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The PARC Code: Theory and Usage

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Sverdrup Technology, Inc.

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This report has been reviewed and approved.

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

The PARC code is a flow-field simulation computer program based on the strong conservation law form of the Navier-Stokes equations. Several variants of these equations are treated, including 2-D, axisymmetric, and 3-D versions and inviscid, laminar, and turbulence specializations. Use is made of perfect gas equations of state and Sutherland's viscosity law. The equations are expressed in curvilinear coordinates while retaining strong conservation law form. The Beam and Warming approximate factorization algorithm is used for forming the implicit central-difference algorithm. Pulliam's scalar penta-diagonal transformation is applied to produce an efficient steady-state solver. Artificial viscosity is added both implicitly and explicitly and follows the switched fourth-order and second-order form of Jameson. The metrics are calculated in a finite volume manner so as to maintain free stream. Variable spatial and temporal time-steps are used for improved algorithm efficiency and robustness. Generalized boundary conditions are selected through code inputs and may be located anywhere within the computational grid. A Baldwin and Lomax

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19. ABSTRACT (Continued)

style algebraic turbulence model with modifications similar to those of Thomas is used. Use of the PARC code is straight-forward, requiring only a restart file and a file of NAMELIST inputs. These inputs allow the selection of flow equation specialization, thermodynamic properties, grid size, artificial viscosity parameters, iteration controls, and output requirements. In addition, boundary-condition types, locations, and parameters are provided througn NAMELIST input. Output from a run includes a record of input parameters, convergence statistics, edited flow-field printout, and appropriate error messages. The PARC code has proven capable of treating many problems that could not be adequately delt with otherwise.

PREFACE

The work reported herein was conducted by the Arnold Engineering Development Center (AEDC), Air Force Systems Command (AFSC). The results of the research were obtained by Sverdrup Technology, Inc., AEDC Group, operating contractor for the engine test facilities at AEDC, AFSC, Arnold Air Force Base, Tennessee, under Project Number DB84EW. The Air Force Project Manager was Capt Matt Towne, DOT. The data analysis was completed on April 31, 1987, and the manuscript was submitted for publication on August 3, 1987.

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1.0 INTRODUCTION

As with other types of aerospace testing, turbine and rocket engine testing requirements are making escalating demands on computational fluid dynamics (CFD) as a means to reduce the costs and risks involved in test planning, execution, and analysis. Since even the simplest engine test always involves a hot, turbulent, chemically complex exhaust, and since many problems of current interest involve complex, multiple flow passages, these demands on CFD are very stringent indeed. Although many specialized CFD codes have been developed to treat selected subsets of engine testing problems, there remains a largely unsatisfied requirement for a general purpose CFD tool, which is at least qualitatively applicable to the bulk of engine testing needs. The PARC Navier-Stokes code was acquired and modified for use within the Engine Test Facility (ETF) at Arnold Engineering Development Center (AEDC) with this in mind. This computer program, while still under active development, has proven capable of treating many propulsion testing problems (e.g., thrust reversing engine exhaust collector design), which could not be dealt with otherwise. This report provides the background and technical details necessary to the use of this Navier-Stokes code.

1.1 BASIC INFORMATION

The PARC codes are flow-field simulation programs that calculate the thermodynamic and kinematic properties of a fluid flow at discrete points within the flow, based on a specified boundary geometry and appropriate flow conditions on these boundaries. The boundaries can be quite complex, and the fluid can be treated fairly generally. Inviscid and viscous flows can be calculated. Viscous flows can be laminar or turbulent and can be treated as fully viscous or as shear layer flows. These programs are currently optimized as steady-state flow simulators and are available in a two-dimensional (2-D) and axisymmetric version and a fully three-dimensional (3-D) version. Although the PARC codes are written in Cray FORTRAN 77, they use no special Cray subroutines and should be easily implemented on any scientific computer. These codes are maintained and periodically updated by personnel of the Propulsion CFD project.

1.2 PHYSICS

The basis of the algorithms used in the PARC codes is the complete Navier-Stokes equations in conservation law form. That is, the divergence form of the time-dependent continuity, momentum, and energy equations is the heart of the physics embodied in these codes. To reduce the complexity and computer memory requirements of these codes, the 2-D/axisymmetric and 3-D specializations of the Navier-Stokes equations are treated in two separate versions of the PARC program (PARC2D and PARC3D, respectively). Various additional specializations are provided for within each of these programs. For example, the viscous terms can be selectively calculated so that a thin-layer simulation can be performed or an inviscid (Euler) flow field calculated. Similarly, for viscous simulations the fluid flow can be treated as laminar or turbulent as desired. Turbulent flow is calculated by considering the Navier-Stokes equations as having been Reynolds-averaged (mass-averaged) and by using an algebraic turbulence model to determine a turbulent viscosity. The viscous coefficients are determined from Sutherland's viscosity law, Stokes hypothesis, and an assumption that the Prandtl number is constant.

1.3 COMPUTATIONAL ALGORITHM

The Beam and Warming approximate factorization algorithm (Ref. 1) forms the heart of the PARC code. This algorithm is an implicit scheme that solves the set of equations produced by central-differencing the Navier-Stokes equations on a regular grid. Since these equations are formulated in the strong conservation form for a curvilinear set of coordinates, the resulting algorithm is quite general with the desirable features of global conservation and shock capturing. Its ADI style formulation makes this implicit scheme very economical in comparison to other implicit and explicit formulations. The implementation of the Beam and Warming algorithm into a Navier-Stokes code was first reported by Pulliam and Steger (Ref. 2). This program, known as AIR2D or AIR3D, was then updated recently by Pulliam (Ref. 3), who diagonalized the implicit matrices for more efficient execution times. He also modified the artificial dissipation so that it was treated completely implicitly and included a Jameson-style (Ref. 4) second-order term for improved shock capturing. This code, termed the ARC2D or ARC3D program, has been in widespread use within the aerodynamics community. The PARC codes, PARC2D and PARC3D and their various specializations, are directly derived from the ARC codes and share many of their principal features.

2.0 THEORY

2.1 NAVIER-STOKES EQUATIONS

Although many simplified versions of the Navier-Stokes equations have been successfully applied to various propulsion testing problems, in general these very complex fluid flows can only be adequately treated by the full set of equations. However, because of certain unresolved problems in turbulence modeling, constraints imposed by the numerical technique, and the desirability of keeping the analysis as simple as possible, a number of assumptions and restrictions are required. This section will present the particular forms of the Navier-Stokes equations, the equations of state, the constitutive equations, and other subsidiary relations that were used in the formulation of the PARC code.

2.1.1 Cartesian Conservation Law Form

The governing differential equations used to model propulsion-related fluid flows are the Reynolds-averaged Navier-Stokes equations for a Newtonian fluid that obey a Fourier heat conduction law. This system of partial differential equations (continuity, momentum, and energy equations) can be expressed in the following nondimensional conservation law form:

$$\frac{\partial Q}{\partial t} + \frac{\partial F_j}{\partial X_j} = \frac{1}{Re} \frac{\partial G_j}{\partial X_j}$$

where Q is a vector containing the conservation variables:

$$Q = \begin{bmatrix} \varrho \\ \varrho u_i \\ E \end{bmatrix}$$

the F_j vectors represent the inviscid flux vectors:

$$F_j = \begin{bmatrix} \varrho u_j \\ \varrho u_i u_j + P\,\delta_{ij} \\ (E + P)u_j \end{bmatrix}$$

and the viscous flux vectors (G_j) are

$$G_j = \begin{bmatrix} 0 \\ \tau_{ij} \\ u_k\,\tau_{jk} - q_j \end{bmatrix}$$

For a Newtonian fluid, the viscous stress tensor takes the form:

$$\tau_{ij} = \mu \left(\frac{\partial u_i}{\partial X_j} + \frac{\partial u_j}{\partial X_i} \right) + \lambda \frac{\partial u_k}{\partial X_k} \delta_{ij}$$

Assuming a Fourier heat conduction law, the heat flux vector is

$$q_j = -\frac{K}{\beta_r Pr} \frac{\partial T}{\partial X_j}$$

The total energy per unit volume, E, is defined to be

$$E = \varrho \left(e + \frac{1}{2} u_k u_k \right)$$

For notational convenience, use has been made of the Kronecker delta:

$$\delta_{ij} = \begin{cases} 1, \text{ if } i = j \\ 0, \text{ if } i \neq j \end{cases}$$

and of the Einstein summation convention:

$$u_k u_k = \sum_{j=1}^{N} u_j u_j$$

(that is, repeated indices in a product indicate summation over the range of the indices). The indices range from 1 to 2 for 2-D and axisymmetric formulations and from 1 to 3 for 3-D formulations.

Definitions of fluid property notation and the associated nondimensionalizing parameters are contained in the following table:

PROPERTY	NOTATION	NON-DIMENSIONALIZING PARAMETER
Density	ϱ	ϱ_r
Pressure	P	$\varrho_r a_r^2$
Temperature	T	T_r
Internal energy per unit mass	e	a_r^2
First coefficient of viscosity	μ	μ_r
Second coefficient of viscosity	λ	μ_r
Thermal conductivity	K	K_r
Velocity components	u_i	a_r
Cartesian coordinates	X_i	X_r
Time	t	X_r/a_r

where the "r" subscript indicates an arbitrary reference fluid state, and "a_r" is the corresponding reference sound speed. The following dimensionless parameters are also required:

$$Re = \varrho_r a_r X_r / \mu_r$$
$$Pr = K_r / C_{p_r} \mu_r$$
$$\beta_r = a_r^2 / C_{p_r} T_r$$

where C_{P_r} = reference specific heat at constant pressure.

When convenient, the following aliases will be used for the velocity and coordinate components:

$$\begin{array}{lll} X_1 = X & \quad & u_1 = u \\ X_2 = Y & & u_2 = v \\ X_3 = Z & & u_3 = w \end{array}$$

Although this mixed vector-Cartesian tensor notation is quite compact, it can also be obtruse. Example expansions in pure vector notation for 2-D would be

$$Q = \begin{bmatrix} \varrho \\ \varrho u \\ \varrho v \\ E \end{bmatrix} \qquad F_1 = \begin{bmatrix} \varrho u \\ \varrho u^2 + P \\ \varrho uv \\ (E+P)u \end{bmatrix}$$

$$G_2 = \begin{bmatrix} 0 \\ \mu\,(u_y + v_x) \\ 2\mu v_y + \lambda\,(u_x + v_y) \\ \mu[u(u_y + v_x) + 2v\,v_y] + \lambda\,v\,(u_x + v_y) + \dfrac{K}{\beta_r\,P_r}\,T_y \end{bmatrix}$$

Where the following subscript notation has been and will be used to denote partial differentiation, when convenient

$$u_x = \frac{\partial u}{\partial X}$$

$$u_y = \frac{\partial u}{\partial y}$$

$$u_z = \frac{\partial u}{\partial z}$$

2.1.2 Thermodynamic Properties

Although the PARC codes can easily be modified to allow for an arbitrary functional form for the second coefficient of viscosity, Stokes hypothesis has been used in all versions:

$$\lambda = -\frac{2}{3}\mu$$

For a general real gas, the thermodynamic properties are found as functions of density and internal energy:

$$P = P(\varrho, e) \qquad \mu = \mu(\varrho, e)$$
$$T = T(\varrho, e) \qquad K = K(\varrho, e)$$

However, the current versions of the PARC code are based on the assumption of a thermally and calorically perfect gas. The following nondimensional equations of state are used:

$$P = \varrho T/\gamma$$

$$e = T/\gamma(\gamma - 1)$$

This allows the pressure and temperature to be expressed simply as functions of the conservation variables:

$$P = (\gamma - 1)(E - \frac{1}{2}\varrho\, u_k u_k)$$

$$T = \gamma(\gamma - 1)(E/\varrho - \frac{1}{2} u_k u_k)$$

In this case, the ratio of specific heats, γ, is a constant and $\beta_r = \gamma - 1$.

The perfect gas versions of the PARC codes also use the assumption of a constant Prandtl number and the Sutherland viscosity law:

$$K = \mu$$

$\mu = T^{3/2}(1 + T_s) / (T + T_s)$ (T_s the nondimensional Southerland temperature)

2.1.3 Curvilinear Coordinate Conservation Law Form

To allow for the easy discretation of these equations on arbitrary grids, it is advantageous to re-express the Navier-Stokes equations in terms of general curvilinear coordinates while retaining the strong conservation law form. The following coordinate transformation is defined:

$$\xi_j = \xi_j(X_i, t)$$

Using this coordinate transformation, the Navier-Stokes equations become

$$\frac{\partial \hat{Q}}{\partial t} + \frac{\partial \hat{F}_j}{\partial \xi_j} = \frac{1}{Re} \frac{\partial \hat{G}_j}{\partial \xi_j}$$

Where the vectors $\hat{Q}$, $\hat{F}_j$, and $\hat{G}_j$ are linear combinations of the corresponding Cartesian vectors Q, F_j, and G_j,

$$\hat{Q} = \frac{1}{J} Q$$

$$\hat{F}_j = \frac{1}{J} \left(\frac{\partial \xi_j}{\partial t} Q + \frac{\partial \xi_j}{\partial X_k} F_k \right)$$

$$\hat{G}_j = \frac{1}{j} \frac{\partial \xi_j}{\partial X_k} G_k$$

or, equivalently:

$$\hat{Q} = \frac{1}{J} \begin{bmatrix} \varrho \\ \varrho u_i \\ E \end{bmatrix}$$

$$\hat{F}_j = \frac{1}{J} \begin{bmatrix} \varrho U_j \\ \varrho u_i U_j + P \dfrac{\partial \xi_j}{\partial X_i} \\ (E + P)\, U_j - P \dfrac{\partial \xi_j}{\partial t} \end{bmatrix} \qquad \hat{G}_j = \frac{1}{J} \begin{bmatrix} 0 \\ \hat{\tau}_{ij} \\ u_k \hat{\tau}_{jk} - \hat{q}_j \end{bmatrix}$$

The contravarient velocities are defined as

$$U_j = \frac{\partial \xi_j}{\partial t} + u_k \frac{\partial \xi_j}{\partial X_k}$$

Transformed viscous stress tensor and heat flux vector are given by

$$\hat{\tau}_{ij} = \frac{\partial \xi_j}{\partial X_k} \tau_{ik}$$

$$\hat{q}_j = \frac{\partial \xi_j}{\partial X_k} q_k$$

where the velocity and temperature derivatives are:

$$\frac{\partial u_i}{\partial X_j} = \frac{\partial \xi_k}{\partial X_j} \frac{\partial u_i}{\partial \xi_k}$$

$$\frac{\partial T}{\partial X_j} = \frac{\partial \xi_k}{\partial X_j} \frac{\partial T}{\partial \xi_k}$$

The PARC code formulation assumes that the curvilinear coordinates do not vary with time so that the above terms involving derivatives of the coordinates with respect to time do not appear. Spatial coordinate derivatives are collectively termed "metrics," and the Jacobian of the transformation is denoted by "J." Wherever it is convenient, the curvilinear coordinates and the contravarient velocities will be referenced by the following aliases:

$$\xi_1 = \xi \qquad U_1 = U$$

$$\xi_2 = \eta \qquad U_2 = V$$

$$\xi_3 = \zeta \qquad U_3 = W$$

2.2 BEAM AND WARMING ALGORITHM

The difference scheme used in the PARC code is the approximate factorization algorithm attributable to Beam and Warming (Ref. 1). This algorithm is an implicit, first- or second-order time-accurate, computationally robust scheme for solving the Navier-Stokes equations. Its "delta" formulation ensures the attainment of steady-state solutions that are independent of the time-step size. The most attractive feature of the algorithm, as modified by Pulliam (Ref. 3), is that it forms an ADI type of scheme in which each sweep involves the inversion of a set of scalar pentadiagonal matrices. This algorithm has solved a variety of complex 2-D, axisymmetric, and 3-D problems of importance to propulsion testing applications in a timely manner.

2.2.1 Time Differencing

Although the original Beam and Warming algorithm contained very general time-difference formulas, the current versions of the PARC codes use Euler backward differencing:

$$\Delta \hat{Q}^n + \Delta t^n \left(\frac{\partial \hat{F}_j^{n+1}}{\partial \xi_j} - \frac{1}{Re} \frac{\partial \hat{G}_j^{n+1}}{\partial \xi_j} \right) = 0$$

which has a truncation error on the order of the time-step size, Δt^n. The superscript indicates evaluation of the variable at the time t^n, that is

$$\hat{Q}^n = \hat{Q}(\xi_i, t^n)$$

where t^n is the nth time variable in a monotone increasing sequence of time variables. The "delta" forward time difference is defined as

$$\Delta\hat{Q}^n = \hat{Q}^{n-1} - \hat{Q}^n$$

2.2.2 Time Linearization

The time-differenced equation cannot be easily solved since the flux vectors are nonlinear functions of the conservation vector. However, the inviscid flux vector may be time-linearized:

$$\hat{F}_j^{n+1} \approx \hat{F}_j^n + A_j^n \Delta\hat{Q}^n$$

which has a truncation error on the order of the square of the time-step size. The Jacobian matrix, A_j, is formally derived from vector differentiation:

$$A_j = \frac{\partial \hat{F}_j}{\partial \hat{Q}}$$

The expanded form for a perfect gas is

$$A_j = \begin{bmatrix} 0 & \dfrac{\partial \xi_j}{\partial X_k} & 0 \\ \dfrac{\partial \xi_j}{\partial X_i}\phi^2 - u_i U_j & U_j \delta_{ik} + \dfrac{\partial \xi_j}{\partial X_k} u_i - (\gamma - 1)\dfrac{\partial \xi_j}{\partial X_i} u_k & (\gamma - 1)\dfrac{\partial \xi_j}{\partial X_i} \\ (\phi^2 - h) U_j & \dfrac{\partial \xi_j}{\partial X_k} h - (\gamma - 1) u_k U_j & \gamma U_j \end{bmatrix}$$

where

$$\phi^2 = \frac{\gamma - 1}{2} u_\ell u_\ell$$

$$h = \gamma \frac{E}{\varrho} - \phi^2$$

The viscous flux vector, $\hat{G}_j^{n+1}$, could be treated similarly but in the current versions of the PARC code is time-lagged to allow the formation of the scalar pentadiagonal algorithm. Thus the linearized form of the time discretation is

$$\left(I + \Delta t \frac{\partial}{\partial \xi_j} A_j^n\right) \Delta\hat{Q}^n = -\Delta t \left(\frac{\partial \hat{F}_j^n}{\partial \xi_j} - \frac{1}{Re}\frac{\partial \hat{G}_j^n}{\partial \xi_j}\right)$$

where "I" denotes the identity matrix of appropriate rank.

2.2.3 Approximate Factorization

Since the operator on $\Delta\hat{Q}^n$ in the above equations contains derivative operators in all spatial directions, the matrix operator that will be formed when the derivatives are replaced by differences will make solution of the resulting block matrix equation computationally expensive. If instead the operator is "factored," a series of inexpensive scalar matrix equations with small bandwidth can be solved:

$$\left(I + \Delta t \frac{\partial}{\partial \xi} A_1^n\right)\left(I + \Delta t \frac{\partial}{\partial \eta} A_2^n\right)\left(I + \Delta t \frac{\partial}{\partial \zeta} A_3^n\right) \Delta\hat{Q}^n = -\Delta t \left(\frac{\partial \hat{F}_j^n}{\partial \xi_j} - \frac{1}{Re}\frac{\partial \hat{G}_j^n}{\partial \xi_j}\right)$$

where the obvious simplification occurs in 2-D. This equation is still formally first-order accurate in time. When the spatial derivatives are replaced by appropriate differences, the following algorithm results:

$$RHS = -\Delta t \left[\left(\delta_\xi \hat{F}_1^n + \delta_\eta \hat{F}_2^n + \delta_\zeta \hat{F}_3^n\right) - \frac{1}{Re}\left(d_\xi \hat{G}_1^n + d_\eta \hat{G}_2^n + d_\zeta \hat{G}_3^n\right)\right]$$

$$(I + \Delta t\, \delta_\xi A_1^n)\, \Delta\hat{Q}^{**} = RHS$$

$$(I + \Delta t\, \delta_\eta A_2^n)\, \Delta\hat{Q}^{*} = \Delta\hat{Q}^{**}$$

$$(I + \Delta t\, \delta_\zeta A_3^n)\, \Delta\hat{Q}^{n} = \Delta\hat{Q}^{*}$$

$$\hat{Q}^{n+1} = \hat{Q}^n + \Delta\hat{Q}^n$$

where the central difference operators are defined:

$$\delta_\xi \hat{F}_1 = \frac{1}{2}\left[\hat{F}_1(\xi+1,\eta,\zeta) - \hat{F}_1(\xi-1,\eta,\zeta)\right]$$

$$\delta_\eta \hat{F}_2 = \frac{1}{2}\left[\hat{F}_2(\xi,\eta+1,\zeta) - \hat{F}_2(\xi,\eta-1,\zeta)\right]$$

$$\delta_\zeta \hat{F}_3 = \frac{1}{2}\left[\hat{F}_3(\xi,\eta,\zeta+1) - \hat{F}_3(\xi,\eta,\zeta-1)\right]$$

and

$$d_\xi \hat{G}_1 = \hat{G}_1\left(\xi + \frac{1}{2},\eta,\zeta\right) - \hat{G}_1\left(\xi - \frac{1}{2},\eta,\zeta\right)$$

$$d_\eta \hat{G}_2 = \hat{G}_2\left(\xi,\eta + \frac{1}{2},\zeta\right) - \hat{G}_2\left(\xi,\eta - \frac{1}{2},\zeta\right)$$

$$d_\zeta \hat{G}_3 = \hat{G}_3\left(\xi,\eta,\zeta + \frac{1}{2}\right) - \hat{G}_3\left(\xi,\eta,\zeta - \frac{1}{2}\right)$$

In evaluating these mid-point values of the $\hat{G}_j$ vectors, $\hat{G}_1(\xi+1/2,\eta,\zeta)$ for example, all quantities are averaged in the direction of the difference, except for derivatives of velocity in this direction, which are central-differenced. For example,

$$\mu\left(\xi+\frac{1}{2},\eta,\zeta\right) = \frac{1}{2}\left[\mu\left(\xi+1,\eta,\zeta\right) + \mu\left(\xi-1,\eta,\zeta\right)\right]$$

$$u_\eta\left(\xi+\frac{1}{2},\eta,\zeta\right) = \frac{1}{2}\left\{\frac{1}{2}\left[u(\xi+1,\eta+1,\zeta) - u(\xi+1,\eta-1,\zeta)\right] + \frac{1}{2}\left[u(\xi,\eta+1,\zeta) - u(\xi,\eta-1,\zeta)\right]\right\}$$

$$w_\xi\left(\xi+\frac{1}{2},\eta,\zeta\right) = w(\xi+1,\eta,\zeta) - w(\xi,\eta,\zeta)$$

2.2.4 Artificial Viscosity

Because of the central-difference nature of this scheme, some artificial viscosity is necessary for stability and to suppress cosmetic blemishes. The Jameson-style (Ref. 4) artificial viscosity model used in the PARC code is

$$\nabla_\xi\left[C_\xi\left(\epsilon^{(2)}\Delta_\xi - \epsilon^{(4)}\Delta_\xi\nabla_\xi\Delta_\xi\right)\right](J\hat{Q}) + \nabla_\eta\left[C_\eta\left(\epsilon^{(2)}\Delta_\eta - \epsilon^{(4)}\Delta_\eta\nabla\Delta_\eta\right)\right](J\hat{Q})$$

$$+ \nabla_\zeta \left[C_\zeta \left(\epsilon^{(2)}\Delta_\zeta - \epsilon^{(4)}\Delta_\zeta\nabla_\zeta\Delta_\zeta \right) \right] (J\hat{Q})$$

where the forward and backward difference operators are

$$\Delta_\xi Q = Q(\xi+1,\nu,\zeta) - Q(\xi,\nu,\zeta)$$

$$\nabla_\xi Q = Q(\xi,\nu,\zeta) - Q(\xi-1,\nu,\zeta)$$

with analogous formulas for the other coordinates. The nonlinear coefficients are given by

$$C_\xi = C(\xi+1,\nu,\zeta) + C(\xi,\nu,\zeta)$$

for example, where

$$C = \left(|U| + a\sqrt{\xi_x^2 + \xi_y^2 + \xi_z^2} \right) + \left(|V| + a\sqrt{\eta_x^2 + \eta_y^2 + \eta_z^2} \right) + \left(|W| + a\sqrt{\zeta_x^2 + \zeta_y^2 + \zeta_z^2} \right)$$

The second- and fourth-order coefficients are defined as

$$\epsilon^{(2)} = K_2 \Delta t f$$

$$\epsilon^{(4)} = \text{Max}\,(0,\ K_4\Delta t - \epsilon^{(2)})$$

and the "switch" function "f" has the basic form:

$$f = \text{Max}\,(f_\xi,\ f_\eta,\ f_\zeta)$$

where

$$f_\xi = |\,P(\xi+1,\eta,\zeta) - 2P(\xi,\eta,\zeta) + P(\xi-1,\eta,\zeta)| / |P(\xi+1,\eta,\zeta) + 2P(\xi,\eta,\zeta) + P(\xi-1,\eta,\zeta)|$$

In actual usage in the PARC codes, f is smoothed (averaged) over immediate neighbor points. The two coefficients, K_2 and K_4, have maximum values of 0.25 and 0.64, respectively.

2.3 PENTADIAGONAL FORMULATION

The basic Beam and Warming algorithm requires the solution of a block tridiagonal matrix for each coordinate line in each coordinate direction. This series of block matrix inversions is computationally expensive, especially for 3-D problems where the blocks are 5 by 5 submatrices. When the fourth-order artificial viscosity is included as part of the implicit operator, the solution of a block pentadiagonal matrix equation is required, an even more expensive process. However, it is very desirable to incorporate the fourth-order artificial dissipation, as it has proven to aid in shock capturing and in rapid convergence to a steady-state solution.

2.3.1 Diagonalized Algorithm

One way to avoid the expense of solving a block pentadiagonal matrix equation is to uncouple (diagonalize) the equations. This can be done by noting that the flux Jacobian, A_j, has a complete set of eigenvectors and real eigenvalues so that if A_j is decomposed,

$$A_j = T_j \Lambda_j T_j^{-1} \text{ (no summation here or in what follows),}$$

where Λ_j is the diagonal matrix of eigenvalues of A_j, and T_j is the matrix of right eigenvectors with T_j^{-1} its inverse, then

$$\left(I + \Delta t \frac{\partial A_j}{\partial \xi_j}\right) = \left(T_j T_j^{-1} + \Delta t \frac{\partial}{\partial \xi_j} T_j \Lambda_j T_j^{-1}\right) \approx T_j \left(I + \Delta t \frac{\partial}{\partial \xi_j} \Lambda_j\right) T_j^{-1}$$

Thus the diagonalized form of the factored algorithm is

$$T_1 \left(I + \Delta t \frac{\partial}{\partial \xi} \Lambda_1\right) N_{12} \left(I + \Delta t \frac{\partial}{\partial \eta} \Lambda_2\right) N_{23} \left(I + \Delta t \frac{\partial}{\partial \zeta} \Lambda_3\right) T_3^{-1} \Delta \hat{Q} = RHS$$

where

$$N_{12} = T_1^{-1} T_2$$

$$N_{23} = T_2^{-1} T_3$$

Following Pulliam (Ref. 3), the explicit form of the eigenvalue matrices is

$$\Lambda_j = \text{Diag}\left[U_j, U_j, U_j + a\left|K_i^j\right|, U_j - a\left|K_i^j\right|\right] \quad \text{(2-D)}$$

$$\Lambda_j = \text{Diag}\left[U_j, U_j, U_j, U_j + a\left|K_i^j\right|, U_j - a\left|K_i^j\right|\right] \quad \text{(3-D)}$$

where

$$K_i^j = \frac{\partial \xi_j}{\partial X_i}$$

$$\left|K_i^j\right| = \sqrt{\sum_i K_i^j K_i^j} \text{ (No sum over j.)}$$

The eigenvectors for 2-D are

$$T_j = \begin{bmatrix} 1 & 0 & \alpha & \alpha \\ u & \varrho \bar{K}_2^j & \alpha\left(u + \bar{K}_1^j a\right) & \alpha\left(u - \bar{K}_1^j a\right) \\ v & -\varrho \bar{K}_1^j & \alpha\left(v + \bar{K}_2^j a\right) & \alpha\left(v - \bar{K}_2^j a\right) \\ \frac{\phi^2}{\gamma - 1} & \varrho\left(\bar{K}_2^j u - \bar{K}_1^j v\right) & \alpha\left[\frac{\phi^2 + a^2}{\gamma - 1} + a\bar{U}_j\right] & \alpha\left[\frac{\phi^2 + a^2}{\gamma - 1} - a\bar{U}_j\right] \end{bmatrix}$$

$$T_j^{-1} = \begin{bmatrix} (1 - \phi^2/a^2) & (\gamma - 1)u/a^2 & (\gamma - 1)v/a^2 & -(\gamma - 1)/a^2 \\ -(\bar{K}_2^j u - \bar{K}_1^j v)/\varrho & \bar{K}_2^j/\varrho & -\bar{K}_1^j/\varrho & 0 \\ \beta\left(\phi^2 - a\bar{U}_j\right) & \beta\left[\bar{K}_1^j a - (\gamma - 1)u\right] & \beta\left[\bar{K}_2^j a - (\gamma - 1)v\right] & \beta(\gamma - 1) \\ \beta\left(\phi^2 + a\bar{U}_j\right) & -\beta\left[\bar{K}_1^j a + (\gamma - 1)u\right] & -\beta\left[\bar{K}_2^j a + (\gamma - 1)v\right] & \beta(\gamma - 1) \end{bmatrix}$$

where

$$\alpha = \varrho/\sqrt{2}\, a$$

$$\beta = 1/\sqrt{2}\, \varrho a$$

$$\bar{U}_j = U_j/|K_i^j|$$

$$\bar{K}_i^j = K_i^j/|K_i^j|$$

In 3-D the eigenvectors are

$$T_j = \begin{bmatrix} \bar{K}_1^j & \bar{K}_2^j \\ \bar{K}_1^j u & \bar{K}_2^j u - \bar{K}_3^j \varrho \\ \bar{K}_1^j v + \bar{K}_3^j \varrho & \bar{K}_2^j v \\ \bar{K}_1^j w - \bar{K}_2^j \varrho & \bar{K}_2^j w + \bar{K}_1^j \varrho \\ \left[\bar{K}_1^j \phi^2/(\gamma-1) + \varrho(\bar{K}_3^j v - \bar{K}_2^j w)\right] & \left[\bar{K}_2^j \phi^2/(\gamma-1) + \varrho(\bar{K}_1^j w - \bar{K}_3^j u)\right] \end{bmatrix}$$

$$\begin{bmatrix} \bar{K}_3^j & \alpha & \alpha \\ \bar{K}_3^j u + \bar{K}_2^j \varrho & \alpha(u+\bar{K}_1^j a) & \alpha(u-\bar{K}_1^j a) \\ \bar{K}_3^j v - \bar{K}_1^j \varrho & \alpha(v+\bar{K}_2^j a) & \alpha(v-\bar{K}_2^j a) \\ \bar{K}_3^j w & \alpha(w+\bar{K}_3^j a) & \alpha(w-\bar{K}_3^j a) \\ \left[\bar{K}_3^j \phi^2/(\gamma-1) + \varrho(\bar{K}_2^j u - \bar{K}_1^j v)\right] & \alpha\left[\dfrac{\phi^2+a^2}{\gamma-1} + a\bar{U}_j\right] & \alpha\left[\dfrac{\phi^2+a^2}{\gamma-1} - a\bar{U}_j\right] \end{bmatrix}$$

$$T_j^{-1} = \begin{bmatrix} \bar{K}_1^j(1 - \phi^2/a^2) - (\bar{K}_3^j v - \bar{K}_2^j w)/\varrho & \bar{K}_1^j(\gamma - 1)u/a^2 \\ \bar{K}_2^j(1 - \phi^2/a^2) - (\bar{K}_1^j w - \bar{K}_3^j u)/\varrho & \bar{K}_2^j(\gamma - 1)u/a^2 - \bar{K}_3^j/\varrho \\ \bar{K}_3^j(1 - \phi^2/a^2) - (\bar{K}_2^j u - (\bar{K}_1^j v)/\varrho & \bar{K}_3^j(\gamma - 1)u/a^2 - \bar{K}_2^j/\varrho \\ \beta(\phi^2 - a\bar{U}_j) & -\beta[(\gamma - 1)u - \bar{K}_1^j a] \\ \beta(\phi^2 + a\bar{U}_j) & -\beta[(\gamma - 1)u + \bar{K}_1^j a] \end{bmatrix}$$

$$
\left.\begin{array}{ccc}
\bar{K}_1^j(\gamma - 1)v/a^2 + \bar{K}_3^j/\varrho & \bar{K}_1^j(\gamma - 1)w/a^2 - \bar{K}_2^j/\varrho & -\bar{K}_1^j(\gamma - 1)/a^2 \\
\bar{K}_2^j(\gamma - 1)v/a^2 & \bar{K}_2^j(\gamma - 1)w/a^2 - \bar{K}_1^j/\varrho & -\bar{K}_2^j(\gamma - 1)/a^2 \\
\bar{K}_3^j(\gamma - 1)v/a^2 - \bar{K}_1^j/\varrho & \bar{K}_3^j(\gamma - 1)w/a^2 & -\bar{K}_3^j(\gamma - 1)/a^2 \\
-\beta[(\gamma - 1)v - \bar{K}_2^j a] & -\beta[(\gamma - 1)w - \bar{K}_3^j a] & \beta(\gamma - 1) \\
-\beta[(\gamma - 1)v + \bar{K}_2^j a] & -\beta[(\gamma - 1)w + \bar{K}_3^j a] & \beta(\gamma - 1)
\end{array}\right]
$$

Also the mixed matrices, N, are

$$
N_{ij}^{-1} = \begin{bmatrix}
M_1 & M_2 & -M_3 & bM_4 & -bM_4 \\
M_2 & M_1 & -M_4 & -bM_3 & bM_3 \\
M_3 & M_4 & M_1 & bM_2 & -bM_2 \\
-bM_4 & bM_3 & -bM_2 & b^2(1 + M_1) & b^2(1 - M_1) \\
bM_4 & -bM_3 & bM_2 & b^2(1 - M_1) & b^2(1 + M_1)
\end{bmatrix} \quad \text{(3-D)}
$$

$$
N_{ij}^{-1} = \begin{bmatrix}
1 & 0 & 0 & 0 \\
0 & M_1 & bM_2 & -bM_2 \\
0 & -bM_2 & b^2(1 + M_1) & b^2(1 - M_1) \\
0 & bM_2 & b^2(1 - M_1) & b^2(1 + M_1)
\end{bmatrix} \quad \text{(2-D)}
$$

where

$$
\begin{aligned}
b &= 1/\sqrt{2} \\
M_1 &= \sum_{\ell} \bar{K}_\ell^i \bar{K}_\ell^j \\
M_2 &= \bar{K}_1^i \bar{K}_2^j - \bar{K}_2^i \bar{K}_1^j \\
M_3 &= \bar{K}_1^i \bar{K}_3^j - \bar{K}_3^i \bar{K}_1^j \\
M_4 &= \bar{K}_2^i \bar{K}_3^j - \bar{K}_3^i \bar{K}_2^j
\end{aligned}
$$

Note that the N matrices are strictly functions of the metrics. The steps involved in advancing one time-step then are

$$T_1 \Delta\hat{Q}^{(6)} = RHS$$

$$[I(1 + IV_1) + \Delta t \delta_\xi \Lambda_1]\Delta\hat{Q}^{(5)} = \Delta\hat{Q}^{(6)}$$

$$N_{12}\Delta\hat{Q}^{(4)} = \Delta\hat{Q}^{(5)}$$

$$[I(1 + IV_2) + \Delta t \delta_\eta \Lambda_2]\Delta\hat{Q}^{(3)} = \Delta\hat{Q}^{(4)}$$

$$N_{23}\Delta\hat{Q}^{(2)} = \Delta\hat{Q}^{(3)}$$

$$[I(1 + IV_3) + \Delta t \delta_\zeta \Lambda_3]\Delta\hat{Q}^{(1)} = \Delta\hat{Q}^{(2)}$$

$$T_3^{-1}\,\Delta\hat{Q} = \Delta\hat{Q}^{(1)}$$

where IV_i is the implicit artificial viscosity operator, for example,

$$IV_1 = \nabla_\xi\,[C_\xi(\epsilon^{(2)}\Delta_\xi - \epsilon^{(4)}\Delta_\xi\nabla_\xi\Delta_\xi)]\,J$$

The difference equations form a set of scalar pentadiagonal equations; whereas the eigenvector operators form a block diagonal vector equation, both of which are straightforward to solve. The pentadiagonal matrix that would be formed from the first difference equation, for instance, has the form

$$\begin{bmatrix}
br_{ja} & cr_{ja} & dr_{ja} & er_{ja} & 0 & 0 & & & \bigcirc \\
ar_{ja+1} & br_{ja+1} & cr_{ja+1} & dr_{ja+1} & er_{ja+1} & 0 & & & \\
0 & ar_{ja+2} & br_{ja+2} & cr_{ja+2} & dr_{ja+2} & er_{ja+2} & & & \\
 & \cdot & & & & \cdot & & & \\
 & & \cdot & & & & \cdot & & \\
 & & & \cdot & & & & \cdot & \\
 & & ar_j & br_j & cr_j & dr_j & er_j & & \\
 & & & \cdot & & & & \cdot & \\
 & & & & \cdot & & & & \cdot \\
 & & & & & \cdot & & & \cdot \\
\bigcirc & & & ar_{jb-1} & br_{jb-1} & cr_{jb-1} & dr_{jb-1} & er_{jb-1} & \\
 & & & 0 & ar_{jb} & br_{jb} & cr_{jb} & dr_{jb} &
\end{bmatrix}.$$

where here the subscript notation means, for example,

$$ar_{ja} = ar(\xi_{ja},\eta,\zeta)$$

for a coordinate line of constant η,ζ. The first flow-field grid point on this line is (ξ_{ja},η,ζ) and the last is (ξ_{jb},η,ζ) where (ξ_{ja-1},η,ζ) and (ξ_{jb+1},η,ζ) are boundary points. The non-zero elements of this matrix are

$$ar_j = \bar{\epsilon}^{(4)}_{j-1} J_{j-2}$$

$$br_j = -(\bar{\epsilon}^{(2)}_{j-1} + 3\bar{\epsilon}^{(4)}_{j-1} + \bar{\epsilon}^{(4)}_{j}) J_{j-1} - \frac{1}{2}\Delta t\lambda_{j-1}$$

$$cr_j = (\bar{\epsilon}^{(2)}_{j-1} + 3\bar{\epsilon}^{(4)}_{j-1} + \bar{\epsilon}^{(2)}_{j} + 3\bar{\epsilon}^{(4)}_{j}) J_j + 1$$

$$dr_j = -(\bar{\epsilon}^{(2)}_{j} + 3\bar{\epsilon}^{(4)}_{j} + \bar{\epsilon}^{(4)}_{j-1}) J_{j+1} + \frac{1}{2}\Delta t\lambda_{j+1}$$

$$er_j = \bar{\epsilon}^{(4)}_{j} J_{j+2}$$

where

$$\bar{\epsilon}_j = \epsilon_j (C_j + C_{j+1})$$

and λ_j is the appropriate eigenvalue at (ξ_j,η,ζ). Note that if the boundary points are to be treated implicitly, then the above matrix must have two rows added to it. If they are to be treated explicitly, as in the PARC code, then the first and last columns need to be deleted.

2.3.2 Pentadiagonal Matrix Solver

The pentadiagonal matrix problem posed by the difference operators is solved by a variant of Gaussian elimination (an extended Thomas algorithm). In matrix form the problem is

$$Aq = f$$

where A is a pentadiagonal matrix, q is the vector of unknowns, and f is a vector of known values. The algorithm is easiest to follow if the matrix A is considered to be decomposed into a product of lower and upper triangular matrices (L and U, respectively):

$$A = LU$$

where

$$
A = \begin{bmatrix}
c_1 & d_1 & e_1 & 0 & 0 & & & & \\
b_2 & c_2 & d_2 & e_2 & 0 & & & \bigcirc & \\
a_3 & b_3 & c_3 & d_3 & e_3 & & & & \\
\ddots & & & & & \ddots & & & \\
& a_j & b_j & c_j & d_j & e_j & & & \\
& & \ddots & & & & \ddots & & \\
& & & a_{J-2} & b_{J-2} & c_{J-2} & d_{J-2} & e_{J-2} & \\
& \bigcirc & & 0 & a_{J-1} & b_{J-1} & c_{J-1} & d_{J-1} & \\
& & & 0 & 0 & a_J & b_J & c_J &
\end{bmatrix}
$$

$$
L = \begin{bmatrix}
n_1 & 0 & 0 & & \\
m_2 & n_2 & 0 & & \bigcirc \\
\ell_3 & m_3 & n_3 & & \\
\ddots & & \ddots & & \\
& \ell_j & m_j & n_j & \\
& & \ddots & & \ddots \\
\bigcirc & & \ell_J & m_J & n_J
\end{bmatrix}
$$

$$
U = \begin{bmatrix}
1 & X_1 & Y_1 & 0 & & \\
0 & 1 & X_2 & Y_2 & & \bigcirc \\
& \ddots & & \ddots & & \\
& & 1 & X_j & Y_j & \\
& & & \ddots & & \ddots \\
& & & 1 & X_{J-2} & Y_{J-2} \\
\bigcirc & & & 0 & 1 & X_{J-1} \\
& & & 0 & 0 & 1
\end{bmatrix}
$$

Then the elements of these matrices, and in the process the unknown vector q, are found by the following recursive algorithm:

1)
$$n_1 = c_1$$
$$X_1 = d_1/n_1$$
$$Y_1 = e_1/n_1$$
$$g_1 = f_1/n_1$$

2)
$$m_2 = b_2$$
$$n_2 = c_2 - m_2X_1$$
$$X_2 = (d_2 - m_2Y_1)/n_2$$
$$Y_2 = e_2/n_2$$
$$g_2 = (f_2 - m_2g_1)/n_2$$

3) For $j = 3$ to $J-2$:
$$\ell_j = a_j$$
$$m_j = b_j - \ell_jX_{j-2}$$
$$n_j = c_j - m_jX_{j-1} - \ell_jY_{j-2}$$
$$X_j = (d_j - m_jY_{j-1})/n_j$$
$$Y_j = e_j/n_j$$
$$g_j = (f_j - m_jg_{j-1} - \ell_jg_{j-2})/n_j$$

4)
$$\ell_{J-1} = a_{J-1}$$
$$m_{J-1} = b_{J-1} - \ell_{J-1}X_{J-3}$$
$$n_{J-1} = c_{J-1} - m_{J-1}X_{J-2} - \ell_{J-1}Y_{J-3}$$
$$X_{J-1} = (d_{J-1} - m_{J-1}Y_{J-2})/n_{J-1}$$
$$g_{J-1} = (f_{J-1} - m_{J-1}g_{J-2} - \ell_{J-1}g_{J-3})/n_{J-1}$$

5)
$$\ell_J = a_J$$
$$m_J = b_J - \ell_JX_{J-2}$$
$$n_J = c_J - m_JX_{J-1} - \ell_JY_{J-2}$$
$$g_J = (f_J - m_Jg_{J-1} - \ell_Jg_{J-2})/n_J$$

6)
$$q_J = g_J$$
$$q_{J-1} = g_{J-1} - X_{J-1}q_J$$

7) For $j = J-2$ to 1:
$$q_j = g_j - X_jq_{j+1} - Y_jq_{j+2}$$

The vector g is the unknown vector in the matrix sub-problem, $Lg = f$.

Note that if $J = 4$, then step 3 is skipped; if $J = 3$, then steps 3 and 4 are skipped; (an unrequired Y_2 will be calculated from a nonexistant e_2 in this case).

This algorithm is highly recursive, which makes its efficient calculation through vectorization on current super computers impractical. However, by solving many of these matrix equations simultaneously, a high degree of vectorization can be obtained.

2.4 METRICS

The term "metrics" is used to refer to the set of all first partial derivatives of the curvilinear coordinates with respect to the Cartesian coordinates. Although they have a precise mathematical definition, their actual evaluation must take into account the numerical scheme in which they are to be used.

2.4.1 Analytical Formulas

It is much more convenient to evaluate the partial derivatives of the Cartesian coordinates with respect to the curvilinear coordinates. The following analytical relations provide the means for deriving the metrics from these derivatives:

3-D

$$J^{-1} = X_\xi(Y_\eta Z_\zeta - Y_\zeta Z_\eta) + X_\eta (Y_\zeta Z_\xi - Y_\xi Z_\zeta) + X_\zeta (Y_\xi Z_\eta - Y_\eta Z_\xi)$$

$$\xi_x = (Y_\eta Z_\zeta - Y_\zeta Z_\eta)J$$
$$\xi_y = (Z_\eta X_\zeta - Z_\zeta X_\eta)J$$
$$\xi_z = (X_\eta Y_\zeta - X_\zeta Y_\eta)J$$

$$\eta_x = (Y_\zeta Z_\xi - Y_\xi Z_\zeta)J$$
$$\eta_y = (Z_\zeta X_\xi - Z_\xi X_\zeta)J$$
$$\eta_z = (X_\zeta Y_\xi - X_\xi Y_\zeta)J$$

$$\zeta_x = (Y_\xi Z_\eta - Y_\eta Z_\xi)J$$
$$\zeta_y = (Z_\xi X_\eta - Z_\eta X_\xi)J$$
$$\zeta_x = (X_\xi Y_\eta - X_\eta Y_\xi)J$$

2-D

$$J^{-1} = X_\xi Y_\eta - X_\eta Y_\xi$$
$$\xi_x = Y_\eta J$$
$$\xi_y = -X_\eta J$$

$$\eta_x = -Y_\xi J$$
$$\eta_y = X_\xi J$$

Axisymmetric (X-axis on symmetry axis)

$$J^{-1} = (X_\xi Y_\eta - X_\eta Y_\xi)Y$$

$$\xi_x = YY_\eta J$$
$$\xi_y = -YX_\eta J$$

$$\eta_x = -YY_\xi J$$
$$\eta_y = YX_\xi J$$

2.4.2 Numerical Formulation

Because it is very desirable to "maintain free stream" (that is, to have the difference analog of the inviscid flux divergence for a constant property flow to be zero), it is not desirable to evaluate the metrics from simple difference analogs to the above formula. Instead, if the analogy between the differenced form of the strong conservation law equations and the finite volume form of these equations is exploited, proper behavior of the metric differences can be obtained. For example, the metric term ξ_x/J plays the same role in the difference equations as the area of the ξ-constant surface projected onto the Y-Z plane. This projected area is just the X-component of one-half the cross product of the distance vectors between the diagonals of the cell surface.

3-D

$$\xi_x = \frac{1}{2}\,[D(0,1,1,Y)D(0,-1,1,Z) - D(0,-1,1,Y)D(0,1,1,Z)]J$$

$$\xi_y = \frac{1}{2}\,[D(0,1,1,Z)D(0,-1,1,X) - D(0,-1,1,Z)D(0,1,1,X)]J$$

$$\xi_z = \frac{1}{2}\,[D(0,1,1,X)D(0,-1,1,Y) - D(0,-1,1,X)D(0,1,1,Y)]J$$

$$\eta_x = \frac{1}{2}\,[D(1,0,1,Y)D(1,0,-1,Z) - D(1,0,-1,Y)D(1,0,1,Z)]J$$

$$\eta_y = \frac{1}{2}\,[D(1,0,1,Z)D(1,0,-1,X) - D(1,0,-1,Z)D(1,0,1,X)]J$$

$$\eta_z = \frac{1}{2}\,[D(1,0,1,X)D(1,0,-1,Y) - D(1,0,-1,X)D(1,0,1,Y)]J$$

$$\zeta_x = \frac{1}{2}\,[D(1,1,0,Y)D(-1,1,0,Z) - D(-1,1,0,Y)D(1,1,0,Z)]J$$

$$\zeta_y = \frac{1}{2}\,[D(1,1,0,Z)D(-1,1,0,X) - D(-1,1,0,Z)D(1,1,0,X)]J$$

$$\zeta_z = \frac{1}{2}\,[D(1,1,0,X)D(-1,1,0,Y) - D(-1,1,0,X)D(1,1,0,Y)]J$$

where the difference operator is defined as

$$D(j,k,\ell,X) = \frac{1}{2}\,[X(\xi+j,\ \eta+k,\ \zeta+\ell) - X(\xi-j,\ \eta-k,\ \zeta-\ell)]$$

For example, the η_y metric has the formulation

$$\eta_y = \frac{J}{8}\,\{[Z(\xi+1,\eta,\zeta+1) - Z(\xi-1,\eta,\zeta-1)]\,[X(\xi+1,\eta,\zeta-1) - X(\xi-1,\eta,\zeta+1)]$$
$$-[Z(\xi+1,\eta,\zeta-1) - Z(\xi-1,\eta,\zeta+1)]\,[X(\xi+1,\eta,\zeta+1) - X(\xi-1),\eta,\zeta-1)]\}$$

2-D

$$\xi_x = \frac{1}{2}\,[Y(\xi,\eta+1) - Y(\xi,\eta-1)]J$$

$$\xi_y = -\frac{1}{2}\,[X(\xi,\eta+1) - X(\xi,\eta-1)]J$$

$$\eta_x = -\frac{1}{2}\,[Y(\xi+1,\eta) - Y(\xi-1,\ \eta)]J$$

$$\eta_y = \frac{1}{2}\,[X(\xi+1,\eta) - X(\xi-1,\eta)]J$$

Axisymmetric

$$\xi_x = \frac{1}{4}\,[Y(\xi,\eta+1) + Y(\xi,\eta-1)]\,[Y(\xi,\eta+1) - Y(\xi,\eta-1)]J$$

$$\xi_y = -\frac{1}{4}\,[Y(\xi,\eta+1) + Y(\xi,\eta-1)]\,[X(\xi,\eta+1) - X(\xi,\eta-1)]J$$

$$\eta_x = -\frac{1}{4}\,[Y(\xi+1,\eta) + Y(\xi-1,\eta)]\,[Y(\xi+1,\eta) - Y(\xi-1,\eta)]J$$

$$\eta_y = \frac{1}{4}\,[Y(\xi+1,\eta) + Y(\xi-1,\eta)]\,[X(\xi+1,\eta) - X(\xi-1,\eta)]J$$

Expressions for the Jacobians have not been given since their exact value is not important for steady-state flow calculations and since their current form is very complicated. Continuing the finite volume analog, the inverse of the Jacobian represents the volume of a computational cell; this approach has been taken in evaluating the Jacobians in the PARC code.

2.5 VARIABLE TIME-STEPS

Since the PARC code is set up to solve steady-state problems, using only the unsteady formulation of the Navier-Stokes equations as a means to construct an iterative solution algorithm, a couple of different time-step variation schemes are employed.

2.5.1 Spatial Varying Time-steps

In steady-state calculations using a constant time-step, the time-step size is determined by stability considerations. For many problems this step size is set by stability problems in a relatively small part of the flow field (e.g., dense grid regions near a body); the step size could be much larger if this region were excluded. Thus, allowing each point to possess its own optimal time-step size should reduce the total number of iterations to reach steady state.

2.5.1.1 Courant Number Formulation

This approach to selecting variable time-step sizes is based on the idea of using a constant Courant number everywhere. Thus at each grid point (ξ,η,ζ),

$$\Delta t = \mathrm{CFL}/\mathop{\mathrm{Max}}_{j} \left(|U_j| + a|K_i^j|\right)$$

where CFL is the Courant number. For viscous flows it has been necessary to add a viscous correction:

$$\Delta t = \mathrm{CFL}/\mathop{\mathrm{Max}}_{j} \left[\left(|U_j| + a|K_i^j|\right) + \frac{2}{Re}\frac{\mu}{\varrho}|K_i^j|^2\right]$$

2.5.1.2 Jacobian Formulation

An alternate, simpler formulation is also used that is based on the idea that in the vast majority of flows, the flow properties vary over less than an order of magnitude (often only by a small factor), whereas the metrics vary over many orders of magnitude. Thus the following approximation to the Courant number formula:

$$\Delta t = \Delta t_0 \,/\, \sqrt{1 + J}$$

2.5.2 Temporal Varying Time-steps

Often a time-step, or Courant number, that gives optimal convergence rates over most iterations causes stability problems over a few iterations; thus a means for automatic temporal adjustment of the time-step size is desirable. This can be done by observing that implicit methods get into unrecoverable stability trouble when one of the conservation variables jumps to a much too high or too low value over one iteration. By limiting the maximum relative change in these variables, stability can be maintained. The following is used in the PARC code:

$$\Delta t = \mathrm{Min}\left[\Delta t_{max},\ \mathrm{MPC} \Big/ \underset{\xi,\eta,\zeta}{\mathrm{Max}} \left(\left| \frac{\Delta\varrho_e}{\varrho} \right| \right) \right]$$

where $\Delta\varrho_e$ is the component of RHS corresponding to the continuity equation using unit time-step (or Courant number); MPC is a specified maximum relative change allowed (~ 0.1); Δt_{max} is the maximum Δt (or CFL) to be used in any case; and Δt should be interpreted as CFL if spatial time-step variation is also used. In addition, a similar formulation involving pressure is used so that the time-step size is limited by either a maximum estimated density or pressure change.

2.6 BOUNDARY CONDITIONS

There are a variety of boundary conditions available for use in the PARC code that are selectable through user inputs.

2.6.1 Fixed

This boundary condition maintains the initial values on this boundary throughout the computation.

2.6.2 Free-Flow Boundary

One of the following boundary conditions is selected depending on whether the component of velocity normal to the boundary surface passes into or out of the flow and on whether the corresponding Mach number is supersonic or subsonic.

2.6.2.1 Subsonic Inflow

The flow is assumed to be normal to this boundary, and the total temperature and total pressure (T_o and P_o) are prescribed. The following equations are solved:

$$T_o = T + \frac{\gamma-1}{2} u_N^2$$

$$P = P_o(T/T_o)^{\gamma/\gamma-1}$$

$$C = u_N - P/\varrho a$$

where if, for example, the boundary is a surface of constant ξ_i, then

$$u_N = u_j \bar{K}^j_i$$

and c is a characteristic-like variable calculated from the flow-field point just off the boundary. This set of equations is solved for T, P, and u_N (ϱa is held constant) by Newton iteration on the equation:

$$\left(\frac{2}{\gamma-1}T_o\right)\left(\frac{P}{P_o}\right)^{\frac{\gamma-1}{\gamma}} + \left(\frac{P_o}{\varrho a}\right)^2\left(\frac{P}{P_o}\right)^2 + \left(\frac{2cP_o}{\varrho a}\right)\left(\frac{P}{P_o}\right) + \left(c^2 - \frac{2}{\gamma-1}T_o\right) = 0$$

Then, having P, the remaining variables, T and u_N, are found by back substitution into the first set of equations. The velocity components are found from

$$u_j = u_N \bar{K}^j_i$$

2.6.2.2 Subsonic Outflow

The static pressure is prescribed, and the density and velocity are extrapolated from upstream. The conservation variables are then updated using these values.

2.6.2.3 Supersonic Outflow

The same approach is used as for subsonic outflow except the static pressure is also extrapolated.

2.6.3 Symmetry or Slip Wall

This boundary condition is determined by extrapolation of density, pressure, and tangent velocity from points adjacent to the boundary. Velocity components are obtained from

$$u_j = (u_j^+ - u_\ell^+ \bar{K}^i_\ell)\bar{K}^i_j \quad \text{(No sum over i.)}$$

where the "+" superscript indicates evaluation at the point just off of the boundary surface.

2.6.4 Axis of Symmetry (Axisymmetric Only)

Evaluation is the same as for the symmetry boundary condition except that since the tangential direction is known (positive X-direction), the velocity components are

$$u = u^+$$

$$v = 0$$

2.6.5 No-slip Wall

All velocity components are zero in this case, and the pressure is always taken to be that at the first point off of the boundary (first-order representation of zero normal gradient of pressure). There are two subcases.

2.6.5.1 Adiabatic Wall

The temperature is obtained in the same way as for pressure.

2.6.5.2 Isothermal Wall

For this case, the temperature is prescribed.

2.6.6 Mass Flux

This boundry condition attempts to achieve a specified mass flux through a surface at steady state by adjusting the pressure according to

$$P^{n+1} = [1 + \alpha (\dot{M}_r - \dot{M}^n) / |\dot{M}_r|]P^n$$

where P represents the static pressure for outflow and the total pressure for inflow. The specified mass flux is given by $\dot{M}_r$, which is positive for inflow and negative for outflow; $\dot{M}^n$ is the current mass flux through the surface, and α is a relaxation parameter. Once this pressure is adjusted, the appropriate inflow or outflow condition is applied.

2.7 TURBULENCE MODEL

The algebraic turbulence model used in the PARC code is loosely based on the Thomas formulation (Ref. 5) of the Baldwin and Lomax model (Ref. 6). When turbulence is required, the viscous coefficients are modified as follows:

$$\mu_{total} = \mu + \mu_T$$

$$\frac{K_{total}}{Pr} = \frac{K}{Pr} + \frac{\mu_T}{Pr_T}$$

where μ_T is the turbulent viscosity, and Pr_T is the turbulent Prandtl number (~ 0.9).

The model is made up of two major parts: an unbounded flow model and a bounded flow model, as follows.

2.7.1 Unbounded Flow

Each coordinate line for each coordinate direction is divided into sections determined by the location of boundaries and vorticity zeros. Within each section the turbulent viscosity is calculated as

$$\mu_T = \mathrm{Re}\,\varrho\,\ell\,V$$

$$V = \ell\omega$$

$$\ell = \ell_0\,[\mathrm{Max}\,(|u_j|) - \mathrm{Min}\,(|u_j|)]/\omega_c$$

$$|u_j| = \sqrt{u_k u_k}$$

where ω_c is the value of the vorticity at the point where $|u_j|\omega$ is a maximum, and ℓ_0 is an adjustable constant (≈ 0.1). The vorticity is defined as usual

$$\omega = \begin{cases} \sqrt{(w_y - v_z)^2 + (u_z - w_x)^2 + (v_x - u_y)^2} & \text{(3-D)} \\ |v_x - u_y| & \text{(2-D)} \end{cases}$$

These turbulent viscosity values are smoothed to alleviate sudden changes in viscosity levels.

2.7.2 Bounded Flow

The bounded part of the algorithm is applied near no-slip boundary surfaces and replaces the unbounded flow values with bounded flow values of the turbulent viscosity between the boundary and the point where they match.

$$\mu_T = \mathrm{Re}\,\varrho\,\ell\,V$$

$$\ell = \ell_0 d\,(1 - e^{-d^+/A^+})$$

$$d = \sqrt{(x - x_w)^2 + (y - y_w)^2 + (z - z_\omega)^2}$$

$$d^+ = \sqrt{\mathrm{Re}\,\varrho_2\,\omega\,d^2/\mu_w}$$

$$V = \ell\omega$$

where ℓ_0 is the Von Karman constant (~ 0.4) and A^+ is the Van Driest constant (~ 26); variables subscripted by "W" are evaluated at the boundary.

2.8 AXISYMMETRIC FORMULATION

In addition to the special form of the metrics and the axis of symmetry boundary condition, implementation of an axisymmetric version requires the following changes to the 2-D algorithm. A source term must be included in the Y-momentum equation RHS vector:

$$RHS_{axi} = RHS_{2\text{-}d} + \frac{1}{J_a}\left[P - \frac{1}{Re}\left(2\,\mu\,\frac{J}{J_a}\,v + \lambda\,\nabla_a \bullet u\right)\right]$$

where

$$J_a = \xi_x \eta_y - \xi_y \eta_x$$

$$\nabla_a \bullet u = \frac{J}{J_a}\,v + u_x + v_y$$

Lastly everywhere the 2-D divergence ($u_x + v_y$) appears in the viscous terms, they are replaced by the axisymmetric divergence ($\nabla_a \bullet u$). Note that it has not been found to be necessary to modify the implicit part of the algorithm.

3.0 USAGE

3.1 PROGRAM EXECUTION

The submit file, batch job file, or job control file (whichever is preferred) must make available (fetch) appropriate input files and compile, load, and execute the source code (PARC2D/3D) and store (dispose) the appropriate output files. This file (the submit file) is not provided as part of the code and must be created by the user. There are three mandatory input files, one of which is the source code, which must always be present at the start of the run:

1. Restart file (assumed to be assigned to unit 2), which contains the grid and current solution;

2. Parameter file (assumed to be assigned to unit 5), which contains information necessary to

   a. specify completely the problem being solved,

   b. control program execution, and

   c. select desired input and output options.

3. Source code (either PARC2D or PARC3D).

Two output files are always created and one, optional, output file can be produced if called for in the inputs. These files are:

1. New restart file (assigned to unit 4), which contains the grid and the just-calculated solution;

2. Run history file (assigned to unit 6), which contains a listing of parameter inputs, convergence information, a printed map of selected portions of the flow field, and diagnostic information;

3. Residual and/or flux file (optional) (assigned to unit 21), which contains residual/flux variables intended for plotting.

3.2 INPUT

3.2.1 Nondimensionalization

Since the PARC codes are based on a nondimensionalized set of equations, many of the inputs to and outputs from the code are also nondimensional. Although there is some flexibility in the choice of the reference parameters for nondimensionalizing the flow variables, the following system is recommended:

1. Select reference pressure, temperature, and density (P_{ref}, T_{ref}, ϱ_{ref}) such that

   a. they are consistent with the ideal gas law (necessary); and

   b. they are realized somewhere in the flow (strongly recommended - ideally they should represent the "bulk" values for the flow).

2. Select a reference length (X_{ref}) that is typical for the length dimensions of the flow field. For complex flows the simplest choice is the unit length used in the specification of the geometry (e.g., inches, feet, or meters).

3. Calculate the reference velocity (the reference speed of sound, a_{ref}) from the ideal gas relation ($a^2_{ref} = \gamma R_g T_{ref}$). Also determine the reference viscosity, ratio of specific heats, and Prandtl number (μ_{ref}, γ, Pr) based on the reference thermodynamic properties.

4. Form nondimensional input parameters and variables (the subscript "d" indicates a dimensional variable):

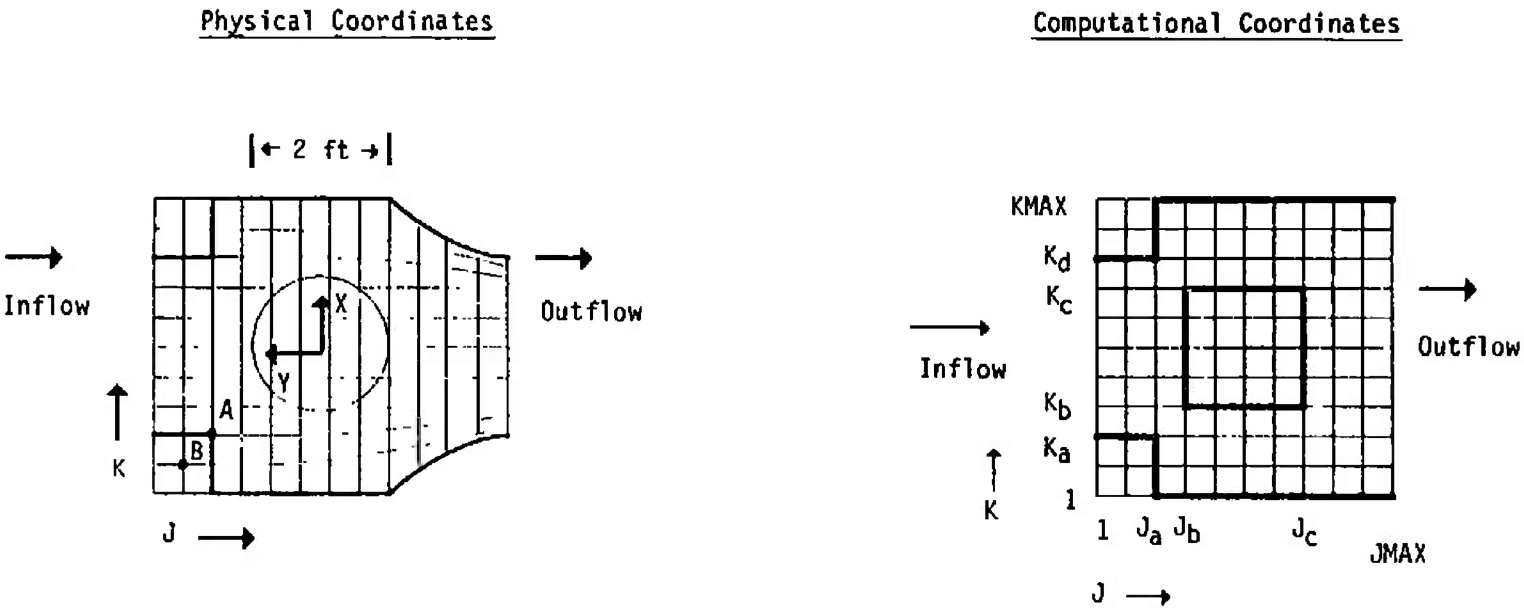
a.	Lengths:	X	=	X_d/X_{ref}
b.	Densities:	ϱ	=	ϱ_d/ϱ_{ref}
c.	Velocities:	U	=	U_d/a_{ref}
d.	Temperatures:	T	=	T_d/T_{ref}
e.	Pressures:	P	=	$P_d/\gamma P_{ref}$
f.	Total energies per unit volume:	E	=	$E_d/\gamma P_{ref}$
g.	Reynolds number:	Re	=	$\varrho_{ref}\, a_{ref}\, X_{ref}/\mu_{ref}$

3.2.2 Grid

The PARC codes require an ordered set of nodal points that represent the geometric boundaries of a flow problem, as well as an appropriate distribution of flow-field points between boundaries. As a minimum, the grid must be constructed and ordered in such a way that the indices can be formally considered as coordinates of a curvilinear coordinate system with non-vanishing Jacobian. (Currently, the Jacobian of the coordinate transformation is required to be strictly positive — thus the handedness of the physical and computational coordinate systems must be the same.) The indices of the grid are taken to be J, K, and L (just J and K in 2-D) so that the coordinates of the J, K, L grid point are [X(J, K, L), Y(J, K, L), Z(J, K, L)]. Each index is required to be able to vary over its entire range (e.g., $1 \leq J \leq JMAX$) even if some of the points so specified are not part of the flow field (see Section 3.2.12 Boundary Conditions and Section 3.2.7 Grid Dimensions). Care must be taken that the grid coordinates are properly nondimensionalized; that is, the dimensional length that corresponds to a unit length in the grid must be the same dimensional length as was used in calculating the Reynolds number (for inviscid flow this is a mute point, of course). Boundary surfaces (physical and computational) must be composed of a patch work of J-, K-, and/or L-constant surfaces with their edges composed of J-, K-, and/or L-varying lines. However, within this restriction, boundary surfaces can be of arbitrary complexity and located anywhere within the grid as long as at least three grid points separate surfaces forming a flow passage (this must always be the case, otherwise incorrect solutions will occur). Finally, best results in terms of accuracy and convergence rates will be obtained if the grid is constructed so that boundary and flow gradients are well resolved, and the grid varies smoothly with minimal skewness. Figure 1 displays these gridding concepts for a simple 2-D configuration.

3.2.3 Initial Conditions

The PARC codes are designed so that every application of the codes is treated as if a partially converged flow field were available for input; that is, execution of these codes always requires



Notes: 1. Both the X-Y and J-K coordinate systems are right-handed (hence strictly positive Jacobian).

2. The coordinates of the point A are $[X(J_a, K_a), Y(J_a, K_a)]$, for example.

3. Point B is given reasonable coordinates even though it is not a flow field or boundary point.

4. If X, Y are dimensioned in feet and are not explicitly nondimensionalized, then X_{ref} = 1 ft; if X, Y are explicitly nondimensionalized by the cylinder's diameter, then X_{ref} = 2 ft.

5. K_{b-1} and JMAX-J_c must be greater than or equal to three; for example, K_c-K_b and J_a-1 are not so restricted--these indices do not bound flow-field points.

Figure 1. Grid concepts.

a restart file. The restart file, which is described in detail in Section 3.2.4, must be supplied by the user on the initial run. This means that the user must generate his own grids and initial conditions for the flow field to be simulated. Although the PARC codes have a demonstrated capability to proceed trouble-free from quite arbitrary initial conditions, there are some useful general guidelines that can avoid certain convergence problems:

1. If the initial conditions are known to be far from the expected steady-state conditions, it helps to start with the second-order artificial viscosity coefficient (DIS2) set at its maximum value (0.25).

2. Avoid starting with very strong gradients (e.g., orders-of-magnitude differences within a few grid points) in any of the thermodynamic variables.

3. It is generally better to evacuate a region than to fill it; that is, specify pressures that are high compared to some of the boundary pressures rather than ones that are low compared to most of the boundary pressures.

4. Avoid trying to converge large regions of low Mach number flow and high Mach number flow simultaneously.

5. Attempt to generate a good estimate of the expected steady-state conditions, but do not try too hard. In general, only a factor of two improvement in the overall convergence rate is observed between poor and very good initial conditions.

3.2.4 Files

Two input data files are required to execute the PARC codes. One, which is always expected to be on logical unit number two (FT02), is the restart file. It was either created by a prior run of the PARC programs or assembled by the user's initial conditions and grid programs. It is an unformatted CRAY file read by:

```
  READ (2) NC1, GAMMA
  READ (2) (((X(J, K, L), J=1, JMAX), K=1, KMAX), L=1, LMAX),
*          (((Y(J, K, L), J=1, JMAX), K=1, KMAX), L=1, LMAX),
*          (((Z(J, K, L), J=1, JMAX), K=1, KMAX), L=1, LMAX)
  READ (2) (((R(J, K, L), J=1, JMAX), K=1, KMAX), L=1, LMAX),
*          (((RU(J, K, L), J=1, JMAX), K=1, KMAX), L=1, LMAX),
*          (((RV(J, K, L), J=1, JMAX), K=1, KMAX), L=1, LMAX),
*          (((RW(J, K, L), J=1, JMAX), K=1, KMAX), L=1, LMAX),
*          (((E(J, K, L), J=1, JMAX), K=1, KMAX), L=1, LMAX)
```

where NC1 is the iteration count when the file was created; GAMMA is the ratio of specific heats (read but not used); the X, Y, and Z arrays are the X, Y, and Z coordinates of the grid; and the R, RU, RV, RW, and E arrays are the nondimensional density, X-momentum, Y-momentum, Z-momentum, and total energy per unit volume, respectively.

The other file, which is always expected to be on logical unit number five (FT05), is the parameter file. It provides parameter input to the code consisting mainly of Namelists. They must be in the following order:

INPUTS	—must always appear
SEQDT	—only if called for (see NUMDT in NAMELIST INPUTS)
PRTSEG	—only if called for (see NPSEG in NAMELIST INPUTS)
BOUNDS	—must always appear, unless replaced by a formatted read (see NBCSEG in NAMELIST INPUTS)

If NAMELIST BOUNDS is to be replaced by a formatted read, then boundary condition data must be placed at the end of the file formatted to be read by:

```
      READ (5,101) JA, JB, KA, KB, LA, LB, TYPE, SIGN,
    *              PT, TT
101   FORMAT (8I5, 2E10.4)
```

where JA, KA, and LA are the minimum J, K, and L indices of the boundary segment and JB, KB, and LB are the maximum indices; the use and meaning of TYPE, SIGN, PT (PRESS), and TT (TEMP) are explained in Section 3.2.12 Boundary Conditions.

Complete information on the parameters contained in this file is provided in the following sections. Unless otherwise noted, parameters are assumed to belong to NAMELIST INPUTS.

3.2.5 Flow Equations

Axisymmetric, inviscid, thin-layer, fully viscous, laminar or turbulent specializations of the Navier-Stokes equations are selected by appropriate use of the following parameters:

IAXISY	—axisymmetric or 2-D form of the Navier-Stokes equations selection parameter. A value of zero for this parameter selects the 2-D form of the Navier-

Stokes equations; the axisymmetric form is selected for a value of one (the default).

INVISC —an integer vector with either two (2-D) or three (3-D) elements. Each element is paired with a grid index as follows: 1-J, 2-K, 3-L (e.g., INVISC (2) contains information relating to the K index). A value of one for an element of INVISC causes viscous flux differences to be included for that coordinate direction (e.g., INVISC (2) = 1 causes the difference of the appropriate viscous fluxes at K+1 and K−1 to be calculated at every grid point). Thus the following options:

1. Inviscid — all elements are zero.

2. Thin-layer — the element corresponding to the coordinate that varies across shear layers is set to one; any others are set to zero (e.g., in a 2-D problem for which the K-varying lines cross the shear layers, this option is selected by INVISC (1) = 0, INVISC (2) = 1).

3. Fully viscous — all elements are one (the default). For complex viscous flows the last option is always recommended.

LAMIN —an integer vector whose elements are connected with the grid indices in the same way as INVISC. A value of one for any element of LAMIN causes the flow to be treated as turbulent. Thus the following options:

1. Laminar — all elements are zero (the default).

2. Turbulent — any element equal to one. For the algebraic turbulence model to produce best results, always set the elements of LAMIN as described for the thin-layer option for INVISC.

3.2.6 Flow Properties

The simulation fluid and flow properties are set by the following parameters (note that default values are appropriate to air at standard conditions):

1. Inviscid and viscous flows:

GAMMA —The ratio of specific heats at the reference conditions. (Default value is 1.4.)

2. Viscous flows:

PR —Prandtl number at reference conditions (default 0.72).

VRAT —Ratio of the second coefficient of viscosity to the first coefficient of viscosity. (Default is −2/3, which is Stokes hypothesis.)

TSUTH —Sutherland viscosity law temperature (frequently denoted as "S") in degrees Rankine. (default 198.6).

TREFR —Reference temperature in degrees Rankine. Only use is to nondimensionalize the Sutherland temperature (TSUTH) and to dimensionalize the printed output.

RE —Reynolds number based on the reference density, speed of sound, length, and viscosity. There is no default for viscous flows, so it must be supplied.

3. Turbulent flows:

PRT —Turbulent Prandtl number (default 0.9).

3.2.7 Grid Dimensions

Effective and actual array dimensioning is controlled by the following parameters:

1. PARAMETER statements in PARC code:

NX, NY, NZ —Array sizes for the first, second, and third (J, K, and L) indices of the grid and flow-field arrays (e.g., the X-coordinate array is dimensioned as X(NX, NY, NZ)). The user can either set these to large values and accept the waste of computer memory, or set them to correspond to JMAX, KMAX, and LMAX, respectively.

NM —The largest of NX, NY, or NZ.

2. NAMELIST INPUTS parameters:

JMAX, KMAX, LMAX —Maximum indices for the first, second, and third (J, K, and L) indices of the grid and flow-field arrays. These parameters, along with the boundary condition parameters (Section 3.2.12), set the DO Loop limits in the PARC codes. Thus JMAX ≤ NX, KMAX ≤ NY, and LMAX ≤ NZ must always be true statements.

3.2.8 Artificial Viscosity

Since the PARC codes use central differencing, an appropriate level of artificial viscosity is always required. The user has control over the type and amount of artificial dissipation through the following parameters:

DIS2 —Coefficient of the second-order artificial viscosity. This type of dissipation is very diffusive in general. Its primary purpose is to enhance stability and accuracy in the vicinity of strong shocks and to improve the robustness of the PARC codes during strong transients. An automatic damping coefficient limits the effectiveness of this type of dissipation to regions of the flow that possess significant numerical pressure gradients (e.g., P(J+1, K, L)−(P(J-1, K, L) is large compared to P(J, K, L)). Thus expansions and compressions that are resolved over a small number of points can trigger an inappropriate amount of this artificial viscosity (only current remedies are to reduce the value of DIS2 and/or regrid for better resolution in these areas). In general, it is recommended that all simulations be started with DIS2 at its maximum value of 0.25 (the default), and then that the value of DIS2 be reduced as low as is consistent with stability and accuracy.

DIS4 —Coefficient of the fourth-order artificial viscosity. This type of dissipation is uniformly applied but should have no more effect on the accuracy of the solution than that produced by the inherent errors of the PARC algorithm. Although the DIS2 parameter's value can often be set to zero with minimal effect on stability, the value of DIS4 must almost always be non-zero. For many problems, variation in the value of DIS4 produces negligible differences in the flow field. Thus it is generally recommended that the value of DIS4 be kept at its maximum (0.64, the default). After the value of DIS2 has been reduced as much as possible, reduction of the value of DIS4 can be attempted to note its effect on the simulation. However, as noted above, this is rarely worthwhile.

3.2.9 Iteration Controls

A number of parameters are available to control the duration and form of the iteration process.

NMAX —Maximum number of iterations to be preformed during the current execution of the PARC program (e.g., if NMAX = 1000 were input in a simulation for which the restart file contained the solution at a total iteration count of 2000, then 1000 iterations would be performed during execution of the PARC code, and the total iteration count of the resulting restart file would be 3000). Typically the PARC codes take 2000 to 20,000 total iterations to reach an acceptable level of convergence. The value of NMAX is ignored if the parameter NUMDT is non-zero (see Section 3.2.10).

NC —Parameter that allows the initial value of the total iteration count to be changed from that on the input restart file (see Section 3.2.4 Files). If the value of NC is −1 (the default value), then the iteration count on the restart file is used; otherwise the value of NC is used (e.g., if the value of NC is 0, the value of NMAX is 1000, and if the value of the iteration count on the input restart file is 2000, then the value of the iteration count on the output restart file will be 1000).

STOPL2 — Value of the L_2 residual at which the current execution of the PARC code is to be terminated with normal printed and restart output. This option must be used with care since the L_2 residual is a relative measure of convergence and not an absolute one. Note that the value of the parameter NSPRT must be a relatively small factor of the value of NMAX for this option to be effective (see Section 3.2.11 Output Controls).

3.2.10 Time-Step Controls

Since the time-step has a direct effect on the convergence rate, quite a bit of flexibility is built into the PARC codes in terms of time-step control.

1. Temporal variation — This option, which can cause the global time-step size to vary from iteration to iteration, is useful for two purposes:

   a. Stability — This option can detect potential stability problems due to the time-step size being too large and automatically attempt to correct this condition by reducing the global time-step size.

   b. Convergence — This option can force the solution to proceed at a rate determined from the maximum relative change in density or pressure in the flow field.

The parameters controlling this option are

DTCAP - Maximum time-step size allowed during a run. This value is ignored if the value of NUMDT is non-zero.

PCQMAX - Maximum percent change in either density or pressure allowed during an iteration. Recommended range is between 1 and 25.

Best use of this option is to set their values appropriately for the degree of convergence:

Initial stage — During the first set of iterations, until the solution begins to resemble its steady-state configuration, it is best to set the value of DTCAP high (say 100.0) and let the value of PCQMAX govern the time-step size (say PCQMAX = 10.0, the default). This will usually get the simulation through the relatively nonphysical, rapidly changing part of the convergence process in the fewest number of iterations.

Asymptotic stage — From the end of the initial stage of convergence until final convergence, it is essential to set the value of DTCAP to a value somewhat lower than the largest value at which the time-step size remains constant throughout a set of iterations (see the convergence statistics section of the Output section). If this is not done, then final convergence is impossible since the solution must then always have at least one point that varies according to the value of PCQMAX.

2. Spatial variation — This option allows the global time-step to be modified on a point-by-point basis so that every point is being advanced at the largest increment allowed by local conditions.

IVARDT — Parameter whose value selects the following options:

- 0 - No local time-step modification
- 1 - Local time-step proportional to the reciprocal of one plus the square root of the Jacobian
- 2 - Local time-step proportional to the reciprocal of the maximum eigenvalue of the inviscid flux Jacobians including a viscous correction, if required. This option can be viewed as selecting a local time-step such that the local Courant numbers are roughly equal.

Option 2 has proved to be the best choice for rapid convergence rates in general. However, this option can lead to "stalled" convergence in some cases. If this should appear to occur, try one of the other options to see if this is indeed the case.

3. Time-step sequencing — This option allows the user to specify a sequence of time-steps (actually values of DTCAP) for use during an execution of the PARC code. Selection and control of this option is effected through the following parameters:

NUMDT — Time-step sequencing selection parameter. A value of zero (the default) does nothing (no time-step sequencing), whereas a positive value both selects this option and provides the number of sequencing steps. Selection of this option requires the presence of the NAMELIST SEQDT as indicated in Section 3.2.4.

DTSEQ — A real vector with twenty elements, this parameter contains the sequence of DTCAP's to be used during the run. Their usage is the same as described earlier in this section. As many elements as indicated by the value of NUMDT must be supplied for this and the following parameter vectors.

ITERDT — An integer vector with twenty elements, this parameter contains the sequence of iteration limits (similar in effect to NMAX for each time-step) to be used during the run. These are paired one-to-one with the elements of DTSEQ.

Although theory and trial calculations show that an optimal sequence of time-steps can dramatically speed-up convergence rates, there is little guidance on how to a priori determine this sequence. Nonoptimal sequences can actually worsen the convergence rate, so it is best to treat this option as experimental.

3.2.11 Output Controls

A number of options are available to control the amount and format of both printed output and output that is intended to be plotted.

1. Convergence history, printed — as spelled out in the Output section, part of the printed output includes a convergence history that gives the user information on the behavior of the simulation during the course of a run. The amount of this history is controlled by the following parameters:

   NSPRT — Frequency of convergence history print parameter. For example, if the value of NSPRT were ten (the default value), then the convergence history parameters (e.g., the L_2 residual) are calculated and printed every tenth iteration.

IFXPRT — Parameter that allows the inclusion of the flux balance histories. A value of zero (default) excludes them from the printed convergence history, and a value of one causes the flux balances to be calculated and printed.

Both of these parameters have an effect on the total amount of work required during a run, so their values must represent a compromise between the need for information on the behavior of the simulation and the need to minimize the cost of the simulation. Information on the actual printed information is contained in the Output section.

2. Convergence history, plots — An option is available whereby an output file can be filled with the convergence history data for the purpose of plots (see the Output section). The parameters that control this option are

IFXPLT — Value of this parameter determines whether flux balances are calculated and written to the plot file each iteration. A value of one activates this option, and a value of zero (default) for IFXPLT causes this option to be ignored.

L2PLOT — Value of this parameter determines whether the L_2 residual is calculated and written to the plot file each iteration. As with the IFXPLT parameter, a value of one activates this option, and a value of zero (the default) causes the option to be ignored.

3. Printed flow field — As part of the printed output, "snapshots" of selected portions of the flow field can be produced as desired by the user of the PARC code (see the Output section for details).

a. Basic parameters —

NP — Flow-field print frequency parameter. A value of zero (default) for NP suppresses flow-field print; a positive value enables flow-field printing and is used as the frequency for printing snapshots of the flow field (see NSPRT, for example).

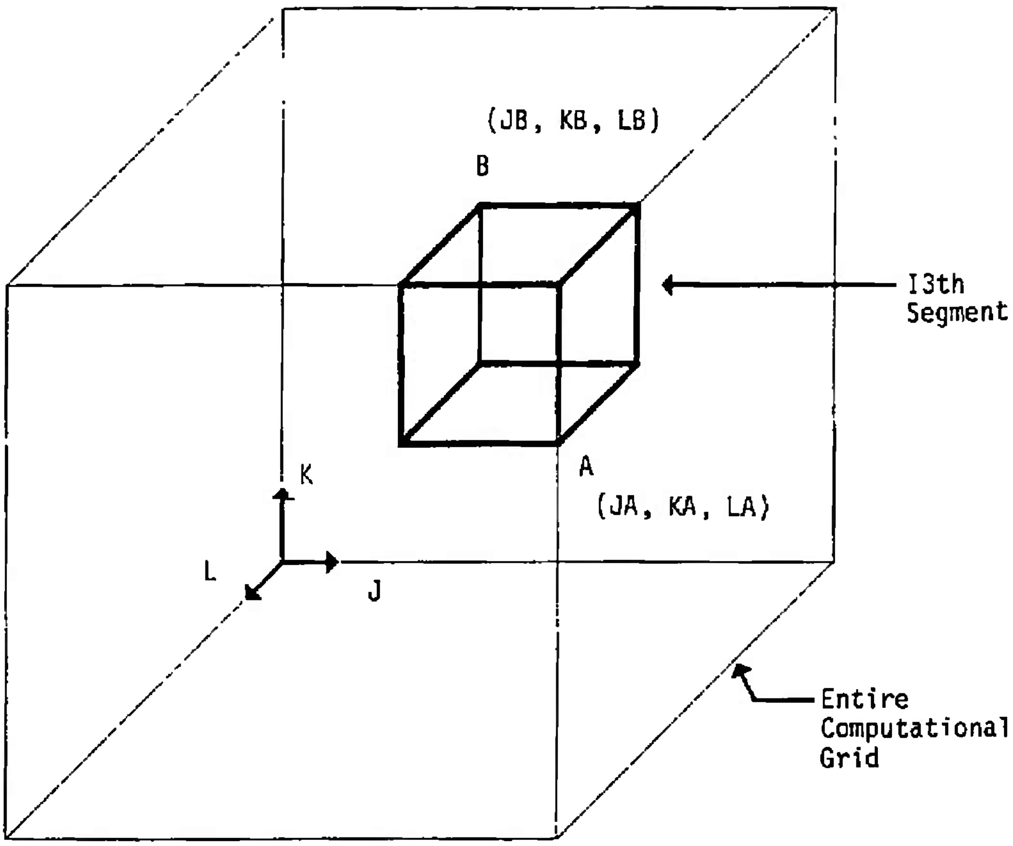
PREF — Scaling factor used to dimensionalize pressures in the printed output. Note that TREFR (Section 3.2.6) is also used to dimensionalize temperature in the printed output.

b. Segmentation parameters — To reduce the amount of printed output while providing information on regions of interest within the flow field, a set of options is available that allows control over the range, increment, and order of the printed flow-field points.

NPSEG —Flow-field print segmention parameter. A value of zero (the default) causes every flow-field point to be printed, in storage order, as called for by the value of NP. A positive value for NPSEG provides the number of flow-field segments specified in NAMELIST PRTSEG. This Namelist must appear in the input as indicated in Section 3.2.4 if NPSEG has a non-zero value.

JKLPI —An integer array dimensioned (3, 3, MPS) for PARC3D and (3, 2, MPS) for PARC2D, this parameter is contained in NAMELIST PRTSEG. The values contained in this array specify the coordinate limits and print increments for each segment called for by the value of NPSEG. Referring to Fig. 2, it can be seen that this array contains the indices of diagonally opposite corner points of the segment to be printed. It also contains the desired increments to be used in stepping the indices from the starting point (point A) to the ending point (point B). For this to produce correct results, the statement (JB-JA)/JI ≥ 1 must be true, as for the other indices.

IPORD —An integer array dimensioned (2, MPS) for PARC3D or an integer vector dimensioned (MPS) for PARC2D, this parameter is also contained in NAMELIST PRTSEG. This parameter determines the order in which the indices are used in printing each segment (the path used to get from A to B in Fig. 2). Associating 1 with J, 2 with K, and 3 with L, the value of the elements of IPORD indicates which index is to be incremented the fastest. For



I1 \ I2	1	2	3
1	JA	KA	LA
2	JB	KB	LB
3	JI	KI	LI

Values of JKLPI (I1, I2, I3)

Figure 2. Flow-field print segmentation.

example, IPORD = 3, 1 in a 3-D problem indicates that the current segment is to be printed with the L-index incrementing the fastest, the J-index the next fastest, and the K-index the slowest (by implication). See the Output section and the examples in Appendix B for more information on segmented printing.

MPS —A Parameter statement parameter in the PARC codes used to dimension the segmented print arrays.

3.2.12 Boundary Conditions

The PARC codes are designed so that specification of boundaries and boundary conditions is done entirely through inputs to the program in a very general manner. This makes the use of the codes very flexible and economical but requires that boundary specification be a large part of the inputs. As an aid in explaining the function of the boundary parameters, the simple problem laid out in Fig. 3 will be used as an example application. Refer to Appendix B for more realistic applications.

1. Basic procedure — The methodology to be used in generating the information required to specify the boundary parameters is as follows:

   a. Locate and label boundary segments — break the boundaries up into segments so that each segment is

      1) contained on a coordinate surface (a J-, K-, or L-constant surface);

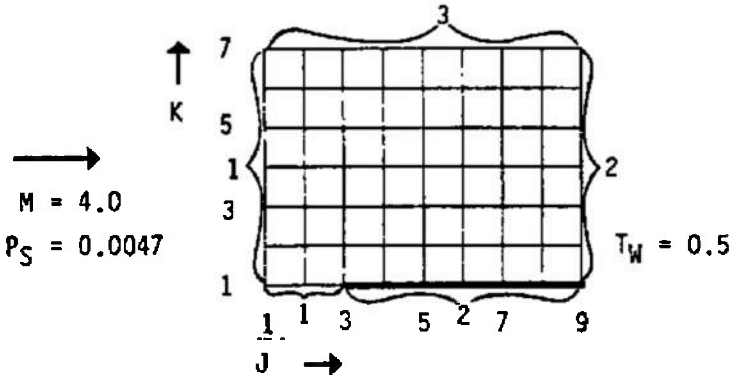
      2) made up of contiguous points that can use the same boundary-condition information (e.g., each point is a no-slip wall point with the same specified temperature);

      3) distinct from all other segments (i.e., no shared points);

      4) simply connected (i.e., no "holes" or excluded points); and

      5) "wetted" by the fluid within the grid on one and *only* one side.

The resulting boundary segments are considered to belong to one of the J-, K-, or L-constant index classes and are then numbered in any convenient manner, starting with 1, within each class. As illustrated in Fig. 3, the example problem's boundaries are split into five segments



J-Constant Index Class

Segment Number	J-Index	K-Indexes		Sign of Normal	Boundary Conditions		
		Minimum	Maximum		Type	Pressure	Temp.
1	1	1	7	1	-10	--	--
2	9	2	6	-1	0	0.0047	1.0

K-Constant Index Class

Segment Number	K-Index	J-Indexes		Sign of Normal	Boundary Conditions		
		Minimum	Maximum		Type	Pressure	Temp.
1	1	2	2	1	50	--	--
2	1	3	9	1	61	--	0.5
3	7	2	9	-1	-10	--	--

Figure 3. Boundary segment specification example.

with two in the J-constant class and three in the K-constant class and have been appropriately numbered.

b. Determine the indices of each segment — this is generally an automatic by-product of the first step.

c. Find the sign of the surface normal for each segment — this is determined by using the index increment required to move from the constant index surface of the segment to the similar constant index surface within the flow field. For example, consider the case of a segment in a K-constant surface. If the K-1 constant surface (bounded by the same J and L limits as the K-constant segment) is within the flow field, then the unit normal is – 1. (Note that if this procedure results in an ambiguous unit normal, then the segment has been incorrectly specified — see step a.5.)

d. Determine the desired boundary-condition code and any auxiliary variables — each boundary condition allowed for in the PARC codes has a boundary-condition type code assigned to it as shown below. Some of these also require auxiliary information (e.g., static pressure) as shown in the following table:

Boundary-Condition Types

Code	Description	Auxiliary Variables
– 10	Fixed conditions	None
0	Free boundary	Total or static pressure and total temperature
50	Slip surface	None
51	Axis of symmetry	None
60	No-slip wall, adiabatic	None
61	No-slip wall, isothermal	Wall temperature
91-96	Specified mass flux	Mass flux and total temperature

where the descriptions mean:

Fixed conditions — All flow-field values are held fixed at their initial values provided by the restart file. Suggested use is for known supersonic inflow boundary segments.

Free boundary — Any boundary segment through which the fluid flow can freely pass and is not a known supersonic inflow (see fixed conditions) or a mass flux (see specified mass flux) boundary is considered to be a free boundary. Imposition of the correct inflow or outflow, supersonic or subsonic boundary condition is taken care of automatically. However, the current implementation requires that the user be careful about a couple of points. One is that this boundary condition works best if the boundary segment is as close to being normal to the expected flow directions as possible. In particular, boundaries of this type that are nearly parallel to the dominant flow direction almost always produce poor results. The second point to be careful about is due to the dual use of the specified pressure auxiliary variable. It is used as a total pressure for subsonic inflow and as a static pressure for subsonic outflow, which does not always produce expected results — especially for external flows. The recommended procedure to avoid this problem is to place these boundaries so that the expected dominant flow through them will be unambiguously inflow or outflow and to specify the pressure auxiliary variable accordingly (total or static, respectively). Note that the total temperature auxiliary variable should always be specified, even if it is only a guess, to avoid possible problems during the large transients portion of the convergence process.

Slip surface — All flow gradients normal to this boundary segment's surface are taken to be zero, along with the component of velocity normal to this surface. This boundary condition does double duty as a symmetry plane boundary condition, as well as the slip wall boundary condition.

Axis of symmetry — Very similar in function to the slip surface boundary condition, this boundary specification is specialized for application to the axis of symmetry for simulations using the axisymmetric option of the PARC2D code.

No-slip wall, adiabatic — All velocity components and the normal gradients of pressure and temperature are set to zero on boundary segments using this option. The current implementation requires that the grid lines intersecting this surface be nearly normal to it for best results.

No-slip wall, isothermal — Similar to the boundary condition discussed above except that the surface temperature is set to that provided through the temperature auxiliary variable.

Specified mass flux — This boundary condition functions very similarly to the free boundary condition except that the pressure is determined indirectly through the specified mass flux auxiliary variable. The last digit of the code for this boundary condition (1 to 6) is used to control the relaxation of the pressure towards the value, which will produce the desired mass flux with one giving the fastest and six the slowest relaxation. The mass flux specified through the auxiliary variable is to be positive for flow into the flow field and negative for flow out of the flow field.

2. NAMELIST BOUNDS parameters — Once the boundaries are split into segments and the appropriate boundary-condition information is determined for each segment, as described above, this information is input to the PARC code through parameters in the NAMELIST BOUNDS. The basic philosophy behind the use of these parameters is very similar to that used in assembling the boundary-condition information in that a set of parameter vectors are associated with each J-, K-, and L-constant index class of boundary segments with the elements of the vectors corresponding to particular segments within each class. This will be made clearer through the description of these parameters and the following example:

NJSEG NKSEG NLSEG	— This parameter gives the total number of boundary segments for each of the J, K, and L coordinate classes.
JLINE KLINE LLINE	— Integer vectors that identify the J-, K-, and L-constant index of each of the cooresponding boundary segments within each coordinate class.
JTYPE KTYPE LTYPE	— Integer vectors whose elements contain the appropriate boundary-condition type code for each boundary segment.
JSIGN KSIGN LSIGN	— Integer vectors that associate the sign of the surface normal with the corresponding boundary segment of each of the J-, K-, and L-constant index classes.
PRESSJ PRESSK PRESSL	— Auxiliary vectors whose elements contain the nondimensional values of total pressure for predominantly subsonic inflow, static pressure for anticipated subsonic outflow, or signed mass flux for specified mass flux boundary segements (type codes 0, 0, and 91-96, respectively).
TEMPJ TEMPK TEMPL	— Auxiliary vectors that specify the nondimensional total temperature for free boundaries or the wall temperature for no-slip walls (type codes 0 and 61, respectively) for each boundary segment.

The following integer parameter vectors associate the appropriate coordinate indices with each boundary segment. This association is coded into the parameter vectors name so that the first letter calls out the J-, K-, or L-constant index class, the second letter identifies the coordinate index being specified, and the remaining letters indicate whether this is the minimum (LOW) or maximum (HIGH) value of this index for the boundary segment. For example, JKLOW(2) = 15 is interpreted to mean that the minimum value of the K-index for the second boundary segment in the J-constant segment class is 15. The complete set of parameter vectors for this purpose are

JKLOW	JKHIGH	KJLOW	KJHIGH	LJLOW	LJHIGH
JLLOW	JLHIGH	KLLOW	KLHIGH	LKLOW	LKHIGH

Consider the example problem shown in Fig. 3. A complete NAMELIST BOUNDS set-up could look like:

```
$BOUNDS
    NJSEG=2,
      JLINE(1)=1, JKLOW(1)=1, JKHIGH(1)=7, JTYPE(1)= -10,
        JSIGN(1)=1,
      JLINE(2)=9, JKLOW(2)=2, JKHIGH(2)=6, JTYPE(2)=0,
        JSIGN(2)= -1, PRESSJ(2)=0.0047, TEMPJ(2)=1.0,
    NKSEG=3,
      KLINE(1)=1, KJLOW(1)=2, KJHIGH(1)=2, KTYPE(1)=50,
        KSIGN(1)=1,
      KLINE(2)=1, KJLOW(2)=3, KJHIGH(2)=9, KTYPE(2)=61,
        KSIGN(2)=1, TEMPK(2)=0.5,
      KLINE(3)=7, KJLOW(3)=2, KJHIGH(3)=9, KTYPE(3)= -10,
        KSIGN(3)= -1,
$END
```

Additional examples of boundary-condition specification through this Namelist are contained in Appendix B.

3.3 OUTPUT

Printed output consists of three parts,

1. a record of the run parameters used,
2. convergence statistics generated as the run progresses, and
3. an edited printout of the solution.

Various error messages may also appear in this file, identified by five leading asterisks.

Convergence information to be plotted by an auxiliary plot program is also part of the available output from the PARC code.

3.3.1 Namelist Parameters

The first part of the printed output written to unit 6 (FT06) is a listing of the values of the Namelist parameters that will be used during the current execution of the PARC code. They are printed in groups corresponding to the individual Namelists. Each group of parameters appears only if the Namelist containing them was part of the actual input on unit 5 (FT05) (see Section 3.2.4). Sample listings showing this output are included in the Appendixes. Note that these tabulated values are not simple echos of the input values as they are not printed immediately after they are read and in that they include default values; users wishing a true echo of their Namelist input should use the "E" prefix on their Namelist records (see the CRAY FORTRAN manual for details).

3.3.2 Grid Patches

To facilitate the treatment of embedded boundaries within a grid, the grid is always broken down into a set of patches for each of the computational coordinate directions (J, K, and L). These patches are automatically constructed from the boundary inputs (see Section 3.2.12) and are, thus, normally of no concern to the user. If boundaries are misspecified, however, incorrect patches will result. Information about the patches can then be of aid in identifying the boundary specification problem. Because the major problem in the provision of proper inputs to the PARC code is often connected to boundary specification, especially for complex 3-D simulations, a summary of the grid patches is provided as part of the printable output.

Grid patches are generated so that for each coordinate family of patches,

1. each patch is distinct from all other patches in the same family,

2. every flow-field point and only flow field points are included in the family of patches, excluding boundary points, and

3. each coordinate line along which the patch family descriptor varies begins and ends one point off of a boundary.

For example, consider Fig. 4, which displays the patches that would be generated for a hypothetical fluid flow problem. The grid for this example is plotted in computational coordinates (J,K) in Fig. 4a, and the J- and K-patches are crosshatched in Figs. 4b and c, respectively. Note how the crosshatched regions obey the above guidelines for both the J and K families of patches. The printed output for this example would appear as below:

GRID PATCHES:

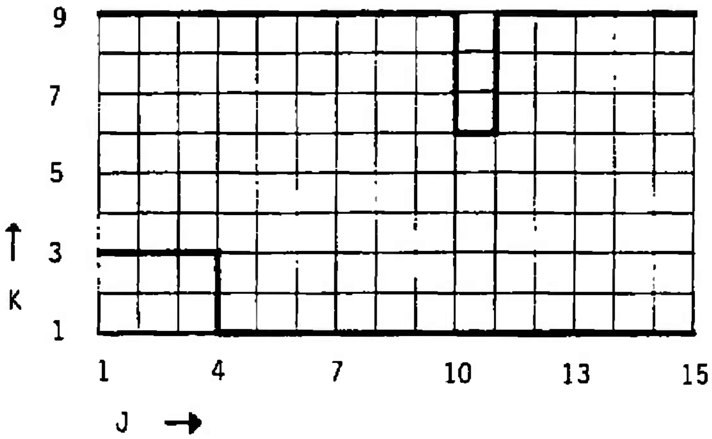
J-PATCHES	MINIMUM		MAXIMUM	
	J	K	J	K
1	5	2	15	3
2	2	4	15	5
3	2	6	9	8
4	12	6	15	8

K-PATCHES	MINIMUM		MAXIMUM	
	J	K	J	K
1	2	4	4	8
2	5	2	9	8
3	10	2	11	6
4	12	2	15	8

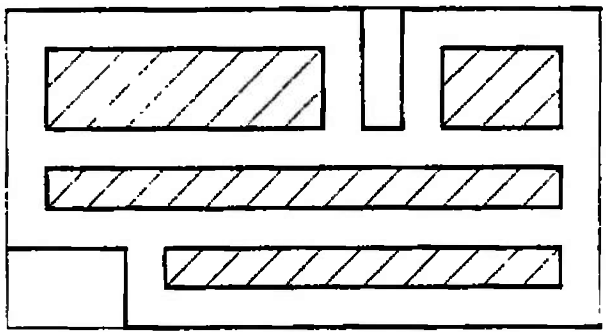
Note that the patches are delimited by giving the coordinates of the corner points of each patch (actually just the maximum and minimum ones). When errors in boundary specification occur, the information contained in the error message, along with the grid patch tabulation, will often pinpoint the source of the error.

3.3.3 Convergence History

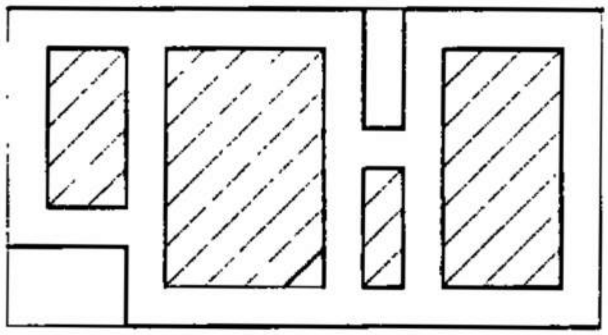
The next portion of the printed output contains information on the behavior of calculations performed. This consists of a line of output at the frequency selected by the parameter NSPRT (see Section 3.2.11). Each line always includes the iteration number (COUNT), time-step scaling factor (DT), L_2 residual, and the magnitude and location of the maximum percentage change in either density or pressure (MAX PERCENT VARIATION). In addition, if selected by the parameter IFXPRT, this line of output will include a measure of the global conservation of mass, momentum, and energy (the net FLUXes). See the Appendixes for sample printouts showing the format of this part of the printable output. This convergence history listing contains the information required to set DTCAP and gives an indication of the overall level of convergence of the solution. As noted previously, the L_2 residual is a relative measure of convergence; it is best to monitor the fluxes for a more absolute measure of convergence.



a. Computational grid



b. J-Patches



c. K-Patches

Figure 4. Patch generation example.

3.3.4 Flow-Field Snapshot

The last part of the printable output contains a listing of selected portions of the flow field at the frequency selected by the parameter NP (see Section 3.2.11, Part 3.). Each line of this listing contains the grid index, dimensional pressure, temperature, Mach number, total pressure, direction cosines of the velocity, and the nondimensional physical coordinates of each grid point selected. The pressures and temperatures are dimensionalized by the input values of PREF and TREFR, respectively. Velocity vector direction cosines are the same as the ratios of the velocity components to the magnitude of the velocity (e.g., V-COSINE is the ratio between the component of velocity parallel to the Y-axis and the magnitude of the velocity at the selected point). See Appendix B for a sample listing containing this information.

3.3.5 Error Messages

A variety of program-generated error messages can occur at any point in the printed output, most of them indicating that execution is being terminated. It is always best to examine both the Namelist values portion of the listing and the very end of the printable output for error messages even if the run appeared to terminate normally. Most of the errors checked for will occur during run initiation, whereas those that happen in the course of execution will cause the program to attempt to terminate with a normal printout and restart file. A special Error Messages Appendix is included with this manual to facilitate resolution of program-detected problems.

3.3.6 Plottable Output

If selected by the L2PLOT and/or the IFXPLT input parameters (see Section 3.2.11, Part 2), a convergence history file, which is suitable for plotting, is created on unit 21 (FT21). All information in this file is written unformatted. The first record is always a plot type, which determines the contents of each subsequent record as follows:

CODE	RECORD CONTENTS
1	N, ΔQ, R_1, R_2, R_3, R_4, R_5, R_6
2	N, ΔQ, F_1, F_2, F_3, F_4, F_5
3	N, ΔQ, R_1, R_2, R_3, R_4, R_5, R_6, F_1, F_2, F_3, F_4, F_5

where N is the iteration number, ΔQ is the maximum percentage change in either density or pressure, $R_1 ... R_5$ ($R_1 ... R_4$ for 2-D) are the L_2 residuals for each of the conservation equations (density, momentum, energy), and R_6 (R_5 for 2-D) is the total L_2 residual; and

$F_1 \ldots F_5$ ($F_1 \ldots F_4$ for 2-D) are the gobal conservation fluxes. One record is created for each iteration so that the total number of records in the file will be the total number of iterations requested plus one. Note that use of this option can be quite expensive computationally since the L_2 residuals and/or conservation fluxes must be calculated and written every iteration. It is recommended that this option only be used when there is good cause for it (e.g., presentation of results or questions about the actual convergence history).

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APPENDIX A

ERROR MESSAGES

A limited amount of error checking is performed by the PARC code. Most of this is confined to the detection of input problems. Execution error detection is intended to initiate an orderly end of the run when a gross error occurs. The error messages printed on unit 6 (FT06) and explanation of their meanings are listed below in alphabetical order. A lower case word (e.g., "value") is used wherever a numerical value would be printed, and the lower case word "name" is used wherever a variable's name would be printed.

NEWTON ITERATION FOR PRESSURE IN SUBROUTINE INSUB FAILED TO CONVERGE

J, K, L, ID, P, PP = value, value, value, value, value, value

This error terminates execution of the PARC code with *no* restart file created. The variables on the second line have the following meanings:

J,K,L	—	Grid coordinates for the point in error.
ID	—	Boundary identifier, the numbers 1, 2, and 3 are associated with J-, K-, and L-constant boundaries.
P	—	Pressure on the boundary.
PP	—	Pressure just off the boundary.

Occurance of this error condition almost always indicates an incompatibility between a boundary-condition value and the interior flow. First try lowering the value of DTCAP (say by half). If this condition happens on the initial run of a flow simulation, it can usually be cleared up by taking more care in the generation of initial conditions.

PATCH ERROR:

This message will then be followed by one of the following lines for PARC3D:

J-PATCH AND K-PATCH WITH NO L-PATCH
K-PATCH AND L-PATCH WITH NO J-PATCH
J-PATCH AND L-PATCH WITH NO K-PATCH
J-PATCH WITH NO K-PATCH OR L-PATCH
K-PATCH WITH NO J-PATCH OR L-PATCH
L-PATCH WITH NO J-PATCH OR K-PATCH

and then the patch mismatch information:

IN REGION BOUNDED BY THE J, K, L POINTS:
(J_{min}, K_{min}, L_{min}), (J_{max}, K_{max}, L_{max})

For PARC2D applications, the first line will be followed by *one* of the following:

J-PATCH HAS NO CORRESPONDING K-PATCH
K-PATCH HAS NO CORRESPONDING J-PATCH

and then the patch mismatch information:

IN REGION BOUNDED BY THE J, K POINTS:
(J_{min}, K_{min}), (J_{max}, K_{max})

As mentioned in the Output section (Section 3.3.2), this information in combination with the grid patch summary should provide clues to the boundary specification error that produced this error condition. For example, consider the hypothetical fluid flow problem depicted in Fig. A-1a, and suppose the printed echo of the BOUNDS NAMELIST input were:

KSEG	KLINE	KJLOW	KJHIGH	KTYPE	KSIGN	PRESSK	TEMPK
1	1	10	13	60	1	0.0	0.0
2	9	1	13	61	−1	0.0	0.5
3	5	1	7	60	1	0.0	0.0
JSEG	JLINE	JKLOW	JKHIGH	JTYPE	JSIGN	PRESSJ	TEMPJ
1	7	2	4	60	1	0.0	0.0
2	1	6	8	0	1	0.7143	1.0
3	13	2	8	0	−1	0.7	1.0

Note that the value of KJLOW(1) is in error (it should be 7). This input would create the grid patches shown in Figs. A1-b and c, which would cause the following error message to be printed:

*****PATCH ERROR:
J-PATCH HAS NO CORRESPONDING K-PATCH
IN REGION BOUNDED BY THE J, K POINTS:
(8,2), (10,5)

This would be listed just after the grid patch table:

J-PATCHES	MINIMUM		MAXIMUM	
	J	K	J	K
1	8	2	12	5
2	2	6	12	8

K-PATCHES	MINIMUM		MAXIMUM	
	J	K	J	K
1	2	6	9	8
2	10	2	12	8

Examination of these listings (if necessary, including construction of diagrams similar to those of Fig. A-1) leads to the conclusion that the incorrect grid patch is K-patch number 1. This must be caused by an incorrect boundary specification for K-segment 1 or 3. Finally examination of these segments' indices reveals that the lower J-index of K-segment number 1 is incorrect.

RANGE ERROR:

This message will then be followed by *one* of the following lines, depending on whether a scalar parameter or a vector parameter, respectively, is in error:

name = value IS OUT OF RANGE (minimum, maximum)

name(index) = value IS OUT OF RANGE (minimum, maximum)

where "name" is the symbolic name of the input parameter (e.g., JMAX), "value" is the input value of this parameter, "minimum" and "maximum" are the smallest and largest values, respectively, allowed for this parameter, and "index" is the element number of the parameter vector that is in error. This error condition only occurs during program initiation for certain input parameters, which are checked for valid values. Corection of these errors is normally self-explanatory.

STOPPING: AT ITERATION NUMBER: iteration

THE TIME-STEP IS SMALLER THAN THE MINIMUM: time-step

This error message usually occurs when the PARC code would like to "blow-up" but cannot due to the time-step limiting feature of the program. The iteration count is given by "iteration," and the minimum allowed time-step size (10^{-7} as set by DTMIN in a DATA statement in SUBROUTINE MAXDT) is given by "time-step." This error allows the code to terminate in a normal fashion, at this iteration, with printed output and a restart file. However, the restart file is usually only good for plots and not for restarting the calculation. In most cases this condition indicates that the value of the input parameter DTCAP is too large. Thus, restarting from the previous restart file with a smaller value of DTCAP should be attempted. This error can also arise if boundary conditions are in error or are very much different from the interior flow conditions.

STOPPING — DENSITIES AND/OR PRESSURES ARE NONPOSITIVE NC = iteration

J	K	L	DENSITY	PRESSURE
j	k	l	density	pressure

The values symbolized by the lower case letters are continued to include all such points or until 100 occurrences happen. At the end of each iteration, all of the densities and pressures are checked to determine if any are nonpositive (physically unrealistic and an unrecoverable error). As with the previous error condition, a normal termination of program execution is attempted. Again the restart file generated is useful only for plotting purposes. This error rarely occurs and typically is recovered from in the same manner as the previous error condition.

STOPPING — JACOBIANS ARE NONPOSITIVE

J	K	L	JACOBIAN
j	k	l	jacobian

The values symbolized by the lower case letters are continued to include all such points or until 100 occurrences happen. This error condition either indicates that some of the grid lines cross or collapse to a single line, or that the physical coordinate system (x, y, z) and the computational coordinate system (J, K, L) have different handedness. The grid must be "fixed."

STOPPING — L2 RESIDUAL HAS CONVERGED TO SPECIFIED LEVEL
L2 RESIDUAL: level ITERATION NUMBER: iteration

This is not really an error message. It indicates that the L_2 residual has decreased to below the level specified by the input parameter L2STOP. Normal print and restart files are generated.

STOPPING — RE MUST BE INPUT FOR VISCOUS FLOWS

Basically self-explanatory, the Reynolds number, RE, must be provided for viscous flows (i.e., when LAMIN has one or more non-zero elements).

STOPPING — TOO MANY B.C'S

INCREASE 'MBC' PARAMETER

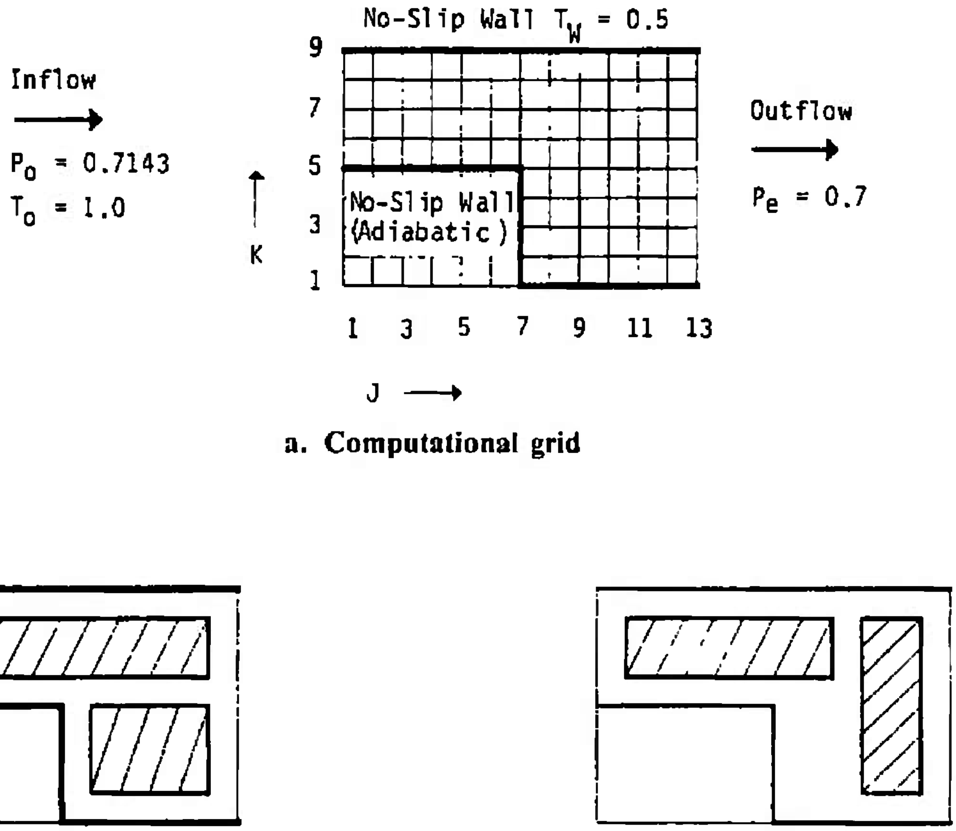
This error condition is only detected if the boundary conditions are input through a formatted read rather than through NAMELIST BOUNDS (see Section 3.2.4).

It declares that the boundary segment vectors are DIMENSIONed too small for the number of segments supplied in the input. Change the value of the MBC parameter in every PARAMETER statement in which it occurs to a value large enough to accommodate the maximum number of segments.

STOPPING — TOO MANY SEGMENTS

INCREASE 'MP' PARAMETER

The number of patches generated for one or more of the patch classes (see Section 3.3.2) is greater than allowed for by the value of the parameter MP. Since the maximum patches are usually not known prior to program execution, try doubling the current value of MP in all of the PARAMETER statements in which it occurs. To make optimal use of memory, this parameter should be adjusted to reflect the maximum number of patches in any of the coordinate classes as given by the patch tabulation in the printed output of an initial, short run.



a. Computational grid

b. J-Patches

c. K-Patches

Figure A-1. Patch error example.

APPENDIX B

EXAMPLES

Consider the sample problem diagramed in Fig. B-1. This is a 2-D diverging nozzle flow with straight duct segments at each end of the nozzle. The desired operating conditions are also indicated on the figure. First a 2-D execution of the PARC2D code for this example will be presented.

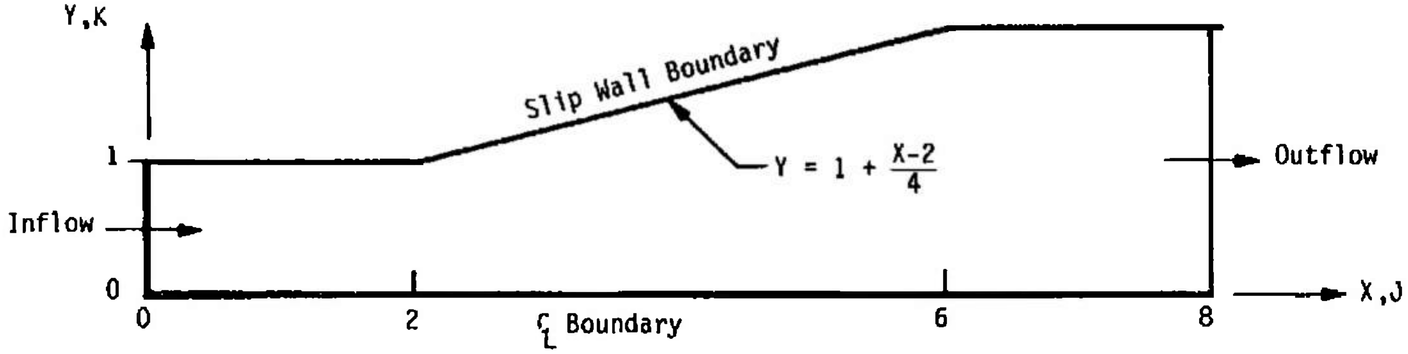
2-D DIVERGING NOZZLE

The grid and initial conditions were generated using the program of Listing B-1. A total of 33 equally spaced J-coordinate lines and 11 K-coordinate lines were used, as shown in Fig. B-2. The initial conditions were appropriate to a free-streaming flow at Mach 0.29 and a ratio of specific heats of 1.4. These initial conditions and grid were stored in the file "A12501.TRIC.ICFILE."

The execution file is displayed in Listing B-2. Note that 2-D, inviscid flow has been specified and that, for this simple flow, the artificial viscosity coefficients are at their practical minimums. The printed output is presented in Listing B-3. A sample Mach number contour plot of the converged solution is shown in Fig. B-3.

3-D DIVERGING NOZZLE

This example problem is exactly the same as the 2-D diverging nozzle problem except that the nozzle has a width of 5 and has 21 L-coordinate lines across this width. The grid and initial conditions were produced by the program in Listing B-4. The execution file, including the NAMELIST inputs to the PARC3D code, is shown in Listing B-5. The corresponding printed output is in Listing B-6.



Inflow Boundary Condition

P_{TOTAL} = 15 psia
T_{TOTAL} = 600°R
Flow Angle = 0 deg

Outflow Boundary Condition

P_{STATIC} = 14.13 psia

Reference Conditions

P_{REF} = 15 psia
T_{REF} = 600°R
γ = 1.4

Figure B-1. Diverging nozzle example.

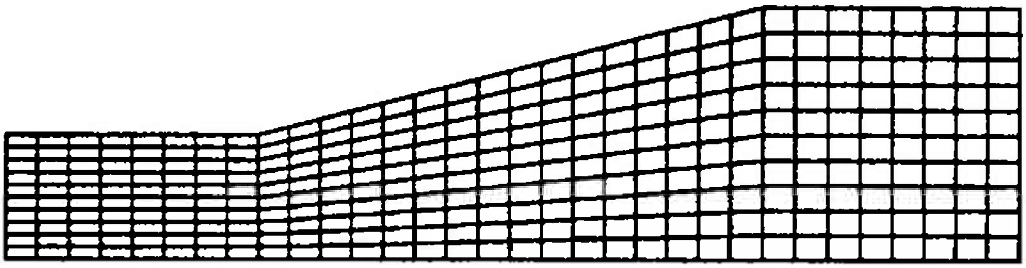


Figure B-2. Diverging nozzle grid.

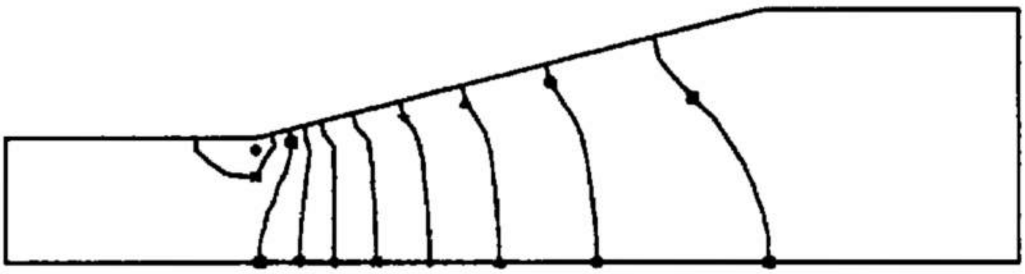


Figure B-3. Mach contours for diverging nozzle (2-D).

Listing B-1. Grid and Initial Condition Generator (2-D)

```
      PROGRAM ICFILE
      PARAMETER(JD=33,KD=11)
      DIMENSION R(JD,KD),RU(JD,KD),RV(JD,KD),RW(JD,KD),E(JD,KD)
      DIMENSION X(JD,KD),Y(JD,KD)
      DATA G/1.4/,NC1/0/
      GM1=G-1.
      DELX=8./32
C  FORM THE 'X' GRID ARRAY
      DO 1 J=1,JD
      DO 1 K=1,KD
       IF(J.EQ.1) THEN
        X(J,K)=0.
       ELSE
        X(J,K)=X(J-1,K)+DELX
       ENDIF
1     CONTINUE
C  FORM THE 'Y' GRID ARRAY
      DO 2 J=1,JD
       IF(X(J,KD).LE.2.) YO=1.
       IF(X(J,KD).GT.6.) YO=2.
       IF((X(J,KD).GT.2.).AND.(X(J,KD).LE.6.)) THEN
        YO=1.+(X(J,KD)-2.)*0.25
       ENDIF
      DELY=YO/(KD-1)
      Y(J,1)=0.0
      DO 2 K=2,KD
       Y(J,K)=Y(J,K-1)+DELY
2     CONTINUE
C  FORM THE ARRAYS OF NON-DIMENSIONAL CONSERVATION VARIABLES CONSISTENT
C  WITH A FREE-STREAM MACH NUMBER OF 0.29
      FMACH=0.29
      FACT=(1.+.2*FMACH**2)
      PBAR=FACT**(-3.5)/G
      DO 1000 J=1,JD
        DO 2000 K=1,KD
          R(J,K)=FACT**(-2.5)
          RU(J,K)=R(J,K)*FMACH*SQRT(1./FACT)
          RV(J,K)=0.
          E(J,K)=PBAR/GM1+.5*(RU(J,K)**2)/R(J,K)
2000    CONTINUE
1000  CONTINUE
      NC1=0
      WRITE(20)NC1,G
      WRITE(20)X,Y
      WRITE(20)R,RU,RV,E
      STOP
      END
```

Listing B-2. Execution and Input File (2-D)

```
//A12501A JOB (SVT,D0000001,01,70005014),'EL2 D.HUDDLESTON',MSGCLASS=Z,
//  MSGLEVEL=(1,1),CLASS=X,TIME=(,5),PASSWORD=XXXXXXXX,PRTY=9,
//  USER=A12501,NOTIFY=A12501
//*
/*ROUTE  PRINT RMT10
/*JOBPARM ROOM=9
//*
// EXEC CRAY
//SYSIN  DD *
 CRSUBMIT F(INPUT) HOLD NOTIFY(A12501)
//INPUT  DD *,DCB=BLKSIZE=6160
JOB,JN=A12501T,T=300,MFL=500000.
ACCOUNT,AC=70005913,US=A12501.
FETCH,DN=FT02,DF=TR,^
      TEXT='DSN=A12501.TRIC.ICFILE,DISP=SHR'.
CFT,L=0.
LDR,L=0.
DISPOSE,DN=FT04,DF=TR,DC=ST,^
       TEXT='DSN=A12501.TRIC.OUTFILE,DISP=SHR'.
/EOF
// DD DSN=A12501.BENCHMAR.CNTL(PARC2D),DISP=SHR
// DD *
/EOF
//*
// DD *
 $INPUTS
   NMAX=2500,      JMAX=33,        KMAX=11,        NP=2500,
   PREF=15.0,      TREFR=600.,
   NPSEG=2,        IFXPRT=1,
   DIS2=0.80,      DIS4=0.30,
   DTCAP=10.0,     PCOMAX=10.0,
   MSPRT=10,       IANISY=0,       STOPL2=1.E-20,
   INVISC(1)=0,    INVISC(2)=0,
 $END
 $PRTSEG
   JKLPI(1,1,1)=1,33,1,     JKLPI(1,2,1)=1,11,1,     IPORD(1)=2,
   JKLPI(1,1,2)=1,33,4,     JKLPI(1,2,2)=1,12,2,     IPORD(2)=1,
 $END
 $BOUNDS
   NJSEG=2,
     JLINE(1)=1,
       JKLOW(1)=2,  JKHIGH(1)=10,          JTYPE(1)=0,
       JSIGN(1)=1,  PRESSJ(1)=0.7142857,  TEMPJ(1)=1.0,
     JLINE(2)=33,
       JKLOW(2)=2,  JKHIGH(2)=10,          JTYPE(2)=0,
       JSIGN(2)=-1, PRESSJ(2)=0.57806,     TEMPJ(2)=1.0,
   NKSEG=2,
     KLINE(1)=1,
       KJLOW(1)=1,  KJHIGH(1)=33,          KTYPE(1)=50,
       KSIGN(1)=1,
     KLINE(2)=11,
       KJLOW(2)=1,  KJHIGH(2)=33,          KTYPE(2)=50,
       KSIGN(2)=-1,
 $END
// DD *
/EOJ
END OF DATA
```

Listing B-3. Diverging Nozzle Output (2-D)

NAMELIST INPUTS.

DIS2	=	0.000000E+00	IAXISY	=	0	INVISC	= 0 0
DIS4	=	0.300000E+00	IFXPLT	=	0	LAMIN	= 0 0
DTCAP	=	0.100000E+02	IFXPRT	=	1		
GAMMA	=	0.140000E+01	IVARDT	=	2		
PCQMAX	=	0.100000E+02	JMAX	=	33		
PR	=	0.720000E+00	KMAX	=	11		
PREF	=	0.150000E+02	L2PLOT	=	0		
PRT	=	0.900000E+00	NBCSEG	=	0		
RE	=	0.000000E+00	NC	=	-1		
STOPL2	=	0.100000E-19	NMAX	=	2500		
TREFR	=	0.600000E+03	NP	=	2500		
TSUTH	=	0.198600E+03	NPSEG	=	2		
VRAT	=	-0.666667E+00	NSPRT	=	10		
			NUMDT	=	0		

NAMELIST PRTSEG:

	JKLPI						IPORD	
	JA	JB	JS	KA	KB	KS	J	K
1	1	33	1	1	11	1	2	1
2	1	33	4	1	12	2	1	2

Listing B-3. Continued

NAMELIST BOUNDS:

JSEG	JLINE	JKLOW	JKHIGH	JTYPE	JSIGN	PRESSJ	TEMPJ
1	1	2	10	0	1	0.714286E+00	0.100000E+01
2	33	2	10	0	-1	0.672850E+00	0.100000E+01

KSEG	KLINE	KJLOW	KJHIGH	KTYPE	KSIGN	PRESSK	TEMPK
1	1	1	33	50	1	0.000000E+00	0.000000E+00
2	11	1	33	50	-1	0.000000E+00	0.000000E+00

Listing B-3. Continued

GRID PATCHES.

J-PATCHES	MINIMUM J	MINIMUM K	MAXIMUM J	MAXIMUM K
1	2	2	32	10

K-PATCHES	MINIMUM J	MINIMUM K	MAXIMUM J	MAXIMUM K
1	2	2	32	10

Listing B-3. Continued

COUNT	DT	L2 RESIDUAL	MASS FLUX	MOMENTUM FLUXES X	MOMENTUM FLUXES Y	ENERGY FLUX	MAX PERCENT VARIATION	MAX LOCATION J	MAX LOCATION K
10	0.1000E+02	0.3736E-03	-0.5682E-03	0.4236E-02	-0.1908E-01	-0.5797E-03	0.2977E+01	32	9
20	0.1000E+02	0.2580E-03	0.3155E-04	0.5396E-02	0.1704E-02	0.4572E-03	0.2389E+01	32	8
30	0.1000E+02	0.1948E-03	0.1574E-03	0.3723E-02	0.1914E-02	0.5824E-03	0.1331E+01	2	10
40	0.1000E+02	0.1727E-03	0 1317E-03	0.2699E-02	0.1524E-02	0 4533E-03	0.1008E+01	2	7
50	0.1000E+02	0.1570E-03	0 5237E-04	0.1933E-02	0.1231E-02	0.2488E-03	0.8159E+00	32	6
60	0.1000E+02	0 1504E-03	-0 3872E-04	0.1470E-02	0.1206E-02	0 6105E-04	0.7322E+00	32	3
70	0.1000E+02	0.1444E-03	-0.1222E-03	0.1146E-02	0.1021E-02	-0.8335E-04	0.6565E+00	32	3
80	0.1000E+02	0 1346E-03	-0 1797E-03	0.9283E-03	0.8399E-03	-0 1690E-03	0.7135E+00	32	10
90	0.1000E+02	0.1220E-03	-0 2075E-03	0.8233E-03	0 7290E-03	-0 2030E-03	0.6574E+00	32	10
100	0.1000E+02	0.1078E-03	-0 2121E-03	0 7643E-03	0.6239E-03	-0 2044E-03	0.5099E+00	32	2
110	0.1000E+02	0.9295E-04	-0.1991E-03	0 7010E-03	0.5432E-03	-0 1851E-03	0.4558E+00	13	5
120	0.1000E+02	0.7656E-04	-0.1746E-03	0 6398E-03	0.4537E-03	-0 1528E-03	0.345'E+00	15	5
130	0.1000E+02	0.6075E-04	-0.1481E-03	0.5953E-03	0.3677E-03	-0.1198E-03	0.2602E+00	13	2
140	0.1000E+02	0.4823E-04	-0.1272E-03	0.5508E-03	0 3306E-03	-0 9621E-04	0.2480E+00	9	10
150	0.1000E+02	0.3836E-04	-0.1121E-03	0.4991E-03	0 3316E-03	-0 8232E-04	0.2149E+00	9	10
160	0.1000E+02	0.3140E-04	-0.1008E-03	0.4476E-03	0.3083E-03	-0.7371E-04	0.1847E+00	9	10
170	0.1000E+02	0.2722E-04	-0.9248E-04	0.3989E-03	0.2625E-03	-0.6848E-04	0.1797E+00	9	10
180	0.1000E+02	0.2413E-04	-0.8637E-04	0.3555E-03	0 2330E-03	-0 6550E-04	0.1622E+00	9	10
190	0.1000E+02	0.2142E-04	-0.8151E-04	0.3186E-03	0.2138E-03	-0.6344E-04	0.1483E+00	9	10
200	0.1000E+02	0.1920E-04	-0.7705E-04	0.2849E-03	0.1872E-03	-0.6128E-04	0.1512E+00	9	10
210	0.1000E+02	0.1709E-04	-0.7242E-04	0.2545E-03	0.1613E-03	-0.5834E-04	0.1434E+00	9	10
220	0.1000E+02	0.1507E-04	-0.6761E-04	0.2295E-03	0.1426E-03	-0.5471E-04	0.1291E+00	9	10
230	0.1000E+02	0.1347E-04	-0.6284E-04	0.2080E-03	0.1268E-03	-0.5092E-04	0 1238E+00	9	10
240	0.1000E+02	0.1215E-04	-0.5811E-04	0.1881E-03	0.1124E-03	-0.4708E-04	0.1166E+00	9	10
250	0.1000E+02	0.1096E-04	-0.5341E-04	0.1704E-03	0.9957E-04	-0 4314E-04	0.1048E+00	9	10
260	0.1000E+02	0.9984E-05	-0.4895E-04	0.1549E-03	0.8843E-04	-0.3937E-04	0.9652E-01	9	10
270	0.1000E+02	0.9133E-05	-0 4484E-04	0.1408E-03	0.7992E-04	-0 3598E-04	0.8921E-01	9	10
280	0.1000E+02	0.8343E-05	-0.4108E-04	0.1279E-03	0.7304E-04	-0.3293E-04	0.8109E-01	9	10
290	0.1000E+02	0.7645E-05	-0.3766E-04	0.1163E-03	0.6631E-04	-0.3019E-04	0.7454E-01	9	10
300	0.1000E+02	0.7011E-05	-0.3457E-04	0.1056E-03	0.6007E-04	-0 2774E-04	0 6879E-01	9	10
310	0.1000E+02	0 6424E-05	-0.3179E-04	0.9599E-04	0.5451E-04	-0.2555E-04	0.6320E-01	9	10
320	0.1000E+02	0.5898E-05	-0 2924E-04	0.8724E-04	0.4920E-04	-0.2357E-04	0 5843E-01	9	10
330	0.1000E+02	0.5417E-05	-0 2691E-04	0.7926E-04	0.4426E-04	-0.2174E-04	0 5398E-01	9	10
340	0.1000E+02	0.4973E-05	-0.2476E-04	0.7207E-04	0.3995E-04	-0.2004E-04	0.4963E-01	9	10
350	0.1000E+02	0.4569E-05	-0.2277E-04	0.6560E-04	0.3614E-04	-0 1845E-04	0 4573E-01	9	10
360	0.1000E+02	0.4199E-05	-0.2093E-04	0.5974E-04	0.3273E-04	-0.1698E-04	0.4208E-01	9	10
370	0.1000E+02	0.3857E-05	-0 1922E-04	0.5444E-04	0.2965E-04	-0.1560E-04	0 3858E-01	9	10
380	0.1000E+02	0.3544E-05	-0.1763E-04	0.4964E-04	0.2687E-04	-0.1431E-04	0 3539E-01	9	10
390	0.1000E+02	0.3255E-05	-0.1617E-04	0.4528E-04	0.2440E-04	-0.1312E-04	0.3246E-01	9	10
400	0.1000E+02	0.2989E-05	-0.1482E-04	0 4131E-04	0.2219E-04	-0.1203E-04	0 2973E-01	9	10
410	0 1000E+02	0.2744E-05	-0.1358E-04	0.3770E-04	0.2021E-04	-0.1103E-04	0 2725E-01	9	10
420	0.1000E+02	0.2518E-05	-0.1245E-04	0 3441E-04	0.1842E-04	-0.1011E-04	0.2498E-01	9	10
430	0.1000E+02	0.2309E-05	-0.1141E-04	0 3141E-04	0 1681E-04	-0.9264E-05	0 2289E-01	9	10
440	0.1000E+02	0.2118E-05	-0.1045E-04	0.2868E-04	0 1533E-04	-0 8494E-05	0.2099E-01	9	10
450	0.1000E+02	0.1941E-05	-0.9581E-05	0.2618E-04	0.1397E-04	-0.7789E-05	0 1925E-01	9	10
460	0.1000E+02	0.1780E-05	-0.8781E-05	0.2391E-04	0.1272E-04	-0.7143E-05	0 1765E-01	9	10
470	0.1000E+02	0.1631E-05	-0.8048E-05	0.2184E-04	0.1159E-04	-0.6549E-05	0.1618E-01	9	10
480	0.1000E+02	0.1495E-05	-0.7375E-05	0.1995E-04	0.1057E-04	-0.6004E-05	0.1483E-01	9	10
490	0.1000E+02	0 1370E-05	-0.6758E-05	0.1822E-04	0.9638E-05	-0.5503E-05	0.1359E-01	9	10
500	0.1000E+02	0.1256E-05	-0.6191E-05	0.1665E-04	0 8793E-05	-0.5043E-05	0 1245E-01	9	10
510	0.1000E+02	[illegible]	-0 5671E-05	0.1522E-04	0.8025E-05	-0.4620E-05	0.1140E-01	9	10
520	0.1000E+02	0.1054E-05	-0 5194E-05	0.1391E-04	0.7325E-05	-0.4232E-05	0.1044E-01	9	10
530	0.1000E+02	0 9659E-06	-0 4756E-05	0.1272E-04	0.6689E-05	-0.3875E-05	0.9560E-02	9	10
540	0.1000E+02	0 8849E-06	-0 4355E-05	0.1163E-04	0.6110E-05	-0.3549E-05	0.8753E-02	9	10
550	0.1000E+02	0 8105E-06	-0.3987E-05	0.1063E-04	0.5583E-05	-0.3250E-05	0.8014E-02	9	10
560	0.1000E+02	0.7423E-06	-0.3651E-05	0.9720E-05	0.5103E-05	-0.2976E-05	0.7338E-02	9	10
570	0.1000E+02	0 6798E-06	-0 3343E-05	0.8888E-05	0.4664E-05	-0 2725E-05	0.6719E-02	9	10

Listing B-3. Continued

580	0.1000E+02	0.6225E-06	-0.3060E-05	0.8127E-05	0.4262E-05	-0.2495E-05	0.6152E-02	9	10
590	0.1000E+02	0.5700E-06	-0.2802E-05	0.7432E-05	0.3895E-05	-0.2285E-05	0.5633E-02	9	10
600	0.1000E+02	0.5219E-06	-0.2565E-05	0.6797E-05	0.3560E-05	-0.2092E-05	0.5157E-02	9	10
610	0.1000E+02	0.4779E-06	-0.2348E-05	0.6216E-05	0.3254E-05	-0.1915E-05	0.4721E-02	9	10
620	0.1000E+02	0.4375E-06	-0.2150E-05	0.5686E-05	0.2975E-05	-0.1753E-05	0.4322E-02	9	10
630	0.1000E+02	0.4006E-06	-0.1968E-05	0.5200E-05	0.2719E-05	-0.1605E-05	0.3957E-02	9	10
640	0.1000E+02	0.3667E-06	-0.1801E-05	0.4757E-05	0.2487E-05	-0.1470E-05	0.3622E-02	9	10
650	0.1000E+02	0.3357E-06	-0.1649E-05	0.4351E-05	0.2274E-05	-0.1345E-05	0.3315E-02	9	10
660	0.1000E+02	0.3073E-06	-0.1509E-05	0.3981E-05	0.2079E-05	-0.1231E-05	0.3034E-02	9	10
670	0.1000E+02	0.2813E-06	-0.1381E-05	0.3641E-05	0.1902E-05	-0.1127E-05	0.2777E-02	9	10
680	0.1000E+02	0.2575E-06	-0.1264E-05	0.3331E-05	0.1739E-05	-0.1032E-05	0.2542E-02	9	10
690	0.1000E+02	0.2357E-06	-0.1157E-05	0.3048E-05	0.1591E-05	-0.9442E-06	0.2326E-02	9	10
700	0.1000E+02	0.2158E-06	-0.1059E-05	0.2786E-05	0.1455E-05	-0.8642E-06	0.2129E-02	9	10
710	0.1000E+02	0.1975E-06	-0.9694E-06	0.2551E-05	0.1331E-05	-0.7910E-06	0.1949E-02	9	10
720	0.1000E+02	0.1808E-06	-0.8872E-06	0.2334E-05	0.1218E-05	-0.7240E-06	0.1784E-02	9	10
730	0.1000E+02	0.1654E-06	-0.8120E-06	0.2135E-05	0.1114E-05	-0.6626E-06	0.1632E-02	9	10
740	0.1000E+02	0.1514E-06	-0.7432E-06	0.1954E-05	0.1019E-05	-0.6065E-06	0.1494E-02	9	10
750	0.1000E+02	0.1386E-06	-0.6802E-06	0.1788E-05	0.9321E-06	-0.5551E-06	0.1367E-02	9	10
760	0.1000E+02	0.1268E-06	-0.6225E-06	0.1635E-05	0.8527E-06	-0.5080E-06	0.1251E-02	9	10
770	0.1000E+02	0.1161E-06	-0.5697E-06	0.1496E-05	0.7801E-06	-0.4649E-06	0.1145E-02	9	10
780	0.1000E+02	0.1062E-06	-0.5214E-06	0.1369E-05	0.7137E-06	-0.4255E-06	0.1048E-02	9	10
790	0.1000E+02	0.9724E-07	-0.4771E-06	0.1253E-05	0.6529E-06	-0.3894E-06	0.9591E-03	9	10
800	0.1000E+02	0.8899E-07	-0.4366E-06	0.1146E-05	0.5974E-06	-0.3564E-06	0.8778E-03	9	10
810	0.1000E+02	0.8144E-07	-0.3996E-06	0.1049E-05	0.5466E-06	-0.3261E-06	0.8033E-03	9	10
820	0.1000E+02	0.7454E-07	-0.3657E-06	0.9598E-06	0.5001E-06	-0.2985E-06	0.7351E-03	9	10
830	0.1000E+02	0.6821E-07	-0.3347E-06	0.8782E-06	0.4575E-06	-0.2732E-06	0.6727E-03	9	10
840	0.1000E+02	0.6243E-07	-0.3063E-06	0.8036E-06	0.4186E-06	-0.2500E-06	0.6156E-03	9	10
850	0.1000E+02	0.5713E-07	-0.2803E-06	0.7353E-06	0.3831E-06	-0.2288E-06	0.5634E-03	9	10
860	0.1000E+02	0.5228E-07	-0.2565E-06	0.6726E-06	0.3505E-06	-0.2094E-06	0.5156E-03	9	10
870	0.1000E+02	0.4785E-07	-0.2347E-06	0.6157E-06	0.3207E-06	-0.1916E-06	0.4718E-03	9	10
880	0.1000E+02	0.4379E-07	-0.2148E-06	0.5634E-06	0.2934E-06	-0.1753E-06	0.4318E-03	9	10
890	0.1000E+02	0.4007E-07	-0.1966E-06	0.5155E-06	0.2685E-06	-0.1604E-06	0.3951E-03	9	10
900	0.1000E+02	0.3667E-07	-0.1799E-06	0.4717E-06	0.2457E-06	-0.1468E-06	0.3616E-03	9	10
910	0.1000E+02	0.3356E-07	-0.1646E-06	0.4316E-06	0.2248E-06	-0.1344E-06	0.3309E-03	9	10
920	0.1000E+02	0.3071E-07	-0.1506E-06	0.3950E-06	0.2057E-06	-0.1230E-06	0.3028E-03	9	10
930	0.1000E+02	0.2810E-07	-0.1379E-06	0.3614E-06	0.1682E-06	-0.1125E-06	0.2771E-03	9	10
940	0.1000E+02	0.2572E-07	-0.1261E-06	0.3307E-06	0.1722E-06	-0.1030E-06	0.2536E-03	9	10
950	0.1000E+02	0.2353E-07	-0.1154E-06	0.3026E-06	0.1576E-06	-0.9423E-07	0.2321E-03	9	10
960	0.1000E+02	0.2154E-07	-0.1056E-06	0.2769E-06	0.1442E-06	-0.8623E-07	0.2124E-03	9	10
970	0.1000E+02	0.1971E-07	-0.9667E-07	0.2534E-06	0.1320E-06	-0.7691E-07	0.1943E-03	9	10
980	0.1000E+02	0.1804E-07	-0.8847E-07	0.2319E-06	0.1208E-06	-0.7221E-07	0.1778E-03	9	10
990	0.1000E+02	0.1650E-07	-0.8095E-07	0.2122E-06	0.1105E-06	-0.6608E-07	0.1627E-03	9	10
1000	0.1000E+02	0.1510E-07	-0.7408E-07	0.1942E-06	0.1011E-06	-0.6047E-07	0.1489E-03	9	10
1010	0.1000E+02	0.1382E-07	-0.6779E-07	0.1777E-06	0.9252E-07	-0.5534E-07	0.1363E-03	9	10
1020	0.1000E+02	0.1265E-07	-0.6204E-07	0.1626E-06	0.8467E-07	-0.5064E-07	0.1247E-03	9	10
1030	0.1000E+02	0.1157E-07	-0.5677E-07	0.1488E-06	0.7747E-07	-0.4634E-07	0.1141E-03	9	10
1040	0.1000E+02	0.1059E-07	-0.5195E-07	0.1362E-06	0.7089E-07	-0.4241E-07	0.1044E-03	9	10
1050	0.1000E+02	0.9692E-08	-0.4754E-07	0.1246E-06	0.6487E-07	-0.3881E-07	0.9557E-04	9	10
1060	0.1000E+02	0.8869E-08	-0.4350E-07	0.1140E-06	0.5936E-07	-0.3551E-07	0.8745E-04	9	10
1070	0.1000E+02	0.8116E-08	-0.3981E-07	0.1043E-06	0.5432E-07	-0.3250E-07	0.8003E-04	9	10
1080	0.1000E+02	0.7427E-08	-0.3643E-07	0.9548E-07	0.4971E-07	-0.2974E-07	0.7323E-04	9	10
1090	0.1000E+02	0.6797E-08	-0.3334E-07	0.8737E-07	0.4549E-07	-0.2721E-07	0.6701E-04	9	10
1100	0.1000E+02	0.6220E-08	-0.3051E-07	0.7995E-07	0.4162E-07	-0.2490E-07	0.6132E-04	9	10
1110	0.1000E+02	0.5692E-08	-0.2792E-07	0.7316E-07	0.3809E-07	-0.2279E-07	0.5612E-04	9	10
1120	0.1000E+02	0.5208E-08	-0.2555E-07	0.6695E-07	0.3486E-07	-0.2085E-07	0.5135E-04	9	10
1130	0.1000E+02	0.4766E-08	-0.2338E-07	0.6126E-07	0.3190E-07	-0.1906E-07	0.4699E-04	9	10
1140	0.1000E+02	0.4362E-08	-0.2139E-07	0.5606E-07	0.2919E-07	-0.1746E-07	0.4300E-04	9	10
1150	0.1000E+02	0.3991E-08	-0.1958E-07	0.5130E-07	0.2671E-07	-0.1598E-07	0.3935E-04	9	10
1160	0.1000E+02	0.3652E-08	-0.1791E-07	0.4695E-07	0.2444E-07	-0.1462E-07	0.3601E-04	9	10
1170	0.1000E+02	0.3342E-08	-0.1639E-07	0.4296E-07	0.2237E-07	-0.1338E-07	0.3295E-04	9	10
1180	0.1000E+02	0.3058E-08	-0.1500E-07	0.3931E-07	0.2047E-07	-0.1225E-07	0.3016E-04	9	10
1190	0.1000E+02	0.2799E-08	-0.1373E-07	0.3597E-07	0.1873E-07	-0.1121E-07	0.2760E-04	9	10
1200	0.1000E+02	0.2561E-08	-0.1256E-07	0.3292E-07	0.1714E-07	-0.1025E-07	0.2525E-04	9	10
1210	0.1000E+02	0.2344E-08	-0.1150E-07	0.3012E-07	0.1568E-07	-0.9384E-08	0.2311E-04	9	10
1220	'OOOE+02	0.2145E-08	-0.1052E-07	0.2757E-07	0.1435E-07	.8587E-08	0.2115E-04	9	10
1230	OOE+02	0.1963E-08	-0.9626E-08	0.2523E-07	0.1313E-0	7858E-08	0.1935E-04	9	10

Listing B-3. Continued

1240	1000E+02	0.1796E-08	-0 8809E-08	0.2308E-07	0.1202E-[illegible]	[illegible] 7191E-08	0.177[illegible]E-04	9	10
1250	1000E+02	0.1643E-08	-0.8061E-08	0.2112E-07	0.1100E-[illegible]	[illegible] 6580E-08	0.1620E-04	9	10
1260	0.1000E+02	0.1504E-08	-0.7377E-08	0.1933E-07	0.[illegible]006E-07	-0 6022E-08	0.1483E-04	9	10
1270	0.1000E+02	0.1376E-08	-0.6750E-08	0.1769E-07	0.9209E-08	-0.5510E-08	0.1357E-04	9	10
1280	0.1000E+02	0.1259E-08	-0.6177E-08	0.1619E-07	0.8427E-08	-0.5042E-08	0.1242E-04	9	10
1290	0.1000E+02	0.1152E-08	-0.5650E-08	0.1481E-07	0.7711E-08	-0.4614E-08	0.1136E-04	9	10
1300	0.1000E+02	0.1055E-08	-0.5173E-08	0.1355E-07	0.7057E-08	-0.4223E-08	0.1040E-04	9	10
1310	0.1000E+02	0.9651E-09	-0.4733E-08	0.1240E-07	0.6457E-08	-0.3864E-08	0.9515E-05	9	10
1320	0.1000E+02	0 8831E-09	-0.4332E-08	0.1135E-07	0.5909E-08	-0.3536E-08	0.8707E-05	9	10
1330	0.1000E+02	0.8081E-09	-0.3964E-08	0.1039E-07	0.5407E-08	-0.3236E-08	0.7968E-05	9	10
1340	0.1000E+02	0.7395E-09	-0.3627E-08	0.9505E-08	0.4948E-08	-0.2961E-08	0.7291E-05	9	10
1350	0.1000E+02	0.8767E-09	-0.3319E-08	0.8698E-08	0.4528E-08	-0.2710E-08	0.6672E-05	9	10
1360	0.1000E+02	0.6193E-09	-0.3037E-08	0 7959E-08	0.4144E-08	-0.2479E-08	0.6106E-05	9	10
1370	0.1000E+02	0.5667E-09	-0.2780E-08	0.7283E-08	0.3792E-08	-0.2269E-08	0.5587E-05	9	10
1380	0.1000E+02	0.5186E-09	-0.2544E-08	0.6665E-08	0.3470E-08	-0.2076E-08	0 5[illegible]3E-05	9	10
1390	0.1000E+02	0.4745E-09	-0.2328E-08	0.6099E-08	0.3175E-08	-0.1900E-08	0.4679E-05	9	10
1400	0.1000E+02	0.4343E-09	-0.2130E-08	0.5581E-08	0.2908E-08	-0.1739E-08	0.4282E-05	9	10
1410	0.1000E+02	0.3974E-09	-0.1949E-08	0.5107E-08	0.2659E-08	-0.1591E-08	0.3918E-05	9	10
1420	0.1000E+02	0.3636E-09	-0.1784E-08	0.4674E-08	0.2433E-08	-0.1456E-08	0.3585E-05	9	10
1430	0.1000E+02	0.3328E-09	-0.1632E-08	0.4277E-08	0 2227E-08	-0.1332E-08	0.3281E-05	9	10
1440	0.1000E+02	0.3045E-09	-0.1494E-08	0.3914E-08	0.2037E-08	-0.1219E-08	0.3002E-05	9	10
1450	0.1000E+02	0.2787E-09	-0.1367E-08	0.3581E-08	0 1865E-08	-0.1116E-08	0.2747E-05	9	10
1460	0.1000E+02	0.2550E-09	-0.1251E-08	0.3277E-08	0.1706E-08	-0.1021E-08	0.2514E-05	9	10
1470	0.1000E+02	0.2333E-09	-0.1145E-08	0.2999E-08	0 1561E-08	-0.9343E-09	0.2301E-05	9	10
1480	0.1000E+02	0.2135E-09	-0.1047E-08	0.2744E-08	0.1429E-08	-0.8550E-09	0.2105E-05	9	10
1490	0.1000E+02	0.1954E-09	-0.9584E-09	0.2511E-08	0.1307E-08	-0.7824E-09	0.1927E-05	9	10
1500	0.1000E+02	0.1788E-09	-0.8770E-09	0.2298E-08	0.1196E-08	-0.7159E-09	0.1763E-05	9	10
1510	0.1000E+02	0.1636E-09	-0.8026E-09	0.2103E-08	0.1095E-08	-0.6551E-09	0.1613E-05	9	10
1520	0.1000E+02	0.1497E-09	-0.7344E-09	0.1924E-08	0.1002E-08	-0.5995E-09	0.1476E-05	9	10
1530	0.1000E+02	0.1370E-09	-0.6721E-09	0.1761E-08	0.9168E-09	-0.5486E-09	0.1351E-05	9	10
1540	0.1000E+02	0.1254E-09	-0.6150E-09	0.1612E-08	0.8390E-09	-0.5020E-09	0.1236E-05	9	10
1550	0.1000E+02	0.1147E-09	-0.5628E-09	0.1475E-08	0.7677E-09	-0.4594E-09	0.1131E-05	9	10
1560	0.1000E+02	0.1050E-09	-0.5150E-09	0.1349E-08	0.7026E-09	-0.4204E-09	0.1035E-05	9	10
1570	0.1000E+02	0.9608E-10	-0.4713E-09	0.1235E-08	0.6429E-09	-0.3847E-09	0.9473E-06	9	10
1580	0.1000E+02	0.8793E-10	-0.4313E-09	0.1130E-08	0.5883E-09	-0.3520E-09	0 8669E-06	9	10
1590	0.1000E+02	0.8046E-10	-0.3946E-09	0.1034E-08	0.5383E-09	-0 3221E-09	0.7933E-06	9	10
1600	0.1000E+02	0.7363E-10	-0.3611E-09	0 9463E-09	0.4926E-09	-0.2948E-09	0.7259E-06	9	10
1610	0.1000E+02	0.6738E-10	-0.3305E-09	0 8659E-09	0.4508E-09	-0.2698E-09	0.6643E-06	9	10
1620	0.1000E+02	0.6166E-10	-0.3024E-09	0.7924E-09	0.4125E-09	-0.2469E-09	0.6079E-06	9	10
1630	0.1000E+02	0.5642E-10	-0.2767E-09	0 7251E-09	0.3775E-09	-0 2259E-09	0.5563E-06	9	10
1640	0.1000E+02	0.5163E-10	-0.2532E-09	0 6636E-09	0.3455E-09	-0 2067E-09	0.5090E-06	9	10
1650	0.1000E+02	0.4725E-10	-0.2317E-09	0 6072E-09	0.3161E-09	-0.1892E-09	0.4658E-06	9	10
1660	0.1000E+02	0.4323E-10	-0.2121E-09	0.5557E-09	0.2893E-09	-0 1731E-09	0.4263E-06	9	10
1670	0.1000E+02	0.3956E-10	-0.1941E-09	0.5085E-09	0.2647E-09	-0.1584E-09	0.3901E-06	9	10
1680	0.1000E+02	0.3620E-10	-0.1776E-09	0.4653E-09	0.2422E-09	-0.1450E-09	0.3570E-06	9	10
1690	0.1000E+02	0.3313E-10	-0.1625E-09	0.4258E-09	0.2216E-09	-0.1327E-09	0.3267E-06	9	10
1700	0.1000E+02	0.3032E-10	-0.1487E-09	0.3896E-09	0.2028E-09	-0.1214E-09	0.2989E-06	9	10
1710	0.1000E+02	0 2774E-10	-0.1361E-09	0 3566E-09	0.1856E-09	-0.1111E-09	0.2735E-06	9	10
1720	0.1000E+02	0.2539E-10	-0.1245E-09	0.3263E-09	0.1698E-09	-0.1016E-09	0.2503E-06	9	10
1730	0.1000E+02	0.2323E-10	-0.1139E-09	0.2986E-09	0.1555E-09	-0.9302E-10	0.2291E-06	9	10
1740	0.1000E+02	0.2126E-10	-0.1043E-09	0.2732E-09	0.1422E-09	-0.8512E-10	0.2096E-06	9	10
1750	0.1000E+02	0.1945E-10	-0.9542E-10	0.2500E-09	0.1302E-09	-0.7789E-10	0.1918E-06	9	10
1760	0.1000E+02	0.1780E-10	-0 8732E-10	0.2288E-09	0.1191E-09	-0.7128E-10	0.1755E-06	9	10
1770	0.1000E+02	0.1629E-10	-0.7990E-10	0.2094E-09	0.1090E-09	-0.6523E-10	0.1606E-06	9	10
1780	0.1000E+02	0.1491E-10	-0 7312E-10	0.1916E-09	0.9973E-10	-0.5969E-10	0.1470E-06	9	10
1790	0.1000E+02	0.1364E-10	-0.6691E-10	0.1753E-09	0.9125E-10	-0.5462E-10	0.1345E-06	9	10
1800	0.1000E+02	0.1248E-10	-0 6123E-10	0.1604E-09	0.8353E-10	-0.4998E-10	0.1231E-06	9	10
1810	0.1000E+02	0.1142E-10	-0.5603E-10	0.1468E-09	0.7646E-10	-0 4574E-10	0.1126E-06	9	10
1820	0.1000E+02	0.1045E-10	-0.5127E-10	0.1344E-09	0 6993E-10	-0.4185E-10	0.1031E-06	9	10
1830	0.1000E+02	0.9566E-11	-0.4692E-10	0.1229E-09	0.6401E-10	-0.3830E-10	0.9432E-07	9	10
1840	0.1000E+02	0.8754E-11	-0.4294E-10	0.1125E-09	0.5858E-10	-0.3505E-10	0.8631E-07	9	10
1850	0.1000E+02	0.8011E-11	-0.3929E-10	0.1030E-09	0 5360E-10	-0.3207E-10	0 7897E-07	9	10
1860	0.1000E+02	0.7330E-11	-0.3596E-10	0.9421E-10	0.4904E-10	-0.2935E-10	0.7228E-07	9	10
1870	0.1000E+02	0.6708E-11	-0.3290E-10	0.8622E-10	0 4489E-10	-0.2686E-10	0.6614E-07	9	10
1880	0.1000E+02	0.6139E-11	-0.3011E-10	0.7889E-10	0 4109E-10	-0.2458E-10	0.6053E-07	9	10
1890	0.1000E+02	0.5617E-11	-0.2755E-10	0.7220E-10	0.3758E-10	-0.2249E-10	0.5538E-07	9	10

Listing B-3. Continued

1900	0.1000E+02	0.5140E-11	-0.2521E-10	0.6607E-10	0.3437E-10	-0.2058E-10	0.5068E-07	9	10
1910	0.1000E+02	0.4704E-11	-0.2307E-10	0.6046E-10	0.3146E-10	-0.1883E-10	0.4638E-07	9	10
1920	0.1000E+02	0.4305E-11	-0.2111E-10	0.5532E-10	0.2882E-10	-0.1724E-10	0.4244E-07	9	10
1930	0.1000E+02	0.3939E-11	-0.1932E-10	0.5062E-10	0.2635E-10	-0.1577E-10	0.3884E-07	9	10
1940	0.1000E+02	0.3605E-11	-0.1768E-10	0.4633E-10	0.2410E-10	-0.1443E-10	0.3554E-07	9	10
1950	0.1000E+02	0.3299E-11	-0.1618E-10	0.4239E-10	0.2205E-10	-0.1321E-10	0.3252E-07	9	10
1960	0.1000E+02	0.3019E-11	-0.1481E-10	0.3880E-10	0.2017E-10	-0.1209E-10	0.2976E-07	9	10
1970	0.1000E+02	0.2762E-11	-0.1355E-10	0.3550E-10	0.1845E-10	-0.1106E-10	0.2723E-07	9	10
1980	0.1000E+02	0.2528E-11	-0.1240E-10	0.3249E-10	0.1689E-10	-0.1012E-10	0.2492E-07	9	10
1990	0.1000E+02	0.2313E-11	-0.4135E-10	0.2973E-10	0.1546E-10	-0.9261E-11	0.2281E-07	9	10
2000	0.1000E+02	0.2117E-11	-0.1038E-10	0.2720E-10	0.1413E-10	-0.8475E-11	0.2087E-07	9	10
2010	0.1000E+02	0.1937E-11	-0.9501E-11	0.2490E-10	0.1298E-10	-0.7755E-11	0.1910E-07	9	10
2020	0.1000E+02	0.1773E-11	-0.8695E-11	0.2278E-10	0.1178E-10	-0.7097E-11	0.1748E-07	9	10
2030	0.1000E+02	0.1822E-11	-0.7957E-11	0.2085E-10	0.1082E-10	-0.6496E-11	0.1599E-07	9	10
2040	0.1000E+02	0.1484E-11	-0.7282E-11	0.1908E-10	0.9920E-11	-0.5944E-11	0.1463E-07	9	10
2050	0.1000E+02	0.1358E-11	-0.6663E-11	0.1746E-10	0.9059E-11	-0.5438E-11	0.1339E-07	9	10
2060	0.1000E+02	0.1243E-11	-0.6098E-11	0.1597E-10	0.8320E-11	-0.4977E-11	0.1225E-07	9	10
2070	0.1000E+02	0.1137E-11	-0.5580E-11	0.1462E-10	0.7602E-11	-0.4555E-11	0.1122E-07	9	10
2080	0.1000E+02	0.1041E-11	-0.5106E-11	0.1338E-10	0.6991E-11	-0.4167E-11	0.1026E-07	9	10
2090	0.1000E+02	0.9526E-12	-0.4673E-11	0.1224E-10	0.6393E-11	-0.3814E-11	0.9390E-08	9	10
2100	0.1000E+02	0.8717E-12	-0.4276E-11	0.1120E-10	0.5832E-11	-0.3490E-11	0.8594E-08	9	10
2110	0.1000E+02	0.7977E-12	-0.3914E-11	0.1025E-10	0.5341E-11	-0.3195E-11	0.7861E-08	9	10
2120	0.1000E+02	0.7299E-12	-0.3581E-11	0.9381E-11	0.4882E-11	-0.2923E-11	0.7193E-08	9	10
2130	0.1000E+02	0.6680E-12	-0.3278E-11	0.8585E-11	0.4464E-11	-0.2675E-11	0.6586E-08	9	10
2140	0.1000E+02	0.6112E-12	-0.2999E-11	0.7857E-11	0.4105E-11	-0.2447E-11	0.6025E-08	9	10
2150	0.1000E+02	0.5593E-12	-0.2745E-11	0.7188E-11	0.3762E-11	-0.2241E-11	0.5516E-08	9	10
2160	0.1000E+02	0.5118E-12	-0.2512E-11	0.6578E-11	0.3429E-11	-0.2050E-11	0.5046E-08	9	10
2170	0.1000E+02	0.4684E-12	-0.2299E-11	0.6019E-11	0.3105E-11	-0.1876E-11	0.4616E-08	9	10
2180	0.1000E+02	0.4286E-12	-0.2103E-11	0.5511E-11	0.2839E-11	-0.1716E-11	0.4226E-08	9	10
2190	0.1000E+02	0.3923E-12	-0.1925E-11	0.5042E-11	0.2596E-11	-0.1570E-11	0.3864E-08	9	10
2200	0.1000E+02	0.3589E-12	-0.1762E-11	0.4612E-11	0.2390E-11	-0.1438E-11	0.3536E-08	9	10
2210	0.1000E+02	0.3285E-12	-0.1612E-11	0.4223E-11	0.2186E-11	-0.1315E-11	0.3236E-08	9	10
2220	0.1000E+02	0.3007E-12	-0.1476E-11	0.3862E-11	0.2030E-11	-0.1204E-11	0.2965E-08	9	10
2230	0.1000E+02	0.2751E-12	-0.1351E-11	0.3534E-11	0.1836E-11	-0.1102E-11	0.2712E-08	9	10
2240	0.1000E+02	0.2517E-12	-0.1237E-11	0.3234E-11	0.1682E-11	-0.1009E-11	0.2480E-08	9	10
2250	0.1000E+02	0.2305E-12	-0.1131E-11	0.2962E-11	0.1528E-11	-0.9225E-12	0.2268E-08	9	10
2260	0.1000E+02	0.2109E-12	-0.1035E-11	0.2711E-11	0.1436E-11	-0.8437E-12	0.2075E-08	9	10
2270	0.1000E+02	0.1930E-12	-0.9478E-12	0.2479E-11	0.1287E-11	-0.7729E-12	0.1897E-08	9	10
2280	0.1000E+02	0.1766E-12	-0.8676E-12	0.2269E-11	0.1169E-11	-0.7074E-12	0.1743E-08	9	10
2290	0.1000E+02	0.1616E-12	-0.7933E-12	0.2079E-11	0.1064E-11	-0.6464E-12	0.1595E-08	9	10
2300	0.1000E+02	0.1479E-12	-0.7268E-12	0.1900E-11	0.9729E-12	-0.5924E-12	0.1455E-08	9	10
2310	0.1000E+02	0.1353E-12	-0.6651E-12	0.1738E-11	0.8867E-12	-0.5423E-12	0.1332E-08	9	10
2320	0.1000E+02	0.1239E-12	-0.6096E-12	0.1591E-11	0.8060E-12	-0.4970E-12	0.1220E-08	9	10
2330	0.1000E+02	0.1133E-12	-0.5574E-12	0.1456E-11	0.7476E-12	-0.4544E-12	0.1113E-08	9	10
2340	0.1000E+02	0.1038E-12	-0.5094E-12	0.1335E-11	0.6765E-12	-0.4147E-12	0.1021E-08	9	10
2350	0.1000E+02	0.9490E-13	-0.4672E-12	0.1220E-11	0.6385E-12	-0.3806E-12	0.9323E-09	9	10
2360	0.1000E+02	0.8690E-13	-0.4275E-12	0.1118E-11	0.5672E-12	-0.3480E-12	0.8575E-09	9	10
2370	0.1000E+02	0.7947E-13	-0.3913E-12	0.1022E-11	0.5345E-12	-0.3184E-12	0.7839E-09	9	10
2380	0.1000E+02	0.7283E-13	-0.3581E-12	0.9358E-12	0.4880E-12	-0.2913E-12	0.7215E-09	9	10
2390	0.1000E+02	0.6665E-13	-0.3283E-12	0.8547E-12	0.4272E-12	-0.2672E-12	0.6561E-09	9	10
2400	0.1000E+02	0.6105E-13	-0.3001E-12	0.7854E-12	0.3765E-12	-0.2438E-12	0.5972E-09	9	10
2410	0.1000E+02	0.5579E-13	-0.2746E-12	0.7183E-12	0.3675E-12	-0.2232E-12	0.5480E-09	9	10
2420	0.1000E+02	0.5113E-13	-0.2516E-12	0.6577E-12	0.3358E-12	-0.2045E-12	0.5024E-09	9	10
2430	0.1000E+02	0.4673E-13	-0.2309E-12	0.6003E-12	0.3028E-12	-0.1878E-12	0.4566E-09	9	10
2440	0.1000E+02	0.4294E-13	-0.2109E-12	0.5509E-12	0.2502E-12	-0.1711E-12	0.4243E-09	9	10
2450	0.1000E+02	0.3920E-13	-0.1936E-12	0.5027E-12	0.2680E-12	-0.1572E-12	0.3828E-09	9	10
2460	0.1000E+02	0.3594E-13	-0.1768E-12	0.4622E-12	0.2106E-12	-0.1432E-12	0.3513E-09	9	10
2470	0.1000E+02	0.3291E-13	-0.1615E-12	0.4234E-12	0.2083E-12	-0.1303E-12	0.3246E-09	9	10
2480	0.1000E+02	0.3010E-13	-0.1491E-12	0.3862E-12	0.1944E-12	-0.1210E-12	0.2950E-09	9	10
2490	0.1000E+02	0.2766E-13	-0.1365E-12	0.3544E-12	0.1863E-12	-0.1107E-12	0.2707E-09	9	10
2500	0.1000E+02	0.2533E-13	-0.1246E-12	0.3259E-12	0.1742E-12	-0.1007E-12	0.2496E-09	9	10

Listing B-3. Continued

ITERATION NUMBER 2500

VARIABLES AT J = 1

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00
2	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1000E+00
3	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.2000E+00
4	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.3000E+00
5	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.4000E+00
6	0.1024E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.5000E+00
7	0.1024E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.6000E+00
8	0.1024E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7000E+00
9	0.1024E+02	0.5381E+03	0.7587E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.8000E+00
10	0.1024E+02	0.5381E+03	0.7587E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.9000E+00
11	0.1024E+02	0.5381E+03	0.7587E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1000E+01

VARIABLES AT J = 2

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1025E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.2500E+00	0.0000E+00
2	0.1025E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	-0.8937E-05	0.2500E+00	0.1000E+00
3	0.1025E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	-0.1586E-04	0.2500E+00	0.2000E+00
4	0.1025E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	-0.2225E-04	0.2500E+00	0.3000E+00
5	0.1025E+02	0.5381E+03	0.7587E+00	0.1500E+02	0.1000E+01	-0.2752E-04	0.2500E+00	0.4000E+00
6	0.1025E+02	0.5381E+03	0.7587E+00	0.1501E+02	0.1000E+01	-0.3039E-04	0.2500E+00	0.5000E+00
7	0.1025E+02	0.5381E+03	0.7588E+00	0.1501E+02	0.1000E+01	-0.3085E-04	0.2500E+00	0.6000E+00
8	0.1025E+02	0.5381E+03	0.7588E+00	0.1501E+02	0.1000E+01	-0.2750E-04	0.2500E+00	0.7000E+00
9	0.1025E+02	0.5381E+03	0.7588E+00	0.1501E+02	0.1000E+01	-0.1996E-04	0.2500E+00	0.8000E+00
10	0.1025E+02	0.5381E+03	0.7588E+00	0.1501E+02	0.1000E+01	-0.1158E-04	0.2500E+00	0.9000E+00
11	0.1025E+02	0.5381E+03	0.7588E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.2500E+00	0.1000E+01

VARIABLES AT J = 3

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1025E+02	0.5381E+03	0.7584E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.5000E+00	0.0000E+00
2	0.1025E+02	0.5381E+03	0.7584E+00	0.1500E+02	0.1000E+01	0.4498E-04	0.5000E+00	0.1000E+00
3	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.9619E-04	0.5000E+00	0.2000E+00
4	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.1325E-03	0.5000E+00	0.3000E+00
5	0.1024E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.1623E-03	0.5000E+00	0.4000E+00
6	0.1024E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.1733E-03	0.5000E+00	0.5000E+00
7	0.1024E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.1708E-03	0.5000E+00	0.6000E+00
8	0.1024E+02	0.5380E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.1461E-03	0.5000E+00	0.7000E+00
9	0.1024E+02	0.5380E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.1065E-03	0.5000E+00	0.8000E+00
10	0.1024E+02	0.5380E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.4777E-04	0.5000E+00	0.9000E+00
11	0.1024E+02	0.5380E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.5000E+00	0.1000E+01

VARIABLES AT J = 4

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1025E+02	0.5382E+03	0.7583E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.7500E+00	0.0000E+00
2	0.1025E+02	0.5382E+03	0.7583E+00	0.1501E+02	0.1000E+01	0.2169E-04	0.7500E+00	0.1000E+00
3	0.1025E+02	0.5382E+03	0.7584E+00	0.1501E+02	0.1000E+01	0.4763E-04	0.7500E+00	0.2000E+00
4	0.1025E+02	0.5382E+03	0.7585E+00	0.1501E+02	0.1000E+01	0.6022E-04	0.7500E+00	0.3000E+00

Listing B-3. Continued

5	0.1025E+02	0.5381E+03	0.7586E+00	0.1501E+02	0.1000E+01	0.6153E-04	0.7500E+00	0.4000E+00
6	0.1025E+02	0.5381E+03	0.7588E+00	0.1501E+02	0.1000E+01	0.4956E-04	0.7500E+00	0.5000E+00
7	0.1025E+02	0.5381E+03	0.7590E+00	0.1501E+02	0.1000E+01	0.2958E-04	0.7500E+00	0.6000E+00
8	0.1025E+02	0.5381E+03	0.7591E+00	0.1501E+02	0.1000E+01	0.3896E-05	0.7500E+00	0.7000E+00
9	0.1025E+02	0.5381E+03	0.7593E+00	0.1501E+02	0.1000E+01	-0.4007E-05	0.7500E+00	0.8000E+00
10	0.1025E+02	0.5381E+03	0.7594E+00	0.1501E+02	0.1000E+01	-0.5936E-06	0.7500E+00	0.9000E+00
11	0.1025E+02	0.5381E+03	0.7594E+00	0.1501E+02	0.1000E+01	-0.2356E-20	0.7500E+00	0.1000E+01

VARIABLES AT J = 5

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1025E+02	0.5382E+03	0.7576E+00	0.1500E+02	0.1000E+01	0.1209E-17	0.1000E+01	0.0000E+00
2	0.1025E+02	0.5382E+03	0.7576E+00	0.1500E+02	0.1000E+01	0.2851E-03	0.1000E+01	0.1000E+00
3	0.1025E+02	0.5382E+03	0.7577E+00	0.1500E+02	0.1000E+01	0.6132E-03	0.1000E+01	0.2000E+00
4	0.1025E+02	0.5381E+03	0.7579E+00	0.1500E+02	0.1000E+01	0.8553E-03	0.1000E+01	0.3000E+00
5	0.1025E+02	0.5381E+03	0.7582E+00	0.1500E+02	0.1000E+01	0.1060E-02	0.1000E+01	0.4000E+00
6	0.1024E+02	0.5380E+03	0.7584E+00	0.1499E+02	0.1000E+01	0.1160E-02	0.1000E+01	0.5000E+00
7	0.1024E+02	0.5380E+03	0.7587E+00	0.1499E+02	0.1000E+01	0.1162E-02	0.1000E+01	0.6000E+00
8	0.1023E+02	0.5379E+03	0.7589E+00	0.1499E+02	0.1000E+01	0.1043E-02	0.1000E+01	0.7000E+00
9	0.1023E+02	0.5379E+03	0.7590E+00	0.1499E+02	0.1000E+01	0.7928E-03	0.1000E+01	0.8000E+00
10	0.1023E+02	0.5378E+03	0.7592E+00	0.1499E+02	0.1000E+01	0.3556E-03	0.1000E+01	0.9000E+00
11	0.1023E+02	0.5378E+03	0.7592E+00	0.1499E+02	0.1000E+01	0.2414E-17	0.1000E+01	0.1000E+01

VARIABLES AT J = 6

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1028E+02	0.5386E+03	0.7556E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.1250E+01	0.0000E+00
2	0.1028E+02	0.5386E+03	0.7556E+00	0.1501E+02	0.1000E+01	0.4423E-03	0.1250E+01	0.1000E+00
3	0.1028E+02	0.5385E+03	0.7560E+00	0.1501E+02	0.1000E+01	0.9123E-03	0.1250E+01	0.2000E+00
4	0.1027E+02	0.5385E+03	0.7566E+00	0.1501E+02	0.1000E+01	0.1246E-02	0.1250E+01	0.3000E+00
5	0.1026E+02	0.5383E+03	0.7575E+00	0.1501E+02	0.1000E+01	0.1451E-02	0.1250E+01	0.4000E+00
6	0.1025E+02	0.5382E+03	0.7586E+00	0.1501E+02	0.1000E+01	0.1463E-02	0.1250E+01	0.5000E+00
7	0.1025E+02	0.5381E+03	0.7597E+00	0.1502E+02	0.1000E+01	0.1320E-02	0.1250E+01	0.6000E+00
8	0.1024E+02	0.5379E+03	0.7611E+00	0.1502E+02	0.1000E+01	0.9182E-03	0.1250E+01	0.7000E+00
9	0.1023E+02	0.5378E+03	0.7623E+00	0.1503E+02	0.1000E+01	0.5437E-03	0.1250E+01	0.8000E+00
10	0.1022E+02	0.5377E+03	0.7633E+00	0.1503E+02	0.1000E+01	-0.1933E-04	0.1250E+01	0.9000E+00
11	0.1022E+02	0.5377E+03	0.7633E+00	0.1503E+02	0.1000E+01	0.0000E+00	0.1250E+01	0.1000E+01

VARIABLES AT J = 7

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1032E+02	0.5392E+03	0.7513E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.1500E+01	0.0000E+00
2	0.1032E+02	0.5392E+03	0.7513E+00	0.1501E+02	0.1000E+01	0.1665E-02	0.1500E+01	0.1000E+00
3	0.1031E+02	0.5391E+03	0.7521E+00	0.1500E+02	0.1000E+01	0.3712E-02	0.1500E+01	0.2000E+00
4	0.1030E+02	0.5388E+03	0.7534E+00	0.1500E+02	0.1000E+01	0.5269E-02	0.1500E+01	0.3000E+00
5	0.1028E+02	0.5386E+03	0.7552E+00	0.1500E+02	0.1000E+01	0.6824E-02	0.1500E+01	0.4000E+00
6	0.1025E+02	0.5382E+03	0.7575E+00	0.1499E+02	0.1000E+01	0.7797E-02	0.1500E+01	0.5000E+00
7	0.1023E+02	0.5378E+03	0.7597E+00	0.1499E+02	0.1000E+01	0.8420E-02	0.1500E+01	0.6000E+00
8	0.1019E+02	0.5372E+03	0.7626E+00	0.1497E+02	0.1000E+01	0.8255E-02	0.1500E+01	0.7000E+00
9	0.1017E+02	0.5369E+03	0.7641E+00	0.1496E+02	0.1000E+01	0.7194E-02	0.1500E+01	0.8000E+00
10	0.1012E+02	0.5362E+03	0.7666E+00	0.1493E+02	0.1000E+01	0.5040E-02	0.1500E+01	0.9000E+00
11	0.1012E+02	0.5362E+03	0.7666E+00	0.1493E+02	0.1000E+01	0.0000E+00	0.1500E+01	0.1000E+01

VARIABLES AT J = 8

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1044E+02	0.5410E+03	0.7388E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.1750E+01	0.0000E+00
2	0.1044E+02	0.5410E+03	0.7388E+00	0.1500E+02	0.1000E+01	0.3387E-02	0.1750E+01	0.1000E+00
3	0.1042E+02	0.5408E+03	0.7402E+00	0.1500E+02	0.1000E+01	0.7482E-02	0.1750E+01	0.2000E+00
4	0.1040E+02	0.5404E+03	0.7432E+00	0.1500E+02	0.9999E+00	0.1047E-01	0.1750E+01	0.3000E+00
5	037E+02	0.5399E+03	0.7463E+00	0.1501E+02	0.9999E+0	1354E-01	0.1750E+01	0.4000E+00
6	31E+02	0.5391E+03	0.7526E+00	0.1501E+02	0.9999E+0	1487E-01	0.1750E+01	0.5000E+00

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7	1027E+02	0.5385E+03	0.7574E+00	0.1503E+02	0.9999E+(	).1607E-01	0.1750E+01	0.6000E+00
8	1017E+02	0.5370E+03	0.7687E+00	0.1504E+02	0.9999E+(	).1388E-01	0.1750E+01	0.7000E+00
9	0.1014E+02	0.5364E+03	0.7746E+00	0.1507E+02	0.9999E+00	0.1278E-01	0.1750E+01	0.8000E+00
10	0.9943E+01	0.5335E+03	0.7966E+00	0.1510E+02	0.1000E+01	0.2664E-02	0.1750E+01	0.9000E+00
11	0.9943E+01	0.5335E+03	0.7966E+00	0.1510E+02	0.1000E+01	0.0000E+00	0.1750E+01	0.1000E+01

VARIABLES AT J = 9

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1067E+02	0.5443E+03	0.7167E+00	0.1502E+02	0.1000E+01	0.0000E+00	0.2000E+01	0.0000E+00
2	0.1067E+02	0.5443E+03	0.7167E+00	0.1502E+02	0.1000E+01	0.6778E-02	0.2000E+01	0.1000E+00
3	0.1065E+02	0.5440E+03	0.7188E+00	0.1502E+02	0.9998E+00	0.1745E-01	0.2000E+01	0.2000E+00
4	0.1059E+02	0.5431E+03	0.7243E+00	0.1502E+02	0.9997E+00	0.2408E-01	0.2000E+01	0.3000E+00
5	0.1056E+02	0.5426E+03	0.7293E+00	0.1504E+02	0.9994E+00	0.3588E-01	0.2000E+01	0.4000E+00
6	0.1043E+02	0.5405E+03	0.741[illegible]E+00	0.1502E+02	0.9992E+00	0.4088E-01	0.2000E+01	0.5000E+00
7	0.1039E+02	0.5399E+03	0.7497E+00	0.1508E+02	0.9984E+00	0.5664E-01	0.2000E+01	0.6000E+00
8	0.1012E+02	0.5358E+03	0.7728E+00	0.1502E+02	0.9983E+00	0.5760E-01	0.2000E+01	0.7000E+00
9	0.1010E+02	0.5353E+03	0.7856E+00	0.1518E+02	0.9965E+00	0.8347E-01	0.2000E+01	0.8000E+00
10	0.9585E+01	0.5273E+03	0.8270E+00	0.1501E+02	0.9972E+00	0.7422E-01	0.2000E+01	0.9000E+00
11	0.9622E+01	0.5280E+03	0.8220E+00	0.1499E+02	0.9923E+00	0.1240E+00	0.2000E+01	0.1000E+01

VARIABLES AT J = 10

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1103E+02	0.5497E+03	0.6756E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.2250E+01	0.0000E+00
2	0.1103E+02	0.5497E+03	0.6756E+00	0.1498E+02	0.9999E+00	0.1218E-01	0.2250E+01	0.1062E+00
3	0.1102E+02	0.5495E+03	0.6771E+00	0.1498E+02	0.9995E+00	0.3307E-01	0.2250E+01	0.2125E+00
4	0.1098E+02	0.5486E+03	0.6814E+00	0.1496E+02	0.9990E+00	0.4544E-01	0.2250E+01	0.3187E+00
5	0.1095E+02	0.5485E+03	0.6848E+00	0.1499E+02	0.9976E+00	0.6958E-01	0.2250E+01	0.4250E+00
6	0.1081E+02	0.5466E+03	0.6932E+00	0.1491E+02	0.9967E+00	0.8087E-01	0.2250E+01	0.5312E+00
7	0.1082E+02	0.5468E+03	0.6982E+00	0.1499E+02	0.9936E+00	0.1131E+00	0.2250E+01	0.6375E+00
8	0.1058E+02	0.5432E+03	0.7112E+00	0.1482E+02	0.9926E+00	0.1211E+00	0.2250E+01	0.7437E+00
9	0.1064E+02	0.5443E+03	0.7197E+00	0.1502E+02	0.9858E+00	0.1678E+00	0.2250E+01	0.8500E+00
10	0.1024E+02	0.5390E+03	0.7290E+00	0.1458E+02	0.9857E+00	0.1687E+00	0.2250E+01	0.9562E+00
11	0.1036E+02	0.5408E+03	0.7175E+00	0.1460E+02	0.9701E+00	0.2425E+00	0.2250E+01	0.1062E+01

VARIABLES AT J = 11

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1156E+02	0.5571E+03	0.6205E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.2500E+01	0.0000E+00
2	0.1156E+02	0.5571E+03	0.6205E+00	0.1498E+02	0.9999E+00	0.1621E-01	0.2500E+01	0.1125E+00
3	0.1155E+02	0.5570E+03	0.6210E+00	0.1498E+02	0.9991E+00	0.4174E-01	0.2500E+01	0.2250E+00
4	0.1153E+02	0.5567E+03	0.6219E+00	0.1496E+02	0.9983E+00	0.5821E-01	0.2500E+01	0.3375E+00
5	0.1154E+02	0.5569E+03	0.6230E+00	0.1499E+02	0.9963E+00	0.8576E-01	0.2500E+01	0.4500E+00
6	0.1150E+02	0.5563E+03	0.6235E+00	0.1494E+02	0.9948E+00	0.1022E+00	0.2500E+01	0.5625E+00
7	0.1153E+02	0.5569E+03	0.6253E+00	0.1501E+02	0.9910E+00	0.1336E+00	0.2500E+01	0.6750E+00
8	0.1148E+02	0.5562E+03	0.6237E+00	0.1492E+02	0.9887E+00	0.1499E+00	0.2500E+01	0.7875E+00
9	0.1154E+02	0.5573E+03	0.6271E+00	0.1504E+02	0.9828E+00	0.1847E+00	0.2500E+01	0.9000E+00
10	0.1153E+02	0.5575E+03	0.6077E+00	0.1479E+02	0.9790E+00	0.2039E+00	0.2500E+01	0.1012E+01
11	0.1159E+02	0.5583E+03	0.6017E+00	0.1480E+02	0.9701E+00	0.2425E+00	0.2500E+01	0.1125E+01

VARIABLES AT J = 12

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1201E+02	0.5633E+03	0.5718E+00	0.1500E+02	0.1000E+01	-0.1002E-15	0.2750E+01	0.0000E+00
2	0.1201E+02	0.5633E+03	0.5718E+00	0.1500E+02	0.9998E+00	0.1910E-01	0.2750E+01	0.1187E+00
3	0.1201E+02	0.5633E+03	0.5717E+00	0.1500E+02	0.9990E+00	0.4521E-01	0.2750E+01	0.2375E+00
4	0.1201E+02	0.5632E+03	0.5711E+00	0.1498E+02	0.9979E+00	0.6462E-01	0.2750E+01	0.3562E+00
5	0.1202E+02	0.5635E+03	0.5713E+00	0.1500E+02	0.9958E+00	0.9158E-01	0.2750E+01	0.4750E+00
6	0.1202E+02	0.5634E+03	0.5692E+00	0.1497E+02	0.9937E+00	0.1117E+00	0.2750E+01	0.5937E+00
7	0.1205E+02	0.5638E+03	0.5698E+00	0.1501E+02	0.9902E+00	0.1398E+00	0.2750E+01	0.7125E+00
8	0.1205E+02	0.5638E+03	0.5661E+00	0.1497E+02	0.9870E+00	0.1607E+00	0.2750E+01	0.8312E+00

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9	0.1209E+02	0.5647E+03	0.5655E+00	0.1501E+02	0.9819E+00	0.1892E+00	0.2750E+01	0.9500E+00
10	0.1211E+02	0.5651E+03	0.5476E+00	0.1484E+02	0.9766E+00	0.2150E+00	0.2750E+01	0.1069E+01
11	0.1215E+02	0.5656E+03	0.5432E+00	0.1485E+02	0.9701E+00	0.2425E+00	0.2750E+01	0.1187E+01

VARIABLES AT J = 13

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1236E+02	0.5679E+03	0.5320E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.3000E+01	0.0000E+00
2	0.1236E+02	0.5679E+03	0.5320E+00	0.1499E+02	0.9998E+00	0.2129E-01	0.3000E+01	0.1250E+00
3	0.1237E+02	0.5679E+03	0.5317E+00	0.1499E+02	0.9989E+00	0.4721E-01	0.3000E+01	0.2500E+00
4	0.1237E+02	0.5680E+03	0.5308E+00	0.1498E+02	0.9976E+00	0.6874E-01	0.3000E+01	0.3750E+00
5	0.1238E+02	0.5681E+03	0.5304E+00	0.1499E+02	0.9955E+00	0.9502E-01	0.3000E+01	0.5000E+00
6	0.1238E+02	0.5682E+03	0.5282E+00	0.1497E+02	0.9931E+00	0.1172E+00	0.3000E+01	0.6250E+00
7	0.1240E+02	0.5685E+03	0.5279E+00	0.1500E+02	0.9896E+00	0.1436E+00	0.3000E+01	0.7500E+00
8	0.1241E+02	0.5687E+03	0.5247E+00	0.1497E+02	0.9860E+00	0.1665E+00	0.3000E+01	0.8750E+00
9	0.1244E+02	0.5693E+03	0.5212E+00	0.1497E+02	0.9813E+00	0.1927E+00	0.3000E+01	0.1000E+01
10	0.1246E+02	0.5697E+03	0.5066E+00	0.1485E+02	0.9756E+00	0.2195E+00	0.3000E+01	0.1125E+01
11	0.1250E+02	0.5702E+03	0.5026E+00	0.1485E+02	0.9701E+00	0.2425E+00	0.3000E+01	0.1250E+01

VARIABLES AT J = 14

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1266E+02	0.5718E+03	0.4975E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.3250E+01	0.0000E+00
2	0.1266E+02	0.5718E+03	0.4975E+00	0.1499E+02	0.9997E+00	0.2277E-01	0.3250E+01	0.1312E+00
3	0.1266E+02	0.5718E+03	0.4970E+00	0.1499E+02	0.9988E+00	0.4826E-01	0.3250E+01	0.2625E+00
4	0.1267E+02	0.5718E+03	0.4960E+00	0.1499E+02	0.9975E+00	0.7113E-01	0.3250E+01	0.3937E+00
5	0.1268E+02	0.5720E+03	0.4951E+00	0.1499E+02	0.9953E+00	0.9676E-01	0.3250E+01	0.5250E+00
6	0.1269E+02	0.5721E+03	0.4929E+00	0.1498E+02	0.9928E+00	0.1201E+00	0.3250E+01	0.6562E+00
7	0.1271E+02	0.5724E+03	0.4921E+00	0.1499E+02	0.9894E+00	0.1453E+00	0.3250E+01	0.7875E+00
8	0.1272E+02	0.5727E+03	0.4889E+00	0.1498E+02	0.9856E+00	0.1691E+00	0.3250E+01	0.9187E+00
9	0.1275E+02	0.5733E+03	0.4835E+00	0.1496E+02	0.9810E+00	0.1942E+00	0.3250E+01	0.1050E+01
10	0.1277E+02	0.5737E+03	0.4712E+00	0.1487E+02	0.9753E+00	0.2210E+00	0.3250E+01	0.1181E+01
11	0.1280E+02	0.5741E+03	0.4677E+00	0.1487E+02	0.9701E+00	0.2425E+00	0.3250E+01	0.1312E+01

VARIABLES AT J = 15

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1291E+02	0.5749E+03	0.4678E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.3500E+01	0.0000E+00
2	0.1291E+02	0.5749E+03	0.4678E+00	0.1499E+02	0.9997E+00	0.2367E-01	0.3500E+01	0.1375E+00
3	0.1291E+02	0.5750E+03	0.4672E+00	0.1499E+02	0.9988E+00	0.4871E-01	0.3500E+01	0.2750E+00
4	0.1292E+02	0.5750E+03	0.4661E+00	0.1499E+02	0.9974E+00	0.7236E-01	0.3500E+01	0.4125E+00
5	0.1293E+02	0.5752E+03	0.4649E+00	0.1499E+02	0.9952E+00	0.9747E-01	0.3500E+01	0.5500E+00
6	0.1294E+02	0.5753E+03	0.4630E+00	0.1498E+02	0.9926E+00	0.1214E+00	0.3500E+01	0.6875E+00
7	0.1295E+02	0.5756E+03	0.4619E+00	0.1499E+02	0.9893E+00	0.1459E+00	0.3500E+01	0.8250E+00
8	0.1297E+02	0.5759E+03	0.4587E+00	0.1498E+02	0.9854E+00	0.1701E+00	0.3500E+01	0.9625E+00
9	0.1299E+02	0.5764E+03	0.4522E+00	0.1495E+02	0.9808E+00	0.1948E+00	0.3500E+01	0.1100E+01
10	0.1302E+02	0.5768E+03	0.4419E+00	0.1489E+02	0.9753E+00	0.2210E+00	0.3500E+01	0.1237E+01
11	0.1304E+02	0.5771E+03	0.4387E+00	0.1489E+02	0.9701E+00	0.2425E+00	0.3500E+01	0.1375E+01

VARIABLES AT J = 16

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1311E+02	0.5775E+03	0.4418E+00	0.1499E+02	0.1000E+01	0.1281E-15	0.3750E+01	0.0000E+00
2	0.1311E+02	0.5775E+03	0.4418E+00	0.1499E+02	0.9997E+00	0.2416E-01	0.3750E+01	0.1437E+00
3	0.1312E+02	0.5775E+03	0.4412E+00	0.1499E+02	0.9988E+00	0.4886E-01	0.3750E+01	0.2875E+00
4	0.1312E+02	0.5776E+03	0.4401E+00	0.1499E+02	0.9973E+00	0.7292E-01	0.3750E+01	0.4312E+00
5	0.1313E+02	0.5778E+03	0.4388E+00	0.1499E+02	0.9952E+00	0.9766E-01	0.3750E+01	0.5750E+00
6	0.1314E+02	0.5779E+03	0.4371E+00	0.1499E+02	0.9926E+00	0.1218E+00	0.3750E+01	0.7187E+00
7	0.1316E+02	0.5781E+03	0.4358E+00	0.1499E+02	0.9893E+00	0.1459E+00	0.3750E+01	0.8625E+00
8	0.1318E+02	0.5785E+03	0.4324E+00	0.1498E+02	0.9854E+00	0.1702E+00	0.3750E+01	0.1006E+01
9	[illegible]119E+02	0.5789E+03	0.4255E+00	0.1494E+02	0.9808E+0[illegible]	[illegible].1949E+00	0.3750E+01	0.1150E+01
10	[illegible].22E+02	0.5793E+03	0.4167E+00	0.1490E+02	0.9754E+0[illegible]	[illegible].2205E+00	0.3750E+01	0.1294E+01

Listing B-3. Continued

11	[illegible]324E+02	0.5796E+03	0.4137E+00	0.1490E+02	0.9701E+[illegible]	[illegible]2425E+00	0.3750E+01	0.1437E+01

VARIABLES AT J = 17

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1329E+02	0.5797E+03	0.4191E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.4000E+01	0.0000E+00
2	0.1329E+02	0.5797E+03	0.4191E+00	0.1499E+02	0.9997E+00	0.2433E-01	0.4000E+01	0.1500E+00
3	0.1329E+02	0.5797E+03	0.4185E+00	0.1499E+02	0.9988E+00	0.4869E-01	0.4000E+01	0.3000E+00
4	0.1330E+02	0.5798E+03	0.4173E+00	0.1499E+02	0.9973E+00	0.7289E-01	0.4000E+01	0.4500E+00
5	0.1331E+02	0.5799E+03	0.4160E+00	0.1499E+02	0.9953E+00	0.9730E-01	0.4000E+01	0.6000E+00
6	0.1332E+02	0.5801E+03	0.4145E+00	0.1499E+02	0.9926E+00	0.1215E+00	0.4000E+01	0.7500E+00
7	0.1333E+02	0.5803E+03	0.4130E+00	0.1499E+02	0.9894E+00	0.1454E+00	0.4000E+01	0.9000E+00
8	0.1335E+02	0.5807E+03	0.4094E+00	0.1498E+02	0.9855E+00	0.1698E+00	0.4000E+01	0.1050E+01
9	0.1337E+02	0.5810E+03	0.4023E+00	0.1494E+02	0.9809E+00	0.1945E+00	0.4000E+01	0.1200E+01
10	0.1339E+02	0.5814E+03	0.3945E+00	0.1490E+02	0.9755E+00	0.2198E+00	0.4000E+01	0.1350E+01
11	0.1341E+02	0.5817E+03	0.3917E+00	0.1490E+02	0.9701E+00	0.2425E+00	0.4000E+01	0.1500E+01

VARIABLES AT J = 18

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1343E+02	0.5815E+03	0.3989E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.4250E+01	0.0000E+00
2	0.1343E+02	0.5815E+03	0.3989E+00	0.1499E+02	0.9997E+00	0.2430E-01	0.4250E+01	0.1562E+00
3	0.1344E+02	0.5816E+03	0.3983E+00	0.1499E+02	0.9988E+00	0.4835E-01	0.4250E+01	0.3125E+00
4	0.1345E+02	0.5816E+03	0.3971E+00	0.1499E+02	0.9974E+00	0.7252E-01	0.4250E+01	0.4687E+00
5	0.1345E+02	0.5818E+03	0.3958E+00	0.1499E+02	0.9953E+00	0.9663E-01	0.4250E+01	0.6250E+00
6	0.1347E+02	0.5819E+03	0.3943E+00	0.1499E+02	0.9927E+00	0.1207E+00	0.4250E+01	0.7812E+00
7	0.1348E+02	0.5821E+03	0.3926E+00	0.1499E+02	0.9895E+00	0.1445E+00	0.4250E+01	0.9375E+00
8	0.1350E+02	0.5825E+03	0.3886E+00	0.1498E+02	0.9856E+00	0.1691E+00	0.4250E+01	0.1094E+01
9	0.1351E+02	0.5828E+03	0.3816E+00	0.1494E+02	0.9810E+00	0.1939E+00	0.4250E+01	0.1250E+01
10	0.1353E+02	0.5832E+03	0.3745E+00	0.1491E+02	0.9757E+00	0.2191E+00	0.4250E+01	0.1406E+01
11	0.1355E+02	0.5834E+03	0.3719E+00	0.1491E+02	0.9701E+00	0.2425E+00	0.4250E+01	0.1562E+01

VARIABLES AT J = 19

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1356E+02	0.5831E+03	0.3811E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.4500E+01	0.0000E+00
2	0.1356E+02	0.5831E+03	0.3811E+00	0.1499E+02	0.9997E+00	0.2399E-01	0.4500E+01	0.1625E+00
3	0.1357E+02	0.5832E+03	0.3805E+00	0.1499E+02	0.9989E+00	0.4755E-01	0.4500E+01	0.3250E+00
4	0.1357E+02	0.5832E+03	0.3793E+00	0.1499E+02	0.9974E+00	0.7145E-01	0.4500E+01	0.4875E+00
5	0.1358E+02	0.5834E+03	0.3779E+00	0.1499E+02	0.9955E+00	0.9514E-01	0.4500E+01	0.6500E+00
6	0.1360E+02	0.5835E+03	0.3764E+00	0.1499E+02	0.9929E+00	0.1190E+00	0.4500E+01	0.8125E+00
7	0.1361E+02	0.5837E+03	0.3745E+00	0.1499E+02	0.9898E+00	0.1427E+00	0.4500E+01	0.9750E+00
8	0.1363E+02	0.5841E+03	0.3701E+00	0.1498E+02	0.9859E+00	0.1675E+00	0.4500E+01	0.1137E+01
9	0.1364E+02	0.5844E+03	0.3631E+00	0.1494E+02	0.9813E+00	0.1926E+00	0.4500E+01	0.1300E+01
10	0.1366E+02	0.5848E+03	0.3564E+00	0.1492E+02	0.9759E+00	0.2181E+00	0.4500E+01	0.1462E+01
11	0.1368E+02	0.5850E+03	0.3539E+00	0.1492E+02	0.9701E+00	0.2425E+00	0.4500E+01	0.1625E+01

VARIABLES AT J = 20

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1367E+02	0.5844E+03	0.3652E+00	0.1499E+02	0.1000E+01	-0.1540E-15	0.4750E+01	0.0000E+00
2	0.1367E+02	0.5844E+03	0.3652E+00	0.1499E+02	0.9997E+00	0.2354E-01	0.4750E+01	0.1687E+00
3	0.1368E+02	0.5845E+03	0.3646E+00	0.1499E+02	0.9989E+00	0.4653E-01	0.4750E+01	0.3375E+00
4	0.1368E+02	0.5846E+03	0.3633E+00	0.1499E+02	0.9975E+00	0.7005E-01	0.4750E+01	0.5062E+00
5	0.1369E+02	0.5847E+03	0.3618E+00	0.1499E+02	0.9956E+00	0.9326E-01	0.4750E+01	0.6750E+00
6	0.1371E+02	0.5849E+03	0.3601E+00	0.1499E+02	0.9931E+00	0.1169E+00	0.4750E+01	0.8437E+00
7	0.1372E+02	0.5851E+03	0.3578E+00	0.1499E+02	0.9901E+00	0.1405E+00	0.4750E+01	0.1012E+01
8	0.1374E+02	0.5854E+03	0.3529E+00	0.1497E+02	0.9862E+00	0.1654E+00	0.4750E+01	0.1181E+01
9	0.1375E+02	0.5858E+03	0.3458E+00	0.1494E+02	0.9816E+00	0.1910E+00	0.4750E+01	0.1350E+01
10	0.1377E+02	0.5861E+03	0.3393E+00	0.1491E+02	0.9762E+00	0.2169E+00	0.4750E+01	0.1519E+01
11	0.1379E+02	0.5863E+03	0.3368E+00	0.1492E+02	0.9701E+00	0.2425E+00	0.4750E+01	0.1687E+01

Listing B-3. Continued

VARIABLES AT J = 21

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1377E+02	0.5856E+03	0.3512E+00	0.1499E+02	0.1000E+01	-0 1600E-15	0.5000E+01	0.0000E+00
2	0.1377E+02	0.5856E+03	0.3512E+00	0.1499E+02	0 9997E+00	0.2272E-01	0.5000E+01	0.1750E+00
3	0.1377E+02	0.5856E+03	0.3505E+00	0.1499E+02	0.9990E+00	0.4467E-01	0 5000E+01	0.3500E+00
4	0.1378E+02	0.5857E+03	0.3491E+00	0.1499E+02	0.9977E+00	0 6742E-01	0.5000E+01	0 5250E+00
5	0.1379E+02	0.5859E+03	0.3475E+00	0.1498E+02	0.9960E+00	0 8968E-01	0.5000E+01	0.7000E+00
6	0.1381E+02	0.5861E+03	0.3456E+00	0.1500E+02	0 9936E+00	0 1128E+00	0.5000E+01	0 8750E+00
7	0.1382E+02	0.5863E+03	0.3428E+00	0.1499E+02	0 9907E+00	0.1360E+00	0.5000E+01	0 1050E+01
8	0.1384E+02	0.5867E+03	0.3373E+00	0.1498E+02	0.9869E+00	0 1611E+00	0.5000E+01	0 1225E+01
9	0.1386E+02	0.5871E+03	0.3301E+00	0.1494E+02	0.9823E+00	0.1872E+00	0.5000E+01	0 1400E+01
10	0.1388E+02	0.5874E+03	0.3236E+00	0.1493E+02	0.9767E+00	0.2145E+00	0 5000E+01	0.1575E+01
11	0.1390E+02	0.5876E+03	0 3210E+00	0.1493E+02	0.9701E+00	0.2425E+00	0 5000E+01	0.1750E+01

VARIABLES AT J = 22

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1385E+02	0.5865E+03	0 3389E+00	0.1499E+02	0.1000E+01	-0.8285E-16	0.5250E+01	0.0000E+00
2	0.1385E+02	0.5865E+03	0.3389E+00	0.1499E+02	0.9998E+00	0.2169E-01	0.5250E+01	0.1812E+00
3	0.1385E+02	0.5866E+03	0.3381E+00	0.1499E+02	0 9991E+00	0.4242E-01	0.5250E+01	0.3625E+00
4	0.1386E+02	0 5867E+03	0.3365E+00	0.1499E+02	0 9979E+00	0.6424E-01	0.5250E+01	0.5437E+00
5	0.1387E+02	0.5868E+03	0.3347E+00	0.1499E+02	0 9963E+00	0.8543E-01	0 5250E+01	0 7250E+00
6	0.1389E+02	0.5871E+03	0 3323E+00	0.1499E+02	0.9941E+00	0.1080E+00	0.5250E+01	0.9062E+00
7	0.1390E+02	0.5873E+03	0.3289E+00	0.1498E+02	0 9914E+00	0 1308E+00	0.5250E+01	0.1087E+01
8	0.1393E+02	0.5878E+03	0.3223E+00	0.1497E+02	0.9877E+00	0.1562E+00	0.5250E+01	0.1269E+01
9	0.1394E+02	0.5881E+03	0.3145E+00	0.1493E+02	0 9831E+00	0 1829E+00	0.5250E+01	0.1450E+01
10	0.1397E+02	0.5885E+03	0.3071E+00	0.1492E+02	0.9775E+00	0.2111E+00	0.5250E+01	0 1631E+01
11	0.1399E+02	0.5887E+03	0.3045E+00	0.1492E+02	0.9701E+00	0.2425E+00	0.5250E+01	0 1812E+01

VARIABLES AT J = 23

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1391E+02	0 5874E+03	0 3282E+00	0.1499E+02	0.1000E+01	0.0000E+00	0 5500E+01	0 0000E+00
2	0.1391E+02	0 5874E+03	0.3282E+00	0 1499E+02	0.9998E+00	0.2011E-01	0 5500E+01	0.1875E+00
3	0 1392E+02	0.5874E+03	0.3273E+00	0.1499E+02	0.9992E+00	0.3885E-01	0.5500E+01	0.3750E+00
4	0.1393E+02	0.5876E+03	0.3255E+00	0.1499E+02	0.9983E+00	0.5904E-01	0.5500E+01	0 5625E+00
5	0.1394E+02	0.5877E+03	0.3235E+00	0.1499E+02	0.9969E+00	0.7806E-01	0 5500E+01	0.7500E+00
6	0.1397E+02	0.5880E+03	0.3204E+00	0.1500E+02	0.9951E+00	0.8924E-01	0 5500E+01	0 9375E+00
7	0.1398E+02	0.5883E+03	0.3163E+00	0.1499E+02	0.9928E+00	0.1198E+00	0.5500E+01	0.1125E+01
8	0.1402E+02	0.5889E+03	0.3086E+00	0.1498E+02	0.9895E+00	0.1448E+00	0.5500E+01	0.1312E+01
9	0 1404E+02	0.5892E+03	0 3004E+00	0.1494E+02	0.9854E+00	0 1700E+00	0 5500E+01	0.1500E+01
10	0 1408E+02	0.5899E+03	0 2919E+00	0.1494E+02	0.9794E+00	0.2019E+00	0.5500E+01	0.1687E+01
11	0.1410E+02	0.5900E+03	0 2886E+00	0.1494E+02	0.9701E+00	0.2425E+00	0 5500E+01	0.1875E+01

VARIABLES AT J = 24

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1397E+02	0.5880E+03	0.3193E+00	0.1499E+02	0.1000E+01	0 0000E+00	0 5750E+01	0.0000E+00
2	0.1397E+02	0.5880E+03	).3193E+00	0.1499E+02	0.9998E+00	0.1830E-01	0.5750E+01	0 1937E+00
3	0.1398E+02	0.5881E+03	0.3184E+00	0.1499E+02	0.9994E+00	0 3489E-01	0.5750E+01	0.3875E+00
4	0.1399E+02	0.5882E+03	0.3164E+00	0.1499E+02	0 9986E+00	0.5320E-01	0.5750E+01	0.5812E+00
5	0.1400E+02	0 5884E+03	0.3141E+00	0 1499E+02	0 9976E+00	0.6995E-01	0.5750E+01	0 7750E+00
6	0.1403E+02	0.5887E+03	0.3104E+00	0.1500E+02	0.9960E+00	0 8957E-01	0.5750E+01	0.9687E+00
7	0.1404E+02	0.5890E+03	0.3052E+00	0.1498E+02	0.9942E+00	0 1080E+00	0.5750E+01	0.1162E+01
8	0.1409E+02	0.5897E+03	0.2958E+00	0.1497E+02	0 9912E+00	0 1325E+00	0.5750E+01	0.1356E+01
9	0.1410E+02	0.5900E+03	0.2858E+00	0.1493E+02	0 9876E+00	0.1572E+00	0.5750E+01	0.1550E+01
10	0.1417E+02	0.5909E+03	0.2718E+00	0.1491E+02	0.9806E+00	0.1960E+00	0 5750E+01	0.1744E+01
11	0.1419E+02	0.5911E+03	0.2691E+00	0.1492E+02	0.9701E+00	0.2425E+00	0 5750E+01	0.1937E+01

VA' BLES AT J = 25

Listing B-3. Continued

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1401E+02	0.5885E+03	0.3118E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.6000E+01	0.0000E+00
2	0.1401E+02	0.5885E+03	0.3118E+00	0.1499E+02	0.9999E+00	0.1579E-01	0.6000E+01	0.2000E+00
3	0.1402E+02	0.5886E+03	0.3108E+00	0.1499E+02	0.9996E+00	0.2939E-01	0.6000E+01	0.4000E+00
4	0.1403E+02	0.5888E+03	0.3087E+00	0.1499E+02	0.9990E+00	0.4480E-01	0.6000E+01	0.6000E+00
5	0.1405E+02	0.5890E+03	0.3060E+00	0.1499E+02	0.9983E+00	0.5768E-01	0.6000E+01	0.8000E+00
6	0.1408E+02	0.5894E+03	0.3016E+00	0.1500E+02	0.9973E+00	0.7361E-01	0.6000E+01	0.1000E+01
7	0.1410E+02	0.5897E+03	0.2953E+00	0.1498E+02	0.9964E+00	0.8512E-01	0.6000E+01	0.1200E+01
8	0.1416E+02	0.5905E+03	0.2841E+00	0.1497E+02	0.9946E+00	0.1043E+00	0.6000E+01	0.1400E+01
9	0.1417E+02	0.5908E+03	0.2708E+00	0.1491E+02	0.9937E+00	0.1124E+00	0.6000E+01	0.1600E+01
10	0.1430E+02	0.5924E+03	0.2533E+00	0.1495E+02	0.9896E+00	0.1439E+00	0.6000E+01	0.1800E+01
11	0.1430E+02	0.5924E+03	0.2539E+00	0.1495E+02	0.9923E+00	0.1240E+00	0.6000E+01	0.2000E+01

VARIABLES AT J = 26

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1405E+02	0.5890E+03	0.3061E+00	0.1499E+02	0.1000E+01	0.4576E-16	0.6250E+01	0.0000E+00
2	0.1405E+02	0.5890E+03	0.3061E+00	0.1499E+02	0.9999E+00	0.1266E-01	0.6250E+01	0.2000E+00
3	0.1405E+02	0.5890E+03	0.3053E+00	0.1499E+02	0.9997E+00	0.2273E-01	0.6250E+01	0.4000E+00
4	0.1407E+02	0.5892E+03	0.3035E+00	0.1500E+02	0.9994E+00	0.3452E-01	0.6250E+01	0.6000E+00
5	0.1408E+02	0.5894E+03	0.3010E+00	0.1499E+02	0.9991E+00	0.4283E-01	0.6250E+01	0.8000E+00
6	0.1411E+02	0.5897E+03	0.2973E+00	0.1500E+02	0.9986E+00	0.5352E-01	0.6250E+01	0.1000E+01
7	0.1413E+02	0.5900E+03	0.2913E+00	0.1498E+02	0.9983E+00	0.5747E-01	0.6250E+01	0.1200E+01
8	0.1418E+02	0.5908E+03	0.2817E+00	0.1499E+02	0.9977E+00	0.6743E-01	0.6250E+01	0.1400E+01
9	0.1420E+02	0.5911E+03	0.2689E+00	0.1493E+02	0.9982E+00	0.5994E-01	0.6250E+01	0.1600E+01
10	0.1430E+02	0.5925E+03	0.2597E+00	0.1499E+02	0.9980E+00	0.6317E-01	0.6250E+01	0.1800E+01
11	0.1430E+02	0.5925E+03	0.2597E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.6250E+01	0.2000E+01

VARIABLES AT J = 27

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1407E+02	0.5892E+03	0.3020E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.6500E+01	0.0000E+00
2	0.1407E+02	0.5892E+03	0.3020E+00	0.1499E+02	0.9999E+00	0.1006E-01	0.6500E+01	0.2000E+00
3	0.1408E+02	0.5893E+03	0.3014E+00	0.1499E+02	0.9998E+00	0.1761E-01	0.6500E+01	0.4000E+00
4	0.1409E+02	0.5894E+03	0.3000E+00	0.1499E+02	0.9996E+00	0.2670E-01	0.6500E+01	0.6000E+00
5	0.1409E+02	0.5895E+03	0.2980E+00	0.1499E+02	0.9995E+00	0.3233E-01	0.6500E+01	0.8000E+00
6	0.1412E+02	0.5898E+03	0.2952E+00	0.1500E+02	0.9992E+00	0.3973E-01	0.6500E+01	0.1000E+01
7	0.1412E+02	0.5900E+03	0.2902E+00	0.1498E+02	0.9991E+00	0.4144E-01	0.6500E+01	0.1200E+01
8	0.1416E+02	0.5905E+03	0.2828E+00	0.1497E+02	0.9989E+00	0.4687E-01	0.6500E+01	0.1400E+01
9	0.1416E+02	0.5907E+03	0.2731E+00	0.1492E+02	0.9992E+00	0.4001E-01	0.6500E+01	0.1600E+01
10	0.1420E+02	0.5913E+03	0.2713E+00	0.1495E+02	0.9995E+00	0.3149E-01	0.6500E+01	0.1800E+01
11	0.1420E+02	0.5913E+03	0.2713E+00	0.1495E+02	0.1000E+01	0.0000E+00	0.6500E+01	0.2000E+01

VARIABLES AT J = 28

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1409E+02	0.5895E+03	0.2988E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.6750E+01	0.0000E+00
2	0.1409E+02	0.5895E+03	0.2988E+00	0.1499E+02	0.1000E+01	0.7526E-02	0.6750E+01	0.2000E+00
3	0.1409E+02	0.5895E+03	0.2983E+00	0.1499E+02	0.9999E+00	0.1277E-01	0.6750E+01	0.4000E+00
4	0.1410E+02	0.5896E+03	0.2973E+00	0.1500E+02	0.9998E+00	0.1929E-01	0.6750E+01	0.6000E+00
5	0.1411E+02	0.5897E+03	0.2958E+00	0.1499E+02	0.9997E+00	0.2261E-01	0.6750E+01	0.8000E+00
6	0.1413E+02	0.5900E+03	0.2936E+00	0.1500E+02	0.9996E+00	0.2715E-01	0.6750E+01	0.1000E+01
7	0.1414E+02	0.5901E+03	0.2892E+00	0.1498E+02	0.9996E+00	0.2726E-01	0.6750E+01	0.1200E+01
8	0.1416E+02	0.5906E+03	0.2830E+00	0.1497E+02	0.9996E+00	0.2958E-01	0.6750E+01	0.1400E+01
9	0.1417E+02	0.5908E+03	0.2755E+00	0.1494E+02	0.9997E+00	0.2290E-01	0.6750E+01	0.1600E+01
10	0.1420E+02	0.5912E+03	0.2750E+00	0.1496E+02	0.9989E+00	0.1370E-01	0.6750E+01	0.1800E+01
11	0.1420E+02	0.5912E+03	0.2750E+00	0.1496E+02	0.1000E+01	0.5085E-16	0.6750E+01	0.2000E+01

VARIABLES AT J = 29

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y

Listing B-3. Continued

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1410E+02	0.5896E+03	0.2967E+00	0.1499E+02	0.1000E+01	0.2359E-16	0.7000E+01	0.0000E+00
2	0.1410E+02	0.5896E+03	0.2967E+00	0.1499E+02	0.1000E+01	0.5700E-02	0.7000E+01	0.2000E+00
3	0.1411E+02	0.5896E+03	0.2964E+00	0.1499E+02	0.1000E+01	0.9561E-02	0.7000E+01	0.4000E+00
4	0.1411E+02	0.5897E+03	0.2958E+00	0.1499E+02	0.9999E+00	0.1437E-01	0.7000E+01	0.6000E+00
5	0.1412E+02	0.5898E+03	0.2947E+00	0.1499E+02	0.9999E+00	0.1651E-01	0.7000E+01	0.8000E+00
6	0.1413E+02	0.5899E+03	0.2931E+00	0.1500E+02	0.9998E+00	0.1943E-01	0.7000E+01	0.1000E+01
7	0.1413E+02	0.5901E+03	0.2894E+00	0.1498E+02	0.9998E+00	0.1933E-01	0.7000E+01	0.1200E+01
8	0.1415E+02	0.5904E+03	0.2843E+00	0.1496E+02	0.9998E+00	0.2005E-01	0.7000E+01	0.1400E+01
9	0.1415E+02	0.5905E+03	0.2788E+00	0.1494E+02	0.9999E+00	0.1474E-01	0.7000E+01	0.1600E+01
10	0.1416E+02	0.5908E+03	0.2790E+00	0.1495E+02	0.1000E+01	0.6657E-02	0.7000E+01	0.1800E+01
11	0.1416E+02	0.5908E+03	0.2790E+00	0.1495E+02	0.1000E+01	0.2506E-16	0.7000E+01	0.2000E+01

VARIABLES AT J = 30

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1411E+02	0.5897E+03	0.2949E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.7250E+01	0.0000E+00
2	0.1411E+02	0.5897E+03	0.2949E+00	0.1499E+02	0.1000E+01	0.4011E-02	0.7250E+01	0.2000E+00
3	0.1411E+02	0.5897E+03	0.2948E+00	0.1499E+02	0.1000E+01	0.6591E-02	0.7250E+01	0.4000E+00
4	0.1412E+02	0.5898E+03	0.2945E+00	0.1499E+02	0.1000E+01	0.9867E-02	0.7250E+01	0.6000E+00
5	0.1412E+02	0.5899E+03	0.2938E+00	0.1499E+02	0.9999E+00	0.1108E-01	0.7250E+01	0.8000E+00
6	0.1413E+02	0.5900E+03	0.2926E+00	0.1500E+02	0.9999E+00	0.1283E-01	0.7250E+01	0.1000E+01
7	0.1414E+02	0.5901E+03	0.2894E+00	0.1498E+02	0.9999E+00	0.1266E-01	0.7250E+01	0.1200E+01
8	0.1415E+02	0.5904E+03	0.2850E+00	0.1497E+02	0.9999E+00	0.1262E-01	0.7250E+01	0.1400E+01
9	0.1415E+02	0.5905E+03	0.2809E+00	0.1495E+02	0.1000E+01	0.8771E-02	0.7250E+01	0.1600E+01
10	0.1416E+02	0.5907E+03	0.2810E+00	0.1496E+02	0.1000E+01	0.2989E-02	0.7250E+01	0.1800E+01
11	0.1416E+02	0.5907E+03	0.2810E+00	0.1496E+02	0.1000E+01	0.0000E+00	0.7250E+01	0.2000E+01

VARIABLES AT J = 31

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1412E+02	0.5898E+03	0.2940E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.7500E+01	0.0000E+00
2	0.1412E+02	0.5898E+03	0.2940E+00	0.1499E+02	0.1000E+01	0.3154E-02	0.7500E+01	0.2000E+00
3	0.1412E+02	0.5898E+03	0.2940E+00	0.1499E+02	0.1000E+01	0.5308E-02	0.7500E+01	0.4000E+00
4	0.1412E+02	0.5899E+03	0.2939E+00	0.1500E+02	0.1000E+01	0.7814E-02	0.7500E+01	0.6000E+00
5	0.1413E+02	0.5899E+03	0.2934E+00	0.1500E+02	0.1000E+01	0.8753E-02	0.7500E+01	0.8000E+00
6	0.1413E+02	0.5900E+03	0.2924E+00	0.1499E+02	0.1000E+01	0.9963E-02	0.7500E+01	0.1000E+01
7	0.1413E+02	0.5901E+03	0.2895E+00	0.1498E+02	0.1000E+01	0.9946E-02	0.7500E+01	0.1200E+01
8	0.1414E+02	0.5902E+03	0.2857E+00	0.1496E+02	0.1000E+01	0.9455E-02	0.7500E+01	0.1400E+01
9	0.1414E+02	0.5904E+03	0.2824E+00	0.1494E+02	0.1000E+01	0.6341E-02	0.7500E+01	0.1600E+01
10	0.1414E+02	0.5905E+03	0.2822E+00	0.1495E+02	0.1000E+01	0.1824E-02	0.7500E+01	0.1800E+01
11	0.1414E+02	0.5905E+03	0.2822E+00	0.1495E+02	0.1000E+01	0.1239E-16	0.7500E+01	0.2000E+01

VARIABLES AT J = 32

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1412E+02	0.5897E+03	0.2927E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.7750E+01	0.0000E+00
2	0.1412E+02	0.5897E+03	0.2927E+00	0.1499E+02	0.1000E+01	0.1979E-02	0.7750E+01	0.2000E+00
3	0.1412E+02	0.5898E+03	0.2929E+00	0.1499E+02	0.1000E+01	0.3293E-02	0.7750E+01	0.4000E+00
4	0.1412E+02	0.5898E+03	0.2931E+00	0.1499E+02	0.1000E+01	0.4801E-02	0.7750E+01	0.6000E+00
5	0.1413E+02	0.5899E+03	0.2929E+00	0.1499E+02	0.1000E+01	0.5364E-02	0.7750E+01	0.8000E+00
6	0.1413E+02	0.5900E+03	0.2922E+00	0.1499E+02	0.1000E+01	0.6012E-02	0.7750E+01	0.1000E+01
7	0.1413E+02	0.5902E+03	0.2897E+00	0.1498E+02	0.1000E+01	0.5965E-02	0.7750E+01	0.1200E+01
8	0.1414E+02	0.5904E+03	0.2866E+00	0.1497E+02	0.1000E+01	0.5441E-02	0.7750E+01	0.1400E+01
9	0.1414E+02	0.5905E+03	0.2839E+00	0.1496E+02	0.1000E+01	0.3654E-02	0.7750E+01	0.1600E+01
10	0.1414E+02	0.5907E+03	0.2835E+00	0.1495E+02	0.1000E+01	0.1135E-02	0.7750E+01	0.1800E+01
11	0.1414E+02	0.5907E+03	0.2835E+00	0.1495E+02	0.1000E+01	0.0000E+00	0.7750E+01	0.2000E+01

VARIABLES AT J = 33

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1413E+02	0.5901E+03	0.2926E+00	0.1499E+02	0.1000E+01	0.1196E-16	0.8000E+01	0.0000E+00
2	113E+02	0.5901E+03	0.2926E+00	0.1499E+02	0.1000E+0	1979E-02	0.8000E+01	0.2000E+00

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3	1413E+02	0.5901E+03	0.2928E+00	0.1500E+02	0.1000E+0	0.3293E-02	0.8000E+01	0.4000E+00
4	1413E+02	0.5900E+03	0.2930E+00	0.1500E+02	0.1000E+0	0.4801E-02	0.8000E+01	0.6000E+00
5	0.1413E+02	0.5900E+03	0.2929E+00	0.1500E+02	0.1000E+01	0.5364E-02	0.8000E+01	0.8000E+00
6	0.1413E+02	0.5900E+03	0.2922E+00	0.1499E+02	0.1000E+01	0.6012E-02	0.8000E+01	0.1000E+01
7	0.1413E+02	0.5900E+03	0.2898E+00	0.1498E+02	0.1000E+01	0.5965E-02	0.8000E+01	0.1200E+01
8	0.1413E+02	0.5900E+03	0.2867E+00	0.1496E+02	0.1000E+01	0.5441E-02	0.8000E+01	0.1400E+01
9	0.1413E+02	0.5901E+03	0.2840E+00	0.1494E+02	0.1000E+01	0.3654E-02	0.8000E+01	0.1600E+01
10	0.1413E+02	0.5901E+03	0.2837E+00	0.1494E+02	0.1000E+01	0.1135E-02	0.8000E+01	0.1800E+01
11	0.1413E+02	0.5901E+03	0.2837E+00	0.1494E+02	0.1000E+01	0.6165E-17	0.8000E+01	0.2000E+01

VARIABLES AT K = 1

J	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00
5	0.1025E+02	0.5382E+03	0.7576E+00	0.1500E+02	0.1000E+01	0.1209E-17	0.1000E+01	0.0000E+00
9	0.1067E+02	0.5443E+03	0.7167E+00	0.1502E+02	0.1000E+01	0.0000E+00	0.2000E+01	0.0000E+00
13	0.1236E+02	0.5679E+03	0.5320E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.3000E+01	0.0000E+00
17	0.1329E+02	0.5797E+03	0.4191E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.4000E+01	0.0000E+00
21	0.1377E+02	0.5856E+03	0.3512E+00	0.1499E+02	0.1000E+01	-0.1600E-15	0.5000E+01	0.0000E+00
25	0.1401E+02	0.5885E+03	0.3118E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.6000E+01	0.0000E+00
29	0.1410E+02	0.5896E+03	0.2967E+00	0.1499E+02	0.1000E+01	0.2359E-16	0.7000E+01	0.0000E+00
33	0.1413E+02	0.5901E+03	0.2926E+00	0.1499E+02	0.1000E+01	0.1196E-16	0.8000E+01	0.0000E+00

VARIABLES AT K = 3

J	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.2000E+00
5	0.1025E+02	0.5382E+03	0.7577E+00	0.1500E+02	0.1000E+01	0.6132E-03	0.1000E+01	0.2000E+00
9	0.1065E+02	0.5440E+03	0.7188E+00	0.1502E+02	0.9998E+00	0.1745E-01	0.2000E+01	0.2000E+00
13	0.1237E+02	0.5679E+03	0.5317E+00	0.1499E+02	0.9989E+00	0.4721E-01	0.3000E+01	0.2500E+00
17	0.1329E+02	0.5797E+03	0.4185E+00	0.1499E+02	0.9988E+00	0.4869E-01	0.4000E+01	0.3000E+00
21	0.1377E+02	0.5856E+03	0.3505E+00	0.1499E+02	0.9990E+00	0.4467E-01	0.5000E+01	0.3500E+00
25	0.1402E+02	0.5888E+03	0.3108E+00	0.1499E+02	0.9996E+00	0.2939E-01	0.6000E+01	0.4000E+00
29	0.1411E+02	0.5896E+03	0.2964E+00	0.1499E+02	0.1000E+01	0.9561E-02	0.7000E+01	0.4000E+00
33	0.1413E+02	0.5901E+03	0.2928E+00	0.1500E+02	0.1000E+01	0.3293E-02	0.8000E+01	0.4000E+00

VARIABLES AT K = 5

J	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1025E+02	0.5381E+03	0.7585E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.4000E+00
5	0.1025E+02	0.5381E+03	0.7582E+00	0.1500E+02	0.1000E+01	0.1060E-02	0.1000E+01	0.4000E+00
9	0.1056E+02	0.5426E+03	0.7293E+00	0.1504E+02	0.9994E+00	0.3588E-01	0.2000E+01	0.4000E+00
13	0.1238E+02	0.5681E+03	0.5304E+00	0.1499E+02	0.9955E+00	0.9502E-01	0.3000E+01	0.5000E+00
17	0.1331E+02	0.5799E+03	0.4160E+00	0.1499E+02	0.9953E+00	0.9730E-01	0.4000E+01	0.6000E+00
21	0.1379E+02	0.5859E+03	0.3475E+00	0.1499E+02	0.9960E+00	0.8968E-01	0.5000E+01	0.7000E+00
25	0.1405E+02	0.5890E+03	0.3060E+00	0.1499E+02	0.9983E+00	0.5768E-01	0.6000E+01	0.8000E+00
29	0.1412E+02	0.5898E+03	0.2947E+00	0.1499E+02	0.9999E+00	0.1651E-01	0.7000E+01	0.8000E+00
33	0.1413E+02	0.5900E+03	0.2929E+00	0.1500E+02	0.1000E+01	0.5364E-02	0.8000E+01	0.8000E+00

VARIABLES AT K = 7

J	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1024E+02	0.5381E+03	0.7586E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.6000E+00
5	0.1024E+02	0.5380E+03	0.7587E+00	0.1499E+02	0.1000E+01	0.1162E-02	0.1000E+01	0.6000E+00
9	0.1039E+02	0.5399E+03	0.7497E+00	0.1508E+02	0.9984E+00	0.5664E-01	0.2000E+01	0.6000E+00
13	0.1240E+02	0.5685E+03	0.5279E+00	0.1500E+02	0.9896E+00	0.1436E+00	0.3000E+01	0.7500E+00
17	0.1333E+02	0.5803E+03	0.4130E+00	0.1499E+02	0.9894E+00	0.1454E+00	0.4000E+01	0.9000E+00
21	0.1382E+02	0.5863E+03	0.3428E+00	0.1499E+02	0.9907E+00	0.1360E+00	0.5000E+01	0.1050E+01
25	0.1410E+02	0.5897E+03	0.2953E+00	0.1498E+02	0.9964E+00	0.8512E-01	0.6000E+01	0.1200E+01
29	0.1413E+02	0.5901E+03	0.2894E+00	0.1498E+02	0.9998E+00	0.1933E-01	0.7000E+01	0.1200E+01
33	0.1413E+02	0.5900E+03	0.2898E+00	0.1498E+02	0.1000E+01	0.5965E-02	0.8000E+01	0.1200E+01

Listing B-3. Concluded

VARIABLES AT K = 9

J	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1024E+02	0.5381E+03	0.7587E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.8000E+00
5	0.1023E+02	0.5379E+03	0.7590E+00	0.1499E+02	0.1000E+01	0.7928E-03	0.1000E+01	0.8000E+00
9	0.1010E+02	0.5353E+03	0.7856E+00	0.1518E+02	0.9965E+00	0.8347E-01	0.2000E+01	0.8000E+00
13	0.1244E+02	0.5693E+03	0.5212E+00	0.1497E+02	0.9813E+00	0.1927E+00	0.3000E+01	0.1000E+01
17	0.1337E+02	0.5810E+03	0.4023E+00	0.1494E+02	0.9809E+00	0.1945E+00	0.4000E+01	0.1200E+01
21	0.1386E+02	0.5871E+03	0.3301E+00	0.1494E+02	0.9823E+00	0.1872E+00	0.5000E+01	0.1400E+01
25	0.1417E+02	0.5908E+03	0.2708E+00	0.1491E+02	0.9937E+00	0.1124E+00	0.6000E+01	0.1600E+01
29	0.1415E+02	0.5905E+03	0.2788E+00	0.1494E+02	0.9999E+00	0.1474E-01	0.7000E+01	0.1600E+01
33	0.1413E+02	0.5901E+03	0.2840E+00	0.1494E+02	0.1000E+01	0.3654E-02	0.8000E+01	0.1600E+01

VARIABLES AT K = 11

J	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	X	Y
1	0.1024E+02	0.5381E+03	0.7587E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1000E+01
5	0.1023E+02	0.5378E+03	0.7592E+00	0.1499E+02	0.1000E+01	0.2414E-17	0.1000E+01	0.1000E+01
9	0.9622E+01	0.5280E+03	0.8220E+00	0.1499E+02	0.9923E+00	0.1240E+00	0.2000E+01	0.1000E+01
13	0.1250E+02	0.5702E+03	0.5026E+00	0.1485E+02	0.9701E+00	0.2425E+00	0.3000E+01	0.1250E+01
17	0.1341E+02	0.5817E+03	0.3917E+00	0.1490E+02	0.9701E+00	0.2425E+00	0.4000E+01	0.1500E+01
21	0.1390E+02	0.5876E+03	0.3210E+00	0.1493E+02	0.9701E+00	0.2425E+00	0.5000E+01	0.1750E+01
25	0.1430E+02	0.5924E+03	0.2539E+00	0.1495E+02	0.9923E+00	0.1240E+00	0.6000E+01	0.2000E+01
29	0.1416E+02	0.5908E+03	0.2790E+00	0.1495E+02	0.1000E+01	0.2506E-16	0.7000E+01	0.2000E+01
33	0.1413E+02	0.5901E+03	0.2837E+00	0.1494E+02	0.1000E+01	0.6166E-17	0.8000E+01	0.2000E+01

Listing B-4. Grid and Initial Condition Generator (3-D)

```
      PROGRAM ICFILE
      PARAMETER(JD=33,KD=11,LD=21)
      DIMENSION R(JD,KD,LD),RU(JD,KD,LD),RV(JD,KD,LD)
      DIMENSION RW(JD,KD,LD),E(JD,KD,LD)
      DIMENSION X(JD,KD,LD),Y(JD,KD,LD),Z(JD,KD,LD)
      DATA G/1.4/,NC1/0/
      GM1=G-1.
      DELX=8./32
C  FORM THE 'X' GRID ARRAY
      DO 1 J=1,JD
      DO 1 K=1,KD
       IF(J.EQ.1) THEN
        X(J,K,11)=0.
       ELSE
        X(J,K,11)=X(J-1,K,11)+DELX
       ENDIF
1     CONTINUE
C  FORM THE 'Y' AND 'Z' GRID ARRAYS
      DO 2 J=1,JD
       IF(X(J,KD,11).LE.2.) YO=1.
       IF(X(J,KD,11).GT.6.) YO=2.
       IF((X(J,KD,11).GT.2.).AND.(X(J,KD,11).LE.6.)) THEN
        YO=1.+(X(J,KD,11)-2.)*0.25
       ENDIF
      DELY=YO/(KD-1)
      Y(J,1,11)=0.0
      Z(J,1,11)=0.0
      DO 2 K=2,KD
       Y(J,K,11)=Y(J,K-1,11)+DELY
       Z(J,K,11)=0.0
2     CONTINUE
C  FORM THE ARRAYS OF NON-DIMENSIONAL CONSERVATION VARIABLES CONSISTENT
C  WITH A FREE-STREAM MACH NUMBER OF 0.29
      FMACH=0.29
      FACT=(1 +.2*FMACH**2)
      PBAR=FACT**(-3.5)/G
      DO 1000 J=1,JD
        DO 2000 K=1,KD
          R(J,K,11)=FACT**(-2.5)
          RU(J,K,11)=R(J,K,11)*FMACH*SQRT(1./FACT)
          RV(J,K,11)=0.
          RW(J,K,11)=0.
          E(J,K,11)=PBAR/GM1+.5*(RU(J,K,11)**2)/R(J,K,11)
2000    CONTINUE
1000  CONTINUE
C  EXTRAPOLATE THE GRID & CONSERVATION VARIABLES INTO THE 'Z' PLANE
      DELZ=0.25
      DO 100 L=12,21
      DO 100 J=1,JD
      DO 100 K=1,KD
       M=22-L
       X(J,K,L)=X(J,K,11)
       X(J,K,M)=X(J,K,11)
       Y(J,K,L)=Y(J,K,11)
       Y(J,K,M)=Y(J,K,11)
       Z(J,K,L)=Z(J,K,11)+DELZ*(L-11)
       Z(J,K,M)=-Z(J,K,L)
       R(J,K,L)=R(J,K,11)
```

Listing B-4. Concluded

```
          R(J,K,M)=R(J,K,11)
          RU(J,K,L)=RU(J,K,11)
          RU(J,K,M)=RU(J,K,11)
          RV(J,K,L)=RV(J,K,11)
          RV(J,K,M)=RV(J,K,11)
          RW(J,K,L)=RW(J,K,11)
          RW(J,K,M)=RW(J,K,11)
          E(J,K,L)=E(J,K,11)
          E(J,K,M)=E(J,K,11)
  100   CONTINUE
        NC1=0
        WRITE(20)NC1,G
        WRITE(20)X,Y,Z
        WRITE(20)R,RU.RV.RW,E
        STOP
        END
```

Listing B-5. Execution and Input File (3-D)

```
//A12501A JOB (SVT,0HH00001,01,70006914),'EL2 D.HUDDLESTON',MSGCLASS=Z,
//   MSGLEVEL=(1,1),CLASS=X,TIME=(,5),PASSWORD=XXXXXXXX,PRTY=9,
//   USER=A12501,NOTIFY=A12501
//*
/*ROUTE  PRINT RMT10
/*JOBPARM ROOM=9
//*
// EXEC CRAY
//SYSIN  DD *
 CRSUBMIT F(INPUT) HOLD NOTIFY(A12501)
//INPUT  DD *,DCB=BLKSIZE=8160
JOB,JN=A12501T,T=900,MFL=1000000.
ACCOUNT,AC=70006913,US=A12501.
FETCH,DN=FT02,DF=TR,^
      TEXT='DSN=A12501.TRIC.ICFILE,DISP=SHR'.
CFT,L=0.
LDR,L=0.
DISPOSE,DN=FT04,DF=TR,DC=ST,^
       TEXT='DSN=A12501.TRIC3.OUTFILE,DISP=SHR'.
/EOF
// DD DSN=A12501.BENCHMAR.CNTL(PARC3D),DISP=SHR
// DD *
/EOF
// DD *
 $INPUTS
   MPMAX=2500.      MP=2500.
   JMAX=33.         KMAX=11.        LMAX=21.
   PREF=15.0.       TREFR=100..
   MPSEQ=1.         IFXPRT=1.
   DIS2=0.0.        DIS4=0.30.
   DTCAP=5.0.       PCOMAX=10.0.
   NSPRT=10.        STOPL2=1.E-20.
   INVISC(1)=0.     INVISC(2)=0.    INVISC(3)=0.
 $END
 $PRTSEQ
   JKLPI(1,1,1)=1,33,1,      JKLPI(1,2,1)=1,11,1,      IPORD(1,1)=2,
   JKLPI(1,3,1)=1,21,10,                               IPORD(2,1)=1.
 $END
 $BOUNDS
   NJSEQ=2,
     JLINE(1)=1,     JTYPE(1)=0,            JSIGN(1)=1.
       JKLOW(1)=2.   JKHIGH(1)=10,
       JLLOW(1)=2.   JLHIGH(1)=20.
       PRESSJ(1)=0.7142857, TEMPJ(1)=1.0,
     JLINE(2)=33,    JTYPE(2)=0,            JSIGN(2)=-1,
       JKLOW(2)=2.   JKHIGH(2)=10,
       JLLOW(2)=2.   JLHIGH(2)=20.
       PRESSJ(2)=0.67895,   TEMPJ(2)=1.0,
   NKSEQ=2,
     KLINE(1)=1,     KTYPE(1)=50,           KSIGN(1)=1,
       KJLOW(1)=1,   KJHIGH(1)=33.
       KLLOW(1)=1.   KLHIGH(1)=21.
     KLINE(2)=11,    KTYPE(2)=50.           KSIGN(2)=-1,
       KJLOW(2)=1,   KJHIGH(2)=33.
       KLLOW(2)=1.   KLHIGH(2)=21.
   NLSEQ=2,
     LLINE(1)=1,     LTYPE(1)=50.           LSIGN(1)=1.
       LJLOW(1)=1,   LJHIGH(1)=33,
       LKLOW(1)=2.   LKHIGH(1)=10,
     LLINE(2)=21.    LTYPE(2)=50.           LSIGN(2)=-1.
       LJLOW(2)=1,   LJHIGH(2)=33,
       LKLOW(2)=2.   LKHIGH(2)=10.
 $END
```

Listing B-6. Diverging Nozzle Output (3-D)

NAMELIST INPUTS.

DIS2	=	0.000000E+00	IFXPLT	=	0	INVISC	=	0 0 0
DIS4	=	0.300000E+00	IFXPRT	=	1	LAMIN	=	0 0 0
DTCAP	=	0.500000E+01	IVARDT	=	2			
GAMMA	=	0.140000E+01	JMAX	=	33			
PCQMAX	=	0.100000E+02	KMAX	=	11			
PR	=	0.720000E+00	LMAX	=	21			
PREF	=	0.150000E+02	L2PLOT	=	0			
PRT	=	0.900000E+00	NBCSEG	=	0			
RE	=	0.000000E+00	NC	=	-1			
STOPL2	=	0.100000E-19	NMAX	=	2500			
TREFR	=	0.100000E+03	NP	=	2500			
TSUTH	=	0.198600E+03	NPSEG	=	1			
VRAT	=	-0.666667E+00	NSPRT	=	10			
			NUMOT	=	0			

NAMELIST PRTSEG.

	JKLPI									IPORD	
	JA	JB	JS	KA	KB	KS	LA	LB	LS	J	K
1	1	33	1	1	11	1	1	21	10	2	1

Listing B-6. Continued

NAMELIST BOUNDS.

JSEG	JLINE	JKLOW	JKHIGH	JLLOW	JLHIGH	JTYPE	JSIGN	PRESSJ	TEMPJ
1	1	2	10	2	20	0	1	0.714286E+00	0.100000E+01
2	33	2	10	2	20	0	-1	0.672850E+00	0.100000E+01

KSEG	KLINE	KJLOW	KJHIGH	KLLOW	KLHIGH	KTYPE	KSIGN	PRESSK	TEMPK
1	1	1	33	1	21	50	1	0.000000E+00	0.000000E+00
2	11	1	33	1	21	50	-1	0.000000E+00	0.000000E+00

LSEG	LLINE	LJLOW	LJHIGH	LKLOW	LKHIGH	LTYPE	LSIGN	PRESSL	TEMPL
1	1	1	33	2	10	50	1	0.000000E+00	0.000000E+00
2	21	1	33	2	10	50	-1	0.000000E+00	0.000000E+00

Listing B-6. Continued

GRID PATCHES

J-PATCHES	MINIMUM			MAXIMUM		
	J	K	L	J	K	L
1	2	2	2	32	10	20

K-PATCHES	MINIMUM			MAXIMUM		
	J	K	L	J	K	L
1	2	2	2	32	10	20

L-PATCHES	MINIMUM			MAXIMUM		
	J	K	L	J	K	L
1	2	2	2	32	10	20

Listing B-6. Continued

COUNT	DT	L2 RESIDUAL	MASS FLUX	MOMENTUM FLUXES X	MOMENTUM FLUXES Y	MOMENTUM FLUXES Z	ENERGY FLUX	MAX PERCENT VARIATION	MAX LOCATION J	MAX LOCATION K	MAX LOCATION L
10	0.5000E+01	0.2396E-03	-0.6096E-02	0.1055E-02	0.6866E-01	-0.1083E+00	-0.8072E-02	0.4441E+01	9	10	20
20	0.5000E+01	0.1759E-03	0.4607E-02	0.9313E-02	0.5360E-02	0.2737E+00	0.6980E-02	0.3271E+01	32	10	20
30	0.5000E+01	0.1776E-03	0.6096E-02	0.1511E-01	0.1883E-01	0.1166E+01	0.8797E-02	0.2141E+01	2	2	20
40	0.5000E+01	0.6372E-04	0.1197E-03	0.5662E-02	0.8456E-02	-0.7529E+00	0.4283E-03	0.1219E+01	32	10	2
50	0.5000E+01	0.8934E-04	-0.3179E-02	-0.1075E-02	-0.1059E-02	0.1111E+00	-0.4197E-02	0.1363E+01	32	10	20
60	0.5000E+01	0.5369E-04	0.2008E-02	0.2992E-03	-0.1296E-02	-0.2535E+00	-0.2545E-02	0.7080E+00	9	10	20
70	0.5000E+01	0.2618E-04	-0.1574E-03	0.2972E-02	0.1528E-02	-0.8268E-01	0.5921E-04	0.3135E+00	32	9	2
80	0.5000E+01	0.2495E-04	0.5143E-03	0.3600E-02	0.3547E-02	0.1631E+00	0.9608E-03	0.1865E+00	2	2	20
90	0.5000E+01	0.1679E-04	0.1659E-03	0.2985E-02	0.3353E-02	-0.1203E+00	0.4313E-03	0.2209E+00	32	10	2
100	0.5000E+01	0.1603E-04	-0.4415E-03	0.1944E-02	0.1650E-02	-0.4301E-01	-0.4239E-03	0.3214E+00	32	10	2
110	0.5000E+01	0.1773E-04	-0.6246E-03	0.1369E-02	0.9373E-03	-0.3076E-01	-0.6838E-03	0.2669E+00	9	10	20
120	0.5000E+01	0.1360E-04	-0.4084E-03	0.1456E-02	0.1318E-02	-0.5238E-01	0.3863E-03	0.2086E+00	9	10	2
130	0.5000E+01	0.1085E-04	0.1971E-03	0.1624E-02	0.1409E-02	0.5698E-01	-0.9825E-04	0.1385E+00	9	10	20
140	0.5000E+01	0.9721E-05	-0.1529E-03	0.1551E-02	0.1255E-02	-0.1403E-01	-0.4961E-04	0.1167E+00	32	2	20
150	0.5000E+01	0.9527E-05	-0.2066E-03	0.1348E-02	0.1189E-02	-0.4127E-01	-0.1363E-03	0.1256E+00	9	10	2
160	0.5000E+01	0.9652E-05	-0.2577E-03	0.1151E-02	0.1025E-02	-0.3302E-01	-0.2148E-03	0.1475E+00	9	10	20
170	0.5000E+01	0.9498E-05	-0.2573E-03	0.1028E-02	0.8466E-03	-0.9219E-02	0.2204E-03	0.1468E+00	9	10	2
180	0.5000E+01	0.8678E-05	-0.2207E-03	0.9721E-03	0.7932E-03	-0.1567E-01	-0.1761E-03	0.1311E+00	9	10	20
190	0.5000E+01	0.8019E-05	-0.1873E-03	0.9247E-03	0.7539E-03	-0.1732E-01	-0.1371E-03	0.1178E+00	9	10	20
200	0.5000E+01	0.7491E-05	0.1746E-03	0.8566E-03	0.7051E-03	-0.6974E-02	-0.1269E-03	0.1111E+00	9	10	2
210	0.5000E+01	0.7103E-05	-0.1736E-03	0.7799E-03	0.6619E-03	-0.2988E-01	-0.1323E-03	0.1088E+00	9	10	20
220	0.5000E+01	0.6863E-05	-0.1714E-03	0.7096E-03	0.5786E-03	-0.4080E-01	-0.1353E-03	0.1074E+00	9	10	20
230	0.5000E+01	0.6424E-05	-0.1635E-03	0.6506E-03	0.5063E-03	0.4124E-02	-0.1299E-03	0.1031E+00	9	10	2
240	0.5000E+01	0.6151E-05	-0.1518E-03	0.6037E-03	0.4903E-03	-0.7195E-02	-0.1191E-03	0.9648E-01	9	10	20
250	0.5000E+01	0.5761E-05	0.1404E-03	0.5620E-03	0.4594E-03	-0.4594E-01	-0.1086E-03	0.9068E-01	9	10	20
260	0.5000E+01	0.5461E-05	-0.1320E-03	0.5208E-03	0.4034E-03	-0.2876E-01	-0.1020E-03	0.8623E-01	9	10	20
270	0.5000E+01	0.5288E-05	0.1258E-03	0.4802E-03	0.3800E-03	0.1105E-01	-0.9814E-04	0.8220E-01	9	10	20
280	0.5000E+01	0.4961E-05	-0.1197E-03	0.4436E-03	0.3582E-03	-0.1886E-01	-0.9417E-04	0.7840E-01	9	10	20
290	0.5000E+01	0.4821E-05	-0.1131E-03	0.4105E-03	0.3117E-03	-0.5827E-01	-0.8917E-04	0.7469E-01	9	10	20
300	0.5000E+01	0.4544E-05	0.1063E-03	0.3805E-03	0.2926E-03	-0.1397E-01	-0.8374E-04	0.7056E-01	9	10	20
310	0.5000E+01	0.4292E-05	-0.9986E-04	0.3538E-03	0.2876E-03	0.1603E-01	0.7852E-04	0.6643E-01	9	10	20
320	0.5000E+01	0.4116E-05	-0.9394E-04	0.3289E-03	0.2488E-03	-0.2982E-01	-0.7386E-04	0.6302E-01	9	10	20
330	0.5000E+01	0.3811E-05	-0.8863E-04	0.3049E-03	0.2207E-03	-0.7482E-01	-0.6986E-04	0.5981E-01	9	10	20
340	0.5000E+01	0.3658E-05	-0.8369E-04	0.2830E-03	0.2264E-03	0.6635E-02	-0.6616E-04	0.5642E-01	9	10	20
350	0.5000E+01	0.3437E-05	-0.7886E-04	0.2635E-03	0.2088E-03	0.2107E-01	-0.6240E-04	0.5337E-01	9	10	20
360	0.5000E+01	0.3235E-05	-0.7419E-04	0.2451E-03	0.1738E-03	-0.5339E-01	0.5871E-04	0.5060E-01	9	10	20
370	0.5000E+01	0.3141E-05	-0.6983E-04	0.2278E-03	0.1688E-03	-0.9236E-01	-0.5533E-04	0.4764E-01	9	10	20
380	0.5000E+01	0.2971E-05	-0.6571E-04	0.2123E-03	0.1679E-03	0.4251E-01	0.5210E-04	0.4487E-01	9	10	2
390	0.5000E+01	0.2900E-05	-0.6179E-04	0.1979E-03	0.1473E-03	0.1601E-01	-0.4898E-04	0.4251E-01	9	10	20
400	0.5000E+01	0.2846E-05	-0.5817E-04	0.1844E-03	0.1348E-03	-0.9665E-01	-0.4617E-04	0.4009E-01	9	10	20
410	0.5000E+01	0.2737E-05	-0.5482E-04	0.1718E-03	0.1286E-03	-0.9517E-01	-0.4359E-04	0.3771E-01	9	10	20
420	0.5000E+01	0.2739E-05	-0.5154E-04	0.1601E-03	0.1156E-03	0.8257E-01	-0.4100E-04	0.3567E-01	9	10	2
430	0.5000E+01	0.2634E-05	-0.4841E-04	0.1494E-03	0.1122E-03	-0.7507E-02	-0.3850E-04	0.3363E-01	9	10	20
440	0.5000E+01	0.2584E-05	-0.4558E-04	0.1397E-03	0.1092E-03	-0.1785E+00	-0.3626E-04	0.3155E-01	9	10	20
450	0.5000E+01	0.2513E-05	-0.4288E-04	0.1304E-03	0.8956E-04	-0.6181E-02	-0.3410E-04	0.2981E-01	9	10	20
460	0.5000E+01	0.2408E-05	-0.4029E-04	0.1214E-03	0.8232E-04	0.9625E-01	-0.3212E-04	0.2819E-01	9	10	2
470	0.5000E+01	0.2338E-05	-0.3788E-04	0.1136E-03	0.9227E-04	-0.5205E-01	0.3020E-04	0.2639E-01	9	10	20
480	0.5000E+01	0.2250E-05	-0.3563E-04	0.1064E-03	0.8205E-04	-0.4545E+00	-0.2841E-04	0.2563E-01	29	9	20
490	0.5000E+01	0.2157E-05	-0.3349E-04	0.9928E-04	0.6205E-04	0.2862E+00	-0.2672E-04	0.2633E-01	28	3	20
500	0.5000E+01	0.2124E-05	-0.3148E-04	0.9258E-04	0.6517E-04	0.7570E-01	0.2515E-04	0.2335E-01	26	3	20
510	0.5000E+01	0.2059E-05	-0.2960E-04	0.8676E-04	0.7113E-04	-0.1357E+00	-0.2364E-04	0.2134E-01	28	9	20
520	0.5000E+01	0.2046E-05	-0.2779E-04	0.8131E-04	0.5935E-04	0.8459E+00	-0.2219E-04	0.2185E-01	29	9	11
530	0.5000E+01	0.2047E-05	-0.2612E-04	0.7599E-04	0.4960E-04	0.3671E+00	-0.2087E-04	0.2428E-01	27	9	11
540	0.5000E+01	0.2036E-05	-0.2459E-04	0.7098E-04	0.4978E-04	0.3287E-01	-0.1968E-04	0.2645E-01	29	9	11
550	0.5000E+01	0.2067E-05	-0.2309E-04	0.6639E-04	0.4990E-04	-0.3791E+00	-0.1847E-04	0.2796E-01	27	9	11
560	0.5000E+01	0.2061E-05	-0.2166E-04	0.6231E-04	0.4823E-04	0.6623E-01	-0.1731E-04	0.2639E-01	26	3	11
570	0.5000E+01	0.2072E-05	-0.2038E-04	0.5847E-04	0.4128E-04	0.2625E+00	-0.1830E-04	0.2714E-01	27	9	11

Listing B-6. Continued

580	0.5000E+01	0 2064E-05	0 1917E-04	0.5453E-04	0.3277E-04	-0.3323E-01	-0.1536E-04	0 2541E-01	26	3	11
590	0.5000E+01	0.2053E-05	-0.1798E-04	0.5090E-04	0.3694E-04	0.3160E+01	-0.1440E-04	0.2382E-01	27	9	11
600	0.5000E+01	0.2024E-05	-0.1688E-04	0.4796E-04	0 4228E-04	-0.2019E+00	-0.1351E-04	0.2184E-01	26	3	11
610	0 5000E+01	0.2014E-05	0.1588E-04	0 4508E-04	0 3062E-04	0.1631E+00	-0 1271E-04	0.2217E-01	27	9	6
620	0 5000E+01	0.1968E-05	-0 1492E-04	0.4195E-04	0.2134E-04	-0.1503E+00	0.1197E-04	0 2287E-01	28	9	2
630	0.5000E+01	0.1972E-05	-0 1401E-04	0.3919E-04	0.3019E-04	0.2834E+00	-0 1124E-04	0.2175E-01	27	3	2
640	0.5000E+01	0.1936E-05	-0.1316E-04	0.3698E-04	0.3392E-04	-0.1701E+01	-0.1054E-04	0.2169E-01	25	3	6
650	0.5000E+01	0.1951E-05	-0 1236E-04	0 3477E-04	0.2243E-04	0.7846E-01	-0.9887E-05	0.2139E-01	27	3	6
660	0.5000E+01	0.1939E-05	0.1162E-04	0 3240E-04	0.1664E-04	-0 5250E+00	-0 9318E-05	0.2288E-01	28	9	11
670	0 5000E+01	0.1966E-05	-0 1092E-04	0.3025E-04	0.2248E-04	0.7125E-01	0.8772E-05	0 2151E-01	27	3	6
680	0 5000E+01	0.1967E-05	-0 1024E-04	0.2849E-04	0.2545E-04	0 6226E+00	-0.8204E-05	0.2553E-01	28	9	11
690	0.5000E+01	0 2001E-05	-0 9606E-05	0.2689E-04	0.1982E-04	-0.9251E-02	-0.7685E-05	0 2308E-01	27	3	11
700	0.5000E+01	0.1998E-05	-0 9049E-05	0.2512E-04	0 1272E-04	0.1100E+01	-0.7262E-05	0 2598E-01	28	9	11
710	0 5000E+01	0.2027E-05	-0.8503E-05	0 2333E-04	0.1382E-04	-0 8379E-01	-0 6838E-05	0 2374E-01	26	3	11
720	0 5000E+01	0 2018E-05	-0 7959E-05	0.2195E-04	0.2094E-04	0 2562E+00	0.6382E-05	0 2433E-01	28	9	11
730	0.5000E+01	0 2030E 05	-0.7476E-05	0.2086E-04	0.1863E-04	-0 1398E+00	-0.5980E-05	0.2323E-01	26	3	11
740	0 5000E+01	0.2019E-05	-0 7043E-05	0.1949E-04	0.7673E-05	0 2456E+00	-0 5652E-05	0.2239E-01	25	3	11
750	0.5000E+01	0.2019E-05	-0.6612E-05	0.1800E-04	0 8238E-05	-0 3925E+00	-0 5323E-05	0 2328E-01	26	3	16
760	0.5000E+01	0 2011E-05	0.6194E-05	0.1696E-04	0.1829E-04	0 1200E+00	-0 4972E-05	0.2174E-01	28	3	16
770	0 5000E+01	0.2009E-05	-0 5816E-05	0.1618E-04	0.1584E-04	-0.6070E+00	0.4652E-05	0 2372E-01	26	3	16
780	0 5000E+01	0.2008E-05	-0 5472E-05	0.1513E-04	0 4643E-05	0 7766E-01	-0 4388E-05	0 2254E 01	27	9	16
790	0.5000E+01	0 2009E-05	-0.5140E-05	0 1394E-04	0 5383E-05	0 3511E+01	-0 4147E-05	0 2393E-01	26	3	16
800	0 5000E+01	0.2022E-05	-0 4823E-05	0 1310E-04	0 1428E-04	0 1447E-01	-0.3878E-05	0.2388E-01	27	9	11
810	0.5000E+01	0 2025E-05	-0.4517E-05	0 1253E-04	0.1344E-04	0 8314E+00	-0 3611E-05	0.2395E-01	26	3	16
820	0.5000E+01	0.2047E-05	-0.4251E-05	0 1179E-04	0.4391E-05	-0.4684E-01	-0 3404E-05	0.2554E-01	27	9	11
830	0.5000E+01	0.2047E-05	-0.4009E-05	0.1083E-04	0 2320E-05	0.3770E+00	-0 3235E-05	0 2418E-01	26	3	11
840	0.5000E+01	0 2073E-05	0.3752E-05	0.1008E-04	0 9866E-05	-0.1254E+00	-0.3073E-05	0.2809E-01	27	9	11
850	0 5000E+01	0 2067E-05	-0 3506E-05	0.9698E-05	0 1291E-04	0 2428E+00	-0.2802E-05	0.2369E-01	26	3	11
860	0.5000E+01	0.2091E-05	-0.3306E-05	0 9219E-05	0.4480E-05	-0.2522E+00	-0 2644E-05	0 2557E-01	27	9	11
870	0.5000E+01	0.2078E-05	-0.3120E-05	0.8409E-05	-0.1005E-05	0.1540E+00	-0.2520E-05	0.2336E-01	25	3	11
880	0 5000E+01	0.2099E-05	-0 2916E-05	0.7750E-05	0 6909E-05	-0.5411E+00	-0 2355E-05	0 2463E-01	27	9	16
890	0.5000E+01	0.2081E-05	0.2725E-05	0.7514E-05	0.1261E-04	0.9261E-01	-0 2178E-05	0 2373E-01	25	3	11
900	0.5000E+01	0.2104E-05	-0 2568E-05	0 7210E-05	0 4003E-05	-0.3568E+01	0.2049E-05	0.2410E-01	27	3	16
910	0.5000E+01	0.2085E-05	-0.2425E-05	0.6542E-05	-0.2874E-05	0.3169E-01	-0.1958E-05	0.2420E-01	25	3	11
920	0.5000E+01	0 2110E-05	-0.2271E-05	0.5969E-05	0.4701E-05	0 1218E+01	-0.1840E-05	0 2383E-01	27	3	6
930	0.5000E+01	0.2095E-05	-0 2119E-05	0.5802E-05	0 1130E-04	-0.2511E-01	-0.1695E-05	0 2481E-01	28	9	6
940	0.5000E+01	0.2123E-05	-0.1991E-05	0.5636E-05	0.4197E-05	0.4260E+00	-0 1584E-05	0 2358E-01	27	3	8
950	0 5000E+01	0.2112E-05	-0 1886E-05	0.5122E-05	-0 3362E-05	-0.9596E-01	-0 1522E-05	0 2544E-01	28	9	11
960	0 5000E+01	0.2140E-05	-0 1771E-05	0.4597E-05	0 1991E-05	0.2953E+00	-0 1441E-05	0 2308E-01	27	3	6
970	0 5000E+01	0 2133E-05	-0.1645E-05	0.4449E-05	0 9789E-05	-0 2194E+00	-0 1318E-05	0.2563E-01	28	9	11
980	0 5000E+01	0.2158E-05	-0 1543E-05	0 4415E-05	0 5359E-05	0.1681E+00	-0.1222E-05	0 2439E-01	26	3	11
990	0 5000E+01	0 2152E-05	0.1468E-05	0 4036E-05	0 3691E-05	-0 3778E+00	-0.1182E-05	0 2531E-01	28	9	6
1000	0.5000E+01	0 2171E-05	-0.1380E-05	0 3530E-05	-0 7803E-06	0 1149E+00	0.1128E-05	0 2534E-01	28	3	6
1010	0.5000E+01	0 2168E-05	-0 1277E-05	0.3396E-05	0.8743E-05	-0.1967E+01	-0.1026E-05	0 2477E-01	28	3	6
1020	0.5000E+01	0.2181E-05	-0.1197E-05	0 3464E-05	0.6452E-05	0 4826E-01	-0 9442E-06	0 2610E-01	26	3	6
1030	0.5000E+01	0.2180E-05	-0 1141E-05	0.3192E-05	-0.3922E-05	0.2608E+01	-0.9155E-06	0 2458E-01	28	3	6
1040	0.5000E+01	0.2188E-05	-0 1076E-05	0.2715E-05	-0.2775E-05	-0.8740E-02	-0 8833E-06	0 2637E-01	26	3	6
1050	0.5000E+01	0.2193E-05	-0 9935E-06	0.2582E-05	0 7560E-05	0.5148E+00	-0.8029E-06	0 2451E-01	27	9	11
1060	0 5000E+01	0.2196E 05	0.9267E-06	0.2708E-05	0.7057E-05	-0.7357E-01	-0 7283E-06	0 2634E-01	26	3	6
1070	0 5000E+01	0.2208E-05	-0 8841E-06	0.2538E-05	-0 3397E-05	0 3203E+00	-0.7050E-06	0.2582E-01	27	9	11
1080	0 5000E+01	0.2208E-05	-0.8400E-06	0.2105E-05	-0 4215E-05	-0 1711E+00	-0.6932E-06	0 2610E-01	26	3	11
1090	0.5000E+01	0 2227E-05	-0.7744E-06	0 1943E-05	0.5782E-05	0 2027E+00	-0.6311E-06	0 2675E-01	27	9	16
1100	0.5000E+01	0 2223E-05	-0.7159E-06	0 2097E-05	0 7636E-05	-0 3502E+00	-0.5603E 06	0 2575E 01	26	3	11
1110	0.5000E+01	0.2246E-05	-0 6846E-06	0 2038E-05	-0 2195E-05	0 1231E+00	-0 5409E-06	0 2746E-01	27	9	16
1120	0.5000E+01	0 2238E-05	-0.6570E-06	0 1646E-05	-0.5573E-05	-0 7825E+00	0.5446E-06	0 2506E-01	26	3	16
1130	0.5000E+01	0.2264E-05	-0 6037E-06	0 1441E-05	0 3813E-05	0.6832E-01	-0.4977E-06	0 2788E-01	27	9	16
1140	0.5000E+01	0 2252E-05	-0 5528E-06	0.1614E-05	0.8288E-05	0 2454E+01	-0.4315E-06	0 2551E-01	25	3	16
1150	0.5000E+01	0.2280E-05	-0 5296E-06	0 1651E-05	-0 8688E-06	0 7251E-02	-0 4132E-06	0.2780E 01	27	9	16
1160	0.5000E+01	0 2265E-05	0 5133E-06	0 1299E-05	-0.6847E-05	0 7739E+00	-0 4266E-06	0 2663E-01	25	3	16
1170	0.5000E+01	0 2294E-05	-0 4717E-06	0 1057E-05	0 1990E-05	-0 5870E-01	-0.3948E-06	0 2755E-01	27	3	16
1180	0.5000E+01	0.2278E-05	0 4274E-06	0 1228E-05	0.8582E-05	0.3351E+00	-0.3341E-06	0 2743E-01	25	3	16
1190	0.5000E+01	0.2208E-05	-0 4081E-06	0.1341E-05	0.4778E-06	-0.1351E+00	-0 3129E-06	0 2740E-01	27	3	16
1200	0.5000E+01	0.2292E-05	-0 4005E-06	0 1043E-05	-0 7087E-05	0.2335E+00	-0 3323E-06	0.2772E-01	25	3	16
1210	0.5000E+01	0 2322E-05	-0 3706E-06	0 7692E-06	0 1477E-06	-0 2945E+00	-0 3161E-06	0.2671E-01	27	3	16
1220	[illegible]00E+01	0 2209E-05	-0 3305E-06	0.9113E-06	0 8356E-05	[illegible]1422E+00	-0 2599E-06	0.2764E-01	25	3	16
1220	[illegible]00E+01	0 2337E-05	-0.3127E-06	0 1090E-05	0.2043E-05	[illegible]6304E+00	0.2342E-06	0.2564E-01	27	3	16

Listing B-6. Continued

1240	·000E+01	0.2327E-05	-0 3122E-06	0 8602E-06	-0 6991E-(	·.7968E-01	-0 2573E-06	0 2743F-01	28	9	11
1250	·000E+01	0 2353E-05	0 2924E-06	0.5540E-06	0.1827E-(	J 6627E+01	0 2553E-06	0 2622E-01	26	3	6
1260	0 5000E+01	0 2346E-05	-0.2553E-06	0 6524E-06	0.7811E-05	0 2470E-01	-0.2034E-06	0.2748E-01	28	9	6
1270	0 5000E+01	0 2368E-05	-0 2386E-06	0 8872E-06	0.3724E-05	0.7876E+00	-0 1738E-06	0 2803E-01	26	3	6
1280	0.5000E+01	0.2365E-05	0.2430E-06	0 7286E-06	0.6581E-05	-0 3818E-01	0 1973E-06	0.2782E-01	28	3	6
1290	0 5000E+01	0 2382E-05	-0.2315E-06	0.3968E-06	-0.3703E-05	0 4438E+00	-0 2071E-08	0.2932E-01	26	3	6
1300	0 5000E+01	0.2384E-05	0.1980E-06	0.4444E-06	0.7021E-05	-0 1205E+00	0.1616E-06	0.2815E-01	28	3	6
1310	0.5000E+01	0.2396E-05	-0 1814E-06	0.7165E-06	0 5234E-05	0.2386E+00	-0.1279E-06	0 3026E-01	26	3	6
1320	0.5000E+01	0.2403E-05	0.1878E-06	0.6317E-06	0 5815E-05	-0.2207E+00	0.1484E-06	0 2820E-01	27	9	6
1330	0.5000E+01	0 2410E-05	-0 1840E-06	0 2897E-06	-0 5274E-05	0 1707E+00	-0 1687E-06	0.3058F-01	26	3	6
1340	0 5000E+01	0.2422E 05	0.1548E-06	0.2782E-06	0 5862E-05	-0.5654E+00	0 1314F-06	0 2927E-01	27	9	6
1350	0.5000E+01	0.2425E-05	-0.1368E-06	0.5672E-06	0 6484E-05	0.9320E-01	-0.9301E-07	0.3047E-01	26	3	6
1360	0.5000E+01	0 2442E-05	-0 1438F-06	0.5606E 06	0 4609E-05	-0 1636E+01	-0 1086E-06	0.2961E-01	27	9	6
1370	0 5000E+01	0.2441E 05	0.1470E-06	0.2235E-06	0.6559E-05	0 3856E-01	0.1378E-06	0 2972E-01	26	3	6
1380	0 5000E+01	0.2463E-05	-0 1222E-06	0 1455E-06	0 4331E-05	0 1083E+01	-0 1095E-06	0 2960E-01	27	9	6
1390	0 5000E+01	0.2459E 05	-0 1023E-06	0.4345E 06	0 7508E-05	-0.2047E-01	-0 6711E-07	0 2847E-01	26	3	6
1400	0.5000E+01	0 2485E-05	-0 1090E-06	0 5071E-06	-0 3065E-05	0 4812E+00	-0 7666E-07	0 2947E-01	27	9	11
1410	0.5000E+01	0 2476E-05	-0 1178E-06	0 1876E 08	-0 7568E-05	-0 9330E-01	-0 1127E-06	0 2738E-01	28	9	16
1420	0.5000E+01	0 2507E-05	-0 9757E-07	0.4294E-07	0 2584E-05	0 2907E+00	-0 9358E-07	0 2984E-01	27	3	16
1430	0 5000E+01	0.2494E 05	0 7613E-07	0.3163E-06	0.8237E-05	-0.2034E+00	0 4889E-07	0 2974E-01	28	9	16
1440	0 5000E+01	0.2528E-05	-0.8121E-07	0 4625E-06	-0 1348E-05	0.1759E+00	-0.5095E-07	0.3109E-01	27	3	16
1450	0 5000E+01	0 2513E 05	-0 9422F-07	0.1745E 06	0 8187E-05	-0 3744E+00	-0.9008E-07	0 3141E-01	28	9	16
1460	0 5000E+01	0 2550E-05	0 7926E-07	-0 3086E-07	0.7283E-06	0.1172E+00	0.8212E-07	0 3175E 01	27	3	16
1470	0.5000E+01	0 2533E-05	-0 5664E-07	0.2092E-06	0 8546E-05	-0 1688E+01	-0 3683E-07	0.3270E-01	28	9	16
1480	0.5000E+01	0 2572E 05	-0 5886E-07	0.4206E-06	0.4783E-06	0.5044E-01	-0 3034E-07	0.3197E-01	27	3	16
1490	0.5000E+01	0 2556F-05	-0 7494E-07	0.1793E-06	-0 8331E-05	0.3291E+01	-0 7064E-07	0 3311E-01	28	9	16
1500	0 5000E+01	0 2593E 05	-0 6585F-07	-0.7917E-07	-0.1207E-05	-0.5984E 02	-0 7387E-07	0.3147E-01	27	3	16
1510	0.5000E+01	0.2581E-05	-0.4209E-07	0 1117E-06	0 8409E-05	0 5114E+00	-0.2925E-07	0 3304E-01	28	9	16
1520	0 5000F+01	0 2815E 05	-0 4106E-07	0 3779E-06	0 2369E-05	-0 6982E 01	0.1435E-07	0 3039E-01	27	3	16
1530	0.5000E+01	0 2608E-05	-0.5894E-07	0 1967E-06	-0.8026E-05	0.3354E+00	-0 5316E-07	0.3203E-01	28	9	16
1540	0.5000E+01	0 2637E-05	-0 5585E-07	-0.1057E-06	-0 3148E-05	-0 1714E+00	-0.6749E-07	0.2897E-01	26	3	11
1550	0.5000E+01	0.2637E-05	-0.3159E-07	0 2454E-07	0.7857E-05	0 2012E+00	-0 2530E-07	0.3062E-01	25	3	16
1560	0.5000E+01	0 2659E-05	-0 2717E-07	0.3322E-06	0 4205E-05	-0 3289E+00	-0 2588E-08	0 3044E-01	26	3	6
1570	0 5000E+01	0 2667E-05	0.4546E-07	0 2202E-06	-0 7312E-05	0 1271E+00	-0.3735E-07	0 2975E-01	27	9	6
1580	0 5000E+01	0 2682E-05	-0.4817E-07	-0 1125E-06	-0 4955E-05	-0 7941E+00	-0.6196E-07	0 3257E-01	26	3	6
1590	0.5000E+01	0 2699E-05	-0 2448E-07	-0 5133E 07	0.6909E-05	0 6980E-01	-0 2431E-07	0 3289E-01	27	9	6
1600	0.5000E+01	0.2708E-05	).1647E-07	0.2813E-06	0.5855E-05	0.3002E+01	0.5523E-08	0.3440E-01	26	3	6
1610	0.5000E+01	0.2732E-05	-0 3382E-07	0 2448E-06	-0 6193E-05	0 8566E-02	-0 2297E-07	0.3520E-01	27	9	6
1620	0 5000E+01	0.2735E-05	-0.4205E-07	-0 1013E-06	-0.6522E-05	0 8040F+00	-0.5658E-07	0 3562E-01	26	3	6
1630	0.5000E+01	0.2765E-05	-0 2009E-07	-0 1153E-06	0 5574E-05	-0.5603E-01	-0 2558E-07	0 3704E-01	27	9	6
1640	0.5000E+01	0 2766E-05	-0 8316E-08	0 2246E-06	0 7239E-05	0 3347E+00	0.1064E-07	0 3629E-01	26	3	6
1650	0.5000E+01	0 2799E-05	-0 2385E-07	0 2673E-06	-0 4700E-05	-0 1306E+00	-0 1028E-07	0 3777E-01	27	9	6
1660	0 5000E+01	0 2800E-05	0 3684E-07	-0.7509E-07	-0.7786E-05	0 2427E+00	-0 5074E-07	0.3613E-01	26	3	6
1670	0.5000E+01	0.2834F-05	-0 1784E-07	-0.1665E-06	0.3908E-05	-0 2998E+00	-0 2845E-07	0 3784E-01	27	9	6
1680	0.5000E+01	0 2838E-05	-0.2375E-08	0.1628E-06	0.8300E-05	0.1403E+00	0.1310E-07	0.3519E-01	26	3	6
1690	0.5000E+01	0.2871E-05	-0.1530E-07	0 2845E-06	-0 2919E-05	-0 5669E+00	0.6423E-09	0 3666E-01	27	9	6
1700	0.5000E+01	0 2878E-05	-0 3200E-07	-0 3777E-07	0 8678E-05	0.8369E-01	-0.4404E-07	0.3329E-01	26	3	6
1710	0.5000E+01	0.2910E-05	-0.1712E-07	-0 2030E-06	0 2006E-05	-0 1644E+02	-0 3212E-07	0 3475E-01	27	9	6
1720	0.5000E+01	0 2920E-05	0 1684E-08	0 9715E 07	0 8868E-05	0 2553E-01	0 1323E-07	0.3301E-01	28	9	16
1730	0 5000E+01	0 2954E-05	0 7920E-08	0.2938E-06	-0.9552E-06	0 8819E+00	0 9818E-08	0.3199E-01	27	3	16
1740	0.5000E+01	0 2963E-05	-0 2716E-07	0 7741E-08	-0 8128E-05	-0.3750E 01	0 3637E-07	0.3645E-01	28	9	16
1750	0.5000E+01	0 3002E-05	-0 1748E-07	-0.2242E-06	0.4076E-07	0.4352E+00	-0 3589E-07	0.3414E-01	27	3	16
1760	0 5000E+01	0.3009E-05	0.4020E-08	0.2978E-07	0 9182E-05	-0 1159E+00	0 1111E-07	0 3957E-01	28	9	16
1770	0 5000E+01	0 3055E-05	-0 1433E-08	0.2924E 08	0 1107E-05	0.2430E+00	0.1745E-07	0.3785E-01	26	3	15
1780	0 5000E+01	0.3057E 05	-0.2246E-07	0 5879E-07	-0.9104E-05	-0.2190E+00	-0 7821E-07	0 4215E-01	28	9	15
1790	0.5000E+01	0 3112E-05	-0 1830E-07	-0 2304E 06	-0 2139E-05	0 1733E+00	0.3892E-07	0 4041E-01	26	3	15
1800	0 5000E+01	0.3110E 05	0 4772E-08	-0.3648E-07	0.8920E-05	-0 5658E+00	0.6868E-08	0 4432E-01	28	9	15
1810	0.5000E+01	0.3173E-05	0 4221E-08	0 2789E-06	0 3172E-05	0 9309E-01	0.2351E-07	0.4189E-01	26	3	15
1820	0 5000E+01	0 3168E 05	0.1789E-07	0.1173F-06	-0 8608E-05	-0 1396E+01	-0 1979E-07	0 4479E-01	28	9	15
1830	0.5000E+01	0 3235E-05	-0 1970E-07	-0 2224E 06	-0 4178E-05	0 4074E-01	-0 4082E-07	0 4149E-01	26	3	15
1840	0.5000E+01	0 3235E 05	0 4182E-08	-0.9854E-07	0.8186E-05	0 9933E+00	0 9768E-09	0.4395E-01	28	9	15
1850	0.5000E+01	0 3300E-05	0 8830E-08	0 2530E 06	0.5130E-05	-0 1888E-01	0 2754E-07	0 3987E-01	26	3	15
1860	0 5000E+01	0 3311E 05	-0.1329E-07	0.1643E-06	-0.7663E-05	0 5180E+00	-0 1102E-07	0 4094E-01	28	9	15
1870	0.5000E+01	0.3366F-05	-0.2002E-07	-0.2004E-06	-0.6039E-05	-0.9443E-01	0.4166E-07	0.3683E-01	26	3	16
1880	0.5000E+01	0.3398E 05	0 2768E-08	-0.1545E-06	0.7007E-05	0 2823E+00	-0 5600E-08	0.3666E-01	25	3	15
1890	0.5000E+01	0.3435E-05	0.1216E-07	0.2155E-06	0 6865E-05	-0 '939E+00	0 2905E-07	0.3758E-01	28	9	7

Listing B-6. Continued

1900	0 5000E+01	0.3490E-05	-0.8330E-08	0.2106E-06	-0.6290E-05	0.1815E+00	-0.1595E-08	0.4085E-01	27	3	7
1910	0.5000E+01	0.3509E-05	-0 2070E-07	-0.1645E-06	-0.7634E-05	-0.3819E+00	-0 4166E-07	0.4352E-01	28	9	7
1920	0.5000E+01	0.3590E-05	0 9660E-09	-0.2025E-06	0.5437E-05	0 1173E+00	-0.1208E-07	0.4893E-01	27	3	7
1930	0 5000E+01	0 3593E-05	0 1405E-07	0.1686E-06	0.8275E-05	-0.1512E+01	0.2787E-07	0.4823E-01	28	9	7
1940	0.5000E+01	0 3695E-05	-0.3081E-08	0.2479E-06	-0.4541E-05	0 5118E-01	0.8058E-08	0.5190E-01	27	3	7
1950	0.5000E+01	0 3689E-05	-0 2090E-07	-0.1164E-06	-0.8884E-05	0.3741E+01	-0 4041E-07	0.5056E-01	28	9	2
1960	0.5000E+01	0.3802E-05	-0.1207E-08	0 2407E-06	0.3556E-05	-0.4027E-02	-0.1849E-07	0.5598E-01	27	9	7
1970	0.5000E+01	0 3800E-05	0.1475E-07	0.1142E-06	0 9280E-05	0.5042E+00	0.2477E-07	0 5127E-01	29	3	7
1980	0.5000E+01	0.3911E-05	0.1846E-08	0.2738E-06	-0.2504E-05	-0.6783E-01	0 1647E-07	0.5801E-01	27	9	7
1990	0.5000E+01	0.3928E-05	-0 1995E-07	-0 5927E-07	-0 9711E-05	0.3511E+00	-0.3679E-07	0 5126E-01	29	3	7
2000	0 5000E+01	0.4022E-05	-0.4359E-08	-0.2658E-06	0.1444E-05	-0 1742E+00	-0.2585E-07	0.5794E-01	27	9	7
2010	0 5000E+01	0.4071E-05	0 1496E-07	0.5295E-07	0 9831E-05	0.1969E+00	0.2116E-07	0.5013E-01	26	3	7
2020	0.5000E+01	0 4140E-05	0 5707E-08	0.2892E-06	-0.3041E-06	-0.3084E+00	0.2212E-07	0.5474E-01	27	9	7
2030	0 5000E+01	0.4226E-05	-0 1719E 07	0 1878E-08	-0 1003E-04	0.1319E+00	-0.2992E-07	0.4852E-01	26	3	7
2040	0 5000E+01	0.4271E-05	-0.8499E 08	-0 2737E-06	-0 8185E-06	-0 8670E+00	-0.3405E-07	0.4922E-01	27	9	7
2050	0 5000E+01	0 4389E-05	0 1498E-07	-0 1384E-07	0.9905E-05	0.6955E-01	0.1745E-07	0 4786E-01	27	9	15
2060	0 5000E+01	0 4419E-05	0 8889E-08	0 2935E-06	0 1942E-05	0 4905E+01	0 2518E-07	0.5246E-01	29	9	15
2070	0.5000E+01	0.4556E-05	-0 1307E-07	0.6321E-07	-0.9814E-05	0.9383E 02	-0 2096E-07	0.5695E-01	27	9	15
2080	0 5000E+01	0.4590E 05	-0 1284E-07	-0 2649E-06	-0.3117E-05	0.7765E+00	-0.4148E-07	0 6012E-01	29	9	15
2090	0.5000E+01	0.4726E-05	0 1405E-07	-0.8203E-07	0 9482E-05	-0 5333E-01	0 1198E-07	0.6429E-01	27	9	15
2100	0 5000E+01	0 4785E-05	0.1167E-07	0.2843E-06	0 4128E-05	0.3406E+00	0 2744E-07	0.6619E-01	29	9	15
2110	0.5000E+01	0.4901E-05	-0 8958E-08	0.1240E-06	-0.9074E-05	-0 1296E+00	-0 1271E-07	0 6942E-01	28	3	15
2120	0 5000E+01	0 5003E 05	-0 1582E-07	-0.2425E-06	-0.5313E-05	0.2469E+00	-0.4526E-07	0.7144E-01	26	3	15
2130	0 5000E+01	0.5084E-05	0 1105E-07	-0 1441E-06	0 8544E-05	-0.3010E+00	0.2580E-08	0.7365E-01	28	3	15
2140	0.5000E+01	0.5241E-05	0.1568E-07	0.2577E-06	0.6167E-05	0.1394E+00	0 3079E-07	0.7433E-01	26	3	15
2150	0.5000E+01	0.5284E-05	-0.6204E-08	0.1851E-06	-0.7873E-05	-0.5286E+00	-0.7412E-08	0.7533E-01	28	3	15
2160	0 5000E+01	0.5489E-05	-0 1662E-07	-0 2107E-06	-0.7247E-05	0.8686E-01	-0.4430E-07	0.7285E-01	26	3	15
2170	0.5000E+01	0.5510E-05	0 5854E-08	-0.1940E-06	0.7090E-05	0.2433E+02	-0 1062E-07	0 7541E-01	28	9	15
2180	0.5000E+01	0.5744E-05	0.2025E-07	0 2134E-06	0.7989E-05	0.2587E-01	0 3415E-07	0.6843E-01	26	3	15
2190	0 5000E+01	0.5770E-05	-0.4163E-08	0.2434E-06	-0 6286E-05	0.1019E+01	-0.3522E-08	0.7134E-01	28	9	15
2200	0.5000E+01	0.6001E-05	-0 1620E-07	-0.1697E-06	-0 8807E-05	-0 3740E-01	-0 4134E-07	0.6377E-01	27	3	15
2210	0.5000E+01	0 6067E-05	0 7462E-09	-0.2309E-06	0 5189E-05	0 4161E+00	-0 2315E-07	0.6411E-01	29	9	2
2220	0.5000E+01	0.6262E-05	0.2303E-07	0.1587E-06	0.9455E-05	-0 1108E+00	0 3292E-07	0.7280E-01	28	3	7
2230	0.5000E+01	0.6399E 05	-0 3953E-09	0.2912E-06	-0.4345E-05	0.2517E+00	0 3578E-08	0.7254E-01	30	9	7
2240	0.5000E+01	0.6533E-05	-0 1700E-07	-0.1152E-06	-0 9962E-05	-0 2219E+00	-0.4159E-07	0 8656E-01	28	9	7
2250	0.5000E+01	0.6759E-05	-0 1495E-08	-0.2598E-06	0.2996E-05	0.1728E+00	-0 2988E-07	0.8420E-01	30	9	7
2260	0.5000E+01	0 6826E-05	0 2146E-07	0 9847E-07	0 1041E-04	-0.5436E+00	0 2298E-07	0.9826E-01	28	9	7
2270	0.5000E+01	0.7139E-05	0 6709E-08	0 3175E-08	-0 2061E-05	0 9384E-01	0 1614E-07	0.9366E-01	30	9	7
2280	0.5000E+01	0.7154E-05	-0 1983E-07	-0.4149E-07	-0.1071E-04	-0 1309E+01	-0 4633E-07	0 1036E+00	28	9	7
2290	0.5000E+01	0.7524E-05	-0 7608E-09	-0.2850E-06	0 6862E-06	0 4289E-01	-0 3135E-07	0.1018E+00	27	3	7
2300	0.5000E+01	0 7531E-05	0.1623E-07	0 4567E-07	0.1073E-04	0.9514E+00	0.7006E-08	0.1057E+00	28	9	7
2310	0 5000E+01	0.7913E-05	0 1459E-07	0.3201E-06	0 4794E-06	-0 1791E-01	0 2811E-07	0.1069E+00	27	3	7
2320	0.5000E+01	0.7962E-05	-0.2127E-07	0.4575E-07	0 1103E-04	0 5563E+00	-0 4871E-07	0.1007E+00	29	3	7
2330	0 5000E+01	0 8302E-05	-0 1602E-08	-0 2989E-06	-0.1663E-05	-0.9535E-01	-0 3660E-07	0.1102E+00	27	9	7
2340	0 5000E+01	0.8446E-05	0.1323E-07	-0 7935E-08	0.1048E-04	0.2735E+00	-0.3647E-08	0.1002E+00	29	9	7
2350	0.5000E+01	0.8702E-05	0.1793E-07	0.3119E-06	0.3029E-05	-0.1839E+00	0 2870E-07	0.1074E+00	27	9	7
2360	0 5000E+01	0.8977E-05	-0 1585E-07	0 1273E-06	-0.1071E-04	0.1890E+00	-0 3862E-07	0.9587E-01	26	3	7
2370	0 5000E+01	0.9126E-05	-0 8341E-08	-0.2819E-06	-0 4092E-05	-0.4007E+00	-0.5341E-07	0.1041E+00	28	9	14
2380	0.5000E+01	0.9535E-05	0 1577E-07	-0.7666E-07	0.9797E-05	0.1158E+00	-0.3371E-08	0.1062E+00	30	9	20
2390	0.5000E+01	0.9598E-05	0.1437E 07	0.3102E-08	0 5319E-05	-0 1250E+01	0 1401E-07	0.1174E+00	28	9	14
2400	0 5000E+01	0.1011E-04	-0 2810E-08	0 1855E-08	-0.9656E-05	0 5255E-01	-0 1729E-07	0.1205E+00	27	3	15
2410	0 5000E+01	0.1013E-04	-0 1991E-07	-0 2256E-06	-0.6556E-05	0 3269E+01	-0 7801E-07	0 1256E+00	29	3	15
2420	0 5000E+01	0 1068E-04	0 2089E-07	-0 1608E-06	0 8770E-05	-0.2022E-02	-0.1167E-09	0.1388E+00	27	9	15
2430	0.5000E+01	0.1075E-04	0.9395E-08	0.3126E-06	0.7202E-05	0.5142E+00	-0.4134E-08	0.1389E+00	29	9	15
2440	0 5000E+01	0.1126E-04	0 9317E 08	0.2264E-06	-0.7946E-05	-0.6714E-01	-0 1554E-08	0.1502E+00	27	9	15
2450	0.5000E+01	0.1144E-04	-0.2666E-07	-0 1472E-06	-0.8848E-05	0.3602E+00	-0.9107E-07	0.1469E+00	29	9	15
2460	0.5000E+01	0.1184E-04	0 1837E-07	-0 2309E-06	0 7251E-05	-0 1744E+00	-0.1474E-07	0 1563E+00	27	9	15
2470	0 5000E+01	0.1220E-04	0 1413E-07	0.2911E-06	0.8801E-05	0.1943E+00	-0.4792E 08	0 1524E+00	26	3	15
2480	0.5000E+01	0.1245E-04	0.9885E-08	0 2844E-06	-0.5942E-05	-0.2931E+00	-0.1129E-07	0.1595E+00	28	3	15
2490	0.5000E+01	0.1300E-04	-0.1950E-07	-0 8564E-07	-0.1053E-04	0.1370E+00	-0 7725E-07	0.1540E+00	26	3	15
2500	0 5000E+01	0.1312E-04	0 2430E-08	-0.2475E-06	0.5048E-05	-0 9688E+00	-0 5719E-07	0.1624E+00	28	9	15

Listing B-6. Continued

ITERATION NUMBER 2500

VARIABLES AT L, J = 1, 1

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	-0.2500E+01
2	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.1000E+00	-0.2500E+01
3	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.2000E+00	-0.2500E+01
4	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.3000E+00	-0.2500E+01
5	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.4000E+00	-0.2500E+01
6	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.5000E+00	-0.2500E+01
7	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.6000E+00	-0.2500E+01
8	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.7000E+00	-0.2500E+01
9	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.8000E+00	-0.2500E+01
10	0.1017E+02	0.8949E+02	0.7662E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.9000E+00	-0.2500E+01
11	0.1017E+02	0.8949E+02	0.7662E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.1000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 2

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.2500E+00	0.0000E+00	-0.2500E+01
2	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.3953E-05	0.0000E+00	0.2500E+00	0.1000E+00	-0.2500E+01
3	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.6494E-05	-0.9639E-21	0.2500E+00	0.2000E+00	-0.2500E+01
4	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.9174E-05	0.0000E+00	0.2500E+00	0.3000E+00	-0.2500E+01
5	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.1186E-04	0.0000E+00	0.2500E+00	0.4000E+00	-0.2500E+01
6	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1349E-04	-0.2410E-21	0.2500E+00	0.5000E+00	-0.2500E+01
7	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1424E-04	-0.4819E-21	0.2500E+00	0.6000E+00	-0.2500E+01
8	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1310E-04	0.0000E+00	0.2500E+00	0.7000E+00	-0.2500E+01
9	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1046E-04	0.1928E-20	0.2500E+00	0.8000E+00	-0.2500E+01
10	0.1017E+02	0.8950E+02	0.7663E+00	0.1500E+02	0.1000E+01	-0.7812E-05	0.0000E+00	0.2500E+00	0.9000E+00	-0.2500E+01
11	0.1017E+02	0.8950E+02	0.7663E+00	0.1500E+02	0.1000E+01	-0.6168E-19	0.0000E+00	0.2500E+00	0.1000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 3

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.5000E+00	0.0000E+00	-0.2500E+01
2	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.3279E-04	0.0000E+00	0.5000E+00	0.1000E+00	-0.2500E+01
3	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.7113E-04	0.9642E-21	0.5000E+00	0.2000E+00	-0.2500E+01
4	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.9828E-04	0.0000E+00	0.5000E+00	0.3000E+00	-0.2500E+01
5	0.1017E+02	0.8949E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.1200E-03	0.0000E+00	0.5000E+00	0.4000E+00	-0.2500E+01
6	0.1017E+02	0.8949E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.1278E-03	0.1928E-20	0.5000E+00	0.5000E+00	-0.2500E+01
7	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.1252E-03	0.1928E-20	0.5000E+00	0.6000E+00	-0.2500E+01
8	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.1054E-03	0.0000E+00	0.5000E+00	0.7000E+00	-0.2500E+01
9	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.7655E-04	-0.1928E-20	0.5000E+00	0.8000E+00	-0.2500E+01
10	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.3746E-04	0.0000E+00	0.5000E+00	0.9000E+00	-0.2500E+01
11	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.4937E-18	0.0000E+00	0.5000E+00	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 1, 4

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7500E+00	0.0000E+00	-0.2500E+01
2	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.2919E-04	0.0000E+00	0.7500E+00	0.1000E+00	-0.2500E+01
3	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.6310E-04	0.3856E-20	0.7500E+00	0.2000E+00	-0.2500E+01
4	0.1018E+02	0.8951E+02	0.7659E+00	0.1500E+02	0.1000E+01	0.8257E-04	0.0000E+00	0.7500E+00	0.3000E+00	-0.2500E+01

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5	0.1018E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.8839E-04	0.0000E+00	0.7500E+00	0.4000E+00	-0.2500E+01
6	0.1017E+02	0.8950E+02	0.7662E+00	0.1501E+02	0.1000E+01	0.8093E-04	0.3855E-20	0.7500E+00	0.5000E+00	-0.2500E+01
7	0.1017E+02	0.8950E+02	0.7664E+00	0.1501E+02	0.1000E+01	0.5807E-04	0.3854E-20	0.7500E+00	0.6000E+00	-0.2500E+01
8	0.1017E+02	0.8950E+02	0.7665E+00	0.1501E+02	0.1000E+01	0.3563E-04	0.0000E+00	0.7500E+00	0.7000E+00	-0.2500E+01
9	0.1017E+02	0.8950E+02	0.7666E+00	0.1501E+02	0.1000E+01	0.1838E-04	-0.7707E-20	0.7500E+00	0.8000E+00	-0.2500E+01
10	0.1017E+02	0.8950E+02	0.7667E+00	0.1501E+02	0.1000E+01	0.7232E-05	0.0000E+00	0.7500E+00	0.9000E+00	-0.2500E+01
11	0.1017E+02	0.8950E+02	0.7667E+00	0.1501E+02	0.1000E+01	0.6165E-19	0.0000E+00	0.7500E+00	0.1000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 5

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1018E+02	0.8952E+02	0.7651E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1000E+01	0.0000E+00	-0.2500E+01
2	0.1018E+02	0.8952E+02	0.7651E+00	0.1500E+02	0.1000E+01	0.2451E-03	0.0000E+00	0.1000E+01	0.1000E+00	-0.2500E+01
3	0.1018E+02	0.8951E+02	0.7652E+00	0.1500E+02	0.1000E+01	0.5321E-03	0.3858E-20	0.1000E+01	0.2000E+00	-0.2500E+01
4	0.1018E+02	0.8951E+02	0.7654E+00	0.1500E+02	0.1000E+01	0.7441E-03	0.0000E+00	0.1000E+01	0.3000E+00	-0.2500E+01
5	0.1017E+02	0.8950E+02	0.7657E+00	0.1500E+02	0.1000E+01	0.9181E-03	0.0000E+00	0.1000E+01	0.4000E+00	-0.2500E+01
6	0.1017E+02	0.8949E+02	0.7659E+00	0.1499E+02	0.1000E+01	0.9988E-03	0.3858E-20	0.1000E+01	0.5000E+00	-0.2500E+01
7	0.1017E+02	0.8948E+02	0.7662E+00	0.1499E+02	0.1000E+01	0.9993E-03	0.3858E-20	0.1000E+01	0.6000E+00	-0.2500E+01
8	0.1016E+02	0.8947E+02	0.7664E+00	0.1499E+02	0.1000E+01	0.8777E-03	0.0000E+00	0.1000E+01	0.7000E+00	-0.2500E+01
9	0.1016E+02	0.8946E+02	0.7666E+00	0.1499E+02	0.1000E+01	0.6558E-03	-0.7716E-20	0.1000E+01	0.8000E+00	-0.2500E+01
10	0.1016E+02	0.8946E+02	0.7667E+00	0.1499E+02	0.1000E+01	0.2401E-03	0.0000E+00	0.1000E+01	0.9000E+00	-0.2500E+01
11	0.1016E+02	0.8946E+02	0.7667E+00	0.1499E+02	0.1000E+01	0.1975E-17	0.0000E+00	0.1000E+01	0.1000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 6

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1020E+02	0.8958E+02	0.7631E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1250E+01	0.0000E+00	-0.2500E+01
2	0.1020E+02	0.8958E+02	0.7631E+00	0.1501E+02	0.1000E+01	0.4504E-03	0.0000E+00	0.1250E+01	0.1000E+00	-0.2500E+01
3	0.1020E+02	0.8957E+02	0.7635E+00	0.1501E+02	0.1000E+01	0.9494E-03	0.7720E-20	0.1250E+01	0.2000E+00	-0.2500E+01
4	0.1020E+02	0.8956E+02	0.7641E+00	0.1501E+02	0.1000E+01	0.1303E-02	0.0000E+00	0.1250E+01	0.3000E+00	-0.2500E+01
5	0.1019E+02	0.8954E+02	0.7650E+00	0.1501E+02	0.1000E+01	0.1514E-02	0.0000E+00	0.1250E+01	0.4000E+00	-0.2500E+01
6	0.1018E+02	0.8952E+02	0.7660E+00	0.1501E+02	0.1000E+01	0.1553E-02	0.3854E-20	0.1250E+01	0.5000E+00	-0.2500E+01
7	0.1017E+02	0.8949E+02	0.7672E+00	0.1501E+02	0.1000E+01	0.1374E-02	0.3851E-20	0.1250E+01	0.6000E+00	-0.2500E+01
8	0.1016E+02	0.8947E+02	0.7685E+00	0.1502E+02	0.1000E+01	0.1013E-02	0.0000E+00	0.1250E+01	0.7000E+00	-0.2500E+01
9	0.1015E+02	0.8945E+02	0.7697E+00	0.1503E+02	0.1000E+01	0.5420E-03	-0.7688E-20	0.1250E+01	0.8000E+00	-0.2500E+01
10	0.1015E+02	0.8943E+02	0.7705E+00	0.1503E+02	0.1000E+01	0.1365E-03	0.0000E+00	0.1250E+01	0.9000E+00	-0.2500E+01
11	0.1015E+02	0.8943E+02	0.7705E+00	0.1503E+02	0.1000E+01	0.9836E-18	0.0000E+00	0.1250E+01	0.1000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 7

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1025E+02	0.8969E+02	0.7584E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1500E+01	0.0000E+00	-0.2500E+01
2	0.1025E+02	0.8969E+02	0.7584E+00	0.1501E+02	0.1000E+01	0.1625E-02	0.0000E+00	0.1500E+01	0.1000E+00	-0.2500E+01
3	0.1024E+02	0.8967E+02	0.7593E+00	0.1500E+02	0.1000E+01	0.3555E-02	0.3868E-20	0.1500E+01	0.2000E+00	-0.2500E+01
4	0.1023E+02	0.8964E+02	0.7606E+00	0.1500E+02	0.1000E+01	0.5101E-02	0.0000E+00	0.1500E+01	0.3000E+00	-0.2500E+01
5	0.1021E+02	0.8959E+02	0.7625E+00	0.1500E+02	0.1000E+01	0.6528E-02	0.0000E+00	0.1500E+01	0.4000E+00	-0.2500E+01
6	0.1018E+02	0.8952E+02	0.7648E+00	0.1499E+02	0.1000E+01	0.7499E-02	0.3860E-20	0.1500E+01	0.5000E+00	-0.2500E+01
7	0.1015E+02	0.8945E+02	0.7672E+00	0.1499E+02	0.1000E+01	0.8029E-02	0.3857E-20	0.1500E+01	0.6000E+00	-0.2500E+01
8	0.1012E+02	0.8936E+02	0.7700E+00	0.1497E+02	0.1000E+01	0.7861E-02	0.0000E+00	0.1500E+01	0.7000E+00	-0.2500E+01
9	0.1009E+02	0.8930E+02	0.7716E+00	0.1496E+02	0.1000E+01	0.6975E-02	-0.7711E-20	0.1500E+01	0.8000E+00	-0.2500E+01
10	0.1004E+02	0.8917E+02	0.7743E+00	0.1493E+02	0.1000E+01	0.4514E-02	0.0000E+00	0.1500E+01	0.9000E+00	-0.2500E+01
11	0.1004E+02	0.8917E+02	0.7743E+00	0.1493E+02	0.1000E+01	0.6320E-16	0.0000E+00	0.1500E+01	0.1000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 8

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1037E+02	0.9000E+02	0.7458E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1750E+01	0.0000E+00	-0.2500E+01
2	0.1037E+02	0.9000E+02	0.7458E+00	0.1500E+02	0.1000E+01	0.3522E-02	0.0000E+00	0.1750E+01	0.1000E+00	-0.2500E+01
3	0.1036E+02	0.8995E+02	0.7473E+00	0.1500E+02	0.1000E+01	0.7612E-02	0.9737E-21	0.1750E+01	0.2000E+00	-0.2500E+01
4	0.1033E+02	0.8989E+02	0.7502E+00	0.1500E+02	0.9999E+00	0.1080E-01	0.0000E+00	0.1750E+01	0.3000E+00	-0.2500E+01
5	[illegible]030E+02	0.8981E+02	0.7537E+00	0.1501E+02	0.9999E+00	[illegible]1381E-01	0.0000E+00	0.1750E+01	0.4000E+00	-0.2500E+[illegible]
6	[illegible]24E+02	0.8968E+02	0.7596E+00	0.1502E+02	0.9999E+0[illegible]	[illegible]1531E-01	0.6039E-22	0.1750E+01	0.5000E+00	-0.2500E+[illegible]

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7	020F+02	0.8956E+02	0 7651E+00	0.1503E+02	0 9999E+0	1644E-01	0 9631E-21	0 1750E+01	0 6000E+00	-0 2500E
8	011E+02	0 8933E+02	0 7755E+00	0 1504E+02	0 9999E+0	1422E-01	0 0000E+00	0 1750E+01	0 7000E+00	-0.2500E
9	0 1006E+02	0 8920E+02	0 7825E+00	0 1507E+02	0.9999E+00	0 1302E 01	-0.1905E 20	0 1750E+01	0 8000E+00	-0 2500E+01
10	0 9881E+01	0 8875E+02	0 8039E+00	0.1512F+02	0 1000E+01	0 1594E-02	0 0000F+00	0 1750E+01	0 9000E+00	-0 2500E+01
11	0.9881E+01	0 8875E+02	0 8039E+00	0 1512E+02	0.1000E+01	0 1543E-16	0 0000E+00	0 1750E+01	0 1000E+01	-0 2500E+01

VARIABLES AT L, J = 1, 9

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0 1061E+02	0 9057E+02	0 7225F+00	0 1502E+02	0 1000F+01	0 6265E-16	0 0000F+00	0 2000E+01	0 0000E+00	-0 2500E+01
2	0 1061E+02	0 9057E+02	0.7325E+00	0.1502E+02	0 1000E+01	0 7299E-02	0 0000E+00	0 2000F+01	0.1000E+00	-0 2500E+01
3	0 1059F+02	0 9051E+02	0 7249F+00	0 1502E+02	0 9999F+00	0 1720E-01	0 0000E+00	0 2000E+01	0 2000E+00	-0 2500E+01
4	0 1054E+02	0 9039E+02	0 7300E+00	0 1502E+02	0 9997E+00	0.2456E-01	0 0000E+00	0 2000E+01	0 3000E+00	-0 2500E+01
5	0 1049F+02	0 9028E+02	0 7360E+00	0 1504E+02	0 9994E+00	0 3516E-01	0 0000E+00	0 2000E+01	0 4000E+00	-0 2500E+01
6	0 1038E+02	0 8998E+02	0 7472E+00	0 1503E+02	0 9992E+00	0 4118E-01	0 0000F+00	0.2000E+01	0 5000E+00	-0 2500E+01
7	0 1032E+02	0 8981E+02	0 7573E+00	0 1509E+02	0 9985E+00	0 5516E-01	0 0000E+00	0 2000E+01	0 6000E+00	-0 2500E+01
8	0 1008E+02	0 8919E+02	0 7783E+00	0 1504E+02	0 9983E+00	0 5743E-01	0 0000F+00	0 2000E+01	0 7000E+00	-0 2500E+01
9	0 1003E+02	0.8902E+02	0 7954E+00	0 1521E+02	0 9967E+00	0 8121E-01	0 0000E+00	0.2000E+01	0 8000E+00	-0.2500E+01
10	0 9534E+01	0.8773E+02	0 8325E+00	0 1502E+02	0 9973E+00	0 7300E-01	-0 3635F-20	0.2000E+01	0.9000E+00	-0.2500E+01
11	0 9534E+01	0 8773E+02	0 8314E+00	0 1500E+02	0 9923E+00	0 1240E+00	-0 1820E 20	0.2000E+01	0 1000F+01	-0.2500E+01

VARIABLES AT L, J = 1, 10

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0 1098F+02	0 9149E+02	0 6810F+00	0 1498E+02	0 1000E+01	0 0000E+00	-0 3823E 20	0 2250E+01	0 0000E+00	-0 2500E+01
2	0 1098E+02	0 9149E+02	0 6811E+00	0 1498E+02	0 9999E+00	0 1379F-01	-0 3872F-20	0 2250E+01	0 1062E+00	-0 2500E+01
3	0 1096F+02	0 9144E+02	0 6830F+00	0 1498E+02	0.9995E+00	0.3268E-01	-0 3818E-20	0 2250E+01	0 2125E+00	-0 2500E+01
4	0 1091E+02	0 9132E+02	0.6871E+00	0.1496E+02	0 9989E+00	0 4722E-01	0 0000F+00	0 2250E+01	0 3187E+00	0 2500E+01
5	0 1088F+02	0 9124E+02	0 6918F+00	0 1498E+02	0 9976E+00	0 6869E-01	-0 7590E 20	0 2250E+01	0 4250E+00	-0 2500E+01
6	0 1076E+02	0 9097E+02	0 6995E+00	0 1492E+02	0 9965E+00	0 8346E-01	0 0000E+00	0 2250E+01	0.5312E+00	-0 2500E+01
7	0.1073E+02	0 9089E+02	0 7070E+00	0 1497E+02	0 9937E+00	0 1117E+00	0.7517E-20	0 2250E+01	0 6375F+00	-0 2500E+01
8	0 1052F+02	0 9039E+02	0 7189F+00	0 1484E+02	0 9921E+00	0 1254E+00	0 0000E+00	0 2250E+01	0 7437E+00	-0 2500E+01
9	0.1050E+02	0 9039E+02	0 7309E+00	0 1498E+02	0 9861E+00	0 1661E+00	0 0000E+00	0 2250E+01	0 8500F+00	-0.2500E+01
10	0 1016F+02	0 8965E+02	0 7352F+00	0 1455E+02	0 9841E+00	0 1776E+00	-0 7579E-20	0 2250E+01	0 9562E+00	-0 2500E+01
11	0 1016E+02	0.8965E+02	0 7336E+00	0 1453E+02	0.9701E+00	0 2425E+00	-0 7596E-20	0 2250E+01	0 1062E+01	-0 2500E+01

VARIABLES AT L, J = 1, 11

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINF	X	Y	Z
1	0 1151F+02	0 9273E+02	0 6254F+00	0 1498E+02	0 1000F+01	0 2476E-15	0 0000E+00	0 2500E+01	0 0000E+00	-0 2500E+01
2	0 1151E+02	0 9273E+02	0 6255E+00	0 1498E+02	0 9998E+00	0 1879E-01	0 0000E+00	0 2500E+01	0 1125E+00	-0 2500E+01
3	0 1150E+02	0 9271E+02	0 6260F+00	0 1497F+02	0 9991E+00	0 4225E-01	0 0000E+00	0 2500E+01	0 2250E+00	-0 2500E+01
4	0 1148E+02	0 9268E+02	0 6269E+00	0 1496E+02	0 9981E+00	0 6169E-01	0 0000F+00	0 2500E+01	0 3375E+00	-0 2500E+01
5	0 1146E+02	0 9267E+02	0 6284E+00	0 1497E+02	0 9962E+00	0 8680E-01	0 0000E+00	0 2500E+01	0 4500E+00	-0 2500E+01
6	0 1144E+02	0 9261E+02	0 6289E+00	0 1494E+02	0 9942F+00	0 1073E+00	0 0000E+00	0 2500E+01	0 5625E+00	0 2500E+01
7	0.1145E+02	0 9263E+02	0 6312E+00	0 1497E+02	0 9908E+00	0 1352E+00	0 0000E+00	0 2500E+01	0 6750E+00	-0.2500E+01
8	0 1143F+02	0 9260E+02	0 6297E+00	0 1493E+02	0 9876F+00	0 1571F+00	0 0000E+00	0 2500E+01	0 7875E+00	-0 2500E+01
9	0 1144E+02	0 9270E+02	0 6316E+00	0 1497E+02	0 9825E+00	0 1864E+00	0 7522E 20	0 2500E+01	0 9000E+00	-0 2500E+01
10	0.1149E+02	0 9289E+02	0 6107F+00	0 1478E+02	0 9765F+00	0 2156E+00	-0 7754E-20	0 2500E+01	0 1012E+01	-0 2500E+01
11	0 1149E+02	0 9289E+02	0 6105E+00	0 1478E+02	0 9701E+00	0 2425E+00	-0 7757E-20	0.2500E+01	0 1125E+01	-0 2500E+01

VARIABLES AT L, J = 1, 12

K	PRESSURF	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINF	X	Y	Z
1	0 1199E+02	0 9382E+02	0 5746F+00	0.1499E+02	0 1000E+01	0 0000E+00	0.0000E+00	0 2750E+01	0 0000E+00	-0 2500E+01
2	0 1199E+02	0 9382E+02	0 5748E+00	0 1499E+02	0 9998E+00	0 2165E-01	0 0000E+00	0 2750E+01	0 1187F+00	-0 2500E+01
3	0 1199E+02	0 9382E+02	0 5745E+00	0 1499E+02	0 9989E+00	0 4587E-01	0.0000E+00	0 2750E+01	0 2375E+00	-0 2500E+01
4	0.1199E+02	0 9383E+02	0 5738F+00	0 1499E+02	0 9977E+00	0 6793E-01	-0 3767F-20	0 2750E+01	0 3562E+00	-0 2500E+01
5	0 1199E+02	0 9385E+02	0 5736E+00	0 1499E+02	0 9957E+00	0 9277E-01	0 0000E+00	0 2750E+01	0 4750E+00	-0 2500E+01
6	0 1200E+02	0 9387E+02	0 5716F+00	0 1498E+02	0 9932E+00	0.1161E+00	0 0000F+00	0 2750E+01	0 5937E+00	-0 2500E+01
7	0.1202E+02	0 9391E+02	0 5716E+00	0 1500E+02	0 9900E+00	0 1412E+00	0 3774E 20	0 2750E+01	0 7125E+00	-0 2500E+01
8	0 1205E+02	0 9400E+02	0 5677F+00	0 1499E+02	0 9861E+00	0 1664E+00	0 0000F+00	0 2750E+01	0 8312E+00	-0 2500E+01

Listing B-6. Continued

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  9  0.1206E+02  0.9408E+02  0.5641E+00  0.1497E+02  0.9816E+00  0.1909E+00 -0.7626E-20  0.2750E+01  0.9500E+00 -0.2500E+01
 10  0.1213E+02  0.9429E+02  0.5469E+00  0.1487E+02  0.9747E+00  0.2236E+00 -0.1566E-19  0.2750E+01  0.1069E+01 -0.2500E+01
 11  0.1213E+02  0.9429E+02  0.5468E+00  0.1487E+02  0.9701E+00  0.2425E+00 -0.7830E-20  0.2750E+01  0.1187E+01 -0.2500E+01

  VARIABLES AT L, J =     1,    13

 K     PRESSURE   TEMPERATURE MACH NUMBER TOTAL PRESS   U-COSINE    V-COSINE    W-COSINE        X           Y           Z

  1  0.1235E+02  0.9462E+02  0.5337E+00  0.1499E+02  0.1000E+01  0.2458E-15  0.0000E+00  0.3000E+01  0.0000E+00 -0.2500E+01
  2  0.1235E+02  0.9462E+02  0.5339E+00  0.1499E+02  0.9997E+00  0.2345E-01  0.0000E+00  0.3000E+01  0.1250E+00 -0.2500E+01
  3  0.1235E+02  0.9462E+02  0.5334E+00  0.1499E+02  0.9989E+00  0.4774E-01  0.0000E+00  0.3000E+01  0.2500E+00 -0.2500E+01
  4  0.1236E+02  0.9464E+02  0.5324E+00  0.1499E+02  0.9974E+00  0.7139E-01 -0.9394E-21  0.3000E+01  0.3750E+00 -0.2500E+01
  5  0.1236E+02  0.9466E+02  0.5316E+00  0.1499E+02  0.9954E+00  0.9593E-01 -0.7524E-20  0.3000E+01  0.5000E+00 -0.2500E+01
  6  0.1238E+02  0.9469E+02  0.5298E+00  0.1498E+02  0.9927E+00  0.1206E+00  0.0000E+00  0.3000E+01  0.6250E+00 -0.2500E+01
  7  0.1239E+02  0.9472E+02  0.5289E+00  0.1499E+02  0.9895E+00  0.1446E+00  0.0000E+00  0.3000E+01  0.7500E+00 -0.2500E+01
  8  0.1242E+02  0.9480E+02  0.5253E+00  0.1499E+02  0.9853E+00  0.1707E+00 -0.7586E-20  0.3000E+01  0.8750E+00 -0.2500E+01
  9  0.1242E+02  0.9487E+02  0.5192E+00  0.1493E+02  0.9809E+00  0.1943E+00  0.0000E+00  0.3000E+01  0.1000E+01 -0.2500E+01
 10  0.1248E+02  0.9503E+02  0.5069E+00  0.1487E+02  0.9742E+00  0.2255E+00  0.0000E+00  0.3000E+01  0.1125E+01 -0.2500E+01
 11  0.1248E+02  0.9503E+02  0.5068E+00  0.1487E+02  0.9701E+00  0.2425E+00  0.0000E+00  0.3000E+01  0.1250E+01 -0.2500E+01

  VARIABLES AT L, J =     1,    14

 K     PRESSURE   TEMPERATURE MACH NUMBER TOTAL PRESS   U-COSINE    V-COSINE    W-COSINE        X           Y           Z

  1  0.1265E+02  0.9526E+02  0.4989E+00  0.1499E+02  0.1000E+01  0.0000E+00  0.2995E-19  0.3250E+01  0.0000E+00 -0.2500E+01
  2  0.1265E+02  0.9526E+02  0.4990E+00  0.1499E+02  0.9997E+00  0.2450E-01  0.2994E-19  0.3250E+01  0.1312E+00 -0.2500E+01
  3  0.1265E+02  0.9527E+02  0.4984E+00  0.1499E+02  0.9988E+00  0.4876E-01  0.0000E+00  0.3250E+01  0.2625E+00 -0.2500E+01
  4  0.1268E+02  0.9529E+02  0.4973E+00  0.1499E+02  0.9973E+00  0.7330E-01  0.0000E+00  0.3250E+01  0.3937E+00 -0.2500E+01
  5  0.1266E+02  0.9531E+02  0.4961E+00  0.1498E+02  0.9952E+00  0.9764E-01  0.0000E+00  0.3250E+01  0.5250E+00 -0.2500E+01
  6  0.1268E+02  0.9535E+02  0.4947E+00  0.1499E+02  0.9924E+00  0.1228E+00  0.0000E+00  0.3250E+01  0.6562E+00 -0.2500E+01
  7  0.1269E+02  0.9537E+02  0.4930E+00  0.1498E+02  0.9893E+00  0.1462E+00  0.0000E+00  0.3250E+01  0.7875E+00 -0.2500E+01
  8  0.1272E+02  0.9547E+02  0.4891E+00  0.1498E+02  0.9850E+00  0.1726E+00 -0.7601E-20  0.3250E+01  0.9187E+00 -0.2500E+01
  9  0.1273E+02  0.9552E+02  0.4817E+00  0.1492E+02  0.9807E+00  0.1957E+00  0.7715E-20  0.3250E+01  0.1050E+01 -0.2500E+01
 10  0.1278E+02  0.9568E+02  0.4720E+00  0.1489E+02  0.9743E+00  0.2253E+00  0.0000E+00  0.3250E+01  0.1181E+01 -0.2500E+01
 11  0.1278E+02  0.9568E+02  0.4720E+00  0.1489E+02  0.9701E+00  0.2425E+00  0.0000E+00  0.3250E+01  0.1312E+01 -0.2500E+01

  VARIABLES AT L, J =     1,    15

 K     PRESSURE   TEMPERATURE MACH NUMBER TOTAL PRESS   U-COSINE    V-COSINE    W-COSINE        X           Y           Z

  1  0.1290E+02  0.9580E+02  0.4686E+00  0.1499E+02  0.1000E+01  0.0000E+00  0.0000E+00  0.3500E+01  0.0000E+00 -0.2500E+01
  2  0.1290E+02  0.9580E+02  0.4688E+00  0.1499E+02  0.9997E+00  0.2499E-01  0.0000E+00  0.3500E+01  0.1375E+00  0.2500E+01
  3  0.1290E+02  0.9581E+02  0.4681E+00  0.1499E+02  0.9988E+00  0.4921E-01  0.0000E+00  0.3500E+01  0.2750E+00 -0.2500E+01
  4  0.1291E+02  0.9583E+02  0.4669E+00  0.1499E+02  0.9973E+00  0.7410E-01  0.0000E+00  0.3500E+01  0.4125E+00 -0.2500E+01
  5  0.1292E+02  0.9584E+02  0.4655E+00  0.1498E+02  0.9952E+00  0.9825E-01  0.6018E-19  0.3500E+01  0.5500E+00 -0.2500E+01
  6  0.1293E+02  0.9588E+02  0.4639E+00  0.1499E+02  0.9924E+00  0.1234E+00  0.0000E+00  0.3500E+01  0.6875E+00 -0.2500E+01
  7  0.1294E+02  0.9591E+02  0.4623E+00  0.1498E+02  0.9892E+00  0.1466E+00 -0.3025E-19  0.3500E+01  0.8250E+00 -0.2500E+01
  8  0.1297E+02  0.9600E+02  0.4580E+00  0.1498E+02  0.9849E+00  0.1729E+00 -0.7618E-20  0.3500E+01  0.9625E+00 -0.2500E+01
  9  0.1298E+02  0.9606E+02  0.4504E+00  0.1492E+02  0.9806E+00  0.1960E+00 -0.7745E-20  0.3500E+01  0.1100E+01  0.2500E+01
 10  0.1303E+02  0.9620E+02  0.4428E+00  0.1491E+02  0.9745E+00  0.2243E+00  0.0000E+00  0.3500E+01  0.1237E+01 -0.2500E+01
 11  0.1303E+02  0.9620E+02  0.4427E+00  0.1491E+02  0.9701E+00  0.2425E+00  0.0000E+00  0.3500E+01  0.1375E+01 -0.2500E+01

  VARIABLES AT L, J =     1,    16

 K     PRESSURE   TEMPERATURE MACH NUMBER TOTAL PRESS   U-COSINE    V-COSINE    W-COSINE        X           Y           Z

  1  0.1310E+02  0.9624E+02  0.4424E+00  0.1499E+02  0.1000E+01  0.0000E+00 -0.1197E-18  0.3750E+01  0.0000E+00 -0.2500E+01
  2  0.1310E+02  0.9624E+02  0.4425E+00  0.1499E+02  0.9997E+00  0.2517E-01 -0.1196E-18  0.3750E+01  0.1437E+00 -0.2500E+01
  3  0.1311E+02  0.9625E+02  0.4419E+00  0.1499E+02  0.9988E+00  0.4934E-01 -0.1197E-18  0.3750E+01  0.2875E+00 -0.2500E+01
  4  0.1312E+02  0.9626E+02  0.4407E+00  0.1499E+02  0.9972E+00  0.7434E-01 -0.6001E-19  0.3750E+01  0.4312E+00 -0.2500E+01
  5  0.1312E+02  0.9628E+02  0.4393E+00  0.1498E+02  0.9952E+00  0.9832E-01  0.1880E-20  0.3750E+01  0.5750E+00 -0.2500E+01
  6  0.1314E+02  0.9632E+02  0.4378E+00  0.1499E+02  0.9924E+00  0.1234E+00  0.6030E-19  0.3750E+01  0.7187E+00 -0.2500E+01
  7  0.1315E+02  0.9634E+02  0.4360E+00  0.1498E+02  0.9892E+00  0.1465E+00  0.0000E+00  0.3750E+01  0.8625E+00  0.2500E+01
  8  0.1318E+02  0.9643E+02  0.4314E+00  0.1498E+02  0.9850E+00  0.1726E+00  0.0000E+00  0.3750E+01  0.1006E+01 -0.2500E+01
  9        318E+02  0.9648E+02  0.4240E+00  0.1492E+02  0.9806E+0      1959E+00 -0.3106E-19  0.3750E+01  0.1150E+01 -0.2500E+
 10        .23E+02  0.9661E+02  0.4177E+00  0.1491E+02  0.9748E+0      2232E+00 -0.3145E-19  0.3750E+01  0.1294E+01 -0.2500E+
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Listing B-6. Continued

11	323E+02	0.9661E+02	0 4176E+00	0.1491E+02	0 9701E+0	.2425E+00	-0.3145E-19	0.3750E+01	0.1437E+01	-0.2500E

VARIABLES AT L, J = 1, 17

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1328E+02	0.9660E+02	0 4194E+00	0.1499E+02	0 1000E+01	-0.4898E-15	0.0000E+00	0.4000E+01	0.0000E+00	-0.2500E+01
2	0.1328E+02	0.9660E+02	0 4195E+00	0.1499E+02	0.9997E+00	0 2512E-01	0 0000E+00	0.4000E+01	0.1500E+00	-0.2500E+01
3	0.1329E+02	0.9661E+02	0 4189E+00	0.1499E+02	0.9988E+00	0.4920E-01	0 0000E+00	0.4000E+01	0 3000E+00	-0.2500E+01
4	0.1329E+02	0.9663E+02	0.4178E+00	0.1499E+02	0.9972E+00	0.7411E-01	0.0000E+00	0.4000E+01	0.4500E+00	-0.2500E+01
5	0.1330E+02	0.9665E+02	0 4165E+00	0.1499E+02	0 9952E+00	0 9790E-01	0 0000E+00	0.4000E+01	0 6000E+00	-0 2500E+01
6	0.1332E+02	0.9668E+02	0 4151E+00	0 1499E+02	0 9924E+00	0.1227E+00	0.0000E+00	0 4000E+01	0 7500E+00	0.2500E+01
7	0 1333E+02	0.9671E+02	0.4129E+00	0.1498E+02	0.9893E+00	0 1459E+00	0.0000E+00	0.4000E+01	0 9000E+00	-0.2500E+01
8	0 1335E+02	0.9679E+02	0 4081E+00	0.1497E+02	0 9851E+00	0.1720E+00	0 0000E+00	0.4000E+01	0 1050E+01	-0 2500E+01
9	0.1336E+02	0.9684E+02	0 4009E+00	0.1492E+02	0 9807E+00	0.1954E+00	0 0000E+00	0.4000E+01	0.1200E+01	-0.2500E+01
10	0 1339E+02	0.9695E+02	0 3956E+00	0 1492E+02	0 9750E+00	0 2223E+00	0.0000E+00	0.4000E+01	0.1350E+01	-0 2500E+01
11	0.1339E+02	0.9695E+02	0 3955E+00	0.1492E+02	0.9701E+00	0 2425E+00	0.0000E+00	0.4000E+01	0 1500E+01	-0.2500E+01

VARIABLES AT L, J = 1, 18

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1343E+02	0.9691E+02	0 3990E+00	0 1499E+02	0 1000E+01	-0.4895E-15	0.0000E+00	0.4250E+01	0 0000E+00	-0.2500E+01
2	0 1343E+02	0 9691E+02	0 3991E+00	0 1499E+02	0.9997E+00	0.2489E 01	0.0000E+00	0 4250E+01	0 1562E+00	-0 2500E+01
3	0 1344E+02	0.9692E+02	0.3986E+00	0.1499E+02	0 9988E+00	0.4880E-01	0 0000E+00	0.4250E+01	0 3125E+00	-0.2500E+01
4	0 1344E+02	0 9694E+02	0 3975E+00	0.1499E+02	0 9973E+00	0.7351E-01	0.0000E+00	0 4250E+01	0.4687E+00	-0 2500E+01
5	0 1345E+02	0.9695E+02	0 3963E+00	0 1499E+02	0 9953E+00	0 9710E-01	0.0000E+00	0 4250E+01	0 6250E+00	-0.2500E+01
6	0.1347E+02	0 9699E+02	0 3948E+00	0 1499E+02	0 9926E+00	0 1217E+00	0 0000E+00	0.4250E+01	0 7812E+00	-0 2500E+01
7	0 1347E+02	0 9702E+02	0 3923E+00	0 1498E+02	0 9894E+00	0 1450E+00	0 1212E-18	0 4250E+01	0 9375E+00	-0 2500E+01
8	0 1350E+02	0.9710E+02	0 3872E+00	0 1497E+02	0 9853E+00	0.1711E+00	0.0000E+00	0 4250E+01	0 1094E+01	-0 2500E+01
9	0 1350E+02	0.9714E+02	0.3803E+00	0 1492E+02	0 9809E+00	0 1947E+00	0.2497E-18	0.4250E+01	0.1250E+01	-0.2500E+01
10	0 1354E+02	0 9724E+02	0 3756E+00	0.1492E+02	0 9752E+00	0.2215E+00	0.6308E-19	0.4250E+01	0 1406E+01	-0 2500E+01
11	0 1354E+02	0.9724E+02	0 3755E+00	0 1492E+02	0 9701E+00	0.2425E+00	0 6309E-19	0.4250E+01	0.1562E+01	-0.2500E+01

VARIABLES AT L, J = 1, 19

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0 1356E+02	0.9718E+02	0 3810E+00	0 1499E+02	0 1000E+01	0.0000E+00	0 0000E+00	0 4500E+01	0 0000E+00	-0 2500E+01
2	0 1356E+02	0 9718E+02	0 3811E+00	0 1499E+02	0 9997E+00	0.2439E 01	0 0000E+00	0 4500E+01	0 1625E+00	-0.2500E+01
3	0.1356E+02	0 9719E+02	0 3806E+00	0 1499E+02	0 9989E+00	0 4793E-01	0 2389E-18	0.4500E+01	0.3250E+00	-0 2500E+01
4	0 1357E+02	0 9720E+02	0 3796E+00	0 1499E+02	0 9974E+00	0 7224E 01	0 0000E+00	0 4500E+01	0 4875E+00	-0 2500E+01
5	0 1358E+02	0.9722E+02	0 3783E+00	0 1499E+02	0.9954E+00	0 9556E-01	0 0000E+00	0 4500E+01	0 6500E+00	-0 2500E+01
6	0 1360E+02	0 9726E+02	0 3768E+00	0 1499E+02	0 9928E+00	0.1200E+00	0 0000E+00	0 4500E+01	0 8125E+00	-0 2500E+01
7	0.1360E+02	0.9729E+02	0 3739E+00	0 1498E+02	0 9896E+00	0 1436E+00	0 0000E+00	0 4500E+01	0.9750E+00	-0 2500E+01
8	0 1363E+02	0.9736E+02	0 3685E+00	0 1497E+02	0 9855E+00	0 1697E+00	0 0000E+00	0 4500E+01	0 1137E+01	-0.2500E+01
9	0.1363E+02	0 9741E+02	0 3619E+00	0 1493E+02	0 9811E+00	0 1936E+00	-0.1564E-19	0 4500E+01	0.1300E+01	-0 2500E+01
10	0 1367E+02	0 9750E+02	0 3576E+00	0 1493E+02	0 9754E+00	0 2206E+00	0 0000E+00	0 4500E+01	0 1462E+01	-0 2500E+01
11	0 1367E+02	0 9750E+02	0 3575E+00	0 1493E+02	0 9701E+00	0 2425E+00	0 0000E+00	0 4500E+01	0 1625E+01	-0 2500E+01

VARIABLES AT L, J = 1, 20

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0 1367E+02	0.9740E+02	0 3651E+00	0 1499E+02	0 1000E+01	-0 4880E 15	0 9531E-18	0.4750E+01	0 0000E+00	-0.2500E+01
2	0.1367E+02	0 9740E+02	0 3652E+00	0 1499E+02	0.9997E+00	0 2378E-01	0 9528E-18	0 4750E+01	0 1687E+00	-0 2500E+01
3	0.1367E+02	0 9741E+02	0 3646E+00	0 1499E+02	0 9989E+00	0 4670E-01	0 0000E+00	0 4750E+01	0 3375E+00	0.2500E+01
4	0.1368E+02	0 9743E+02	0 3635E+00	0.1499E+02	0 9975E+00	0 7043E-01	0 0000E+00	0 4750E+01	0.5062E+00	-0 2500E+01
5	0 1369E+02	0 9744E+02	0 3621E+00	0 1499E+02	0.9956E+00	0 9338E-01	0 0000E+00	0 4750E+01	0 6750E+00	-0.2500E+01
6	0.1371E+02	0 9748E+02	0 3602E+00	0.1499E+02	0 9930E+00	0.1178E+00	0.0000E+00	0.4750E+01	0 8437E+00	-0 2500E+01
7	0 1372E+02	0 9751E+02	0 3569E+00	0 1498E+02	0 9899E+00	0 1415E+00	0 0000E+00	0 4750E+01	0 1012E+01	0 2500E+01
8	0 1374E+02	0 9759E+02	0 3512E+00	0 1496E+02	0 9858E+00	0 1679E+00	0 0000E+00	0.4750E+01	0 1181E+01	-0 2500E+01
9	0.1375E+02	0.9764E+02	0 3449E+00	0.1492E+02	0.9814E+00	0 1921E+00	0 0000E+00	0.4750E+01	0.1350E+01	-0 2500E+01
10	0 1378E+02	0 9773E+02	0 3406E+00	0.1493E+02	0 9756E+00	0 2196E+00	0 0000E+00	0 4750E+01	0 1519E+01	-0 2500E+01
11	0.1378E+02	0.9773E+02	0.3406E+00	0 1493E+02	0 9701E+00	0 2425E+00	0 0000E+00	0 4750E+01	0 1687E+01	0.2500E+01

Listing B-6. Continued

VARIABLES AT L, J = 1, 21

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1376E+02	0.9759E+02	0.3511E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.5000E+01	0.0000E+00	-0.2500E+01
2	0.1376E+02	0.9759E+02	0.3511E+00	0.1499E+02	0.9997E+00	0.2302E-01	0.0000E+00	0.5000E+01	0.1750E+00	-0.2500E+01
3	0.1377E+02	0.9761E+02	0.3505E+00	0.1499E+02	0.9990E+00	0.4467E-01	0.0000E+00	0.5000E+01	0.3500E+00	-0.2500E+01
4	0.1378E+02	0.9762E+02	0.3493E+00	0.1499E+02	0.9977E+00	0.6735E-01	0.0000E+00	0.5000E+01	0.5250E+00	-0.2500E+01
5	0.1379E+02	0.9764E+02	0.3476E+00	0.1499E+02	0.9960E+00	0.8946E-01	0.0000E+00	0.5000E+01	0.7000E+00	-0.2500E+01
6	0.1381E+02	0.9768E+02	0.3453E+00	0.1499E+02	0.9938E+00	0.1134E+00	0.0000E+00	0.5000E+01	0.8750E+00	-0.2500E+01
7	0.1382E+02	0.9772E+02	0.3415E+00	0.1498E+02	0.9906E+00	0.1369E+00	0.0000E+00	0.5000E+01	0.1050E+01	-0.2500E+01
8	0.1384E+02	0.9780E+02	0.3355E+00	0.1497E+02	0.9865E+00	0.1636E+00	-0.2473E-18	0.5000E+01	0.1225E+01	-0.2500E+01
9	0.1385E+02	0.9785E+02	0.3293E+00	0.1493E+02	0.9821E+00	0.1886E+00	0.0000E+00	0.5000E+01	0.1400E+01	-0.2500E+01
10	0.1388E+02	0.9795E+02	0.3251E+00	0.1494E+02	0.9761E+00	0.2175E+00	0.0000E+00	0.5000E+01	0.1575E+01	-0.2500E+01
11	0.1389E+02	0.9795E+02	0.3250E+00	0.1494E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.5000E+01	0.1750E+01	-0.2500E+01

VARIABLES AT L, J = 1, 22

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1385E+02	0.9776E+02	0.3389E+00	0.1499E+02	0.1000E+01	-0.4840E-15	0.0000E+00	0.5250E+01	0.0000E+00	-0.2500E+01
2	0.1385E+02	0.9776E+02	0.3389E+00	0.1499E+02	0.9998E+00	0.2217E-01	0.0000E+00	0.5250E+01	0.1812E+00	-0.2500E+01
3	0.1385E+02	0.9777E+02	0.3384E+00	0.1499E+02	0.9991E+00	0.4223E-01	-0.9463E-18	0.5250E+01	0.3625E+00	-0.2500E+01
4	0.1386E+02	0.9779E+02	0.3369E+00	0.1499E+02	0.9980E+00	0.6378E-01	0.0000E+00	0.5250E+01	0.5437E+00	-0.2500E+01
5	0.1387E+02	0.9781E+02	0.3347E+00	0.1499E+02	0.9964E+00	0.8483E-01	0.0000E+00	0.5250E+01	0.7250E+00	-0.2500E+01
6	0.1389E+02	0.9785E+02	0.3316E+00	0.1499E+02	0.9941E+00	0.1081E+00	0.0000E+00	0.5250E+01	0.9062E+00	-0.2500E+01
7	0.1390E+02	0.9789E+02	0.3271E+00	0.1497E+02	0.9914E+00	0.1311E+00	0.0000E+00	0.5250E+01	0.1087E+01	-0.2500E+01
8	0.1393E+02	0.9798E+02	0.3202E+00	0.1495E+02	0.9874E+00	0.1582E+00	0.0000E+00	0.5250E+01	0.1269E+01	-0.2500E+01
9	0.1394E+02	0.9802E+02	0.3136E+00	0.1492E+02	0.9830E+00	0.1838E+00	0.0000E+00	0.5250E+01	0.1450E+01	-0.2500E+01
10	0.1398E+02	0.9812E+02	0.3087E+00	0.1493E+02	0.9766E+00	0.2150E+00	0.0000E+00	0.5250E+01	0.1631E+01	-0.2500E+01
11	0.1398E+02	0.9812E+02	0.3086E+00	0.1493E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.5250E+01	0.1812E+01	-0.2500E+01

VARIABLES AT L, J = 1, 23

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1392E+02	0.9790E+02	0.3283E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.5500E+01	0.0000E+00	-0.2500E+01
2	0.1392E+02	0.9790E+02	0.3284E+00	0.1500E+02	0.9998E+00	0.2059E-01	0.0000E+00	0.5500E+01	0.1875E+00	-0.2500E+01
3	0.1392E+02	0.9791E+02	0.3279E+00	0.1500E+02	0.9992E+00	0.3906E-01	0.0000E+00	0.5500E+01	0.3750E+00	-0.2500E+01
4	0.1393E+02	0.9793E+02	0.3260E+00	0.1500E+02	0.9982E+00	0.5919E-01	0.0000E+00	0.5500E+01	0.5625E+00	-0.2500E+01
5	0.1394E+02	0.9795E+02	0.3234E+00	0.1499E+02	0.9969E+00	0.7849E-01	0.0000E+00	0.5500E+01	0.7500E+00	-0.2500E+01
6	0.1397E+02	0.9800E+02	0.3196E+00	0.1499E+02	0.9950E+00	0.1001E+00	0.0000E+00	0.5500E+01	0.9375E+00	-0.2500E+01
7	0.1398E+02	0.9805E+02	0.3142E+00	0.1497E+02	0.9927E+00	0.1210E+00	0.0000E+00	0.5500E+01	0.1125E+01	-0.2500E+01
8	0.1402E+02	0.9818E+02	0.3064E+00	0.1496E+02	0.9891E+00	0.1470E+00	0.0000E+00	0.5500E+01	0.1312E+01	-0.2500E+01
9	0.1403E+02	0.9821E+02	0.2992E+00	0.1493E+02	0.9852E+00	0.1714E+00	0.0000E+00	0.5500E+01	0.1500E+01	-0.2500E+01
10	0.1409E+02	0.9835E+02	0.2934E+00	0.1496E+02	0.9782E+00	0.2078E+00	0.0000E+00	0.5500E+01	0.1687E+01	-0.2500E+01
11	0.1409E+02	0.9835E+02	0.2932E+00	0.1496E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.5500E+01	0.1875E+01	-0.2500E+01

VARIABLES AT L, J = 1, 24

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1397E+02	0.9801E+02	0.3190E+00	0.1499E+02	0.1000E+01	-0.2386E-15	0.1864E-17	0.5750E+01	0.0000E+00	-0.2500E+01
2	0.1397E+02	0.9801E+02	0.3192E+00	0.1499E+02	0.9998E+00	0.1826E-01	0.1863E-17	0.5750E+01	0.1937E+00	-0.2500E+01
3	0.1398E+02	0.9802E+02	0.3187E+00	0.1500E+02	0.9994E+00	0.3590E-01	0.0000E+00	0.5750E+01	0.3875E+00	-0.2500E+01
4	0.1399E+02	0.9804E+02	0.3166E+00	0.1500E+02	0.9985E+00	0.5475E-01	0.1877E-17	0.5750E+01	0.5812E+00	-0.2500E+01
5	0.1400E+02	0.9807E+02	0.3137E+00	0.1499E+02	0.9974E+00	0.7243E-01	0.2365E-18	0.5750E+01	0.7750E+00	-0.2500E+01
6	0.1403E+02	0.9813E+02	0.3094E+00	0.1499E+02	0.9957E+00	0.9215E-01	-0.9581E-18	0.5750E+01	0.9687E+00	-0.2500E+01
7	0.1404E+02	0.9818E+02	0.3031E+00	0.1498E+02	0.9939E+00	0.1107E+00	0.1954E-17	0.5750E+01	0.1162E+01	-0.2500E+01
8	0.1408E+02	0.9829E+02	0.2937E+00	0.1495E+02	0.9908E+00	0.1354E+00	0.0000E+00	0.5750E+01	0.1356E+01	-0.2500E+01
9	0.1410E+02	0.9834E+02	0.2840E+00	0.1491E+02	0.9873E+00	0.1592E+00	-0.4159E-17	0.5750E+01	0.1550E+01	-0.2500E+01
10	0.1416E+02	0.9850E+02	0.2735E+00	0.1492E+02	0.9793E+00	0.2024E+00	0.0000E+00	0.5750E+01	0.1744E+01	-0.2500E+01
11	0.1417E+02	0.9850E+02	0.2733E+00	0.1492E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.5750E+01	0.1937E+01	-0.2500E+01

VA [illegible]LES AT L, J = 1, 25

Listing B-6. Continued

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1401E+02	0.9809E+02	0.3109E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.3756E-17	0.6000E+01	0.0000E+00	-0.2500E+01
2	0.1401E+02	0.9809E+02	0.3111E+00	0.1498E+02	0.9999E+00	0.1491E-01	0.3754E-17	0.6000E+01	0.2000E+00	-0.2500E+01
3	0.1402E+02	0.9810E+02	0.3103E+00	0.1498E+02	0.9995E+00	0.3105E-01	0.7525E-17	0.6000E+01	0.4000E+00	-0.2500E+01
4	0.1403E+02	0.9813E+02	0.3083E+00	0.1499E+02	0.9989E+00	0.4737E-01	0.0000E+00	0.6000E+01	0.6000E+00	-0.2500E+01
5	0.1405E+02	0.9816E+02	0.3055E+00	0.1499E+02	0.9981E+00	0.6182E-01	0.0000E+00	0.6000E+01	0.8000E+00	-0.2500E+01
6	0.1408E+02	0.9823E+02	0.3009E+00	0.1499E+02	0.9970E+00	0.7734E-01	0.0000E+00	0.6000E+01	0.1000E+01	-0.2500E+01
7	0.1410E+02	0.9829E+02	0.2938E+00	0.1497E+02	0.9960E+00	0.8939E-01	-0.3954E-17	0.6000E+01	0.1200E+01	-0.2500E+01
8	0.1416E+02	0.9844E+02	0.2828E+00	0.1497E+02	0.9943E+00	0.1070E+00	0.0000E+00	0.6000E+01	0.1400E+01	-0.2500E+01
9	0.1418E+02	0.9850E+02	0.2697E+00	0.1491E+02	0.9933E+00	0.1153E+00	0.0000E+00	0.6000E+01	0.1600E+01	-0.2500E+01
10	0.1430E+02	0.9877E+02	0.2557E+00	0.1497E+02	0.9898E+00	0.1427E+00	0.0000E+00	0.6000E+01	0.1800E+01	-0.2500E+01
11	0.1431E+02	0.9877E+02	0.2557E+00	0.1497E+02	0.9923E+00	0.1240E+00	0.0000E+00	0.6000E+01	0.2000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 26

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1404E+02	0.9815E+02	0.3046E+00	0.1497E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.6250E+01	0.0000E+00	-0.2500E+01
2	0.1404E+02	0.9815E+02	0.3047E+00	0.1498E+02	0.9999E+00	0.1135E-01	0.0000E+00	0.6250E+01	0.2000E+00	-0.2500E+01
3	0.1405E+02	0.9816E+02	0.3036E+00	0.1497E+02	0.9997E+00	0.2466E-01	0.3778E-17	0.6250E+01	0.4000E+00	-0.2500E+01
4	0.1406E+02	0.9819E+02	0.3023E+00	0.1498E+02	0.9993E+00	0.3705E-01	0.0000E+00	0.6250E+01	0.6000E+00	-0.2500E+01
5	0.1408E+02	0.9822E+02	0.3002E+00	0.1499E+02	0.9989E+00	0.4679E-01	0.0000E+00	0.6250E+01	0.8000E+00	-0.2500E+01
6	0.1411E+02	0.9830E+02	0.2965E+00	0.1500E+02	0.9984E+00	0.5665E-01	-0.1927E-17	0.6250E+01	0.1000E+01	-0.2500E+01
7	0.1414E+02	0.9838E+02	0.2901E+00	0.1499E+02	0.9981E+00	0.6135E-01	-0.1966E-17	0.6250E+01	0.1200E+01	-0.2500E+01
8	0.1419E+02	0.9851E+02	0.2806E+00	0.1499E+02	0.9976E+00	0.6951E-01	0.0000E+00	0.6250E+01	0.1400E+01	-0.2500E+01
9	0.1421E+02	0.9857E+02	0.2691E+00	0.1495E+02	0.9981E+00	0.6185E-01	0.8443E-17	0.6250E+01	0.1600E+01	-0.2500E+01
10	0.1432E+02	0.9882E+02	0.2619E+00	0.1502E+02	0.9983E+00	0.5791E-01	0.0000E+00	0.6250E+01	0.1800E+01	-0.2500E+01
11	0.1433E+02	0.9882E+02	0.2615E+00	0.1502E+02	0.1000E+01	0.5525E-15	0.0000E+00	0.6250E+01	0.2000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 27

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1406E+02	0.9819E+02	0.3002E+00	0.1497E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.6500E+01	0.0000E+00	-0.2500E+01
2	0.1406E+02	0.9819E+02	0.3002E+00	0.1497E+02	0.1000E+01	0.9144E-02	0.0000E+00	0.6500E+01	0.2000E+00	-0.2500E+01
3	0.1407E+02	0.9820E+02	0.2992E+00	0.1497E+02	0.9998E+00	0.1853E-01	-0.1914E-17	0.6500E+01	0.4000E+00	-0.2500E+01
4	0.1408E+02	0.9823E+02	0.2986E+00	0.1498E+02	0.9996E+00	0.2696E-01	0.0000E+00	0.6500E+01	0.6000E+00	-0.2500E+01
5	0.1409E+02	0.9825E+02	0.2972E+00	0.1498E+02	0.9995E+00	0.3284E-01	0.0000E+00	0.6500E+01	0.8000E+00	-0.2500E+01
6	0.1412E+02	0.9831E+02	0.2945E+00	0.1499E+02	0.9992E+00	0.3910E-01	0.4849E-18	0.6500E+01	0.1000E+01	-0.2500E+01
7	0.1413E+02	0.9835E+02	0.2891E+00	0.1498E+02	0.9991E+00	0.4151E-01	0.3948E-17	0.6500E+01	0.1200E+01	-0.2500E+01
8	0.1417E+02	0.9845E+02	0.2818E+00	0.1497E+02	0.9989E+00	0.4606E-01	0.0000E+00	0.6500E+01	0.1400E+01	-0.2500E+01
9	0.1417E+02	0.9849E+02	0.2743E+00	0.1493E+02	0.9992E+00	0.3900E-01	-0.1661E-16	0.6500E+01	0.1600E+01	-0.2500E+01
10	0.1421E+02	0.9859E+02	0.2739E+00	0.1497E+02	0.9996E+00	0.2676E-01	0.0000E+00	0.6500E+01	0.1800E+01	-0.2500E+01
11	0.1421E+02	0.9859E+02	0.2736E+00	0.1497E+02	0.1000E+01	0.2658E-15	0.0000E+00	0.6500E+01	0.2000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 28

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1408E+02	0.9824E+02	0.2976E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.6750E+01	0.0000E+00	-0.2500E+01
2	0.1408E+02	0.9823E+02	0.2974E+00	0.1497E+02	0.1000E+01	0.7764E-02	0.0000E+00	0.6750E+01	0.2000E+00	-0.2500E+01
3	0.1409E+02	0.9825E+02	0.2968E+00	0.1498E+02	0.9999E+00	0.1218E-01	-0.7708E-17	0.6750E+01	0.4000E+00	-0.2500E+01
4	0.1410E+02	0.9826E+02	0.2966E+00	0.1499E+02	0.9999E+00	0.1690E-01	0.0000E+00	0.6750E+01	0.6000E+00	-0.2500E+01
5	0.1411E+02	0.9829E+02	0.2954E+00	0.1499E+02	0.9998E+00	0.1945E-01	0.0000E+00	0.6750E+01	0.8000E+00	-0.2500E+01
6	0.1413E+02	0.9833E+02	0.2928E+00	0.1499E+02	0.9997E+00	0.2317E-01	0.1949E-17	0.6750E+01	0.1000E+01	-0.2500E+01
7	0.1414E+02	0.9837E+02	0.2877E+00	0.1497E+02	0.9997E+00	0.2441E-01	0.7931E-17	0.6750E+01	0.1200E+01	-0.2500E+01
8	0.1416E+02	0.9844E+02	0.2814E+00	0.1496E+02	0.9996E+00	0.2709E-01	0.0000E+00	0.6750E+01	0.1400E+01	-0.2500E+01
9	0.1417E+02	0.9848E+02	0.2763E+00	0.1494E+02	0.9998E+00	0.2112E-01	-0.3299E-16	0.6750E+01	0.1600E+01	-0.2500E+01
10	0.1420E+02	0.9856E+02	0.2768E+00	0.1498E+02	0.9999E+00	0.1279E-01	0.0000E+00	0.6750E+01	0.1800E+01	-0.2500E+01
11	0.1420E+02	0.9856E+02	0.2765E+00	0.1497E+02	0.1000E+01	0.1316E-15	0.0000E+00	0.6750E+01	0.2000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 29

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z

Listing B-6. Continued

1	0.1410E+02	0.9828E+02	0.2966E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7000E+01	0.0000E+00	-0.2500E+01
2	0.1410E+02	0.9827E+02	0.2963E+00	0.1499E+02	0.1000E+01	0.6539E-02	0.0000E+00	0.7000E+01	0.2000E+00	0.2500E+01
3	0.1411E+02	0.9829E+02	0.2963E+00	0.1500E+02	0.1000E+01	0.7306E-02	-0.1542E-16	0.7000E+01	0.4000E+00	-0.2500E+01
4	0.1411E+02	0.9829E+02	0.2961E+00	0.1500E+02	0.1000E+01	0.9901E-02	0.0000E+00	0.7000E+01	0.6000E+00	-0.2500E+01
5	0.1412E+02	0.9830E+02	0.2948E+00	0.1500E+02	0.9999E+00	0.1074E-01	0.0000E+00	0.7000E+01	0.8000E+00	-0.2500E+01
6	0.1413E+02	0.9833E+02	0.2920E+00	0.1499E+02	0.9999E+00	0.1324E-01	0.3909E-17	0.7000E+01	0.1000E+01	-0.2500E+01
7	0.1413E+02	0.9835E+02	0.2870E+00	0.1496E+02	0.9999E+00	0.1418E-01	0.7955E-17	0.7000E+01	0.1200E+01	-0.2500E+01
8	0.1414E+02	0.9840E+02	0.2816E+00	0.1494E+02	0.9999E+00	0.1593E-01	0.0000E+00	0.7000E+01	0.1400E+01	-0.2500E+01
9	0.1414E+02	0.9843E+02	0.2780E+00	0.1492E+02	0.9999E+00	0.1153E-01	-0.3283E-16	0.7000E+01	0.1600E+01	-0.2500E+01
10	0.1416E+02	0.9848E+02	0.2793E+00	0.1495E+02	0.1000E+01	0.7435E-02	0.0000E+00	0.7000E+01	0.1800E+01	-0.2500E+01
11	0.1416E+02	0.9848E+02	0.2790E+00	0.1495E+02	0.1000E+01	0.6536E-16	0.0000E+00	0.7000E+01	0.2000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 30

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z
1	0.1412E+02	0.9831E+02	0.2958E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7250E+01	0.0000E+00	-0.2500E+01
2	0.1412E+02	0.9830E+02	0.2956E+00	0.1500E+02	0.1000E+01	0.4747E-02	0.0000E+00	0.7250E+01	0.2000E+00	-0.2500E+01
3	0.1412E+02	0.9832E+02	0.2961E+00	0.1501E+02	0.1000E+01	0.4441E-02	-0.7712E-17	0.7250E+01	0.4000E+00	-0.2500E+01
4	0.1412E+02	0.9831E+02	0.2958E+00	0.1501E+02	0.1000E+01	0.6360E-02	0.0000E+00	0.7250E+01	0.6000E+00	-0.2500E+01
5	0.1413E+02	0.9832E+02	0.2943E+00	0.1500E+02	0.1000E+01	0.6835E-02	0.0000E+00	0.7250E+01	0.8000E+00	-0.2500E+01
6	0.1413E+02	0.9833E+02	0.2913E+00	0.1499E+02	0.1000E+01	0.8626E-02	0.1959E-17	0.7250E+01	0.1000E+01	-0.2500E+01
7	0.1413E+02	0.9835E+02	0.2865E+00	0.1496E+02	0.1000E+01	0.9153E-02	0.3984E-17	0.7250E+01	0.1200E+01	-0.2500E+01
8	0.1414E+02	0.9839E+02	0.2818E+00	0.1494E+02	0.1000E+01	0.9677E-02	0.0000E+00	0.7250E+01	0.1400E+01	0.2500E+01
9	0.1414E+02	0.9841E+02	0.2790E+00	0.1492E+02	0.1000E+01	0.6124E-02	-0.8182E-17	0.7250E+01	0.1600E+01	-0.2500E+01
10	0.1415E+02	0.9844E+02	0.2803E+00	0.1494E+02	0.1000E+01	0.4047E-02	0.0000E+00	0.7250E+01	0.1800E+01	-0.2500E+01
11	0.1414E+02	0.9844E+02	0.2801E+00	0.1494E+02	0.1000E+01	0.3258E-16	0.0000E+00	0.7250E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 1, 31

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1412E+02	0.9831E+02	0.2950E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7500E+01	0.0000E+00	-0.2500E+01
2	0.1413E+02	0.9832E+02	0.2950E+00	0.1500E+02	0.1000E+01	0.2691E-02	0.0000E+00	0.7500E+01	0.2000E+00	-0.2500E+01
3	0.1413E+02	0.9832E+02	0.2956E+00	0.1501E+02	0.1000E+01	0.3611E-02	0.3861E-17	0.7500E+01	0.4000E+00	0.2500E+01
4	0.1413E+02	0.9832E+02	0.2952E+00	0.1501E+02	0.1000E+01	0.5700E-02	0.0000E+00	0.7500E+01	0.6000E+00	-0.2500E+01
5	0.1413E+02	0.9832E+02	0.2938E+00	0.1500E+02	0.1000E+01	0.6635E-02	0.0000E+00	0.7500E+01	0.8000E+00	-0.2500E+01
6	0.1413E+02	0.9833E+02	0.2911E+00	0.1498E+02	0.1000E+01	0.8039E-02	-0.1225E-18	0.7500E+01	0.1000E+01	-0.2500E+01
7	0.1413E+02	0.9835E+02	0.2868E+00	0.1496E+02	0.1000E+01	0.8193E-02	-0.3981E-17	0.7500E+01	0.1200E+01	-0.2500E+01
8	0.1413E+02	0.9839E+02	0.2827E+00	0.1494E+02	0.1000E+01	0.7412E-02	0.0000E+00	0.7500E+01	0.1400E+01	-0.2500E+01
9	0.1413E+02	0.9841E+02	0.2803E+00	0.1493E+02	0.1000E+01	0.3978E-02	0.1629E-16	0.7500E+01	0.1600E+01	-0.2500E+01
10	0.1413E+02	0.9843E+02	0.2813E+00	0.1493E+02	0.1000E+01	0.1416E-02	0.0000E+00	0.7500E+01	0.1800E+01	-0.2500E+01
11	0.1414E+02	0.9843E+02	0.2813E+00	0.1493E+02	0.1000E+01	0.8116E-17	0.0000E+00	0.7500E+01	0.2000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 32

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1412E+02	0.9828E+02	0.2936E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7750E+01	0.0000E+00	-0.2500E+01
2	0.1412E+02	0.9829E+02	0.2937E+00	0.1499E+02	0.1000E+01	0.7106E-03	0.0000E+00	0.7750E+01	0.2000E+00	-0.2500E+01
3	0.1412E+02	0.9828E+02	0.2942E+00	0.1500E+02	0.1000E+01	0.2935E-02	0.1553E-16	0.7750E+01	0.4000E+00	-0.2500E+01
4	0.1412E+02	0.9829E+02	0.2941E+00	0.1500E+02	0.1000E+01	0.4872E-02	0.0000E+00	0.7750E+01	0.6000E+00	0.2500E+01
5	0.1413E+02	0.9831E+02	0.2931E+00	0.1499E+02	0.1000E+01	0.6153E-02	0.0000E+00	0.7750E+01	0.8000E+00	-0.2500E+01
6	0.1413E+02	0.9834E+02	0.2909E+00	0.1498E+02	0.1000E+01	0.6988E-02	-0.1962E-17	0.7750E+01	0.1000E+01	0.2500E+01
7	0.1413E+02	0.9837E+02	0.2874E+00	0.1497E+02	0.1000E+01	0.6780E-02	-0.7942E-17	0.7750E+01	0.1200E+01	-0.2500E+01
8	0.1414E+02	0.9842E+02	0.2841E+00	0.1495E+02	0.1000E+01	0.5758E-02	0.0000E+00	0.7750E+01	0.1400E+01	-0.2500E+01
9	0.1414E+02	0.9845E+02	0.2823E+00	0.1495E+02	0.1000E+01	0.2705E-02	0.3234E-16	0.7750E+01	0.1600E+01	0.2500E+01
10	0.1414E+02	0.9846E+02	0.2826E+00	0.1494E+02	0.1000E+01	-0.6592E-03	0.0000E+00	0.7750E+01	0.1800E+01	-0.2500E+01
11	0.1414E+02	0.9846E+02	0.2827E+00	0.1495E+02	0.1000E+01	-0.8073E-17	0.0000E+00	0.7750E+01	0.2000E+01	-0.2500E+01

VARIABLES AT L, J = 1, 33

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	113E+02	0.9837E+02	0.2926E+00	0.1499E+02	0.1000E+01	0000E+00	0.0000E+00	0.8000E+01	0.0000E+00	-0.2500E+
2	.13E+02	0.9836E+02	0.2927E+00	0.1500E+02	0.1000E+01	8405E-03	0.0000E+00	0.8000E+01	0.2000E+00	-0.2500E+

Listing B-6. Continued

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
3	413E+02	0.9834E+02	0.2926E+00	0.1499E+02	0.1000E+0	.2664E-02	-0.9386E-03	0.8000E+01	0.4000E+00	-0.5000E
4	413E+02	0.9834E+02	0.2929E+00	0.1500E+02	0.1000E+0	.3446E-02	-0.6545E-03	0.8000E+01	0.6000E+00	-0.5000E
5	0.1413E+02	0.9833E+02	0.2925E+00	0.1499E+02	0.1000E+01	0.3451E-02	-0.2353E-03	0.8000E+01	0.8000E+00	-0.5000E+00
6	0.1413E+02	0.9834E+02	0.2909E+00	0.1498E+02	0.1000E+01	0.4046E-02	0.1613E-03	0.8000E+01	0.1000E+01	-0.5000E+00
7	0.1413E+02	0.9835E+02	0.2880E+00	0.1497E+02	0.1000E+01	0.4158E-02	0.4988E-03	0.8000E+01	0.1200E+01	-0.5000E+00
8	0.1413E+02	0.9838E+02	0.2853E+00	0.1495E+02	0.1000E+01	0.4189E-02	0.8305E-03	0.8000E+01	0.1400E+01	-0.5000E+00
9	0.1413E+02	0.9839E+02	0.2839E+00	0.1494E+02	0.1000E+01	0.2853E-02	0.1030E-02	0.8000E+01	0.1600E+01	-0.5000E+00
10	0.1413E+02	0.9838E+02	0.2841E+00	0.1494E+02	0.1000E+01	0.2874E-02	0.1561E-02	0.8000E+01	0.1800E+01	-0.5000E+00
11	0.1413E+02	0.9838E+02	0.2841E+00	0.1494E+02	0.1000E+01	0.3215E-16	0.1561E-02	0.8000E+01	0.2000E+01	-0.5000E+00

VARIABLES AT L, J = 11, 1

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.1000E+00	0.0000E+00
3	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.2000E+00	0.0000E+00
4	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.3000E+00	0.0000E+00
5	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.4000E+00	0.0000E+00
6	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.5000E+00	0.0000E+00
7	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.6000E+00	0.0000E+00
8	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.7000E+00	0.0000E+00
9	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.8000E+00	0.0000E+00
10	0.1017E+02	0.8949E+02	0.7662E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.9000E+00	0.0000E+00
11	0.1017E+02	0.8949E+02	0.7662E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 2

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.7850E-07	0.2500E+00	0.0000E+00	0.0000E+00
2	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.3959E-05	0.5412E-07	0.2500E+00	0.1000E+00	0.0000E+00
3	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.6491E-05	0.8420E-07	0.2500E+00	0.2000E+00	0.0000E+00
4	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.9184E-05	0.6442E-07	0.2500E+00	0.3000E+00	0.0000E+00
5	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.1186E-04	0.7219E-07	0.2500E+00	0.4000E+00	0.0000E+00
6	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1349E-04	0.6363E-07	0.2500E+00	0.5000E+00	0.0000E+00
7	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1424E-04	0.7230E-07	0.2500E+00	0.6000E+00	0.0000E+00
8	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1308E-04	0.6458E-07	0.2500E+00	0.7000E+00	0.0000E+00
9	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1046E-04	0.8439E-07	0.2500E+00	0.8000E+00	0.0000E+00
10	0.1017E+02	0.8950E+02	0.7663E+00	0.1500E+02	0.1000E+01	-0.7806E-05	0.5432E-07	0.2500E+00	0.9000E+00	0.0000E+00
11	0.1017E+02	0.8950E+02	0.7663E+00	0.1500E+02	0.1000E+01	-0.6168E-19	0.7870E-07	0.2500E+00	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 3

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.1427E-06	0.5000E+00	0.0000E+00	0.0000E+00
2	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.3259E-04	0.9527E-07	0.5000E+00	0.1000E+00	0.0000E+00
3	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.7113E-04	0.1321E-06	0.5000E+00	0.2000E+00	0.0000E+00
4	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.9820E-04	0.1112E-06	0.5000E+00	0.3000E+00	0.0000E+00
5	0.1017E+02	0.8949E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.1200E-03	0.1198E-06	0.5000E+00	0.4000E+00	0.0000E+00
6	0.1017E+02	0.8949E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.1278E-03	0.1083E-06	0.5000E+00	0.5000E+00	0.0000E+00
7	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.1253E-03	0.1200E-06	0.5000E+00	0.6000E+00	0.0000E+00
8	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.1054E-03	0.1115E-06	0.5000E+00	0.7000E+00	0.0000E+00
9	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.7656E-04	0.1326E-06	0.5000E+00	0.8000E+00	0.0000E+00
10	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.3766E-04	0.9568E-07	0.5000E+00	0.9000E+00	0.0000E+00
11	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.4937E-18	0.1431E-06	0.5000E+00	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 4

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z
1	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.1271E-06	0.7500E+00	0.0000E+00	0.0000E+00
2	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.2884E-04	0.5784E-07	0.7500E+00	0.1000E+00	0.0000E+00
3	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.6309E-04	0.9201E-07	0.7500E+00	0.2000E+00	0.0000E+00
4	0.1018E+02	0.8951E+02	0.7659E+00	0.1500E+02	0.1000E+01	0.8243E-04	0.7693E-07	0.7500E+00	0.3000E+00	0.0000E+00

5	0.1018E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.8838E-04	0.8541E-07	0.7500E+00	0.4000E+00	0.0000E+00
6	0.1017E+02	0.8950E+02	0.7662E+00	0.1501E+02	0.1000E+01	0.8094E-04	0.7355E-07	0.7500E+00	0.5000E+00	0.0000E+00
7	0.1017E+02	0.8950E+02	0.7664E+00	0.1501E+02	0.1000E+01	0.5809E-04	0.8548E-07	0.7500E+00	0.6000E+00	0.0000E+00
8	0.1017E+02	0.8950E+02	0.7665E+00	0.1501E+02	0.1000E+01	0.3577E-04	0.7729E-07	0.7500E+00	0.7000E+00	0.0000E+00
9	0.1017E+02	0.8950E+02	0.7666E+00	0.1501E+02	0.1000E+01	0.1840E-04	0.9315E-07	0.7500E+00	0.8000E+00	0.0000E+00
10	0.1017E+02	0.8950E+02	0.7667E+00	0.1501E+02	0.1000E+01	0.7583E-05	0.5921E-07	0.7500E+00	0.9000E+00	0.0000E+00
11	0.1017E+02	0.8950E+02	0.7667E+00	0.1501E+02	0.1000E+01	0.6165E-19	0.1286E-06	0.7500E+00	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 5

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W COSINE	X	Y	Z
1	0.1018E+02	0.8952E+02	0.7651E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.3463E-07	0.1000E+01	0.0000E+00	0.0000E+00
2	0.1018E+02	0.8952E+02	0.7651E+00	0.1500E+02	0.1000E+01	0.2447E-03	0.5312E-07	0.1000E+01	0.1000E+00	0.0000E+00
3	0.1018E+02	0.8951E+02	0.7652E+00	0.1500E+02	0.1000E+01	0.5321E-03	-0.3176E-07	0.1000E+01	0.2000E+00	0.0000E+00
4	0.1018E+02	0.8951E+02	0.7654E+00	0.1500E+02	0.1000E+01	0.7440E-03	-0.3638E-07	0.1000E+01	0.3000E+00	0.0000E+00
5	0.1017E+02	0.8950E+02	0.7657E+00	0.1500E+02	0.1000E+01	0.9180E-03	-0.2871E-07	0.1000E+01	0.4000E+00	0.0000E+00
6	0.1017E+02	0.8949E+02	0.7659E+00	0.1499E+02	0.1000E+01	0.9988E-03	-0.3889E-07	0.1000E+01	0.5000E+00	0.0000E+00
7	0.1017E+02	0.8948E+02	0.7662E+00	0.1499E+02	0.1000E+01	0.9993E-03	-0.2797E-07	0.1000E+01	0.6000E+00	0.0000E+00
8	0.1016E+02	0.8947E+02	0.7664E+00	0.1499E+02	0.1000E+01	0.8779E-03	-0.3494E-07	0.1000E+01	0.7000E+00	0.0000E+00
9	0.1016E+02	0.8946E+02	0.7666E+00	0.1499E+02	0.1000E+01	0.6559E-03	-0.2907E-07	0.1000E+01	0.8000E+00	0.0000E+00
10	0.1016E+02	0.8946E+02	0.7667E+00	0.1499E+02	0.1000E+01	0.2405E-03	-0.5030E-07	0.1000E+01	0.9000E+00	0.0000E+00
11	0.1016E+02	0.8946E+02	0.7667E+00	0.1499E+02	0.1000E+01	0.1975E-17	0.3735E-07	0.1000E+01	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 6

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1020E+02	0.8958E+02	0.7631E+00	0.1501E+02	0.1000E+01	0.0000E+00	-0.1089E-06	0.1250E+01	0.0000E+00	0.0000E+00
2	0.1020E+02	0.8958E+02	0.7631E+00	0.1501E+02	0.1000E+01	0.4501E-03	-0.2052E-06	0.1250E+01	0.1000E+00	0.0000E+00
3	0.1020E+02	0.8957E+02	0.7635E+00	0.1501E+02	0.1000E+01	0.9494E-03	-0.2121E-06	0.1250E+01	0.2000E+00	0.0000E+00
4	0.1020E+02	0.8956E+02	0.7641E+00	0.1501E+02	0.1000E+01	0.1303E-02	-0.2052E-06	0.1250E+01	0.3000E+00	0.0000E+00
5	0.1019E+02	0.8954E+02	0.7650E+00	0.1501E+02	0.1000E+01	0.1514E-02	0.2020E-06	0.1250E+01	0.4000E+00	0.0000E+00
6	0.1018E+02	0.8952E+02	0.7660E+00	0.1501E+02	0.1000E+01	0.1553E-02	-0.2074E-06	0.1250E+01	0.5000E+00	0.0000E+00
7	0.1017E+02	0.8949E+02	0.7672E+00	0.1501E+02	0.1000E+01	0.1374E-02	-0.1989E-06	0.1250E+01	0.6000E+00	0.0000E+00
8	0.1016E+02	0.8947E+02	0.7685E+00	0.1502E+02	0.1000E+01	0.1013E-02	0.2020E-06	0.1250E+01	0.7000E+00	0.0000E+00
9	0.1015E+02	0.8945E+02	0.7697E+00	0.1503E+02	0.1000E+01	0.5421E-03	-0.2108E-06	0.1250E+01	0.8000E+00	0.0000E+00
10	0.1015E+02	0.8943E+02	0.7705E+00	0.1503E+02	0.1000E+01	0.1368E-03	0.2090E-06	0.1250E+01	0.9000E+00	0.0000E+00
11	0.1015E+02	0.8943E+02	0.7705E+00	0.1503E+02	0.1000E+01	0.9836E-18	-0.1125E-06	0.1250E+01	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 7

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W COSINE	X	Y	Z
1	0.1025E+02	0.8969E+02	0.7584E+00	0.1501E+02	0.1000E+01	0.0000E+00	-0.2074E-06	0.1500E+01	0.0000E+00	0.0000E+00
2	0.1025E+02	0.8969E+02	0.7584E+00	0.1501E+02	0.1000E+01	0.1625E-02	-0.3863E-06	0.1500E+01	0.1000E+00	0.0000E+00
3	0.1024E+02	0.8967E+02	0.7593E+00	0.1500E+02	0.1000E+01	0.3555E-02	-0.4244E-06	0.1500E+01	0.2000E+00	0.0000E+00
4	0.1023E+02	0.8964E+02	0.7606E+00	0.1500E+02	0.1000E+01	0.5101E-02	-0.3972E-06	0.1500E+01	0.3000E+00	0.0000E+00
5	0.1021E+02	0.8959E+02	0.7625E+00	0.1500E+02	0.1000E+01	0.6526E-02	-0.3939E-06	0.1500E+01	0.4000E+00	0.0000E+00
6	0.1018E+02	0.8952E+02	0.7648E+00	0.1499E+02	0.1000E+01	0.7499E-02	-0.3903E-06	0.1500E+01	0.5000E+00	0.0000E+00
7	0.1015E+02	0.8945E+02	0.7672E+00	0.1499E+02	0.1000E+01	0.8029E-02	-0.3893E-06	0.1500E+01	0.6000E+00	0.0000E+00
8	0.1012E+02	0.8936E+02	0.7700E+00	0.1497E+02	0.1000E+01	0.7861E-02	-0.3880E-06	0.1500E+01	0.7000E+00	0.0000E+00
9	0.1009E+02	0.8930E+02	0.7716E+00	0.1496E+02	0.1000E+01	0.6975E-02	-0.4126E-06	0.1500E+01	0.8000E+00	0.0000E+00
10	0.1004E+02	0.8917E+02	0.7743E+00	0.1493E+02	0.1000E+01	0.4514E-02	-0.3731E-06	0.1500E+01	0.9000E+00	0.0000E+00
11	0.1004E+02	0.8917E+02	0.7743E+00	0.1493E+02	0.1000E+01	0.6320E-16	-0.2818E-06	0.1500E+01	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 8

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W COSINE	X	Y	Z
1	0.1037E+02	0.9000E+02	0.7458E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.4985E-06	0.1750E+01	0.0000E+00	0.0000E+00
2	0.1037E+02	0.9000E+02	0.7458E+00	0.1500E+02	0.1000E+01	0.3523E-02	-0.5727E-06	0.1750E+01	0.1000E+00	0.0000E+00
3	0.1036E+02	0.8995E+02	0.7473E+00	0.1500E+02	0.1000E+01	0.7612E-02	-0.6152E-06	0.1750E+01	0.2000E+00	0.0000E+00
4	0.1033E+02	0.8989E+02	0.7502E+00	0.1500E+02	0.9999E+00	0.1080E-01	-0.5470E-06	0.1750E+01	0.3000E+00	0.0000E+00
5	030E+02	0.8981E+02	0.7537E+00	0.1501E+02	0.9999E+00	1381E-01	-0.5321E-06	0.1750E+01	0.4000E+00	0.0000E+
6	24E+02	0.8968E+02	0.7596E+00	0.1502E+02	0.9999E+0	1531E-01	0.5263E-06	0.1750E+01	0.5000E+00	0.0000F

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7	020E+02	0.8958E+02	0.7651E+00	0.1503E+02	0.9999E+0	1644E-01	-0.5514E-06	0.1750E+01	0.6000E+00	0.0000E
8	011E+02	0.8933E+02	0.7755E+00	0.1504E+02	0.9999E+0	1422E-01	-0.5534E-06	0.1750E+01	0.7000E+00	0.0000E
9	0.1006E+02	0.8920E+02	0.7825E+00	0.1507E+02	0.9999E+00	0.1302E-01	-0.5981E-06	0.1750E+01	0.8000E+00	0.0000E+00
10	0.9881E+01	0.8875E+02	0.8039E+00	0.1512E+02	0.1000E+01	0.1594E-02	-0.5095E-06	0.1750E+01	0.9000E+00	0.0000E+00
11	0.9881E+01	0.8875E+02	0.8039E+00	0.1512E+02	0.1000E+01	0.1543E-16	-0.4416E-06	0.1750E+01	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 9

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z
1	0.1061E+02	0.9057E+02	0.7225E+00	0.1502E+02	0.1000E+01	0.6265E-16	-0.5276E-06	0.2000E+01	0.0000E+00	0.0000E+00
2	0.1061E+02	0.9057E+02	0.7225E+00	0.1502E+02	0.1000E+01	0.7299E-02	-0.5797E-06	0.2000E+01	0.1000E+00	0.0000E+00
3	0.1059E+02	0.9051E+02	0.7249E+00	0.1502E+02	0.9999E+00	0.1720E-01	-0.6767E-06	0.2000E+01	0.2000E+00	0.0000E+00
4	0.1054E+02	0.9039E+02	0.7300E+00	0.1502E+02	0.9997E+00	0.2456E-01	-0.6587E-06	0.2000E+01	0.3000E+00	0.0000E+00
5	0.1049E+02	0.9028E+02	0.7360E+00	0.1504E+02	0.9994E+00	0.3516E-01	-0.6982E-06	0.2000E+01	0.4000E+00	0.0000E+00
6	0.1038E+02	0.8998E+02	0.7472E+00	0.1503E+02	0.9992E+00	0.4118E-01	-0.6921E-06	0.2000E+01	0.5000E+00	0.0000E+00
7	0.1032E+02	0.8981E+02	0.7573E+00	0.1509E+02	0.9985E+00	0.5516E-01	-0.6953E-06	0.2000E+01	0.6000E+00	0.0000E+00
8	0.1008E+02	0.8919E+02	0.7783E+00	0.1504E+02	0.9983E+00	0.5743E-01	-0.6585E-06	0.2000E+01	0.7000E+00	0.0000E+00
9	0.1003E+02	0.8902E+02	0.7954E+00	0.1521E+02	0.9967E+00	0.8121E-01	-0.6914E-06	0.2000E+01	0.8000E+00	0.0000E+00
10	0.9534E+01	0.8773E+02	0.8325E+00	0.1502E+02	0.9973E+00	0.7300E-01	-0.5759E-06	0.2000E+01	0.9000E+00	0.0000E+00
11	0.9534E+01	0.8773E+02	0.8314E+00	0.1500E+02	0.9923E+00	0.1240E+00	0.5394E-06	0.2000E+01	0.1000E+01	0.0000E+00

VARIABLES AT L, J = 11, 10

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z
1	0.1098E+02	0.9149E+02	0.6810E+00	0.1498E+02	0.1000E+01	0.0000E+00	-0.3873E-06	0.2250E+01	0.0000E+00	0.0000E+00
2	0.1098E+02	0.9149E+02	0.6811E+00	0.1498E+02	0.9999E+00	0.1379E-01	-0.3591E-06	0.2250E+01	0.1062E+00	0.0000E+00
3	0.1096E+02	0.9144E+02	0.6830E+00	0.1498E+02	0.9995E+00	0.3268E-01	-0.6731E-06	0.2250E+01	0.2125E+00	0.0000E+00
4	0.1091E+02	0.9132E+02	0.6871E+00	0.1496E+02	0.9989E+00	0.4722E-01	-0.8663E-06	0.2250E+01	0.3187E+00	0.0000E+00
5	0.1088E+02	0.9124E+02	0.6918E+00	0.1498E+02	0.9976E+00	0.6869E-01	-0.1010E-05	0.2250E+01	0.4250E+00	0.0000E+00
6	0.1076E+02	0.9097E+02	0.6995E+00	0.1492E+02	0.9965E+00	0.8346E-01	-0.9094E-06	0.2250E+01	0.5312E+00	0.0000E+00
7	0.1073E+02	0.9089E+02	0.7070E+00	0.1497E+02	0.9937E+00	0.1117E+00	0.7408E-06	0.2250E+01	0.6375E+00	0.0000E+00
8	0.1052E+02	0.9039E+02	0.7189E+00	0.1484E+02	0.9921E+00	0.1254E+00	-0.5748E-06	0.2250E+01	0.7437E+00	0.0000E+00
9	0.1050E+02	0.9039E+02	0.7309E+00	0.1498E+02	0.9861E+00	0.1661E+00	-0.5394E-06	0.2250E+01	0.8500E+00	0.0000E+00
10	0.1016E+02	0.8965E+02	0.7352E+00	0.1455E+02	0.9841E+00	0.1776E+00	-0.4460E-06	0.2250E+01	0.9562E+00	0.0000E+00
11	0.1016E+02	0.8965E+02	0.7336E+00	0.1453E+02	0.9701E+00	0.2425E+00	-0.4585E-06	0.2250E+01	0.1062E+01	0.0000E+00

VARIABLES AT L, J = 11, 11

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W COSINE	X	Y	Z
1	0.1151E+02	0.9273E+02	0.6254E+00	0.1498E+02	0.1000E+01	0.2478E-15	-0.1208E-05	0.2500E+01	0.0000E+00	0.0000E+00
2	0.1151E+02	0.9273E+02	0.6255E+00	0.1498E+02	0.9998E+00	0.1879E-01	0.1050E-05	0.2500E+01	0.1125E+00	0.0000E+00
3	0.1150E+02	0.9271E+02	0.6260E+00	0.1497E+02	0.9991E+00	0.4225E-01	-0.1086E-05	0.2500E+01	0.2250E+00	0.0000E+00
4	0.1148E+02	0.9268E+02	0.6269E+00	0.1496E+02	0.9981E+00	0.6169E-01	-0.8051E-06	0.2500E+01	0.3375E+00	0.0000E+00
5	0.1148E+02	0.9267E+02	0.6284E+00	0.1497E+02	0.9962E+00	0.8680E-01	-0.4533E-06	0.2500E+01	0.4500E+00	0.0000E+00
6	0.1144E+02	0.9261E+02	0.6289E+00	0.1494E+02	0.9942E+00	0.1073E+00	-0.2121E-06	0.2500E+01	0.5625E+00	0.0000E+00
7	0.1145E+02	0.9263E+02	0.6312E+00	0.1497E+02	0.9908E+00	0.1352E+00	-0.3348E-06	0.2500E+01	0.6750E+00	0.0000E+00
8	0.1143E+02	0.9260E+02	0.6297E+00	0.1493E+02	0.9876E+00	0.1571E+00	-0.5483E-06	0.2500E+01	0.7875E+00	0.0000E+00
9	0.1144E+02	0.9269E+02	0.6316E+00	0.1497E+02	0.9825E+00	0.1864E+00	-0.6994E-06	0.2500E+01	0.9000E+00	0.0000E+00
10	0.1149E+02	0.9289E+02	0.6107E+00	0.1478E+02	0.9765E+00	0.2156E+00	0.6076E-06	0.2500E+01	0.1012E+01	0.0000E+00
11	0.1149E+02	0.9289E+02	0.6105E+00	0.1478E+02	0.9701E+00	0.2425E+00	-0.7522E-06	0.2500E+01	0.1125E+01	0.0000E+00

VARIABLES AT L, J = 11, 12

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1199E+02	0.9382E+02	0.5746E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.2572E-05	0.2750E+01	0.0000E+00	0.0000E+00
2	0.1199E+02	0.9382E+02	0.5748E+00	0.1499E+02	0.9998E+00	0.2165E-01	-0.2717E-05	0.2750E+01	0.1187E+00	0.0000E+00
3	0.1199E+02	0.9382E+02	0.5745E+00	0.1499E+02	0.9989E+00	0.4587E-01	-0.1260E-05	0.2750E+01	0.2375E+00	0.0000E+00
4	0.1199E+02	0.9383E+02	0.5738E+00	0.1499E+02	0.9977E+00	0.6793E-01	0.4732E-06	0.2750E+01	0.3562E+00	0.0000E+00
5	0.1199E+02	0.9385E+02	0.5736E+00	0.1499E+02	0.9957E+00	0.9277E-01	0.1777E-05	0.2750E+01	0.4750E+00	0.0000E+00
6	0.1200E+02	0.9387E+02	0.5716E+00	0.1498E+02	0.9932E+00	0.1161E+00	0.1492E-05	0.2750E+01	0.5937E+00	0.0000E+00
7	0.1202E+02	0.9391E+02	0.5716E+00	0.1500E+02	0.9900E+00	0.1412E+00	-0.1826E-07	0.2750E+01	0.7125E+00	0.0000E+00
8	0.1205E+02	0.9400E+02	0.5677E+00	0.1499E+02	0.9861E+00	0.1664E+00	-0.1553E-05	0.2750E+01	0.8312E+00	0.0000E+00

Listing B-6. Continued

9	0.1206E+02	0.9408E+02	0.5641E+00	0.1497E+02	0.9816E+00	0.1909E+00	-0.2294E-05	0.2750E+01	0.9500E+00	0.0000E+00
10	0.1213E+02	0.9429E+02	0.5469E+00	0.1487E+02	0.9747E+00	0.2236E+00	-0.2288E-05	0.2750E+01	0.1069E+01	0.0000E+00
11	0.1213E+02	0.9429E+02	0.5468E+00	0.1487E+02	0.9701E+00	0.2425E+00	-0.2312E-05	0.2750E+01	0.1187E+01	0.0000E+00

VARIABLES AT L, J = 11, 13

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1235E+02	0.9462E+02	0.5337E+00	0.1499E+02	0.1000E+01	0.2458E-15	0.1756E-05	0.3000E+01	0.0000E+00	0.0000E+00
2	0.1235E+02	0.9462E+02	0.5339E+00	0.1499E+02	0.9997E+00	0.2345E-01	0.8812E-06	0.3000E+01	0.1250E+00	0.0000E+00
3	0.1235E+02	0.9462E+02	0.5334E+00	0.1499E+02	0.9989E+00	0.4774E-01	0.1666E-05	0.3000E+01	0.2500E+00	0.0000E+00
4	0.1236E+02	0.9464E+02	0.5324E+00	0.1499E+02	0.9974E+00	0.7139E-01	0.1271E-05	0.3000E+01	0.3750E+00	0.0000E+00
5	0.1236E+02	0.9466E+02	0.5316E+00	0.1499E+02	0.9954E+00	0.9593E-01	-0.1031E-06	0.3000E+01	0.5000E+00	0.0000E+00
6	0.1238E+02	0.9469E+02	0.5296E+00	0.1498E+02	0.9927E+00	0.1206E+00	-0.1958E-05	0.3000E+01	0.6250E+00	0.0000E+00
7	0.1239E+02	0.9472E+02	0.5289E+00	0.1499E+02	0.9895E+00	0.1446E+00	0.2766E-05	0.3000E+01	0.7500E+00	0.0000E+00
8	0.1242E+02	0.9480E+02	0.5253E+00	0.1499E+02	0.9853E+00	0.1707E+00	-0.2202E-05	0.3000E+01	0.8750E+00	0.0000E+00
9	0.1242E+02	0.9487E+02	0.5192E+00	0.1493E+02	0.9809E+00	0.1943E+00	-0.1291E-05	0.3000E+01	0.1000E+01	0.0000E+00
10	0.1248E+02	0.9503E+02	0.5069E+00	0.1487E+02	0.9742E+00	0.2255E+00	0.5220E-06	0.3000E+01	0.1125E+01	0.0000E+00
11	0.1248E+02	0.9503E+02	0.5068E+00	0.1487E+02	0.9701E+00	0.2425E+00	0.3395E-06	0.3000E+01	0.1250E+01	0.0000E+00

VARIABLES AT L, J = 11, 14

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1265E+02	0.9526E+02	0.4989E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.1262E-04	0.3250E+01	0.0000E+00	0.0000E+00
2	0.1265E+02	0.9526E+02	0.4990E+00	0.1499E+02	0.9997E+00	0.2450E-01	0.1274E-04	0.3250E+01	0.1312E+00	0.0000E+00
3	0.1265E+02	0.9527E+02	0.4984E+00	0.1499E+02	0.9988E+00	0.4879E-01	0.5796E-05	0.3250E+01	0.2625E+00	0.0000E+00
4	0.1266E+02	0.9529E+02	0.4973E+00	0.1499E+02	0.9973E+00	0.7331E-01	0.3823E-05	0.3250E+01	0.3937E+00	0.0000E+00
5	0.1266E+02	0.9531E+02	0.4961E+00	0.1498E+02	0.9952E+00	0.9764E-01	-0.1323E-04	0.3250E+01	0.5250E+00	0.0000E+00
6	0.1268E+02	0.9535E+02	0.4942E+00	0.1499E+02	0.9924E+00	0.1228E+00	0.1461E-04	0.3250E+01	0.6562E+00	0.0000E+00
7	0.1269E+02	0.9537E+02	0.4930E+00	0.1498E+02	0.9893E+00	0.1462E+00	-0.7872E-05	0.3250E+01	0.7875E+00	0.0000E+00
8	0.1272E+02	0.9547E+02	0.4891E+00	0.1498E+02	0.9850E+00	0.1725E+00	0.3178E-05	0.3250E+01	0.9187E+00	0.0000E+00
9	0.1273E+02	0.9552E+02	0.4817E+00	0.1492E+02	0.9807E+00	0.1957E+00	0.1037E-04	0.3250E+01	0.1050E+01	0.0000E+00
10	0.1278E+02	0.9568E+02	0.4720E+00	0.1489E+02	0.9743E+00	0.2253E+00	0.1518E-04	0.3250E+01	0.1181E+01	0.0000E+00
11	0.1278E+02	0.9568E+02	0.4720E+00	0.1489E+02	0.9701E+00	0.2425E+00	0.1560E-04	0.3250E+01	0.1312E+01	0.0000E+00

VARIABLES AT L, J = 11, 15

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1290E+02	0.9580E+02	0.4686E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.7489E-05	0.3500E+01	0.0000E+00	0.0000E+00
2	0.1290E+02	0.9580E+02	0.4688E+00	0.1499E+02	0.9997E+00	0.2500E-01	0.1169E-04	0.3500E+01	0.1375E+00	0.0000E+00
3	0.1290E+02	0.9581E+02	0.4681E+00	0.1499E+02	0.9988E+00	0.4923E-01	0.4157E-06	0.3500E+01	0.2750E+00	0.0000E+00
4	0.1291E+02	0.9583E+02	0.4669E+00	0.1499E+02	0.9972E+00	0.7412E-01	0.1052E-04	0.3500E+01	0.4125E+00	0.0000E+00
5	0.1292E+02	0.9584E+02	0.4656E+00	0.1498E+02	0.9952E+00	0.9826E-01	-0.1776E-04	0.3500E+01	0.5500E+00	0.0000E+00
6	0.1293E+02	0.9588E+02	0.4639E+00	0.1499E+02	0.9924E+00	0.1234E+00	-0.1277E-04	0.3500E+01	0.6875E+00	0.0000E+00
7	0.1294E+02	0.9591E+02	0.4623E+00	0.1498E+02	0.9892E+00	0.1466E+00	-0.1356E-05	0.3500E+01	0.8250E+00	0.0000E+00
8	0.1297E+02	0.9600E+02	0.4580E+00	0.1498E+02	0.9849E+00	0.1729E+00	0.1155E-04	0.3500E+01	0.9625E+00	0.0000E+00
9	0.1298E+02	0.9606E+02	0.4504E+00	0.1492E+02	0.9806E+00	0.1960E+00	0.1695E-04	0.3500E+01	0.1100E+01	0.0000E+00
10	0.1303E+02	0.9620E+02	0.4428E+00	0.1491E+02	0.9745E+00	0.2243E+00	0.2435E-04	0.3500E+01	0.1237E+01	0.0000E+00
11	0.1303E+02	0.9620E+02	0.4427E+00	0.1491E+02	0.9701E+00	0.2425E+00	0.1857E-04	0.3500E+01	0.1375E+01	0.0000E+00

VARIABLES AT L, J = 11, 16

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1310E+02	0.9624E+02	0.4424E+00	0.1499E+02	0.1000E+01	0.0000E+00	-0.3561E-04	0.3750E+01	0.0000E+00	0.0000E+00
2	0.1310E+02	0.9624E+02	0.4425E+00	0.1499E+02	0.9997E+00	0.2516E-01	0.2953E-04	0.3750E+01	0.1437E+00	0.0000E+00
3	0.1311E+02	0.9625E+02	0.4419E+00	0.1499E+02	0.9988E+00	0.4935E-01	-0.1763E-04	0.3750E+01	0.2875E+00	0.0000E+00
4	0.1312E+02	0.9626E+02	0.4407E+00	0.1499E+02	0.9972E+00	0.7433E-01	0.1671E-05	0.3750E+01	0.4312E+00	0.0000E+00
5	0.1312E+02	0.9628E+02	0.4393E+00	0.1498E+02	0.9952E+00	0.9831E-01	0.2877E-04	0.3750E+01	0.5750E+00	0.0000E+00
6	0.1314E+02	0.9632E+02	0.4379E+00	0.1499E+02	0.9924E+00	0.1233E+00	0.4188E-04	0.3750E+01	0.7187E+00	0.0000E+00
7	0.1315E+02	0.9634E+02	0.4360E+00	0.1498E+02	0.9892E+00	0.1465E+00	0.3300E-04	0.3750E+01	0.8625E+00	0.0000E+00
8	0.1318E+02	0.9643E+02	0.4314E+00	0.1498E+02	0.9850E+00	0.1727E+00	0.4616E-05	0.3750E+01	0.1006E+01	0.0000E+00
9	318E+02	0.9648E+02	0.4239E+00	0.1497E+02	0.9806E+00	1959E+00	-0.2336E-04	0.3750E+01	0.1150E+01	0.0000E+
10	323E+02	0.9661E+02	0.4177E+00	0.1491E+02	0.9748E+00	2232E+00	0.3759E-04	0.3750E+01	0.1294E+01	0.0000E+

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11	.1323E+02	0.9661E+02	0.4176E+00	0.1491E+02	0.9701E+00	.2425E+00	-0.4954E-04	0.3750E+01	0.1437E+01	0.0000E

VARIABLES AT L, J = 11, 17

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1328E+02	0.9660E+02	0.4194E+00	0.1499E+02	0.1000E+01	-0.4898E-15	0.8660E-04	0.4000E+01	0.0000E+00	0.0000E+00
2	0.1328E+02	0.9660E+02	0.4195E+00	0.1499E+02	0.9997E+00	0.2508E-01	-0.9011E-04	0.4000E+01	0.1500E+00	0.0000E+00
3	0.1329E+02	0.9661E+02	0.4189E+00	0.1499E+02	0.9988E+00	0.4912E-01	-0.3597E-04	0.4000E+01	0.3000E+00	0.0000E+00
4	0.1329E+02	0.9663E+02	0.4178E+00	0.1499E+02	0.9973E+00	0.7400E-01	0.2707E-04	0.4000E+01	0.4500E+00	0.0000E+00
5	0.1330E+02	0.9665E+02	0.4165E+00	0.1499E+02	0.9952E+00	0.9784E-01	0.1025E-03	0.4000E+01	0.6000E+00	0.0000E+00
6	0.1332E+02	0.9668E+02	0.4151E+00	0.1499E+02	0.9924E+00	0.1227E+00	0.1180E-03	0.4000E+01	0.7500E+00	0.0000E+00
7	0.1333E+02	0.9671E+02	0.4129E+00	0.1498E+02	0.9893E+00	0.1460E+00	0.7972E-04	0.4000E+01	0.9000E+00	0.0000E+00
8	0.1335E+02	0.9679E+02	0.4080E+00	0.1497E+02	0.9851E+00	0.1721E+00	0.7774E-05	0.4000E+01	0.1050E+01	0.0000E+00
9	0.1336E+02	0.9684E+02	0.4009E+00	0.1492E+02	0.9807E+00	0.1955E+00	-0.7772E-04	0.4000E+01	0.1200E+01	0.0000E+00
10	0.1339E+02	0.9695E+02	0.3956E+00	0.1492E+02	0.9750E+00	0.2223E+00	0.1494E-03	0.4000E+01	0.1350E+01	0.0000E+00
11	0.1339E+02	0.9695E+02	0.3955E+00	0.1492E+02	0.9701E+00	0.2425E+00	-0.1464E-03	0.4000E+01	0.1500E+01	0.0000E+00

VARIABLES AT L, J = 11, 18

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1343E+02	0.9691E+02	0.3991E+00	0.1499E+02	0.1000E+01	-0.4894E-15	0.5753E-04	0.4250E+01	0.0000E+00	0.0000E+00
2	0.1343E+02	0.9691E+02	0.3992E+00	0.1499E+02	0.9997E+00	0.2489E-01	-0.8514E-04	0.4250E+01	0.1562E+00	0.0000E+00
3	0.1344E+02	0.9692E+02	0.3986E+00	0.1499E+02	0.9988E+00	0.4863E-01	-0.3071E-04	0.4250E+01	0.3125E+00	0.0000E+00
4	0.1344E+02	0.9694E+02	0.3975E+00	0.1499E+02	0.9973E+00	0.7327E-01	0.1741E-04	0.4250E+01	0.4687E+00	0.0000E+00
5	0.1345E+02	0.9695E+02	0.3962E+00	0.1499E+02	0.9953E+00	0.9696E-01	0.7798E-04	0.4250E+01	0.6250E+00	0.0000E+00
6	0.1346E+02	0.9699E+02	0.3947E+00	0.1499E+02	0.9926E+00	0.1218E+00	0.8352E-04	0.4250E+01	0.7812E+00	0.0000E+00
7	0.1347E+02	0.9702E+02	0.3922E+00	0.1498E+02	0.9894E+00	0.1452E+00	0.7020E-04	0.4250E+01	0.9375E+00	0.0000E+00
8	0.1350E+02	0.9710E+02	0.3872E+00	0.1497E+02	0.9852E+00	0.1713E+00	0.2164E-04	0.4250E+01	0.1094E+01	0.0000E+00
9	0.1350E+02	0.9714E+02	0.3804E+00	0.1492E+02	0.9808E+00	0.1949E+00	0.1787E-06	0.4250E+01	0.1250E+01	0.0000E+00
10	0.1354E+02	0.9724E+02	0.3757E+00	0.1492E+02	0.9752E+00	0.2215E+00	-0.9427E-04	0.4250E+01	0.1406E+01	0.0000E+00
11	0.1354E+02	0.9724E+02	0.3756E+00	0.1492E+02	0.9701E+00	0.2425E+00	0.5736E-04	0.4250E+01	0.1562E+01	0.0000E+00

VARIABLES AT L, J = 11, 19

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1356E+02	0.9718E+02	0.3812E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.1724E-03	0.4500E+01	0.0000E+00	0.0000E+00
2	0.1356E+02	0.9718E+02	0.3813E+00	0.1499E+02	0.9997E+00	0.2452E-01	0.1193E-03	0.4500E+01	0.1625E+00	0.0000E+00
3	0.1356E+02	0.9719E+02	0.3808E+00	0.1499E+02	0.9989E+00	0.4782E-01	0.8620E-04	0.4500E+01	0.3250E+00	0.0000E+00
4	0.1357E+02	0.9720E+02	0.3796E+00	0.1499E+02	0.9974E+00	0.7209E-01	0.1093E-04	0.4500E+01	0.4875E+00	0.0000E+00
5	0.1358E+02	0.9722E+02	0.3781E+00	0.1499E+02	0.9954E+00	0.9547E-01	-0.8645E-04	0.4500E+01	0.6500E+00	0.0000E+00
6	0.1359E+02	0.9725E+02	0.3765E+00	0.1499E+02	0.9928E+00	0.1200E+00	0.1451E-03	0.4500E+01	0.8125E+00	0.0000E+00
7	0.1360E+02	0.9729E+02	0.3737E+00	0.1498E+02	0.9896E+00	0.1435E+00	-0.1026E-03	0.4500E+01	0.9750E+00	0.0000E+00
8	0.1363E+02	0.9736E+02	0.3685E+00	0.1497E+02	0.9855E+00	0.1697E+00	0.8071E-05	0.4500E+01	0.1137E+01	0.0000E+00
9	0.1363E+02	0.9741E+02	0.3621E+00	0.1493E+02	0.9811E+00	0.1936E+00	0.1610E-03	0.4500E+01	0.1300E+01	0.0000E+00
10	0.1367E+02	0.9750E+02	0.3577E+00	0.1493E+02	0.9754E+00	0.2200E+00	0.2018E-03	0.4500E+01	0.1462E+01	0.0000E+00
11	0.1367E+02	0.9750E+02	0.3576E+00	0.1493E+02	0.9701E+00	0.2425E+00	0.2325E-03	0.4500E+01	0.1625E+01	0.0000E+00

VARIABLES AT L, J = 11, 20

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1367E+02	0.9740E+02	0.3651E+00	0.1499E+02	0.1000E+01	-0.4878E-15	0.6404E-03	0.4750E+01	0.0000E+00	0.0000E+00
2	0.1367E+02	0.9740E+02	0.3653E+00	0.1499E+02	0.9997E+00	0.2393E-01	0.6085E-03	0.4750E+01	0.1687E+00	0.0000E+00
3	0.1367E+02	0.9741E+02	0.3648E+00	0.1499E+02	0.9989E+00	0.4697E-01	0.4206E-03	0.4750E+01	0.3375E+00	0.0000E+00
4	0.1368E+02	0.9743E+02	0.3635E+00	0.1499E+02	0.9975E+00	0.7087E-01	0.1775E-03	0.4750E+01	0.5062E+00	0.0000E+00
5	0.1369E+02	0.9744E+02	0.3620E+00	0.1499E+02	0.9956E+00	0.9381E-01	-0.1914E-03	0.4750E+01	0.6750E+00	0.0000E+00
6	0.1371E+02	0.9748E+02	0.3601E+00	0.1499E+02	0.9930E+00	0.1179E+00	-0.4213E-03	0.4750E+01	0.8437E+00	0.0000E+00
7	0.1371E+02	0.9751E+02	0.3568E+00	0.1498E+02	0.9900E+00	0.1412E+00	0.4602E-03	0.4750E+01	0.1012E+01	0.0000E+00
8	0.1374E+02	0.9759E+02	0.3512E+00	0.1496E+02	0.9859E+00	0.1673E+00	-0.3062E-03	0.4750E+01	0.1181E+01	0.0000E+00
9	0.1374E+02	0.9763E+02	0.3448E+00	0.1492E+02	0.9815E+00	0.1916E+00	0.4277E-04	0.4750E+01	0.1350E+01	0.0000E+00
10	0.1378E+02	0.9773E+02	0.3407E+00	0.1493E+02	0.9756E+00	0.2195E+00	0.2218E-03	0.4750E+01	0.1519E+01	0.0000E+00
11	0.1378E+02	0.9773E+02	0.3405E+00	0.1493E+02	0.9701E+00	0.2425E+00	0.1815E-03	0.4750E+01	0.1687E+01	0.0000E+00

Listing B-6. Continued

VARIABLES AT L, J = 11, 21

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1376E+02	0.9759E+02	0.3508E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.9478E-03	0.5000E+01	0.0000E+00	0.0000E+00
2	0.1376E+02	0.9759E+02	0.3509E+00	0.1499E+02	0.9997E+00	0.2286E-01	0.1050E-02	0.5000E+01	0.1750E+00	0.0000E+00
3	0.1377E+02	0.9760E+02	0.3504E+00	0.1499E+02	0.9990E+00	0.4551E-01	0.7082E-03	0.5000E+01	0.3500E+00	0.0000E+00
4	0.1378E+02	0.9762E+02	0.3492E+00	0.1499E+02	0.9976E+00	0.6873E-01	0.4398E-03	0.5000E+01	0.5250E+00	0.0000E+00
5	0.1379E+02	0.9764E+02	0.3477E+00	0.1499E+02	0.9959E+00	0.9088E-01	-0.6147E-04	0.5000E+01	0.7000E+00	0.0000E+00
6	0.1381E+02	0.9768E+02	0.3456E+00	0.1499E+02	0.9935E+00	0.1142E+00	-0.4193E-03	0.5000E+01	0.8750E+00	0.0000E+00
7	0.1382E+02	0.9772E+02	0.3418E+00	0.1498E+02	0.9906E+00	0.1370E+00	-0.6739E-03	0.5000E+01	0.1050E+01	0.0000E+00
8	0.1384E+02	0.9780E+02	0.3357E+00	0.1497E+02	0.9866E+00	0.1631E+00	-0.7709E-03	0.5000E+01	0.1225E+01	0.0000E+00
9	0.1385E+02	0.9785E+02	0.3292E+00	0.1493E+02	0.9822E+00	0.1879E+00	-0.7055E-03	0.5000E+01	0.1400E+01	0.0000E+00
10	0.1389E+02	0.9794E+02	0.3249E+00	0.1494E+02	0.9762E+00	0.2170E+00	-0.5010E-03	0.5000E+01	0.1575E+01	0.0000E+00
11	0.1389E+02	0.9794E+02	0.3247E+00	0.1494E+02	0.9701E+00	0.2425E+00	-0.5380E-03	0.5000E+01	0.1750E+01	0.0000E+00

VARIABLES AT L, J = 11, 22

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1384E+02	0.9775E+02	0.3382E+00	0.1498E+02	0.1000E+01	-0.4851E-15	0.2065E-03	0.5250E+01	0.0000E+00	0.0000E+00
2	0.1384E+02	0.9775E+02	0.3383E+00	0.1498E+02	0.9998E+00	0.2164E-01	0.5205E-03	0.5250E+01	0.1812E+00	0.0000E+00
3	0.1385E+02	0.9776E+02	0.3376E+00	0.1499E+02	0.9991E+00	0.4331E-01	0.1708E-03	0.5250E+01	0.3625E+00	0.0000E+00
4	0.1386E+02	0.9778E+02	0.3364E+00	0.1499E+02	0.9979E+00	0.6547E-01	0.2006E-03	0.5250E+01	0.5437E+00	0.0000E+00
5	0.1387E+02	0.9781E+02	0.3349E+00	0.1499E+02	0.9962E+00	0.8661E-01	0.9004E-04	0.5250E+01	0.7250E+00	0.0000E+00
6	0.1389E+02	0.9785E+02	0.3323E+00	0.1499E+02	0.9940E+00	0.1094E+00	0.7027E-04	0.5250E+01	0.9062E+00	0.0000E+00
7	0.1390E+02	0.9789E+02	0.3279E+00	0.1498E+02	0.9913E+00	0.1319E+00	-0.7652E-04	0.5250E+01	0.1087E+01	0.0000E+00
8	0.1393E+02	0.9798E+02	0.3208E+00	0.1496E+02	0.9874E+00	0.1584E+00	-0.3315E-03	0.5250E+01	0.1269E+01	0.0000E+00
9	0.1394E+02	0.9803E+02	0.3138E+00	0.1492E+02	0.9830E+00	0.1835E+00	-0.5989E-03	0.5250E+01	0.1450E+01	0.0000E+00
10	0.1398E+02	0.9812E+02	0.3085E+00	0.1493E+02	0.9769E+00	0.2139E+00	-0.9017E-03	0.5250E+01	0.1631E+01	0.0000E+00
11	0.1398E+02	0.9812E+02	0.3083E+00	0.1493E+02	0.9701E+00	0.2425E+00	-0.7108E-03	0.5250E+01	0.1812E+01	0.0000E+00

VARIABLES AT L, J = 11, 23

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1391E+02	0.9789E+02	0.3275E+00	0.1498E+02	0.1000E+01	0.0000E+00	-0.1825E-02	0.5500E+01	0.0000E+00	0.0000E+00
2	0.1391E+02	0.9789E+02	0.3276E+00	0.1498E+02	0.9998E+00	0.2026E-01	-0.1460E-02	0.5500E+01	0.1875E+00	0.0000E+00
3	0.1392E+02	0.9790E+02	0.3267E+00	0.1499E+02	0.9992E+00	0.3942E-01	-0.1443E-02	0.5500E+01	0.3750E+00	0.0000E+00
4	0.1393E+02	0.9793E+02	0.3255E+00	0.1499E+02	0.9982E+00	0.5943E-01	-0.8889E-03	0.5500E+01	0.5625E+00	0.0000E+00
5	0.1394E+02	0.9795E+02	0.3236E+00	0.1499E+02	0.9969E+00	0.7852E-01	-0.7232E-04	0.5500E+01	0.7500E+00	0.0000E+00
6	0.1397E+02	0.9801E+02	0.3203E+00	0.1500E+02	0.9950E+00	0.1001E+00	0.8258E-03	0.5500E+01	0.9375E+00	0.0000E+00
7	0.1398E+02	0.9800E+02	0.3150E+00	0.1498E+02	0.9926E+00	0.1212E+00	0.1442E-02	0.5500E+01	0.1125E+01	0.0000E+00
8	0.1402E+02	0.9817E+02	0.3071E+00	0.1497E+02	0.9891E+00	0.1475E+00	0.1709E-02	0.5500E+01	0.1312E+01	0.0000E+00
9	0.1404E+02	0.9822E+02	0.2998E+00	0.1494E+02	0.9851E+00	0.1719E+00	0.1493E-02	0.5500E+01	0.1500E+01	0.0000E+00
10	0.1409E+02	0.9836E+02	0.2933E+00	0.1496E+02	0.9783E+00	0.2072E+00	0.9090E-03	0.5500E+01	0.1687E+01	0.0000E+00
11	0.1409E+02	0.9836E+02	0.2931E+00	0.1496E+02	0.9701E+00	0.2425E+00	0.1320E-02	0.5500E+01	0.1875E+01	0.0000E+00

VARIABLES AT L, J = 11, 24

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1397E+02	0.9800E+02	0.3189E+00	0.1499E+02	0.1000E+01	-0.2388E-15	-0.3652E-02	0.5750E+01	0.0000E+00	0.0000E+00
2	0.1397E+02	0.9800E+02	0.3189E+00	0.1499E+02	0.9998E+00	0.1879E-01	-0.3602E-02	0.5750E+01	0.1937E+00	0.0000E+00
3	0.1398E+02	0.9802E+02	0.3180E+00	0.1499E+02	0.9994E+00	0.3477E-01	-0.2890E-02	0.5750E+01	0.3875E+00	0.0000E+00
4	0.1399E+02	0.9804E+02	0.3166E+00	0.1499E+02	0.9986E+00	0.5230E-01	-0.2045E-02	0.5750E+01	0.5812E+00	0.0000E+00
5	0.1400E+02	0.9807E+02	0.3141E+00	0.1499E+02	0.9976E+00	0.6901E-01	-0.4975E-03	0.5750E+01	0.7750E+00	0.0000E+00
6	0.1403E+02	0.9813E+02	0.3097E+00	0.1499E+02	0.9960E+00	0.8900E-01	0.1117E-02	0.5750E+01	0.9687E+00	0.0000E+00
7	0.1404E+02	0.9818E+02	0.3032E+00	0.1497E+02	0.9941E+00	0.1084E+00	0.2525E-02	0.5750E+01	0.1167E+01	0.0000E+00
8	0.1409E+02	0.9829E+02	0.2937E+00	0.1496E+02	0.9909E+00	0.1347E+00	0.3716E-02	0.5750E+01	0.1356E+01	0.0000E+00
9	0.1410E+02	0.9834E+02	0.2842E+00	0.1491E+02	0.9871E+00	0.1598E+00	0.4065E-02	0.5750E+01	0.1550E+01	0.0000E+00
10	0.1417E+02	0.9851E+02	0.2733E+00	0.1492E+02	0.9790E+00	0.2040E+00	0.4297E-02	0.5750E+01	0.1744E+01	0.0000E+00
11	0.1417E+02	0.9851E+02	0.2731E+00	0.1492E+02	0.9701E+00	0.2425E+00	0.4416E-02	0.5750E+01	0.1937E+01	0.0000E+00

VA[illegible]BLES AT L, J = 11, 25

Listing B-6. Continued

K	PESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1401E+02	0.9809E+02	0.3118E+00	0.1499E+02	0.1000E+01	0.0000E+00	-0.3321E-02	0.6000E+01	0.0000E+00	0.0000E+00
2	0.1401E+02	0.9809E+02	0.3118E+00	0.1499E+02	0.9999E+00	0.1624E-01	-0.3833E-02	0.6000E+01	0.2000E+00	0.0000E+00
3	0.1402E+02	0.9811E+02	0.3111E+00	0.1500E+02	0.9996E+00	0.2878E-01	-0.2548E-02	0.6000E+01	0.4000E+00	0.0000E+00
4	0.1403E+02	0.9813E+02	0.3093E+00	0.1500E+02	0.9991E+00	0.4312E-01	-0.1928E-02	0.6000E+01	0.6000E+00	0.0000E+00
5	0.1405E+02	0.9816E+02	0.3060E+00	0.1499E+02	0.9984E+00	0.5609E-01	-0.6340E-03	0.6000E+01	0.8000E+00	0.0000E+00
6	0.1408E+02	0.9823E+02	0.3007E+00	0.1499E+02	0.9974E+00	0.7185E-01	0.5123E-03	0.6000E+01	0.1000E+01	0.0000E+00
7	0.1410E+02	0.9829E+02	0.2929E+00	0.1496E+02	0.9984E+00	0.8474E-01	0.1527E-02	0.6000E+01	0.1200E+01	0.0000E+00
8	0.1415E+02	0.9843E+02	0.2814E+00	0.1495E+02	0.9949E+00	0.1044E+00	0.2657E-02	0.6000E+01	0.1400E+01	0.0000E+00
9	0.1417E+02	0.9849E+02	0.2685E+00	0.1490E+02	0.9934E+00	0.1147E+00	0.3117E-02	0.6000E+01	0.1600E+01	0.0000E+00
10	0.1430E+02	0.9877E+02	0.2550E+00	0.1496E+02	0.9892E+00	0.1462E+00	0.4802E-02	0.6000E+01	0.1800E+01	0.0000E+00
11	0.1430E+02	0.9877E+02	0.2549E+00	0.1496E+02	0.9923E+00	0.1240E+00	0.4008E-02	0.6000E+01	0.2000E+01	0.0000E+00

VARIABLES AT L, J = 11, 26

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1405E+02	0.9817E+02	0.3062E+00	0.1499E+02	0.1000E+01	0.0000E+00	-0.1275E-03	0.6250E+01	0.0000E+00	0.0000E+00
2	0.1405E+02	0.9817E+02	0.3062E+00	0.1499E+02	0.9999E+00	0.1256E-01	-0.1079E-02	0.6250E+01	0.2000E+00	0.0000E+00
3	0.1406E+02	0.9818E+02	0.3058E+00	0.1500E+02	0.9998E+00	0.2214E-01	0.3090E-03	0.6250E+01	0.4000E+00	0.0000E+00
4	0.1407E+02	0.9820E+02	0.3041E+00	0.1500E+02	0.9994E+00	0.3323E-01	0.2706E-03	0.6250E+01	0.6000E+00	0.0000E+00
5	0.1408E+02	0.9823E+02	0.3010E+00	0.1500E+02	0.9991E+00	0.4214E-01	0.2864E-03	0.6250E+01	0.8000E+00	0.0000E+00
6	0.1411E+02	0.9829E+02	0.2962E+00	0.1500E+02	0.9986E+00	0.5249E-01	-0.2851E-03	0.6250E+01	0.1000E+01	0.0000E+00
7	0.1413E+02	0.9835E+02	0.2887E+00	0.1497E+02	0.9983E+00	0.5781E-01	-0.1044E-02	0.6250E+01	0.1200E+01	0.0000E+00
8	0.1418E+02	0.9849E+02	0.2785E+00	0.1497E+02	0.9977E+00	0.6728E-01	-0.1473E-02	0.6250E+01	0.1400E+01	0.0000E+00
9	0.1420E+02	0.9855E+02	0.2667E+00	0.1492E+02	0.9982E+00	0.6037E-01	-0.2023E-02	0.6250E+01	0.1600E+01	0.0000E+00
10	0.1431E+02	0.9880E+02	0.2606E+00	0.1501E+02	0.9982E+00	0.6004E-01	-0.6033E-03	0.6250E+01	0.1800E+01	0.0000E+00
11	0.1431E+02	0.9880E+02	0.2602E+00	0.1500E+02	0.1000E+01	0.5555E-15	-0.1899E-02	0.6250E+01	0.2000E+01	0.0000E+00

VARIABLES AT L, J = 11, 27

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1407E+02	0.9821E+02	0.3018E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.4380E-02	0.6500E+01	0.0000E+00	0.0000E+00
2	0.1407E+02	0.9821E+02	0.3019E+00	0.1499E+02	0.1000E+01	0.8967E-02	0.3527E-02	0.6500E+01	0.2000E+00	0.0000E+00
3	0.1408E+02	0.9822E+02	0.3017E+00	0.1499E+02	0.9998E+00	0.1718E-01	0.4019E-02	0.6500E+01	0.4000E+00	0.0000E+00
4	0.1409E+02	0.9824E+02	0.3003E+00	0.1500E+02	0.9997E+00	0.2612E-01	0.3101E-02	0.6500E+01	0.6000E+00	0.0000E+00
5	0.1410E+02	0.9826E+02	0.2979E+00	0.1499E+02	0.9995E+00	0.3276E-01	0.1452E-02	0.6500E+01	0.8000E+00	0.0000E+00
6	0.1412E+02	0.9831E+02	0.2942E+00	0.1499E+02	0.9992E+00	0.3975E-01	-0.9428E-03	0.6500E+01	0.1000E+01	0.0000E+00
7	0.1413E+02	0.9835E+02	0.2880E+00	0.1497E+02	0.9991E+00	0.4233E-01	-0.3377E-02	0.6500E+01	0.1200E+01	0.0000E+00
8	0.1416E+02	0.9844E+02	0.2802E+00	0.1495E+02	0.9989E+00	0.4633E-01	-0.5359E-02	0.6500E+01	0.1400E+01	0.0000E+00
9	0.1418E+02	0.9848E+02	0.2721E+00	0.1491E+02	0.9992E+00	0.3826E-01	-0.6609E-02	0.6500E+01	0.1600E+01	0.0000E+00
10	0.1420E+02	0.9857E+02	0.2727E+00	0.1495E+02	0.9996E+00	0.2584E-01	-0.6601E-02	0.6500E+01	0.1800E+01	0.0000E+00
11	0.1420E+02	0.9857E+02	0.2727E+00	0.1495E+02	0.1000E+01	0.2669E-15	-0.7392E-02	0.6500E+01	0.2000E+01	0.0000E+00

VARIABLES AT L, J = 11, 28

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1409E+02	0.9824E+02	0.2983E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.6919E-02	0.6750E+01	0.0000E+00	0.0000E+00
2	0.1409E+02	0.9824E+02	0.2983E+00	0.1499E+02	0.1000E+01	0.6043E-02	0.6780E-02	0.6750E+01	0.2000E+00	0.0000E+00
3	0.1409E+02	0.9825E+02	0.2981E+00	0.1499E+02	0.9999E+00	0.1302E-01	0.5681E-02	0.6750E+01	0.4000E+00	0.0000E+00
4	0.1410E+02	0.9827E+02	0.2972E+00	0.1499E+02	0.9998E+00	0.1982E-01	0.4238E-02	0.6750E+01	0.6000E+00	0.0000E+00
5	0.1411E+02	0.9828E+02	0.2955E+00	0.1499E+02	0.9997E+00	0.2441E-01	0.1714E-02	0.6750E+01	0.8000E+00	0.0000E+00
6	0.1413E+02	0.9833E+02	0.2927E+00	0.1499E+02	0.9996E+00	0.2866E-01	-0.1154E-02	0.6750E+01	0.1000E+01	0.0000E+00
7	0.1414E+02	0.9837E+02	0.2875E+00	0.1497E+02	0.9996E+00	0.2950E-01	-0.3782E-02	0.6750E+01	0.1200E+01	0.0000E+00
8	0.1416E+02	0.9844E+02	0.2813E+00	0.1496E+02	0.9995E+00	0.2996E-01	-0.6074E-02	0.6750E+01	0.1400E+01	0.0000E+00
9	0.1417E+02	0.9849E+02	0.2758E+00	0.1494E+02	0.9997E+00	0.2179E-01	-0.7211E-02	0.6750E+01	0.1600E+01	0.0000E+00
10	0.1420E+02	0.9856E+02	0.2767E+00	0.1497E+02	0.9999E+00	0.9589E-02	-0.8932E-02	0.6750E+01	0.1800E+01	0.0000E+00
11	0.1420E+02	0.9856E+02	0.2767E+00	0.1497E+02	0.1000E+01	0.1315E-15	-0.8672E-02	0.6750E+01	0.2000E+01	0.0000E+00

VARIABLES AT L, J = 11, 29

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z

Listing B-6. Continued

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1410E+02	0.9827E+02	0.2959E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.5361E-02	0.7000E+01	0.0000E+00	0.0000E+00
2	0.1410E+02	0.9827E+02	0.2959E+00	0.1498E+02	0.1000E+01	0.4470E-02	0.6080E-02	0.7000E+01	0.2000E+00	0.0000E+00
3	0.1410E+02	0.9827E+02	0.2957E+00	0.1499E+02	0.9999E+00	0.9913E-02	0.3818E-02	0.7000E+01	0.4000E+00	0.0000E+00
4	0.1411E+02	0.9828E+02	0.2953E+00	0.1499E+02	0.9999E+00	0.1474E-01	0.2671E-02	0.7000E+01	0.6000E+00	0.0000E+00
5	0.1412E+02	0.9830E+02	0.2943E+00	0.1499E+02	0.9998E+00	0.1778E-01	0.7872E-03	0.7000E+01	0.8000E+00	0.0000E+00
6	0.1413E+02	0.9833E+02	0.2921E+00	0.1499E+02	0.9998E+00	0.2041E-01	-0.7986E-03	0.7000E+01	0.1000E+01	0.0000E+00
7	0.1414E+02	0.9836E+02	0.2878E+00	0.1497E+02	0.9998E+00	0.2075E-01	-0.2004E-02	0.7000E+01	0.1200E+01	0.0000E+00
8	0.1415E+02	0.9842E+02	0.2830E+00	0.1496E+02	0.9998E+00	0.1981E-01	-0.3281E-02	0.7000E+01	0.1400E+01	0.0000E+00
9	0.1415E+02	0.9845E+02	0.2795E+00	0.1494E+02	0.9999E+00	0.1347E-01	-0.3727E-02	0.7000E+01	0.1600E+01	0.0000E+00
10	0.1417E+02	0.9849E+02	0.2804E+00	0.1496E+02	0.1000E+01	0.4079E-02	-0.6418E-02	0.7000E+01	0.1800E+01	0.0000E+00
11	0.1417E+02	0.9849E+02	0.2804E+00	0.1496E+02	0.1000E+01	0.3251E-16	-0.5240E-02	0.7000E+01	0.2000E+01	0.0000E+00

VARIABLES AT L, J = 11, 30

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1411E+02	0.9828E+02	0.2942E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.6002E-03	0.7250E+01	0.0000E+00	0.0000E+00
2	0.1411E+02	0.9828E+02	0.2942E+00	0.1498E+02	0.1000E+01	0.3640E-02	0.1748E-02	0.7250E+01	0.2000E+00	0.0000E+00
3	0.1411E+02	0.9829E+02	0.2941E+00	0.1498E+02	0.1000E+01	0.6981E-02	-0.3453E-03	0.7250E+01	0.4000E+00	0.0000E+00
4	0.1412E+02	0.9830E+02	0.2941E+00	0.1499E+02	0.1000E+01	0.9981E-02	-0.4843E-03	0.7250E+01	0.6000E+00	0.0000E+00
5	0.1412E+02	0.9831E+02	0.2934E+00	0.1499E+02	0.9999E+00	0.1168E-01	-0.6374E-03	0.7250E+01	0.8000E+00	0.0000E+00
6	0.1413E+02	0.9833E+02	0.2915E+00	0.1499E+02	0.9999E+00	0.1331E-01	-0.2906E-04	0.7250E+01	0.1000E+01	0.0000E+00
7	0.1414E+02	0.9836E+02	0.2879E+00	0.1497E+02	0.9999E+00	0.1357E-01	0.8699E-03	0.7250E+01	0.1200E+01	0.0000E+00
8	0.1414E+02	0.9841E+02	0.2840E+00	0.1496E+02	0.9999E+00	0.1263E-01	0.1236E-02	0.7250E+01	0.1400E+01	0.0000E+00
9	0.1415E+02	0.9844E+02	0.2817E+00	0.1495E+02	0.1000E+01	0.8245E-02	0.1645E-02	0.7250E+01	0.1600E+01	0.0000E+00
10	0.1416E+02	0.9847E+02	0.2822E+00	0.1496E+02	0.1000E+01	0.2458E-02	-0.6164E-03	0.7250E+01	0.1800E+01	0.0000E+00
11	0.1416E+02	0.9847E+02	0.2822E+00	0.1496E+02	0.1000E+01	0.3232E-16	0.8465E-03	0.7250E+01	0.2000E+01	0.0000E+00

VARIABLES AT L, J = 11, 31

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1412E+02	0.9830E+02	0.2935E+00	0.1499E+02	0.1000E+01	0.0000E+00	-0.3631E-02	0.7500E+01	0.0000E+00	0.0000E+00
2	0.1412E+02	0.9830E+02	0.2934E+00	0.1499E+02	0.1000E+01	0.3210E-02	-0.2801E-02	0.7500E+01	0.2000E+00	0.0000E+00
3	0.1412E+02	0.9831E+02	0.2935E+00	0.1499E+02	0.1000E+01	0.5130E-02	-0.3649E-02	0.7500E+01	0.4000E+00	0.0000E+00
4	0.1412E+02	0.9831E+02	0.2937E+00	0.1499E+02	0.1000E+01	0.7102E-02	-0.2839E-02	0.7500E+01	0.6000E+00	0.0000E+00
5	0.1413E+02	0.9832E+02	0.2931E+00	0.1499E+02	0.1000E+01	0.8186E-02	-0.1538E-02	0.7500E+01	0.8000E+00	0.0000E+00
6	0.1413E+02	0.9833E+02	0.2912E+00	0.1499E+02	0.1000E+01	0.9392E-02	0.5154E-03	0.7500E+01	0.1000E+01	0.0000E+00
7	0.1413E+02	0.9836E+02	0.2879E+00	0.1497E+02	0.9999E+00	0.9656E-02	0.2683E-02	0.7500E+01	0.1200E+01	0.0000E+00
8	0.1414E+02	0.9839E+02	0.2845E+00	0.1495E+02	0.1000E+01	0.8741E-02	0.4200E-02	0.7500E+01	0.1400E+01	0.0000E+00
9	0.1414E+02	0.9842E+02	0.2828E+00	0.1494E+02	0.1000E+01	0.5622E-02	0.5275E-02	0.7500E+01	0.1600E+01	0.0000E+00
10	0.1414E+02	0.9844E+02	0.2830E+00	0.1495E+02	0.1000E+01	0.2209E-02	0.4439E-02	0.7500E+01	0.1800E+01	0.0000E+00
11	0.1414E+02	0.9844E+02	0.2829E+00	0.1495E+02	0.1000E+01	0.3228E-16	0.5385E-02	0.7500E+01	0.2000E+01	0.0000E+00

VARIABLES AT L, J = 11, 32

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1412E+02	0.9829E+02	0.2925E+00	0.1498E+02	0.1000E+01	0.0000E+00	-0.8171E-02	0.7750E+01	0.0000E+00	0.0000E+00
2	0.1412E+02	0.9829E+02	0.2925E+00	0.1498E+02	0.1000E+01	0.2341E-02	-0.5989E-02	0.7750E+01	0.2000E+00	0.0000E+00
3	0.1412E+02	0.9829E+02	0.2928E+00	0.1499E+02	0.1000E+01	0.3054E-02	-0.5282E-02	0.7750E+01	0.4000E+00	0.0000E+00
4	0.1412E+02	0.9830E+02	0.2930E+00	0.1499E+02	0.1000E+01	0.4116E-02	-0.3844E-02	0.7750E+01	0.6000E+00	0.0000E+00
5	0.1413E+02	0.9831E+02	0.2926E+00	0.1499E+02	0.1000E+01	0.4614E-02	-0.1801E-02	0.7750E+01	0.8000E+00	0.0000E+00
6	0.1413E+02	0.9833E+02	0.2910E+00	0.1498E+02	0.1000E+01	0.5264E-02	0.7564E-03	0.7750E+01	0.1000E+01	0.0000E+00
7	0.1413E+02	0.9836E+02	0.2881E+00	0.1497E+02	0.1000E+01	0.5372E-02	0.3294E-02	0.7750E+01	0.1200E+01	0.0000E+00
8	0.1414E+02	0.9840E+02	0.2853E+00	0.1496E+02	0.1000E+01	0.4886E-02	0.5342E-02	0.7750E+01	0.1400E+01	0.0000E+00
9	0.1414E+02	0.9843E+02	0.2839E+00	0.1495E+02	0.1000E+01	0.3316E-02	0.6823E-02	0.7750E+01	0.1600E+01	0.0000E+00
10	0.1414E+02	0.9845E+02	0.2840E+00	0.1496E+02	0.1000E+01	0.1994E-02	0.7871E-02	0.7750E+01	0.1800E+01	0.0000E+00
11	0.1414E+02	0.9845E+02	0.2839E+00	0.1495E+02	0.1000E+01	0.1608E-16	0.7928E-02	0.7750E+01	0.2000E+01	0.0000E+00

VARIABLES AT L, J = 11, 33

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U COSINE	V-COSINE	W-COSINE	X	Y	Z
1	413E+02	0.9836E+02	0.2925E+00	0.1499E+02	0.1000E+0	0000E+00	-0.2226E-02	0.8000E+01	0.0000E+00	0.0000E
2	113E+02	0.9836E+02	2926E+00	0.1499E+02	0.1000E+0	1879E-02	-0.2226E-02	0.8000E+01	0.2000E+00	0.0000F

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3	.1413E+02	0.9834E+02	0.2927E+00	0.1500E+02	0.1000E+01	0.2568E-02	0.6524E-03	0.8000E+01	0.4000E+00	0.2000E+01
4	.1413E+02	0.9834E+02	0.2930E+00	0.1500E+02	0.1000E+01	0.3424E-02	0.3881E-03	0.8000E+01	0.6000E+00	0.2000E+01
5	0.1413E+02	0.9833E+02	0.2926E+00	0.1499E+02	0.1000E+01	0.3581E-02	0.6392E-04	0.8000E+01	0.8000E+00	0.2000E+01
6	0.1413E+02	0.9834E+02	0.2909E+00	0.1498E+02	0.1000E+01	0.4201E-02	-0.7027E-04	0.8000E+01	0.1000E+01	0.2000E+01
7	0.1413E+02	0.9835E+02	0.2880E+00	0.1497E+02	0.1000E+01	0.4308E-02	-0.1138E-03	0.8000E+01	0.1200E+01	0.2000E+01
8	0.1413E+02	0.9836E+02	0.2852E+00	0.1495E+02	0.1000E+01	0.4170E-02	-0.3411E-03	0.8000E+01	0.1400E+01	0.2000E+01
9	0.1413E+02	0.9839E+02	0.2838E+00	0.1494E+02	0.1000E+01	0.2766E-02	-0.5055E-03	0.8000E+01	0.1600E+01	0.2000E+01
10	0.1413E+02	0.9839E+02	0.2840E+00	0.1494E+02	0.1000E+01	0.2500E-02	-0.1531E-02	0.8000E+01	0.1800E+01	0.2000E+01
11	0.1413E+02	0.9839E+02	0.2840E+00	0.1494E+02	0.1000E+01	0.3216E-16	-0.1531E-02	0.8000E+01	0.2000E+01	0.2000E+01

VARIABLES AT L, J = 21, 1

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.2500E+01
2	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.1000E+00	0.2500E+01
3	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.2000E+00	0.2500E+01
4	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.3000E+00	0.2500E+01
5	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.4000E+00	0.2500E+01
6	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.5000E+00	0.2500E+01
7	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.6000E+00	0.2500E+01
8	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.7000E+00	0.2500E+01
9	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.8000E+00	0.2500E+01
10	0.1017E+02	0.8949E+02	0.7662E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.9000E+00	0.2500E+01
11	0.1017E+02	0.8949E+02	0.7662E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 2

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.2500E+00	0.0000E+00	0.2500E+01
2	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.4240E-05	0.0000E+00	0.2500E+00	0.1000E+00	0.2500E+01
3	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.6503E-05	0.1928E-20	0.2500E+00	0.2000E+00	0.2500E+01
4	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.9296E-05	0.0000E+00	0.2500E+00	0.3000E+00	0.2500E+01
5	0.1017E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	-0.1187E-04	0.0000E+00	0.2500E+00	0.4000E+00	0.2500E+01
6	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1349E-04	0.1928E-20	0.2500E+00	0.5000E+00	0.2500E+01
7	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1422E-04	0.1928E-20	0.2500E+00	0.6000E+00	0.2500E+01
8	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1297E-04	0.0000E+00	0.2500E+00	0.7000E+00	0.2500E+01
9	0.1017E+02	0.8950E+02	0.7662E+00	0.1500E+02	0.1000E+01	-0.1045E-04	-0.3855E-20	0.2500E+00	0.8000E+00	0.2500E+01
10	0.1017E+02	0.8950E+02	0.7663E+00	0.1500E+02	0.1000E+01	0.7525E-05	0.0000E+00	0.2500E+00	0.9000E+00	0.2500E+01
11	0.1017E+02	0.8950E+02	0.7663E+00	0.1500E+02	0.1000E+01	-0.6168E-19	0.0000E+00	0.2500E+00	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 3

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.5000E+00	0.0000E+00	0.2500E+01
2	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.3223E-04	0.0000E+00	0.5000E+00	0.1000E+00	0.2500E+01
3	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.7111E-04	0.1928E-20	0.5000E+00	0.2000E+00	0.2500E+01
4	0.1017E+02	0.8950E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.9809E-04	0.0000E+00	0.5000E+00	0.3000E+00	0.2500E+01
5	0.1017E+02	0.8949E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.1200E-03	0.0000E+00	0.5000E+00	0.4000E+00	0.2500E+01
6	0.1017E+02	0.8949E+02	0.7660E+00	0.1500E+02	0.1000E+01	0.1278E-03	0.1928E-20	0.5000E+00	0.5000E+00	0.2500E+01
7	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.1253E-03	0.1928E-20	0.5000E+00	0.6000E+00	0.2500E+01
8	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.1056E-03	0.0000E+00	0.5000E+00	0.7000E+00	0.2500E+01
9	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.7658E-04	-0.3857E-20	0.5000E+00	0.8000E+00	0.2500E+01
10	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.3802E-04	0.0000E+00	0.5000E+00	0.9000E+00	0.2500E+01
11	0.1017E+02	0.8949E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.4937E-18	0.0000E+00	0.5000E+00	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 4

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7500E+00	0.0000E+00	0.2500E+01
2	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.2854E-04	0.0000E+00	0.7500E+00	0.1000E+00	0.2500E+01
3	0.1018E+02	0.8951E+02	0.7658E+00	0.1500E+02	0.1000E+01	0.6307E-04	0.1928E-20	0.7500E+00	0.2000E+00	0.2500E+01
4	0.1018E+02	0.8951E+02	0.7659E+00	0.1500E+02	0.1000E+01	0.8230E-04	0.0000E+00	0.7500E+00	0.3000E+00	0.2500E+01

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5	0.1018E+02	0.8950E+02	0.7661E+00	0.1500E+02	0.1000E+01	0.8837E-04	0.0000E+00	0.7500E+00	0.4000E+00	0.2500E+01
6	0.1017E+02	0.8950E+02	0.7662E+00	0.1501E+02	0.1000E+01	0.8094E-04	0.9637E-21	0.7500E+00	0.5000E+00	0.2500E+01
7	0.1017E+02	0.8950E+02	0.7664E+00	0.1501E+02	0.1000E+01	0.5810E-04	0.1927E-20	0.7500E+00	0.6000E+00	0.2500E+01
8	0.1017E+02	0.8950E+02	0.7665E+00	0.1501E+02	0.1000E+01	0.3591E-04	0.0000E+00	0.7500E+00	0.7000E+00	0.2500E+01
9	0.1017E+02	0.8950E+02	0.7666E+00	0.1501E+02	0.1000E+01	0.1842E-04	-0.3853E-20	0.7500E+00	0.8000E+00	0.2500E+01
10	0.1017E+02	0.8950E+02	0.7667E+00	0.1501E+02	0.1000E+01	0.7885E-05	0.0000E+00	0.7500E+00	0.9000E+00	0.2500E+01
11	0.1017E+02	0.8950E+02	0.7667E+00	0.1501E+02	0.1000E+01	0.8165E-19	0.0000E+00	0.7500E+00	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 5

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1018E+02	0.8952E+02	0.7651E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1000E+01	0.0000E+00	0.2500E+01
2	0.1018E+02	0.8952E+02	0.7651E+00	0.1500E+02	0.1000E+01	0.2446E-03	0.0000E+00	0.1000E+01	0.1000E+00	0.2500E+01
3	0.1018E+02	0.8951E+02	0.7652E+00	0.1500E+02	0.1000E+01	0.5321E-03	0.2411E-21	0.1000E+01	0.2000E+00	0.2500E+01
4	0.1018E+02	0.8951E+02	0.7654E+00	0.1500E+02	0.1000E+01	0.7439E-03	0.0000E+00	0.1000E+01	0.3000E+00	0.2500E+01
5	0.1017E+02	0.8950E+02	0.7657E+00	0.1500E+02	0.1000E+01	0.9181E-03	0.0000E+00	0.1000E+01	0.4000E+00	0.2500E+01
6	0.1017E+02	0.8949E+02	0.7659E+00	0.1499E+02	0.1000E+01	0.9988E-03	-0.4822E-21	0.1000E+01	0.5000E+00	0.2500E+01
7	0.1017E+02	0.8948E+02	0.7662E+00	0.1499E+02	0.1000E+01	0.9994E-03	-0.1507E-22	0.1000E+01	0.6000E+00	0.2500E+01
8	0.1016E+02	0.8947E+02	0.7664E+00	0.1499E+02	0.1000E+01	0.8780E-03	0.0000E+00	0.1000E+01	0.7000E+00	0.2500E+01
9	0.1016E+02	0.8946E+02	0.7666E+00	0.1499E+02	0.1000E+01	0.6559E-03	-0.4822E-21	0.1000E+01	0.8000E+00	0.2500E+01
10	0.1016E+02	0.8946E+02	0.7667E+00	0.1499E+02	0.1000E+01	0.2400E-03	0.0000E+00	0.1000E+01	0.9000E+00	0.2500E+01
11	0.1016E+02	0.8946E+02	0.7667E+00	0.1499E+02	0.1000E+01	0.1975E-17	0.0000E+00	0.1000E+01	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 6

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1020E+02	0.8958E+02	0.7631E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1250E+01	0.0000E+00	0.2500E+01
2	0.1020E+02	0.8958E+02	0.7631E+00	0.1501E+02	0.1000E+01	0.4501E-03	0.0000E+00	0.1250E+01	0.1000E+00	0.2500E+01
3	0.1020E+02	0.8957E+02	0.7635E+00	0.1501E+02	0.1000E+01	0.9494E-03	-0.1930E-20	0.1250E+01	0.2000E+00	0.2500E+01
4	0.1020E+02	0.8956E+02	0.7641E+00	0.1501E+02	0.1000E+01	0.1303E-02	0.0000E+00	0.1250E+01	0.3000E+00	0.2500E+01
5	0.1019E+02	0.8954E+02	0.7650E+00	0.1501E+02	0.1000E+01	0.1514E-02	0.0000E+00	0.1250E+01	0.4000E+00	0.2500E+01
6	0.1018E+02	0.8952E+02	0.7660E+00	0.1501E+02	0.1000E+01	0.1553E-02	-0.1927E-20	0.1250E+01	0.5000E+00	0.2500E+01
7	0.1017E+02	0.8949E+02	0.7672E+00	0.1501E+02	0.1000E+01	0.1374E-02	-0.1925E-20	0.1250E+01	0.6000E+00	0.2500E+01
8	0.1016E+02	0.8947E+02	0.7685E+00	0.1502E+02	0.1000E+01	0.1013E-02	0.0000E+00	0.1250E+01	0.7000E+00	0.2500E+01
9	0.1015E+02	0.8945E+02	0.7697E+00	0.1503E+02	0.1000E+01	0.5421E-03	0.1922E-20	0.1250E+01	0.8000E+00	0.2500E+01
10	0.1015E+02	0.8943E+02	0.7705E+00	0.1503E+02	0.1000E+01	0.1368E-03	0.0000E+00	0.1250E+01	0.9000E+00	0.2500E+01
11	0.1015E+02	0.8943E+02	0.7705E+00	0.1503E+02	0.1000E+01	0.9836E 18	0.0000E+00	0.1250E+01	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 7

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z
1	0.1025E+02	0.8969E+02	0.7584E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1500E+01	0.0000E+00	0.2500E+01
2	0.1025E+02	0.8969E+02	0.7584E+00	0.1501E+02	0.1000E+01	0.1625E-02	0.0000E+00	0.1500E+01	0.1000E+00	0.2500E+01
3	0.1024E+02	0.8967E+02	0.7593E+00	0.1500E+02	0.1000E+01	0.3555E-02	-0.3868E-20	0.1500E+01	0.2000E+00	0.2500E+01
4	0.1023E+02	0.8964E+02	0.7606E+00	0.1500E+02	0.1000E+01	0.5101E-02	0.0000E+00	0.1500E+01	0.3000E+00	0.2500E+01
5	0.1021E+02	0.8959E+02	0.7625E+00	0.1500E+02	0.1000E+01	0.6526E-02	0.0000E+00	0.1500E+01	0.4000E+00	0.2500E+01
6	0.1018E+02	0.8952E+02	0.7648E+00	0.1499E+02	0.1000E+01	0.7499E 02	-0.3860E-20	0.1500E+01	0.5000E+00	0.2500E+01
7	0.1015E+02	0.8945E+02	0.7672E+00	0.1499E+02	0.1000E+01	0.8029E-02	-0.3857E-20	0.1500E+01	0.6000E+00	0.2500E+01
8	0.1012E+02	0.8936E+02	0.7700E+00	0.1497E+02	0.1000E+01	0.7861E-02	0.0000E+00	0.1500E+01	0.7000E+00	0.2500E+01
9	0.1009E+02	0.8930E+02	0.7716E+00	0.1496E+02	0.1000E+01	0.6975E 02	0.7711E-20	0.1500E+01	0.8000E+00	0.2500E+01
10	0.1004E+02	0.8918E+02	0.7743E+00	0.1493E+02	0.1000E+01	0.4514E-02	0.0000E+00	0.1500E+01	0.9000E+00	0.2500E+01
11	0.1004E+02	0.8918E+02	0.7743E+00	0.1493E+02	0.1000E+01	0.6320E-16	0.0000E+00	0.1500E+01	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 8

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1037E+02	0.9000E+02	0.7458E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.1750E+01	0.0000E+00	0.2500E+01
2	0.1037E+02	0.9000E+02	0.7458E+00	0.1500E+02	0.1000E+01	0.3523E-02	0.0000E+00	0.1750E+01	0.1000E+00	0.2500E+01
3	0.1036E+02	0.8995E+02	0.7473E+00	0.1500E+02	0.1000E+01	0.7612E-02	-0.3893E-20	0.1750E+01	0.2000E+00	0.2500E+01
4	0.1033E+02	0.8989E+02	0.7502E+00	0.1500E+02	0.9999E+00	0.1060E-01	0.0000E+00	0.1750E+01	0.3000E+00	0.2500E+01
5	030E+02	0.8981E+02	0.7537E+00	0.1501E+02	0.9999E+00	.1381E-01	0.0000E+00	0.1750E+01	0.4000E+00	0.2500E
6	024E+02	0.8968E+02	0.7596E+00	0.1502E+02	0.9999E+0	.1531E-01	-0.3865E-20	0.1750E+01	0.5000E+00	0.2500E

Listing B-6. Continued

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
7	020E+02	0.8956E+02	0.7651E+00	0.1503E+02	0.9999E+0	.1644E-01	-0.3852E-20	0.1750E+01	0.6000E+00	0.2500E
8	011E+02	0.8933E+02	0.7755E+00	0.1504E+02	0.9999E+0	.1422E-01	0.0000E+00	0.1750E+01	0.7000E+00	0.2500E
9	0.1006E+02	0.8920E+02	0.7825E+00	0.1507E+02	0.9999E+00	0.1302E-01	0.7621E-20	0.1750E+01	0.8000E+00	0.2500E+01
10	0.9881E+01	0.8875E+02	0.8039E+00	0.1512E+02	0.1000E+01	0.1594E-02	0.0000E+00	0.1750E+01	0.9000E+00	0.2500E+01
11	0.9881E+01	0.8875E+02	0.8039E+00	0.1512E+02	0.1000E+01	0.1543E-16	0.0000E+00	0.1750E+01	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 9

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1061E+02	0.9057E+02	0.7225E+00	0.1502E+02	0.1000E+01	0.6265E-16	0.0000E+00	0.2000E+01	0.0000E+00	0.2500E+01
2	0.1061E+02	0.9057E+02	0.7225E+00	0.1502E+02	0.1000E+01	0.7299E-02	0.0000E+00	0.2000E+01	0.1000E+00	0.2500E+01
3	0.1059E+02	0.9051E+02	0.7249E+00	0.1502E+02	0.9999E+00	0.1720E-01	0.0000E+00	0.2000E+01	0.2000E+00	0.2500E+01
4	0.1054E+02	0.9039E+02	0.7300E+00	0.1502E+02	0.9997E+00	0.2456E-01	0.0000E+00	0.2000E+01	0.3000E+00	0.2500E+01
5	0.1049E+02	0.9028E+02	0.7360E+00	0.1504E+02	0.9994E+00	0.3516E-01	0.0000E+00	0.2000E+01	0.4000E+00	0.2500E+01
6	0.1038E+02	0.8998E+02	0.7472E+00	0.1503E+02	0.9992E+00	0.4118E-01	0.0000E+00	0.2000E+01	0.5000E+00	0.2500E+01
7	0.1032E+02	0.8981E+02	0.7573E+00	0.1509E+02	0.9985E+00	0.5516E-01	0.0000E+00	0.2000E+01	0.6000E+00	0.2500E+01
8	0.1008E+02	0.8919E+02	0.7783E+00	0.1504E+02	0.9983E+00	0.5743E-01	0.0000E+00	0.2000E+01	0.7000E+00	0.2500E+01
9	0.1003E+02	0.8902E+02	0.7954E+00	0.1521E+02	0.9987E+00	0.8121E-01	0.0000E+00	0.2000E+01	0.8000E+00	0.2500E+01
10	0.9534E+01	0.8773E+02	0.8325E+00	0.1502E+02	0.9973E+00	0.7300E-01	-0.7269E-20	0.2000E+01	0.9000E+00	0.2500E+01
11	0.9534E+01	0.8773E+02	0.8314E+00	0.1500E+02	0.9923E+00	0.1240E+00	-0.7279E-20	0.2000E+01	0.1000E+01	0.2500E+01

VARIABLES AT L, J = 21, 10

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1098E+02	0.9149E+02	0.6810E+00	0.1498E+02	0.1000E+01	0.0000E+00	-0.3823E-20	0.2250E+01	0.0000E+00	0.2500E+01
2	0.1098E+02	0.9149E+02	0.6811E+00	0.1498E+02	0.9999E+00	0.1379E-01	-0.3822E-20	0.2250E+01	0.1062E+00	0.2500E+01
3	0.1096E+02	0.9144E+02	0.6830E+00	0.1498E+02	0.9995E+00	0.3268E-01	-0.3818E-20	0.2250E+01	0.2125E+00	0.2500E+01
4	0.1091E+02	0.9132E+02	0.6871E+00	0.1496E+02	0.9989E+00	0.4722E-01	0.0000E+00	0.2250E+01	0.3187E+00	0.2500E+01
5	0.1088E+02	0.9124E+02	0.6918E+00	0.1498E+02	0.9976E+00	0.6869E-01	-0.7590E-20	0.2250E+01	0.4250E+00	0.2500E+01
6	0.1076E+02	0.9097E+02	0.6995E+00	0.1492E+02	0.9965E+00	0.8346E-01	0.0000E+00	0.2250E+01	0.5312E+00	0.2500E+01
7	0.1073E+02	0.9089E+02	0.7070E+00	0.1497E+02	0.9937E+00	0.1117E+00	0.7517E-20	0.2250E+01	0.6375E+00	0.2500E+01
8	0.1052E+02	0.9039E+02	0.7189E+00	0.1484E+02	0.9921E+00	0.1254E+00	0.0000E+00	0.2250E+01	0.7437E+00	0.2500E+01
9	0.1050E+02	0.9039E+02	0.7309E+00	0.1498E+02	0.9861E+00	0.1661E+00	0.0000E+00	0.2250E+01	0.8500E+00	0.2500E+01
10	0.1016E+02	0.8965E+02	0.7352E+00	0.1455E+02	0.9841E+00	0.1776E+00	-0.3790E-20	0.2250E+01	0.9562E+00	0.2500E+01
11	0.1016E+02	0.8965E+02	0.7336E+00	0.1453E+02	0.9701E+00	0.2425E+00	-0.3798E-20	0.2250E+01	0.1062E+01	0.2500E+01

VARIABLES AT L, J = 21, 11

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1151E+02	0.9273E+02	0.6254E+00	0.1498E+02	0.1000E+01	0.2476E-15	0.0000E+00	0.2500E+01	0.0000E+00	0.2500E+01
2	0.1151E+02	0.9273E+02	0.6255E+00	0.1498E+02	0.9998E+00	0.1879E-01	0.0000E+00	0.2500E+01	0.1125E+00	0.2500E+01
3	0.1150E+02	0.9271E+02	0.6260E+00	0.1497E+02	0.9991E+00	0.4225E-01	0.0000E+00	0.2500E+01	0.2250E+00	0.2500E+01
4	0.1148E+02	0.9268E+02	0.6269E+00	0.1496E+02	0.9981E+00	0.6169E-01	0.0000E+00	0.2500E+01	0.3375E+00	0.2500E+01
5	0.1148E+02	0.9267E+02	0.6284E+00	0.1497E+02	0.9962E+00	0.8679E-01	0.0000E+00	0.2500E+01	0.4500E+00	0.2500E+01
6	0.1144E+02	0.9261E+02	0.6289E+00	0.1494E+02	0.9942E+00	0.1073E+00	0.0000E+00	0.2500E+01	0.5625E+00	0.2500E+01
7	0.1145E+02	0.9263E+02	0.6312E+00	0.1497E+02	0.9908E+00	0.1352E+00	0.0000E+00	0.2500E+01	0.6750E+00	0.2500E+01
8	0.1143E+02	0.9260E+02	0.6297E+00	0.1493E+02	0.9876E+00	0.1571E+00	0.0000E+00	0.2500E+01	0.7875E+00	0.2500E+01
9	0.1144E+02	0.9269E+02	0.6316E+00	0.1497E+02	0.9825E+00	0.1864E+00	-0.7522E-20	0.2500E+01	0.9000E+00	0.2500E+01
10	0.1149E+02	0.9289E+02	0.6107E+00	0.1478E+02	0.9765E+00	0.2156E+00	-0.7754E-20	0.2500E+01	0.1012E+01	0.2500E+01
11	0.1149E+02	0.9289E+02	0.6105E+00	0.1478E+02	0.9701E+00	0.2425E+00	-0.7757E-20	0.2500E+01	0.1125E+01	0.2500E+01

VARIABLES AT L, J = 21, 12

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1199E+02	0.9382E+02	0.5746E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.2750E+01	0.0000E+00	0.2500E+01
2	0.1199E+02	0.9382E+02	0.5748E+00	0.1499E+02	0.9998E+00	0.2165E-01	0.0000E+00	0.2750E+01	0.1187E+00	0.2500E+01
3	0.1199E+02	0.9382E+02	0.5745E+00	0.1499E+02	0.9989E+00	0.4587E-01	0.0000E+00	0.2750E+01	0.2375E+00	0.2500E+01
4	0.1199E+02	0.9383E+02	0.5738E+00	0.1499E+02	0.9977E+00	0.6793E-01	-0.3767E-20	0.2750E+01	0.3562E+00	0.2500E+01
5	0.1199E+02	0.9385E+02	0.5736E+00	0.1499E+02	0.9957E+00	0.9277E-01	0.0000E+00	0.2750E+01	0.4750E+00	0.2500E+01
6	0.1200E+02	0.9387E+02	0.5716E+00	0.1498E+02	0.9932E+00	0.1161E+00	0.0000E+00	0.2750E+01	0.5937E+00	0.2500E+01
7	0.1202E+02	0.9391E+02	0.5716E+00	0.1500E+02	0.9900E+00	0.1412E+00	-0.3774E-20	0.2750E+01	0.7125E+00	0.2500E+01
8	0.1205E+02	0.9400E+02	0.5677E+00	0.1499E+02	0.9861E+00	0.1664E+00	0.0000E+00	0.2750E+01	0.8312E+00	0.2500E+01

Listing B-6. Continued

9	0.1206E+02	0.9408E+02	0.5641E+00	0.1497E+02	0.9816E+00	0.1909E+00	0.7626E-20	0.2750E+01	0.9500E+00	0.2500E+01
10	0.1213E+02	0.9429E+02	0.5469E+00	0.1487E+02	0.9747E+00	0.2236E+00	-0.1566E-19	0.2750E+01	0.1069E+01	0.2500E+01
11	0.1213E+02	0.9429E+02	0.5468E+00	0.1487E+02	0.9701E+00	0.2425E+00	-0.1566E-19	0.2750E+01	0.1187E+01	0.2500E+01

VARIABLES AT L, J = 21, 13

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1235E+02	0.9462E+02	0.5337E+00	0.1499E+02	0.1000E+01	0.2458E-15	0.0000E+00	0.3000E+01	0.0000E+00	0.2500E+01
2	0.1235E+02	0.9462E+02	0.5339E+00	0.1499E+02	0.9997E+00	0.2345E-01	0.0000E+00	0.3000E+01	0.1250E+00	0.2500E+01
3	0.1235E+02	0.9462E+02	0.5334E+00	0.1499E+02	0.9989E+00	0.4774E-01	0.0000E+00	0.3000E+01	0.2500E+00	0.2500E+01
4	0.1238E+02	0.9464E+02	0.5324E+00	0.1499E+02	0.9974E+00	0.7140E-01	-0.9394E 21	0.3000E+01	0.3750E+00	0.2500E+01
5	0.1236E+02	0.9466E+02	0.5316E+00	0.1499E+02	0.9954E+00	0.9593E-01	-0.7524E-20	0.3000E+01	0.5000E+00	0.2500E+01
6	0.1238E+02	0.9469E+02	0.5296E+00	0.1498E+02	0.9927E+00	0.1208E+00	0.0000E+00	0.3000E+01	0.6250E+00	0.2500E+01
7	0.1239E+02	0.9472E+02	0.5289E+00	0.1499E+02	0.9895E+00	0.1446E+00	0.0000E+00	0.3000E+01	0.7500E+00	0.2500E+01
8	0.1242E+02	0.9481E+02	0.5253E+00	0.1499E+02	0.9853E+00	0.1707E+00	-0.7586E-20	0.3000E+01	0.8750E+00	0.2500E+01
9	0.1242E+02	0.9487E+02	0.5192E+00	0.1493E+02	0.9809E+00	0.1943E+00	0.0000E+00	0.3000E+01	0.1000E+01	0.2500E+01
10	0.1248E+02	0.9503E+02	0.5069E+00	0.1487E+02	0.9742E+00	0.2255E+00	0.0000E+00	0.3000E+01	0.1125E+01	0.2500E+01
11	0.1248E+02	0.9503E+02	0.5068E+00	0.1487E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.3000E+01	0.1250E+01	0.2500E+01

VARIABLES AT L, J = 21, 14

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1265E+02	0.9526E+02	0.4989E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.5991E-19	0.3250E+01	0.0000E+00	0.2500E+01
2	0.1265E+02	0.9526E+02	0.4990E+00	0.1499E+02	0.9997E+00	0.2451E-01	0.5989E-19	0.3250E+01	0.1312E+00	0.2500E+01
3	0.1265E+02	0.9527E+02	0.4984E+00	0.1499E+02	0.9988E+00	0.4881E-01	0.0000E+00	0.3250E+01	0.2625E+00	0.2500E+01
4	0.1266E+02	0.9529E+02	0.4973E+00	0.1489E+02	0.9973E+00	0.7332E-01	0.0000E+00	0.3250E+01	0.3937E+00	0.2500E+01
5	0.1266E+02	0.9531E+02	0.4961E+00	0.1498E+02	0.9952E+00	0.9765E-01	0.0000E+00	0.3250E+01	0.5250E+00	0.2500E+01
6	0.1268E+02	0.9535E+02	0.4943E+00	0.1499E+02	0.9924E+00	0.1228E+00	0.0000E+00	0.3250E+01	0.6562E+00	0.2500E+01
7	0.1269E+02	0.9537E+02	0.4930E+00	0.1498E+02	0.9893E+00	0.1462E+00	0.0000E+00	0.3250E+01	0.7875E+00	0.2500E+01
8	0.1272E+02	0.9547E+02	0.4891E+00	0.1498E+02	0.9850E+00	0.1725E+00	-0.1520E-19	0.3250E+01	0.9187E+00	0.2500E+01
9	0.1273E+02	0.9552E+02	0.4817E+00	0.1492E+02	0.9807E+00	0.1957E+00	0.3857E-20	0.3250E+01	0.1050E+01	0.2500E+01
10	0.1278E+02	0.9568E+02	0.4720E+00	0.1489E+02	0.9743E+00	0.2253E+00	0.0000E+00	0.3250E+01	0.1181E+01	0.2500E+01
11	0.1278E+02	0.9568E+02	0.4720E+00	0.1489E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.3250E+01	0.1312E+01	0.2500E+01

VARIABLES AT L, J = 21, 15

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1290E+02	0.9580E+02	0.4686E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.3500E+01	0.0000E+00	0.2500E+01
2	0.1290E+02	0.9580E+02	0.4688E+00	0.1499E+02	0.9997E+00	0.2500E-01	0.0000E+00	0.3500E+01	0.1375E+00	0.2500E+01
3	0.1290E+02	0.9581E+02	0.4681E+00	0.1499E+02	0.9988E+00	0.4924E-01	0.0000E+00	0.3500E+01	0.2750E+00	0.2500E+01
4	0.1291E+02	0.9583E+02	0.4669E+00	0.1499E+02	0.9972E+00	0.7412E-01	0.0000E+00	0.3500E+01	0.4125E+00	0.2500E+01
5	0.1292E+02	0.9584E+02	0.4656E+00	0.1498E+02	0.9952E+00	0.9824E-01	-0.3009E 19	0.3500E+01	0.5500E+00	0.2500E+01
6	0.1293E+02	0.9588E+02	0.4639E+00	0.1499E+02	0.9924E+00	0.1234E+00	0.0000E+00	0.3500E+01	0.6875E+00	0.2500E+01
7	0.1294E+02	0.9591E+02	0.4623E+00	0.1499E+02	0.9892E+00	0.1466E+00	-0.3025E-19	0.3500E+01	0.8250E+00	0.2500E+01
8	0.1297E+02	0.9600E+02	0.4580E+00	0.1498E+02	0.9849E+00	0.1729E+00	-0.3047E-19	0.3500E+01	0.9625E+00	0.2500E+01
9	0.1298E+02	0.9606E+02	0.4504E+00	0.1492E+02	0.9806E+00	0.1980E+00	-0.3098E-19	0.3500E+01	0.1100E+01	0.2500E+01
10	0.1303E+02	0.9620E+02	0.4428E+00	0.1491E+02	0.9745E+00	0.2243E+00	0.0000E+00	0.3500E+01	0.1237E+01	0.2500E+01
11	0.1303E+02	0.9620E+02	0.4427E+00	0.1491E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.3500E+01	0.1375E+01	0.2500E+01

VARIABLES AT L, J = 21, 16

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1310E+02	0.9624E+02	0.4423E+00	0.1499E+02	0.1000E+01	0.0000E+00	-0.2393E 18	0.3750E+01	0.0000E+00	0.2500E+01
2	0.1310E+02	0.9624E+02	0.4425E+00	0.1499E+02	0.9997E+00	0.2514E-01	-0.2393E-18	0.3750E+01	0.1437E+00	0.2500E+01
3	0.1311E+02	0.9625E+02	0.4410E+00	0.1499E+02	0.9988E+00	0.4929E-01	-0.1198E-18	0.3750E+01	0.2875E+00	0.2500E+01
4	0.1312E+02	0.9626E+02	0.4407E+00	0.1499E+02	0.9972E+00	0.7427E-01	-0.1200E 18	0.3750E+01	0.4312E+00	0.2500E+01
5	0.1312E+02	0.9628E+02	0.4394E+00	0.1498E+02	0.9952E+00	0.9827E-01	-0.1504E-19	0.3750E+01	0.5750E+00	0.2500E+01
6	0.1314E+02	0.9632E+02	0.4379E+00	0.1499E+02	0.9924E+00	0.1234E+00	0.6030E 19	0.3750E+01	0.7187E+00	0.2500E+01
7	0.1315E+02	0.9634E+02	0.4359E+00	0.1498E+02	0.9892E+00	0.1466E+00	0.0000E+00	0.3750E+01	0.8625E+00	0.2500E+01
8	0.1318E+02	0.9643E+02	0.4314E+00	0.1498E+02	0.9850E+00	0.1728E+00	0.0000E+00	0.3750E+01	0.1006E+01	0.2500E+01
9	718E+02	0.9648E+02	0.4239E+00	0.1492E+02	0.9806E+0C	1960E+00	-0.1942E-20	0.2750E+01	0.1150E+01	0.2500E+
10	123E+02	0.9661E+02	0.4177E+00	0.1491E+02	0.9748E+0C	2233E+00	0.1572E-19	0.3750E+01	0.1294E+01	0.2500E+

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11	0.1323E+02	0.9661E+02	0.4176E+00	0.1491E+02	0.9701E+00	0.2425E+00	0.1573E-19	0.3750E+01	0.1437E+01	0.2500E

VARIABLES AT L, J = 21, 17

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z
1	0.1328E+02	0.9660E+02	0.4194E+00	0.1499E+02	0.1000E+01	-0.4898E-15	0.0000E+00	0.4000E+01	0.0000E+00	0.2500E+01
2	0.1328E+02	0.9660E+02	0.4195E+00	0.1499E+02	0.9997E+00	0.2503E-01	0.0000E+00	0.4000E+01	0.1500E+00	0.2500E+01
3	0.1329E+02	0.9661E+02	0.4189E+00	0.1499E+02	0.9988E+00	0.4901E-01	0.0000E+00	0.4000E+01	0.3000E+00	0.2500E+01
4	0.1329E+02	0.9663E+02	0.4178E+00	0.1499E+02	0.9973E+00	0.7388E-01	0.0000E+00	0.4000E+01	0.4500E+00	0.2500E+01
5	0.1330E+02	0.9665E+02	0.4164E+00	0.1499E+02	0.9952E+00	0.9780E-01	0.0000E+00	0.4000E+01	0.6000E+00	0.2500E+01
6	0.1332E+02	0.9668E+02	0.4150E+00	0.1499E+02	0.9924E+00	0.1228E+00	0.0000E+00	0.4000E+01	0.7500E+00	0.2500E+01
7	0.1333E+02	0.9671E+02	0.4128E+00	0.1498E+02	0.9893E+00	0.1462E+00	0.0000E+00	0.4000E+01	0.9000E+00	0.2500E+01
8	0.1335E+02	0.9679E+02	0.4081E+00	0.1497E+02	0.9850E+00	0.1723E+00	0.0000E+00	0.4000E+01	0.1050E+01	0.2500E+01
9	0.1336E+02	0.9684E+02	0.4010E+00	0.1492E+02	0.9807E+00	0.1956E+00	0.0000E+00	0.4000E+01	0.1200E+01	0.2500E+01
10	0.1339E+02	0.9695E+02	0.3957E+00	0.1492E+02	0.9750E+00	0.2223E+00	0.0000E+00	0.4000E+01	0.1350E+01	0.2500E+01
11	0.1339E+02	0.9695E+02	0.3956E+00	0.1492E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.4000E+01	0.1500E+01	0.2500E+01

VARIABLES AT L, J = 21, 18

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1343E+02	0.9691E+02	0.3991E+00	0.1499E+02	0.1000E+01	-0.4893E-15	0.0000E+00	0.4250E+01	0.0000E+00	0.2500E+01
2	0.1343E+02	0.9691E+02	0.3992E+00	0.1499E+02	0.9997E+00	0.2488E-01	0.0000E+00	0.4250E+01	0.1562E+00	0.2500E+01
3	0.1344E+02	0.9692E+02	0.3987E+00	0.1499E+02	0.9988E+00	0.4858E-01	0.0000E+00	0.4250E+01	0.3125E+00	0.2500E+01
4	0.1344E+02	0.9694E+02	0.3975E+00	0.1499E+02	0.9973E+00	0.7322E-01	0.0000E+00	0.4250E+01	0.4687E+00	0.2500E+01
5	0.1345E+02	0.9695E+02	0.3960E+00	0.1498E+02	0.9953E+00	0.9698E-01	0.0000E+00	0.4250E+01	0.6250E+00	0.2500E+01
6	0.1346E+02	0.9699E+02	0.3945E+00	0.1499E+02	0.9926E+00	0.1218E+00	0.0000E+00	0.4250E+01	0.7812E+00	0.2500E+01
7	0.1347E+02	0.9702E+02	0.3921E+00	0.1498E+02	0.9894E+00	0.1453E+00	0.3032E-19	0.4250E+01	0.9375E+00	0.2500E+01
8	0.1350E+02	0.9710E+02	0.3872E+00	0.1497E+02	0.9852E+00	0.1714E+00	0.0000E+00	0.4250E+01	0.1094E+01	0.2500E+01
9	0.1350E+02	0.9714E+02	0.3805E+00	0.1492E+02	0.9808E+00	0.1949E+00	0.2495E-18	0.4250E+01	0.1250E+01	0.2500E+01
10	0.1354E+02	0.9724E+02	0.3758E+00	0.1493E+02	0.9752E+00	0.2215E+00	0.1261E-18	0.4250E+01	0.1406E+01	0.2500E+01
11	0.1354E+02	0.9725E+02	0.3757E+00	0.1492E+02	0.9701E+00	0.2425E+00	0.6305E-19	0.4250E+01	0.1562E+01	0.2500E+01

VARIABLES AT L, J = 21, 19

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1356E+02	0.9718E+02	0.3812E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.4500E+01	0.0000E+00	0.2500E+01
2	0.1356E+02	0.9718E+02	0.3813E+00	0.1499E+02	0.9997E+00	0.2464E-01	0.0000E+00	0.4500E+01	0.1625E+00	0.2500E+01
3	0.1357E+02	0.9719E+02	0.3808E+00	0.1499E+02	0.9988E+00	0.4798E-01	0.4775E-18	0.4500E+01	0.3250E+00	0.2500E+01
4	0.1357E+02	0.9720E+02	0.3795E+00	0.1499E+02	0.9974E+00	0.7228E-01	0.0000E+00	0.4500E+01	0.4875E+00	0.2500E+01
5	0.1358E+02	0.9722E+02	0.3780E+00	0.1499E+02	0.9954E+00	0.9561E-01	0.0000E+00	0.4500E+01	0.6500E+00	0.2500E+01
6	0.1359E+02	0.9725E+02	0.3764E+00	0.1499E+02	0.9928E+00	0.1200E+00	0.0000E+00	0.4500E+01	0.8125E+00	0.2500E+01
7	0.1360E+02	0.9728E+02	0.3737E+00	0.1498E+02	0.9897E+00	0.1433E+00	0.0000E+00	0.4500E+01	0.9750E+00	0.2500E+01
8	0.1363E+02	0.9736E+02	0.3685E+00	0.1497E+02	0.9856E+00	0.1693E+00	0.0000E+00	0.4500E+01	0.1137E+01	0.2500E+01
9	0.1363E+02	0.9741E+02	0.3621E+00	0.1493E+02	0.9811E+00	0.1933E+00	-0.2501E-18	0.4500E+01	0.1300E+01	0.2500E+01
10	0.1367E+02	0.9750E+02	0.3578E+00	0.1493E+02	0.9754E+00	0.2206E+00	0.0000E+00	0.4500E+01	0.1462E+01	0.2500E+01
11	0.1367E+02	0.9750E+02	0.3577E+00	0.1493E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.4500E+01	0.1625E+01	0.2500E+01

VARIABLES AT L, J = 21, 20

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1367E+02	0.9740E+02	0.3651E+00	0.1499E+02	0.1000E+01	-0.4879E-15	-0.2382E-18	0.4750E+01	0.0000E+00	0.2500E+01
2	0.1367E+02	0.9741E+02	0.3652E+00	0.1499E+02	0.9997E+00	0.2411E-01	0.2381E-18	0.4750E+01	0.1687E+00	0.2500E+01
3	0.1368E+02	0.9741E+02	0.3648E+00	0.1499E+02	0.9989E+00	0.4738E-01	0.0000E+00	0.4750E+01	0.3375E+00	0.2500E+01
4	0.1368E+02	0.9743E+02	0.3635E+00	0.1499E+02	0.9974E+00	0.7141E-01	0.0000E+00	0.4750E+01	0.5062E+00	0.2500E+01
5	0.1369E+02	0.9744E+02	0.3620E+00	0.1499E+02	0.9956E+00	0.9422E-01	0.0000E+00	0.4750E+01	0.6750E+00	0.2500E+01
6	0.1370E+02	0.9748E+02	0.3602E+00	0.1499E+02	0.9930E+00	0.1179E+00	0.0000E+00	0.4750E+01	0.8437E+00	0.2500E+01
7	0.1371E+02	0.9751E+02	0.3569E+00	0.1498E+02	0.9900E+00	0.1408E+00	0.0000E+00	0.4750E+01	0.1012E+01	0.2500E+01
8	0.1374E+02	0.9759E+02	0.3512E+00	0.1496E+02	0.9860E+00	0.1668E+00	0.0000E+00	0.4750E+01	0.1181E+01	0.2500E+01
9	0.1374E+02	0.9763E+02	0.3447E+00	0.1492E+02	0.9816E+00	0.1912E+00	0.0000E+00	0.4750E+01	0.1350E+01	0.2500E+01
10	0.1378E+02	0.9772E+02	0.3405E+00	0.1493E+02	0.9756E+00	0.2194E+00	0.0000E+00	0.4750E+01	0.1519E+01	0.2500E+01
11	0.1378E+02	0.9772E+02	0.3404E+00	0.1493E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.4750E+01	0.1687E+01	0.2500E+01

Listing B-6. Continued

VARIABLES AT L, J = 21, 21

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1376E+02	0.9759E+02	0.3506E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.5000E+01	0.0000E+00	0.2500E+01
2	0.1378E+02	0.9759E+02	0.3507E+00	0.1499E+02	0.9997E+00	0.2283E-01	0.0000E+00	0.5000E+01	0.1750E+00	0.2500E+01
3	0.1377E+02	0.9760E+02	0.3502E+00	0.1499E+02	0.9989E+00	0.4604E-01	0.0000E+00	0.5000E+01	0.3500E+00	0.2500E+01
4	0.1378E+02	0.9762E+02	0.3491E+00	0.1499E+02	0.9976E+00	0.6955E-01	0.0000E+00	0.5000E+01	0.5250E+00	0.2500E+01
5	0.1379E+02	0.9764E+02	0.3479E+00	0.1499E+02	0.9958E+00	0.9165E-01	0.0000E+00	0.5000E+01	0.7000E+00	0.2500E+01
6	0.1381E+02	0.9768E+02	0.3459E+00	0.1500E+02	0.9934E+00	0.1147E+00	0.0000E+00	0.5000E+01	0.8750E+00	0.2500E+01
7	0.1382E+02	0.9772E+02	0.3422E+00	0.1498E+02	0.9906E+00	0.1371E+00	0.0000E+00	0.5000E+01	0.1050E+01	0.2500E+01
8	0.1384E+02	0.9780E+02	0.3358E+00	0.1497E+02	0.9866E+00	0.1630E+00	0.9886E-18	0.5000E+01	0.1225E+01	0.2500E+01
9	0.1385E+02	0.9785E+02	0.3250E+00	0.1493E+02	0.9823E+00	0.1876E+00	0.0000E+00	0.5000E+01	0.1400E+01	0.2500E+01
10	0.1389E+02	0.9794E+02	0.3246E+00	0.1494E+02	0.9762E+00	0.2167E+00	0.0000E+00	0.5000E+01	0.1575E+01	0.2500E+01
11	0.1389E+02	0.9794E+02	0.3245E+00	0.1494E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.5000E+01	0.1750E+01	0.2500E+01

VARIABLES AT L, J = 21, 22

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1384E+02	0.9775E+02	0.3378E+00	0.1498E+02	0.1000E+01	-0.4858E-15	0.0000E+00	0.5250E+01	0.0000E+00	0.2500E+01
2	0.1384E+02	0.9775E+02	0.3379E+00	0.1498E+02	0.9998E+00	0.2127E-01	0.0000E+00	0.5250E+01	0.1812E+00	0.2500E+01
3	0.1385E+02	0.9776E+02	0.3371E+00	0.1498E+02	0.9990E+00	0.4368E-01	-0.4753E-18	0.5250E+01	0.3625E+00	0.2500E+01
4	0.1386E+02	0.9778E+02	0.3363E+00	0.1499E+02	0.9978E+00	0.6605E-01	0.0000E+00	0.5250E+01	0.5437E+00	0.2500E+01
5	0.1387E+02	0.9781E+02	0.3352E+00	0.1499E+02	0.9962E+00	0.8731E-01	0.0000E+00	0.5250E+01	0.7250E+00	0.2500E+01
6	0.1389E+02	0.9785E+02	0.3328E+00	0.1500E+02	0.9939E+00	0.1101E+00	0.0000E+00	0.5250E+01	0.9062E+00	0.2500E+01
7	0.1390E+02	0.9790E+02	0.3284E+00	0.1498E+02	0.9912E+00	0.1326E+00	0.0000E+00	0.5250E+01	0.1087E+01	0.2500E+01
8	0.1393E+02	0.9799E+02	0.3211E+00	0.1496E+02	0.9873E+00	0.1590E+00	0.0000E+00	0.5250E+01	0.1269E+01	0.2500E+01
9	0.1394E+02	0.9803E+02	0.3139E+00	0.1493E+02	0.9830E+00	0.1837E+00	0.0000E+00	0.5250E+01	0.1450E+01	0.2500E+01
10	0.1398E+02	0.9813E+02	0.3083E+00	0.1493E+02	0.9770E+00	0.2133E+00	0.0000E+00	0.5250E+01	0.1631E+01	0.2500E+01
11	0.1398E+02	0.9813E+02	0.3082E+00	0.1493E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.5250E+01	0.1812E+01	0.2500E+01

VARIABLES AT L, J = 21, 23

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1391E+02	0.9788E+02	0.3271E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.5500E+01	0.0000E+00	0.2500E+01
2	0.1391E+02	0.9788E+02	0.3271E+00	0.1497E+02	0.9998E+00	0.1988E-01	0.0000E+00	0.5500E+01	0.1875E+00	0.2500E+01
3	0.1391E+02	0.9790E+02	0.3260E+00	0.1498E+02	0.9992E+00	0.3916E-01	0.0000E+00	0.5500E+01	0.3750E+00	0.2500E+01
4	0.1393E+02	0.9792E+02	0.3252E+00	0.1499E+02	0.9983E+00	0.5893E-01	0.0000E+00	0.5500E+01	0.5625E+00	0.2500E+01
5	0.1394E+02	0.9795E+02	0.3238E+00	0.1499E+02	0.9970E+00	0.7797E-01	0.0000E+00	0.5500E+01	0.7500E+00	0.2500E+01
6	0.1397E+02	0.9801E+02	0.3207E+00	0.1500E+02	0.9950E+00	0.9977E-01	0.0000E+00	0.5500E+01	0.9375E+00	0.2500E+01
7	0.1399E+02	0.9806E+02	0.3154E+00	0.1499E+02	0.9926E+00	0.1213E+00	0.0000E+00	0.5500E+01	0.1125E+01	0.2500E+01
8	0.1403E+02	0.9817E+02	0.3075E+00	0.1498E+02	0.9890E+00	0.1479E+00	0.0000E+00	0.5500E+01	0.1312E+01	0.2500E+01
9	0.1404E+02	0.9823E+02	0.3003E+00	0.1495E+02	0.9850E+00	0.1725E+00	0.0000E+00	0.5500E+01	0.1500E+01	0.2500E+01
10	0.1410E+02	0.9836E+02	0.2934E+00	0.1497E+02	0.9784E+00	0.2069E+00	0.0000E+00	0.5500E+01	0.1687E+01	0.2500E+01
11	0.1410E+02	0.9836E+02	0.2932E+00	0.1497E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.5500E+01	0.1875E+01	0.2500E+01

VARIABLES AT L, J = 21, 24

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1396E+02	0.9800E+02	0.3189E+00	0.1498E+02	0.1000E+01	-0.2388E-15	0.7463E-17	0.5750E+01	0.0000E+00	0.2500E+01
2	0.1396E+02	0.9800E+02	0.3188E+00	0.1498E+02	0.9998E+00	0.1892E-01	0.7487E-17	0.5750E+01	0.1937E+00	0.2500E+01
3	0.1397E+02	0.9802E+02	0.3178E+00	0.1499E+02	0.9994E+00	0.3362E-01	0.0000E+00	0.5750E+01	0.3875E+00	0.2500E+01
4	0.1399E+02	0.9804E+02	0.3166E+00	0.1499E+02	0.9987E+00	0.5024E-01	0.3754E-17	0.5750E+01	0.5812E+00	0.2500E+01
5	0.1400E+02	0.9807E+02	0.3142E+00	0.1499E+02	0.9978E+00	0.6637E-01	0.9449E-18	0.5750E+01	0.7750E+00	0.2500E+01
6	0.1403E+02	0.9813E+02	0.3097E+00	0.1499E+02	0.9962E+00	0.8657E-01	-0.3828E-17	0.5750E+01	0.9687E+00	0.2500E+01
7	0.1404E+02	0.9818E+02	0.3031E+00	0.1497E+02	0.9943E+00	0.1064E+00	-0.7816E-17	0.5750E+01	0.1162E+01	0.2500E+01
8	0.1409E+02	0.9830E+02	0.2936E+00	0.1496E+02	0.9910E+00	0.1338E+00	0.0000E+00	0.5750E+01	0.1356E+01	0.2500E+01
9	0.1410E+02	0.9835E+02	0.2843E+00	0.1491E+02	0.9871E+00	0.1599E+00	-0.8306E-17	0.5750E+01	0.1550E+01	0.2500E+01
10	0.1417E+02	0.9852E+02	0.2733E+00	0.1493E+02	0.9788E+00	0.2049E+00	0.0000E+00	0.5750E+01	0.1744E+01	0.2500E+01
11	0.1417E+02	0.9852E+02	0.2731E+00	0.1493E+02	0.9701E+00	0.2425E+00	0.0000E+00	0.5750E+01	0.1937E+01	0.2500E+01

VARIABLES AT L, J = 21, 25

Listing B-6. Continued

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W COSINE	X	Y	Z
1	0.1402E+02	0.9810E+02	0.3125E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.7472E-17	0.6000E+01	0.0000E+00	0.2500E+01
2	0.1402E+02	0.9810E+02	0.3124E+00	0.1500E+02	0.9999E+00	0.1695E-01	0.7476E-17	0.6000E+01	0.2000E+00	0.2500E+01
3	0.1403E+02	0.9812E+02	0.3118E+00	0.1501E+02	0.9996E+00	0.2714E-01	0.7483E-17	0.6000E+01	0.4000E+00	0.2500E+01
4	0.1404E+02	0.9814E+02	0.3100E+00	0.1500E+02	0.9992E+00	0.4030E-01	0.0000E+00	0.6000E+01	0.6000E+00	0.2500E+01
5	0.1405E+02	0.9816E+02	0.3063E+00	0.1499E+02	0.9986E+00	0.5231E-01	0.0000E+00	0.6000E+01	0.8000E+00	0.2500E+01
6	0.1408E+02	0.9823E+02	0.3005E+00	0.1498E+02	0.9977E+00	0.6810E-01	0.0000E+00	0.6000E+01	0.1000E+01	0.2500E+01
7	0.1409E+02	0.9828E+02	0.2922E+00	0.1495E+02	0.9967E+00	0.8128E-01	-0.3978E-17	0.6000E+01	0.1200E+01	0.2500E+01
8	0.1415E+02	0.9842E+02	0.2804E+00	0.1494E+02	0.9948E+00	0.1022E+00	0.0000E+00	0.6000E+01	0.1400E+01	0.2500E+01
9	0.1417E+02	0.9848E+02	0.2676E+00	0.1489E+02	0.9935E+00	0.1136E+00	0.0000E+00	0.6000E+01	0.1600E+01	0.2500E+01
10	0.1430E+02	0.9877E+02	0.2545E+00	0.1496E+02	0.9890E+00	0.1482E+00	0.0000E+00	0.6000E+01	0.1800E+01	0.2500E+01
11	0.1430E+02	0.9876E+02	0.2543E+00	0.1496E+02	0.9923E+00	0.1240E+00	0.0000E+00	0.6000E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 21, 26

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1406E+02	0.9818E+02	0.3074E+00	0.1501E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.6250E+01	0.0000E+00	0.2500E+01
2	0.1406E+02	0.9818E+02	0.3074E+00	0.1501E+02	0.9999E+00	0.1340E-01	0.0000E+00	0.6250E+01	0.2000E+00	0.2500E+01
3	0.1407E+02	0.9820E+02	0.3075E+00	0.1502E+02	0.9998E+00	0.2068E-01	-0.1863E-17	0.6250E+01	0.4000E+00	0.2500E+01
4	0.1407E+02	0.9821E+02	0.3053E+00	0.1501E+02	0.9995E+00	0.3114E-01	0.0000E+00	0.6250E+01	0.6000E+00	0.2500E+01
5	0.1408E+02	0.9824E+02	0.3015E+00	0.1500E+02	0.9992E+00	0.3950E-01	0.0000E+00	0.6250E+01	0.8000E+00	0.2500E+01
6	0.1411E+02	0.9829E+02	0.2959E+00	0.1499E+02	0.9987E+00	0.5004E-01	0.4828E-18	0.6250E+01	0.1000E+01	0.2500E+01
7	0.1412E+02	0.9834E+02	0.2877E+00	0.1496E+02	0.9985E+00	0.5556E-01	0.3968E-17	0.6250E+01	0.1200E+01	0.2500E+01
8	0.1418E+02	0.9847E+02	0.2770E+00	0.1495E+02	0.9978E+00	0.6578E-01	0.0000E+00	0.6250E+01	0.1400E+01	0.2500E+01
9	0.1419E+02	0.9852E+02	0.2648E+00	0.1490E+02	0.9982E+00	0.5919E-01	-0.1719E-16	0.6250E+01	0.1600E+01	0.2500E+01
10	0.1430E+02	0.9878E+02	0.2595E+00	0.1499E+02	0.9981E+00	0.6152E-01	0.0000E+00	0.6250E+01	0.1800E+01	0.2500E+01
11	0.1430E+02	0.9878E+02	0.2591E+00	0.1499E+02	0.1000E+01	0.5582E-15	0.0000E+00	0.6250E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 21, 27

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z
1	0.1408E+02	0.9822E+02	0.3030E+00	0.1500E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.6500E+01	0.0000E+00	0.2500E+01
2	0.1408E+02	0.9823E+02	0.3032E+00	0.1501E+02	0.1000E+01	0.9152E-02	0.0000E+00	0.6500E+01	0.2000E+00	0.2500E+01
3	0.1408E+02	0.9823E+02	0.3035E+00	0.1501E+02	0.9999E+00	0.1682E-01	-0.1509E-16	0.6500E+01	0.4000E+00	0.2500E+01
4	0.1409E+02	0.9825E+02	0.3015E+00	0.1501E+02	0.9997E+00	0.2629E-01	0.0000E+00	0.6500E+01	0.6000E+00	0.2500E+01
5	0.1410E+02	0.9826E+02	0.2984E+00	0.1500E+02	0.9994E+00	0.3344E-01	0.0000E+00	0.6500E+01	0.8000E+00	0.2500E+01
6	0.1411E+02	0.9830E+02	0.2939E+00	0.1499E+02	0.9992E+00	0.4082E-01	0.3887E-17	0.6500E+01	0.1000E+01	0.2500E+01
7	0.1412E+02	0.9834E+02	0.2872E+00	0.1496E+02	0.9991E+00	0.4344E-01	0.7951E-17	0.6500E+01	0.1200E+01	0.2500E+01
8	0.1415E+02	0.9842E+02	0.2790E+00	0.1494E+02	0.9989E+00	0.4703E-01	0.0000E+00	0.6500E+01	0.1400E+01	0.2500E+01
9	0.1416E+02	0.9846E+02	0.2705E+00	0.1490E+02	0.9993E+00	0.3817E-01	-0.3371E-16	0.6500E+01	0.1600E+01	0.2500E+01
10	0.1419E+02	0.9855E+02	0.2716E+00	0.1494E+02	0.9997E+00	0.2554E-01	0.0000E+00	0.6500E+01	0.1800E+01	0.2500E+01
11	0.1419E+02	0.9855E+02	0.2718E+00	0.1494E+02	0.1000E+01	0.2678E-15	0.0000E+00	0.6500E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 21, 28

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1409E+02	0.9825E+02	0.2986E+00	0.1499E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.6750E+01	0.0000E+00	0.2500E+01
2	0.1409E+02	0.9825E+02	0.2990E+00	0.1499E+02	0.1000E+01	0.5245E-02	0.0000E+00	0.6750E+01	0.2000E+00	0.2500E+01
3	0.1409E+02	0.9825E+02	0.2990E+00	0.1499E+02	0.9999E+00	0.1425E-01	-0.1530E-16	0.6750E+01	0.4000E+00	0.2500E+01
4	0.1410E+02	0.9827E+02	0.2976E+00	0.1499E+02	0.9997E+00	0.2252E-01	0.0000E+00	0.6750E+01	0.6000E+00	0.2500E+01
5	0.1411E+02	0.9828E+02	0.2956E+00	0.1499E+02	0.9996E+00	0.2852E-01	0.0000E+00	0.6750E+01	0.8000E+00	0.2500E+01
6	0.1413E+02	0.9833E+02	0.2925E+00	0.1499E+02	0.9995E+00	0.3307E-01	0.3902E-17	0.6750E+01	0.1000E+01	0.2500E+01
7	0.1414E+02	0.9837E+02	0.2874E+00	0.1497E+02	0.9994E+00	0.3365E-01	0.1588E-16	0.6750E+01	0.1200E+01	0.2500E+01
8	0.1416E+02	0.9845E+02	0.2811E+00	0.1496E+02	0.9995E+00	0.3256E-01	0.0000E+00	0.6750E+01	0.1400E+01	0.2500E+01
9	0.1418E+02	0.9850E+02	0.2754E+00	0.1494E+02	0.9997E+00	0.2287E-01	-0.3308E-16	0.6750E+01	0.1600E+01	0.2500E+01
10	0.1419E+02	0.9855E+02	0.2765E+00	0.1497E+02	0.1000E+01	0.7736E-02	0.0000E+00	0.6750E+01	0.1800E+01	0.2500E+01
11	0.1420E+02	0.9855E+02	0.2769E+00	0.1497E+02	0.1000E+01	0.6572E-16	0.0000E+00	0.6750E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 21, 29

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V COSINE	W-COSINE	X	Y	Z

Listing B-6. Concluded

1	0.1409E+02	0.9826E+02	0.2951E+00	0.1497E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7000E+01	0.0000E+00	0.2500E+01
2	0.1410E+02	0.9826E+02	0.2954E+00	0.1498E+02	0.1000E+01	0.3206E-02	0.0000E+00	0.7000E+01	0.2000E+00	0.2500E+01
3	0.1409E+02	0.9825E+02	0.2951E+00	0.1497E+02	0.9999E+00	0.1217E-01	-0.1550E-16	0.7000E+01	0.4000E+00	0.2500E+01
4	0.1411E+02	0.9827E+02	0.2946E+00	0.1498E+02	0.9998E+00	0.1854E-01	0.0000E+00	0.7000E+01	0.6000E+00	0.2500E+01
5	0.1411E+02	0.9829E+02	0.2938E+00	0.1498E+02	0.9997E+00	0.2314E-01	0.0000E+00	0.7000E+01	0.8000E+00	0.2500E+01
6	0.1413E+02	0.9833E+02	0.2921E+00	0.1499E+02	0.9997E+00	0.2581E-01	0.1954E-17	0.7000E+01	0.1000E+01	0.2500E+01
7	0.1414E+02	0.9837E+02	0.2884E+00	0.1498E+02	0.9997E+00	0.2576E-01	0.7909E-17	0.7000E+01	0.1200E+01	0.2500E+01
8	0.1416E+02	0.9843E+02	0.2841E+00	0.1497E+02	0.9997E+00	0.2304E-01	0.0000E+00	0.7000E+01	0.1400E+01	0.2500E+01
9	0.1417E+02	0.9848E+02	0.2807E+00	0.1496E+02	0.9999E+00	0.1521E-01	-0.1623E-16	0.7000E+01	0.1600E+01	0.2500E+01
10	0.1417E+02	0.9850E+02	0.2813E+00	0.1497E+02	0.1000E+01	0.1846E-02	0.0000E+00	0.7000E+01	0.1800E+01	0.2500E+01
11	0.1417E+02	0.9850E+02	0.2816E+00	0.1497E+02	0.1000E+01	0.1618E-16	0.0000E+00	0.7000E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 21, 30

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1410E+02	0.9826E+02	0.2927E+00	0.1496E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7250E+01	0.0000E+00	0.2500E+01
2	0.1410E+02	0.9826E+02	0.2928E+00	0.1496E+02	0.1000E+01	0.2757E-02	0.0000E+00	0.7250E+01	0.2000E+00	0.2500E+01
3	0.1410E+02	0.9827E+02	0.2923E+00	0.1496E+02	0.1000E+01	0.8856E-02	0.2444E-18	0.7250E+01	0.4000E+00	0.2500E+01
4	0.1411E+02	0.9828E+02	0.2927E+00	0.1497E+02	0.9989E+00	0.1257E-01	0.0000E+00	0.7250E+01	0.6000E+00	0.2500E+01
5	0.1412E+02	0.9830E+02	0.2926E+00	0.1498E+02	0.9999E+00	0.1517E-01	0.0000E+00	0.7250E+01	0.8000E+00	0.2500E+01
6	0.1413E+02	0.9834E+02	0.2917E+00	0.1499E+02	0.9999E+00	0.1663E-01	0.1223E-18	0.7250E+01	0.1000E+01	0.2500E+01
7	0.1414E+02	0.9837E+02	0.2890E+00	0.1499E+02	0.9999E+00	0.1668E-01	-0.3947E-17	0.7250E+01	0.1200E+01	0.2500E+01
8	0.1415E+02	0.9842E+02	0.2858E+00	0.1498E+02	0.9999E+00	0.1461E-01	0.0000E+00	0.7250E+01	0.1400E+01	0.2500E+01
9	0.1416E+02	0.9847E+02	0.2839E+00	0.1498E+02	0.1000E+01	0.9675E-02	0.8028E-17	0.7250E+01	0.1600E+01	0.2500E+01
10	0.1417E+02	0.9849E+02	0.2839E+00	0.1498E+02	0.1000E+01	0.1142E-02	0.0000E+00	0.7250E+01	0.1800E+01	0.2500E+01
11	0.1417E+02	0.9849E+02	0.2839E+00	0.1498E+02	0.1000E+01	0.1605E-16	0.0000E+00	0.7250E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 21, 31

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1411E+02	0.9829E+02	0.2921E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7500E+01	0.0000E+00	0.2500E+01
2	0.1411E+02	0.9829E+02	0.2920E+00	0.1497E+02	0.1000E+01	0.3382E-02	0.0000E+00	0.7500E+01	0.2000E+00	0.2500E+01
3	0.1412E+02	0.9830E+02	0.2917E+00	0.1498E+02	0.1000E+01	0.6028E-02	0.7831E-17	0.7500E+01	0.4000E+00	0.2500E+01
4	0.1412E+02	0.9831E+02	0.2924E+00	0.1498E+02	0.1000E+01	0.7868E-02	0.0000E+00	0.7500E+01	0.6000E+00	0.2500E+01
5	0.1413E+02	0.9831E+02	0.2924E+00	0.1499E+02	0.1000E+01	0.9059E-02	0.0000E+00	0.7500E+01	0.8000E+00	0.2500E+01
6	0.1413E+02	0.9833E+02	0.2914E+00	0.1499E+02	0.9989E+00	0.1008E-01	-0.1959E-17	0.7500E+01	0.1000E+01	0.2500E+01
7	0.1413E+02	0.9836E+02	0.2888E+00	0.1498E+02	0.9999E+00	0.1038E-01	-0.7903E-17	0.7500E+01	0.1200E+01	0.2500E+01
8	0.1414E+02	0.9840E+02	0.2861E+00	0.1497E+02	0.1000E+01	0.9311E-02	0.0000E+00	0.7500E+01	0.1400E+01	0.2500E+01
9	0.1414E+02	0.9843E+02	0.2848E+00	0.1496E+02	0.1000E+01	0.6447E-02	0.3205E-16	0.7500E+01	0.1600E+01	0.2500E+01
10	0.1415E+02	0.9845E+02	0.2845E+00	0.1497E+02	0.1000E+01	0.2474E-02	0.0000E+00	0.7500E+01	0.1800E+01	0.2500E+01
11	0.1415E+02	0.9845E+02	0.2844E+00	0.1496E+02	0.1000E+01	0.3209E-16	0.0000E+00	0.7500E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 21, 32

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	0.1412E+02	0.9829E+02	0.2915E+00	0.1498E+02	0.1000E+01	0.0000E+00	0.0000E+00	0.7750E+01	0.0000E+00	0.2500E+01
2	0.1412E+02	0.9829E+02	0.2914E+00	0.1497E+02	0.1000E+01	0.3392E-02	0.0000E+00	0.7750E+01	0.2000E+00	0.2500E+01
3	0.1412E+02	0.9831E+02	0.2916E+00	0.1498E+02	0.1000E+01	0.2783E-02	0.1566E-16	0.7750E+01	0.4000E+00	0.2500E+01
4	0.1412E+02	0.9831E+02	0.2921E+00	0.1499E+02	0.1000E+01	0.3170E-02	0.0000E+00	0.7750E+01	0.6000E+00	0.2500E+01
5	0.1413E+02	0.9832E+02	0.2921E+00	0.1499E+02	0.1000E+01	0.3014E-02	0.0000E+00	0.7750E+01	0.8000E+00	0.2500E+01
6	0.1413E+02	0.9833E+02	0.2910E+00	0.1499E+02	0.1000E+01	0.3508E-02	-0.1961E-17	0.7750E+01	0.1000E+01	0.2500E+01
7	0.1413E+02	0.9835E+02	0.2886E+00	0.1497E+02	0.1000E+01	0.3790E-02	-0.7909E-17	0.7750E+01	0.1200E+01	0.2500E+01
8	0.1414E+02	0.9839E+02	0.2863E+00	0.1496E+02	0.1000E+01	0.4107E-02	0.0000E+00	0.7750E+01	0.1400E+01	0.2500E+01
9	0.1414E+02	0.9841E+02	0.2852E+00	0.1496E+02	0.1000E+01	0.3257E-02	0.3202E-16	0.7750E+01	0.1600E+01	0.2500E+01
10	0.1414E+02	0.9845E+02	0.2851E+00	0.1496E+02	0.1000E+01	0.3732E-02	0.0000E+00	0.7750E+01	0.1800E+01	0.2500E+01
11	0.1414E+02	0.9844E+02	0.2849E+00	0.1496E+02	0.1000E+01	0.3204E-16	0.0000E+00	0.7750E+01	0.2000E+01	0.2500E+01

VARIABLES AT L, J = 21, 33

K	PRESSURE	TEMPERATURE	MACH NUMBER	TOTAL PRESS	U-COSINE	V-COSINE	W-COSINE	X	Y	Z
1	413E+02	0.9835E+02	0.2925E+00	0.1499E+02	0.1000E+0	0000E+00	0.0000E+00	0.8000E+01	0.0000E+00	0.2500E
2	413E+02	0.9835E+02	0.2924E+00	0.1499E+02	0.1000E+0	2706E-02	0.0000E+00	0.8000E+01	0.2000E+00	0.2500E

NOMENCLATURE

A_j	Flux Jacobian formed from the derivatives of F_j with respect to Q
a	Speed of sound; for a perfect gas, $a^2 = T$
E	Total energy per unit volume; $E = \varrho (e + 1/2u_ju_j)$
e	Internal energy per unit mass; for a perfect gas, $e = T/(\gamma - 1)$
F_j	Inviscid flux vector
G_j	Viscous flux vector
I	Identity matrix of rank 4 or 5 for 2-D or 3-D, respectively
J	Jacobian of the coordinate transformation from X_j to ξ_j
K	Coefficient of thermal conductivity
K_j^i	Metric element; the derivative of ξ_i with respect to X_j
P	Pressure; for a perfect gas, $P = (\gamma - 1)(E - 1/2\varrho u_ju_j)$
Pr	Prandtl number: $Pr = \mu C_p/K$
Q	Conservation vector
q_j	Heat flux vector
Re	Reynolds number: $Re = \varrho a X_r/\mu$
RHS	Right-hand-side vector; finite difference form of the steady Navier-Stokes equation multiplied by $-\Delta t$
T	Temperature; for a perfect, gas $T = \gamma P/\varrho$
t	Time variable
U_j	Contravarient velocity components (U, V, W) .

u_j	Physical velocity components (u, v, w)
X_j	Spatial coordinates (X, Y, Z)
γ	Ratio of specific heats
δ_{ij}	Kronecker delta
λ	Second coefficient of viscosity
μ	First coefficient of viscosity
ξ_i	Curvilinear coordinates (ξ, η, ζ)
ϱ	Density of fluid
τ_{ij}	Viscous stress tensor
ϕ^2	Kinetic energy factor: $1/2(\gamma-1)u_ju_j$

Subscripts

x, y, z ξ, η, ζ	Differentiation with respect to subscript

Superscript

n	Time level