL
   72 IF (NPRINT.EQ.1.AND.NPIV.EQ.0) PRINT 159, (CP(I),I=1,N)
      IF (NPRINT.EQ.1.AND.NPIV.EQ.0) PRINT 149, (FUN(I,4),I=1,N)
C     INTSTEP - TOTAL NUMBER OF GOOD INTEGRATION STEPS
      INTSTEP=INTSTEP+INTCNT
      IF (NPRINT.NE.2) GO TO 73
      IF (M.NE.2) GO TO 76
C
C     COMPUTE FORCE AND MOMENT COEFFICIENTS
C
      CALL FMCOEFS (N,NA,NP,NSPACE,XI,A,M,AA,AAA,P,A2,A1,A4,GY,YO,SINALP
     1,COSALP,G2B)
   73 IF (NCOUNT.NE.0) GO TO 102
C
C     TESTS FOR CONVERGENCE
C
      DO 74 I=1,N
      IF (I.EQ.1) VMAX=ABS(FUN(I,4))
      IF (ABS(FUN(I,4)).GT.VMAX) VMAX=ABS(FUN(I,4))
   74 CONTINUE
      IF (NCYCLE.EQ.1.AND.VMAX.GT.VTEST) GO TO 102
      IF (NCYCLE.GT.1.AND.VMAX.GT.VTEST1) GO TO 102
      IF (VMAX.LE.VTEST) GO TO 75
      IF (N.EQ.1) GO TO 102
      IF (NCYCLE.GT.1.AND.VMAX.LT.VTEST1) NSKIP=1
      IF (NCYCLE.GT.1.AND.VMAX.LT.VTEST1) KCOUNT=KCOUNT+1
      IF (NCYCLE.GT.1.AND.VMAX.LT.VTEST1) GO TO 103
   75 NPRINT=NPRINT+1
      IF (NPRINT.EQ.3) GO TO 76
C
C     BEGINNING OF PRINT RUN
C
      KCOUNT=KCOUNT+1
      IF (M.EQ.0) GO TO 100
      IF (M.EQ.2) GO TO 101
   76 NCNVRG=NCNVRG+1
      IF (N.NE.1) GO TO 78
      IF (M.EQ.0.AND.MHLD.EQ.0) GO TO 1
C
C     ETAS(I) FROM TAYLOR-MACCOLL
C
      M=MHLD
      N=NHLD
      NCNVRG=0
      NREAD=1
      DO 77 I=1,N
   77 ETAS(I)=ETAS(1)
      GO TO 8
   78 IF (PARAM.EQ.PARAMF) GO TO 1
C
C     COMPUTE NEW PARAM AND CORRESPONDING ETAS (DEPENDS ON NUMBER OF
C     CONVERGED SOLUTIONS)
C
      IF (NCNVRG.EQ.1) GO TO 79
      IF (NCNVRG.EQ.2) GO TO 82
      IF (NCNVRG.GE.3) GO TO 91
   79 PARAM1=PARAM
      DO 80 I=1,N
   80 ETAS1(I)=ETAS(I)
   81 PARAM=PARAM1+DPRAM1
      GO TO 132
   82 DO 83 I=1,N
   83 ETAS2(I)=ETAS(I)
      DO 84 I=1,N
      IF (ABS(ETAS1(I)-ETAS2(I)).GT.1.E-05) GO TO 85
   84 CONTINUE
      GO TO 89
   85 PARAM2=PARAM
   86 PARAM=PARAM1+DPRAM
   87 COEFF1=(PARAM-PARAM2)/(PARAM1-PARAM2)
      COEFF2=(PARAM-PARAM1)/(PARAM2-PARAM1)
      DO 88 I=1,N
   88 ETAS(I)=COEFF1*ETAS1(I)+COEFF2*ETAS2(I)
      GO TO 132
   89 DPRAM1=2.*DPRAM1
      NCNVRG=NCNVRG-1
      DO 90 I=1,N
   90 ETAS(I)=ETAS1(I)
      PARAM=PARAM1+DPRAM1
      GO TO 132
   91 IF (NCNVRG.GT.3) GO TO 93
      PARAM3=PARAM
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      DO 92 I=1,N
   92 ETAS3(I)=ETAS(I)
      GO TO 95
   93 DO 94 I=1,N
      ETAS1(I)=ETAS2(I)
      ETAS2(I)=ETAS3(I)
   94 ETAS3(I)=ETAS(I)
      PARAM1=PARAM2
      PARAM2=PARAM3
      PARAM3=PARAM
   95 IF (DPRAM.LT.0.0.AND.PARAM+DPRAM.LT.PARAMF) GO TO 96
      IF (DPRAM.GT.0.0.AND.PARAM+DPRAM.GT.PARAMF) GO TO 96
      GO TO 97
   96 PARAM=PARAMF
      GO TO 98
   97 PARAM=PARAM+DPRAM
   98 COEFF1=(PARAM-PARAM2)*(PARAM-PARAM3)/((PARAM1-PARAM2)*(PARAM1-PARA
     1M3))
      COEFF2=(PARAM-PARAM1)*(PARAM-PARAM3)/((PARAM2-PARAM1)*(PARAM2-PARA
     1M3))
      COEFF3=(PARAM-PARAM1)*(PARAM-PARAM2)/((PARAM3-PARAM1)*(PARAM3-PARA
     1M2))
      DO 99 I=1,N
   99 ETAS(I)=COEFF1*ETAS1(I)+COEFF2*ETAS2(I)+COEFF3*ETAS3(I)
      GO TO 132
C
C     HEADING PRINTOUT FOR TAYLOR-MACCOLL
C
  100 PRINT 148
      PRINT 136, STMACH,GAMMA,T,THETAD,ALPHAD
      PRINT 141, EPSIGOM
      PRINT 137, N,M,NREAD,NSPACE,NP,NCNVRG
      PRINT 156, VTEST,VTEST1
      IF (M2E.EQ.0) PRINT 180, M2E
      IF (M2E.EQ.1) PRINT 179, M2E,TU
      PRINT 160, SLOPE,KTRANSF
      PRINT 153, KCOUNT,VMAX,EPSIG,SPACER,VMXTEST
C
C     IF(IPRINT.EQ.2.AND.PARAM.NE.PARAMF)PRINT OUT ONLY AT ZETA=0
C
      IF (IPRINT.EQ.2.AND.PARAM.NE.PARAMF) GO TO 37
C
C     COMPLETE PRINT OUT FROM  ZETA=1  TO  ZETA=0
C
      GO TO 103
C
C     HEADING PRINTOUT FOR  M=2 BODY
C
  101 CONTINUE
      PRINT 138
      PRINT 137, N,M,NREAD,NSPACE,NP,NCNVRG
      PRINT 145, NA,ANA,NB,BNB
      PRINT 136, STMACH,GAMMA,T,THETAD,ALPHAD
      PRINT 167, RANGLE
      PRINT 165, EPSIG,EPSIGMX,SPACER,EPSIVAR,EPSINT
      PRINT 178, NCYCLE,VTEST,VMAX,AAST,PTINF
      PRINT 156, VTEST,VTEST1
      IF (M2E.EQ.0) PRINT 180, M2E
      IF (M2E.EQ.1) PRINT 179, M2E,TU
      PRINT 160, SLOPE,KTRANSF
      PRINT 153, KCOUNT,VMAX,EPSIG,SPACER,VMXTEST
      PRINT 140
      LPRINT=2
      CALL PRINT (NLINEP1,LPRINT,ZETA,DZETA,NP,NPLOT,NZETA)
C
C     IF(IPRINT.EQ.2.AND.PARAM.NE.PARAMF)PRINT OUT ONLY AT ZETA=0
C
      IF (IPRINT.EQ.2.AND.PARAM.NE.PARAMF) GO TO 37
C
C     COMPLETE PRINT OUT FROM  ZETA=1  TO  ZETA=0
C
      GO TO 103
C
C     VARIATION OF SHOCK DISTANCE FOR NEWTON-RAPHSON COMPUTATION OF SHOC
C     NCOUNT - COUNTER OF PIVOTAL AND VARIATION INTEGRATIONS  NCOUNT =1
C
  102 NCOUNT=NCOUNT+1
      KCOUNT=KCOUNT+1
      NPIV=NPIV+1
      IF (NCOUNT.GT.1) GO TO 112
C
C     PIVOTAL RUNS
C
  103 DO 104 I=1,N
      VO(I)=FUN(I,4)
      IF (I.EQ.1) VMAX=ABS(VO(1))
      IF (ABS(VO(I)).GT.VMAX) VMAX=ABS(VO(I))
  104 ETASO(I)=ETAS(I)
      IF (VMAX.GT.VMXTEST) GO TO 105
      IF (NPIV.EQ.2) GO TO 111
      IF (NPRINT.EQ.1.AND.NPIV.EQ.1) PRINT 153, KCOUNT,VMAX,EPSIG,SPACER
     1,VMXTEST
      IF (NCYCLE.GT.10.AND.NPRINT.EQ.1) STOP 6666
      IF (NPIV.EQ.1.AND.N.EQ.1) GO TO 111
      IF (NPRINT.EQ.1.AND.NSKIP.EQ.1) PRINT 153, KCOUNT,VMAX,EPSIG,SPACE
     1R,VMXTEST
C
C     NSKIP=1 IS THE MODIFIED NEWTON METHOD (D(I,J) NOT RECOMPUTED)
C
      IF (NSKIP.EQ.1) GO TO 116
      IF (EPSIG.EQ.EPSIGMX) GO TO 111
      NCOUNT=0
      GO TO 21
C
C     DECREASE PARAM INCREMENT AND RESTART FROM LAST CONVERGED SOLUTION
C
  105 IF (NCNVRG.EQ.0) GO TO 106
      IF (NCNVRG.EQ.1) GO TO 107
      IF (NCNVRG.EQ.2) GO TO 109
      IF (NCNVRG.GE.3) GO TO 110
  106 PRINT 170
      STOP 7776
  107 PARAM=PARAM1-DPRAM1
      DPRAM1=.5*DPRAM1
      DO 108 I=1,N
  108 ETAS(I)=ETAS1(I)
      GO TO 81
  109 PARAM=PARAM1-DPRAM
      DPRAM=.5*DPRAM
      IF (DPRAM.LT.0.0.AND.DPRAM.GT.DPRMIN) STOP 7777
      IF (DPRAM.GE.0.0.AND.DPRAM.LT.DPRMIN) STOP 7777
      GO TO 86
  110 PARAM=PARAM-DPRAM
      DPRAM=.5*DPRAM
      IF (DPRAM.LT.0.0.AND.DPRAM.GT.DPRMIN) STOP 7777
      IF (DPRAM.GE.0.0.AND.DPRAM.LT.DPRMIN) STOP 7777
      GO TO 97
C
C     BEGIN ETAS(I) VARIATION
C
  111 ETAS(J+1)=ETAS(J+1)*(1.+EPSIVAR)
      GO TO 21
  112 J=J+1
      IF (N.NE.1) GO TO 113
C
C     COMPUTE DETA FOR TAYLOR-MACCOLL
C
      DETA(1)=EPSIVAR*ETASO(1)/(1.-FUN(1,4)/VO(1))
      GO TO 130
  113 IF (J.LT.N) ETAS(J+1)=ETAS(J+1)*(1.+EPSIVAR)
      ETAS(J)=ETASO(J)
C
C     COMPUTE ELEMENTS OF JACOBIAN MATRIX
C
      DO 114 I=1,N
      D(I,J)=(FUN(I,4)-VO(I))/(EPSIVAR*ETASO(J))
      DHOLD(I,J)=D(I,J)
  114 CONTINUE
      IF (J.EQ.N) GO TO 115
      GO TO 21
C
C     SECTION TO PREPARE AND SOLVE  D(I,J)  MATRIX
C
  115 CONTINUE
  116 DO 117 I=1,N
  117 B(I,1)=-VO(I)
      IF (NSKIP.EQ.0) GO TO 120
      IF (NDEBUG.EQ.0) PRINT 176
      DO 119 I=1,N
      DO 118 J=1,N
  118 D(I,J)=DHOLD(I,J)
      IF (NDEBUG.EQ.0) PRINT 175, (D(I,J),J=1,N),B(I,1)
  119 CONTINUE
  120 DO 123 I=1,N
      SQSUM=0.
      DO 121 J=1,N
      SQSUM=SQSUM+D(I,J)**2
  121 CONTINUE
      TEMP=SQRT(SQSUM)
      DO 122 J=1,N
  122 D(I,J)=D(I,J)/TEMP
      B(I,1)=B(I,1)/TEMP
  123 CONTINUE
      CALL SIMEQ (D,N,B,1,DETERM,IPIVOT,NMAX,ISCALE)
      PRINT 177, DETERM
      IF (DETERM.LT.0.0.AND.DPRAM.EQ.DPRMIN) GO TO 75
```

APPENDIX A

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      IF (DETERM.GE.0.0) GO TO 128
      IF (NCNVRG.EQ.0) STOP 6666
      IF (NCNVRG.EQ.1) GO TO 124
      PARAM=PARAM-DPRAM
      DPRAM=.5*DPRAM
      PARAM=PARAM+DPRAM
      GO TO 125
  124 PARAM=PARAM1-DPRAM1
      DPRAM1=.5*DPRAM1
      PARAM=PARAM1+DPRAM1
      GO TO 126
  125 IF (NCNVRG.EQ.2) GO TO 97
      IF (NCNVRG.GE.3) GO TO 98
  126 DO 127 I=1,N
  127 ETAS(I)=ETAS1(I)
      GO TO 132
  128 DO 129 I=1,N
  129 DETA(I)=B(I,1)
  130 PRINT 150, (DETA(I),I=1,N)
      J=0
      NCYCLE=NCYCLE+1
      NCOUNT=0
      NPIV=0
      DO 131 I=1,N
  131 ETAS(I)=ETASO(I)+DETA(I)
      GO TO 21
  132 CONTINUE
      GO TO 1
  133 CALL DAYTIM (IDATE)
      PRINT 169, IDATE
      STOP 0101
C
C
  134 FORMAT (5F14.8)
  135 FORMAT (16I5)
  136 FORMAT (8H STMACH=E16.8,2X,6HGAMMA=E16.8,2X,2HT=E16.8,2X,7HTHETAD=
     1E16.8,2X,7HALPHAD=E16.8/)
  137 FORMAT (3H N=I2,2X,2HM=I1,2X,6HNREAD=I1,2X,7HNSPACE=I1,2X,3HNP=I2,
     12X,7HNCNVRG=I1)
  138 FORMAT (1H1//)
  139 FORMAT (2A10/)
  140 FORMAT (/)
  141 FORMAT (9H EPSIGOM=E16.8)
  142 FORMAT (1X1A6,I5/(8E16.8))
  143 FORMAT (1X,2HI=I4,2X,5HU(I)=E16.8,2X,5HP(I)=E16.8,2X,5HV(I)=E16.8,
     12X,5HW(I)=E16.8)
  144 FORMAT (2I5,2E16.8).
  145 FORMAT (4H NA=I2,2X,4HANA=E16.8,2X,3HNB=I2,2X,4HBNB=E16.8/)
  146 FORMAT (8H INTCNT=I5,2X,8HNEXTRAP=I1)
  147 FORMAT (/48X,5HZETA=F16.8/)
  148 FORMAT(//29H ZERO-INCIDENCE CIRCULAR CONE//)
  149 FORMAT (2H V/(1X8F16.8))
  150 FORMAT (5H DETA/(1X8F16.8))
  151 FORMAT (5H ETAS/(8F16.8))
  152 FORMAT (5F16.8)
  153 FORMAT (8H KCOUNT=I5,2X,5HVMAX=E16.8,2X,6HEPSIG=E16.8,2X,7HSPACER=
     1F16.8,2X,8HVMXTEST=F16.8)
  154 FORMAT (6H AAST=E16.8/)
  155 FORMAT (7H PARAM=E16.8,2X,2HM=I1,2X,7HINCRMT=I2,2X,7HNCYCLE=I4)
  156 FORMAT (7H VTEST=E16.8,2X,7HVTEST1=E16.8)
  157 FORMAT (6H ETASP/(8E16.8))
  158 FORMAT (15H CP(I) AT SHOCK/(8E16.8))
  159 FORMAT (16H CP(I) AT ZETA=0/(8E16.8))
  160 FORMAT (7H SLOPE=E16.8,2X,8HKTRANSF=I2)
  161 FORMAT (133H      U              RHO              S          POROGAM          U
     1C            VC              WC              VX              VY              VZ
     2  PT/PT1NF    /)
  162 FORMAT (/72H                                                            WINDWA
     1RD LINE ZETA LIMIT/)
  163 FORMAT (/71H                                                            LEEWAR
     1D LINE ZETA LIMIT/)
  164 FORMAT (11E12.4)
  165 FORMAT (/7H EPSIG=E16.8,2X,8HEPSIGMX=E16.8,2X,7HSPACER=E16.8,2X,8H
     1EPSIVAR=E16.8,2X,7HEPSINT=E16.8/)
  166 FORMAT (///41H SURFACE VALUES ARE NOT CONVERGED, NSTOP=,I5///)
  167 FORMAT (/8H RANGLE=F16.8/)
  168 FORMAT (/8H NCYCLE=,I2,6H   AT   ,2A10/)
  169 FORMAT (20H A2617 COMPLETED AT ,2A10)
  170 FORMAT (/35H NCNVRG=0 AND I CANNOT HALVE DPRAM1/)
  171 FORMAT (///44H SURFACE PROPERTIES NOT CORRECTED FOR  M2E=1///)
  172 FORMAT (//42H DAVIS-OLO-A2617-APPLIED MECHANICS -9-8-69)
  173 FORMAT (15H BERNIE KLUNKER)
  174 FORMAT (93H CONICAL FLOW ABOUT ELLIPTIC CONES BY THE METHOD OF LIN
     1ES  WITH INCREMENTATION OF A PARAMETER//)
  175 FORMAT (1X8E16.8)
  176 FORMAT (7H D(I,J))
  177 FORMAT (8H DETERM=E16.8)
  178 FORMAT (8H NCYCLE=I2,2X,6HVTEST=E16.8,2X,5HVMAX=E16.8,2X,5HAAST=E1
     16.8,2X,6HPTINF=E16.8/)
  179 FORMAT (/5H M2E=I5,2X,3HTU=E16.8/)
  180 FORMAT (/5H M2E=I5/)
      END
      SUBROUTINE BG
C
C     BODY GEOMETRY
C
      COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
      COMMON FUN(20,5),DFUN(20,5),FUNC(20,5),DFUNC(20,6),B1(20,6),B2(20,
     16),B3(20,6),B4(20,6)
      COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
     14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
     20),A7(20),A8(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
     3(20),ETAS(20),ETASP(20),BETAD(20),RHO(20),Q(20),P(20),U(20),V(20),
     4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
     5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1(20),ZETA2(20),ZETA3(20),ZETA4
     6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
     70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSID(20),DP1(20),DP2(20),
     8DP3(20),DP4(20),DEONS(20),CROSSM(20),POROGAM(20),Q(20),QP(20),PSIS
     90(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
      COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2B(20),DPDZE
     1X(20)
      COMMON KTRANSF,SLOPE
      COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
     1A,DX1,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
     2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
     3EPSIGOM,EPSINT,DEO,XIN1,SIGNP1
      COMMON /ERROR/ ER(12),ERR(12),BLK(12)
      COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
     1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
     2POPT1(20),PTOPT1(20),PT(20),POASTSO(20),POPINF(20),CPBODY(20)
      COMMON /BLOCK2/ NA,NB,ANA,BNB,M2E,TU
      DIMENSION IDATE(2)
      TL=T
      NTIMES=1
      NF=2
      AB=TAN(THETAR)
      N1=(N+1)/2
C
C     BODY SELECTION
C
      IF (M.EQ.0) GO TO 1
      IF (M.EQ.2) GO TO 2
C
C     TAYLOR-MACCOLL
C
    1 I=1
      XI(I)=0.0
      XO(I)=0.0
      YO(I)=-AB
      GX(I)=2.*XO(I)
      GY(I)=2.*YO(I)
      GXX(I)=2.
      GYY(I)=2.
      GXY(I)=0.0
      IF (NDEBUG.EQ.0) PRINT 46, I,XI(I),XO(I),YO(I)
      IF (NDEBUG.EQ.0) PRINT 45, I,GX(I),GY(I),GXX(I),GYY(I),GXY(I)
      GO TO 36
    2 NSTEP=2
C
C     CIRCULAR AND ELLIPTIC CONE - COMPUTATION OF  XI(NI)
C
      NINT=1
      NQUAD=1
      F(1)=0.0
      F(2)=0.0
      DS=.01*AB
      DF(1)=DS
C
C     INTEGRATION WITH XO OR YO INDEPENDENT VARIABLE - NINT=1
C     INTEGRATION OVER XO - NCHANGE=1, VARIABLE STEP - NSTEP=2
C
      XOO=0.0
      NCHANGE=1
      CHECK1=AB/SQRT(1.+T**2)
      CHECK2=-T**2*AB/SQRT(1.+T**2)
      DO 6 INTCNT=1,100000
      CALL DERIV (NINT,NCHANGE,NDEBUG,T,AB,F,DF,NF,XOO,XIR,SLOPE,BSLP,AS
     1LP)
      IF (NCHANGE.EQ.2.AND.ABS(F(1)).LE.1.E-10) GO TO 7
      CALL RUNKUT (NINT,NCHANGE,NSTEP,NDEBUG,T,AB,F,DF,FC,DFC,DS,AB1,AB2
     1,AB3,AB4,NF,EPSIGOM,NQUAD,XOO,XIR,SLOPE,BSLP,ASLP)
      IF (INTCNT.EQ.1) DSOAB=DS/AB
      IF (NDEBUG.EQ.0) PRINT 47, INTCNT
      IF (NCHANGE.EQ.1.AND.ABS(CHECK1-F(1)).LE.1.E-07) GO TO 4
      IF (NCHANGE.EQ.1.AND.(F(1)+DF(1)).LE.CHECK1.AND.CHECK1-(F(1)+DF(1
     1)).GT.1.E-07) GO TO 6
```

```
      IF (NCHANGE.EQ.1.AND.(F(1)+DF(1)).LE.CHECK1.AND.CHECK1-(F(1)+DF(1)
     1).LE.1.E-07) GO TO 3
      IF (NCHANGE.EQ.1.AND.(F(1)+DF(1)).GT.CHECK1) GO TO 3
      IF (NCHANGE.EQ.2.AND.(F(1)+DF(1)).LE.0.0.AND.ABS(F(1)+DF(1)).GT.1.
     1E-07) GO TO 6
      IF (NCHANGE.EQ.2.AND.(F(1)+DF(1)).LE.0.0.AND.ABS(F(1)+DF(1)).LE.1.
     1E-07) GO TO 5
      IF (NCHANGE.EQ.2.AND.(F(1)+DF(1)).GT.0.0) GO TO 5
    3 DS=CHECK1-F(1)
      DF(1)=DS
      GO TO 6
C
C     INTEGRATION OVER YO - NCHANGE=2, VARIABLE STEP - NSTEP=2
C
    4 NCHANGE=2
      F(1)=CHECK2
      DS=.01*AB
      DF(1)=DS
      GO TO 6
    5 DS=-F(1)
    6 CONTINUE
    7 TAUN1=F(2)
      IF (M2E.EQ.1.AND.NTIMES.EQ.1) TAUL=TAUN1
      IF (M2E.EQ.1.AND.NTIMES.EQ.2) TAUU=TAUN1
      TAU(N)=2.*TAUN1
      IF (M2E.EQ.1.AND.NTIMES.EQ.2) TAU(N)=TAUL+TAUU
      TAUN=TAU(N)
      GO TO (8,9,10), KTRANSF
    8 TAUR=0.
      XIR=TAUR
      BSLP=TAUR
      ASLP=1.
      XIN1=TAUN1
      XIN=2.*XIN1
      XI(N)=XIN
      GO TO 11
    9 TAUR=TAUN1
      ASLP=SLOPE
      XIR=3.*TAUR/(2.*SLOPE+1.)
      XIN1=XIR
      XIN=2.*XIN1
      XI(N)=XIN
      BSLP=(1.-SLOPE)/(3.*XIR**2)
      GO TO 11
   10 TAUR=0.
      XIR=TAUR
      ASLP=1.
      XI(N)=3.*TAU(N)/(2.+SLOPE)
      XIN=XI(N)
      BSLP=(SLOPE-1.)/(3.*XI(N)**2)
      XIN1=.5*XI(N)
   11 XI(1)=0.0
      IF (M2E.NE.1) GO TO 12
      IF (M2E.EQ.1.AND.NTIMES.EQ.1) XIL=XIN1
      IF (M2E.EQ.1.AND.NTIMES.EQ.2) XIU=XIN1
      IF (M2E.EQ.1.AND.NTIMES.EQ.2) XI(N)=XIL+XIU
      IF (M2E.EQ.1.AND.NTIMES.EQ.2) GO TO 12
      NTIMES=2
      T=TU
      GO TO 2
   12 IF (NDEBUG.EQ.0) PRINT 50, BLK(1),XIR,TAUR,XIN,SLOPE,BSLP,EQUAN,DT
     1AUDXI,DXI,XIN1
      PRINT 47, INTCNT
      XI(NA)=ANA*XIN1
      XI(NB)=BNB*XIN1
      IF (NDEBUG.EQ.0) PRINT 39, XI(1),XI(NA),XI(NB),XIN1,XI(N),TAUN1,TA
     1U(N),TAUU,TAUL,XIU,XIL
      IF (NSPACE.EQ.1) GO TO 13
      AA=XI(NA)/FLOAT(NA-1)
      ABB=(XI(NB)-XI(NA))/FLOAT(NB-NA)
   13 AN=(XI(N)-XI(NB))/FLOAT(N-NB)
      IF (NDEBUG.EQ.0) PRINT 48, AA,ABB,AN
      DO 16 I=1,N
      IF (I.EQ.1.OR.I.EQ.NA.OR.I.EQ.NB.OR.I.EQ.N) GO TO 15
      IF (NSPACE.EQ.1) GO TO 14
      IF (I.GT.1.AND.I.LT.NA) XI(I)=AA*FLOAT(I-1)
      IF (I.GT.NA.AND.I.LT.NB) XI(I)=XI(NA)+ABB*FLOAT(I-NA)
   14 IF (I.GT.NB.AND.I.LT.N) XI(I)=XI(NB)+AN*FLOAT(I-NB)
   15 TAU(I)=TAUR+(XI(I)-XIR)*(ASLP+BSLP*(XI(I)-XIR)**2)
      TAUX1=ASLP+3.*BSLP*(XI(I)-XIR)**2
      G2B(I)=1./TAUX1
   16 CONTINUE
      IF (NDEBUG.EQ.0) PRINT 38, (XI(I),I=1,N)
      IF (NDEBUG.EQ.0) PRINT 50, BLK(2),(TAU(I),I=1,N)
      IF (NDEBUG.EQ.0) PRINT 50, BLK(3),(G2B(I),I=1,N)
C
C     CIRCULAR AND ELLIPTIC CONE - COMPUTATION OF XO(I)
C     INTEGRATION OVER XI  -  NINT=2,VARIABLE STEP SIZE -  NSTEP =2
C
      NF=3
      NINT=2
      NQUAD=2
      NSTEP=2
      INT10=40
      IF (NSPACE.EQ.1) DXI=AN/FLOAT(INT10)
      IF (NSPACE.EQ.2) DXI=AA/FLOAT(INT10)
      IF (NDEBUG.EQ.0) PRINT 49, DXI
      XI(1)=0.0
      XO(1)=0.0
      IF (M2E.EQ.1) T=TL
      NCHANGE=1
      YO(1)=-T*AB
      F(1)=XI(1)
      F(2)=XO(1)
      F(3)=YO(1)
      DF(1)=DXI
      IF (M2E.EQ.1) GO TO 21
      DO 20 IZ=2,N
      DO 17 I=2,100000
      CALL DERIV (NINT,NCHANGE,NDEBUG,T,AB,F,DF,NF,XOO,XIR,SLOPE,BSLP,AS
     1LP)
      CALL RUNKUT (NINT,NCHANGE,NSTEP,NDEBUG,T,AB,F,DF,FC,DFC,DXI,AB1,AB
     12,AB3,AB4,NF,EPSIGOM,NQUAD,XOO,XIR,SLOPE,BSLP,ASLP)
      IF (NDEBUG.EQ.0) PRINT 43, I,F(1),F(2),F(3)
      IF (ABS(F(1)-XI(IZ)).LE.1.E-10) GO TO 18
      IF ((F(1)+DF(1)).LE.XI(IZ).AND.XI(IZ)-(F(1)+DF(1)).GT.1.E-07) GO T
     1O 17
      DXIHLD=DXI
      DXI=XI(IZ)-F(1)
      DF(1)=DXI
   17 CONTINUE
   18 IF (NSPACE.EQ.1) DXI=DXIHLD
      IF (NSPACE.EQ.1) DF(1)=DXI
      IF (NSPACE.EQ.1) GO TO 19
      IF (F(1).GE.XI(NA).AND.F(1).LT.XI(NB)) DXI=ABB/FLOAT(INT10)
      IF (F(1).GE.XI(NB).AND.F(1).LE.XI(N)) DXI=AN/FLOAT(INT10)
      IF (NDEBUG.EQ.0) PRINT 49, DXI
      DF(1)=DXI
   19 XI(IZ)=F(1)
      XO(IZ)=F(2)
      YO(IZ)=F(3)
      IF (NDEBUG.EQ.0) PRINT 44, IZ,XI(IZ),XO(IZ),YO(IZ),DF(1),I
   20 CONTINUE
      GO TO 31
   21 DO 30 IZ=2,N
      DO 27 I=2,100000
      CALL DERIV (NINT,NCHANGE,NDEBUG,T,AB,F,DF,NF,XOO,XIR,SLOPE,BSLP,AS
     1LP)
      CALL RUNKUT (NINT,NCHANGE,NSTEP,NDEBUG,T,AB,F,DF,FC,DFC,DXI,AB1,AB
     12,AB3,AB4,NF,EPSIGOM,NQUAD,XOO,XIR,SLOPE,BSLP,ASLP)
      IF (NDEBUG.EQ.0) PRINT 43, I,F(1),F(2),F(3),T
      IF (ABS(F(1)-XI(IZ)).LE.1.E-10) GO TO 28
      IF (NCHANGE.EQ.1.AND.ABS(XIL-F(1)).LE.1.E-10) GO TO 24
   22 IF (F(1)+DF(1).LE.XI(IZ).AND.ABS(XI(IZ)-F(1)-DF(1)).GT.1.E-10) GO
     1TO 23
      IF (F(1)+DF(1).LE.XI(IZ).AND.ABS(XI(IZ)-F(1)-DF(1)).LE.1.E-10) GO
     1TO 26
      IF (F(1)+DF(1).GT.XI(IZ)) GO TO 25
   23 IF (NCHANGE.EQ.2) GO TO 27
      IF (F(1)+DF(1).LT.XIL.AND.ABS(XIL-F(1)-DF(1)).GT.1.E-10) GO TO 27
      IF (F(1)+DF(1).LT.XIL.AND.ABS(XIL-F(1)-DF(1)).LT.1.E-10) GO TO 25
      IF (F(1)+DF(1).GT.XIL) GO TO 25
   24 NCHANGE=2
      DXI=DXIHLD
      DF(1)=DXI
      T=TU
      GO TO 22
   25 DXIHLD=DXI
      DXI=XIL-F(1)
      DF(1)=DXI
      GO TO 27
   26 DXIHLD=DXI
      DXI=XI(IZ)-F(1)
      DF(1)=DXI
   27 CONTINUE
   28 DXI=DXIHLD
      DF(1)=DXI
      XI(IZ)=F(1)
      XO(IZ)=F(2)
      YO(IZ)=F(3)
      IF (NDEBUG.EQ.0) PRINT 44, IZ,XI(IZ),XO(IZ),YO(IZ),DF(1),I
      IF (NDEBUG.EQ.0) PRINT 43, NCHANGE,DXI,T
      IF (ABS(XI(IZ)-XIL).GT.1.E-10) GO TO 29
      NCHANGE=2
      T=TU
      GO TO 30
```

```
29 IF (NCHANGE.EQ.1.AND.F(1)+DF(1).GT.XIL) DXI=XIL-F(1)
   IF (NCHANGE.EQ.1.AND.F(1)+DF(1).LT.XIL.AND.ABS(XIL-F(1)-DF(1)).LT.
  11.E-10) DXI=XIL-F(1)
   DF(1)=DXI
   IF (NDEBUG.EQ.0) PRINT 49, DXI
30 CONTINUE
C
C     GEOMETRIC PARAMETERS FOR CIRCULAR AND ELLIPTIC CONES
C
31 IF (NDEBUG.EQ.1) GO TO 33
   DO 32 I=1,N
32 PRINT 40, I,XI(I),XO(I),YO(I),TAU(I)
33 DO 35 I=1,N
   IF (M2F.EQ.0) GO TO 34
   IF (XI(I).LE.XIL) T=TL
   IF (XI(I).GT.XIL) T=TU
34 GX(I)=2.*T**2*XO(I)
   GY(I)=2.*YO(I)
   GXX(I)=2.*T**2
   GYY(I)=2.
   GXY(I)=0.0
   IF (NDEBUG.EQ.0) PRINT 45, I,GX(I),GY(I),GXX(I),GYY(I),GXY(I)
35 CONTINUE
36 IF (M.EQ.0) LIMIT1=1
   IF (M.NE.0) LIMIT1=N
   DO 37 I=1,LIMIT1
   A1(I)=1.+XO(I)**2+YO(I)**2
   A4(I)=XO(I)*GX(I)+YO(I)*GY(I)
   A2(I)=GX(I)**2+GY(I)**2+A4(I)**2
   A5(I)=GY(I)+YO(I)*A4(I)
   A6(I)=GX(I)+XO(I)*A4(I)
   A7(I)=XO(I)*GY(I)-YO(I)*GX(I)
   A8(I)=GY(I)**2*GXX(I)+GX(I)**2*GYY(I)-2.*GX(I)*GY(I)*GXY(I)
   AKB(I)=-A8(I)*(A1(I)/A2(I))**1.5
   PSID(I)=57.2957795I*ATAN2(YO(I),XO(I))
   Q(I)=1.0
   QP(I)=0.0
   IF (NDEBUG.EQ.0) PRINT 41
   IF (NDEBUG.EQ.0) PRINT 42, A1(I),A2(I),A3(I),A4(I),A5(I),A6(I),A7(
  1I),A8(I),AKB(I),GX(I),GY(I),PSID(I)
37 CONTINUE
   IF (M2F.EQ.1) T=TL
   RETURN
C
C
38 FORMAT (6H XI(I)/(8F16.8))
39 FORMAT (5X,5HXI(1),12X,6HXI(NA),10X,6HXI(NB),10X,4HXIN1,11X,5HXI(N
  1),11X,5HTAUN1,12X,6HTAU(N)/7E16.8)
40 FORMAT (3H I=I5,2X,6HXI(I)=E16.8,2X,6HXO(I)=E16.8,2X,6HYO(I)=E16.8
  1,2X,7HTAU(I)=F16.8)
41 FORMAT (10H AI(I)ETC.)
42 FORMAT (1X8E16.8)
43 FORMAT (1XI5,4F16.8)
44 FORMAT (4H IZ=I5,2X,7HXI(IZ)=E16.8,2X,7HXO(IZ)=E16.8,2X,7HYO(IZ)=E
  116.8,2X,6HDF(I)=E16.8,2X,2HI=I5)
45 FORMAT (3H I=I4,2X,6HGX(I)=E16.8,2X,6HGY(I)=E16.8,2X,7HGXX(I)=E16.
  18,2X,7HGYY(I)=E16.8,2X,7HGXY(I)=E16.8)
46 FORMAT (3H I=I4,2X,6HXI(I)=E16.8,2X,6HXO(I)=E16.8,2X,6HYO(I)=E16.8
  1)
47 FORMAT (8H INTCNT=I5/)
48 FORMAT (4H AA=E16.8,2X,4HABB=E16.8,2X,3HAN=E16.8)
49 FORMAT (5H DXI=E16.8)
50 FORMAT (15H SUBROUTINE BG ,1X1A6/(8E16.8))
   END
   SUBROUTINE RUNKUT (NINT,NCHANGE,NSTEP,NDEBUG,T,AB,F,DF,FC,DFC,DS,A
  1B1,AB2,AB3,AB4,NF,EPSIGOM,NQUAD,XOO,XIR,SLOPE,BSLP,ASLP)
C
C     INTEGRATION FOR BODY GEOMETRY
C
   DIMENSION F(NF), DF(NF), FC(NF), DFC(NF), AB1(NF), AB2(NF), AB3(NF
  1), AB4(NF)
   IF (NDEBUG.EQ.0) PRINT 10, NF,F(1),F(2),DF(1),DF(2)
C     FIXED STEP INTEGRATION - NSTEP=1, VARIABLE STEP INTEGRATION - NSTE
C     QUADRATURE - NQUAD=1, INTEGRATION - NQUAD=2
   TESTMAX=.5*EPSIGOM
   DSMAX=.02*AB
   DSMIN=1.E-06
   DO 1 I=1,NF
   DFC(I)=DF(I)
 1 FC(I)=F(I)
 2 IF (NDEBUG.EQ.0) PRINT 11, DS
   DF(1)=DS
   DO 3 I=2,NF
   AB1(I)=DS*DFC(I)
 3 F(I)=FC(I)+AB1(I)/2.
   F(1)=FC(1)+DS/2.
   IF (NDEBUG.EQ.0) PRINT 12, (I,AB1(I),F(I),I=1,NF)
   CALL DERIV (NINT,NCHANGE,NDEBUG,T,AB,F,DF,NF,XOO,XIR,SLOPE,BSLP,AS
  1LP)
   DO 4 I=2,NF
   AB2(I)=DS*DF(I)
 4 F(I)=FC(I)+AB2(I)/2.
   IF (NDEBUG.EQ.0) PRINT 13, (I,AB2(I),F(I),I=1,NF)
   CALL DERIV (NINT,NCHANGE,NDEBUG,T,AB,F,DF,NF,XOO,XIR,SLOPE,BSLP,AS
  1LP)
   DO 5 I=2,NF
   AB3(I)=DS*DF(I)
 5 F(I)=FC(I)+AB3(I)
   F(1)=FC(1)+DS
   IF (NDEBUG.EQ.0) PRINT 14, (I,AB3(I),F(I),I=1,NF)
   CALL DERIV (NINT,NCHANGE,NDEBUG,T,AB,F,DF,NF,XOO,XIR,SLOPE,BSLP,AS
  1LP)
   DO 6 I=2,NF
   AB4(I)=DS*DF(I)
 6 F(I)=FC(I)+1./6.*(AB1(I)+2.*AB2(I)+2.*AB3(I)+AB4(I))
   IF (NDEBUG.EQ.0) PRINT 15, (I,AB4(I),F(I),I=1,NF)
   IF (NSTEP.EQ.1) RETURN
   IF (NQUAD.EQ.1.AND.F(1).LT..2*AB) RETURN
   DO 7 I=2,NF
   IF (NQUAD.EQ.2.AND.ABS(AB2(I)/DS).LE.1.E-06) GO TO 7
   IF (NQUAD.EQ.1.AND.ABS(AB1(I)/DS).LE.1.E-06) GO TO 7
   IF (NQUAD.EQ.1.AND.ABS(AB4(I)/DS).LE.1.E-06) GO TO 7
   IF (NQUAD.EQ.2) TEST=ABS(1.-AB3(I)/AB2(I))
   IF (NQUAD.EQ.1) TEST=ABS(1.-AB1(I)/AB4(I))
   IF (I.EQ.2) TESTMAX=TEST
   IF (TEST.GT.TESTMAX) TESTMAX=TEST
 7 CONTINUE
   IF (TESTMAX.GE.EPSIGOM.AND.ABS(DS).GT.DSMIN) GO TO 8
   IF (TESTMAX.LE.(.1*EPSIGOM)) GO TO 9
   RETURN
 8 DS=.5*DS
   GO TO 2
 9 IF ((1.9*DS).GT.DSMAX) RETURN
   DS=1.9*DS
   DF(1)=DS
   RETURN
C
C
10 FORMAT (7H RUNKUT/I4,8E16.8)
11 FORMAT (4H DS=E16.8)
12 FORMAT (1X,2HI=I5,2X,6HB1(I)=E16.8,2X,5HF(I)=E16.8)
13 FORMAT (1X,2HI=I5,2X,6HB2(I)=E16.8,2X,5HF(I)=E16.8)
14 FORMAT (1X,2HI=I5,2X,6HB3(I)=E16.8,2X,5HF(I)=F16.8)
15 FORMAT (1X,2HI=I5,2X,6HB4(I)=F16.8,2X,5HF(I)=F16.8)
   END
   SUBROUTINE DERIV (NINT,NCHANGE,NDEBUG,T,AB,F,DF,NF,XOO,XIR,SLOPE,B
  1SLP,ASLP)
C
C     COMPUTE DERIVATIVES FOR BODY GEOMETRY INTEGRATION
C
   DIMENSION F(NF), DF(NF)
   GO TO (1,5), NINT
 1 GO TO (2,3), NCHANGE
 2 FBI=T*SQRT(AB**2-F(1)**2)
   GXI=2.*T**2*F(1)
   A1I=1.+F(1)**2+FBI**2
   GO TO 4
 3 XOO=1./T*SQRT(AB**2*T**2-F(1)**2)
   FBI=T*SQRT(AB**2-XOO**2)
   GXI=2.*T**2*XOO
   A1I=1.+XOO**2+FBI**2
 4 GYI=-2.*FBI
   A4I=2.*AB**2*T**2
   A2I=GXI**2+GYI**2+A4I**2
   IF (NCHANGE.EQ.1) DF(2)=-SQRT(A2I)/(A1I*GYI)
   IF (NCHANGE.EQ.2) DF(2)=SQRT(A2I)/(A1I*GXI)
   IF (NDEBUG.EQ.0) PRINT 6, NINT,T,AB,F(1),F(2),FBI,GXI,GYI,A1I,A4I,
  1A2I,FI,DF(1),DF(2)
   RETURN
 5 QUAN=AB**2-F(2)**2
   FBI=T*SQRT(ABS(QUAN))
   GXI=2.*T**2*F(2)
   GYI=2.*F(3)
   A1I=1.+F(2)**2+FBI**2
   A4I=2.*AB**2*T**2
   A2I=GXI**2+GYI**2+A4I**2
   TAUXI=ASLP+3.*BSLP*(F(1)-XIR)**2
   G2BI=1./TAUXI
   DF(2)=-A1I*GYI/(SQRT(A2I)*G2BI)
   DF(3)=A1I*GXI/(SQRT(A2I)*G2BI)
   IF (NDEBUG.EQ.0) PRINT 6, NINT,T,AB,FBI,GXI,GYI,A1I,A2I,A4I,F(1),F
  1(2),F(3),DF(1),DF(2),DF(3),T,DTAUDXI,G2BI
   RETURN
C
C
 6 FORMAT (17H SUBROUTINE DERIV/I15/(8E16.8))
```

APPENDIX A

```
      END
      SUBROUTINE APPROX
C
C     COMPUTE APPROXIMATE SHOCK SHAPE
C
      COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
      COMMON FUN(20,6),DFUN(20,6),FUNC(20,6),DFUNC(20,6),B1(20,6),B2(20,
     16),B3(20,6),B4(20,6)
      COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
     14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
     20),A7(20),A8(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
     3(20),ETAS(20),ETASP(20),BETAD(20),RHO(20),R(20),P(20),U(20),V(20),
     4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
     5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1(20),ZETA2(20),ZETA3(20),ZETA4
     6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
     70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSID(20),DP1(20),DP2(20),
     8DP3(20),DP4(20),DEONS(20),CROSSM(20),POROGAM(20),Q(20),QP(20),PSIS
     9D(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
      COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2B(20),DPDZE
     1X(20)
      COMMON KTRANSF,SLOPF
      COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
     1A,DXI,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
     2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
     3EPSIGOM,EPSINT,DEQ,XIN1,SIGNP1
      COMMON /ERROR/ ER(12),ERR(12),BLK(12)
      COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
     1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
     2POPTI(20),PTOPTI(20),PT(20),POASTSQ(20),POPINF(20),CPBODY(20)
      ALPHAD=ALPHAR*RAD
      IF (NDEBUG.EQ.0) PRINT 3
      THETA1=ATAN(T*AB)
      THETAN1=THETAR
      SINSQB=(GAMMA+1.)/2.*SIN(THETA1)**2+1./STMACH**2
      BETA1=ASIN(SQRT(SINSQB))
      BETAD1=BETA1*57.29577951
      SINSQB=(GAMMA+1.)/2.*SIN(THETAN1)**2+1./STMACH**2
      BETAN1=ASIN(SQRT(SINSQB))
      BETADN1=BETAN1*57.29577951
      IF (NDEBUG.EQ.0) PRINT 4, THETA1,THETAN1,BETAD1,BETADN1
      ETAS(1)=BETA1-THETA1
      IF (M.EQ.0) RETURN
      ETAS(N1)=BETAN1-THETAN1
C     CALCULATE ETAS
      LZ=N1-1
      QUAN=ETAS(N1)-ETAS(1)
      DO 1 I=2,LZ
      QUAN2=XI(I)/XI(N1)
      ETAS(I)=ETAS(1)+QUAN*QUAN2**2
      IF (NDEBUG.EQ.0) PRINT 5, I,XI(I),QUAN2,ETAS(I)
    1 CONTINUE
      DO 2 I=1,LZ
    2 ETAS(N1+I)=ETAS(N1-I)
      IF (NDEBUG.EQ.0) PRINT 6, (I,XI(I),ETAS(I),I=1,N)
      RETURN
C
C
    3 FORMAT (18H SUBROUTINE APPROX)
    4 FORMAT (8H THETA1=E16.8,2X,8HTHETAN1=E16.8,2X,7HBETAD1=E16.8,2X,7H
     1BETAn2=E16.8)
    5 FORMAT (3H I=I5,2X,6HXI(I)=E16.8,2X,6HQUAN2=E16.8,2X,8HETAS(I)=E16
     1.8)
    6 FORMAT (3H I=I4,2X,6HXI(I)=F16.9,2X,8HETAS(I)=E16.8)
      END
      SUBROUTINE LGRANGE (I,NP,NLINES,NDEBUG,XO,XREAL,YREAL,X,Y,DYDX)
C
C     ESTABLISHES LINE ARRANGEMENT, ACCOUNTING FOR SYMMETRY WHERE
C     APPROPRIATE, FOR COMPUTATION OF  XI  DERIVATIVES FOR FUNCTION DIF
C
      DIMENSION XREAL(NLINES), YREAL(NLINES), X(NP), Y(NP)
      COMMON /BLOCK1/ ISTL,NCYCLE,NCOUNT,ISIGN
      NE=(NP-1)/2
      N=NE+1
      NDEBUG=1
      IF (NDEBUG.EQ.0) PRINT 9
      IF (NDEBUG.EQ.0) PRINT 10, I,NP,NLINES,ISTL,ISIGN,NCOUNT,NCYCLE,NE
     1,XO
      IF (NDEBUG.EQ.0) PRINT 11, (II,XREAL(II),YREAL(II),II=1,NLINES)
      X(N)=XREAL(I)
      Y(N)=YREAL(I)
      IF (ISIGN.EQ.500) GO TO 5
      IF (ISIGN.NE.500.AND.ISTL.NE.2.AND.ISTL.NE.5) GO TO 5
      IF (I.LE.ISIGN-NE) GO TO 5
      IF (I.GT.ISIGN-NE.AND.I.LE.ISIGN) GO TO 1
      IF (I.GT.ISIGN+NE.AND.I.LE.NLINES) GO TO 5
      IF (I.GE.ISIGN+1.AND.I.LT.ISIGN+1+NE) GO TO 3
    1 NUM=0
      IXZ=ISIGN-NP+1
      N=NP+1-ISIGN
      DO 2 II=1,NP
      X(II)=XREAL(IXZ+NUM)
      Y(II)=YREAL(IXZ+NUM)
    2 NUM=NUM+1
      GO TO 7
    3 NUM=0
      NUM1=0
      IXZ=ISIGN+1
      N=I-ISIGN
      DO 4 II=1,NP
      IF (IXZ+NUM.GT.NLINES) NUM1=NUM1+1
      IF (IXZ+NUM.LE.NLINES) X(II)=XREAL(IXZ+NUM)
      IF (IXZ+NUM.LE.NLINES) Y(II)=YREAL(IXZ+NUM)
      A=FLOAT(NUM1)
      IF (IXZ+NUM.GT.NLINES) X(II)=XREAL(NLINES)+A*(XREAL(NLINES)-XREAL(
     1NLINES-1))
      IF (IXZ+NUM.GT.NLINES) Y(II)=YREAL(NLINES-NUM1)
    4 NUM=NUM+1
      GO TO 7
    5 IZZ=0
      DO 6 II=1,NE
      IF ((I+II).GT.NLINES) IZZ=IZZ+1
      IF ((I+II).GT.NLINES) IXI=NLINES-IZZ
      IF ((I+II).LE.NLINES) IXI=IABS(I+II)
      IF ((I-II).LE.0) IX2=IABS(I-II)+2
      IF ((I-II).GT.0) IX2=IABS(I-II)
      IF ((I+II).LE.NLINES) X(N+II)=XREAL(IXI)
      IF ((I+II).GT.NLINES) X(N+II)=2.*XREAL(NLINES)-XREAL(IXI)
      X(N-II)=XREAL(IX2)
      IF ((I-II).LE.0) X(N-II)=-XREAL(IX2)
      IF ((I+II).GT.NLINES.AND.ISTL.EQ.5) Y(N+II)=-YREAL(IXI)
      IF (((I+II).GT.NLINES.AND.ISTL.NE.5).OR.((I+II).LE.NLINES)) Y(N+II
     1)=YREAL(IXI)
      IF ((I-II).LE.0.AND.ISTL.EQ.5) Y(N-II)=-YREAL(IX2)
      IF (((I-II).LE.0.AND.ISTL.NE.5).OR.((I-II).GT.0)) Y(N-II)=YREAL(IX
     12)
    6 CONTINUE
    7 IF (NDEBUG.EQ.0) PRINT 8, (II,X(II),Y(II),II=1,NP)
      DYDX=DIF(N,NE,NP,X,Y)
      IF (NDEBUG.EQ.0) PRINT 12, N,NE,NP,DYDX
      NDEBUG=1
      RETURN
C
C
    8 FORMAT (4H II=I4,2X,6HX(II)=E16.8,2X,6HY(II)=E16.8)
    9 FORMAT (19H SUBROUTINE LGRANGE)
   10 FORMAT (3H I=I3,2X,3HNP=I3,2X,7HNLINES=I3,2X,5HISTL=I2,2X,6HISIGN=
     1I3,2X,7HNCOUNT=I3,2X,7HNCYCLE=I5,2X,3HNE=I2,2X,3HXO=E16.8)
   11 FORMAT (4H II=I4,2X,10HXREAL(II)=E16.8,2X,10HYREAL(II)=E16.8)
   12 FORMAT (1X3I3/(8E16.8))
      END
      SUBROUTINE DIRCOS (I)
C
C     COMPUTE DIRECTION COSINES OF H,ETA,TAU COORDINATES
C
      COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
      COMMON FUN(20,6),DFUN(20,6),FUNC(20,6),DFUNC(20,6),B1(20,6),B2(20,
     16),B3(20,6),B4(20,6)
      COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
     14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
     20),A7(20),A8(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
     3(20),ETAS(20),ETASP(20),BETAD(20),RHO(20),R(20),P(20),U(20),V(20),
     4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
     5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1[illegible]ZETA3(20),ZETA4
     6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
     70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSID(20),DP1(20),DP2(20),
     8DP3(20),DP4(20),DEONS(20),CROSSM(20),POROGAM(20),Q(20),QP(20),PSIS
     9D(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
      COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2B(20),DPDZE
     1X(20)
      COMMON KTRANSF,SLOPF
      COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
     1A,DXI,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
     2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
     3EPSIGOM,EPSINT,DEQ,XIN1,SIGNP1
      COMMON /ERROR/ ER(12),ERR(12),BLK(12)
      COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
     1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
     2POPTI(20),PTOPTI(20),PT(20),POASTSQ(20),POPINF(20),CPBODY(20)
      IF (NDEBUG.EQ.0) PRINT 2
      IF (NDEBUG.EQ.0) PRINT 1, I,ETA(I),A1(I),A2(I),A3(I),A4(I),A5(I),A
     16(I),A7(I),A8(I),GX(I),GY(I),XO(I),YO(I)
      QUAN1=CON1/SQRT(A1(I))
      QUAN2=CON2/SQRT(A2(I))
      QUAN3=CON2/SQRT(A1(I))
      QUAN4=CON1/SQRT(A2(I))
      QUAN5=1./SQRT(A1(I)*A2(I))
```

```
      A11=-XO(I)*QUAN1+GX(I)*QUAN2
      A12=-YO(I)*QUAN1+GY(I)*QUAN2
      A13=-QUAN1-A4(I)*QUAN2
      A21=-QUAN5*(GY(I)+YO(I)*A4(I))
      A22=QUAN5*(GX(I)+XO(I)*A4(I))
      A23=QUAN5*A7(I)
      A31=XO(I)*QUAN3+GX(I)*QUAN4
      A32=YO(I)*QUAN3+GY(I)*QUAN4
      A33=QUAN3-A4(I)*QUAN4
      IF (NDEBUG.EQ.0) PRINT 1, I,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,A11,A12,
     1A13,A21,A22,A23,A31,A32,A33
      PHIR=ATAN2(GY(I),GX(I))
      SINPHIR=SIN(PHIR)
      COSPHIR=COS(PHIR)
      B11=A11*COSPHIR+A12*SINPHIR
      B12=A21*COSPHIR+A22*SINPHIR
      B13=A31*COSPHIR+A32*SINPHIR
      B21=-A11*SINPHIR+A12*COSPHIR
      B22=-A21*SINPHIR+A22*COSPHIR
      B23=-A31*SINPHIR+A32*COSPHIR
      IF (NDEBUG.EQ.0) PRINT 1, I,GY(I),GX(I),PHIR,SINPHIR,COSPHIR,B11,B
     112,B13,B21,B22,B23
      RETURN
C
C
    1 FORMAT (3H I=15/(8E16.8))
    2 FORMAT (18H SUBROUTINE DIRCOS/)
      END
      SUBROUTINE SHOCK (I)
C
C     COMPUTE FLOW QUANTITIES AT SHOCK
C
      COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
      COMMON FUN(20,6),DFUN(20,6),FUNC(20,6),DFUNC(20,6),B1(20,6),B2(20,
     16),B3(20,6),B4(20,6)
      COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
     14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
     20),A7(20),AB(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
     3(20),ETAS(20),ETASP(20),BETAD(20),RHO(20),R(20),P(20),U(20),V(20),
     4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
     5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1(20),ZETA2(20),ZETA3(20),ZETA4
     6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
     70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSID(20),DP1(20),DP2(20),
     8DP3(20),DP4(20),DFONS(20),CROSSM(20),POROGAM(20),Q(20),QP(20),PSIS
     9D(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
      COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2B(20),DPDZE
     1X(20)
      COMMON KTRANSF,SLOPE
      COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
     1A,DXI,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
     2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
     3EPSIGOM,EPSINT,DEQ,XIN1,SIGNP1
      COMMON /ERROR/ ER(12),ERR(12),BLK(12)
      COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
     1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
     2POPTI(20),PTOPTI(20),PT(20),POASTSQ(20),POPINF(20),CPBODY(20)
      IF (NDEBUG.EQ.0) PRINT 3
C
C     STREAM VELOCITY COMPONENTS
C
      VETA=A12*SIN(ALPHAR)+A13*COS(ALPHAR)
      VXI=A22*SIN(ALPHAR)+A23*COS(ALPHAR)
      VR=A32*SIN(ALPHAR)+A33*COS(ALPHAR)
      CON3=SIN(SIGMA)
      CON4=COS(SIGMA)
C
C     SHOCK FUNCTIONS
C
      SINBETA=-(VETA*CON4+VXI*CON3)
      BETAR=ASIN(SINBETA)
      BETAD(I)=BETAR*RAD
      RHO(I)=((GAMMA+1.)*STMACH**2*SINBETA**2)/(2.+(GAMMA-1.)*STMACH**2*
     1SINBETA**2)
      P(I)=1./(GAMMA*(GAMMA+1.)*STMACH**2)*(2.*GAMMA*STMACH**2*SINBETA**
     12-(GAMMA-1.))
      UN=SINBETA
      UT=-VETA*CON3+VXI*CON4
      U(I)=VR/AAST
      IF (ABS(RHO(I)).GE.1.E-10) GO TO 1
      PRINT 4, ERR(1),I,ALPHAR,A12,A13,A22,A23,A32,A33,VETA,VXI,VR,SIGMA
     1,CON3,CON4,SINBETA,BETAR,BETAD(I),RHO(I),P(I),UN,UT,U(I),RHO(I)
      STOP
    1 V(I)=-1./AAST*(UN*CON4/RHO(I)+UT*CON3)
      W(I)=-1./AAST*(UN*CON3/RHO(I)-UT*CON4)
      S(I)=ALOG(P(I)*GAMMA*STMACH**2/RHO(I)**GAMMA)
      SBAR(I)=S(I)
C
C     SHOCK COORDINATES
C
      X=A31
      Y=A32
      Z=A33
      IF (ABS(Z).GT.1.E-10) GO TO 2
      PRINT 4, ERR(2),I,V(I),W(I),ETA(I),A11,A12,A13,A21,A22,A23,A31,A32
     1,A33,XI(I),X,Y,Z
      STOP
    2 XS(I)=X/Z
      YS(I)=Y/Z
      PSISD(I)=ATAN2(YS(I),XS(I))*RAD
      XSBAR(I)=XS(I)/AB
      YSBAR(I)=YS(I)/AB
      XOBAR(I)=XO(I)/AB
      YOBAR(I)=YO(I)/AB
      IF (NDEBUG.EQ.0) PRINT 4, BLK(1),I,ALPHAR,A11,A12,A13,A21,A22,A23,
     1A31,A32,A33,XI(I),SIGMA,VETA,VXI,VR,CON3,CON4,SINBETA,BETAR,BETAD(
     2I),RHO(I),P(I),UN,UT,U(I),V(I),W(I),X,Y,Z,XS(I),YS(I),S(I),SBAR(I)
     3,XSBAR(I),YSBAR(I),XOBAR(I),YOBAR(I)
      RETURN
C
C
    3 FORMAT (17H SUBROUTINE SHOCK)
    4 FORMAT (1X1A6,15/(8E16.8))
      END
      SUBROUTINE DERIV2 (DS,NP)
C
C     EXECUTIVE SUBROUTINE TO COMPUTE DERIVATIVES FOR INTEGRATION
C     OF EQUATIONS
C
      COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
      COMMON FUN(20,6),DFUN(20,6),FUNC(20,6),DFUNC(20,6),B1(20,6),B2(20,
     16),B3(20,6),B4(20,6)
      COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
     14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
     20),A7(20),AB(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
     3(20),ETAS(20),ETASP(20),BETAD(20),RHO(20),R(20),P(20),U(20),V(20),
     4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
     5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1(20),ZETA2(20),ZETA3(20),ZETA4
     6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
     70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSID(20),DP1(20),DP2(20),
     8DP3(20),DP4(20),DFONS(20),CROSSM(20),POROGAM(20),Q(20),QP(20),PSIS
     9D(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
      COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2B(20),DPDZE
     1X(20)
      COMMON KTRANSF,SLOPE
      COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
     1A,DXI,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
     2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
     3EPSIGOM,EPSINT,DEQ,XIN1,SIGNP1
      COMMON /ERROR/ ER(12),ERR(12),BLK(12)
      COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
     1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
     2POPTI(20),PTOPTI(20),PT(20),POASTSQ(20),POPINF(20),CPBODY(20)
      COMMON /BLOCK1/ ISTL,NCYCLE,NCOUNT,ISIGN
      COMMON /BLOCK6/ NEGP
      DIMENSION XREAL(20), YREAL(20), X(20), Y(20)
      IF (NDEBUG.EQ.0) PRINT 6
      IF (M.NE.0) GO TO 1
      ETASP(1)=0.0
      UP(1)=0.0
      PP(1)=0.0
      VP(1)=0.0
      WP(1)=0.0
      SBARP(1)=0.0
      GO TO 5
    1 DO 4 I=1,N
      DO 3 ISTL=2,NF
      DO 2 IX=1,NLINES
      YREAL(IX)=FUN(IX,ISTL)
    2 CONTINUE
      CALL LGRANGE (I,NP,NLINES,NDEBUG,XI(I),XI,YREAL,X,Y,DYDX)
      IF (ISTL.EQ.2) UP(I)=DYDX*G2B(I)
      IF (ISTL.EQ.3) PP(I)=DYDX*G2B(I)
      IF (ISTL.EQ.4) VP(I)=DYDX*G2B(I)
      IF (ISTL.EQ.5) WP(I)=DYDX*G2B(I)
      IF (ISTL.EQ.6) SBARP(I)=DYDX*G2B(I)
    3 CONTINUE
    4 CONTINUE
      ISTL=1
    5 IF (NDEBUG.EQ.0) PRINT 7, (I,UP(I),PP(I),VP(I),WP(I),SBARP(I),I=1,
     1N)
      CALL EQNS (DS)
      RETURN
C
C
    6 FORMAT (18H SUBROUTINE DERIV2)
    7 FORMAT (3H I=14,2X,6HUP(I)=E16.8,2X,6HPP(I)=E16.8,2X,6HVP(I)=E16.8
```

APPENDIX A

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     1,2X,6HWP(I)=E16.8,2X,9HSBARP(I)=E16.8)
      END
      SUBROUTINE FONS (DZETA)
C
C     COMPUTE ZETA DERIVATIVES
C
      COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
      COMMON FUN(20,6),DFUN(20,6),FUNC(20,6),DFUNC(20,6),B1(20,6),B2(20,
     16),B3(20,6),B4(20,6)
      COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
     14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
     20),A7(20),A8(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
     3(20),ETAS(20),ETASP(20),DETAD(20),RHO(20),R(20),P(20),U(20),V(20),
     4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
     5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1(20),ZETA2(20),ZETA3(20),ZETA4
     6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
     70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSID(20),DP1(20),DP2(20),
     8DP3(20),DP4(20),DEONS(20),CROSSM(20),POROGAM(20),Q(20),QP(20),PSIS
     9D(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
      COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2R(20),DPDZE
     1X(20)
      COMMON KTRANSF,SLOPE
      COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
     1A,DXI,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
     2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
     3EPSIGOM,EPSINT,DEQ,XIN1,SIGNP1
      COMMON /BLOCKN/ DWDXI,WP1,WP2,WP3,WP4
      COMMON /ERROR/ ER(12),ERR(12),BLK(12)
      COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
     1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
     2POPTI(20),PTOPTI(20),PT(20),POASTSQ(20),POPINF(20),CPBODY(20)
      COMMON /BLOCKS/ NEGP
      IF (NDEBUG.EQ.0) PRINT 11
      NEXTRAP=0
    1 DO 10 I=1,N
      ANUM=2.*FUN(I,1)*ETAS(I)
      SQRT1=SQRT(Q(I)**2+4.*FUN(I,1)*(1.-Q(I)))
      IF (Q(I).GE.0.0) ETA(I)=ANUM/(Q(I)+SQRT1)
      IF (Q(I).LT.0.0) ETA(I)=ANUM/(Q(I)-SQRT1)
      IF (NDEBUG.EQ.0) PRINT 12, BLK(1),I,ETAS(I),ETASP(I),ETA(I),ANUM,S
     1QRT1,FUN(I,1),FUN(I,2),FUN(I,3),FUN(I,4),FUN(I,5),Q(I),QP(I),AKB(I
     2),GAMMA,STMACH,AB,PP(I),UP(I),VP(I),WP(I),ZETA1(I),ZETA2(I),ZETA3(
     3I),ZETA4(I),DU1(I),DU2(I),DU3(I),DU4(I),DP1(I),DP2(I),DP3(I),DP4(I
     4),DV1(I),DV2(I),DV3(I),DV4(I),DW1(I),DW2(I),DW3(I),DW4(I),FUN(I,6)
      F1B=Q(I)+2.*(1.-Q(I))*ETA(I)/ETAS(I)
      G1B=ETA(I)*(QP(I)*(1.-ETA(I)/ETAS(I))-ETASP(I)*F1B/ETAS(I))
      CON1=SIN(ETA(I))
      CON2=COS(ETA(I))
      H=CON2-AKB(I)*CON1
      HK=CON1+AKB(I)*CON2
      IF (ABS(H).GE.1.0E-07) GO TO 2
      PRINT 12, ERR(1),I,FUN(I,1),ETAS(I),ETA(I),CON1,CON2,H,HK
      STOP 1201
    2 TANSIG=-ETASP(I)/H
      SIGMA=ATAN(TANSIG)
      BUSQ=FUN(I,2)**2+FUN(I,4)**2+FUN(I,5)**2
      DENOM=EXP(FUN(I,6))
      IF (NDEBUG.EQ.0) PRINT 12, BLK(2),I,CON1,CON2,AKB(I),H,HK,ETASP(I)
     1,TANSIG,SIGMA,BUSQ,GAMMA,STMACH,DENOM,F1B,G1B
      IF (ABS(DENOM).GE.1.E-07.AND.FUN(I,3).GT.0.0) GO TO 3
      PRINT 12, ERR(2),I,GAMMA,STMACH,TANSIG,SIGMA,BUSQ,DENOM,FUN(I,1),F
     1UN(I,2),FUN(I,3),FUN(I,4),FUN(I,5)
      NEGP=0
      PRINT 14
      RETURN
    3 RHO(I)=(GAMMA*STMACH**2*FUN(I,3)/DENOM)**(1./GAMMA)
      DENOM=1.+2./((GAMMA-1.)*STMACH**2)
      BERNOUL(I)=1.-(2.*GAMMA*FUN(I,3)/(RHO(I)*(GAMMA-1.))+BUSQ*AAST**2)
     1/DENOM
      IF (RHO(I).GE.1.E-10) GO TO 4
      PRINT 12, ERR(3),I,BUSQ,DENOM,RHO(I),FUN(I,3)
      STOP 1203
    4 ASQ=GAMMA*FUN(I,3)/RHO(I)
      IF (NDEBUG.EQ.0) PRINT 12, BLK(3),I,RHO(I),ASQ
      IF (ASQ.GT.1.E-20) GO TO 5
      PRINT 12, ERR(4),I,RHO(I),FUN(I,3),BUSQ,ASQ
      STOP 1204
    5 AM(I)=SQRT(AAST**2*BUSQ/ASQ)
      CROSSM(I)=SQRT(AAST**2*((BUSQ-FUN(I,2)**2)/ASQ))
      POROGAM(I)=FUN(I,3)/RHO(I)**GAMMA
      S(I)=ALOG(FUN(I,3)*GAMMA*STMACH**2/RHO(I)**GAMMA)
      FF=ETAS(I)*(H*(FUN(I,4)**2+FUN(I,5)**2)-FUN(I,5)*UP(I))
      F1=ETAS(I)*(FUN(I,5)*PP(I)/RHO(I)/ASQ+WP(I)+2.*H*FUN(I,2)-HK*FUN(I
     1,4))
      F2=ETAS(I)*(FUN(I,5)*VP(I)+H*FUN(I,2)*FUN(I,4)+HK*FUN(I,5)**2)
      F3=ETAS(I)*(PP(I)/(RHO(I)*AAST**2)+FUN(I,5)*WP(I)+H*FUN(I,2)*FUN(I
     1,5)-HK*FUN(I,4)*FUN(I,5))
      G(I)=H*FUN(I,4)*F1B+FUN(I,5)*G1B
      DEONS(I)=(H*F1B/AAST)**2+(G1B/AAST)**2-G(I)**2/ASQ
      IF (NDEBUG.EQ.0) PRINT 12, BLK(4),I,AM(I),CROSSM(I),POROGAM(I),S(I
     1),UP(I),PP(I),VP(I),WP(I),SBARP(I),FF,F1,F2,F3,QUAN,F1B,G1B,G(I),D
     2EONS(I),FUN(I,1)
      IF (NEXTRAP.EQ.1) GO TO 9
      IF ((G(I).GT.EPSIG.OR.DEONS(I).LT.EPSIG).AND.FUN(I,1).GE..80) GO T
     1O 6
      IF (ABS(G(I)).LT.EPSIG.OR.G(I).GT.0.) GO TO 7
      IF (DEONS(I).GT.0.) GO TO 6
      DEQ=0.
      PRINT 13
      RETURN
C
C     ZETA DERIVATIVES
C
    6 DFUN(I,2)=FF/G(I)
      DFUN(I,3)=RHO(I)/DEONS(I)*(F1*G(I)-F2*H*F1B-F3*G1B)
      DFUN(I,4)=-1./G(I)*(H*F1B*DFUN(I,3)/(AAST**2*RHO(I))+F2)
      DFUN(I,5)=-1./G(I)*(G1B*DFUN(I,3)/(AAST**2*RHO(I))+F3)
      DFUN(I,6)=-ETAS(I)*FUN(I,5)*SBARP(I)/G(I)
      IF (NDEBUG.EQ.0) PRINT 12, BLK(6),I,DFUN(I,1),DFUN(I,2),DFUN(I,3),
     1DFUN(I,4),DFUN(I,5),DFUN(I,6)
      GO TO 10
C
C     EXTRAPOLATION OF VELOCITIES AND PRESSURE
C
    7 NEXTRAP=1
      DO 8 II=1,N
      FUN(II,1)=FUNC(II,1)
      FUN(II,2)=FUNC(II,2)
      FUN(II,3)=FUNC(II,3)
      FUN(II,4)=FUNC(II,4)
      FUN(II,5)=FUNC(II,5)
      FUN(II,6)=FUNC(II,6)
    8 CONTINUE
      GO TO 1
    9 EXTA1=ZETA2(I)+ZETA3(I)+ZETA4(I)
      EXTB1=ZETA2(I)*ZETA3(I)+ZETA2(I)*ZETA4(I)+ZETA3(I)*ZETA4(I)
      EXTC1=ZETA2(I)*ZETA3(I)*ZETA4(I)
      EXTA2=ZETA1(I)+ZETA3(I)+ZETA4(I)
      EXTB2=ZETA1(I)*ZETA3(I)+ZETA1(I)*ZETA4(I)+ZETA3(I)*ZETA4(I)
      EXTC2=ZETA1(I)*ZETA3(I)*ZETA4(I)
      EXTA3=ZETA2(I)+ZETA1(I)+ZETA4(I)
      EXTC3=ZETA2(I)*ZETA1(I)*ZETA4(I)
      EXTB3=ZETA2(I)*ZETA1(I)+ZETA2(I)*ZETA4(I)+ZETA1(I)*ZETA4(I)
      EXTA4=ZETA2(I)+ZETA3(I)+ZETA1(I)
      EXTB4=ZETA2(I)*ZETA3(I)+ZETA2(I)*ZETA1(I)+ZETA3(I)*ZETA1(I)
      EXTC4=ZETA2(I)*ZETA3(I)*ZETA1(I)
      DENOM1=(ZETA1(I)-ZETA2(I))*(ZETA1(I)-ZETA3(I))*(ZETA1(I)-ZETA4(I))
      DENOM2=(ZETA2(I)-ZETA1(I))*(ZETA2(I)-ZETA3(I))*(ZETA2(I)-ZETA4(I))
      DENOM3=(ZETA3(I)-ZETA1(I))*(ZETA3(I)-ZETA2(I))*(ZETA3(I)-ZETA4(I))
      DENOM4=(ZETA4(I)-ZETA1(I))*(ZETA4(I)-ZETA2(I))*(ZETA4(I)-ZETA3(I))
      IF (NDEBUG.EQ.0) PRINT 12, BLK(7),I,EXTA1,EXTB1,EXTC1,EXTA2,EXTB2,
     1EXTC2,EXTA3,EXTB3,EXTC3,EXTA4,EXTB4,EXTC4,DENOM1,DENOM2,DENOM3,DEN
     2OM4
      TERM1=FUN(I,1)**3/4.
      TERM2=FUN(I,1)**2/3.
      TERM3=FUN(I,1)/2.
      IF (NDEBUG.EQ.0) PRINT 12, BLK(10),I,FUN(I,1),DV1(I),DV2(I),DV3(I)
     1,DV4(I),TERM1,TERM2,TERM3,WP1,WP2,WP3,WP4
      FAC1=(TERM1-EXTA1*TERM2+EXTB1*TERM3-EXTC1)/DENOM1
      FAC2=(TERM1-EXTA2*TERM2+EXTB2*TERM3-EXTC2)/DENOM2
      FAC3=(TERM1-EXTA3*TERM2+EXTB3*TERM3-EXTC3)/DENOM3
      FAC4=(TERM1-EXTA4*TERM2+EXTB4*TERM3-EXTC4)/DENOM4
      IF (NDEBUG.EQ.0) PRINT 12, BLK(11),I,FAC1,FAC2,FAC3,FAC4
      DVDZ(I)=-EXTC1*DV1(I)/DENOM1-EXTC2*DV2(I)/DENOM2-EXTC3*DV3(I)/DENO
     1M3-EXTC4*DV4(I)/DENOM4
      FUN(I,4)=FUN(I,4)-FUN(I,1)*(FAC1*DV1(I)+FAC2*DV2(I)+FAC3*DV3(I)+FA
     1C4*DV4(I))
      DPDZEX(I)=-EXTC1*DP1(I)/DENOM1-EXTC2*DP2(I)/DENOM2-EXTC3*DP3(I)/DE
     1NOM3-EXTC4*DP4(I)/DENOM4
      IF (NPRINT.EQ.1) FUN(I,1)=0.0
      IF (NDEBUG.EQ.0) PRINT 12, BLK(8),I,TERM1,TERM2,FAC1,FAC2,FAC3,FAC
     14,FUN(I,4),FUN(I,1)
      FUN(I,2)=FUN(I,2)-FUN(I,1)*(FAC1*DU1(I)+FAC2*DU2(I)+FAC3*DU3(I)+FA
     1C4*DU4(I))
      FUN(I,3)=FUN(I,3)-FUN(I,1)*(FAC1*DP1(I)+FAC2*DP2(I)+FAC3*DP3(I)+FA
     1C4*DP4(I))
      FUN(I,5)=FUN(I,5)-FUN(I,1)*(FAC1*DW1(I)+FAC2*DW2(I)+FAC3*DW3(I)+FA
     1C4*DW4(I))
      FUN(I,6)=FUN(I,6)-FUN(I,1)*(FAC1*DSB1(I)+FAC2*DSB2(I)+FAC3*DSB3(I)
     1+FAC4*DSB4(I))
      FUN(I,1)=0.0
      IF (NDEBUG.EQ.0) PRINT 12, BLK(9),I,FUN(I,2),FUN(I,3),FUN(I,4),FUN
     1(I,5),FUN(I,6)
   10 CONTINUE
      RETURN
C
```

APPENDIX A

```
11 FORMAT (16H SUBROUTINE EQNS)
12 FORMAT (17H SUBROUTINE EQNS ,1X1A6,I5/(8E16.8))
13 FORMAT (18H DEQNS IS NEGATIVE)
14 FORMAT (//23H OUCH-NEGATIVE PRESSURE//)
   END
   SUBROUTINE RUNKUT2 (DS,NP)
   COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
   COMMON FUN(20,6),DFUN(20,6),FUNC(20,6),DFUNC(20,6),B1(20,6),B2(20,
  16),B3(20,6),B4(20,6)
   COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
  14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
  20),A7(20),A8(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
  3(20),ETAS(20),ETASP(20),BETAD(20),RHO(20),R(20),P(20),U(20),V(20),
  4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
  5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1(20),ZETA2(20),ZETA3(20),ZETA4
  6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
  70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSIO(20),DP1(20),DP2(20),
  8DP3(20),DP4(20),DEQNS(20),CROSSM(20),POROGAM(20),G(20),QP(20),PSIS
  9D(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
   COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2B(20),DPDZE
  1X(20)
   COMMON KTRANSF,SLOPE
   COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
  1A,DX1,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
  2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
  3EPSIGOM,EPSINT,DEQ,XIN1,SIGNP1
   COMMON /BLOCKN/ DWDX1,WP1,WP2,WP3,WP4
   COMMON /ERROR/ ER(12),ERR(12),BLK(12)
   COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
  1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
  2POPTI(20),PTOPTI(20),PT(20),POASTSO(20),POPINF(20),CPBODY(20)
   COMMON /BLOCK6/ NEGP
   NDEBUG=1
   IF (NDEBUG.NE.0) GO TO 2
   PRINT 27
   DO 1 I=1,N
 1 PRINT 28, I,(NXF,FUN(I,NXF),DFUN(I,NXF),NXF=1,NF)
 2 TESTMAX=.5*EPSINT
   DSMIN=.1
   DSMAX=DSMIN
   IF (DSMIN.EQ.DSMAX) DS=-DSMAX
C
C     (DSMIN.EQ.DSMAX)  GIVES A FIXED INTEGRATION STEP
C     (DSMIN.NE.DSMAX)  GIVES A VARIABLE INTEGRATION STEP
C
   IF (DSMIN.NE.DSMAX) GO TO 3
   IF (FUN(1,1)-.1.GE.1.E-07) DS=-.1
   IF (FUN(1,1)-.1.LT.1.E-07) DS=-.05
   IF (FUN(1,1)-.05.LT.1.E-07) DS=-.025
   IF (FUN(1,1)-.025.LT.1.E-07) DS=-.0125
 3 IF (FUN(1,1).NE.1.0) GO TO 5
   DO 4 I=1,N
 4 DFUN(I,1)=DS
C
C     SET EXTRAPOLATION PARAMETERS
C
 5 DO 6 I=1,N
   IF (ZETA4(I)-FUN(I,1).LT.SPACER.AND.FUN(I,1).LT.1.) GO TO 6
   IF (G(I).GT.EPSIG.OR.DEQNS(I).LT.EPSIG) GO TO 6
   ZETA1(I)=ZETA2(I)
   ZETA2(I)=ZETA3(I)
   ZETA3(I)=ZETA4(I)
   ZETA4(I)=FUN(I,1)
   DU1(I)=DU2(I)
   DU2(I)=DU3(I)
   DU3(I)=DU4(I)
   DU4(I)=DFUN(I,2)
   DP1(I)=DP2(I)
   DP2(I)=DP3(I)
   DP3(I)=DP4(I)
   DP4(I)=DFUN(I,3)
   DV1(I)=DV2(I)
   DV2(I)=DV3(I)
   DV3(I)=DV4(I)
   DV4(I)=DFUN(I,4)
   DW1(I)=DW2(I)
   DW2(I)=DW3(I)
   DW3(I)=DW4(I)
   DW4(I)=DFUN(I,5)
   DSB1(I)=DSB2(I)
   DSB2(I)=DSB3(I)
   DSB3(I)=DSB4(I)
   DSB4(I)=DFUN(I,6)
 6 CONTINUE
   WP1=WP2
   WP2=WP3
   WP3=WP4
   WP4=WP(N)
   DO 8 I=1,N
   DO 7 NXF=1,NF
   DFUNC(I,NXF)=DFUN(I,NXF)
 7 FUNC(I,NXF)=FUN(I,NXF)
 8 CONTINUE
 9 DO 10 I=1,N
10 DFUN(I,1)=DS
   IF (NDEBUG.EQ.0) PRINT 29, DS
   DO 11 I=1,N
   DO 11 NXF=2,NF
   B1(I,NXF)=DS*DFUNC(I,NXF)
11 FUN(I,NXF)=FUNC(I,NXF)+B1(I,NXF)/2.
   DO 12 I=1,N
12 FUN(I,1)=FUNC(I,1)+DS/2.
   IF (NDEBUG.NE.0) GO TO 14
   DO 13 I=1,N
13 PRINT 30, I,(NXF,B1(I,NXF),FUN(I,NXF),NXF=1,NF)
14 CALL DERIV2 (DS,NP)
   IF (DEQ.EQ.0.0) RETURN
   IF (NEGP.EQ.0) RETURN
   IF (NEXTRAP.EQ.1) RETURN
   DO 15 I=1,N
   DO 15 NXF=2,NF
   B2(I,NXF)=DS*DFUN(I,NXF)
15 FUN(I,NXF)=FUNC(I,NXF)+B2(I,NXF)/2.
   IF (NDEBUG.NE.0) GO TO 17
   DO 16 I=1,N
16 PRINT 31, I,(NXF,B2(I,NXF),FUN(I,NXF),NXF=1,NF)
17 CALL DERIV2 (DS,NP)
   IF (DEQ.EQ.0.0) RETURN
   IF (NEGP.EQ.0) RETURN
   IF (NEXTRAP.EQ.1) RETURN
   NCCNT=0
   DO 19 I=1,N
   FUN(I,1)=FUNC(I,1)+DS
   DO 19 NXF=2,NF
   B3(I,NXF)=DS*DFUN(I,NXF)
   IF (ABS(B2(I,NXF)/DS).LE.1.E-03) GO TO 18
   TEST=ABS(1.-B3(I,NXF)/B2(I,NXF))
   NCCNT=NCCNT+1
   IF (NCCNT.EQ.1) TESTMAX=TEST
   IF (TEST.GT.TESTMAX) TESTMAX=TEST
18 FUN(I,NXF)=FUNC(I,NXF)+B3(I,NXF)
   IF (NDEBUG.EQ.0) PRINT 32, I,NXF,B3(I,NXF),FUN(I,NXF),TEST
19 CONTINUE
   IF (DSMIN.EQ.DSMAX) GO TO 20
   IF (TESTMAX.GE.EPSINT.AND.ABS(DS).GT.DSMIN) GO TO 24
20 CALL DERIV2 (DS,NP)
   IF (DEQ.EQ.0.0) RETURN
   IF (NEGP.EQ.0) RETURN
   IF (NEXTRAP.EQ.1) RETURN
   DO 21 I=1,N
   DO 21 NXF=2,NF
   B4(I,NXF)=DS*DFUN(I,NXF)
21 FUN(I,NXF)=FUNC(I,NXF)+1./6.*(B1(I,NXF)+2.*B2(I,NXF)+2.*B3(I,NXF)+
  1B4(I,NXF))
   IF (NDEBUG.NE.0) GO TO 23
   DO 22 I=1,N
22 PRINT 33, I,(NXF,B4(I,NXF),FUN(I,NXF),NXF=1,NF)
23 IF (TESTMAX.LE.(.1*EPSINT)) GO TO 25
   RETURN
24 DS=.5*DS
   GO TO 9
25 IF (DSMIN.EQ.DSMAX) RETURN
   IF (ABS(1.9*DS).GT.DSMAX) RETURN
   DS=1.9*DS
   DO 26 I=1,N
26 DFUN(I,1)=DS
   RETURN
C
C
27 FORMAT (19H SUBROUTINE RUNKUT2)
28 FORMAT (3H I=I5/(5H NXF=I3,2X,11HFUN(I,NXF)=E16.8,2X,12HDFUN(I,NXF
  1)=E16.8))
29 FORMAT (4H DS=E16.8)
30 FORMAT (3H I=I5/(5H NXF=I3,2X,10HB1(I,NXF)=E16.8,2X,11HFUN(I,NXF)=
  1E16.8))
31 FORMAT (3H I=I5/(5H NXF=I3,2X,10HB2(I,NXF)=E16.8,2X,11HFUN(I,NXF)=
  1E16.8))
32 FORMAT (3H I=I3,2X,4HNXF=I3,2X,10HB3(I,NXF)=E16.8,2X,11HFUN(I,NXF)
  1=E16.8,2X,5HTEST=E16.8)
33 FORMAT (3H I=I5/(5H NXF=I3,2X,10HB4(I,NXF)=E16.8,2X,11HFUN(I,NXF)=
  1E16.8))
   END
   SUBROUTINE PRINT (NLINEP1,LPRINT,ZETA,DZETA,NP,NPLOT,NZETA)
   COMMON F(3),DF(3),FC(3),DFC(3),AB1(3),AB2(3),AB3(3),AB4(3)
   COMMON FUN(20,6),DFUN(20,6),FUNC(20,6),DFUNC(20,6),B1(20,6),B2(20,
```

```
16),B3(20,6),B4(20,6)
 COMMON SBAR(20),DSBDZ(20),SBARP(20),DSB1(20),DSB2(20),DSB3(20),DSB
14(20),XI(20),XO(20),YO(20),A1(20),A2(20),A3(20),A4(20),A5(20),A6(2
20),A7(20),A8(20),AKB(20),GX(20),GY(20),GXX(20),GYY(20),GXY(20),ETA
3(20),ETAS(20),ETASP(20),BETAD(20),RHO(20),R(20),P(20),U(20),V(20),
4W(20),PP(20),UP(20),VP(20),WP(20),XS(20),YS(20),DUDZ(20),DPDZ(20),
5DVDZ(20),DWDZ(20),AM(20),S(20),ZETA1(20),ZETA2(20),ZETA3(20),ZETA4
6(20),DU1(20),DU2(20),DU3(20),DU4(20),DW1(20),DW2(20),DW3(20),DW4(2
70),DV1(20),DV2(20),DV3(20),DV4(20),G(20),PSID(20),DP1(20),DP2(20),
8DP3(20),DP4(20),DEQNS(20),CROSSM(20),POROGAM(20),Q(20),QP(20),PSIS
9D(20),BERNOUL(20),XSBAR(20),YSBAR(20),RHOISEN(20),UISEN(20)
 COMMON XOBAR(20),YOBAR(20),XBAR(20),YBAR(20),TAU(20),G2P(20),DPDZE
1X(20)
 COMMON KTRANSF,SLOPE
 COMMON AAST,B11,B12,B13,B21,B22,B23,NSPACE,PI,M,N,L1,T,THETAR,GAMM
1A,DXI,CON1,CON2,STMACH,AB,A11,A12,A13,A21,A22,A23,A31,A32,A33,ALPH
2AR,N1,NDEBUG,H,HK,SIGMA,RAD,NF,NLINES,EPSIG,NPRINT,SPACER,NEXTRAP,
3EPSIGOY,EPSINT,DEQ,XIN1,SIGNPI
 COMMON /BLOCKN/ DWDXI,WP1,WP2,WP3,WP4
 COMMON /ERROR/ ER(12),ERR(12),BLK(12)
 COMMON VCC(20),WCC(20),CPSHOCK(20),CP(20),SBARHLD(20),XBHLD(20),YB
1HLD(20),UC(20),VC(20),WC(20),VX(20),VY(20),THETNOR(20),PSINOR(20),
2POPTI(20),PTOPTI(20),PT(20),POASTSQ(20),POPINF(20),CPBODY(20)
 DIMENSION NAME(16), NAME1(16), NAME2(16), NAME3(8)
 DIMENSION NAME4(20)
 DATA (NAME(I),I=1,15)/1HP,3HRHO,1HS,1HU,1HV,1HW,4HDPDZ,4HDUDZ,4HDV
1DZ,4HDWDZ,3HETA,1HG,5HDSBDZ,5HSBARP,7HBERNOUL/
 DATA (NAME1(I),I=1,16)/2HPP,2HUP,2HVP,2HWP,5HDEQNS,3HAMU,2HUO,2HAM
1,6HCROSSM,7HRHOISEN,5HUISEN,7HPOROGAM,4HSBAR,2HUC,2HVC,2HWC/
 DATA (NAME2(I),I=1,14)/4HPSID,2HXO,2HYO,2HXS,2HYS,4HETAS,5HBETAD,2
1HXI,2HAM,2HUP,2HWP,2HPP,2HRP,2HVP/
 DATA (NAME3(I),I=1,4)/5HXOBAR,5HYOBAR,5HXSBAR,5HYSBAR/
 DATA NAME4/5HPSISQ,4HXBAR,4HYBAR,2HVX,2HVY,2HVZ,6HPSINOR,7HTHETNOR
1,7HP/PTINF,8HPT/PTINF,7HP/ROVSQ,9HP/ROASTSQ,2HPT,6HP/PINF,3HVCC,3H
2WCC,7HCPSHOCK,6HCPBODY,5HXBHLD,5HYBHLD/
 LB=1
 IF (LPRINT.EQ.2) PRINT 29
 IF (N.LE.10) LL=N
 IF (N.GT.10) LL=10
 PRINT 22
 NM1=N-1
 GO TO (1,18), LPRINT
1 IF (N.EQ.1) GO TO 12
 IF (ZETA.EQ.1.) GO TO 2
 IF (ZETA.EQ.0.) GO TO 9
 GO TO 4
2 DO 3 I=1,N
 XBHLD(I)=XBAR(I)
 YBHLD(I)=YBAR(I)
3 SBARHLD(I)=SBAR(I)
 NZETA=0
 IF (NPLOT.EQ.1) PUNCH 28, (PSISD(I),I=1,N)
 IF (NPLOT.EQ.1) PUNCH 28, (CPSHOCK(I),I=1,N)
 GO TO 11
4 DO 8 I=2,NM1
 DO 7 II=1,NM1
 IF (SBARHLD(I).LT.SBARHLD(I-1).AND.T.LT.1.) GO TO 5
 IF (SBAR(II).LE.SBARHLD(I).AND.SBAR(II+1).GE.SBARHLD(I)) GO TO 6
 IF (T.GT.1..AND.SBARHLD(I+1).GT.SBARHLD(I)) GO TO 7
5 IF (SBAR(II).GE.SBARHLD(I).AND.SBAR(II+1).LE.SBARHLD(I)) GO TO 6
 GO TO 7
6 XBHLD(I)=XBAR(II)+(SBARHLD(I)-SBAR(II))*(XBAR(II+1)-XBAR(II))/(SBA
1R(II+1)-SBAR(II))
 YBHLD(I)=YBAR(II)+(SBARHLD(I)-SBAR(II))*(YBAR(II+1)-YBAR(II))/(SBA
1R(II+1)-SBAR(II))
 GO TO 8
7 CONTINUE
8 CONTINUE
 GO TO 11
9 DO 10 I=2,N
 XBHLD(I)=XBAR(N)
10 YBHLD(I)=YBAR(N)
11 NZETA=NZETA+1
 XBHLD(1)=XBAR(1)
 XBHLD(N)=XBAR(N)
 YBHLD(1)=YBAR(1)
 YBHLD(N)=YBAR(N)
 IF (NPLOT.EQ.1) PUNCH 28, (XBHLD(I),I=1,N)
 IF (NPLOT.EQ.1) PUNCH 28, (YBHLD(I),I=1,N)
12 PRINT 24, NAME(1),(P(I),I=LB,LL)
 PRINT 24, NAME4(12),(POASTSQ(I),I=LB,LL)
 PRINT 24, NAME4(9),(POPTI(I),I=LB,LL)
 PRINT 24, NAME4(14),(POPINF(I),I=LB,LL)
 PRINT 24, NAME(2),(RHO(I),I=LB,LL)
 PRINT 24, NAME(4),(U(I),I=LB,LL)
 PRINT 24, NAME(5),(V(I),I=LB,LL)
 PRINT 24, NAME(6),(W(I),I=LB,LL)
 PRINT 24, NAME1(14),(UC(I),I=LB,LL)
 PRINT 24, NAME1(15),(VC(I),I=LB,LL)
 PRINT 24, NAME1(16),(WC(I),I=LB,LL)
 PRINT 24, NAME4(15),(VCC(I),I=LB,LL)
 PRINT 24, NAME4(16),(WCC(I),I=LB,LL)
 PRINT 24, NAME4(4),(VX(I),I=LB,LL)
 PRINT 24, NAME4(5),(VY(I),I=LB,LL)
 PRINT 24, NAME4(6),(UC(I),I=LB,LL)
 PRINT 24, NAME4(7),(PSINOR(I),I=LB,LL)
 PRINT 24, NAME4(8),(THETNOR(I),I=LB,LL)
 PRINT 24, NAME4(2),(XBAR(I),I=LB,LL)
 PRINT 24, NAME4(19),(XBHLD(I),I=LB,LL)
 PRINT 24, NAME4(3),(YBAR(I),I=LB,LL)
 PRINT 24, NAME4(20),(YBHLD(I),I=LB,LL)
 PRINT 24, NAME(11),(ETA(I),I=LB,LL)
 PRINT 24, NAME(12),(G(I),I=LB,LL)
 PRINT 24, NAME1(5),(DEQNS(I),I=LB,LL)
 PRINT 24, NAME1(8),(AM(I),I=LB,LL)
 PRINT 24, NAME1(9),(CROSSM(I),I=LB,LL)
 PRINT 24, NAME1(13),(SBAR(I),I=LB,LL)
 PRINT 24, NAME1(12),(POROGAM(I),I=LB,LL)
 PRINT 24, NAME4(10),(PTOPTI(I),I=LB,LL)
 PRINT 24, NAME4(13),(PT(I),I=LB,LL)
 PRINT 24, NAME(15),(BERNOUL(I),I=LB,LL)
 IF (NEXTRAP.EQ.1) PRINT 24, NAME(9),(DVDZ(I),I=LB,LL)
 IF (NEXTRAP.EQ.1) PRINT 24, NAME(7),(DPDZ(I),I=LB,LL)
 IF (NEXTRAP.EQ.1) PRINT 24, NAME1(1),(PP(I),I=LB,LL)
 IF (NEXTRAP.EQ.1) PRINT 24, NAME1(2),(UP(I),I=LB,LL)
 IF (NEXTRAP.EQ.1) PRINT 24, NAME1(4),(WP(I),I=LB,LL)
 IF (NEXTRAP.EQ.1) GO TO 13
 PRINT 24, NAME(7),(DPDZ(I),I=LB,LL)
 PRINT 24, NAME(8),(DUDZ(I),I=LB,LL)
 PRINT 24, NAME(9),(DVDZ(I),I=LB,LL)
 PRINT 24, NAME(10),(DWDZ(I),I=LB,LL)
 PRINT 24, NAME(13),(DSBDZ(I),I=LB,LL)
 PRINT 24, NAME1(1),(PP(I),I=LB,LL)
 PRINT 24, NAME1(2),(UP(I),I=LB,LL)
 PRINT 24, NAME1(3),(VP(I),I=LB,LL)
 PRINT 24, NAME1(4),(WP(I),I=LB,LL)
 PRINT 24, NAME(14),(SBARP(I),I=LB,LL)
13 IF (LL.EQ.N) RETURN
 IF (N.GT.LL.AND.LL.LE.10) GO TO 14
 IF (N.GT.LL.AND.LL.LE.20) GO TO 15
 IF (N.GT.LL.AND.LL.LE.30) GO TO 16
 IF (N.GT.LL.AND.LL.LE.40) GO TO 17
14 LB=LL+1
 IF (N.LE.20) LL=N
 IF (N.GT.20) LL=20
 PRINT 23
 GO TO (12,18), LPRINT
15 LB=LL+1
 IF (N.LE.30) LL=N
 IF (N.GT.30) LL=30
 PRINT 25
 GO TO (12,18), LPRINT
16 LB=LL+1
 IF (N.LE.40) LL=N
 IF (N.GT.40) LL=40
 PRINT 26
 GO TO (12,18), LPRINT
17 LB=LL+1
 LL=N
 PRINT 27
 GO TO (12,18), LPRINT
18 PRINT 24, NAME2(1),(PSID(I),I=LB,LL)
 PRINT 24, NAME4(1),(PSISD(I),I=LB,LL)
 PRINT 24, NAME2(2),(XO(I),I=LB,LL)
 PRINT 24, NAME2(3),(YO(I),I=LB,LL)
 PRINT 24, NAME3(1),(XOBAR(I),I=LB,LL)
 PRINT 24, NAME3(2),(YOBAR(I),I=LB,LL)
 PRINT 24, NAME2(4),(XS(I),I=LB,LL)
 PRINT 24, NAME2(5),(YS(I),I=LB,LL)
 PRINT 24, NAME3(3),(XSBAR(I),I=LB,LL)
 PRINT 24, NAME3(4),(YSBAR(I),I=LB,LL)
 PRINT 24, NAME2(6),(ETAS(I),I=LB,LL)
 PRINT 24, NAME2(7),(BETAD(I),I=LB,LL)
 PRINT 24, NAME2(8),(XI(I),I=LB,LL)
 PRINT 24, NAME4(17),(CPSHOCK(I),I=LB,LL)
 PRINT 24, NAME4(18),(CPBODY(I),I=LB,LL)
 IF (LL.EQ.N) GO TO 19
 IF (N.GT.LL.AND.LL.LE.10) GO TO 14
 IF (N.GT.LL.AND.LL.LE.20) GO TO 15
 IF (N.GT.LL.AND.LL.LE.30) GO TO 16
 IF (N.GT.LL.AND.LL.LE.40) GO TO 17
19 PRINT 21
 PRINT 20, (I,TAU(I),XI(I),XO(I),YO(I),ETAS(I),ETASP(I),I=1,N)
 PRINT 21
 RETURN
C
```

APPENDIX A

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C
   20 FORMAT (3X,1HI,6X,3HTAU,14X,2HXI,14X,2HXO,14X,2HYO,13X,4HETAS,11X,
     15HETASP//(I4,6F16.5))
   21 FORMAT (/)
   22 FORMAT (14X,3HI=19X,3HI=29X,3HI=39X,3HI=49X,3HI=59X,3HI=69X,3HI=79
     1X,3HI=89X,3HI=99X,4HI=10/)
   23 FORMAT (/14X,4HI=118X,4HI=128X,4HI=138X,4HI=148X,4HI=158X,4HI=168X
     1,4HI=178X,4HI=188X,4HI=198X,4HI=20/)
   24 FORMAT (1X1A13,10F12.4)
   25 FORMAT (/14X,4HI=218X,4HI=228X,4HI=238X,4HI=248X,4HI=258X,4HI=268X
     1,4HI=278X,4HI=288X,4HI=298X,4HI=30/)
   26 FORMAT (/14X,4HI=318X,4HI=328X,4HI=338X,4HI=348X,4HI=358X,4HI=368X
     1,4HI=378X,4HI=388X,4HI=398X,4HI=40/)
   27 FORMAT (/14X,4HI=418X,4HI=428X,4HI=438X,4HI=448X,4HI=458X,4HI=468X
     1,4HI=478X,4HI=488X,4HI=498X,4HI=50/)
   28 FORMAT (5F16.8)
   29 FORMAT (//55X,19HSUMMARY PRINT BLOCK//)
      END
      SUBROUTINE FMCOEFS (N,NA,NB,NSPACE,XI,A,M,AA,AAA,P,A2,A1,A4,GY,YO,
     1SINALP,COSALP,G2B)
C
C     COMPUTE FORCE AND MOMENT COEFFICIENTS
C
      DIMENSION XI(N), P(N), A2(N), A1(N), A4(N), GY(N), YO(N), G2B(N)
      IF (NSPACE.EQ.1) GO TO 5
      SUM1=0.0
      SUM2=0.0
      SUM3=0.0
      NCOMP=1
      DXI1=XI(NA)-XI(NA-1)
      DO 2 I=1,NA
      GO TO 11
    1 CONTINUE
    2 CONTINUE
      AINT1=DXI1/3.*SUM1
      AINT2=DXI1/3.*SUM2
      AINT3=DXI1/3.*SUM3
      SUM1=0.0
      SUM2=0.0
      SUM3=0.0
      NCOMP=2
      DXI2=XI(NB)-XI(NB-1)
      DO 4 I=NA,NB
      GO TO 11
    3 CONTINUE
    4 CONTINUE
      AINT4=DXI2/3.*SUM1
      AINT5=DXI2/3.*SUM2
      AINT6=DXI2/3.*SUM3
    5 SUM1=0.0
      SUM2=0.0
      SUM3=0.0
      NCOMP=3
      DXI3=XI(N)-XI(N-1)
      DO 7 I=NB,N
      GO TO 11
    6 CONTINUE
    7 CONTINUE
      AINT7=DXI3/3.*SUM1
      AINT8=DXI3/3.*SUM2
      AINT9=DXI3/3.*SUM3
      GO TO (8,9), NSPACE
    8 CZ=2./A*AINT7
      CY=-2./A*AINT8
      YBRR=4./(3.*A*CZ)*AINT9
      GO TO 10
    9 CZ=2./A*(AINT1+AINT4+AINT7)
      CY=-2./A*(AINT2+AINT5+AINT8)
      YBRR=4./(3.*A*CZ)*(AINT3+AINT6+AINT9)
   10 CD=CZ*COSALP+CY*SINALP
      CL=-CZ*SINALP+CY*COSALP
      ZBAR=2./3.
      CM=YBRR*CZ-ZBAR*CY
      PRINT 14
      PRINT 12, CZ,CY,CD,CL
      PRINT 13, YBRR,ZBAR,CM
      RETURN
   11 AAA=P(I)-AA
      DENOM=SQRT(A2(I)*G2B(I))
      QUAN1=AAA*A4(I)*A1(I)/DENOM
      QUAN2=AAA*GY(I)*A1(I)/DENOM
      QUAN3=QUAN1*YO(I)
      IF (MOD(I,2).EQ.0) FACT=4.0
      IF (MOD(I,2).NE.0) FACT=2.0
      IF (I.EQ.1.OR.I.EQ.NA.OR.I.EQ.NB.OR.I.EQ.N) FACT=1.0
      SUM1=SUM1+FACT*QUAN1
      SUM2=SUM2+FACT*QUAN2
      SUM3=SUM3+FACT*QUAN3
      GO TO (1,3,6), NCOMP
C
C
   12 FORMAT (4H CZ=E16.8,2X,3HCY=E16.8,2X,3HCD=E16.8,2X,3HCL=E16.8)
   13 FORMAT (6H YBAR=E16.9,2X,5HZBAR=E16.8,2X,3HCM=E16.8//)
   14 FORMAT (/60X,19H FORCE COEFFICIENTS/)
      END
      SUBROUTINE SIMEQ (A,N,B,M,DETERM,IPIVOT,NMAX,ISCALE)
C     *** DOCUMENT DATE 08-01-68   SUBROUTINE REVISED 08-01-68 *********
C     SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS
C
      DIMENSION IPIVOT(N), A(NMAX,N), B(NMAX,M)
      EQUIVALENCE (IROW,JROW), (ICOLUM,JCOLUM), (AMAX,T,SWAP)
C
C     INITIALIZATION
C
    1 ISCALE=0
      R1=10.0**100
      R2=1.0/R1
      DETERM=1.0
      DO 2 J=1,N
    2 IPIVOT(J)=0
      DO 38 I=1,N
C
C     SEARCH FOR PIVOT ELEMENT
C
      AMAX=0.0
      DO 7 J=1,N
      IF (IPIVOT(J)-1) 3,7,3
    3 DO 6 K=1,N
      IF (IPIVOT(K)-1) 4,6,39
    4 IF (ABS(AMAX)-ABS(A(J,K))) 5,6,6
    5 IROW=J
      ICOLUM=K
      AMAX=A(J,K)
    6 CONTINUE
    7 CONTINUE
      IF (AMAX) 9,8,9
    8 DETERM=0.0
      ISCALE=0
      GO TO 39
    9 IPIVOT(ICOLUM)=IPIVOT(ICOLUM)+1
C
C     INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL
C
      IF (IROW-ICOLUM) 10,14,10
   10 DETERM=-DETERM
      DO 11 L=1,N
      SWAP=A(IROW,L)
      A(IROW,L)=A(ICOLUM,L)
   11 A(ICOLUM,L)=SWAP
      IF (M) 14,14,12
   12 DO 13 L=1,M
      SWAP=B(IROW,L)
      B(IROW,L)=B(ICOLUM,L)
   13 B(ICOLUM,L)=SWAP
   14 PIVOT=A(ICOLUM,ICOLUM)
      IF (PIVOT) 15,8,15
C
C     SCALE THE DETERMINANT
C
   15 PIVOT1=PIVOT
      IF (ABS(DETERM)-R1) 18,16,16
   16 DETERM=DETERM/R1
      ISCALE=ISCALE+1
      IF (ABS(DETERM)-R1) 21,17,17
   17 DETERM=DETERM/R1
      ISCALE=ISCALE+1
      GO TO 21
   18 IF (ABS(DETERM)-R2) 19,19,21
   19 DETERM=DETERM*R1
      ISCALE=ISCALE-1
      IF (ABS(DETERM)-R2) 20,20,21
   20 DETERM=DETERM*R1
      ISCALE=ISCALE-1
   21 IF (ABS(PIVOT1)-R1) 24,22,22
   22 PIVOT1=PIVOT1/R1
      ISCALE=ISCALE+1
      IF (ABS(PIVOT1)-R1) 27,23,23
   23 PIVOT1=PIVOT1/R1
      ISCALE=ISCALE+1
      GO TO 27
   24 IF (ABS(PIVOT1)-R2) 25,25,27
   25 PIVOT1=PIVOT1*R1
      ISCALE=ISCALE-1
      IF (ABS(PIVOT1)-R2) 26,26,27
   26 PIVOT1=PIVOT1*R1
      ISCALE=ISCALE-1
```

```
   27 DETERM=DETERM*PIVOTI
C
C     DIVIDE PIVOT ROW BY PIVOT ELEMENT
C
      DO 29 L=1,N
      IF (IPIVOT(L)-1) 28,29,39
   28 A(ICOLUM,L)=A(ICOLUM,L)/PIVOT
   29 CONTINUE
      IF (M) 32,32,30
   30 DO 31 L=1,M
   31 B(ICOLUM,L)=B(ICOLUM,L)/PIVOT
C
C     REDUCE NON-PIVOT ROWS
C
   32 DO 38 L1=1,N
      IF (L1-ICOLUM) 33,38,33
   33 T=A(L1,ICOLUM)
      DO 35 L=1,N
      IF (IPIVOT(L)-1) 34,35,39
   34 A(L1,L)=A(L1,L)-A(ICOLUM,L)*T
   35 CONTINUE
      IF (M) 38,38,36
   36 DO 37 L=1,M
   37 B(L1,L)=B(L1,L)-B(ICOLUM,L)*T
   38 CONTINUE
   39 RETURN
      END
      FUNCTION DIF (L,M,NP,VARI,VARD)
C
C        THIS FUNCTION SUBPROGRAM FINDS THE DERIVATIVE AT A GIVEN POINT,
C        L, FOR THE DESIRED X AND Y IN A GIVEN TABLE.  THE N-POINT
C        LAGRANGIAN FORMULA IS USED WHERE N IS ODD.
C
C        L = INTEGER, THE POINT OF X AND Y AT WHICH DERIVATIVE IS FOUND
C        M = INTEGER, 1-5, TO DETERMINE THE POINT FORMULA, N.  N=2*M+1
C        NP= INTEGER, THE NUMBER OF POINTS IN TABLE OF VARIABLES
C        VARI = ARRAY OF INDEPENDENT VARIABLE, X.  VARI(NP)
C        VARD = ARRAY OF DEPENDENT VARIABLE, Y.    VARD(NP)
C
      DIMENSION VARI(NP), VARD(NP), X(11), Y(11)
C
      DIF=017770000000000000000
      IF (M.LT.1) RETURN
      N=2*M+1
      IF (M.GT.5.OR.N.GT.NP) RETURN
      M1=M+1
      M2=NP-M+1
      K=L
      IF (L.LE.M1.OR.N.EQ.NP) GO TO 1
      K=M1
      IF (L.LT.M2) GO TO 1
      K=L-(NP-N)
    1 MX=L-K
      DO 2 J=1,N
      MJ=MX+J
      X(J)=VARI(MJ)
    2 Y(J)=VARD(MJ)
      A=1.
      B=0.
      C=0.
      DO 4 J=1,N
      IF (J.EQ.K) GO TO 4
      P=1.
      DO 3 I=1,N
      IF (I.EQ.J) GO TO 3
      P=P*(X(J)-X(I))
    3 CONTINUE
      T=X(K)-X(J)
      B=B+Y(J)/(P*T)
      A=A*T
      C=C+1./T
    4 CONTINUE
      DIF=A*B+Y(K)*C
      RETURN
      END
```

APPENDIX A

Subroutines

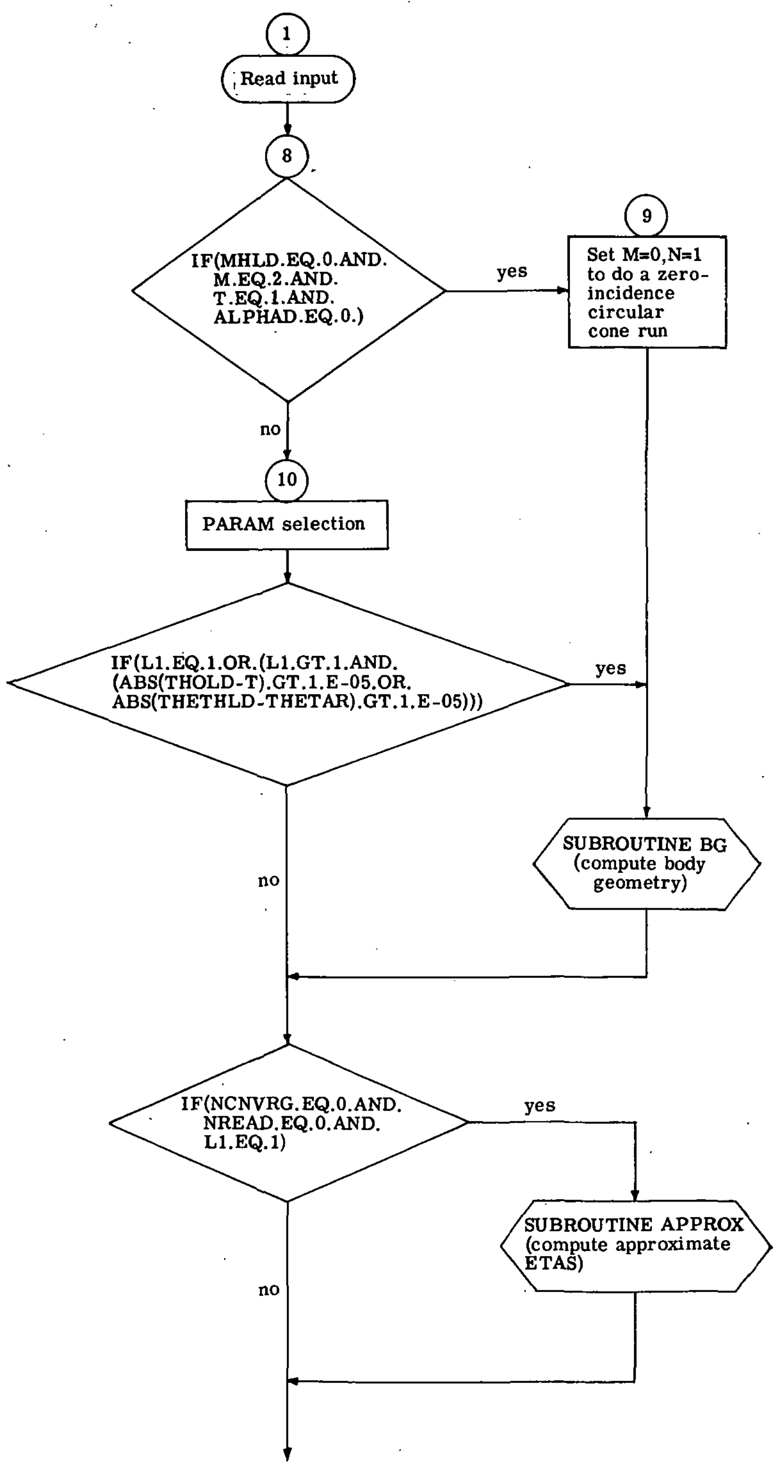
A list of the subroutines used in this program is presented.

FORTRAN name	Called by	Function
BG	MAIN	Executive subroutine for computation of body geometry
RUNKUT	BG	Runge-Kutta integration for body geometry
DERIV	BG RUNKUT	Computation of derivatives for body-geometry integration
APPROX	MAIN	Computation of approximate shock shape for NREAD = 0
LGRANGE	MAIN DERIV2	Establishes line arrangement, accounts for symmetry where appropriate, for computation of XI derivatives for function DIF
DIRCOS	MAIN	Computation of direction cosines of R, ETA, TAU coordinates
SHOCK	MAIN	Computation of flow quantities behind shock
DERIV2	MAIN RUNKUT2	Executive subroutine for computation of derivatives for integration of equations
EQNS	DERIV2	Computation of zeta-derivatives for integration of equations
RUNKUT2	MAIN	Runge-Kutta integration of equations
PRINT	MAIN	Print instructions
FMCOEFS	MAIN	Computation of force and moment coefficients
SIMEQ	MAIN	Solution of simultaneous linear equations to evaluate corrections DETA to the shock shape
DIF	LGRANGE	Computation of derivatives from the Lagrange formula

APPENDIX A

Flow Chart

A flow chart of the computer program is given:



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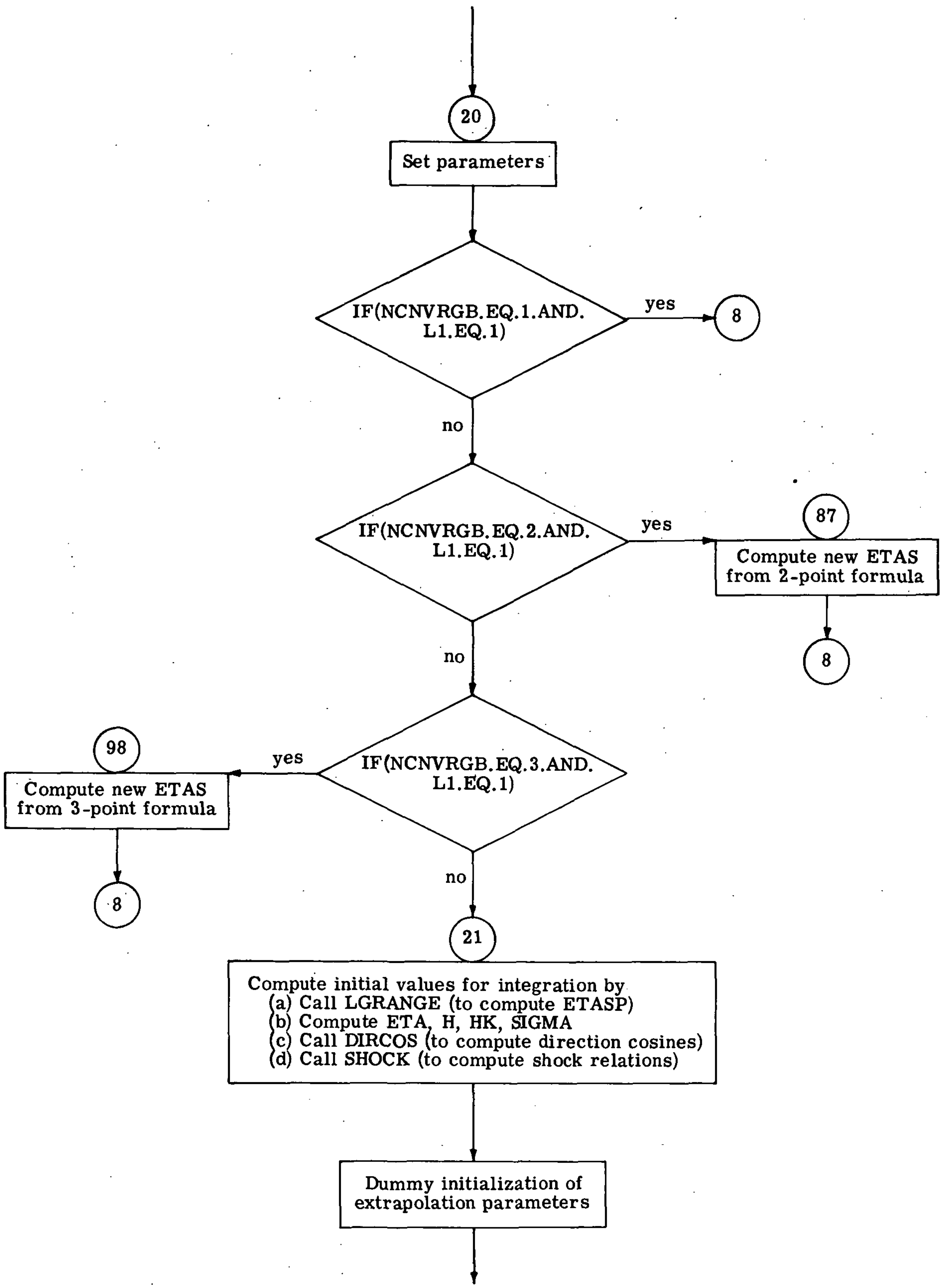
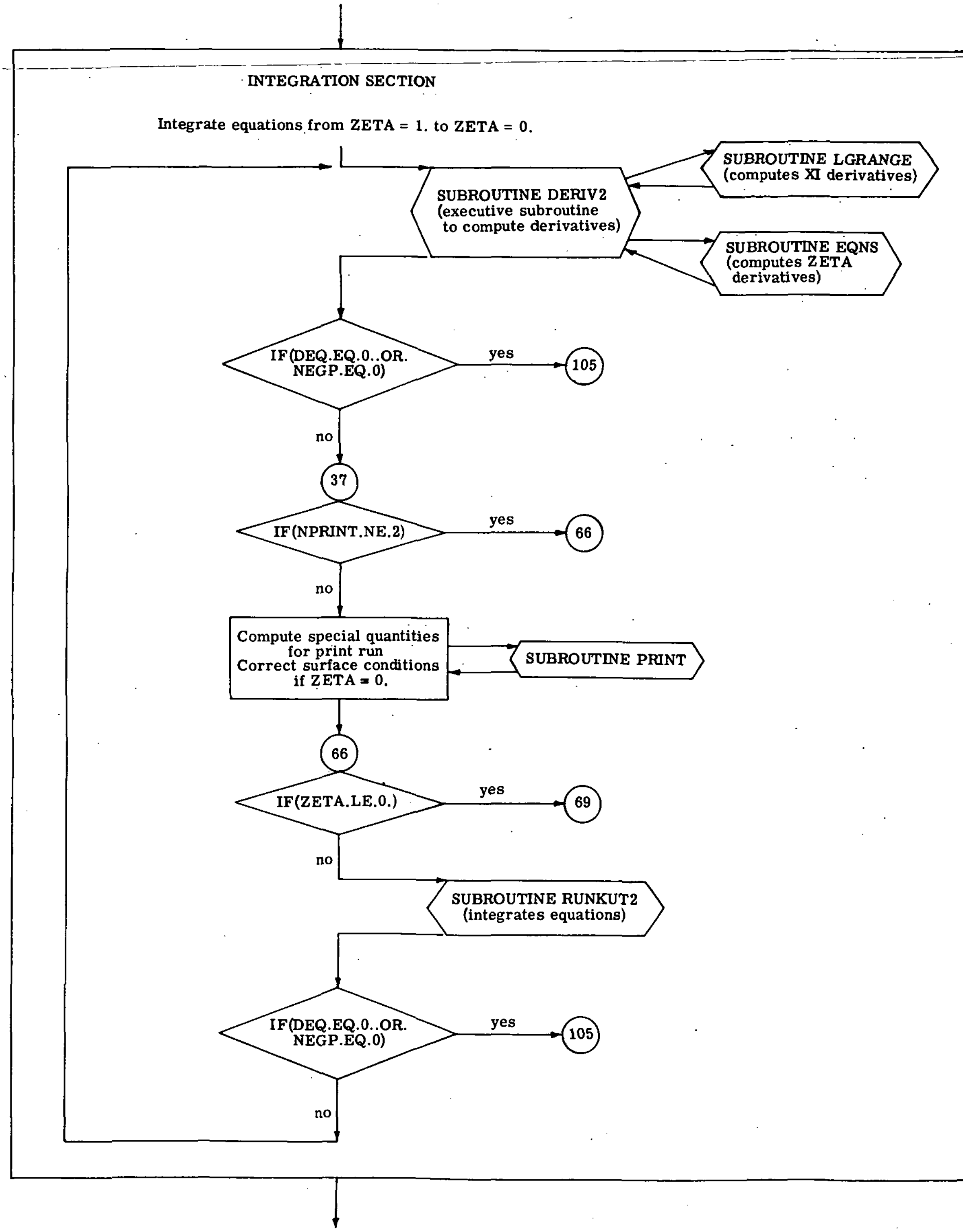
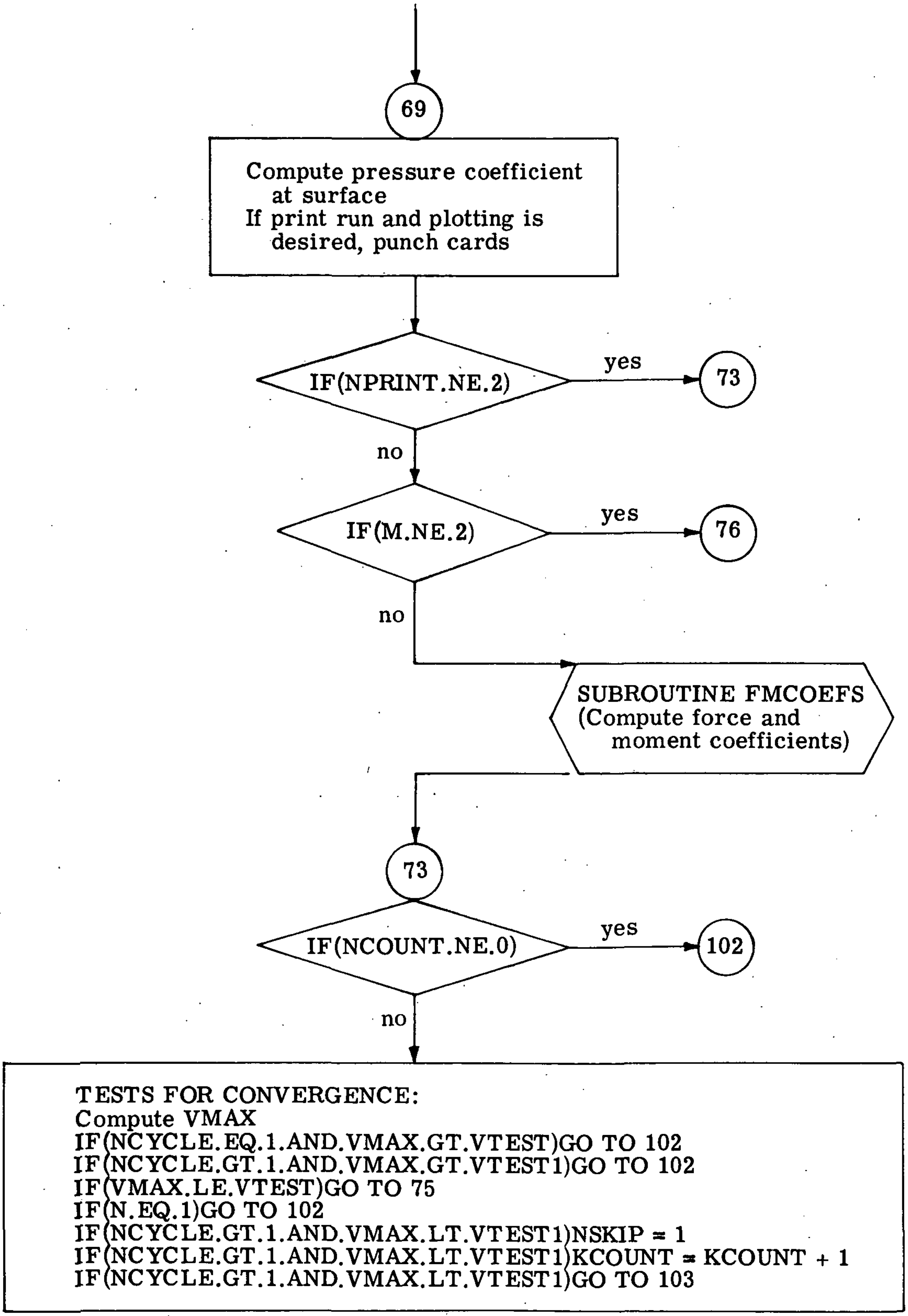


20
Set parameters
IF(NCNVRGB.EQ.1.AND.
L1.EQ.1)
yes
8
no
IF(NCNVRGB.EQ.2.AND.
L1.EQ.1)
yes
87
Compute new ETAS
from 2-point formula
8
no
IF(NCNVRGB.EQ.3.AND.
L1.EQ.1)
yes
98
Compute new ETAS
from 3-point formula
8
no
21
Compute initial values for integration by
(a) Call LGRANGE (to compute ETASP)
(b) Compute ETA, H, HK, SIGMA
(c) Call DIRCOS (to compute direction cosines)
(d) Call SHOCK (to compute shock relations)
Dummy initialization of
extrapolation parameters


INTEGRATION SECTION
Integrate equations from ZETA = 1. to ZETA = 0.
SUBROUTINE DERIV2 (executive subroutine to compute derivatives)
SUBROUTINE LGRANGE (computes XI derivatives)
SUBROUTINE EQNS (computes ZETA derivatives)
IF(DEQ.EQ.0..OR. NEGP.EQ.0)
yes
105
no
37
IF(NPRINT.NE.2)
yes
66
no
Compute special quantities for print run Correct surface conditions if ZETA = 0.
SUBROUTINE PRINT
66
IF(ZETA.LE.0.)
yes
69
no
SUBROUTINE RUNKUT2 (integrates equations)
IF(DEQ.EQ.0..OR. NEGP.EQ.0)
yes
105
no


69
Compute pressure coefficient at surface
If print run and plotting is desired, punch cards
IF(NPRINT.NE.2)
yes
73
no
IF(M.NE.2)
yes
76
no
SUBROUTINE FMCOEFS
(Compute force and moment coefficients)
73
IF(NCOUNT.NE.0)
yes
102
no
TESTS FOR CONVERGENCE:
Compute VMAX
IF(NCYCLE.EQ.1.AND.VMAX.GT.VTEST)GO TO 102
IF(NCYCLE.GT.1.AND.VMAX.GT.VTEST1)GO TO 102
IF(VMAX.LE.VTEST)GO TO 75
IF(N.EQ.1)GO TO 102
IF(NCYCLE.GT.1.AND.VMAX.LT.VTEST1)NSKIP = 1
IF(NCYCLE.GT.1.AND.VMAX.LT.VTEST1)KCOUNT = KCOUNT + 1
IF(NCYCLE.GT.1.AND.VMAX.LT.VTEST1)GO TO 103

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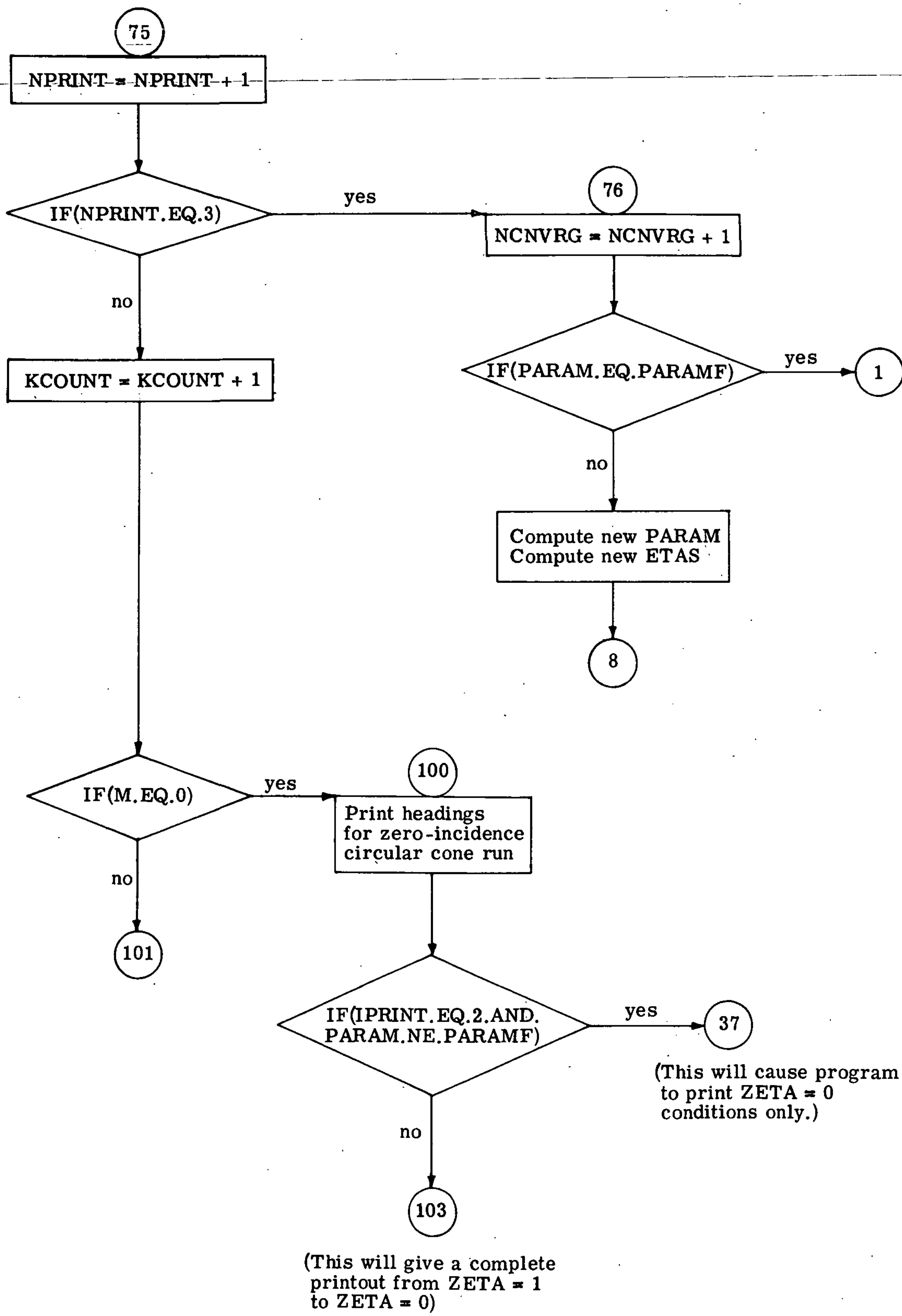
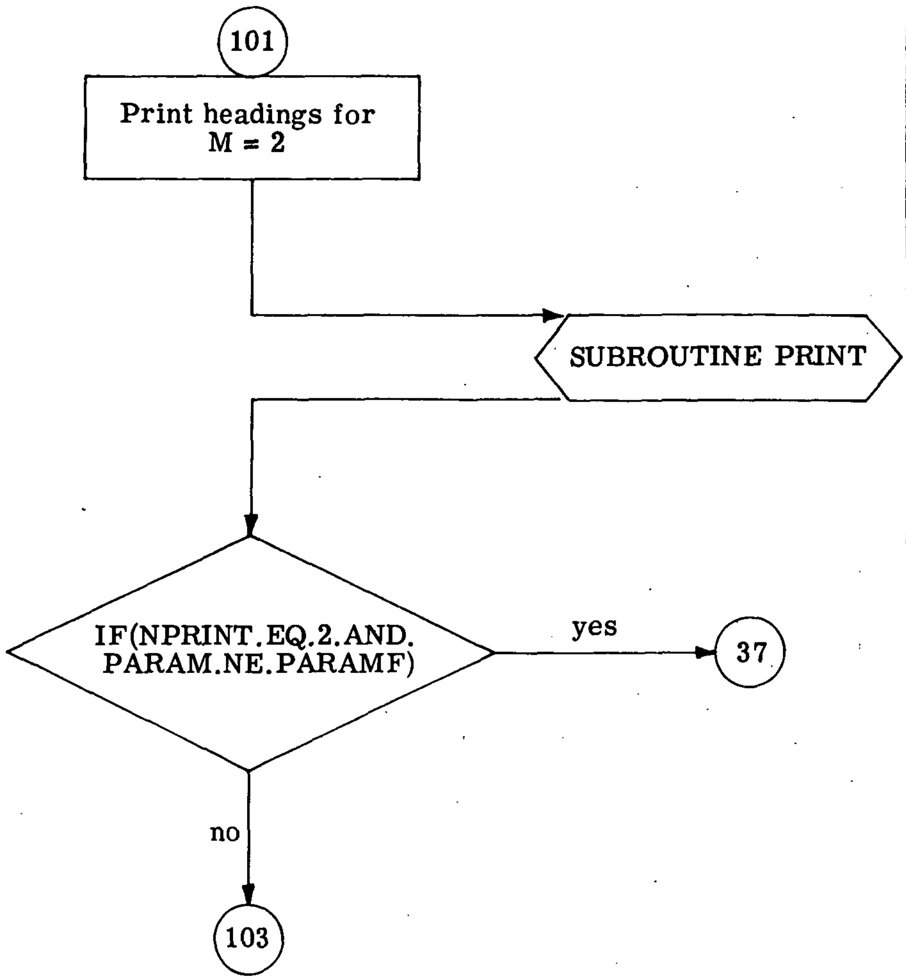
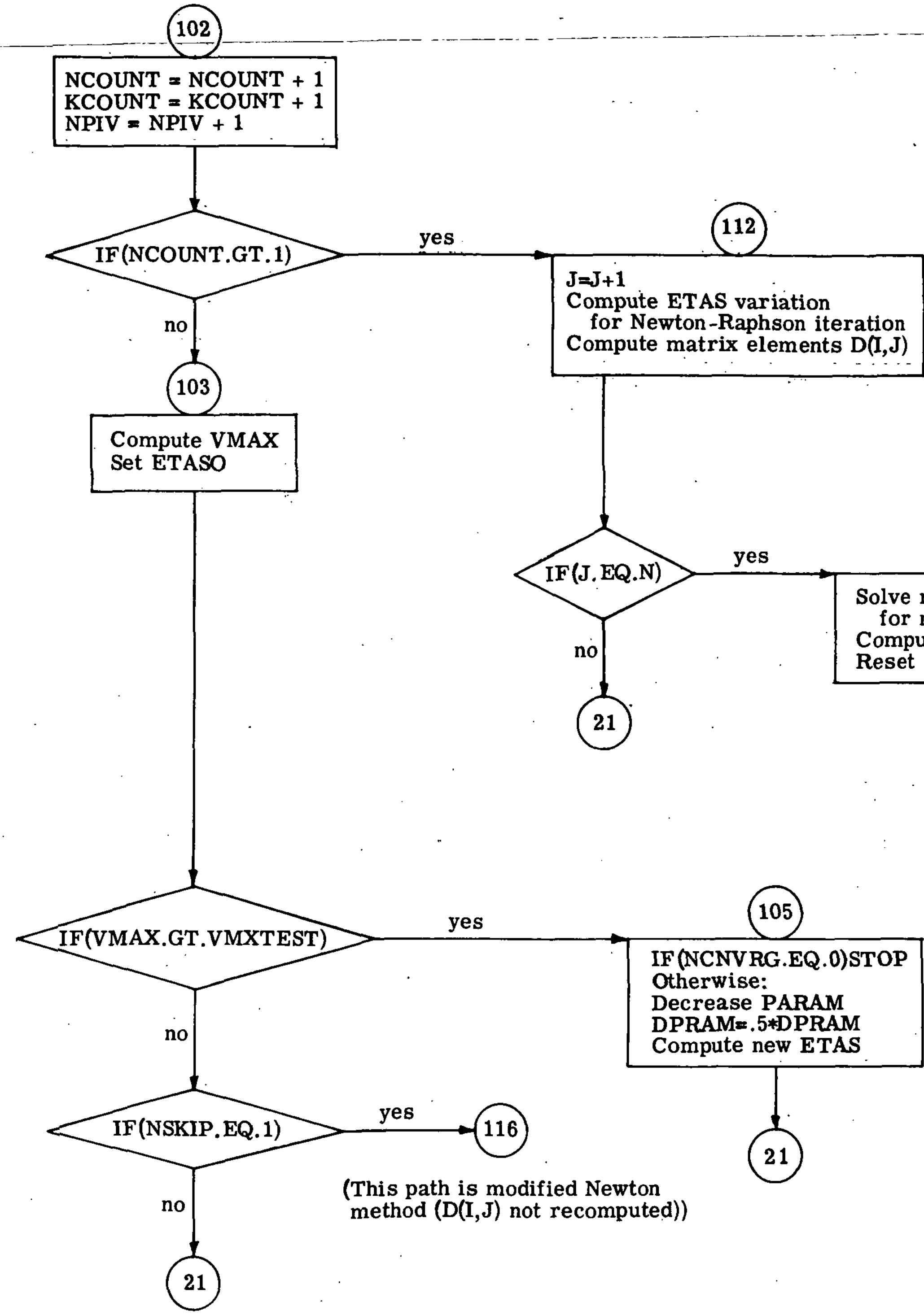


75
NPRINT = NPRINT + 1
IF(NPRINT.EQ.3)
yes
76
NCNVRG = NCNVRG + 1
IF(PARAM.EQ.PARAMF)
yes
1
no
Compute new PARAM
Compute new ETAS
8
no
KCOUNT = KCOUNT + 1
IF(M.EQ.0)
yes
100
Print headings
for zero-incidence
circular cone run
no
101
IF(IPRINT.EQ.2.AND.
PARAM.NE.PARAMF)
yes
37
(This will cause program
to print ZETA = 0
conditions only.)
no
103
(This will give a complete
printout from ZETA = 1
to ZETA = 0)


101
Print headings for
M = 2
SUBROUTINE PRINT
IF(NPRINT.EQ.2.AND.
PARAM.NE.PARAMF)
yes
37
no
103


102
NCOUNT = NCOUNT + 1
KCOUNT = KCOUNT + 1
NPIV = NPIV + 1
IF(NCOUNT.GT.1)
yes
112
J=J+1
Compute ETAS variation
for Newton-Raphson iteration
Compute matrix elements D(I,J)
no
103
Compute VMAX
Set ETASO
IF(J.EQ.N)
yes
116
Solve matrix D(I,J)
for new DETA
Compute new ETAS
Reset counters
no
21
21
IF(VMAX.GT.VMXTEST)
yes
105
IF(NCNVRG.EQ.0)STOP
Otherwise:
Decrease PARAM
DPRAM=.5*DPRAM
Compute new ETAS
no
IF(NSKIP.EQ.1)
yes
116
21
(This path is modified Newton
method (D(I,J) not recomputed))
no
21

APPENDIX B

SAMPLE COMPUTATIONS

Two computations are presented which illustrate the operation of the program. The first computation makes use of the built-in approximate shock shape to start the calculations for the zero-incidence circular cone after which T is decremented to obtain the solution for an elliptic cone with T = 0.6. The second solution uses the converged values of η_s for T = 0.6 to start computations which increment the angle of attack up to 4°. The central processor times, including compilation, for the first and second cases, respectively, were 171 seconds and 116 seconds on the CDC 6600.

Explanations of sections of the sample-computation output are provided at the end of this appendix. Circled numbers at the left side of each section indicate the appropriate explanatory note. These notes describe the first two sets of computations in the first case, the circular cone at zero incidence and the elliptic cone at zero incidence with T = 0.95. The printout for other values of the parameters is similar to that which is annotated.

The input for the first case is

Input card	Description
1	STMACH = 8.0, GAMMA = 1.4, T = 1.0, THETAD = 10.0, ALPHAD = 0
2	N = 9, M = 2, NREAD = 0, NSPACE = 1, INCRMT = 1, IPRINT = 2, NCNVRGB = 0, KTRANSF = 1, NPLOT = 0, NPUNCH = 1
3	PARAM = 1, PARAMF = .6, DPRAM1 = -.05, DPRAM = -.1, DPRMIN = -.05
4	SLOPE = 1.
5	VTEST = .001, VTEST1 = .03
6	M2E = 0

The input for the second case is

Input card	Description
1	STMACH = 8.0, GAMMA = 1.4, T = 0.6, THETAD = 10.0, ALPHAD = 0.
2	N = 9, M = 2, NREAD = 1, NSPACE = 1, INCRMT = 2, IPRINT = 2, NCNVRGB = 0, KTRANSF = 1, NPLOT = 0, NPUNCH = 0

Input card	Description
3	PARAM = 0., PARAMF = 4.0, DPRAM1 = 0.5, DPRAM = 2.0, DPRMIN = 0.5
4	SLOPE = 1.
5	VTEST = .001, VTEST1 = .03
6	M2E = 0
7	ETAS(I) values from first computation for T = 0.6

Input Cards for First Sample Case

```
  80000000+01    14000000+01    10000000+01    10000000+02    00000000+00
   9     2     0     1     1     2     0     1     0     1
  10000000+01    60000000+00   -50000000-01   -10000000+00   -50000000-01
1.
.001               .03
   0
```

Conical Flow About Elliptic Cones by the Method of Lines

With Incrementation of a Parameter

```
N= 9   M=2   NREAD=0   NSPACE=1   NP= 5   NCNVRG=0
NA= 1   ANA=   0.                  NB= 1   BNB=   0.

VTEST=   1.00000000E-03   VTEST1=   3.00000000E-02
SLOPE=   1.00000000E+00   KTRANSF= 1

M2E=      0
```

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(1)

```
STMACH=  8.0030C000E+00  GAMMA=  1.40000C00E+00  T=  1.0C0000C0E+00  THETAD=  1.00000000E+01  ALPHAD=  0.

EPSIGOM=  1.C00CCC0CE-C3
AAST=  4.23895624E-01

VTEST=  1.00000C00E-03  VTEST1=  3.00300000E-02

M2E=     0

SLOPE=  1.00C3000CE+CC  KTRANSF= 1

RANGLE=  0.

EPSIG=  1.00000C00E-C3  EPSIGMX=  1.03000000E-03  SPACER=  1.0C000000E-03  EPSIVAR=  1.00000000E-C8  EPSINT=  2.50000000E-02

NCYCLE= 1  AT   C8/04/71  14.22.56.
```

(2)

```
ETAS
 5.50956561E-02
ETASP
 0.
CP(I) AT SHOCK
 6.03073792E-02
CP(I) AT ZETA=0
 7.07611156E-02
V
 1.47011292E-02
KCOUNT=     1  VMAX=  1.47011292E-02  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.12222428E-01
```

(3)

```
DETA
 -2.97082982E-02
```

```
NCYCLE= 2  AT   C8/04/71  14.22.58.
```

(4)

```
ETAS
 5.21258263E-02
ETASP
 0.
CP(I) AT SHOCK
 5.81257080E-02
CP(I) AT ZETA=0
 6.84973446E-02
V
  9.49271631E-05
```

(5)

```
ZERO-INCIDENCE CIRCULAR CONE

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  1.00000000E+00  THETAD=  1.00000000E+01  ALPHAD=  0.

EPSIGOM=  1.C00CC000E-C3
N= '  M=0  NREAD=0  NSPACE=1  NP= 5  NCNVRG=0
VTEST=  1.00C0CC00E-C3  VTEST1=  3.00300000E-02

M2E=     0

SLOPE=  1.00C00CCCE+00  KTRANSF= 1
KCOUNT=     3  VMAX=  9.49271631E-05  EPSIG=  1.00C00000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.12522436E-01
```

(6)

```
                                        ZETA=  0.

            I=1        I=2        I=3        I=4        I=5        I=6        I=7        I=8        I=9        I=10

P           4.5404E-02
P/ROASTSQ   2.5269E-01
P/PTINF     4.1671E-C4
P/PINF      4.0682E+00
RHO         2.5686E+C0
U           2.3046E+00
V           9.4927E-C5
W           0.
UC          2.2696E+00
VC          4.0029E-C1
WC          6.8655E-16
VCC         4.0029E-01
WCC         0.
VX          0.
VY         -4.0029E-C1
VZ          2.2696E+00
PSINOR      0.
THETNOR     7.9998E+01
XBAR        0.
XBHLD            IIIII
YBAR       -1.0000E+00
YBHLD            IIIII
ETA         0.
G          -2.9139E-03
DEQNS       5.6061E+CC
AM          6.2101E+00
CROSSM      7.8230E-C3
SBAR        8.2482E-02
POROGAM     1.2120E-C2
PT/PTINF    8.1367E-C1
PT          9.8657E+C1
BERNOUL     2.C6C4E-1C
DVDZ       -1.4029E-C1
DPDZ       -7.7589E-C5
PP          0.
UP          0.
WP          0.
```

(7)

WINDWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3046E+00	2.5686E+00	8.2482E-02	1.2120E-02	2.2696E+00	4.0020E-01	6.8639E-16	0.	-4.0020E-01	2.2696E+00	8.1367E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3046E+00	2.5686E+CC	8.2482E-02	1.2120E-02	IIIII	IIIII	IIIII	IIIII	IIIII	IIIII	IIIII

(8)

```
STMACH=  8.0C00COCCE+00  GAMMA=  1.40000000E+00  T=  1.00000000E+00  THETAD=  1.00000000E+01  ALPHAD=  0.

EPSIGOM=  1.000C0000E-C3
AAST=  4.23895624E-01

VTEST=  1.00000CC0E-C3  VTESTI=  3.00000000E-02

M2E=     C

SLOPE=  1.00000C00E+00  KTRANSF= 1

RANGLE=  0.

INTCNT=  562

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00C00000E-03  EPSIVAR=  1.00000000E-C8  EPSINT=  2.50000000E-02

NCYCLE= 1  AT   C8/04/71  14.23.12.

ETAS
 5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02
 5.21258263E-02
ETASP
-1.70437284E-15 -1.78294202E-15 -5.61136102E-15 -3.14659334E-16 -3.14659334E-16 -3.14659334E-16 -3.14659334E-16 -3.14659334E-16
 3.15981575E-15
CP(I) AT SHOCK
 5.81257080E-02  5.81257080E-02  5.81257080E-02  5.81257C80E-02  5.81257080E-02  5.81257080E-02  5.81257080E-02  5.81257080E-02
 5.81257080E-02
CP(I) AT ZETA=0
 6.84873446E-02  6.84873446E-02  6.84873446E-02  6.84873446E-02  6.84873446E-02  6.84873446E-02  6.84873446E-02  6.84873446E-02
 6.84873446E-C2
V
  9.49271644E-05  9.49271634E-05  9.49271625E-05  9.49271625E-05  9.49271623E-05  9.49271621E-05  9.49271622E-05  9.49271613E-05
  9.49271602E-05
```

APPENDIX B

```
N= 9  M=2  NREAD=1  NSPACE=1  NP= 5  NCNVRG=0
NA= 1  ANA=  0.                  NB= 1  BNB=  0.

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  1.00000000E+00  THETAO=  1.00000000E+01  ALPHAO=  0.

RANGLE=  0.

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 1  VTEST=  1.00000000E-03  VMAX=  9.49271644E-05  AAST=  4.23895624E-01  PTINF=  1.08960426E+02

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=   0

SLOPE=  1.00000000E+00  KTRANSF= 1
KCOUNT=    4  VMAX=  9.49271644E-05  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.12522436E-01
```

(9)

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSIO	-9.0000E+01	-6.7500E+01	-4.5000E+01	-2.2500E+01	-1.3505E-08	2.2500E+01	4.5000E+01	6.7500E+01	9.0000E+01	
PSISD	-9.0000E+01	-6.7500E+01	-4.5000E+01	-2.2500E+01	-1.3505E-08	2.2500E+01	4.5000E+01	6.7500E+01	9.0000E+01	
XO	0.	6.7477E-02	1.2468E-01	1.6290E-01	1.7633E-01	1.6290E-01	1.2468E-01	6.7477E-02	7.9849E-11	
YO	-1.7633E-01	-1.6290E-01	-1.2468E-01	-6.7477E-02	-4.1561E-11	6.7477E-02	1.2468E-01	1.6290E-01	1.7633E-01	
XOBAR	0.	3.8268E-01	7.0711E-01	9.2388E-01	1.0000E+00	9.2388E-01	7.0711E-01	3.8268E-01	4.5285E-10	
YOBAR	-1.0000E+00	-9.2388E-01	-7.0711E-01	-3.8268E-01	-2.3571E-10	3.8268E-01	7.0711E-01	9.2388E-01	1.0000E+00	
XS	0.	8.8255E-02	1.6307E-01	2.1307E-01	2.3062E-01	2.1307E-01	1.6307E-01	8.8255E-02	1.0444E-10	
YS	-2.3062E-01	-2.1307E-01	-1.6307E-01	-8.8255E-02	-5.4359E-11	8.8255E-02	1.6307E-01	2.1307E-01	2.3062E-01	
XSBAR	0.	5.0052E-01	9.2484E-01	1.2084E+00	1.3079E+00	1.2084E+00	9.2484E-01	5.0052E-01	5.9229E-10	
YSBAR	-1.3079E+00	-1.2084E+00	-9.2484E-01	-5.0052E-01	-3.0828E-10	5.0052E-01	9.2484E-01	1.2084E+00	1.3079E+00	
ETAS	5.2126E-02	5.2126E-02	5.2126E-02	5.2126E-02	5.2126E-02	5.2126E-02	5.2126E-02	5.2126E-02	5.2126E-02	
BETAD	1.2987E+01	1.2987E+01	1.2987E+01	1.2987E+01	1.2987E+01	1.2987E+01	1.2987E+01	1.2987E+01	1.2987E+01	
XI	0.	6.8191E-02	1.3638E-01	2.0457E-01	2.7277E-01	3.4096E-01	4.0915E-01	4.7734E-01	5.4553E-01	
CPSHOCK	5.8126E-02	5.8126E-02	5.8126E-02	5.8126E-02	5.8126E-02	5.8126E-02	5.8126E-02	5.8126E-02	5.8126E-02	
CPBODY	6.8487E-02	6.8487E-02	6.8487E-02	6.8487E-02	6.8487E-02	6.8487E-02	6.8487E-02	6.8487E-02	6.8487E-02	

(10)

I	TAU	XI	XO	YO	ETAS	ETASP
1	0.	0.	0.	-1.76326981E-01	5.21258263E-02	-1.70437284E-15
2	6.81914799E-02	6.81914799E-02	6.74774142E-02	-1.62904889E-01	5.21258263E-02	-1.78294202E-15
3	1.36382960E-01	1.36382960E-01	1.24682004E-01	-1.24682004E-01	5.21258263E-02	-5.61136102E-15
4	2.04574440E-01	2.04574440E-01	1.62904889E-01	-6.74774142E-02	5.21258263E-02	-3.14659334E-16
5	2.72765920E-01	2.72765920E-01	1.76326981E-01	-4.15612935E-11	5.21258263E-02	-3.14659334E-16
6	3.40957400E-01	3.40957400E-01	1.62904889E-01	6.74774142E-02	5.21258263E-02	-3.14659334E-16
7	4.09148880E-01	4.09148880E-01	1.24682004E-01	1.24682004E-01	5.21258263E-02	-3.14659334E-16
8	4.77340359E-01	4.77340359E-01	6.74774143E-02	1.62904888E-01	5.21258263E-02	-3.14659334E-16
9	5.45531839E-01	5.45531839E-01	7.98491802E-11	1.76326981E-01	5.21258263E-02	3.15981575E-15

(11)

ZETA= 0.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.5404E-02	4.5404E-02	4.5404E-02	4.5404E-02	4.5404E-02	4.5404E-02	4.5404E-02	4.5404E-02	4.5404E-02	
P/RDASTSQ	2.5269E-01	2.5269E-01	2.5269E-01	2.5269E-01	2.5269E-01	2.5269E-01	2.5269E-01	2.5269E-01	2.5269E-01	
P/PTINF	4.1671E-04	4.1671E-04	4.1671E-04	4.1671E-04	4.1671E-04	4.1671E-04	4.1671E-04	4.1671E-04	4.1671E-04	
P/PINF	4.0682E+00	4.0682E+00	4.0682E+00	4.0682E+00	4.0682E+00	4.0682E+00	4.0682E+00	4.0682E+00	4.0682E+00	
RHO	2.5686E+00	2.5686E+00	2.5686E+00	2.5686E+00	2.5686E+00	2.5686E+00	2.5686E+00	2.5686E+00	2.5686E+00	
U	2.3046E+00	2.3046E+00	2.3046E+00	2.3046E+00	2.3046E+00	2.3046E+00	2.3046E+00	2.3046E+00	2.3046E+00	
V	9.4927E-05	9.4927E-05	9.4927E-05	9.4927E-05	9.4927E-05	9.4927E-05	9.4927E-05	9.4927E-05	9.4927E-05	
W	-1.0080E-13	4.1380E-12	3.4736E-12	3.6249E-12	3.7356E-12	3.7457E-12	-2.8160E-08	2.2532E-07	1.5570E-13	
UC	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	
VC	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	
WC	-1.0011E-13	4.1370E-12	3.4736E-12	3.6244E-12	3.7356E-12	3.7462E-12	-2.8160E-08	2.2532E-07	1.5621E-13	
VCC	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	4.0029E-01	
WCC	-1.0080E-13	4.1380E-12	3.4737E-12	3.6255E-12	3.7356E-12	3.7463E-12	-2.8160E-08	2.2532E-07	1.5570E-13	
VX	-1.0080E-13	1.5318E-01	2.8305E-01	3.6982E-01	4.0029E-01	3.6982E-01	2.8305E-01	1.5318E-01	1.8111E-10	
VY	-4.0029E-01	-3.6982E-01	-2.8305E-01	-1.5318E-01	-9.0615E-11	1.5318E-01	2.8305E-01	3.6982E-01	4.0029E-01	
VZ	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	2.2696E+00	
PSINOR	-2.5446E-12	3.8612E+00	7.1088E+00	9.2547E+00	1.0002E+01	9.2547E+00	7.1088E+00	3.8612E+00	4.5722E-09	
THETNOR	7.9998E+01	8.0766E+01	8.2945E+01	8.6189E+01	9.0000E+01	8.6189E+01	8.2945E+01	8.0766E+01	7.9998E+01	
XBAR	0.	3.8268E-01	7.0711E-01	9.2388E-01	1.0000E+00	9.2388E-01	7.0711E-01	3.8268E-01	4.5285E-10	
XBHLD	0.	4.5285E-10	4.5285E-10	4.5285E-10	4.5285E-10	4.5285E-10	4.5285E-10	4.5285E-10	4.5285E-10	
YBAR	-1.0000E+00	-9.2388E-01	-7.0711E-01	-3.8268E-01	-2.3571E-10	3.8268E-01	7.0711E-01	9.2388E-01	1.0000E+00	
YBHLD	-1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	
ETA	0.	0.	0.	0.	0.	0.	0.	0.	0.	
G	-2.9139E-03	-2.9139E-03	-2.9139E-03	-2.9139E-03	-2.9139E-03	-2.9139E-03	-2.9139E-03	-2.9139E-03	-2.9139E-03	
DEQNS	5.6061E+00	5.6061E+00	5.6061E+00	5.6061E+00	5.6061E+00	5.6061E+00	5.6061E+00	5.6061E+00	5.6061E+00	
AM	6.2101E+00	6.2101E+00	6.2101E+00	6.2101E+00	6.2101E+00	6.2101E+00	6.2101E+00	6.2101E+00	6.2101E+00	
CROSSM	2.7161E-13	1.1150E-11	9.3601E-12	9.7677E-12	1.0066E-11	1.0093E-11	7.5881E-08	6.0714E-07	4.1956E-13	
SBAR	8.2482E-02	8.2482E-02	8.2482E-02	8.2482E-02	8.2482E-02	8.2482E-02	8.2482E-02	8.2482E-02	8.2482E-02	
POROGAM	1.2120E-02	1.2120E-02	1.2120E-02	1.2120E-02	1.2120E-02	1.2120E-02	1.2120E-02	1.2120E-02	1.2120E-02	
PT/PTINF	8.1367E-01	8.1367E-01	8.1367E-01	8.1367E-01	8.1367E-01	8.1367E-01	8.1367E-01	8.1367E-01	8.1367E-01	
PT	8.8657E+01	8.8657E+01	8.8657E+01	8.8657E+01	8.8657E+01	8.8657E+01	8.8657E+01	8.8657E+01	8.8657E+01	
BERNOUL	-1.5018E-09	-1.5018E-09	-1.5018E-09	-1.5018E-09	-1.5018E-09	-1.5018E-09	-1.5018E-09	-1.5018E-09	-1.5018E-09	
DVDZ	-2.4026E-01	-2.4026E-01	-2.4026E-01	-2.4026E-01	-2.4026E-01	-2.4026E-01	-2.4026E-01	-2.4026E-01	-2.4026E-01	
DPDZ	1.3863E-27	2.3363E-24	1.6463E-24	1.7928E-24	1.9041E-24	1.9144E-24	1.0820E-16	6.9269E-15	3.3078E-27	
PP	-1.3224E-15	-4.6368E-12	-3.9636E-12	-3.8338E-12	-3.8923E-12	-3.8407E-12	-3.9386E-12	-4.7721E-12	5.7555E-15	
UP	-1.0080E-13	4.1380E-12	3.4736E-12	3.6249E-12	3.7356E-12	3.7457E-12	-2.8160E-08	2.2532E-07	1.5570E-13	
WP	7.3525E-11	2.5750E-11	-1.1457E-11	2.3367E-13	4.3119E-14	-6.2658E-13	1.2671E-11	-2.5400E-11	-7.6030E-11	

(12)

WINDWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3046E+00	2.5686E+00	8.2482E-02	1.2120E-02	2.2696E+00	4.0020E-01	5.8639E-16	0.	-4.0020E-01	2.2696E+00	8.1367E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3046E+00	2.5686E+00	8.2482E-02	1.2120E-02	2.2696E+00	4.0020E-01	5.1328E-16	1.81235-10	4.0020E-01	2.2696E+00	8.1367E-01

(13)

FORCE COEFFICIENTS

```
CZ=  6.84873446E-02  CY=  6.26860872E-11  CD=  6.84873446E-02  CL=  6.26860872E-11
YBAR= -2.05052079E-1?  ZBAR=  6.66666667E-01  CM= -4.31950720E-1?
```

(14)

```
STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  9.50000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

EPSIGCM=  1.00000000E-03
AAST=  4.23895624E-01

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=    0

SLOPE=  1.00000000E+00  KTRANSF= 1

RANGLE=  0.

INTCNT=  555

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02
```

```
NCYCLE= 1  AT   08/04/71  14.24.02.
```

(15)

```
ETAS
 5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02  5.21258263E-02
 5.21258263E-02
ETASP
 2.85368924E-16  2.86575581E-15 -1.16880593E-14 -2.40433891E-15  2.20983018E-15 -6.65434544E-15  4.67522372E-15 -2.60524180E-15
-1.36253089E-14
CP(I) AT SHOCK
 5.19854497E-02  5.27780493E-02  5.48302035E-02  5.71069656E-02  5.81257079E-02  5.71069656E-02  5.48302035E-02  5.27780493E-02
 5.19854497E-02
CP(I) AT ZETA=0
 6.13742661E-02  6.22910070E-02  6.47580514E-02  6.76538881E-02  6.90026268E-02  6.76538881E-02  6.47580514E-02  6.22910070E-02
 6.13742660E-02
V
-1.29580395E-02 -1.01038641E-02 -2.26212560E-03  7.00722059E-03  1.12901814E-02  7.00722060E-03 -2.26212559E-03 -1.01038641E-02
-1.29580395E-02
KCOUNT=    5  VMAX=  1.29580396E-02  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.12522436E-01
DETERM=  3.07170127E-01
```

(16)

```
DETA
  1.89315963E-03  1.41672756E-03  2.60993148E-04 -9.01379894E-04 -1.38493720E-03 -9.01380635E-04  2.60994501E-04  1.41672706E-03
  1.89315963E-03
```

```
NCYCLE= 2  AT   08/04/71  14.28.33.
```

(17)

```
ETAS
 5.40189859E-02  5.35425539E-02  5.23868194E-02  5.12244464E-02  5.07408891E-02  5.12244457E-02  5.23868208E-02  5.35425534E-02
 5.40189859E-02
ETASP
 5.70737848E-16 -1.34483821E-02 -1.91180715E-02 -1.35862656E-02 -9.12009542E-09  1.35862847E-02  1.91180739E-02  1.34483682E-02
-1.72370963E-14
CP(I) AT SHOCK
 5.33239299E-02  5.38191407E-02  5.50920708E-02  5.64933699E-02  5.71176935E-02  5.64933694E-02  5.50920718E-02  5.38191403E-02
 5.33239299E-02
CP(I) AT ZETA=0
 6.31159473E-02  6.36912425E-02  6.52111283E-02  6.69549602E-02  6.77559429E-02  6.69549596E-02  6.52111296E-02  6.36912421E-02
 6.31159470E-02
V
  2.37640844E-04 -2.58904529E-05 -3.03235054E-04 -7.95653304E-05  1.54874302E-04 -7.95735848E-05 -3.03222178E-04 -2.58922999E-05
  2.37634468E-04
```

(18)

```
N= 9  M=2  NREAD=1  NSPACE=1  NP= 5  MCNVRG=1
NA= 1  ANA=  0.                  NB= 1  BNB=  0.

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  9.50000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

RANGLE=  0.

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE=  2  VTEST=  1.C00000C0E-03  VMAX=  3.03235054E-04  AAST=  4.23895624E-01  PTINF=  1.08960426E+02

VTEST=  1.00000CC0E-C3  VTEST1=  3.00000000E-02

M2E=    0

SLOPE=  1.00000000E+00  KTRANSF= 1
KCOUNT=   15  VMAX=  3.03235054E-04  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.12670063E-01
```

(19)

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSID	-9.0000E+01	-6.6984E+01	-4.4286E+01	-2.2006E+01	-7.3995E-09	2.2006E+01	4.4286E+01	6.6984E+01	9.0000E+01	
PSISD	-9.0000E+01	-6.7475E+01	-4.4972E+01	-2.2486E+C1	-7.5782E-09	2.2486E+01	4.4972E+01	6.7475E+01	9.0000E+01	
XD	0.	6.5989E-02	1.2303E-01	1.6225E-01	1.7633E-01	1.6225E-01	1.2303E-01	6.5989E-02	4.1534E-11	
YD	-1.6751E-C1	-1.5534E-01	-1.2000E-01	-6.5576E-02	-2.2772E-11	6.5576E-02	1.2000E-01	1.5534E-01	1.6751E-01	
XDBAR	0.	3.7424E-01	6.9773E-01	9.2019E-C1	1.0000E+00	9.2019E-01	6.9773E-C1	3.7424E-01	2.3555E-10	
YDBAR	-9.5000E-01	-8.8096E-01	-6.8055E-01	-3.7190E-01	-1.2915E-10	3.7190E-01	6.8055E-01	8.8096E-01	9.5000E-C1	
XS	0.	8.5952E-02	1.6008E-01	2.1094E-C1	2.2916E-C1	2.1094E-01	1.60C8E-01	8.5952E-02	5.4124E-11	
YS	-2.2361E-01	-2.0725E-01	-1.5993E-01	-8.7314E-02	-3.0310E-11	8.7314E-02	1.5993E-01	2.0725E-01	2.2361E-01	
XSBAR	0.	4.8746E-01	9.0787E-01	1.1963E+00	1.2997E+00	1.1963E+00	9.0787E-01	4.8746E-01	3.0695E-10	
YSBAR	-1.2681E+00	-1.1754E+00	-9.0699E-01	-4.9518E-C1	-1.7190E-10	4.9518E-01	9.0699E-01	1.1754E+00	1.2681E+00	
ETAS	5.4C19E-02	5.3543E-02	5.2387E-02	5.1224E-02	5.0741E-02	5.1224E-02	5.2387E-02	5.3543E-02	5.4019E-02	
BETAD	1.2604E+01	1.2644E+01	1.2746E+01	1.2858E+C1	1.2907E+01	1.2858E+01	1.2746E+01	1.2644E+01	1.2604E+01	
XI	0.	6.6546E-02	1.3309E-01	1.9964E-01	2.6618E-01	3.3273E-01	3.9928E-01	4.6582E-01	5.3237E-01	
CPSHOCK	5.3324E-02	5.3819E-02	5.5092E-02	5.6493E-02	5.7118E-02	5.6493E-02	5.5092E-02	5.3819E-02	5.3324E-02	
CPBODY	6.3116E-C2	6.3691E-02	6.5211E-02	6.6955E-02	6.7756E-02	6.6955E-02	6.5211E-02	6.3691E-02	6.3116E-02	

(20)

I	TAU	XI	XO	YO	ETAS	ETASP
1	0.	0.	0.	-1.67510632E-01	5.40189859E-02	5.7C737848E-16
2	6.65459501E-02	6.65459501E-02	6.59891976E-02	-1.55337724E-01	5.35425539E-02	-1.34483821E-02
3	1.33091900E-01	1.33091900E-01	1.23028049E-01	-1.19958589E-01	5.23868194E-02	-1.91180715E-02
4	1.99637850E-01	1.99637850E-01	1.62254180E-01	-6.55760522E-02	5.12244464E-02	-1.35862696E-C2
5	2.66183801E-01	2.66183801E-01	1.76326981E-01	-2.27718478E-11	5.07408891E-02	-9.12009542E-C9
6	3.32729751E-C1	3.32729751E-01	1.62254180E-01	6.55760521E-02	5.12244457E-02	1.35862847E-02
7	3.99275701E-01	3.99275701E-01	1.23028049E-01	1.19958589E-01	5.23868208E-02	1.91180739E-02
8	4.65821651E-C1	4.65821651E-01	6.59891977E-02	1.55337724E-01	5.35425534E-02	1.34483682E-C2
9	5.32367601E-01	5.32367601E-01	4.15336541E-11	1.67510632E-01	5.40189859E-02	-1.72370963E-14

(21)

ZETA= 0.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.2719E-02	4.3006E-02	4.3766E-02	4.4638E-C2	4.5039E-02	4.4638E-02	4.3766E-02	4.3006E-02	4.2719E-02	
P/ROASTSQ	2.3774E-C1	2.3934E-01	2.4357E-01	2.4842E-01	2.5065E-01	2.4842E-01	2.4357E-01	2.3934E-01	2.3774E-01	
P/PTINF	3.9206E-C4	3.9470E-04	4.0167E-04	4.0967E-04	4.1335E-04	4.0967E-04	4.0167E-04	3.9470E-04	3.9206E-04	
P/PINF	3.8276E+00	3.8534E+00	3.9215E+00	3.9996E+00	4.0355E+00	3.9996E+00	3.9215E+00	3.8534E+00	3.8276E+00	
RHO	2.4633E+C0	2.4751E+00	2.5063E+00	2.5418E+00	2.5581E+00	2.5418E+00	2.5063E+00	2.4751E+00	2.4633E+00	
U	2.3C75E+C0	2.3072E+00	2.3064E+00	2.3056E+00	2.3052E+00	2.3056E+00	2.3064E+0C	2.3072E+00	2.3075E+00	
V	2.3764E-04	-2.5890E-05	-3.0324E-04	-7.9565E-05	1.5487E-04	-7.9574E-05	-3.0322E-04	-2.5892E-05	2.3763E-C4	
W	9.1318E-14	-8.5833E-03	-1.2983E-C2	-9.8120E-03	4.3999E-C9	9.8120E-03	1.2983E-C2	8.5836E-03	-6.3422E-13	
UC	2.2757E+C0	2.2751E+00	2.2733E+00	2.2712E+00	2.2702E+C0	2.2712E+00	2.2733E+00	2.2751E+00	2.2757E+00	
VC	3.8145E-01	3.8370E-01	3.8986E-01	3.9711E-C1	4.0045E-01	3.9711E-01	3.8986E-01	3.8370E-01	3.8145E-C1	
WC	9.1972E-14	5.0840E-03	7.0309E-03	4.8723E-C3	4.4055E-C9	-4.8723E-03	-7.0309E-03	-5.0838E-03	-9.8508E-12	
VCC	3.8145E-01	3.8364E-01	3.8971E-C1	3.9702E-01	4.0045E-01	3.9702E-01	3.8971E-01	3.8364E-01	3.8145E-01	
WCC	9.1318E-14	-8.5771E-03	-1.2951E-02	-9.8026E-03	4.3999E-09	9.8026E-03	1.2951E-02	8.5774E-03	-6.2856E-13	
VX	9.1318E-14	1.4210E-01	2.6993E-01	3.6442E-01	4.0045E-01	3.6442E-01	2.6993E-01	1.4210E-01	9.5207E-11	
VY	-3.8145E-01	-3.5645E-01	-2.8138E-01	-1.5786E-01	4.3482E-C9	1.5786E-01	2.8138E-01	3.5645E-01	3.8145E-01	
VZ	2.2757E+CC	2.2751E+00	2.2733E+00	2.2712E+C0	2.2702E+00	2.2712E+00	2.2733E+0C	2.2751E+00	2.2757E+00	
PSINOR	2.2991E-12	3.5742E+00	6.7718E+00	9.1157E+00	1.0004E+C1	9.1157E+00	6.7718E+00	3.5742E+00	2.3970E-C9	
THETNOR	8.0485E+01	8.1112E+01	8.2993E+01	8.6074E+C1	9.0000E+01	8.6074E+01	8.2993E+01	8.1112E+01	8.0485E+01	
XBAR	0.	3.7424E-01	6.9773E-01	9.2019E-01	1.0000E+00	9.2019E-01	6.9773E-01	3.7424E-01	2.3555E-10	
XBHLD	0.	2.3555E-10	2.3555E-10	2.3555E-10	2.3555E-10	2.3555E-10	2.3555E-1C	2.3555E-10	2.3555E-10	
YBAR	-9.5C00E-01	-8.8096E-01	-6.8055E-01	-3.7190E-01	-1.2915E-10	3.7190E-01	6.8055E-01	8.8096E-01	9.5000E-01	
YBHLD	-9.5000E-01	9.5000E-01	9.5000E-01	9.5000E-C1	9.5C00E-C1	9.5000E-01	9.5000E-01	9.50C0E-01	9.5000E-01	
ETA	0.	C.	0.	0.	0.	0.	0.	C.	0.	
G	-2.7872E-03	-3.0474E-03	-3.3247E-03	-3.1096E-03	-2.8806E-03	-3.1096E-03	-3.3247E-03	-3.0474E-03	-2.7872E-03	
DEQNS	5.6055E+00	5.6059E+00	5.6071E+00	5.6086E+C0	5.6093E+00	5.6086E+00	5.6071E+00	5.6059E+00	5.6055E+00	
AM	6.2774E+00	6.2706E+00	6.2529E+00	6.2331E+00	6.2241E+00	6.2331E+00	6.2529E+00	6.2706E+00	6.2774E+C0	
CROSSM	2.4843E-13	2.3328E-02	3.5198E-02	2.6526E-C2	1.1880E-08	2.6526E-02	3.5197E-02	2.3329E-02	1.7254E-12	
SBAR	8.0142E-02	8.0142E-02	8.0142E-02	8.0142E-02	8.0142E-02	8.0142E-02	8.C142E-02	8.0142E-02	8.0142E-C2	
POROGAM	1.2092E-C2	1.2092E-02	1.2092E-02	1.2092E-C2	1.2092E-C2	1.2092E-02	1.2092E-02	1.2092E-02	1.2092E-02	
PT/PTINF	8.1844E-01	8.1844E-01	8.1844E-01	8.1844E-01	8.1844E-01	8.1844E-01	8.1844E-01	8.1844E-01	8.1844E-01	
PT	8.9178E+01	8.9178E+01	8.9178E+C1	8.9178E+01	8.9178E+C1	8.9178E+01	8.9178E+01	8.9178E+01	8.9178E+01	
BERNOUL	-9.4122E-09	-1.1126E-10	-1.5326E-08	-1.0554E-09	-3.9977E-C9	-1.0557E-09	-1.5200E-C8	-7.7266E-10	-9.4117E-09	
DVDZ	-2.4158E-C1	-2.4115E-01	-2.4094E-01	-2.4172E-01	-2.4227E-01	-2.4172E-01	-2.4094E-01	-2.4115E-01	-2.4158E-C1	
DPDZ	1.0742E-27	9.6496E-06	2.3049E-C5	1.3811E-C5	2.8374E-18	1.3811E-05	2.3049E-05	9.6501E-06	5.1816E-26	
PP	2.8537E-16	8.4523E-03	1.3443E-C2	1.07C4E-02	-4.2424E-09	-1.0704E-02	-1.3443E-02	-8.4523E-03	-1.2168E-14	
UP	9.1318E-14	-8.5833E-03	-1.2983E-C2	-9.8120E-C3	4.3999E-C9	9.8120E-03	1.2983E-02	8.5836E-03	-6.3422E-13	
WP	-1.4283E-01	-1.0927E-01	-1.0661E-02	1.0927E-01	1.6415E-01	1.0927E-01	-1.0661E-02	-1.0927E-01	-1.4283E-01	

(22)

WINDWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3084E+00	2.4786E+00	7.1462E-C2	1.1987E-02	2.2767E+0C	3.8136E-01	6.5409E-15	0.	-3.8136E-01	2.2767E+00	8.3639E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3084E+00	2.4786E+00	7.1462E-02	1.1987E-02	2.2767E+00	3.8136E-01	-9.2202E-12	9.4558E-11	3.8136E-01	2.2767E+00	8.3639E-01

(23)

FORCE COEFFICIENTS

```
CZ=  6.53537194E-02  CY=  3.03431525E-10  CD=  6.53537194E-02  CL=  3.03431525E-10
YBAR= -8.83952681E-11  ZBAR=  6.66666567E-01  CM= -2.08C64643E-10
```

APPENDIX B

```
STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  9.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

EPSIGOM=  1.00000000E-03
AAST=  4.23895624E-01

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=    0

SLOPE=  1.00000000E+00  KTRANSF= 1

RANGLE=  0.

INTCNT=  543

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 1  AT   08/04/71  14.29.23.

ETAS
 5.59121456E-02  5.49592814E-02  5.26478126E-02  5.03230665E-02  4.93559519E-02  5.03230650E-02  5.26478153E-02  5.49592804E-02
 5.59121456E-02
ETASP
-7.94559377E-15 -2.75714772E-02 -3.91953075E-02 -2.78541699E-02 -1.86977596E-08  2.78542009E-02  3.91953124E-02  2.75714487E-02
-3.01191438E-15
CP(I) AT SHOCK
 4.86393337E-02  4.95003356E-02  5.18482708E-02  5.47163004E-02  5.61154345E-02  5.47162995E-02  5.18482727E-02  4.95003348E-02
 4.86393337E-02
CP(I) AT ZETA=0
 5.78802328E-02  5.88228886E-02  6.15368096E-02  6.51675153E-02  6.70626822E-02  6.51675142E-02  6.15368124E-02  5.88228875E-02
 5.78802322E-02
V
 -5.63894722E-05 -1.10763317E-03 -1.89480205E-03 -2.85522826E-04  1.04842179E-03 -2.85538879E-04 -1.89477585E-03 -1.10763680E-03
 -5.64026023E-05
KCOUNT=   16  VMAX=  1.89480205E-03  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.12822761E-01
DETERM=  2.80852110E-01
DETA
  1.34347153E-04  1.96503280E-04  2.25596807E-04  7.34915189E-05 -3.26704956E-05  7.34936784E-05  2.25593524E-04  1.96503899E-04
  1.34346843E-04

NCYCLE= 2  AT   08/04/71  14.34.45.

ETAS
 5.50464927E-02  5.51557847E-02  5.28734094E-02  5.03965580E-02  4.93232814E-02  5.03965587E-02  5.28734088E-02  5.51557843E-02
 5.50464924E-02
ETASP
-7.96468565E-15 -2.64764857E-02 -4.02441731E-02 -3.03485275E-02  7.69344303E-09  3.03485213E-02  4.02441625E-02  2.64764898E-02
-3.41545646E-15
CP(I) AT SHOCK
 4.87320085E-02  4.96324350E-02  5.20128217E-02  5.47801497E-02  5.60918609E-02  5.47801501E-02  5.20128212E-02  4.96324348E-02
 4.87320083E-02
CP(I) AT ZETA=0
 5.79520091E-02  5.89605591E-02  6.17582348E-02  6.52534220E-02  6.69983733E-02  6.52534226E-02  6.17582341E-02  5.89605588E-02
 5.79520090E-02
V
 -1.93618346E-06  1.13209254E-06  2.74780192E-06 -5.90074459E-06  1.99749039E-07 -5.89223510E-06  2.74207456E-06  1.12796235E-06
 -1.93494933E-06
```

APPENDIX B

```
N= 9  M=2  NREAD=1  NSPACE=1  NP= 5  NCNVRG=2
NA= 1  ANA=  0.              NB= 1  BNB=  0.

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  9.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

RANGLE=  0.

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 2  VTEST=  1.00000000E-03  VMAX=  5.90074459E-06  AAST=  4.23895624E-01  PTINF=  1.08960426E+02

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

MZE=    0

SLOPE=  1.00000000E+00  KTRANSF= 1
KCOUNT=   26  VMAX=  5.90074459E-06  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.12826425E-01
```

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSID	-9.0000E+01	-6.6411E+01	-4.3527E+01	-2.1507E+01	-2.2776E-09	2.1507E+01	4.3527E+01	6.6411E+01	9.0000E+01	
PSISD	-9.0000E+01	-6.7460E+01	-4.4972E+01	-2.2505E+01	-2.3945E-09	2.2505E+01	4.4972E+01	6.7460E+01	9.0000E+01	
XO	0.	6.4494E-02	1.2128E-01	1.6152E-01	1.7633E-01	1.6152E-01	1.2128E-01	6.4494E-02	9.3519E-12	
YO	-1.5869E-01	-1.4770E-01	-1.1520E-01	-6.3648E-02	-7.0094E-12	6.3648E-02	1.1520E-01	1.4770E-01	1.5869E-01	
XOBAR	0.	3.6576E-01	6.8780E-01	9.1605E-01	1.0000E+00	9.1605E-01	6.8780E-01	3.6576E-01	5.3037E-11	
YOBAR	-9.0000E-01	-8.3764E-01	-6.5331E-01	-3.6097E-01	-3.9752E-11	3.6097E-01	6.5331E-01	8.3764E-01	9.0000E-01	
XS	0.	8.3648E-02	1.5700E-01	2.0871E-01	2.2767E-01	2.0871E-01	1.5700E-01	8.3648E-02	1.2138E-11	
YS	-2.1673E-01	-2.0154E-01	-1.5685E-01	-8.6471E-02	-9.5148E-12	8.6471E-02	1.5685E-01	2.0154E-01	2.1673E-01	
XSBAR	0.	4.7439E-01	8.9041E-01	1.1836E+00	1.2912E+00	1.1836E+00	8.9041E-01	4.7439E-01	6.8838E-11	
YSBAR	-1.2291E+00	-1.1430E+00	-8.8956E-01	-4.9040E-01	-5.3961E-11	4.9040E-01	8.8956E-01	1.1430E+00	1.2291E+00	
ETAS	5.6046E-02	5.5156E-02	5.2873E-02	5.0397E-02	4.9323E-02	5.0397E-02	5.2873E-02	5.5156E-02	5.6046E-02	
BETAD	1.2229E+01	1.2303E+01	1.2498E+01	1.2721E+01	1.2826E+01	1.2721E+01	1.2498E+01	1.2303E+01	1.2229E+01	
XI	0.	6.4917E-02	1.2983E-01	1.9475E-01	2.5967E-01	3.2459E-01	3.8950E-01	4.5442E-01	5.1934E-01	
CPSHOCK	4.8732E-02	4.9632E-02	5.2013E-02	5.4780E-02	5.6092E-02	5.4780E-02	5.2013E-02	4.9632E-02	4.8732E-02	
CPBODY	5.7952E-02	5.8961E-02	6.1758E-02	6.5253E-02	6.6998E-02	6.5253E-02	6.1758E-02	5.8961E-02	5.7952E-02	

I	TAU	XI	XO	YO	ETAS	ETASP
1	0.	0.	0.	-1.58694283E-01	5.60464927E-02	-7.96468565E-15
2	6.49174769E-02	6.49174769E-02	6.44938945E-02	-1.47698039E-01	5.51557847E-02	-2.64764857E-02
3	1.29834954E-01	1.29834954E-01	1.21276822E-01	-1.15196964E-01	5.28734094E-02	-4.02441731E-02
4	1.94752431E-01	1.94752431E-01	1.61523466E-01	-6.36483536E-02	5.03965580E-02	-3.03485275E-02
5	2.59669907E-01	2.59669907E-01	1.76326981E-01	-7.00940347E-12	4.93232814E-02	7.69344303E-09
6	3.24587384E-01	3.24587384E-01	1.61523466E-01	6.36483535E-02	5.03965587E-02	3.03485213E-02
7	3.89504861E-01	3.89504861E-01	1.21276822E-01	1.15196964E-01	5.28734088E-02	4.02441625E-02
8	4.54422338E-01	4.54422338E-01	6.44938945E-02	1.47698039E-01	5.51557843E-02	2.64764898E-02
9	5.19339815E-01	5.19339815E-01	9.35185349E-12	1.58694283E-01	5.60464924E-02	-3.41545646E-15

ZETA= 0.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.0137E-02	4.0641E-02	4.2040E-02	4.3787E-02	4.4660E-02	4.3787E-02	4.2040E-02	4.0641E-02	4.0137E-02	
P/RDASTSQ	2.2337E-01	2.2618E-01	2.3396E-01	2.4369E-01	2.4854E-01	2.4369E-01	2.3396E-01	2.2618E-01	2.2337E-01	
P/PTINF	3.6836E-04	3.7299E-04	3.8583E-04	4.0187E-04	4.0987E-04	4.0187E-04	3.8583E-04	3.7299E-04	3.6836E-04	
P/PINF	3.5963E+00	3.6414E+00	3.7668E+00	3.9234E+00	4.0015E+00	3.9234E+00	3.7668E+00	3.6414E+00	3.5963E+00	
RHO	2.3600E+00	2.3811E+00	2.4394E+00	2.5114E+00	2.5470E+00	2.5114E+00	2.4394E+00	2.3811E+00	2.3600E+00	
U	2.3103E+00	2.3097E+00	2.3082E+00	2.3066E+00	2.3058E+00	2.3066E+00	2.3082E+00	2.3097E+00	2.3103E+00	
V	-1.9362E-06	1.1321E-06	2.7478E-06	-5.9007E-06	1.9975E-07	-5.8922E-06	2.7421E-06	1.1280E-06	-1.9349E-06	
W	-2.2907E-13	-1.7165E-02	-2.6421E-02	-2.0466E-02	-3.9948E-09	2.0466E-02	2.6421E-02	1.7165E-02	-1.2989E-13	
UC	2.2817E+00	2.2805E+00	2.2771E+00	2.2729E+00	2.2708E+00	2.2729E+00	2.2771E+00	2.2805E+00	2.2817E+00	
VC	3.6210E-01	3.6659E-01	3.7878E-01	3.9341E-01	4.0041E-01	3.9341E-01	3.7878E-01	3.6659E-01	3.6210E-01	
WC	-2.2845E-13	9.1795E-03	1.3499E-02	1.0047E-02	-3.9910E-09	-1.0047E-02	-1.3499E-02	-9.1793E-03	-4.1845E-12	
VCC	3.6210E-01	3.6631E-01	3.7811E-01	3.9301E-01	4.0041E-01	3.9301E-01	3.7811E-01	3.6631E-01	3.6210E-01	
WCC	-2.2907E-13	-1.7122E-02	-2.6280E-02	-2.0406E-02	-3.9948E-09	2.0406E-02	2.6280E-02	1.7122E-02	-1.2992E-13	
VX	-2.2907E-13	1.3089E-01	2.5605E-01	3.5816E-01	4.0041E-01	3.5816E-01	2.5605E-01	1.3089E-01	2.1468E-11	
VY	-3.6210E-01	-3.4255E-01	-2.7946E-01	-1.6307E-01	-4.0107E-09	1.6307E-01	2.7946E-01	3.4255E-01	3.6210E-01	
VZ	2.2817E+00	2.2805E+00	2.2771E+00	2.2729E+00	2.2708E+00	2.2729E+00	2.2771E+00	2.2805E+00	2.2817E+00	
PSINOR	-5.7521E-12	3.2850E+00	6.4158E+00	8.9551E+00	1.0000E+01	8.9551E+00	6.4158E+00	3.2850E+00	5.3908E-10	
THETNOR	8.0983E+01	8.1471E+01	8.3047E+01	8.5946E+01	9.0000E+01	8.5946E+01	8.3047E+01	8.1471E+01	8.0983E+01	
XBAR	0.	3.6576E-01	6.8780E-01	9.1605E-01	1.0000E+00	9.1605E-01	6.8780E-01	3.6576E-01	5.3037E-11	
XBHLD	0.	5.3037E-11	5.3037E-11	5.3037E-11	5.3037E-11	5.3037E-11	5.3037E-11	5.3037E-11	5.3037E-11	
YBAR	-9.0000E-01	-8.3764E-01	-6.5331E-01	-3.6097E-01	-3.9752E-11	3.6097E-01	6.5331E-01	8.3764E-01	9.0000E-01	
YBHLD	-9.0000E-01	9.0000E-01	9.0000E-01	9.0000E-01	9.0000E-01	9.0000E-01	9.0000E-01	9.0000E-01	9.0000E-01	
ETA	0.	0.	0.	0.	0.	0.	0.	0.	0.	
G	-3.0377E-03	-3.0357E-03	-3.0438E-03	-3.0658E-03	-3.0652E-03	-3.0658E-03	-3.0438E-03	-3.0357E-03	-3.0377E-03	
DEQNS	5.6047E+00	5.6056E+00	5.6082E+00	5.6114E+00	5.6130E+00	5.6114E+00	5.6082E+00	5.6056E+00	5.6047E+00	
AM	6.3467E+00	6.3340E+00	6.2996E+00	6.2584E+00	6.2386E+00	6.2584E+00	6.2996E+00	6.3340E+00	6.3467E+00	
CROSSM	6.2928E-13	4.7070E-02	7.2103E-02	5.5528E-02	1.0808E-08	5.5528E-02	7.2103E-02	4.7070E-02	3.5684E-13	
SBAR	7.7775E-02	7.7775E-02	7.7775E-02	7.7775E-02	7.7775E-02	7.7775E-02	7.7775E-02	7.7775E-02	7.7775E-02	
PORDGAM	1.2063E-02	1.2063E-02	1.2063E-02	1.2063E-02	1.2063E-02	1.2063E-02	1.2063E-02	1.2063E-02	1.2063E-02	
PT/PTINF	8.2330E-01	8.2330E-01	8.2330E-01	8.2330E-01	8.2330E-01	8.2330E-01	8.2330E-01	8.2330E-01	8.2330E-01	
PT	8.9707E+01	8.9707E+01	8.9707E+01	8.9707E+01	8.9707E+01	8.9707E+01	8.9707E+01	8.9707E+01	8.9707E+01	
BERNOUL	-6.1107E-13	5.6779E-11	-8.8463E-11	-5.6922E-11	1.4211E-14	-5.6708E-11	1.7279E-10	-1.3009E-09	-6.0396E-13	
DVDZ	-2.4254E-01	-2.4204E-01	-2.4204E-01	-2.4351E-01	-2.4457E-01	-2.4351E-01	-2.4204E-01	-2.4204E-01	-2.4254E-01	
DPDZ	6.3655E-27	3.6893E-05	9.5149E-05	6.3107E-05	2.5222E-18	6.3107E-05	9.5148E-05	3.6894E-05	2.0468E-27	
PP	-6.2208E-15	1.5493E-02	2.6504E-02	2.2882E-02	3.8415E-09	-2.2882E-02	-2.6504E-02	-1.5493E-02	-4.4792E-16	
UP	-2.2907E-13	-1.7165E-02	-2.6421E-02	-2.0466E-02	-3.9948E-09	2.0466E-02	2.6421E-02	1.7165E-02	-1.2989E-13	
WP	-2.9307E-01	-2.2657E-01	-2.6829E-02	2.2657E-01	3.4673E-01	2.2657E-01	-2.6829E-02	-2.2657E-01	-2.9307E-01	

WINDWARD LINE ZETA LIMIT

U	RHO	S	PORDGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3120E+00	2.3880E+00	6.1261E-02	1.1866E-02	2.2834E+00	3.6236E-01	6.2150E-16	0.	-3.6236E-01	2.2834E+00	8.5800E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	PORDGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3120E+00	2.3880E+00	6.1261E-02	1.1866E-02	2.2834E+00	3.6236E-01	-4.0575E-12	2.1354E-11	3.6236E-01	2.2834E+00	8.5800E-01

FORCE COEFFICIENTS

```
CZ=  6.22307376E-02  CY=  3.45491988E-10  CD=  6.22307376E-02  CL=  3.45491988E-10
YBAR= -9.47682764E-11  ZBAR=  6.66666667E-01  CM= -2.36225497E-10*
```

APPENDIX B

```
STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  8.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

EPSIGCM=  1.00000000E-03
AAST=  4.23895624E-01

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=    0

SLOPE=  1.00000000E+00  KTRANSF= 1

RANGLE=  0.

INTCNT=  534

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02


NCYCLE= 1  AT   08/04/71  14.35.36.

ETAS
 6.05045477E-02  5.89717562E-02  5.45233797E-02  4.89612558E-02  4.63900545E-02  4.89612658E-02  5.45233654E-02  5.89717579E-02
 6.05045459E-02
ETASP
 3.37880377E-15 -5.10888235E-02 -8.90699696E-02 -7.43350400E-02  1.27216364E-07  7.43348700E-02  8.90658825E-02  5.10889688E-02
 6.45418027E-15
CP(I) AT SHOCK
 4.01578326E-02  4.16406487E-02  4.57216855E-02  5.10011352E-02  5.39884539E-02  5.10011407E-02  4.57216750E-02  4.16406508E-02
 4.01578313E-02
CP(I) AT ZETA=0
 4.82123171E-02  4.97329155E-02  5.43519132E-02  6.11710440E-02  6.53961132E-02  6.11710500E-02  5.43518962E-02  4.97329198E-02
 4.82123201E-02
V
 -1.94853445E-03  2.33063061E-04  2.27762106E-03  9.19976049E-04 -1.02281102E-03  9.20089324E-04  2.27747291E-03  2.33050669E-04
 -1.94844967E-03
KCOUNT=   27  VMAX=  2.27762106E-03  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.13167277E-01
DETERM=  2.23930617E-01
DETA
  7.47246962E-05 -9.24857545E-05 -2.16155374E-04 -1.38775937E-04  1.32280609E-05 -1.38785586E-04 -2.16141046E-04 -9.24865536E-05
  7.47272115E-05

NCYCLE= 2  AT   08/04/71  14.40.43.

ETAS
 6.05792724E-02  5.88792705E-02  5.43072244E-02  4.88224799E-02  4.64032826E-02  4.88224802E-02  5.43072244E-02  5.88792714E-02
 6.0[illegible]E-02
ETASP
 4.22350471E-15 -5.41682213E-02 -8.94869352E-02 -7.17948767E-02  3.65641834E-09  7.17948755E-02  8.94869403E-02  5.41682271E-02
 8.51495962E-15
CP(I) AT SHOCK
 4.02064869E-02  4.16001473E-02  4.55810055E-02  5.08825033E-02  5.39978816E-02  5.08825035E-02  4.55810055E-02  4.16001480E-02
 4.02064873E-02
CP(I) AT ZETA=0
 4.83446136E-02  4.97500934E-02  5.41536146E-02  6.09850818E-02  6.54544308E-02  6.09850820E-02  5.41536147E-02  4.97500942E-02
 4.83446141E-02
V
  3.63565881E-06 -4.13366731E-06  3.58628345E-06 -8.11137010E-06 -1.79487195E-06 -8.10913418E-06  3.58526017E-06 -4.12837365E-06
  3.64161159E-06
```

APPENDIX B

N= 9 M=2 NREAD=1 NSPACE=1 NP= 5 NCNVRG=3
NA= 1 ANA= 0. NB= 1 BNB= 0.

STMACH= 8.00000000E+00 GAMMA= 1.40000000E+00 T= 8.00000000E-01 THETAD= 1.00000000E+01 ALPHAD= 0.

RANGLE= 0.

EPSIG= 1.00000000E-03 EPSIGMX= 1.00000000E-03 SPACER= 1.00000000E-03 EPSIVAR= 1.00000000E-08 EPSINT= 2.50000000E-02

NCYCLE= 2 VTEST= 1.00000000E-03 VMAX= 8.11137010E-06 AAST= 4.23895624E-01 PTINF= 1.08960426E+02

VTEST= 1.00000000E-03 VTEST1= 3.00000000E-02

M2E= 0

SLOPE= 1.00000000E+00 KTRANSF= 1
KCOUNT= 37 VMAX= 8.11137010E-06 EPSIG= 1.00000000E-03 SPACER= 1.00000000E-03 VMXTEST= 1.13165686E-01

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSID	-9.0000E+01	-6.5053E+01	-4.1838E+01	-2.0481E+01	5.0788E-09	2.0481E+01	4.1838E+01	6.5053E+01	9.0000E+01	
PSISD	-9.0000E+01	-6.7460E+01	-4.5061E+01	-2.2657E+01	5.6744E-09	2.2657E+01	4.5061E+01	6.7460E+01	9.0000E+01	
XO	0.	6.1500E-02	1.1749E-01	1.5977E-01	1.7633E-01	1.5977E-01	1.1749E-01	6.1500E-02	-3.7834E-11	
YO	-1.4106E-01	-1.3220E-01	-1.0519E-01	-5.9676E-02	1.5630E-11	5.9676E-02	1.0519E-01	1.3220E-01	1.4106E-01	
XOBAR	0.	3.4878E-01	6.6631E-01	9.0611E-01	1.0000E+00	9.0611E-01	6.6631E-01	3.4878E-01	-2.1457E-10	
YOBAR	-8.0000E-01	-7.4976E-01	-5.9654E-01	-3.3844E-01	8.8642E-11	3.3844E-01	5.9654E-01	7.4976E-01	8.0000E-01	
XS	0.	7.8995E-02	1.5038E-01	2.0366E-01	2.2460E-01	2.0366E-01	1.5038E-01	7.8995E-02	-4.8662E-11	
YS	-2.0346E-01	-1.9033E-01	-1.5070E-01	-8.5013E-02	2.2244E-11	8.5013E-02	1.5070E-01	1.9033E-01	2.0346E-01	
XSBAR	0.	4.4801E-01	8.5284E-01	1.1550E+00	1.2738E+00	1.1550E+00	8.5284E-01	4.4801E-01	-2.7598E-10	
YSBAR	-1.1539E+00	-1.0794E+00	-8.5464E-01	-4.8213E-01	1.2615E-10	4.8213E-01	8.5464E-01	1.0794E+00	1.1539E+00	
ETAS	6.0579E-02	5.8879E-02	5.4307E-02	4.8822E-02	4.6403E-02	4.8822E-02	5.4307E-02	5.8879E-02	6.0579E-02	
BETAD	1.1500E+01	1.1622E+01	1.1964E+01	1.2406E+01	1.2659E+01	1.2406E+01	1.1964E+01	1.1622E+01	1.1500E+01	
XI	0.	6.1721E-02	1.2344E-01	1.8516E-01	2.4688E-01	3.0860E-01	3.7032E-01	4.3204E-01	4.9377E-01	
CPSHOCK	4.0206E-02	4.1600E-02	4.5581E-02	5.0883E-02	5.3998E-02	5.0883E-02	4.5581E-02	4.1600E-02	4.0206E-02	
CPBODY	4.8345E-02	4.9750E-02	5.4154E-02	6.0985E-02	6.5454E-02	6.0985E-02	5.4154E-02	4.9750E-02	4.8345E-02	

I	TAU	XI	XO	YO	ETAS	ETASP
1	0.	0.	0.	-1.41061585E-01	6.05792724E-02	4.22350471E-15
2	6.17206808E-02	6.17206808E-02	5.14995678E-02	-1.22203497E-01	5.88792705E-02	-5.41682213E-02
3	1.23441362E-01	1.23441362E-01	1.17488020E-01	-1.05186370E-01	5.43072244E-02	-8.94869352E-02
4	1.85162042E-01	1.85162042E-01	1.59771228E-01	-5.96757047E-02	4.88224799E-02	-7.17948767E-02
5	2.46882723E-01	2.46882723E-01	1.76326981E-01	1.56300545E-11	4.64032826E-02	3.65641834E-09
6	3.08603404E-01	3.08603404E-01	1.59771228E-01	5.96757047E-02	4.88224802E-02	7.17948755E-02
7	3.70324085E-01	3.70324085E-01	1.17488020E-01	1.05186370E-01	5.43072244E-02	8.94869403E-02
8	4.32044765E-01	4.32044765E-01	5.14995677E-02	1.22203497E-01	5.88792714E-02	5.41682271E-02
9	4.93765446E-01	4.93765446E-01	-3.78342080E-11	1.41061585E-01	6.05792731E-02	8.51495962E-15

ZETA= 0.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	3.5333E-02	3.6036E-02	3.8238E-02	4.1653E-02	4.3888E-02	4.1653E-02	3.8238E-02	3.6036E-02	3.5333E-02	
P/ROASTSQ	1.9664E-01	2.0055E-01	2.1280E-01	2.3181E-01	2.4425E-01	2.3181E-01	2.1280E-01	2.0055E-01	1.9664E-01	
P/PTINF	3.2427E-04	3.3072E-04	3.5093E-04	3.8228E-04	4.0279E-04	3.8228E-04	3.5093E-04	3.3072E-04	3.2427E-04	
P/PINF	3.1658E+00	3.2288E+00	3.4261E+00	3.7321E+00	3.9324E+00	3.7321E+00	3.4261E+00	3.2288E+00	3.1658E+00	
RHO	2.1620E+00	2.1926E+00	2.2875E+00	2.4316E+00	2.5241E+00	2.4316E+00	2.2875E+00	2.1926E+00	2.1620E+00	
U	2.3159E+00	2.3149E+00	2.3121E+00	2.3088E+00	2.3071E+00	2.3088E+00	2.3121E+00	2.3149E+00	2.3159E+00	
V	3.6357E-06	-4.1337E-06	3.5863E-06	-8.1114E-06	-1.7949E-06	-8.1091E-06	3.5853E-06	-4.1284E-06	3.6416E-06	
W	2.2976E-13	-3.2469E-02	-5.3840E-02	-4.6165E-02	-1.3446E-09	4.6165E-02	5.3840E-02	3.2470E-02	2.0429E-13	
UC	2.2932E+00	2.2913E+00	2.2857E+00	2.2772E+00	2.2720E+00	2.2772E+00	2.2857E+00	2.2913E+00	2.2932E+00	
VC	3.2348E-01	3.3053E-01	3.5176E-01	3.8273E-01	4.0062E-01	3.8273E-01	3.5176E-01	3.3053E-01	3.2348E-01	
WC	2.3031E-13	1.6144E-02	2.4776E-02	1.9837E-02	-1.3646E-09	-1.9837E-02	-2.4776E-02	-1.6144E-02	3.1441E-11	
VCC	3.2348E-01	3.2936E-01	3.4869E-01	3.8053E-01	4.0062E-01	3.8053E-01	3.4869E-01	3.2936E-01	3.2348E-01	
WCC	2.2976E-13	-3.2130E-02	-5.2574E-02	-4.5511E-02	-1.3446E-09	4.5511E-02	5.2574E-02	3.2131E-02	2.0394E-13	
VX	2.2976E-13	1.0979E-01	2.2472E-01	3.4055E-01	4.0062E-01	3.4055E-01	2.2472E-01	1.0979E-01	-8.6966E-11	
VY	-3.2348E-01	-3.1219E-01	-2.7176E-01	-1.7578E-01	-1.3091E-09	1.7578E-01	2.7176E-01	3.1219E-01	3.2348E-01	
VZ	2.2932E+00	2.2913E+00	2.2857E+00	2.2772E+00	2.2720E+00	2.2772E+00	2.2857E+00	2.2913E+00	2.2932E+00	
PSINOR	5.7406E-12	2.7432E+00	5.6150E+00	8.5053E+00	1.0000E+01	8.5053E+00	5.6150E+00	2.7432E+00	-2.1729E-09	
THETNOR	8.1971E+01	8.2250E+01	8.3252E+01	8.5634E+01	9.0000E+01	8.5634E+01	8.3252E+01	8.2250E+01	8.1971E+01	
XBAR	0.	3.4878E-01	6.6631E-01	9.0611E-01	1.0000E+00	9.0611E-01	6.6631E-01	3.4878E-01	-2.1457E-10	
XBHLD	0.	-2.1457E-10	-2.1457E-10	-2.1457E-10	-2.1457E-10	-2.1457E-10	-2.1457E-10	-2.1457E-10	-2.1457E-10	
YBAR	-8.0000E-01	-7.4976E-01	-5.9654E-01	-3.3844E-01	8.8642E-11	3.3844E-01	5.9654E-01	7.4976E-01	8.0000E-01	
YBHLD	-8.0000E-01	8.0000E-01	8.0000E-01	8.0000E-01	8.0000E-01	8.0000E-01	8.0000E-01	8.0000E-01	8.0000E-01	
ETA	0.	0.	0.	0.	0.	0.	0.	0.	0.	
G	-3.0679E-03	-3.0705E-03	-3.0946E-03	-3.1473E-03	-3.1557E-03	-3.1473E-03	-3.0946E-03	-3.0705E-03	-3.0679E-03	
DEQNS	5.6031E+00	5.6046E+00	5.6095E+00	5.6171E+00	5.6222E+00	5.6171E+00	5.6095E+00	5.6046E+00	5.6031E+00	
AM	6.4900E+00	6.4696E+00	6.4085E+00	6.3211E+00	6.2682E+00	6.3211E+00	6.4085E+00	6.4696E+00	6.4900E+00	
CROSSM	6.4387E-13	9.0737E-02	1.4919E-01	1.2637E-01	3.6532E-09	1.2637E-01	1.4919E-01	9.0737E-02	5.7251E-13	
SBAR	7.2988E-02	7.2988E-02	7.2988E-02	7.2988E-02	7.2988E-02	7.2988E-02	7.2988E-02	7.2988E-02	7.2988E-02	
PORDGAM	1.2006E-02	1.2006E-02	1.2006E-02	1.2006E-02	1.2006E-02	1.2006E-02	1.2006E-02	1.2006E-02	1.2006E-02	
PT/PTINF	8.3321E-01	8.3321E-01	8.3321E-01	8.3321E-01	8.3321E-01	8.3321E-01	8.3321E-01	8.3321E-01	8.3321E-01	
PT	9.0787E+01	9.0787E+01	9.0787E+01	9.0787E+01	9.0787E+01	9.0787E+01	9.0787E+01	9.0787E+01	9.0787E+01	
BERNOUL	-2.1885E-12	9.4581E-09	-1.1373E-08	-1.1020E-08	-5.4001E-13	-1.1020E-08	-1.0811E-08	6.7504E-09	-2.1885E-12	
DVDZ	-2.4577E-01	-2.4305E-01	-2.4221E-01	-2.4703E-01	-2.5149E-01	-2.4703E-01	-2.4221E-01	-2.4305E-01	-2.4577E-01	
DPDZ	5.6365E-27	1.1875E-04	3.8187E-04	3.4931E-04	3.3719E-19	3.4931E-04	3.8187E-04	1.1875E-04	4.4562E-27	
PP	3.5900E-15	2.3738E-02	4.9103E-02	5.3508E-02	1.1752E-09	-5.3508E-02	-4.9103E-02	-2.3738E-02	4.4067E-15	
UP	2.2976E-13	-3.2469E-02	-5.3840E-02	-4.6165E-02	-1.3446E-09	4.6165E-02	5.3840E-02	3.2470E-02	2.0429E-13	
WP	-5.7479E-01	-4.8681E-01	-1.1534E-01	4.8681E-01	8.0546E-01	4.8681E-01	-1.1534E-01	-4.8681E-01	-5.7479E-01	

WINDWARD LINE ZETA LIMIT

U	PHC	S	PORDGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3188E+00	2.2091E+00	4.3449E-02	1.1656E-02	2.2960E+00	3.2388E-01	5.5550E-16	0.	-3.2388E-01	2.2960E+00	8.9707E-01

LEEWARD LINE ZETA LIMIT

U	PHC	S	PORDGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3189E+00	2.2081E+00	4.3449E-02	1.1656E-02	2.2960E+00	3.2388E-01	3.1275E-11	-8.6868E-11	3.2388E-01	2.2960E+00	8.9707E-01

FORCE COEFFICIENTS

CZ= 5.58778043E-02 CY= -1.15912119E-09 CD= 5.58778043E-02 CL= -1.15912119E-09
YBAR= 2.73556786E-10 ZBAR= 6.66666667E-01 CM= 7.88033212E-10

APPENDIX B

```
STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  7.CCC00000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

EPSIGOM=  1.000C0000E-C3
AAST=  4.23895624E-01

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=   C

SLOPE=  1.00C00C00E+C0  KTRANSF= 1

RANGLE=  0.

INTCNT=  542

EPSIG=  1,00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.0000000CE-03  EPSIVAR=  1.00000000E-C8  EPSINT=  2.50000000E-02

NCYCLE= 1  AT   08/04/71  14.41.33.

ETAS
 6.57490737E-02  6.32654550E-02  5.63552194E-02  4.73573333E-02  4.33702392E-02  4.73573290E-02  5.63552260E-02  6.32654586E-02
 6.57490774E-02
ETASP
 2.06221158E-15 -8.42162182E-02 -1.49100432E-01 -1.25055806E-01 -5.73739710E-08  1.25055883E-01  1.49100515E-01  8.42161740E-02
-4.08110428E-15
CP(I) AT SHOCK
 3.25155250E-02  3.40934796E-02  3.88905924E-02  4.60771394E-02  5.18500397E-02  4.60771376E-02  3.88905977E-02  3.40934814E-02
 3.25155273E-02
CP(I) AT ZETA=0
 3.96779986E-02  4.10897283E-02  4.58533962E-02  5.50538919E-02  6.38243004E-02  5.50538906E-02  4.58534064E-02  4.10897298E-02
 3.96779993E-02
V
  1.06714185E-03  1.02873411E-04 -2.01853932E-03 -5.14720956E-04 -4.90439374E-04 -5.14773373E-04 -2.01846954E-03  1.02912137E-04
  1.06711690E-03
KCOUNT=   38  VMAX=  2.01853932E-03  EPSIG=  1.00C00000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.13543428E-01
DETERM=  1.61954078E-01
DETA
  6.42158968E-05  9.12949475E-C6  2.61804489E-04  6.90076870E-05  1.50031559E-04  6.90119831E-C5  2.61795682E-04  9.12565645E-06
  6.42114645E-05

NCYCLE= 2  AT   08/04/71  14.46.44.

ETAS
 6.58132896E-02  6.32745845E-02  5.66170239E-02  4.74263409E-C2  4.35202708E-02  4.74263410E-02  5.66170227E-02  6.32745843E-02
 6.58132889E-02
ETASP
 1.37480772E-15 -8.20542882E-02 -1.48541466E-01 -1.26412054E-01  2.58082281E-09  1.26412041E-01  1.48541463E-01  8.20542939E-02
-8.55287937E-15
CP(I) AT SHOCK
 3.25549427E-02  3.40818064E-02  3.90488275E-02  4.61410855E-02  5.19556313E-02  4.61410854E-02  3.90488267E-02  3.40818063E-02
 3.25549422E-02
CP(I) AT ZETA=0
 3.96612636E-02  4.10207947E-02  4.60410509E-02  5.51670752E-02  6.39200737E-02  5.51670748E-02  4.60410498E-02  4.10207947E-02
 3.96612633E-02
V
 -1.65205243E-06 -2.87239876E-06  2.71192694E-06 -2.76485214E-06 -4.63137971E-07 -2.76422458E-06  2.70187141E-06 -2.87419557E-06
 -1.65065455E-06
```

APPENDIX B

```
N= 9  M=2  NREAD=1  NSPACE=1  NP= 5  NCNVRG=4
NA= 1  ANA=  0.                 NB= 1  BNB=  0.

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  7.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

RANGLE=  0.

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACEP=  1.00000000E-03  EPSIVAR=  1.00000000E-C8  EPSINT=  2.50000000E-02

NCYCLE= 2  VTEST=  1.00000000E-03  VMAX=  2.87419557E-C6  AAST=  4.23895624E-01  PTINF=  1.08960426E+02

VTEST=  1.00000000E-C3  VTEST1=  3.CC000000E-02

M2E=   0

SLOPE=  1.0000000CE+00  KTRANSF= 1
KCOUNT=   48  VMAX=  2.87419557E-06  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.13524119E-01
```

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSIO	-9.0C00E+01	-6.3310E+01	-3.9832E+01	-1.9392E+C1	7.5264E-C9	1.9392E+01	3.9832E+01	6.3310E+01	9.0000E+C1	
PSISD	-9.0C00E+01	-6.7507E+01	-4.5277E+01	-2.2981E+01	9.0779E-09	2.2981E+01	4.5277E+01	6.7507E+01	9.0000E+01	
XO	0.	5.8532E-C2	1.1335E-01	1.5753E-C1	1.7633E-01	1.5753E-01	1.1335E-01	5.8532E-02	-5.6387E-11	
YO	-1.2343E-01	-1.1643E-01	-9.4546E-02	-5.5450E-C2	2.3162E-11	5.5450E-02	9.4546E-02	1.1643E-01	1.2343E-01	
XOBAR	0.	3.3195E-01	6.4284E-01	8.9341E-01	1.0000E+00	8.9341E-01	6.4284E-01	3.3195E-01	-3.1978E-10	
YOBAR	-7.0C00E-01	-6.6031E-01	-5.3620E-01	-3.1447E-C1	1.3136E-10	3.1447E-01	5.3620E-01	6.6031E-01	7.0000E-01	
XS	0.	7.4291E-02	1.4322E-01	1.9763E-01	2.2158E-01	1.9763E-01	1.4322E-01	7.4291E-02	-7.1724E-11	
YS	-1.9C89E-01	-1.7942E-01	-1.4462E-01	-8.38C8E-02	3.5106E-11	8.3808E-02	1.4462E-01	1.7942E-01	1.9089E-C1	
XSBAR	0.	4.2133E-01	8.1226E-01	1.1208E+00	1.2566E+00	1.1208E+00	8.1226E-01	4.2133E-01	-4.0676E-10	
YSBAR	-1.0826E+00	-1.0175E+00	-8.2015E-01	-4.7530E-01	1.9910E-10	4.7530E-01	8.2015E-C1	1.0175E+00	1.0826E+00	
ETAS	6.5813E-C2	6.3275E-02	5.6617E-02	4.7426E-C2	4.3520E-C2	4.7426E-02	5.6617E-02	6.3275E-02	6.5813E-02	
BETAD	1.0807E+01	1.0949E+01	1.1398E+01	1.2012E+01	1.2494E+01	1.2012E+01	1.1398E+01	1.0949E+01	1.0807E+01	
XI	0.	5.8622E-02	1.1724E-01	1.7586E-C1	2.3449E-C1	2.9311E-01	3.5173E-01	4.1035E-01	4.6897E-01	
CPSHOCK	3.2555E-C2	3.4082E-02	3.9049E-02	4.6141E-C2	5.1956E-02	4.6141E-02	3.9049E-C2	3.4082E-02	3.2555E-02	
CPBODY	3.9661E-02	4.1021E-02	4.6041E-02	5.5167E-02	6.3920E-02	5.5167E-02	4.6041E-02	4.1021E-02	3.9661E-02	

I	TAU	XI	XO	YO	ETAS	ETASP
1	0.	0.	0.	-1.23429887E-01	6.58132896E-02	1.37480772E-15
2	5.86216388E-02	5.86216388E-02	5.85323331E-02	-1.16429950E-01	6.32745845E-02	-8.20542882E-C2
3	1.17243278E-01	1.17243278E-01	1.1335038CE-C1	-9.45463842E-02	5.66170239E-02	-1.48541466E-01
4	1.75864916E-01	1.75864916E-01	1.57532010E-01	-5.54498529E-02	4.74263409E-02	-1.26412054E-C1
5	2.34486555E-01	2.34486555E-01	1.76326981E-01	2.31624650E-11	4.35202708E-02	2.58082281E-C9
6	2.93108194E-01	2.93108194E-01	1.57532010E-01	5.54498530E-02	4.74263410E-02	1.26412041E-C1
7	3.51729833E-01	3.51729833E-01	1.13350380E-01	9.45463843E-02	5.66170227E-02	1.48541463E-C1
8	4.10351471E-01	4.10351471E-01	5.85323331E-C2	1.16429550E-01	6.32745843E-02	8.20542939E-02
9	4.68973110E-01	4.68973110E-01	-5.63865170E-11	1.23428886E-01	6.58132889E-02	-8.55287937E-15

ZETA= C.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	3.0991E-02	3.1671E-02	3.4181E-02	3.8744E-02	4.3121E-02	3.8744E-02	3.4181E-C2	3.1671E-02	3.0991E-02	
P/ROASTSQ	1.7247E-01	1.7626E-01	1.9023E-01	2.1562E-01	2.3998E-C1	2.1562E-01	1.9023E-C1	1.7626E-01	1.7247E-01	
P/PTINF	2.8443E-04	2.9067E-04	3.1370E-04	3.5558E-04	3.9575E-04	3.5558E-04	3.1370E-04	2.9067E-04	2.8443E-04	
P/PINF	2.7768E+00	2.8377E+00	3.0626E+00	3.4715E+00	3.8636E+00	3.4715E+00	3.0626E+00	2.8377E+00	2.7768E+00	
RHO	1.9752E+00	2.0060E+00	2.1183E+00	2.3167E+00	2.5007E+00	2.3167E+00	2.1183E+00	2.0060E+00	1.9752E+00	
U	2.3214E+C0	2.3201E+00	2.3162E+00	2.3114E+C0	2.3083E+00	2.3114E+00	2.3162E+00	2.32C1E+00	2.3214E+00	
V	-1.6521E-06	-2.8724E-06	2.7119E-C6	-2.7649E-C6	-4.6314E-07	-2.7642E-C6	2.7019E-06	-2.8742E-06	-1.6507E-06	
W	1.5398E-13	-4.6077E-02	-8.0580E-02	-7.7729E-02	-9.7760E-10	7.7729E-02	8.0580E-02	4.6077E-02	-1.9795E-13	
UC	2.3039E+C0	2.3020E+00	2.2953E+00	2.2833E+C0	2.2732E+C0	2.2833E+00	2.2953E+00	2.3020E+00	2.3039E+00	
VC	2.8436E-01	2.9246E-01	3.1890E-01	3.6600E-01	4.0083E-01	3.6600E-01	3.1890E-01	2.9246E-01	2.8436E-01	
WC	1.5447E-13	2.0626E-02	3.3731E-02	2.9214E-C2	-1.0324E-09	-2.9214E-02	-3.3731E-02	-2.0626E-02	6.6057E-11	
VCC	2.8436E-C1	2.8972E-01	3.1156E-01	3.5949E-01	4.0083E-C1	3.5949E-01	3.1156E-C1	2.8972E-01	2.8436E-01	
WCC	1.5398E-13	-4.4941E-02	-7.5940E-02	-7.4684E-C2	-9.7760E-10	7.4684E-02	7.5940E-02	4.4941E-02	-1.9756E-13	
VX	1.5398E-13	8.9980E-02	1.9062E-01	3.1430E-01	4.C083E-01	3.1430E-01	1.9062E-01	8.9980E-02	-1.2971E-10	
VY	-2.8436E-C1	-2.7904E-01	-2.5788E-01	-1.8981E-C1	-9.2495E-10	1.8981E-01	2.5788E-01	2.79C4E-01	2.8436E-C1	
VZ	2.3039E+00	2.3020E+00	2.2953E+00	2.2833E+00	2.2732E+00	2.2833E+00	2.2953E+00	2.3020E+00	2.3039E+00	
PSINOR	3.8293E-12	2.2285E+00	4.7472E+00	7.8375E+00	1.0000E+01	7.8375E+00	4.7472E+00	2.2285E+00	-3.2258E-09	
THETNOR	8.2964E+C1	8.3094E+01	8.3611E+C1	8.5292E+01	9.0000E+01	8.5292E+01	8.3611E+01	8.3094E+01	8.2964E+01	
XBAR	0.	3.3195E-01	6.4284E-01	8.9341E-01	1.0000E+00	8.9341E-01	6.4284E-C1	3.3195E-01	-3.1978E-10	
XBHLD	0.	-3.1978E-10	-3.1978E-10	-3.1978E-10	-3.1978E-10	-3.1978E-10	-3.1978E-10	-3.1978E-10	-3.1978E-10	
YBAR	-7.0000E-01	-6.6031E-01	-5.3620E-01	-3.1447E-C1	1.3136E-10	3.1447E-01	5.3620E-01	6.6031E-01	7.0000E-01	
YBHLD	-7.0C00E-01	7.0000E-01	7.0000E-01	7.0000E-01	7.0000E-01	7.0000E-01	7.0000E-01	7.00C0E-01	7.00C0E-01	
ETA	0.	0.	0.	C.	0.	0.	0.	C.	0.	
G	-3.1138E-03	-3.1036E-03	-3.1672E-C3	-3.2458E-03	-3.2899E-03	-3.2458E-03	-3.1672E-03	-3.1036E-03	-3.1138E-03	
DEQNS	5.6C12E+00	5.6030E+00	5.6096E+00	5.6225E+00	5.6351E+00	5.6225E+00	5.6096E+00	5.6030E+00	5.6012E+00	
AM	6.6393E+00	6.6164E+00	6.5365E+00	6.4068E+00	6.2977E+00	6.4068E+00	6.5365E+00	6.6164E+00	6.6393E+00	
CROSSM	4.4C39E-13	1.3138E-01	2.2726E-01	2.1533E-C1	2.6672E-C9	2.1533E-01	2.2726E-01	1.3138E-01	5.6614E-13	
SBAR	6.8385E-02	6.8385E-02	6.8385E-02	6.8385E-C2	6.8385E-02	6.8385E-02	6.8385E-02	6.8385E-02	6.8385E-02	
POROGAM	1.1951E-C2	1.1951E-02	1.1951E-02	1.1951E-02	1.1951E-02	1.1951E-02	1.1951E-02	1.1951E-02	1.1951E-02	
PT/PTINF	8.4285E-01	8.4285E-01	8.4285E-01	8.4285E-C1	8.4285E-01	8.4285E-01	8.4285E-01	8.4285E-01	8.4285E-01	
PT	9.1838E+C1	9.1838E+01	9.1838E+01	9.1838E+C1	9.1838E+01	9.1838E+01	9.1838E+01	9.1838E+01	9.1838E+01	
BERNOUL	-4.4C54E-13	1.5064E-12	-7.5957E-12	-4.6327E-12	-2.1316E-14	-4.6114E-12	8.7873E-10	-4.0532E-09	-4.3343E-13	
DVDZ	-2.4968E-C1	-2.4370E-01	-2.4051E-01	-2.4861E-01	-2.6217E-01	-2.4861E-01	-2.4051E-C1	-2.4370E-01	-2.4969E-01	
DPDZ	2.1986E-27	2.0992E-04	7.9518E-04	1.0405E-03	2.1632E-19	1.0405E-03	7.9518E-04	2.0992E-04	3.6334E-27	
PP	0.	2.6117E-02	6.3106E-02	9.1745E-C2	-1.6428E-C9	-9.1745E-02	-6.3106E-02	-2.6117E-02	-3.8239E-15	
UP	1.5398E-13	-4.6077E-02	-8.0580E-02	-7.7729E-02	-9.7760E-10	7.7729E-02	8.0580E-02	4.6077E-02	-1.9795E-13	
WP	-8.49C1E-01	-7.6183E-01	-2.7922E-01	7.6183E-01	1.4C74E+C0	7.6183E-01	-2.7922E-01	-7.6183E-01	-8.4901E-01	

WINDWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3250E+00	2.C314E+00	2.9125E-02	1.1491E-02	2.3075E+C0	2.8481E-01	4.8849E-16	0.	-2.8481E-01	2.3075E+00	9.2977E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3250E+00	2.0314E+00	2.9125E-02	1.1491E-02	2.3075E+C0	2.8481E-01	6.6358E-11	-1.3C11E-10	2.8481E-01	2.3075E+00	9.2977E-01

FORCE COEFFICIENTS

```
CZ=  4.93030902E-02  CY=  8.47105821E-10  CD=  4.93030902E-02  CL=  8.47105821E-10
YBAR= -1.76233989E-1C  ZBAR=  6.66666667E-01  CM= -5.73426C94E-10
```

APPENDIX B

```
STMACH= 8.00000000E+00  GAMMA= 1.40000000E+00  T= 6.00000000E-01  THETAD= 1.00000000E+01  ALPHAD= 0.

EPSIGCM= 1.00000000E-03
AAST= 4.23895624E-01

VTEST= 1.00000000E-03  VTEST1= 3.00000000E-02

M2E=   0

SLOPE= 1.00000000E+00  KTRANSF= 1

RANGLE= 0.

INTCNT= 535

EPSIG= 1.00000000E-03  EPSIGMX= 1.00000000E-03  SPACER= 1.00000000E-03  EPSIVAR= 1.00000000E-08  EPSINT= 2.50000000E-02

NCYCLE= 1  AT  08/04/71  14.47.36.

ETAS
 7.17485442E-02  6.83417268E-02  5.98028079E-02  4.62081412E-02  4.06742459E-02  4.62081411E-02  5.98028037E-02  6.83417230E-02
 7.17485398E-02
ETASP
-1.71669201E-16 -1.09969229E-01 -2.18635250E-01 -1.96022889E-01  4.96504407E-09  1.96022844E-01  2.18635213E-01  1.09969233E-01
-1.47248656E-14
CP(I) AT SHOCK
 2.57185511E-02  2.71312239E-02  3.25938638E-02  4.02067556E-02  4.99642127E-02  4.02067547E-02  3.25938607E-02  2.71312217E-02
 2.57185486E-02
CP(I) AT ZETA=0
 3.18264032E-02  3.29607162E-02  3.78422765E-02  4.74111446E-02  6.22466445E-02  4.74111425E-02  3.78422712E-02  3.29607139E-02
 3.18264008E-02
V
 -5.95435799E-04  8.96580725E-04 -1.04556122E-03  1.06644452E-05 -3.11654826E-03  1.06655817E-05 -1.04559695E-03  8.96552226E-04
 -5.95446112E-04
KCOUNT=   49  VMAX= 3.11654826E-03  EPSIG= 1.00000000E-03  SPACER= 1.00000000E-03  VMXTEST= 1.13901763E-01
DETERM= 1.02596375E-01
DETA
  2.26748504E-04 -1.50012641E-04  3.04148110E-04  2.11108647E-05  3.96943556E-04  2.11107987E-05  3.04152947E-04 -1.50007970E-04
  2.26753718E-04

NCYCLE= 2  AT  08/04/71  14.53.44.

ETAS
 7.19752927E-02  6.81917142E-02  6.01069560E-02  4.62292520E-02  4.10711895E-02  4.62292519E-02  6.01069567E-02  6.81917151E-02
 7.19752935E-02
ETASP
-2.97510361E-15 -1.09298213E-01 -2.16839987E-01 -1.95167423E-01 -3.06864049E-09  1.95167429E-01  2.16839998E-01  1.09298214E-01
-1.43085416E-14
CP(I) AT SHOCK
 2.58497446E-02  2.70381576E-02  3.27478878E-02  4.02049007E-02  5.02404907E-02  4.02049007E-02  3.27478883E-02  2.70381581E-02
 2.58497451E-02
CP(I) AT ZETA=0
 3.19477657E-02  3.28410192E-02  3.79526754E-02  4.73487283E-02  6.25566225E-02  4.73487284E-02  3.79526765E-02  3.28410198E-02
 3.19477661E-02
V
  3.76298864E-06 -5.76764817E-07 -3.18456270E-06 -1.10974277E-06  8.35007932E-06 -1.11283905E-06 -3.17889150E-06 -5.69367358E-07
  3.76567373E-06
```

APPENDIX B

```
N= 9  M=2  NREAD=1  NSPACE=1  NP= 5  NCNVRG=5
NA= 1  ANA=  0.            NB= 1  BNB=  0.

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  6.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

RANGLE=  0.

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACEP=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 2  VTEST=  1.00000000E-03  VMAX=  8.35007932E-06  AAST=  4.23895624E-01  PTINF=  1.08960426E+02

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=    0

SLOPE=  1.00000000E+00  KTRANSF= 1
KCOUNT=    59  VMAX=  8.35007932E-06  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.13847636E-01
```

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSID	-9.0000E+01	-6.1006E+01	-3.7365E+01	-1.8178E+01	-1.0489E-09	1.8178E+01	3.7365E+01	6.1006E+01	9.0000E+01	
PSISD	-9.0000E+01	-6.7599E+01	-4.5646E+01	-2.3470E+01	-1.4014E-09	2.3470E+01	4.5646E+01	6.7599E+01	9.0000E+01	
XO	0.	5.5635E-02	1.0894E-01	1.5468E-01	1.7633E-01	1.5468E-01	1.0894E-01	5.5635E-02	-1.2308E-11	
YO	-1.0580E-01	-1.0039E-01	-8.3188E-02	-5.0790E-02	-3.2281E-12	5.0790E-02	8.3188E-02	1.0039E-01	1.0580E-01	
XOBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
YOBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
XS	0.	6.9525E-02	1.3565E-01	1.9024E-01	2.1901E-01	1.9024E-01	1.3565E-01	6.9525E-02	-1.5445E-11	
YS	-1.7926E-01	-1.6867E-01	-1.3875E-01	-8.2603E-02	-5.3568E-12	8.2603E-02	1.3875E-01	1.6867E-01	1.7926E-01	
XSBAR	0.	3.9429E-01	7.6932E-01	1.0789E+00	1.2421E+00	1.0789E+00	7.6932E-01	3.9429E-01	-8.7593E-11	
YSBAR	-1.0167E+00	-9.5658E-01	-7.8687E-01	-4.6846E-01	-3.0380E-11	4.6846E-01	7.8687E-01	9.5658E-01	1.0167E+00	
ETAS	7.1975E-02	6.8192E-02	6.0107E-02	4.6229E-02	4.1071E-02	4.6229E-02	6.0107E-02	6.8192E-02	7.1975E-02	
BETAD	1.0163E+01	1.0280E+01	1.0825E+01	1.1500E+01	1.2353E+01	1.1500E+01	1.0825E+01	1.0280E+01	1.0163E+01	
XI	0.	5.5646E-02	1.1129E-01	1.6694E-01	2.2258E-01	2.7823E-01	3.3388E-01	3.8952E-01	4.4517E-01	
CPSHOCK	2.5850E-02	2.7038E-02	3.2748E-02	4.0205E-02	5.0240E-02	4.0205E-02	3.2748E-02	2.7038E-02	2.5850E-02	
CPBODY	3.1948E-02	3.2841E-02	3.7953E-02	4.7349E-02	6.2557E-02	4.7349E-02	3.7953E-02	3.2841E-02	3.1948E-02	

I	TAU	XI	XO	YO	ETAS	ETASP
1	0.	0.	0.	-1.05796188E-01	7.19752927E-02	-2.97510361E-15
2	5.56460997E-02	5.56460997E-02	5.56348315E-02	-1.00391977E-01	6.81917142E-02	-1.09298213E-01
3	1.11292199E-01	1.11292199E-01	1.08942518E-01	-8.31876403E-02	6.01069560E-02	-2.16839987E-01
4	1.66938299E-01	1.66938299E-01	1.54678616E-01	-5.07903803E-02	4.62292520E-02	-1.95167423E-01
5	2.22584399E-01	2.22584399E-01	1.76326980E-01	-3.22812610E-12	4.10711895E-02	-3.06864049E-09
6	2.78230498E-01	2.78230498E-01	1.54678616E-01	5.07903804E-02	4.62292519E-02	1.95167429E-01
7	3.33876598E-01	3.33876598E-01	1.08942518E-01	8.31876403E-02	6.01069567E-02	2.16839998E-01
8	3.89522698E-01	3.89522698E-01	5.56348315E-02	1.00391977E-01	6.81917151E-02	1.09298214E-01
9	4.45168797E-01	4.45168797E-01	-1.23075942E-11	1.05796188E-01	7.19752935E-02	-1.43085416E-14

ZETA= 1.00000000E+00

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.4086E-02	2.4680E-02	2.7535E-02	3.1263E-02	3.6281E-02	3.1263E-02	2.7535E-02	2.4680E-02	2.4086E-02	
P/ROASTSQ	1.3404E-01	1.3735E-01	1.5324E-01	1.7399E-01	2.0191E-01	1.7399E-01	1.5324E-01	1.3735E-01	1.3404E-01	
P/PTINF	2.2105E-04	2.2650E-04	2.5270E-04	2.8692E-04	3.3297E-04	2.8692E-04	2.5270E-04	2.2650E-04	2.2105E-04	
P/PINF	2.1581E+00	2.2113E+00	2.4671E+00	2.8012E+00	3.2508E+00	2.8012E+00	2.4671E+00	2.2113E+00	2.1581E+00	
RHO	1.7098E+00	1.7376E+00	1.8664E+00	2.0233E+00	2.2165E+00	2.0233E+00	1.8664E+00	1.7376E+00	1.7098E+00	
U	2.3221E+00	2.3208E+00	2.3159E+00	2.3099E+00	2.3045E+00	2.3099E+00	2.3159E+00	2.3208E+00	2.3221E+00	
V	-2.4346E-01	-2.3747E-01	-2.2197E-01	-2.1807E-01	-2.2770E-01	-2.1807E-01	-2.2197E-01	-2.3747E-01	-2.4346E-01	
W	0.	-6.5836E-02	-1.1276E-01	-1.2163E-01	5.0328E-10	1.2163E-01	1.1276E-01	6.5836E-02	0.	
UC	2.3286E+00	2.3272E+00	2.3204E+00	2.3116E+00	2.2998E+00	2.3116E+00	2.3204E+00	2.3272E+00	2.3286E+00	
VC	1.7009E-01	1.7519E-01	1.9934E-01	2.3099E-01	2.7059E-01	2.3099E-01	1.9934E-01	1.7519E-01	1.7009E-01	
WC	2.9172E-16	1.5086E-02	3.2730E-02	3.1231E-02	5.1635E-10	-3.1231E-02	-3.2730E-02	-1.5086E-02	1.8280E-11	
VCC	1.7009E-01	1.7481E-01	1.9907E-01	2.2865E-01	2.7059E-01	2.2865E-01	1.9907E-01	1.7481E-01	1.7009E-01	
WCC	0.	-1.8981E-02	-3.4341E-02	-4.5266E-02	5.0921E-10	4.5266E-02	3.4341E-02	1.8981E-02	1.0748E-11	
VX	0.	4.9071E-02	1.1461E-01	1.9171E-01	2.7059E-01	1.9171E-01	1.1461E-01	4.9071E-02	-2.5402E-11	
VY	-1.7009E-01	-1.6886E-01	-1.6635E-01	-1.3259E-01	5.0259E-10	1.3259E-01	1.6635E-01	1.6886E-01	1.7009E-01	
VZ	2.3286E+00	2.3272E+00	2.3204E+00	2.3116E+00	2.2998E+00	2.3116E+00	2.3204E+00	2.3272E+00	2.3286E+00	
PSINOR	0.	1.2080E+00	2.8277E+00	4.7408E+00	6.7103E+00	4.7408E+00	2.8277E+00	1.2080E+00	-6.2504E-10	
THETNOR	8.5822E+01	8.5851E+01	8.5905E+01	8.6729E+01	9.0000E+01	8.6729E+01	8.5905E+01	8.5851E+01	8.5822E+01	
XBAR	0.	3.9429E-01	7.6932E-01	1.0789E+00	1.2421E+00	1.0789E+00	7.6932E-01	3.9429E-01	-8.7593E-11	
XBHLD	0.	3.9429E-01	7.6932E-01	1.0789E+00	1.2421E+00	1.0789E+00	7.6932E-01	3.9429E-01	-8.7593E-11	
YBAR	-1.0167E+00	-9.5658E-01	-7.8687E-01	-4.6846E-01	-3.0380E-11	4.6846E-01	7.8687E-01	9.5658E-01	1.0167E+00	
YBHLD	-1.0167E+00	-9.5658E-01	-7.8687E-01	-4.6846E-01	-3.0380E-11	4.6846E-01	7.8687E-01	9.5658E-01	1.0167E+00	
ETA	7.1975E-02	6.8192E-02	6.0107E-02	4.6229E-02	4.1071E-02	4.6229E-02	6.0107E-02	6.8192E-02	7.1975E-02	
G	-3.0240E-01	-3.0500E-01	-3.1550E-01	-3.3705E-01	-3.7478E-01	-3.3705E-01	-3.1550E-01	-3.0500E-01	-3.0240E-01	
DEQNS	3.9494E+00	4.1406E+00	5.0102E+00	6.4482E+00	8.5482E+00	6.4482E+00	5.0102E+00	4.1406E+00	3.9494E+00	
AM	7.0474E+00	7.0156E+00	6.8701E+00	6.6961E+00	6.4844E+00	6.6961E+00	6.8701E+00	7.0156E+00	7.0474E+00	
CROSSM	7.3487E-01	7.4078E-01	7.3435E-01	7.1965E-01	6.3760E-01	7.1965E-01	7.3435E-01	7.4078E-01	7.3487E-01	
SBAR	1.8312E-02	2.0089E-02	2.9463E-02	4.3446E-02	6.4571E-02	4.3446E-02	2.9463E-02	2.0089E-02	1.8312E-02	
POROGAM	1.1367E-02	1.1387E-02	1.1494E-02	1.1656E-02	1.1905E-02	1.1656E-02	1.1494E-02	1.1387E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.5102E-01	9.2899E-01	8.9708E-01	8.5093E-01	8.9708E-01	9.2899E-01	9.5102E-01	9.5525E-01	
PT	1.0408E+02	1.0362E+02	1.0122E+02	9.7746E+01	9.2717E+01	9.7746E+01	1.0122E+02	1.0362E+02	1.0408E+02	
BERNOUL	2.8422E-14	4.2633E-14	4.2633E-14	2.8422E-14	4.2633E-14	2.8422E-14	4.2633E-14	4.2633E-14	4.2633E-14	
DPDZ	-7.8749E-03	-7.5013E-03	-6.6731E-03	-8.5496E-03	-1.0657E-02	-8.5496E-03	-6.6731E-03	-7.5013E-03	-7.8749E-03	
DUDZ	-1.7523E-02	-1.6176E-02	-1.3257E-02	-1.0274E-02	-9.3517E-03	-1.0274E-02	-1.3257E-02	-1.6176E-02	-1.7523E-02	
DVDZ	-2.7241E-01	-2.6024E-01	-2.2805E-01	-2.1699E-01	-2.1217E-01	-2.1699E-01	-2.2805E-01	-2.6024E-01	-2.7241E-01	
DWDZ	-1.2305E-15	-2.8268E-04	-5.6038E-03	-1.6764E-02	-1.9070E-10	1.6764E-02	5.6038E-03	2.8268E-04	-3.6606E-12	
DSBDZ	-1.0254E-31	-1.4515E-03	-4.5233E-03	-6.4335E-03	-8.5780E-20	-6.4335E-03	-4.5233E-03	-1.4515E-03	8.5819E-27	
PP	-1.3691E-15	3.1463E-02	6.0609E-02	9.4926E-02	-4.5707E-10	-9.4926E-02	-6.0609E-02	-3.1463E-02	-5.8514E-15	
UP	-1.3199E-13	-5.7790E-02	-1.0366E-01	-1.2061E-01	1.4179E-09	1.2061E-01	1.0366E-01	5.7790E-02	-3.6250E-13	
VP	1.1607E-14	2.2839E-01	2.0880E-01	-9.7623E-02	2.0465E-09	9.7623E-02	-2.0880E-01	-2.2839E-01	6.2932E-14	
WP	-1.2398E+00	-1.0702E+00	-6.6843E-01	1.0702E+00	2.5766E+00	1.0702E+00	-6.6843E-01	-1.0702E+00	-1.2398E+00	
SBARP	-1.0409E-15	9.8609E-02	2.1055E-01	3.8564E-01	-1.6279E-09	-3.8564E-01	-2.1055E-01	-9.8609E-02	-1.9623E-15	

APPENDIX B

ZETA= 5.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.4775E-02	2.5344E-02	2.8142E-02	3.2050E-02	3.7291E-02	3.2050E-02	2.8142E-02	2.5344E-02	2.4775E-02	
P/ROASTSQ	1.3788E-01	1.4104E-01	1.5662E-01	1.7837E-01	2.0753E-01	1.7837E-01	1.5662E-01	1.4104E-01	1.3788E-01	
P/PTINF	2.2737E-04	2.3260E-04	2.5828E-04	2.9415E-04	3.4225E-04	2.9415E-04	2.5828E-04	2.3260E-04	2.2737E-04	
P/PINF	2.2198E+00	2.2708E+00	2.5215E+00	2.8717E+00	3.3413E+00	2.8717E+00	2.5215E+00	2.2708E+00	2.2198E+00	
RHO	1.7446E+00	1.7707E+00	1.8950E+00	2.0585E+00	2.2605E+00	2.0585E+00	1.8950E+00	1.7707E+00	1.7446E+00	
U	2.3237E+00	2.3223E+00	2.3171E+00	2.3109E+00	2.3053E+00	2.3109E+00	2.3171E+00	2.3223E+00	2.3237E+00	
V	-2.1711E-01	-2.1217E-01	-1.9953E-01	-1.9670E-01	-2.0666E-01	-1.9670E-01	-1.9953E-01	-2.1217E-01	-2.1711E-01	
W	0.	-6.5855E-02	-1.1230E-01	-1.2003E-01	5.2273E-10	1.2003E-01	1.1230E-01	6.5855E-02	0.	
UC	2.3269E+00	2.3255E+00	2.3189E+00	2.3095E+00	2.2974E+00	2.3095E+00	2.3189E+00	2.3255E+00	2.3269E+00	
VC	1.7958E-01	1.8452E-01	2.0772E-01	2.4147E-01	2.8189E-01	2.4147E-01	2.0772E-01	1.8452E-01	1.7958E-01	
WC	3.0799E-16	1.5046E-02	3.3155E-02	3.2795E-02	5.3579E-10	-3.2795E-02	-3.3155E-02	-1.5046E-02	1.8275E-11	
VCC	1.7958E-01	1.8379E-01	2.0672E-01	2.3872E-01	2.8189E-01	2.3872E-01	2.0672E-01	1.8379E-01	1.7958E-01	
WCC	0.	-2.2213E-02	-3.8873E-02	-4.8963E-02	5.2821E-10	4.8963E-02	3.8873E-02	2.2213E-02	9.9858E-12	
VX	0.	5.0856E-02	1.1857E-01	2.0050E-01	2.8189E-01	2.0050E-01	1.1857E-01	5.0856E-02	-2.5794E-11	
VY	-1.7958E-01	-1.7801E-01	-1.7375E-01	-1.3850E-01	5.2146E-10	1.3850E-01	1.7375E-01	1.7801E-01	1.7958E-01	
VZ	2.3269E+00	2.3255E+00	2.3189E+00	2.3095E+00	2.2974E+00	2.3095E+00	2.3189E+00	2.3255E+00	2.3269E+00	
PSINOR	0.	1.2528E+00	2.9271E+00	4.9618E+00	6.9953E+00	4.9618E+00	2.9271E+00	1.2528E+00	-6.3514E-10	
THETNOR	8.5587E+01	8.5624E+01	8.5721E+01	8.6581E+01	9.0000E+01	8.6581E+01	8.5721E+01	8.5624E+01	8.5587E+01	
XBAR	0.	3.8634E-01	7.5404E-01	1.0586E+00	1.2177E+00	1.0586E+00	7.5404E-01	3.8634E-01	-8.5796E-11	
XBHLD	0.	3.5460E-01	7.3553E-01	1.0441E+00	1.2177E+00	1.0441E+00	7.3553E-01	3.5460E-01	-8.5796E-11	
YBAR	-9.7458E-01	-9.1749E-01	-7.5508E-01	-4.5029E-01	-2.9163E-11	4.5029E-01	7.5508E-01	9.1749E-01	9.7458E-01	
YBHLD	-9.7458E-01	-9.2218E-01	-7.6326E-01	-4.6485E-01	-2.9166E-11	4.6485E-01	7.6326E-01	9.2218E-01	9.7458E-01	
ETA	6.4778E-02	6.1373E-02	5.4096E-02	4.1606E-02	3.6964E-02	4.1606E-02	5.4096E-02	6.1373E-02	6.4778E-02	
G	-2.6448E-01	-2.6721E-01	-2.7737E-01	-2.9513E-01	-3.2684E-01	-2.9513E-01	-2.7737E-01	-2.6721E-01	-2.6448E-01	
DEQNS	4.7402E+00	4.8952E+00	5.6334E+00	6.9776E+00	9.2943E+00	6.9776E+00	5.6334E+00	4.8952E+00	4.7402E+00	
AM	7.0162E+00	6.9859E+00	6.8452E+00	6.6678E+00	6.4560E+00	6.6678E+00	6.8452E+00	6.9859E+00	7.0162E+00	
CROSSM	6.5270E-01	6.6524E-01	6.7312E-01	6.6161E-01	5.7644E-01	6.6161E-01	6.7312E-01	6.6524E-01	6.5270E-01	
SBAR	1.8312E-02	2.0248E-02	2.9951E-02	4.4123E-02	6.4571E-02	4.4123E-02	2.9951E-02	2.0248E-02	1.8312E-02	
POROGAM	1.1367E-02	1.1389E-02	1.1500E-02	1.1664E-02	1.1905E-02	1.1664E-02	1.1500E-02	1.1389E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.5064E-01	9.2786E-01	8.9556E-01	8.5093E-01	8.9556E-01	9.2786E-01	9.5064E-01	9.5525E-01	
PT	1.0408E+02	1.0358E+02	1.0110E+02	9.7580E+01	9.2717E+01	9.7580E+01	1.0110E+02	1.0358E+02	1.0408E+02	
BERNOUL	6.6078E-10	-1.4036E-06	-9.4252E-06	2.5311E-05	1.1720E-10	2.5311E-05	-9.4251E-06	-1.4036E-06	6.6079E-10	
DPDZ	-6.0665E-03	-5.9070E-03	-5.5332E-03	-7.2595E-03	-9.5977E-03	-7.2595E-03	-5.5332E-03	-5.9070E-03	-6.0665E-03	
DUDZ	-1.5626E-02	-1.4440E-02	-1.1888E-02	-9.2537E-03	-8.4879E-03	-9.2537E-03	-1.1888E-02	-1.4440E-02	-1.5626E-02	
DVDZ	-2.5639E-01	-2.4714E-01	-2.2148E-01	-2.1107E-01	-2.0902E-01	-2.1107E-01	-2.2148E-01	-2.4714E-01	-2.5639E-01	
DWDZ	-9.1311E-16	6.1089E-04	-3.6273E-03	-1.5258E-02	-1.9803E-10	1.5258E-02	3.6273E-03	-6.1089E-04	-4.2418E-12	
DSBDZ	-1.0636E-31	-1.7425E-03	-5.2752E-03	-7.1263E-03	-1.2545E-19	-7.1263E-03	-5.2752E-03	-1.7425E-03	1.3698E-26	
PP	-8.5017E-16	3.0298E-02	6.1602E-02	9.9572E-02	-6.1888E-10	-9.9572E-02	-6.1602E-02	-3.0298E-02	-4.3289E-15	
UP	[illegible].3209E-13	-6.1747E-02	-1.0915E-01	-1.2415E-01	1.3452E-09	1.2415E-01	1.0915E-01	6.1747E-02	-4.8855E-13	
VP	2.2952E-15	1.8744E-01	1.6965E-01	-1.0862E-01	-1.4664E-09	1.0862E-01	-1.6965E-01	-1.8744E-01	3.8642E-14	
WP	-1.2416E+00	-1.0671E+00	-6.4907E-01	1.0671E+00	2.5397E+00	1.0671E+00	-6.4907E-01	-1.0671E+00	-1.2416E+00	
SBARP	-7.6187E-16	1.0369E-01	2.1676E-01	3.7901E-01	-1.9098E-09	-3.7901E-01	-2.1676E-01	-1.0369E-01	-2.7995E-15	

ZETA= 8.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.5320E-02	2.5878E-02	2.8650E-02	3.2724E-02	3.8207E-02	3.2724E-02	2.8650E-02	2.5878E-02	2.5320E-02	
P/ROASTSQ	1.4091E-01	1.4402E-01	1.5944E-01	1.8212E-01	2.1263E-01	1.8212E-01	1.5944E-01	1.4402E-01	1.4091E-01	
P/PTINF	2.3238E-04	2.3750E-04	2.6294E-04	3.0033E-04	3.5065E-04	3.0033E-04	2.6294E-04	2.3750E-04	2.3238E-04	
P/PINF	2.2687E+00	2.3187E+00	2.5670E+00	2.9321E+00	3.4234E+00	2.9321E+00	2.5670E+00	2.3187E+00	2.2687E+00	
RHO	1.7719E+00	1.7970E+00	1.9186E+00	2.0882E+00	2.3000E+00	2.0882E+00	1.9186E+00	1.7970E+00	1.7719E+00	
U	2.3252E+00	2.3237E+00	2.3183E+00	2.3118E+00	2.3062E+00	2.3118E+00	2.3183E+00	2.3237E+00	2.3252E+00	
V	-1.9195E-01	-1.8785E-01	-1.7757E-01	-1.7575E-01	-1.8580E-01	-1.7575E-01	-1.7757E-01	-1.8785E-01	-1.9195E-01	
W	0.	-6.5950E-02	-1.1202E-01	-1.1857E-01	5.4282E-10	1.1857E-01	1.1202E-01	6.5950E-02	0.	
UC	2.3255E+00	2.3241E+00	2.3175E+00	2.3075E+00	2.2950E+00	2.3075E+00	2.3175E+00	2.3241E+00	2.3255E+00	
VC	1.8789E-01	1.9288E-01	2.1562E-01	2.5155E-01	2.9303E-01	2.5155E-01	2.1562E-01	1.9288E-01	1.8789E-01	
WC	3.2225E-16	1.4933E-02	3.3411E-02	3.4233E-02	5.5588E-10	-3.4233E-02	-3.3411E-02	-1.4933E-02	1.8271E-11	
VCC	1.8789E-01	1.9176E-01	2.1377E-01	2.4830E-01	2.9303E-01	2.4830E-01	2.1377E-01	1.9176E-01	1.8789E-01	
WCC	0.	-2.5566E-02	-4.3704E-02	-5.2876E-02	5.4784E-10	5.2876E-02	4.3704E-02	2.5566E-02	9.2147E-12	
VX	0.	5.2380E-02	1.2217E-01	2.0892E-01	2.9303E-01	2.0892E-01	1.2217E-01	5.2380E-02	-2.6139E-11	
VY	-1.8789E-01	-1.8623E-01	-1.8078E-01	-1.4422E-01	5.4098E-10	1.4422E-01	1.8078E-01	1.8623E-01	1.8789E-01	
VZ	2.3255E+00	2.3241E+00	2.3175E+00	2.3075E+00	2.2950E+00	2.3075E+00	2.3175E+00	2.3241E+00	2.3255E+00	
PSINOR	0.	1.2911E+00	3.0176E+00	5.1733E+00	7.2763E+00	5.1733E+00	3.0176E+00	1.2911E+00	-6.4400E-10	
THETNOR	8.5381E+01	8.5420E+01	8.5546E+01	8.6438E+01	9.0000E+01	8.6438E+01	8.5546E+01	8.5420E+01	8.5381E+01	
XBAR	0.	3.7841E-01	7.3879E-01	1.0383E+00	1.1933E+00	1.0383E+00	7.3879E-01	3.7841E-01	-8.4003E-11	
XBHLD	0.	3.1590E-01	7.0084E-01	1.0085E+00	1.1933E+00	1.0085E+00	7.0084E-01	3.1590E-01	-8.4003E-11	
YBAR	-9.3260E-01	-8.7849E-01	-7.2337E-01	-4.3214E-01	-2.7949E-11	4.3214E-01	7.2337E-01	8.7849E-01	9.3260E-01	
YBHLD	-9.3260E-01	-8.8743E-01	-7.3970E-01	-4.6116E-01	-2.7955E-11	4.6116E-01	7.3970E-01	8.8743E-01	9.3260E-01	
ETA	5.7580E-02	5.4553E-02	4.8086E-02	3.6983E-02	3.2857E-02	3.6983E-02	4.8086E-02	5.4553E-02	5.7580E-02	
G	-2.2922E-01	-2.3188E-01	-2.4127E-01	-2.5570E-01	-2.8186E-01	-2.5570E-01	-2.4127E-01	-2.3188E-01	-2.2922E-01	
DEQNS	5.3099E+00	5.4387E+00	6.0687E+00	7.2919E+00	9.3910E+00	7.2919E+00	6.0687E+00	5.4387E+00	5.3099E+00	
AM	6.9922E+00	6.9624E+00	6.8243E+00	6.6437E+00	6.4310E+00	6.6437E+00	6.8243E+00	6.9624E+00	6.9922E+00	
CROSSM	5.7526E-01	5.9437E-01	6.1553E-01	6.0673E-01	5.1645E-01	6.0673E-01	6.1553E-01	5.9437E-01	5.7526E-01	
SBAR	1.8312E-02	2.0441E-02	3.0525E-02	4.4876E-02	6.4571E-02	4.4876E-02	3.0525E-02	2.0441E-02	1.8312E-02	
POROGAM	1.1367E-02	1.1391E-02	1.1507E-02	1.1673E-02	1.1905E-02	1.1673E-02	1.1507E-02	1.1391E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.5018E-01	9.2653E-01	8.9387E-01	8.5093E-01	8.9387E-01	9.2653E-01	9.5018E-01	9.5525E-01	
PT	1.0408E+02	1.0353E+02	1.0095E+02	9.7397E+01	9.2717E+01	9.7397E+01	1.0095E+02	1.0353E+02	1.0408E+02	
BERNOUL	8.8227E-10	-3.3866E-06	-1.9189E-05	5.3220E-05	1.5980E-10	5.3220E-05	-1.9189E-05	-3.3867E-06	8.8228E-10	
DPDZ	-4.9048E-03	-4.8261E-03	-4.6607E-03	-6.2438E-03	-8.7450E-03	-6.2438E-03	-4.6607E-03	-4.8261E-03	-4.9048E-03	
DUDZ	-1.3815E-02	-1.2766E-02	-1.0539E-02	-8.2399E-03	-7.6311E-03	-8.2399E-03	-1.0539E-02	-1.2766E-02	-1.3815E-02	
DVDZ	-2.4761E-01	-2.3982E-01	-2.1803E-01	-2.0842E-01	-2.0860E-01	-2.0842E-01	-2.1803E-01	-2.3982E-01	-2.4761E-01	
DWDZ	-8.5479E-16	1.2780E-03	-2.0769E-03	-1.4129E-02	-2.0328E-10	1.4129E-02	2.0769E-03	-1.2780E-03	-4.9064E-12	
DSBDZ	-2.0352E-31	-2.1279E-03	-6.2365E-03	-7.9591E-03	-1.7644E-19	-7.9591E-03	-6.2365E-03	-2.1279E-03	1.5404E-26	
PP	-8.8116E-16	2.9645E-02	6.2721E-02	1.0425E-01	-7.4580E-10	-1.0425E-01	-6.2721E-02	-2.9645E-02	-3.5535E-15	
UP	-7.1550E-15	-6.5217E-02	-1.1396E-01	-1.2720E-01	1.3010E-09	1.2720E-01	1.1396E-01	6.5217E-02	-5.0733E-13	
VP	3.0974E-15	1.5408E-01	1.3581E-01	-1.1669E-01	-5.0548E-09	1.1669E-01	-1.3581E-01	-1.5408E-01	3.4072E-14	
WP	-1.2447E+00	-1.0658E+00	-6.3035E-01	1.0658E+00	2.5054E+00	1.0658E+00	-6.3035E-01	-1.0658E+00	-1.2447E+00	
SBARP	-1.0409E-15	1.0972E-01	2.2347E-01	3.7130E-01	-2.2306E-09	-3.7130E-01	-2.2347E-01	-1.0972E-01	-2.7995E-15	

APPENDIX B

ZETA= 7.CCCOOOCCE-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.5766E-02	2.6317E-02	2.9078E-02	3.3304E-C2	3.9044E-02	3.3304E-02	2.9078E-02	2.6317E-02	2.5766E-02	
P/ROASTSQ	1.4339E-01	1.4646E-01	1.6183E-01	1.8534E-01	2.1729E-01	1.8534E-01	1.6183E-01	1.4646E-01	1.4339E-01	
P/PTINF	2.3647E-C4	2.4153E-C4	2.6687E-04	3.0565E-04	3.5833E-04	3.0565E-04	2.6687E-04	2.4153E-04	2.3647E-C4	
P/PINF	2.3086E+C0	2.3580E+00	2.6054E+00	2.9840E+00	3.4983E+C0	2.9840E+00	2.6054E+00	2.3580E+00	2.3086E+00	
RHO	1.7941E+CC	1.8184E+00	1.9381E+00	2.1133E+00	2.3358E+00	2.1133E+00	1.9381E+00	1.8184E+00	1.7941E+00	
U	2.3265E+00	2.3249E+00	2.3192E+0C	2.3125E+00	2.3069E+00	2.3125E+00	2.3192E+00	2.3249E+00	2.3265E+00	
V	-1.6747E-01	-1.6411E-01	-1.5586E-01	-1.5495E-01	-1.6487E-01	-1.5495E-01	-1.5586E-01	-1.6411E-01	-1.6747E-C1	
W	0.	-6.6107E-02	-1.1188E-01	-1.1720E-01	5.6322E-10	1.1720E-01	1.1188E-01	6.61C7E-02	0.	
UC	2.3243E+00	2.3229E+00	2.3162E+00	2.3056E+00	2.2927E+00	2.3056E+00	2.3162E+00	2.3229E+00	2.3243E+00	
VC	1.9553E-C1	2.0067E-01	2.2329E-01	2.6148E-01	3.0424E-01	2.6148E-01	2.2329E-01	2.0067E-01	1.9553E-01	
WC	3.3535E-16	1.4763E-02	3.3530E-02	3.5574E-C2	5.7628E-10	-3.5574E-02	-3.3530E-02	-1.4763E-02	1.8268E-11	
VCC	1.9553E-C1	1.9910E-01	2.2043E-01	2.5765E-01	3.0424E-01	2.5765E-01	2.2043E-01	1.9910E-01	1.9553E-01	
WCC	0.	-2.9120E-02	-4.8899E-C2	-5.7C73E-C2	5.6776E-10	5.7073E-02	4.8899E-02	2.9120E-02	8.4078E-12	
VX	0.	5.3738E-02	1.2555E-01	2.1716E-01	3.0424E-01	2.1716E-01	1.2555E-01	5.3738E-02	-2.6455E-11	
VY	-1.9553E-C1	-1.9391E-01	-1.8767E-01	-1.4993E-01	5.6080E-10	1.4993E-01	1.8767E-01	1.9391E-01	1.9553E-01	
VZ	2.3243E+00	2.3229E+00	2.3162E+00	2.3056E+00	2.2927E+00	2.3056E+00	2.3162E+00	2.3229E+00	2.3243E+00	
PSINOR	0.	1.3253E+00	3.1026E+00	5.3807E+00	7.5592E+00	5.3807E+00	3.1026E+00	1.3253E+00	-6.5215E-10	
THETNOR	8.5191E+01	8.5229E+01	8.5375E+01	8.6296E+01	9.0000E+01	8.6296E+01	8.5375E+01	8.5229E+01	8.5191E+01	
XBAR	0.	3.7C49E-01	7.2357E-01	1.0181E+00	1.1690E+00	1.0181E+00	7.2357E-01	3.7C49E-01	-8.2215E-11	
XBHLD	0.	2.7822E-01	6.6503E-01	9.7190E-C1	1.1690E+00	9.7190E-01	6.6503E-01	2.7822E-01	-8.2215E-11	
YBAR	-8.9073E-C1	-8.3958E-01	-6.9172E-01	-4.1403E-01	-2.6737E-11	4.1403E-01	6.9172E-C1	8.3958E-01	8.9073E-01	
YBHLD	-8.9073E-C1	-8.5232E-01	-7.1623E-01	-4.5756E-C1	-2.6739E-11	4.5756E-01	7.1623E-01	8.5232E-01	8.9073E-C1	
ETA	5.0383E-C2	4.7734E-02	4.2075E-02	3.2360E-02	2.8750E-02	3.2360E-02	4.2C75E-02	4.7734E-02	5.0383E-02	
G	-1.9596E-C1	-1.9844E-01	-2.0686E-01	-2.1837E-01	-2.3947E-01	-2.1837E-01	-2.0686E-01	-1.9844E-01	-1.9596E-01	
DEQNS	5.7C96E+00	5.8171E+00	6.3508E+00	7.4345E+0C	9.2897E+00	7.4345E+00	6.3508E+00	5.8171E+00	5.7096E+00	
AM	6.9731E+00	6.9433E+00	6.8065E+00	6.6228E+00	6.4087E+00	6.6228E+00	6.8065E+00	6.9433E+00	6.9731E+00	
CROSSM	5.0066E-01	5.2687E-01	5.6115E-01	5.5444E-01	4.5687E-01	5.5444E-01	5.6115E-01	5.2687E-01	5.0066E-01	
SBAR	1.8312E-02	2.0679E-02	3.1208E-02	4.5722E-02	6.4571E-C2	4.5722E-02	3.1208E-02	2.0679E-02	1.8312E-02	
POROGAM	1.1367E-C2	1.1394E-02	1.1515E-02	1.1683E-C2	1.1905E-02	1.1683E-02	1.1515E-02	1.1394E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.4962E-01	9.2494E-01	8.9199E-01	8.5093E-01	8.9199E-01	9.2494E-01	9.4962E-01	9.5525E-01	
PT	1.04C8E+C2	1.0347E+02	1.0078E+C2	9.7191E+01	9.2717E+01	9.7191E+01	1.0078E+02	1.0347E+02	1.04C8E+02	
BERNOUL	9.7423E-10	-6.1188E-06	-2.9235E-05	8.4333E-C5	1.7570E-10	8.4333E-05	-2.9235E-05	-6.1188E-06	9.7425E-10	
DPDZ	-4.0446E-C3	-3.9933E-03	-3.9218E-03	-5.3626E-03	-7.9932E-03	-5.3626E-03	-3.9218E-03	-3.9933E-03	-4.0446E-03	
DUDZ	-1.2C54E-02	-1.1125E-02	-9.1891E-03	-7.2159E-C3	-6.7716E-03	-7.2159E-03	-9.1891E-03	-1.1125E-02	-1.2054E-02	
DVDZ	-2.4236E-01	-2.3549E-01	-2.1650E-01	-2.0795E-C1	-2.1025E-01	-2.0795E-01	-2.1650E-01	-2.3549E-01	-2.4236E-01	
DWDZ	3.4500E-16	1.8381E-03	-8.0926E-C4	-1.3211E-02	-2.C343E-10	1.3211E-02	8.0927E-04	-1.8381E-03	-5.7031E-12	
DSBDZ	-2.7204E-31	-2.6578E-03	-7.5013E-03	-8.9867E-03	-2.5124E-19	-8.9867E-C3	-7.5013E-03	-2.6578E-03	5.2815E-27	
PP	2.0973E-16	2.9228E-02	6.3814E-02	1.0893E-01	-8.4385E-10	-1.0893E-01	-6.3814E-02	-2.9228E-02	-5.2275E-15	
UP	-1.1439E-13	-6.8260E-02	-1.1815E-01	-1.2976E-C1	1.2879E-09	1.2976E-01	1.1815E-01	6.8260E-02	-3.6527E-13	
VP	1.7061E-15	1.2538E-01	1.0586E-01	-1.2171E-01	-8.8705E-09	1.2171E-01	-1.0586E-01	-1.2528E-01	2.6580E-14	
WP	-1.2489E+C0	-1.0659E+00	-6.1211E-01	1.0659E+00	2.4731E+00	1.0659E+00	-6.1211E-01	-1.0659E+00	-1.2489E+00	
SBARP	-1.0409E-15	1.1700E-01	2.3075E-01	3.6220E-C1	-2.6009E-09	-3.6220E-01	-2.3075E-C1	-1.1700E-01	-8.4613E-16	

ZETA= 6.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.6134E-02	2.6681E-02	2.9437E-02	3.3798E-C2	3.9807E-02	3.3798E-02	2.9437E-02	2.6681E-02	2.6134E-02	
P/ROASTSQ	1.4544E-01	1.4849E-01	1.6382E-01	1.8810E-01	2.2153E-01	1.8810E-01	1.6382E-01	1.4849E-01	1.4544E-01	
P/PTINF	2.3985E-04	2.4487E-04	2.7016E-04	3.1019E-04	3.6533E-04	3.1019E-04	2.7016E-04	2.4487E-C4	2.3985E-C4	
P/PINF	2.3416E+00	2.3906E+00	2.6375E+00	3.0283E+00	3.5667E+00	3.0283E+00	2.6375E+00	2.3906E+00	2.3416E+00	
RHO	1.8124E+00	1.8359E+00	1.9540E+00	2.1342E+00	2.3684E+00	2.1342E+00	1.9540E+00	1.8359E+00	1.8124E+00	
U	2.3276E+C0	2.3259E+00	2.32C1E+00	2.3132E+CC	2.3075E+C0	2.3132E+00	2.3201E+00	2.3259E+00	2.3276E+C0	
V	-1.4341E-01	-1.4070E-01	-1.3423E-01	-1.3411E-C1	-1.4369E-01	-1.3411E-01	-1.3423E-01	-1.4070E-01	-1.4341E-01	
W	0.	-6.6315E-02	-1.1185E-01	-1.1592E-01	5.8316E-10	1.1592E-01	1.1185E-01	6.6315E-02	0.	
UC	2.3232E+C0	2.3217E+00	2.3149E+00	2.3038E+00	2.2903E+C0	2.3038E+00	2.3149E+00	2.3217E+00	2.3232E+00	
VC	2.0276E-C1	2.0814E-01	2.3087E-01	2.7146E-01	3.1572E-C1	2.7146E-01	2.3087E-01	2.0814E-01	2.0276E-C1	
WC	3.4776E-16	1.4543E-02	3.3538E-02	3.6832E-C2	5.9622E-10	-3.6832E-02	-3.3538E-02	-1.4543E-02	1.8265E-11	
VCC	2.0276E-C1	2.0603E-01	2.2684E-01	2.6693E-01	3.1572E-01	2.6693E-01	2.2684E-01	2.0603E-01	2.0276E-C1	
WCC	0.	-3.2936E-02	-5.4511E-02	-6.1617E-02	5.8720E-10	6.1617E-02	5.4511E-02	3.2936E-02	7.5457E-12	
VX	0.	5.4983E-02	1.2879E-01	2.2538E-01	3.1572E-C1	2.2538E-01	1.2879E-01	5.4983E-02	-2.6755E-11	
VY	-2.0276E-01	-2.0127E-01	-1.9453E-01	-1.5572E-C1	5.8016E-10	1.5572E-01	1.9453E-01	2.0127E-01	2.0276E-01	
VZ	2.3232E+00	2.3217E+00	2.3149E+00	2.3038E+00	2.2903E+C0	2.3038E+00	2.3149E+00	2.3217E+00	2.3232E+00	
PSINOR	0.	1.3566E+00	3.1843E+00	5.5876E+00	7.8487E+00	5.5876E+00	3.1843E+00	1.3566E+00	-6.5986E-10	
THETNOR	8.5012E+01	8.5047E+01	8.5204E+01	8.6151E+01	9.0000E+01	8.6151E+01	8.5204E+01	8.5047E+01	8.5012E+01	
XBAR	0.	3.6260E-01	7.0839E-01	9.9785E-01	1.1448E+00	9.9785E-01	7.C839E-C1	3.6260E-01	-8.0431E-11	
XBHLD	0.	2.4152E-01	6.2780E-01	9.3387E-01	1.1448E+C0	9.3387E-01	6.2780E-01	2.4152E-01	-8.0431E-11	
YBAR	-8.4895E-01	-8.0076E-01	-6.6013E-01	-3.9595E-01	-2.5527E-11	3.9595E-C1	6.6013E-01	8.0076E-01	8.4895E-01	
YBHLD	-8.4895E-01	-8.1685E-01	-6.9290E-01	-4.5434E-01	-2.5530E-11	4.5434E-01	6.9290E-01	8.1685E-01	8.4895E-01	
ETA	4.3185E-02	4.0915E-02	3.6064E-02	2.7738E-02	2.4643E-C2	2.7738E-02	3.6064E-02	4.0915E-02	4.3185E-02	
G	-1.6434E-01	-1.6658E-01	-1.7391E-01	-1.8286E-01	-1.9942E-01	-1.8286E-01	-1.7391E-01	-1.6658E-01	-1.6434E-01	
DEQNS	5.9707E+00	6.0594E+00	6.5043E+00	7.4364E+C0	9.0295E+00	7.4364E+00	6.5043E+00	6.0594E+00	5.9707E+00	
AM	6.9575E+C0	6.9275E+00	6.7911E+00	6.6047E+00	6.3888E+00	6.6047E+00	6.7911E+00	6.9275E+00	6.9575E+00	
CROSSM	4.2785E-01	4.6224E-01	5.0999E-01	5.0464E-C1	3.9707E-C1	5.0464E-01	5.0999E-01	4.6224E-01	4.2785E-C1	
SBAR	1.8312E-02	2.0980E-02	3.2040E-02	4.6683E-02	6.4571E-02	4.6683E-02	3.2040E-02	2.0980E-02	1.8312E-02	
POROGAM	1.1367E-02	1.1397E-02	1.1524E-02	1.1694E-C2	1.1905E-02	1.1694E-02	1.1524E-02	1.1397E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.4890E-01	9.2302E-01	8.8985E-C1	8.5093E-01	8.8985E-01	9.2302E-01	9.4890E-01	9.5525E-01	
PT	1.0408E+02	1.0339E+02	1.0057E+02	9.6958E+01	9.2717E+01	9.6958E+01	1.0057E+02	1.0339E+02	1.0408E+02	
BERNOUL	1.0151E-09	-9.8528E-06	-3.9420E-05	1.1953E-04	1.8851E-10	1.1953E-04	-3.9420E-05	-9.8528E-06	1.0151E-09	
DPDZ	-3.3466E-03	-3.2942E-03	-3.2467E-03	-4.5367E-03	-7.2733E-03	-4.5367E-03	-3.2467E-03	-3.2942E-03	-3.3466E-03	
DUDZ	-1.0322E-02	-9.4941E-03	-7.8194E-03	-6.1646E-03	-5.9015E-03	-6.1646E-03	-7.8194E-03	-9.4941E-03	-1.0322E-02	
DVDZ	-2.3919E-01	-2.3300E-01	-2.1634E-01	-2.0913E-01	-2.1372E-C1	-2.0913E-01	-2.1634E-01	-2.3300E-01	-2.3919E-01	
DWDZ	-1.7676E-15	2.3051E-03	1.8893E-04	-1.2436E-02	-1.9302E-10	1.2436E-02	-1.8893E-04	-2.3051E-03	-6.6925E-12	
DSBDZ	-7.4734E-32	-3.4198E-03	-9.2259E-03	-1.0293E-02	-3.6481E-19	-1.0293E-02	-9.2259E-03	-3.4198E-03	1.0072E-26	
PP	-1.4855E-15	2.8906E-02	6.4795E-02	1.1358E-C1	-9.1300E-10	-1.1359E-01	-6.4795E-02	-2.8906E-02	-5.1789E-15	
UP	-4.3011E-14	-7.0928E-02	-1.2176E-01	-1.3182E-C1	1.3120E-C9	1.3182E-01	1.2176E-01	7.0928E-02	-4.1954E-13	
VP	5.9193E-15	1.0009E-01	7.9370E-02	-1.2323E-01	-1.3042E-08	1.2323E-01	-7.9370E-02	-1.00C9E-01	2.7161E-14	
WP	-1.2540E+00	-1.0671E+00	-5.9427E-01	1.0671E+0C	2.4425E+00	1.0671E+00	-5.9427E-01	-1.0671E+00	-1.2540E+C0	
SBARP	-2.0376E-16	1.2598E-01	2.3865E-01	3.5125E-01	-3.0375E-C9	-3.5125E-01	-2.3865E-C1	-1.2598E-01	-1.4042E-15	

APPENDIX B

ZETA= 5.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.6438E-02	2.6979E-02	2.9728E-02	3.4211E-02	4.0498E-02	3.4211E-02	2.9728E-02	2.6979E-02	2.6438E-02	
P/ROASTSQ	1.4713E-01	1.5014E-01	1.6545E-01	1.9039E-01	2.2538E-01	1.9039E-01	1.6545E-01	1.5014E-01	1.4713E-01	
P/PTINF	2.4264E-04	2.4760E-04	2.7284E-04	3.1398E-04	3.7167E-04	3.1398E-04	2.7284E-04	2.4760E-04	2.4264E-04	
P/PINF	2.3688E+00	2.4173E+00	2.6637E+00	3.0653E+00	3.6286E+00	3.0653E+00	2.6637E+00	2.4173E+00	2.3688E+00	
RHO	1.8274E+00	1.8500E+00	1.9663E+00	2.1511E+00	2.3976E+00	2.1511E+00	1.9663E+00	1.8500E+00	1.8274E+00	
U	2.3285E+00	2.3267E+00	2.3208E+00	2.3138E+00	2.3081E+00	2.3138E+00	2.3208E+00	2.3267E+00	2.3285E+00	
V	-1.1959E-01	-1.1746E-01	-1.1256E-01	-1.1307E-01	-1.2207E-01	-1.1307E-01	-1.1256E-01	-1.1746E-01	-1.1959E-01	
W	0.	-6.6563E-02	-1.1191E-01	-1.1471E-01	6.0114E-10	1.1471E-01	1.1191E-01	6.6563E-02	0.	
UC	2.3222E+00	2.3206E+00	2.3137E+00	2.3019E+00	2.2879E+00	2.3019E+00	2.3137E+00	2.3206E+00	2.3222E+00	
VC	2.0975E-01	2.1543E-01	2.3850E-01	2.8163E-01	3.2762E-01	2.8163E-01	2.3850E-01	2.1543E-01	2.0975E-01	
WC	3.5974E-16	1.4285E-02	3.3466E-02	3.8022E-02	6.1420E-10	-3.8022E-02	-3.3466E-02	-1.4285E-02	1.8263E-11	
VCC	2.0975E-01	2.1269E-01	2.3309E-01	2.7628E-01	3.2762E-01	2.7628E-01	2.3309E-01	2.1269E-01	2.0975E-01	
WCC	0.	-3.7065E-02	-6.0585E-02	-6.6567E-02	6.0465E-10	6.6567E-02	6.0585E-02	3.7065E-02	6.6104E-12	
VX	0.	5.6156E-02	1.3198E-01	2.3370E-01	3.2762E-01	2.3370E-01	1.3198E-01	5.6156E-02	-2.7046E-11	
VY	-2.0975E-01	-2.0847E-01	-2.0146E-01	-1.6170E-01	5.9754E-10	1.6170E-01	2.0146E-01	2.0847E-01	2.0975E-01	
VZ	2.3222E+00	2.3206E+00	2.3137E+00	2.3019E+00	2.2879E+00	2.3019E+00	2.3137E+00	2.3206E+00	2.3222E+00	
PSINOR	0.	1.3862E+00	3.2647E+00	5.7971E+00	8.1491E+00	5.7971E+00	3.2647E+00	1.3862E+00	-6.6732E-10	
THETNOR	8.4839E+01	8.4868E+01	8.5032E+01	8.6002E+01	9.0000E+01	8.6002E+01	8.5032E+01	8.4868E+01	8.4839E+01	
XBAR	0.	3.5471E-01	6.9323E-01	9.7767E-01	1.1205E+00	9.7767E-01	6.9323E-01	3.5471E-01	-7.8651E-11	
XBHLD	0.	2.0576E-01	5.8865E-01	8.9363E-01	1.1205E+00	8.9363E-01	5.8865E-01	2.0576E-01	-7.8651E-11	
YBAR	-9.0726E-01	-7.6201E-01	-6.2860E-01	-3.7790E-01	-2.4319E-11	3.7790E-01	6.2860E-01	7.6201E-01	8.0726E-01	
YBHLD	-8.0726E-01	-7.8101E-01	-6.6982E-01	-4.5197E-01	-2.4322E-11	4.5197E-01	6.6982E-01	7.8101E-01	8.0726E-01	
ETA	3.5988E-02	3.4096E-02	3.0053E-02	2.3115E-02	2.0536E-02	2.3115E-02	3.0053E-02	3.4096E-02	3.5988E-02	
G	-1.3415E-01	-1.3610E-01	-1.4226E-01	-1.4899E-01	-1.6153E-01	-1.4899E-01	-1.4226E-01	-1.3610E-01	-1.3415E-01	
DEQNS	6.1147E+00	6.1865E+00	6.5477E+00	7.3214E+00	8.6416E+00	7.3214E+00	6.5477E+00	6.1865E+00	6.1147E+00	
AM	6.9449E+00	6.9144E+00	6.7778E+00	6.5888E+00	6.3712E+00	6.5888E+00	6.7778E+00	6.9144E+00	6.9448E+00	
CROSSM	3.5619E-01	4.0054E-01	4.6245E-01	4.5756E-01	3.3650E-01	4.5756E-01	4.6245E-01	4.0054E-01	3.5619E-01	
SBAR	1.8312E-02	2.1376E-02	3.3078E-02	4.7794E-02	6.4571E-02	4.7794E-02	3.3078E-02	2.1376E-02	1.8312E-02	
PORJGAM	1.1367E-02	1.1402E-02	1.1536E-02	1.1707E-02	1.1905E-02	1.1707E-02	1.1536E-02	1.1402E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.4796E-01	9.2063E-01	8.8738E-01	8.5093E-01	8.8738E-01	9.2063E-01	9.4796E-01	9.5525E-01	
PT	1.0408E+02	1.0329E+02	1.0031E+02	9.6689E+01	9.2717E+01	9.6689E+01	1.0031E+02	1.0329E+02	1.0408E+02	
BERNOUL	1.0318E-09	-1.4984E-05	-4.9420E-05	1.6014E-04	2.1499E-10	1.6014E-04	-4.9420E-05	-1.4984E-05	1.0318E-09	
DPDZ	-2.7414E-03	-2.6691E-03	-2.5919E-03	-3.7118E-03	-6.5298E-03	-3.7118E-03	-2.5919E-03	-2.6691E-03	-2.7414E-03	
DUDZ	-8.6073E-03	-7.8554E-03	-6.4037E-03	-5.0640E-03	-5.0136E-03	-5.0640E-03	-6.4037E-03	-7.8554E-03	-8.6073E-03	
DVDZ	-2.3741E-01	-2.3181E-01	-2.1727E-01	-2.1175E-01	-2.1896E-01	-2.1175E-01	-2.1727E-01	-2.3181E-01	-2.3741E-01	
DWDZ	-1.6780E-15	2.6197E-03	8.1240E-04	-1.1806E-02	-1.6189E-10	1.1806E-02	-8.1239E-04	-2.6197E-03	-7.9826E-12	
DSBDZ	-2.1043E-31	-4.5803E-03	-1.1689E-02	-1.2021E-02	-5.4549E-19	-1.2021E-02	-1.1689E-02	-4.5803E-03	1.1788E-26	
PP	-1.2238E-15	2.8591E-02	6.5592E-02	1.1819E-01	-9.4910E-10	-1.1819E-01	-6.5592E-02	-2.8591E-02	-4.5317E-15	
UP	-7.8784E-14	-7.3282E-02	-1.2482E-01	-1.3335E-01	1.3823E-09	1.3335E-01	1.2482E-01	7.3282E-02	-5.2729E-13	
VP	1.0041E-16	7.7653E-02	5.6329E-02	-1.2058E-01	-1.7703E-08	1.2058E-01	-5.6329E-02	-7.7653E-02	2.6778E-14	
WP	-1.2597E+00	-1.0692E+00	-5.7680E-01	1.0692E+00	2.4133E+00	1.0692E+00	-5.7680E-01	-1.0692E+00	-1.2597E+00	
SBARP	-4.8282E-16	1.3734E-01	2.4723E-01	3.3774E-01	-3.5689E-09	-3.3774E-01	-2.4723E-01	-1.3734E-01	-1.4042E-15	

ZETA= 4.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.6684E-02	2.7216E-02	2.9955E-02	3.4539E-02	4.1110E-02	3.4539E-02	2.9955E-02	2.7216E-02	2.6684E-02	
P/ROASTSQ	1.4850E-01	1.5146E-01	1.6670E-01	1.9222E-01	2.2879E-01	1.9222E-01	1.6670E-01	1.5146E-01	1.4850E-01	
P/PTINF	2.4490E-04	2.4978E-04	2.7491E-04	3.1699E-04	3.7730E-04	3.1699E-04	2.7491E-04	2.4978E-04	2.4490E-04	
P/PINF	2.3909E+00	2.4386E+00	2.6839E+00	3.0947E+00	3.6835E+00	3.0947E+00	2.6839E+00	2.4386E+00	2.3909E+00	
RHO	1.8396E+00	1.8609E+00	1.9751E+00	2.1638E+00	2.4235E+00	2.1638E+00	1.9751E+00	1.8609E+00	1.8396E+00	
U	2.3293E+00	2.3275E+00	2.3214E+00	2.3142E+00	2.3085E+00	2.3142E+00	2.3214E+00	2.3275E+00	2.3293E+00	
V	-9.5889E-02	-9.4297E-02	-9.0740E-02	-9.1709E-02	-9.9836E-02	-9.1709E-02	-9.0740E-02	-9.4297E-02	-9.5889E-02	
W	0.	-6.6828E-02	-1.1199E-01	-1.1355E-01	6.1420E-10	1.1355E-01	1.1199E-01	6.6828E-02	0.	
UC	2.3212E+00	2.3196E+00	2.3125E+00	2.3000E+00	2.2855E+00	2.3000E+00	2.3125E+00	2.3196E+00	2.3212E+00	
VC	2.1662E-01	2.2265E-01	2.4627E-01	2.9213E-01	3.4014E-01	2.9213E-01	2.4627E-01	2.2265E-01	2.1662E-01	
WC	3.7152E-16	1.4011E-02	3.3364E-02	3.9162E-02	6.2726E-10	-3.9162E-02	-3.3364E-02	-1.4011E-02	1.8261E-11	
VCC	2.1662E-01	2.1919E-01	2.3928E-01	2.8582E-01	3.4014E-01	2.8582E-01	2.3928E-01	2.1919E-01	2.1662E-01	
WCC	0.	-4.1553E-02	-6.7151E-02	-7.1979E-02	6.1713E-10	7.1979E-02	6.7151E-02	4.1553E-02	5.5829E-12	
VX	0.	5.7302E-02	1.3520E-01	2.4223E-01	3.4014E-01	2.4223E-01	1.3520E-01	5.7302E-02	-2.7332E-11	
VY	-2.1662E-01	-2.1561E-01	-2.0853E-01	-1.6793E-01	6.0996E-10	1.6793E-01	2.0853E-01	2.1561E-01	2.1662E-01	
VZ	2.3212E+00	2.3196E+00	2.3125E+00	2.3000E+00	2.2855E+00	2.3000E+00	2.3125E+00	2.3196E+00	2.3212E+00	
PSINOR	0.	1.4151E+00	3.3459E+00	6.0120E+00	8.4650E+00	6.0120E+00	3.3459E+00	1.4151E+00	-6.7465E-10	
THETNOR	8.4669E+01	8.4691E+01	8.4856E+01	8.5847E+01	9.0000E+01	8.5847E+01	8.4856E+01	8.4691E+01	8.4669E+01	
XBAR	0.	3.4685E-01	6.7810E-01	9.5752E-01	1.0964E+00	9.5752E-01	6.7810E-01	3.4685E-01	-7.6874E-11	
XBHLD	0.	1.7081E-01	5.4672E-01	8.4980E-01	1.0964E+00	8.4980E-01	5.4672E-01	1.7081E-01	-7.6874E-11	
YBAR	-7.6565E-01	-7.2334E-01	-5.9713E-01	-3.5987E-01	-2.3113E-11	3.5987E-01	5.9713E-01	7.2334E-01	7.6565E-01	
YBHLD	-7.6565E-01	-7.4482E-01	-6.4719E-01	-4.5134E-01	-2.3116E-11	4.5134E-01	6.4719E-01	7.4482E-01	7.6565E-01	
ETA	2.8790E-02	2.7277E-02	2.4043E-02	1.8492E-02	1.6428E-02	1.8492E-02	2.4043E-02	2.7277E-02	2.8790E-02	
G	-1.0524E-01	-1.0686E-01	-1.1179E-01	-1.1662E-01	-1.2566E-01	-1.1662E-01	-1.1179E-01	-1.0686E-01	-1.0524E-01	
DEQNS	6.1584E+00	6.2144E+00	6.4963E+00	7.1088E+00	8.1517E+00	7.1088E+00	6.4963E+00	6.2144E+00	6.1584E+00	
AM	6.9347E+00	6.9033E+00	6.7661E+00	6.5752E+00	6.3559E+00	6.5752E+00	6.7661E+00	6.9033E+00	6.9347E+00	
CROSSM	2.8523E-01	3.4239E-01	4.1931E-01	4.1388E-01	2.7462E-01	4.1388E-01	4.1931E-01	3.4239E-01	2.8523E-01	
SBAR	1.8312E-02	2.1921E-02	3.4420E-02	4.9109E-02	6.4571E-02	4.9109E-02	3.4420E-02	2.1921E-02	1.8312E-02	
PORJGAM	1.1367E-02	1.1408E-02	1.1552E-02	1.1722E-02	1.1905E-02	1.1722E-02	1.1552E-02	1.1408E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.4667E-01	9.1755E-01	8.8446E-01	8.5093E-01	8.8446E-01	9.1755E-01	9.4667E-01	9.5525E-01	
PT	1.0408E+02	1.0315E+02	9.9976E+01	9.6372E+01	9.2717E+01	9.6372E+01	9.9976E+01	1.0315E+02	1.0408E+02	
BERNOUL	1.0367E-09	-2.2172E-05	-5.8502E-05	2.0833E-04	2.7131E-10	2.0833E-04	-5.8502E-05	-2.2172E-05	1.0368E-09	
DPDZ	-2.1887E-03	-2.0813E-03	-1.9260E-03	-2.8430E-03	-5.7078E-03	-2.8430E-03	-1.9260E-03	-2.0813E-03	-2.1887E-03	
DUDZ	-6.9017E-03	-6.1800E-03	-4.8958E-03	-3.8784E-03	-4.1004E-03	-3.8784E-03	-4.8958E-03	-6.1900E-03	-6.9017E-03	
DVDZ	-2.3670E-01	-2.3168E-01	-2.1920E-01	-2.1576E-01	-2.2610E-01	-2.1576E-01	-2.1920E-01	-2.3168E-01	-2.3670E-01	
DWDZ	-1.4780E-15	2.6079E-03	7.6489E-04	-1.1417E-02	-8.9846E-11	1.1417E-02	-7.6488E-04	-2.6079E-03	-9.7786E-12	
DSBDZ	-6.8916E-31	-6.4935E-03	-1.5442E-02	-1.4426E-02	-8.5324E-19	-1.4426E-02	-1.5442E-02	-6.4935E-03	8.5431E-27	
PP	-9.5871E-16	2.8214E-02	6.6133E-02	1.2269E-01	-9.4410E-10	-1.2269E-01	-6.6133E-02	-2.8214E-02	-5.8018E-15	
UP	-1.1455E-13	-7.5409E-02	-1.2739E-01	-1.3429E-01	1.5160E-09	1.3429E-01	1.2739E-01	7.5409E-02	-4.0276E-13	
VP	3.7763E-15	5.7808E-02	3.6925E-02	-1.1284E-01	-2.3018E-08	1.1284E-01	-3.6925E-02	-5.7809E-02	2.2006E-14	
WP	-1.2658E+00	-1.0716E+00	-5.5974E-01	1.0716E+00	2.3853E+00	1.0716E+00	-5.5974E-01	-1.0716E+00	-1.2658E+00	
SBARP	-1.0409E-15	1.5227E-01	2.5645E-01	3.2051E-01	-4.2503E-09	-3.2051E-01	-2.5645E-01	-1.5227E-01	-8.4613E-16	

APPENDIX B

ZETA= 3.0000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.6876E-02	2.7395E-02	3.0112E-02	3.4777E-02	4.1634E-02	3.4777E-02	3.0112E-02	2.7395E-02	2.6876E-02	
P/ROASTSQ	1.4957E-01	1.5246E-01	1.6758E-01	1.9354E-01	2.3170E-01	1.9354E-01	1.6758E-01	1.5246E-01	1.4957E-01	
P/PTINF	2.4666E-04	2.5142E-04	2.7636E-04	3.1917E-04	3.8211E-04	3.1917E-04	2.7636E-04	2.5142E-04	2.4666E-04	
P/PINF	2.4081E+00	2.4546E+00	2.6981E+00	3.1160E+00	3.7304E+00	3.1160E+00	2.6981E+00	2.4546E+00	2.4081E+00	
RHO	1.8490E+00	1.8686E+00	1.9799E+00	2.1719E+00	2.4455E+00	2.1719E+00	1.9799E+00	1.8686E+00	1.8490E+00	
U	2.3299E+00	2.3280E+00	2.3218E+00	2.3145E+00	2.3089E+00	2.3145E+00	2.3218E+00	2.3280E+00	2.3299E+00	
V	-7.2214E-02	-7.1094E-02	-6.8683E-02	-6.9873E-02	-7.6779E-02	-6.9873E-02	-6.8683E-02	-7.1094E-02	-7.2214E-02	
W	0.	-6.7059E-02	-1.1201E-01	-1.1241E-01	6.1634E-10	1.1241E-01	1.1201E-01	6.7059E-02	0.	
UC	2.3203E+00	2.3186E+00	2.3113E+00	2.2981E+00	2.2829E+00	2.2981E+00	2.3113E+00	2.3186E+00	2.3203E+00	
VC	2.2346E-01	2.2991E-01	2.5429E-01	3.0310E-01	3.5347E-01	3.0310E-01	2.5429E-01	2.2991E-01	2.2346E-01	
WC	3.8327E-16	1.3773E-02	3.3328E-02	4.0286E-02	6.2939E-10	-4.0286E-02	-3.3328E-02	-1.3773E-02	1.8260E-11	
VCC	2.2346E-01	2.2560E-01	2.4549E-01	2.9568E-01	3.5347E-01	2.9568E-01	2.4549E-01	2.2560E-01	2.2346E-01	
WCC	0.	-4.6422E-02	-7.4203E-02	-7.7901E-02	6.1864E-10	7.7901E-02	7.4203E-02	4.6422E-02	4.4414E-12	
VX	0.	5.8489E-02	1.3858E-01	2.5109E-01	3.5347E-01	2.5109E-01	1.3858E-01	5.8489E-02	-2.7617E-11	
VY	-2.2346E-01	-2.2277E-01	-2.1579E-01	-1.7449E-01	6.1141E-10	1.7449E-01	2.1579E-01	2.2277E-01	2.2346E-01	
VZ	2.3203E+00	2.3186E+00	2.3113E+00	2.2981E+00	2.2829E+00	2.2981E+00	2.3113E+00	2.3186E+00	2.3203E+00	
PSINOR	0.	1.4450E+00	3.4313E+00	6.2354E+00	8.8014E+00	6.2354E+00	3.4313E+00	1.4450E+00	-6.8196E-10	
THETNOR	8.4499E+01	8.4514E+01	8.4676E+01	8.5683E+01	9.0000E+01	8.5683E+01	8.4676E+01	8.4514E+01	8.4499E+01	
XBAR	0.	3.3900E-01	6.6300E-01	9.3740E-01	1.0722E+00	9.3740E-01	6.6300E-01	3.3900E-01	-7.5101E-11	
XBHLD	0.	1.3644E-01	5.0038E-01	7.9948E-01	1.0722E+00	7.9948E-01	5.0038E-01	1.3644E-01	-7.5101E-11	
YBAR	-7.2413E-01	-6.8475E-01	-5.6572E-01	-3.4188E-01	-2.1909E-11	3.4188E-01	5.6572E-01	6.8475E-01	7.2413E-01	
YBHLD	-7.2413E-01	-7.0828E-01	-6.2546E-01	-4.5438E-01	-2.1911E-11	4.5438E-01	6.2546E-01	7.0828E-01	7.2413E-01	
ETA	2.1593E-02	2.0458E-02	1.8032E-02	1.3869E-02	1.2321E-02	1.3869E-02	1.8032E-02	2.0458E-02	2.1593E-02	
G	-7.7503E-02	-7.8751E-02	-8.2411E-02	-8.5627E-02	-9.1675E-02	-8.5627E-02	-8.2411E-02	-7.8751E-02	-7.7503E-02	
DEQNS	6.1150E+00	6.1562E+00	6.3626E+00	6.8144E+00	7.5817E+00	6.8144E+00	6.3626E+00	6.1562E+00	6.1150E+00	
AM	6.9268E+00	6.8940E+00	6.7556E+00	6.5636E+00	6.3430E+00	6.5636E+00	6.7556E+00	6.8940E+00	6.9268E+00	
CROSSM	2.1459E-01	2.8916E-01	3.8170E-01	3.7472E-01	2.1081E-01	3.7472E-01	3.8170E-01	2.8916E-01	2.1459E-01	
SBAR	1.8312E-02	2.2727E-02	3.6249E-02	5.0719E-02	6.4571E-02	5.0719E-02	3.6249E-02	2.2727E-02	1.8312E-02	
POROGAM	1.1367E-02	1.1417E-02	1.1573E-02	1.1741E-02	1.1905E-02	1.1741E-02	1.1573E-02	1.1417E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.4477E-01	9.1336E-01	8.8091E-01	8.5093E-01	8.8091E-01	9.1336E-01	9.4477E-01	9.5525E-01	
PT	1.0408E+02	1.0294E+02	9.9520E+01	9.5984E+01	9.2717E+01	9.5984E+01	9.9520E+01	1.0294E+02	1.0408E+02	
BERNOUL	1.0406E-09	-3.2605E-05	-6.4880E-05	2.6801E-04	3.7376E-10	2.6801E-04	-6.4880E-05	-3.2605E-05	1.0406E-09	
DPDZ	-1.6617E-03	-1.5055E-03	-1.2235E-03	-1.8876E-03	-4.7441E-03	-1.8876E-03	-1.2235E-03	-1.5055E-03	-1.6617E-03	
DUDZ	-5.1976E-03	-4.4069E-03	-3.1912E-03	-2.5369E-03	-3.1534E-03	-2.5369E-03	-3.1912E-03	-4.4069E-03	-5.1976E-03	
DVDZ	-2.3695E-01	-2.3254E-01	-2.2212E-01	-2.2120E-01	-2.3544E-01	-2.2120E-01	-2.2212E-01	-2.3254E-01	-2.3695E-01	
DWDZ	-3.3885E-15	1.8132E-03	-6.8494E-04	-1.1560E-02	6.7421E-11	1.1560E-02	6.8495E-04	-1.8132E-03	-1.2511E-11	
DSBDZ	-1.9429E-31	-1.0044E-02	-2.1738E-02	-1.8048E-02	-1.4377E-18	-1.8048E-02	-2.1738E-02	-1.0044E-02	1.4274E-26	
PP	-1.5278E-15	2.7714E-02	6.6332E-02	1.2699E-01	-8.8548E-10	-1.2699E-01	-6.6332E-02	-2.7714E-02	-5.0850E-15	
UP	-9.6722E-14	-7.7473E-02	-1.2952E-01	-1.3450E-01	1.7477E-09	1.3450E-01	1.2952E-01	7.7473E-02	-4.3886E-13	
VP	1.8725E-15	4.0482E-02	2.1471E-02	-9.8823E-02	-2.9201E-08	9.8823E-02	-2.1471E-02	-4.0482E-02	1.2784E-14	
WP	-1.2713E+00	-1.0732E+00	-5.4329E-01	1.0732E+00	2.3579E+00	1.0732E+00	-5.4329E-01	-1.0732E+00	-1.2713E+00	
SBARP	-2.0376E-15	1.7297E-01	2.6608E-01	2.9739E-01	-5.2066E-09	-2.9739E-01	-2.6608E-01	-1.7297E-01	-1.1252E-15	

ZETA= 2.0000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.7017E-02	2.7517E-02	3.0197E-02	3.4912E-02	4.2052E-02	3.4912E-02	3.0197E-02	2.7517E-02	2.7017E-02	
P/ROASTSQ	1.5035E-01	1.5314E-01	1.6805E-01	1.9430E-01	2.3403E-01	1.9430E-01	1.6805E-01	1.5314E-01	1.5035E-01	
P/PTINF	2.4795E-04	2.5254E-04	2.7714E-04	3.2041E-04	3.8594E-04	3.2041E-04	2.7714E-04	2.5254E-04	2.4795E-04	
P/PINF	2.4207E+00	2.4655E+00	2.7057E+00	3.1282E+00	3.7678E+00	3.1282E+00	2.7057E+00	2.4655E+00	2.4207E+00	
RHO	1.8559E+00	1.8727E+00	1.9801E+00	2.1747E+00	2.4630E+00	2.1747E+00	1.9801E+00	1.8727E+00	1.8559E+00	
U	2.3304E+00	2.3283E+00	2.3220E+00	2.3147E+00	2.3091E+00	2.3147E+00	2.3220E+00	2.3283E+00	2.3304E+00	
V	-4.8464E-02	-4.7752E-02	-4.6281E-02	-4.7416E-02	-5.2660E-02	-4.7416E-02	-4.6281E-02	-4.7752E-02	-4.8464E-02	
W	0.	-6.7121E-02	-1.1174E-01	-1.1119E-01	5.9426E-10	1.1119E-01	1.1174E-01	6.7121E-02	0.	
UC	2.3194E+00	2.3176E+00	2.3100E+00	2.2960E+00	2.2803E+00	2.2960E+00	2.3100E+00	2.3176E+00	2.3194E+00	
VC	2.3039E-01	2.3731E-01	2.6263E-01	3.1468E-01	3.6786E-01	3.1468E-01	2.6263E-01	2.3731E-01	2.3039E-01	
WC	3.9515E-16	1.3705E-02	3.3580E-02	4.1482E-02	6.0731E-10	-4.1482E-02	-3.3580E-02	-1.3705E-02	1.8259E-11	
VCC	2.3039E-01	2.3203E-01	2.5187E-01	3.0599E-01	3.6786E-01	3.0599E-01	2.5187E-01	2.3203E-01	2.3039E-01	
WCC	0.	-5.1633E-02	-8.1638E-02	-8.4344E-02	5.9587E-10	8.4344E-02	8.1638E-02	5.1633E-02	3.1588E-12	
VX	0.	5.9869E-02	1.4237E-01	2.6045E-01	3.6786E-01	2.6045E-01	1.4237E-01	5.9869E-02	-2.7906E-11	
VY	-2.3039E-01	-2.3004E-01	-2.2324E-01	-1.8141E-01	5.8860E-10	1.8141E-01	2.2324E-01	2.3004E-01	2.3039E-01	
VZ	2.3194E+00	2.3176E+00	2.3100E+00	2.2960E+00	2.2803E+00	2.2960E+00	2.3100E+00	2.3176E+00	2.3194E+00	
PSINOR	0.	1.4797E+00	3.5268E+00	6.4717E+00	9.1642E+00	6.4717E+00	3.5268E+00	1.4797E+00	-6.8935E-10	
THETNOR	8.4327E+01	8.4333E+01	8.4491E+01	8.5511E+01	9.0000E+01	8.5511E+01	8.4491E+01	8.4333E+01	8.4327E+01	
XBAR	0.	3.3116E-01	6.4793E-01	9.1731E-01	1.0481E+00	9.1731E-01	6.4793E-01	3.3116E-01	-7.3331E-11	
XBHLD	0.	1.0217E-01	4.4581E-01	7.3517E-01	1.0481E+00	7.3517E-01	4.4581E-01	1.0217E-01	-7.3331E-11	
YBAR	-6.8268E-01	-6.4622E-01	-5.3435E-01	-3.2391E-01	-2.0707E-11	3.2391E-01	5.3435E-01	6.4622E-01	6.8268E-01	
YBHLD	-6.8268E-01	-6.7143E-01	-6.0573E-01	-4.6620E-01	-2.0709E-11	4.6620E-01	6.0573E-01	6.7143E-01	6.8268E-01	
ETA	1.4395E-02	1.3638E-02	1.2021E-02	9.2459E-03	8.2142E-03	9.2459E-03	1.2021E-02	1.3638E-02	1.4395E-02	
G	-5.0833E-02	-5.1666E-02	-5.4022E-02	-5.5907E-02	-5.9472E-02	-5.5907E-02	-5.4022E-02	-5.1666E-02	-5.0833E-02	
DEQNS	5.9958E+00	6.0229E+00	6.1571E+00	6.4517E+00	6.9503E+00	6.4517E+00	6.1571E+00	6.0229E+00	5.9958E+00	
AM	6.9211E+00	6.8856E+00	6.7453E+00	6.5538E+00	6.3328E+00	6.5538E+00	6.7453E+00	6.8856E+00	6.9211E+00	
CROSSM	1.4391E-01	2.4346E-01	3.5088E-01	3.4179E-01	1.4438E-01	3.4179E-01	3.5088E-01	2.4346E-01	1.4391E-01	
SBAR	1.8312E-02	2.4072E-02	3.8965E-02	5.2803E-02	6.4571E-02	5.2803E-02	3.8965E-02	2.4072E-02	1.8312E-02	
POROGAM	1.1367E-02	1.1433E-02	1.1604E-02	1.1766E-02	1.1905E-02	1.1766E-02	1.1604E-02	1.1433E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.4159E-01	9.0718E-01	8.7634E-01	8.5093E-01	8.7634E-01	9.0718E-01	9.4159E-01	9.5525E-01	
PT	1.0408E+02	1.0260E+02	9.8847E+01	9.5486E+01	9.2717E+01	9.5486E+01	9.8847E+01	1.0260E+02	1.0408E+02	
BERNOUL	1.0694E-09	-4.8721E-05	-6.3468E-05	3.4743E-04	5.2492E-10	3.4743E-04	-6.3467E-05	-4.8722E-05	1.0694E-09	
DPDZ	-1.1398E-03	-9.2084E-04	-4.6239E-04	-8.0001E-04	-3.5561E-03	-8.0001E-04	-4.6239E-04	-9.2084E-04	-1.1398E-03	
DUDZ	-3.4882E-03	-2.3410E-03	-9.7272E-04	-8.5347E-04	-2.1628E-03	-8.5347E-04	-9.7272E-04	-2.3410E-03	-3.4882E-03	
DVDZ	-2.3825E-01	-2.3451E-01	-2.2611E-01	-2.2821E-01	-2.4743E-01	-2.2821E-01	-2.2611E-01	-2.3451E-01	-2.3825E-01	
DWDZ	3.2058E-15	-1.1671E-03	-5.5751E-03	-1.3071E-02	4.2492E-10	1.3071E-02	5.5751E-03	1.1671E-03	-1.7399E-11	
DSBDZ	-1.1147E-30	-1.8108E-02	-3.4182E-02	-2.4251E-02	-2.7950E-18	-2.4251E-02	-3.4182E-02	-1.8108E-02	1.5480E-28	
PP	4.1767E-16	2.7030E-02	6.6087E-02	1.3095E-01	-7.5505E-10	-1.3095E-01	-6.6087E-02	-2.7030E-02	-5.7307E-15	
UP	-9.6746E-14	-7.9847E-02	-1.3128E-01	-1.3363E-01	2.1691E-09	1.3363E-01	1.3128E-01	7.9847E-02	-4.2127E-13	
VP	1.6386E-15	2.5655E-02	1.0313E-02	-7.6926E-02	-3.6558E-08	7.6926E-02	-1.0313E-02	-2.5655E-02	9.6535E-15	
WP	-1.2736E+00	-1.0717E+00	-5.2800E-01	1.0717E+00	2.3296E+00	1.0717E+00	-5.2800E-01	-1.0717E+00	-1.2736E+00	
SBARP	-7.6187E-16	2.0440E-01	2.7493E-01	2.6375E-01	-6.8106E-09	-2.6375E-01	-2.7493E-01	-2.0440E-01	-8.9674E-18	

ZETA= -1.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.7104E-02	2.7579E-02	3.0202E-02	3.4931E-02	4.2334E-02	3.4931E-02	3.0202E-02	2.7579E-02	2.7104E-02	
P/ROASTSQ	1.5084E-01	1.5348E-01	1.6808E-01	1.9440E-01	2.3560E-01	1.9440E-01	1.6808E-01	1.5348E-01	1.5084E-01	
P/PTINF	2.4875E-04	2.5311E-04	2.7719E-04	3.2058E-04	3.8853E-04	3.2058E-04	2.7719E-04	2.5311E-04	2.4875E-04	
P/PINF	2.4285E+00	2.4710E+00	2.7061E+00	3.1298E+00	3.7932E+00	3.1298E+00	2.7061E+00	2.4710E+00	2.4285E+00	
RHO	1.8602E+00	1.8718E+00	1.9735E+00	2.1708E+00	2.4748E+00	2.1708E+00	1.9735E+00	1.8718E+00	1.8602E+00	
U	2.3306E+00	2.3284E+00	2.3219E+00	2.3147E+00	2.3093E+00	2.3147E+00	2.3219E+00	2.3284E+00	2.3306E+00	
V	-2.4510E-02	-2.4141E-02	-2.3421E-02	-2.4175E-02	-2.7184E-02	-2.4175E-02	-2.3421E-02	-2.4141E-02	-2.4510E-02	
W	0.	-6.6559E-02	-1.1054E-01	-1.0965E-01	5.1162E-10	1.0965E-01	1.1054E-01	6.6559E-02	0.	
UC	2.3186E+00	2.3165E+00	2.3085E+00	2.2938E+00	2.2774E+00	2.2938E+00	2.3085E+00	2.3165E+00	2.3186E+00	
VC	2.3752E-01	2.4497E-01	2.7141E-01	3.2703E-01	3.8359E-01	3.2703E-01	2.7141E-01	2.4497E-01	2.3752E-01	
WC	4.0738E-16	1.4259E-02	3.4762E-02	4.3003E-02	5.2467E-10	-4.3003E-02	-3.4762E-02	-1.4259E-02	1.8258E-11	
VCC	2.3752E-01	2.3870E-01	2.5875E-01	3.1699E-01	3.8359E-01	3.1699E-01	2.5875E-01	2.3870E-01	2.3752E-01	
WCC	0.	-5.6856E-02	-8.8995E-02	-9.1182E-02	5.1247E-10	9.1182E-02	8.8995E-02	5.6866E-02	1.6992E-12	
VX	0.	6.1911E-02	1.4718E-01	2.7060E-01	3.8359E-01	2.7060E-01	1.4718E-01	6.1911E-02	-2.8204E-11	
VY	-2.3752E-01	-2.3745E-01	-2.3067E-01	-1.8861E-01	5.0516E-10	1.8861E-01	2.3067E-01	2.3745E-01	2.3752E-01	
VZ	2.3186E+00	2.3165E+00	2.3085E+00	2.2938E+00	2.2774E+00	2.2938E+00	2.3085E+00	2.3165E+00	2.3186E+00	
PSINOR	0.	1.5309E+00	3.6481E+00	6.7280E+00	9.5609E+00	6.7280E+00	3.6481E+00	1.5309E+00	-6.9697E-10	
THETNOR	8.4151E+01	8.4150E+01	8.4305E+01	8.5332E+01	9.0000E+01	8.5332E+01	8.4305E+01	8.4150E+01	8.4151E+01	
XBAR	0.	3.2333E-01	6.3287E-01	8.9726E-01	1.0240E+00	8.9726E-01	6.3287E-01	3.2333E-01	-7.1564E-11	
XBHLD	0.	6.6516E-02	3.6955E-01	6.2685E-01	1.0240E+00	6.2685E-01	3.6955E-01	6.6516E-02	-7.1564E-11	
YBAR	-6.4131E-01	-6.0775E-01	-5.0304E-01	-3.0596E-01	-1.9506E-11	3.0596E-01	5.0304E-01	6.0775E-01	6.4131E-01	
YBHLD	-6.4131E-01	-6.3441E-01	-5.9212E-01	-5.0508E-01	-1.9510E-11	5.0508E-01	5.9212E-01	6.3441E-01	6.4131E-01	
ETA	7.1975E-03	6.8192E-03	6.0107E-03	4.6229E-03	4.1071E-03	4.6229E-03	6.0107E-03	6.8192E-03	7.1975E-03	
G	-2.5110E-02	-2.5487E-02	-2.6551E-02	-2.7373E-02	-2.8942E-02	-2.7373E-02	-2.6551E-02	-2.5487E-02	-2.5110E-02	
DEONS	5.8100E+00	5.8234E+00	5.8888E+00	6.0321E+00	6.2736E+00	6.0321E+00	5.8888E+00	5.8234E+00	5.8100E+00	
AM	6.9176E+00	6.8755E+00	6.7321E+00	6.5449E+00	6.3260E+00	6.5449E+00	6.7321E+00	6.8755E+00	6.9176E+00	
CROSSM	7.2745E-02	2.0897E-01	3.2722E-01	3.1712E-01	7.4461E-02	3.1712E-01	3.2722E-01	2.0897E-01	7.2745E-02	
SBAR	1.8312E-02	2.6951E-02	4.3774E-02	5.5813E-02	6.4571E-02	5.5813E-02	4.3774E-02	2.6951E-02	1.8312E-02	
PORDGAM	1.1367E-02	1.1466E-02	1.1660E-02	1.1801E-02	1.1905E-02	1.1801E-02	1.1660E-02	1.1466E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.3494E-01	8.9634E-01	8.6976E-01	8.5093E-01	8.6976E-01	8.9634E-01	9.3484E-01	9.5525E-01	
PT	1.0408E+02	1.0186E+02	9.7666E+01	9.4770E+01	9.2717E+01	9.4770E+01	9.7666E+01	1.0186E+02	1.0408E+02	
BERNOUL	1.2743E-09	-7.6625E-05	-3.3685E-05	4.7034E-04	6.1543E-10	4.7034E-04	-3.3684E-05	-7.6625E-05	1.2743E-09	
DPDZ	-6.0218E-04	-3.0924E-04	3.6986E-04	4.6721E-04	-2.0289E-03	4.6721E-04	3.6986E-04	-3.0924E-04	-6.0218E-04	
DUDZ	-1.7641E-03	1.1708E-03	3.3731E-03	1.9370E-03	-1.1165E-03	1.9370E-03	3.3732E-03	1.1708E-03	-1.7641E-03	
DVDZ	-2.4125E-01	-2.3809E-01	-2.3130E-01	-2.3689E-01	-2.6269E-01	-2.3689E-01	-2.3130E-01	-2.3809E-01	-2.4125E-01	
DWDZ	-1.0379E-14	-1.2979E-02	-2.1970E-02	-1.8907E-02	1.4074E-09	1.8907E-02	2.1970E-02	1.2979E-02	-2.9734E-11	
DSBDZ	1.7373E-30	-4.6624E-02	-6.9193E-02	-3.8137E-02	-7.9425E-18	-3.8137E-02	-6.9193E-02	-4.6624E-02	-7.9347E-26	
PP	-1.5407E-15	2.6111E-02	6.5274E-02	1.3434E-01	-5.2821E-10	-1.3434E-01	-6.5274E-02	-2.6111E-02	-5.5062E-15	
UP	-5.1042E-14	-8.3820E-02	-1.3259E-01	-1.3047E-01	3.1798E-09	1.3047E-01	1.3259E-01	8.3820E-02	-3.8572E-13	
VP	5.5607E-16	1.3098E-02	3.5973E-03	-4.5029E-02	-4.5588E-08	4.5029E-02	-3.5972E-03	-1.3098E-02	5.0005E-15	
WP	-1.2637E+00	-1.0604E+00	-5.1626E-01	1.0604E+00	2.2963E+00	1.0604E+00	-5.1626E-01	-1.0604E+00	-1.2637E+00	
SBARP	6.3340E-16	2.6182E-01	2.7651E-01	2.0594E-01	-1.0940E-08	-2.0594E-01	-2.7651E-01	-2.6182E-01	2.7816E-15	

ZETA= 5.00000000E-02

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.7127E-02	2.7586E-02	3.0173E-02	3.4890E-02	4.2413E-02	3.4890E-02	3.0173E-02	2.7586E-02	2.7127E-02	
P/ROASTSQ	1.5097E-01	1.5352E-01	1.6792E-01	1.9417E-01	2.3604E-01	1.9417E-01	1.6792E-01	1.5352E-01	1.5097E-01	
P/PTINF	2.4896E-04	2.5318E-04	2.7692E-04	3.2021E-04	3.8925E-04	3.2021E-04	2.7692E-04	2.5318E-04	2.4896E-04	
P/PINF	2.4306E+00	2.4717E+00	2.7035E+00	3.1261E+00	3.8002E+00	3.1261E+00	2.7035E+00	2.4717E+00	2.4306E+00	
RHO	1.8613E+00	1.8674E+00	1.9656E+00	2.1655E+00	2.4781E+00	2.1655E+00	1.9656E+00	1.8674E+00	1.8613E+00	
U	2.3307E+00	2.3282E+00	2.3216E+00	2.3145E+00	2.3093E+00	2.3145E+00	2.3216E+00	2.3282E+00	2.3307E+00	
V	-1.2379E-02	-1.2168E-02	-1.1782E-02	-1.2209E-02	-1.3827E-02	-1.2209E-02	-1.1782E-02	-1.2168E-02	-1.2379E-02	
W	0.	-6.5440E-02	-1.0889E-01	-1.0852E-01	4.1111E-10	1.0852E-01	1.0889E-01	6.5440E-02	0.	
UC	2.3182E+00	2.3158E+00	2.3075E+00	2.2925E+00	2.2759E+00	2.2925E+00	2.3075E+00	2.3158E+00	2.3182E+00	
VC	2.4124E-01	2.4895E-01	2.7598E-01	3.3353E-01	3.9207E-01	3.3353E-01	2.7598E-01	2.4895E-01	2.4124E-01	
WC	4.1376E-16	1.5368E-02	3.6382E-02	4.4118E-02	4.2416E-10	-4.4118E-02	-3.6382E-02	-1.5368E-02	1.8258E-11	
VCC	2.4124E-01	2.4235E-01	2.6270E-01	3.2287E-01	3.9207E-01	3.2287E-01	2.6270E-01	2.4235E-01	2.4124E-01	
WCC	0.	-5.8968E-02	-9.2075E-02	-9.4567E-02	4.1155E-10	9.4567E-02	9.2075E-02	5.8968E-02	8.8642E-13	
VX	0.	6.3777E-02	1.5060E-01	2.7615E-01	3.9207E-01	2.7615E-01	1.5060E-01	6.3777E-02	-2.8360E-11	
VY	-2.4124E-01	-2.4113E-01	-2.3411E-01	-1.9217E-01	4.0422E-10	1.9217E-01	2.3411E-01	2.4113E-01	2.4124E-01	
VZ	2.3182E+00	2.3158E+00	2.3075E+00	2.2925E+00	2.2759E+00	2.2925E+00	2.3075E+00	2.3158E+00	2.3182E+00	
PSINOR	0.	1.5775E+00	3.7342E+00	6.8685E+00	9.7746E+00	6.8685E+00	3.7342E+00	1.5775E+00	-7.0094E-10	
THETNOR	8.4059E+01	8.4058E+01	8.4219E+01	8.5243E+01	9.0000E+01	8.5243E+01	8.4219E+01	8.4058E+01	8.4059E+01	
XBAR	0.	3.1943E-01	6.2536E-01	8.8724E-01	1.0120E+00	8.8724E-01	6.2536E-01	3.1943E-01	-7.0682E-11	
XBHLD	0.	4.6462E-02	2.9152E-01	5.3982E-01	1.0120E+00	5.3982E-01	2.9152E-01	4.6462E-02	-7.0682E-11	
YBAR	-6.2065E-01	-5.8855E-01	-4.8741E-01	-2.9700E-01	-1.8907E-11	2.9700E-01	4.8741E-01	5.8855E-01	6.2065E-01	
YBHLD	-6.2065E-01	-6.1598E-01	-5.9135E-01	-5.1569E-01	-1.8909E-11	5.1569E-01	5.9135E-01	6.1598E-01	6.2065E-01	
ETA	3.5988E-03	3.4096E-03	3.0053E-03	2.3115E-03	2.0536E-03	2.3115E-03	3.0053E-03	3.4096E-03	3.5988E-03	
G	-1.2531E-02	-1.2681E-02	-1.3147E-02	-1.3535E-02	-1.4274E-02	-1.3535E-02	-1.3147E-02	-1.2681E-02	-1.2531E-02	
DEONS	5.6946E+00	5.7013E+00	5.7334E+00	5.8040E+00	5.9226E+00	5.8040E+00	5.7334E+00	5.7013E+00	5.6946E+00	
AM	6.9167E+00	6.8656E+00	6.7205E+00	6.5398E+00	6.3241E+00	6.5398E+00	6.7205E+00	6.8656E+00	6.9167E+00	
CROSSM	3.6737E-02	1.9620E-01	3.1669E-01	3.0821E-01	3.7864E-02	3.0821E-01	3.1669E-01	1.9620E-01	3.6737E-02	
SBAR	1.8312E-02	3.0530E-02	4.8460E-02	5.8109E-02	6.4571E-02	5.8109E-02	4.8460E-02	3.0530E-02	1.8312E-02	
PORDGAM	1.1367E-02	1.1507E-02	1.1715E-02	1.1828E-02	1.1905E-02	1.1828E-02	1.1715E-02	1.1507E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.2652E-01	8.8590E-01	8.6479E-01	8.5093E-01	8.6479E-01	8.8590E-01	9.2652E-01	9.5525E-01	
PT	1.0408E+02	1.0095E+02	9.6528E+01	9.4227E+01	9.2717E+01	9.4227E+01	9.6528E+01	1.0095E+02	1.0408E+02	
BERNOUL	1.3331E-09	-9.9532E-05	2.6586E-05	5.7603E-04	5.9700E-10	5.7603E-04	2.6586E-05	-9.9532E-05	1.3331E-09	
DPDZ	-3.1699E-04	9.8950E-06	8.0386E-04	1.1788E-03	-1.0892E-03	1.1788E-03	8.0386E-04	9.8955E-06	-3.1699E-04	
DUDZ	-3.9101E-04	6.9404E-03	1.0265E-02	5.1913E-03	-5.6788E-04	5.1913E-03	1.0265E-02	6.9404E-03	-8.9101E-04	
DVDZ	-2.4431E-01	-2.4104E-01	-2.3430E-01	-2.4178E-01	-2.7176E-01	-2.4178E-01	-2.3430E-01	-2.4104E-01	-2.4431E-01	
DWDZ	1.2468E-14	-3.6754E-02	-4.8152E-02	-2.7393E-02	2.8286E-09	2.7393E-02	4.8152E-02	3.6754E-02	-4.9828E-11	
DSBDZ	3.1893E-30	-1.1256E-01	-1.3001E-01	-5.6236E-02	-2.1742E-17	-5.6236E-02	-1.3001E-01	-1.1256E-01	-1.1580E-25	
PP	4.1139E-16	2.5556E-02	6.4610E-02	1.3570E-01	-3.7104E-10	-1.3570E-01	-6.4610E-02	-2.5556E-02	-4.1254E-15	
UP	-7.4678E-15	-8.8294E-02	-1.3251E-01	-1.2630E-01	4.7610E-09	1.2630E-01	1.3251E-01	8.8294E-02	-4.0362E-13	
VP	6.3292E-16	7.2228E-03	1.6753E-03	-2.4440E-02	-5.1032E-08	2.4440E-02	-1.6751E-03	-7.2230E-03	2.2990E-15	
WP	-1.2419E+00	-1.0440E+00	-5.1609E-01	1.0440E+00	2.2741E+00	1.0440E+00	-5.1609E-01	-1.0440E+00	-1.2419E+00	
SBARP	6.3340E-16	3.1988E-01	2.6114E-01	1.5172E-01	-1.8380E-08	-1.5172E-01	-2.6114E-01	-3.1988E-01	2.5025E-15	

ZETA= 2.50000000E-02

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.7133E-02	2.7584E-02	3.0150E-02	3.4856E-02	4.2434E-02	3.4856E-02	3.0150E-02	2.7584E-02	2.7133E-02	
P/ROASTSQ	1.5100E-01	1.5351E-01	1.6779E-01	1.9398E-01	2.3615E-01	1.9398E-01	1.6779E-01	1.5351E-01	1.5100E-01	
P/PTINF	2.4902E-04	2.5315E-04	2.7671E-04	3.1989E-04	3.8944E-04	3.1989E-04	2.7671E-04	2.5315E-04	2.4902E-04	
P/PINF	2.4311E+00	2.4715E+00	2.7015E+00	3.1231E+00	3.8021E+00	3.1231E+00	2.7015E+00	2.4715E+00	2.4311E+00	
RHO	1.8616E+00	1.8617E+00	1.9585E+00	2.1614E+00	2.4790E+00	2.1614E+00	1.9585E+00	1.8617E+00	1.8616E+00	
U	2.3307E+00	2.3279E+00	2.3212E+00	2.3143E+00	2.3094E+00	2.3143E+00	2.3212E+00	2.3279E+00	2.3307E+00	
V	-6.2399E-03	-6.1166E-03	-5.9061E-03	-6.1338E-03	-6.9720E-03	-6.1338E-03	-5.9060E-03	-6.1165E-03	-6.2399E-03	
W	0.	-6.4102E-02	-1.0731E-01	-1.0773E-01	3.2059E-10	1.0773E-01	1.0731E-01	6.4102E-02	0.	
UC	2.3180E+00	2.3152E+00	2.3067E+00	2.2918E+00	2.2751E+00	2.2918E+00	2.3067E+00	2.3152E+00	2.3180E+00	
VC	2.4318E-01	2.5098E-01	2.7829E-01	3.3685E-01	3.9649E-01	3.3685E-01	2.7829E-01	2.5098E-01	2.4318E-01	
WC	4.1708E-16	1.6694E-02	3.7929E-02	4.4892E-02	3.3364E-10	-4.4892E-02	-3.7929E-02	-1.6694E-02	1.8258E-11	
VCC	2.4318E-01	2.4443E-01	2.6501E-01	3.2595E-01	3.9649E-01	3.2595E-01	2.6501E-01	2.4443E-01	2.4318E-01	
WCC	0.	-5.9362E-02	-9.3039E-02	-9.6137E-02	3.2081E-10	9.6137E-02	9.3039E-02	5.9362E-02	4.5428E-13	
VX	0.	6.5474E-02	1.5298E-01	2.7913E-01	3.9649E-01	2.7913E-01	1.5298E-01	6.5474E-02	-2.8441E-11	
VY	-2.4318E-01	-2.4286E-01	-2.3554E-01	-1.9384E-01	3.1347E-10	1.9384E-01	2.3554E-01	2.4286E-01	2.4318E-01	
VZ	2.3180E+00	2.3152E+00	2.3067E+00	2.2918E+00	2.2751E+00	2.2918E+00	2.3067E+00	2.3152E+00	2.3180E+00	
PSINOR	0.	1.6199E+00	3.7944E+00	6.9441E+00	9.8859E+00	6.9441E+00	3.7944E+00	1.6199E+00	-7.0300E-10	
THETNOR	8.4011E+01	8.4014E+01	8.4182E+01	8.5201E+01	9.0000E+01	8.5201E+01	8.4182E+01	8.4014E+01	8.4011E+01	
XBAR	0.	3.1747E-01	6.2160E-01	8.8223E-01	1.0060E+00	8.8223E-01	6.2160E-01	3.1747E-01	-7.0241E-11	
XBHLD	0.	3.4348E-02	2.1552E-01	4.6483E-01	1.0060E+00	4.6483E-01	2.1552E-01	3.4348E-02	-7.0241E-11	
YBAR	-6.1032E-01	-5.7895E-01	-4.7959E-01	-2.9252E-01	-1.8607E-11	2.9252E-01	4.7959E-01	5.7895E-01	6.1032E-01	
YBHLD	-6.1032E-01	-6.0693E-01	-5.8902E-01	-5.3081E-01	-1.8609E-11	5.3081E-01	5.8902E-01	6.0693E-01	6.1032E-01	
ETA	1.7994E-03	1.7048E-03	1.5027E-03	1.1557E-03	1.0268E-03	1.1557E-03	1.5027E-03	1.7048E-03	1.7994E-03	
G	-6.2781E-03	-6.3309E-03	-6.5340E-03	-6.7266E-03	-7.0847E-03	-6.7266E-03	-6.5340E-03	-6.3309E-03	-6.2781E-03	
DEQNS	5.6316E+00	5.6349E+00	5.6509E+00	5.6859E+00	5.7446E+00	5.6859E+00	5.6509E+00	5.6349E+00	5.6316E+00	
AM	6.9164E+00	6.8543E+00	6.7096E+00	6.5362E+00	6.3236E+00	6.5362E+00	6.7096E+00	6.8543E+00	6.9164E+00	
CROSSM	1.8517E-02	1.8952E-01	3.1034E-01	3.0441E-01	1.9091E-02	3.0441E-01	3.1034E-01	1.8953E-01	1.8517E-02	
SBAR	1.8312E-02	3.4738E-02	5.2711E-02	5.9749E-02	6.4571E-02	5.9749E-02	5.2711E-02	3.4738E-02	1.8312E-02	
POROGAM	1.1367E-02	1.1555E-02	1.1765E-02	1.1848E-02	1.1905E-02	1.1848E-02	1.1765E-02	1.1555E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.1682E-01	8.7654E-01	8.6125E-01	8.5093E-01	8.6125E-01	8.7654E-01	9.1682E-01	9.5525E-01	
PT	1.0408E+02	9.9897E+01	9.5508E+01	9.3842E+01	9.2717E+01	9.3842E+01	9.5508E+01	9.9897E+01	1.0408E+02	
BERNOUL	1.3458E-09	-1.1250E-04	1.1078E-04	6.6374E-04	5.9503E-10	6.6374E-04	1.1078E-04	-1.1250E-04	1.3458E-09	
DPDZ	-1.6569E-04	1.6924E-04	1.0133E-03	1.5518E-03	-5.6463E-04	1.5518E-03	1.0133E-03	1.6924E-04	-1.6569E-04	
DUDZ	-4.4912E-04	1.9393E-02	2.2316E-02	9.3091E-03	-2.8635E-04	9.3091E-03	2.2316E-02	1.9393E-02	-4.4912E-04	
DVDZ	-2.4713E-01	-2.4318E-01	-2.3570E-01	-2.4420E-01	-2.7666E-01	-2.4420E-01	-2.3570E-01	-2.4318E-01	-2.4713E-01	
DWDZ	-2.3295E-15	-7.8233E-02	-8.2406E-02	-3.6304E-02	4.6698E-09	3.6304E-02	8.2406E-02	7.8233E-02	-8.2469E-11	
DSBDZ	-1.1524E-29	-2.5869E-01	-2.2743E-01	-7.7468E-02	-5.8397E-17	-7.7468E-02	-2.2743E-01	-2.5869E-01	-2.6878E-25	
PP	-4.2612E-16	2.5259E-02	6.4206E-02	1.3627E-01	-2.8226E-10	-1.3627E-01	-6.4206E-02	-2.5259E-02	-2.4548E-15	
UP	-1.3249E-13	-9.3188E-02	-1.3109E-01	-1.2183E-01	7.3261E-09	1.2183E-01	1.3109E-01	9.3188E-02	-4.0363E-13	
VP	1.8029E-16	4.0254E-03	8.8968E-04	-1.2744E-02	-5.4115E-08	1.2745E-02	-8.8955E-04	-4.0256E-03	1.2158E-15	
WP	-1.2145E+00	-1.0284E+00	-5.2266E-01	1.0284E+00	2.2599E+00	1.0284E+00	-5.2266E-01	-1.0284E+00	-1.2145E+00	
SBARP	-1.0409E-15	3.7466E-01	2.3038E-01	1.0463E-01	-3.1422E-08	-1.0463E-01	-2.3038E-01	-3.7466E-01	3.6187E-15	

ZETA= 1.25000000E-02

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.7135E-02	2.7581E-02	3.0137E-02	3.4835E-02	4.2439E-02	3.4835E-02	3.0137E-02	2.7581E-02	2.7135E-02	
P/ROASTSQ	1.5101E-01	1.5350E-01	1.6772E-01	1.9386E-01	2.3618E-01	1.9386E-01	1.6772E-01	1.5350E-01	1.5101E-01	
P/PTINF	2.4903E-04	2.5313E-04	2.7659E-04	3.1970E-04	3.8949E-04	3.1970E-04	2.7659E-04	2.5313E-04	2.4903E-04	
P/PINF	2.4313E+00	2.4713E+00	2.7003E+00	3.1212E+00	3.8025E+00	3.1212E+00	2.7003E+00	2.4713E+00	2.4313E+00	
RHO	1.8617E+00	1.8553E+00	1.9529E+00	2.1588E+00	2.4792E+00	2.1588E+00	1.9529E+00	1.8553E+00	1.8617E+00	
U	2.3307E+00	2.3276E+00	2.3208E+00	2.3142E+00	2.3094E+00	2.3142E+00	2.3208E+00	2.3276E+00	2.3307E+00	
V	-3.1368E-03	-3.0684E-03	-2.9566E-03	-3.0741E-03	-3.4979E-03	-3.0741E-03	-2.9566E-03	-3.0684E-03	-3.1368E-03	
W	0.	-6.2781E-02	-1.0607E-01	-1.0723E-01	2.4981E-10	1.0723E-01	1.0607E-01	6.2781E-02	0.	
UC	2.3179E+00	2.3147E+00	2.3061E+00	2.2914E+00	2.2747E+00	2.2914E+00	2.3061E+00	2.3147E+00	2.3179E+00	
VC	2.4418E-01	2.5199E-01	2.7943E-01	3.3853E-01	3.9874E-01	3.3853E-01	2.7943E-01	2.5199E-01	2.4418E-01	
WC	4.1879E-16	1.8001E-02	3.9147E-02	4.5381E-02	2.6287E-10	-4.5381E-02	-3.9147E-02	-1.8001E-02	1.8258E-11	
VCC	2.4418E-01	2.4565E-01	2.6635E-01	3.2754E-01	3.9874E-01	3.2754E-01	2.6635E-01	2.4565E-01	2.4418E-01	
WCC	0.	-5.8962E-02	-9.3137E-02	-9.6846E-02	2.4993E-10	9.6846E-02	9.3137E-02	5.8962E-02	2.3029E-13	
VX	0.	6.6954E-02	1.5457E-01	2.8070E-01	3.9874E-01	2.8070E-01	1.5457E-01	6.6954E-02	-2.8483E-11	
VY	-2.4418E-01	-2.4360E-01	-2.3606E-01	-1.9460E-01	2.4259E-10	1.9460E-01	2.3606E-01	2.4360E-01	2.4418E-01	
VZ	2.3179E+00	2.3147E+00	2.3061E+00	2.2914E+00	2.2747E+00	2.2914E+00	2.3061E+00	2.3147E+00	2.3179E+00	
PSINOR	0.	1.6569E+00	3.8347E+00	6.9841E+00	9.9426E+00	6.9841E+00	3.8347E+00	1.6569E+00	-7.0407E-10	
THETNOR	8.3986E+01	8.3995E+01	8.4168E+01	8.5181E+01	9.0000E+01	8.5181E+01	8.4168E+01	8.3995E+01	8.3986E+01	
XBAR	0.	3.1650E-01	6.1972E-01	8.7973E-01	1.0030E+00	8.7973E-01	6.1972E-01	3.1650E-01	-7.0020E-11	
XBHLD	0.	2.6576E-02	1.6675E-01	3.8810E-01	1.0030E+00	3.8810E-01	1.6675E-01	2.6576E-02	-7.0020E-11	
YBAR	-6.0516E-01	-5.7415E-01	-4.7569E-01	-2.9028E-01	-1.8457E-11	2.9028E-01	4.7569E-01	5.7415E-01	6.0516E-01	
YBHLD	-6.0516E-01	-6.0256E-01	-5.8882E-01	-5.5090E-01	-1.8460E-11	5.5090E-01	5.8882E-01	6.0256E-01	6.0516E-01	
ETA	8.9969E-04	8.5240E-04	7.5134E-04	5.7787E-04	5.1339E-04	5.7787E-04	7.5134E-04	8.5240E-04	8.9969E-04	
G	-3.1464E-03	-3.1640E-03	-3.2556E-03	-3.3525E-03	-3.5262E-03	-3.3525E-03	-3.2556E-03	-3.1640E-03	-3.1464E-03	
DEQNS	5.5989E+00	5.6005E+00	5.6084E+00	5.6258E+00	5.6551E+00	5.6258E+00	5.6084E+00	5.6005E+00	5.5989E+00	
AM	6.9164E+00	6.8416E+00	6.7002E+00	6.5337E+00	6.3235E+00	6.5337E+00	6.7002E+00	6.8416E+00	6.9164E+00	
CROSSM	9.3083E-03	1.8469E-01	3.0602E-01	3.0254E-01	9.5779E-03	3.0254E-01	3.0602E-01	1.8469E-01	9.3083E-03	
SBAR	1.8312E-02	3.9476E-02	5.6288E-02	6.0842E-02	6.4571E-02	6.0842E-02	5.6288E-02	3.9476E-02	1.8312E-02	
POROGAM	1.1367E-02	1.1610E-02	1.1807E-02	1.1861E-02	1.1905E-02	1.1861E-02	1.1807E-02	1.1610E-02	1.1367E-02	
PT/PTINF	9.5525E-01	9.0602E-01	8.6873E-01	8.5890E-01	8.5093E-01	8.5890E-01	8.6873E-01	9.0602E-01	9.5525E-01	
PT	1.0408E+02	9.8721E+01	9.4658E+01	9.3586E+01	9.2717E+01	9.3586E+01	9.4658E+01	9.8721E+01	1.0408E+02	
BERNOUL	1.3482E-09	-1.1234E-04	2.1174E-04	7.3298E-04	5.9492E-10	7.3298E-04	2.1174E-04	-1.1234E-04	1.3482E-09	
DPDZ	-8.5887E-05	2.4427E-04	1.1085E-03	1.7405E-03	-2.8727E-04	1.7405E-03	1.1085E-03	2.4427E-04	-8.5887E-05	
DUDZ	-2.2577E-04	4.7394E-02	.2579E-02	1.4299E-02	-1.4366E-04	1.4299E-02	4.2579E-02	4.7394E-02	-2.2577E-04	
DVDZ	-2.4960E-01	-2.4459E-01	-2.3615E-01	-2.4532E-01	-2.7920E-01	-2.4532E-01	-2.3615E-01	-2.4459E-01	-2.4960E-01	
DWDZ	5.0908E-15	-1.4540E-01	-1.2072E-01	-4.3769E-02	6.9629E-09	4.3769E-02	1.2072E-01	1.4540E-01	-1.3545E-10	
DSBDZ	1.9014E-29	-5.7231E-01	-3.6561E-01	-9.9430E-02	-1.5138E-16	-9.9430E-02	-3.6561E-01	-5.7231E-01	-6.2701E-25	
PP	-4.2621E-16	2.5108E-02	6.3985E-02	1.3652E-01	-2.3695E-10	-1.3652E-01	-6.3985E-02	-2.5108E-02	-4.9673E-15	
UP	-1.3249E-13	-9.8159E-02	-1.2831E-01	-1.1758E-01	1.1432E-08	1.1758E-01	1.2831E-01	9.8159E-02	-4.0363E-13	
VP	1.7830E-16	2.1674E-03	4.7217E-04	-6.4765E-03	-5.5795E-08	6.4766E-03	-4.7203E-04	-2.1676E-03	6.0096E-16	
WP	-1.1866E+00	-1.0162E+00	-5.3251E-01	1.0162E+00	2.2516E+00	1.0162E+00	-5.3251E-01	-1.0162E+00	-1.1866E+00	
SBARP	6.3340E-16	4.2297E-01	1.8670E-01	6.7245E-02	-5.2025E-08	-6.7245E-02	-1.8670E-01	-4.2297E-01	5.2931E-15	

ZETA= 0.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.7135E-02	2.7578E-02	3.0123E-02	3.4812E-02	4.2441E-02	3.4812E-02	3.0123E-02	2.7578E-02	2.7135E-02	
P/ROASTSQ	1.5101E-01	1.5348E-01	1.6764E-01	1.9374E-01	2.3619E-01	1.9374E-01	1.6764E-01	1.5348E-01	1.5101E-01	
P/PTINF	2.4904E-04	2.5310E-04	2.7645E-04	3.1949E-04	3.8951E-04	3.1949E-04	2.7645E-04	2.5310E-04	2.4904E-04	
P/PINF	2.4313E+00	2.4710E+00	2.6990E+00	3.1192E+00	3.8027E+00	3.1192E+00	2.6990E+00	2.4710E+00	2.4313E+00	
RHO	1.8012E+00	1.8222E+00	1.9408E+00	2.1521E+00	2.4793E+00	2.1521E+00	1.9408E+00	1.8222E+00	1.8012E+00	
U	2.3266E+00	2.3253E+00	2.3204E+00	2.3144E+00	2.3094E+00	2.3144E+00	2.3204E+00	2.3253E+00	2.3266E+00	
V	3.7731E-06	-5.7667E-07	-3.1874E-06	-1.1091E-06	8.3500E-06	-1.1128E-06	-3.1789E-06	-5.6937E-07	3.7657E-06	
W	-1.3225E-13	-5.7929E-02	-1.0507E-01	-1.1609E-01	3.0585E-09	1.1609E-01	1.0507E-01	5.7929E-02	-4.1893E-13	
UC	2.3137E+00	2.3121E+00	2.3054E+00	2.2919E+00	2.2743E+00	2.2919E+00	2.3054E+00	2.3121E+00	2.3137E+00	
VC	2.4478E-01	2.5280E-01	2.8057E-01	3.4036E-01	4.0102E-01	3.4036E-01	2.8057E-01	2.5280E-01	2.4478E-01	
WC	-1.3183E-13	2.2772E-02	4.0118E-02	3.6554E-02	3.0716E-09	-3.6554E-02	-4.0118E-02	-2.2771E-02	1.7807E-11	
VCC	2.4478E-01	2.4775E-01	2.6757E-01	3.2545E-01	4.0102E-01	3.2545E-01	2.6757E-01	2.4775E-01	2.4478E-01	
WCC	-1.3225E-13	-5.5216E-02	-9.3470E-02	-1.0612E-01	3.0585E-09	1.0612E-01	9.3470E-02	5.5216E-02	-4.1921E-13	
VX	-1.3225E-13	7.1792E-02	1.5593E-01	2.7610E-01	4.0102E-01	2.7610E-01	1.5593E-01	7.1791E-02	-2.8057E-11	
VY	-2.4478E-01	-2.4346E-01	-2.3667E-01	-2.0236E-01	3.0512E-09	2.0236E-01	2.3667E-01	2.4346E-01	2.4478E-01	
VZ	2.3137E+00	2.3121E+00	2.3054E+00	2.2919E+00	2.2743E+00	2.2919E+00	2.3054E+00	2.3121E+00	2.3137E+00	
PSINOR	-3.2751E-12	1.7785E+00	3.8695E+00	6.8653E+00	1.0000E+01	6.8693E+00	3.8695E+00	1.7784E+00	-6.9480E-10	
THETNOR	8.3961E+01	8.3992E+01	8.4152E+01	8.4990E+01	9.0000E+01	8.4990E+01	8.4152E+01	8.3992E+01	8.3961E+01	
XBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
XBHLD	0.	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	
YBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
YBHLD	-6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	
ETA	0.	0.	0.	0.	0.	0.	0.	0.	0.	
G	-3.1464E-03	-3.1640E-03	-3.2556E-03	-3.3525E-03	-3.5262E-03	-3.3525E-03	-3.2556E-03	-3.1640E-03	-3.1464E-03	
DEQNS	5.5989E+00	5.6005E+00	5.6084E+00	5.6258E+00	5.6551E+00	5.6258E+00	5.6084E+00	5.6005E+00	5.5989E+00	
AM	6.7911E+00	6.7737E+00	6.6795E+00	6.5274E+00	6.3235E+00	6.5274E+00	6.6795E+00	6.7737E+00	6.7911E+00	
CROSSM	3.8603E-13	1.6870E-01	3.0214E-01	3.2700E-01	8.3748E-09	3.2700E-01	3.0214E-01	1.6870E-01	1.2228E-12	
SBAR	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	
POROGAM	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	
PT/PTINF	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	
PT	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	
BERNOUL	-2.3590E-12	9.3827E-11	-2.8993E-10	-1.1044E-10	-1.1603E-11	-1.1043E-10	9.3040E-10	-5.2885E-09	-2.3448E-12	
DVDZ	-2.5396E-01	-2.4611E-01	-2.3563E-01	-2.4399E-01	-2.8188E-01	-2.4399E-01	-2.3563E-01	-2.4611E-01	-2.5396E-01	
DPDZ	1.3865E-27	2.8193E-04	1.2057E-03	2.2823E-03	2.6963E-18	2.2823E-03	1.2057E-03	2.8193E-04	1.3912E-26	
PP	-4.2624E-16	2.4959E-02	6.3750E-02	1.3674E-01	-1.9696E-10	-1.3674E-01	-6.3750E-02	-2.4959E-02	-2.1771E-15	
UP	-1.3225E-13	-5.7929E-02	-1.0507E-01	-1.1609E-01	3.0585E-09	1.1609E-01	1.0507E-01	5.7929E-02	-4.1893E-13	
WP	-1.1248E+00	-1.0039E+00	-5.5985E-01	1.0039E+00	2.2445E+00	1.0039E+00	-5.5985E-01	-1.0039E+00	-1.1248E+00	

WINDWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3307E+00	1.8617E+00	1.8312E-02	1.1367E-02	2.3178E+00	2.4521E-01	4.2057E-16	0.	-2.4521E-01	2.3178E+00	9.5525E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3307E+00	1.8617E+00	1.8312E-02	1.1367E-02	2.3178E+00	2.4521E-01	1.8258E-11	-2.8526E-11	2.4521E-01	2.3178E+00	9.5525E-01

FORCE COEFFICIENTS

CZ= 4.23665934E-02 CY= -1.11726977E-09 CD= 4.23665934E-02 CL= -1.11726977E-09
YBAR= 1.95010171E-10 ZBAR= 6.66666667E-01 CM= 7.53108427E-10

APPENDIX B

Input Cards for Second Sample Case

```
   80000000+01     14000000+01     60000000+00     10000000+02     00000000+00
    9   2   1    1   2   2    0   1    0    0
   00000000+00     40000000+01     10000000+00     20000000+01     25000000+00
1.
.001               .03
  0

  7.19752927E-02  6.81917142E-02  6.01069560E-02  4.62292520E-02  4.10711895E-02
  4.62292519E-02  6.01069567E-02  6.81917151E-02  7.19752935E-02
```

Conical Flow About Elliptic Cones by the Method of Lines

With Incrementation of a Parameter

```
N= 9   M=2   NREAD=1   NSPACE=1   NP= 5   NCNVRG=0
NA= 1   ANA=  0.                  NB= 1   BNB=  0.

VTEST=  1.00000000E-03   VTEST1=  3.00000000E-02
SLOPE=  1.00000000E+00   KTRANSF= 1

M2E=     0
```

```
STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  6.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

EPSIGCM=  1.00000000E-03
AAST=  4.23895624E-01

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=   C

SLOPE=  1.00000000E+00  KTRANSF= 1

RANGLE=  0.

INTCNT=  535

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 1  AT  11/23/71  10.43.45.

ETAS
 7.19752927E-02  6.81917142E-02  6.01069560E-02  4.62292520E-02  4.10711895E-02  4.62292519E-02  6.01069567E-02  6.81917151E-02
 7.19752935E-02
ETASP
-1.84558363E-16 -1.09298214E-01 -2.16839587E-01 -1.95167422E-01 -2.24633824E-09  1.95167429E-01  2.16839598E-01  1.09298213E-01
-1.87734140E-14
CP(I) AT SHOCK
 2.58497446E-02  2.70381576E-02  3.27478878E-02  4.02049007E-02  5.02404908E-02  4.02049007E-02  3.27478884E-02  2.70381581E-02
 2.58497451E-02
CP(I) AT ZETA=0
 3.19477657E-02  3.28410192E-02  3.79526754E-02  4.73487282E-02  6.25566226E-02  4.73487284E-02  3.79526765E-02  3.28410198E-02
 3.19477661E-02
V
  3.76373538E-06 -5.76569892E-07 -3.18515018E-06 -1.11030199E-06  8.35045244E-06 -1.11252286E-06 -3.17852788E-06 -5.69227898E-07
  3.76530080E-06
```

APPENDIX B

```
N= 9  M=2  NREAC=1  NSPACE=1  NP= 5  NCNVRG=0
NA= 1  AAA=  0.             NB= 1  BNB=  0.

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  6.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  0.

RANGLE=  0.

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 1  VTEST=  1.00000000E-03  VMAX=  8.35045244E-06  AAST=  4.23895624E-01  PTINF=  1.08960426E+02

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=     0

SLOPE=  1.00000000E+00  KTRANSF= 1
KCOUNT=    1  VMAX=  8.35045244E-06  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.13847636E-01
```

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSID	-9.0000E+01	-6.1006E+01	-3.7365E+01	-1.8178E+01	-1.0489E-09	1.8178E+01	3.7365E+01	6.1006E+01	9.0000E+01	
PSISD	-9.0000E+01	-6.7599E+01	-4.5646E+01	-2.3470E+01	-1.4014E-09	2.3470E+01	4.5646E+01	6.7599E+01	9.0000E+01	
XO	0.	5.5635E-02	1.0894E-01	1.5468E-01	1.7633E-01	1.5468E-01	1.0894E-01	5.5635E-02	-1.2308E-11	
YO	-1.0580E-01	-1.0039E-01	-8.3188E-02	-5.0790E-02	-3.2281E-12	5.0790E-02	8.3188E-02	1.0039E-01	1.0580E-01	
XOBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
YOBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
XS	0.	6.9525E-02	1.3565E-01	1.9024E-01	2.1901E-01	1.9024E-01	1.3565E-01	6.9525E-02	-1.5445E-11	
YS	-1.7926E-01	-1.6867E-01	-1.3875E-01	-8.2603E-02	-5.3568E-12	8.2603E-02	1.3875E-01	1.6867E-01	1.7926E-01	
XSBAR	0.	3.9429E-01	7.6932E-01	1.0789E+00	1.2421E+00	1.0789E+00	7.6932E-01	3.9429E-01	-8.7593E-11	
YSBAR	-1.0167E+00	-9.5658E-01	-7.8687E-01	-4.6846E-01	-3.0380E-11	4.6846E-01	7.8687E-01	9.5658E-01	1.0167E+00	
ETAS	7.1975E-02	6.8192E-02	6.0107E-02	4.6229E-02	4.1071E-02	4.6229E-02	6.0107E-02	6.8192E-02	7.1975E-02	
BETAD	1.0163E+01	1.0280E+01	1.0825E+01	1.1500E+01	1.2353E+01	1.1500E+01	1.0825E+01	1.0280E+01	1.0163E+01	
XI	0.	5.5646E-02	1.1129E-01	1.6694E-01	2.2258E-01	2.7823E-01	3.3388E-01	3.8952E-01	4.4517E-01	
CPSHOCK	2.5850E-02	2.7038E-02	3.2748E-02	4.0205E-02	5.0240E-02	4.0205E-02	3.2748E-02	2.7038E-02	2.5850E-02	
CPBODY	3.1948E-02	3.2841E-02	3.7953E-02	4.7349E-02	6.2557E-02	4.7349E-02	3.7953E-02	3.2841E-02	3.1948E-02	

I	TAU	XI	XC	YO	ETAS	ETASP
1	0.	0.	0.	-1.05796188E-01	7.19752927E-02	-1.84558363E-16
2	5.56460957E-02	5.56460957E-02	5.56348315E-02	-1.00391977E-01	6.81917142E-02	-1.09298214E-01
3	1.11292159E-01	1.11292159E-01	1.08942518E-01	-8.21876403E-02	6.01069560E-02	-2.16839987E-01
4	1.66938299E-01	1.66938299E-01	1.54678616E-01	-5.07903803E-02	4.62292520E-02	-1.95167422E-01
5	2.22584399E-01	2.22584399E-01	1.76326980E-01	-3.22812610E-12	4.10711895E-02	-2.24633824E-09
6	2.78230498E-01	2.78230498E-01	1.54678616E-01	5.07903804E-02	4.62292519E-02	1.95167429E-01
7	3.33876598E-01	3.33876598E-01	1.08942518E-01	8.21876403E-02	6.01069567E-02	2.16839998E-01
8	3.89522698E-01	3.89522698E-01	5.56348315E-02	1.00391977E-01	6.81917151E-02	1.09298213E-01
9	4.45168797E-01	4.45168797E-01	-1.23075942E-11	1.05796188E-01	7.19752935E-02	-1.87734140E-14

ZETA= 0.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.7135E-02	2.7581E-02	3.0137E-02	3.4835E-02	4.2439E-02	3.4835E-02	3.0137E-02	2.7581E-02	2.7135E-02	
P/ROASTSC	1.5101E-01	1.5350E-01	1.6772E-01	1.9386E-01	2.3618E-01	1.9386E-01	1.6772E-01	1.5350E-01	1.5101E-01	
P/PTINF	2.4903E-04	2.5313E-04	2.7659E-04	3.1970E-04	3.8949E-04	3.1970E-04	2.7659E-04	2.5313E-04	2.4903E-04	
P/PINF	2.4313E+00	2.4713E+00	2.7003E+00	3.1212E+00	3.8025E+00	3.1212E+00	2.7003E+00	2.4713E+00	2.4313E+00	
RHO	1.8012E+00	1.8223E+00	1.9414E+00	2.1531E+00	2.4792E+00	2.1531E+00	1.9414E+00	1.8223E+00	1.8012E+00	
U	2.3266E+00	2.3253E+00	2.3204E+00	2.3144E+00	2.3094E+00	2.3144E+00	2.3204E+00	2.3253E+00	2.3266E+00	
V	3.7637E-06	-5.7657E-07	-3.1852E-06	-1.1103E-06	8.3505E-06	-1.1125E-06	-3.1785E-06	-5.6923E-07	3.7653E-06	
W	-7.8674E-14	-5.8164E-02	-1.0510E-01	-1.1583E-01	1.9027E-09	1.1583E-01	1.0510E-01	5.8164E-02	-4.0107E-13	
UC	2.3137E+00	2.3121E+00	2.3054E+00	2.2918E+00	2.2743E+00	2.2918E+00	2.3054E+00	2.3121E+00	2.3137E+00	
VC	2.4478E-01	2.5280E-01	2.8057E-01	3.4036E-01	4.0102E-01	3.4036E-01	2.8057E-01	2.5280E-01	2.4478E-01	
WC	-7.8254E-14	2.2537E-02	4.0087E-02	3.6807E-02	1.9157E-09	-3.6807E-02	-4.0087E-02	-2.2536E-02	1.7825E-11	
VCC	2.4478E-01	2.4767E-01	2.6755E-01	3.2555E-01	4.0102E-01	3.2555E-01	2.6755E-01	2.4767E-01	2.4478E-01	
WCC	-7.8674E-14	-5.5440E-02	-9.3497E-02	-1.0589E-01	1.9027E-09	1.0589E-01	9.3497E-02	5.5440E-02	-4.0135E-13	
VX	-7.8674E-14	7.1561E-02	1.5591E-01	2.7627E-01	4.0102E-01	2.7627E-01	1.5591E-01	7.1561E-02	-2.8075E-11	
VY	-2.4478E-01	-2.4351E-01	-2.3669E-01	-2.0217E-01	1.8953E-09	2.0217E-01	2.3669E-01	2.4351E-01	2.4478E-01	
VZ	2.3137E+00	2.3121E+00	2.3054E+00	2.2918E+00	2.2743E+00	2.2918E+00	2.3054E+00	2.3121E+00	2.3137E+00	
PSINOR	-1.9483E-12	1.7727E+00	3.8688E+00	6.8735E+00	1.0000E+01	6.8735E+00	3.8688E+00	1.7727E+00	-6.9525E-10	
THETNOR	8.3961E+01	8.3951E+01	8.4152E+01	8.4995E+01	9.0000E+01	8.4995E+01	8.4152E+01	8.3951E+01	8.3961E+01	
XBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
XBHLD	0.	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	
YBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
YBHLD	-6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	
ETA	0.	0.	0.	0.	0.	0.	0.	0.	0.	
G	-3.1464E-03	-3.1640E-03	-3.2556E-03	-3.3525E-03	-3.5262E-03	-3.3525E-03	-3.2556E-03	-3.1640E-03	-3.1464E-03	
DEONS	5.5989E+00	5.6005E+00	5.6084E+00	5.6258E+00	5.6551E+00	5.6258E+00	5.6084E+00	5.6005E+00	5.5989E+00	
AM	6.7911E+00	6.7735E+00	6.6790E+00	6.5267E+00	6.3235E+00	6.5267E+00	6.6790E+00	6.7735E+00	6.7911E+00	
CROSSM	2.2964E-13	1.6938E-01	3.0221E-01	3.2625E-01	5.2099E-09	3.2625E-01	3.0221E-01	1.6938E-01	1.1707E-12	
SBAR	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	6.4571E-02	
PORDGAM	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	
PT/PTINF	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	8.5093E-01	
PT	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	9.2717E+01	
BERNOUL	-2.3519E-12	1.3530E-10	-3.7947E-10	-1.6757E-10	-1.1603E-11	-1.6696E-10	8.4078E-10	-5.2692E-09	-2.3448E-12	
DVDZ	-2.5396E-01	-2.4609E-01	-2.3563E-01	-2.4407E-01	-2.8188E-01	-2.4407E-01	-2.3563E-01	-2.4609E-01	-2.5396E-01	
DPDZ	4.9064E-28	2.8424E-04	1.2068E-03	2.2733E-03	1.0434E-18	2.2733E-03	1.2068E-03	2.8425E-04	1.2751E-26	
PP	-1.5425E-15	2.4959E-02	6.3750E-02	1.3674E-01	4.7032E-10	-1.3674E-01	-6.3750E-02	-2.4959E-02	-4.4095E-15	
UP	-7.8674E-14	-5.8164E-02	-1.0510E-01	-1.1583E-01	1.9027E-09	1.1583E-01	1.0510E-01	5.8164E-02	-4.0107E-13	
WP	-1.1248E+00	-1.0039E+00	-5.5985E-01	1.0039E+00	2.2445E+00	1.0039E+00	-5.5985E-01	-1.0039E+00	-1.1248E+00	

WINDWARD LINE ZETA LIMIT

U	RHO	S	PORDGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3307E+00	1.8617E+00	1.8312E-02	1.1367E-02	2.3178E+00	2.4521E-01	4.2057E-16	0.	-2.4521E-01	2.3178E+00	9.5525E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	PORDGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3307E+00	1.8617E+00	1.8312E-02	1.1367E-02	2.3178E+00	2.4521E-01	1.8258E-11	-2.8526E-11	2.4521E-01	2.3178E+00	9.5525E-01

FORCE COEFFICIENTS

```
CZ=  4.23900661E-02  CY= -1.73145544E-09  CD=  4.23900661E-02  CL= -1.73145544E-09
YBAR=  3.03015755E-10  ZBAR=  6.66666667E-01  CM=  1.16714849E-09
```

APPENDIX B

```
STMACH=  8.00000000E+00  GAMMA=  1.40000000E+0C  T=  6.CCCOCCCOE-01  THETAD=  1.000000C0E+01  ALFHAD=  1.00000000E-01

EPSIGOM=  1.00000000E-C3
AAST=  4.23895624E-01

VTEST=  1.C0000000E-03  VTEST1=  3.0C00C000E-02

M2E=    0

SLOPE=  1.00000000E+00  KTRANSF= 1

RANGLE=  1.65584572E-02

EPSIG=  1.000C0000E-03  EPSIGMX=  1.00000000E-C3  SPACER=  1.0C0C0000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 1  AT   11/23/71  10.44.25.

ETAS
 7.19752927E-02  6.81917142E-02  6.01069560E-02  4.62292520E-02  4.1C711895E-02  4.62292519E-02  6.01069567E-02  6.81917151E-02
 7.19752935E-C2
ETASP
-1.84558363E-16 -1.09258214E-C1 -2.16839987E-C1 -1.95167422E-01 -2.24633824E-09  1.95167429E-01  2.16839998E-01  1.09298213E-01
-1.87734140E-14
CP(I) AT SHOCK
 2.68649448E-02  2.80235122E-02  3.36347846E-02  4.08527973E-02  5.02402584E-02  3.95597553E-C2  3.18672759E-02  2.60615452E-02
 2.48440665E-02
CP(I) AT ZETA=0
 3.31102988E-02  3.40260143E-02  3.91575001E-02  4.84372601E-02  6.25323730E-02  4.63263643E-02  3.67981562E-02  3.16693858E-02
 3.07832291E-02
V
  3.48546669E-03  3.04583404E-03  2.49925858E-03  1.50756657E-03 -2.87172450E-05 -2.02377997E-03 -2.59574138E-03 -3.13299132E-03
 -3.54570000E-03
KCOUNT=    2  VMAX=  3.545700C0E-03  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.13847682E-01
DETERM=  1.01689119E-01
DETA
 -5.52070562E-04 -5.05545334E-04 -3.92264699E-C4 -2.15575846E-C4 -1.94939215E-06  2.15562375E-04  3.96269468E-04  5.15607810E-04
  5.69646920E-04

NCYCLE= 2  AT   11/23/71  1C.49.34.

ETAS
 7.14232221E-02  6.76861689E-C2  5.97146913E-02  4.6C132762E-02  4.10692401E-02  4.64448143E-02  6.05032262E-02  6.87073229E-02
 7.25449404E-02
ETASP
-2.94372203E-15 -1.07817311E-C1 -2.14194646E-C1 -1.91571161E-01  3.98915366E-03  1.98842690E-01  2.19578685E-01  1.1C926022E-C1
-1.52228381E-14
CP(I) AT SHOCK
 2.65427949E-02  2.77148372E-C2  3.33618575E-02  4.06561636E-02  5.02414689E-02  3.97593277E-02  3.21421413E-C2  2.63731177E-02
 2.51712561E-02
CP(I) AT ZETA=0
 3.27251379E-02  3.36315758E-C2  3.87514139E-02  4.8C593930E-02  6.25519315E-02  4.66378439E-02  3.71597108E-02  3.20650976E-02
 3.11884848E-02
V
  6.78013186E-05  6.01856081E-06 -2.52866966E-05 -1.56674581E-05 -1.25864189E-05 -1.58065137E-05 -1.77344153E-05  8.87268619E-C6
  4.81169288E-05
```

APPENDIX B

```
N= 9  M=2  NREAD=1  NSPACE=1  NP= 5  NCNVRG=1
NA= 1  ANA=  0.                  NB= 1  BNB=  0.

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  6.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  1.00000000E-01

RANGLE= -1.65584572E-02

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 2  VTEST=  1.00000000E-03  VMAX=  6.78013186E-05  AAST=  4.23895624E-01  PTINF=  1.08960426E+02

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=     0

SLOPE=  1.00000000E+00  KTRANSF= 1
KCOUNT=    12  VMAX=  6.78013186E-05  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.13847446E-01
```

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSID	-9.0000E+01	-6.1006E+01	-3.7365E+01	-1.8178E+01	-1.0489E-09	1.8178E+01	3.7365E+01	6.1006E+01	9.0000E+01	
PSISD	-9.0000E+01	-6.7566E+01	-4.5608E+01	-2.3451E+01	-1.4014E-09	2.3490E+01	4.5685E+01	6.7630E+01	9.0000E+01	
XO	0.	5.5635E-02	1.0894E-01	1.5468E-01	1.7633E-01	1.5468E-01	1.0894E-01	5.5635E-02	-1.2308E-11	
YO	-1.0580E-01	-1.0039E-01	-8.3188E-02	-5.0790E-02	-3.2281E-12	5.0790E-02	8.3188E-02	1.0039E-01	1.0580E-01	
XOBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
YOBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
XS	0.	6.9421E-02	1.3548E-01	1.9008E-01	2.1901E-01	1.9041E-01	1.3583E-01	6.9631E-02	-1.5470E-11	
YS	-1.7869E-01	-1.6816E-01	-1.3838E-01	-8.2453E-02	-5.3567E-12	8.2752E-02	1.3912E-01	1.6919E-01	1.7985E-01	
XSBAR	0.	3.9370E-01	7.6832E-01	1.0780E+00	1.2420E+00	1.0799E+00	7.7032E-01	3.9490E-01	-8.7735E-11	
YSBAR	-1.0134E+00	-9.5368E-01	-7.8479E-01	-4.6761E-01	-3.0379E-11	4.6931E-01	7.8896E-01	9.5954E-01	1.0200E+00	
ETAS	7.1423E-02	6.7686E-02	5.9715E-02	4.6013E-02	4.1069E-02	4.6445E-02	6.0503E-02	6.8707E-02	7.2545E-02	
BETAD	1.0231E+01	1.0346E+01	1.0882E+01	1.1540E+01	1.2353E+01	1.1461E+01	1.0769E+01	1.0215E+01	1.0096E+01	
XI	0.	5.5646E-02	1.1129E-01	1.6694E-01	2.2258E-01	2.7823E-01	3.3388E-01	3.8952E-01	4.4517E-01	
CPSHOCK	2.6543E-02	2.7715E-02	3.3362E-02	4.0656E-02	5.0241E-02	3.9759E-02	3.2142E-02	2.6373E-02	2.5171E-02	
CPBODY	3.2725E-02	3.3632E-02	3.8751E-02	4.8059E-02	6.2552E-02	4.6638E-02	3.7160E-02	3.2065E-02	3.1188E-02	

I	TAU	XI	XO	YO	ETAS	ETASP
1	0.	0.	0.	-1.05796188E-01	7.14232221E-02	-2.94372203E-15
2	5.56460957E-02	5.56460957E-02	5.56348315E-02	-1.00391977E-01	6.76861689E-02	-1.07817311E-01
3	1.11292159E-01	1.11292159E-01	1.08942518E-01	-8.31876403E-02	5.97146913E-02	-2.14194646E-01
4	1.66938299E-01	1.66938299E-01	1.54676616E-01	-5.07903803E-02	4.60132762E-02	-1.91571161E-01
5	2.22584359E-01	2.22584399E-01	1.76326980E-01	-3.22812610E-12	4.10692401E-02	3.98915366E-03
6	2.78230498E-01	2.78230498E-01	1.54676616E-01	5.07903804E-02	4.64448143E-02	1.98842690E-01
7	3.33876558E-01	3.33876558E-01	1.08942518E-01	8.31876403E-02	6.05032262E-02	2.19578685E-01
8	3.89522698E-01	3.89522658E-01	5.56348315E-02	1.00391977E-01	6.87073229E-02	1.10926022E-01
9	4.45168797E-01	4.45168797E-01	-1.23075942E-11	1.05796188E-01	7.25449404E-02	-1.52228381E-14

ZETA= 0.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	2.7523E-02	2.7977E-02	3.0536E-02	3.5190E-02	4.2437E-02	3.4480E-02	2.9741E-02	2.7193E-02	2.6755E-02	
P/ROASTSC	1.5317E-01	1.5570E-01	1.6994E-01	1.9584E-01	2.3617E-01	1.9189E-01	1.6551E-01	1.5134E-01	1.4890E-01	
P/PTINF	2.5260E-04	2.5676E-04	2.8025E-04	3.2297E-04	3.8947E-04	3.1644E-04	2.7295E-04	2.4957E-04	2.4555E-04	
P/PINF	2.4661E+00	2.5067E+00	2.7361E+00	3.1531E+00	3.8023E+00	3.0894E+00	2.6648E+00	2.4365E+00	2.3972E+00	
RHO	1.8196E+00	1.8409E+00	1.9597E+00	2.1687E+00	2.4791E+00	2.1373E+00	1.9231E+00	1.8040E+00	1.7832E+00	
U	2.3261E+00	2.3248E+00	2.3200E+00	2.3141E+00	2.3094E+00	2.3146E+00	2.3208E+00	2.3258E+00	2.3271E+00	
V	6.7801E-05	6.0186E-06	-2.5287E-05	-1.5667E-05	-1.2586E-05	-1.5807E-05	-1.7734E-05	8.8727E-06	4.8117E-05	
W	-2.5066E-14	-5.6998E-02	-1.0269E-01	-1.1232E-01	4.1425E-03	1.1936E-01	1.0752E-01	5.9268E-02	-6.1570E-13	
UC	2.3132E+00	2.3116E+00	2.3049E+00	2.2914E+00	2.2743E+00	2.2923E+00	2.3059E+00	2.3127E+00	2.3142E+00	
VC	2.4479E-01	2.5275E-01	2.8048E-01	3.4027E-01	4.0100E-01	3.4041E-01	2.8062E-01	2.5287E-01	2.4488E-01	
WC	-2.4647E-14	2.3685E-02	4.2470E-02	4.0258E-02	4.1425E-03	-3.3300E-02	-3.7699E-02	-2.1450E-02	1.7614E-11	
VCC	2.4479E-01	2.4797E-01	2.6857E-01	3.2691E-01	4.0100E-01	3.2416E-01	2.6650E-01	2.4741E-01	2.4488E-01	
WCC	-2.5066E-14	-5.4331E-02	-9.1341E-02	-1.0267E-01	4.1425E-03	1.0911E-01	9.5639E-02	5.6495E-02	-6.1926E-13	
VX	-2.5066E-14	7.2677E-02	1.5802E-01	2.7856E-01	4.0100E-01	2.7394E-01	1.5377E-01	7.0508E-02	-2.7869E-11	
VY	-2.4479E-01	-2.4323E-01	-2.3559E-01	-1.9954E-01	4.1425E-03	2.0480E-01	2.3775E-01	2.4378E-01	2.4488E-01	
VZ	2.3132E+00	2.3116E+00	2.3049E+00	2.2914E+00	2.2743E+00	2.2923E+00	2.3059E+00	2.3127E+00	2.3142E+00	
PSINOR	-6.2088E-13	1.8008E+00	3.9221E+00	6.9313E+00	9.9997E+00	6.8149E+00	3.8150E+00	1.7463E+00	-6.8998E-10	
THETNOR	8.3959E+01	8.3956E+01	8.4177E+01	8.5059E+01	8.9897E+01	8.4931E+01	8.4126E+01	8.3985E+01	8.3960E+01	
XBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
XBHLD	0.	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	
YBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
YBHLD	-6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	
ETA	0.	0.	0.	0.	0.	0.	0.	0.	0.	
G	-3.0758E-03	-3.1485E-03	-3.2725E-03	-3.3577E-03	-3.5469E-03	-3.3769E-03	-3.2747E-03	-3.1631E-03	-3.1112E-03	
DEQNS	5.5986E+00	5.6002E+00	5.6081E+00	5.6256E+00	5.6551E+00	5.6261E+00	5.6087E+00	5.6008E+00	5.5991E+00	
AM	6.7758E+00	6.7583E+00	6.6650E+00	6.5161E+00	6.3235E+00	6.5373E+00	6.6930E+00	6.7887E+00	6.8062E+00	
CROSSM	7.3017E-14	1.6564E-01	2.9472E-01	3.1589E-01	1.1343E-02	3.3668E-01	3.0974E-01	1.7294E-01	1.8008E-12	
SBAR	6.4583E-02	6.4583E-02	6.4583E-02	6.4583E-02	6.4583E-02	6.4583E-02	6.4583E-02	6.4583E-02	6.4583E-02	
POROGAM	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	1.1905E-02	
PT/PTINF	8.5090E-01	8.5090E-01	8.5090E-01	8.5090E-01	8.5090E-01	8.5090E-01	8.5090E-01	8.5090E-01	8.5090E-01	
PT	9.2715E+01	9.2715E+01	9.2715E+01	9.2715E+01	9.2715E+01	9.2715E+01	9.2715E+01	9.2715E+01	9.2715E+01	
BERNOUL	-7.6616E-10	1.2713E-10	-4.7316E-10	-1.9956E-10	-2.5175E-11	-2.1264E-10	8.1193E-10	-5.3860E-09	-3.8585E-10	
DVDZ	-2.5334E-01	-2.4564E-01	-2.3607E-01	-2.4439E-01	-2.8184E-01	-2.4373E-01	-2.3511E-01	-2.4649E-01	-2.5480E-01	
DPDZ	4.9929E-29	2.7370E-04	1.1553E-03	2.1430E-03	4.9457E-06	2.4075E-03	1.2593E-03	2.9437E-04	2.9984E-26	
PP	-4.4833E-16	2.5152E-02	6.3875E-02	1.3305E-01	-7.3627E-03	-1.4036E-01	-6.3555E-02	-2.4704E-02	-5.0093E-15	
UP	-2.5066E-14	-5.6998E-02	-1.0269E-01	-1.1232E-01	4.1425E-03	1.1936E-01	1.0752E-01	5.9268E-02	-6.1570E-13	
WP	-1.1052E+00	-9.8364E-01	-5.3131E-01	1.0153E+00	2.2444E+00	9.9348E-01	-5.8959E-01	-1.0252E+00	-1.1419E+00	

WINDWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3301E+00	1.8793E+00	1.9341E-02	1.1379E-02	2.3172E+00	2.4515E-01	4.2046E-16	0.	-2.4515E-01	2.3172E+00	9.5280E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	POROGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3313E+00	1.9444E+00	1.7327E-02	1.1356E-02	2.3183E+00	2.4527E-01	1.8263E-11	-2.8533E-11	2.4527E-01	2.3183E+00	9.5761E-01

FORCE COEFFICIENTS

```
CZ=  4.23925916E-02  CY=  4.60056012E-03  CC=  4.24005572E-02  CL=  4.52696412E-03
YBAR= -8.05855034E-04  ZBAR=  6.66666667E-01  CM= -3.10163860E-03
```

APPENDIX B

```
STMACH=  8.00C00000E+00  GAMMA=  1.40000C00E+0C  T=  6.000000CC0E-01  THETAD=  1.00C00000E+01  ALPHAD=  2.0C000000E+00

EPSIGCP=  1.CC00C000E-03
AAST=  4.23895624E-01

VTEST=  1.000C0000E-03  VTEST1=  3.00000000E-02

M2E=     C

SLOPE=  1.00CC0000E+00  KTRANSF= 1

RANGLE=  3.31169144E-01

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-C3  SPACER=  1.00000000E-03  EPSIVAR=  1.0C000000E-08  EPSINT=  2.5CCCC000E-02

NCYCLE= 1  AT  11/23/71  10.50.14.

ETAS
  6.09338815E-02  5.80808C75E-C2  5.22616620E-02  4.15C57351E-C2  4.10322017E-02  5.05404994E-02  6.80323461E-02  7.85038713E-02
  8.33682319E-C2
ETASP
 -1.5103CE47E-15 -7.96801622E-C2 -1.63933172E-01 -1.23242203E-01  7.97831158E-02  2.68672648E-01  2.71613743E-01  1.41854379E-01
 -2.08741818E-14
CP(I) AT SHOCK
  4.05509760E-02  4.14323956E-C2  4.59023081E-02  5.01421199E-02  5.11495725E-02  3.21161771E-02  2.14538340E-02  1.45792461E-02
  1.31057107E-02
CP(I) AT ZETA=0
  4.81018466E-02  4.91311747E-C2  5.40674504E-C2  6.117C5403E-02  6.13298977E-02  3.17268117E-02  2.16482668E-02  1.74766251E-02
  1.71248353E-C2
V
 -9.83706054E-03 -9.45977817E-03 -7.54535302E-03 -4.74992613E-03  7.63098167E-04 -1.10366227E-02 -1.22928208E-02 -1.42992494E-02
 -1.55944168E-02
KCOUNT=   13  VMAX=  1.55944168E-02  EPSIG=  1.0CCC0C00E-C3  SPACER=  1.00000000E-03  VMXTEST=  1.13673517E-01
DETERM=  9.12166681E-02
DETA
  1.75709050E-03  1.71351465E-03  1.28641629E-C3  9.17074509E-04  3.95273348E-04  1.0840C409E-03  1.55115695E-03  2.12212091E-03
  2.23271172E-03

NCYCLE= 2  AT  11/23/71  10.55.17.

ETAS
  6.26909720E-02  5.97943222E-02  5.35480783E-02  4.28268C96E-C2  4.14274750E-02  5.16245035E-02  6.95835030E-02  8.06259522E-C2
  8.56009436E-02
ETASP
 -7.73023930E-16 -8.41263462E-C2 -1.71435501E-01 -1.32975789E-01  8.13865466E-02  2.8C716053E-01  2.81299202E-01  1.48465C87E-01
 -1.83634E31E-14
CP(I) AT SHOCK
  4.17028240E-02  4.25910411E-C2  4.68394346E-02  5.08683302E-C2  5.14401036E-02  3.30C88874E-C2  2.24425036E-02  1.57254850E-C2
  1.42407628E-02
CP(I) AT ZETA=0
  4.94614482E-02  5.05247370E-C2  5.52865904E-02  6.20756138E-02  6.15937145E-02  3.35939129E-02  2.32453729E-02  1.91000738E-02
  1.86581896E-02
V
  1.49714339E-04  6.59535718E-C5 -4.17424518E-05 -8.97677752E-05 -4.43872632E-05 -3.95666605E-04 -3.15906295E-C4 -3.96441855E-C5
  5.569C1220E-04
```

APPENDIX B

N= 9 M=2 NREAD=1 NSPACE=1 NP= 5 NCAVRG=2
NA= 1 AAA= 0. NB= 1 BNB= 0.

STMACH= 8.00000000E+00 GAMMA= 1.40000000E+00 T= 6.00000000E-01 THETAD= 1.00000000E+01 ALPHAD= 2.00000000E+00

RANGLE= 3.31169144E-01

EPSIG= 1.00000000E-03 EPSIGMX= 1.00000000E-03 SPACER= 1.00000000E-03 EPSIVAR= 1.00000000E-08 EPSINT= 2.50000000E-02

NCYCLE= 2 VTEST= 1.00000000E-03 VMAX= 5.56501220E-04 AAST= 4.23895624E-01 PTINF= 1.08960426E+02

VTEST= 1.00000000E-03 VTEST1= 3.00000000E-02

M2E= 0

SLOPE= 1.00000000E+00 KTRANSF= 1
KCOUNT= 23 VMAX= 5.56501220E-04 EPSIG= 1.00000000E-03 SPACER= 1.00000000E-03 VMXTEST= 1.13619136E-01

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSID	-9.0000E+01	-6.1006E+01	-3.7365E+01	-1.8178E+01	-1.0489E-09	1.8178E+01	3.7365E+01	6.1006E+01	9.0000E+01	
PSISO	-9.0000E+01	-6.7059E+01	-4.4983E+01	-2.3158E+01	-1.4039E-09	2.3947E+01	4.6533E+01	6.8314E+01	9.0000E+01	
XO	0.	5.5635E-02	1.0894E-01	1.5468E-01	1.7633E-01	1.5468E-01	1.0894E-01	5.5635E-02	-1.2308E-11	
YO	-1.0580E-01	-1.0039E-01	-8.3188E-02	-5.0790E-02	-3.2281E-12	5.0790E-02	8.3188E-02	1.0039E-01	1.0580E-01	
XOBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
YOBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
XS	0.	6.7799E-02	1.3271E-01	1.8769E-01	2.1936E-01	1.9443E-01	1.3991E-01	7.2090E-02	-1.6047E-11	
YS	-1.6970E-01	-1.6019E-01	-1.3263E-01	-8.0243E-02	-5.3754E-12	8.6351E-02	1.4761E-01	1.8128E-01	1.9336E-01	
XSBAR	0.	3.8450E-01	7.5264E-01	1.0640E+00	1.2442E+00	1.1027E+00	7.9347E-01	4.0884E-01	-9.1007E-11	
YSBAR	-9.6240E-01	-9.0846E-01	-7.5219E-01	-4.5508E-01	-3.0485E-11	4.8972E-01	8.3712E-01	1.0281E+00	1.0966E+00	
ETAS	6.2691E-02	5.9794E-02	5.3548E-02	4.2827E-02	4.1427E-02	5.1625E-02	6.9584E-02	8.0626E-02	8.5601E-02	
BETAD	1.1631E+01	1.1708E+01	1.2070E+01	1.2405E+01	1.2452E+01	1.0849E+01	9.8203E+00	9.1085E+00	8.9438E+00	
XI	0.	5.5646E-02	1.1129E-01	1.6694E-01	2.2258E-01	2.7823E-01	3.3388E-01	3.8952E-01	4.4517E-01	
CPSHOCK	4.1703E-02	4.2591E-02	4.6839E-02	5.0868E-02	5.1440E-02	3.3009E-02	2.2443E-02	1.5725E-02	1.4241E-02	
CPBODY	4.9461E-02	5.0525E-02	5.5287E-02	6.2076E-02	6.1594E-02	3.3594E-02	2.3245E-02	1.9100E-02	1.8658E-02	

I	TAU	XI	XC	YO	ETAS	ETASP
1	0.	0.	0.	-1.05796188E-01	6.26909720E-02	-7.73023930E-16
2	5.56460997E-02	5.56460997E-02	5.56348315E-02	-1.00391977E-01	5.97943222E-02	-8.41263462E-02
3	1.11292199E-01	1.11292199E-01	1.08942518E-01	-8.31876403E-02	5.35480783E-02	-1.71435501E-01
4	1.66938299E-01	1.66938299E-01	1.54678616E-01	-5.07903803E-02	4.28268096E-02	-1.32975789E-01
5	2.22584399E-01	2.22584399E-01	1.76326980E-01	-3.22812610E-12	4.14274750E-02	8.13865466E-02
6	2.78230498E-01	2.78230498E-01	1.54678616E-01	5.07903804E-02	5.16245035E-02	2.80716053E-01
7	3.33876598E-01	3.33876598E-01	1.08942518E-01	8.31876403E-02	6.95835030E-02	2.81299202E-01
8	3.89522698E-01	3.89522698E-01	5.56348315E-02	1.00391977E-01	8.06259922E-02	1.48465087E-01
9	4.45168797E-01	4.45168797E-01	-1.23075942E-11	1.05796188E-01	8.56009436E-02	-1.83634831E-14

ZETA= 0.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	3.5891E-02	3.6423E-02	3.8804E-02	4.2199E-02	4.1958E-02	2.7958E-02	2.2783E-02	2.0711E-02	2.0490E-02	
P/ROASTSC	1.9974E-01	2.0270E-01	2.1595E-01	2.3484E-01	2.3350E-01	1.5559E-01	1.2679E-01	1.1526E-01	1.1403E-01	
P/PTINF	3.2940E-04	3.3428E-04	3.5613E-04	3.8728E-04	3.8507E-04	2.5659E-04	2.0910E-04	1.9008E-04	1.8805E-04	
P/PINF	3.2159E+00	3.2635E+00	3.4768E+00	3.7810E+00	3.7594E+00	2.5050E+00	2.0414E+00	1.8557E+00	1.8359E+00	
RHO	2.1887E+00	2.2119E+00	2.3142E+00	2.4570E+00	2.4470E+00	1.8311E+00	1.5820E+00	1.4778E+00	1.4666E+00	
U	2.3154E+00	2.3145E+00	2.3115E+00	2.3084E+00	2.3077E+00	2.3171E+00	2.3267E+00	2.3339E+00	2.3357E+00	
V	1.4971E-04	6.5954E-05	-4.1742E-05	-8.9768E-05	-4.4387E-05	-3.9567E-04	-3.1591E-04	-3.9644E-05	5.5690E-04	
W	-9.5898E-14	-3.8112E-02	-6.2374E-02	-4.9561E-02	8.2198E-02	1.9013E-01	1.5917E-01	6.2995E-02	-4.0678E-13	
UC	2.3026E+00	2.3007E+00	2.2939E+00	2.2816E+00	2.2726E+00	2.2994E+00	2.3151E+00	2.3216E+00	2.3227E+00	
VC	2.4375E-01	2.5162E-01	2.7913E-01	3.3874E-01	4.0068E-01	3.4109E-01	2.8143E-01	2.5379E-01	2.4630E-01	
WC	-9.5480E-14	4.2203E-02	8.2172E-02	1.0254E-01	8.2198E-02	3.7146E-02	1.3486E-02	1.9804E-03	1.7891E-11	
VCC	2.4375E-01	2.5253E-01	2.8564E-01	3.5102E-01	4.0068E-01	2.9592E-01	2.4367E-01	2.4116E-01	2.4630E-01	
WCC	-9.5898E-14	-3.6347E-02	-5.5469E-02	-4.5271E-02	8.2198E-02	1.7365E-01	1.4146E-01	7.9097E-02	-4.4801E-13	
VX	-9.5898E-14	9.0617E-02	1.9336E-01	3.1937E-01	4.0068E-01	2.2697E-01	1.0782E-01	4.7712E-02	-2.8204E-11	
VY	-2.4375E-01	-2.3850E-01	-2.1744E-01	-1.5252E-01	8.2198E-02	2.5730E-01	2.6031E-01	2.4927E-01	2.4630E-01	
VZ	2.3026E+00	2.3007E+00	2.2939E+00	2.2816E+00	2.2726E+00	2.2994E+00	2.3151E+00	2.3216E+00	2.3227E+00	
PSINOR	-2.3863E-12	2.2555E+00	4.8182E+00	7.9684E+00	9.9989E+00	5.6372E+00	2.6664E+00	1.1774E+00	-6.9573E-10	
THETNOR	8.3957E+01	8.4086E+01	8.4604E+01	8.6212E+01	8.7960E+01	8.3646E+01	8.3591E+01	8.3873E+01	8.3947E+01	
XBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
XBHLD	0.	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	
YBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
YBHLD	-6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	
ETA	0.	0.	0.	0.	0.	0.	0.	0.	0.	
G	-2.8630E-03	-2.9312E-03	-3.2202E-03	-3.3030E-03	-3.6303E-03	-3.9953E-03	-3.7087E-03	-3.3512E-03	-2.7958E-03	
DEONS	5.5946E+00	5.5962E+00	5.6037E+00	5.6214E+00	5.6558E+00	5.6328E+00	5.6152E+00	5.6069E+00	5.6054E+00	
AM	6.4778E+00	6.4626E+00	6.3974E+00	6.3118E+00	6.3176E+00	6.7406E+00	6.9623E+00	7.0676E+00	7.0795E+00	
CROSSM	2.6829E-13	1.0640E-01	1.7257E-01	1.3549E-01	2.2489E-01	5.5124E-01	4.7519E-01	2.5117E-01	1.2329E-12	
SBAR	7.1441E-02	7.1441E-02	7.1441E-02	7.1441E-02	7.1441E-02	7.1441E-02	7.1441E-02	7.1441E-02	7.1441E-02	
POROGAM	1.1987E-02	1.1987E-02	1.1987E-02	1.1987E-02	1.1987E-02	1.1987E-02	1.1987E-02	1.1987E-02	1.1987E-02	
PT/PTINF	8.3644E-01	8.3644E-01	8.3644E-01	8.3644E-01	8.3644E-01	8.3644E-01	8.3644E-01	8.3644E-01	8.3644E-01	
PT	9.1139E+01	9.1139E+01	9.1139E+01	9.1139E+01	9.1139E+01	9.1139E+01	9.1139E+01	9.1139E+01	9.1139E+01	
BERNOUL	-3.7357E-09	-6.9194E-10	-3.5128E-10	-1.3477E-09	-3.4309E-10	-2.5996E-08	-1.4776E-08	-7.9982E-09	-5.1690E-08	
DVDZ	-2.4145E-01	-2.3638E-01	-2.4309E-01	-2.5022E-01	-2.7744E-01	-2.3474E-01	-2.2440E-01	-2.4958E-01	-2.7247E-01	
DPDZ	7.7155E-28	1.2988E-04	4.5136E-04	4.3958E-04	1.9389E-03	5.8167E-03	2.6112E-03	5.5492E-04	1.2701E-26	
PP	-9.2401E-16	2.6176E-02	6.0136E-02	5.0419E-02	-1.4741E-01	-1.9771E-01	-5.3934E-02	-1.6332E-02	-3.0451E-15	
UP	-9.5898E-14	-3.8112E-02	-6.2374E-02	-4.9561E-02	8.2198E-02	1.9013E-01	1.5917E-01	6.2995E-02	-4.0678E-13	
WP	-7.7945E-01	-6.5712E-01	-1.4804E-02	1.2919E+00	2.3154E+00	8.8629E-01	-1.1666E+00	-1.3211E+00	-1.4885E+00	

WINDWARD LINE ZETA LIMIT

U	RHO	S	PORCGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3179E+00	2.2282E+00	4.6451E-02	1.1691E-02	2.3050E+00	2.4386E-01	4.1825E-16	0.	-2.4386E-01	2.3050E+00	8.9036E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	PORCGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3412E+00	1.5380E+00	4.8763E-03	1.1215E-02	2.3282E+00	2.4631E-01	1.8340E-11	-2.8654E-11	2.4631E-01	2.3282E+00	9.8788E-01

FORCE COEFFICIENTS

CZ= 4.33630484E-02 CY= 9.23243484E-02 CD= 4.65587061E-02 CL= 9.07547583E-02
YBAR= -1.58871219E-02 ZBAR= 6.66666667E-01 CM= -6.22384796E-02

APPENDIX B

```
STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  6.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  4.00000000E+00

EPSIGOM=  1.00000000E-03
AAST=  4.23895624E-01

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=     0

SLOPE=  1.00000000E+00  KTRANSF= 1

RANGLE=  6.62338287E-01

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 1  AT  11/23/71  10.56.03.

ETAS
  5.71057891E-02  5.50043294E-02  4.96974454E-02  4.13550504E-02  4.26159149E-02  5.93018690E-02  8.23256429E-02  9.75278923E-02
  1.03927039E-01
ETASP
  1.02566007E-16 -6.83148663E-02 -1.41825391E-01 -9.12759147E-02  1.66148739E-01  3.91619215E-01  3.66148845E-01  2.01549240E-01
 -2.75899443E-14
CP(I) AT SHOCK
  6.23081671E-02  6.29350687E-02  6.50848005E-02  6.50554219E-02  5.51913507E-02  2.92340819E-02  1.55382225E-02  8.04002435E-03
  6.19048647E-03
CP(I) AT ZETA=0
  7.18671981E-02  7.29640045E-02  7.61385638E-02  7.81817104E-02  5.89847833E-02  1.98189549E-02  9.52996627E-03  8.22316664E-03
  8.50866161E-03
V
   3.13590376E-03  4.26116068E-03  3.13709417E-03  2.00123827E-03  4.51393242E-04 -1.07370231E-02 -1.14404335E-02 -8.64716521E-03
  -3.33121264E-03
KCOUNT=   24  VMAX=  1.14404335E-02  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.11651068E-01
DETERM=  4.96810152E-02
DETA
  -6.65642026E-04 -7.54603087E-04 -5.65569366E-04 -3.63084535E-04 -2.02071743E-04  3.47875098E-04  6.70528349E-04  1.09556953E-03
   8.38469080E-04

NCYCLE= 2  AT  11/23/71  11.01.00.

ETAS
  5.64401471E-02  5.42497263E-02  4.91318761E-02  4.09919658E-02  4.24138432E-02  5.96497441E-02  8.29961713E-02  9.86234618E-02
  1.04765509E-01
ETASP
  4.19457901E-16 -6.77022706E-02 -1.37829037E-01 -8.85720672E-02  1.72815243E-01  3.99888957E-01  3.73548308E-01  2.02441533E-01
 -2.14169116E-14
CP(I) AT SHOCK
  6.18116966E-02  6.23692064E-02  6.46460458E-02  6.47838567E-02  5.51927197E-02  2.96374977E-02  1.59980359E-02  8.55583128E-03
  6.57651052E-03
CP(I) AT ZETA=0
  7.13349532E-02  7.23141941E-02  7.56217879E-02  7.79172893E-02  5.93372194E-02  2.11254900E-02  1.05087409E-02  8.80368423E-03
  8.99560551E-03
V
   2.00708611E-05  1.03949796E-05  1.64161191E-07  7.28417927E-07 -4.44601693E-05 -5.55113121E-04 -2.81041930E-04 -1.03900309E-05
   3.22546646E-04
```

```
N= 9  M=2  NREAC=1  NSPACE=1  NP= 5  NCNVRG=3
NA=-1  ANA= 0.          NB=-1  BNB= 0.

STMACH=  8.00000000E+00  GAMMA=  1.40000000E+00  T=  6.00000000E-01  THETAD=  1.00000000E+01  ALPHAD=  4.00000000E+00

RANGLE=  6.62338287E-01

EPSIG=  1.00000000E-03  EPSIGMX=  1.00000000E-03  SPACER=  1.00000000E-03  EPSIVAR=  1.00000000E-08  EPSINT=  2.50000000E-02

NCYCLE= 2  VTEST=  1.00000000E-03  VMAX=  5.55113121E-04  AAST=  4.23895624E-01  PTINF=  1.08960426E+02

VTEST=  1.00000000E-03  VTEST1=  3.00000000E-02

M2E=    0

SLOPE=  1.00000000E+00  KTRANSF= 1
KCOUNT=    34  VMAX=  5.55113121E-04  EPSIG=  1.00000000E-03  SPACER=  1.00000000E-03  VMXTEST=  1.11683828E-01
```

SUMMARY PRINT BLOCK

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
PSIO	-9.0000E+01	-6.1006E+01	-3.7365E+01	-1.8178E+01	-1.0489E-09	1.8178E+01	3.7365E+01	6.1006E+01	9.0000E+01	
PSISD	-9.0000E+01	-6.6674E+01	-4.4511E+01	-2.2965E+01	-1.4107E-09	2.4614E+01	4.7662E+01	6.9203E+01	9.0000E+01	
XO	0.	5.5635E-02	1.0894E-01	1.5468E-01	1.7633E-01	1.5468E-01	1.0894E-01	5.5635E-02	-1.2308E-11	
YO	-1.0580E-01	-1.0039E-01	-8.3188E-02	-5.0790E-02	-3.2281E-12	5.0790E-02	8.3188E-02	1.0039E-01	1.0580E-01	
XOBAR	0.	3.1552E-01	6.1784E-01	8.7723E-01	1.0000E+00	8.7723E-01	6.1784E-01	3.1552E-01	-6.9800E-11	
YOBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.8805E-01	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
XS	0.	6.6662E-02	1.3074E-01	1.8618E-01	2.2042E-01	2.0068E-01	1.4597E-01	7.5826E-02	-1.6899E-11	
YS	-1.6327E-01	-1.5460E-01	-1.2852E-01	-7.8972E-02	-5.4270E-12	9.1940E-02	1.6020E-01	1.9964E-01	2.1332E-01	
XSBAR	0.	3.7806E-01	7.4144E-01	1.0559E+00	1.2500E+00	1.1381E+00	8.2782E-01	4.3003E-01	-9.5841E-11	
YSBAR	-9.2596E-01	-8.7676E-01	-7.2888E-01	-4.4787E-01	-3.0778E-11	5.2142E-01	9.0856E-01	1.1322E+00	1.2098E+00	
ETAS	5.6440E-02	5.4250E-02	4.9132E-02	4.0952E-02	4.2414E-02	5.9650E-02	8.2996E-02	9.8623E-02	1.0477E-01	
BETAD	1.3273E+01	1.3316E+01	1.3489E+01	1.3500E+01	1.2754E+01	1.0532E+01	9.1384E+00	8.2839E+00	8.0418E+00	
XI	0.	5.5646E-02	1.1129E-01	1.6694E-01	2.2258E-01	2.7823E-01	3.3388E-01	3.8952E-01	4.4517E-01	
CPSHOCK	6.1812E-02	6.2369E-02	6.4646E-02	6.4764E-02	5.5193E-02	2.9637E-02	1.5998E-02	8.5558E-03	6.5765E-03	
CPBODY	7.1335E-02	7.2314E-02	7.5622E-02	7.7917E-02	5.9337E-02	2.1125E-02	1.0509E-02	8.8037E-03	8.9956E-03	

I	TAU	XI	XO	YO	ETAS	ETASP
1	0.	0.	0.	-1.05796188E-01	5.64401471E-02	4.19457901E-16
2	5.56460997E-02	5.56460997E-02	5.56348315E-02	-1.00391977E-01	5.42497263E-02	-6.77022706E-02
3	1.11292199E-01	1.11292199E-01	1.08942518E-01	-8.31876403E-02	4.91318761E-02	-1.37829037E-01
4	1.66938299E-01	1.66938299E-01	1.54678616E-01	-5.07903803E-02	4.09919658E-02	-8.85720672E-02
5	2.22584399E-01	2.22584399E-01	1.76326980E-01	-3.22812610E-12	4.24138432E-02	1.72815243E-01
6	2.78230498E-01	2.78230498E-01	1.54678616E-01	5.07903804E-02	5.96497441E-02	3.99888957E-01
7	3.33876598E-01	3.33876598E-01	1.08942518E-01	8.31876403E-02	8.29961713E-02	3.73548308E-01
8	3.89522698E-01	3.89522698E-01	5.56348315E-02	1.00391977E-01	9.86234618E-02	2.02441533E-01
9	4.45168797E-01	4.45168797E-01	-1.23075942E-11	1.05796188E-01	1.04765509E-01	-2.14169116E-14

ZETA= 1.00000000E+00

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.2067E-02	4.2345E-02	4.3484E-02	4.3553E-02	3.8757E-02	2.5979E-02	1.9160E-02	1.5439E-02	1.4449E-02	
P/ROASTSQ	2.3411E-01	2.3566E-01	2.4200E-01	2.4238E-01	2.1569E-01	1.4458E-01	1.0663E-01	8.5919E-02	8.0412E-02	
P/PTINF	3.8607E-04	3.8863E-04	3.9908E-04	3.9971E-04	3.5570E-04	2.3843E-04	1.7584E-04	1.4169E-04	1.3261E-04	
P/PINF	3.7692E+00	3.7941E+00	3.8961E+00	3.9023E+00	3.4726E+00	2.3278E+00	1.7167E+00	1.3833E+00	1.2946E+00	
RHO	2.4173E+00	2.4264E+00	2.4633E+00	2.4655E+00	2.3051E+00	1.7972E+00	1.4644E+00	1.2556E+00	1.2019E+00	
U	2.2961E+00	2.2956E+00	2.2939E+00	2.2939E+00	2.2982E+00	2.3128E+00	2.3257E+00	2.3336E+00	2.3359E+00	
V	-2.2406E-01	-2.2257E-01	-2.2045E-01	-2.2318E-01	-2.1324E-01	-1.8925E-01	-2.1554E-01	-2.5743E-01	-2.7457E-01	
W	0.	-3.0415E-02	-3.9106E-02	-1.0027E-02	1.3415E-01	2.2826E-01	1.8706E-01	1.0367E-01	0.	
UC	2.3022E+00	2.3009E+00	2.2961E+00	2.2908E+00	2.2902E+00	2.3122E+00	2.3282E+00	2.3387E+00	2.3418E+00	
VC	1.4885E-01	1.5323E-01	1.7113E-01	2.0980E-01	2.8643E-01	2.9178E-01	2.6119E-01	2.2914E-01	2.1879E-01	
WC	2.5530E-16	4.9539E-02	1.0480E-01	1.4151E-01	1.3415E-01	7.5004E-02	4.0770E-02	2.2168E-02	1.8423E-11	
VCC	1.4885E-01	1.6019E-01	1.9682E-01	2.4487E-01	2.8643E-01	2.5501E-01	2.3766E-01	2.2233E-01	2.1879E-01	
WCC	0.	1.6479E-02	3.9104E-02	6.3859E-02	1.3415E-01	1.6040E-01	1.1575E-01	5.9739E-02	1.0252E-11	
VX	0.	7.8560E-02	1.6777E-01	2.5037E-01	2.8643E-01	1.6503E-01	7.4503E-02	2.3052E-02	-2.7585E-11	
VY	-1.4885E-01	-1.4057E-01	-1.1009E-01	-3.6830E-02	1.3415E-01	2.5204E-01	2.5363E-01	2.2905E-01	2.1879E-01	
VZ	2.3022E+00	2.3009E+00	2.2961E+00	2.2908E+00	2.2902E+00	2.3122E+00	2.3282E+00	2.3387E+00	2.3418E+00	
PSINOR	0.	1.9555E+00	4.1751E+00	6.2372E+00	7.1290E+00	4.0825E+00	1.8329E+00	5.6572E-01	-6.7492E-10	
THETNOR	8.6301E+01	8.6506E+01	8.7262E+01	8.9084E+01	8.6673E+01	8.3795E+01	8.3786E+01	8.4407E+01	8.4662E+01	
XBAR	0.	3.7806E-01	7.4144E-01	1.0559E+00	1.2500E+00	1.1381E+00	8.2782E-01	4.3003E-01	-9.5841E-11	
XBHLD	0.	3.7806E-01	7.4144E-01	1.0559E+00	1.2500E+00	1.1381E+00	8.2782E-01	4.3003E-01	-9.5841E-11	
YBAR	-9.2596E-01	-8.7676E-01	-7.2888E-01	-4.4787E-01	-3.0778E-11	5.2142E-01	9.0856E-01	1.1322E+00	1.2098E+00	
YBHLD	-9.2596E-01	-8.7676E-01	-7.2888E-01	-4.4787E-01	-3.0778E-11	5.2142E-01	9.0856E-01	1.1322E+00	1.2098E+00	
ETA	5.6440E-02	5.4250E-02	4.9132E-02	4.0952E-02	4.2414E-02	5.9650E-02	8.2996E-02	9.8623E-02	1.0477E-01	
G	-2.6671E-01	-2.6971E-01	-2.8198E-01	-3.1053E-01	-3.7867E-01	-3.8707E-01	-3.7777E-01	-3.7254E-01	-3.7077E-01	
DEONS	4.9659E+00	5.0963E+00	5.6493E+00	6.8567E+00	9.5408E+00	7.0820E+00	4.3418E+00	2.5192E+00	1.9795E+00	
AM	6.2652E+00	6.2552E+00	6.2148E+00	6.2124E+00	6.3877E+00	6.9479E+00	7.3388E+00	7.6045E+00	7.6851E+00	
CROSSM	6.0850E-01	6.0919E-01	6.0369E-01	6.0219E-01	6.5607E-01	8.8351E-01	8.9387E-01	8.9803E-01	8.9718E-01	
SBAR	9.1142E-02	9.2466E-02	9.7902E-02	9.8233E-02	7.5712E-02	2.4193E-02	6.3970E-03	1.3909E-03	7.0168E-04	
POROGAM	1.2226E-02	1.2242E-02	1.2309E-02	1.2313E-02	1.2039E-02	1.1434E-02	1.1232E-02	1.1176E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9361E-01	7.8290E-01	7.8225E-01	8.2756E-01	9.4131E-01	9.8413E-01	9.9653E-01	9.9825E-01	
PT	8.6759E+01	8.6472E+01	8.5305E+01	8.5234E+01	9.0171E+01	1.0257E+02	1.0723E+02	1.0858E+02	1.0877E+02	
BERNOUL	3.5527E-14	4.2633E-14	4.2633E-14	4.2633E-14	4.9738E-14	4.2633E-14	3.5527E-14	4.2633E-14	4.9738E-14	
DPDZ	-1.0060E-02	-1.0572E-02	-1.0777E-02	-1.2575E-02	-7.0015E-03	-3.6484E-04	1.1217E-03	-3.3834E-03	-7.7853E-03	
DUDZ	-1.2646E-02	-1.2067E-02	-1.0799E-02	-9.1737E-03	-9.1650E-03	-1.1663E-02	-1.7652E-02	-2.5351E-02	-2.8766E-02	
DVDZ	-2.3296E-01	-2.3265E-01	-2.2010E-01	-2.2076E-01	-1.9157E-01	-1.8460E-01	-2.1028E-01	-2.9899E-01	-3.7600E-01	
DWDZ	-1.1611E-15	-8.4387E-03	-1.6420E-02	-2.1330E-02	5.7116E-03	-9.8767E-03	-4.1070E-02	-2.5585E-02	-2.3693E-12	
DSBDZ	4.3386E-32	-4.4261E-04	-6.2825E-04	2.1657E-04	-1.1270E-02	-2.4109E-02	-6.6105E-03	-9.3546E-04	-3.6046E-27	
PP	-2.3912E-15	1.5170E-02	1.9420E-02	-3.2119E-02	-1.7411E-01	-1.9268E-01	-8.9881E-02	-4.0652E-02	-1.6397E-15	
UP	-7.6937E-14	-2.2742E-02	-2.3417E-02	2.4761E-02	1.7877E-01	2.7045E-01	1.9248E-01	9.0828E-02	-4.9616E-13	
VP	1.0504E-14	4.4228E-02	-2.3581E-02	3.6424E-02	3.9918E-01	2.3757E-02	-7.2454E-01	-6.0518E-01	7.1226E-14	
WP	-6.1165E-01	-4.0794E-01	4.3350E-02	1.6884E+00	2.5160E+00	4.6362E-01	-1.2917E+00	-1.7440E+00	-1.9237E+00	
SBARP	-1.8322E-15	7.2349E-02	9.2203E-02	-1.6361E-01	-7.5000E-01	-6.8540E-01	-1.6085E-01	-3.4066E-02	5.0307E-16	

APPENDIX B

ZETA= 9.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.2998E-02	4.3325E-02	4.4493E-02	4.4733E-02	3.9408E-02	2.5973E-02	1.9040E-02	1.5693E-02	1.4956E-02	
P/ROASTSC	2.3930E-01	2.4111E-01	2.4761E-01	2.4895E-01	2.1932E-01	1.4454E-01	1.0556E-01	8.7333E-02	8.3234E-02	
P/PTINF	3.9462E-04	3.9762E-04	4.0834E-04	4.1054E-04	3.6168E-04	2.3837E-04	1.7474E-04	1.4402E-04	1.3726E-04	
P/PINF	3.8527E+00	3.8819E+00	3.9866E+00	4.0080E+00	3.5310E+00	2.3272E+00	1.7060E+00	1.4061E+00	1.3401E+00	
RHO	2.4554E+00	2.4663E+00	2.5039E+00	2.5130E+00	2.3308E+00	1.7935E+00	1.4570E+00	1.2742E+00	1.2319E+00	
U	2.2973E+00	2.2967E+00	2.2950E+00	2.2948E+00	2.2990E+00	2.3139E+00	2.3274E+00	2.3359E+00	2.3386E+00	
V	-2.0109E-01	-1.9963E-01	-1.9868E-01	-2.0140E-01	-1.9414E-01	-1.7087E-01	-1.9444E-01	-2.2870E-01	-2.4115E-01	
W	0.	-2.9604E-02	-3.7563E-02	-7.8533E-03	1.3370E-01	2.2946E-01	1.9121E-01	1.0615E-01	0.	
UC	2.3006E+00	2.2992E+00	2.2942E+00	2.2884E+00	2.2882E+00	2.3113E+00	2.3281E+00	2.3376E+00	2.3399E+00	
VC	1.5873E-01	1.6357E-01	1.8146E-01	2.2194E-01	2.9558E-01	2.9628E-01	2.6296E-01	2.3473E-01	2.2754E-01	
WC	2.7225E-16	5.0331E-02	1.0631E-01	1.4365E-01	1.3370E-01	7.6223E-02	4.4913E-02	2.4665E-02	1.8416E-11	
VCC	1.5873E-01	1.7057E-01	2.0739E-01	2.5746E-01	2.9558E-01	2.5752E-01	2.3669E-01	2.2690E-01	2.2754E-01	
WCC	0.	1.3901E-02	3.4952E-02	6.0063E-02	1.3370E-01	1.6515E-01	1.2306E-01	6.4982E-02	9.4696E-12	
VX	0.	8.1359E-02	1.7354E-01	2.6078E-01	2.9558E-01	1.6753E-01	7.1514E-02	2.1736E-02	-2.7944E-11	
VY	-1.5873E-01	-1.5056E-01	-1.1860E-01	-4.3436E-02	1.3370E-01	2.5598E-01	2.5701E-01	2.3502E-01	2.2754E-01	
VZ	2.3006E+00	2.2992E+00	2.2942E+00	2.2884E+00	2.2882E+00	2.3113E+00	2.3281E+00	2.3376E+00	2.3399E+00	
PSINOR	0.	2.0266E+00	4.3258E+00	6.5014E+00	7.3604E+00	4.1457E+00	1.7555E+00	5.3274E-01	-6.8425E-10	
THETNCR	8.6053E+01	8.6256E+01	8.7044E+01	8.8920E+01	8.6683E+01	8.3697E+01	8.3703E+01	8.4259E+01	8.4446E+01	
XBAR	0.	3.7176E-01	7.2900E-01	1.0379E+00	1.2248E+00	1.1118E+00	8.0655E-01	4.1840E-01	-9.3194E-11	
XBHLD	0.	3.5907E-01	7.2477E-01	1.0559E+00	1.2222E+00	1.0715E+00	7.5364E-01	3.6100E-01	-9.3194E-11	
YBAR	-8.9313E-01	-8.4580E-01	-7.0300E-01	-4.3179E-01	-2.9521E-11	4.9785E-01	8.6421E-01	1.0751E+00	1.1478E+00	
YBHLD	-8.9313E-01	-8.4742E-01	-7.0469E-01	-4.4787E-01	1.1703E-02	5.4621E-01	8.9304E-01	1.0851E+00	1.1478E+00	
ETA	5.0796E-02	4.8825E-02	4.4219E-02	3.6853E-02	3.8172E-02	5.3685E-02	7.4697E-02	8.8761E-02	9.4289E-02	
G	-2.3557E-01	-2.3786E-01	-2.4890E-01	-2.7226E-01	-3.3150E-01	-3.4007E-01	-3.3379E-01	-3.2343E-01	-3.1733E-01	
DEQNS	5.3740E+00	5.5014E+00	6.0059E+00	7.1846E+00	9.7474E+00	7.6537E+00	5.2304E+00	3.9561E+00	3.7123E+00	
AM	6.2431E+00	6.2320E+00	6.1917E+00	6.1857E+00	6.3675E+00	6.9411E+00	7.3439E+00	7.5849E+00	7.6441E+00	
CROSSM	5.4440E-01	5.4551E-01	5.4341E-01	5.4121E-01	6.4946E-01	8.5173E-01	8.5466E-01	8.1397E-01	7.8408E-01	
SBAR	9.1142E-02	9.2512E-02	9.7567E-02	9.8213E-02	7.6890E-02	2.6781E-02	7.1698E-03	1.5005E-03	7.0168E-04	
POROGAM	1.2226E-02	1.2242E-02	1.2309E-02	1.2312E-02	1.2053E-02	1.1464E-02	1.1241E-02	1.1177E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9352E-01	7.8277E-01	7.8229E-01	8.2512E-01	9.3524E-01	9.8224E-01	9.9626E-01	9.9825E-01	
PT	8.6759E+01	8.6462E+01	8.5291E+01	8.5238E+01	8.9906E+01	1.0190E+02	1.0702E+02	1.0855E+02	1.0877E+02	
BERNOUL	1.3911E-10	-5.9647E-07	-3.7619E-06	3.3360E-06	3.5301E-05	-8.5090E-06	-1.4224E-05	1.4240E-06	5.4311E-09	
DPDZ	-8.6336E-03	-9.0854E-03	-9.4596E-03	-1.1081E-02	-6.0491E-03	4.8239E-04	1.3032E-03	-1.8746E-03	-3.4469E-03	
DUDZ	-1.1349E-02	-1.0819E-02	-9.7270E-03	-8.2763E-03	-8.2887E-03	-1.0453E-02	-1.5877E-02	-2.2502E-02	-2.5264E-02	
DVDZ	-2.2697E-01	-2.2652E-01	-2.1569E-01	-2.1552E-01	-1.9090E-01	-1.8325E-01	-2.1144E-01	-2.7814E-01	-3.0957E-01	
DWDZ	-2.4446E-16	-7.7970E-03	-1.4466E-02	-2.2214E-02	3.3294E-03	-1.4225E-02	-4.1900E-02	-2.4475E-02	-2.5935E-12	
DSBDZ	8.3431E-33	-4.9440E-04	-6.6464E-04	1.8218E-04	-1.2313E-02	-2.7790E-02	-8.9753E-03	-1.2828E-03	-3.8810E-27	
PP	-4.9079E-16	1.5801E-02	2.2236E-02	-3.4931E-02	-1.8663E-01	-2.0054E-01	-8.6542E-02	-3.3528E-02	-1.8172E-15	
UP	-5.5673E-15	-2.4412E-02	-2.6183E-02	2.2981E-02	1.8060E-01	2.7780E-01	2.0514E-01	1.0111E-01	-3.3711E-13	
VP	5.8495E-15	3.1520E-02	-3.1546E-02	1.1354E-02	3.5936E-01	3.7209E-02	-6.2247E-01	-4.7293E-01	4.5860E-14	
WP	-5.9684E-01	-3.9392E-01	6.0360E-02	1.6639E+00	2.5006E+00	5.1818E-01	-1.2771E+00	-1.7881E+00	-1.9707E+00	
SBARP	-1.2741E-15	7.3222E-02	8.9639E-02	-1.5408E-01	-7.1981E-01	-6.9044E-01	-1.8878E-01	-3.9631E-02	4.6818E-16	

ZETA= 8.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.3802E-02	4.4171E-02	4.5383E-02	4.5778E-02	3.5970E-02	2.5885E-02	1.8896E-02	1.5836E-02	1.5224E-02	
P/ROASTSQ	2.4377E-01	2.4582E-01	2.5257E-01	2.5476E-01	2.2244E-01	1.4405E-01	1.0516E-01	8.8133E-02	8.4723E-02	
P/PTINF	4.0200E-04	4.0539E-04	4.1651E-04	4.2013E-04	3.6683E-04	2.3756E-04	1.7342E-04	1.4534E-04	1.3972E-04	
P/PINF	3.9247E+00	3.9577E+00	4.0663E+00	4.1017E+00	3.5813E+00	2.3193E+00	1.6931E+00	1.4189E+00	1.3640E+00	
RHO	2.4881E+00	2.5005E+00	2.5394E+00	2.5549E+00	2.3523E+00	1.7854E+00	1.4481E+00	1.2824E+00	1.2476E+00	
U	2.2983E+00	2.2977E+00	2.2959E+00	2.2955E+00	2.2958E+00	2.3149E+00	2.3289E+00	2.3381E+00	2.3409E+00	
V	-1.7859E-01	-1.7718E-01	-1.7723E-01	-1.7999E-01	-1.7500E-01	-1.5256E-01	-1.7327E-01	-2.0147E-01	-2.1134E-01	
W	0.	-2.8853E-02	-3.6204E-02	-5.5726E-03	1.3349E-01	2.3110E-01	1.9547E-01	1.0859E-01	0.	
UC	2.2991E+00	2.2976E+00	2.2925E+00	2.2861E+00	2.2862E+00	2.3106E+00	2.3279E+00	2.3369E+00	2.3389E+00	
VC	1.6815E-01	1.7343E-01	1.9148E-01	2.3373E-01	3.0475E-01	3.0072E-01	2.6481E-01	2.3885E-01	2.3273E-01	
WC	2.8840E-16	5.1066E-02	1.0764E-01	1.4590E-01	1.3349E-01	7.7874E-02	4.9175E-02	2.7119E-02	1.8412E-11	
VCC	1.6815E-01	1.8045E-01	2.1754E-01	2.6972E-01	3.0475E-01	2.5968E-01	2.3549E-01	2.2991E-01	2.3273E-01	
WCC	0.	1.1144E-02	3.0436E-02	5.6250E-02	1.3349E-01	1.7047E-01	1.3072E-01	7.0182E-02	8.7527E-12	
VX	0.	8.4010E-02	1.7902E-01	2.7100E-01	3.0475E-01	1.6970E-01	6.8444E-02	2.0136E-02	-2.8158E-11	
VY	-1.6815E-01	-1.6009E-01	-1.2730E-01	-4.9714E-02	1.3349E-01	2.6019E-01	2.6049E-01	2.3954E-01	2.3273E-01	
VZ	2.2991E+00	2.2976E+00	2.2925E+00	2.2861E+00	2.2862E+00	2.3106E+00	2.3279E+00	2.3369E+00	2.3389E+00	
PSINOR	0.	2.0940E+00	4.4651E+00	6.7606E+00	7.5927E+00	4.2005E+00	1.6841E+00	4.9368E-01	-6.8978E-10	
THETNCR	8.5817E+01	8.6017E+01	8.6831E+01	8.8763E+01	8.6688E+01	8.3592E+01	8.3618E+01	8.4148E+01	8.4317E+01	
XBAR	0.	3.6547E-01	7.1657E-01	1.0200E+00	1.1997E+00	1.0855E+00	7.8534E-01	4.0682E-01	-9.0558E-11	
XBHLD	0.	3.3996E-01	7.0802E-01	1.0559E+00	1.1939E+00	1.0077E+00	6.8007E-01	2.9423E-01	-9.0558E-11	
YBAR	-8.6036E-01	-8.1490E-01	-6.7715E-01	-4.1513E-01	-2.8267E-11	4.7433E-01	8.2020E-01	1.0181E+00	1.0861E+00	
YBHLD	-8.6036E-01	-8.1807E-01	-6.8051E-01	-4.4787E-01	2.4189E-02	5.6399E-01	8.7525E-01	1.0370E+00	1.0861E+00	
ETA	4.5152E-02	4.3400E-02	3.9306E-02	3.2754E-02	3.3931E-02	4.7720E-02	6.6397E-02	7.8859E-02	8.3812E-02	
G	-2.0584E-01	-2.0751E-01	-2.1738E-01	-2.3619E-01	-2.8688E-01	-2.9526E-01	-2.9120E-01	-2.7817E-01	-2.7081E-01	
DEQNS	5.6739E+00	5.7936E+00	6.2461E+00	7.3556E+00	9.7401E+00	7.9876E+00	5.9003E+00	4.9808E+00	4.8444E+00	
AM	6.2245E+00	6.2125E+00	6.1718E+00	6.1627E+00	6.3496E+00	6.9366E+00	7.3456E+00	7.5737E+00	7.6231E+00	
CROSSM	4.8221E-01	4.8389E-01	4.8477E-01	4.8195E-01	6.0492E-01	8.2393E-01	8.1920E-01	7.3785E-01	6.8544E-01	
SBAR	9.1142E-02	9.2565E-02	9.8036E-02	9.8197E-02	7.8180E-02	2.9781E-02	8.2242E-03	1.6546E-03	7.0168E-04	
POROGAM	1.2226E-02	1.2243E-02	1.2310E-02	1.2312E-02	1.2068E-02	1.1498E-02	1.1253E-02	1.1179E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9341E-01	7.8264E-01	7.8232E-01	8.2246E-01	9.2825E-01	9.7965E-01	9.9567E-01	9.9825E-01	
PT	8.6759E+01	8.6451E+01	8.5276E+01	8.5242E+01	8.9616E+01	1.0114E+02	1.0674E+02	1.0851E+02	1.0877E+02	
BERNOUL	2.0486E-10	-1.2900E-06	-7.6822E-06	6.1104E-06	7.4267E-05	-1.6283E-05	-3.3953E-05	2.8269E-06	5.9762E-09	
DPDZ	-7.4740E-03	-7.8671E-03	-8.3656E-03	-9.8544E-03	-5.2002E-03	1.2734E-03	1.5818E-03	-1.0640E-03	-2.0761E-03	
DUDZ	-1.0080E-02	-9.5976E-03	-8.6706E-03	-7.3935E-03	-7.3916E-03	-9.1986E-03	-1.4075E-02	-1.9792E-02	-2.2142E-02	
DVDZ	-2.2332E-01	-2.2275E-01	-2.1348E-01	-2.1305E-01	-1.9207E-01	-1.8312E-01	-2.1197E-01	-2.6757E-01	-2.8907E-01	
DWDZ	-1.1210E-15	-7.2456E-03	-1.2696E-02	-2.3458E-02	9.1428E-04	-1.8642E-02	-4.3379E-02	-2.4474E-02	-2.7344E-12	
DSBDZ	-8.7142E-32	-5.5931E-04	-7.1096E-04	1.3913E-04	-1.3522E-02	-3.2380E-02	-1.2309E-02	-1.8481E-03	-6.5109E-27	
PP	-1.9318E-15	1.6535E-02	2.4985E-02	-3.7462E-02	-1.9866E-01	-2.0764E-01	-8.3326E-02	-2.8947E-02	-1.8451E-15	
UP	-5.9207E-14	-2.5872E-02	-2.8595E-02	2.1413E-02	1.8212E-01	2.8436E-01	2.1632E-01	1.0985E-01	-4.6360E-13	
VP	5.6868E-15	2.0433E-02	-3.8952E-02	-1.0115E-02	3.2264E-01	5.2891E-02	-5.3148E-01	-3.8289E-01	5.0665E-14	
WP	-5.8290E-01	-3.8219E-01	7.8957E-02	1.6437E+00	2.4886E+00	5.7154E-01	-1.2678E+00	-1.8331E+00	-2.0165E+00	
SBARP	-3.5065E-15	7.4148E-02	8.6884E-02	-1.4386E-01	-6.8515E-01	-6.9353E-01	-2.2094E-01	-4.8002E-02	6.7748E-16	

ZETA= 7.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.4458E-02	4.4904E-02	4.6170E-02	4.6708E-02	4.0449E-02	2.5718E-02	1.8722E-02	1.5914E-02	1.5392E-02	
P/ROASTSQ	2.4764E-01	2.4990E-01	2.5695E-01	2.5994E-01	2.2511E-01	1.4312E-01	1.0419E-01	8.8566E-02	8.5658E-02	
P/PTINF	4.0839E-04	4.1211E-04	4.2373E-04	4.2867E-04	3.7123E-04	2.3603E-04	1.7182E-04	1.4606E-04	1.4126E-04	
P/PINF	3.9870E+00	4.0234E+00	4.1369E+00	4.1850E+00	3.6243E+00	2.3043E+00	1.6775E+00	1.4259E+00	1.3791E+00	
RHO	2.5163E+00	2.5300E+00	2.5707E+00	2.5919E+00	2.3700E+00	1.7727E+00	1.4370E+00	1.2867E+00	1.2575E+00	
U	2.2993E+00	2.2986E+00	2.2967E+00	2.2962E+00	2.3005E+00	2.3157E+00	2.3302E+00	2.3359E+00	2.3430E+00	
V	-1.5637E-01	-1.5503E-01	-1.5553E-01	-1.5872E-01	-1.5567E-01	-1.3422E-01	-1.5205E-01	-1.7506E-01	-1.8304E-01	
W	0.	-2.8154E-02	-3.5023E-02	-3.1493E-03	1.3353E-01	2.3320E-01	1.9989E-01	1.1106E-01	0.	
UC	2.2978E+00	2.2962E+00	2.2909E+00	2.2838E+00	2.2843E+00	2.3099E+00	2.3278E+00	2.3364E+00	2.3382E+00	
VC	1.7729E-01	1.8300E-01	2.0137E-01	2.4537E-01	3.1412E-01	3.0518E-01	2.6669E-01	2.4214E-01	2.3644E-01	
WC	3.0408E-16	5.1750E-02	1.0880E-01	1.4829E-01	1.3353E-01	7.9984E-02	5.3558E-02	2.9590E-02	1.8410E-11	
VCC	1.7729E-01	1.9001E-01	2.2746E-01	2.8188E-01	3.1412E-01	2.6156E-01	2.3396E-01	2.3195E-01	2.3644E-01	
WCC	0.	8.1580E-03	2.5481E-02	5.2367E-02	1.3353E-01	1.7641E-01	1.3877E-01	7.5519E-02	8.0195E-12	
VX	0.	8.6555E-02	1.8428E-01	2.8122E-01	3.1412E-01	1.7158E-01	6.5246E-02	1.8355E-02	-2.8311E-11	
VY	-1.7729E-01	-1.6934E-01	-1.3575E-01	-5.5792E-02	1.3353E-01	2.6476E-01	2.6408E-01	2.4325E-01	2.3644E-01	
VZ	2.2978E+00	2.2962E+00	2.2909E+00	2.2838E+00	2.2843E+00	2.3099E+00	2.3278E+00	2.3364E+00	2.3382E+00	
PSINOR	0.	2.1587E+00	4.5991E+00	7.0199E+00	7.8299E+00	4.2481E+00	1.6055E+00	4.5011E-01	-6.9373E-10	
THETNOR	8.5588E+01	8.5785E+01	8.6620E+01	8.8611E+01	8.6686E+01	8.3479E+01	8.3530E+01	8.4056E+01	8.4226E+01	
XBAR	0.	3.5920E-01	7.0417E-01	1.0020E+00	1.1746E+00	1.0593E+00	7.6420E-01	3.5528E-01	-8.7933E-11	
XBHLD	0.	3.2061E-01	6.9114E-01	1.0559E+00	1.1649E+00	9.4550E-01	6.0884E-01	2.3058E-01	-8.7933E-11	
YBAR	-8.2764E-01	-7.8404E-01	-6.5135E-01	-3.9969E-01	-2.7014E-11	4.5087E-01	7.7623E-01	9.6143E-01	1.0246E+00	
YBHLD	-8.2764E-01	-7.8873E-01	-6.5637E-01	-4.4787E-01	3.7871E-02	5.7631E-01	8.5422E-01	9.8776E-01	1.0246E+00	
ETA	3.9508E-02	3.7975E-02	3.4392E-02	2.8694E-02	2.9690E-02	4.1755E-02	5.8097E-02	6.9036E-02	7.3336E-02	
G	-1.7727E-01	-1.7840E-01	-1.8715E-01	-2.0199E-01	-2.4455E-01	-2.5246E-01	-2.5006E-01	-2.3582E-01	-2.2818E-01	
DEQNS	5.8826E+00	5.9913E+00	6.3850E+00	7.3959E+00	9.5587E+00	8.1215E+00	6.3696E+00	5.6958E+00	5.6106E+00	
AM	6.2086E+00	6.1959E+00	6.1545E+00	6.1427E+00	6.3337E+00	6.9341E+00	7.3562E+00	7.5673E+00	7.6101E+00	
CROSSM	4.2127E-01	4.2372E-01	4.2722E-01	4.2367E-01	5.6242E-01	8.0031E-01	7.8828E-01	6.6785E-01	5.9270E-01	
SBAR	9.1142E-02	9.2625E-02	9.8110E-02	9.8185E-02	7.9601E-02	3.3299E-02	9.6808E-03	1.8831E-03	7.0168E-04	
POROGAM	1.2226E-02	1.2244E-02	1.2311E-02	1.2312E-02	1.2085E-02	1.1539E-02	1.1269E-02	1.1182E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9329E-01	7.8249E-01	7.8234E-01	8.1955E-01	9.2012E-01	9.7609E-01	9.9530E-01	9.9825E-01	
PT	8.6759E+01	8.6438E+01	8.5260E+01	8.5244E+01	8.9298E+01	1.0026E+02	1.0636E+02	1.0845E+02	1.0877E+02	
BERNOUL	2.3524E-10	-2.1072E-06	-1.1837E-05	8.1369E-06	1.1818E-04	-2.3869E-05	-6.0435E-05	4.0547E-06	6.1680E-09	
DPDZ	-6.4678E-03	-6.8014E-03	-7.3939E-03	-8.7710E-03	-4.3822E-03	2.0738E-03	1.9098E-03	-5.2477E-04	-1.3438E-03	
DUDZ	-8.8257E-03	-8.3905E-03	-7.6204E-03	-6.5153E-03	-6.4591E-03	-7.8712E-03	-1.2229E-02	-1.7148E-02	-1.9176E-02	
DVDZ	-2.2125E-01	-2.2054E-01	-2.1286E-01	-2.1258E-01	-1.9480E-01	-1.8380E-01	-2.1245E-01	-2.6087E-01	-2.7796E-01	
DWDZ	-3.1289E-16	-6.7279E-03	-1.0907E-02	-2.5075E-02	-1.6502E-03	-2.3465E-02	-4.5071E-02	-2.4858E-02	-2.8342E-12	
DSBDZ	-2.1124E-31	-6.4331E-04	-7.7144E-04	8.4937E-05	-1.4936E-02	-3.8210E-02	-1.7131E-02	-2.8111E-03	-1.0001E-26	
PP	-5.7605E-16	1.7330E-02	2.7681E-02	-3.9806E-02	-2.1037E-01	-2.1419E-01	-7.9924E-02	-2.5214E-02	-2.5082E-15	
UP	-1.1284E-13	-2.7132E-02	-3.0660E-02	2.0024E-02	1.8327E-01	2.9010E-01	2.2615E-01	1.1734E-01	-5.0061E-13	
VP	3.3076E-15	1.0832E-02	-4.5261E-02	-2.8057E-02	2.8772E-01	6.7829E-02	-4.4835E-01	-3.1004E-01	5.0824E-14	
WP	-5.6970E-01	-3.7272E-01	5.9608E-02	1.6279E+00	2.4798E+00	6.2403E-01	-1.2634E+00	-1.8752E+00	-2.0623E+00	
SBARP	-4.6227E-15	7.5141E-02	8.3902E-02	-1.3290E-01	-6.4495E-01	-6.9346E-01	-2.5822E-01	-6.0527E-02	8.8677E-16	

ZETA= 6.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.5099E-02	4.5534E-02	4.6864E-02	4.7534E-02	4.0846E-02	2.5468E-02	1.8513E-02	1.5946E-02	1.5501E-02	
P/ROASTSQ	2.5098E-01	2.5341E-01	2.6081E-01	2.6454E-01	2.2732E-01	1.4174E-01	1.0303E-01	8.8741E-02	8.6267E-02	
P/PTINF	4.1390E-04	4.1790E-04	4.3010E-04	4.3625E-04	3.7487E-04	2.3374E-04	1.6990E-04	1.4634E-04	1.4226E-04	
P/PINF	4.0408E+00	4.0799E+00	4.1990E+00	4.2591E+00	3.6598E+00	2.2820E+00	1.6587E+00	1.4287E+00	1.3889E+00	
RHO	2.5405E+00	2.5552E+00	2.5980E+00	2.6245E+00	2.3839E+00	1.7551E+00	1.4235E+00	1.2882E+00	1.2638E+00	
U	2.3001E+00	2.2994E+00	2.2974E+00	2.2968E+00	2.3011E+00	2.3164E+00	2.3313E+00	2.3415E+00	2.3448E+00	
V	-1.3430E-01	-1.3304E-01	-1.3462E-01	-1.3742E-01	-1.3599E-01	-1.1578E-01	-1.3077E-01	-1.4923E-01	-1.5564E-01	
W	0.	-2.7507E-02	-3.4026E-02	-5.4269E-04	1.3383E-01	2.3582E-01	2.0448E-01	1.1357E-01	0.	
UC	2.2965E+00	2.2948E+00	2.2893E+00	2.2816E+00	2.2823E+00	2.3091E+00	2.3277E+00	2.3360E+00	2.3377E+00	
VC	1.8629E-01	1.9242E-01	2.1127E-01	2.5705E-01	3.2384E-01	3.0975E-01	2.6862E-01	2.4485E-01	2.3924E-01	
WC	3.1952E-16	5.2385E-02	1.0977E-01	1.5087E-01	1.3383E-01	8.2608E-02	5.8187E-02	3.2107E-02	1.8409E-11	
VCC	1.8629E-01	1.9937E-01	2.3724E-01	2.9411E-01	3.2384E-01	2.6317E-01	2.3207E-01	2.3325E-01	2.3924E-01	
WCC	0.	4.8948E-03	2.0010E-02	4.8373E-02	1.3383E-01	1.8306E-01	1.4726E-01	8.1093E-02	7.2392E-12	
VX	0.	8.9020E-02	1.8938E-01	2.9159E-01	3.2384E-01	1.7318E-01	6.1918E-02	1.6418E-02	-2.8427E-11	
VY	-1.8629E-01	-1.7845E-01	-1.4428E-01	-6.1760E-02	1.3383E-01	2.6977E-01	2.6778E-01	2.4640E-01	2.3924E-01	
VZ	2.2965E+00	2.2948E+00	2.2893E+00	2.2816E+00	2.2823E+00	2.3091E+00	2.3277E+00	2.3360E+00	2.3377E+00	
PSINOR	0.	2.2215E+00	4.7291E+00	7.2831E+00	8.0759E+00	4.2890E+00	1.5237E+00	4.0269E-01	-6.9672E-10	
THETNOR	8.5362E+01	8.5557E+01	8.6406E+01	8.8462E+01	8.6677E+01	8.3355E+01	8.3440E+01	8.3979E+01	8.4157E+01	
XBAR	0.	3.5293E-01	6.9179E-01	9.8413E-01	1.1495E+00	1.0331E+00	7.4313E-01	3.8378E-01	-8.5318E-11	
XBHLD	0.	3.0087E-01	6.7401E-01	1.0559E+00	1.1350E+00	8.8347E-01	5.4117E-01	1.7175E-01	-8.5318E-11	
YBAR	-7.9498E-01	-7.5324E-01	-6.2559E-01	-3.8367E-01	-2.5764E-11	4.2746E-01	7.3239E-01	9.0491E-01	9.6338E-01	
YBHLD	-7.9498E-01	-7.5940E-01	-6.3229E-01	-4.4787E-01	5.3452E-02	5.8481E-01	8.2935E-01	9.3721E-01	9.6338E-01	
ETA	3.3864E-02	3.2550E-02	2.9479E-02	2.4595E-02	2.5448E-02	3.5790E-02	4.9798E-02	5.9174E-02	6.2859E-02	
G	-1.4970E-01	-1.5038E-01	-1.5805E-01	-1.6942E-01	-2.0434E-01	-2.1153E-01	-2.1036E-01	-1.9597E-01	-1.8860E-01	
DEQNS	6.0126E+00	6.1078E+00	6.4451E+00	7.3400E+00	9.2354E+00	8.0859E+00	6.6581E+00	6.1598E+00	6.1006E+00	
AM	6.1952E+00	6.1818E+00	6.1394E+00	6.1253E+00	6.3196E+00	6.9334E+00	7.3633E+00	7.5639E+00	7.6018E+00	
CROSSM	3.6112E-01	3.6459E-01	3.7039E-01	3.6582E-01	5.2220E-01	7.8131E-01	7.6249E-01	6.0385E-01	5.0346E-01	
SBAR	9.1142E-02	9.2695E-02	9.8191E-02	9.8180E-02	8.1176E-02	3.7481E-02	1.1729E-02	2.2418E-03	7.0168E-04	
POROGAM	1.2226E-02	1.2245E-02	1.2312E-02	1.2312E-02	1.2104E-02	1.1587E-02	1.1292E-02	1.1186E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9316E-01	7.8233E-01	7.8235E-01	8.1633E-01	9.1055E-01	9.7110E-01	9.9441E-01	9.9825E-01	
PT	8.6759E+01	8.6423E+01	8.5243E+01	8.5245E+01	8.8947E+01	9.9214E+01	1.0581E+02	1.0835E+02	1.0877E+02	
BERNOUL	2.4599E-10	-3.0906E-06	-1.6332E-05	9.1167E-06	1.6894E-04	-3.2084E-05	-9.5360E-05	4.7220E-06	6.2855E-09	
DPDZ	-5.5491E-03	-5.8215E-03	-6.4813E-03	-7.7535E-03	-3.5397E-03	2.9257E-03	2.2744E-03	-1.2040E-04	-8.7528E-04	
DUDZ	-7.5800E-03	-7.1901E-03	-6.5690E-03	-5.6346E-03	-5.4729E-03	-6.4299E-03	-1.0302E-02	-1.4521E-02	-1.6305E-02	
DVDZ	-2.2033E-01	-2.1946E-01	-2.1350E-01	-2.1375E-01	-1.9902E-01	-1.8509E-01	-2.1313E-01	-2.5607E-01	-2.7042E-01	
DWDZ	-1.0069E-15	-6.2111E-03	-9.0155E-03	-2.7143E-02	-4.4649E-03	-2.9000E-02	-4.6650E-02	-2.5387E-02	-2.8909E-12	
DSBDZ	-5.5995E-31	-7.5640E-04	-8.5303E-04	1.5909E-05	-1.6604E-02	-4.5772E-02	-2.4337E-02	-4.5346E-03	-1.5722E-26	
PP	-1.4473E-15	1.8153E-02	3.0326E-02	-4.2046E-02	-2.2190E-01	-2.2026E-01	-7.6130E-02	-2.1821E-02	-2.8557E-15	
UP	-1.3074E-13	-2.8202E-02	-3.2380E-02	1.8772E-02	1.8395E-01	2.9499E-01	2.3478E-01	1.2378E-01	-4.8386E-13	
VP	-1.7937E-16	2.7278E-03	-4.9923E-02	-4.2259E-02	2.5345E-01	8.0190E-02	-3.7130E-01	-2.4776E-01	3.3691E-14	
WP	-5.5718E-01	-3.6564E-01	1.2263E-01	1.6166E+00	2.4746E+00	6.7551E-01	-1.2642E+00	-1.9265E+00	-2.1087E+00	
SBARP	-5.1809E-15	7.6224E-02	8.0647E-02	-1.2116E-01	-5.9773E-01	-6.8833E-01	-3.0166E-01	-7.9341E-02	1.1658E-15	

APPENDIX B

ZETA= 5.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.5609E-02	4.6069E-02	4.7467E-02	4.8259E-02	4.1135E-02	2.5130E-02	1.8266E-02	1.5941E-02	1.5571E-02	
P/ROASTSQ	2.5383E-01	2.5639E-01	2.6416E-01	2.6857E-01	2.2904E-01	1.3985E-01	1.0165E-01	8.8715E-02	8.6658E-02	
P/PTINF	4.1859E-04	4.2281E-04	4.3564E-04	4.4290E-04	3.7770E-04	2.3063E-04	1.6764E-04	1.4630E-04	1.4291E-04	
P/PINF	4.0866E+00	4.1278E+00	4.2530E+00	4.3240E+00	3.6875E+00	2.2516E+00	1.6366E+00	1.4283E+00	1.3952E+00	
RHO	2.5610E+00	2.5764E+00	2.6217E+00	2.6531E+00	2.3938E+00	1.7322E+00	1.4069E+00	1.2874E+00	1.2679E+00	
U	2.3008E+00	2.3001E+00	2.2980E+00	2.2974E+00	2.3016E+00	2.3170E+00	2.3322E+00	2.3428E+00	2.3463E+00	
V	-1.1228E-01	-1.1111E-01	-1.1319E-01	-1.1592E-01	-1.1581E-01	-9.7186E-02	-1.0941E-01	-1.2361E-01	-1.2890E-01	
W	0.	-2.6913E-02	-3.3227E-02	2.2998E-03	1.3443E-01	2.3904E-01	2.0920E-01	1.1613E-01	0.	
UC	2.2952E+00	2.2935E+00	2.2877E+00	2.2793E+00	2.2802E+00	2.3084E+00	2.3276E+00	2.3357E+00	2.3374E+00	
VC	1.9525E-01	2.0178E-01	2.2129E-01	2.6893E-01	3.3404E-01	3.1446E-01	2.7062E-01	2.4714E-01	2.4138E-01	
WC	3.3488E-16	5.2970E-02	1.1055E-01	1.5369E-01	1.3443E-01	8.5836E-02	6.2913E-02	3.4672E-02	1.8408E-11	
VCC	1.9525E-01	2.0861E-01	2.4697E-01	3.0658E-01	3.3404E-01	2.6448E-01	2.2979E-01	2.3392E-01	2.4138E-01	
WCC	0.	1.3040E-03	1.3935E-02	4.4241E-02	1.3443E-01	1.9054E-01	1.5618E-01	8.6964E-02	6.3899E-12	
VX	0.	5.1424E-02	1.9436E-01	3.0227E-01	3.3404E-01	1.7449E-01	5.8498E-02	1.4351E-02	-2.8515E-11	
VY	-1.9525E-01	-1.8752E-01	-1.5302E-01	-6.7683E-02	1.3443E-01	2.7533E-01	2.7161E-01	2.4915E-01	2.4138E-01	
VZ	2.2952E+00	2.2935E+00	2.2877E+00	2.2793E+00	2.2802E+00	2.3084E+00	2.3276E+00	2.3357E+00	2.3374E+00	
PSINOR	0.	2.2828E+00	4.8562E+00	7.5540E+00	8.3344E+00	4.3227E+00	1.4397E+00	3.5204E-01	-6.9899E-10	
THETNCR	8.5138E+01	8.5325E+01	8.6187E+01	8.8314E+01	8.6662E+01	8.3217E+01	8.3346E+01	8.3911E+01	8.4104E+01	
XBAR	0.	3.4667E-01	6.7942E-01	9.6625E-01	1.1245E+00	1.0070E+00	7.2212E-01	3.7232E-01	-8.2712E-11	
XBHLD	0.	2.8051E-01	6.5651E-01	6.7650E-01	1.1035E+00	8.1939E-01	4.7739E-01	1.1956E-01	-8.2712E-11	
YBAR	-7.6236E-01	-7.2248E-01	-5.9987E-01	-3.6768E-01	-2.4517E-11	4.0411E-01	6.8868E-01	8.4858E-01	9.0235E-01	
YBHLD	-7.6236E-01	-7.3009E-01	-6.0831E-01	-6.0054E-01	7.2230E-02	5.9150E-01	8.0055E-01	8.8503E-01	9.0235E-01	
ETA	2.8220E-02	2.7125E-02	2.4566E-02	2.0496E-02	2.1207E-02	2.9825E-02	4.1498E-02	4.9312E-02	5.2383E-02	
G	-1.2301E-01	-1.2332E-01	-1.2953E-01	-1.3830E-01	-1.6609E-01	-1.7239E-01	-1.7204E-01	-1.5838E-01	-1.5169E-01	
DEQNS	6.0734E+00	6.1534E+00	6.4375E+00	7.1930E+00	8.7966E+00	7.9066E+00	6.7852E+00	6.4150E+00	6.3687E+00	
AM	6.1840E+00	6.1699E+00	6.1265E+00	6.1103E+00	6.3073E+00	6.9342E+00	7.3705E+00	7.5625E+00	7.5964E+00	
CROSSM	3.0141E-01	3.0629E-01	3.1409E-01	3.0798E-01	4.8481E-01	7.6751E-01	7.4230E-01	5.4652E-01	4.1670E-01	
SBAR	9.1142E-02	9.2778E-02	9.8281E-02	9.8183E-02	8.2932E-02	4.2536E-02	1.4681E-02	2.8408E-03	7.0168E-04	
POROGAM	1.2226E-02	1.2246E-02	1.2313E-02	1.2312E-02	1.2126E-02	1.1646E-02	1.1326E-02	1.1192E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9299E-01	7.8215E-01	7.8235E-01	8.1275E-01	8.9912E-01	9.6396E-01	9.9252E-01	9.9825E-01	
PT	8.6759E+01	8.6405E+01	8.5224E+01	8.5245E+01	8.8558E+01	9.7968E+01	1.0503E+02	1.0819E+02	1.0877E+02	
BERNOUL	2.4447E-10	-4.3099E-06	-2.1320E-05	8.5486E-06	2.2957E-04	-4.2244E-05	-1.4106E-04	3.9069E-06	6.3737E-09	
DPDZ	-4.6746E-03	-4.8841E-03	-5.5820E-03	-6.7443E-03	-2.6211E-03	3.8635E-03	2.6731E-03	2.0626E-04	-5.5005E-04	
DUDZ	-6.3368E-03	-5.9897E-03	-5.5100E-03	-4.7452E-03	-4.4074E-03	-4.8092E-03	-8.2163E-03	-1.1854E-02	-1.3504E-02	
DVDZ	-2.2033E-01	-2.1925E-01	-2.1526E-01	-2.1643E-01	-2.0480E-01	-1.8688E-01	-2.1416E-01	-2.5238E-01	-2.6454E-01	
DWDZ	-1.9789E-15	-5.6773E-03	-6.9270E-03	-2.9830E-02	-7.6245E-03	-3.5633E-02	-4.7714E-02	-2.5769E-02	-2.8901E-12	
DSBDZ	-7.9048E-31	-5.1672E-04	-9.6809E-04	-7.4060E-05	-1.8588E-02	-5.5822E-02	-3.5567E-02	-7.8119E-03	-2.2782E-26	
PP	-2.3135E-15	1.8974E-02	3.2905E-02	-4.4264E-02	-2.3337E-01	-2.2582E-01	-7.1773E-02	-1.8518E-02	-3.1787E-15	
UP	-5.7681E-15	-2.9092E-02	-3.3756E-02	1.7606E-02	1.8400E-01	2.9898E-01	2.4237E-01	1.2938E-01	-5.9195E-13	
VP	-1.4314E-15	-3.7778E-03	-5.2333E-02	-5.2259E-02	2.1879E-01	8.8505E-02	-2.9942E-01	-1.9356E-01	2.2554E-14	
WP	-5.4533E-01	-3.6122E-01	1.4866E-01	1.6103E+00	2.4732E+00	7.2533E-01	-1.2712E+00	-1.9744E+00	-2.1560E+00	
SBARP	-4.0646E-15	7.7431E-02	7.7052E-02	-1.0865E-01	-5.4149E-01	-6.7491E-01	-3.5242E-01	-1.0803E-01	1.3751E-15	

ZETA= 4.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.6034E-02	4.6512E-02	4.7979E-02	4.8882E-02	4.1366E-02	2.4692E-02	1.7977E-02	1.5906E-02	1.5614E-02	
P/ROASTSQ	2.5619E-01	2.5885E-01	2.6702E-01	2.7204E-01	2.3021E-01	1.3741E-01	1.0005E-01	8.8521E-02	8.6897E-02	
P/PTINF	4.2248E-04	4.2687E-04	4.4034E-04	4.4862E-04	3.7964E-04	2.2661E-04	1.6499E-04	1.4598E-04	1.4330E-04	
P/PINF	4.1246E+00	4.1674E+00	4.2989E+00	4.3798E+00	3.7064E+00	2.2124E+00	1.6107E+00	1.4252E+00	1.3990E+00	
RHO	2.5780E+00	2.5939E+00	2.6417E+00	2.6774E+00	2.3991E+00	1.7029E+00	1.3866E+00	1.2844E+00	1.2704E+00	
U	2.3014E+00	2.3006E+00	2.2985E+00	2.2978E+00	2.3020E+00	2.3174E+00	2.3329E+00	2.3439E+00	2.3475E+00	
V	-9.0209E-02	-8.9164E-02	-9.1533E-02	-9.4082E-02	-5.4971E-02	-7.8389E-02	-8.7925E-02	-9.8725E-02	-1.0270E-01	
W	0.	-2.6372E-02	-3.2650E-02	5.4550E-03	1.3537E-01	2.4300E-01	2.1398E-01	1.1870E-01	0.	
UC	2.2940E+00	2.2922E+00	2.2862E+00	2.2771E+00	2.2780E+00	2.3077E+00	2.3275E+00	2.3354E+00	2.3371E+00	
VC	2.0425E-01	2.1116E-01	2.3155E-01	2.8115E-01	3.4490E-01	3.1938E-01	2.7274E-01	2.4910E-01	2.4297E-01	
WC	3.5032E-16	5.3501E-02	1.1111E-01	1.5682E-01	1.3537E-01	8.9808E-02	6.7695E-02	3.7244E-02	1.8407E-11	
VCC	2.0425E-01	2.1782E-01	2.5673E-01	3.1944E-01	3.4490E-01	2.6545E-01	2.2711E-01	2.3401E-01	2.4297E-01	
WCC	0.	-2.6679E-03	7.1582E-03	3.9964E-02	1.3537E-01	1.9900E-01	1.6550E-01	9.3158E-02	5.4504E-12	
VX	0.	9.3780E-02	1.9924E-01	3.1340E-01	3.4490E-01	1.7544E-01	5.5076E-02	1.2211E-02	-2.8581E-11	
VY	-2.0425E-01	-1.9661E-01	-1.6205E-01	-7.3602E-02	1.3537E-01	2.8158E-01	2.7557E-01	2.5157E-01	2.4297E-01	
VZ	2.2940E+00	2.2922E+00	2.2862E+00	2.2771E+00	2.2780E+00	2.3077E+00	2.3275E+00	2.3354E+00	2.3371E+00	
PSINOR	0.	2.3425E+00	4.9808E+00	7.8366E+00	8.6096E+00	4.3476E+00	1.3556E+00	2.9958E-01	-7.0068E-10	
THETNCR	8.4912E+01	8.5102E+01	8.5961E+01	8.8166E+01	8.6637E+01	8.3063E+01	8.3250E+01	8.3852E+01	8.4065E+01	
XBAR	0.	3.4043E-01	6.6707E-01	9.4840E-01	1.0995E+00	9.8092E-01	7.0116E-01	3.6090E-01	-8.0114E-11	
XBHLD	0.	2.5914E-01	6.3837E-01	6.5799E-01	1.0693E+00	7.4933E-01	4.1655E-01	7.7355E-02	-8.0114E-11	
YBAR	-7.2980E-01	-6.9177E-01	-5.7418E-01	-3.5171E-01	-2.3271E-11	3.8080E-01	6.4509E-01	7.9242E-01	8.4153E-01	
YBHLD	-7.2980E-01	-7.0085E-01	-5.8451E-01	-5.7745E-01	9.6881E-02	5.9958E-01	7.6833E-01	8.3101E-01	8.4153E-01	
ETA	2.2576E-02	2.1700E-02	1.9653E-02	1.6397E-02	1.6966E-02	2.3860E-02	3.3198E-02	3.9449E-02	4.1906E-02	
G	-9.7115E-02	-9.7137E-02	-1.0269E-01	-1.0849E-01	-1.2970E-01	-1.3495E-01	-1.3506E-01	-1.2291E-01	-1.1725E-01	
DEQNS	6.0727E+00	6.1364E+00	6.3631E+00	6.9731E+00	8.2651E+00	7.6064E+00	6.7687E+00	6.4948E+00	6.4549E+00	
AM	6.1747E+00	6.1601E+00	6.1157E+00	6.0976E+00	6.2968E+00	6.9365E+00	7.3764E+00	7.5619E+00	7.5932E+00	
CROSSM	2.4185E-01	2.4877E-01	2.5834E-01	2.4987E-01	4.5116E-01	7.5968E-01	7.2789E-01	4.9702E-01	3.3188E-01	
SBAR	9.1142E-02	9.2881E-02	9.8386E-02	9.8196E-02	8.4906E-02	4.8767E-02	1.9081E-02	3.9171E-03	7.0168E-04	
POROGAM	1.2226E-02	1.2247E-02	1.2315E-02	1.2312E-02	1.2150E-02	1.1718E-02	1.1376E-02	1.1205E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9279E-01	7.8195E-01	7.8232E-01	8.0875E-01	8.8522E-01	9.5342E-01	9.9025E-01	9.9825E-01	
PT	8.6759E+01	8.6382E+01	8.5202E+01	8.5242E+01	8.8122E+01	9.6454E+01	1.0388E+02	1.0790E+02	1.0877E+02	
BERNOUL	2.3441E-10	-5.8883E-06	-2.7052E-05	5.5234E-06	3.0513E-04	-5.6484E-05	-2.0087E-04	-5.2742E-07	6.4280E-09	
DPDZ	-3.8129E-03	-3.9583E-03	-4.6578E-03	-5.6930E-03	-1.5701E-03	4.9209E-03	3.1060E-03	4.8386E-04	-3.1913E-04	
DUDZ	-5.0914E-03	-4.7825E-03	-4.4372E-03	-3.8426E-03	-3.2208E-03	-2.8946E-03	-5.8029E-03	-9.1421E-03	-1.0759E-02	
DVDZ	-2.2113E-01	-2.1977E-01	-2.1811E-01	-2.2058E-01	-2.1238E-01	-1.8911E-01	-2.1568E-01	-2.4952E-01	-2.5955E-01	
DWDZ	-2.6559E-15	-5.1240E-03	-4.5481E-03	-3.3474E-02	-1.1210E-02	-4.3984E-02	-4.7616E-02	-2.5421E-02	-2.8071E-12	
DSBDZ	-1.3113E-30	-1.1609E-03	-1.1407E-03	-1.9670E-04	-2.0958E-02	-6.9539E-02	-5.4074E-02	-1.4575E-02	-4.3896E-26	
PP	-2.6167E-15	1.9758E-02	3.5384E-02	-4.6557E-02	-2.4488E-01	-2.3083E-01	-6.6690E-02	-1.5150E-02	-2.9264E-15	
UP	-5.9379E-14	-2.9814E-02	-3.4781E-02	1.6455E-02	1.8320E-01	3.0190E-01	2.4910E-01	1.3447E-01	-4.4983E-13	
VP	4.0116E-15	-8.4959E-03	-5.1788E-02	-5.7326E-02	1.8261E-01	9.1360E-02	-2.3205E-01	-1.4655E-01	2.7938E-14	
WP	-5.3411E-01	-3.5984E-01	1.7859E-01	1.6095E+00	2.4766E+00	7.7224E-01	-1.2865E+00	-2.0219E+00	-2.2032E+00	
SBARP	-3.5065E-15	7.8821E-02	7.3021E-02	-9.5432E-02	-4.7343E-01	-6.4742E-01	-4.1122E-01	-1.5303E-01	2.0727E-15	

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P	4.6372E-02	4.6861E-02	4.8396E-02	4.9395E-02	4.1462E-02	2.4140E-02	1.7643E-02	1.5845E-02	1.5638E-02	
P/ROASTSC	2.5807E-01	2.6075E-01	2.6934E-01	2.7489E-01	2.3075E-01	1.3435E-01	9.8189E-02	8.8182E-02	8.7027E-02	
P/PTINF	4.2558E-04	4.3007E-04	4.4417E-04	4.5333E-04	3.8052E-04	2.2155E-04	1.6192E-04	1.4542E-04	1.4352E-04	
P/PINF	4.1549E+00	4.1987E+00	4.3363E+00	4.4258E+00	3.7150E+00	2.1630E+00	1.5808E+00	1.4197E+00	1.4011E+00	
RHO	2.5915E+00	2.6075E+00	2.6578E+00	2.6974E+00	2.3993E+00	1.6663E+00	1.3615E+00	1.2789E+00	1.2718E+00	
U	2.3018E+00	2.3010E+00	2.2989E+00	2.2981E+00	2.3022E+00	2.3176E+00	2.3334E+00	2.3446E+00	2.3484E+00	
V	-6.8025E-02	-6.7136E-02	-6.9531E-02	-7.1751E-02	-7.3265E-02	-5.9352E-02	-6.6257E-02	-7.3882E-02	-7.6966E-02	
W	0.	-2.5887E-02	-3.2330E-02	9.0499E-03	1.3669E-01	2.4793E-01	2.1865E-01	1.2114E-01	0.	
UC	2.2929E+00	2.2909E+00	2.2847E+00	2.2748E+00	2.2756E+00	2.3069E+00	2.3272E+00	2.3352E+00	2.3370E+00	
VC	2.1338E-01	2.2063E-01	2.4215E-01	2.9386E-01	3.5661E-01	3.2453E-01	2.7502E-01	2.5080E-01	2.4409E-01	
WC	3.6597E-16	5.3979E-02	1.1142E-01	1.6040E-01	1.3669E-01	9.4750E-02	7.2370E-02	3.9691E-02	1.8407E-11	
VCC	2.1338E-01	2.2702E-01	2.6655E-01	3.2289E-01	3.5661E-01	2.6598E-01	2.2406E-01	2.3357E-01	2.4409E-01	
WCC	0.	-7.0777E-03	-4.3590E-04	3.5569E-02	1.3669E-01	2.0868E-01	1.7513E-01	9.9620E-02	4.3952E-12	
VX	0.	5.6101E-02	2.0404E-01	3.2520E-01	3.5661E-01	1.7592E-01	5.1821E-02	1.0145E-02	-2.8628E-11	
VY	-2.1338E-01	-2.0580E-01	-1.7151E-01	-7.9525E-02	1.3669E-01	2.8870E-01	2.7962E-01	2.5372E-01	2.4409E-01	
VZ	2.2929E+00	2.2909E+00	2.2847E+00	2.2748E+00	2.2756E+00	2.3069E+00	2.3272E+00	2.3352E+00	2.3370E+00	
PSINOR	0.	2.4021E+00	5.1035E+00	8.1359E+00	8.5063E+00	4.3607E+00	1.2756E+00	2.4892E-01	-7.0188E-10	
THETNOR	8.4683E+01	8.4871E+01	8.5724E+01	8.8018E+01	8.6604E+01	8.2887E+01	8.3150E+01	8.3799E+01	8.4037E+01	
XBAR	0.	3.3419E-01	6.5474E-01	9.3057E-01	1.0746E+00	9.5492E-01	6.8026E-01	3.4951E-01	-7.7525E-11	
XBHLD	0.	2.3609E-01	6.1913E-01	6.3841E-01	1.0298E+00	6.5079E-01	3.5538E-01	4.5094E-02	-7.7525E-11	
YBAR	-6.9728E-01	-6.6111E-01	-5.4853E-01	-3.3577E-01	-2.2027E-11	3.5755E-01	6.0161E-01	7.3644E-01	7.8090E-01	
YBHLD	-6.9728E-01	-6.7173E-01	-5.6104E-01	-5.5427E-01	1.3390E-01	6.1362E-01	7.3404E-01	7.7517E-01	7.8090E-01	
ETA	1.6932E-02	1.6275E-02	1.4740E-02	1.2298E-02	1.2724E-02	1.7895E-02	2.4899E-02	2.9587E-02	3.1430E-02	
G	-7.1934E-02	-7.1764E-02	-7.6200E-02	-7.9864E-02	-9.5031E-02	-9.9148E-02	-9.9334E-02	-8.9431E-02	-8.5158E-02	
DEQNS	6.0167E+00	6.0637E+00	6.2332E+00	6.6916E+00	7.6605E+00	7.2053E+00	6.6248E+00	6.4271E+00	6.3917E+00	
AM	6.1574E+00	6.1523E+00	6.1068E+00	6.0872E+00	6.2885E+00	6.9398E+00	7.3784E+00	7.5602E+00	7.5914E+00	
CROSSM	1.8218E-01	1.9229E-01	2.0358E-01	1.9146E-01	4.2265E-01	7.5882E-01	7.1900E-01	4.5610E-01	2.4866E-01	
SBAR	9.1142E-02	9.3016E-02	9.8513E-02	9.8224E-02	8.7139E-02	5.6625E-02	2.5968E-02	6.0435E-03	7.0168E-04	
POROGAM	1.2226E-02	1.2249E-02	1.2316E-02	1.2313E-02	1.2177E-02	1.1811E-02	1.1454E-02	1.1228E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9252E-01	7.8170E-01	7.8227E-01	8.0425E-01	8.6800E-01	9.3714E-01	9.8500E-01	9.9825E-01	
PT	8.6759E+01	8.6353E+01	8.5175E+01	8.5236E+01	8.7631E+01	9.4578E+01	1.0211E+02	1.0733E+02	1.0877E+02	
BERNOUL	2.1826E-10	-8.0667E-06	-3.3984E-05	-1.8110E-06	4.0506E-04	-7.8116E-05	-2.7993E-04	-1.3631E-05	6.3976E-09	
DPDZ	-2.9384E-03	-3.0201E-03	-3.6720E-03	-4.5483E-03	-3.1711E-04	6.1366E-03	3.5709E-03	7.2799E-04	-1.6201E-04	
DUDZ	-3.8393E-03	-3.5584E-03	-3.3432E-03	-2.9263E-03	-1.8334E-03	-4.7006E-04	-2.6477E-03	-6.0042E-03	-8.0634E-03	
DVDZ	-2.2268E-01	-2.2090E-01	-2.2212E-01	-2.2633E-01	-2.2214E-01	-1.9168E-01	-2.1778E-01	-2.4748E-01	-2.5524E-01	
DWDZ	-2.7553E-15	-4.5812E-03	-1.7862E-03	-3.8800E-02	-1.5237E-02	-5.5258E-02	-4.5212E-02	-2.2835E-02	-2.6426E-12	
DSBDZ	-1.3137E-30	-1.5754E-03	-1.4258E-03	-2.7983E-04	-2.3776E-02	-8.8724E-02	-8.7059E-02	-3.0319E-02	-9.5936E-26	
PP	-2.3569E-15	2.0464E-02	3.7710E-02	-4.9052E-02	-2.5650E-01	-2.3512E-01	-6.0704E-02	-1.1607E-02	-2.2434E-15	
UP	-5.8260E-15	-3.0364E-02	-3.5437E-02	1.5210E-02	1.8116E-01	3.0339E-01	2.5513E-01	1.3968E-01	-4.3256E-13	
VP	3.3086E-15	-1.1140E-02	-4.7442E-02	-5.6391E-02	1.4364E-01	8.7150E-02	-1.6853E-01	-1.0654E-01	1.6871E-14	
WP	-5.2346E-01	-3.6212E-01	2.1387E-01	1.6148E+00	2.4861E+00	8.1407E-01	-1.3143E+00	-2.0668E+00	-2.2478E+00	
SBARP	-1.8322E-15	8.0502E-02	6.8399E-02	-8.1769E-02	-3.8973E-01	-5.9481E-01	-4.7655E-01	-2.2695E-01	3.3285E-15	

ZETA= 2.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.6620E-02	4.7114E-02	4.8710E-02	4.9786E-02	4.1419E-02	2.3457E-02	1.7262E-02	1.5761E-02	1.5649E-02	
P/ROASTSC	2.5945E-01	2.6220E-01	2.7108E-01	2.7707E-01	2.3051E-01	1.3054E-01	9.6067E-02	8.7716E-02	8.7089E-02	
P/PTINF	4.2787E-04	4.3240E-04	4.4705E-04	4.5692E-04	3.8013E-04	2.1528E-04	1.5843E-04	1.4465E-04	1.4362E-04	
P/PINF	4.1772E+00	4.2215E+00	4.3644E+00	4.4608E+00	3.7112E+00	2.1018E+00	1.5467E+00	1.4122E+00	1.4021E+00	
RHO	2.6014E+00	2.6172E+00	2.6698E+00	2.7126E+00	2.3932E+00	1.6207E+00	1.3293E+00	1.2697E+00	1.2724E+00	
U	2.3021E+00	2.3013E+00	2.2992E+00	2.2984E+00	2.3023E+00	2.3175E+00	2.3334E+00	2.3450E+00	2.3491E+00	
V	-4.5648E-02	-4.4965E-02	-4.7064E-02	-4.8758E-02	-5.0449E-02	-4.0048E-02	-4.4353E-02	-4.9192E-02	-5.1610E-02	
W	0.	-2.5452E-02	-3.2308E-02	1.3331E-02	1.3842E-01	2.5424E-01	2.2288E-01	1.2304E-01	0.	
UC	2.2918E+00	2.2897E+00	2.2832E+00	2.2724E+00	2.2731E+00	2.3060E+00	2.3267E+00	2.3348E+00	2.3369E+00	
VC	2.2269E-01	2.3024E-01	2.5322E-01	3.0722E-01	3.6941E-01	3.2993E-01	2.7751E-01	2.5233E-01	2.4484E-01	
WC	3.8195E-16	5.4410E-02	1.1143E-01	1.6466E-01	1.3842E-01	1.0108E-01	7.6627E-02	4.1598E-02	1.8407E-11	
VCC	2.2269E-01	2.3628E-01	2.7651E-01	3.4717E-01	3.6941E-01	2.6585E-01	2.2072E-01	2.3271E-01	2.4484E-01	
WCC	0.	-1.1982E-02	-8.9843E-03	3.1180E-02	1.3842E-01	2.1999E-01	1.8484E-01	1.0605E-01	3.1901E-12	
VX	0.	9.8404E-02	2.0878E-01	3.3795E-01	3.6941E-01	1.7564E-01	4.9030E-02	8.5736E-03	-2.8659E-11	
VY	-2.2269E-01	-2.1514E-01	-1.8152E-01	-8.5380E-02	1.3842E-01	2.9702E-01	2.8369E-01	2.5559E-01	2.4484E-01	
VZ	2.2918E+00	2.2897E+00	2.2832E+00	2.2724E+00	2.2731E+00	2.3060E+00	2.3267E+00	2.3348E+00	2.3369E+00	
PSINOR	0.	2.4608E+00	5.2246E+00	8.4591E+00	9.2308E+00	4.3557E+00	1.2072E+00	2.1039E-01	-7.0267E-10	
THETNOR	8.4450E+01	8.4637E+01	8.5473E+01	8.7872E+01	8.6560E+01	8.2682E+01	8.3050E+01	8.3753E+01	8.4019E+01	
XBAR	0.	3.2796E-01	6.4243E-01	9.1277E-01	1.0497E+00	9.2897E-01	6.5941E-01	3.3815E-01	-7.4943E-11	
XBHLD	0.	2.0993E-01	5.9772E-01	6.1673E-01	9.7610E-01	4.9840E-01	1.8905E-01	2.2877E-02	-7.4943E-11	
YBAR	-6.6481E-01	-6.3048E-01	-5.2291E-01	-3.1984E-01	-2.0785E-11	3.3434E-01	5.5824E-01	6.8060E-01	7.2045E-01	
YBHLD	-6.6481E-01	-6.4284E-01	-5.3821E-01	-5.3170E-01	2.0379E-01	6.1956E-01	6.9817E-01	7.1775E-01	7.2045E-01	
ETA	1.1288E-02	1.0850E-02	9.8264E-03	8.1984E-03	8.4828E-03	1.1930E-02	1.6599E-02	1.9725E-02	2.0953E-02	
G	-4.7399E-02	-4.7143E-02	-5.0361E-02	-5.2307E-02	-6.1973E-02	-6.4905E-02	-6.4834E-02	-5.7815E-02	-5.5278E-02	
DEQNS	5.9107E+00	5.9410E+00	6.0540E+00	6.3581E+00	6.9997E+00	6.7210E+00	6.3676E+00	6.2364E+00	6.2069E+00	
AM	6.1621E+00	6.1465E+00	6.1000E+00	6.0794E+00	6.2826E+00	6.9436E+00	7.3707E+00	7.5524E+00	7.5906E+00	
CROSSM	1.2216E-01	1.3796E-01	1.5141E-01	1.3367E-01	4.0121E-01	7.6645E-01	7.1446E-01	4.2608E-01	1.6673E-01	
SBAR	9.1142E-02	9.3210E-02	9.8680E-02	9.8277E-02	8.9679E-02	6.6765E-02	3.7559E-02	1.0889E-02	7.0168E-04	
POROGAM	1.2226E-02	1.2251E-02	1.2318E-02	1.2313E-02	1.2208E-02	1.1931E-02	1.1588E-02	1.1283E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9213E-01	7.8138E-01	7.8216E-01	7.9916E-01	8.4627E-01	9.1038E-01	9.7314E-01	9.9825E-01	
PT	8.6759E+01	8.6311E+01	8.5139E+01	8.5225E+01	8.7077E+01	9.2210E+01	9.9195E+01	1.0603E+02	1.0877E+02	
BERNOUL	1.9948E-10	-1.1408E-05	-4.3136E-05	-1.8011E-05	5.4948E-04	-1.1068E-04	-3.8715E-04	-4.8265E-05	6.1587E-09	
DPDZ	-2.0281E-03	-2.0493E-03	-2.5842E-03	-3.2505E-03	1.2304E-03	7.5632E-03	4.0568E-03	9.4366E-04	-7.2371E-05	
DUDZ	-2.5764E-03	-2.2946E-03	-2.2179E-03	-2.0150E-03	-4.9403E-05	2.9047E-03	2.4502E-03	-1.4073E-03	-5.4069E-03	
DVDZ	-2.2498E-01	-2.2260E-01	-2.2749E-01	-2.3385E-01	-2.3474E-01	-1.9442E-01	-2.2035E-01	-2.4652E-01	-2.5224E-01	
DWDZ	-2.3175E-15	-4.1779E-03	1.4078E-03	-4.7691E-02	-1.9430E-02	-7.2369E-02	-3.8668E-02	-1.3112E-02	-2.6999E-12	
DSBDZ	-3.9248E-30	-2.4226E-03	-1.9826E-03	-7.1289E-04	-2.7094E-02	-1.1532E-01	-1.5298E-01	-7.5117E-02	-2.6255E-25	
PP	-1.8129E-15	2.1038E-02	3.9796E-02	-5.1921E-02	-2.6834E-01	-2.3846E-01	-5.3607E-02	-7.8020E-03	-2.8085E-15	
UP	-5.8442E-15	-3.0824E-02	-3.5660E-02	1.3665E-02	1.7724E-01	3.0241E-01	2.6030E-01	1.4657E-01	-3.4369E-13	
VP	1.1995E-15	-1.1277E-02	-3.8252E-02	-4.7917E-02	1.0029E-01	7.3679E-02	-1.0781E-01	-7.3245E-02	9.9460E-15	
WP	-5.1308E-01	-3.6892E-01	2.5734E-01	1.6266E+00	2.5041E+00	8.4759E-01	-1.3646E+00	-2.1052E+00	-2.2806E+00	
SBARP	-2.9484E-15	8.2713E-02	6.2901E-02	-6.8237E-02	-2.8600E-01	-4.9355E-01	-5.3617E-01	-3.5789E-01	5.9795E-15	

APPENDIX B

ZETA= 1.00000000E-01

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.6775E-02	4.7269E-02	4.8908E-02	5.0037E-02	4.1202E-02	2.2617E-02	1.6832E-02	1.5658E-02	1.5654E-02	
P/ROASTSQ	2.6031E-01	2.6306E-01	2.7218E-01	2.7847E-01	2.2930E-01	1.2587E-01	9.3675E-02	8.7141E-02	8.7120E-02	
P/PTINF	4.2929E-04	4.3382E-04	4.4886E-04	4.5922E-04	3.7814E-04	2.0757E-04	1.5448E-04	1.4371E-04	1.4367E-04	
P/PINF	4.1911E+00	4.2353E+00	4.3822E+00	4.4833E+00	3.6917E+00	2.0265E+00	1.5082E+00	1.4030E+00	1.4026E+00	
RHO	2.6076E+00	2.6227E+00	2.6771E+00	2.7221E+00	2.3792E+00	1.5645E+00	1.2854E+00	1.2507E+00	1.2727E+00	
U	2.3023E+00	2.3015E+00	2.2993E+00	2.2985E+00	2.3022E+00	2.3169E+00	2.3327E+00	2.3447E+00	2.3495E+00	
V	-2.3001E-02	-2.2599E-02	-2.3974E-02	-2.4913E-02	-2.6186E-02	-2.0476E-02	-2.2210E-02	-2.4529E-02	-2.6371E-02	
W	0.	-2.5028E-02	-3.2618E-02	1.8930E-02	1.4052E-01	2.6286E-01	2.2626E-01	1.2283E-01	0.	
UC	2.2907E+00	2.2885E+00	2.2817E+00	2.2698E+00	2.2702E+00	2.3050E+00	2.3256E+00	2.3339E+00	2.3368E+00	
VC	2.3228E-01	2.4005E-01	2.6492E-01	3.2142E-01	3.8362E-01	3.3558E-01	2.8016E-01	2.5377E-01	2.4546E-01	
WC	3.9840E-16	5.4830E-02	1.1112E-01	1.7024E-01	1.4052E-01	1.0972E-01	8.0062E-02	4.1414E-02	1.8407E-11	
VCC	2.3228E-01	2.4561E-01	2.8667E-01	3.6270E-01	3.8362E-01	2.6458E-01	2.1713E-01	2.3189E-01	2.4546E-01	
WCC	0.	-1.7418E-02	-1.8640E-02	2.7251E-02	1.4052E-01	2.3377E-01	1.9430E-01	1.1108E-01	1.7767E-12	
VX	0.	1.0073E-01	2.1348E-01	3.5220E-01	3.8362E-01	1.7399E-01	4.7052E-02	9.0355E-03	-2.8685E-11	
VY	-2.3228E-01	-2.2468E-01	-1.9224E-01	-9.0827E-02	1.4052E-01	3.0721E-01	2.8755E-01	2.5696E-01	2.4546E-01	
VZ	2.2907E+00	2.2885E+00	2.2817E+00	2.2698E+00	2.2702E+00	2.3050E+00	2.3256E+00	2.3339E+00	2.3368E+00	
PSINOR	0.	2.5204E+00	5.3451E+00	8.8202E+00	9.5913E+00	4.3169E+00	1.1591E+00	2.2182E-01	-7.0333E-10	
THETNOR	8.4210E+01	8.4398E+01	8.5205E+01	8.7736E+01	8.6507E+01	8.2430E+01	8.2953E+01	8.3717E+01	8.4004E+01	
XBAR	0.	3.2173E-01	6.3013E-01	8.9499E-01	1.0248E+00	9.0308E-01	6.3860E-01	3.2682E-01	-7.2368E-11	
XBHLD	0.	1.7662E-01	5.7069E-01	5.8962E-01	8.5053E-01	3.1037E-01	7.5249E-02	9.1059E-03	-7.2368E-11	
YBAR	-6.3239E-01	-5.9990E-01	-4.9733E-01	-3.0393E-01	-1.9545E-11	3.1117E-01	5.1496E-01	6.2491E-01	6.6015E-01	
YBHLD	-6.3239E-01	-6.1455E-01	-5.1710E-01	-5.1081E-01	3.5166E-01	6.2669E-01	6.5204E-01	6.5917E-01	6.6015E-01	
ETA	5.6440E-03	5.4250E-03	4.9132E-03	4.0992E-03	4.2414E-03	5.9650E-03	8.2996E-03	9.8623E-03	1.0477E-02	
G	-2.3442E-02	-2.3229E-02	-2.5037E-02	-2.5712E-02	-3.0364E-02	-3.2144E-02	-3.1622E-02	-2.7924E-02	-2.7309E-02	
DEQNS	5.7590E+00	5.7734E+00	5.8302E+00	5.9805E+00	6.2973E+00	6.1696E+00	6.0058E+00	5.9432E+00	5.9251E+00	
AM	6.1588E+00	6.1424E+00	6.0954E+00	6.0743E+00	6.2796E+00	6.9480E+00	7.3376E+00	7.5179E+00	7.5902E+00	
CROSSM	6.1525E-02	8.9988E-02	1.0730E-01	8.2678E-02	3.8915E-01	7.8558E-01	7.1176E-01	4.0104E-01	8.5187E-02	
SBAR	9.1142E-02	9.3553E-02	9.8941E-02	9.8385E-02	9.2613E-02	7.9758E-02	5.9393E-02	2.5438E-02	7.0168E-04	
POROGAM	1.2226E-02	1.2255E-02	1.2321E-02	1.2315E-02	1.2244E-02	1.2087E-02	1.1844E-02	1.1448E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9146E-01	7.8087E-01	7.8195E-01	7.9332E-01	8.1923E-01	8.6202E-01	9.3839E-01	9.9825E-01	
PT	8.6759E+01	8.6237E+01	8.5083E+01	8.5202E+01	8.6440E+01	8.9263E+01	9.3926E+01	1.0225E+02	1.0877E+02	
BERNOUL	1.9092E-10	-1.7796E-05	-5.7889E-05	-5.9298E-05	7.9316E-04	-1.3886E-04	-5.4235E-04	-1.4311E-04	6.3489E-09	
DPDZ	-1.0582E-03	-1.0282E-03	-1.3430E-03	-1.7225E-03	3.2009E-03	9.2967E-03	4.5325E-03	1.1050E-03	-4.8085E-05	
DUDZ	-1.2982E-03	-8.8693E-04	-1.0460E-03	-1.2830E-03	2.9754E-03	8.1309E-03	1.3787E-02	1.1891E-02	-2.7628E-03	
DVDZ	-2.2813E-01	-2.2480E-01	-2.3471E-01	-2.4342E-01	-2.5128E-01	-1.9697E-01	-2.2209E-01	-2.4700E-01	-2.5412E-01	
DWDZ	-7.8142E-15	-4.5439E-03	4.6099E-03	-6.7275E-02	-2.1973E-02	-1.0399E-01	-3.0613E-02	2.7978E-02	-6.8914E-12	
DSBDZ	-1.3448E-29	-5.0379E-03	-3.5650E-03	-1.6643E-03	-3.2181E-02	-1.4085E-01	-3.0473E-01	-2.6974E-01	-1.0834E-24	
PP	-2.6589E-15	2.1408E-02	4.1511E-02	-5.5407E-02	-2.8046E-01	-2.4048E-01	-4.5116E-02	-3.6901E-03	-3.2305E-15	
UP	-5.8552E-15	-3.1186E-02	-3.5183E-02	1.1211E-02	1.7027E-01	2.9606E-01	2.6153E-01	1.5987E-01	-3.7966E-13	
VP	8.8885E-16	-8.1920E-03	-2.2951E-02	-2.9683E-02	5.0515E-02	4.7058E-02	-4.8280E-02	-4.3779E-02	5.7455E-15	
WP	-5.0200E-01	-3.8165E-01	3.1619E-01	1.6432E+00	2.5347E+00	8.7157E-01	-1.4672E+00	-2.1331E+00	-2.2654E+00	
SBARP	-4.0646E-15	8.6189E-02	5.5695E-02	-5.5150E-02	-1.6394E-01	-2.8875E-01	-5.1313E-01	-6.2180E-01	1.2398E-14	

ZETA= 5.00000000E-02

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.6815E-02	4.7307E-02	4.8958E-02	5.0101E-02	4.1013E-02	2.2127E-02	1.6600E-02	1.5602E-02	1.5657E-02	
P/ROASTSQ	2.6054E-01	2.6327E-01	2.7246E-01	2.7883E-01	2.2824E-01	1.2314E-01	9.2381E-02	8.6830E-02	8.7134E-02	
P/PTINF	4.2965E-04	4.3417E-04	4.4932E-04	4.5981E-04	3.7640E-04	2.0307E-04	1.5235E-04	1.4319E-04	1.4369E-04	
P/PINF	4.1947E+00	4.2387E+00	4.3866E+00	4.4891E+00	3.6747E+00	1.9826E+00	1.4873E+00	1.3980E+00	1.4029E+00	
RHO	2.6092E+00	2.6236E+00	2.6786E+00	2.7244E+00	2.3683E+00	1.5326E+00	1.2565E+00	1.2276E+00	1.2729E+00	
U	2.3024E+00	2.3015E+00	2.2994E+00	2.2986E+00	2.3020E+00	2.3164E+00	2.3318E+00	2.3435E+00	2.3496E+00	
V	-1.1546E-02	-1.1328E-02	-1.2125E-02	-1.2604E-02	-1.3372E-02	-1.0597E-02	-1.1129E-02	-1.2179E-02	-1.3499E-02	
W	0.	-2.4767E-02	-3.2865E-02	2.2852E-02	1.4159E-01	2.6863E-01	2.2816E-01	1.1979E-01	0.	
UC	2.2901E+00	2.2879E+00	2.2809E+00	2.2684E+00	2.2685E+00	2.3044E+00	2.3245E+00	2.3324E+00	2.3367E+00	
VC	2.3721E-01	2.4504E-01	2.7107E-01	3.2890E-01	3.9138E-01	3.3849E-01	2.8143E-01	2.5440E-01	2.4602E-01	
WC	4.0685E-16	5.5089E-02	1.1087E-01	1.7415E-01	1.4159E-01	1.1552E-01	8.2017E-02	3.8420E-02	1.8407E-11	
VCC	2.3721E-01	2.5033E-01	2.9189E-01	3.7126E-01	3.9138E-01	2.6323E-01	2.1487E-01	2.3206E-01	2.4602E-01	
WCC	0.	-2.0309E-02	-2.3906E-02	2.5987E-02	1.4159E-01	2.4214E-01	1.9940E-01	1.1109E-01	9.5236E-13	
VX	0.	1.0197E-01	2.1588E-01	3.6036E-01	3.9138E-01	1.7224E-01	4.5829E-02	1.2094E-02	-2.8708E-11	
VY	-2.3721E-01	-2.2953E-01	-1.9791E-01	-9.2974E-02	1.4159E-01	3.1346E-01	2.8954E-01	2.5700E-01	2.4602E-01	
VZ	2.2901E+00	2.2879E+00	2.2809E+00	2.2684E+00	2.2685E+00	2.3044E+00	2.3245E+00	2.3324E+00	2.3367E+00	
PSINOR	0.	2.5518E+00	5.4067E+00	9.0266E+00	9.7887E+00	4.2745E+00	1.1295E+00	2.9710E-01	-7.0392E-10	
THETNOR	8.4086E+01	8.4277E+01	8.5063E+01	8.7682E+01	8.6480E+01	8.2275E+01	8.2901E+01	8.3712E+01	8.3990E+01	
XBAR	0.	3.1863E-01	6.2398E-01	8.8610E-01	1.0124E+00	8.9015E-01	6.2822E-01	3.2117E-01	-7.1083E-11	
XBHLD	0.	1.5241E-01	5.5011E-01	5.6928E-01	6.1148E-01	1.5956E-01	3.8664E-02	4.6812E-03	-7.1083E-11	
YBAR	-6.1619E-01	-5.8462E-01	-4.8455E-01	-2.9599E-01	-1.8926E-11	2.9960E-01	4.9336E-01	5.9712E-01	6.3006E-01	
YBHLD	-6.1619E-01	-6.0109E-01	-5.0876E-01	-5.0248E-01	4.9902E-01	6.1369E-01	6.2609E-01	6.2958E-01	6.3006E-01	
ETA	2.8220E-03	2.7125E-03	2.4566E-03	2.0496E-03	2.1207E-03	2.9825E-03	4.1498E-03	4.9312E-03	5.2383E-03	
G	-1.1657E-02	-1.1527E-02	-1.2506E-02	-1.2748E-02	-1.5042E-02	-1.6267E-02	-1.5631E-02	-1.3613E-02	-1.3740E-02	
DEQNS	5.6672E+00	5.6742E+00	5.7027E+00	5.7772E+00	5.9343E+00	5.8732E+00	5.7971E+00	5.7637E+00	5.7543E+00	
AM	6.1579E+00	6.1408E+00	6.0939E+00	6.0729E+00	6.2789E+00	6.9530E+00	7.3027E+00	7.4568E+00	7.5900E+00	
CROSSM	3.0880E-02	7.2662E-02	9.2826E-02	6.8945E-02	3.8718E-01	8.0158E-01	7.1199E-01	3.8262E-01	4.3607E-02	
SBAR	9.1142E-02	9.3909E-02	9.9177E-02	9.8503E-02	9.4438E-02	8.6626E-02	7.7310E-02	4.7986E-02	7.0168E-04	
POROGAM	1.2226E-02	1.2260E-02	1.2324E-02	1.2316E-02	1.2266E-02	1.2171E-02	1.2058E-02	1.1709E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9075E-01	7.8041E-01	7.8172E-01	7.8971E-01	8.0528E-01	8.2425E-01	8.8695E-01	9.9825E-01	
PT	8.6759E+01	8.6161E+01	8.5033E+01	8.5177E+01	8.6047E+01	8.7744E+01	8.9811E+01	9.6643E+01	1.0877E+02	
BERNOUL	1.9322E-10	-2.4894E-05	-7.2545E-05	-1.1419E-04	1.0058E-03	-8.2617E-05	-6.5149E-04	-2.5135E-04	7.1908E-09	
DPDZ	-5.4226E-04	-4.9408E-04	-6.4209E-04	-8.3841E-04	4.3955E-03	1.0345E-02	4.7736E-03	1.1112E-03	-5.0526E-05	
DUDZ	-6.5165E-04	1.3236E-04	-4.6336E-04	-1.5871E-03	6.8964E-03	1.2665E-02	2.3238E-02	4.3458E-02	-1.4143E-03	
DVDZ	-2.3012E-01	-2.2607E-01	-2.3944E-01	-2.4901E-01	-2.6148E-01	-1.9830E-01	-2.2057E-01	-2.4688E-01	-2.6252E-01	
DWDZ	-1.9794E-15	-6.2921E-03	4.6648E-03	-9.3457E-02	-2.0330E-02	-1.2667E-01	-5.8298E-02	1.1054E-01	-2.6837E-11	
DSBDZ	-3.6083E-29	-1.0418E-02	-6.4691E-03	-3.3702E-03	-4.3733E-02	-1.2761E-01	-3.9076E-01	-7.4630E-01	-3.3107E-24	
PP	-1.5449E-15	2.1486E-02	4.2169E-02	-5.7481E-02	-2.8669E-01	-2.4081E-01	-4.0197E-02	-1.5259E-03	-3.2321E-15	
UP	-5.9436E-14	-3.1389E-02	-3.4227E-02	8.7849E-03	1.6490E-01	2.8951E-01	2.5282E-01	1.7325E-01	-5.4046E-13	
VP	2.3772E-16	-5.0237E-03	-1.2558E-02	-1.6038E-02	2.2557E-02	2.6232E-02	-1.8715E-02	-2.6039E-02	3.2784E-15	
WP	-4.9502E-01	-3.9086E-01	3.5846E-01	1.6507E+00	2.5537E+00	8.9193E-01	-1.5712E+00	-2.1517E+00	-2.1869E+00	
SBARP	-4.6227E-15	8.9373E-02	5.0106E-02	-4.5863E-02	-1.0954E-01	-1.2955E-01	-3.2255E-01	-8.5994E-01	1.9653E-14	

APPENDIX B

ZETA= 2.50000000E-02

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.6826E-02	4.7316E-02	4.8970E-02	5.0116E-02	4.0895E-02	2.1861E-02	1.6478E-02	1.5575E-02	1.5658E-02	
P/ROASTSQ	2.6059E-01	2.6332E-01	2.7253E-01	2.7891E-01	2.2759E-01	1.2166E-01	9.1706E-02	8.6679E-02	8.7140E-02	
P/PTINF	4.2975E-04	4.3425E-04	4.4942E-04	4.5955E-04	3.7532E-04	2.0064E-04	1.5123E-04	1.4294E-04	1.4370E-04	
P/PINF	4.1956E+00	4.2395E+00	4.3877E+00	4.4904E+00	3.6642E+00	1.9588E+00	1.4765E+00	1.3955E+00	1.4030E+00	
RHO	2.6096E+00	2.6232E+00	2.6786E+00	2.7248E+00	2.3612E+00	1.5157E+00	1.2432E+00	1.2017E+00	1.2730E+00	
U	2.3024E+00	2.3015E+00	2.2954E+00	2.2987E+00	2.3018E+00	2.3160E+00	2.3313E+00	2.3417E+00	2.3496E+00	
V	-5.7787E-03	-5.6674E-03	-6.1035E-03	-6.3414E-03	-6.7678E-03	-5.6223E-03	-5.6463E-03	-6.0229E-03	-6.8145E-03	
W	0.	-2.4577E-02	-3.2950E-02	2.5553E-02	1.4210E-01	2.7173E-01	2.3060E-01	1.1569E-01	0.	
UC	2.2899E+00	2.2876E+00	2.2805E+00	2.2677E+00	2.2675E+00	2.3039E+00	2.3241E+00	2.3305E+00	2.3367E+00	
VC	2.3972E-01	2.4756E-01	2.7424E-01	3.3275E-01	3.9543E-01	3.3996E-01	2.8203E-01	2.5456E-01	2.4655E-01	
WC	4.1114E-16	5.5278E-02	1.1078E-01	1.7685E-01	1.4210E-01	1.1864E-01	8.4488E-02	3.4385E-02	1.8407E-11	
VCC	2.3572E-01	2.5272E-01	2.9457E-01	3.7593E-01	3.9543E-01	2.6241E-01	2.1294E-01	2.3273E-01	2.4655E-01	
WCC	0.	-2.1757E-02	-2.6608E-02	2.5942E-02	1.4210E-01	2.4655E-01	2.0331E-01	1.0871E-01	4.9235E-13	
VX	0.	1.0264E-01	2.1715E-01	3.6502E-01	3.9543E-01	1.7122E-01	4.3847E-02	1.6083E-02	-2.8730E-11	
VY	-2.3972E-01	-2.3196E-01	-2.0081E-01	-9.3571E-02	1.4210E-01	3.1675E-01	2.9113E-01	2.5636E-01	2.4655E-01	
VZ	2.2899E+00	2.2876E+00	2.2805E+00	2.2677E+00	2.2675E+00	2.3039E+00	2.3241E+00	2.3305E+00	2.3367E+00	
PSINOR	0.	2.5691E+00	5.4353E+00	9.1441E+00	9.8923E+00	4.2501E+00	1.0808E+00	3.9541E-01	-7.0448E-10	
THETNOR	8.4024E+01	8.4216E+01	8.4990E+01	8.7667E+01	8.6467E+01	8.2193E+01	8.2861E+01	8.3723E+01	8.3977E+01	
XBAR	0.	3.1707E-01	6.2091E-01	8.8166E-01	1.0062E+00	8.8368E-01	6.2303E-01	3.1834E-01	-7.0441E-11	
XBHLO	0.	1.3390E-01	5.3252E-01	5.5216E-01	3.1716E-01	9.9328E-02	2.4081E-02	2.9141E-03	-7.0441E-11	
YBAR	-6.0809E-01	-5.7698E-01	-4.7817E-01	-2.9202E-01	-1.8617E-11	2.9382E-01	4.8257E-01	5.8323E-01	6.1502E-01	
YBHLO	-6.0809E-01	-5.9496E-01	-5.0691E-01	-5.0053E-01	5.8335E-01	6.0510E-01	6.1262E-01	6.1473E-01	6.1502E-01	
ETA	1.4110E-03	1.3562E-03	1.2283E-03	1.0248E-03	1.0603E-03	1.4912E-03	2.0749E-03	2.4656E-03	2.6191E-03	
G	-5.8064E-03	-5.7380E-03	-6.2561E-03	-6.3464E-03	-7.4948E-03	-8.4182E-03	-7.8608E-03	-6.6642E-03	-6.8752E-03	
DEQNS	5.6174E+00	5.6209E+00	5.6352E+00	5.6723E+00	5.7505E+00	5.7206E+00	5.6833E+00	5.6666E+00	5.6621E+00	
AM	6.1577E+00	6.1397E+00	6.0932E+00	6.0726E+00	6.2779E+00	6.9563E+00	7.2899E+00	7.3782E+00	7.5899E+00	
CROSSM	1.5455E-02	6.7280E-02	8.8791E-02	6.9550E-02	3.8727E-01	8.1078E-01	7.1780E-01	3.6456E-01	2.2012E-02	
SBAR	9.1142E-02	9.4276E-02	9.9390E-02	9.8615E-02	9.5772E-02	9.0053E-02	8.4848E-02	7.5951E-02	7.0168E-04	
POROGAM	1.2226E-02	1.2264E-02	1.2327E-02	1.2317E-02	1.2282E-02	1.2212E-02	1.2149E-02	1.2042E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.9003E-01	7.7999E-01	7.8150E-01	7.8708E-01	7.9841E-01	8.0887E-01	8.2658E-01	9.9825E-01	
PT	8.6759E+01	8.6082E+01	8.4988E+01	8.5153E+01	8.5760E+01	8.6995E+01	8.8135E+01	9.0108E+01	1.0877E+02	
BERNOUL	1.9357E-10	-3.2595E-05	-8.8189E-05	-1.7897E-04	1.1661E-03	7.0520E-05	-7.1481E-04	-3.3834E-04	7.4794E-09	
DPDZ	-2.7458E-04	-2.2062E-04	-2.6546E-04	-3.5600E-04	5.0558E-03	1.0907E-02	4.9660E-03	1.0462E-03	-4.3078E-05	
DUDZ	-3.2615E-04	1.2820E-03	-3.3427E-04	-3.4445E-03	1.2184E-02	2.5515E-02	8.2657E-03	1.1057E-01	-7.1392E-04	
DVDZ	-2.3128E-01	-2.2675E-01	-2.4236E-01	-2.5203E-01	-2.6681E-01	-1.9998E-01	-2.1761E-01	-2.4469E-01	-2.7380E-01	
DWDZ	-3.1259E-15	-9.5660E-03	1.1360E-03	-1.2752E-01	-2.2496E-02	-1.1079E-01	-1.6736E-01	2.3901E-01	-8.4842E-11	
DSBDZ	-2.0423E-29	-2.1450E-02	-1.1657E-02	-6.1109E-03	-6.4972E-02	-1.8675E-01	-6.3530E-02	-1.6899E+00	-1.0874E-23	
PP	-1.5455E-15	2.1491E-02	4.2434E-02	-5.8620E-02	-2.8985E-01	-2.4079E-01	-3.7517E-02	-4.1355E-04	-2.5352E-15	
UP	-4.1578E-14	-3.1533E-02	-3.3007E-02	6.5216E-03	1.5995E-01	2.8894E-01	2.3663E-01	1.8166E-01	-5.4048E-13	
VP	3.2848E-16	-2.8817E-03	-6.5937E-03	-8.0265E-03	7.9314E-03	1.2959E-02	-4.7295E-03	-1.3396E-02	1.6448E-15	
WP	-4.9019E-01	-3.9622E-01	3.8778E-01	1.6535E+00	2.5546E+00	9.2527E-01	-1.6566E+00	-2.1825E+00	-2.0814E+00	
SBARP	-1.2741E-15	9.2313E-02	4.5047E-02	-3.7024E-02	-8.0795E-02	-9.6993E-02	-2.6093E-02	-9.8706E-01	3.4164E-14	

ZETA= 1.25000000E-02

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.6828E-02	4.7318E-02	4.8972E-02	5.0119E-02	4.0829E-02	2.1723E-02	1.6415E-02	1.5563E-02	1.5659E-02	
P/ROASTSQ	2.6061E-01	2.6333E-01	2.7254E-01	2.7893E-01	2.2722E-01	1.2090E-01	9.1354E-02	8.6609E-02	8.7143E-02	
P/PTINF	4.2977E-04	4.3427E-04	4.4944E-04	4.5958E-04	3.7472E-04	1.9937E-04	1.5065E-04	1.4283E-04	1.4371E-04	
P/PINF	4.1958E+00	4.2397E+00	4.3879E+00	4.4907E+00	3.6583E+00	1.9464E+00	1.4708E+00	1.3944E+00	1.4030E+00	
RHO	2.6097E+00	2.6226E+00	2.6783E+00	2.7247E+00	2.3572E+00	1.5039E+00	1.2445E+00	1.1764E+00	1.2730E+00	
U	2.3024E+00	2.3015E+00	2.2994E+00	2.2987E+00	2.3016E+00	2.3154E+00	2.3315E+00	2.3357E+00	2.3496E+00	
V	-2.8837E-03	-2.8309E-03	-3.0634E-03	-3.1810E-03	-3.4181E-03	-3.1096E-03	-2.9422E-03	-2.9842E-03	-3.3301E-03	
W	0.	-2.4430E-02	-3.2926E-02	2.7381E-02	1.4247E-01	2.7274E-01	2.3381E-01	1.1181E-01	0.	
UC	2.2897E+00	2.2874E+00	2.2803E+00	2.2674E+00	2.2670E+00	2.3033E+00	2.3245E+00	2.3284E+00	2.3366E+00	
VC	2.4098E-01	2.4882E-01	2.7586E-01	3.3470E-01	3.9750E-01	3.4066E-01	2.8237E-01	2.5447E-01	2.4695E-01	
WC	4.1331E-16	5.5423E-02	1.1081E-01	1.7868E-01	1.4247E-01	1.1969E-01	8.7673E-02	3.0580E-02	1.8407E-11	
VCC	2.4098E-01	2.5393E-01	2.9597E-01	3.7849E-01	3.9750E-01	2.6217E-01	2.1109E-01	2.3345E-01	2.4695E-01	
WCC	0.	-2.2448E-02	-2.7928E-02	2.6330E-02	1.4247E-01	2.4828E-01	2.0703E-01	1.0579E-01	2.4355E-13	
VX	0.	1.0303E-01	2.1787E-01	3.6770E-01	3.9750E-01	1.7103E-01	4.1111E-02	1.9799E-02	-2.8747E-11	
VY	-2.4098E-01	-2.3317E-01	-2.0227E-01	-9.3537E-02	1.4247E-01	3.1800E-01	2.9279E-01	2.5554E-01	2.4695E-01	
VZ	2.2897E+00	2.2874E+00	2.2803E+00	2.2674E+00	2.2670E+00	2.3033E+00	2.3245E+00	2.3284E+00	2.3366E+00	
PSINOR	0.	2.5791E+00	5.4575E+00	9.2114E+00	9.9453E+00	4.2467E+00	1.0132E+00	4.8719E-01	-7.0491E-10	
THETNOR	8.3992E+01	8.4165E+01	8.4954E+01	8.7668E+01	8.6458E+01	8.2161E+01	8.2822E+01	8.3737E+01	8.3967E+01	
XBAR	0.	3.1630E-01	6.1938E-01	8.7944E-01	1.0031E+00	8.8045E-01	6.2044E-01	3.1693E-01	-7.0121E-11	
XBHLO	0.	1.1921E-01	5.1608E-01	5.3642E-01	2.2784E-01	7.1354E-02	1.7299E-02	2.0934E-03	-7.0121E-11	
YBAR	-6.0405E-01	-5.7317E-01	-4.7457E-01	-2.9003E-01	-1.8462E-11	2.9093E-01	4.7717E-01	5.7629E-01	6.0751E-01	
YBHLO	-6.0405E-01	-5.9241E-01	-5.0844E-01	-5.0185E-01	5.8507E-01	6.0048E-01	6.0581E-01	6.0730E-01	6.0751E-01	
ETA	7.0550E-04	6.7812E-04	6.1415E-04	5.1240E-04	5.3017E-04	7.4562E-04	1.0375E-03	1.2328E-03	1.3096E-03	
G	-2.8906E-03	-2.8588E-03	-3.1299E-03	-3.1662E-03	-3.7544E-03	-4.4949E-03	-4.0499E-03	-3.2810E-03	-3.3450E-03	
DEQNS	5.5916E+00	5.5933E+00	5.6005E+00	5.6190E+00	5.6580E+00	5.6433E+00	5.6248E+00	5.6164E+00	5.6143E+00	
AM	6.1577E+00	6.1387E+00	6.0927E+00	6.0725E+00	6.2772E+00	6.9497E+00	7.3093E+00	7.2962E+00	7.5898E+00	
CROSSM	7.7123E-03	6.5556E-02	8.7611E-02	7.2812E-02	3.8793E-01	8.1306E-01	7.2939E-01	3.4840E-01	1.0757E-02	
SBAR	9.1142E-02	9.4653E-02	9.9582E-02	9.8720E-02	9.6532E-02	9.4712E-02	7.9598E-02	1.0504E-01	7.0168E-04	
POROGAM	1.2226E-02	1.2269E-02	1.2329E-02	1.2319E-02	1.2292E-02	1.2269E-02	1.2085E-02	1.2397E-02	1.1169E-02	
PT/PTINF	7.9624E-01	7.8928E-01	7.7961E-01	7.8130E-01	7.8558E-01	7.8916E-01	8.1955E-01	7.6904E-01	9.9825E-01	
PT	8.6759E+01	8.6000E+01	8.4947E+01	8.5130E+01	8.5597E+01	8.5988E+01	8.9299E+01	8.3795E+01	1.0877E+02	
BERNOUL	1.9361E-10	-4.0873E-05	-1.0572E-04	-2.5085E-04	1.2758E-03	2.6965E-04	-7.4828E-04	-3.8339E-04	7.5339E-09	
DPDZ	-1.3792E-04	-8.2379E-05	-6.9489E-05	-1.0063E-04	5.4121E-03	1.1127E-02	5.1846E-03	9.6636E-04	-2.9390E-05	
DUDZ	-1.6275E-04	3.1570E-03	-8.5413E-04	-8.0436E-03	1.3474E-02	8.1498E-02	-7.5901E-02	2.2955E-01	-3.4988E-04	
DVDZ	-2.3194E-01	-2.2711E-01	-2.4411E-01	-2.5367E-01	-2.6900E-01	-2.0246E-01	-2.1479E-01	-2.4088E-01	-2.8474E-01	
DWDZ	3.3074E-14	-1.4768E-02	-6.8203E-03	-1.7078E-01	-4.3554E-02	-3.2113E-02	-3.9397E-01	4.0326E-01	-2.2251E-10	
DSBDZ	-1.2113E-28	-4.4052E-02	-2.1010E-02	-1.2983E-02	-2.9120E-02	-7.6858E-01	1.2807E+00	-3.2289E+00	-2.8227E-23	
PP	-7.0849E-16	2.1464E-02	4.2548E-02	-5.9219E-02	-2.9144E-01	-2.4074E-01	-3.6116E-02	1.6228E-04	-2.6750E-15	
UP	-2.3718E-14	-3.1631E-02	-3.1664E-02	5.1946E-03	1.5212E-01	2.9722E-01	2.1927E-01	1.8071E-01	-4.5119E-13	
VP	1.2904E-16	-1.6288E-03	-3.3951E-03	-3.8321E-03	6.7480E-04	5.4063E-03	1.3702E-03	-4.8349E-03	7.5674E-16	
WP	-4.8676E-01	-3.9888E-01	4.0736E-01	1.6563E+00	2.5401E+00	9.6780E-01	-1.7147E+00	-2.2252E+00	-1.9789E+00	
SBARP	-3.5065E-15	9.5019E-02	4.0651E-02	-3.6623E-02	-1.8093E-02	-2.1235E-01	2.6728E-01	-9.6069E-01	4.7001E-14	

APPENDIX B

ZETA= C.

	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9	I=10
P	4.6829E-02	4.7318E-02	4.8971E-02	5.C119E-C2	4.C759E-02	2.1583E-02	1.6348E-C2	1.5551E-02	1.5659E-02	
P/ROASTSC	2.6061E-01	2.6333E-01	2.7254E-01	2.7852E-01	2.2683E-01	1.2012E-C1	9.0982E-02	8.6546E-02	8.7144E-02	
P/PTINF	4.2978E-04	4.3427E-C4	4.4944E-04	4.5957E-C4	3.7407E-C4	1.9808E-04	1.50C4E-04	1.4272E-C4	1.4371E-C4	
P/PINF	4.1959E+00	4.2397E+00	4.3878E+00	4.49C7E+00	3.6520E+00	1.9339E+00	1.4648E+00	1.3934E+00	1.4030E+00	
RHO	2.5916E+00	2.6109E+00	2.6757E+CC	2.72C4E+CO	2.3469E+00	1.4903E+00	1.2221E+00	1.1792E+00	1.1851E+00	
U	2.3013E+0C	2.3008E+00	2.2992E+00	2.2983E+CO	2.3017E+CO	2.3155E+00	2.3296E+00	2.3395E+00	2.3421E+CO	
V	2.0078E-05	1.0395E-05	1.6232E-07	7.2888E-C7	-4.4460E-05	-5.5511E-04	-2.8104E-04	-1.0390E-C5	3.2255E-C4	
W	-1.3081E-13	-2.2237E-02	-2.991CE-02	8.2664E-03	1.6024E-01	2.7266E-01	2.2767E-01	1.1326E-01	-3.7501E-13	
UC	2.2885E+00	2.2865E+00	2.2797E+00	2.2679E+CC	2.2667E+00	2.3032E+00	2.3222E+00	2.3282E+CO	2.3290E+00	
VC	2.4214E-01	2.5001E-01	2.7745E-01	3.3680E-C1	3.5964E-C1	3.4149E-01	2.8233E-01	2.5455E-01	2.4673E-C1	
WC	-1.3040E-13	5.7591E-02	1.1380E-01	1.5958E-01	1.6024E-01	1.1961E-C1	8.1666E-C2	3.2035E-02	1.7972E-11	
VCC	2.4214E-01	2.5568E-C1	2.9870E-01	3.7262E-C1	3.5964E-01	2.6249E-01	2.1310E-01	2.3273E-01	2.4673E-01	
WCC	-1.3C81E-13	-2.1199E-02	-2.66C9E-C2	7.5566E-03	1.6024E-01	2.4903E-C1	2.C241E-01	1.C796E-01	-3.9889E-13	
VX	-1.3081E-13	1.0539E-01	2.2125E-C1	3.5638E-01	3.9964E-01	1.7170E-01	4.6529E-02	1.8385E-02	-2.8304E-11	
VY	-2.4214E-01	-2.3391E-C1	-2.0242E-01	-1.09C7E-01	1.6024E-C1	3.1849E-C1	2.9020E-01	2.5585E-01	2.4673E-01	
VZ	2.2885E+00	2.2865E+00	2.2797E+C0	2.2679E+00	2.2667E+00	2.3032E+00	2.3222E+C0	2.3282E+00	2.3290E+00	
PSINOR	-3.2751E-12	2.6391E+00	5.5433E+CC	8.93C5E+00	5.5989E+00	4.2634E+00	1.1479E+00	4.5245E-01	-6.9629E-10	
THETNOR	8.3960E+01	8.4165E+01	8.4949E+01	8.7280E+01	8.6018E+01	8.2149E+01	8.2878E+01	8.3728E+01	8.3953E+01	
XBAR	0.	3.1552E-01	6.1784E-01	8.7723E-C1	1.0000E+00	8.7723E-01	6.1784E-C1	3.1552E-01	-6.9800E-11	
XBHLD	C.	-6.9800E-11	-6.9800E-11	-6.98C0E-11	-6.9800E-11	-6.9800E-11	-6.9800E-11	-6.98C0E-11	-6.9800E-11	
YBAR	-6.0000E-01	-5.6935E-01	-4.7178E-01	-2.88C5E-C1	-1.8308E-11	2.8805E-01	4.7178E-01	5.6935E-01	6.0000E-01	
YBHLD	-6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-01	6.0000E-C1	6.0000E-01	6.0000E-01	6.00C0E-01	6.0000E-01	
ETA	0.	C.	0.	C.	C.	0.	0.	C.	0.	
G	-2.8906E-03	-2.8588E-C3	-3.1299E-03	-3.1662E-03	-3.7544E-C3	-4.4949E-C3	-4.C499E-03	-3.2810E-03	-3.3450E-03	
DEQNS	5.5916E+00	5.5533E+0C	5.60C5E+00	5.6190E+00	5.6580E+00	5.6433E+00	5.6248E+00	5.6164E+00	5.6143E+00	
AM	6.1333E+00	6.1230E+C0	6.0851E+00	6.0662E+C0	6.2723E+00	6.9408E+00	7.25C3E+00	7.3072E+00	7.2993E+00	
CROSSM	3.4864E-13	5.5176E-C2	7.9208E-02	2.1818E-02	4.3561E-01	8.1170E-01	7.0520E-01	3.5335E-01	1.1688E-12	
SBAR	1.0093E-01	1.0093E-01	1.0093E-01	1.0093E-C1	1.0093E-01	1.0093E-01	1.0093E-01	1.0093E-01	1.0093E-01	
POROGAM	1.2346E-02	1.2346E-02	1.2346E-02	1.2346E-02	1.2346E-02	1.2346E-02	1.2346E-C2	1.2346E-C2	1.2346E-02	
PT/PTINF	7.77C0E-01	7.7700E-C1	7.77C0E-C1	7.7700E-01	7.7700E-01	7.7700E-01	7.7700E-01	7.77C0E-01	7.7700E-01	
PT	8.4662E+01	8.4662E+01	8.4662E+01	8.4662E+C1	8.4662E+01	8.4662E+01	8.4662E+01	8.4662E+01	8.4662E+01	
BERNOUL	-6.7175E-11	7.8354E-09	1.2754E-08	1.9943E-C9	-1.5192E-C8	-8.0709E-C8	3.2243E-08	2.3383E-C8	-1.7339E-08	
DVDZ	-2.3260E-01	-2.2756E-01	-2.4628E-01	-2.5687E-C1	-2.6212E-01	-2.0704E-C1	-2.1697E-01	-2.3043E-01	-2.9962E-C1	
DPDZ	1.5304E-27	4.7353E-C5	1.1011E-C4	1.2971E-C5	7.2349E-C3	1.1250E-02	4.9221E-03	1.0087E-03	1.0676E-26	
PP	-2.1038E-15	2.147CE-02	4.2647E-02	-5.5851E-C2	-2.9299E-01	-2.4071E-01	-3.4697E-02	8.04C6E-04	-2.5356E-15	
UP	-1.3C81E-13	-2.2237E-02	-2.9910E-02	8.2664E-03	1.6024E-01	2.7266E-01	2.2767E-01	1.1326E-01	-3.7501E-13	
WP	-4.8145E-01	-4.0016E-01	4.3141E-01	1.6717E+00	2.4849E+00	1.0715E+00	-1.7635E+0C	-2.3430E+00	-1.8242E+C0	

WINDWARD LINE ZETA LIMIT

U	RHO	S	PORCGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3024E+00	2.6097E+00	9.1142E-02	1.2226E-02	2.2896E+0C	2.4223E-01	4.1546E-16	0.	-2.4223E-01	2.2896E+00	7.9624E-01

LEEWARD LINE ZETA LIMIT

U	RHO	S	PORCGAM	UC	VC	WC	VX	VY	VZ	PT/PTINF
2.3496E+C0	1.2730E+C0	7.0168E-04	1.1169E-02	2.3366E+0C	2.4720E-01	1.8407E-11	-2.8758E-11	2.4720E-01	2.3366E+00	9.9825E-01

FORCE COEFFICIENTS

CZ= 4.62736810E-02 CY= 1.86505024E-01 CD= 5.5170B934E-02 CL= 1.82822818E-01
YBAR= -3.00745746E-02 ZBAR= 6.66666667E-01 CM= -1.25728362E-01

APPENDIX B

Explanatory Notes

(1) Some input and auxiliary parameters. Only one line is used in this preliminary calculation for the zero-incidence circular cone.

(2) Computed values for first pivotal integration.

(3) Change in shock shape.

(4) New shock shape and computed values for second pivotal integration.

(5) Input quantities, auxiliary quantities, and secondary quantities, beginning on a new page, for converged solution of circular cone at zero incidence.

(6) Zeta print block at cone surface for circular cone at zero incidence.

(7) Windward-line and leeward-line zeta limits or circular cone at zero incidence.

(8) Repetition of input quantities, auxiliary quantities, and secondary quantities for circular cone at zero incidence. At this stage, the program takes the η_s-value just obtained from the N = 1 calculation and assigns it at all the lines. The problem is now reintegrated, using the full program logic, cross derivatives, and so on; of course, the shock shape satisfies the convergence criterion on the first integration.

(9) Summary print block for circular cone at zero incidence.

(10) Arc length and body coordinates at each of the lines.

(11) Repetition of zeta print block at cone surface for circular cone at zero incidence

(12) Repetition of windward-line and leeward-line zeta limits for circular cone at zero incidence.

(13) Force and moment coefficients together with center-of-pressure location.

(14) Input quantities, auxiliary quantities, and secondary quantities for T = 0.95 (PARAM + DPRAM1). The η_s-values from the zero-incidence circular cone are used to start the iteration for the zero-incidence elliptic cone with T = 0.95.

(15) Input values of η_s from converged circular cone at zero incidence and computed values from first pivotal integration.

(16) Change in shock shape.

(17) New shock shape and computed values for second pivotal integration.

(18) Input quantities, auxiliary quantities, and secondary quantities, beginning on a new page, for converged solution of elliptic cone with $T = 0.95$.

(19) Summary print block for elliptic cone with $T = 0.95$.

(20) Arc length and body coordinates at each line for elliptic cone with $T = 0.95$.

(21) Zeta print block at cone surface for elliptic cone with $T = 0.95$.

(22) Windward-line and leeward-line zeta limits on elliptic cone with $T = 0.95$.

(23) Force and moment coefficients together with center-of-pressure location for elliptic cone with $T = 0.95$.

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1. Klunker, E. B.; South, Jerry C., Jr.; and Davis, Ruby M.: Calculation of Nonlinear Conical Flows by the Method of Lines. NASA TR R-374, 1971.

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