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A Supersonic Three-Dimensional Code for Flow Over Blunt Bodies - Program Documentation and Test Cases

D. S. Chaussee and O. J. McMillan

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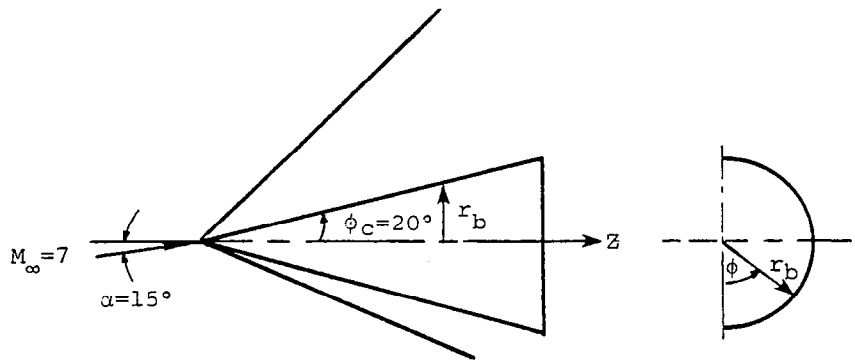
1. INTRODUCTION

In this report we present various test cases to exemplify the use of the three-dimensional code employed to calculate supersonic flow over blunt bodies.

Problem formulation, mathematical framework and the overall program logic are presented in a separate report (ref. 1). In section 2 of this report we present the input data and answer listings for the first test case which is for a 20° half-angle cone at 15° angle of attack and a free-stream Mach number of 7. Section 3 of this report involves the test case for a cone-ogive-cylinder at 10° angle of attack and a free-stream Mach number of 2.86. A complete listing of the code is given in the appendix.

2. FIRST TEST CASE: CONE

The first test case is for a 20° half-angle cone at 15° angle of attack and a free-stream Mach number of 7 as shown below.



The input data cards required are listed below. Further information about the parameters specified on these cards is provided in reference 1. Following this list is the input data set used for the first test case.

Card No.	Format	Variables	
1	8I5	NSEG:	Number of segment points.
		KIND:	Flag for kind of segment. 0 = sphere or circular ogive 1 = circular cone 2 = circular cone with flat cut
2	8F10.6	ZSEG:	Z - station initiating segment.
3	8F10.6	RSEG:	r - coord. initiating segment.
4	8F10.6	DSEG:	Distance from centerline to flat chord, initiating segment.
5	8F10.6	ASEG:	ϕ_{seg} - Angle between straight down and DSEG initiating segment.
5a	3F10.6	ZC:	Z at center of longitudinal arc.
		RC:	r at center of longitudinal arc.
		RADIUS:	Radius of longitudinal arc.

(Cards 6-11 are read in SUB.INPUT)

6	3E15.6, 5X,I5	XMACH:	Mach number
		ALPHA:	Angle of attack (degrees)
		GAMMA:	Ratio of specific heats
		NREAL:	0 for perfect gas, -1 for real gas (pointed cone starting solutions are generated internally for perfect gas option only).
7	3F10.5	PHIFD:	Meridional angle about which points are clustered.
		RK:	Meridional clustering parameter (0 for no clustering).
		RJ:	Radial clustering parameter (0 for no clustering).

Card No.	Format	Variables	
8	5I5	NIT:	No. of points between body and shock (max = 20)
		NIPHI:	No. of intervals in meridional direction (max = 36)
		NITER:	No. of integration steps desired (when ZEND is specified set NITER to 99999)
		ICONST(49):	Stepsize is computed every ICONST(49) iterations (5 is nominal)
		NCONE:	1 for pointed cone solutions, 2 for all other geometries
9	3F10.5	CONST(9):	Courant No. (usually 0.9)
		CONST(4):	Radial dissipation constant
		CONST(5):	Meridional dissipation constant
10	5I5	DISK 1:	1 reads solution from tape, 2 writes solution on tape, 3 does nothing (logical unit 12)
		DISK 2:	1 reads solution from tape, 2 writes solution on tape, 3 does nothing (logical unit 11)
		TAPE 1:	1 does nothing, 2 stores body shape and writes data on tape each Z station, 3 writes data only (logical unit 9)
		TAPE 2:	1 does nothing, 2 reads starting solution from punched cards, 3 stores solution on punched cards when exiting (logical unit 7). If TAPE2 = 1 and DISK 1 and DISK 2 = 2 or 3, a pointed cone solution will be generated for the perfect gas case only
		NTDSOS:	0
11	2F10.5 3I5	ZBS:	increment in z for printing shock and body variables (ZBS > ZEND if not desired) — print based on z station
		ZFLD:	increment in z for printing field variables (ZFLD > ZEND if not desired) — print based on z station

Card No.	Format	Variables
		ITPRTB: No. of iterations for printing shock and body variables (ITPRTB > NITER if not desired) ITPRTF: No. of iterations for printing field variables (ITPRTF > NITER if not desired) } print based on number of iterations
		NCASE: If > 0, new case follows

(The following card contains values used in force and moment calculations or in shifting the origin of the pointed-cone starting solution.)

12	5F10.5 I5	DIAM: Length used in calculating reference area; usually maximum diameter ALENGT: Reference length used in calculating moments ZREF: Moment reference center ZCG: Center of gravity location for static margin calculation ZSHIFT: The value of Z which corresponds to the starting cone origin; if no shift set = 0 IFANDM: { 0, force and moment calculation 1, no force and moment calculation

(If starting solution is to be read from punched cards (TAPE 2 = 2), the following three cards are read in main program. If solution is read from magnetic storage device, these are not required.)

12a	5E15.6	XMACH, ALPHA, GAMMA, RK, PHIFD: (Defined above)
12b	5E15.6	RJ: (Defined above)
12c	3I5, 4E15.6	NIT, NIPHI, NREAL: (Defined above)
		P1INF: free stream pressure, R1INF: free stream density, V1INF: free stream velocity, GASCON: gas constant (1716.0 for air) } real gas option only (dimensional)

Card No.	Format	Variables

[If NREAL = -1, gas tables are placed here and will be read in SUB.RGAS(523 cards for equilibrium air)]

(If TAPE 2 = 2 punch card starting solution is placed here. The first card is the Z station of the starting plane and is followed by flow variables at each node.)

(The following card(s) is used to change the program control variables at preselected longitudinal (Z) stations and is read in Program MAIN. At least one card is required if no modifications are asked for. In this case ZALTER should then be > ZEND)

Card No.	Format	Variables
13	F10.5,I2, I3,F10.5, I2,I3	ZALTER: Z station where altering occurs NITA: New NIT NIPHEA: New NIPHI RJA: New RJ RKA: New RK PHFDA: New PHFD STP: { 0, stepsize determined automatically ; >0, value of desired constant stepsize } DISS1: New CONST(4) DISS2: New CONST(5) NSWCH1: { 0, new MacCormack ; 1, old MacCormack } NSWCH5: { 0, no entropy relaxation ; 1, entropy relaxation }

(The following card is used to initialize the force and moment calculations, and is read in SUB.COMPUT. This card is needed only if IFANDM = 0. *If NCONE = 2 and IFANDM = 0 this card is read before the first card 13, otherwise it is read after all card 13's.)

Card No.	Format	Variables
14	6F12.8	FTX:, FTY:, FTZ: } initial plane forces in the z, r, ϕ direction RMTX:, RMTY:, RMTZ: } initial plane moments in the z, r, ϕ direction

Sample Input for First Test Case

```
0.0        0.0        0.0        0.0        0.0        0.0                    14
10001.                                                                         13
800.       20 18 0.0        0.        90.        .0        .00        .00        0  013
1.0        1.0        0.0        0.0        0.0        0                      12
10000.     10000.     750 1500   0                                             11
   3    3    1    1    0                                                       10
0.9        0.0        0.0                                                      9.
  20   18 1500    5    1                                                       8
90.0       0.0        0.0                                                      7
7.0             15.00        1.4                  0                            6
0.0        0.0                                                                 5
0.0        0.0                                                                 4
.3639702343639.70234                                                           3
1.0        10000.                                                              2
   2    1    1                                                                CARD 1
```

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A complete output for this test case is now presented. In the following, the velocities are made dimensionless with respect to the maximum adiabatic velocity, $V_m = \sqrt{2\gamma/\gamma-1 \cdot p_{t_\infty}/\rho_{t_\infty}}$ and the pressure and density for the complete flow field printout are normalized with respect to the free stream stagnation conditions. Polar coordinates (z,r,ϕ) are used with the corresponding velocity components (u,v,w). The circumferential index is k, the radial index is j (j = 3 indicates the body surface). The output consists of the following sections:

1. Printout of the input quantities
2. Printout of the free-stream velocity field and the computational mesh. TAU is the radial computational variable, XI is the normalized physical radial variable running from 0 on the body to 1 at the shock. TXI = $\frac{\partial(TAU)}{\partial(XI)}$, TXIT = $\frac{\partial(TXI)}{\partial(TAU)}$. ETA is the computational circumferential variable, DTIL = $\frac{\partial(ETA)}{\partial(PHI)}$, DTILE = $\frac{\partial(DTIL)}{\partial(ETA)}$.
3. Intermediate printout of shock and body variables controlled by card 11.
4. Printout of the flow field at the final z station.
5. Line-printer plot of the normalized density field at the final z station.
6. Printout of the shock and body variables at the final z station.
7. The solution reset to the initial z plane using the conical property of the converged flow field. Sections 4-6 are repeated at z-initial.
8. Printout of the force and moment calculations.

```
NSEG,KIND    2    1    1    0    0    0    0    0
ZSEG    1.00000**********          -I        -I        -I        -I        -I
RSEG     .363973639.70234          -I        -I        -I        -I        -I
DSEG    0.00000   0.00000          -I        -I        -I        -I        -I
RSEG    0.00000   0.00000          -I        -I        -I        -I        -I
```

```
MACH =  7.000000
ALPHA = 15.000000
GAMMA = 1.400
SIGMA = 20.00

Z-INITIAL =    1.00
Z-FINAL =  10000.00
PHI-ZERO =  90.00

NIT = 20
NIPHI = 18
METHOD ORDER = 2
NITER = 1500
NPRNT = 0
IPRNT = 1
NCONE = 1
NWRPRT= 0
NREAL = 0

DZ/DT =  0.000 INITIALLY
DELTA-X =  0.000
DELTA-Y =  0.000

DISK1 = 3
DISK2 = 3
TAPE1 = 1
TAPE2 = 1

PERCENT OF MAX. STEPSIZE =  .90
METHOD = 2
BND. COND. = 1
BETA=0.000
OMEGA= 0.000

PINF =     .241555E-03     RHOIN =     .260860E-02     QINF =     .952579E+00

GASCON= 1.7160E+03

K =  3     PHI=  0.000000     UINF=  .920121     VINF=  -.246546     WINF=  0.000000
K =  4     PHI= 10.000000     UINF=  .920121     VINF=  -.242800     WINF=   .042812
K =  5     PHI= 20.000000     UINF=  .920121     VINF=  -.231677     WINF=   .084324
K =  6     PHI= 30.000000     UINF=  .920121     VINF=  -.213515     WINF=   .123273
K =  7     PHI= 40.000000     UINF=  .920121     VINF=  -.188865     WINF=   .158477
K =  8     PHI= 50.000000     UINF=  .920121     VINF=  -.158477     WINF=   .188865
K =  9     PHI= 60.000000     UINF=  .920121     VINF=  -.123273     WINF=   .213515
K = 10     PHI= 70.000000     UINF=  .920121     VINF=  -.084324     WINF=   .231677
K = 11     PHI= 80.000000     UINF=  .920121     VINF=  -.042812     WINF=   .242800
K = 12     PHI= 90.000000     UINF=  .920121     VINF=  -.000000     WINF=   .246546
K = 13     PHI=100.000000     UINF=  .920121     VINF=   .042812     WINF=   .242800
K = 14     PHI=110.000000     UINF=  .920121     VINF=   .084324     WINF=   .231677
K = 15     PHI=120.000000     UINF=  .920121     VINF=   .123273     WINF=   .213515
K = 16     PHI=130.000000     UINF=  .920121     VINF=   .158477     WINF=   .188865
K = 17     PHI=140.000000     UINF=  .920121     VINF=   .188865     WINF=   .158477
K = 18     PHI=150.000000     UINF=  .920121     VINF=   .213515     WINF=   .123273
K = 19     PHI=160.000000     UINF=  .920121     VINF=   .231677     WINF=   .084324
K = 20     PHI=170.000000     UINF=  .920121     VINF=   .242800     WINF=   .042812
K = 21     PHI=180.000000     UINF=  .920121     VINF=   .246546     WINF=   .000000
```

RADIAL MESH DESCRIPTION

J= 3	TAU=	0.	XI =	0.	TXI =	.1000E+01	TXIT =	0.
J= 4	TAU=	.4762E-01	XI =	.4762E-01	TXI =	.1000E+01	TXIT =	0.
J= 5	TAU=	.9524E-01	XI =	.9524E-01	TXI =	.1000E+01	TXIT =	0.
J= 6	TAU=	.1429E+00	XI =	.1429E+00	TXI =	.1000E+01	TXIT =	0.
J= 7	TAU=	.1905E+00	XI =	.1905E+00	TXI =	.1000E+01	TXIT =	0.
J= 8	TAU=	.2381E+00	XI =	.2381E+00	TXI =	.1000E+01	TXIT =	0.
J= 9	TAU=	.2857E+00	XI =	.2857E+00	TXI =	.1000E+01	TXIT =	0.
J=10	TAU=	.3333E+00	XI =	.3333E+00	TXI =	.1000E+01	TXIT =	0.
J=11	TAU=	.3810E+00	XI =	.3810E+00	TXI =	.1000E+01	TXIT =	0.
J=12	TAU=	.4286E+00	XI =	.4286E+00	TXI =	.1000E+01	TXIT =	0.
J=13	TAU=	.4762E+00	XI =	.4762E+00	TXI =	.1000E+01	TXIT =	0.
J=14	TAU=	.5238E+00	XI =	.5238E+00	TXI =	.1000E+01	TXIT =	0.
J=15	TAU=	.5714E+00	XI =	.5714E+00	TXI =	.1000E+01	TXIT =	0.
J=16	TAU=	.6190E+00	XI =	.6190E+00	TXI =	.1000E+01	TXIT =	0.
J=17	TAU=	.6667E+00	XI =	.6667E+00	TXI =	.1000E+01	TXIT =	0.
J=18	TAU=	.7143E+00	XI =	.7143E+00	TXI =	.1000E+01	TXIT =	0.
J=19	TAU=	.7619E+00	XI =	.7619E+00	TXI =	.1000E+01	TXIT =	0.
J=20	TAU=	.8095E+00	XI =	.8095E+00	TXI =	.1000E+01	TXIT =	0.
J=21	TAU=	.8571E+00	XI =	.8571E+00	TXI =	.1000E+01	TXIT =	0.
J=22	TAU=	.9048E+00	XI =	.9048E+00	TXI =	.1000E+01	TXIT =	0.
J=23	TAU=	.9524E+00	XI =	.9524E+00	TXI =	.1000E+01	TXIT =	0.
J=24	TAU=	.1000E+01	XI =	.1000E+01	TXI =	.1000E+01	TXIT =	0.

MERIDIANOL MESH DESCRIPTION

K= 2	ETA= -.1745E+00	PHI= -.1745E+00	DTIL= .1000E+01	DTILE= 0.
K= 3	ETA= 0.	PHI= 0.	DTIL= .1000E+01	DTILE= 0.
K= 4	ETA= .1745E+00	PHI= .1745E+00	DTIL= .1000E+01	DTILE= 0.
K= 5	ETA= .3491E+00	PHI= .3491E+00	DTIL= .1000E+01	DTILE= 0.
K= 6	ETA= .5236E+00	PHI= .5236E+00	DTIL= .1000E+01	DTILE= 0.
K= 7	ETA= .6981E+00	PHI= .6981E+00	DTIL= .1000E+01	DTILE= 0.
K= 8	ETA= .8727E+00	PHI= .8727E+00	DTIL= .1000E+01	DTILE= 0.
K= 9	ETA= .1047E+01	PHI= .1047E+01	DTIL= .1000E+01	DTILE= 0.
K=10	ETA= .1222E+01	PHI= .1222E+01	DTIL= .1000E+01	DTILE= 0.
K=11	ETA= .1396E+01	PHI= .1396E+01	DTIL= .1000E+01	DTILE= 0.
K=12	ETA= .1571E+01	PHI= .1571E+01	DTIL= .1000E+01	DTILE= 0.
K=13	ETA= .1745E+01	PHI= .1745E+01	DTIL= .1000E+01	DTILE= 0.
K=14	ETA= .1920E+01	PHI= .1920E+01	DTIL= .1000E+01	DTILE= 0.
K=15	ETA= .2094E+01	PHI= .2094E+01	DTIL= .1000E+01	DTILE= 0.
K=16	ETA= .2269E+01	PHI= .2269E+01	DTIL= .1000E+01	DTILE= 0.
K=17	ETA= .2443E+01	PHI= .2443E+01	DTIL= .1000E+01	DTILE= 0.
K=18	ETA= .2618E+01	PHI= .2618E+01	DTIL= .1000E+01	DTILE= 0.
K=19	ETA= .2793E+01	PHI= .2793E+01	DTIL= .1000E+01	DTILE= 0.
K=20	ETA= .2967E+01	PHI= .2967E+01	DTIL= .1000E+01	DTILE= 0.
K=21	ETA= .3142E+01	PHI= .3142E+01	DTIL= .1000E+01	DTILE= 0.
K=22	ETA= .3316E+01	PHI= -.2967E+01	DTIL= .1000E+01	DTILE= 0.

SURFACE FLOW VARIABLES AT Z = 52.042571
X/L = .005204 DZDT= 5.956151 ITER= 750

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	18.9419	.6709	2.4012E+01	5.0298E+00	2.3607	.8592	0.0000	2.9733E-01	1.0000	.44204	.00	9.1703E-01
10.0	18.9419	.6616	2.3694E+01	4.9821E+00	2.3675	.8617	.0841	2.9677E-01	1.0000	.44036	.00	9.1703E-01
20.0	18.9419	.6346	2.2767E+01	4.8421E+00	2.3877	.8691	.1679	2.9508E-01	1.0000	.43536	.00	9.1703E-01
30.0	18.9419	.5919	2.1303E+01	4.6175E+00	2.4218	.8815	.2506	2.9229E-01	1.0000	.42717	.00	9.1703E-01
40.0	18.9419	.5368	1.9413E+01	4.3211E+00	2.4701	.8990	.3318	2.8844E-01	1.0000	.41598	.00	9.1703E-01
50.0	18.9419	.4733	1.7234E+01	3.9687E+00	2.5332	.9220	.4106	2.8357E-01	1.0000	.40207	.00	9.1703E-01
60.0	18.9419	.4056	1.4913E+01	3.5793E+00	2.6116	.9505	.4863	2.7777E-01	1.0000	.38579	.00	9.1703E-01
70.0	18.9419	.3379	1.2589E+01	3.1714E+00	2.7059	.9848	.5580	2.7113E-01	1.0000	.36757	.00	9.1703E-01
80.0	18.9419	.2737	1.0387E+01	2.7643E+00	2.8162	1.0250	.6244	2.6378E-01	1.0000	.34791	.00	9.1703E-01
90.0	18.9419	.2155	8.3901E+00	2.3734E+00	2.9429	1.0711	.6837	2.5586E-01	1.0000	.32733	.00	9.1703E-01
100.0	18.9419	.1650	6.6550E+00	2.0120E+00	3.0852	1.1229	.7341	2.4755E-01	1.0000	.30640	.00	9.1703E-01
110.0	18.9419	.1232	5.2255E+00	1.6923E+00	3.2407	1.1795	.7711	2.3913E-01	1.0000	.28591	.00	9.1703E-01
120.0	18.9419	.0899	4.0842E+00	1.4193E+00	3.4064	1.2398	.7889	2.3086E-01	1.0000	.26648	.00	9.1703E-01
130.0	18.9419	.0648	3.2218E+00	1.1980E+00	3.5746	1.3010	.7806	2.2316E-01	1.0000	.24901	.00	9.1703E-01
140.0	18.9419	.0471	2.6150E+00	1.0321E+00	3.7318	1.3583	.7362	2.1661E-01	1.0000	.23460	.00	9.1703E-01
150.0	18.9419	.0365	2.2523E+00	9.2769E-01	3.8590	1.4046	.6142	2.1204E-01	1.0000	.22480	.00	9.1703E-01
160.0	18.9419	.0321	2.0998E+00	8.8237E-01	3.9350	1.4322	.3957	2.0993E-01	1.0000	.22034	.00	9.1703E-01
170.0	18.9419	.0310	2.0633E+00	8.7141E-01	3.9619	1.4420	.1721	2.0940E-01	1.0000	.21924	.00	9.1703E-01
180.0	18.9419	.0309	2.0583E+00	8.6988E-01	3.9670	1.4439	0.0000	2.0933E-01	1.0000	.21909	.00	9.1703E-01

BODY AND SHOCK GEOMETRY AT Z =52.043

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	18.9419	.3640	0.0000	22.8994	.4400	0.0000
10.0	18.9419	.3640	0.0000	22.9130	.4402	.1553
20.0	18.9419	.3640	0.0000	22.9536	.4410	.3148
30.0	18.9419	.3640	0.0000	23.0229	.4423	.4809
40.0	18.9419	.3640	0.0000	23.1215	.4442	.6582
50.0	18.9419	.3640	0.0000	23.2526	.4467	.8452
60.0	18.9419	.3640	0.0000	23.4165	.4499	1.0479
70.0	18.9419	.3640	0.0000	23.6184	.4538	1.2558
80.0	18.9419	.3640	0.0000	23.8549	.4584	1.4708
90.0	18.9419	.3640	0.0000	24.1318	.4637	1.6724
100.0	18.9419	.3640	0.0000	24.4387	.4696	1.8280
110.0	18.9419	.3640	0.0000	24.7699	.4760	1.9449
120.0	18.9419	.3640	0.0000	25.1176	.4826	1.9406
130.0	18.9419	.3640	0.0000	25.4473	.4892	1.7229
140.0	18.9419	.3640	0.0000	25.7190	.4940	1.3042

150.0	18.9419	.3640	0.0000	25.9026	.4971	.5014
160.0	18.9419	.3640	0.0000	25.8940	.4979	-.6586
170.0	18.9419	.3640	0.0000	25.6727	.4946	-1.0678
180.0	18.9419	.3640	0.0000	25.5213	.4916	0.0000

SURFACE FLOW VARIABLES AT Z =797.994173
X/L = .079799 DZDT= 91.327918 ITER= 1256

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	290.4461	.6709	2.4012E+01	5.0298E+00	2.3607	.8592	0.0000	2.9733E-01	1.0000	.44204	.00	9.1703E-01
10.0	290.4461	.6616	2.3694E+01	4.9821E+00	2.3675	.8617	.0841	2.9677E-01	1.0000	.44036	.00	9.1703E-01
20.0	290.4461	.6346	2.2767E+01	4.8421E+00	2.3877	.8691	.1679	2.9508E-01	1.0000	.43536	.00	9.1703E-01
30.0	290.4461	.5919	2.1303E+01	4.6175E+00	2.4218	.8815	.2506	2.9229E-01	1.0000	.42717	.00	9.1703E-01
40.0	290.4461	.5368	1.9413E+01	4.3211E+00	2.4701	.8990	.3317	2.8844E-01	1.0000	.41598	.00	9.1703E-01
50.0	290.4461	.4733	1.7233E+01	3.9687E+00	2.5332	.9220	.4106	2.8357E-01	1.0000	.40207	.00	9.1703E-01
60.0	290.4461	.4056	1.4913E+01	3.5793E+00	2.6116	.9505	.4862	2.7777E-01	1.0000	.38579	.00	9.1703E-01
70.0	290.4461	.3379	1.2590E+01	3.1714E+00	2.7059	.9849	.5580	2.7113E-01	1.0000	.36757	.00	9.1703E-01
80.0	290.4461	.2736	1.0356E+01	2.7642E+00	2.8163	1.0250	.6241	2.6378E-01	1.0000	.34791	.00	9.1703E-01
90.0	290.4461	.2155	8.3904E+00	2.3734E+00	2.9429	1.0711	.6835	2.5586E-01	1.0000	.32733	.00	9.1703E-01
100.0	290.4461	.1649	6.6576E+00	2.0119E+00	3.0853	1.1230	.7339	2.4755E-01	1.0000	.30639	.00	9.1703E-01
110.0	290.4461	.1232	5.2252E+00	1.6922E+00	3.2409	1.1796	.7704	2.3913E-01	1.0000	.28590	.00	9.1703E-01
120.0	290.4461	.0899	4.0846E+00	1.4193E+00	3.4065	1.2399	.7887	2.3086E-01	1.0000	.26648	.00	9.1703E-01
130.0	290.4461	.0648	3.2210E+00	1.1978E+00	3.5747	1.3011	.7807	2.2316E-01	1.0000	.24899	.00	9.1703E-01
140.0	290.4461	.0471	2.6166E+00	1.0326E+00	3.7322	1.3584	.7310	2.1663E-01	1.0000	.23464	.00	9.1703E-01
150.0	290.4461	.0367	2.2581E+00	9.2940E-01	3.8571	1.4039	.6141	2.1212E-01	1.0000	.22497	.00	9.1703E-01
160.0	290.4461	.0321	2.0995E+00	8.8240E-01	3.9332	1.4316	.4149	2.0993E-01	1.0000	.22035	.00	9.1703E-01
170.0	290.4461	.0309	2.0592E+00	8.7016E-01	3.9628	1.4423	.1864	2.0934E-01	1.0000	.21912	.00	9.1703E-01
180.0	290.4461	.0307	2.0544E+00	8.6870E-01	3.9684	1.4444	0.0000	2.0927E-01	1.0000	.21897	.00	9.1703E-01

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MACH =  7.000000
ALPHA = 15.000000
GAMMA = 1.400
SIGMA = 20.00

Z-INITIAL =  797.99
Z-FINAL =  10000.00
PHI-ZERO =  90.00

NIT = 20
NIPHI = 18
METHOD ORDER = 2
NITER = 1500
NPRNT = 0
IPRNT = 1
NCONE = 1
NWRPRT= 0
NREAL = 0

DZ/DT = 91.328 INITIALLY
DELTA-X =  0.000
DELTA-Y =  0.000

DISK1 = 3
DISK2 = 3
TAPE1 = 1
TAPE2 = 1

PERCENT OF MAX. STEPSIZE =  .90
METHOD = 2
BND. COND. = 1
BETA=0.000
OMEGA= 0.000

PINF =     .241555E-03     RHOIN =     .260880E-02     QINF =     .952579E+00

GASCON= 1.7160E+03

K =  3     PHI=  0.000000     UINF=   .920121     VINF=  -.246546     WINF=  0.000000
K =  4     PHI= 10.000000     UINF=   .920121     VINF=  -.242800     WINF=   .042812
K =  5     PHI= 20.000000     UINF=   .920121     VINF=  -.231677     WINF=   .084324
K =  6     PHI= 30.000000     UINF=   .920121     VINF=  -.213515     WINF=   .123273
K =  7     PHI= 40.000000     UINF=   .920121     VINF=  -.188865     WINF=   .158477
K =  8     PHI= 50.000000     UINF=   .920121     VINF=  -.158477     WINF=   .188865
K =  9     PHI= 60.000000     UINF=   .920121     VINF=  -.123273     WINF=   .213515
K = 10     PHI= 70.000000     UINF=   .920121     VINF=  -.084324     WINF=   .231677
K = 11     PHI= 80.000000     UINF=   .920121     VINF=  -.042812     WINF=   .242800
K = 12     PHI= 90.000000     UINF=   .920121     VINF=  -.000000     WINF=   .246546
K = 13     PHI=100.000000     UINF=   .920121     VINF=   .042812     WINF=   .242800
K = 14     PHI=110.000000     UINF=   .920121     VINF=   .084324     WINF=   .231677
K = 15     PHI=120.000000     UINF=   .920121     VINF=   .123273     WINF=   .213515
K = 16     PHI=130.000000     UINF=   .920121     VINF=   .158477     WINF=   .188865
K = 17     PHI=140.000000     UINF=   .920121     VINF=   .188865     WINF=   .158477
K = 18     PHI=150.000000     UINF=   .920121     VINF=   .213515     WINF=   .123273
K = 19     PHI=160.000000     UINF=   .920121     VINF=   .231677     WINF=   .084324
K = 20     PHI=170.000000     UINF=   .920121     VINF=   .242800     WINF=   .042812
K = 21     PHI=180.000000     UINF=   .920121     VINF=   .246546     WINF=   .000000
```

RADIAL MESH DESCRIPTION

J= 3	TAU= 0.	XI = 0.	TXI =	.1000E+01	TXIT = 0.
J= 4	TAU= .4762E-01	XI = .4762E-01	TXI =	.1000E+01	TXIT = 0.
J= 5	TAU= .9524E-01	XI = .9524E-01	TXI =	.1000E+01	TXIT = 0.
J= 6	TAU= .1429E+00	XI = .1429E+00	TXI =	.1000E+01	TXIT = 0.
J= 7	TAU= .1905E+00	XI = .1905E+00	TXI =	.1000E+01	TXIT = 0.
J= 8	TAU= .2381E+00	XI = .2381E+00	TXI =	.1000E+01	TXIT = 0.
J= 9	TAU= .2857E+00	XI = .2857E+00	TXI =	.1000E+01	TXIT = 0.
J=10	TAU= .3333E+00	XI = .3333E+00	TXI =	.1000E+01	TXIT = 0.
J=11	TAU= .3810E+00	XI = .3810E+00	TXI =	.1000E+01	TXIT = 0.
J=12	TAU= .4286E+00	XI = .4286E+00	TXI =	.1000E+01	TXIT = 0.
J=13	TAU= .4762E+00	XI = .4762E+00	TXI =	.1000E+01	TXIT = 0.
J=14	TAU= .5238E+00	XI = .5238E+00	TXI =	.1000E+01	TXIT = 0.
J=15	TAU= .5714E+00	XI = .5714E+00	TXI =	.1000E+01	TXIT = 0.
J=16	TAU= .6190E+00	XI = .6190E+00	TXI =	.1000E+01	TXIT = 0.
J=17	TAU= .6667E+00	XI = .6667E+00	TXI =	.1000E+01	TXIT = 0.
J=18	TAU= .7143E+00	XI = .7143E+00	TXI =	.1000E+01	TXIT = 0.
J=19	TAU= .7619E+00	XI = .7619E+00	TXI =	.1000E+01	TXIT = 0.
J=20	TAU= .8095E+00	XI = .8095E+00	TXI =	.1000E+01	TXIT = 0.
J=21	TAU= .8571E+00	XI = .8571E+00	TXI =	.1000E+01	TXIT = 0.
J=22	TAU= .9048E+00	XI = .9048E+00	TXI =	.1000E+01	TXIT = 0.
J=23	TAU= .9524E+00	XI = .9524E+00	TXI =	.1000E+01	TXIT = 0.
J=24	TAU= .1000E+01	XI = .1000E+01	TXI =	.1000E+01	TXIT = 0.

MERIDIANOL MESH DESCRIPTION

K= 2	ETA= -.1745E+00	PHI= -.1745E+00	DTIL= .1000E+01	DTILE= 0.
K= 3	ETA= 0.	PHI= 0.	DTIL= .1000E+01	DTILE= 0.
K= 4	ETA= .1745E+00	PHI= .1745E+00	DTIL= .1000E+01	DTILE= 0.
K= 5	ETA= .3491E+00	PHI= .3491E+00	DTIL= .1000E+01	DTILE= 0.
K= 6	ETA= .5236E+00	PHI= .5236E+00	DTIL= .1000E+01	DTILE= 0.
K= 7	ETA= .6981E+00	PHI= .6981E+00	DTIL= .1000E+01	DTILE= 0.
K= 8	ETA= .8727E+00	PHI= .8727E+00	DTIL= .1000E+01	DTILE= 0.
K= 9	ETA= .1047E+01	PHI= .1047E+01	DTIL= .1000E+01	DTILE= 0.
K=10	ETA= .1222E+01	PHI= .1222E+01	DTIL= .1000E+01	DTILE= 0.
K=11	ETA= .1396E+01	PHI= .1396E+01	DTIL= .1000E+01	DTILE= 0.
K=12	ETA= .1571E+01	PHI= .1571E+01	DTIL= .1000E+01	DTILE= 0.
K=13	ETA= .1745E+01	PHI= .1745E+01	DTIL= .1000E+01	DTILE= 0.
K=14	ETA= .1920E+01	PHI= .1920E+01	DTIL= .1000E+01	DTILE= 0.
K=15	ETA= .2094E+01	PHI= .2094E+01	DTIL= .1000E+01	DTILE= 0.
K=16	ETA= .2269E+01	PHI= .2269E+01	DTIL= .1000E+01	DTILE= 0.
K=17	ETA= .2443E+01	PHI= .2443E+01	DTIL= .1000E+01	DTILE= 0.
K=18	ETA= .2618E+01	PHI= .2618E+01	DTIL= .1000E+01	DTILE= 0.
K=19	ETA= .2793E+01	PHI= .2793E+01	DTIL= .1000E+01	DTILE= 0.
K=20	ETA= .2967E+01	PHI= .2967E+01	DTIL= .1000E+01	DTILE= 0.
K=21	ETA= .3142E+01	PHI= .3142E+01	DTIL= .1000E+01	DTILE= 0.
K=22	ETA= .3316E+01	PHI= -.2967E+01	DTIL= .1000E+01	DTILE= 0.

SURFACE FLOW VARIABLES AT Z =797.994173
X/L = .079799 DZDT= 91.828467 ITER= 1256

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	290.4461	.6709	2.4012E+01	5.0298E+00	2.3607	.8592	0.0000	2.9733E-01	1.0000	.44204	.00	9.1703E-01
10.0	290.4461	.6616	2.3694E+01	4.9821E+00	2.3675	.8617	.0841	2.9677E-01	1.0000	.44036	.00	9.1703E-01
20.0	290.4461	.6346	2.2767E+01	4.8421E+00	2.3877	.8691	.1679	2.9508E-01	1.0000	.43536	.00	9.1703E-01
30.0	290.4461	.5919	2.1303E+01	4.6175E+00	2.4218	.8815	.2506	2.9239E-01	1.0000	.42717	.00	9.1703E-01
40.0	290.4461	.5368	1.9413E+01	4.3211E+00	2.4701	.8990	.3317	2.8874E-01	1.0000	.41598	.00	9.1703E-01
50.0	290.4461	.4733	1.7233E+01	3.9687E+00	2.5332	.9220	.4106	2.8357E-01	1.0000	.40207	.00	9.1703E-01
60.0	290.4461	.4056	1.4913E+01	3.5793E+00	2.6116	.9505	.4862	2.7777E-01	1.0000	.38579	.00	9.1703E-01
70.0	290.4461	.3379	1.2590E+01	3.1714E+00	2.7059	.9849	.5580	2.7113E-01	1.0000	.36757	.00	9.1703E-01
80.0	290.4461	.2736	1.0386E+01	2.7642E+00	2.8163	1.0250	.6241	2.6378E-01	1.0000	.34791	.00	9.1703E-01
90.0	290.4461	.2158	8.3904E+00	2.3734E+00	2.9429	1.0711	.6835	2.5566E-01	1.0000	.32733	.00	9.1703E-01
100.0	290.4461	.1649	6.6576E+00	2.0119E+00	3.0853	1.1230	.7339	2.4755E-01	1.0000	.30639	.00	9.1703E-01
110.0	290.4461	.1232	5.2252E+00	1.6922E+00	3.2409	1.1796	.7704	2.3913E-01	1.0000	.28590	.00	9.1703E-01
120.0	290.4461	.0899	4.0846E+00	1.4193E+00	3.4065	1.2399	.7887	2.3086E-01	1.0000	.26648	.00	9.1703E-01
130.0	290.4461	.0648	3.2210E+00	1.1976E+00	3.5747	1.3011	.7807	2.2316E-01	1.0000	.24899	.00	9.1703E-01
140.0	290.4461	.0471	2.6166E+00	1.0326E+00	3.7322	1.3584	.7310	2.1643E-01	1.0000	.23464	.00	9.1703E-01
150.0	290.4461	.0367	2.2501E+00	9.2940E-01	3.8571	1.4039	.6141	2.1212E-01	1.0000	.22497	.00	9.1703E-01
160.0	290.4461	.0321	2.0999E+00	8.8240E-01	3.9332	1.4316	.4149	2.0993E-01	1.0000	.22035	.00	9.1703E-01
170.0	290.4461	.0309	2.0592E+00	8.7016E-01	3.9628	1.4423	.1864	2.0954E-01	1.0000	.21912	.00	9.1703E-01
180.0	290.4461	.0307	2.0544E+00	8.6870E-01	3.9684	1.4444	0.0000	2.0927E-01	1.0000	.21897	.00	9.1703E-01

K= 3 PHI = 0.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076	5.80033E-03	1.31218E-02	.70192138	.25547849	0.00000000	.91703047	.29733386	0.0000	.4420
41103.12979391	5.79883E-03	1.31194E-02	.70319446	.25202113	0.00000000	.91702521	.29732235	.0476	.4420
51113.99662706	5.79570E-03	1.31144E-02	.70446865	.24857450	0.00000000	.91702521	.29729939	.0952	.4419
61124.86346021	5.79067E-03	1.31062E-02	.70574906	.24513914	0.00000000	.91702521	.29726253	1429	.4418
71135.73029336	5.78359E-03	1.30948E-02	.70703527	.24172402	0.00000000	.91702521	.29721057	.1905	.4417
81146.59712651	5.77455E-03	1.30802E-02	.70832715	.23832627	0.00000000	.91702521	.29714415	.2381	.4415
91157.46395965	5.76356E-03	1.30624E-02	.70962511	.23494511	0.00000000	.91702521	.29706329	.2857	.4412
101168.33079280	5.75064E-03	1.30415E-02	.71092973	.23157854	0.00000000	.91702521	.29696811	.3333	.4410
111179.19762595	5.73582E-03	1.30175E-02	.71224169	.22822460	0.00000000	.91702521	.29685865	.3810	.4406
121190.06445910	5.71911E-03	1.29904E-02	.71356174	.22488107	0.00000000	.91702521	.29673495	.4286	.4403
131200.93129225	5.70052E-03	1.29602E-02	.71489078	.22154555	0.00000000	.91702521	.29659695	.4762	.4398
141211.79812540	5.68005E-03	1.29269E-02	.71622978	.21821548	0.00000000	.91702521	.29644457	.5238	.4394
151222.66495855	5.65770E-03	1.28906E-02	.71757978	.21488820	0.00000000	.91702521	.29627768	.5714	.4389
161233.53179170	5.63348E-03	1.28511E-02	.71894191	.21156086	0.00000000	.91702521	.29609611	.6190	.4384

171244.39862485	5.60736E-03	1.28085E-02	.72031743	.20823047	0.00000000	.91702521	.29589960	.6667	.4378
181255.26545800	5.57933E-03	1.27628E-02	.72170767	.20489388	0.00000000	.91702521	.29560786	.7143	.4372
191266.13229115	5.54937E-03	1.27138E-02	.72311413	.20154763	0.00000000	.91702521	.29546049	.7619	.4365
201276.99912430	5.51745E-03	1.26615E-02	.72453829	.19818826	0.00000000	.91702521	.29521710	.8095	.4358
211287.86595745	5.48350E-03	1.26058E-02	.72598251	.19481110	0.00000000	.91702521	.29495696	.8571	.4350
221298.73279060	5.44758E-03	1.25468E-02	.72744657	.19141471	0.00000000	.91702521	.29468013	.9048	.4342
231309.59962375	5.40929E-03	1.24837E-02	.72894039	.18798432	0.00000000	.91702521	.29438336	.9524	.4333
241320.46645690	5.36965E-03	1.24183E-02	.73044069	.18454858	0.00000000	.91702521	.29407422	1.0000	.4324

K= 4 PHI = 10.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092	26296076	5.72347E-03	1.29974E-02	.70258673	.25572066	.02496519	.91703047	.29676778	0.0000	.4404
41103	16693592	5.72251E-03	1.29924E-02	.70375068	.25224761	.02561434	.91739748	.29679961	.0476	.4405
51114	07091108	5.71994E-03	1.29802E-02	.70518404	.24888630	.02670375	.91833028	.29666749	.0952	.4401
61124	97488624	5.71555E-03	1.29670E-02	.70694258	.24550954	.02763921	.91568198	.29656659	.1429	.4398
71135	87886140	5.70918E-03	1.29519E-02	.70889169	.24214938	.02851151	.91511687	.29645915	.1905	.4394
81146	78283657	5.70090E-03	1.29329E-02	.71092864	.23880222	.02933339	.91463821	.29634702	.2381	.4391
91157	68681173	5.69073E-03	1.29104E-02	.71306359	.23547051	.03010033	.91419783	.29622484	.2857	.4387
101168	59078689	5.67869E-03	1.28845E-02	.71189672	.23215212	.03087793	.91379746	.29609289	.3333	.4384
111179	49476205	5.66479E-03	1.28554E-02	.71323180	.22884611	.03161204	.91342087	.29594950	.3810	.4379
121190	39873721	5.64906E-03	1.28230E-02	.71458968	.22556028	.03226574	.91306744	.29579462	.4286	.4375
131201	30271238	5.63150E-03	1.27874E-02	.71591252	.22230056	.03300196	.91273056	.29562752	.4762	.4370
141212	20668754	5.61212E-03	1.27508E-02	.71726150	.21908053	.03370262	.91240912	.29544200	.5238	.4364
151223	11066270	5.59090E-03	1.27067E-02	.71861823	.21570148	.03436944	.91210001	.29525560	.5714	.4359
161234	01463786	5.56786E-03	1.27917E-02	.71998407	.21242324	.03502369	.91180219	.29505005	.6190	.4353
171244	91861302	5.54297E-03	1.27534E-02	.72135056	.20914232	.03566647	.91151403	.29483091	.6667	.4346
181255	82258819	5.51621E-03	1.27119E-02	.72274922	.20585583	.03629869	.91123469	.29459781	.7143	.4339
191266	72656335	5.48758E-03	1.26672E-02	.72415169	.20256041	.03692109	.91096320	.29435028	.7619	.4332
201277	63053851	5.45702E-03	1.26192E-02	.72556969	.19925251	.03753436	.91069895	.29408782	.8095	.4324
211288	53451367	5.42450E-03	1.25677E-02	.72700516	.19592821	.03813893	.91044132	.29380982	.8571	.4316
221299	43848883	5.38999E-03	1.25128E-02	.72846001	.19258330	.03873566	.91018979	.29351564	.9048	.4308
231310	34246399	5.35339E-03	1.24543E-02	.72993696	.18921314	.03932369	.90994433	.29320439	.9524	.4298
241321	24643916	5.31469E-03	1.23920E-02	.73143730	.18581369	.03990744	.90970316	.29287545	1.0000	.4289

K= 5 PHI = 20.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092	26296076	5.49950E-03	1.26320E-02	.70457174	.25644314	.04953493	.91703047	.29508029	0.0000	.4354
41103	27863318	5.50014E-03	1.26726E-02	.70655773	.25333584	.05077114	.91266038	.29462499	.0476	.4340
51114	29430561	5.49919E-03	1.26997E-02	.70824600	.25014794	.05206784	.90949725	.29428510	.0952	.4330
61125	30997803	5.49663E-03	1.27133E-02	.70972094	.24690806	.05468199	.90750584	.29405627	.1429	.4323
71136	32565045	5.49225E-03	1.27222E-02	.71115628	.24366842	.05637399	.90574711	.29383019	.1905	.4317
81147	34132288	5.48613E-03	1.27288E-02	.71254732	.24044255	.05797063	.90424139	.29363348	.2381	.4311
91158	35699530	5.47829E-03	1.27254E-02	.71392034	.23723198	.05949964	.90284919	.29342752	.2857	.4305
101169	37266772	5.46873E-03	1.27212E-02	.71527548	.23403448	.06097253	.90157137	.29322047	.3333	.4299
111180	38834015	5.45747E-03	1.27134E-02	.71662172	.23085053	.06239992	.90036318	.29300769	.3810	.4293
121191	40401257	5.44452E-03	1.27022E-02	.71796033	.22767824	.06378805	.89922153	.29278889	.4286	.4286
131202	41968500	5.42985E-03	1.26878E-02	.71929565	.22451590	.06514234	.89812782	.29256208	.4762	.4280
141213	43535742	5.41350E-03	1.26700E-02	.72062928	.22136122	.06646663	.89707849	.29232681	.5238	.4273
151224	45102984	5.39559E-03	1.26491E-02	.72196394	.21821802	.06776414	.89606460	.29208205	.5714	.4266
161235	46670227	5.37591E-03	1.26250E-02	.72330131	.21506561	.06903740	.89508506	.29182729	.6190	.4258
171246	48237469	5.35453E-03	1.25977E-02	.72464354	.21191928	.07028853	.89412907	.29156182	.6667	.4250
181257	49804712	5.33142E-03	1.25671E-02	.72599242	.20877005	.07151929	.89320021	.29128511	.7143	.4242
191268	51371954	5.30657E-03	1.25334E-02	.72734989	.20561478	.07273114	.89229362	.29099652	.7619	.4234
201279	52939196	5.27994E-03	1.24963E-02	.72871803	.20244983	.07392539	.89140753	.29069542	.8095	.4225
211290	54506439	5.25151E-03	1.24559E-02	.73009841	.19927220	.07510299	.89054001	.29038128	.8571	.4216
221301	56073681	5.22114E-03	1.24120E-02	.73149502	.19607538	.07626534	.88969003	.29005278	.9048	.4207
231312	57640923	5.18906E-03	1.23648E-02	.73290411	.19286345	.07741183	.88885556	.28971112	.9524	.4197
241323	59208166	5.15432E-03	1.23128E-02	.73434831	.18960342	.07854746	.88803787	.28934872	1.0000	.4186

K= 6 PHI = 30.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT

31092.26296076	5.14579E-03	1.20462E-02	.70787184	.25764428	.07325329	.91703047	.29229124	0.0000	.4272
41103.46858896	5.14885E-03	1.21593E-02	.71122024	.25514499	.07494908	.90459325	.29101527	.0476	.4234
51114.67421717	5.15038E-03	1.22198E-02	.71330006	.25223378	.07789299	.89800991	.29034939	.0952	.4215
61125.87984537	5.15000E-03	1.22554E-02	.71494971	.24919824	.08047573	.89385808	.28992096	.1429	.4203
71137.08547357	5.14928E-03	1.22855E-02	.71651588	.24616977	.08288722	.89017263	.28952898	.1905	.4191
81148.29110178	5.14847E-03	1.23085E-02	.71798704	.24314694	.08516994	.88700697	.28917924	.2381	.4181
91159.49672998	5.14217E-03	1.23270E-02	.71941588	.24012767	.08735757	.88407255	.28884188	.2857	.4171
101170.70235818	5.13640E-03	1.23409E-02	.72080163	.23712722	.08946764	.88137358	.28851732	.3333	.4162
111181.90798639	5.12917E-03	1.23510E-02	.72216170	.23414262	.09151361	.87881781	.28819610	.3810	.4153
121193.11361459	5.12049E-03	1.23574E-02	.72349780	.23117164	.09350467	.87639911	.28787757	.4286	.4144
131204.31924280	5.11036E-03	1.23604E-02	.72481771	.22821383	.09544799	.87407944	.28755779	.4762	.4134
141215.52487100	5.09877E-03	1.23600E-02	.72612369	.22526692	.09734909	.87185128	.28723592	.5238	.4125
151226.73049920	5.08573E-03	1.23564E-02	.72742007	.22232916	.09921237	.86969646	.28690998	.5714	.4116
161237.93612741	5.07123E-03	1.23496E-02	.72870917	.21939804	.10104144	.86760839	.28657916	.6190	.4106
171249.14175561	5.05528E-03	1.23397E-02	.72999397	.21647112	.10283926	.86557735	.28624226	.6667	.4097
181260.34738381	5.03777E-03	1.23256E-02	.73127673	.21354559	.10460832	.86359816	.28589849	.7143	.4087
191271.55301202	5.01877E-03	1.23104E-02	.73255934	.21061863	.10635070	.86166505	.28554699	.7619	.4077
201282.75864022	4.99820E-03	1.22909E-02	.73384389	.20768653	.10806829	.85977422	.28518687	.8095	.4067
211293.96426843	4.97608E-03	1.22683E-02	.73513607	.20474748	.10976243	.85792171	.28481771	.8571	.4056
221305.16989663	4.95219E-03	1.22420E-02	.73643665	.20179230	.11143510	.85610540	.28443739	.9048	.4045
231316.37552483	4.92699E-03	1.22131E-02	.73773792	.19883409	.11308576	.85432081	.28404907	.9524	.4034
241327.58115304	4.89866E-03	1.21784E-02	.73907957	.19581589	.11472006	.85257119	.28363950	1.0000	.4023

K= 7 PHI = 40.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076	4.68926E-03	1.12728E-02	.71247322	.25931904	.09567938	.91703047	.28843751	0.0000	.4160
41103.73971941	4.69521E-03	1.13768E-02	.71762483	.25763501	.09764794	.89318335	.28604324	.0476	.4091
51115.21647807	4.69978E-03	1.15761E-02	.72090421	.25503249	.10121768	.88209387	.28495217	.0952	.4060
61126.69323573	4.70359E-03	1.16417E-02	.72300638	.25234519	.10441163	.87495157	.28425741	.1429	.4040
71138.16999538	4.70570E-03	1.16837E-02	.72472197	.24959598	.10740167	.86862594	.28353656	.1905	.4022
81149.64675404	4.70699E-03	1.17484E-02	.72599678	.24683578	.11024540	.86318443	.28309629	.2381	.4007
91161.12351270	4.70703E-03	1.17809E-02	.72689643	.24409110	.11297380	.85814285	.28255735	.2857	.3993
101172.60027135	4.70590E-03	1.18259E-02	.72831948	.24135859	.11561091	.85350750	.28211022	.3333	.3979
111184.07703001	4.70351E-03	1.18589E-02	.72969473	.23864470	.11816962	.84911904	.28164881	.3810	.3966
121195.55378867	4.70016E-03	1.18879E-02	.73102412	.23594705	.12066239	.84496887	.28120217	.4286	.3954
131207.03054732	4.69555E-03	1.19134E-02	.73232043	.23326661	.12309653	.84098972	.28076350	.4762	.3941
141218.50730598	4.68979E-03	1.19355E-02	.73358045	.23060119	.12547933	.83717021	.28033157	.5238	.3929
151229.98406464	4.68286E-03	1.19543E-02	.73482697	.22794972	.12781558	.83347775	.27990301	.5714	.3917
161241.46082329	4.67476E-03	1.19701E-02	.73605089	.22530997	.13010994	.82990193	.27947664	.6190	.3905
171252.93758195	4.66547E-03	1.19829E-02	.73725646	.22267954	.13236579	.82642519	.27905053	.6667	.3893
181264.41434061	4.65497E-03	1.19928E-02	.73844649	.22005638	.13458631	.82303908	.27862360	.7143	.3882
191275.89109926	4.64325E-03	1.19998E-02	.73962999	.21743779	.13677598	.81973519	.27819460	.7619	.3870
201287.36785792	4.63034E-03	1.20026E-02	.74080421	.21482000	.13893119	.81650116	.27776235	.8095	.3858
211298.84461657	4.61600E-03	1.20037E-02	.74197194	.21220275	.14105953	.81333592	.27732647	.8571	.3845
221310.32137523	4.60024E-03	1.20009E-02	.74314177	.20957411	.14316156	.81023373	.27688401	.9048	.3833
231321.79813389	4.58359E-03	1.19960E-02	.74429924	.20695497	.14523675	.80718718	.27643971	.9524	.3821
241333.27489254	4.56408E-03	1.19850E-02	.74549456	.20427319	.14729114	.80419983	.27597668	1.0000	.3808

K= 8 PHI = 50.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076	4.16288E-03	1.03537E-02	.71834342	.26145562	.11642966	.91703047	.28357285	0.0000	.4021
41104.09912909	4.17184E-03	1.05559E-02	.72559262	.26074174	.11841567	.87890580	.27982381	.0476	.3915
51115.93529742	4.17961E-03	1.08002E-02	.72879187	.25866231	.12232549	.86192546	.27820593	.0952	.3870
61127.77146575	4.18679E-03	1.08984E-02	.73095606	.25627434	.12594139	.85097363	.27718783	.1429	.3842
71139.60763408	4.19311E-03	1.09859E-02	.73288921	.25386973	.12934189	.84133544	.27629186	.1905	.3817
81151.44380241	4.19858E-03	1.10611E-02	.73458503	.25144198	.13259529	.83303825	.27552867	.2381	.3796
91163.27997074	4.20320E-03	1.11306E-02	.73616304	.24902210	.13572320	.82537804	.27481928	.2857	.3776
101175.11613905	4.20702E-03	1.11939E-02	.73762597	.24662596	.13875331	.81853786	.27416458	.3333	.3758
111186.95230741	4.21001E-03	1.12526E-02	.73901329	.24424502	.14169646	.81166826	.27354190	.3810	.3741
121198.78847574	4.21216E-03	1.13076E-02	.74032941	.24188354	.14456690	.80540602	.27294576	.4286	.3725
131210.62464407	4.21348E-03	1.13589E-02	.74159174	.23954375	.14737145	.79939344	.27237553	.4762	.3709
141222.46081240	4.21398E-03	1.14067E-02	.74280465	.23722384	.15011844	.79362933	.27182000	.5238	.3694
151234.29698073	4.21365E-03	1.14515E-02	.74397733	.23492343	.15281265	.78806544	.27127735	.5714	.3680

161246.13314906	4.21248E-03	1.14933E-02	.74511370	.23264052	.15545941	.78268447	.27074576	.6190	.3665
171257.96931739	4.21046E-03	1.15323E-02	.74621936	.23037360	.15806226	.77745985	.27022250	.6667	.3651
181269.80548572	4.20756E-03	1.15686E-02	.74729790	.22812024	.16062486	.77237814	.26970601	.7143	.3637
191281.64165406	4.20379E-03	1.16021E-02	.74835295	.22587878	.16314986	.76742327	.26919464	.7619	.3623
201293.47782239	4.19906E-03	1.16330E-02	.74938864	.22364514	.16564009	.76258523	.26868676	.8095	.3610
211305.31399072	4.19348E-03	1.16612E-02	.75040533	.22142083	.16809725	.75785304	.26818202	.8571	.3596
221317.15015905	4.18660E-03	1.16863E-02	.75141367	.21919160	.17052434	.75322043	.26767666	.9048	.3583
231328.98632738	4.17941E-03	1.17098E-02	.75239658	.21698340	.17292100	.74867694	.26717632	.9524	.3569
241340.82249571	4.16969E-03	1.17276E-02	.75340677	.21472024	.17529297	.74422418	.26666302	1.0000	.3555

K= 9 PHI = 60.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076	3.60231E-03	9.33745E-03	.72543162	.26403552	.13506581	.91703047	.27777381	0.0000	.3858
41104.55024065	3.61397E-03	9.73815E-03	.73502273	.26442731	.13676531	.86143639	.27243900	.0476	.3711
51116.83752054	3.62474E-03	9.92777E-03	.73820622	.26297910	.14071643	.83741424	.27022622	.0952	.3651
61129.12480043	3.63528E-03	1.00581E-02	.74133841	.26089954	.14455463	.82204387	.26885799	.1429	.3614
71141.41208032	3.64522E-03	1.01760E-02	.74350528	.25809444	.14817081	.80848009	.26766359	.1905	.3582
81153.69936022	3.65470E-03	1.02799E-02	.74532452	.25685037	.15166380	.79684324	.26665233	.2381	.3555
91165.98664011	3.66356E-03	1.03772E-02	.74698291	.25481944	.15502771	.78611134	.26572542	.2857	.3530
101178.27392000	3.67216E-03	1.04677E-02	.74848174	.25279377	.15829794	.77627434	.26488097	.3333	.3508
111190.56119989	3.68019E-03	1.05538E-02	.74987513	.25080203	.16147763	.76700280	.26408734	.3810	.3487
121202.84847978	3.68765E-03	1.06351E-02	.75116868	.24883773	.16456337	.75826496	.26334111	.4286	.3467
131215.13575967	3.69467E-03	1.07132E-02	.75238567	.24687975	.16761916	.74992214	.26262898	.4762	.3449
141227.42303957	3.70121E-03	1.07881E-02	.75353194	.24495669	.17059501	.74194305	.26194778	.5238	.3431
151239.71031946	3.70726E-03	1.08601E-02	.75461944	.24305897	.17351398	.73425960	.26129093	.5714	.3414
161251.99759935	3.71282E-03	1.09295E-02	.75565333	.24119500	.17638195	.72684592	.26065581	.6190	.3397
171264.28487924	3.71788E-03	1.09964E-02	.75664065	.23933387	.17920228	.71966447	.26003875	.6667	.3381
181276.57215913	3.72243E-03	1.10609E-02	.75758595	.23750342	.18197881	.71269522	.25943761	.7143	.3365
191288.85943902	3.72647E-03	1.11232E-02	.75849351	.23569276	.18471418	.70591521	.25885023	.7619	.3350
201301.14671892	3.72992E-03	1.11832E-02	.75936845	.23389760	.18741141	.69930955	.25827444	.8095	.3335
211313.43399881	3.73289E-03	1.12412E-02	.76021094	.23212103	.19007228	.69286254	.25770979	.8571	.3321
221325.72127870	3.73535E-03	1.12966E-02	.76103276	.23034798	.19269986	.68656419	.25715198	.9048	.3306
231338.00855859	3.73707E-03	1.13508E-02	.76181745	.22860473	.19529442	.68040104	.25660637	.9524	.3292
241350.29583848	3.73733E-03	1.14004E-02	.76261167	.22682435	.19786026	.67437027	.25605682	1.0000	.3278

K=10 PHI = 70.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076	3.04114E-03	8.27365E-03	.73365014	.26702681	.15127516	.91703047	.27113464	0.0000	.3676
41105.10274873	3.05492E-03	8.76161E-03	.74563875	.26858700	.15235607	.84132510	.26407253	.0476	.3487
51117.94253669	3.06815E-03	8.99197E-03	.75021874	.26761345	.15602948	.80931112	.26123158	.0952	.3412
61130.78232466	3.08135E-03	9.15368E-03	.75300571	.26610171	.15983884	.78865048	.25947016	.1429	.3366
71143.62211263	3.09435E-03	9.30108E-03	.75536644	.26454384	.16346218	.77050046	.25794883	.1905	.3327
81156.46190060	3.10715E-03	9.43233E-03	.75733803	.26292620	.16701401	.75500879	.25667693	.2381	.3294
91169.30168856	3.11977E-03	9.55632E-03	.75907835	.26131774	.17044568	.74077708	.25552353	.2857	.3265
101182.14147653	3.13220E-03	9.67274E-03	.76060779	.25971511	.17379997	.72780219	.25448671	.3333	.3238
111194.98126450	3.14446E-03	9.78455E-03	.76199935	.25813803	.17706488	.71561727	.25352309	.3810	.3214
121207.82105247	3.15655E-03	9.89134E-03	.76325876	.25658507	.18026033	.70418737	.25262873	.4286	.3191
131220.66084044	3.16848E-03	9.99508E-03	.76441778	.25506275	.18338439	.69331214	.25178507	.4762	.3170
141233.50062840	3.18025E-03	1.00938E-02	.76548288	.25356989	.18644763	.68295362	.25098826	.5238	.3150
151246.34041637	3.19187E-03	1.01953E-02	.76647018	.25210833	.18945133	.67301278	.25022911	.5714	.3131
161259.18020434	3.20334E-03	1.02915E-02	.76738558	.25067676	.19240174	.66345663	.24950435	.6190	.3113
171272.01999231	3.21466E-03	1.03855E-02	.76823828	.24927515	.19530108	.65423067	.24880890	.6667	.3095
181284.85978028	3.22581E-03	1.04779E-02	.76903353	.24790160	.19815346	.64530858	.24814005	.7143	.3079
191297.69956824	3.23681E-03	1.05685E-02	.76977667	.24655602	.20096113	.63665743	.24749490	.7619	.3063
201310.53935621	3.24759E-03	1.06574E-02	.77047347	.24523431	.20372719	.62825705	.24687081	.8095	.3047
211323.37914418	3.25827E-03	1.07450E-02	.77112480	.24393997	.20645361	.62008545	.24626682	.8571	.3032
221336.21893215	3.26850E-03	1.08306E-02	.77174155	.24266024	.20914287	.61212602	.24567875	.9048	.3018
231349.05872011	3.27897E-03	1.09156E-02	.77251244	.24141465	.21179696	.60436789	.24510998	.9524	.3004
241361.89850808	3.28850E-03	1.09975E-02	.77286934	.24015927	.21441681	.59679618	.24454936	1.0000	.2990

K=11 PHI = 80.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT

31092.26296076	2.50379E-03	7.21112E-03	.74288185	.27036688	.16465480	.91703047	.26378260	0.0000	.3479
41105.75441797	2.52388E-03	7.77044E-03	.75726394	.27315199	.16472546	.81844036	.25487441	.0476	.3248
51119.24587518	2.53875E-03	8.03922E-03	.76265051	.27282169	.16774116	.77670851	.25131471	.0952	.3158
61132.73733239	2.55375E-03	8.22658E-03	.76578113	.27180558	.17131784	.75000601	.24913899	.1429	.3104
71146.22878960	2.56884E-03	8.40087E-03	.76836608	.27070421	.17478550	.72688765	.24729854	.1905	.3058
81159.72024681	2.58397E-03	8.55526E-03	.77042411	.26952344	.17824219	.70726647	.24577776	.2381	.3020
91173.21170402	2.59919E-03	8.70177E-03	.77221554	.26834522	.18159541	.68936617	.24441649	.2857	.2987
101186.70316123	2.61449E-03	8.84031E-03	.77375078	.26717050	.18486722	.67312033	.24320624	.3333	.2957
111200.19461844	2.62989E-03	8.97427E-03	.77511643	.26602309	.18809255	.65793650	.24209396	.3810	.2930
121213.68607565	2.64539E-03	9.10379E-03	.77632170	.26490283	.19123213	.64375408	.24107317	.4286	.2906
131227.17753286	2.66102E-03	9.23034E-03	.77740436	.26381799	.19429880	.63031695	.24012101	.4762	.2883
141240.66899007	2.67678E-03	9.35912E-03	.77837244	.26276798	.19739383	.61757316	.23923233	.5238	.2862
151254.16044728	2.69268E-03	9.47584E-03	.77924518	.26175550	.20024611	.60539479	.23839568	.5714	.2842
161267.65190449	2.70873E-03	9.59570E-03	.78002935	.26077963	.20313246	.59373938	.23760699	.6190	.2823
171281.14336170	2.72493E-03	9.71409E-03	.78073594	.25984090	.20596373	.58253601	.23685589	.6667	.2805
181294.63481891	2.74129E-03	9.83114E-03	.78137054	.25893785	.20874437	.57175234	.23615125	.7143	.2788
191308.12627612	2.75781E-03	9.94711E-03	.78193986	.25807043	.21147619	.56134458	.23547719	.7619	.2772
201321.61773333	2.77448E-03	1.00621E-02	.78244917	.25723616	.21416227	.55128716	.23483500	.8095	.2757
211335.10919054	2.79134E-03	1.01762E-02	.78290206	.25643577	.21680468	.54155107	.23422242	.8571	.2743
221348.60064774	2.80831E-03	1.02895E-02	.78330470	.25566463	.21940566	.53211594	.23363568	.9048	.2729
231362.09210495	2.82548E-03	1.04021E-02	.78365726	.25492563	.22196839	.52296165	.23307662	.9524	.2716
241375.58356216	2.84272E-03	1.05140E-02	.78396799	.25421175	.22449116	.51407088	.23254002	1.0000	.2701

K-12 PHI = 90.0 Z = xxxxxxxxxx

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076	2.02675E-03	6.19174E-03	.75297969	.27406220	.17487440	.91703047	.25586342	0.0000	.3273
41106.51218838	2.04223E-03	6.80613E-03	.76974315	.27804850	.17357108	.79219157	.24497249	.0476	.3001
51120.76141601	2.05784E-03	7.10209E-03	.77582750	.27832440	.17571342	.74021673	.24072890	.0952	.2898
61135.01064363	2.07365E-03	7.31016E-03	.77920532	.27777419	.17892321	.70744215	.23818777	.1429	.2837
71149.25987126	2.08978E-03	7.50122E-03	.78196274	.27712251	.18205862	.67906919	.23604747	.1905	.2786
81163.50909888	2.10612E-03	7.67351E-03	.78411085	.27637814	.18525350	.65506598	.23429317	.2381	.2745
91177.75832651	2.12277E-03	7.83809E-03	.78595167	.27563349	.18835912	.63322877	.23273461	.2857	.2708
101192.00755414	2.13969E-03	7.99456E-03	.78749454	.27489032	.19142689	.61349769	.23136266	.3333	.2676
111206.25678176	2.15694E-03	8.14662E-03	.78883650	.27415529	.19441447	.59514710	.23011508	.3810	.2648
121220.50600939	2.17451E-03	8.29431E-03	.78999360	.27348672	.19734502	.57810818	.22898427	.4286	.2622
131234.75523701	2.19244E-03	8.43924E-03	.79100299	.27284045	.20020421	.56206585	.22794325	.4762	.2598
141249.00446464	2.21072E-03	8.58158E-03	.79187611	.27223009	.20300371	.54695628	.22698568	.5238	.2576
151263.25369226	2.22940E-03	8.72217E-03	.79263473	.27166206	.20573896	.53261900	.22609794	.5714	.2556
161277.50291989	2.24845E-03	8.86113E-03	.79328769	.27113945	.20841666	.51900007	.22527461	.6190	.2537
171291.75214751	2.26790E-03	8.99867E-03	.79384671	.27064911	.21103654	.50601784	.22450861	.6667	.2520
181306.00137514	2.28776E-03	9.13502E-03	.79431875	.27020267	.21360254	.49362279	.22379553	.7143	.2504
191320.25060276	2.30805E-03	9.27067E-03	.79471102	.26979824	.21611565	.48175741	.22313048	.7619	.2489
201334.49983039	2.32877E-03	9.40716E-03	.79503200	.26943354	.21857878	.47036295	.22250978	.8095	.2476
211348.74905801	2.34995E-03	9.54434E-03	.79529430	.26910906	.22099349	.45945981	.22193020	.8571	.2463
221362.99828564	2.37154E-03	9.67723E-03	.79547450	.26882196	.22336215	.44895702	.22138848	.9048	.2451
231377.24751327	2.39363E-03	9.81213E-03	.79560512	.26857431	.22568663	.43884561	.22088272	.9524	.2439
241391.49674089	2.41611E-03	9.94687E-03	.79568298	.26836008	.22796884	.42910052	.22040947	1.0000	.2429

K-13 PHI =100.0 Z = xxxxxxxxxx

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076	1.60821E-03	5.24877E-03	.76375443	.27798388	.18167908	.91703047	.24754670	0.0000	.3064
41107.35553856	1.62323E-03	5.89445E-03	.78264227	.28311000	.17870983	.76390565	.23468387	.0476	.2754
51122.44811636	1.63863E-03	6.21076E-03	.78944506	.28399184	.17968727	.70016743	.22971183	.0952	.2638
61137.54069416	1.65419E-03	6.43527E-03	.79316159	.28395972	.18227738	.65990329	.22673813	.1429	.2571
71152.63327196	1.67023E-03	6.64210E-03	.79614506	.28373330	.18488454	.62528417	.22426153	.1905	.2515
81167.72584977	1.68666E-03	6.82870E-03	.79841391	.28341180	.18766342	.59626295	.22225905	.2381	.2470
91182.81842757	1.70351E-03	7.00332E-03	.80031227	.28307079	.19039220	.57015667	.22050942	.2857	.2431
101197.91100537	1.72078E-03	7.17591E-03	.80185636	.28271854	.19312267	.54686120	.21899782	.3333	.2398
111213.00358317	1.73853E-03	7.34004E-03	.80316239	.28238623	.19576822	.52546134	.21764923	.3810	.2369
121228.09616097	1.75676E-03	7.49924E-03	.80424483	.28207765	.19840511	.50584879	.21645224	.4286	.2343
131243.18873878	1.77549E-03	7.65535E-03	.80515599	.28180531	.20095338	.48760698	.21537286	.4762	.2319
141258.28131658	1.79474E-03	7.80860E-03	.80590783	.28157157	.20344208	.47064559	.21440212	.5238	.2298

151273.37389438	1.81453E-03	7.95994E-03	.80652821	.28138116	.20586161	.45473909	.21352184	.5714	.2280
161288.46647218	1.83490E-03	8.10969E-03	.80702608	.28123695	.20821763	.43980818	.21272522	.6190	.2263
171303.55904998	1.85587E-03	8.25854E-03	.80741868	.28114220	.21050725	.42570672	.21200040	.6667	.2247
181318.65162778	1.87743E-03	8.40666E-03	.80771403	.28109638	.21273480	.41237336	.21134180	.7143	.2233
191333.74420559	1.89962E-03	8.55445E-03	.80792200	.28110116	.21490071	.39972210	.21074243	.7619	.2221
201348.83678339	1.92243E-03	8.70210E-03	.80804915	.28115544	.21700786	.38770258	.21019790	.8095	.2209
211363.92936119	1.94589E-03	8.84990E-03	.80810186	.28125973	.21905882	.37625548	.20970340	.8571	.2199
221379.02193899	1.97002E-03	8.99802E-03	.80808534	.28141336	.22105442	.36534082	.20925561	.9048	.2189
231394.11451679	1.99479E-03	9.14656E-03	.80800511	.28161380	.22300045	.35491366	.20885029	.9524	.2181
241409.20709459	2.02033E-03	9.29599E-03	.80786240	.28186631	.22489267	.34494439	.20848646	1.0000	.2173

K=14 PHI =110.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.28296076	1.26213E-03	4.41455E-03	.77498133	.28207014	.18422596	.91703047	.23912389	0.0000	.2859
41108.26687619	1.27575E-03	5.08108E-03	.79602455	.28830076	.17930296	.75090084	.22408839	.0476	.2511
51124.27079161	1.29011E-03	5.41311E-03	.80356442	.28973450	.17890516	.65347836	.21832594	.0952	.2383
61140.27470704	1.30460E-03	5.64778E-03	.80756694	.29008833	.18080873	.60522746	.21493841	.1429	.2310
71156.27862247	1.31971E-03	5.86312E-03	.81070189	.29034163	.18285371	.56435973	.21217293	.1905	.2251
81172.28253790	1.33518E-03	6.08590E-03	.81300947	.29034374	.18519626	.53072487	.20990832	.2381	.2205
91188.28645333	1.35121E-03	6.23899E-03	.81468749	.29020769	.18751631	.50095859	.20812280	.2857	.2166
101204.29036875	1.36773E-03	6.41195E-03	.81636604	.29015565	.18986288	.47482503	.20654754	.3333	.2133
111220.29428418	1.38481E-03	6.57931E-03	.81757833	.29011736	.19213970	.45116491	.20517307	.3810	.2105
121236.29819961	1.40248E-03	6.74125E-03	.81854597	.29010807	.19435793	.42978320	.20398084	.4286	.2080
131252.30211504	1.42070E-03	6.89805E-03	.81932806	.29014051	.19651326	.41015008	.20292982	.4762	.2059
141268.30603046	1.43955E-03	7.05543E-03	.81994022	.29021916	.19858701	.39211376	.20200588	.5238	.2040
151284.30994589	1.45903E-03	7.20911E-03	.82041326	.29035110	.20057732	.37539073	.20116999	.5714	.2024
161300.31386132	1.47917E-03	7.36124E-03	.82075931	.29053842	.20249137	.35986394	.20046968	.6190	.2009
171316.31777675	1.49997E-03	7.51244E-03	.82099379	.29078245	.20432710	.34535485	.19983253	.6667	.1997
181332.32169218	1.52149E-03	7.66312E-03	.82112647	.29103724	.20608833	.33180541	.19927224	.7143	.1985
191348.32560760	1.54367E-03	7.81347E-03	.82117065	.29144744	.20777862	.31907562	.19877687	.7619	.1976
201364.32952303	1.56657E-03	7.96425E-03	.82112676	.29187413	.20939770	.30710726	.19834966	.8095	.1967
211380.33343846	1.59025E-03	8.11484E-03	.82101303	.29234726	.21095547	.29582266	.19797397	.8571	.1960
221396.33735389	1.61489E-03	8.26709E-03	.82081553	.29290041	.21244351	.28517010	.19765575	.9048	.1953
231412.34126932	1.63981E-03	8.41843E-03	.82057203	.29347455	.21388382	.27508896	.19737677	.9524	.1948
241428.34518474	1.66635E-03	8.57379E-03	.82023183	.29416540	.21524991	.26554402	.19715676	1.0000	.1944

K=15 PHI =120.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076	9.86712E-04	3.70272E-03	.78641166	.28623044	.18205979	.91703047	.23096060	0.0000	.2665
41109.21417219	9.98655E-04	4.38297E-03	.80954342	.29348072	.17509901	.69293872	.21347077	.0476	.2278
51126.16538363	1.01135E-03	4.72442E-03	.81772102	.29535209	.17329600	.60054245	.20691447	.0952	.2141
61143.11659506	1.02399E-03	4.96340E-03	.82195199	.29601298	.17453495	.54386422	.20312990	.1429	.2063
71160.06780650	1.03735E-03	5.17983E-03	.82515944	.29639370	.17606028	.49707783	.20013268	.1905	.2003
81177.01901794	1.05105E-03	5.37106E-03	.82744496	.29659700	.17759174	.45945619	.19783203	.2381	.1957
91193.97022937	1.06535E-03	5.55130E-03	.82936267	.29674705	.17987165	.42675930	.19591310	.2857	.1919
101210.92144081	1.08018E-03	5.72003E-03	.83064861	.29687658	.18180079	.39863401	.19433767	.3333	.1888
111227.87265224	1.09554E-03	5.89210E-03	.83175595	.29702633	.18364085	.37357540	.19299590	.3810	.1862
121244.82386368	1.11151E-03	6.05879E-03	.83260593	.29720946	.18539886	.35133371	.19186518	.4286	.1841
131261.77507511	1.12809E-03	6.19135E-03	.83326512	.29744248	.18705873	.33121579	.19089503	.4762	.1822
141278.72628655	1.14551E-03	6.34053E-03	.83376073	.29773242	.18863051	.31303285	.19007034	.5238	.1806
151295.67749798	1.16317E-03	6.48752E-03	.83409525	.29808424	.19009955	.29641457	.18936371	.5714	.1793
161312.62870942	1.18173E-03	6.63294E-03	.83430826	.29850183	.19147698	.28121587	.18876500	.6190	.1782
171329.57992086	1.20033E-03	6.77717E-03	.83441315	.29898948	.19276227	.26721703	.18825658	.6667	.1772
181346.53113229	1.22093E-03	6.92111E-03	.83441115	.29955164	.19395996	.25430643	.18783311	.7143	.1764
191363.48234373	1.24152E-03	7.05435E-03	.83432560	.30017064	.19507836	.24234103	.18747944	.7619	.1757
201380.43355516	1.26307E-03	7.20874E-03	.83414412	.30088023	.19611415	.23123685	.18719718	.8095	.1752
211397.38476660	1.28504E-03	7.35221E-03	.83390404	.30162639	.19706555	.22094089	.18696677	.8571	.1748
221414.33597803	1.30334E-03	7.49867E-03	.83356421	.30248927	.19797660	.21134509	.18680269	.9048	.1745
231431.28718947	1.33160E-03	7.64279E-03	.83320047	.30334452	.19882141	.20221280	.18667036	.9524	.1742
241448.23840090	1.35694E-03	7.79327E-03	.83271084	.30437340	.19956239	.19376651	.18660994	1.0000	.1741

K=16 PHI =130.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.	26296076	7.78018E-04	3.12468E-03	.79771585	.29034483	.17423638	.91703047	.22315510	0.0000	.2490
41110.	11885106	7.87680E-04	3.81722E-03	.82291010	.29852495	.16538698	.64910638	.20314968	.0476	.2063
51127.	97474137	7.98158E-04	4.16813E-03	.83171042	.30071844	.16228242	.53919837	.19569906	.0952	.1915
61145.	83063169	8.08452E-04	4.40635E-03	.83607514	.30152408	.16305566	.47420378	.19155910	.1429	.1835
71163.	68652198	8.19498E-04	4.61693E-03	.83925974	.30195427	.16422042	.42241595	.18841357	.1905	.1775
81181.	54241229	8.30800E-04	4.79850E-03	.84147863	.30219965	.16579359	.38182094	.18606535	.2381	.1731
91199.	39830260	8.42708E-04	4.98377E-03	.84319600	.30231081	.16750994	.34751949	.18417371	.2857	.1696
101217.	25419290	8.55044E-04	5.12498E-03	.84447418	.30250978	.16832182	.31872088	.18266816	.3333	.1668
111235.	11008321	8.67947E-04	5.27306E-03	.84566830	.30271125	.17019815	.29366735	.18142078	.3810	.1646
121252.	96597352	8.81383E-04	5.41526E-03	.84680579	.30293961	.17147700	.27192869	.18042117	.4286	.1628
131270.	82186382	8.95336E-04	5.55243E-03	.84675629	.30322787	.17261615	.25267269	.17958659	.4762	.1613
141288.	67775413	9.09993E-04	5.68575E-03	.84713582	.30358943	.17364035	.23562462	.17891159	.5238	.1600
151306.	53364444	9.25176E-04	5.81655E-03	.84737671	.30402404	.17453942	.22033051	.17835811	.5714	.1591
161324.	38953474	9.41045E-04	5.94571E-03	.84746958	.30456845	.17532798	.20660019	.17791738	.6190	.1583
171342.	24542505	9.57471E-04	6.07356E-03	.84750143	.30514117	.17601043	.19416143	.17756718	.6667	.1577
181360.	10131536	9.74710E-04	6.20106E-03	.84740486	.30586605	.17659242	.18287873	.17730450	.7143	.1572
191377.	95720366	9.92419E-04	6.32773E-03	.84723431	.30665939	.17708803	.17257418	.17710816	.7619	.1568
201395.	81309597	1.01116E-03	6.45615E-03	.84696143	.30746227	.17749278	.16315374	.17698565	.8095	.1566
211413.	66898528	1.03014E-03	6.58313E-03	.84664370	.30836347	.17783110	.15448705	.17690818	.8571	.1565
221431.	52487658	1.05056E-03	6.71419E-03	.84621341	.30941756	.17808488	.14651840	.17690078	.9048	.1565
231449.	38076689	1.07075E-03	6.84207E-03	.84577841	.31044432	.17829310	.13913336	.17691511	.9524	.1565
241467.	23665720	1.09310E-03	6.97766E-03	.84519846	.31168801	.17841824	.13232031	.17700682	1.0000	.1567

K-17 PHI =140.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.	26296076	6.32089E-04	2.69382E-03	.80850817	.29427291	.15834842	.91703047	.21663045	0.0000	.2346
41110.	87711105	6.39160E-04	3.41997E-03	.83603843	.30347387	.14821347	.59402728	.19333521	.0476	.1869
51129.	49126135	6.47077E-04	3.78097E-03	.84527039	.30581481	.14441138	.46584042	.18500845	.0952	.1711
61148.	10541165	6.54648E-04	4.01254E-03	.84957284	.30656919	.14522948	.39424344	.18063760	.1429	.1631
71166.	71956195	6.62950E-04	4.21213E-03	.85265897	.30687394	.14652236	.33889204	.17742088	.1905	.1574
81185.	33371224	6.71383E-04	4.37730E-03	.85472820	.30696673	.14778664	.29765069	.17514203	.2381	.1534
91203.	94780254	6.80297E-04	4.52643E-03	.85630169	.30697072	.14907080	.26396861	.17337490	.2857	.1503
101222.	56201284	6.89537E-04	4.65934E-03	.85744435	.30690948	.15028197	.23679229	.17203154	.3333	.1480
111241.	17616313	6.99234E-04	4.78424E-03	.85832241	.30693671	.15127803	.21384550	.17096819	.3810	.1462
121259.	79031343	7.09344E-04	4.90072E-03	.85895976	.30704698	.15212666	.19455527	.17014300	.4286	.1447
131278.	40446373	7.19910E-04	5.01203E-03	.85942857	.30724930	.15278790	.17789421	.16949115	.4762	.1436
141297.	01861402	7.30981E-04	5.11927E-03	.85973004	.30750450	.15330213	.16351654	.16899109	.5238	.1428
151315.	63276432	7.42511E-04	5.22373E-03	.85992829	.30784547	.15376375	.15089942	.16860721	.5714	.1421
161334.	24691462	7.54655E-04	5.32669E-03	.85999708	.30823641	.15389566	.13978664	.16832972	.6190	.1417
171352.	86106491	7.67245E-04	5.42819E-03	.85997753	.30883024	.15400650	.12990508	.16813360	.6667	.1413
181371.	47521521	7.80600E-04	5.53020E-03	.85985233	.30918941	.15400677	.12109602	.16801916	.7143	.1412
191390.	08936551	7.94317E-04	5.63125E-03	.85966415	.31021438	.15391328	.11316634	.16796148	.7619	.1411
201408.	70351691	8.09036E-04	5.73477E-03	.85937086	.31108618	.15372594	.10602228	.16797348	.8095	.1411
211427.	31766610	8.23918E-04	5.83696E-03	.85901277	.31196948	.15346871	.09952469	.16802109	.8571	.1412
221445.	93181640	8.40170E-04	5.94359E-03	.85859530	.31307525	.15313086	.09362647	.16813622	.9048	.1413
231464.	54596670	8.56203E-04	6.04812E-03	.85815138	.31413450	.15274448	.08820542	.16826458	.9524	.1416
241483.	16011699	8.74206E-04	6.16040E-03	.85755568	.31543561	.15228719	.08326364	.16846794	1.0000	.1419

K-18 PHI =150.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.	26296076	5.45450E-04	2.42459E-03	.81816095	.29778623	.13026966	.91703047	.21211593	0.0000	.2250
41111.	32440315	5.49652E-04	3.22208E-03	.84847056	.30520455	.12045743	.52625930	.18468804	.0476	.1705
51130.	38584553	5.54851E-04	3.60979E-03	.85787546	.31072452	.11726179	.37732291	.17535657	.0952	.1537
61149.	44728792	5.59547E-04	3.83756E-03	.86201126	.31133980	.11863007	.29970301	.17076770	.1429	.1458
71168.	50873031	5.64914E-04	4.01554E-03	.86478599	.31133930	.12055896	.24574624	.16773704	.1905	.1407
81187.	57017270	5.70170E-04	4.15181E-03	.86655705	.31113298	.12224823	.20832001	.16572901	.2381	.1373
91206.	63161509	5.75810E-04	4.26836E-03	.86788356	.31082126	.12354956	.17941681	.16425820	.2857	.1349
101225.	69305747	5.81557E-04	4.36717E-03	.86883600	.31052287	.12463495	.15729510	.16319662	.3333	.1332
111244.	75449986	5.87580E-04	4.45648E-03	.86957874	.31025503	.12540448	.13925540	.16238741	.3810	.1318
121263.	81594225	5.93817E-04	4.53723E-03	.87012529	.31006157	.12596525	.12467487	.16178786	.4286	.1309
131282.	87738464	6.00320E-04	4.61302E-03	.87054595	.30994241	.12629153	.11237260	.16132941	.4762	.1301

141301.93882702	6.07145E-04	4.68480E-03	.87083896	.30992285	.12644620	.10206138	.16099620	.5238	.1296
151321.00026941	6.14250E-04	4.75406E-03	.87104403	.30998921	.12642677	.09314936	.16075153	.5714	.1292
161340.06171180	6.21801E-04	4.82209E-03	.87114925	.31013140	.12626975	.08547829	.16059180	.6190	.1289
171359.12315419	6.29641E-04	4.88896E-03	.87118816	.31043775	.12598152	.07872425	.16049189	.6667	.1288
181378.18459658	6.38093E-04	4.95671E-03	.87113497	.31083710	.12558281	.07279142	.16045755	.7143	.1287
191397.24603696	6.46804E-04	5.02395E-03	.87103254	.31130722	.12508377	.06748756	.16046444	.7619	.1287
201416.30748135	6.56359E-04	5.09404E-03	.87083239	.31193466	.12449567	.06275636	.16052946	.8095	.1288
211436.36892374	6.66071E-04	5.16355E-03	.87060239	.31260634	.12383015	.05846949	.16062057	.8571	.1290
221454.43036613	6.76954E-04	5.23811E-03	.87025719	.31347139	.12309323	.05460368	.16077075	.9048	.1292
231473.49180852	6.87766E-04	5.31118E-03	.86990956	.31433576	.12229644	.05105533	.16093102	.9524	.1295
241492.55325090	7.00216E-04	5.39206E-03	.86941613	.31544650	.12144397	.04783593	.16115859	1.0000	.1299

K-19 PHI =160.0 Z = **********

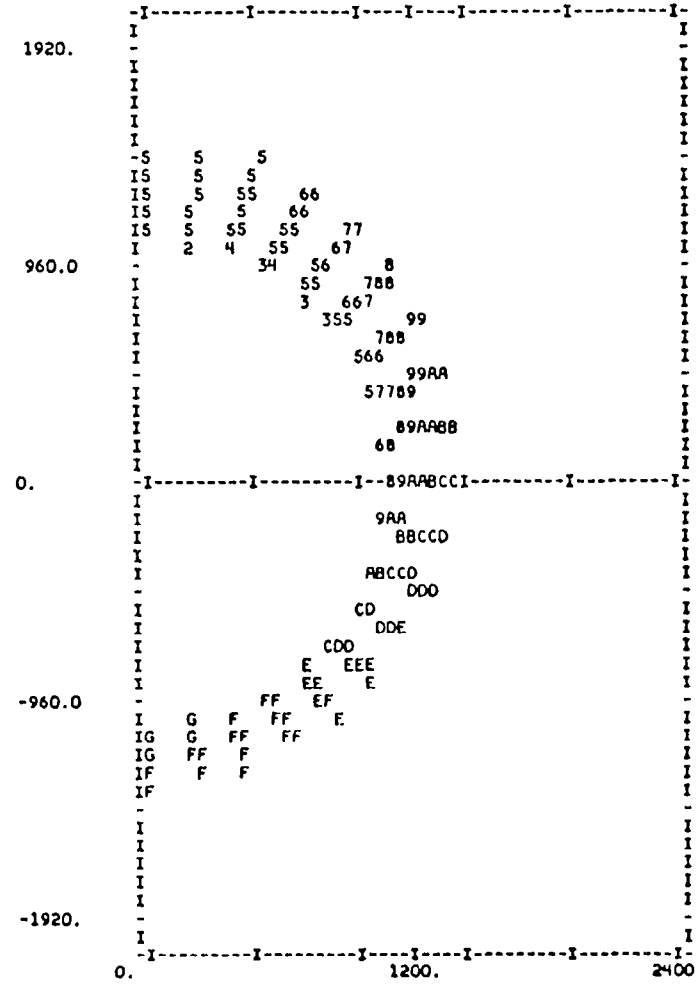
J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076		5.07233E-04	2.30200E-03	.82568490	.30052472	.08708835	.91703047	.20992616	0.0000	.2203
41111.32224569		5.08647E-04	3.28648E-03	.86070874	.31293828	.08080071	.42135895	.17593734	.0476	.1548
51130.38153062		5.11275E-04	3.71899E-03	.86969062	.31518949	.08043005	.25342221	.16581731	.0952	.1375
61149.44081555		5.13361E-04	3.90330E-03	.87265235	.31524232	.08001972	.16974701	.16218333	.1429	.1315
71168.50010048		5.15928E-04	4.03206E-03	.87490556	.31484853	.07833705	.14932535	.15997275	.1905	.1280
81187.55938541		5.18292E-04	4.12097E-03	.87612900	.31433869	.07827413	.12365711	.15861704	.2381	.1258
91206.61867035		5.20676E-04	4.19088E-03	.87705788	.31378114	.07957086	.10478316	.15766289	.2857	.1243
101225.67795528		5.23338E-04	4.24726E-03	.87774493	.31326906	.08053504	.09088779	.15699028	.3333	.1232
111244.73724021		5.26011E-04	4.29609E-03	.87830339	.31279057	.08113567	.07988194	.15648611	.3810	.1224
121263.79652514		5.28654E-04	4.33647E-03	.87874415	.31238173	.08150762	.07115159	.15611068	.4286	.1219
131282.85581007		5.31372E-04	4.37697E-03	.87911214	.31202561	.08165217	.06390911	.15582153	.4762	.1214
141301.91509500		5.34190E-04	4.41249E-03	.87940635	.31174347	.08163696	.05788310	.15560408	.5238	.1211
151320.97437993		5.37031E-04	4.44591E-03	.87965242	.31151551	.08146777	.05271666	.15543703	.5714	.1208
161340.03306487		5.40163E-04	4.47834E-03	.87984066	.31136846	.08118191	.04826923	.15531722	.6190	.1206
171359.09289980		5.43325E-04	4.50960E-03	.87999417	.31126705	.08078369	.04435880	.15522375	.6667	.1205
181378.15223473		5.46795E-04	4.54135E-03	.88009178	.31125810	.08029618	.04090506	.15517955	.7143	.1204
191397.21151966		5.50344E-04	4.57250E-03	.88016395	.31129120	.07972001	.03780578	.15515124	.7619	.1204
201416.27080459		5.54350E-04	4.60561E-03	.88017195	.31143629	.07907279	.03501435	.15515851	.8095	.1204
211435.33008952		5.58473E-04	4.63830E-03	.88016337	.31161203	.0883[illegible]	.03246622	.15518033	.8571	.1204
221454.38937445		5.63304E-04	4.67469E-03	.88007230	.31193509	.0875[illegible]	.03013823	.15524229	.9048	.1205
231473.44865939		5.68130E-04	4.71051E-03	.87997611	.3122[illegible].050	.0864[illegible]927	.02798183	.15531191	.9524	.1206
241492.50794432		5.74063E-04	4.75234E-03	.87976720	.31280688	.08582315	.02599473	.15543224	1.0000	.1208

K-20 PHI =170.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
31092.26296076		4.97409E-04	2.27006E-03	.82957376	.30194016	.03901894	.91703047	.20934041	0.0000	.2191
41110.86585196		4.97184E-04	3.69297E-03	.87376434	.31701593	.03703787	.23530506	.16409145	.0476	.1346
51129.46874317		4.97894E-04	4.00737E-03	.87937067	.31755223	.04028871	.12334541	.15763541	.0952	.1242
61148.07163437		4.97569E-04	4.07236E-03	.88056582	.31688118	.04370072	.09997489	.15638440	.1429	.1223
71166.67452558		4.98415E-04	4.13870E-03	.88174126	.31629500	.04594152	.07824088	.15519494	.1905	.1204
81185.27741678		4.98672E-04	4.17027E-03	.88236257	.31570175	.04680619	.06812276	.15464662	.2381	.1196
91203.88030799		4.99021E-04	4.20179E-03	.88296477	.31518819	.04760045	.05827890	.15411931	.2857	.1188
101222.48319920		4.99303E-04	4.22177E-03	.88338199	.31471323	.04819837	.05220485	.15379776	.3333	.1183
111241.08609040		4.99588E-04	4.24116E-03	.88378288	.31429168	.04851749	.04635121	.15348908	.3810	.1178
121259.68898161		4.99844E-04	4.25547E-03	.88410042	.31390147	.04871582	.04215467	.15327041	.4286	.1175
131278.29187281		5.00066E-04	4.26901E-03	.88440636	.31354266	.04876291	.03815188	.15306115	.4762	.1171
141296.89476402		5.00274E-04	4.27869E-03	.88466850	.31320533	.04873109	.03500332	.15289823	.5238	.1169
151315.49765522		5.00425E-04	4.28994E-03	.88492427	.31288255	.04860673	.03202397	.15274222	.5714	.1167
161334.10054643		5.00577E-04	4.29651E-03	.88515410	.31257547	.04842669	.02953250	.15261300	.6190	.1165
171352.70343763		5.00648E-04	4.30516E-03	.88536309	.31226913	.04818219	.02716536	.15248820	.6667	.1163
181371.30632884		5.00742E-04	4.31301E-03	.88559404	.31197707	.04789456	.02513845	.15238085	.7143	.1161
191389.90922005		5.00722E-04	4.31866E-03	.88581019	.31167336	.04755971	.02321101	.15227513	.7619	.1159
201408.51211125		5.00765E-04	4.32446E-03	.88601018	.31138744	.04717777	.02147954	.15218284	.8095	.1158
211427.11500246		5.00648E-04	4.32880E-03	.88622238	.31107724	.04675138	.01984332	.15208889	.8571	.1157
221445.71789366		5.00661E-04	4.33353E-03	.88641523	.31079471	.04628954	.01834143	.15200788	.9048	.1155
231464.32078487		5.00453E-04	4.33667E-03	.88662876	.31047359	.04577440	.01691132	.15192123	.9524	.1154
241482.92367607		5.00485E-04	4.34100E-03	.88681379	.31019947	.04522186	.01557797	.15185031	1.0000	.1153

K-21 PHI =180.0 Z = **********

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	M/MT
31092.	26296076	4.96248E-04	2.26627E-03	.83046139	.30226323	0.00000000	.91703047	.20927056	0.0000	.2190
41110.	44098347	4.95676E-04	3.96012E-03	.87956885	.31850305	0.00000000	.13165F70	.15805977	.0476	.1249
51128.	61900618	4.95831E-04	4.13408E-03	.88259927	.31793240	0.00000000	.07461170	.15487899	.0952	.1199
61146.	79702890	4.95202E-04	4.14608E-03	.88318207	.31709745	0.00000000	.06928435	.15455655	.1429	.1194
71164.	97505161	4.94814E-04	4.18288E-03	.88404281	.31550139	0.00000000	.05612998	.15381494	.1905	.1183
81183.	15307432	4.94304E-04	4.19191E-03	.88445002	.31595850	0.00000000	.05207673	.15356978	.2391	.1179
91201.	33109704	4.93802E-04	4.20996E-03	.88493841	.31553479	0.00000000	.04538162	.15318082	.2857	.1173
101219.	50911975	4.93288E-04	4.21568E-03	.88525447	.31513785	0.00000000	.04210463	.15297887	.3333	.1170
111237.	68714246	4.92729E-04	4.22538E-03	.88560163	.31479863	0.00000000	.03775129	.15271645	.3810	.1166
121255.	86516518	4.92160E-04	4.23014E-03	.88586950	.31446647	0.00000000	.03502186	.15254249	.4286	.1163
131274.	04318789	4.91523E-04	4.23584E-03	.88615299	.31415573	0.00000000	.03184093	.15234110	.4762	.1160
141292.	22121060	4.90856E-04	4.23674E-03	.88639815	.31384018	0.00000000	.02952777	.15218585	.5238	.1158
151310.	39923332	4.90098E-04	4.24157E-03	.88665533	.31352224	0.00000000	.02704285	.15201719	.5714	.1155
161328.	57725603	4.89288E-04	4.24259E-03	.88689528	.31319149	0.00000000	.02505719	.15187353	.6190	.1153
171346.	75527874	4.88343E-04	4.24287E-03	.88714930	.31283986	0.00000000	.02302937	.15172168	.6667	.1151
181364.	93330146	4.87327E-04	4.24178E-03	.88739830	.31246914	0.00000000	.02130507	.15158317	.7143	.1149
191383.	11132417	4.86113E-04	4.23940E-03	.88766783	.31205914	0.00000000	.01959650	.15143675	.7619	.1147
201401.	28934688	4.84807E-04	4.23585E-03	.88793966	.31162441	0.00000000	.01808055	.15129665	.8098	.1145
211419.	46736960	4.83201E-04	4.23029E-03	.88824322	.31112653	0.00000000	.01660278	.15114514	.8571	.1142
221437.	64539231	4.81482E-04	4.22361E-03	.88855539	.31059854	0.00000000	.01525083	.15099527	.9048	.1140
231455.	82341502	4.79279E-04	4.21374E-03	.88891931	.30996847	0.00000000	.01393956	.15082574	.9524	.1137
241474.	00143774	4.76948E-04	4.20278E-03	.88929594	.30930387	0.00000000	.01270887	.15065447	1.0000	.1135



VERTICAL SCALING

0.	< 0 <	.800E-03	.800E-03	< 1 <	.160E-02
.160E-02	< 2 <	.240E-02	.240E-02	< 3 <	.320E-02
.320E-02	< 4 <	.400E-02	.400E-02	< 5 <	.480E-02
.480E-02	< 6 <	.560E-02	.560E-02	< 7 <	.640E-02
.640E-02	< 8 <	.720E-02	.720E-02	< 9 <	.800E-02
.800E-02	< A <	.880E-02	.880E-02	< B <	.960E-02
.960E-02	< C <	.104E-01	.104E-01	< D <	.112E-01
.112E-01	< E <	.120E-01	.120E-01	< F <	.128E-01
.128E-01	< G <	.136E-01	.136E-01	< H <	.144E-01
.144E-01	< I <	.152E-01			

SURFACE FLOW VARIABLES AT Z =**********

X/L = .300097 DZDT=343.454220 ITER= 1500

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	1092.2630	.6709	2.4012E+01	5.0298E+00	2.3607	.8592	0.0000	2.9733E-01	1.0000	.44204	.00	9.1703E-01
10.0	1092.2630	.6616	2.3694E+01	4.9821E+00	2.3675	.8617	.0841	2.9677E-01	1.0000	.44036	.00	9.1703E-01
20.0	1092.2630	.6346	2.2767E+01	4.8421E+00	2.3877	.8691	.1679	2.9508E-01	1.0000	.43536	.00	9.1703E-01
30.0	1092.2630	.5919	2.1303E+01	4.6175E+00	2.4218	.8815	.2506	2.9229E-01	1.0000	.42717	.00	9.1703E-01
40.0	1092.2630	.5368	1.9413E+01	4.3211E+00	2.4701	.8990	.3317	2.8844E-01	1.0000	.41598	.00	9.1703E-01
50.0	1092.2630	.4733	1.7234E+01	3.9688E+00	2.5352	.9220	.4106	2.8357E-01	1.0000	.40207	.00	9.1703E-01
60.0	1092.2630	.4056	1.4913E+01	3.5792E+00	2.6116	.9505	.4862	2.7777E-01	1.0000	.38579	.00	9.1703E-01
70.0	1092.2630	.3379	1.2590E+01	3.1714E+00	2.7059	.9848	.5579	2.7113E-01	1.0000	.36757	.00	9.1703E-01
80.0	1092.2630	.2736	1.0386E+01	2.7642E+00	2.8163	1.0250	.6242	2.6370E-01	1.0000	.34791	.00	9.1703E-01
90.0	1092.2630	.2155	8.3904E+00	2.3734E+00	2.9429	1.0711	.6835	2.5586E-01	1.0000	.32733	.00	9.1703E-01
100.0	1092.2630	.1649	6.6577E+00	2.0119E+00	3.0853	1.1230	.7339	2.4755E-01	1.0000	.30640	.00	9.1703E-01
110.0	1092.2630	.1232	5.2250E+00	1.6922E+00	3.2409	1.1796	.7704	2.3912E-01	1.0000	.28590	.00	9.1703E-01
120.0	1092.2630	.0899	4.0848E+00	1.4193E+00	3.4064	1.2398	.7886	2.3086E-01	1.0000	.26648	.00	9.1703E-01
130.0	1092.2630	.0647	3.2205E+00	1.1977E+00	3.5747	1.3011	.7808	2.2316E-01	1.0000	.24899	.00	9.1703E-01
140.0	1092.2630	.0471	2.6167E+00	1.0326E+00	3.7322	1.3584	.7310	2.1663E-01	1.0000	.23464	.00	9.1703E-01
150.0	1092.2630	.0367	2.2581E+00	9.2939E-01	3.8571	1.4039	.6141	2.1212E-01	1.0000	.22497	.00	9.1703E-01
160.0	1092.2630	.0321	2.0959E+00	8.8240E-01	3.9332	1.4316	.4149	2.0993E-01	1.0000	.22034	.00	9.1703E-01
170.0	1092.2630	.0309	2.0592E+00	8.7015E-01	3.9628	1.4423	.1864	2.0934E-01	1.0000	.21912	.00	9.1703E-01
180.0	1092.2630	.0307	2.0544E+00	8.6870E-01	3.9684	1.4444	0.0000	2.0927E-01	1.0000	.21897	.00	9.1703E-01

BODY AND SHOCK GEOMETRY AT Z =******

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	1092.2630	.3640	0.0000	1320.4665	.4400	0.0000
10.0	1092.2630	.3640	0.0000	1321.2464	.4402	8.9543
20.0	1092.2630	.3640	0.0000	1323.5921	.4410	18.1476
30.0	1092.2630	.3640	0.0000	1327.5812	.4423	27.7392
40.0	1092.2630	.3640	0.0000	1333.2749	.4442	37.9337
50.0	1092.2630	.3640	0.0000	1340.8225	.4467	48.7614
60.0	1092.2630	.3640	0.0000	1350.2958	.4499	60.3783
70.0	1092.2630	.3640	0.0000	1361.8985	.4538	72.9440
80.0	1092.2630	.3640	0.0000	1375.5836	.4584	84.7927
90.0	1092.2630	.3640	0.0000	1391.4967	.4637	96.3243
100.0	1092.2630	.3640	0.0000	1409.2071	.4696	105.5630
110.0	1092.2630	.3640	0.0000	1428.3452	.4760	111.8165
120.0	1092.2630	.3640	0.0000	1448.2384	.4827	111.4159
130.0	1092.2630	.3640	0.0000	1467.2367	.4890	100.0433
140.0	1092.2630	.3640	0.0000	1483.1601	.4943	72.5267
150.0	1092.2630	.3640	0.0000	1492.5533	.4974	26.7796
160.0	1092.2630	.3640	0.0000	1492.5079	.4974	-27.5867
170.0	1092.2630	.3640	0.0000	1482.9237	.4942	-53.0172
180.0	1092.2630	.3640	0.0000	1474.0014	.4912	0.0000

CONE SOLUTION RESET TO Z-INITIAL= 1.00000

K= 3 PHI = 0.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	5.80033E-03	1.31218E-02	.70192138	.25547849	0.00000000	.91703047	.29733386	0.0000	.4420
4	.36759134	5.79883E-03	1.31194E-02	.70319446	.25202113	0.00000000	.91702521	.29732235	.0476	.4420
5	.37121245	5.79570E-03	1.31144E-02	.70445865	.24857450	0.00000000	.91702521	.29729939	.0952	.4419
6	.37483356	5.79067E-03	1.31062E-02	.70574906	.24513914	0.00000000	.91702521	.29726253	.1429	.4418
7	.37845467	5.78359E-03	1.30948E-02	.70703527	.24172402	0.00000000	.91702521	.29721057	.1905	.4417
8	.38207578	5.77455E-03	1.30802E-02	.70832715	.23832627	0.00000000	.91702521	.29714415	.2381	.4415
9	.38569689	5.76356E-03	1.30624E-02	.70962511	.23494511	0.00000000	.91702521	.29706329	.2857	.4412
10	.38931800	5.75064E-03	1.30415E-02	.71092973	.23157854	0.00000000	.91702521	.29696811	.3333	.4410
11	.39293911	5.73582E-03	1.30175E-02	.71224169	.22822460	0.00000000	.91702521	.29685865	.3810	.4406
12	.39655022	5.71911E-03	1.29904E-02	.71356174	.22488107	0.00000000	.91702521	.29673495	.4286	.4403
13	.40018133	5.70052E-03	1.29602E-02	.71489078	.22154555	0.00000000	.91702521	.29659695	.4762	.4398
14	.40380244	5.68005E-03	1.29269E-02	.71622978	.21821548	0.00000000	.91702521	.29644457	.5238	.4394
15	.40742355	5.65770E-03	1.28906E-02	.71757978	.21488820	0.00000000	.91702521	.29627768	.5714	.4389
16	.41104466	5.63348E-03	1.28511E-02	.71894191	.21156086	0.00000000	.91702521	.29609611	.6190	.4384

17	.41466577	5.60736E-03	1.28085E-02	.72031743	.20823047	0.00000000	.91702521	.29589960	.6667	.4378
18	.41828688	5.57933E-03	1.27628E-02	.72170767	.20489388	0.00000000	.91702521	.29568786	.7143	.4372
19	.42190799	5.54937E-03	1.27138E-02	.72311413	.20154763	0.00000000	.91702521	.29546049	.7619	.4365
20	.42552910	5.51745E-03	1.26615E-02	.72453829	.19818826	0.00000000	.91702521	.29521710	.8095	.4358
21	.42915021	5.48350E-03	1.26058E-02	.72598251	.19481110	0.00000000	.91702521	.29495696	.8571	.4350
22	.43277131	5.44750E-03	1.25466E-02	.72744657	.19141471	0.00000000	.91702521	.29468013	.9048	.4342
23	.43639242	5.40929E-03	1.24837E-02	.72894039	.18798432	0.00000000	.91702521	.29438336	.9524	.4333
24	.44001353	5.36965E-03	1.24183E-02	.73044069	.18454858	0.00000000	.91702521	.29407422	1.0000	.4324

K= 4 PHI = 10.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	5.72347E-03	1.29974E-02	.70258673	.25572066	.02496519	.91703047	.29676778	0.0000	.4404
4	.36760372	5.72251E-03	1.29924E-02	.70375068	.25224761	.02561434	.91739748	.29679961	.0476	.4405
5	.37123721	5.71994E-03	1.29882E-02	.70510404	.24888630	.02670375	.91813028	.29666749	.0952	.4401
6	.37487069	5.71555E-03	1.29770E-02	.70654258	.24550954	.02763921	.91869498	.29656659	.1429	.4398
7	.37850418	5.70918E-03	1.29619E-02	.70789169	.24214938	.02851151	.91911687	.29645915	.1905	.4394
8	.38213766	5.70093E-03	1.29429E-02	.70922864	.23880222	.02933339	.91963821	.29634702	.2381	.4391
9	.38577115	5.69073E-03	1.29204E-02	.71056359	.23547051	.03012033	.91919783	.29622484	.2857	.4387
10	.38940464	5.67865E-03	1.28945E-02	.71189672	.23215212	.03087793	.91379746	.29609289	.3333	.4384
11	.39303812	5.66479E-03	1.28654E-02	.71323180	.22884611	.03161204	.91342087	.29594950	.3810	.4379
12	.39667161	5.64905E-03	1.28330E-02	.71456968	.22555026	.03232574	.91308744	.29579462	.4286	.4375
13	.40030510	5.63150E-03	1.27974E-02	.71591252	.22226256	.03302196	.91273056	.29562752	.4762	.4370
14	.40393858	5.61212E-03	1.27586E-02	.71726150	.21898053	.03370262	.91240912	.29544800	.5238	.4364
15	.40757207	5.59090E-03	1.27167E-02	.71861823	.21570168	.03436944	.91210001	.29525560	.5714	.4359
16	.41120555	5.56788E-03	1.26717E-02	.71998407	.21242324	.03502369	.91180219	.29505005	.6190	.4353
17	.41483904	5.54297E-03	1.26234E-02	.72136056	.20914232	.03566647	.91151403	.29483091	.6667	.4346
18	.41847253	5.51621E-03	1.25719E-02	.72274922	.20585583	.03629869	.91123469	.29459781	.7143	.4339
19	.42210601	5.48759E-03	1.25172E-02	.72415169	.20256041	.03692109	.91096320	.29435028	.7619	.4332
20	.42573950	5.45702E-03	1.24592E-02	.72556969	.19925251	.03753436	.91069895	.29408782	.8095	.4324
21	.42937299	5.42450E-03	1.23977E-02	.72700516	.19592821	.03813893	.91044132	.29380982	.8571	.4316
22	.43300647	5.38999E-03	1.23328E-02	.72846001	.19258350	.03873566	.91018979	.29351564	.9048	.4308
23	.43663996	5.35339E-03	1.22643E-02	.72993696	.18921314	.03932369	.90994433	.29320439	.9524	.4298
24	.44027344	5.31469E-03	1.21920E-02	.73143730	.18581369	.03990744	.90970316	.29287545	1.0000	.4289

K= 5 PHI = 20.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	5.49950E-03	1.26320E-02	.70457174	.25644314	.01953493	.91703047	.29508029	0.0000	.4354
4	.36760094	5.50014E-03	1.26726E-02	.70655773	.25333584	.02077114	.91266038	.29462499	.0476	.4340
5	.37131165	5.49919E-03	1.26997E-02	.70824600	.25014794	.02256784	.90949728	.29428510	.0952	.4330
6	.37498235	5.49663E-03	1.27135E-02	.70972094	.24690206	.02468199	.90750584	.29405627	.1429	.4323
7	.37865306	5.49225E-03	1.27222E-02	.71115628	.24366842	.02637599	.90574711	.29383819	.1905	.4317
8	.38232377	5.48613E-03	1.27256E-02	.71254732	.24044255	.02797063	.90424139	.29363348	.2381	.4311
9	.38599447	5.47826E-03	1.27254E-02	.71393034	.23723198	.02949964	.90284919	.29342752	.2857	.4305
10	.38966518	5.46873E-03	1.27212E-02	.71527548	.23403448	.03097253	.90157137	.29322047	.3333	.4299
11	.39333589	5.45747E-03	1.27134E-02	.71662172	.23085063	.03239992	.90036318	.29300769	.3810	.4293
12	.39700659	5.44452E-03	1.27022E-02	.71796033	.22767824	.03378805	.89922153	.29278889	.4286	.4286
13	.40067730	5.42989E-03	1.26878E-02	.71929565	.22451590	.03514234	.89812782	.29256208	.4762	.4280
14	.40434801	5.41359E-03	1.26700E-02	.72062928	.22136122	.03646663	.89707849	.29232681	.5238	.4273
15	.40801871	5.39559E-03	1.26491E-02	.72196394	.21821202	.03776414	.89606460	.29208205	.5714	.4266
16	.41168942	5.37591E-03	1.26250E-02	.72330131	.21506561	.03903740	.89509306	.29182729	.6190	.4258
17	.41536013	5.35453E-03	1.25977E-02	.72464354	.21191928	.04028853	.89417290	.29156182	.6667	.4250
18	.41903083	5.33142E-03	1.25671E-02	.72599242	.20877005	.04151929	.89330021	.29128511	.7143	.4242
19	.42270154	5.30657E-03	1.25334E-02	.72734989	.20561478	.04273114	.89249552	.29099552	.7619	.4234
20	.42637225	5.27994E-03	1.24963E-02	.72871803	.20244983	.04392539	.89180753	.29069242	.8095	.4225
21	.43004295	5.25151E-03	1.24559E-02	.73009841	.19927220	.04510299	.89094001	.29038128	.8571	.4216
22	.43371366	5.22114E-03	1.24120E-02	.73149502	.19607538	.04626534	.88969003	.29005278	.9048	.4207
23	.43738437	5.18906E-03	1.23648E-02	.73290411	.19286345	.04741163	.88885556	.28971112	.9524	.4197
24	.44105507	5.15432E-03	1.23128E-02	.73434831	.18960342	.04854746	.88803787	.28934872	1.0000	.4186

K= 6 PHI = 30.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT

3	.36397023	5.14579E-03	1.20462E-02	.70787184	.25764428	.07325329	.91703047	.29229124	0.0000	.4272
4	.36770424	5.14885E-03	1.21593E-02	.71122024	.25514499	.07494908	.90454325	.29101527	.0476	.4234
5	.37143824	5.15038E-03	1.22188E-02	.71330006	.25223378	.07769299	.89800991	.29034939	.0952	.4215
6	.37517225	5.15060E-03	1.22554E-02	.71494971	.24919824	.08047573	.89385808	.28992096	.1429	.4203
7	.37890625	5.14928E-03	1.22855E-02	.71651588	.24616977	.08288722	.89017263	.28952898	.1905	.4191
8	.38264026	5.14647E-03	1.23085E-02	.71796704	.24314094	.08516994	.88700697	.28917924	.2381	.4181
9	.38637426	5.14217E-03	1.23270E-02	.71941588	.24012767	.08735757	.88407255	.28884188	.2857	.4171
10	.39010827	5.13640E-03	1.23409E-02	.72080163	.23712722	.08946764	.88137358	.28851732	.3333	.4162
11	.39384227	5.12917E-03	1.23510E-02	.72216170	.23414262	.09151361	.87881781	.28819610	.3810	.4153
12	.39757628	5.12049E-03	1.23574E-02	.72349780	.23117164	.09350467	.87639911	.28787757	.4286	.4144
13	.40131028	5.11036E-03	1.23604E-02	.72481771	.22821383	.09544799	.87407944	.28755779	.4762	.4134
14	.40504429	5.09877E-03	1.23600E-02	.72612369	.22526692	.09734909	.87185128	.28723592	.5238	.4125
15	.40877829	5.08573E-03	1.23564E-02	.72742007	.22232916	.09921237	.86969646	.28690998	.5714	.4116
16	.41251230	5.07123E-03	1.23496E-02	.72870917	.21939804	.10104144	.86760839	.28657916	.6190	.4106
17	.41624630	5.05525E-03	1.23397E-02	.72999337	.21647112	.10283926	.86557735	.28624226	.6667	.4097
18	.41998031	5.03777E-03	1.23268E-02	.73127673	.21354559	.10460832	.86359816	.28589849	.7143	.4087
19	.42371431	5.01877E-03	1.23104E-02	.73255984	.21061063	.10635070	.86166505	.28554699	.7619	.4077
20	.42744832	4.99820E-03	1.22909E-02	.73384588	.20768453	.10806829	.85977422	.28518687	.8095	.4067
21	.43118232	4.97608E-03	1.22683E-02	.73513607	.20474748	.10976243	.85792171	.28481771	.8571	.4056
22	.43491632	4.95219E-03	1.22420E-02	.73643665	.20179230	.11143510	.85610540	.28443739	.9048	.4045
23	.43865033	4.92699E-03	1.22131E-02	.73773792	.19883409	.11308576	.85432081	.28401907	.9524	.4034
24	.44238433	4.89886E-03	1.21784E-02	.73907957	.19581589	.11472006	.85257119	.28363950	1.0000	.4023

K= 7 PHI = 40.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	4.68926E-03	1.12728E-02	.71247322	.25931904	.09567938	.91703047	.28843751	0.0000	.4160
4	.36779459	4.69521E-03	1.14768E-02	.71762483	.25763501	.09764794	.89318335	.28604324	.0476	.4091
5	.37161894	4.69978E-03	1.15761E-02	.72020421	.25509249	.10121768	.88209387	.28495217	.0952	.4060
6	.37544329	4.70339E-03	1.16417E-02	.72208538	.25234519	.10441163	.87495157	.28425741	.1429	.4040
7	.37926764	4.70578E-03	1.16987E-02	.72382197	.24956598	.10740167	.86862594	.28363656	.1905	.4022
8	.38309200	4.70699E-03	1.17484E-02	.72539878	.24683578	.11024540	.86318443	.28309629	.2381	.4007
9	.38691635	4.70705E-03	1.17889E-02	.72689643	.24409110	.11297360	.85814285	.28258735	.2857	.3993
10	.39074070	4.70590E-03	1.18259E-02	.72831948	.24135859	.11561091	.85350750	.28211022	.3333	.3979
11	.39456505	4.70361E-03	1.18589E-02	.72969473	.23864470	.11815962	.84911904	.28164881	.3810	.3966
12	.39838941	4.70016E-03	1.18879E-02	.73102412	.23594705	.12066239	.84496887	.28120217	.4286	.3954
13	.40221376	4.69555E-03	1.19134E-02	.73232043	.23325661	.12309653	.84098972	.28076350	.4762	.3941
14	.40603811	4.68979E-03	1.19355E-02	.73358645	.23060119	.12547933	.83717021	.28033157	.5238	.3929
15	.40986246	4.68286E-03	1.19543E-02	.73482897	.22796972	.12781558	.83347775	.27990301	.5714	.3917
16	.41368682	4.67476E-03	1.19701E-02	.73605089	.22535987	.13010994	.82990193	.27947664	.6190	.3905
17	.41751117	4.66547E-03	1.19828E-02	.73725646	.22276964	.13236579	.82642519	.27905053	.6667	.3893
18	.42133552	4.65497E-03	1.19925E-02	.73844849	.22005638	.13458631	.82303908	.27862360	.7143	.3882
19	.42515987	4.64325E-03	1.19993E-02	.73962999	.21743779	.13677398	.81973319	.27819460	.7619	.3870
20	.42898423	4.63024E-03	1.20029E-02	.74080421	.21483060	.13893119	.81650116	.27776235	.8095	.3858
21	.43280858	4.61600E-03	1.20037E-02	.74197194	.21220275	.14105953	.81333592	.27732647	.8571	.3845
22	.43663293	4.60024E-03	1.20009E-02	.74314177	.20957411	.14316156	.81023373	.27688401	.9048	.3833
23	.44045728	4.58359E-03	1.19960E-02	.74429924	.20695497	.14523675	.80718718	.27643971	.9524	.3821
24	.44428164	4.56408E-03	1.19850E-02	.74549456	.20427319	.14729114	.80419983	.27597668	1.0000	.3809

K= 8 PHI = 50.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	4.16288E-03	1.03537E-02	.71834342	.26145562	.11642986	.91703047	.28357285	0.0000	.4021
4	.36791435	4.17184E-03	1.06559E-02	.72559262	.26074174	.11841567	.87890580	.27982381	.0476	.3915
5	.37185047	4.17961E-03	1.08003E-02	.72879187	.25866231	.12032549	.86192546	.27820593	.0952	.3870
6	.37580259	4.18679E-03	1.09004E-02	.73095606	.25627434	.12594139	.85097363	.27718783	.1429	.3842
7	.37974670	4.19311E-03	1.09855E-02	.73288921	.25386973	.12934189	.84133544	.27629486	.1905	.3817
8	.38369082	4.19858E-03	1.10511E-02	.73458503	.25144198	.13250529	.83303825	.27552867	.2381	.3796
9	.38763494	4.20322E-03	1.11308E-02	.73616304	.24902810	.13572320	.82537804	.27481928	.2857	.3776
10	.39157905	4.20703E-03	1.11939E-02	.73762591	.24662596	.13875331	.81833786	.27416458	.3333	.3758
11	.39552317	4.21001E-03	1.12529E-02	.73901329	.24424502	.14169646	.81168826	.27354190	.3810	.3741
12	.39946729	4.21216E-03	1.13076E-02	.74032941	.24188354	.14456690	.80540602	.27294876	.4286	.3725
13	.40341140	4.21348E-03	1.13589E-02	.74159174	.23954375	.14737145	.79939344	.27237553	.4762	.3709
14	.40735552	4.21398E-03	1.14067E-02	.74280465	.23722384	.15011844	.79362933	.27182000	.5238	.3694
15	.41129964	4.21365E-03	1.14515E-02	.74397733	.23492343	.15281265	.78806844	.27127735	.5714	.3680

16	.41524376	4.21248E-03	1.14933E-02	.74511370	.23264052	.15545941	.78268447	.27074576	.6190	.3665
17	.41918787	4.21046E-03	1.15323E-02	.74621936	.23037360	.15806226	.77745985	.27022250	.6667	.3651
18	.42313199	4.20756E-03	1.15686E-02	.74729790	.22812024	.16062486	.77237814	.26970601	.7143	.3637
19	.42707611	4.20379E-03	1.16021E-02	.74835295	.22587878	.16314986	.76742327	.26919464	.7619	.3623
20	.43102022	4.19906E-03	1.16330E-02	.74938864	.22364514	.16564009	.76256523	.26868676	.8095	.3610
21	.43496434	4.19340E-03	1.16612E-02	.75040533	.22142083	.16809725	.75785304	.26818202	.8571	.3596
22	.43890846	4.18668E-03	1.16863E-02	.75141367	.21919160	.17052434	.75322043	.26767666	.9048	.3583
23	.44285257	4.17941E-03	1.17098E-02	.75239358	.21698340	.17292100	.74867694	.26717632	.9524	.3569
24	.44679669	4.16969E-03	1.17276E-02	.75340677	.21472024	.17529297	.74422418	.26666302	1.0000	.3555

K= 9 PHI = 60.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	3.60231E-03	9.33745E-03	.72543162	.26403552	.13506581	.91703047	.27777381	0.0000	.3858
4	.36806467	3.61397E-03	9.73815E-03	.73502273	.26442731	.13676531	.86143839	.27243900	.0476	.3711
5	.37215911	3.62174E-03	9.92777E-03	.73890622	.26287910	.14071643	.83741424	.27022622	.0952	.3651
6	.37625355	3.63524E-03	1.00581E-02	.74135941	.26089954	.14455463	.82204387	.26885799	.1429	.3614
7	.38031799	3.64824E-03	1.01760E-02	.74350528	.25884944	.14817081	.80942009	.26766359	.1905	.3582
8	.38444243	3.65470E-03	1.02799E-02	.74532452	.25680037	.15166380	.79694324	.26665233	.2381	.3555
9	.38857687	3.66388E-03	1.03772E-02	.74690291	.25481944	.15502771	.78611134	.26572542	.2857	.3530
10	.39263131	3.67216E-03	1.04577E-02	.74848174	.25278877	.15829794	.77627434	.26480097	.3333	.3508
11	.39672575	3.68015E-03	1.05536E-02	.74987513	.25080203	.16147763	.76720280	.26400734	.3810	.3487
12	.40082019	3.68765E-03	1.06361E-02	.75116868	.24882773	.16458337	.75826496	.26334111	.4286	.3467
13	.40491462	3.69467E-03	1.07132E-02	.75238567	.24687975	.16761946	.74992214	.26282598	.4762	.3449
14	.40900906	3.70121E-03	1.07851E-02	.75353194	.24495669	.17059501	.74194305	.26194778	.5238	.3431
15	.41310350	3.70726E-03	1.08601E-02	.75461944	.24305897	.17351396	.73425960	.26120093	.5714	.3414
16	.41719794	3.71280E-03	1.09289E-02	.75565333	.24118500	.17638195	.72684592	.26055501	.6190	.3397
17	.42129238	3.71787E-03	1.09944E-02	.75664065	.23933587	.17920228	.71966447	.26003878	.6667	.3381
18	.42538682	3.72243E-03	1.10560E-02	.75758598	.23750342	.18197881	.71269522	.25943761	.7143	.3368
19	.42948126	3.72647E-03	1.11232E-02	.75849351	.23569276	.18471418	.70591521	.25883023	.7619	.3350
20	.43357570	3.72992E-03	1.11832E-02	.75936943	.23389760	.18741141	.69930955	.25827444	.8095	.3335
21	.43767014	3.73289E-03	1.12412E-02	.76021094	.23212103	.19007228	.69286254	.25770979	.8571	.3321
22	.44176458	3.73505E-03	1.12966E-02	.76103276	.23034798	.19269986	.68656419	.25715198	.9048	.3306
23	.44585902	3.73707E-03	1.13508E-02	.76181745	.22860473	.19529442	.68040104	.25660637	.9524	.3292
24	.44995345	3.73733E-03	1.14004E-02	.76261167	.22692435	.19786026	.67437027	.25605682	1.0000	.3278

K=10 PHI = 70.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	3.04114E-03	8.27365E-03	.73365014	.26702681	.15127516	.91703047	.27113464	0.0000	.3676
4	.36824878	3.05492E-03	8.76161E-03	.74563875	.26858700	.15235607	.84132510	.26407253	.0476	.3487
5	.37252733	3.06815E-03	8.99197E-03	.75021874	.26761345	.15602948	.80931112	.26123158	.0952	.3412
6	.37680588	3.08135E-03	9.15356E-03	.75300571	.26610171	.15985084	.78865048	.25947016	.1429	.3366
7	.38102443	3.09435E-03	9.30103E-03	.75520644	.26454304	.16346218	.77050046	.25794883	.1905	.3327
8	.38536298	3.10715E-03	9.43353E-03	.75733603	.26292620	.16701401	.75500879	.25667693	.2381	.3294
9	.38964153	3.11977E-03	9.55635E-03	.75907835	.26131774	.17044568	.74077708	.25552353	.2857	.3265
10	.39392008	3.13220E-03	9.67274E-03	.76060779	.25971511	.17379997	.72780219	.25448671	.3333	.3238
11	.39819863	3.14446E-03	9.78465E-03	.76199935	.25813803	.17708488	.71581727	.25352309	.3810	.3214
12	.40247718	3.15655E-03	9.89184E-03	.76325876	.25658507	.18026033	.70418737	.25262873	.4286	.3191
13	.40675572	3.16848E-03	9.99530E-03	.76441778	.25506273	.18338439	.69331214	.25178507	.4762	.3170
14	.41103427	3.18025E-03	1.00966E-02	.76548288	.25355989	.18644763	.68295362	.25098826	.5238	.3150
15	.41531282	3.19187E-03	1.01953E-02	.76647018	.25210835	.18945133	.67301278	.25022911	.5714	.3131
16	.41959137	3.20334E-03	1.02915E-02	.76738558	.25067676	.19240174	.66345663	.24950435	.6190	.3113
17	.42388992	3.21466E-03	1.03855E-02	.76823828	.24927515	.19530108	.65425067	.24880890	.6667	.3095
18	.42814847	3.22581E-03	1.04779E-02	.76903353	.24790160	.19815346	.64538858	.24814005	.7143	.3079
19	.43242702	3.23681E-03	1.05689E-02	.76977667	.24655602	.20095113	.63685743	.24749490	.7619	.3063
20	.43670557	3.24765E-03	1.06574E-02	.77047347	.24523431	.20372719	.62825705	.24687081	.8095	.3047
21	.44098412	3.25827E-03	1.07450E-02	.77112480	.24393997	.20645561	.62006545	.24626682	.8571	.3032
22	.44526267	3.26853E-03	1.08306E-02	.77174155	.24266024	.20914287	.61212802	.24567875	.9048	.3018
23	.44954121	3.27897E-03	1.09156E-02	.77231244	.24141465	.21179696	.60436789	.24510998	.9524	.3004
24	.45381976	3.28850E-03	1.09975E-02	.77286934	.24015927	.21441681	.59679618	.24454936	1.0000	.2990

K=11 PHI = 80.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT

3	.36397023	2.50879E-03	7.21112E-03	.74288185	.27038688	.16465480	.91703047	.26378260	0.0000	.3479
4	.36846594	2.52388E-03	7.77044E-03	.75726394	.27315199	.16472546	.81844036	.25487441	.0476	.3248
5	.37296164	2.53875E-03	8.03922E-03	.76265051	.27282169	.16774116	.77670851	.25131471	.0952	.3158
6	.37745734	2.55375E-03	8.22858E-03	.76578113	.27180558	.17131784	.75000601	.24913899	.1429	.3104
7	.38195304	2.56884E-03	8.40087E-03	.76836608	.27070421	.17478550	.72668765	.24729854	.1905	.3058
8	.38644874	2.58397E-03	8.55526E-03	.77042411	.26952344	.17824219	.70726647	.24577776	.2381	.3020
9	.39094445	2.59919E-03	8.70177E-03	.77221554	.26834522	.18159541	.68936617	.24441649	.2857	.2987
10	.39544015	2.61443E-03	8.84031E-03	.77375078	.26717050	.18488722	.67312033	.24320624	.3333	.2957
11	.39993585	2.62989E-03	8.97427E-03	.77511643	.26602309	.18809255	.65793650	.24209396	.3810	.2930
12	.40443155	2.64539E-03	9.10379E-03	.77632170	.26490283	.19123213	.64375408	.24107317	.4286	.2906
13	.40892725	2.66103E-03	9.23034E-03	.77740436	.26381799	.19429880	.63031695	.24012101	.4762	.2883
14	.41342296	2.67678E-03	9.35412E-03	.77837244	.26274798	.19730383	.61757316	.23923233	.5238	.2862
15	.41791866	2.69268E-03	9.47504E-03	.77924518	.26170550	.20024811	.60539479	.23839668	.5714	.2842
16	.42241436	2.70873E-03	9.59570E-03	.78002935	.26077963	.20313246	.59373938	.23760699	.6190	.2823
17	.42691006	2.72493E-03	9.71409E-03	.78073594	.25994090	.20596373	.58253601	.23685939	.6667	.2805
18	.43140576	2.74129E-03	9.83114E-03	.78137054	.25913785	.20874437	.57175234	.23615125	.7143	.2788
19	.43590147	2.75781E-03	9.94711E-03	.78193386	.25807043	.21147619	.56134458	.23547719	.7619	.2772
20	.44039717	2.77448E-03	1.00621E-02	.78244917	.25723616	.21416227	.55129716	.23483500	.8095	.2757
21	.44489287	2.79134E-03	1.01762E-02	.78290206	.25643577	.21680488	.54155107	.23422242	.8571	.2743
22	.44938857	2.80831E-03	1.02895E-02	.78330470	.25566463	.21940586	.53211594	.23363668	.9048	.2729
23	.45388428	2.82548E-03	1.04021E-02	.78366726	.25492563	.22196839	.52296165	.23307692	.9524	.2716
24	.45837998	2.84272E-03	1.05140E-02	.78396799	.25421175	.22449116	.51407088	.23254002	1.0000	.2704

K-12 PHI = 90.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	2.02675E-03	6.19174E-03	.75297969	.27404220	.17487440	.91703047	.25586342	0.0000	.3273
4	.36871844	2.04223E-03	6.80613E-03	.76974315	.27804850	.17357108	.79219157	.24497249	.0476	.3001
5	.37346666	2.05784E-03	7.10209E-03	.77562750	.27832440	.17571342	.74021673	.24072890	.0952	.2898
6	.37821487	2.07365E-03	7.31016E-03	.77920532	.27777419	.17892321	.70744215	.23818777	.1429	.2837
7	.38296308	2.08976E-03	7.50122E-03	.78196274	.27712251	.18205862	.67906919	.23604747	.1905	.2786
8	.38771129	2.10612E-03	7.67351E-03	.78411085	.27637014	.18525350	.65506598	.23429317	.2381	.2745
9	.39245950	2.12277E-03	7.83009E-03	.78595167	.27563349	.18835912	.63328877	.23273461	.2857	.2708
10	.39720771	2.13969E-03	7.99488E-03	.78749464	.27480032	.19142689	.61349769	.23136268	.3333	.2676
11	.40195592	2.15694E-03	8.14662E-03	.78885850	.27417529	.19441447	.59514710	.23011508	.3810	.2648
12	.40670413	2.17451E-03	8.29131E-03	.78999360	.27348972	.19734502	.57810318	.22893427	.4286	.2622
13	.41145234	2.19244E-03	8.43924E-03	.79100299	.27284045	.20020421	.56206585	.22784325	.4762	.2598
14	.41620055	2.21072E-03	8.58158E-03	.79187611	.27223009	.20300371	.54695628	.22698568	.5238	.2576
15	.42094876	2.22940E-03	8.72217E-03	.79263473	.27166206	.20573896	.53261900	.22609794	.5714	.2556
16	.42569697	2.24845E-03	8.86113E-03	.79328769	.27113445	.20841666	.51900007	.22527461	.6190	.2537
17	.43044518	2.26790E-03	8.99887E-03	.79384671	.27064811	.21103654	.50601784	.22450861	.6667	.2520
18	.43519339	2.28776E-03	9.13562E-03	.79431875	.27020267	.21360254	.49362279	.22379553	.7143	.2504
19	.43994161	2.30805E-03	9.27167E-03	.79471182	.26979824	.21611565	.48175741	.22313018	.7619	.2489
20	.44468982	2.32877E-03	9.40716E-03	.79503100	.26943354	.21857876	.47038295	.22250978	.8095	.2476
21	.44943803	2.34995E-03	9.54234E-03	.79526430	.26910906	.22099349	.45945981	.22193020	.8571	.2463
22	.45418624	2.37154E-03	9.67723E-03	.79547458	.26882196	.22336215	.44895702	.22138048	.9048	.2451
23	.45893445	2.39363E-03	9.81213E-03	.79560512	.26857431	.22568663	.43884561	.22088272	.9524	.2439
24	.46368266	2.41611E-03	9.94687E-03	.79568298	.26836008	.22796884	.42910052	.22040947	1.0000	.2429

K-13 PHI =100.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	1.60821E-03	5.24877E-03	.76375443	.27798388	.18167908	.91703047	.24754670	0.0000	.3064
4	.36899947	1.62323E-03	5.89445E-03	.78264227	.28311000	.17870983	.76390365	.23468387	.0476	.2754
5	.37402871	1.63863E-03	6.21076E-03	.78944506	.28399184	.17968727	.70016743	.22971183	.0952	.2638
6	.37905794	1.65419E-03	6.43527E-03	.79316159	.28393442	.18227738	.65990329	.22673813	.1429	.2571
7	.38408718	1.67026E-03	6.64210E-03	.79614506	.28373330	.18488454	.62528417	.22426153	.1905	.2515
8	.38911642	1.68666E-03	6.82870E-03	.79941391	.28341180	.18766742	.59626295	.22225905	.2381	.2470
9	.39414565	1.70351E-03	7.00502E-03	.80031227	.28307079	.19039220	.57015667	.22050942	.2857	.2431
10	.39917489	1.72076E-03	7.17591E-03	.80185636	.28271054	.19312267	.54686120	.21899762	.3333	.2398
11	.40420413	1.73855E-03	7.34004E-03	.80316239	.28238023	.19578622	.52540134	.21764923	.3810	.2369
12	.40923337	1.75676E-03	7.49924E-03	.80424483	.28207765	.19840511	.50584879	.21645224	.4286	.2343
13	.41426260	1.77549E-03	7.65535E-03	.80515599	.28180531	.20095338	.48760898	.21537286	.4762	.2319
14	.41929184	1.79474E-03	7.80860E-03	.80590783	.28157167	.20344208	.47064559	.21440212	.5238	.2298

15	.42432108	1.81453E-03	7.95994E-03	.80652821	.28138116	.20586161	.45473909	.21352184	.5714	.2280
16	.42935031	1.83490E-03	8.10969E-03	.80702608	.28123695	.20821763	.43980818	.21272522	.6190	.2263
17	.43437955	1.85587E-03	8.25854E-03	.80741868	.28114220	.21050725	.42570672	.21200040	.6667	.2247
18	.43940879	1.87743E-03	8.40666E-03	.80771403	.28109638	.21273480	.41237336	.21134180	.7143	.2233
19	.44443802	1.89962E-03	8.55445E-03	.80792200	.28110116	.21490071	.39972210	.21074243	.7619	.2221
20	.44946726	1.92243E-03	8.70210E-03	.80804915	.28115544	.21700786	.38770258	.21019790	.8095	.2209
21	.45449650	1.94589E-03	8.84990E-03	.80810186	.28125973	.21905862	.37625548	.20970340	.8571	.2199
22	.45952573	1.97002E-03	8.99802E-03	.80808534	.28141336	.22105442	.36534082	.20925561	.9048	.2189
23	.46455497	1.99479E-03	9.14656E-03	.80800511	.28161360	.22300045	.35491366	.20885029	.9524	.2181
24	.46958421	2.02033E-03	9.29599E-03	.80786240	.28183631	.22489267	.34494439	.20848646	1.0000	.2173

K=14 PHI =110.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	M/MT
3	.36397023	1.26213E-03	4.41455E-03	.77498133	.28207014	.18422596	.91703047	.23912389	0.0000	.2859
4	.36930315	1.27575E-03	4.50100E-03	.79602455	.28830076	.17930296	.73090084	.22408839	.0476	.2511
5	.37463607	1.29011E-03	4.41311E-03	.80356442	.26973450	.17690516	.65347836	.21832594	.0952	.2383
6	.37996899	1.30460E-03	5.64770E-03	.80756694	.29000833	.18080873	.60522746	.21493841	.1429	.2310
7	.38530191	1.31971E-03	5.86312E-03	.81070189	.29029163	.18285371	.56435973	.21217293	.1905	.2251
8	.39063482	1.33519E-03	6.05590E-03	.81300947	.29029374	.18519626	.53072487	.20993882	.2381	.2205
9	.39596774	1.35121E-03	6.23699E-03	.81488749	.29030769	.18751631	.50095859	.20812280	.2857	.2166
10	.40130066	1.36773E-03	6.41195E-03	.81636604	.29013365	.18986288	.47482503	.20654754	.3333	.2133
11	.40663358	1.38481E-03	6.57931E-03	.81757833	.29011736	.19213970	.45116491	.20517307	.3810	.2105
12	.41196650	1.40245E-03	6.74125E-03	.81854597	.29010307	.19436793	.42978320	.20398084	.4286	.2080
13	.41729941	1.42070E-03	6.89985E-03	.81932306	.29014051	.19651326	.41015008	.20292962	.4762	.2059
14	.42263233	1.43955E-03	7.05543E-03	.81994022	.29021946	.19858701	.39211376	.20200588	.5238	.2040
15	.42796525	1.45903E-03	7.20911E-03	.82041326	.29035110	.20057732	.37539073	.20119999	.5714	.2024
16	.43329817	1.47917E-03	7.36124E-03	.82075831	.29053942	.20249137	.35986394	.20048068	.6190	.2009
17	.43863109	1.49997E-03	7.51244E-03	.82099379	.29078245	.20432710	.34536485	.19983253	.6667	.1997
18	.44396400	1.52149E-03	7.66312E-03	.82112647	.29103724	.20608033	.33180541	.19927224	.7143	.1985
19	.44929692	1.54367E-03	7.81347E-03	.82117065	.29144744	.20777062	.31907562	.19877687	.7619	.1976
20	.45462984	1.56667E-03	7.96425E-03	.82112676	.29187413	.20939770	.30710726	.19834966	.8095	.1967
21	.45996276	1.59025E-03	8.11484E-03	.82101503	.29234726	.21095547	.29582266	.19797397	.8571	.1960
22	.46529568	1.61489E-03	8.26709E-03	.82081553	.29290041	.21244351	.28517010	.19765575	.9048	.1953
23	.47062859	1.63981E-03	8.41843E-03	.82057203	.29347455	.21388382	.27508696	.19737677	.9524	.1948
24	.47596151	1.66635E-03	8.57379E-03	.82023183	.29416540	.21524991	.26554402	.19715676	1.0000	.1944

K=15 PHI =120.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	M/MT
3	.36397023	9.86712E-04	3.70272E-03	.78641166	.28623044	.18205979	.91703047	.23086060	0.0000	.2665
4	.36961382	9.98655E-04	4.36297E-03	.80954342	.29348072	.17509901	.69291872	.21347077	.0476	.2278
5	.37526740	1.01135E-03	4.72442E-03	.81772102	.29553209	.17329600	.60084245	.20691447	.0952	.2141
6	.38091598	1.02599E-03	4.96340E-03	.82195199	.29601299	.17453495	.54388422	.20312990	.1429	.2063
7	.38656456	1.03735E-03	5.17980E-03	.82515944	.29659370	.17606028	.49707783	.20013268	.1905	.2003
8	.39221314	1.05105E-03	5.37106E-03	.82744496	.29659700	.17798174	.45945619	.19783203	.2381	.1957
9	.39786172	1.06535E-03	5.55130E-03	.82926267	.29674705	.17987465	.42675930	.19591310	.2857	.1919
10	.40351030	1.08015E-03	5.72003E-03	.83064861	.29687658	.18180079	.39863401	.19433767	.3333	.1888
11	.40915889	1.09552E-03	5.88249E-03	.83175596	.29702633	.18363085	.37357540	.19299590	.3810	.1862
12	.41480747	1.11151E-03	6.03879E-03	.83260593	.29720946	.18539866	.35133371	.19186518	.4286	.1841
13	.42045605	1.12809E-03	6.19135E-03	.83326612	.29744248	.18705873	.33121579	.19089503	.4762	.1822
14	.42610463	1.14531E-03	6.34033E-03	.83375073	.29773242	.18863051	.31303285	.19007034	.5238	.1806
15	.43175321	1.16317E-03	6.48755E-03	.83409525	.29809424	.19009955	.29644457	.18935371	.5714	.1793
16	.43740179	1.18173E-03	6.63294E-03	.83430826	.29850188	.19147698	.28121587	.18876500	.6190	.1782
17	.44305038	1.20093E-03	6.77717E-03	.83441315	.29898948	.19276227	.26721703	.18825658	.6667	.1772
18	.44869896	1.22093E-03	6.92111E-03	.83441115	.29955164	.19395996	.25430643	.18783311	.7143	.1764
19	.45434754	1.24152E-03	7.06439E-03	.83432560	.30017084	.19507836	.24234103	.18747944	.7619	.1757
20	.45999612	1.26307E-03	7.20874E-03	.83414412	.30088023	.19611415	.23123685	.18719718	.8095	.1752
21	.46564470	1.28504E-03	7.35221E-03	.83390404	.30162639	.19708555	.22089089	.18696677	.8571	.1748
22	.47129328	1.30834E-03	7.49867E-03	.83356421	.30248927	.19797660	.21124509	.18680269	.9048	.1745
23	.47694186	1.33160E-03	7.64279E-03	.83320047	.30334452	.19882141	.20221280	.18667036	.9524	.1742
24	.48259045	1.35694E-03	7.79327E-03	.83271084	.30437340	.19958239	.19376651	.18660994	1.0000	.1741

K=16 PHI =130.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	7.78018E-04	3.12468E-03	.79771585	.29034483	.17423638	.91703047	.22315510	0.0000	.2490
4	.36992028	7.87680E-04	3.81722E-03	.82291010	.29852495	.16536598	.64910638	.20314968	.0476	.2063
5	.37587032	7.98158E-04	4.16813E-03	.83171042	.30071844	.16228242	.53919837	.19569906	.0952	.1915
6	.38182037	8.08452E-04	4.40635E-03	.83607514	.30152408	.16305566	.47420378	.19155910	.1429	.1835
7	.38777041	8.19498E-04	4.61693E-03	.83925974	.30195427	.16422042	.42241595	.18841357	.1905	.1775
8	.39372045	8.30800E-04	4.79960E-03	.84147663	.30219965	.16579359	.38182094	.18606535	.2381	.1731
9	.39967050	8.42702E-04	4.96077E-03	.84319400	.30237081	.16730994	.34751949	.18417371	.2857	.1696
10	.40562054	8.55044E-04	5.12498E-03	.84447418	.30252978	.16882182	.31872088	.18266816	.3333	.1668
11	.41157059	8.67947E-04	5.27364E-03	.84546820	.30271125	.17019615	.29366735	.18142878	.3810	.1646
12	.41752063	8.81303E-04	5.41525E-03	.84620579	.30293961	.17147700	.27192369	.18042117	.4286	.1628
13	.42347067	8.95205E-04	5.55243E-03	.84675629	.30322787	.17261615	.25267269	.17958859	.4762	.1613
14	.42942072	9.09993E-04	5.68572E-03	.84713382	.30353943	.17364035	.23562462	.17891159	.5238	.1600
15	.43537076	9.25176E-04	5.81659E-03	.84737671	.30402404	.17455942	.22033051	.17835011	.5714	.1591
16	.44132080	9.41048E-04	5.94571E-03	.84748958	.30484645	.17532798	.20660018	.17791738	.6190	.1583
17	.44727085	9.57471E-04	6.07338E-03	.84750143	.30514117	.17601043	.19416143	.17755718	.6667	.1577
18	.45322089	9.74710E-04	6.20105E-03	.84740486	.30583605	.17659242	.18287873	.17730450	.7143	.1572
19	.45917094	9.92419E-04	6.32773E-03	.84723431	.30659389	.17708803	.17257418	.17710816	.7619	.1568
20	.46512098	1.01116E-03	6.45615E-03	.84696143	.30748227	.17749278	.16315374	.17698565	.8095	.1566
21	.47107102	1.03014E-03	6.58313E-03	.84664370	.30836347	.17783110	.15448705	.17690818	.8571	.1565
22	.47702107	1.05056E-03	6.71419E-03	.84621341	.30941756	.17803488	.14651840	.17690078	.9048	.1565
23	.48297111	1.07075E-03	6.84207E-03	.84577841	.31044432	.17829310	.13913336	.17691511	.9524	.1565
24	.48892116	1.09310E-03	6.97766E-03	.84519846	.31168801	.17841024	.13232031	.17700682	1.0000	.1567

K=17 PHI =140.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	6.32089E-04	2.69382E-03	.80850917	.29427291	.16834842	.91703047	.21663045	0.0000	.2346
4	.37017295	6.39168E-04	3.41997E-03	.83609843	.30347387	.14821347	.59402728	.19333521	.0476	.1869
5	.37637567	6.47077E-04	3.78097E-03	.84527039	.30581481	.14441138	.46584042	.18500845	.0952	.1711
6	.38257838	6.54640E-04	4.01255E-03	.84957284	.30655919	.14522948	.39424344	.18053760	.1429	.1631
7	.38878110	6.62950E-04	4.21213E-03	.85265097	.30687394	.14632236	.33393204	.17742038	.1905	.1574
8	.39498381	6.71353E-04	4.37750E-03	.85472620	.30699673	.14778664	.29765069	.17514203	.2381	.1534
9	.40118653	6.80297E-04	4.52643E-03	.85630169	.30697072	.14907080	.26394861	.17337490	.2857	.1503
10	.40738924	6.89537E-04	4.65594E-03	.85744435	.30686948	.15028197	.23679229	.17203154	.3333	.1480
11	.41359196	6.99231E-04	4.78434E-03	.85832241	.30699671	.15127803	.21384550	.17096819	.3810	.1462
12	.41979468	7.09546E-04	4.90072E-03	.85895976	.30702698	.15212666	.19455527	.17014300	.4286	.1447
13	.42599739	7.19910E-04	5.01205E-03	.85942357	.30724930	.15278790	.17789421	.16949115	.4762	.1436
14	.43220011	7.30981E-04	5.11927E-03	.85973804	.30750450	.15330213	.16351654	.16899109	.5238	.1428
15	.43840282	7.42511E-04	5.22373E-03	.85992829	.30784947	.15366375	.15028842	.16850721	.5714	.1421
16	.44460554	7.54653E-04	5.32559E-03	.85998708	.30825641	.15389566	.13778664	.16852972	.6190	.1417
17	.45080825	7.67245E-04	5.42810E-03	.85997753	.30883024	.15400650	.12590508	.16813360	.6667	.1413
18	.45701097	7.80400E-04	5.53020E-03	.85985233	.30940941	.15400677	.12109402	.16801916	.7143	.1412
19	.46321369	7.94317E-04	5.63128E-03	.85966415	.31021438	.15391328	.11316634	.16796148	.7619	.1411
20	.46941640	8.09038E-04	5.73477E-03	.85937086	.31102618	.15372694	.10602228	.16797348	.8095	.1411
21	.47561912	8.23910E-04	5.83696E-03	.85904277	.31198948	.15346871	.09952469	.16802109	.8571	.1412
22	.48182183	8.40176E-04	5.94399E-03	.85859530	.31307525	.15313086	.09362847	.16813622	.9048	.1413
23	.48802455	8.56202E-04	6.04812E-03	.85815138	.31413450	.15274448	.08820542	.16826458	.9524	.1416
24	.49422726	8.74206E-04	6.16040E-03	.85755568	.31543561	.15228719	.08326364	.16846794	1.0000	.1419

K=18 PHI =150.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	5.45450E-04	2.42459E-03	.81816095	.29778623	.13026966	.91703047	.21211593	0.0000	.2250
4	.37032200	5.49652E-04	3.22285E-03	.84847056	.30820455	.12045743	.62625930	.18468804	.0476	.1705
5	.37667376	5.54851E-04	3.60879E-03	.85787546	.31072452	.11726179	.51732291	.17535657	.0952	.1537
6	.38302553	5.59547E-04	3.83756E-03	.86204126	.31133980	.11693007	.29970301	.17076770	.1429	.1458
7	.38937729	5.64914E-04	4.01564E-03	.86478599	.31133930	.12055896	.24574624	.16773704	.1905	.1407
8	.39572906	5.70170E-04	4.15181E-03	.86655705	.31113298	.12224823	.20852001	.16572901	.2381	.1373
9	.40203082	5.75810E-04	4.26836E-03	.86728356	.31052126	.12354956	.17941681	.16425820	.2857	.1349
10	.40843259	5.81557E-04	4.36717E-03	.86883600	.31052287	.12463495	.15729510	.16319662	.3333	.1332
11	.41478435	5.87580E-04	4.45648E-03	.86957874	.31025503	.12540948	.13925540	.16238741	.3810	.1318
12	.42113612	5.93817E-04	4.53723E-03	.87012529	.31006157	.12596525	.12467487	.16178786	.4286	.1309
13	.42748788	6.00320E-04	4.61302E-03	.87054595	.30994241	.12629153	.11237260	.16132941	.4762	.1301

14	.43383965	6.07145E-04	4.68480E-03	.87083896	.30992255	.12644620	.10206138	.16099620	.5238	.1296
15	.44019141	6.14250E-04	4.75406E-03	.87104403	.30998921	.12642677	.09314936	.16075153	.5714	.1292
16	.44654318	6.21801E-04	4.82209E-03	.87114925	.31017140	.12626975	.08547829	.16059180	.6190	.1289
17	.45289494	6.29641E-04	4.88896E-03	.87116816	.31043775	.12598152	.07872425	.16049189	.6667	.1288
18	.45924671	6.38093E-04	4.95671E-03	.87113497	.31083710	.12558281	.07279142	.16045755	.7143	.1287
19	.46559847	6.46804E-04	5.02395E-03	.87103254	.31130722	.12508377	.06748756	.16046444	.7619	.1287
20	.47195024	6.56359E-04	5.09104E-03	.87083239	.31193466	.12449567	.06275636	.16052946	.8095	.1288
21	.47830200	6.66071E-04	5.16355E-03	.87060239	.31260634	.12383015	.05846949	.16062057	.8571	.1290
22	.48465377	6.76954E-04	5.23811E-03	.87025719	.31347139	.12309323	.05460368	.16077075	.9048	.1292
23	.49100553	6.87766E-04	5.31118E-03	.86990956	.31433576	.12229644	.05105533	.16093102	.9524	.1295
24	.49735730	7.00216E-04	5.39206E-03	.86941613	.31544650	.12144397	.04783593	.16115859	1.0000	.1299

K=19 PHI =160.0 Z = 1.000000

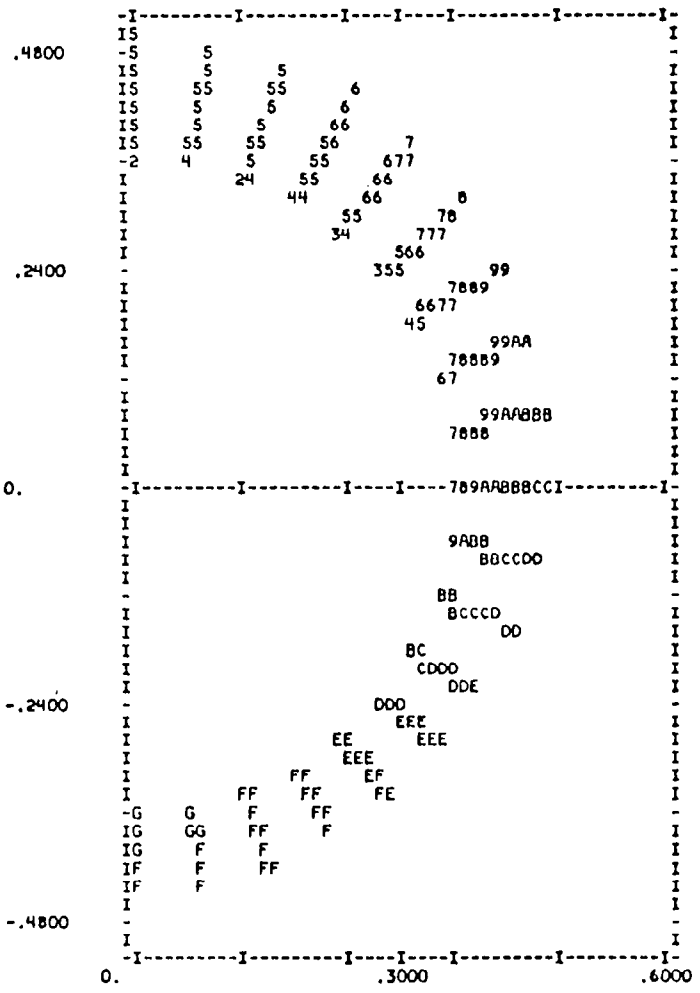
J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	5.07233E-04	2.30200E-03	.82568490	.30052472	.08708835	.91703047	.20992616	0.0000	.2203
4	.37032128	5.08647E-04	3.20840E-03	.86070874	.31293028	.08050071	.42135595	.17593754	.0476	.1548
5	.37667233	5.11275E-04	3.71899E-03	.86989052	.31510949	.08043005	.25342221	.16581731	.0952	.1375
6	.38302337	5.13361E-04	3.90333E-03	.87295235	.31524232	.08401972	.18974701	.16218333	.1429	.1315
7	.38937442	5.15923E-04	4.03206E-03	.87490566	.31484853	.08633705	.14932535	.15997275	.1905	.1280
8	.39572546	5.18292E-04	4.12007E-03	.87612900	.31433869	.08827413	.12366711	.15861704	.2381	.1258
9	.40207651	5.20876E-04	4.19038E-03	.87705788	.31378114	.08957096	.10478316	.15768289	.2857	.1243
10	.40842756	5.23308E-04	4.24729E-03	.87774493	.31328906	.09053504	.09058779	.15699028	.3333	.1232
11	.41477860	5.26011E-04	4.29602E-03	.87830339	.31279057	.09113567	.07980184	.15646611	.3810	.1224
12	.42112965	5.28854E-04	4.33047E-03	.87874415	.31238173	.09150762	.07115159	.15611068	.4286	.1219
13	.42748069	5.31372E-04	4.37697E-03	.87911214	.31202561	.09165217	.06390911	.15582153	.4762	.1214
14	.43383174	5.34190E-04	4.41245E-03	.87940635	.31174347	.09163696	.05788310	.15560408	.5238	.1211
15	.44018279	5.37081E-04	4.44591E-03	.87955242	.31151551	.09146777	.05271666	.15543703	.5714	.1208
16	.44653383	5.40163E-04	4.47832E-03	.87981064	.31134646	.09118191	.04826923	.15531722	.6190	.1206
17	.45288488	5.43523E-04	4.50980E-03	.87999417	.31126708	.09078369	.04435860	.15522975	.6667	.1205
18	.45923593	5.46796E-04	4.54130E-03	.88009178	.31125810	.09029615	.04090506	.15517955	.7143	.1204
19	.46558697	5.50344E-04	4.57250E-03	.88016395	.31129120	.08972001	.03780578	.15515124	.7619	.1204
20	.47193802	5.54300E-04	4.60331E-03	.88017195	.31140629	.08907279	.03501435	.15515851	.8095	.1204
21	.47828906	5.58473E-04	4.63830E-03	.88016337	.31161203	.08834993	.03246622	.15518033	.8571	.1204
22	.48464011	5.63304E-04	4.67469E-03	.88007230	.31193509	.08756944	.03013823	.15524229	.9048	.1205
23	.49099116	5.68130E-04	4.71051E-03	.87997611	.31229050	.08671927	.02798183	.15531191	.9524	.1206
24	.49734220	5.74063E-04	4.75234E-03	.87976720	.31280688	.08582318	.02599473	.15543224	1.0000	.1208

K=20 PHI =170.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	4.97409E-04	2.27006E-03	.82957376	.30194016	.03901894	.91703047	.20934041	0.0000	.2191
4	.37016920	4.97184E-04	3.69297E-03	.87376434	.31701593	.03703787	.23530506	.16409145	.0476	.1346
5	.37636816	4.97894E-04	4.00737E-03	.87937067	.31755223	.04028871	.12234541	.15763541	.0952	.1242
6	.38256713	4.97965E-04	4.07235E-03	.88056552	.31688118	.04370072	.09997489	.15638440	.1429	.1223
7	.38876609	4.98413E-04	4.13706E-03	.88174126	.31629500	.04541452	.07824088	.15519494	.1905	.1204
8	.39496505	4.98572E-04	4.17027E-03	.88236257	.31570175	.04680619	.06812276	.15464662	.2381	.1196
9	.40116402	4.99021E-04	4.20179E-03	.88296477	.31518819	.04760045	.05827890	.15411931	.2857	.1188
10	.40736298	4.99503E-04	4.22177E-03	.88336199	.31471323	.04819837	.05220485	.15379776	.3333	.1183
11	.41356195	4.99503E-04	4.24110E-03	.88370288	.31429188	.04851749	.04635121	.15348908	.3810	.1178
12	.41976091	4.99594E-04	4.25917E-03	.88410042	.31390147	.04871582	.04215467	.15327041	.4286	.1175
13	.42595987	5.00026E-04	4.27901E-03	.88440536	.31354266	.04876291	.03815188	.15306115	.4762	.1171
14	.43215884	5.00274E-04	4.27900E-03	.88466050	.31320533	.04873109	.03500332	.15289023	.5238	.1169
15	.43835780	5.00425E-04	4.28994E-03	.88492427	.31283255	.04860673	.03202397	.15274222	.5714	.1167
16	.44455676	5.00577E-04	4.29051E-03	.88515410	.31257547	.04842669	.02953250	.15261300	.6190	.1165
17	.45075573	5.00840E-04	4.30616E-03	.88538309	.31228913	.04818219	.02719536	.15248820	.6667	.1163
18	.45695469	5.00742E-04	4.31304E-03	.88559404	.31197707	.04785456	.02513845	.15238085	.7143	.1161
19	.46315366	5.00722E-04	4.31885E-03	.88581019	.31167336	.04755471	.02321101	.15227513	.7619	.1159
20	.46935262	5.00765E-04	4.32445E-03	.88601018	.31138744	.04717777	.02147954	.15218284	.8095	.1158
21	.47555158	5.00548E-04	4.32880E-03	.88622238	.31107724	.04675 38	.01984332	.15208809	.8571	.1157
22	.48175055	5.00561E-04	4.33353E-03	.88641523	.31079471	.04628954	.01834143	.15200788	.9048	.1155
23	.48794951	5.00453E-04	4.33667E-03	.88662876	.31047359	.04577440	.01691132	.15192123	.9524	.1154
24	.49414848	5.00485E-04	4.34100E-03	.88681379	.31019947	.04522186	.01557797	.15185031	1.0000	.1153

K=21 PHI =180.0 Z = 1.000000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.36397023	4.96248E-04	2.26627E-03	.83046139	.30226323	0.00000000	.91703047	.20927056	0.0000	.2190
4	.37002762	4.95676E-04	3.96812E-03	.87956885	.31850305	0.00000000	.13165870	.15805977	.0476	.1249
5	.37608501	4.95831E-04	4.13408E-03	.88259927	.31793240	0.00000000	.07461170	.15487899	.0952	.1199
6	.38214239	4.95202E-04	4.14608E-03	.88318207	.31709745	0.00000000	.06928435	.15455655	.1429	.1194
7	.38819978	4.94814E-04	4.18208E-03	.88404281	.31650139	0.00000000	.05612998	.15381494	.1905	.1183
8	.39425717	4.94304E-04	4.19191E-03	.88445002	.31595850	0.00000000	.05207873	.15356978	.2381	.1179
9	.40031455	4.93602E-04	4.20896E-03	.88493841	.31553479	0.00000000	.04538162	.15318082	.2857	.1173
10	.40637194	4.93203E-04	4.21565E-03	.88525447	.31513785	0.00000000	.04210463	.15297887	.3333	.1170
11	.41242933	4.92729E-04	4.22538E-03	.88560163	.31479363	0.00000000	.03775129	.15271645	.3810	.1166
12	.41848671	4.92160E-04	4.23014E-03	.88586950	.31446647	0.00000000	.03502186	.15254249	.4286	.1163
13	.42454410	4.91523E-04	4.23584E-03	.88615299	.31415575	0.00000000	.03194093	.15234110	.4762	.1160
14	.43060149	4.90850E-04	4.23874E-03	.88639815	.31381018	0.00000000	.02952777	.15218585	.5238	.1158
15	.43665887	4.90098E-04	4.24157E-03	.88665533	.31352224	0.00000000	.02704285	.15201719	.5714	.1155
16	.44271626	4.89288E-04	4.24350E-03	.88689528	.31319149	0.00000000	.02505719	.15187353	.6190	.1153
17	.44877365	4.88343E-04	4.24287E-03	.88714930	.31283986	0.00000000	.02302937	.15172168	.6667	.1151
18	.45483104	4.87327E-04	4.24176E-03	.88739830	.31246914	0.00000000	.02130507	.15158317	.7143	.1149
19	.46088842	4.86113E-04	4.23940E-03	.88766753	.31205914	0.00000000	.01959650	.15143675	.7619	.1147
20	.46694561	4.84807E-04	4.23585E-03	.88793966	.31162441	0.00000000	.01808085	.15129665	.8095	.1145
21	.47300320	4.83201E-04	4.23029E-03	.88824322	.31112653	0.00000000	.01660278	.15114514	.8571	.1142
22	.47906058	4.81482E-04	4.22361E-03	.88856539	.31059804	0.00000000	.01525083	.15099527	.9048	.1140
23	.48511797	4.79278E-04	4.21374E-03	.88891931	.30996847	0.00000000	.01393956	.15082574	.9524	.1137
24	.49117536	4.76948E-04	4.20278E-03	.88929594	.30930387	0.00000000	.01270887	.15065447	1.0000	.1135



VERTICAL SCALING

0.	< 0 <	.800E-03	.80 E-03	< 1 <	.160E-02
.160E-02	< 2 <	.240E-02	.240E-02	< 3 <	.320E-02
.320E-02	< 4 <	.400E-02	.400E-02	< 5 <	.480E-02
.480E-02	< 6 <	.560E-02	.560E-02	< 7 <	.640E-02
.640E-02	< 8 <	.720E-02	.720E-02	< 9 <	.800E-02
.800E-02	< A <	.880E-02	.880E-02	< B <	.960E-02
.960E-02	< C <	.104E-01	.104E-01	< D <	.112E-01
.112E-01	< E <	.120E-01	.120E-01	< F <	.128E-01
.128E-01	< G <	.136E-01	.136E-01	< H <	.144E-01
.144E-01	< I <	.152E-01			

SURFACE FLOW VARIABLES AT Z = 1.000000
X/L = .000100 DZDT=343.454220 ITER= 1500

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	M/MT	TEMP	(S-S.INF)/CV
0.0	.3640	.6709	2.4012E+01	5.0298E+00	2.3607	.8592	0.0000	2.9733E-01	1.0000	.44204	.00	9.1703E-01
10.0	.3640	.6616	2.3694E+01	4.9821E+00	2.3675	.8617	.0841	2.9677E-01	1.0000	.44036	.00	9.1703E-01
20.0	.3640	.6346	2.2767E+01	4.8421E+00	2.3877	.8691	.1679	2.9508E-01	1.0000	.43536	.00	9.1703E-01
30.0	.3640	.5919	2.1303E+01	4.6175E+00	2.4218	.8815	.2506	2.9229E-01	1.0000	.42717	.00	9.1703E-01
40.0	.3640	.5368	1.9412E+01	4.3211E+00	2.4701	.8990	.3317	2.8844E-01	1.0000	.41598	.00	9.1703E-01
50.0	.3640	.4733	1.7234E+01	3.9688E+00	2.5332	.9220	.4106	2.8357E-01	1.0000	.40207	.00	9.1703E-01
60.0	.3640	.4056	1.4913E+01	3.5702E+00	2.6116	.9505	.4862	2.7777E-01	1.0000	.38579	.00	9.1703E-01
70.0	.3640	.3379	1.2560E+01	3.1714E+00	2.7059	.9848	.5579	2.7115E-01	1.0000	.36757	.00	9.1703E-01
80.0	.3640	.2736	1.0338E+01	2.7844E+00	2.8163	1.0250	.6242	2.6378E-01	1.0000	.34791	.00	9.1703E-01
90.0	.3640	.2155	8.3907E+00	2.4234E+00	2.9429	1.0711	.6835	2.5584E-01	1.0000	.32733	.00	9.1703E-01
100.0	.3640	.1649	6.6577E+00	2.0119E+00	3.0853	1.1230	.7339	2.4755E-01	1.0000	.30640	.00	9.1703E-01
110.0	.3640	.1232	5.2250E+00	1.6922E+00	3.2409	1.1796	.7704	2.3912E-01	1.0000	.28590	.00	9.1703E-01
120.0	.3640	.0899	4.0848E+00	1.4193E+00	3.4064	1.2398	.7886	2.3086E-01	1.0000	.26648	.00	9.1703E-01
130.0	.3640	.0647	3.2203E+00	1.1977E+00	3.5747	1.3011	.7808	2.2316E-01	1.0000	.24899	.00	9.1703E-01
140.0	.3640	.0471	2.6167E+00	1.0326E+00	3.7322	1.3584	.7310	2.1663E-01	1.0000	.23464	.00	9.1703E-01
150.0	.3640	.0367	2.2581E+00	9.2939E-01	3.8571	1.4039	.6141	2.1212E-01	1.0000	.22497	.00	9.1703E-01
160.0	.3640	.0321	2.0999E+00	8.8240E-01	3.9332	1.4316	.4149	2.0995E-01	1.0000	.22034	.00	9.1703E-01
170.0	.3640	.0309	2.0592E+00	8.7015E-01	3.9628	1.4423	.1864	2.0934E-01	1.0000	.21912	.00	9.1703E-01
180.0	.3640	.0307	2.0544E+00	8.6870E-01	3.9684	1.4444	0.0000	2.0927E-01	1.0000	.21897	.00	9.1703E-01

BODY AND SHOCK GEOMETRY AT Z = 1.000

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	.3640	.3640	0.0000	.4400	.4400	0.0000
10.0	.3640	.3640	0.0000	.4403	.4402	.0030
20.0	.3640	.3640	0.0000	.4411	.4410	.0060
30.0	.3640	.3640	0.0000	.4424	.4423	.0092
40.0	.3640	.3640	0.0000	.4443	.4442	.0126
50.0	.3640	.3640	0.0000	.4468	.4467	.0162
60.0	.3640	.3640	0.0000	.4500	.4499	.0201
70.0	.3640	.3640	0.0000	.4538	.4538	.0241
80.0	.3640	.3640	0.0000	.4584	.4584	.0285
90.0	.3640	.3640	0.0000	.4637	.4637	.0321
100.0	.3640	.3640	0.0000	.4696	.4696	.0352
110.0	.3640	.3640	0.0000	.4760	.4760	.0373
120.0	.3640	.3640	0.0000	.4826	.4827	.0371
130.0	.3640	.3640	0.0000	.4889	.4890	.0333
140.0	.3640	.3640	0.0000	.4942	.4943	.0242
150.0	.3640	.3640	0.0000	.4974	.4974	.0089
160.0	.3640	.3640	0.0000	.4973	.4974	-.0092
170.0	.3640	.3640	0.0000	.4941	.4942	-.0177
180.0	.3640	.3640	0.0000	.4912	.4912	0.0000

```
     REF. AREA =     .785398 REF. LENGTH =   1.000000
Z=  1.000000
DCY,DCN,DCA,CY,CN,CA= -.16223537E+06  .15764677E+06  .10116989E+06 -.16223537E+06  .15764677E+06  .10116989E+06
DMX,DMY,DMZ,CMX,CMY,CMZ= -.94998641E+08 -.97763753E+08 0.             -.94998641E+08 -.97763753E+08 0.
```

REF. AREA = .785398 REF. LENGTH = 1.000000

NORMAL FORCE COEFFICIENT = .157647E+06 LIFT COEFFICIENT = .126090E+06

SIDE FORCE COEFFICIENT = -.162235E+06 YAW COEFFICIENT = -.162235E+06

AXIAL FORCE COEFFICIENT = .101170E+06 DRAG COEFFICIENT = .138525E+06

PITCHING MOMENT COEFFICIENT = -.949986E+08

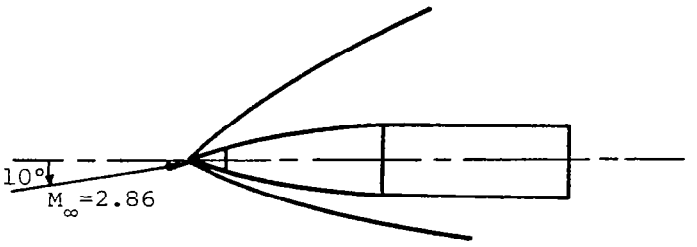
SIDE MOMENT COEFFICIENT = .977638E+08

ROLLING MOMENT COEFFICIENT = 0.

CENTER OF PRESSURE= .602604E+03 BASED ON REF. LENGTH= .100000E+01 AND MOMENT REF. CENTER= 0.

STATIC STABILITY MARGIN = .602604E+03 BASED ON REF. LENGTH = .100000E+01 AND C.G. LOCATION = 0.

3. SECOND TEST CASE: CONE-OGIVE-CYLINDER



This problem is run as two stacked cases (NCASE > 0). The first part of the solution is to obtain a pointed-cone starting solution; this solution is then used to start the integration down the ogive-cylinder body. The slopes at the cone-ogive intersection are matched, thus causing a ZSHIFT≠0. This is a case which covers most of the options of the code except that force and moment calculations are not made. The input cards used are now listed and follow the formats displayed in section 2.

Sample Input for Second Test Case

```
10001.                                                                                                  13
11.320459 33.80      0.0        20.28      0.0          1                                              12
200.       200.        0250 0550     0                                                                  11
    1     3     1     1     0                                                                           10
0.9        0.15       0.4                                                                               9
   20    18 9999     5     2                                                                            8
90.0       0.0        0.0                                                                               7
2.86            10.00          1.4                  0                                                   6
7.8        -22.75     24.05                                                                             5a
0.0        0.0                                                                                          5
0.0        0.0                                                                                          4
.034047    1.3        1.3                                                                               3
0.1        7.8        33.8                                                                              2
    3     0     1     1                                                                                 1
10001.                                                                                                  13
11.320495 33.80      0.0        20.28      0.0          1                                              12
200.       200.        0250 0550     1                                                                  11
    2     3     1     1     0                                                                           10
0.9        0.0        0.0                                                                               9
   20    18  500     5     1                                                                            8
90.0       0.0        0.0                                                                               7
2.86            10.00          1.4                  0                                                   6
0.1        0.0                                                                                          5
0.0        0.0                                                                                          4
.034047    34.04047                                                                                     3
0.1        100.                                                                                         2
    2     1     1                                                                                       CARD 1
```

The output listing for this test case is now displayed. The variable definitions and normalizations described in section 2 are, of course, still applicable. The output consists of the following sections:

1. Printout of the input quantities.
2. Printout of the free-stream velocity field and computational mesh.
3. Intermediate printout of the shock and body variables controlled by card 11.
4. The converged (starting) flow field reset to the initial z plane using the conical property of this converged solution.
5. Line-printer plot of the normalized density field at the initial z plane for the ogive-cylinder solution.
6. Shock and body variables at this initial z plane.
7. Input quantities for the ogive-cylinder case.
8. Printout of the free-stream velocity field and computational mesh for this case.
9. Flow field, line-printer plot of normalized density, and shock and body variables at z-initial (same as items 4, 5, and 6 above).
10. Intermediate printout of the shock and body variables for the ogive-cylinder solution (controlled by card 11).
11. Intermediate printout of the flow field and line-printer plot of the normalized density field controlled by card 11.
12. Flow field, line-printer plot of the normalized density field, and shock and body variables at the final z station of the ogive-cylinder solution.

```
NSEG,KIND     2     1     1     0     0     0     0     0     0
ZSEG       .10000 100.00000       -I       -I       -I       -I       -I
RSEG       .03405  34.04047       -I       -I       -I       -I       -I
DSEG      0.00000   0.00000       -I       -I       -I       -I       -I
ASEG      0.00000   0.00000       -I       -I       -I       -I       -I
```

```
MACH =  2.860000
ALPHA = 10.000000
GAMMA = 1.400
SIGMA = 18.80

Z-INITIAL =      .10
Z-FINAL =     100.00
PHI-ZERO =   90.00

NIT = 20
NIPHI = 18
METHOD ORDER = 2
NITER =  500
NPRNT = 0
IPRNT = 1
NCONE = 1
NWPRT= 0
NREAL = 0

DZ/DT =  0.000 INITIALLY
DELTA-X =  0.000
DELTA-Y =  0.000

DISK1 = 2
DISK2 = 3
TAPE1 = 1
TAPE2 = 1

PERCENT OF MAX. STEPSIZE =  .90
METHOD = 2
BND. COND. = 1
BETA=0.000
OMEGA= 0.000

PINF =      .336308E-01     RHOIN =      .8864A1E-01     QINF =      .787798E+00

GASCON= 1.7160E+03

K =  3     PHI=  0.000000     UINF=  .775830     VINF= -.136400     WINF= 0.000000
K =  4     PHI= 10.000000     UINF=  .775830     VINF= -.134721     WINF=  .023355
K =  5     PHI= 20.000000     UINF=  .775830     VINF= -.128550     WINF=  .046788
K =  6     PHI= 30.000000     UINF=  .775830     VINF= -.118472     WINF=  .065400
K =  7     PHI= 40.000000     UINF=  .775830     VINF= -.104795     WINF=  .080133
K =  8     PHI= 50.000000     UINF=  .775830     VINF= -.087753     WINF=  .090795
K =  9     PHI= 60.000000     UINF=  .775830     VINF= -.068400     WINF=  .097272
K = 10     PHI= 70.000000     UINF=  .775830     VINF= -.046788     WINF=  .099550
K = 11     PHI= 80.000000     UINF=  .775830     VINF= -.023355     WINF=  .097721
K = 12     PHI= 90.000000     UINF=  .775830     VINF=  .000000     WINF=  .091800
K = 13     PHI=100.000000     UINF=  .775830     VINF=  .023355     WINF=  .081721
K = 14     PHI=110.000000     UINF=  .775830     VINF=  .046788     WINF=  .067550
K = 15     PHI=120.000000     UINF=  .775830     VINF=  .068400     WINF=  .049272
K = 16     PHI=130.000000     UINF=  .775830     VINF=  .087753     WINF=  .027795
K = 17     PHI=140.000000     UINF=  .775830     VINF=  .104795     WINF=  .004133
K = 18     PHI=150.000000     UINF=  .775830     VINF=  .118472     WINF= -.019200
K = 19     PHI=160.000000     UINF=  .775830     VINF=  .128550     WINF= -.043788
K = 20     PHI=170.000000     UINF=  .775830     VINF=  .134721     WINF= -.068355
K = 21     PHI=180.000000     UINF=  .775830     VINF=  .136800     WINF= -.091800
```

RADIAL MESH DESCRIPTION

J= 3	TAU= 0.	XI = 0.	TXI = .1000E+01	TXIT = 0.
J= 4	TAU= .4762E-01	XI = .4762E-01	TXI = .1000E+01	TXIT = 0
J= 5	TAU= .9524E-01	XI = .9524E-01	TXI = .1000E+01	TXIT = 0.
J= 6	TAU= .1429E+00	XI = .1429E+00	TXI = .1000E+01	TXIT = 0.
J= 7	TAU= .1905E+00	XI = .1905E+00	TXI = .1000E+01	TXIT = 0.
J= 8	TAU= .2381E+00	XI = .2381E+00	TXI = .1000E+01	TXIT = 0.
J= 9	TAU= .2857E+00	XI = .2857E+00	TXI = .1000E+01	TXIT = 0.
J=10	TAU= .3333E+00	XI = .3333E+00	TXI = .1000E+01	TXIT = 0.
J=11	TAU= .3810E+00	XI = .3810E+00	TXI = .1000E+01	TXIT = 0.
J=12	TAU= .4286E+00	XI = .4286E+00	TXI = .1000E+01	TXIT = 0.
J=13	TAU= .4762E+00	XI = .4762E+00	TXI = .1000E+01	TXIT = 0.
J=14	TAU= .5238E+00	XI = .5238E+00	TXI = .1000E+01	TXIT = 0.
J=15	TAU= .5714E+00	XI = .5714E+00	TXI = .1000E+01	TXIT = 0.
J=16	TAU= .6190E+00	XI = .6190E+00	TXI = .1000E+01	TXIT = 0.
J=17	TAU= .6667E+00	XI = .6667E+00	TXI = .1000E+01	TXIT = 0.
J=18	TAU= .7143E+00	XI = .7143E+00	TXI = .1000E+01	TXIT = 0.
J=19	TAU= .7619E+00	XI = .7619E+00	TXI = .1000E+01	TXIT = 0.
J=20	TAU= .8095E+00	XI = .8095E+00	TXI = .1000E+01	TXIT = 0.
J=21	TAU= .8571E+00	XI = .8571E+00	TXI = .1000E+01	TXIT = 0.
J=22	TAU= .9048E+00	XI = .9048E+00	TXI = .1000E+01	TXIT = 0.
J=23	TAU= .9524E+00	XI = .9524E+00	TXI = .1000E+01	TXIT = 0.
J=24	TAU= .1000E+01	XI = .1000E+01	TXI = .1000E+01	TXIT = 0.

MERIDIANOL MESH DESCRIPTION

K= 2	ETA= -.1745E+00	PHI= -.1745E+00	DTIL= .1000E+01	DTILE= 0.
K= 3	ETA= 0.	PHI= 0.	DTIL= .1000E+01	DTILE= 0.
K= 4	ETA= .1745E+00	PHI= .1745E+00	DTIL= .1000E+01	DTILE= 0.
K= 5	ETA= .3491E+00	PHI= .3491E+00	DTIL= .1000E+01	DTILE= 0.
K= 6	ETA= .5236E+00	PHI= .5236E+00	DTIL= .1000E+01	DTILE= 0.
K= 7	ETA= .6981E+00	PHI= .6981E+00	DTIL= .1000E+01	DTILE= 0.
K= 8	ETA= .8727E+00	PHI= .8727E+00	DTIL= .1000E+01	DTILE= 0.
K= 9	ETA= .1047E+01	PHI= .1047E+01	DTIL= .1000E+01	DTILE= 0.
K=10	ETA= .1222E+01	PHI= .1222E+01	DTIL= .1000E+01	DTILE= 0.
K=11	ETA= .1396E+01	PHI= .1396E+01	DTIL= .1000E+01	DTILE= 0.
K=12	ETA= .1571E+01	PHI= .1571E+01	DTIL= .1000E+01	DTILE= 0.
K=13	ETA= .1745E+01	PHI= .1745E+01	DTIL= .1000E+01	DTILE= 0.
K=14	ETA= .1920E+01	PHI= .1920E+01	DTIL= .1000E+01	DTILE= 0.
K=15	ETA= .2094E+01	PHI= .2094E+01	DTIL= .1000E+01	DTILE= 0.
K=16	ETA= .2269E+01	PHI= .2269E+01	DTIL= .1000E+01	DTILE= 0.
K=17	ETA= .2443E+01	PHI= .2443E+01	DTIL= .1000E+01	DTILE= 0.
K=18	ETA= .2618E+01	PHI= .2618E+01	DTIL= .1000E+01	DTILE= 0.
K=19	ETA= .2793E+01	PHI= .2793E+01	DTIL= .1000E+01	DTILE= 0.
K=20	ETA= .2967E+01	PHI= .2967E+01	DTIL= .1000E+01	DTILE= 0.
K=21	ETA= .3142E+01	PHI= .3142E+01	DTIL= .1000E+01	DTILE= 0.
K=22	ETA= .3316E+01	PHI= -.2967E+01	DTIL= .1000E+01	DTILE= 0.

SURFACE FLOW VARIABLES AT Z = .945090
X/L = .009451 DZDT= .163362 ITER= 250

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	.3217	.4982	3.8524E+00	2.4986E+00	1.7814	.6064	0.0000	3.4217E-01	1.0000	.58540	.00	6.7798E-02
10.0	.3217	.4930	3.8229E+00	2.4829E+00	1.7854	.6078	.0550	3.4179E-01	1.0000	.58411	.00	6.7798E-02
20.0	.3217	.4787	3.7409E+00	2.4444E+00	1.7963	.6115	.1119	3.4074E-01	1.0000	.58050	.00	6.7798E-02
30.0	.3217	.4554	3.6077E+00	2.3823E+00	1.8148	.6178	.1661	3.3878E-01	1.0000	.57452	.00	6.7798E-02
40.0	.3217	.4252	3.4344E+00	2.3005E+00	1.8403	.6264	.2170	3.3601E-01	1.0000	.56650	.00	6.7798E-02
50.0	.3217	.3895	3.2293E+00	2.2013E+00	1.8726	.6374	.2636	3.3268E-01	1.0000	.55665	.00	6.7798E-02
60.0	.3217	.3503	3.0057E+00	2.0910E+00	1.9112	.6506	.3047	3.2902E-01	1.0000	.54532	.00	6.7798E-02
70.0	.3217	.3098	2.7740E+00	1.9746E+00	1.9555	.6657	.3381	3.2649E-01	1.0000	.53297	.00	6.7798E-02
80.0	.3217	.2699	2.5453E+00	1.8559E+00	2.0044	.6823	.3630	3.2250E-01	1.0000	.52003	.00	6.7798E-02
90.0	.3217	.2323	2.3298E+00	1.7432E+00	2.0566	.7001	.3781	3.1845E-01	1.0000	.50705	.00	6.7798E-02
100.0	.3217	.1983	2.1357E+00	1.6375E+00	2.1101	.7183	.3856	3.1451E-01	1.0000	.49457	.00	6.7798E-02
110.0	.3217	.1692	1.9698E+00	1.5455E+00	2.1623	.7361	.3865	3.1046E-01	1.0000	.48322	.00	6.7798E-02
120.0	.3217	.1455	1.8334E+00	1.4670E+00	2.2102	.7524	.3897	3.0773E-01	1.0000	.47350	.00	6.7798E-02
130.0	.3217	.1278	1.7318E+00	1.4104E+00	2.2507	.7661	.2849	3.0523E-01	1.0000	.46582	.00	6.7798E-02
140.0	.3217	.1156	1.6621E+00	1.3696E+00	2.2813	.7766	.2294	3.0345E-01	1.0000	.46041	.00	6.7798E-02
150.0	.3217	.1086	1.6217E+00	1.3457E+00	2.3010	.7833	.1688	3.0238E-01	1.0000	.45718	.00	6.7798E-02
160.0	.3217	.1053	1.6031E+00	1.3347E+00	2.3112	.7868	.1087	3.0189E-01	1.0000	.45568	.00	6.7798E-02
170.0	.3217	.1044	1.5978E+00	1.3315E+00	2.3150	.7880	.0527	3.0175E-01	1.0000	.45525	.00	6.7798E-02
180.0	.3217	.1042	1.5967E+00	1.3308E+00	2.3160	.7884	0.0000	3.0171E-01	1.0000	.45516	.00	6.7798E-02

BODY AND SHOCK GEOMETRY AT Z = .945

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	.3217	.3404	0.0000	.4890	.5130	0.0000
10.0	.3217	.3404	0.0000	.4897	.5135	.0076
20.0	.3217	.3404	0.0000	.4917	.5157	.0152
30.0	.3217	.3404	0.0000	.4951	.5193	.0230
40.0	.3217	.3404	0.0000	.4997	.5242	.0307
50.0	.3217	.3404	0.0000	.5058	.5309	.0384
60.0	.3217	.3404	0.0000	.5131	.5391	.0460
70.0	.3217	.3404	0.0000	.5218	.5491	.0531
80.0	.3217	.3404	0.0000	.5317	.5608	.0594
90.0	.3217	.3404	0.0000	.5426	.5741	.0642
100.0	.3217	.3404	0.0000	.5541	.5889	.0667
110.0	.3217	.3404	0.0000	.5658	.6052	.0666
120.0	.3217	.3404	0.0000	.5773	.6206	.0641
130.0	.3217	.3404	0.0000	.5882	.6353	.0576
140.0	.3217	.3404	0.0000	.5981	.6437	.0538

150.0	.3217	.3404	0.0000	.6066	.6520	.0433
160.0	.3217	.3404	0.0000	.6132	.6582	.0310
170.0	.3217	.3404	0.0000	.6175	.6621	.0161
180.0	.3217	.3404	0.0000	.6189	.6633	0.0000

SURFACE FLOW VARIABLES AT Z = 7.046967
X/L = .070470 DZDT= 1.199208 IIER= 500

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	2.3988	.5004	3.8650E+00	2.5012E+00	1.7784	.6054	0.0000	3.4241E-01	1.0000	.58622	.00	6.8463E-02
10.0	2.3988	.4954	3.8369E+00	2.4890E+00	1.7820	.6066	.0616	3.4205E-01	1.0000	.58498	.00	6.8463E-02
20.0	2.3988	.4809	3.7565E+00	2.4539E+00	1.7926	.6102	.1227	3.4098E-01	1.0000	.58133	.00	6.8463E-02
30.0	2.3988	.4576	3.6290E+00	2.3971E+00	1.8103	.6162	.1823	3.3923E-01	1.0000	.57537	.00	6.8463E-02
40.0	2.3988	.4272	3.4606E+00	2.3204E+00	1.8347	.6245	.2395	3.3684E-01	1.0000	.56731	.00	6.8463E-02
50.0	2.3988	.3913	3.2603E+00	2.2253E+00	1.8656	.6350	.2936	3.3389E-01	1.0000	.55742	.00	6.8463E-02
60.0	2.3988	.3519	3.0393E+00	2.1139E+00	1.9026	.6476	.3431	3.3049E-01	1.0000	.54605	.00	6.8463E-02
70.0	2.3988	.3110	2.8109E+00	1.9881E+00	1.9448	.6620	.3870	3.2680E-01	1.0000	.53360	.00	6.8463E-02
80.0	2.3988	.2707	2.5901E+00	1.8509E+00	1.9916	.6779	.4243	3.2296E-01	1.0000	.52055	.00	6.8463E-02
90.0	2.3988	.2327	2.3896E+00	1.7058E+00	2.0414	.6949	.4542	3.1909E-01	1.0000	.50746	.00	6.8463E-02
100.0	2.3988	.1985	2.1995E+00	1.5578E+00	2.0927	.7124	.4761	3.1541E-01	1.0000	.49489	.00	6.8463E-02
110.0	2.3988	.1692	1.9887E+00	1.5040E+00	2.1434	.7296	.4903	3.1203E-01	1.0000	.48346	.00	6.8463E-02
120.0	2.3988	.1456	1.8339E+00	1.4682E+00	2.1907	.7457	.4957	3.0974E-01	1.0000	.47375	.00	6.8463E-02
130.0	2.3988	.1279	1.7341E+00	1.4054E+00	2.2325	.7600	.4975	3.0654E-01	1.0000	.46609	.00	6.8463E-02
140.0	2.3988	.1159	1.6609E+00	1.3685E+00	2.2672	.7718	.3980	3.0349E-01	1.0000	.46054	.00	6.8463E-02
150.0	2.3988	.1075	1.6156E+00	1.3414E+00	2.2937	.7808	.2692	3.0234E-01	1.0000	.45691	.00	6.8463E-02
160.0	2.3988	.1029	1.5892E+00	1.3258E+00	2.3116	.7869	.1787	3.0178E-01	1.0000	.45477	.00	6.8463E-02
170.0	2.3988	.1006	1.5760E+00	1.3179E+00	2.3211	.7902	.0877	3.0152E-01	1.0000	.45368	.00	6.8463E-02
180.0	2.3988	.0998	1.5712E+00	1.3150E+00	2.3247	.7913	0.0000	3.0140E-01	1.0000	.45328	.00	6.8463E-02

BODY AND SHOCK GEOMETRY AT Z = 7.047

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	2.3988	.3404	0.0000	3.6294	.5150	0.0000
10.0	2.3988	.3404	0.0000	3.6343	.5156	.0949
20.0	2.3988	.3404	0.0000	3.6486	.5176	.1100
30.0	2.3988	.3404	0.0000	3.6727	.5210	.1657
40.0	2.3988	.3404	0.0000	3.7064	.5258	.2525
50.0	2.3988	.3404	0.0000	3.7502	.5321	.2791
60.0	2.3988	.3404	0.0000	3.8038	.5397	.3562
70.0	2.3988	.3404	0.0000	3.8676	.5487	.3915
80.0	2.3988	.3404	0.0000	3.9405	.5591	.4441
90.0	2.3988	.3404	0.0000	4.0226	.5708	.4901
100.0	2.3988	.3404	0.0000	4.1116	.5834	.5268
110.0	2.3988	.3404	0.0000	4.2065	.5969	.5521
120.0	2.3988	.3404	0.0000	4.3043	.6109	.5590
130.0	2.3988	.3404	0.0000	4.4016	.6248	.5421
140.0	2.3988	.3404	0.0000	4.4935	.6380	.4958
150.0	2.3988	.3404	0.0000	4.5747	.6499	.4159
160.0	2.3988	.3404	0.0000	4.6390	.6592	.2977
170.0	2.3988	.3404	0.0000	4.6786	.6649	.1539
180.0	2.3988	.3404	0.0000	4.6917	.6674	0.0000

CONE SOLUTION RESET TO Z-INITIAL= .10000

K= 3 PHI = 0.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	R	T	H/HT
3	.03404056	1.29982E-01	2.21729E-01	.60894191	.20728668	0.00000000	.06845970	.34240969	0.0000	.5862
4	.03487212	1.29931E-01	2.21667E-01	.61155040	.20624083	0.00000000	.06845970	.34238989	.0476	.5862
5	.03570368	1.29730E-01	2.21422E-01	.61370994	.19555716	0.00000000	.06845970	.34231439	.0952	.5859
6	.03653525	1.29417E-01	2.21040E-01	.61601464	.18717663	0.00000000	.06845970	.34219610	.1429	.5855
7	.03736681	1.29002E-01	2.20533E-01	.61827195	.18106950	0.00000000	.06845970	.34203907	.1905	.5850
8	.03819837	1.28495E-01	2.19915E-01	.62048809	.17520594	0.00000000	.06845970	.34184716	.2381	.5843
9	.03902994	1.27905E-01	2.19197E-01	.62266868	.16956016	0.00000000	.06845970	.34162342	.2857	.5835
10	.03986150	1.27246E-01	2.18396E-01	.62481994	.16410356	0.00000000	.06845970	.34137027	.3333	.5827
11	.04069306	1.26516E-01	2.17490E-01	.62694613	.15883209	0.00000000	.06845970	.34108970	.3810	.5817

12	.04152463	1.25723E-01	2.16514E-01	.62905276	.15370965	0.00000000	.06845970	.34078321	.4286	.5807
13	.04235619	1.24870E-01	2.15464E-01	.63119451	.14870423	0.00000000	.06845970	.34045197	.4762	.5795
14	.04318776	1.23961E-01	2.14343E-01	.63322618	.14336958	0.00000000	.06845970	.34009677	.5238	.5783
15	.04401932	1.22998E-01	2.13152E-01	.63530209	.13803343	0.00000000	.06845970	.33971811	.5714	.5770
16	.04485088	1.21983E-01	2.11894E-01	.63737860	.13442942	0.00000000	.06845970	.33931615	.6190	.5757
17	.04568245	1.20916E-01	2.10569E-01	.63945965	.12908436	0.00000000	.06845970	.33889066	.6667	.5742
18	.04651401	1.19798E-01	2.09177E-01	.64155039	.12539052	0.00000000	.06845970	.33844139	.7143	.5727
19	.04734557	1.18628E-01	2.07714E-01	.64365979	.12091010	0.00000000	.06845970	.33796672	.7619	.5711
20	.04817714	1.17404E-01	2.06178E-01	.64578613	.11631049	0.00000000	.06845970	.33746752	.8095	.5694
21	.04900870	1.16118E-01	2.04563E-01	.64795738	.11182942	0.00000000	.06845970	.33693619	.8571	.5676
22	.04984026	1.14795E-01	2.02899E-01	.65013366	.10747701	0.00000000	.06845970	.33638517	.9048	.5658
23	.05067183	1.13346E-01	2.01066E-01	.65244193	.10293059	0.00000000	.06845970	.33577517	.9524	.5637
24	.05150339	1.11961E-01	1.99308E-01	.65462775	.09856234	0.00000000	.06845970	.33518591	1.0000	.5617

K= 4 PHI = 10.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	1.29025E-01	2.20561E-01	.60952474	.20748505	.02108710	.06846347	.34204821	0.0000	.5850
4	.03487539	1.28380E-01	2.20490E-01	.61185377	.20543479	.02122911	.06863551	.34205567	.0476	.5850
5	.03571022	1.28804E-01	2.20287E-01	.61423797	.19576419	.02112330	.06849670	.34190877	.0952	.5847
6	.03654505	1.28507E-01	2.19935E-01	.61659991	.18743174	.02102655	.06841787	.34184625	.1429	.5843
7	.03737988	1.28108E-01	2.19471E-01	.61883683	.18135973	.02084252	.06826834	.34167620	.1905	.5837
8	.03821471	1.27619E-01	2.18879E-01	.62105155	.17553254	.02078728	.06821984	.34148344	.2381	.5831
9	.03904954	1.27047E-01	2.18195E-01	.62324799	.16930824	.02068920	.06811724	.34125213	.2857	.5823
10	.03988437	1.26402E-01	2.17410E-01	.62559761	.16448438	.02060117	.06806978	.34099804	.3333	.5814
11	.04071920	1.25688E-01	2.16503E-01	.62752972	.15923642	.02052157	.06792972	.34071369	.3810	.5804
12	.04155403	1.24910E-01	2.15503E-01	.62963485	.15414155	.02045140	.06795338	.34040825	.4286	.5794
13	.04238886	1.24074E-01	2.14414E-01	.63172672	.14918435	.02039975	.06787702	.34007341	.4762	.5782
14	.04322369	1.23181E-01	2.13241E-01	.63380572	.14434730	.02035673	.06783369	.33971770	.5238	.5770
15	.04405852	1.22235E-01	2.11986E-01	.63587859	.13961409	.02029186	.06781879	.33933869	.5714	.5758
16	.04489335	1.21237E-01	2.10650E-01	.63795369	.13497325	.02029426	.06778156	.33893683	.6190	.5744
17	.04572818	1.20187E-01	2.09236E-01	.64002650	.13040627	.02023573	.06774708	.33851180	.6667	.5730
18	.04656301	1.19086E-01	2.07739E-01	.64211131	.12590067	.02026794	.06771462	.33806327	.7143	.5714
19	.04739784	1.17932E-01	2.06159E-01	.64421333	.12143878	.02018944	.06768480	.33758975	.7619	.5698
20	.04823267	1.16728E-01	2.04451E-01	.64633298	.11701283	.02018201	.06765607	.33709179	.8095	.5682
21	.04906750	1.15459E-01	2.02857E-01	.64849489	.11255596	.02016168	.06763064	.33656250	.8571	.5664
22	.04990233	1.14152E-01	2.01210E-01	.65066408	.10819183	.02015818	.06760341	.33601255	.9048	.5645
23	.05073716	1.12725E-01	1.99404E-01	.65295606	.10369070	.02009198	.06758493	.33540704	.9524	.5625
24	.05157199	1.11349E-01	1.98658E-01	.65514775	.09952843	.02022248	.06756256	.33481527	1.0000	.5605

K= 5 PHI = 20.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	1.26225E-01	2.17131E-01	.61124959	.20807219	.04184351	.06846347	.34097772	0.0000	.5813
4	.03488506	1.26234E-01	2.17242E-01	.61375304	.20114519	.04204871	.06862304	.34090336	.0476	.5811
5	.03573956	1.26033E-01	2.17144E-01	.61618790	.19459183	.04187759	.06855082	.34079221	.0952	.5807
6	.03657406	1.25843E-01	2.16875E-01	.61850723	.18850435	.04163297	.06849857	.34066310	.1429	.5803
7	.03741856	1.25496E-01	2.16490E-01	.62079825	.18230976	.04137316	.06837015	.34048772	.1905	.5797
8	.03826307	1.25017E-01	2.15970E-01	.62300470	.17696660	.04117091	.06829633	.34029440	.2381	.5790
9	.03910757	1.24522E-01	2.15356E-01	.62519212	.17100784	.04096326	.06837252	.34006268	.2857	.5782
10	.03995207	1.23922E-01	2.14637E-01	.62732589	.16565883	.04077534	.06832785	.33981075	.3333	.5774
11	.04079657	1.23255E-01	2.13836E-01	.62944160	.16048661	.04062458	.06826333	.33952867	.3810	.5764
12	.04164107	1.22524E-01	2.12949E-01	.63150633	.15546739	.04045243	.06823642	.33922499	.4286	.5754
13	.04248558	1.21734E-01	2.11987E-01	.63359679	.15058650	.04031746	.06830819	.33889624	.4762	.5743
14	.04333008	1.20898E-01	2.10951E-01	.63565201	.14582604	.04017566	.06836693	.33854550	.5238	.5731
15	.04417458	1.19988E-01	2.09845E-01	.63770253	.14117121	.04004820	.06850120	.33817192	.5714	.5718
16	.04501908	1.19009E-01	2.08670E-01	.63974550	.13660397	.03991061	.06849417	.33777611	.6190	.5705
17	.04586358	1.17957E-01	2.07429E-01	.64179317	.13211622	.03978257	.06843566	.33735765	.6667	.5691
18	.04670809	1.16838E-01	2.06118E-01	.64384874	.12769171	.03989695	.06851860	.33691621	.7143	.5676
19	.04755259	1.15680E-01	2.04737E-01	.64592050	.12350970	.03984613	.06853938	.33645029	.7619	.5660
20	.04839709	1.14426E-01	2.03289E-01	.64800850	.11836458	.03981923	.06816356	.33598044	.8095	.5643
21	.04924159	1.13007E-01	2.01755E-01	.65013698	.11461950	.03992082	.06829439	.33543992	.8571	.5626
22	.05008609	1.12251E-01	2.00167E-01	.65227411	.11050710	.03980720	.06852547	.33486885	.9048	.5608
23	.05093059	1.10890E-01	1.98426E-01	.65452689	.10588582	.03983375	.06836686	.33430430	.9524	.5588
24	.05177510	1.09549E-01	1.96731E-01	.65669121	.10160711	.03985007	.06829772	.33371983	1.0000	.5568

K= 6 PHI = 30.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	1.21756E-01	2.11612E-01	.61408883	.2098[illegible]848	.06184440	.06846347	.33922648	0.0000	.5754
4	.03460133	1.21836E-01	2.12018E-01	.616[illegible]737	.20[illegible]952	.06219758	.06643570	.33901278	.0476	.5746
5	.03576210	1.21769E-01	2.12[illegible]E-01	.615[illegible]	.19[illegible]	.06183202	.06594608	.33886612	.0952	.5742
6	.03662288	1.21584E-01	2.11943E-01	.61[illegible]	.18[illegible]	.06[illegible]	.06499447	.33872915	.1429	.5737
7	.03748365	1.21[illegible]E-01	2.11660E-01	.6[illegible]	.18[illegible]	.06[illegible]	.06[illegible]	.33859647	.1905	.5731
8	.03834442	1.20935E-01	2.11377E-01	.6[illegible]	.17[illegible]	.06[illegible]	.06[illegible]	.33845306	.2381	.5724
9	.03920520	1.20[illegible]E-01	2.10[illegible]E-01	.6[illegible]	.17[illegible]	.06[illegible]	.06[illegible]	.33832272	.2857	.5716
10	.04006597	1.19957E-01	2.10157E-01	.6[illegible]	.16[illegible]	.06[illegible]	.06[illegible]	.33787482	.3333	.5709
11	.04092675	1.19367E-01	2.09459E-01	.63257006	.16251318	.06976233	.06293086	.33759814	.3810	.5699
12	.04178752	1.18705E-01	2.08671E-01	.63[illegible]	.15761794	.06955879	.06267921	.33730122	.4286	.5689
13	.04264829	1.17989E-01	2.07807E-01	.63605623	.15[illegible]	.06[illegible]	.06243577	.33698037	.4762	.5678
14	.04350907	1.17216E-01	2.06867E-01	.63867215	.14867565	.06931952	.06221842	.33663946	.5238	.5666
15	.04436984	1.16[illegible]E-01	2.05[illegible]E-01	.64[illegible]	.14[illegible]	.06[illegible]	.06201529	.33627467	.5714	.5654
16	.04523061	1.15516E-01	2.04770E-01	.64248141	.13918777	.05894924	.06182743	.33588944	.6190	.5641
17	.04609139	1.14589E-01	2.03667E-01	.64468359	.13[illegible]	.05[illegible]	.06165268	.33548838	.6667	.5627
18	.04695216	1.13614E-01	2.02[illegible]E-01	.64689156	.13562722	.05851122	.06148856	.33505313	.7143	.5613
19	.04781294	1.12586E-01	2.01123E-01	.64871402	.12[illegible]	.05[illegible]	.06133557	.33460014	.7619	.5598
20	.04867371	1.11510E-01	1.99965E-01	.65075085	.12215913	.05831999	.06119053	.33412411	.8095	.5582
21	.04953448	1.10370E-01	1.98527E-01	.6528[illegible]	.11764332	.05811664	.06105941	.33361806	.8571	.5565
22	.05039526	1.09194E-01	1.96834E-01	.65490966	.11376673	.05829185	.06092455	.33309237	.9048	.5548
23	.05125603	1.07907E-01	1.95[illegible]E-01	.65710426	.10[illegible]	.05[illegible]	.06080696	.33251456	.9524	.5528
24	.05211680	1.06654E-01	1.93589E-01	.65921666	.10533363	.05830500	.06068293	.33194540	1.0000	.5509

K= 7 PHI = 40.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	1.15891E-01	2.04280E-01	.61799672	.21034895	.08048848	.06846347	.33884249	0.0000	.5673
4	.03492413	1.16061E-01	2.05072E-01	.62119210	.20[illegible]	.08[illegible]	.06451413	.33643829	.0476	.5660
5	.03580771	1.16085E-01	2.05348E-01	.62379092	.19[illegible]	.08[illegible]	.06283850	.33624677	.0952	.5653
6	.03669129	1.15997E-01	2.05335E-01	.62612820	.19[illegible]	.07[illegible]	.06159152	.33609825	.1429	.5648
7	.03757486	1.15804E-01	2.05071E-01	.62[illegible]	.18[illegible]	.07[illegible]	.06071482	.33590847	.1905	.5642
8	.03845844	1.15[illegible]	2.04[illegible]	.63[illegible]	.18[illegible]	.07[illegible]	.06[illegible]	.33571707	.2381	.5635
9	.03934202	1.15[illegible]	2.04[illegible]	.63[illegible]	.17[illegible]	.07[illegible]	.05[illegible]	.33549058	.2857	.5628
10	.04022559	1.14754E-01	2.04164E-01	.63480260	.17[illegible]	.07[illegible]	.05[illegible]	.33525004	.3333	.5620
11	.04110917	1.14[illegible]	2.04[illegible]	.63685238	.16[illegible]	.07[illegible]	.05[illegible]	.33498248	.3810	.5611
12	.04199274	1.13[illegible]	2.03[illegible]	.63885772	.16[illegible]	.07[illegible]	.05831708	.33469640	.4286	.5601
13	.04287632	1.13[illegible]	2.03[illegible]	.64084179	.15[illegible]	.07[illegible]	.05793212	.33438781	.4762	.5591
14	.04375990	1.12[illegible]	2.03[illegible]	.64285505	.15[illegible]	.07[illegible]	.05758541	.33405931	.5238	.5580
15	.04464347	1.11[illegible]	2.02[illegible]	.64475571	.14[illegible]	.07[illegible]	.05726446	.33371012	.5714	.5568
16	.04552705	1.10[illegible]	1.99[illegible]	.64[illegible]	.14[illegible]	.07[illegible]	.05696743	.33334045	.6190	.5556
17	.04641063	1.10[illegible]	1.98[illegible]	.64[illegible]	.13[illegible]	.07[illegible]	.05667326	.33294697	.6667	.5543
18	.04729420	1.09[illegible]	1.97[illegible]	.65[illegible]	.13[illegible]	.07[illegible]	.05634529	.33251826	.7143	.5529
19	.04817778	1.08[illegible]	1.96[illegible]	.65[illegible]	.12[illegible]	.07[illegible]	.05596771	.33210367	.7619	.5515
20	.04906136	1.07[illegible]	1.95[illegible]	.65451957	.12[illegible]	.07[illegible]	.05556776	.33164722	.8095	.5499
21	.04994493	1.06[illegible]	1.93681[illegible]	.65651747	.12[illegible]	.07[illegible]	.05515432	.33116133	.8571	.5483
22	.05082851	1.05[illegible]	1.92309[illegible]	.65852698	.11[illegible]	.07[illegible]	.05555562	.33065741	.9048	.5467
23	.05171209	1.03948E-01	1.90787E-01	.66069364	.11434664	.07[illegible]	.05536825	.33010190	.9524	.5448
24	.05259566	1.02790E-01	1.89303E-01	.66268583	.11037685	.07[illegible]	.05518096	.32955577	1.0000	.5430

K= 8 PHI = 50.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	1.08975E-01	1.95494E-01	.62990176	.21283865	.09[illegible]	.06846347	.33889369	0.0000	.5574
4	.03495376	1.09245E-01	1.96733E-01	.62657142	.20[illegible]	.09[illegible]	.06211074	.33325562	.0476	.5553
5	.03586696	1.09336E-01	1.97255E-01	.62928624	.19[illegible]	.09[illegible]	.05955594	.33300744	.0952	.5545
6	.03678016	1.09388E-01	1.97476E-01	.63165063	.19[illegible]	.09[illegible]	.05816864	.33284897	.1429	.5539
7	.03769336	1.09303E-01	1.97559E-01	.63391836	.18871529	.09611451	.05684484	.33265490	.1905	.5533
8	.03860657	1.09179E-01	1.97494E-01	.63605778	.18[illegible]	.09[illegible]	.05552131	.33246913	.2381	.5527
9	.03951977	1.08973E-01	1.97255E-01	.63816139	.17[illegible]	.09[illegible]	.05551979	.33225070	.2857	.5520
10	.04043297	1.08843E-01	1.96924E-01	.64016464	.17[illegible]	.09[illegible]	.05430656	.33202227	.3333	.5512

11	.04134617	1.08147E-01	1.96504E-01	.64217507	.16587365	.09548579	.05363190	.33176867	.3810	.5504
12	.04225937	1.07688E-01	1.95930E-01	.64412268	.16434924	.09294084	.05305130	.33149847	.4286	.5495
13	.04317258	1.07171E-01	1.95326E-01	.64604368	.16286330	.09046229	.05251956	.33120745	.4762	.5485
14	.04408578	1.06600E-01	1.94716E-01	.64794085	.16146866	.08804149	.05203173	.33089766	.5238	.5475
15	.04499898	1.05978E-01	1.94096E-01	.64982191	.16015039	.08568859	.05158814	.33056854	.5714	.5464
16	.04591218	1.05313E-01	1.93461E-01	.65169289	.15890432	.08340374	.05117819	.33021991	.6190	.5452
17	.04682538	1.04585E-01	1.92848E-01	.65355946	.15773537	.08118390	.05080065	.32985157	.6667	.5440
18	.04773859	1.03817E-01	1.91983E-01	.65542027	.15664185	.07902101	.05044810	.32946303	.7143	.5427
19	.04865179	1.02995E-01	1.91150E-01	.65727513	.15562419	.07691685	.05011105	.32905244	.7619	.5414
20	.04956499	1.02113E-01	1.90316E-01	.65913146	.15468262	.07487297	.04981347	.32862138	.8095	.5400
21	.05047819	1.01212E-01	1.89476E-01	.66111695	.15381266	.07293807	.04952722	.32816117	.8571	.5384
22	.05139139	1.00257E-01	1.86758E-01	.66303748	.15282734	.07078210	.04929453	.32768523	.9048	.5369
23	.05230460	9.91936E-02	1.85356E-01	.66507249	.15203920	.06867000	.04900394	.32715707	.9524	.5352
24	.05321780	9.81650E-02	1.84011E-01	.66701831	.11657776	.08957385	.04875589	.32664131	1.0000	.5335

K= 9 PHI = 60.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	1.01388E-01	1.85674E-01	.62872138	.21401967	.11337167	.06846347	.33046993	0.0000	.5461
4	.03499997	1.01763E-01	1.87405E-01	.63294650	.20835773	.11337865	.05926247	.32955264	.0476	.5430
5	.03595938	1.01997E-01	1.88101E-01	.63577622	.20366171	.11233494	.05567192	.32924511	.0952	.5420
6	.03688879	1.02119E-01	1.88556E-01	.63811666	.19716751	.11130612	.05379203	.32903065	.1429	.5415
7	.03783821	1.02142E-01	1.88802E-01	.64039117	.19189514	.11028689	.05264056	.32888528	.1905	.5408
8	.03878762	1.02074E-01	1.88933E-01	.64248914	.18686827	.10933599	.05208788	.32870951	.2381	.5402
9	.03973703	1.01935E-01	1.88950E-01	.64454461	.18206504	.10843111	.05096394	.32850388	.2857	.5396
10	.04068645	1.01707E-01	1.88759E-01	.64650416	.17744673	.10757497	.04970394	.32829257	.3333	.5389
11	.04163586	1.01417E-01	1.88408E-01	.64841640	.17302378	.10676078	.04878203	.32805842	.3810	.5381
12	.04258527	1.01068E-01	1.87914E-01	.65033052	.16876340	.10600375	.04780626	.32780952	.4286	.5373
13	.04353469	1.00666E-01	1.87298E-01	.65215005	.16465824	.10529423	.04691213	.32754152	.4762	.5364
14	.04448410	1.00211E-01	1.86573E-01	.65397998	.16071454	.10463456	.04598456	.32725578	.5238	.5355
15	.04543351	9.96858E-02	1.85754E-01	.65578019	.15693622	.10401751	.04502133	.32695207	.5714	.5345
16	.04638292	9.91299E-02	1.84853E-01	.65756871	.15329975	.10345685	.04417377	.32662968	.6190	.5334
17	.04733234	9.85224E-02	1.83881E-01	.65933044	.14980963	.10294349	.04327701	.32628860	.6667	.5323
18	.04828175	9.78696E-02	1.84261E-01	.66115071	.14652558	.10253937	.04239287	.32592831	.7143	.5311
19	.04923116	9.71672E-02	1.83268E-01	.66292308	.14318607	.10217093	.04144245	.32554656	.7619	.5299
20	.05018058	9.64235E-02	1.82213E-01	.66471439	.13997372	.10184565	.04046743	.32514589	.8095	.5286
21	.05112999	9.56173E-02	1.81076E-01	.66654666	.13698644	.10156641	.03947001	.32471580	.8571	.5272
22	.05207940	9.47831E-02	1.80028E-01	.66837180	.13389461	.10132037	.03847293	.32427293	.9048	.5258
23	.05302881	9.38445E-02	1.78900E-01	.67031658	.13078223	.10110846	.03748947	.32377579	.9524	.5242
24	.05397823	9.29444E-02	1.77849E-01	.67215637	.12870524	.10096228	.03679266	.32329619	1.0000	.5226

K=10 PHI = 70.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	9.35239E-02	1.75270E-01	.63533008	.21620930	.12642415	.06846347	.32668034	0.0000	.5336
4	.03503306	9.39065E-02	1.77492E-01	.64013095	.21101148	.12617412	.05934145	.32545679	.0476	.5296
5	.03602557	9.43506E-02	1.78526E-01	.64208574	.20716750	.12543574	.05128949	.32508135	.0952	.5284
6	.03701808	9.45542E-02	1.79135E-01	.64369120	.20366401	.12411514	.04887489	.32491100	.1429	.5278
7	.03801058	9.46790E-02	1.79585E-01	.64768760	.19941861	.12241789	.04668952	.32471869	.1905	.5272
8	.03900309	9.47140E-02	1.79855E-01	.64972840	.19601841	.12076220	.04519874	.32455838	.2381	.5267
9	.03999560	9.46691E-02	1.79951E-01	.65132095	.19261793	.11920111	.04391111	.32437214	.2857	.5261
10	.04098810	9.45516E-02	1.79959E-01	.65361983	.18918994	.11743767	.04261662	.32418432	.3333	.5255
11	.04198061	9.43677E-02	1.79816E-01	.65548564	.18576130	.11611565	.04154314	.32397577	.3810	.5248
12	.04297312	9.41231E-02	1.79556E-01	.65724243	.18256296	.11476296	.04031451	.32375403	.4286	.5241
13	.04396562	9.38221E-02	1.79196E-01	.65906483	.17960962	.11359465	.03934680	.32351478	.4762	.5233
14	.04495813	9.34694E-02	1.78694E-01	.66097595	.17659452	.11231440	.03831716	.32325845	.5238	.5225
15	.04595064	9.30647E-02	1.78042E-01	.66294705	.17357356	.11096169	.03728529	.32298149	.5714	.5216
16	.04694314	9.26133E-02	1.77672E-01	.66486945	.17061114	.10962589	.03636247	.32269392	.6190	.5207
17	.04793565	9.21156E-02	1.77202E-01	.66681931	.16811588	.10850278	.03540959	.32238466	.6667	.5197
18	.04892816	9.15743E-02	1.76579E-01	.66875609	.16506279	.10735763	.03439596	.32205686	.7143	.5186
19	.04992066	9.09833E-02	1.75821E-01	.67074251	.16228298	.10634822	.03353078	.32170784	.7619	.5175
20	.05091317	9.03553E-02	1.75009E-01	.67295890	.15986937	.10537657	.03261245	.32134144	.8095	.5163
21	.05190568	8.96653E-02	1.74009E-01	.67467954	.15715446	.10435455	.03174754	.32094453	.8571	.5150
22	.05289818	8.89502E-02	1.73153E-01	.67653942	.15421834	.10336101	.03083423	.32053840	.9048	.5137
23	.05389069	8.81250E-02	1.72045E-01	.67826175	.15177569	.10262252	.03003227	.32007419	.9524	.5122

24	.05488320	8.73546E-02	1.71005E-01	.67798230	.13152504	.11049782	.03470967	.31963460	1.0000	.5108

K-11 PHI = 80.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	8.57628E-02	1.64752E-01	.64260326	.21874513	.13659183	.06846347	.32266214	0.0000	.5206
4	.03508233	8.63148E-02	1.67447E-01	.64805646	.21407275	.13682636	.05216672	.32109387	.0476	.5155
5	.03612409	8.67339E-02	1.68735E-01	.65116683	.20960038	.13517612	.04628744	.32063213	.0952	.5140
6	.03716586	8.70428E-02	1.69508E-01	.65346095	.20406790	.13354284	.04344422	.32046941	.1429	.5135
7	.03820763	8.72544E-02	1.70112E-01	.65566598	.19940449	.13197031	.04089164	.32028856	.1905	.5129
8	.03924940	8.73770E-02	1.70457E-01	.65764114	.19432681	.13049663	.03913181	.32015150	.2381	.5125
9	.04029117	8.74207E-02	1.70759E-01	.65955770	.19001220	.12908351	.03753809	.31999151	.2857	.5120
10	.04133294	8.73905E-02	1.70960E-01	.66134963	.18654116	.12777560	.03626574	.31983214	.3333	.5115
11	.04237471	8.72994E-02	1.70879E-01	.66313096	.18263798	.12659063	.03514071	.31965482	.3810	.5109
12	.04341648	8.71462E-02	1.70779E-01	.66484104	.17866120	.12553789	.03416885	.31946376	.4286	.5103
13	.04445825	8.69375E-02	1.70591E-01	.66651121	.17521462	.12460622	.03331844	.31925742	.4762	.5096
14	.04550001	8.66774E-02	1.70310E-01	.66815619	.17161402	.12381630	.03254976	.31903522	.5238	.5089
15	.04654178	8.63654E-02	1.69987E-01	.66977379	.16829165	.12314675	.03187368	.31879349	.5714	.5081
16	.04758355	8.60135E-02	1.67594E-01	.67133956	.16491985	.12259911	.03128245	.31853535	.6190	.5073
17	.04862532	8.56125E-02	1.69096E-01	.67287625	.16163692	.12215186	.03079727	.31825968	.6667	.5064
18	.04966709	8.51702E-02	1.66863E-01	.67456037	.15840978	.11977266	.03018466	.31796804	.7143	.5055
19	.05070886	8.46790E-02	1.67844E-01	.67617229	.15526821	.11906383	.02971962	.31765067	.7619	.5045
20	.05175063	8.41535E-02	1.67152E-01	.67777165	.15214137	.11847563	.02928804	.31731962	.8095	.5035
21	.05279240	8.35835E-02	1.66360E-01	.67942240	.14906010	.11785944	.02889392	.31695587	.8571	.5023
22	.05383417	8.29618E-02	1.65547E-01	.68104081	.14599050	.11726172	.02852363	.31658706	.9048	.5011
23	.05487594	8.22405E-02	1.64557E-01	.68280943	.14271644	.11674956	.02818783	.31615445	.9524	.4998
24	.05591770	8.15822E-02	1.63653E-01	.68443212	.13971731	.11629896	.02786240	.31575506	1.0000	.4985

K-12 PHI = 90.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	7.84464E-02	1.54586E-01	.65035462	.22130373	.14341625	.06846347	.31857806	0.0000	.5075
4	.03513781	7.90532E-02	1.57713E-01	.65746127	.21725474	.14357458	.04813115	.31662132	.0476	.5012
5	.03623506	7.95338E-02	1.59136E-01	.65966243	.21356890	.14163367	.04112604	.31610389	.0952	.4996
6	.03733232	7.99058E-02	1.60988E-01	.66184193	.20971749	.13995802	.03733202	.31595389	.1429	.4991
7	.03842957	8.01622E-02	1.60417E-01	.66400872	.20552459	.13796636	.03503042	.31578258	.1905	.4986
8	.03952682	8.03714E-02	1.61310E-01	.66594787	.19930870	.13613801	.03308059	.31566898	.2381	.4982
9	.04062408	8.04834E-02	1.61675E-01	.66776207	.19559627	.13447719	.03134359	.31553597	.2857	.4978
10	.04172133	8.05251E-02	1.61895E-01	.66951083	.19185725	.13282287	.02997111	.31540468	.3333	.4974
11	.04281858	8.05304E-02	1.61997E-01	.67118129	.18790710	.13133743	.02878812	.31525904	.3810	.4969
12	.04391584	8.04725E-02	1.61996E-01	.67280205	.18439763	.12998818	.02776917	.31509935	.4286	.4964
13	.04501309	8.02872E-02	1.61906E-01	.67439581	.18101138	.12866691	.02689591	.31492572	.4762	.4959
14	.04611034	8.01034E-02	1.61731E-01	.67593290	.17773526	.12742490	.02611280	.31473419	.5238	.4953
15	.04720760	7.98712E-02	1.61474E-01	.67745486	.17455732	.12626186	.02543525	.31452746	.5714	.4946
16	.04830485	7.95944E-02	1.61140E-01	.67897495	.17141232	.12517112	.02481609	.31430218	.6190	.4939
17	.04940210	7.92728E-02	1.60734E-01	.68048169	.16841609	.12419584	.02427815	.31405939	.6667	.4932
18	.05049936	7.89114E-02	1.60276E-01	.68198518	.16549137	.12334125	.02377144	.31379832	.7143	.4923
19	.05159661	7.85066E-02	1.59730E-01	.68350375	.16269755	.12253777	.02332649	.31351461	.7619	.4915
20	.05269386	7.80597E-02	1.59136E-01	.68502493	.15997714	.12184077	.02291402	.31321630	.8095	.4905
21	.05379112	7.75515E-02	1.58437E-01	.68658592	.15666864	.12073293	.02254379	.31288281	.8571	.4895
22	.05488837	7.70375E-02	1.57725E-01	.68811690	.15381695	.12001846	.02219695	.31254696	.9048	.4884
23	.05598562	7.64018E-02	1.56829E-01	.68981299	.15079797	.11939487	.02188680	.31214268	.9524	.4872
24	.05708288	7.58366E-02	1.56024E-01	.69135403	.14800532	.11876890	.02158788	.31177491	1.0000	.4860

K-13 PHI =100.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	7.18511E-02	1.45187E-01	.65838716	.22411804	.14632776	.06846347	.31450630	0.0000	.4949
4	.03519792	7.24812E-02	1.48700E-01	.66518388	.22058627	.14641768	.04373949	.31222875	.0476	.4874
5	.03635528	7.27926E-02	1.50336E-01	.66851981	.21629112	.14411608	.03543900	.31161835	.0952	.4855
6	.03751264	7.33950E-02	1.51313E-01	.67076576	.21197532	.14260291	.03187008	.31146593	.1429	.4851
7	.03867000	7.37069E-02	1.52114E-01	.67280157	.20790753	.13988513	.02871258	.31130343	.1905	.4845
8	.03982737	7.39334E-02	1.52679E-01	.67461293	.20400749	.13781157	.02667493	.31121336	.2381	.4843
9	.04098473	7.40852E-02	1.53086E-01	.67634979	.20030617	.13576138	.02491725	.31110920	.2857	.4839

10	.04214209	7.41693E-02	1.53355E-01	.67797847	.19675975	.13414946	.02356660	.31100956	.3333	.4836
11	.04329945	7.41913E-02	1.53514E-01	.67954561	.19336314	.13444769	.02343805	.31089743	.3810	.4833
12	.04446661	7.41576E-02	1.53376E-01	.68104877	.19009758	.13083821	.02347116	.31076988	.4286	.4829
13	.04561418	7.40712E-02	1.53524E-01	.68254519	.18694522	.12933113	.02368231	.31063065	.4762	.4825
14	.04677154	7.39371E-02	1.53414E-01	.68400523	.18389572	.12790759	.01996122	.31047024	.5238	.4820
15	.04793890	7.37569E-02	1.53278E-01	.68543675	.18093455	.12657576	.01937167	.31029648	.5714	.4814
16	.04909626	7.35334E-02	1.52931E-01	.68686384	.17806187	.12537269	.01882031	.31010135	.6190	.4808
17	.05034362	7.32669E-02	1.52657E-01	.68826529	.17526758	.12414699	.01835797	.30988913	.6667	.4802
18	.05140099	7.29634E-02	1.52195E-01	.68970178	.17254171	.12306209	.01792607	.30965769	.7143	.4794
19	.05255835	7.26102E-02	1.51700E-01	.69113929	.16967558	.12201110	.01755068	.30940286	.7619	.4787
20	.05371571	7.22320E-02	1.51172E-01	.69257269	.16696733	.12103987	.01720183	.30913238	.8095	.4778
21	.05487307	7.17888E-02	1.50534E-01	.69401077	.16421438	.12014183	.01689200	.30882524	.8571	.4769
22	.05603043	7.13329E-02	1.49889E-01	.69553612	.16154245	.11929010	.01660254	.30851367	.9048	.4759
23	.05718780	7.07667E-02	1.49006E-01	.69716429	.15868455	.11852210	.01634492	.30813428	.9524	.4747
24	.05834516	7.02467E-02	1.48309E-01	.69866613	.15602554	.11777461	.01609811	.30778265	1.0000	.4737

K=14 PHI =110.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	6.62098E-02	1.36951E-01	.66650251	.22688054	.14436608	.06846347	.31095273	0.0000	.4835
4	.03526207	6.69228E-02	1.40818E-01	.67409466	.22401063	.14459849	.03869011	.30806912	.0476	.4745
5	.03648357	6.73095E-02	1.42945E-01	.67752908	.22010723	.14201458	.02918092	.30735615	.0952	.4723
6	.03770508	6.77302E-02	1.43520E-01	.67959187	.21609563	.13977124	.02556971	.30722030	.1429	.4719
7	.03892659	6.80456E-02	1.44316E-01	.68155680	.21230366	.13740073	.02246855	.30708398	.1905	.4715
8	.04014810	6.82900E-02	1.44867E-01	.68335518	.20867218	.13535670	.02057836	.30702755	.2381	.4713
9	.04136961	6.84420E-02	1.45274E-01	.68483665	.20531923	.13327940	.01900875	.30695977	.2857	.4711
10	.04258112	6.85920E-02	1.45591E-01	.68625518	.20191001	.13133949	.01777960	.30688861	.3333	.4709
11	.04381263	6.85817E-02	1.45711E-01	.68779229	.19875455	.12946800	.01681851	.30681197	.3810	.4707
12	.04503414	6.85676E-02	1.45782E-01	.68920651	.19571685	.12774600	.01598525	.30670928	.4286	.4704
13	.04625565	6.85061E-02	1.45758E-01	.69059693	.19278521	.12606596	.01525359	.30659992	.4762	.4700
14	.04747716	6.83980E-02	1.45657E-01	.69197242	.18994111	.12445013	.01472393	.30646248	.5238	.4696
15	.04869867	6.82455E-02	1.45470E-01	.69331749	.18717466	.12290814	.01425620	.30631295	.5714	.4691
16	.04992018	6.80591E-02	1.45209E-01	.69466676	.18447948	.12140542	.01379449	.30613893	.6190	.4686
17	.05119169	6.78178E-02	1.44903E-01	.69601944	.18184772	.11995945	.01341873	.30594646	.6667	.4680
18	.05236320	6.75479E-02	1.44536E-01	.69736580	.17928848	.11856456	.01306456	.30573351	.7143	.4674
19	.05358471	6.72095E-02	1.44074E-01	.69874644	.17681179	.11719073	.01275982	.30549397	.7619	.4666
20	.05480621	6.68855E-02	1.43576E-01	.70017262	.17440154	.11587415	.01247740	.30523242	.8095	.4659
21	.05602772	6.64731E-02	1.42968E-01	.70158078	.17196860	.11459212	.01222736	.30494267	.8571	.4650
22	.05724923	6.60582E-02	1.42334E-01	.70293858	.16963134	.11340960	.01199490	.30464465	.9048	.4640
23	.05847074	6.55206E-02	1.41514E-01	.70461589	.16617016	.11207525	.01179005	.30426658	.9524	.4629
24	.05969225	6.50429E-02	1.40826E-01	.70607645	.16369464	.11321158	.01159146	.30392749	1.0000	.4619

K=15 PHI =120.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	6.16737E-02	1.30181E-01	.67433565	.22994698	.13720818	.06846347	.30781603	0.0000	.4738
4	.03532815	6.22275E-02	1.34333E-01	.68274511	.22728748	.13754363	.03545453	.30439003	.0476	.4632
5	.03661575	6.26907E-02	1.36061E-01	.68632620	.22386910	.13492600	.02897545	.30356418	.0952	.4608
6	.03790334	6.30521E-02	1.36937E-01	.68899546	.22013728	.13275596	.01973268	.30346182	.1429	.4604
7	.03919094	6.33347E-02	1.37650E-01	.69089459	.21651626	.13044609	.01693126	.30335215	.1905	.4601
8	.04047854	6.35436E-02	1.38143E-01	.69245478	.21304263	.12819294	.01522335	.30330975	.2381	.4600
9	.04176613	6.36847E-02	1.38464E-01	.69390719	.21003502	.12606671	.01396092	.30327243	.2857	.4599
10	.04306373	6.37683E-02	1.38723E-01	.69485267	.20697193	.12403726	.01288947	.30320997	.3333	.4597
11	.04434132	6.37923E-02	1.38931E-01	.69550432	.20402455	.12211865	.01213945	.30315361	.3810	.4595
12	.04563892	6.37608E-02	1.38977E-01	.69706405	.20119048	.12024478	.01145959	.30305984	.4286	.4592
13	.04691652	6.37078E-02	1.38905E-01	.69867785	.19845944	.11856406	.01097525	.30296837	.4762	.4589
14	.04820411	6.36093E-02	1.38706E-01	.69999884	.19579710	.11693765	.01047113	.30283373	.5238	.4585
15	.04949171	6.34187E-02	1.38501E-01	.70098216	.19319757	.11540942	.01010464	.30269115	.5714	.4581
16	.05077930	6.32607E-02	1.38245E-01	.70217607	.19065775	.11390160	.00974306	.30252392	.6190	.4576
17	.05206690	6.30307E-02	1.37913E-01	.70346966	.18814566	.11242508	.00845321	.30233515	.6667	.4570
18	.05335450	6.27690E-02	1.37530E-01	.70477574	.18567852	.11101749	.00918561	.30212612	.7143	.4564
19	.05464209	6.24570E-02	1.37065E-01	.70612559	.18319150	.10962648	.00694820	.30188648	.7619	.4557
20	.05592969	6.21245E-02	1.36564E-01	.70747749	.18075160	.10826649	.00675183	.30163206	.8095	.4549
21	.05721729	6.17176E-02	1.35993E-01	.70902957	.17834951	.10693457	.00834382	.30132936	.8571	.4540
22	.05850488	6.13139E-02	1.35524E-01	.71052646	.17578652	.10560717	.00836504	.30102791	.9048	.4531

23	.05979248	6.07728E-02	1.34485E-01	.71197886	.17299999	.10610910	.00821371	.30063058	.9524	.4519
24	.06108007	6.03041E-02	1.33757E-01	.71344722	.17052168	.10521019	.00806180	.30028195	1.0000	.4508

K=16 PHI =130.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	5.82509E-02	1.24197E-01	.68162203	.23202730	.12436721	.06846347	.30531542	0.0000	.4661
4	.03539391	5.87059E-02	1.29335E-01	.69041271	.23065568	.12515965	.02830802	.30130276	.0476	.4539
5	.03674727	5.90918E-02	1.30563E-01	.69423974	.22748621	.12276388	.01751469	.30040314	.0952	.4512
6	.03810063	5.93910E-02	1.31689E-01	.69532694	.22406036	.12061272	.01450735	.30031367	.1429	.4509
7	.03945398	5.96028E-02	1.32245E-01	.69751428	.22078479	.11840757	.01230376	.30023576	.1905	.4507
8	.04080734	5.97589E-02	1.32636E-01	.69877514	.21767446	.11622261	.01076509	.30018231	.2381	.4505
9	.04216070	5.98504E-02	1.32864E-01	.70038423	.21468193	.11417018	.00992334	.30015913	.2857	.4505
10	.04351406	5.98959E-02	1.33067E-01	.70168768	.21195191	.11217442	.00898571	.30008979	.3333	.4503
11	.04486741	5.98694E-02	1.33056E-01	.70236092	.20933447	.11054427	.00851054	.30003348	.3810	.4501
12	.04622077	5.98540E-02	1.33031E-01	.70413019	.20664613	.10854697	.00795203	.29993555	.4286	.4498
13	.04757413	5.97447E-02	1.32815E-01	.70559440	.20384120	.10668262	.00759159	.29983209	.4762	.4495
14	.04892748	5.96136E-02	1.32747E-01	.70659852	.20152140	.10537797	.00721200	.29969739	.5238	.4491
15	.05028084	5.94428E-02	1.32465E-01	.70793408	.19885467	.10386416	.00694991	.29954655	.5714	.4486
16	.05163420	5.92385E-02	1.32195E-01	.70978047	.19642633	.10247350	.00668164	.29937056	.6190	.4481
17	.05298755	5.89931E-02	1.31625E-01	.71035753	.19400971	.10113359	.00647471	.29917096	.6667	.4475
18	.05434091	5.87189E-02	1.31406E-01	.71164936	.19162633	.09991899	.00627297	.29895040	.7143	.4469
19	.05569427	5.83937E-02	1.30700E-01	.71296636	.18919993	.09876576	.00610705	.29869557	.7619	.4461
20	.05704763	5.80495E-02	1.30063E-01	.71432929	.18681424	.09765457	.00594782	.29842649	.8095	.4453
21	.05840098	5.76250E-02	1.28699E-01	.71580762	.18428134	.09668581	.00581268	.29810012	.8571	.4443
22	.05975434	5.72091E-02	1.29036E-01	.71733173	.18184739	.09563641	.00568254	.29777716	.9048	.4434
23	.06110770	5.66388E-02	1.28126E-01	.71866447	.17902025	.09479117	.00557491	.29733988	.9524	.4421
24	.06246105	5.61478E-02	1.27342E-01	.72049346	.17650415	.09388560	.00546150	.29695823	1.0000	.4409

K=17 PHI =140.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	5.58591E-02	1.21250E-01	.68807753	.23422478	.10560774	.06846347	.30349137	0.0000	.4605
4	.03545803	5.61811E-02	1.25778E-01	.69800010	.23371711	.10729252	.02335618	.29888749	.0476	.4467
5	.03687150	5.64671E-02	1.27192E-01	.70126914	.23085150	.10548593	.01278709	.29797744	.0952	.4440
6	.03828498	5.66711E-02	1.27756E-01	.70274723	.22768755	.10356023	.01019486	.29785509	.1429	.4436
7	.03970245	5.68052E-02	1.28104E-01	.70411243	.22466873	.10156610	.00874954	.29780192	.1905	.4434
8	.04111792	5.68836E-02	1.28366E-01	.70548261	.22178116	.09956171	.00740083	.29772391	.2381	.4432
9	.04253339	5.69207E-02	1.28459E-01	.70656941	.21900462	.09772960	.00620885	.29769263	.2857	.4431
10	.04394887	5.69094E-02	1.28506E-01	.70792495	.21633589	.09585604	.00617491	.29760612	.3333	.4428
11	.04536434	5.68510E-02	1.28441E-01	.70909163	.21374498	.09423957	.00587385	.29753048	.3810	.4426
12	.04677981	5.67560E-02	1.28329E-01	.71036255	.21124428	.09261983	.00543870	.29741369	.4286	.4423
13	.04819529	5.66237E-02	1.28135E-01	.71147566	.20876752	.09114613	.00524454	.29728649	.4762	.4419
14	.04961076	5.64577E-02	1.27885E-01	.71289716	.20655576	.08974607	.00493524	.29713309	.5238	.4414
15	.05102623	5.62513E-02	1.27574E-01	.71310629	.20397480	.08841658	.00478517	.29696122	.5714	.4409
16	.05244171	5.60166E-02	1.27212E-01	.71512491	.20161858	.08714730	.00455486	.29676284	.6190	.4403
17	.05385718	5.57417E-02	1.26779E-01	.71639649	.19935120	.08601481	.00440885	.29653890	.6667	.4397
18	.05527265	5.54402E-02	1.26302E-01	.71768271	.19691408	.08485905	.00426004	.29629354	.7143	.4389
19	.05668813	5.50863E-02	1.25736E-01	.71904506	.19449370	.08356756	.00414026	.29600995	.7619	.4381
20	.05810360	5.47149E-02	1.25141E-01	.72041519	.19211698	.08248178	.00402223	.29571153	.8095	.4372
21	.05951907	5.42589E-02	1.24404E-01	.72194274	.18954616	.08196991	.00392448	.29534788	.8571	.4362
22	.06093455	5.38098E-02	1.23676E-01	.72342635	.18706504	.08108231	.00382582	.29498700	.9048	.4351
23	.06235002	5.31914E-02	1.22666E-01	.72587910	.18410751	.08029115	.00374803	.29449210	.9524	.4336
24	.06376549	5.26544E-02	1.21788E-01	.72691791	.18146307	.07947312	.00366006	.29405630	1.0000	.4323

K=18 PHI =150.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	5.43326E-02	1.18914E-01	.69337083	.23602664	.08137863	.06846347	.30229318	0.0000	.4569
4	.03551087	5.45156E-02	1.23574E-01	.70417461	.23634265	.08435688	.01801550	.29703817	.0476	.4412
5	.03698119	5.46852E-02	1.24634E-01	.70683789	.23565490	.08378424	.00916410	.29623206	.0952	.4388
6	.03845150	5.47946E-02	1.24996E-01	.70896987	.23078855	.08198456	.00711190	.29609958	.1429	.4384
7	.03992182	5.48396E-02	1.25150E-01	.70996337	.22803260	.08053408	.00617679	.29603466	.1905	.4382
8	.04139213	5.48531E-02	1.25262E-01	.71071375	.22533667	.07975013	.00519260	.29594178	.2381	.4379

9	.04286245	5.48124E-02	1.25224E-01	.71182446	.22275318	.07728700	.00186900	.29587622	.2857	.4377
10	.04433276	5.47423E-02	1.25156E-01	.71300104	.22028471	.07571945	.00435401	.29576773	.3333	.4374
11	.04580307	5.46303E-02	1.24992E-01	.71411494	.21778955	.07418051	.00916190	.29566090	.3810	.4371
12	.04727339	5.44879E-02	1.24765E-01	.71527786	.21558388	.07304048	.00868083	.29551782	.4286	.4367
13	.04874370	5.43106E-02	1.24503E-01	.71642450	.21302136	.07187059	.00369237	.29536360	.4762	.4362
14	.05021402	5.41077E-02	1.24188E-01	.71765710	.21064638	.07066318	.00348515	.29518036	.5238	.4357
15	.05168433	5.38874E-02	1.23848E-01	.71890455	.20836055	.06950642	.00335007	.29497505	.5714	.4351
16	.05315465	5.36585E-02	1.23574E-01	.72033518	.20605793	.06857812	.00320184	.29478082	.6190	.4344
17	.05462496	5.32844E-02	1.23077E-01	.72150736	.20371930	.06763741	.00306752	.29449617	.6667	.4336
18	.05609528	5.29500E-02	1.22736E-01	.72260942	.20138596	.06675594	.00297451	.29421952	.7143	.4328
19	.05756559	5.25827E-02	1.21704E-01	.72400144	.19896683	.06589701	.00287957	.29390117	.7619	.4319
20	.05903591	5.21570E-02	1.21041E-01	.72541341	.19654770	.06510205	.00278792	.29356639	.8095	.4309
21	.06050622	5.16614E-02	1.20224E-01	.72701369	.19390029	.06436442	.00271072	.29315820	.8571	.4297
22	.06197654	5.11711E-02	1.19415E-01	.72857621	.19133876	.06364752	.00263161	.29275081	.9048	.4285
23	.06344685	5.04932E-02	1.18288E-01	.73057767	.18819890	.06301180	.00257146	.29218730	.9524	.4269
24	.06491717	4.98977E-02	1.17296E-01	.73235920	.18537532	.06234736	.00249737	.29168485	1.0000	.4254

K=19 PHI =160.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	5.34476E-02	1.17527E-01	.69714538	.23731152	.05389252	.00816347	.30158487	0.0000	.4548
4	.03555365	5.35293E-02	1.22434E-01	.70905240	.23809280	.05787170	.01272592	.29570505	.0476	.4372
5	.03706674	5.35729E-02	1.23047E-01	.71111533	.23563465	.05838611	.00694500	.29508723	.0952	.4354
6	.03857983	5.35942E-02	1.23184E-01	.71218824	.23360549	.05677479	.00538953	.29498253	.1429	.4351
7	.04009292	5.35626E-02	1.23203E-01	.71344252	.23041957	.05599240	.00458362	.29487282	.1905	.4347
8	.04160602	5.35057E-02	1.23153E-01	.71456049	.22795769	.05492719	.00409427	.29477653	.2381	.4345
9	.04311911	5.34670E-02	1.23021E-01	.71561614	.22557293	.05353542	.00378124	.29466740	.2857	.4341
10	.04463220	5.32636E-02	1.22844E-01	.71672182	.22319512	.05256152	.00345352	.29453423	.3333	.4338
11	.04614529	5.31271E-02	1.22604E-01	.71781138	.22080229	.05141882	.00324562	.29438844	.3810	.4333
12	.04765839	5.29415E-02	1.22318E-01	.71893581	.21855636	.05044643	.00301842	.29421739	.4286	.4328
13	.04917148	5.27272E-02	1.21978E-01	.72006783	.21627089	.04959440	.00286190	.29403048	.4762	.4323
14	.05068457	5.24845E-02	1.21591E-01	.72123275	.21399899	.04876851	.00269621	.29381945	.5238	.4316
15	.05219766	5.22119E-02	1.21150E-01	.72242736	.21172102	.04801154	.00256800	.29358739	.5714	.4310
16	.05371075	5.19115E-02	1.20660E-01	.72365229	.20944254	.04729765	.00244327	.29333249	.6190	.4302
17	.05523385	5.15745E-02	1.20111E-01	.72494289	.20712117	.04668727	.00235805	.29304854	.6667	.4294
18	.05675694	5.12113E-02	1.19515E-01	.72626007	.20476917	.04606517	.00243943	.29274269	.7143	.4285
19	.05828003	5.07949E-02	1.18828E-01	.72769602	.20239543	.04541752	.00215322	.29239239	.7619	.4275
20	.05976312	5.05585E-02	1.18104E-01	.72913661	.19989653	.04486590	.00207132	.29202355	.8095	.4264
21	.06127621	4.98264E-02	1.17221E-01	.73060060	.19718737	.04434295	.00200156	.29157528	.8571	.4251
22	.06278931	4.92989E-02	1.16336E-01	.73244302	.19452941	.04385205	.00192941	.29112317	.9048	.4238
23	.06430240	4.85646E-02	1.15100E-01	.73458955	.19120342	.04341831	.00187556	.29049410	.9524	.4219
24	.06581549	4.79135E-02	1.14001E-01	.73650994	.18819918	.04295893	.00180464	.28992713	1.0000	.4203

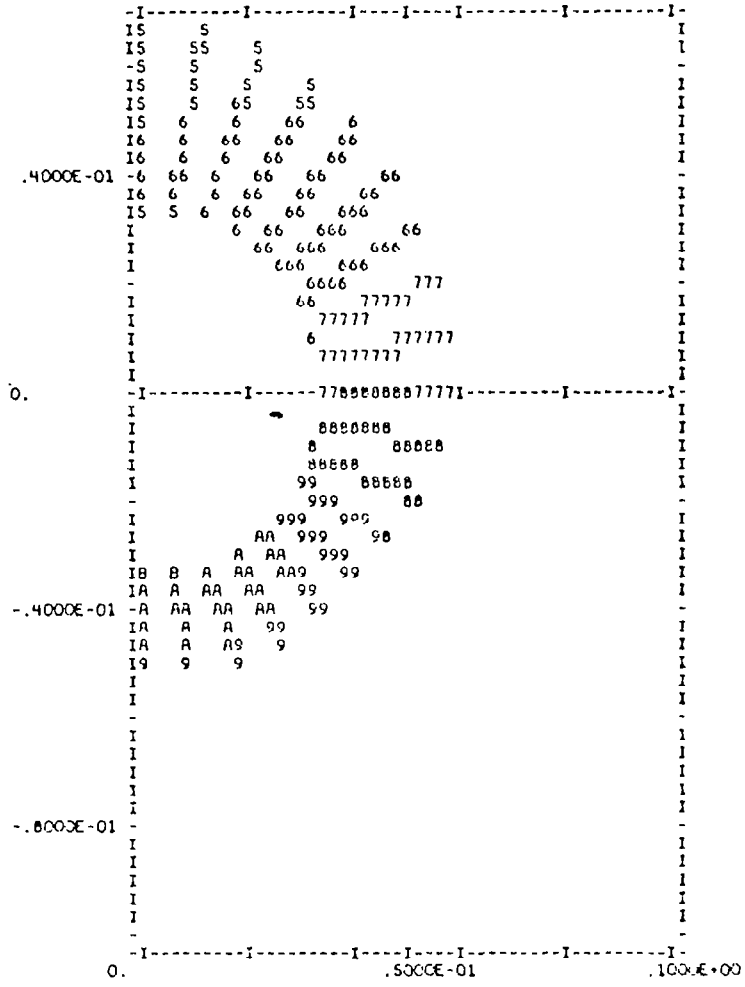
K=20 PHI =170.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	5.30018E-02	1.16826E-01	.69925885	.23805035	.02642556	.00816347	.30122418	0.0000	.4537
4	.03556110	5.30466E-02	1.21974E-01	.71216010	.23587852	.04941523	.00693842	.29492365	.0476	.4349
5	.03712165	5.29859E-02	1.22193E-01	.71374653	.23673077	.03010389	.00528095	.29449038	.0952	.4336
6	.03866219	5.29434E-02	1.22196E-01	.71485078	.23428296	.02906760	.00444284	.29436859	.1429	.4333
7	.04020274	5.28651E-02	1.22126E-01	.71598674	.23192517	.02874997	.00376999	.29423567	.1905	.4329
8	.04174329	5.27513E-02	1.21959E-01	.71691574	.22860590	.02793423	.00353056	.29411998	.2381	.4325
9	.04328383	5.26218E-02	1.21767E-01	.71795435	.22746862	.02745755	.00318073	.29399049	.2857	.4322
10	.04482438	5.24551E-02	1.21508E-01	.71893555	.22501148	.02681180	.00287578	.29383675	.3333	.4317
11	.04636493	5.22703E-02	1.21221E-01	.72003872	.22278638	.02632706	.00263230	.29366258	.3810	.4312
12	.04790547	5.20598E-02	1.20884E-01	.72115842	.22055886	.02591272	.00243652	.29346827	.4286	.4306
13	.04944602	5.18169E-02	1.20506E-01	.72229369	.21822710	.02556112	.00244499	.29325619	.4762	.4300
14	.05098656	5.15504E-02	1.20075E-01	.72343628	.21610052	.02495462	.00230035	.29302514	.5238	.4293
15	.05252711	5.12568E-02	1.19598E-01	.72462883	.21385563	.02454084	.00216220	.29277178	.5714	.4286
16	.05406766	5.09371E-02	1.19074E-01	.72585376	.21160074	.02417421	.00208147	.29249858	.6190	.4278
17	.05560820	5.05801E-02	1.18486E-01	.72719800	.20928952	.02382450	.00194625	.29219386	.6667	.4269
18	.05714875	5.02012E-02	1.17859E-01	.72847668	.20696342	.02350721	.00185611	.29187078	.7143	.4259
19	.05868930	4.97635E-02	1.17131E-01	.72992191	.20455540	.02319163	.00177546	.29149735	.7619	.4249
20	.06022984	4.93120E-02	1.16377E-01	.73128607	.20220493	.02290769	.00169893	.29111019	.8095	.4237
21	.06177039	4.87580E-02	1.15443E-01	.73309586	.19960068	.02264737	.00163562	.29063414	.8571	.4223

22	.06331093	4.82052E-02	1.14516E-01	.73478557	.19657570	.02238877	.00156734	.29015406	.9048	.4209
23	.06485148	4.74366E-02	1.13213E-01	.73702228	.19313900	.02217144	.00151921	.28948365	.9524	.4190
24	.06639203	4.67370E-02	1.12023E-01	.73906799	.18996996	.02193724	.00145106	.28886283	1.0000	.4172

K=21 PHI =180.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404056	5.28402E-02	1.16572E-01	.69995947	.23826945	0.00000000	.06846347	.30109281	0.0000	.4533
4	.03558996	5.28874E-02	1.21809E-01	.71319961	.23005815	0.00000000	.00787640	.29468527	.0476	.4342
5	.03713936	5.27904E-02	1.21879E-01	.71461269	.23704579	0.00000000	.00519157	.29432567	.0952	.4331
6	.03868876	5.27203E-02	1.21849E-01	.71572087	.23464350	0.00000000	.00424770	.29417212	.1429	.4327
7	.04023816	5.26294E-02	1.21743E-01	.71673656	.23257450	0.00000000	.00368094	.29403772	.1905	.4323
8	.04178757	5.24922E-02	1.21559E-01	.71774019	.23011689	0.00000000	.00345423	.29390313	.2381	.4319
9	.04333697	5.23518E-02	1.21324E-01	.71873714	.22784987	0.00000000	.00323683	.29376985	.2857	.4315
10	.04488637	5.21692E-02	1.21026E-01	.71977052	.22563610	0.00000000	.00306841	.29360564	.3333	.4310
11	.04643577	5.19756E-02	1.20739E-01	.72084068	.22340066	0.00000000	.00279933	.29342149	.3810	.4305
12	.04798517	5.17481E-02	1.20378E-01	.72193598	.22119961	0.00000000	.00259942	.29321636	.4286	.4299
13	.04953458	5.15020E-02	1.19988E-01	.72306149	.21898707	0.00000000	.00237568	.29299377	.4762	.4292
14	.05108398	5.12267E-02	1.19542E-01	.72421328	.21677355	0.00000000	.00222668	.29275394	.5238	.4285
15	.05263338	5.09262E-02	1.19094E-01	.72540628	.21454033	0.00000000	.00207461	.29249211	.5714	.4278
16	.05418278	5.05994E-02	1.18617E-01	.72663221	.21229118	0.00000000	.00196328	.29221160	.6190	.4269
17	.05573218	5.02354E-02	1.17917E-01	.72793133	.20998170	0.00000000	.00184960	.29189850	.6667	.4260
18	.05728159	4.98519E-02	1.17281E-01	.72925406	.20766453	0.00000000	.00175755	.29156956	.7143	.4251
19	.05883099	4.94053E-02	1.16537E-01	.73071893	.20518990	0.00000000	.00167327	.29118618	.7619	.4239
20	.06038039	4.89518E-02	1.15778E-01	.73218082	.20274014	0.00000000	.00159430	.29079467	.8095	.4228
21	.06192979	4.83872E-02	1.14828E-01	.73351410	.19995237	0.00000000	.00152962	.29030635	.8571	.4214
22	.06347919	4.78298E-02	1.13887E-01	.73561219	.19723046	0.00000000	.00145788	.28981889	.9048	.4200
23	.06502860	4.70485E-02	1.12559E-01	.73788403	.19374783	0.00000000	.00140978	.28913282	.9524	.4180
24	.06657800	4.63281E-02	1.11331E-01	.73998590	.19050454	0.00000000	.00133808	.28848878	1.0000	.4161



VERTICAL SCALING

0.	< 0 <	.200E-01	.200E-01	< 1 <	.400E-01
.400E-01	< 2 <	.600E-01	.600E-01	< 3 <	.800E-01
.800E-01	< 4 <	.100E+00	.100E+00	< 5 <	.120
.120	< 6 <	.140	.140	< 7 <	.160
.160	< 8 <	.180	.180	< 9 <	.200
.200	< A <	.220	.220	< B <	.240
.240	< C <	.260	.260	< D <	.280
.280	< E <	.300	.300	< F <	.320
.320	< G <	.340	.340	< H <	.360
.360	< I <	.380			

SURFACE FLOW VARIABLES AT Z = .100000
X/L = .001000 DZDT= 1.199208 ITER= 500

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M PHI	R	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	.0340	.5004	3.8655E+00	2.5017E+00	1.7784	.6054	0.0000	3.4241E-01	1.0000	.58622	.00	6.8463E-02
10.0	.0340	.4954	3.8365E+00	2.4884E+00	1.7820	.6066	.0616	3.4205E-01	1.0000	.58498	.00	6.8463E-02
20.0	.0340	.4809	3.7532E+00	2.4496E+00	1.7926	.6102	.1227	3.4098E-01	1.0000	.58133	.00	6.8463E-02
30.0	.0340	.4576	3.6204E+00	2.3871E+00	1.8103	.6162	.1823	3.3925E-01	1.0000	.57537	.00	6.8463E-02
40.0	.0340	.4272	3.4460E+00	2.3044E+00	1.8347	.6245	.2395	3.3684E-01	1.0000	.56731	.00	6.8463E-02
50.0	.0340	.3913	3.2403E+00	2.2053E+00	1.8656	.6350	.2936	3.3387E-01	1.0000	.55742	.00	6.8463E-02
60.0	.0340	.3519	3.0147E+00	2.0944E+00	1.9025	.6476	.3431	3.3047E-01	1.0000	.54605	.00	6.8463E-02
70.0	.0340	.3110	2.7801E+00	1.9771E+00	1.9448	.6620	.3870	3.2668E-01	1.0000	.53360	.00	6.8463E-02
80.0	.0340	.2707	2.5511E+00	1.8598E+00	1.9916	.6779	.4243	3.2264E-01	1.0000	.52055	.00	6.8463E-02
90.0	.0340	.2327	2.3360E+00	1.7494E+00	2.0419	.6949	.4542	3.1858E-01	1.0000	.50746	.00	6.8463E-02
100.0	.0340	.1985	2.1500E+00	1.6526E+00	2.0947	.7124	.4761	3.1461E-01	1.0000	.49489	.00	6.8463E-02
110.0	.0340	.1692	1.9983E+00	1.5719E+00	2.1494	.7296	.4893	3.1095E-01	1.0000	.48346	.00	6.8463E-02
120.0	.0340	.1456	1.8838E+00	1.5085E+00	2.1907	.7457	.4957	3.0782E-01	1.0000	.47375	.00	6.8463E-02
130.0	.0340	.1279	1.7821E+00	1.4598E+00	2.2325	.7600	.4975	3.0532E-01	1.0000	.46609	.00	6.8463E-02
140.0	.0340	.1154	1.6609E+00	1.3602E+00	2.2672	.7718	.3480	3.0349E-01	1.0000	.46054	.00	6.8463E-02
150.0	.0340	.1075	1.6159E+00	1.3419E+00	2.2937	.7808	.2692	3.0229E-01	1.0000	.45691	.00	6.8463E-02
160.0	.0340	.1029	1.5866E+00	1.3258E+00	2.3116	.7869	.1787	3.0158E-01	1.0000	.45477	.00	6.8463E-02
170.0	.0340	.1006	1.5760E+00	1.3179E+00	2.3214	.7902	.0877	3.0122E-01	1.0000	.45368	.00	6.8463E-02
180.0	.0340	.0998	1.5722E+00	1.3150E+00	2.3247	.7913	0.0000	3.0109E-01	1.0000	.45328	.00	6.8463E-02

BODY AND SHOCK GEOMETRY AT Z = .100

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	.0340	.3404	0.0000	.0515	.5150	0.0000
10.0	.0340	.3404	0.0000	.0516	.5156	.0008
20.0	.0340	.3404	0.0000	.0518	.5176	.0016
30.0	.0340	.3404	0.0000	.0521	.5210	.0024
40.0	.0340	.3404	0.0000	.0526	.5258	.0032
50.0	.0340	.3404	0.0000	.0532	.5321	.0040
60.0	.0340	.3404	0.0000	.0540	.5397	.0048
70.0	.0340	.3404	0.0000	.0549	.5487	.00
80.0	.0340	.3404	0.0000	.0559	.5591	.0063
90.0	.0340	.3404	0.0000	.0571	.5708	.0070
100.0	.0340	.3404	0.0000	.0583	.5834	.0075
110.0	.0340	.3404	0.0000	.0597	.5969	.0078
120.0	.0340	.3404	0.0000	.0611	.6109	.0079
130.0	.0340	.3404	0.0000	.0625	.6248	.0077
140.0	.0340	.3404	0.0000	.0638	.6378	.0073
150.0	.0340	.3404	0.0000	.0649	.6488	.0069
160.0	.0340	.3404	0.0000	.0658	.6582	.0062
170.0	.0340	.3404	0.0000	.0664	.6644	.0042
180.0	.0340	.3404	0.0000	.0666	.6674	0.0000

FLOW FIELD DATA IS STORED ON DISK1

```
NSEG,KIND     3     0     1     1     0     0     0     0
ZSEG      .10000   7.80000  33.80000        -I        -I        -I        -I
RSEG      .03405   1.30000   1.30000        -I        -I        -I        -I
DSEG     0.00000   0.00000   0.00000        -I        -I        -I        -I
ASEG     0.00000   0.00000   0.00000        -I        -I        -I        -I

SEGMENT  1  ZCENT,RCENT,RADIUS    7.80000 -22.75000  24.05000
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```
MACH =  2.860000
ALPHA = 10.000000
GAMMA = 1.400
SIGMA =  9.34

Z-INITIAL =      .10
Z-FINAL =      33.80
PHI-ZERO =   90.00

NIT = 20
NIPHI = 18
METHOD ORDER = 2
NITER = 9999
NPRNT = 0
IPRNT = 1
NCONE = 2
NUMPRT= 0
NREAL = 0

DZ/DT =  1.199 INITIALLY
DELTA-X =    .150
DELTA-Y =    .400

DISK1 = 1
DISK2 = 3
TAPE1 = 1
TAPE2 = 1

PERCENT OF MAX. STEPSIZE =   .90
METHOD = 2
BND. COND. = 1
BETA=0.000
OMEGA= 0.000

PINF =      .336308E-01     RHOIN =      .886481E-01     QINF =      .787798E+00

GASCON= 1.716CE+03

K =  3     PHI=  0.000000     UINF=   .775830     VINF=  -.136800     WINF=  0.000000
K =  4     PHI= 10.000000     UINF=   .775830     VINF=  -.134721     WINF=   .023755
K =  5     PHI= 20.000000     UINF=   .775830     VINF=  -.128550     WINF=   .046788
K =  6     PHI= 30.000000     UINF=   .775830     VINF=  -.118472     WINF=   .068400
K =  7     PHI= 40.000000     UINF=   .775830     VINF=  -.104795     WINF=   .087933
K =  8     PHI= 50.000000     UINF=   .775830     VINF=  -.087933     WINF=   .104795
K =  9     PHI= 60.000000     UINF=   .775830     VINF=  -.068400     WINF=   .118472
K = 10     PHI= 70.000000     UINF=   .775830     VINF=  -.046788     WINF=   .128550
K = 11     PHI= 80.000000     UINF=   .775830     VINF=  -.023755     WINF=   .134721
K = 12     PHI= 90.000000     UINF=   .775830     VINF=  -.000000     WINF=   .136800
K = 13     PHI=100.000000     UINF=   .775830     VINF=   .023755     WINF=   .134721
K = 14     PHI=110.000000     UINF=   .775830     VINF=   .046788     WINF=   .128550
K = 15     PHI=120.000000     UINF=   .775830     VINF=   .068400     WINF=   .118472
K = 16     PHI=130.000000     UINF=   .775830     VINF=   .087933     WINF=   .104795
K = 17     PHI=140.000000     UINF=   .775830     VINF=   .104795     WINF=   .087933
K = 18     PHI=150.000000     UINF=   .775830     VINF=   .118472     WINF=   .068400
K = 19     PHI=160.000000     UINF=   .775830     VINF=   .128550     WINF=   .046788
K = 20     PHI=170.000000     UINF=   .775830     VINF=   .134721     WINF=   .023755
K = 21     PHI=180.000000     UINF=   .775830     VINF=   .136800     WINF=   .000000
```

RADIAL MESH DESCRIPTION

J= 3	TAU= 0.	XI = 0.	TXI = .1000E+01	TXIT = 0.
J= 4	TAU= .4762E-01	XI = .4762E-01	TXI = .1000E+01	TXIT = 0
J= 5	TAU= .9524E-01	XI = .9524E-01	TXI = .1000E+01	TXIT = 0.
J= 6	TAU= .1429E+00	XI = .1429E+00	TXI = .1000E+01	TXIT = 0.
J= 7	TAU= .1905E+00	XI = .1905E+00	TXI = .1000E+01	TXIT = 0.
J= 8	TAU= .2381E+00	XI = .2381E+00	TXI = .1000E+01	TXIT = 0.
J= 9	TAU= .2857E+00	XI = .2857E+00	TXI = .1000E+01	TXIT = 0.
J=10	TAU= .3333E+00	XI = .3333E+00	TXI = .1000E+01	TXIT = 0.
J=11	TAU= .3810E+00	XI = .3810E+00	TXI = .1000E+01	TXIT = 0.
J=12	TAU= .4286E+00	XI = .4286E+00	TXI = .1000E+01	TXIT = 0.
J=13	TAU= .4762E+00	XI = .4762E+00	TXI = .1000E+01	TXIT = 0.
J=14	TAU= .5238E+00	XI = .5238E+00	TXI = .1000E+01	TXIT = 0.
J=15	TAU= .5714E+00	XI = .5714E+00	TXI = .1000E+01	TXIT = 0.
J=16	TAU= .6190E+00	XI = .6190E+00	TXI = .1000E+01	TXIT = 0.
J=17	TAU= .6667E+00	XI = .6667E+00	TXI = .1000E+01	TXIT = 0.
J=18	TAU= .7143E+00	XI = .7143E+00	TXI = .1000E+01	TXIT = 0.
J=19	TAU= .7619E+00	XI = .7619E+00	TXI = .1000E+01	TXIT = 0.
J=20	TAU= .8095E+00	XI = .8095E+00	TXI = .1000E+01	TXIT = 0.
J=21	TAU= .8571E+00	XI = .8571E+00	TXI = .1000E+01	TXIT = 0.
J=22	TAU= .9048E+00	XI = .9048E+00	TXI = .1000E+01	TXIT = 0.
J=23	TAU= .9524E+00	XI = .9524E+00	TXI = .1000E+01	TXIT = 0.
J=24	TAU= .1000E+01	XI = .1000E+01	TXI = .1000E+01	TXIT = 0.

MERIDIANOL MESH DESCRIPTION

K= 2	ETA= -.1745E+00	PHI= -.1745E+00	DTIL= .1000E+01	DTILE= 0.
K= 3	ETA= 0.	PHI= 0.	DTIL= .1000E+01	DTILE= 0.
K= 4	ETA= .1745E+00	PHI= .1745E+00	DTIL= .1000E+01	DTILE= 0.
K= 5	ETA= .3491E+00	PHI= .3491E+00	DTIL= .1000E+01	DTILE= 0.
K= 6	ETA= .5236E+00	PHI= .5236E+00	DTIL= .1000E+01	DTILE= 0.
K= 7	ETA= .6981E+00	PHI= .6981E+00	DTIL= .1000E+01	DTILE= 0.
K= 8	ETA= .8727E+00	PHI= .8727E+00	DTIL= .1000E+01	DTILE= 0.
K= 9	ETA= .1047E+01	PHI= .1047E+01	DTIL= .1000E+01	DTILE= 0.
K=10	ETA= .1222E+01	PHI= .1222E+01	DTIL= .1000E+01	DTILE= 0.
K=11	ETA= .1396E+01	PHI= .1396E+01	DTIL= .1000E+01	DTILE= 0.
K=12	ETA= .1571E+01	PHI= .1571E+01	DTIL= .1000E+01	DTILE= 0.
K=13	ETA= .1745E+01	PHI= .1745E+01	DTIL= .1000E+01	DTILE= 0.
K=14	ETA= .1920E+01	PHI= .1920E+01	DTIL= .1000E+01	DTILE= 0.
K=15	ETA= .2094E+01	PHI= .2094E+01	DTIL= .1000E+01	DTILE= 0.
K=16	ETA= .2269E+01	PHI= .2269E+01	DTIL= .1000E+01	DTILE= 0.
K=17	ETA= .2443E+01	PHI= .2443E+01	DTIL= .1000E+01	DTILE= 0.
K=18	ETA= .2618E+01	PHI= .2618E+01	DTIL= .1000E+01	DTILE= 0.
K=19	ETA= .2793E+01	PHI= .2793E+01	DTIL= .1000E+01	DTILE= 0.
K=20	ETA= .2967E+01	PHI= .2967E+01	DTIL= .1000E+01	DTILE= 0.
K=21	ETA= .3142E+01	PHI= .3142E+01	DTIL= .1000E+01	DTILE= 0.
K=22	ETA= .3316E+01	PHI= -.2967E+01	DTIL= .1000E+01	DTILE= 0.

FLOW FIELD DATA WAS READ FROM DISK1

K= 3 PHI = 0.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	1.29982E-01	2.21729E-01	.60894191	.20728665	0.00000000	.06846347	.34240969	0.0000	.5862
4	.03487203	1.29931E-01	2.21667E-01	.61135050	.20024083	0.00000000	.06845970	.34238989	.0476	.5862
5	.03570360	1.29730E-01	2.21422E-01	.61370994	.19259726	0.00000000	.06845970	.34231439	.0952	.5859
6	.03653517	1.29417E-01	2.21040E-01	.61601464	.18717683	0.00000000	.06845970	.34219610	.1429	.5855
7	.03736674	1.29003E-01	2.20533E-01	.61827195	.18106950	0.00000000	.06845970	.34203907	.1905	.5850
8	.03819831	1.28496E-01	2.19915E-01	.62048809	.17520594	0.00000000	.06845970	.34184716	.2381	.5843
9	.03902987	1.27908E-01	2.19197E-01	.62266888	.16959016	0.00000000	.06845970	.34162342	.2857	.5835
10	.03986144	1.27246E-01	2.18386E-01	.62481984	.16410226	0.00000000	.06845970	.34137027	.3333	.5827
11	.04069301	1.26516E-01	2.17499E-01	.62690613	.15881209	0.00000000	.06845970	.34108970	.3810	.5817
12	.04152458	1.25723E-01	2.16514E-01	.62900276	.15370965	0.00000000	.06845970	.34078321	.4286	.5807
13	.04235614	1.24870E-01	2.15464E-01	.63114451	.14879423	0.00000000	.06845970	.34045197	.4762	.5795
14	.04318771	1.23961E-01	2.14345E-01	.63332618	.14368738	0.00000000	.06845970	.34009677	.5238	.5783
15	.04401928	1.22999E-01	2.13158E-01	.63553259	.13920743	0.00000000	.06845970	.33971811	.5714	.5770
16	.04485085	1.21983E-01	2.11894E-01	.63776860	.13442942	0.00000000	.06845970	.33931615	.6190	.5757
17	.04568242	1.20916E-01	2.10569E-01	.63998965	.12983436	0.00000000	.06845970	.33889066	.6667	.5742
18	.04651398	1.19798E-01	2.09177E-01	.64155039	.12538052	0.00000000	.06845970	.33844139	.7143	.5727
19	.04734555	1.18627E-01	2.07714E-01	.64365939	.12081310	0.00000000	.06845970	.33796672	.7619	.5711
20	.04817712	1.17405E-01	2.06184E-01	.64578615	.11637569	0.00000000	.06845970	.33746752	.8095	.5694
21	.04900869	1.16118E-01	2.04566E-01	.64795738	.11189842	0.00000000	.06845970	.33693619	.8571	.5676
22	.04984025	1.14795E-01	2.02899E-01	.65013366	.10767701	0.00000000	.06845970	.33638517	.9048	.5658
23	.05067182	1.13346E-01	2.01066E-01	.65244193	.10193154	0.00000000	.06845970	.33577517	.9524	.5637
24	.05150339	1.11961E-01	1.99306E-01	.65462775	.09856234	0.00000000	.06845970	.33518591	1.0000	.5617

K= 4 PHI = 10.0 Z = .100000

J	R	P	RHO	U	V	W	(S SINF)/CV	A	T	H/HT
3	.03404047	1.29025E-01	2.20561E-01	.60952474	.20748505	.02108710	.06846347	.34204821	0.0000	.5850
4	.03487530	1.28985E-01	2.20490E-01	.61185377	.20043479	.02124411	.06863551	.34205567	.0476	.5850
5	.03571014	1.28804E-01	2.20287E-01	.61423797	.19378419	.02112320	.06849670	.34196877	.0952	.5847
6	.03654497	1.28507E-01	2.19936E-01	.61654891	.18743174	.02109855	.06841787	.34184625	.1429	.5843
7	.03737980	1.28108E-01	2.19471E-01	.61883683	.18135973	.02087252	.06846634	.34167620	.1905	.5837
8	.03821464	1.27619E-01	2.18879E-01	.62105155	.17552591	.02078728	.06821984	.34148344	.2381	.5831
9	.03904947	1.27047E-01	2.18195E-01	.62324789	.16990634	.02066980	.06811724	.34125213	.2857	.5823
10	.03988431	1.26402E-01	2.17410E-01	.62539761	.16448458	.02060117	.06830078	.34099804	.3333	.5814
11	.04071914	1.25688E-01	2.16543E-01	.62752972	.15923642	.02054157	.06799972	.34071369	.3810	.5804
12	.04155398	1.24910E-01	2.15592E-01	.62963485	.15414155	.02045140	.06795338	.34040625	.4286	.5794

13	.04238881	1.24074E-01	2.14568E-01	.63172672	.14918435	.02039975	.06790202	.34007341	.4762	.5782
14	.04320364	1.23181E-01	2.13471E-01	.63190572	.14934730	.02038673	.06785969	.33971770	.5238	.5770
15	.04406848	1.22235E-01	2.12304E-01	.63187899	.13951529	.02037186	.06781879	.33933869	.5714	.5758
16	.04489331	1.21237E-01	2.11070E-01	.63195069	.13497335	.02035496	.06778156	.33893683	.6190	.5744
17	.04572815	1.20187E-01	2.09769E-01	.64002650	.13040627	.02033573	.06774708	.33851180	.6667	.5730
18	.04656298	1.19086E-01	2.08399E-01	.64211131	.12580667	.02031394	.06771462	.33806327	.7143	.5714
19	.04739782	1.17932E-01	2.06958E-01	.64421333	.12143878	.02028944	.06768480	.33758975	.7619	.5698
20	.04823265	1.16728E-01	2.05451E-01	.64633298	.11701283	.02026201	.06765807	.33709179	.8095	.5682
21	.04906748	1.15469E-01	2.03857E-01	.64849089	.11256946	.02023168	.06763064	.33656250	.8571	.5664
22	.04990232	1.14152E-01	2.02210E-01	.65066498	.10819123	.02019818	.06760541	.33601255	.9048	.5645
23	.05073715	1.12725E-01	2.00404E-01	.65295696	.10368070	.02016198	.06758493	.33540704	.9524	.5625
24	.05157199	1.11349E-01	1.98650E-01	.65514775	.09932843	.02022248	.06755256	.33481527	1.0000	.5605

K= 5 PHI = 20.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	1.26225E-01	2.17131E-01	.61124959	.20807219	.04184351	.06846347	.34097772	0.0000	.5813
4	.03489497	1.26234E-01	2.17242E-01	.61375304	.20114519	.04207871	.06782304	.34090336	.0476	.5811
5	.03572948	1.26095E-01	2.17144E-01	.61618790	.19456183	.04187759	.06735082	.34079221	.0952	.5807
6	.03657399	1.25843E-01	2.16875E-01	.61850723	.18830495	.04163297	.06708957	.34066310	.1429	.5803
7	.03741849	1.25490E-01	2.16490E-01	.62075825	.18276836	.04137316	.06677015	.34048772	.1905	.5797
8	.03826300	1.25047E-01	2.15997E-01	.62300470	.17654060	.04111091	.06655633	.34029440	.2381	.5790
9	.03910750	1.24502E-01	2.15356E-01	.62519212	.17100784	.04090326	.06637252	.34006268	.2857	.5782
10	.03995201	1.23902E-01	2.14657E-01	.62732589	.16565483	.04077534	.06622785	.33981075	.3333	.5774
11	.04079652	1.23255E-01	2.13836E-01	.62944160	.16048661	.04066458	.06606333	.33952867	.3810	.5764
12	.04164102	1.22524E-01	2.12949E-01	.63152633	.15546739	.04045243	.06593642	.33922499	.4286	.5754
13	.04248552	1.21734E-01	2.11987E-01	.63359679	.15058650	.04031746	.06580819	.33889624	.4762	.5743
14	.04333003	1.20888E-01	2.10951E-01	.63565201	.14582504	.04019966	.06569693	.33854550	.5238	.5731
15	.04417454	1.19983E-01	2.09845E-01	.63770023	.14117121	.04006620	.06559128	.33817192	.5714	.5718
16	.04501905	1.19039E-01	2.08670E-01	.63974530	.13660687	.04001261	.06545417	.33777611	.6190	.5705
17	.04586355	1.18057E-01	2.07428E-01	.64179317	.13211922	.03990037	.06536566	.33735765	.6667	.5691
18	.04670806	1.16985E-01	2.06116E-01	.64384874	.12769171	.03984655	.06531860	.33691621	.7143	.5676
19	.04755257	1.15880E-01	2.04737E-01	.64592030	.12330770	.03976613	.06523938	.33645029	.7619	.5660
20	.04839707	1.14726E-01	2.03289E-01	.64800830	.11896458	.03981923	.06516396	.33596044	.8095	.5643
21	.04924158	1.13507E-01	2.01755E-01	.65013698	.11461950	.0398 682	.06509439	.33543992	.8571	.5626
22	.05008608	1.12251E-01	2.00167E-01	.65227411	.11026710	.0398 720	.06502547	.33489885	.9048	.5608
23	.05093059	1.10880E-01	1.98426E-01	.65452689	.10588582	.0398 375	.06496086	.33430430	.9524	.5588
24	.05177510	1.09549E-01	1.96731E-01	.65669121	.10160711	.03985007	.06489772	.33371983	1.0000	.5568

K= 6 PHI = 30.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	1.21756E-01	2.11612E-01	.61408883	.20903868	.06184440	.06846347	.33922648	0.0000	.5754
4	.03490124	1.21836E-01	2.12018E-01	.61688737	.20231932	.06219758	.06843570	.33901278	.0476	.5746
5	.03576202	1.21766E-01	2.12084E-01	.61939484	.19589694	.06183202	.06544608	.33886612	.0952	.5742
6	.03662280	1.21589E-01	2.11943E-01	.62172009	.18974322	.06143642	.06490447	.33872915	.1429	.5737
7	.03748358	1.21308E-01	2.11682E-01	.62401528	.18387343	.06101942	.06431882	.33854647	.1905	.5731
8	.03834436	1.20937E-01	2.11275E-01	.62620746	.17823112	.06060942	.06374509	.33835306	.2381	.5724
9	.03920513	1.20488E-01	2.10771E-01	.62837635	.17281774	.06019160	.06353863	.33812272	.2857	.5716
10	.04006591	1.19957E-01	2.10157E-01	.63048451	.16759188	.06014402	.06323822	.33787482	.3333	.5708
11	.04092669	1.19363E-01	2.09458E-01	.63257066	.16254518	.05976233	.06293286	.33759814	.3810	.5699
12	.04178747	1.18705E-01	2.08671E-01	.63462216	.15769734	.05951879	.06267921	.33730122	.4286	.5689
13	.04264825	1.17988E-01	2.07807E-01	.63665623	.15289121	.05928124	.06243577	.33698037	.4762	.5678
14	.04350902	1.17216E-01	2.06867E-01	.63867255	.14825455	.05907962	.06221642	.33663846	.5238	.5666
15	.04436980	1.16392E-01	2.05856E-01	.64067938	.14372605	.0589 246	.06201529	.33627467	.5714	.5654
16	.04523058	1.15516E-01	2.04770E-01	.64268101	.13928777	.05874924	.06182743	.33588944	.6190	.5641
17	.04609136	1.14589E-01	2.03627E-01	.64468539	.13492789	.05861913	.06165208	.33548238	.6667	.5627
18	.04696214	1.13614E-01	2.02410E-01	.64669156	.13059722	.05851102	.06148466	.33506513	.7143	.5613
19	.04781291	1.12586E-01	2.01123E-01	.64871402	.12637786	.0584 505	.06133267	.33460014	.7619	.5598
20	.04867369	1.11510E-01	1.99765E-01	.65075085	.12215413	.05835099	.06119053	.33412411	.8095	.5582
21	.04953447	1.10370E-01	1.98327E-01	.65282694	.11794152	.05831604	.06105941	.33361806	.8571	.5565
22	.05039525	1.09194E-01	1.96834E-01	.65490766	.11376023	.05829185	.06092455	.33309237	.9048	.5548
23	.05125603	1.07907E-01	1.95196E-01	.65710426	.10960243	.05829217	.06080696	.33251456	.9524	.5528
24	.05211680	1.06654E-01	1.93585E-01	.65921666	.10553363	.05830500	.06068293	.33194540	1.0000	.5509

K=12 PHI = 90.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	7.84464E-02	1.54586E-01	.65035462	.22136373	.14341625	.06846347	.31857806	0.0000	.5075
4	.03513772	7.90533E-02	1.57713E-01	.65646127	.21729474	.14357458	.04813115	.31662132	.0476	.5012
5	.03623498	7.95239E-02	1.59192E-01	.65966243	.21256890	.14160367	.04112604	.31610389	.0952	.4996
6	.03733224	7.99058E-02	1.60098E-01	.66199193	.20791749	.13970402	.03783202	.31595389	.1429	.4991
7	.03842950	8.01553E-02	1.60817E-01	.66404872	.20355639	.13790336	.03503042	.31578258	.1905	.4986
8	.03951675	8.03714E-02	1.61312E-01	.66591187	.19934870	.13616901	.03302059	.31566959	.2381	.4982
9	.04062401	8.04834E-02	1.61673E-01	.66774207	.19535637	.13447719	.03134359	.31553597	.2857	.4978
10	.04172127	8.05591E-02	1.61[illegible]E-01	.66955083	.19155725	.13280487	.02997111	.31540468	.3333	.4974
11	.04281853	8.0[illegible]E-02	1.61[illegible]E-01	.67111918	.18793710	.13119743	.02878812	.31525904	.3810	.4969
12	.04391579	8.0[illegible]E-02	1.61996E-01	.67268405	.18447763	.12998818	.02776917	.31509935	.4286	.4964
13	.04501304	8.0[illegible]E-02	1.61500E-01	.67453021	.18101138	.12866791	.02699591	.31492572	.4762	.4959
14	.04611030	8.01034E-02	1.61751E-01	.67595290	.17773526	.12742390	.02611290	.31473419	.5238	.4953
15	.04720756	7.98712E-02	1.61474E-01	.67743989	.17455702	.12626186	.02543525	.31452746	.5714	.4946
16	.04830482	7.95545E-02	1.61246E-01	.67897495	.17145632	.12517112	.02496609	.31430218	.6190	.4939
17	.04940207	7.92728E-02	1.60745E-01	.68044169	.16841609	.12415784	.02427245	.31405939	.6667	.4932
18	.05049933	7.87114E-02	1.60276E-01	.68198518	.16544107	.12320125	.02377144	.31379832	.7143	.4923
19	.05159659	7.85004E-02	1.59735E-01	.68359375	.16249255	.12231777	.02332649	.31351461	.7619	.4915
20	.05269385	7.80593E-02	1.59136E-01	.68503493	.15960044	.12149077	.02291402	.31321630	.8095	.4905
21	.05379110	7.75515E-02	1.58437E-01	.68655592	.15666864	.12073493	.02254379	.31288281	.8571	.4895
22	.05488836	7.70375E-02	1.57725E-01	.68811690	.15380695	.12001846	.02219695	.31254696	.9048	.4884
23	.05598562	7.64018E-02	1.56829E-01	.68981299	.15079797	.11930487	.02188680	.31214268	.9524	.4872
24	.05708288	7.58306E-02	1.56024E-01	.69135403	.14800532	.11876890	.02158788	.31177491	1.0000	.4860

K=13 PHI =100.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	7.18511E-02	1.45187E-01	.65838716	.22411804	.14632776	.06846347	.31460630	0.0000	.4949
4	.03519783	7.24812E-02	1.48700E-01	.66518388	.22053637	.14841768	.04373049	.31222875	.0476	.4874
5	.03635520	7.29208E-02	1.50316E-01	.66851981	.21624112	.14911608	.03543900	.31161835	.0952	.4855
6	.03751257	7.33950E-02	1.51315E-01	.67073576	.21197552	.14902591	.03187008	.31146593	.1429	.4851
7	.03866993	7.37069E-02	1.52114E-01	.67285157	.20780753	.14956713	.02871258	.31130343	.1905	.4845
8	.03982730	7.39334E-02	1.52670E-01	.67461293	.20400249	.13787157	.02667493	.31121336	.2381	.4843
9	.04098466	7.40852E-02	1.53040E-01	.67615979	.20035017	.13595678	.02491725	.31110920	.2857	.4839
10	.04214203	7.41693E-02	1.53258E-01	.67797847	.19679675	.13419046	.02356660	.31100956	.3333	.4836
11	.04329940	7.41913E-02	1.53324E-01	.67955561	.19330324	.13244769	.02243805	.31089743	.3810	.4833
12	.04445676	7.41576E-02	1.53370E-01	.68107877	.18990778	.13082821	.02147116	.31076988	.4286	.4829
13	.04561413	7.40712E-02	1.53359E-01	.68259519	.18654592	.12933113	.02068231	.31063065	.4762	.4825
14	.04677150	7.39371E-02	1.53410E-01	.68401523	.18329512	.12790759	.01946122	.31047024	.5238	.4820
15	.04792886	7.37505E-02	1.53308E-01	.68543675	.18009965	.12657576	.01937167	.31029648	.5714	.4814
16	.04909623	7.35318E-02	1.52976E-01	.68686584	.17694067	.12532069	.01868031	.31010135	.6190	.4808
17	.05024359	7.32604E-02	1.52593E-01	.68824328	.17386658	.12414699	.01835797	.30988913	.6667	.4802
18	.05140096	7.29634E-02	1.52183E-01	.68970178	.17083171	.12304209	.01742607	.30965769	.7143	.4794
19	.05255833	7.26100E-02	1.51700E-01	.69113529	.16785308	.12201110	.01755068	.30940286	.7619	.4787
20	.05371569	7.22326E-02	1.51172E-01	.69257269	.16496743	.12103587	.01720183	.30913238	.8095	.4778
21	.05487306	7.17689E-02	1.50539E-01	.69407077	.16212498	.12014183	.01689200	.30882524	.8571	.4769
22	.05603042	7.13329E-02	1.49889E-01	.69553612	.15934215	.11929010	.01660254	.30851367	.9048	.4759
23	.05718779	7.07667E-02	1.49066E-01	.69716429	.15668455	.11852210	.01634492	.30813428	.9524	.4747
24	.05834516	7.02467E-02	1.48309E-01	.69866613	.15402554	.11777461	.01609811	.30778265	1.0000	.4737

K=14 PHI =110.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	6.62098E-02	1.36951E-01	.66650251	.22688054	.14436606	.06846347	.31095275	0.0000	.4835
4	.03526198	6.68276E-02	1.40818E-01	.67409466	.22401763	.14458649	.03869011	.30806912	.0476	.4745
5	.03648349	6.73295E-02	1.42854E-01	.67750908	.22110743	.14201458	.02918092	.30735615	.0952	.4723
6	.03770501	6.77302E-02	1.43560E-01	.67959187	.21809583	.13977124	.02568971	.30722030	.1429	.4719
7	.03892652	6.80156E-02	1.44316E-01	.68156680	.21505586	.13749073	.02346855	.30708398	.1905	.4715
8	.04014803	6.82860E-02	1.44867E-01	.68325518	.21196718	.13533670	.02057836	.30702755	.2381	.4713
9	.04136955	6.84426E-02	1.45276E-01	.68487665	.20892143	.13327540	.01900875	.30695977	.2857	.4711
10	.04259106	6.85420E-02	1.45554E-01	.68635618	.20191961	.13150249	.01777960	.30688861	.3333	.4709

K= 7 PHI = 40.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	1.15891E-01	2.04280E-01	.61799672	.21036895	.08068848	.06846347	.33684249	0.0000	.5673
4	.03492405	1.16061E-01	2.05072E-01	.62119210	.20593421	.08110254	.06451413	.33643829	.0476	.5660
5	.03580763	1.16028E-01	2.05348E-01	.62379092	.19770355	.08065181	.06283850	.33624677	.0952	.5653
6	.03669121	1.15997E-01	2.05573E-01	.62612520	.19172127	.07991667	.06190452	.33609825	.1429	.5648
7	.03757479	1.15805E-01	2.05771E-01	.62642421	.18803196	.07941259	.06097482	.33590947	.1905	.5642
8	.03845837	1.15587E-01	2.05009E-01	.63569935	.18504466	.07888713	.06034078	.33571707	.2381	.5635
9	.03934195	1.15168E-01	2.04146E-01	.63273506	.17536206	.07831156	.05970625	.33549058	.2857	.5628
10	.04022553	1.14734E-01	2.04166E-01	.63480170	.17024139	.07793739	.05920884	.33529004	.3333	.5620
11	.04110911	1.14285E-01	2.03598E-01	.63635233	.16575238	.07751829	.05872750	.33498248	.3810	.5611
12	.04199269	1.13667E-01	2.02856E-01	.63845772	.16062381	.07713734	.05831708	.33469640	.4286	.5601
13	.04287627	1.13244E-01	2.02196E-01	.64024179	.15604113	.07679143	.05793212	.33438781	.4762	.5591
14	.04375986	1.12367E-01	2.01382E-01	.64240505	.15157278	.07644068	.05758541	.33405931	.5238	.5580
15	.04464344	1.11637E-01	2.00918E-01	.64475571	.14721096	.07626232	.05726446	.33371012	.5714	.5568
16	.04552702	1.10856E-01	1.99632E-01	.64649872	.14294103	.07597628	.05696743	.33334045	.6190	.5556
17	.04641060	1.10015E-01	1.98503E-01	.64863998	.13879810	.07574124	.05665226	.33294997	.6667	.5543
18	.04729418	1.09147E-01	1.97406E-01	.65010468	.13461954	.07555579	.05643451	.33253826	.7143	.5529
19	.04817776	1.08218E-01	1.96237E-01	.65234177	.13056592	.07537971	.05619440	.33210367	.7619	.5515
20	.04906134	1.07243E-01	1.95007E-01	.65461037	.12654530	.07521704	.05596776	.33164722	.8095	.5499
21	.04994492	1.06205E-01	1.93581E-01	.65661727	.12244458	.07517192	.05575632	.33116133	.8571	.5483
22	.05082850	1.05132E-01	1.92303E-01	.65862698	.11845298	.07504661	.05555362	.33065741	.9048	.5467
23	.05171208	1.03948E-01	1.90787E-01	.66064794	.11434664	.07505567	.05536825	.33010190	.9524	.5448
24	.05259566	1.02798E-01	1.89303E-01	.66268583	.11037683	.07502959	.05518096	.32955577	1.0000	.5430

K= 8 PHI = 50.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	1.08973E-01	1.95494E-01	.62290176	.21203865	.09802051	.06846347	.33389369	0.0000	.5574
4	.03495367	1.09245E-01	1.96733E-01	.62651149	.20595813	.09845394	.06211074	.33325562	.0476	.5553
5	.03586688	1.09372E-01	1.97255E-01	.62948624	.19997158	.09767516	.05955994	.33300744	.0952	.5545
6	.03678009	1.09388E-01	1.97477E-01	.63165103	.19420140	.09688730	.05816864	.33284897	.1429	.5539
7	.03769329	1.09303E-01	1.97550E-01	.63331696	.18871529	.09611251	.05684484	.33265490	.1905	.5533
8	.03860650	1.09128E-01	1.97454E-01	.63615778	.18346680	.09558445	.05592131	.33246913	.2381	.5527
9	.03951970	1.08873E-01	1.97250E-01	.63816138	.17846526	.09493471	.05501979	.33225070	.2857	.5520
10	.04043291	1.08544E-01	1.96794E-01	.64018404	.17352101	.09407361	.05430656	.33202227	.3333	.5512
11	.04134612	1.08147E-01	1.96504E-01	.64217587	.16887865	.09348519	.05363190	.33176867	.3810	.5504
12	.04225932	1.07685E-01	1.95950E-01	.64412268	.16434624	.09269584	.05305130	.33149847	.4286	.5495
13	.04317253	1.07171E-01	1.95292E-01	.64664568	.15986350	.09196526	.05191596	.33120745	.4762	.5485
14	.04408574	1.06605E-01	1.94716E-01	.64796085	.15567766	.09120149	.05163173	.33089766	.5238	.5475
15	.04499894	1.05978E-01	1.93964E-01	.64958191	.15154139	.09059357	.05134814	.33056854	.5714	.5464
16	.04591215	1.05308E-01	1.93141E-01	.65169289	.14747432	.09122574	.05117819	.33021991	.6190	.5452
17	.04682535	1.04585E-01	1.92248E-01	.65315946	.14348537	.09089390	.05080065	.32985157	.6667	.5440
18	.04773856	1.03817E-01	1.91287E-01	.65542697	.13956185	.09060101	.05044810	.32946303	.7143	.5427
19	.04865177	1.02999E-01	1.90255E-01	.65736513	.13568419	.09029105	.05012105	.32905244	.7619	.5414
20	.04956497	1.02137E-01	1.89156E-01	.65919136	.13186142	.09001347	.04981347	.32862138	.8095	.5400
21	.05047818	1.01213E-01	1.87970E-01	.66111595	.12801186	.08994567	.04952702	.32816117	.8571	.5384
22	.05139139	1.00257E-01	1.86738E-01	.66313748	.12422134	.08978410	.04925453	.32768523	.9048	.5369
23	.05230459	9.91910E-02	1.85394E-01	.66507249	.12052420	.08960424	.04900534	.32715707	.9524	.5352
24	.05321780	9.81650E-02	1.84011E-01	.66701831	.11657776	.08957585	.04875589	.32664131	1.0000	.5335

K= 9 PHI = 60.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	1.01388E-01	1.85674E-01	.62832138	.21401967	.11337167	.06846347	.33016993	0.0000	.5461
4	.03498589	1.01763E-01	1.87400E-01	.63264290	.20833773	.11377883	.05920247	.32955264	.0476	.5430
5	.03593930	1.01997E-01	1.88181E-01	.63577622	.20265171	.11273194	.05567192	.32924511	.0952	.5420
6	.03688872	1.02139E-01	1.88534E-01	.63811666	.19712751	.11170612	.05379203	.32906065	.1429	.5415
7	.03783814	1.02142E-01	1.88862E-01	.64037117	.19185114	.11064856	.05240056	.32889528	.1905	.5408
8	.03878755	1.02074E-01	1.88939E-01	.64249514	.18685827	.10977599	.05060788	.32870951	.2381	.5402
9	.03973697	1.01926E-01	1.88902E-01	.64454461	.18205504	.10883111	.04963584	.32850288	.2857	.5396
10	.04068639	1.01705E-01	1.88734E-01	.64660916	.17745675	.10796927	.04870354	.32829257	.3333	.5389
11	.04163580	1.01417E-01	1.88469E-01	.64843540	.17289515	.10720518	.04784025	.32805842	.3810	.5381

12	.04258522	1.01065E-01	1.88104E-01	.65031252	.16970240	.10647875	.04709626	.32780952	.4286	.5373
13	.04353464	1.00661E-01	1.87604E-01	.65215525	.16954424	.10581693	.04641913	.32754152	.4762	.5364
14	.04448406	1.00201E-01	1.87122E-01	.65397949	.16931454	.10515652	.04575956	.32725578	.5238	.5355
15	.04543347	9.96803E-02	1.86624E-01	.65578019	.16908522	.10451751	.04509433	.32695207	.5714	.5345
16	.04638289	9.91293E-02	1.85833E-01	.65756871	.16879475	.10389885	.04444377	.32662968	.6190	.5334
17	.04733231	9.85329E-02	1.85091E-01	.65933044	.16848963	.10328349	.04379701	.32628860	.6667	.5323
18	.04828172	9.78039E-02	1.84261E-01	.66107071	.16819058	.10269437	.04314287	.32593831	.7143	.5311
19	.04923114	9.71672E-02	1.8336*E-01	.66280058	.16784607	.10208593	.04249245	.32554656	.7619	.5299
20	.05018056	9.64235E-02	1.82413E-01	.66451459	.16744572	.10148555	.04186743	.32514569	.8095	.5286
21	.05112998	9.56175E-02	1.81367E-01	.66624966	.16697644	.10216841	.04122021	.32471580	.8571	.5272
22	.05207939	9.47961E-02	1.80282E-01	.66797180	.16649161	.10190037	.04233073	.32427293	.9048	.5258
23	.05302881	9.38945E-02	1.79099E-01	.67031538	.16781220	.10166346	.04278847	.32377579	.9524	.5242
24	.05397823	9.29444E-02	1.77849E-01	.67215637	.16370524	.10145228	.04179266	.32329619	1.0000	.5226

K=10 PHI = 70.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	9.35239E-02	1.75270E-01	.63533008	.21626930	.12642415	.06846347	.32668034	0.0000	.5336
4	.03503298	9.39963E-02	1.77402E-01	.64013283	.21107198	.12677312	.05594145	.32545679	.0476	.5296
5	.03603549	9.43206E-02	1.78609E-01	.64[5674	.2[4350	.12741514	.05128949	.32503135	.0952	.5284
6	.03701800	9.45540E-02	1.79176E-01	.64[3103	.2[4401	.12811514	.04837482	.32471100	.1429	.5278
7	.03801051	9.46793E-02	1.79595E-01	.64[0[0	.19[1761	.12281789	.04668952	.32471969	.1905	.5272
8	.03900302	9.47114E-02	1.79829E-01	.64[2840	.19071941	.12160320	.04515838	.32455838	.2381	.5267
9	.03999553	9.46692E-02	1.79950E-01	.65[2215	.19017193	.12[5011	.04374111	.32437214	.2857	.5261
10	.04098804	9.45516E-02	1.79935E-01	.65[1583	.18[1044	.11937767	.04261662	.32418432	.3333	.5255
11	.04198055	9.43677E-02	1.79816E-01	.65[4564	.17783130	.11836565	.04159314	.32397577	.3810	.5248
12	.04297307	9.41231E-02	1.79596E-01	.65[6943	.17357719	.11742086	.04071431	.32375403	.4286	.5241
13	.04396558	9.38021E-02	1.79280E-01	.65[8483	.1[8[62	.11694765	.03972590	.32351478	.4762	.5233
14	.04495809	9.34694E-02	1.78894E-01	.66[0503	.1[9[52	.11[7540	.03[1716	.32325845	.5238	.5225
15	.04595060	9.30647E-02	1.78422E-01	.66[2[85	.16221 55	.11497769	.03[9149	.32298529	.5714	.5216
16	.04694311	9.26137E-02	1.77879E-01	.66[6936	.15963114	.11427569	.03792747	.32269392	.5190	.5207
17	.04793562	9.21150E-02	1.77262E-01	.66[8931	.15611588	.11362978	.03746909	.32238966	.6667	.5197
18	.04892813	9.15743E-02	1.76579E-01	.66[4609	.1[6[6279	.11303783	.03677876	.32205686	.7143	.5186
19	.04992064	9.09337E-02	1.75821E-01	.66[4261	.14823698	.11249722	.03653078	.32170784	.7619	.5175
20	.05091315	9.03553E-02	1.75005E-01	.67[9838	.14489337	.11200457	.03611245	.32134144	.8095	.5163
21	.05190566	8.96632E-02	1.74094E-01	.67[6554	.1[15[46	.11156965	.03572754	.32094453	.8571	.5150
22	.05289817	8.89523E-02	1.73153E-01	.67[3942	.13721834	.11116101	.03536423	.32053840	.9048	.5137
23	.05389069	8.81280E-02	1.72048E-01	.67[2[75	.13477569	.11082452	.03503227	.32007419	.9524	.5122
24	.05488320	8.73546E-02	1.71005E-01	.67[9230	.13152504	.11049782	.03470967	.31963460	1.0000	.5108

K=11 PHI = 80.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	8.57626E-02	1.64752E-01	.64260326	.21874513	.13659183	.06846347	.32266214	0.0000	.5206
4	.03503224	8.63198E-02	1.67447E-01	.64806646	.21407273	.13682636	.05210672	.32108387	.0476	.5155
5	.03612401	8.67336E-02	1.68735E-01	.65[66[3	.2[0[0[5	.13512612	.04628744	.32063213	.0952	.5140
6	.03716579	8.70127E-02	1.69509E-01	.65[5[96	.2[4[0[0	.13[7[51	.04[4[22	.32016941	.1429	.5135
7	.03820756	8.72844E-02	1.70112E-01	.65[6[98	.19[2[48	.13[7[51	.04[9[64	.32[8856	.1905	.5129
8	.03924933	8.73770E-02	1.70497E-01	.65[64[4	.1[4[2[61	.13[0[65	.03913161	.32015150	.2381	.5125
9	.04029111	8.74207E-02	1.70753E-01	.65[5[70	.1[6[5[20	.12[0[51	.03753209	.31999151	.2857	.5120
10	.04133288	8.73926E-02	1.70868E-01	.66[36[3	.18[55116	.12775820	.03626574	.31983214	.3333	.5115
11	.04237465	8.72932E-02	1.70875E-01	.66[5[96	.18263728	.12650663	.03514071	.31969482	.3810	.5109
12	.04341643	8.71461E-02	1.70779E-01	.66[84[4	.17886120	.12533[89	.03416885	.31946376	.4286	.5103
13	.04445820	8.69375E-02	1.70531E-01	.66651121	.17521462	.12[24[22	.03331[44	.31925742	.4762	.5096
14	.04549997	8.66774E-02	1.70519E-01	.66815019	.17168402	.12[21430	.03254976	.31903322	.5238	.5089
15	.04654175	8.63698E-02	1.69967E-01	.66977379	.16825[65	.12[66[5	.03187368	.31879349	.5714	.5081
16	.04758352	8.60135E-02	1.69544E-01	.67137956	.16491[65	.12136911	.03122245	.31853535	.6190	.5073
17	.04862529	8.56185E-02	1.69046E-01	.67297625	.16163642	.12[94[85	.0[63727	.31825968	.6667	.5064
18	.04966707	8.51702E-02	1.68483E-01	.67456837	.15842[78	.11977[66	.03018455	.31796604	.7143	.5055
19	.05070884	8.46790E-02	1.67814E-01	.67617229	.15528621	.11864[83	.02971962	.31765067	.7619	.5045
20	.05175061	8.41539E-02	1.67152E-01	.67777165	.15214137	.11940[63	.02[9804	.31731962	.8095	.5035
21	.05279238	8.35633E-02	1.66360E-01	.67942240	.14906010	.11780744	.02886392	.31695587	.8571	.5023
22	.05383416	8.29618E-02	1.65547E-01	.68104081	.14599[50	.11725172	.02852363	.31658706	.9048	.5011
23	.05487593	8.22405E-02	1.64557E-01	.68269413	.14271649	.11676956	.02818783	.31615445	.9524	.4998
24	.05591770	8.15822E-02	1.63653E-01	.68443212	.13971731	.11629896	.02786290	.31575506	1.0000	.4985

11	.04381258	6.85817E-02	1.45711E-01	.68779324	.19875453	.12946400	.01684831	.30681197	.3810	.4707
12	.04503409	6.85693E-02	1.45782E-01	.68920651	.19571685	.12770630	.01598525	.30670928	.4286	.4704
13	.04625560	6.85061E-02	1.45752E-01	.69059823	.19276021	.12606596	.01535359	.30659992	.4762	.4700
14	.04747712	6.83953E-02	1.45643E-01	.69197242	.18994111	.12450813	.01472993	.30646248	.5238	.4696
15	.04869863	6.82456E-02	1.45470E-01	.69331749	.18717466	.12302814	.01425620	.30631295	.5714	.4691
16	.04992014	6.80531E-02	1.45225E-01	.69466676	.18447948	.12165542	.01379449	.30613898	.6190	.4686
17	.05114166	6.78178E-02	1.44903E-01	.69601444	.18182772	.12035945	.01341873	.30594646	.6667	.4680
18	.05236317	6.75479E-02	1.44509E-01	.69736580	.17922948	.11913514	.01306456	.30573351	.7143	.4674
19	.05358468	6.72285E-02	1.44074E-01	.69874619	.17668179	.11779013	.01275982	.30549397	.7619	.4666
20	.05480620	6.68959E-02	1.43576E-01	.70017262	.17426534	.11690655	.01247740	.30523942	.8095	.4659
21	.05602771	6.64731E-02	1.42969E-01	.70159078	.17140660	.11590272	.01222796	.30494267	.8571	.4650
22	.05724923	6.60582E-02	1.42394E-01	.70299868	.16893754	.11490600	.01199450	.30464465	.9048	.4640
23	.05847074	6.55206E-02	1.41545E-01	.70461589	.16617016	.11407525	.01179005	.30426658	.9524	.4629
24	.05969225	6.50429E-02	1.40828E-01	.70607645	.16364464	.11321158	.01159146	.30392749	1.0000	.4619

K=15 PHI =120.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	6.16737E-02	1.30181E-01	.67453565	.22094698	.13720818	.06846347	.30781603	0.0000	.4738
4	.03532807	6.22278E-02	1.34333E-01	.68274511	.22138698	.13758363	.06345453	.30436003	.0476	.4632
5	.03661567	6.26907E-02	1.36061E-01	.68622620	.22586310	.13699200	.02227545	.30356418	.0952	.4608
6	.03790327	6.30521E-02	1.36957E-01	.68809546	.22012728	.13573576	.01973208	.30346182	.1429	.4604
7	.03919087	6.33347E-02	1.37690E-01	.68989459	.21361816	.13042009	.01693126	.30335215	.1905	.4601
8	.04047847	6.35435E-02	1.38143E-01	.69145478	.21326963	.12818284	.01522335	.30330975	.2381	.4600
9	.04176607	6.36847E-02	1.38486E-01	.69262719	.21402802	.12806671	.01399092	.30327243	.2857	.4599
10	.04305367	6.37683E-02	1.38723E-01	.69351367	.21037573	.12602236	.01286647	.30320997	.3333	.4597
11	.04434127	6.37967E-02	1.38855E-01	.69466932	.20607815	.12311965	.01219345	.30315361	.3810	.4595
12	.04562887	6.37703E-02	1.38877E-01	.69736305	.20119948	.12022478	.01145459	.30306984	.4286	.4592
13	.04691647	6.37098E-02	1.38804E-01	.69820785	.19845944	.11869068	.01095525	.30296237	.4762	.4589
14	.04820407	6.35998E-02	1.38660E-01	.69956484	.19578710	.11697705	.01047113	.30285375	.5238	.4585
15	.04949167	6.34487E-02	1.38501E-01	.70086016	.19319757	.11546942	.01010404	.30269115	.5714	.4581
16	.05077927	6.32607E-02	1.38243E-01	.70217007	.19065775	.11403160	.00974366	.30252392	.6190	.4576
17	.05206687	6.30307E-02	1.37913E-01	.70346966	.18814596	.11262838	.00945321	.30233515	.6667	.4570
18	.05335447	6.27690E-02	1.37530E-01	.70477574	.18567852	.11141749	.00918061	.30212612	.7143	.4564
19	.05464207	6.24570E-02	1.37065E-01	.70612559	.18319150	.11022846	.00894800	.30188648	.7619	.4557
20	.05592967	6.21245E-02	1.36564E-01	.70747099	.18072420	.10906499	.00873183	.30163266	.8095	.4549
21	.05721727	6.17176E-02	1.35983E-01	.70882257	.17826351	.10794957	.00854382	.30132936	.8571	.4540
22	.05850487	6.13139E-02	1.35324E-01	.71052646	.17575852	.10705217	.00836594	.30102791	.9048	.4531
23	.05979247	6.07729E-02	1.34481E-01	.71197896	.17385299	.10619910	.00821371	.30063058	.9524	.4519
24	.06108007	6.03741E-02	1.33757E-01	.71344722	.17052148	.10542019	.00806180	.30028195	1.0000	.4508

K=16 PHI =130.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	5.82509E-02	1.24979E-01	.68162203	.23052730	.12436721	.06846347	.30531542	0.0000	.4661
4	.03539383	5.87059E-02	1.29372E-01	.69081271	.23165568	.12515965	.02837852	.30130276	.0476	.4539
5	.03674719	5.90918E-02	1.30905E-01	.69403374	.23046131	.12276388	.01731469	.30040314	.0952	.4512
6	.03810055	5.93947E-02	1.31609E-01	.69592694	.22946836	.12061272	.01450735	.30031367	.1429	.4509
7	.03945391	5.96028E-02	1.32213E-01	.69751428	.22868479	.11860757	.01270976	.30023576	.1905	.4507
8	.04080727	5.97509E-02	1.32636E-01	.69897514	.21747246	.11641261	.01076509	.30018231	.2381	.4505
9	.04216063	5.98534E-02	1.32964E-01	.70029423	.21468503	.11417018	.00952334	.30015913	.2857	.4505
10	.04351400	5.96959E-02	1.33004E-01	.70164768	.21183591	.11216842	.00898571	.30008979	.3333	.4503
11	.04486736	5.98884E-02	1.33054E-01	.70296392	.20908247	.11054947	.00851054	.30005348	.3810	.4501
12	.04622072	5.98382E-02	1.33031E-01	.70413219	.20642613	.10894907	.00793203	.29993555	.4286	.4498
13	.04757408	5.97447E-02	1.32915E-01	.70555440	.20384140	.10689962	.00759159	.29983209	.4762	.4495
14	.04892744	5.96137E-02	1.32742E-01	.70659852	.20132340	.10552797	.00721200	.29969739	.5238	.4491
15	.05028080	5.94462E-02	1.32495E-01	.70785106	.19885287	.10396416	.00690991	.29954655	.5714	.4486
16	.05163416	5.92795E-02	1.32193E-01	.70938047	.19642633	.10247550	.00668164	.29937056	.6190	.4481
17	.05298752	5.89931E-02	1.31822E-01	.71055753	.19406971	.10117859	.00647471	.29917096	.6667	.4475
18	.05434089	5.87189E-02	1.31406E-01	.71169236	.19176233	.09973559	.00627297	.29895040	.7143	.4469
19	.05569425	5.83937E-02	1.30908E-01	.71298636	.18949953	.09838576	.00610705	.29869557	.7619	.4461
20	.05704761	5.80195E-02	1.30365E-01	.71432929	.18681494	.09698457	.00594782	.29842649	.8095	.4453
21	.05840097	5.76259E-02	1.29695E-01	.71586562	.18428154	.09566581	.00581368	.29810012	.8571	.4443
22	.05975433	5.72091E-02	1.29036E-01	.71725173	.18184739	.09436741	.00569254	.29777716	.9048	.4434
23	.06110769	5.66388E-02	1.28126E-01	.71956447	.17902405	.09297117	.00557491	.29733588	.9524	.4421

24	.06246105	5.61478E-02	1.27342E-01	.72049346	.17650415	.07388560	.00546150	.29695923	1.0000	.4409

K=17 PHI =140.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	5.58581E-02	1.21290E-01	.68807753	.23422478	.10560774	.06846347	.30349137	0.0000	.4605
4	.03545594	5.61811E-02	1.25778E-01	.69800040	.23371711	.10725252	.02335618	.29888749	.0476	.4467
5	.03687142	5.64871E-02	1.27192E-01	.70116514	.23183150	.10546593	.01278709	.29797744	.0952	.4440
6	.03828690	5.66711E-02	1.27756E-01	.70274723	.22908715	.10350033	.01019486	.29785509	.1429	.4436
7	.03970238	5.68052E-02	1.28104E-01	.70411243	.22668973	.10158610	.00874954	.29780192	.1905	.4434
8	.04111785	5.68913E-02	1.28308E-01	.70548081	.22478516	.09955171	.00780083	.29772391	.2381	.4432
9	.04253333	5.69207E-02	1.28459E-01	.70666941	.22306042	.09772960	.00690885	.29769263	.2857	.4431
10	.04394881	5.69094E-02	1.28508E-01	.70792495	.22133589	.09569054	.00617491	.29760612	.3333	.4428
11	.04536429	5.68510E-02	1.28441E-01	.70909163	.21974288	.09423957	.00587385	.29753048	.3810	.4426
12	.04677976	5.67566E-02	1.28329E-01	.71035255	.21802586	.09261963	.00543870	.29741369	.4286	.4423
13	.04819524	5.66227E-02	1.28133E-01	.71147766	.21646752	.09114613	.00521454	.29728949	.4762	.4419
14	.04961072	5.64554E-02	1.27898E-01	.71268716	.21495596	.08972607	.00493524	.29713399	.5238	.4414
15	.05102620	5.62514E-02	1.27574E-01	.71368529	.21357260	.08841658	.00475517	.29696122	.5714	.4409
16	.05244167	5.60105E-02	1.27212E-01	.71512991	.21161988	.08716730	.00455486	.29676284	.6190	.4403
17	.05385715	5.57417E-02	1.26779E-01	.71639649	.20985540	.08600481	.00440885	.29653890	.6667	.4397
18	.05527263	5.54402E-02	1.26352E-01	.71769271	.20791269	.08489905	.00426004	.29629354	.7143	.4389
19	.05668810	5.50863E-02	1.25736E-01	.71904566	.20599370	.08386756	.00414026	.29600995	.7619	.4381
20	.05810358	5.47145E-02	1.25141E-01	.72041519	.20411688	.08288178	.00402223	.29571153	.8095	.4372
21	.05951906	5.42686E-02	1.24404E-01	.72194274	.20194616	.08196991	.00392448	.29534788	.8571	.4362
22	.06093454	5.38098E-02	1.23676E-01	.72342635	.19986504	.08108231	.00382582	.29498709	.9048	.4351
23	.06235001	5.31914E-02	1.22666E-01	.72527910	.19710751	.08029115	.00374803	.29449210	.9524	.4336
24	.06376549	5.26544E-02	1.21788E-01	.72691791	.19496307	.07947312	.00366006	.29405630	1.0000	.4323

K=18 PHI =150.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	5.43326E-02	1.18914E-01	.69337083	.23602664	.08137863	.06846347	.30229318	0.0000	.4569
4	.03551079	5.45156E-02	1.23574E-01	.70417461	.23534065	.08439688	.01801550	.29703817	.0476	.4412
5	.03698111	5.46852E-02	1.24634E-01	.70683688	.23365500	.08378424	.00916410	.29623206	.0952	.4388
6	.03845142	5.47944E-02	1.24995E-01	.70826487	.23076965	.08198936	.00711190	.29609958	.1429	.4384
7	.03992174	5.48396E-02	1.25150E-01	.70946337	.22912960	.08056408	.00617679	.29603466	.1905	.4382
8	.04139206	5.48851E-02	1.25262E-01	.71071375	.22755197	.07878013	.00519260	.29594178	.2381	.4379
9	.04286238	5.49104E-02	1.25324E-01	.71182446	.22575518	.07728720	.00486900	.29587622	.2857	.4377
10	.04433270	5.47423E-02	1.25156E-01	.71300104	.22123471	.07571945	.00434401	.29576773	.3333	.4374
11	.04580302	5.46303E-02	1.24980E-01	.71411494	.21778558	.07438651	.00416190	.29566090	.3810	.4371
12	.04727334	5.44867E-02	1.24785E-01	.71527786	.21538588	.07303048	.00386083	.29551782	.4286	.4367
13	.04874366	5.43106E-02	1.24503E-01	.71642450	.21262116	.07185059	.00369237	.29536360	.4762	.4362
14	.05021398	5.41076E-02	1.24188E-01	.71760710	.21068129	.07066318	.00348515	.29518036	.5238	.4357
15	.05168430	5.38624E-02	1.23800E-01	.71886455	.20876635	.06959642	.00335007	.29497805	.5714	.4351
16	.05315461	5.35924E-02	1.23374E-01	.72005518	.20665193	.06857812	.00320184	.29475082	.6190	.4344
17	.05462493	5.32844E-02	1.22877E-01	.72130736	.20471950	.06763261	.00308752	.29449617	.6667	.4336
18	.05609525	5.29155E-02	1.22316E-01	.72260342	.20258596	.06673594	.00297451	.29421952	.7143	.4328
19	.05756557	5.25027E-02	1.21704E-01	.72400044	.19966083	.06589821	.00287957	.29390117	.7619	.4319
20	.05903589	5.21570E-02	1.21010E-01	.72541541	.19694770	.06516205	.00278792	.29356639	.8095	.4309
21	.06050621	5.16614E-02	1.20224E-01	.72701369	.19390429	.06436442	.00271072	.29315820	.8571	.4297
22	.06197653	5.11711E-02	1.19419E-01	.72857621	.19133876	.06364752	.00263161	.29275081	.9048	.4285
23	.06344685	5.04932E-02	1.18289E-01	.73057767	.18819850	.06301180	.00257146	.29218730	.9524	.4269
24	.06491717	4.98977E-02	1.17296E-01	.73235820	.18537552	.06234736	.00249737	.29168485	1.0000	.4254

K=19 PHI =160.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	5.34476E-02	1.17527E-01	.69714538	.23731152	.05389252	.06846347	.30158487	0.0000	.4548
4	.03555356	5.35290E-02	1.22434E-01	.70905540	.23600260	.05787170	.01272592	.29570505	.0476	.4372
5	.03706666	5.35725E-02	1.23047E-01	.71111633	.23563465	.05938611	.00659500	.29508723	.0952	.4354
6	.03857976	5.35942E-02	1.23184E-01	.71232594	.23390349	.05617475	.00538953	.29498253	.1429	.4351
7	.04009285	5.35626E-02	1.23203E-01	.71344232	.23047957	.05594040	.00498362	.29487282	.1905	.4347
8	.04160595	5.35057E-02	1.23153E-01	.71455049	.22709768	.05452719	.00405427	.29477653	.2381	.4345
9	.04311905	5.34090E-02	1.23021E-01	.71561614	.22557293	.05353522	.00378124	.29466740	.2857	.4341

10	.04463214	5.32838E-02	1.22844E-01	.71672182	.22319512	.05236132	.00345382	.29453423	.3333	.4338
11	.04614524	5.31271E-02	1.22604E-01	.71781138	.22086329	.05241842	.00324562	.29438844	.3810	.4333
12	.04765833	5.29715E-02	1.22318E-01	.71893581	.21855686	.05246643	.00301842	.29421739	.4286	.4328
13	.04917143	5.27272E-02	1.21978E-01	.72006183	.21627089	.05249940	.00286140	.29403048	.4762	.4323
14	.05068453	5.24845E-02	1.21591E-01	.72123475	.21399499	.05252891	.00269621	.29381945	.5238	.4316
15	.05219762	5.22118E-02	1.21150E-01	.72242738	.21172102	.05201154	.00256800	.29358739	.5714	.4310
16	.05371072	5.19115E-02	1.20663E-01	.72365429	.20944764	.05249765	.00244727	.29333249	.6190	.4302
17	.05522382	5.15743E-02	1.20111E-01	.72494269	.20712117	.05260247	.00235805	.29304854	.6667	.4294
18	.05673691	5.12113E-02	1.19513E-01	.72630307	.20473917	.05270317	.00225943	.29274269	.7143	.4285
19	.05825001	5.07944E-02	1.18878E-01	.72765402	.20234583	.05281652	.00215322	.29239239	.7619	.4275
20	.05976311	5.03983E-02	1.18104E-01	.72915561	.19999673	.05296690	.00207132	.29202355	.8095	.4264
21	.06127620	4.98284E-02	1.17221E-01	.73090360	.19718737	.05334925	.00200156	.29157528	.8571	.4251
22	.06278930	4.92989E-02	1.16336E-01	.73249302	.19452491	.05385205	.00192941	.29112317	.9048	.4238
23	.06430239	4.85646E-02	1.15106E-01	.73456955	.19139292	.05434851	.00181556	.29049410	.9524	.4219
24	.06581549	4.79135E-02	1.14001E-01	.73650994	.18819919	.05429593	.00180464	.28992713	1.0000	.4203

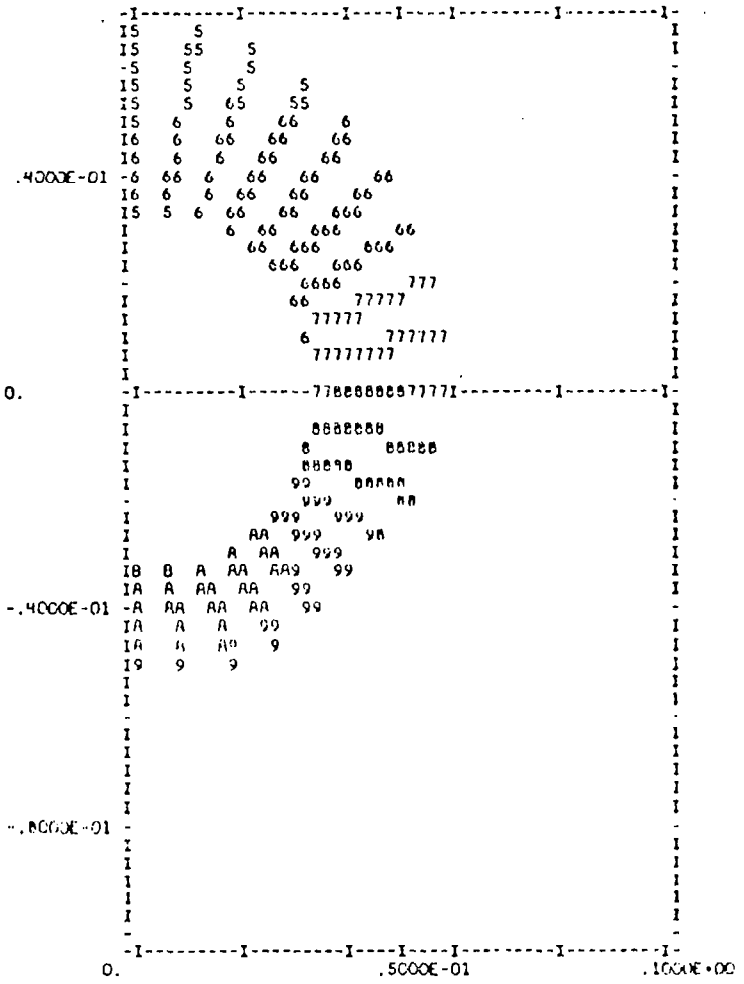
K=20 PHI =170.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	5.30018E-02	1.16826E-01	.69925885	.23803095	.02642555	.00846347	.30122418	0.0000	.4537
4	.03558102	5.30466E-02	1.21974E-01	.71216010	.23887852	.02941523	.00853042	.29492365	.0476	.4349
5	.03712157	5.29058E-02	1.22193E-01	.71374055	.23672077	.03010589	.00528095	.29449038	.0952	.4336
6	.03866212	5.29434E-02	1.22196E-01	.71485078	.23496786	.02906760	.00444294	.29436859	.1429	.4333
7	.04020267	5.28651E-02	1.22122E-01	.71589074	.23133517	.02874997	.00576999	.29423567	.1905	.4329
8	.04174322	5.27513E-02	1.21959E-01	.71691574	.22960560	.02893323	.00353056	.29411998	.2381	.4325
9	.04328377	5.26214E-02	1.21767E-01	.71793425	.22749862	.02945355	.00328073	.29399949	.2857	.4322
10	.04482432	5.24551E-02	1.21508E-01	.71894255	.22544288	.02991080	.00308578	.29387675	.3333	.4317
11	.04636487	5.22702E-02	1.21135E-01	.72005872	.22328034	.02932705	.00283230	.29366258	.3810	.4312
12	.04790542	5.20549E-02	1.20784E-01	.72115842	.22095846	.02781272	.00263652	.29346827	.4286	.4306
13	.04944597	5.18166E-02	1.20501E-01	.72225569	.21852730	.02746712	.00244499	.29325619	.4762	.4300
14	.05098652	5.15504E-02	1.20075E-01	.72343628	.21613042	.02693862	.00230335	.29302514	.5238	.4293
15	.05252707	5.12568E-02	1.19598E-01	.72462883	.21385563	.02654084	.00216220	.29277178	.5714	.4286
16	.05406762	5.09371E-02	1.19074E-01	.72585376	.21160014	.02611321	.00205147	.29249858	.6190	.4278
17	.05560817	5.05801E-02	1.18498E-01	.72719800	.20928532	.02582250	.00194623	.29219386	.6667	.4269
18	.05714872	5.02013E-02	1.17852E-01	.72847058	.20696722	.02555021	.00185611	.29187078	.7143	.4259
19	.05868927	4.97635E-02	1.17131E-01	.72992171	.20451540	.02513565	.00177946	.29149735	.7619	.4249
20	.06022983	4.93132E-02	1.16377E-01	.73151407	.20219193	.02490769	.00162993	.29111019	.8095	.4237
21	.06177038	4.87589E-02	1.15447E-01	.73304756	.19962008	.02464737	.00163562	.29063414	.8571	.4223
22	.06331093	4.82052E-02	1.14516E-01	.73478957	.19657570	.02459877	.00156734	.29015406	.9048	.4209
23	.06485148	4.74366E-02	1.13213E-01	.73702628	.19313560	.02417144	.00151921	.28948365	.9524	.4190
24	.06639203	4.67370E-02	1.12023E-01	.73906799	.18976596	.02193724	.00145106	.28886283	1.0000	.4172

K=21 PHI =180.0 Z = .100000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	.03404047	5.28402E-02	1.16577E-01	.69995247	.23876945	0.00000000	.00846347	.30109281	0.0000	.4533
4	.03558987	5.28874E-02	1.21805E-01	.71219661	.23946515	0.00000000	.00787640	.29468527	.0476	.4342
5	.03713928	5.27904E-02	1.21879E-01	.71461269	.23724579	0.00000000	.00519157	.29432567	.0952	.4331
6	.03868869	5.27222E-02	1.21849E-01	.71572697	.23484330	0.00000000	.00424770	.29417212	.1429	.4327
7	.04023809	5.26584E-02	1.21743E-01	.71673656	.23251430	0.00000000	.00348094	.29403772	.1905	.4323
8	.04178750	5.24923E-02	1.21539E-01	.71774019	.23011699	0.00000000	.00343423	.29390313	.2381	.4319
9	.04333690	5.25518E-02	1.21324E-01	.71875714	.22774487	0.00000000	.00325683	.29376985	.2857	.4315
10	.04488631	5.21692E-02	1.21056E-01	.71977652	.22565030	0.00000000	.00320841	.29360564	.3333	.4310
11	.04643572	5.19754E-02	1.20738E-01	.72084268	.22330286	0.00000000	.00279933	.29342149	.3810	.4305
12	.04798512	5.17481E-02	1.20340E-01	.72197758	.22110261	0.00000000	.00255842	.29321636	.4286	.4299
13	.04953453	5.15004E-02	1.19884E-01	.72309149	.21879707	0.00000000	.00243568	.29299377	.4762	.4292
14	.05108394	5.12078E-02	1.19351E-01	.72421528	.21647253	0.00000000	.00229669	.29275394	.5238	.4285
15	.05263334	5.08206E-02	1.18691E-01	.72540638	.21410033	0.00000000	.00207461	.29249211	.5714	.4278
16	.05418275	5.05534E-02	1.18017E-01	.72663521	.21174118	0.00000000	.00196528	.29221160	.6190	.4269
17	.05573215	5.02354E-02	1.17417E-01	.72793133	.20934170	0.00000000	.00184960	.29189850	.6667	.4260
18	.05728156	4.98519E-02	1.17281E-01	.72925466	.20704433	0.00000000	.00175755	.29156956	.7143	.4251
19	.05883097	4.94053E-02	1.16537E-01	.73071873	.20518990	0.00000000	.00167327	.29118618	.7619	.4239
20	.06038037	4.89518E-02	1.15774E-01	.73218052	.20279014	0.00000000	.00159430	.29079467	.8095	.4228
21	.06192978	4.83974E-02	1.14839E-01	.73372410	.19997297	0.00000000	.00156962	.29030635	.8571	.4214
22	.06347919	4.78270E-02	1.13887E-01	.73561219	.19723046	0.00000000	.00145788	.28981889	.9048	.4200

23	.06502859	4.70485E-02	1.12559E-01	.73788403	.19374783	0.00000000	.00140978	.25913282	.9524	.4180
24	.06657800	4.63281E-02	1.11331E-01	.73598590	.19050454	0.00000000	.00133608	.28848878	1.0000	.4161



VERTICAL SCALING

0.	< 0 <	.200E-01	.200E-01	< 1 <	.400E-01
.400E-01	< 2 <	.600E-01	.600E-01	< 3 <	.800E-01
.800E-01	< 4 <	.100E+00	.100E+00	< 5 <	.120
.120	< 6 <	.140	.140	< 7 <	.160
.160	< 8 <	.180	.180	< 9 <	.200
.200	< A <	.220	.220	< B <	.240
.240	< C <	.260	.260	< D <	.280
.280	< E <	.300	.300	< F <	.320
.320	< G <	.340	.340	< H <	.360
.360	< I <	.380			

SURFACE FLOW VARIABLES AT Z = .100000
X/L = .002959 DZDT= .017156 ITER= 0

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	.0340	.5004	3.8650E+00	2.5012E+00	1.7784	.6054	0.0000	3.4241E-01	1.0000	.58622	.00	6.8463E-02
10.0	.0340	.4954	3.8706E+00	2.4983E+00	1.7840	.6066	.0618	3.4075E-01	1.0000	.58498	.00	6.8463E-02
20.0	.0340	.4805	3.7931E+00	2.4909E+00	1.7926	.6102	.1227	3.4096E-01	1.0000	.58133	.00	6.8463E-02
30.0	.0340	.4576	3.6209E+00	2.3872E+00	1.8105	.6162	.1815	3.3973E-01	1.0000	.57537	.00	6.8463E-02
40.0	.0340	.4272	3.4460E+00	2.3044E+00	1.8347	.6245	.2375	3.3684E-01	1.0000	.56731	.00	6.8463E-02
50.0	.0340	.3913	3.2405E+00	2.2055E+00	1.8656	.6350	.2936	3.3369E-01	1.0000	.55742	.00	6.8463E-02
60.0	.0340	.3519	3.0147E+00	2.0944E+00	1.9025	.6476	.3451	3.3047E-01	1.0000	.54605	.00	6.8463E-02
70.0	.0340	.3110	2.7803E+00	1.9771E+00	1.9448	.6620	.3870	3.2668E-01	1.0000	.53360	.00	6.8463E-02
80.0	.0340	.2707	2.5501E+00	1.8587E+00	1.9916	.6779	.4213	3.2206E-01	1.0000	.52055	.00	6.8463E-02
90.0	.0340	.2327	2.3327E+00	1.7479E+00	2.0414	.6949	.4502	3.1658E-01	1.0000	.50746	.00	6.8463E-02
100.0	.0340	.1985	2.1385E+00	1.6478E+00	2.0927	.7124	.4651	3.1401E-01	1.0000	.49489	.00	6.8463E-02
110.0	.0340	.1692	1.9659E+00	1.5611E+00	2.1434	.7296	.4643	3.1095E-01	1.0000	.48316	.00	6.8463E-02
120.0	.0340	.1456	1.8179E+00	1.4863E+00	2.1907	.7457	.4457	3.0782E-01	1.0000	.47375	.00	6.8463E-02
130.0	.0340	.1279	1.7031E+00	1.4296E+00	2.2325	.7600	.4073	3.0534E-01	1.0000	.46609	.00	6.8463E-02
140.0	.0340	.1154	1.6203E+00	1.3884E+00	2.2672	.7718	.3480	3.0349E-01	1.0000	.46054	.00	6.8463E-02
150.0	.0340	.1075	1.5655E+00	1.3614E+00	2.2937	.7808	.2692	3.0229E-01	1.0000	.45691	.00	6.8463E-02
160.0	.0340	.1029	1.5892E+00	1.3258E+00	2.3116	.7869	.1787	3.0158E-01	1.0000	.45477	.00	6.8463E-02
170.0	.0340	.1006	1.5760E+00	1.3179E+00	2.3214	.7902	.0877	3.0122E-01	1.0000	.45368	.00	6.8463E-02
180.0	.0340	.0998	1.5712E+00	1.3150E+00	2.3247	.7913	0.0000	3.0109E-01	1.0000	.45328	.00	6.8463E-02

BODY AND SHOCK GEOMETRY AT Z = .100

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	.0340	.3380	0.0000	.0515	.5150	0.0000
10.0	.0340	.3380	0.0000	.0516	.5156	.0018
20.0	.0340	.3380	0.0000	.0518	.5176	.0016
30.0	.0340	.3380	0.0000	.0521	.5210	.0034
40.0	.0340	.3380	0.0000	.0526	.5258	.0052
50.0	.0340	.3380	0.0000	.0532	.5321	.0040
60.0	.0340	.3380	0.0000	.0540	.5397	.0048
70.0	.0340	.3380	0.0000	.0549	.5487	.0045
80.0	.0340	.3380	0.0000	.0559	.5591	.0064
90.0	.0340	.3380	0.0000	.0571	.5708	.0070
100.0	.0340	.3380	0.0000	.0583	.5834	.0075
110.0	.0340	.3380	0.0000	.0597	.5969	.0078
120.0	.0340	.3380	0.0000	.0611	.6109	.0079
130.0	.0340	.3380	0.0000	.0625	.6248	.0077
140.0	.0340	.3380	0.0000	.0638	.6380	.0070
150.0	.0340	.3380	0.0000	.0649	.6498	.0059
160.0	.0340	.3380	0.0000	.0658	.6592	.0042
170.0	.0340	.3380	0.0000	.0664	.6654	.0029
180.0	.0340	.3380	0.0000	.0666	.6674	0.0000

SURFACE FLOW VARIABLES AT Z = .766404
X/L = .022675 DZDT= .136026 ITER= 250

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	.2485	.4409	3.5245E+00	2.3418E+00	1.8525	.5669	0.0000	3.3793E-01	1.0000	.57098	.00	6.8463E-02
10.0	.2485	.4363	3.4981E+00	2.3292E+00	1.8512	.5680	.0627	3.3753E-01	1.0000	.56975	.00	6.8463E-02
20.0	.2485	.4227	3.4204E+00	2.2928E+00	1.8482	.5714	.1247	3.3768E-01	1.0000	.56611	.00	6.8463E-02
30.0	.2485	.4010	3.2906E+00	2.2336E+00	1.8465	.5769	.1856	3.3471E-01	1.0000	.56015	.00	6.8463E-02
40.0	.2485	.3725	3.1339E+00	2.1520E+00	1.9118	.5847	.2447	3.3229E-01	1.0000	.55208	.00	6.8463E-02
50.0	.2485	.3389	2.9403E+00	2.0575E+00	1.9438	.5945	.3008	3.2923E-01	1.0000	.54217	.00	6.8463E-02
60.0	.2485	.3018	2.7283E+00	1.9506E+00	1.9822	.6062	.3537	3.2576E-01	1.0000	.53068	.00	6.8463E-02
70.0	.2485	.2634	2.5082E+00	1.8366E+00	2.0261	.6196	.4022	3.2194E-01	1.0000	.51809	.00	6.8463E-02
80.0	.2485	.2261	2.2947E+00	1.7238E+00	2.0742	.6343	.4410	3.1785E-01	1.0000	.50509	.00	6.8463E-02
90.0	.2485	.1913	2.0954E+00	1.6156E+00	2.1254	.6500	.4688	3.1374E-01	1.0000	.49215	.00	6.8463E-02
100.0	.2485	.1601	1.9163E+00	1.5154E+00	2.1782	.6662	.4829	3.0978E-01	1.0000	.47977	.00	6.8463E-02
110.0	.2485	.1336	1.7651E+00	1.4305E+00	2.2303	.6821	.4800	3.0614E-01	1.0000	.46861	.00	6.8463E-02
120.0	.2485	.1126	1.6446E+00	1.3650E+00	2.2785	.6958	.4598	3.0334E-01	1.0000	.45923	.00	6.8463E-02
130.0	.2485	.0969	1.5546E+00	1.3151E+00	2.3206	.7097	.4188	3.0084E-01	1.0000	.45192	.00	6.8463E-02

140.0	.2485	.0857	1.4908E+00	1.2666E+00	2.3558	.7205	.3583	2.9884E-01	1.0000	.44654	.00	6.8463E-02
150.0	.2485	.0789	1.4517E+00	1.2427E+00	2.3815	.7263	.2838	2.9771E-01	1.0000	.44315	.00	6.8463E-02
160.0	.2485	.0766	1.4388E+00	1.2344E+00	2.3900	.7334	.1977	2.9734E-01	1.0000	.44203	.00	6.8463E-02
170.0	.2485	.0748	1.4282E+00	1.2278E+00	2.4052	.7356	.0966	2.9702E-01	1.0000	.44109	.00	6.8463E-02
180.0	.2485	.0726	1.4157E+00	1.2207E+00	2.4124	.7378	0.0000	2.9664E-01	1.0000	.43999	.00	6.8463E-02

BODY AND SHOCK GEOMETRY AT Z = .766

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	.2485	.3058	0.0000	.3843	.4855	0.0000
10.0	.2485	.3058	0.0000	.3849	.4863	.0065
20.0	.2485	.3058	0.0000	.3866	.4886	.0129
30.0	.2485	.3058	0.0000	.3894	.4926	.0194
40.0	.2485	.3058	0.0000	.3934	.4982	.0260
50.0	.2485	.3058	0.0000	.3985	.5054	.0327
60.0	.2485	.3058	0.0000	.4048	.5143	.0392
70.0	.2485	.3058	0.0000	.4122	.5247	.0456
80.0	.2485	.3058	0.0000	.4207	.5368	.0525
90.0	.2485	.3058	0.0000	.4304	.5505	.0590
100.0	.2485	.3058	0.0000	.4410	.5653	.0625
110.0	.2485	.3058	0.0000	.4522	.5812	.0654
120.0	.2485	.3058	0.0000	.4638	.5975	.0660
130.0	.2485	.3058	0.0000	.4753	.6136	.0637
140.0	.2485	.3058	0.0000	.4860	.6287	.0580
150.0	.2485	.3058	0.0000	.4955	.6418	.0488
160.0	.2485	.3058	0.0000	.5031	.6523	.0357
170.0	.2485	.3058	0.0000	.5080	.6591	.0188
180.0	.2485	.3058	0.0000	.5096	.6613	0.0000

SURFACE FLOW VARIABLES AT Z = 8.000443
X/L = .236699 DZOT= 2.110117 ITER= 500

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	M/MT	TEMP	(S-S.INF)/CV
0.0	1.3000	.0498	1.2851E+00	1.1391E+00	2.5851	-.0000	0.0000	2.9257E-01	1.0000	.42799	.00	6.8463E-02
10.0	1.3000	.0475	1.2726E+00	1.1310E+00	2.5877	-.0000	.0997	2.9215E-01	1.0000	.42676	.00	6.8463E-02
20.0	1.3000	.0410	1.2346E+00	1.1069E+00	2.6034	-.0000	.1993	2.9095E-01	1.0000	.42310	.00	6.8463E-02
30.0	1.3000	.0304	1.1742E+00	1.0686E+00	2.6265	-.0000	.2985	2.8892E-01	1.0000	.41709	.00	6.8463E-02
40.0	1.3000	.0169	1.0965E+00	1.0176E+00	2.6583	-.0000	.3978	2.8601E-01	1.0000	.40901	.00	6.8463E-02
50.0	1.3000	.0011	1.0061E+00	9.5641E-01	2.6989	-.0000	.4947	2.8254E-01	1.0000	.39908	.00	6.8463E-02
60.0	1.3000	-.0162	9.0747E-01	8.8846E-01	2.7483	-.0000	.5921	2.7859E-01	1.0000	.38749	.00	6.8463E-02
70.0	1.3000	-.0332	8.0393E-01	8.1916E-01	2.8039	-.0000	.6840	2.7390E-01	1.0000	.37510	.00	6.8463E-02
80.0	1.3000	-.0492	7.1840E-01	7.5191E-01	2.8646	-.0000	.7672	2.6923E-01	1.0000	.36247	.00	6.8463E-02
90.0	1.3000	-.0635	6.3670E-01	6.8979E-01	2.9288	-.0000	.8369	2.6464E-01	1.0000	.35018	.00	6.8463E-02
100.0	1.3000	-.0751	5.7021E-01	6.3753E-01	2.9914	-.0000	.8872	2.6058E-01	1.0000	.33951	.00	6.8463E-02
110.0	1.3000	-.0836	5.2134E-01	5.9601E-01	3.0491	-.0000	.9060	2.5719E-01	1.0000	.33074	.00	6.8463E-02
120.0	1.3000	-.0878	4.9742E-01	5.7588E-01	3.0902	-.0000	.8791	2.5543E-01	1.0000	.32633	.00	6.8463E-02
130.0	1.3000	-.0873	5.0013E-01	5.8053E-01	3.1081	-.0000	.7986	2.5567E-01	1.0000	.32684	.00	6.8463E-02
140.0	1.3000	-.0821	5.2292E-01	6.0494E-01	3.0989	-.0000	.6669	2.5773E-01	1.0000	.33227	.00	6.8463E-02
150.0	1.3000	-.0730	5.8192E-01	6.4686E-01	3.0679	-.0000	.4851	2.6126E-01	1.0000	.34129	.00	6.8463E-02
160.0	1.3000	-.0651	6.2697E-01	6.8224E-01	3.0410	-.0000	.3060	2.6406E-01	1.0000	.34864	.00	6.8463E-02
170.0	1.3000	-.0609	6.5130E-01	7.0105E-01	3.0272	-.0000	.1493	2.6550E-01	1.0000	.35245	.00	6.8463E-02
180.0	1.3000	-.0594	6.6000E-01	7.0772E-01	3.0220	-.0000	0.0000	2.6600E-01	1.0000	.35379	.00	6.8463E-02

BODY AND SHOCK GEOMETRY AT Z = 8.000

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	1.3000	0.0000	0.0000	3.1842	.3215	0.0000
10.0	1.3000	0.0000	0.0000	3.1955	.3279	.1059
20.0	1.3000	0.0000	0.0000	3.2211	.3273	.2119
30.0	1.3000	0.0000	0.0000	3.2674	.3347	.3187
40.0	1.3000	0.0000	0.0000	3.3324	.3451	.4273
50.0	1.3000	0.0000	0.0000	3.4166	.3585	.5352
60.0	1.3000	0.0000	0.0000	3.5192	.3749	.6419
70.0	1.3000	0.0000	0.0000	3.6407	.3942	.7468
80.0	1.3000	0.0000	0.0000	3.7799	.4163	.8484
90.0	1.3000	0.0000	0.0000	3.9361	.4410	.9458

100.0	1.3000	0.0000	0.0000	4.1045	.4674	.9932
110.0	1.3000	0.0000	0.0000	4.2828	.4954	1.0210
120.0	1.3000	0.0000	0.0000	4.4630	.5235	1.0276
130.0	1.3000	0.0000	0.0000	4.6431	.5509	.9762
140.0	1.3000	0.0000	0.0000	4.8036	.5762	.8669
150.0	1.3000	0.0000	0.0000	4.9427	.5973	.7185
160.0	1.3000	0.0000	0.0000	5.0544	.6141	.5757
170.0	1.3000	0.0000	0.0000	5.1244	.6247	.4656
180.0	1.3000	0.0000	0.0000	5.1454	.6277	0.0000

K= 3 PHI = 0.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	4.12295E-02	9.76394E-02	.76008991	-.00000000	0.00000000	.06846347	.29060741	0.0000	.4223
4	1.49438474	4.14186E-02	1.00565E-01	.76644577	-.02641352	0.00000000	.03171536	.28700616	.0476	.4119
5	1.68876949	4.10056E-02	1.00519E-01	.76823784	-.04320794	0.00000000	.02232405	.28563556	.0952	.4079
6	1.88315423	4.06557E-02	1.00129E-01	.76872256	-.05553105	0.00000000	.01911154	.28495702	.1429	.4060
7	2.07753898	4.03816E-02	9.98691E-02	.76911373	-.06419239	0.00000000	.01606785	.28437441	.1905	.4043
8	2.27192372	4.01857E-02	9.96651E-02	.76966080	-.07059125	0.00000000	.01409839	.28397714	.2381	.4032
9	2.46630847	4.00337E-02	9.95115E-02	.76976575	-.07532068	0.00000000	.01238622	.28364998	.2857	.4023
10	2.66069521	3.99914E-02	9.95567E-02	.76931235	-.07983995	0.00000000	.01103725	.28347053	.3333	.4018
11	2.85507795	4.00815E-02	9.97253E-02	.76913518	-.08251895	0.00000000	.00988138	.28341433	.3810	.4016
12	3.04946270	4.05043E-02	9.97106E-02	.76710769	-.08551610	0.00000000	.00891039	.28326834	.4286	.4012
13	3.24384744	3.98947E-02	9.95044E-02	.76978820	-.08826760	0.00000000	.00805851	.28303059	.4762	.4005
14	3.43823219	3.99554E-02	9.97269E-02	.76655506	-.08835731	0.00000000	.00731886	.28305774	.5238	.4006
15	3.63261693	4.05332E-02	1.00590E-01	.76811651	-.08811362	0.00000000	.00668638	.28358153	.5714	.4021
16	3.82700168	4.15704E-02	1.02457E-01	.76038514	-.08474191	0.00000000	.00612451	.28449977	.6190	.4047
17	4.02138642	4.27261E-02	1.04761E-01	.76500951	-.08031274	0.00000000	.00561013	.28560958	.6667	.4079
18	4.21577116	4.40102E-02	1.07036E-01	.76394560	-.07613854	0.00000000	.00513965	.28677022	.7143	.4112
19	4.41015591	4.53112E-02	1.09316E-01	.76130247	-.07185347	0.00000000	.00471238	.28792229	.7619	.4145
20	4.60454065	4.65913E-02	1.11544E-01	.76008156	-.06776016	0.00000000	.00432598	.28903035	.8095	.4177
21	4.79892540	4.78678E-02	1.13747E-01	.75856475	-.06369495	0.00000000	.00397459	.29011234	.8571	.4208
22	4.99331014	4.90744E-02	1.15814E-01	.75674216	-.06026358	0.00000000	.00365390	.29111261	.9048	.4237
23	5.18769488	5.03412E-02	1.17966E-01	.75523930	-.05632647	0.00000000	.00337166	.29214498	.9524	.4267
24	5.38207963	5.13983E-02	1.19753E-01	.75361715	-.05347084	0.00000000	.00310155	.29298535	1.0000	.4292

K= 4 PHI = 10.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	4.07056E-02	9.67515E-02	.76030671	-.00000000	.03479215	.06846347	.29007696	0.0000	.4207
4	1.49539176	4.10122E-02	9.98511E-02	.76648415	-.02594712	.01310247	.03181807	.28661229	.0476	.4107
5	1.69078352	4.06817E-02	9.99466E-02	.76888754	-.04248128	.02299557	.02238670	.28531860	.0952	.4070
6	1.88617528	4.03855E-02	9.98603E-02	.76877209	-.05475317	.02974035	.01915456	.28469201	.1429	.4052
7	2.08156704	4.01304E-02	9.97665E-02	.76836221	-.06384394	.03451194	.01609832	.28414759	.1905	.4037
8	2.27695880	3.99284E-02	9.97091E-02	.76931491	-.06986235	.03834527	.01411791	.28377797	.2381	.4026
9	2.47235056	3.98574E-02	9.98014E-02	.76922133	-.07447452	.04176842	.01239651	.28347216	.2857	.4018
10	2.66774232	3.98345E-02	9.98169E-02	.76916589	-.07852500	.04413685	.01104057	.28331173	.3333	.4013
11	2.86313408	3.99076E-02	9.99695E-02	.76918984	-.08113438	.04536215	.00987842	.28326833	.3810	.4012
12	3.05852585	3.98678E-02	9.99678E-02	.76916205	-.08383483	.04324268	.00890182	.28312913	.4286	.4008
13	3.25391761	3.97209E-02	9.98814E-02	.76969007	-.08666781	.04299942	.00804542	.28290176	.4762	.4002
14	3.44930937	3.98406E-02	9.99436E-02	.76948529	-.08779698	.04226852	.00730324	.28294598	.5238	.4003
15	3.64470113	4.04964E-02	1.00657E-01	.76858067	-.08543450	.04259356	.00666862	.28348640	.5714	.4018
16	3.84009289	4.14423E-02	1.02448E-01	.76643424	-.08314726	.04216752	.00610411	.28441582	.6190	.4045
17	4.03548465	4.26459E-02	1.04655E-01	.76519553	-.07894721	.04161409	.00558729	.28553294	.6667	.4076
18	4.23087641	4.39345E-02	1.06930E-01	.76395555	-.07495282	.04113552	.00511453	.28669701	.7143	.4110
19	4.42626817	4.52378E-02	1.09170E-01	.76119871	-.07101403	.04103332	.00468580	.28785291	.7619	.4143
20	4.62165993	4.65177E-02	1.11421E-01	.76007548	-.06661695	.04084960	.00429553	.28896220	.8095	.4175
21	4.81705169	4.77955E-02	1.13632E-01	.75854619	-.06159573	.04064960	.00394583	.29004938	.8571	.4206
22	5.01244345	4.90003E-02	1.15692E-01	.75672467	-.05840657	.04034659	.00362282	.29104654	.9048	.4235
23	5.20785521	5.02809E-02	1.17868E-01	.75499928	-.05459139	.04018246	.00334235	.29209196	.9524	.4266
24	5.40322697	5.13180E-02	1.19602E-01	.75359999	-.05182498	.04004244	.00306748	.29291635	1.0000	.4290

K= 5 PHI = 20.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT

3	1.30000000	3.91971E-02	9.41787E-02	.76090166	-.00000000	.06942891	.06846347	.28851630	0.0000	.4162
4	1.49840691	3.98241E-02	9.77825E-02	.76667326	-.02459755	.06584262	.03172962	.28940213	.0476	.4073
5	1.69681382	3.97252E-02	9.82662E-02	.76848883	-.04027704	.05950761	.02233677	.28934540	.0952	.4043
6	1.89522072	3.95894E-02	9.82620E-02	.76897175	-.05154592	.05552281	.01911395	.28887938	.1429	.4029
7	2.09362763	3.94734E-02	9.82404E-02	.76955289	-.05991901	.05274557	.01605975	.28845101	.1905	.4017
8	2.29203454	3.93910E-02	9.82337E-02	.76996497	-.06616777	.05061934	.01406654	.28816481	.2381	.4009
9	2.49044145	3.93278E-02	9.82626E-02	.76961198	-.07109489	.04904485	.01233352	.28792469	.2857	.4002
10	2.68884836	3.93618E-02	9.84192E-02	.76954905	-.07460107	.04784953	.01096769	.28782161	.3333	.3999
11	2.88725527	3.94728E-02	9.86993E-02	.76937514	-.07702045	.04683582	.00979661	.28781708	.3810	.3999
12	3.08566217	3.95945E-02	9.87367E-02	.76937348	-.07970413	.04601933	.00881143	.28769888	.4286	.3996
13	3.28406908	3.93478E-02	9.85066E-02	.76949589	-.08235568	.04533666	.00794879	.28750246	.4762	.3990
14	3.48247599	3.95150E-02	9.89551E-02	.76895102	-.08332272	.04471614	.00720534	.28754679	.5238	.3993
15	3.68088290	4.01571E-02	1.00160E-01	.76837348	-.08179721	.04408751	.00656992	.28818587	.5714	.4010
16	3.87928981	4.11838E-02	1.02049E-01	.76699012	-.07851947	.04344349	.00600325	.28914851	.6190	.4037
17	4.07769672	4.24553E-02	1.04205E-01	.76553787	-.07467261	.04284879	.00548473	.28528533	.6667	.4069
18	4.27610362	4.36010E-02	1.06495E-01	.76358911	-.06962158	.04226850	.00501120	.28546220	.7143	.4103
19	4.47451053	4.50025E-02	1.08764E-01	.76181408	-.06537447	.04164837	.00458281	.28762795	.7619	.4136
20	4.67291744	4.62846E-02	1.11030E-01	.76007165	-.06106139	.04113958	.00419319	.28874433	.8095	.4169
21	4.87132435	4.75707E-02	1.13253E-01	.75832944	-.05706206	.04066154	.00384530	.28994103	.8571	.4200
22	5.06973126	4.87710E-02	1.15313E-01	.75668885	-.05346414	.04025137	.00352321	.29084125	.9048	.4229
23	5.26813817	5.00654E-02	1.17515E-01	.75492932	-.04976680	.03982620	.00324610	.29190275	.9524	.4260
24	5.46654507	5.10873E-02	1.19246E-01	.75353836	-.04688622	.03953827	.00297066	.29271773	1.0000	.4284

K= 6 PHI = 30.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.68224E-02	9.00651E-02	.76185008	-.00000000	.10304929	.06846347	.28595186	0.0000	.4088
4	1.50345872	3.79502E-02	9.45006E-02	.76702504	-.02250459	.09787338	.03152834	.28340322	.0476	.4016
5	1.70691745	3.82102E-02	9.55878E-02	.76881728	-.03682423	.09444971	.02214485	.28275086	.0952	.3997
6	1.91037617	3.83219E-02	9.60059E-02	.76969364	-.04721470	.09141562	.01896394	.28254767	.1429	.3992
7	2.11383489	3.83636E-02	9.63245E-02	.76967629	-.05483345	.07816049	.01592047	.28230555	.1905	.3985
8	2.31729362	3.84322E-02	9.65458E-02	.76983306	-.06064854	.07562096	.01391555	.28215450	.2381	.3981
9	2.52075234	3.84725E-02	9.67421E-02	.76994236	-.06512433	.07356681	.01217298	.28202101	.2857	.3977
10	2.72421106	3.85949E-02	9.70571E-02	.76986824	-.06862945	.07166458	.01080075	.28201076	.3333	.3977
11	2.92766978	3.87636E-02	9.74385E-02	.76976393	-.07081276	.06981116	.00962105	.28206573	.3810	.3978
12	3.13112851	3.87737E-02	9.75209E-02	.76973955	-.07350562	.06780944	.00862897	.28197839	.4286	.3976
13	3.33458723	3.87188E-02	9.74509E-02	.76986175	-.07541730	.06654566	.00776413	.28183426	.4762	.3972
14	3.53804595	3.87604E-02	9.75833E-02	.76955814	-.07664642	.06485130	.00702509	.28201416	.5238	.3977
15	3.74150468	3.96797E-02	9.93104E-02	.76819767	-.07415723	.06485100	.00633258	.28268452	.5714	.3996
16	3.94496340	4.07478E-02	1.01254E-01	.76714714	-.07052571	.06385866	.00562544	.28370176	.6190	.4024
17	4.14842212	4.19926E-02	1.03492E-01	.76594781	-.06615451	.06289148	.00500707	.28487121	.6667	.4058
18	4.35188085	4.32594E-02	1.05810E-01	.76366201	-.06196431	.06198497	.00445497	.28606851	.7143	.4092
19	4.55533957	4.46076E-02	1.08128E-01	.76185524	-.05763472	.06113689	.00400940	.28725009	.7619	.4126
20	4.75879828	4.58960E-02	1.10376E-01	.76024698	-.05367214	.06036901	.00362512	.28837919	.8095	.4159
21	4.96225702	4.71883E-02	1.12615E-01	.75862996	-.04960181	.05964805	.00367952	.28948993	.8571	.4190
22	5.16571574	4.83906E-02	1.14684E-01	.75604040	-.04594000	.05902610	.00336118	.29049928	.9048	.4219
23	5.36917446	4.96979E-02	1.16911E-01	.75483640	-.04148745	.05838158	.00308940	.29157932	.9524	.4251
24	5.57263319	5.07121E-02	1.18633E-01	.75343661	-.03860698	.05794253	.00281671	.29239358	1.0000	.4275

K= 7 PHI = 40.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.37690E-02	8.46632E-02	.76304439	-.00000000	.13752028	.06846347	.28243634	0.0000	.3989
4	1.51056585	3.55413E-02	9.01995E-02	.76743403	-.01947502	.12808065	.03096364	.28072396	.0476	.3940
5	1.72113170	3.62544E-02	9.28602E-02	.76924811	-.03181708	.11625347	.02193557	.28061596	.0952	.3937
6	1.93169755	3.66777E-02	9.30566E-02	.76974509	-.04069241	.10801845	.01978075	.28076477	.1429	.3941
7	2.14226340	3.69655E-02	9.37805E-02	.77012567	-.04771539	.10226589	.01575009	.28077457	.1905	.3942
8	2.35282925	3.71807E-02	9.43060E-02	.77007165	-.05286530	.09798878	.01372835	.28080442	.2381	.3943
9	2.56339510	3.73539E-02	9.47384E-02	.77004472	-.05680269	.09467592	.01197255	.28081482	.2857	.3943
10	2.77396095	3.75897E-02	9.52594E-02	.77031569	-.05948850	.09200150	.01058630	.28092822	.3333	.3946
11	2.98452680	3.78832E-02	9.57673E-02	.77013194	-.06146271	.08995515	.00959344	.28105711	.3810	.3950
12	3.19509265	3.78742E-02	9.59243E-02	.77025996	-.06359029	.08821485	.00839076	.28101062	.4286	.3948
13	3.40565850	3.78926E-02	9.60172E-02	.77037207	-.06602156	.08674693	.00752124	.28094286	.4762	.3946
14	3.61622435	3.82436E-02	9.67026E-02	.76997577	-.06603393	.08538646	.00678585	.28123942	.5238	.3955

15	3.82679020	3.90487E-02	9.81964E-02	.76890641	-.03374752	.08405945	.00615381	.28201381	.5714	.3977
16	4.03735605	4.01692E-02	1.00248E-01	.76737155	-.03366700	.08464753	.00558487	.28309836	.6190	.4007
17	4.24792190	4.14892E-02	1.02439E-01	.76561170	-.03353746	.08513316	.00508615	.28430737	.6667	.4042
18	4.45848775	4.27528E-02	1.04556E-01	.76377960	-.03341413	.08551310	.00459605	.28552978	.7143	.4078
19	4.66905360	4.40739E-02	1.07017E-01	.76192681	-.03326650	.08580857	.00417443	.28673068	.7619	.4111
20	4.87961945	4.53646E-02	1.09487E-01	.76011592	-.03312598	.08604112	.00379313	.28787619	.8095	.4144
21	5.09018530	4.66620E-02	1.11735E-01	.75812940	-.03298473	.08621892	.00345566	.28900340	.8571	.4176
22	5.30075115	4.78637E-02	1.13815E-01	.75663193	-.03287247	.08638342	.00314337	.29002616	.9048	.4206
23	5.51131700	4.91842E-02	1.16064E-01	.7547 92	-.03251109	.08653629	.00287886	.29112501	.9524	.4238
24	5.72188285	5.01956E-02	1.17786E-01	.75331136	-.03283759	.08473256	.00261181	.29194490	1.0000	.4262

K= 8 PHI = 50.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.02229E-02	7.82146E-02	.76452132	.00000000	.17057887	.06846347	.27799640	0.0000	.3864
4	1.51977340	3.27269E-02	8.50049E-02	.76803968	-.01552657	.15851250	.01051945	.27739093	.0476	.3847
5	1.73954680	3.35488E-02	8.78706E-02	.76984821	-.01655625	.14258702	.02174472	.27797499	.0952	.3864
6	1.95932020	3.47297E-02	8.95393E-02	.77054464	-.01720668	.13215641	.01661839	.27856822	.1429	.3880
7	2.17909360	3.52759E-02	9.07049E-02	.77072523	-.01688430	.12481417	.01558744	.27888786	.1905	.3889
8	2.39886701	3.56797E-02	9.15576E-02	.77091366	-.01726802	.11953106	.01353080	.27913656	.2381	.3896
9	2.61864041	3.60082E-02	9.23006E-02	.77103000	-.01659112	.11552458	.01174729	.27932426	.2857	.3901
10	2.83841381	3.63714E-02	9.30106E-02	.77092580	-.01671672	.11164413	.01033358	.27958386	.3333	.3908
11	3.05818721	3.66734E-02	9.36946E-02	.77082511	-.01696949	.10869210	.00911288	.27919257	.3810	.3914
12	3.27796061	3.67728E-02	9.39429E-02	.77097743	-.01720449	.10668145	.00809017	.27979533	.4286	.3914
13	3.49773401	3.68894E-02	9.42151E-02	.77103650	-.01733181	.10445460	.00721308	.27983731	.4762	.3915
14	3.71750741	3.73052E-02	9.51354E-02	.77065209	-.01737451	.10295167	.00647905	.28029	.5238	.3928
15	3.93728081	3.82737E-02	9.68217E-02	.76932914	-.01691927	.10117480	.00584476	.2811	.5714	.3953
16	4.15705421	3.94953E-02	9.89769E-02	.76769472	-.01677165	.09943779	.00527337	.28235+2	.6190	.3986
17	4.37682761	4.07441E-02	1.01324E-01	.76565327	-.01621650	.09778653	.00476570	.28358974	.6667	.4021
18	4.59660102	4.20085E-02	1.03701E-01	.76397347	-.01552510	.09624773	.00429049	.28484128	.7143	.4057
19	4.81637442	4.33950E-02	1.06057E-01	.76206935	-.01506430	.09483116	.00387613	.28606504	.7619	.4092
20	5.03614782	4.46902E-02	1.08338E-01	.76037414	-.01481401	.09354513	.00350362	.28723117	.8095	.4125
21	5.25592122	4.57915E-02	1.10407E-01	.75837414	-.01468564	.09234360	.00317590	.28837745	.8571	.4158
22	5.47569462	4.72023E-02	1.12704E-01	.75653487	-.01435461	.09129140	.00287392	.28941893	.9048	.4188
23	5.69546802	4.85235E-02	1.14969E-01	.75469038	-.01394118	.09022733	.00261983	.29053617	.9524	.4221
24	5.91524142	4.95390E-02	1.16704E-01	.75319658	-.01413912	.08947450	.00236318	.29137042	1.0000	.4245

K= 9 PHI = 60.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.63906E-02	7.09947E-02	.76609539	.00000000	.20339922	.06846347	.27266339	0.0000	.3717
4	1.53103410	2.98699E-02	7.93224E-02	.76831073	-.01071115	.18088811	.01050680	.27351129	.0476	.3740
5	1.76206821	3.14378E-02	8.31785E-02	.77054974	-.01204445	.16756481	.02165356	.27492417	.0952	.3779
6	1.99310231	3.25996E-02	8.59494E-02	.77104704	-.01401414	.15918709	.01594505	.27603149	.1429	.3810
7	2.22413642	3.34044E-02	8.72576E-02	.77154685	-.01452323	.15459182	.01537767	.27670367	.1905	.3828
8	2.45517052	3.40043E-02	8.85087E-02	.77173702	-.01540441	.15016792	.01324737	.27719719	.2381	.3842
9	2.68620462	3.44966E-02	8.55402E-02	.77186182	-.01547163	.13326086	.01140728	.27758482	.2857	.3853
10	2.91723873	3.48875E-02	9.05429E-02	.77175310	-.01625832	.12903856	.00994742	.27800042	.3333	.3864
11	3.14827283	3.53464E-02	9.12865E-02	.77173178	-.01778857	.12569412	.00869479	.27828154	.3810	.3872
12	3.37930693	3.54978E-02	9.16333E-02	.77196252	-.01988503	.12287677	.00765867	.27834041	.4286	.3874
13	3.61034104	3.57356E-02	9.21278E-02	.77197363	-.02084743	.12042032	.00678619	.27852664	.4762	.3879
14	3.84137514	3.61604E-02	9.33246E-02	.77127872	-.01950614	.11813794	.00606942	.27914581	.5238	.3896
15	4.07240925	3.72004E-02	9.52009E-02	.76995523	-.01761232	.11559490	.00543631	.28017662	.5714	.3925
16	4.30344335	3.85996E-02	9.74759E-02	.76815529	-.01566145	.11374058	.00487131	.28141826	.6190	.3960
17	4.53447745	3.99162E-02	9.98774E-02	.76623248	-.01486948	.11172675	.00436432	.28271972	.6667	.3997
18	4.76551156	4.12497E-02	1.02283E-01	.76422264	-.01420806	.10987063	.00391246	.28400423	.7143	.4033
19	4.99654566	4.25902E-02	1.04658E-01	.76231382	-.01367255	.10816409	.00351334	.28525449	.7619	.4069
20	5.22757977	4.38795E-02	1.06956E-01	.76033578	-.01340750	.10661551	.00315711	.28644534	.8095	.4103
21	5.45861387	4.51827E-02	1.09240E-01	.75844905	-.01324297	.10517578	.00284572	.28761366	.8571	.4136
22	5.68964797	4.63998E-02	1.11357E-01	.75667417	-.01294741	.10391144	.00256019	.28867849	.9048	.4167
23	5.92068208	4.77223E-02	1.13634E-01	.75496213	-.01251855	.10263454	.00232156	.28981512	.9524	.4200
24	6.15171618	4.87459E-02	1.15390E-01	.75313142	.00123551	.10171563	.00208051	.29067008	1.0000	.4224

K=10 PHI = 70.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	1.19451E-02	3.93338E-02	.78142412	.00000000	.30960938	.06846347	.24228969	0.0000	.2935
4	1.63431013	1.73042E-02	5.34471E-02	.77809194	.04428132	.20473263	.04387917	.25946503	.0476	.3238
5	1.96862025	2.12061E-02	6.25597E-02	.78005870	.03501411	.27616531	.02635976	.26033141	.0952	.3389
6	2.30291038	2.36214E-02	6.79856E-02	.78100443	.04159620	.28136225	.01866553	.26366443	.1429	.3476
7	2.63724051	2.52768E-02	7.15128E-02	.78179604	.04564450	.18555574	.01358056	.26566889	.1905	.3529
8	2.97155064	2.64054E-02	7.40521E-02	.78210321	.04830305	.17116593	.01012406	.26706607	.2381	.3566
9	3.30586076	2.72537E-02	7.58731E-02	.78275928	.05006985	.16170146	.00766597	.26803046	.2857	.3592
10	3.64017089	2.77159E-02	7.68853E-02	.78315816	.05103338	.15415182	.00586868	.26852847	.3333	.3605
11	3.97448102	2.80443E-02	7.76036E-02	.78346079	.05117032	.14821151	.00443031	.26884180	.3810	.3614
12	4.30879115	2.82994E-02	7.82403E-02	.78344189	.05312104	.14296196	.00333663	.26950558	.4286	.3632
13	4.64310127	2.84693E-02	8.00934E-02	.78406045	.05215514	.13918097	.00254760	.27066077	.4762	.3661
14	4.97741140	3.05555E-02	8.46310E-02	.78007410	.04254558	.13546227	.00195231	.27195139	.5238	.3698
15	5.31172153	3.17374E-02	8.79427E-02	.77775945	.04784479	.13249684	.00148757	.27338717	.5714	.3737
16	5.64603166	3.29504E-02	8.72554E-02	.77531197	.04335193	.12614422	.00113787	.27482147	.6190	.3776
17	5.98034178	3.41694E-02	8.95667E-02	.77281317	.04858652	.12243046	.00145583	.27622338	.6667	.3815
18	6.31465191	3.53828E-02	9.18402E-02	.77033460	.04358170	.11896364	.00122617	.27758100	.7143	.3853
19	6.64896204	3.65897E-02	9.40881E-02	.76777801	.04834402	.11733580	.00103577	.27889563	.7619	.3889
20	6.98327217	3.77781E-02	9.62651E-02	.76532591	.04285520	.11496549	.00088273	.28015636	.8095	.3924
21	7.31758229	3.89624E-02	9.84021E-02	.76287056	.04713117	.11226721	.00075582	.28138172	.8571	.3959
22	7.65189242	4.00894E-02	1.00455E-01	.76054714	.04103551	.11019684	.00064547	.28251917	.9048	.3991
23	7.98620255	4.12806E-02	1.02599E-01	.75806109	.04510455	.10856840	.00056231	.28370376	.9524	.4024
24	8.32051268	4.21793E-02	1.04172E-01	.75628740	.04777039	.10743643	.00047363	.28456013	1.0000	.4049

K=16 PHI =190.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	1.60755E-02	4.96254E-02	.78819182	.00000000	.23694060	.06846347	.25402224	0.0000	.3226
4	1.65342133	2.01232E-02	5.91626E-02	.78604678	.04567792	.23436441	.05456871	.26081927	.0476	.3401
5	2.00684266	2.34962E-02	6.71041E-02	.78127736	.04040909	.19419573	.03126309	.26463068	.0952	.3501
6	2.36026398	2.59537E-02	7.07935E-02	.78251862	.04054521	.17617655	.02036910	.26603681	.1429	.3539
7	2.71368531	2.61634E-02	7.33524E-02	.78348759	.04616586	.16211967	.01407763	.26708823	.1905	.3567
8	3.06710664	2.69565E-02	7.51602E-02	.78385055	.04054100	.15421518	.00985470	.26784588	.2381	.3587
9	3.42052797	2.74472E-02	7.62682E-02	.78445172	.04284562	.14432794	.00701442	.26824472	.2857	.3598
10	3.77394930	2.76095E-02	7.67115E-02	.78594272	.04318169	.13819194	.00516145	.26829504	.3333	.3599
11	4.12737063	2.77870E-02	7.71314E-02	.78607847	.04374045	.13536861	.00395464	.26842317	.3810	.3603
12	4.48079195	2.82837E-02	7.81570E-02	.78561912	.04647582	.13812107	.00313287	.26902264	.4286	.3619
13	4.83421328	2.91045E-02	7.99600E-02	.78412126	.04154477	.13417070	.00254131	.27006914	.4762	.3647
14	5.18763461	3.01197E-02	8.19121E-02	.78202795	.03694442	.13026106	.00208656	.27135101	.5238	.3682
15	5.54105594	3.12193E-02	8.39648E-02	.77961105	.04284445	.12601417	.00172245	.27270922	.5714	.3719
16	5.89447727	3.23491E-02	8.61534E-02	.77702779	.04774593	.12135760	.00143245	.27406929	.6190	.3756
17	6.24789860	3.34866E-02	8.83607E-02	.77415845	.04574935	.11704872	.00119667	.27540489	.6667	.3792
18	6.60131992	3.46277E-02	9.04526E-02	.77197077	.04826990	.11275765	.00100727	.27670482	.7143	.3828
19	6.95474125	3.57636E-02	9.25727E-02	.76940980	.04260870	.10853127	.00084053	.27796757	.7619	.3863
20	7.30816258	3.68863E-02	9.46486E-02	.76668714	.04139939	.10511757	.00070269	.27918391	.8095	.3897
21	7.66158391	3.80045E-02	9.69054E-02	.76458414	.04116882	.10171290	.00058716	.28036580	.8571	.3930
22	8.01500524	3.90757E-02	9.86435E-02	.76200919	.04156936	.09913583	.00048491	.28147125	.9048	.3961
23	8.36842657	4.00284E-02	1.00685E-01	.75994640	.04163463	.09714398	.00040490	.28261448	.9524	.3994
24	8.72184789	4.10361E-02	1.02166E-01	.75775825	.04222221	.09603261	.00032140	.28342992	1.0000	.4017

K=17 PHI =190.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.52335E-02	6.87572E-02	.78413497	.00000000	.13467398	.06846347	.27092260	0.0000	.3670
4	1.67114515	2.59585E-02	7.04811E-02	.77808933	.03902810	.16076343	.05825915	.27068214	.0476	.3669
5	2.04229030	2.80774E-02	7.59709E-02	.77521887	.04974988	.14451330	.03544849	.27186090	.0952	.3695
6	2.41343545	2.81779E-02	7.69186E-02	.78184844	.04315549	.13744726	.02179498	.27067854	.1429	.3663
7	2.78458060	2.84859E-02	7.79479E-02	.78554454	.04324298	.13454348	.01419411	.27078975	.1905	.3655
8	3.15572576	2.89410A-02	7.85[illegible]E-02	.78400669	.04390160	.13454366	.00935366	.26998726	.2381	.3644
9	3.52687091	2.84037E-02	7.82136E-02	.78552214	.04354038	.13211160	.00640123	.26950167	.2857	.3632
10	3.89801606	2.80735E-02	7.76624E-02	.78465521	.04551272	.13153254	.00469648	.26887974	.3333	.3615
11	4.26916121	2.79567E-02	7.74955E-02	.78780940	.03602266	.13265624	.00345153	.26860853	.3810	.3608
12	4.64030636	2.82845E-02	7.81854E-02	.78748268	.03911613	.13085719	.00269974	.26898393	.4286	.3618

13	5.01145151	2.89892E-02	7.96024E-02	.78592868	.08404199	.10525309	.00216341	.26987954	.4762	.3642
14	5.38259666	2.99014E-02	8.14077E-02	.78374586	.08975553	.10191174	.00174842	.27103651	.5238	.3673
15	5.75374181	3.09088E-02	8.33771E-02	.78127599	.09455996	.09896772	.00141982	.27229063	.5714	.3707
16	6.12488696	3.19568E-02	8.54626E-02	.77864645	.09851651	.09611651	.00115897	.27356523	.6190	.3742
17	6.49603211	3.30227E-02	8.74406E-02	.77604125	.10239789	.09316872	.00095025	.27482999	.6667	.3777
18	6.86717727	3.40947E-02	8.94699E-02	.77341602	.10641471	.09133208	.00078194	.27607059	.7143	.3811
19	7.23832242	3.51610E-02	9.14797E-02	.77078357	.11015939	.08911653	.00064959	.27728104	.7619	.3844
20	7.60946757	3.62278E-02	9.34559E-02	.76824659	.11365283	.08745757	.00053273	.27844954	.8095	.3877
21	7.98061272	3.72778E-02	9.53836E-02	.76567813	.11677207	.08571445	.00043895	.27957855	.8571	.3908
22	8.35175787	3.82814E-02	9.72161E-02	.76329230	.12015110	.08414359	.00035663	.28063384	.9048	.3938
23	8.72290302	3.93206E-02	9.90989E-02	.76085349	.12336026	.08264291	.00028987	.28170315	.9524	.3968
24	9.09404817	4.00942E-02	1.00421E-01	.75917881	.13470485	.08147874	.00021781	.28244056	1.0000	.3989

K=18 PHI =150.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.08286E-02	7.93310E-02	.77824437	.00000000	.07569938	.06846347	.27878552	0.0000	.3886
4	1.68004126	3.02642E-02	7.90111E-02	.77656482	.04835598	.10064985	.05544332	.27678048	.0476	.3830
5	2.07008252	3.14110E-02	8.23227E-02	.77743756	.06035620	.10122164	.03535515	.27624612	.0952	.3816
6	2.45812379	3.08401E-02	8.07288E-02	.77696667	.07554604	.09661701	.02068469	.27409734	.1429	.3756
7	2.84816505	3.07837E-02	8.07507E-02	.77617930	.08245276	.09315499	.01323348	.27329652	.1905	.3735
8	3.23820631	3.03554E-02	8.00594E-02	.77574736	.08765404	.09013489	.00870525	.27255477	.2381	.3709
9	3.61624757	2.97972E-02	8.05315E-02	.78427564	.08879420	.09004146	.00536928	.27134886	.2857	.3682
10	4.00028883	2.90163E-02	7.95039E-02	.78705108	.08838071	.08864402	.00482971	.27017271	.3333	.3650
11	4.38833010	2.85575E-02	7.81461E-02	.78948250	.08815158	.08815466	.00385670	.26945793	.3810	.3630
12	4.77437136	2.86227E-02	7.81595E-02	.78893643	.09070122	.08435437	.00308338	.26947804	.4286	.3631
13	5.16041262	2.91213E-02	7.96366E-02	.78726594	.09516141	.08197863	.00255965	.27009319	.4762	.3648
14	5.54645388	2.98049E-02	8.13148E-02	.78503519	.10049164	.07961991	.00212761	.27102600	.5238	.3673
15	5.93249514	3.07310E-02	8.30134E-02	.78267156	.10567062	.07744711	.00176232	.27209927	.5714	.3702
16	6.31853641	3.16575E-02	8.48117E-02	.78031626	.11139731	.07545918	.00145005	.27322636	.6190	.3733
17	6.70457767	3.26130E-02	8.66691E-02	.77751142	.11654766	.07355419	.00118798	.27436921	.6667	.3764
18	7.09061893	3.35926E-02	8.85756E-02	.77492649	.12141129	.07181385	.00096222	.27550895	.7143	.3795
19	7.47666019	3.45860E-02	9.05191E-02	.77237677	.12604360	.07018776	.00076866	.27663500	.7619	.3826
20	7.86270145	3.55779E-02	9.24490E-02	.76978058	.13049523	.06867436	.00060051	.27773706	.8095	.3857
21	8.24874272	3.65655E-02	9.40765E-02	.76724060	.13484437	.06725438	.00045699	.27881135	.8571	.3887
22	8.63478398	3.75196E-02	9.58322E-02	.76482158	.13911856	.06605520	.00033386	.27982710	.9048	.3915
23	9.02082524	3.85023E-02	9.76260E-02	.76235187	.14219621	.06482402	.00023470	.28085240	.9524	.3944
24	9.40686650	3.91574E-02	9.88150E-02	.76078595	.14436543	.06397727	.00014368	.28152097	1.0000	.3963

K=19 PHI =160.0 Z = 15.592103

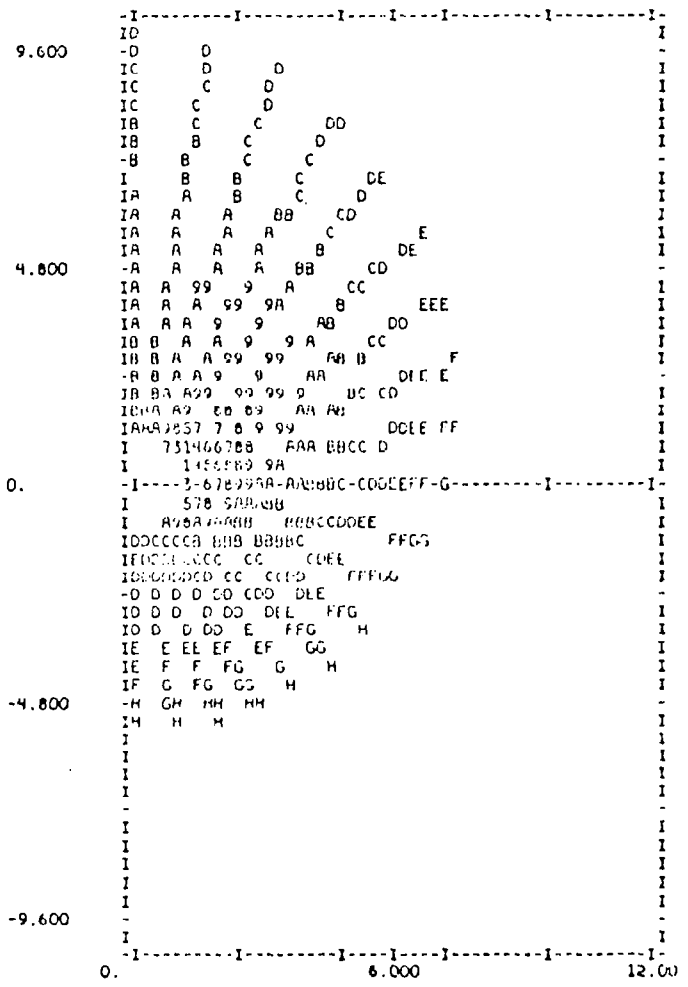
J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.27218E-02	8.27811E-02	.77645529	-.00000000	.04285446	.06846347	.28116929	0.0000	.3953
4	1.69785185	3.24123E-02	8.30907E-02	.77650379	.04621445	.06941348	.05334635	.27931636	.0476	.3901
5	2.09570366	3.26547E-02	8.47161E-02	.77797320	.06063145	.06933257	.03436241	.27765454	.0952	.3855
6	2.49355549	3.20712E-02	8.45121E-02	.78075177	.06163697	.06555344	.01940729	.27549456	.1429	.3795
7	2.89140732	3.19386E-02	8.47011E-02	.78159471	.06294789	.06266117	.01213704	.27461760	.1905	.3771
8	3.28925915	3.14902E-02	8.41081E-02	.78266472	.06468094	.06111037	.00789362	.27365077	.2381	.3744
9	3.68711098	3.07675E-02	8.29557E-02	.78446336	.06927650	.06055444	.00565735	.27252432	.2857	.3713
10	4.08496281	2.97805E-02	8.10315E-02	.78670562	.07276679	.06019178	.00419178	.27111590	.3333	.3675
11	4.48281464	2.91110E-02	7.97811E-02	.78842914	.07476241	.05881088	.00320040	.27014134	.3810	.3649
12	4.88066647	2.89955E-02	7.95594E-02	.78895352	.07675863	.05576435	.00254033	.26992473	.4286	.3643
13	5.27851830	2.93515E-02	8.03781E-02	.78781319	.07949143	.05434528	.00207390	.27035494	.4762	.3655
14	5.67637013	2.99959E-02	8.15950E-02	.78589475	.08079938	.05348648	.00176544	.27115566	.5238	.3676
15	6.07422196	3.07796E-02	8.31279E-02	.78346928	.08246777	.05346574	.00149040	.27212504	.5714	.3703
16	6.47207379	3.16557E-02	8.47892E-02	.78093141	.08407164	.05311762	.00115197	.27317014	.6190	.3731
17	6.86992562	3.25323E-02	8.65114E-02	.77832175	.08489140	.05259446	.00094817	.27424301	.6667	.3760
18	7.26777745	3.34596E-02	8.82593E-02	.77569458	.08573466	.05251528	.00078090	.27531928	.7143	.3790
19	7.66562928	3.43794E-02	9.00044E-02	.77336381	.08745285	.05183434	.00064110	.27638022	.7619	.3819
20	8.06348111	3.52772E-02	9.17301E-02	.77059437	.08913677	.05143430	.00051430	.27741442	.8095	.3848
21	8.46133294	3.62012E-02	9.34179E-02	.76807762	.09057824	.05064664	.00040624	.27841197	.8571	.3876
22	8.85918477	3.70776E-02	9.50256E-02	.76575503	.09216911	.05025380	.00029380	.27934885	.9048	.3902
23	9.25703660	3.79631E-02	9.66433E-02	.76342639	.09365083	.04984850	.00019906	.28028033	.9524	.3928
24	9.65488843	3.85179E-02	9.78623E-02	.76205424	.09515496	.04940670	.00010190	.28095525	1.0000	.3944

K-20 PHI =170.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.37536E-02	8.46179E-02	.77516604	-.00000000	.01774187	.06846347	.28241913	0.0000	.3988
4	1.70531088	3.40819E-02	8.66[illegible]E-02	.77729269	.03940118	.03[illegible]313	.04476462	.28042633	.0476	.3932
5	2.11062175	3.34027E-02	8.65[illegible]E-02	.77974295	.06715547	.05[illegible]078	.02730815	.27758317	.0952	.3861
6	2.51593263	3.29443E-02	8.63[illegible]E-02	.78129541	.08408170	.07251114	.01640828	.27625764	.1429	.3816
7	2.92124351	3.26636E-02	8.61408E-02	.78156237	.09472390	.08317601	.01099463	.27558331	.1905	.3792
8	3.32655438	3.21521E-02	8.58884E-02	.78237350	.10192061	.08[illegible]9490	.00748701	.27442300	.2381	.3765
9	3.73186526	3.13364E-02	8.39475E-02	.78480734	.10358825	.09[illegible]346	.00581450	.27323464	.2857	.3733
10	4.13717614	3.02343E-02	8.15659E-02	.78695362	.10518632	.09[illegible]593	.00427893	.27171036	.3333	.3691
11	4.54248701	2.91433E-02	8.04271E-02	.78892692	.10657486	.09[illegible]548	.00331041	.27058485	.3810	.3661
12	4.94779789	2.92171E-02	8.05[illegible]E-02	.78931651	.10699259	.09[illegible]594	.00262594	.27022595	.4286	.3651
13	5.35310877	2.94918E-02	8.05874E-02	.78813978	.10715701	.09[illegible]122	.00213678	.27054056	.4762	.3660
14	5.75841964	3.00615E-02	8.17181E-02	.78633369	.11425631	.09[illegible]949	.00176214	.27124473	.5238	.3679
15	6.16373052	3.07859E-02	8.31687E-02	.78400087	.11974686	.02[illegible]216	.00144447	.27213807	.5714	.3703
16	6.56904140	3.15220E-02	8.47007E-02	.78144533	.12504627	.02[illegible]762	.00117637	.27311645	.6190	.3730
17	6.97435227	3.24420E-02	8.63377E-02	.77894265	.13011230	.02[illegible]040	.00095113	.27413321	.6667	.3757
18	7.37966315	3.33206E-02	8.80[illegible]E-02	.77628072	.13491667	.02[illegible]367	.00076393	.27516412	.7143	.3786
19	7.78497403	3.42136E-02	8.97[illegible]E-02	.77360959	.13943660	.02[illegible]077	.00060734	.27619020	.7619	.3814
20	8.19028490	3.51667E-02	9.15[illegible]E-02	.77110619	.14366361	.02[illegible]144	.00047309	.27719599	.8095	.3842
21	8.59559578	3.59[illegible]E-02	9.33[illegible]E-02	.76867417	.14762769	.02[illegible]772	.00035818	.27816805	.8571	.3869
22	9.00030666	3.62697E-02	9.45[illegible]E-02	.76626726	.15106820	.02[illegible]06	.00025916	.27907850	.9048	.3894
23	9.40621754	3.76513E-02	9.60[illegible]E-02	.76406394	.15435469	.02[illegible]572	.00017572	.27995118	.9524	.3919
24	9.81152841	3.81299E-02	9.69602E-02	.76283472	.15596056	.02[illegible]037	.00008076	.28044729	1.0000	.3933

K-21 PHI =180.0 Z = 15.592103

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.38357E-02	8.47844E-02	.77519042	-.00000000	0.00[illegible]000	.06846347	.28251718	0.0000	.3991
4	1.70751068	3.44174E-02	8.76[illegible]E-02	.77858437	.03415606	0.00[illegible]000	.03836745	.28017820	.0476	.3925
5	2.11503335	3.34640E-02	8.69[illegible]E-02	.78112693	.06[illegible]7834	0.00[illegible]000	.02364750	.27759285	.0952	.3853
6	2.52255603	3.31467E-02	8.67[illegible]E-02	.78162369	.08[illegible]5659	0.00[illegible]000	.01579651	.27643789	.1429	.3821
7	2.93056670	3.27355E-02	8.63571E-02	.78171329	.09[illegible]3807	0.00[illegible]000	.01150641	.27559616	.1905	.3798
8	3.33758338	3.23296E-02	8.56483E-02	.78224128	.10[illegible]1457	0.00[illegible]000	.00840971	.27472941	.2381	.3774
9	3.74510006	3.15137E-02	8.42[illegible]E-02	.78399491	.10[illegible]3121	0.00[illegible]000	.00668133	.27355910	.2857	.3742
10	4.15261673	3.03946E-02	8.21[illegible]E-02	.78666952	.10[illegible]7912	0.00[illegible]000	.00540186	.27202547	.3333	.3700
11	4.56013341	2.95575E-02	8.05[illegible]E-02	.78873769	.10[illegible]2310	0.00[illegible]000	.00445145	.27085036	.3810	.3668
12	4.96765008	2.92078E-02	8.00[illegible]E-02	.78919783	.10[illegible]0055	0.00[illegible]000	.00374890	.27042721	.4286	.3657
13	5.37516676	2.93[illegible]E-02	8.03[illegible]E-02	.78[illegible]4	.11[illegible]7	0.00[illegible]00	.00330459	.27066483	.4762	.3663
14	5.78268344	3.00[illegible]E-02	8.15[illegible]E-02	.78[illegible]355	.11995121	0.00[illegible]000	.00277797	.27126996	.5238	.3679
15	6.19020011	3.06[illegible]E-02	8.28[illegible]E-02	.78[illegible]3	.12[illegible]9519	0.00[illegible]000	.00235306	.27206442	.5714	.3701
16	6.59771679	3.14[illegible]E-02	8.42[illegible]E-02	.78206518	.12[illegible]1470	0.00[illegible]000	.00196797	.27295888	.6190	.3725
17	7.00523346	3.22[illegible]E-02	8.58[illegible]E-02	.77959[illegible]2	.13072512	0.00[illegible]000	.00160846	.27391267	.6667	.3751
18	7.41275014	3.30[illegible]E-02	8.74[illegible]E-02	.77705640	.13[illegible]1178	0.00[illegible]000	.00128464	.27490086	.7143	.3779
19	7.82026682	3.39[illegible]E-02	8.91[illegible]E-02	.77447322	.13[illegible]5[illegible]5	0.00[illegible]000	.00099518	.27590512	.7619	.3806
20	8.22778349	3.48[illegible]E-02	9.09[illegible]E-02	.77189549	.13[illegible]0184	0.00[illegible]000	.00074250	.27690546	.8095	.3834
21	8.63530017	3.57[illegible]E-02	9.25[illegible]E-02	.76936901	.14[illegible]3940	0.00[illegible]000	.00052671	.27788400	.8571	.3861
22	9.04281684	3.65[illegible]E-02	9.41[illegible]E-02	.76697[illegible]0	.14[illegible]1186	0.00[illegible]000	.00034629	.27881123	.9048	.3887
23	9.45033352	3.74[illegible]E-02	9.56707E-02	.76465292	.15[illegible]6840	0.00[illegible]000	.00020145	.27971422	.9524	.3912
24	9.85785020	3.79181E-02	9.65756E-02	.76354812	.15708161	0.00[illegible]000	.00007548	.28022313	1.0000	.3926



VERTICAL SCALING

.300E-01	< 0 <	.350E-01	.350E-01	< 1 <	.400E-01
.400E-01	< 2 <	.450E-01	.450E-01	< 3 <	.500E-01
.500E-01	< 4 <	.550E-01	.550E-01	< 5 <	.600E-01
.600E-01	< 6 <	.650E-01	.650E-01	< 7 <	.700E-01
.700E-01	< 8 <	.750E-01	.750E-01	< 9 <	.800E-01
.800E-01	< A <	.850E-01	.850E-01	< B <	.900E-01
.900E-01	< C <	.950E-01	.950E-01	< D <	.100E+00
.100E+00	< E <	.105	.105	< F <	.110
.110	< G <	.115	.115	< H <	.120
.120	< I <	.125			

K= 3 PHI = 0.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.86236E-02	9.31903E-02	.76520646	-.00000000	0.00000000	.06846347	.28790939	0.0000	.4145
4	1.70441859	3.93044E-02	9.88867E-02	.77434646	-.05402375	0.00000000	.00287382	.28194645	.0476	.3975
5	2.10883719	3.77288E-02	9.58104E-02	.77488497	-.07594131	0.00000000	.00620629	.28063720	.0952	.3938
6	2.51325578	3.70574E-02	9.48035E-02	.77491589	-.08689569	0.00000000	.00384126	.27971386	.1429	.3912
7	2.91767437	3.65183E-02	9.37955E-02	.77504804	-.09476954	0.00000000	.00335538	.27904859	.1905	.3893
8	3.32209297	3.62153E-02	9.32775E-02	.77494013	-.10030715	0.00000000	.00276715	.27865802	.2381	.3883
9	3.72651156	3.60455E-02	9.29570E-02	.77484251	-.10496811	0.00000000	.00233819	.27840549	.2857	.3875
10	4.13093015	3.59495E-02	9.28155E-02	.77465382	-.10855038	0.00000000	.00205605	.27829425	.3333	.3872
11	4.53534874	3.59437E-02	9.26935E-02	.77446660	-.11126120	0.00000000	.00176501	.27825934	.3810	.3871
12	4.93976734	3.60254E-02	9.27045E-02	.77430157	-.11319974	0.00000000	.00158274	.27833108	.4286	.3873
13	5.34418593	3.61964E-02	9.32424E-02	.77392686	-.11555765	0.00000000	.00139587	.27844588	.4762	.3877
14	5.74860452	3.62993E-02	9.35339E-02	.77363305	-.11576212	0.00000000	.00125698	.27860044	.5238	.3881
15	6.15302312	3.65674E-02	9.40347E-02	.77322369	-.11512579	0.00000000	.00112954	.27888032	.5714	.3889
16	6.55744171	3.68756E-02	9.46073E-02	.77277523	-.11420661	0.00000000	.00102344	.27920433	.6190	.3898
17	6.96186030	3.70839E-02	9.49952E-02	.77245273	-.11375671	0.00000000	.00092711	.27941947	.6667	.3904
18	7.36627890	3.72970E-02	9.53903E-02	.77213332	-.11321134	0.00000000	.00084644	.27964024	.7143	.3910
19	7.77069749	3.77503E-02	9.62217E-02	.77157634	-.11157832	0.00000000	.00077917	.28011659	.7619	.3923
20	8.17511608	3.84614E-02	9.75535E-02	.77060744	-.10816088	0.00000000	.00072196	.28087943	.8095	.3945
21	8.57953468	3.94343E-02	9.92762E-02	.76940383	-.10332316	0.00000000	.00066944	.28185739	.8571	.3972
22	8.98395327	4.04315E-02	1.01067E-01	.76813309	-.09661766	0.00000000	.00061927	.28285964	.9048	.4000
23	9.38837186	4.16051E-02	1.03156E-01	.76663357	-.09461888	0.00000000	.00057915	.28401417	.9524	.4033
24	9.79279046	4.25530E-02	1.04833E-01	.76539855	-.09085357	0.00000000	.00053110	.28492479	1.0000	.4059

K= 4 PHI = 10.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.80033E-02	9.21188E-02	.76551579	-.00000000	.03793946	.06846347	.28724423	0.0000	.4125
4	1.70680965	3.89159E-02	9.81787E-02	.77430685	-.05222618	.03105887	.00310169	.28157365	.0476	.3964
5	2.11361931	3.74755E-02	9.53471E-02	.77491935	-.07455551	.03[illegible]66	.00625717	.28037239	.0952	.3930
6	2.52042896	3.69006E-02	9.44653E-02	.77494668	-.08540064	.02796944	.00395021	.27952923	.1429	.3907
7	2.92723861	3.63777E-02	9.35304E-02	.77509464	-.09617859	.02666671	.00345758	.27890503	.1905	.3889
8	3.33404827	3.61004E-02	9.30409E-02	.77494978	-.10[illegible]373	.02576918	.00286672	.27854053	.2381	.3879
9	3.74085792	3.59329E-02	9.27807E-02	.77484593	-.10814804	.02510586	.00242148	.27831227	.2857	.3873
10	4.14766757	3.58715E-02	9.26870E-02	.77465977	-.11078427	.02460661	.00213621	.27821635	.3333	.3870
11	4.55447723	3.58154E-02	9.27199E-02	.77446543	-.11247893	.02[illegible]18	.00184257	.27819526	.3810	.3870
12	4.96128688	3.59705E-02	9.29013E-02	.77419949	-.11336532	.02451718	.00164910	.27827709	.4286	.3872
13	5.36809653	3.60983E-02	9.31569E-02	.77382573	-.11390520	.02334351	.00145370	.27839971	.4762	.3875
14	5.77490618	3.62671E-02	9.34854E-02	.77367256	-.11299116	.02258127	.00130722	.27855870	.5238	.3880
15	6.18171584	3.65291E-02	9.39615E-02	.77302519	-.11134180	.02151583	.00117216	.27884288	.5714	.3888
16	6.58852549	3.68192E-02	9.45565E-02	.77277747	-.11026074	.02291973	.00105887	.27916747	.6190	.3897
17	6.99533514	3.70468E-02	9.49264E-02	.77245862	-.11088305	.02273186	.00095606	.27938245	.6667	.3903
18	7.40214480	3.72622E-02	9.53252E-02	.77213945	-.11173289	.02257566	.00086937	.27960525	.7143	.3909
19	7.80895445	3.77212E-02	9.61674E-02	.77155693	-.10947856	.02250863	.00079753	.28008749	.7619	.3922
20	8.21576410	3.84549E-02	9.75042E-02	.77060271	-.10652540	.02212047	.00073551	.28085321	.8095	.3944
21	8.62257376	3.94144E-02	9.92597E-02	.76938717	-.10199428	.02185065	.00068013	.28183815	.8571	.3972
22	9.02938341	4.04087E-02	1.01022E-01	.76811792	-.09772470	.02157270	.00062454	.28283542	.9048	.4000
23	9.43619306	4.15979E-02	1.03143E-01	.76659073	-.09265139	.02126948	.00056498	.28400774	.9524	.4033
24	9.84300272	4.25286E-02	1.04791E-01	.76537269	-.08897936	.02107575	.00052723	.28490108	1.0000	.4058

K= 5 PHI = 20.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.62536E-02	8.90690E-02	.76631622	-.00000000	.07570818	.06846347	.28531657	0.0000	.4070
4	1.71400191	3.78055E-02	9.62117E-02	.77438653	-.05067[illegible]68	.06968[illegible]04	.00235437	.28033567	.0476	.3929
5	2.12800382	3.67236E-02	9.39949E-02	.77504203	-.07044827	.05[illegible]1.89	.00598484	.27953454	.0952	.3907
6	2.54200573	3.63941E-02	9.34386E-02	.77502333	-.08[illegible]9425	.05[illegible]9018	.00395085	.27891737	.1429	.3890
7	2.95600764	3.59352E-02	9.27169E-02	.77513333	-.09[illegible]7398	.05[illegible]1875	.00348305	.27841833	.1905	.3876
8	3.37000955	3.57380E-02	9.23872E-02	.77502084	-.09910069	.05111826	.00290194	.27814382	.2381	.3868
9	3.78401145	3.56268E-02	9.22125E-02	.77492270	-.10[illegible]9473	.04976[illegible]69	.00246500	.27797660	.2857	.3864
10	4.19801336	3.56062E-02	9.21932E-02	.77474024	-.10577482	.[illegible]8749[illegible]1	.00218046	.27792543	.3333	.3862
11	4.61201527	3.56439E-02	9.22626E-02	.77454859	-.10738140	.04791956	.00188297	.27793792	.3810	.3862

12	5.02601718	3.57593E-02	9.25090E-02	.77428256	-.10819989	.04721899	.00168493	.27804664	.4286	.3865
13	5.44001909	3.59037E-02	9.27889E-02	.77401132	-.10879458	.04663867	.00148442	.27818680	.4762	.3869
14	5.85402100	3.60790E-02	9.31217E-02	.77371625	-.10853433	.04618364	.00133376	.27836509	.5238	.3874
15	6.26802291	3.63659E-02	9.36598E-02	.77330110	-.10743771	.04561901	.00119445	.27866602	.5714	.3883
16	6.68202482	3.66905E-02	9.42459E-02	.77285530	-.10701695	.04518174	.00107703	.27899817	.6190	.3892
17	7.09602673	3.68928E-02	9.46429E-02	.77254117	-.10657479	.04482799	.00096999	.27921762	.6667	.3898
18	7.51002864	3.71214E-02	9.50666E-02	.77221365	-.10597429	.04450117	.00088000	.27945489	.7143	.3905
19	7.92403054	3.76033E-02	9.59464E-02	.77158635	-.10403569	.04409520	.00080521	.27995974	.7619	.3919
20	8.33803245	3.83510E-02	9.73156E-02	.77062402	-.10074062	.04360102	.00075981	.28074505	.8095	.3941
21	8.75203436	3.93644E-02	9.90777E-02	.76937858	-.09643649	.04315184	.00068101	.28174622	.8571	.3969
22	9.16603627	4.07220E-02	1.00971E-01	.76808796	-.09216435	.04252202	.00062126	.28275030	.9048	.3997
23	9.58003818	4.15304E-02	1.03025E-01	.76658047	-.08763414	.04191536	.00057937	.28394179	.9524	.4031
24	9.99404009	4.24516E-02	1.04656E-01	.76530013	-.08342888	.04154297	.00051513	.28482609	1.0000	.4056

K= 6 PHI = 30.0 Z = 33.600000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.35036E-02	8.41890E-02	.76756579	-.00000000	.11351615	.06846347	.28211926	0.0000	.3980
4	1.72612138	3.60640E-02	9.30997E-02	.77446355	-.04606807	.10353678	.00125755	.27834138	.0476	.3874
5	2.15224276	3.55570E-02	9.18319E-02	.77518605	-.06965897	.08884779	.00573425	.27620106	.0952	.3870
6	2.57836414	3.54624E-02	9.18121E-02	.77512613	-.07873436	.06833549	.00393303	.27793867	.1429	.3862
7	3.00448552	3.52257E-02	9.14045E-02	.77528218	-.08019673	.07829956	.00346686	.27762676	.1905	.3854
8	3.43060691	3.51557E-02	9.13089E-02	.77516178	-.08169350	.07547676	.00294137	.27749575	.2381	.3850
9	3.85672829	3.51269E-02	9.12844E-02	.77507748	-.08516334	.07342712	.00249538	.27741901	.2857	.3848
10	4.28284967	3.51676E-02	9.13765E-02	.77490110	-.09142573	.07183590	.00221264	.27743691	.3333	.3849
11	4.70897105	3.52532E-02	9.15569E-02	.77471152	-.09869684	.07057471	.00191196	.27750348	.3810	.3850
12	5.13508243	3.54046E-02	9.18498E-02	.77444822	-.09971901	.06956491	.00170956	.27765271	.4286	.3855
13	5.56121381	3.55752E-02	9.21802E-02	.77417676	-.10005572	.06866969	.00150899	.27782426	.4762	.3859
14	5.98733519	3.57784E-02	9.25637E-02	.77387686	-.10052176	.06781165	.00135462	.27803303	.5238	.3865
15	6.41345657	3.60976E-02	9.31961E-02	.77344759	-.09959476	.06706111	.00121466	.27836312	.5714	.3874
16	6.83957795	3.64114E-02	9.37505E-02	.77305350	-.09874086	.06659584	.00103300	.27870648	.6190	.3884
17	7.26569933	3.66838E-02	9.41591E-02	.77269463	-.09781049	.06545184	.00098367	.27893376	.6667	.3890
18	7.69182072	3.69819E-02	9.46279E-02	.77234847	-.09702273	.06515164	.00089071	.27919796	.7143	.3898
19	8.11794210	3.73561E-02	9.55737E-02	.77167634	-.09513590	.06446946	.00081296	.27974298	.7619	.3913
20	8.54406348	3.81767E-02	9.69993E-02	.77066363	-.09172925	.06392177	.00074272	.28056276	.8095	.3936
21	8.97018486	3.91718E-02	9.88032E-02	.76936822	-.08773865	.06308781	.00067885	.28158958	.8571	.3965
22	9.39630624	4.01817E-02	1.00621E-01	.76803769	-.08346634	.06228540	.00061342	.28260875	.9048	.3993
23	9.82242762	4.14034E-02	1.02811E-01	.76641457	-.07786358	.06137948	.00056695	.28382173	.9524	.4028
24	10.24854900	4.23291E-02	1.04442E-01	.76517179	-.07433008	.06081084	.00049620	.28470659	1.0000	.4053

K= 7 PHI = 40.0 Z = 33.800600

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.99397E-02	7.76904E-02	.76915923	-.00000000	.15175028	.06846347	.27762277	0.0000	.3854
4	1.74328953	3.37508E-02	8.89091E-02	.77469357	-.04042078	.13646495	-.00055261	.27553971	.0476	.3796
5	2.18657906	3.39481E-02	8.89200E-02	.77543980	-.05683328	.11676571	.00510319	.27632693	.0952	.3818
6	2.62986859	3.42452E-02	8.95586E-02	.77536964	-.06861966	.10844512	.00379752	.27654200	.1429	.3824
7	3.07315812	3.42659E-02	8.96204E-02	.77549441	-.07617622	.10237192	.00342598	.27652878	.1905	.3823
8	3.51644765	3.43537E-02	8.98137E-02	.77539405	-.08103971	.09846499	.00298568	.27658680	.2381	.3825
9	3.95973718	3.44435E-02	9.00096E-02	.77530541	-.08429907	.09560345	.00256678	.27664905	.2857	.3827
10	4.40302672	3.45724E-02	9.02655E-02	.77512049	-.08632857	.09348184	.00230586	.27677028	.3333	.3830
11	4.84631625	3.47263E-02	9.05717E-02	.77462991	-.08760452	.09163192	.00200294	.27691622	.3810	.3834
12	5.28960578	3.49323E-02	9.09681E-02	.77465408	-.08838173	.09015862	.00180286	.27713046	.4286	.3840
13	5.73289531	3.51431E-02	9.13737E-02	.77439306	-.08942023	.08872160	.00158866	.27734749	.4762	.3846
14	6.17618484	3.53832E-02	9.18209E-02	.77407233	-.08967832	.08778973	.00142774	.27760151	.5238	.3853
15	6.61947437	3.57209E-02	9.24767E-02	.77362692	-.08993782	.08674850	.00127395	.27796580	.5714	.3863
16	7.06276390	3.60618E-02	9.31038E-02	.77318781	-.09049965	.08583740	.00113981	.27832728	.6190	.3873
17	7.50605343	3.63806E-02	9.36924E-02	.77288091	-.09067688	.08518455	.00101660	.27856483	.6667	.3880
18	7.94934296	3.65713E-02	9.40614E-02	.77252111	-.09077445	.08479648	.00091241	.27886294	.7143	.3888
19	8.39263249	3.71271E-02	9.50812E-02	.77179672	-.09301827	.08354740	.00080514	.27945581	.7619	.3905
20	8.83592202	3.79427E-02	9.65739E-02	.77071459	-.09707191	.08245167	.00074614	.28031670	.8095	.3929
21	9.27921155	3.89614E-02	9.84241E-02	.76935518	-.10203249	.08134215	.00067422	.28137251	.8571	.3959
22	9.72250108	3.99873E-02	1.00274E-01	.76796813	-.10711728	.08046555	.00060116	.28241182	.9048	.3988
23	10.16579061	4.12324E-02	1.02498E-01	.76627591	-.11255975	.07988026	.00054835	.28364626	.9524	.4023
24	10.60908015	4.21549E-02	1.04136E-01	.76499626	-.11697585	.07942840	.00047001	.28453624	1.0000	.4048

K= 8 PHI = 90.0 Z = 35.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.59110E-02	7.00[illegible]E-02	.77086192	.00[illegible]	.18970579	.06846347	.27194985	0.0000	.3698
4	1.76567783	3.11[illegible]E-02	8.40[illegible]E-02	.77476063	-.03[illegible]	.16[illegible]	-.00223819	.27221952	.0476	.3705
5	2.23135766	3.20[illegible]E-02	8.54[illegible]E-02	.77537691	-.01[illegible]	.14[illegible]	.00477200	.27406645	.0952	.3756
6	2.69703319	3.28[illegible]E-02	8.69[illegible]E-02	.77502278	-.05719537	.13[illegible]	.00783003	.27491284	.1429	.3779
7	3.16271152	3.31[illegible]E-02	8.74[illegible] 02	.77512851	-.06331940	.12[illegible]	.00761107	.27522459	.1905	.3787
8	3.62838915	3.34[illegible]E-02	8.82[illegible]E-02	.77560177	-.06788783	.12[illegible]	.00815811	.27552634	.2381	.3796
9	4.09406697	3.36[illegible]E-02	8.85[illegible]E-02	.77552845	-.07268938	.11574736	.00771649	.27573967	.2857	.3802
10	4.55974480	3.38[illegible]E-02	8.89[illegible]E-02	.77536352	-.07565[illegible]	.11267694	.00742267	.27567185	.3333	.3808
11	5.02542263	3.40[illegible]E-02	8.97[illegible]E-02	.77518611	-.07367257	.11057759	.00[illegible]	.27619977	.3810	.3814
12	5.49110046	3.43519E-02	8.98[illegible]E-02	.77492805	-.07412176	.10[illegible]	.00166219	.27647377	.4286	.3822
13	5.95677829	3.45[illegible]E-02	9.03[illegible] 02	.77467655	-.07[illegible]	.10[illegible]	.00183066	.27673295	.4762	.3829
14	6.42245512	3.48765E 02	9.08[illegible]E 02	.77435941	-.07[illegible]	.10[illegible]	.00145192	.27703237	.5238	.3837
15	6.88813395	3.52[illegible]E 02	9.15[illegible] 02	.77391053	-.07[illegible]	.10[illegible]	.00128621	.27743896	.5714	.3849
16	7.35581178	3.55[illegible]E 02	9.20[illegible] 02	.77330715	-.07[illegible]	.10[illegible]	.00134282	.27780489	.6190	.3859
17	7.81956961	3.58[illegible]E 02	9.26[illegible] 02	.77310659	-.07[illegible]	.10[illegible]	.00101352	.27805368	.6667	.3866
18	8.28516744	3.61501E 02	9.32[illegible] 02	.77260219	-.07[illegible]	.10[illegible]	.00093652	.27840133	.7143	.3875
19	8.75084527	3.63636E 02	9.44[illegible] 02	.77198742	-.06[illegible]	.10[illegible]	.00091761	.27858275	.7619	.3894
20	9.21652309	3.76276E 02	9.60[illegible]E-02	.77081418	-.06[illegible]	.09[illegible]	.00073430	.27998176	.8095	.3919
21	9.68220092	3.86765E-02	9.79107E 02	.76976805	-.05[illegible]	.09[illegible]	.00065695	.28107595	.8571	.3950
22	10.14787875	3.97263E 02	9.98[illegible]E 02	.76790084	-.05[illegible]	.09[illegible]	.00057848	.28214543	.9048	.3980
23	10.61355658	4.09879E-02	1.02[illegible]E 01	.76612415	-.05[illegible]	.09[illegible]	.00[illegible]	.28340247	.9524	.4016
24	11.07923441	4.19225E-02	1.03729E 01	.76478450	-.04670650	.09360875	.00[illegible]	.28430826	1.0000	.4042

K= 9 PHI = 60.0 Z = 35.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.13834E-02	6.10[illegible]E-02	.77274475	.00000000	.27987863	.06846347	.26459010	0.0000	.3500
4	1.79331789	2.81[illegible]E-02	7.83[illegible]E 02	.77812[illegible]	-.00[illegible]	.25[illegible]	-.00390077	.26823194	.0476	.3597
5	2.28663578	3.00[illegible]E-02	8.19[illegible] 02	.77[illegible]	-.03[illegible]	.16[illegible]	.00[illegible]	.27139891	.0952	.3683
6	2.77995367	3.12[illegible]E 02	8.39[illegible] 02	.77[illegible]	-.04[illegible]	.15[illegible]	.00[illegible]	.27290778	.1429	.3724
7	3.27327156	3.18[illegible]E 02	8.49[illegible] 02	.77[illegible]	-.04[illegible]	.14[illegible]	.00[illegible]	.27361042	.1905	.3743
8	3.76659945	3.22[illegible]E 02	8.59[illegible] 02	.77[illegible]	-.04[illegible]	.13[illegible]	.00[illegible]	.27415793	.2381	.3758
9	4.25992734	3.26[illegible]E 02	8.66[illegible] 02	.77[illegible]	-.04[illegible]	.13[illegible]	.00[illegible]	.27456865	.2857	.3769
10	4.75325523	3.29[illegible]E 02	8.72[illegible] 02	.77[illegible]	-.04[illegible]	.13[illegible]	.00[illegible]	.27493633	.3333	.3779
11	5.24658312	3.32[illegible]E 02	8.79[illegible] 02	.77[illegible]	-.04[illegible]	.12[illegible]	.00[illegible]	.27527492	.3810	.3789
12	5.73986100	3.36[illegible]E-02	8.85[illegible] 02	.77539232	-.05[illegible]	.12[illegible]	.00185559	.27562858	.4286	.3799
13	6.23317889	3.39[illegible]E 02	8.93[illegible]E 02	.77[illegible]	-.05[illegible]	.12[illegible]	.00162993	.27595195	.4762	.3807
14	6.72649678	3.42[illegible]E 02	8.97[illegible]E 02	.77[illegible]	-.05[illegible]	.11[illegible]	.00145552	.27632056	.5238	.3818
15	7.21981467	3.46[illegible]E 02	9.05[illegible]E 02	.77[illegible]	-.05[illegible]	.11[illegible]	.00[illegible]	.27677626	.5714	.3830
16	7.71313256	3.50[illegible]E 02	9.11[illegible]E 02	.77[illegible]	-.05[illegible]	.11[illegible]	.00[illegible]	.27719934	.6190	.3841
17	8.20645045	3.50[illegible]E 02	9.16[illegible]E 02	.77[illegible]	-.05[illegible]	.11[illegible]	.00[illegible]	.27742232	.6667	.3848
18	8.69976834	3.56[illegible]E-02	9.23[illegible]E 02	.77[illegible]	-.05[illegible]	.11[illegible]	.00[illegible]	.27784719	.7143	.3860
19	9.19308623	3.60[illegible]E 02	9.30[illegible]E 02	.77[illegible]	-.05[illegible]	.11[illegible]	.00[illegible]	.27836635	.7619	.3841
20	9.68640412	3.63[illegible]E 02	9.38[illegible]E 02	.77[illegible]	-.05[illegible]	.11[illegible]	.00[illegible]	.27857991	.8095	.3878
21	10.17972201	3.65[illegible]E 02	9.42[illegible]E 02	.76[illegible]	-.05[illegible]	.11[illegible]	.00[illegible]	.28071283	.8571	.3940
22	10.67303990	3.94[illegible]E-02	9.92[illegible]E 02	.76784163	-.03[illegible]	.11[illegible]	.00[illegible]	.28181559	.9048	.3971
23	11.16635779	4.06796E-02	1.01519E-01	.76596801	-.03[illegible]	.10[illegible]	.00048435	.28309334	.9524	.4007
24	11.65967568	4.16293E-02	1.03215E-01	.76455213	-.02[illegible]	.10[illegible]	.00039603	.28401925	1.0000	.4033

K=10 PHI = 30.0 Z = 35.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	1.70422E-02	5.19[illegible]E-02	.77336042	.00[illegible]	.27[illegible]	.06846347	.25615020	0.0000	.3281
4	1.82672966	2.51035E-02	7.21[illegible]E 02	.77510578	-.01[illegible]	.24[illegible]	-.00[illegible]	.26371481	.0476	.3477
5	2.35265932	2.77484E-02	7.70[illegible]E 02	.77[illegible]	-.01[illegible]	.19[illegible]	.00[illegible]	.26836439	.0952	.3601
6	2.87858897	2.95876E-02	8.06[illegible]E 02	.77[illegible]	-.02[illegible]	.18[illegible]	.00[illegible]	.27082748	.1429	.3667
7	3.40451863	3.04497E-02	8.25[illegible]E 02	.77[illegible]	-.02[illegible]	.18[illegible]	.00[illegible]	.27192462	.1905	.3697
8	3.93316829	3.11750E-02	8.52[illegible]E 02	.77[illegible]	-.03[illegible]	.17[illegible]	.00[illegible]	.27280540	.2381	.3721
9	4.45797795	3.16694E-02	8.47[illegible]E 02	.77[illegible]	-.03[illegible]	.17[illegible]	.00[illegible]	.27337421	.2857	.3737
10	4.98430760	3.21022E-02	8.55974E 02	.77629[illegible]	-.03[illegible]	.17[illegible]	.00[illegible]	.27387495	.3333	.3750

11	5.51063726	3.24915E-02	8.63588E 02	.77615284	-.03969140	.14001446	.00216708	.27431330	.3810	.3762
12	6.03896692	3.28783E-02	8.71683E-02	.77550233	-.03972187	.13367323	.00191904	.27475073	.4286	.3774
13	6.56329659	3.32159E-02	8.77683E 02	.77566685	-.03971154	.13516360	.00166913	.27513445	.4762	.3785
14	7.08962623	3.36043E-02	8.85499E 02	.77511011	-.03963890	.13456662	.00147574	.27556808	.5238	.3797
15	7.61595589	3.40377E-02	8.93537E 02	.77483311	-.03796570	.13047752	.00129315	.27609520	.5714	.3810
16	8.14228555	3.45374E-02	8.99711E 02	.77448172	-.03726659	.12234047	.00113192	.27642763	.6190	.3821
17	8.66861521	3.46657E-02	9.02555E 02	.77470632	-.03776551	.12788369	.00099380	.27673591	.6667	.3829
18	9.19494487	3.51116E-02	9.13914E 02	.77334784	-.03704119	.12635158	.00087646	.27724150	.7143	.3843
19	9.72127452	3.55591E-02	9.23711E 02	.77253154	-.03576670	.12455564	.00077182	.27806554	.7619	.3866
20	10.24760418	3.60135E-02	9.45160E 02	.77116593	-.02786614	.12264181	.00067444	.27910183	.8095	.3895
21	10.77393384	3.79157E-02	9.65720E 02	.76955837	-.02411619	.12406353	.00058830	.28027031	.8571	.3928
22	11.30026350	3.90147E-02	9.86532E 02	.76742414	-.01857875	.11892143	.00050266	.28141024	.9048	.3960
23	11.82659315	4.02980E-02	1.00694E 01	.76585278	-.01339901	.11701927	.00043625	.28270753	.9524	.3996
24	12.35292281	4.12676E-02	1.02575E 01	.76432566	-.00971618	.11573706	.00034942	.28366065	1.0000	.4023

K=11 PHI = 80.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	1.46939E-02	4.67277E-02	.77567378	.00000000	.28987454	.06846347	.25078207	0.0000	.3145
4	1.85428108	2.22745E 02	6.62084E 02	.77516719	.00169594	.25437168	-.00339516	.25939429	.0476	.3364
5	2.42856336	2.61104E-02	7.37859E 02	.77610109	-.00026692	.24024310	.00380410	.26603304	.0952	.3539
6	2.99284503	2.82009E-02	7.79470E-02	.77842445	-.00077268	.18775906	.00401445	.26899649	.1429	.3618
7	3.55712671	2.93629E-02	8.02513E 02	.77873739	-.01453200	.17468825	.00395621	.27054709	.1905	.3660
8	4.12140839	3.01928E-02	8.18715E 02	.77893119	-.01716853	.16569917	.00349307	.27158141	.2381	.3688
9	4.68569007	3.07843E-02	8.30444E 02	.77870783	-.01835166	.15926432	.00298281	.27228561	.2857	.3707
10	5.24997175	3.12521E-02	8.40174E 02	.77885870	-.01997311	.15427475	.00257767	.27287078	.3333	.3723
11	5.81425342	3.17175E-02	8.48871E 02	.77874154	-.02044514	.15056598	.00217441	.27337058	.3810	.3737
12	6.37855510	3.21165E-02	8.56735E 02	.77856218	-.02134527	.14699771	.00187372	.27382998	.4286	.3749
13	6.94285678	3.24795E-02	8.63696E 02	.77876372	-.02209536	.14419194	.00160289	.27424293	.4762	.3760
14	7.50709846	3.28598E-02	8.71807E 02	.77759421	-.02178415	.14168645	.00135210	.27472673	.5238	.3774
15	8.07138014	3.33334E-02	8.80118E 02	.77554768	-.01812128	.13942551	.00119725	.27522203	.5714	.3787
16	8.63566181	3.36485E-02	8.86155E 02	.77526916	-.01812919	.13753765	.00103750	.27557642	.6190	.3797
17	9.19994349	3.39477E-02	8.91865E 02	.77498957	-.01794658	.13580524	.00090535	.27591241	.6667	.3806
18	9.76422517	3.44659E-02	9.01019E 02	.77431095	-.01594885	.13556146	.00079713	.27649846	.7143	.3823
19	10.32850685	3.52877E-02	9.16884E 02	.77350449	-.01136962	.13584682	.00070064	.27741358	.7619	.3848
20	10.89278852	3.62365E-02	9.35001E 02	.77159595	-.00276545	.13766043	.00060802	.27852561	.8095	.3879
21	11.45707020	3.74205E-02	9.56379E 02	.76912588	-.00232860	.13965305	.00052545	.27974002	.8571	.3913
22	12.02135188	3.85483E-02	9.76953E 02	.76720183	.00017658	.13945879	.00044400	.28092104	.9048	.3946
23	12.58563356	3.98419E-02	1.00004E 01	.76578484	.00017618	.13836070	.00037838	.28224251	.9524	.3983
24	13.14991524	4.08276E-02	1.01796E 01	.76416235	.01095955	.12192848	.00029736	.28322126	1.0000	.4011

K=12 PHI = 90.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	1.64139E-02	5.05726E-02	.78185959	.00000000	.25329446	.06846347	.25477945	0.0000	.3248
4	1.90711301	2.04780E-02	6.22693E-02	.77965942	.00 [illegible]	.2 [illegible]	-.00353650	.25621259	.0476	.3282
5	2.51421602	2.52567E-02	7.20155E-02	.77662377	.01 [illegible]	.21 [illegible]	.00382677	.26485280	.0952	.3507
6	3.12131904	2.74726E-02	7.69017E 02	.77849415	.00 [illegible]	.19 [illegible]	.00355513	.26799687	.1429	.3591
7	3.72842205	2.87826E-02	7.90713E-02	.77869209	.00 [illegible]	.18 [illegible]	.00327548	.26980736	.1905	.3640
8	4.33552506	2.96300E-02	8.07836E 02	.77712373	.00 [illegible]	.17 [illegible]	.00302677	.27087192	.2381	.3669
9	4.94262807	3.02204E-02	8.19598E 02	.77729372	.00 [illegible]	.16 [illegible]	.00300666	.27158813	.2857	.3688
10	5.54973109	3.06809E-02	8.28671E-02	.77737594	.00 [illegible]	.15 [illegible]	.00261094	.27211868	.3333	.3702
11	6.15683410	3.10689E-02	8.36812E 02	.77736890	-.00 [illegible]	.14 [illegible]	.00219017	.27259391	.3810	.3715
12	6.76401711	3.14757E-02	8.44370E-02	.77724780	-.00 [illegible]	.13 [illegible]	.00184464	.27303743	.4286	.3727
13	7.37113012	3.18639E-02	8.51 [illegible] 02	.77710459	-.00 [illegible]	.13 [illegible]	.00156354	.27345224	.4762	.3739
14	7.97824314	3.22510E 02	8.58 [illegible] 02	.77676240	.00 [illegible]	.12 [illegible]	.00132490	.27383762	.5238	.3752
15	8.58535615	3.26 [illegible] 02	8.67 [illegible] 02	.77640068	.00 [illegible]	.12 [illegible]	.00114775	.27439998	.5714	.3765
16	9.19246916	3.29 [illegible] 02	8.72 [illegible] 02	.77600792	.00 [illegible]	.11 [illegible]	.00093516	.27472659	.6190	.3774
17	9.79958217	3.32 [illegible] 02	8.76 [illegible] 02	.77554152	.00 [illegible]	.11 [illegible]	.00080444	.27510271	.6667	.3784
18	10.40669519	3.38 [illegible] 02	8.80 [illegible] 02	.77507997	.00 [illegible]	.11 [illegible]	.00070190	.27577773	.7143	.3803
19	11.01380820	3.47 [illegible] 02	9.06 [illegible] 02	.77394211	.00 [illegible]	.11 [illegible]	.00061108	.27677231	.7619	.3830
20	11.62092121	3.57 [illegible] 02	9.29 [illegible] 02	.77195058	.01 [illegible]	.11 [illegible]	.00052308	.27793711	.8095	.3862
21	12.22803422	3.69 [illegible] 02	9.47 [illegible] 02	.77001770	.01 [illegible]	.11 [illegible]	.00044574	.27917855	.8571	.3897
22	12.83514724	3.80 [illegible] 02	9.63 [illegible] 02	.76805875	.00 [illegible]	.11 [illegible]	.00037413	.28038616	.9048	.3931
23	13.44226025	3.93 [illegible] 02	9.81 [illegible] 02	.76578958	.00 [illegible]	.11 [illegible]	.00031732	.28172987	.9524	.3969

24	14.04937326	4.03397E-02	1.00935E-01	.76405020	.03205206	.12457310	.00024544	.28273008	1.0000	.3997

K=13 PHI =100.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.46641E-02	6.76452E-02	.78269384	.00000000	.15093260	.06846347	.27004063	0.0000	.3646
4	1.95334469	1.91203E-02	5.97599E-02	.77579166	.06[illegible]	.24[illegible]	-.00520330	.25381511	.0476	.3221
5	2.60877938	2.68[illegible]E-02	7.51[illegible]E-02	.77566975	.02[illegible]	.2[illegible]	.00048212	.26712527	.0952	.3568
6	3.26009407	2.76411E-02	7.69[illegible]E-02	.77551841	.02597692	.14078100	.00062005	.26826520	.1429	.3599
7	3.91345876	2.90607E-02	7.95[illegible]E-02	.77536420	.02[illegible]	.13[illegible]	.00037109	.27034545	.1905	.3652
8	4.56682345	2.96775E-02	8.08[illegible]E-02	.77730883	.02[illegible]	.16769982	.00011652	.27097478	.2381	.3671
9	5.22018814	3.01732E-02	8.18[illegible]E-02	.77758225	.02213073	.16175341	.00139299	.27155148	.2857	.3687
10	5.87355283	3.05855E-02	8.29[illegible]E-02	.77776552	.02156775	.15772517	.00277032	.27193386	.3333	.3697
11	6.52691752	3.08[illegible]E-02	8.31791E-02	.77788173	.02[illegible]	.15429719	.00220504	.27226806	.3810	.3706
12	7.18028221	3.10[illegible]E-02	8.36619E-02	.77800597	.02[illegible]	.15143184	.00178067	.27252557	.4286	.3714
13	7.83364689	3.13081E-02	8.41[illegible]E-02	.77800738	.02[illegible]	.14839121	.00143691	.27281698	.4762	.3721
14	8.48701158	3.16071E-02	8.48[illegible]E-02	.77735330	.02[illegible]	.14[illegible]	.00117026	.27323538	.5238	.3733
15	9.14037627	3.23[illegible]E-02	8.61[illegible]E-02	.77748592	.02[illegible]	.14396142	.00095060	.27361142	.5714	.3743
16	9.79374096	3.22[illegible]E-02	8.59[illegible]E-02	.77743888	.02[illegible]	.14[illegible]	.00079282	.27386777	.6190	.3750
17	10.44710565	3.25[illegible]E-02	8.66[illegible]E-02	.77706149	.02[illegible]	.13978037	.00067153	.27426696	.6667	.3761
18	11.10047034	3.32126E-02	8.78233E-02	.77667277	.02[illegible]	.13740547	.00058078	.27501915	.7143	.3782
19	11.75383503	3.41216E-02	8.96385E-02	.77465066	.02[illegible]	.13483651	.00050655	.27607398	.7619	.3811
20	12.40719972	3.51806E-02	9.15190E-02	.77265942	.02[illegible]	.13226712	.00042613	.27727441	.8095	.3844
21	13.06056441	3.63313E-02	9.36519E-02	.77055666	.02[illegible]	.12977[illegible]60	.00036150	.27854594	.8571	.3879
22	13.71392910	3.74784E-02	9.57559E-02	.76835030	.04[illegible]	.12750[illegible]97	.00030129	.27977973	.9048	.3914
23	14.36729379	3.87655E-02	9.81403E-02	.76594495	.04[illegible]	.12516409	.00025648	.28115136	.9524	.3952
24	15.02065848	3.97562E-02	9.98896E-02	.76414459	.01[illegible]	.12356727	.00019109	.28213677	1.0000	.3980

K=14 PHI =110.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.14903E-02	8.05435E-02	.77749330	.00000000	.04732211	.06846347	.27963258	0.0000	.3910
4	2.00232914	1.94379E-02	6.02168E-02	.77787583	.10[illegible]	.24[illegible]	-.00498056	.25407899	.0476	.3228
5	2.70465827	3.11775E-02	8.38[illegible]	.77[illegible]	.05[illegible]	.13[illegible]	.00133184	.27261107	.0952	.3716
6	3.40698741	2.90417E-02	7.95[illegible]	.77664252	.04[illegible]	.1[illegible]	.00025535	.27041064	.1429	.3656
7	4.10931654	3.03[illegible]E-02	8.28[illegible]	.77572646	.04[illegible]	.15[illegible]	.00021155	.27259473	.1905	.3715
8	4.81164568	3.06[illegible]E-02	8.37[illegible]	.77669758	.04[illegible]	.15[illegible]	.00075992	.27251273	.2381	.3708
9	5.51397482	3.05[illegible]E-02	8.35[illegible]	.77719673	.04[illegible]	.15[illegible]	.00138694	.27257833	.2857	.3715
10	6.21630396	3.09375E-02	8.32[illegible]	.77773900	.04[illegible]	.14[illegible]	.00293275	.27247369	.3333	.3712
11	6.91863309	3.10044E-02	8.35[illegible]	.77814581	.04[illegible]	.14[illegible]	.00227216	.27249374	.3810	.3713
12	7.62096223	3.10772E-02	8.36[illegible]	.77844281	.04[illegible]	.14[illegible]	.00176006	.27253511	.4286	.3714
13	8.32329136	3.12104E-02	8.39617E-02	.77855511	.04[illegible]	.14[illegible]	.00135554	.27266264	.4762	.3717
14	9.02562050	3.14655E-02	8.47[illegible]	.77855048	.04[illegible]	.14[illegible]	.00104700	.27283567	.5238	.3723
15	9.72794963	3.17[illegible]	8.54[illegible]	.77855210	.04[illegible]	.13[illegible]	.00082449	.27303284	.5714	.3727
16	10.43027877	3.16[illegible]	8.54[illegible]	.77866[illegible]	.04[illegible]	.13[illegible]	.00066808	.27316381	.6190	.3731
17	11.13260791	3.19[illegible]	8.[illegible]	.77829[illegible]	.04[illegible]	.13[illegible]	.00056965	.27355045	.6667	.3741
18	11.83493704	3.[illegible]	8.[illegible]	.77716857	.04[illegible]	.13[illegible]	.00051635	.27433864	.7143	.3763
19	12.53726619	3.[illegible]	8.[illegible]	.77544758	.04[illegible]	.13[illegible]	.00050784	.27542536	.7619	.3793
20	13.23959531	3.46[illegible]	9.01[illegible]	.77359366	.04[illegible]	.1[illegible]	.00054605	.27663727	.8095	.3826
21	13.94192445	3.57[illegible]	9.29[illegible]	.77114642	.05[illegible]	.12[illegible]	.00059360	.27791294	.8571	.3862
22	14.64425359	3.69130E-02	9.47267E-02	.76886043	.04[illegible]	.12[illegible]	.00024290	.27916700	.9048	.3897
23	15.34658272	3.82144E-02	9.71051E-02	.76624744	.04[illegible]	.12[illegible]	.00020182	.28054805	.9524	.3935
24	16.04891186	3.91632E-02	9.88253E-02	.76436552	.07[illegible]	.11881067	.00014410	.28152691	1.0000	.3963

K=15 PHI =120.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.13467E-02	8.02811E-02	.78012378	.00000000	.05[illegible]	.06846347	.27945013	0.0000	.3905
4	2.05213800	2.28689E-02	6.73[illegible]	.77[illegible]	.12[illegible]	.15[illegible]	-.00120731	.26057589	.0476	.3395
5	2.80427599	3.47615E-02	9.08[illegible]	.76914612	.04[illegible]	.[illegible]	-.00342620	.27661729	.0952	.3826
6	3.55641399	3.09726E-02	8.31[illegible]	.77514787	.07[illegible]	.14[illegible]	.00068503	.27290267	.1429	.3729
7	4.30855199	3.25302E-02	8.66[illegible]	.77391544	.04[illegible]	.13[illegible]	.00717965	.27521220	.1905	.3787
8	5.06068299	3.20[illegible]	8.53[illegible]	.77[illegible]	.04[illegible]	.13[illegible]	.00[illegible]	.27414539	.2381	.3758
9	5.81282798	3.23[illegible]	8.58[illegible]	.77[illegible]	.04[illegible]	.13[illegible]	.00041011	.27432629	.2857	.3763

10	6.56426598	3.20514E-02	8.5465[illegible]E-02	.77673815	.06488925	.13183697	.00333157	.27389320	.3333	.3751
11	7.31710398	3.19191E-02	8.5[illegible]76E-02	.77732059	.06376827	.13129255	.00258813	.27365875	.3810	.3744
12	8.06924198	3.16512E-02	8.47679E-02	.77808144	.06221037	.13031894	.00199448	.27327153	.4286	.3734
13	8.82137997	3.14662E-02	8.44434E-02	.77866810	.06108728	.12960089	.00150172	.27299474	.4762	.3726
14	9.57351797	3.14705E-02	8.4208[illegible]E-02	.77857736	.06171153	.12925977	.00114291	.27290559	.5238	.3724
15	10.32565597	3.13359E-02	8.4[illegible]3[illegible]E-02	.77941730	.06045149	.12637980	.00087036	.27277092	.5714	.3720
16	11.07779396	3.12566E-02	8.4[illegible]6[illegible]E-02	.77991788	.05[illegible]7376	.12[illegible]5689	.00067678	.27265425	.6190	.3717
17	11.82993196	3.1[illegible]2[illegible]E-02	8.45[illegible]3[illegible]E-02	.77[illegible]2563	.05[illegible]6577	.12[illegible]7407	.00051405	.27294585	.6667	.3725
18	12.58206996	3.21[illegible]4E-02	8.58[illegible]E-02	.77[illegible]2558	.06[illegible]5394	.12[illegible]6141	.00044759	.27373428	.7143	.3746
19	13.33420796	3.3[illegible]61E-02	8.7[illegible]E-02	.7765[illegible]362	.06[illegible]4[illegible]6	.12[illegible]2610	.00037007	.27481919	.7619	.3776
20	14.08634595	3.41138E-02	8.95[illegible]E-02	.77462196	.07381157	.11877422	.00031464	.27604557	.8095	.3810
21	14.83849395	3.5[illegible]03E-02	9.1642[illegible]E-02	.77186845	.07853764	.11634493	.00025275	.27732503	.8571	.3845
22	15.59062195	3.63827E-02	9.37572E-02	.76991559	.08321524	.11411783	.00020280	.27858643	.9048	.3881
23	16.34275995	3.76858E-02	9.61066E-02	.76864947	.08852227	.11187686	.00016003	.27996284	.9524	.3919
24	17.09489794	3.85943E-02	9.78004E-02	.76467822	.09202407	.11034393	.00010643	.28093523	1.0000	.3946

K=16 PHI =130.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	3.0210[illegible]E-02	7.81915E-02	.78334738	-.00000000	.00156320	.06846347	.27797999	0.0000	.3864
4	2.10009459	2.7796[illegible]E-02	7.67863E-02	.77831771	.12217923	.13151581	.01057334	.26907151	.0476	.3620
5	2.90018918	3.46923E-02	9.10951E-02	.76837568	.07193194	.14310187	.00156418	.27717338	.0952	.3841
6	3.70028376	3.18723E-02	8.47218E-02	.77481404	.09009606	.12631004	.00089116	.27407725	.1429	.3756
7	4.50037835	3.3[illegible]E-02	8.7859[illegible]E-02	.77341343	.07848070	.12594826	.00050055	.27610487	.1905	.3812
8	5.30047294	3.2656[illegible]E-02	8.6[illegible]E-02	.77534714	.08[illegible]4360	.11714756	.00030893	.27491999	.2381	.3779
9	6.10056753	3.30397E-02	8.7[illegible]E-02	.77545643	.08[illegible]3025	.11[illegible]5273	.00018246	.27522960	.2857	.3788
10	6.90066211	3.2850[illegible]E-02	8.69[illegible]E-02	.77609944	.08[illegible]1127	.11334473	.00011683	.27488263	.3333	.3778
11	7.70075670	3.2841[illegible]E-02	8.69[illegible]E-02	.77637886	.08[illegible]3651	.11279311	.00078139	.27479420	.3810	.3776
12	8.50085129	3.2765[illegible]E-02	8.6[illegible]E-02	.77726995	.08[illegible]453	.11087880	.00019414	.27440203	.4286	.3765
13	9.30094588	3.2[illegible]95E-02	8.6[illegible]E-02	.77773308	.08[illegible]1324	.11327312	.00017022	.27404812	.4762	.3755
14	10.10104047	3.1[illegible]72E-02	8.53[illegible]E-02	.77864004	.06[illegible]3873	.11[illegible]2081	.00133176	.27354596	.5238	.3741
15	10.90113505	3.1[illegible]59E-02	8.[illegible]E-02	.77988048	.07873423	.11[illegible]6953	.00039665	.27293266	.5714	.3725
16	11.70122964	3.11260E-02	8.39357E-02	.78088625	.07712514	.11[illegible]9583	.00074514	.27249753	.6190	.3713
17	12.50132423	3.12[illegible]E-02	8.40[illegible]E-02	.78081590	.07765285	.11[illegible]1639	.00056808	.27259730	.6667	.3715
18	13.30141882	3.1766[illegible]E-02	8.5[illegible]E-02	.77966655	.08[illegible]6564	.11 [illegible]2960	.00048537	.27326619	.7143	.3734
19	14.10151340	3.26137E-02	8.6[illegible]E-02	.77770515	.08[illegible]2712	.10[illegible]1939	.00039952	.27428719	.7619	.3762
20	14.90160799	3.36170E-02	8.96018E-02	.77536317	.08[illegible]1512	.10[illegible]0738	.00032155	.27546938	.8095	.3794
21	15.70170258	3.4[illegible]3E-02	9.[illegible]E-02	.77285585	.09[illegible]5338	.10[illegible]6590	.00025214	.27671695	.8571	.3829
22	16.50179717	3.56[illegible]4E-02	9.2700[illegible]E-02	.77020661	.09376336	.10[illegible]1870	.00019006	.27795388	.9048	.3863
23	17.30189176	3.70[illegible]9E-02	9.[illegible]E-02	.76740078	.10[illegible]2[illegible]	.09[illegible]1275	.00013534	.27930932	.9524	.3901
24	18.10198634	3.79489E-02	9.66318E-02	.76537853	.10856123	.09[illegible]5596	.00007192	.28025581	1.0000	.3927

K=17 PHI =140.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.85349E-02	7.50689E-02	.78713860	-.00000[illegible]	-.01[illegible]	.06846347	.27572336	0.0000	.3801
4	2.14459823	3.04713E-02	8.08[illegible]E-02	.77757572	.10611[illegible]	.08[illegible]1	.02941780	.27446745	.0476	.3767
5	2.98919646	3.3[illegible]1E-02	8.76[illegible]E-02	.76[illegible]	.09[illegible]	.1[illegible]	.00937534	.27613087	.0952	.3812
6	3.83379468	3.25319E-02	8.6[illegible]E-02	.77442619	.10[illegible]	.10[illegible]	.01110029	.27523871	.1429	.3788
7	4.67839291	3.3[illegible]E-02	8.79570E-02	.77355200	.09[illegible]	.10[illegible]	.00580727	.27638186	.1905	.3819
8	5.52299114	3.29752E-02	8.69610E-02	.77553723	.09[illegible]	.09[illegible]	.00721499	.27538902	.2381	.3792
9	6.36758937	3.3[illegible]E-02	8.76667E-02	.77560151	.09716[illegible]	.09[illegible]	.00504296	.27553640	.2857	.3796
10	7.21218759	3.30730E-02	8.73715E-02	.77624229	.09[illegible]	.09[illegible]	.00358345	.27514847	.3333	.3785
11	8.05678582	3.3[illegible]E-02	8.74573E-02	.77649327	.09[illegible]	.09[illegible]	.00269622	.27508041	.3810	.3783
12	8.90138405	3.2[illegible]E-02	8.72[illegible]E-02	.77[illegible]	.09[illegible]	.09[illegible]	.00208200	.27486749	.4286	.3778
13	9.74598228	3.2[illegible]E-02	8.73[illegible]E-02	.77039551	.10[illegible]	.09[illegible]	.00166565	.27486120	.4762	.3777
14	10.59058050	3.2731[illegible]E-02	8.[illegible]E-02	.77749703	.09[illegible]	.09[illegible]	.00135567	.27452397	.5238	.3768
15	11.43517873	3.2[illegible]E-02	8.[illegible]E-02	.77951719	.09[illegible]	.09[illegible]	.00108456	.27362215	.5714	.3743
16	12.27977696	3.1[illegible]E-02	8.41[illegible]E-02	.78115[illegible]	.09[illegible]	.0[illegible]	.00077217	.27271755	.6190	.3719
17	13.12437519	3.11534E-02	8.38[illegible]E-02	.78165369	.09[illegible]	.0[illegible]	.00057504	.27251521	.6667	.3713
18	13.96897341	3.1584[illegible]E-02	8.47[illegible]E-02	.78[illegible]	.09[illegible]	.0[illegible]	.00045680	.27303924	.7143	.3728
19	14.81357164	3.2360[illegible]E-02	8.6[illegible]E-02	.77854[illegible]	.09[illegible]	.0[illegible]	.00036786	.27397870	.7619	.3753
20	15.65816987	3.33034E-02	8.8[illegible]E-02	.77626[illegible]	.10[illegible]	.0[illegible]	.00029380	.27509809	.8095	.3784
21	16.50276810	3.43346E-02	8.99[illegible]E-02	.77366[illegible]	.10[illegible]	.0[illegible]	.00023290	.27629208	.8571	.3817
22	17.34736632	3.53946E-02	9.19[illegible]E-02	.77101526	.11[illegible]	.0[illegible]	.00016250	.27748879	.9048	.3850

23	18.19196455	3.65728E-02	9.41131E-02	.76808516	.11959446	.08448337	.00011125	.27878483	.9524	.3886
24	19.03656278	3.73909E-02	9.56164E-02	.76611264	.12283181	.08526016	.00004858	.27966105	1.0000	.3911

K=18 PHI =150.0 Z = 35.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T[d]	H/HT
3	1.30000000	2.76699E-02	7.34363E-02	.78990243	-.00000000	-.02887043	.06846347	.27451354	0.0000	.3768
4	2.18207304	3.29415E-02	8.31134E-02	.77512906	.07935017	.04[illegible]2669	.05732735	.27983231	.0476	.3915
5	3.06414769	3.14058E-02	8.30179E-02	.77179062	.10342577	.12[illegible]8658	.02346559	.27506831	.0952	.3783
6	3.94622153	3.35503E-02	8.74077E-02	.77377837	.10101173	.04[illegible]6837	.01734964	.27707181	.1429	.3838
7	4.82829538	3.34773E-02	8.75755E-02	.77419326	.10560128	.03[illegible]5880	.01240897	.27650543	.1905	.3823
8	5.71036922	3.34541E-02	8.77541E-02	.77553283	.10844769	.07621251	.00825618	.27603614	.2381	.3810
9	6.59244306	3.35178E-02	8.80765E-02	.77574821	.10970412	.07558396	.00537238	.27585024	.2857	.3805
10	7.47451691	3.34172E-02	8.80287E-02	.77613995	.11170599	.07367596	.00376194	.27557325	.3333	.3797
11	8.35659075	3.33882E-02	8.80[illegible]E-02	.77651858	.11249922	.07[illegible]3643	.00288187	.27545250	.3810	.3794
12	9.23866460	3.31841E-02	8.76614E-02	.77693102	.11259905	.07[illegible]3599	.00229866	.27515395	.4286	.3785
13	10.12073844	3.31802E-02	8.76605E-02	.77691258	.11325920	.07[illegible]8818	.00187353	.27510738	.4762	.3784
14	11.00281228	3.31640E-02	8.76603E-02	.77691279	.11404174	.03[illegible]4668	.00153265	.27505356	.5238	.3783
15	11.88488613	3.26639E-02	8.66724E-02	.77831206	.11197458	.07[illegible]8903	.00131001	.27439587	.5714	.3765
16	12.76695997	3.17453E-02	8.50037E-02	.78067095	.10814352	.07[illegible]8607	.00107386	.27329751	.6190	.3735
17	13.64903382	3.12884E-02	8.41374E-02	.78192011	.10676116	.07[illegible]5498	.00085286	.27270807	.6667	.3718
18	14.53110766	3.14822E-02	8.45031E-02	.78157193	.10796866	.07[illegible]2911	.00068989	.27293543	.7143	.3725
19	15.41318150	3.21206E-02	8.57539E-02	.77961918	.11167619	.07175533	.00054897	.27370551	.7619	.3746
20	16.29525535	3.29784E-02	8.73904E-02	.77728330	.11626172	.07031738	.00041780	.27472508	.8095	.3774
21	17.17732919	3.39644E-02	8.92870E-02	.77465327	.12115804	.06883602	.00029791	.27556034	.8571	.3805
22	18.05940304	3.49876E-02	9.11756E-02	.77189200	.12602184	.06745653	.00019479	.27703398	.9048	.3837
23	18.94147688	3.61322E-02	9.33018E-02	.76887597	.13113943	.06612758	.00011182	.27830260	.9524	.3873
24	19.82355072	3.68899E-02	9.47005E-02	.76694164	.13417584	.06522839	.00003229	.27912099	1.0000	.3895

K=19 PHI =160.0 Z = 35.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.72945E-02	7.27232E-02	.78970509	-.00000000	-.03[illegible]2862	.06846347	.27397837	0.0000	.3753
4	2.21114940	3.34570E-02	8.31797E-02	.77230219	.03382288	.01[illegible]1381	.08395843	.28362645	.0476	.4022
5	3.12226981	3.01738E-02	7.99534E-02	.77636002	.10[illegible]8[illegible]	.09[illegible]1389	.03604688	.27473269	.0952	.3774
6	4.03337321	3.46201E-02	8.87557E-02	.77279406	.09[illegible]8951	.06[illegible]0595	.02808173	.27938509	.1429	.3903
7	4.94447762	3.32411E-02	8.65[illegible]E-02	.77569185	.11[illegible]9478	.06[illegible]1025	.01604212	.27633908	.1905	.3818
8	5.85572202	3.37173E-02	8.82104E-02	.77502219	.11348945	.05[illegible]5651	.00950550	.27649206	.2381	.3822
9	6.76686643	3.34706E-02	8.79504E-02	.77645653	.11792308	.05[illegible]9560	.00569508	.27582258	.2857	.3804
10	7.67801083	3.35022E-02	8.83001E-02	.77651475	.11984660	.05[illegible]9546	.00362192	.27570249	.3333	.3801
11	8.58915524	3.34857E-02	8.81962E-02	.77656089	.12147049	.05[illegible]5180	.00283099	.27556226	.3810	.3797
12	9.50029964	3.33529E-02	8.80053E-02	.77605851	.12224747	.04[illegible]5307	.00219020	.27535461	.4286	.3791
13	10.41144405	3.33625E-02	8.80511E-02	.77680071	.12302239	.04[illegible]7518	.00176740	.27531256	.4762	.3790
14	11.32258845	3.33799E-02	8.80841E-02	.77669217	.12415985	.04[illegible]2010	.00144856	.27530180	.5238	.3790
15	12.23373286	3.29791E-02	8.73420E-02	.77778491	.12270432	.04[illegible]6316	.00121556	.27480391	.5714	.3776
16	13.14487726	3.21537E-02	8.57987E-02	.78006876	.11916619	.04[illegible]2963	.00098017	.27378873	.6190	.3748
17	14.05602167	3.19607E-02	8.46673E-02	.78169737	.11678784	.05[illegible]9550	.00078428	.27304178	.6667	.3728
18	14.96716607	3.15897E-02	8.47319E-02	.78154100	.11768367	.05[illegible]4582	.00064478	.27306394	.7143	.3728
19	15.87831048	3.21093E-02	8.57317E-02	.77998952	.12067840	.04[illegible]8522	.00053438	.27369026	.7619	.3745
20	16.78945488	3.28772E-02	8.71976E-02	.77775643	.12529341	.04[illegible]2848	.00043019	.27460570	.8095	.3770
21	17.70059929	3.37704E-02	8.88904E-02	.77520793	.12992839	.04[illegible]5533	.00032558	.27564893	.8571	.3799
22	18.61174369	3.47263E-02	9.06606E-02	.77252572	.13457845	.04[illegible]5235	.00022274	.27674015	.9048	.3829
23	19.52288810	3.57936E-02	9.26758E-02	.76957507	.13947627	.04[illegible]7121	.00012094	.27792943	.9524	.3862
24	20.43403250	3.64716E-02	9.39330E-02	.76776793	.14229262	.04[illegible]6178	.00002176	.27866562	1.0000	.3883

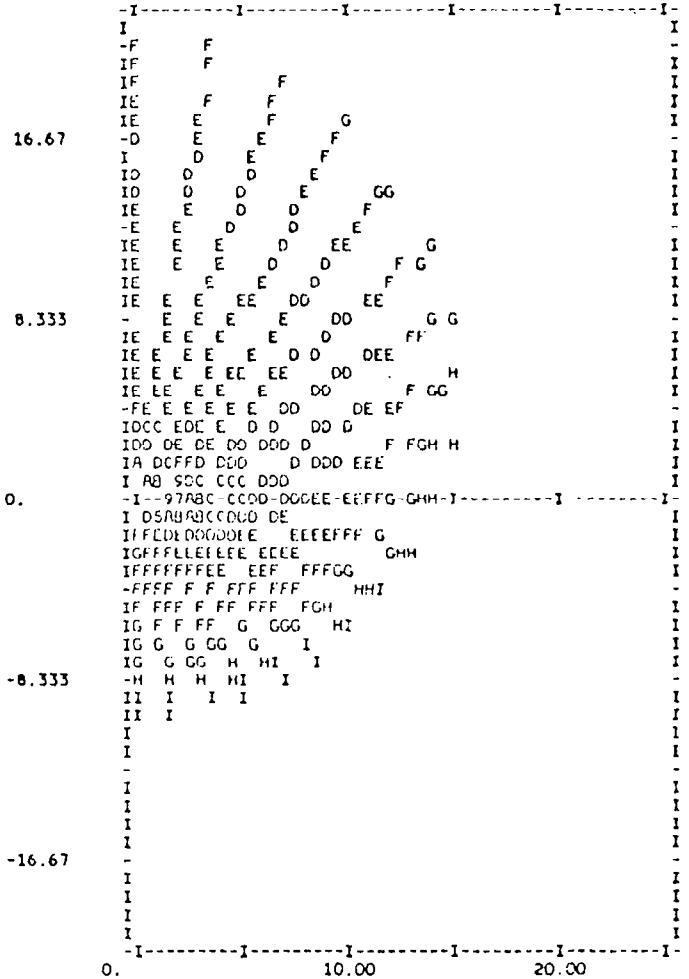
K=20 PHI =170.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.74537E-02	7.30260E-02	.78965804	-.00000000	-.02[illegible]5360	.06846347	.27420611	0.0000	.3759
4	2.22968678	3.40098E-02	8.39089E-02	.77110265	-.00834779	.04[illegible]0750	.08811645	.28471676	.0476	.4053
5	3.15937355	3.08348E-02	8.11865E-02	.78032850	.08035462	.05[illegible]7818	.03622836	.27560930	.0952	.3798
6	4.08906033	3.54166E-02	8.98556E-02	.77310637	.08543342	.05[illegible]2722	.03289907	.28077555	.1429	.3942
7	5.01874711	3.30553E-02	8.65151E-02	.77748173	.11445710	.05[illegible]1765	.01651104	.27640049	.1905	.3820
8	5.94843389	3.40346E-02	8.87686E-02	.77624959	.11523876	.04[illegible]5778	.01003360	.27691448	.2381	.3834

9	6.87812066	3.35200E-02	8.80673E-02	.77692333	.12253761	.0[illegible]	.00590400	.27590525	.2857	.3806
10	7.80780744	3.36346E-02	8.83994E-02	.77671128	.12470675	.02[illegible]	.00409530	.27585653	.3333	.3805
11	8.73749422	3.35140E-02	8.8[illegible]E-02	.77678707	.12[illegible]	.02[illegible]	.00296447	.27560864	.3810	.3798
12	9.66718100	3.33863E-02	8.80[illegible]E-02	.77708436	.12778537	.02[illegible]	.00226352	.27538839	.4286	.3792
13	10.59686777	3.33085E-02	8.80794E-02	.77693537	.12910149	.02519308	.00177909	.27534438	.4762	.3791
14	11.52655455	3.34961E-02	8.85028E-02	.77694027	.13[illegible]2678	.02[illegible]9989	.00145309	.27543890	.5238	.3793
15	12.45624133	3.31784E-02	8.77167E-02	.77739732	.12[illegible]240	.02[illegible]531	.00124427	.27504364	.5714	.3782
16	13.38592811	3.23672E-02	8.61914E-02	.77970287	.12611897	.02[illegible]944	.00105045	.27405381	.6190	.3755
17	14.31561488	3.16950E-02	8.49497E-02	.78160083	.12[illegible]80	.02[illegible]580	.00093444	.27321724	.6667	.3732
18	15.24530166	3.16[illegible]E-02	8.48[illegible]E-02	.78132442	.12381424	.02[illegible]217	.00084362	.27311790	.7143	.3730
19	16.17498844	3.20788E-02	8.56714E-02	.78051597	.12678527	.02[illegible]973	.00057042	.27369664	.7619	.3744
20	17.10467521	3.28102E-02	8.70705E-02	.77810494	.13005717	.02[illegible]682	.00040005	.27452665	.8095	.3768
21	18.03436199	3.36774E-02	8.87114E-02	.77553633	.13561695	.02[illegible]555	.00031911	.27553979	.8571	.3796
22	18.96404877	3.46109E-02	9.04[illegible]E-02	.77282527	.14010899	.02[illegible]561	.00021029	.27660732	.9048	.3826
23	19.89373555	3.56340E-02	9.23810E-02	.76960558	.14485093	.02213018	.00011244	.27775119	.9524	.3857
24	20.82342232	3.62509E-02	9.35269E-02	.76820858	.14742510	.02[illegible]6969	.00001723	.27842356	1.0000	.3876

K=21 PHI =180.0 Z = 33.800000

J	R	P	RHO	U	V	W	(S-SINF)/CV	A	T	H/HT
3	1.30000000	2.77404E-02	7.35697E-02	.78926413	-.000[illegible]0000	0.00[illegible]000	.06846347	.27461323	0.0000	.3771
4	2.23526657	3.43139E-02	8.50151F-02	.77181558	-.02603598	0.00[illegible]000	.07867261	.28412018	.0476	.4036
5	3.17053313	3.15155E-02	8.28475E-02	.78322184	.07840433	0.00[illegible]000	.02977961	.27582740	.0952	.3804
6	4.10579970	3.56104E-02	9.02540E-02	.77371937	.08246910	0.00[illegible]000	.03205978	.28021179	.1429	.3946
7	5.04106627	3.30687E-02	8.65910E-02	.77787593	.11408050	0.00[illegible]000	.01601316	.27636739	.1905	.3819
8	5.97633283	3.41028E-02	8.86614E-02	.77683045	.[illegible]1500[illegible]89	0.00[illegible]000	.01057162	.27704686	.2381	.3838
9	6.91159940	3.34824E-02	8.75456E-02	.77717377	.12369608	0.00[illegible]000	.00665328	.27593485	.2857	.3807
10	7.84686596	3.36659E-02	8.84140E-02	.77672267	.12[illegible]834	0.00[illegible]000	.00477813	.27596136	.3333	.3808
11	8.78213253	3.39402E-02	8.82967E-02	.77665751	.12914983	0.00[illegible]000	.00355862	.27572809	.3810	.3801
12	9.71739910	3.34980E-02	8.81[illegible]E-02	.77687272	.13000133	0.00[illegible]000	.00261590	.27551938	.4286	.3796
13	10.65266566	3.34006E-02	8.80659E-02	.77684755	.13130671	0.00[illegible]000	.00235656	.27541544	.4762	.3793
14	11.58793223	3.34965E-02	8.82701E-02	.77667566	.13[illegible]9507	0.00[illegible]000	.00196184	.27549140	.5238	.3795
15	12.52319880	3.32191E-02	8.77632E-02	.77721961	.13190890	0.00[illegible]000	.00172881	.27513946	.5714	.3785
16	13.45846536	3.24247E-02	8.62705E-02	.77949437	.12860670	0.00[illegible]000	.00153890	.27417106	.6190	.3758
17	14.39373193	3.16843E-02	8.48717E-02	.78102677	.12[illegible]5601	0.00[illegible]000	.00132765	.27324728	.6667	.3733
18	15.32899849	3.15102E-02	8.45613E-02	.78[illegible]6845	.125[illegible]595	0.00[illegible]000	.00113835	.27302126	.7143	.3727
19	16.26426506	3.19040E-02	8.53175E-02	.78063588	.12785793	0.00[illegible]000	.00092671	.27347863	.7619	.3740
20	17.19953163	3.26211E-02	8.66958E-02	.77866589	.13194016	0.00[illegible]000	.00069495	.27432507	.8095	.3763
21	18.13479819	3.34946E-02	8.83615E-02	.77664725	.13659267	0.00[illegible]000	.00048058	.27534153	.8571	.3791
22	19.07006476	3.44485E-02	9.01572E-02	.77380729	.14131240	0.00[illegible]000	.00029606	.27642633	.9048	.3821
23	20.00533133	3.54872E-02	9.21070E-02	.77038754	.14620005	0.00[illegible]000	.00014360	.27759058	.9524	.3853
24	20.94059789	3.61138E-02	9.32743E-02	.76854582	.14885824	0.00000000	.00001475	.27827272	1.0000	.3872



VERTICAL SCALING

.300E-01	< 0 <	.340E-01	.340E-01	< 1 <	.380E-01
.380E-01	< 2 <	.420E-01	.420E-01	< 3 <	.460E-01
.460E-01	< 4 <	.500E-01	.500E-01	< 5 <	.540E-01
.540E-01	< 6 <	.580E-01	.580E-01	< 7 <	.620E-01
.620E-01	< 8 <	.660E-01	.660E-01	< 9 <	.700E-01
.700E-01	< A <	.740E-01	.740E-01	< B <	.780E-01
.780E-01	< C <	.820E-01	.820E-01	< D <	.860E-01
.860E-01	< E <	.900E-01	.900E-01	< F <	.940E-01
.940E-01	< G <	.980E-01	.980E-01	< H <	.102
.102	< I <	.106			

SURFACE FLOW VARIABLES AT Z = 33.800000
X/L = 1.000000 DZDT= 3.350363 ITER= 626

PHI	RB	CP	P/PINF	R/RINF	M-Z	M-R	M-PHI	A	COMP	H/HT	TEMP	(S-S.INF)/CV
0.0	1.3000	.0259	1.1485E+00	1.0512E+00	2.6578	-.0000	0.0000	2.8791E-01	1.0000	.41446	.00	6.8463E-02
10.0	1.3000	.0227	1.1300E+00	1.0392E+00	2.6650	-.0000	.1321	2.8724E-01	1.0000	.41255	.00	6.8463E-02
20.0	1.3000	.0136	1.0780E+00	1.0047E+00	2.6858	-.0000	.2653	2.8532E-01	1.0000	.40703	.00	6.8463E-02
30.0	1.3000	-.0007	9.9622E-01	9.4970E-01	2.7207	-.0000	.4024	2.8212E-01	1.0000	.39796	.00	6.8463E-02
40.0	1.3000	-.0192	8.9025E-01	8.7639E-01	2.7705	-.0000	.5465	2.7762E-01	1.0000	.38537	.00	6.8463E-02
50.0	1.3000	-.0401	7.7045E-01	7.9044E-01	2.8346	.0000	.6976	2.7195E-01	1.0000	.36978	.00	6.8463E-02
60.0	1.3000	-.0636	6.3583E-01	6.8911E-01	2.9205	.0000	.8687	2.6459E-01	1.0000	.35004	.00	6.8463E-02
70.0	1.3000	-.0861	5.0674E-01	5.8660E-01	3.0192	.0000	1.0608	2.5615E-01	1.0000	.32806	.00	6.8463E-02
80.0	1.3000	-.0983	4.3697E-01	5.2711E-01	3.0930	.0000	1.1548	2.5078E-01	1.0000	.31446	.00	6.8463E-02
90.0	1.3000	-.0894	4.8806E-01	5.7048E-01	3.0488	.0000	.9940	2.5476E-01	1.0000	.32456	.00	6.8463E-02
100.0	1.3000	-.0466	7.3338E-01	7.6308E-01	2.8984	.0000	.5589	2.7004E-01	1.0000	.36461	.00	6.8463E-02
110.0	1.3000	-.0111	9.3635E-01	9.0258E-01	2.7804	.0000	.2408	2.7963E-01	1.0000	.39097	.00	6.8463E-02
120.0	1.3000	-.0119	9.3208E-01	9.0542E-01	2.7916	.0000	.1109	2.7945E-01	1.0000	.39046	.00	6.8463E-02
130.0	1.3000	-.0178	8.9835E-01	8.8204E-01	2.8180	-.0000	.0057	2.7758E-01	1.0000	.38636	.00	6.8463E-02
140.0	1.3000	-.0265	8.4848E-01	8.4682E-01	2.8548	-.0000	-.0624	2.7572E-01	1.0000	.38012	.00	6.8463E-02
150.0	1.3000	-.0310	8.2276E-01	8.2840E-01	2.8738	-.0000	-.1052	2.7451E-01	1.0000	.37679	.00	6.8463E-02
160.0	1.3000	-.0329	8.1159E-01	8.2036E-01	2.8824	-.0000	-.1180	2.7398E-01	1.0000	.37532	.00	6.8463E-02
170.0	1.3000	-.0321	8.1633E-01	8.2377E-01	2.8798	-.0000	-.0812	2.7421E-01	1.0000	.37594	.00	6.8463E-02
180.0	1.3000	-.0306	8.2485E-01	8.2991E-01	2.8741	-.0000	0.0000	2.7461E-01	1.0000	.37706	.00	6.8463E-02

BODY AND SHOCK GEOMETRY AT Z =33.800

PHI	RB	DRB/DZ	DRB/DPHI	RS	DRS/DZ	DRS/DPHI
0.0	1.3000	0.0000	0.0000	9.7928	.2270	0.0000
10.0	1.3000	0.0000	0.0000	9.8430	.2286	.5765
20.0	1.3000	0.0000	0.0000	9.9940	.2334	1.1618
30.0	1.3000	0.0000	0.0000	10.2485	.2414	1.7620
40.0	1.3000	0.0000	0.0000	10.6091	.2530	2.3797
50.0	1.3000	0.0000	0.0000	11.0792	.2682	3.0097
60.0	1.3000	0.0000	0.0000	11.6597	.2873	3.6488
70.0	1.3000	0.0000	0.0000	12.3529	.3103	4.2892
80.0	1.3000	0.0000	0.0000	13.1499	.3371	4.9600
90.0	1.3000	0.0000	0.0000	14.0194	.3675	5.3593
100.0	1.3000	0.0000	0.0000	15.0207	.4007	5.7283
110.0	1.3000	0.0000	0.0000	16.0459	.4358	5.9423
120.0	1.3000	0.0000	0.0000	17.0949	.4720	5.8816
130.0	1.3000	0.0000	0.0000	18.1020	.5066	5.5625
140.0	1.3000	0.0000	0.0000	19.0366	.5387	4.9319
150.0	1.3000	0.0000	0.0000	19.8236	.5660	4.0035
160.0	1.3000	0.0000	0.0000	20.4340	.5866	2.8644
170.0	1.3000	0.0000	0.0000	20.8234	.5993	1.4512
180.0	1.3000	0.0000	0.0000	20.9406	.6040	0.0000

REFERENCE

1. Chaussee, D. S.; and McMillan, O. J.: A Supersonic, Three-Dimensional Code for Flow Over Blunt Bodies - User's Manual. NASA CR-3223, 1980.

APPENDIX

SOURCE CODE

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      PROGRAM MAIN(INPUT,OUTPUT,PUNCH,TAPE5=INPUT,TAPE6=OUTPUT,TAPE7=PUN
     >CH,TAPE9,TAPE11,TAPE12,TAPE1)
      LEVEL 2,ETEMP,EO,FO,GO,HO
      COMMON/LARGE ETEMP(4,24,41),EO(4,24,41),
     *       FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4
     *1) ,
     *       ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,
     *       ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,
     *      DTOPH(24,41), BCT(41)  ,DTOZ(24,41),DTOR(41) , ACT(41)  ,
     *       ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,
     *       RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)
      COMMON /IOVARB/RX,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24)
      COMMON/SVARB/T,Z      , PHI    , DT     , DZ     , DPHI   , ZINT   ,
     *       ZERO   , PI     , ALPHA  , GAMMA  , SIGMA  , XMACH  , TAPE1  ,
     *       TAPE2  , DISK1  , ALPH   , DISK2  , SIGM   , NPRNT  , DZDT   ,
     *       DZDPH  , ZM     , TMUD   , TMLD   , TMW    , TML    , TTMW   ,
     *       TTML   , RZ     , BZ     , NIPHI  , NIT    , KPHI   , NITER  ,
     *       NPHI   , NPHI1  , NPHI2  , NPHI3  , NPHM1  , NPHM2  , NPHM3  ,
     *       NT     , NT1    , NT2    , NT3    , PHIFD  , NCONE  , RMDI   ,
     *       PHIF   , METHOD , LAG    , NBC    , PINF   , RHOIN  , UINF   ,
     *       QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFRADM
      INTEGER DISK1,DISK2,TAPE1,TAPE2
      COMMON /L1800/NTEST(11),NCRTA,NOCXY(4),NCRTB(3),NSWCH(32),INC(32)
      COMMON/XYZ/NXYZ(3),X1(160),X2(160),X3(160),Y1(160),Y2(160),Y3(160
     *),Z4(160),Z2(160),Z3(160)
      COMMON/JOE/ZL1,CF1,CF2,ZLF,ZTRAN,DZTRAN
      COMMON/EPSL/EPSL1,EPSL2
      COMMON/REALG/NREAL,NWNPPT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF
     *,V1INF,NITMAX,NMROUT
      COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRHTO,WRGX
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTDSOS
      COMMON/CFS/NCFS
      COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)
      DIMENSION RMES(3)
      DIMENSION MM(2),YS(24)
   11 CONTINUE
      IPRNT=ICONST(4)
      CALL GLOM3(0,PHIP,NPHI,Z,RB,RBZ,RBPH,IPRNT,NCONE)
      CALL INPUT
      GASCON=1716.
    9 IF(DISK1.GT.1) GO TO 1
      READ (12) XMACH,ALPHA,GAMMA,NIT,NIPHI,NREAL,P1INF,R1INF,V1INF,GASC
     *ON,RK,PHIFD,RJ
    1 IF(DISK2.GT.1) GO TO 2
      READ (11) XMACH,ALPHA,GAMMA,NIT,NIPHI,NREAL,P1INF,R1INF,V1INF,GASC
     *ON,RK,PHIFD,RJ
    2 IF(TAPE2.EQ.1.OR.TAPE2.EQ.3) GO TO 3
      READ (5,112) XMACH,ALPHA,GAMMA,RK,PHIFD
      READ(5,112) RJ
      READ (5,113) NIT,NIPHI,NREAL,P1INF,R1INF,V1INF,GASCON
    3 CONTINUE
      ZINT=ZL1
      ZEND=ZLF
      SIGMA=ATAN(CF2)*57.29578
      ZTINT=ZINT
      ICONST(48)=0
```

```
                IF (NREAL.NE.0) CALL INITIL                                     MAIN      40
              7 CALL INITA                                                      MAIN      41
     60       C.....CALCULATES COEFFICIENTS FOR STARTUP(FIRST CARD BEFORE ZALTER CARD MAIN  42
                IF(NCONE .EQ. 2 .AND. IFANDM .EQ. 0)CALL AERCO(1)               MAIN      43
                IEND=0                                                          MAIN      44
                DDZZ=(ZEND-ZTINT)/500.0                                         MAIN      45
                ZZZ=ZINT                                                        MAIN      46
     65       C.....READ RESPACING PARAMETERS                                   MAIN      47
              C                                                                 MAIN      48
              C      ZALTER = ZSTATION WHERE ALTERING OCCURS                    MAIN      49
              C      NJ,NK  = NUMBER OF POINTS IN RADIAL AND MERIDIONAL DIRECTIONS MAIN   50
              C     RJA,RKA = AMOUNT OF CLUSTERING IN RADIAL AND MERIDIONAL DIRECTIONS MAIN 51
     70       C      PHIFDA = MERIDIONAL ANGLE ABOUT WHICH CLUSTERING OCCURS    MAIN      52
              C      STPSZE = 0,AUTOMATIC STEPSIZER ; >0, CONSTANT STEPSIZE     MAIN      53
              CCONST(49AND5) = THE AMOUNT OF DISSIPATION IN RADIAL AND MERIDIONAL DIREC MAIN 54
              C               I.E.  .09                                         MAIN      55
              C      NSWCH1=0,NEW AVERAGING SCHEME;=1,REGULAR SCHEME            MAIN      56
     75       C      NSWCH5=0,NO ENTROPY RELAXATION;=1,RELAXATION               MAIN      57
              C                                                                 MAIN      58
                READ(5,100)ZALTER,NITA,NIPHIA,RJA,RKA,PHIFDA,STP,DISS1,DISS2,   MAIN      59
               <          NSWCH1,NSWCH5                                        MAIN      60
                STPSZE=0.0                                                      MAIN      61
     80         CALL BNDRY(2)                                                   MAIN      62
                CALL EIGEN(1)                                                   MAIN      63
              C.....OUTPUT INITIAL FLOW VARIABLES                               MAIN      64
                ICONST(5)=0                                                     MAIN      65
                IF(NCONE.EQ.1) GO TO 15                                         MAIN      66
     85         CALL OUTPUT(2)                                                  MAIN      67
                CALL OUTPUT(5)                                                  MAIN      68
                CALL OUTPUT(6)                                                  MAIN      69
             15 CONTINUE                                                        MAIN      70
              C.....CONE AT ZERO ALPHA BYPASS                                   MAIN      71
     90         IF(NCONE.EQ.1.AND.ALPHA.EQ.0.0.OR.NITER.EQ.0) GO TO 16          MAIN      72
                DO 4 JUDI=1,NITER                                               MAIN      73
                ICONST(5)=JUDI                                                  MAIN      74
                IF(STPSZE .EQ. 0.)GO TO 10227                                   MAIN      75
                DZ=STPSZE                                                       MAIN      76
     95         DZDT=DZ/DT                                                      MAIN      77
                DZDPH=DZ/DETA                                                   MAIN      78
                GO TO 5                                                         MAIN      79
             10227 CONTINUE                                                     MAIN      80
              C.....COMPUTE AUTOMATIC STEPSIZE                                  MAIN      81
    100         IF (MOD(JUDI,ICONST(49)).NE.0) GO TO 5                          MAIN      82
                IF (JUDI.EQ.1) GO TO 5                                          MAIN      83
                CALL EIGEN(1)                                                   MAIN      84
              5 CONTINUE                                                        MAIN      85
              C.....GENERATES DATA TAPE                                         MAIN      86
    105         GO TO (34,35,35), TAPE1                                         MAIN      87
             35 CONTINUE                                                        MAIN      88
                IF(Z.LT.ZZZ) GO TO 34                                           MAIN      89
                ZZZ=Z+DDZZ                                                      MAIN      90
                CALL OUTPUT(3)                                                  MAIN      91
    110      34 CONTINUE                                                        MAIN      92
                IF(Z+DZ .LT. ZEND)GO TO 30                                      MAIN      93
                IF(IEND .EQ. 1)GO TO 19                                         MAIN      94
                DZ=ZEND-Z                                                       MAIN      95
                DZDT=DZ/DT                                                      MAIN      96
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      DZDPH=DZ/DETA                                                     MAIN     97
      IEND=1                                                            MAIN     98
   30 CONTINUE                                                          MAIN     99
      IF(ZALTER.GE.Z.AND.ZALTER.LT.(Z+DZ)) GO TO 10                     MAIN    100
      GO TO 8                                                           MAIN    101
C........CLUSTER POINTS IN RADIAL OR MERIDIONAL DIRECTIONS              MAIN    102
   10 CONTINUE                                                          MAIN    103
      CALL OUTPUT(5)                                                    MAIN    104
      CALL SETSPC(NITA,RJA,NIPHIA,RKA,PHIFDA)                           MAIN    105
      STPSZE=STP                                                        MAIN    106
      CONST(4)=DISS1                                                    MAIN    107
      CONST(5)=DISS2                                                    MAIN    108
      NSWCH(5)=NSWCH5                                                   MAIN    109
      NSWCH(11)=NSWCH1                                                  MAIN    110
      READ(5,100)ZALTER,NITA,NIPHIA,RJA,RKA,PHIFDA,STP,DISS1,DISS2,     MAIN    111
     <          NSWCH1,NSWCH5                                           MAIN    112
      IF(STPSZE .EQ. 0.0)CALL EIGEN(1)                                  MAIN    113
      CALL OUTPUT(5)                                                    MAIN    114
    8 CONTINUE                                                          MAIN    115
      CALL DIFFR                                                        MAIN    116
      IF(NCONE .EQ. 2 .AND. IFANDM .EQ. 0)CALL AERCO(2)                 MAIN    117
C........OUTPUT INTERMEDIATE DATA                                       MAIN    118
C...OUTPUT BASED ON ITERATIONS                                          MAIN    119
      IF(MOD(JUDI,ITPRTF).NE.0) GO TO 21                                MAIN    120
      CALL OUTPUT(2)                                                    MAIN    121
   21 IF(MOD(JUDI,ITPRTB).NE.0) GO TO 20                                MAIN    122
      CALL OUTPUT(5)                                                    MAIN    123
      CALL OUTPUT(6)                                                    MAIN    124
   20 CONTINUE                                                          MAIN    125
C...OUTPUT BASED ON Z STATIONS                                          MAIN    126
      IF(AMOD(Z,ZFLD).LE.DZ) CALL OUTPUT(2)                             MAIN    127
      IF(AMOD(Z,ZBS).LE.DZ) GO TO 12                                    MAIN    128
      GO TO 4                                                           MAIN    129
   12 CONTINUE                                                          MAIN    130
      CALL OUTPUT(5)                                                    MAIN    131
      CALL OUTPUT(6)                                                    MAIN    132
    4 CONTINUE                                                          MAIN    133
   19 CONTINUE                                                          MAIN    134
C                                                                       MAIN    135
C.......RESET CONE SOLUTION TO Z=ZINT                                   MAIN    136
      IF(NCONE.EQ.2) GO TO 16                                           MAIN    137
      ZR=(ZTINT-ZSHIFT)/(Z-ZSHIFT)                                      MAIN    138
      DO 14 K=1,NPHI2                                                   MAIN    139
      RB(K)=ZR*RB(K)                                                    MAIN    140
      RS(K)=ZR*RS(K)                                                    MAIN    141
      RBPH(K)=ZR*RBPH(K)                                                MAIN    142
   14 RSPHI(K)=ZR*RSPHI(K)                                              MAIN    143
      Z=ZTINT                                                           MAIN    144
      CALL GEOM1(2)                                                     MAIN    145
      WRITE(6,102) Z                                                    MAIN    146
   16 CONTINUE                                                          MAIN    147
C........OUTPUT FINAL DATA                                              MAIN    148
      CALL OUTPUT(2)                                                    MAIN    149
      CALL OUTPUT(5)                                                    MAIN    150
      CALL OUTPUT(6)                                                    MAIN    151
      ZSAVE=ZEND                                                        MAIN    152
      ZEND=ZTINT                                                        MAIN    153
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                IF(NCONE .EQ. 1 .AND. IFANOM .EQ. 0)CALL AERCO(1)                MAIN      154
                IF(IFANOM .EQ. 0)CALL AERCO(2)                                   MAIN      155
                ZERO=ZSAVE                                                       MAIN      156
175           C.....STORE SOLUTION ON PUNCHED CARDS                              MAIN      157
                IF(TAPE2.EQ.3) CALL OUTPUT(8)                                    MAIN      158
              C.....STORE SOLUTION ON DISK1 FOR RESTART                          MAIN      159
                IF(DISK1.NE.2) GO TO 17                                          MAIN      160
                CALL OUTPUT(4)                                                   MAIN      161
180             17 CONTINUE                                                      MAIN      162
              C.....STORE SOLUTION ON DISK2 FOR RESTART                          MAIN      163
                IF(DISK2.NE.2) GO TO 18                                          MAIN      164
                CALL OUTPUT(7)                                                   MAIN      165
                18 CONTINUE                                                      MAIN      166
185            100 FORMAT(F10.5,I2,I3,6F10.5,I2,I3)                              MAIN      167
               102 FORMAT(* CONE SOLUTION RESET TO Z-INITIAL=*,F10.5)             MAIN      168
               112 FORMAT(5E15.6)                                                MAIN      169
               113 FORMAT(3I5,4E15.6)                                            MAIN      170
               6   ZZZ=ZZZ                                                       MAIN      171
190            IF (TAPE1.EQ.1) GO TO 13                                          MAIN      172
                END FILE 9                                                       MAIN      173
                REWIND 9                                                         MAIN      174
                13 CONTINUE                                                      MAIN      175
                IF(NCASE.GT.0) GO TO 11                                          MAIN      176
195           C.....PUNCH DATA CARDS FOR 3-D S-O-S CODE                          MAIN      177
                IF(NTDSOS.GT.0) CALL OUTPUT(9)                                   MAIN      178
                STOP                                                             MAIN      179
                END                                                              MAIN      180
```

```
      SUBROUTINE AERCO(K1)                                                  AERCO    2
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4    PVARB    2
     *1) ,                                                                  PVARB    3
     *       ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,                  PVARB    4
     *       ROBPH(41)  ,            EB(41)   , RBZ(41)  , RBPH(41) ,     PVARB    5
     *      DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,     PVARB    6
     *       ICONST(50) , GAM(20)  , CONST(50) ,NREGN    , RS(41)   ,     PVARB    7
     *       RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)     PVARB    8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24)     IDVARB   2
      COMMON/SVARB/Z     , PHI    , DT     , DZ     , DPHI   , ZINT   ,    SVARB    2
     *       ZERO   , PI     , ALPHA  , GAMMA  , SIGMA  , XMACH  , TAPE1 ,  SVARB    3
     *       TAPE2  , DISK1  , ALPH   , DISK2  , SIGM   , NPRNT  , DZDT  ,  SVARB    4
     *       DZDPH  , ZM     , TM4D   , TM5D   , TMM    , TM     , TIMM  ,  SVARB    5
     *       TIML   , MZ     , DZ     , NIPHI  , NIT    , KPHI   , NITER ,  SVARB    6
     *       NPHI   , NPHI1  , NPHI2  , NPHI3  , NPHM1  , NPHM2  , NPHM3 ,  SVARB    7
     *       NT     , NT1    , NT2    , NT3    , PHIFD  , NCONE  , RNDI  ,  SVARB    8
     *       PHIF   , METHOD , LAG    , IAC    , PINF   , RHOIN  , UINF  ,  SVARB    9
     *       QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM.                       SVARB   10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                       SVARB   11
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITERTB,ITERTF,NCASE,NTDSDS                ENTRO    2
      COMMON/FORCES/ZZ(3),CPS(41),ARB(41),ARBPH(41),ARBZ(41)                AERCO    7
      COMMON/FRNDM/FTX,FTY,FTZ,RMTX,RMTY,RMTZ,FTX2,FTY2,FTZ2,RMTX2,RMTY2    AERCO    8
     <  ,RMTZ2                                                              AERCO    9
      REAL LENGTH                                                           AERCO   10
C..NO YAW OR ROLL CAPABILITY,3/16/78                                        AERCO   11
      BETA=0.0                                                              AERCO   12
      ROLL=0.0                                                              AERCO   13
      ZO=Z+DZ                                                               AERCO   14
      GAM(5)=2./(GAMMA*XMACH**2)                                            AERCO   15
      ZZ(3)=Z                                                               AERCO   16
      GO TO (5,3),K1                                                        AERCO   17
C.....PIECEWISE SUMMATION OF FORCES AND MOMENTS                             AERCO   18
    3 IF(ZO.GE. ZERO)ZZ(3)=ZERO                                             AERCO   19
      CALL COMPUT(NSTART)                                                   AERCO   20
      NSTART=2                                                              AERCO   21
      ZZ(1)=ZZ(2)                                                           AERCO   22
      ZZ(2)=ZZ(3)                                                           AERCO   23
      IF(NCONE .EQ. 1)GO TO 7                                               AERCO   24
      GO TO 10                                                              AERCO   25
C.....INITIALIZES THE FORCES AND MOMENTS FOR EACH STARTUP                   AERCO   26
    5 CONTINUE                                                              AERCO   27
      ZZ(1)=ZZ(3)                                                           AERCO   28
      ZZ(2)=ZZ(3)                                                           AERCO   29
      NSTART=1                                                              AERCO   30
      CALL COMPUT(NSTART)                                                   AERCO   31
      NSTART=2                                                              AERCO   32
      ZSTART=Z                                                              AERCO   33
      LENGTH=ALENGT                                                         AERCO   34
      SB=PI*DIAM**2*0.25                                                    AERCO   35
      WRITE(6,105)SB,LENGTH                                                 AERCO   36
   10 DO 15 K=3,NPHI                                                        AERCO   37
      CPS(K)=(P(3,K)/PINF-1.0)*GAM(5)                                       AERCO   38
      ARB(K)=RB(K)                                                          AERCO   39
      ARBPH(K)=RBPH(K)                                                      AERCO   40
      ARBZ(K)=RBZ(K)                                                        AERCO   41
   15 CONTINUE                                                              AERCO   42
      IF(Z .EQ. ZSTART)RETURN                                               AERCO   43
```

```
    7   CONTINUE
C......COMPUTE AERODYNAMIC COEFFICIENTS
        REF1=2./SB
        FTX1=FTX2*REF1
        FTY1=FTY2*REF1
        FTZ1=FTZ2*REF1
        FTX=FTX+FTX1
        FTY=FTY+FTY1
        FTZ=FTZ+FTZ1
C......COMPUTE AERODYNAMIC MOMENT COEFFICIENTS
        REF2=2./(SB*LENGTH)
        RMTX1=RMTX2*REF2
        RMTY1=RMTY2*REF2
        RMTZ1=RMTZ2*REF2
        RMTX=RMTX+RMTX1
        RMTY=RMTY+RMTY1
        RMTZ=RMTZ+RMTZ1
        WRITE(6,101)Z,FTX1,FTY1,FTZ1,FTX,FTY,FTZ,RMTX1,RMTY1,RMTZ1,RMTX,
       <RMTY,RMTZ
   20   CONTINUE
        IF(ZZ(3).LT. ZEND)RETURN
C......PRINT OUT FINAL AERODYNAMIC FORCE AND MOMENT COEFFICIENTS
C......CALCULATE LIFT,DRAG,AND YAW FORCES(WIND AXES, AND STATIC MARGIN
        A1=ALPH
        A2=BETA
        A3=ROLL
        CD=FTZ*COS(A1)*COS(A2)-FTX*COS(A1)*SIN(A2)+FTY*SIN(A1)
        CY=FTZ*(SIN(A2)*COS(A3)-SIN(A1)*COS(A2)*SIN(A3))+FTX*(COS(A2)*
       <COS(A3)+SIN(A1)*SIN(A2)*SIN(A3))+FTY*SIN(A3)*COS(A1)
        CL=-FTZ*(SIN(A2)*SIN(A3)+SIN(A1)*COS(A2)*COS(A3))+FTY*COS(A1)*
       <COS(A2)+FTX*(-SIN(A3)*COS(A2)+SIN(A1)*SIN(A2)*COS(A3))
        WRITE(6,105)SB,LENGTH
        WRITE(6,102)FTY,CL,FTX,CY,FTZ,CD
        RMTY=-RMTY
        RMTZ=-RMTZ
        WRITE(6,104)RMTX,RMTY,RMTZ
        ZCP=-RMTX/FTY
        SM=ZCP-ZCG/LENGTH
        WRITE(6,106)ZCP,LENGTH,ZREF
        WRITE(6,107)SM,LENGTH,ZCG
        WRITE(6,108)
      8 CONTINUE
  101   FORMAT(1X,2HZ=,F10.6/1X,21HDCY,DCN,DCA,CY,CN,CA=,6E15.8 /1X,24HDMX
       <,DMY,DMZ,CMX,CMY,CMZ=,6E15.8)
  102   FORMAT(1H0,5X,27HNORMAL FORCE COEFFICIENT = ,E15.6,10X,19HLIFT COE
       <FFICIENT = ,E15.6//6X,27H  SIDE FORCE COEFFICIENT = ,E15.6,10X,19H
       <YAW  COEFFICIENT = ,E15.6//6X,27H AXIAL FORCE COEFFICIENT = ,E15.6
       <,10X,19HDRAG COEFFICIENT = ,E15.6)
  104   FORMAT(1H0,/6X,30HPITCHING MOMENT COEFFICIENT = ,E15.6//
       *6X,30H     SIDE MOMENT COEFFICIENT = ,E15.6//
       *6X,30H ROLLING MOMENT COEFFICIENT = ,E15.6)
  105   FORMAT(1H1,5X,12HREF. AREA = ,F10.6,1X,14HREF. LENGTH = ,F10.6)
  106   FORMAT(1H0,/6X,19HCENTER OF PRESSURE=,E15.6,1X,21HBASED ON REF. LE
       <NGTH=,E15.6,1X,23HAND MOMENT REF. CENTER=,E15.6)
  107   FORMAT(1H0,6X,26HSTATIC STABILITY MARGIN = ,E15.6,1X,23HBASED ON R
       <EF. LENGTH = ,E15.6,1X,20HAND C.G. LOCATION = ,E15.6)
  108   FORMAT(1H1,7HTHE END)
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SUBROUTINE AERCO      76/76   OPT=1                    FTN 4.6+460       06/15/79  18.58.36       PAGE    3

115                RETURN                                                  AERCO     101
                   END                                                     AERCO     102
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      SUBROUTINE COMPUT (NSTART)                                        COMPUT     2
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB     2
     *1) ,                                                              PVARB     3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,               PVARB     4
     *      ROBPH(41)  ,              RB(41)   , RBZ(41)  , RBPH(41) ,  PVARB     5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDP(41) , ACT(41)  ,   PVARB     6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NRLCON   , RS(41)   ,    PVARB     7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)    PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24) IDVARB     2
      COMMON/SVARB/T,Z     , PHI    , DT     , DZ     , DPHI   , ZINT  ,  SVARB     2
     *      ZEND  , PI    , ALPHA , GAMMA , SIGMA , MACH , TAPE1 ,    SVARB     3
     *      TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,    SVARB     4
     *      DZDPH , ZM    , TMAD  , TMLD  , TMW   , TML   , TTMW  ,    SVARB     5
     *      TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,    SVARB     6
     *      NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,    SVARB     7
     *      NT    , NT1   , NT2   , NTS   , PHIFD , NCONE , RADI  ,    SVARB     8
     *      PHIF  , METHOD, LAG   , NAC   , PINF  , RHOIN , UINF  ,    SVARB     9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANOM                     SVARB    10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB    11
      COMMON/FORCES/ZZ(3),CPS(41),ARB(41),ARBPH(41),ARBZ(41)            COMPUT     6
      COMMON/FANOM/FTX,FTY,FTZ,RMTX,RMTY,RMTZ,FTX2,FTY2,FTZ2,RMTX2,RMTY2 COMPUT    7
     < ,RMTZ2                                                           COMPUT     8
      REAL MTEMPX,MTEMPY,MTEMPZ                                         COMPUT     9
      DZ1=(ZZ(3)-ZZ(2))*0.5                                             COMPUT    10
      DZ2=(ZZ(2)-ZZ(1))*0.5                                             COMPUT    11
      FTEMPX=0.0                                                        COMPUT    12
      FTEMPY=0.0                                                        COMPUT    13
      FTEMPZ=0.0                                                        COMPUT    14
      MTEMPX=0.0                                                        COMPUT    15
      MTEMPY=0.0                                                        COMPUT    16
      MTEMPZ=0.0                                                        COMPUT    17
      DO 4 K=3,NPHI                                                     COMPUT    18
      SPHI=SIN(PHIP(K))                                                 COMPUT    19
      CPHI=COS(PHIP(K))                                                 COMPUT    20
      GO TO (1,2),NSTART                                                COMPUT    21
    1 CONTINUE                                                          COMPUT    22
C.....FORCE AND MOMENT FROM STARTING SOLUTION                           COMPUT    23
      READ(5,200)FTX,FTY,FTZ,RMTX,RMTY,RMTZ                             COMPUT    24
      H=ZINT-ZSHIFT                                                     COMPUT    25
      RO=H*TAN(SIGM)                                                    COMPUT    26
  200 FORMAT(6F12.8)                                                    COMPUT    27
      RETURN                                                            COMPUT    28
    2 CONTINUE                                                          COMPUT    29
C.....AFT BODY CALCULATIONS                                             COMPUT    30
      DPHIS=PHIP(K+1)-PHIP(K-1)                                         COMPUT    31
      IF(K .EQ. NPHI)DPHIS=2.*(PHIP(K)-PHIP(K-1))                       COMPUT    32
      AA=(DZ1+DZ2)*ARB(K)*0.5*DPHIS                                     COMPUT    33
      IF(NCONE .EQ. 1)AA=0.5*DPHIS*0.5*RO*SQRT(RO**2+H**2)              COMPUT    34
      IF(K .EQ. 3 .OR. K .EQ. NPHI)AA=0.5*AA                            COMPUT    35
      FORCE=CPS(K)*AA                                                   COMPUT    36
      ZARM=ZZ(2)-ZREF                                                   COMPUT    37
      IF(NCONE .EQ. 1)ZARM=2.*(ZINT-ZSHIFT)*(1.+TAN(SIGM)**2)/3.+ZSHIFT COMPUT    38
     <-ZREF                                                             COMPUT    39
      FTEMPX=FTEMPX+FORCE*(ARBPH(K)/ARB(K)*SPHI-SPHI)                   COMPUT    40
      FTEMPY=FTEMPY+FORCE*(ARBPH(K)/ARB(K)*CPHI+CPHI)                   COMPUT    41
      FTEMPZ=FTEMPZ+FORCE*ARBZ(K)                                       COMPUT    42
C.....MOMENT CENTER LOCATED AT Z=ZREF                                   COMPUT    43
```

```
                MTEMPX=MTEMPX-FORCE*(ZARM *ARBPH(K)*SPHI/ARB(K)+(ZARM +ARB(K)*      COMPUT     44
               <ARBZ(K))*CPHI)                                                      COMPUT     45
60              MTEMPY=MTEMPY+FORCE*(ZARM *ARBPH(K)*CPHI/ARB(K)-(ZARM +ARB(K)*      COMPUT     46
               <ARBZ(K))*SPHI)                                                      COMPUT     47
                MTEMPZ=MTEMPZ+FORCE*ARBPH(K)                                        COMPUT     48
            4   CONTINUE                                                            COMPUT     49
                FTX2=FTEMPX                                                         COMPUT     50
65              FTY2=FTEMPY                                                         COMPUT     51
                FTZ2=FTEMPZ                                                         COMPUT     52
                RMTX2=MTEMPX                                                        COMPUT     53
                RMTY2=MTEMPY                                                        COMPUT     54
                RMTZ2=MTEMPZ                                                        COMPUT     55
70              RETURN                                                              COMPUT     56
                END                                                                 COMPUT     57
```

```
      SUBROUTINE BNDRY(K1)                                                  BNDRY    2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                             CVARB    2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                              CVARB    3
     *     FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                       CVARB    4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4    PVARB    2
     *1) ,                                                                  PVARB    3
     *     ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,                    PVARB    4
     *     RDUPH(41)  ,            RB(41)   , RBZ(41)  , RHPH(41) ,        PVARB    5
     *    DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,        PVARB    6
     *     ICONST(50) , GAM(20)  , CONST(50) ,NALGON   , RS(41)    ,        PVARB    7
     *     RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)        PVARB    8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILP(41),DETA,TP(24)     IDVARB   2
      COMMON/SVARB/T,Z     , PHI    , DT    , DZ    , DPHI  , ZINT  ,      SVARB    2
     *     ZEND  , PI    , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,        SVARB    3
     *     TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,        SVARB    4
     *     DZDPH , ZM    , TMWO  , TMLO  , TMW   , TML   , TTMW  ,        SVARB    5
     *     TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,        SVARB    6
     *     NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,        SVARB    7
     *     NT    , NT1   , NT2   , NT3   , PHIFO , NCONE , RADI  ,        SVARB    8
     *     PHIF  , METHOD, LAG   , NOC   , PINF  , RHOIN , UINF  ,        SVARB    9
     *     QINF,DIAM,FLENGT,ZREF,ZCG,ZSHIFT,IFANUM                        SVARB   10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                       SVARB   11
      COMMON /L1800/NTES(11),NCRTA,NOSXY(4),NCRTB(3),NSWCH(32),INC(32)      L1800    2
      COMMON/XYZ/NXYZ(3),X1(160),X2(160),X3(160),Y1(160),Y2(160),Y3(160     XYZ      2
     *),Z4(160),Z2(160),Z3(160)                                             XYZ      3
      COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRRTO,WRGX     CONRG    2
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF       REALG    2
     *,V1INF,NITPVG,NWROUT                                                  REALG    3
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTDSOS                ENTRO    2
      DIMENSION PK13(41),PK14(41),PK21(41),PK22(41),PK23(41)                BNDRY   12
      LOGICAL ITDNO                                                         BNDRY   13
      ARSIN(A)=ASIN(A)                                                      BNDRY   14
      GO TO (10,18,11),K1                                                   BNDRY   15
   10 CONTINUE                                                              BNDRY   16
      IF(NCONE.EQ.2) GO TO 32                                               BNDRY   17
C...DETERMINE SURFACE ENTROPY FOR CONICAL BODIES                            BNDRY   18
      IF(W( ,4)) 16,16,15                                                   BNDRY   19
   15 DO 13 K=5,NPHM1                                                       BNDRY   20
      IF(W(3,K)) 17,17,13                                                   BNDRY   21
   13 CONTINUE                                                              BNDRY   22
      KENT=NPHI                                                             BNDRY   23
      GO TO 19                                                              BNDRY   24
   17 CONTINUE                                                              BNDRY   25
      KENT=K-1                                                              BNDRY   26
      GO TO 19                                                              BNDRY   27
   16 DO 7 K=5,NPHM1                                                        BNDRY   28
      IF(W(3,K)) 7,8,8                                                      BNDRY   29
    7 CONTINUE                                                              BNDRY   30
      KENT=NPHI                                                             BNDRY   31
      GO TO 20                                                              BNDRY   32
    8 CONTINUE                                                              BNDRY   33
      KENT=K-1                                                              BNDRY   34
      GO TO 20                                                              BNDRY   35
   19 CONTINUE                                                              BNDRY   36
      DO 24 K=3,NPHI                                                        BNDRY   37
      IF(K.LE.KENT) S(K)=P(4,3)/RHO(4,3)**GAMMA                             BNDRY   38
      IF(K.GT.KENT) S(K)=P(4,NPHI)/RHO(4,NPHI)**GAMMA                       BNDRY   39
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   24 CONTINUE                                                          BNDRY   40
      GO TO 32                                                          BNDRY   41
   20 CONTINUE                                                          BNDRY   42
      DO 31 K=3,NPHI                                                    BNDRY   43
   31 S(K)=P(4,KENT)/RHO(4,KENT)**GAMMA                                 BNDRY   44
   32 CONTINUE                                                          BNDRY   45
C..WEAK OR SMALL ANGLE CORRECTIONS (USES PRANDTL-MEYER RELATIONS)       BNDRY   46
      DO 9 K=3,NPHI                                                     BNDRY   47
      PK4=1.0/SQRT(RBZ(K)**2+1.0+(RBPH(K)/RB(K))**2)                    BNDRY   48
      PK1=-RBZ(K)*PK4                                                   BNDRY   49
      PK2=PK4                                                           BNDRY   50
      PK3=-RBPH(K)/RB(K)*PK4                                            BNDRY   51
      IT2ND=.FALSE.                                                     BNDRY   52
25    CONTINUE                                                          BNDRY   53
      QSQ=U(3,K)**2+V(3,K)**2+W(3,K)**2                                 BNDRY   54
      IF(P(3,K).GE.0.0) GO TO 4                                         BNDRY   55
C..NEGATIVE SURFACE PRESSURE                                            BNDRY   56
      ICHECK=1                                                          BNDRY   57
      WRITE(6,100)K,Z,P(3,K),RHO(3,K),U(3,K),V(3,K),W(3,K),ICHECK       BNDRY   58
      P(3,K)=ABS(P(3,K))                                                BNDRY   59
      PPPP=0.5*(P(3,K+1)+P(3,K-1))                                      BNDRY   60
      IF(P(3,K) .GT. PPPP)P(3,K)=ABS(PPPP)                              BNDRY   61
      RHO(3,K)=(P(3,K)/S(K))**(1.0/GAMMA)                               BNDRY   62
      Q3K=SQRT(1.0-P(3,K)/RHO(3,K))                                     BNDRY   63
      U(3,K)=U(3,K)*Q3K/QSQ**0.5                                        BNDRY   64
      V(3,K)=V(3,K)*Q3K/QSQ**0.5                                        BNDRY   65
      W(3,K)=W(3,K)*Q3K/QSQ**0.5                                        BNDRY   66
      WRITE(6,103) P(3,K),RHO(3,K),U(3,K),V(3,K),W(3,K)                 BNDRY   67
      QSQ=Q3K**2                                                        BNDRY   68
4     CONTINUE                                                          BNDRY   69
      IF(RHO(3,K) .GE. 0.0)GO TO 5                                      BNDRY   70
      ICHECK=2                                                          BNDRY   71
      WRITE(6,100)K,Z,P(3,K),RHO(3,K),U(3,K),V(3,K),W(3,K),ICHECK       BNDRY   72
      RHO(3,K)=ABS(RHO(3,K))                                            BNDRY   73
      RRRR=0.5*(RHO(3,K+1)+RHO(3,K-1))                                  BNDRY   74
      IF(RHO(3,K) .GT. RRRR)RHO(3,K)=ABS(RRRR)                          BNDRY   75
      P(3,K)=S(K)*RHO(3,K)**GAMMA                                       BNDRY   76
      Q3K=SQRT(1.0-P(3,K)/RHO(3,K))                                     BNDRY   77
      U(3,K)=U(3,K)*Q3K/QSQ**0.5                                        BNDRY   78
      V(3,K)=V(3,K)*Q3K/QSQ**0.5                                        BNDRY   79
      W(3,K)=W(3,K)*Q3K/QSQ**0.5                                        BNDRY   80
      WRITE(6,103)P(3,K),RHO(3,K),U(3,K),V(3,K),W(3,K)                  BNDRY   81
5     CONTINUE                                                          BNDRY   82
      PK5=SQRT(QSQ)                                                     BNDRY   83
      PK6=(PK1*U(3,K)+PK2*V(3,K)+PK3*W(3,K))/PK5                        BNDRY   84
      PK6D=PK6*RADI                                                     BNDRY   85
      PK7=ARSIN(PK6)                                                    BNDRY   86
      PK7D=PK7*RADI                                                     BNDRY   87
      IF(PK7D .GT. 5.0)WRITE(6,102)K,PK7D                               BNDRY   88
      IF (NPEAL.EQ.-1) GO TO 22                                         BNDRY   89
      PK8=GAM(1)*P(3,K)/RHO(3,K)                                        BNDRY   90
      PK9=PK5**2/PK8                                                    BNDRY   91
      PK10=PK9-1.0                                                      BNDRY   92
      IF(PK10 .GT. 0.0)GO TO 6                                          BNDRY   93
      ICHECK=3                                                          BNDRY   94
      WRITE(6,100)K,Z,P(3,K),RHO(3,K),U(3,K),V(3,K),W(3,K),ICHECK       BNDRY   95
      PK10=0.5                                                          BNDRY   96
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                      PK9=1.5                                                    BNDRY      97
                      PK8=PK5**2/PK9                                             BNDRY      98
                      RHO(3,K)=GAM(1)*P(3,K)/PK8                                 BNDRY      99
                      Q3K=SQRT(1.0-P(3,K)/RHO(3,K))                              BNDRY     100
                      U(3,K)=U(3,K)*Q3K/Q5Q**0.5                                 BNDRY     101
                      V(3,K)=V(3,K)*Q3K/Q5Q**0.5                                 BNDRY     102
                      W(3,K)=W(3,K)*Q3K/Q5Q**0.5                                 BNDRY     103
                      WRITE(6,103)P(3,K),RHO(3,K),U(3,K),V(3,K),W(3,K)           BNDRY     104
                    6 CONTINUE                                                   BNDRY     105
                      PK11=GAMMA*PK9/SQRT(PK10)                                  BNDRY     106
                      PK12=GAMMA*PK9*((GAMMA+1.0)*PK3**2-4.0*PK10)/(4.0*PK10**2) BNDRY     107
                C..NEXT TWO TERMS COMPUTE COEFFICIENTS FOR DENSITY EXPANSION     BNDRY     108
                      IF(NSWCH(5).EQ.0) GO TO 2                                  BNDRY     109
                      PK25=PK11/GAMMA                                            BNDRY     110
                      PK26=PK9*((3.0-GAMMA)*PK9*(PK9-2.0)+4.0)/(4.0*PK10**2)     BNDRY     111
                    2 CONTINUE                                                   BNDRY     112
                      PK13(K)=P(3,K)*(1.0-PK11*PK7+PK12*PK7**2)                  BNDRY     113
                      FACTOR=0.5*GAMMA**2*PK9/(PK10**3.5)                        BNDRY     114
                      TERM1=(GAMMA+1.0)*PK9**4/6.0                               BNDRY     115
                      TERM2=-(5.0+7.0*GAMMA-2.0*GAMMA**2)*PK9**3/6.0             BNDRY     116
                      TERM3= 5.0*(GAMMA+1.0)*PK9**2/3.0                          BNDRY     117
                      TERM4=4.0/3.0-2.0*PK9                                      BNDRY     118
                      COEFF3=FACTOR*(TERM1+TERM2+TERM3+TERM4)                    BNDRY     119
                      PTEST=PK13(K)-P(3,K)*COEFF3*PK7**5                         BNDRY     120
                      IF(ABS(PK7) .LT. ABS(0.1))GO TO 123                        BNDRY     121
                      WRITE (6,122) PK7,P(3,K),PK13(K),PTEST,K                   BNDRY     122
                      XM1 = SQRT(PK9)                                            BNDRY     123
                      CALL PHYTURN(XM1,PK7,P2P1,NITS,GAMMA)                      BNDRY     124
                      PTRUE = P(3,K)*P2P1                                        BNDRY     125
                      WRITE(6,124) PTRUE,NITS                                    BNDRY     126
                  124 FORMAT(1H+,88X,F15.9," NITS=",I3)                          BNDRY     127
                      PTEST = PTRUE                                              BNDRY     128
                  122 FORMAT (1X*DANGLE,P1,P2,P2TEST*,4F15.9,I5)                 BNDRY     129
                  123 CONTINUE                                                   BNDRY     130
                      PK13(K)=(PTEST+P(3,K))*0.5*0.60+.200*(P(3,K+1)+P(3,K-1))   BNDRY     131
                      PK13(K)=(PTEST+P(3,K))*0.5*0.70+.150*(P(3,K+1)+P(3,K-1))   BNDRY     132
                      PK13(K)=(PTEST+P(3,K))*0.5*0.99+.005*(P(3,K+1)+P(3,K-1))   BNDRY     133
                      PK13(K)=PTEST                                              LINE        1
                      PK14(K)=(PK13(K)/S(K))**(1.0/GAMMA)                        BNDRY     134
                      IF(NSWCH(5).EQ.0) GO TO 3                                  BNDRY     135
                      PK14(K)=RHO(3,K)*(1.0-PK25*PK7+PK26*PK7**2)                BNDRY     136
                      S(K)=P(3,K)/RHO(3,K)**GAMMA                                BNDRY     137
                    3 CONTINUE                                                   BNDRY     138
                      PK15=SQRT(1.0-PK13(K)/PK14(K))                             BNDRY     139
                      GO TO 23                                                   BNDRY     140
                   22 CONTINUE                                                   BNDRY     141
                      IF (NWRPRT.EQ.2) WRITE (6,101) PK7,BODYH,BODYS             BNDRY     142
                      IF (NSWCH(2).GT.0) GO TO 26                                BNDRY     143
                C      FOLLOWING STATEMENTS TO 23 ARE FOR RELAXING CONSTANT ENTROPY. BNDRY     144
                      CALL PRANG(PK7,P(3,K),PK13(K),PK14(K),PK15)                BNDRY     145
                      GO TO 23                                                   BNDRY     146
                   26 CONTINUE                                                   BNDRY     147
                      CALL RGAS(P(3,K),RHO(3,K),WRAX,WRMY,WRTX,WRSX,GASCON,WRGX,-1,1,2) BNDRY     148
                      WRMACH=(PK5/WRAX)**2                                       BNDRY     149
                      WMSTA=SQRT(WRMACH-1.)                                      BNDRY     150
                      DP=PK7*RHO(3,K)*Q5Q/WRBETA                                 BNDRY     151
                      PK13(K)=P(3,K)-DELP                                        BNDRY     152
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                CALL RGAS(PK13(K),PK14(K),WRAX,WRHX,WRTX,S(K),GASCON,WRGX,-1.5,2)  BNDRY  153
                PK15=SQRT(2.0*(BODYH-WRGX))                                       BNDRY  154
             23 CONTINUE                                                          BNDRY  155
C75             PK16=PK6*PK5*PK4                                                  BNDRY  156
                PK17=U(3,K)+PK16*RHBZ(K)                                          BNDRY  157
                PK18=V(3,K)-PK16                                                  BNDRY  158
                PK19=W(3,K)+PK16*RHPHI(K)/RB(K)                                   BNDRY  159
                PK20=SQRT(PK17**2+PK18**2+PK19**2)                                BNDRY  160
C80             PK24=PK15/PK20                                                    BNDRY  161
                PK21(K)=PK24*PK17                                                 BNDRY  162
                PK22(K)=PK24*PK18                                                 BNDRY  163
                PK23(K)=PK24*PK19                                                 BNDRY  164
                IF (NSWCH(2).LE.0) GO TO 9                                        BNDRY  165
C85             IF (NREAL.EQ.-1) GO TO 9                                          BNDRY  166
                IF (IT2ND) GO TO 9                                                BNDRY  167
                IT2ND=.TRUE.                                                      BNDRY  168
                IF (ABS(P(3,K)-PK13(K)).LT.P(3,K)*1.0E-3) GO TO 9                 BNDRY  169
                P(3,K)=PK13(K)                                                    BNDRY  170
C90             RHO(3,K)=PK14(K)                                                  BNDRY  171
                U(3,K)=PK21(K)                                                    BNDRY  172
                V(3,K)=PK22(K)                                                    BNDRY  173
                W(3,K)=PK23(K)                                                    BNDRY  174
                GO TO 25                                                          BNDRY  175
C95          9  CONTINUE                                                          BNDRY  176
             11 CONTINUE                                                          BNDRY  177
             C..RESET BODY VARIABLES TO THOSE CALCULATED BY ABBETTS SCHEME        BNDRY  178
                DO 12 K=3,NPHI                                                    BNDRY  179
                P(3,K)=PK13(K)                                                    BNDRY  180
C100            RHO(3,K)=PK14(K)                                                  BNDRY  181
                U(3,K)=PK21(K)                                                    BNDRY  182
                V(3,K)=PK22(K)                                                    BNDRY  183
                W(3,K)=PK23(K)                                                    BNDRY  184
             12 CONTINUE                                                          BNDRY  185
C105            GO TO 21                                                          BNDRY  186
             18 CONTINUE                                                          BNDRY  187
             C                                                                    BNDRY  188
             C..APPLY REFLECTION PRINCIPLE AT PLANES OF SYMMETRY                  BNDRY  189
             C                                                                    BNDRY  190
C110            DO 1 K=1,2                                                        BNDRY  191
                M=6-K                                                             BNDRY  192
                L=NPHI+K                                                          BNDRY  193
                N=NPHI-K                                                          BNDRY  194
                DO 1 J=3,NT2                                                      BNDRY  195
C115            RHO(J,K)=RHO(J,M)                                                 BNDRY  196
                RHO(J,L)=RHO(J,N)                                                 BNDRY  197
                P(J,K)=P(J,M)                                                     BNDRY  198
                P(J,L)=P(J,N)                                                     BNDRY  199
                U(J,K)=U(J,M)                                                     BNDRY  200
C120            U(J,L)=U(J,N)                                                     BNDRY  201
                V(J,K)=V(J,M)                                                     BNDRY  202
                V(J,L)=V(J,N)                                                     BNDRY  203
                W(J,K)=-W(J,M)                                                    BNDRY  204
                W(J,L)=-W(J,N)                                                    BNDRY  205
C125            W(J,3)=0.0                                                        BNDRY  206
                W(J,NPHI)=0.0                                                     BNDRY  207
             1  CONTINUE                                                          BNDRY  208
                IF(ICONST(5).LT.100.OR.NCONE.EQ.2) GO TO 21                       BNDRY  209
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      C..SET ENTROPY CONSTANT IN WINDWARD PLANE FOR CONICAL FLOWS                BNDRY    210
230         IF(ALPH) 27,28,28                                                    BNDRY    211
         27 SSH=P(NT2,NPHI)/RHO(NT2,NPHI)**GAMMA                                 BNDRY    212
            DO 29 J=4,NT1                                                        BNDRY    213
            RHO(J,NPHI)=(P(J,NPHI)/SSH)**(1.0/GAMMA)                             BNDRY    214
            QN2=1.0-P(J,NPHI)/RHO(J,NPHI)                                        BNDRY    215
235         VOU=V(J,NPHI)/U(J,NPHI)                                              BNDRY    216
            U(J,NPHI)=SQRT(QN2/(1.0+VOU**2))                                     BNDRY    217
            V(J,NPHI)=U(J,NPHI)*VOU                                              BNDRY    218
         29 CONTINUE                                                             BNDRY    219
            GO TO 21                                                             BNDRY    220
240      28 SSH=P(NT2,3)/RHO(NT2,3)**GAMMA                                       BNDRY    221
            DO 30 J=4,NT1                                                        BNDRY    222
            RHO(J,3)=(P(J,3)/SSH)**(1.0/GAMMA)                                   BNDRY    223
            QN2=1.0-P(J,3)/RHO(J,3)                                              BNDRY    224
            VOU=V(J,3)/U(J,3)                                                    BNDRY    225
245         U(J,3)=SQRT(QN2/(1.0+VOU**2))                                        BNDRY    226
            V(J,3)=U(J,3)*VOU                                                    BNDRY    227
         30 CONTINUE                                                             BNDRY    228
         21 CONTINUE                                                             BNDRY    229
         100 FORMAT(1HO,38HERROR CHECK-NEGATIVE PRESSURE IN BNDRY /1H ,          BNDRY    230
250        *2HK=,I3,3X,2HZ=,F10.3/1H ,2HP=,E13.6,3X,4HPHO=,E13.6,3X,2HU=,E13.6 BNDRY    231
            *,3X,                                                                BNDRY    232
            *2HV=,E13.6,3X,2HW=,E13.6,3X,7HICHECK=,I2)                           BNDRY    233
         101 FORMAT(1H ,18H*BNDRY - ANG(PK7)= ,1PE12.5,1X,3HHB=,1PE12.5,1X,      BNDRY    234
            *3HSB=,1PE12.5)                                                      BNDRY    235
255      102 FORMAT(1HO,31HDEFLECTION ANGLE IN BNDRY AT K=,I3,1X,                BNDRY    236
            *2HIS,F7.3)                                                          BNDRY    237
         103 FORMAT(1H ,23HMODIFICATION INSTITUTED /1H ,2HP=,E13.6,3X,           BNDRY    238
            *4HRHO=,E13.6,3X,                                                    BNDRY    239
            *2HU=,E13.6,3X,2HV=,E13.6,3X,2HW=,E13.6)                             BNDRY    240
260         RETURN                                                               BNDRY    241
            END                                                                  BNDRY    242
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SUBROUTINE PMYTURN 76/76 OPT=1 FTN 4.6+460 06/15/79 18.58.36 PAGE 1

```
      SUBROUTINE PMYTURN(M1,DNU,P2P1,NITS,GM)                           PMYTURN    2
C  A THOMAS R. SMOKES PRODUCTION.                                       PMYTURN    3
      REAL M1,M2,M                                                      PMYTURN    4
              XNU(M) = ATAN(SQRT(C*(M*M-1.)))/SQRTC-ATAN(SQRT(M*M-1.))  PMYTURN    5
              XNUP(M) = SQRT(M*M-1.)/(1.+(GM-1.)/2.*M*M)/M              PMYTURN    6
      C = (GM-1.)/(GM+1.)                                               PMYTURN    7
      SQRTC = SQRT(C)                                                   PMYTURN    8
      EPS = 0.1E-6                                                      PMYTURN    9
      XNU1 = XNU(M1)                                                    PMYTURN   10
      XNU2 = XNU1+DNU                                                   PMYTURN   11
      XM = M1                                                           PMYTURN   12
      DO 10 I=1,20                                                      PMYTURN   13
      NITS = I                                                          PMYTURN   14
      M2 = XM - (XNU(XM)-XNU2)/XNUP(XM)                                 PMYTURN   15
      IF (M2 .GT. 100.0) GO TO 20                                       PMYTURN   16
      IF (ABS((M2-XM)/XM) .LT. EPS) GO TO 30                            PMYTURN   17
   10 XM = M2                                                           PMYTURN   18
   20 CONTINUE                                                          PMYTURN   19
      M2 = 100.0                                                        PMYTURN   20
      WRITE(6,1)                                                        PMYTURN   21
    1 FORMAT(1H ,15X,*- - - - BODY TURN STOPPED AT M2 = 100.0 - - - -*) PMYTURN   22
   30 CONTINUE                                                          PMYTURN   23
      P2P1 = ((1.+(GM-1.)/2.*M1*M1)/(1.+(GM-1.)/2.*M2*M2))**(GM/(GM-1.)) PMYTURN   24
      RETURN                                                            PMYTURN   25
      END                                                               PMYTURN   26
```

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                                                                                PMYTURN   27
                                                                                PMYTURN   28
      SUBROUTINE BODENT(S)                                                      BODENT     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                                 CVARB      2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                                  CVARB      3
     *       FO(4,24,41)     , GO(4,24,41) , HO(4,24,41)                        CVARB      4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB      2
     *1) ,                                                                      PVARB      3
     *       ROB(41)     , ROBZ(41) , VINF(41) , WINF(41) ,                     PVARB      4
     *       ROBPH(41)   ,              RB(41)    , RBZ(41)   , RBPH(41) ,     PVARB      5
     *      DTDPH(24,41), BCT(41)   ,DTDZ(24,41),DTDR(41) , ACT(41)   ,        PVARB      6
     *       ICONST(50) , GAM(20)   , CONST(50) ,NREGON    , RS(41)    ,        PVARB      7
     *       RSZ(41)     , RSPHI(41), RST(41)    , RSZT(41), RSPHIT(41)         PVARB      8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24)  IDVARB      2
      COMMON/SVARB/T,Z      , PHI    , DT     , DZ     , DPHI   , ZINT   ,     SVARB      2
     *       ZEND   , PI     , ALPHA  , GAMMA  , SIGMA  , XMACH  , TAPE1  ,     SVARB      3
     *       TAPE2  , DISK1  , ALPH   , DISK2  , SIGM   , NPRNT  , DZDT   ,     SVARB      4
     *       DZDPH  , ZM     , TMWD   , TMLD   , TMW    , TML    , TTMW   ,     SVARB      5
     *       TTML   , RZ     , BZ     , NIPHI  , NIT    , KPHI   , NITER  ,     SVARB      6
     *       NPHI   , NPHI1  , NPHI2  , NPHI3  , NPHM1  , NPHM2  , NPHM3  ,     SVARB      7
     *       NT     , NT1    , NT2    , NT3    , PHIFD  , NCONE  , RADI   ,     SVARB      8
     *       PHIF   , METHOD, LAG    , NBC    , PINF   , RHOIN  , UINF   ,     SVARB      9
     *       QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                            SVARB     10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                           SVARB     11
      COMMON /L1800/NTEST(11),NCRTA,NOSXY(4),NCRTB(3),NSWCH(32),IN(32)   L1800      2
      COMMON/XYZ/NXYXY(3),X1(160),X2(160),X3(160),Y1(160),Y2(160),Y3(160 XYZ        2
     *),Z4(160),Z2(160),Z3(160)                                                 XYZ        3
      COMMON/CONRG/WRRO,WRRO,WRTO,WRCON,GASCON,WRHO,WPSC,WRAO,WFRTO,WRGX CONRG      2
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF    REALG      2
     *,V1INF,NITAVG,NWROUT                                                      REALG      3
      DIMENSION S(41),ST(41)                                                    BODENT    11
      I=NSWCH(2)                                                                BODENT    12
      DO 1 K=3,NPHI                                                             BODENT    13
      IF(NREAL.EQ.-1) GO TO 10                                                  BODENT    14
      S4K=P(4,K)/RHO(4,K)**GAMMA                                                BODENT    15
      GO TO 11                                                                  BODENT    16
   10 CONTINUE                                                                  BODENT    17
      CALL AGAS(P(4,K),RHO(4,K),WRAX,WRHX,WRTX,S4K,GASCON,WRGX,-1,4,2)          BODENT    18
   11 CONTINUE                                                                  BODENT    19
      GO TO(7,7,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8),I                       BODENT    20
    7 CONTINUE                                                                  BODENT    21
      R=TP(4)*(ROB(K)-RB(K))+RB(K)                                              BODENT    22
      A4K=DTDZ(4,K)+(V(4,K)*DTDR(K)  +W(4,K)*DTDPH(4,K)/R)/U(4,K)               BODENT    23
      R=TP(3)*(ROB(K)-RB(K))+RB(K)                                              BODENT    24
      RKP1=TP(3)*(ROB(K+1)-RB(K+1))+RB(K+1)                                     BODENT    25
      RKM1=TP(3)*(ROB(K-1)-RB(K-1))+RB(K-1)                                     BODENT    26
      BK=W(3,K)*DTIL(K)/(U(3,K)*R)                                              BODENT    27
      BKP1=W(3,K+1)*DTIL(K+1)/(U(3,K+1)*RKP1)                                   BODENT    28
      BKM1=W(3,K-1)*DTIL(K-1)/(U(3,K-1)*RKM1)                                   BODENT    29
      ST(K)=S(K)-DZDT*A4K*0.5*(S4K-S(K))-DZDPH*0.25*(BKP1+BKM1)                 BODENT    30
     * *(S(K+1)-S(K-1))+0.5*DZDPH**2*((BKP1+BK)*0.5*(S(K+1)-S(K))               BODENT    31
     * -(BK+BKM1)*0.5*(S(K)-S(K-1)))                                            BODENT    32
      GO TO 1                                                                   BODENT    33
    8 CONTINUE                                                                  BODENT    34
      PERCTS=I*0.0100000                                                        BODENT    35
      DELS=(S(K)-S4K)*PERCTS                                                    BODENT    36
      ST(K)=S(K)-DELS                                                           BODENT    37
```

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                1     CONTINUE                                                  BODENT     38
                      ST(2)=ST(4)                                               BODENT     39
60                    ST(NPHI1)=ST(NPHM1)                                       BODENT     40
                      GO TO(3,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4),I          BODENT     41
                3     DO 5 K=2,NPHI1                                            BODENT     42
                5     S(K)=ST(K)                                                BODENT     43
                      GO TO 6                                                   BODENT     44
65              4     CONTINUE                                                  BODENT     45
                      DO 2 K=3,NPHI                                             BODENT     46
                2     S(K)=0.25*(ST(K+1)+2.0*ST(K)+ST(K-1))                     BODENT     47
                      S(2)=S(4)                                                 BODENT     48
                      S(NPHI1)=S(NPHM1)                                         BODENT     49
70              6     CONTINUE                                                  BODENT     50
              100     FORMAT(1H ,21HSURFACE ENTROPY AT Z=,F10.5,15H WAS REDUCED BY,F10.5 BODENT     51
                     *)                                                         BODENT     52
                      RETURN                                                    BODENT     53
                      END                                                       BODENT     54
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```
FUNCTION COSH        76/76   OPT=1                    FTN 4.6+460        06/15/79  18.58.36        PAGE     1

1                FUNCTION COSH(A)                                          COSH        2
                 COSH=.5*(EXP(A)+EXP(-A))                                  COSH        3
                 RETURN                                                    COSH        4
                 END                                                       COSH        5
```

```
FUNCTION SINH        76/76   OPT=1                    FTN 4.6+460        06/15/79  18.58.36        PAGE     1

1                FUNCTION SINH(A)                                                  SINH        2
                 SINH=.5*(EXP(A)-EXP(-A))                                          SINH        3
                 RETURN                                                            SINH        4
                 END                                                               SINH        5
```

```
      BLOCK DATA                                                        DATA1     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         CVARB     2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                          CVARB     3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                  CVARB     4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB     2
     *1) ,                                                              PVARB     3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,               PVARB     4
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,    PVARB     5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,    PVARB     6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NRECON   , RS(41)   ,    PVARB     7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(4,     PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24) IDVARB     2
      COMMON/SVARB/T,Z      , PHI   , DT    , DZ    , DPHI  , ZINT  ,   SVARB     2
     *      ZEND  , PI    , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,    SVARB     3
     *      TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,    SVARB     4
     *      DZDPH , ZM    , TMWD  , TMLD  , TMW   , TML   , TTMW  ,    SVARB     5
     *      TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,    SVARB     6
     *      NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,    SVARB     7
     *      NT    , NT1   , NT2   , NT3   , PHIFD , NCONE , RADI  ,    SVARB     8
     *      PHIF  , METHOD, LAG   , NBC   , PINF  , RHOIN , UINF  ,    SVARB     9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANOM                     SVARB    10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB    11
      COMMON /L1800/NTEST(11),NCRTA,NOSXY(4),NCRTB(3),NSWCH(32),IN(32)  L1800     2
      COMMON/XYZ/NXYXY(3),X1(160),X2(160),X3(160),Y1(160),Y2(160),Y3(160 XYZ       2
     *),Z4(160),Z2(160),Z3(160)                                         XYZ       3
      COMMON/JOE/ZL1,CF1,CF2,ZLF,ZTRAN,DZTRAN                           JOE       2
      COMMON/EPSL/EPSL1,EPSL2                                           EPSL      2
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG     2
     *,V1INF,NITAVG,NWROUT                                              REALG     3
      COMMON/CONRG/WRHO,WRHO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAC,WRATO,WRGX CONRG     2
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTDSOS            ENTRO     2
      COMMON/CFS/NCFS                                                   CFS       2
      COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)                          CLUSTR    2
      COMMON /ACCNT/NRECA(51)                                           ACCNT     2
      COMMON/WRDK01/K,J,NPHIWR,NT2WR,WRMACH,PKKFUN,WRZ                  WRDK01    2
C     ICONST(4)=1  PRINTS GEOM DATA WHEN GEOM3 IS CALLED.               DATA1    18
C..   NSWCH(5) .NE.0 BOUNDRY DENSITY CONDITION DETERMINED FROM WEAK -   DATA1    19
C      SHOCK EXPANSION.                                                 DATA1    20
C..   NSWCH(5) .EQ.0 CONSTANT ENTROPY EXPRESSIONS USED.                DATA1    21
C..   NSWCH(2) .EQ.0 DETERMINE BODY SURFACE ENTROPY DISTRIBUTION FOR    DATA1    22
C      PURPOSE OF RELAXING ENTROPY PROFILE  (CALLS BODENT).             DATA1    23
C..   NSWCH(2) .EQ.0 CONSTANT ENTROPY.                                  DATA1    24
      DATA ICONST/0,2,0,1,46*0/                                         DATA1    25
      DATA NBC,METHOD/1,2/                                              DATA1    26
      DATA NPRNT/0/                                                     DATA1    27
      DATA NWRPRT,NWROUT/0,0/                                           DATA1    28
      DATA IN/32*0/                                                     DATA1    29
      DATA NTEST,NCRTA,NOSXY,NCRTB/11*0,0,4*0,3*0/                      DATA1    30
      DATA NXYXY,X1,X2,X3,Y1,Y2,Y3,Z4,Z2,Z3/3*0,160*0.,160*0.,          DATA1    31
     *160*0.,160*0.,160*0.,160*0.,160*0.,160*0.,160*0.,160*0./         DATA1    32
      DATA NSWCH/32*0/                                                  DATA1    33
      DATA DZDT/0./                                                     DATA1    34
      DATA NRECA/51*0/                                                  DATA1    35
      DATA WRMACH/0./                                                   DATA1    36
      END                                                               DATA1    37
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```
BLOCK DATA BLKDAT.    76/76   OPT=1                          FTN 4.6+460        06/15/79  18.58.36        PAGE     1

                BLOCK DATA                                                                DATA2       2
                LEVEL 2,ETEMP,EO,FO,GO,HO                                                 CVARB       2
                COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                                  CVARB       3
               *       FO(4,24,41)     , GO(4,24,41) , HO(4,24,41)                        CVARB       4
                COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB       2
               *1) ,                                                                      PVARB       3
               *       ROB(41)     , ROBZ(41) , VINF(41) , WINF(41) ,                     PVARB       4
               *       ROBPH(41)   ,            RB(41)    , RBZ(41)   , RBPH(41) ,        PVARB       5
               *      DTDPH(24,41), BCT(41)   ,DTDZ(24,41),DTDR(41) , ACT(41)   ,         PVARB       6
               *       ICONST(50) , GAM(20)   , CONST(50) ,NREGCN    , RS(41)    ,         PVARB       7
               *       RSZ(41)     , RSPHI(41), RST(41)    , RSZT(41), RSPHIT(41)         PVARB       8
                COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24)  IDVARB       2
                COMMON/SVARB/T,Z      , PHI    , DT     , DZ     , DPHI   , ZINT   ,       SVARB       2
               *       ZEND   , PI     , ALPHA  , GAMMA  , SIGMA  , XMACH  , TAPE1  ,       SVARB       3
               *       TAPE2  , DISK1  , ALPH   , DISK2  , SIGM   , NPRNT  , DZDT   ,       SVARB       4
               *       DZDPH  , ZM     , TMWD   , TMED   , TMW    , TML    , TTMW   ,       SVARB       5
               *       TTML   , RZ     , BZ     , NIPHI  , NIT    , KPHI   , NITER  ,       SVARB       6
               *       NPHI   , NPHI1  , NPHI2  , NPHI3  , NPHM1  , NPHM2  , NPHM3  ,       SVARB       7
               *       NT     , NT1    , NT2    , NT3    , PHIFD  , NCONE  , RADI   ,       SVARB       8
               *       PHIF   , METHOD, LAG    , NBC    , PINF   , RHOIN  , UINF   ,       SVARB       9
               *       QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                             SVARB      10
                INTEGER DISK1,DISK2,TAPE1,TAPE2                                           SVARB      11
                COMMON /L1BOO/NTEST(11),NCRTA,NOSXY(4),NCRTB(3),NSWCH(32),IN(32)  L1BOO       2
                COMMON/XYZ/NXYXY(3),X1(160),X2(160),X3(160),Y1(160),Y2(160),Y3(160 XYZ         2
               *),Z4(160),Z2(160),Z3(160)                                                 XYZ         3
                COMMON/JOE/ZL1,CF1,CF2,ZLF,ZTRAN,DZTRAN                                   JOE         2
                COMMON/EPSL/EPSL1,EPSL2                                                   EPSL        2
                COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG       2
               *,V1INF,NITAVG,NWROUT                                                      REALG       3
                COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAC,WRRTO,WRGX CONRG       2
                COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTDSOS             ENTRO       2
                COMMON/CFS/NCFS                                                           CFS         2
                COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)                                  CLUSTR      2
                END                                                                       DATA2      16
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      BLOCK DATA                                                        DATA3     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         CVARB     2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                          CVARB     3
     *       FO(4,24,41)     , GO(4,24,41) , HO(4,24,41)                CVARB     4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB     2
     *1) ,                                                              PVARB     3
     *       ROB(41)     , ROBZ(41) , VINF(41) , WINF(41) ,             PVARB     4
     *       ROBPH(41)   ,              RB(41)   , RBZ(41)  , RBPH(41) , PVARB     5
     *      DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,   PVARB     6
     *       ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,   PVARB     7
     *       RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)   PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24) IDVARB     2
      COMMON/SVARB/T,Z     , PHI   , DT    , DZ    , DPHI  , ZINT  ,    SVARB     2
     *       ZEND  , PI    , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,    SVARB     3
     *       TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,    SVARB     4
     *       DZDPH , ZM    , TMWO  , TMLO  , TMW   , TML   , TTMW  ,    SVARB     5
     *       TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,    SVARB     6
     *       NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,    SVARB     7
     *       NT    , NT1   , NT2   , NT3   , PHIFD , NCONE , RADI  ,    SVARB     8
     *       PHIF  , METHOD, LAG   , NBC   , PINF  , RHOIN , UINF  ,    SVARB     9
     *       QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                    SVARB     10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB     11
      COMMON /L1800/NTEST(11),NCRTA,NOSXY(4),NCRTB(3),NSWCH(12),INC(32) L1800     2
      COMMON/XYZ/NXYXY(3),X1(160),X2(160),X3(160),Y1(160),Y2(160),Y3(160 XYZ       2
     *),Z4(160),Z2(160),Z3(160)                                         XYZ       3
      COMMON/JOE/ZL1,CF1,CF2,ZLF,ZTRAN,DZTRAN                           JOE       2
      COMMON/EPSL/EPSL1,EPSL2                                           EPSL      2
      COMMON/REALG/NREAL,NUMPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG     2
     *,V1INF,NITAVG,NWROUT                                              REALG     3
      COMMON/CONFG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAC,WRRTO,WRGX CONFG     2
      COMMON/ENTRO/S(41),ZBS,ZFLO,ITPRTB,ITPRTF,NCASE,NTOSOS            ENTRO     2
      COMMON/CFS/NCFS                                                   CFS       2
      COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)                          CLUSTR    2
      DATA RHO,P,U,V,W/984*0.,984*0.,984*0.,984*0.,984*0./              DATA3     16
      DATA ROB,ROBZ,VINF,WINF,ROBPH,RB,RBZ,RBPH,BCT,DTDR,ACT,RS,        DATA3     17
     *RSZ,RSPHI,RST,RSZT,RSPHIT,ETA,PHIP,DTIL,DTILE/41*0.,41*0.,        DATA3     18
     *41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,     DATA3     19
     *41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,41*0.,     DATA3     20
     *41*0./                                                            DATA3     21
      DATA GAM/20*0./                                                   DATA3     22
      DATA CONST/50*0./                                                 DATA3     23
      DATA TP/24*0./                                                    DATA3     24
      DATA DTDPH,DTDZ/984*0.,984*0./                                    DATA3     25
      END                                                               DATA3     26
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SUBROUTINE DERIV      76/76   OPT=1                    FTN 4.6+460      06/15/79  18.58.36      PAGE    1

                SUBROUTINE DERIV                                                  DERIV      2
          C     SUBROUTINE TO COMPUTE DERIVATIVES                                 DERIV      3
                COMMON T(27)                                                      BLANK      2
                COMMON/COM1/MER,GAMMA                                             COM2       2
                COMMON /ERINT/IER                                                 ERINT      2
                COTAN(A)=COS(A)/SIN(A)                                            DERIV      7
                IER=0                                                             DERIV      8
                THET=T(2)                                                         DERIV      9
                A2=0.5*(GAMMA-1.0)*(1.0-T(4)**2-T(5)**2)                          DERIV     10
                QUAN=T(4)**2-A2                                                   DERIV     11
                IF(ABS(QUAN)-0.0000000) 1,1,2                                     DERIV     12
          1     IER=2                                                             DERIV     13
                MER=1                                                             DERIV     14
                RETURN                                                            DERIV     15
          2     T(6)=(A2*(T(5)+T(4)*COTAN(THET)))/(T(4)**2-A2)-T(5)               DERIV     16
                T(7)=T(4)                                                         DERIV     17
                RETURN                                                            DERIV     18
                END                                                               DERIV     19
```

```
      SUBROUTINE DIFFR                                                  DIFFR      2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         CVARB      2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                          CVARB      3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                 CVARB      4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB      2
     *1) ,                                                              PVARB      3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,              PVARB      4
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,   PVARB      5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTLR(41) , ACT(41)  ,   PVARB      6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,   PVARB      7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)   PVARB      8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24) IDVARB     2
      COMMON/SVARB/T,Z     , PHI    , DT    , DZ    , DPHI   , ZINT  ,  SVARB      2
     *      ZEND  , PI     , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,   SVARB      3
     *      TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,   SVARB      4
     *      DZDPH , ZM     , TMWD  , TMLD  , TMW   , TML   , TTMW  ,   SVARB      5
     *      TTML  , RZ     , BZ    , NIPHI , NIT   , KPHI  , NITER ,   SVARB      6
     *      NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,   SVARB      7
     *      NT    , NT1    , NT2   , NT3   , PHIFD , NCONE , RADI  ,   SVARB      8
     *      PHIF  , METHOD, LAG   , NBC   , PINF  , RHOIN , UINF  ,   SVARB      9
     *      QINF,DIAM,ALENGT,ZREF,ZSG,ZSHIFT,IFANUM                     SVARB     10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB     11
      COMMON /L1800/NTEST(11),NCRTA,NOSXY(4),NCRTB(3),NSWCH(32),IN(32)  L1800     2
      COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRRTO,WRGX CONRG     2
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG     2
     *,V1INF,NITAVG,NLROUT                                              REALG     3
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTDSOS            ENTRO     2
C..FORM CONSERVATIVE VARIABLES AT ALL POINTS                            DIFFR     11
      CALL IOCON(0)                                                     DIFFR     12
      DO 1 K=3,NPHI                                                     DIFFR     13
      DO 1 J=3,NT2                                                      DIFFR     14
      DO 1 N=1,4                                                        DIFFR     15
      IF(J.EQ.NT2) GO TO 2                                              DIFFR     16
C..PREDICTOR STEP AT BODY AND IN FIELD                                  DIFFR     17
      ETEMP(N,J,K)=EO(N,J,K)-(DZDT*(FO(N,J+1,K)-FO(N,J,K))              DIFFR     18
     *                  +DZDPH*(GO(N,J,K+1)-GO(N,J,K))+DZ*HO(N,J,K))    DIFFR     19
      GO TO 1                                                           DIFFR     20
2     CONTINUE                                                          DIFFR     21
C..PREDICTOR STEP AT SHOCK                                              DIFFR     22
      ETEMP(N,J,K)=EO(N,J,K)-(DZDT*(FO(N,J,K)-FO(N,J-1,K))              DIFFR     23
     *                  +DZDPH*(GO(N,J,K+1)-GO(N,J,K))+DZ*HO(N,J,K))    DIFFR     24
      GO TO 1                                                           DIFFR     25
1     CONTINUE                                                          DIFFR     26
      Z=Z+DZ                                                            DIFFR     27
C..DECODE CONSERVATIVE VARIABLES                                        DIFFR     28
      CALL IOCON(2)                                                     DIFFR     29
C..CALCULATE PREDICTED SHOCK VALUES                                     DIFFR     30
      CALL SHOCK(1)                                                     DIFFR     31
C..CALCULATES GEOMETRIC FACTORS BASED ON NEW BODY AND SHOCK GEOMETRY     DIFFR     32
      CALL GEOM1(1)                                                     DIFFR     33
C..APPLIES PLANE OF SYMMETRY BOUNDARY CONDITIONS                        DIFFR     34
      CALL BNDRY(2)                                                     DIFFR     35
C..FORM INTERMEDIATE CONSERVATIVE VARIABLES AT ALL POINTS               DIFFR     36
      CALL IOCON(1)                                                     DIFFR     37
      DO 3 KPHI=3,NPHI                                                  DIFFR     38
      DO 3 J=3,NT2                                                      DIFFR     39
      DO 3 N=1,4                                                        DIFFR     40
```

```
      K=KPHI                                                            DIFFR     41
C..DISSIPATION FUNCTION                                                 DIFFR     42
      DISS=0.0                                                          DIFFR     43
      IF(CONST(4) .NE. 0.0 .OR. CONST(5) .NE. 0.0)CALL DISSIP(N,J,K,DIS DIFFR     44
     1S)                                                                DIFFR     45
      IF(J.EQ.3) GO TO 9                                                DIFFR     46
      IF(J.EQ.NT2) GO TO 5                                              DIFFR     47
C..CORRECTOR IN FIELD                                                   DIFFR     48
      ETEMP(N,J,K)=0.5*(EO(N,J,K)+ETEMP(N,J,K)-(DZDT*(FO(N,J,K)         DIFFR     49
     *-FO(N,J-1,K))+DZDPH*(GO(N,J,K)-GO(N,J,K-1))+DZ*HO(N,J,K))+DISS)   DIFFR     50
      GO TO 3                                                           DIFFR     51
5     CONTINUE                                                          DIFFR     52
C..CORRECTOR AT SHOCK                                                   DIFFR     53
      ETEMP(N,J,K)=0.5*(ETEMP(N,J,K)+EO(N,J,K)-(DZDT*(FO(N,J,K)         DIFFR     54
     *-FO(N,J-1,K))+DZDPH*(GO(N,J,K)-GO(N,J,K-1))+DZ*HO(N,J,K))+DISS)   DIFFR     55
      GO TO 3                                                           DIFFR     56
9     CONTINUE                                                          DIFFR     57
C..CORRECTOR AT BODY                                                    DIFFR     58
      ETEMP(N,J,K)=0.5*(ETEMP(N,J,K)+EO(N,J,K)-(DZDT*(FO(N,4,K)-FC(N,3,K DIFFR     59
     *)                                                                 DIFFR     60
     *)+DZDPH*(GO(N,3,K)-GO(N,3,K-1))+DZ*HO(N,3,K))+DISS)               DIFFR     61
3     CONTINUE                                                          DIFFR     62
C..DECODE CONSERVATIVE VARIABLES                                        DIFFR     63
      CALL IOCON(2)                                                     DIFFR     64
C..CALCULATE CORRECTED SHOCK VALUES                                     DIFFR     65
      CALL SHOCK(2)                                                     DIFFR     66
C..CALCULATES GEOMETRIC FACTORS BASED ON OLD BODY AND NEW SHOCK GEOMETR DIFFR     67
      CALL GEOM1(2)                                                     DIFFR     68
C..RESETS BODY VARIABLES                                                DIFFR     69
      CALL BNDRY(1)                                                     DIFFR     70
C..APPLIES PLANE OF SYMMETRY BOUNDARY CONDITIONS                        DIFFR     71
      CALL BNDRY(2)                                                     DIFFR     72
      RETURN                                                            DIFFR     73
      END                                                               DIFFR     74
```

```
      SUBROUTINE DISSIP(N,J,K,DISS)                                     DISSIP     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         DISSIP     3
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                          DISSIP     4
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                 DISSIP     5
      COMMON/PVARB/RHO(24,41),P(24,41),U(24,41),V(24,41),W(24,41),      DISSIP     6
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,              DISSIP     7
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,   DISSIP     8
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,   DISSIP     9
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,   DISSIP    10
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIJ(41)   DISSIP    11
      COMMON/IOVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24)  DISSIP    12
      COMMON/SVARB/T,Z      , PHI    , DT    , DZ    , DPHI   , ZINT  ,  DISSIP    13
     *      ZERO   , PI     , ALPHA  , GAMMA , SIGMA , XMACH  , TAPE1 ,  DISSIP    14
     *      TAPE2  , DISK1  , ALPH   , DISK2 , SIGM  , NPRNT  , DZDT  ,  DISSIP    15
     *      DZDPH  , ZM     , TMWO   , TMLO  , TMW   , TML    , TTMW   ,  DISSIP    16
     *      TTML   , RZ     , BZ     , NIPHI , NIT   , KPHI   , NITER  ,  DISSIP    17
     *      NPHI   , NPHI1  , NPHI2  , NPHI3 , NPHM1 , NPHM2  , NPHM3  ,  DISSIP    18
     *      NT     , NT1    , NT2    , NT3   , PHIFD , NCONE  , RADI   ,  DISSIP    19
     *      PHIF   , METHOD , LAG    , NBC   , PINF  , RHOIN  , UINF   ,  DISSIP    20
     *      QINF                                                        DISSIP    21
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   DISSIP    22
C                                                                       DISSIP    23
C                                                                       DISSIP    24
C.....  CONST(4)<0 , LAX DAMPING                                        DISSIP    25
C.....  CONST(4)=0 , NO DAMPING                                        DISSIP    26
C.....  CONST(4)>0 , 4TH ORDER DAMPING                                  DISSIP    27
C                                                                       DISSIP    28
C                                                                       DISSIP    29
      IF(CONST(4))21,1,20                                               DISSIP    30
C...DISSIPATION TERM IN THE RADIAL DIRECTION                            DISSIP    31
 20   IF(J .GE. 5 .AND. J .LE. NT)GO TO 5                               DISSIP    32
      IF(J.LT.5) GO TO 7                                                DISSIP    33
      JD=NT                                                             DISSIP    34
      GO TO 6                                                           DISSIP    35
    7 JD=5                                                              DISSIP    36
      GO TO 6                                                           DISSIP    37
    5 JD=J                                                              DISSIP    38
    6 DISSR=-CONST(4)*0.01*(EO(N,JD+2,K)+EO(N,JD-2,K)-4.0*(EO(N,JD+1,K) DISSIP    39
     * +EO(N,JD-1,K))+6.0*EO(N,JD,K))                                   DISSIP    40
      GO TO 2                                                           DISSIP    41
 21   CONTINUE                                                          DISSIP    42
      IF(J .GE. 4 .AND. J .LE. NT1)GO TO 50                             DISSIP    43
      IF(J.LT. 4)GO TO 70                                               DISSIP    44
      JD=NT                                                             DISSIP    45
      GO TO 60                                                          DISSIP    46
 70   JD=4                                                              DISSIP    47
      GO TO 60                                                          DISSIP    48
 50   JD=J                                                              DISSIP    49
 60   DISSR=-CONST(4)*(.125*(EO(N,JD+1,K)+EO(N,JD-1,K))-0.25*EO(N,JD,K)) DISSIP    50
      GO TO 2                                                           DISSIP    51
    1 DISSR=0.0                                                         DISSIP    52
C                                                                       DISSIP    53
C                                                                       DISSIP    54
C.....  CONST(5)<0 , LAX DAMPING                                        DISSIP    55
C.....  CONST(5)=0 , NO DAMPING                                        DISSIP    56
C.....  CONST(5)>0 , 4TH ORDER DAMPING                                  DISSIP    57
C                                                                       DISSIP    58
```

```
      C                                                                 DISSIP     59
       2    IF(CONST(5))31,3,11                                        DISSIP     60
60     C...DISSIPATION TERM IN THE MERIDIANOL DIRECTION                 DISSIP     61
       31   CONTINUE                                                   DISSIP     62
            IF(K .GE. 4 .AND. K .LE. NPHM1)GO TO 80                    DISSIP     63
            IF(K .LT. 4)GO TO 100                                      DISSIP     64
            KD=NPHM1                                                   DISSIP     65
65          GO TO 90                                                   DISSIP     66
       100  KD=4                                                       DISSIP     67
            GO TO 90                                                   DISSIP     68
       80   KD=K                                                       DISSIP     69
       90   DISSP=-CONST(5)*(.125*(EO(N,J,KD+1)+EO(N,J,KD-1))-0.25*EO(N,J,KD)) DISSIP 70
70          GO TO 4                                                    DISSIP     71
         11 CONTINUE                                                   DISSIP     72
            IF(K.EQ.3) P(J,1)=P(J,5)                                   DISSIP     73
            IF(K.EQ.NPHI) P(J,NPHI2)=P(J,NPHM2)                        DISSIP     74
            PF1=ABS(P(J,K+2)-2.0*P(J,K+1)+P(J,K))/(P(J,K+2)+2.0*P(J,K+1)+P(J,K DISSIP 75
75         *))                                                         DISSIP     76
            PF2=ABS(P(J,K+1)-2.0*P(J,K)+P(J,K-1))/(P(J,K+1)+2.0*P(J,K)+P(J,K-1 DISSIP 77
           *))                                                         DISSIP     78
            PF3=ABS(P(J,K)-2.0*P(J,K-1)+P(J,K-2))/(P(J,K)+2.0*P(J,K-1)+P(J,K-2 DISSIP 79
           *))                                                         DISSIP     80
80          DISSP=0.5/DETA*((PF1+PF2)*(EO(N,J,K+1)-EO(N,J,K))-         DISSIP     81
           * (PF2+PF3)*(EO(N,J,K)-EO(N,J,K-1)))*CONST(5)               DISSIP     82
            GO TO 4                                                    DISSIP     83
          3 DISSP=0.0                                                  DISSIP     84
          4 DISS=DISSR+DISSP                                           DISSIP     85
85          RETURN                                                     DISSIP     86
            END                                                        DISSIP     87
```

```
      SUBROUTINE EIGEN(K4)                                                    EIGEN     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                               CVARB     2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                                CVARB     3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                       CVARB     4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4      PVARB     2
     *1) ,                                                                    PVARB     3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,                     PVARB     4
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,        PVARB     5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,        PVARB     6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,        PVARB     7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)        PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24)       IDVARB    2
      COMMON/SVARB/T,Z     , PHI   , DT    , DZ    , DPHI  , ZINT  ,          SVARB     2
     *      ZEND  , PI    , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,          SVARB     3
     *      TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,          SVARB     4
     *      DZDPH , ZM    , TMSO  , TMID  , TMW   , TML   , TTMW  ,          SVARB     5
     *      TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,          SVARB     6
     *      NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,          SVARB     7
     *      NT    , NT1   , NT2   , NT3   , PHIFD , NCONE , RADI  ,          SVARB     8
     *      PHIF  , METHOD, LAG   , NBC   , PINF  , RHOIN , UINF  ,          SVARB     9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANOM                          SVARB    10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                         SVARB    11
      COMMON/REALG/NREAL,NWRPRT,BODYN,BODYS,PSONIC,RSONIC,P1INF,R1INF         REALG     2
     *,V1INF,NITAVG,NSHOUT                                                    REALG     3
      COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRRTO,WRGX CONRG     2
      COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)                                CLUSTR    2
      DIMENSION SG12(24,41),SG34(24,41)                                       EIGEN    10
C.....K4=1 IMPLYS EIGENVALUES AND STEPSIZE                                    EIGEN    11
      IPRNT=ICONST(4)                                                         EIGEN    12
      SIG12M=0.0                                                              EIGEN    13
      SIG34M=0.0                                                              EIGEN    14
      DO 1 K=3,NPHI                                                           EIGEN    15
      DO 1 J=3,NT2                                                            EIGEN    16
      T=XI(J)                                                                 EIGEN    17
      R=T*(ROB(K)-RB(K))+RB(K)                                                EIGEN    18
      IF (NREAL.EQ.-1) GO TO 50                                               EIGEN    19
      C2=GAM(1)*P(J,K)/RHO(J,K)                                               EIGEN    20
      IF(C2) 17,17,18                                                         EIGEN    21
   50 CALL RGAS(P(J,K),RHO(J,K) ,C,WRH,WRT,WRS,GASCON,WRGX,-1,2,2)            EIGEN    22
      C2=C*C                                                                  EIGEN    23
      GO TO 51                                                                EIGEN    24
   17 CONTINUE                                                                EIGEN    25
      C2=-C2                                                                  EIGEN    26
      GO TO (23,24),IPRNT                                                     EIGEN    27
   24 CONTINUE                                                                EIGEN    28
      WRITE(6,102) J,K                                                        EIGEN    29
   23 CONTINUE                                                                EIGEN    30
   18 CONTINUE                                                                EIGEN    31
      C=SQRT(C2)                                                              EIGEN    32
   51 CONTINUE                                                                EIGEN    33
      BP=DTDPH(J,K)*(ROB(K)-RB(K))/R                                          EIGEN    34
      Q1=(V(J,K)+W(J,K)*BP)*U(J,K)                                            EIGEN    35
      GG01=U(J,K)**2*(1.0+BP**2)+(V(J,K)+W(J,K)*BP)**2-C2*(1.0+BP**2)         EIGEN    36
      IF(GG01) 19,19,20                                                       EIGEN    37
   19 CONTINUE                                                                EIGEN    38
      GG01=-GG01                                                              EIGEN    39
      WRITE(6,103) J,K                                                        EIGEN    40
```

```
      20    CONTINUE                                                  EIGEN   41
            Q2=C*SQRT(G001)                                           EIGEN   42
      60    Q3=U(J,K)**2-C2                                           EIGEN   43
            SIG81=(Q1+Q2)/Q3                                          EIGEN   44
            SIG82=(Q1-Q2)/Q3                                          EIGEN   45
            G002=U(J,K)**2+W(J,K)**2-C2                               EIGEN   46
            IF(G002) 21,21,22                                         EIGEN   47
      65    21    CONTINUE                                            EIGEN   48
            G002=-G002                                                EIGEN   49
            WRITE(6,104) J,K                                          EIGEN   50
            22    CONTINUE                                            EIGEN   51
            Q4= U(J,K)*W(J,K)                                         EIGEN   52
      70    Q5=C*SQRT(G002)                                           EIGEN   53
            SIG83=(Q4+Q5)/Q3/R*DTIL(K)                                EIGEN   54
            SIG84=(Q4-Q5)/Q3/R*DTIL(K)                                EIGEN   55
            C.....COMPUTE LOCAL T AND PHI EIGENVALUES                 EIGEN   56
            SIG1=ABS((DTDZ(J,K)+SIG81*DTDR(K))*TXI(J))                EIGEN   57
      75    SIG2=ABS((DTDZ(J,K)+SIG82*DTDR(K))*TXI(J))                EIGEN   58
            SIG12=AMAX1(SIG1,SIG2)                                    EIGEN   59
            SIG3=ABS(SIG83)                                           EIGEN   60
            SIG4=ABS(SIG84)                                           EIGEN   61
            SIG34=AMAX1(SIG3,SIG4)                                    EIGEN   62
      80    SG12(J,K)=SIG12                                           EIGEN   63
            SG34(J,K)=SIG34                                           EIGEN   64
            IF(SIG12.LE.SIG12M) GO TO 2                               EIGEN   65
            C.....LOCATE MAXIMUM U-V EIGENVALUE                       EIGEN   66
            JMAX1=J                                                   EIGEN   67
      85    KMAX1=K                                                   EIGEN   68
            SIG12M=SIG12                                              EIGEN   69
            ICONST(11)=JMAX1                                          EIGEN   70
            ICONST(12)=KMAX1                                          EIGEN   71
            2     CONTINUE                                            EIGEN   72
      90    IF(SIG34.LE.SIG34M) GO TO 3                               EIGEN   73
            C.....LOCATE MAXIMUM U-W EIGENVALUE                       EIGEN   74
            JMAX2=J                                                   EIGEN   75
            KMAX2=K                                                   EIGEN   76
            ICONST(13)=JMAX2                                          EIGEN   77
      95    ICONST(14)=KMAX2                                          EIGEN   78
            SIG34M=SIG34                                              EIGEN   79
            3     CONTINUE                                            EIGEN   80
            GO TO (13,14),IPRNT                                       EIGEN   81
            14    CONTINUE                                            EIGEN   82
     100    WRITE(6,100)Z,J,K,SIG81,SIG82,SIG1,SIG2,SIG12,SIG83,SIG84,SIG3,  EIGEN   83
           *SIG4,SIG34                                                EIGEN   84
            13    CONTINUE                                            EIGEN   85
            1     CONTINUE                                            EIGEN   86
            C.....COMPUTE STEPSIZE BASED ON MAXIMUM EIGENVALUE        EIGEN   87
     105    DZ12=DT*CONST(9)/SIG12M                                   EIGEN   88
            DZ34=DETA*CONST(9)/SIG34M                                 EIGEN   89
            IF(DZ12.GT.DZ34) GO TO 4                                  EIGEN   90
            DZDT=CONST(9)/SIG12M                                      EIGEN   91
            DZ=DZDT*DT                                                EIGEN   92
     110    DZDPH=DZ/DETA                                             EIGEN   93
            ICONST(13)=100*ICONST(13)                                 EIGEN   94
            ICONST(14)=100*ICONST(14)                                 EIGEN   95
            GO TO 6                                                   EIGEN   96
            4     CONTINUE                                            EIGEN   97
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      DZDPH=CONST(9)/SIG34M                                              EIGEN    98
      DZ=DZDPH*DETA                                                      EIGEN    99
      DZDT=DZ/DT                                                         EIGEN   100
      ICONST(11)=100*ICONST(11)                                          EIGEN   101
      ICONST(12)=100*ICONST(12)                                          EIGEN   102
    6 CONTINUE                                                           EIGEN   103
      GO TO (15,16),IPRNT                                                EIGEN   104
   16 CONTINUE                                                           EIGEN   105
      WRITE(6,101) JMAX1,KMAX1,SIG12M,JMAX2,KMAX2,SIG34M,DZ              EIGEN   106
   15 CONTINUE                                                           EIGEN   107
  100 FORMAT(1X,F6.4,2I3,10F11.5)                                        EIGEN   108
  101 FORMAT(2I5,E12.4,5X,2I5,2E12.4)                                    EIGEN   109
  102 FORMAT(1H ,42HERROR CHECK - SPEED OF SOUND IN EIGEN.  J=,I2,4H  K= EIGEN   110
     *,                                                                  EIGEN   111
     *I2)                                                                EIGEN   112
  103 FORMAT(1H ,39HERROR CHECK - SIGMA-BAR-1 IN EIGEN.  J=,I2,4H  K=,I2 EIGEN   113
     *)                                                                  EIGEN   114
  104 FORMAT(1H ,39HERROR CHECK - SIGMA-BAR-2 IN EIGEN.  J=,I2,4H  K=,I2 EIGEN   115
     *)                                                                  EIGEN   116
      RETURN                                                             EIGEN   117
      END                                                                EIGEN   118
```

```
      SUBROUTINE ESPACE(P,NX,MX,NC1,MC1,Q)                                ESPACE    2
C  ESPACE     NOVEMBER 1969    CONVERT FOR 360   VARY DIMENSION           ESPACE    3
CESPACE              LOMAX                                                ESPACE    4
C TC1432 UPDATED NOVEMBER 1969                                            ESPACE    5
C     SUBROUTINE ESPACE(P, NX, MX, NC1, MC1, Q)                           ESPACE    6
C     EXPLANATION OF ARGUMENTS                                            ESPACE    7
C          P - INPUT ARRAY, DEFINING DATA POINTS P(NX, MX)                ESPACE    8
C         NX - MAXIMUM VALUE OF FIRST SUBSCRIPT OF P, WHICH EQUALS THE    ESPACE    9
C              DIMENSION OF THE DATA PPINTS                               ESPACE   10
C         MX - MAXIMUM VALUE OF SECOND SUBSCRIPT OF P, WHICH EQUALS THE   ESPACE   11
C              NUMBER OF DATA POINTS                                      ESPACE   12
C        NC1 - VALUE OF NX TO DEFINE BESPACEDB VARIABLE  (NVAR)           ESPACE   13
C        MC1 - NUMBER OF POINTS DESIRED FOR INTERPOLATION                 ESPACE   14
C          Q - OUTPUT ARRAY Q(NX, MC1) OF INTERPOLATION RESULTS           ESPACE   15
C                                                                         ESPACE   16
      DIMENSION P(2),Q(2),F(11)                                           ESPACE   17
      INTEGER XTRUN                                                       ESPACE   18
C     XTRUN TRANSFORMS A PAIR OF SUBSCRIPTS INTO A ONE-DIM ARRAY          ESPACE   19
C     DIMENSION P(2),Q(2),F(11)                                           ESPACE   20
      XTRUN(K000FX,K001FX)=K000FX+NAX*(K001FX-1)                          ESPACE   21
      DATA DATE /0.0/                                                     ESPACE   22
      DATE=9999.9                                                         ESPACE   23
      NAX=NX                                                              ESPACE   24
      MAX=MX                                                              ESPACE   25
      K=2                                                                 ESPACE   26
      NC=NC1                                                              ESPACE   27
      MC=MC1                                                              ESPACE   28
      MCM1=MC-1                                                           ESPACE   29
      EMC=MC                                                              ESPACE   30
      J1=XTRUN(NC,MAX)                                                    ESPACE   31
      J2=XTRUN(NC,1)                                                      ESPACE   32
      DIFF=(P(J1)-P(J2))/(EMC-1.0)                                        ESPACE   33
      X=P(J2)                                                             ESPACE   34
      DO 12 N=1,NAX                                                       ESPACE   35
      J1=XTRUN(N,1)                                                       ESPACE   36
      J2=XTRUN(N,MC)                                                      ESPACE   37
      J3=XTRUN(N,MAX)                                                     ESPACE   38
      Q(J1)=P(J1)                                                         ESPACE   39
   12 Q(J2)=P(J3)                                                         ESPACE   40
      DO 1 M=2,MCM1                                                       ESPACE   41
      X=X+DIFF                                                            ESPACE   42
      IF(DIFF) 14,15,15                                                   ESPACE   43
   14 DO 16 J=K,MAX                                                       ESPACE   44
      J1=XTRUN(NC,J)                                                      ESPACE   45
      IF(P(J1)-X) 3,3,16                                                  ESPACE   46
   16 CONTINUE                                                            ESPACE   47
      GO TO 17                                                            ESPACE   48
   15 DO 2 J=K,MAX                                                        ESPACE   49
      J1=XTRUN(NC,J)                                                      ESPACE   50
      IF(X-P(J1)) 3,3,2                                                   ESPACE   51
    2 CONTINUE                                                            ESPACE   52
   17 WRITE (6,13)                                                        ESPACE   53
   13 FORMAT(12H0 ERR ESPACE)                                             ESPACE   54
      RETURN                                                              ESPACE   55
    3 K=J                                                                 ESPACE   56
      IF(J-2) 5,5,6                                                       ESPACE   57
    5 J=3                                                                 ESPACE   58
```

```
      6     KK=0                                                          ESPACE  59
            DO 8 NN=1,NAX                                                 ESPACE  60
60          IF(NN-NC) 9,8,9                                               ESPACE  61
      9     IF(KK) 10,11,10                                               ESPACE  62
     11     KK=7                                                          ESPACE  63
            DO 7 N=1,3                                                    ESPACE  64
            N1=J-3+N                                                      ESPACE  65
65          J1=XTRUN(NC,N1)                                               ESPACE  66
            J2=XTRUN(NN,N1)                                               ESPACE  67
            F(N)=P(J1)                                                    ESPACE  68
      7     F(N+3)=P(J2)                                                  ESPACE  69
            B1M2=F(1)-F(2)                                                ESPACE  70
70          B1M3=F(1)-F(3)                                                ESPACE  71
            B2M3=F(2)-F(3)                                                ESPACE  72
            BM1=X-F(1)                                                    ESPACE  73
            BM2=X-F(2)                                                    ESPACE  74
            BM3=X-F(3)                                                    ESPACE  75
75          F(9)=BM1*BM3/(B1M2*B1M3)                                      ESPACE  76
            F(10)=-BM1*BM3/(B1M2*B2M3)                                    ESPACE  77
            F(11)=BM1*BM2/(B1M3*B2M3)                                     ESPACE  78
            J1=XTRUN(NN,M)                                                ESPACE  79
            J2=XTRUN(NC,M)                                                ESPACE  80
80          Q(J2)=X                                                       ESPACE  81
            GO TO 19                                                      ESPACE  82
     10     DO 18 N=1,3                                                   ESPACE  83
            N1=J-3+N                                                      ESPACE  84
            J2=XTRUN(NN,N1)                                               ESPACE  85
85   18     F(N+3)=P(J2)                                                  ESPACE  86
     19     J1=XTRUN(NN,M)                                                ESPACE  87
            Q(J1)=F(4)*F(9)+F(5)*F(10)+F(6)*F(11)                         ESPACE  88
      8     CONTINUE                                                      ESPACE  89
      1     CONTINUE                                                      ESPACE  90
90          RETURN                                                        ESPACE  91
            END                                                           ESPACE  92
```

```
      SUBROUTINE GEOM1(K5)                                              GEOM1     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         CVARB     2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                          CVARB     3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                  CVARB     4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB     2
     *1) ,                                                              PVARB     3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,               PVARB     4
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,    PVARB     5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,    PVARB     6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,    PVARB     7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)    PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24) IDVARB    2
      COMMON/SVARB/T,Z     , PHI   , DT    , DZ    , DPHI  , ZINT  ,    SVARB     2
     *      ZEND  , PI    , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,    SVARB     3
     *      TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,    SVARB     4
     *      DZDPH , ZM    , TMWD  , TMLD  , TMW   , TML   , TTMW  ,    SVARB     5
     *      TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,    SVARB     6
     *      NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,    SVARB     7
     *      NT    , NT1   , NT2   , NT3   , PHIFD , NCONE , RADI  ,    SVARB     8
     *      PHIF  , METHOD, LAG   , NBC   , PINF  , RHOIN , UINF  ,    SVARB     9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                     SVARB    10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB    11
      COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)                          CLUSTR    2
      IPRNT=ICONST(4)                                                   GEOM1     8
      IF(K5.EQ.2) GO TO 12                                              GEOM1     9
      CALL GEOM3(1,PHIP,NPHI,Z,RB,RBZ,RBPH,IPRNT,NCONE)                 GEOM1    10
   12 CONTINUE                                                          GEOM1    11
      CALL GEOM2(K5)                                                    GEOM1    12
      IF(NPRNT) 3,3,4                                                   GEOM1    13
    4 CONTINUE                                                          GEOM1    14
      GO TO (3,10),IPRNT                                                GEOM1    15
   10 CONTINUE                                                          GEOM1    16
      WRITE(6,103)                                                      GEOM1    17
      WRITE(6,100) Z                                                    GEOM1    18
    3 CONTINUE                                                          GEOM1    19
      DO 1 J=3,NT2                                                      GEOM1    20
      T=XI(J)                                                           GEOM1    21
      IF(NPRNT) 5,5,6                                                   GEOM1    22
    6 CONTINUE                                                          GEOM1    23
      GO TO (5,11),IPRNT                                                GEOM1    24
   11 CONTINUE                                                          GEOM1    25
      WRITE(6,101) T                                                    GEOM1    26
    5 CONTINUE                                                          GEOM1    27
      DO 2 K=2,NPHI1                                                    GEOM1    28
      PHI=PHIP(K)                                                       GEOM1    29
      A=-RBZ(K)-T*(ROBZ(K)-RBZ(K))                                      GEOM1    30
      B=-RBPH(K)-T*(ROBPH(K)-RBPH(K))                                   GEOM1    31
      C=ROB(K)-RB(K)                                                    GEOM1    32
      D=-(ROBZ(K)-RBZ(K))                                               GEOM1    33
      E=-(ROBPH(K)-RBPH(K))                                             GEOM1    34
      DTDZ(J,K)=A/C                                                     GEOM1    35
      DTDPH(J,K)=B/C                                                    GEOM1    36
      DTDR(K)=1.0/C                                                     GEOM1    37
      ACT(K)=D/C                                                        GEOM1    38
      BCT(K)=E/C                                                        GEOM1    39
      R=C*T+RB(K)                                                       GEOM1    40
      X=R*SIN(PHI)                                                      GEOM1    41
```

```
                Y=-R*COS(PHI)                                                    GEOM1   42
                IF(NPRNT) 7,7,8                                                  GEOM1   43
60          8   CONTINUE                                                         GEOM1   44
                GO TO (7,9),IPRNT                                                GEOM1   45
            9   CONTINUE                                                         GEOM1   46
                PHID=PHI*RADI                                                    GEOM1   47
                WRITE(6,102) PHID,R,X,Y,DTDZ(J,K),DTDPM(J,K),DTDR(K),ACT(K),BCT(K) GEOM1 48
65          7   CONTINUE                                                         GEOM1   49
            2   CONTINUE                                                         GEOM1   50
            1   CONTINUE                                                         GEOM1   51
          100   FORMAT(1HO,4X,4HZ = ,F8.5)                                       GEOM1   52
          101   FORMAT(1HO,4X,4HT = ,F8.5)                                       GEOM1   53
70        102   FORMAT(1HO,7X,6HPHI = ,F10.5,3X,4HR = ,F8.5,3X,4HX = ,F8.5,      GEOM1   54
               * 3X,4HY = ,F8.5/8X,8HDT/DZ = ,F10.5,3X,10HDT/DPHI = ,F8.5,      GEOM1   55
               * 3X,8HDT/DR = ,F10.5,3X,8H(A/C)T = ,F10.5,3X,8H(B/C)T = ,F8.5)  GEOM1   56
          103   FORMAT(1H1,41X,25HMESH GEOMETRY DESCRIPTION //)                  GEOM1   57
                RETURN                                                           GEOM1   58
75              END                                                              GEOM1   59
```

```
      SUBROUTINE GEOM2(K3)                                              GEOM2     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         CVARB     2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                          CVARB     3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                  CVARB     4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB     2
     *1) ,                                                              PVARB     3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,               PVARB     4
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,    PVARB     5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,    PVARB     6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,    PVARB     7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)    PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24) IDVARB    2
      COMMON/SVARB/T,Z      , PHI    , DT     , DZ     , DPHI   , ZINT  ,  SVARB     2
     *      ZEND  , PI     , ALPHA  , GAMMA  , SIGMA  , XMACH  , TAPE1 ,  SVARB     3
     *      TAPE2 , DISK1  , ALPH   , DISK2  , SIGM   , NPRNT  , DZDT  ,  SVARB     4
     *      DZDPH , ZM     , TMWD   , TMLD   , TMW    , TML    , TTMW  ,  SVARB     5
     *      TTML  , RZ     , BZ     , NIPHI  , NIT    , KPHI   , NITER ,  SVARB     6
     *      NPHI  , NPHI1  , NPHI2  , NPHI3  , NPHM1  , NPHM2  , NPHM3 ,  SVARB     7
     *      NT    , NT1    , NT2    , NT3    , PHIFD  , NCONE  , RADI  ,  SVARB     8
     *      PHIF  , METHOD, LAG    , NBC    , PINF   , RHOIN  , UINF  ,  SVARB     9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                     SVARB    10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB    11
      IF(NPRNT) 10,10,11                                                GEOM2     7
   11 WRITE(6,101)                                                      GEOM2     8
   10 CONTINUE                                                          GEOM2     9
      DO 1 K=1,NPHI2                                                    GEOM2    10
      PHI=PHIP(K)                                                       GEOM2    11
      GO TO (3,2),K3                                                    GEOM2    12
    2 CONTINUE                                                          GEOM2    13
      ROB(K)=RS(K)                                                      GEOM2    14
      ROBZ(K)=RSZ(K)                                                    GEOM2    15
      ROBPH(K)=RSPHI(K)                                                 GEOM2    16
      GO TO 4                                                           GEOM2    17
    3 CONTINUE                                                          GEOM2    18
      ROB(K)=RST(K)                                                     GEOM2    19
      ROBZ(K)=RSZT(K)                                                   GEOM2    20
      ROBPH(K)=RSPHIT(K)                                                GEOM2    21
    4 CONTINUE                                                          GEOM2    22
      IF(NPRNT) 14,14,15                                                GEOM2    23
   15 CONTINUE                                                          GEOM2    24
      IF(K3.EQ.1) GO TO 14                                              GEOM2    25
      PH=PHI*RADI                                                       GEOM2    26
      X=ROB(K)*SIN(PHI)                                                 GEOM2    27
      Y=-ROB(K)*COS(PHI)                                                GEOM2    28
      WRITE(6,100) Z,PH,X,Y,ROB(K),ROBPH(K),ROBZ(K)                     GEOM2    29
   14 CONTINUE                                                          GEOM2    30
    1 CONTINUE                                                          GEOM2    31
  100 FORMAT(1H ,1X,4HZ = ,F8.5,3X,6HPHI = ,F10.5,3X,4HX = ,F8.5,3X,4HY GEOM2    32
     *=                                                                 GEOM2    33
     * ,F8.5,3X,5HRS = ,F8.5,3X,10H DRS/DPHI=,F8.5,3X,9H DRS/DZ= ,F8.5) GEOM2    34
  101 FORMAT(1H1,60X,14HSHOCK GEOMETRY //)                              GEOM2    35
      RETURN                                                            GEOM2    36
      END                                                               GEOM2    37
```

```
      C     GEOM3                                                          GEOM3    2
            SUBROUTINE GEOM3(K7,PHIP,NPHI,Z,RB,RBZ,RBPH,IPRNT,NCONE)       GEOM3    3
            COMMON/JOE/ZL1,CF1,CF2,ZLF,ZTRAN,DZTRAN                        JOE      2
            COMMON /ACCNT/NPECA(51)                                        ACCNT    2
            COMMON /BREAKS/ JBREAK(10),PHIBRK(10),RBREAK(10),ZSEG(7),LONG,BKX  GEOM3  6
           1 ,KIND(7),RSEG(7),DSEG(7),ASEG(7),NSEG,KSEG,KPOSS,DZTINY       GEOM3    7
           2 ,NELL,LQZ(14),ZTABLE(14),YTOP(14),XSIDE(14),YBOT(14)          GEOM3    8
            DIMENSION RB(41),RBPH(41),RBZ(41),PHIP(41)                     GEOM3    9
            DIMENSION DRATZ(14)                                            GEOM3   10
            DIMENSION BOP(15,14),LQPH(15),PHIOP(15),DRATPH(15),DORDZ(15)   GEOM3   11
            DIMENSION ZCENT(7),RCENT(7),RADIUS(7)                          GEOM3   12
            DATA DEGPRD/57.295778/                                         GEOM3   13
      C  CODING FOR SIMPLE CIRCULAR CONES WITH CUTS.                       GEOM3   14
      C  NSEG=0 OF SEGMENTS, ZSEG,RSEG = Z AND CONE R AT START OF SEGMENT. GEOM3   15
      C  DSEG,ASEG = NORMAL DISTANCE FROM CENTER TO CUT AND ANGLE THEREOF. GEOM3   16
      C  KIND = KIND OF CONTOUR.                                           GEOM3   17
      C    0 = CIRCULAR CROSS-SECTION AND LONGITUDINAL AXISYMMETRIC CIRCLE ARC GEOM3 18
      C    1 = CIRCULAR CROSS-SECTION AND LONGITUDINAL CONE.               GEOM3   19
      C    2 = CIRCULAR CROSS-SECTION WITH CHORD CUT, LONGITUDINALLY FLAT. GEOM3   20
      C    3 = ELLIPTIC CROSS-SECTION ON BOTTOM, POSSIBLY ON TOP.          GEOM3   21
      C    4 = ELLIPTIC CROSS-SECTIONS WITH DELTA R DEVIATIONS ADDED.      GEOM3   22
      C  JOE DATA ARE USED IN DECODE AND INITA.                            GEOM3   23
      C  REGION 1 READS IN DATA ONCE. REGION 2 FINDS DATA AT Z,PHI REPEATEDLY. GEOM3 24
            IF (K7.NE.0) GO TO 2                                           GEOM3   25
          1 CONTINUE                                                       GEOM3   26
            WRITE(6,999)                                                   LINE     2
        999 FORMAT(1H1)                                                    LINE     3
            READ (5,3) NSEG,(KIND(N), N=1,7)                               GEOM3   27
          3 FORMAT (8I5)                                                   GEOM3   28
            READ (5,4) (ZSEG(N), N=1,NSEG)                                 GEOM3   29
            READ (5,4) (RSEG(N), N=1,NSEG)                                 GEOM3   30
            READ (5,4) (DSEG(N), N=1,NSEG)                                 GEOM3   31
            READ (5,4) (ASEG(N), N=1,NSEG)                                 GEOM3   32
          4 FORMAT (7F10.5)                                                GEOM3   33
            ZL1=ZSEG(1)                                                    GEOM3   34
            ZLF=ZSEG(NSEG)                                                 GEOM3   35
            CF1=RSEG(1)                                                    GEOM3   36
            CF2=(RSEG(2)-RSEG(1))/(ZSEG(2)-ZSEG(1))                        GEOM3   37
            WRITE (6,5) NSEG,KIND,ZSEG,RSEG,DSEG,ASEG                      GEOM3   38
          5 FORMAT (1X,NSEG,KIND=,8I5/1X,ZSEG=,7F10.5/1X,RSEG=,7F10.5/     GEOM3   39
           1                              1X,DSEG=,7F10.5/1X,ASEG=,7F10.5/) GEOM3  40
      C  LOCATE CIRCULAR ARC CENTERS, IF ANY.                              GEOM3   41
      C  SPECIFY ELLIPTIC CONTOURS,IF ANY.                                 GEOM3   42
            DO 7 N=1,NSEG                                                  GEOM3   43
            IF (N.EQ.NSEG) GO TO 7                                         GEOM3   44
            IF (KIND(N).NE.3.AND.KIND(N).NE.4) GO TO 107                   GEOM3   45
      C  KIND 3 AND 4  CODING OMITTED.                                     GEOM3   46
          107 CONTINUE                                                     GEOM3   47
            IF (KIND(N).NE.0) GO TO 7                                      GEOM3   48
            READ (5,4) ZCENT(N),RCENT(N),RADIUS(N)                         GEOM3   49
            WRITE (6,6) N,ZCENT(N),RCENT(N),RADIUS(N)                      GEOM3   50
          6 FORMAT (1X,SEGMENT=,I3,=  ZCENT,RCENT,RADIUS=,_  ,5)           GEOM3   51
          7 CONTINUE                                                       GEOM3   52
            DO 110 N=1,10                                                  GEOM3   53
            PHIBRK(N)=0.0                                                  GEOM3   54
            RBREAK(N)=0.0                                                  GEOM3   55
          110 CONTINUE                                                     GEOM3   56
```

```
      RETURN                                                            GEOM3    57
    2 CONTINUE                                                          GEOM3    58
C  COMPUTE SHOCK RADII AND DERIVATIVES.                                 GEOM3    59
C  FIRST, LOCATE WHICH SEGMENT Z IS IN.                                 GEOM3    60
C  NOTE THAT LAST SEGMENT IS SIMPLY A CONTINUATION OF THE SECOND-LAST.  GEOM3    61
      NSEGM1=NSEG-1                                                     GEOM3    62
      NSEGP1=NSEG+1                                                     GEOM3    63
      DO 10 N=1,NSEGM1                                                  GEOM3    64
      KSEG=N                                                            GEOM3    65
      IF (Z.GE.ZSEG(N).AND.Z.LT.ZSEG(N+1)) GO TO 11                     GEOM3    66
   10 CONTINUE                                                          GEOM3    67
   11 CONTINUE                                                          GEOM3    68
      LSEG=KSEG+1                                                       GEOM3    69
C  COMPUTE LOCAL CROSS-SECTION GEOMETRIC CONSTANTS.                     GEOM3    70
      ZF=(Z-ZSEG(KSEG))/(ZSEG(LSEG)-ZSEG(KSEG))                         GEOM3    71
      R=RSEG(KSEG)+ZF*(RSEG(LSEG)-RSEG(KSEG))                           GEOM3    72
      IF (KIND(KSEG).NE.3.AND.KIND(KSEG).NE.4) GO TO 130                GEOM3    73
C  KIND 3 AND 4  CODING OMITTED.                                        GEOM3    74
  130 CONTINUE                                                          GEOM3    75
      IF (KIND(KSEG).NE.0) GO TO 14                                     GEOM3    76
C  FIND R ON CIRCULAR ARC FROM (R-RC)SQ = RADSQ - (Z-ZC)SQ              GEOM3    77
      RMRCSQ=RADIUS(KSEG)**2-(Z-ZCENT(KSEG))**2                         GEOM3    78
      R=SQRT(RMRCSQ)+RCENT(KSEG)                                        GEOM3    79
   14 CONTINUE                                                          GEOM3    80
      D=DSEG(KSEG)+ZF*(DSEG(LSEG)-DSEG(KSEG))                           GEOM3    81
      A=ASEG(KSEG)+ZF*(ASEG(LSEG)-ASEG(KSEG))                           GEOM3    82
      IF (KIND(KSEG).NE.2) GO TO 34                                     GEOM3    83
      DOR=D/R                                                           GEOM3    84
      DOR =AMIN1(DOR,1.0)                                               GEOM3    85
      DELPHI=ACOS(DOR)                                                  GEOM3    86
      PHINOM=A/DEGRAD                                                   GEOM3    87
      PHIMIN=PHINOM-DELPHI                                              GEOM3    88
      PHIMAX=PHINOM+DELPHI                                              GEOM3    89
      WFLAT=R*SIN(DELPHI)                                               GEOM3    90
      WRITE (6,16) WFLAT                                                GEOM3    91
   16 FORMAT (1X*WFLAT =*,F12.6)                                        GEOM3    92
      PHIBRK(1)=PHIMAX                                                  GEOM3    93
      RBREAK(1)=R                                                       GEOM3    94
      IF (PHIMIN.LE.0.0) GO TO 142                                      GEOM3    95
      PHIBRK(1)=PHIMIN                                                  GEOM3    96
      PHIBRK(2)=PHIMAX                                                  GEOM3    97
      RBREAK(1)=RBREAK(2)=R                                             GEOM3    98
  142 CONTINUE                                                          GEOM3    99
C..DETERMINE RB, DRB/DPHI, AND DRB/DZ FOR EACH MERIDIAN                 GEOM3   100
   34 CONTINUE                                                          GEOM3   101
      DO 8 K=3,NPHI                                                     GEOM3   102
      PHI=PHIP(K)                                                       GEOM3   103
      SP=SIN(PHI)                                                       GEOM3   104
      CP=COS(PHI)                                                       GEOM3   105
      S2P=SP*SP                                                         GEOM3   106
      C2P=CP*CP                                                         GEOM3   107
      IF (KIND(KSEG).NE.2) GO TO 15                                     GEOM3   108
C  TEST WHETHER PHI RAY CROSSES FLAT OR CIRCLE.                         GEOM3   109
      IF (PHI.LT.PHIMIN.OR.PHI.GT.PHIMAX) GO TO 15                      GEOM3   110
C  CODING FOR FLAT CUT CENTERED AT ANGLE PHINOM.                        GEOM3   111
C  CURRENT CODING IS FOR FLAT CUT PARALLEL TO AXIS OF SYMMETRY.         GEOM3   112
      RBZ(K)=0.0                                                        GEOM3   113
```

```
                  DPHI=PHI-PHINOM                                          GEOM3  114
                  COSDFI=COS(DPHI)                                         GEOM3  116
                  SINDFI=SIN(DPHI)                                         GEOM3  116
                  COSDSQ=COSDFI**2                                         GEOM3  117
                  RB(K)=D/COSDFI                                           GEOM3  118
                  DEND = DSEG(LSEG)                                        GEOM3  119
                  RBL = DEND/COSDFI                                        GEOM3  120
                  RBZ(K) = (RBL-RB(K))/(ZSEG(LSEG)-Z)                      GEOM3  121
                  IF (ABS(DPHI).LT.0.00001) RBPH(K)=0.0                    GEOM3  122
                  IF (ABS(DPHI).LT.0.000001) GO TO 20                      GEOM3  123
            C  SECANT(DPHI) DIFFERENTIATED * D.                            GEOM3  124
                  RBPH(K)=D*SINDFI/COSDSQ                                  GEOM3  125
                  GO TO 20                                                 GEOM3  126
               15 CONTINUE                                                 GEOM3  127
            C  FOR POINT ON A CIRCLE                                       GEOM3  128
                  RB(K)=R                                                  GEOM3  129
                  RBZ(K)=(RSEG(LSEG)-RSEG(KSEG))/(ZSEG(LSEG)-ZSEG(KSEG))   GEOM3  130
                  IF (KIND(KSEG).EQ.0) RBZ(K)=(ZCENT(KSEG)-Z)/(R-RCENT(KSEG))  GEOM3  131
                  RBPH(K)=0.0                                              GEOM3  132
               20 CONTINUE                                                 GEOM3  133
                  IF (KIND(KSEG).LT.2) GO TO 8                             GEOM3  134
                  IF (PHI.LT.PHIMIN.OR.PHI.GT.PHIMAX) GO TO 8              GEOM3  135
                  XFLAT=RB(K)*SP                                           GEOM3  136
                  YFLAT=-RB(K)*CP                                          GEOM3  137
                  WRITE (6,12) Z,K,PHI,RB(K),RBZ(K),RBPH(K),XFLAT,YFLAT    GEOM3  138
               12 FORMAT (1X*  Z,K,PHI,RB(K),RBZ(K),RBPH(K)*,F10.5,I5,6F12.5)  GEOM3  139
                8 CONTINUE                                                 GEOM3  140
               80 CONTINUE                                                 GEOM3  141
                  DO 36 K=1,2                                              GEOM3  142
                  M=6-K                                                    GEOM3  143
                  I=NPHI+K                                                 GEOM3  144
                  N=NPHI-K                                                 GEOM3  145
                  RB(K)=RB(M)                                              GEOM3  146
                  RB(I)=RB(N)                                              GEOM3  147
                  RBZ(K)=RBZ(M)                                            GEOM3  148
                  RBZ(I)=RBZ(N)                                            GEOM3  149
                  RBPH(K)=-RBPH(M)                                         GEOM3  150
                  RBPH(I)=-RBPH(N)                                         GEOM3  151
               36 CONTINUE                                                 GEOM3  152
                  RETURN                                                   GEOM3  153
                  END                                                      GEOM3  154
```

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SUBROUTINE HMACH      76/76   OPT=1                    FTN 4.6+460        06/15/79  18.58.36        PAGE     1

                SUBROUTINE HMACH(US,THETAS,GAMMA,HMAC,THETAW,MER)                HMACH      2
          C     SUBROUTINE TO COMPUTE MACH NUMBER AND SHOCK ANGLE GIVEN CONE     HMACH      3
          C     SEMIVERTEX ANGLE AND SURFACE VELOCITY                            HMACH      4
                COMMON T(27)                                                     BLANK      2
                COMMON /COM1/MER1,GAMMA1                                         COM1       2
                COMMON /ERINT/IER                                                ERINT      2
                EXTERNAL DERIV                                                   HMACH      8
                GAMMA1=GAMMA                                                     HMACH      9
                MER=0                                                            HMACH     10
                T(2)=THETAS                                                      HMACH     11
                T(3)=0.002                                                       HMACH     12
                T(4)=0.0                                                         HMACH     13
                T(5)=US                                                          HMACH     14
                T2=T(2)                                                          HMACH     15
                T4=T(4)                                                          HMACH     16
                T5=T(5)                                                          HMACH     17
                Q1=-1.0                                                          HMACH     18
                CALL INTS(T,2,0,5.0E-8,0.0,0.0,0.10,0.0,0.0,DERIV)               HMACH     19
                IF (IER.NE.0) GO TO 998                                          HMACH     20
          100   CALL INTM(T,2,0,5.0E-8,0.0,0.0,0.10,0.0,0.0,DERIV)               HMACH     21
                IF (IER.NE.0) GO TO 998                                          HMACH     22
                IF(ABS(T(4))-1.0) 202,101,101                                    HMACH     23
          202   IF(ABS(T(5))-1.0) 302,101,101                                    HMACH     24
          302   IF(T(2)-1.68) 102,101,101                                       HMACH     25
          101   MER=2                                                            HMACH     26
                GO TO 999                                                        HMACH     27
          102   IF(ABS(T(4))-2.0E-7) 120,120,103                                 HMACH     28
          103   IF(ABS(T(5))-2.0E-7) 120,120,104                                 HMACH     29
          104   Q=TAN(T(2))+((1.0-T(5)**2)*(GAMMA-1.0))/(T(5)*T(4)*(GAMMA+1.0))  HMACH     30
                IF(ABS(Q)-2.E-7) 400,400,105                                     HMACH     31
          105   IF(Q) 120,400,109                                                HMACH     32
          109   SL=(T(2)-T2)/(Q-Q1)                                              HMACH     33
          110   H=-SL*Q                                                          HMACH     34
                IF(ABS(1.0*H/T(2))-2.0E-6) 400,400,112                           HMACH     35
          112   T(3)=H                                                           HMACH     36
                CALL INTS(T,2,2,0.0,0.0,0.0,0.0,0.0,0.0,DERIV)                   HMACH     37
                IF (IER.NE.0) GO TO 998                                          HMACH     38
                CALL INTM(T,2,2,0.0,0.0,0.0,0.0,0.0,0.0,DERIV)                   HMACH     39
                IF (IER.NE.0) GO TO 998                                          HMACH     40
                Q=TAN(T(2))+((1.0-T(5)**2)*(GAMMA-1.0))/(T(5)*T(4)*(GAMMA+1.0))  HMACH     41
                IF(ABS(Q)-2.E-7) 400,400,110                                     HMACH     42
          120   T2=T(2)                                                          HMACH     43
                T4=T(4)                                                          HMACH     44
                T5=T(5)                                                          HMACH     45
                Q1=Q                                                             HMACH     46
                GO TO 100                                                        HMACH     47
          400   HMAC=SQRT((2.0*T(5)**2)/((GAMMA-1.0)*((COS(T(2)))**2-T(5)**2)))  HMACH     48
                THETAW=T(2)                                                      HMACH     49
                GO TO 999                                                        HMACH     50
          998   MER=MER1                                                         HMACH     51
          999   RETURN                                                           HMACH     52
                END                                                              HMACH     53
```

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      SUBROUTINE INITA                                                  INITA     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         CVARB     2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                          CVARB     3
     *     FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                   CVARB     4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB    2
     *1) ,                                                              PVARB     3
     *     ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,                PVARB     4
     *     ROBPH(41)  ,             RH(41)   , RBZ(41)  , RBPH(41) ,    PVARB     5
     *    DTOPH(24,41), BCT(41)  ,DTOZ(24,41),DTOP(41) , ACT(41)  ,    PVARB     6
     *     ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,     PVARB     7
     *     RSZ(41)    , RSPHI(41), R1(41)    , RSZI(41), RSPHIT(41)    PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DELTA,TP(24) IDVARB    2
      COMMON/SVARB/T,Z     , PHI    , DT     , DZ     , DPHI   , ZINT   ,SVARB     2
     *     ZERO   , PI     , ALPHA  , GAMMA  , SIGMA  , XMACH  , TAPE1 ,SVARB     3
     *     TAPE2  , DISK1  , ALPH   , DISK2  , SIGM   , NPRNT , DZDT  ,SVARB     4
     *     DZDPH  , ZM     , TMLO   , TMLD   , TMW    , TM     , TTMW  ,SVARB     5
     *     TTML   , RZ     , BZ     , NIPHI  , NIT    , KPHI   , NITER ,SVARB     6
     *     NPHI   , NPHI1  , NPHI2  , NPHI3  , NPHM1  , NPHM2  , NPHM3 ,SVARB     7
     *     NT     , NT1    , NT2    , NT3    , PHIFD  , NPONE  , RADI  ,SVARB     8
     *     PHIF   , METHOD , LAG    , NGO    , PINF   , RHOIN  , UINF  ,SVARB     9
     *     QINF,DIAM,RELNGT,ZREF,ZOG,ZSHIFT,IFRROM                       SVARB    10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB    11
      COMMON/JOE/ZL1,CF1,CF2,ZLF,ZIRAN,DZTRAN                           JOE      2
      COMMON/REALG/NREAL,NUMPRT,BODTH,BODYS,PSONIC,RSONIC,PIINF,RIINF   REALG    2
     *,VIINF,NITMAX,NPOUT                                               REALG    3
      COMMON/CONRG/WPO,WRHO,WRTO,WPCON,WASCON,WRHO,WRSO,WRAO,WRRTO,WRGX  CONRG    2
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTOSOS            ENTRO    2
      COMMON/CLUSTR/RJ,X1(24),TXI(24),TXIT(24)                          CLUSTR   2
      DIMENSION YA(24),UA(24),VA(24),RHOA(24),PA(24),TMA(24)            INITA    12
      RADI=57.2958                                                      INITA    13
      PI=3.14159265                                                     INITA    14
      IF(ICONST(48).EQ.1) ZINT=Z                                        INITA    15
      IF(ICONST(48).NE.1) Z=ZINT                                        INITA    16
      ZTINT=ZINT                                                        INITA    17
      ALPH=ALPHA/RADI                                                   INITA    18
      SIGM=SIGMA/RADI                                                   INITA    19
      PHIF=180.0/RADI                                                   INITA    20
      NPHI=NIPHI+3                                                      INITA    21
      NPHI1=NPHI+1                                                      INITA    22
      NPHI2=NPHI+2                                                      INITA    23
      NPHM1=NPHI-1                                                      INITA    24
      NPHM2=NPHI-2                                                      INITA    25
      NT=NIT+2                                                          INITA    26
      NT1=NT+1                                                          INITA    27
      NT2=NT+2                                                          INITA    28
      ICONST(1)=1                                                       INITA    29
      ICONST(10)=1                                                      INITA    30
      IPRNT=ICONST(4)                                                   INITA    31
      IF (ICONST(48).NE.1) ICONST(5)=0                                  INITA    32
      LAG=1                                                             INITA    33
      DELTA=PHIF/NIPHI                                                  INITA    34
      DPHI=DELTA                                                        INITA    35
      DT=1.0/(NT-1)                                                     INITA    36
      DZ=DZDT*DT                                                        INITA    37
      DZDPH=DZ/DELTA                                                    INITA    38
      GAM(1)=(GAMMA-1.0)*0.5                                            INITA    39
      GAM(2)=GAM(1)/GAMMA                                               INITA    40
```

```
      C..MERIDIONAL CLUSTERING                                          INITA   41
            IF(RK.EQ.0.0) GO TO 15                                      INITA   42
   60       YO=0.5/RK*ALOG((1.0+(EXP(RK)-1.0)*PHIFD/180.0)/             INITA   43
           * (1.0-(1.0-EXP(-RK))*PHIFD/180.0))                          INITA   44
            YO1=SINH(RK*YO)                                             INITA   45
            YO2=YO1/(RK*PHIFD/RADI)                                     INITA   46
      15    CONTINUE                                                    INITA   47
   65       DO 35 II=2,NPHI1                                            INITA   48
            ETA(II)=(II-3)*DETA                                         INITA   49
            IF(RK.GT.0.0) GO TO 40                                      INITA   50
            PHIP(II)=ETA(II)                                            INITA   51
            DTIL(II)=1.0                                                INITA   52
   70       DTILE(II)=0.0                                               INITA   53
            GO TO 35                                                    INITA   54
      40    CONTINUE                                                    INITA   55
            YO3=RK*(ETA(II)/PI-YO)                                      INITA   56
            SHETA=SINH(YO3)                                             INITA   57
   75       CHETA=COSH(YO3)                                             INITA   58
            PHIP(II)=PHIFD/RADI*(1.0+SHETA/YO1)                         INITA   59
            DTIL(II)=YO2*DETA/CHETA                                     INITA   60
            DTILE(II)=-YO2*RK*SHETA/CHETA**2                            INITA   61
      35    CONTINUE                                                    INITA   62
   80       PHIP(2)=-PHIP(4)                                            INITA   63
            PHIP(NPHI1)=-PHIP(NPHM1)                                    INITA   64
            DTIL(2)=DTIL(4)                                             INITA   65
            DTIL(NPHI1)=DTIL(NPHM1)                                     INITA   66
            DTILE(2)=-DTILE(4)                                          INITA   67
   85       DTILE(NPHI1)=-DTILE(NPHM1)                                  INITA   68
            DTILE(3)=0.0                                                INITA   69
            DTILE(NPHI)=0.0                                             INITA   70
      C..RADIAL CLUSTERING                                              INITA   71
            SINRJ=SINH(RJ)                                              INITA   72
   90       DO 36 II=1,NT2                                              INITA   73
            TP(II)=(II-3)*DT                                            INITA   74
            IF(RJ.EQ.0.0) GO TO 41                                      INITA   75
            OT=RJ*TP(II)                                                INITA   76
            SOT=SINH(OT)                                                INITA   77
   95       COT=COSH(OT)                                                INITA   78
            XI(II)=SOT/SINRJ                                            INITA   79
            TXI(II)=SINH**2/(RJ*COT)                                    INITA   80
            TXIT(II)=-SINHRJ*SOT/COT**2                                 INITA   81
            GO TO 42                                                    INITA   82
  100       41 XI(II)=TP(II)                                            INITA   83
            TXI(II)=1.0                                                 INITA   84
            TXIT(II)=0.0                                                INITA   85
      42    CONTINUE                                                    INITA   86
      36    CONTINUE                                                    INITA   87
  105       IF (DIREAL.EQ.-1) GAM(2)=1.0                                INITA   88
            IF(DISK1) 8,8,9                                             INITA   89
      8     DISK1=3                                                     INITA   90
      9     IF(DISK2) 10,10,11                                          INITA   91
      10    DISK2=3                                                     INITA   92
  110 11    IF(NCONE) 12,12,13                                          INITA   93
      12    NCONE=1                                                     INITA   94
      13    CONTINUE                                                    INITA   95
            IF(ICONST(4))16,16,17                                       INITA   96
      16    ICONST(4)=1                                                 INITA   97
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      17    CONTINUE                                                          INITA   98
            IF(TAPE1) 1,1,20                                                  INITA   99
      1     TAPE1=1                                                           INITA  100
            IF(TAPE2) 4,4,26                                                  INITA  101
      4     TAPE2=1                                                           INITA  102
      26    CONTINUE                                                          INITA  103
      20    CONTINUE                                                          INITA  104
      C                                                                       INITA  105
      C..CALCULATE FREE STREAM QUANTITIES                                     INITA  106
      C                                                                       INITA  107
            GAM(3)=GAMMA/(GAMMA-1.0)                                          INITA  108
            GAM(4)=1.0/(GAMMA-1.0)                                            INITA  109
            AA=1.0+GAM(1)*MACH**2                                             INITA  110
            BB=AA-1.0                                                         INITA  111
            PINF=1.0/AA**GAM(3)                                               INITA  112
            RHOIN=1.0/AA**GAM(4)                                              INITA  113
            QINF=SQRT(BB/AA)                                                  INITA  114
            CONST(1)=SIN(ALPH)                                                INITA  115
            CONST(2)=COS(ALPH)                                                INITA  116
            UINF=QINF*CONST(2)                                                INITA  117
            IF (NREAL.EQ.-1) UINF=CONST(2)*V1INF                              INITA  118
            DO 3 K=2,NPHI1                                                    INITA  119
            PHI=PHIP(K)                                                       INITA  120
            VINF(K)=-QINF*CONST(1)*COS(PHI)                                   INITA  121
            WINF(K)=QINF*CONST(1)*SIN(PHI)                                    INITA  122
            IF (NREAL.EQ.0) GO TO 14                                          INITA  123
            VINF(K)=VINF(K)*V1INF/QINF                                        INITA  124
            WINF(K)=WINF(K)*V1INF/QINF                                        INITA  125
      14    CONTINUE                                                          INITA  126
      3     CONTINUE                                                          INITA  127
      2     CONTINUE                                                          INITA  128
            CALL OUTPUT(1)                                                    INITA  129
            WRITE(6,103)                                                      INITA  130
            WRITE(6,105) (II,TP(II),XI(II),TXI(II), XIT(II),II=3,NT2)         INITA  131
            WRITE(6,101)                                                      INITA  132
            WRITE(6,100) (II,ETA(II),PHIP(II),DTIL(II),DTILE(II),II=2,NPHI1)  INITA  133
            IF(IC.NE.48).EQ.1) GO TO 27                                       INITA  134
            IF(TAPE2.EQ.1.AND.DISK1.NE.1.AND.DISK2.NE.1) GO TO 30             INITA  135
            GO TO 31                                                          INITA  136
      30    CONTINUE                                                          INITA  137
      C..GUESS CONE STARTING SOLUTION IF ALPHA IS DIFFERENT FROM ZERO         INITA  138
            ZSTA=ZINT-ZSHIFT                                                  INITA  139
            THETAS=SIGM                                                       INITA  140
            CALL START(THETAS,XMACH,GAMMA,ZSTA,0.0,NT,NT,YA,UA,VA,RHOA,PA,MER, INITA  141
           *THA)                                                              INITA  142
            DO 32 K=3,NPHI                                                    INITA  143
            DO 33 J=3,NT2                                                     INITA  144
            P(J,K)=PA(J-2)                                                    INITA  145
            RHO(J,K)=RHOA(J-2)                                                INITA  146
            U(J,K)=UA(J-2)                                                    INITA  147
            V(J,K)=VA(J-2)                                                    INITA  148
            W(J,K)=0.0                                                        INITA  149
      33    CONTINUE                                                          INITA  150
            RS(K)=YA(NT)+ZSTA*TAN(SIGM)                                       INITA  151
            RSZ(K)=RS(K)/ZSTA                                                 INITA  152
      32    CONTINUE                                                          INITA  153
            RSPHI(3)=0.0                                                      INITA  154
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```
                RSPHI(NPHI)=0.0                                                 INITA  155
                DO 34 K=4,NPHM1                                                 INITA  156
             34 RSPHI(K)=(RS(K+1)-RS(K-1))/(2.0*DETA)*OTIL(K)                   INITA  157
175             GO TO 27                                                        INITA  158
             31 CONTINUE                                                        INITA  159
                IF(TAPE2.EQ.2) GO TO 19                                         INITA  160
             C                                                                  INITA  161
             C..READ INITIAL DATA FROM DISK1                                    INITA  162
180          C                                                                  INITA  163
                GO TO(6,7,7),DISK1                                              INITA  164
             6  CONTINUE                                                        INITA  165
                READ(12) Z,((P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),K=3,NPHI ),J=3,N INITA  166
               *T2),(RS(K),RSZ(K),RSPHI(K),K=3,NPHI)                            INITA  167
185             ZINT=Z                                                          INITA  168
                WRITE(6,102)                                                    INITA  169
                REWIND 12                                                       INITA  170
             7  CONTINUE                                                        INITA  171
             C                                                                  INITA  172
190          C..READ INITIAL DATA FROM DISK2                                    INITA  173
             C                                                                  INITA  174
                GO TO (18,19,19),DISK2                                          INITA  175
             18 CONTINUE                                                        INITA  176
                READ(11) Z,((P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),K=3,NPHI ),J=3,N INITA  177
195            *T2),(RS(K),RSZ(K),RSPHI(K),K=3,NPHI)                           INITA  178
                ZINT=Z                                                          INITA  179
                WRITE(6,109)                                                    INITA  180
                REWIND 11                                                       INITA  181
             19 CONTINUE                                                        INITA  182
200          5  CONTINUE                                                        INITA  183
             C                                                                  INITA  184
             C..READ INITIAL DATA FROM PUNCHED CARDS                            INITA  185
             C                                                                  INITA  186
                IF(TAPE2.EQ.1.OR.TAPE2.EQ.3) GO TO 27                           INITA  187
205             READ(5,111) Z                                                   INITA  188
                READ(5,112) ((P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),K=3,NPHI),J=3, INITA  189
               *NT2)                                                            INITA  190
                READ(5,113) (RS(K),RSZ(K),RSPHI(K),K=3,NPHI)                    INITA  191
                ZINT=Z                                                          INITA  192
210             WRITE(6,110)                                                    INITA  193
             27 CONTINUE                                                        INITA  194
                DO 25 K=1,2                                                     INITA  195
                M=6-K                                                           INITA  196
                I=NPHI+K                                                        INITA  197
215             N=NPHI-K                                                        INITA  198
                RS(K)=RS(M)                                                     INITA  199
                RS(I)=RS(N)                                                     INITA  200
                RSZ(K)=RSZ(M)                                                   INITA  201
                RSZ(I)=RSZ(N)                                                   INITA  202
220             RSPHI(K)=-RSPHI(M)                                              INITA  203
                RSPHI(I)=-RSPHI(N)                                              INITA  204
             25 CONTINUE                                                        INITA  205
             C.....WRITE TAPE - INITIAL DATA AND BODY SHAPE                     INITA  206
                GO TO (21,22,21),TAPE1                                          INITA  207
225          22 CONTINUE                                                        INITA  208
                DDZZ=(ZEND-ZTINT)/100.0                                         INITA  209
                Z=ZTINT                                                         INITA  210
             23 CONTINUE                                                        INITA  211
```

```
      CALL GEOM3(1,PHIP,NPHI,Z,RB,RBZ,RBPH,IPRNT,NCONE)
      Z=Z+DDZZ
      IF(Z-ZEND) 23,24,24
   24 CONTINUE
      Z=ZINT
      ICONST(1)=1
   21 CONTINUE
      ZM=P(3,3)/ABS(RHO(3,3))**GAMMA
      ZM=ABS(ZM)
      DO 38 K=3,NPHI
      IF (NREAL.EQ.-1) GO TO 39
      S(K)=P(3,K)/ABS(RHO(3,K))**GAMMA
      S(K)=ABS(S(K))
      GO TO 38
   39 CONTINUE
      CALL RGAS(P(3,K),RHO(3,K),SOUND,ENTH,TEM,S(K),GASCON,WRGX,-1,4,2)
   38 CONTINUE
      S(2)=S(4)
      S(NPHI1)=S(NPHM1)
      IF (NREAL.NE.-1) GO TO 29
   37 CONTINUE
      CALL RGAS(P(3,3),RHO(3,3),SOUND,ENTH,TEM,BODYS,GASCON,WRGX,-1,4,2)
      BODYV2=U(3,3)*U(3,3)+V(3,3)*V(3,3)+W(3,3)*W(3,3)
      BODYH=ENTH+BODYV2*0.5
   29 CONTINUE
      IF (NWPRT.NE.0) WRITE(6,114) BODYH,BODYS,BODYV2
      CALL GEOM3(1,PHIP,NPHI,Z,RB,RBZ,RBPH,IPRNT,NCONE)
      CALL GEOM1(2)
  100 FORMAT(1H ,5X,2HK=,I2,3X,4HETA=,E11.4,3X,4HPHI=,E11.4,3X,
     * 5HOTIL=,E11.4,3X,6HOTILE=,E11.4)
  101 FORMAT(1H1,27HMERIDIANAL MESH DESCRIPTION,/)
  102 FORMAT(1H0,3HFLOW FIELD DATA WAS READ FROM DISK1)
  103 FORMAT(1H1,23HRADIAL MESH DESCRIPTION,/)
  104 FORMAT(1H1,15HGEOMETRY INPUT)
  105 FORMAT(1H ,5X,2HL=,I2,3X,4HTAU=,E11.4,3X,4HXI =,E11.4,3X,5HTXI =,
     * E11.4,3X,6HTXIT =,E11.4)
  109 FORMAT(1H0,3HFLOW FIELD DATA WAS READ FROM DISK2)
  110 FORMAT(1H0,43HFLOW FIELD DATA WAS READ FROM PUNCHED CARDS)
  111 FORMAT(E15.6)
  112 FORMAT(5E15.6)
  113 FORMAT(3E15.6)
  114 FORMAT(1H0,32HBODY STREAM-LINE CONSTANTS.  HT=,1PE13.6,1X,24S=
     11PE13.6,1X,5HV**2=1PE13.6)
      RETURN
      END
```

```
SUBROUTINE INITIL      76/76    OPT=1                    FTN 4.6+460        06/15/79  18.58.36        PAGE     1

                SUBROUTINE INITIL                                                  INITIL      2
                COMMON/CONRG/PO,RO,TO,CONC,GASCON,HO,SO,AO,RTO,GX                  CONRG1      2
                COMMON/REALG/NREAL,NWRPRT,BODY4,BODYS,PSONIC,RSONIC,P1INF,R1INF    REALG       2
               *,V1INF,NITAVG,NWROUT                                               REALG       3
                DATA I123/0/                                                       INITIL      5
                IF (I123.EQ.123) RETURN                                            INITIL      6
                GX=1.4                                                             INITIL      7
                I123=123                                                           INITIL      8
          C     PO=ATM PRES IN UNITS LBS PER FT**2                                 INITIL      9
                PO=2116.                                                           INITIL     10
                CONC=0.996291                                                      INITIL     11
          C     RO=STGD DENSITY IN SLUGS PER FT**3                                 INITIL     12
                RO=0.002498*CONC                                                   INITIL     13
          C     TO=STGD TEMP                                                       INITIL     14
                TO=493.635                                                         INITIL     15
          C     RRR=SPECIFIC GAS CONSTANT                                          INITIL     16
                RRR=1716.0/CONC                                                    INITIL     17
                GASCON=RRR                                                         INITIL     18
                CALL RGAS(PO,RO,AO,HO,TO,SO,RRR,GX,-1.4,2)                         INITIL     19
                RTO=GASCON*TO                                                      INITIL     20
           86   CONTINUE                                                           INITIL     21
                IF (NWRPRT.GE.1) GO TO 87                                          INITIL     22
                RETURN                                                             INITIL     23
           87   WRITE (6,88) PO,RO,TO,CONC,GASCON,HO,SO,    AO,RTO,GX              INITIL     24
           88   FORMAT(1H0,26HFROM INITIL - PRT /CONRG/  /1H ,3HPO=1PE13.6,1X,     INITIL     25
               13HRO=1PE13.6,1X,3HTO=1PE13.6,1X,5HCONC=1PE13.6,1X,3HRR=1PE13.6,1X, INITIL     26
               23HHO=1PE13.6,1X,3HSO=1PE13.6/1H ,3HAO=1PE13.6,1X,4HRTO=1PE13.6,1X, INITIL     27
               33HGX=1PE13.6)                                                      INITIL     28
                RETURN                                                             INITIL     29
                END                                                                INITIL     30
```

```
      SUBROUTINE INPUT                                                  INPUT     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         CVARB     2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                          CVARB     3
     *     FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                  CVARB     4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB    2
     *1) ,                                                              PVARB     3
     *     ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,                PVARB     4
     *     ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,    PVARB     5
     *    DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,    PVARB     6
     *     ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,    PVARB     7
     *     RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSFMIT(41)    PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24) IDVARB    2
      COMMON/SVARB/T,Z     , PHI    , DT    , DZ    , DPHI  , ZINT  ,   SVARB     2
     *     ZEND  , PI    , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,    SVARB     3
     *     TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,    SVARB     4
     *     DZDPH , ZM    , TMUD  , TMLD  , TMW   , TML   , TTMW  ,    SVARB     5
     *     TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,    SVARB     6
     *     NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,    SVARB     7
     *     NT    , NT1   , NT2   , NT3   , PHIFD , NCONE , RADI  ,    SVARB     8
     *     PHIF  , METHOD, LAG   , NBC   , PINF  , RHOIN , UINF  ,    SVARB     9
     *     QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                      SVARB    10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB    11
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG     2
     *,V1INF,NITAVG,NWROUT                                              REALG     3
      COMMON/CONRG/WRPD,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRRTO,WRGX CONRG    2
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTDSOS            ENTRO     2
      COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)                          CLUSTR    2
C                                                                       INPUT    11
      READ(5,103) XMACH,ALPHA,GAMMA,NREAL                               INPUT    12
C                                                                       INPUT    13
C..XMACH=MACH NUMBER                                                    INPUT    14
C..ALPHA=ANGLE OF ATTACK(DEGREES)                                       INPUT    15
C..GAMMA=RATIO OF SPECIFIC HEATS                                        INPUT    16
C..NREAL=0 FOR PERFECT GAS, -1 FOR REAL AIR                             INPUT    17
C                                                                       INPUT    18
      READ(5,100) PHIFD,RK,RJ                                           INPUT    19
C                                                                       INPUT    20
C..RJ= RADIAL CLUSTERING PARAMETER.                                     INPUT    21
C..RK=  MERIDIONAL CLUSTERING PARAMETER.                                INPUT    22
C..PHIFD=MERIDIONAL ANGLE ABOUT WHICH POINTS ARE CLUSTERED.             INPUT    23
C                                                                       INPUT    24
      READ(5,101)NIT,NIPHI,NITER,ICONST(49),NCONE                       INPUT    25
C                                                                       INPUT    26
C..NIT=NUMBER OF POINTS BETWEEN BODY AND SHOCK                          INPUT    27
C..NIPHI=NUMBER OF INTERVALS IN MERIDIONAL DIRECTION                    INPUT    28
C..NITER=NUMBER OF INTEGRATION STEPS DESIRED                            INPUT    29
C.. NWRPRT=CONTROL OF REAL GAS ITERATION AND OTHER MONITOR PRINTING.     INPUT    30
C..       SET NWRPRT=0 FOR LEAST PRINTED OUTPUT.                        INPUT    31
C.. NWROUT=                                                             INPUT    32
C..ICONST(49)= STEPSIZE COMPUTED EVERY INCONST(49) ITERATIONS.          INPUT    33
C..NCONE=CONTROL VARIABLE FOR CONE SOLUTION(1) OR AFTERBODY SOLUTION(2) INPUT    34
C                                                                       INPUT    35
      READ(5,100) CONST(9),CONST(4),CONST(5)                            INPUT    36
C.. CONST(9)=COURANT NUMBER (USUALLY SET TO 0.9)                        INPUT    37
C..CONST(4)=FOURTH ORDER DISSIPATION CONST IN R DIRECTION               INPUT    38
C..CONST(5)=FOURTH ORDER DISSIPATION CONSTANT IN THE PHI DIRECTION       INPUT    39
C                                                                       INPUT    40
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      READ(5,102) DISK1,DISK2,TAPE1,TAPE2,NTDSOS                        INPUT   41
C                                                                       INPUT   42
C..DISK1=1 TO READ DISK1; 2 TO WRITE DISK1; 3 TO DO NOTHING             INPUT   43
C..DISK2=1 TO READ DISK2; 2 TO WRITE DISK2; 3 TO DO NOTHING             INPUT   44
C..TAPE1=1 TO DO NOTHING; 2 STORES BODY SHAPE AND WRITES DATA ON TAPE;  INPUT   45
C          3 WRITES DATA ONLY ON TAPE                                   INPUT   46
C..TAPE2=1 TO DO NOTHING; 2 TO READ STARTING SOLN FROM DATA CARDS       INPUT   47
C          3 STORE SOLUTION ON PUNCHED CARDS                            INPUT   48
C..NTDSOS=0-DO NOTHING; 1-PUNCH; 2-WRITE TAPE FOR 3-D S-O-S STARTING SOL INPUT   49
C          IF NTDSOS>0, LAST DATA CARD SHOULD CONTAIN MACHI AND LAMBDA  INPUT   50
C          TO BE USED IN SUBROUTINE OUTPUT                              INPUT   51
C                                                                       INPUT   52
      READ(5,104) ZBS,ZFLD,ITPRTB,ITPRTF,NCASE                          INPUT   53
C                                                                       INPUT   54
C..ZBS=INCREMENT IN Z FOR PRINTING BODY AND SHOCK VARIABLES             INPUT   55
C..ZFLD=INCREMENT IN Z FOR PRINTING FIELD VARIABLES                     INPUT   56
C..ITPRTB=NO. OF ITERATION FOR PRINTING BODY AND SHOCK VARIABLES        INPUT   57
C...ITPRTF=NO. OF ITERATIONS FOR PRINTING FIELD VARIABLES               INPUT   58
C..NCASE=IF NCASE>0,THEN NEW CASE FOLLOWS                               INPUT   59
C                                                                       INPUT   60
      READ(5,105)DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                     INPUT   61
C                                                                       INPUT   62
C..VALUES USED IN FORCE AND MOMENT CALCULATIONS OR IN SHIFTING ORGIN OF INPUT   63
C  SHARP CONE SOLUTION                                                  INPUT   64
C..DIAM= LENGTH USED IN CALCULATING REFERENCE AREA;USUALLY MAX DIAMETER INPUT   65
C..ALENGT= REFERENCE LENGTH USED IN CALCULATING MOMENTS                 INPUT   66
C..ZREF= MOMENT REFERENCE CENTER                                        INPUT   67
C..ZCG = CENTER OF GRAVITY LOCATION FOR STATIC MARGIN CALCULATION       INPUT   68
C..ZSHIFT= THE VALUE OF Z WHICH CORRESPONDS TO THE STARTING CONE ORGIN; INPUT   69
C          IF NO SHIFT SET=0                                            INPUT   70
C..IFANDM= 0 IF FORCE AND MOMENTS ARE DESIRED; = 1 IF NOT DESIRED       INPUT   71
100   FORMAT(3F10.5,)                                                   INPUT   72
101   FORMAT(5I5)                                                       INPUT   73
102   FORMAT(5I5)                                                       INPUT   74
103   FORMAT(3E15.6,5X,I5)                                              INPUT   75
  104 FORMAT(2F10.5,3I5)                                                INPUT   76
 105  FORMAT(5F10.5,I5)                                                 INPUT   77
999   RETURN                                                            INPUT   78
      END                                                               INPUT   79
```

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      SUBROUTINE INTS(T,M,L,E ,B,C,HMA ,HMI ,BET,DERIV)                  INTS     2
      COMMON /ERINT/IER                                                 ERINT    2
      DOUBLE PRECISION XX,XS,EU,P,A,HMAX,HMIN,BETA,EL ,H,XO,AK,EN,D,D14 INTS     4
     1 ,TEST1,TEST2                                                     INTS     5
      DIMENSION T(100),XX(4),XS(2)                                      INTS     6
      EQUIVALENCE (TEM,ITEM)                                            INTS     7
      IER=0                                                             INTS     8
      K=L                                                               INTS     9
      N=M                                                               INTS    10
      N3=3*N                                                            INTS    11
      N5=5*N                                                            INTS    12
      N2=2*N                                                            INTS    13
      N4=4*N                                                            INTS    14
      N6=6*N                                                            INTS    15
      N10=10*N                                                          INTS    16
      EU=E                                                              INTS    17
      P=B                                                               INTS    18
      JN=0                                                              INTS    19
      A=C                                                               INTS    20
      XS(1)=T(2)                                                        INTS    21
      HMAX=HMA                                                          INTS    22
      IF (HMAX .LE.0.D0)HMAX=1.0D38                                     INTS    23
      HMIN=HMI                                                          INTS    24
      ITEM=N                                                            INTS    25
      T(1)=TEM                                                          INTS    26
      IF (K-1) 1,2,2                                                    INTS    27
    1 IF (P .LE.0.D0)P=100.000                                          INTS    28
      IF (A .LE.0.D0) A=1.D0                                            INTS    29
      BETA=BET                                                          INTS    30
      IF (BETA .LE.0.D0.OR. BETA .GE. 1.D0)BETA=0.5D0                   INTS    31
      EL=EU/P                                                           INTS    32
    2 J=0                                                               INTS    33
      ISTEP=4                                                           INTS    34
      H=T(3)                                                            INTS    35
      CALL DERIV                                                        INTS    36
      IF(IER.NE.0) RETURN                                               INTS    37
      GO TO 25                                                          INTS    38
      ENTRY INTM                                                        INTS    39
   10 IF (K-1) 20,11,20                                                 INTS    40
   11 XO=T(2)                                                           INTS    41
      XX(2)=XO+H*0.5D0                                                  INTS    42
      XX(1)=XX(2)                                                       INTS    43
      XX(4)=XO+H                                                        INTS    44
      XX(3)=XX(4)                                                       INTS    45
      DO 16 JJ=1,4                                                      INTS    46
      T(2)=XX(JJ)                                                       INTS    47
      DO 12 I=1,N                                                       INTS    48
      I1= 3+I                                                           INTS    49
      IJ=I1+N                                                           INTS    50
      IK=IJ+N                                                           INTS    51
      IL=IK+N                                                           INTS    52
      AK=H*T(IJ)                                                        INTS    53
      GO TO (13,14,15,16),JJ                                            INTS    54
   13 T(IK)=T(I1)                                                       INTS    55
      T(IL)=AK                                                          INTS    56
      T(I1)=T(IK)+0.5D0*AK                                              INTS    57
      GO TO 12                                                          INTS    58
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      14    T(II)=T(IK)+0.500*AK                                          INTS       59
      17    T(IL)=T(IL)+2.000*AK                                          INTS       60
60          GO TO 12                                                      INTS       61
      15    T(II)=T(IK)+AK                                                INTS       62
            GO TO 17                                                      INTS       63
      18    T(II)=T(IK)+(T(IL)+AK)/6.000                                  INTS       64
      12    CONTINUE                                                      INTS       65
65          CALL DERIV                                                    INTS       66
            IF(IER.NE.0) RETURN                                           INTS       67
      16    CONTINUE                                                      INTS       68
      25    IF (K .EQ. 1) RETURN                                          INTS       69
            DO 21 I=1,N2                                                  INTS       70
70          II=3+I                                                        INTS       71
            IJ=II+N2*(J+2)                                                INTS       72
      21    T(IJ)=T(II)                                                   INTS       73
            RETURN                                                        INTS       74
      20    IF (J .GE. 3) GO TO 22                                        INTS       75
75          J=J+1                                                         INTS       76
            GO TO 11                                                      INTS       77
      22    DO 23 I=1,N                                                   INTS       78
            II=3+I                                                        INTS       79
            IJ=II+N5                                                      INTS       80
80          IK=IJ+N2                                                      INTS       81
            IL=IK+N2                                                      INTS       82
            IM=IL+N2                                                      INTS       83
            IN=IL+N                                                       INTS       84
            IP=II+N3                                                      INTS       85
85          T(IP)=19.000*T(IM)-5.000*T(IL)+T(IK)                          INTS       86
      23    T(II)=T(IN)+H/24.D0*(55.D0*T(IM)-59.D0*T(IL)+37.D0*T(IK)      INTS       87
     1     -9.D0*T(IJ))                                                  INTS       88
            XS(2)=T(2)                                                    INTS       89
            XO=XS(2)                                                      INTS       90
90          T(2)=XO+H                                                     INTS       91
            CALL DERIV                                                    INTS       92
            IF(IER.NE.0) RETURN                                           INTS       93
            DO 24 I=1,N                                                   INTS       94
            II=3+I                                                        INTS       95
95          IJ=II+N2                                                      INTS       96
            T(IJ)=T(II)                                                   INTS       97
            IL=II+2*N5                                                    INTS       98
            IK=II+N                                                       INTS       99
            IP=II+N3                                                      INTS      100
100         T(II)=T(IL)+H/24.D0*(9.000*T(IK)+T(IP))                       INTS      101
      24    CONTINUE                                                      INTS      102
            IF (K .EQ. 2) GO TO 30                                        INTS      103
            EN=0                                                          INTS      104
            DO 27 I=1,N                                                   INTS      105
105         TEST1=T(I+3)                                                  INTS      106
      26    D=DMAX1(DABS(TEST1         ),D)                               INTS      107
            D14=14.000*D                                                  INTS      108
            II=3+N2+I                                                     INTS      109
            TEST2=T(II)                                                   INTS      110
110   27    EN=DMAX1(DABS((TEST2-TEST1)/D14),EN)                          INTS      111
            IF (EN .GE. EU) GO TO 28                                      INTS      112
            JN=4                                                          INTS      113
            IF (EN .LT. EL) GO TO 29                                      INTS      114
      31    ISTEP=ISTEP+1                                                 INTS      115
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      GO TO 30                                                          INTS     116
   29 IF (ISTEP .LT. 6) GO TO 31                                        INTS     117
      IF(DABS(H/BETA) .GT. HMAX) GO TO 30                               INTS     118
      H=H/BETA                                                          INTS     119
      T(3)=H                                                            INTS     120
      GO TO 2                                                           INTS     121
   28 IF(DABS(H*BETA) .LT. HMIN) GO TO 30                               INTS     122
      H=H*BETA                                                          INTS     123
      T(3)=H                                                            INTS     124
      IF (JN.GE. 4) GO TO 40                                            INTS     125
      J=0                                                               INTS     126
      DO 32 I=1,N                                                       INTS     127
      II=3+I                                                            INTS     128
      IJ=II+N4                                                          INTS     129
   32 T(II)=T(IJ)                                                       INTS     130
      T(2)=XS(1)                                                        INTS     131
      CALL DERIV                                                        INTS     132
      IF(IER.NE.0) RETURN                                               INTS     133
      GO TO 25                                                          INTS     134
   40 T(2)=XS(2)                                                        INTS     135
      J=0                                                               INTS     136
      DO 41 I=1,N                                                       INTS     137
      II=3+I                                                            INTS     138
      IJ=II+N10                                                         INTS     139
   41 T(II)=T(IJ)                                                       INTS     140
      CALL DERIV                                                        INTS     141
      IF(IER.NE.0) RETURN                                               INTS     142
      GO TO 25                                                          INTS     143
   30 CALL DERIV                                                        INTS     144
      IF(IER.NE.0) RETURN                                               INTS     145
      DO 42 I=1,N6                                                      INTS     146
      II=3+I+N4                                                         INTS     147
      IJ=II+N2                                                          INTS     148
   42 T(II)=T(IJ)                                                       INTS     149
      DO 43 I=1,N2                                                      INTS     150
      II=3+I                                                            INTS     151
      IJ=II+N10                                                         INTS     152
   43 T(IJ)=T(II)                                                       INTS     153
      RETURN                                                            INTS     154
      END                                                               INTS     155
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```
      SUBROUTINE IOCON(K1)                                                  IOCON      2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                             IOCON      2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                              CVARB      3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                     CVARB      4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4    PVARB      2
     *1) ,                                                                  PVARB      3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,                   PVARB      4
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,       PVARB      5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,       PVARB      6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,       PVARB      7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)       PVARB      8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24)     IDVARB     2
      COMMON/SVARB/T,Z      , PHI    , DT     , DZ     , DPHI   , ZINT  ,  SVARB      2
     *      ZEND  , PI    , ALPHA  , GAMMA  , SIGMA  , XMACH  , TAPE1 ,    SVARB      3
     *      TAPE2 , DISK1 , ALPH   , DISK2  , SIGM   , NPRNT  , DZDT  ,    SVARB      4
     *      DZOPH , ZM    , TMWO   , TMLO   , TMW    , TML    , TTMW  ,    SVARB      5
     *      TTML  , RZ    , BZ     , NIPHI  , NIT    , KPHI   , NITER ,    SVARB      6
     *      NPHI  , NPHI1 , NPHI2  , NPHI3  , NPHM1  , NPHM2  , NPHM3 ,    SVARB      7
     *      NT    , NT1   , NT2    , NT3    , PHIFD  , NCONE  , RADI  ,    SVARB      8
     *      PHIF  , METHOD, LAG    , NBC    , PINF   , RHOIN  , UINF  ,    SVARB      9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANOM                         SVARB     10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                       SVARB     11
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF       REALG      2
     *,V1INF,NITAVG,NSROUT                                                  REALG      3
      COMMON/WRDK00/AWR,BWR,CWR,DWR,UWR,VWR,WWR,PWR,RHOWR,WRC1,NEWR,NTAL    WRDK00     2
      COMMON/WRDK01/K,J,NPHIWR,NT2WR,WRMACH,PKKFUN,WRZ                      WRDK01     2
      COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRRTO,WRGX    CONRG      2
      COMMON /ACCNT/NRECA(51)                                               ACCNT      2
      COMMON/CLUSTR/RJ,XI(24) TXI(24),TXIT(24)                              CLUSTR     2
      DIMENSION E(4),F(4),G(4),H(4)                                         IOCON     13
      DIMENSION GOOF(6)                                                     IOCON     14
      COMMON/L1800/NTEST(11),NCRTA,NOSXY(4),NCRTB(3),NSWCH(32),IN(32)       IOCON     15
      DATA GOOF/4HERRO,4HR IN,4H IOC,4HON A,4HT J,,4HK=  /                  IOCON     16
      JERK=1                                                                IOCON     17
      NONB=NRECA(1)-2                                                       IOCON     18
  780 IF(JERK.EQ.2)  GO TO 2                                                IOCON     19
      II=K1+1                                                               IOCON     20
      GO TO (5,5,2),II                                                      IOCON     21
    5 CONTINUE                                                              IOCON     22
      DO 3 K=2,NPHI1                                                        IOCON     23
      DO 3 J=3,NT2                                                          IOCON     24
      T=XI(J)                                                               IOCON     25
C..CODE CONSERVATIVE VARIABLES                                              IOCON     26
      R=T*(ROB(K)-RB(K))+RB(K)                                              IOCON     27
      RR=RHO(J,K)                                                           IOCON     28
      PP=P(J,K)                                                             IOCON     29
      UU=U(J,K)                                                             IOCON     30
      VV=V(J,K)                                                             IOCON     31
      WW=W(J,K)                                                             IOCON     32
      IF(NSWCH(11) .GT. 0)GO TO 10                                          IOCON     33
      A=DTDZ(J,K)                                                           IOCON     34
      B=DTDR(K)                                                             IOCON     35
      C=DTDPH(J,K)                                                          IOCON     36
      D=ROB(K)-RB(K)                                                        IOCON     37
      IF(J .EQ. 3)GO TO 4875                                                IOCON     38
      RJM1=XI(J-1)*D+RB(K)                                                  IOCON     39
      VSTAR1=DTDZ(J-1,K)*U(J-1,K)+B*V(J-1,K)+DTDPH(J-1,K)*W(J-1,K)/RJM1     IOCON     40
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                      VSTAR1=VSTAR1*UU/U(J-1,K)                                          IOCON     41
                4875  VSTAR2=A*UU+B*VV+C*WW/R                                            IOCON     42
60                    IF(J .EQ. NT2)GO TO 4775                                           IOCON     43
                      RJP1=XI(J+1)*D+RB(K)                                               IOCON     44
                      VSTAR3=DTDZ(J+1,K)*U(J+1,K)+B*V(J+1,K)+DTDPH(J+1,K)*W(J+1,K)/RJP1  IOCON     45
                      VSTAR3=VSTAR3*UU/U(J+1,K)                                          IOCON     46
                4775  CONTINUE                                                           IOCON     47
65                    IF(II-1)4,4,6                                                      IOCON     48
                4     VBAR=VSTAR2                                                        IOCON     49
                      IF(J .LE. 4)GO TO 14                                               IOCON     50
                      IF(J .GE. (NT2-1))GO TO 14                                         IOCON     51
                      IF(VSTAR2 .GT. VSTAR1)VBAR=0.5*(VSTAR2+VSTAR1)                     IOCON     52
70              14    WBAR=WW                                                            IOCON     53
                      IF(WW .GT. W(J,K-1))WBAR=0.5*(WW+W(J,K-1))                         IOCON     54
                      GO TO 10                                                           IOCON     55
                6     VBAR=VSTAR2                                                        IOCON     56
                      IF(J .LE. 4)GO TO 15                                               IOCON     57
75                    IF(J .GE. (NT2-1))GO TO 15                                         IOCON     58
                      IF(VSTAR3 .GT. VSTAR2)VBAR=0.5*(VSTAR3+VSTAR2)                     IOCON     59
                15    WBAR=WW                                                            IOCON     60
                      IF(W(J,K+1) .GT. WW)WBAR=0.5*(W(J,K+1)+WW)                         IOCON     61
                10    CONTINUE                                                           IOCON     62
80                    E(1)=RR*UU                                                         IOCON     63
                      E(2)=GAM(2)*PP+E(1)*UU                                             IOCON     64
                      E(3)=E(1)*VV                                                       IOCON     65
                      E(4)=E(1)*WW                                                       IOCON     66
                      IF(NSWCH(11))11,11,12                                              IOCON     67
85              12    CONTINUE                                                           IOCON     68
                      F(1)=RR*VV                                                         IOCON     69
                      F(2)=F(1)*UU                                                       IOCON     70
                      F(3)=GAM(2)*PP+F(1)*VV                                             IOCON     71
                      F(4)=F(1)*WW                                                       IOCON     72
90                    G(1)=RR*WW/R                                                       IOCON     73
                      G(2)=G(1)*UU                                                       IOCON     74
                      G(3)=G(1)*VV                                                       IOCON     75
                      G(4)=(GAM(2)*PP+RR*WW**2)/R                                        IOCON     76
                      H(1)=F(1)/R                                                        IOCON     77
95                    H(2)=H(1)*UU                                                       IOCON     78
                      H(3)=RR*(VV**2-WW**2)/R                                            IOCON     79
                      H(4)=2.0*G(3)                                                      IOCON     80
                      GO TO 13                                                           IOCON     81
                11    CONTINUE                                                           IOCON     82
100                   D=GAM(2)*PP                                                        IOCON     83
                      F(1)=RR*VBAR                                                       IOCON     84
                      F(2)=A*D+F(1)*UU                                                   IOCON     85
                      F(3)=B*D+F(1)*VV                                                   IOCON     86
                      F(4)=C*D/R+F(1)*WW                                                 IOCON     87
105                   G(1)=RR*WBAR/R                                                     IOCON     88
                      G(2)=G(1)*UU                                                       IOCON     89
                      G(3)=G(1)*VV                                                       IOCON     90
                      G(4)=D/R+G(1)*WW                                                   IOCON     91
                      H(1)=RR*VV/R-ACT(K)*E(1)-(BCT(K)+DTILE(K))*RR*WW/R-TXIT(J)*RR*VV   IOCON     92
110                   H4=RR*VV*UU/R                                                      IOCON     93
                      H(2)=HH      -ACT(K)*E(2)-(BCT(K)+DTILE(K))*RR*WW*UU/R-TXIT(J)*RR*V IOCON     94
                     $V*UU                                                               IOCON     95
                      H(3)=RR*(VV**2-WW**2)/R-ACT(K)*E(3)-(BCT(K)+DTILE(K))*RR*WW*VV/R-  IOCON     96
                     $TXIT(J)*(GAM(2)*PP+RR*VV**2)                                       IOCON     97
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115               H(4)=2.0*RR*VV*WW/R-ACT(K)*E(4)-(BCT(K)+DTILE(K))*(GAM(2)*PP+RR*WW  IOCON     98
                 $**2)/R-TXIT(J)*RR*VV*WW                                            IOCON     99
                13   CONTINUE                                                        IOCON    100
                     DO 16 N=1,4                                                     IOCON    101
                     IF(NSWCH(11) .GT. 0)F(N)=DTDZ(J,K)*E(N)+DTDR(K)*F(N)+DTDPH(J,K)*  IOCON  102
120                 $  G(N)                                                         IOCON    103
                     IF(NSWCH(11) .GT. 0)H(N)=H(N)-ACT(K)*E(N)-(BCT(K)+DTILE(K))*G(N)-  IOCON 104
                    $TXIT(J)*H(N)                                                    IOCON    105
                     H(N)=H(N)                                                       IOCON    106
                     F(N)=F(N)*TXI(J)                                                IOCON    107
125                  G(N)=G(N)*DTIL(K)                                               IOCON    108
                16   CONTINUE                                                        IOCON    109
                     GO TO (17,18),II                                                IOCON    110
                17   CONTINUE                                                        IOCON    111
                C..SET CONSERVATIVE VARIABLES AT N                                   IOCON    112
130                  DO 20 N=1,4                                                     IOCON    113
                     EO(N,J,K)=E(N)                                                  IOCON    114
                     FO(N,J,K)=F(N)                                                  IOCON    115
                     GO(N,J,K)=G(N)                                                  IOCON    116
                     HO(N,J,K)=H(N)                                                  IOCON    117
135             20   CONTINUE                                                        IOCON    118
                     GO TO 3                                                         IOCON    119
                18   CONTINUE                                                        IOCON    120
                C..SET CONSERVATIVE VARIABLES AT N+1 TILDE                           IOCON    121
                     DO 9 N=1,4                                                      IOCON    122
140                  IF(J.EQ.NT2) GO TO 36                                           IOCON    123
                     GO TO 35                                                        IOCON    124
                C..RESET ETEMP AT BODY AND SHOCK                                     IOCON    125
                36   ETEMP(N,J,K)=E(N)                                               IOCON    126
                35   CONTINUE                                                        IOCON    127
145                  FO(N,J,K)=F(N)                                                  IOCON    128
                     GO(N,J,K)=G(N)                                                  IOCON    129
                     HO(N,J,K)=H(N)                                                  IOCON    130
                9    CONTINUE                                                        IOCON    131
                3    CONTINUE                                                        IOCON    132
150                  RETURN                                                          IOCON    133
                2    CONTINUE                                                        IOCON    134
                C..DECODE CONSERVATIVE VARIABLES--PERFECT GAS.                       IOCON    135
                     IF (NREAL.EQ.-1) GO TO 50                                       IOCON    136
                     AA=1.0-GAM(2)                                                   IOCON    137
155                  DO 1 K=3,NPHI                                                   IOCON    138
                     DO 1 J=3,NT2                                                    IOCON    139
                     IF(JERK.EQ.2)  GO TO 779                                        IOCON    140
                     A=ETEMP(1,J,K)                                                  IOCON    141
                     B=ETEMP(2,J,K)                                                  IOCON    142
160                  C=ETEMP(3,J,K)                                                  IOCON    143
                     D=ETEMP(4,J,K)                                                  IOCON    144
                     BB=-B/A                                                         IOCON    145
                     V(J,K)=C/A                                                      IOCON    146
                     W(J,K)=D/A                                                      IOCON    147
165                  CC=GAM(2)*(1.0-V(J,K)**2-W(J,K)**2)                             IOCON    148
                     DD=BB**2-4.0*AA*CC                                              IOCON    149
                     IF(DD) 7,8,8                                                    IOCON    150
                7    CONTINUE                                                        IOCON    151
                C                                                                    IOCON    152
170             779  CONTINUE                                                        IOCON    153
                C                                                                    IOCON    154
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```
      DD=0.0
    8 CONTINUE
      U(J,K)=(-BB+SQRT(DD))/(2.0*AA)
      RHO(J,K)=A/U(J,K)
      P(J,K)=RHO(J,K)*(1.0-U(J,K)**2-V(J,K)**2-W(J,K)**2)
    1 CONTINUE
      RETURN
C..DECODE CONSERVATIVE VARIABLES --REAL GAS.
   50 CONTINUE
      IF (XMACH.EQ.WRMACH) GO TO 54
      WRMACH=XMACH
      PKKFUN=GAM(1)/GAMMA
      NPHIWR=NPHI
      NT2WR=NT2
   54 CONTINUE
      DO 51 K=3,NPHI
      DO 51 J=3,NT2
      AWR=ETEMP(1,J,K)
      BWR=ETEMP(2,J,K)
      CWR=ETEMP(3,J,K)
      DWR=ETEMP(4,J,K)
      VWR=CWR/AWR
      WWR=DWR/AWR
      WRZ=Z
      CALL RDCODE(P(J,K),RHO(J,K),U(J,K),NR)
      IF (NR.NE.0) GO TO 52
      V(J,K)=VWR
      W(J,K)=WWR
      GO TO 51
   52 WRITE (6,53) J,K,ICONST(5)
   51 CONTINUE
   53 FORMAT(1H0,1X,43HERROR IN IOCON (REAL GAS) - PROGRAM EXITING,5X,
     12HJ=,I3,3X,2HK=,I3,3X,7H JUDI= ,I4)
  100 FORMAT(1H0,1X,34HERROR IN IOCON - PROGRAM CONTINUES/5X,2HJ=,I3,3X,
     *2HK=,I3,3X,8HDISCRIM=,F10.6,3X,8H JUDI = ,I4)
      RETURN
      END
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SUBROUTINE MULLER     76/76   OPT=1                    FTN 4.6+460        06/15/79  18.58.36        PAGE     1

      C     MULLER                                                                  MULLER      2
            SUBROUTINE MULLER(COE,N1,ROOTR,ROOTI)                                   MULLER      3
            DIMENSION COE(16),ROOTR(15),ROOTI(15)                                   MULLER      4
      C     DIMENSION COE(16),ROOTR(15),ROOTI(15)                                   MULLER      5
            N2=N1+1                                                                 MULLER      6
            N4=0                                                                    MULLER      7
            I=N1+1                                                                  MULLER      8
      19    IF(COE(I))9,7,9                                                         MULLER      9
      7     N4=N4+1                                                                 MULLER     10
            ROOTR(N4)=0.0                                                           MULLER     11
            ROOTI(N4)=0.0                                                           MULLER     12
            I=I-1                                                                   MULLER     13
            IF(N4-N1)19,37,19                                                       MULLER     14
      9     CONTINUE                                                                MULLER     15
      10    AXR=0.8                                                                 MULLER     16
            AXI=0.0                                                                 MULLER     17
            L=1                                                                     MULLER     18
            N3=1                                                                    MULLER     19
            ALP1R=AXR                                                               MULLER     20
            ALP1I=AXI                                                               MULLER     21
            M=1                                                                     MULLER     22
            GOTO99                                                                  MULLER     23
      11    BET1R=TEMR                                                              MULLER     24
            BET1I=TEMI                                                              MULLER     25
            AXR=0.85                                                                MULLER     26
            ALP2R=AXR                                                               MULLER     27
            ALP2I=AXI                                                               MULLER     28
            M=2                                                                     MULLER     29
            GOTO99                                                                  MULLER     30
      12    BET2R=TEMR                                                              MULLER     31
            BET2I=TEMI                                                              MULLER     32
            AXR=0.9                                                                 MULLER     33
            ALP3R=AXR                                                               MULLER     34
            ALP3I=AXI                                                               MULLER     35
            M=3                                                                     MULLER     36
            GOTO99                                                                  MULLER     37
      13    BET3R=TEMR                                                              MULLER     38
            BET3I=TEMI                                                              MULLER     39
      14    TE1=ALP1R-ALP3R                                                         MULLER     40
            TE2=ALP1I-ALP3I                                                         MULLER     41
            TE5=ALP3R-ALP2R                                                         MULLER     42
            TE6=ALP3I-ALP2I                                                         MULLER     43
            TEM=TE5*TE5+TE6*TE6                                                     MULLER     44
            TE3=(TE1*TE5+TE2*TE6)/TEM                                               MULLER     45
            TE4=(TE2*TE5-TE1*TE6)/TEM                                               MULLER     46
            TE7=TE3+1.0                                                             MULLER     47
            TE9=TE3*TE3-TE4*TE4                                                     MULLER     48
            TE10=2.0*TE3*TE4                                                        MULLER     49
            DE15=TE7*BET3R-TE4*BET3I                                                MULLER     50
            DE16=TE7*BET3I+TE4*BET3R                                                MULLER     51
            TE11=TE3*BET2R-TE4*BET2I+BET1R-DE15                                     MULLER     52
            TE12=TE3*BET2I+TE4*BET2R+BET1I-DE16                                     MULLER     53
            TE7=TE9-1.0                                                             MULLER     54
            TE1=TE9*BET2R-TE10*BET2I                                                MULLER     55
            TE2=TE9*BET2I+TE10*BET2R                                                MULLER     56
            TE13=TE1-BET1R-TE7*BET3R+TE10*BET3I                                     MULLER     57
            TE14=TE2-BET1I-TE7*BET3I-TE10*BET3R                                     MULLER     58
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                TE15=DE15*TE3-DE16*TE4                                  MULLER  59
                TE16=DE15*TE4+DE16*TE3                                  MULLER  60
60              TE1=TE13*TE13-TE14*TE14-4.0*(TE11*TE15-TE12*TE16)       MULLER  61
                TE2=2.0*TE13*TE14-4.0*(TE12*TE15+TE11*TE16)             MULLER  62
                TEM=SQRT(TE1*TE1+TE2*TE2)                               MULLER  63
                IF(TE1)113,113,112                                      MULLER  64
          113   TE4=SQRT(.5*(TEM-TE1))                                  MULLER  65
65              IF(TE4.EQ.0.0) GO TO 111                                MULLER  66
                TE3=.5*TE2/TE4                                          MULLER  67
                GO TO 111                                               MULLER  68
          112   TE3=SQRT(.5*(TEM+TE1))                                  MULLER  69
                IF(TE2)110,200,200                                      MULLER  70
70        110   TE3=-TE3                                                MULLER  71
          200   TE4=.5*TE2/TE3                                          MULLER  72
          111   TE7=TE13+TE3                                            MULLER  73
                TE8=TE14+TE4                                            MULLER  74
                TE9=TE13-TE3                                            MULLER  75
75              TE10=TE14-TE4                                           MULLER  76
                TE1=2.0*TE15                                            MULLER  77
                TE2=2.0*TE16                                            MULLER  78
                IF(TE7*TE7+TE8*TE8-TE9*TE9-TE10*TE10)204,204,205        MULLER  79
          204   TE7=TE9                                                 MULLER  80
80              TE8=TE10                                                MULLER  81
          205   TEM=TE7*TE7+TE8*TE8                                     MULLER  82
                IF(TEM.EQ.0.0) GO TO 6                                  MULLER  83
                TE3=(TE1*TE7+TE2*TE8)/TEM                               MULLER  84
                TE4=(TE2*TE7-TE1*TE8)/TEM                               MULLER  85
85        6     AXR=ALP3R+TE3*TE5-TE4*TE6                               MULLER  86
                AXI=ALP3I+TE3*TE6+TE4*TE5                               MULLER  87
                ALP4R=AXR                                               MULLER  88
                ALP4I=AXI                                               MULLER  89
                M=4                                                     MULLER  90
90              GO TO 99                                                MULLER  91
          15    N6=1                                                    MULLER  92
          38    IF(ABS(HELL)+ABS(BELL)-1.E-20)18,19,16                  MULLER  93
          16    TE7=ABS(ALP3R-AXR)+ABS(ALP3I-AXI)                       MULLER  94
                IF(TE7/(ABS(AXR)+ABS(AXI))-1.E-7)18,18,17               MULLER  95
95        17    N3=N3+1                                                 MULLER  96
                ALP1R=ALP2R                                             MULLER  97
                ALP1I=ALP2I                                             MULLER  98
                ALP2R=ALP3R                                             MULLER  99
                ALP2I=ALP3I                                             MULLER 100
100             ALP3R=ALP4R                                             MULLER 101
                ALP3I=ALP4I                                             MULLER 102
                BET1R=BET2R                                             MULLER 103
                BET1I=BET2I                                             MULLER 104
                BET2R=BET3R                                             MULLER 105
105             BET2I=BET3I                                             MULLER 106
                BET3R=TEMR                                              MULLER 107
                BET3I=TEMI                                              MULLER 108
                IF(N3-100)14,18,18                                      MULLER 109
          18    NN=NN+1                                                 MULLER 110
110             ROOTR(NN)=ALP4R                                         MULLER 111
                ROOTI(NN)=ALP4I                                         MULLER 112
                N3=0                                                    MULLER 113
          41    IF(NN-N1)30,37,37                                       MULLER 114
          30    IF(ABS(ROOTI(NN))-1.E-5)10,10,31                        MULLER 115
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      31    GO TO(32,10),L                                          MULLER   116
      32    AXR=ALP1R                                               MULLER   117
            AXI=-ALP1I                                              MULLER   118
            ALP1I=-ALP1I                                            MULLER   119
            M=5                                                     MULLER   120
            GO TO 99                                                MULLER   121
      33    BET1R=TEMR                                              MULLER   122
            BET1I=TEMI                                              MULLER   123
            AXR=ALP2R                                               MULLER   124
            AXI=-ALP2I                                              MULLER   125
            ALP2I=-ALP2I                                            MULLER   126
            M=6                                                     MULLER   127
            GO TO 99                                                MULLER   128
      34    BET2R=TEMR                                              MULLER   129
            BET2I=TEMI                                              MULLER   130
            AXR=ALP3R                                               MULLER   131
            AXI=-ALP3I                                              MULLER   132
            ALP3I=-ALP3I                                            MULLER   133
            L=2                                                     MULLER   134
            M=3                                                     MULLER   135
      99    TEMR=COE(1)                                             MULLER   136
            TEMI=0.0                                                MULLER   137
            DO100I=1,N1                                             MULLER   138
            TE1=TEMR*PTR-TEMI*AXI                                   MULLER   139
            TEMI=TEMI*AXR+TEMR*AXI                                  MULLER   140
      100   TEMR=      TE1+COE(I+1)                                 MULLER   141
            HELL=TEMR                                               MULLER   142
            BELL=TEMI                                               MULLER   143
      42    IF(N4)102,103,102                                       MULLER   144
      102   DO101I=1,N4                                             MULLER   145
            TEM1=AXR-ROOTR(I)                                       MULLER   146
            TEM2=AXI-ROOTI(I)                                       MULLER   147
            TE1=TEM1*TEM1+TEM2*TEM2                                 MULLER   148
            TE2=(TEMR*TEM1+TEMI*TEM2)/TE1                           MULLER   149
            TEMI=(TEMI*TEM1-TEMR*TEM2)/TE1                          MULLER   150
      101   TEMR=TE2                                                MULLER   151
      103   GO TO(11,12,13,15,33,34),M                              MULLER   152
      37    RETURN                                                  MULLER   153
            END                                                     MULLER   154
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      SUBROUTINE OUTPUT(K2)                                                  OUTPUT     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                              CVARB      2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                               CVARB      3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                       CVARB      4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4     PVARB      2
     *1) ,                                                                   PVARB      3
     *      RO8(41)    , RO8Z(41) , VINF(41) , WINF(41) ,                    PVARB      4
     *      RO8PH(41)  ,            R8(41)   , R8Z(41)  , R8PH(41) ,        PVARB      5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDP(41) , ACT(41)  ,        PVARB      6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,        PVARB      7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)        PVARB      8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),CETA,TP(24)      IDVARB     2
      COMMON/SVARB/T,Z     , PHI    , DT     , DZ     , DPHI   , ZINT  ,    SVARB      2
     *      ZEND  , PI    , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,        SVARB      3
     *      TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPHNT , DZDT  ,        SVARB      4
     *      DZDPH , ZM    , TM4D  , TMLD  , TMW   , TML   , TTMW  ,        SVARB      5
     *      TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,        SVARB      6
     *      NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHP2 , NPHM3 ,        SVARB      7
     *      NT    , NT1   , NT2   , NT3   , PHIFD , NCONE , RADI  ,        SVARB      8
     *      PHIF  , METHOD, LAG   , NBC   , PINF  , RHOIN , UINF  ,        SVARB      9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANOM                         SVARB      10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                        SVARB      11
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF        REALG      2
     *,V1INF,NITAKS,NWROUT                                                   REALG      3
      COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRRTO,WRGX     CONRG      2
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTOSOS                 ENTRO      2
      COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)                               CLUSTR     2
      DIMENSION YS(41)                                                       OUTPUT     11
      DIMENSION FCUT(100),XX(814),YY(814),ZZ(814)                            OUTPUT     12
      INTEGER CARDNO                                                         OUTPUT     13
      IF (NREAL.EQ.0) GO TO 17                                               OUTPUT     14
      IF (NWROUT.EQ.0) GO TO 17                                              OUTPUT     15
      IF ((P1INF.EQ.P1INFP).AND.(R1INF.EQ.R1INFP).AND.(V1INF.EQ.V1INFP))     OUTPUT     16
     1GO TO 17                                                               OUTPUT     17
      P1INFP=P1INF                                                           OUTPUT     18
      R1INFP=R1INF                                                           OUTPUT     19
      V1INFP=V1INF                                                           OUTPUT     20
      CALL RGAS(P1INF,R1INF,AWRFS,HWRFS,TWRFS,SWRFS,GASCON,WRGX,-1,4,2)      OUTPUT     21
      HTWRFS=HWRFS+(V1INF**2)*0.5                                            OUTPUT     22
      VMAXH=SQRT(ABS(HTWRFS)*2.0)                                            OUTPUT     23
      PSTAG=PGAS(HTWRFS,SWRFS,0.)                                            OUTPUT     24
      RSTAG=PSTAG*GAMMA/((GAMMA-1.)*VMAXH**2)                                OUTPUT     25
   17 CONTINUE                                                               OUTPUT     26
      GO TO (1,2,3,4,5,6,14,15,19),K2                                        OUTPUT     27
    1 CONTINUE                                                               OUTPUT     28
C                                                                            OUTPUT     29
C..OUTPUT INITIAL INPUT DATA                                                 OUTPUT     30
C                                                                            OUTPUT     31
      WRITE(6,100) XMACH,ALPHA,GAMMA,SIGMA                                   OUTPUT     32
      WRITE(6,101) ZINT,ZEND,PHIFD                                           OUTPUT     33
      WRITE (6,102) NIT,NIPHI,ICONST(2),NITER,NPHNT,ICONST(4),NCONE,         OUTPUT     34
     *NWRPRT,NREAL                                                           OUTPUT     35
      WRITE(6,103) DZDT,CONST(4),CONST(5)                                    OUTPUT     36
      WRITE(6,104) DISK1,DISK2,TAPE1,TAPE2                                   OUTPUT     37
      WRITE(6,115) CONST(9),METHOD,NBC,RK,RJ                                 OUTPUT     38
      IF (NREAL.EQ.-1)                WRITE (6,123) P1INF,R1INF,V1INF        OUTPUT     39
     1,BODYH,BODYS                                                           OUTPUT     40
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```
      IF (NREAL.EQ.-1) WRITE (6,126) PSTAG,RSTAG,VMAXH,HWRFS,SWRFS      OUTPUT    41
      WRITE(6,116) PINF,RHOIN,QINF                                      OUTPUT    42
60    WRITE (6,128) GASCON                                              OUTPUT    43
      DO 16 K=3,NPHI                                                    OUTPUT    44
      PHI=PHIP(K)*RADI                                                  OUTPUT    45
      IF (NREAL.EQ.0)   WRITE (6,117) K,PHI,UINF,VINF(K),WINF(K)        OUTPUT    46
      IF (NREAL.EQ.-1)  WRITE (6,124) K,PHI,UINF,VINF(K),WINF(K)        OUTPUT    47
65  16  CONTINUE                                                        OUTPUT    48
      GO TO 7                                                           OUTPUT    49
    2 CONTINUE                                                          OUTPUT    50
    C                                                                   OUTPUT    51
    C..OUTPUT ALL FLOW FIELD VARIABLES                                  OUTPUT    52
70  C                                                                   OUTPUT    53
      I=0                                                               OUTPUT    54
      DO 9 K=3,NPHI                                                     OUTPUT    55
      PHI=PHIP(K)*RADI                                                  OUTPUT    56
      WRITE(6,105) K,PHI,Z                                              OUTPUT    57
75    IF (NREAL.EQ.0) WRITE (6,106)                                     OUTPUT    58
      IF (NREAL.EQ.-1) WRITE (6,127)                                    OUTPUT    59
      DO 10 J=3,NT2                                                     OUTPUT    60
      T=XI(J)                                                           OUTPUT    61
      R=T*(ROB(K)-RB(K))+RB(K)                                          OUTPUT    62
80    I=I+1                                                             OUTPUT    63
      XX(I)=R*SIN(PHIP(K))                                              OUTPUT    64
      YY(I)=-R*COS(PHIP(K))                                             OUTPUT    65
      ZZ(I)=RHO(J,K)                                                    OUTPUT    66
      IF (NREAL.EQ.-1) GO TO 20                                         OUTPUT    67
85    GOO=GAM(1)*P(J,K)/RHO(J,K)                                        OUTPUT    68
      IF(GOO) 8,8,13                                                    OUTPUT    69
    8 CONTINUE                                                          OUTPUT    70
      GOO=-GOO                                                          OUTPUT    71
      WRITE(6,113)                                                      OUTPUT    72
90  13  CONTINUE                                                        OUTPUT    73
      SPSND=SQRT(GOO)                                                   OUTPUT    74
      ENTRO=ALOG(ABS(P(J,K)/RHO(J,K)**GAMMA))                           OUTPUT    75
      QSQ=U(J,K)**2+V(J,K)**2+W(J,K)**2                                 OUTPUT    76
      ENTH=1.0-QSQ                                                      OUTPUT    77
95    WRITE(6,107) J,R,P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),ENTRO,SPSND, OUTPUT    78
     *T,ENTH                                                            OUTPUT    79
      GO TO 21                                                          OUTPUT    80
   20 IF (NWROUT.EQ.1) GO TO 18                                         OUTPUT    81
      CALL PGAS(P(J,K),RHO(J,K),SPSND,ENTH,TEM,ENTRO,GASCON,WPGX,-1,4,2) OUTPUT    82
100   ENTRO=ENTRO/GASCON                                                OUTPUT    83
      ENTH=ENTH/GOOYH                                                   OUTPUT    84
      UMA=U(J,K)/SPSND                                                  OUTPUT    85
      VMA=V(J,K)/SPSND                                                  OUTPUT    86
      WMA=W(J,K)/SPSND                                                  OUTPUT    87
105   COMP=P(J,K)/(GASCON*TEM *RHO(J,K))                                OUTPUT    88
      TEMP=TEM /1.8                                                     OUTPUT    89
      WRITE (6,125) J,R,P(J,K),RHO(J,K),TEMP,UMA,VMA,WMA,ENTRO,SPSND,T, OUTPUT    90
     1ENTH,COMP                                                         OUTPUT    91
      GO TO 21                                                          OUTPUT    92
110   18  CONTINUE                                                      OUTPUT    93
      XP=P(J,K)/PSTAG                                                   OUTPUT    94
      XR=RHO(J,K)/RSTAG                                                 OUTPUT    95
      XU=U(J,K)/VMAXH                                                   OUTPUT    96
      XV=V(J,K)/VMAXH                                                   OUTPUT    97
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      XW=W(J,K)/VMAXH                                                   OUTPUT    98
      WRITE (6,125) J,R,XP,XR,TEMP,XU,XV,XW,ENTRO,SPSND,T,ENTH          OUTPUT    99
21    CONTINUE                                                          OUTPUT   100
10    CONTINUE                                                          OUTPUT   101
9     CONTINUE                                                          OUTPUT   102
C.....CALL JOE MULLENSS PRINTER PLOT                                    OUTPUT   103
      KMAX=(NPHI-3)+1                                                   OUTPUT   104
      JMAX=(NT2-3)+1                                                    OUTPUT   105
      KJMAX=KMAX*JMAX                                                   OUTPUT   106
      CALL ARPLOT(ZZ,XX,YY,1,3,20,KJMAX,FCUT,50,50)                     OUTPUT   107
      GO TO 7                                                           OUTPUT   108
3     CONTINUE                                                          OUTPUT   109
C                                                                       OUTPUT   110
C..STORE DATA ON TAPE FOR DATA REDUCTION PROGRAM                        OUTPUT   111
C                                                                       OUTPUT   112
      WRITE(9) Z,NT2,NPHI2,RK,RJ,PHIFD,((P(J,K),RHO(J,K),U(J,K),V(J,K),W OUTPUT   113
     *(J,K),J=1                                                         OUTPUT   114
     *,NT2),RB(K),RBZ(K),RBPH(K),RS(K),RSZ(K),RSPHI(K),K=1,NPHI2)       OUTPUT   115
      GO TO 7                                                           OUTPUT   116
4     CONTINUE                                                          OUTPUT   117
C                                                                       OUTPUT   118
C..STORE DATA ON DISK 1 OR 2                                            OUTPUT   119
C                                                                       OUTPUT   120
      REWIND 12                                                         OUTPUT   121
      WRITE(12) XMACH,ALPHA,GAMMA,NIT,NIPHI,NREAL,P1INF,R1INF,V1INF,GASC OUTPUT   122
     *ON,RK,PHIFD,RJ                                                    OUTPUT   123
      WRITE(12) Z,((P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),K=3,NPHI ),J=3, OUTPUT   124
     *NT2),(RS(K),RSZ(K),RSPHI(K),K=3,NPHI)                             OUTPUT   125
      END FILE 12                                                       OUTPUT   126
      REWIND 12                                                         OUTPUT   127
      WRITE(6,112)                                                      OUTPUT   128
      GO TO 7                                                           OUTPUT   129
14    CONTINUE                                                          OUTPUT   130
      REWIND 11                                                         OUTPUT   131
      WRITE(11) XMACH,ALPHA,GAMMA,NIT,NIPHI,NREAL,P1INF,R1INF,V1INF,GASC OUTPUT   132
     *ON,RK,PHIFD,RJ                                                    OUTPUT   133
      WRITE(11) Z,((P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),K=3,NPHI ),J=3, OUTPUT   134
     *NT2),(RS(K),RSZ(K),RSPHI(K),K=3,NPHI)                             OUTPUT   135
      END FILE 11                                                       OUTPUT   136
      REWIND 11                                                         OUTPUT   137
      WRITE(6,114)                                                      OUTPUT   138
      GO TO 7                                                           OUTPUT   139
C                                                                       OUTPUT   140
C..STORE DATA ON PUNCHED CARDS FOR RESTART CAPABILITY                   OUTPUT   141
C                                                                       OUTPUT   142
15    CONTINUE                                                          OUTPUT   143
      CARDNO=0                                                          OUTPUT   144
      CARDNO=CARDNO+1                                                   OUTPUT   145
      WRITE (7,132) XMACH,ALPHA,GAMMA,RK,PHIFD,CARDNO                   OUTPUT   146
      WRITE(7,132) RJ                                                   OUTPUT   147
      CARDNO=CARDNO+1                                                   OUTPUT   148
      WRITE (7,122) NIT,NIPHI,NREAL,P1INF,R1INF,V1INF,GASCON,CARDNO     OUTPUT   149
      CARDNO=CARDNO+1                                                   OUTPUT   150
      WRITE(7,119) Z,CARDNO                                             OUTPUT   151
      DO 30 J=3,NT2                                                     OUTPUT   152
      DO 30 K=3,NPHI                                                    OUTPUT   153
      CARDNO=CARDNO+1                                                   OUTPUT   154
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                WRITE (7,120) P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),CARDNO          OUTPUT  155
          30    CONTINUE                                                           OUTPUT  156
                DO 31 K=3,NPHI                                                     OUTPUT  157
      175       CARDNO=CARDNO+1                                                    OUTPUT  158
                WRITE (7,121) RS(K),RSZ(K),RSPHI(K),CARDNO                         OUTPUT  159
          31    CONTINUE                                                           OUTPUT  160
                END FILE 7                                                         OUTPUT  161
                REWIND 7                                                           OUTPUT  162
      180       C                                                                  OUTPUT  163
                C                                                                  OUTPUT  164
                WRITE(6,118)                                                       OUTPUT  165
                GO TO 7                                                            OUTPUT  166
          5     CONTINUE                                                           OUTPUT  167
      185       C                                                                  OUTPUT  168
                C..OUTPUT SURFACE FLOW VARIABLES                                   OUTPUT  169
                C                                                                  OUTPUT  170
                XL=Z/ZEND                                                          OUTPUT  171
                WRITE(6,108) Z,XL,DZDT,ICONST(5)                                   OUTPUT  172
      190       PART=1                                                             OUTPUT  173
                DO 11 K=3,NPHI                                                     OUTPUT  174
                PHI=PHIP(K)*RADI                                                   OUTPUT  175
                UMA=U(3,K)                                                         OUTPUT  176
                VMA=V(3,K)                                                         OUTPUT  177
      195       WMA=W(3,K)                                                         OUTPUT  178
                IF (NREAL.NE.-1) GO TO 23                                          OUTPUT  179
                POPI=P(3,K)/P1INF                                                  OUTPUT  180
                CP=2.0/(GAMMA*XMACH**2)*(POPI-1.0)                                 OUTPUT  181
                RORI=RHO(3,K)/R1INF                                                OUTPUT  182
      200       CALL RGAS(P(3,K),RHO(3,K),C,ENTH,TEM,ENTRO,GASCON,WRGX,-1,4,2)     OUTPUT  183
                RT=GASCON*TEM                                                      OUTPUT  184
                TEMPK=TEM/1.8                                                      OUTPUT  185
                PART=P(3,K)/(RHO(3,K)*RT)                                          OUTPUT  186
                HRT=ENTH/BODYH                                                     OUTPUT  187
      205       GO TO 24                                                           OUTPUT  188
          23    CONTINUE                                                           OUTPUT  189
                POPI=P(3,K)/PINF                                                   OUTPUT  190
                CP=2.0/(GAMMA*XMACH**2)*(POPI-1.0)                                 OUTPUT  191
                RORI=RHO(3,K)/RHOIN                                                OUTPUT  192
      210       POVERR=P(3,K)/RHO(3,K)                                             OUTPUT  193
                QSQ=UMA**2+VMA**2+WMA**2                                           OUTPUT  194
                HRT=1.0-QSQ                                                        OUTPUT  195
                C=SQRT(GAM(1)*ABS(POVERR))                                         OUTPUT  196
                ENTRO=ALOG(ABS(P(3,K))/RHO(3,K)**GAMMA)                            OUTPUT  197
      215       IF (GASCON.NE.0.0) TEMPK=POVERR/GASCON                             OUTPUT  198
          24    CONTINUE                                                           OUTPUT  199
                UMA=UMA/C                                                          OUTPUT  200
                VMA=VMA/C                                                          OUTPUT  201
                WMA=WMA/C                                                          OUTPUT  202
      220       WRITE (6,109) PHI,RB(K),CP,POPI,RORI,UMA,VMA,WMA,C,PART,HRT,TEMPK, OUTPUT  203
                1ENTRO                                                             OUTPUT  204
          11    CONTINUE                                                           OUTPUT  205
                GO TO 7                                                            OUTPUT  206
          6     CONTINUE                                                           OUTPUT  207
      225       C                                                                  OUTPUT  208
                C..OUTPUT SHOCK LOCATION                                           OUTPUT  209
                C                                                                  OUTPUT  210
                WRITE(6,110) Z                                                     OUTPUT  211
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                DO 12 K=3,NPHI                                                    OUTPUT  212
230             PHI=PHIP(K)*RADI                                                  OUTPUT  213
                WRITE(6,111) PHI,RB(K),RBZ(K),RBPH(K),ROB(K),ROBZ(K),ROBPH(K)     OUTPUT  214
             12 CONTINUE                                                          OUTPUT  215
                GO TO 7                                                           OUTPUT  216
             19 CONTINUE                                                          OUTPUT  217
235          C                                                                    OUTPUT  218
             C..PUNCH DATA CARDS FOR 3-D S-O-S CODE                               OUTPUT  219
             C                                                                    OUTPUT  220
                READ(5,135) XMACHI,XLAMDD                                         OUTPUT  221
            135 FORMAT(2F10.5)                                                    OUTPUT  222
240             PIN=1.0                                                           OUTPUT  223
                RIN=1.0                                                           OUTPUT  224
                READ(11) XMACHO,ALPHAO,G,NIT,NIPHI,NR,P1,R1,Q1,GA,RK,PHIFD,RJ     OUTPUT  225
                AIN=SQRT(G)                                                       OUTPUT  226
                QIN=XMACHO*AIN                                                    OUTPUT  227
245             READ(11) Z,((P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),K=3,NPHI),      OUTPUT  228
               * J=3,NT2),(RS(K),RSZ(K),RSPHI(K),K=3,NPHI)                        OUTPUT  229
                P3OP1=(2.0*G*XMACHI**2-(G-1.0))/(G+1.0)                           OUTPUT  230
                R3OR1=(G+1.0)*XMACHI**2/((G-1.0)*XMACHI**2+2.0)                   OUTPUT  231
                A3OA1=SQRT(P3OP1/R3OR1)                                           OUTPUT  232
250             JC=NT2-2                                                          OUTPUT  233
                KM=NPHI-2                                                         OUTPUT  234
                DO 22 K=3,NPHI                                                    OUTPUT  235
                KK=K-2                                                            OUTPUT  236
                DO 25 J=3,NT2                                                     OUTPUT  237
255             JJ=J-2                                                            OUTPUT  238
                P(J,K)=P(J,K)/PINF*PIN                                            OUTPUT  239
                RHO(J,K)=RHO(J,K)/RHOIN*RIN                                       OUTPUT  240
                U(J,K)=U(J,K)/QINF*QIN                                            OUTPUT  241
                V(J,K)=V(J,K)/QINF*QIN                                            OUTPUT  242
260             W(J,K)=W(J,K)/QINF*QIN                                            OUTPUT  243
                EO(1,JJ,KK)=RHO(J,K)                                              OUTPUT  244
                EO(2,JJ,KK)=RHO(J,K)*U(J,K)                                       OUTPUT  245
                EO(3,JJ,KK)=RHO(J,K)*V(J,K)                                       OUTPUT  246
                EO(4,JJ,KK)=RHO(J,K)*W(J,K)                                       OUTPUT  247
265          25 FO(1,JJ,KK)=P(J,K)*GAM(4)+0.5*RHO(J,K)*(U(J,K)**2+V(J,K)**2+W(J,K) OUTPUT  248
               **2)                                                               OUTPUT  249
                ROB(KK)=RS(K)                                                     OUTPUT  250
                ROBZ(KK)=RSZ(K)                                                   OUTPUT  251
             22 ROBPH(KK)=RSPHI(K)                                                OUTPUT  252
270             IF(NTDSOS.GT.1) GO TO 28                                          OUTPUT  253
                WRITE(7,133) (((EO(II,JJ,KK),II=1,4),FO(1,JJ,KK),JJ=1,JC),KK=1,KM) OUTPUT 254
                WRITE(7,134) (ROB(K),ROBZ(K),ROBPH(K),K=1,KM)                     OUTPUT  255
                GO TO 29                                                          OUTPUT  256
             28 WRITE(7) (((EO(II,JJ,KK),II=1,4),FO(1,JJ,KK),JJ=1,JC),KK=1,KM),   OUTPUT  257
275            * (ROB(K),ROBZ(K),ROBPH(K),K=1,KM)                                OUTPUT  258
             29 CONTINUE                                                          OUTPUT  259
                READ(12) XMACHN,ALPHAN,G,NIT,NIPHI,NR,P3,R3,Q3,GA,RK,PHIFD,RJ     OUTPUT  260
                READ(12) Z,((P(J,K),RHO(J,K),U(J,K),V(J,K),W(J,K),K=3,NPHI),      OUTPUT  261
               * J=3,NT2),(RS(K),RSZ(K),RSPHI(K),K=3,NPHI)                        OUTPUT  262
280             AA=1.0+GAM(1)*XMACHN**2                                           OUTPUT  263
                BB=AA-1.0                                                         OUTPUT  264
                PINF4=1.0/AA**GAM(3)                                              OUTPUT  265
                RINF4=1.0/AA**GAM(4)                                              OUTPUT  266
                QINF4=SQRT(BB/AA)                                                 OUTPUT  267
285             AINF4=SQRT(GAM(1)*(1.0-QINF4**2))                                 OUTPUT  268
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                DO 26 K=3,NPHI                                                    OUTPUT  269
                KK=K-2                                                            OUTPUT  270
                DO 27 J=3,NT2                                                     OUTPUT  271
                JJ=J-2                                                            OUTPUT  272
290             P(J,K)=P(J,K)/PINF4*P30P1*PIN                                     OUTPUT  273
                RHO(J,K)=RHO(J,K)/RINF4*R30R1*RIN                                 OUTPUT  274
                U(J,K)=U(J,K)/AINF4*A30A1*AIN                                     OUTPUT  275
                V(J,K)=V(J,K)/AINF4*A30A1*AIN                                     OUTPUT  276
                W(J,K)=W(J,K)/AINF4*A30A1*AIN                                     OUTPUT  277
295             EO(1,JJ,KK)=RHO(J,K)                                              OUTPUT  278
                EO(2,JJ,KK)=RHO(J,K)*U(J,K)                                       OUTPUT  279
                EO(3,JJ,KK)=RHO(J,K)*V(J,K)                                       OUTPUT  280
                EO(4,JJ,KK)=RHO(J,K)*W(J,K)                                       OUTPUT  281
             27 FO(1,JJ,KK)=P(J,K)*GAM(4)+0.5*RHO(J,K)*(U(J,K)**2+V(J,K)**2+W(J,K) OUTPUT  282
300            **2)                                                              OUTPUT  283
                ROB(KK)=RS(K)                                                     OUTPUT  284
                ROBZ(KK)=RSZ(K)                                                   OUTPUT  285
             26 ROBPH(KK)=RSPHI(K)                                                OUTPUT  286
                IF(NTOSOS.GT.1) GO TO 32                                          OUTPUT  287
305             WRITE(7,133) (((EO(II,JJ,KK),II=1,4),FO(1,JJ,KK),JJ=1,JC),KK=1,KM) OUTPUT 288
                WRITE(7,134) (ROB(K),ROBZ(K),ROBPH(K),K=1,KM)                     OUTPUT  289
                GO TO 33                                                          OUTPUT  290
             32 WRITE(7) (((EO(II,JJ,KK),II=1,4),FO(1,JJ,KK),JJ=1,JC),KK=1,KM),   OUTPUT  291
               * (ROB(K),ROBZ(K),ROBPH(K),K=1,KM)                                 OUTPUT  292
310          33 CONTINUE                                                          OUTPUT  293
                R4=RHO(3,NPHI)                                                    OUTPUT  294
                P4=P(3,NPHI)                                                      OUTPUT  295
                Q4=SQRT(U(3,NPHI)**2+V(3,NPHI)**2)                                OUTPUT  296
                A4=SQRT(GAM(4)*P4/R4)                                             OUTPUT  297
315             ZSTAT=(Q4-A4)*COS(SIGM)                                           OUTPUT  298
                XLAMD=XLAMDD/RADI                                                 OUTPUT  299
                ZMIN1=ZSTAT*(1.0-TAN(SIGM)*TAN(XLAMD))                            OUTPUT  300
                Q1=XMACHC*SQRT(GAMMA)                                             OUTPUT  301
                ALPH=ALPHAD/RADI                                                  OUTPUT  302
320             SALF=SIN(ALPH)                                                    OUTPUT  303
                CALF=COS(ALPH)                                                    OUTPUT  304
                SLAM=SIN(XLAMD)                                                   OUTPUT  305
                CLAM=COS(XLAMD)                                                   OUTPUT  306
                Q1I=XMACHI*SQRT(GAMMA)                                            OUTPUT  307
325             U1S=Q1*SALF-Q1I*SLAM                                              OUTPUT  308
                W1S=Q1*CALF+Q1I*CLAM                                              OUTPUT  309
                Q1S=SQRT(U1S**2+W1S**2)                                           OUTPUT  310
                XKAPA=ALPH+ATAN(U1S/W1S)                                          OUTPUT  311
                Z1S=Q1S*COS(XKAPA)/CLAM                                           OUTPUT  312
330             WRITE(6,129) XMACHI,XLAMDD,ZMIN1,Z1S                              OUTPUT  313
            129 FORMAT(* STARTING SOLUTION GENERATED FOR 3-D S-O-S CODE*/* MACHI=* OUTPUT  314
               * ,F6.2/* LAMBDA=*,F6.2/* ZMIN=*,F6.2/* Z1S=*,F6.2)                OUTPUT  315
            133 FORMAT(5E15.7)                                                    OUTPUT  316
            134 FORMAT(6E13.6)                                                    OUTPUT  317
335         7   CONTINUE                                                          OUTPUT  318
            100 FORMAT(1H1,5X,7HMACH = ,F9.6/6X,8HALPHA = ,F9.6/6X,8HGAMMA = ,F5.3 OUTPUT 319
               */6X,8HSIGMA =  ,F5.2)                                             OUTPUT  320
            101 FORMAT(1HO,5X,12HZ-INITIAL = ,F7.2/6X,10HZ-FINAL = ,F9.2/6X,11HPHI OUTPUT 321
               *-ZERO =  ,F6.2)                                                   OUTPUT  322
340         102 FORMAT(1HO,5X,6HNIT = ,I2/6X,8HNIPHI = ,I2/6X,15HMETHOD ORDER = ,I OUTPUT 323
               *1                                                                 OUTPUT  324
               */6X,8HNITER = ,I4/6X,8HNPRNT = ,I1/6X,8HIPRNT = ,I1/6X,8HNCONE = , OUTPUT 325
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     *I1./6X,7HNWRPRT=,I2./6X,7HNREAL = ,I2)                                OUTPUT   326
 103  FORMAT(1HO,5X,8HDZ/DT = ,F6.3,10H INITIALLY /6X,10HDELTA-X =  F6.3    OUTPUT   327
345  *,/6X,                                                                 OUTPUT   328
     *10HDELTA-Y = ,F6.3)                                                   OUTPUT   329
 104  FORMAT(1HO,5X,8HDISK1 = ,I1/6X,8HDISK2 = ,I1/6X,8HTAPE1 = ,I1/        OUTPUT   330
     *6X,8HTAPE2 = ,I1)                                                     OUTPUT   331
 105  FORMAT(1HO,48X,2HK=,I2.3X,6H PHI =,F5.1,3X,4HZ = ,F10.6)              OUTPUT   332
350  106  FORMAT(1HO,1X,1HJ,3X,1CH     R       , 8X,1HP,11X,3HRHO,11X,1HU,12X,1 OUTPUT   333
     *HV,12X,1HW,6X,11H(S-SINF)/CV, 8X,1HA,6X,5H - T   ,7X,4HH/HT ,/)       OUTPUT   334
 107  FORMAT(1X,I3,0PF13.8,2(1PE13.5),5(0PF13.8),0PF8.4,2X,0PF7.4)          OUTPUT   335
 108  FORMAT(1HO,15X,29HSURFACE FLOW VARIABLES AT Z =,F10.6/10X,6HX/L =      OUTPUT   336
     *F                                                                     OUTPUT   337
355  *10.6,5X,5HDZDT=,F10.6,5X,5HITER=,I5//3X,3HPHI,4X,                     OUTPUT   338
     *2HRB,7X,2HCP,7X,6HP/PINF,7X,6HR/RINF,7X,3HM-Z,7X,3HM-R,6X,5HM-PHI,    OUTPUT   339
     *9X,1HA,8X,4HCOMP ,4X,4HH/HT,5X,4HTEMP,4X,12H(S-S.INF)/CV/)            OUTPUT   340
 109  FORMAT(1H ,0PF5.1,1X,0PF9.4,1X,0PF7.4,1X,1PE11.4,2X,1PE11.4,2X,       OUTPUT   341
     *0PF8.4,2X,0PF8.4,2X,0PF8.4 ,2X,1PE11.4,1X,0PF7.4,1X,0PF8.5,1X,        OUTPUT   342
360  *0PF9.2,1X,1PE11.4)                                                    OUTPUT   343
 110  FORMAT(1HO,10X,30HBODY AND SHOCK GEOMETRY AT Z = ,F6.3,//6X,3HPHI,     OUTPUT   344
     *9X                                                                    OUTPUT   345
     *,2HRB,8X,6HDRB/DZ,5X,8HDRB/DPHI,7X,2HRS,8X,6HDRS/DZ,5X,8HDRS/DPHI)    OUTPUT   346
 111  FORMAT(1H ,4X,F5.1,3X,F9.4,5X,F7.4,3X,F9.4,4X,F9.4,4X,F7.4,3X,F9.4     OUTPUT   347
365  *)                                                                     OUTPUT   348
 112  FORMAT(1HO,34HFLOW FIELD DATA IS STORED ON DISK1)                      OUTPUT   349
 113  FORMAT(1H ,38HERROR CHECK - SPEED OF SOUND IN OUTPUT)                  OUTPUT   350
 114  FORMAT(1HO,34HFLOW FIELD DATA IS STORED ON DISK2)                      OUTPUT   351
 115  FORMAT(1HO,5X,27HPERCENT OF MAX. STEPSIZE = ,F4.2/6X,8HMETHOD = ,I    OUTPUT   352
370  *2                                                                     OUTPUT   353
     *//6X,12HBND. COND. = ,I2/6X,5HBETA=,F5.2/6X,6HOMEGA=,F6.3)             OUTPUT   354
 116  FORMAT(1HO,5X,7HPINF = ,E15.6,5X,8HRHOIN = ,E15.6,5X,7HQINF = ,        OUTPUT   355
     *E15.6)                                                                OUTPUT   356
 117  FORMAT(1H ,5X,4HK = ,I2,5X,4HPHI=,F10.6,5X5HUINF=,F10.6,5X,5HVINF=     OUTPUT   357
375  *,F10.6,5X,5HWINF=,F10.6)                                              OUTPUT   358
 118  FORMAT(1HO,31HDATA IS STORED ON PUNCHED CARDS)                         OUTPUT   359
 119  FORMAT(1PE15.6,61X,I4)                                                 OUTPUT   360
 120  FORMAT(5(1PE15.6),1X,I4)                                               OUTPUT   361
 121  FORMAT(3(1PE15.6),31X,I4)                                              OUTPUT   362
380  122  FORMAT(3I5,4(1PE15.6),1X,I4)                                       OUTPUT   363
 123  FORMAT(1HO,12HP(LBS/SQFT)=,1PE13.6,1X,16HRHO(SLUGS/CUFT)=,1PE13.6,     OUTPUT   364
     *1X,                                                                   OUTPUT   365
     114HV1INF(FT/SEC)=1PE13.6,1X,6HBODYH=,1PE11.4,1X,6HBODYS=,             OUTPUT   366
     21PE11.4)                                                              OUTPUT   367
385  124  FORMAT(1H ,5X,4HK = ,I2,5X,4HPHI=,F10.6,5X,5HUINF=,E13.6,5X,5HVINF OUTPUT   368
     *=,E13.6,5X,5HWINF=,E13.6)                                             OUTPUT   369
 125  FORMAT(1H ,I3,1X,0PF9.5,1X,1PE12.5,1X,1PE12.5,1X,0PF9.2,1X,0PF9.5,     OUTPUT   370
     *1X,0PF9.5,1X,0PF9.5,1X,0PF9.4,1X,1PE12.5,1X,0PF8.4,1X,0PF8.5,1X,      OUTPUT   371
     *0PF7.4)                                                               OUTPUT   372
390  126  FORMAT(1HO,5X,40HFREE STREAM NORMALIZATION CONSTANTS - P=,1PE12.5,  OUTPUT   373
     11X,2HR=,1PE12.5,1X,7HVMAX.A=,1PE12.5,1X,2HM=,1PE12.5,1X,2HS=,         OUTPUT   374
     21PE12.5)                                                              OUTPUT   375
 127  FORMAT(1HO,1X,1HJ,5X,1HR,10X,1HP,12X,3HRHO,8X,4HTEMP,5X,6HU-MACH,     OUTPUT   376
     *4X,6HV-MACH,6X,6HW-MACH,5X,3HS/R,10X,1HA,9X,1HT,8X,4HH/HT,5X,         OUTPUT   377
395  *4HCOMP)                                                               OUTPUT   378
 128  FORMAT(1HO,5X,7HGASCON=,1PE11.4 /1H )                                  OUTPUT   379
 131  FORMAT(1H ,18HDATA STORED FOR Z=, 1PE15.7)                             OUTPUT   380
 132  FORMAT(5(1PE15.6),1X,I4)                                               OUTPUT   381
      RETURN                                                                 OUTPUT   382
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SUBROUTINE OUTPUT     76/76   OPT=1                    FTN 4.6+460      06/15/79  18.58.36      PAGE    8

400              END                                                     OUTPUT    383
```

```
      FUNCTION PGHS(H,S,M)                                                  PGHS     2
C     PROG. COMPUTES PRESSURE THAT CORRESPONDS TO A GIVEN ENERGY AND        PGHS     3
C     ENTROPY.                                                              PGHS     4
      EXTERNAL PROOT                                                        PGHS     5
      REAL M                                                                PGHS     6
      COMMON/REALG/NPEAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF       REALG    2
     *,V1INF,NITAVG,NWROUT                                                  REALG    3
      COMMON/JOIN1/HP,SP,GMACH,NEW                                          JOIN1    2
      COMMON/CONRG/PO,RO,TO,CONC,GASCON,HC,SO,AO,RTO,GX                     CONRG1   2
      LOGICAL BOL,TRN                                                       PGHS    10
      HP=H                                                                  PGHS    11
      SP=S                                                                  PGHS    12
      GMACH=M                                                               PGHS    13
      TRN=.FALSE.                                                           PGHS    14
      PH=(1.0E+3)*PO                                                        PGHS    15
      PL=(5.0E-6)*PO                                                        PGHS    16
   99 CONTINUE                                                              PGHS    17
      NEW=1                                                                 PGHS    18
      CALL ZEROIN(PL,PH,1.0E-6,PROOT ,BC ,XX,YY)                            PGHS    19
      PGHS=(XX+YY)/2.0                                                      PGHS    20
      IF (BOL) GO TO 101                                                    PGHS    21
      CALL RGAS(PGHS,RX,AX,HX,TX,SP,GASCON,GX,-1,5,2)                       PGHS    22
      HX=H/(GASCON*TX)                                                      PGHS    23
      SX=S/GASCON                                                           PGHS    24
      RX=RX/RO                                                              PGHS    25
      WRITE (6,100) HX,SX,PL,PH,M,PGHS,RX                                   PGHS    26
  100 FORMAT(1H0,18HNONCON.PGHS. H/RT=         ,1PE11.4,1X,4HS/R=,1PE11.4 PGHS    27
     *,                                                                     PGHS    28
     11X,3HPL=,1PE11.4,1X,3HPH=,1PE11.4,1X,2HM=    ,0PF7.3,1X,5HPGHS=,     PGHS    29
     21PE11.4,1X,5HR/RO=,1PE11.4)                                          PGHS    30
      IF (TRN) RETURN                                                       PGHS    31
      TRN=.TRUE.                                                            PGHS    32
      PH=(3.5E+3)*PO                                                        PGHS    33
      GO TO 99                                                              PGHS    34
  101 CONTINUE                                                              PGHS    35
      IF (NWRPRT.GE.2) GO TO 102                                            PGHS    36
      RETURN                                                                PGHS    37
  102 CONTINUE                                                              PGHS    38
      CALL RGAS(PGHS,RX,AX,HX,TX,SP,GASCON,GX,-1,5,2)                       PGHS    39
      HX=H/(GASCON*TX)                                                      PGHS    40
      SX=S/GASCON                                                           PGHS    41
      PX=PGHS/PO                                                            PGHS    42
      WRITE (6,103) H,S,M,PGHS,HX,SX,PX,TX                                  PGHS    43
  103 FORMAT(1H ,10H*PGHS-  H=,1PE11.4,1X,2HS=1PE11.4,1X,2HM=0PF7.3,1X,     PGHS    44
     13HPS=1PE11.4,1X,5HH/RT=,1PE11.4,1X,4HS/R=1PE11.4,1X,5HP/PO=1PE11.4   PGHS    45
     2,1X,2HT=,1PE11.4)                                                     PGHS    46
      RETURN                                                                PGHS    47
      END                                                                   PGHS    48
```

```
      SUBROUTINE PMANG(ANG,P1,P2,R2,LR2)                                PMANG    2
C     REINHARDT (10-6-71) --BY USE OF PRANDTL-MEYER FORMULA AND STATE   PMANG    3
C     RELATION AND GIVEN FLOW PROP AND TURNING ANGLE PROGRAM COMPUTES   PMANG    4
C     DOWN-STREAM FLOW PROP.                                            PMANG    5
      REAL MACH                                                         PMANG    6
      LOGICAL BOL                                                       PMANG    7
      COMMON/CONRG/PO,RO,TO,CONC,GASCON,HO,SO,AO,RTO,GX                 CONRG1   2
      COMMON/REALG/NREAL,NUMPRT,    M,    S,PSONIC,RSONIC,P1INF,R1INF   REALG1  2
     *,V1INF,NITAG,NUMOUT                                               REALG1   3
      DIMENSION ERROR(2),NER(2)                                         PMANG   10
      DIMENSION PTAB(250),PMTAB(250)                                    PMANG   11
      DATA ERROR(1),ERROR(2)/4HNRES,4HANG /                             PMANG   12
      DATA RADDEG/57.29578/                                             PMANG   13
      DATA HTOT,STOT/1.,1./                                             PMANG   14
      DATA MMACH/12.0/                                                  PMANG   15
      DATA NUMTAB/250/                                                  PMANG   16
      DATA I123/0/                                                      PMANG   17
      DATA RXPRE/0./                                                    PMANG   18
      IF (I123.NE.123) GO TO 87                                         PMANG   19
      IF (H.NE.HTOT.OR.S.NE.STOT) GO TO 87                              PMANG   20
      IF (ANG.EQ.0.0) GO TO 88                                          PMANG   21
      GO TO 100                                                         PMANG   22
   87 I123=123                                                          PMANG   23
      RRX=GASCON                                                        PMANG   24
      STOT=S                                                            PMANG   25
      HTOT=H                                                            PMANG   26
      IF (NUMPRT.GE.1) WRITE (6,106) ANG,H,S                            PMANG   27
  106 FORMAT(1HO,13H*PMANG ANGLE=,1PE12.5,1X,7HBODY-H=,1PE12.5,1X,7HBODY PMANG   28
     *-S=,                                                              PMANG   29
     11PE12.5)                                                          PMANG   30
   90 PXO=PGHS(H,S,1.0)                                                 PMANG   31
      PLNPRE=ALOG(PXO)                                                  PMANG   32
      PTAB(1)=PLNPRE                                                    PMANG   33
      PLNO=PLNPRE                                                       PMANG   34
      PMTAB(1)=0.0                                                      PMANG   35
      SUM=0.0                                                           PMANG   36
      CALL RGAS(PXO,RX,AX,HX,TX,STOT,RRX,GX,-1,S,2)                     PMANG   37
      IF (NUMPRT.GE.1) WRITE (6,107) PXO,RX,AX,HX,TX,STOT               PMANG   38
  107 FORMAT(2H ,10H*PMANG PS=,1PE11.4,1X,3HRS=1PE11.4,1X,3HAS=1PE11.4,1 PMANG   39
     *X,                                                                PMANG   40
     23HHS=1PE11.4,1X,3HTS=1PE11.4,1X,3HSS=1PE11.4)                     PMANG   41
      GAMEQ=AX*AX*RX/PXO                                                PMANG   42
      GGM1=GAMEQ/(GAMEQ-1.0)                                            PMANG   43
      PSONIC=PXO                                                        PMANG   44
      RSONIC=RX                                                         PMANG   45
      FPRE=HTOT-HX                                                      PMANG   46
      FO=FPRE                                                           PMANG   47
      AXO=AX                                                            PMANG   48
      HXO=HX                                                            PMANG   49
      DELP=0.05                                                         PMANG   50
      GPRE=0.0                                                          PMANG   51
      NT=0                                                              PMANG   52
      PLNPRE=PLNPRE+DELP                                                PMANG   53
   91 PLNPRE=PLNPRE-DELP                                                PMANG   54
      IF (NT.GE.NUMTAB) GO TO 96                                        PMANG   55
      PX=EXP(PLNPRE)                                                    PMANG   56
      CALL RGAS(PX ,RX,AX,HX,TX,STOT,RRX,GX,-1,S,2)                     PMANG   57
```

```
      AMACH=SQRT(ABS((HTOT-HX)*2.0))/AX
      F=HTOT-HX
      TWOF=2.0*F
      SQMACH=TWOF/(AX*AX)
      G=SQRT(ABS(SQMACH-1.0))/TWOF
      TRMSUM=(G+GPRE)*(F-FPRE)*0.5
      SUM=TRMSUM+SUM
      NT=NT+1
      PTAB(NT)=PLNPRE
      PMTAB(NT)=SUM
      IF (NWPRT.NE.2) GO TO 151
      TC=TX/1.8
      PMTABD=TRMSUM*RADDEG
      PMTABS=SUM*RADDEG
      WRITE (6,150) NT,PX,RX,AX,HX,TC,AMACH,F,G,PMTABD,PMTABS
  150 FORMAT(1H ,I3,1X,2HP=,1PE13.6,1X,2HR=,1PE10.3,1X,2HA=,1PE10.3,1X,
     12HH=,1PE10.3,1X,2HT=,0PF8.2,1X,2HM=,0PF7.3,1X,2HF=,1PE11.4,1X,2HG=
     2,1PE11.4,1X,2HO=,0PF8.5,1X,3HNU=,0PF9.4)
  151 CONTINUE
      FPRE=F
      GPRE=G
      IF (RX.EQ.RXPRE) GO TO 96
      IF (SUM*RADDEG.GT.360.0) GO TO 96
      IF (AMACH.GE.MXMACH) GO TO 96
      RXPRE=RX
      GO TO 91
C     - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   96 CONTINUE
      IF (NWPRT.EQ.0) GO TO 97
      MXMACH=AMACH
      HRAT=H/RTO
      SRAT=S/GASCON
      WRITE (6,92) HRAT,SRAT,GAMEQ,GGM1,PO,RO,TO,RRX
   92 FORMAT(1H1,31H---PRANDTL-MEYER TURNING ANG-- ,8HTOTENTH=,1PE15.7,1
     *X
     1,8HENTROPY=,1PE15.7,1X,10H(GAMMA)EQ=,1PE15.7,1X,5HCP/R=,1PE15.7
     2/1H ,3HPO=,1PE13.6,1X,3HRO=,1PE13.6,1X,3HTO=,1PE13.6,1X,8HGAS-CON=
     3,1PE13.6 /1H0,9X,4HP/PO,9X,6HPM-ANG,7X,5HDADLP, 8X,4HMACH, 9X,
     46HRHO/RO,7X,5HH/RTO, 8X,7HTEMP(K),6X,5HSOUND,8X,5HENTRO)
   93 DO 95 N1=1,NT
      P=EXP(PTAB(N1))
      CALL RGAS(P,RX,AX,HX,TX,STOT,RRX,GX,-1.5,2)
      AMACH=SQRT(ABS((HTOT-HX)*2.0))/AX
      PRAT=P/PO
      PMTABD=PMTAB(N1)*RADDEG
      RRAT=RX/RO
      HRAT=HX/RTO
      TC=TX/1.8
      CALL RGAS(P,RX,AX,HX,TX,ENTRO,RRX,GX,-1.4,2)
      IF (N1.NE.NT) DADLP=(PMTAB(N1+1)-PMTAB(N1))/(PTAB(N1+1)-PTAB(N1))
      WRITE(6,94) N1,PRAT,PMTABD,DADLP,AMACH,RRAT,HRAT,TC,AX,ENTRO
   94 FORMAT(1H ,I3,1X,9(1PE13.6))
   95 CONTINUE
   97 CONTINUE
      IF (ANG.NE.0.0) GO TO 100
   88 P2=P1
      GO TO 101
```

```
                      SUBROUTINE PMANG(P1,PSONIC,PTAB,PMTAB,NT,NZ,NY,WRMACH)                PMANG     1
                      DIMENSION PTAB(NT),PMTAB(NT),NER(2)                                   PMANG     2
                      COMMON/BLK1/ERROR(2),JMP                                              PMANG     3
                      COMMON/BLK2/P2,R2,A2,M2,T2,STOT,GX,GAMMA,GAMM1,GAMP1,GAMM2,GAMP2      PMANG     4
                      COMMON/BLK3/NWRRT                                                     PMANG     5
                      EXTERNAL RGAS                                                         PMANG     6
                      IF (P1.GT.PSONIC) GO TO 104                                           PMANG     7
                      ALNP1=ALOG(P1)                                                        PMANG     8
                      JMP=1                                                                 PMANG     9
                      CALL SEARCH(ALNP1,PTAB,1,NT,1,NZ,NER(1))                              PMANG    10
                      IF (NER(1).NE.0) GO TO 102                                            PMANG    11
                      ALNP0=PTAB(NZ)                                                        PMANG    12
                      ALNP2=PTAB(NZ+1)                                                      PMANG    13
                      ANG0=PMTAB(NZ)                                                        PMANG    14
                      ANG2=PMTAB(NZ+1)                                                      PMANG    15
                      DER1=(ALNP1-ALNP0)/(ALNP2-ALNP0)                                      PMANG    16
                      ANGZ=ANG0+(ANG2-ANG0)*DER1                                            PMANG    17
                      ANG1=ANG+ANGZ                                                         PMANG    18
                      JMP=2                                                                 PMANG    19
                      CALL SEARCH(ANG1,PMTAB,1,NT,1,NY,NER(2))                              PMANG    20
                      IF (NER(2).NE.0) GO TO 102                                            PMANG    21
                      ANG0=PMTAB(NY)                                                        PMANG    22
                      ANG2=PMTAB(NY+1)                                                      PMANG    23
                      BLNP0=PTAB(NY)                                                        PMANG    24
                      BLNP2=PTAB(NY+1)                                                      PMANG    25
                      DER2=(ANG1-ANG0)/(ANG2-ANG0)                                          PMANG    26
                      ALNPX2=BLNP0+(BLNP2-BLNP0)*DER2                                       PMANG    27
                      P2=EXP(ALNPX2)                                                        PMANG    28
                  101 CALL RGAS(P2,R2,A2,M2,T2,STOT,GAMMA,GX,-1.5,2)                        PMANG    29
                      U2=SQRT(AMAX1((HTOT-H2)*2.0))                                         PMANG    30
                      WRMACH=U2/A2                                                          PMANG    31
                      IF (NWRRT.LE.1) RETURN                                                PMANG    32
                      WRITE (6,110) DER1,ALNP0,ALNP1,ALNP2,ANG0,ANGZ,ANG2,DER2,ANG0,ANG1    PMANG    33
                     1,ANG2,BLNP0,ALNPX2,BLNP2,P2,R2,A2,M2,T2,STOT,WRMACH                   PMANG    34
                  110 FORMAT(1H ,12H*PMANG*- F-P=,OPF7.4,2X,4HLNP=3(1PE11.4,1X),2X,3HNU=    PMANG    35
                     13(1PE11.4,1X)/1H ,8X,4HF-A=OPF7.4,2X,4HANG=3(1PE11.4,1X),2X,4HLNP=    PMANG    36
                     23(1PE11.4,1X) /1H ,8X,2HP=1PE11.4,1X,2HR=1PE11.4,1X,2HA=1PE11.4,      PMANG    37
                     31X,2HM=1PE11.4,1X,2HT=1PE11.4,1X,2HS=1PE11.4,1X,2HM=1PE11.4)          PMANG    38
                      RETURN                                                                PMANG    39
                  102 CONTINUE                                                              PMANG    40
                      WRITE (6,103) ERROR(JMP),NER(JMP),PTAB(1),P1,PTAB(NT),PMTAB(1),       PMANG    41
                     1ANG1,PMTAB(NT)                                                        PMANG    42
                  103 FORMAT(1H ,34HERROR IN SEARCH FROM PMANG ROUTINE ,2X,A4,2X,I3,2X,     PMANG    43
                     125HRETURNED WITH P2=P1, ETC./1H ,5HP(1)=1PE13.6,1X,2HP=1PE13.6,1X,    PMANG    44
                     25HP(N)=1PE13.6,5X,5HA(1)=1PE13.6,1X,2HA=1PE13.6,1X,5HA(N)=1PE13.6)    PMANG    45
                      GO TO 88                                                              PMANG    46
                  104 CONTINUE                                                              PMANG    47
                      WRITE (6,105) P1,PSONIC                                               PMANG    48
                  105 FORMAT(1H ,42HENTRY PRES TO PMANG ROUTINE TOO LARGE. P1=,1PE13.6,1    PMANG    49
                     *X,                                                                    PMANG    50
                     129HIS GREATER THAN SONIC P(M,S)=,1PE13.6,1X,24HRETURNED WITH P2=P1    PMANG    51
                     *,ETC.)                                                                PMANG    52
                      GO TO 88                                                              PMANG    53
                      END                                                                   PMANG    54
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FUNCTION POLY        76/76    OPT-1                    FTN 4.6+460        06/15/79  18.58.36        PAGE     1

      C     POLY                                                                  POLY        2
            FUNCTION POLY(X,M,C,XO)                                               POLY        3
            DIMENSION C(20)                                                       POLY        4
            K=M-1                                                                 POLY        5
            SUM=C(M)                                                              POLY        6
            DO 2 I=1,K                                                            POLY        7
            I1=M-I                                                                POLY        8
            SUM=SUM*(X-XO)+C(I1)                                                  POLY        9
      2     CONTINUE                                                              POLY       10
            POLY=SUM                                                              POLY       11
            RETURN                                                                POLY       12
            END                                                                   POLY       13
```

```
FUNCTION PROOT      76/76   OPT=1                    FTN 4.6+460        06/15/79  18.58.36        PAGE     1

                FUNCTION PROOT(PX)                                                PROOT      2
                COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG      2
               *,V1INF,NITAVG,NWROUT                                              REALG      3
                COMMON/CONRG/PO,RO,TO,CONC,GASCON,HO,SO,AO,RTO,GX                 CONRG1     2
                COMMON/JOIN1/HP,SP,GMACH,NEW                                      JOIN1      2
                DATA I123/0/                                                      PROOT      6
                DATA NEWP/0/                                                      PROOT      7
                IF (NEWP.NE.NEW) NT=0                                             PROOT      8
                NEW=0                                                             PROOT      9
                NT=NT+1                                                           PROOT     10
                IF (I123.EQ.123) GO TO 99                                         PROOT     11
                NEWP=NEW                                                          PROOT     12
                I123=123                                                          PROOT     13
                NT=1                                                              PROOT     14
                RRX=GASCON                                                        PROOT     15
          99    CONTINUE                                                          PROOT     16
                CALL RGAS(PX,RX,AX,HX,TX,SP,RRX,GX,-1,5,2)                        PROOT     17
                IF (GMACH.EQ.0.0) GO TO 100                                       PROOT     18
                VEL=AX*GMACH                                                      PROOT     19
                ENG=VEL*VEL*0.5                                                   PROOT     20
                PROOT=(HP-HX)/ENG-1.0                                             PROOT     21
                IF (NWRPRT.GE.2) GO TO 102                                        PROOT     22
                RETURN                                                            PROOT     23
         100    IF (HP.EQ.0.0) GO TO 101                                          PROOT     24
                PROOT=(HP-HX)/HP                                                  PROOT     25
                IF (NWRPRT.GE.2) GO TO 102                                        PROOT     26
                RETURN                                                            PROOT     27
         101    PROOT=HX                                                          PROOT     28
                IF (NWRPRT.GE.2) GO TO 102                                        PROOT     29
                RETURN                                                            PROOT     30
         102    CONTINUE                                                          PROOT     31
                TX=TX/1.8                                                         PROOT     32
                PRAT=PX/PO                                                        PROOT     33
                RRAT=RX/RO                                                        PROOT     34
                WRITE (6,103) NT,PX,PRAT,VEL,HP,HX,PROOT,RRAT,SP                  PROOT     35
         103    FORMAT(1H ,7H*PROOT-,I2,1X,2HT=,1PE11.4,1X,5HP/PO=,1PE11.4,1X,    PROOT     36
               12HV=,1PE11.4,1X,3HHP=,1PE11.4,1X,2HH=,1PE11.4,1X,2HF=,1PE11.4,1X, PROOT     37
               25HR/RO=,1PE11.4,1X,2HS=,1PE11.4)                                  PROOT     38
                RETURN                                                            PROOT     39
                END                                                               PROOT     40
```

```
      FUNCTION PROOT1(U)                                                PROOT1     2
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG      2
     *,V1INF,NITAVG,NWROUT                                              REALG      3
      COMMON/WRDKOD/AWR,BWR,CWR,DWR,UWR,VWR,WWR,PWR,RHOWR,WRC1,NEWR,NTAL WRDKOD    2
      COMMON/WRDK02/AX,HX,TX,SX                                         WRDK02     2
      COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRRTO,WRGX CONRG     2
      UWR=U                                                             PROOT1     7
      PWR=BWR-AWR*UWR                                                   PROOT1     8
      IF (PWR.LE.0.0) GO TO 102                                         PROOT1     9
      RHOWR=AWR/UWR                                                     PROOT1    10
      NUMX=-2                                                           PROOT1    11
      IF (NTAL.GT.400) NUMX=2                                           PROOT1    12
      CALL RGAS(PWR,RHOWR,AX,HX,TX,SX,GASCON,WRGX,-1,NUMX,2)            PROOT1    13
   99 PROOT1=WRC1-HX-UWR*UWR*0.5                                        PROOT1    14
      NTAL=NTAL+100                                                     PROOT1    15
      IF (NEWR.NE.1) GO TO 103                                          PROOT1    16
      AX=0.0                                                            PROOT1    17
      NTAL=100                                                          PROOT1    18
      NEWR=0                                                            PROOT1    19
  103 CONTINUE                                                          PROOT1    20
      IF (NEWR.EQ.2) GO TO 100                                          PROOT1    21
      IF (NWRPRT.EQ.0) RETURN                                           PROOT1    22
      IF (NWRPRT.NE.4) RETURN                                           PROOT1    23
      USQ=U*U*.5                                                        PROOT1    24
      ENTHC=WRC1-USQ                                                    PROOT1    25
      CALL RGAS(PWR,RHOWR,AX,HX,TX,SX,GASCON,WRGX,-1,4,2)               PROOT1    26
      NTXX=NTAL/100                                                     PROOT1    27
      PZ=PWR/WRPO                                                       PROOT1    28
      RHOZ=RHOWR/WRRO                                                   PROOT1    29
      HZ=HX/(TX*GASCON)                                                 PROOT1    30
      SZ=SX/GASCON                                                      PROOT1    31
      TZ=TX/1.8                                                         PROOT1    32
      IF(AWR.NE.0.0) UHI=BWR/AWR                                        PROOT1    33
      IF (UHI.NE.0.0) FFF=U/UHI                                         PROOT1    34
      WRITE (6,101) NTXX,PWR,RHOWR,U,WRC1,ENTHC,HX,PROOT1,PZ,AX,RHOZ,   PROOT1    35
     1TZ,SZ,HZ,FFF                                                      PROOT1    36
  101 FORMAT(1H ,2HN=I3,1X,2HP=1PE13.6,1X,2HR=1PE13.6,1X,2HU=1PE13.6,1X, PROOT1    37
     16HH-CON=1PE13.6,1X,6HH-QSQ=1PE13.6,1X,2HH=1PE13.6,1X,5HROOT=      PROOT1    38
     21PE13.6 /1H ,4X,5HP/PO=,1PE11.4,1X,2HA=,1PE11.4,1X,5HR/RO=,1PE11.4 PROOT1    39
     3,1X,2HT=,1PE11.4,1X,4HS/R=,1PE11.4,1X,5HH/RT=,1PE11.4,1X,2HF=,    PROOT1    40
     4OPF8.4)                                                           PROOT1    41
      RETURN                                                            PROOT1    42
  100 NEWR=0                                                            PROOT1    43
      CALL RGAS(PWR,RHOWR,AX,HX,TX,SX,GASCON,WRGX,-1,2,2)               PROOT1    44
      RETURN                                                            PROOT1    45
  102 U=BWR/AWR                                                         PROOT1    46
      RHOWR=BWR/U                                                       PROOT1    47
      HX=0.0                                                            PROOT1    48
      GO TO 99                                                          PROOT1    49
      END                                                               PROOT1    50
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SUBROUTINE RDCODE      76/76    OPT=1                    FTN 4.6+460        06/15/79  18.58.36        PAGE     1

                SUBROUTINE RDCODE(P,RHO,U,NR)                                          RDCODE      2
                EXTERNAL PROOT1                                                        RDCODE      3
                COMMON/WRDKOD/AWR,BWR,CWR,DWR,UWR,VWR,WWR,PWR,RHOWR,WRC1,NEWR,NTAL     WRDKOD      2
                COMMON/WRDKO1/K,J,NPHIWR,NT2WR,WRMACH,PKKFUN,WRZ                       WRDK01      2
                COMMON/WRDKO2/AX,HX,TX,SX                                              WRDK02      2
                COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRHTO,WRGX     CONRG       2
                COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF        REALG       2
               *,V1INF,NITAVG,NWROUT                                                   REALG       3
                LOGICAL BOL,TRN,TRN1,TRN2,TRN3,TRN4,BOL1,APRXPR                        RDCODE      9
                LOGICAL LOTST,KTST,T11H,T12H,T21H,T22H,T3L                             RDCODE     10
                DATA NTOT,NTOT1/0,0/                                                   RDCODE     11
                DATA LHTSTL,LHTSTH/1HL,1HH/                                            RDCODE     12
                DATA I123/0/                                                           RDCODE     13
          C     LOGICAL CODES FOR M>8.0                                                RDCODE     14
          C        TRN=.TRUE.      STGO MODE                                           RDCODE     15
          C           =.FALSE.     MACH. NO <1 ON 1ST ITER.                            RDCODE     16
          C        TRN1=.FALSE.    STGO MODE                                           RDCODE     17
          C            =.TRUE.     ITER. CONV. SATISFACTORILY, BUT DESIRE PRINT.       RDCODE     18
          C        TRN2=.TRUE.     STGO MODE                                           RDCODE     19
          C            =.FALSE.    ROOT NOT WITHIN SPECIFIED BOUNDS, SO BOUNDS ARE     RDCODE     20
          C                          EXPANDED.                                         RDCODE     21
          C        BOL =.TRUE.     STGO MODE                                           RDCODE     22
          C            =.FALSE.    NON-CONVERGENT ITERATION.                           RDCODE     23
                VPRM=VWR*VWR+WWR*WWR                                                   RDCODE     24
                WRC1=BODYH-VPRM*0.5                                                    RDCODE     25
                UHI=(BWR/AWR)                                                          RDCODE     26
                IF (I123.EQ.123) GO TO 100                                             RDCODE     27
                I123=123                                                               RDCODE     28
                APRXPR=.FALSE.                                                         RDCODE     29
                IF (WRMACH.LT.8.0) APRXPR=.TRUE.                                       RDCODE     30
                CON1=1.0/(2.0*(1.0-PKKFUN))                                            RDCODE     31
                CON2=4.0*PKKFUN/CON1                                                   RDCODE     32
                UPER=1.0                                                               RDCODE     33
                JWR1=NT2WR/3                                                           RDCODE     34
                JWR2=2*JWR1                                                            RDCODE     35
                RMED=0.35                                                              RDCODE     36
                KWR=NPHIWR/2                                                           RDCODE     37
                T11H=.FALSE.                                                           RDCODE     38
                T12H=.FALSE.                                                           RDCODE     39
                T21H=.FALSE.                                                           RDCODE     40
                T22H=.FALSE.                                                           RDCODE     41
                T3L =.FALSE.                                                           RDCODE     42
                R11LO=.98                                                              RDCODE     43
                R11HI=.999                                                             RDCODE     44
                R12LO=.98                                                              RDCODE     45
                R12HI=.999                                                             RDCODE     46
                R21LO=.98                                                              RDCODE     47
                R21HI=.999                                                             RDCODE     48
                R22LO=.98                                                              RDCODE     49
                R22HI=.999                                                             RDCODE     50
                R3LO=.5                                                                RDCODE     51
                R3HI=.6                                                                RDCODE     52
                TRN=.TRUE.                                                             RDCODE     53
                TRN3=.TRUE.                                                            RDCODE     54
                TRN4=.TRUE.                                                            RDCODE     55
          100   CONTINUE                                                               RDCODE     56
                IF (APRXPR) GO TO 300                                                  RDCODE     57
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```
      TRN=.TRUE.                                                        RDCODE   58
      TRN1=.FALSE.                                                      RDCODE   59
      TRN2=.TRUE.                                                       RDCODE   60
      KTST=.TRUE.                                                       RDCODE   61
      IF (K.LE.KWR) KTST=.FALSE.                                        RDCODE   62
      IF (J.LT.JWR1) GO TO 80                                           RDCODE   63
      IF (J.GT.JWR2) GO TO 81                                           RDCODE   64
      JREG=0                                                            RDCODE   65
      IF (KTST) GO TO 83                                                RDCODE   66
      FACTLO=R21LO                                                      RDCODE   67
      FACTHI=R21HI                                                      RDCODE   68
      GO TO 82                                                          RDCODE   69
   83 CONTINUE                                                          RDCODE   70
      FACTLO=R22LO                                                      RDCODE   71
      FACTHI=R22HI                                                      RDCODE   72
      GO TO 82                                                          RDCODE   73
   80 JREG=-1                                                           RDCODE   74
      IF (KTST) GO TO 84                                                RDCODE   75
      FACTLO=R11LO                                                      RDCODE   76
      FACTHI=R11HI                                                      RDCODE   77
      GO TO 82                                                          RDCODE   78
   84 CONTINUE                                                          RDCODE   79
      FACTLO=R12LO                                                      RDCODE   80
      FACTHI=R12HI                                                      RDCODE   81
      GO TO 82                                                          RDCODE   82
   81 JREG=1                                                            RDCODE   83
      FACTLO=R3LO                                                       RDCODE   84
      FACTHI=R3HI                                                       RDCODE   85
   82 CONTINUE                                                          RDCODE   86
  101 NEWR=1                                                            RDCODE   87
   99 CONTINUE                                                          RDCODE   88
      UL=FACTLO*UHI                                                     RDCODE   89
      UH=FACTHI*UHI                                                     RDCODE   90
   97 CONTINUE                                                          RDCODE   91
      CALL ZEROIN(UL,UH,1.0E-5,PROOT1,BOL,XX,YY)                        RDCODE   92
      IF (BOL) GO TO 102                                                RDCODE   93
      IF (TRN2) GO TO 107                                               RDCODE   94
      IF (LOTST.AND.JREG.EQ.-1) GO TO 111                               RDCODE   95
      NR=1                                                              RDCODE   96
  504 NWRPTP=NWRPRT                                                     RDCODE   97
      IF (NREAL.EQ.-1) GO TO 103                                        RDCODE   98
      NWRPRT=4                                                          RDCODE   99
      CALL ZEROIN(UL,UH,1.0E-5,PROOT1,BOL,XX,YY)                        RDCODE  100
      WRITE (6,501) AWR;BWR,CWR,DWR,VWR,WWR,BODYH,BODYS                 RDCODE  101
  501 FORMAT(1H0,65HPRINT TO CHECK FOR ROOTS OF PROOT1.  THIS IS PRINTED RDCODE  102
     1FROM RDCODE /1H ,3X,2HA=,1PE11.4,1X,2HB=,1PE11.4,1X,2HC=,1PE11.4,  RDCODE  103
     21X,2HD=1PE11.4,3X,2HV=,1PE11.4,1X,2HW=,1PE11.4 /1H ,3X,            RDCODE  104
     33HHT=,1PE11.4,1X,2HS=,1PE11.4)                                    RDCODE  105
      DELTSP=0.01                                                       RDCODE  106
      ULIST=0.0                                                         RDCODE  107
  500 CONTINUE                                                          RDCODE  108
      ULIST=ULIST+DELTSP                                                RDCODE  109
      IF (ULIST.GE.1.0) GO TO 503                                       RDCODE  110
      XXX=PROOT1(ULIST*UHI)                                             RDCODE  111
      GO TO 500                                                         RDCODE  112
  503 CONTINUE                                                          RDCODE  113
      WRITE (6,502)                                                     RDCODE  114
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115         502   FORMAT(1HO,33HEND OF CHECK FOR ROOTS OF PROOT1.)                RDCODE  115
                  NWRPRT=NWRPTP                                                   RDCODE  116
                  GO TO 103                                                       RDCODE  117
              111 RMED=RMED*.9                                                    RDCODE  118
              107 CONTINUE                                                        RDCODE  119
120               TRN2=.FALSE.                                                    RDCODE  120
                  UFAIL=UWR                                                       RDCODE  121
                  FACTLO=RMED                                                     RDCODE  122
                  FACTHI=0.999996                                                 RDCODE  123
                  IF (ABS(UWR-UL).LT.0.001*UL) GO TO 96                           RDCODE  124
125               LOTST=.FALSE.                                                   RDCODE  125
                  BFAIL=UW                                                        RDCODE  126
                  LHTSTX=LHTSTH                                                   RDCODE  127
                  GO TO 99                                                        RDCODE  128
              96  LOTST=.TRUE.                                                    RDCODE  129
130               BFAIL=UL                                                        RDCODE  130
                  LHTSTX=LHTSTL                                                   RDCODE  131
                  GO TO 99                                                        RDCODE  132
              102 U=UWR                                                           RDCODE  133
                  P=PWR                                                           RDCODE  134
135               RHO=RHOWR                                                       RDCODE  135
                  IF (AX.NE.0.0) GO TO 110                                        RDCODE  136
                  U=(XX+YY)/2.0                                                   RDCODE  137
                  NEWR=2                                                          RDCODE  138
                  XXX=PROOT1(U)                                                   RDCODE  139
140               P=PWR                                                           RDCODE  140
                  RHO=RHOWR                                                       RDCODE  141
                  IF (AX.EQ.0.0) GO TO 97                                         RDCODE  142
              110 AMACH=U/AX                                                      RDCODE  143
                  IF (AMACH.GE.1.0) GO TO 108                                     RDCODE  144
145               IF (TRN) GO TO 105                                              RDCODE  145
                  NR=1                                                            RDCODE  146
                  GO TO 106                                                       RDCODE  147
              108 CONTINUE                                                        RDCODE  148
                  NR=0                                                            RDCODE  149
150               IF (K.NE.3) GO TO 109                                           RDCODE  150
                  IF (J.NE.3) GO TO 109                                           RDCODE  151
                  NTOT=0                                                          RDCODE  152
                  NTOT1=0                                                         RDCODE  153
              109 CONTINUE                                                        RDCODE  154
155               NTOT=NTOT+NTRL                                                  RDCODE  155
                  NTOT1=NTOT1+1                                                   RDCODE  156
                  NITAVG=NTOT/NTOT1                                               RDCODE  157
                  IF (TRN2) GO TO 91                                              RDCODE  158
              C   RESETS ITERATION BOUNDS - - - - - - - - - - - - - - - - - - -   RDCODE  159
160           C   JREG=-1       3.LE.(J).LT.JWR1                                  RDCODE  160
              C         0       JWR1.LE.(J).LT.JWR2                               RDCODE  161
              C         1       JWR2.LT.(J).LT.NT2WR                              RDCODE  162
              C   LOTST=.TRUE.    ROOT WAS BELOW LOWER BOUND.                     RDCODE  163
              C         .FALSE.   ROOT WAS ABOVE UPPER BOUND.                     RDCODE  164
165           C   KTST=.TRUE.       3.LE.(K).LT.KWR                               RDCODE  165
              C         .FALSE.     KWR.LT.(K).LT.NPHIWR                          RDCODE  166
              C   T11H,T12H,T21H,T22H,T3L ARE LOGICAL VARIABLES THAT FACILITATE   RDCODE  167
              C     COLLAPSING THE UPPER ITERATION BOUNDS TO REASONABLE VALUES.    RDCODE  168
              C     EACH VARIABLE (SUCH AS R11H1) IS SET ONLY ONCE.  WHEN THIS    RDCODE  169
170           C     OCCURS THE LOGICAL VARIABLES ARE CHANGED FROM .FALSE. TO .TRUE..RDCODE  170
                  DATA BCMDFY/0.025/                                              RDCODE  171
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                      PERC=U/UHI                                                RDCODE  172
                      RATIOL=PERC                                               RDCODE  173
                      RATIOH=PERC*1.01                                          RDCODE  174
175                   IF (RATIOH.GE.1.) RATIOH=0.99999                          RDCODE  175
                      IF (JREG) 70,74,78                                        RDCODE  176
                C     CLOSE TO BODY - 1ST THIRD                                 RDCODE  177
                70    IF (LOTST) GO TO 72                                       RDCODE  178
                      IF (KTST) GO TO 71                                        RDCODE  179
180                   R11HI=RATIOH                                              RDCODE  180
                      IF (T21H) GO TO 65                                        RDCODE  181
                      IF (T11H) GO TO 69                                        RDCODE  182
                      GO TO 60                                                  RDCODE  183
                65    IF (R11HI.GT.R21LO) R21LO=(R11HI+2.*R21LO)/3.0            RDCODE  184
185                   GO TO 69                                                  RDCODE  185
                71    R12HI=RATIOH                                              RDCODE  186
                      IF (T22H) GO TO 67                                        RDCODE  187
                      IF (T12H) GO TO 69                                        RDCODE  188
                      GO TO 61                                                  RDCODE  189
190             67    IF (R12HI.GT.R22LO) R22LO=(R12HI+2.*R22LO)/3.0            RDCODE  190
                      GO TO 69                                                  RDCODE  191
                72    IF (KTST) GO TO 73                                        RDCODE  192
                      R11LO=RATIOL                                              RDCODE  193
                      IF (T11H) GO TO 69                                        RDCODE  194
195                   R11HI=RATIOL*(1.+BCMDFY)                                  RDCODE  195
                      IF (R11HI.GE.1.) R11HI=.9999                              RDCODE  196
                60    T11H=.TRUE.                                               RDCODE  197
                      GO TO 69                                                  RDCODE  198
                73    R12LO=RATIOL                                              RDCODE  199
200                   IF (T12H) GO TO 69                                        RDCODE  200
                      R12HI=RATIOL*(1.+BCMDFY)                                  RDCODE  201
                      IF (R12HI.GE.1.) R12HI=.9999                              RDCODE  202
                61    T12H=.TRUE.                                               RDCODE  203
                      GO TO 69                                                  RDCODE  204
205             C     MIDWAY BETWEEN BODY AND SHOCK - 2ND THIRD                 RDCODE  205
                74    IF (LOTST) GO TO 76                                       RDCODE  206
                      IF (KTST) GO TO 75                                        RDCODE  207
                      R21HI=RATIOH                                              RDCODE  208
                      IF (T3L) GO TO 66                                         RDCODE  209
210                   IF (T21H) GO TO 69                                        RDCODE  210
                      GO TO 62                                                  RDCODE  211
                66    IF (R21HI.GT.R3LO) R3LO=(R21HI+2.*R3LO)/3.0               RDCODE  212
                      GO TO 69                                                  RDCODE  213
                75    R22HI=RATIOH                                              RDCODE  214
215                   IF (T22H) GO TO 69                                        RDCODE  215
                      GO TO 63                                                  RDCODE  216
                76    IF (KTST) GO TO 77                                        RDCODE  217
                      R21LO=RATIOL                                              RDCODE  218
                      IF (T21H) GO TO 69                                        RDCODE  219
220                   R21HI=RATIOL*(1.+BCMDFY)                                  RDCODE  220
                      IF (R21HI.GE.1.) R21HI=.9999                              RDCODE  221
                62    T21H=.TRUE.                                               RDCODE  222
                      GO TO 69                                                  RDCODE  223
                77    R22LO=RATIOL                                              RDCODE  224
225                   IF (T22H) GO TO 69                                        RDCODE  225
                      R22HI=RATIOL*(1.+BCMDFY)                                  RDCODE  226
                      IF (R22HI.GE.1.) R22HI=.9999                              RDCODE  227
                63    T22H=.TRUE.                                               RDCODE  228
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                GO TO 69                                                        RDCODE   229
230         C   CLOSE TO SHOCK - LAST THIRD                                     RDCODE   230
            78  IF (LOTST) GO TO 79                                            RDCODE   231
                R3HI=RATIOH                                                     RDCODE   232
                IF (T3L) GO TO 69                                               RDCODE   233
                R3LO=RATIOH*(1.-BCMDFY)                                         RDCODE   234
235             64  T3L=.TRUE.                                                  RDCODE   235
                GO TO 69                                                        RDCODE   236
                79  R3LO=RATIOL                                                RDCODE   237
                IF (.NOT.T3L) GO TO 64                                          RDCODE   238
                69  GO TO 106                                                   RDCODE   239
240         C   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   RDCODE   240
            91  CONTINUE                                                        RDCODE   241
                IF (NWRPRT.GE.1) GO TO 106                                      RDCODE   242
                RETURN                                                          RDCODE   243
            105 CONTINUE                                                        RDCODE   244
245             TRN=.FALSE.                                                     RDCODE   245
                UL=1.001*UWR                                                    RDCODE   246
                AMED=UL/UHI                                                     RDCODE   247
                IF (NWRPRT.GE.1) GO TO 103                                      RDCODE   248
                GO TO 97                                                        RDCODE   249
250             106 CONTINUE                                                    RDCODE   250
                TRN1=.TRUE.                                                     RDCODE   251
            C   ----MONITOR PRINTING-----------------------------------         RDCODE   252
            103 CONTINUE                                                        RDCODE   253
                IF (NWRPRT.EQ.0) GO TO 115                                      RDCODE   254
255             USQ=UWR*UWR                                                     RDCODE   255
                HTOT=HX+(USQ+VPPM)*0.5                                          RDCODE   256
                B=PWR+RHOWR*USQ                                                 RDCODE   257
                A=RHOWR*UWR                                                     RDCODE   258
                IF (AWR.NE.0) A=(AWR-A)/AWR                                     RDCODE   259
260             IF (BWR.NE.0) B  =(BWR-B)/BWR                                   RDCODE   260
                HTOT=(BODYH-HTOT)/BODYH                                         RDCODE   261
                DATA C4,NC4/1.0E+6,6/                                           RDCODE   262
                A=A*C4                                                          RDCODE   263
                B=B*C4                                                          RDCODE   264
265             HTOT=HTOT*C4                                                    RDCODE   265
                IF (UHI.NE.0.0) PERC=UWR/UHI                                    RDCODE   266
                IF (TRN2.AND.(MOD(J,2).EQ.0)) GO TO 115                         RDCODE   267
                NTA=NTAL/100                                                    RDCODE   268
                AVGNX1=NTOT                                                     RDCODE   269
270             AVGNX2=100*NTOT1                                                RDCODE   270
                IF (AVGNX2.NE.0.0) AVGNIT=AVGNX1/AVGNX2                         RDCODE   271
                WRITE (6,104) PAL,NTA,PWR,RHOWR,UWR,AMACH,UHI,PERC,AWR,A,B,HTOT,RDCODE   272
               1NC4,J,K,AVGNIT                                                  RDCODE   273
            104  FORMAT (1H , 5H*DCOD,L1,I2, 2H,P,1PE11.4,   2H,R,1PE11.4,   2H,U,RDCODE   274
275            11PE11.4,   2H,M,0PF6.3,   4H,B/A,1PE11.4,   2H,F,0PF7.4        RDCODE   275
               2,   2H,A,1PE11.4,   0PF5.2,      0PF5.2,3H,HT,0PF8.3,1H,I1,   2H,JRDCODE   276
               3,I2,2H,K,I2,1X,0PF6.2)                                          RDCODE   277
                IF (TRN2) GO TO 120                                             RDCODE   278
                UFAIL=UFAIL/UHI                                                 RDCODE   279
280             BFAIL=BFAIL/UHI                                                 RDCODE   280
                WRITE (6,119) JREG,KTST,UFAIL,LHTSTX,BFAIL,FACTLO,FACTHI,R11LO,RDCODE   281
               1R11HI,R12LO,R12HI,R21LO,R21HI,R22LO,R22HI,R3LO,R3HI,T11H,T12H,RDCODE   282
               2T21H,T22H,T3L,URZ                                               RDCODE   283
            119  FORMAT (1H ,1H(,I2,L1,1H),1X,3HUF=,F8.5,1X,1HB,A1,1H=,F8.5,1X,RDCODE   284
285            13HBL=,F8.5,1X,3HBH=,F8.5,1X,5HR11L=,F8.5,1X,5HR11H=,F8.5,1X,5HR12L RDCODE   285
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     2=,F8.5,1X,5HR12H=,F8.5  /1H ,6X,5HR21L=,F8.5,1X,5HR21H=,F8.5,1X,     RDCODE  286
     35HR22L=,F8.5,1X,5HR22H=,F8.5,1X,4HR3L=,F8.5,1X,4HR3H=,F8.5,2X,5L1    RDCODE  287
     4,3X,6H--- Z=,1PE11.4)                                                RDCODE  288
 120  CONTINUE                                                             RDCODE  289
290   IF (NWRPRT.LE.1.AND.TRN2) GO TO 115                                  RDCODE  290
      IF (AMACH.LE.1.0) GO TO 113                                          RDCODE  291
      UPERH=UPER                                                           RDCODE  292
      IF (APRXPR) GO TO 116                                                RDCODE  293
      RATHU=CON2*WRC1/UHI**2                                               RDCODE  294
295   IF (RATHU.GT.1.) RATHU=1.                                            RDCODE  295
      RADIC=SQRT(1.-RATHU)                                                 RDCODE  296
      UPER=CON1*(1.+RADIC)                                                 RDCODE  297
 116  CONTINUE                                                             RDCODE  298
      UPERL=2.0*CON1-UPERH                                                 RDCODE  299
300   ULMOD=10.                                                            RDCODE  300
      UHMOD=.99*UWR                                                        RDCODE  301
      NTALS=NTAL                                                           RDCODE  302
      NEWR=1                                                               RDCODE  303
      CALL ZEROIN(ULMOD,UHMOD,1.0E-5,PROOT1,BOL1,XX,YY)                    RDCODE  304
305   SECROT=(XX+YY)/2.0                                                   RDCODE  305
      IF (AX.NE.0.0) AMACH2=SECROT/AX                                      RDCODE  306
      F2ND=SECROT/UHI                                                      RDCODE  307
      RMED=F2ND                                                            RDCODE  308
      NTAL=NTALS                                                           RDCODE  309
310   ULX=UL/UHI                                                           RDCODE  310
      UHX=UH/UHI                                                           RDCODE  311
      WRITE (6,112) BOL1,UL,UH,ULX,UHX,AMACH2,SECROT,F2ND,UPERL,UPERH,     RDCODE  312
     1TRN,TRN1,TRN2,TRN3,TRN4,APRXPR                                       RDCODE  313
 112  FORMAT(1H ,5X,L1,1X,8H(T. B)=,2(1PE11.4,1X),2(0PF7.4,1X),4H;M2=      RDCODE  314
315  10PF7.4,1X,3HU2=1PE11.4,1X,3HF2=0PF7.4,2X,11H;<P.G.> FL=,0PF7.4,1X,  RDCODE  315
     23HFH=0PF7.4,1X,6L1)                                                  RDCODE  316
      IF (TRN1) RETURN                                                     RDCODE  317
      IF (NWRPRT.LE.2) GO TO 115                                           RDCODE  318
      SPGAM=(RX**2)*RHO/P                                                  RDCODE  319
320   SPK=(SPGAM-1.0)/(2.0*SPGAM)                                          RDCODE  320
      SPC1=1./(2.0*(1.-SPK))                                               RDCODE  321
      SPC2=4.*SPK/SPC1                                                     RDCODE  322
      SRADIC=PERC/SPC1-1.                                                  RDCODE  323
      SRATHU=1.-SRADIC**2                                                  RDCODE  324
325   WRITE (6,117) SPGAM,CON1,SPC1,CON2,SPC2,RATHU,SRATHU,RADIC,SRADIC    RDCODE  325
 117  FORMAT(1H ,7X,7HGAM-SP=0PF7.3,4H;C1=,2(0PF9.4,1X),4H;C2=,            RDCODE  326
     12(0PF9.4,1X),6H;H/KE=,2(1PE11.4,1X),6H;SQRT=,2(1PE11.4,1X))         RDCODE  327
      GO TO 115                                                            RDCODE  328
 113  CONTINUE                                                             RDCODE  329
330   WRITE (6,114) TRN,TRN1,TRN2,TRN3,TRN4,APRXPR,BOL,BOL1                RDCODE  330
 114  FORMAT(1X,8(L1,1X))                                                  RDCODE  331
 115  CONTINUE                                                             RDCODE  332
      IF (TRN1) RETURN                                                     RDCODE  333
      IF (BOL.AND..NOT.TRN) GO TO 97                                       RDCODE  334
335   IF (BOL.AND..NOT.TRN3) GO TO 302                                     RDCODE  335
      RETURN                                                               RDCODE  336
C     - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  RDCODE  337
C     - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  RDCODE  338
C     ITERATION WHEN FLOW IS APPROX PERFECT.                               RDCODE  339
340   C     LOGICAL CODES FOR M<8.0                                        RDCODE  340
C        TRN3=.TRUE.    STSD MODE                                         RDCODE  341
C            =.FALSE.   (SAME AS TRN DEFINED ABOVE)                       RDCODE  342
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```
      C        TRN4=.TRUE.    STAD MODE                                  RDCODE   343
      C            =.FALSE.   (SAME AS TRN2 DEFINED ABOVE)               RDCODE   344
      300   RATHU=CON2*WRC1/UHI**2                                       RDCODE   345
            SQRTAR=1.-RATHU                                              RDCODE   346
            IF (SQRTAR.GE.0.0) GO TO 308                                 RDCODE   347
            WRITE (6,309) RATHU,SQRTAR                                   RDCODE   348
      309   FORMAT(1H0,48HNEG. SQ. ROOT IN RDCODE. ARG SET TO ZERO. RATHU-  RDCODE   349
           1,1PE14 7,1X,10H(1-RATHU)=,1PE14.7)                           RDCODE   350
            SQRTAR=0.0                                                   RDCODE   351
      308   CONTINUE                                                     RDCODE   352
            RADIC=SQRT(SQRTAR)                                           RDCODE   353
            UPER=CON1*(1.+RADIC)                                         RDCODE   354
            UPERF=UPER*UHI                                               RDCODE   355
            TRN3=.TRUE.                                                  RDCODE   356
            TRN4=.TRUE.                                                  RDCODE   357
            FACTLO=0.95                                                  RDCODE   358
            FACTHI=1.01                                                  RDCODE   359
      301   NEWR=1                                                       RDCODE   360
      306   UL=FACTLO*UPERF                                              RDCODE   361
            UH=FACTHI*UPERF                                              RDCODE   362
      302   IF (UH.GT.UHI) UH=UHI*.999                                   RDCODE   363
            CALL ZEROIN(UL,UH,1.0E-5,PROOT1,BOL,XX,YY)                   RDCODE   364
            IF (BOL) GO TO 303                                           RDCODE   365
            IF (TRN4) GO TO 305                                          RDCODE   366
            NR=1                                                         RDCODE   367
            GO TO 504                                                    RDCODE   368
      303   U=UWR                                                        RDCODE   369
            P=PWR                                                        RDCODE   370
            RHO=RHOWR                                                    RDCODE   371
            IF (AX.NE.0.0) GO TO 307                                     RDCODE   372
            U=(XX+YY)/2.0                                                RDCODE   373
            XXX=PROOT1(U)                                                RDCODE   374
            P=PWR                                                        RDCODE   375
            RHO=RHOWR                                                    RDCODE   376
      307   AMACH=U/AX                                                   RDCODE   377
            IF (AMACH.GE.1.0) GO TO 108                                  RDCODE   378
            IF (TRN3) GO TO 304                                          RDCODE   379
            NR=1                                                         RDCODE   380
            GO TO 106                                                    RDCODE   381
      304   CONTINUE                                                     RDCODE   382
            TRN3=.FALSE.                                                 RDCODE   383
            UL=1.001*U                                                   RDCODE   384
            IF (NWRPRT.GE.2) GO TO 103                                   RDCODE   385
            GO TO 302                                                    RDCODE   386
      305   CONTINUE                                                     RDCODE   387
            TRN4=.FALSE.                                                 RDCODE   388
            UL=0.5*UPERF                                                 RDCODE   389
            UH=UHI*.999                                                  RDCODE   390
            GO TO 302                                                    RDCODE   391
            END                                                          RDCODE   392
```

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                                                                      RDCODE   393
                                                                      RDCODE   394
      CHA1724   RGAS          AS MODIFIED BY W.A.REINHARDT           RGAS       2
      CRGASR     WALKER     TEMP CONVERTED TO RANKINE                RGAS       3
      SUBROUTINE RGAS(PX,RX,AX,HX,TX,SX,RRX,GX,NTEST,NUMX,NGAS)      RGAS       4
C     NOTE*** ARRAY DIMENSIONS ARE DIFFERENT THAN ARE GIVEN IN THE   RGAS       5
C      ORIGINIAL VERSION OF RGAS.                                    RGAS       6
C     DIMENSION NLL(8),JXX(8),DZZ(8),TZ(3000),NDZ(89)                RGAS       7
      DIMENSION NLL(8),JXX(8),DZZ(8),TZ(2565),NDZ(89)                RGAS       8
      DIMENSION TH(5,513),NDL(4,11),NDU(4,11),AN(4),C(7),ANR(17),BN(4) RGAS     9
      EQUIVALENCE (TZ(1),TH(1,1)),(NDZ(1),NDL(1,1)),(NDZ(45),NDU(1,1)) RGAS     10
      DATA KEY,NTIMES/0,0/                                           RGAS       11
      DATA WORD1,WORD2/4HMI  ,4HLO  /                                RGAS       12
C     DATA NTAPE/7/                                                  RGAS       13
      DATA NFIRST/0/                                                 RGAS       14
      DATA GTESTR/0./                                                RGAS       15
164   KEY=KEY+1                                                      RGAS       16
      P=PX                                                           RGAS       17
      S=SX                                                           RGAS       18
      R=RX                                                           RGAS       19
      NUM=NUMX                                                       RGAS       20
      NUMWR=0                                                        RGAS       21
      IF (NUM) 20,1,2                                                RGAS       22
20    NUMWR=1                                                        RGAS       23
      NUM=2                                                          RGAS       24
2     IF(NUM-5) 3,3,4                                                RGAS       25
4     WORD=WORD1                                                     RGAS       26
6     WRITE(6,5) WORD, PX,RX,SX                                      RGAS       27
5     FORMAT(16HO ER IN RGAS-NUM ,1X,A4,4H PX=,1PE12.4,4H RX=,1PE12.4,4H RGAS    28
     * SX=,1PE12.4)                                                  RGAS       29
25    RETURN                                                         RGAS       30
1     WORD=WORD2                                                     RGAS       31
      GO TO 6                                                        RGAS       32
3     IF(NTEST) 7,8,8                                                RGAS       33
7     IF (NFIRST-NGAS) 10,9,10                                       RGAS       34
10    NFIRST=NGAS                                                    RGAS       35
C                                                                    RGAS       36
C                                                                    RGAS       37
C                                                                    RGAS       38
      NTYPRD=2                                                       RGAS       39
C     NTYPRD=1   READS TAPE.                                         RGAS       40
C            2   READS CARDS.                                       RGAS       41
C            3   READS DISK.                                        RGAS       42
C                                                                    RGAS       43
      GO TO (53,54,55),NTYPRD                                        RGAS       44
C                                                                    RGAS       45
C     THE FOLLOWING COMMENTS CARDS EXPLAIN TAPE READ PROCEDURE.      RGAS       46
53    CONTINUE                                                       RGAS       47
C     READ(7,201) WTMIX,(C(N),N=1,7)                                 RGAS       48
C     READ(7,200) (NDZ(N),N=1,89)                                    RGAS       49
      DATA NMM/2563/                                                 RGAS       50
C     NMM=NDZ(89)                                                    RGAS       51
C 200 FORMAT(16I8)                                                   RGAS       52
C 201 FORMAT(8E16.8)                                                 RGAS       53
C     READ(7,201) (TZ(N),N=1,NMM)                                    RGAS       54
      GO TO 56                                                       RGAS       55
54    CONTINUE                                                       RGAS       56
```

```
C***  CARD READ PROCEDURE BEG.                                          RGAS   57
      READ ( 5,2012) WTMIX,(C(N),N=1,7)                                 RGAS   58
2012  FORMAT(5(1PE15.7))                                                RGAS   59
      READ  ( 5,2013) (NDZ(N),N=1,89)                                   RGAS   60
2013  FORMAT(12I6)                                                      RGAS   61
      READ  ( 5,2012) (TZ(N),N=1,NMM)                                   RGAS   62
C***  CARD READ PROCEDURE END.                                          RGAS   63
      GO TO 56                                                          RGAS   64
55    CONTINUE                                                          RGAS   65
      READ  ( 5) WTMIX,(C(N),N=1,7),(NDZ(N),N=1,89),(TZ(N),N=1,2563)    RGAS   66
56    CONTINUE                                                          RGAS   67
C                                                                       RGAS   68
C                                                                       RGAS   69
      DO 120 N=1,88                                                     RGAS   70
120   NDZ(N)=5*NDZ(N)                                                   RGAS   71
      CONC=WTMIX/28.966                                                 RGAS   72
C     CONC(AIR)=28.858566/28.966=.9962910                               RGAS   73
C     PO=(ATM.) 2116. LB PER FT**2                                      RGAS   74
      PO=2116.                                                          RGAS   75
C     RO=STAD DENSITY=2.498E-3 SLUGS/FT**3                              RGAS   76
      RO=.002498*CONC                                                   RGAS   77
C***  SP. GAS CONSTANT= 1716 FT-LB PER SLUG DEG. RANKIN= (FT/SEC)**2    RGAS   78
      RRR=1716./CONC                                                    RGAS   79
      RRX=RRR                                                           RGAS   80
C     493.635 APPROX. STAD TEMP (491.69 DEG. R OR 273.16 DEG. K)        RGAS   81
      RTO=RRR*493.635                                                   RGAS   82
      SQPORO=SQRT (RO/PO)                                               RGAS   83
      B=TZ(NMM-2)                                                       RGAS   84
      E=TZ(NMM-1)                                                       RGAS   85
      D=TZ(NMM)                                                         RGAS   86
      FM=2.1632+.3468*CONC                                              RGAS   87
      AA=D*FM                                                           RGAS   88
      BB=E*FM+1.                                                        RGAS   89
      CCC=B+FM                                                          RGAS   90
9     P=ALOG10(P/PO)                                                    RGAS   91
11    IF (NUM-5) 40,31,4                                                RGAS   92
C***  (NUM.EQ.5) DEPENDENT VARIABLES ARE PRESSURE AND ENTROPY           RGAS   93
31    REAL=S/RRR                                                        RGAS   94
      GG=(REAL-C(1)-C(2)*P)/(C(3)+P*(C(4)+P*C(5)))                      RGAS   95
110   R=C(6)*GG+C(7)*P                                                  RGAS   96
      RL=P-B                                                            RGAS   97
      CC=CCC-P                                                          RGAS   98
      RH=-CC*(1.+AA*CC/(BB*BB))/BB+.005                                 RGAS   99
      IF(RH+7.)183,185,185                                              RGAS  100
183   RH=-7.                                                            RGAS  101
185   IF(R-RH) 180,181,181                                              RGAS  102
180   R=RH                                                              RGAS  103
184   RL=3.                                                             RGAS  104
181   IF(3.-RL) 184,186,186                                             RGAS  105
186   IF(RL-R) 182,163,163                                              RGAS  106
182   R=RL                                                              RGAS  107
163   NUMB=0                                                            RGAS  108
      NIMX=0                                                            RGAS  109
35    NUMM=5                                                            RGAS  110
      NBOT=9-NUM                                                        RGAS  111
      NUP=NBOT                                                          RGAS  112
      GO TO 42                                                          RGAS  113
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115          C***  (1,GE.NUM,LE.4) DEPENDENT VARIABLES ARE PRESSURE AND DENSITY      RGAS  114
             40    R=ALOG10(R/RO)                                                    RGAS  115
                   NUMM=5                                                            RGAS  116
                   NBOT=1                                                            RGAS  117
                   NUP=NUM                                                           RGAS  118
120                IF (NUMM.EQ.1) NBOT=2                                             RGAS  119
             42    CONTINUE                                                          RGAS  120
                   IF(R) 12,12,13                                                    RGAS  121
             12    NR=R-1.                                                           RGAS  122
                   IF(NR+7) 16,16,15                                                 RGAS  123
125          16    NR=-7                                                             RGAS  124
                   GO TO 15                                                          RGAS  125
             13    NR=R                                                              RGAS  126
                   IF(NR-3) 15,14,14                                                 RGAS  127
             14    NR=2                                                              RGAS  128
130          15    DX=R-FLOAT (NR)                                                   RGAS  129
                   NR=NR+8                                                           RGAS  130
                   F=(P-R-B)/(1.+R*(E+D*R))                                          RGAS  131
                   IF(NUMM-9+NUM) 22,162,22                                          RGAS  132
             162   IF(F-.0000001) 27,161,161                                         RGAS  133
135          161   IF(FM-F) 44,22,22                                                 RGAS  134
             22    DO 17 N1=NBOT,NUP                                                 RGAS  135
                   IF(N1-NUMM) 36,81,36                                              RGAS  136
             36    NER1=N1                                                           RGAS  137
                   NER2=N1+4                                                         RGAS  138
140                NL=NDL(N1,NR)                                                     RGAS  139
                   IF(NLL(NER1)-NL) 301,302,301                                      RGAS  140
             302   J=JXX(NER1)                                                       RGAS  141
                   DIFF2=F-TH(5,J)                                                   RGAS  142
                   IF(DIFF2) 301,308,308                                             RGAS  143
145          308   IF(DZZ(NER1)-ABS (DIFF2)) 301,301,303                             RGAS  144
             301   NU=NDU(N1,NR)                                                     RGAS  145
                   CALL SERCH(F,TH,NL,NU,5,J,NER)                                    RGAS  146
                   J=J/5                                                             RGAS  147
                   DZZ(NER1)=ABS (TH(5,J+1)-TH(5,J))                                 RGAS  148
150                JXX(NER1)=J                                                       RGAS  149
                   NLL(NER1)=NL                                                      RGAS  150
             303   XYZ=XYZ                                                           RGAS  151
                   NL=NDL(N1,NR+1)                                                   RGAS  152
                   IF(NLL(NER2)-NL) 305,306,305                                      RGAS  153
155          306   K=JXX(NER2)                                                       RGAS  154
                   DIFF2=F-TH(5,K)                                                   RGAS  155
                   IF(DIFF2) 305,309,309                                             RGAS  156
             309   IF(DZZ(NER2)-ABS(DIFF2)) 305,305,307                              RGAS  157
             305   NU=NDU(N1,NR+1)                                                   RGAS  158
160                CALL SERCH(F,TH,NL,NU,5,K,NER)                                    RGAS  159
                   K=K/5                                                             RGAS  160
             100   MI=MI                                                             RGAS  161
                   DZZ(NER2)=ABS (TH(5,K+1)-TH(5,K))                                 RGAS  162
                   JXX(NER2)=K                                                       RGAS  163
165                NLL(NER2)=NL                                                      RGAS  164
             307   Y1=TH(1,J)+F*(TH(2,J)+F*(TH(3,J)+F*TH(4,J)))                      RGAS  165
             128   Y2=TH(1,K)+F*(TH(2,K)+F*(TH(3,K)+F*TH(4,K)))                      RGAS  166
                   AN(N1)=Y1+DX*(Y2-Y1)                                              RGAS  167
                   GO TO 17                                                          RGAS  168
170          81    AN(N1)=REAL                                                       RGAS  169
             17    CONTINUE                                                          RGAS  170
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                      IF (NUMWR.EQ.1) GO TO 18                                  RGAS      171
                      IF (NUM-5) 51,52,4                                        RGAS      172
                51    GO TO (121,122,123,124,124),NUM                           RGAS      173
175           124     IF (NUM.NE.5) SX=AN(4)*RRR                                RGAS      174
              123     TX= AN(3)*1.8                                             RGAS      175
              122     HX=AN(2)*RTO                                              RGAS      176
              121     AX=AN(1)/SQPORO                                           RGAS      177
                      RETURN                                                    RGAS      178
180           18      HX=AN(2)*RTO                                              RGAS      179
                      RETURN                                                    RGAS      180
                52    IF(NUMM-9+NUM) 39,108,39                                  RGAS      181
                108   AX=RO*10.**R                                              RGAS      182
                      GO TO 51                                                  RGAS      183
185           39      DIFF=ABS ((REAL-AN(NUP))/REAL)                            RGAS      184
                      IF(DIFF-.0001)  37,37,38                                  RGAS      185
                37    NUP1=9-NUM                                                RGAS      186
                      NBOT=1                                                    RGAS      187
                      NUP=4                                                     RGAS      188
190                   GO TO 42                                                  RGAS      189
                38    NUMB=NUMB+1                                               RGAS      190
                      NIMX=NIMX+1                                               RGAS      191
                      IF(NIMX-20) 43,43,44                                      RGAS      192
                43    IF(NUMB-2)82,83,84                                        RGAS      193
195           82      IF(REAL-AN(NUP)) 85,37,86                                 RGAS      194
              85      R1=R                                                      RGAS      195
              141     S1=AN(NUP)                                                RGAS      196
                      R=R+.3                                                    RGAS      197
                      IF(RL-R)150,99,99                                         RGAS      198
200           150     R=RL                                                      RGAS      199
              99      R2=R                                                      RGAS      200
              151     L=0                                                       RGAS      201
                      GO TO 42                                                  RGAS      202
              86      R2=R                                                      RGAS      203
205           153     S2=AN(NUP)                                                RGAS      204
                      R=R-.3                                                    RGAS      205
                      IF(R-RH)142,102,102                                       RGAS      206
              142     R=RH                                                      RGAS      207
              102     R1=R                                                      RGAS      208
210           143     L=1                                                       RGAS      209
                      GO TO 42                                                  RGAS      210
              83      IF(L) 91,90,91                                            RGAS      211
              90      S2=AN(NUP)                                                RGAS      212
              126     R=R2-(S2      -REAL)/(S2-S1)*(R2-R1)                      RGAS      213
215                   IF(RL-R) 187,93,93                                        RGAS      214
              187     R=RL                                                      RGAS      215
                      GO TO 93                                                  RGAS      216
              91      S1=AN(NUP)                                                RGAS      217
              127     R=(REAL-S1      )/(S2-S1)*(R2-R1)+R1                      RGAS      218
220                   IF(R-RH) 188,93,93                                        RGAS      219
              188     R=RH                                                      RGAS      220
              93      IF(R2-R) 104,37 ,105                                      RGAS      221
              104     NUMB=1                                                    RGAS      222
                      R1=R2                                                     RGAS      223
225                   S1=S2                                                     RGAS      224
                      L=0                                                       RGAS      225
                      IF(R2+.3-RL) 210,211,211                                  RGAS      226
              211     R2=RL                                                     RGAS      227
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                R=R2                                                    RGAS    228
230             GO TO 42                                                RGAS    229
          210   R2=R2+.3                                                RGAS    230
                R=R2                                                    RGAS    231
                GO TO 42                                                RGAS    232
          105   IF(R-R1) 106,37,42                                      RGAS    233
235       106   NUMB=1                                                  RGAS    234
                R2=R1                                                   RGAS    235
                S2=S1                                                   RGAS    236
                L=1                                                     RGAS    237
                IF(RH-R1+.3) 212,213,213                                RGAS    238
240       213   R1=RH                                                   RGAS    239
                R=R1                                                    RGAS    240
                GO TO 42                                                RGAS    241
          212   R1=R1-.3                                                RGAS    242
                R=R1                                                    RGAS    243
245             GO TO 42                                                RGAS    244
          84    IF(REAL-AN(NUP)) 87,87,88                               RGAS    245
          87    R1=R                                                    RGAS    246
                GO TO 91                                                RGAS    247
          88    R2=R                                                    RGAS    248
250             GO TO 90                                                RGAS    249
          44    IF(F-.000001) 27,444,444                                RGAS    250
          444   NTIMES=NTIMES+1                                         RGAS    251
                WRITE(6,190)                                            RGAS    252
          190   FORMAT(1HO,10X,36HOUTSIDE TABLES IN RGAS ENTERING WITH) RGAS    253
255             WRITE(6,191) PX                                         RGAS    254
          191   FORMAT(11X,2HP=,E13.6)                                  RGAS    255
                IF(NUM-5) 192,193,193                                   RGAS    256
          192   WRITE(6,194) RX                                         RGAS    257
          194   FORMAT(11X,2HR=E14.6)                                   RGAS    258
260             GO TO 196                                               RGAS    259
          193   WRITE(6,195) SX                                         RGAS    260
          195   FORMAT(11X,2HS=,E13.6)                                  RGAS    261
          196   IF (NTIMES-10) 199,197,197                              RGAS    262
          197   WRITE(6,198)                                            RGAS    263
265       198   FORMAT(20X,28HEXIT CALLED ON TENTH FAILURE)             RGAS    264
                GO TO 25                                                RGAS    265
          199   RETURN                                                  RGAS    266
          C***  PERFECT GAS COMPUTATIONS START HERE                     RGAS    267
          8     L=0                                                     RGAS    268
270             IF(GTEST-GX) 64,441,64                                  RGAS    269
          64    GTEST= GX                                               RGAS    270
                L1=2                                                    RGAS    271
                ANR(1)=RRX                                              RGAS    272
          C***  ANR(1)=GAS CONSTANT                                     RGAS    273
275             ANR(2)=GX                                               RGAS    274
          C***  ANR(2)=ISENTROPIC EXPONENT                              RGAS    275
                ANR(3)=ANR(1)/(ANR(2)-1.)                               RGAS    276
          C***  ANR(3)=DIMENSIONLESS SPECIFIC HEAT (CONST. DENSITY)     RGAS    277
                ANR(4)=ANR(1)+ANR(3)                                    RGAS    278
280       C***  ANR(4)=DIMENSIONLESS SPECIFIC HEAT (CONST. PRESSURE)    RGAS    279
                ANR(8)=45008.609-ANR(3)*ALOG(171.6/.0001 **ANR(2))      RGAS    280
          C***  ANR(8)= REFERENCE ENTROPY                               RGAS    281
          26    ANR(L+5)=1./ANR(L+2)                                    RGAS    282
                ANR(L+6)=ANR(L+4)/ANR(L+1)                              RGAS    283
285             ANR(L+7)=ANR(L+6)/ANR(L+2)                              RGAS    284
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                441   GO TO (440,440,440,440,69,70,71,72),NUM                    RGAS    285
                440   QUOD=P/R**ANR(L+2)                                         RGAS    286
                      QUOT=P/R                                                   RGAS    287
                      GO TO(65,66,67,68,69,70,71,72),NUM                         RGAS    288
290             68    S=ANR(L+8)+ANR(L+3)*ALOG(QUOD)                             RGAS    289
                67    T=QUOT/ANR(L+1)                                            RGAS    290
                66    H=QUOT*ANR(L+6)                                            RGAS    291
                65    LL=L+L1                                                    RGAS    292
                      A=SQRT (ANR(LL )*QUOT)                                     RGAS    293
295                   GO TO 30                                                   RGAS    294
                69    EX=S-ANR(L+8)                                              RGAS    295
                      EX=EXP (EX/ANR(L+3))                                       RGAS    296
                      R=(P/EX)**ANR(L+5)                                         RGAS    297
                      QUOD=P/R**ANR(L+2)                                         RGAS    298
300                   QUOT=P/R                                                   RGAS    299
                      GO TO 67                                                   RGAS    300
                70    R=P/(T*ANR(L+1))                                           RGAS    301
                      QUOD=P/R**ANR(L+2)                                         RGAS    302
                      QUOT=P/R                                                   RGAS    303
305                   S=ANR(L+8)+ANR(L+3)*ALOG(QUOD)                             RGAS    304
                      GO TO 66                                                   RGAS    305
                71    ASSIGN 65 TO NJUMP                                         RGAS    306
                73    T=H/ANR(L+4)                                               RGAS    307
                      R=P/(T*ANR(L+1))                                           RGAS    308
310                   QUOD=P/R**ANR(L+2)                                         RGAS    309
                      QUOT=P/R                                                   RGAS    310
                      S=ANR(L+8)+ANR(L+3)*ALOG(QUOD)                             RGAS    311
                      GO TO NJUMP,(65,30)                                        RGAS    312
                72    ASSIGN 30 TO NJUMP                                         RGAS    313
315                   H=ANR(L+7)*A**2                                            RGAS    314
                      GO TO 73                                                   RGAS    315
                30    AX=A                                                       RGAS    316
                      HX=H                                                       RGAS    317
                      TX= T                                                      RGAS    318
320                   IF (NUM.NE.5) SX=S                                         RGAS    319
                      IF (NUM.EQ.5) RX=R                                         RGAS    320
                109   RETURN                                                     RGAS    321
                C***  F .LT. (1.0E-6)                                            RGAS    322
                27    L=8                                                        RGAS    323
325                   P=PX                                                       RGAS    324
                      R=RX                                                       RGAS    325
                      IF(GTESTR-GX) 24,441,24                                    RGAS    326
                24    GTESTR=GX                                                  RGAS    327
                      L1=9                                                       RGAS    328
330                   Z2=RO/10.**7                                               RGAS    329
                      PR=-7.+B                                                   RGAS    330
                      PR=PO*10.**PR                                              RGAS    331
                      Z1=PR                                                      RGAS    332
                      DO 21 N1=1,4                                               RGAS    333
335                   NL=NDL(N1,1)                                               RGAS    334
                      NU=NDU(N1,1)                                               RGAS    335
                      F=0.                                                       RGAS    336
                      CALL SERCH(F,TH,NL,NU,5,J,NER)                             RGAS    337
                      J=J/5                                                      RGAS    338
340             21    BN(N1)=TH(1,J)                                             RGAS    339
                      BN(1)=BN(1)/SQPORO                                         RGAS    340
                      BN(2)=BN(2)*RTO                                            RGAS    341
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                BN(3)=BN(3)*1.8                                          RGAS    342
                BN(4)=BN(4)*RRR                                          RGAS    343
345             ANR(9)=PR/(Z2 *BN(3))                                    RGAS    344
                RRX=ANR(9)                                               RGAS    345
                ANR(12)=BN(2)/BN (3)                                     RGAS    346
                ANR(10)=1.+ANR(9)/(ANR(12)-ANR(9))                       RGAS    347
                ANR(11)=ANR(12)/ANR(10)                                  RGAS    348
350             ANR(17)=BN(1)*BN(1)*Z2/Z1                                RGAS    349
                ANR(16)=BN(4)-ANR(11)*ALOG(Z1/Z2**ANR(10))               RGAS    350
                GO TO 26                                                 RGAS    351
                END                                                      RGAS    352
```

```
FUNCTION RHOFN      76/76   OPT=1                          FTN 4.6+460        06/15/79  18.58.36        PAGE     1

                FUNCTION RHOFN(P,HT,QSQ)                                        RHOFN      2
                COMMON/CONRG/PO,RO,TO,CONC,GASCON,HO,SO,AO,RTO,GX               CONRG1     2
                COMMON/WRDK03/PIT,HTOT,QSQ2                                     WRDK03     2
                EXTERNAL RROOT                                                  RHOFN      5
                LOGICAL BOL                                                     RHOFN      6
                RL=1.0E-7*RO                                                    RHOFN      7
                RH=1.0E+3*RO                                                    RHOFN      8
                PIT=P                                                           RHOFN      9
                HTOT=HT                                                         RHOFN     10
                QSQ2=QSQ/2.                                                     RHOFN     11
                CALL ZEROIN(RL,RH,1.0E-5,RROOT,BOL,XX,YY)                       RHOFN     12
                RHOFN=(XX+YY)/2.0                                               RHOFN     13
                IF (BOL) GO TO 102                                              RHOFN     14
                WRITE (6,101) XX,YY,RHOFN                                       RHOFN     15
          101   FORMAT(1H0,22HERROR RETURN IN RHOFN ,3(1PE13.5))                RHOFN     16
          102   RETURN                                                          RHOFN     17
                END                                                             RHOFN     18
```

```
1               FUNCTION RROOT(RHO)                                          RROOT     2
                COMMON/CONRG/PO,RO,TO,CONC,GASCON,HO,SO,AO,RTO,GX            CONRG1    2
                COMMON/WRDK03/PIT,HTOT,QSQ2                                  WRDK03    2
                CALL RGAS(PIT,RHO,AX,HX,TX,SX,GASCON,GX,-1.,-1.2)            RROOT     5
5               FUN=1.0-(HX+QSQ2)/HTOT                                       RROOT     6
                RROOT=FUN                                                    RROOT     7
                RETURN                                                       RROOT     8
                END                                                          RROOT     9
```

```
1                SUBROUTINE RSHOCK(P1,R1,U1,A1,H1,T1,S1,P2,R2,U2,A2,H2,T2,S2)        RSHOCK     2
                 COMMON/CONRG/PO,RO,TO,CONC,GASCON,HO,SO,BO,RTO,GX                  CONRG1     2
                 COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF    REALG      2
                *,V1INF,NITAVG,NWROUT                                               REALG      3
5                DIMENSION NX(30),XPMIN(30),XP2(30),XPMAX(30)                       RSHOCK     5
                 DATA NTOT/30/                                                      RSHOCK     6
                 DATA I123/0/                                                       RSHOCK     7
                 DATA P1X,R1X/0.,0./                                                RSHOCK     8
                 IF (I123.EQ.123) GO TO 99                                          RSHOCK     9
10               I123=123                                                           RSHOCK    10
                 RRX=GASCON                                                         RSHOCK    11
                 TEST=5.0E-5                                                        RSHOCK    12
           99    CONTINUE                                                           RSHOCK    13
                 U1X=U1                                                             RSHOCK    14
15               IF (P1.EQ.P1X.AND.R1.EQ.R1X) GO TO 98                              RSHOCK    15
                 P1X=P1                                                             RSHOCK    16
                 R1X=R1                                                             RSHOCK    17
                 CALL RGAS(P1X,R1X,A1,H1X,T1,S1,RRX,GX,-1,4,2)                      RSHOCK    18
                 H1=H1X                                                             RSHOCK    19
20         98    CONTINUE                                                           RSHOCK    20
                 U12=U1*U1                                                          RSHOCK    21
                 H1TOT=H1X+0.5*U12                                                  RSHOCK    22
          110    C1=U1*R1                                                           RSHOCK    23
                 C2=P1+U1*C1                                                        RSHOCK    24
25               C3=H1TOT                                                           RSHOCK    25
                 C1S=C1*C1                                                          RSHOCK    26
                 C4=.5*C2*C2/C1S-C3                                                 RSHOCK    27
                 C5=C2/C1S                                                          RSHOCK    28
                 C6=.5/C1S                                                          RSHOCK    29
30               N=1                                                                RSHOCK    30
                 IF (NWRPRT.LE.2) GO TO 108                                         RSHOCK    31
                 DO 109 KZ=1,30                                                     RSHOCK    32
                 NX(KZ)=0                                                           RSHOCK    33
                 XPMIN(KZ)=0.0                                                      RSHOCK    34
35               XP2(KZ)=0.0                                                        RSHOCK    35
          109    XPMAX(KZ)=0.0                                                      RSHOCK    36
          108    CONTINUE                                                           RSHOCK    37
                 EMIN=U1/A1                                                         RSHOCK    38
                 IF (EMIN.GT.7.) GO TO 1091                                         RSHOCK    39
40               WT1=3.                                                             RSHOCK    40
                 WT2=4.                                                             RSHOCK    41
                 GO TO 1092                                                         RSHOCK    42
          1091   CONTINUE                                                           RSHOCK    43
                 WT1=2.                                                             RSHOCK    44
45               WT2=3.                                                             RSHOCK    45
          1092   CONTINUE                                                           RSHOCK    46
                 PSTR=(GX+1.0)/((GX-1.0)+2.0/(EMIN*EMIN))                           RSHOCK    47
                 PMIN=P1+(C2-P1)*(PSTR-1.)/PSTR                                     RSHOCK    48
                 PMAX=C2                                                            RSHOCK    49
50        111    CONTINUE                                                           RSHOCK    50
                 P2=(WT1*PMIN+PMAX)/WT2                                             RSHOCK    51
                 IF (NWRPRT.LE.2) GO TO 1111                                        RSHOCK    52
                 IF (N.GE.NTOT) GO TO 1111                                          RSHOCK    53
                 NX(N)=N                                                            RSHOCK    54
55               NLAST=N                                                            RSHOCK    55
                 XPMIN(N)=PMIN                                                      RSHOCK    56
                 XP2(N)=P2                                                          RSHOCK    57
```

```
      XPMAX(N)=PMAX                                                     RSHOCK   58
 1111 CONTINUE                                                          RSHOCK   59
      PMAX1=PMAX/PMIN                                                   RSHOCK   60
      DELT1=PMAX1-1.0                                                   RSHOCK   61
  112 R=C1S/(C2-P2)                                                     RSHOCK   62
      IF (NWRPRT.GT.2) WRITE (6,122) P2,R,PMAX,PMIN,C1,C2,C3            RSHOCK   63
  122 FORMAT(1H ,12H*RSHOCK- P2=,1PE12.5,1X,2HR=1PE12.5,1X,5HPMAX=1PE12. RSHOCK   64
     *5,                                                                RSHOCK   65
     21X,5HPMIN=1PE12.5,1X,3HCM=1PE11.4,1X,3HCP=1PE11.4,1X,3HCH=1PE11.4) RSHOCK   66
      CALL RGAS(P2,R,A2,H2,T2,S2,GASCON,GX,-1,4,2)                      RSHOCK   67
      DELTA=C4+P2*(P2*C6-C5)+H2                                         RSHOCK   68
      IF (DELTA) 113,116,114                                            RSHOCK   69
  113 PMAX=P2                                                           RSHOCK   70
      GO TO 115                                                         RSHOCK   71
  114 PMIN=P2                                                           RSHOCK   72
      WT1=1                                                             RSHOCK   73
      WT2=2                                                             RSHOCK   74
  115 CONTINUE                                                          RSHOCK   75
      N=N+1                                                             RSHOCK   76
      IF (N.GT.500) GO TO 120                                           RSHOCK   77
      IF (ABS(DELT1).GT.1.0E-6) GO TO 111                               RSHOCK   78
  116 R2=C1S/(C2-P2)                                                    RSHOCK   79
      U2=C1/R2                                                          RSHOCK   80
      IF (NWRPRT.EQ.0) RETURN                                           RSHOCK   81
      IF (NWRPRT.LE.2) RETURN                                           RSHOCK   82
      K3=0                                                              RSHOCK   83
  101 CONTINUE                                                          RSHOCK   84
      K1=K3+1                                                           RSHOCK   85
      K3=K1+2                                                           RSHOCK   86
  102 WRITE (6,100) (NX(KX),XPMIN(KX),XP2(KX),XPMAX(KX),KX=K1,K3)       RSHOCK   87
      IF (K3.GE.NLAST) GO TO 103                                        RSHOCK   88
  100 FORMAT(1H ,3(2X,I2,1X,1PE12.5,1X,1PE12.5,1X,1PE12.5))             RSHOCK   89
      GO TO 101                                                         RSHOCK   90
  103 CONTINUE                                                          RSHOCK   91
      RETURN                                                            RSHOCK   92
  120 WRITE (6,121)                                                     RSHOCK   93
  121 FORMAT(1H0,21HERROR IN NORMAL SHOCK)                              RSHOCK   94
      RETURN                                                            RSHOCK   95
      END                                                               RSHOCK   96
```

```
      SUBROUTINE RU1TLD(P2X,R2X,U1X)                                    RU1TLD     2
      COMMON/CONRG/PO,RO,TO,CONC,GASCON,HO,SO,AO,RTO,GX                 CONRG1     2
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG      2
     *,V1INF,NITAVG,NWROUT                                              REALG      3
      DIMENSION P2T(350),R2T(350),U1T(350)                              RU1TLD     5
      DATA NARTOT/350/                                                  RU1TLD     6
      DATA UP,DN,UPD,DND/4H(1)-,4H(2)-,4H(1)D,4H(2)D/                   RU1TLD     7
      DATA P1,R1/0.,0./                                                 RU1TLD     8
      IF (P1.EQ.P1INF.AND.R1.EQ.R1INF) GO TO 110                        RU1TLD     9
      RRX=GASCON                                                        RU1TLD    10
      AMACHH=10.                                                        RU1TLD    11
  101 CONTINUE                                                          RU1TLD    12
      IF (NWRPRT.NE.0) WRITE (6,102)                                    RU1TLD    13
  102 FORMAT(1H1,23HNORMAL SHOCK CONDITIONS /1H0,16X,1HP,14X,3HRHO,12X, RU1TLD    14
     13HVEL,12X,5HSOUND,10X,4HENTH,11X,4HTEMP,11X,5HENTRO)              RU1TLD    15
      P1=P1INF                                                          RU1TLD    16
      R1=R1INF                                                          RU1TLD    17
      CALL RGAS(P1,R1,A1,HA,T1,S1,RRX,GX,-1,4,2)                        RU1TLD    18
      NH=1                                                              RU1TLD    19
      U1=A1                                                             RU1TLD    20
      N=1                                                               RU1TLD    21
  103 CALL RSHOCK(P1,R1,U1,A1,HA,T1,S1,P2,R2,U2,A2,H2,T2,S2)            RU1TLD    22
      IF (N.GT.NARTOT) GO TO 114                                        RU1TLD    23
      U1T(N)=U1                                                         RU1TLD    24
      P2T(N)=P2                                                         RU1TLD    25
      R2T(N)=R2                                                         RU1TLD    26
      NTOT=N                                                            RU1TLD    27
      U1Y=U1/A1                                                         RU1TLD    28
      IF (NWRPRT.EQ.0) GO TO 107                                        RU1TLD    29
      IF (N.NE.1) GO TO 106                                             RU1TLD    30
      P1Y=P1/PO                                                         RU1TLD    31
      R1Y=R1/RO                                                         RU1TLD    32
      H1Y=HA/RTO                                                        RU1TLD    33
      T1Y=T1/1.8                                                        RU1TLD    34
      S1Y=S1/GASCON                                                     RU1TLD    35
      CM1=R1*U1                                                         RU1TLD    36
      CP1=P1+U1*CM1                                                     RU1TLD    37
      CH1=HA+U1*U1*0.5                                                  RU1TLD    38
      WRITE (6,1040)CM1,CP1,CH1                                         RU1TLD    39
 1040 FORMAT(1H0,11X,19HUPSTREAM CONDITIONS,2X,4HCM1=1PE13.6,1X,4HCP1= RU1TLD    40
     11PE13.6,1X,4HCH1=1PE13.6)                                         RU1TLD    41
      NZ=N-1                                                            RU1TLD    42
      WRITE (6,104)NZ,UP,P1Y,R1Y,U1Y,A1,H1Y,T1Y,S1Y                     RU1TLD    43
      WRITE (6,104)NZ,UPD,P1,R1,U1,A1,HA,T1,S1                          RU1TLD    44
  106 CONTINUE                                                          RU1TLD    45
      U1Y=U1/A1                                                         RU1TLD    46
      CM1=R1*U1                                                         RU1TLD    47
      CP1=P1+U1*CM1                                                     RU1TLD    48
      CH1=HA+U1*U1*0.5                                                  RU1TLD    49
      WRITE (6,1043) U1,U1Y,CM1,CP1,CH1                                 RU1TLD    50
 1043 FORMAT(1H0,13HUPSTREAM VEL=,1PE15.7,1X,5HMACH=0PF9.5 ,10X,4HCM1= RU1TLD    51
     11PE13.6,1X,4HCP1=1PE13.6,1X,4HCH1=1PE13.6)                        RU1TLD    52
      P2Y=P2/PO                                                         RU1TLD    53
      R2Y=R2/RO                                                         RU1TLD    54
      U2Y=U2/A2                                                         RU1TLD    55
      H2Y=H2/RTO                                                        RU1TLD    56
      T2Y=T2/1.8                                                        RU1TLD    57
```

```
                S2Y=S2/GASCON                                                   RU1TLD     58
                CM2=R2*U2                                                       RU1TLD     59
60              CP2=P2+U2*CM2                                                   RU1TLD     60
                CH2=H2+U2*U2*0.5                                                RU1TLD     61
                IF (N.LE.1) GO TO 1045                                          RU1TLD     62
                DP2=P2T(N)-P2T(N-1)                                             RU1TLD     63
                DP2X=ALOG(P2T(N))-ALOG(P2T(N-1))                                RU1TLD     64
65              IF (DP2.EQ.0.0) GO TO 1045                                      RU1TLD     65
                DR2DP2=(R2T(N)-R2T(N-1))/DP2                                    RU1TLD     66
                DU1DP2=(U1T(N)-U1T(N-1))/DP2                                    RU1TLD     67
                IF (DPEX.EQ.0.0) GO TO 1045                                     RU1TLD     68
                DR2DLN=DP2*DR2DP2/DP2X                                          RU1TLD     69
70              DU1DLN=DP2*DU1DP2/DP2X                                          RU1TLD     70
          1045  CONTINUE                                                        RU1TLD     71
                WRITE (6,1041)CM2,CP2,CH2                                       RU1TLD     72
                WRITE (6,104) N,DN,P2Y,R2Y,U2Y,A2,H2Y,T2Y,S2Y                   RU1TLD     73
                WRITE (6,104) N,DND,P2,R2,U2,A2,H2,T2,S2                        RU1TLD     74
75              IF (N.LE.1) WRITE (6,1042)                                      RU1TLD     75
                IF (N.GT.1) WRITE (6,1044) DR2DP2,DU1DP2,DR2DLN,DU1DLN          RU1TLD     76
          1041  FORMAT(1H ,11X,21HDOWNSTREAM CONDITIONS,21X,4HCM2=1PE13.6,1X,4HCP2 RU1TLD     77
                *=                                                              RU1TLD     78
                11PE13.6,1X,4HCH2=1PE13.6)                                      RU1TLD     79
80        1042  FORMAT(1HC)                                                     RU1TLD     80
          1044  FORMAT(1HO,13X,8HDR2/DP2=,1PE12.5,2X,8HDU1/DP2=,1PE12.5,3X,     RU1TLD     81
                110HDR2/DLNP2=,1PE12.5,2X,10HDU1/DLNP2=,1PE12.5)                RU1TLD     82
          104   FORMAT (1H ,14,2X,A4,1X,7(1PE15.7))                             RU1TLD     83
          107   CONTINUE                                                        RU1TLD     84
85              IF (U1Y.GT.AMACHH) GO TO 105                                    RU1TLD     85
                N=N+1                                                           RU1TLD     86
                U1=U1Y*A1*1.02                                                  RU1TLD     87
                GO TO 103                                                       RU1TLD     88
          C     - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   RU1TLD     89
90        105   CONTINUE                                                        RU1TLD     90
                IF (NWRPRT.LT.2) GO TO 110                                      RU1TLD     91
                WRITE (6,120) (NNN,P2T(NNN),R2T(NNN),U1T(NNN),NNN=NH,NTOT)      RU1TLD     92
                NH=NTOT+1                                                       RU1TLD     93
          120   FORMAT(1H ,I3,1PE12.5,1X,1PE12.5,1X,1PE12.5)                    RU1TLD     94
95        110   CONTINUE                                                        RU1TLD     95
                IF (P2X.GT.P2T(NTOT)) GO TO 112                                 RU1TLD     96
                ARG=P2X                                                         RU1TLD     97
                CALL SERCH(ARG,P2T,1,NTOT,1,NX,NERR)                            RU1TLD     98
          111   PL=P2T(NX)                                                      RU1TLD     99
100             PH=P2T(NX+1)                                                    RU1TLD    100
                FACT1=(ARG-PL)/(PH-PL)                                          RU1TLD    101
                RL=R2T(NX)                                                      RU1TLD    102
                RH=R2T(NX+1)                                                    RU1TLD    103
                RM=RL+FACT1*(RH-RL)                                             RU1TLD    104
105             UL=U1T(NX)                                                      RU1TLD    105
                UH=U1T(NX+1)                                                    RU1TLD    106
                UM=UL+FACT1*(UH-UL)                                             RU1TLD    107
                R2X=RM                                                          RU1TLD    109
                U1X=UM                                                          RU1TLD    109
110             IF (NWRPRT.EQ.0) RETURN                                         RU1TLD    110
                WRITE (6,118) FACT1,PL,ARG,PH,RL,RM,RH,UL,UM,UH                 RU1TLD    111
          118   FORMAT (1H ,11H*RU1TLD- F=,OPF7.4,1X,3H,P=,3(1PE10.3,1X),3H,R=, RU1TLD    112
                13(1PE10.3,1X),3H,U=,3(1PE10.3,1X))                             RU1TLD    113
                RETURN                                                          RU1TLD    114
```

```
115          112   AMACHH=AMACHH*1.5                                          RU1TLD   115
                   WRITE (6,117) P2X,P2T(NTOT),R2T(NTOT),U1T(NTOT)            RU1TLD   116
              117  FORMAT(1HO,25HARRY IN RU1TLD EXPANDED. ,3HP2=1PE13.6,1X,6HP2(N)=  RU1TLD   117
                  11PE13.6,1X,6HR2(N)=1PE13.6,1X,6HU1(N)=1PE13.6)             RU1TLD   118
                   GO TO 107                                                  RU1TLD   119
120           114  WRITE (6,115)                                              RU1TLD   120
              115  FORMAT(1HO,48HEXITED.  ARRY STORAGE IS INSUFFICIENT IN RU1TLD.)  RU1TLD   121
                   IF (P2X.GT.P2T(NTOT)) STOP                                 RU1TLD   122
                   GO TO 110                                                  RU1TLD   123
                   END                                                        RU1TLD   124
```

```
      SUBROUTINE SERCH(X,Q,NL,NU,NS,NOUT,NERR)                          SERCH     2
      DIMENSION Q(1)                                                    SERCH     3
   20 IF (Q(NU)-Q(NL)) 30,40,40                                         SERCH     4
C     SET MONOTONIC DECREASING                                          SERCH     5
   30 NTRN=-1                                                           SERCH     6
      IF (X.LT.Q(NU)) GO TO 69                                          SERCH     7
      IF (X.GT.Q(NL)) GO TO 68                                          SERCH     8
      GO TO 50                                                          SERCH     9
C     X IS NOT WITHIN DESIGNATED BOUNDS.                                SERCH    10
   68 NOUT=NL                                                           SERCH    11
      NERR=-1                                                           SERCH    12
      GO TO 70                                                          SERCH    13
   69 NOUT=NU                                                           SERCH    14
      NERR=1                                                            SERCH    15
   70 RETURN                                                            SERCH    16
C     SET MONOTONIC INCREASING                                          SERCH    17
   40 NTRN=1                                                            SERCH    18
      IF (X.LT.Q(NL)) GO TO 68                                          SERCH    19
      IF (X.GT.Q(NU)) GO TO 69                                          SERCH    20
   50 NERR=0                                                            SERCH    21
      MI=NL                                                             SERCH    22
      MA=NL+((NU-NL)/NS)*NS                                             SERCH    23
      IF (NTRN) 130,60,60                                               SERCH    24
   60 IQ=(MA-MI)/NS                                                     SERCH    25
      IF (IQ.LE.1) GO TO 120                                            SERCH    26
      MM=MI+NS*(IQ/2)                                                   SERCH    27
      IF (Q(MM)-X) 100,90,110                                           SERCH    28
   90 NOUT=MM                                                           SERCH    29
      RETURN                                                            SERCH    30
  100 MI=MM                                                             SERCH    31
      GO TO 60                                                          SERCH    32
  110 MA=MM                                                             SERCH    33
      GO TO 60                                                          SERCH    34
  120 NOUT=MI                                                           SERCH    35
      RETURN                                                            SERCH    36
  130 IQ=(MA-MI)/NS                                                     SERCH    37
      IF (IQ.LE.1) GO TO 120                                            SERCH    38
      MM=MI+NS*(IQ/2)                                                   SERCH    39
  140 IF (Q(MM)-X) 160,90,150                                           SERCH    40
  150 MI=MM                                                             SERCH    41
      GO TO 130                                                         SERCH    42
  160 MA=MM                                                             SERCH    43
      GO TO 130                                                         SERCH    44
      END                                                               SERCH    45
```

```
      SUBROUTINE SETSPC(NITT,RJT,NIPHIT,RKT,PHIFDT)                          SETSPC     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                              CVARB      2
      COMMON/LARGE/ETEMP(4,24,41),EO(4,24,41),                               CVARB      3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                      CVARB      4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4     PVARB      2
     *1) ,                                                                   PVARB      3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,                    PVARB      4
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,        PVARB      5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,        PVARB      6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,        PVARB      7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41)        PVARB      8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24)      IDVARB     2
      COMMON/SVARB/T,Z     , PHI   , DT    , DZ    , DPHI  , ZINT  ,         SVARB      2
     *      ZEND  , PI    , ALPHA , GAMMA , SIGMA , XMACH , TAPE1 ,         SVARB      3
     *      TAPE2 , DISK1 , ALPH  , DISK2 , SIGM  , NPRNT , DZDT  ,         SVARB      4
     *      DZDPH , ZM    , TMWO  , TMLO  , TMW   , TML   , TTMW  ,         SVARB      5
     *      TTML  , RZ    , BZ    , NIPHI , NIT   , KPHI  , NITER ,         SVARB      6
     *      NPHI  , NPHI1 , NPHI2 , NPHI3 , NPHM1 , NPHM2 , NPHM3 ,         SVARB      7
     *      NT    , NT1   , NT2   , NT3   , PHIFD , NCONE , RADI  ,         SVARB      8
     *      PHIF  , METHOD, LAG   , NBC   , PINF  , RHOIN , UINF  ,         SVARB      9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                          SVARB     10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                        SVARB     11
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF        REALG      2
     *,V1INF,NITAVG,NWROUT                                                   REALG      3
      COMMON/CONRG/WRPO,WRRO,WRTO,WRCON,GASCON,WRHO,WRSO,WRAO,WRRTO,WRGX      CONRG      2
      COMMON/ENTRO/S(41),ZBS,ZFLD,ITPRTB,ITPRTF,NCASE,NTDSDS                 ENTRO      2
      COMMON/CLUSTR/RJ,XI(24),TXI(24),TXIT(24)                               CLUSTR     2
      DIMENSION PB(45,45),PPB(45,45)                                         SETSPC     11
      DATA PB/2025*0.0/,PPB/2025*0.0/                                        SETSPC     12
      IF(NITT.EQ.NIT.AND.RJT.EQ.RJ) GO TO 54                                 SETSPC     13
C.....RESPACE IN RADIAL DIRECTION                                            SETSPC     14
      WRITE (6,102) Z                                                        SETSPC     15
      MX=NT                                                                  SETSPC     16
      NX=NPHM1                                                               SETSPC     17
      NC1=NX                                                                 SETSPC     18
      MC1=NITT+2                                                             SETSPC     19
      SINHRJ=SINH(RJT)                                                       SETSPC     20
      DO 57 J=3,NT2                                                          SETSPC     21
      T=TP(J)                                                                SETSPC     22
      X=XI(J)                                                                SETSPC     23
      IF(RJT.EQ.0.0) GO TO 57                                                SETSPC     24
      T=1.0/RJT*ALOG(X*SINHRJ+SQRT(1.0+(X*SINHRJ)**2))                       SETSPC     25
   57 PB(NPHM1,J-2)=T                                                        SETSPC     26
      DO 65 N=1,4                                                            SETSPC     27
      DO 58 J=3,NT2                                                          SETSPC     28
      DO 58 K=3,NPHI                                                         SETSPC     29
      GO TO (61,62,63,64),N                                                  SETSPC     30
   61 PB(K-2,J-2)=P(J,K)                                                     SETSPC     31
      GO TO 58                                                               SETSPC     32
   62 PB(K-2,J-2)=U(J,K)                                                     SETSPC     33
      GO TO 58                                                               SETSPC     34
   63 PB(K-2,J-2)=V(J,K)                                                     SETSPC     35
      GO TO 58                                                               SETSPC     36
   64 PB(K-2,J-2)=W(J,K)                                                     SETSPC     37
   58 CONTINUE                                                               SETSPC     38
      CALL ESPACE(PB,45,MX,NC1,MC1,PPB)                                      SETSPC     39
      DO 59 J=1,MC1                                                          SETSPC     40
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      DO 59 K=1,NPHM2                                                   SETSPC   41
      GO TO (66,67,68,69),N                                             SETSPC   42
   66 P(J+2,K+2)=PPB(K,J)                                               SETSPC   43
      GO TO 59                                                          SETSPC   44
   67 U(J+2,K+2)=PPB(K,J)                                               SETSPC   45
      GO TO 59                                                          SETSPC   46
   68 V(J+2,K+2)=PPB(K,J)                                               SETSPC   47
      GO TO 59                                                          SETSPC   48
   69 W(J+2,K+2)=PPB(K,J)                                               SETSPC   49
   59 CONTINUE                                                          SETSPC   50
   65 CONTINUE                                                          SETSPC   51
      WRITE(6,100) NIT,NITT,RJ,RJT                                      SETSPC   52
      NIT=NITT                                                          SETSPC   53
      NT2=NIT+4                                                         SETSPC   54
      RJ=RJT                                                            SETSPC   55
      IF (NREAL.EQ.-1) GO TO 31                                         SETSPC   56
      DO 70 J=3,NT2                                                     SETSPC   57
      DO 70 K=3,NPHI                                                    SETSPC   58
   70 RHO(J,K)=P(J,K)/(1.0-U(J,K)**2-V(J,K)**2-W(J,K)**2)               SETSPC   59
      GO TO 54                                                          SETSPC   60
   31 CONTINUE                                                          SETSPC   61
      DO 32 J=3,NT2                                                     SETSPC   62
      DO 32 K=3,NPHI                                                    SETSPC   63
      QSQ=U(J,K)**2+V(J,K)**2+W(J,K)**2                                 SETSPC   64
      RHO(J,K)=RHOFN(P(J,K),BODYH,QSQ)                                  SETSPC   65
   32 CONTINUE                                                          SETSPC   66
   54 IF(NIPHIT.EQ.NIPHI.AND.RKT.EQ.RK.AND.PHIFDT.EQ.PHIFD) GO TO 56    SETSPC   67
C........RESPACE IN MERIDINOL DIRECTION                                 SETSPC   68
      WRITE (6,102)Z                                                    SETSPC   69
      NX=NT2+2                                                          SETSPC   70
      MX=NPHM2                                                          SETSPC   71
      NC1=NT2+2                                                         SETSPC   72
      MC1=NIPHIT+1                                                      SETSPC   73
      IF(RKT.EQ.0.0) GO TO 85                                           SETSPC   74
      YO=0.5/RKT*ALOG((1.0+(EXP(RKT)-1.0)*PHIFDT/180.0)/                SETSPC   75
     * (1.0-(1.0-EXP(-RKT))*PHIFDT/180.0))                              SETSPC   76
      YO1=SINH(RKT*YO)                                                  SETSPC   77
   85 CONTINUE                                                          SETSPC   78
      DO 55 K=3,NPHI                                                    SETSPC   79
      PB(NX-1,K-2)=RSPHI(K)                                             SETSPC   80
      PB(NX-2,K-2)=RSZ(K)                                               SETSPC   81
      PB(NX-3,K-2)=RS(K)                                                SETSPC   82
      IF(RKT.GT.0.0) GO TO 86                                           SETSPC   83
      PB(NX,K-2)=PHIP(K)                                                SETSPC   84
      GO TO 55                                                          SETSPC   85
   86 YO2=(PHIP(K)/PHIFDT*RADI-1.0)*YO1                                 SETSPC   86
      PB(NX,K-2)=(YO+1.0/RKT*ALOG(YO2+SQRT(YO2**2+1.0)))*PI             SETSPC   87
   55 CONTINUE                                                          SETSPC   88
      DO 81 N=1,4                                                       SETSPC   89
      DO 60 J=3,NT2                                                     SETSPC   90
      DO 60 K=3,NPHI                                                    SETSPC   91
      GO TO (71,72,73,74),N                                             SETSPC   92
   71 PB(J-2,K-2)=P(J,K)                                                SETSPC   93
      GO TO 60                                                          SETSPC   94
   72 PB(J-2,K-2)=U(J,K)                                                SETSPC   95
      GO TO 60                                                          SETSPC   96
   73 PB(J-2,K-2)=V(J,K)                                                SETSPC   97
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      GO TO 60                                                          SETSPC     98
   74 PB(J-2,K-2)=W(J,K)                                                SETSPC     99
   60 CONTINUE                                                          SETSPC    100
      CALL ESPACE(PB,HS,MX,NC1,MC1,PPB)                                 SETSPC    101
      NT2M2=NT2-2                                                       SETSPC    102
      DO 75 J=1,NT2M2                                                   SETSPC    103
      DO 75 K=1,MC1                                                     SETSPC    104
      GO TO (76,77,78,79),N                                             SETSPC    105
   76 P(J+2,K+2)=PPB(J,K)                                               SETSPC    106
      IF (P(J+2,K+2).LE..0) WRITE (6,115) J,K,P(J+2,K+2)                SETSPC    107
      IF(P(J+2,K+2) .LE. 0.0)P(J+2,K+2)=PINF*(1.-GAMMA*0.5)             SETSPC    108
      GO TO 75                                                          SETSPC    109
   77 U(J+2,K+2)=PPB(J,K)                                               SETSPC    110
      GO TO 75                                                          SETSPC    111
   78 V(J+2,K+2)=PPB(J,K)                                               SETSPC    112
      GO TO 75                                                          SETSPC    113
   79 W(J+2,K+2)=PPB(J,K)                                               SETSPC    114
   75 CONTINUE                                                          SETSPC    115
   81 CONTINUE                                                          SETSPC    116
      WRITE(6,101) NIPHI,NIPHIT,RK,RKT,PHIFD,PHIFDT                     SETSPC    117
      NIPHI=NIPHIT                                                      SETSPC    118
      NPHI=NIPHI+3                                                      SETSPC    119
      RK=RKT                                                            SETSPC    120
      PHIFD=PHIFDT                                                      SETSPC    121
      IF (NREAL.EQ.-1)GO TO 33                                          SETSPC    122
      DO 80 J=3,NT2                                                     SETSPC    123
      DO 80 K=3,NPHI                                                    SETSPC    124
   80 RHO(J,K)=P(J,K)/(1.0-U(J,K)**2-V(J,K)**2-W(J,K)**2)               SETSPC    125
      GO TO 83                                                          SETSPC    126
   33 CONTINUE                                                          SETSPC    127
      DO 84 J=3,NT2                                                     SETSPC    128
      DO 84 K=3,NPHI                                                    SETSPC    129
      QSQ=U(J,K)**2+V(J,K)**2+W(J,K)**2                                 SETSPC    130
      RHO(J,K)=RHOFN(P(J,K),BOOYM,QSQ)                                  SETSPC    131
   84 CONTINUE                                                          SETSPC    132
   83 CONTINUE                                                          SETSPC    133
      DO 82 K=1,MC1                                                     SETSPC    134
      RS(K+2)=PPB(NX-3,K)                                               SETSPC    135
      RSZ(K+2)=PPB(NX-2,K)                                              SETSPC    136
   82 RSPHI(K+2)=PPB(NX-1,K)                                            SETSPC    137
   56 CONTINUE                                                          SETSPC    138
      ICONST(48)=1                                                      SETSPC    139
      CALL INITA                                                        SETSPC    140
      CALL ENDRY(2)                                                     SETSPC    141
  115 FORMAT(5X,4HJ-2=,I2,3X,4HK-2=,I2,3X,7HP(J,K)=,E15.6)              SETSPC    142
  100 FORMAT(1HO,49HNUMBER OF POINTS IN RADIAL DIRECTION CHANGED FROM,I3 SETSPC    143
     *,                                                                 SETSPC    144
     * 3H TO,I3,2HOR,/1X,37HRADIAL SPACING PARAMETER CHANGED FROM,F5.2,  SETSPC    145
     * 3H TO,F5.2)                                                      SETSPC    146
  101 FORMAT(1HO,39HNUMBER OF MERIDINOL PLANES CHANGED FROM,I3,         SETSPC    147
     * 3H TO,I3,3H OR,/1X,40HMERIDINOL SPACING PARAMETER CHANGED FROM,F5 SETSPC    148
     *,                                                                 SETSPC    149
     *2,3H TO,F5.2,3H OR,/1X,29HCLUSTERING POINT CHANGED FROM,F6.1,3H TO SETSPC    150
     *,                                                                 SETSPC    151
     * F6.1,8H DEGREES)                                                 SETSPC    152
  102 FORMAT(1HO,13HRESPACE AT Z=,1PE12.5)                              SETSPC    153
      RETURN                                                            SETSPC    154
```

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      END
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```
      SUBROUTINE SHOCK(K4)                                              SHOCK     2
      LEVEL 2,ETEMP,EO,FO,GO,HO                                         CVARB     2
      COMMON/LPAGE/ETEMP(4,24,41),EO(4,24,41),                          CVARB     3
     *      FO(4,24,41)    , GO(4,24,41) , HO(4,24,41)                  CVARB     4
      COMMON /PVARB/RHO(24,41) , P(24,41) , U(24,41) , V(24,41) , W(24,4 PVARB     2
     *1) ,                                                              PVARB     3
     *      ROB(41)    , ROBZ(41) , VINF(41) , WINF(41) ,               PVARB     4
     *      ROBPH(41)  ,            RB(41)   , RBZ(41)  , RBPH(41) ,    PVARB     5
     *     DTDPH(24,41), BCT(41)  ,DTDZ(24,41),DTDR(41) , ACT(41)  ,    PVARB     6
     *      ICONST(50) , GAM(20)  , CONST(50) ,NREGON   , RS(41)   ,    PVARB     7
     *      RSZ(41)    , RSPHI(41), RST(41)   , RSZT(41), RSPHIT(41,    PVARB     8
      COMMON /IDVARB/RK,ETA(41),PHIP(41),DTIL(41),DTILE(41),DETA,TP(24) IDVARB     2
      COMMON/SVARB/T,Z      , PHI    , DT     , DZ     , DPHI   , ZINT  ,  SVARB     2
     *      ZEND  , PI     , ALPHA  , GAMMA  , SIGMA  , XMACH  , TAPE1 ,  SVARB     3
     *      TAPE2 , DISK1  , ALPH   , DISK2  , SIGM   , NPRNT  , DZDT  ,  SVARB     4
     *      DZDPH , ZM     , TMWO   , TMLO   , TMW    , TML    , TTMW  ,  SVARB     5
     *      TTML  , RZ     , BZ     , NIPHI  , NIT    , KPHI   , NITER ,  SVARB     6
     *      NPHI  , NPHI1  , NPHI2  , NPHI3  , NPHM1  , NPHM2  , NPHM3 ,  SVARB     7
     *      NT    , NT1    , NT2    , NT3    , PHIFO  , NCONE  , RADI  ,  SVARB     8
     *      PHIF  , METHOD, LAG    , NBC    , PINF   , RHOIN  , UINF  ,  SVARB     9
     *      QINF,DIAM,ALENGT,ZREF,ZCG,ZSHIFT,IFANDM                     SVARB    10
      INTEGER DISK1,DISK2,TAPE1,TAPE2                                   SVARB    11
      COMMON/REALG/NREAL,NWRPRT,BODYH,BODYS,PSONIC,RSONIC,P1INF,R1INF   REALG     2
     *,V1INF,NITAVG,NWROUT                                              REALG     3
C..RANKINE-HUGONIOT FUNCTIONS                                           SHOCK     8
      U1TILD(A)=SQRT(C1+C2*(A-1.))                                      SHOCK     9
      DRSDZ(A,B,C,D)=(UINF*C+A*SQRT(D*(1.+B*B)+C*C))/D                  SHOCK    10
      RHOS(A)=(A+GRATIO)/(1.+GRATIO*A)                                  SHOCK    11
      ABAR(A,B,D,E,F)=(F-1.)*ABS(-UINF*D+A-B*E)/((D*D+1.+E*E)*F)        SHOCK    12
      US(A,B,C)=A-C*B                                                   SHOCK    13
      VS(A,B)=A+B                                                       SHOCK    14
      WS(A,B,C)=A-B*C                                                   SHOCK    15
      GAMPM1=GAMMA                                                      SHOCK    16
      GAMP1=GAMMA+1.                                                    SHOCK    17
      GAMM1=GAMMA-1.                                                    SHOCK    18
      GRATIO=GAMM1/GAMP1                                                SHOCK    19
      GAMP1G=GAMP1/GAMMA                                                SHOCK    20
      C1=0.5*GAMM1*PINF/RHOIN                                           SHOCK    21
      C2=0.5*GAMP1G*C1                                                  SHOCK    22
C...AUTOMATIC  ANGLE OF ATTACK INCREMENTER FOR CONE SOLUTIONS           SHOCK    23
      IF(NCONE.EQ.2.OR.K4.EQ.2) GO TO 17                                SHOCK    24
      IF(ICONST(5).EQ.1) KLAG=0                                         SHOCK    25
      IF(KLAG .GT. 100)GO TO 17                                         SHOCK    26
      ALP=KLAG*ALPH/100.                                                SHOCK    27
      CONST(1)=SIN(ALP)                                                 SHOCK    28
      CONST(2)=COS(ALP)                                                 SHOCK    29
      UINF=QINF*CONST(2)                                                SHOCK    30
      DO 18 K=2,NPHI1                                                   SHOCK    31
      PHI=PHIP(K)                                                       SHOCK    32
      VINF(K)=-QINF*CONST(1)*COS(PHI)                                   SHOCK    33
   18 WINF(K)= QINF*CONST(1)*SIN(PHI)                                   SHOCK    34
      ALPD=ALP*RADI                                                     SHOCK    35
      KLAG=KLAG+1                                                       SHOCK    36
   17 CONTINUE                                                          SHOCK    37
12    CONTINUE                                                          SHOCK    38
      GO TO (1,2),K4                                                    SHOCK    39
1     CONTINUE                                                          SHOCK    40
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      C..SHOCK PREDICTOR                                                SHOCK   41
            DO 3 K=3,NPHI                                               SHOCK   42
   60   3     RST(K)=RS(K)+OZ*RSZ(K)                                     SHOCK   43
            DO 4 K=1,2                                                  SHOCK   44
            M=6-K                                                       SHOCK   45
            I=NPHI+K                                                    SHOCK   46
            N=NPHI-K                                                    SHOCK   47
   65       RST(K)=RST(M)                                              SHOCK   48
            RST(I)=RST(N)                                               SHOCK   49
   4     CONTINUE                                                       SHOCK   50
            DO 5 K=3,NPHI                                               SHOCK   51
            RSPHIT(K)=(RST(K+1)-RST(K-1))/(2.0*DETA)*DTIL(K)            SHOCK   52
   70       PS=P(NT2,K)                                                SHOCK   53
            PSRAT=PS/PINF                                               SHOCK   54
            IF (NREAL.EQ.-1) GO TO 13                                   SHOCK   55
            U1T=U1TILD(PSRAT)                                           SHOCK   56
            RHRAT=RHOS(PSRAT)                                           SHOCK   57
   75       GO TO 14                                                   SHOCK   58
   13    CALL RU1TLD(PS,ROST,U1T)                                       SHOCK   59
            RHRAT=ROST/RHINF                                            SHOCK   60
   14    CONTINUE                                                       SHOCK   61
            RS1=RST(K)                                                  SHOCK   62
   80       RSPH=RSPHIT(K)                                             SHOCK   63
            RSPHR=RSPH/RS1                                              SHOCK   64
            FACT1=VINF(K)-WINF(K)*RSPHR                                 SHOCK   65
            FACT2=UINF*UINF-U1T*U1T                                     SHOCK   66
            IF(FACT2 .LT. 0.)U1T=-U1T                                   SHOCK   67
   85       IF(FACT2 .LT. 0.)WRITE(6,200)UINF,U1T,FACT2                 SHOCK   68
    200  FORMAT(1H1,3X,5HUINF=,E13.6,3X,4HU1T=,E13.6,3X,6HFACT2=,E13.6) SHOCK   69
            RSZT1=DRSDZ(U1T,RSPHR,FACT1,FACT2)                          SHOCK   70
            RSZT(K)=RSZT1                                               SHOCK   71
            ABART=ABAR(VINF(K),WINF(K),RSZT1,RSPHR,RHRAT)               SHOCK   72
   90       UST=US(UINF,ABART,RSZT1)                                   SHOCK   73
            VST=VS(VINF(K),ABART)                                       SHOCK   74
            WST=WS(WINF(K),ABART,RSPHR)                                 SHOCK   75
            IF (NREAL.EQ.0) ROST=RHRAT*RHOIN                            SHOCK   76
            RHO(NT2,K)=ROST                                             SHOCK   77
   95       U(NT2,K)=UST                                               SHOCK   78
            V(NT2,K)=VST                                                SHOCK   79
            W(NT2,K)=WST                                                SHOCK   80
            DATA NSMEN1,NSMEN2/13,15/                                   SHOCK   81
            IF (NREAL.NE.-1) GO TO 5                                    SHOCK   82
  100       IF (NWRPAT.GE.2) WRITE (6,100) NSMEN1,K,PS,ROST,U1T,UST,VST,WST,
           1ABART                                                       SHOCK   84
   5     CONTINUE                                                       SHOCK   85
            DO 6 K=1,2                                                  SHOCK   86
            M=6-K                                                       SHOCK   87
  105       I=NPHI+K                                                   SHOCK   88
            N=NPHI-K                                                    SHOCK   89
            RSZT(K)=RSZT(M)                                             SHOCK   90
            RSZT(I)=RSZT(N)                                             SHOCK   91
            RSPHIT(K)=-RSPHIT(M)                                        SHOCK   92
  110       RSPHIT(I)=-RSPHIT(N)                                       SHOCK   93
   6     CONTINUE                                                       SHOCK   94
            RETURN                                                      SHOCK   95
   2     CONTINUE                                                       SHOCK   96
      C..SHOCK CORRECTOR                                                SHOCK   97
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```
      DO 8 K=3,NPHI                                                     SHOCK    98
    8 RS(K)=RS(K)+0.5*(RSZ(K)+RSZT(K))*DZ                               SHOCK    99
      DO 9 K=1,2                                                        SHOCK   100
      M=6-K                                                             SHOCK   101
      I=NPHI+K                                                          SHOCK   102
      N=NPHI-K                                                          SHOCK   103
      RS(K)=RS(M)                                                       SHOCK   104
      RS(I)=RS(N)                                                       SHOCK   105
    9 CONTINUE                                                          SHOCK   106
      DO 10 K=3,NPHI                                                    SHOCK   107
      RSPHI(K)=(RS(K+1)-RS(K-1))/(2.0*DETA)*DTIL(K)                     SHOCK   108
      PS=P(NT2,K)                                                       SHOCK   109
      PSRAT=PS/PINF                                                     SHOCK   110
      IF (NREAL.EQ.-1) GO TO 15                                         SHOCK   111
      U1T=U1TILD(PSRAT)                                                 SHOCK   112
      RHRAT=RHOS(PSRAT)                                                 SHOCK   113
      GO TO 16                                                          SHOCK   114
   15 CALL RU1TLD(PS,ROSF,U1T)                                          SHOCK   115
      RHRAT=ROSF/R1INF                                                  SHOCK   116
   16 CONTINUE                                                          SHOCK   117
      RS1=RS(K)                                                         SHOCK   118
      RSPH=RSPHI(K)                                                     SHOCK   119
      RSPHR=RSPH/RS1                                                    SHOCK   120
      FACT1=VINF(K)-WINF(K)*RSPHR                                       SHOCK   121
      FACT2=UINF*UINF-U1T*U1T                                           SHOCK   122
      IF(FACT2 .LT. 0.)U1T=-U1T                                         SHOCK   123
      IF(FACT2 .LT. 0.)WRITE(6,200)UINF,U1T,FACT2                       SHOCK   124
      RSZ1 =DRSDZ(U1T,RSPHR,FACT1,FACT2)                                SHOCK   125
      RSZ(K)=RSZ1                                                       SHOCK   126
      ABART=ABAR(VINF(K),WINF(K),RSZ1 ,RSPHR,RHRAT)                     SHOCK   127
      USF=US(UINF,ABART,RSZ1)                                           SHOCK   128
      VSF=VS(VINF(K),ABART)                                             SHOCK   129
      WSF=WS(WINF(K),ABART,RSPHR)                                       SHOCK   130
      IF (NREAL.EQ.0) ROSF=RHRAT*RHOIN                                  SHOCK   131
      RHO(NT2,K)=ROSF                                                   SHOCK   132
      U(NT2,K)=USF                                                      SHOCK   133
      V(NT2,K)=VSF                                                      SHOCK   134
      W(NT2,K)=WSF                                                      SHOCK   135
      IF (NREAL.NE.-1) GO TO 10                                         SHOCK   136
      IF (NWRPRT.GE.2) WRITE (6,100) NSMEN2,K,PS,ROSF,U1T,USF,VSF,WSF,  SHOCK   137
     1ABART                                                             SHOCK   138
   10 CONTINUE                                                          SHOCK   139
      DO 11 K=1,2                                                       SHOCK   140
      M=6-K                                                             SHOCK   141
      I=NPHI+K                                                          SHOCK   142
      N=NPHI-K                                                          SHOCK   143
      RSZ(K)=RSZ(M)                                                     SHOCK   144
      RSZ(I)=RSZ(N)                                                     SHOCK   145
      RSPHI(K)=-RSPHI(M)                                                SHOCK   146
      RSPHI(I)=-RSPHI(N)                                                SHOCK   147
   11 CONTINUE                                                          SHOCK   148
      RETURN                                                            SHOCK   149
  100 FORMAT(1H ,16H*SHOCK- STAT NO=,I2,1X,2HK=,I2,1X,2HP=,1PE11.4,1X,  SHOCK   150
     12HR=1PE11.4,1X,3HUT=,1PE11.4,1X,2HU=,1PE11.4,1X,2HV=,1PE11.4,1X,  SHOCK   151
     22HW=,1PE11.4,1X,3HAB=1PE11.4)                                     SHOCK   152
      END                                                               SHOCK   153
```

```
      SUBROUTINE START (THETAS,HMFS,GAMMA,XO,THAB,M,MW,Y,U,V,RHO,P,MER,
     1TH)
C  A SUBROUTINE TO COMPUTE STARTING VALUES FROM CONICAL FLOW SOLUTION
      COMMON T(27)
      COMMON /COM1/MER1,GAMMA1
      COMMON /ERINT/IER
      EXTERNAL DERIV
      DIMENSION TH(M),Y(M),U(M),V(M),RHO(M),P(M)
      GAMMA1=GAMMA
      MER=0
      CALL USTHW(HMFS,THETAS,GAMMA,US,THETAW,MER)
      IF(MER) 999,50,999
   50 AN=M-1
      AMW=MW-1
      DS=XO/COS(THETAS)
      THDIF=THETAS-THAB
      YW=(DS*SIN(THETAW-THETAS))/COS(THETAW-THAB)
      DELY=YW/AMW
      DO 100 I=1,M
      AI=I
  100 TH(I)=THETAS+  ATAN(((AI-1.0)*DELY*COS(THDIF))/(DS+(AI-1.0)*DELY*
     1SIN(THDIF)))
  210 Z1=HMFS**2*SIN(THETAW)**2
      Z2=GAMMA+1.0
      Z3=GAMMA-1.0
      P2OP1= ((Z2*Z1)/(Z3*Z1+2.0))**(GAMMA/Z3)*(Z2/(2.0*GAMMA*Z1-Z3))**
     1(1.0/Z3)
      VFS=SQRT((Z3*HMFS**2/2.0)/(1.0+Z3*HMFS**2/2.0))
      T(2)=TH(1)
      T(4)=0.0
      T(5)=US
      I=0
  300 I=I+1
      AI=I
      CIAB=COS(T(2)-THAB)
      SIAB=SIN(T(2)-THAB)
      Y(I)=(AI-1.0)*DELY
      U(I)=T(5)*CIAB-T(4)*SIAB
      V(I)=T(4)*CIAB+T(5)*SIAB
      P(I)=P2OP1*(1.0-T(4)**2-T(5)**2)**(GAMMA/Z3)
      RHO(I)=P2OP1*(1.0-T(4)**2-T(5)**2)**(1.0/Z3)
      IF((I+1).GT.MW) GO TO 999
      T(3)=TH(I+1)-TH(I)
      T3=T(3)
  400 CALL INTS(T,2,0,5.0E-6,0.0,0.0,T3           ,0.0,0.0,DERIV)
      IF (IER.NE.0) GO TO 998
  450 CALL INTM(T,2,0,5.0E-6,0.0,0.0,T3           ,0.0,0.0,DERIV)
      IF (IER.NE.0) GO TO 998
      IF(T(2)-TH(I+1))475,300,500
  500 IF(ABS(T(2)-TH(I+1))-5.0E-6) 300,300,600
  600 T(2)=T2
      T(3)=TH(I+1)-T2
      T(4)=T4
      T(5)=T5
      CALL INTS(T,2,2,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,DERIV)
      IF (IER.NE.0) GO TO 998
      CALL INTM(T,2,2,0.0,0.0,0.0 0.0,0.0,0.0,0.0,0.0,DERIV)
```

```
SUBROUTINE START      76/76   OPT=1                    FTN 4.6+460      06/15/79  18.58.36      PAGE    2

                IF (IER.NE.0) GO TO 998                                  START      59
                GO TO 300                                                START      60
      475       T2=T(2)                                                  START      61
                T4=T(4)                                                  START      62
                T5=T(5)                                                  START      63
                GO TO 450                                                START      64
      998       MER=MER1                                                 START      65
      999       RETURN                                                   START      66
                END                                                      START      67
```

```
      SUBROUTINE USTHW(HMFS,THETAS,GAMMA,US,THETAW,MER)                  USTHW     2
C  A SUBROUTINE TO COMPUTE SURFACE VELOCITY AND MACH ANGLE WHEN         USTHW     3
C  THE FREE STREAM MACH NUMBER AND CONE ANGLE ARE GIVEN                 USTHW     4
      MER=0                                                             USTHW     5
      US1=SQRT((GAMMA-1.0)/(GAMMA+1.0))                                 USTHW     6
      CALL HMACH(US1,THETAS,GAMMA,HM1,THETAW,MER)                       USTHW     7
      IF(HMFS-HM1) 200,100,10                                           USTHW     8
200   MER=3                                                             USTHW     9
      GO TO 999                                                         USTHW    10
100   US=US1                                                            USTHW    11
      GO TO 999                                                         USTHW    12
10    IF(MER) 999,20,999                                                USTHW    13
20    IF(US1-0.700) 21,22,22                                            USTHW    14
21    US3=0.5*(US1+1.0)                                                 USTHW    15
      GO TO 23                                                          USTHW    16
22    US3=US1+0.005                                                     USTHW    17
23    CONTINUE                                                          USTHW    18
      CALL HMACH(US3,THETAS,GAMMA,HM3,THETAW,MER)                       USTHW    19
      IF(MER) 999,25,999                                                USTHW    20
25    IF(HMFS-HM3)30,27,29                                              USTHW    21
27    US=US3                                                            USTHW    22
      GO TO 999                                                         USTHW    23
29    US1=US3                                                           USTHW    24
      HM1=HM3                                                           USTHW    25
      GO TO 20                                                          USTHW    26
30    US2=0.5*(US1+US3)                                                 USTHW    27
      CALL HMACH(US2,THETAS,GAMMA,HM2,THETAW,MER)                       USTHW    28
      DET=(HM2-HM1)*(HM3-HM1)**2-(HM3-HM1)*(HM2-HM1)**2                 USTHW    29
      A1=((US2-US1)*(HM3-HM1)**2-(US3-US1)*(HM2-HM1)**2) /DET           USTHW    30
      A2=((HM2-HM1)*(US3-US1)-(US2-US1)*(HM3-HM1))/DET                  USTHW    31
      USE=US1+A1*(HMFS-HM1)+A2*(HMFS-HM1)**2                            USTHW    32
40    CALL HMACH(USE,THETAS,GAMMA,HMAC,THETAW,MER)                      USTHW    33
      IF(ABS(1.0-HMFS/HMAC)-2.0E-4) 45,45,60                            USTHW    34
45    US=USE                                                            USTHW    35
      GO TO 999                                                         USTHW    36
60    USE=USE+(A1+2.0*A2*(HMAC-HM1))*(HMFS-HMAC)                        USTHW    37
      GO TO 40                                                          USTHW    38
999   RETURN                                                            USTHW    39
      END                                                               USTHW    40
```

```
      SUBROUTINE ZEROIN(X1,Y1,TOLX,FXN,BOL,X,Y)                         ZEROIN    2
      LOGICAL BOL                                                       ZEROIN    3
      A=X1                                                              ZEROIN    4
      FA=FXN(A)                                                         ZEROIN    5
      B=Y1                                                              ZEROIN    6
      X=B                                                               ZEROIN    7
      FB=FXN(B)                                                         ZEROIN    8
   10 C=A                                                               ZEROIN    9
      FC=FA                                                             ZEROIN   10
   20 IF ( ABS(FC) .GE. ABS(FB) ) GO TO 30                              ZEROIN   11
      A=B                                                               ZEROIN   12
      FA=FB                                                             ZEROIN   13
      X=C                                                               ZEROIN   14
      B=C                                                               ZEROIN   15
      FB=FC                                                             ZEROIN   16
      C=A                                                               ZEROIN   17
      FC=FA                                                             ZEROIN   18
   30 TOL=TOLX*AMAX1(ABS(A),ABS(B))                                     ZEROIN   19
      EM=0.5*(C+B)                                                      ZEROIN   20
      IF ( ABS(EM-B) .LE. TOL) GO TO 40                                 ZEROIN   21
      P=FB*(B-A)                                                        ZEROIN   22
      IF (P .GT. 0.0) GO TO 31                                          ZEROIN   23
      Q=FB-FA                                                           ZEROIN   24
      P=-P                                                              ZEROIN   25
      GO TO 32                                                          ZEROIN   26
   31 Q= FA - FB                                                        ZEROIN   27
   32 A=B                                                               ZEROIN   28
      FA=FB                                                             ZEROIN   29
      IF ( P .LE. ABS(Q)*TOL) GO TO 34                                  ZEROIN   30
      IF ( P .LT. (EM-B)*Q ) GO TO 33                                   ZEROIN   31
      X=EM                                                              ZEROIN   32
      B=EM                                                              ZEROIN   33
      GO TO 35                                                          ZEROIN   34
   33 X=P/Q+B                                                           ZEROIN   35
      B=X                                                               ZEROIN   36
      GO TO 35                                                          ZEROIN   37
   34 X=SIGN(TOL,C-B)+B                                                 ZEROIN   38
      B=X                                                               ZEROIN   39
   35 FB=FXN(X)                                                         ZEROIN   40
      IF (FB.EQ.0.0) GO TO 50                                           ZEROIN   41
      IF ( SIGN(1.,FC) .EQ. SIGN(1.,FB) ) GO TO 10                      ZEROIN   42
      GO TO 20                                                          ZEROIN   43
   40 Y=C                                                               ZEROIN   44
      BOL= SIGN(1.,FB)*SIGN(1.,FC) .LE. 0.0                             ZEROIN   45
      RETURN                                                            ZEROIN   46
   50 BOL=.TRUE.                                                        ZEROIN   47
      Y=X                                                               ZEROIN   48
      RETURN                                                            ZEROIN   49
      END                                                               ZEROIN   50
```

```
      SUBROUTINE TAINT(XTAB,FTAB,X,FX,N,K,NER, MON)                    TAINT      2
      DIMENSION XTAB(1),FTAB(1),T(10),C(10)                            TAINT      3
CPSOHOO  TAINT SUBROUTINE- IN FORTRAN II.                              TAINT      4
      IF (N - K) 1,1,2                                                 TAINT      5
    1 NER=2                                                            TAINT      6
      RETURN                                                           TAINT      7
    2 IF (K-9) 3,3,1                                                   TAINT      8
    3 IF ( MON) 4,4,5                                                  TAINT      9
    5 IF ( MON-2) 6,7,4                                                TAINT     10
    4 J=0                                                              TAINT     11
      NM1=N-1                                                          TAINT     12
      DO 8 I=1,NM1                                                     TAINT     13
      IF (XTAB(I)-XTAB(I+1)) 9,11,10                                   TAINT     14
   11 NER=3                                                            TAINT     15
      RETURN                                                           TAINT     16
    9 J=J-1                                                            TAINT     17
      GO TO 8                                                          TAINT     18
   10 J=J+1                                                            TAINT     19
    8 CONTINUE                                                         TAINT     20
      MON=1                                                            TAINT     21
      IF (J) 12,6,6                                                    TAINT     22
   12 MON=2                                                            TAINT     23
    7 DO 13 I=1,N                                                      TAINT     24
      IF (X-XTAB(I)) 14,14,13                                          TAINT     25
   14 J=I                                                              TAINT     26
      GO TO 18                                                         TAINT     27
   13 CONTINUE                                                         TAINT     28
      GO TO 15                                                         TAINT     29
    6 DO 16 I=1,N                                                      TAINT     30
      IF (X-XTAB(I)) 16,17,17                                          TAINT     31
   17 J=I                                                              TAINT     32
      GO TO 18                                                         TAINT     33
   16 CONTINUE                                                         TAINT     34
   15 J=N                                                              TAINT     35
   18 J=J-(K+1)/2                                                      TAINT     36
      IF (J) 19,19,20                                                  TAINT     37
   19 J=1                                                              TAINT     38
   20 M=J+K                                                            TAINT     39
      IF (M-N) 21,21,22                                                TAINT     40
   22 J=J-1                                                            TAINT     41
      GO TO 20                                                         TAINT     42
   21 KP1=K+1                                                          TAINT     43
      JSAVE=J                                                          TAINT     44
   26 DO 23 L=1,KP1                                                    TAINT     45
      C(L)=X-XTAB(J)                                                   TAINT     46
      T(L)=FTAB(J)                                                     TAINT     47
   23 J=J+1                                                            TAINT     48
      DO 24 J=1,K                                                      TAINT     49
      I=J+1                                                            TAINT     50
   25 T(I)=(C(J)*T(I)-C(I)*T(J))/(C(J)-C(I))                           TAINT     51
      I=I+1                                                            TAINT     52
      IF (I-KP1) 25,25 ,24                                             TAINT     53
   24 CONTINUE                                                         TAINT     54
      FX=T(KP1)                                                        TAINT     55
      NER=1                                                            TAINT     56
      RETURN                                                           TAINT     57
      END                                                              TAINT     58
```

```
      SUBROUTINE GEOMH(K7,PHIP,NPHI,Z,R,RZ,RPHI,IPRNT,ZO,ZJUNC,NCONE)
C
      COMMON/BODY/AAR(52),IND(500),X(3),XU(3),DUM1(6),XW(3),DUM2(33)
      COMMON/MINITB/ZSAV(25),NPSAV(25),NOW
C
      DIMENSION PHIP(41),R(41),PZ(41),RPHI(41)
      DIMENSION RCONE(41),RPCONE(41),RZCONE(41)
C
      DATA EPS,NIT,ISTRT/.1E-5,20,3/
C
      IF(K7.GT.0)  GO TO 21
      IFLAG=0
      READ(5,457)  NPAT
  457 FORMAT(I5)
      CALL OPENMS(1,IND,500,0)
      CALL READMS(1,ZSAV,51,NPAT+1)
      RETURN
   21 IF(IFLAG.EQ.0) GO TO 458
   22 IF(NCONE.EQ.2) GO TO 456
C
      ZFRACT=(Z-ZO)/(ZJUNC-ZO)
      DO 20 I=ISTRT,NPHI
      R(I)=RCONE(I)*ZFRACT
      RPHI(I)=RPCONE(I)*ZFRACT
   20 RZ(I)=RZCONE(I)
      GO TO 18
C
  458 ZSAVE=Z
      Z=ZJUNC
  456 DO 17 I=ISTRT,NPHI
      IEND=0
      PHI=PHIP(I)
      IF(I.NE.ISTRT)  GO TO 40
      U=W=.5
C
      DO 1 J=1,NOW
      NSEG=J
      IF(Z.LE.ZSAV(J+1))GO TO 3
    1 CONTINUE
      WRITE(6,100)Z
  100 FORMAT(* STOP - GEOMH - Z = *,E12.5,* EXCEEDS TABLE*)
    3 NPAT=NPSAV(NSEG+1)
    4 CALL READMS(1,AAR,52,NPAT)
C     WRITE(6,105)NPAT, ,PHI,(AAR(IO),IO=49,52)
  105 FORMAT(* NPAT,Z,PHI,NB = *,I5,6E12.5)
   40 IEU=IEW=0
C
      DO 15 IT=1,NIT
      CALL POINT(NPAT,U,W,1)
      X(2)=ABS(X(2))
      PH=ATAN2(X(2),-X(1))
      G=PH-PHI
      F=X(3)-Z
C     WRITE(6,106)IT,NPAT,U,W,F,G
  106 FORMAT(* IT,NPAT,U,W,F,G = *,2I5,4E12.5)
      IF(ABS(F).LT.EPS.AND.ABS(G).LT.EPS)IEND=1
      RAD2=X(1)**2+X(2)**2
```

```
                DPHIDU=(X(2)*XU(1)-X(1)*XU(2))/RAD2                     GEOMH   59
                DPHIDW=(X(2)*XW(1)-X(1)*XW(2))/RAD2                     GEOMH   60
60              DEN=XU(3)*DPHIDW-XW(3)*DPHIDU                           GEOMH   61
                IF(IEND.EQ.1)GO TO 16                                   GEOMH   62
                IF(DEN.NE.0.)GO TO 5                                    GEOMH   63
                WRITE(6,102)                                            GEOMH   64
              102 FORMAT(* STOP - GEOMH - DEN = 0.*)                    GEOMH   65
65              GO TO 18                                                GEOMH   66
              5 W=W+(F*DPHIDU-G*XU(3))/DEN                              GEOMH   67
                U=U+(G*XW(3)-F*DPHIDW)/DEN                              GEOMH   68
                IF(IPRNT.EQ.2)WRITE(6,106)IT,NPAT,U,W,F,G               GEOMH   69
                IF(W.LT.0.)GO TO 7                                      GEOMH   70
70              IF(W.GT.1.)GO TO 9                                      GEOMH   71
              6 IF(U.LT.0.)GO TO 11                                     GEOMH   72
                IF(U.GT.1.)GO TO 13                                     GEOMH   73
                GO TO 15                                                GEOMH   74
              7 IF(AAR(52).NE.0.)GO TO 70                               GEOMH   75
75              W=0.                                                    GEOMH   76
                GO TO 6                                                 GEOMH   77
             70 W=1.                                                    GEOMH   78
                IF(IEW.EQ.0)GO TO 8                                     GEOMH   79
                NPAT=AAR(52)                                            GEOMH   80
80              IF(NPAT.EQ.0)GO TO 900                                  GEOMH   81
                GO TO 400                                               GEOMH   82
              8 IEW=1                                                   GEOMH   83
                W=0.                                                    GEOMH   84
                GO TO 6                                                 GEOMH   85
85            9 IF(AAR(50).NE.0.)GO TO 71                               GEOMH   86
                W=1.                                                    GEOMH   87
                GO TO 6                                                 GEOMH   88
             71 W=0.                                                    GEOMH   89
                IF(IEW.EQ.0)GO TO 10                                    GEOMH   90
90              NPAT=AAR(50)                                            GEOMH   91
                IF(NPAT.EQ.0)GO TO 900                                  GEOMH   92
                GO TO 400                                               GEOMH   93
             10 IEW=1                                                   GEOMH   94
                W=1.                                                    GEOMH   95
95              GO TO 15                                                GEOMH   96
             11 IF(AAR(49).NE.0.)GO TO 72                               GEOMH   97
                U=0.                                                    GEOMH   98
                GO TO 15                                                GEOMH   99
             72 U=1.                                                    GEOMH  100
100             IF(IEU.EQ.0)GO TO 12                                    GEOMH  101
                NPAT=AAR(49)                                            GEOMH  102
                IF(NPAT.EQ.0)GO TO 900                                  GEOMH  103
                GO TO 400                                               GEOMH  104
             12 IEU=1                                                   GEOMH  105
105             U=0.                                                    GEOMH  106
                GO TO 15                                                GEOMH  107
             13 IF(AAR(51).NE.0.)GO TO 73                               GEOMH  108
                U=1.                                                    GEOMH  109
                GO TO 15                                                GEOMH  110
110          73 U=0.                                                    GEOMH  111
                IF(IEU.EQ.0)GO TO 14                                    GEOMH  112
                NPAT=AAR(51)                                            GEOMH  113
                IF(NPAT.EQ.0)GO TO 900                                  GEOMH  114
                GO TO 400                                               GEOMH  115
```

```
   14 IEU=1                                                          GEOMH   116
      U=1.                                                           GEOMH   117
      GO TO 15                                                       GEOMH   118
  400 CALL READMS(1,AAR,52,NPAT)                                     GEOMH   119
      IEU=IEW=0                                                      GEOMH   120
   15 CONTINUE                                                       GEOMH   121
C                                                                    GEOMH   122
      WRITE(6,103)F,G,EPS                                            GEOMH   123
  103 FORMAT(* STOP - GEOMH - EXCEEDED MAX ITERATIONS - F,G,EPS = *,3E12 GEOMH   124
     1.5)                                                            GEOMH   125
      WRITE(6,108)I,NPAT,PHI,Z                                       GEOMH   126
  108 FORMAT(* I,NPAT,PHI,Z*,5X,2I10,2F20,6)                         GEOMH   127
      GO TO 16                                                       GEOMH   128
C                                                                    GEOMH   129
  900 WRITE(6,104)                                                   GEOMH   130
  104 FORMAT(* STOP - GEOMH - PATCH POINTER =0*)                     GEOMH   131
      GO TO 18                                                       GEOMH   132
C                                                                    GEOMH   133
   16 R(I)=SQRT(RAD2)                                                GEOMH   134
      DRDW=(X(1)*XW(1)+X(2)*XW(2))/R(I)                              GEOMH   135
      DRDU=(X(1)*XU(1)+X(2)*XU(2))/R(I)                              GEOMH   136
      RZ(I)=(DPHIDW*DRDU-DPHIDU*DRDW)/DEN                            GEOMH   137
      RPHI(I)=(DRDW*XU(3)-DRDU*XW(3))/DEN                            GEOMH   138
      IF(IPRNT.EQ.0)GO TO 17                                         GEOMH   139
      PHO=PHI/.017453293                                             GEOMH   140
      IF(IPRNT.EQ.2) WRITE(6,107)I,PHO,X,DRDU,DRDW,DPHIDU,DPHIDW,DEN GEOMH   141
  107 FORMAT(I5,F7.1,9E12.5)                                         GEOMH   142
   17 CONTINUE                                                       GEOMH   143
      RPHI(ISTRT)=0.0                                                GEOMH   144
      RPHI(NPHI)=0.0                                                 GEOMH   145
C                                                                    GEOMH   146
      IF(IFLAG.GT.0) GO TO 18                                        GEOMH   147
      ZFRACT=1.0/(ZJUNC-ZO)                                          GEOMH   148
      DO 19 I=ISTRT,NPHI                                             GEOMH   149
      RCONE(I)=R(I)                                                  GEOMH   150
      RPCONE(I)=RPHI(I)                                              GEOMH   151
   19 RZCONE(I)=R(I)*ZFRACT                                          GEOMH   152
      Z=ZSAVE                                                        GEOMH   153
      IFLAG=1                                                        GEOMH   154
      GO TO 22                                                       GEOMH   155
C                                                                    GEOMH   156
   18 RETURN                                                         GEOMH   157
      END                                                            GEOMH   158
```

```
      SUBROUTINE POINT(K,U,W,ND)                                        POINT      2
      COMMON/BODY/AAR(52),IND(500),X(3),XU(3),XUU(3),X3U(3),XW(3),XUW(3 POINT      3
     1),X2UW(3),X3UW(3),XWW(3),XU2W(3),X2U2W(3),X3U2W(3),X3W(3),XU3W(3), POINT      4
     2X2U3W(3),X3U3W(3)                                                 POINT      5
      ND1=ND+1                                                          POINT      6
      DO 10 I=1,3                                                       POINT      7
      J=16*(I-1)                                                        POINT      8
      J1=J+1                                                            POINT      9
      J2=J+5                                                            POINT     10
      J3=J+9                                                            POINT     11
      A1=((AAR(J1)*U+AAR(J2))*U+AAR(J3))*U+AAR(J3+4)                    POINT     12
      IF(ND1.EQ.1)GO TO 1                                               POINT     13
      C1=AAR(J1)+AAR(J1)+AAR(J1)                                        POINT     14
      C2=AAR(J2)+AAR(J2)                                                POINT     15
      A1P=(C1*U+C2)*U+AAR(J3)                                           POINT     16
      IF(ND1.EQ.2)GO TO 1                                               POINT     17
      A1PP=(C1+C1)*U+C2                                                 POINT     18
    1 J1=J1+1                                                           POINT     19
      J2=J2+1                                                           POINT     20
      J3=J3+1                                                           POINT     21
      A2=((AAR(J1)*U+AAR(J2))*U+AAR(J3))*U+AAR(J3+4)                    POINT     22
      IF(ND1.EQ.1)GO TO 2                                               POINT     23
      C1=AAR(J1)+AAR(J1)+AAR(J1)                                        POINT     24
      C2=AAR(J2)+AAR(J2)                                                POINT     25
      A2P=(C1*U+C2)*U+AAR(J3)                                           POINT     26
      IF(ND1.EQ.2)GO TO 2                                               POINT     27
      A2PP=(C1+C1)*U+C2                                                 POINT     28
    2 J1=J1+1                                                           POINT     29
      J2=J2+1                                                           POINT     30
      J3=J3+1                                                           POINT     31
      A3=((AAR(J1)*U+AAR(J2))*U+AAR(J3))*U+AAR(J3+4)                    POINT     32
      IF(ND1.EQ.1)GO TO 3                                               POINT     33
      C1=AAR(J1)+AAR(J1)+AAR(J1)                                        POINT     34
      C2=AAR(J2)+AAR(J2)                                                POINT     35
      A3P=(C1*U+C2)*U+AAR(J3)                                           POINT     36
      IF(ND1.EQ.2)GO TO 3                                               POINT     37
      A3PP=(C1+C1)*U+C2                                                 POINT     38
    3 J1=J1+1                                                           POINT     39
      J2=J2+1                                                           POINT     40
      J3=J3+1                                                           POINT     41
      A4=((AAR(J1)*U+AAR(J2))*U+AAR(J3))*U+AAR(J3+4)                    POINT     42
      IF(ND1.EQ.1)GO TO 4                                               POINT     43
      C1=AAR(J1)+AAR(J1)+AAR(J1)                                        POINT     44
      C2=AAR(J2)+AAR(J2)                                                POINT     45
      A4P=(C1*U+C2)*U+AAR(J3)                                           POINT     46
      IF(ND1.EQ.2)GO TO 4                                               POINT     47
      A4PP=(C1+C1)*U+C2                                                 POINT     48
    4 X(I)=((A1*W+A2) *W+A3) *W+A4                                      POINT     49
      IF(ND1.EQ.1)GO TO 10                                              POINT     50
      XU(I)=((A1P*W+A2P) *W+A3P) *W+A4P                                 POINT     51
      C1=A1+A1+A1                                                       POINT     52
      C2=A2+A2                                                          POINT     53
      XW(I)=(C1*W+C2)*W+A3                                              POINT     54
      IF(ND1.EQ.2)GO TO 10                                              POINT     55
      XUU(I)=((A1PP*W+A2PP )*W+A3PP )*W+A4PP                            POINT     56
      XUW(I)=((A1P+A1P+A1P)*W+A2P+A2P)*W+A3P                            POINT     57
      XWW(I)=(C1+C1)*W+C2                                               POINT     58
```

```
                10 CONTINUE
                   RETURN
60                 END
```

```
POINT     59
POINT     60
POINT     61
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Topical Report

16. Abstract

The use of a computer code for the calculation of steady, supersonic, three-dimensional, inviscid flow over blunt bodies is illustrated. Input and output are given and explained for two cases: a pointed cone of 20° half angle at 15° angle of attack in a free stream with $M_\infty = 7$, and a cone-ogive-cylinder at 10° angle of attack with $M_\infty = 2.86$.

A source listing of the computer code is provided.

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