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DOCUMENTATION OF PROGRAM AFTBDY TO GENERATE COORDINATE SYSTEM FOR 3-D AFTER BODY USING BODY-FITTED CURVILINEAR COORDINATES-Part I

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ABSTRACT

The computer program AFTBDY generates a body-fitted curvilinear coordinate system for a wedge curved after body. (Figure 1). This wedge curved after body is being used in an experimental program at the Langley Research Center. The coordinate system generated by AFTBDY will be used to solve 3D compressible N.S. equations. The coordinate system in the physical plane is a cartesian x,y,z system, whereas, in the transformed plane a rectangular ξ,η,ζ system is used. The coordinate system generated is such that in the transformed plane coordinate spacing in the ξ,η,ζ direction is constant and equal to unity. The physical plane coordinate lines in the different regions are clustered heavily or sparsely depending on the regions where physical quantities to be solved for by the N.S. equations have high or low gradients. The coordinate distribution in the physical plane is such that x stays constant in η and ζ direction, whereas, z stays constant in ξ and η direction. The desired distribution in x and z is input to the program. Consequently, only the y-coordinate is solved for by the program AFTBDY.

List of Symbols

D	Physical Plane
D*	Transformed Plane
IMAX	Maximum number of points in ξ - direction
JMAX	Maximum number of points in η - direction
KMAX	Maximum number of points in ζ - direction
J	Jacobian
P,Q,R	Inhomogeneous terms used for coordinate attraction
S.O.R	Successive-Over-Relaxation iteration
x,y,z	Physical coordinates
ξ,η,ζ	Transformed coordinates
ε	Error criterion for convergence
$\Gamma_1,\Gamma_2,\Gamma_3,$ $\Gamma_4,\Gamma_5,\Gamma_6$	Boundary contour surfaces in the physical plane
$\Gamma_1^*,\Gamma_2^*,\Gamma_3^*,$ $\Gamma_4^*,\Gamma_5^*,\Gamma_6^*$	Boundary contour surfaces in the transformed plane
ω	Acceleration parameter for Gauss-Seidel iteration

Subscripts

ξ,η,ζ,x,y,z	Denotes first partial differentiation
$\xi\xi,\eta\eta,xx,yy$ etc.	Denotes second partial differentiation
$\xi\eta,xy,xz$ etc.	Denotes corss partial differentiation

Superscripts

(s)	Denotes iteration number

I. Numerical Generation of Body-Fitted Curvilinear Coordinate Systems

The method for numerically generating the Boundary-Fitted curvilinear coordinate system is presented as applicable in the case of the wedge-curved after body. The coordinate system generated is to be used to solve 3-D compressible Navier Stokes equations. The coordinate system in the physical plane is a cartesian x,y,z system, whereas in the transformed plane rectangular ξ,η,ζ system is used. The coordinate system generated is such that in the transformed plane, coordinate spacing in all three ξ,η,ζ direction is constant and equal to unity. The physical plane coordinate lines in the different directions are clustered heavily or sparsely depending on the regions where the physical quantities to be solved by the N.S. equations have large or small gradients. The coordinate distribution in the physical plane is such that x stays constant in η and ζ direction, whereas z stays constant in ξ and η direction. The desired distribution in x and z direction is input to the program. Consequently, only the y coordinate is solved for by the program AFTBDY. The clustering of points in y direction is specified by a point distribution on $\xi = 1$, $\zeta = 1$ line.

Section A provides a brief discussion of the mathematical formulation and section B describes the numerical technique used to generate the coordinate system.

A. Mathematics of Transformation

Consider the transformation of a simply connected 3-d region D (Figure 2), into a right angle parallepoid region D* (Figure 3). We require that faces Γ_1, Γ_2, Γ_3, Γ_4, Γ_5, Γ_6 map into Γ_1^*, Γ_2^*, Γ_3^*, Γ_4^*, Γ_5^*, Γ_6^* respectively. For identification purposes, region D is referred to as the physical plane, and D^* as the transformed plane. In the D plane it is assumed that x is constant for a specified η and ζ and z is constant for a specified ξ and η. In the present problem only y is solved for since the desired distribution in x and z direction is input to the program. A 3-d formulation from x,y,z to ξ,η,ζ coordinates is defined as follows:

$$\begin{bmatrix} \xi \\ \eta \\ \zeta \end{bmatrix} = \begin{bmatrix} \xi(x,y,z) \\ \eta(x,y,z) \\ \zeta(x,y,z) \end{bmatrix} \tag{1}$$

The generating elliptic system is chosen to be the inhomogeneous Laplace equation,

$$\xi_{xx} + \xi_{yy} + \xi_{zz} = P(\xi,\eta,\zeta) \tag{2a}$$

$$\eta_{xx} + \eta_{yy} + \eta_{zz} = Q(\xi,\eta,\zeta) \tag{2b}$$

$$\zeta_{xx} + \zeta_{yy} + \zeta_{zz} = R(\xi,\eta,\zeta) \tag{2c}$$

with the following boundary conditions:

$$\Gamma_1 \qquad \begin{bmatrix} \xi \\ \eta \\ \zeta \end{bmatrix} = \begin{bmatrix} \xi_1(x,y,z) \\ \eta_1(x,y,z) \\ \zeta_1 \end{bmatrix} \tag{3a}$$

$$\Gamma_2 \qquad \begin{bmatrix} \xi \\ \eta \\ \zeta \end{bmatrix} = \begin{bmatrix} \xi_2 \\ \eta_2(x,y,z) \\ \zeta_2(z,y,z) \end{bmatrix} \tag{3b}$$

$$\Gamma_3 \qquad \begin{bmatrix} \xi \\ \eta \\ \zeta \end{bmatrix} = \begin{bmatrix} \xi_3(x,y,z) \\ \eta_3 \\ \zeta_3(x,y,z) \end{bmatrix} \tag{3c}$$

$$\Gamma_4 \qquad \begin{bmatrix} \xi \\ \eta \\ \zeta \end{bmatrix} = \begin{bmatrix} \xi_4(x,y,z) \\ \eta_4(x,y,z) \\ \zeta_4 \end{bmatrix} \tag{3d}$$

$$\Gamma_5 \qquad \begin{bmatrix} \xi \\ \eta \\ \zeta \end{bmatrix} = \begin{bmatrix} \xi_5 \\ \eta_5(x,y,z) \\ \zeta_5(x,y,z) \end{bmatrix} \tag{3e}$$

$$\Gamma_6 \qquad \begin{bmatrix} \xi \\ \eta \\ \zeta \end{bmatrix} = \begin{bmatrix} \xi_6(x,y,z) \\ \eta_6 \\ \zeta_6(z,y,z) \end{bmatrix} \tag{3f}$$

where ζ_1, ξ_2, η_3, ζ_4, ξ_5, η_6 are specified constants and ξ_1, η_1, η_2, ζ_2, ξ_3, ζ_3, ξ_4, η_4, η_5, ζ_5, ξ_6 and ζ_6 are

specified functions.

The inhomogeneous terms P,Q, and R are selected to control the spacing of η = constant and ζ = constant lines in the physical plane and several forms for these terms can be used. In the present case a special form of P, Q and R was used based on the point distribution on ab, ac, and ae lines (Figure 2). (For convenience $\xi_2 = \eta_3 = \zeta_1 = 1$ and ξ_5 = IMAX, η_6 = JMAX and ζ_4 = KMAX is chosen thus ensuring a field size of IMAX x JMAX x KMAX).

In order that the transformed plane contain a uniform grid, the dependent and independent variables must be interchanged in equations (2a), (2b) and (2c). The resulting equations are given by,

$$c_{11}x_{\xi\xi} - 2.0\, c_{12}x_{\xi\eta} + 2.0\, c_{13}x_{\xi\zeta} + c_{22}x_{\eta\eta} - 2.0\, c_{23}x_{\eta\zeta} + c_{33}x_{\zeta\zeta} = -J^2(P(\xi,\eta,\zeta)x_\xi + Q(\xi,\eta,\zeta)x_\eta + R(\xi,\eta,\zeta)x_\zeta) \quad (4a)$$

$$c_{11}y_{\xi\xi} - 2.0\, c_{12}y_{\xi\eta} + 2.0\, c_{13}y_{\xi\zeta} + c_{22}y_{\eta\eta} - 2.0\, c_{23}y_{\eta\zeta} + c_{33}y_{\zeta\zeta} = -J^2(P(\xi,\eta,\zeta,)y_\xi + Q(\xi,\eta,\zeta)y_\eta + R(\xi,\eta,\zeta)y_\zeta) \quad (4b)$$

$$c_{11}z_{\xi\xi} - 2.0\, c_{12}z_{\xi\eta} + 2.0\, c_{13}z_{\xi\zeta} + c_{22}z_{\eta\eta} - 2.0\, c_{23}z_{\eta\zeta} + c_{33}z_{\zeta\zeta} = -J^2(P(\xi,\eta,\zeta)z_\xi + Q(\xi,\eta,\zeta)z_\eta + R(\xi,\eta,\zeta)Z\ ) \quad (4c)$$

where

$$c_{11} = (x_\eta y_\zeta - x_\zeta y_\eta)^2 + (x_\eta z_\zeta - x_\zeta z_\eta)^2 + (y_\eta z_\zeta - y_\zeta z_\eta)^2 \quad (5a)$$

$$c_{12} = (x_\xi y_\zeta - x_\zeta y_\xi) * (x_\xi y_\zeta - x_\zeta y_\eta) + (x_\xi z_\zeta - x_\zeta z_\xi) * (x_\eta z_\zeta - x_\zeta z_\eta) + (y_\xi z_\zeta - y_\zeta z_\xi) * (y_\eta z_\zeta - y_\zeta z_\eta) \quad (5b)$$

$$c_{13} = (x_\xi y_\eta - x_\eta y_\xi) * (x_\eta y_\zeta - x_\zeta y_\eta) + (x_\xi z_\eta - x_\eta z_\xi) * (x_\eta z_\zeta - x_\zeta z_\eta) + (y_\xi z_\eta - y_\eta z_\xi) * (y_\eta z_\zeta - y_\zeta z_\eta) \quad (5c)$$

$$c_{22} = (x_\xi y_\zeta - x_\zeta y_\xi)^2 + (x_\xi z_\zeta - x_\zeta z_\xi)^2 + (y_\xi z_\zeta - y_\zeta z_\xi)^2 \quad (5d)$$

$$c_{23} = (x_\xi y_\eta - x_\eta y_\xi) * (x_\xi y_\zeta - x_\zeta y_\xi) + (x_\xi z_\eta - x_\eta z_\xi) * (x_\xi z_\zeta - x_\zeta z_\xi) + (y_\xi z_\eta - y_\eta z_\xi) * (y_\xi z_\zeta - y_\zeta z_\xi) \quad (5e)$$

$$c_{33} = (x_\xi y_\eta - x_\eta y_\xi)^2 + (x_\xi z_\eta - x_\eta z_\xi)^2 + (y_\xi z_\eta - y_\eta z_\xi)^2 \quad (5f)$$

$$J = x_\xi (y_\eta z_\zeta - z_\eta y_\zeta) - x_\eta (y_\xi z_\zeta - y_\zeta z_\xi) + x_\zeta (y_\xi z_\eta - y_\eta z_\xi) \quad (5g)$$

The boundary conditions transform as follows:

on Γ_1^*,
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} a_1(\xi_1, \eta_1, \zeta_1) \\ a_2(\xi_1, \eta_1, \zeta_1) \\ a_3(\xi_1, \eta_1, \zeta_1) \end{bmatrix} \quad (6a)$$

on Γ_2^*,
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} b_1(\xi_2, \eta_2, \zeta_2) \\ b_2(\xi_2, \eta_2, \zeta_2) \\ b_3(\xi_2, \eta_2, \zeta_2) \end{bmatrix} \quad (6b)$$

on Γ_3^*,
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} c_i(\xi_3, \eta_3, \zeta_3) \\ c_2(\xi_3, \eta_3, \zeta_3) \\ c_3(\xi_3, \eta_3, \zeta_3) \end{bmatrix} \quad (6c)$$

on Γ_4^*,
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} d_1(\xi_4, \eta_4, \zeta_4) \\ d_2(\xi_4, \eta_4, \zeta_4) \\ d_3(\xi_4, \eta_4, \zeta_4) \end{bmatrix} \quad (6d)$$

on Γ_5^*,
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} e_1(\xi_5, \eta_5, \zeta_5) \\ e_2(\xi_5, \eta_5, \zeta_5) \\ e_3(\xi_5, \eta_5, \zeta_5) \end{bmatrix} \quad (6e)$$

$$\text{on } \Gamma_6^*, \quad \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} f_1(\xi_6,\eta_6,\zeta_6) \\ f_2(\xi_6,\eta_6,\zeta_6) \\ f_3(\xi_6,\eta_6,\zeta_6) \end{bmatrix} \tag{6f}$$

The functions a, b, c, d, e, f are specified by the known surfaces Γ_1, Γ_2, Γ_3, Γ_4, Γ_5 and Γ_6. On all six surfaces Γ_1, Γ_2, Γ_3, Γ_4, Γ_5 and Γ_6 Dirchlet boundary conditions are used.

As indicated before, in the present problem only y is solved for since the desired distribution in x and z is input to the program. The last aspect to be discussed is how P, Q and R are computed. P is computed based on x variation of points on line ab (Figure 2). Similarly, Q and R are computed based on y, z variation on line ac and ae,respectively. The following discussion will make this point clearer.

If one assumes on ab that the y and z variation is zero ($y_\xi = z_\xi = 0$), on ac x and z variation is zero ($x_\eta = z_\eta = 0$), and on ae x and y variation is zero ($x_\zeta = y_\zeta = 0$) then from equations (4) and (5) we obtain

$$P(\xi,\eta,\zeta) = -\frac{x_{\xi\xi}}{x_\xi^3} \tag{7a}$$

$$Q(\xi,\eta,\zeta) = -\frac{y_{\eta\eta}}{y_\eta^3} \tag{7b}$$

$$R(\xi,\eta,\zeta) = -\frac{z_{\zeta\zeta}}{z_\zeta^3} \tag{7c}$$

Notice P, Q, and R are functions of ξ,η, and ζ, respectively. Thus only one dimensional arrays of size IMAX, JMAX, KMAX are required to store P, Q, and R, respectively.

B. Numerical Solution Techniques

Based on the above discussion equation (4b) must be numerically solved. The coefficients C_{ij} are given by equations (5) and P, Q, R are given by equations (7). The numerical solution of the transformation can be easily performed. First P, Q, and R are computed as follows:

$$P(I) = \frac{x(I+1,1,1) - 2x(I,1,1) + x(I-1,1,1)}{(x(I+1,1,1) - x(I-1,1,1))**3} \qquad (8a)$$

$$2 \leq I \leq IMAX-1$$

$$Q(J) = \frac{y(1,J+1,1) - 2y(1,J,1) + y(1,J-1,1)}{(y(1,J+1,1) - y(1,J-1,1))**3} \qquad (8b)$$

$$2 \leq J \leq MAX-1$$

$$R(K) = \frac{z(1,1,K+1) - 2z(1,1,K) + z(1,1,K-1)}{(z(1,1,K+1) - z(1,1,K-1))**3} \qquad (8c)$$

$$2 \leq K \leq MAX-1$$

A S.O.R Gauss Seidell iteration is used to numerically solve equation (4b). All derivatives in (4b) are written in second order central difference form. Then following expression for intermediate value of y at point (I, J, K) is obtained,

$$\begin{aligned} \bar{y}(I,J,K) = CF*[&c_{11}(y(I+1,J,K) + y(I-1,J,K)) - 2\, c_{12}y_{\xi\eta} \\ &+2c_{13}y_{\xi\zeta} + c_{22}(y(I,J+1,K) + y(I,J-1,K)) \\ &+c_{33}(y(I,J,K+1) + y(I,J,K-1)) - 2\, c_{23}y_{\eta\zeta} + \\ &J^2(P(I)y_{\xi} + Q(J)y_{\eta} + R(K)y_{\zeta})] \end{aligned} \qquad (9a)$$

where

$$C_F = 0.5/(c_{11} + c_{22} + c_{33}) \tag{9b}$$

In (9a) we have $2 \leq I \leq IMAX-1$, $2 \leq J \leq MAX-1$ and $2 \leq K \leq KMAX-1$. In addition c_{11}, c_{12} etc. are given by equation (5). If f denotes x, y, or z then the derivatives of x, y, z in difference form required for equation (9a) are given by,

$$f_\xi = 0.5(f(I+1,J,K) - f(I-1,J,K)) \tag{10a}$$

$$f_\eta = 0.5(f(I,J+1,K) - f(I,J-1,K)) \tag{10b}$$

$$f_\zeta = 0.5(f(I,J,K+1) - f(I,J,K-1)) \tag{10c}$$

$$f_{\xi\eta} = 0.25(f(I+1,J+1,K) - f(I-1,J+1,K) - f(I+1,J-1,K) + f(I-1,J-1,K)) \tag{10d}$$

$$f_{\eta\zeta} = 0.25(f(I,J+1,K+1) - f(I,J-1,K+1) - f(I,J+1,K-1) + f(I,J-1,K-1)) \tag{10e}$$

$$f_{\xi\zeta} = 0.25(f(I+1,J,K+1) - f(I-1,J,K+1) - f(I+1,J,K-1) + f(I-1,J,K-1)) \tag{10f}$$

$$f_{\xi\xi} = f(I+1,J,K) - 2f(I,J,K) + f(I-1,J,K) \tag{10g}$$

$$f_{\eta\eta} = f(I,J+1,K) - 2f(I,J,K) + f(I,J-1,K) \tag{10h}$$

$$f_{\zeta\zeta} = f(I,J,K+1) - 2f(I,J,K) + f(I,J,K-1) \tag{10j}$$

If (9a) is the intermediate value for S.O.R iteration then value of y at the next iteration (S + 1) is as follows:

$$y^{(s+1)}(I,J,K) = (1-w)\, y^{(s)}(I,J,K) + w\, \bar{y}(I,J,K) \qquad (11)$$

In equations (9) and (10) most current iterative value of y are used and ω is the acceleration parameter.

In equations (9) and (10) most current iterative value of y are used and ω is the acceleration parameter.

The convergence is reached whenever the absolute value of $y(I, J, K)^{(S+1)} - y(I, J, K)^{(S)}$ is less than a specified quantity ε. Generally a value of 0.000005 to 0.00001 is specified for ε. A value of 0.4 to 0.8 is used for ω.

C. Initial Guess and Boundary Point Specification

The input to the program consists of x coordinate specification on line ab, y specification on line ac, and z specification on line ae. This implies that $\{x(I,1,1),\ 1 \le I \le IMAX\}$, $\{y(1,J,1),\ 1 \le J \le JMAX\}$ and $\{z(1,1,K),\ 1 \le K \le KMAX\}$ are known. (The program is written for a body for which x varies from o to 90.0, and z varies from 0 to 12.0). The initial guess is specified as follows,

$$x(I,J,K) = x(I,1,1) \qquad (12a)$$

$$z(I,J,K) = z(1,1,K) \qquad (12b)$$

where $1 \le I \le IMAX$, $1 \le J \le JMAX$, $1 \le K \le KMAX$.

The y coordinates are specified as follows. On surface Γ_6 (J=JMAX) the coordinates are given by,

$$y(I,JMAX,K) = y(1,JMAX,1) \qquad (13a)$$

$1 \le I \le IMAX$ and $1 \le K \le KMAX$.

on Γ_3(J =1) y coordinate is specified as follows:

$$y(I,1,1) = x(I,1,1) * \tan(4^{o})$$

$$\text{if } x(I,1,1) \leq 62.3 \qquad (13b)$$

$$y(I,1,1) = C+[D^2 - (x(I,1,1) - E)^2] **0.5$$

$$\text{if } x(I,1,1) > 62.3 \qquad (13c)$$

$$C = -457.8350$$

$$D = 463.3164$$

also $$E = 94.56704$$

$$y(I,1,K) = y(I,1,1)$$

$$\text{if } x \leq 62.3 \qquad (13d)$$

and

$$y(I,1,K) = y(I,1,1) - R + [R^2 - z^2]^{\frac{1}{2}} \text{ if } x>62.3 \qquad (13e)$$

$$R = [A + B(x(I,1,1) - 62.3)]**0.5$$

$$A = 0.00035521$$

$$B = 0.000223505$$

$2 \leq I \leq IMAX$ and $2 \leq K \leq KMAX$.

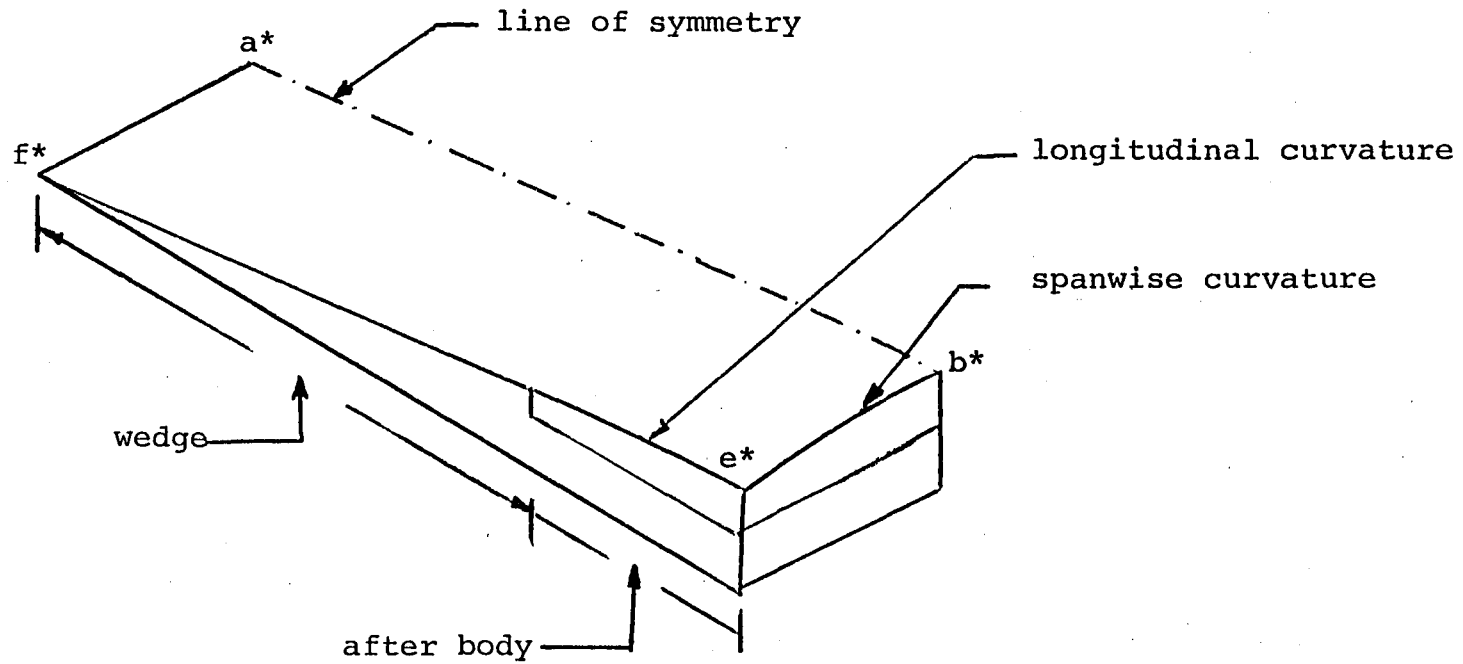
y on remaining of the points is given as follows:

$$y(I,J,K) = y(I,1,K) + (y(I,JMAX,K) - y(I,1,K))*$$

$$(y(1,J,1) - y(1,1,1))/$$

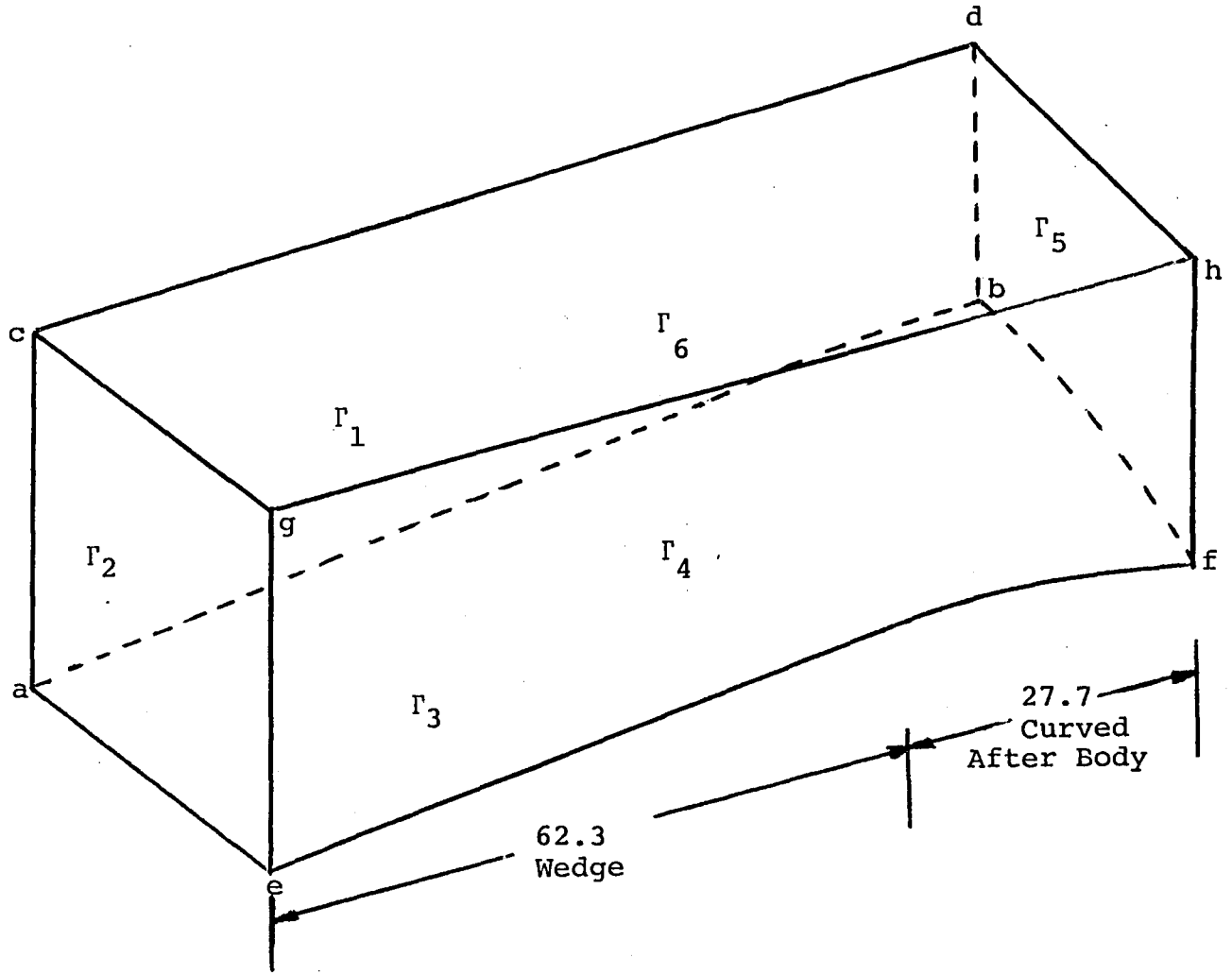
$$y(1,JMAX,1) - y(1,1,1)) \qquad (13f)$$

$1 \leq I \leq IMAX$, $2 \leq J \leq JMAX-1$ and $1 \leq K \leq KMAX$



note: a* e* f* b* is surface aefb in figure 2.

Figure 1. Wedge Curve After Body



Γ_1 - surface abdc

Γ_2 - surface aegc

Γ_3 - surface aefb

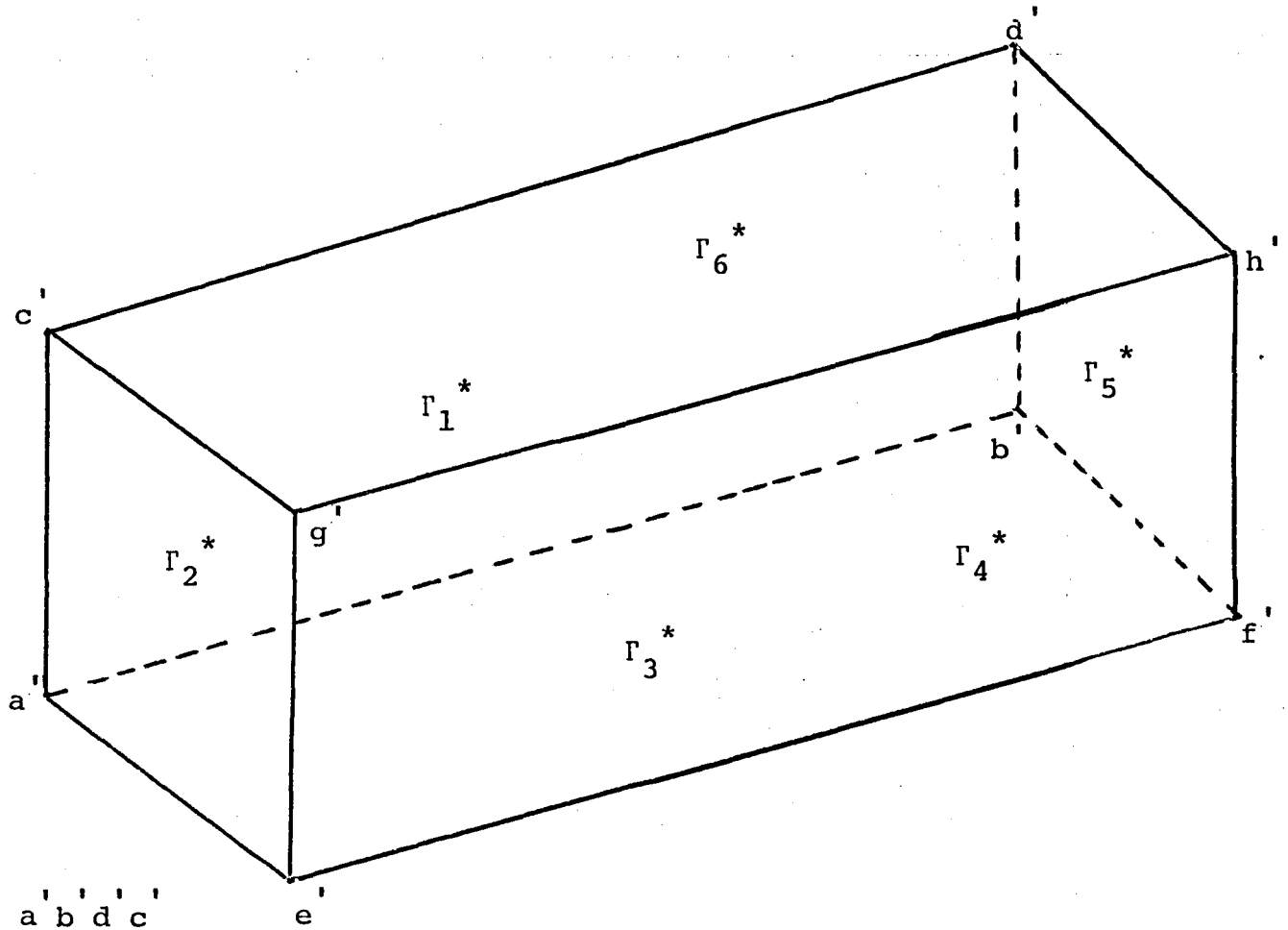
Γ_4 - surface efhg

Γ_5 - surface bfhd

Γ_6 - surface cghd

Physical Plane

Figure 2. (continued)



Γ_1 - surface a'b'd'c'

Γ_2 - surface a'e'g'c'

Γ_3 - surface a'e'f'b'

Γ_4 - surface e'f'h'g'

Γ_5 - surface b'f'h'd'

Γ_6 - surface c'g'h'd'

Transformed Plane

Figure 2. Coordinate Transformation

II. Computer Program

A. Program Listing

A computer program to numerically generate boundary-fitted coordinate system for a wedge after body combination was written in FORTRAN IV language to run on the LaRC CDC NOS system complex. The computer program consists of the main program AFTBDY and subroutines INIT, CALCOR, IPRTC, and IPLTC. A brief description of the main program and the four subroutines is provided in Chapter IV. The program listing follows this page.

```
*****    *DECK AFTBDY                                                          AFTBDY      1
               PROGRAM AFTBDY(INPUT,OUTPUT,SOLNXX,TAPE1=SOLNXX,TAPE5=INPUT,    AFTBDY      2
              1    TAPE6=OUTPUT)                                               AFTBDY      3
               C*****************************************************************AFTBDY      4
               C**                                                             *  AFTBDY      5
               C**       THIS PROGRAM GENERATES COORDINATE SYSTEM FOR A 3-D AFTER *AFTBDY      6
               C**       BODY. THE COORDINATES GENERATED ARE BASED ON THE METHOD *AFTBDY      7
               C**       DEVELOPED BY THOMPSON, THAMES AND MASTIN OF MISSISSIPPI *AFTBDY      8
               C**       STATE UNIVERSITY.                                     *  AFTBDY      9
               C**                                                             *  AFTBDY     10
               C**       FOR FURTHES ENQUIRIES CONTACT :                       *  AFTBDY     11
               C**                                                             *  AFTBDY     12
               C**           DR. DILIP KUMAR                                   *  AFTBDY     13
               C**           DR. JULIUS HARRIS                                 *  AFTBDY     14
               C**           NASA - LANGLEY RESEARCH CENTER                    *  AFTBDY     15
               C**           MAIL STOP 163                                     *  AFTBDY     16
               C**           HAMPTON, VA 23665                                 *  AFTBDY     17
               C**           PHONE: 804-827-3696                               *  AFTBDY     18
               C**           FTS CODE 928-1110                                 *  AFTBDY     19
               C**                                                             *  AFTBDY     20
               C*****************************************************************AFTBDY     21
               C**                                                                AFTBDY     22
               C**       THIS PROGRAM GENERATES COORDINATES FOR A AFTER BODY. DUE  AFTBDY     23
               C**       TO SYMMETRY ONLY HALF OF THE BODY IS CONSIDERED. THE     AFTBDY     24
               C**       COORDINATES IN X AND Z DIRECTION ARE FIXED. SOLUTION IS  AFTBDY     25
               C**       OBTAINED FOR Y ONLY. THE DESIRED DISTRIBUTION OF POINTS  AFTBDY     26
               C**       IS DEFINED ON J=1,K=1 AND I = 1,IMAX POINTS, THEN ON     AFTBDY     27
               C**       I=1,K=1 AND J=1,JMAX AND FINALLY ON I=1,J=1 AND K=1,KMAX. AFTBDY     28
               C**       THIS DISTRIBUTION CAN BE SPECIFIED BASED ON UNIFORM,     AFTBDY     29
               C**       EXPONENTIAL, OR POLYNOMIAL DISTRIBUTION. BASED ON THIS   AFTBDY     30
               C**       DISTRIBUTION THE ATTRACTION COEFFICIENTS P,Q, AND R ARE  AFTBDY     31
               C**       COMPUTED. THE DISTRIBUTION OF POINTS MUST BE SPECIFIED   AFTBDY     32
               C**       SO THAT P,Q,AND R ARE CONTINOUS. BASED ON THESE P,Q,AND R AFTBDY     33
               C**       THEN Y COORDINATE IS COMPUTED.                           AFTBDY     34
               C**                                                                AFTBDY     35
               C**         --- CARD  INPUT ---                                    AFTBDY     36
               C**                                                                AFTBDY     37
               C**     CARD1 : SPECIFIES GRID SIZE                                AFTBDY     38
               C**          ++ IMAX,JMAX,KMAX    (FORMAT 3I5)                    AFTBDY     39
               C**             IMAX  : NO OF NODES IN X-DIRECTION                 AFTBDY     40
               C**             JMAX  : NO OF NODES IN Y-DIRECTION                 AFTBDY     41
               C**             KMAX  : NO OF NODES IN Z-DIRECTION                 AFTBDY     42
               C**                                                                AFTBDY     43
               C**     CARD2 : GAUSS-SEIDELL PAR.,CONVERGENCE CRITERION, ERROR    AFTBDY     44
```

```
C**           PRINT FREQUENCY FLAG, AND MAXIMUM NO OF ITERATIONS
C**        ++ R1,R2,R3,R4,IERR,ITERMX  (FORMAT 4F10.0,2I5)
C**           R1     : GAUSS SEIDELL ITERATION PARAMETER
C**                    (USUALLY 0.6)
C**           R2,R3,: MAXIMUM ERROR ALLOWED IN X,Y,AND Z DIRECTION
C**           R4      RESPECTIVELY (USUALLY 0.000005 TO 0.00001)
C**           IERR   : INTERVAL AT WHICH MAX ERROR IS PRINTED.
C**           ITERMX: MAXIMUM NUMBER OF ITERATIONS PERFORMED.
C**
C**     CARD3 : BOUNDARY POINT COORDINATES
C**           X,Y,Z    (FORMAT 3F10.0)
C**        ++ THERE ARE IMAX+JMAX+KMAX SUCH CARDS. IMAX CARDS ARE
C**           INPUT FOR J=1,K=1 AND I=1 TO IMAX. SIMILARY CARDS
C**           FOR I=1,K=1,J=1 TO JMAX AND I=1,J=1,K=1 TO KMAX ARE
C**           INPUT.            FOR IMAX CARDS ONLY X IS INPUT,
C**           FOR JMAX CARD Y, AND KMAX CARDS ONLY Z IS INPUT.
C**            OTHER COORDINATES ARE LEFT BLANK AND ARE COMPUTED
C**           BY THE PROGRAM.
C**     CARD4 : PRINT OPTION PARAMETERS
C**           IPRT1,IDEL1,JDEL1,IPRT2,IDEL2,JDEL2  (FORMAT 6I5)
C**        ++ IPRT1  : PRINT INITIAL GUESS  0-NO 1-YES.
C**           IDEL1  : INTERVAL OF I AT WHICH INITIAL GUESS IS
C**                    PRINTED. 1 MEANS FOR EVERY 1, 2 MEANS FOR I=
C**                    1,3,5,7 AND SO ON.
C**           JDEL1  : INTERVAL OF J-COORDINATE FOR WHICH INITIAL
C**                    GUESS IS PRINTED.
C**           IPRT2  : SAME AS IPRT1,IDEL1,JDEL1 FOR CONVERGED OR
C**           IDEL2    PARTIALLY CONVERGED SOLUTION. PARTIALLY
C**           JDEL2    CONVERGED SOLUTION IS PRINTED IN CASE THE
C**                    SOLUTION DOES NOT CONVERGE AFTER ITERMX
C**                    ITERATIONS.
C**
C**     CARD5 : HEADER CARD
C**           HED1(I),I=1,4      (FORMAT 4A10)
C**        ++ HED1   : 40 BYTES OF HEADER INFO PRINTED ON COORDINATE
C**                    PRINTOUT AND PLOTS
C**
C**     CARD6 : ADDITIONAL HEADER CARD
C**           HED2(I),I=1,4       (FORMAT4A10)
C**           SAME AS CARD5.  (BOTH CARD5 AND CARD6 REQUIRED)
C**
C**
C**     CARD7 : INITIAL GUESS PLOT OPTION
C**           NPLT1    (FORMAT I5)
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AFTBDY 87
AFTBDY 88

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C**       ++  NPLT1 : SPECIFIES NUMBER OF SURFACES FOR WHICH                  AFTBDY     89
C**                   INITIAL GUESS IS PLOTTED.                               AFTBDY     90
C**                                                                           AFTBDY     91
C**     CARD8 : THERE ARE NPLT1 CARD TYPE 8. THESE CARDS SPECIFY              AFTBDY     92
C**             VARIOUS SURFACES THAT NEED TO BE PLOTTED.                     AFTBDY     93
C**             ITYPE,ISTN,SIZE1          (FORMAT 2I5,F10.0)                  AFTBDY     94
C**         ++  ITYPE : TYPE OF SURFACE . = 1 I STATION. = 2 K STATION        AFTBDY     95
C**             ISTN  : VALUE OF I OR K STATION DEPENDING ON ITYPE.           AFTBDY     96
C**             SIZE1 : MAX PLOT SIZE IN Z DIRECTION IF ITYPE = 1,            AFTBDY     97
C**                     OR MAX PLOT SIZE IN X-DIRECTION IF ITYPE = 2.         AFTBDY     98
C**                                                                           AFTBDY     99
C**     CARD9 : SIMILAR TO  CARD TYPE 7 AND 8 RESPECTIVELY FOR                AFTBDY    100
C**     CARD10  CONVERGED OR PARTIALLY CONVERGED SOLUTION.                    AFTBDY    101
C**                                                                           AFTBDY    102
C**                                                                           AFTBDY    103
C**     *** SAMPLE  RUNSTREAM                                                 AFTBDY    104
C**                                                                           AFTBDY    105
C**                                                                           AFTBDY    106
C**       AFTBDY,T7777,CM320000.                BIN 34    D KUMAR             AFTBDY    107
C**       USER,479019C.                                                       AFTBDY    108
C**       CHARGE,100718,LRC.                                                  AFTBDY    109
C**       GET(OLDPL=AFTBDY/UN=375732N).                                       AFTBDY    110
C**       UPDATE(F,C=VISFL1).                                                 AFTBDY    111
C**       COPYBR,INPUT,EDTFT1.                                                AFTBDY    112
C**       REWIND,VISFL1,EDTFT1.                                               AFTBDY    113
C**       EDIT,VISFL1,I=EDTFT1.                                               AFTBDY    114
C**       REWIND,VISFL1.                                                      AFTBDY    115
C**       FTN(PL=77777,I=VISFL1).                                             AFTBDY    116
C**       ATTACH,LRCGOSF/UN=LIBRARY,NA.                                       AFTBDY    117
C**       LDSET,LIB=LRCGOSF,PRESET=ZERO.                                      AFTBDY    118
C**       LGO.                                                                AFTBDY    119
C**       PLOT.VARIAN                                                         AFTBDY    120
C**       REWIND,SOLNXX.                                                      AFTBDY    121
C**       COPYBR,SOLNXX,AFSOLN.                                               AFTBDY    122
C**       REWIND,AFSOLN.                                                      AFTBDY    123
C**       SAVE,AFSOLN.                                                        AFTBDY    124
C**       7/8/9                                                               AFTBDY    125
C**       *IDENT DUM1                                                         AFTBDY    126
C**       *INSERT AFTBDY.4                                                    AFTBDY    127
C**       C**                                                                 AFTBDY    128
C**       7/8/9                                                               AFTBDY    129
C**       RS:/ MXLL/,/   26/;*                                                AFTBDY    130
C**       RS:/ MXLL/,/   26/;*                                                AFTBDY    131
C**       RS:/ MXLL/,/   21/;*                                                AFTBDY    132
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C**        END                                                                  AFTBDY     133
C**       7/8/9                                                                 AFTBDY     134
C**            INPUT DATA.  SEE EXPLANATION ABOVE.                              AFTBDY     135
C**       6/7/8/9                                                               AFTBDY     136
C**       NOTE: AFTER FIRST 7/8/9 CARD 3 CARDS ARE INPUT TO                     AFTBDY     137
C**             SATISFY INPUT FOR UPDATE UTILITY.                               AFTBDY     138
C**                                                                             AFTBDY     139
C**             AFTER 2ND 7/8/9 CARD EDIT CARDS ARE INPUT.  THE                 AFTBDY     140
C**             PROGRAM IS WRITTEN SO THAT MAXIMUM NUMBER OF                    AFTBDY     141
C**             POINTS IN X,Y,Z DIRECTION CAN BE CHANGED BY SIMPLE              AFTBDY     142
C**             INPUT.  IN THE ABOVE CASE FIELD SIZE OF 26,26,21                AFTBDY     143
C**             IS ASSUMED.  IN THE THREE CARDS AFTER RS:/ AND MXLL             AFTBDY     144
C**             I,J,K SHOULD BE INPUT RESPECTIVELY.  THIS COULD NOT             AFTBDY     145
C**             BE SHOWN ABOVE BECAUSE TEXT EDITOR CHANGES TEXT IN              AFTBDY     146
C**             COMMENTS CARDS ALSO.                                            AFTBDY     147
C**                                                                             AFTBDY     148
C**             IT IS ASSUMED THAT PROGRAM RESIDES ON FILE AFTBDY               AFTBDY     149
C**             UNDER USER NO. OF 375732N AND USER 479019C HAS                  AFTBDY     150
C**             PERMISSION TO USE IT.  FURTHERMORE, IT IS ALSO ASSUMED          AFTBDY     151
C**             THAT THE COORDINATE SYSTEM SOLUTION IS TO BE STORED             AFTBDY     152
C**             ON FILE AFSOLN.  THIS NAME CAN BE CHANGED BY                    AFTBDY     153
C**             CHANGING THREE CARDS TOWARDS THE END OF THE RUNSTREAM.          AFTBDY     154
C**                                                                             AFTBDY     155
C**             THE PLOTS ON CALCOMP CAN BE OBTAINED BY REPLACING               AFTBDY     156
C**             PLOT.VARIAN CARD BY FOLLOWING CARDS.                            AFTBDY     157
C**               PLOT.CALPOST,11(XO=1.0,YO=0.2)                                AFTBDY     158
C**               CONT.  //PAPER 00,                                            AFTBDY     159
C**               CONT.    LEROY PEN SIZE 0.3                                   AFTBDY     160
C**               CONT.    MULTIPLE PLOT MODE                                   AFTBDY     161
C**               CONT.    THESE PLOTS ARE FOR REPORTS//                        AFTBDY     162
C**                                                                             AFTBDY     163
C**                                                                             AFTBDY     164
      COMMON /BXXX/ X(IMXLL,JMXLL,KMXLL),Y(IMXLL,JMXLL,KMXLL),                  AFTBDY     165
     1      Z(IMXLL,JMXLL,KMXLL),P(IMXLL),Q(JMXLL),R(KMXLL)                     AFTBDY     166
      COMMON /AXXX/ IMAX,JMAX,KMAX,ILIMIT,JLIMIT,KLIMIT,ISOLN,                  AFTBDY     167
     1    KKK,XERRMX,YERRMX,ZERRMX,IXERI,IXERJ,IXERK,IYERI,IYERJ,               AFTBDY     168
     2    IYERK,IZERI,IZERJ,IZERK,R1,R2,R3,R4,IERR,ITERMX,IPRT1,                AFTBDY     169
     3    IDEL1,JDEL1,IPRT2,IDEL2,JDEL2,NPLT1,ITYPE,ISTN,SIZE1,                 AFTBDY     170
     4    SIZE2,LL,HED1(4),HED2(4),IPLSET,FILLXX(25)                            AFTBDY     171
      DATA KKK,IXERI,IXERJ,IXERK,IYERI,IYERJ,IYERK,IZERI,IZERJ,IZERK,           AFTBDY     172
     1    XERRMX,YERRMX,ZERRMX,IPLSET/10*0,3*0.0,0/                             AFTBDY     173
C**                                                                             AFTBDY     174
      ILIMIT = IMXLL                                                            AFTBDY     175
      JLIMIT = JMXLL                                                            AFTBDY     176
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      KLIMIT = KMXLL                                                    AFTBDY     177
C**                                                                     AFTBDY     178
C**       INITIALIZE X,Y,Z AND P,Q,R ARRAYS TO 0.                       AFTBDY     179
C**                                                                     AFTBDY     180
      DO 10 I = 1,ILIMIT                                                AFTBDY     181
        P(I) = 0.0                                                      AFTBDY     182
   10 CONTINUE                                                          AFTBDY     183
      DO 20 J = 1,JLIMIT                                                AFTBDY     184
        Q(J) = 0.0                                                      AFTBDY     185
   20 CONTINUE                                                          AFTBDY     186
      DO 30 K = 1,KLIMIT                                                AFTBDY     187
        R(K) = 0.0                                                      AFTBDY     188
   30 CONTINUE                                                          AFTBDY     189
C**                                                                     AFTBDY     190
      DO 50 I = 1,ILIMIT                                                AFTBDY     191
        DO 50 J = 1,JLIMIT                                              AFTBDY     192
          DO 50 K = 1,KLIMIT                                            AFTBDY     193
            X(I,J,K) = 0.0                                              AFTBDY     194
            Y(I,J,K) = 0.0                                              AFTBDY     195
            Z(I,J,K) = 0.0                                              AFTBDY     196
   50 CONTINUE                                                          AFTBDY     197
C**                                                                     AFTBDY     198
C**       READ PART OF INPUT AND CHECK FOR GRID SIZE. PLOT CARDS ARE    AFTBDY     199
C**       READ IN IPLTC ROUTINES.                                       AFTBDY     200
C**                                                                     AFTBDY     201
      READ(5,1000) IMAX,JMAX,KMAX                                       AFTBDY     202
      WRITE(6,1010)                                                     AFTBDY     203
      WRITE(6,1020) IMAX,JMAX,KMAX                                      AFTBDY     204
      IF(IMAX.GT.ILIMIT) GO TO 80                                       AFTBDY     205
        IF(JMAX.GT.JLIMIT) GO TO 80                                     AFTBDY     206
          IF(KMAX.GT.KLIMIT) GO TO 80                                   AFTBDY     207
            GO TO 100                                                   AFTBDY     208
C**                                                                     AFTBDY     209
C**             GRID SIZE SPECIFIED TOO LARGE                           AFTBDY     210
C**                                                                     AFTBDY     211
   80 CONTINUE                                                          AFTBDY     212
        WRITE(6,1030) IMAX,JMAX,KMAX,ILIMIT,JLIMIT,KLIMIT               AFTBDY     213
        STOP                                                            AFTBDY     214
  100 CONTINUE                                                          AFTBDY     215
C**                                                                     AFTBDY     216
      READ(5,1040) R1,R2,R3,R4,IERR,ITERMX                              AFTBDY     217
      WRITE(6,1050) R1,R2,R3,R4,IERR,ITERMX                             AFTBDY     218
      READ(5,1060)  ((X(I,1,1),Y(I,1,1),Z(I,1,1)),I=1,IMAX)            AFTBDY     219
      READ(5,1060)  ((X(1,J,1),Y(1,J,1),Z(1,J,1)),J=1,JMAX)            AFTBDY     220
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      READ(5,1060)  ((X(1,1,K),Y(1,1,K),Z(1,1,K)),K=1,KMAX)
      READ(5,1000)  IPRT1,IDEL1,JDEL1,IPRT2,IDEL2,JDEL2
      WRITE(6,1070) IPRT1,IDEL1,JDEL1,IPRT2,IDEL2,JDEL2
      READ(5,1080) (HED1(I),I=1,4)
      WRITE(6,1090) (HED1(I),I=1,4)
      READ(5,1080) (HED2(I),I=1,4)
      WRITE(6,1100) (HED2(I),I=1,4)
C**
C**       CALL INIT TO SET UP INITIAL GUESS AND COMPUTE P,Q,R
C**
      CALL INIT
C**
C**     CALL IPRTC TO PRINT INITIAL GUESS IF IPRT1 SET.
C**
      ISOLN = 0
      CALL IPRTC
C**
C**       CALL IPLTC FOR PLOTTING INITIAL GUESS IF OPTIONS SET.
C**
      CALL IPLTC
C**
C**       COMPUTE  COORDINATE SYSTEM
C**
      CALL CALCCR
C**
C**       CALL IPRTC AND IPLTC TO PRINT,PLOT CONVERGED OR
C**       PARTIALLY CONVERGED SOLUTION IF PROPER OPTIONS SET.
C**
      ISOLN = 1
      CALL IPRTC
      CALL IPLTC
C**
C**       STORE CONVERGED SOLUTION.
C**
      IF(KKK.EQ.0) GO TO 150
        WRITE(1,1110) ILIMIT,JLIMIT,KLIMIT,IMAX,JMAX,KMAX,
     1     ((HED1(I),HED2(I)),I=1,4)
        WRITE(1,1120) ((((X(I,J,K),Y(I,J,K),Z(I,J,K)),K=1,KLIMIT),
     1    J=1,JLIMIT),I=1,ILIMIT)
        GO TO 200
C**
C**     SOLUTION DID NOT CONVERGE. WRITE A MESSAGE.
C**
  150 CONTINUE
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AFTBDY  263
AFTBDY  264
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      WRITE(6,1130) YERRMX,IYERI,IYERJ,IYERK,R3,ITERMX                  AFTBDY     265
C**                                                                     AFTBDY     266
C**        ALL FUNCTION COMPLETE                                        AFTBDY     267
C**                                                                     AFTBDY     268
  200 CONTINUE                                                          AFTBDY     269
      STOP                                                              AFTBDY     270
C**                                                                     AFTBDY     271
C**        ALL FUNCTIONS COMPLETE.  FORMAT STATEMENTS                   AFTBDY     272
C**                                                                     AFTBDY     273
 1000 FORMAT(16I5)                                                      AFTBDY     274
 1010 FORMAT("1")                                                       AFTBDY     275
 1020 FORMAT("0",5X,"IMAX,JMAX,KMAX = ",3I5)                            AFTBDY     276
 1030 FORMAT(///5X,"*** GRID SIZE LARGER THAN ALLOWED",                 AFTBDY     277
     1          /5X,"*** GRID SIZE INPUT      = ",3I5,                  AFTBDY     278
     2          /5X,"*** LARGEST SIZE ALLOWED = ",3I5,                  AFTBDY     279
     3          /5X,"*** INCREASE VALUE OF IMXLL,JMXLL,KMXLL IN TEXT",  AFTBDY     280
     4            " EDITOR",                                            AFTBDY     281
     5          /5X,"*** RUN ABORTED ")                                 AFTBDY     282
 1040 FORMAT(4F10.0,2I5)                                                AFTBDY     283
 1050 FORMAT("0",5X,"R1,R2,R3,R4,IERR,ITERMX = ",4E15.5,2I5)            AFTBDY     284
 1060 FORMAT(3F10.0)                                                    AFTBDY     285
 1070 FORMAT("0",5X,"IPRT1,IDEL1,JDEL1,IPRT2,IDEL2,JDEL2 = ",6I5)       AFTBDY     286
 1080 FORMAT(4A10)                                                      AFTBDY     287
 1090 FORMAT("0",5X,"HED1 = ",4A10)                                     AFTBDY     288
 1100 FORMAT("0",5X,"HED2 = ",4A10)                                     AFTBDY     289
 1110 FORMAT(6I5,8A10)                                                  AFTBDY     290
 1120 FORMAT(1X,8E15.8)                                                 AFTBDY     291
 1130 FORMAT("1"////5X,"*** SOLUTION DID NOT CONVERGE. SOLUTION",       AFTBDY     292
     1      " NOT STORED ON UNIT 1"//5X,"*** MAX ERROR IN Y = ",E15.6,  AFTBDY     293
     2      "OCCURED AT LOCATION = ",I5,",",I5,",",I5//5X,"*** MAX",    AFTBDY     294
     3      " ERROR ALLOWED = ",E15.6//5X,"*** NO. OF ITERATIONS",      AFTBDY     295
     4      " PERFORMED = ",I5)                                         AFTBDY     296
C**                                                                     AFTBDY     297
      END                                                               AFTBDY     298
      SUBROUTINE INIT                                                   AFTBDY     299
C**                                                                     AFTBDY     300
C**       THIS SUBROUTINE COMPUTES INITIAL GUESS ON THE AFTER BODY      AFTBDY     301
C**       MODEL. ONLY ONE-HALF OF THE BODY IS CONSIDERED. THE BODY      AFTBDY     302
C**       CONSISTS OF A 4-DEGREE WEDGE SECTION AND A AFTER BODY         AFTBDY     303
C**       WHICH IS CURVED IN X AS WELL AS Z-DIRECTION. THE WEDGE        AFTBDY     304
C**       HAS A LENGTH OF 62.3 AND THE AFT BODY HAS A LENGTH OF         AFTBDY     305
C**       27.7. THE HALF WIDTH IS  12. IN THE AFTER BODY                AFTBDY     306
C**       Y-CENTERLINE (YCL)  IS GIVEN BY                               AFTBDY     307
C**             YCL = C + (D*D - (X-E)*(X-E))**0.5                      AFTBDY     308
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C**               WHERE  C = -457.8350                                    AFTBDY     309
C**                      D =  463.3164                                    AFTBDY     310
C**                      E =  94.56704                                    AFTBDY     311
C**                                                                       AFTBDY     312
C**       IN LATERAL DIRECTION                                            AFTBDY     313
C**             Y = YCL - R + (R*R - Z*Z) ** 0.5                          AFTBDY     314
C**             WHERE  R = (A+B(Y-62.3)) **-1.0                           AFTBDY     315
C**                    A = 3.5521E-4     B=2.23505E-4                     AFTBDY     316
C**                    NOTE: Z COMPUTED FROM CENTERLINE OF BODY.          AFTBDY     317
C**                                                                       AFTBDY     318
      COMMON /BXXX/ X(IMXLL,JMXLL,KMXLL),Y(IMXLL,JMXLL,KMXLL),            AFTBDY     319
     1     Z(IMXLL,JMXLL,KMXLL),P(IMXLL),Q(JMXLL),R(KMXLL)                AFTBDY     320
      COMMON /AXXX/ IMAX,JMAX,KMAX,ILIMIT,JLIMIT,KLIMIT,ISOLN,            AFTBDY     321
     1    KKK,XERRMX,YERRMX,ZERRMX,IXERI,IXERJ,IXERK,IYERI,IYERJ,         AFTBDY     322
     2    IYERK,IZERI,IZERJ,IZERK,R1,R2,R3,R4,IERR,ITERMX,IPRT1,          AFTBDY     323
     3    IDEL1,JDEL1,IPRT2,IDEL2,JDEL2,NPLT1,ITYPE,ISTN,SIZE1,           AFTBDY     324
     4    SIZE2,LL,HED1(4),HED2(4),IPLSET,FILLXX(25)                      AFTBDY     325
C**                                                                       AFTBDY     326
C**       COMPUTE YCL.  TAN4 IS TANGENT OF 4-DEGREES.                     AFTBDY     327
C**                                                                       AFTBDY     328
      TAN4 = .0699268119                                                  AFTBDY     329
      A = 0.00035521                                                      AFTBDY     330
      B = 0.000223505                                                     AFTBDY     331
      DO 50 I = 1,IMAX                                                    AFTBDY     332
        Z(I,1,1) = 0.0                                                    AFTBDY     333
        IF(X(I,1,1).GT.62.3) GO TO 20                                     AFTBDY     334
          Y(I,1,1) = X(I,1,1) * TAN4                                      AFTBDY     335
          GO TO 40                                                        AFTBDY     336
   20   CONTINUE                                                          AFTBDY     337
          Y(I,1,1) = -457.8350 + (463.3164*463.3164 -                     AFTBDY     338
     1         (X(I,1,1) - 94.56704)* (X(I,1,1) - 94.56704))**0.5         AFTBDY     339
   40     CONTINUE                                                        AFTBDY     340
   50 CONTINUE                                                            AFTBDY     341
C**                                                                       AFTBDY     342
C**       ON  ALL I STATIONS X IS CONSTANT AND ON ALL                     AFTBDY     343
C**       K-STATIONS Z IS CONSTANT                                        AFTBDY     344
C**                                                                       AFTBDY     345
      DO 75 I = 1,IMAX                                                    AFTBDY     346
        DO 75 J = 1,JMAX                                                  AFTBDY     347
          DO 75 K = 1,KMAX                                                AFTBDY     348
            X(I,J,K) = X(I,1,1)                                           AFTBDY     349
            Z(I,J,K) = Z(1,1,K)                                           AFTBDY     350
   75 CONTINUE                                                            AFTBDY     351
C**                                                                       AFTBDY     352
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C**       ON J = JMAX Y = Y(1,JMAX,1)                                    AFTBDY     353
C**                                                                      AFTBDY     354
      DO 100 I = 1,IMAX                                                 AFTBDY     355
        DO 100 K = 1,KMAX                                               AFTBDY     356
          Y(I,JMAX,K) = Y(1,JMAX,1)                                     AFTBDY     357
  100 CONTINUE                                                          AFTBDY     358
C**                                                                     AFTBDY     359
C**         COMPUTE Y ON J = 1.  UPTO X = 62.3 Y STAYS CONSTANT IN K    AFTBDY     360
C**         DIRECTION. FOR X GREATER THAN 62.3 Y HAS TO BE COMPUTED.    AFTBDY     361
C**                                                                     AFTBDY     362
      DO 130 I = 1,IMAX                                                 AFTBDY     363
        DO 120 K = 2,KMAX                                               AFTBDY     364
          IF(X(I,1,1).GT.62.3) GO TO 110                                AFTBDY     365
            Y(I,1,K) = Y(I,1,1)                                         AFTBDY     366
            GO TO 115                                                   AFTBDY     367
  110     CONTINUE                                                      AFTBDY     368
          RR = 1.0 / (A + B*(X(I,1,1) - 62.3))                          AFTBDY     369
          Y(I,1,K) = Y(I,1,1) - RR + (RR*RR - Z(I,1,K)                  AFTBDY     370
     1      * Z(I,1,K)) ** 0.5                                         AFTBDY     371
  115   CONTINUE                                                        AFTBDY     372
  120 CONTINUE                                                          AFTBDY     373
  130 CONTINUE                                                          AFTBDY     374
C**                                                                     AFTBDY     375
C**         COMPUTE Y FROM J = 2 THRU JMAX - 1. POINTS  ARE             AFTBDY     376
C**         DISTRIBUTED IN THE SAME RATIO AS ON I = 1,K=1 LINE.         AFTBDY     377
C**                                                                     AFTBDY     378
      J1 = JMAX - 1                                                     AFTBDY     379
      DO 150 I = 1,IMAX                                                 AFTBDY     380
        DO 150 J = 2,J1                                                 AFTBDY     381
          DO 150 K = 1,KMAX                                             AFTBDY     382
            Y(I,J,K) = Y(I,1,K) + (Y(I,JMAX,K) - Y(I,1,K)) *            AFTBDY     383
     1        (Y(1,J,1) - Y(1,1,1)) /(Y(1,JMAX,1) - Y(1,1,1))           AFTBDY     384
  150 CONTINUE                                                          AFTBDY     385
C**                                                                     AFTBDY     386
C**         INITIAL GUESS SPECIFIED. COMPUTE P,Q, AND R                 AFTBDY     387
C**                                                                     AFTBDY     388
      I1 = IMAX - 1                                                     AFTBDY     389
      DO 200 I = 2,I1                                                   AFTBDY     390
         XUU =  X(I+1,1,1) - 2.0*X(I,1,1) + X(I-1,1,1)                  AFTBDY     391
         XU  =  0.5 * (X(I+1,1,1) - X(I-1,1,1))                         AFTBDY     392
         P(I) = - XUU / (XU*XU*XU)                                      AFTBDY     393
  200 CONTINUE                                                          AFTBDY     394
C**                                                                     AFTBDY     395
      DO 250 J = 2,J1                                                   AFTBDY     396
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      YUU =  Y(1,J+1,1) - 2.0*Y(1,J,1) + Y(1,J-1,1)                     AFTBDY     397
      YU  =  0.5 * (Y(1,J+1,1) - Y(1,J-1,1))                            AFTBDY     398
      Q(J) = - YUU / (YU*YU*YU)                                         AFTBDY     399
  250 CONTINUE                                                          AFTBDY     400
C**                                                                     AFTBDY     401
      K1 = KMAX - 1                                                     AFTBDY     402
      DO 300 K = 2,K1                                                   AFTBDY     403
      ZUU = Z(1,1,K+1) - 2.0*Z(1,1,K) + Z(1,1,K-1)                      AFTBDY     404
      ZU  =  0.5 * (Z(1,1,K+1) - Z(1,1,K-1))                            AFTBDY     405
      R(K) = - ZUU / (ZU*ZU*ZU)                                         AFTBDY     406
  300 CONTINUE                                                          AFTBDY     407
C**                                                                     AFTBDY     408
      RETURN                                                            AFTBDY     409
      END                                                               AFTBDY     410
      SUBROUTINE CALCOR                                                 AFTBDY     411
C**                                                                     AFTBDY     412
C**       THIS SUBROUTINE COMPUTES Y-CORDINATE ONLY IN THE INNER GRID.  AFTBDY     413
C**       X AND Z COORDINATES IN THE GRID ARE FIXED. FOR SIMPLICITY     AFTBDY     414
C**       U SIGNIFIES XI, V - ETA, AND W - TAU. THUS XU SIGNIFIES       AFTBDY     415
C**       DX/DXI. XUU = D2X/DXI2 AND SO ON.                             AFTBDY     416
C**       KKK = 0 SIGNIFIES UNCONVERGED SOLUTION.                       AFTBDY     417
C**                                                                     AFTBDY     418
      COMMON /BXXX/ X(IMXLL,JMXLL,KMXLL),Y(IMXLL,JMXLL,KMXLL),          AFTBDY     419
     1     Z(IMXLL,JMXLL,KMXLL),P(IMXLL),Q(JMXLL),R(KMXLL)              AFTBDY     420
      COMMON /AXXX/ IMAX,JMAX,KMAX,ILIMIT,JLIMIT,KLIMIT,ISOLN,          AFTBDY     421
     1    KKK,XERRMX,YERRMX,ZERRMX,IXERI,IXERJ,IXERK,IYERI,IYERJ,       AFTBDY     422
     2    IYERK,IZERI,IZERJ,IZERK,R1,R2,R3,R4,IERR,ITERMX,IPRT1,        AFTBDY     423
     3    IDEL1,JDEL1,IPRT2,IDEL2,JDEL2,NPLT1,ITYPE,ISTN,SIZE1,         AFTBDY     424
     4    SIZE2,LL,HED1(4),HED2(4),IPLSET,FILLXX(25)                    AFTBDY     425
C**                                                                     AFTBDY     426
           ISOLN = 1                                                    AFTBDY     427
      KKK = 0                                                           AFTBDY     428
      IERFLG = 0                                                        AFTBDY     429
      I1 = IMAX - 1                                                     AFTBDY     430
      J1 = JMAX - 1                                                     AFTBDY     431
      K1 = KMAX - 1                                                     AFTBDY     432
      DO 600 IJK = 1,ITERMX                                             AFTBDY     433
      LL = IJK                                                          AFTBDY     434
      YERRMX = 0.0                                                      AFTBDY     435
      DO 400 I = 2,I1                                                   AFTBDY     436
      DO 400 J = 2,J1                                                   AFTBDY     437
      DO 400 K = 2,K1                                                   AFTBDY     438
        YTEMP = Y(I,J,K)                                                AFTBDY     439
        PPP = P(I)                                                      AFTBDY     440
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      QQQ = Q(J)                                                          AFTBDY     441
      RRR = R(K)                                                          AFTBDY     442
      IP1 = I+1                                                           AFTBDY     443
      IM1 = I-1                                                           AFTBDY     444
      JP1 = J+1                                                           AFTBDY     445
      JM1 = J-1                                                           AFTBDY     446
      KP1 = K+1                                                           AFTBDY     447
      KM1 = K-1                                                           AFTBDY     448
      XU = (X(IP1,J,K) - X(IM1,J,K)) * 0.5                                AFTBDY     449
      YU = (Y(IP1,J,K) - Y(IM1,J,K)) * 0.5                                AFTBDY     450
      ZU = (Z(IP1,J,K) - Z(IM1,J,K)) * 0.5                                AFTBDY     451
      XV = (X(I,JP1,K) - X(I,JM1,K)) * 0.5                                AFTBDY     452
      YV = (Y(I,JP1,K) - Y(I,JM1,K)) * 0.5                                AFTBDY     453
      ZV = (Z(I,JP1,K) - Z(I,JM1,K)) * 0.5                                AFTBDY     454
      XW = (X(I,J,KP1) - X(I,J,KM1)) * 0.5                                AFTBDY     455
      YW = (Y(I,J,KP1) - Y(I,J,KM1)) * 0.5                                AFTBDY     456
      ZW = (Z(I,J,KP1) - Z(I,J,KM1)) * 0.5                                AFTBDY     457
      YUU = Y(IP1,J,K) - 2.0*Y(I,J,K) + Y(IM1,J,K)                        AFTBDY     458
      YVV = Y(I,JP1,K) - 2.0*Y(I,J,K) + Y(I,JM1,K)                        AFTBDY     459
      YWW = Y(I,J,KP1) - 2.0*Y(I,J,K) + Y(I,J,KM1)                        AFTBDY     460
      YUV = 0.25*(Y(IP1,JP1,K) - Y(IP1,JM1,K) - Y(IM1,JP1,K) +            AFTBDY     461
     1    Y(IM1,JM1,K))                                                  AFTBDY     462
      YUW = 0.25*(Y(IP1,J,KP1) - Y(IP1,J,KM1) - Y(IM1,J,KP1) +            AFTBDY     463
     1    Y(IM1,J,KM1))                                                  AFTBDY     464
      YVW = 0.25*(Y(I,JP1,KP1) - Y(I,JM1,KP1) - Y(I,JP1,KM1) +            AFTBDY     465
     1    Y(I,JM1,KM1))                                                  AFTBDY     466
C**                                                                       AFTBDY     467
      AJ = XU*(YV*ZW - ZV*YW) - XV*(YU*ZW - YW*ZU) +                       AFTBDY     468
     1     XW*(YU*ZV - YV*ZU)                                             AFTBDY     469
      CUU = (XV*YW - XW*YV)**2 + (XV*ZW - XW*ZV)**2 +                      AFTBDY     470
     1    (YV*ZW - YW*ZV)**2                                             AFTBDY     471
      CUV = (XU*YW - XW*YU)*(XV*YW - XW*YV) + (XU*ZW - XW*ZU) *            AFTBDY     472
     1    (XV*ZW - XW*ZV) + (YU*ZW - YW*ZU) * (YV*ZW - YW*ZV)             AFTBDY     473
      CUW = (XU*YV - XV*YU)*(XV*YW - XW*YV) + (XU*ZV - XV*ZU) *            AFTBDY     474
     1    (XV*ZW - XW*ZV) + (YU*ZV - YV*ZU) * (YV*ZW - YW*ZV)             AFTBDY     475
      CVV = (XU*YW - XW*YU)**2 + (XU*ZW - XW*ZU)**2 +                      AFTBDY     476
     1      (YU*ZW - YW*ZU)**2                                           AFTBDY     477
      CVW = (XU*YV - XV*YU)*(XU*YW - XW*YU)+ (XU*ZV - XV*ZU) *             AFTBDY     478
     1      (XU*ZW - XW*ZU) + (YU*ZV - YV*ZU) * (YU*ZW - YW*ZU)           AFTBDY     479
      CWW = (XU*YV - XV*YU)**2 + (XU*ZV - XV*ZU)**2 +                      AFTBDY     480
     1      (YU*ZV - YV*ZU)**2                                           AFTBDY     481
      CF = 0.5 / (CUU + CVV + CWW)                                        AFTBDY     482
      YTEMP1 = CF*(CUU*(Y(I+1,J,K) + Y(I-1,J,K)) - 2.0*CUV*YUV            AFTBDY     483
     1    +2.0*CUW*YUW + CVV*(Y(I,J+1,K) + Y(I,J-1,K))                   AFTBDY     484
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     2          + CWW*(Y(I,J,K+1) + Y(I,J,K-1)) - 2.0*CVW*YVW +                  AFTBDY     485
     3          (PPP*YU + QQQ*YV + RRR*YW) * (AJ*AJ))                            AFTBDY     486
           Y(I,J,K) = (1.0-R1) * YTEMP + R1*YTEMP1                               AFTBDY     487
C**                                                                              AFTBDY     488
C**             COMPUTE  MAX Y-ERROR                                             AFTBDY     489
C**                                                                              AFTBDY     490
           YERR   = ABS(YTEMP - Y(I,J,K))                                        AFTBDY     491
           IF(YERR.LE.YERRMX) GO TO 150                                          AFTBDY     492
             YERRMX = YERR                                                       AFTBDY     493
             IYERI  = I                                                          AFTBDY     494
             IYERJ  = J                                                          AFTBDY     495
             IYERK  = K                                                          AFTBDY     496
  150      CONTINUE                                                             AFTBDY     497
  400    CONTINUE                                                               AFTBDY     498
C**                                                                              AFTBDY     499
C**         CHECK IF ERROR NEEDS TO BE PRINTED                                   AFTBDY     500
C**                                                                              AFTBDY     501
         IERFLG = IERFLG + 1                                                     AFTBDY     502
         IF(IERFLG.LT.IERR) GO TO 450                                            AFTBDY     503
            WRITE(6,1000) LL,YERRMX,IYERI,IYERJ,IYERK                            AFTBDY     504
            IERFLG = 0                                                           AFTBDY     505
  450    CONTINUE                                                               AFTBDY     506
C**                                                                              AFTBDY     507
C**         CHECK FOR CONVERGENCE                                                AFTBDY     508
C*                                                                               AFTBDY     509
         IF(YERRMX.LT.R3) KKK = 1                                                AFTBDY     510
         IF(YERRMX.LT.R3) GO TO 650                                              AFTBDY     511
  600 CONTINUE                                                                   AFTBDY     512
C**                                                                              AFTBDY     513
  650 CONTINUE                                                                   AFTBDY     514
C**                                                                              AFTBDY     515
      RETURN                                                                     AFTBDY     516
 1000 FORMAT("0",5X,"ITERATION NO.,MAX Y-ERR, LOC  = ",I5,2X,E15.5,2X,          AFTBDY     517
     1    3I5)                                                                   AFTBDY     518
C**                                                                              AFTBDY     519
      END                                                                        AFTBDY     520
      SUBROUTINE IPRTC                                                           AFTBDY     521
C**                                                                              AFTBDY     522
C**         SUBROUTINE USED TO PRINT INITIAL, CONVERGED OR PARTIALLY             AFTBDY     523
C**         CONVERGED SOLUTION. ALL PERTINENT PARAMETERS ARE PASSED              AFTBDY     524
C**         THRU COMMON.                                                         AFTBDY     525
C**         ISOLN = 0 INDICATES INITIAL GUESS                                    AFTBDY     526
C**         ISOLN = 1 AND KKK = 0 INDICATES PARTIALLY CONVERGED SOLN             AFTBDY     527
C**         ISOLN = 1 AND KKK = 1 INDICATES CONVERGED SOLUTION.                  AFTBDY     528
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C**                                                                    AFTBDY     529
      COMMON /BXXX/ X(IMXLL,JMXLL,KMXLL),Y(IMXLL,JMXLL,KMXLL),         AFTBDY     530
     1      Z(IMXLL,JMXLL,KMXLL),P(IMXLL),Q(JMXLL),R(KMXLL)           AFTBDY     531
      COMMON /AXXX/ IMAX,JMAX,KMAX,ILIMIT,JLIMIT,KLIMIT,ISOLN,         AFTBDY     532
     1     KKK,XERRMX,YERRMX,ZERRMX,IXERI,IXERJ,IXERK,IYERI,IYERJ,     AFTBDY     533
     2     IYERK,IZERI,IZERJ,IZERK,R1,R2,R3,R4,IERR,ITERMX,IPRT1,      AFTBDY     534
     3     IDEL1,JDEL1,IPRT2,IDEL2,JDEL2,NPLT1,ITYPE,ISTN,SIZE1,       AFTBDY     535
     4     SIZE2,LL,HED1(4),HED2(4),IPLSET,FILLXX(25)                  AFTBDY     536
C**                                                                    AFTBDY     537
      IF(ISOLN.EQ.1) GO  TO  10                                        AFTBDY     538
         IPRTX = IPRT1                                                 AFTBDY     539
         IDELX = IDEL1                                                 AFTBDY     540
         JDELX = JDEL1                                                 AFTBDY     541
         GO TO 20                                                      AFTBDY     542
   10 CONTINUE                                                         AFTBDY     543
C**                                                                    AFTBDY     544
         IPRTX = IPRT2                                                 AFTBDY     545
         IDELX = IDEL2                                                 AFTBDY     546
         JDELX = JDEL2                                                 AFTBDY     547
   20 CONTINUE                                                         AFTBDY     548
C**                                                                    AFTBDY     549
      IF(IPRTX.EQ.0) GO TO 600                                         AFTBDY     550
C**                                                                    AFTBDY     551
C**           WRITE HEADINGS                                           AFTBDY     552
C**                                                                    AFTBDY     553
      WRITE(6,1000) HED1                                               AFTBDY     554
      WRITE(6,1010) HED2                                               AFTBDY     555
      IF(ISOLN.EQ.0) WRITE(6,1020)                                     AFTBDY     556
      IF(ISOLN.EQ.1.AND.KKK.EQ.0) WRITE(6,1030)                        AFTBDY     557
      IF(ISOLN.EQ.1.AND.KKK.EQ.1) WRITE(6,1040)                        AFTBDY     558
      WRITE(6,1050) IMAX,JMAX,KMAX                                     AFTBDY     559
      IF(ISOLN.EQ.0) GO TO 50                                          AFTBDY     560
          WRITE(6,1060) LL                                             AFTBDY     561
           WRITE(6,1070) YERRMX,IYERI,IYERJ,IYERK                      AFTBDY     562
   50 CONTINUE                                                         AFTBDY     563
C**                                                                    AFTBDY     564
      DO 300 I = 1,IMAX,IDELX                                          AFTBDY     565
        DO 290 J = 1,JMAX,JDELX                                        AFTBDY     566
          WRITE(6,1080) I,J                                            AFTBDY     567
          WRITE(6,1090) ((X(I,J,K),Y(I,J,K),Z(I,J,K)),K=1,KMAX)        AFTBDY     568
  290   CONTINUE                                                       AFTBDY     569
  300 CONTINUE                                                         AFTBDY     570
C**                                                                    AFTBDY     571
  600 CONTINUE                                                         AFTBDY     572
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      RETURN                                                            AFTBDY     573
C**                                                                     AFTBDY     574
C**         FORMAT STATEMENTS                                           AFTBDY     575
C**                                                                     AFTBDY     576
 1000 FORMAT("1"//40X,4A10)                                             AFTBDY     577
 1010 FORMAT(/40X,4A10)                                                 AFTBDY     578
 1020 FORMAT("0",49X,"*** INITIAL SOLUTION ***")                        AFTBDY     579
 1030 FORMAT("0",41X,"*** PARTIALLY CONVERGED SOLUTION ***")            AFTBDY     580
 1040 FORMAT("0",48X,"*** CONVERGED SOLUTION ***")                      AFTBDY     581
 1050 FORMAT("0",41X,"IMAX = ",I3,4X,"JMAX = ",I3,4X,"KMAX = ",I3)      AFTBDY     582
 1060 FORMAT("0",47X,"ITERATION PERFORMED = ",I5)                       AFTBDY     583
 1070 FORMAT(" ",34X,"MAX Y-ERR = ",E14.6,"   AT LOC I,J,K = ",3I5)     AFTBDY     584
 1080 FORMAT(//5X,"I = ",I3,"  J = ",I3,"  (X,Y,Z)")                    AFTBDY     585
 1090 FORMAT(5X,E11.5,3X,E11.5,3X,E11.5,3X,E11.5,3X,E11.5,3X,E11.5,     AFTBDY     586
     1    3X,E11.5,3X,E11.5,3X,E11.5)                                   AFTBDY     587
C**                                                                     AFTBDY     588
      END                                                               AFTBDY     589
      SUBROUTINE IPLTC                                                  AFTBDY     590
C**                                                                     AFTBDY     591
C**         SUBROUTINE USED TO PLOT INITIAL CONVERGED OR PARTIALL       AFTBDY     592
C**         CONVERGED SOLUTION. SEE COMMENTS  UNDER IPRTC ROUTINE       AFTBDY     593
C**                                                                     AFTBDY     594
      COMMON /BXXX/ X(IMXLL,JMXLL,KMXLL),Y(IMXLL,JMXLL,KMXLL),          AFTBDY     595
     1     Z(IMXLL,JMXLL,KMXLL),P(IMXLL),Q(JMXLL),R(KMXLL)              AFTBDY     596
      COMMON /AXXX/ IMAX,JMAX,KMAX,ILIMIT,JLIMIT,KLIMIT,ISOLN,          AFTBDY     597
     1    KKK,XERRMX,YERRMX,ZERRMX,IXERI,IXERJ,IXERK,IYERI,IYERJ,       AFTBDY     598
     2    IYERK,IZERI,IZERJ,IZERK,R1,R2,R3,R4,IERR,ITERMX,IPRT1,        AFTBDY     599
     3    IDEL1,JDEL1,IPRT2,IDEL2,JDEL2,NPLT1,ITYPE,ISTN,SIZE1,         AFTBDY     600
     4    SIZE2,LL,HED1(4),HED2(4),IPLSET,FILLXX(25)                    AFTBDY     601
C**                                                                     AFTBDY     602
      DIMENSION XDUM(75),YDUM(75),ZDUM(75),HED(4)                       AFTBDY     603
     1                                                                  AFTBDY     604
C**                                                                     AFTBDY     605
C**         READ A CARD AND SEE IF PLOTS PLOTTED OR NOT                 AFTBDY     606
C**                                                                     AFTBDY     607
      READ(5,1000) NPLT1                                                AFTBDY     608
      IF(NPLT1.EQ.0) GO TO 900                                          AFTBDY     609
C**                                                                     AFTBDY     610
      IF(IPLSET.EQ.1) GO TO 20                                          AFTBDY     611
        IPLSET = 1                                                      AFTBDY     612
        CALL PSEUDO                                                     AFTBDY     613
        CALL FONTS(1)                                                   AFTBDY     614
   20 CONTINUE                                                          AFTBDY     615
C**                                                                     AFTBDY     616
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C**        READ NPLT1 CARDS AND PLOT                                    AFTBDY     617
C**                                                                     AFTBDY     618
      DO 500 KLM = 1,NPLT1                                              AFTBDY     619
        READ(5,1040) ITYPE,ISTN,SIZE1                                   AFTBDY     620
C**                                                                     AFTBDY     621
C**        PRINT HEADINGS.                                              AFTBDY     622
C**                                                                     AFTBDY     623
      CALL SCRIBE(0.3,1.5,0.15,0.5,HED1,90.,40,9)                       AFTBDY     624
      CALL SCRIBE(0.55,1.5,0.15,0.5,HED2,90.,40,9)                      AFTBDY     625
C**                                                                     AFTBDY     626
      IF(ISOLN.EQ.1) GO TO 50                                           AFTBDY     627
          HED(1) = 10H--- INITIA                                        AFTBDY     628
          HED(2) = 10HL GUESS --                                        AFTBDY     629
          HED(3) = 1H-                                                  AFTBDY     630
          INUMC = 21                                                    AFTBDY     631
          GO TO 100                                                     AFTBDY     632
C**                                                                     AFTBDY     633
   50 CONTINUE                                                          AFTBDY     634
      IF(KKK.EQ.1) GO TO 75                                             AFTBDY     635
          HED(1) = 10H--- PARTIA                                        AFTBDY     636
          HED(2) = 10HLLY CONVER                                        AFTBDY     637
          HED(3) = 10HGED SOLUTI                                        AFTBDY     638
          HED(4) = 10HON ---                                            AFTBDY     639
          INUMC = 37                                                    AFTBDY     640
          GO TO 100                                                     AFTBDY     641
C**                                                                     AFTBDY     642
   75 CONTINUE                                                          AFTBDY     643
          HED(1) = 10H--- CONVER                                        AFTBDY     644
          HED(2) = 10HGED SOLUTI                                        AFTBDY     645
          HED(3) = 7HON ---                                             AFTBDY     646
          INUMC = 27                                                    AFTBDY     647
C**                                                                     AFTBDY     648
  100 CONTINUE                                                          AFTBDY     649
      CALL SCRIBE(0.70,3.0,0.1,0.5,HED,90.0,INUMC,9)                    AFTBDY     650
C**                                                                     AFTBDY     651
C**        WRITE ARRAY SIZES                                            AFTBDY     652
C**                                                                     AFTBDY     653
      ENCODE(40,1020,HED) IMAX,JMAX,KMAX                                AFTBDY     654
      CALL SCRIBE(0.85,3.0,0.1,0.5,HED,90.0,36,9)                       AFTBDY     655
        IF(ITYPE.EQ.2) GO TO 140                                        AFTBDY     656
          XX = X(ISTN,1,1)                                              AFTBDY     657
          ENCODE(40,1060,HED) ISTN,XX                                   AFTBDY     658
          GO TO 160                                                     AFTBDY     659
C**                                                                     AFTBDY     660
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  140   CONTINUE                                                          AFTBDY     661
           ZZ = Z(1,1,ISTN)                                               AFTBDY     662
           ENCODE(40,1080,HED) ISTN,ZZ                                    AFTBDY     663
  160   CONTINUE                                                          AFTBDY     664
        CALL SCRIBE(1.2,3.0,0.1,0.5,HED,90.0,38,9)                        AFTBDY     665
        CALL NFRAME                                                       AFTBDY     666
C**                                                                       AFTBDY     667
C**        START PLOT. IF ITYPE = 1 THEN Y-Z PLANE PLOTTED. IF ITYPE =2   AFTBDY     668
C**        THEN X-Y PLANE PLOTTED.                                        AFTBDY     669
C**                                                                       AFTBDY     670
        IF(ITYPE.EQ.2) GO TO 300                                          AFTBDY     671
C**                                                                       AFTBDY     672
C**        COMPUTE YMIN,YMAX, ZMIN,ZMAX                                   AFTBDY     673
C**                                                                       AFTBDY     674
        YMIN = 10000.0                                                    AFTBDY     675
        YMAX = -10000.0                                                   AFTBDY     676
        ZMIN = 10000.0                                                    AFTBDY     677
        ZMAX = -10000.0                                                   AFTBDY     678
        DO 180 J = 1,JMAX                                                 AFTBDY     679
          DO 180 K = 1,KMAX                                               AFTBDY     680
            IF(Y(ISTN,J,K).LT.YMIN) YMIN = Y(ISTN,J,K)                    AFTBDY     681
            IF(Y(ISTN,J,K).GT.YMAX) YMAX = Y(ISTN,J,K)                    AFTBDY     682
            IF(Z(ISTN,J,K).GT.ZMAX) ZMAX = Z(ISTN,J,K)                    AFTBDY     683
            IF(Z(ISTN,J,K).LT.ZMIN) ZMIN = Z(ISTN,J,K)                    AFTBDY     684
  180   CONTINUE                                                          AFTBDY     685
        SIZE2 = SIZE1 * (YMAX - YMIN) / (ZMAX - ZMIN)                     AFTBDY     686
C**                                                                       AFTBDY     687
C**        START PLOT. ETA LINES FIRST.                                   AFTBDY     688
C**                                                                       AFTBDY     689
        DO 200 J = 1,JMAX                                                 AFTBDY     690
          DO 190 K = 1,KMAX                                               AFTBDY     691
            YDUM(K) = Y(ISTN,J,K)                                         AFTBDY     692
            ZDUM(K) = Z(ISTN,J,K)                                         AFTBDY     693
  190     CONTINUE                                                        AFTBDY     694
          CALL INFOPLT(0,KMAX,ZDUM,1,YDUM,1,ZMIN,ZMAX,YMIN,YMAX,          AFTBDY     695
     1         1.0,0,HED,0,HED,0,SIZE1,SIZE2,0.0,2.0)                     AFTBDY     696
  200   CONTINUE                                                          AFTBDY     697
C**                                                                       AFTBDY     698
C**             ZETA LINES.                                               AFTBDY     699
C**                                                                       AFTBDY     700
        KK = 0                                                            AFTBDY     701
        DO 230 K = 1,KMAX                                                 AFTBDY     702
          IF(K.EQ.KMAX) KK = 1                                            AFTBDY     703
          DO 215 J = 1,JMAX                                               AFTBDY     704
```

```
            YDUM(J) = Y(ISTN,J,K)                                          AFTBDY     705
            ZDUM(J) = Z(ISTN,J,K)                                          AFTBDY     706
  215     CONTINUE                                                         AFTBDY     707
          CALL INFOPLT(KK,JMAX,ZDUM,1,YDUM,1,ZMIN,ZMAX,YMIN,YMAX,          AFTBDY     708
         1      1.0,0,HED,0,HED,0,SIZE1,SIZE2,0.0,2.0)                    AFTBDY     709
  230   CONTINUE                                                           AFTBDY     710
        GO TO 480                                                          AFTBDY     711
C**                                                                        AFTBDY     712
C**                                                                        AFTBDY     713
C**       X-Y PLANE IS TO BE PLOTTED.                                      AFTBDY     714
C**                                                                        AFTBDY     715
  300   CONTINUE                                                           AFTBDY     716
        XMIN = 10000.0                                                     AFTBDY     717
        XMAX = -10000.0                                                    AFTBDY     718
        YMIN = 10000.0                                                     AFTBDY     719
        YMAX = -10000.0                                                    AFTBDY     720
        DO 320 I = 1,IMAX                                                  AFTBDY     721
          DO 320 J = 1,JMAX                                                AFTBDY     722
            IF(X(I,J,ISTN).LT.XMIN) XMIN = X(I,J,ISTN)                     AFTBDY     723
            IF(X(I,J,ISTN).GT.XMAX) XMAX = X(I,J,ISTN)                     AFTBDY     724
            IF(Y(I,J,ISTN).LT.YMIN) YMIN = Y(I,J,ISTN)                     AFTBDY     725
            IF(Y(I,J,ISTN).GT.YMAX) YMAX = Y(I,J,ISTN)                     AFTBDY     726
  320   CONTINUE                                                           AFTBDY     727
        SIZE2 = SIZE1 * (YMAX - YMIN) / (XMAX - XMIN)                      AFTBDY     728
C**                                                                        AFTBDY     729
C**       ETA  LINES                                                       AFTBDY     730
C**                                                                        AFTBDY     731
        DO 350 J = 1,JMAX                                                  AFTBDY     732
          DO 340 I = 1,IMAX                                                AFTBDY     733
            XDUM(I) = X(I,J,ISTN)                                          AFTBDY     734
            YDUM(I) = Y(I,J,ISTN)                                          AFTBDY     735
  340     CONTINUE                                                         AFTBDY     736
          CALL INFOPLT(0,IMAX,XDUM,1,YDUM,1,XMIN,XMAX,YMIN,YMAX,           AFTBDY     737
         1      1.0,0,HED,0,HED,0,SIZE1,SIZE2,0.0,2.0)                    AFTBDY     738
  350   CONTINUE                                                           AFTBDY     739
C**                                                                        AFTBDY     740
C**       XI - LINES                                                       AFTBDY     741
C**                                                                        AFTBDY     742
        KK = 0                                                             AFTBDY     743
        DO 400 I = 1,IMAX                                                  AFTBDY     744
          IF(I.EQ.IMAX) KK = 1                                             AFTBDY     745
          DO 380 J = 1,JMAX                                                AFTBDY     746
            XDUM(J) = X(I,J,ISTN)                                          AFTBDY     747
            YDUM(J) = Y(I,J,ISTN)                                          AFTBDY     748
```

```
      380     CONTINUE                                                          AFTBDY     749
              CALL INFOPLT(KK,JMAX,XDUM,1,YDUM,1,XMIN,XMAX,YMIN,YMAX,           AFTBDY     750
         1        1.0,0,HED,0,HED,0,SIZE1,SIZE2,0.0,2.0)                        AFTBDY     751
      400   CONTINUE                                                            AFTBDY     752
     C**                                                                        AFTBDY     753
      480  CONTINUE                                                            AFTBDY     754
      500 CONTINUE                                                             AFTBDY     755
     C**                                                                        AFTBDY     756
     C**            ALL FUNCTIONS COMPLETE                                      AFTBDY     757
     C**                                                                        AFTBDY     758
      900 CONTINUE                                                            AFTBDY     759
          RETURN                                                              AFTBDY     760
     1000 FORMAT(16I5)                                                        AFTBDY     761
     1020 FORMAT(7HIMAX = ,I3,10H   JMAX = ,I3,10H   KMAX = ,I3)              AFTBDY     762
     1040 FORMAT(2I5,F10.0)                                                   AFTBDY     763
     1060 FORMAT(17H-- Y-Z PLOT  I = ,I3,7H   X = ,E11.5)                     AFTBDY     764
     1080 FORMAT(17H-- X-Y PLOT  K = ,I3,7H   Z = ,E11.5)                     AFTBDY     765
     C**                                                                        AFTBDY     766
          END                                                                 AFTBDY     767
```

CORRECTION IDENTS ARE LISTED IN CHRONOLOGICAL ORDER OF INSERTION

AFTBDY

S ARE LISTED IN THE ORDER OF THEIR OCCURRENCE ON A NEW PROGRAM LIBRARY IF ONE IS CREATED BY THIS UPDATE

YANK$$$ AFTBDY

B. Job Control Cards

A list of job control cards needed to run this program are included in the comment section of the main program AFTBDY.

C. Input Explanation

The instructions for input preparation are included in the comment section of the main program COORDC.

D. Sample Input

Sample input listing follows on the next page.

E. Sample Output

Sample output follows sample input.

PROGRAM NO.
CODED BY
DIVISION SECTION

LANGLEY RESEARCH CENTER
FORTRAN - DATA CODING FORM

DAT
PAG
JOB ORDER

FORTRAN STATEMENT

STATEMENT NUMBER (1-5)	6	7-10	11-15	16-63
26		26	21	
		0.9	0.	00001 0.000005 0.00001 50 500
		0.0		
		3.6		
		7.2		
		10.8		
		14.4		
		18.0		
		21.6		
		25.2		
		28.8		
		32.4		
		36.0		
		39.6		
		43.2		
		46.8		
		50.4		
		54.0		
		57.6		
		61.2		
		64.8		
		68.4		
		72.0		
		75.6		
		79.2		

NASA-Langley Form 67 (MAR 69)

NOTE: WRITE NUMBERS 10, LETTERS I Ø U G Ƶ C, SYMBOLS / . , *

PROGRAM NO.__________
CODED BY__________
DIVISION__________ SECTION__________

LANGLEY RESEARCH CENTER

FORTRAN - DATA CODING FORM

C
P
JOB ORDER_

STATEMENT NUMBER | CONTINUATION | FORTRAN STATEMENT

```
      82.8
      86.4
      90.0
                 0.0
           0.181317
           0.370322
           0.574111
           0.799135
           1.051200
           1.335468
           1.656453
           2.018028
           2.423416
           2.875200
           3.375314
           3.925048
           4.525048
           5.175314
           5.875200
           6.623416
           7.418028
           8.256453
           9.135468
          10.051200
          10.999135
```

NASA-Langley Form 67 (MAR 69)

NOTE: WRITE NUMBERS 10, LETTERS I Ø U G Z C, SYMBOLS / . , *

PROGRAM NO._____

CODED BY_____

DIVISION_____SECTION_____

LANGLEY RESEARCH CENTER

FORTRAN - DATA CODING FORM

DATE_____

PAGE_____

JOB ORDER_____

STATEMENT NUMBER | CONTINUATION | FORTRAN STATEMENT

```
      11.97411 1
      12.97032 2
      13.98131 7
      15.000000
          0.000000
          0.301463
          0.611400
          0.937463
          1.286400
          1.664063
          2.075400
          2.524463
          3.014400
          3.547463
          4.125000
          4.747463
          5.414400
          6.124463
          6.875400
          7.664063
          8.486400
          9.337463
         10.211400
         11.101463
         12.000000
```

USA-Langley Form 67 (MAR 69)

NOTE: WRITE NUMBERS 10, LETTERS I Ø U G Z C, SYMBOLS / . , *

*U.S. GOVT

PROGRAM NO._____

CODED BY_____

DIVISION_____ SECTION_____

LANGLEY RESEARCH CENTER

FORTRAN - DATA CODING FORM

D

P.

JOB ORDER____

STATEMENT NUMBER | ↓ CONTINUATION | FORTRAN STATEMENT

```
      5       5       1       5       5
      AFTER BØDY NUMBER 1
      TEST STARTED FEB 16,1979
6
1     1       4.0
1     22      4.0
1     26      4.0
2     1       6.0
2     11      6.0
2     21      6.0
6
1     1       4.0
1     22      4.0
1     26      4.0
2     1       6.0
2     11      6.0
2     21      6.0
```

NOTE: WRITE NUMBERS 10, LETTERS I Ø U G Z C, SYMBOLS / . , *

NASA-Langley Form 67 (MAR 69)

```
 IMAX,JMAX,KMAX =    26   26   21
 R1,R2,R3,R4,IERR,ITERMX =    .90000E+00    .10000E-04    .50000E-05    .10000E-04   50  500
 IPRT1,IDEL1,JDEL1,IPRT2,IDEL2,JDEL2 =    1    5    5    1    5    5
 HED1 =          AFTER BODY NUMBER 1
 HED2 =          TEST STARTED FEB 16,1979
```

AFTER BODY NUMBER 1

TEST STARTED FEB 16,1979

*** INITIAL SOLUTION ***

IMAX = 26 JMAX = 26 KMAX = 21

I = 1 J = 1 (X,Y,Z)

0.	0.	0.	0.	0.	.30146E+00	0.	0.	.61140E+00
0.	0.	.93746E+00	0.	0.	.12864E+01	0.	0.	.16641E+01
0.	0.	.20754E+01	0.	0.	.25245E+01	0.	0.	.30144E+01
0.	0.	.35475E+01	0.	0.	.41250E+01	0.	0.	.47475E+01
0.	0.	.54144E+01	0.	0.	.61245E+01	0.	0.	.68754E+01
0.	0.	.76641E+01	0.	0.	.84864E+01	0.	0.	.93375E+01
0.	0.	.10211E+02	0.	0.	.11101E+02	0.	0.	.12000E+02

I = 1 J = 6 (X,Y,Z)

0.	.10512E+01	0.	0.	.10512E+01	.30146E+00	0.	.10512E+01	.61140E+00
0.	.10512E+01	.93746E+00	0.	.10512E+01	.12864E+01	0.	.10512E+01	.16641E+01
0.	.10512E+01	.20754E+01	0.	.10512E+01	.25245E+01	0.	.10512E+01	.30144E+01
0.	.10512E+01	.35475E+01	0.	.10512E+01	.41250E+01	0.	.10512E+01	.47475E+01
0.	.10512E+01	.54144E+01	0.	.10512E+01	.61245E+01	0.	.10512E+01	.68754E+01
0.	.10512E+01	.76641E+01	0.	.10512E+01	.84864E+01	0.	.10512E+01	.93375E+01
0.	.10512E+01	.10211E+02	0.	.10512E+01	.11101E+02	0.	.10512E+01	.12000E+02

I = 1 J = 11 (X,Y,Z)

0.	.28752E+01	0.	0.	.28752E+01	.30146E+00	0.	.28752E+01	.61140E+00
0.	.28752E+01	.93746E+00	0.	.28752E+01	.12864E+01	0.	.28752E+01	.16641E+01
0.	.28752E+01	.20754E+01	0.	.28752E+01	.25245E+01	0.	.28752E+01	.30144E+01
0.	.28752E+01	.35475E+01	0.	.28752E+01	.41250E+01	0.	.28752E+01	.47475E+01
0.	.28752E+01	.54144E+01	0.	.28752E+01	.61245E+01	0.	.28752E+01	.68754E+01
0.	.28752E+01	.76641E+01	0.	.28752E+01	.84864E+01	0.	.28752E+01	.93375E+01
0.	.28752E+01	.10211E+02	0.	.28752E+01	.11101E+02	0.	.28752E+01	.12000E+02

I = 1 J = 16 (X,Y,Z)

0.	.58752E+01	0.	0.	.58752E+01	.30146E+00	0.	.58752E+01	.61140E+00
0.	.58752E+01	.93746E+00	0.	.58752E+01	.12864E+01	0.	.58752E+01	.16641E+01
0.	.58752E+01	.20754E+01	0.	.58752E+01	.25245E+01	0.	.58752E+01	.30144E+01
0.	.58752E+01	.35475E+01	0.	.58752E+01	.41250E+01	0.	.58752E+01	.47475E+01
0.	.58752E+01	.54144E+01	0.	.58752E+01	.61245E+01	0.	.58752E+01	.68754E+01
0.	.58752E+01	.76641E+01	0.	.58752E+01	.84864E+01	0.	.58752E+01	.93375E+01
0.	.58752E+01	.10211E+02	0.	.58752E+01	.11101E+02	0.	.58752E+01	.12000E+02

I = 1 J = 21 (X,Y,Z)

0.	.10051E+02	0.	0.	.10051E+02	.30146E+00	0.	.10051E+02	.61140E+00
0.	.10051E+02	.93746E+00	0.	.10051E+02	.12864E+01	0.	.10051E+02	.16641E+01
0.	.10051E+02	.20754E+01	0.	.10051E+02	.25245E+01	0.	.10051E+02	.30144E+01
0.	.10051E+02	.35475E+01	0.	.10051E+02	.41250E+01	0.	.10051E+02	.47475E+01
0.	.10051E+02	.54144E+01	0.	.10051E+02	.61245E+01	0.	.10051E+02	.68754E+01
0.	.10051E+02	.76641E+01	0.	.10051E+02	.84864E+01	0.	.10051E+02	.93375E+01
0.	.10051E+02	.10211E+02	0.	.10051E+02	.11101E+02	0.	.10051E+02	.12000E+02

I = 1 J = 26 (X,Y,Z)

0.	.15000E+02	0.	0.	.15000E+02	.30146E+00	0.	.15000E+02	.61140E+00
0.	.15000E+02	.93746E+00	0.	.15000E+02	.12864E+01	0.	.15000E+02	.16641E+01
0.	.15000E+02	.20754E+01	0.	.15000E+02	.25245E+01	0.	.15000E+02	.30144E+01
0.	.15000E+02	.35475E+01	0.	.15000E+02	.41250E+01	0.	.15000E+02	.47475E+01
0.	.15000E+02	.54144E+01	0.	.15000E+02	.61245E+01	0.	.15000E+02	.68754E+01
0.	.15000E+02	.76641E+01	0.	.15000E+02	.84864E+01	0.	.15000E+02	.93375E+01
0.	.15000E+02	.10211E+02	0.	.15000E+02	.11101E+02	0.	.15000E+02	.12000E+02

I = 6 J = 1 (X,Y,Z)

.18000E+02	.12587E+01	0.	.18000E+02	.12587E+01	.30146E+00	.18000E+02	.12587E+01	.61140E+00
.18000E+02	.12587E+01	.93746E+00	.18000E+02	.12587E+01	.12864E+01	.18000E+02	.12587E+01	.16641E+01
.18000E+02	.12587E+01	.20754E+01	.18000E+02	.12587E+01	.25245E+01	.18000E+02	.12587E+01	.30144E+01
.18000E+02	.12587E+01	.35475E+01	.18000E+02	.12587E+01	.41250E+01	.18000E+02	.12587E+01	.47475E+01
.18000E+02	.12587E+01	.54144E+01	.18000E+02	.12587E+01	.61245E+01	.18000E+02	.12587E+01	.68754E+01
.18000E+02	.12587E+01	.76641E+01	.18000E+02	.12587E+01	.84864E+01	.18000E+02	.12587E+01	.93375E+01
.18000E+02	.12587E+01	.10211E+02	.18000E+02	.12587E+01	.11101E+02	.18000E+02	.12587E+01	.12000E+02

I = 6 J = 6 (X,Y,Z)

.18000E+02	.22217E+01	0.	.18000E+02	.22217E+01	.30146E+00	.18000E+02	.22217E+01	.61140E+00
.18000E+02	.22217E+01	.93746E+00	.18000E+02	.22217E+01	.12864E+01	.18000E+02	.22217E+01	.16641E+01
.18000E+02	.22217E+01	.20754E+01	.18000E+02	.22217E+01	.25245E+01	.18000E+02	.22217E+01	.30144E+01
.18000E+02	.22217E+01	.35475E+01	.18000E+02	.22217E+01	.41250E+01	.18000E+02	.22217E+01	.47475E+01
.18000E+02	.22217E+01	.54144E+01	.18000E+02	.22217E+01	.61245E+01	.18000E+02	.22217E+01	.68754E+01
.18000E+02	.22217E+01	.76641E+01	.18000E+02	.22217E+01	.84864E+01	.18000E+02	.22217E+01	.93375E+01
.18000E+02	.22217E+01	.10211E+02	.18000E+02	.22217E+01	.11101E+02	.18000E+02	.22217E+01	.12000E+02

I = 6 J = 11 (X,Y,Z)

.18000E+02	.38926E+01	0.	.18000E+02	.38926E+01	.30146E+00	.18000E+02	.38926E+01	.61140E+00
.18000E+02	.38926E+01	.93746E+00	.18000E+02	.38926E+01	.12864E+01	.18000E+02	.38926E+01	.16641E+01
.18000E+02	.38926E+01	.20754E+01	.18000E+02	.38926E+01	.25245E+01	.18000E+02	.38926E+01	.30144E+01
.18000E+02	.38926E+01	.35475E+01	.18000E+02	.38926E+01	.41250E+01	.18000E+02	.38926E+01	.47475E+01
.18000E+02	.38926E+01	.54144E+01	.18000E+02	.38926E+01	.61245E+01	.18000E+02	.38926E+01	.68754E+01
.18000E+02	.38926E+01	.76641E+01	.18000E+02	.38926E+01	.84864E+01	.18000E+02	.38926E+01	.93375E+01

.18000E+02	.38926E+01	.10211E+02	.18000E+02	.38926E+01	.11101E+02	.18000E+02	.38926E+01	.12000E+02

I = 6 J = 16 (X,Y,Z)

.18000E+02	.66409E+01	0.	.18000E+02	.66409E+01	.30146E+00	.18000E+02	.66409E+01	.61140E+00
.18000E+02	.66409E+01	.93746E+00	.18000E+02	.66409E+01	.12864E+01	.18000E+02	.66409E+01	.16641E+01
.18000E+02	.66409E+01	.20754E+01	.18000E+02	.66409E+01	.25245E+01	.18000E+02	.66409E+01	.30144E+01
.18000E+02	.66409E+01	.35475E+01	.18000E+02	.66409E+01	.41250E+01	.18000E+02	.66409E+01	.47475E+01
.18000E+02	.66409E+01	.54144E+01	.18000E+02	.66409E+01	.61245E+01	.18000E+02	.66409E+01	.68754E+01
.18000E+02	.66409E+01	.76641E+01	.18000E+02	.66409E+01	.84864E+01	.18000E+02	.66409E+01	.93375E+01
.18000E+02	.66409E+01	.10211E+02	.18000E+02	.66409E+01	.11101E+02	.18000E+02	.66409E+01	.12000E+02

I = 6 J = 21 (X,Y,Z)

.18000E+02	.10466E+02	0.	.18000E+02	.10466E+02	.30146E+00	.18000E+02	.10466E+02	.61140E+00
.18000E+02	.10466E+02	.93746E+00	.18000E+02	.10466E+02	.12864E+01	.18000E+02	.10466E+02	.16641E+01
.18000E+02	.10466E+02	.20754E+01	.18000E+02	.10466E+02	.25245E+01	.18000E+02	.10466E+02	.30144E+01
.18000E+02	.10466E+02	.35475E+01	.18000E+02	.10466E+02	.41250E+01	.18000E+02	.10466E+02	.47475E+01
.18000E+02	.10466E+02	.54144E+01	.18000E+02	.10466E+02	.61245E+01	.18000E+02	.10466E+02	.68754E+01
.18000E+02	.10466E+02	.76641E+01	.18000E+02	.10466E+02	.84864E+01	.18000E+02	.10466E+02	.93375E+01
.18000E+02	.10466E+02	.10211E+02	.18000E+02	.10466E+02	.11101E+02	.18000E+02	.10466E+02	.12000E+02

I = 6 J = 26 (X,Y,Z)

.18000E+02	.15000E+02	0.	.18000E+02	.15000E+02	.30146E+00	.18000E+02	.15000E+02	.61140E+00
.18000E+02	.15000E+02	.93746E+00	.18000E+02	.15000E+02	.12864E+01	.18000E+02	.15000E+02	.16641E+01
.18000E+02	.15000E+02	.20754E+01	.18000E+02	.15000E+02	.25245E+01	.18000E+02	.15000E+02	.30144E+01
.18000E+02	.15000E+02	.35475E+01	.18000E+02	.15000E+02	.41250E+01	.18000E+02	.15000E+02	.47475E+01
.18000E+02	.15000E+02	.54144E+01	.18000E+02	.15000E+02	.61245E+01	.18000E+02	.15000E+02	.68754E+01
.18000E+02	.15000E+02	.76641E+01	.18000E+02	.15000E+02	.84864E+01	.18000E+02	.15000E+02	.93375E+01
.18000E+02	.15000E+02	.10211E+02	.18000E+02	.15000E+02	.11101E+02	.18000E+02	.15000E+02	.12000E+02

I = 11 J = 1 (X,Y,Z)

.36000E+02	.25174E+01	0.	.36000E+02	.25174E+01	.30146E+00	.36000E+02	.25174E+01	.61140E+00
.36000E+02	.25174E+01	.93746E+00	.36000E+02	.25174E+01	.12864E+01	.36000E+02	.25174E+01	.16641E+01
.36000E+02	.25174E+01	.20754E+01	.36000E+02	.25174E+01	.25245E+01	.36000E+02	.25174E+01	.30144E+01
.36000E+02	.25174E+01	.35475E+01	.36000E+02	.25174E+01	.41250E+01	.36000E+02	.25174E+01	.47475E+01
.36000E+02	.25174E+01	.54144E+01	.36000E+02	.25174E+01	.61245E+01	.36000E+02	.25174E+01	.68754E+01
.36000E+02	.25174E+01	.76641E+01	.36000E+02	.25174E+01	.84864E+01	.36000E+02	.25174E+01	.93375E+01
.36000E+02	.25174E+01	.10211E+02	.36000E+02	.25174E+01	.11101E+02	.36000E+02	.25174E+01	.12000E+02

I = 11 J = 6 (X,Y,Z)

.36000E+02	.33921E+01	0.	.36000E+02	.33921E+01	.30146E+00	.36000E+02	.33921E+01	.61140E+00
.36000E+02	.33921E+01	.93746E+00	.36000E+02	.33921E+01	.12864E+01	.36000E+02	.33921E+01	.16641E+01
.36000E+02	.33921E+01	.20754E+01	.36000E+02	.33921E+01	.25245E+01	.36000E+02	.33921E+01	.30144E+01
.36000E+02	.33921E+01	.35475E+01	.36000E+02	.33921E+01	.41250E+01	.36000E+02	.33921E+01	.47475E+01
.36000E+02	.33921E+01	.54144E+01	.36000E+02	.33921E+01	.61245E+01	.36000E+02	.33921E+01	.68754E+01

.36000E+02	.33921E+01	.76641E+01	.36000E+02	.33921E+01	.84864E+01	.36000E+02	.33921E+01	.93375E+01
.36000E+02	.33921E+01	.10211E+02	.36000E+02	.33921E+01	.11101E+02	.36000E+02	.33921E+01	.12000E+02

I = 11 J = 11 (X,Y,Z)

.36000E+02	.49100E+01	0.	.36000E+02	.49100E+01	.30146E+00	.36000E+02	.49100E+01	.61140E+00
.36000E+02	.49100E+01	.93746E+00	.36000E+02	.49100E+01	.12864E+01	.36000E+02	.49100E+01	.16641E+01
.36000E+02	.49100E+01	.20754E+01	.36000E+02	.49100E+01	.25245E+01	.36000E+02	.49100E+01	.30144E+01
.36000E+02	.49100E+01	.35475E+01	.36000E+02	.49100E+01	.41250E+01	.36000E+02	.49100E+01	.47475E+01
.36000E+02	.49100E+01	.54144E+01	.36000E+02	.49100E+01	.61245E+01	.36000E+02	.49100E+01	.68754E+01
.36000E+02	.49100E+01	.76641E+01	.36000E+02	.49100E+01	.84864E+01	.36000E+02	.49100E+01	.93375E+01
.36000E+02	.49100E+01	.10211E+02	.36000E+02	.49100E+01	.11101E+02	.36000E+02	.49100E+01	.12000E+02

I = 11 J = 16 (X,Y,Z)

.36000E+02	.74066E+01	0.	.36000E+02	.74066E+01	.30146E+00	.36000E+02	.74066E+01	.61140E+00
.36000E+02	.74066E+01	.93746E+00	.36000E+02	.74066E+01	.12864E+01	.36000E+02	.74066E+01	.16641E+01
.36000E+02	.74066E+01	.20754E+01	.36000E+02	.74066E+01	.25245E+01	.36000E+02	.74066E+01	.30144E+01
.36000E+02	.74066E+01	.35475E+01	.36000E+02	.74066E+01	.41250E+01	.36000E+02	.74066E+01	.47475E+01
.36000E+02	.74066E+01	.54144E+01	.36000E+02	.74066E+01	.61245E+01	.36000E+02	.74066E+01	.68754E+01
.36000E+02	.74066E+01	.76641E+01	.36000E+02	.74066E+01	.84864E+01	.36000E+02	.74066E+01	.93375E+01
.36000E+02	.74066E+01	.10211E+02	.36000E+02	.74066E+01	.11101E+02	.36000E+02	.74066E+01	.12000E+02

I = 11 J = 21 (X,Y,Z)

.36000E+02	.10882E+02	0.	.36000E+02	.10882E+02	.30146E+00	.36000E+02	.10882E+02	.61140E+00
.36000E+02	.10882E+02	.93746E+00	.36000E+02	.10882E+02	.12864E+01	.36000E+02	.10882E+02	.16641E+01
.36000E+02	.10882E+02	.20754E+01	.36000E+02	.10882E+02	.25245E+01	.36000E+02	.10882E+02	.30144E+01
.36000E+02	.10882E+02	.35475E+01	.36000E+02	.10882E+02	.41250E+01	.36000E+02	.10882E+02	.47475E+01
.36000E+02	.10882E+02	.54144E+01	.36000E+02	.10882E+02	.61245E+01	.36000E+02	.10882E+02	.68754E+01
.36000E+02	.10882E+02	.76641E+01	.36000E+02	.10882E+02	.84864E+01	.36000E+02	.10882E+02	.93375E+01
.36000E+02	.10882E+02	.10211E+02	.36000E+02	.10882E+02	.11101E+02	.36000E+02	.10882E+02	.12000E+02

I = 11 J = 26 (X,Y,Z)

.36000E+02	.15000E+02	0.	.36000E+02	.15000E+02	.30146E+00	.36000E+02	.15000E+02	.61140E+00
.36000E+02	.15000E+02	.93746E+00	.36000E+02	.15000E+02	.12864E+01	.36000E+02	.15000E+02	.16641E+01
.36000E+02	.15000E+02	.20754E+01	.36000E+02	.15000E+02	.25245E+01	.36000E+02	.15000E+02	.30144E+01
.36000E+02	.15000E+02	.35475E+01	.36000E+02	.15000E+02	.41250E+01	.36000E+02	.15000E+02	.47475E+01
.36000E+02	.15000E+02	.54144E+01	.36000E+02	.15000E+02	.61245E+01	.36000E+02	.15000E+02	.68754E+01
.36000E+02	.15000E+02	.76641E+01	.36000E+02	.15000E+02	.84864E+01	.36000E+02	.15000E+02	.93375E+01
.36000E+02	.15000E+02	.10211E+02	.36000E+02	.15000E+02	.11101E+02	.36000E+02	.15000E+02	.12000E+02

I = 16 J = 1 (X,Y,Z)

.54000E+02	.37760E+01	0.	.54000E+02	.37760E+01	.30146E+00	.54000E+02	.37760E+01	.61140E+00
.54000E+02	.37760E+01	.93746E+00	.54000E+02	.37760E+01	.12864E+01	.54000E+02	.37760E+01	.16641E+01
.54000E+02	.37760E+01	.20754E+01	.54000E+02	.37760E+01	.25245E+01	.54000E+02	.37760E+01	.30144E+01
.54000E+02	.37760E+01	.35475E+01	.54000E+02	.37760E+01	.41250E+01	.54000E+02	.37760E+01	.47475E+01

.54000E+02	.37760E+01	.54144E+01	.54000E+02	.37760E+01	.61245E+01	.54000E+02	.37760E+01	.68754E+01
.54000E+02	.37760E+01	.76641E+01	.54000E+02	.37760E+01	.84864E+01	.54000E+02	.37760E+01	.93375E+01
.54000E+02	.37760E+01	.10211E+02	.54000E+02	.37760E+01	.11101E+02	.54000E+02	.37760E+01	.12000E+02

I = 16 J = 6 (X,Y,Z)

.54000E+02	.45626E+01	0.	.54000E+02	.45626E+01	.30146E+00	.54000E+02	.45626E+01	.61140E+00
.54000E+02	.45626E+01	.93746E+00	.54000E+02	.45626E+01	.12864E+01	.54000E+02	.45626E+01	.16641E+01
.54000E+02	.45626E+01	.20754E+01	.54000E+02	.45626E+01	.25245E+01	.54000E+02	.45626E+01	.30144E+01
.54000E+02	.45626E+01	.35475E+01	.54000E+02	.45626E+01	.41250E+01	.54000E+02	.45626E+01	.47475E+01
.54000E+02	.45626E+01	.54144E+01	.54000E+02	.45626E+01	.61245E+01	.54000E+02	.45626E+01	.68754E+01
.54000E+02	.45626E+01	.76641E+01	.54000E+02	.45626E+01	.84864E+01	.54000E+02	.45626E+01	.93375E+01
.54000E+02	.45626E+01	.10211E+02	.54000E+02	.45626E+01	.11101E+02	.54000E+02	.45626E+01	.12000E+02

I = 16 J = 11 (X,Y,Z)

.54000E+02	.59275E+01	0.	.54000E+02	.59275E+01	.30146E+00	.54000E+02	.59275E+01	.61140E+00
.54000E+02	.59275E+01	.93746E+00	.54000E+02	.59275E+01	.12864E+01	.54000E+02	.59275E+01	.16641E+01
.54000E+02	.59275E+01	.20754E+01	.54000E+02	.59275E+01	.25245E+01	.54000E+02	.59275E+01	.30144E+01
.54000E+02	.59275E+01	.35475E+01	.54000E+02	.59275E+01	.41250E+01	.54000E+02	.59275E+01	.47475E+01
.54000E+02	.59275E+01	.54144E+01	.54000E+02	.59275E+01	.61245E+01	.54000E+02	.59275E+01	.68754E+01
.54000E+02	.59275E+01	.76641E+01	.54000E+02	.59275E+01	.84864E+01	.54000E+02	.59275E+01	.93375E+01
.54000E+02	.59275E+01	.10211E+02	.54000E+02	.59275E+01	.11101E+02	.54000E+02	.59275E+01	.12000E+02

I = 16 J = 16 (X,Y,Z)

.54000E+02	.81722E+01	0.	.54000E+02	.81722E+01	.30146E+00	.54000E+02	.81722E+01	.61140E+00
.54000E+02	.81722E+01	.93746E+00	.54000E+02	.81722E+01	.12864E+01	.54000E+02	.81722E+01	.16641E+01
.54000E+02	.81722E+01	.20754E+01	.54000E+02	.81722E+01	.25245E+01	.54000E+02	.81722E+01	.30144E+01
.54000E+02	.81722E+01	.35475E+01	.54000E+02	.81722E+01	.41250E+01	.54000E+02	.81722E+01	.47475E+01
.54000E+02	.81722E+01	.54144E+01	.54000E+02	.81722E+01	.61245E+01	.54000E+02	.81722E+01	.68754E+01
.54000E+02	.81722E+01	.76641E+01	.54000E+02	.81722E+01	.84864E+01	.54000E+02	.81722E+01	.93375E+01
.54000E+02	.81722E+01	.10211E+02	.54000E+02	.81722E+01	.11101E+02	.54000E+02	.81722E+01	.12000E+02

I = 16 J = 21 (X,Y,Z)

.54000E+02	.11297E+02	0.	.54000E+02	.11297E+02	.30146E+00	.54000E+02	.11297E+02	.61140E+00
.54000E+02	.11297E+02	.93746E+00	.54000E+02	.11297E+02	.12864E+01	.54000E+02	.11297E+02	.16641E+01
.54000E+02	.11297E+02	.20754E+01	.54000E+02	.11297E+02	.25245E+01	.54000E+02	.11297E+02	.30144E+01
.54000E+02	.11297E+02	.35475E+01	.54000E+02	.11297E+02	.41250E+01	.54000E+02	.11297E+02	.47475E+01
.54000E+02	.11297E+02	.54144E+01	.54000E+02	.11297E+02	.61245E+01	.54000E+02	.11297E+02	.68754E+01
.54000E+02	.11297E+02	.76641E+01	.54000E+02	.11297E+02	.84864E+01	.54000E+02	.11297E+02	.93375E+01
.54000E+02	.11297E+02	.10211E+02	.54000E+02	.11297E+02	.11101E+02	.54000E+02	.11297E+02	.12000E+02

I = 16 J = 26 (X,Y,Z)

.54000E+02	.15000E+02	0.	.54000E+02	.15000E+02	.30146E+00	.54000E+02	.15000E+02	.61140E+00
.54000E+02	.15000E+02	.93746E+00	.54000E+02	.15000E+02	.12864E+01	.54000E+02	.15000E+02	.16641E+01
.54000E+02	.15000E+02	.20754E+01	.54000E+02	.15000E+02	.25245E+01	.54000E+02	.15000E+02	.30144E+01

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.54000E+02  .15000E+02  .35475E+01  .54000E+02  .15000E+02  .41250E+01  .54000E+02  .15000E+02  .47475E+01
.54000E+02  .15000E+02  .54144E+01  .54000E+02  .15000E+02  .61245E+01  .54000E+02  .15000E+02  .68754E+01
.54000E+02  .15000E+02  .76641E+01  .54000E+02  .15000E+02  .84864E+01  .54000E+02  .15000E+02  .93375E+01
.54000E+02  .15000E+02  .10211E+02  .54000E+02  .15000E+02  .11101E+02  .54000E+02  .15000E+02  .12000E+02

I =  21  J =  1  (X,Y,Z)
.72000E+02  .49315E+01  0.          .72000E+02  .49314E+01  .30146E+00  .72000E+02  .49310E+01  .61140E+00
.72000E+02  .49304E+01  .93746E+00  .72000E+02  .49294E+01  .12864E+01  .72000E+02  .49280E+01  .16641E+01
.72000E+02  .49260E+01  .20754E+01  .72000E+02  .49234E+01  .25245E+01  .72000E+02  .49200E+01  .30144E+01
.72000E+02  .49156E+01  .35475E+01  .72000E+02  .49100E+01  .41250E+01  .72000E+02  .49030E+01  .47475E+01
.72000E+02  .48945E+01  .54144E+01  .72000E+02  .48842E+01  .61245E+01  .72000E+02  .48718E+01  .68754E+01
.72000E+02  .48574E+01  .76641E+01  .72000E+02  .48406E+01  .84864E+01  .72000E+02  .48215E+01  .93375E+01
.72000E+02  .47999E+01  .10211E+02  .72000E+02  .47760E+01  .11101E+02  .72000E+02  .47498E+01  .12000E+02

I =  21  J =  6  (X,Y,Z)
.72000E+02  .56371E+01  0.          .72000E+02  .56370E+01  .30146E+00  .72000E+02  .56366E+01  .61140E+00
.72000E+02  .56361E+01  .93746E+00  .72000E+02  .56351E+01  .12864E+01  .72000E+02  .56338E+01  .16641E+01
.72000E+02  .56320E+01  .20754E+01  .72000E+02  .56296E+01  .25245E+01  .72000E+02  .56264E+01  .30144E+01
.72000E+02  .56223E+01  .35475E+01  .72000E+02  .56171E+01  .41250E+01  .72000E+02  .56106E+01  .47475E+01
.72000E+02  .56027E+01  .54144E+01  .72000E+02  .55931E+01  .61245E+01  .72000E+02  .55816E+01  .68754E+01
.72000E+02  .55682E+01  .76641E+01  .72000E+02  .55526E+01  .84864E+01  .72000E+02  .55348E+01  .93375E+01
.72000E+02  .55147E+01  .10211E+02  .72000E+02  .54925E+01  .11101E+02  .72000E+02  .54681E+01  .12000E+02

I =  21  J =  11  (X,Y,Z)
.72000E+02  .68614E+01  0.          .72000E+02  .68613E+01  .30146E+00  .72000E+02  .68610E+01  .61140E+00
.72000E+02  .68605E+01  .93746E+00  .72000E+02  .68597E+01  .12864E+01  .72000E+02  .68586E+01  .16641E+01
.72000E+02  .68570E+01  .20754E+01  .72000E+02  .68549E+01  .25245E+01  .72000E+02  .68521E+01  .30144E+01
.72000E+02  .68486E+01  .35475E+01  .72000E+02  .68441E+01  .41250E+01  .72000E+02  .68384E+01  .47475E+01
.72000E+02  .68315E+01  .54144E+01  .72000E+02  .68232E+01  .61245E+01  .72000E+02  .68132E+01  .68754E+01
.72000E+02  .68015E+01  .76641E+01  .72000E+02  .67880E+01  .84864E+01  .72000E+02  .67725E+01  .93375E+01
.72000E+02  .67551E+01  .10211E+02  .72000E+02  .67357E+01  .11101E+02  .72000E+02  .67145E+01  .12000E+02

I =  21  J =  16  (X,Y,Z)
.72000E+02  .88751E+01  0.          .72000E+02  .88750E+01  .30146E+00  .72000E+02  .88748E+01  .61140E+00
.72000E+02  .88744E+01  .93746E+00  .72000E+02  .88738E+01  .12864E+01  .72000E+02  .88730E+01  .16641E+01
.72000E+02  .88718E+01  .20754E+01  .72000E+02  .88702E+01  .25245E+01  .72000E+02  .88681E+01  .30144E+01
.72000E+02  .88655E+01  .35475E+01  .72000E+02  .88621E+01  .41250E+01  .72000E+02  .88578E+01  .47475E+01
.72000E+02  .88526E+01  .54144E+01  .72000E+02  .88463E+01  .61245E+01  .72000E+02  .88388E+01  .68754E+01
.72000E+02  .88306E+01  .76641E+01  .72000E+02  .88198E+01  .84864E+01  .72000E+02  .88082E+01  .93375E+01
.72000E+02  .87951E+01  .10211E+02  .72000E+02  .87805E+01  .11101E+02  .72000E+02  .87646E+01  .12000E+02

I =  21  J =  21  (X,Y,Z)
.72000E+02  .11678E+02  0.          .72000E+02  .11678E+02  .30146E+00  .72000E+02  .11678E+02  .61140E+00
.72000E+02  .11678E+02  .93746E+00  .72000E+02  .11678E+02  .12864E+01  .72000E+02  .11677E+02  .16641E+01
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.72000E+02	.11676E+02	.20754E+01	.72000E+02	.11675E+02	.25245E+01	.72000E+02	.11674E+02	.30144E+01
.72000E+02	.11673E+02	.35475E+01	.72000E+02	.11671E+02	.41250E+01	.72000E+02	.11669E+02	.47475E+01
.72000E+02	.11666E+02	.54144E+01	.72000E+02	.11663E+02	.61245E+01	.72000E+02	.11659E+02	.68754E+01
.72000E+02	.11654E+02	.76641E+01	.72000E+02	.11648E+02	.84864E+01	.72000E+02	.11642E+02	.93375E+01
.72000E+02	.11635E+02	.10211E+02	.72000E+02	.11627E+02	.11101E+02	.72000E+02	.11618E+02	.12000E+02

I = 21 J = 26 (X,Y,Z)

.72000E+02	.15000E+02	0.	.72000E+02	.15000E+02	.30146E+00	.72000E+02	.15000E+02	.61140E+00
.72000E+02	.15000E+02	.93746E+00	.72000E+02	.15000E+02	.12864E+01	.72000E+02	.15000E+02	.16641E+01
.72000E+02	.15000E+02	.20754E+01	.72000E+02	.15000E+02	.25245E+01	.72000E+02	.15000E+02	.30144E+01
.72000E+02	.15000E+02	.35475E+01	.72000E+02	.15000E+02	.41250E+01	.72000E+02	.15000E+02	.47475E+01
.72000E+02	.15000E+02	.54144E+01	.72000E+02	.15000E+02	.61245E+01	.72000E+02	.15000E+02	.68754E+01
.72000E+02	.15000E+02	.76641E+01	.72000E+02	.15000E+02	.84864E+01	.72000E+02	.15000E+02	.93375E+01
.72000E+02	.15000E+02	.10211E+02	.72000E+02	.15000E+02	.11101E+02	.72000E+02	.15000E+02	.12000E+02

I = 26 J = 1 (X,Y,Z)

.90000E+02	.54589E+01	0.	.90000E+02	.54586E+01	.30146E+00	.90000E+02	.54577E+01	.61140E+00
.90000E+02	.54560E+01	.93746E+00	.90000E+02	.54535E+01	.12864E+01	.90000E+02	.54498E+01	.16641E+01
.90000E+02	.54448E+01	.20754E+01	.90000E+02	.54380E+01	.25245E+01	.90000E+02	.54291E+01	.30144E+01
.90000E+02	.54177E+01	.35475E+01	.90000E+02	.54032E+01	.41250E+01	.90000E+02	.53851E+01	.47475E+01
.90000E+02	.53629E+01	.54144E+01	.90000E+02	.53361E+01	.61245E+01	.90000E+02	.53041E+01	.68754E+01
.90000E+02	.52665E+01	.76641E+01	.90000E+02	.52230E+01	.84864E+01	.90000E+02	.51732E+01	.93375E+01
.90000E+02	.51172E+01	.10211E+02	.90000E+02	.50550E+01	.11101E+02	.90000E+02	.49868E+01	.12000E+02

I = 26 J = 6 (X,Y,Z)

.90000E+02	.61275E+01	0.	.90000E+02	.61273E+01	.30146E+00	.90000E+02	.61264E+01	.61140E+00
.90000E+02	.61249E+01	.93746E+00	.90000E+02	.61225E+01	.12864E+01	.90000E+02	.61191E+01	.16641E+01
.90000E+02	.61144E+01	.20754E+01	.90000E+02	.61081E+01	.25245E+01	.90000E+02	.60999E+01	.30144E+01
.90000E+02	.60892E+01	.35475E+01	.90000E+02	.60757E+01	.41250E+01	.90000E+02	.60589E+01	.47475E+01
.90000E+02	.60383E+01	.54144E+01	.90000E+02	.60133E+01	.61245E+01	.90000E+02	.59836E+01	.68754E+01
.90000E+02	.59486E+01	.76641E+01	.90000E+02	.59082E+01	.84864E+01	.90000E+02	.58619E+01	.93375E+01
.90000E+02	.58098E+01	.10211E+02	.90000E+02	.57519E+01	.11101E+02	.90000E+02	.56886E+01	.12000E+02

I = 26 J = 11 (X,Y,Z)

.90000E+02	.72877E+01	0.	.90000E+02	.72875E+01	.30146E+00	.90000E+02	.72867E+01	.61140E+00
.90000E+02	.72854E+01	.93746E+00	.90000E+02	.72834E+01	.12864E+01	.90000E+02	.72804E+01	.16641E+01
.90000E+02	.72763E+01	.20754E+01	.90000E+02	.72709E+01	.25245E+01	.90000E+02	.72637E+01	.30144E+01
.90000E+02	.72544E+01	.35475E+01	.90000E+02	.72427E+01	.41250E+01	.90000E+02	.72281E+01	.47475E+01
.90000E+02	.72101E+01	.54144E+01	.90000E+02	.71885E+01	.61245E+01	.90000E+02	.71626E+01	.68754E+01
.90000E+02	.71322E+01	.76641E+01	.90000E+02	.70970E+01	.84864E+01	.90000E+02	.70568E+01	.93375E+01
.90000E+02	.70115E+01	.10211E+02	.90000E+02	.69612E+01	.11101E+02	.90000E+02	.69062E+01	.12000E+02

I = 26 J = 16 (X,Y,Z)

.90000E+02	.91960E+01	0.	.90000E+02	.91958E+01	.30146E+00	.90000E+02	.91952E+01	.61140E+00

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 .90000E+02  .91942E+01  .93746E+00  .90000E+02  .91927E+01  .12864E+01  .90000E+02  .91904E+01  .16641E+01
 .90000E+02  .91874E+01  .20754E+01  .90000E+02  .91833E+01  .25245E+01  .90000E+02  .91779E+01  .30144E+01
 .90000E+02  .91709E+01  .35475E+01  .90000E+02  .91621E+01  .41250E+01  .90000E+02  .91511E+01  .47475E+01
 .90000E+02  .91376E+01  .54144E+01  .90000E+02  .91212E+01  .61245E+01  .90000E+02  .91018E+01  .68754E+01
 .90000E+02  .90789E+01  .76641E+01  .90000E+02  .90524E+01  .84864E+01  .90000E+02  .90222E+01  .93375E+01
 .90000E+02  .89881E+01  .10211E+02  .90000E+02  .89502E+01  .11101E+02  .90000E+02  .89088E+01  .12000E+02

 I =  26  J =  21  (X,Y,Z)
 .90000E+02  .11852E+02  0.          .90000E+02  .11852E+02  .30146E+00  .90000E+02  .11852E+02  .61140E+00
 .90000E+02  .11851E+02  .93746E+00  .90000E+02  .11850E+02  .12864E+01  .90000E+02  .11849E+02  .16641E+01
 .90000E+02  .11848E+02  .20754E+01  .90000E+02  .11845E+02  .25245E+01  .90000E+02  .11842E+02  .30144E+01
 .90000E+02  .11839E+02  .35475E+01  .90000E+02  .11834E+02  .41250E+01  .90000E+02  .11828E+02  .47475E+01
 .90000E+02  .11821E+02  .54144E+01  .90000E+02  .11812E+02  .61245E+01  .90000E+02  .11801E+02  .68754E+01
 .90000E+02  .11789E+02  .76641E+01  .90000E+02  .11774E+02  .84864E+01  .90000E+02  .11758E+02  .93375E+01
 .90000E+02  .11739E+02  .10211E+02  .90000E+02  .11719E+02  .11101E+02  .90000E+02  .11696E+02  .12000E+02

 I =  26  J =  26  (X,Y,Z)
 .90000E+02  .15000E+02  0.          .90000E+02  .15000E+02  .30146E+00  .90000E+02  .15000E+02  .61140E+00
 .90000E+02  .15000E+02  .93746E+00  .90000E+02  .15000E+02  .12864E+01  .90000E+02  .15000E+02  .16641E+01
 .90000E+02  .15000E+02  .20754E+01  .90000E+02  .15000E+02  .25245E+01  .90000E+02  .15000E+02  .30144E+01
 .90000E+02  .15000E+02  .35475E+01  .90000E+02  .15000E+02  .41250E+01  .90000E+02  .15000E+02  .47475E+01
 .90000E+02  .15000E+02  .54144E+01  .90000E+02  .15000E+02  .61245E+01  .90000E+02  .15000E+02  .68754E+01
 .90000E+02  .15000E+02  .76641E+01  .90000E+02  .15000E+02  .84864E+01  .90000E+02  .15000E+02  .93375E+01
 .90000E+02  .15000E+02  .10211E+02  .90000E+02  .15000E+02  .11101E+02  .90000E+02  .15000E+02  .12000E+02

 ITERATION NO.,MAX Y-ERR, LOC =   50   .53452E-02   23  15  13

 ITERATION NO.,MAX Y-ERR, LOC =  100   .18832E-02   22  17  12

 ITERATION NO.,MAX Y-ERR, LOC =  150   .62140E-03   22  17  12

 ITERATION NO.,MAX Y-ERR, LOC =  200   .19682E-03   22  17  12

 ITERATION NO.,MAX Y-ERR, LOC =  250   .61322E-04   22  17  12

 ITERATION NO.,MAX Y-ERR, LOC =  300   .18962E-04   22  17  12

 ITERATION NO.,MAX Y-ERR, LOC =  350   .58633E-05   21  17  12
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AFTER BODY NUMBER 1

TEST STARTED FEB 16,1979

*** CONVERGED SOLUTION ***

IMAX = 26 JMAX = 26 KMAX = 21

ITERATION PERFORMED = 357

MAX Y=ERR = .497551E-05 AT LOC I,J,K = 21 17 12

I = 1 J = 1 (X,Y,Z)

0.	0.	0.	0.	0.	.30146E+00	0.	0.	.61140E+00
0.	0.	.93746E+00	0.	0.	.12864E+01	0.	0.	.16641E+01
0.	0.	.20754E+01	0.	0.	.25245E+01	0.	0.	.30144E+01
0.	0.	.35475E+01	0.	0.	.41250E+01	0.	0.	.47475E+01
0.	0.	.54144E+01	0.	0.	.61245E+01	0.	0.	.68754E+01
0.	0.	.76641E+01	0.	0.	.84864E+01	0.	0.	.93375E+01
0.	0.	.10211E+02	0.	0.	.11101E+02	0.	0.	.12000E+02

I = 1 J = 6 (X,Y,Z)

0.	.10512E+01	0.	0.	.10512E+01	.30146E+00	0.	.10512E+01	.61140E+00
0.	.10512E+01	.93746E+00	0.	.10512E+01	.12864E+01	0.	.10512E+01	.16641E+01
0.	.10512E+01	.20754E+01	0.	.10512E+01	.25245E+01	0.	.10512E+01	.30144E+01
0.	.10512E+01	.35475E+01	0.	.10512E+01	.41250E+01	0.	.10512E+01	.47475E+01
0.	.10512E+01	.54144E+01	0.	.10512E+01	.61245E+01	0.	.10512E+01	.68754E+01
0.	.10512E+01	.76641E+01	0.	.10512E+01	.84864E+01	0.	.10512E+01	.93375E+01
0.	.10512E+01	.10211E+02	0.	.10512E+01	.11101E+02	0.	.10512E+01	.12000E+02

I = 1 J = 11 (X,Y,Z)

0.	.28752E+01	0.	0.	.28752E+01	.30146E+00	0.	.28752E+01	.61140E+00
0.	.28752E+01	.93746E+00	0.	.28752E+01	.12864E+01	0.	.28752E+01	.16641E+01
0.	.28752E+01	.20754E+01	0.	.28752E+01	.25245E+01	0.	.28752E+01	.30144E+01
0.	.28752E+01	.35475E+01	0.	.28752E+01	.41250E+01	0.	.28752E+01	.47475E+01
0.	.28752E+01	.54144E+01	0.	.28752E+01	.61245E+01	0.	.28752E+01	.68754E+01
0.	.28752E+01	.76641E+01	0.	.28752E+01	.84864E+01	0.	.28752E+01	.93375E+01
0.	.28752E+01	.10211E+02	0.	.28752E+01	.11101E+02	0.	.28752E+01	.12000E+02

I = 1 J = 16 (X,Y,Z)

0.	.58752E+01	0.	0.	.58752E+01	.30146E+00	0.	.58752E+01	.61140E+00
0.	.58752E+01	.93746E+00	0.	.58752E+01	.12864E+01	0.	.58752E+01	.16641E+01
0.	.58752E+01	.20754E+01	0.	.58752E+01	.25245E+01	0.	.58752E+01	.30144E+01
0.	.58752E+01	.35475E+01	0.	.58752E+01	.41250E+01	0.	.58752E+01	.47475E+01

0.	.58752E+01	.54144E+01	0.	.58752E+01	.61245E+01	0.	.58752E+01	.68754E+01
0.	.58752E+01	.76641E+01	0.	.58752E+01	.84864E+01	0.	.58752E+01	.93375E+01
0.	.58752E+01	.10211E+02	0.	.58752E+01	.11101E+02	0.	.58752E+01	.12000E+02

I = 1 J = 21 (X,Y,Z)

0.	.10051E+02	0.	0.	.10051E+02	.30146E+00	0.	.10051E+02	.61140E+00
0.	.10051E+02	.93746E+00	0.	.10051E+02	.12864E+01	0.	.10051E+02	.16641E+01
0.	.10051E+02	.20754E+01	0.	.10051E+02	.25245E+01	0.	.10051E+02	.30144E+01
0.	.10051E+02	.35475E+01	0.	.10051E+02	.41250E+01	0.	.10051E+02	.47475E+01
0.	.10051E+02	.54144E+01	0.	.10051E+02	.61245E+01	0.	.10051E+02	.68754E+01
0.	.10051E+02	.76641E+01	0.	.10051E+02	.84864E+01	0.	.10051E+02	.93375E+01
0.	.10051E+02	.10211E+02	0.	.10051E+02	.11101E+02	0.	.10051E+02	.12000E+02

I = 1 J = 26 (X,Y,Z)

0.	.15000E+02	0.	0.	.15000E+02	.30146E+00	0.	.15000E+02	.61140E+00
0.	.15000E+02	.93746E+00	0.	.15000E+02	.12864E+01	0.	.15000E+02	.16641E+01
0.	.15000E+02	.20754E+01	0.	.15000E+02	.25245E+01	0.	.15000E+02	.30144E+01
0.	.15000E+02	.35475E+01	0.	.15000E+02	.41250E+01	0.	.15000E+02	.47475E+01
0.	.15000E+02	.54144E+01	0.	.15000E+02	.61245E+01	0.	.15000E+02	.68754E+01
0.	.15000E+02	.76641E+01	0.	.15000E+02	.84864E+01	0.	.15000E+02	.93375E+01
0.	.15000E+02	.10211E+02	0.	.15000E+02	.11101E+02	0.	.15000E+02	.12000E+02

I = 6 J = 1 (X,Y,Z)

.18000E+02	.12587E+01	0.	.18000E+02	.12587E+01	.30146E+00	.18000E+02	.12587E+01	.61140E+00
.18000E+02	.12587E+01	.93746E+00	.18000E+02	.12587E+01	.12864E+01	.18000E+02	.12587E+01	.16641E+01
.18000E+02	.12587E+01	.20754E+01	.18000E+02	.12587E+01	.25245E+01	.18000E+02	.12587E+01	.30144E+01
.18000E+02	.12587E+01	.35475E+01	.18000E+02	.12587E+01	.41250E+01	.18000E+02	.12587E+01	.47475E+01
.18000E+02	.12587E+01	.54144E+01	.18000E+02	.12587E+01	.61245E+01	.18000E+02	.12587E+01	.68754E+01
.18000E+02	.12587E+01	.76641E+01	.18000E+02	.12587E+01	.84864E+01	.18000E+02	.12587E+01	.93375E+01
.18000E+02	.12587E+01	.10211E+02	.18000E+02	.12587E+01	.11101E+02	.18000E+02	.12587E+01	.12000E+02

I = 6 J = 6 (X,Y,Z)

.18000E+02	.22217E+01	0.	.18000E+02	.22403E+01	.30146E+00	.18000E+02	.22542E+01	.61140E+00
.18000E+02	.22649E+01	.93746E+00	.18000E+02	.22732E+01	.12864E+01	.18000E+02	.22798E+01	.16641E+01
.18000E+02	.22849E+01	.20754E+01	.18000E+02	.22890E+01	.25245E+01	.18000E+02	.22922E+01	.30144E+01
.18000E+02	.22945E+01	.35475E+01	.18000E+02	.22963E+01	.41250E+01	.18000E+02	.22975E+01	.47475E+01
.18000E+02	.22982E+01	.54144E+01	.18000E+02	.22983E+01	.61245E+01	.18000E+02	.22979E+01	.68754E+01
.18000E+02	.22967E+01	.76641E+01	.18000E+02	.22942E+01	.84864E+01	.18000E+02	.22896E+01	.93375E+01
.18000E+02	.22809E+01	.10211E+02	.18000E+02	.22629E+01	.11101E+02	.18000E+02	.22217E+01	.12000E+02

I = 6 J = 11 (X,Y,Z)

.18000E+02	.38926E+01	0.	.18000E+02	.39181E+01	.30146E+00	.18000E+02	.39408E+01	.61140E+00
.18000E+02	.39612E+01	.93746E+00	.18000E+02	.39796E+01	.12864E+01	.18000E+02	.39961E+01	.16641E+01
.18000E+02	.40107E+01	.20754E+01	.18000E+02	.40235E+01	.25245E+01	.18000E+02	.40342E+01	.30144E+01

.18000E+02	.40431E+01	.35475E+01	.18000E+02	.40499E+01	.41250E+01	.18000E+02	.40549E+01	.47475E+01			
.18000E+02	.40577E+01	.54144E+01	.18000E+02	.40584E+01	.61245E+01	.18000E+02	.40566E+01	.68754E+01			
.18000E+02	.40515E+01	.76641E+01	.18000E+02	.40421E+01	.84864E+01	.18000E+02	.40261E+01	.93375E+01			
.18000E+02	.40001E+01	.10211E+02	.18000E+02	.39584E+01	.11101E+02	.18000E+02	.38926E+01	.12000E+02			

I = 6 J = 16 (X,Y,Z)

.18000E+02	.66409E+01	0.	.18000E+02	.66632E+01	.30146E+00	.18000E+02	.66845E+01	.61140E+00
.18000E+02	.67050E+01	.93746E+00	.18000E+02	.67249E+01	.12864E+01	.18000E+02	.67443E+01	.16641E+01
.18000E+02	.67628E+01	.20754E+01	.18000E+02	.67803E+01	.25245E+01	.18000E+02	.67962E+01	.30144E+01
.18000E+02	.68103E+01	.35475E+01	.18000E+02	.68219E+01	.41250E+01	.18000E+02	.68307E+01	.47475E+01
.18000E+02	.68361E+01	.54144E+01	.18000E+02	.68375E+01	.61245E+01	.18000E+02	.68341E+01	.68754E+01
.18000E+02	.68251E+01	.76641E+01	.18000E+02	.68091E+01	.84864E+01	.18000E+02	.67847E+01	.93375E+01
.18000E+02	.67499E+01	.10211E+02	.18000E+02	.67025E+01	.11101E+02	.18000E+02	.66409E+01	.12000E+02

I = 6 J = 21 (X,Y,Z)

.18000E+02	.10466E+02	0.	.18000E+02	.10479E+02	.30146E+00	.18000E+02	.10492E+02	.61140E+00
.18000E+02	.10504E+02	.93746E+00	.18000E+02	.10516E+02	.12864E+01	.18000E+02	.10528E+02	.16641E+01
.18000E+02	.10540E+02	.20754E+01	.18000E+02	.10552E+02	.25245E+01	.18000E+02	.10563E+02	.30144E+01
.18000E+02	.10573E+02	.35475E+01	.18000E+02	.10581E+02	.41250E+01	.18000E+02	.10588E+02	.47475E+01
.18000E+02	.10592E+02	.54144E+01	.18000E+02	.10593E+02	.61245E+01	.18000E+02	.10591E+02	.68754E+01
.18000E+02	.10584E+02	.76641E+01	.18000E+02	.10572E+02	.84864E+01	.18000E+02	.10555E+02	.93375E+01
.18000E+02	.10532E+02	.10211E+02	.18000E+02	.10503E+02	.11101E+02	.18000E+02	.10466E+02	.12000E+02

I = 6 J = 26 (X,Y,Z)

.18000E+02	.15000E+02	0.	.18000E+02	.15000E+02	.30146E+00	.18000E+02	.15000E+02	.61140E+00
.18000E+02	.15000E+02	.93746E+00	.18000E+02	.15000E+02	.12864E+01	.18000E+02	.15000E+02	.16641E+01
.18000E+02	.15000E+02	.20754E+01	.18000E+02	.15000E+02	.25245E+01	.18000E+02	.15000E+02	.30144E+01
.18000E+02	.15000E+02	.35475E+01	.18000E+02	.15000E+02	.41250E+01	.18000E+02	.15000E+02	.47475E+01
.18000E+02	.15000E+02	.54144E+01	.18000E+02	.15000E+02	.61245E+01	.18000E+02	.15000E+02	.68754E+01
.18000E+02	.15000E+02	.76641E+01	.18000E+02	.15000E+02	.84864E+01	.18000E+02	.15000E+02	.93375E+01
.18000E+02	.15000E+02	.10211E+02	.18000E+02	.15000E+02	.11101E+02	.18000E+02	.15000E+02	.12000E+02

I = 11 J = 1 (X,Y,Z)

.36000E+02	.25174E+01	0.	.36000E+02	.25174E+01	.30146E+00	.36000E+02	.25174E+01	.61140E+00
.36000E+02	.25174E+01	.93746E+00	.36000E+02	.25174E+01	.12864E+01	.36000E+02	.25174E+01	.16641E+01
.36000E+02	.25174E+01	.20754E+01	.36000E+02	.25174E+01	.25245E+01	.36000E+02	.25174E+01	.30144E+01
.36000E+02	.25174E+01	.35475E+01	.36000E+02	.25174E+01	.41250E+01	.36000E+02	.25174E+01	.47475E+01
.36000E+02	.25174E+01	.54144E+01	.36000E+02	.25174E+01	.61245E+01	.36000E+02	.25174E+01	.68754E+01
.36000E+02	.25174E+01	.76641E+01	.36000E+02	.25174E+01	.84864E+01	.36000E+02	.25174E+01	.93375E+01
.36000E+02	.25174E+01	.10211E+02	.36000E+02	.25174E+01	.11101E+02	.36000E+02	.25174E+01	.12000E+02

I = 11 J = 6 (X,Y,Z)

.36000E+02	.33921E+01	0.	.36000E+02	.34278E+01	.30146E+00	.36000E+02	.34544E+01	.61140E+00
.36000E+02	.34749E+01	.93746E+00	.36000E+02	.34910E+01	.12864E+01	.36000E+02	.35038E+01	.16641E+01

.36000E+02	.35139E+01	.20754E+01	.36000E+02	.35219E+01	.25245E+01	.36000E+02	.35282E+01	.30144E+01
.36000E+02	.35329E+01	.35475E+01	.36000E+02	.35364E+01	.41250E+01	.36000E+02	.35388E+01	.47475E+01
.36000E+02	.35402E+01	.54144E+01	.36000E+02	.35405E+01	.61245E+01	.36000E+02	.35396E+01	.68754E+01
.36000E+02	.35371E+01	.76641E+01	.36000E+02	.35322E+01	.84864E+01	.36000E+02	.35232E+01	.93375E+01
.36000E+02	.35060E+01	.10211E+02	.36000E+02	.34711E+01	.11101E+02	.36000E+02	.33921E+01	.12000E+02

I = 11 J = 11 (X,Y,Z)

.36000E+02	.49100E+01	0.	.36000E+02	.49597E+01	.30146E+00	.36000E+02	.50034E+01	.61140E+00
.36000E+02	.50424E+01	.93746E+00	.36000E+02	.50774E+01	.12864E+01	.36000E+02	.51087E+01	.16641E+01
.36000E+02	.51364E+01	.20754E+01	.36000E+02	.51604E+01	.25245E+01	.36000E+02	.51808E+01	.30144E+01
.36000E+02	.51975E+01	.35475E+01	.36000E+02	.52106E+01	.41250E+01	.36000E+02	.52199E+01	.47475E+01
.36000E+02	.52253E+01	.54144E+01	.36000E+02	.52266E+01	.61245E+01	.36000E+02	.52231E+01	.68754E+01
.36000E+02	.52136E+01	.76641E+01	.36000E+02	.51956E+01	.84864E+01	.36000E+02	.51654E+01	.93375E+01
.36000E+02	.51163E+01	.10211E+02	.36000E+02	.50370E+01	.11101E+02	.36000E+02	.49100E+01	.12000E+02

I = 11 J = 16 (X,Y,Z)

.36000E+02	.74066E+01	0.	.36000E+02	.74508E+01	.30146E+00	.36000E+02	.74924E+01	.61140E+00
.36000E+02	.75322E+01	.93746E+00	.36000E+02	.75705E+01	.12864E+01	.36000E+02	.76073E+01	.16641E+01
.36000E+02	.76424E+01	.20754E+01	.36000E+02	.76751E+01	.25245E+01	.36000E+02	.77048E+01	.30144E+01
.36000E+02	.77308E+01	.35475E+01	.36000E+02	.77523E+01	.41250E+01	.36000E+02	.77683E+01	.47475E+01
.36000E+02	.77781E+01	.54144E+01	.36000E+02	.77806E+01	.61245E+01	.36000E+02	.77745E+01	.68754E+01
.36000E+02	.77579E+01	.76641E+01	.36000E+02	.77286E+01	.84864E+01	.36000E+02	.76833E+01	.93375E+01
.36000E+02	.76178E+01	.10211E+02	.36000E+02	.75273E+01	.11101E+02	.36000E+02	.74066E+01	.12000E+02

I = 11 J = 21 (X,Y,Z)

.36000E+02	.10882E+02	0.	.36000E+02	.10907E+02	.30146E+00	.36000E+02	.10932E+02	.61140E+00
.36000E+02	.10956E+02	.93746E+00	.36000E+02	.10980E+02	.12864E+01	.36000E+02	.11004E+02	.16641E+01
.36000E+02	.11027E+02	.20754E+01	.36000E+02	.11049E+02	.25245E+01	.36000E+02	.11070E+02	.30144E+01
.36000E+02	.11089E+02	.35475E+01	.36000E+02	.11105E+02	.41250E+01	.36000E+02	.11117E+02	.47475E+01
.36000E+02	.11124E+02	.54144E+01	.36000E+02	.11126E+02	.61245E+01	.36000E+02	.11122E+02	.68754E+01
.36000E+02	.11109E+02	.76641E+01	.36000E+02	.11087E+02	.84864E+01	.36000E+02	.11055E+02	.93375E+01
.36000E+02	.11011E+02	.10211E+02	.36000E+02	.10954E+02	.11101E+02	.36000E+02	.10882E+02	.12000E+02

I = 11 J = 26 (X,Y,Z)

.36000E+02	.15000E+02	0.	.36000E+02	.15000E+02	.30146E+00	.36000E+02	.15000E+02	.61140E+00
.36000E+02	.15000E+02	.93746E+00	.36000E+02	.15000E+02	.12864E+01	.36000E+02	.15000E+02	.16641E+01
.36000E+02	.15000E+02	.20754E+01	.36000E+02	.15000E+02	.25245E+01	.36000E+02	.15000E+02	.30144E+01
.36000E+02	.15000E+02	.35475E+01	.36000E+02	.15000E+02	.41250E+01	.36000E+02	.15000E+02	.47475E+01
.36000E+02	.15000E+02	.54144E+01	.36000E+02	.15000E+02	.61245E+01	.36000E+02	.15000E+02	.68754E+01
.36000E+02	.15000E+02	.76641E+01	.36000E+02	.15000E+02	.84864E+01	.36000E+02	.15000E+02	.93375E+01
.36000E+02	.15000E+02	.10211E+02	.36000E+02	.15000E+02	.11101E+02	.36000E+02	.15000E+02	.12000E+02

I = 16 J = 1 (X,Y,Z)

.54000E+02	.37760E+01	0.	.54000E+02	.37760E+01	.30146E+00	.54000E+02	.37760E+01	.61140E+00

.54000E+02	.37760E+01	.93746E+00	.54000E+02	.37760E+01	.12864E+01	.54000E+02	.37760E+01	.16641E+01
.54000E+02	.37760E+01	.20754E+01	.54000E+02	.37760E+01	.25245E+01	.54000E+02	.37760E+01	.30144E+01
.54000E+02	.37760E+01	.35475E+01	.54000E+02	.37760E+01	.41250E+01	.54000E+02	.37760E+01	.47475E+01
.54000E+02	.37760E+01	.54144E+01	.54000E+02	.37760E+01	.61245E+01	.54000E+02	.37760E+01	.68754E+01
.54000E+02	.37760E+01	.76641E+01	.54000E+02	.37760E+01	.84864E+01	.54000E+02	.37760E+01	.93375E+01
.54000E+02	.37760E+01	.10211E+02	.54000E+02	.37760E+01	.11101E+02	.54000E+02	.37760E+01	.12000E+02

I = 16 J = 6 (X,Y,Z)

.54000E+02	.45626E+01	0.	.54000E+02	.46143E+01	.30146E+00	.54000E+02	.46528E+01	.61140E+00
.54000E+02	.46824E+01	.93746E+00	.54000E+02	.47059E+01	.12864E+01	.54000E+02	.47246E+01	.16641E+01
.54000E+02	.47395E+01	.20754E+01	.54000E+02	.47514E+01	.25245E+01	.54000E+02	.47607E+01	.30144E+01
.54000E+02	.47678E+01	.35475E+01	.54000E+02	.47730E+01	.41250E+01	.54000E+02	.47766E+01	.47475E+01
.54000E+02	.47787E+01	.54144E+01	.54000E+02	.47791E+01	.61245E+01	.54000E+02	.47778E+01	.68754E+01
.54000E+02	.47741E+01	.76641E+01	.54000E+02	.47668E+01	.84864E+01	.54000E+02	.47532E+01	.93375E+01
.54000E+02	.47278E+01	.10211E+02	.54000E+02	.46767E+01	.11101E+02	.54000E+02	.45626E+01	.12000E+02

I = 16 J = 11 (X,Y,Z)

.54000E+02	.59275E+01	0.	.54000E+02	.60006E+01	.30146E+00	.54000E+02	.60643E+01	.61140E+00
.54000E+02	.61206E+01	.93746E+00	.54000E+02	.61707E+01	.12864E+01	.54000E+02	.62154E+01	.16641E+01
.54000E+02	.62548E+01	.20754E+01	.54000E+02	.62889E+01	.25245E+01	.54000E+02	.63178E+01	.30144E+01
.54000E+02	.63415E+01	.35475E+01	.54000E+02	.63599E+01	.41250E+01	.54000E+02	.63731E+01	.47475E+01
.54000E+02	.63809E+01	.54144E+01	.54000E+02	.63827E+01	.61245E+01	.54000E+02	.63777E+01	.68754E+01
.54000E+02	.63641E+01	.76641E+01	.54000E+02	.63387E+01	.84864E+01	.54000E+02	.62958E+01	.93375E+01
.54000E+02	.62259E+01	.10211E+02	.54000E+02	.61125E+01	.11101E+02	.54000E+02	.59275E+01	.12000E+02

I = 16 J = 16 (X,Y,Z)

.54000E+02	.81722E+01	0.	.54000E+02	.82384E+01	.30146E+00	.54000E+02	.82999E+01	.61140E+00
.54000E+02	.83581E+01	.93746E+00	.54000E+02	.84136E+01	.12864E+01	.54000E+02	.84664E+01	.16641E+01
.54000E+02	.85161E+01	.20754E+01	.54000E+02	.85621E+01	.25245E+01	.54000E+02	.86035E+01	.30144E+01
.54000E+02	.86394E+01	.35475E+01	.54000E+02	.86688E+01	.41250E+01	.54000E+02	.86906E+01	.47475E+01
.54000E+02	.87039E+01	.54144E+01	.54000E+02	.87072E+01	.61245E+01	.54000E+02	.86989E+01	.68754E+01
.54000E+02	.86763E+01	.76641E+01	.54000E+02	.86361E+01	.84864E+01	.54000E+02	.85732E+01	.93375E+01
.54000E+02	.84810E+01	.10211E+02	.54000E+02	.83508E+01	.11101E+02	.54000E+02	.81722E+01	.12000E+02

I = 16 J = 21 (X,Y,Z)

.54000E+02	.11297E+02	0.	.54000E+02	.11336E+02	.30146E+00	.54000E+02	.11373E+02	.61140E+00
.54000E+02	.11409E+02	.93746E+00	.54000E+02	.11445E+02	.12864E+01	.54000E+02	.11479E+02	.16641E+01
.54000E+02	.11512E+02	.20754E+01	.54000E+02	.11544E+02	.25245E+01	.54000E+02	.11573E+02	.30144E+01
.54000E+02	.11599E+02	.35475E+01	.54000E+02	.11621E+02	.41250E+01	.54000E+02	.11637E+02	.47475E+01
.54000E+02	.11648E+02	.54144E+01	.54000E+02	.11650E+02	.61245E+01	.54000E+02	.11644E+02	.68754E+01
.54000E+02	.11627E+02	.76641E+01	.54000E+02	.11597E+02	.84864E+01	.54000E+02	.11552E+02	.93375E+01
.54000E+02	.11489E+02	.10211E+02	.54000E+02	.11405E+02	.11101E+02	.54000E+02	.11297E+02	.12000E+02

I = 16 J = 26 (X,Y,Z)

.54000E+02	.15000E+02	0.	.54000E+02	.15000E+02	.30146E+00	.54000E+02	.15000E+02	.61140E+00
.54000E+02	.15000E+02	.93746E+00	.54000E+02	.15000E+02	.12864E+01	.54000E+02	.15000E+02	.16641E+01
.54000E+02	.15000E+02	.20754E+01	.54000E+02	.15000E+02	.25245E+01	.54000E+02	.15000E+02	.30144E+01
.54000E+02	.15000E+02	.35475E+01	.54000E+02	.15000E+02	.41250E+01	.54000E+02	.15000E+02	.47475E+01
.54000E+02	.15000E+02	.54144E+01	.54000E+02	.15000E+02	.61245E+01	.54000E+02	.15000E+02	.68754E+01
.54000E+02	.15000E+02	.76641E+01	.54000E+02	.15000E+02	.84864E+01	.54000E+02	.15000E+02	.93375E+01
.54000E+02	.15000E+02	.10211E+02	.54000E+02	.15000E+02	.11101E+02	.54000E+02	.15000E+02	.12000E+02

I = 21 J = 1 (X,Y,Z)

.72000E+02	.49315E+01	0.	.72000E+02	.49314E+01	.30146E+00	.72000E+02	.49310E+01	.61140E+00
.72000E+02	.49304E+01	.93746E+00	.72000E+02	.49294E+01	.12864E+01	.72000E+02	.49280E+01	.16641E+01
.72000E+02	.49260E+01	.20754E+01	.72000E+02	.49234E+01	.25245E+01	.72000E+02	.49200E+01	.30144E+01
.72000E+02	.49156E+01	.35475E+01	.72000E+02	.49100E+01	.41250E+01	.72000E+02	.49030E+01	.47475E+01
.72000E+02	.48945E+01	.54144E+01	.72000E+02	.48842E+01	.61245E+01	.72000E+02	.48718E+01	.68754E+01
.72000E+02	.48574E+01	.76641E+01	.72000E+02	.48406E+01	.84864E+01	.72000E+02	.48215E+01	.93375E+01
.72000E+02	.47999E+01	.10211E+02	.72000E+02	.47760E+01	.11101E+02	.72000E+02	.47498E+01	.12000E+02

I = 21 J = 6 (X,Y,Z)

.72000E+02	.56371E+01	0.	.72000E+02	.57010E+01	.30146E+00	.72000E+02	.57481E+01	.61140E+00
.72000E+02	.57840E+01	.93746E+00	.72000E+02	.58120E+01	.12864E+01	.72000E+02	.58337E+01	.16641E+01
.72000E+02	.58504E+01	.20754E+01	.72000E+02	.58625E+01	.25245E+01	.72000E+02	.58707E+01	.30144E+01
.72000E+02	.58753E+01	.35475E+01	.72000E+02	.58764E+01	.41250E+01	.72000E+02	.58740E+01	.47475E+01
.72000E+02	.58682E+01	.54144E+01	.72000E+02	.58586E+01	.61245E+01	.72000E+02	.58449E+01	.68754E+01
.72000E+02	.58262E+01	.76641E+01	.72000E+02	.58007E+01	.84864E+01	.72000E+02	.57655E+01	.93375E+01
.72000E+02	.57136E+01	.10211E+02	.72000E+02	.56290E+01	.11101E+02	.72000E+02	.54681E+01	.12000E+02

I = 21 J = 11 (X,Y,Z)

.72000E+02	.68614E+01	0.	.72000E+02	.69527E+01	.30146E+00	.72000E+02	.70308E+01	.61140E+00
.72000E+02	.70989E+01	.93746E+00	.72000E+02	.71586E+01	.12864E+01	.72000E+02	.72110E+01	.16641E+01
.72000E+02	.72564E+01	.20754E+01	.72000E+02	.72946E+01	.25245E+01	.72000E+02	.73258E+01	.30144E+01
.72000E+02	.73496E+01	.35475E+01	.72000E+02	.73665E+01	.41250E+01	.72000E+02	.73758E+01	.47475E+01
.72000E+02	.73772E+01	.54144E+01	.72000E+02	.73702E+01	.61245E+01	.72000E+02	.73535E+01	.68754E+01
.72000E+02	.73250E+01	.76641E+01	.72000E+02	.72807E+01	.84864E+01	.72000E+02	.72141E+01	.93375E+01
.72000E+02	.71137E+01	.10211E+02	.72000E+02	.69595E+01	.11101E+02	.72000E+02	.67145E+01	.12000E+02

I = 21 J = 16 (X,Y,Z)

.72000E+02	.88751E+01	0.	.72000E+02	.89577E+01	.30146E+00	.72000E+02	.90334E+01	.61140E+00
.72000E+02	.91040E+01	.93746E+00	.72000E+02	.91703E+01	.12864E+01	.72000E+02	.92323E+01	.16641E+01
.72000E+02	.92897E+01	.20754E+01	.72000E+02	.93416E+01	.25245E+01	.72000E+02	.93872E+01	.30144E+01
.72000E+02	.94253E+01	.35475E+01	.72000E+02	.94550E+01	.41250E+01	.72000E+02	.94750E+01	.47475E+01
.72000E+02	.94842E+01	.54144E+01	.72000E+02	.94811E+01	.61245E+01	.72000E+02	.94638E+01	.68754E+01
.72000E+02	.94291E+01	.76641E+01	.72000E+02	.93730E+01	.84864E+01	.72000E+02	.92890E+01	.93375E+01
.72000E+02	.91685E+01	.10211E+02	.72000E+02	.89991E+01	.11101E+02	.72000E+02	.87646E+01	.12000E+02

I = 21 J = 21 (X,Y,Z)

.72000E+02	.11678E+02	0.	.72000E+02	.11727E+02	.30146E+00	.72000E+02	.11773E+02	.61140E+00
.72000E+02	.11817E+02	.93746E+00	.72000E+02	.11859E+02	.12864E+01	.72000E+02	.11900E+02	.16641E+01
.72000E+02	.11939E+02	.20754E+01	.72000E+02	.11975E+02	.25245E+01	.72000E+02	.12007E+02	.30144E+01
.72000E+02	.12036E+02	.35475E+01	.72000E+02	.12058E+02	.41250E+01	.72000E+02	.12074E+02	.47475E+01
.72000E+02	.12083E+02	.54144E+01	.72000E+02	.12082E+02	.61245E+01	.72000E+02	.12071E+02	.68754E+01
.72000E+02	.12047E+02	.76641E+01	.72000E+02	.12008E+02	.84864E+01	.72000E+02	.11950E+02	.93375E+01
.72000E+02	.11869E+02	.10211E+02	.72000E+02	.11760E+02	.11101E+02	.72000E+02	.11618E+02	.12000E+02

I = 21 J = 26 (X,Y,Z)

.72000E+02	.15000E+02	0.	.72000E+02	.15000E+02	.30146E+00	.72000E+02	.15000E+02	.61140E+00
.72000E+02	.15000E+02	.93746E+00	.72000E+02	.15000E+02	.12864E+01	.72000E+02	.15000E+02	.16641E+01
.72000E+02	.15000E+02	.20754E+01	.72000E+02	.15000E+02	.25245E+01	.72000E+02	.15000E+02	.30144E+01
.72000E+02	.15000E+02	.35475E+01	.72000E+02	.15000E+02	.41250E+01	.72000E+02	.15000E+02	.47475E+01
.72000E+02	.15000E+02	.54144E+01	.72000E+02	.15000E+02	.61245E+01	.72000E+02	.15000E+02	.68754E+01
.72000E+02	.15000E+02	.76641E+01	.72000E+02	.15000E+02	.84864E+01	.72000E+02	.15000E+02	.93375E+01
.72000E+02	.15000E+02	.10211E+02	.72000E+02	.15000E+02	.11101E+02	.72000E+02	.15000E+02	.12000E+02

I = 26 J = 1 (X,Y,Z)

.90000E+02	.54589E+01	0.	.90000E+02	.54586E+01	.30146E+00	.90000E+02	.54577E+01	.61140E+00
.90000E+02	.54560E+01	.93746E+00	.90000E+02	.54535E+01	.12864E+01	.90000E+02	.54498E+01	.16641E+01
.90000E+02	.54448E+01	.20754E+01	.90000E+02	.54380E+01	.25245E+01	.90000E+02	.54291E+01	.30144E+01
.90000E+02	.54177E+01	.35475E+01	.90000E+02	.54032E+01	.41250E+01	.90000E+02	.53851E+01	.47475E+01
.90000E+02	.53629E+01	.54144E+01	.90000E+02	.53361E+01	.61245E+01	.90000E+02	.53041E+01	.68754E+01
.90000E+02	.52665E+01	.76641E+01	.90000E+02	.52230E+01	.84864E+01	.90000E+02	.51732E+01	.93375E+01
.90000E+02	.51172E+01	.10211E+02	.90000E+02	.50550E+01	.11101E+02	.90000E+02	.49868E+01	.12000E+02

I = 26 J = 6 (X,Y,Z)

.90000E+02	.61275E+01	0.	.90000E+02	.61273E+01	.30146E+00	.90000E+02	.61264E+01	.61140E+00
.90000E+02	.61249E+01	.93746E+00	.90000E+02	.61225E+01	.12864E+01	.90000E+02	.61191E+01	.16641E+01
.90000E+02	.61144E+01	.20754E+01	.90000E+02	.61081E+01	.25245E+01	.90000E+02	.60999E+01	.30144E+01
.90000E+02	.60892E+01	.35475E+01	.90000E+02	.60757E+01	.41250E+01	.90000E+02	.60589E+01	.47475E+01
.90000E+02	.60383E+01	.54144E+01	.90000E+02	.60133E+01	.61245E+01	.90000E+02	.59836E+01	.68754E+01
.90000E+02	.59486E+01	.76641E+01	.90000E+02	.59082E+01	.84864E+01	.90000E+02	.58619E+01	.93375E+01
.90000E+02	.58098E+01	.10211E+02	.90000E+02	.57519E+01	.11101E+02	.90000E+02	.56886E+01	.12000E+02

I = 26 J = 11 (X,Y,Z)

.90000E+02	.72877E+01	0.	.90000E+02	.72875E+01	.30146E+00	.90000E+02	.72867E+01	.61140E+00
.90000E+02	.72854E+01	.93746E+00	.90000E+02	.72834E+01	.12864E+01	.90000E+02	.72804E+01	.16641E+01
.90000E+02	.72763E+01	.20754E+01	.90000E+02	.72709E+01	.25245E+01	.90000E+02	.72637E+01	.30144E+01
.90000E+02	.72544E+01	.35475E+01	.90000E+02	.72427E+01	.41250E+01	.90000E+02	.72281E+01	.47475E+01
.90000E+02	.72101E+01	.54144E+01	.90000E+02	.71885E+01	.61245E+01	.90000E+02	.71626E+01	.68754E+01
.90000E+02	.71322E+01	.76641E+01	.90000E+02	.70970E+01	.84864E+01	.90000E+02	.70568E+01	.93375E+01
.90000E+02	.70115E+01	.10211E+02	.90000E+02	.69612E+01	.11101E+02	.90000E+02	.69062E+01	.12000E+02

I = 26 J = 16 (X,Y,Z)

.90000E+02	.91960E+01	0.	.90000E+02	.91958E+01	.30146E+00	.90000E+02	.91952E+01	.61140E+00
.90000E+02	.91942E+01	.93746E+00	.90000E+02	.91927E+01	.12864E+01	.90000E+02	.91904E+01	.16641E+01
.90000E+02	.91874E+01	.20754E+01	.90000E+02	.91833E+01	.25245E+01	.90000E+02	.91779E+01	.30144E+01
.90000E+02	.91709E+01	.35475E+01	.90000E+02	.91621E+01	.41250E+01	.90000E+02	.91511E+01	.47475E+01
.90000E+02	.91376E+01	.54144E+01	.90000E+02	.91212E+01	.61245E+01	.90000E+02	.91018E+01	.68754E+01
.90000E+02	.90789E+01	.76641E+01	.90000E+02	.90524E+01	.84864E+01	.90000E+02	.90222E+01	.93375E+01
.90000E+02	.89881E+01	.10211E+02	.90000E+02	.89502E+01	.11101E+02	.90000E+02	.89088E+01	.12000E+02

I = 26 J = 21 (X,Y,Z)

.90000E+02	.11852E+02	0.	.90000E+02	.11852E+02	.30146E+00	.90000E+02	.11852E+02	.61140E+00
.90000E+02	.11851E+02	.93746E+00	.90000E+02	.11850E+02	.12864E+01	.90000E+02	.11849E+02	.16641E+01
.90000E+02	.11848E+02	.20754E+01	.90000E+02	.11845E+02	.25245E+01	.90000E+02	.11842E+02	.30144E+01
.90000E+02	.11839E+02	.35475E+01	.90000E+02	.11834E+02	.41250E+01	.90000E+02	.11828E+02	.47475E+01
.90000E+02	.11821E+02	.54144E+01	.90000E+02	.11812E+02	.61245E+01	.90000E+02	.11801E+02	.68754E+01
.90000E+02	.11789E+02	.76641E+01	.90000E+02	.11774E+02	.84864E+01	.90000E+02	.11758E+02	.93375E+01
.90000E+02	.11739E+02	.10211E+02	.90000E+02	.11719E+02	.11101E+02	.90000E+02	.11696E+02	.12000E+02

I = 26 J = 26 (X,Y,Z)

.90000E+02	.15000E+02	0.	.90000E+02	.15000E+02	.30146E+00	.90000E+02	.15000E+02	.61140E+00
.90000E+02	.15000E+02	.93746E+00	.90000E+02	.15000E+02	.12864E+01	.90000E+02	.15000E+02	.16641E+01
.90000E+02	.15000E+02	.20754E+01	.90000E+02	.15000E+02	.25245E+01	.90000E+02	.15000E+02	.30144E+01
.90000E+02	.15000E+02	.35475E+01	.90000E+02	.15000E+02	.41250E+01	.90000E+02	.15000E+02	.47475E+01
.90000E+02	.15000E+02	.54144E+01	.90000E+02	.15000E+02	.61245E+01	.90000E+02	.15000E+02	.68754E+01
.90000E+02	.15000E+02	.76641E+01	.90000E+02	.15000E+02	.84864E+01	.90000E+02	.15000E+02	.93375E+01
.90000E+02	.15000E+02	.10211E+02	.90000E+02	.15000E+02	.11101E+02	.90000E+02	.15000E+02	.12000E+02

III. Conclusions and Recommendations

A method for numerically generating three-dimensional coordinate system for a wedge with a curved after body has been presented. The computer program AFTBDY used to numerically generate the coordinate system stores the data on a disk file. This coordinate system will become a part of the input to the three-dimensional Navier-Stokes computer program GANS (developed by Dr. Julius E. Harris at the NASA Langley Research Center). The computer program GANS is a code to solve three dimensional, time split, viscous, compressible Navier-Stokes equations.

No Navier-Stokes computer runs using GANS have been made as yet for a wedge curved after body using the coordinate system generated by the program AFTBDY. There are two areas in program AFTBDY where improvements may have to be made in case the Navier-Stokes solution generates errors which are attributable to the coordinate system.

The first area could be the way the attraction term Q is computed. Q is presently computed based on the y variation on $\xi = 1$, $\zeta = 1$, $\eta = 1$, JMAX line. For all η planes the same value of Q is used. However, as the total y variation from $\eta = 1$ to $\eta =$ JMAX for various ξ and ζ stations changes, this treatment of Q gives η coordinate line variation as shown in Figure 10. Close to the after body, the η lines do not follow the after body contour satisfactorily. This problem can be minimized by choosing Q as a sum of exponential functions as suggested by Thompson, Mastin, and Thames of the Mississippi State University.

The second problem area is the use of Dirchlet boundary conditions on $\zeta = 1$ and $\zeta =$ KMAX planes. This results in abrupt change of slope near the $\zeta = 1$ and $\zeta =$ KMAX planes (Figure 10). This problem can be avoided by using Neumann boundary conditions on these two planes instead of Dirchlet boundary conditions.

IV. Programmer/Analyst Section

Program AFTBDY is structured such that the array size in ξ,η, and ζ direction can be varied from problem to problem by the use of text editor on the CDC 6600 machine. The array sizes are coded to be IMXLL, JMXLL, KMXLL in ξ, η, ζ direction, respectively. These are changed to the appropriate numeric number by the text editor prior to compiling the program. The job control cards, input explanation and other helpful hints are provided towards the beginning of main program AFTBDY. The program is extensively commented. Though, the code is not structured in the true sense, extreme care was taken to avoid unnecessary upward branching in the code. A brief discussion of each subroutine and their function follows.

A. Main Program AFTBDY

This program performs the following function,

i) Initialize variables to zero.

ii) Read in input data. If the field size is larger than the maximum field size allowed then the program aborts with a diagnostic message. The maximum size allowed is ILIMIT, JLIMIT, KLIMIT and field size input is IMAX, JMAX, KMAX. ILIMIT, JLIMIT, KLIMIT are set by the text editor. The storage in N.S. code is such that it is necessary to set,

```
ILIMIT = IMAX
JLIMIT = JMAX
KLIMIT = KMAX
```

iii) Call subroutine INIT to specify initial guess and compute P, Q, and R.

iv) Call IPRTC to print initial guess.

v) Call IPLTC to plot initial guess.

vi) Call CALCOR to iterate for the value of y CALCOR passes back flag KKK = 1 if the solution converges, otherwise KKK remains set to 0.

vii) Call IPRTC to print partially or converged solution.

viii) Call IPLTC to plot partially or converged solution.

ix) If the solution converges, then store solution on unit 1. If the convergence is not reached in ITERMX iterations, then a diagnostic message is printed and the solution is not stored on unit 1.

B. Subroutine INIT

This subroutine computes the initial guess and the inhomogeneous terms P, Q, and R.

C. Subroutine CALCOR

This subroutine computes for y. A do loop is set to perform ITERMX iterations. Maximum error in y and its I, J, K location is stored in YERRMX, IYERI, IYERJ and IYERK. After each iteration maximum error is checked against the maximum error allowed. If maximum error is less than maximum error allowed, then the flag KKK is set to 1 and an exit from the do loop is taken. If convergence is not reached in ITERMX iteration, then the flag KKK remains set to zero.

D. Subroutine IPRTC

This subroutine prints initial guess, partially converged solution or the converged solution. The following flags indicate the status of the solution

ISOLN = 0	Initial guess
ISOLN = 0 and KKK = 0	Partially converged solution
ISOLN = 0 and KKK = 1	Converged solution

In case of ISOLN = 0, IPRT1 flag indicates whether the solution is to be printed or not. IDEL1 and JDEL1 indicate the interval of ξ and η at which the solution is to be printed.

When ISOLN = 1, IPRT2 flag indicates whether the solution is to be printed or not. In this case IDEL2 and JDEL2 take on the same significance as IDEL1 and JDEL1 in the case of the initial guess.

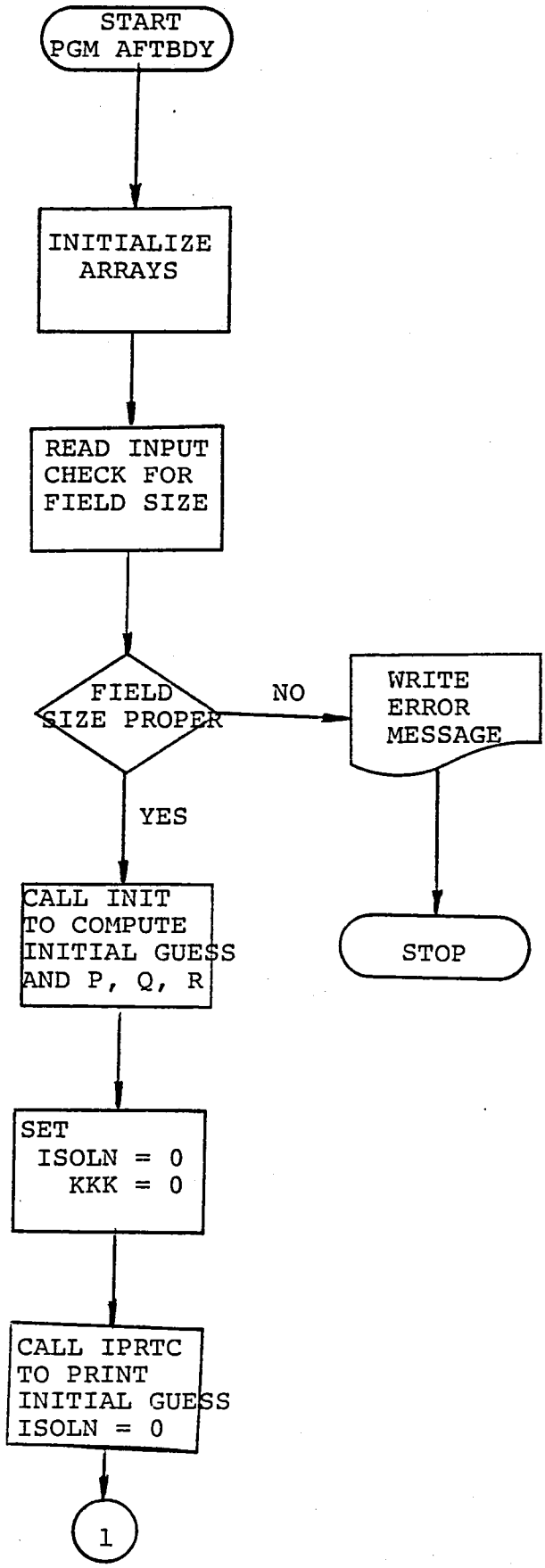
E. Subroutine IPLTC

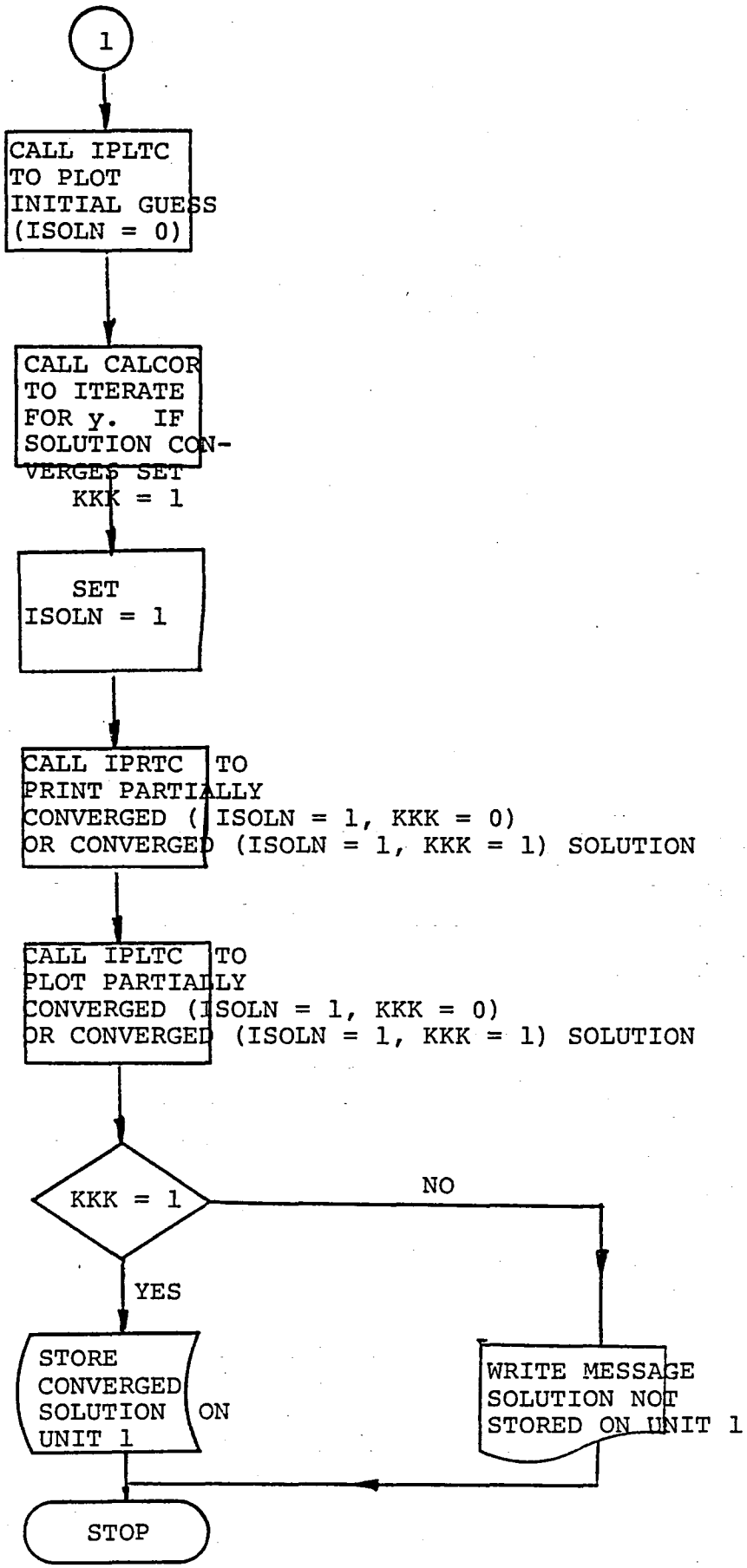
This subroutine is used to plot initial guess, partially converged solution or the converged solution. The flags to indicate the type of solution are the same as in the subroutine IPRTC. This subroutine plots ξ and ζ planes as indicated by input to the program.

F. Block Diagram

The block diagram is presented on the next page.

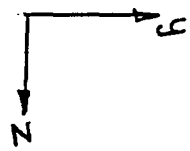
F. Block Diagram

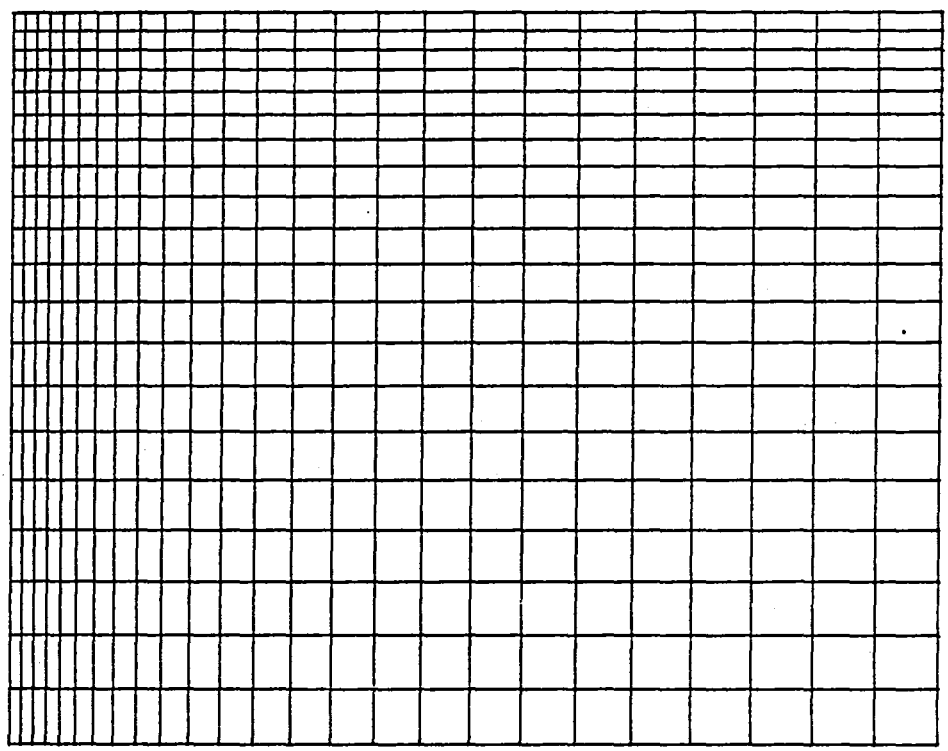



1
CALL IPLTC TO PLOT INITIAL GUESS (ISOLN = 0)
CALL CALCOR TO ITERATE FOR y. IF SOLUTION CONVERGES SET KKK = 1
SET ISOLN = 1
CALL IPRTC TO PRINT PARTIALLY CONVERGED (ISOLN = 1, KKK = 0) OR CONVERGED (ISOLN = 1, KKK = 1) SOLUTION
CALL IPLTC TO PLOT PARTIALLY CONVERGED (ISOLN = 1, KKK = 0) OR CONVERGED (ISOLN = 1, KKK = 1) SOLUTION
KKK = 1
NO
YES
STORE CONVERGED SOLUTION ON UNIT 1
WRITE MESSAGE SOLUTION NOT STORED ON UNIT 1
STOP

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- INITIAL GUESS ---
IMAX 26 JMAX 26 KMAX 21

-- Y-Z PLOT I 1 X 0.



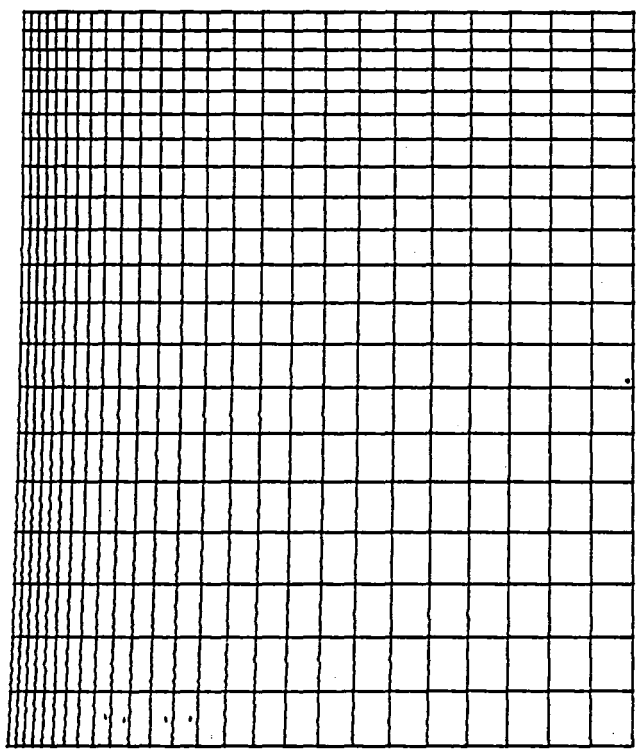


INFOPLT 1

Figure 3. Initial Guess ξ = 1 Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- INITIAL GUESS ---
IMAX 26 JMAX 26 KMAX 21

-- Y-Z PLOT I 22 X .75600E 02

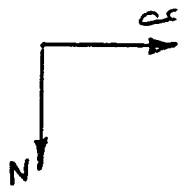


INFOPLT 2.

Figure 4. Initial Guess ξ = 22 Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- INITIAL GUESS ---
IMAX 26 JMAX 26 KMAX 21

-- Y-Z PLOT I 26 X .90000E 02



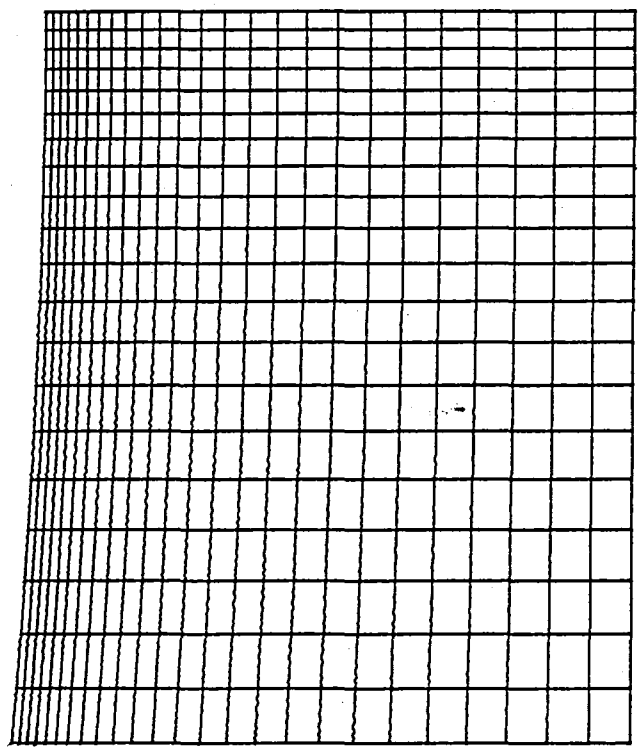


Figure 5. Initial Guess ξ = 26 Plane

INFOPLT 3.

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- INITIAL GUESS ---
IMAX 26 JMAX 26 KMAX 21

-- X-Y PLOT K 1 Z 0.

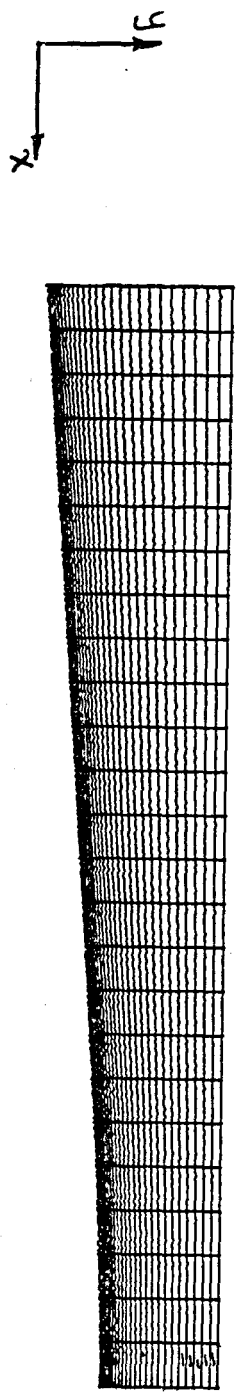


Figure 6. Initial Guess ζ = 1 Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- INITIAL GUESS ---
IMAX 26 JMAX 26 KMAX 21

-- X-Y PLOT K 11 Z .41250E 01

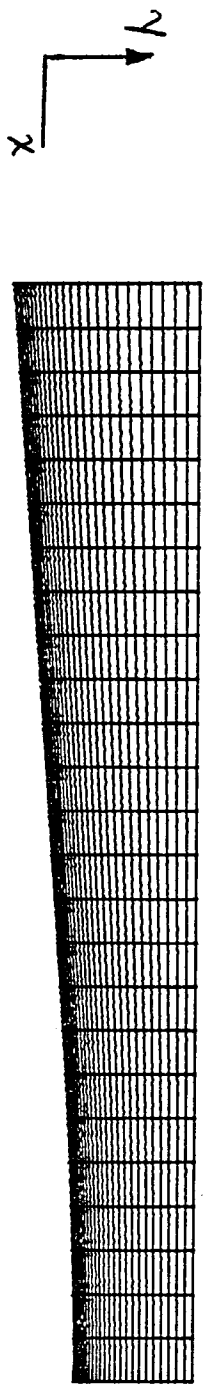


Figure 7. Initial Guess ζ = 11 Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- INITIAL GUESS ---
IMAX 26 JMAX 26 KMAX 21

-- X-Y PLOT K 21 Z .12000E 02

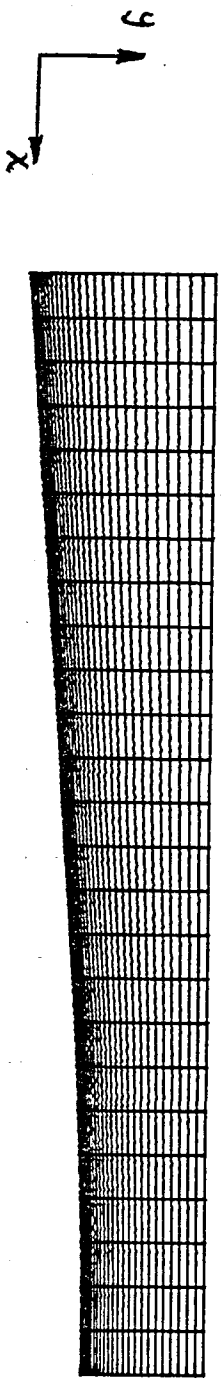
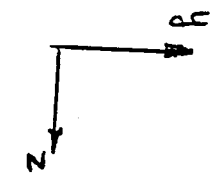
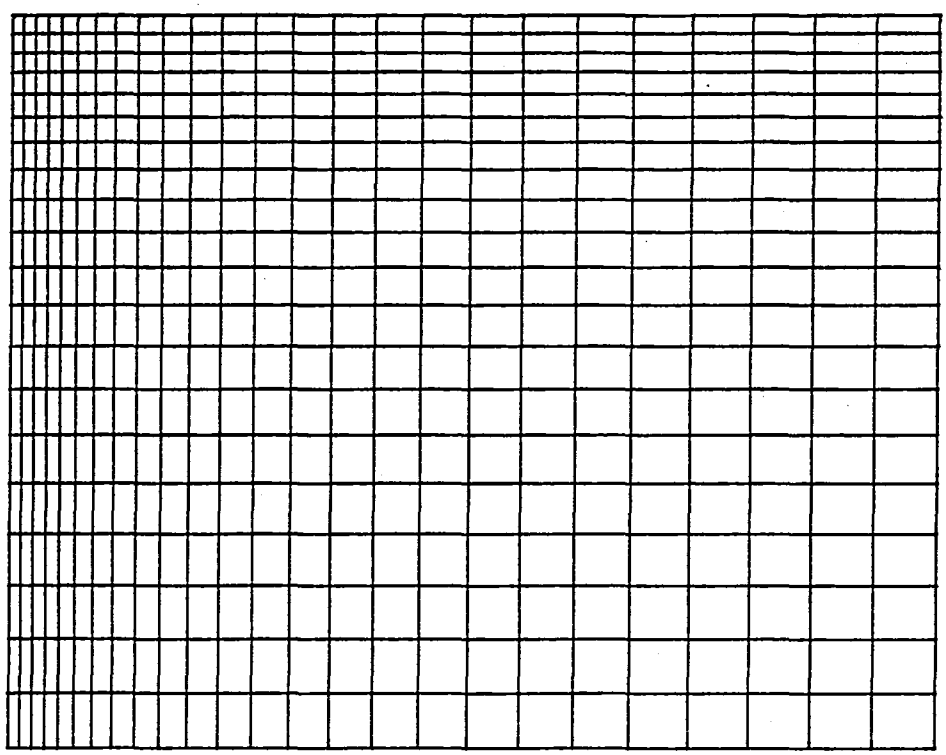


Figure 8. Initial Guess ζ = 21 Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- CONVERGED SOLUTION ---
IMAX 26 JMAX 26 KMAX 21

-- Y-Z PLOT I 1 X 0.





INFOPLT 7.

Figure 9. Converged Solution ξ = 1 Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- CONVERGED SOLUTION ---
IMAX 26 JMAX 26 KMAX 21

-- Y-Z PLOT I 22 X .75600E 02

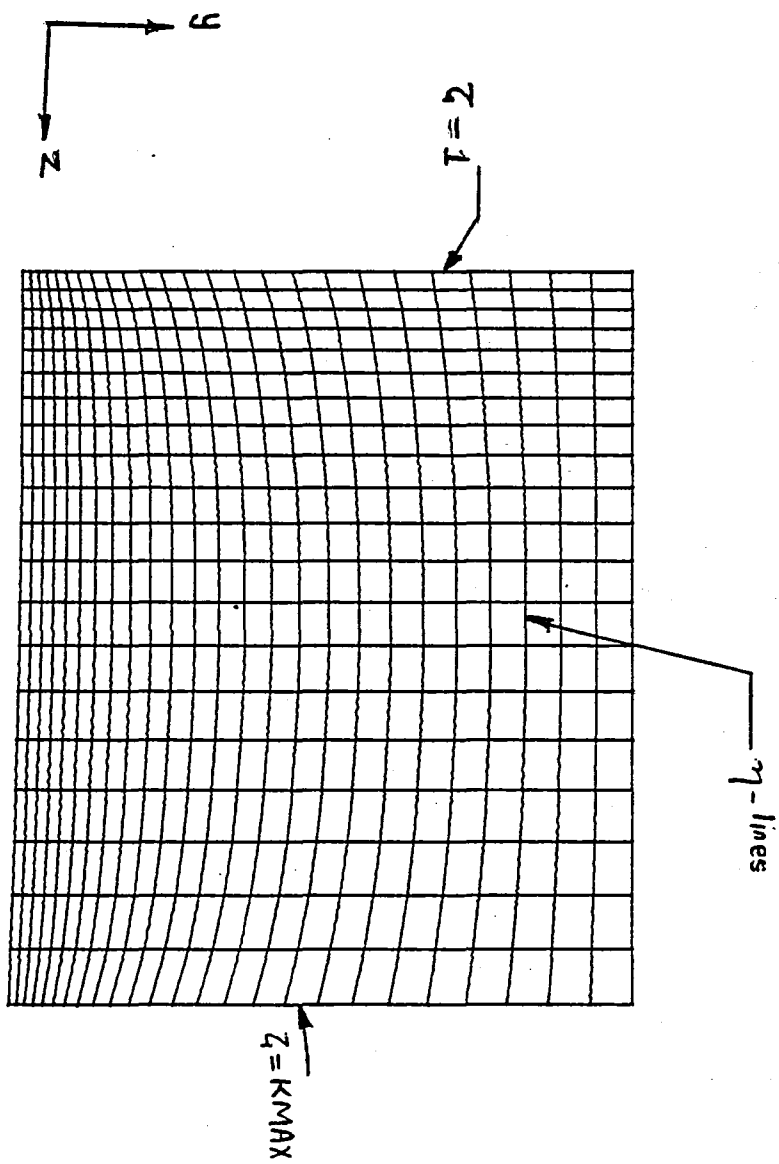
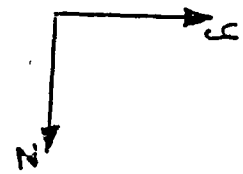
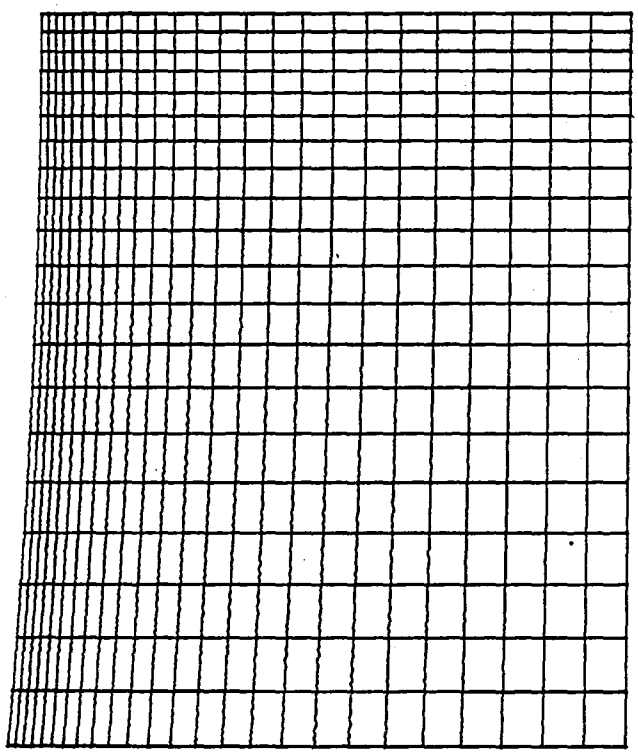


Figure 10. Converged Solution $\xi = 22$

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- CONVERGED SOLUTION ---
IMAX 26 JMAX 26 KMAX 21

-- Y-Z PLOT I 26 X .90000E 02





INFOPLT 9.

Figure 11 Converged Solution ξ = 26 Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- CONVERGED SOLUTION ---
IMAX 26 JMAX 26 KMAX 21

-- X-Y PLOT K 1 Z 0.

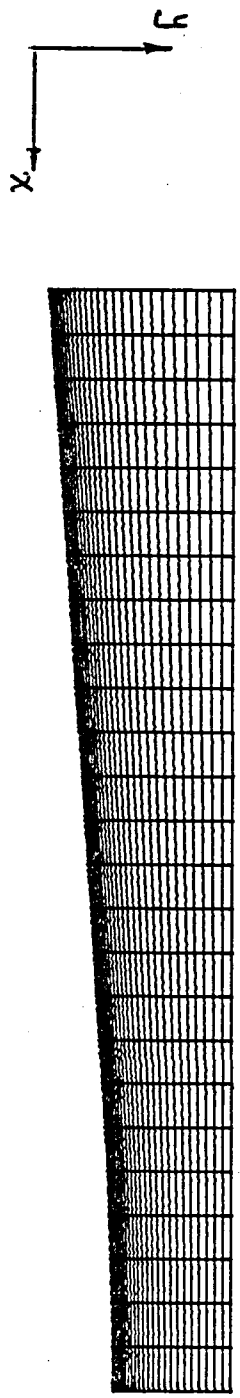
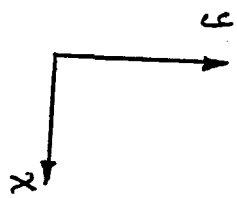


Figure 12. Converged Solution $\zeta = 1$ Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- CONVERGED SOLUTION ---
IMAX 26 JMAX 26 KMAX 21

-- X-Y PLOT K 11 Z .41250E 01



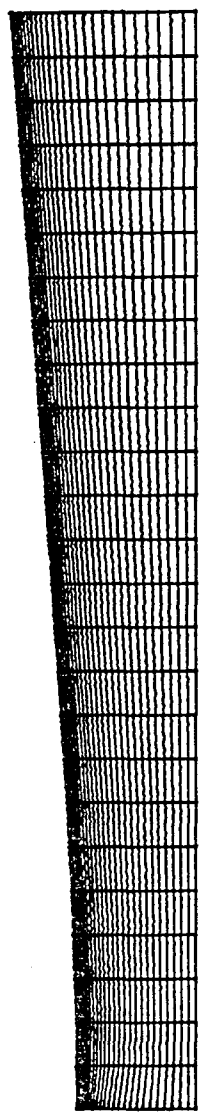
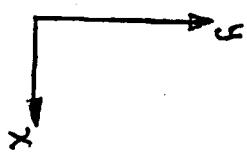


Figure 13. Converged Solution $\zeta = 11$ Plane

AFTER BODY NUMBER 1
TEST STARTED FEB 16,1979
--- CONVERGED SOLUTION ---
IMAX 26 JMAX 26 KMAX 21

- X-Y PLOT K 21 Z .12000E 02



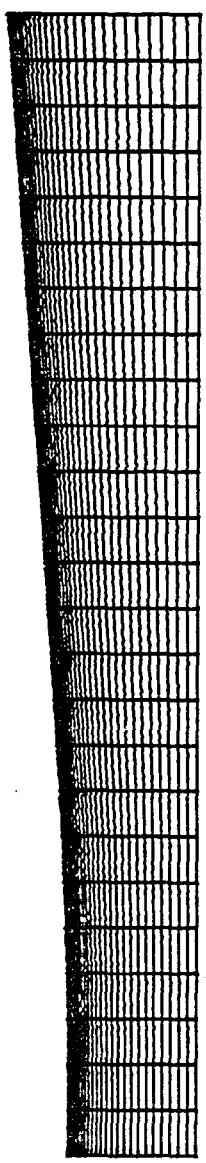


Figure 14. Converged Solution ζ = 21 Plane

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15. Supplementary Notes

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16. Abstract The computer program AFTBDY generates a body-fitted curvilinear coordinate system for a wedge curved after body.(Fig. 1). This wedge curved after body is being used in an experimental program at the Langley Research Center. The coordinate system generated by AFTBDY will be used to solve 3D compressible N.S. equations. The coordinate system in the physical plane is a cartesian x,y,z system, whereas, in the transformed plane a rectangular ξ,η,ζ system is used. The coordinate system generated is such that in the transformed plane coordinate spacing in the ξ,η,ζ direction is constant and equal to unity. The physical plane coordinate lines in the different regions are clustered heavily or sparsely depending on the regions where physical quantities to be solved for by the N.S. equations have high or low gradients. The coordinate distribution in the physical plane is such that x stays constant in η and ζ direction, whereas, z stays constant in ξ and η direction. The desired distribution in x and z is input to the program. Consequently, only the y-coordinate is solved for by the program AFTBDY.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
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