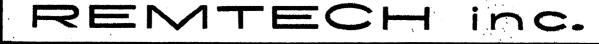
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# BOUNDARY LAYER SIMULATOR IMPROVEMENT

December 1984



Huntsville, Alabama

ASA CR-174, 199

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### BOUNDARY LAYER SIMULATOR IMPROVEMENT

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December 1984

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Prepared under

Contract NAS8-35976

# for

National Aeronautics and Space Administration George C. Marshall Space Flight Center Marshall Space Flight Center, Alabama 35812

N85-13802 #

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# FOREWORD

/ This final report presents work conducted for the Marshall Space Flight Center (MSFC) in response to the requirements of Contract NAS8-35976. The work presented here was performed by REMTECH, Inc., Hunstville, Alabama and is titied, "Boundary Layer Simulator Improvement".

The project manager for this project was Dr. Sarat C. Praharaj. The project was very much aided by the helpful technical support of the NASA contract monitor, Mr. Klaus Gross, and by Mr. A. Krebsbach, both of the Systems Performance Branch of the Mission Analysis Division.

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LISTING OF THE UPDATED SUBROUTINES IN BLIMPJ

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### Section 1.0

## INTRODUCTION

The primary goal of the work reported here was to improve the existing Boundary Layer Integral Matrix Procedure, Version J (BLIMPJ)<sup>1</sup>. BLIMPJ has been used in the industry as a rigorous boundary layer program in connection with the existing JANNAF reference programs such as ODE and TDK<sup>2</sup>. It is capable of treating two-dimensional and axisymmetric nozzles with a variety of wall boundary conditions which include regenerative and transpiration cooling as well as ablating wall materials. The improvements described herein have potential use in the design of the future Orbit Transfer Vehicle (OTV) engines.

The projected engine design for the OTV would utilize an expander cycle operation mode. In this mode, heat energy obtained through a regeneratively cooled wall is used to drive the turbines and pumps.  $0_2$ -H<sub>2</sub> propeliant system is used to react in the combustion chamber at pressure levels of 1500-2000 psia at a mixture ratio of 6. The reaction products are expanded through a nozzle of large area ratio, ranging from 400 to 3000. Although the above chamber pressures and 0/F ratio for a  $0_2$ -H<sub>2</sub> system are not uncommon for the currently operating Space Shuttle main engines (SSMEs), the area ratio is only of the order of 80. These high chamber pressure expander cycle engines depend primarily on the heat energy transmitted from the combustion products through the higher the chamber wall. The larger the regenerative heat transfer the higher the chamber pressure which in turn permits larger area ratio motors. These engines

- Evans, R., "Boundary Layer Integral Matrix Procedure, BLIMP-J User's Manual," Aerotherm Division/Acurex Corporation, July 1975, under Contract NAS8-30930.
- Nickerson, G.R., Coats, D.E., and Bartz, J.L., "The Two-Dimensional Kinetic (TDK) Reference Computer Program," Engineering and Programming Manual, Ultrasystems, Inc., December 1973, under Contract NAS9-12652.

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and the associated interior nozzle flowfields are outside the range of current engineering experience. The heat transfer to the nozzle wall is affected by such variables as wall roughness, relaminarization, and the presence of particles in the flow. The motor performance loss for these nozzles with thick boundary layers is inaccurate using the existing procedure coded in BLIMPJ. Flow expansion within large area ratio nozzles and associated low pressures and temperatures may produce two-phase flow conditions (liquid droplets or ice crystals) adjacent to the wall especially in connection with strongly cooled walls. The presence of such particles will have some effect on the friction and heat transfer mechanism within the boundary layer. Moreover, there are discussions in the technical community of replacing the nozzle wall around the throat by an ablative wall. This would reduce high heat-transfer to the nozzle throat because of ablation while introducing the ablation products in the nozzle boundary layer and the inviscid part of the nozzle flowfield. All these modifications and innovations require investigations and implementation in BLIMPJ code of the following simplified analytical formulations:

- Wall surface roughness simulation and its impact on heat transfer and shear effects.
- Prediction of relaminarization regions with approximations on heat transfer and friction along the wall.
- Presence of particles in the boundary layer and their impact on heat transfer and friction.
- Re-evaluation of the existing boundary layer thrust loss calculation method for nozzles with large area ratios, experiencing thick boundary layers at low density and high Mach number flow situations.

Various versions of BLIMPJ were received from Marshall Space Flight Center (MSFC). Apart from the version available at REMTECH, a total of three additional versions including the (I) Aerotherm, (II) MSFC, and (III) mini-versions was

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	MINI	AERO THERM	MINI	AERO THERM	MINI	AERO THERM
	ABMAX	ABMAX	ITERAT	ITERAT	SATEMP	
	BLKDTA			KINET	SCRND	
	BLMAIN	MAIN	LIAD	LIAD		SECOND
	CHANGE		LIMIT		SETUP	SETUP
			LIMIL*			SHOMO
		CHOMO	LINCER	LINCER	SLOPE	
	CRECT	CRECT	LINMAT	LINMAT		
		DATE	LOGPLT			SLOPL
		DUMCOM	LTCPHS			SLOPQ
	EQUIL	EQUIL	MATER	MATER	STATE	STATE
	ERF*	ERF	MATS1	MATS1	STATEN	STATEN
	ERP	ERP	MATS2	MATS2	TAYLOR	TAYLOR
		ETIME*				
		ETIMEF	MINMAX		THERM	THERM
		FILQ3		MISCIN		TLEFT
		FILQ5	NICK			TOD
		FINEQ	NNNCER	NNNCER	TRANCR	TRANCR
	FIRSTG	FIRSTG	NONCER*	OGLE	TRINT	TRINT
	FISLEQ	FISLEQ	OUTPUT	OUTPUT	TRMBL	TRMBL
	FUNXS	FUNXS	PLOT		TVCCOE*	
	GEOM	GEOM	POINTS	POINTS	TVCM1 *	TVCM1 *
		HHOMO	PROPS	PROPS	TVCI *	TVCI *
	HISTXI	HISTXI	RECASE	RECASE	ROUGH	
	ICOEFF	ICOEFF	REFCON	REFCON	PARTCL	
	IMONE	IMONE	REFIT	REFIT		
	INPUT	INPUT	RERAY	RERAY		
	INTRP		RNLCER	RNLCER		
	IONLY	IONLY	ROCOUT	ROCOUT		
NTRY	POINT ROU	TINE	 [[ <del>]                                   </del>			
					ine Modifie EMTECH	d Or Added

# TABLE 1.1 BLIMPJ SUBROUTINES

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obtained. It was recommended by MSFC to use the mini-version for making modifications to the code. The mini-version is a cleaner and shorter version of the code and has fewer subroutines when compared with the Aerotherm version in Table 1.1. In order to access the code at various subroutines for modifications, a macro flow diagram was prepared and is provided in Fig. 1.1.

The various tasks described earlier are discussed in the following sections. Section 2 discusses the effects of wall roughness on skin friction and heat transfer. Section 3 highlights the mechanism and effects of relaminarization, whereas Section 4 discusses the effects of particles on skin friction and heat transfer rate on the nozzle wall. Section 5, on the other hand, focuses on the re-evaluation of the existing boundary layer thrust loss calculation method for nozzles with large area ratios experiencing thick boundary layers. The last four sections described above are self-contained in that the technical discussion for each item along with the corresponding figures and list of references are contained in that section, independent of any other section. These sections also describe applications of the various modules in a composite fashion if more than one effect needs to be considered. Finally, Section 6 makes recommendations both in the areas of analytical and experimental techniques for future work.

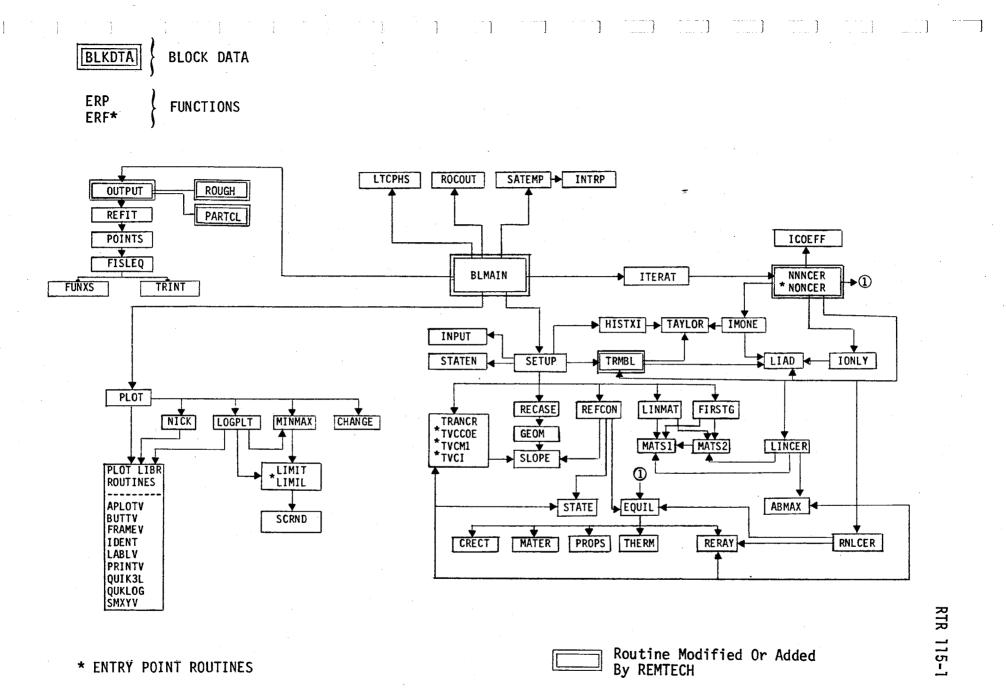


Fig. 1.1 BLIMPJ Mini-Version Macro Flow Diagram

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# Section 2.0

# WALL SURFACE ROUGHNESS EFFECTS

#### 2.1 Background

The importance of wall surface roughness which increases the resistance to fluid flows has been recognized for many years. One of the principal parameters influencing the surface heat transfer to a rough wall is the roughness height, k.

The problem of modeling turbulent flow over rough surfaces has been divided into three regimes:

- Regime I: <u>Smooth</u> The roughness size is so small that the protrusions are contained within the laminar sublayer. The surface skin friction and heat transfer are not changed from smooth surface values.
- Regime II: <u>Transitional</u> Some of the roughness elements protrude outside of the laminar sublayer. The skin friction and heat transfer are increased above the smooth surface values.
- Regime III: <u>Fully Rough</u> All surface roughness elements protrude outside of the laminar sublayer. The increase in skin friction is primarily a result of form drag of the roughness elements.

H. Schlichting (Ref. 1) summarizes all the early work on rough wall measurements in turbulent flow and describes the evaluation of the "equivalent sand grain roughness height",  $K_s$ , which is based on the early work of Nikuradse (Ref. 2). Many theories and correlations, following Nikuradse, employ the parameter  $K_s$ . Defining  $K_s$  for a given surface condition is not a straightforward task. Schlichting (Ref. 1) describes procedures for a given array of roughness elements. Recently, Dirling (Ref. 3) has devised a correlation for  $K_s$  and has applied it to the prediction of nosetip shape change. In modeling the effects of roughness on skin friction, the velocity profile through the boundary layer has

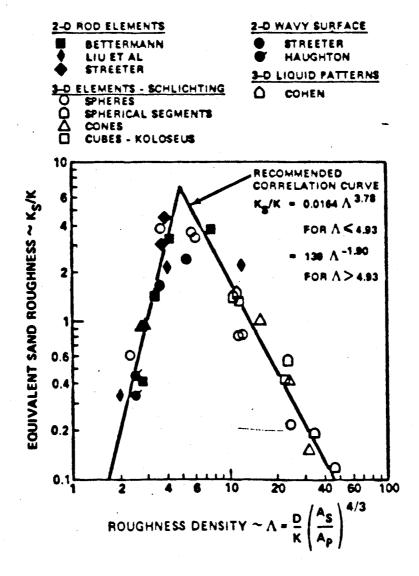
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been correlated with surface roughness of sand. Data and empirical correlations have been developed for other types of roughness elements to obtain the equivalent sand roughness. That is, the sand roughness which yields the same velocity profile is the roughness of interest. There is considerable uncertainty in the determination of the equivalent sand roughness for roughness elements which are randomly shaped and spaced. Physical spacing, relating to the type of cavity flow that is established, the inclination of the roughness element surface to the flow direction, and the increased surface area are some of the important elements in the calculation of K<sub>s</sub>. Figure 2.1 shows the correlation developed by Dirling (Ref. 3). The roughness density parameter  $\Lambda$  is defined as shown on the figure, where  $A_s$  is the windward surface area of the roughness,  $A_p$ is the projected area of the roughness in the flow direction and D is the inverse square root of the roughness elements per unit area. The correlation shown is derived from velocity measurements and is applicable for rough wall skin friction calculations. For the analysis given here, the K parameter is not investigated, but instead, it is assumed that  ${\rm K}_{\rm s}$  is given.

# 2.2 Roughness Options

The purpose of the task in this section is to determine which simplified correlations are appropriate for application in the BLIMPJ computer code. The correlations available in the literature, which perform "point" calculations based on local edge and wall quantities, were reviewed. The significance of "point" calculations lies in the fact that the history effects in the boundary layer at other points do not affect the calculation at the point under consideration. An excellent paper by Seidman (Ref. 4) reviewed some of these correlations and compared them with incompressible and compressible data. The appropriate options performing "point" calculations are given below:

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# Fig. 2.1 Roughness Density Effect On Equivalent Sand Roughness Depth

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Skin Friction Options	Heat Transfer Options
1. Prandtl-Schlichting	1. Seidman
2. Droblenkov	2. HIII

The mathematical expressions are given in Ref. 4. There are two options for calculating skin friction and four possible combinations that can be used to calculate heat transfer rate. For reasons described in the next subsection, Hill's correlation was not coded in BLIMPJ. As a result, only two combinations for heat-transfer rate calculation remained. The mathematical expressions for the above options were taken from Ref. 4 and are listed in Table 2.1 along with the input-output variable list that is used in the roughness subroutine. The expression (A.1) in Table 2.1 contain the calculation of a compressibility factor in terms of the enthalpy ratio. Although, in the original paper (Ref. 4) the corresponding temperature ratios are chosen, it is customary to use the enthalpy ratios instead of temperature ratio in order to include real gas effects. This would be appropriate for the  $0_2$ -H<sub>2</sub> reactive system to be used in the future OTV motor, where the combustion temperatures are in the order of  $6000^{\circ}R$  and real gas effects exist.

Another option by Cebeci was selected to simulate the effects of a rough wall on the boundary layer and to account for "history" effects in the boundary layer. In Ref. 8, the turbulent mixing length of the eddy viscosity expression is modified for the inner region of a two-layer turbulence model to include the effects of surface roughness. Assuming that the velocity profiles for smooth and rough walls are similar, the expression for the mixing length given by

 $l = 0.4 \text{ y} \{1 - \exp(-y/A)\}$  (2.1)

is modified and rewritten as,

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# TABLE 2.1

# ROUGH WALL HEAT TRANSFER OPTIONS

# Options 1 and 2:

Skin friction compressibility (Young)

$$\frac{C_{f}}{C_{fi}} = 0.365 \left( \frac{H_{e}}{H_{aw}} \right) + 0.635 \left( \frac{H_{e}}{H_{w}} \right)$$
(A.1)

Incompressible rough wall skin friction

Option (1) Prandtl-Schlichting

$$C_{fi} = \left[2.87 + 1.58 \log_{10}(X/k)\right]^{-2.5}$$
 (A.2)

Option (2) Droblenkov

$$C_{fi} = 0.0139 (X/k)$$
 (A.3)

Rough surface turbulent Stanton Number (Seidman)

St = 
$$\frac{C_f}{2} \left[ 1 + A \left( \frac{C_f}{2} \right)^{0.725} (Re_k)^{0.45} (Pr)^{0.8} \right]^{-1}$$
 (A.3)

where A = 0.52 nominal and range from 0.45 to 0.7 (Owen & Thomson), and  $C_{f}$  is obtained from Equ. (A.1).

Transition criterion (Fenter)

$$n_{k} = \frac{\rho_{W} U_{\tau} k}{\mu_{W}} \text{ where } U_{\tau} = U_{e} \sqrt{\frac{C_{f}}{2} \frac{\rho_{e}}{\rho_{W}}}$$
(A.4)

$$n_k \leqslant 5$$
 Smooth  
 $5 \leqslant n_k \leqslant 100$  Transitionally rough  
 $100 \leqslant n_k$  Rough

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# TABLE 2.1 (Continued)

# INPUT VARIABLES

X = Running length (ft)

k = Sand roughness height (ft)

H<sub>aw</sub> = Aidabatic wall enthalpy (Btu/lbm)

H<sub>e</sub> = B.L. edge enthalpy (Btu/lbm)

 $H_{w}$  = Wall enthalpy (Btu/lbm)

 $\rho_e$  = B.L. edge density (lbm/ft<sup>3</sup>)

 $\rho_{w}$  = Wall density (lbm/ft<sup>3</sup>)

 $\mu_W$  = Wall viscosity (lbm/ft-sec)

 $\mu_{e}$  = Edge viscosity (lbm/ft-sec)

Pr = Prandtl number (Edge)

ICF = Skin friction flag 1 ----> Prandtl-Schlichting 2 ----> Droblenkov

 $St_s = Smooth wall Stanton number$ 

 $U_{\rho} = B.L.$  edge velocity (ft/sec)

# OUTPUT

 $C_{f}$  = Rough wall sking friction coefficient

St = Rough wall Stanton number

PCT = Percent of transition to fully rough

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$$l = 0.4 (y + \Delta y) [1 - \exp \{-(y + \Delta y)/A\}]$$
(2.2)

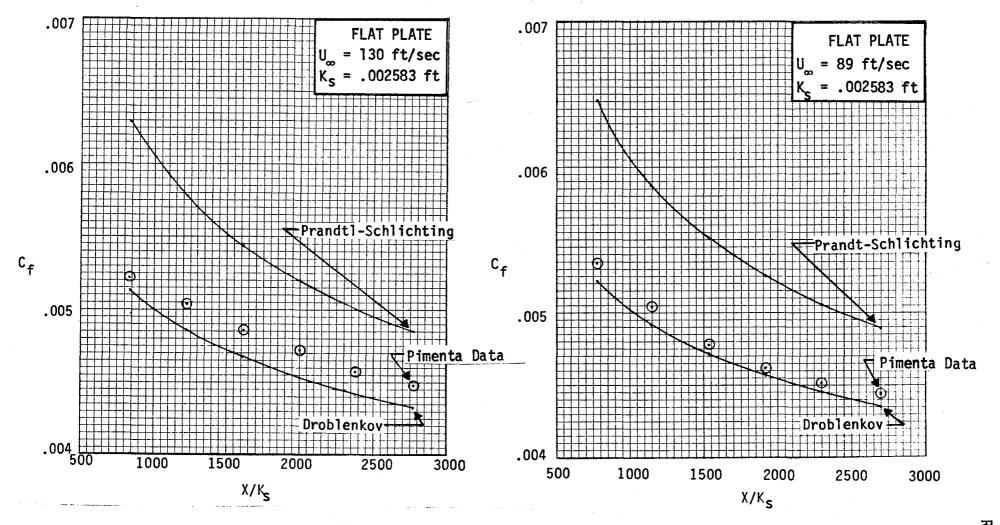
where the coordinates are displaced by an amount  $\Delta y$ . He expresses  $\Delta y$  as a function of an equivalent sand-grain roughness parameter  $K_s^+$  ( $\Xi K_s U_T / v$ ), i.e.,

$$y = 0.9 (v/U_{\tau}) \left\{ \sqrt{K_s^+ - K_s^+} \exp(-K_s^+/6) \right\}$$
 (2.3)

This expression is valid for  $4.535 < K_s^+ < 2000$ , with the lower limit corresponding to the upper bound for a hydraulically smooth surface.

#### 2.3 Examples

In order to illustrate the validity of the roughness options against measured data, first the skin-friction and heat-transfer data were collected from the original report by Pimenta, Moffat and Kays (Ref. 5). The two sets of data collected were for flat plates at moderate freestream velocities. Since BLIMPJ could not be run for external flow situations, BLIMPK (applicable for external flow) was modified to include the roughness options 1 and 2 and was run for an equivalent sand roughness of  $K_c = .002583$  ft. employing the only-resident, Kendall's turbulence model. Figure 2.2 contains the two cases for which the two skin-friction options were used. It is seen that the two options bracket the data, although Droblenkov's approach is closer to the data. Figure 2.3, on the other hand, shows the heat-transfer computations based on Seidman's Stanton number correlation. Again, the two skin-friction options along with Seidman's heat transfer correlation bracket the heat-transfer data, although one combination seems to predict the data better than the other one. Another Stanton number correlation by Hill was checked out (Fig. 2.4a), by varying the value of A in Hill's correlation. It is found that Hill's correlation underpredicts the data considerably. Figure 2.4b, on the other hand, gives comparison of

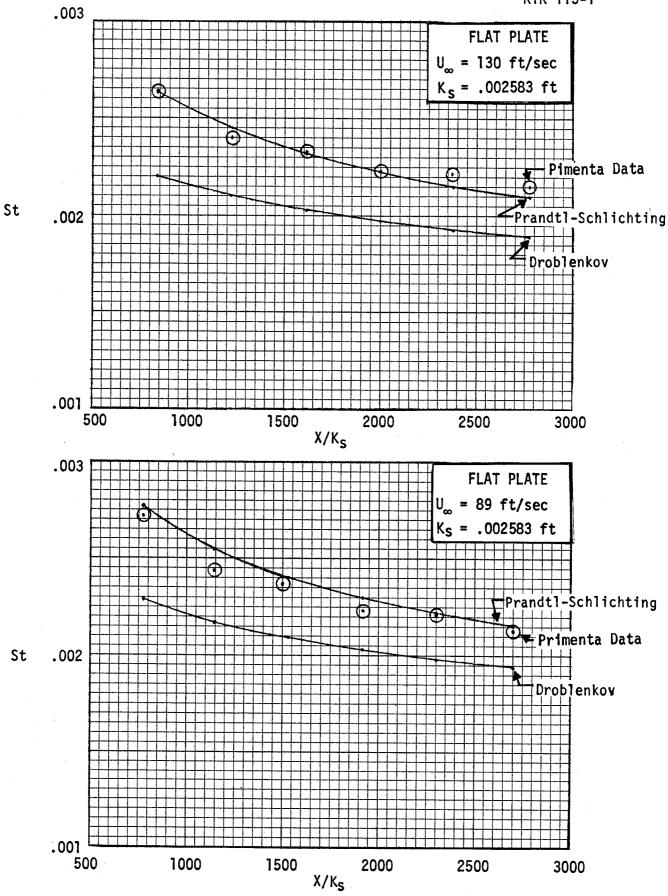


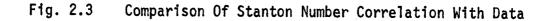
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# Fig. 2.2 Comparison Of Skin-Friction Correlation With Data

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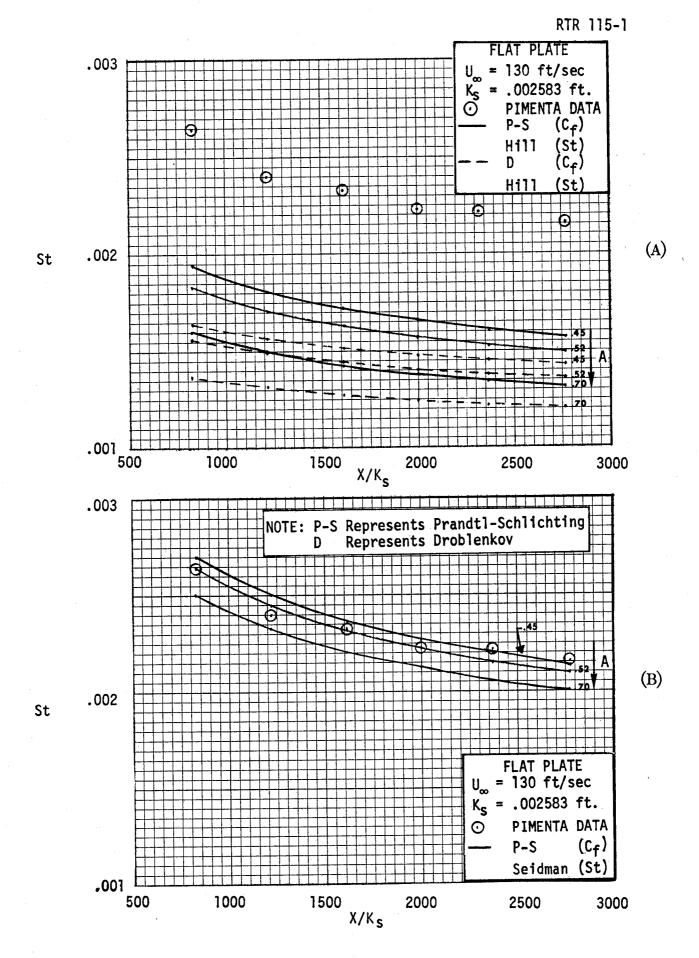
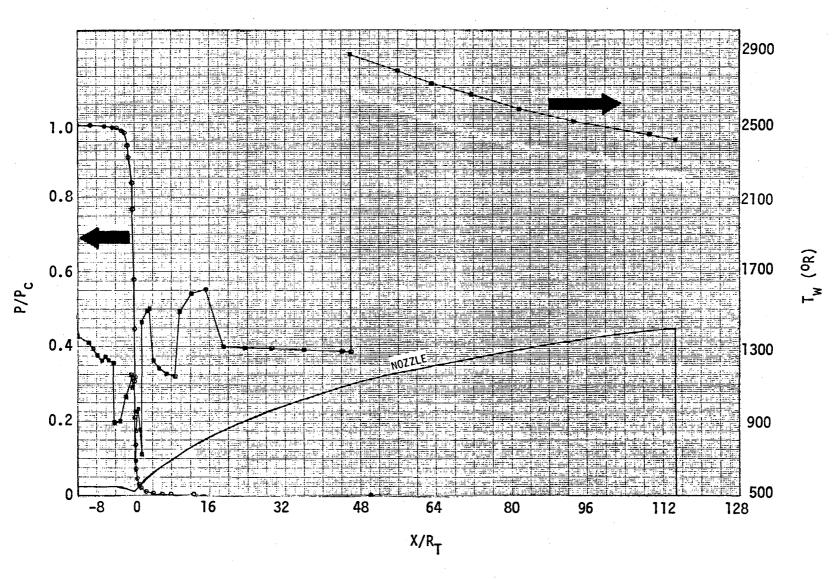


Fig. 2.4 Comparison Between Stanton Number Correlation And Data With Variable Parameter A

Seidman's correlation with heat-transfer data for three values of A. The nominal value of 0.52 for A seems to predict the data quite well.

The rationale for checking the roughness heat-transfer options against data in external flow is a result of little or no data being available for nozzles having rough walls. Some roughness data obtained in an MSFC test on a 40-K subscale regenatively cooled nozzle (Ref. 6) were communicated to the authors. 0n closer examination, it was found, however, that the nozzle was rough at the throat region only. In other words, the equivalent sand roughness is not constant throughout the nozzle and none of the roughness options described here applies to such a situation. Moreover, the concept of equivalent sand roughness breaks down, since similarity in the boundary layer can no longer be satisfied. Instead, to exercise the three roughness options in BLIMPJ, the code was modified to integrate all the options. In the meantime, the geometry package of a generic OTV nozzle was received (Ref. 7) along with the wall temperatures and wall pressures (given in Fig. 2.5). The code was first checked out for the OTV smooth wall situation using two different turbulence models including the Kendall and Cebeci-Smith models. The heat transfer distributions on the nozzle wall are given in Fig. 2.6. As noted by other investigators, the Cebeci-Smith model predicted lower heating rates. A fictitious value of the equivalent sand roughness of 0.00125 ft. was used to run BLIMPJ for the OTV nozzle using first the roughness option 3 (which used a modification to Cebeci-Smith turbulence model). An example of the namelist tape for BLIMPJ using a roughness option is given in Table 2.2. The heat-transfer results are plotted in Fig. 2.9 and compared with those for a smooth wall. Heat rates are approximately 3 times higher for the rough wall than for the smooth wall in the peak heating region occurring around the throat. Although the skin friction and heating rate values are quite high for a rough nozzie locally in the throat region, the integrated values of



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Fig. 2.5 Input Wall Pressure And Temperature Variation For A Typical OTV Nozzle

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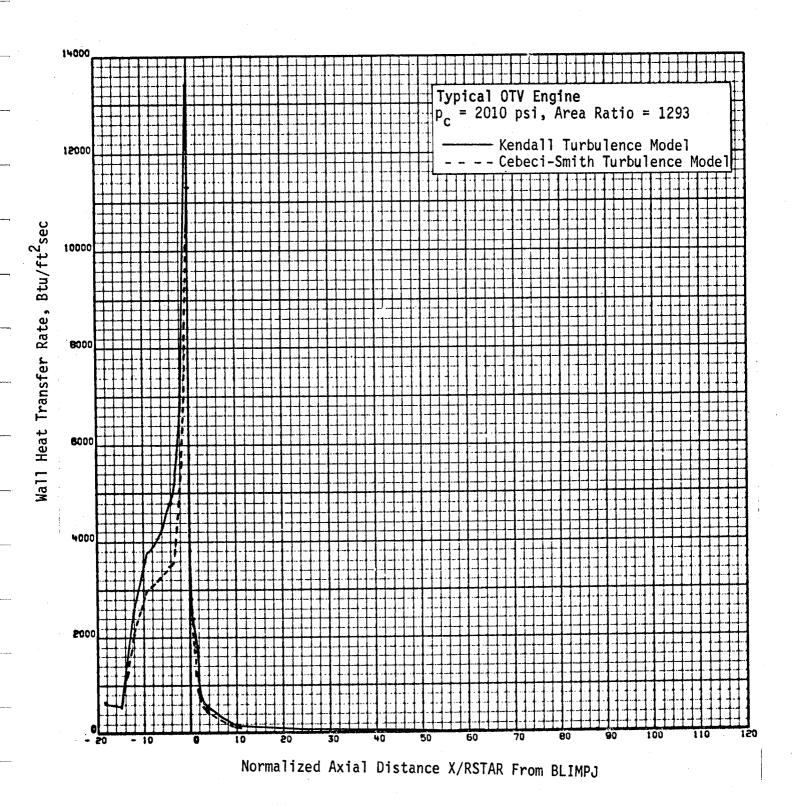


Fig. 2.6 Comparison Of Two Turbulence Models

TABLE 2.2 Example Of Namelist Input For Roughness Option

1. 2. 3. 4.		2/06/8	4 21:52:00 (3->4)
1. 2. 3. 4.	NEN		
<u> </u>	+1	04	ROCKETOYNE CTV ENGINE PC = 2010., AREA RATIO = 1293.0, ROUGHNESS OPTION - 2
4.	•	00	SDATA
		01	
		00	NSP = 2,
. 5.		02	<u>uer = 5 * * * * * * * * * * * * * * * * * *</u>
6.	NE 🖬	04	MR = 0.0, FUEL = 2.0,6*0.0x = 0.0,2.0,5*0.0,
7.	NEW		NS=49,
8.	NEW	04	IPLOT-1, ORIGINAL DE LA
9.	NEW	04	TPK=:00125,1CF=2.
10.	NEW	04	VAP=-11.823, Roughness Option, ICF = 2
11.	NEW	04	<u>S=1</u> ,
12.	NEW	04	RTH=_C0900633,
13.	NEW	04	PCHAM5_2009.59
14.	NEW	04 60	GE=77.9558.6W=-50C0.00.
15.	-6	<u> </u>	KAT = 2HH .2HD . ATA = 4HHYDR.4H OXY, ATB = 4HOGEN.4HGEN . ATC = 2#4H
16.			
17.	NEN.	04	TKP = -1.6,-6.08, Th=1445_+1375.+1340++1305++1234++696++895++900++900++1031++1088++1095++
19.	NEW	04	1060+,103L+,1114+,1122+,110C++100U++790++690+,740++850+,870+,880++910++
20.	NEH	04	12 Co., 96 U., 95 U., 88 U., 88 U., 86 C., 85 U., 72 T., 14 G., 15 QG., 14, D., 12 3G., 114 G.,
21.	NEW	04	1520., 1296., 1275., 1275., 2270., 2276., 2240., 2250., 2240., 2407.,
22.	NEW	0.	N=353,NTH=36,
23.	NE	04	NP=1, 2, 3, 4, 5, -9, 12, 14, 16, 25, 30, 36, 42, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150,
24.	NEN	04	160,170,160,190,200,210,220,255,-275,-266,267,288,-294,295,305,315,316,
25 .	NEW	04	-317.326.335.340.346.353
26.	-7	00	TP = 1,
27.	NEN	04	ju = 0,
28.	NEW	04	KTURB = D .
29.	NEW	Ŭ4	RE1R=360++
30 .	NEW	04	X1YA8=-1a-5C14,-14-601,-12-026,-9-251,-6-475,
31.	NEW	04	¥ITAB=5+2_,
32 +	NEW	04	P11A8=.9993,.99652,.99369,.99090,.98791,
33.	NEW	04	VITA8=52.5,210.0,367.5,516.4,682.4,
34 .	NEW	04	X1TAB( L) = -4.629640, -4.486464, -4.332684, -4.176904, -4.021124, -3.865344,
35.	NEW	04	-3.709563, -3.553763, +3.398003, +3.242223, -3.066443, -2.930662, -2.774882,
36.	NEW	04	-2.619102, -2.463322, -2.307542, -2.151761, -1.495581, -1.840201, -1.684421,
37.	NEw	84	-1.528641, -1.372860, -1.217080, -1.061300,905520,749739,593959,
38.	NEW	04	438179,282399,126618,
39.	NEW	D4	XITAB( 36) = .0000000, .C026841, .0054051, .0081631, .0109557, .0137826,
ąD .	NEW	04	·0166440, ·0195390, ·0224674, ·0254285, ·0264217, ·0314471, ·03450444
41.	NEW	_04	.0375934040714204386640470496050264305351020567872.
42.	NEW	04	•0600955, •0634349, •0668057, •0702078, •0736420, •0771078, •0806054,
43.	NEW	04	<u>.0841347, .0876959, .0912899, .0949169, .0945759, .1022678, .1059541,</u>
44.	NEW	64	·1097530, ·1135461, ·1173736, ·1212348, ·1251319, ·1290635, ·1330140,
45.	NEW	04	<u>.1370354</u> , .1410858, .1451667, .1492819, .1534127, .15762 <u>1</u> 7, .1618628,
46.	NEW	04	.1661349, .1704193, .1747863, .1791886, .1835969, .1880890, .1926184,
47.	NEW	04	1971513, .2017714, .2064334, .2110955, .2158496, .2206147, .2254662.
48.	NEW	04	.2303253, .2352729, .2*02253, .2*52701, .2503176, .25554613, .2606C47,
49.	NEW	_0*	.2658488, .2710883, .2764313, .2817655, .2871431, .2926704, .2982837,
50.	NEW	04	· 30 396 36 . 310 462 50 . 315 1908 . 3206446 . 3265262 . 332 134 . 337 8464 .
51	NEW	04	.3435913, .3492695, .3550602, .3608782, .3666981, .3724603, .3783393,
52.	NEW	04	- 3842594, - 3901933, - 3960694, - + 020641, - + 061228, - + 161769, - + 202377
53.	NEW	04	.4263254, 4324444, .4365660, .4447029, .4509437, .4572341, .4635464;
54.	NEW	04	•698995, 676268C, 4826573, 4890841, 4955500, 5020569, 5086027,
55.	NEW	_04	.5151893, .5218162, .5285065, .5352209, .5419597, .5487456, .5555785,

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these quantities over the whole nozzle in relation to the smooth wall values are much lesser in magnitude. Since this roughness option modifies the turbulence model due to the presence of roughness, Fig. 2.7a was prepared to compare the velocity profiles between the rough and smooth wall cases at the nozzle throat. Figure 2.7b, on the other hand, compares the velocity profiles given in normalized y-coordinates. It is clearly seen from both the plots that not only the boundary layer is thicker but is pushed upward as suggested by Cebeci. This phenomenon has also been observed experimentally be Voisinet (Ref. 9) and is reproduced in Fig. 2.7c as evidence.

The other two roughness options were also exercised for the same OTV nozzle with the above equivalent sand roughness height. Since the enthalpies in the expression (A1) in Table 2.1 are with respect to  $T = 0^{\circ}R$  as the reference, the concept was modified in BLIMPJ to integrate  $C_p$  with respect to T from  $T = 0^{\circ}R$  to either the wall or the edge temperature to calculate  $H_w$  or  $H_e$ , respectively. Noting that  $C_p$  is calculated as a function of T in the boundary layer, an extrapolation was made on  $C_p$  to a value down to  $T = 0^{\circ}R$  as shown in Fig. 2.8 for the OTV nozzle throat location. A numerical intergration was performed within the code to calculate all the required enthalples, and consequently, to compute skin friction and heat transfer rates. Figures 2.9, 2.10 and 2.11 compare heat flux, Stanton number and skin friction coefficient distribution using all the three available roughness options with  $K_s = 0.00125$  ft. The comparison among the three options is quite reasonable near the throat and downstream of the throat. However, some disparities remain in Stanton number and skin friction in the subsonic contraction section of the nozzle, particulary for Options 1 and 2.

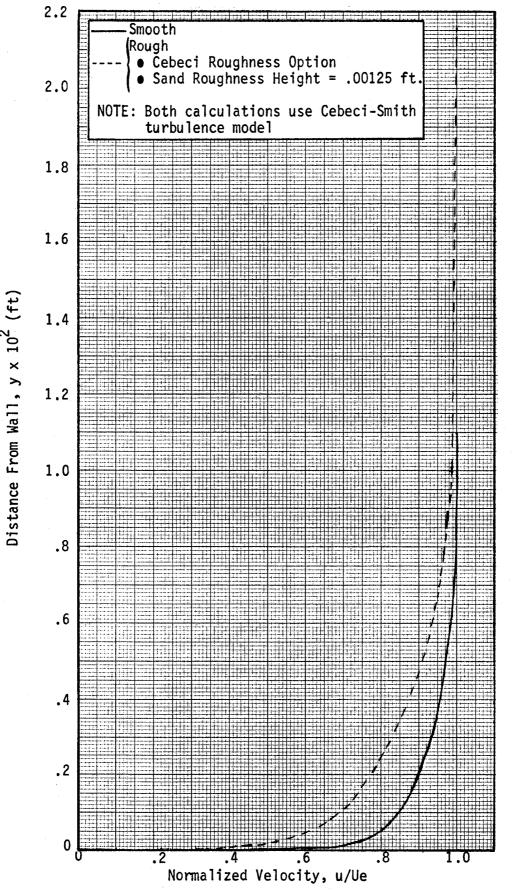


Fig. 2.7a Comparison Of Velocity Distribution Between Rough And Smooth Walls At The OTV Nozzle Throat

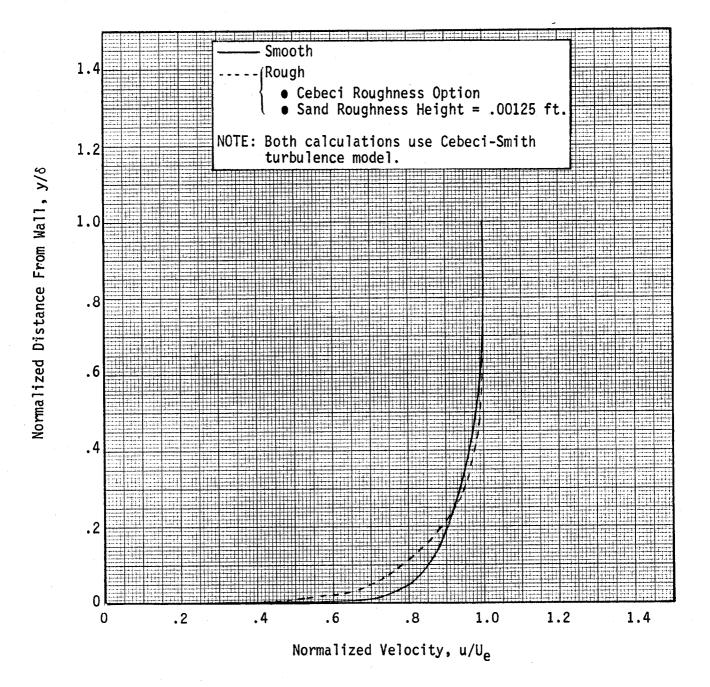
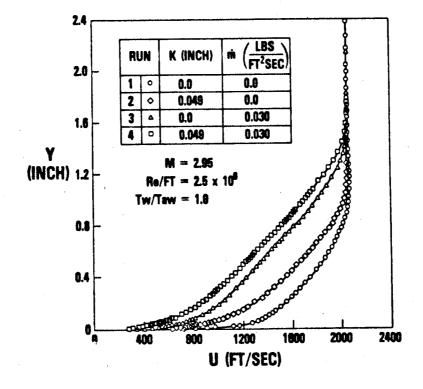


Fig. 2.7b Comparison Of Velocity Distribution Between Rough And Smooth Walls At The OTV Nozzle Throat



- K = Equivalent Sand Roughness Height
- $\dot{\mathbf{m}}$  = Mass Transfer Rate
- Fig. 2.7c Typical Velocity Profiles Given By Voisinet (Ref. 9)

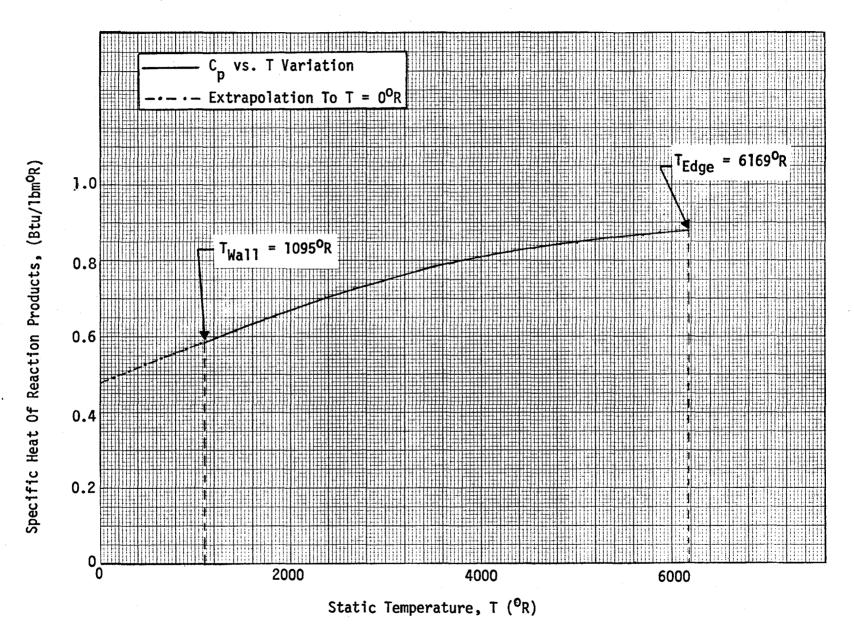


Fig. 2.8 Variation Of Specific Heat Of  $H_2/O_2$  Reaction Products With Static Temperature At OTV Nozzle Throat

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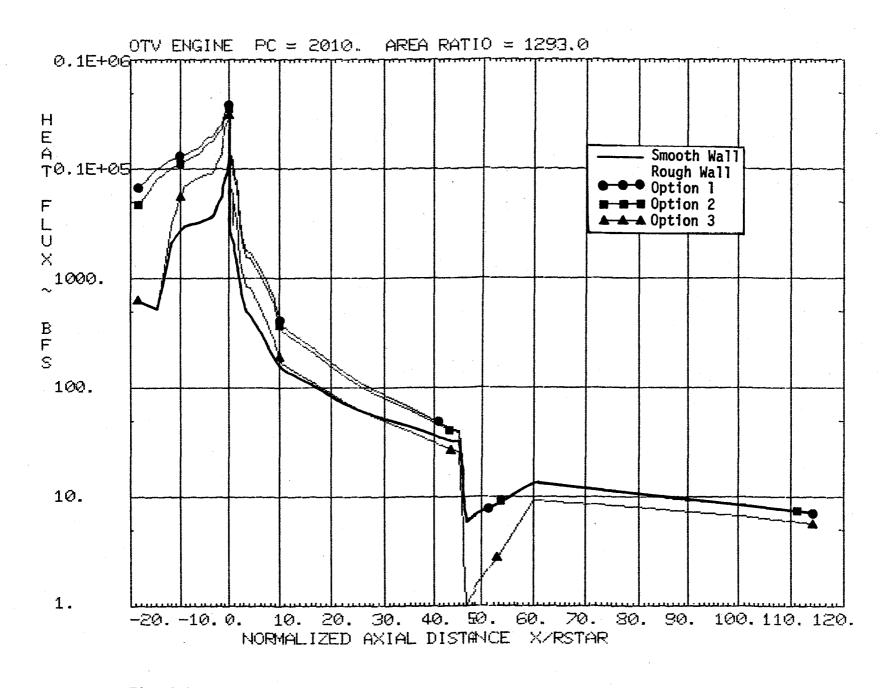
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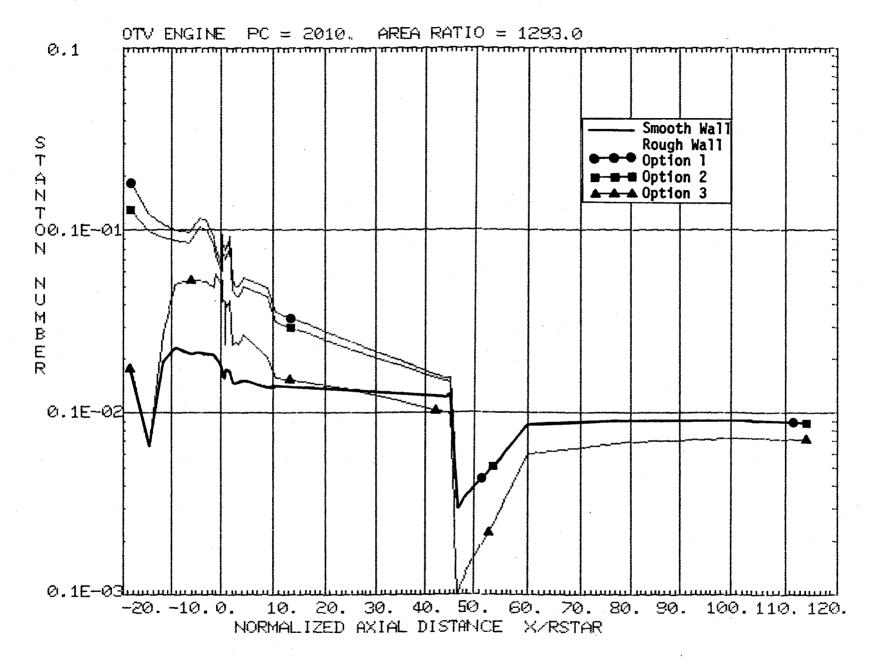
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# Fig. 2.9 Comparison Of Heat Flux Distribution On The Wall Of The OTV Nozzle Wall Using Various Roughness Options

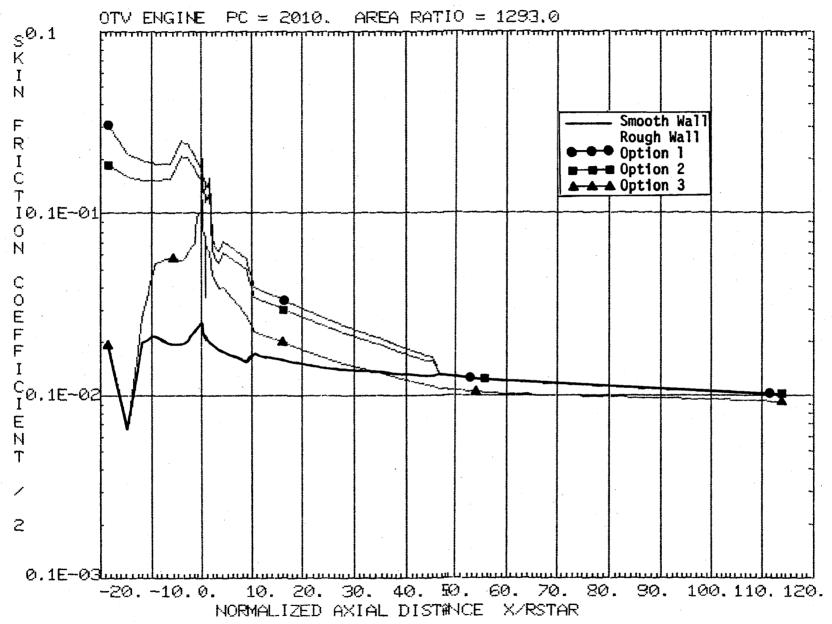
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Fig. 2.10 Comparison Of Stanton Number Distribution On The OTV Nozzle Wall Using Various Roughness Options



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# 2.4 Discussions

The correlations and modifications incorporated in BLIMPJ to account for roughness would be very good candidates for evaluating the thermal losses on the OTV nozzles. The results given in Figs. 2.9-2.11 for a fictitious sand roughness show that although the comparison of  $\dot{q}$ , St and C<sub>f.</sub> on the OTV wall between the three options is reasonable, there is still about 20 to 30 percent variation in the peak heating areas of the nozzle. It must be noted that certain engineering approximations have been incorporated in the evaluation of H in the calculation of the compressiblity factor,  $C_f/C_{f_2}$  in Options 1 and 2. The Option 3, on the other hand, is a more systematic modification of the turbulence model to account for wall surface roughness. It not only gives the heat transfer at the wall, but also provides the details of the turbulence scale change effects within the boundary layer. The effects of wall roughness on the law-of-the-wall results have been noted by others (Ref. 8) to cause a downward shift in the profiles with increased roughness. This meant that for the same value of the law-of-the-wall coordinate,  $y^{+}$ , the velocity is lower. The same phenomenon was observed in the work presented earlier. One item in the Cebeci roughness model (Ref. 8) is the upper limit of 2000 for the equivalent sand-grain roughness parameter, K<sub>c</sub> for which the modification of the length scale is valid. In the code modification, a value of 4000 was used for running the case presented earlier. The validity of this limit must be examined experimentally. Suggestions for future work in this area appear in Sec. 6.

### 2.5 <u>References</u>

- 1. Schlichting, H., <u>Boundary Layer Theory</u>, Fourth Edition, McGraw-Hill Book Company, New York, 1960.
- 2. Nukuradse, J., "Laws of Flow in Rough Pipes," Translated as NACA TM 1292, November 1950.

#### RTR 115-1

- 3. Dirling, Jr., R.B., "A Method for Computing Roughwall Heat Transfer Rates on Reentry Nostips," AIAA Paper No. 73-763, July 1973.
- 4. Seidman, M.H., "Rough Wall Heat Transfer in a Compressible Turbulent Boundary Layer," AIAA Paper No. 78-163, January 1978.
- 5. Pimenta, M.M., Moffat, R.J., and Kays, W.M., "The Turbulent Boundary Layer: An Experimental Study of the Transport of Momentum and Heat with the Effect of Roughness," Stanford University, Thermosciences Division Report No. HMT-21, May 1975.
- 6. Romine, W.D., "Thermal Analysis of the Data from the 40K Subscale Regenerating Cooled Thrust Chamber Cyclic Life Tests," Rockwell Internal Letter No. ASR 76-206 (SSME 76-2523), September 1976.
- 7. Generic OTV Nozzle Geometry Obtained from Mr. Klaus Gross, EL 24, Marshall Space Flight Center, Al.
- Cebeci, T., and Chang, K.C., "Calculation of Incompressible Rough-Wall Boundary Layer Flows," AIAA Journal, Vol. 16, No. 7, July 1978, pp. 730-735.
- 9. Voisinet, R.L.P., "Combined Influence of Roughness and Mass Transfer on Turbulent Skin Friction at Mach 2.9," AIAA Paper No. 79-0003, January 1979.

# Section 3.0

# RELAMINARIZATION

### 3.1 Background

The prediction of relaminarization phenomena is one of the strongest tests of validity of the turbulence models. Relaminarization is basically a reversion from turbulent to laminar boundary layer. Relaminarization is principally caused by severe flow acceleration effects that typically occur internally in the convergent portion of nozzles where subsonic flow exists; in the divergent portion of nozzles where supersonic flow is dominant; and externally in expanding supersonic flows around bodies such as ogive-cylinder and sphere-cylinder configurations. Some of the theoretical and experimental work is reported in Refs. 1-5. Many of these works are experimental in nature. Patel and Head in Ref. 1 have shown experimentally that quite large departures occur from the universal inner-law velocity distribution in the presence of severe favorable pressure gradients in turbulent boundary layers. The work of such investigators as Launder in Ref. 2 has described investigations generally similar to that reported by Patel et al. (Ref. 1), but emphasizes the measurements of turbulence and mean velocity profiles, and covers the complete reversal transition process. In the measurements of Back, Cuffel and Massier (Ref. 3), a reduction in heat-transfer below values typical of a turbulent boundary layer was found when the values of the parameter,  $K = (\mu_e / \rho_e U_e) (dU_e / dx)$  exceeded about 2 to 3 x  $10^6$ . One of the best documented experimental investigations of compressible boundary layer relaminarization is that reported by Nash-Webber (Ref. 4). In this work, an instrumented flat plate was tested in the presence of a variety of upper-wall profiles. The profiles were chosen to impose various pressure gradients on the flat-plate turbulent boundary layer. He deduced a comprehensive criterion for

relaminarization, which will be discussed in detail in the following subsection. It was noticed that acceleration effects tend to keep flow laminar beyond the normally-prescribed transition value.

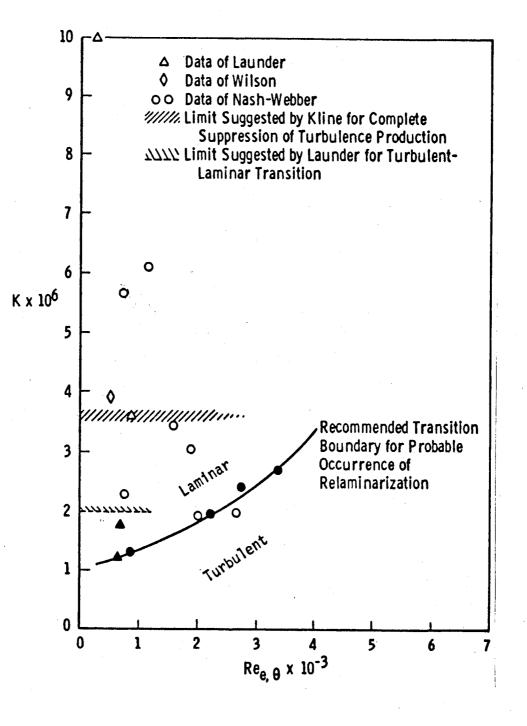
# 3.2 <u>Relaminarization</u> <u>Criterion</u>

The various turbulence models in BLIMPJ were derived based on zero to moderate pressure gradients existing in the flow direction and thus, would not be able to predict laminarization for severe favorable pressure gradients. However, a treatment done by Adams et al. (Ref. 5) using the IKET (Integral form of the Kinetic Energy of Turbulence) approach was able to predict laminarization on the shoulder of a sphere-cylinder configuration tested at  $M_{\infty}$ = 9 in Tunnel F at AEDC. It was also pointed out by Adams that BLIMP could not predict either the onset of relaminarization or the degree of relaminarization.

The acceleration parameter which is a potential candidate for relaminarization and chosen for this study is that due to Nash-Webber (Ref. 4). According to Ref. 4, the acceleration parameter is defined as,

$$K = \frac{\overline{\mu}_{W}}{\overline{\mu}_{W}} \cdot \frac{dU_{e}}{dx}$$
(3.1)

Where the subscript 'w' denotes wall conditions, the subscript 'e' denotes boundary-layer edge conditions, and the barred quantities are time-averaged values. The importance of this parameter is illustrated in Ref. 4 and is reproduced here in Fig. 3.1 for completeness. According to this, the numerical value of K can be used as an indicator for probable occurrence of relaminarization provided that the momentum thickness Reynolds number based on edge conditions is sufficiently low. The recommended boundary value for the onset of relaminarization in Fig. 3.1 seems to be somewhat lower than the threshold recommended by Launder



# Fig. 3.1 Turbulent-Laminar Transition Boundary

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(Ref. 2) and was curve-fitted by a quadratic polynominal given by

$$K = aR^2 + bR + C$$
 (3.2)

where

$$a = 8.935 \times 10^{-14}$$
  

$$b = 2.239 \times 10^{-6}$$
  

$$c = 1.0248 \times 10^{-6}$$

The end of relaminarization (complete laminar condition) is the limit (Fig. 3.1) suggested by Kline (given in Ref. 4) where there is complete suppression of turbulence production.

Currently, BLIMPJ contains a criterion for transition where a specified or input value of  $\operatorname{Re}_{e,\theta}$  is used to trigger transition. When the prescribed  $\operatorname{Re}_{e,\theta}$  is exceeded, the turbulent transport properties are introduced into the calculations. In order to simulate a transition zone, these transport properties are reduced by a factor varying between 0 and 1 for complete laminar and complete turbulent flow respectively. A linear relationship that is used for varying  $\varepsilon_m$  (eddy viscosity) is given by

$$\varepsilon_{\rm m} = 1(S) \cdot \varepsilon_{\rm m} (\rm ref) \tag{3.3}$$

where  $\boldsymbol{\epsilon}_{m}(\text{ref})$  is the reference value for complete by turbulent flow and

$$I(S) = \frac{S}{S_{+}} - 1.0, S_{+} < S < 2S_{+}$$
  
with  $I(S) = 0$  for  $S \le S_{+}$   
 $I(S) = 1$  for  $S \ge 2S_{+}$ 

where S is the running length and S<sub>t</sub> is the running lenght up to the point of transition on the body. It is suggested by Ref. 6 that a flat plate zero pressure gradient value of  $R_{e,\theta} = 360$  serves as a nominal estimate. Now, in order to

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account for flow acceleration effects, the recommended transition boundaries described in the previous paragraph and given in Fig. 3.1 has been coded in BLIMPJ. For acceleration parameters K less than  $1 \times 10^{-6}$ , Eq.(3.3) is used to check the state of the boundary layer. However, for acceleration parameter greater than  $1 \times 10^{-6}$ , the new criterion given in Fig. 3.1 and described in the previous paragraph is used. In order to simulate a relaminarization zone, the values of K are used instead of S in Eq. (3.3).  $K_1$  and  $K_2$  at any  $Re_{e,\theta}$  corresponding to the beginning and the end of relaminarization have been coded in BLIMPJ according to the following formula:

$$\varepsilon_{\rm m} = \left(\frac{\kappa - \kappa_1}{\kappa_2 - \kappa_1}\right) \cdot \varepsilon_{\rm m} \ ({\rm ref}) \tag{3.4}$$

It should be observed that  $\varepsilon_m$  linearly varies with K from a turbulent  $\varepsilon_m$  (ref) value to a value of zero for completely laminar flow. Incidentally, the percent relaminarization value is

$$PCT = \left(\frac{K - K_1}{K_2 - K_1}\right) \times 100$$
(3.5)

This additional logic in BLIMPJ only applies for turbulent flow. Depending on the value K, a value of turbulent eddy viscosity is calculated and fed into the boundary layer calculations.

## 3.3 Examples

In order to check the limits of relaminarization, an example of flow over the Shuttle clean ET configuration was considered. The aeroheating data were measured on a 0.0175 scale clean ET model tested at  $M_{\infty}$ = 7.3 in the Ames HWT facility. The measured data had been compared against turbulent and laminar cal-

culations made by other aeroheating codes in Fig. 3.2. Because of tripping of the boundary layer due to the ET triple-cone nose, the boundary layer becomes turbulent over the ogive. The flow remains turbulent up to X/L = 0.2, becomes fully laminar at X/L = 0.25, and finally turbulent again beyond X/L = 0.4. The acceleration parameter in Eq. (3.2) was examined after calculating the pressure gradient from the method-of-characteristics procedure and then the acceleration parameter, and was plotted in Fig. 3.3 as a function of X/L. It is evident that the parameter peaks at X/L = 0.2 and drops off very rapidly as X/L is increased. Another way of plotting this information is shown in Fig. 3.4, where K is plotted vs. Re  $_{e,\theta}.$  From both the figures, it is obvious that the peak value is not higher than the threshold value of K(=1.58  $\times 10^{-6}$ ) at Re<sub>e,0</sub> = 1550. This indicates that the acceleration parameter is not high enough to trigger relaminarization, even though the data seem to suggest it. A similar observation was made by Adams (Ref. 5) for the sphere-cylinder case. Even though his IKET approach as well as the measured data seemed to show relaminarization, the Nash-Webber correlation did not strongly suggest that.

In order to examine the validity of this correlation for nozzle boundary layers, the relevant data taken on a  $10^{\circ} - 10^{\circ}$  half angle conical nozzle by Back et al. (Ref. 3) were examined in Fig. 3.5. Wall pressures calculated by TDK (Ref. 7) were input to the REMTECH version of BLIMPJ, and the heat-transfer. (Fig. 3.5.B) along with the acceleration parameter distributions (Fig. 3.5.C) were calculated. The acceleration parameter based on edge quantities, K<sub>e</sub>, compared quite well with Back's calculations. The K<sub>e</sub> peak occuring upstream of the nozzle throat was not predicted by BLIMPJ because of inadequate wall pressure definition in this region. The heat-transfer calculations were made by using the coded relaminarization criterion. The momentum thickness Reynolds number,  $Re_{e,\theta}$  distribution compared well with Back's calculations. The K<sub>w</sub>

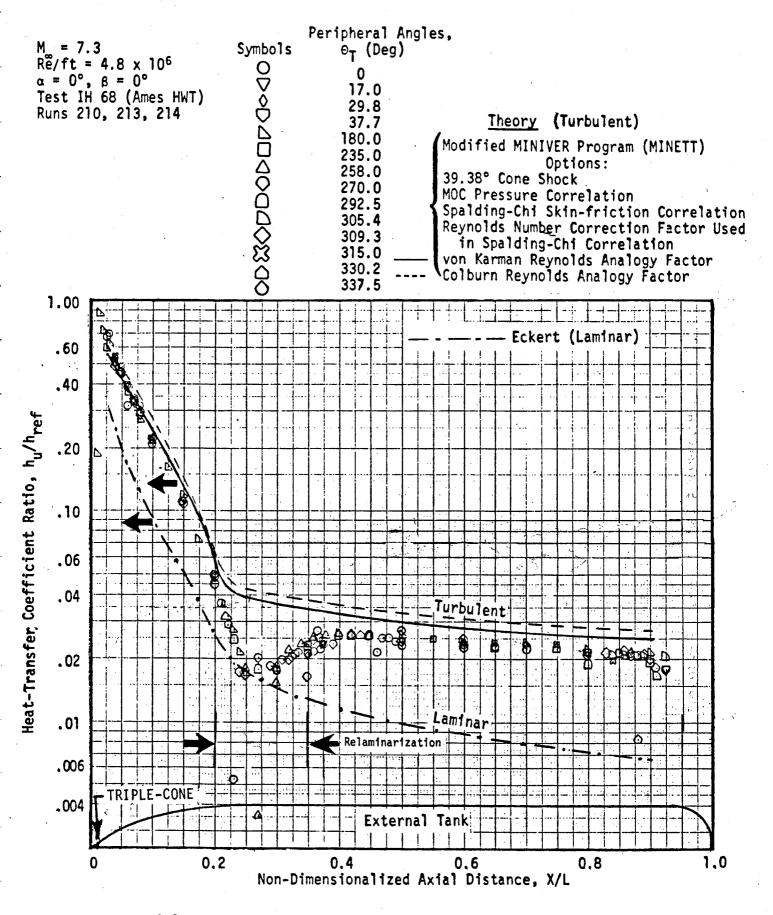
vs.  $R_{e,\theta}$  correlation for relaminarization [Eq. (3.2)] suggested that the turbulent boundary layer was on the verge of relaminarization at the tangency point located at the juncture of the conical and curved portions of the nozzle contraction section. It is seen from Fig. 3.5.B, however, that the prediction is consistently higher than the measured data and that the boundary layer is predicted to be turbulent throughout the contraction section of the nozzle, but not partially relaminarized as evident from the measured data and as pointed out by Back's analysis. Back et al. point out in their paper that if  $K_e$  is higher than 2 to 3 x 10<sup>-6</sup> relaminarization occurs. Since  $K_e$  satisfies this criterion in the contraction portion of the nozzle as evident from Fig. 3.5.C, it suggests that relaminarization occurs. The currently coded criterion, which is different from the above criterion and is more definite in structure, is not able to quantify the degree of laminarization as well as suggested by Nash-Webber (Ref. 4).

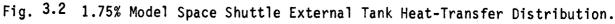
An example of the name list input to turn on the relaminarization flag is given in Table 3.1.

## 3.4 Discussions

The Nash-Webber criterion for relaminarization worked only marginally for the external flow situations, whereas for the limited measured data available on nozzles where relaminarization occurs in the boundary layer, this criterion seems to be only approximate. Without going through an extensive analysis such as the IKET-type model (Ref. 5), the current approach needs to be modified somewhat for engineering calculations. In addition, relaminarization can be predicted in the presence of roughness. In order to accomplish this, the roughness option 3 due to Cebeci must be input (RK = ...., ICF = 3) along with the relaminarization option (ILAMIN = 1). The occurence of relaminarization will tend to reduce the turbulence length scales whereas the presence of wall rough-

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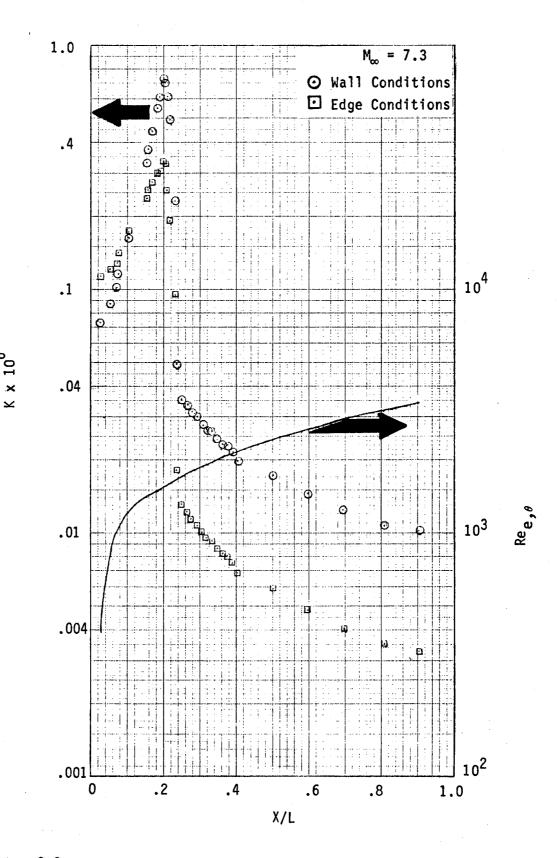


Fig. 3.3 Plot Of Acceleration Parameters Based On Edge And Wall Conditions And Momentum Thickness Reynolds Number Vs. X/L For The Shuttle ET Model

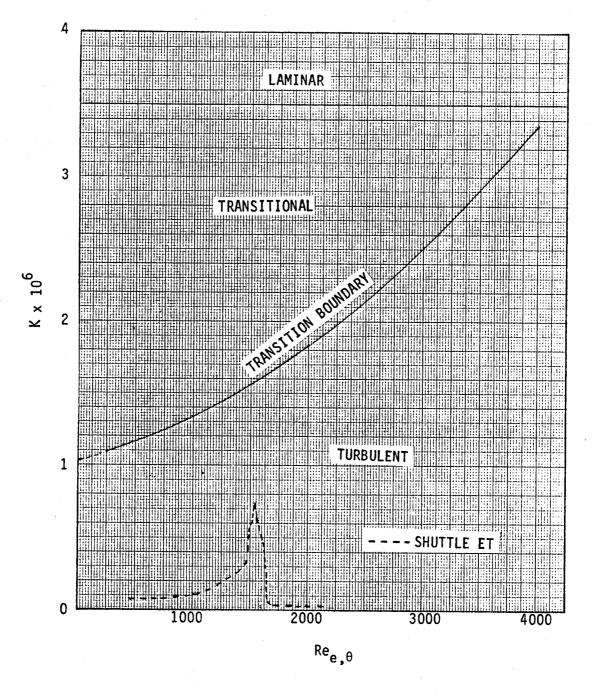


Fig. 3.4 Acceleration Parameter Vs.  $Re_{\theta,\theta}$  for the Shuttle ET Shoulder Region

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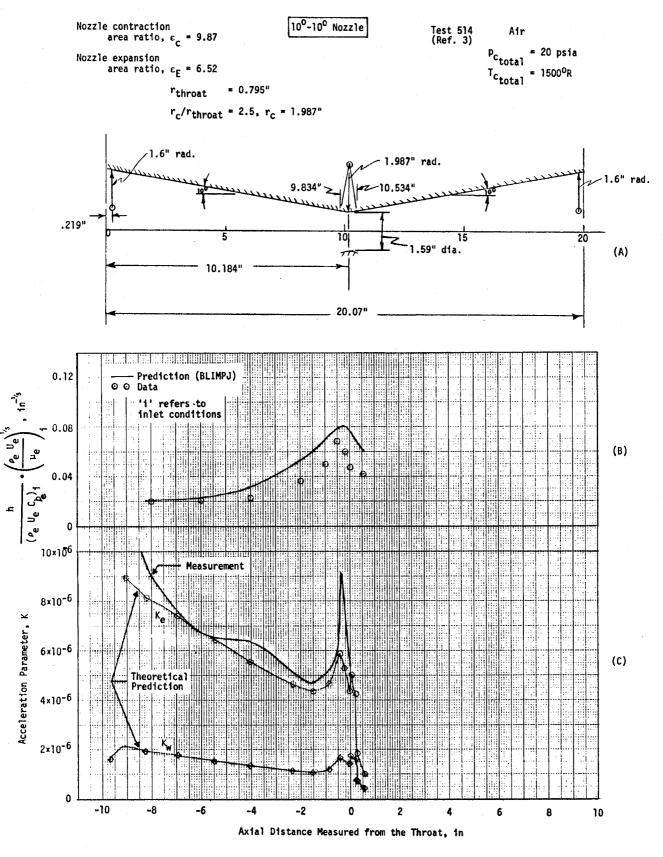


Fig. 3.5 Relaminarization Analysis Of The Boundary Layer Flow In Back Et Al.  $10^{\circ}$  -  $10^{\circ}$  Half Cone Angle Nozzle

# TABLE 3.1 Example Of Namelist Input For Relaminarization

. 1	NEW	04	ROCKETDYNE OTV ENGINE PC = 2010., AREA RATIO = 1293.0 PARTICLE OPTION = 1
2.	- 1	00	\$DATA
э.		01	ITDK = 0.
4.		00	NCD = 2
5.		02	NEL = 2,
6.	NEW	04	NEL = 2, MR = 0.0, FUEL = 2.0,6*0.0, DX = 0.0,2.0,5*0.0, MS = 0
7.	NEW	04	NS=48,
8.	NEW	04	
9.	NEW	04	RK=.00125, ICF=0,
0.	NEW	04	$\frac{RF=0.00125.ICF=0}{RF=1.E-5.RHOPA=169CPART=0.208.WP=4.0.IPART=1.}$ Relaminarization Flag.
1.	NEW	04	
2.	NEW	04	YAP=-11.823, ILAMIN = ]
з.	NEW	04	S=1
4.	NEW	04	RTM=.0900833.
5.	NEW	04	RT#- (050833), PCHAMB=2009.59, GE=77.9558,GW=-5000.00,
6.	NEW	04	GE = 77.9558, GW = - 5000.00,
<u>7</u>	-6	00	KAT = 2HH ,2HO , ATA + 4HHYDR,4H DXY, ATB + 4HOGEN,4HGEN , ATC = 2+4H
8.	A1514	00	WAT = 1.0080.16.0,
9. 0.	NEW	04	TKP = -1.0, -6.08, TW=1445., 1375., 1340., 1305., 1234., 890., 895., 900., 900., 1031., 1088., 1095.,
0. 1.	NEW	04 04	1060., 1030., 1114., 1122., 1100., 1000., 790., 690., 740., 850., 870., 880., 910.,
2.	NEW	04	1060, 1030, 1114, 1122, 1100, 1000, 190, 190, 190, 180, 180, 180, 1910,
2. 3.	NEW	04	
4.	NEW	04	1520., 1298., 1275., 1272., 2870., 2740., 2590., 2540., 2430., 2407., N=353, NTH=36,
≠. 5.	NEW	04	NP=1,2,3,4,5,-9,12,14,16,25,30,36,42,50,60,70,80,90,100,110,120,130,140,150,
6.	NEW	04	160, 170, 180, 190, 200, 210, 220, 235, 255, -275, -286, 287, 288, -294, 295, 305, 315, 316.
7.	NEW	04	-317, 325, 335, 340, 346, 353,
8.	-7	00	IP = 1.
9.	NEW	04	IU = 0.
<b>o</b> .	NEW	04	
1.	NEW	04	RETR=360.
2.	NEW	04	KIURB=0, RETR=360. XITAB=-18.5014,-14.801,-12.026,-9.251,-6.475, VITAB=5+2
3.	NEW	04	YITAB=5+2.,
4.	NEW	04	PITAB=.9993,.99652,.99369,.99090,.98791,
	NEW	04	VITAB=52.5,210.0,367.5,518.4,682.4,
	NEW	04	XITAB(6) = -4.629640, -4.488464, -4.332684, -4.176904, -4.021124, -3.865344,
	NEW	04	-3.709563, -3.553783, -3.398003, -3.242223, -3.086443, -2.930662, -2.774882,
8.	NEW	04	-2.619102, -2.463322, -2.307542, -2.151761, -1.995981, -1.840201, -1.684421,
	NEW	04	-1.528641, -1.372860, -1.217080, -1.061300,905520,749739,593959,
	NEW	04	438179,282399,126618,
	NEW	04	XITAB( 36) = .0000000, .0026841, .0054051, .0081631, .0109557, .0137826,
	NEW	04	.0166440, .0195390, .0224674, .0254285, .0284217, .0314471, .0345044,
	NEW	04	.0375934, .0407142, .0438664, .0470496, .0502643, .0535102, .0557872,
4.	NEW	04	.0600955, .0634349, .0668057, .0702078, .0736420, .0771078, .0806054,
	NEW	04	.0841347, .0876959, .0912899, .0949169, .0985759, .1022678, .1059941
	NEW	04	.1097530, .1135461, .1173736, .1212348, .1251319, .1290635, .1330140, .1370354, .1410858, .1451667, .1492819, .1534127, .1576217, .1618628,
	NEW	04	
	NEW	04	.1001349, .1/04193, .1/4/803, .1/91880, .1830909, .1880890, .1920184,
	NEW	04	. 197 15 13, .20177 14, .2064334, .21 10955, .2158496, .2206 147, .2254662, .2303253, .2352729, .2402253, .2452701, .2503 176, .25546 13, .2606047,
<b>-</b> ·	NEW	04	. 2303253, 2332729, 2402253, 2452701, 250376, 2554613, 2606047, 260568488, 2710883, 2764313, 2817655, 2871431, 2926704, 2982837,
	NEW	04	
	NEW	04	4263254, 4324444, 4385360, 4447029, 4593477, 4572341, 4635464, 4698995, 4762680, 4826573, 4890841, 4955500, 5020569, 5086027,
	NEW	04	

and so on.

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ness will tend to increase it. Although the code has not been exercised extensively for both being present in a nozzle, it is believed that the code would handle it adequately.

## 3.5 <u>References</u>

- 1. Patel, V.C., and Head, M.R., "Reversion of Turbulent to Laminar Flow," Journal of Fluid Mechanics, Vol. 34, Part 2, 1968, pp. 371-392.
- Launder, B.E., "Laminarization of the Turbulent Boundary Layer by Acceleration," MIT Gas Turbine Lab. Report No.-71, 1963.
- Back, L.H., Cuffel, R.F., and Massier, P.F., "Laminarization of a Turbulent Boundary Layer in Nozzle Flow - Boundary Layer and Heat Transfer Measurements With Wall Cooling", ASME Paper 69-HT-56, August 1969.
- Nash-Webber, J.L., "Wall Shear-Stress and Laminarization in Accelerated Turbulent Compressible Boundary Layers," MIT Gas Turbine Lab. Report No. 94, April 1968.
- 5. Hodge, B.K. and Adams, J.C., "The Calculation of Compressible Transitional, Turbulent, and Relaminarizational Boundary Layers Over Smooth and Rough Surfaces Using an Extended Mixing-Length Hypothesis," AEDC-TR-77-96, February 1978.
- Evans, M., "BLIMPJ User's Manual," Aerotherm Division/Acurex Corporation, July 1975, under Contract NAS8-30930 (Document number no available).
- Nickerson, G.R. and Dang, L.D., "Improved Two-Dimensional Kinetics (TDK) Computer Program," SEA Report SN-54, Santa Ana, California, October 1983.

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## Section 4.0

## PARTICLE EFFECTS

## 4.1 Background

The study of the boundary layer flow containing particles (in the fluid-particle systems) is of special interest because of the influence of the particles on the wall shear and heat transfer, the possible tendency of particles to collect near a wall, and the problem of particle impingement on the wall. Typical data (Ref. 1) in the chemical engineering literature correlated in terms of voldage show that there is negligible effect caused by solid particles until the volume percent of solids reaches 0.05 percent, but a very marked increase occurred in heat transfer for higher solids loading. In fact, Nusselt number increases by factors as high as eight have been reported for the addition of particles to a flowing gas (Ref. 1). Material deposited on the nozzle wall also represents a loss in performance, because the resulting rough surface causes increased skin friction losses.

Correlation of gas-particle heat transfer in terms of solids loading and, sometimes, tube diameter (for pipe flow) is not entirely satisfactory, since such correlations ignore the effect of particle size. The differences in the data reported by Leva (Refs. 2 and 3) suggest that the enhancement in heat transfer is at least partially associated with disturbance of the laminar sub-layer by particles, causing a local increase in heat transfer. On the other hand, reduction in heat transfer and shear stress have been reported in Ref. 4 for large populations of the smallest particles, less than  $1\mu$ , by primarily displacing the boundary layer and thereby reducing thermal gradients.

The laminar particle-gas boundary layer has been investigated by Marble (Ref. 5), Soo (Ref. 6), Tabakoff and Hamed (Ref. 7) using momentum integral

techniques. In all these studies, analytical expressions have been found relating wall heat transfer and shear with particles to those without the particles. These investigations have determined that the introduction of particles leads to an increase in the gas boundary layer thickness. In addition, it was found that the gas boundary layer characteristics are more sensitive to particle concentration than any other particulate flow parameter. It has been shown that for gas-particle flow systems, the wall heat transfer and skin friction are related to non-particle flow by a non-dimensional parameter called the "momentum range" which depends on particle size, the fluid viscosity, the fluid velocity and the distance from the leading edge, and another quantity called the "particle momentum interaction parameter", which depends on the ratio of particle mass density to fluid mass density.

Particulate-laden turbulent boundary layer flows in nozzles have not been understood completely and substantial empiricism must be employed to estimate the effects of particle concentration, particle size, density, pressure and entropy gradients on wall shear and heat transfer rate. Tien (Ref. 8) analyzed the increase in heat transfer due to differences in the gas and particle temperatures in boundary layer regions, under the assumptions of incompressible, constant property flow with no radiation or velocity lag effects and no effect of the particles on the gas flowfield. In this case, there is an increase in heat transfer rate while the flow is developing in the pipe. Soo and Tien (Ref. 9) considered particle motion in a turbulent fluid stream with emphasis on the effect of wall interference. The high particle intensity in wall regions increases the heat transfer by increasing the particle to gas heat transfer rates. Disruption of the gas laminar sublayer by particle motion further increases the local heat transfer. Also, if temperatures are high enough for radiation to occur, the radiation from particles to colder walls causes additional

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heat transfer. Farbar and Morley (Ref. 10) also concluded from their experimental work on flowing gas-solids mixtures in a circular tube that the use of solids in gaseous heat transfer systems may prove to be advantageous when an increase in the heat transfer rate is desired without any increase in the heat transfer area. It was concluded from this study that the gas-side heat transfer factor increases rapidly for solids loading ratios greater than unity. The solids affect both the gas boundary layer and the heat capacity of the flowing mixture. On the other hand, for solids loading ratios of unity or less, a transitional region exists in which the effect is primarily one of increased heat capacity.

#### 4.2 Particle Options

The various options integrated in BLIMPJ fall into the following two categories:

## 4.2.1 Laminar Boundary Layer-Particulate Flow

The approach used in the modification of BLIMPJ to account for the presence of particles and their effect on wall shear and heat transfer is taken from the work of Marble (Ref. 10). Marble developed an expression for the shear coefficient from an integral momentum solution of the laminar boundary layer equations, particle continuity and momentum equations for an incompressible flat plate flow. The final expression for the case where  $\lambda_v/x < 1$  is given in Table 4.1. The applicable momentum range,  $\lambda_v$ , in the OTV-type nozzles would fall basically in this category. We recognize in Eq. (B.1) of Table 4.1 C<sub>fo</sub> as the shear coefficient for the fluid boundary layer without particles. In his original paper, Marble used

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$$C_{f_0}/2 = 0.332/\sqrt{R_X}$$
 (4.1)

Since BLIMPJ provides a shear coefficient for clean flow, that value was used as reference instead to calculate the shear coefficient for the gas-particle system. The quantity,  $\lambda_{v}$ , represents a distance, x, which describes the particle motion relative to the fluid. For  $x < \lambda_{v}$ , there is a high degree of fluid-particle slip, whereas for  $x > \lambda_{v}$ , the particles tend to take on the motions of the gas. The heat transfer characteristics are more complex in the high "particle-slip" regime in that the initial conditions become quite important in such a calculation. Since there is very litter work in the literature for this regime, this was not coded in BLIMPJ.

Returning our attention to the expression for shear, the factor  $\sqrt{1 + K}$  multiplying the usual shear coefficient gives the result for no particle slip and represents a minimum value for shearing stress. The first order correction 0.49 ( $\lambda_v/x$  . K/1 + K) gives shear stress due to particle slip reduction along the flow path.

Heat transfer through the boundary layer was treated in a similar manner as given in Eq. (B.2).

## 4.2.2 <u>Turbulent Boundary Laver-Particulate Flow</u>

The approach for modification of the heat transfer and skin friction calculations in BLIMPJ for a turbulent boundary layer is based on the analytical results of Tien (Ref. 8) and the empirical expressions of Farbar and Morley (Ref. 10). Tien solved the turbulent gas-particle energy equations for flow in a pipe and found that the qualitative effect of particle concentration is to flatten the temperature profile and consequently to increase the heat transfer. He has theoretically confirmed the test results of Farbar and Morley that

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## TABLE 4.1

## GAS-PARTICLE SKIN FRICTION AND HEAT TRANSFER

Laminar Boundary Layer (Marble)

$$C_{f} = C_{f_{0}} \sqrt{1 + K} \left( 1 + 0.49 \frac{K \lambda_{V/X}}{1 + K} \right), \frac{\lambda_{V}}{X} << 1$$
 (B.1)

and

$$\dot{q} = \dot{q}_0 \sqrt{1 + K} \left( 1 + 0.49 \frac{K\lambda_{V/X}}{1 + K} \right), \frac{\lambda_V}{X} << 1$$
 (B.2)

where

1.....

$$K = \rho_p / \rho_e$$
$$\lambda_v = \frac{mU_e}{6\pi a \mu_e}$$

(B.3)

## TABLE 4.1 (Continued)

## Turbulent Boundary Layer

For

and

.

where

 $\beta_5 = \frac{C_p W_p}{C_f W_f}$ 

 $C_{f} = C_{f_{0}} (1 + \beta_{5})$ 

 $\dot{q} = \dot{q}_0 (1 + \beta_5)$ 

For

<sup>₩</sup>p > 1 (Farbar and Morley) <sup>₩</sup>f

 $Nu = 0.14 \text{ Re}_{D}^{0.6} (W_{p}/W_{f})^{0.45}$ (B.4)

$$\dot{q} = \frac{Nu \cdot K_g}{D} \cdot (T_{aw} - T_w)$$

Particle Factor =  $\dot{q}/\dot{q}_0$ 

$$C_{f} = \begin{pmatrix} \dot{q} \\ \dot{q}_{0} \end{pmatrix} \cdot C_{f_{0}}$$
(B.6)

# TABLE 4.1 (Continued)

Nomenclature

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m	= average particle mass, 1bm
Ue	<pre>= boundary layer edge velocity, ft/sec</pre>
σ	= Stokes drag coefficient (= 6πμ <sub>e</sub> a)
a	= radius of spherical particle, ft.
μ	= gas viscesity, lbm/ft.sec
λ <sub>V</sub>	= momentum range, ft.
к	= Particle momentum interaction parameter
ρ <sub>p</sub>	= particle mass density of the gas, lbm/ft <sup>3</sup>
<sup>р</sup> е	= gas density, lbm/ft <sup>3</sup>
Re <sub>D</sub>	= edge Reynolds number based on diameter
Х	= running length, ft.
τ	= shear stress, lbf/ft <sup>2</sup>
°f₀	= friction coefficient calculated by BLIMPJ
C <sub>f</sub>	<pre>= modified friction coefficient</pre>
٩ <sub>0</sub>	= heat transfer rate calculated by BLIMPJ, Btu/ft <sup>2</sup> sec.
ģ	= modified heat transfer rate, Btu/ft <sup>2</sup> sec.
с <sub>р</sub>	= specific heat of the solid particle, Btu/lb.degF
Wp	= mass flow of particles, lb/sec.ft <sup>2</sup>
°f	= specific heat at constant pressure of fluid, Btu/lb.degF
₩ <sub>f</sub>	= mass flow of fluid, lb/sec.ft <sup>2</sup>
Kg	= thermal conductivity of the gas, Btu/sec.ft <sup>O</sup> K
D	= diameter of the tube, ft.
Nu	= Nusselt's number

suspended solids, having a solids-to-gas loading ratio of less than 1.0, have a negligible effect on heat transfer. As pointed out earlier, Tien's analysis is valid for the entrance region of a pipe. Since the flow is not fully developed in this region of the pipe, the boundary layers do not merge. This flow situation is similar to what happens in a nozzle, where the boundary layers develop near the nozzle wall and do not merge. Consequently, the expressions developed by Tien for the pipe may be applicable to a nozzle. The expressions for particle-to-fluid loading ratio of less than 1 are given in Eq. (B.3) of Table 4.1.

For higher particulate loading where interactions and collisions among particles become important, the above expression is no longer valid. For the case, where the particle-to-fluid loading ratio is more than 1, the experimental results of Farbar and Morley (Ref. 10) have been correlated and are given in Eq. (B.4) of Table 4.1. This expression is valid for a limited Reynolds number range of 13,500 <  $R_e$  < 27,000 which were the limits in the test conditions. It has further been noted by Farbar and Morley that for loading ratios up to unity, the Nusselt number varies as the 0.03 power of the loading ratio, while that above unity varies as the 0.45 power of the loading ratio, except that for the lowest Reynolds number which indicates a variation to the 0.5 power. The expressions for Nu in Eq. (B.4) was used to calculate a particle factor which was then used to calculate skin friction coefficient from Eq. (B.5). The above expressions were coded in BLIMPJ and checked with a few examples.

## 4.3 EXAMPLES

In order to illustrate the effect of particles in the fluid boundary layer on skin friction and heat transfer rate, the following hypothetical example was chosen. Aluminum particles of 10  $\mu$ radius (density of AI = 169 lbm/ft<sup>3</sup>) and particles-to-fluid loading ratio of 0.5 was chosen. Thus,

 $r = 10 \mu = 10^{-5} m$   $\rho_{al} = 169 \ lbm/ft^{3}$  $C_{pal} = 0.208 \ Btu/lbm.^{O}F$ 

An example of the namelist input in BLIMPJ for particles-in-flow is given in Table 4.2. The OTV nozzle was used for testing the effects of these particles. The relative magnitudes of the resultant skin friction and heat flux are plotted in Figs. 4.1-4.3. Since the OTV nozzle contains both laminar and turbulent boundary layer flow regimes, both laminar and turbulent expressions for particles-in-flow could be checked out simultaneously.

## 4.4 Discussions

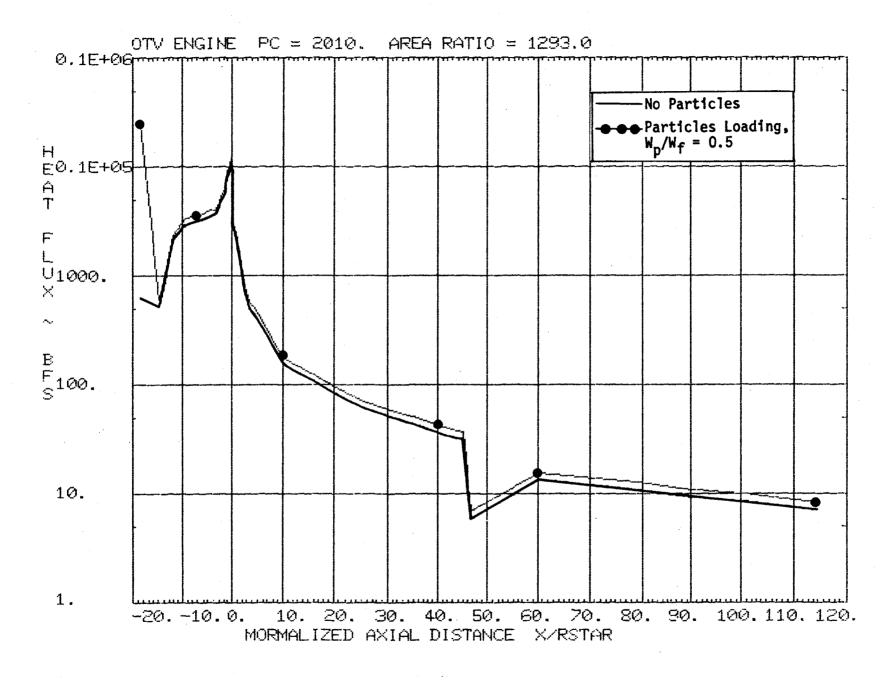
The particle options chosen in the present work are designed to perform "point" calculations and are not capable of taking into account the "history" effects. The particle option can either be used independently or used along with one or both of the roughness and relaminarization options. The reference value for the particle factor will be obtained either from the smooth wall value or from the relaminarization or rough wall value and then be enhanced by the particle factor. It has been pointed out previously that the particle factor expressions for turbulent flow were derived from tube data and do not represent a rocket nozzle case, and in that sense are only approximate in nature. However, they will provide relative values of wall skin friction and heat flux for various particle sizes and particle loadings. Some relevant suggestions for future work for gas-particle flows in rocket nozzles are given in Sec. 6.

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TABLE 4.2 Example Of Namelist Input Particle Option

1.	NEW	04	OTV ENGINE PC = 2010., AREA RATIO = 1293.0 PARTICLE OPTION = 1
2.	- 1	00	\$DATA
з.		01	ITDK = 0,
4.		00	NSP = 2.
5.		02	NEL = 2.
6.	NEW	04	MR = 0.0, FUEL = 2.0,6*0.0, DX = 0.0,2.0,5*0.0,
7. 8.	NEW	. 04	NS*48, JPLOT=1.
9.	NEW	04	$RK = 00125, ICF = 0,$ Radius of the narticle RP = 1 F_05
10.	NEW	04	
11.	NEW	04	TIANTNEO
12	NEW	04	vAP11.823. Specific heat of the particle, CPART = .208,Btu,
13.	NEW	04	S=1. Particle loading $(W_p/W_p)$ WP = 0.5
14.	NEW	04	RTM= 0900833. PCHAME=2009 59 Particle Option, IPART = ]
15.	NEW	04	PCHAMB=2009.59, Failure option, TPART = 1
16.	NEW	04	GE = 77.9558, GW = - 5000.00,
17.	-6	00	KAT = 2HH ,2HO , ATA = 4HHYDR,4H OXY, ATB = 4HOGEN,4HGEN , ATC = 2+4H ,
18.		00	WAT = 1.0080.16.0,
19.	NEW	04	TKP = -1.0, -6.08.
20.	NEW	04	TW=1445.,1375.,1340.,1305.,1234.,890.,895.,900.,900.,1031.,1088.,1095.,
21.	NEW	04	1060.1030.1114.1122.1100.1000.790.690.740.850.870.880.910.
22.	NEW	04	920.,960.,950.,890.,880.,860.,850.,727.,1460.,1500.,1460.,1230.,1140.,
23.	NEW	04	1520. 1298. 1275. 1272. 2870. 2740. 2590. 2540. 2430. 2407.
∡4. 25.	NEW	04	N=353.NTH=36. NP=1,2,3,4,5,-9,12,14,16,25,30,36,42,50,60,70,80,90,100,110,120,130,140,150.
25.	NEW.	04	NP=1,2,3,4,5,-9,12,14,16,25,30,36,42,50,60,7,280,90,100,110,120,130,140,150, 160,170,180,190,200,210,220,235,255,275,-275,-286,287,288,-294,295,305,315,316.
20.	NEW	04	-317, 325, 335, 340, 346, 353,
28.	-7	00	IP = 1.
29.	NEW	04	IU = 0.
30.	NEW	04	KTURB-O.
31.	NEW	04	RETR=360.
32.	NEW	04	XITAB=-18.5014,-14.801,-12.026,-9.251,-6.475,
33.	NEW	04	YITAB*5*2.,
34.	NEW	04	PITAB=.9993,.99652,.99369,.99090,.98791,
35	NEW	. 04	VITAB=52.5,210.0,367.5,518.4,682.4,
36.	NEW	04	XITAB( 6) = -4.629640, -4.488464, -4.332684, -4.176904, -4.021124, -3.865344,
37.	NEW	04	-3.709563, -3.553783, -3.398003, -3.242223, -3.086443, -2.930662, -2.774882,
38.	NEW	04	-2.619102, -2.463322, -2.307542, -2.151761, -1.995981, -1.840201, -1.684421,
39.	NEW	04	-1.528641, -1.372860, -1.217080, -1.061300,905520,749739,593959,
40. 41.	NEW	04 04	438179,282399,126618, XITAB( 36) = .0000000, .0026841, .0054051, .0081631, .0109557, .0137826,
42.	NEW	04	XITAB(36) = .0000000, .0026841, .0054051, .0081631, .0109557, .0137826, .0166440, .0195390, .0224674, .0254285, .0284217, .0314471, .0345044,
43.	NEW	04	.0100440, .0193390, .0224074, .0234253, .0204217, .0314471, .034044, .0375934, .0407142, .0438664, .0470496, .0502643, .0535102, .0567872,
44.	NEW	04	.0600955, .0634349, .0668057, .0702078, .0736420, .0771078, .0806054,
45.	NEW	04	.0841347, .0876959, .0912899, .0949169, .0985759, .1022678, .1059941,
46.	NEW	04	.1097530, .1135461, .1173736, .1212348, .1251319, .1290635, .1330140,
47.	NEW	04	.1370354, .1410858, .1451667, .1492819, .1534127, .1576217, .1618628,
48.	NEW	04	.1661349, .1704193, .1747863, .1791886, .1835969, .1880890, .1926184,
49.	NEW	04	.1971513, .2017714, .2064334, .2110955, .2158496, .2206147, .2254662,
50.	NEW	04	.2303253, .2352729, .2402253, .2452701, .2503176, .2554613, .2606047,
51.	NEW	04	.2658488, .2710883, .2764313, .2817655, .2871431, .2926704, .2982837,
52.	NEW	04	.3039638, .3096250, .3151908, .3208446, .3265262, .3321344, .3378464,
53.	NEW	04	.3435913, .3492695, .3550602, .3608782, .3666981, .3724603, .3783393,
54.	NEW	04	.3842594, .3901933, .3960694, .4020641, .4081228, .4141769, .4202372,
55.	NEW	04	.4253254, .4324444, .4385960, .4447029, .4509437, .4572341, .4635464,
56. 57.	NEW	04	.4698995, .4762680, .4826573, .4890841, .4955500, .5020569, .5086027,
	NEW	04	.5151893, .5218162, .5285065, .5352209, .5419597, .5487456, .5555785,

and so on.



# Fig. 4.1 Comparison Of Heat Flux Distribution Over The OTV Nozzle Wall For With And Without Particles In Flow

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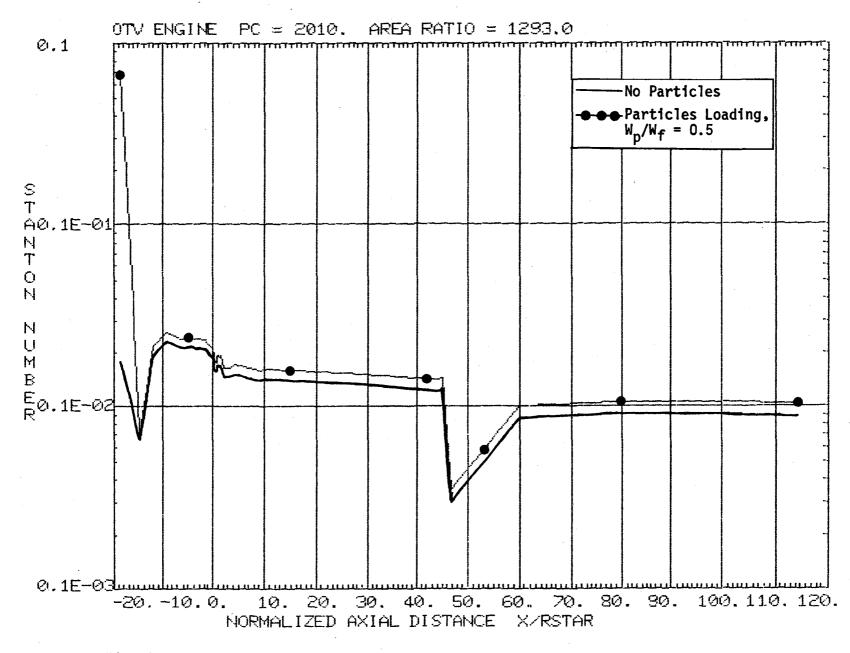
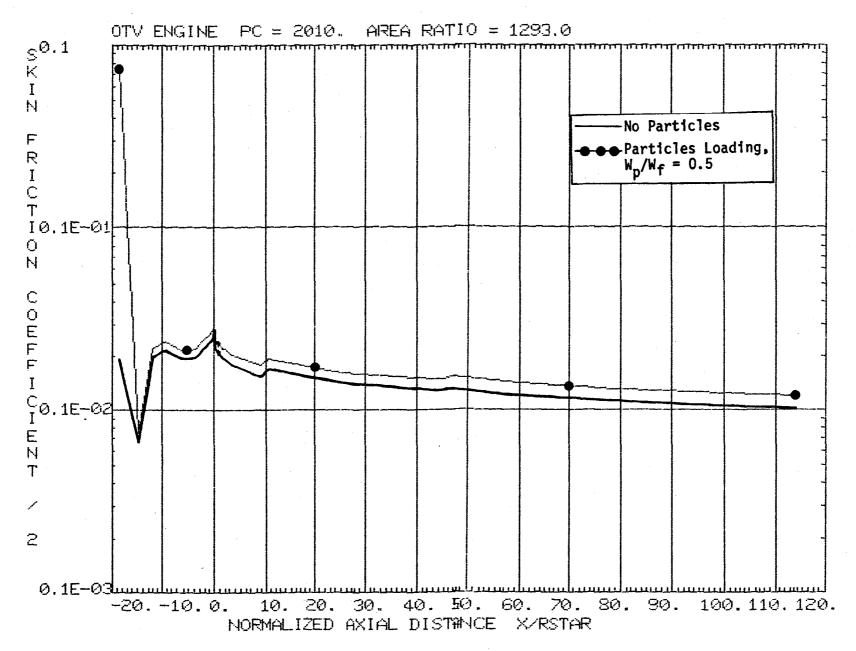


Fig. 4.2 Comparison Of Stanton Number Distribution Over The OTV Nozzle Wall For With And Without Particles In Flow

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Fig. 4.3 Comparison Of Skin Friction Coefficient Distribution Over The OTV Nozzle Wall For With And Without Particles In Flow

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## 4.5 <u>References</u>

- Schlinderberg, D.C., Discussion of Ref. 8 Heat Transfer, Transactions of American Society of Mechanical Engineers 83, 188 (1961).
- Leva, M., Weintrub, M., and Grummer, M., "Heat Transmission Through Fluidized Beds of Fine Particles," Chemical Engineering Progress 45, 563, (1949).
- 3. Leva, M., Weintrub, M., Grummer, M., and Clark, E.L., "Cooling of Gases Through Packed Tubes," Ind. Eng. Chem. 40, 747, (1948).
- 4. Buckingham, C., "Dusty Gas Influences in Turbulent Erosive Propellant Flows," AIAA Journal, Vol. 19, No. 4, April 1981.
- Marble, F.E., "Dynamics of a Gas Containing Small Solid Particles," Combustion and Propulsion, Fifth AGARD Colquium, Braunschweig, April 1962.
- 6. Soo, S.L., <u>Single and Multi-Component Flow Process</u>, "Gas-Solid Flow," Engineering Research Publication No. 45, Rutgers University, 1965.
- 7. Tabakoff, W., and Hamed, A., "Analysis of Cascade Particle-Gas Boundary Layer Flows With Pressure Gradient," AIAA 6th Propulsion Joint Specialist Conference, AIAA Paper No. 80-712.
- 8. Tien, C.L., "Heat Transfer by a Turbulently Flowing Fluids-Solids Mixture in a Pipe," Transactions of the ASME, Journal of Heat Transfer, pp. 183, May 1961.
- 9. Soo, S.L., and Tien, C.L., "Effect of the Wall on Two-Phase Turbulent Motion," J. Appl. Mech., Trans. Am. Soc. Mech. Engrs., 27, 5 (1960).
- 10. Farbar, L., and Morley, M.J., "Heat Transfer to Flowing Gas-Solids Mixtures in a Circular Tube," Ind. Eng. Chem. 49, 1143 (1957).

#### Section 5.0

## THRUST LOSS RE-EVALUATION

## 5.1 Background

A thrust loss calculation method which has been previously implemented in BLIMPJ code is given in Ref. 1. The thrust loss due to the boundary layer effects for a circular cross-section nozzle is given at a specified cross-section by (for vacuum ambient conditions)

$$\Delta F = 2 \pi r_e \cos \phi_e (\rho_e U_e^2 \theta - P \delta_B^*)$$
(5.1)

where

 $r_{e} = Body radius at the station of interest$  $\phi_{e} = Wall angle$  $\rho_{e} = Boundary layer edge density$  $U_{e} = Boundary layer edge velocity$  $\theta = Momentum thickness$ P = Static pressure in the boundary layer $<math>\delta_{B}^{*}$  = Body displacement thickness

The assumptions used in deriving the above expression are the following:

- (i) The boundary layer is thin, i.e., the thickness of the boundary layer is small compared to the radius of the nozzle at any cross-section.
- (ii) The inviscid values of density and velocity do not change within the thickness of the boundary layer. In other words, if there was no viscosity (i.e. for inviscid flow), there would be no variation of the inviscid values between the edge location and the nozzle wall.
- (iii) The pressure is constant across the boundary layer. This assumption is consistent with the derivation of the usual boundary layer equations.
- (iv) The definitions of body displacement thickness and momentum thickness are given by

$$\delta_{B}^{*} = \int_{0}^{e} \left(1 - \frac{\rho U}{\rho_{e} U_{e}}\right) dy \qquad (5.2)$$

and

$$\theta = \int_{0}^{0} \frac{e \rho U}{\rho_{e} U_{e}} \left(1 - \frac{U}{U_{e}}\right) dy \qquad (5.3)$$

where e and o refer to edge and wall conditions respectively.

As the nozzles grow in area ratio, the boundary layers grow in size, and the above assumptions may not hold. The proposed OTV nozzles such as the one given in Fig. 2.5 will utilize an expander cycle operations mode in which the walls will be regenerately cooled and the heat energy will be used to drive the turbines and pumps. So, while the regenratively cooled walls will help in reducing the size of the boundary layers to some extent, the large area ratio nozzles will produce thick boundary layers. Consequently, depending on the reservoir and exit conditions, and the geometry of the nozzle, it is possible and very likely that boundary layer thicknesses will vary from small to large values. The displacement and transverse curvature effects become important for thick boundary layers and must be included in the boundary layer calculations. In addition, as the flow expands in the nozzle, it will create low density and high Mach number flows. If the flow passes from the continuum to a non-continuum regime, velocity slip and temperature jump (STJ) may become important.

Similar boundary layer solutions are not applicable for such an investigation, since similarity cannot be satisfied for any specified set of reservoir conditions, nozzle geometry and wall temperature distributions. Fortunately, the boundary layer procedure in BLIMPJ does not assume similarity. Furthermore, it takes into account transverse curvature effects (TVC) in the derivation. It also calculates the displacement effects for thin boundary layers. As far as the STJ effects are concerned, it has been pointed out by previous investiga-

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tions (Ref. 2) that they are generally small compared to the other effects discussed above and thus, will be ignored in the present approach.

## 5.2 Thrust Loss Reevaluation Procedure For Thick Boundary Layers

In accordance with the above discussions, the expression for thrust loss for thick boundary layers has been modified. The assumptions made in deriving Eq. (5.2) and (5.3) are no more strictly valid. The u-component of the velocity in the inviscid flow will vary to some extent between the nozzle wall to the edge location. Consequently, the definitions for  $\delta_B^*$  and  $\theta$  are

$$\delta_{B+}^{*} = \int_{0}^{0} \left[ 1 - \frac{\rho U}{\rho_{1}(y) \cdot U_{1}(y)} \right] dy$$
 (5.4)

and

$$\frac{\theta}{t} = \int_{0}^{0} \frac{e}{\rho_{1}(y) \cdot U_{1}(y)} \left[ 1 - \frac{U}{U_{1}(y)} \right] dy$$
 (5.5)

The expression for the thrust loss calculation given in Eq. (5.1) will also have to be modified in its derivation where the edge quantities, ( $\rho_e$ ,  $U_e$ ) and pressure will no more be constants but would be replaced by local inviscid values  $\rho_1(\gamma)$ ,  $U_1(\gamma)$  and  $P(\gamma)$ . However, it was decided that the whole procedure of thrust loss calculation will be much more simple and adapted a lot easier in the BLIMPJ algorithm, if the pressure is replaced by an average value of the pressure distribution within the thickness of the boundary layer. As a result, averaged inviscid edge values of velocity and density will automatically be calculated from the BLIMPJ algorithm in BLIMPJ. In the above calculations, the location of the boundary layer edge is not precisely known and has to be determined by iterating upon the inviscid and viscous flowfields.

There are two different problems to be solved when one attempts to calcu-

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late performance for a rocket nozzle having thick boundary layers:

<u>Case 1</u> - The potential nozzle contour is given and the objective is to define the hardware wall contour and calculate the rocket nozzle performance. For details, see Attachment 5.1.

<u>Case 2</u> - The hardware wall contour is given and the objective is to define the potential contour and calculate the rocket nozzle performance. For details, see Attachment 5.2.

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## Attachment 5.1

In the case, where the potential contour is given, the objective is to define the wall contour for thick boundary layer situations. The suggested iteration procedure is given below: (Also see Fig. 5.1).

- (i) Run the inviscid code (TDK and RAMP) to define the distribution of pressure on the potential wall and everywhere else in the nozzle, particularly near the potential wall.
- (ii) Run BLIMPJ with the given pressure distribution on the potential wall. This calculates  $\delta$  and  $\delta$ . Then, the body radius is calculated from

$$R_{B} = R_{p} + \delta^{*} \cos \phi$$

This is the first iteration.

- (iii) Calculate an average inviscid pressure for the height between the potential wall and the boundary layer edge, which was obtained from the previous calculation at each station. Use these pressures to run BLIMPJ again, and calculate  $\delta_2$  and  $\delta_2^*$ . Then, calculate  $R_B^*$ . This is the second iteration.
- (iv) Iterations stop when convergence on  $\delta^{*}$  is achieved within a specified accuracy.

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## Attachment 5.2

In the case where the hardware wall contour is given, the objective is to define the inviscid edge for thick boundary layer situations. The suggested iteration procedure is given below: (also see Fig. 5.2)

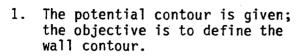
- (i) Run the inviscid code (TDK or RAMP) to calculate the distribution of pressure on the hardware wall in the nozzle.
- (11) Run BLIMPJ with the calculated wall pressure distribution on the hardware wall. This calculates  $\delta$  and  $\delta$  as a function of the nozzle axial coordinate. Then, the radius of the potential wall is calculated from

$$R_p = R_p - \delta^* \cos \phi$$

This is the first itertation.

- (111) Calculate the pressures again by using the inviscid code (TDK or RAMP) on the new potential wall and everywhere else in the nozzle, particularly near the potential wall.
- (iv) Calculate the average pressure for the height between the boundary layer edge, which was obtained previously, and the hardware wall. Use the pressures on the hardware wall to run BLIMPJ again and calculate  $\delta_2$  and  $\delta_2$ . Then calculate R<sub>p</sub>. This is the second iteration.
- (v) Go back to (III) and iterate until a prescribed convergence criterion on  $\delta^{\circ}$  is achieved. If it is found that the pressure calculations in (III) in the first two iterations are very close, do not go back to (III), instead go back to the beginning of (IV).

Once the iterations are completed, the thrust loss will automatically have been calculated by BLIMPJ to yield the final answer.

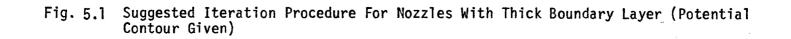


NOTES:

- 2. Subscript refers to iteration number.
- 3.  $\delta^*$  refers to displacement thickness.
- 4.  $\delta$  refers to boundary layer thickness.

-Potential Contour





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1. The wall contour is given; the objective is to define the inviscid edge.

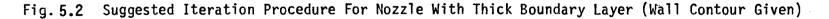
] . . ] . . . ]

- 2. Subscript refers to iteration number.
- 3.  $\delta_{\bullet}$  refers to displacement thickness.

1.

4.  $\delta$  refers to boundary layer thickness.



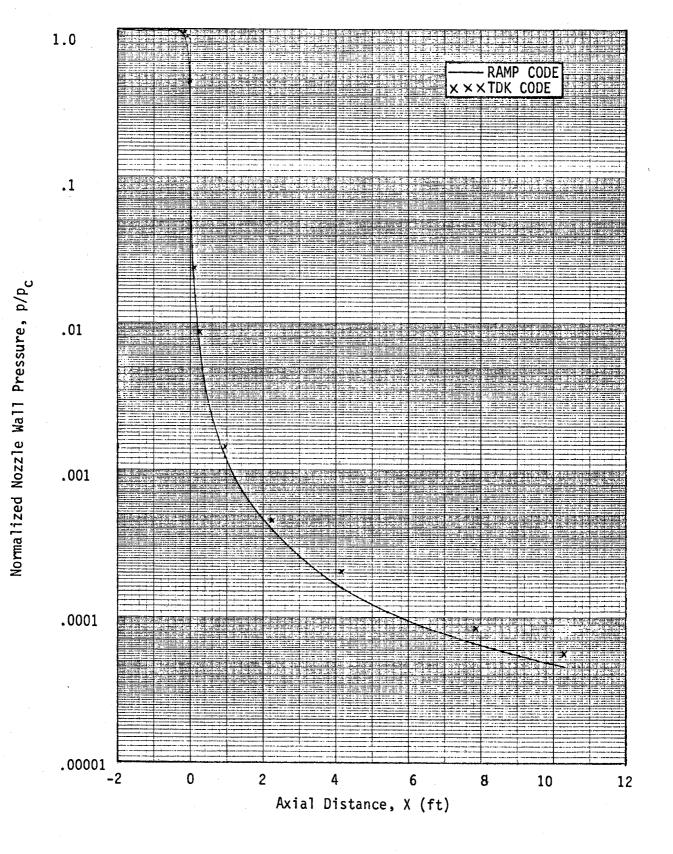


## 5.3 Example

For illustrating the procedure given above for calculating thrust loss for thick boundary layer situations, the OTV nozzle given earlier in Sec. 2.3 was used. Furthermore, since the given wall coordinates represent a generic class of OTV nozzles, these coordinates were assumed to represent the potential wall contour of the OTV nozzle. Consequently, the iterations were performed based on the procedure shown in Attachment 5.1.

Since REMTECH did not have the information to run TDK for computing and storing the pressures for the interior points away from the wall, another available code called RAMP (Ref. 3) was run for the OTV nozzle contour to compute the pressure fields both on the wall and near the wall. Figure 5.3 gives a comparison of wall pressure distributions from TDK and RAMP on the nozzle wall. The comparison is quite good. A comparison of  $\delta^*$  calculations based on results from both codes is given in Fig. 5.4 showing a close agreement. The pressure distribution near the potential contour obtained from RAMP is given in Fig. 5.5 along tion of pressure through the thickness of the boundary layer and as a result, the shown inviscid edge of the boundary layer is not accurate. Going through the step (iii) in Attachment 5.1 yields a new average pressure distribution given in Fig. 5.6, which is distinctly different from the first iteration both in the high pressure region near the throat and in the low pressure region near the exit plane. The BLIMPJ calculation vielded a  $\delta^*$  distribution which was compared with the original distribution in Fig. 5.7. Again, the two iterations are somewhat different. A third iteration was done when it was found that the average pressure and  $\delta^*$  distributions were very close to the second iteration (Figs. 5.6 and 5.7). The thrust loss in the successive iterations is given in Fig. 5.8.

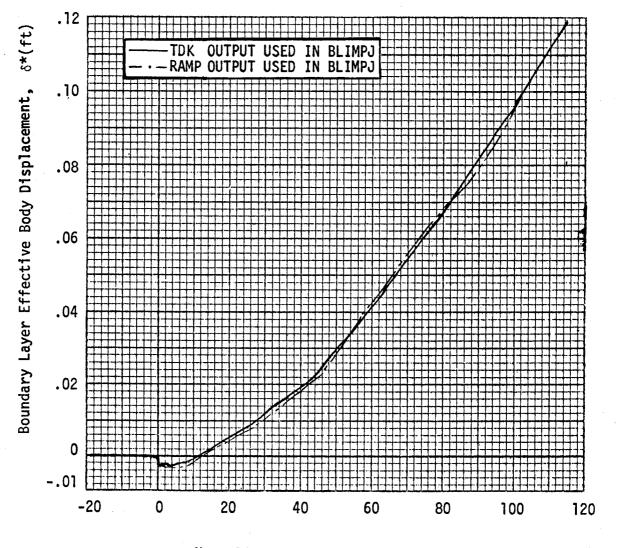
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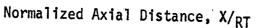


## Fig. 5.3

Comparison Of OTV Nozzle Wall Pressure Distribution Using Two Different Codes

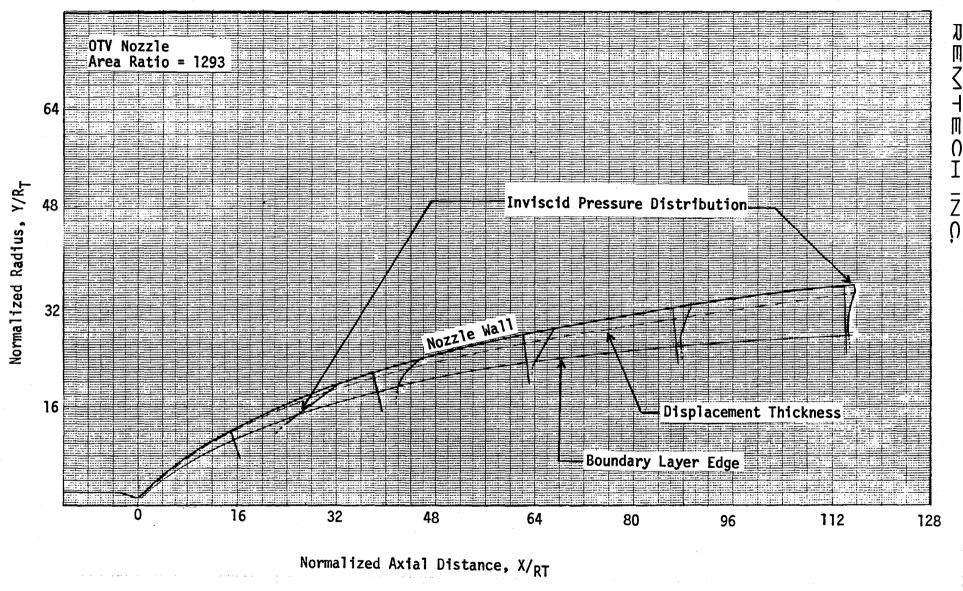
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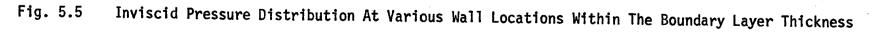






Comparison Between TDK And RAMP Output For The Boundary Layer Effective Displacement For First Iteration





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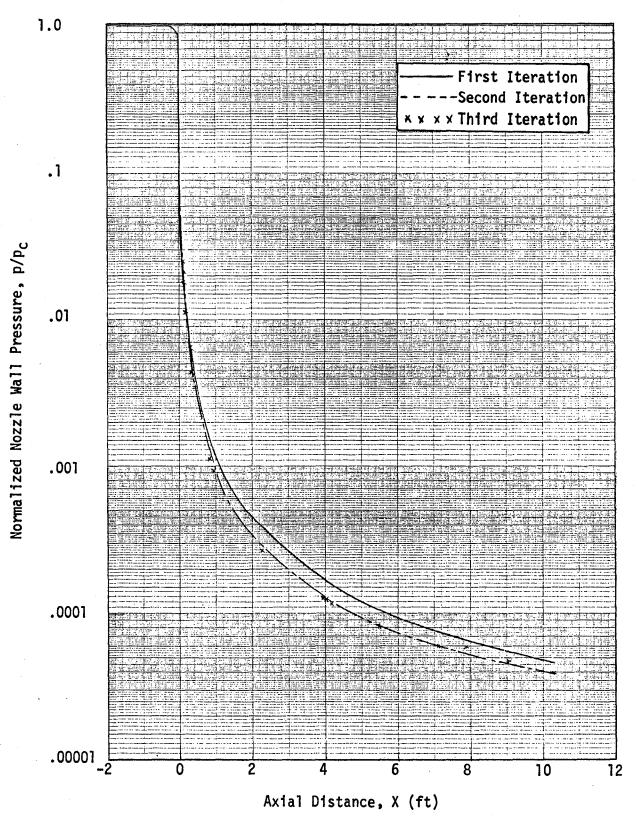


Fig.5.6 Iterations Of The Wall Pressure Distribution For The OTV Nozzle With Thick Boundary Layer

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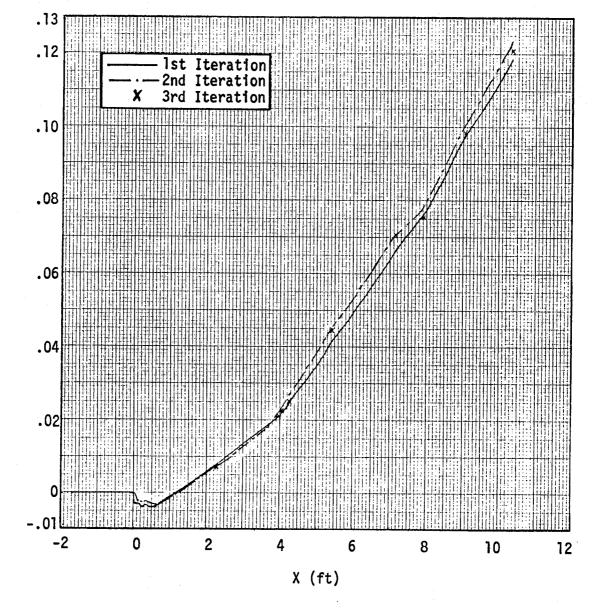
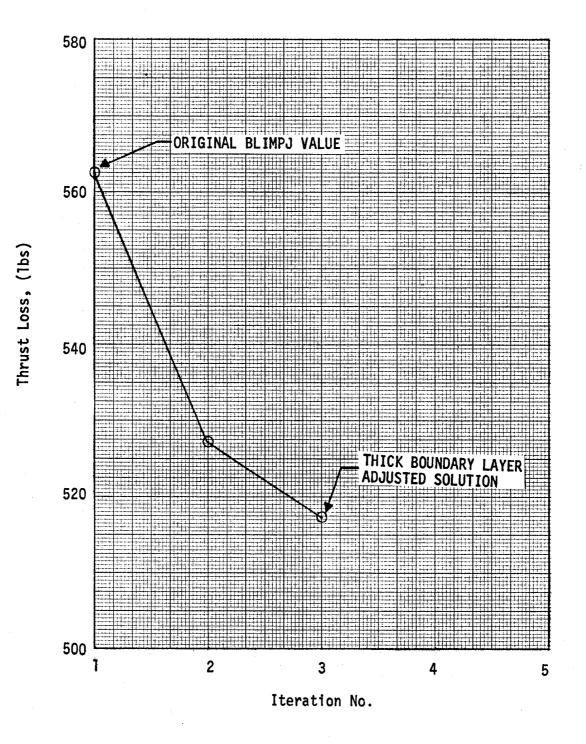
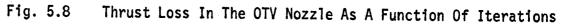


Fig. 5.7 Iterations Of  $\delta^{\star}$  Distribution For The OTV Nozzle With Thick Boundary Layer

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## 5.4 Discussions

The procedures described before and the example given in Subsection 5.3 are engineering procedures which could be used for thrust loss calculation in nozzies with thick boundary layers. The calculations performed at the time were not all computerized and as a result, could contain some inaccuracies in the various steps of the calculation. Even though the convergence was observed in the pressure distribution in Fig. 5.6 in the third iteration, it was not absolutely so in the convergence of  $\delta^*$  in Fig. 5.7 and thrust loss in Fig. 5.8. However, the difference between the second and third iteration for the thrust loss in the OTV nozzle is around 10 lbs and it might be even less between the third and a fourth iteration. The thrust loss for thick boundary layers has not been programmed, since TDK cannot presently provide the necessary data away from the nozzle wall. However, a number of suggestions are made in Sec. 6 for future work.

## 5.5 <u>References</u>

- Evans, M., "BLIMPJ User's Manual," Aerotherm/Acurex Corporaton, July 1975, under Contract NAS8-30930.
- Whitfield, D.L., and Lewis, C.H., "Boundary-Layer Analysis of Low-Density Nozzles, Including Displacement, Slip, and Transverse Curvature," Journal of Spacecraft, April 1970, pp. 462-468.
- Smith, Sheldon D., "High Altitude Chemically Reacting Gas-Particle Mixture, Volume 1 - A Theoretical Analysis and Development of Numerical Solution," August 1984, LMSC-HREC TRD867400-1.

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## Section 6.0

## RECOMMENDATIONS

Future work in the OTV research and development areas described in the previous sections may be categorized into three broad areas;

- Analytical
- Numerical
- Experimental

### 6.1 <u>Analytical</u>

The future analytical work on OTV-class nozzles, with reference to the four modules that have been addressed in the previous sections of this report, consists of the following recommendations:

## 6.1.1 Wall Roughness Effects

- Roughness module in BLIMPJ needs to be checked out further with other available data for any size nozzle. This would enhance confidence in the usability of the various roughness options incorporated in BLIMPJ. The modules should also be exercised with the data to be taken on the future OTV model or flight tests.
- 2. Effects of partially smooth and partially rough nozzle wall on wall skin friction and heat transfer rate need to be examined. This problem does not lend itself to the assumption of an equivalent sand roughness, because the concept of equivalent sand roughness which is based on similarity assumptions breaks down. Some related developments appear in works by T.C. Lin, J.C. Adams, etc.

## 6.1.2 <u>Relaminarization</u>

- 1. The relaminarization module needs to be checked out with any other available data for internal flow situations.
- 2. Questions remain as to whether the relaminarization criterion using wall quantities rather than edge quantities is valid for OTV-type nozzles. What happens to this criterion when wall roughness is present?
- 3. It is well known that freestream turbulence is present in the inviscid flow inside the nozzle. The question, then, is what role does the freestream turbulence play in the turbulence length scales and thus, in the relaminarization process?

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## 6.1.3 Particle Effects

- 1. Check the options in BLIMPJ with available data both in laminar and turbulent flows.
- 2. For the case of replaceable and ablating nozzle inserts, the particles or debris in boundary layer flow will enhance heat transfer at the nozzle wall. If the particle loading could be determined, the effects of ablating nozzle wall could be determined.
- 3. Modify the turbulent mixing length due to the presence of particles in the flow.

## 6.1.4 Thrust Loss Reevaluation

- 1. Check the predicted performance with available nozzle data having large area ratios, and consequently, thick boundary layers.
- 2. A procedure which consists of a combination of machine and hand calculations has been given in Sec. 5 for computing final performance calculations for large area ratio nozzles. This procedure should be considered approximate. A special software using a flow diagram involving TDK and BLIMPJ needs to be written for smooth calculation of high area ratio nozzles.
- 3. An optimization procedure needs to be developed to design a nozzle with length and area ratio constraints for minimizing thrust loss in large area ratio nozzles.

## 6.2 <u>Numerical</u>

Computational fluid dynamics (CFD) procedures should be examined to evaluate the nozzle wall thermal losses due to relaminarization, the presence of wall roughness and particles in flow. Without going into too many details, the following concerns should be borne in mind:

- 1. The turbulence models in the existing codes need to be examined. The problems of modifying the turbulence models for roughness, particles and relaminarization remain.
- 2. Acceptable chemistry packages have to be integrated in the CFD codes.
- 3. On the positive side, the iteration procedure necessary for calculating the thrust loss for thick boundary layers is eliminated in the CFD procedure, since the code defines both the inviscid and viscous flowfields in the nozzle at the same time. However, the thrust loss formula for nozzles needs to be integrated with the CFD code, if the boundary layer effects need to be singled-out.

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## 6.3 Experimental

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It is the opinion of the authors that not enough applicable experimental data is available for the OTV-class nozzles. In order to validate the modules described in this report, measurements need to be made to support them. The parameters that need to be measured, the size of the models, the kind of flow to be tested and the accuracies involved in conducting these tests are the items described in modular form in Table 6.1. This table presents a number of choices and possibilities from which any combinations could be selected for future experimental programs to support the OTV nozzle development.

## TABLE 6.1 Recommendations For OTV Experimental Programs

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STUDY ITEMS ITEMS TO EXPLORE	WALL ROUGHNESS EFFECTS	RELAMINARIZATION EFFECTS	PARTICLE EFFECTS	THICK BOUNDARY LAYER ISP LOSSES
EXISTING DATA BASE FOR NOZZLES	<ul> <li>NO OTV NOZZLE DATA</li> <li>ROCKETDYNE 40K SUBSCALE CHAMBER TEST AT MSFC</li> <li>FOR SSME, NO INTERNAL NOZZLE DATA</li> </ul>	<ul> <li>BACK AND CUFFEL</li> <li>10° - 10° HALF</li> <li>ANGLE CONE DATA</li> <li>NASH-WEBBER VARIABLE</li> <li>NOZZLE WHICH STUDIED</li> <li>RELAMINARIZATION</li> <li>EFFECTS</li> </ul>	<ul> <li>NO OTV NOZZLE OR ANY OTHER NOZZLE BOUNDARY LAYER DATA</li> <li>THE AVAILABLE DATA BASE IS FOR TUBES AND PIPES</li> </ul>	NO OTV THICK BOUNDAR' LAYER DATA
MODEL TESTS - SHORT DURATION	<ul> <li>STEADY STATE TEST TIMES 10 MSEC - 100 MSEC</li> <li>TEST TIME DEPENDENT ON ALTITUDE CHAMBER SIZE AND/OR DIFFUSER CAPACITY</li> <li>USE DIFFERENT NOZZLES OR NOZZLE INSERTS FOR ROUGHNESS EFFECTS STUDY</li> </ul>	• TEST ARRANGEMENT SAME AS WITH WALL ROUGHNESS	• VERY DIFFICULT IF NOT IMPOSSIBLE TO INJECT <u>KNOWN</u> PARTICLES INTO FLOWS ON SHORT DURATION BASIS	
COLD, HOT OR REACTIVE FLOW	<ul> <li>EXACT SIMULATION OF HOT FLOWING H<sub>2</sub>/O<sub>2</sub></li> <li>Ø/F = 6 AND P<sub>CH</sub> = 2000 PS1</li> <li>USE OF COLD/NON-REACTING GASES</li> </ul>	SAME AS WITH WALL ROUGHNESS	<ul> <li>COMBUSTION OF SOLID PROPELLANT - THE PROBLEM IS THE LACK OF CONTROL OR KNOWLEDGE OF PARTICLE SIZE AND CONCENTRATION</li> </ul>	
PARAMETERS TO Be measured	<ul> <li>WALL ROUGHNESS</li> <li>NOZZLE WALL HEAT TRANSFER AS A FUNCTION OF TIME</li> <li>NOZZLE WALL PRESSURES</li> <li>NOZZLE WALL TEMPERATURES</li> <li>EXIT VELOCITY/TEMPERATURE PROFILES</li> </ul>	<ul> <li>WALL HEAT TRANSFER</li> <li>WALL TEMPERATURES</li> <li>WALL PRESSURES</li> </ul>	<ul> <li>WALL HEAT TRANSFER</li> <li>WALL TEMPERATURES</li> <li>WALL PRESSURES</li> </ul>	
INSTRUMENTS TO BE USED; SPECIAL INNOVATIVE PROBES THAT COULD BE USED	<ul> <li>FAST-RESPONSE PIEZO-ELECTRIC PRESSURE TRANSDUCERS</li> <li>THIN FILM SHORT DURATION HEAT TRANSFER GAGES</li> <li>CO-AXIAL SURFACE HEAT TRANSFER GAGES</li> <li>MINIATURE THIN WIRE/T.C. GAGES</li> <li>MECHANICAL MEASUREMENTS OF WALL ROUGHNESS</li> </ul>	• SAME AS WITH WALL Roughness	• SAME AS WITH WALL ROUGHNESS	
ACCURACY OF MEASUREMENTS	<ul> <li>±5% TO ±10% FOR THIN-FILM AND CO-AXIAL GAGES</li> <li>±0.5% ON TEMPERATURE</li> <li>±2% ON PRESSURE</li> </ul>	<ul> <li>±5\$ TO ±10\$ ON HEAT TRANSFER</li> <li>±0.5\$ ON TEMPERATURE</li> <li>±2\$ ON PRESSURE</li> </ul>	● ±5≸ TO 10≸ ON HEAT TRANSFER ● ±0.5≸ ON TEMPERATURE ● ±2≸ ON PRESSURE	
MODEL SCALE PROBLEMS, IF ANY	<ul> <li>CHEMISTRY, THERMODYNAMICS AND TRANSPORT PROPERTIES ARE REALISTIC IN NOZZLE</li> <li>SMALL THROAT AREAS AND IMPERFECTIONS MAY OBSCURE EFFECTS BEING SOUGHT</li> </ul>	SAME AS WITH WALL ROUGHNESS	<ul> <li>PARTICLE SIZE AND CONCENTRATIONS VERY DIFFICULT TO SCALE FOR SMALL TEST RIG</li> </ul>	
FACILITIES TO BE USED	<ul> <li>IMPULSE BASE FLOW FACILITY (IBFF) AT MSFC</li> <li>PLUMBROOK SPACE POWER FACILITY AT NASA LEWIS</li> <li>CHAMBER A AT JOHNSON SPACE CENTER</li> <li>LUDWIG TUBE AT CALSPAN, BUFFALO</li> </ul>	SAME AS FOR WALL ROUGHNESS EFFECTS	<ul> <li>SAME FACILITIES AS FOR WALL ROUGHNESS STUDIES</li> </ul>	

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## TABLE 6.1 (Continued)

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STUDY ITEMS ITEMS TO EXPLORE	WALL ROUGHNESS EFFECTS	RELAMINAR IZATION EFFECTS	PARTICLE EFFECTS	THICK BOUNDARY Layer isp losses
MODEL TESTS - Long duration	<ul> <li>DEPENDING ON MODEL SIZE AND TEST DURATION, OCSTS CAN BE A FACTOR OF 10 LARGER THAN SHORT DURATION</li> <li>ALLOWS MORE THAN ONE MEASUREMENT PER RUN</li> <li>SCALE PROBLEMS ARE ALLEVIATED</li> <li>HIGH ALTITUDE SIMULATION REQUIRES VERY LARGE FACILITY</li> </ul>	ROUGHNESS EFFECTS	<ul> <li>LONG DURATION ALLOWS FOR POSSIBLE UTILIZATION OF PARTICLE INJECTION TECHNIQUES IN COLD/WARM GAS FLOW</li> <li>REACTIVE FLOWS STILL HAVE UNKNOWN PARTICLE SIZE/CONCENTRATION</li> </ul>	<ul> <li>LARGE OTV MODELS SHOULD BE USED</li> <li>CAN MAKE BETTER THRUST MEASUREMENTS THAN SHORT DURATION TEST</li> <li>BOUNDARY LAYER PROBING IS POSSIBLE</li> </ul>
COLD, HOT OR Reactive flow	<ul> <li>COLD/WARM FLOWS SIMPLEST AND LEAST COSTLY</li> <li>HOT OR REACTIVE FLOWS REQUIRE COMPLEX FACILITY AND MODEL COOLING</li> </ul>	ROUGHNESS EFFECTS	<ul> <li>COLD, HOT OR REACTIVE FLOW SIMULATION IS NOW COMPLICATED BY THE NEED FOR PARTICLES</li> <li>PARTICLE INJECTION SCHEME CAN BE UNRELIABLE</li> </ul>	<ul> <li>HOT/REACTIVE FLOWS SIMULATING H2/02 SYSTEM ARE PREFERABLE</li> </ul>
PARAMETERS TO BE MEASURED	<ul> <li>WALL ROUGHNESS</li> <li>WALL PRESSURE AND TEMPERATURE MEASUREMENTS</li> <li>EXIT VELOCITY/TEMPERATURE PROFILES</li> <li>WALL HEAT TRANSFER RATE</li> <li>PROBE THE BOUNDARY LAYER INSIDE NOZZLE</li> </ul>	ROUGHNESS FEFECTS	<ul> <li>PARTICLE DENSITY AND SIZE</li> <li>NOZZLE PROBES TO MEASURE PRESSURE AND TEMPERATURE</li> <li>WALL PRESSURE AND TEMPERATURE MEASUREMENTS</li> </ul>	<ul> <li>THRUST MEASUREMENT</li> <li>BOUNDARY LAYER PRESSURE A TEMPERATURE MEASUREMENTS, BOTH INSIDE AND AT EXIT PLANE OF NOZZLE</li> </ul>
INSTRUMENTS AND PROBES TO BE USED	<ul> <li>THERMOCOUPLES FOR TEMPERATURE</li> <li>PRESSURE TANSDUCERS</li> <li>LASER DOPPLER VELOCIMETER (PARTICLES)</li> <li>FOR HOT/REACTIVE FLOW MEASUREMENTS, SYSTEMS/PROBES REQUIRE SPECIAL PROTECTION</li> <li>OPTICAL SCHLIEREN AT EXIT PLANE</li> <li>PHASE CHANGE PAINT</li> </ul>	ROUGHNESS FEFECTS	<ul> <li>LDV VERY ADAPTABLE TO PARTICLE FLOWS</li> <li>PARTICLE MEASUREMENT TECHNIQUES ARE GENERALLY UNRELIABLE EXCEPT IN SPECIAL FLOW SITUATIONS</li> </ul>	<ul> <li>THRUST/STRAIN GAGE         <ul> <li>MEASUREMENTS FOR ISP DETERMINATION</li> <li>INTRUSIVE TECHNIQUES SUCH AS HOT-WIRE ANENOMETERS AND PRESSURE PROBES</li> <li>NON-INTRUSIVE TECHNIQUE SUCH AS LDV</li> </ul> </li> </ul>
ACCURACY OF Measurements	<ul> <li>SAME AS FOR SHORT DURATION</li> <li>LDV ±15\$ DUE TO PARTICLE LAG</li> </ul>	SAME AS FOR SHORT Duration	<ul> <li>SAME AS FOR SHORT DURATION</li> <li>LDV ±15\$ DUE TO PARTICLE LAG</li> <li>PARTICLE - UNKNOWN</li> </ul>	<ul> <li>SAME AS FOR SHORT DURATIC</li> <li>HOT WIRE ±15\$</li> </ul>
MODEL SCALE PROBLEMS, IF ANY	<ul> <li>SCALE PROBLEMS ARE ALLEVIATED TO SOME</li> <li>EXTENT ASSUMING THAT MODELS ARE LARGER ON LONG DURATION</li> <li>THROAT MUST BE PROTECTED AGAINST HIGH Q RESULTING IN WALL TEMPERATURE DISCONTINUITY WHERE MATERIALS CHANGE</li> </ul>	SCALE PROBLEMS ARE ALLEVIATED IF MODEL SIZES ARE INCREASED	• SCALE PROBLEMS ARE ALLEVIATED IF MODEL SIZES ARE INCREASED	<ul> <li>SCALE PROBLEMS ARE ALLEVIATED IF MODEL SIZES ARE INCREASED</li> </ul>
FACILITIES To be used	<ul> <li>ENGINE TEST FACILITY AT AEDC CAN SIMULATE ALTITUDE</li> <li>ENGINE TEST FACILITY AT MSFC HAS NO ALTITUDE SIMULATION</li> <li>LEWIS TEST FACILITY ALTITUDE</li> </ul>	SAME FACILITIES AS For Wall Roughness Studies	• SAME FACILITIES AS FOR WALL Roughness studies	<ul> <li>SAME FACILITIES AS FOR WALL ROUGHNESS STUDIES</li> </ul>

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## APPENDIX

# A LISTING OF THE UPDATED SUBROUTINES IN BLIMPJ

0001	000565	411G	0001	00102	3 42L	0001	001042	447G	0001	001057	452G	0001	001072	464G
0001	001107	500G	0001	00112	4 513G	0001	001131	520G	0001	001172	533G	0001	001246	65L
0001	001252	70L	0006	I 00000	O ADARY	0005	000000	CASE	0005	000015	CBAR	0004	000000	
 0006 I	000026	ESPER	0006	I 00002	7 FLDP	0007	000000 1	FLDX	0006	I 000313	FLDY	0000 I	000000	I
0006 I	001077	IAXIS	0000	I 00000	3 IERR	0006	001100	INJ	0000	000071	INJP\$	0006 I	001101	INKI
0003	000000	IPLOT	0007	I 00003	O IPP	0005	000020	IS	0005	000021	ISH	0003 I	000001	
 0006 I	001102	IWALL	0000	I 00000	1 IX ·	0006	001103	J	0006	I 001104	к	0006 I	001105	KELVIN
0006 I	001106	KGDE	0006	I 00110	7 L	0006	026161	LA	0006	I 001110	LANK	0006 I	026162	
 0006 1	026163	LC	0006	I 00111	1 LOGRAM	0006	001112	LWXO	0006	I 001126	LWYO	0006 I	001142	LXIN
 0006 I	001156	LXIV	0006	I 00117	2 LYIN	0006	001206	LYIV	0006	I 026164	M	0006 I	001222	
 0007 1	000031	MS	0004	I 00000	6 N	0005 1	000114	NETA	0006 1	I 001223	NJOUL	0005	000115	NNLEQ
0006 I	026165	NOGRID	0007	I 00003	2 NPCON	0007	000033	NPLOT	0005	I 000120	NS	0007 I	000072	NSTAT
 0007 I	000154	NSTP	0000	I 00000	2 NUMBR	0006 1	001224	OULES	0006 F	R 020266	Q	0006 R	023222	R
0006 R	026156	RCIRC	0006	R 02615	7 RSQAR	0006 F	₹ 026160	RSTAR	0006 1	I 001225	S	0006 I	001226	SECON
 0006 I	001227	SPER	0006	I 00123	O SQUARE	0006 F	001231	U	0006 F	R 004165	V	0006 R	007121	W
0006 I	012055	WATTS	0006	R 01205	6 X	0006 F	012224	XL	0006 F	R 012222	XMAX	0006 R	012223	XMIN
 0006 R	012225	XR	0006	R 01222	6 Y	0006 F	015244	YB	0006 F	R 015245	YMAX	0006	015246	YMIN
0006 R	015247	ΥT	0006	R 01525	0 Z	0006 1	020204	ZS						

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00101	1*		SUBROUTINE PLOT	00	0000		
00101	2*	С	SOBROOTINE PLUT		0000		••••••
00101	2* 3*	č	BLIMP PLOT SUBROUTINE FOR PLOTTING BLIMP DATA STORED ON DRUM		0000		
00101	4*	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ORDER OF PARAMETERS TO BE PLOTTED: 1 PRESSURE, 2 EDGE TEMPERATURE,		0000		•••••••••
00101	5*	č	3 VELOCITY, 4 MACH NUMBER, 5 DENSITY, 6 TOTAL ENTHALPY, 7 TOTAL HEAT,		0000		
00101	6*	č	8 TOTAL WALL AREA, 9 MOMENTUM THICKNESS, 10 DISPLACEMENT THICKNESS,	······································	0000	•••••	•••••••
00101	7*	č	11 THRUST LOSS, 12 WALL TEMPERATURE, 13 SHEAR AT WALL,		0000		
00101	8*	Ċ	14 ACCELERATION PARAMETER, 15 VISCOSITY, 16 SPECIFIC HEAT.		0000	••••••	••••••
00101	9*	č	17 THERMAL CONDUCTIVITY, 18 WALL LENGTH, 19 CONDUCTIVE HEAT FLUX,		0000		
00101	10*	C	20 INVISID MASS FLOW, 21 TOTAL MASS FLOW, 22 BETAP, 23 BETAV.		0000		•••••••
00101	11*	С	24 MOMENTUM TRANSFER COEFFICIENT, 25 HEAT TRANSFER COEFFICIENT,		0000		
00101	12*	С	26 XI, 27 TOTAL GAS FLUX, 28 TOTAL GAS BLOWING PARAMETER.	00	0000	······	••••••
00101	13*	С	ORDER OF PROFILE PLOTS: 1 TEMPERATURE, 2 VELOCITY RATIO, 3 MACH NUMBE	R, 00	0000		
00101	14*	С	4 DENSITY, 5 VISCOSITY, 6 SPECIFIC HEAT, 7 STATIC ENTHALPY,	00	0000		
00101	15*	С	8 TOTAL ENTHALPY, 9 THERMAL CONDUCTIVITY, 10 EPSA (RHOSQ*EPS/RHO/MU),	00	0000		
00101	16*	С	11 SHEAR, 12 ETA, 13 GAMMA, 14 PITOT TUBE PRESSURE.	00	0000		
00101	17*	С	NOTE FOR PLOTTING PURPOSES THE FOLLOWING VALUES OF IP AND THEIR	00	0000		
00101	18*	С	CORRESPONDING CHARACTERS ARE GIVEN: 35 = (PLOTTING DOT), 43 = (SMALL		0000		
00101	19*	C	CIRCLE), $34 = +$ , $5 = (BLANK)$ , $40 = *$ , $20 = 0$ , $48 = 0$ , $39 = $ \$, $23 = 0$ ,		0000		
00101	20*	С	62 = (SMALL SQUARE), 61 = (PERIOD), 46 = ,(COMMA), 33 = -, 58 = '.		0000		
00101	21*	C	36 = =, 3 AND 4 GIVE SMALL CIRCULAR SYMBOLS.		0000		
00101	22*	C.			0000		
00103	23*		COMMON /AL/ IPLOT.IUNIT /A		0000		•••••••
00104	24*		······································		0000		
00105	25*				0000		
00106	26*		COMMON /NONCOM/ ADARY(22), ESPER, FLDP(12,15), FLDY(12,31), IAXIS, INJ, /NO				
00106	27*	•••••		NCOM/ -0100			••••••
00106	28*				0000		
00106	29* 30*				0000		
00106	30≁ 31*			NCOM/ NEWOO NCOM/ -0100			
00108	32*		COMMON /PLOTS/FLDX(12,2), IPP, MS, NPCON, NPLOT(31), NSTAT(50), NSTP(15) /P	LOTE / NEWOO	0000		•••••••
00107	32≁ 33*	c	COMMON / PLUIS/FLDA(12,2), IPP, MS, NPCUN, NPLUI(31), NSIAI(50), NSIP(15) / P	-0100			
00110	34*		INTEGER ADARY, CASE, ESPER, FLDP, FLDX, FLDY, OULES, S, SECON, SPER, SQUARE,		0000		
00110	34*		1 WATTS,ZS		0000		
00111	36*				0000		•••••••••••••••••
00111	37*		1 1H5, 1H6, 1H7, 1H8, 1H9, 2H10, 2H11, 2H12, 2H13, 2H14, 2H15, 2H16, 2H17, 2H18,	•	0000	9	•
00111	38*		2 2H19, 2H20, 2H21, 2H22, 2H23, 2H24, 2H25, 2H26, 2H27, 2H28, 2H29, 2H30, 2H31,		0000	~	•••••••••••••••••
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00111 00111	39* 40*		0000 1000
00111	41*		000
00111	42*		000
00111	43*		000
00111	44*		000
00111	45*		000
00111	46*		000
00111	47*		000
00111	48*		000
00111	49*		000
00111	50*		000
00111	51*		000
00111	52*	F/RSTAR FOR NEW INVISCID CONTOUR //,LYIV/'ADJUSTED NORMALIZED I OOC	000
00111	53*	GNVISCID NOZZLE CONTOUR RADIUS R/RSTAR ',2*6H / 000	000
00142	54*	DATA ((FLDY(1,J),I=1,12),J=1,17)/'PRESSURE AT THE EDGE OF THE BOUN OOD	000
00142	55* '		000
00142	56*		000
00142	57*	CHE EDGE OF THE BOUNDARY LAYER IN FEET PER SECOND ', OOC	000
00142	58*		000
00142	59*		000
00142	60*		000
00142	61*		000
00142	62*		000
00142	63*		000
00142	64*		000
00142	65*		000
00142	66*		000
00142	67*		000
00142	68*		000
00142	69*		000
00142	70*		000
00142	71*		000
00142	72*		000
00144	73*		000
00144	74*		000
00144	75*		000
00144 00144	76* 77*		000
00144	78*	***************************************	000
00144	79*		000
00144	80*		000
00144	81*		000
00144	82*		000
00144	83*		000
00144	84*	KR ', 7*6H /	
00146	85*	DATA((FLDY(I,J),I=1,12),J=29,31)/'MOMENTUM TRANSFER COEFFICIENT ', NEWOOD	
00146	86*	\$ 7*6H , HEAT TRANSFER COEFFICIENT ', 7*6H , NEW000	
00146	87*	\$ 'HEAT FLUX ' 10*6H / NEW000	
00150	88*		000
00150	89*	AREES RANKINE ', 'RATIO OF BOUNDARY LAYER VELOCITY TO EDGE VELO 000	000
00150	90*	BCITY FROM WALL TO EDGE ', 'MACH NUMBER FROM THE WALL TO THE BO 000	000
00150	91*	CUNDARY LAYER EDGE '. 3*6H . 'DENSITY FROM THE WALL TO THE BO 000	000
00150	92*	DUNDARY LAYER EDGE IN POUNDS/CUBIC FOOT', 'VISCOSITY FROM WALL T 0000	000
00150	93*	ED B. L. EDGE TIMES 100,000 POUNDS PER FOOT SECOND ', 'SPECIFIC HEANK 7/83 000	000
0150	94*	FAT FROM WALL TO BOUNDARY LAYER EDGE IN BTU PER POUND DEGREE R', 000	000
00150	95*		000
0150	96*	HND ', 'TOTAL ENTHALPY FROM THE WALL TO THE BOUNDARY LAYER EDG 000	000
0150	97*		000
0150	98*		000
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Colta         99*         KY FROM THE WALL TO BUNDARY LAYER FOOT THE WALL TO BUNDARY LAYER FOOT THE WALL TO BUNDARY LAYER FOOT THE WALL TO SHE BUNDARY LAYER FOOT THE BUNDARY LAYER FOOT THE						
OOISO         INTHE MALL TO THE BOLDARY LAYEE DECE         . 3-FML         . SPECIFIC HE         OCCOOD           ODISO         OOISO         MATIO GAMMA FROM THE MALL TO THE BOLMARY LAYEE IN POLNOS PER SQUA         OCCOOD           ODISO         OOISO         C         OCCOOD         OCCOOD           ODISO         OO         FR         INENT (105, ADARY)         OCCOOD           ODISO         O         FR         OCCOOD         OCCOOD         OCCOOD           ODISO         IN         FR         OCCOOD         OCCOOD         OCCOOD           ODISO         IN         FR         OCCOOD         OCCOOD         OCCOOD           ODISO         IN         FR         OCCOOD <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>						
DOISD         IO2+         NAT BATID GAMMA FROM THE WALL TO THE BOUNDARY LAYER EDGE         '.'         OCCOOD           DOISD         O -         PPE INCH: ',12+EH         /'         OCCOOD           DOISD         O -         PPE INCH: ',12+EH         /'         OCCOOD           DOISD         O -         PEE INCH: ',12+EH         OCCOOD         OCCOOD           DOISD         O -         PEE INCH: ',12+EH         OCCOOD         OCCOOD           DOISD         O -         DOISD         OCCOOD         OCCOOD           DOISD         O -         PEE INCH: ',12+EH         OCCOOD         OCCOOD           DOISD         O -         PEEAI (3) X(1,2), Y(1,12), Y(1,12), Y(1,2), Y(1,2), Y(1,2)         OCCOOD         OCCOOD           DOI7T         ITP         DO 20 T * 1,1S         INK         OCCOOD         OCCOOD           DOI7T         ITP         DO 20 T * 1,1S         INK         OCCOOD         OCCOOD           DOITT         DD 20 T * 1,1S         INK         OCCOOD         OCCOOD         OCCOOD           DOITT         DD 20 T * 1,1S         INK         OCCOOD         OCCOOD         OCCOOD           DOITT         DD 20 T * 1,1S         INK         INK         OCCOOD         OCCOOD						
00150         003*         0'PITOT TUBE PRESSURE ACROSS THE BOUNDARY LAYER IN POUNDS PER SOLA         000000           00150         100*         C         000000         000000           00151         100*         C         000000         000000           00153         100*         C         000000         000000           00154         100*         C         000000         000000           00155         100*         D         1         1,NS         000000           00157         10         READ (3) Y(1,12),Y(1,12),Y(1,12),Y(1,12),Y(1,23),Y(1,26)         0000054           00176         112*         PEAD (3) Y(1,2),Y(1,12),Y(1,12)         0000054           002071         113*         READ (3) Y(1,2),Y(1,12),Y(1,2)         0000054           00231         115*         READ (3) Y(1,2),Y(1,12),Y(1,12)         000017           002325         11*         READ (3) Y(1,2),Y(1,12),Y(1,14),Y(1,2)         00017           00231         118         READ (3) Y(1,2),Y(1,14),Y(1,14),Y(1,2)         00017           002325         11*         READ (3) Y(1,2),Y(1,14),Y(1,14),Y(1,2)         00017           00231         118         READ (3) Y(1,2),Y(1,14),Y(1,14),Y(1,2)         00017           002326         12*						·····
COISO         104*         PRE         INCH         / 12-6H         /           COISO         C         CALL IDENT         105 ADARY)         COCCOD           COISS         106*         C         CALL IDENT         105 ADARY)         COCCOD           COISS         106*         C         CALL IDENT         105 ADARY)         COCCOD           COISS         106*         C         CALL IDENT         106 ADARY)         COCCOD           COISS         106*         C         CALL IDENT         COCCOD         COCCOD           COISS         106*         READ         XILI         YILI         COCCOD         COCCOD           COISS         106*         READ         XILI         YILI         COCCOD         COCCOD           COISS         106*         READ         XILI         XILI         COCCOD						
00150         105*         C         CALL IDENT (105, ADARY)         000000           00152         106*         REVIND 3         000000         000000           00153         100*         REVIND 3         000000         000000           00157         100         PAR (3) X(11) Y(1, 2) Y(1, 12), Y(1, 12), Y(1, 22), Y(1, 23), Y(1, 25)         000000           00172         110*         METE (10) IS, IAXIS         -01000033         -01000033           00174         112*         D0 20 I = 1, IS         -01000033         -000004           00201         115*         READ (3) Y(1, 3), Y(1, 2), Y(1, 12)         0000054           00210         115*         READ (3) Y(1, 3), Y(1, 1), Y(1, 14)         0000071           00220         115*         READ (3) Y(1, 3), Y(1, 1), Y(1, 14), Y(1, 12), Y(1, 2)         000016           00221         115*         READ (3) Y(1, 3), Y(1, 1), Y(1, 1, 1), Y(1, 1, 1), Y(1, 1, 2)         000017           00221         115*         READ (3) Y(1, 1), Y(1, 1, 1), Y(1, 1, 1), Y(1, 1, 2), Y(1, 1)         000116           00231         115*         READ (3) Y(1, 1), Y(1, 1, 1), Y(1, 1, 1), Y(1, 1, 2), Y(1, 2)         000116           00231         115*         READ (3) Y(1, 2), Y(1, 1), Y(1, 1, 1), Y(1, 1, 2), Y(1, 2)         000116           00231		· · · · · · · · · · · · · · · · · · ·				
Odf52         ODe- The Ext Intern (IDE, DARY)         Occord Decode Decod				FRE INCH , 12*0H /		
00153         107*         REWIND 3         000003           00154         108         D0 10 T = 1,NS         000006           00177         109         READ (2) X(1),Y(1,2),Y(1,12),Y(1,22),Y(1,23),Y(1,26)         000006           00172         111*         WRITE (10) IS, LAXIS         = 0000084           00176         112*         DD 20 T = 1, 1S         = 0000084           00076         112*         DD 20 T = 1, 1S         = 0000084           00076         112*         DD 20 T = 1, 1S         = 0000084           00077         114*         READ (3) Y(1, 3), Y(1, 6), Y(1, 10)         = 0000084           000231         114*         READ (3) Y(1, 3), Y(1, 6), Y(1, 10)         = 000007           00231         114*         READ (3) Y(1, 13), Y(1, 16), Y(1, 14), Y(1, 20), Y(1, 21)         = 00017           00231         114*         READ (3) Y(1, 15), Y(1, 16), Y(1, 17), Y(1, 20), Y(1, 20), Y(1, 21)         = 000167           00231         114*         READ (3) Y(1, 15), Y(1, 16), Y(1, 17), Y(1, 20), Y(1, 20), Y(1, 21)         = 000167           00241         119*         READ (3) Y(1, 15), Y(1, 16), Y(1, 17), Y(1, 20), Y(1, 2						
00154         106         DD 10 T * 1.NS         000006           00157         109         100 RAD (3) X(11,2),Y(1,2),Y(1,12),Y(1,2),Y(1,26)         000006           00171         110         IAAIS = 31         NEW000031           00172         111         WATTE (10) IS, IAAIS         -01000033           00171         110         READ (3) Y(1,3),Y(1,2),Y(1,2)         0000064           000071         113         READ (3) Y(1,3),Y(1,2),Y(1,2)         0000064           000201         114         READ (3) Y(1,2),Y(1,2),Y(1,2)         0000064           000211         115         READ (3) Y(1,2),Y(1,2),Y(1,2)         000007           000220         116         READ(3) Y(1,2),Y(1,1),Y(1,1),Y(1,1),Y(1,2)         000017           000221         116         READ (3) Y(1,2),Y(1,1),Y(1,1),Y(1,1),Y(1,2)         000017           00221         116         READ (3) Y(1,1),Y(1,1),Y(1,1),Y(1,2)         000017           00221         120         WRITE (10) X(1),Y(1,1),Y(1,1),Y(1,2)         00017           00221         120         WRITE (10) X(1),Y(1,1),Y(1,1),Y(1,2)         000166           00221         120         WRITE (10) X(1),Y(1,1),Y(1,1),Y(1,2)         000167           002260         120         WRITE (10) X(1),Y(1,1),Y(1,1),Y(1,2)         000		-	-			
00157         10         READ (2) X(1),Y(1,2),Y(1,12),Y(1,12),Y(1,23),Y(1,26)         000016           00171         111*         WRITE (10) IS, IAXIS         -0100033           00172         111*         WRITE (10) IS, IAXIS         -0100033           00174         112*         D0 20 T * 115         (12, 12, 1) Y(1, 27)           00174         112*         D0 20 T * 115         (12, 22, Y(1, 25), Y(1, 27)           00213         115*         READ (3) Y(1, 24), Y(1, 25), Y(1, 20)         0000071           002220         116*         READ (3) Y(1, 24), Y(1, 25), Y(1, 17), Y(1, 17), Y(1, 20), Y(1, 21)         000107           002231         116*         READ (3) Y(1, 24), Y(1, 16), Y(1, 15), Y(1, 17), Y(1, 14)         000115           002241         118*         READ (3) Y(1, 17), Y(1, 16), Y(1, 15), Y(1, 12), Y(1, 20), Y(1, 20)         000115           00241         118*         READ (3) Y(1, 15), Y(1, 15), Y(1, 12), Y(1, 20), Y(1, 20)         000115           00241         118*         READ (3) Y(1, 15), Y(1, 15), Y(1, 12), Y(1, 20), Y(1, 20)         000115           00241         118*         READ (3) Y(1, 15), Y(1, 15), Y(1, 12), Y(1, 20), Y(1, 20)         000165           00241         F (1WLIT (5, 1, 15, X, 9R, Y(1, 10), TY, Y(1, 20),	*** ***************		·····			
OD171         110*         IAXIS = 31         MEMOD031           00172         11*         WRITE (10) IS, IAXIS         -01000033           00174         112*         D0 20 I * 1, IS         -01000033           00175         112*         D0 20 I * 1, IS         -01000033           00176         112*         D0 20 I * 1, IS         -01000033           00201         11*         RED0 (3) V(1, 23), V(1, 20), V(1, 30)         000064           00220         116*         READ (3) V(1, 23), V(1, 30), V(1, 31)         NEW00100           00221         118*         READ (3) V(1, 2), V(1, 10), V(1, 10), V(1, 10)         000115           00223         117*         READ (3) V(1, 10), V(1, 10), J * 1, IAXIS         000115           00241         119*         READ (3) V(1, 10), V(1, 11), J * 1, IAXIS         000117           00250         122*         OF IF (INNT, E0, 1), AXX, AL)         000117           00266         124*         IF (PPLDT(0)) EG, 0) GO TD 30         000220           00272         125*         IF (PPLDT(1) J, EG, 0) GO TD 30         ANK 7/83         000220           00272         126*         CALL MIMMAX (IS, 2, 1, 1, V(1, 1), PLDY(1, 1), -1S, X, V(1, 0))         ANK 7/83         000221           0027         12*		-	10			
00172         111+         WRITE (10) IS, IAXIS         -0100033           00176         112+         00 20 I = 1, IS         000054           00201         113+         READ (3) V(1,3), V(1,2)         000054           00201         113+         READ (3) V(1,3), V(1,2)         000054           00220         116+         READ (3) V(1,3), V(1,10)         000054           00221         116+         READ (3) V(1,3), V(1,10)         000107           00223         116+         READ (3) V(1,3), V(1,10), V(1,12)         000107           00223         117+         READ (3) V(1,5), V(1,13), V(1,11), V(1,12)         000107           00231         118+         READ (3) V(1,5), V(1,13), V(1,12), V(1,2)         000107           00231         118+         READ (3) V(1,5), V(1,13), V(1,12), V(1,2)         000146           00241         119+         READ (3) V(1,5), V(1,13), V(1,12), V(1,2)         000147           00254         120+         D0 X(1, V(1,1), V(1,17), V(1,2)         000147           00264         123+         D1 (10) ISO, 01 G0 TO 20         000174           00265         122+         IF (MPLDT(1)) ISO, 01 G0 TO 26         000220           00276         129+         D1 (0 2715) + ASO(17), ISO, 00 TO 30         AMK 7/83						
00176         112+         00 20 T = 1, 15         000054           00201         113+         READ (3) V(1, 3), V(1, 6), V(1, 19)         000054           00210         113+         READ (3) V(1, 3), V(1, 27)         0000063           00221         115+         READ (3) V(1, 20), V(1, 20)         000007           00223         117+         READ (3) V(1, 2), V(1, 10)         000107           00234         118+         READ (3) V(1, 7), V(1, 6), V(1, 10), V(1, 4)         000115           00241         119+         READ (3) V(1, 7), V(1, 6), V(1, 10), V(1, 4)         000115           00250         120+         200 WTIE (10) V(1), V(1, 10), V(1, 110)         000116           00261         21+         CALL MINMAX (15, 1, 1, 15, X, XR, XL)         000166           00261         12+         CALL CHANGE         000167           00261         12+         CALL CHANGE         000167           00261         12+         CALL CHANGE         000216           00272         126+         CALL MINMAX (15, 2, 1, 1, Y(1, J), TV VB)         0002210           00272         126+         CALL MINMAX (15, 2, 1, 1, Y(1, J), TV VB)         000230           00272         126+         CALL MINMAX (15, 2, 1, 1, Y(1, J), TX, X, X, Z, R, Y(1, J))         ANK 7/83 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
00207         114*         READ (3) Y(1, 12), Y(1, 25), Y(1, 28)         0000071           00213         115*         READ (3) Y(1, 25), Y(1, 30), Y(1, 31)         NEW000100           00224         116*         READ (3) Y(1, 25), Y(1, 30), Y(1, 31)         000071           00225         116*         READ (3) Y(1, 2), Y(1, 30), Y(1, 31)         000177           00236         12*         READ (3) Y(1, 2), Y(1, 5), Y(1, 10), Y(1, 14), Y(1, 12)         000174           00236         12*         CALL MINMAX (15, 1, 115, X, XR, XL)         000167           00260         12*         CALL MINMAX (15, 1, 115, X, XR, XL)         000167           00266         12*         LF (INPLOT(J), EG, 0) GG TO 30         000167           00266         12*         LF (INPLOT(J), EG, 0) GG TO 30         000270           00272         12*         LF (NPLOT(J), EG, 0) GO TO 30         ANK 7/83<000231	*** *** **********	112*			000054	
00207         114*         READ (3) Y(1, 12), Y(1, 25), Y(1, 28)         0000071           00213         115*         READ (3) Y(1, 25), Y(1, 30), Y(1, 31)         NEW000100           00224         116*         READ (3) Y(1, 25), Y(1, 30), Y(1, 31)         000071           00225         116*         READ (3) Y(1, 2), Y(1, 30), Y(1, 31)         000177           00236         12*         READ (3) Y(1, 2), Y(1, 5), Y(1, 10), Y(1, 14), Y(1, 12)         000174           00236         12*         CALL MINMAX (15, 1, 115, X, XR, XL)         000167           00260         12*         CALL MINMAX (15, 1, 115, X, XR, XL)         000167           00266         12*         LF (INPLOT(J), EG, 0) GG TO 30         000167           00266         12*         LF (INPLOT(J), EG, 0) GG TO 30         000270           00272         12*         LF (NPLOT(J), EG, 0) GO TO 30         ANK 7/83<000231	00201	113*		READ (3) Y(1,3),Y(1,6),Y(1,1),Y(1,19)	000054	
00220         116+         READ(3)Y(1,29),Y(1,30)         NEW000100           00221         117+         READ(3)Y(1,2),Y(1,30)         000107           00231         118+         READ(3)Y(1,2),Y(1,8),Y(1,1),Y(1,20),Y(1,21)         000115           00231         119-         READ(3)Y(1,2),Y(1,1),Y(1,4),Y(1,20),Y(1,21)         000115           00241         119-         READ(3)Y(1,5),Y(1,15),Y(1,16),Y(1,10)         000127           00250         120-         CALL MIMMAX (15,1,115,X,RX,RJ)         000156           00261         121-         CALL MIMMAX (15,0)         000174           00262         122+         IF (MPLOT(J) E0,0)         000170           00272         128+         IF (MPLOT(J) E0,0)         000 T0 30         000220           00272         128+         IF (ABS(W) + ABS(T) LE.0,0)         000 T0 30         ANK 7/83         0002210           00273         128+         GO T0 27         CALL MIMAX (15,2,1,1,Y(1,J),I),Y,Y8)         000223         00277           00274         129+         GO T0 27         CALL DGFLT (FLDX(1,1),FLDY(1,J),IS,X,XL,XR,Y(1,J))         ANK 7/83         000230           00275         129-         GO T0 27         CALL APLOTY (MWBR,X,Y(1,J),IX,IX,I,I,PLDY(1,J),-IS,X,Y(1,J))         ANK 7/83         000321 <t< td=""><td>00207</td><td>114*</td><td></td><td></td><td>000063</td><td></td></t<>	00207	114*			000063	
C0225         117*         PEAD (3) V(1, 9), V(1, 10), V(1, 14), V(1, 20), V(1, 21)         C000107           C0231         118*         EEAD (3) V(1, 5), V(1, 15), V(1, 16), V(1, 17), V(1, 20)         C000117           C0241         118*         EEAD (3) V(1, 5), V(1, 15), V(1, 16), V(1, 17), V(1, 20)         C000117           C0250         C0*         C0         VRITE (10) X(11, V(1), U, U, U, I, IAXIS)         C000146           C0250         C1*         C1*         CAL         CARMEE         C000174           C0261         C2*         C1*         CAL         CARMEE         C000174           C0262         C2*         IF (NPLOT(J), EO. O) GO TO 30         C000270         C00220           C0272         C2*         C SLIP PLOT IF ALL DATA IS ZERO         C00210         C00230           C0273         12*         IF (ABS(VB) + ABS(VT) .LE. O.O) GO TO 30         ANK 7/83         C00223           C0277         C30         C3         CALL DATA IS ZERO         C00230         C0232           C0277         C30         CALL CARTIN V (78, CASE, 30, 1023)         ANK 7/83         C00232           C0371         C32         CALL CAURAL X, KYB VT, 5, FLDX(1, 1), FLDY (1, J), ANK 3/83         C00231           C0300         132*         CALL CAURAL X, KYB VT, 5, FLDX	00213	115*		READ $(3)$ Y(1,24),Y(1,25),Y(1,28)	000071	
CO225         117*         READ (3) Y(1, 9), Y(1, 10)         CO00107           CO231         118*         READ (3) Y(1, 8), Y(1, 11), Y(1, 14), Y(1, 20), Y(1, 21)         CO00112           CO241         118*         READ (3) Y(1, 5), Y(1, 15), Y(1, 16), Y(1, 17), Y(1, 4)         CO00127           CO250         C20         20         WRITE (10) X(11, Y(1), U, 1, *, 1, IAX, X)         CO00146           CO250         C20         CLUMINAX (15), 1, 115, X, RX, X)         CO00146         CO00174           CO250         C22*         L0 03 (01, Y(1, 0), 0, 12, K, X, X)         CO00174         CO00263           CO226         C24*         LF (NPLOT(J), E0, 0) GO TO 30         CO00270         CO0220           CO272         C2*         C ALL MINMAX (15, 2, 1, 1, Y(1, J), YT, YB)         CO00210         CO0223           CO271         C3*         C3 CT C1         FL (ABS(YB) + ABS(YT)         LE         CO C0 T 30         ANK 7/83         CO0223           CO272         C3*         C4 CL L CAPLT (FLDX(1, 1), FLDY(1, J), PF, IS, X, XL, XR, Y(1, J))         ANK 7/83         CO0223           CO277         C3*         C4 CL L CAPLT (FLDX(1, 1), FLDY(1, J), FLDX(1, J), C1, X, Y(1, J))         ANK 7/83         CO0237           C0301         C3*         C4 CALL LOGPLT (FLDX(1, 1), FLDX(1, J), FLDX(1, J), C1, J, J, X, Y(1,	00220			READ(3)Y(I,29),Y(I,30),Y(I,31)	NEW000100	
00241         119*         PEAD (3) Y(I, 15), Y(I, 16), Y(I, 17), Y(I, 4)         000127           00250         120*         20 WRITE (10) X(I), Y(I, 1, 0), I, I, IXXIS)         000140           00260         121*         CALL MINMAX (IS, 1, 1, IS, X, R, XL)         000166           00261         122*         DI 30 J = 1, IAXIS         000174           00266         122*         DI 30 J = 1, IAXIS         000174           00266         124*         IF (NPLOT(J). E0. 0) GO TO 30         000203           00270         125*         IF (NPLOT(J). E0. 0) GO TO 30         000210           00272         126*         CALL MINAX (IS, 2, I, Y(I, J), Y, YB)         000210           00273         129*         GD TO 27         000230         000232           00274         129*         GD TO 27         GD TO 27         000247         000247           00300         132*         27 CALL QUIK3L (-1, X, LXR, YB, YT, 5, FLDX(1, 1), FLDY(1, J), -IS, X, Y(1, J))         ANK 7/83         000274           00301         132*         28 CALL PRINTY (78, CASE, 30, 1023)         ANK 7/83         000274           00301         132*         28 CALL PRINTY (78, CASE, 30, 1023)         ANK 7/83         00031           00302         13*         NUMMER = IS/1X	00225	117*		READ (3) Y(I,9),Y(I,10)	000107	
00250         120*         20         WRITE (10) X(1), (Y(1,J), J = 1, IXX, X, X)         000165           00260         121*         CALL MINMAX (15, 1, 11, X, X, X, X)         000165           00261         122*         IF (1UNIT .E0. 1) CALL CHANGE         000174           00265         124*         DI 30 u = 1, 1AXX, X, X, X)         000174           00266         124*         IF (NPLOT(J) .E0. 0) GD 70 30         000205           00272         125*         IF (NPLOT(J) .E0. 2) GD TO 30         000210           00275         125*         IF (ABS(YB) + ABS(YT) .LE. 0.0) GD TO 30         ANK 7/83         000210           00276         125*         IF (ABS(YB) + ABS(YT) .LE. 0.0) GD TO 30         ANK 7/83         000247           00307         129*         GG ALL DEPLT (FLDX(1,1), FLDY(1,J), IP, IS, X, XL, XP, Y(1,J))         ANK 5/83         000247           00307         130*         26         ALL DIKAL (-1, XL, XP, YB, YT, S, FLDX(1, J), -IS, X, Y(1,J))         ANK 7/83         000247           00300         132*         27         CALL ONIKAL (-1, XL, XP, YB, YT, S, FLDX(1, J), -IS, X, Y(1,J)         ANK 7/83         000241           00303         132*         28         CALL PRINTY (78, CASE, 30, 1023)         ANK 7/83         000241           00303         132		118*		READ (3) Y(I,7),Y(I,8),Y(I,11),Y(I,14),Y(I,20),Y(I,21)		
00260         121*         CALL MINMAX (IS, 1, 1, IS, X, XR, XL)         000156           00261         122*         DI 30 J = 1, IAXIS         000167           00263         123*         DO 30 J = 1, IAXIS         000174           00264         124*         DF (IUNT FG. 1, 20, 0) GG TO 30         000205           00270         125*         IF (MPLOT(J) .E0, 2) GG TO 26         000205           00272         126*         CALL MINMAX (IS, 1, 1, Y(1, J), YT, YB)         000210           00273         128*         IF (ABS/YB) + ABS(YT) .LE. 0.01 GG TO 30         ANK 7/83         000233           00275         129*         GG TO 27         CALL GOPLT (FLOX(1, T), FLDY(1, J), TP, IS, X, XL, XR, Y(1, J))         ANK 7/83         000247           00300         132*         27         CALL GUPKAL (TA, KR, YB, YT, 5, FLDX(1, 1), FLDY(1, J), ANK 5/83         000247           00301         132*         22         CALL PRINTY (TB, CASE, 30, 1023)         ANK 7/83         000210           00303         134*         IX = MAXO (IS/KS, 1)         ANK 7/83         000315           00304         134*         IX = MAXO (IS/KS, 1)         ANK 7/83         000315           00303         135*         NUMBR * 15/I         ANK 5/83         000315				READ (3) Y(I,5),Y(I,15),Y(I,16),Y(I,17),Y(I,4)		
00281         122+         IF         (INNT + E0, 1)         CALL CHANGE         000167           00286         124+         IF         (NPLOT(U) + E0, 2)         GO TO 30         000203           00270         125+         IF         (NPLOT(U) + E0, 2)         GO TO 26         000205           00271         126+         CALL MINNAX (IS, 2, 1, 1, V(1, J), VT, VE)         000210         000210           00272         126+         CALL MINNAX (IS, 2, 1, 1, V(1, J), TY, VE)         000210         000210           00273         128+         IF         (ABS(YB) + ABS(YT) - LE. 0.0) GO TO 30         ANK 7/83         000223           00276         130+         26         CALL LOGALT (FLDX(1, 1), FLDY(1, J), IPP, IS, X, XL, XR, Y(1, J))         ANK 5/83         000247           00301         132+         27         CALL GUTK3L (-1, XL, XR, YE, YT, 5, FLDX(1, 1), FLDY(1, J), -IS, X, Y(1, J))         ANK 7/83         000274           00301         132+         27         CALL PRINT Y (7R, CASE, 30, 1023)         ANK 7/83         000274           00302         134+         IX = MAXO (IS/MS, 1)         MAK 3/83         000311         00335           00303         135+         NUMER = IS/IX         ANK 5/83         000315         000335           00304<			20			21 
00283         123+         D0         30         J = 1, IAXIS         0000174           00286         124+         IF         (NPLOT(u) = E0. 0)         60         TO         260           00270         125+         IF         (NPLOT(u) = E0. 0)         60         TO         260           00272         126+         CALL <minmax< td="">         CS. 21, 1., V(1, u), VT, VB)         000210           00273         128+         IF         (ABS(VB) + ABS(VT) = LE. 0.0)         GO         TO         300           00275         129+         GO         TD         27         NHK         7/83         000230           00276         130+         26         CALL LORPLT (FLDX(1, J), FLDY(1, J), IPP, IS, X, XL, XR, YK, YK, JN)         ANK         5/83         000247           00300         132+         27         CALL ORPLITY (JS, CASE, 30, 1023)         ANK         7/83         000214           00301         132+         28         CALL PRINTY (JS, CASE, 30, 1023)         ANK         3/83         000214           00303         134+         15         NUBER = IS/1Z         ANK         3/83         000031           00304         136+         CALL APLOTY (NUMBR, X, Y(1, U), IX, IX, 1, IPP, IERR)         ANK         &lt;</minmax<>						
00266         124+         IF (NPLDT(J), E0, 2), G0 T0 30         000203           00270         125+         IF (NPLDT(J), E0, 2), G0 T0 26         000205           00271         126+         CALL MINMAX (IS, 2, 1, 1, Y(1, J), YT, YB)         000210           00273         128+         IF (ABS(YB) + ABS(YT), LE, 0, 0) G0 T0 30         ANK 7/83         000223           00275         129+         G0 T0 27         G0 T0 27         000205         000240           00275         130+         26         CALL LOGPLT (FLDX(1, 1), FLDY(1, J), IPP, IS, X, XL, XR, Y(1, J))         ANK 5/83         0002210           00276         130+         26         CALL PRINTV (TP, CASE, 30, 1023)         ANK 7/83         000271           00300         132+         27         CALL PRINTV (TP, CASE, 30, 1023)         ANK 3/83         000210           00301         134+         28         CALL PRINTV (NUMBR, X, Y(1, J), IX, IX, 1, IPP, IERR)         ANK 3/83         000311           00304         135+         MUMBR = IS/IX         ANK 5/83         000315           00304         136+         CALL APLOTV (NUMBR, X, Y(1, J), IX, IX, 1, IPP, IERR)         ANK 5/83         000315           003050         137+         30         CONTINUE         000335         000335 <tr< td=""><td></td><td></td><td></td><td></td><td></td><td></td></tr<>						
00270         125*         IF (NPLOT(J).E0.2) G0 T0 26         00020           00272         126*         CALL MINMAX (15, 2, 1, 1, 1, 17, 18)         000210           00272         127*         C         SKIP PLOT IF ALL DATA IS ZER0         000210           00275         128*         GD T0 27         000230         000230           00275         129*         GD T0 27         000230         000230           00276         130*         C6 CALL LOGPLT (FL0X(1,1), FL0Y(1, J), 1PP, IS, X, XL, XR, Y(1, J))         ANK 7/83         000247           00300         132*         26         CALL PGINTV (78, CASE, 30, 1023)         ANK 7/83         000274           00301         132*         28         CALL PRINTV (78, CASE, 30, 1023)         ANK 3/83         00031           00302         134*         IX = MAXO (15, MS, 1)         ANK 3/83         00031         000301           00304         134*         IX = MAXO (15, MS, 1)         ANK 3/83         000315         000305           00305         137*         30         CONTINUE         NOMBR, X, Y(1, J), IX, 1, IX, 1, IPP, IERR)         ANK 5/83         000335           00305         137*         30         CONTINUE         000336         000336           00303 <t< td=""><td></td><td></td><td>· · · · · · · · · · · · · · · · · · ·</td><td></td><td></td><td></td></t<>			· · · · · · · · · · · · · · · · · · ·			
00272         128+         CALL MINMAX (IS, 2, 1, 1, Y(1, J), YT, YB)         000210           00273         128+         C SKIP PLOT IF ALL DATA IS ZERO         000210           00273         128+         C ABS(YB) + ABS(YT) . LE. 0.0) GD TD 30         ANK 7/83         0002230           00275         129+         GD TD 27         CALL LOGPLT (FLDX(1,1), FLDY(1, J), IPP, IS, X, XL, XR, Y(1, J))         ANK 5/83         0002230           00275         130+         26         CALL LOGPLT (FLDX(1,1), FLDY(1, J), -IS, X, Y(1, J))         ANK 5/83         0002247           00300         132+         27         CALL PRINTV (78, CASE, 30, 1023)         ANK 7/83         000274           00301         132+         28         CALL PRINTV (78, CASE, 30, 1023)         ANK 7/83         00031           00302         134+         IX = MAXO (IS/MS, 1)         ANK 3/83         00031         000361           00303         135+         NUMER = IS/IX         ANK 5/83         000315         000335           00304         136+         CALL APLOTV (NUMER, X, Y(1, U), IX, IX, 1, IPP, IERR)         ANK 5/83         000315           00305         137+         30         CONTINUE         000335         003316           00307         138+         REWIND 2         000335						
00272         127*         C         SKIP PLOT IF ALL DATA IS ZERO         000210           00275         128*         GD TO 27         GD TO 27         000230           00275         129*         GD TO 27         GD TO 28         000230           00276         130*         26         CALL LOGPLT (FLDX(1,1), FLDY(1,J), IPP, IS, X, XL, XR, Y(1,J))         ANK 5/83         000230           00276         130*         26         CALL DRINTY (TR, CASE, 30, 1023)         ANK 7/83         000247           00301         132*         27         CALL QUIX3L (-1,XL, XR, YB, YT, 5, FLDX(1,1), FLDY(1,J), -IS, X, Y(1,J))         ANK 7/83         000214           00301         134*         12         CALL APRINTY (TR, CASE, 30, 1023)         ANK 7/83         000214           00302         134*         IX * MAXO (TS/MS, 1)         ANK 7/83         00031         000310           00303         135*         NUMBR * IS/IX         ANK 5/83         000311         00035           00304         136*         CALL APLOTV (NUMBR, X, Y(1,J), IX, IX, 1, IPP, IERR)         ANK 5/83         000315           00305         137*         30         00011NUE         000356         000335           00301         139*         WRITE (10) N         000360 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>						
00273         128*         IF (ABS(YB) + ABS(YT) . LE. O.O) GO TO 30         ANK 7/83         000223           00275         129*         GO TO 27         00215         000230         000230           00275         130*         26         CALL LOGPLT (FLDX(1,1), FLDY(1,J), IPP, IS, X, XL, XR, Y(1,J))         ANK 5/83         000230           00275         131*         GO D 28         27         CALL QUIK3L (-1, XL, XR, YB, YT, 5, FLDX(1,1), FLDY(1,J), -IS, X, Y(1,J))         ANK 3/83         000251           00300         132*         28         CALL PRINTV (78, CASE, 30, 1023)         ANK 7/83         000211           00301         134*         MAXO (IS/MS, 1)         ANK 3/83         000311         00034           00303         136*         NUMBR = 15/1X         ANK 7/83         000315         000335           00304         136*         CONTINUE         000335         000335         000335           00303         138*         REWIND 2         000335         000305         000335           003310         139*         WRITE (10) N         STAR.(Q(I), R(I), I = 1, N)         000336         000336           00333         142*         READ (2) RSTAR.(Q(I), W(I), U(I), V(I), I = 1, N)         000346         000346           00333			•			
00275         129*         GO TO 27         000236           00276         130*         GO TO 28         000247           00300         132*         27         CALL DGPLT (FLDX(1,1), FLDY(1, J), IPP, IS, X, XL, XR, Y(1, J))         ANK 5/83         000247           00300         132*         27         CALL PRINTV (78, CASE, 30, 1023)         ANK 7/83         000214           00301         133*         28         CALL PRINTV (78, CASE, 30, 1023)         ANK 7/83         000214           00302         134*         IX = MAXO (IS/MS, 1)         ANK 3/83         00031           00303         135*         NUMER = IS/IX         ANK 3/83         00031           00304         136*         CALL APLDTV (NUMER, X, Y(1, J), IX, IX, 1, IPP, IERR)         ANK 5/83         000315           00305         137*         30         CONTINUE         000335         00036           00313         140*         READ (2) RSTAR, (0(I), R(I), I = 1, N)         000363         00036           00333         142*         READ (2) RCIRC, RSGAR, (2(I), W(I), U(I), U(I), V(I), I = 1, N)         000376           00334         144*         D0 3I J = 1, N         000376         000376           00333         142*         READ (2) RCIRC, RSGAR, (2(I), W(I), U(I), V(I), I			C			
00276       130+       26       CALL LOGPLT (FLDX(1,1), FLDY(1,J), IPP, IS, X, XL, XR, Y(1,J))       ANK 5/83       000247         00300       132+       27       CALL QUIK3L (-1, XL, XR, YB, YT, 5, FLDX(1,1), FLDY(1,J), -IS, X, Y(1,J))       ANK 3/83       000251         00300       133+       28       CALL PRINTV (78, CASE, 30, 1023)       ANK 7/83       000274         00301       133+       28       CALL PRINTV (78, CASE, 30, 1023)       ANK 3/83       00031         00303       135+       NUMBR = IS/IX       ANK 3/83       00031         00304       136+       CALL APLOTV (NUMBR, X, V(1, J), IX, IX, 1, IPP, IERR)       ANK 3/83       00031         00305       137+       30       CONTINUE       000335       000335         00301       139+       WRITE (10) N       000340       000340         00313       140+       READ (2) RSTAR, (Q(I), R(I), I = 1, N)       000356         00333       142+       READ (2) RSTAR, (Q(I), R(I), U(I), U(I), V(I), I = 1, N)       000376         00331       142+       READ (2) RSTAR, RO(I), R(I), U(I), U(I), V(I), I = 1, N)       000376         00333       142+       READ (2) RSTAR, RO(I), R(I), U(I), U(I), V(I), I = 1, N)       000376         00332       143+       D0 31 J = 1, N       00						
00277         131*         GO TO 28         000207           00300         132*         27         CALL OUTK3L (-1, X, XR, YB, YT, 5, FLDX(1, 1), FLDY(1, J), -IS, X, Y(1, J))         ANK 7/83         000274           00300         133*         28         CALL PRINTV (78, CASE, 30, 1023)         ANK 7/83         000274           00302         134*         IX = MAXO (IS/MS, 1)         ANK 3/83         000301           00303         135*         NUMBR = IS/IX         ANK 3/83         000315           00304         136*         CALL APLOTV (NUMBR, X, Y(1, J), IX, IX, 1, IPP, IERR)         ANK 5/83         000315           00305         137*         30         CONTINUE         000335         00030           00304         136*         REWIND 2         000335         000315           00303         139*         WRITE (10) N         000360         000335           00331         140*         REG (2) RSTAR, (Q(1), R(1), I = 1, N)         000361           00333         142*         RERC (20 RECETED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING         000376           00333         143*         C         NORMALIZE CORRECTED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING         000417           00351         146*         W(J) = W(J) * RCIAR, RSTAR <td></td> <td></td> <td>0.0</td> <td></td> <td></td> <td></td>			0.0			
00300       132*       27       CALL QUIK3L (-1, XL, XR, YB, YT, 5, FLDX(1, 1), FLDY(1, J), -IS, X, Y(1, J))       ANK 3/83       000251         00301       133*       28       CALL PRINTV (78, CASE, 30, 1023)       ANK 7/83       000274         00302       135*       IX = MAXO (I5/MS, 1)       ANK 3/83       000311         00303       135*       NUMER = IS/IX       ANK 3/83       000315         00304       136*       CALL APLOTV (NUMER, X, Y(1, J), IX, IX, 1, IPP, IERR)       ANK 5/83       000315         00305       137*       30       CONTINUE       000335       000335         00310       139*       WRITE (10) N       000340       000335         00313       140*       READ (2) RSTAR, (Q(I), R(I), I = 1, N)       000360       000316         00333       142*       READ (2) RCIRC, RSGAR, Z(I), W(I), U(I), V(I), I = 1, N)       000376       000317         00334       143*       D0 31 J = 1, N       000417       000316         00351       145*       Z (U) = Z (U) + RCIRC/RSTAR       0000417         00352       146*       W (U) = W (U) + RSQAR/RSTAR       0000422         00354       148*       31 V (U) = V (U) + RSQAR/RSTAR       0000432         00354       149*       WRITE (			26			
00301       133*       28       CALL PRINTV (78, CASE, 30, 1023)       ANK 7/83       000274         00302       134*       IX = MAXO (IS/MS, 1)       ANK 3/83       000301         00303       135*       NUMBR = IS/IX       ANK 3/83       000311         00304       136*       CALL APLOTV (NUMBR, X, Y(1, J), IX, IX, 1, IPP, IERR)       ANK 5/83       000315         00305       137*       30       CONTINUE       000335         00306       138*       REWIND 2       000335         00311       40*       REM 02       000335         00311       40*       READ (2) RSTAR, (Q(I), R(I), I = 1, N)       000340         00323       144*       WRITE (10) RSTAR, (Q(I), W(I), U(I), V(I), I = 1, N)       000363         00331       142*       READ (2) RSTAR, (Q(I), W(I), U(I), V(I), I = 1, N)       000376         00333       142*       READ (2) RSTAR, RQ (1), W(I), U(I), V(I), I = 1, N)       000363         00333       142*       READ (2) ASTAR, RQ (1), W(I), U(I), V(I), I = 1, N)       000376         00346       144*       DO 31 J = 1, N       000417       000417         00351       145*       Z(J) = Z(J)*RCIRC/RSTAR       000417       000417         00352       146*       W(J) = W(						
00302       134*       IX = MAX0 (IS/MS, 1)       ANK 3/83       000301         00303       135*       NUMBR = IS/IX       ANK 3/83       00031         00304       136*       CALL APLOTV (NUMBR, X, Y(1, J), IX, IX, 1, IPP, IERR)       ANK 5/83       000315         00305       137*       30       CONTINUE       000335       000335         00301       139*       WRITE (10) N       000340       000340         00313       140*       READ (2) RSTAR, (Q(I), R(I), I = 1, N)       000363       000363         00333       142*       READ (2) RCIRC, RSOAR, (Z(I), W(I), U(I), V(I), I = 1, N)       000376       000376         00334       144*       DO 31 J = 1, N       000376       000417         00351       145*       Z(J) = Z(J)*RCIRC/RSTAR       000417       000417         00351       145*       Z(J) = Z(J)*RCIRC/RSTAR       000417       000426         00353       147*       U(J) = U(J)*RSQAR/RSTAR       000426       000426         00354       148*       31       V(J) = V(J)#RSQAR/RSTAR       000425       000455         00351       150*       IF (NPCDN .EQ. Q) GO TO 42       000455       000455       000455         00357       152*       CALL FRAMEV (2) <td></td> <td></td> <td>28</td> <td>CALL DDINTS <math>(1, 1, 2, 3, 1, 3, 1, 3, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,</math></td> <td></td> <td></td>			28	CALL DDINTS $(1, 1, 2, 3, 1, 3, 1, 3, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,$		
00303       135*       NUMBR = IS/IX       ANK 3/83       000311         00304       136*       CALL APLOTV (NUMER,X,Y(1,J),IX,IX,1,IPP,IERR)       ANK 5/83       000315         00307       138*       REWIND 2       000335       000335         00310       139*       WRITE (10) N       000340       000340         00313       140*       READ (2) RSTAR, (0(I),R(I), I = 1,N)       000360         00323       141*       WRITE (10) RSTAR, (0(I),W(I),U(I),V(I), I = 1,N)       000363         00333       142*       READ (2) RCIRC,RSGAR, (2(I),W(I),U(I),V(I), I = 1,N)       000366         00333       143*       C       NORMALIZE CORRECTED CONTOURS TO DRIGINAL THROAT RADIUS FOR PLOTTING       000317         00351       145*       Z(J) = Z(J)*RCIRC/RSTAR       000417       000417         00352       146*       W(J) = W(J)*RCIRC/RSTAR       000422       000422         00354       148*       31       V(J) = V(J)*RSGAR/RSTAR       000432         00354       148*       31       V(J) = U(J)*RSGAR/RSTAR       000432         00354       148*       31       V(J) = U(J)*RSGAR/RSTAR       000432         00354       148*       31       V(J) = CIRC,RSGAR, (Z(I), W(I), U(I), U(I), I = 1,N)       000432			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
00304       136*       CALL APLOTV (NUMER,X,Y(1,J),IX,IX,1,IPP,IERR)       ANK 5/83       000315         00305       137*       30       CONTINUE       000335         00307       138*       REWIND 2       000335         00310       139*       WRITE (10) N       000350         00313       140*       READ (2) RSTAR, (Q(I), R(I), I = 1, N)       000360         00333       142*       READ (2) RCIRC, RSDAR, (Z(I), W(I), U(I), V(I), I = 1, N)       000366         00334       142*       READ (2) RCIRC, RSDAR, (Z(I), W(I), U(I), V(I), I = 1, N)       000376         00333       142*       READ (2) RCIRC, RSDAR, (Z(I), W(I), U(I), V(I), I = 1, N)       000376         00334       143*       C       NORMALIZE CORRECTED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING       0000417         00352       146*       W(J) = W(J)*RCIRC/RSTAR       000417       000422         00353       147*       U(J) = U(J)*RCIRC/RSTAR       000422       000426         00354       148*       31       V(J) = U(J)*RSAR/RSTAR       000432         00351       150*       IF (NPCON .EQ. O) GO TO 42       000455         00371       150*       IF (NPCON .EQ. O) GO TO 42       000455         00373       152*       CALL FRAMEV						
00305         137*         30         CONTINUE         000335           00307         138*         REWIND 2         000335           00310         139*         WRITE (10) N         000340           00313         140*         READ (2) RSTAR, (Q(I), R(I), I = 1, N)         000350           00323         141*         WRITE (10) RSTAR, (Q(I), R(I), I = 1, N)         000363           00333         142*         READ (2) RCTRC, RSQAR, (Z(I), W(I), U(I), V(I), I = 1, N)         000376           00333         143*         C         NORMALIZE CORRECTED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING         000376           00346         144*         D0 31 J = 1, N         000417         000417           00352         146*         W(J) = W(J)*RCIRC/RSTAR         000417         000422           00353         147*         U(U) = U(J)*RCIRC/RSTAR         000422         000426           00354         148*         31         V(J) = V(J)*RSQAR,RSTAR         000432         000437           00354         149*         WRITE (10) RCIRC,RSQAR, (Z(I), W(I), U(I), V(I), I = 1, N)         000422         000355           00371         150*         IF (NPCON .EQ .O) GD TO 42         000455         000455           00371         150*						
00307         138*         REWIND 2         000335           00310         139*         WRITE (10) N         000340           00313         140*         READ (2) RSTAR, (Q(I), R(I), I = 1, N)         000350           00323         141*         WRITE (10) RSTAR, (Q(I), R(I), I = 1, N)         000363           00333         142*         READ (2) RSTAR, (Q(I), W(I), U(I), V(I), I = 1, N)         000376           00334         143*         C NORMALIZE CORRECTED CONTOURS TO DRIGINAL THROAT RADIUS FOR PLOTTING         000376           00346         144*         DO 31 J = 1, N         000417         000417           00351         145*         Z(J) = Z(J)*RCIRC/RSTAR         000417         000422           00353         147*         U(J) = U(J)*RSQAR/RSTAR         000426         000426           00354         148*         31 <v(j) =="" rstar<="" td="" v(j)*rsqar="">         000426         000437           00356         149*         WRITE (10) RCIRC, RSQAR, (Z(I), W(I), U(I), V(I), I = 1, N)         000455         000455           00371         150*         IF (NPCDN . EQ. O) GO TO 42         000455         000455           00373         152*         CALL FRAME N THE MICROFICHE         000457         000457           00374         153*         XMAX = AMAX1(Q(N</v(j)>			30			
00310         139*         WRITE (10) N         000340           00313         140*         READ (2) RSTAR, (Q(I), R(I), I = 1, N)         000350           00333         142*         READ (2) RCIRC, RSOAR, (Z(I), W(I), U(I), V(I), I = 1, N)         000376           00333         142*         READ (2) RCIRC, RSOAR, (Z(I), W(I), U(I), V(I), I = 1, N)         000376           00333         143*         C         NORMALIZE CORRECTED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING         000376           00346         144*         DO 31 J = 1, N         000417         000417           00351         145*         Z(J) = Z(J)*RCIRC/RSTAR         000417         000417           00352         146*         W(J) = W(J)*RSOAR/RSTAR         000422         000422           00354         148*         31         V(J) = V(J)*RSOAR/RSTAR         000432           00356         149*         WRITE (10) RCIRC, RSOAR, (Z(I), W(I), U(I), V(I), I = 1, N)         000437           00371         150*         IF (NPCON .EO .O) GO TO 42         000455           00373         152*         CALL FRAMEV (2)         000455           00374         153*         XMIN = AMAX1 (Q(N), U(N), Z(N))         000474           00376         155*         YMAX = AMAX1 (R(N), V(N), W(N))						
00323         141*         WRITE (10) RSTAR (Q(I), R(I), I = 1,N)         000363           00333         142*         READ (2) RCIRC, RSQAR, (2(I), W(I), U(I), V(I), I = 1,N)         000376           00333         143*         C         NORMALIZE CORECTED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING         000376           00346         144*         D0 31 J = 1,N         000417         000417           00351         145*         Z(J) = Z(J)*RCIRC/RSTAR         000417           00352         146*         W(J) = U(J)*RCIRC/RSTAR         000426           00354         148*         31         V(J) = U(J)*RSQAR/RSTAR         000426           00354         148*         31         V(J) = V(J)*RSQAR/RSTAR         000432           00354         148*         31         V(J) = V(J)*RSQAR/RSTAR         000432           00354         148*         31         V(J) = Q(J).         00 GD TO 42         000432           00371         150*         IF (NPCON .EQ. O) GO TO 42         000455         000455           00373         152*         CALL FRAMEV (2)         ANK 7/83         000457           00375         154*         XMAX = AMAX1(Q(N), U(N), Z(N))         000474         000474           00376         155*         YMA		139*				
00323         141*         WRITE (10) RSTAR (Q(I), R(I), I = 1,N)         000363           00333         142*         READ (2) RCIRC, RSQAR, (2(I), W(I), U(I), V(I), I = 1,N)         000376           00333         143*         C         NORMALIZE CORECTED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING         000376           00346         144*         D0 31 J = 1,N         000417         000417           00351         145*         Z(J) = Z(J)*RCIRC/RSTAR         000417           00352         146*         W(J) = U(J)*RCIRC/RSTAR         000426           00354         148*         31         V(J) = U(J)*RSQAR/RSTAR         000426           00354         148*         31         V(J) = V(J)*RSQAR/RSTAR         000432           00354         148*         31         V(J) = V(J)*RSQAR/RSTAR         000432           00354         148*         31         V(J) = Q(J).         00 GD TO 42         000432           00371         150*         IF (NPCON .EQ. O) GO TO 42         000455         000455           00373         152*         CALL FRAMEV (2)         ANK 7/83         000457           00375         154*         XMAX = AMAX1(Q(N), U(N), Z(N))         000474         000474           00376         155*         YMA	00313	140*		READ (2) RSTAR, $(Q(I), R(I), I = 1, N)$	000350	
00333       142*       READ (2) RCIRC,RSOAR,(Z(I),W(I),U(I),V(I), I = 1,N)       000376         00333       143*       C       NORMALIZE CORRECTED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING       000376         00346       144*       DD 31 J = 1,N       000417       000417         00351       145*       Z(J) = Z(J)*RCIRC/RSTAR       000417         00352       146*       W(J) = W(J)*RCIRC/RSTAR       000422         00353       147*       U(J) = U(J)*RSQAR/RSTAR       000426         00354       148*       31 V(J) = V(J)*RSQAR/RSTAR       000432         00354       148*       31 V(J) = V(J)*RSQAR,(Z(I),W(I),U(I),V(I), I = 1,N)       000432         00371       150*       IF (NPCON .EQ. O) GO TO 42       000455         00371       150*       IF (NPCON .EQ. O) GO TO 42       000455         00374       152*       CALL FRAMEV (2)       ANK 7/83       000457         00375       154*       XMAX = AMAX1(Q(N),U(N),Z(N))       000462 *       000507         00376       155*       YMAX = AMAX1(R(N),V(N)       000507       000507         00376       155*       YMAX = AMAX1(RN),V(MAX) + 1       000507         00376       157*       NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1       000532 <td>00323</td> <td>141*</td> <td></td> <td></td> <td>000363</td> <td></td>	00323	141*			000363	
00346144*DU 31 J = 1,N00041700351145* $Z(J) = Z(J) * RCIRC/RSTAR$ 00041700352146* $W(J) = W(J) * RCIRC/RSTAR$ 00042200353147* $U(J) = U(J) * RSQAR/RSTAR$ 00042600354148*31 V(J) = V(J) * RSQAR/RSTAR00043200356149*WRITE (10) RCIRC, RSQAR, (Z(I), W(I), U(I), V(I), I = 1, N)00043700371150*IF (NPCON .EQ. O) GO TO 4200045500373152*CALL FRAME ON THE MICROFICHE00045500374153*XMIN = AMIN1 (Q(1), U(1), Z(1))00047400375154*XMAX = AMAX1(Q(N), U(N), Z(N))00047400376155*YMAX = AMAX1 (R(N), V(N), W(N))00050700377156*XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10, XMIN)00052100400157*NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1000521	00333	142*			000376	
00346144*DU 31 J = 1,N00041700351145* $Z(J) = Z(J) * RCIRC/RSTAR$ 00041700352146* $W(J) = W(J) * RCIRC/RSTAR$ 00042200353147* $U(J) = U(J) * RSQAR/RSTAR$ 00042600354148*31 V(J) = V(J) * RSQAR/RSTAR00043200356149*WRITE (10) RCIRC, RSQAR, (Z(I), W(I), U(I), V(I), I = 1, N)00043700371150*IF (NPCON .EQ. O) GD TO 4200045500373152*CALL FRAME ON THE MICROFICHE00045500374153*XMIN = AMIN1 (Q(1), U(1), Z(1))00047400375154*XMAX = AMAX1(Q(N), U(N), Z(N))00047400376155*YMAX = AMAX1 (R(N), V(N), W(N))00050700377156*XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10, XMIN)00052100400157*NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1000532	00333	143*	С	NORMALIZE CORRECTED CONTOURS TO ORIGINAL THROAT RADIUS FOR PLOTTING	000376	
00352       146*       W(J) = W(J)*RCIRC/RSTAR       000422         00353       147*       U(J) = U(J)*RSQAR/RSTAR       000426         00354       148*       31       V(J) = V(J)*RSQAR/RSTAR       000432         00356       149*       WRITE (10) RCIRC, RSQAR, (Z(I), W(I), U(I), V(I), I = 1, N)       000437         00371       150*       IF (NPCON .EQ. O) GO TO 42       000455         00371       151*       C FORCE A BLANK FRAME ON THE MICROFICHE       000455         00373       152*       CALL FRAMEV (2)       ANK 7/83       000457         00374       153*       XMIN = AMIN1 (Q(1), U(1), Z(1))       000462       •         00375       154*       XMAX = AMAX1 (Q(N), U(N), Z(N))       000474       000474         00377       156*       YMAX = AMAX1 (R(N), V(N), W(N))       000507       000521         00377       156*       XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10, XMIN)       000521       000532	00346	144*			000417	
00353         147*         U(J) = U(J)*RSQAR/RSTAR         000426           00354         148*         31         V(J) = V(J)*RSQAR/RSTAR         000432           00356         149*         WRITE (10) RCIRC, RSQAR, (Z(I), W(I), U(I), V(I), I = 1, N)         000437           00371         150*         IF (NPCON .EQ. O) GO TO 42         000455           00371         151*         C         FORCE A BLANK FRAME ON THE MICROFICHE         000455           00373         152*         CALL FRAMEV (2)         ANK 7/83         000457           00374         153*         XMIN = AMIN1 (Q(1), U(1), Z(1))         000462         000474           00376         155*         YMAX = AMAX1 (Q(N), U(N), Z(N))         000507         000507           00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10, XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532	00351	145*		Z(J) = Z(J) * RCIRC/RSTAR	000417	
00354       148*       31       V(J) = V(J)*RSQAR/RSTAR       000432         00356       149*       WRITE (10) RCIRC,RSQAR,(Z(I),W(I),U(I),V(I), I = 1,N)       000437         00371       150*       IF (NPCON .EQ. 0) GD TD 42       000455         00371       151*       C       FORCE A BLANK FRAME ON THE MICROFICHE       000455         00373       152*       CALL FRAMEV (2)       ANK 7/83       000457         00374       153*       XMIN = AMIN1 (Q(1),U(1),Z(1))       000474       000462         00376       155*       YMAX = AMAX1(Q(N),U(N),Z(N))       000474       000507         00377       156*       XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10,XMIN)       000521         00400       157*       NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1       000532					000422	
00356         149*         WRITE (10) RCIRC,RSQAR,(2(1),W(1),U(1),U(1), 1 = 1,N)         000437           00371         150*         IF (NPCON .EQ. O) GO TO 42         000455           00371         151*         C         FORCE A BLANK FRAME ON THE MICROFICHE         000455           00373         152*         CALL FRAMEV (2)         ANK 7/83         000457           00374         153*         XMIN = AMIN1 (Q(1),U(1),Z(1))         000462         000474           00376         155*         YMAX = AMAX1 (Q(N),U(N),Z(N))         000507         000507           00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10,XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532				U(J) = U(J) * RSQAR/RSTAR		
00356         149*         WRITE (10) RCIRC, RSQAR, (2(1), W(1), U(1), U(1), 1 = 1, N)         000437           00371         150*         IF (NPCON .EQ. O) GO TO 42         000455           00371         151*         C         FORCE A BLANK FRAME ON THE MICROFICHE         000455           00373         152*         CALL FRAMEV (2)         ANK 7/83         000457           00374         153*         XMIN = AMIN1 (Q(1), U(1), Z(1))         000462         000474           00376         155*         YMAX = AMAX1 (Q(N), U(N), Z(N))         000507         000507           00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10, XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532			31	V(J) = V(J) * RSQAR/RSTAR		
00371         151*         C         FORCE A BLANK FRAME ON THE MICROFICHE         000455           00373         152*         CALL FRAMEV (2)         ANK 7/83         000457           00374         153*         XMIN = AMIN1 (Q(1),U(1),Z(1))         000462           00375         154*         XMAX = AMAX1(Q(N),U(N),Z(N))         000474           00376         155*         YMAX = AMAX1 (R(N),V(N),W(N))         000507           00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10,XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532				WRITE (10) RCIRC, RSQAR, $(2(1), W(1), U(1), V(1), 1 = 1, N)$		
00373         152*         CALL FRAMEV (2)         ANK 7/83         000457           00374         153*         XMIN = AMIN1 (Q(1),U(1),Z(1))         000462         000462           00375         154*         XMAX = AMAX1(Q(N),U(N),Z(N))         000474           00376         155*         YMAX = AMAX1 (R(N),V(N),W(N))         000507           00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10,XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532		-	_			
00374         153*         XMIN = AMIN1 (Q(1),U(1),Z(1))         000462           00375         154*         XMAX = AMAX1(Q(N),U(N),Z(N))         000474           00376         155*         YMAX = AMAX1 (R(N),V(N),W(N))         000507           00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10,XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532			С	FURCE A BLANK FRAME ON THE MICROFICHE	000455	
00375         154*         XMAX = AMAX1(Q(N), U(N), Z(N))         000474           00376         155*         YMAX = AMAX1 (R(N), V(N), W(N))         000507           00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10, XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532				CALL FRAMEV (2) ANK 7/83	000457	
00376         155*         YMAX = AMAX1 (R(N),V(N),W(N))         000507           00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10,XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532	*** *****************				***************************************	•
00377         156*         XMIN = SIGN(AINT(ABS(XMIN)*10.0)/10.0 + 0.10,XMIN)         000521           00400         157*         NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1         000532						
00400 157* NOGRID = IFIX((XMAX - XMIN)/YMAX) + 1 000532			· · · · · · · · · · · · · · · · · · ·	$\frac{1}{2} \frac{1}{2} \frac{1}$		
				AMIN = SIGN(AIN)(ABS(AMIN)*10.0)/10.0 + 0.10, XMIN)		
	************************					
	00401	100*		CALL DUTIV(1)	000044	

00402	159*		YB = 0.0	000547
00403	160*		YT = YMAX	000550
00404	161*		XR = XMIN	000552
00405	162*	•••••	LA = 1	000554
00406	163*		LB = 1	000556
00407	164*		LC = 1	000557
00410	165*		DO 35 M = 1.NOGRID	000565
00413	166*		XL = XR	000565
00414	167*		XR = XR + YT	000567
00415	168*		CALL NICK (11.N.LA.LXIN.XL.XR.YB.YT.Q.R) ANK 3/83	000571
00416	169*		IF (M .NE. 1) GO TO 32	000606
00420	170*	••••••	CALL PRINTV (8,8HRSTAR = ,100,1005) ANK 8/83	000611
00421	171*		CALL LABLY (RSTAR.215.1005.7.1.2)	000617
00422	172*	••••••••	CALL PRINTV (11,11HR CIRCLE = ,420,1005) ANK 8/83	000627
00423	173*		CALL LABLV (RCIRC, 574, 1005, 7, 1, 2)	000635
00423	174*		CALL PRINTV (11,11HR SQUARE = ,775,1005) ANK 8/83	000645
00424	175*		CALL LABLV (RSQAR, 930, 1005, 7, 1, 2)	000653
00425	176*	20	CALL NICK (2.0, N, LB, LWX0, XL, XR, YB, YT, Z, W) ANK 3/83	000664
00428	177*	32	IF(MOD(M,2).EQ.1.AND.MOD(M,3).EQ.1) CALL PRINTV(72.LYIN.30.1023) ANK 8/83	000700
00427	178*	•••••••	un and a succession of the second	000726
			IF(MOD(M,2).EQ.O.AND.MOD(M,3).EQ.1) CALL PRINTV(72,LWY0,30,1023) ANK 8/83	
00433	179*		IF(MOD(M,2).EQ.1.AND.MOD(M,3).EQ.0) CALL PRINTV(72,LYIV,30,1023) ANK 8/83	000753
00435	180*	35	CALL NICK (3,0,N,LC,LXIV,XL,XR,YB,YT,U,V) ANK 3/83	001000
00437	181*		CALL BUTTV(0)	001017
00440	182*	42	IWALL = 14	001023
00441	183*		WRITE (10) NETA, IWALL	001024
00445	184*		REWIND 4	001034
00446	185*		D0 70 L = 1,IS	001042
00451	186*		DO 45 Î = 1,NETA	001057
00454	187*	45	READ (4) Y(I,12),Y(I,2),Y(I,13),Y(I,11)	001057
00463	188*		DO 50 I = 1.NETA	001072
00466	189*	50	READ (4) X(I),Y(I,4),Y(I,3),Y(I,14),Y(I,7),Y(I,8)	001072
00477	190*		DO 52 I = 1,NETA	001107
00502	191*		READ (4) Y(I,5),Y(I,6),Y(I,9),Y(I,1),Y(I,10)	001107
00512	192*		DO 55 I = 1,NETA	001124
00515	193*	55	WRITE (10) $X(I), (Y(I,K), K = 1, IWALL)$	001124
00525	194*		IF (NSTAT(L) .EQ. O) GO TO 70	001141
00527	195*		CALL MINMAX (NETA,1,1,NETA,X,XR,XL)	001143
00530	196*		IF (L .GT. 1) $FLDX(12,2) = ZS(L)$	001157
00532	197*		DO 65 J = 1,IWALL	001172
00535	198*		IF (NSTP(J) .EQ. O) GO TO 65	001172
00537	199*		CALL MINMAX (NETA,2,1,1,Y(1,J),YT,YB)	001174
00537	200*	С	SKIP PLOT IF ALL DATA IS ZERO	001174
00540	201*		IF (ABS(YB) + ABS(YT) .LE. O.O) GO TO 65 ANK 7/83	001207
00542	202*		CALL QUIK3L(-1,YB,YT,XL,XR,IPP,FLDP(1,J),FLDX(1,2),-NETA,Y(1,J),X)ANK 5/83	001214
00543	203*		CALL PRINTV (78,CASE,30,1023) ANK 7/83	001237
00544	204*	65	CONTINUE	001253
00546	205*	70	CONTINUE	001253
00550	206*	•••••••••••••••••••••••••••••••••••••••	WRITE (6,2) IS,N,NETA	001253
00555	207*	2	FORMAT (///10X,'BLIMP PLOT TAPE COMPLETED IS =', I3,' N =', I4,	001263
00555	208*		1 'NETA =', I3//)	001263
00556	209*		CALL ENDJOB	001263
00557	210*	••••••••••	RETURN	001265
00560	211*		END	001322

END OF COMPILATION:

NO DIAGNOSTICS.

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### @SYS\$\*MSFCFOR\$.FOR,IS ROUGH HSA E3 -12/10/84-22:23:44 (,0)

### SUBROUTINE ROUGH ENTI

ENTRY POINT 000172

## STORAGE USED: CODE(1) 000176; DATA(0) 000034; BLANK COMMON(2) 000000

### COMMON BLOCKS:

0003 RUF 000022 0004 RUF3 000002

EXTERNAL REFERENCES (BLOCK, NAME)

0005 AL0G10 0006 XPRR 0007 SQRT 0010 NERR3\$

## STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000041	10L	0001	. (	000163	100L	0001		000052	20L	0003 F	R	000021	CF	0000	R 00000	) CFCFI
0000 R	000001	CFI	0000	R (	000002	CFR	0003	R	000000	CFS	0004	(	000001	DEACY	0000	R 00000-	4 ETAK
0003 R	000016	FMF	0003	R (	000004	HAW	0003	R	000003	HE	0003 F	R	000005	HW	0003	I 00001	5 ICF
0000	000025	INJP\$	0003	R	000011	MUE	0003	R	000010	MUW	0003 F	R (	000020	PCT	0003	R 00001	
0000 R	000005	REK	0003	R	000006	RHOE	0003	R	000007	RHOW	0003 F	R (	000014	RK	0003	R 00001	
0000 R			0003	R	000001	STS	0003	R	000013	UE	0004		000000	UTAU	0000	R 000003	B UTAU1
0003 R	000002	X															

00101	1*		SUBROUTINE ROUGH(A)	000000
00103	2*		REAL MUW, MUE	000000
00104	3*		COMMON/RUF/CFS,STS,X,HE,HAW,HW,RHOE,RHOW,MUW,MUE,PR,UE,RK,ICF,	000000
00104	4*		\$ FMF,ST,PCT,CF	000000
00105	5*		COMMON/RUF3/UTAU, DEACY	000000
00105	6*	С		000000
00105	7*	С	INPUT VARIABLES	000000
00105	8*	С		000000
00105	9*	С	CFS - SMOOTH WALL SKIN FRICTION COEFFICIENT	000000
00105	10*	С	STS - SMOOTH WALL STANTON NUMBER	000000
00105	11*	С	X - RUNNING LENGTH (FT)	000000
00105	12*	С	HE - B.L. EDGE ENTHALPY (BTU/LBM)	000000
00105	13*	С	HAW - ADIABATIC WALL ENTHALPY (BTU/LBM)	000000
00105	14+	С	HW - WALL ENTHALPY (BTU/LBM)	000000
00105	15*	C	RHOE - B.L. EDGE DENSITY (LBM/CU.FT.)	000000
00105	16*	С	RHOW - WALL DENSITY (LBM/CU.FT.)	000000
00105	17*	C	MUW - WALL VISCOSITY (LBM/FTSEC)	000000
00105	18*	С	MUE - EDGE VISCOSITY (LBM/FTSEC)	000000
00105	19*	С	PR - PRANDTL NUMBER (EDGE)	000000
00105	20*	С	UE - B.L. EDGE VELOCITY (FT/SEC)	000000
00105	21*	С	RK - SAND ROUGHNESS HEIGHT (FT)	000000
00105	22*	С	ICF - SKIN FRICTION FLAG 1 - PRANDTL - SCHLICHTING	000000
00105	23*	С	2 - DROBLENKOV	000000
00105	24*	С	FMF - MANGLER FACTOR 1.00 - 2D OPTION	000000

0105	25*	C 1.15 - AXISYMETRIC	000000
0105	26*	C	000000
0105	27*	C	000000
0105	28*	C OUTPUT VARIABLES	000000
105	29*	C	000000
105	30*	Č ST - ROUGH WALL STANTON NUMBER	000000
105	31*	C PCT - PERCENT OF TRANSITION TO FULLY ROUGH	000000
105	32*	C CF - ROUGH WALL SKIN FRICTION COEFFICIENT	000000
105	33*		000000
0106	34*	IF(ICF.EQ.3)GO TO 100	000000
0106	34+ 35*	C SKIN FRICTION COMPRESSIBILITY (YOUNG)	000000
0110	36*	CFCFI=(0.365*HE/HAW)+(0.635*HE/HW)	000002
<u>2111</u>	37*	IF(CFCFI.LE.O.O)CFCFI=0.0	000012
0111	38*	C INCOMPRESSIBLE ROUGH WALL SKIN FRICTION	000012
0113	39*	IF(ICF_NE_1)GO_TO_10	000016
0113	40*	C OPTION(1) PRANDTL - SCHLICHTING	000016
)115	41*	CFI=(2.87+1.58*ALOG1O(X/RK))**-2.5	000021
0116	42*	GD TO 20	000037
0117	43*	10 CONTINUE	000041
0117	44*	C OPTION(2) DROBLENKOV	000041
0120	45 <b>*</b>	CFI=0.0139*(X/RK)**-(1.0/7.0)	000041
0121	46*	20 CONTINUE	000052
0122	47*	CFR=CFCFI*CFI*FMF	000052
)122	48*	C TRANSITION CRITERION (FENTER)	000052
0123	49*	UTAU1=UE*SQRT((CFR/2.0)*(RHDE/RHDW))	000055
0124	50*	ETAK=RHQW+UTAU1+RK/MUW	000070
0124	51*	C ROUGH SURFACE TURBULENT STANTON NUMBER	000070
0124	52*	C A=0.52 NOMINAL . RANGE OF 0.45 TO 0.7 (OWEN - THOMSON)	000070
0125	53*		000074
0126	54*	STR=CFR/2.*(1.+A*(CFR/2.)**.725*REK**.45*PR**.8)**-1. @ (SEIDMAN)	000101
0126	55*	C STR=CFR/2.*(1.+A*((CFR/2.)*(HW/HE))**.5*REK**.45*PR**.8)**-1. @ (HILL)	000101
0126	56*		000101
0126	57*	C 100 USED BY FENTER , 70 USED BY HILL , 65 USED BY PIMENTA	000101
)126	58*	C PIMENTA VALUE CURRENTLY USED FOR TRANSITION	000101
)126	59*	C ETAK LE. 5.0 SMODTH	000101
)126		C 5.0 LE. ETAK LE. 5.0 TRANSITIONALLY ROUGH	000101
	- +		000101
)126	61*	C 65.0 .LT. ETAK ROUGH	
)126	62*		000101
)127	63*	PCT=(ETAK-5.0)/(65.0-5.0)	000126
)130	64*	IF(PCT.LT.O.O)PCT=0.0	000132
)132	65*	IF(PCT.GT.1.0)PCT=1.0	000136
)134	66*	CF=(PCT*CFR)+((1.0-PCT)*CFS)	000144
)135	67*	ST=(PCT*STR)+((1.0-PCT)*STS)	000154
0136	68*	100 CONTINUE	000163
0137	69*	RETURN	000163
0140	70*	ÉND	000175
			·
	ND 05 C(	DMPILATION: NO DIAGNOSTICS.	

### @SYS\$\*MSFCFOR\$.FOR,IS PARTCL-HSA E3 -12/10/84 - 22:23:46 (,0)

#### SUBROUTINE PARTCL ENTRY POINT 000165

## STORAGE USED: CODE(1) 000170; DATA(0) 000026; BLANK COMMON(2) 000000

COMMON	BLOCKS:
	DE00110.

PARTI 000020 0003 0004 RUF 000022

EXTERNAL REFERENCES (BLOCK, NAME)

0005 SQRT XPRR 0006 0007

NERR3\$

### STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000041	100L	0001	000075	105L	0001	000110	110L	0001	000152	120L	0001	000155	160L
 0000 R	000003	BETA5	0003	R 000006	CF	0004 R	000021	CFR	0004 R	000000	CFRO	0003 R	000004	СР
0000 R	000005	D	0004	000012	DUMM11	0004	000020	DUMM17	0004	000003	DUMM4	0004 R	000004	DUMM5
 0004 R	000005	DUMM6	0004	000007	DUMM8	0004	000010	DUMM9	0004	000016	FMF	0004	000015	ICF
0003 I	000013	ILT	0000	000016	INJP\$	0003	000017	IPART	0003 R	000015	K	0003 R	000010	KG
0003 R	000001	LAMBV	0003	R 000000	M	0004 R	000011	MUE	0000 R	000000	NU	0000 R	000001	PI
0003 R	000014	Q	0000	R 000006	QDOT	0003 R	000003	RED	0004 R	000006	RHOE	0003 R	000002	RHOP
 0004	000014	RK	0003	000016	RP	0004 R	000017	STR	0004 R	000001	STS	0003 R	000011	TAW
0003 R	000012	TW	0004	R 000013	UE	0000 R	000004	W	0003 R	000007	WF	0003 R	000005	WP
 0004 R	000002	X	0000	R 000002	Y									

00101	1*	SUBROUTINE PARTCL		000000	
00103	2*	REAL K,KG,LAMBV,M,MUE,NU		000000	•••••
00104	3*	COMMON /PARTI/M,LAMBV,RHOP,RED,CP,WP,CF,W	/F,KG,IAW,IW,	000000	····
00104	4*	\$ ILT,Q,K,RP,IPART		000000	
00105	5*	COMMON/RUF/CFRO,STS,X ,DUMM4,DUMM5,DUM	IM6, RHOE, DUMM8,	000000	
00105	6*	1 DUMM9, MUE, DUMM11, UE, RK, ICF, FMF, STR, DUMN	117,CFR	000000	
00105	7*	C	,	000000	
00105	8*	C INPUT VARIABLES		000000	
00105	9*	С	· · · · · · · · · · · · · · · · · · ·	000000	
00105	10*	C M - AVERAGE PARTICLE MASS	(LBM)	000000	
00105	11*	C UE - BOUNDARY LAYER EDGE VELOCITY	(FT/SEC)	000000	
00105	12*	C SIGMA - STOKERS DRAG COEFFICIENT	(LBM/SEC)	000000	
00105	13*	C A - RADIUS OF SPHERICAL PARTICLE	(FT)	000000	
00105	14*	C MUE - GAS VISCOSITY	(LBM/FT SEC)	000000	
00105	15*	C LAMBV - MOMENTUM RANGE	(FT)	000000	
00105	16*	C RHOP - PARTICLE MASS DENSITY OF THE GAS	(LBM/FT3)	000000	
00105	17*	C RHOE - GAS DENSITY	(LBM/FT3)	000000	
00105	18*	C RED - EDGE REYNOLDS NUMBER BASED ON D	·	000000	
00105	19*	C X - RUNNING LENGTH	(FT)	000000	
00105	20*	C TAU - SHEAR STRESS	(LBF/FT2)	000000	
00105	21*	C CFRO - FRICTION COEFFICIENT		000000	
00105	22*	C STS - SMOOTH STANTON NUMBER		000000	

00105	23*	C CP - SPECIFIC HEAT OF THE SOLID PARTICLE (BTU/LB DEG F)	000000
00105	24*	C WP - MASS FLOW OF PARTICLES (LB/FT2 SEC)	000000
00105	25*	C CF - SPECIFIC HEAT AT CONSTANT PRESSURE OF FLUID (BTU/LB DEG F)	000000
00105	26*	C WF - MASS FLOW OF FLUID (LB/FT2 SEC)	000000
00105	27*	C K- RATIO OF PARTICLE DENSITY TO FLUID MASS DENSITY AT EDGE	000000
00105	28*	C KG - THERMAL CONDUCTIVITY OF THE GAS (BTU/SEC FT DEG K)	000000
00105	29*	C D - DIAMETER OF THE TUBE (FT)	000000
00105	30*	C NU - NUSSELT'S NUMBER	000000
00105	31*	C TAW - ADIABATIC WALL TEMPERATURE DEG. R	000000
00105	32*	C TW - WALL TEMPERATURE DEG. R	000000
00105	33*	C ILT - FLOW TYPE FLAG 1 - LAMINAR	000000
00105	34*	C 2 - TURBULENT	000000
00105	35*	C OUTPUT VARIABLES	000000
00105	36*	С	000000
00105	37*	C CFR - MODIFIED FRICTION COEFFICIENT	000000
00105	38*	C STR - PARTICLE STANTON NUMBER	000000
00105	39*	с	000000
00106	40*	PI=3.1415927	000000
00107	41*	IF(ILT.EQ.2) GOTO 100	000001
00107	42*	C IF ILT = 2 THE FLOW IS TURBULENT	000001
00111	43*	K=RHOP/RHOE	000004
00112	44*	Y=LAMBV/X	000007
00112	45*	C THE EQUATIONS USED TO COMPUTE QDOT AND CFR ARE DIFFERENT WHEN	000007
00112	46*	C LAMBDA/X IS LESS THAN 1. THAT THE EQUATIONS USED WHEN LAMBDA/X	000007
00112	47*	C IS GREATER THAN 1. HERE ONLY LAMBDA/X LESS THAN 1 CASE IS USED.	000007
00113	48*	10 CFR=CFR0*SQRT(1.+K)*(1.+(.49*(Y*K /(1.+K))))	000012
00114	49*	STR = STS*SQRT(1.+K)*(1.+(.49*(Y*K /(1.+K))))	000031
00115	50*	Q =STR/STS	000035
00116	51*	GOTD 160	000037
00117	52*	100 BETA5=(WP*CP)/(WF*CF)	000041
00120	53*	W=WP/WF	000046
00121	54*	IF(W.LT.1OR.ABS(W-1.).LTOO1) GD TO 105	000051
00123	55*	IF(W.GT.1.) GOTO 110	000070
00123	56*	C THIS IF STATEMENT SERVES THE SAME PURPOSE AS THE IF STATEMENT FOR	000070
00123	57*	C THE LAMINAR CASE	000070
00125	58*	105 CFR=CFRO*(1.+BETA5)	000075
00126	59*	STR =STS *(1.+BETA5)	000101
00127	60*	Q =STR/STS	000104
00130	61*	GOTO 120	000106
00131	62*	110 NU=.14*(RED**.6)*(W**.45)	000110
00132	63*	D=RED/(RHOE*UE/MUE)	000123
00133	64*	QDOT = ((NU * KG)/D) * (TAW - TW)	000131
00134	65*	STR=QDOT/((DUMM5-DUMM6)*RHDE*UE)	000137
00135	66*	Q =STR/STS	000145
00136	67*	CFR=Q*CFR0	000147
00137	68*	120 CONTINUE	000152
00140	69*	RETURN	000152
00141	70*	160 CONTINUE	000155
00142	71*	RETURN	000155
00143	72*	END	000167

END OF COMPILATION:

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NO DIAGNOSTICS.

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### @SYS\$\*MSFCFOR\$.FOR,WUS BLKDTA

HSA E3 -12/10/84-22:23:49 (22,23)	
-21	
COMMON/RUF/DUMM1, DUMM2, DUMM3, DUMM4, DUMM5, DUMM6, DUMM7, DUMM8, DUMM9,	
\$ DUMM 10, DUMM 11, DUMM 12, RK, ICF, FMF, DUMM 16, DUMM 17, DUMM 18	
COMMON/PARTI/PARTM, DUMM24, RHOPA, DUMM23, CPART, WP, DUMM19, WF,	
<pre>\$ DUMM22,DUMM20,DUMM21,ILT,PF,AK,RP,IPART</pre>	
COMMON /LAM/ ILAMIN	
-92	
C DEFAULT VALUES FOR ROUGHNESS OPTION	•
DATA FMF/1.15/,ICF/0/,RK/0.0/	
C DEFAULT VALUES FOR PARTICLE OPTION	
DATA IPART/O/,RP/O./,WP/O./,WF/1./,CPART/O./,RHOPA/O./	
C DEFAULT VALUES FOR RELAMINARIZATION OPTION	
DATA ILAMIN/O/	

BLOCK DATA

STORAGE USED: CODE(1) 000000; DATA(0) 000000; BLANK COMMON(2) 000000

COMMON BLOCKS:

0003	AL	000002			•					
0004	CARDS	000003								
0005	CONSTS									
0006	CRBCOM									
0007	EPSCOM	000045	·							
0010	EQPCOM	000435				•••••••••••••••••••••••••••••••••••••••	••••••			
0011	ETACOM	000017								
0012	HOLLER					••••••		······································		
0013	INPUTI	000015								
0014	INTCOM	000115			••••••••••••••••••••••••••••••••••••					
0015	LOWTH	001372								
0016	NZERO	000001			•••••••••••••••••••••••					
0017	PLOTS	000172								
0020	PRMALS	000154			••••••••••••••••				·····	
0021	RFTCOM	000045								
0022	RUF	000022		•••••••••••••••••••••••••••••••••••••••						
0023	PARTI	000020								
0024	LAM	000001								
0025	SAHA	000066								
0026	TEMCOM	000162					******	***************************************		
0027	UNICOM	000011							1	
0030	WALTEM	000715			••••••••••	•••••••••••••••••	•••••••••••••••••••••••••••••••••••••••			

## STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0020	)	000000	Α	0023	000015	AK	0030	000000	ALTAB	0012 I	000000	AREA	0006	000000	ASU
0010	)	000000	ATA	0010 R	000030	BASMOL	0014	000000	CASE	0014 R	000015	CBAR	0007 R	000000	CLNUM
0023	R	000004	CPART	0005 R	000000	CPFL	0025	000000	CPH	0015 R	000000	CPL	0012 I	000002	CQ
0012	2 I (	000006	DENS	0012 I	000010	DIST	0007	000001	DL	0005 R	000001	DPR	0004	000000	DUB8
0022	2	000000	DUMM 1	0022	000011	DUMM10	0022	000012	DUMM11	0022	000013	DUMM12	0022	000017	DUMM16
0022	2	000020	DUMM17	0022	000021	DUMM18	0023	000006	DUMM19	0022	000001	DUMM2	0023	000011	DUMM20
0023	}	000012	DUMM21	0023	000010	DUMM22	0023	000003	DUMM23	0023	000001	DUMM24	0022	000002	DUMM3
0022	!	000003	DUMM4	0022	000004	DUMM5	0022	000005	DUMM6	0022	000006	DUMM7	0022	000007	DUMM8
0022	2	000010	DUMM9	0007 R	000020	ELCON	0012 I	000012	ENERGY	0010 R	000031	EPOVRK	0007	000021	EPSA
0011	R	000000	ETA	0010	000032	FF	0004 R	000001	FFAR	0004 R	000002	FITMOL	0017	000000	FLDX
0012	? I (	000014	FLUX	0022 R	000016	FMF	0021 R	000000	F2FIX	0021	000017	F2FIXT	0005 R	000002	GC
0012	! I •	000016	HEAT	0015 R	000226	HL	0012 I	000022	HWALL	0014	000016	I	0015 I	000454	IADD

0013 I 000000 IBODY	0022 I 000015 ICF	0025 I 000062 ICON	0030 I 000231 ICOOL	0026 I 000000 IDAT
0013 I 000001 IDERIV	0013 I 000002 IDIFF	0026 I 000001 IED	0030 000232 IENH	0013 I 000003 IETA
0013 I 000004 IFIT	0013 I 000005 IFLOW	0013 I 000006 IGUESS	0024 I 000000 ILAMIN	0015 I 000455 ILSP
0023 000013 ILT	0026 I 000002 IND	0015 I 000537 INEW	0026 I 000003 IOR	0026 I 000004 IOUT
0023 I 000017 IPART	- 0025 I 000063 IPASS	0003 I 000000 IPLOT	0017 I 000030 IPP	0020 I 000146 IPUNCH
0026 I 000005 IRE	0025 I 000064 IRITE	0026 I 000006 IROC	0026 I 000007 ISAV	0026 I 000010 ITA
0013 I 000007 ITDK	0026 I 000011 ITE	0013 I 000010 ITHERM	0025 I 000065 ITRCNT	0003 I 000001 IUNIT
0013 I 000011 IWALL	0020 000147 J	0013 I 000012 JWALL	0014 I 000023 KAPPA	0013 I 000013 KEDGP
0014 I 000024 KONRFT	0014 000025 KR9	0026 I 000012 LIF	0026 I 000014 LLA	0026 I 000015 LLAW
0026 I 000016 LOT	0026 I 000017 MAIN	0012 I 000024 MASS	0026 I 000020 MDEG	0017 I 000031 MS
0026 I 000021 MURD	0026 I 000022 NCH	0014 I 000114 NETA	0026 I 000023 NIT	0015 I 000551 NLTSP
0017 I 000032 NPCON	0017 I 000033 NPLOT	0021 I 000043 NP0INT	0017 I 000071 NSTAT	0017 I 000153 NSTP
0026 I 000024 NTOR	0013 I 000014 NTROPY	0016 I 000000 NUL	0026 I 000026 NW	0023 000000 PARTM
0005 R 000003 PATM	0023 000014 PF	0005 R 000004 PI	0020 R 000153 PN0RM	0012 I 000030 PRESS
0007 R 000040 PRT	0012 I 000032 RAD	0021 R 000044 RATLIM	0005 R 000005 RBAR	0007 R 000041 RETR
0012 I 000034 REY	0023 R 000002 RH0PA	0007. 000042 RHOVS	0022 R 000014 RK	0023 R 000016 RP
0005 R 000006 RVAR	0007 R 000043 SCT	0012 I 000036 SHEAR	0010 R 000434 SIGMA	0005 R 000007 SIPSF
0015 R 000552 SL	0006 R 000110 STEF	0015 I 001000 SUBLT	0012 I 000040 TCON	0012 I 000044 TEMP
0012 I 000046 THRUST	0015 R 001144 TL	0030 R 000714 TOLOW	0027 R 000000 UCD	0027 R 000001 UCE
0027 R 000002 UCL	0027 R 000003 UCM	0027 R 000004 UCP	0027 R 000005 UCR	0027 R 000006 UCS
0027 R 000007 UCT	0027 R 000010 UCV	0012 I 000050 VEL	0012 I 000052 VIS	0023 R 000007 WF
0023 R 000005 WP	0012 I 000056 XIPR	0007 R 000044 YAP		

00101	1*	BLOCK DATA		000000	
00101	2*	C		000000	
00102	3*	COMMON /AL/ IPLOT,IUNIT	/AL/	000000	
00103	4*	COMMON /CARDS/ DUB8,FFAR,FITMOL	/CARDS/	000000	
00104	5*	COMMON /CONSTS/ CPFL,DPR,GC,PATM,PI,RBAR,RVAR,SIPSF	/CONSTS/	000000	
00105	6*	COMMON /CRBCOM/ ASU(72),STEF	/CRBCOM/	000000	
00106	7*	COMMON /EPSCOM/ CLNUM,DL(15),ELCON,EPSA(15),PRT,RETR,RHOVS,SCT,YA	P/EPSCOM/	000000	
00107	8*	COMMON /EQPCOM/ ATA(24),BASMOL,EPOVRK,FF(258),SIGMA	/EQPCOM/	000000	
00110	9*	COMMON /ETACOM/ ETA(15)	/ETACOM/	000000	
00111	10*	COMMON /HOLLER/ AREA(2),CQ(2,2),DENS(2),DIST(2),ENERGY(2),FLUX(2)	/HOLLER/	000000	· · ·
00111	11*	1 HEAT(2,2),HWALL(2),MASS(2,2),PRESS(2),RAD(2),REY(2),SHEAR(2),	/HOLLER/	000000	
00111	12*	2 TCON(2,2),TEMP(2),THRUST(2),VEL(2),VIS(2,2),XIPR(2)	/HOLLER/	000000	
00112	13*	COMMON /INPUTI/ IBODY,IDERIV,IDIFF,IETA,IFIT,IFLOW,IGUESS,ITDK,	/INPUTI/	000000	
00112	14*	1 ITHERM, IWALL, JWALL, KEDGP, NTROPY	/INPUTI/	000000	
00113	15*	COMMON /INTCOM/ CASE(13),CBAR,I(5),KAPPA,KONRFT,KR9(55),NETA	/INTCOM/	000000	
00114	16*	COMMON /LOWTH/ CPL(3,50),HL(3,50),IADD,ILSP(50),INEW(10),NLTSP,	/LOWTH/	000000	
00114	17*	1 SL(3,50), SUBLT(50,2), TL(50,3)	/LOWTH/	000000	
00115	18*	COMMON /NZERO/ NUL	/NZERO/	000000	
00116	19*	COMMON/PLOTS/ FLDX(12,2), IPP,MS,NPCON,NPLOT(30),NSTAT(50),NSTP(15	) /PLOTS/	000000	
00117	20*	COMMON /PRMALS/ A(102), IPUNCH, J(4), PNORM	/PRMALS/	000000	
00120	21*	COMMON /RFTCOM/ F2FIX(15),F2FIXT(20),NPOINT,RATLIM	/RFTCOM/	000000	
00121	22*	COMMON/RUF/DUMM1,DUMM2,DUMM3,DUMM4,DUMM5,DUMM6,DUMM7,DUMM8,DUMM9,	•••••••	NEW000000	
00121	23*	\$ DUMM10,DUMM11,DUMM12,RK,ICF,FMF,DUMM16,DUMM17,DUMM18		NEW000000	
00122	24*	COMMON/PARTI/PARTM, DUMM24, RHOPA, DUMM23, CPART, WP, DUMM19, WF,		NEW000000	
00122	25*	<pre>\$ DUMM22,DUMM20,DUMM21,ILT,PF,AK,RP,IPART</pre>		NEW000000	
00123	26*	COMMON /LAM/ ILAMIN		NEW000000	
00124	27*	COMMON /SAHA/ CPH(50),ICON,IPASS,IRITE,ITRCNT	/SAHA/	000000	
00125	28*	COMMON /TEMCOM/ IDAT, IED, IND, IOR, IOUT, IRE, IROC, ISAV, ITA, ITE,	/TEMCOM/	000000	· · · · · · · · · · · · · · · · · · ·
00125	29*	1 LIF(2),LLA,LLAW,LOT,MAIN,MOEG,MURD,NCH,NIT,NTOR(2),NW(92)	/TEMCOM/	000000	
00126	30*	COMMON /UNICOM/ UCD,UCE,UCL,UCM,UCP,UCR,UCS,UCT,UCV	/UNICOM/	000000	
00127	31*	COMMON /WALTEM/ ALTAB(153),ICODL,IENH(306),TOLQW	/WALTEM/	000000	
00127	32*	C		000000	
00130	33*	INTEGER AREA, CO, DENS, DIST, ENERGY, FLUX, HEAT, HWALL, PRESS, RAD, REY,	ANK 5/83	000000	
00130	34*	1 SHEAR, SUBLT, TCON, TEMP, THRUST, VEL, VIS, XIPR		000000	

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00130	35*	С		000000
00131	36*		DATA IDAT/5HDATA)/.IED/5HEDGE /.IND/6HREWIND/.IOR/2HOR/.IOUT ANK 7/83	000000
00131	37*		1 /GHOUTPUT/, IRE/5HREAD(/, IROC/6HROCOUT/, ISAV/5HSAVE /, ITA/6HTAPE) ANK 7/83	000000
00131	38*	••••••	2/,ITE/6HWRITE(/,LIF/4HPROF,4HILE /,LLA/3HALL/,LLAW/5HWALL /, ANK 7/83	000000
00131	39*		3 LOT/6H PLOT / MAIN/6HBLMAIN/, MOEG/6HGEOM [/, MURD/6H(DRUM /, ANK 7/83	000000
	40*			
00131	-			000000
00131	41*		5 60H7X, 'THE FOLLOWING STORAGE UNITS ARE USED IN THE BLIMP PROGR, ANK 7/83	000000
00131	42*		6 60HAM'///A6, 2 ', A6, A2, 1X, A6, 1X, A6, ' [', A6, ']; ', 2A6, ANK 7/83	000000
00131	43*		7 60H2A5, ', ', A6, ']; ', A6, ' [', 3A5, ', ', A6, ', ', A6, 2A4, A5, ']; '/ , ANK 7/83	000000
00131	44*		8 60H23X, A6, '[', A6, ', ', A5, 2A4, A5, ']'//A6, '3 ', A6, A2, 1X, A6, 1X, , ANK 7/83	000000
00131	45*		9 60HA6, ' [',A6,']; ',A6,' [',A6,2A5,']; ',A6,'[',A6,', ',3A5, , ANK 7/83	000000
00131	46*		A 60H']'// A6, '4 ', A6, A2, 1X, A6, 1X, A6, '[', A6, ']; ', A6, '[', , ANK 7/83	000000
00131	47*		B 60HA6, 2A4, A5, ']; ', A6, '[', A6, ', ', A5, 2A4, A5, ']'// A6, ANK 7/83	000000
00131	48*		C 60H'10 '.A6, A2, A6, A5, 2A6, '[', A6, A3, A6, A5, ']'// A6, . ANK 7/83	000000
00131	49*		D 60H'15 ', A6, A2, 1X, A6, A5, A6, 1X, A6, '[', A6, A3, 1X, A6, A5,, ANK 7/83	000000
00131	50*		E 6H'1'/ )/ ANK 7/83	000000
00157	50+ 51*		DATA NPCON,NSTP,NPLOT,IPLOT,NSTAT,IUNIT,IPUNCH,NPOINT,IPP/16*1,5* ANK 7/83	000000
00157	52*		12,7*1,2,2,16*1,0,1,49*0,2,3,3,40/,ELCON,ETA/.44,0,,002,006,01, ANK 7/83	000000
00157	53*		4 0.025,0.06,0.15,0.35,0.60,0.80,1.0,1.35,1.75,2.05,2.50/,	000000
00157	54*		5 F2F1X/0.0,0.05,0.12,0.25,0.35,0.45,0.60,0.68,0.77,0.86,0.95,0.97,	000000
00157	55*		6 0.98.0.99,1.0/,MS/30/,PNORM/1.0/,YAP/11.8230/, ANK 3/83	000000
00157	56*		1 CLNUM/0.0180/,SCT,PRT/2*0.90/,RETR/0.0/,RATLIM/0.50/	000000
00204	57*		DATA IBODY/4/, IDERIV, IDIFF/2, 2/, IETA, IFIT/1, 1/, IFLOW/2/, IGUESS/0/, ANK 4/83	000000
00204	58*		1 ITHERM, IWALL/2, 2/, JWALL, KEDGP, NTROPY/0, 1, 0/ ANK 8/83	000000
00221	59*		DATA FITMOL/26.70/.BASMOL/32.0/.NETA/15/.FFAR/0.4890/. ANK 8/83	000000
00221	60*		3 SIGMA/3.4670/.EPOVRK/106.70/.KAPPA/11/.CBAR/0.950/.TOLOW/1.0E-4/.	000000
00221	61*		J ICON, ICOOL, IPASS, ITRCNT, ITDK, NUL, IRITE, KONRFT/6*0, 1, 1/, ANK 5/83	000000
00221	62*	••••••••••	K STEF/4.7589105E-13/	000000
00244	63*		DATA AREA/12HSQ. M SQ. FT/,CQ/24H(J/KG DEG K)BTU/LB DEG R/,DENS/12ANK 5/83	000000
00244	64*		1HKG/M3 LB/FT3/,DIST/12HMETERS(FEET)/,ENERGY/12H(J/KG)BTU/LB/,FLUX/	000000
00244	65*		3 12HKG/SM2LB/SF2/,HEAT/24H (WATTS/M2) BTU/SEC FT2 /,HWALL/12HWATTS	000000
00244	66*		4 BTU/S /,MASS/24H(KG/SEC-M2) LB/SEC SQ FT/,PRESS/12H(N/M2)(ATM) /,	000000
00244	67*		5 RAD/12HJ/S-M2B/SFT2/,REY/12H METER FOOT /,SHEAR/12H(N/M2)LB/FT2/,	000000
00244	68*		6 TCON/24H(WATTS/M-K) BTU/SEC FT R/,TEMP/12HDEG. KDEG. R/,THRUST/	000000
00244	69*		7 12HNEWTONPOUNDS/,VEL/12HM/SEC FT/SEC/,VIS/24H (N-SEC/M2) (LBM/SEC	000000
00244	70*		8 FT)/,XIPR/12H(KG/SE(LB/SE/	000000
00244	71*	С	CONVERSION FACTORS SI UNITS TO BLIMP UNITS	000000
00270	72*		DATA UCD/6.2427962E-2/,UCE/4.3021E-4/,UCL/3.280839895/,UCM/2.20462	000000
00270	.73*		A26/,UCP/9.8692327E-6/,UCR/8.8114E-5/,UCS/2.0885434E-2/,UCT/1.80/,	000000
00270	74*		B UCV/0.671968995/, CPFL/777.64867981/, DPR/57.2957795/, GC/32.174/, ANK 4/83	000000
				000000
00270	75*			
00270	76*	~	D SIPSF/144.0/ ANK 4/83	000000
00270	77*	<u> </u>	COMPOUNDS IN LOW TEMPERATURE EXTENSION ARRAY ARE: 1 = 0H, 2 = H,	000000
00270	78*	С	3 = H02, $4 = H2$ , $5 = H202$ , $6 = 0$ , $7 = 02$ , $8 = H20$ , $9 = N2$ , $10 = AR$	000000
00312	79*		DATA CPL/3.6484136.3.9241834.3.701756.2.5010504.2*2.5000943,	000000
00312	80*		1 3.995642,4.000171,4.0273454,3.6081553,3.3857279,3.3011853,	000000
00312	81*		2 4.0057066,4.0323777,4.4349613,2.6545354,2.8510969,2.7345992,	000000
00312	82*		3 3.4924125,3.5014706,3.5029803,3.9553836,4.0062098,4.0102356,	000000
00312	83*		4 3.4909028,3.5004642,3.5009674,2.5005472,2*2.500943,120*0.0/,	000000
00312	84*	•••••	5 SL/1.7978376,17.978376,20.62486,1.1052932,11.052932,12.786054,	000000
00312	85*		6 2.2956322,22.956322,25.732639,1.2102165,12.102165,14.349588,	000000
00312	86*	·····	7 2.2422898,22.422898,25.320494,1.6337344,16.337344,18.286352,	000000
	87*		8 2.0831184,20.831184,23.258259,1.8315539,18.315539,21.093366,	
00312		•••••••••••••••••••••••••••••••••••••••		000000
00312	88*		9 1.9208269, 19.208269, 21.634841, 1.5879808, 15.879808, 17.612729, 120*	000000
00312	89*		A0.0/,HL/3589.6616,39.508546,21.65648,25476.983,257.24587,	000000
00312	90*		B 129.87094, 1317.4245, 17.129931, 10.570335, -1014.9283, -6.577209,	000000
00312	91*		<u>C -1.6682057,-17671.426,-172.74861,-84.05693,29164.349,294.27148,</u>	000000
00312	92*		D 148.53824,-1040.7087,-6.949599,-1.7235609,-30272.845,-298.81263,	000000
00312	93*		E -147.40094,-1039.3515,-6.937521,-1.7185286,-742.9332,-4.9537909,	000000
00312	94*	••••••	F -1.2268734,120*0.0/,TL/50*1.0,50*100.0,50*200.0/,ILSP/50*3/,	000000

0312 0312 0312	95* 96* 97*	H 6H02 , 6HH20 , 6HN2	6HH02 ,6HH2 ,6HH2D2 ,6HD ,6HAR ,9O*6H /,NLTSP	/10/,	000000 000000 000000
0312	98*	C DEFAULT VALUES FOR ROUGHN	ESS OPTION		NEW000000 NEW000000
0324 0324	99* 100*	DATA FMF/1.15/,ICF/O/,RK/C C DEFAULT VALUES FOR PARTIC	LE OPTION		NEW000000
0330	101*	DATA IPART/O/, RP/O./, WP/O	./,WF/1./,CPART/O./,RHOPA/O./		NEWOOOOO
0330 0337	102* 103*	C DEFAULT VALUES FOR RELAMIN DATA ILAMIN/O/	NARIZATION OPTION		NEW000000 NEW000000
341	104*	END	· · · · · · · · · · · · · · · · · · ·		000000
	END OF C	MPILATION: NO DIAGNOSTICS			
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@SYS\$ <b>≭MS</b> FC	FOR, WUS BLMAIN
HSA E3 -1 -34	(84-22:23:51 (22,23)
COMM	CCN/ACCPK, ILAM, SPCT
COMM	TH/RETHMO
C D11M	JF/DUMM1,DUMM2,DUMM3,DUMM4,DUMM5,DUMM6,DUMM7,DUMM8,DUMM9, DUMM11,DUMM12,RK,ICF,FMF,DUMM16,DUMM17,DUMM18
COMM	NTI/PARTM,DUMM24,RHOPA,DUMM23,CPART,WP,DUMM19,WF,
\$ DUM	JUMM20, JUMM21, ILI, PF, AK, RP, IPARI
	AM/ ILAMIN JF3/UTAU,DEACY
-97	
\$ IPA	P,WP,WF,RHOPA,CPART,ILAMIN,
-98,98- /ZP	TO THE TOE OU!
/ 25	ZP, FMF, ICF, RK/
MAIN PR	
STOPACE	- CODE(4) 000576- DATA(0) 000046- DLANK CONNON(0) 000000
STURAGE	0: CODE(1) 000576; DATA(0) 002046; BLANK COMMON(2) 000000
COMMON	KS:
2000	
0003	000002 CDM 002043
0004	UM 002043 US 000077
0006	FS 002354
0007	OM 000111
0010	00 001217 00 000045
0012	0M 002433
0013	OM 000243
0014 0015	OM 002631 ITI 000015
0015	IN 000123
0017	RI 000007
0020	H 001372
0021	0M 035230 S 000172
0022	LS 000243
0024	RG 000455
0025	0M 000045
0026 0027	000003
0030	000022
0031	I 000020
0032	000001
0033	000151
0035	000010
0036	QL 000005
0037	IIS 000475 AT 000056
0040	ICR 000175
0042	UT 000021
0043	BL 000067
0044 0045	RM 000020 0M 000044
0045	0M 000162
0047	OM 000645

#### 0051 WALTEM 001372

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EXTERNAL REFERENCES (BLOCK, NAME) 0052 LTCPHS 0053 SETUP 0054 ITERAT 0055 OUTPUT 0056 SATEMP 0057 ROCOUT 0060 PLOT 0061 EXIT 0062 NINTR\$ 0063 NWDU\$ 0064 NI03\$ 0065 NI01\$ 0066 NI02\$ NRDU\$ 0067 0070 NRNL\$ 0071 NWNL\$ 0072 NREW\$ 0073 NWBU\$ 0074 NSTOP\$

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	002000	15	0001	000533	151	0000	002016	25	0001	000236	251	0000	002001	25
0001	000334		0001	000262		00001	0002010	<del></del>	0001	000230		0001	002001	
0001	000445		0001	000401		0001	000137		0001	000550		0026	000000	
0031	000015			2 000000	*****************************		000000			000033			000030	
- +	000032		·	000031		0000	001677			000000			000000	
0012 I	000010			000020			000030		0014	000321		0012	001727	
0044	000000		0040	000000		0044	000010		0014	000072			000003	
0040	000010		0036	000000		0014	000110			000000			000015	
0040	000000			000000			000034			000000			000062	
0043	000000		0023	000000			000004			000000			0000002	
			00000	000075		0043	000001		0014	000054		0033	0000001	
0043	000002		0023	000062		0043	000003		0014	000017		0011	000001	
0037	0000002			000000		0043	000004			000000		0014	000036	
	000000			002734		0010	000062		0021	005670	<del>.</del>	0030	000000	
0030		DUMM 10	0030	000012	· ·	0030	000013		0030	000017		0030	000020	
0030	000021		0031	000006		0030	000001		0031	000011		0031	000012	
0031	000010		0031	000003		0031	000001		0030	000002		0030	000003	
0030	000004		0030	000005		0030	000006		0030	000007		0030	000010	
0041	000001		0043	000042		0021	010624		0040	000020		0040	000030	
0040	000040			000020		0007	000006		0007	000007	<b> </b>		000010	
	000011	-		000145		0042	000000		0040	000050			000031	
0011	000021		0043	000043			000000			000001			000032	
	000001	-		000002		••••	000026	+ · · ·	0045	000000			000000	
0051 R	000227	FLMASS	0050 F	000000	FLUXJ		000016		0004	000000			000000	
0050	000226	FW	0025 F	000000	F2FIX		000017			000075	G	0045	000025	
0023 R	000144	GE	0010	000063		·····	000126		0047 R	000075	GW	0037	000001	HALPH
0007	000014	HCARB	0036	000001	HCH	0007 R	000015	HCHAR	0010	000064	HE		000023	HFU
0037	000002	HGP	0020 F	000226	HL	0000 R	000024	HOX	0007	000020	HPG	0007 R	000021	HPYG
0037	000057	HSP	0007 F	000024	HTEF		000310	HW	0016	000016	I	0020 I	000454	
0051 I	000230	IAREA	0015 1	000000	IBODY		000015	*** ************************		000062			000231	
0041	000174	ICORM	0024	000000	ID	0046 I	000000	IDAT	0015 I	000001				IDIFF
0046 I	000001	IED	0051 1	000232	IENH	0015 I	000003	IETA	0012	000222	IFC	********	000051	IFCJC

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0015 I	000004	IFIT	0015	1 000	0005	IFLOW	0005	I	000003	IFRAC	0015	I	000006	IGUESS	0026		000001	ILAM	
0032 I			0020				0031		000013				000002				000537		
	000000		0046						000004	TOUT	0023		000145		0031	I	000017	IPART	
0034 I									000030			******		IPUNCH			000017		
	000316		0046						000064				000006				000020		
0046 I			0016					******	000000				000147	******************************	0007		000025		
0046 I		-							000007		-		000011				000004		
	000002								000234				**************	ITLINP	0034			ITRCNT	
	000022		0023						000001				000011				000027		
	000052								000023		0025			KAPPAL				KAPPAT	
0012 I			0017		0000		0017		000001				000013					KONRFT	
0017 I			0017		0002		0036		000003				000025				000026		
	000004		0017		005	•			000040		0017		000006				000005		
0051 R			0012		336				000237		0014		000126				001606		
	001616		0004		626		0004		001636				000012				000014		
0046 I			0046						000016		0004		001604		0004		001605		
0046 I			0016				0016		000110		0016		000111		0004		001646		,
******	001742		0046						000017				000031				000021		
0016 I			0005				0016		000113				000026				000020		
0046 I			0036		0004				000432				000114		0025		000041		·····
0040 I 0025 I			0005						000023		0020		000551		0016		000115	NNI EO	
0016 I			0005						000032				000033					NPOINT	······································
	000117		0016						000032		-		000121		00023		002036		- <sup>26</sup>
	000122		0010	************					000153				000021				000151		
0046 I									000026				000025		0000		001106		•
0000 R			0012		)433		0031		0000020	· · · · · · · · · · · · · · · · · · ·				PCHAMB	0010		000065		••••••
	000014		0004				0043		0000044				013560		0043		000045		
0023 R			0045						000030				000031				000032		·····
0045 R			0043		-				000040		0013		000074		0013		000120		
	000067								000145	********************************	0024		000227		0023		000154		
	000155	-							000321		0024		0000227		0023			RETHMO	
0011 R			0010		)147				000002		0011		000040				000372		
0030 R			0010						000016				000157				000373		
0011 R			0024	********	******		0035		000002				000434				000552	*****************************	
0047 R			0035		001	-	0010		000002		0005		000072	-	00020		000073		
0050 R			0020		002				001000		0023		000160		0012		000435		
	000454	-	0012						000322		0023		000404				000433		
0005 R			0012						000322				001144				000466		
0005 R			0012				0013		000147		0020		000034		0043		0000488		
	000767		0012		616				000526	· · · · · · · · · · · · · · · · · · ·	0045		000034				001130		
	001052		0012				0033		0000715		0021		016514		0030		000050		
0010 0021 R		*****	0042		***********				000000				000041				000042		
	021450		0045		037		0045		001216		0045		001102		0045		001176		
	024404		0045		043		0042		000020	******************************			002136				000007		
	024404		0013						000020		0012		002136				0000716		
0012 0051 R			0013						001062		0012		000161				001226		
											0023		002337					ZMUTAB	
	002243		0011	R 000	044	1 AP	0021	<b>K</b>	032274	TITAD .	0012		002331	1 1	0031		001310	LINUIAD	

00100	1*	CBLIMP	BOUNDARY LAYER INTEGRAL MATRIX PROCEDURE	BLIM OO1	000000	
00100	2*	C	·		000000	
00101	3*	COMMON	/AL/ IPLOT, IUNIT	/AL/	000000	
00103	4*	COMMON	/BLQCOM/ FR(60,15),L2,L3,LEF(8),LEFS(8),LEFT(8),LEFW(8),	/BLQCOM/	000001	
00103	5*	1	MOA(60), MOB(60), NSPEC, PIEASE, W(3)	/BLQCOM/	000001	
00104	6*	COMMON	/CARDS/ DUB8, FFAR, FITMOL, IFRAC, ITEMP, KU, N, NFF, NP(50), SPL,	/CARDS/	000001	
00104	7*	1	SPU, TJA(3)	/CARDS/	000001	
00105	8*	COMMON	/COEFFS/ COEF(7,3,60)	/COEFFS/	000001	· · · · · · · · · · · · · · · · · · ·

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00106	9*			/CRBCOM/		
00106	10*			/CRBCOM/		
00107	11*	······	COMMON /EDGCOM/ DSIP(50), DUEDGE, GEP, HE, PE(50), RHOE(50), SPE(6,50),			
00107	12* 13*			/EDGCOM/		
00110			COMMON /EPSCOM/ CLNUM, DL(15), ELCON, EPSA(15), PRT, RETR, RHOVS, SCT, YAP,			
00111	14* 15*		COMMON /EQPCOM/ ATA(8), ATB(8), ATC(8), BASMOL, EPOVRK, FF(60), GG(60),			
00111	15+			/EQPCOM/ /EQPCOM/		
00112	17*		COMMON/EQTCOM/1SN(3,20), PVMW(20), PVOL(20), TJ(3), TKT(20,2), WMS(20)			
00113	18*	••••••	COMMON /ETACOM/ ETA(15),DETA(15),DSQ(14),DCU(14),BONE(14),B2(14),			
00113	19*			/EATCOM/		
00114	20*			/INPUTI/	00000	
00114	21*			/INPUTI/	00000	
00115	22*		COMMON /INTCOM/ CASE(13), CBAR, I, IQ, IS, ISH, ITS, KAPPA, KONRFT, KR9(50),	/INTCOM/	00000	1
00115	23*		1 ,MAT1I,MAT1J,MAT2I,MWE,NAM,NETA,NNLEQ,NON,NRNL,NS,NSP,NSPM1			
00116	24*			/INTERI/	00000	t
00117	25*		COMMON /LOWTH/ CPL(3,50),HL(3,50),IADD,ILSP(50),INEW(10),NLTSP,	/LOWTH/		
00117	26*		1 SL(3,50),SUBLT(50,2),TL(50,3)	/LOWTH/		
00120	27*		COMMON /NONCOM/ DPDX(1500), DUDX(1500), DUM(1500), DXDS(1500), PITAB(			
00120	28*			/NONCOM/		
00121	29*		COMMON/PLOTS/ FLDX(12,2), IPP, MS, NPCON, NPLOT(30), NSTAT(50), NSTP(15)			
00122	30*			/PRMALS/		
00122	31*			/PRMALS/		
00123	32*			/PRMORG/		
00124	33*	·····		/RFTCOM/		
00124	34*			/RFTCOM/		
00125 00126	35* 36*		COMMON/ACCN/ACCPK,ILAM,SPCT COMMON/RETH/RETHMO		NEW00000	
0126	30*		COMMON/RETH/RETH/MO COMMON/RUF/DUMM1,DUMM2,DUMM3,DUMM4,DUMM5,DUMM6,DUMM7,DUMM8,DUMM9,		NEW00000	
00127	38*		\$ DUMM10, DUMM11, DUMM12, RK, ICF, FMF, DUMM16, DUMM17, DUMM18		NEW00000	
00127	39*		COMMON/PARTI/PARTM, DUMM24, RHOPA, DUMM23, CPART, WP, DUMM19, WF,		NEW00000	
00130	40*		\$ DUMM22, DUMM20, DUMM21, ILT, PF, AK, RP, IPART		NEW00000	
00131	41*		COMMON /LAM/ ILAMIN		NEW00000	
00132	42*		COMMON/RUF3/UTAU, DEACY	••••••	NEW00000	
00133	43*		COMMON /SAHA/ CPH(50), ICON, IPASS, IRITE, ITRCNT, NSJ, QWG(50)	/SAHA/	00000	
00134	44*			/SAVE/	00000	
00135	45*			/SAVEQL/		
00136	46*		COMMON /SAVHIS/ DLX2,HALPH,HGP(15,3),HSP(15,3,6)	/SAVHIS/	00000	
00137	47*			/SAVMAT/	*******	
00140	48*			/SAVNCR/		
	49*			/SAVOUT/		***************************************
	50*			/SAVTBL/	000001	
00142				/SAVTBL/	00000	
00142 00142	51*			/SAVTRM/	000001	
00142 00142 00143	52*		COMMON /SAVTRM/ BC(8), BLNK(8)			
00142 00142 00143 00144	52* 53*		COMMON /STTCOM/ FLD(7,3), GAM1, NC, PRA, PRB, PRC, PRD, PRDUM, TR(3),	/STTCOM/	00000	
00142 00142 00143 00144 00144	52* 53* 54*		COMMON /STTCOM/ FLD(7,3), GAM1, NC, PRA, PRB, PRC, PRD, PRDUM, TR(3), 1 VMUA, VMUB, VMUC, VMUD, VMWD	/STTCOM/ /STTCOM/	00000	
00142 00142 00143 00144 00144 00145	52* 53* 54* 55*		COMMON /STTCOM/ FLD(7,3),GAM1,NC,PRA,PRB,PRC,PRD,PRDUM,TR(3), 1 VMUA,VMUB,VMUC,VMUD,VMWD COMMON /TEMCOM/ IDAT,IED,IND,IOR,IOUT,IRE,IROC,ISAV,ITA,ITE,	/STTCOM/ /STTCOM/ /TEMCOM/	00000	l
00142 00142 00143 00144 00144 00145 00145	52* 53* 54* 55* 56*		COMMON /STTCOM/ FLD(7,3),GAM1,NC,PRA,PRB,PRC,PRD,PRDUM,TR(3), 1 VMUA,VMUB,VMUC,VMUD,VMWD COMMON /TEMCOM/ IDAT,IED,IND,IOR,IOUT,IRE,IROC,ISAV,ITA,ITE, 1 LIF(2),LLA,LLAW,LOT,MAIN,MOEG,MURD,NCH,NIT,NTOR(2),NW(92)	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/	00000 00000 00000	l I
00142 00142 00143 00144 00144 00145 00145 00145	52* 53* 54* 55* 56* 57*		COMMON /STTCOM/ FLD(7,3),GAM1,NC,PRA,PRB,PRC,PRD,PRDUM,TR(3), 1 VMUA,VMUB,VMUC,VMUD,VMWD COMMON /TEMCOM/ IDAT,IED,IND,IOR,IOUT,IRE,IROC,ISAV,ITA,ITE, 1 LIF(2),LLA,LLAW,LOT,MAIN,MOEG,MURD,NCH,NIT,NTOR(2),NW(92) COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7)	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/	00000 00000 00000 00000	l I I
00142 00142 00143 00144 00144 00145 00145 00145 00146 00147	52* 53* 54* 55* 56* 57* 58*		COMMON /STTCOM/ FLD(7,3),GAM1,NC,PRA,PRB,PRC,PRD,PRDUM,TR(3), 1 VMUA,VMUB,VMUC,VMUD,VMWD COMMON /TEMCOM/ IDAT,IED,IND,IOR,IOUT,IRE,IROC,ISAV,ITA,ITE, 1 LIF(2),LLA,LLAW,LOT,MAIN,MOEG,MURD,NCH,NIT,NTOR(2),NW(92) COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7) COMMON /WALL/ FLUXJ(3,50),FW(50),HW(50),RHOVW(50),SPW(6,50),TW(50)	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/ /WALL/	00000 00000 00000 00000 00000	     
00142 00142 00143 00144 00144 00145 00145 00145 00145 00147 00150	52* 53* 54* 55* 56* 57* 58* 59*		COMMON /STTCOM/ FLD(7,3),GAM1,NC,PRA,PRB,PRC,PRD,PRDUM,TR(3), 1 VMUA,VMUB,VMUC,VMUD,VMWD COMMON /TEMCOM/ IDAT,IED,IND,IOR,IOUT,IRE,IROC,ISAV,ITA,ITE, 1 LIF(2),LLA,LLAW,LOT,MAIN,MOEG,MURD,NCH,NIT,NTOR(2),NW(92) COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7) COMMON /WALL/ FLUXJ(3,50),FW(50),HW(50),RHOVW(50),SPW(6,50),TW(50) COMMON /WALTEM/ ALTAB(50),COEFCL,CPLTAB(50),ENHTAB(50),FLMASS,	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/ /WALL/ /WALTEM/	00000 00000 00000 00000 00000 00000	
00142 00142 00143 00144 00144 00145 00145 00145 00145 00146 00147 00150	52* 53* 54* 55* 56* 57* 58* 59* 60*		COMMON /STTCOM/ FLD(7.3),GAM1,NC,PRA,PRB,PRC,PRD,PRDUM,TR(3), 1 VMUA,VMUB,VMUC,VMUD,VMWD COMMON /TEMCOM/ IDAT,IED,IND,IOR,IOUT,IRE,IROC,ISAV,ITA,ITE, 1 LIF(2),LLA,LLAW,LOT,MAIN,MOEG,MURD,NCH,NIT,NTOR(2),NW(92) COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7) COMMON /WALL/ FLUXJ(3,50),FW(50),HW(50),RHOVW(50),SPW(6,50),TW(50) COMMON /WALTEM/ ALTAB(50),COEFCL,CPLTAB(50),ENHTAB(50),FLMASS, 1 IAREA,ICOOL,IENH,ITCOOL,ITHICK,ITLINP,LAMDAW,LAMTAB(50),RECOFT,	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/ /WALTEM/ /WALTEM/ /WALTEM/	000000 000000 000000 000000 000000 00000	
00142 00142 00143 00144 00144 00145 00145 00145 00146 00147 00150 00150	52* 53* 54* 55* 56* 57* 58* 59* 60* 61*		COMMON /STTCOM/ FLD(7.3).GAM1.NC.PRA.PRB.PRC.PRD.PRDUM.TR(3). 1 VMUA.VMUB.VMUC.VMUD.VMWD COMMON /TEMCOM/ IDAT.IED.IND.IOR.IOUT.IRE.IROC.ISAV.ITA.ITE. 1 LIF(2).LLA.LLAW.LOT.MAIN.MOEG.MURD.NCH.NIT.NTOR(2).NW(92) COMMON /VARCOM/ ALPH.F(15.4).G(15.3).SP(15.3.7) COMMON /WALL/ FLUXJ(3.50).FW(50).HW(50).RHDVW(50).SPW(6.50).TW(50) COMMON /WALL/ FLUXJ(3.50).FW(50).HW(50).RHDVW(50).SPW(6.50).TW(50) COMMON /WALLFM.ALTAB(50).COEFCL.CPLTAB(50).ENHTAB(50).FLMASS. 1 IAREA.ICOOL.IENH.ITCOOL.ITHICK.ITLINP.LAMDAW.LAMTAB(50).RECOFT. 2 THITAB(50).TI(50).TLINP(100).TLTAB(50).TOLQW.TUBEN.XAREA(50).	/STTCOM/ /STTCOM/ /TEMCOM/ /VARCOM/ /WALCOM/ /WALTEM/ /WALTEM/ /WALTEM/	00000 00000 00000 00000 00000 00000 0000	
00142 00142 00143 00144 00144 00145 00145 00145 00146 00147 000150 00150 00150	52* 53* 54* 55* 56* 57* 58* 59* 60*	c	COMMON /STTCOM/ FLD(7.3).GAM1.NC.PRA.PRB.PRC.PRD.PRDUM.TR(3). 1 VMUA.VMUB.VMUC.VMUD.VMWD COMMON /TEMCOM/ IDAT.IED.IND.IOR.IOUT.IRE.IROC.ISAV.ITA.ITE. 1 LIF(2).LLA.LLAW.LOT.MAIN.MOEG.MURD.NCH.NIT.NTOR(2).NW(92) COMMON /VARCOM/ ALPH.F(15.4).G(15.3).SP(15.3.7) COMMON /VARL/ FLUXJ(3.50).FW(50).HW(50).RHOVW(50).SPW(6.50).TW(50) COMMON /WALL/ FLUXJ(3.50).FW(50).HW(50).RHOVW(50).SPW(6.50).TW(50) COMMON /WALLFM/ ALTAB(50).COEFCL.CPLTAB(50).ENHTAB(50).FLMASS. 1 IAREA.ICOOL.IENH.ITCOOL.ITHICK.ITLINP.LAMDAW.LAMTAB(50).RECOFT. 2 THITAB(50).TI(50).TLINP(100).TLTAB(50).TOLOW.TUBEN.XAREA(50).	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/ /WALTEM/ /WALTEM/	000000 000000 000000 000000 000000 00000	
00142 00142 00143 00144 00144 00145 00145 00145 00145 00146 00147 00150 00150 00150 00150	52* 53* 54* 55* 56* 57* 58* 59* 60* 60* 61* 62*	c	COMMON /STTCOM/ FLD(7.3).GAM1.NC.PRA.PRB.PRC.PRD.PRDUM.TR(3). 1 VMUA.VMUB.VMUC.VMUD.VMWD COMMON /TEMCOM/ IDAT.IED.IND.IOR.IOUT.IRE.IROC.ISAV.ITA.ITE. 1 LIF(2).LLA.LLAW.LOT.MAIN.MOEG.MURD.NCH.NIT.NTOR(2).NW(92) COMMON /VARCOM/ ALPH.F(15.4).G(15.3).SP(15.3.7) COMMON /VARCOM/ ALPH.F(15.4).G(15.3).SP(15.3.7) COMMON /VALL/ FLUXJ(3.50).FW(50).HW(50).RHOVW(50).SPW(6.50).TW(50) COMMON /WALL/ FLUXJ(3.50).COEFCL.CPLTAB(50).ENHTAB(50).FLMASS. 1 IAREA.ICOOL.IENH.ITCOOL.ITHICK.ITLINP.LAMDAW.LAMTAB(50).RECOFT. 2 THITAB(50).TLINP(100).TLTAB(50).TOLOW.TUBEN.XAREA(50). 3 XENH(50).XLTAB(100).XTHIK(50).ZMUTAB(50)	/STTCOM/ /STTCOM/ /TEMCOM/ /VARCOM/ /WALCOM/ /WALTEM/ /WALTEM/ /WALTEM/	00000 00000 00000 00000 00000 00000 0000	
00142 00142 00143 00144 00144 00145 00145 00145 00145 00146 00147 00150 00150 00150 00150 00150 00150	52* 53* 54* 55* 56* 57* 58* 59* 60* 61* 62* 63*	C C	COMMON /STTCOM/ FLD(7.3).GAM1.NC.PRA.PRB.PRC.PRD.PRDUM.TR(3). 1 VMUA.VMUB.VMUC.VMUD.VMWD COMMON /TEMCOM/ IDAT.IED.IND.IOR.IOUT.IRE.IROC.ISAV.ITA.ITE. 1 LIF(2).LLA.LLAW.LOT.MAIN.MOEG.MURD.NCH.NIT.NTOR(2).NW(92) COMMON /VARCOM/ ALPH.F(15.4).G(15.3).SP(15.3.7) COMMON /VARCOM/ ALPH.F(15.4).G(15.3).SP(15.3.7) COMMON /VALL/ FLUXJ(3.50).FW(50).HW(50).RHOVW(50).SPW(6.50).TW(50) COMMON /WALL/ FLUXJ(3.50).COEFCL.CPLTAB(50).ENHTAB(50).FLMASS. 1 IAREA.ICOOL.IENH.ITCOOL.ITHICK.ITLINP.LAMDAW.LAMTAB(50).RECOFT. 2 THITAB(50).TI(50).TLINP(100).TLTAB(50).TOLOW.TUBEN.XAREA(50). 3 XENH(50).XLTAB(100).XTHIK(50).ZMUTAB(50) ORDER OF PARAMETERS TO BE PLOTTED: 1 PRESSURE. 2 EDGE TEMPERATURE.	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/ /WALTEM/ /WALTEM/ /WALTEM/	000000 000000 000000 000000 000000 00000	
00142 00142 00143 00144 00145 00145 00145 00145 00145 00150 00150 00150 00150 00150 00150	52* 53* 54* 55* 56* 57* 58* 59* 60* 61* 62* 63* 64*	c	COMMON /STTCOM/ FLD(7.3).GAM1.NC.PRA.PRB.PRC.PRD.PRDUM.TR(3). 1 VMUA.VMUB.VMUC.VMUD.VMWD COMMON /TEMCOM/ IDAT.IED.IND.IOR.IOUT.IRE.IROC.ISAV.ITA.ITE. 1 LIF(2).LLA.LLAW.LOT.MAIN.MOEG.MURD.NCH.NIT.NTOR(2).NW(92) COMMON /VARCOM/ ALPH.F(15.4).G(15.3).SP(15.3.7) COMMON /VARCOM/ ALPH.F(15.4).G(15.3).SP(15.3.7) COMMON /VALL/ FLUXJ(3.50).FW(50).HW(50).RHOVW(50).SPW(6.50).TW(50) COMMON /WALL/ FLUXJ(3.50).COEFCL.CPLTAB(50).ENHTAB(50).FLMASS. 1 IAREA.ICOOL.IENH.ITCOOL.ITHICK.ITLINP.LAMDAW.LAMTAB(50).RECOFT. 2 THITAB(50).TLINP(100).TLTAB(50).TOLOW.TUBEN.XAREA(50). 3 XENH(50).XLTAB(100).XTHIK(50).ZMUTAB(50)	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/ /WALTEM/ /WALTEM/ /WALTEM/ /WALTEM/	000000 000000 000000 000000 000000 00000	
00142 00142 00143 00144 00144 00145 00145 00145 00146 00147 00150 00150 00150 00150 00150 00150 00150 00150 00150	52* 53* 54* 55* 56* 57* 58* 59* 60* 61* 62* 63* 64* 65*	C C C	COMMON /STTCOM/ FLD(7.3),GAM1,NC,PRA,PRB,PRC,PRD,PRDUM,TR(3), 1 VMUA,VMUB,VMUC,VMUD,VMWD COMMON /TEMCOM/ IDAT,IED,IND,IOR,IOUT,IRE,IROC,ISAV,ITA,ITE, 1 LIF(2),LLA,LLAW,LOT,MAIN,MOEG,MURD,NCH,NIT,NTOR(2),NW(92) COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7) COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7) COMMON /VALL/ FLUXJ(3,50),FW(50),HW(50),RHOVW(50),SPW(6,50),TW(50) COMMON /WALLFH,ALTAB(50),COEFCL,CPLTAB(50),ENHTAB(50),FLMASS, 1 IAREA,ICOOL,IENH,ITCOOL,ITHICK,ITLINP,LAMDAW,LAMTAB(50),RECOFT, 2 THITAB(50),TI(50),TLINP(100),TLTAB(50),TOLQW,TUBEN,XAREA(50), 3 XENH(50),XLTAB(100),XTHIK(50),ZMUTAB(50) ORDER OF PARAMETERS TO BE PLOTTED: 1 PRESSURE, 2 EDGE TEMPERATURE, 3 VELOCITY, 4 MACH NUMBER, 5 DENSITY, 6 TOTAL ENTHALPY, 7 TOTAL HEJ	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/ /WALTEM/ /WALTEM/ /WALTEM/ /WALTEM/	000000 000000 000000 000000 000000 00000	
00141 00142 00143 00143 00144 00145 00145 00145 00145 00145 00150 00150 00150 00150 00150 00150 00150 00150 00150 00150 00150	52* 53* 54* 55* 56* 57* 58* 59* 60* 61* 62* 63* 64* 65* 66*	C C C C	COMMON /STTCOM/ FLD(7.3),GAM1,NC,PRA,PRB,PRC,PRD,PRDUM,TR(3), VMUA,VMUB,VMUC,VMUD,VMWD COMMON /TEMCOM/ IDAT,IED,IND,IOR,IOUT,IRE,IROC,ISAV,ITA,ITE, 1 LIF(2),LLA,LLAW,LOT,MAIN,MOEG,MURD,NCH,NIT,NTOR(2),NW(92) COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7) COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7) COMMON /VALL/ FLUXJ(3,50),FW(50),HW(50),RHOVW(50),SPW(6,50),TW(50) COMMON /WALLTEM/ ALTAB(50),COEFCL,CPLTAB(50),ENHTAB(50),FLMASS, 1 IAREA,ICOOL,IENH,ITCOOL,ITHICK,ITLINP,LAMDAW,LAMTAB(50),RECOFT, 2 THITAB(50),TI(50),TLINP(100),TLTAB(50),TOLOW,TUBEN,XAREA(50), 3 XENH(50),XLTAB(100),XTHIK(50),ZMUTAB(50) ORDER OF PARAMETERS TO BE PLOTTED: 1 PRESSURE, 2 EDGE TEMPERATURE, 3 VELOCITY, 4 MACH NUMBER, 5 DENSITY, 6 TOTAL ENTHALPY, 7 TOTAL HEA 8 TOTAL WALL AREA, 9 MOMENTUM THICKNESS, 10 DISPLACEMENT THICKNESS	/STTCOM/ /STTCOM/ /TEMCOM/ /TEMCOM/ /VARCOM/ /WALTEM/ /WALTEM/ /WALTEM/ /WALTEM/	000000 000000 000000 000000 000000 00000	

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	$\mathbf{C}$			£	$\sim$
00150	69*	C 17 THERMAL CONDUCTIVITY, 18 WALL LENGTH, 19 CONDUCTIVE HEAT FLU.	Χ.	000001	
00150		C 20 INVISID MASS FLOW, 21 TOTAL MASS FLOW, 22 BETAP, 23 BETAV,	••	000001	
00150	71*	24 MOMENTUM TRANSFER COEFFICIENT, 25 HEAT TRANSFER COEFFICIENT,		000001	
00150	72*	C 26 XI, 27 TOTAL GAS FLUX, 28 TOTAL GAS BLOWING PARAMETER.		000001	
00150	73*	C ORDER OF PROFILE PLOTS: 1 TEMPERATURE, 2 VELOCITY RATIO, 3 MACH	NUMBER,	000001	
00150	74*	C 4 DENSITY, 5 VISCOSITY, 6 SPECIFIC HEAT, 7 STATIC ENTHALPY,		000001	
00150	75*	C 8 TOTAL ENTHALPY, 9 THERMAL CONDUCTIVITY, 10 EPSA (RHOSQ*EPS/RH	D/MU),	000001	
00150		C 11 SHEAR, 12 ETA, 13 GAMMA, 14 PITOT TUBE PRESSURE.		000001	
00150	77*	C NOTE FOR PLOTTING PURPOSES THE FOLLOWING VALUES OF IP AND THEIR	C 14 4 1 1	000001	
00150		C CORRESPONDING CHARACTERS ARE GIVEN: $35 = (PLOTTING DOT), 43 = (CORRESPONDING CHARACTERS ARE GIVEN: 35 = (PLOTTING DOT), 43 = (PLOT$		000001	
00150	79* 80*	C CIRCLE), 34 = +, 5 = (BLANK), 40 = *, 20 = 0, 48 = 0, 39 = \$, 2 C 62 = (SMALL SQUARE), 61 = (PERIOD), 46 = .(COMMA), 33 = -, 58 =		000001	
00150		36 = -3 AND 4 GIVE SMALL CIRCULAR SYMBOLS.	•	000001	
00150		C COMPOUNDS IN LOW TEMPERATURE EXTENSION ARRAY ARE: 1 = OH, 2 = H		000001	
00150		3 = H02, 4 = H2, 5 = H202, 6 = 0, 7 = 02, 8 = H20, 9 = N2, 10 =		000001	
00150				000001	
00151	85*	DIMENSION FUEL(7),OX(7),TF(60)	ANK 5/83		
00152	86*	EQUIVALENCE (G,GW), (TU(121), TF)	ANK 4/83	000001	
00153	87*	INTEGER ASU, ATA, ATB, ATC, BSU, CASE, FLDX, SUBLT		000001	
00154	88*	LOGICAL LOWT		000001	
00155	89*	REAL LAMDAW, LAMTAB, MR	ANK 4/83	***************************************	
00156	90*	DATA FUEL,MR,OX/15*0.0/,LOWT/F/,NCASE,NTAL/0,0/,ZP/-1.0/	ANK 7/83		
00156				000001	<u>-</u>
00166	92* 93*	NAMELIST /DATA/ ALPH, ALTAB, ASU, ATA, ATB, ATC, BASMOL, BSU, CBAR, CLNU		000001	
00166	93* 94*	1 COEF, COEFCL, CPL, CPLTAB, DPDX, DSIP, DUB8, DUDX, ELCON, EMIST 2 EMIV, ENHTAB, EPOVRK, ETA, F, FF, FFAR, FITMOL, FLDX, FLMASS,	, /DATA/ /DATA/	000001	
00166	95*	3 FLUXJ, FUEL, F2FIX, F2FIXT, G, GE, GG, GW, HCHAR, HFU, HL, HOX, HPYG, HT		000001	
00166	96*	4 HW, IADD, IAREA, IBODY, ICOOL, IDERIV, IDIFF, IENH, IETA, IFIT,	/DATA/	000001	
00166	97*	5 IFLOW, IFRAC, IGUESS, ILSP, INEW, IP, IPLOT, IPP, IPUNCH, ISN,	/DATA/	000001	
00166	98*	6 IST, ITCOOL, ITDK, ITEMP, ITHERM, ITHICK, ITLINP, IU, IUNIT,	/DATA/	000001	
00166	99*	7 IWALL, JWALL, KAPPA, KAPPAT, KAT, KEDGP, KONRFT, KR9, KS, KTURB	, /DATA/	000001	· · · · · · · · · · · · · · · · · · ·
00166	100*	8 KU,LAMDAW,LAMTAB,LEF,LOWT,MR,MS,N,NC,NEL,NETA,NETAT,NFF,NP	, /DATA/	000001	
00166	101*	9 NPCON, NPLOT, NPOINT, NS, NSP, NSTAT, NSTP, NTAL, NTH, NTROPY, 0		000001	
00166	102*	A PCHAMB, PITAB, PNORM, PRA, PRB, PRC, PRD, PRDUM, PRE, PRT, RADFL		000001	
00166	103*	B RADR, RATLIM, RECOFT, RETR, RHOVW, ROKAP, RTM, S, SCT, SIGMA, SL	***************************************	000001	
00166	104*	C SP, SPW, SUBLT, TF, THITAB, TJ, TJA, TKP, TKT, TL, TLINP, TLTAB,	/DATA/	000001	
00166 00166	105* 106*	D TOLQW, TUBEN, TW, VITAB, VMUA, VMUB, VMUC, VMUD, WAT, WMS, XAREA \$ IPART, RP, WP, WF, RHOPA, CPART, ILAMIN,	, /DATA/	000001 NEW000001	
00166	107*	E XENH, XITAB, XLTAB, XTHIK, YAP, YITAB, ZMUTAB, ZP, FMF, ICF, RK	/DATA/	NEW000001	
00167	108*	NAMELIST /OUT/ ALPH, BASMOL, CBAR, CLNUM, COEFCL, DUB8, ELCON, EMIST,	/0UT/	-01000001	
00167	109*	1 EMIV, EPOVRK, ETA, F, FFAR, FITMOL, FLMASS, FUEL, F2FIX, F2FIXT		000001	
00167	110*	2 G, GE, GW, HCHAR, HFU, HOX, HPYG, HTEF, HW, IADD, IAREA, IBODY,	/0UT/	000001	
00167	111*	3 ICOOL, IDERIV, IDIFF, IENH, IETA, IFIT, IFLOW, IFRAC, IGUESS,	/OUT/	000001	
00167	112*	4 INEW, IP, IPLOT, IPP, IPUNCH, IST, ITCOOL, ITDK, ITEMP, ITHERM,	/OUT/	000001	
00167	113*	5 ITHICK, ITLINP, IU, IUNIT, IWALL, JWALL, KAPPA, KAPPAT, KEDGP,	/0UT/	000001	
00167	114*	6 KONRFT, KR9, KS, KTURB, KU, LAMDAW, LEF, LOWT, MR, MS, N, NC, NEL,	/001/	000001	
00167	115*	7 NETA, NETAT, NFF, NP, NPCON, NPLOT, NPOINT, NS, NSP, NSTAT, NSTP	, /OUT/	000001	
00167	116*	8 NTAL, NTH, NTROPY, OX, PCHAMB, PNORM, PRA, PRB, PRC, PRD, PRDUM, 9 PRE, PRT, RADEL, RADR, RATLIM, RECOFT, RETR, RHOVW, ROKAP, RTM.	/0UT/	000001	
00167 00167	117* 118*	9 PRE, PRT, RADFL, RADR, RATLIM, RECOFT, RETR, RHOVW, ROKAP, RTM, A S, SCT, SIGMA, TJ, TJA, TKP, TOLQW, TUBEN, TW, VMUA, VMUB, VMUC,	/OUT/ /OUT/	000001	
00167	119*	B VMUD, WAT, WMS, YAP, ZP	/001/ /0UT/	000001	
00107	120*	NAMELIST /ARRAYS/ ALTAB, CPL, CPLTAB, DSIP, ENHTAB, FLUXJ, HL, ILSP,	/ARRAYS/		
00170	121*	1 LAMTAB, SL, SP, TF, THITAB, TKT, TL, TLINP, XAREA, XENH, XLTAB,	/ARRAYS/		· ·
00170	122*	2 XTHIK, ZMUTAB	/ARRAYS/		
00170		2		000001	
00171	124*	WRITE (6,NW) NIT, MURD, IOR, ITA, MAIN, IND, MOEG, ITE, LLAW, IDAT, IND,	ANK 7/83	000001	
00171	125*	1 IROC, IRE, LLAW, IDAT, IND, ITE, NTOR, IDAT, LOT, IND, IRE, NTOR, IDAT, NIT			
00171	126*	2 MURD, IOR, ITA, MAIN, IND, IOUT, ITE, IED, IDAT, LOT, IND, IRE, IED, IDAT, N			
00171	127*	3 MURD, IOR, ITA, MAIN, IND, IOUT, ITE, LIF, IDAT, LOT, IND, IRE,	ANK 7/83	000001	

00171 00307	129* 130*		MWE = -1	NK 7		000001 000137
00310	131*		READ (5,1,END=50) CASE			000140
00313	132*		FORMAT (13A6)			000151
00314	133* 134*		READ (5,DATA,END=50) IF (ZP .GT. 0.0) WRITE (6,ARRAYS)			000151
00317 00323			IF (ZP .GT. 0.0) WRITE (6, ARRAYS)	ANK 3	5/83 5/02	000156
00323	135*			NK 3		000165
00321	130 <i>+</i> 137*		WRITE (6.3) NEL NSP	ANK 8		000212
00335	138*	3		NK 8		000221
00335	139*			NK 8		000221
00336	140*		NEL = MINO(NEL,8)	NK 8		000221
00337	141*	<u></u>		NK 8		000227
00340	142*	25	IF (MR .LE. 0.0) GO TO 30	NK 8		000236
00342	143* 144*	~	IF (NTAL .GT. O) GE = (MR*HOX + HFU)/(MR + 1.O) A CALCULATE RELATIVE NUMBER OF ATOMS FROM THE MIXTURE RATIO AND THE	NK 4	/83	000240
00342	145*	C C	NUMBER OF FACH FLEMENT IN THE OXIDIZED AND FUEL			000240
00344	146*		OK = 0.0	NK 5	5/83	000255
00345	147*		FK = 0.0	NK 5		000256
00346	148*		$D0 \ 10 \ J = 1.NSP$	NK 5		000262
00351	149*			NK 5		000262
00352	150*	10	UK = UK + UX(J) * WAT(J)	NK 5		000265
00354	101*		AMNO = MR + FR / UR	NK 5		000272
00355 00356	152* 153*			NK 5		000275 000300
00355	153*		AMNFS = 1.0/AMWP	NK 5		000302
00360	155*		DD 20 J = 1,NSP	NK 5		000310
00363	156*	20		NK 5		000310
00365	157*		CMR = AMNUS*UK/(AMNFS*FK)	NK 5		000316
00366	158*		WRITE (6,2) CMR, MR	NK 5		000324
00372	159*	2	FORMAT (//10X, 'COMPUTED MIXTURE RATIO =', F10.6,' INPUT MIXTURE', A	NK 5	6/83	000334
00372	160*			NK 5		000334
00373	161* 162*	30	NCASE = NCASE + 1 // // // // // // // // // // // // /	NK 5	1/03	000334
00374	162*	с	IF LOW TEMPERATURE EXTENSION DATA HAS BEEN READ IN, CONVERT IT			000336
00374	164*	č	TO INTERNALLY REQUIRED UNITS	•••••		000336
00375	165*		IF (LOWT) CALL LTCPHS			000341
00377	166*			NK 7	/83	000345
00401	167*		IF (IPLOT .EQ. 0) GO TO 45			000354
00403	168* 169*			NK 7	783	000356
00405	169*		REWIND 3 REWIND 4	••••••		000362
00407	171*	35	NSTAT(NS) = 1	NK 7	/83	000371
00410	172*			NK 4		000373
00412			NPLUT(7) = 0			000376
00413	174*		NPLOT(12) = 0			000377
00414	175*	45	IS = 1 A	NK 5	/83	000401
00415 00416	176* 177*		IQ = 1 $IE (ICOU) NE O AND ICON EO O) IDITE = O$			000402 000404
00416	<u>1//*</u> 178*		IF (ICOOL .NE. O .AND. ICON .EQ. O) IRITE = O IF (IPLOT .EQ. O .OR. ICOOL .NE. O) IPASS = 1			000404
00420	179*		IF (IPLD) EQ. 0 .0R. ICODE .NE. 0) IPASS = $1$ IF (ICON .EQ. 1 .AND. IPLOT .NE. 0) IPASS = 0			000427
00424	180*	41	CALL SETUP	•••••		000443
00425	181*		CALL ITERAT	LIM		000445
00426	182*		CALL OUTPUT E	LIM	032	000446
00427	183*		IF (NON) 43,44,15			000450
00432	184*	44		NK 5	/83	000454
00433	185* 186*		IQ = IQ + 1 $IS = IS + 1$	NK 5	/82	000456
00434 00435	186* 187*			NK 5	· .	000461 000464
00435	188*			NK 5		000474

00441         169+         IF (15, EC, NS) IDITE = 1         ANK 5/83         000507           00445         191+         IS, KE, NS) GO TO 41         ANK 5/83         000513           00445         191+         IS, KE, NS) GO TO 41         ANK 5/83         000513           00455         191+         IS, KE, NS)         GO TO 45         000513           00451         191+         IS, KE, NS)         GO TO 45         000513           00451         191+         IS, RE, NS, ICON, ICON, IEO, 1)         GO TO 45         000513           00451         191+         IS, RE, NS, ICON, IEO, IEO, IION, IEO, IEO, IEO, IION, IEO, IEO, IION, IEO, IEO, IEO, IEO, IEO, IEO, IEO, IEO		-								-
00445         191+         15 = MS         ANK 5/83         000513           00445         192+         CALL SATEMP         000515         000515           00451         193+         CALL SATEMP         000515         000517           00451         193+         CALL SATEMP         000513         000513           00451         193+         CALL SATEMP         000513         000531           00451         193+         CALL SATEMP         000541         000531           00451         193+         CALL PLOT         000541         000541           00452         193+         CO TO 45         000545         000546           00452         200+         J = 0         ANK 5/83         000555           00453         202+         END         ELIM 038         000575			IF (IS .EC	Q. NS) IRITE = 1	ł					
00446 192* IF (TCOOL .EO. 0) OR. ICON .EO. 1) GO TO 15 000515 00450 193* CALL SATEMP 000531 194* GO TO 45 000531 194* CF (NOTOT 61, 0) CALL PLOT ANK 8/83 000531 00457 193* GO TO 46 000541 00457 193* GO TO 46 000546 00457 193* 50 IF (IPUNCH .NE. 1 .AND. IPUNCH .NE. 2) CALL EXIT ANK 8/83 000550 00462 200* J = 0 00462 200* J = 0 00462 200* J = 0 00466 000575 END OF COMPILATION: NO DIAGNOSTICS.				2. NS) GU IU 41				ANK 5/83		
OddSo         193+         CALL SATEMP         O00527           00451         194-         GO TO 45         ANK 8/83         000533           00452         195-         15         IF (NP(15) LE, NTH) GO TO 46         ANK 8/83         000531           00456         196-         CLL (ROUTO)         ANK 8/83         000531           00456         196-         CL (ROUTO)         ANK 8/83         000531           00457         198-         GO TO 46         GO TO 46         000546           00450         199-         50         IF (IPPURCH NE, 1, AND, IPUNCH, NE, 2)         CALL EXIT         ANK 8/83         000550           00462         200-         J = 0         ANK 8/83         000555         00462         202+         END         GF COMPILATION:         NO         DIAGNOSTICS.			IF (ICOOL	EO. O .OR. ICON	EO. 1) GO	TO 15	······	ANK 3765		 
00451         194+         60 T0 45         000531           00452         195+         15         IF (NP(15)_LE_NTH) GD T0 46         ANK 8/83         000533           00454         196+         CALL ROCOUT         ANK 8/83         000531           00454         196+         CALL ROCOUT         ANK 8/83         000533           00454         196+         CALL ROCOUT         ANK 8/83         000531           00450         197+         IE (IPLOT. GT. O) CALL PLOT         ANK 8/83         000550           00452         197+         IE (IPLOT. AGT. O) CALL PLOT         ANK 8/83         000550           00452         197+         IE (IPLOT. AGT. O) CALL PLOT         ANK 8/83         000550           00452         200+         J         O         ANK 8/83         000550           00452         200+         WRITE (15) J         ANK 8/83         000550           00462         202+         END         BLIN 038         000575						10 13				 
Cod54         196+         CALL ROCOUT         ANK 8/83         COO537           Cod54         197+         IF (IPLOT)         COD541         COD541           Cod57         198+         GO TO 46         COO541         COO540           Cod57         198+         GO TO 46         COO541         COO540           Cod52         207+         J = 0         ANK 8/83         COO560           Cod52         202+         FND         ANK 8/83         COO566           Cod52         202+         END         FLIM 038         COO575	00451		GO TO 45		·	••••••				
00455         197-         IF (IPLOT .GT. 0) CALL PLOT         000541           00457         198+         50 IT (IPUNCH .NE. 1 .AND. IPUNCH .NE. 2) CALL EXIT         ANK 8/83         000550           00462         200+         J * 0         ANK 8/83         000556           00462         200+         J * 0         ANK 8/83         000556           00462         200+         J * 0         ANK 8/83         000556           00463         201+         WRITE (15) J         ANK 8/83         000556           00466         202+         END         BLIM 038         000575					0 46					 
00450 1994 50 10 46 000546 000550 000550 000552 000550 000522 2004 J = 0 000546 000550 000550 000555 000452 2004 WRITE (15) J 000556 000555 000452 2004 000555 000455 20024 ENO BLIM 038 000575 00055000000			CALL RUCUU		от					
00460 199* 50 IF (IPUNCH .NE. 1 AND. IPUNCH .NE. 2) CALL EXIT ANK 8/83 000550 00462 200* J = 0 00463 201* WRITE (15) J ANK 8/83 000566 00466 202* END BLIN 038 000575 END 0F COMPILATION: NO DIAGNOSTICS.		198*	GO TO 46							 
00462 200- J = 0 ANK 8/83 000565 00466 202- END BLIM 038 000575 END OF COMPILATION: NO DIAGNOSTICS.	00460	199* 5	50 IF (IPUNCH	H .NE. 1 .AND. IP	UNCH .NE. 2)	CALL EXIT			000550	 
CO466     202+     END     BLIM 038     CO0575		200*	J = O			,				
END OF COMPILATION: NO DIAGNOSTICS.				<u>, J</u>						 
	00-400	202						BLIM COU	0000.0	
	EN	ND OF COMPIL	ATION:	NO DIAGNOSTICS.						 
							·····			
						1				
		· .								 
			•			· · · · · · · · · · · · · · · · · · ·				 
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	·····	•••••	•••••							 
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							·····		·	 ••••••

-20	.,HF(15,5),XI(50)		
/251),	\$(50) /151), RADS(50), ROKAP(50), \$(50)/		
-30,30	)- HOP(15),TP /15),RHO(15),RHOP(15),TP/		
-34			
	COMMON/ACCN/ACCPK, ILAM, SPCT		
	COMMON/ACPK/ACCPK1,ACCPK2 COMMON/RETH/RETHMO		
	COMMON/RUF/DUMM1,DUMM2,DUMM3,DUMM4,DUMM5,DUMM6,DUMM7,DUMM8,DUMM9,		
	DUMM10,DUMM11,DUMM12,RK,ICF,FMF,DUMM16,DUMM17,DUMM18 COMMON/PARTI/PARTM,DUMM24,RHOPA,DUMM23,CPART,WP,DUMM19,WF,		
\$	DUMM22,DUMM20,DUMM21,ILT,PF,AK,RP,IPART	······	
-313	COMMON /LAM/ ILAMIN		
	RETHMO=-C3M(IS)*RHOE(IS)*UE(IS)*CTE*VMUE(IS)/VMU(NETA)		
	ACCP=BETAV(IS)*VMUE(IS)**2*ROKAP(IS)**2/2.0/XI(IS)		
	ACCPK=ACCP*RHOE(IS)*VMU(1)/(VMUE(IS)*RHO(1)) IF(ILAMIN.EQ.O)GO TO 79		
	ILAM=O		•
	IF(S(IS).GT.2.*STURB.AND.ACCPK.GT.1.1E-06)G0 T0 69		
	GO TO 79 IF(RETHMO.LT.250.)GO TO 79		
	ILAM= 1		
	AA=8.935E-14 BB=2.239E-10		
	CC=1.0247E-06		
	ACCPK1=AA*RETHMO**2+BB*RETHMO+CC IF(RETHMO.LT.4100.)G0 T0 98		
	ILAM=0		
	GO TO 99		
	ACCPK2=3.5E-06 IF(ACCPK.LT.ACCPK1)ILAM=0		
	IF(ACCPK.GT.ACCPK2)ILAM=1		
79 -320	CONTINUE		- -
	IF(RETHMO.GT.RETR)ILT=2	······	······
-321	IF(RETHMO.LT.RETR)ILT=1		
	IF(REIHMU.LI.REIR)ILI=1		
SUB	ROUTINE NNNCER ENTRY POINT 002554 NONCER ENTRY POINT 002557		
STO	RAGE USED: CODE(1) 002562; DATA(0) 000142; BLANK COMMON(2) 000000		
CO	MMON BLOCKS:		
00	03 BLQCOM 002043		
00			
00			
00	07 CONSTS 000003		
00			
00			
_			

0014	EQTCOM	001427	
0015	ERRCOM		
 0016	ETACOM		
0017	FLXCOM		
 0020	HISCOM		
0021	INPUTI		, ,
 0022	INTCOM		
0023	INTERI	000006	
 0024	NONCOM		
0025	NZERO	000001	
 0026	PRMALS	000145	
0027	PRMORG	000455	
 0030	PRPCOM	000303	
0031	PRPNPT	000076	
 0032	SAVNCR	000175	· · · · · · · · · · · · · · · · · · ·
0033	TURB	000001	
 0034	VARCOM	000645	······································
0035	WALL	000226	
0036	ACCN	000003	
 0037	ACPK	000002	
 0040	RETH	000001	
 0041	RUF	000022	
 0042	PARTI	000020	

EXTERNAL REFERENCES (BLOCK, NAME)

000001

EQPCOM 000433

0013

0043

LAM

0044	EQUIL	
		•
0045	STATE	
0046	LINCER	
0047	TRMBL	
0050	IMONE	
0051	TVCM1	
0052	ICOEFF	
0053	TVCCOE	
0054	IONLY	
0055	TVCI	
0056	LIAD	
0057	ABMAX	
0060	RERAY	
0061	RNLCER	
0062	NERR3\$	

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	000067 10L	0001	000626 100L	0001	001141 1001L	0001	000163 11L	0001	000157 12L
0001	000642 120L	0001	001022 145L	0001	000056 167G	0001	000113 202G	0001	000137 216G
0001	000204 230G	0001	000206 234G	0001	001163 244L	0001	000247 251G	0001	000345 270G
0001	000346 273G	0001	000025 3L	0001	000364 302G	0001	000417 317G	0001	000426 325G
0001	000435 331G	0001	000501 354G	0001	000504 360G	0001	000513 364G	0001	000030 4L
0001	000604 417G	0001	000671 441G	0001	000672 444G	0001	001002 470G	0001	001033 500G
0001	001114 512G	0001	001117 516G	0001	001134 526G	0001	000373 53L	0001	001173 535G
0001	000401 54L	0001	001274 560G	0001	001304 565G	0001	001324 574G	0001	000424 58L
0001	000544 60L	0001	001350 605G	0001	001204 605L	0001	001376 614G	0001	001407 621G
0001	001445 629L	0001	001425 630G	0001	001472 642G	0001	001474 645G	0001	001512 654G
0001	001520 660G	0001	001663 665L	0001	001545 671G	0001	001703 673L	0001	001720 675L
0001	002320 69L	0001	001572 701G	0001	001617 704G	0001	001624 710G	0001	001646 717G

0001	002022	740L	0001	002005	747G	0001	(	002077	760G	0001	C	002121	7651	0001	002127	770L
0001	002163		0001	002366		0001	-	002406		0001	-	000612		0001	002351	
0001	002353			R 000044			-	000020			-	000017			000000	
	R 000000		*****************	R 000001		0042		000015				000000	,,		000000	
	R 000000			I 000000		0013		000000				000321			001727	
	R 000021			R 000001				000063				000003		***********************	000000	
0022	000000			R 000015				000022		0006	Ċ	00000	CKA		000006	
0012	000000	******************************		R 000000				0000022		0026	č	2000000	COSALF		000004	
0007 R	₹ 000000			R 000015				000145		0005	RC	000005	0.10	0005	000004	
	R 000007			000010				000146				000147			000013	
	2 000000			R 000001				000002	C7			000003	68		000004	
0030	000255	· · · · · · · · · · · · · · · · · · ·		R 035431		0024	R (	035441	DLPK	0007		000001			000000	
	2 000001			R 000612		0011		000000				000254			035521	
	2 000037			R 035522				000012				000062			000014	
0041	000000		0041	000011		0041		000012		0041		000013		0041		DUMM16
0041	000020	***************************************	0041	000021	**********	0042	********	000006	·····	0041		000001	· · · · · · · · · · · · · · · · · · ·		000011	
0042	000012		0042	000010		0042		000003		0042		000001		0041	000002	
0041	000003	· · · · · · · · · · · · · · · · · · ·	0041	000004		0041		000005		0041		000006		0041	000007	
0041	000010			R 000001	DVNI	0004		000001	FASE			000375			000007	
0010	000010			R 000011				000376				000571			000601	
	2 000021	FPSA	0014 F	R 000000	FOT	0016		000000	FTA	0034		000001			000000	
	2 000000			000016		0003		000000				000075			000002	
	R 000144			R 000063	GED	0015		000053	CL F	0031		000000	HR	0010 P	000014	
	₹ 000015	. <b>. .</b>		R 000064		0020		000231				000017			000020	
	R 000021			I 000016	т	0021		000000	IBODY	0041		000015			000174	
	000000			I 000602				000005				000006		0021	000007	
	000001			I 000000				000013		0000		000077		0042	000017	
	000017	IQ	0022	I 000020	IS	0022		000021		0014		000016		0010 I	000025	ISU
0022 I	000022	ITS	0021	I 000011	IWALL	0000	IC	000010	IX	0004	ΙC	000002	1777	0000 I	000001	J
	000013	JJ	0021	000012	J₩	0000	IC	000004	ĸ	0022	ΙC	000023	КАРРА	0023	000000	KBC
0023 I	000001	ксс	0000 1	I 000000	ĸĸ	0022		000024		0023	ΙC	00003	KQ10	0023 I	000002	KQ9
	000025	KR9	0010 1	I 000026	KS	0023	(	000004	KSB	0023	IC	000005		0000 I	000005	L
0016 I	000126	LAR	0003	I 001606	LEF	0003	IC	001616	LEFS	0000	ΙC	000016	LPI	0003 I	001604	L2
0003 1	001605	L3	0000	I 000002	M	0022	IC	000107	MAT1I	0022	IC	000110	MAT1J	0022 I	000111	MAT2I
0000 I	000006	MM	0003	I 001646	MOA	0003	IC	001742	MOB	0022	C	000112	MWE	0000 I	000003	MX
0000 I	000007	N	0022	I 000113	NAM	0013	1 (	000432	NEL	0022	ΙC	000114	NETA	0022 I	000115	NNLEQ
0022	000116	NON	0022 7	I 000117	NRNL	0022	C	000120	NS	0022	ΙC	000121	NSP	0003 I	002036	NSPEC
	000122	NSPM1	0021	I 000014		0025	IC	000000	NUL	0014	C	000017		0042	000000	PARTM
0011 R	000065	PE	0042	000014	PF	0003	RC	002037	PIEASE	0030	RC	000000	PREQ	0031	000020	QR
	000007	QW	0014	000350	R	0027	C	000227	RADS	0040	RC	000000	RETHMO	0012 R	000041	RETR
0031 R	₹ 000037	RHO	0011 F	R 000147				000056		0042	C	00002	RHOPA	0041	000014	RK
	2 000311	ROKAP	0042	000016	RP	0027		000373		0000	RC	000011	SFE	0034 R	000152	SP
0036	000002	SPCT	0015 F	R 000111	SPLE	0033	RC	000000	STURB	0014	RC	01237	тс	0024 R	035530	TCW
	000075	TP	0017 F	R 000017				000767		0011		00770	TVCC	0011 R	001052	UE
0017 R	000010			R 001333,		0024	RC	035531	VLNKW			00264		0011 R	001134	VMUE
0000 5	₹ 002040	1.1	0017 1	R 000001	WALL.	0017	D (	000000	WALLO			00003		0042	000007	WE

00101	1*		SUBROUTINE NNNCE	2		000000	
00101	2*	С				000000	
00103	3*		COMMON /BLQCOM/ F	R(900),L2,L3,LEF(8),LEFS(24),MOA(60),MOB(60),	/BLQCOM/	000000	
00103	4*		1	NSPEC, PIEASE, W(3)	/BLQCOM/	000000	
00104	5*		COMMON /BUMCOM/ E	BUMP,EASE,1777,WDOT	/BUMCOM/	000000	
00105	6*		COMMON /COECOM/ C	C5,C6,C7,C8,C9,C10,C12,C13,C14(3),C32	/COECOM/	000000	
00106	7*		COMMON /COECON/ (	CK1(6),CK6(156),XM(5)	/COECON/	000000	
00107	8*		COMMON /CONSTS/ (	CPFL, DPR, GC	/CONSTS/	000000	
00110	9*	·	COMMON /CRBCOM/ A	ASU(3),BSU(4),EMISC,EMIST,EMIV(3),HCARB,HCHAR(3)	), /CRBCOM/	000000	

00111         10**         CDMMON / DEGCDM / DSIF (05) , DURDE LAGP , PE (160) , PMEE (400), TTVC. / EDGCDM / DOCODO           00111         13*         CDMMON / EDGCDM / CLANK (17), FPSA (16), PETR         / FPSCDM / DOCODO           00112         13*         CDMMON / EDGCDM / CLANK (17), FPSA (16), PETR         / FPSCDM / DOCODO           00113         14*         CDMMON / EDGCDM / EDGCDM / EDGCDM / DOCODO         / CDMMON / EDGCDM / DOCODO           00115         14*         CDMMON / EDGCDM / ELG (21), ATL (14), RETAR         / FPSCDM / DOCODO           00115         14*         CDMMON / ERCOM / ELG (20), SELS (20, SELM / ELG (20), FLMK / FLMK (20), METAR         / FFACOM / DOCODO           00116         14*         CDMMON / FEACOM / ELG (20), SELM (20), SELM (20), ELM / FLACOM / DOCODO         / FFACOM / DOCODO           00112         22*         CDMMON / INFORM / ALTON (20, FEAR (20), BETAR (20), BETAR (20), ELM (20, TRDPY / INFUTI / DOCODO         / NEUCODOO           00121         22*         CDMMON / INFORM / ALTON (20, CBR, 11 (0), 15, 15H, 15, 15H, 15, 15H, 15K, 12H (20), 17H (17H (20), 20000)         / NEUCODOO           00122         22*         CDMMON / INFORM / NEUK (10, CGR, 11 (0), 15, 15H, 15, 15H, 15K, 15H (20), 17H (20	00110	10+		CRBCOM/	000000	
00111         1         TCC(50), UE E50, WAUE (50)         /E0620M/         000000           00112         14         COMMON / F20X0W/         AG123, 155-         000000         000000           00115         16         COMMON / E1243, 155-         000000         000000         000000           00115         16         COMMON / E1243, 155-         000000         000000         000000           00115         17         ENLMAN, ICHLIGO, VILL (20, 3), ELMA, ELML (20, 3), ELMA, ELML (20, 151)         /ERRCMV         000000           00116         18         COMMON / ETACBO, LAR (23), BALL (20, 161), ELC2, CALL (20, 151)         /ERRCMV         000000           00116         18         COMMON / FLXCBW/ MALLO, WALL (21, 0, MALL (21, 0, ELML (20, 151), / ELXCBW / 000000         000000           00120         21         S. HK (150)         FLGUY SALL (20, 151), / ELXCBW / 000000         00122           00121         22         COMMON / FLXCBW/ MALL (21, 21, 21, 21, 21, 21, 21, 21, 21, 21,	00110	10*		,	000000	
CONTROL         13*         COMMON / (PCPSCOM/ CLAUM(17), EPSA(16), RETR         /PESCOM/ CONCOUNC         CONCOUNC           CONTROL         FERCENCY         CLAUMON / (PCPCCM/ CONCOUNC)         CONCOUNC         CONCOUNC           CONTROL         FERCENCY         CLAUMON / (PCPCCM/ CONCOUNC)         CONCOUNC         CONCOUNC           CONTROL         FERCENCY         CLAUMON / FLACOUNC         FERCENCY         CONCOUNC           CONTROL         FERCENCY         CLAUNC / FLACOUNC         FERCENCY         CONCOUNC           CONTROL         FERCENCY         CLAUNC / FLACOUNC         FERCENCY         CONCOUNC           CONTROL         FERCENCY         CLAUNC / FLACOUNC         FERCENCY         CONCOUNC           CONTROL         FERCENCY         FERCENCY         CONCOUNC         FERCENCY         CONCOUNC           CONTROL         FERCENCY         FERCENCY         FERCENCY         CONCOUNC         FERCENCY         CONCOUNC           CONTROL         FERCENCY         FERCENCONCOUNC         FERCENCONCOUNC	-			• .		
00113         14*         COMMON /EGPCOM/ ATA(222), NEL         //EGPCOM/ O00000           00114         15*         COMMON /EGPCOM/ EDT(4); SEP (21), A(14, 14), R(439), TC(60), VLNK(60), ZEPCCOM/ 000000           00116         16*         COMMON /ELRCOM/ ELL(14), SEP (21), A(14, 14), R(439), TC(60), VLNK(60), ZEPCCOM/ 000000           00116         16*         COMMON /ELRCOM/ ELL(14), SEP (21), A(14, 14), R(439), TC(60), VLNK(60), ZEPCCOM/ 000000           00116         16*         COMMON /ELRCOM/ ELL(14), SEP (21), R(14), R(14), SEP (21), SEP (21), R(14), SEP (21), SEP (2						
OD114         15*         COMMON /EDTCOM/ EDT(14), 15P, P(21), A(14, 14), R(439), TC(60), VENK(60) /EDTCOM/         OCCOMON           00115         15*         COMMON /ERCOV / FLC(30, GL, ELM, R(12), ELM, R(3), /ERCOM/         OCCOMON           00115         17*         T         DIMON / FLCOV / FLC(30, GL, ELM, R(12), ELM, R(3), /ERCOM/         OCCOMON           00117         19*         COMMON / FLCOV / FLC(30, GL, ELM, R(12), ELM, R(3), /ERCOM/         OCCOMON         OCCOMON           00120         20*         COMMON / FLCOV / FLC(30, GL, R(2), BETAV(50), C1, C2, C3M(50)         /HECOV/         OCCOMON           00120         21*         S, IH(15, S), TICOV, AURO, SE, IH(2), INALL, JM(2), NTROPY         /INTERI/         OCCOMON           00121         22*         COMMON / INTERI / RCC, KCC, KO3, KO1, KS5, KS0L         /INTERI /				•		
OD15         16*         COMMON / ERECOM/ FLE(43), GLE(30, SPLE(30, 6), LEUM, EN. (123), EN. (M(8)), / ERECOM/         COMMON / ERECOM/         CLM (123), BAL(43, 13), BAL(10, 15)         / ERECOM/         COMMON           00115         18*         COMMON / ELECOM/         EN. (M, ELEN(8), DEN. (123), BAL(120, 15)         / ERECOM/         COMMON           00112         20*         COMMON / MEXCOM/         ELEMA, ELEMA(5), DET. (23, C3, C3, C3, C3, C3, C3, C3, C3, C3, C						
CONTS         17*         INLAWA (ENLAR(2), BANL(4)         //ERCOM/         CONDON           CONTS         18*         CONMON /FLXCOM/ WALLO, WALLO, WALLO, (4), (4), (4), (4), (4), (4), (4), (4)						
Optime         Image: Imag	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			· • • • • • • • • • • • • • • • • • • •	
00117         19*         CDMMON /FLXCOM, VALLO, WALLO, D.W.KKT 7), TPAALL         /FLXCOM/         000000           00120         20*         CDMMON /FLXCOM/ ALPL.025, D.W.KKT 7), TPAALL         /FLXCOM/         000000           00122         21*         S. HF (15, 5), X15 (50)         S. HT (15, 5), X15 (50)         NEXTON         NEWDOX           00122         22*         CDMMON / INTORY         CARLON (50), TETCOM         000000           00122         24*         1.0MTT 11, MAT 1J, MAT 21, MME, NMM, NETA, NNE 0, NDM, NRHL, NS, MSPMI         /INTEGTM         000000           00123         25*         CDMMON / INTEGT/ KEG, KC, KOS, KOI G, KS, KSOL         /INTEGTM         000000           00124         26*         CDMMON / NDNCOM / AMT 123, 123 ), DLPH(8), DLPK(6, 8), DTM+, DTKW(6), TCW, VLNKW / NONCOM         000000           00125         27*         CDMMON / PRMORE/ TISS (151), RADS(50), ROXAP(50), S(50)         /INTEGTM         0000000           00130         30*         CDMMON / PRMORE/ TISS (151), RADS(50), ROXAP(50), S(50)         /PAROMK / NEVODO000         00133           0131         31*         CDMMON / PRMORE/ TISS (151), RADS(50), ROXAP(50), S(50)         /PAROMK / NEVODO000         00133           0132         CDMMON / ART NOR / CORA, DUNA, S(141), DHT, LORAPC(17), VMUL(15)         PRPCOMK / NEVODO000         NEVODO000						
OD120         20*         CDMMON /HISCOM/ ALPHO, BETAY(S0), SETAY(S0), C1, C2, C3M(S0)         /H1SCOM/         OD02000           OD121         21*         CDMMON /INPUTI/. ISCOM/S0, ITLOY, BETAY(S0), C1, C2, C3M(S0)         /H1SCOM/         NEW000000           OD122         22*         CDMMON /INPUTI/. ISCOM/S0, ITLOY, SES, IHC.), ISALL, UM(2), UTDUTI/         OD0000           OD122         24*         1 MATI, MATI, MATI, ME, MAN, MTA, NHUE, NUE, NUE, NUE, NUE, NUE, NUE, NUE, N						
CO120         21+         S. HF (15, 5), X1 (50)         NEL 000000           CO121         22+         COMMON /INFORM/CASE (13), CBAR, 1, 10, 15, 15H, 175, KAPPA, KONRET, KR8 (50), /INFCRM/         COMMON /INFORM/CASE (13), CBAR, 1, 10, 15, 15H, 175, KAPPA, KONRET, KR8 (50), /INFCRM/         COMMON /INFORM/CASE (13), CBAR, 1, 10, 15, 15H, 175, KAPPA, KONRET, KR8 (50), /INFCRM/         COMMON /INFORM/CASE (13), CBAR, 1, 10, 15, 15H, 175, KAPPA, KONRET, KR8 (50), /INFCRM/         COMMON /INFORM/CASE (13), CBAR, 50, 10, 10, 10, 10, 10, 10, 10, 10, 10, 1				· · · ·		
CONTROL         1 ECOMMON         / INPUTI/         COORDON         CONTROL		<b></b> <del>.</del>		HISCUM/		
C0122         23*         COMMON / INTCOM/CASE(13), CEAR, I, To, IS, ISH, IT'S, KAPPA, KURFT, KR9(50), / INTCOM/         O00000           C0122         C1*         TL MAT11, MAT21, MRE, NAM, NEA, NAN, KAR, NAN, NS, NSP, NSPH         / INTCOM/         O00000           C0122         C5*         COMMON / INTERT/         KBC, KCC, KOS, KOIO, KSB, KSOL         // INTERT/         O00000           C0123         C5*         COMMON / INTERT/         KBC, KCC, KOS, KOIO, KSB, KSOL         // INTERT/         O00000           C0124         C5*         COMMON / PRENLS/, COSALF(100), DE         // VIRCOM/         O00000           C0127         C2*         COMMON / PRENCB/, IDISCI, BIO, ROKAP(50), S(50)         // PRENCB/, IDISCI, HEVOCODO         // CONCODO           C0131         COMMON / PREPCM/ DRHOH, DRHOK (30), DTK (141), DTH, DCAPCH (15), TP         / PRENCM/ - DIO00000         // VIRCOM           C0132         C2*         COMMON / PREPCM / B(15), HP, OR (15), RHO (15), RTP         / VIRCOM         O000000           C0133         COMMON / VALCY / TUK/G3, SOI         / VIRCOM         O000000         // VIRCOM         O000000           C0134         S5*         COMMON / ACCK X, LAW, SPCT         / VIRCOM         O00000         // VIRCOM         O00000         // VIRCOM         O00000         // VIRCOM         O00000         // VIRCOM						
00122         24*         1 MAT11, MAT12, MWE, NAM, NETA, NNLEG, NDN, NRNL, NS, NSP, NSPM1         /INTCOM/         000000           00123         25*         COMMON/DINCEN/ ANK (123, 123), LDPH(8), DLPK(6, 8), DTH/, DLW(6), TCV, VLNKV/NUNCOM/         000000           00124         26*         COMMON / INTERT/ KGK, CK, CKG, SK (10, DLPH(8), DLPK(6, 8), DTH/, DLW(6), TCV, VLNKV/NUNCOM/         000000           00125         27*         COMMON / PRANLS/ CCS, LC (15, 1), RDG (16), RDK (16), DLPK(6, 8), DTH/, DLPCH(1), VLNKV/NUNCOM/         000000           00130         30*         COMMON / PRPANLS/ CCS, LL (15), TRDG (16), RDG (16), RDG (15), TP         //PRENOV         000000           00130         30*         COMMON / PRPANT / HE (15), HP, GR (15), RHD (15), RHD (15), TP         //PRENOT / NEVOCODO           00133         33*         COMMON / VARCP/ CARA, DUNL (123), LCORM         //SANCR / CORA, LL / REVOCODO           00133         33*         COMMON / VARCP/ CARA, MA, SPCT         //MALL / MEVOCODO           00134         34*         COMMON / VARCP/ CARA, MA, SPCT         MEVOCODO           00135         35*         COMMON / MARCP/ CARA, MA, SPCT         MEVOCODO           00136         35*         COMMON / MARCP/ CARA, MA, SPCT         MEVOCODO           00137         35*         COMMON / MARCP/ CARA, MA, SPCT         MEVOCODO           00138						
CO123         25+         COMMON / INTERIT / KRC, KCC, KOG, KOG, KSGL         / INTERIT / 000000           C0124         26+         COMMON / NORCOM/AM (123, 123), LDFHM, BJ, DLFK(6, 8), DTFM, DTKW(6), TCW, VLINKY/NORCOM / 000000           C0125         27+         COMMON / NARCOM / INTERIT / KRC, KCC, KOG, KOG, S(B, 0), TCHM, DTKW(6), TCW, VLINKY/NORCOM / 000000           C0126         22+         COMMON / PRANS, / COSALF (100), GE         / PRANS, / COSALF (100), GE         / PRANS, / COSALF (100), GE           C0126         22+         COMMON / PRANS, / COSALF (100), GE         / PRANS, / COSALF (100, GE         / PRANS, / COSALF (100, GE           C0130         30+         COMMON / PRANS, / COSALF (100, GE         / PRANS, / COSALF (100, GE         / PRANS, / COSALF (100, GE           C0133         30+         COMMON / ALPH, CORMA, DUNIL (123), ICDRM         / TURE/ / VURE/ /				· · ·		
00124         26+         COMMON/NEXTONCOM/AM(122,123),DLPH(B),DLPK(G,B,,DTHW,DTKW(G),TCW,VLNKW/NONCOM/         000000           00125         27+         COMMON /PRRACK, COSALF(100), GE         /PRMALS/         000000           00126         28+         COMMON /PRRACK, COSALF(100), GE         /PRMALS/         000000           00130         30+         COMMON /PRROKG/ DIGIOS(151), RAD(50), S(50)         /PRMALS/         000000           00131         31+         COMMON /PRPCM/ DRHOH, DRHOK(30), DTK(141), DTH, DCAPCH71, VMU(15)         /PRPCMV -01000000           00132         32+         COMMON /PRPCM/ CONMA.DVN.(123), ICORM         //VRCM/         000000           00133         33+         COMMON /ACCP/ACOPK1, LAW, SPCT         /MACMA         000000           00136         35+         COMMON /ACPC/ACOPK1, LAW, SPCT         /WACMA         000000           00136         35+         COMMON/ACPK/ACOPK1, LAW, SPCT         /WACMA         NEW00000           00137         7*         COMMON/ACPK/ACPK1, LAW, SPCT         NEW00000         NEW00000           0141         39+         COMMON/ACPK/ACOPK1, LAW, SPCT         NEW00000         NEW00000           0141         39+         COMMON/ACPK/ACPK1, TH, PLAK, FP, DUMH3, DUMH4, DUMH3, DUMH3, DUMH3, OLMM4, DUMH3, OLMM4, ME, MONO         NEW000000		· · · · · · · · · · · · · · · · · · ·				
CO125         27*         COMMON /NZERG/ NUL         /NZERG/ 000000           C0126         28*         COMMON /PRMALS/ COSALF(100), GE         /PRMALS/ 000000           C0127         29*         COMMON /PRMALS/ COSALF(100), GE         /PRMALS/ 000000           C0130         COMMON /PRECM/ DISC(151), RADS(50), RCAP(15), TH, DCAPCH(7), VMU(15)         /PRPCOM/ -01000000           C0131         31*         COMMON /PRPCOM/ DISOL (151), RADF(15), RTDF(15), T         /PRPCOM/ -01000000           C0133         32*         COMMON /PRPCOM/ DISOL (VL (123), ICOSM         /STDPCOM/ -0000000           C0133         34*         COMMON /VARCOM/ ALPH, F(15, 4), G(15, 3), SP(15, 3, 7)         /VARCOM/ 000000           C0134         34*         COMMON /VARCOM/ ALCPH, IZOS         NEW000000           C0135         35*         COMMON /VARCOM/ ALCPH, IZOS         NEW000000           C0136         36*         COMMON/ACCN/ACCH/, IZOS/R         NEW000000         NEW000000           C0141         38*         COMMON/ARETH/RETHMO         NEW000000         NEW000000           C0141         40*         \$ DUMMO/ DUMAY, IDMA2, RUMAS, DUMAS, DUMAY, DUMAY, BUMAY, BUMAY, BUMAY, NEWNY, NEW00000         NEW000000           C01414         40*         COMMON/ARETH/ARETHMO         NEW000000         NEW000000           C01414						
00126         28*         COMMON / PRNDRG/ JDS(151), RADS(50), ROKAP(50), S(50)         /PRNDRG/ NEWO0000           00130         30*         COMMON / PRNDRG/ DIS(151), RADS(50), ROKAP(50), S(50)         /PRNDRG/ NEW00000           00131         31*         COMMON / PRPNDR/ HB (15), HP, Q(15), RHQ(15), RHQ(15), TP         /PRNDRG/ NEW00000           00132         32*         COMMON / SAVNCR/ CORMA, DVNL (122), ICORM         //SAVNCR/ -01000000           00133         33*         COMMON / NARC/MC (2000)         //ILVR/ SOUDO           00134         34*         COMMON / NARC/MC (2000)         //ILVR/ SOUDO           00135         35*         COMMON / NARC/ LUX (3800)         //ILVR/ SOUDO           00136         55*         COMMON / NARC/MC (2000)         NEW000000           00137         37*         COMMON / NARC/MC (2011, ACCPK 2000)         NEW000000           00136         55*         COMMON / NARC/MC (2011, ACCPK 2000)         NEW000000           00141         39*         COMMON / NARC/MC 2014, RHOPA, DUMMAS, DUMMAT, DUMMAS, DUMMAT, DUMMAS, DUMMAT, NEW00000         NEW000000           00142         41*         COMMON / NARC/MC 2014, RHOPA, DUMMAS, DUMMAT, DUMMAS, NEW000000           00142						
00127         29+         COMMON /PRMCR2/ IDISC(151), RADS(50), RDKAP(50), S(50)         /PRMCR2/ NEWCOOCO           00130         30+         COMMON /PRPCOM/ DEMOH, DRNGK(30), DTK(141), DTH, DCAPCH(7), VWU(15)         /PRPCM7/ NEWCOOCO           00131         31+         COMMON /PRPCM7/ HB(15), HP, OR(15), RH0(15), RH0(15), TP         /PRPNT7/ NEWCOOCO           00132         32+         COMMON /VALC/ ACMA, DVKL(123), ICGRM         /TURB/ 000000           00133         33+         COMMON /VALC/ FLUXJ(3, ISO)         /TURB/ 000000           00134         34+         COMMON /VALC/ FLUXJ(3, ISO)         /VALL/ 000000           00135         35-         COMMON /AACM/ACK/ACFK1, IAM, SPCT         NEW000000           00143         35-         COMMON /ACM/ACK/ACFK1, IAM, SPCT         NEW000000           00144         35-         COMMON /ACM/ACFKACFK2         NEW000000           00142         45-         COMMON /RIF/DUMM1, DUM2, DUMR5, DUMM5, DUMM5, DUMM5, DUMM5, NEW000000         NEW000000           00142         42-         SOMMON / LAM/ IAN/NACH/ACFF, MF, DUMM5, DUMM5, DUMM5, DUMM5, NEW000000         NEW000000           00143         43-         COMMON / LAM/ IAN/NACH/ACFF, MF, DUMM5, DUMM5, DUMM5, NEW         NEW000000           00144         45-         OUMMON / LAM/ IAN/NACH/ACFF, MF, DUMM15, DUMM5, MACH, MACH, MACH, MACH, MACH, MACH, MACH, MACH, MA						
00130         30*         COMMON /PRECOM/ DRHOM, (30), DTK (141), DTH, CAPCH (7), VMU(15)         /PRECOM/ -01000000           00131         31*         COMMON /SRNPC/ CORMA, DVML (123), ICOMM         /SAVWCR/ -01000000           00132         32*         COMMON /SAVNCR/ CORMA, DVML (123), ICOMM         /SAVWCR/ -01000000           00133         33*         COMMON /SAVNCR/ CORMA, DVML (123), ICOMM         /YURB         /YURB/ 000000           00134         34*         COMMON /VARC/ XCC/K, ILAN, SPCT         /WALL/ 000000           00135         35*         COMMON /ACC/ACC/K, ILAN, SPCT         NEW000000           00136         36*         COMMON/ACC/ACC/K, ILAN, SPCT         NEW000000           00141         39*         COMMON/ACC/ACC/K, ILAN, SPCT         NEW000000           00141         39*         COMMON/ARET//RETHMO         NEW000000           00142         40*         S DUMM 1, DUMM2, RUMA2, DUMM3, DUMM5, DUMM5, DUMM5, DUMM5, NEW000000         NEW000000           00142         42*         S DUMM21, DUM21, DUM2, Z, PART, YP, DUMM14, PWF, NEW000000         NEW000000           00142         42*         COMMON /LAW /LANN         NEW000000         00143           00142         42*         DUMM22, DUMM21, ILT, PF, AK, RP, IPART         NEW000000         00144           44*						·····
00131         31+         COMMON /PRPNPT / HB(15), HP, OR(15), RHO(15), RHO(15), TP         /PRPNPT / NEW00000           00132         32+         COMMON /SAVICE/ CORMA, DVAL(123), LCORM         /SAVICE/ -0100000           00133         33+         COMMON /VACD/ ACPH, F(15, 4), 6(15, 3), SP(15, 3, 7)         /VARCD/ ACM/ ACM/ ACM/ ACM/ ACM/ ACM/ ACM/ ACM	-		CUMMUN / PRMURG/ IDISC(151), RADS(50), RUKAP(50), S(50) //	· · · ·		
00132         32+         CDMMON /SAVNCR/ CDRMA DVNL (123), iCDRM         /SAVNCR/ -01000000           00133         33+         CDMMON /VRRCOM/ ALPH, f15, 4), G(15, 3), SP(15, 3, 7)         /VARCDM/ 000000           00134         34+         CDMMON /VRRCOM/ ALPH, f15, 4), G(15, 3), SP(15, 3, 7)         /VARCDM/ 000000           00135         35+         CDMMON /VARCOM/ ALPH, f15, 4), G(15, 3), SP(15, 3, 7)         /VARCDM/ 000000           00136         36+         CDMMON/ACCN/ACCPK, ILAM, SPCT         NEW000000           00137         37+         CDMMON/ACN/ACCN/ACCPK, ILAM, SPCT         NEW000000           00140         38+         CDMMON/ACN/ACN/ACCPK, ILAM, SPCT         NEW000000           00141         40+         \$ DUMM O, DUMM 1, DUMM 2, DUMM3, DUMM4, DUMM5, DUMM5, DUMM5, DUMM5, NEW000000         NEW000000           00142         41+         COMMON/PARTI/PARTM, DUMM22, RK, ICF, FW, DUMM16, DUMM 19, WF,         NEW000000           00142         42+         \$ DUMM20, DUMM21, ILT, PF, AK, RP, IPART         NEW000000           00143         44+         C         DUMM20, DUMM21, ILT, PF, AK, RP, IPART         NEW000000           00144         45+         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00144         45+         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
00133         33*         COMMON /TURE/ STURE         /TURE/         000000           00134         34*         COMMON /VARCOM /LPH, F(15, 4), G(15, 3, 7)         /VARCOM /000000           00135         35*         COMMON /VALC/ FLUXJ(3, 50)         /VALL/         000000           00136         36*         COMMON /VALC/ FLUXJ(3, 50)         /VALL/         000000           00137         37*         COMMON/ACC/ACC/RCFK1, LAM, SPCT         NEW000000           00140         38*         COMMON/ACE/ACC/RCFK1, LAM, SPCT         NEW000000           00141         39*         COMMON/RETH/RETHMO         NEW000000           00141         40*         \$DUMM10, DUMM1, DUMM2, DUMM3, DUMM3, DUMM3, DUMM5, DUMM5, NEW000000         NEW000000           00142         41*         COMMON/PART/PARTM, DUMM2, RHOPA, DUMM23, CPART, WP, DUMM19, WF,         NEW000000           00143         43*         COMMON /LAM/ ILAMIN         NEW000000         00144           00143         43*         COMMON /LAM/ ILAMIN         NEW000000         00145           00144         45*         DUMM21, RLF, ICP, FAK, DUM +D, DUM + S, MK, IAK 4/83         000000           00144         45*         DUMA2, RUM21, DREG(1)         ANK 4/83         000000           00145         46*         EQUM21				•		
00134         34+         COMMON /ARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7)         /VARCOM/ 00000           00135         35+         COMMON /ARCH/ACCH,ILAM,SPCT         /VALL/         000000           00136         36+         COMMON/ACCH/ACCFK,ILAM,SPCT         NEW000000           00137         37+         COMMON/ACCH/ACCFK,ILAM,SPCT         NEW000000           00140         38+         COMMON/ACFH/ACTHMO         NEW000000           00141         49+         COMMON/RET/IARTH JUMM3, DUMM3, DUMM5, DUMM5, DUMM5, DUMM5, NEW00000         NEW000000           00142         41+         COMMON/PARTI/FARTM, DUMM3, RHOPA, DUMM3, PF, NEW00000         NEW000000           00142         42+         \$ DUMM2, DUMM2, DUMM2, ILT, PF, AK, RP, IPART         NEW00000           00143         44+         C         OOMMON /LAM/ ILAMIN         NEW00000           00144         45+         DUMM2, DUMM2, OUMM2, ILT, PF, AK, RP, IPART         NEW00000           00144         45+         DUMMS, DUM 2, OUMA2, ILT, PF, AK, RP, IPART         NEW00000           00144         45+         DUMM COUMA, CRAR, I, IPREQ(1)         AK (#33         00000           00144         45+         DUMN COUMA, ILAM, ILAMIN         NEW00000         NEW00000           00145         45+         DUMN COUMA, ILAM, IL						
00135         35*         CCMMON /WALL/ FLUXJ(3,50)         /WALL/         00000           00136         36*         CCMMON/ACCN/ACCN/ACCPK, ILASPCT         NEW000000           00140         38*         COMMON/ACCN/ACCN/ACCPK, ILASPCT         NEW000000           00141         39*         COMMON/ACCN/ACCPK, ILASPCT         NEW000000           00141         39*         COMMON/EFT/PETHMO         NEW000000           00142         41*         COMMON/ACCN/ACCN/ACCN/ACCN/ACCN/ACCN/ACCN/AC						
00136         36+         COMMON/ACCP/ACCPK, 1, Aú, SPCT         NEW000000           00137         37+         COMMON/ACPK/ACCPK, 1, ACCPK, 2         NEW000000           00140         38+         COMMON/ACPK/ACCPK, 1, ACCPK, 2         NEW000000           00141         39+         COMMON/ACPK/ACCPK, 1, ACCPK, 1, ACCPK, 2         NEW000000           00141         40+         \$ DUMM10, DUMM3, DUMM3, DUMM3, DUMM3, DUMM17, DUMM18, NEW000000         NEW000000           00142         41+         COMMON/ACPK/ACAPK, ACMAR, 2, HCPA, FUFA, DUMM19, VF.         NEW000000           00142         42+         \$ DUMM2, DUMM2, DUMM23, LIT, PF, AK, RP, IPART         NEW000000           00143         44+         C         COMMON / LAM/ ILAMIN         NEW000000           00143         44+         C         DUMM2, DUMM2, DUMA2, DUMA2, DUMA2, DUMA2, DUMA3, DUMM3, DUMA3, DUMM3, DUMA3, DUMM3, DUMA3, DUMM3, DUMA3, DUM					*****	
00137         37*         CDMMON/ACPK/ACCPK1, ACCPK2         NEW000000           00140         38*         CDMMON/RETH/RETHMD         NEW000000           00141         39*         CDMMON/RETH/RETHMD         NEW000000           00142         41*         CDMMON/RETH/RETHMD         NEW000000           00142         42*         SDUMM2, DUMM2, RTH/PARTM, DUMM2, RHOPA, DUMM3, DUMM5, DUMM19, WF.         NEW000000           00142         42*         SDUMM22, DUMM20, DUMM21, ILT, PF, AK, RP, IPART         NEW000000           00143         44*         C         COMMON /LAWT, ILAMIN         NEW00000           00143         44*         C         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00146         47*         INTEGR ASU, BSU         000000         00000           00146         48*         C         000000         000000         00110           00146         48*         C         000000         000000         000000           00146         48*         C         0000000         000000				/WALL/		•
00140         38*         COMMON/RETH/RETHMO         NEW000000           00141         39*         COMMON/RETH/RETHMO         NEW000000           00141         40*         \$ DUMM 1, DUMM 2, RK ICF, FMF, DUMM 5, DUMM 7, DUMM 8, DUMM 9, NEW000000         NEW000000           00142         41*         COMMON/PARTI/PARTM, DUMM 2, RHOPA, DUMM 2, CPART, WP, DUMM 19, WF, NEW00000         NEW000000           00142         42*         \$ DUMM 2, DUMM 2, ILL, PF, AK, RP, IPART         NEW000000           00143         43*         COMMON / LAW / ILLANIN         NEW000000           00143         44*         C         000000           00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00144         45*         C         000000         00144           00145         64*         EQUIVALENCE (AM, CORAR), (DRHOH, PREQ)         ANK 4/83         000000           00146         47*         INTEGER ASU, BSU         000000         00145         000000           00145         50*         IF (ITS S.NE, 1) GO TO 1         000000         00145           00152         51*         EASE = ALIN/HI (EASE*2, 1, 0)         OD 11         000000           00153         52*         BUMP = 1, 0 GO TO 3         ANK 5/83 </td <td></td> <td></td> <td></td> <td></td> <td>***************************************</td> <td></td>					***************************************	
00141         39*         COMMON/PARTI/PARTM, DUMM2, DUMM2, DUMM5, DUMS, DUMOS, DO0000, DO000,						
00141         40*         \$ DUMM 10, DUMM 11, DUMM 12, RK, ICF, FMF, DUMM 15, DUMM 16, DUMM 19, WF.         NEW000000           00142         41*         COMMON/PARTM, DUMM 20, RDAPA, DUMM 20, CPART, WP, DUMM 19, WF.         NEW000000           00143         43*         COMMON / LAM / ILAMIN         NEW000000           00143         44*         C         NEW000000           00143         44*         C         NEW000000           00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00146         47*         INTEGER ASU, BSU         000000         00000           00146         47*         INTEGER ASU, BSU         000000         00000           00146         47*         INTEGER ASU, BSU         000000         00000           00147         49*         EASE=ANIN1(EASE*2, 1, 0)         000000         000000           00152         51*         EASE * 1, 0/3, 0         0011         000001           00153         52*         BUMP = 1, 0         B05A0740         000021           00154         53*         IF (IO, LE, 1) GO TO 3         ANK 5/83         000021 <tr< td=""><td></td><td>· · · · · · · · · · · · · · · · · · ·</td><td></td><td></td><td>***************************************</td><td></td></tr<>		· · · · · · · · · · · · · · · · · · ·			***************************************	
00142         41*         COMMON/PARTI/PARTM, DUMM23, CHOPA, DUMM23, CPART, WP, DUMM19, WF,         NEW000000           00142         42*         \$ DUMM20, DUMM21, ILT, PF, AK, RP, IPART         NEW000000           00143         44*         C         000000           00143         44*         C         000000           00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00145         46*         EQUIVALENCE (AM, CORAR), (DRHOH, PREQ)         ANK 4/83         000000           00146         47*         INTEGER ASU, ESU         000000           00146         48*         C         000000           00150         50*         IF (ITS .NE. 1) GD TD 11         000006           00152         51*         EASE= ANINI(EASE*21.0)         000001           00153         52*         EUMP = 1.0         GO TD 3         ANK 5/83         000011           00154         53*         IF (IO LE. 1) GO TD 3         ANK 5/83         000021         00021           00154         53*         IF (KR9(IS) .GT. 0) IWALL = KR9(IS)         ANK 5/83         000015         000021           00152         57*         I CORM = 1. E * 10         B05A0770         000033         0000055						
00142         42*         \$ DUMM20, DUMM21, ILT, PF, AK, RP, IPART         NEW00000           00143         43*         COMMON / LAM/ ILAMIN         NEW00000           00143         44*         C         000000           00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00145         46*         EQUIVALENCE (AM, CORAR), (DRHOH, PREQ)         ANK 4/83         000000           00146         47*         INTEGER ASU, BSU         000000         000000           00146         48*         C         000000         000000           00150         50*         IF (ITS .NE. I) GO TO 11         000000         000000           00153         52*         BUMP = 1.0         CO TO 3         ANK 5/83         000011           00156         54*         IF (IDT .LE. 1) GO TO 3         ANK 5/83         000015           00156         54*         IF (WDT .LT. 0.0) GO TO 4         000025           001612         55*         3 WDDT=12/CI         000003           00162         57*         ICDRM = 1.         BO5A0760         000031           00163         58*         CORMA = 1.E * 10         IMAL = KR9(IS)         ANK 4/83         0000035           <					• • • • • • • • • • • • • • • • • • •	
00143         44+ C         COMMON /LAM/ ILAMIN         NEw00000           00143         44+ C         C         000000           00144         45+ DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00145         46+ EQUIVALENCE (AM,CORAR), (DRHOH, PREQ)         ANK 4/83         000000           00146         47+ INTEGER ASU, BSU         000000         000000           00146         48+ C         C         000000           00150         50+ IF (ITS_NE_1) GO TO 11         000000           00153         51+ EASE = 1.0/3.0         ANK 8/83         000011           00154         53+ IF (10 - LE_1) GO TO 3         BO5A0740         000013           00154         53+ IF (10 - LE_1) GO TO 4         0000021         000015           00154         53+ IF (10 - LE_1) GO TO 4         0000021         000015           00154         53+ IF (KR9(IS) .GT. 0) IWALL = KR9(IS)         ANK 5/83         000015           00162         57+ IF (KR9(IS) .GT. 0) IWALL = KR9(IS)         ANK 4/83         000035           00164         59+ IF (KR9(IS) .GT. 0) IWALL = KR9(IS)         ANK 4/83         000035           00164         59+ IF (IWALL - 2) 11, 10, 9         ANK 4/83         000035           00171         63+ IF						
00143         44*         C         000000           00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00145         46*         EQUIVALENCE (AM, CURAR), (DRHOH, PREQ)         ANK 4/83         000000           00146         47*         INTEGER ASU, BSU         000000         000000           00146         48*         C         000000         000000           00147         49*         EASE=AMIN1(EASE*21.0)         000000         000000           00150         50*         IF (ITS .NE. 1) GD TO 11         0000006         000000           00153         52*         BUMP = 1.0         GD TO 3         B05A0740         000013           00156         54*         IF (WDT .LT. 0.0) GO TO 4         0000025         0000025           00161         56*         4         PIEASE=1.         0000030         000031           00162         57*         ICORM = 1         000005         000031         000005           00164         59*         IF (KR9(IS). GT. 0)         IWALL = KR9(IS)         ANK 4/83         000003           00164         59*         IF (KR9(IS). GT. 0)         IWALL = KR9(IS)         ANK 4/83         000056           0						
00144         45*         DIMENSION CORAR(1), PREQ(1)         ANK 4/83         000000           00145         46*         EQUIVALENCE (AM, CORAR), (DRHOH, PREQ)         ANK 4/83         000000           00146         47*         INTEGER ASU, BSU         000000           00146         48*         C         000000           00147         49*         EASE=AMIN1(EASE*2., 1.0)         000000           00150         50*         IF (ITS_NE_1) GO TO 11         000000           00152         51*         EASE = 1.0/3.0         BOSA0740         000013           00153         52*         BUMP = 1.0         BOSA0740         000013           00154         53*         IF (10.LE.1) GO TO 3         ANK 5/83         000015           00154         53*         IF (WDDT_LT_0.0) GD TO 4         000021           00160         55*         3 WDDT=12/C1         000021           00161         56*         4 PIEASE=1.         0000031           00162         57*         ICORM = 1.E         000031           00163         58*         CORMA = 1.E + 10         BOSA0700         000033           00164         59*         IF (KR9(IS) GT. 0) IWALL = KR9(IS)         ANK 4/83         000056						
00145         46*         EQUIVALENCE (AM, CORAR), (DRHOH, PREQ)         ANK 4/83         000000           00146         47*         INTEGER ASU, BSU         000000           00146         48*         C         000000           00147         49*         EASE=AMIN1(EASE*2., 1.0)         000000           00150         50*         IF (ITS .NE. 1) GO TO 11         000006           00152         51*         EASE = 1.0/3.0         ANK 8/83         000011           00153         52*         BUMP = 1.0         B05A0740         000021           00160         55*         3 WDDT12/C1         000021         000000           00161         56*         4 PIEASE=1.         000021         0000015           00162         57*         ICORM = 1         000000         000030           00162         57*         ICORM = 1         000030         000031           00164         59*         IF (KRGIS). GT. O) IWALL = KR9(IS)         ANK 4/83         000035           00166         60*         DD 17 I = 1.NETA         000056         000056           00171         61*         17 EPSA(I]=0.         000063         000057           00176         63*         9 FLUXU(3.IS) = -1.0			c		*******************************	
O0146         47*         INTEGER ASU,BSU         O00000           00146         48*         C         000000           00147         49*         EASE=AMIN1(EASE*2.,1.0)         000000           00150         50*         IF (ITS.NE.1) G0 T0 11         000000           00152         51*         EASE = 1.0/3.0         ANK 8/83         000011           00153         51*         EASE = 1.0/3.0         B05A0740         000013           00154         53*         IF (IO.LE.1) G0 T0 3         ANK 5/83         000015           00156         54*         IF (WOD.LT.O.O) G0 T0 4         0000021         000002           00160         55*         3 WODT=12/C1         000002         000003           00161         56*         4 PIEASE=1.         000003         000003           00162         57*         ICORM = 1         000003         00003           00163         58*         CORMA = 1.E + 10         B05A0770         00003           00164         59*         IF (KR9(IS). GT. O) IWALL = KR9(IS)         ANK 4/83         000005           00171         61*         17 EPSA(I)=0.         000056         00007         000056           00173         62*         IF (IWA				• •		
O0146         48*         C         O00000           O0147         49*         EASE=AMIN1(EASE*2.,1.0)         000000           O0150         50*         IF (ITS.NE.1) GO TO 1         000000           O0152         51*         EASE = 1.0/3.0         ANK 8/83         000011           O0153         52*         BUMP = 1.0         BO5A0740         000013           O0154         53*         IF (IO.LE.1) GO TO 3         BO5A0740         000021           O0156         54*         IF (WDOT.LT.0.0.0) GD TO 4         000022         000021           O0160         55*         3 WDOT=12/C1         000025         000021           O0161         56*         4 PIEASE=1.         0000025         000021           O0162         57*         ICORM = 1         000030         000031           O0163         58*         CORMA = 1.E + 10         BO5A0760         000031           O0164         59*         IF (KR9(IS).GT. 0) IWALL = KR9(IS)         ANK 4/83         000035           O0166         60*         D0 17 I = 1.NETA         000056         000171           O0173         62*         IF (IWALL - 2) 11,10,9         ANK 4/83         000057           O0176         63*				NK 4/83		
00147       49*       EASE=AMIN1(EASE*2.,1.0)       000000         00150       50*       IF (ITS .NE. 1) GO TO 11       000006         00152       51*       EASE = 1.0/3.0       ANK 8/83       000011         00153       52*       BUMP = 1.0       B05A0740       000013         00154       53*       IF (IO .LE. 1) GO TO 3       ANK 5/83       000015         00156       54*       IF (WD T .LT .0.0) GO TO 4       0000021         00160       55*       3 WD0T=12/C1       000025         00161       56*       4 PIEASE=1.       0000030         00162       57*       ICORM = 1       B05A0760       000031         00163       58*       CORMA = 1.E + 10       B05A0770       000033         00164       59*       IF (KR9(IS) .GT. 0) IWALL = KR9(IS)       ANK 4/83       000035         00164       59*       IF (IWALL - 2) 11.10.9       ANK 4/83       000056         00171       61*       17 EPSA(I)=0.       000056       00071         00176       63*       9 FLUXJ(3.IS) = -1.0       000056       000071         00177       64*       10 ISP = NEL + 1       ANK 5/83       000067         00200       65*       KK=MAX0(						
O0150         50*         IF (ITS_NE_1) GO TO 11         O00006           00152         51*         EASE = 1.0/3.0         ANK 8/83         O00011           00153         52*         BUMP = 1.0         B05A0740         O000013           00154         53*         IF (IQ_LE_1) GO TO 3         ANK 5/83         O00015           00156         54*         IF (WDOT_LT_0.0) GO TO 4         000021           00160         55*         3 WDDT=12/C1         000025           00161         56*         4 PIEASE=1.         000030           00162         57*         ICORM = 1         000030           00163         58*         CORMA = 1.E + 10         B05A0700         000031           00164         59*         IF (KR9(IS) .GT. 0) IWALL = KR9(IS)         ANK 4/83         000035           00166         60*         DD 17 I = 1.NETA         000056         000056           00171         61*         17 EPSA(I)=0.         000056         000057           00176         63*         9 FLUXJ(3.IS) = -1.0         0000067         000067           00176         63*         9 FLUXJ(3.IS) = -1.0         0000067         000067           00176         63*         9 FLUXJ(3.IS)         00006			C			
00152 $51*$ EASE = 1.0/3.0ANK 8/83 $000011$ $00153$ $52*$ $BUMP = 1.0$ $BO5A0740$ $000013$ $00154$ $53*$ IF (I0 . LE. 1) GO TO 3 $ANK 5/83$ $000015$ $00156$ $54*$ IF (WDOT .LT. 0.0) GO TO 4 $000021$ $00160$ $55*$ $3$ WDOT=12/C1 $000025$ $00161$ $56*$ $4$ PIEASE=1. $000030$ $00162$ $57*$ I CORM = 1 $000030$ $00163$ $58*$ CORMA = 1.E + 10 $B05A0760$ $000031$ $00164$ $59*$ IF (KR9(IS) .GT. 0) IWALL = KR9(IS)ANK 4/83 $000035$ $00166$ $60*$ D0 17 I = 1.NETA $000056$ $000056$ $00171$ $61*$ 17 EPSA(I)=0. $000056$ $00176$ $63*$ 9 FLUXJ(3.IS) = -1.0 $000063$ $00176$ $63*$ 9 FLUXJ(3.IS) = -1.0 $000067$ $00200$ $65*$ KK=MAXO(1,KS(IS)) $000067$ $00200$ $65*$ KK=MAXO(1,KS(IS)) $000071$ $00200$ $66*$ D0 13 J = 1.3 $ANK 6/83$ $000113$ $00206$ $68*$ L2=2*KK $ANK 6/83$ $000115$						
O0153         52*         BUMP = 1.0         B05A0740         O00013           O0154         53*         IF (IQ.LE.1) GO TO 3         ANK 5/83         O00015           O0156         54*         IF (WDT.LT.O.O) GO TO 4         O00021         O00021           O0160         55*         3 WDT=12/C1         O000030         O00030           O0161         56*         4 PIEASE=1.         O000030         O00031           O0162         57*         ICORM = 1         B05A0760         O00031           O0163         58*         CORMA = 1.E + 10         B05A0770         O00033           O0164         59*         IF (KR9(IS).GT.O) IWALL = KR9(IS)         ANK 4/83         O00035           O0166         60*         D0 17 I = 1,NETA         O00056         O00056           O0171         61*         17 EPSA(I)=0.         000056         O00057           O0176         63*         9 FLUXJ(3,IS) = -1.0         000056         O0077           O0177         64*         10 ISP = NEL + 1         O00057         O00063           O0200         65*         KK=MAXO(1,KS(IS))         O00071         O00067           O0201         66*         D0 13 J = 1,3         O00071         O00071 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
O0154         53*         IF         IQ         LE         1         GO         TO         ANK         5/83         O00015           O0156         54*         IF         (WDDT         LT         0.0         GO         TO         3         O00021           O0160         55*         3         WDDT=12/C1         000021         000025           O0161         56*         4         PIEASE=1.         000030           O0162         57*         ICORM = 1         B05A0760         000031           O0163         58*         CORMA = 1.E + 10         B05A0770         000033           O0164         59*         IF         (KR9(IS)         GT. 0)         IWALL = KR9(IS)         ANK 4/83         000035           O0164         59*         IF         (KR9(IS)         GT. 0)         IWALL = KR9(IS)         ANK 4/83         000035           O0164         59*         IF         (INPLA         0         000056         0<			•	-		
O0156         54*         IF (WDDT.LT.0.0) GD TD 4         O00021           00160         55*         3 WDDT=12/C1         0000025           00161         56*         4 PIEASE=1.         0000030           00162         57*         ICDRM = 1         B05A0760         000031           00163         58*         CDRMA = 1.E + 10         B05A0770         000033           00164         59*         IF (KR9(IS).GT.O) IWALL = KR9(IS)         ANK 4/83         000035           00166         60*         DD 17 I = 1,NETA         000056         000056           00171         61*         17 EPSA(I)=0.         000056         000057           00176         63*         9 FLUXJ(3,IS) = -1.0         000063         000071           00177         64*         10 ISP = NEL + 1         0000063         000071           00200         65*         KK=MAXO(1,KS(IS))         000071         000071           00201         66*         DD 13 J = 1.3         000071         000071           00204         67*         13 W(J) = FLUXJ(J,IS)         ANK 6/83         000113           00206         68*         L2=2*KK         000115         000115						
00160       55*       3 WDDT=12/C1       000025         00161       56*       4 PIEASE=1.       000030         00162       57*       ICORM = 1       B05A0760       000031         00163       58*       CORMA = 1.E + 10       B05A0770       000033         00164       59*       IF (KR9(IS) .GT. 0) IWALL = KR9(IS)       ANK 4/83       000035         00166       60*       D0 17 I = 1.NETA       000056       000056         00171       61*       17 EPSA(I)=0.       000056       000057         00176       63*       9 FLUXJ(3,IS) = -1.0       000063       000067         00177       64*       10 ISP = NEL + 1       000071       000071         00200       65*       KK=MAX0(1,KS(IS))       000071       000071         00201       66*       D0 13 J = 1.3       ANK 6/83       000104         00204       67*       13 W(J) = FLUXJ(J,IS)       ANK 6/83       000113         00206       68*       L2=2*KK       000115       000115				NK 5/83		
00161 $56*$ 4 PIEASE=1.       000030         00162 $57*$ ICORM = 1       B05A0760       000031         00163 $58*$ CORMA = 1.E + 10       B05A0770       000033         00164 $59*$ IF (KR9(IS) .GT. 0) IWALL = KR9(IS)       ANK 4/83       000035         00166       60*       DD 17 I = 1.NETA       000056         00171       61*       17 EPSA(I)=0.       000056         00173       62*       IF (IWALL - 2) 11.10.9       ANK 4/83       000057         00176       63*       9 FLUXJ(3,IS) = -1.0       000063         00177       64*       10 ISP = NEL + 1       000071         00200       65*       KK=MAXO(1,KS(IS))       000071         00200       65*       DI 3 J = 1.3       000071         00204       67*       13 W(J) = FLUXJ(J,IS)       ANK 6/83       000113         00206       68*       L2=2*KK       000115       ANK 6/83       000113						······
O0162         57*         ICORM = 1         B05A0760         O00031           00163         58*         CORMA = 1.E + 10         B05A0770         000033           00164         59*         IF (KR9(IS) .GT. 0) IWALL = KR9(IS)         ANK 4/83         000035           00166         60*         DD 17 I = 1,NETA         000056           00171         61*         17 EPSA(I)=0.         000056           00173         62*         IF (IWALL - 2) 11,10,9         ANK 4/83         000057           00176         63*         9 FLUXJ(3,IS) = -1.0         000063           00177         64*         10 ISP = NEL + 1         000067           00200         65*         KK=MAXO(1,KS(IS))         000071           00201         66*         DD 13 J = 1,3         00013 J = 1,3           00204         67*         13 W(J) = FLUXJ(J,IS)         ANK 6/83         000113           00206         68*         L2=2*KK         000115         000115						
00163         58*         CORMA = 1.E + 10         B05A0770         000033           00164         59*         IF (KR9(IS).GT.O) IWALL = KR9(IS)         ANK 4/83         000035           00166         60*         D0 17 I = 1,NETA         000056           00171         61*         17 EPSA(I)=0.         000056           00173         62*         IF (IWALL - 2) 11,10,9         ANK 4/83         000057           00176         63*         9 FLUXJ(3,IS) = -1.0         000063         000067           00177         64*         10 ISP = NEL + 1         000071         000071           00200         65*         KK=MAXO(1,KS(IS))         000071           00201         66*         DD 13 J = 1,3         00013 J = 1,3           00204         67*         13 W(J) = FLUXJ(J,IS)         ANK 6/83         000113           00206         68*         L2=2*KK         000115         000115						
00164       59*       IF (KR9(IS) .GT. 0) IWALL = KR9(IS)       ANK 4/83       000035         00166       60*       D0 17 I = 1,NETA       000056         00171       61*       17 EPSA(I)=0.       000056         00173       62*       IF (IWALL - 2) 11,10,9       ANK 4/83       000057         00176       63*       9 FLUXJ(3,IS) = -1.0       000063         00177       64*       10 ISP = NEL + 1       000071         00200       65*       KK=MAXO(1,KS(IS))       000071         00201       66*       DD 13 J = 1,3       00013 J = 1,3         00204       67*       13 W(J) = FLUXJ(J,IS)       ANK 6/83       000113         00206       68*       L2=2*KK       000115       000115						
O0166         60*         D0 17 I = 1,NETA         O00056           O0171         61*         17 EPSA(I)=0.         000056           O0173         62*         IF (IWALL - 2) 11,10,9         ANK 4/83         000057           O0176         63*         9 FLUXJ(3,IS) = -1.0         000063           O0177         64*         10 ISP = NEL + 1         000071           O0200         65*         KK=MAXO(1,KS(IS))         000071           O0201         66*         DD 13 J = 1,3         000104           O0204         67*         13 W(J) = FLUXJ(J,IS)         ANK 6/83         000113           O0206         68*         L2=2*KK         000115         000115			$\frac{1}{100} \frac{1}{100} \frac{1}$			
00171       61*       17 EPSA(I)=0.       000056         00173       62*       IF (IWALL - 2) 11,10,9       ANK 4/83 000057         00176       63*       9 FLUXJ(3,IS) = -1.0       000063         00177       64*       10 ISP = NEL + 1       000067         00200       65*       KK=MAXOLL + KS(IS))       000071         00201       66*       DD 13 J = 1,3       000104         00204       67*       13 W(J) = FLUXJ(J,IS)       ANK 6/83 000113         00206       68*       L2=2*KK       000115				VK 4/83		
OO173         62*         IF (IWALL - 2) 11,10,9         ANK 4/83         OO0057           O0176         63*         9         FLUXJ(3,IS) = -1.0         000063           O0177         64*         10         ISP = NEL + 1         ANK 5/83         000067           O0200         65*         KK=MAXO(1,KS(IS))         000071         000071           O0201         66*         DD 13 J = 1,3         ANK 6/83         000104           O0204         67*         13         W(J) = FLUXJ(J,IS)         ANK 6/83         000113           O0206         68*         L2=2*KK         000115         000115						
00176         63*         9         FLUXJ(3,IS) = -1.0         000063           00177         64*         10         ISP = NEL + 1         ANK 5/83         000067           00200         65*         KK=MAXO(1,KS(IS))         000071         000071           00201         66*         DD 13 J = 1,3         ANK 6/83         000104           00204         67*         13         W(J) = FLUXJ(J,IS)         ANK 6/83         000113           00206         68*         L2=2*KK         000115         000115						
OO177         64*         10         ISP = NEL + 1         ANK 5/83         OO0067           O0200         65*         KK=MAXO(1,KS(IS))         000071           O0201         66*         DD 13 J = 1,3         ANK 6/83         OO0104           O0204         67*         13 W(J) = FLUXJ(J,IS)         ANK 6/83         OO0113           O0206         68*         L2=2*KK         OO0115				VK 4/83	·······	······
OO200         65*         KK=MAXO(1,KS(IS))         OO0071           OO201         66*         DD 13 J = 1,3         ANK 6/83         OO0104           OO204         67*         13 W(J) = FLUXJ(J,IS)         ANK 6/83         OO0113           OO206         68*         L2=2*KK         OO0115						
OO201         66*         DD 13 J = 1,3         ANK 6/83         OO0104           O0204         67*         13 W(J) = FLUXJ(J,IS)         ANK 6/83         OO0113           O0206         68*         L2=2*KK         OO0115		***************************************		VK 5/83		
00204         67*         13         W(J) = FLUXJ(J,IS)         ANK 6/83         000113           00206         68*         L2=2*KK         000115						· ·
00206 68* L2=2*KK 000115	····					
				VK 6/83		
00207 69* L3=L2+1 000120	· · · · · · · · · · · · · · · · · · ·					
	00207	69*	L3=L2+1		000120	

00210	70* 71*	IF (IWALL .LE. 2) GO TO 11 ANK 4/	
00212	72*	HPG = HPYG(KK) Emisc=Emiv(KK)	000126 000130
00214	73*	HCARB=HCHAR(KK)	000132
00215	74+	DO 12 J=ISP,NSPEC	000137
00220	75*	IF (MOA(J) .NE. ASU(KK) .OR. MOB(J) .NE. BSU(KK)) GO TO 12	000137
00222	76*	ISU = J	000153
00223	77*	GO TO 11	000155
00224	78*	12 CONTINUE	000160
00226	79*	ISU=ISP	000160
00226	80* 81*	C INITIALIZE AM MATRIX AND ENL ARRAY; COMPUTE COEFF. FOR NONLINEAR EQUATION 11 DO 15 I = 1.123 ANK 4/	
00227	01.	$E_{\rm NI}$ (T) =0	33 000163 000204
00232	83*	DO 15 J=1,NNLEQ BO5A08	
00236	84*	15  AM(I,J) = 0. B05A08	
00236	85*	C EVAL. GROUPINGS WHICH CHANGE DURING ITERATION BUT ARE NOT F(ETA) BO5AOB	
00241	86*	C5 = 1.0/ALPH	000214
00242	87*	C6 = ALPH**2*BETAP(IS) ANK 7/2	33 000217
00243	88*	C7 = -UE(IS)**2/ALPH**2/(CPFL*GC) ANK 4/	33 000222
00244	89*	C8 = ALPHD * C5 BO5A09	
00245	<u>90*</u>	C9 = BETAV(IS) + C1 - C8 ANK 8/	
00245	91* 92*	C FINALLY, EVAL CONTRIBUTIONS TO AM AND ERRORS FROM OTHER COEFFS BO5A11	
00245	92*	C START OF MAJOR DO LOOP FOR EVAL OF COEFFS AND ERRORS AT EACH ETA BO5A12 KCC = 2	
00240	94 *	KSOI = O	
00250	95*	DO 49 I=1,NETA	000247
00253	96*	M = MATIJ + I - NETA ANK 8/1	
00254	97*	MX = NETA - 1 ANK 8/	
00255	98*	HB(I) = G(I,1) + C7*F(I,2)**2/2.0 ANK 5/1	000256
00256	99*	HP = G(I,2) + C7 * F(I,2) * F(I,3)	000264
00257	100*	IF (IFLOW .LE. O) CALL EQUIL (HB(I),PE(IS)) ANK 5/	
00261	101*	IF (IFLOW .GT. O) CALL STATE ANK 4/3	
00263 00265	102* 103*	IF (I .GT. 1) GO TO 54 IF (NSPM1 .LE. 0) GO TO 53	000314
00265	103*	DO 52 K = $1,NSPM1$	000330 000333
00272	104*	D0.31  KK = 1.NEL	
00275	106*	31 $DLPK(K,KK) = A(KK+2, K+2)$	000346
00277	107*	52 $DTKW(K) = DTK(K)$	000350
00301	108*	DO 32 KK = 1,NEL ANK 5/	000364
00304	109*	32 DLPH(KK)= A(KK+2,1)	000364
00306	110*	VLNKW=VLNK(ISU)	000366
00307	111*	TCW=TC(ISU)	000370
00310 00311	<u>112*</u> 113*	53 DTHW=DTH M=116	000373
00312	114*	M~110 MX=1	000376
00313	115*	54 RHOP(I)=DRHOH*HP	000401
00314	116*	IF (NSPM1 .LE. O) GO TO 58	000405
00316	117*	DO 57 K = 1,NSPM1	000410
00321	118*	57 RHOP(I) = RHOP(I) + DRHOK(K) $*$ SP(I,2,K)	000417
00323	119*	58 L=O	000424
00323	120*	CUPPER LIMIT IS MAX NUMBER OF SPECIES (MXNSP) ≃LAST DIM ON SP	000424
00324	121* 122*	DO 49 MM=1, 7 M=M+MX	000426 000426
00327 00327	122*	CUPPER LIMIT CORRESPONDS TO DIMENSIONS ON AM ARRAY	000426
00327	123+	C LOWER LIMIT CORRESPONDS TO DIMENSIONS ON AM ARRAY C LOWER LIMIT IS UPPER LIMIT (123) MINUS $(2*7 + 11 + 4/7 \text{ OR } 25)$ (123 - 25)	000426
00330	125*	D0 49 N=98,123	000430
00333	126*	L=L+1	000435
00334	127*	49 AM(M,N)=PREQ(L)	000440
00340	128*	RETURN	000447
00340	129*	C	000447
1.	1		· · · · · · · · · · · · · · · · · · ·

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00341	130*	ENTRY NONCER		000452
00341	131*	DUEDGE=0.		000452
00343	132*	GEP=O.		000453
00344	133*	HE = GE	ANK 4/83	000454
00345	134*		ANN 4700	000456
00346	135*	CALL LINCER IF (KQ10 .GT. O) CALL TRMBL(2)	ANK 4/83	000460
00350	136*	TTVC=1.0		000466
00351	137*	M=116		000470
00352	138*	MX = 1		000472
00353	139*	DO 120 I=1,NETA	B05A1300	000501
00356	140*	L=O		000501
00357	141*	L=O DO 59 MM=1, 7	B05B	000504
00362	142*	MEMTMA		000504
00363	143*	DO 59 N= 98,123	B05B	000506
00366	144*	L=L+1		000513
00367	145*	PREQ(L)=AM(M,N)		000515
00370	146*	PREQ(L)=AM(M,N) 59 AM(M,N)=O. C TEST TO BYPASS COMMANDS THAT CANNOT BE PERFORMED AT ETA(1)		000520
00370			B05A1310	000520
00373	148*	IF (I .LE. 1) GO TO 60		000523
00375	149*	CALL IMONE		000527
00376	150*	IF (KQ9 .NE. O) CALL TVCM1	ANK 4/83	000531
00400	151*	IF (KQ10,GT, O) CALL TRMBL(4)	ANK 4/83	000535
00400	152*	C COMPUTE STATIC ENTHALPY AND DETERMINE STATE OF GAS	B05A1340	000535
00402	153*	60  C10 = C7 + F(I,2)		000544
00403	154*	C13 = C7 + F(I,3)		000546
00404	155*	HP = C13*F(I,2) + G(I,2)		000551
00404	156*	C EVAL GROUPINGS WHICH ARE USED AT I-1 AS WELL AS AT I	B05A1460	000551
00405	157*	CALL ICOEFF		000554
00406	158*	IF (KQ9 .NE. O) CALL TVCCOE	ANK 4/83	000556
00410	159*	IF (KQ10 .GT. 0) CALL TRMBL(3)	ANK 4/83	000562
00412	160*	IF (I .NE. 1) GO TO 100	B05A1490	000570
00412	161*	C DLPK, TCW, VLNKW, DLPH, AND Y1 NEEDED ONLY FOR CARBON PROBLEM	B05A1490	000570
00414	162*	IF (NSPM1 .LE. O) GO TO 95		000574
00416	163*	DO 90 K = 1,NSPM1		000577
00421	164* 165*	WALLJ(K) = CKG(K) 90 VJKW(K) = CKG(K)/C3M(IS)	B05A1520	000604
00422	165*	90  VURW(K) = CRO(K)/CSM(15)	ANK 8/83	000605 000612
00424	167*	95 WALLQ = C32 QW = C32/C3M(IS)	B05A1620 ANK 8/83	000612
00425	168*	TPWALL = TP	ANK 0/03	000617
00420	169*	MX = NETA - 1	ANK 8/83	000621
00427	170*	GO TO 120	ANK 4/83	000624
00430	171*	C BACK TO CONSERVATION EQUATIONS	B05A1650	000624
00430	172*		B05A 1660	000626
00431	172+	100 CALL IONLY IF (KQ10 .GT. 0) CALL TRMBL(5) IF (KOD .NE 0) CALL TWOL	ANK 4/83	000627
00432	174*	IF (KQ9.NE. O) CALL TVCI	ANK 4/83	000635
00436	175*	120 M=MAT1J+I-MX	ANN 4/03	000642
00440	176*	DO 122 I=2.4		000647
00443	177*	DO 122 J=1.NNLEQ		000672
00446		122  AM(1, 1)=0		000672
00451	179*	ENL(4) = F(NETA, 2) - ALPH	ANK 4/83	000677
00452	180*	$\lambda M(A + 1) \approx 1.0$	ANK 4/83	000702
00453	181*	AM(4, 1) = 1.0 AM(4, MAT1J) = -1.		000704
00454	182*	ENL(3) = -F(1,2)		000707
00455	183*	AM(3, 4) = 1.		000711
00456	184*	ENL(2) = CBAR*(F(NETA, 2) - (ETA(NETA) - ETA(KAPPA))*F(NETA, 3))	- ANK 4/83	000713
00456	185*	1 F(KAPPA, 2)	ANK 4/83	000713
00457	186*	IF (NTROPY .EQ. 0) ENL(2) = $CBAR*F(NETA,2) - F(KAPPA,2)$	ANK 4/83	000724
00461	187*	AM(2,KAPPA+3)=1.		000734
00462	188*	AM(2, MAT1J) = -CBAR		000737
00463	189*	IF (NTROPY .EQ. 5) CALL LIAD (-1,2,2*NETA-2,(ETA(NETA) -	ANK 4/83	000742
			-	

00463	190*		1 ETA(KAPPA))*CBAR)	ANK 4/83	000742
00465	191*		IF (ITS .GT. 1) GO TO 145	ANK 5/83	000771
00467	192*		D0 140 K = 1,NSP		001002
00472	193*		IF $(LEFS(K) . LE. O . AND. LEF(K) . GT. O) EASE = 0.050$		001002
00475	194*	145		ANK 4/83	001022
00476	195*		MM=MAT1J-1		001023
00477	196*				001033
00502	197*		CALL ABMAX(MM-1,ENL(M),ENLM(I),IENLM(I))		001034
00503	198*		IENLM(I) = IENLM(I)+1		
00504 00505	199* 200*	200	M=M+MM	+++/ 0/00	001056
00505	200*	200 C	MM = NETA - 1 SOLVE REDUCED SET OF EQUATIONS	ANK 8/83	001061
00505	201*	Ľ,	IF (IGUESS .LT. O) RETURN	BO5A2O7O ANK 4/83	001061 001066
00507	202*	С	IF (IGUESS .LT. O) RETURN SCRUNTCH DEFINED ROWS OF AM MATRIX TO THE TOP	B05A2090	001066
00507	203* 204*	U .	DO 240 M=1.NAM	B05A2090 B05A2130	001074
00514	204+		ENL(M)=ENL(M+1)	BUJAZ 100	001114
00515	205* 206*		DO 240 J=1.NNLEQ		001117
00520	207*	240	) AM(M,J)=AM(M+1,J)		001117
00523	208*		IF (KQ10 .LE. 0) GO TO 1001	ANK 4/83	001126
00525	209*		DO 1000 M = 4.NAM		001134
00530	210*	1000	AM(M,3) = AM(M,3) + ENL(M)/F(1,3)		001134
00530	211*	C		B05A2250	001134
00530	212*	-	AM MATRIX, ACCORDING TO LAR, INVERTS((AM(I,J), J=2, NAM), I=1, NAM) AND		001134
00530	213*	С	MULTIPLIES THE INVERSE TIMES THE REMAINING COLUMNS OF AM MATRIX	B05A2270	001134
00530	214*	C	AND TIMES THE ENL.	B05A2280	001134
00532	215*	1001			001141
00532	216*		1 EQT(332), EQT(445))	ANK 4/83	001141
00532	217*	С	TREAT SURFACE OPTIONS IN RNLCER WITH REDUCED NONLINEAR SET	,	001141
00533	218*	244	CALL RNLCER	ANK 4/83	001163
00533	219*	С	DETERMINE MAXIMUM NONLINEAR ERRORS	B05A4010	001163
00534	220*				
00537	221*		DD 605 I = 1,NRNL IF (ABS(ENLM(I)).GE.ABS(DRNL(I))) GD TD 605		001173
00541	222*		ENLM(1) = DRNL(1)		001177
00542	223*		IENLM(I) = 1		001201
00543	224*		CONTINUE SFE = ALPH*AMAX1(ABS(BETAP(IS)),0.10)		001205
00545	225*			ANK 7/83	001205
00546	226*		DUB = AMAX1(ABS(G(NETA, 1) - G(1, 1)), 1.0E3)		001214
00547	227*		ENLM(1) = ENLM(1)/SFE	•	001224
00550	228*		ENLM(2) = ENLM(2)/DUB		001227
00551	229*		CALL ABMAX (NRNL, ENLM, ENLMM, M)		001232
00552	230* 231*		$\frac{\text{ENLMM} = \text{ENLMM}}{10}$		001240
00553	000+		ENLM(1) = ENLM(1)*SFE ENLM(2) = ENLM(2)*DUB		001243
00555	232*		ENLM(2) = ENLM(2)*DUB ELMM = ABS(ELMM)	POE 4 160	001246 001251
00555	234*				001251
00556	234*	C	ENLMM = ABS(ENLMM) EVALUATE NONLINEAR CORRECTIONS FROM THE REDUCED SET	B05A4180	001253
00557	236*		DO 615 I=1,NAM	B05A4180	001274
00562	230*			B05A4190 B05A4200	001274
00563	237*		DVNL(L) = ENL(I)	B05A4200	001274
00564	239*	•••••	D0 615 K=1,NRNL	B05A4210 B05A4220	001278
00567	240*		I = K + NAM	B05A4230	001304
00570	241*	615	DVNL(L) = DVNL(L) - DRNL(K) * AM(I,J)	B05A4240	001307
00573	242*	-	D0 620 K=1,NRNL	B05A4250	001324
00576	243*		I = NAM + K	B05A4260	001324
00577	244*		J = LAR(I)	B05A4270	001327
00600	245*		DVNL(J) = DRNL(K)	B05A4280	001332
00600	246*		-RECYCLE IF ALPH WANTS TO GO NEGATIVE	DUCT	001332
00602	247*		IF (DVNL(1) .GT0.90*ALPH) GO TO 629		001337
00604	248*		DO 627 K=NUL,NSPM1		001350
00607	249*		WALLJ(K) = VJKW(K)*C3M(IS)	ANK 8/83	001350

0610	250*	627 ENL(K+117)=0.		
612	251*	dJ = NAM + 1		001354
613	252*	DO 628 I=2, NNLEQ		001357
616	253*	DUM=AM(I,1)/AM(1,1)		001376
617	254*	ENL(I) = ENL(I) - ENL(1) + DUM		001400
620	255*	DO 628 J = $JJ$ , NNLEQ		001407
0623	256*	628 AM(I,J)=AM(I,J)-DUM*AM(1,J)		001407
0626	257*	ENL(1)=0.		001420
0627	258*	DO 631 J = JJ, NNLEQ		001425
0632	259*	631 AM(1,J)=0.		001425
0634	260*	ITS=ITS+1		001426
0635	261*	EASE = AMIN1(EASE, 0.2)		001431
0636	262*	IF (ITS - 101) 244,244,850	20211000	001437
0636	263*	CEVALUATE LINEAR CORRECTIONS	B05A4300	001437
0641 0644	264* 265*	629 DO 630 I = 1,MAT1I DO 630 J=1,MAT1J	B05A4320	001445 001474
0647	205* 266*	630 FLE(I) = FLE(I) - DVNL(J) * BA1(I,J)	B05A4330	001474
0652	267*	$\frac{1}{JJ} = MATIJ$	B05A4330	001505
0653	268*	DO 635 J = 1,NETA	ANK 8/83	001512
0656	269*	JJ = JJ + 1	B05A4360	001512
0657	270*			001514
0662	271*	DO 635 I=1,MAT2I 635 GLE(I) = GLE(I) - DVNL(JJ) * BA2(I,J)	B05A4380	001520
0665	272*	CORAR(1)=DVNL(1)/ALPH*0.5		001530
0666	273*	L=NETA	· · · · · · · · · · · · · · · · · · ·	001534
0667	274*	J=MAT 1J+2		001536
0670	275*	DO 640 I=2,NETA		001545
0673	276*	CORAR(I) = DVNL(J)/AMAX1(G(NETA, 1), 1.0E4)		001546
0674	277*	640 J=J+1		001556
0676	278*	IF (NSPM1 .LE. 0) GO TO 665		001562
0700	279*	DO 655 K = 1,NSPM1		001565
0703	280*	DO 650 J = 1,NETA	ANK 8/83	001617
0706	281*	JJ = JJ + 1	B05A4460	001617
0707	282*	DO 650 I=1,MAT2I	B05A4470	001621
0712	283*	DO 650 I=1,MAT2I 650 SPLE(I,K) = SPLE(I,K) - DVNL(JJ) * BA2(I,J J = MAT1J + K*NETA + 2	B05A4480	001624
0715	284*			001637
0716 0721	285*	DO 655 I=2,NETA	B05A4510 B05A4520	001646 001646
)721 )722	286* 287*	L = L + 1 CORAR(L)=DVNL(J)	BU5A4520	001652
0722 0723	287* 288*	655 J=J+1		001652
0726	289*	665 IF (EASE .LT. 0.20) GD TO 673		001663
)726	289*	IF (CORAR(ICORM)/CORMA .LT0.330) BUMP	= 2 0*BUMP	001666
)732	291*	GO TO 675		001701
0733	292*	673 IF (ABS(1.0 - CORAR(ICORM)/CORMA) .LE. 0.2	50) BUMP = BUMP/2.0	001703
0735	293*	675 CALL ABMAX(L,CORAR,CORMA,ICORM)	B05A4580	001720
0735	294*	C CORRECT PRIMARY VARIABLES		001720
736	295*	DUM = 0.050/BUMP	ANK 4/83	001725
0737	296*	EASE=AMIN1(1.5*EASE, 1.0, DUM/ABS(CORMA))	, · · · · · · · · · · · · · · · · · · ·	001730
0740	297*	IF(ITS.EQ.2) BUMP=AMAX1(BUMP,.02/ABS(CORMA	))	001745
0742	298*	IF (KQ10 .GT. 0) EASE=AMIN1(ABS(F(1,3)/(DV	NL(3)+1.E-30)/2.),EASE) ANK 6/83	001760
)744	299*	IF (EASE .GE. 1.0) GO TO 740	ANK 4/83	001776
746	300*	DO 730 I = 1,253		002005
0751	301*	IF (I .LE. 123) DVNL(I) = DVNL(I)*EASE	ANK 7/83	002005
753	302*	730 FLE(I) = FLE(I) * EASE	B05A4800	002014
755	303*	740 PIEASE = PIEASE*(1.0 - EASE)	· ·	002022
756	304*	CTE = F(NETA, 1) - F(1, 1) - XM(5)/F(NETA, 2)		002025
757	305*	DO 785 I = 1,NETA		002077
0762	306*	F(1,2) = F(1,2) + DVNL(1+3)		002077
0763	307*	F(I,2) = F(I,2) + DVNL(I+3) F(I,4) = F(I,4) + FLE(2*NETA+I-2) IF (I GT 1) GD TD 765		002102
0764	308*	11 (1.47.17 46 76 765		002105
)766	309*	F(1,1) = F(1,1) + DVNL(2)		002111

00767	310*	F(1,3) = F(1,3) + DVNL(3)	002114	
00770	310+	GO TO 770	002114	
00771	- · ·			
	312*	765 F(I,1) = F(I,1) + FLE(I-1)	002121	
00772	313*	F(I,3) = F(I,3) + FLE(NETA+I-2)	002123	
00773	314*	770 LPI=MAT1J+I+1	002127	
00774	315*	DO 785 K=NUL,NSPM1	002132	
00777	316*	IF (I .EQ. NETA) $SP(I, 1, K) = SP(I, 1, K) + SPLE(1, K)$	002165	
01001	317*	IF (I .NE. NETA) $SP(I,1,K) = SP(I,1,K) + DVNL(LPI)$	002172	
01003	318*	SP(I,3,K) = SP(I,3,K) + SPLE(NETA+I,K)	002201	
01004	319*	IF (I .LE. 1) $SP(1,2,K) = SP(1,2,K) + DVNL(LPI-1)$	002210	
01006	320*	IF (I .GT. 1) $SP(I,2,K) = SP(I,2,K) + SPLE(I,K)$	002216	
01010	321*	785 LPI = LPI + NETA	ANK 8/83 002223	
01013	322*	ALPH=ALPH+DVNL(1)	002242	
01014	323*	RETHMO=-C3M(IS)*RHOE(IS)*UE(IS)*CTE*VMUE(IS)/VMU(NETA)	NEWOO2245	
01015	324*	ACCP=BETAV(IS)*VMUE(IS)**2*ROKAP(IS)**2/2.0/XI(IS)	NEW002255	
01016	325*	ACCPK=ACCP*RHOE(IS)*VMU(1)/(VMUE(IS)*RHO(1))	NEW002266	
01017	326*	IF(ILAMIN.EQ.O)GO TO 79	NEW002274	
01021	327*	ILAM=O	NEW002276	
01022	328*	IF(S(IS).GT.2.*STURB.AND.ACCPK.GT.1.1E-06)G0 TO 69	NEW002277	
01024	329*	GO TO 79	NEW002316	
01025	330*	69 IF(RETHMO.LT.250.)GO TO 79	NEW002320	
01027	331*	ILAM=1	NEW002323	••••
01030	332*	AA=8.935E-14	NEW002325	
01031	333*	BB=2.239E-10	NEW002327	••••
01032	334*	CC=1.0247E-06	NEW002331	
01033	335*	ACCPK1=AA*RETHMO**2+BB*RETHMO+CC	NEW002333	
01034	336*	IF(RETHMO.LT.4100.)GO TO 98	NEW002342	
01036	337*	ILAM=O	NEW002346	••••••••
01037	338*	GO TO 99	NEW002347	
01040	339*	98 ACCPK2=3.5E-06	NEW002351	
01041	340*	99 IF(ACCPK.LT.ACCPK1)ILAM=0	NEWOO2353	
01043	341*	IF (ACCPK.GT.ACCPK2) ILAM= 1	NEW002357	
01045	342*	79 CONTINUE	NEWOO2366	
01046	343*	IF (ITS .NE. 99 .OR. 1777 .EQ. 777) GO TO 850	002366	
01050	344*	1777 = 777	002401	
01051	345*	ITS = 60	002403	•••••
01052	346*	850 IF (KQ10 .GT1 .OR. KQ10 .LT10) RETURN	ANK 4/83 002406	
01054	347*	RETHMD = -C3M(IS)*RHDE(IS)*UE(IS)*CTE*VMUE(IS)/VMU(NETA)	ANK 8/83 002426	
01055	348*	IF (RETHMO.GT.RETR) STURB = $S(IS)$	002440	
01057	349*	IF (RETHMO.GT. RETR) KQ10 = -10	ANK 4/83 002447	
01061	350*	IF (RETHMO.GT.RETR) ILT=2	NEWOO2455	
01063	351*	IF (RETHMO .LT. RETR) KQ10 = $-1$	ANK 4/83 002463	
01065	352*	IF (RETHMO.LT.RETR)ILT=1	NEW002471	
01067	353*	RETURN	B05A5350 002477	
01070	354*	END	B05A5360 002561	
				•••••

END OF COMPILATION:

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NO DIAGNOSTICS.

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	\$*MSFCFOR\$.FOR,WUS OUTPUT
HSA	E3 -12/10/84-22:24:00 (39.40)
-8,8	
	COMMON/EDGCOM/DSP(53),PE(50),RHOE(350),TE(51),TVCC(50),UE(50),
-30	\$ VMUE(50)
-30	CONTROL DURING DURING DURING DURING DURING DURING DURING
·····	COMMON/RUF/DUMM1,DUMM2,DUMM3,DUMM4,DUMM5,DUMM6,DUMM7,DUMM8,DUMM9, \$ DUMM10,DUMM11,DUMM12,RK,ICF,FMF,DUMM16,DUMM17,DUMM18
	© COMMON/PARTI/PARTM, DUMM12, RK, ICF, FMF, DUMM16, DUMM17, DUMM18 COMMON/PARTI/PARTM, DUMM24, RHOPA, DUMM23, CPART, WP, DUMM19, WF,
••••••••••	\$ DUMM22,DUMM20,DUMM21,ILT,PF,AK,RP,IPART
	COMMON /LAM/ ILAMIN
-37	
	COMMON/ACCPK,ILAM,SPCT
	COMMON/RETH/RETHMO
-99,9	DIMENSION DM1(15), DM2(15)
-99,9 \///\	
- 196	
	IF(IPART.EQ.1)GD TD 40
••••••	IF(ICF.GT.O.AND.ICF.LT.3)GO TO 40
	GO TO 41
40	
·····	DUMM2=DER(12) DUMM3=S(IS)
	DUMM3=5(15) AM=F(NETA,2)/ALPH*UE(IS)/SQRT(GMR(NETA)/VMW(NETA)*TT(NETA)*49732.)
•••••••••	REFF=(1.+(GMR(NETA)-1.)/2.*PR(NETA)**.333*AM**2)/
	\$ (1.+(GMR(NETA)-1.)/2.*AM**2)
	DO 42 I=1,NETA
	DM1(I)=CPBAR(I)*UCT/UCE
•••	DM2(I)=TT(I)/UCT
42	CONTINUE DZERO=DM1(1)-(DM1(2)-DM1(1))/(DM2(2)-DM2(1))*DM2(1)
	DZERU=DM1(1)-(DM1(2)-DM1(1))/(DM2(2)-DM2(1))*DM2(1) AINT=0.5*(DZERO+DM1(1))*DM2(1)
••••••••	DUMM6=AINT
	DO 43 I=2,NETA
	AINT=AINT+0.5*(DM1(I-1)+DM1(I))*(DM2(I)-DM2(I-1))
43	CONTINUE
	DUMM4=AINT DUMM5=(DUMM4+(C(NETA_1)-HB(NETA)/UCE))*DEEE
·· ·····	DUMM5=(DUMM4+(G(NETA,1)-HB(NETA)/UCE))*REFF DUMM7=RH0(NETA)
	DUMM8=RH0(1)
•••••••••••••••••••••••••••••••••••••••	DUMM9≠VMU(1)
	DUMM 10=VMUE (IS)
	DUMM11=PR(NETA)
	DUMM12=UE(IS) IF(IPART.EQ.1.AND.(ICF.EQ.0.OR.ICF.EQ.3))GO TO 41
	IF(IPART.EQ.1.ANU.(ICF.EQ.O.UR.ICF.EQ.3)JGU IU 41 AFACT-0 52
······	AFACT=0.52 CALL ROUGH(AFACT)
	CF=DUMM18/2.
	ST=DUMM16
·····	WALLQ=ST*(G(NETA,1)-G(1,1))*RHOE(IS)*UE(IS)
41	
· • · · · · · · · • • • • • • • • • • •	IF(IPART.EQ.1)GO TO 45 GO TO 44
45	GU TU 44 IF(ICF.EQ.0.0R.ICF.EQ.3)GO TO 46
4	DUMM1=DUMM18
	DUMM 1-DUMM 18
46	CONTINUE
	DUMM5=G(NETA,1)

DUMM19=CPBAR(NETA)*UCT/UCE	
DUMM20=REFF*TE(1)/UCT	
DUMM21=TT(1)/UCT	
DUMM22=DUMM19+VMU(NETA)/UCV/DUMM11	
DUMM23=(DUMM7*DUMM12*2.*ROKAP(IS)/RAD5)/DUMM10	
PARTM=(4./3.)*(22./7.)*((RP/12.)**3)*RHOPA	
DUMM24=PARTM*DUMM12/((22./7.)*6.*RP/12.*DUMM10)	
CALL PARTCL	
CF=DUMM18/2.	
ST=DUMM16	
WALLQ=ST*(G(NETA,1)-G(1,1))*RHOE(IS)*UE(IS)	
44 CONTINUE	
- 204	
IF(IPASS.EQ.O) WRITE(3)CF,CH,WALLQ	
- 235	
ACCPK=ACCP*RHDE(IS)*VMU(1)/(VMUE(IS)*RHD(1))	
-240	
IF(ICF.EQ.0)G0 TO 1111	
WRITE(6,1009) 1009 FORMAT(/,1X,56('*'),' REMTECH INC. 11-84 ',56('*'))	
1010 FORMAT(/,1X,132('*'))	•
WRITE(6, 1000)ICF,RK	
1000 FORMAT(/,2X,'ROUGHNESS MODULE USED - OPTION ',12,/, \$ 6X,'EQUIVALENT SAND ROUGHNESS HEIGHT, RK = ',E10.3,'(FEET)') IE(ICE ED 2)CD 1112	
IF(ICF.EQ.3)G0 TO 1112	,
RFACT=DUMM16/DUMM2	
TE(DUMM17_EO_O_O)WRITE(6_1001)REACT	
IF (DUMM17.GT.O.O.AND.DUMM17.LT.1.0)WRITE(6,1002)RFACT	
IF(DUMM17.EQ.1.0)WRITE(6,1003)RFACT	
1001 FORMAT(6X,'SMOOTH',14X,20X,'ROUGHNESS FACTOR = ',F7.3)	
1002 FORMAT(6X,'TRANSITIONALLY ROUGH',20X,'ROUGHNESS FACTOR = ',F7.3)	
1003 FORMAT(6X,'ROUGH',15X,20X,'ROUGHNESS FACTOR = ',F7.3)	
WRITE(6,1008)CF,ST,WALLO	
1008 FORMAT(1X,' CF/2=', 1PE10.3,5X,' ST NO. =', 1PE10.3,5X,	
\$ 'HEAT FLUX=', 1PE10.3)	
GO TO 1111	
1112 CONTINUE IF(ABS(DUMM17).LE.O.OO1)WRITE(6,1004)	
IF(ABS(DUMM17)).LE.0.001)WRITE(6,1004) IF(ABS(DUMM17-1.).LE.0.001)WRITE(6,1005)	
IF (ABS(DUMM17-1.).LE.0.001)WRITE(6,1005)	
1004 EDDWAT(EY (SNOOTH))	
1005 FORMAT(6X, SMOOTH )	
1006 FORMAT(6X, 'RKS BEYOND UPPER LIMIT - EQUATION BECOMES INVALID - ',	
\$ 'THEREFORE RKS = 0.0 WAS USED.')	
WRITE(6, 1010)	
1111 CONTINUE	
IF(IPART.EQ.1)GD TO 1301	
GD TD 1302	
1301 WRITE(6,1009)	
IF(ILT.EQ.1)WRITE(6,1303)RP,AK,PF	
1303 FORMAT(/,2X,'PARTICLE MODULE USED',/,6X,'LAMINAR FLOW',5X,	
1303 FORMAT(/,2X,'PARTICLE MODULE USED',/,6X,'LAMINAR FLOW',5X, \$ 'PARTICLE SIZE RP=',E10.3,'IN RADIUS',/,1X,'PARTICLE LOADING =', \$ E10.2 10X 'PARTICLE FACTOR =' E10.4)	
IF(ILT.EQ.2)WRITE(6, 1305)RP,WP,PF	
1305 FORMAT(/,2X, 'PARTICLE MODULE USED',/,6X, 'TURBULENT FLOW',5X,	
<pre>1305 FORMAT(/,2X,'PARTICLE MODULE USED',/,6X,'TURBULENT FLOW',5X, \$ 'PARTICLE SIZE RP=',E10.3,'IN RADIUS',/,1X,'PARTICLE LOADING =', \$ F10.2,10X,'PARTICLE FACTOR =',F10.4)</pre>	
\$ F10.2, 102, PARTICLE FACTOR = , F10.4) WRITE(6, 1008)CF, ST, WALLQ	
WRITE(6, 1010)	
1302 CONTINUE	

	i					$\sim$
TE()	LAMIN.EQ.O.OR.ILAM.EQ.O	NOD TO 1011				
	E(6,1009)	JGU 10 1211				
WRIT	E(6,1200)SPCT					
200 FORM	MAT(/,2X,'RELAMINARIZATI	ON OCCURED',/,				
\$ 2X,	'DEGREE OF RELAMINARIZA	TION = ', E10.3,' PERCENT'	<u>')</u>		·	
	E(6,1010)					
211 CONT						
	E(6,1007)RETHMO,ACCP,ACC MAT(/,1X,′ RETHMO AC	CCN PARA ACCN PARA',/,1X,				
\$ '	(EDGE) (V	WALL)'./, 3X, 1P3E10.3)	·			·
•	• • • •	····				
SUBROUT	INE OUTPUT ENTRY POIN	NT 003775			,	
		•				
STORAGE	USED: CODE(1) 004015:	DATA(O) 001251; BLANK COM	MMON(2) 000000	••••••		
<b>~ · ·</b> · · · · · · · · · · · · · · · · ·		, , , , , , , , , , , , , , , , , , ,				
COMMON	BLOCKS :					
0003	AL 000002					
0003	BLQCOM 002043					
0005	COECON 000317					·····
0006	CONSTS 000010					
0007	CRBCOM 000111					
0010	EDGCOM 001216					
0011	EPSCOM 000040					
0012	EQPCOM 002243 ETACOM 000017				·····	
0013	FLXCOM 000020					
0015	HISCOM 000426					
0016	HOLLER 000056	· · · · · · · · · · · · · · · · · · ·				
0017	INPUTI 000015					
0020	INTCOM 000123		••••••			<u></u>
0021 0022	INTERI 000004 PRMALS 000243					
0022	PRMORG 000455		·····			
0024	PRPCOM 000303					•
0025	PRPERT 000151					
0026	PRPIOP 000016					••••••
0027	PRPNPT 000056					
0030	RFTCOM 000045 RUF 000022					
0031	PARTI 000020					
0033	LAM 000001					
0034	SAHA 000151					
0035	SAVOUT 000021			*****		
0036	TEMCOM 000201		·····			
0037 0040	TURB 000020 UNICOM 000011					
	VARCOM 000645					
0041	WALL 000454					
0041 0042						
0042 0043	ACCN 000003					
0042	ACCN 000003 RETH 000001					

0045	ROUGH			 
0046	PARTCL			
	REFIT	 		

0050	ATAN2				
0051	COS				
0052	NWDU\$				
0053	NIO1\$		 		
0054	NIO3\$	-			 
0055	NI02\$				
0056	NWBU\$		 	•	
0057	SQRT				 
0060	XPRR		 		
0061	NERR3\$		 		

## STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0000	000111 1F	0000 0	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	0000	000437 1001F	· 0000	000450 1002F	0000	000463 1003F	
0000	000512 1004F	0000 0	00515 1005F	0000	000520 1006F	0000	000650 1007F	0000	000474 1008F	
0000	000377 1009F	0000 0	00410 1010F	0001	002343 1111L	0001	002277 1112L	0001	002544 1155G	
0001	002552 1163G	0000 0	00722 12F	0000	000630 1200F	0001	002447 1211L	0001	002641 1220G	
0001	002653 1231G	0000 0	01070 13F	0001	002347 1301L	0001	002417 1302L	0000	000540 1303F	
0000	000574 1305F	0001 0	03101 1307G	0001	003107 1313G	0001	003115 1317G	0001	003127 1330G	
0000	001122 14F	0001 0	03255 1406G	0001	003273 1417G	0001	003302 1425G	0001	003313 1434G	
0001	003324 1442G	0001 0	03363 1453G	0001	003364 1456G	0001	003423 1472G	0000	001134 15F	·····
0001	003432 1500G	0001 0	03554 1537G	0001	003562 1544G	0001	003603 1553G	0001	003614 1561G	
0001	003654 1577G	0000 0	001141 16F	0001	003667 1605G	0001	003707 1615G	0001	000041 166G	
0000	001145 17F	0000 0	00215 18F	0001	003035 184L	0001	003173 185L	0000	000151 2F	
0000	001002 20F	0001 0	000541 2021L	0001	000123 204G	0001	003377 2041L	0001	001041 2071L	
0001	001047 2074L	0001 0	01224 2078L	0000	000330 21F	0001	000260 2103L	0001	000246 2104L	
0001	000271 2105L	0001 0	00317 2106L	0001	000556 2135L	0001	000625 2137L	0000	000374 22F	
0000	000205 23F	0000 0	00326 24F	0000	001103 25F	0001	000334 262G	0000	000212 3F	
0001	000371 30L	0001 0	000047 3051L	0001	000433 314G	0001	000436 316G	0001	000444 323G	
0001	003460 325L	0001 0	03744 327L	0001	000477 336G	0001	000513 347G	0001	000707 35L	
0001	000516 352G		000574 373G	0000	000263 4F	0001	001334 40L	0001	000604 400G	
0001	000457 400L	0001 0	03623 4002L	0001	003700 4012L	0001	003534 4019L	0001	003565 4021L	
0001	003630 4022L	0001 0	00607 404G	0001	001543 41L	0001	000661 423G	0001	000673 431G	
0001	001657 44L	0001 0	01547 45L	0001	000776 455G	0001	001565 46L	0001	001007 463G	
0000	001062 5F	0001 0	02074 50L	0001	001070 502G	0001	001205 514G	0001	001275 525G	•
0001	002477 55L	0001 0	01415 551G	0001	001444 563G	0000	000671 6F	0001	003227 60L	
0001	001707 642G	0001 0	03343 65L	0001	001745 664G	0001	001763 674G	0000	000726 7F	
0001	001775 704G	0001 0	02023 717G	0001	002040 730G	0001	002070 746G	0000	001010 BF	
0015	000000 A	0000 R 0	00062 ACCP	0043 R	000000 ACCPK	0000 R	000055 ACH	0000 R	000047 ADR	
0000	R 000101 AFACT	0000 R 0	OOOOO AINT	0032 R	000015 AK	0041 R	000000 ALPH	0000 R	000076 AM	
0016	I OOOOOO AREA	0000 R 0	00057 ARET	0007	000000 ASU	0012 I	000000 ATA	0012 I	000010 ATB	
0015	R 000001 BETAP	0015 R 0	OOO63 BETAV	0000 R	000073 BLOW	0015	000146 C	0025 R	000000 CAPC	
0020	000000 CASE	0000 R 0	000064 CF	0000 R	000063 CH	0005	000000 CK	0011	000000 CLNUM	
0036	R 000000 CM	0000 R 0	00106 COND	0022 R	000000 COSALF	0000 R	000044 COSOR	0032	000004 CPART	
0025	R 000017 CPBAR	0006 0	000000 CPFL	0034 R	000000 CPH		000002 CQ	0026 R	000000 CRH0	
0015	R 000145 C1	0015 R 0	00147 C3M	0000 R	000045 C89	0000 R	000072 DELBD	0000 R	000067 DELST	
0022	R 000062 DELTBI	0016 I 0	00006 DENS	0036 R	000007 DER	0000 R	000075 DF	0016 I	000010 DIST	
0011	R 000001 DL	0000 R 0	00001 DM1	0000 R	000020 DM2	0024	000000 DRHOH	0010	000000 DSP	
0036	R 000071 DUDS	0031 R 0	00000 DUMM1	0031 R	000011 DUMM10	0031 R	000012 DUMM11	0031 R	000013 DUMM12	
0031	R 000017 DUMM10	5 0031 R 0	00020 DUMM17	0031 R	000021 DUMM18	0032 R	000006 DUMM19	0031 R	000001 DUMM2	
.0032	R 000011 DUMM20	) 0032 R O	00012 DUMM21	0032 R	000010 DUMM22	0032 R	000003 DUMM23	0032 R	000001 DUMM24	
0031	R 000002 DUMM3	0031 R 0	00003 DUMM4	0031 R	000004 DUMM5	0031 R	000005 DUMM6	0031 R	000006 DUMM7	
0031	R 000007 DUMM8	0031 R 0	00010 DUMM9	0000 R	000066 DUM3	0000 R	000074 DUZ	0000 R	000105.DW	
0000	R 000054 DX	0000 R 0	OO100 DZERO	0007 R	000006 EMIS	0007	000007 EMISC	0016 I	000012 ENERGY	
0035	R 000000 ENTHAL	0011 R O	00021 EPSA	0013 R	000000 ETA	0041 R	000001 F	00000 I	000037 FLOW	
0042	000000 FLUXJ	0031 0	00016 FMF	0004 R	000000 FR	0030 R	000000 F2FIX	0030 R	000017 F2FIXT	
0041	R 000075 G		00002 GC		000036 GMR	0027 R	000000 HB	0000 R	000056 HEAD	
0016	I 000016 HEAT	0015 R 0	00231 HF	0016 I	000022 HWALL	0000 I	000051 I	0017	000000 IB	
	****************		00000 IDISC		000005 IFLOW		000006 IG		000001 ILAM	

0033 I 000000 IL		00013 ILT	0000 001211	INJP\$	0032 I (	DOOO17 IPART	0034 I 000063	IPASS
0003 000000 IF		00064 IRITE	0020 I 000020	IS	0020 (	000021 ISH	0022 I 000147	IST
0007 I 000025 IS	SU 0017 I C	00007 ITDK	0017 000010	ITH	0034 (	DOOO65 ITRCNT	0022 000150	IU
0003 I 000001 IL	JNIT 0017 I C	00011 IWALL	00000 I 000060		0017 (	000012 JW	0000 I 000046	к
0020 I 000023 KA	APPA 0030 I C	00036 KAPPAL	0030 I 000037	KAPPAT	0021 (	000000 KBC	0020 I 000024	KONRFT
0021 I 000003 KG	Q10 0021 I C	00002 KQ9	0020 000025	KR9	0007 (	000026 KS	0030 I 000040	
0004 001604 L2	2 0000 I 0	00110 M	0016 I 000024	MASS	0004 I (	DO1646 MOA	0004 I 001742	MOB
0012 I 000432 NE		00114 NETA	0030 I 000041	NETAL	0030 I (	000042 NETAT	0020 000115	NNLEQ
0020 I 000116 NC	DN 0030 0	00043 NPDINT	0020 000117	NRNL	0020 1 (	000120 NS	0034 I 000066	NSJ
0020 I 000121 NS	SP 0004 I C	02036 NSPEC	0020 I 000122	NSPM1	0017 I (	DOOO14 NTROPY	0000 I 000043	NUM
0012 000433 P	0032 R 0	OOOOO PARTM	0006 R 000003	PATM	0010 R (	000065 PE	0032 R 000014	PF
0006 000004 PI	t 0004 C	02037 PIEASE	0000 R 000104	PITOT	0000 R (	000061 POUT	0025 R 000055	PR
0000 I 000041 PF	RES 0016 I 0	00030 PRESS	0000 R 000053	QDIFU	0034 R (	000067 QWG	0022 000156	RADFL
0023 R 000227 RA	ADS 0022 R 0	00154 RAD5	0022 R 000155	RAD6	0030 R 0	DOOO44 RATLIM	0000 R 000077	REFF
0044 R 000000 RE	THMO OO16 I O	00034 REY	0000 R 000103	RFACT	0027 R (	000037 RHO	0010 R 000147	RHOE
0032 R 000002 RH	10PA 0042 R 0	00372 RHOVW	0031 R 000014	RK	0023 R (	DOO311 ROKAP	0032 R 000016	RP
0022 R 000157 RT	M 0006 R 0	OOOOG RVAR	0023 R 000373	S	0025 R (	000074 SC	0000 R 000052	SHEAD
0016 I 000036 SH	IEAR OOOO R O	00050 SHFAC	0006 R 000007	SIPSE	0041 R (	000152 SP	0043 R 000002	SPCT
0000 R 000102 ST	F 0007 R 0	OO110 STEF	0037 000000	STURB	0022 R (	DOO160 SUMQG	0016 I 000040	TCON
0010 R 000705 TE	E 0016 I 0	00044 TEMP	0036 R 000153	THELEM	0000 R (	DOOO70 THENGY	0000 R 000071	THMOM
0016 I 000046 TH	RUST OO14 R O	00017 TPWALL	0025 R 000113	тт	0037 R (	DOOOO1 TURPR	0010 R 000770	TVCC
0040 R 000000 UC	CD 0040 R 0		0040 R 000002		0040 R (	00003 UCM	0000 R 000065	UCMF
0040 R 000004 UC	CP 0040 R 0	00005 UCR	0040 R 000006	UCS	0040 R (	000007 UCT	0040 R 000010	UCV
0010 R 001052 UE	E 0035 R 0	00001 UKAPPA	0016 I 000050	VEL	0016 I (	000052 VIS	0000 R 000107	VISC
0014 R 000010 Vu	JKW 0024 R 0	00264 VMU	0010 R 001134	VMUE	0025 R (	000132 VMW	0012 R 001176	VNU
0004 R 002040 W	0035 R 0	00020 WALLA	0014 R 000001	WALLJ	0014 R (	DOODOO WALLQ	0012 R 002136	WAT
0032 000007 WF	- 0032 R 0	00005 WP	0012 R 002147	WTM	0005 R (	000247 XG	0015 R 000344	XI
0005 R 000242 XM	1 0005 R 0	00254 XSP	0022 R 000161	XST	0036 R 0	000162 Y		

00101	1*	SUBRO	UTINE OUTPUT	B11A 002	2 000000	•
00101	2*	C			000000	
00103	3*	COMMO	N /AL/ IPLOT, IUNIT	/AL/	000000	
00104	4*	COMMO	N /BLQCOM/ FR(60,15),L2(34),MOA(60),MOB(60),NSPEC,PIEASE,W(	3)/BLQCOM/	000000	
00105	5*	COMMO	N /CDECON/ CK(162),XM(5),XG(5),XSP(5,7)	/COECON/	000000	
00106	· 6*	COMMO	N /CONSTS/ CPFL(2),GC,PATM,PI(2),RVAR,SIPSF	/CONSTS/	000000	
00107	7*	COMMO	N /CRBCOM/ ASU(6), EMIS, EMISC(14), ISU, KS(50), STEF	/CRBCOM/	000000	
00110	8*	COMMO	N/EDGCOM/DSP(53),PE(50),RHOE(350),TE(51),TVCC(50),UE(50),		NEW000000	
00110	9*	\$ VMU	(50)		NEW000000	
00111	10*	COMMO	N /EPSCOM/ CLNUM,DL(16),EPSA(15)	/EPSCOM/	-01000000	
00112	11*	COMMO	<pre>\/EQPCOM/ATA(8),ATB(274),NEL,P(355),VNU(60,8),WAT(9),WTM(60</pre>	) /EQPCOM/	000000	
00113	12*	COMMO	N /ETACOM/ ETA(15)	/ETACOM/	000000	
00114	13*	COMMO	N /FLXCOM/ WALLQ,WALLJ(7),VJKW(7),TPWALL	/FLXCOM/	000000	
00115	14*	COMMO	<pre>N /HISCOM/ A,BETAP(50),BETAV(50),C1,C,C3M(50),HF(15,5),XI(50)</pre>	O)/HISCOM/	000000	
00116	15*		N /HOLLER/ AREA(2),CQ(2,2),DENS(2),DIST(2),ENERGY(4),HEAT(2			
00116	16*	12),ł	WALL(2), MASS(2,2), PRESS(4), REY(2), SHEAR(2), TCON(2,2), TEMP(2	),/HOLLER/	000000	
00116	17*		ST(2),VEL(2),VIS(2,2)	/HOLLER/	000000	·
00117	18*		N /INPUTI/ IB(5), IFLOW, IG, ITDK, ITH, IWALL, JW(2), NTROPY	/INPUTI/	000000	
00120	19*	COMMO	N /INTCOM/ CASE(16),IS,ISH(2),KAPPA,KONRFT,KR9(55),	/INTCOM/	000000	
00120	20*	1	NETA, NNLEQ, NON, NRNL, NS, NSP, NSPM1	/INTCOM/	000000	
00121	21*		N /INTERI/ KBC(2),KQ9,KQ10	/INTERI/	000000	
00122	22*	COMMO	<pre>N /PRMALS/ COSALF(50),DELTBD(53),IST,IU(4),</pre>	/PRMALS/	000000	
00122	23*	1	RAD5, RAD6, RADFL, RTM, SUMQG, XST (50)	/PRMALS/	000000	·
00123	24*	COMMO	<pre>N /PRMORG/ IDISC(151),RADS(50),ROKAP(50),S(50)</pre>	/PRMORG/	000000	
00124	25*	COMMO	N /PRPCOM/ DRHOH(180),VMU(15)	/PRPCOM/	000000	
00125	26*	COMMO	<pre>N /PRPERT/ CAPC(15),CPBAR(15),GMR(15),PR(15),SC(15),TT(15),</pre>	/PRPERT/	000000	
00125	27*	1	VMW(15)	/PRPERT/	000000	
00126	28*	COMMO	N /PRPIOP/ CRHO(14)	/PRPIOP/	000000	

00127	29*	COMMON /PRPNPT/ HB(31),RHO(15)	/PRPNPT/		
00130 00130	30* 31*	COMMON /RFTCOM/ F2FIX(15),F2FIXT(15),KAPPAL,KAPPAT,KTURB,NETAL,	/RFTCOM/		
00130	31*	1 NETAT, NPOINT, RATLIM COMMON/RUF/DUMM1, DUMM2, DUMM3, DUMM4, DUMM5, DUMM6, DUMM7, DUMM8, DUMM9,	/RFTCOM/	000000 NEW000000	
00131	33*	a annana annan - conner an contra anna anna a' contra a'		NEW0000000	
00132	34*	\$ DUMM10,DUMM11,DUMM12,RK,ICF,FMF,DUMM16,DUMM17,DUMM18 COMMON/PARTI/PARTM,DUMM24,RHOPA,DUMM23,CPART,WP,DUMM19,WF, \$ DUMM20,DUMM20,ILI,DE,AK, DB,ADT	·····	NEW000000	
00132	35*	\$ DUMM22, DUMM20, DUMM21, ILT, PF, AK, RP, IPART		NEW000000	
00133	36*	COMMON /LAM/ ILAMIN		NEW000000	
00134	37*	COMMON /SAHA/ CPH(51), IPASS, IRITE, ITRCNT, NSJ, QWG(50)	/SAHA/	000000	
00135	38*	COMMON /SAVOUT/ ENTHAL,UKAPPA(15),WALLA	/SAVOUT/	000000	
00136	39*	COMMON /TEMCOM/ CM(7),DER(50),DUDS(50),THELEM(7),Y(15)	/TEMCOM/	000000	
00137	40* 41*	COMMON /TURB/ STURB, TURPR(15)	/TURB/	000000	
00140 00141	41*	COMMON /UNICOM/ UCD,UCE,UCL,UCM,UCP,UCR,UCS,UCT,UCV COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7)	/UNICOM/ /VARCOM/		
00141	42*	COMMON /VARCOM/ ALPH, P(15,4), G(15,5), SP(15,3,7) COMMON /WALL/ FLUXJ(250), RHOVW(50)	/WARCUM/	000000	
00143	44*	COMMON/ACCN/ACCPK, ILAM, SPCT	/ #ALL/	NEW000000	
00144	45*	COMMON/RETH/RETHMO		NEW000000	
00145	46*	DIMENSION DM1(15),DM2(15)		NEW000000	
00145	47*	С		000000	
00146	48*	DIMENSION FLOW(2), PRES(2)	ANK 5/83		
00147	49*	INTEGER AREA, CO, DENS, DIST, ENERGY, FLOW, HEAT, HWALL, PRES, PRESS, REY,			
00147	50*	1 SHEAR, TCON, TEMP, THRUST, VEL, VIS, ATA, ATB	ANK 8/83		
00150 00150	<u>51*</u> 52*	DATA FLOW/12HKG/SECLB/SEC/,NUM/6HNUMBER/,PRES/12H(N/M2)LB/IN2/ C		000000	
00150	52* 53*	TVCE(X) = (SOBT(AMAX) (0, 1, 1) + (SOBD + X)) = (1) (CDCOD		000000	
00154	54*	С	·····	000000	
00155	55*	IF (IWALL .GT. 2) RHOVW(IS) = C1*F(1,1) + HF(1,5)	ANK 4/83		· · · · ·
00157	56*	C89 = -ALPH*C3M(IS)*VMUE(IS)	ANK 8/83		
00160	57*	WALLQ = -WALLQ/C3M(IS)	ANK 8/83	000017	
00161	58×	DER(3) = WALLQ - RHOVW(IS)*G(1,1)/C3M(IS)	ANK 8/83	000022	
00162	59*	WALLJ(NSP)=0.	B11A 149		
00163	60*	IF (NSPM1 .LE. 0) GO TO 3051		000031	
00165 00170	61* 62*	D0 305  K = 1, NSPM1		000034	
00171	62* 63*	WALLJ(K)=VJKW(K) 305 WALLJ(NSP)=WALLJ(NSP)-WALLJ(K)	B11A 151 B11A 152		
00173	64*	3051  DER(1) = W(2)/C3M(IS)	ANK 8/83		
00174	65*	DED(2) = W(2)/(2M(1S))	ANHZ 0/03		
00175	66*	ADR = (W(2) + W(3) - RHOVW(IS))/C3M(IS)	ANK 8/83		
00176	67*	IF (ADR*100.0 .LT. RHOVW(IS)/C3M(IS)) ADR = 0.0	ANK 8/83	000063	
00200	68*	Y(1) = 0.0		000074	
00201	69*	SHFAC = -UE(IS)/(ALPH**2*C3M(IS)*GC)	ANK 8/83		
00202	70*	SHFAC = -UE(IS)/(ALPH**2*C3M(IS)*GC) DUDS(1) = F(1,3)*SHFAC*(CAPC(1) + EPSA(1)) DO 192 J=2 NETA		000105	
00203 00206	71* 72*	D0 182 I=2, NETA $DUDS(I) = F(I,3)*SHFAC*(CAPC(I) + EPSA(I))$	B11A 162	000123	
00206	72* 73*	182 Y(I) = Y(I-1) + C89 + CRHO(I-1)	B11A 163		
00207	73*	SHEAD = DUDS(1)	ANK 8/83	***********************************	
00212	75*		1111 1100		
00214	76*	QDIFU = -CAPC(1)/ALPH*CPBAR(1)/PR(1)*TPWALL/C3M(IS)	ANK 8/83		
00215	77*	CPH(1S) = CPBAR(NETA)	ANK 5/83	000155	
00216	78*	QWG(IS) = QDIFU		000160	
00217	79*	DER(11)=ALPH	EV 10/73		
00220	80*	DER(12) = ROKAP(IS)/RAD5 $DER(12) = PE(IS)(ICP)$		000163	
00221	81* 82*	DER(13) = PE(IS)/UCP DER(14)=UE(IS)/UCL	EV 10/73	000166	
00222	82* 83*	DER(14)=DE(15)/DCL DX = UE(15)**2*RHOE(15)/GC	ANK 4/83	000171	
00223	84*	ACH = DER(12) * RAD6	ANT 4/03	000174	
00225	85*	DER(15) = BETAP(1S)	ANK 7/83	000204	
00226	86*	DER(16) = BETAV(IS)		000206	
00227	87*	DER(17) = WALLQ/UCR		000210	
00230	88*	DER(18) = DER(3)/UCR		000213	
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CO231         B9+ DER(10) = STEF-TT(1)***+ENIS/UCR         ANK 5/83         CO234           CO233         90+ DER(20) = COIFU/UCR         ANK 5/83         COC234           CO233         91+ DER(20) = COIFU/UCR         ANK 5/83         COC234           CO234         91+ DER(20) = COIFU/UCR         ANK 5/83         COC234           CO235         91+ DER(20) = COIFU/UCR         ANK 5/83         COC234           CO236         91+ DER(20) = COIFU/UCR         ANK 5/83         COC234           CO237         91+ DER(20) = COIFU/UCR         ANK 5/83         COC234           CO234         91+ DER(15) = COIFU/UCR         ANK 5/83         COC234           CO234         100 TD 2:06         ANK 5/83         COC234           CO234         100 TD 2:06 TD 1:00 COIFU/UCR         ANK 5/83         COC234           CO234         100 TD 2:00 COIFU/UCR         ANK 5/83         COC234           CO234         100 TD 2:00 COIFU/UCR         ANK 5/83         COC234           CO234         100							
00232         90*         DER(20) = 00 FPU/UE         000024           00233         91*         HEAD - ACH-DER(18)         ANK 4/83         000025           00234         91*         FF LIWALL LE. 2)         00 TO 2104         ANK 4/83         000025           00234         95*         2104         IF (LIWLIC, LE. 2)         00 TO 2103         000046           00241         95*         2104         IF (LIS, NE, 1)         00 TO 2103         000046           00244         95*         2104         ARK 4/83         0000246           00246         95*         CIO TO 2105         O. COSALF(1) + 1.0         ANK 6/83         0000246           00247         95*         2103         ARE + 5 (15) - 5 (15-1)/UEL         ANK 6/83         0000246           00248         10*         IF (TIST, E0, O)         GOT 0 2105         ANK 6/83         0000247           00249         105*         IF (ITK, GO, O)         GOT 0 2105         ANK 6/83         0000247           00244         105*         IF (ITK, GO, O)         GOT 0 2105         ANK 6/83         0000271           00254         104*         IF (ITK, GO, O)         GOT 1/10         ANK 6/83         0000271           00254         10*	00221	80+		NED(10) = STEE*TT(1)*****MTS/100	ANIC 5/92	000216	
00234         91*         HEAD * ACHIERE(18)         ANK 6/83         000226           00234         92*         IF (TMALL LE: 2) GG TO 2104         ANK 6/83         000236           00241         95*         2106. IF (15 NE. 10) GG TO 2103         ANK 6/83         000246           00243         95*         2106. IF (15 NE. 10) GG TO 2103         ANK 6/83         000246           00244         95*         2106. IF (15 NE. 10) GG TO 2103         ANK 6/83         000256           00244         95*         2103. ARE 1 * 6(5 IS) - 5(15 : 1))/UCL         EN 6/83         000266           00255         100*         IF (15 T.60. 0) GO TO 2105         ANK 6/83         000266           00256         100*         IF (15 T.60. 0) GO TO 2105         ANK 6/83         000266           00256         100*         IF (18 T.60. 0) GO TO 2105         ANK 6/83         000267           00256         100*         IF (18 T.60. 0) GO TO 20 - 20 - 30 - 30 - 30 - 30 - 30 - 30 -					ANK 5785		
00228         93*         HEAD = 0.0         ANK 5/83         000224           00237         94*         11F (AAS(15), LT, -1, DE-4)         HEAD = -RADS(TS)/UCE         ANK 6/83         000245           00241         95*         2104         1F (IS, MC, 1)         00 TD 2103         ANK 6/83         000245           00244         95*         00 TO 2106         EV 10/73         000255           00244         95*         00 TO 2105         EV 10/73         000265           00247         95*         2103         ARK 6/83         000260           00250         100*         FF (IST, CO, O GO TO 2105         ANK 6/83         000267           00254         103*         2105         IF (IST, CO, O GO TO 2105         COS(ATAN2((R0KAP(IS)-ISTS))))         ANK 6/83         000271           00254         104*         1 (IRTE 6, I) (NG (GO TO 30, I, 12, D) ISTS((UNT), PRESS(UNT), ANK 6/83         000271         000271           00254         104*         1 (IRTE 6, I) (NG (GO TO 30, I, 12, J) ISTS((UNT), PRESS(UNT), ANK 6/83         000271         000271           00254         104*         IST FO, O GO TO 30, IS, SFPRESSURE 4, AS, HEDEE VEL, K, MEVDO346         000271           00272         106*         1 FORMAT/A, ARHADIUS, SA, SFPRESSURE 4, AS, HEDEE VEL, K, MEVDO346		91*			ANK 8/83		
CO243         96         Line         ARE 7 × 0.0         J. B. OLLOG         AMK 8/83         CO0255           CO244         98*         GG TO 2106         EV 107/3         CO0256         CO0266           CO247         98*         CO TO 2105         EV 107/3         CO0266         CO0266           CO247         10*         LARE * 5 (15) - 5 (15, -1))/UCL         ANK 8/83         CO0256         CO0266           CO253         LO1*         ARE 7 • 6 (10)         COSALF(15) = COSALF(15) = COSALF(15) = COSALF(15)         COSAC         CO0266         CO0266           CO254         LO1*         ARE 7 • 6 (0)         COSALF(15) = COSALF(15) = COSALF(15) = COSALF(15)         COSAC         COSAC         CO0266         CO0271         CO0266         CO0271         CO0266         CO0271         CO0271         CO0271         CO0272         CO0*         T         FUEL(INIT), CORCU, J = 11, 20)         CO0272         CO0272         CO0*         T         FUEL(INIT), CORCU, J = 7, 24, FUEL AS, CO02020         CO0220         CO0230         CO0220         CO0220         CO0220         CO0220         CO0220         CO0220         CO0220         CO		92*		IF (IWALL .LE. 2) GO TO 2104	ANK 4/83	000230	
CO243         96         Line         ARE 7 × 0.0         J. B. OLLOG         AMK 8/83         CO0255           CO244         98*         GG TO 2106         EV 107/3         CO0256         CO0266           CO247         98*         CO TO 2105         EV 107/3         CO0266         CO0266           CO247         10*         LARE * 5 (15) - 5 (15, -1))/UCL         ANK 8/83         CO0256         CO0266           CO253         LO1*         ARE 7 • 6 (10)         COSALF(15) = COSALF(15) = COSALF(15) = COSALF(15)         COSAC         CO0266         CO0266           CO254         LO1*         ARE 7 • 6 (0)         COSALF(15) = COSALF(15) = COSALF(15) = COSALF(15)         COSAC         COSAC         CO0266         CO0271         CO0266         CO0271         CO0266         CO0271         CO0271         CO0271         CO0272         CO0*         T         FUEL(INIT), CORCU, J = 11, 20)         CO0272         CO0272         CO0*         T         FUEL(INIT), CORCU, J = 7, 24, FUEL AS, CO02020         CO0220         CO0230         CO0220         CO0220         CO0220         CO0220         CO0220         CO0220         CO0220         CO				HEAD = 0.0	ANK 8/83	000234	
CO243         96         Line         ARE 7 × 0.0         J. B. OLLOG         AMK 8/83         CO0255           CO244         98*         GG TO 2106         EV 107/3         CO0256         CO0266           CO247         98*         CO TO 2105         EV 107/3         CO0266         CO0266           CO247         10*         LARE * 5 (15) - 5 (15, -1))/UCL         ANK 8/83         CO0256         CO0266           CO253         LO1*         ARE 7 • 6 (10)         COSALF(15) = COSALF(15) = COSALF(15) = COSALF(15)         COSAC         CO0266         CO0266           CO254         LO1*         ARE 7 • 6 (0)         COSALF(15) = COSALF(15) = COSALF(15) = COSALF(15)         COSAC         COSAC         CO0266         CO0271         CO0266         CO0271         CO0266         CO0271         CO0271         CO0271         CO0272         CO0*         T         FUEL(INIT), CORCU, J = 11, 20)         CO0272         CO0272         CO0*         T         FUEL(INIT), CORCU, J = 7, 24, FUEL AS, CO02020         CO0220         CO0230         CO0220         CO0220         CO0220         CO0220         CO0220         CO0220         CO0220         CO				IF $(RADS(IS) . LT1.0E-4)$ HEAD = - RADS(IS)/UCR	ANK 8/83	000235	
00244         97*         IF (ITDK off. 0) COSALF(1) = 1.0         ANK 4/83         000251           00246         98*         100         ABET * (S(IS) - S(IS-1))/UCL         ANK 8/83         000256           00251         ABET * (S(IS) - S(IS-1))/UCL         ANK 8/83         000266           00252         IOS -         ABET * 0.0         GOTO 2105         ANK 8/83         000267           00252         IOS -         IST * 0         GOUZ67         GOUZ67         GOUZ67           00254         IOS -         IST * 0         GOUZ67         GOUZ67         GOUZ67           00254         IOS -         IST * 0         GOUZ67         GOUZ67         GOUZ67           00254         IOS -         IF (ITDK GT, 0) COSALF(IS) - COS(ATAN2((ROKAP(IS) - ROKAP(IS)-I))))         GOUZ71         GOUZ71           00256         IST * 0         GOUZ71         GOUZ72         GOUZ71         GOUZ72         IOS * IFORMT(/GK, SHALPMA, 7K, GHADUS, SK, BHAGDA/K, FUEDEV KL, SK, GA, GUX, GUUX74         GOUZ74         III * GUUT * SUPROVINUUT * GUUX74         GOUZ74         III * GUUT * GUUX74         GOUZ74         GOUZ74	****************		2104	11 (15 .NE. 1) do 10 2100		000240	
D0246         94*         EV 10/73         CO0256           00350         92 100         ARE (r 5 (15) - 5 (15 - 1))/UCL         ANK 6/83         CO0256           00350         910         ARE (r - 0.0)         CO TO 2105         ANK 6/83         CO0256           00251         101*         ARE (r - 0.0)         COSALF(15) = COS(ATAN2((ROKAP(15) - 1))ANK 4/83         CO0267           00254         103*         2105         IF (ITRE .60.0)         GO TO 30         UCL*(XST(15) - XST(15^-1)))/UCL         CO0267           00254         103*         2106         IF (IRTE .60.0)         GO TO 30         UCL*(XST(15) - NCAP(15))         CO0271           00256         106*         2106         IF (IRTE .60.0)         GO TO 30         UCL*(XST(15) - NCAP(15, 1))/UL         CO0271         CO0272           0036         1         FORMAT /6X. SHAETA, 7X. SHAETA					ANK 8/83	000250	
00247         99         2103         ARET = (S(TS) - S(TS-1))/UCL         ANK 8/83         000250           00250         101*         ARET = 0.0         GG TD 2105         ANK 8/83         000266           00251         101*         ARET = 0.0         GG TD 2105         ANK 8/83         000271           00254         104*         2105         1F         (TDK, GT, O)         COSALF(TS) - SCT(TS-1))/UCL*(XST(TS) - ROXAP(TS-1))/INK 8/83         0000271           00256         106*         VRITE (6, 1)         (HAT)(J, DER(J), J = 11, 20)         000317         000330           00260         106*         VRITE (6, 1)         (DER(J), J = 11, 20)         111*         000346         000320           00272         108*         1         FDRTAN, 7X, HEAT FLUXE, 2/2AO/TSA, 67, A5, 67, A6, 31X, 000346         000320           00274         11*         2 HOT = ADMAL : AA, 70         PLOT TINK : MEEADA, 8A, 5HACDMAU / AA, 78, 80         000346           00274         11*         2 HOT = ADMAL : AA, 70         OT TINK : MELOCITY, ENTHALPY, PRESSURE (HAT FLUX         PLOT         000346           00274         11*         C         STORE ON DRUM FOR PLOTTING : WELOCITY, ENTHALPY, PRESSURE (HAT FLUX         PLOT         000351           00276         11*         G LAPC(L) (ALPH+VMALE (13			••••••	GO TO 2106	EV 10/73	000256	
00250         100*         IF (157, E0, O)         00 To 2105         000256           00353         010*         ARET = 0.0         000264         000264         000264         000264         000271         000271           00254         103*         2105         IF (1T0K, GT, O)         005 ALF(15) = C05(ATAN2((ROKAP(15) - ROKAP(15-1)))AK 4/83         0000271           00254         106*         IF (ITTE, E0, O)         GO TO 30         UC (XST(15) - XST(15-1)))         ANK 8/83         0000271           00256         106*         IF (ITTE, E0, O)         GO TO 30         UC (XST(15) - RST(15), TAST(15-1)))         ANK 8/83         0000271           00260         106*         WRITE (6,1) (HAT (J, ULNIT), J = 1,2).DIST(UUNIT), ARK 8/83         0000020         000027           00260         107*         1         WRITE (6,1) DIST(10, J, LAT (RAST), AS (ST, LAT (RAST), AS	00247	99*	2103				
00253         102+         IST * 0         00264         102+         IST * 0         00264         103+         105+         100254         000271         000271           00254         104+         1         IRTE (6,1) (HEAT(J, IDATT), U = 1,2) IDIST (IDATT), ANK 8/83         0000271           00266         106+         WITTE (6,1) (HEAT(J, IDATT), U = 1,2) IDIST (IDATT), ANK 8/83         0000370           00260         166+         WITTE (6,1) (HEAT(J, IDATT), U = 1,2) IDIST (IDATT), ANK 8/83         0000370           00272         109+         1 SHBETAP, 8X, SHBETAV, 17X, 'HEAT FLUXES, '2AF/18X, AS, 7A, 65A, 65, 46, 31X, -01000346           00273         110+         2 'DIFFUSIONL', 4X, SHTOT ENTH, 7X, SHREAD, 8X, SHOCONV(X, HOLE A, 50K)         ANK 5/83         000366           00274         112+         IF (1UNTS, 60, 0) FOUT = DER(13)         PLOT         0000351           00274         112+         IF (1DATT E(3) DER(14), DER (14),				IF (IST .EQ. 0) GO TO 2105			
00254 103+ 2105 IF (ITOK.GT.O). COSALF(IS) = COS(ATAX2((ROKAP(IS)-) = NGKAP(IS-1))ANK 4/83 000271 00256 105+ 2106 IF (IRITE E0.O) GD TO 30 00000011 00260 105+ 2106 IF (IRITE E0.O) GD TO 30 00000011 00260 105+ WRITE (6.1) (HEAT(I, UNIT), U = 1,2).DIST(UNIT). ANK 8/83 000220 00272 106+ 1 FURMAT(/6X, FMEIDHA, 7X, FMEIAT, ELUKES (IAK, AS, TA, AS, A, AS, AK, S, AK,	**********************				ANK 8/83		
00254         104*         1         .UCL*(SST(IS) - SST(IS-S))))         000271         ,           00256         105*         206         007         007         000017			0405				
00256       105*       2106       IF (IRITE ED. 0) GD T0 30       000317         00260       106*       WRITE (G.1) (HEAT(JUNIT), J = 1,2),DIST(IUNIT), PRESS(IUNIT), ANK 8/3       000320         00272       106*       I FORMAT(FOK,USHALPHA,7), GHRADIUS, 6X, 8HPRESSURE, 4X, 9HEDGE VEL., 6X, NEW00346       000320         00273       109*       I DERTAP, 8X, SHEETAV, XI, SHERADI, 6X, SHOCNOVIK, IA, 10:13, 63, 10, 10:00346       000346         00273       109*       I DERTAP, 8X, SHEETAV, XI, SHERADI, 6X, SHOCNOVIK, IA, 10:13, 61, AG, 6X, AG, 31, -       01000346         00274       112*       IF (IUNIT, ED. 1) POUT = DER(13)       SHOCNOVIK, SHOCNOVIK, IA, 10:00351       000351         00274       112*       IF (IPASS, EG. 0) WRITE (3) DER(14), DER(18), POUT, DER(20)       ANK 7/83       000356         00305       116*       OC CF = CARC(I)/ALPH*WURE(IS)/CBS+F(1,3)       000405       000405         00301       118*       IF (IRITE, ED. 0) GD TO 400       000403       000403         00301       118*       IF (IRITE, ED. 0) GD TO 400       000403       000403         00301       12*       2 KA, HOHKR, 3V, TOTAL, AG, S', AB, CA, SK, SY, PHENDER, SK, BENDRIAL, MAS, SK, INS, AG, SK, 200403       000405         00301       12*       2 KA, HOHKR, SV, TOTAL, GA, S', AS, AG, AS, SK, SK, SK, SK, SK, SK, SK, SK, SK, S				$\frac{11}{11} = \frac{11}{11} = 11$	JANK 4/83		
OO260         106+         WRITE (6, 1) (HEAT(J, IUNIT), J = 1, 2), DIST(TUNIT), ANK 8/83         OO0320           OO271         1         VEL(IUNIT), (DER(U), J = 11, 20)         OO0320           OO272         108+         1         FORMAT(/6X, SHALPHA, 7X, GHRADUS, 6X, 8HPEGSSUBE, 4X, 9HEDGE VEL., 6X, NEW000346           OO272         109+         1         SHBETAP, 4X, SHBETAV, 1X, 'HEAT FUXES '2A6/HEGS VEL., 6X, OO0346           OO273         110+         2         'DIFFUSIONAL', 4X, BHITOT ENTH, 7X, SHRERAD, 8X, SHOCONDIX, 1P10E13, 6)         OO0346           OO274         112         IF (IUNIT), EG, 1)         PUIT = DER(13)         PUIT = DER(14) PATM         PUIT = DER(13)           OO366         115+         30         ACF = RHO(NETA) /VMU(NETA) 'UE(15)/ALPH+PESSUBE, HEAT FLUX PLOT         PLOT         OO0361           OO3050         115+         30         ACF = RHO(NETA) /VMU(NETA) 'UE(15)/ALPH+F(NETA,2)         OO0400         OO0400           OO3061         118+         IF (IRIXE, 12A, 12MASS 20, 83, 23HELEMENTA MASS D)         OO0403         OO0400           OO3071         CF = CAPC(1)/ALPH+VMUE(15)/ALPH+F(NETA,2)         OO0400         OO0400         OO0400           OO330         121+         IF (IRIXE, 2A6, 4X, 3HELEMENTA, SA, 7DTAL MASS D)         OO04013         OO0400           OO330         121+				TE (TRITE EQ O) GO TO 30			; ;
00260         107*         1         VEL(IUNIT), (DER(4), J = 11,20)         000320           00272         108*         1         FORMAT/RS, SHALPHAY, SR, SHAPERSUE, 4X, SHEDGE VEL., SK.         NERV00346           00272         109*         1         SHEETAP, BX, SHEETAV, 17X, 'HEAT FLUXES' 2265/18X, AG, 7X, AG, SX, AG, SX, AG, SX, CA, SX, SA, SY, AG, SX,				WRITE $(6,1)$ (HEAT(J,IUNIT), J = 1,2), DIST(IUNIT), PRESS(IUNIT),	ANK 8/83		
00272         109+         1 5HBETÅP, BX, SHBETAV, 17X, 'HEAT FLUKES '2A6/18X, KA, TX, A6, 6X, A6, 31X, -01000346           00273         111+         POUT = DER(13)+PATM         ANK 5/83         000346           00274         112+         IF (IUNIT E0.1) PATM         ANK 5/83         000351           00274         112+         IF (IUNIT E0.1) POUT = DER(13)         PLOT         000351           00276         112+         IF (IUNIT E0.1) POUT = DER(13) DER(14), DER(14), PRESSURE, HEAT FLUX         PLOT         000356           00276         114+         IF (IUNITA), VMU(NETA)+UE(IS)/ALPH+F(NETA,2)         000356         000366           00306         115+         30         ACCP = RH0(NETA)/VMU(NETA)+UE(IS)/ALPH+F(NETA,2)         000405           00307         17*         CF = CAPC(1)/ALPH+VMUE(IS)/CB9+F(1,3)         000405         000405           00310         118+         IF (IRITE E0.0)         000413         000423         000423           00310         129+         IEE (6,2)         SHER (A, 3X, 7HEMOVAL, 5X, 3HGAS S)         000450           00330         122+         2 (SA, HICHAR, 3X, 7HAEMOVAL, 5X, 3HGAS S)         000450         000450           00331         124+         23 FORMAT (A, AG, 3X, 7HEEMOVAL, 5X, 3HGAS S)         0000450         000450 <td< td=""><td>00260</td><td>107*</td><td></td><td></td><td></td><td></td><td></td></td<>	00260	107*					
00272         110*         2 'DIFFUSIONAL', 4X, BHTOT ENTH, 7X, SHRERAD, 8X, SHQCOND/ XX, 1P10E 13. 6)         000346           00273         111*         POUT         DER(13) +PATM         ANK 5/83         000346           00274         112*         C         STORE ON DRUM FOR VELOCITY, ENTHALPY, PRESSURE, HEAT FLUX         PLOT         000351           00274         114*         C         STORE ON DRUM FOR VELOCITY, ENTHALPY, PRESSURE, HEAT FLUX         PLOT         000351           00276         114*         C         STORE ON DRUM FOR UE (LS)/ALPH*FINETA, 2)         000371         000356           00305         115*         30         ACCP = RHO(NETA/YMM(NETA)-VEL(S)/ALPH*FINETA, 2)         000371         000405           00307         11*         GC = r CARC(1)/ALPH*WME (LS)/CREST(1, 3)         000405         000413           00312         118*         IF FLUSIVE, FLUXES 2, 364, 37, 37, 37, 37, 37, 37, 37, 37, 37, 37		-	1	FORMAT(/6X,5HALPHA,7X,6HRADIUS,6X,8HPRESSURE,4X,9HEDGE VEL.,6X,		NEW000346	
00273         111*         POUT = DER(13)*PATM         ANK 5/83         000346           00274         112*         IF (TUNT EG. 1) POUT = DER(13)         PLOT         000351           00274         113*         C         STORE ON DRUM FOR PLOTTING: VELOCITY,ENTHALPY, PRESSURE,HEAT FLUX         PLOT         000351           00276         114*         IF (TPASS EG. 0) WRITE (3) DER(14),DER(14),PUE(20)         ANK 7/83         000356           00306         115*         30         ACCP = RH0(NETA),YWU(NETA)+UE(15)/CB9+F(1,8)         000405           00307         117*         CF = CAPC(1)/ALPH+VMUE(1S)/CB9+F(1,3)         000405         000405           00310         118*         IF (TRTE EG. 0) GO T0 400         000413         000423           00330         12*         1 FRMTT EG. 36, 13, 3HFDR/AS, STLUSES, 2A6, 9X, 32HELEMENTAL MASS DI         000450           00330         12*         1 FRMTT EG. 3, SHEAR(IUNIT)         ANK 8/83         000450           00331         12*         2 FX, AHCAR, 3X, THREMOVAL, 5X, 3HSAER, 3X, 17HMECHANICAL PYROL,         000450           00331         12*         2 STORMAT (4X, A6, 3X, THREMOVAL, 5X, 3HGAS)         000450           00334         12*         2 STORMAT (4X, A6, 3X, THREMOVAL, 5X, 3HGAS)         000450           00334         12* <td></td> <td></td> <td></td> <td>1 5HBETAP,8X,5HBETAV,17X,'HEAT FLUXES '2A6/18X,A6,7X,A6,6X,A6,31X,</td> <td></td> <td>-01000346</td> <td>······</td>				1 5HBETAP,8X,5HBETAV,17X,'HEAT FLUXES '2A6/18X,A6,7X,A6,6X,A6,31X,		-01000346	······
C0274         112*         IF (TUNIT 160.1)         PDDT = DER(13)         PLDT         C00351           C0276         114*         IF (TPASS 150.0)         WRITE (3) DER(14), DER(18), POUT, DER(20)         ANK 7/83         C00356           C0305         115*         30         ACCP = RHO(NETA)/VMU(NETA)-UE(15)/ALPH*(NETA.2)         C00307           C0306         116*         0         H = WALLO/(G(NETA.1) - G(1,1))         C00400         C00307           C0307         117*         CF = CAPC(1)/ALPH*VMUE(15)/CSPs+f(1.3)         C000405         C00405           C0310         118*         IF (IRITE 160.0)         G0 TO 400         C00310         CP = CAPC(1)/ALPH*VMUE(15)/CSPs+f(1.3)         C000405           C0330         120*         2         FORMAT (//EX, HHWALL 12X, 12HRASS FLUXES 2A6.9X 3/HELEMENTAL MASS D1         C00450           C0330         121*         IFFUSIVE FLUXES 2.06, 1X 3HFO/2X, SHSHER, 3X, 7HREMOVAL, 5X, 3HGAS)         C00457           C0331         123*         WRITE (6.2) (MASA 3/HERMECHANICAL PYROL         C00457           C0331         124*         23         FGRMAT (4X, A.5, 3HGAS)         C00457           C0334         124*         23         FGRMAT (4X, A.5, 3HGAS)         C00457           C0334         126*         SP(1,1, NSP) = 1.0 <td< td=""><td></td><td></td><td>2</td><td>POUT = PER(AO) PATH</td><td>ANIX E /00</td><td></td><td></td></td<>			2	POUT = PER(AO) PATH	ANIX E /00		
00274         113*         C         STORE ON DRUM FOR PLOTING: VELOCITY.ENTHALPY.PRESURE, HEAT FLUX         PLOT         00035           00276         114*         IF (IFASS.EC.0) WRITE (3) DRC(14), DER(18), POLITER(20)         ANK 7/83         00035           00306         116*         OC         CF = RHO(INETA)/VMU(NETA)+UE(1S)/ALPH+F(NETA,2)         000400           00307         117*         CF = CAPC(1)/ALPH-VMUE(1S)/CB9+F(1,3)         000405           00310         118*         IF (IRTE.EC.0) GO TO 400         000433           00330         120*         2 FORMATI//5X, 4HWALL 12X, 12HMASS FLUXES, 2A6, 9X, 28HELEMENTAL MASS DO 00450           00330         120*         2 FORMATI//5X, 4HWALL 12X, 12HMASS FLUXES, 2A6, 9X, 28HELEMENTAL MASS DO 00450           00330         121*         1FFUSIVE FLUXES, 2A6, 1X, 3HFDR/4X, 5HSHEAR, 3X, 17HMECHANICAL PYRDL, 000450           00330         122*         2 6X, 4HCHAR, 3X, 7HREMOVAL, 5X, 3HGAS)         000450           00331         123*         WRITE (6, 23) SHEAR(1UNIT)         ANK 8/83         000450           00334         124*         23 FORMATI (4X, A6 3X, 7HREMOVAL, 5X, 3HGAS)         000457           00340         124*         23 FORMATI (4X, A6 3X, 7HREMOVAL, 5X, 3HGAS)         000457           00340         124*         20 SP(1,1, NSP) = 0.0         0000506			÷••••••••	$\frac{1}{10} = \frac{1}{10} $			
00276         114*         IF (IPASS : E0. 0) WRITE (3) DER(14).DER(18).PDUT_DER(20)         ANK 7/83         000356           00305         115*         30         ACCP = RHO(KTA)*UE(IS)/ALPH*F(NETA_2)         000371           00306         116*         CH = WALLO/(G(NETA,1) - G(1,1))         000405         000405           00310         118*         IF (IRITE : E0. 0) G0 T0 400         000413         000413           00312         119*         WRITE (6.2) (MASS(J, IUNIT), J1,2).K=1,2).(AIA(K),AIB(K),K=1,NSP)         000423           00330         120*         2 FORMAT(//SX.4HWALL 12X, 12HMASS FLUXES 246,9,32HELEMENTAL MASS DI         000450           00330         121*         IFFUSIVE FLUXES.2A6,1X,3HFG0/4X,SHSHEAR,3X.17HMECHANICAL PYROL,         000450           00330         122*         2 GX.4HCHAR,3X.7TOFAL GAS ', 8(1X,2A4,1X))         000450           00331         124*         23         FORMAT (4X, AE, 3X, 7HREMOVAL, 5X, 3HGAS)         000457           00334         124*         23         FORMAT (4X, AE, 3X, 7HREMOVAL, 5X, 3HGAS)         000457           00335         125*         400         DD 202 I = 1, NETA         000457           00341         127*         SP(I,1, NSP) = 0.0         000457           00344         129*         IF (NSPMI LE : 0) GD TO 2021		–	C	STORE ON DRIM FOR PLOTTING VELOCITY ENTHALPY PRESSURE HEAT FLUX	-		
OO306         116+         CH = WALLO/(G(NETA, 1) - G(1, 1))         OO0400           O0307         117*         CF = CAPC(1)/ALPH+VMUE(15)/CB3+F(1,3)         OO0413           O0310         118*         IF (IRITE_E0,0) G0 TO 400         OO0413           O0312         119*         WRITE (6.2) ((MASS(J,LUNIT), J=1,2), K=1,2), (ATA(K), ATB(K), K=1,NSP)         OO0423           O0330         120*         2 FORMAT(//5X, 4HWALL 12X, 12HMASS FLUXES, 2A6, 9X, 32HELEMENTAL MASS DI         OO0450           O0330         121*         (IFFUSTVE FLUXES, 2A6, 1X, 3HFOR/AX, 5HSHEAR, 3X, 17HMECHANICAL PYROL, 000450         OO0450           O0330         122*         2 6X, 4HCHAR, 3X, 7HTOR (AS, 7, 81(X, 2A4, 1X))         ANK 8/83         OO0450           O0331         123*         WRITE (6, 23) SHEAR(IUNIT)         ANK 8/83         OO0457           O0331         124*         23 FORMAT (4X, A6, 3X, 7HREMOVAL, 5X, 3HGAS)         OO0457           O0342         126*         SP(1,1, NSP) = 1.0         OO0450           O0341         127*         SP(I,1, INSP) = 0.0         OO0506           O0341         128*         203         SP(I,1, INSP) = 0.0         OO0506           O0344         129*         IF (NSPM1, LE, 0) G0 TO 2021         OO0506           O0344         128*         SP(I,1, INSP			·····				
00306         116*         CH = WALLQ/(G(NETA, 1) - G(1, 1))         000400           00307         117*         CF = CAPC(1)/ALPH+VMUE(15)/CB3*F(1,3)         000405           00310         118*         IF (IRITE .E0. O) GD TO 400         000413           00330         120*         2 FDRMAT(/5X, 4HWALL 12X, 12HMASS FLUXES 2.46, 3X, 32HELEMENTAL MASS DI 000450         000450           00330         120*         2 FDRMAT(/5X, 4HWALL 12X, 12HMASS FLUXES 2.46, 3X, 31HHECHANICAL PYROL, 000450         000450           00330         122*         2 GX, 4HCHAR 3X, 'TOTAL GAS ', 8(1X, 2.4A, 1X))         000450         000450           00331         123*         WRITE (6, 2.2) SHEAR(IUNIT)         AAH 8/B3         000457         000457           00331         124*         23 FDRMAT (4X, A6, 3X, 7HREMONAL, 5X, 3HGAS)         000457         000457           00334         124*         23 FDRMAT (4X, A6, 3X, 7HREMONAL, 5X, 3HGAS)         000457         000457           00334         124*         23 FDRMAT (4X, A6, 3X, 7HREMONAL, 5X, 3HGAS)         000457         000457           00334         124*         23 FDRMAT (4X, A6, 3X, 7HREMONAL, 5X, 3HGAS)         000457         000457           00334         124*         20 SP(1, 1, NSP) = SO(1         000506         000506           00345         128* <td>00305</td> <td>115*</td> <td>30</td> <td></td> <td>•</td> <td>000371</td> <td></td>	00305	115*	30		•	000371	
00310         118*         1F (1k1FE_EQ. 0) GU TU 400         000413           00330         120*         2         FORMAT(//5X, 4HWALL 12X, 12HMASS FLUXES, 2A6, 9X, 32HELEMENTAL MASS DI         000423           00330         120*         2         FORMAT(//5X, 4HWALL 12X, 12HMASS FLUXES, 2A6, 9X, 32HELEMENTAL MASS DI         000450           00330         122*         2         6X, 4HCHAR, 3X, 'TOTAL GAS ', 8(1X, 2A4, 1X))         000450           00331         123*         WRITE (6, 23) SHEAR(1UNIT)         000457         000457           00334         124*         23         FORMAT (4X, A6, 3X, 'THREMOVAL, 5X, 3HGAS)         000457           00334         124*         23         FORMAT (4X, A6, 3X, 'THREMOVAL, 5X, 3HGAS)         000457           00340         126*         SP(I, 1, NSP) = 1.0         000457         000457           00341         127*         SP(I, 1, SPP) = 0.0         000500         000500           00344         128*         DI (1, SPP) = 50.0         0000500         000501           00344         129*         IF (NSPM1, LE 0) GO TU 2021         000506         00           00351         131*         DD 202 I = 1, NETA         000516         00356           00355         133*         SP(I, 2, K)/ALPH         0000523				$CH = WALLQ/(G(NETA_1) - G(1,1))$		000400	
00310         118*         1F (1k1FE_EQ. 0) GU TU 400         000413           00330         120*         2         FORMAT(//5X, 4HWALL 12X, 12HMASS FLUXES, 2A6, 9X, 32HELEMENTAL MASS DI         000423           00330         120*         2         FORMAT(//5X, 4HWALL 12X, 12HMASS FLUXES, 2A6, 9X, 32HELEMENTAL MASS DI         000450           00330         122*         2         6X, 4HCHAR, 3X, 'TOTAL GAS ', 8(1X, 2A4, 1X))         000450           00331         123*         WRITE (6, 23) SHEAR(1UNIT)         000457         000457           00334         124*         23         FORMAT (4X, A6, 3X, 'THREMOVAL, 5X, 3HGAS)         000457           00334         124*         23         FORMAT (4X, A6, 3X, 'THREMOVAL, 5X, 3HGAS)         000457           00340         126*         SP(I, 1, NSP) = 1.0         000457         000457           00341         127*         SP(I, 1, SPP) = 0.0         000500         000500           00344         128*         DI (1, SPP) = 50.0         0000500         000501           00344         129*         IF (NSPM1, LE 0) GO TU 2021         000506         00           00351         131*         DD 202 I = 1, NETA         000516         00356           00355         133*         SP(I, 2, K)/ALPH         0000523				CF = CAPC(1)/ALPH*VMUE(IS)/C89*F(1,3)		000405	
00330       120*       2       FORMAT(//5X,4HwALL 12X,12HMASS FLUXES, 2AG,9X,32HELEMENTAL MASS DI       000450         00330       121*       1FFUSIVE FLUXES, 2AG,1X,3HFGR/3X,5H5HEAR,3X,17HMECHANICAL PYRDL,       000450         00331       122*       2 6X,4HCHAR,3X,'TOTAL GAS ',8(1X,2A4,1X))       000450         00331       123*       WRITE (6,23) SHEAR(1UNIT)       ANK 8/83       000457         00334       124*       23       FORMAT (4X,AG,3X, 7HREMOVAL,5X,3HGAS)       000457         00340       126*       400       D0 203 I = 1,NETA       000457         00341       127*       SP(I,1,NSP) = 0.0       000500         00344       128*       203       SP(I,1,NSP) = 0.0       000501         00344       129*       IF (NSPM1 .LE. 0) GG TD 2021       000506         00354       134*       D0 202 L = 1,NETA       000566         00355       133*       SP(I,2,K)/ALPH       000520         00355       134*       SP(I,2,K)/ALPH       000520         00355       134*       SP(I,2,K)/ALPH+*2       000521         00356       134*       SP(I,3,NSP) = SP(I,3,NSP) - SP(I,3,K)       000530         00356       134*       SP(I,3,NSP) = SP(I,3,K)       000520         00356						000413	
O0330         121*         1FFUSIVE FLUXES ,2A6,1X,3HF0R/4X,5HSHEAR,3X,17HMECHANICAL PYROL,         O00450           00330         122*         2 6X,4HCHAR,3X,7DTAL GAS ', 8(1X,2A4,1X))         ANK 8/83         O00450           00331         123*         WRITE (6,23) SHEAR(IUNIT)         ANK 8/83         O00450           00334         124*         23 F0RMAT (4X,A6,3X,7HREMOVAL,5X,3HGAS)         O00457         O00457           00334         126*         SP(1,1,NSP) = 1.0         O00457         O00457           00341         127*         SP(1,2,NSP) = 0.0         O00500         O00500           00342         128*         203         SP(1,3, NSP) = 0.0         O00500         O00500           00344         129*         IF (NSPM1 LE, 0) GD TD 2021         O00503         O00506           00354         130*         DD 202 K = 1,NSPM 1         O00516         O00516           00355         133*         SP(1,2,K) = SP(1,1,KP) - SP(1,2,K)         O00523         O00523           00365         134*         SP(1,2,K) = SP(1,2,K)/ALPH+*2         O00523         O005516           00364         138*         SP(1,3,KP) = SP(1,3,K)         O00551         O00551           00364         138*         IF (NSPM1 .GT. 0) GD TD 2135         O00554			·····	WRITE $(0,2)$ ((MASS(0,1UNIT), J=1,2), K=1,2), (ATA(K), ATB(K), K=1, NSP) ENDMAT(//52 AHWALL 102 10HMASS ELLIYES 0AG 02 00HELEMENTAL MASS D	т	000423	
00330       122*       2 6X,4HCHAR,3X,'TOTAL GAS ',8(1X,2A4,1X))       000450         00331       123*       WRITE (6,23) SHEAR(IUNIT)       ANK 8/83       000457         00334       124*       23 FORMAT (4X,A6,3X,7HREMOVAL,5X,3HGAS)       000457         00335       125*       400       D0 203 I = 1,INETA       000457         00340       126*       SP(I,1,NSP) = 1.0       000477         00341       127*       SP(I,2,NSP) = 0.0       000500         00342       128*       203 SP(I,3,NSP) = 0.0       000501         00344       129*       IF (NSPM1,LE,0) GD TD 2021       000506         00351       30*       DD 202 I K = 1,NSPM1       001450       000506         00354       130*       DD 202 I K = 1,NSPM1       000516       000516         003554       132*       SP(I,1,NSP) = SP(I,1,NSP) - SP(I,1,K)       000520       000523         00356       134*       SP(I,2,K) = SP(I,2,K)ALPH       000523       000525       00366         00366       136*       202 SP(I,3,K) / ALPH**2       000523       000561       000551         00366       136*       SP(I,3,KP) = SP(I,1,NSP) = SP(I,1,K)       000520       000525       00366         00366       139* <t< td=""><td></td><td></td><td><b>د</b></td><td>1FUSIVE FLUXES . 2A6. 1X. 3HFOR/4X. 5HSHEAR. 3X. 17HMECHANICAL PYROL.</td><td>1</td><td>000450</td><td></td></t<>			<b>د</b>	1FUSIVE FLUXES . 2A6. 1X. 3HFOR/4X. 5HSHEAR. 3X. 17HMECHANICAL PYROL.	1	000450	
OO300         120         OO         OO <th< td=""><td></td><td></td><td></td><td>2 6X AHCHAR 3X (TOTAL GAS ( <math>8(1X 2AA 1X))</math></td><td></td><td>000450</td><td></td></th<>				2 6X AHCHAR 3X (TOTAL GAS ( $8(1X 2AA 1X))$		000450	
OO300         120         OO         OO <th< td=""><td>00331</td><td>123*</td><td></td><td>WRITE (6,23) SHEAR(IUNIT)</td><td>ANK 8/83</td><td>000450</td><td>· · · · · · · · · · · · · · · · · · ·</td></th<>	00331	123*		WRITE (6,23) SHEAR(IUNIT)	ANK 8/83	000450	· · · · · · · · · · · · · · · · · · ·
OO300         120         OO         OO <th< td=""><td></td><td></td><td>23</td><td>FORMAT (4X,A6,3X,7HREMOVAL,5X,3HGAS)</td><td></td><td>000457</td><td></td></th<>			23	FORMAT (4X,A6,3X,7HREMOVAL,5X,3HGAS)		000457	
00341         127*         SP(1,2, NSP) = 0.0         000500           00342         128*         203         SP(1,3, NSP) = 0.0         000501           00344         129*         IF (NSPM1.LE. 0.) GD TD 2021         000503           00346         130*         DD 202 K = 1, NSPM1         000506           00351         131*         DD 202 K = 1, NSPM1         000516           00354         132*         SP(1,1, NSP) = SP(1,1, NSP) - SP(1,1, K)         000516           00355         133*         SP(1,2, K) = SP(1,2, K)/ALPH         000520           00357         135*         SP(1,3, NSP) = SP(1,2, K)/ALPH+*2         000523           00360         136*         202         SP(1,3, NSP) = SP(1,3, K)         000530           00361         136*         202         SP(1,3, NSP) = SP(1,3, K)         000530           00360         136*         202         SP(1,1, NSP) = SP(1,3, K)         000530           00364         138*         IF (NSPM1.GT. 0) GD TD 2135         000551         000551           00370         141*         THELEM(1)=0.         000553         000554           00371         142*         GD TD 2137         000554         000554           00371         142*         GD TD 2137<			400			000437	
00342         128*         203         SP(I,3,NSP) = 0.0         000501           00344         129*         IF (NSPM1,LE,0) GD TD 2021         000503           00345         130*         DD 202 K = 1,NSPM1         000506           00351         131*         DD 202 I = 1,NETA         B11A 191         000516           00354         132*         SP(I,2,K) = SP(I,2,NSP) - SP(I,1,K)         000520           00356         134*         SP(I,2,K) = SP(I,2,NSP) - SP(I,2,K)         000523           00357         135*         SP(I,3,K) = SP(I,3,K)/ALPH+2         000525           00363         137*         2021         XSP(5,NSP) = SP(I,3,K)/ALPH+2         000523           00363         137*         2021         XSP(5,NSP) = SP(I,3,K)/ALPH+2         000530           00363         137*         2021         XSP(5,NSP) = F(NETA,1) - F(1,1)         000541           00364         138*         IF (NSPM1,GT,0) GD TD 2135         000552           00370         140*         CM(1)=0.         000552           00371         142*         GD TD 2137         000553           00371         142*         GD TD 2137         000554           00371         142*         2135 DD 2136 I =1,NSPM1         B11A <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>							
00344         129*         IF         (NSPM1_LE.O)         G0 TO 2021         000503           00346         130*         D0 202 K = 1,NSPM1         000506         000506           00351         131*         D0 202 I = 1,NETA         B11A 191         000516           00355         133*         SP(I,1,NSP) = SP(I,2,K)/ALPH         000520           00356         134*         SP(I,2,K) = SP(I,2,K)/ALPH         000523           00357         135*         SP(I,3,K) = SP(I,3,K) = SP(I,3,K)         000525           00360         136*         202 SP(I,3,NSP) = SP(I,3,K)         000530           00363         137*         2021         XSP(5,NSP) = F(NETA,1) - F(1,1)         000541           00364         138*         IF (NSPM1 .GT. 0) GD TD 2135         000551         000551           00367         140*         CM(1)=0.         000554         000554           00370         141*         THELEM(1)=0.         000554         000554           00372         143*         2136 XSP(5,NSP)=XSP(5,I)         B11A         0000574           00377         144*         2136 XSP(5,NSP)=XSP(5,I)         B11A 200         000604           00377         145*         D0 2131 I=1,NSP         B11A 200         000604			203	***************************************		·······	
00346         130*         DD 202 k = 1,NSPM1         000506           00351         131*         DD 202 I = 1,NETA         B11A 191         000516           00354         132*         SP(I,1,NSP) = SP(I,2,K)ALPH         000520           00356         134*         SP(I,2,K) = SP(I,2,K)ALPH         000523           00357         135*         SP(I,3,K) = SP(I,3,K)/ALPH*2         000523           00360         136*         202 SP(I,3,NSP) = SP(I,3,K)/ALPH*2         000525           00361         136*         202 SP(I,3,NSP) = SP(I,2,K)         000520           00360         136*         202 SP(I,3,NSP) = SP(I,1,1)         P(I,1,1)           00361         137*         2021 XSP(5,NSP) = F(NETA,1) - F(1,1)         000541           00364         138*         IF (NSPM1 GT. 0) GD TD 2135         000551           00366         139*         VJKW(1) = 0.0         000552           00370         141*         THELEM(1)=0.         000553           00371         140*         CM(1)=0.         000554           00372         143*         2135 DD 2136 I=1,NSPM1         B11A 199         000574           00375         144*         2136 XSP(5,NSP)=XSP(5,IS)         B11A 199         000574           00377 </td <td></td> <td></td> <td>200</td> <td>IF (NSPM1 .LE. 0) GD TO 2021</td> <td></td> <td>000503</td> <td></td>			200	IF (NSPM1 .LE. 0) GD TO 2021		000503	
OO356         134*         SP(I,2,NSP) = SP(I,2,NSP) - SP(I,2,K)         OO0523           OO357         135*         SP(I,3,K) = SP(I,3,K)/ALPH**2         OO0525           OO360         136*         202         SP(I,3,NSP) = SP(I,3,K)         OO0530           OO363         137*         2021         XSP(5,NSP) = F(NETA,1) - F(1,1)         OO0541           OO364         138*         IF (NSPM1.GT.O) GO TO 2135         OO0551           OO366         139*         VJKW(1) = 0.0         OO0552           OO370         141*         THELEM(1)=0.         OO0553           OO371         142*         GO TO 2137         OO0554           OO372         143*         2135 DO 2136 I=1,NSPM1         B11A         OO0556           OO375         144*         2136 XSP(5,NSP)=XSP(5,NSP)-XSP(5,I)         B11A         000574           OO377         145*         DO 2131 I=1,NSP         B11A 200         OO0604           OO402         146*         VJKW(I)=0.         B11A 201         OO0604	00346	130*	•••••				
OO356         134*         SP(I,2,NSP) = SP(I,2,NSP) - SP(I,2,K)         OO0523           OO357         135*         SP(I,3,K) = SP(I,3,K)/ALPH**2         OO0525           OO360         136*         202         SP(I,3,NSP) = SP(I,3,K)         OO0530           OO363         137*         2021         XSP(5,NSP) = F(NETA,1) - F(1,1)         OO0541           OO364         138*         IF (NSPM1.GT.O) GO TO 2135         OO0551           OO366         139*         VJKW(1) = 0.0         OO0552           OO370         141*         THELEM(1)=0.         OO0553           OO371         142*         GO TO 2137         OO0554           OO372         143*         2135 DO 2136 I=1,NSPM1         B11A         OO0556           OO375         144*         2136 XSP(5,NSP)=XSP(5,NSP)-XSP(5,I)         B11A         000574           OO377         145*         DO 2131 I=1,NSP         B11A 200         OO0604           OO402         146*         VJKW(I)=0.         B11A 201         OO0604		131*		DO 202 I=1,NETA	B11A 191	000516	
OO356         134*         SP(I,2,NSP) = SP(I,2,NSP) - SP(I,2,K)         OO0523           OO357         135*         SP(I,3,K) = SP(I,3,K)/ALPH**2         OO0525           OO360         136*         202         SP(I,3,NSP) = SP(I,3,K)         OO0530           OO363         137*         2021         XSP(5,NSP) = F(NETA,1) - F(1,1)         OO0541           OO364         138*         IF (NSPM1.GT.O) GO TO 2135         OO0551           OO366         139*         VJKW(1) = 0.0         OO0552           OO370         141*         THELEM(1)=0.         OO0553           OO371         142*         GO TO 2137         OO0554           OO372         143*         2135 DO 2136 I=1,NSPM1         B11A         OO0556           OO375         144*         2136 XSP(5,NSP)=XSP(5,NSP)-XSP(5,I)         B11A         000574           OO377         145*         DO 2131 I=1,NSP         B11A 200         OO0604           OO402         146*         VJKW(I)=0.         B11A 201         OO0604				SP(I, 1, NSP) = SP(I, 1, NSP) - SP(I, 1, K)		000516	
00357         135*         SP(I,3,K) = SP(I,3,K)/ALPH**2         000525           00360         136*         202         SP(I,3,NSP) = SP(I,3,K)         000530           00363         137*         2021         XSP(5,NSP) = F(NETA,1) - F(1,1)         000541           00364         138*         IF (NSPM1.GT.0)         GO TO 2135         000546           00366         139*         VJKW(1) = 0.0         000551           00367         140*         CM(1)=0.         000552           00370         141*         THELEM(1)=0.         000553           00371         142*         GO TO 2137         000554           00372         143*         2135 DO 2136 I=1,NSPM1         B11A         000556           00375         144*         2136 XSP(5,NSP)=XSP(5,NSP)-XSP(5,I)         B11A 199         000574           00377         145*         DO 2131 I=1,NSP         B11A 200         000604           00402         146*         VJKW(I)=0.         B11A 201         000604							
00360       136*       202       SP(I,3,NSP) = SP(I,3,NSP) - SP(I,3,K)       000530         00363       137*       2021       XSP(5,NSP) = F(NETA,1) - F(1,1)       000541         00364       138*       IF (NSPM1.GT.0) GD TD 2135       000546         00366       139*       VJKW(1) = 0.0       000551         00367       140*       CM(1)=0.       000552         00370       141*       THELEM(1)=0.       000553         00371       142*       GD TD 2137       000554         00372       143*       2136 JE 1, NSPM1       B11A       000556         00375       144*       2136 XSP(5,NSP)=XSP(5,NSP)-XSP(5,I)       B11A 199       000574         00377       145*       DD 2131 I=1,NSP       B11A 200       000604         00402       146*       VJKW(I)=0.       B11A 201       000604							
00363       137*       2021       XSP(5,NSP) = F(NETA, 1) - F(1, 1)       000541         00364       138*       IF (NSPM1.GT. 0) GD TD 2135       000546         00366       139*       VJKW(1) = 0.0       000551         00367       140*       CM(1)=0.       000552         00370       141*       THELEM(1)=0.       000553         00372       143*       2135       000556         00375       144*       2136       XSP(5,NSP)=XSP(5,I)       B11A       000574         00377       145*       D0       2131       I=1,NSP       B11A       200       000604         00402       146*       VJKW(I)=0.       B11A       201       000604		*******	202				······
00364         138*         IF (NSPM1.GT. 0)         GO TO 2135         000546           00366         139*         VJKW(1) = 0.0         000551           00367         140*         CM(1)=0.         000552           00370         141*         THELEM(1)=0.         000553           00371         142*         GO TO 2137         000554           00372         143*         2135 DD 2136 I=1,NSPM1         000556           00375         144*         2136 XSP(5,NSP)=XSP(5,ISP)-XSP(5,I)         B11A         000574           00377         145*         DD 2131 I=1,NSP         B11A 200         000604           00402         146*         VJKW(I)=0.         B11A 201         000604				VCD(E NCD) = E(NETA A) = E(A A)		000544	
00367         140*         CM(1)=0.         000552           00370         141*         THELEM(1)=0.         000553           00371         142*         G0 TO 2137         000554           00372         143*         2135 DO 2136 I=1,NSPM1         B11A         000556           00375         144*         2136 XSP(5,NSP)=XSP(5,ISP)-XSP(5,I)         B11A 199         000574           00377         145*         DO 2131 I=1,NSP         B11A 200         000604           00402         146*         VJKW(I)=0.         B11A 201         000604		· · · · · · · · · · · · · · · · · · ·					
00367       140*       CM(1)=0.       000552         00370       141*       THELEM(1)=0.       000553         00371       142*       GO TO 2137       000554         00372       143*       2135 DD 2136 I=1,NSPM1       B11A       000556         00375       144*       2136 XSP(5,NSP)=XSP(5,ISP)-XSP(5,I)       B11A 199       000574         00377       145*       DD 2131 I=1,NSP       B11A 200       000604         00402       146*       VJKW(I)=0.       B11A 201       000604		139*					
00371       142*       0010 2137       160 2137         00372       143*       2135 DD 2136 I=1,NSPM1       B11A       000556         00375       144*       2136 XSP(5,NSP)=XSP(5,ISP)-XSP(5,I)       B11A 199       000574         00377       145*       DD 2131 I=1,NSP       B11A 200       000604         00402       146*       VJKW(I)=0.       B11A 201       000604				CM(1)=O.		000552	····
00371       142*       0010 2137       160 2137         00372       143*       2135 DD 2136 I=1,NSPM1       B11A       000556         00375       144*       2136 XSP(5,NSP)=XSP(5,ISP)-XSP(5,I)       B11A 199       000574         00377       145*       DD 2131 I=1,NSP       B11A 200       000604         00402       146*       VJKW(I)=0.       B11A 201       000604				THELEM(1)=0.		000553	
00402 146* VJKW(I)=0. B11A 201 000604						000554	
00402 146* VJKW(I)=0. B11A 201 000604			2130	$x \le 1.50 \ x = 1, \ x \le 1.50 \ x \ge 1.50 \ $	B11A 199		
00402 146* VJKW(I)=0. B11A 201 000604			2100	DO 2131 I=1.NSP	B114 200		
00406 148* 2132 VJKW(I) = VJKW(I) - WALLJ(K)/WTM(K)*VNU(I,K) ANK 4/83 000607	00403						
	00406	148*	2132	VJKW(I) = VJKW(I) - WALLJ(K)/WTM(K)*VNU(I,K)	ANK 4/83	000607	

Control         Total         Control         Control <thcontrol< th=""> <thcontrol< th=""> <thcon< th=""><th>00410</th><th>149*</th><th>2131</th><th>VJKW(I)=VJKW(I)*WAT(I) B11A</th><th>204</th><th>000614</th><th></th></thcon<></thcontrol<></thcontrol<>	00410	149*	2131	VJKW(I)=VJKW(I)*WAT(I) B11A	204	000614	
00419         151*         IF (IRTIF: 16, 0) GD 10.35         000827           00415         152*         DER(II) * SKEAD/USS         ANK #/83         000831           00415         153*         DER(II) * SKEAD/USS         ANK #/83         000831           00420         153*         DER(IS)*DER(I)/USK         EV 10/73         000864           00421         156*         DER(IS)         ANK #/83         000864           00422         157*         DER(IS)         ANK #/83         000864           00423         156*         DER(IS)         ANK #/83         000864           00424         156*         DER(IS)         ANK #/83         000864           00425         156*         DER(IS)         ANK #/83         000864           00425         16*         C         STORE DN DRUM TOR PLOTTING: WALL SHEAP: TOTAL GAS FLUX         PLOT         000876           00445         16*         DELLSTY(NETA)         F(1,1)         DECT         000771           00444         16*         DUM3 * ADD*(F(NETA,1) * F(1,1))         GO0715         000721           00445         16*         DELD* * VINTA)         ADPX:C(D)// C(NETA,1) * G(1,1)         GO0721           00445         THEKMY = EDM WALL * ADPX:C(D)/							
00416         153+         DER(12) - ADR-UDMF         000836           00417         154+         DER(13)-DER(1)-UCMF         EV 10/73         00081           00422         155+         DER(14)-DER(2)-UCMF         EV 10/73         00061           00422         155+         DER(14)-DER(2)-UCMF         EV 10/73         000661           00422         155+         2237         DER(14)-DER(2)-UCMF         EV 10/73         000661           00423         154+         2237         DER(14)-DER(2)-UCMF         EV 10/73         000661           00424         156+         2237         DER(14)-DER(2)-UCMF         EV 10/73         000666           00425         157+         CER(14)-DER(2)-UTMER(10)         ADK 7/80         000676           00436         163+         35         ADR = CA9/FLNETA, 2) + ENECT(10)         BUTA         000715           00441         164+         DELST-VIRTA, 2) + ADR+C(15)/FLNETA, 2)         000724         000724           00444         164+         DELST-VIRTA, 2) + ADR+C(16)/FLNETA, 2)         000734         000745           00445         166+         DELST + VIRTA, 2) - ADR+C(16)/FLNETA, 2)         000734         000745           00445         166+         DELMP + NECHA, 1) - CONTA <td< td=""><td></td><td></td><td></td><td>•</td><td></td><td></td><td></td></td<>				•			
Oci1         154         DER(13)=DER(1)=UCMF         EV         10/73         OD0655           00420         155         DER(14)=DER(2)=UCMF         EV         10/73         OD0664           00421         156         DER(15)         RADWE(15)         ANK 8/83         OD0664           00421         159         DER(15)         RADWE(11)UCMF         EV         IO/73         OD0664           00425         159*         WEITE (6.3)         DER(15)         ANK 7/83         OD0664           00435         161*         C         STORE ON DRUE FOR PLOTTING: MALL SHEAR TOTAL GAS FLUX         PLOT         OD0676           00436         161*         C         STORE ON DRUE FOR PLOTTING: MALL SHEAR TOTAL GAS FLUX         PLOT         OD0676           00444         164*         DDWA = ADPR/16//14/10 F (11, 1) - ER(15)         ANK 7/83         OD0715           00445         166*         THENGY         CUUS-GRINTEX, (1) - ADPR/36(5)/(G(NETA,1) - G(1,1))         OD0723           00446         166*         THENGY         CUUS-GRINTEX, (1) - ADPR/36(5)/(G(NETA,1) - G(1,1))         OD0774           00447         16*         DELOV = RHDW(15)/CGMIN5//CH (14,1,2)         SUD0774         OD0776           00447         16*         DELOV = RHDW(15)/CGMIN5//CH	00415	152*	·····	DER(11) = SHEAD/UCS ANK	8/83	000631	
Code30         F55*         DER(14)=DER(2)=UCM*         FV 10/73         CODE41           Cod21         F56*         DER(15) = REV(15)         Alk K 8/83         CoDE44           Cod22         F55*         2237         DE 2237         L=1, hS7         EV 10/73         CODE64           Cod22         F55*         2237         DE 2237         L=1, hS7         EV 10/73         CODE64           Cod23         F60*         3         FORMIT (6.3, 10, ER(1), J. = 11, NS0)         CODE76         CODE76           Cod43         F60*         5         FORMIT (23, 1713C FC0, 3)         CODE76         CODE76           Cod43         F63*         DE 3.5*         C.O. OF MRTE (1.3) DER(1), DER(15)         ANK 7/83         CODE76           Cod443         F65*         DE 1.5***(NETA) - CODE71(S)/CE(NETA, 1)         GO073         COD73           Cod444         F65*         DE 1.5***(NETA) - ADRF (NETA, 1)         GO073         COD73           Cod45         F65*         DE 1.5****(NETA) - ADRF (NETA, 1)         GO074         COD73           Cod46         F67*         THEUM = OUMS - ADR NK(5)/CH(NETA, 1)         GO074         COD74           Cod46         F7**         DU20         COD74         COD775         COD776      <	00416	153*		DER(12) = ADR*UCMF		000634	
00421         156*         DER(15)         = HovY(15) + UCK#/C3M(15)         ALK         #/83         000644           00422         158*         2237         DER(1+15) + UCK#/ C3M(15)         EV         10/73         000651           00433         158*         2237         DER(1+15) + UCK#/ CAM(15)         EV         10/73         000651           00435         161*         C         STREE ON DEW FOR PLOTTING: VALL SHEAR.TOTAL GAS FLUX         PLOT         000676           00443         163*         3         ADM * C83/(161*, 10)         ANK         7/83         000676           00443         163*         3         ADM * C83/(161*, 21)         PLOT         000676           00443         163*         3         ADM * C83/(161*, 21)         ANK         7/83         000775           00444         166*         THENRY * (DWA-GURTA, 1) - ADF XR(51)/(16(NETA, 1) - G(1, 1))         000721         000774           00445         166*         DELBS = V(NETA) - ADF XR(51)/(16(NETA, 1))         G00776         000776           00445         174*         DD 2071 L = 1, NSP         G00776         000776         000776           00450         174*         DD 2072 L + 1, NSP         G00776         000776         000776      <	00417	154*		DER(13)=DER(1)+UCMF EV 10	0/73	000636	
Cod22         157*         DD         DD <t< td=""><td>00420</td><td>155*</td><td></td><td>DER(14)=DER(2)*UCMF EV 10</td><td>0/73</td><td>000641</td><td></td></t<>	00420	155*		DER(14)=DER(2)*UCMF EV 10	0/73	000641	
Cod22         157*         DD         DD <t< td=""><td>00421</td><td>156*</td><td></td><td>DER(15) = RHOVW(IS)*UCMF/C3M(IS) ANK</td><td>8/83</td><td>000644</td><td></td></t<>	00421	156*		DER(15) = RHOVW(IS)*UCMF/C3M(IS) ANK	8/83	000644	
00427         159*         WRITE (5,3) (DER(U), J = 11,NSJ)         000664           00435         161*         C         STORE ON DRUM FOR PLOTTING: VALL SHEAR, TOTAL GAS FLUX         PLOT         000676           00438         161*         C         STORE ON DRUM FOR PLOTTING: VALL SHEAR, TOTAL GAS FLUX         PLOT         000676           00434         164*         DLNG * ADR*(FINETA, 11) E(1), DER(15)         ANK 7/83         000676           00444         164*         DLNG * ADR*(FINETA, 11) E(1), DER(15)         ANK 7/83         000715           00445         166*         DELST*V(NETA, 1-OUM3         OKETA, 1)         B11A 200         000714           00446         166*         THENRY * (DUM3+G(NETA, 1)         ADR*AFG(5)/(G(NETA, 1) - G(1, 1))         000723           00445         166*         DELBD * V(NETA) - ADR*AFG(5)/(G(NETA, 1)         ANK 8/83         000741           00451         168*         DELBD * V(NETA) - ADR*AFG(5)/(C)/(C)/(C)/(C)/(C)/(C)/(C)/(C)/(C)/(C	00422	157*		DO 2237 I=1,NSP EV 10	0/73	000661	
00435         160+         3         FORMAT (2X, 1F13E(0,3)         000676           00436         161+         C         STORE ON DUM FOR PLOTTING: MALL SHEAR, TOTAL GAS FLUX         PLOT         000676           00436         162+         1F (1PASS E0. 0) WRITE (3) DER(11), DER(11), DER(15)         Ank 7/83         000676           00443         163+         DUMS - ADP+1F(META, 2)-MER(15)/F(0KTA, 1)         000713         000713           00446         165+         DUMS - ADP+3K(E1A, 1)         - ADP+3K(5)/F(NETA, 2)         000734           00447         167+         THENGY - (DUMS-3(NETA, 1)         - ADP+3K(5)/F(NETA, 2)         000745           00450         168+         DELBD * Y(NUMS-3(NETA, 1)         ADP<4		158*	2237		0/73	000661	
Codas         Teom         Teom         Teom         Teom         Codas           Codas         Teom         STARE IND NUMB FOR PLOTTINGE WALL SHEAR TOTAL GAS FLUX         PLOT         Codas           Codas         Teom         STARE IND NUMB FOR PLOTE (15) DER (15)         ANK 7/83         Codos           Codas         Teom         Teom         Teom         Codas         Codas           Codas         Teom         Teom         Codas         Teom         Codas           Codas         Teom         Teom         Codas         Codas         Codas           Codas         Teom         Teom         Codas         Codas         Codas           Codas         Teom         Teom         Codas         Codas         Codas           Codas         Teom         Teom         Teom         Codas         Codas         Codas           Codas         Teom         Teom         Teom         Codas						000664	
00443         163*         05         ADR = C29/F(NETA, 2)*RHOE(15)/(RHO(NETA))         000707           00444         164*         DUN3 = ADR+F(NETA, 1) - F(1, 1))         010075           00445         165*         DELST+Y(NETA)-DUN3         ADR+XG(5)//(G(NETA, 1) - G(1, 1))         00073           00450         169*         DELDD = Y(NETA) - ADR+F(NETA, 1)         00074         00074           00451         169*         DELDD = Y(NETA) - ADR+F(NETA, 1)         00074         00074           00451         169*         DELDW = HVW(TS)/CSMU(TS)/CRM         ANK 8/80         000776           00451         170*         IF (NSPM1, LE, 0) GO TO 2074         000776         00076           00453         170*         THELEM(T)=0.         B11A 221         000776           00460         173*         CM(1)=0.         B11A 221         000776           00461         T74         DUZ-0.         PELEM(T) = THELEM(T) = SP(1,1,K)/VTM(K)+VNU(T,K) NK 4/83         001077           00463         177*         2072         THELEM(T) = THELEM(T) = C007 OD TO 2071         00076           00464         174         DUZ-0.         PELEMENT)         00126           00473         179*         CM(1) = VHKUEM(T))         001026           00474		160*	3	FORMAT (2X, 1P13E10.3)		000676	
00443         163*         05         ADR = C29/F(NETA, 2)*RHOE(15)/(RHO(NETA))         000707           00444         164*         DUN3 = ADR+F(NETA, 1) - F(1, 1))         010075           00445         165*         DELST+Y(NETA)-DUN3         ADR+XG(5)//(G(NETA, 1) - G(1, 1))         00073           00450         169*         DELDD = Y(NETA) - ADR+F(NETA, 1)         00074         00074           00451         169*         DELDD = Y(NETA) - ADR+F(NETA, 1)         00074         00074           00451         169*         DELDW = HVW(TS)/CSMU(TS)/CRM         ANK 8/80         000776           00451         170*         IF (NSPM1, LE, 0) GO TO 2074         000776         00076           00453         170*         THELEM(T)=0.         B11A 221         000776           00460         173*         CM(1)=0.         B11A 221         000776           00461         T74         DUZ-0.         PELEM(T) = THELEM(T) = SP(1,1,K)/VTM(K)+VNU(T,K) NK 4/83         001077           00463         177*         2072         THELEM(T) = THELEM(T) = C007 OD TO 2071         00076           00464         174         DUZ-0.         PELEMENT)         00126           00473         179*         CM(1) = VHKUEM(T))         001026           00474			С	STORE ON DRUM FOR PLOTTING: WALL SHEAR, TOTAL GAS FLUX PLO	.OT	000676	
00444         164+         DUM3 = ADR+(F(NTA, 1) - F(1, 1))         000715           00444         165+         DELST=V(NETA)-DUM3         B11A 208         000721           00444         166+         THEMGY * (DUM3-G(NETA, 1) - ADR+G(S))/(G(NETA, 1) - G(1, 1))         00073           00450         168+         DELBST=V(NETA)-DUM3 - ADR+KG(S)/F(NETA, 2)         00074           00451         168+         DELW = P(NUTS)/CAMIS/CAMIS)/CM         ANK 8/83         00074           00451         163+         DELW = P(NUTS)/CAMIS)/CM         ANK 8/83         00075           00451         170+         IF (NSPHT LE.O) GD TO 2074         00075           00462         173+         CM(1)=0.         00077         00077           00463         173+         CM(1)=0.         00077         00077           00464         174+         DUZ=0         000 DO ZOT         00007           00465         177+         DD 2072 K=1,NSP         001 DO ZOT         00102           00466         177+         2072         HELEM(1) = THELEM(1) + (SP(NETA, 1, K) - SP(1, 1, K))/WTM(K)+VNU(1, K) ANK 4/83         00107           00466         177+         2072         HELEM(K)         DO ZOT OT ZO ZO         00107           0047         17 (KGSE				IF (IPASS .EQ. O) WRITE (3) DER(11),DER(15) ANK	7/83		
C044         164*         DUM = AUX+(F(N,TA, -DUM3         D00/15           C0445         165         DELST=V(RETA)-DUM3         B11A 208         C00721           C0446         165         DELST=V(RETA)-DUM3         C00723         C00721           C0447         166         THEW* = (DUM3-SCHETA, 1) - ADX-RG(5)/(G(NETA, 1) - G(1, 1))         C00721         C00721           C0450         166*         DELBD = V(NETA) - DUA3         C0074         C0074           C0451         169*         BLOW = RHOW(15)/GM(15)/GH         ANK 8/83         C0074           C0452         170*         THELEM(1)=0.         D11A 21         C00776           C0454         171*         DUZ = C012         CM(1)=0.         D00776           C0461         173*         CM(1)=0.         B11A 220         C00776           C0462         175*         DUZ = C012         CM(2)         CM(2)         CM(2)           C0462         175*         DUZ = C012         CM(1) = THELEM(1) = (SK(NETA, 1, K) - C89/ALPH+XSP(5, K))/VTM(K)+VMU(1, K) ANK 4/83         C0107           C0466         176*         DUZ = C012         CM(1) = THELEM(1) = (D C001 TO 10         C01036           C0472         180*         CM(1) = THELEM(1) = THELEM(1) = (D C001 TO 10         C01036      <							
00446         166+         THENCY = (DUM3 = ADR+XG(5))/(G(NETA, 1) - G(1, 1))         000723           00450         168+         DELBD = Y(NETA) - ADR+F(NETA, 1)         000741           00451         169+         DELOW = RVNW[5)/(GNETA, 1)         ANK 8/83         000745           00451         169+         DELOW = NOW(15)/CH         ANK 8/83         000751           00452         170+         IF (NSPM1 LE 0)         G0 TO 2074         000776           00451         169+         DLOW = NOW(15)/CH         ANK 8/83         000776           00451         170+         IH 2071 I = 1, NSP         B11A 221         000776           00461         170+         DU2-0         000776         00461           00462         177+         DU2-0 U2 + (DUM3-SP(NETA, 1, K) - C89/ALPH+XSP(5, K))/WTM(K)+VNU(I, K) ANK 4/83         00107           00465         177+         DU2 = U2 + (DUM3-SP(NETA, 1, K) - SP(1, 1, K))/WTM(K)+VNU(I, K) ANK 4/83         00107           00466         177+         DU2 = U2 + (DUM3-SP(NETA, 1, K) - SP(1, 1, K))/WTM(K)+VNU(I, K) ANK 4/83         00107           00470         178+         IF (A85(THELEM (I) + (SP(NETA, 1, K) - SP(1, 1, K))/WTM(K)+VNU(I, K) ANK 4/83         00107           00471         179+         CMI (1 = U0, K) = (I = U = V)         001047         001				DUM3 = ADR*(F(NETA, 1) - F(1, 1))		000715	
OddS0         F68         DELED         = V(META) <sup></sup> . ADR+F(NETA, 1, 1) <sup></sup> .         Ox0741           OddS1         169         BLDW = PHOW(15)/CM(S1)/CH         ANK 8/83         O00745           OddS1         170*         DF (NSPMI).LE. 0)         GO TO 2074         O00776           OddS1         172*         THELEW(1)=0.         B11A 221         O00776           Odd60         173*         CM(1)=0.         000777           Odd61         174*         DUZ=0.         000777           Odd62         176*         DU 2072, K=1,NSP         000777           Odd64         176*         DUZ + (DUM3*S(NETA, 1, K)-GS9/ALPH+XSP(5, K))/WTM(K)*VNU(1, K) ANK 4/83         00107           Odd65         176*         DUZ + (DUM3*S(NETA, 1, K)-GS9/ALPH+XSP(5, K))/WTM(K)*VNU(1, K) ANK 4/83         00107           Odd64         174*         CM(1) = VUKWI1/V.THELEM(1)*         CO         00102           Odd72         78*         CM(1) = VUKWI1/V.THELEM(1)*         001031         001047           Odd74         180*         2074         THELEM(1) DUZ/THELEM(1)*         001036         001047           Odd74         180*         2074         FU(K0K E C)         00         00103         001047           Odd74         2074				DELST=Y(NETA)-DUM3 B11A	208		
OddS0         F68         DELED         = V(META) <sup></sup> . ADR+F(NETA, 1, 1) <sup></sup> .         Ox0741           OddS1         169         BLDW = PHOW(15)/CM(S1)/CH         ANK 8/83         O00745           OddS1         170*         DF (NSPMI).LE. 0)         GO TO 2074         O00776           OddS1         172*         THELEW(1)=0.         B11A 221         O00776           Odd60         173*         CM(1)=0.         000777           Odd61         174*         DUZ=0.         000777           Odd62         176*         DU 2072, K=1,NSP         000777           Odd64         176*         DUZ + (DUM3*S(NETA, 1, K)-GS9/ALPH+XSP(5, K))/WTM(K)*VNU(1, K) ANK 4/83         00107           Odd65         176*         DUZ + (DUM3*S(NETA, 1, K)-GS9/ALPH+XSP(5, K))/WTM(K)*VNU(1, K) ANK 4/83         00107           Odd64         174*         CM(1) = VUKWI1/V.THELEM(1)*         CO         00102           Odd72         78*         CM(1) = VUKWI1/V.THELEM(1)*         001031         001047           Odd74         180*         2074         THELEM(1) DUZ/THELEM(1)*         001036         001047           Odd74         180*         2074         FU(K0K E C)         00         00103         001047           Odd74         2074				THENGY = (DUM3*G(NETA, 1) - ADR*XG(5))/(G(NETA, 1) - G(1, 1))			
Od51         169+         BLOW = RHOW(15)/C3M(15)/CH         ANK 8/83         OO0745           Od52         170+         DF (NSPH LE. 0)         GO TO 2074         OO0776           Od454         171+         DD 2071 I = 1.NSP         OO0776         OO0776           Od450         172+         CM(1)=0.         B11A 221         OO0776           Od460         173+         CM(1)=0.         B11A 221         OO0776           Od461         174+         DUZ = DUZ + (DUM*SP(NETA.1,K)-SB(JALPH*XSP(5,K))/WTM(K)*VNU(1,K)ANK 4/83         OO107           Od465         177+         2072         THELEM(1) + (SP(NETA.1,K) - SP(1,1,K))/WTM(K)*VNU(1,K)ANK 4/83         OO107           Od465         177+         CUZ + (DUM*SP(NETA.1,K) - SP(1,1,K))/WTM(K)*VNU(1,K)ANK 4/83         OO107           Od466         177+         COT 1 COTTINUE         GO TO 2078         OO1036           Od473         180+         THELEM(1) = VUKWI(1)*WAT(1)         OO1036           Od474         181+         2071         COTTINUE         OO1047           Od476         182+         C         TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         OO1047           Od476         183+         CO 207 0 L=1, NETA         OO1047         OO1047           Od476				$\frac{1}{1000} = \frac{1}{1000} = 1$			
Od452         170*         IF (NSPM1 LE 0) GO T0 2074         OO0751           Od454         171*         DD 2071 I = 1,NSP         OO0776           Od461         172*         CMCI190.         B11A 221         OO0776           Od461         174*         DU2*0.         B11A 221         OO0776           Od461         174*         DU2*0.         B11A 220         OO0776           Od462         175*         DU 2072 K=1,NSP         B11A 220         OO0077           Od465         176*         DU 2072 K=1,NSP         B11A 223         O01007           Od466         176*         DU2 * DU2 * DU2 * (DUW3*SP(NETA,1,K) - SP(1,1,K))/WTM(K)*VNU(I,K) ANK 4/83         OO1007           Od467         176*         CMCI1 = THELEM(I) + LE 0.0'O GD T0 2071         OO1020         OO1020           Od470         176*         CMCI I = TANSVERSE CUPVATURE CALLED OT 2071         OO1020         OO1020           Od471         B1*         2071 TDETMINUE         OO TO 2078         PI NEDDY INPUT AS 8         OO1047           Od476         B2*         2076 TURSVERSE CUPVATURE CALLED FOR BY IEDDY INPUT AS 8         OO1047         OO1060           Od501         B4*         CO TO 2076 J=1.NETA         OO1070         OO1070         OO1050							
00454         171*         D0 2071 I = 1, NSP         000776           00457         172*         CM(I)=0.         000776         000776           00460         173*         CM(I)=0.         000776         000776           00462         175*         DU 2072 K=1, NSP         000777         001007           00465         176*         DU 2 + (DUM3*SP(NETA,1,K) - SP(1,1,K))/WTM(K)*VNU(I,K) ANK 4/83         001007           00466         177*         2072 THELEM(I) = THELEM(I) + (SP(NETA,1,K) - SP(1,1,K))/WTM(K)*VNU(I,K) ANK 4/83         001017           00470         178*         IF (ABS/THELEM(I)) LE 0.0 G 0 T0 2071         001026           00473         180*         THELEM(I)=DUZ/THELEM(I)         00107         001026           00474         181*         2071 CONTINUE         001047         001047           00476         182*         2071 IF (K08 FEO.0) GD TO 2078         ANK 4/83         001047           00476         182*         C TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         001047           00460         184*         COSOR IS* TVCC(IS)/VMUE(IS)*0.50/C3M(IS)         ANK 4/83         001062           00501         184*         D076 L=1.NETA         001050         00112           00505         18*         DU 20					8/83		
00457         172*         THELEM(1)=0.         B 11A 221         000776           00460         173*         CM(1)=0.         000776         000776           00461         174*         DUZ=0.         000776         000777           00462         175*         DU 2072 K=1.NSP         B11A 223         001007           00465         176*         DUZ = DUZ * (DUM3*SP(NETA.1,K) - SP(1,1,K))/WTM(K)*VNU(1,K) ANK 4/83         00107           00466         177*         2072         THELEM(1) = THELEM(1) + (SP(NETA.1,K) - SP(1,1,K))/WTM(K)*VNU(1,K) ANK 4/83         00107           00470         178*         IF (ABS(THELEM(1)) LE 0.0) GD T0 2071         001031           00472         179*         CM(1) - VJKW(1)/(THELEM(1)*WAT(1))         001031           00474         180*         THELEM(1)= DUZ/THELEM(1)*         001047           00474         181*         2071 CONTINUE         001047           00475         182*         2074 IF (K09 : 50. 0) GD T0 2078         NE MAK 4/83         001047           00476         182*         2074 IF (K09 : 50. 0) CO T0 2078         IEDON         001047           00476         182*         2074 IF (K09 : 50. 0) CO T0 2078         IEDON         001047           005051         184*         CDSOR = TVCC(1							
OpeRes         173+         CM(1)=0.         000776           Od461         174+         DUZ-0.         Bila 223         001007           Od462         175+         DUZ 2 (LUNA*SP(NETA.1,K)=C89/ALPH*XSP(5,K))/WTW(K)*VNU(I,K) ANK 4/83         001007           Od465         176+         2072         THELEM(1) = THELEM(1) + (SP(NETA.1,K) - SP(1,1,K))/WTM(K)*VNU(I,K) ANK 4/83         001017           Od470         178+         2072         THELEM(1) - ULO 0.         00 TO 2071         001026           Od473         180+         THELEM(1) - ULO/(THELEM(1)*WAT(I))         001036         00107           Od473         180+         THELEM(1) - UU/(THELEM(1)*WAT(I))         001036         00107           Od474         181+         2071 (CMNTINUE         001047         001047           Od476         182+         2074         IF (K09 EO. 0.         0.50/C3M(IS)         ANK 4/83         001047           Od500         182+         2076         IF (K09 EO. 0.         0.50/C3M(IS)         ANK 4/83         001050           Od504         184+         OD 2076         IF (K09 EO. 0.         0.50/C3M(IS)         ANK 4/83         001050           Od504         184+         OD 2076         IF (K01)         0.01050         00162	*****************	**********************	••••••				
00461         174+         DU2-0.         00077           00462         175+         DD 2072 X=1,NSP         B11A 223         001007           00465         176+         DU2 = DU2 + (DUM3+SP(NETA.1,K) - SP(1,1,K))/WTM(K)+VNU(I,K) ANK 4/83         001007           00465         177+         2072 THELEM(I) = THELEM(I) + (SP(NETA.1,K) - SP(1,1,K))/WTM(K)+VNU(I,K) ANK 4/83         001017           00470         178+         CM(LI) = THELEM(I) + (SP(NETA.1,K) - SP(1,1,K))/WTM(K)+VNU(I,K) ANK 4/83         001031           00472         TP4.         CM(I) (THELEM(I))+WAT(I))         001036           00473         180+         THELEM(I) = THELE FOR BY IBODY INPUT AS 8         001047           00476         182+         2074 IF (K09 .E0. 0) GO TO 2078         ANK 4/83         001060           00476         182+         2073 LIF(NATURE CALLED FOR BY IBODY INPUT AS 8         001047           00501         184+         COSOR = TVCC(IS)/WWE(IS)+0.50/C3M(IS)         ANK 4/83         001062           00505         185+         DD 2077 BUS(I)+(1,+coSOR+Y(I))         001105         0050           00505         184+         DELST=TVCF(DELST)         001105         0011130           00510         189+         DELST=TVCF(THENGY)         0011146         005124           005050 <td></td> <td></td> <td></td> <td></td> <td>221</td> <td></td> <td></td>					221		
00462         175+         DD 2072         X=1,NSP         B11A         223         001007           00465         176+         DUZ + (DUM3+SP(NETA,1,K)-C89/ALPH+XSP(5,K))/WTM(K)+VNU(I,K) ANK 4/83         00107           00466         177+         2072         THELEM(I) = THELEM(I) + (SP(NETA,1,K) - SP(1,1,K))/WTM(K)+VNU(I,K) ANK 4/83         001026           00470         178+         CM(I) = VLWK(I)/(IHELEM(I))         00         0010         001026           00473         180+         THELEM(I) > DUZ/THELEM(I)         00         001036         001047           00474         181+         2071         CONTINUE         001047         001047           00476         182+         2071         IF (K09 - EG. 0)         GO TO 207B         ANK 4/83         001047           00476         182+         2074         IF (K09 - EG. 0)         GO TO 207B         ANK 4/83         001047           00450         184+         COSTG I TO CONTINUE         COSTG I ISIN/VWUE(IS) NUT AS B         001047         001047           00500         184+         COSTG I TO COSTO INDE(I) NUT ISIN         ANK 4/83         001047         001050         001050           00500         184+         COSTG I INETA         COSTG I INETA         ON 1050         001050							
00465         176+         DUZ = DUZ + (DUM3-SP(NETA,1,K) - CB9/ALPH-XSP(5,K))/VTW(K)+VNU(1,K) ANK 4/83         001007           00466         177+         2072         THELLEM(1) + THELEM(1) + (SP(NETA,1,K) - SP(1,1,K))/WTW(K)+VNU(1,K)ANK 4/83         001026           00472         179+         CM(1)         VUKW(1)/(THELEM(1))         001036           00472         179+         CM(1)         VUKW(1)/(THELEM(1))         001036           00474         181+         2071         CONTINUE         001047           00474         181+         2071         CONTINUE         001047           00476         182+         2074         IF (KQ9, E0, O)         GD TO 2078         ANK 4/83         001047           00476         183+         C         TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         001047           00500         184+         COSGR = TVCC(15)/VMUE(1)+0.50.50/CSM(IS)         ANK 4/83         001047           00501         185+         DD 2076         1=1, NETA         001050         001050           00501         185+         DU 2076         1=1, NETA         001105         001105           00505         187+         2070         DUDS(1)=UDUS(1)+(1, +COSGR+Y(1))         001105         001105           00505							
00466         177*         2072         THELEM(I) = THELEM(I) + (SP(NETA.1,K) - SP(1,1,K))/WTM(K)*VNU(I,K)ANK 4/83         00101           00470         178*         CM(I) = VuKW(I)/(THELEM(I))         001026           00472         179*         CM(I) = VuKW(I)/(THELEM(I))         001036           00473         180*         00101         001036           00474         181*         2071         CONTINUE         001047           00474         182*         2074         IF (K09:EQ. O) GO TO 2078         ANK 4/83         001047           00476         182*         2074         IF (K09:EQ. O) GO TO 2078         ANK 4/83         001047           00476         182*         2076         TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         001047           00505         184*         COSOR = TVCC(IS)/VMWE(IS)*0.50/C3M(IS)         ANK 4/83         001062           00505         184*         CO76 DUDS(I)=DUDS(I)+(1:+COSOR*Y(I))         001105         001105           00505         187*         2076 DUDS(I)=DUDS(I)+(1:+COSOR*Y(I))         001146         00512           00510         189*         DELEST=TVCF(DELEST         001120         001164           00511         190*         THMOM=TVCF(I+HENY)         001164         001164 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
00470         178*         IF (ABS(THELEM(I)). LE. 0.0) GD TD 2071         001026           00472         179*         CM(I) = VuKW(I)/(THELEM(I))         001031           00473         180*         THELEM(I)-DUZ/THELEM(I)         001036           00474         181*         2071 CONTINUE         001047           00476         183*         C         TRANSVERSE CURVATURE CALLED FOR BY IEDDY INPUT AS 8         001047           00500         184*         COSOR = TVCC(1S)/VMUE(IS)*0.50/C3M(IS)         ANK 4/83         001050           00501         185*         D0 2076         1=1,NETA         001062           00501         185*         D0 2076 [=1,NETA         001070           00501         185*         D0 2076 [DUDS(I)*(I)*(1.*COSOR*Y(I))         001070           00505         187*         2076 DUDS(I)=DUDS(I)*(I)*(1.*COSOR*Y(I))         001105           00507         188*         DELED=TVCF(DELED)         001112           00511         190*         THEMGN=TVCF(THENGY)         001146           00512         191*         THEMGN=TVCF(THENGY)         001205           00520         193*         2077 THELEM(K)) =TVCF(THENGY)         001205           00522         195*         C         CALCULATE THE BOUNDARY LAYER T							·
00472         179*         CM(1) - VJKW(1)/(THELEM(1)*MAT(1))         001031           00473         180*         THELEM(1)=DUZ/THELEM(1)         001036           00474         181*         2071         CONTINUE         001036           00474         181*         2071         CONTINUE         001036           00476         182*         2074         IF (K09.E0.0)         GO TD 2078         ANK 4/83         001047           00476         182*         C         TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         001047           00500         184*         COSOR = TVCC(1S)/VMUE(1S)*0.50/C3M(1S)         ANK 4/83         001050           00501         185*         D0 2076 I =1.NETA         001062         001070           00505         187*         2076 DUDS(I)=VDIS(I)*(I)*(I-COSOR*Y(I))         001105         001105           00505         188*         DELST=TVCF(DELBD)         001146         001205           00511         190*         THMOM=TVCF(THENOY)         001164         001205           00512         191*         THOMEYTVCF(THELEM(K))         001205         001205           00520         193*         DO 2077 K=1.NSP         001164         001205           00521         191*			2072		4/83	· · • · · • • • • • • • · · · • • • • •	
00473         180*         THELEM(1)=DUZ/THELEM(1)         001036           00474         181*         2071 CONTINUE         001047           00476         182*         2074 IF (K09.EQ.O) GO TO 2078         ANK 4/83         001047           00476         183*         C         TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         001047           00500         184*         COSOR = TVCC(TS)/VMUE(TS)*0.50/C3M(IS)         ANK 4/83         001062           00504         186*         D0 2076 I=1, NETA         001070         001062           00505         187*         2076 DUDS(I)*(1.+COSOR*Y(I))         001105           00507         188*         DELSD=TVCF(DELST)         001112           00507         188*         DELSD=TVCF(DELST)         001130           00510         189*         DELBD=TVCF(DELST)         001146           00511         190*         THMOM=TVCF(THELM(K))         001205           00513         192*         DD 2077 K=1, NSP         001164           00514         193*         2077 THELMK/L=VCF(THELM(K))         001205           00520         194*         2078 IF (IRTTE .EG.O) GO TO 50         001224           00522         195*         C C ALCULATE THE BOUNDARY LAYER THRUST LOSS							
00474         181*         2071 CONTINUE         001047           00476         182*         2074         1F (KQ9_E0_0)         00 to 2078         ANK 4/83         001047           00476         183*         C         TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         001047           00500         184*         COSOR = TVCC(IS)/VMUE(IS)*0.50/C3M(IS)         ANK 4/83         001050           00501         185*         D0 2076 I = 1,NETA         001062         001062           00504         186*         Y(I)=TVCF(Y(I))         001051         001051           00505         187*         2076 DUDS(I)*(I)=(DUDS(I)*(I)*(I)*(COSOR*Y(I))         001130           00507         189*         DELBD=TVCF(DELBD)         001146           00511         190*         THENGY TVCF(THENGY)         001205           00512         191*         THENGY TVCF(THELEM(K))         001205           00520         194*         2078         IF (IRITE .EQ. 0) GD TO 50         001224           00522         195*         C CALCULATE THE BOUNDARY LAYER THRUST LOSS         001225           00523         195*         C CALCULATE THE BOUNDARY LAYER THRUST LOSS         001225           00523         195*         C CALCULATE THE BOUNDARY LAYER THRUST LOSS							
00476         133*         C         TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         001047           00500         184*         COSR = TVCC(IS)*0.50/C3M(IS)         ANK 4/83         001050           00501         185*         D0 2076 I=1,NETA         001062           00504         186*         Y(I)=TVCF(Y(I))         001070           00505         187*         2076 DUDS(I)=DUDS(I)*(1.+COSOR*Y(I))         001105           00507         188*         DELST=TVCF(DELST)         001112           00510         199*         DELBD=TVCF(FILED)         001130           00511         190*         THMOM=TVCF(THMOM)         001164           00512         191*         THENGY=TVCF(THELEM(K))         001205           00514         192*         D0 2077 K=1,NSP         001205           00515         193*         2077 THELEM(K)=TVCF(THELEM(K))         001205           00520         194*         2078         I RINTSTERS         001224           00522         195*         C         CALQLATE THE BUINDARY LAYER THRUST LOSS         001225           00521         195*         C         CALCULATE THE BUINDARY LAYER THRUST LOSS         001225           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*			2071				
00476         133*         C         TRANSVERSE CURVATURE CALLED FOR BY IBODY INPUT AS 8         001047           00500         184*         COSR = TVCC(IS)*0.50/C3M(IS)         ANK 4/83         001050           00501         185*         D0 2076 I=1,NETA         001062           00504         186*         Y(I)=TVCF(Y(I))         001070           00505         187*         2076 DUDS(I)=DUDS(I)*(1.+COSOR*Y(I))         001105           00507         188*         DELST=TVCF(DELST)         001112           00510         199*         DELBD=TVCF(FILED)         001130           00511         190*         THMOM=TVCF(THMOM)         001164           00512         191*         THENGY=TVCF(THELEM(K))         001205           00514         192*         D0 2077 K=1,NSP         001205           00515         193*         2077 THELEM(K)=TVCF(THELEM(K))         001205           00520         194*         2078         I RINTSTERS         001224           00522         195*         C         CALQLATE THE BUINDARY LAYER THRUST LOSS         001225           00521         195*         C         CALCULATE THE BUINDARY LAYER THRUST LOSS         001225           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*			2071		1/83	. <b> </b>	
00501         185*         D0 2076         I=1,NETA         001062           00504         186*         Y (I)=TVCF(V[I))         001070           00505         187*         2076         DUDS(I)=DUDS(I)*(1.+COSDR*Y(I))         001105           00507         188*         DELSD=TVCF(DELST)         001112           00510         189*         DELBD=TVCF(DELST)         001130           00511         190*         THMOM=TVCF(ITHMOM)         001146           00512         191*         THENCYTVCF(ITHELEM(K))         001205           00513         192*         D0 2077 K=1,NSP         001205           00514         193*         2077         THELMCK)=TVCF(ITHELEM(K))         001205           00520         194*         D0 2077 K=1,NSP         001205         001224           00520         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001224           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM - ACH*PE(IS)*DELBD* ANK 5/83         001225           00523         198*         WRITE (6, 18)         (ATA(K), ATB(K), K = 1, NEL         ANK 5/83         001265           00532         200*         1         3GHELEMENTAL         MASS TRANSFER COEFFICIENTS/4X, 2(GHCDEFF, .4X), 25H(NOR <td></td> <td></td> <td></td> <td>TRANSFERSE CIEVATINE CALLED FOR BY TRONY INDUIT AS 8</td> <td>4/00</td> <td>001047</td> <td></td>				TRANSFERSE CIEVATINE CALLED FOR BY TRONY INDUIT AS 8	4/00	001047	
00501         185*         D0 2076         I=1,NETA         001062           00504         186*         Y (I)=TVCF(V[I))         001070           00505         187*         2076         DUDS(I)=DUDS(I)*(1.+COSDR*Y(I))         001105           00507         188*         DELSD=TVCF(DELST)         001112           00510         189*         DELBD=TVCF(DELST)         001130           00511         190*         THMOM=TVCF(ITHMOM)         001146           00512         191*         THENCYTVCF(ITHELEM(K))         001205           00513         192*         D0 2077 K=1,NSP         001205           00514         193*         2077         THELMCK)=TVCF(ITHELEM(K))         001205           00520         194*         D0 2077 K=1,NSP         001205         001224           00520         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001224           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM - ACH*PE(IS)*DELBD* ANK 5/83         001225           00523         198*         WRITE (6, 18)         (ATA(K), ATB(K), K = 1, NEL         ANK 5/83         001265           00532         200*         1         3GHELEMENTAL         MASS TRANSFER COEFFICIENTS/4X, 2(GHCDEFF, .4X), 25H(NOR <td></td> <td>· · · · · · · · · · · · · · · · · · ·</td> <td></td> <td>COSOR = TVCC(1S)/VMUE(1S)*0.50/C3M(1S)</td> <td>4/83</td> <td>001050</td> <td></td>		· · · · · · · · · · · · · · · · · · ·		COSOR = TVCC(1S)/VMUE(1S)*0.50/C3M(1S)	4/83	001050	
00504         186*         Y(I)=TVCF(Y(I))         001070           00505         187*         2076         DUDS(I)=DUDS(I)*(1.+COSDR*Y(I))         001105           00507         188*         DELST=TVCF(DELST)         001112           00510         189*         DELSD=TVCF(DELBD)         001130           00511         190*         THMON=TVCF(THENGY)         001164           00512         191*         THENGY=TVCF(THENGY)         001205           00513         192*         D0 2077 K=1,NSP         001205           00520         194*         2078         IF (IRITE EQ. 0) GD TD 50         001224           00520         194*         2078         IF (IRITE EQ. 0) GD TD 50         001224           00521         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001224           00521         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001225           00522         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LOSS         001225           00523         198*         WRITE (6,18) (ATA(K), ATB(K), K = 1,NEL)         ANK 5/83         001225           00532         200*         1         3GHELEMENTAL MASS TRANSFER COEFFICIENTS/4X, 2(GHCDEFF., 4X), 25H(NOR         0013					.,, 00		
00505         187*         2076         DUDS(1)=DUDS(1)*(1.+CDSOR*Y(1))         001105           00507         188*         DELSD=TVCF(DELST)         001112           00510         189*         DELBD=TVCF(DELBD)         001130           00511         190*         THMOM=TVCF(THENGY)         001146           00512         191*         THENGY=TVCF(THENGY)         001205           00513         192*         D0 2077 K=1,NSP         001205           00516         193*         2077         THELEM(K)=TVCF(THEM(K))         001205           00520         194*         2078         IF (IRITE:EQ.O) GO TO 50         001224           00522         196*         DF = 2. O*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM - ACH*PE(IS)*DELED*         ANK 5/83         001225           00522         196*         DF = 2. O*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM - ACH*PE(IS)/GC/UCL)         ANK 5/83         001225           00523         197*         1         PATM*SIPSF + RAD6*SORT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83         001225           00532         199*         WRITE (6, 18) (ATA(K), ATRIK)K, K = 1,NEL)         ANK 5/83         001225           00532         200*         1 3GHELEMENTAL MASS TRANSFER COEFFICIENTS/4X.2(GHCOEFF.,4X),25H(NOR         001301 <t< td=""><td></td><td></td><td></td><td></td><td>••••</td><td></td><td></td></t<>					••••		
00507         188*         DELST=TVCF(DELST)         001112           00510         189*         DELBD-TVCF(DELBD)         001130           00511         190*         THM0M=TVCF(THENGY)         001146           00512         191*         THENGY=TVCF(THENGY)         001205           00516         193*         2077         K=1,NSP         001205           00520         194*         2078         IF (IRITE .EQ. O) GD TO 50         001205           00522         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001224           00522         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001225           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH+DX*THMOM - ACH+PE(IS)*DELBD* ANK 5/83 001225         00522           00522         197*         1         PATM*SIPSF + RAD6*SQRT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83 001225           00532         199*         18         FORMAT (//3X,20HMOM TRANS HEAT TRANS,5X,18HBL0WING PARAMETERS,7X,         001301           00532         200*         1 36HELMENTAL MASS TRANSFER COEFFICIENTS/4X,2(6HC0EFF.,4X),25H(NOR         001301           00532         201*         2M. BY RHDE*UE*ST) FOR,14X,8HCM, F0R/54,4HCF/2,5X,38HST NO. PYRO         001301           00			2076	P(L) = P(D(L) * (1) + COSOR * Y(L))		001105	
OO510         189*         DELBD=TVCF(DELBD)         OO1130           O0511         190*         THHMOM=TVCF(THMOM)         OO1146           O0512         191*         THENGY=TVCF(THENGY)         OO1164           O0513         192*         D0 2077 K=1,NSP         OO1205           O0516         193*         2077 THELEM(K)=TVCF(THELEM(K))         OO1205           O0520         194*         2078 IF (IRTE .E0, 0) GO TO 50         O01224           O0522         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LOSS         OO1224           O0522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH+DX*THMOM - ACH+PE(IS)*DELBD*         ANK 5/83         O01225           00523         198*         WRITE (6,18) (ATA(K), ATB(K), K = 1, NEL)         ANK 5/83         O01265           00532         199*         18 FORMAT (//3X, 20HMOM TRANS HEAT TRANS, 5X, 18HBLOWING PARAMETERS, 7X, 001301         O01301           00532         201*         2M. BY RHDE*UE*ST) FOR, 14X, 8HCM, FOR/5X, 4HCF/2, 5X, 38HST NO. PYRO         O01301           00532         202*         3L GAS CHAR TOTAL GAS , 8(1X, 2A4, 1X))         O01301           00533         202*         3L GAS CHAR TOTAL GAS , 8(1X, 2A4, 1X))         O01301           00534         204*         DER(10) = RHOE(IS)*UE(IS)				DELST=TVCF(DELST)		001112	
00511         190+         THMOM=TVCF(THMOM)         001146           00512         191+         THENGY=TVCF(THENGY)         001164           00513         192*         D0 2077 K=1,NSP         001205           00514         193*         2077 THELEM(K)=TVCF(THELEM(K))         001205           00520         194*         2078         IF (IRITE .EQ. 0) GD TO 50         001224           00520         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001225           00522         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001225           00522         197*         1         PATM*SIPSF + RAD6*SQRT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83         001225           00523         198*         WRITE (6,18) (ATA(K),ATB(K), K = 1,NEL)         ANK 5/83         001265           00532         200*         1         36HELEMENTAL MASS TRANSFER CDEFFICIENTS/4X,2(6HCDEFF.,4X),25H(NOR         001301           00532         200*         1         36HELEMENTAL MASS TRANSFER CDEFFICIENTS/4X,2(6HCDEFF.,4X),25H(NOR         001301           00532         201*         2M. BY RHOE*UE*ST) FOR,14X,8HCM, FOR/5X,4HCF/2,5X,38HST NO. PYRO         001301           00532         202*         3L GAS         CHARUS,8(1X,2A4,1X)) <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>							
00512         191*         THENGY=TVCF(THENGY)         001164           00513         192*         D0 2077 K=1,NSP         001205           00516         193*         2077 THELEM(K)=TVCF(THELEM(K))         001205           00520         194*         2078 IF (IRITE .EQ. 0) GD TD 50         001224           00522         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LOSS         001224           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM ~ ACH*PE(IS)*DELBD* ANK 5/83         001225           00523         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM ~ ACH*PE(IS)*DELBD* ANK 5/83         001225           00523         197*         1         PATM*SIPSF + RAD6*SQRT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83         001225           00523         199*         18         FORMAT (//3X,2OHMOM TRANS HEAT TRANS,5X, 18HBLOWING PARAMETERS,7X,         001301           00532         200*         1         3GHELEMENTAL MASS TRANSFER COEFFICIENTS/4X,2(GHCDEFF.,4X),25H(NOR         001301           00532         201*         2M. BY RHDE*UE*ST) FOR,14X,8HCM, FOR/5X,4HCF/2,5X,38HST NO. PYRO         001301           00532         202*         3L GAS         CHAR         TOTAL GAS, 8(1X,2A4,1X))         001301           00534         204*         DER					••••••		
00513         192*         D0 2077 K=1,NSP         001205           00516         193*         2077 THELEM(K)=TVCF(THELEM(K))         001205           00520         194*         2078 IF (IRITE .EQ. 0) GD TO 50         001224           00521         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LOSS         001225           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM ~ ACH*PE(IS)*DELBD*         ANK 5/83         001225           00522         197*         1         PATM*SIPSF + RAD6*SQRT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83         001225           00523         198*         WRITE (6,18) (ATA(K), ATB(K), K = 1, NEL)         ANK 5/83         001265           00532         199*         18         FORMAT (//3X, 20HMOM TRANS HEAT TRANS, 5X, 18HBLOWING PARAMETERS, 7X, 001301         001301           00532         200*         1         36HELEMENTAL MASS TRANSFER CDEFFICIENTS/4X, 2(6HCDEFF.4X), 25H(NOR         001301           00532         201*         2M. BY RHDE*UE*ST) FDR, 14X, 8HCM, FDR/5X, 4HCF/2, 5X, 38HST ND. PYRD         001301           00532         202*         3L GAS CHAR TOTAL GAS ,8(1X, 2A4, 1X))         001301         001301           00534         204*         DER(10) = RHDE(IS)*UE(IS)         001301         001301 <t< td=""><td></td><td>191*</td><td></td><td></td><td></td><td></td><td></td></t<>		191*					
00516         193*         2077         THELEM(K)=TVCF(THELEM(K))         001205           00520         194*         2078         IF (IRITE _EQ, O) GD TD 50         001224           00520         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001224           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM ~ ACH*PE(IS)*DELBD*         ANK 5/83         001225           00523         197*         1         PATM*SIPSF + RAD6*SQRT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83         001225           00523         198*         WRITE (6,18) (ATA(K),ATB(K), K = 1,NEL)         ANK 5/83         001265           00532         199*         18         FORMAT (//3X,20HMOM TRANS HEAT TRANS,5X,18HBLOWING PARAMETERS,7X,         001301           00532         200*         1         36HELEMENTAL MASS TRANSFER CDEFFICIENTS/4X,2(6HCDEFF.,4X),25H(NOR         001301           00532         201*         2M. BY RHDE*UE*S) FOR,14X,8HCM, FOR/5X,4HCF/2,5X,38HST NO. PYRO         001301           00533         203*         DER(10) = RHDE(IS)*UE(IS)         001301           00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001304							
00520         195*         C         CALCULATE THE BOUNDARY LAYER THRUST LDSS         001224           00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM - ACH*PE(IS)*DELBD*         ANK 5/83         001225           00522         197*         1         PATM*SIPSF + RAD6*SQRT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83         001225           00523         198*         WRITE (6,18)         (ATA(K), ATB(K), K = 1, NEL)         ANK 5/83         001301           00532         199*         18         FORMAT (//3X, 20HMOM TRANS HEAT TRANS, 5X, 18HBLOWING PARAMETERS, 7X, 001301         001301           00532         200*         1         3GHELEMENTAL MASS TRANSFER COEFFICIENTS/4X, 2(GHCOEFF., 4X), 25H(NOR         001301           00532         201*         2M. BY RHDE*UE*ST)         FOR, 14X, 8HCM, FOR/5X, 4HCF/2, 5X, 38HST NO. PYRO         001301           00532         202*         3L GAS         CHAR         TOTAL GAS ,8(1X, 2A4, 1X))         001301           00533         203*         DER(10) = RHOE(IS)*UE(IS)         001301         001301           00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001304           00536         206*         I	00516	193*	2077	THELEM(K)=TVCF(THELEM(K))		001205	
00522         196*         DF = 2.0*COSALF(IS)/(UCL*UCS)*(ACH*DX*THMOM - ACH*PE(IS)*DELBD*         ANK 5/83         001225           00522         197*         1         PATM*SIPSF + RAD6*SQRT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83         001225           00523         198*         WRITE (6,18) (ATA(K),ATB(K), K = 1,NEL)         ANK 5/83         001265           00532         199*         18         FORMAT (//3X,2OHMOM TRANS HEAT TRANS,5X,18HBLOWING PARAMETERS,7X,         001301           00532         200*         1         36HELEMENTAL MASS TRANSFER COEFFICIENTS/4X,2(6HCOEFF.,4X),25H(NOR         001301           00532         201*         2M. BY RHOE*UE*ST) FOR,14X,8HCM, FOR/5X,4HCF/2,5X,38HST NO.         PYRO         001301           00532         202*         3L GAS         CHAR         TOTAL GAS,8(1X,2A4,1X)         001301           00533         203*         DER(10) = RHOE(IS)*UE(IS)         001301         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           00536         206*         IF(IPART.EQ.1)GO TO 40         NEW001312         NEW001315	00520	194*	2078	IF (IRITE .EQ. 0) GO TO 50		001224	
00522         197*         1         PATM*SIPSF + RAD6*SQRT(XI(IS)*2.0)*F(1,1)*UE(IS)/GC/UCL)         ANK 5/83         001225           00523         198*         WRITE (6,18) (ATA(K), ATB(K), K = 1,NEL)         ANK 5/83         001265           00532         199*         18         FORMAT (//3X,20HMOM TRANS HEAT TRANS,5X,18HBLOWING PARAMETERS,7X,         001301           00532         200*         1         3GHELEMENTAL MASS TRANSFER CDEFFICIENTS/4X,2(GHCDEFF.,4X),25H(NOR         001301           00532         201*         2M. BY RHOE*UE*ST) FOR,14X,8HCM, FOR/5X,4HCF/2,5X,38HST NO. PYRO         001301           00532         202*         3L GAS         CHAR TOTAL GAS ,8(1X,2A4,1X))         001301           00533         203*         DER(10) = RHOE(IS)*UE(IS)         001301           00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           00536         206*         IF(IPART.EQ.1)GO TD 40         NEW001312           00540         207*         IF(ICF.GT.O.AND.ICF.LT.3)GO TO 40         NEW001315	00520	195*	С			001224	
00523         198*         WRITE (6,18) (ATA(K), ATB(K), K = 1,NEL)         ANK 5/83         001265           00532         199*         18         FORMAT (//3X,20HMOM TRANS HEAT TRANS,5X,18HBLOWING PARAMETERS,7X,         001301           00532         200*         1         36HELEMENTAL MASS TRANSFER COEFFICIENTS/4X,2(6HCOEFF.,4X),25H(NOR         001301           00532         201*         2M. BY RHDE*UE*ST) FOR,14X,8HCM, FOR/5X,4HCF/2,5X,38HST NO. PYRO         001301           00532         202*         3L GAS         CHAR TOTAL GAS ,8(1X,2A4,1X))         001301           00533         203*         DER(10) = RHOE(IS)*UE(IS)         001301           00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           00536         206*         IF(IPART.EQ.1)GO TO 40         NEW001312           00540         207*         IF(ICF.GT.O.AND.ICF.LT.3)GO TO 40         NEW001315	00522	196*				001225	
00532         199*         18         FORMAT         (//3x, 20HMOM         TRANS         HEAT         TRANS, 5x, 18HBLOWING         PARAMETERS, 7x,         001301           00532         200*         1         36HELEMENTAL         MASS         TRANSFER         CDEFFICIENTS/4X, 2(6HCDEFF., 4X), 25H(NOR         001301           00532         201*         2M.         BY         RHDE*UE*ST)         FOR, 14X, 8HCM, FOR/5X, 4HCF/2, 5X, 38HST         NO.         PYRO         001301           00532         202*         3L         GAS         CHAR         TOTAL         GAS         ,8(1X, 2A4, 1X))         001301           00533         203*         DER(10) =         RHDE(IS)*UE(IS)         001301         001301           00534         204*         DER(11)=CF/DER(10)         001304         001304           00535         205*         DER(12)=CH/DER(10)         EV         10/73         001307           00536         206*         IF(IPART.EQ.1)GO         TO 40         NEW001312         NEW001315           00540         207*         IF(ICF.GT.O.AND.ICF.LT.3)GO         TO 40         NEW001315	00522		•				
00532         200*         1 36HELEMENTAL MASS TRANSFER CDEFFICIENTS/4X,2(6HC0EFF.,4X),25H(NOR         001301           00532         201*         2M. BY RHDE*UE*ST) FOR,14X,8HCM, FOR/5X,4HCF/2,5X,38HST NO. PYRO         001301           00532         202*         3L GAS         CHAR         TOTAL GAS,8(1X,2A4,1X))         001301           00533         203*         DER(10) = RHDE(IS)*UE(IS)         001301         001301           00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           00536         206*         IF(IPART.EQ.1)GD TD 40         NEW001312           00540         207*         IF(ICF.GT.O.AND.ICF.LT.3)GO TD 40         NEW001315				WRITE $(6, 18)$ $(ATA(K), ATB(K), K = 1, NEL)$ ANK S	5/83		
OO532         201*         2M. BY RHOE*UE*ST) FOR, 14X, 8HCM, FOR/5X, 4HCF/2, 5X, 38HST NO. PYRO         OO1301           O0532         202*         3L GAS         CHAR         TOTAL GAS, 8(1X, 2A4, 1X))         OO1301           O0533         203*         DER(10) = RHOE(IS)*UE(IS)         001301         001301           O0534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           O0535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           O0536         206*         IF(IPART.EQ.1)GO TO 40         NEW001312           O0540         207*         IF(ICF.GT.O.AND.ICF.LT.3)GO TO 40         NEW001315		199*				001301	
00532         202*         3L GAS         CHAR         TOTAL GAS         ,8(1X,2A4,1X))         001301           00533         203*         DER(10) = RHOE(IS)*UE(IS)         001301           00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           00536         206*         IF(IPART.EQ.1)GO TO 40         NEW001312           00540         207*         IF(ICF.GT.O.AND.ICF.LT.3)GO TO 40         NEW001315							· · · · · · · · · · · · · · · · · · ·
00533         203*         DER(10) = RHOE(IS)*UE(IS)         001301           00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           00536         206*         IF(IPART.EQ.1)GO TO 40         NEW001312           00540         207*         IF(ICF.GT.O.AND.ICF.LT.3)GO TO 40         NEW001315							
00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           00536         206*         IF(IPART.EQ.1)GO TO 40         NEW001312           00540         207*         IF(ICF.GT.O.AND.ICF.LT.3)GO TO 40         NEW001315			3				
00534         204*         DER(11)=CF/DER(10)         EV 10/73         001304           00535         205*         DER(12)=CH/DER(10)         EV 10/73         001307           00536         206*         IF(IPART.EQ.1)GO TO 40         NEW001312           00540         207*         IF(ICF.GT.0.AND.ICF.LT.3)GO TO 40         NEW001315		·····		DER(10) = RHOE(IS)*UE(IS)			
00536         206*         IF(IPART.EQ.1)G0 T0 40         NEW001312           00540         207*         IF(ICF.GT.0.AND.ICF.LT.3)G0 T0 40         NEW001315				DER(11)=CF/DER(10) EV 10			•
00540 207* IF(ICF.GT.O.AND.ICF.LT.3)GO TO 40 NEW001315							
00542 208* GU IU 41 NEW001332		• • • • • • • • • • • • • • • • • • •					
	00542	208*			1	NEW001332	

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00540	000+	. 40	019974-000/443-0	
00543 00544	209*	40	DUMM1=DER(11)*2.	NEW001334
00544	210* 211*		DUMM2=DER(12) DUMM3=S(IS)	NEWOO1336 NEWOO1340
00545	211*		AM=F(NETA,2)/ALPH*UE(IS)/SQRT(GMR(NETA)/VMW(NETA)*TT(NETA)*49732.	
00546	212*		AM = F(NETA, 2)/ALPH*UE(15)/SURT(GMR(NETA)/VMW(NETA)*TT(NETA)*49/32. REFF=(1.+(GMR(NETA)-1.)/2.*PR(NETA)**.333*AM**2)/	NEW001343
00547	213+	·····	\$ (1.+(GMR(NETA)-1.)/2.*AM**2)	NEW001361
00550	215*		DO 42 I=1.NETA	NEWOO1415
00553	216*		DM1(I)=CPBAR(I)+UCT/UCE	NEWOO1415
00554	217*		DM2(I)=TT(I)/UCT	NEWOO1420
00555	218*	42	CONTINUE	NEWOO1424
00557	219*		DZERO=DM1(1)-(DM1(2)-DM1(1))/(DM2(2)-DM2(1))*DM2(1)	NEWOO1424
00560	220*		AINT=0.5*(DZERO+DM1(1))*DM2(1)	NEW001434
00561	221*		DUMM6=AINT	NEWOO1440
00562	222*		DO 43 I=2, NETA	NEW001444
00565	223*		AINT=AINT+0.5*(DM1(I-1)+DM1(I))*(DM2(I)-DM2(I-1))	NEW001444
00566	224*	43		NEW001454
00570	225*		DUMM4=AINT DUMM5=(DUMM4+(G(NETA,1)-HB(NETA)/UCE))*REFF	NEWOO 1454
00571	226* 227*		DUMM5=(DUMM4+(G(NEIA,T)-HB(NEIA)/UCE))*REFF DUMM7=RHO(NETA)	NEWO01455 NEWO01463
00572	227*		DUMM/=RHU(NETA) DUMM8=RHO(1)	NEWOO 1465
00573	229*		DUMM9=VMU(1)	NEW001467
00575	230*		DUMM10=VMUE(IS)	NEW001471
00576	231*		DUMM11=PR(NETA)	NEWOO 1472
00577	232*		DUMM12=UE(IS)	NEWO01475
00600	233*		IF(IPART.EQ.1.AND.(ICF.EQ.O.OR.ICF.EQ.3))GO TO 41	NEWO01477
00602	234*		AFACT=0.52	NEWOO1520
00603	235*	: 	CALL ROUGH(AFACT)	NEWOO1522
00604	236*		CF=DUMM18/2.	NEW001525
00605	237*			NEW001530
00606	238*		WALLQ=ST*(G(NETA,1)-G(1,1))*RHOE(IS)*UE(IS)	NEW001532
00607 00610	239*	41	CONTINUE IF(IPART.EQ.1)GO TO 45	NEW001543
00610	240* 241*		GO TO 44	NEWOO1543 NEWOO1545
00612	241*	45	IF(ICF.EQ.O.OR.ICF.EQ.3)GD TO 46	NEWO01545 NEWO01547
00615	242*		DUMM1=DUMM18	NEW001560
00616	244*		DUMM2=DUMM16	NEW001562
00617	245*	46	CONTINUE	NEW001565
00620	246*		DUMM5=G(NETA,1)	NEW001565
00621	247*		DUMM6=G(1,1)	NEWOO1567
00622	248*		DUMM19=CPBAR(NETA)*UCT/UCE	NEW001571
00623	249*		DUMM2O=REFF*TE(1)/UCT	NEWO01575
00624	250*		DUMM2 1=TT(1)/UCT	NEW001601
00625	251*	·····	DUMM22=DUMM19*VMU(NETA)/UCV/DUMM11	NEW001604
00626	252*		DUMM23=(DUMM7*DUMM12*2.*ROKAP(IS)/RAD5)/DUMM10	NEW001610
00627	253* 254*	·····	PARTM=(4./3.)*(22./7.)*((RP/12.)**3)*RHOPA DUMM24=PARTM*DUMM12/((22./7.)*6.*RP/12.*DUMM10)	NEWOO 1620 NEWOO 1630
00630 00631	254* 255*			NEW001627
00632	255*		CF=DUMM18/2.	NEW001641
00633	257*			
00634	258*		ST=DUMM16 WALLQ=ST*(G(NETA,1)-G(1,1))*RHDE(IS)*UE(IS) CONTINUE	NEW001646
00635	259*	44		NEW001657
00636	260*		DER(13) = DER(1)/CH	001657
00637	261*		DER(14) = DER(2)/CH	001661
00640	262*	••••••••••••••••••	DER(15)=BLOW	EV 10/73 001664
00641	263*		DO 2139 I=1,NSP	EV 10/73 001707
00644	264*	2139	DER(I+15)=CM(I)/DER(10)	EV 10/73 001707
00644	265*	<u> </u>	STORE ON DRUM FOR PLOTTING: MOMENTUM TRANSFER COEFFICIENT, HEAT	001707
00644	266*	С	TRANSFER COEFFICIENT, TOTAL GAS BLOWING PARAMETER	001707
00646	267*		IF (IPASS .EQ. O) WRITE (3) DER(11),DER(12),BLOW IF(IPASS.EQ.O) WRITE(3)CF,CH,WALLQ	PLOT 001714 NEW001725

00662 00670	269* 270*		WRITE (6,3) (DER(J), J = 11,NSJ) WRITE (6,4) DIST(IUNIT),REY(IUNIT),(ATA(K),ATB(K), K = 1,NEL) ANK 5/83	001736 001750
00701	270+	4	FORMAT( $//3X$ , 68HMOMENTUM DISPLACE. EFFECTIVE ENTHALPY REYNOLDS M	001750
00701	272*		1ASS THICKNESS IN , A6, 4H FOR/2X, 48HTHICKNESS THICKNESS BODY TH	001767
00701	273*		21CKNESS NUMBER/4X,5HTHETA,4X,33HDELSTAR DISPLACE. LAMBDA PE	001767
00701	274*		3R, A6, 8(1X, 2A4, 1X))	001767
00702 00710	275* 276*	24	WRITE (6,24) (DIST(IUNIT), K = 1,4) FORMAT (4(4X,A6))	001767 002000
00711	277*	24	THMOM = THMOM/UCL	002000
00712	278*		DELTBD(IS) = DELBD/UCL	002003
00713	279*		DER(13) = DELST/UCL	002007
00714 00715	280* 281*		DER(14) = THENGY/UCL DER(15) = ACCP*UCL	002012 002015
00716	282*		DO 2140 I=1,NSP EV 10/73	
00721	283*	2140	DER(I+15) = THELEM(I)/UCL	002023
00723	284*	_	WRITE (6,3) THMOM,DER(13),DELTBD(IS),(DER(K), K = 14,NSJ)	002026
00723	285*	C	STORE ON DRUM FOR PLOTTING: MOMENTUM THICKNESS, EFFECTIVE DISPLACEMENT	002026
00734 00741	286* 287*		IF (IPASS .EQ. O) WRITE (3) THMOM,DELTBD(IS) PLOT WRITE (6,21) HWALL(IUNIT),THRUST(IUNIT),AREA(IUNIT),(FLOW(IUNIT), ANK 8/83	002043 002055
00741	288*	••••••••••	1 K = 1.2)	002055
00752	289*	21	FORMAT (//5X,'TOTAL HEAT',7X,6HTHRUST,9X,5HTOTAL,7X,'ACCELERATION'	002074
00752	290*		1,5X,8HINVISCID,9X,5HTOTAL,7X,'AREA RATIO'/6X,7HTO WALL,10X,4HLOSS,	002074
00752 00752	291* 292*		A 8X,9HWALL AREA, 25X,'PARAMETER-K',5X,2(9HMASS FLOW,7X)/7X,A6,2(9X,A6),15X,2(9X,A6))	002074
00753	293*		WALLA = WALLA + (ROKAP(IS-1) + ROKAP(IS)) * RAD6 * ARET/RAD5 ANK 8/83	
00754	294*	······	SUMQG = SUMQG + (ENTHAL + HEAD)*ARET ANK 8/83	002103
00755	295*		ENTHAL = HEAD ANK 8/83	
00755 00755	296* 297*	C	ENTHAL IS PI*ROKAP(I)*QWALL, SUMOG IS THE TOTAL HEAT TO THE WALL, AND WALLA IS THE ACCUMULATED WALL AREA	002110 002110
00756	298*	С	IE(IRITE E0, 0) GO TO 60	002112
00760	<b>2</b> 99*		ACCP = BETAV(IS)*VMUE(IS)**2*ROKAP(IS)**2/2.0/XI(IS)	002114
00761	300*		ACCPK=ACCP*RHDE(IS)*VMU(1)/(VMUE(IS)*RHO(1))	NEW002125
00762 00763	301* 302*		THENGY = $2.0*SQRT(XI(IS)*2.0)*RAD6/UCM*F(NETA,1)$ THMOM = $2.0*SQRT(XI(IS)*2.0)*RAD6/UCM*(F(NETA,1) - F(1,1))$ ARET = $(ROKAP(IS)/RAD5/RTM)**2$	002133
00763	302*		ARET = (ROKAP(IS)/RAD5/RTM) **2 ANK 8/83	002150 002154
00765	304*	••••••••••	ARET = (ROKAP(IS)/RAD5/RTM)**2ANK 8/83WRITE (6,22) SUMQG,DF,WALLA,ACCP,THENGY,THMOM,ARETANK 8/83FORMAT (1) 107516 (c)ANK 8/83	
00776	305*	22	FURMAT (17, 177613.0)	002175
00777	306* 307*			NEW002175
01001	307*	1009		NEW002177 NEW002204
01004	309*	1010	FORMAT(/, 1X, 132('*'))	NEW002204
01005	310*	••••••	WRITE(6, 1000)ICF,RK	NEW002204
01011	311*	1000	FORMAT(/,2X, 'ROUGHNESS MODULE USED - OPTION ',12,/,	NEW002213
01011 01012	312* 313*			NEWOO2213 NEWOO2213
01012	314*	· ••••••••••••••••••••••••••••••••••••		NEW002216
01015	315*		IF(DUMM17.EQ.O.O)WRITE(6,1001)RFACT	NEW002221
01021	316*			NEW002231
01025 01031	317* 318*	1001	IF(DUMM17.EQ.1.0)WRITE(6,1003)RFACT FORMAT(6X,'SMOOTH',14X,20X,'ROUGHNESS FACTOR = ',F7.3)	NEWOO2254 NEWOO2265
01031	319*	1001		NEW002205
01033	320*	1003	FORMAT(6X, 'ROUGH', 15X, 20X, 'ROUGHNESS FACTOR = ', F7.3)	NEW002265
01034	321*	1000	······································	NEW002265
01041 01041	322* 323*			NEW002275
01041	323*		······································	NEW002275 NEW002275
01043	325*	1112		NEW002277
01044	326*			NEW002277
01047	327*			NEWOO2307
01052	328*		IF(ABS(DUMM17-2.).LE.0.001)WRITE(6,1006)	NEW002322
	,	]		· · · · · · · · · · · · · · · · · · ·

						1
01055	329*	1004	FORMAT(6X,'SMOOTH')		NEW002335	r ·
01056	330*	1005	FORMAT(6X, 'ROUGH')		NEW002335	
1057	331*		FORMAT(6X, 'RKS BEYOND UPPER LIMIT - EQUATION BECOMES INVALID - ',		NEW002335	
1057	332*		\$ 'THEREFORE RKS = 0.0 WAS USED.')		NEW002335	
1060	333*		WRITE(6, 1010)		NEW002335	
1062	334*	1111	CONTINUE		NEW002343	
1063	335*		IF(IPART.EQ.1)GO TO 1301		NEW002343	
1065	336*		GD TO 1302		NEW002345	
1066	337*	1301	WRITE(6,1009)		NEW002347	
1070	338*		IF(ILT.EQ.1)WRITE(6,1303)RP,AK,PF		NEW002353	
1076	339*		FORMAT(/,2X, 'PARTICLE MODULE USED',/,6X, 'LAMINAR FLOW',5X,		NEW002366	·
1076 1076	340*		\$ 'PARTICLE SIZE RP=', E10.3, 'IN RADIUS', /, 1X, 'PARTICLE LOADING =',		NEW002366	
1078	<u>341*</u> 342*	·····	\$ F10.2, 10X, 'PARTICLE FACTOR =', F10.4)		NEW002366	
11077	342* 343*	1005	IF(ILT.EQ.2)WRITE(6,1305)RP,WP,PF FORMAT(/,2X,'PARTICLE MODULE USED',/,6X,'TURBULENT FLOW',5X,		NEW002366 NEW002401	
1105	343+	1305	\$ 'PARTICLE SIZE RP=',E10.3,'IN RADIUS',/,1X,'PARTICLE LOADING =',	·····	NEW002401	
1105	344+		$\Rightarrow$ PARTICLE SIZE RP=, E10.3, IN RADIOS ,/, IX, PARTICLE LOADING = , $\Leftrightarrow$ E40 2 107 (DADITCLE FACTOR = ( E40 4)		NEW002401	· ·
1106	346*		\$ F10.2,10X,'PARTICLE FACTOR =',F10.4) WRITE(6,1008)CF,ST,WALLQ		NEW002401	
01113	347*				NEW002401	
1115	348*	1302	WRITE(6,1010) CONTINUE		NEW002417	· · · · · · · · · · · · · · · · · · ·
1116	349*	1002	IF(ILAMIN.EQ.O.OR.ILAM.EQ.O)GO TO 1211		NEW002417	
1120	350*		WRITE(6,1009)		NEW002426	
1122	351*		WRITE(6, 1200)SPCT		NEW002433	
1125	352*	1200	FORMAT(/,2X,'RELAMINARIZATION OCCURED',/,		NEW002441	
1125	353*		\$ 2X, 'DEGREE OF RELAMINARIZATION = ',E10.3, ' PERCENT')		NEW002441	
1126	354*	*** • • • • • • • • • • • • • • • • • •	WRITE(6, 1010)	•••••••	NEW002441	
1130	355*	1211	CONTINUE		NEW002447	
1131	356*	······································	WRITE(6,1007)RETHMD,ACCP,ACCPK		NEW002447	
1136	357*	1007	FORMAT(/,1X,' RETHMO ACCN PARA ACCN PARA',/,1X,		NEW002456	
1136	358*		\$ ' (EDGE) (WALL)',/, 3X, 1P3E 10.3)		NEW002456	
)1137	359*		IF (IPASS .EQ. 1) GO TO 55	PLOT	002456	
)1141	360*		ACCP = 1.0E6*ACCP		002461	
1141	361*	c	STORE ON DRUM FOR PLOTTING: TOTAL HEAT TO WALL, WALL AREA, THRUST LE	oss,	002461	
1141	362*	С	ACCELERATION PARAMETER, INVISCID MASS FLOW, AND TOTAL MASS FLOW		002461	
1142	363*		WRITE (3) SUMOG,WALLA,DF,ACCP,THENGY,THMOM WRITE (6,6) SHEAR(IUNIT),(ENERGY(IUNIT), K = 1,2) A	PLOT	002464	
1152	364*	55	WRITE $(6,6)$ SHEAR(IUNIT), (ENERGY(IUNIT), K = 1,2)	NK 8/83	002477	
1161	365*		FORMAT (1H1,5X, 'NODAL INFORMATION'//1X,2HND,7X,3HETA,10X,4HU/UE,		002552	
1161	366*		1 8X, 5HGAMMA, 8X, 6HSHEAR , A6, 3X, 'STREAM FUNCTION F', 8X, 'FPP', 12X,		002552	
1161	367*		2 'GP 'A6,8X,'GPP ',A6) DO 183 I=1,NETA B		002552	
1162	368*					
1165	369*	•••••	DER(1) = F(I,2)/ALPH		002552	
1166 1167	370* 371*		DER(2) = DUDS(1)/UCS $DER(2) = E(1, 2)/ALDH++2$		002555 002560	
1167	371*		DER(3) = F(I,3)/ALPH**2		002560	·····
1170	372*		DER(4) = G(I.2)/(ALPH*UCE) DER(5) = G(I.3)/(ALPH**2*UCE)		002563	
1171	373*	С	STORE ON DRUM FOR PLOTTING: ETA VALUES, VELOCITY RATIO, GAMMA, AND	SHEAD	002566	
1172	374+	C	IF (IPASS .NE. 1) WRITE (4) ETA(I), DER(1), DER(2)	PLOT	002588	
1201	376*	183	WRITE (6,12) I.ETA(I).DER(1).GMR(I).DER(2).F(I,1).(DER(J).J=3,5)	1	002603	
1213	377*	12			002603	
1214	378*		WRITE $(6,7)$ DIST(IUNIT), DENS(IUNIT), (ENERGY(IUNIT), K = 1.2),		002623	
1214	379*		1 PRES(IUNIT), NUM, NUM		002623	
1227	380*	7	FORMAT (//1X,2HNO.5X,'DISTANCE FROM',8X,'DENSITY',7X,'STATIC ENTHA		002653	
1227	381*	•	1LPY',4X,'TOTAL ENTHALPY',6X,'PITOT TUBE',7X,'MACH',7X,'MOLECULAR',		002653	
1227	382*		2 5X, 'PRANDTL'/ 9X, 'WALL ', A6, 8X, 'RHD ', A6, 8X, 'H ', A6, 9X, 'G. ',		002653	
1227	383*		3 A6.5X, 'PRESSURE ', A6.4X, A6.7X, 'WEIGHT'.7X, A6)		002653	
1230	384*			11A 259	002653	
1233	385*		GMR(I)≠ABS(GMR(I))		002657	
1234	386*			NK 5/83	002661	
1235	387*			V 10/73	002676	
			DX = GMR(I) - 1.0			

01237	389*		ADR = GMR(I) + 1.0	002704	
01240	390*		IF (ACH .GE. 1.0) PITOT = POUT*(ACH**2*ADR/2.0)**(GMR(I)/DX)/	002707	
01240	391*		1 $((2,O*GMR(I)*ACH**2 - DX)/ADR)**(1,O/DX)$	002707	
01242	392*	•••••••	DX = (UE(IS)/UCL*F(I,2)/ALPH)**2	002752	
01243	393*		IF (IUNIT FO 2) DX = DX/(GC*SIPSF) ANK 4/8		
01245	394*	•••••	IF (ACH .LT. 1.0) PITOT = POUT + (1.0 + ACH**2/4.0)*DER(2)*DX/2.0	002762	*****
01247	395*		Y(T) = Y(T)/HCI	002777	
01250	396*		$\frac{T(1) = T(1)/UCL}{DER(1) = HB(1)/UCE}$ ANK 5/8	3 003002	•••••
01251	397*		DER(6) = G[1,1]/UCF	003005	
01252	398*		DER(6) = G(I, 1)/UCE IF (IPASS .EQ. 1) GO TO 184 ANK 7/8 CONVENT DISTANCE FROM WALK TO CONTINUE FROM WALK TO	***************************************	
01252	399*	С	CONVEDT DISTANCE FOOM WALL TO CENTIMETEDS OF INCHES	003010	
01254	400*		IF (IPASS .EQ. 1) GO TO 184 ANK 7/8 CONVERT DISTANCE FROM WALL TO CENTIMETERS OR INCHES DW = 100.0*Y(I) ANK 7/8	3 003012	
01255	401*		IF (IUNIT .EQ. 2) DW = 12.0*Y(I) ANK 7/8	3 003012	
01255	402*	<u> </u>	STORE ON DRUM FOR PLOTTING: DISTANCE FROM WALL, DENSITY, MACH NUMBER,	003014	
01255	402*	C C	STORE ON DROW FOR PLUITING: DISTANCE FROM WALL, DENSITY, MACH NUMBER, DITOT TURE DRESCHERE CTATLE ENTWALDY AND TOTAL ENTWALDY	003014	
		C	PITOT TUBE PRESSURE, STATIC ENTHALPY, AND TOTAL ENTHALPY.		
01257	404*	104	WRITE (4) DW, DER(2), ACH, PITOT, DER(1), DER(6) ANK 7/8		
01267	405*		WRITE (6,20) I,Y(I),DER(2),DER(1),DER(6),PITOT,ACH,VMW(I),PR(I)	003035	
01303	406*	20	FORMAT (1X, I2, 1P5E18.7, OPF13.8, F13.6, F13.8)	003054	
01304	407*		WRITE (6,8) DIST(IUNIT), (VIS(J, IUNIT), $J = 1,2$ ), (TCON(J, IUNIT),	003054	
01304	408*		1 J = 1,2),(CQ(J,IUNIT), J = 1,2),TEMP(IUNIT),NUM,NUM ANK 5/8		
01326	409*	8	FORMAT (//1X,2HND,5X,'MIXING LENGTH',6X,'VISCOSITY MU',5X,'THERMAL	003127	
01326	410*		1 COND. 1.5X, SPECIFIC HEAT', 4X, KINEMATIC EDDY', 2X, TEMPERATURE', 2X	003127	
01326	411*	· · · · <b>·</b> · · · · · · · · · · · · · ·	2,'SCHMIDT',5X,'TURBULENT'/11X,A6,10X,2A6,6X,2A6,6X,2A6,4X,'VISCOSI	003127	
01326	412*		3TY EPSA',4X,A6,5X,A6,4X,'PRANDTL ',A6)	003127	
01327	413*		DO 185 I = 1,NETA	003127	
01332	414*		DER(1) = DL(1)/C89/ALPH/UCL ANK 5/8	3 003127	
01333	415*		DER(3)=VMU(I)/UCV EV 10/7	3 003134	
01334	416*		DER(4)=CPBAR(I)+UCT/UCE EV 10/7	3 003137	
01335	417*		DER(5)=DER(4)*DER(3)/PR(I) EV 10/7		
01336	418*		DER(6) = TT(I)/UCT ANK 5/8	3 003146	
01337	419*		IF (IPASS .EQ. 1) GO TO 185 ANK 7/8	3 003151	
01341	420*		COND = 1.0E5*DER(5) ANK 7/8		•••••
01342	421*		VISC = 1.0E5*DER(3) ANK 7/8		
01342	422*	C	STORE ON DRUM FOR PLOTTING: VISCOSITY, SPECIFIC HEAT, THERMAL	003156	
01342	423*	Ċ	CONDUCTIVITY, TEMPERATURE, AND KINEMATIC EDDY VISCOSITY.	003156	
01343	424*		WRITE (4) VISC.DER(4),COND,DER(6),EPSA(I) ANK 7/8		
01352	425*	185	WRITE (6,5) I, DER(1), DER(3), DER(5), DER(4), EPSA(I), DER(6), SC(I),	003173	
01352	426*		$\frac{W(1)}{1} = \frac{U(0,3)}{1} \frac{1}{2} \frac{U(0,3)}{U(0,3)} \frac{U(0,3)}{U($	003173	•••••
01366	427*	5	FORMAT (1X, I2, 195E18.7, OPF11.3, F12.8, F13.8)	003212	
01366	428*	C			•
01366	428≁ 429*	C C	STORE ON DRUM FOR PLOTTING: EDGE DENSITY, VISCOSITY, SPECIFIC HEAT, THERMAL CONDUCTIVITY, AND MACH NUMBER IF (IPASS .NE. 1) WRITE (3) DER(2),DER(3),DER(4),DER(5),ACH PLOT	003212	
01367	429+	<u> </u>	IF (IPASS .NE. 1) WRITE (3) DER(2), DER(3), DER(4), DER(5), ACH PLOT	003212	••••••
01367	430* 431*	60	IF (IFLOW .EQ. 1) GO TO 325 ANK 4/8	3 003212	
01377		00	IF (IFLOW .EQ. 1) GO TO 325 ANK 4/8 IF (IRITE .EQ. 0) GO TO 65		••••••
	432*			003231	
01403	433*		WRITE (6, 13) DIST(IUNIT), (Y(I), I = 1, NETA)	003242	
01412	434*	13	FORMAT (1H1,45X,22HDISTANCE FROM WALL IN ,A6/(12X,1P10E12.4/18X,	003260	
01412	435*		1 9E12.4))	003260	
01413				003260	
01415	437*	25	FORMAT (//1X, 78HELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERI	003273	
01415	438*		IVATIVES WITH RESPECT TO ETA/)	003273	
01416	439*		D0 201 K=1,NSP B11A 26		
01421	440*		WRITE (6,14) MOA(K),MOB(K),(SP(I,1,K), I = 1,NETA)	003273	
01431	441*	14	FORMAT (2X,2A6,1X,1P9E13.5/21X,8E13.5/(15X,9E13.5/21X,8E13.5))	003305	
01432	442*		WRITE (6,15) (SP(I,2,K), I = 1,NETA)	003305	
01440	443*	201	WRITE (6, 15) (SP(I,3,K), I = 1,NETA)	003316	
01447	444*		FORMAT (12X, 1P10E12.4/18X,9E12.4)	003343	
01450	445*		IF (NSPM1 , LE, O) GO TO 2041	003343	
01452	446*		DO 204 K = 1,NSPM1	003345	•••••
01455	447*		DO 204 I=1,NETA B11A 270		
	448*		SP(1,2,K) = SP(1,2,K) * ALPH	003364	

01461	449*	204	SP(I,3,K) = SP(I,3,K)*ALPH**2	003366
01464	450*	2041	IF (IRITE .EQ. O) GO TO 325	003377
01466	451*		WRITE (6,16)	003400
01470	452*	16	FORMAT (/2X14HMOLE FRACTIONS,/) B11A 130	003405
01471	453*		DO 196 J=1,NSPEC B11A 274	003405
01474	454*	196	WRITE (6,14) MOA(J), MOB(J), (FR(J,I), I = 1, NETA)	003423
01505	455*		IF (IWALL .EQ. 4) WRITE (6,17) MOA(ISU), MOB(ISU) ANK 4/83	003443
01512	456*	17	FORMAT (/4X,'SURFACE SPECIES IS ',2AG)	003460
01513	457*	325	WALLQ = -WALLQ*C3M(IS) ANK 8/83	
01514	458*		IF (NON.LT.O) RETURN	003463
01516	459*		J = NETA - 1	003471
01517	460*		M = KAPPA - 1	003474
01520	461*		K = KAPPA + 1	003477
01521	462*		NETAL=NETA	003502
01522	463*		KAPPAL=KAPPA	003504
01523	464*		IF (KONRFT.EQ.O) RETURN	003506
01525	465*		IF (KQ10 .GT. 0 .AND. KTURB .GT. 0) GO TO 4019 ANK 4/83	
01527	466*	<b>C</b>	IF (IS - 1) 4002,4021,4002	003527
01527 01532	467* 468*	C	TRANSITION TO TURBULENCE - CHANGE NODE DATA	003527
01532	468*	4019	KTURB=-1 Y(I)=Y(I)*UCL EV 10/73	003534 003535
01533	409*	·····	NETA=NETAT	003535
01534	470*		KAPPA=KAPPAT	003543
01536	472*		DO 4020 I=1.NETA	003554
01541	473*	4020	F2FIX(I)=F2FIXT(I)	003554
01543	474*	4020	DD 4018 I = NETAL, J	003562
01546	475*	4018	TT(T+1) = -1.0	
01550	476*	4013	IF (NTROPY . EQ. 0) GO TO 4002 ANK 4/83	
01550	477*	C	SPECIAL ENTROPY OPTION NTROPY = 5	003565
01552	478*	¥	D0 4000 I = 1.M	003566
01555	479*	4000	UKAPPA(I) = F2FIX(I)/F2FIX(KAPPA)	003603
01557	480*		UKAPPA(KAPPA)=1.0	003606
01560	481*		DO = 4OOt = K	003614
01563	482*	4001	UKAPPA(I)=(F2FIX(I)-F2FIX(KAPPA))/(F2FIX(NETA)-F2FIX(KAPPA)) ANK 8/83	003614
01565	483*		UKAPPA(NETA)=1.0	003620
01566	484*	4002	IF (KTURB .NE1) GD TO 4022	003623
01570	485*		KTURB = O	003625
01571	486*		GO TO 327	003626
01572	487*	4022	IF (IS .EQ. NS) RETURN	003630
01574	488*		IF (NTROPY .EQ. 0) GO TO 4012 ANK 4/83	003635
01574	489*	с	SPECIAL ENTROPY OPTION NTROPY = 5	003635
01576	490*		DO 4010 I = 1,M	003654
01601	491*	4010	F2FIX(I) = UKAPPA(I)*F(KAPPA,2)/ALPH	003654
01603	492*		F2FIX(KAPPA) = F(KAPPA,2)/ALPH	003660
01604	493*		DD 4011 I = K,J	003667
01607	494*	4011	F2FIX(I) = (F(KAPPA,2) + (F(NETA,2) - F(KAPPA,2)) * UKAPPA(I)) / ALPH ANK 8/83	
01611	495*		F2FIX(NETA) = F(NETA,2)/ALPH	003674
01612	496*	4012	IF (IS .EQ. 1) GO TO 327	003700
01614	497*		00 326 I = 2,J	003702
01617	498*		M=I	003707
01620	499*		IF $(F(I,2) - F2FIX(I)*ALPH .LT. 0.0)$ M = I + 1 ANK 8/83	003711
01622	500*	326	IF(ABS((F(I,2)-F2FIX(I)*ALPH)/(F(M,2)-F(M-1,2))).GT.RATLIM)GOT0327ANK 8/83	003721
01625	501*		KONRFT=1	003736
01626	502*	207	RETURN	003740
01627	503*	327	CALL REFIT KONRFT=2	003744
01630 01631	504* 505*		RETURN	003745 003747
01631	505* 506*	·····	END B11A 307	004014
01032	000-			

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	\$*MSFCFOR\$_FOR,WUS_TRMBL
HSA -23	E3 -12/10/84-22:24:09 (31,32)
	COMMON/ACPK/ACCPK1,ACCPK2
- <b>-</b>	COMMON/ACCN/ACCPK,ILAM,SPCT
	COMMON/RETH/RETHMO COMMON/RUF/DUMM1,DUMM2,DUMM3,DUMM4,DUMM5,DUMM6,DUMM7,DUMM8,DUMM9,
	\$ DUMM10, DUMM11, DUMM12, RK, ICF, FMF, DUMM16, DUMM17, DUMM18
-80	COMMON /LAM/ ILAMIN
	IF(ILAMIN.EQ.O)GO TO 39
	IF(ILAM.EQ.1)GO TO 29
29	GO TO 39 SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)
	$SALFH-1(ACCPR-ACCPRT)/(ACCPR2-ACCPRT)$ $SPCT=SALFH-100. (1 SALPH) \times 100.$
39	CONTINUE
-304 C	
C F	ROUGHNESS OPTION (3) ICF = 3
C	·
·•····	IF(ICF.EQ.3)GD TO 201 GO TO 202
201	CONTINUE
	RKS=RK*UTAU*RHD(I)/VMU(I)
·····	IF(RKS.LE.4.535)PCT=0.0 IF(RKS.GT.4.535.AND.RKS.LE.4000.)PCT=1.0
	IF(RKS.GT.4000.)PCT=2.0
-	DUMM17=PCT
	IF(ABS(PCT).LE001)GD TO 203 DEACY=.9*(VMU(I)/(RHO(I)*UTAU))*(RKS**.5-RKS*EXP(-RKS/6.))
203	CONTINUE
202	ACY=ALPH*DEL*CAPY+DEACY CONTINUE
• · · -	
51	BROUTINE TRMBL ENTRY POINT 004622
30	BRUUTINE TRMBL ENTRT FUINT 004022
	ORAGE USED: CODE(1) 004637; DATA(0) 000631; BLANK COMMON(2) 000000
<b>S</b> 1	
	COMMON BLOCKS:
ر د	COMMON         BLOCKS:           XXXX3         CDECOM         000017           XXXX4         CDECON         000014
	0003 CDECOM 000017 004 CDECON 000014 005 EDGCOM 001216
	XXXXX         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
	0003 CDECOM 000017 004 CDECON 000014 005 EDGCOM 001216
	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
	X003         CDECOM         000017           X004         CDECON         000014           X005         EDGCOM         001216           X006         EPSCOM         000045           X007         ERRCOM         000571           X010         ETACOM         00036           X011         HISCOM         000344           X012         INPUTI         000006           X013         INTCOM         000123           X014         INTERI         000004           X015         NDNCOM         035431           X016         NZER0         000001           X017         PRMORG         000455           X020         PRPCOM         00303

0025	VARCOM	000645	
0026	ACPK	000002	
0027	ACCN	000003	
0030	RETH	000001	
0031	RUF	000022	
0032	LAM	000001	

## EXTERNAL REFERENCES (BLOCK, NAME)

0033	LIAD	
0034	TAYLOR	
0035	ERP	
0036		
0037	V NERR2\$	
0040	) NWDU\$	
0041	NIO2\$	·
0042	SQRT	
0043	B EXP	
0044	XPRR	
0045	TANH	
0046		
0047	NERR3\$	

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STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

	617 1000G	0001	000012		0001	000213		0001	001402		0001	004232	1004L
0001 004	245 1005L	0001	001534	103L	0001	003114	1036G	0001	001576	104L	0001	003454	1100G
0001 003	565 1122G	0001	003661	1136G	0001	003716	1150G	0001	004051		0001	004074	
0001 004	167 1226G	0001	004310	1255G	0001	004434	1275G	0001	004511	1307G	0001	004556	1317G
0001 000	577 15L	0001	000074	2003L	0001	000123	2004L	0001	000155	2005L	0001	002456	
0001 002	560 202L	0001	002553	203L	0001	000227	247G	0001	000264	29L	0001	001651	305L
0001 001	127 32L	0001	001702	320L	0001	000415	321G	0001	000432		0001	000752	33L
0001 001	712 330L	0001	001742	331L	0001	002022	350L	0001	002111	362L	0001	000275	39L
0001 000	710 400G	0001	003773	400L	0001	004027	401L	0001	004063	405L	0001	003770	406L
0001 004	133 415L	0000	000360	42F	0001	000064	43L	0001	001065	431G	0000	000437	44F
0000 000	407 45F	0001	001215	456G	0000	000417	46F	0001	001220	461G	0000	000351	
0001 001	336 477G	0000	000457	48F	0000	000516	49F	0001	002143	505L	0001	002216	525L
0001 002	317 532L	0001	002664	547L	0001	002701	550L	0001	003253	554L	0001	003203	
0001 001	656 561G	0001	001675	573G	0001	004252	600L	0001	001706	601G	0001	001775	616G
0001 002	101 636G	0001	004600	650L	0001	002206	663G	0001	002213	670G	0001	003257	
0001 003	650 703L	0001	002273	711G	0001	001204	75L	0003	000000	Α	0000 R	000321	ABECK
0027 R 000	OOO ACCPK	0026 R	000000	ACCPK1		000001		0000 R	000341	ACEB	0000 R	000325	ACY
0000 R 000	311 AF	0025 R	000000	ALPH	0011	000000	ALPHD	0015 R	000000	AM		000301	
0011 R 000	OO1 BETAP	0000 R	000312	BF	0003	000003	С	0021 R	000000	CAPC	0000 R	000307	CAPY
0013 000	000 CASE	0013 R	000015	CBAR	0000 R	000300	CBECK	0000 R	000275	CCEB	0005	000000	CG
0004 000	000 CK1	0004 R	000006	CK6	0023 R	000000	CL		000000		0021 R	000017	
0000 R 000	324 CRD		000145	C1	0003 R	000005	C10	0003 R	000007	C13	0011	000146	C2
0003 R 000		0003 R	000012		· · · ·	000147			000013			000015	
0003 R 000	016 C56	0003 R	000002	C7	0003	000006	D	0000 R	000320	DADA		000313	
0000 R 000	306 DADVP	0000 R	000277	DB	0020 R	000255	DCAPCH		000067			000000	
0023 R 000	001 DCLNUM	0000 R	000344	DEACY	0000 R	000304	DEL		000002			000007	
0023 R 000	003 DEPC		000017		0006 R	000001	DL		000346			000004	
0020 000	256 DPRH	0020 R	000000			000331	• • • • • • • • . • • • • • • • • • • •		000001			000332	
	OOO DUMM1	0031	000011			000012			000013		0031	000017	
0031 R 000	020 DUMM17	0031	000021	DUMM18		000001			000002		0031	000003	***************************************
0031 000	004 DUMM5	0031	000005	DUMM6	0031	000006	DUMM7		000007		0031	000010	
0000 R 000	326 DUM1	0000 R	000327	DUM2	0023 R	000042	DVS		000071		0003	000010	
0006 R 000	020 ELCON	0007 R	000376	ENL	0000 R	000330	EPI	0000 R	000322	EPS	0006 R	000021	EPSA

	000043			R 000000			R 00000		0010 F	R 000000	÷		R 000345	
0025 R	000001	F	0007	000000	) FLE	0000	R 00026	54 FM	0031	000016	FMF	0025	R 000075	G
0022	000000	HB	0011	R 00023	HF	0022	R 0000	17 HP	0013	I 000016	I	0012	000000	IBODY
0031 I	000015	ICF	0017	000000	IDISC	0012	I 00000	5 IFLOW	0027	I 000001	ILAM	0032	I 000000	ILAMIN
0000	000574	INJP\$	0000	I 000334	INK	0000	I 00021	4 IPRT	0013	000017	IQ	0013	I 000020	IS
0013	000021	ISH	0000	I 000302	IWK	0000	I 00033	85 J	0000	I 000316	K	0013	I 000023	KAPPA
0014	000000	KBC	0013	000024	KONRFT	0014	I 00000	)3 KQ10	0013	000025	KR9	0000	I 000315	L
0013 I	000110	MAT1J	0013	000111	MAT2I	0000	I 00034	7 MINK	0000 1	I 000333	MPJ	0013	I 000114	NETA
0013 I	000115	NNLEQ	0013	000116	NON	0013	I_00012	1 NSP	0013	I 000122	NSPM1	0016	I 000000	NUL
0003	000014	0	0000	R 000323	ONK	0000	R 00034	3 PCT	0023 F	₹ 000044	PIM	0023	R 000045	РМ
0000 R	000317	PPL	0021	R 000055	PR	0006	R 00004	O PRT	0022	000020	QR	0000	R 000305	RC
0023 R	000046	RED	0030	000000	RETHMO	0006	R 00004	1 RETR	0022 F	R 000037	RHO	0005	R 000147	RHOE
0022 R	000056	RHOP	0006	R 000042	RHOVS	0031	R 0000	4 RK	0000 F	R 000342	RKS	0017	R 000373	
0000 R	000303	SALPH	0006	R 000043	SCT	0025	R 00015	2 SP	0027 F	2 000002	SPCT	0000	R 000350	SQPI
0024 R	000000	STURB	0000	R 000336	TAUW	0022 1	R 00007	'5 TP	0000 F	R 000276	TPCON	0023	R 000047	TREF
0005 R	000767	TTVC	0024	R 000001	TURPR	0005	00071	O TVCC	0005 F	2 001052	UE	0000	R 000337	
0000 R	000314	VA	0023	R 000050	VINTR	0020 I	R 00026	4 VMU	0005 F	2 001134	VMUE	0000	R 000340	
0000 R	000270	ХР	0006	R 000044	YAP	0000	R 0003	O YDI						

00101	1*	SUBROUTINE TRMBL(ILK)		000000	
00101	2*	C		000000	
00103	3*	COMMON /COECOM/ A(2),C7,C(2),C10,D,C13,E,C26,C28,C32,D,C53,C56	/COECOM/	000000	
00104	4*	COMMON /COECON/ CK1(6),CK6(6)	/COECON/	000000	1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 - 1947 -
00105	5*	COMMON /EDGCOM/ CG(103), RHDE(400), TTVC, TVCC(50), UE(50), VMUE(50)	/EDGCOM/	000000	
00106	6*	COMMON /EPSCOM/ CLNUM,DL(15),ELCON,EPSA(15),PRT,RETR,RHOVS,SCT,Y	AP/EPSCOM/	000000	
00107	7*	COMMON /ERRCOM/ FLE(254),ENL(123)	/ERRCOM/	000000	
00110	8*	COMMON /ETACOM/ ETA(15),DETA(15)	/ETACOM/	000000	
00111	9*	COMMON /HISCOM/ ALPHD,BETAP(100),C1,C2,C3M(50),HF(15,5)	/HISCOM/	000000	
00112	10*	COMMON /INPUTI/ IBODY(5),IFLOW	/INPUTI/	000000	
00113	11*	COMMON /INTCOM/ CASE(13),CBAR,I,IQ,IS,ISH(2),KAPPA,KONRFT,KR9(51	),/INTCOM/	000000	
00113	12*	1 MATIJ, MAT2I(3), NETA, NNLEQ, NON(3), NSP, NSPM1	/INTCOM/	000000	
00114	13*	COMMON /INTERI/ KBC(3),KQ10	/INTERI/	000000	
00115	14*	COMMON /NONCOM/ AM(123,123)	/NONCOM/	000000	
00116	15*	COMMON /NZERO/ NUL	/NZERO/	000000	
00117	16*	COMMON /PRMORG/ IDISC(251),S(50)	/PRMORG/	000000	
00120	17*	COMMON /PRPCOM/ DRHOH, DRHOK(54), DCAPCK(118), DCAPCH, DPRH(6), VMU(1	5)/PRPCOM/	000000	
00121	18*	COMMON /PRPERT/ CAPC(15),CPBAR(30),PR(15)	/PRPERT/	000000	
00122	19*	COMMON /PRPNPT/ HB(15), HP, QR(15), RHO(15), RHOP(15), TP	/PRPNPT/	000000	
00123	20*	COMMON /SAVTBL/ CL,DCLNUM,DELCON,DEPC,DPI(15,2),DVS,EPS1,PIM,PM,	/SAVTBL/	000000	
00123	21*	1 RED, TREF, VINTR(15)	/SAVTBL/	000000	
00124	22*	COMMON /TURB/ STURB,TURPR(15)	/TURB/	000000	
00125	23*	COMMON /VARCOM/ ALPH,F(15,4),G(15,3),SP(15,3,7)	/VARCOM/	000000	
00126	24*	COMMON/ACPK/ACCPK1,ACCPK2		NEW000000	
00127	25*	COMMON/ACCN/ACCPK, ILAM, SPCT		NEW000000	
00130	26*	COMMON/RETH/RETHMO		NEW000000	
00131	27*	COMMON/RUF/DUMM1, DUMM2, DUMM3, DUMM4, DUMM5, DUMM6, DUMM7, DUMM8, DUMM9	•	NEW000000	
00131	28*	\$ DUMM10,DUMM11,DUMM12,RK,ICF,FMF,DUMM16,DUMM17,DUMM18		NEW000000	
00132	29*	COMMON /LAM/ ILAMIN		NEW000000	
00132	30*	c		000000	
00133	31*	DIMENSION DCAPCW(7),DELTA(50),DYA(123),FM(4),XP(4)	ANK 4/83	000000	
00133	32*	c		000000	
00134	33*	GD TO (1001,1002,1003,1004,1005),ILK		000000	
00135	34*	1001 IPRT = 0	ANK 8/83	000012	
00136	35*	IF (YAP)2002,2003,2004		000012	
00136	36*	C CEBECI-SMITH TURBULENCE MODEL		000012	
00141	37*	2002  YAP = - YAP		000015	
00142	38*	CCEB = 26.0		000016	

00145         40*         47         FORMAT (//X, //EEECI-SHITH TURBULENCE MODEL*)         000025           00155         42         DOMMAT (//X, //EEECI-SHITH TURBULENCE MODEL*)         00153         43*         000005           00153         43*         (DOMSTAMT / X, // X, // K,	00143	39*		WRITE (6,47)	000020	
00153         42*         42*         FORMAT (/ 1K, 'MIXIMA LENGTH CONSTANT ELCON *', LEI3.6)         0000035           00154         44*         1F (RFT, GT, 0.0) WRITE (6,45) PRT         000035           00154         44*         1F (RFT, GT, 0.0) WRITE (6,45) PRT         0000035           00154         44*         1G*, 0.0) GR T0 43         000005           00164         44*         1G*, 0.0) GR T0 43         000005           00165         44*         1PRT - 1G*, 0.0) GR T0 43         000005           00166         44*         TPRT - 1G*, 0.0) GR T0 43         000005           00165         44*         MRITE (6, 46) TPCON         000005           00166         44*         MRITE (6, 46) TPCON         000005           00175         54*         1         TABASTANDAL CONSTANT #*/ 1PE13.6/1X, 0000072           00175         54*         1         TABASTINN MARET SCT **, 1PE13.6/1X, 0000072           00176         55*         GR T0200CH T00001         000072           00176         56*         10         0000072           00176         56*         GR T0200CH T0000CH T0000CH         000012           00200         66*         2000 CECK * 26 OM         000012           002016         58	00145	40*	47	FORMAT (/1X, 'CEBECI-SMITH TURBULENCE MODEL')	000025	
00153         44         10DMSTANT YAP, BX, '*', E13, 6/1X, 'CLAUSER NUMBER ELANUM', 9X, '*', E13, 6)         000035           00154         45         FRANKTY, 'LS, 'DUBULENT PRANDIL NUMBER PRT =', IPE13, 6)         000035           00163         45         FRANKTY, 'LS, 'DUBULENT PRANDIL NUMBER PRT =', IPE13, 6)         000035           00163         45         FRANKTY, 'LS, 'DUBULENT PRANDIL NUMBER PRT =', IPE13, 6)         000035           00164         45         FRANKTY, 'LS, 'LV, 'LS, 'LB, 'LS, 'LS, 'LS, 'LS, 'LS, 'LS, 'LS, 'LS						
00154         44+         1F (PRT, cT, 0, 0) WRITE (6, 45) PRT         000035           00160         45         1F (PRT, GT, 0, 0) GO TO 43         000046           00161         46+         1F (PRT, GT, 0, 0) GO TO 43         000046           00164         46+         1F (PRT, GT, 0, 0) GO TO 43         000046           00164         46+         1F (PRT, GT, 0, 0) GO TO 43         000053           00165         46+         WRITE (6, 46) TPCON         000053           00164         46+         TPCON-PRT         0000053           00170         51+         43         TURBULENT PRANDT CONSTANT         0000072           00175         54+         1         'TRANSTITON MOM. THICK, RETR *', E13, 6)         0000072           00176         55+         GO TO 2005         000072         000072           00176         56+         C         BCCWLINM MM. THICK, RETR *', E13, 6)         0000072           00176         57+         2003 DE         FLEDMC/LAUM         0000162           002021         59+         BECK-CLOM         000162         000162           002021         59+         BECK-CLOM, PRT         000162         000112           002020         69+         WRITE (6, 43) BECK, ELCON, PRT						
00160         45*         45         FORMAT (/TX, "TURBULENT PRANDTL NUMBER PRT *', IPET3.6)         000046           00161         46*         IF (PRT .61. 0.0) GD T0 43         000046           00163         47*         IPRT = 1         000046           00164         47*         IPRT = 1         000046           00165         44         FORMAT (/TX, "VARIABLE TURBULENT PRANDTL MUMBER TN USE'/TX.         000064           00170         50*         46         FORMAT (/TX, "URBULENT PRANDTL CONSTANT *', IPET3.6/TX.         000064           00170         51*         1         TURBULENT SCHUDT CONSTANT *', IPET3.6/TX.         0000072           00176         53*         44         FORMAT (/TX, "URBULENT SCHUDT NUMBER SCT *', IPET3.6/TX.         0000072           00176         55*         0         DECKWITH-HUSHNEL TURBULENCE MODEL         000072           00176         55*         0         DECKWITH-HUSHNEL TURBULENT SCHUDT NUMBER SCT *', IPET3.6/TX.         000074           00200         58         CERCWITH-HUSHNEL TURBULENT SCHUDT NUMBER SCT *', IPET3.6/TX.         000072           00176         59*         0         000072         000072           00176         59*         0         000074         000074           002017         57* <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
Ool61         46-         IF (FRT_GT_0, 0, 0) GD TO 43         O000061           Ool63         47         IPRT = 1         0000051           Ool64         48-         IPCOM-PRT         0000051           Ool64         48-         IPCOM-PRT         0000051           Ool65         4         WITE (6, 40, VOLMA         0000051           OO170         51-         1         IVEBULENT SCHNOT NUMBER SCT */ IPE13.6)         0000064           OO171         52-         43         WITE (6, 40, SCT, RETR         0000072         0000072           O0175         53-         44         FORMAT (/IX, IVERULENT SCHNOT NUMBER SCT */ IPE13.6)         0000072           O0175         53-         47         TORMATTION NOM. THICK. RETR */ E13.6)         0000072           O0176         55-         GD TO 2000         DE ELCON/CLIMM         0000074         0000074           O0200         58-         GDECX-CLIMM         000010         00012         000076           O0200         58-         GDECX-CLIMM SCH.PETR         000012         00012           O0200         58-         GD TO 2005         CECX-CLIMM SCH.PETR         000112           O0210         56-         CECX-CLIMM SCH.PETR         000112         00011						
00163         47*         IPRT = 1         000051           00164         48*         IPPCON-PRT         0000055           00170         50*         48*         IPPCON-PRT         0000055           00170         50*         40         FORMAT (// X. VARIABLE TURBULENT PRANDTL NUMBER IN USE // 1X.         0000064           00170         51*         41         IVETTE (6, 46) TPCON         0000072           00175         54*         1         TRANSITION MON. THICK. RETR = X: F181.6 (1X.         0000072           00176         55*         G DD 2000         000072         000072           00176         56*         C BECKWITH-BUSHNELL TURBULENCE MODEL         0000072           00176         56*         C BECKWITH-BUSHNELL TURBULENCE MODEL         0000072           00176         56*         C BECKWITH SURSHNELL TURBULENCE MODEL // (X. 'BECKWITH CON         0000072           00202         60*         WRITE (6, 48) BECK, ELCON, PRT         000102           00207         61*         48         FORMAT (/X. 'BECKWITH SURSHNEL CONSTANT ELCON = '.         000112           00207         63*         2 E13.6 (1X. 'TURBULENCE MODEL'/) (X. 'BECKWITH CON         000112           00207         64*         48         FORMAT (/X. 'RENALL TURBULENCE MODEL')<						
00164         44•         IPCON-PRT         000053           00155         4*         IPCON-PRT         000055           00170         50*         45         FORMAT (/1X, "VARIABLE TUBBULENT PRANDTL NUMBER IN USE//IX, 000064           00170         51*         4         FORMAT (/1X, "TUBBULENT SCHMOT NUMBER SCT *: IPE13.6/1X, 000072           00175         53*         44         FORMAT (/1X, "TUBBULENT SCHMOT NUMBER SCT *: IPE13.6/1X, 000072           00176         55*         GD TD 2005         000072           00176         55*         GD TD 2005         000072           00176         56         CD SECKWITH-BUSHNELL TUBBULENCE MODEL         0000072           00176         57         2003         DE = ELCON/CLNUM         000074           00201         59*         GB SECK-CLNUM         0000100         000102           00201         59*         GB SECK-CLNUM         000112         000112           00202         60*         WRITE (6,48)         BECK*CLNUM         000112           00207         61*         15.6/1X, "IDBULENT PARDUTL NUMBER PRT *: LEI3.6/1         000112           00207         62*         15.6/1X, "IDBULENT PARDUTL NUMBER PRT *: LEI3.6/1         000112           00207         22*         15.6/1				, ,		
00165         49-         WRITE (6,46) TPCON         000065           00170         50-         46         FORMAT (//X, 'VARIABLE TURBULENT PRANDTL NUMBER IN USE'/1X, 000064           00170         51-         1         'TURBULENT PRANDTL CONSTANT *', IPE13.6)         0000064           00171         52-         43         NORMAT (//X) SCT.RETR         000072           00176         55-         G ID 20005         000072           00176         55-         C         BCCKWITH-BUSHWELL TURBULENCE MODEL         0000072           00176         55-         C         BCCKWITH-BUSHWELL TURBULENCE MODEL         0000074           00200         58-         BCECKCLAUM         0000074         0000074           00200         58-         CBECK (-LCON, PRT         0000102         000074           00207         63-         48         FORMAT (/1X, 'RECKWITH-BUSHWELL TURBULENCE MODEL'//1X, 'RECKWITH-CON         000112           00207         63-         2 E13.6/1X, 'TURBULENT PRANDT NUMBER PRT *', E13.6         000112         000112           00207         63-         2 E13.6/1X, 'TURBULENT PRANDT NUMBER PRT *', E13.6         000112         000112           00207         63-         2 E13.6/1X, 'TURBULENT PRANDT NUMBER PRT *', E13.6         000112						
CO1TO         50*         46         FORMAT (/ XX, 'VARIABLE TURBULENT PRANDT, NUMBER IN USE / IX,         CO00064           C01TO         51*         1         'TURBULENT PRANDT, CONSTANT =', IPE13.6)         CO00064           C01TS         53*         43         WRITE (6, 44) SCT, RETR         CO00064           C01TS         54*         TURANSTITION MON, THICK, RETR         CO00072           C01T6         55*         C         BECKUTTH BUSINELT UNBULENCE MODEL         CO00072           C01T6         55*         C         BECKUTTH BUSINELT UNBULENCE MODEL         CO00072           C0200         55*         CBECK = 26.0         CO000076         CO00076           C0201         55*         BECKUTTH BUSINELT UNBULENCE MODEL         CO0112         CO00076           C0202         61*         48         FORMAT (/ 1X, 'RECKUTTH-BUSINELT UNBULENCE MODEL '// 1X, 'BECKWITH CON         CO0112           C0207         61*         48         FORMAT (/ 1X, 'RECKUTTH-BUSINELT UNBULENCE MODEL '// 1X, 'BECKWITH CON         CO0112           C0207         64*         GO TO 2005         CO0112         CO0112           C0214         66*         C         KINANDL TURBULENCE MODEL ')         CO0123           C0214         66*         C         KINANDL TUNBULENCE MO						
00170         51*         1         'TURBULENT PRANDTL CONSTANT         *', 1PE13.6}         000064           00171         52*         43         FORMAT (/1X, 'TURBULENT SCHNDT NUMBER SCT *', 1PE13.6/1X,         0000072           00175         53*         44         FORMAT (/1X, 'TURBULENT SCHNDT NUMBER SCT *', 1PE13.6/1X,         0000072           00175         53*         G0 TO 2005         0000072         0000072           00176         55*         G0 TO 2005         0000072         0000072           00176         55*         G0 TO 2005         0000072         0000074           00200         56*         Call (X, 'MURDUENT SCHNDEL // URBULENT SCHNDEL // /1X, 'BECKNTTH 0000010         0000076           00201         56*         Call (A) BECK*CLOMM         000102         00012           00207         64*         FORMAT (/1X, 'BECKNTH-BUSTNELL TURBULENCE MODEL '/1X, 'BECKNTTH CON         000112           00207         64*         WRITE (6, 44) SCT, RETR         000112         000112           00207         64*         WRITE (6, 44) SCT, RETR         000112         000112           00215         64*         WRITE (6, 44) SCT, RETR         000112         00012           00216         64*         WRITE (6, 42) ELCON, YAP, CLNUM         000127 </td <td></td> <td></td> <td>46</td> <td></td> <td></td> <td></td>			46			
00171         52*         43         WRITE (6,44) SCT, RETR         000064           00175         54*         1         TRANSITION MOM. THICK. RETR         *, 1P13.6/1X,         000072           00175         54*         1         TRANSITION MOM. THICK. RETR         *, 213.6)         0000072           00176         56*         C         BECKWITH-BUSHNELL TURBULENCE MODEL         000072           00176         55*         C         BECKWITH-BUSHNELL TURBULENCE MODEL         000072           00201         59*         BECKWITH-BUSHNELL TURBULENCE MODEL ///1X,*BECKWITH CON         000100           00201         59*         BECKWITH-BUSHNELL TURBULENCE MODEL ///1X,*BECKWITH CON         000112           00201         64*         KRITE (6, 48)         BECKWITH-BUSHNELL TURBULENCE MODEL //1X,*BECKWITH CONSTANT ELCON */.         000112           00207         64*         KRITE (6, 44)         SCT, RETR         000112         00012           00214         66*         GO TO 2005         00012         00012         00012           00215         67*         2004         WRITE (6, 44)         SCT, RETR         00013           00215         67*         2004         WRITE (6, 44)         SCT, RETR         000013           00224						
00175         54         44         FDRMAT (/ix,'TURBULENT SCHMDDT NUMBER SCT *', IPE13.6/1X,         000072           00175         54         1         'TRANSITION MON. THICK. RETR *', E13.6)         000072           00176         55*         CD 10 2005         000072         000072           00176         55*         CD 10 2005         000072         000072           00175         57*         2003         DB * ELCON/CLNUM         0000072           00175         57*         2003         DB * ELCON/CLNUM         000000           00201         55*         CD 10 2005         00000           00202         60*         WRITE (6, 48)         BECK.ELCON, PRT         00010           00207         62*         151AIT BECK.', 6X, '*', IPE13.6 (1X, 'MIXING LENGT MODEL /'/1X, 'EECKWITH CON         000112           00207         64*         WRITE (6, 44) SCT, RETR         000112         000112           00216         64*         WRITE (6, 44) SCT, RETR         000112         000112           00216         64*         WRITE (6, 44) SCT, RETR         000112         000127           00216         64*         WRITE (6, 44) SCT, RETR         000137         000137           00216         64*         9 <t< td=""><td></td><td>52*</td><td>43</td><td>WRITE (6,44) SCT.RETR</td><td>000064</td><td></td></t<>		52*	43	WRITE (6,44) SCT.RETR	000064	
00176         54*         1         'TRANSITION MOM. THICK. RETR =', E13.6)         000072           00176         55*         GO TO 2005         0016         55*         000072           00176         55*         C         BECKWITH-BUSHNELL TURBULENCE MODEL         000072           00175         5*         GD TO 2005         00016         000072           00175         5*         GD TO 2005         00016         000072           00176         5*         GD TO 2005         00016         000010           00200         6*         WETTE (6.4) BECK*, ELCON, PRT         000102         000112           00207         6*         48         FORMAT (/1X, 'BECKWITH-BUSHNELL TURBULENCE MODEL'//1X, 'BECKWITH CON         000112           00207         6*         2. E13.6/1X, 'TURBULENCE MODEL         000112         000112           00210         6*         WRITE (6.44) SCT, RETR         000112         000123           00217         6*         49         FORMAT (/1X, 'EECOM, TAP, CLMM         000123           00216         6*         49         FORMAT (/1X, 'EECOM, TAP, CLMM         000123           00217         6*         49         FORMAT (/1X, 'EECOM, TAP, CLMM         000137           002237	00175					
0011/         5/1         2003         DB = ELCUNYLENDM         000074           00200         59         DBECK - CLAM         000076           00201         69         WRITE (6, 48) BBECK ELCON_PRT         000012           00207         62         15TANT BBECK (8x, '') PE13.6(1X, 'MIKTUNG LENGTH CONSTANT ELCON -'.         000112           00207         62         15TANT BBECK (6x, '') PE13.6(1X, 'MIKTUNG LENGTH CONSTANT ELCON -'.         000112           00207         62         15TANT BBECK (6x, '-') PE13.6(1X, 'MIKTUNG LENGTH CONSTANT ELCON -'.         000112           00216         64         WRITE (6, 44) SCT, RETR         00012           00216         64         WRITE (6, 49)         000123           00217         68         49         FORMAT (/1X, 'RECNUM         000127           00220         69         WRITE (6, 40, 2) ELCON VAP, CLNM         000127           00221         67         2004         WRITE (6, 40, 2) ELCON VAP, CLNM         000127           00223         70*         WRITE (6, 40) SCT, RETR         000137           00230         71*         WRITE (6, 41) SCT, RETR         000145           00231         72*         2005         ELCON         000145           00232         70*	00175	54*	•	1 'TRANSITION MOM. THICK. RETR =',E13.6)	000072	
0011/         5/1         2003         DB = ELCUNYLENDM         000074           00200         59         DBECK - CLAM         000076           00201         69         WRITE (6, 48) BBECK ELCON_PRT         000012           00207         62         15TANT BBECK (8x, '') PE13.6(1X, 'MIKTUNG LENGTH CONSTANT ELCON -'.         000112           00207         62         15TANT BBECK (6x, '') PE13.6(1X, 'MIKTUNG LENGTH CONSTANT ELCON -'.         000112           00207         62         15TANT BBECK (6x, '-') PE13.6(1X, 'MIKTUNG LENGTH CONSTANT ELCON -'.         000112           00216         64         WRITE (6, 44) SCT, RETR         00012           00216         64         WRITE (6, 49)         000123           00217         68         49         FORMAT (/1X, 'RECNUM         000127           00220         69         WRITE (6, 40, 2) ELCON VAP, CLNM         000127           00221         67         2004         WRITE (6, 40, 2) ELCON VAP, CLNM         000127           00223         70*         WRITE (6, 40) SCT, RETR         000137           00230         71*         WRITE (6, 41) SCT, RETR         000145           00231         72*         2005         ELCON         000145           00232         70*		55*		GD TO 2005	000072	
0010         5/1         2003         DB = ELCURY_CLOUM         000074           00201         59         CEECK-CLOW         000076           00202         60+         WRITE (6,48)         BBECK (ELCON_PRT         000112           00207         62+         ISTANT BBECK (SK, 'r=', 'PE13, 6/1X, 'MEXTH CONSTANT ELCON ='.         000112           00207         62+         ISTANT BBECK (SK, 'r=', 'PE13, 6/1X, 'MEXTH GLENGTH CONSTANT ELCON ='.         000112           00207         62+         ISTANT BBECK (SK, 'r=', 'PE13, 6/1X, 'MEXTH GLENGTH CONSTANT ELCON ='.         000112           00207         63+         2, E13, 6/1X, 'TURBULENCE MODEL         000112           00214         66+         GO TO 2005         00012           00215         67+         2004 WRITE (6,49)         000127           00216         64+         WRITE (6,49)         000127           00220         69+         WRITE (6,40) ELCON AP, CLNM         000127           00223         70+         WRITE (6,40) ELCON         00014           00234         72+         2005         DELCON = CLNM         000145           00234         72+         IF (NETE GT, 0.0)         NG10 = -1         ANK 4/83         000163           00247         75+			С	BECKWITH-BUSHNELL TURBULENCE MODEL	000072	
00201         59*         BBECK*CLNUM         000100           00202         60*         WRTTE (6, 49)         BECK, ELCON, PRT         000102           00207         61*         48         FORMAT (/1X, 'BECKWITH-BUSHNELL TURBULENCE MODEL//1X, 'BECKWITH CON         000112           00207         63*         2 E13.6/1X, 'TURBULENT PRANDTL NUMBER PRT *', E13.6)         000112           00216         64*         WRITE (6, 44)         SCT, RETR         000121           00216         66*         C KENDALL TURBULENCE MODEL         000121           00215         67*         2004         WRITE (6, 49)         000127           00225         69*         WRITE (6, 45)         PRT         000137           00234         71*         WRITE (6, 45)         PRT         000137           00235         73*         DCLNUM = CLNUM         000155         000160           00247         75*         K010 = 1         ANK 4/83         000160           00247         75*         K010 = 1         ANK 4/83         000162           00247         75*         K010 = 1         ANK 4/83         000162           00247         75*         K010 = 1         ANK 4/83         000162           002426			2003	DB = ELCON/CLNOM	000074	
00207         61*         48         FORMAT (/1x, 'BECKWITH-BUSHNELL TURBULENCE MODEL//1x, 'BECKWITH CON         000112           00207         63*         2         E13.6/1X, 'TURBULENT PRANDTL NUMBER PRT *',E13.6)         000112           00210         64*         WRITE (6, 44) SCT, RETR         000112         000112           00214         65*         G0 TO 2005         000112         000112           00215         67*         2004         WRITE (6, 49)         000123           00216         64*         WRITE (6, 42) SCT, RETR         000123           00225         67*         2004         WRITE (6, 42) LCON, YAP, CLNUM         000127           00226         69*         WRITE (6, 42) SCT, RETR         000137         000145           00230         71*         WRITE (6, 42) SCT, RETR         000155         000150           00234         72         2005 BELCON         000156         000150           00235         73*         DELNUM         2         ANK 4/83         000160           00247         75*         K010 = 1         ANK 4/83         000161           00246         76*         FER GRITA . T 1.999) KQ10 = RETR - 10.010         ANK 4/83         00017           00244         76* <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
00207         61*         48         FORMAT (/1x, 'BECKWITH-BUSHNELL TURBULENCE MODEL//1x, 'BECKWITH CON         000112           00207         63*         2         E13.6/1X, 'TURBULENT PRANDTL NUMBER PRT *',E13.6)         000112           00210         64*         WRITE (6, 44) SCT, RETR         000112         000112           00214         65*         G0 TO 2005         000112         000112           00215         67*         2004         WRITE (6, 49)         000123           00216         64*         WRITE (6, 42) SCT, RETR         000123           00225         67*         2004         WRITE (6, 42) LCON, YAP, CLNUM         000127           00226         69*         WRITE (6, 42) SCT, RETR         000137         000145           00230         71*         WRITE (6, 42) SCT, RETR         000155         000150           00234         72         2005 BELCON         000156         000150           00235         73*         DELNUM         2         ANK 4/83         000160           00247         75*         K010 = 1         ANK 4/83         000161           00246         76*         FER GRITA . T 1.999) KQ10 = RETR - 10.010         ANK 4/83         00017           00244         76* <td></td> <td>59*</td> <td></td> <td>BBECK=CLNUM</td> <td></td> <td></td>		59*		BBECK=CLNUM		
00207         62*         1STANT BBECK', 6X, '=', 1PE13.6/1X, 'MIXING LENGTH CONSTANT ELCON ='.         000112           00207         63*         2 E13.6/1X, 'TURBULENT PRANDT NUMBER PRT =', E13.6/1         000112           00214         66*         GG TO 2005         000112           00214         66*         GG TO 2005         000121           00215         67*         2004         WRITE (6, 49)         000123           00216         66*         WRITE (6, 42)         1CLON, YAP, CLNUM         000123           00215         67*         2004         WRITE (6, 42)         1CLON, YAP, CLNUM         000127           00220         69*         WRITE (6, 42)         SCT, RETR         000145         000145           00230         71*         WRITE (6, 43) SCT, RETR         000145         000145           00235         73*         DCLONM = CLNUM         000156         00237           00234         72*         2005         DCLONM = CLNUM         000163           00247         74*         IF (RETR .GT. 0.0)         K010 = -1         ANK 4/83         000163           00244         76*         IF (RETR .GT. 0.0)         K010 = RETR - 10.010         ANK 4/83         000172           00244         78*<				WRITE (6,48) BBECK, ELCON, PRT	000102	
00207         63*         2 E13.6/1X, 'TURBULENT PRANDTL NUMBER PRT *', E13.6)         000112           00210         64*         WRITE (6,44) SCT.RETR         000121           00214         65*         G0 TD 2005         000121           00215         67*         2004         WRITE (6,49)         000123           00217         68*         49         FORMAT (/1X, 'RENDALL TURBULENCE MODEL')         000127           00220         69*         WRITE (6,42). ELCON, YAP, CLNUM         000137           002217         64*         49         FORMAT (/1X, 'RENDALL TURBULENCE MODEL')         000137           00225         70*         WRITE (6,43) SCT, RETR         000137         000145           00234         72*         2005         DELCON         000145           00235         73*         COLNUM = CLNUM         000163           00240         74*         IFLOW = I         2         ANK 4/83         000163           00242         77*         IF (RETR dT. 0.0) K010 = RETR - 10.010         ANK 4/83         000207           00244         79*         C***** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         000207           00244         79*         C***** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,) <td></td> <td>••••••••</td> <td>48</td> <td>FORMAT (/1X, 'BECKWITH-BUSHNELL TURBULENCE MODEL'//1X, 'BECKWITH CON</td> <td>000112</td> <td></td>		••••••••	48	FORMAT (/1X, 'BECKWITH-BUSHNELL TURBULENCE MODEL'//1X, 'BECKWITH CON	000112	
00210         64*         WRITE (6,44) SCT,RETR         000112           00214         65*         GD TO 2005         000121           00215         67*         2004         WRITE (6,49)         000123           00217         68*         49         FORMAT (/1X, 'KENDALL TURBULENCE MODEL')         000127           00220         69*         WRITE (6,42) ECON, YAP, CLNUM         000127           00225         70*         WRITE (6,43) ECT, RETR         000137           00230         71*         WRITE (6,44) SCT, RETR         000155           00234         72*         2005         DELCON         000155           00235         73*         DCLNUM = CLNUM         000156         000160           00236         74*         IFLOW 12         ANK 4/83         000163           00240         75*         K010 = 1         ANK 4/83         000163           00241         78*         RETR GT. 0.0)         K010 = RETR - 10.010         ANK 4/83         000163           00244         78*         RETURN         000207         000213           00244         78*         RETR dt. 0.0         AND AM(1,)         0002013           00245         81*         C         INTERNT				A FAR CAN ATURDU ENT RRANDTI NUMBER POT AL FAR CO	000440	
00214         65+         G0 T0 2005         000121           00214         66+         C KKDALL TURBULENCE MODEL         000123           00215         67+         2004         WRITE (6,49)         000127           00220         69+         49         FORMAT (/1X, 'KENDALL TURBULENCE MODEL')         000127           00220         69+         49         FORMAT (/1X, 'KENDALL TURBULENCE MODEL')         000137           00225         70+         WRITE (6,43) ELCON, YAP, CLNUM         000137         000145           00234         72+         2005         DELCON         000155           00235         73+         0CLNUM = CLNUM         000156           00236         74+         IFLOW - 2         ANK 4/83         000160           00240         76+         IF (RETR CT. 0.0) KQ10 = -1         ANK 4/83         000172           00242         77+         IF (RETR CT. 0.0) KQ10 = RETR - 10.010         ANK 4/83         000172           00244         78+         C++++ CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         000207           00245         80+         1002 I WK = 0         000213         000213           00245         81+         C         INTERMITTANCY CORRECTIONS         000213						
00214         66+         C         KKNDALL TURBULENCE MODEL         000121           00215         67+         2004         WEITE (6,43)         000123           00220         68+         49         FORMAT (/1x, 'KENDALL TURBULENCE MODEL')         000127           00220         69+         WEITE (6,42) ELCON, YAP, CLNUM         000137           00230         71+         WEITE (6,43) PET         000145           00234         72+         2005         DELCON = ELCON         000155           00235         73+         OCLNUM = CLNUM         000160           00236         74+         IFLOW = 1FLOW - 2         ANK 4/83         000160           00240         76+         IF (RETR .GT. 0.0) KQ10 = -1         ANK 4/83         000165           00242         77+         IF (RETR .GT. 0.0) KQ10 = -1         ANK 4/83         000172           00244         79+         C+*** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         000207           00244         79+         C+ IF (RETR .GT. 0.0) AND. I .GT. KAPPA)         VINTR(1) = 1.0 - (ETA(I) - 000213           00245         80+         1002         Iwk = 0         000213           00245         80+         1002         Iwk = 0         0002213 <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td>	-					
00215         67*         2004         WRITE (6, 49)         000123           00217         68*         49         FORMAT (/1X, *KENDALL TURBULENCE MODEL')         000127           00220         69*         WRITE (6, 42) ELCON, YAP, CLNUM         000127           00225         70*         WRITE (6, 42) ELCON, YAP, CLNUM         000137           00230         71*         WRITE (6, 44) SCT, RETR         000145           00237         73*         DCLNUM = CLNUM         000156           00238         74*         IFLOW = IFLOW - 2         ANK 4/83         000163           00237         75*         KQ10 = 1         ANK 4/83         000163           00240         76*         IF (RETR .LT1.999) KQ10 = RETR - 10.010         ANK 4/83         000172           00244         78*         RETURN         000207         000213           00244         78*         RETURN         000207         000213           00244         78*         RETURN         000213         000213           00244         78*         C         INTERGITIONS         000213           00245         81*         C         INTERCITIONS         000213           00252         85*         1 <td< td=""><td>**********************</td><td>••••••••••• •••••••••</td><td></td><td></td><td></td><td></td></td<>	**********************	••••••••••• •••••••••				
00217         68*         49         FORMAT (/1X, 'KENDALL TURBULENCE MODEL')         000127           00220         69*         WRITE (6,42) ELCON, YP, CLNUM         000137           00230         71*         WRITE (6,43) PRT         000145           00234         72*         2005         DELCON = ELCON         000155           00235         73*         DCLNUM = CLNUM         000156           00236         74*         IFLOW = IFLOW - 2         ANK 4/83         000160           00237         75*         K010 = 1         ANK 4/83         000165           00240         76*         IF (RETR .GT. 0.0) K010 = -1         ANK 4/83         000165           00242         77*         IF (RETR .LT1.999) K010 = RETR - 10.010         ANK 4/83         000172           00244         79*         C**** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         000207           00244         79*         C**** CALCULATES EPS2/NUE AND I.S DERIVITIVES AS DVS AND AM(1,)         000213           00245         80*         1002 I WK = 0         000213         000221           00245         81*         C         INTERITTANCY CORRECTIONS         000213           00245         82*         D0 13 I = 1, NETA         000223			2004	KENUALL JURBULENUE MUUEL		
00220         69+         WRITE (6,42) ELCON, YAP, CLNUM         000127           00225         70+         WRITE (6,43) SCT, RETR         000145           00234         72+         2005         DELCON         ELCON           00235         73+         DCLNUM = CLNUM         000155           00236         74+         IFLOW = 1FLOW - 2         ANK 4/83         000160           00237         75+         KQ10 = 1         ANK 4/83         000163           00242         76+         IF (RETR .GT. 0.0)         KQ10 = RETR - 10.010         ANK 4/83         000172           00244         78+         RETURN         000207         000217         000217           00244         78+         RETURN         000207         000213           00244         78+         CLULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         000207           00245         80+         1002         IWK = 0         000213           00245         81+         C         INTERMITTANCY CORRECTIONS         000213           00251         83+         VINTR(I) = 1.0         000213         000213           00252         85+         1 ETA(KAPPA)/(ETA(NETA) - ETA(KAPPA))         000221           00252			2004	WRITE (0.49) EODMAT (//V /VENDALL THDRILENCE MODEL/)		
00225         70*         WRITE (6,45) PRT         000137           00230         71*         WRITE (6,45) PRT         000145           00234         72*         2005         DELCON = ELCON         000155           00235         73*         DCLNUM = CLNUM         000166           00236         74*         IFLOW = IFLOW = I         000165           00237         75*         K010 = 1         ANK 4/83         000165           00240         76*         IF (RETR .GT. 0.0) K010 = -1         ANK 4/83         000122           00244         77*         IF (RETR .GT1.999) K010 = RETR - 10.010         ANK 4/83         000207           00244         79*         C**** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         000207           00245         80*         1002         IWK = 0         000213           00245         10*         IWRMITIC (D. AND. I.GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231           00246         82*         D0 13 I = 1, NETA         000213           00251         83*         IT C(BECK . LE. 0.0 .AND. I.GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231           00252         84*         13 IF (CBECK . LE. 0.0 .AND. I.GT. KAPPA)         000253           00255         86*         SALPH = 1.0 </td <td></td> <td>60+</td> <td></td> <td>WATTE (6 42) ELCON VAD CLANINA</td> <td></td> <td></td>		60+		WATTE (6 42) ELCON VAD CLANINA		
00230         71*         WRITE (6, 44) SCT, RETR         000145           00234         72*         2005         DELCON         000155           00235         73*         DCLNUM = CLNUM         000156           00236         74*         IFLOW = IFLOW - 2         ANK 4/83         000163           00237         75*         KQ10 = 1         ANK 4/83         000163           00240         76*         IF (RETR .GT. 0.0) KQ10 = RETR - 10.010         ANK 4/83         000172           00244         78*         RETURN         ERTUR .LT1.999) KQ10 = RETR - 10.010         ANK 4/83         000172           00244         78*         C**** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         000207           00245         80*         1002 IW = 0         000213         000213           00245         81*         C         INTERMITTANCY CORRECTIONS         0002213           00246         82*         D0 I I I = 1.0         0002213         000213           00252         84*         13 IF (CBECK .LE. 0.0 .AND. I.GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231         000251           00255         86*         SALPH = 1.0         0002213         000255           00256         87*         IF(ILAMIN.EQ.0)GO TO 39						
00234       72*       2005       DELCON = ELCON       000155         00235       73*       DCLNUM = CLNUM       000156         00237       75*       K010 = 1       ANK 4/83       000160         00237       75*       K010 = 1       ANK 4/83       000165         00240       76*       IF (RETR .GT. 0.0)       K010 = -1       ANK 4/83       000165         00242       77*       IF (RETR .LT1.999)       K010 = RETR - 10.010       ANK 4/83       000172         00244       78*       RETURN       000207       00241       000207         00244       78*       RETURN       000207       000213         00244       78*       RETURN       000207       000213         00245       80*       1002       IKK = 0       000213         00246       82*       D0 13 I = 1.NETA       000213       000213         00251       83*       VINTR(I) = 1.0       000213       000213         00252       85*       1       ETA(KAPPA)/(ETA(KAPPA))       000253         00255       86*       SALPH = 1.0       000253       000255         00260       88*       IF(ILAMI.EQ.1)GO TO 29       NEW000257		74		WRITE (C AA) COT RETR		
00235         7.3*         DCLNM = CLNM         000156           00236         7.4*         IFLOW = 11C0W - 2         ANK 4/83         000163           00240         7.5*         KQ10 = 1         ANK 4/83         000163           00242         7.7*         IF (RETR .GT. 0.0) KQ10 = RETR - 10.010         ANK 4/83         000172           00244         78*         RETURN         000207         000213           00245         80*         1002 IWK = 0         000213         000213           00245         81*         C         INTERMITTANCY CORRECTIONS         000213           00251         83*         VINTR(1) = 1.0         000221         000231           00252         85*         1         ECA(KAPPA)/(ETA(NETA) - ETA(KAPPA) VINTR(1) = 1.0 - (ETA(1) - 000231           00252         85*         1         ETA(KAPPA)/(ETA(NETA) - ETA(KAPPA))         000253           00255         86*         SALPH = 1.0         000253         000253           00260         88*         IF(ILAMIN.EQ.0)GO TO 39         NEW000255           00260         88*         IF(ILAMIN.EQ.1)/(ACCPK2-ACCPK1)         NEW000255           00263         90+         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000272		72*	2005	DELCON = FLCON		
00236       74*       IFLOW = IFLOW - 2       ANK 4/83       000160         00237       75*       KQ10 = 1       ANK 4/83       000163         00240       76*       IF (RETR .GT. 0.0) KQ10 = -1       ANK 4/83       000165         00242       77*       IF (RETR .LT1.999) KQ10 = RETR - 10.010       ANK 4/83       000172         00244       79*       C**** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)       000207         00245       80*       1002       IWK = 0       000213         00246       82*       D0 13 I = 1,NETA       000213         00251       83*       VINTR(I) = 1.0       000227         00252       84*       13 IF (CBECK .LE 0.0 .AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231         00255       87*       1 ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))       000255         00256       87*       IF (ILAMIN.EQ.0)GO TO 39       NEW000255         00260       88*       IF (ILAM.EQ.1) GO TO 29       NEW000257         00263       90*       29       SALPH = 1(ACCPK1)/(ACCPK2-ACCPK1)       NEW000257         00264       91*       SPCT=SALPH + 100.       (1 SALPH) × 100.       NEW000275         00263       90*       29       SALPH = 1(ACCPK-ACCPK1)/(ACC					000156	
OO237         7.5*         K010 = 1         ANK 4/83         OO0163           OO240         76*         IF (RETR .GT. 0.0) K010 = -1         ANK 4/83         OO0165           OO242         77*         IF (RETR .LT1.999) K010 = RETR - 10.010         ANK 4/83         OO0207           OO244         78*         RETURN         OO0207         OO244         78*         CALCULATES EP52/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         OO0207           OO245         80*         1002         IWK = 0         OO0213         OO0213           OO245         81*         C         INTERMITTANCY CORRECTIONS         OO0213           OO251         83*         VINTR(I) = 1.0         OO02213         OO02213           OO252         84*         13         IF (CEBECK .LE. O.O. AND. I.GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - O00231         OO02231           OO255         86*         SALPH = 1.0         OO0253         OO255           OO266         87*         IF (ILAMIN.EQ. 1)GO TO 39         NEW000257           OO262         89*         GO TO 39         NEW000262           OO263         90*         29         SALPH=1 (ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000275           OO264         91*         SPCT=SALPH=1.00.         (1 SALP			•••••••	IFLOW = IFLOW - 2 ANK 4/83	000160	
00240       76*       IF (RETR .GT. 0.0) K010 = -1       ANK 4/83       000165         00242       77*       IF (RETR .LT1.999) K010 = RETR - 10.010       ANK 4/83       000172         00244       78*       RETURN       OCO207       000207         00244       79*       C***** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)       000207         00245       81*       C       INTERMITTANCY CORRECTIONS       000213         00246       82*       D0 13 I = 1, NETA       000227         00251       83*       VINTR(I) = 1.0       0002213         00252       84*       13 IF (CBECK .LE. 0.0 AND. I.GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231         00255       85*       1 ETA(KAPPA)/(ETA(NETA) - ETA(KAPPA))       000253         00256       87*       IF(ILAMIN.EQ.0)GD TD 39       NEW000255         00266       88*       IF(ILAMIN.EQ.1)GD TD 29       NEW000257         00263       90* 29       SALPH = 1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)       NEW000264         00264       91*       SPCT=SALPH+300.       (I - SALPH), N L00.       NEW000275         00265       92*       39       CONTINUE       NEW000275       NEW000275         00266       93*       IF (S(IS).LT. 2.0*STURB) SALPH = S(I		76+			000163	
00242       77*       IF (RETR .LT1.999) KQ10 = RETR - 10.010       ANK 4/83       000172         00244       78*       RETURN       000207         00244       79*       C**** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)       0000207         00245       80*       1002       IWK = 0       000213         00245       81*       C       INTERMITTANCY CORRECTIONS       000213         00251       83*       VINTR(1) = 1.0       000227         00252       84*       13       IF (CBECK .LE. 0.0 .AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231         00252       84*       13       IF (CBECK .LE. 0.0 .O. AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231         00255       86*       SALPH = 1.0       000253         00256       87*       IF (ILAMIN.EQ.0)GD TD 39       000255         00266       88*       IF (ILAMIN.EQ.0)GD TD 29       NEW000257         00262       89*       GD TO 39       NEW000262         00264       91*       SPCT=SALPH=1.0.       (I.cCPK-ACCPK1)         00264       91*       SPCT=SALPH=1.0.       NEW000262         00263       90*       29       SALPH=1(ACCPK-ACCPK1)       NEW000264         00264       91*			•••••••	IF (RETR .GT. 0.0) K010 = -1 ANK 4/83	3 000165 <b>'</b>	s
O0244         78*         RETURN         O00207           O0244         79*         C*****         CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)         O00207           O0245         80*         1002         IWK = 0         O00213           O0246         82*         D0 13 I = 1,NETA         O00213           O0251         83*         VINTR(I) = 1.0         O00227           O0252         84*         13 IF (CBECK .LE. O.O .AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231           O0255         85*         1         ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))         O00221           O0256         87*         IF(ILAMIN.EQ.O)GD TO 39         000253           O0260         88*         IF(ILAMI.EQ.1)GO TO 29         NEW000257           O0262         89*         GD TO 39         NEW000262           O0264         91*         SPCT=SALPH*100. (1 SALPH) × LOQ.         NEW000264           O0265         92*         39         CONTINUE         NEW000275           O0266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           O0267         92*         39         CONTINUE         000275           O0268         92*         1F (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB -		77*		IF (RETR .LT1.999) KQ10 = RETR - 10.010 ANK 4/83	000172	
00245         80*         1002         IWK = 0         000213           00245         81*         C         INTERMITTANCY CORRECTIONS         000213           00246         82*         D0 13 I = 1,NETA         000213           00251         83*         VINTR(I) = 1.0         000217           00252         84*         13         IF (CBECK .LE. O.O .AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231           00252         85*         1         ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))         000213           00255         86*         SALPH = 1.0         000231           00256         87*         IF(ILAMIN.EQ.O)GO TD 39         NEW000255           00260         88*         IF(ILAMIN.EQ.I)GO TO 29         NEW000262           00262         89*         GO TO 39         NEW000262           00264         91*         SPCT=SALPH=100.         (1 SALPH) × 100.         NEW000264           00265         92*         39         CONTINUE         NEW000272         NEW000275           00266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         0000275         000275           00270         94*         ELCON = DELCON*SQRT(SALPH)         000310         0000310           00271	00244	78*		RETURN		
00245         81*         C         INTERMITTANCY CORRECTIONS         000213           00246         82*         D0 13 I = 1,NETA         000213           00251         83*         VINTR(I) = 1.0         000213           00252         84*         13 IF (CBECK, LE. O.O. AND. I.GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) -         000231           00252         85*         1         ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))         000213           00255         86*         SALPH = 1.0         000253         000253           00256         87*         IF(ILAMIN.EQ.O)GO TD 39         000255           00262         89*         GO TD 39         NEW000257           00263         90*         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000262           00264         91*         SPCT=SALPH+100.         (1 SALPH), X.IQQ+.         NEW000275           00266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SORT(SALPH)         000316           00271         95*         TPCON * SORT(SALPH)         000316           00272         96*         BECK = DCLNUM*SORT(SALPH)         000321           00273         97*         CLNUM	00244	79*	C****	CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,)	000207	
00246         82*         D0 13 I = 1,NETA         000213           00251         83*         VINTR(I) = 1.0         000227           00252         84*         13 IF (CBECK . LE. O.O .AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) -         000231           00252         85*         1         ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))         000231           00255         86*         SALPH = 1.0         000253           00256         87*         IF (ILAMIN.EQ.0)GO TD 39         000255           00260         88*         IF (ILAMI.EQ.1)GO TO 29         NEW000255           00263         90*         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000262           00264         91*         SPCT=SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000272           00265         92*         39         CONTINUE         NEW000272           00264         91*         SPCT=SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000272           00265         92*         39         CONTINUE         NEW000275           00266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SORT(SALPH)         000310           00271         95* <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td></td<>						
00246         82*         D0 13 I = 1,NETA         000213           00251         83*         VINTR(I) = 1.0         000227           00252         84*         13 IF (CBECK . LE. 0.0 . AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) -         000223           00252         85*         1         ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))         00021           00255         86*         SALPH = 1.0         000253           00256         87*         IF(ILAMIN.EQ.O)GD TD 39         000253           00260         88*         IF(ILAMI.EQ.1)GO TD 29         NEW000257           00262         89*         GD TO 39         NEW000262           00263         90*         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000262           00264         91*         SPCT=5ALPH+100.         (1 SALPH).X.LOO.         NEW000275           00265         92*         39         CDNTINUE         NEW000275           00266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SORT(SALPH)         000310           00271         95*         TPCON = TPCON*SORT(SALPH)         000310           00272         96*         BEECK = DCLNUM*SORT(SALPH)	· · · · · · · · · · · · · · · · · · ·	81*				
00252       84*       13       IF (CBECK . LE. O.O . AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231         00252       85*       1       ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))       000231         00255       86*       SALPH = 1.0       000253         00256       87*       IF (ILAMIN.EQ.O)GO TO 39       NEW000255         00260       88*       IF (ILAM.EQ.1)GO TO 29       NEW000257         00262       89*       GO TO 39       NEW000262         00264       91*       SPCT=SALPH+1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)       NEW000264         00265       92*       39       CONTINUE       NEW000275         00266       93*       IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0       000275         00270       94*       ELCON = DELCON*SQRT(SALPH)       000316         00271       95*       TPCON = TPCON*SQRT(SALPH)       000316         00272       96*       BBECK = DCLNUM*SQRT(SALPH)       000321         00273       97*       CLNUM = DCLNUM*SALPH       000324		82*				
00252       84*       13       IF (CBECK . LE. O.O .AND. I .GT. KAPPA) VINTR(I) = 1.0 - (ETA(I) - 000231         00252       85*       1       ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))       000231         00255       86*       SALPH = 1.0       000253         00256       87*       IF (ILAMIN.EQ.O)GD TD 39       NEW000255         00260       88*       IF (ILAM.EQ.1)GO TO 29       NEW000257         00262       89*       GD TO 39       NEW000262         00263       90*       29       SALPH=1 (ACCPK-ACCPK1)/(ACCPK2-ACCPK1)       NEW000262         00264       91*       SPCT=SALPH=100. (1 SALPH) + 100.       NEW000272         00265       92*       39       CONTINUE       NEW000275         00266       93*       IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0       000275         00270       94*       ELCON = DELCON*SQRT(SALPH)       000310         00271       95*       TPCON = TPCON*SQRT(SALPH)       000316         00272       96*       BBECK = DCLNUM*SQRT(SALPH)       000321         00273       97*       CLNUM = DCLNUM*SALPH       000324	************************			VINTR(I) = 1.0		
00255         86*         SALPH = 1.0         000253           00256         87*         IF(ILAMIN.EQ.0)GD TD 39         NEW000255           00260         88*         IF(ILAM.EQ.1)GD TD 29         NEW000257           00262         89*         GD TD 39         NEW000262           00263         90*         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000264           00264         91*         SPCT=SALPH*100.         (1 SALPH) * 100.         NEW000272           00265         92*         39         CONTINUE         NEW000272           00266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON*SQRT(SALPH)         000310           00271         95*         TPCON = TPCON*SQRT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324						
00256         87*         IF(ILAMIN.EQ.0)GD TD 39         NEW000255           00260         88*         IF(ILAM.EQ.1)GO TO 29         NEW000257           00262         89*         GD TO 39         NEW000262           00263         90*         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000264           00264         91*         SPCT=SALPH*100.         (1 SALPH) × 100.         NEW000272           00265         92*         39         CONTINUE         NEW000275           00266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SQRT(SALPH)         000310           00271         95*         TPCON = TPCON*SQRT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324				1 ETA(KAPPA))/(ETA(NETA) - ETA(KAPPA))		
00260         88*         IF (ILAM.EQ.1)G0 T0 29         NEW000257           00262         89*         GD T0 39         NEW000262           00263         90*         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000264           00264         91*         SPCT=SALPH+100. (1SALPH) × 100.         NEW000272           00265         92*         39         CONTINUE         NEW000275           00266         93*         IF (S(IS).LT.2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SQRT(SALPH)         000310           00271         95*         TPCON = TPCON*SQRT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324						
00262         89*         GO TO 39         NEW000262           00263         90*         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000264           00264         91*         SPCT=SALPH=100. (1 SALPH) × 100.         NEW000272           00265         92*         39         CONTINUE         NEW000275           00266         93*         IF (S(IS).LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SQRT(SALPH)         000310           00271         95*         TPCON = TPCON*SQRT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324						
00263         90*         29         SALPH=1(ACCPK-ACCPK1)/(ACCPK2-ACCPK1)         NEW000264           00264         91*         SPCT=SALPH=100. (1 SALPH) × 100.         NEW000272           00265         92*         39         CONTINUE         NEW000275           00266         93*         IF (S(IS).LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SQRT(SALPH)         000310           00271         95*         TPCON = TPCON*SQRT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324						
00264         91*         SPCT=SALPH*100. (1 SALPH) × 100.         NEW000272           00265         92*         39         CONTINUE         NEW000275           00266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SQRT(SALPH)         000310           00271         95*         TPCON = TPCON*SQRT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324					***************************************	
00265         92*         39         CONTINUE         NEW000275           00266         93*         IF (S(IS) .LT. 2.0*STURB) SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SORT(SALPH)         000310           00271         95*         TPCON = TPCON*SORT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SORT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324			29			
00266         93*         IF (S(IS) .LT. 2.0*STURB)         SALPH = S(IS)/STURB - 1.0         000275           00270         94*         ELCON = DELCON*SQRT(SALPH)         000310           00271         95*         TPCON = TPCON*SQRT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324			20	SPCI=SALPHISION (1 SALPH) + 100.		
00270         94*         ELCON = DELCON*SQRT(SALPH)         000310           00271         95*         TPCON = TPCON*SQRT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324			33	$\frac{1}{100} = \frac{1}{100} = \frac{1}$		
00271         95*         TPCON = TPCON*SORT(SALPH)         000316           00272         96*         BBECK = DCLNUM*SORT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324						
00272         96*         BBECK = DCLNUM*SQRT(SALPH)         000321           00273         97*         CLNUM = DCLNUM*SALPH         000324						
00273 97* CLNUM = DCLNUM*SALPH 000324						
		•••••••••••••••••••••••••••	COMME	CENOM - DELNOM-SALPH NT C2=-DEL/VMUE DHOVS=-DEL/VMUE*DHOV=-DED*DHOV/(BHOF*UE)		
	00275	20	COMMEN	VI C3-"DEL/VMCE , KINV3- DEL/VMCERKINV- REDERINV/(KINCEVE)	000327	

00274	99×	DEL = -C3M(IS) *VMUE(IS) ANK 8/83	000327
00275	100*	RED = -C3M(IS) * RHOE(IS) * UE(IS) ANK 8/83	000333
00276	101*	RC=RED*CLNUM	000337
00277	102*	PM = 0.0 ANK 5/83	000341
00300	103*	EPS1=0.	000342
00301	104*	DEPC=0.	000343
00302	105*	RHOVS≈C1*F(1,1)+HF(1,5)	000344
00303	106*	IF (RC .LT. 0.0) GO TO 75	000350
00305	107*	DADVP = RHOE(IS)/RHO(1)	000361
00306	108*	CAPY = DADVP/RHO(1) * RHOP(1)	000364
00307	109*	YDI=O.	000367
00310	110*	AF = 0.0	000370
00311	111*	BF = 0.0	000371
00312	112*	AM(1,1)=0.	000372
00313	113*	DADPP = (0.995 - CBAR)/(1.0 - CBAR)	000373
00314	114*	SALPH = 0.0	000401
00315	115*	VA = 0.0	000402
00316	116*	DVS=O.	000403
00317	117*	L = 117	000404
00320	118*	DO 66 I=1,NETA	000415
00323	119*	DO 3 K=1,NSP	000432
00326	120*	3 DRHOK(K-1) = AM(L,K+97)	000432
00330	121*	PPL = - CAPY	000434
00331	122*	DADA = DADVP	000436
00332	123*	ABECK = YDI	000440
00333	124*	EPS = BF	000442
00334	125*	ONK = RHOE(IS)/RHO(I)**2	000444
00335	126*	C10 = C7*F(1,2)	000452
00336	127*	C56 = F(I,2)/ALPH	000455
00337	128*	CRD=DRH0H+C10	000460
00340	129*	ACY = -VA	000462
00341	130*	IF (I.GE.NETA) GO TO 15	000464
00343	131*	DADVP = RHOE(IS)/RHO(I+1)	000470
00344	132*	CAPY = DADVP/RHO(I+1) * RHOP(I+1)	000474
00345	133*	PPL = PPL + CAPY	000477
00346	134*	YDI = DETA(I)/2.0*(DADVP + DADA + DETA(I)/6.0*PPL)	000501
00347	135*	SALPH = SALPH + YDI	000513
00350	136*	DUM1 = YDI*(F(I,3)/DADA - F(I+1,3)/DADVP)/6.0	000515
00351	137*	DUM2 = F(NETA,2) - (F(I,2) + F(I+1,2))/2.0	000525
00352	138*	DVS=DVS+YDI+(DUM2-DUM1/2.)	000532
00353	139*	VA = YDI**2	000537
00354	140*	ACY = ACY + VA	000542
00355	141*	AF = AF + DETA(I)/2.0*(DUM2 - DUM1)	000544
00356	142*	ABECK = ABECK + YDI	000552
00357	143*	BF = ALPH*DEL*DETA(I)/2.0	000555
00360	144*	IF (I .EQ. KAPPA) EPI = BF*DADPP	000562
00362	145*	IF (I .NE. KAPPA) EPS = EPS + BF	000570
00364	146*	15 DRHOI = - AF*DADA/RHO(I) - F(I,3)/12.0*ACY/RHOE(IS)	000577
00365	147*	IF(CBECK.GT.O.) GO TO 33	000611
00367	148*	DUM = AM(L,98)*DRHOI*RC	000613
00370	149*	AM(1,I+3) = AM(1,I+3) - RC*ABECK/2.0 + C7*DUM*F(I,2)	000616
00371	150*	IF (I .LE. 1) AM(1,3) = AM(1,3) - RC/DADA*ACY/12.0	000626
00373	151*	IF (I .GT. 1) CALL LIAD (-1,1,NETA-2+I,-RC/DADA*ACY/12.0)	000640
00375	152*	AM(1,1) = AM(1,1) - C7*DUM*F(1,2)**2/ALPH	000663
00376	153*	MPJ=MAT1J+1+I	000700
00377	154*	DD 60 K=NUL, NSPM1	000710
00402	155*	IF (K .GT. O) DUM = AM(L,K+98)*DRH0I*RC	000713
00404	156*	IF (I .EQ. NETA) CALL LIAD (K,1,1,DUM)	000722
00406	157*	IF (I.NE. NETA) $AM(1,MPJ) = AM(1,MPJ) + DUM$	000733
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00412	159*		GO TO 32		000750
00412	160*	С	BECKWITH-BUSHNELL MODEL		000750
00413	161*	33	IF (I .LT. KAPPA) $AM(1,1) = AM(1,1) + DEL*YDI + CRD*C56*ONK*EPS$		000752
00415	162*		<pre>IF (I .EQ. KAPPA) AM(1,1) = AM(1,1)+CRD*C56*ONK*EPS+DADPP*DEL*YD</pre>	I	000777
00417	163*		IF (I .GE. KAPPA) AM(1,1) = AM(1,1) + EPI*ONK*CRD*C56		~001013
00421	164*		INK=I+3		001024
00422	165*		AM(1,INK) = - CRD*EPS*ONK		001030
00423	166*		IF (I .EQ. KAPPA) AM(1,INK) = AM(1,INK) - CRD*EPI*ONK		001035
00425	167*		IF (I .EQ. KAPPA + 1) AM(1,INK) = - CRD*BF*ONK		001046
00427	168*		INK=INK+1		001057
00430	169*		D0 68 K=1,NSP		001065
00433	170*		INK = INK + NETA	ANK 8/83	001065
00434	171*		AM(1,INK) = - EPS*ONK*DRHOK(K-1)		001071
00435	172*		IF (I .EQ. KAPPA) AM(1,INK) = AM(1,INK) - EPI*ONK*DRHOK(K-1)		001075
00437	173*		IF (I .EQ. NETA) CALL LIAD (K-1,1,1,-EPI*ONK*DRHOK(K-1))		001105
00442	174*		IF (I .EQ. KAPPA - 1) DELTA(IS) = SALPH		001127
00444	175*	66	L = MAT1J + I		001137
00446	176*		DVS=AMAX1(O.,RC*DVS)		001145
00447	177*		IF (CBECK .LE. O.O) AM(1,MAT1J) = AM(1,MAT1J) + SALPH*RC		001154
00451	178*		DELTA(IS) = ALPH*DEL*(DELTA(IS) + (SALPH - DELTA(IS))*DADPP)		001167
00452	179*		RETURN		001200
00453	180*	75	RC=-RC		001204
00454	181*		DVS=0.		001205
00455	182*		DO 80 I=2,NETA		001220
00460	183*		DO 76 J = 1,3	ANK 6/83	001220
00463	184*	76	FM(J) = F(I, J+1)	ANK 6/83	001220
00465	185*		FM(4) = F(1-1,4)		001222
00466	186*		CALL TAYLOR (DETA(I-1), FM(2), FM, XP)		001224
00467	187*		DVS = DVS+F(I,2)*XP(1)+F(I,3)*XP(2)+F(I,4)*XP(3)+F(I-1,4)*XP(4)		001234
00470	188*		AM(1,I+3) = AM(1,I+3) + XP(1)		001251
00471	189*		CALL LIAD (-1,1,NETA+I-2,XP(2))		001254
00472	190*		CALL LIAD (-1,1,2*NETA+I-2,XP(3))		001266
00473	191*		CALL LIAD (-1,1,2*NETA+I-3,XP(4))	·	001301
00475	192*		DVS = DVS*RC/F(NETA,2)		001321
00476	193*		DO 85 I=1,NNLEQ		001326
00501	194*	85	AM(1,I) = -2.0*AM(1,I)*RC/F(NETA,2)		001336
00503	195*		AM(1,2)=AM(1,2)-RC		001343
00504	196*		AM(1,MAT1J) = AM(1,MAT1J) + DVS/F(NETA,2)		001346
00505	197*		CALL LIAD(-1,1,NETA-1,RC) DVS = AMAX1(RC*(F(NETA,1) - F(1,1)) - DVS,O.O)		001353
00506	198*		DVS = AMAX1(RC*(F(NETA, 1) - F(1, 1)) - DVS, 0.0)		001364
00507	199*		KEIURN		001370
00510	200*	1003	TURPR(I) = PRT		001402
00511	201*		TURPR(1)=0.		001404
00512	202*		IF(ELCON.LE.0.00001) GD TD 401		001405
00514	203*		IF(IPRT.EQ.1) GO TO 505		001411
00516	204*		IF(IWK.EQ.1) GD TO 401		001414
00520	205*		IF(CCEB.GT.OOR.CBECK.GT.O.) GO TO 505		001417
00520	206*	C****	CALCULATES MIXING LENGTH AND ITS DERIVITIVES FOR KENDALL MODEL		001417
00522	207*		PIM = PM	ANK 5/83	001433
00523	208*		PM = SQRT(ABS(RED/C26*(CAPC(1)*F(1,3) ~ ALPH*RHOVS*F(I,2))))/	ANK 5/83	001435
00523	209*	1	(CAPC(I)*YAP)		001435
00524	210*		IF (I .LE. 1) GO TO 305		001457
00526	211*		EPI = EXP(-(PM + PIM)/2.0*DETA(I-1))	ANK 5/83	001463
00527	212*		ONK = PM - PIM	ANK 5/83	001474
00530	213*		IF (ONK/PM .GT. 1.0E-4) GO TO 103	ANK 5/83	001477
00532	214*		PM = AMAX1(PM,PIM)	ANK 5/83	001503
00533	215*		DNK = 1.0		001511
00534	216*		AF=1.0		001513
00535	217*		BF = 1.0/PM	ANK 5/83	001514
00536	218*		DADA = -2.0/PM**2	ANK 5/83	001516

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00537	219*	CRD = 1.0/PIM		001522		
00540	220*	EPS = -2.0/PIM * *2		001525		
00541	221*	GD TO 104		001532		
00542	222*	103 AF = $SQRT(2.0*DETA(I-1)/ONK)$		001534		
00543	223*	BF = ERP(AF * PM/2.0)	ANK 5/83	001544		
00544	224*	DADA = 1.0 - AF * PM * BF	ANK 5/83	001553		
00545	225* 226*	CRD = ERP(AF*PIM/2.0) EPS = 1.0 - AF*PIM*CRD		001560		
00540	227*	104  BF = BF - EPI + CRD		001570 001576		
00550	228*	DUM1 = EPI*(AF*CRD - CL)*DETA(I-1)/2.0		001601		••••••
00551	229*	CL=CL*EPI+AF*BF		001611		
00552	230*	DL(I) = ALPH*ELCON*(ETA(I) - CL)	ANK 5/83	001616		••••••
00553	231*	DUM2 = AF/ONK*(BF/2.0 + DADA*AF*PM/4.0 - EPI*EPS*AF*PIM/4.0)	ANK 5/83	001623		
00554	232*	IF(I-2) 305,330,320		001644		
00557	233*	305  DL(1) = 0.0	ANK 5/83	001651		
00560	234*	DD 307 J=1,NNLEQ		001651		
00563	235*	307 AM(2,J)=0.		001656		
00566	236* 237*	CL=O. DPI(1,2)= CAPC(1)		001657 001660		
00567	238*	DPI(3,1) = F(1,3)*DCAPCH		001662		
00570	239*	IF (NSPM1 .LE. 0) GO TO 350		001665		
00572	240*	DO 315 K = 1,NSPM1		001670		••••••
00575	241*	315 $DPI(K+3,1) = F(1,3)*DCAPCK(K)$		001675	·	
00577	242*	GO TO 350		001700		
00600	243*	320 D0 325 J=1, NNLEQ		001702	·····	
00603	244*	325  AM(2,J) = AM(2,J) * EPI		001706		
00605	245* 246*	330 DUM = -ALPH*ELCON*(DUM1 + DUM2 - EPI*EPS*AF**2/2.0)*TREF AM(2,1) = AM(2,1) + (DL(I) - EPI*DL(I-1))/ALPH	ANK 5/83	001712		
00607	240*	Am(2,1) - Am(2,1) + (DL(1) - CP1+DL(1-1))/ALPH L=I-1	ANK 3/83	001727 001736		
00610	248*	331 AM(2,1)= AM(2,1)+DPI(1,1)*DUM		001742		••••••
00611	249*	AM(2,2) = AM(2,2) + DPI(2,1) * DUM		001745		
00612	250*	AM(2,3) = AM(2,3) + DPI(1,2) + DUM		001751		
00613	251*	AM(2,L+3)= AM(2,L+3)+DPI(2,2)+DUM		001755		
00614	252*	J=MAT1J+2		001764		
00615	253*	DO 340 K=NUL, NSPM1		001775		•••••
00620	254* 255*	AM(2,J) = AM(2,J) + DPI(K+3,1) * DUM AM(2,J+1,1) = AM(2,J+1,1) + DPI(K+2,2) + DUM		002001		
00622	255*	AM(2,J+L-1) = AM(2,J+L-1) + DPI(K+3,2)*DUM 340 J = J + NETA	ANK 8/83	002005	•••••••••••••••••••••••••••••••••••••••	
00624	257*	IF (L.GE. I) GO TO 400	ANK 0700	002015		
00626	258*	350 TREF= RED/C26 /(2.*CAPC(I)*YAP*PM*YAP*CAPC(I))	ANK 5/83	002022		••••••
00627	259*	DPI(3,2) = -PM/TREF*(DCAPCH/CAPC(I)-DRHOH/(2.*RHO(I)))	ANK 5/83	002034	•	
00630	260*	DPI(2,2)= C10+DPI(3,2)-RHOVS+ALPH		002047		
00631	261*	DPI(1,1) = - C10*C56*DPI(3,2) - F(I,2)*RHOVS		002054		
00632	262*	DPI(2,1) = -ALPH*C1*F(1,2)		002063		
00633	263* 264*	IF (NSPM1 .LE. O) GO TO 362 DO 360 K = 1.NSPM1		002067		
00635	265*	360 DPI(K+3,2)=-PM/TREF*(DCAPCK(K)/CAPC(I)-DRHOK(K)/(2.*RHO(I)))	ANK 5/83	002072 002101		
00642	266*	362 L=I	AIR 3/03	002111	•	
00643	267*	DUM = - ALPH*ELCON*(DUM1 - DUM2 + DADA*AF**2/2.0)*TREF		002112		
00644	268*	IF (I.LE. 1) RETURN		002126		
00646	269*	IF (I - NETA) 331,400,400		002135		
00646	270*	C CEBECI-SMITH AND BECKWITH-BUSHNELL MODELS		002135		
00651	271*	505  DEL = -C3M(IS)*VMUE(IS)	ANK 8/83	002143		
00652 00653	272* 273*	INK = I - 1 $ONK = -12.0$		002146		
00653	273*	IF (I .GT. 1) GO TO 525		002151 002153		
00656	275*	IF (1 .G1. F) GU 10 525		002153		
00657	276*	ONK=ABS(ONK)		002161		
00660	277*	TAUW = -AMAX1(C28,1.OE-4)*UE(IS)/ALPH/C3M(IS)	ANK 8/83	002163		

00662	279*				~~~~~	
	2191		D0 515 K=1,NSPM1		002206	
00665	280*	515	DCAPCW(K+1)=DCAPCK(K)		002206	
00667	281*		DO 520 J=1,NNLEQ		002213	
00672	282*	520	DYA(J)=0.		002213	
00674	283*		CAPY=O.		002214	
00675	284*	525	VA = DETA(INK)*C26*(0.50 - C53*DETA(INK)/ONK)		002216	
00676	285*		CADV-CADV-VA		000006	
00677	286*		DYA(1)=DYA(1)+VA*DEL		002230	•••••••••••••••••••••••••••••••••••••••
00700	287*		IF(I.EQ.NETA) GO TO 532		002234	
00702	288*		DADA = ~ DETA(INK)/2.0*C26/RHO(I)*ALPH*DEL		002237	
00703	289*				002247	
00704	290*	••••••••••••••••••••	DYA(1)=DYA(1)-VA*C56	·····	002252	а
00705	291*		INK=I+3		002255	
00706	292*	••••••	DYA(INK)=DYA(INK)+VA		002260	
00707	293*		INK=INK+1		002264	
00710	294*		D0 530 K=1.NSP	·····	002273	
00713	295*			ANK 8/83	002273	
00713	295*		DYA(INK) = DYA(INK) + DADA*DRHOK(K-1)	ANK 0/03	002275	
00714	290* 297*	530	DTA(INK) = DTA(INK) = DADA*DKRUK(K-1)		002273	
00710		•••••	IF(I.EQ.1) RETURN IF(ONK.GT.O.) GD TO 406	•••••••••••••••••••••••••••••••••••••••		
	298*				002311	
00722	299*		ONK=ABS(ONK)		002314	
00723	300*		UTAU = SQRT(TAUW/RHO(I))		002317	
00724	301*		IF(CBECK.GT.O.) GD TO 700		002326	
00724	302*	C ***	**************************************	*	002326	
00726	303*			ANK 8/83	002331	
00727	304*		EPI = EXP(YAP*VWP)		002342	
00730	305*		PPL=0.		002350	
00731	306*		IF (ABS(BETAP(IS)) .GE. 1.0E-7) PPL = -BETAP(IS)*RHOE(IS)*UE(IS)		002351	
00731	307*		/C3M(IS)**2*CAPC(I)/(RHO(I)*UTAU)**3	ANK 8/83	002351	
00733	308 *		EPS = EPI - 1.0		002400	
00734	309*		IF (ABS(VWP) .LT. 1.0E-7) AF = YAP	•	002403	
00736	310*		IF (ABS(VWP) .GE. 1.OE-7) AF = EPS/VWP		002411	
00740	311*		BF = AF*PPL		002420	
00741	312*	•	SALPH = BF + EPI		002423	
00742	313*		IF (SALPH .LE. 0.0) SALPH = 1.0E-30		002425	
00744	314*		SALPH = SQRT(SALPH)		002432	
00745	315*		ACEB = CCEB*VMU(I)/RHO(I)/UTAU/SALPH		002436	
00746	316*		ACY=ALPH*DEL*CAPY		002445	
00746	317*	C C R(			NEW002445	· · · · · · · · · · · · · · · · · · ·
00746	318*	C RO	DUGHNESS OPTION (3) ICF = 3		NEW002445	
00746	319*	С			NEW002445	<u>.</u>
00747	320*		IF(ICF.EQ.3)G0 TO 201		NEW002451	
00751	321*		GO TO 202		NEW002454	
00752	322*	201	CONTINUE		NEW002456	
00753	323*		RKS=RK+UTAU+RHO(I)/VMU(I)		NEW002456	
00754	324*	••••••••••••••••••••••••••••••	1F(KKS.LE.4.333)//01-0.0		NEW002464	
00756	325*		IF(RKS.GT.4.535.AND.RKS.LE.4000.)PCT=1.0		NEW002471	
00760	326*		IF(RKS.GT.4000.)PCT=2.0		NEW002511	
00762	327*		DUMM17=PCT		NEW002517	
00763	328*		IF(ABS(PCT).LE001)G0 T0 203		NEW002521	
00765	329*		DEACY=.9*(VMU(I)/(RHD(I)*UTAU))*(RKS**.5-RKS*EXP(-RKS/6.))		NEW002525	
00766	330*	203	CONTINUE		NEW002553	
00767	331*	_ ~ -	ACY=ALPH*DEL*CAPY+DEACY		NEW002553	
00770	332*	202	CONTINUE		NEW002560	
00771	333*		VA = ACY/ACEB		002560	
00772	334*	••••••	FXPA = FXP(-VA)	·····	002562	
00773	335*		DI(I) = FICON * ACY * (1 - FXPA)	ANK 5/83	002562	
00774	336*		DL(I) = ELCON + ACY + (1 EXPA) $DADA = ELCON + (1.0 - (1.0 - VA) + EXPA)$ $IE(I) + EO(I) + O(I) + O(I$		002575	
00775	337*		IF(IWK.EQ.1) GO TO 555		002603	
00777	338*		DO 545 J=1,NNLEQ		002603	
20.77	000				002017	•

01002	339*	545  AM(2,J) = DYA(J) * DADA	002617
01004	340*	DLDA = - ELCON*EXPA*VA**2	002622
01005	341*	IF(ABS(VWP).LT.1.E-O7) GO TO 547	002630
01007	342*	DADPP = - ACEB/2.0/VWP/(PPL/VWP + EPI/EPS)	002634
01010	343*	DADVP = - ACEB/2.0*(- BF/VWP + YAP*(1.0 + PPL/VWP)*EPI)/(BF + EPI)	002646
01011	344*	GD TO 550	002662
01012	345*	547 DADPP=-ACEB/2./(PPL+1./YAP)	002664
01013	346*	DADVP=DADPP*(1.+YAP*PPL/2.)	002672
01014	347*	550 BF = - C10*C56*DRH0H	002701
01015	348*	AF = - C10*C56*DCAPCH	002705
01016	349*	DADA = DADPP*PPL*(AF/CAPC(I) - 1.50*BF/RHD(I) + 3.0/ALPH) - 1.50*	002710
01016	350*	1 ACEB*BF/RHO(I) + ACEB/ALPH + DADVP*VWP*(BF/RHO(I)/2.0 + 1.0/ALPH)	002710
01016	351*	2 + AF*ACEB/CAPC(I)	002710
01017	352*	AM(2,1)=AM(2,1)+DLDA*DADA	002755
01020	353*	AM(2,2) = AM(2,2) + DLDA*DADVP*C1/C3M(IS)/RHO(1)/UTAU  ANK 8/83	002760
01021	354*	DADA = (-ACEB/2.0 - 1.50*DADPP*PPL - DADVP*VWP/2.0)/F(1,3)	002771
01022	355*	AM(2,3) = AM(2,3) + DLDA*DADA	003005
01023	356*	INK=I+3	003010
01024	357*	DADA = C1Q*((ACEB + DADPP*PPL)*(DCAPCH/CAPC(I) - 1.50*DRHOH/RHO(I)	003013
01024	358*	1) + $DADVP * VWP * DRHOH/RHO(I)/2.0$	003013
01025	359*	AM(2, INK) = AM(2, INK) + DLDA*DADA	003034
01026	360*	INK = INK + NETA + 1 ANK 8/83	003040
01027	361*	MTNUZ-MATA LLO	003044
01030	362*	MINK=MAI10+2 AM(2,MINK) = AM(2,MINK) + DLDA*DCAPCW(1)/CAPC(1)*(- ACEB/2.0 -	003047
01030	363*	1 1.50*UAUPP*PPE = UAUVP*VWP/2.01	003047
01031	364*	IF (I .NE. NETA) AM(2,INK) = AM(2,INK) + DADA*DLDA/C10	003057
01033	365*	IF (I .EQ. NETA) CALL LIAD (0,2,1,DLDA*DADA/C10)	003072
01035	366*	DO 553 K = 2.NSP	003107
01040	367*	INK = INK + NETA ANK 8/83	003115
01041	368*	MINK = MINK + NETA ANK 8/83	003120
01042	369*	AF = (ACEB + DADPP*PPL)*(DCAPCK(K-1)/CAPC(I) - 1.50*DRHOK(K-1)/	003123
01042	370*	1  RHO(1) + DADVP *VWP *DRHOK(K-1)/RHO(1)/2.0	003123
01043	371*	AM(2,MINK) = AM(2,MINK) + DLDA*DCAPCW(K)/CAPC(1)*(-ACEB/2.0 - 1.50)	003140
01043	372*	1 *DADPP*PPL - DADVP*VWP/2.0)	003140
01044	373*	IF (I.NE. NETA) $AM(2, INK) = AM(2, INK) + DLDA*AF$	003151
01046	374*	553 IF (I .EQ. NETA) CALL LIAD (K-1,2,1,DLDA*AF)	003161
01046	375*	CALCULATE THE TURBULENT PRANDTL NUMBER	003161
01051	376*	555 IF(IPRT.NE.1) GO TO 554	003203
01053	377*	AF = ACY+UTAU+RHO(I)/VMU(I)/CCEB/SALPH	003205
01054	378+	BF = ACY+UTAU+RHO(I)/VMU(I)+SQRT(PR(I))/34.0/SALPH	003216
01055	379*	PRT = ELCON/TPCON*(1.0 - EXP(-AF))/(1.0 - EXP(-BF))	003227
01056	380*	554 TURPR(I)=PRT	003253
01057	381*	GD TO 703	003255
01057	382*	C ************************************	003255
01060	383*	700 SQPI = 1,772453851	003257
01061	384*	ABECK=CBECK/RHO(I)*VMU(I)/UTAU	003260
01062	385*	ACY=ALPH+DEL+CAPY	003266
01063	386*	VA = DB * ACY/DELTA(IS)	003273
01064	387*	EPI = 5.0 + ACY/DELTA(IS) - 3.90	003277
01065	388*	EXPA = EXP(-ACY/ABECK)	003304
01065	389*	AF = 1.0 - EXPA	003313
01067	390*	BF = TANH(VA)	003315
01087	390* 391*	CRD = SQRT(0.50 - ERF(EPI)/2.0)	003321
01070	391* 392*	DL(I) = BBECK*DELTA(IS)*AF*BF*CRD ANK 5/83	****
		DL(I) = BBECK*DELIA(IS)*AF*BF*CRD ANK 5/83 DRHOI = 1.50*DRHOH/RHO(I)	003333 003343
01072	393*		
01073	394*	EPS = EXP(-EPI**2) DADA = BBECK*(DELTA(IS)/ABECK*BF*CRD*EXPA + DB*AF*CRD/COSH(VA)**2	003347 003356
01074	395*		
01074	396*	1 ~ 2.50/SQPI*AF*BF/CRD*EPS)	003356
01075	397*	DLDA = -BBECK+DELTA(IS)+BF+CRD+ACY/ABECK++2+EXPA	003406
01076	398*	DADPP = BBECK*(AF*BF*CRD - DB*ACY/DELTA(IS)*AF*CRD/COSH(VA)**2 +	003420

1076	399*		1 2.50/SQPI*AF*BF/CRD*ACY/DELTA(IS)*EPS)		003420
1077	400*		DO 701 J=1.NNLEQ		003454
01102	401*	701	AM(2,J) = DYA(J) * DADA + AM(1,J) * DADPP		003454
01104	402*		DADA = ABECK*(C10*C56*(-DCAPCH/CAPC(I) + DRHOI) + 1.0/ALPH)		003462
01105	403*		$\Delta M(2, 1) = \Delta M(2, 1) + D I D A * D A D A$		003472
01106	404*		AM(2,3) = AM(2,3) - DLDA*ABECK/2.0/F(1,3)	••••••	003475
01107	405*		INK=I+3		
01110	406*		INK=I+3 AM(2,INK) = AM(2,INK) + DLDA*ABECK*C10*(DCAPCH/CAPC(I) - DRHOI) INK = INK + NETA + 1		003505
01111	407*		INK = INK + NETA + 1	ANK 8/83	003513
01112	408*		MINK=MAT1J+2	Ann: -/	003517
01113	409*				003522
01114	410*	••••••	DADA = ABECK*(DCAPCH/CAPC(1) - DRHO1) $AM(2,MINK) = AM(2,MINK) - DLDA*ABECK*DCAPCW(1)/CAPC(1)/2.0$ $I = (1 - NE - NETA) - AM(2 - NE(2) - AM(2 - NE(2) - AM(2) - AM(2) - AM(2) - AM(2 - AM(2) - AM(2$	•••••	003525
01115	411*		AM(2,MINR) = AM(2,MINR) = DEDA+ABECR+DCAPCW(1)/CAPC(1)/2.0 IF (I .NE. NETA) AM(2,INR) = AM(2,INR) + DADA+DLDA		003525
01117	412*		IF (I .EQ. NETA) CALL LIAD ( $0,2,1,DADA+DLDA$ )	••••••	003547
01121	413*		DO 708 K = 2,NSP		003560
01121	413*		INK = INK + NETA	ANK 8/83	003566
01124	414*		INK = INK + NETA MINK = MINK + NETA	ANK 8/83 ANK 8/83	003566
01125	415*		DADA = ABECK*(DCAPCK(K-1)/CAPC(I) - 1.50*DRHOK(K-1)/RHO(I))	ANK 0/00	003572
	416*				
01127			AM(2,MINK) = AM(2,MINK) - ABECK*DCAPCW(K)*DLDA/CAPC(1)/2.0		003606
01130	418*		IF (I .NE. NETA) $AM(2, INK) = AM(2, INK) + DADA*DLDA$ IF (I .SO NETA) CALL LIAD (K-1, 2, 1, DADA*DLDA)		003616
01132	419*		IF (I .EQ. NETA) CALL LIAD (K-1,2,1,DADA*DLDA)	,	003626
01132	420*		CEBECI-SMITH AND BECKWITH-BUSHNELL MODELS		003626
01135	421*	703	$D0 \ 704 \ J = 1, NNLEQ$		003650
01140	422*	704	$\Delta M(2, \mu) = \Delta M(2, \mu) / C26 / DE1$		003661
01142	423*		EPI = DL(I)/RHOE(IS)/DEL AM(2,1) = AM(2,1) - C10*C56*DRHOH*EPI INK=I+3	ANK 5/83	003665
01143	424*		AM(2,1) = AM(2,1) - C10*C56*DRHOH*EPI		003671
01144	425*		INK=I+3 AM(2,INK) = AM(2,INK) + C10*DRH0H*EPI		003677
01145	426*		AM(2,INK) = AM(2,INK) + C1O*DRHOH*EPI		003702
01146	427*		INK=INK+1		003710
01147	<b>428</b> *		DO 706 K = 1,NSP		003716
01152	429*		INK = INK + NETA	ANK 8/83	003716
01153	430*		IF (I .NE. NETA) AM(2,INK) = AM(2,INK) + DRHOK(K-1)*EPI		003723
01155	431*		IF (I .EQ. NETA) CALL LIAD (K-1,2,1,DRHOK(K-1)*EPI)		003733
01160	432*		DL(I) = DL(I)/C26/DEL	ANK 5/83	003754
01161	433*		IF(I.EQ.NETA) GO TO 406		003761
01163	434*		INK=I		003764
01164	435*		GO TO 525		003766
01164	436*	C	CALCULATES EPS AND EPS DERIVATIVES		003766
01164	437*	č	CEBECI-SMITH AND BECKWITH-BUSHNELL MODELS		003766
01165	438*	406	IF(IWK.EQ.1) GO TO 401		003770
01165	439*				003770
01167	440*	400	KENDALL TURBULENCE MODEL DUM1 = DL(I)**2/ALPH**2*RED/C26 EDS1 = DUM1*APS(E(I, 2))	ANK 5/83	003773
01170	441*		EPS1 = DUM1*ABS(F(I,3))		
01171	442*		EPS1 = DUM1*ABS(F(I,3)) IF (CBECK .GT. 0.0 .OR. EPS1 .LT. DVS/C26**2) GD TD 405 EPS = VINTP(I)*DVS(C26**2)		004006
01173	443*	401	EPS = VINTR(I) * DVS/C26 * * 2		004027
01174	444*		IWK = 1		004035
01175	444*		ENL(3) = ENL(1) * VINTR(I) / C26 * * 2		004035
01176	445*		D0 402 J=1, NNLEQ		004037
01201	440 <i>+</i> 447*		AM(3,J) = AM(1,J)*VINTR(I)/C26**2		004051
01201	447*		DUM1=2.0*EPS/RHO(I)		004051
01203	448*		GO TO 415		004055
01204	449* 450*		BECKWITH-BUSHNELL MODEL		
01204	450*				004061
			EPS=EPS1+VINTR(I)	·····•	004063
01206	452*		ENL(3)=0.		004066
01207	453*		D0 410 J=1, NNLEQ	-/22	004074
01212	454*		AM(3,J) = 2.0*AM(2,J)*EPS/DL(I)	ANK 5/83	004074
01214	455*		AM(3,1)=AM(3,1)-2.0/ALPH*EPS		004101
01215	456*		CALL LIAD (-1,3,NETA+I-2,SIGN(1.0,F(I,3))*VINTR(I)*DUM1)		004106
01216	457*		DUM1=EPS/RHO(I) DUM=DUM1*DRHOH		004126 004133

01220	459*		EPSA(I)=EPS	004135
01221	460*		AM(3,1)=AM(3,1)-C56+C10+DUM	004140
01222	461*		AM(3,I+3)= AM(3,I+3)+DUM*C10	004145
01223	462*		J=MAT1J+I+1	004154
01224	463*		L=MAT1J	004160
01225	464*		DO 420 K=NUL,NSPM1	004167
01230	465*		IF (I .LT. NETA) $AM(3,J) = AM(3,J) + DUM$	004172
01232	466*		IF (I .GE. NETA) CALL LIAD (K,3,1,DUM)	004202
01234	· 467+		J = J + NETA ANK 8/8	83 004214
01235	468*	420	DUM=DUM1+DRHOK(K+1)	004217
01237	469*		DEPC=ENL(3)	004224
01240	470*		RETURN	004226
01240	471*	C****	MODIFIES ENL AND AM AFTER IMONE	004226
01241	472*	1004	L = I - 1	004232
01242	473*		SALPH=-ALPH/TTVC	004234
01243	474*	••••••	IF(1-2) 650,650,600	004237
01243	475*	C****	MODIFIES ENL AND AM AFTER IONLY	004237
01246	476*	1005	L = I	004245
01247	477*		SALPH= ALPH/TTVC	004246
01250	478*	600	DUM = F(L,3)/SALPH	004252
01251	479*		ENL(I+3)=ENL(I+3)-DUM*(EPS-DEPC)	004255
01252	480*	•••••••••••••••••••••••••••••••	AM(I+3,1)=AM(I+3,1)-DUM+EPS/ALPH	004263
01253	481*		C28=C28+DUM*EPS	004271
01254	482*		D0 605 J=1,NNLEQ	004310
01257	483*	605	AM(1+3,J)=AM(1+3,J)+DUM*AM(3,J)	004310
01261	484*	••••••	CALL LIAD (-1,I+3,L+NETA-2,EPS/SALPH)	004314
01262	485*		MPJ=MAT1J+I-1	004331
01263	486*		EPI = 1.0 - 1.0/PRT	004335
01264	487*		DEL = - C13+F(L,2)+EPI/SALPH	004342
01265	488*		AF = G(L,2)/(SALPH*PRT)	004347
01266	489*		CRD = DEL*EPS	004354
01267	490*		DEL = DEL + AF	004356
01270	491*		BF = EPS/SALPH*(1.0/SCT - 1.0/PRT)*(HP - CPBAR(L)*TP)	004360
01271	492*		ENL(MPJ) = ENL(MPJ) - AF+(EPS - DEPC) - BF - CRD	004371
01272	493*		C32 = C32 + AF + EPS + BF + CRD	004401
01273	494*		AM(MPJ,1) = AM(MPJ,1) - AF/ALPH*EPS - 3.0/ALPH*CRD	004407
01274	495*		DO 610 J=1,NNLEQ	004434
01277	496*	610	AM(MPJ,J) = AM(MPJ,J) + DEL*AM(3,J)	004434
01301	497*		AM(MPJ,L+3) = AM(MPJ,L+3) - EPI+C13/SALPH+EPS	004440
01302	498*		CALL LIAD (-1.MPJ.NETA+L-2EPI*C10/SALPH*EPS)	004447
01303	499+		CALL LIAD (O,MPJ,L,EPS/(SALPH*PRT))	004466
01304	500*		IF (NSPM1 .LE. O) GO TO 650	004501
01306	501*		D0 630 K = 1,NSPM1	004504
01311	502*		DUM = SP(L,2,K)/(SALPH*SCT)	004520
01312	503*		MPJ = MPJ + NETA - 1 ANK 8/E	
01313	504*		CK6(K)=CK6(K)+DUM*EPS	004534
01314	505*		ENL(MPJ)=ENL(MPJ)-DUM*(EPS-DEPC)	004537
01315	506*		AM(MPJ,1)=AM(MPJ,1)-DUM/ALPH+EPS	004544
01316	507*		D0 620 J=1, NNLEQ	004556
01321	508*		AM(MPJ,J) = AM(MPJ,J) + DUM * AM(3,J)	004556
01323	509*		CALL LIAD (K,MPJ,L,EPS/(SALPH*SCT))	004562
01325	510*	650	RETURN ANK 4/8	
01326	511*	•••••••••••••••••••	END	004636

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END OF COMPILATION:

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NO DIAGNOSTICS.

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