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NAS9-14767 Exhibit C

Final
Report

February 1978

Orbiter/Payload Contamination Control Assessment Support

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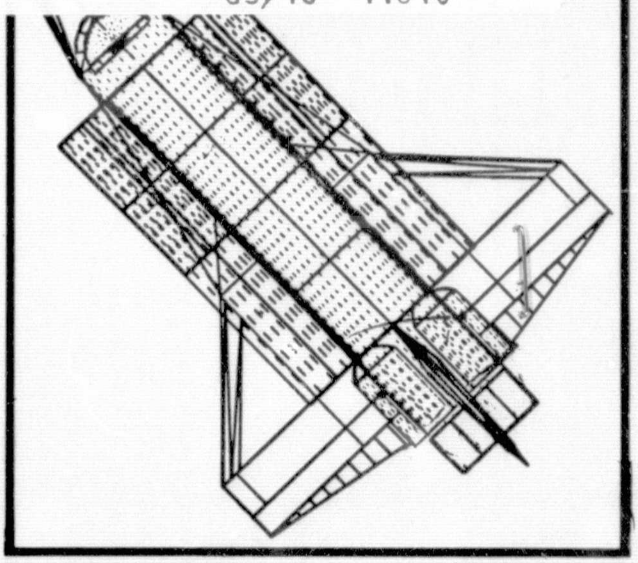

MARTIN MARIETTA

MCR-78-517
February 1, 1978

Technical Report

ORBITER/PAYLOAD CONTAMINATION CONTROL ASSESSMENT SUPPORT

FINAL REPORT

Contract NAS9-14767
Exhibit C

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1.0 SCOPE

1.1 Purpose

The purpose of this report is to present the results achieved in performing the Orbiter/Payload Contamination Control Assessment Support study. The intent of this activity was to include payload bay filters as Orbiter sources, begin the development of a mission profile model to simulate missions, develop a temperature conversion program between thermal math model node structure and the contamination model and develop a plot capability for various contamination parameters and time intervals. The major source changes were to be reflected in the Users Manual update for the Shuttle/Payload Contamination Evaluation (SPACE) program delivered previously under Exhibit B of this contract.

1.2 Scope

This report describes the development and integration of payload bay liner filters into the existing SPACE program and the development of an initial mission profile model. As part of the mission profile model, a thermal conversion program, a temperature cycling routine , a flexible plot routine and a mission simulation of OFT-3 are presented.

1.3 Summary

Additional sources and external modifications to the SPACE program have been established. The additional sources include a total of 16 filters in the payload bay liner. Eight of these are between the payload bay volume and the bulkhead and the other eight are positioned at the locations where the overboard vents exist. Viewfactors between the filters and the points along 17 lines-of-sight, that currently exist in the SPACE program, were calculated and integrated into the SPACE program.

The thermal conversion program was designed to access current thermal program output tapes at JSC and convert the thermal node structure to the contamination node structure in SPACE.

A mission profile of OFT 3 was simulated to understand ramifications of simulation modeling and determine desired methods of data acquisition and handling.

The plot routine was developed primarily to plot molecular number column density as a function of time but has been generalized to accept almost any parameter derived from the SPACE program.

2.0 APPLICABLE DOCUMENTS

2.1 Program Documents

The following documents form a part of this report in the extent that they were used for related program information relevant to this study.

PROGRAM DOCUMENTS

MCR-77-107	"Orbiter/Payload Contamination Control Assessment Support" NAS9-14767, Exhibit B, April 29, 1977, Martin Marietta Aerospace, Denver Division
MCR-77-106	"Shuttle/Payload Contamination Evaluation Program" User's Manual NAS9-14767, Exhibit B, April 28, 1977, Martion Marietta Aerospace, Denver Division
JSC 10982	"OFT Payload Planning Status", Rev D November 1, 1976

3.0 STUDY RESULTS

3.1 Thermal Mapper Conversion Program

In order to determine the necessary surface temperatures for contamination analysis using the SPACE program, it is required to relate thermal data as derived from thermal model nodes to those of the SPACE contamination model. This capability is important because of the many temperature profiles that will be experienced by the Shuttle Orbiter for the various missions to be flown. The nodal breakdown is necessarily quite different for the two disciplines so that where detail was required in one model it was not necessarily so for the other model. The result was an overlaying of several nodes or parts of nodes of one model by a single node of the other.

Three thermal models were used in the conversion program. These were the forward and aft fuselage models developed by Rockwell International and the midsection model developed by JSC. Because of the lack of nodal detail, important to contamination in the JSC wing model, only the forward wing section (forward of X_o station 1307) was correlated with the JSC model. The aft wing section was correlated with the Rockwell aft wing model and will use Rockwell aft wing temperatures for analysis operations.

The process of correlation of the applicable models involved superimposing one over the other and determining the percentage of contamination model nodes covered by specific thermal model nodes. In some cases, the divisions and relationships were evident and could be determined readily by a side by side visual inspection. In other cases, it was necessary to redraw the nodal configuration of one model directly on the other. This latter case was especially true of the forward fuselage models where the Rockwell model involved many small nodes.

The program developed to convert the temperatures consists of five subroutines. The flow of this program and a description of each subroutine is as follows.

MAIN - This is the driver routine. It requires four input tapes and creates one output tape. Unit 11 (tape form) is used to store the Rockwell forward model SINDA tape, unit 12 is the 390 node JSC midsection model SINDA tape and unit 13 is the aft model SINDA tape. Unit 14 is the actual map of contamination model nodes onto the combination of the three thermal models. This subroutine reads in unit 14 and then calls subroutine BLKT.

BLKT - This is a block data subroutine that has the node names used by the contamination model for each thermal model. This optimizes the core and time problem resulting from the fact that the contamination model will use approximately 100 pieces of information on a record containing 1800 pieces of information. This data is then used by subroutine SORT.

SORT - This routine gathers in the entire (up to 2000 words) thermal record for the model of interest (forward, mid and aft) and locates the address of each thermal node needed (defined in BLKT). This address is saved and is used as an index for all following records which contain the actual temperatures. The control of the program returns to the main program which loops over unit 14 and collects the partial temperatures for each contamination node in the present SPACE model. In this loop, subroutine SHORT is called.

SHORT - This subroutine uses the index defined in SORT to fill a short array with temperatures off of the SINDA records. The temperatures on the SINDA tapes are degrees fahrenheit and must be converted to centigrade for the contamination model. To do this, function CENTI is called.

CENTI - This function converts degrees F to degrees C.

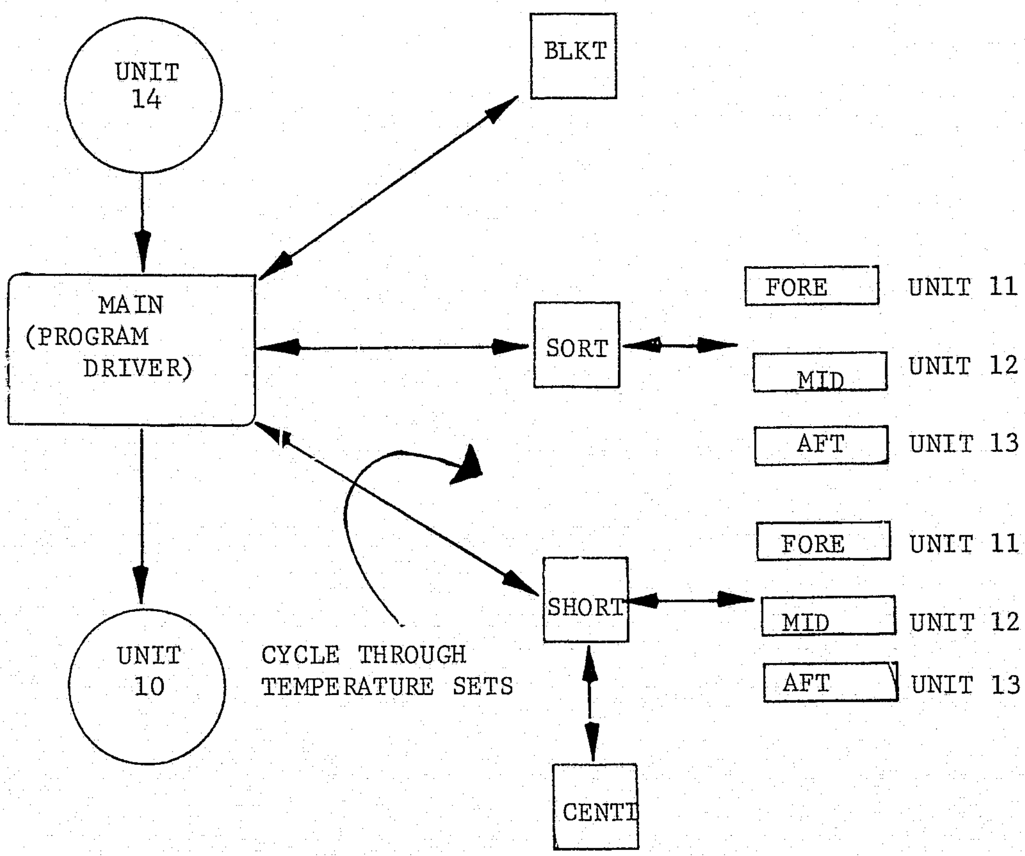
Control returns to the subroutine MAIN. The cycling is continued until 7 temperatures are stored for each contamination model node. An output tape (unit 10) is then formatted and written. The format can be directly input into the SPACE model and stored in ATCODE for use.

The user of the conversion program may select any or all of the thermal models and may turn on a DEBUG command for listing of extensive intermediate calculations. The number of sets of temperatures (up to seven) can be chosen and must match the number of sets of temperatures on the SINDA tapes. For example, if only maximum and minimum temperatures are on the SINDA tapes then only two temperature sets can be assigned to contamination model nodes.

Figure 1 shows the flow of the Thermal Mapper program as defined above.

A listing of unit 14 data and the MAIN driver program is included as Appendix A.

The input to the Thermal Mapper program consists of 2 namelist input cards. The first card has the word name $TIN beginning in column 2 and the second card has the word name sequence FORE = .T., MID = .T., AFT = .T., DEBUG - .T., NUM = 7 $ beginning anywhere after column 2. The user may negate any



ORIGINAL PAGE IS OF POOR QUALITY

Figure 1 Flow Chart of Thermal Mapper Program portion by putting .F. in place of .T.. The NUM = 7 pertains to the number of temperatures for each surface or equivalently the number of temperature profiles on the SINDA tape.

3.2 Payload Bay Filter Sources

A total of 16 liner filters have been input to the SPACE program. Figure 2 shows graphic displays of the filter locations. There are a total of 8 filters to a side. Four of these were input from data supplied by NASA JSC and represent the filters between the payload bay and the mid fuselage region between the bay and the bulkhead. The others are connected to openings overboard and were taken from Rockwell drawings "Orbiter Compartments Baseline, Drawing Number VC70-000003" and "Orbiter Leakage Allowables, Drawing VC70-000005". These have been developed as individual sources for the SPACE program. The payload bay liner filters and those connected to overboard openings were treated separately since they are anticipated to have different flow rates.

Viewfactors were calculated between the filters and all points along the 17 lines-of-sight that exist in the SPACE program.

The mass flow rates of the filters can be arbitrarily input at any rate and components anticipated to exist. The mass rates through the filters is a complex function of mass inputs to the volume between the liner and the outer wall of the Orbiter. Primary sources in this region are leakage and mass loss rates of nonmetallic sources within this volume.

For an open payload bay door case, the pressure in the mid fuselage region (between liner and outer Orbiter wall) was specified to be $P_{Mid} = 0.0275\ Q_2$ where Q_2 = mass input to mid fuselage region.

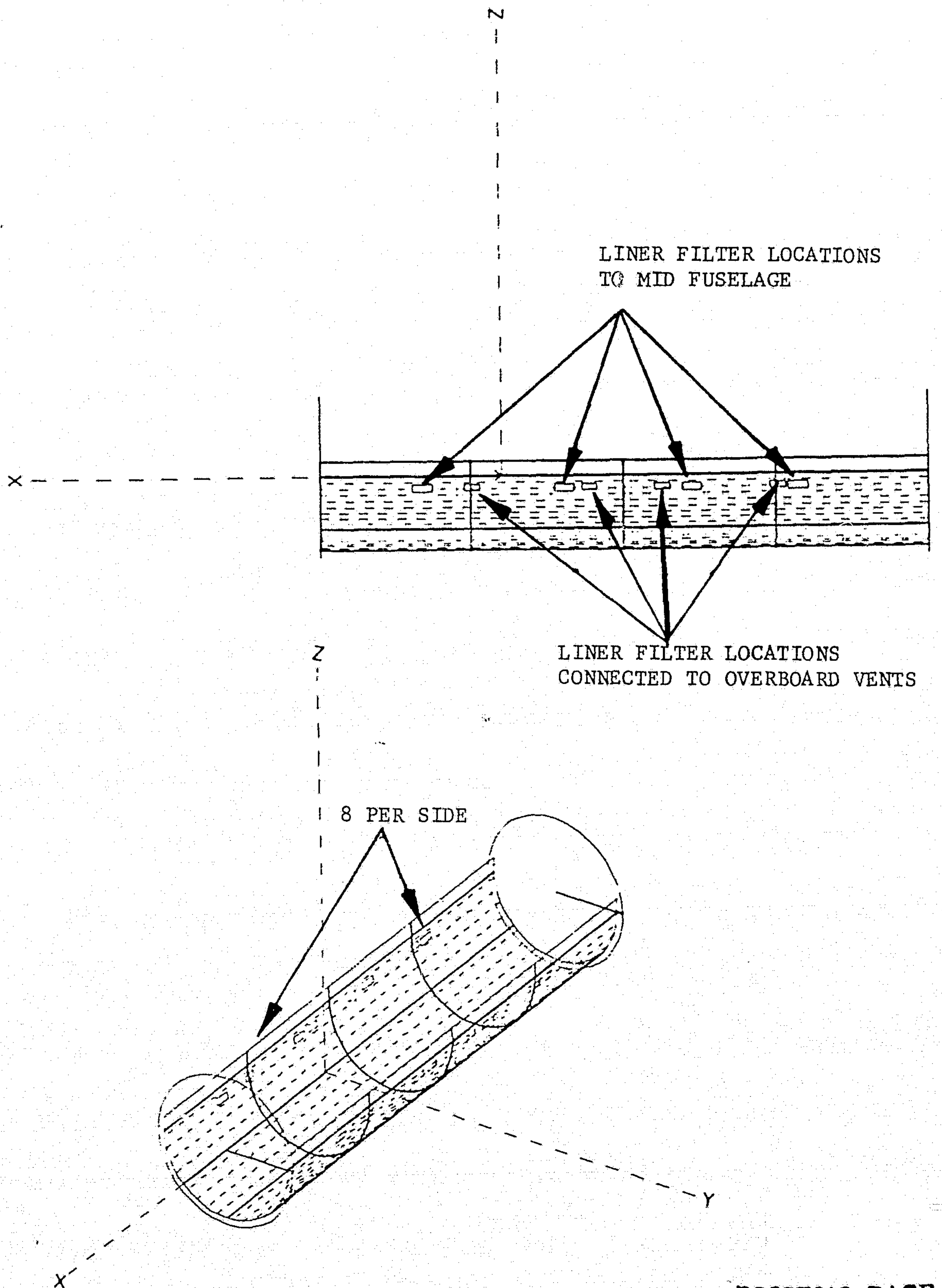


Figure 2 Filters in Payload Bay Liner

The total flow rate through the vents is $\dot{m} = 0.72\ Q_2$ for the liner vents and $\dot{m} = 0.28\ Q_2$ for the overboard duct vents. Assuming a leakage input to the mid fuselage area that is one half of the total habitation area leakage, the mass flow is $1.35 \times 10^{-2}\ g \cdot s^{-1}$ for the liner vents and $2.63 \times 10^{-3}\ g \cdot s^{-1}$ for the overboard vents. Considering the areas of the vents the rates are $3.5 \times 10^{-7}\ g \cdot cm^{-2} \cdot s^{-1}$ for the duct vents and $1.3 \times 10^{-6}\ g \cdot cm^{-2} \cdot s^{-1}$ for the liner vents. This assumes that the flow into the payload bay through the filters, that also vent overboard, is one half the flow given by the above $\dot{m}$ equation.

Incorporating the liner vents into the SPACE program involved modifications to the SPACE program. Appendix B contains an updated major program listing for the modifications to SPACE.

3.3 Plot Routine

The external plot package, NCD/RF PLT, is an independent program that is used to plot NCD and RF output from the SPACE program as a function of start time and time interval of interest (TSTART).

The units are $mol. \cdot cm^{-2}$ for NCD and $g \cdot cm^{-2} \cdot s^{-1}$ for RF and decimal hours for time. These data are punched from subroutines in the appropriate format that is accepted by the plot program. When the user accumulates any number (maximum 50) of related monotonically increasing times and number column densities, he can submit these cards as a unit with the following additions. The first card is a title card. The user may use up to 72 columns describing the data. The following cards are the NCD and time data. The last card is blank. In summary, a title card at the beginning and a blank card at the end of the data is all that is required to input the data.

The plot program contains a dynamic scaler for minimums and maximums on both the ordinate (log scale) and abscissa (linear). The program labels each coordinate and plots the data with a line connecting the points. Time intervals between points can be varied.

Figure 3 shows a sample of the plot routine for the return flux resulting from early desorption and outgassing for the simulated OFT-3 mission discussed in detail in section 3.4. The figure shows the return flux levels as they vary for different time intervals in the mission. Figure 4 shows the return flux plot for the entire mission simulation and does include the effects of RCS and OMS engine firings. Figures 3 and 4 demonstrate how the output can be selected to cover portions of the mission. The automatic scaling on the coordinates allows a wide range of decades (ten maximum) as demonstrated in the figures for the return flux values. Included on the figures is a sample of the input data that consists of a title card and the data with a blank card following the data.

```
..
  100-    MISSION SIMULATION    RETURN FLUX PROFILE - OFT3
  110- 06.   40.   00.   06.   55.   00.     .17E-13
  120- 06.   55.   00.   07.   10.   05.     .16E-13
  130- 07.   10.   00.   07.   25.   00.     .27E-14
  140- 07.   25.   00.   07.   40.   00.     .16E-13
  150- 07.   40.   00.   07.   55.   00.     .46E-13
  160- 07.   55.   00.   08.   10.   00.     .15E-13
  170-
..
```

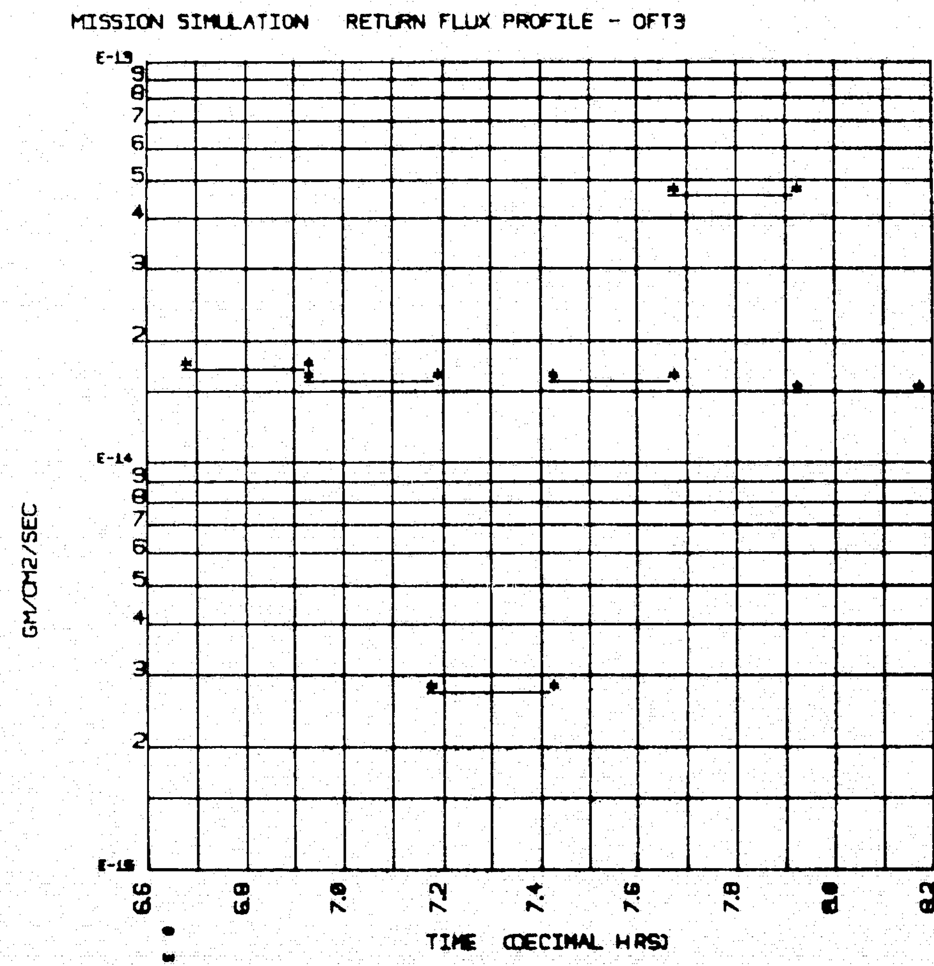


Figure 3 OFT-3 Mission Profile Return Flux Plot

```
100-    MISSION SIMULATION    RETURN FLUX PROFILE - OFT3
110- 06.  40.  00.  06.  55.  00.     .17E-13
120- 06.  55.  00.  07.  10.  05.     .16E-13
130- 07.  10.  00.  07.  25.  00.     .27E-14
140- 07.  25.  00.  07.  40.  00.     .16E-13
150- 07.  40.  00.  07.  55.  00.     .46E-13
160- 07.  55.  00.  08.  10.  00.     .15E-13
170- 11.  30.  00.  11.  40.  00.     .14E-13
180- 11.  40.  00.  11.  40.  01.     .28E-06
190- 11.  40.  56.  11.  41.  51.7    .14E-13
200- 35.  50.  00.  36.  00.  00.     .83E-14
210- 48.  00.  00.  48.  10.  00.     .22E-13
220- 59.  40.  00.  59.  50.  00.     .12E-14
230-105.  40.  00. 105.  50.  00.     .49E-15
240-162.  29.  00. 16[illegible] [illegible] 05.     .32E-07
250-
```

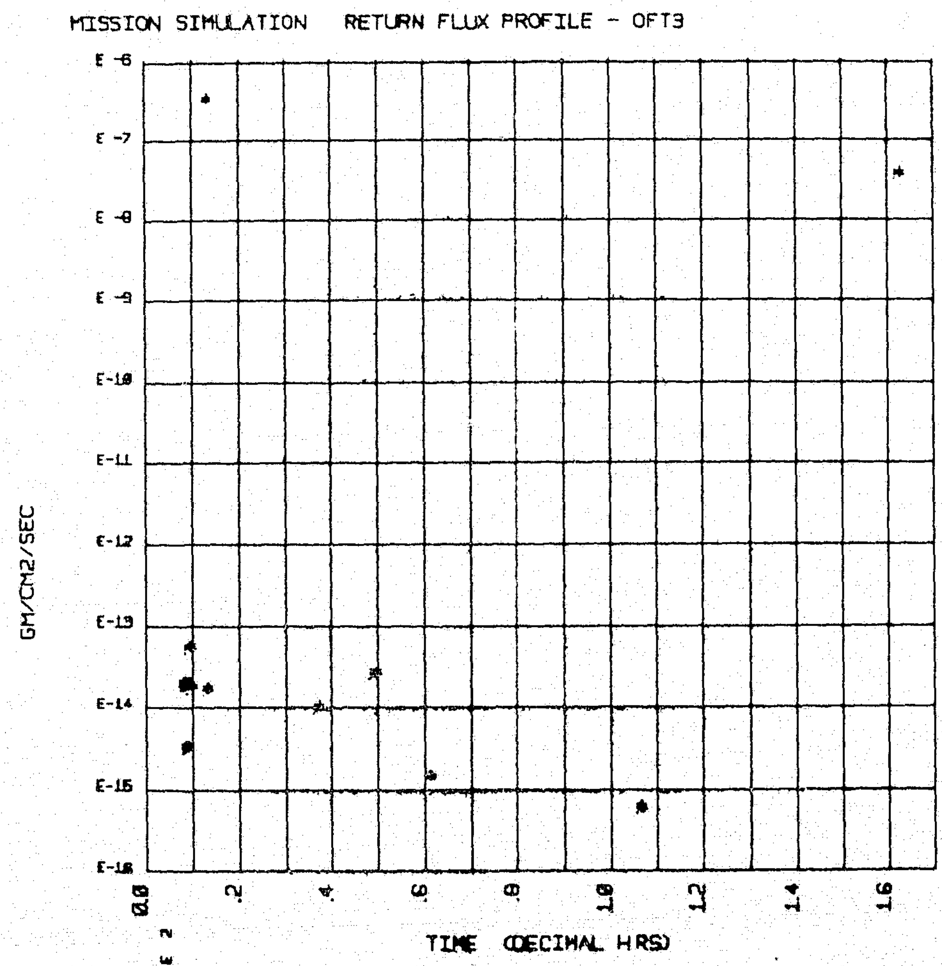


Figure 4 OFT-3 Mission Profile Return Flux Plot

3.4 Mission Profile Model

A mission profile model should ideally be designed to simulate a mission. In the development of such a model, many considerations have to be weighed and alternate routes of handling the simulation evaluated. The thermal conversion program and plot routine are both essential to the development of a mission profile model. These programs were developed to be independent programs until the full logic and data for such a model can be established. To help answer questions and reveal unknown problems, an early flight was analyzed, specifically OFT-3.

This section discusses a procedure for translating an STS mission timeline into input data for the modified NASA SPACE code. Orbital Test Flight No. 3 (OFT-3) to be flown in the fall of 1979 was selected as an example to illustrate the mission analysis capability of the computer program. OFT-3 will have the IECM on board (see Figure 5) which provides a unique opportunity to evaluate existing analytical prediction techniques, particularly the return flux models. The IECM will not provide direct information on mass column density; however, if return flux predictions are found to be accurate, it could be inferred that densities within the cloud were accurately predicted.

A new sample case (#16) has been constructed to illustrate the following items:

a) A procedure for translating a mission timeline into computer input data.

b) Some preflight predictions for actual instrumentation flown on the Orbiter can be made for insertion into an OFT-3 mission environments data book.

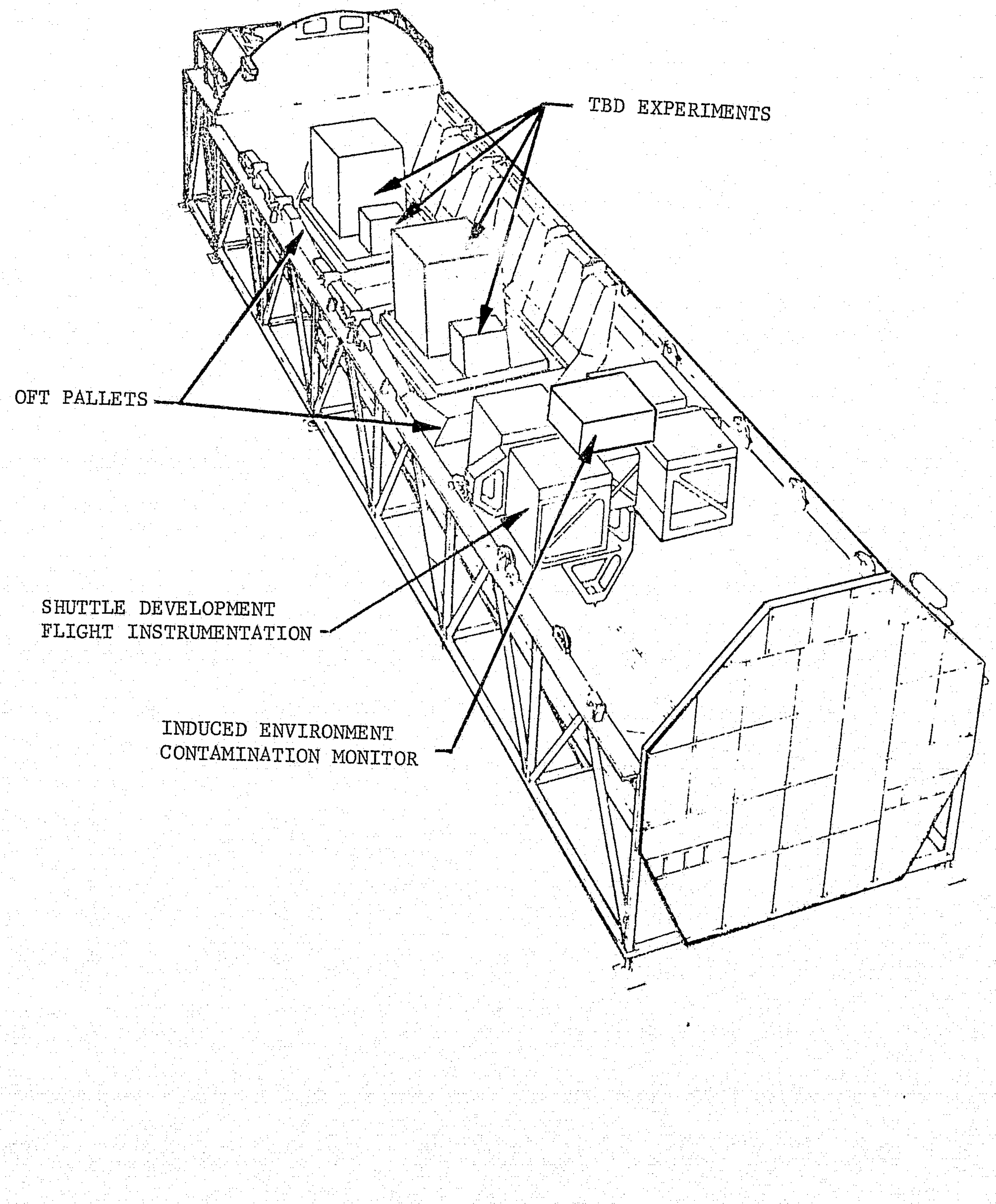


Figure 5 IECM Payload Bay Integration

c) The use of different temperature profiles to simulate on-orbit surface temperature variation per revolution.

d) Current capabilities of the analytical tool and areas where modification or extension are required.

e) Preflight mission analysis using SPACE can result in recommendations for on-orbit operations.

To establish a baseline for the analysis, the following documents were used:

"OFT Payload Planning Status", JSC 10982, Rev D, November 1, 1976.

"RCS Duty Cycles for a Typical Orbiter Maneuver Sequence at IUS Separation", JSC TM No. 14-1111B-128, 22 August 1977.

"IECM (OFT/DFI Configuration) Critical Design Review Documentation Package", 1 December 1977.

Portions of these documents have been reproduced and included as figures and tables within this section.

Time-dependent Orbiter surface temperatures were not available for this study. To construct the additional Orbiter temperature profiles required to simulate actual orbital variations, the minimum and maximum surface temperatures previously delivered were subdivided assuming a sinusoidal variation. These new temperature profiles are representative of day/night variation but purely ficticious.

IECM instrumentation was examined and a decision was made to make return flux predictions that could be compared to the output from the mass spectrometer. Focusing on the mass spectrometer dictates the type of analysis, output and time points to be evaluated. The mission timeline defined in JSC 10982, Rev D (see Table I) has undoubtedly been modified since November 1976; nevertheless it was used as a baseline.

On this test flight, the Orbiter is held in a +X SI, Z-PEP for 80-100 hours as illustrated in Figure 6. Where the OFT-3 timeline indicates a +X roll, the IUS 180° roll maneuver was substituted to illustrate engine firings and attitude changes. The RCS duty cycles are listed in Table II.

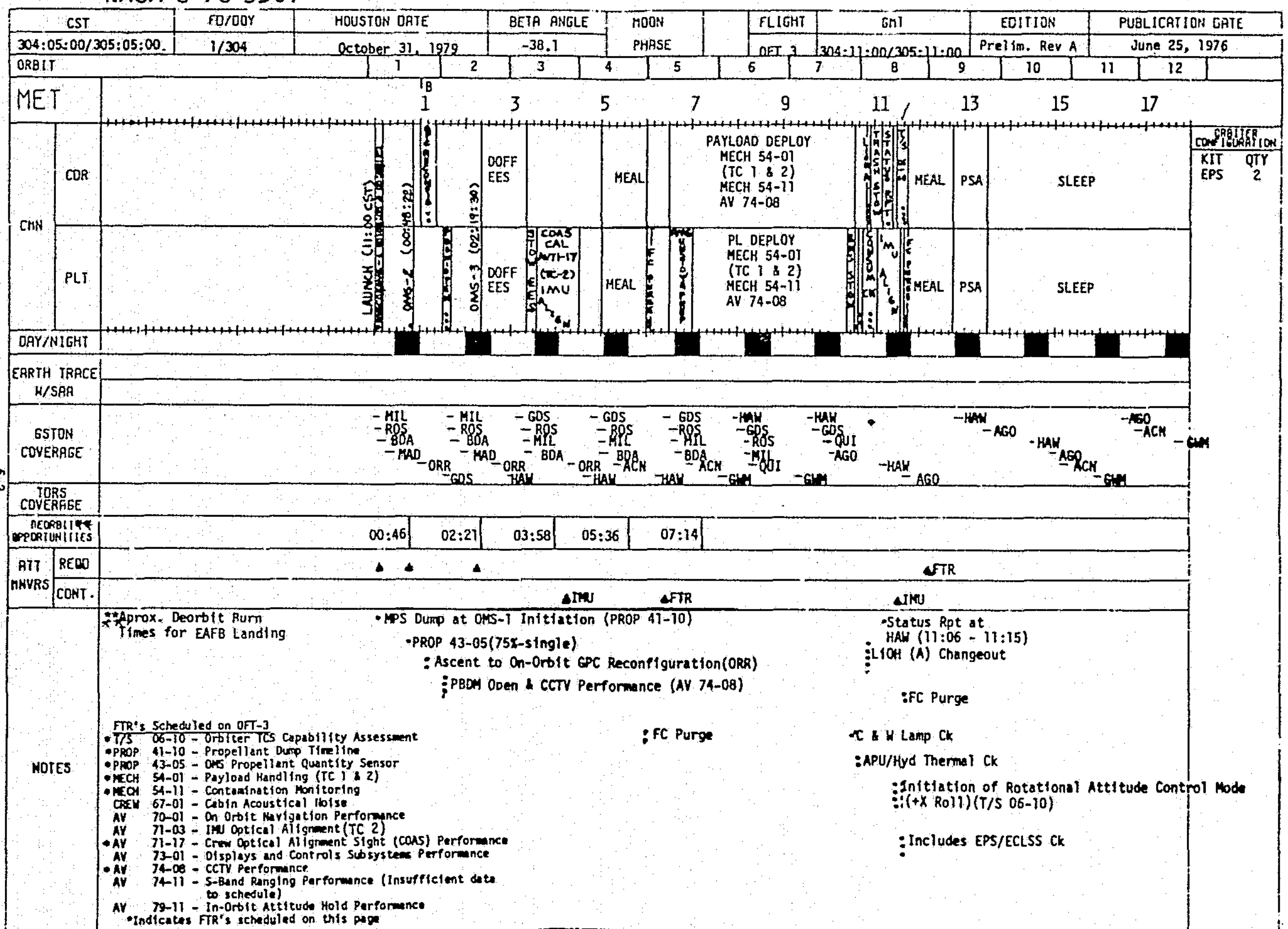
Figure 7 illustrates the installation of the IECM package in the Orbiter bay. The mass spectrometer is located approximately at Orbiter station (1088, 8, 473) as indicated in Figure 7 and was selected for preflight analysis. As indicated in Table III, the mass spectrometer is scheduled to be activated on-orbit sometime after bay pressures have decreased below corona limits. Normal operation will provide 30 samples per minute or 1 sample every 2 seconds. It was assumed that at best a complete scan over the range of mass numbers requires 2 seconds. (This point should be clarified later.) The high data acquisition mode of 300 samples per minute is scheduled to be used when the RMS deploys the IECM.

The acceptance half-angle for the mass spectrometer is approximately 10° which results in a 0.1 steradian field-of-view looking up the Z-axis. It was assumed the inlet tube walls are warm enough to prevent condensation of contaminants.

The mission timeline for OFT-3 given in Table I indicates the payload bay doors are opened 1 hr 30 min after liftoff and the IECM is scheduled to be activated sometime after 6 hours into the mission. It appears that at 2 hr 19 min an OMS firing takes place. This event may be detectable on the QCM's or by

TABLE I OFT-3 MISSION PROFILE

NASA-S-76-5307



6-2

TABLE I CONTINUED

NASA-S-76-5308

CST	FD/DOY	HOUSTON DATE	BETA ANGLE	MOON PHASE		FLIGHT	GMT	EDITION	PUBLICATION DATE
305:05:00/306:05:00	2/305	November 1, 1979	-41.9			OFT 3	305:11:00/306:11:00	Prelim. Rev A	June 25, 1976

ORBIT: 13, 14, 15, 16, 17 (B), 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28

MET: 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41

CMN	CDR	SLEEP · PSA · MEAL · CABIN FAN FLTR · DOSBAC FLTR · TS 06-10 · CREW 67-01 · MEAL · STATUS RPT · AV 73-01 · TRASH STOW · L · MEAL · PSA · SLEEP
CMN	PLT	SLEEP · PSA · MEAL · IMU ALIGN · AV 79 11 · MEAL · C&W LAMP CK · AV 73-01 · IMU ALIGN · MEAL · PSA · SLEEP
DAY/NIGHT		
EARTH TRACE W/SAA		
GSTDN COVERAGE		AGO, MAD, ORR, QUI, MAD, ORR, QUI, MIL, BDA, MAD, ORR, MIL, ROS, BDA, MAD, ORR, GDS, ROS, MIL, BDA, MAD, ORR, HAW, GDS, ROS, MIL, BDA, ORR, ACN, HAW, GDS, ROS, MIL, BDA, ACN, HAW, GDS, ROS, MIL, BDA, QUI, GWM, HAW, GDS, ROS, MIL, GWM, HAW, GDS, QUI, AGO, HAW, AGO, HAW, AGO, HAW, AG, GWM, AGO, ACN, GWM, AGO, MAD
TDRS COVERAGE		
DEORBIT** OPPORTUNITIES		31:56
ATT MNVRS	REQD	FTR
ATT MNVRS	CONT.	IMU; IMU

Orbiter Configuration: KIT EPS, QTY 2

NOTES

**Approx. Deorbit Burn Times for EAFB Landing

FC Purge

-XSI, Z PEP Mnvr (TS 06-10) for 96 hrs

AV 79-11 coverage GDS, ROS, MIL, BDA

Status Rpt at AGO (34:39 - 34:48)

LiOH (B) Changeout

FC Purge

C & W Lamp Ck

APU/Hyd Thermal Ck

Includes EPS/ECLSS Ck

FTR's Scheduled on OFT-3

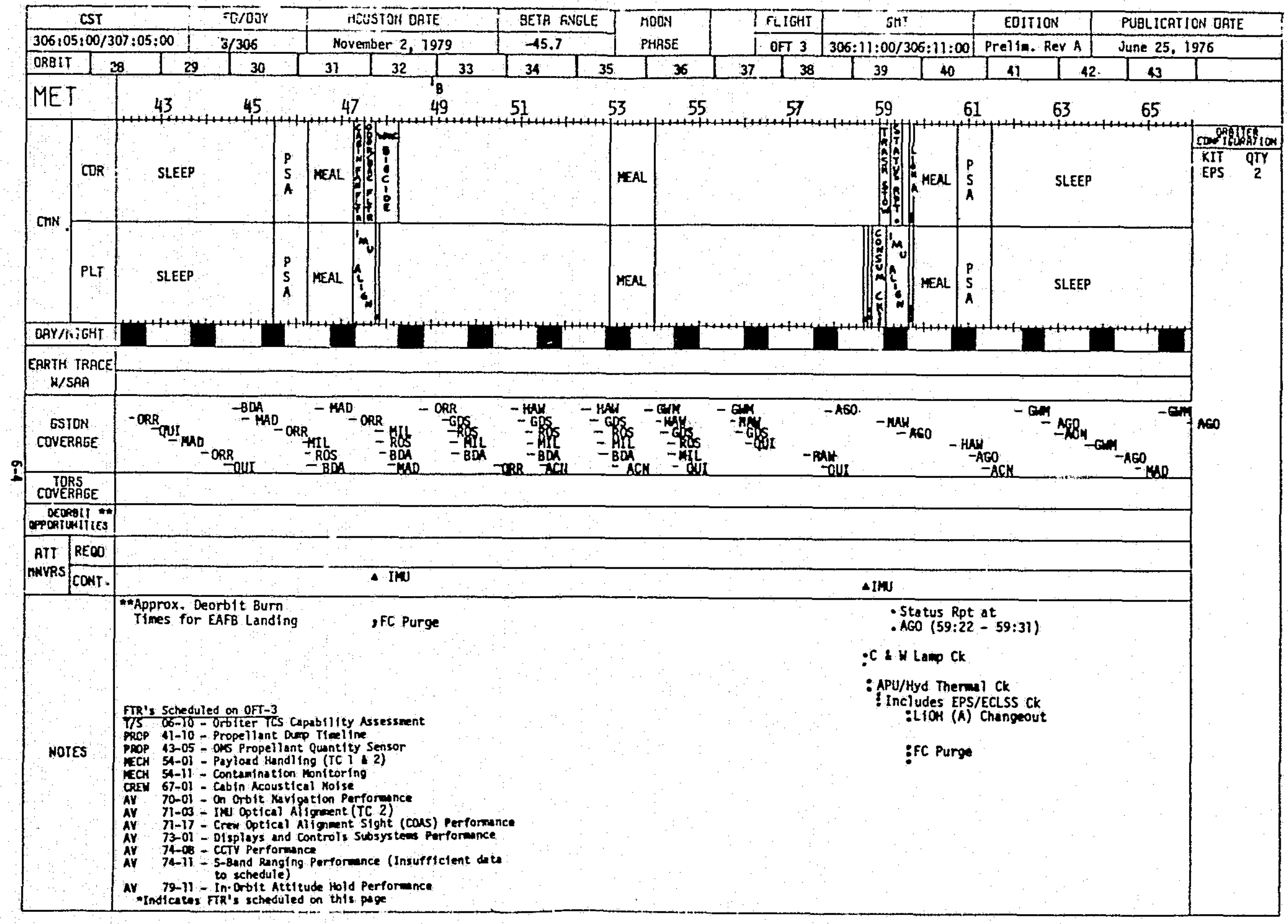
- • T/S 06-10 - Orbiter TCS Capability Assessment
- PROP 41-10 - Propellant Dump Timeline
- PROP 43-05 - OMS Propellant Quantity Sensor
- MECH 54-01 - Payload Handling (TC 1 & 2)
- MECH 54-11 - Contamination Monitoring
- • CREW 67-01 - Cabin Acoustical Noise
- AV 70-01 - On Orbit Navigation Performance
- AV 71-03 - IMU Optical Alignment (TC 2)
- AV 71-17 - Crew Optical Alignment Sight (COAS) Performance
- • AV 73-01 - Displays and Controls Subsystems Performance
- AV 74-08 - CCTV Performance
- AV 74-11 - S-Band Ranging Performance (Insufficient data to schedule)
- • AV 79-11 - In-Orbit Attitude Hold Performance

*Indicates FTR's scheduled on this page

6-3

TABLE I CONTINUED

NASA-S-76-5309



6-4

TABLE I CONTINUED

NASA-S-76-5310

CST	FD/DOY	HOUSTON DATE	BETA ANGLE	MOON PHASE		FLIGHT	GMT	EDITION	PUBLICATION DATE
307:05:00/308:05:00	4/307	November 3, 1979	-48.8			OFT 3	307:11:00/308:11:00	Prelim. Rev A	June 25, 1976

ORBIT: 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

MET: 67 69 71 73 75 77 79 81 83 85 87 89

CMN
- CDR: SLEEP – PSA – MEAL – CABIN FLT – MEAL – STATUS RPT – TRASH STO – MEAL – PSA – SLEEP
- PLT: SLEEP – PSA – MEAL – IMU ALIGN – MEAL – CONSOLE CK – IMU ALIGN – MEAL – PSA – SLEEP

ORBITER CONFIGURATION: KIT EPS, QTY 2

DAY/NIGHT

EARTH TRACE W/SAA

GSTDN COVERAGE: QUI, MAD, ORR, QUI, BDA, MAD, ORR, BDA, MAD, ORR, QUI, MIL, ROS, MAD, ORR, MIL, ROS, BDA, ORR, GDS, ROS, MIL, BDA, ORR, ACN, HAW, GDS, ROS, MIL, BDA, HAW, ACN, GDS, ROS, MIL, BDA, BDA, GWM, ACN, HAW, GDS, ROS, MIL, GWM, HAW, GDS, QUI, HAW, GDS, QUI, AGO, HAW, AGO, HAW, AGO, ACN, GWM, AGO, ACN, GWM, AGO, ACN, GWM, AGO, MAD

TDRS COVERAGE

DEORBIT** OPPORTUNITIES

ATT MNVRS
- REQD
- CONT.: ▲IMU ▲IMU

NOTES

**Approx. Deorbit Burn Times for EAFB Landing

* FC Purge

* Status Rpt at AGO (82:27 - 82:36)

* C & W Lamp Ck

* APU/Hyd Thermal Ck

* LiOH (B) Changeout

* FC Purge

* Includes EPS/ECLSS Ck

FTR's Scheduled on OFT-3

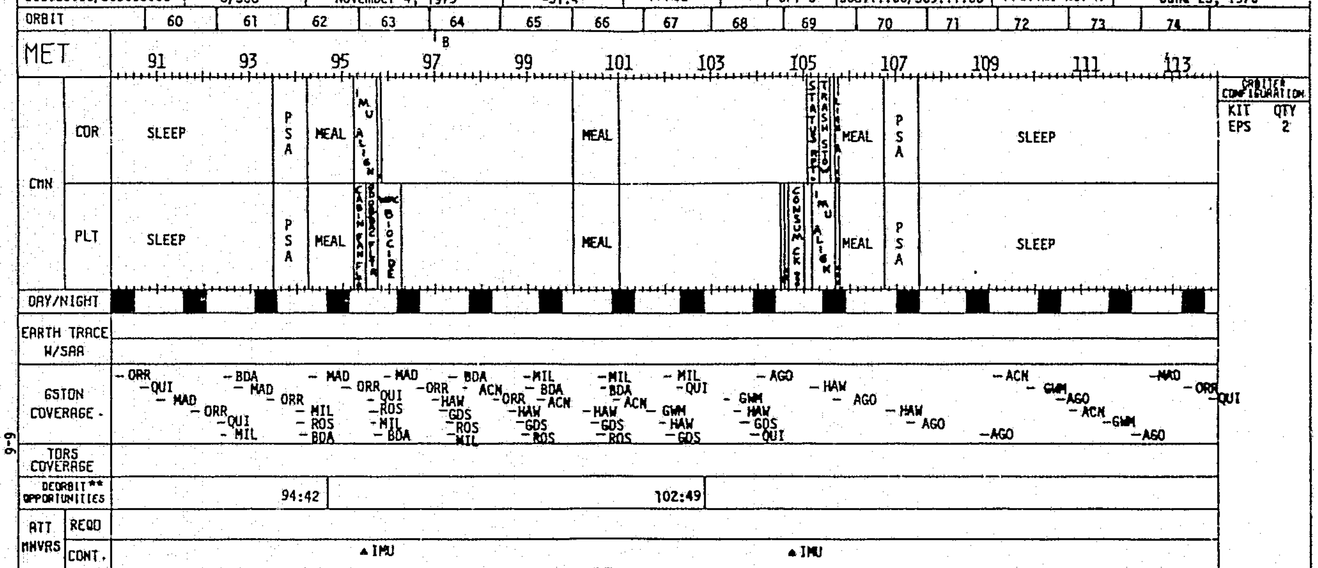
T/S 06-10 - Orbiter TCS Capability Assessment
PROP 41-10 - Propellant Dump Timeline
PROP 43-05 - OMS Propellant Quantity Sensor
MECH 54-01 - Payload Handling (TC 1 & 2)
MECH 54-11 - Contamination Monitoring
CREW 67-01 - Cabin Acoustical Noise
AV 70-01 - On Orbit Navigation Performance
AV 71-03 - IMU Optical Alignment (TC 2)
AV 71-17 - Crew Optical Alignment Sight (COAS) Performance
AV 73-01 - Displays and Controls Subsystems Performance
AV 74-08 - CCTV Performance
AV 74-11 - S-Band Ranging Performance (Insufficient data to schedule)
AV 79-11 - In-Orbit Attitude Hold Performance

*Indicates FTR's scheduled on this page

TABLE I CONTINUED

NASA-S-76-5311

CST	FD/DOY	HOUSTON DATE	BETA ANGLE	MOON PHASE		FLIGHT	GMT	EDITION	PUBLICATION DATE
308:05:00/309:05:00	5/308	November 4, 1979	-51.4	PHASE		OFT 3	308:11:00/309:11:00	Prelim. Rev A	June 25, 1976



NOTES

**Approx. Deorbit Burn Times for EAFB Landing

• FC Purge

• Status Rpt at HAW (105:05 - 105:14)

• C & W Lamp Ck

• APU/Hyd Thermal Ck

• Includes EPS/ECLSS Ck

• LiOH (A) Changeout

• FC Purge

FTR's Scheduled on OFT-3

T/S 06-10 - Orbiter TCS Capability Assessment
PROP 41-10 - Propellant Dump Timeline
PROP 43-05 - OMS Propellant Quantity Sensor
MECH 54-01 - Payload Handling (TC 1 & 2)
MECH 54-11 - Contamination Monitoring
CREW 67-01 - Cabin Acoustical Noise
AV 70-01 - On Orbit Navigation Performance
AV 71-03 - IMU Optical Alignment (TC 2)
AV 71-17 - Crew Optical Alignment Sight (COAS) Performance
AV 73-01 - Displays and Controls Subsystems Performance
AV 74-08 - CCTV Performance
AV 74-11 - S-Band Ranging Performance (Insufficient data to schedule)
AV 79-11 - In-Orbit Attitude Hold Performance

*Indicates FTR's scheduled on this page

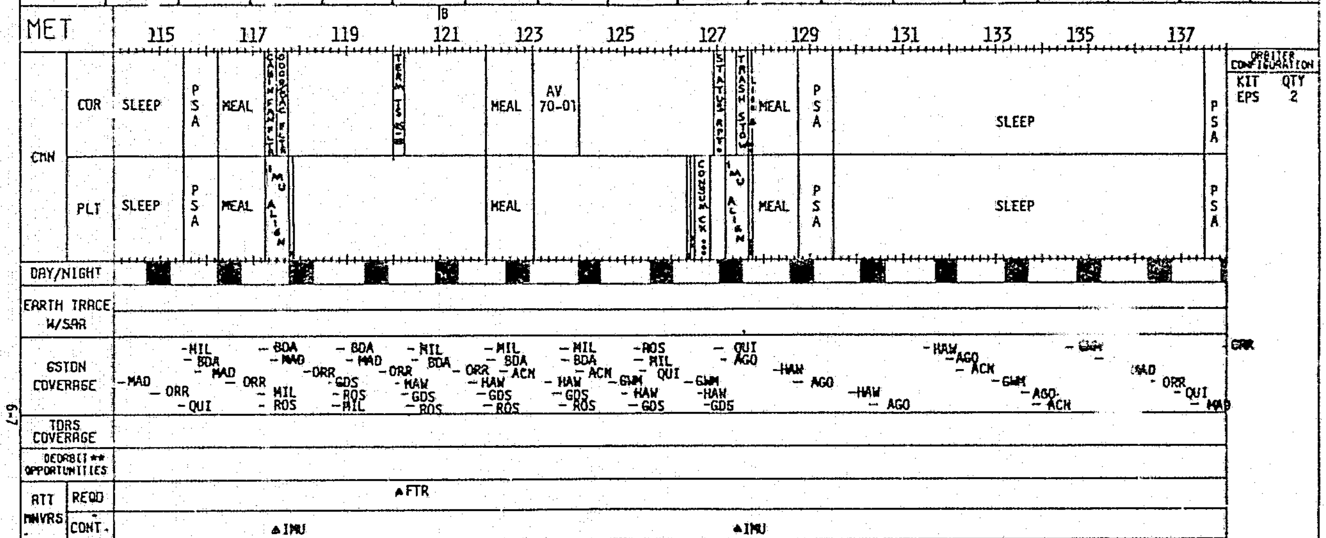
6-9

TABLE I CONTINUED

NASA-S-76-5312

CST	FD/DOY	HOUSTON DATE	BETA ANGLE	MOON PHASE		FLIGHT	GMT	EDITION	PUBLICATION DATE
309:05:00/310:05:00	6/309	November 5, 1979	-53.1			OFT 3	309:11:00/310:11:00	Prelim. Rev A	June 25, 1976

ORBIT	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90



NOTES

**Approx. Deorbit Burn Times for EAFB Landing

FC Purge

Status Rpt at AGO (127:03 - 127:08)

C & W Lamp Ck

APU/Hyd Thermal Ck

LiOH (B) Changeout

FC Purge

Includes EPS/ECLSS Ck

FTR's Scheduled on OFT-3

- • T/S 06-10 - Orbiter TCS Capability Assessment
- PROP 41-10 - Propellant Dump Timeline
- PROP 43-05 - OMS Propellant Quantity Sensor
- MECH 54-01 - Payload Handling (TC 1 & 2)
- MECH 54-11 - Contamination Monitoring
- CREW 67-01 - Cabin Acoustical Noise
- * AV 70-01 - On Orbit Navigation Performance
- AV 71-03 - IMU Optical Alignment (TC 2)
- AV 71-17 - Crew Optical Alignment Sight (COAS) Performance
- AV 73-01 - Displays and Controls Subsystems Performance
- AV 74-08 - CCTV Performance
- AV 74-11 - S-Band Ranging Performance (Insufficient data to schedule)
- AV 79-11 - In-Orbit Attitude Hold Performance

*Indicates FTR's scheduled on this page

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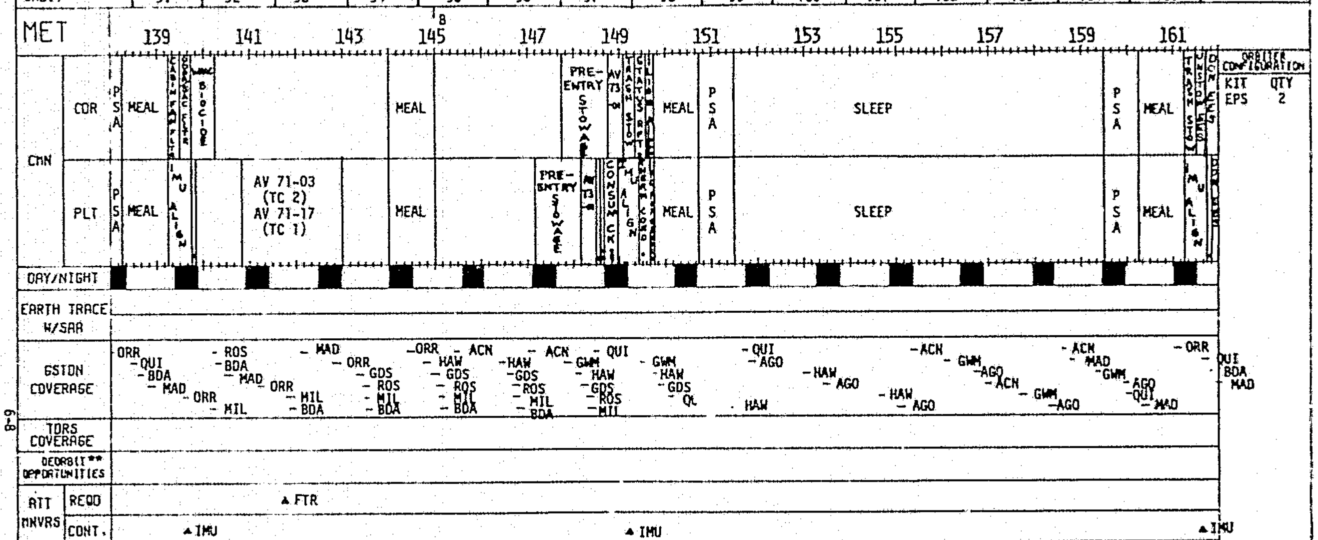
TABLE I CONTINUED

NASA-S-76-5313

CST	FD/DOY	HOUSTON DATE	BETA ANGLE	MOON PHASE		FLIGHT	GMT	EDITION	PUBLICATION DATE
310:05:00/311:05:00	7/310	November 6, 1979	-54.0			OFT 3	310:11:00/311:11:00	Prelim. Rev A	June 25, 1976

ORBIT	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105



NOTES	

**Approx. Deorbit Burn Times for EAFB Landing

•FC Purge

•Status Rpt at GWM (149:22 - 149:30)

•C & W Lamp Ck

•APU/Hyd Thermal Ck

•LiOH (A) Changeout

•FC Purge

•Includes EPS/ECLSS Ck

•Initation of Rotational Attitude Control Mode (+X Roll)

•FC Purge

FTR's Scheduled on OFT-3

TCS 06-10 - Orbiter TCS Capability Assessment
PROP 41-10 - Propellant Dump Timeline
PROP 43-05 - OMS Propellant Quantity Sensor
MECH 54-01 - Payload Handling (TC 1 & 2)
MECH 54-11 - Contamination Monitoring
CREW 67-01 - Cabin Acoustical Noise
AV 70-01 - On Orbit Navigation Performance
•AV 71-03 - IMU Optical Alignment (TC 2)
•AV 71-17 - Crew Optical Alignment Sight (COAS) Performance
•AV 73-01 - Displays and Controls Subsystems Performance
AV 74-08 - CCTV Performance
AV 74-11 - S-Band Ranging Performance (Insufficient data to schedule)
AV 79-11 - In-Orbit Attitude Hold Performance

*Indicates FTR's scheduled on this page

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TABLE I CONCLUDED

NASA-S-76-5314

FST	FD/CC	MISSION DATE	BETA ANGLE	MOON PHASE	FLIGHT	GMT	EDITION	PUBLICATION DATE
311:05:00/312:05:00	8/311	November 7, 1979	-53.9		OFT 3	311:11:00/312:11:00	Prelim. Rev A	June 25, 1976

ORBIT	106	107	108	109

MET: 163, 165, 167 — B

CMN	CDR	
	PLT	OMS-4; DEORBIT (165:37:31); OMS-5; ENTRY (166:04:11); LANDING (166:54:00)
DAY/NIGHT		
EARTH TRACE W/SAA		
GSTDN COVERAGE		MAD – ORR – MIL – BDA – ROS – MAD – QUI – ORR – ROS – BDA – MAD – MIL – ORR – MIL – BDA – GDS – ROS
TDRS COVERAGE		
DEORBIT OPPORTUNITIES**		165:37; 167:06
ATT MNVRS	REQD	▲ ▲
	CONT.	▲ IMU
NOTES		see below

ORBITER CONFIGURATION: KIT #

NOTES:

**Approx. Deorbit Burn Times for EAFB Landing

•PROP 43-05 (50% - single)

:On-Orbit to FCS C/O GPC Reconfiguration (ORR)

:PBDM Close & CCTV Performance (AV 74-08)

:FCS C/O Coverage (MIL)

•Entry GPC Reconfiguration (MIL)

FTR's Scheduled on OFT-3

T/S 06-10 - Orbiter TCS Capability Assessment
PROP 41-10 - Propellant Dump Timeline
•PROP 43-05 - OMS Propellant Quantity Sensor
MECH 54-01 - Payload Handling (TC 1 & 2)
MECH 54-11 - Contamination Monitoring
CREW 67-01 - Cabin Acoustical Noise
AV 70-01 - On Orbit Navigation Performance
AV 71-03 - IMU Optical Alignment (TC 2)
AV 71-17 - Crew Optical Alignment Sight (COAS) Performance
AV 73-01 - Displays and Controls Subsystems Performance
•AV 74-08 - CCTV Performance
AV 74-11 - S-Band Ranging Performance (Insufficient data to schedule)
AV 79-11 - In-Orbit Attitude Hold Performance

*Indicates FTR's scheduled on this page

6-9

TABLE II ENGINE DUTY CYCLES

Time (Sec)	Jets Turned On	Jets Turned Off
0.00	L4D, R4U	
1.00	F2U, L2D	R4U
1.16		F2U, L4D, L2D
11.28	F1L, R4R	
11.36		F1L, R4R
15.60	F1D, F2D, L4U, R4U	
15.64		F1D, F2D, L4U, R4U
16.24	F1D, F2D, L4U, R4U	
16.28		F1D, F2D, L4U, R4U
53.76	F1D, F2D, L4U, R4U	
53.80		F1D, F2D, L4U, R4U
55.96	L4U, R4D	
56.00		L4U, R4D
111.72	F1D, F2D, L4U, R4U	
111.76		F1D, F2D, L4U, R4U
136.76	F1D, F2D, L4U, R4U	
136.80		F1D, F2D, L4U, R4U
160.16	L4D, R4U	
160.20		L4D, R4U
180.00	L4U, R4D	
181.12	F1U, R2D	L4U
181.16	F3U, L4D	F1U, R2D
181.28		F3U, L4D, R4D

TAIL TO SUN $\beta = 0^{o}$
(Z - PEP, +X SI)

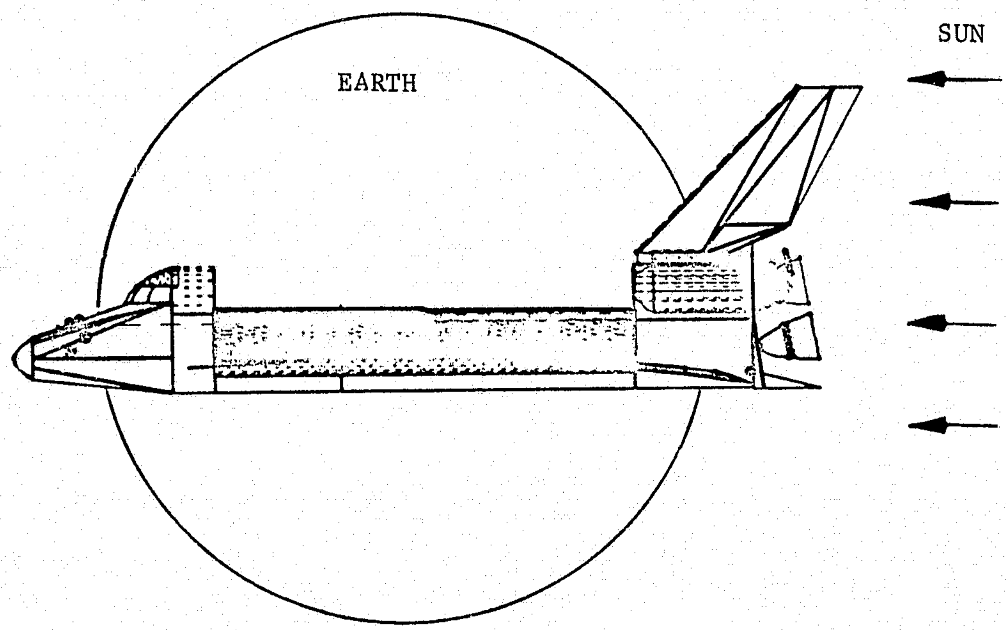

Figure 6 OFT-3 Attitude

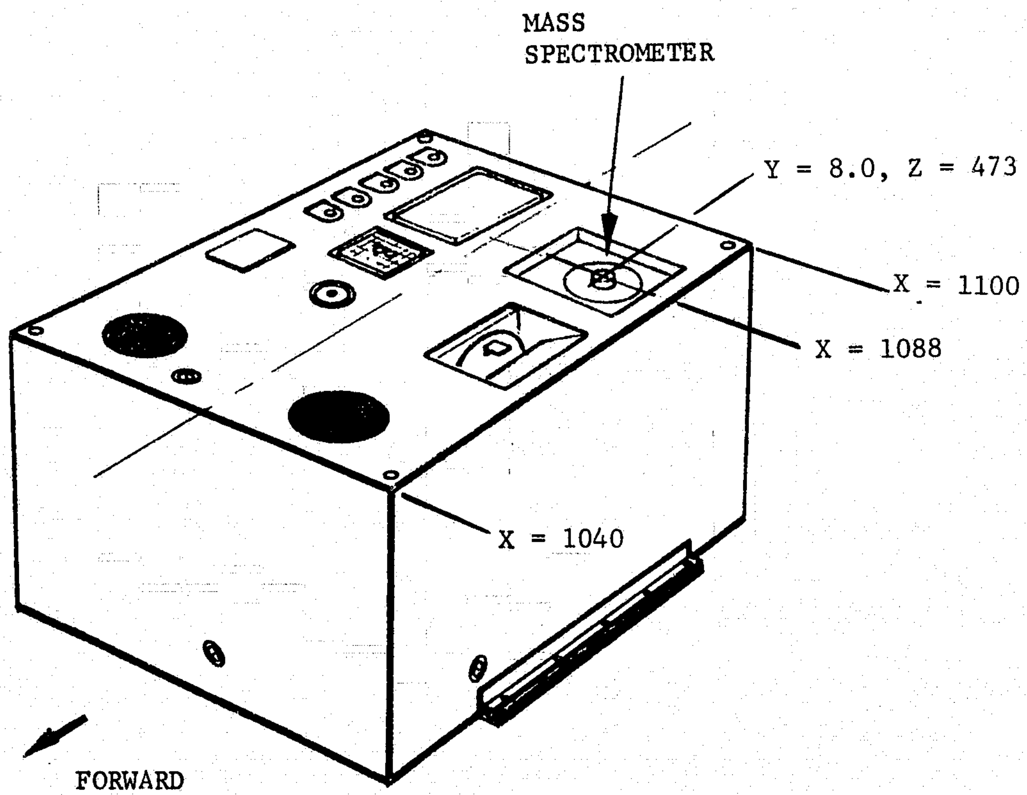

Figure 7 IECM Location

TABLE III. OFT/IECM INSTRUMENT OPERATION CHART

MISSION PHASES		PRELAUNCH	ASCENT	ON-ORBIT	RMS AND INTERRUPT	DESENT	POST
DEW POINTER		◄──	──►			◄──	──►
HUMIDITY MONITOR		◄──	──►			◄──	──►
CASCADE MONITOR	STAGES	◄──	──►			◄──	──►
	NVR	◄──	────	────	────	────	──►
AIR SAMPLER		◄──	──►			◄──	──►
MASS SPEC	NORMAL			◄──►			
	FAST				◄──►		
CAMERA/PHOTOMETER				◄──►			
OPTICAL MODULE		◄──►		◄──	────	────	──►
TQCM		◄──	────	────	────	────	──►
CQCM		◄──	────	────	────	────	──►

◄──► UNIT OPERATING

the mass spectrometer if it could be activated earlier than planned.

Several time intervals were examined early in the flight (fifth orbit) to illustrate the variation expected in the mass spec data due to day/night cycling. During this orbit, it was assumed the vehicle attitude is +X SI, Z-PEP so the velocity vector is changing constantly with respect to vehicle coordinates (see Figure 6).

The flight appears relatively uninteresting from a contamination standpoint until about 11 hours 40 minutes into the mission where an Orbiter attitude maneuver is scheduled. A +X roll for a thermal control test is to be initiated at this point for a 10-15 minute time period. Because the RCS duty cycles are not yet available for the maneuver, a 180° +X roll requiring 180 seconds to complete was inserted to illustrate typical engine sequencing. The complete 180° roll requires 13 discrete DAP cycles involving the simultaneous firing of 2, 3 and 4 thrusters. Of this 13 events 9 are the minimum impulse bit of 0.04 seconds, 1 is .12 seconds and 1 is .16 seconds. Based on current understanding of the mass spec, none of these events can be observed accurately with the normal data acquisition mode. Even the remaining two primary firings to initiate and terminate the roll rate last for only 1.0 and 1.12 seconds respectively. The 2 second per sample rate for the mass spec may not even be capable of accurately monitoring the primary burns during this roll maneuver. Nevertheless, to illustrate the construction of an OFT-3 mission data book, several of these engine firing events were examined.

At 16 hours, the Orbiter is scheduled to maintain a +X SI attitude for 96 hours. Its prior attitude is not specified from data at hand so engine firings could not be predicted.

The flight is again rather uninteresting in terms of contamination events except for the fuel cell purges at 36, 48, 60, 72, 84, 96, 105, 128 and 139 hours. The current SPACE code does not predict this release of H_2O, H_2 and O_2. Several points are evaluated during this time period to estimate the outgassing background.

At 142 hours an FTR is scheduled that requires an attitude change. Here again, the test requirements are not available and no engine firing sequence can be defined.

One hundred fifty hours into the mission a +X roll is again initiated. As before, a 180° roll maneuver could be substituted.

The OMS engines are scheduled to be tested at 162 hrs, 29 minutes just before the payload bay doors are closed at 163 hours.

A summary of selected time intervals is provided in Table IV.

A preliminary evaluation of the mission timeline for OFT-3 has illustrated the analysis procedure and type of data required to make preflight predictions for on-board instrumentation. The IECM mass spectrometer was chosen because it monitors return flux which is directly amenable to prediction by the current NASA SPACE code.

Where information was incomplete (RCS duty cycles, thermal profiles, vehicle attitude) representative data were used to construct a preliminary mission data book.

Modifications were made to the SPACE code to facilitate mission analysis. Sample Case No. 16 was constructed for the

TABLE IV OFT-3 MISSION TIMELINE DATA

Time (MET)	Source	V_X km/sec	V_Y km/sec	V_Z km/sec	Attitude	Temp Profile Atcode	Day-Night	Comments	Computed	Time Interval Hr	Min	Sec
6:40:00	Outgassing	6.62	-3.83	0 [1]	Z-PEP +X SI [2]	2	N	Activate IECH Mass Spec	X		15	
6:55:00	Outgassing	0	-7.65	0		TMin	N		X		15	
7:10:00	Outgassing	-6.62	-3.83	0		1	D		X		15	
7:25:00	Outgassing	-6.62	3.83	0		2	D		X		15	
7:40:00	Outgassing	0	7.65	0		3	D		X		15	
7:55:00	Outgassing	6.62	3.83	0		4	D		X		15	
8:10:00	Outgassing	V [3]	V	V		V	V		0	3	20	
11:30:00	Outgassing	6.62	3.83	0		TMax	D		X		10	
11:40:00					+X SI			Initiate +X Roll, $\dot{\theta} \sim 1^\circ$/sec				
	7246, 7345	0	-7.65	0	Roll = 0°	2	D		X			1.0
11:40:01	7125, 7226, 7246	0	-7.65	0		2	D		0			.16
11:40:01.16	Outgassing	0	-7.65	0		2	D		0			.12
11:40:11.28	7113, 7344	0	-7.51	-1.46	Roll = 11°	2	D		0			.04
11:40:11.36	Outgassing	0	-7.51	-1.46		2	D		0			4.24
11:40:15.60	7116, 7126, 7245, 7345	0	-7.37	-2.06	Roll = 16°	2	D		0			.04
11:40:15.64	Outgassing	0	-7.37	-2.06		2	D		0			.6
11:40:16.24	7116, 7126, 7245, 7345	0	-7.34	-2.14		2	D		0			.04
11:40:16.28	Outgassing	0	-7.34	-2.14		2	D		0			37.5
11:40:53.76	7116, 7126, 7245, 7345	0	-4.52	-6.17	Roll = 54°	2	D		0			.04
11:40:53.80	Outgassing		-4.52	-6.17		2	D		0			2.16
11:40:55.96	7245, 7346		-4.28	-6.34		2	D		0			.04
11:40:56.00	Outgassing		-4.28	-6.34	Roll = 56°	2	D		0			55.7
11:41:51.72	7116, 7126, 7245, 7345		+2.83	-7.1	Roll = 112°	2	D		X			.04
11:42:16.76	Outgassing		2.83	-7.1	Roll = 137°	2	D		0			25
11:42:16.76	7116, 7126, 7245, 7345		+5.50	-5.3		2	D		0			.04
11:42:16.80	Outgassing		5.50	-5.3		2	D		0			23.4
11:42:40.16	7246, 7345		+7.19	-2.62	Roll = 160°	2	D		0			.04
11:42:40.20	Outgassing		7.19	-2.62		2	D		0			20
11:43:00	7245, 7346		7.65	0	Roll = 180°	2	D	Counteract Roll Rate	X			1.12
11:43:01.12	7115, 7326, 7346		7.65	0		2	D		0			.04
11:43:01.16	7135, 7246, 7346		7.65	0		2	D	End Roll	0			.12
11:43:01.28	Outgassing	V	V	V	V	V	V	Assume +X SI, Z-PEP Attitude	0	24	7	
35:50:00	Fuel Cell Purge	6.620	3.83	0	Z-PEP +X SI	4	D		X		10	
36:00:00	Outgassing	V	V	V		V	V		0	12		
48:00:00	F. C. Purge	0	7.65	0		3	D		X		10	
48:10:00	Outgassing	V	V	V		V	V		0	11	30	
59:40:00	F. C. Purge	6.62	3.83	0		1	D		X		10	
59:50:00	Outgassing	V	V	V		V	V		0	45	50	
105:40:00	F. C. Purge	0	-7.65	0		Tmin	N		X		10	
105:50:00	Outgassing	V	V	V		V	V		0	56	39	
162:29:00	OMS Engines								X			5
162:29:05	Outgassing	V	V	V		V	V	Close Bay Doors	0		31	

Nominal Altitude = 398 km (215 n.m.)

[1] V_Z was actually set to -100 km/sec because return flux model requires an angle greater than 90° between LOS and V_A.

[2] Actual orbiter attitude is not known during this time.

[3] V = Varies with time.

OFT-3 mission to illustrate the form of a typical input deck and to begin the construction of an OFT-3 mission data book. As additional data become available, time segments can be added or deleted to update the data book.

Figure 8 is a detailed printout of the return flux values and input data requirements for the first time interval of the simulated OFT-3 mission. Reports number 1,3, 7, 8 and 11 show the inputs used to determine the return flux values. Reports 41, 42 and 43 show the actual predicted results. Figure 9 lists the summary only for the remaining time periods. These predictions are presented in plot form in Figures 3 and 4. The value of the approach presented here is that the time intervals can be increased or decreased at will. This allows rather static situations to be spot checked only and eliminates reproducing repititious events such as engine firings that occur with similiar mission parameters. Figures 3 and 4 show that the return flux values for the combined environmen of early desorption, outgassing and engines varies from the 10^{-16} to the $10^{-7} g \cdot cm^{-2} \cdot s^{-1}$ range.

REPORT NO. 1 *** OFT-3 PREFLIGHT EVAL. *** IECM MASS SPEC (06:40:00-06:55:00) 01/26/78 09.01.09. PAGE 1

CONTENTS: LISTING OF INPUT CONTROL PARAMETERS

Figure 8 Detailed Input/Results for First OFT-3 Time Interval

```
$CONTRL
DBUGA    = F,
DBUGB    = F,
DBUGC    = F,
DBUGD    = F,
DEPSIT   = F,
ED       = T,
ENG      = F,
EVAP     = F,
FIVP     = F,
LEAK     = F,
LMOP     = F,
MAXTMP   = F,
MCD      = F,
MFPATH   = F,
NEWCON   = F,
NEWTNL   = F,
NEWMFP   = F,
NEWMFS   = F,
NEWMLC   = F,
NEWTCD   = F,
MINTMP   = F,
ORBITR   = T,
OUT      = T,
OLDS     = F,
REFLCT   = F,
REPORT   = T, F, T, F, F, F, T, T, F, F, T, F, F, F, F, F, F, F, F, F, F, F, F,  F, F, F, F, F, F, F, F, F, F, F, F, F, F, F, F, F, T
           T, F, F, F, T, F, F, T,
RFAS     = T,
RFSS     = F,
SMTP     = F,
TSTART   = .6E+01, .4E+02, 0.0,
```


Figure 8 continued

```
TSTOP   = .6E+01, .55E+02, 0.0,
ATCODE  = 0.0,
GO      = T,
$END
```


Figure 8 continued

CONTENTS: LIST OF SOURCES TO BE EVALUATED

* * * SURFACES * * *

SEQUENCE NO.	IDENT NO.	SECTION	MATERIAL	AREA (SQ IN)
1	20	RADOOR	TEFLON	12200.
2	22	RADOOR	TEFLON	12200.
3	24	RADOOR	TEFLON	12200.
4	26	RADOOR	TEFLON	12200.
5	30	RADOOR	TEFLON	12200.
6	32	RADOOR	TEFLON	12200.
7	34	RADOOR	TEFLON	12200.
8	36	RADOOR	TEFLON	12200.
9	40	RADOOR	TEFLON	25580.
10	42	RADOOR	TEFLON	25580.
11	44	RADOOR	TEFLON	25580.
12	46	RADOOR	TEFLON	25580.
13	50	RADOOR	TEFLON	25580.
14	52	RADOOR	TEFLON	25580.
15	54	RADOOR	TEFLON	25580.
16	56	RADOOR	TEFLON	24990.
17	21	FUSLAG	LRSI	12200.
18	23	FUSLAG	LRSI	12200.
19	25	FUSLAG	LRSI	12200.
20	27	FUSLAG	LRSI	12200.
21	31	FUSLAG	LRSI	12200.
22	33	FUSLAG	LRSI	12200.
23	35	FUSLAG	LRSI	12200.
24	37	FUSLAG	LRSI	12200.
25	41	FUSLAG	LRSI	25580.
26	43	FUSLAG	LRSI	25580.
27	45	FUSLAG	LRSI	25530.
28	47	FUSLAG	LRSI	25580.
29	51	FUSLAG	LRSI	24990.
30	53	FUSLAG	LRSI	24990.
31	55	FUSLAG	LRSI	24990.
32	57	FUSLAG	LRSI	24990.
33	202	FUSLAG	LRSI	32520.
34	203	FUSLAG	LRSI	32520.
35	230	FUSLAG	LRSI	25730.
36	240	FUSLAG	LRSI	16340.
37	241	FUSLAG	LRSI	16340.
38	250	FUSLAG	LRSI	19580.
39	260	FUSLAG	LRSI	20240.
40	301	FUSLAG	LRSI	26600.
41	305	FUSLAG	LRSI	30930.
42	306	FUSLAG	NOMEX	30930.
43	307	FUSLAG	NOMEX	24770.
44	311	FUSLAG	LRSI	26600.
45	315	FUSLAG	LRSI	30930.
46	316	FUSLAG	NOMEX	30930.
47	317	FUSLAG	NOMEX	24770.
48	420	FUSLAG	LRSI	1312.
49	425	FUSLAG	LRSI	1312.
50	60	OMS	LRSI	1145.
51	62	OMS	LRSI	7850.

Figure 8 continued

52	64	OMS	LRSI	37920.
53	66	OMS	LRSI	1991.
54	67	OMS	LRSI	2028.
55	68	OMS	LRSI	415.
56	70	OMS	LRSI	895.
57	72	OMS	LRSI	1406.
58	74	OMS	LRSI	1312.
59	76	OMS	LRSI	715.
60	77	OMS	LRSI	600.
61	80	OMS	LRSI	1145.
62	82	OMS	LRSI	7813.
63	84	OMS	LRSI	37740.
64	86	OMS	LRSI	1991.
65	87	OMS	LRSI	2028.
66	88	OMS	LRSI	415.
67	90	OMS	LRSI	895.
68	92	OMS	LRSI	1406.
69	94	OMS	LRSI	1312.
70	96	OMS	LRSI	715.
71	97	OMS	LRSI	601.
72	100	WING	NOMEX	6356.
73	102	WING	NOMEX	29590.
74	104	WING	NOMEX	9125.
75	110	WING	NOMEX	23340.
76	112	WING	NOMEX	19380.
77	115	WING	LRSI	19280.
78	117	WING	HRSI	5650.
79	118	WING	HRSI	2508.
80	119	WING	LRSI	3302.
81	121	WING	RCC	2251.
82	122	WING	RCC	3123.
83	130	WING	NOMEX	6356.
84	132	WING	NOMEX	29590.
85	134	WING	NOMEX	9125.
86	140	WING	NOMEX	23340.
87	142	WING	NOMEX	19380.
88	145	WING	LRSI	19280.
89	147	WING	HRSI	5650.
90	148	WING	HRSI	2508.
91	149	WING	LRSI	3302.
92	151	WING	RCC	2251.
93	152	WING	RCC	3123.
94	106	ELEVON	NOMEX	6499.
95	107	ELEVON	NOMEX	17210.
96	136	ELEVON	NOMEX	6499.
97	137	ELEVON	NOMEX	9125.
98	450	ELEVON	NOMEX	138.
99	451	ELEVON	NOMEX	415.
100	452	ELEVON	NOMEX	692.
101	453	ELEVON	NOMEX	960.
102	454	ELEVON	NOMEX	1246.
103	455	ELEVON	NOMEX	1523.
104	456	ELEVON	NOMEX	1800.
105	457	ELEVON	NOMEX	2076.
106	458	ELEVON	NOMEX	2353.
107	459	ELEVON	NOMEX	2630.
108	460	ELEVON	NOMEX	138.
109	461	ELEVON	NOMEX	415.
110	462	ELEVON	NOMEX	692.
111	463	ELEVON	NOMEX	969.
112	464	ELEVON	NOMEX	1246.
113	465	ELEVON	NOMEX	1523.
114	466	ELEVON	NOMEX	1800.

Figure 8 continued

115	467	ELEVON	NOMEX	2076.
116	468	ELEVON	NOMEX	2353.
117	469	ELEVON	NOMEX	2630.
118	160	CREW	RCC	7191.
119	161	CREW	LRSI	9348.
120	162	CREW	LRSI	9348.
121	163	CREW	LRSI	3380.
122	164	CREW	LRSI	3380.
123	165	CREW	LRSI	4253.
124	166	CREW	LRSI	4253.
125	167	CREW	HRSI	12590.
126	168	CREW	HRSI	12590.
127	169	CREW	HRSI	9600.
128	170	CREW	HRSI	9600.
129	171	CREW	HRSI	3705.
130	172	CREW	HRSI	3705.
131	174	CREW	LRSI	20720.
132	175	CREW	LRSI	10150.
133	177	CREW	LRSI	10150.
134	180	CREW	WINDOW	1424.
135	181	CREW	WINDOW	1424.
136	182	CREW	WINDOW	1424.
137	183	CREW	WINDOW	1424.
138	184	CREW	WINDOW	1424.
139	185	CREW	WINDOW	1424.
140	190	CREW	LRSI	10250.
141	380	TAIL	LRSI	16920.
142	381	TAIL	LRSI	16920.
143	382	TAIL	LRSI	6833.
144	383	TAIL	LRSI	6833.
145	384	TAIL	LRSI	13940.
146	385	TAIL	LRSI	13940.
147	386	TAIL	LRSI	6116.
148	387	TAIL	LRSI	6116.
149	388	TAIL	LRSI	2744.
150	389	TAIL	LRSI	2744.
151	390	TAIL	LRSI	1160.
152	391	TAIL	LRSI	1160.
153	392	TAIL	LRSI	3081.
154	393	TAIL	LRSI	3081.
155	399	TAIL	HRSI	3823.
156	1	BAY	LINER	26620.
157	2	BAY	LINER	26620.
158	3	BAY	LINER	26520.
159	4	BAY	LINER	26620.
160	5	BAY	LINER	25620.
161	6	BAY	LINER	26620.
162	7	BAY	LINER	26620.
163	8	BAY	LINER	26520.
164	11	BAY	BLKHED	32690.
165	13	BAY	BLKHED	32690.
166	440	BAY	LINER	3444.
167	441	BAY	LINER	3444.
168	442	BAY	LINER	3444.
169	443	BAY	LINER	3444.
170	445	BAY	LINER	3444.
171	446	BAY	LINER	3444.
172	447	BAY	LINER	3444.
173	448	BAY	LINER	3444.
174	570	FILTER	FILI	207.
175	571	FILTER	FILI	207.
176	572	FILTER	FILI	207.
177	573	FILTER	FILI	207.

Figure 8 continued

178	580	FILTER	FILI	207.
179	581	FILTER	FILI	207.
180	582	FILTER	FILI	207.
181	583	FILTER	FILI	207.
182	575	FILTER	FILO	144.
183	576	FILTER	FILO	144.
184	577	FILTER	FILO	144.
185	578	FILTER	FILO	144.
186	585	FILTER	FILO	144.
187	586	FILTER	FILO	144.
188	587	FILTER	FILO	144.
189	588	FILTER	FILO	144.

Figure 8 continued

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CONTENTS: LIST OF SURFACE TEMPERATURES THAT WILL BE USED

SEQUENCE NO.	IDENT NO.	TEMP (DEG C)	MATERIAL	AREA (SQ IN)
1	20	-34.	TEFLON	12200.
2	22	-14.	TEFLON	12200.
3	24	-32.	TEFLON	12200.
4	26	-14.	TEFLON	12200.
5	30	-14.	TEFLON	12200.
6	32	-34.	TEFLON	12200.
7	34	-32.	TEFLON	12200.
8	36	-14.	TEFLON	12200.
9	40	17.	TEFLON	25580.
10	42	-31.	TEFLON	25580.
11	44	10.	TEFLON	25580.
12	46	-20.	TEFLON	25580.
13	50	17.	TEFLON	25580.
14	52	-31.	TEFLON	25580.
15	54	9.	TEFLON	25580.
16	56	-20.	TEFLON	24990.
17	21	-34.	LRSI	12200.
18	23	-14.	LRSI	12200.
19	25	-32.	LRSI	12200.
20	27	-14.	LRSI	12200.
21	31	-14.	LRSI	12200.
22	33	-34.	LRSI	12200.
23	35	-14.	LRSI	12200.
24	37	-32.	LRSI	12200.
25	41	-38.	LRSI	25580.
26	43	-35.	LRSI	25580.
27	45	-38.	LRSI	25580.
28	47	-35.	LRSI	25580.
29	51	-38.	LRSI	24990.
30	53	-35.	LRSI	24990.
31	55	-38.	LRSI	24990.
32	57	-35.	LRSI	24990.
33	202	8.	LRSI	32520.
34	203	8.	LRSI	32520.
35	230	81.	LRSI	25730.
36	240	68.	LRSI	16340.
37	241	81.	LRSI	16340.
38	250	-12.	LRSI	19580.
39	260	26.	LRSI	20240.
40	301	-12.	LRSI	26600.
41	305	-3.	LRSI	30930.
42	306	11.	NOMEX	30930.
43	307	-17.	NOMEX	24770.
44	311	-12.	LRSI	26600.
45	315	-3.	LRSI	30930.
46	316	12.	NOMEX	30930.
47	317	-17.	NOMEX	24770.
48	420	-17.	LRSI	1312.
49	425	-17.	LRSI	1312.
50	60	-27.	LRSI	1145.
51	62	-28.	LRSI	7850.
52	64	-13.	LRSI	37920.
53	66	37.	LRSI	1991.

Figure 8 continued

54	67	46.	LRSI	2028.
55	68	42.	LRSI	415.
56	70	39.	LRSI	895.
57	72	39.	LRSI	1406.
58	74	46.	LRSI	1312.
59	76	38.	LRSI	715.
60	77	41.	LRSI	600.
61	80	-73.	LRSI	1145.
62	82	-73.	LRSI	7813.
63	84	-13.	LRSI	37740.
64	86	43.	LRSI	1991.
65	87	46.	LRSI	2028.
66	88	42.	LRSI	415.
67	90	39.	LRSI	895.
68	92	39.	LRSI	1406.
69	94	46.	LRSI	1312.
70	96	38.	LRSI	715.
71	97	41.	LRSI	601.
72	100	5.	NOMEX	6356.
73	102	28.	NOMEX	29590.
74	104	19.	NOMEX	9125.
75	110	15.	NOMEX	23340.
76	112	14.	NOMEX	19380.
77	115	-6.	LRSI	19280.
78	117	15.	HRSI	5650.
79	118	13.	HRSI	2508.
80	119	11.	LRSI	3302.
81	121	15.	RCC	2251.
82	122	13.	RCC	3123.
83	130	5.	NOMEX	6356.
84	132	28.	NOMEX	29590.
85	134	19.	NOMEX	9125.
86	140	15.	NOMEX	23340.
87	142	14.	NOMEX	19380.
88	146	-6.	LRSI	19280.
89	147	15.	HRSI	5650.
90	148	13.	HRSI	2508.
91	149	11.	LRSI	3302.
92	151	15.	RCC	2251.
93	152	13.	RCC	3123.
94	106	27.	NOMEX	6499.
95	107	25.	NOMEX	17210.
96	136	27.	NOMEX	6499.
97	137	25.	NOMEX	9125.
98	450	24.	NOMEX	138.
99	451	24.	NOMEX	415.
100	452	24.	NOMEX	692.
101	453	24.	NOMEX	960.
102	454	24.	NOMEX	1246.
103	455	27.	NOMEX	1523.
104	456	27.	NOMEX	1600.
105	457	27.	NOMEX	2076.
106	458	27.	NOMEX	2353.
107	459	27.	NOMEX	2630.
108	460	24.	NOMEX	138.
109	461	24.	NOMEX	415.
110	462	24.	NOMEX	692.
111	463	24.	NOMEX	969.
112	464	24.	NOMEX	1246.
113	465	27.	NOMEX	1523.
114	466	27.	NOMEX	1800.
115	467	27.	NOMEX	2076.
116	468	27.	NOMEX	2353.

Figure 8 continued

117	469	27.	NOMEX	2530.
118	160	2.	RCC	7191.
119	161	9.	LRSI	9348.
120	162	4.	LRSI	9348.
121	163	20.	LRSI	3380.
122	164	20.	LRSI	3380.
123	165	25.	LRSI	4253.
124	166	25.	LRSI	4253.
125	167	-32.	HRSI	12590.
126	168	-33.	HRSI	12590.
127	169	-56.	HRSI	9600.
128	170	-56.	HRSI	9600.
129	171	-48.	HRSI	3705.
130	172	-48.	HRSI	3705.
131	174	-12.	LRSI	20720.
132	175	-60.	LRSI	10150.
133	177	-61.	LRSI	10150.
134	180	-16.	WINDOW	1424.
135	181	-14.	WINDOW	1424.
136	182	-50.	WINDOW	1424.
137	183	-8.	WINDOW	1424.
138	184	-14.	WINDOW	1424.
139	185	-16.	WINDOW	1424.
140	190	-9.	LRSI	10250.
141	380	-47.	LRSI	16920.
142	381	-46.	LRSI	16920.
143	382	-49.	LRSI	8833.
144	383	-49.	LRSI	3833.
145	384	-40.	LRSI	13940.
146	385	-40.	LRSI	13940.
147	386	-46.	LRSI	6116.
148	387	-46.	LRSI	6116.
149	388	-41.	LRSI	2744.
150	389	-36.	LRSI	2744.
151	390	-41.	LRSI	1160.
152	391	-36.	LRSI	1160.
153	392	-41.	LRSI	3081.
154	393	-41.	LRSI	3081.
155	399	-50.	HRSI	3823.
156	1	23.	LINER	26620.
157	2	13.	LINER	26620.
158	3	10.	LINER	26620.
159	4	19.	LINER	26620.
160	5	22.	LINER	26620.
161	6	13.	LINER	26620.
162	7	10.	LINER	26620.
163	8	20.	LINER	26620.
164	11	-6.	BLKHED	32690.
165	13	-12.	BLKHED	32690.
166	440	10.	LINER	3444.
167	441	1.	LINER	3444.
168	442	5.	LINER	3444.
169	443	14.	LINER	3444.
170	445	9.	LINER	3444.
171	446	1.	LINER	3444.
172	447	5.	LINER	3444.
173	448	14.	LINER	3444.
174	570	100.	FILI	207.
175	571	100.	FILI	207.
176	572	100.	FILI	207.
177	573	100.	FILI	207.
178	580	100.	FILI	207.
179	581	100.	FILI	207.

Figure 8 continued

180	582	100.	FILI	207.
181	583	100.	FILI	207.
182	575	100.	FILO	144.
183	576	100.	FILO	144.
184	577	100.	FILO	144.
185	578	100.	FILO	144.
186	585	100.	FILO	144.
187	586	100.	FILO	144.
188	587	100.	FILO	144.
189	588	100.	FILO	144.

Figure 8 continued

CONTENTS: LIST OF MISSION DATA THAT WILL BE USED

Figure 8 continued

```
$MPDB
BETA    = 0.0,
PITCH   = 0.0,
YAW     = 0.0,
ROLL    = 0.0,
ALT     = .398E+03,
SUNL    = F,
SUNM    = T,
SUNH    = F,
VX      = .662E+04,
VY      = -.383E+04,
VZ      = -.1E+03,
NLOS    = 1,
XLOS    = .1107E+04, .1107E+04, .1107E+04, .1107E+04, .1107E+04, .1107E+04,      .1107E+04, .1107E+04, .1107E+04, .1107E+04,
          .1107E+04, .1107E+04, .1107E+04, .1107E+04, .1107E+04, .1107E+04,      .1107E+04, .1107E+04, .1107E+04, .1107E+04,
          .1107E+04, .1107E+04, .1107E+04, .1107E+04, .1107E+04,
YLOS    = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
          0.0, 0.0, 0.0, 0.0,
ZLOS    = .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03,
          .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03,
          .507E+03, .507E+03, .507E+03,
THETAL  = 0.0, .3E+02, .6E+02, .3E+02, .6E+02, .3E+02, .6E+02, .3E+02, .6E+02,      .3E+02, .6E+02, .3E+02, .6E+02, .3E+02,
          .6E+02, .3E+02, .6E+02, .825E+02, .825E+02, .825E+02, .825E+02,        .825E+02, .825E+02, .825E+02, .825E+02,
PHIL    = 0.0, 0.0, 0.0, .45E+02, .45E+02, .9E+02, .9E+02, .135E+03, .135E+03,   .18E+03, .18E+03, .225E+03, .225E+03,
          .27E+03, .27E+03, .315E+03, .315E+03, 0.0, .45E+02, .9E+02, .135E+03, .18E+03, .225E+03, .27E+03, .315E+03,
DSMCD   = .25E+01, .5E+01, .5E+01, .5E+01, .5E+01, .5E+01, .5E+01, .5E+01,      .5E+01, .5E+01, .15E+02, .25E+02, .375E+02,
          .5E+02, .124E+03, 0.0, 0.0, 0.0, 0.0  0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
RMAXL   = .3E+03,
RFSURF  = 1000, 0, 0, 0, 0, 0, 0, 0, 0, 0,
COSXX   = .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01,      .1E+01, .1E+01,
COSXY   = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
COSXZ   = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
COSYX   = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
COSYY   = .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01,      .1E+01, .1E+01,
COSYZ   = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
COSZX   = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
```


Figure 8 continued

```
COSZY   = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
COSZZ   = .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01, .1E+01,      .1E+01, .1E+01,
THETA1  = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
THETA2  = .1024E+02, .1024E+02, .1024E+02, .1024E+02, .1024E+02, .1024E+02,     .1024E+02, .1024E+02, .1024E+02, .1024E+02,
PHI1    = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
PHI2    = .36E+03, .36E+03, .36E+03, .36E+03, .36E+03, .36E+03, .36E+03,       .36E+03, .36E+03, .36E+03,
DOMEGA  = .1E+00, .1E+00, .1E+00, .1E+00, .1E+00, .1E+00, .1E+00, .1E+00,      .1E+00, .1E+00,
DSRTNF  = .25E+01, .5E+01, .5E+01, .5E+01, .5E+01, .5E+01, .5E+01, .5E+01,     .5E+01, .5E+01, .15E+02, .25E+02, .375E+02,
          .5E+02, .124E+03, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
DTHETA  = .2048E+02, .2048E+02, .2048E+02, .2048E+02, .2048E+02, .2048E+02,     .2048E+02, .2048E+02, .2048E+02, .2048E+02,
DPHI    = .1024E+02, .1024E+02, .1024E+02, .1024E+02, .1024E+02, .1024E+02,     .1024E+02, .1024E+02, .1024E+02, .1024E+02,
RMAXRF  = .3E+03,
RFSTK   = .1E+01, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
VFACTR  = .3E+01,
TIMEOO  = 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
JKEEP   = 50,
XO      = .1088E+04, .1107E+04, .1107E+04, .1107E+04, .1107E+04, .1107E+04,     .1107E+04, .1107E+04, .1107E+04, .1107E+04,
YO      = .8E+01, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
ZO      = .473E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03, .507E+03,
GO      = T,
$END
```


Figure 8 continued

CONTENTS: PHYSICAL CHARACTERISTICS OF SURFACE SOURCES AT TIME 6.HRS 40.MINS 0.SECS

SURFACE NUMBER	AREA (IN**2) - (CM**2)	SECTION - MATERIAL	MASS LOSS (GM/SEC) TEMP (DEG C)	SPECIES MASS LOSS RATES (GM/CM**2/SEC) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION	OUT GASSING
570	.21E+03	FILTER	.186E-02	0.	0.	.14E-07	.10E-05	.14E-07		
	.13E+04	FILI	100.	.34E-06	0.	0.	0.	0.	.139E-05	0.
571	.21E+03	FILTER	.186E-02	0.	0.	.14E-07	.10E-05	.14E-07		
	.13E+04	FILI	100.	.34E-06	0.	0.	0.	0.	.139E-05	0.
572	.21E+03	FILTER	.186E-02	0.	0.	.14E-07	.10E-05	.14E-07		
	.13E+04	FILI	100.	.34E-06	0.	0.	0.	0.	.139E-05	0.
573	.21E+03	FILTER	.186E-02	0.	0.	.14E-07	.10E-05	.14E-07		
	.13E+04	FILI	100.	.34E-06	0.	0.	0.	0.	.139E-05	0.
580	.21E+03	FILTER	.186E-02	0.	0.	.14E-07	.10E-05	.14E-07		
	.13E+04	FILI	100.	.34E-06	0.	0.	0.	0.	.139E-05	0.
581	.21E+03	FILTER	.186E-02	0.	0.	.14E-07	.10E-05	.14E-07		
	.13E+04	FILI	100.	.34E-06	0.	0.	0.	0.	.139E-05	0.
582	.21E+03	FILTER	.186E-02	0.	0.	.14E-07	.10E-05	.14E-07		
	.13E+04	FILI	100.	.34E-06	0.	0.	0.	0.	.139E-05	0.
583	.21E+03	FILTER	.186E-02	0.	0.	.14E-07	.10E-05	.14E-07		
	.13E+04	FILI	100.	.34E-06	0.	0.	0.	0.	.139E-05	0.
230	.26E+05	FUSLAG	.350E-03	.27E-09	0.	.78E-09	.49E-09	.39E-09		
	.17E+06	LRSI	81.	.18E-09	0.	0.	0.	0.	.184E-08	.267E-09
575	.14E+03	FILTER	.330E-03	0.	0.	.36E-08	.27E-06	.36E-08		
	.93E+03	FILO	100.	.82E-07	0.	0.	0.	0.	.356E-06	0.
576	.14E+03	FILTER	.330E-03	0.	0.	.36E-08	.27E-06	.36E-08		
	.93E+03	FILO	100.	.82E-07	0.	0.	0.	0.	.356E-06	0.
577	.14E+03	FILTER	.330E-03	0.	0.	.36E-08	.27E-06	.36E-08		
	.93E+03	FILO	100.	.82E-07	0.	0.	0.	0.	.356E-06	0.
578	.14E+03	FILTER	.330E-03	0.	0.	.36E-08	.27E-06	.36E-08		
	.93E+03	FILO	100.	.82E-07	0.	0.	0.	0.	.356E-06	0.
585	.14E+03	FILTER	.330E-03	0.	0.	.36E-08	.27E-06	.36E-08		
	.93E+03	FILO	100.	.82E-07	0.	0.	0.	0.	.356E-06	0.
586	.14E+03	FILTER	.330E-03	0.	0.	.36E-08	.27E-06	.36E-08		
	.93E+03	FILO	100.	.82E-07	0.	0.	0.	0.	.356E-06	0.
587	.14E+03	FILTER	.330E-03	0.	0.	.36E-08	.27E-06	.36E-08		
	.93E+03	FILO	100.	.82E-07	0.	0.	0.	0.	.356E-06	0.
588	.14E+03	FILTER	.330E-03	0.	0.	.36E-08	27E-06	.36E-08		
	.93E+03	FILO	100.	.82E-07	0			0.	.356E-06	0.

Figure 8 continued

241	.16E+05	FUSLAG	.222E-03	.27E-09	0.	.78E-09	.49E-09	.39E-09		
	.11E+06	LRSI	81.	.18E-09	0.	0.	0.	0.	.184E-08	.267E-09
132	.30E+05	WING	.158E-03	.10E-09	0.	.31E-09	.19E-09	.15E-09		
	.19E+06	NOMEX	28.	.73E-10	0.	0.	0.	0.	.721E-09	.105E-09
102	.30E+05	WING	.157E-03	.10E-09	0.	.30E-09	.19E-09	.15E-09		
	.19E+06	NOMEX	28.	.72E-10	0.	0.	0.	0.	.718E-09	.104E-09
240	.16E+05	FUSLAG	.141E-03	.17E-09	0.	.49E-09	.31E-09	.25E-09		
	.11E+06	LRSI	68.	.12E-09	0.	0.	0.	0.	.117E-08	.169E-09
316	.31E+05	FUSLAG	.934E-04	.59E-10	0.	.17E-09	.11E-09	.87E-10		
	.20E+06	NOMEX	12.	.41E-10	0.	0.	0.	0.	.409E-09	.593E-10
306	.31E+05	FUSLAG	.911E-04	.58E-10	0.	.17E-09	.11E-09	.85E-10		
	.20E+06	NOMEX	11.	.40E-10	0.	0.	0.	0.	.398E-09	.578E-10
107	.17E+05	ELEVON	.820E-04	.94E-10	0.	.27E-09	.17E-09	.14E-09		
	.11E+06	NOMEX	25.	.65E-10	0.	0.	0.	0.	.645E-09	.936E-10
140	.23E+05	WING	.792E-04	.67E-10	0.	.19E-09	.12E-09	.98E-10		
	.15E+06	NOMEX	15.	.46E-10	0.	0.	0.	0.	.459E-09	.667E-10
110	.23E+05	WING	.788E-04	.66E-10	0.	.19E-09	.12E-09	.97E-10		
	.15E+06	NOMEX	15.	.46E-10	0.	0.	0.	0.	.457E-09	.664E-10
142	.19E+05	WING	.635E-04	.64E-10	0.	.19E-09	.12E-09	.94E-10		
	.13E+06	NOMEX	14.	.45E-10	0.	0.	0.	0.	.443E-09	.644E-10
112	.19E+05	WING	.631E-04	.64E-10	0.	.19E-09	.12E-09	.94E-10		
	.13E+06	NOMEX	14.	.44E-10	0.	0.	0.	0.	.441E-09	.640E-10
137	.91E+04	ELEVON	.435E-04	.94E-10	0.	.27E-09	.17E-09	.14E-09		
	.59E+05	NOMEX	25.	.65E-10	0.	0.	0.	0.	.645E-09	.936E-10
11	.33E+05	BAY	.426E-04	.26E-10	0.	.75E-10	.46E-10	.38E-10		
	.21E+06	BLKHED	-6.	.18E-10	0.	0.	0.	0.	.176E-09	.256E-10
260	.20E+05	FUSLAG	.411E-04	.40E-10	0.	.12E-09	.73E-10	.58E-10		
	.13E+06	LRSI	26.	.28E-10	0.	0.	0.	0.	.275E-09	.398E-10
50	.26E+05	RADOOR	.377E-04	.29E-10	0.	.84E-10	.53E-10	.43E-10		
	.17E+06	TEFLON	17.	.20E-10	0.	0.	0.	0.	.200E-09	.290E-10
40	.26E+05	RADOOR	.377E-04	.29E-10	0.	.84E-10	.53E-10	.43E-10		
	.17E+06	TEFLON	17.	.20E-10	0.	0.	0.	0.	.200E-09	.290E-10
134	.91E+04	WING	.354E-04	.76E-10	0.	.22E-09	.14E-09	.11E-09		
	.59E+05	NOMEX	19.	.53E-10	0.	0.	0.	0.	.525E-09	.762E-10
202	.33E+05	FUSLAG	.352E-04	.21E-10	0.	.62E-10	.39E-10	.31E-10		
	.21E+06	LRSI	8.	.15E-10	0.	0.	0.	0.	.147E-09	.213E-10
203	.33E+05	FUSLAG	.352E-04	.21E-10	0.	.62E-10	.39E-10	.31E-10		
	.21E+06	LRSI	8.	.15E-10	0.	0.	0.	0.	.147E-09	.213E-10
104	.91E+04	WING	.349E-04	.75E-10	0.	.22E-09	.14E-09	.11E-09		
	.59E+05	NOMEX	19.	.52E-10	0.	0.	0.	0.	.518E-09	.752E-10
13	.33E+05	BAY	.348E-04	.21E-10	0.					
	.21E+06	BLKHED	-12.	.14E-10	0.				.144E-09	.209E-10

Figure 8 continued

136	.65E+04	ELEVON	.335E-04	.10E-09	0.	.29E-09	.18E-09	.15E-09		
	.42E+05	NOMEX	27.	.70E-10	0.	0.	0.	0.	.697E-09	.101E-09
106	.65E+04	ELEVON	.335E-04	.10E-09	0.	.29E-09	.18E-09	.15E-09		
	.42E+05	NOMEX	27.	.70E-10	0.	0.	0.	0.	.697E-09	.101E-09
44	.26E+05	RADOOR	.295E-04	.23E-10	0.	.66E-10	.41E-10	.33E-10		
	.17E+06	TEFLON	10.	.16E-10	0.	0.	0.	0.	.156E-09	.227E-10
54	.26E+05	RADOOR	.286E-04	.22E-10	0.	.64E-10	.40E-10	.32E-10		
	.17E+06	TEFLON	9.	.15E-10	0.	0.	0.	0.	.151E-09	.220E-10
307	.25E+05	FUSLAG	.277E-04	.22E-10	0.	.64E-10	.40E-10	.32E-10		
	.16E+06	NOMEX	-17.	.15E-10	0.	0.	0.	0.	.152E-09	.220E-10
317	.25E+05	FUSLAG	.277E-04	.22E-10	0.	.64E-10	.40E-10	.32E-10		
	.16E+06	NOMEX	-17.	.15E-10	0.	0.	0.	0.	.151E-09	.219E-10
315	.31E+05	FUSLAG	.232E-04	.15E-10	0.	.43E-10	.27E-10	.22E-10		
	.20E+06	LRSI	-3.	.10E-10	0.	0.	0.	0.	.102E-09	.148E-10
305	.31E+05	FUSLAG	.229E-04	.15E-10	0.	.42E-10	.26E-10	.21E-10		
	.20E+06	LRSI	-3.	.10E-10	0.	0.	0.	0.	.100E-09	.145E-10
64	.38E+05	OMS	.200E-04	.10E-10	0.	.30E-10	.19E-10	.15E-10		
	.24E+06	LRSI	-13.	.72E-11	0.	0.	0.	0.	.713E-10	.103E-10
84	.38E+05	OMS	.199E-04	.10E-10	0.	.30E-10	.19E-10	.15E-10		
	.24E+06	LRSI	-13.	.72E-11	0.	0.	0.	0.	.712E-10	.103E-10
130	.64E+04	WING	.154E-04	.47E-10	0.	.14E-09	.86E-10	.70E-10		
	.41E+05	NOMEX	5.	.33E-10	0.	0.	0.	0.	.327E-09	.474E-10
100	.64E+04	WING	.151E-04	.47E-10	0.	.14E-09	.85E-10	.69E-10		
	.41E+05	NOMEX	5.	.32E-10	0.	0.	0.	0.	.322E-09	.468E-10
TOTALS	.78E+06		.197E-01							
	.50E+07									
AVERAGE				.57E-10	0.	.20E-09	.27E-08	.12E-09	.388E-08	.569E-10
				.89E-09	0.	0.	0.	0.		

ORIGINAL PAGE IS
OF POOR QUALITY

Figure 8 continued

CONTENTS: RETURN FLUX AT 398.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** HIGHEST TO LOWEST CONTRIBUTOR ***

SURFACE NUMBER	SECTION / MATERIAL	MASS LOSS (GM/SEC) / TEMP (DEG C)	SPECIES RETURN FLUX CONTRIBUTION (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) / (MOLECULES/CM**2)	OUT GASSING	TOTAL RTN FLX	% OF TOTAL	PLACE
140	WING	.792E-04	.44E+07	-0.	.10E+08	.67E+07	.47E+07	.11E-14	.74E-15	.18E-14		
	NOMEX	15.280	.22E+07	0.	0.	0.	0.	.24E+08	.44E+07	.28E+08	10.5516	1
110	WING	.788E-04	.43E+07	0.	.10E+08	.65E+07	.46E+07	.10E-14	.72E-15	.18E-14		
	NOMEX	15.140	.21E+07	0.	0.	0.	0.	.23E+08	.43E+07	.28E+08	10.2887	2
11	BAY	.426E-04	.39E+07	0.	.90E+07	.59E+07	.42E+07	.95E-15	.65E-15	.16E-14		
	BLKHED	-6.260	.19E+07	0.	0.	0.	0.	.21E+08	.39E+07	.25E+08	9.3524	3
50	RADOOR	.377E-04	.36E+07	0.	.83E+07	.54E+07	.38E+07	.87E-15	.60E-15	.15E-14		
	TEFLON	17.430	.18E+07	0.	0.	0.	0.	.19E+08	.36E+07	.23E+08	8.5566	4
142	WING	.635E-04	.33E+07	0.	.75E+07	.49E+07	.35E+07	.79E-15	.54E-15	.13E-14		
	NOMEX	14.250	.16E+07	0.	0.	0.	0.	.17E+08	.33E+07	.21E+08	7.7285	5
112	WING	.631E-04	.32E+07	0.	.73E+07	.48E+07	.34E+07	.77E-15	.53E-15	.13E-14		
	NOMEX	14.080	.16E+07	0.	0.	0.	0.	.17E+08	.32E+07	.20E+08	7.5740	6
137	ELEVON	.435E-04	.30E+07	0.	.69E+07	.45E+07	.32E+07	.73E-15	.50E-15	.12E-14		
	NOMEX	25.110	.15E+07	0.	0.	0.	0.	.16E+08	.30E+07	.19E+08	7.1258	7
107	ELEVON	.820E-04	.30E+07	0.	.68E+07	.44E+07	.32E+07	.72E-15	.49E-15	.12E-14		
	NOMEX	25.110	.15E+07	0.	0.	0.	0.	.16E+08	.30E+07	.19E+08	7.0453	8
44	RADOOR	.295E-04	.27E+07	0.	.63E+07	.41E+07	.29E+07	.66E-15	.45E-15	.11E-14		
	TEFLON	10.310	.14E+07	0.	0.	0.	0.	.15E+08	.27E+07	.17E+08	6.4922	9
40	RADOOR	.377E-04	.18E+07	0.	.42E+07	.27E+07	.19E+07	.44E-15	.30E-15	.75E-15		
	TEFLON	17.430	.90E+06	0.	0.	0.	0.	.98E+07	.18E+07	.12E+08	4.3376	10
13	BAY	.348E-04	.16E+07	0.	.36E+07	.24E+07	.17E+07	.38E-15	.26E-15	.64E-15		
	BLKHED	-12.140	.78E+06	0.	0.	0.	0.	.84E+07	.16E+07	.10E+08	3.7335	11
54	RADOOR	.286E-04	.15E+07	0.	.34E+07	.22E+07	.16E+07	.36E-15	.25E-15	.61E-15		
	TEFLON	9.420	.74E+06	0.	0.	0.	0.	.80E+07	.15E+07	.95E+07	3.5356	12
134	WING	.354E-04	.11E+07	0.	.26E+07	.17E+07	.12E+07	.27E-15	.19E-15	.46E-15		
	NOMEX	19.170	.55E+06	0.	0.	0.	0.	.60E+07	.11E+07	.71E+07	2.6634	13
104	WING	.349E-04	.11E+07	0.	.25E+07	.16E+07	.12E+07	.27E-15	.18E-15	.45E-15		
	NOMEX	18.750	.54E+06	0.	0.	0.	0.	.59E+07	.11E+07	.70E+07	2.6015	14

Figure 8 continued

CONTENTS: RETURN FLUX AT 398.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** HIGHEST TO LOWEST CONTRIBUTOR ***(CONT)

SURFACE NUMBER	SECTION / MATERIAL	MASS LOSS (GM/SEC) / TEMP (DEG C)	SPECIES RETURN FLUX CONTRIBUTION (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL RTN FLX	% OF TOTAL	PLACE
64	OMS	.200E-04	.72E+06	0.	.17E+07	.11E+07	.77E+06	.17E-15	.12E-15	.29E-15		
	LRSI	-13.020	.36E+06	0.	0.	0.	0.	.39E+07	.72E+06	.46E+07	1.7111	15
84	OMS	.199E-04	.70E+06	0.	.16E+07	.11E+07	.75E+06	.17E-15	.12E-15	.29E-15		
	LRSI	-13.040	.35E+06	0.	0.	0.	0.	.38E+07	.70E+06	.45E+07	1.6689	16
136	ELEVON	.335E-04	.69E+06	0.	.16E+07	.10E+07	.73E+06	.17E-15	.11E-15	.28E-15		
	NOMEX	27.360	.34E+06	0.	0.	0.	0.	.37E+07	.69E+06	.44E+07	1.6321	17
106	ELEVON	.335E-04	.65E+06	0.	.15E+07	.98E+06	.69E+06	.16E-15	.11E-15	.27E-15		
	NOMEX	27.360	.32E+06	0.	0.	0.	0.	.35E+07	.65E+06	.41E+07	1.5480	18
102	WING	.157E-03	.19E+06	0.	.43E+06	.28E+06	.20E+06	.45E-16	.31E-16	.76E-16		
	NOMEX	28.220	.92E+05	0.	0.	0.	0.	.99E+06	.19E+06	.12E+07	.4400	19
130	WING	.154E-04	.15E+06	0.	.34E+06	.22E+06	.16E+06	.36E-16	.24E-16	.60E-16		
	NOMEX	5.410	.73E+05	0.	0.	0.	0.	.79E+06	.15E+06	.94E+06	.3496	20
100	WING	.151E-04	.14E+06	0.	.33E+06	.21E+06	.15E+06	.34E-16	.24E-16	.58E-16		
	NOMEX	5.000	.70E+05	0.	0.	0.	0.	.76E+06	.14E+06	.90E+06	.3369	21
305	FUSLAG	.229E-04	.87E+05	0.	.20E+06	.13E+06	.92E+05	.21E-16	.14E-16	.35E-16		
	LRSI	-3.160	.43E+05	0.	0.	0.	0.	.46E+06	.87E+05	.55E+06	.2060	22
316	FUSLAG	.934E-04	.74E+05	0.	.17E+06	.11E+06	.79E+05	.18E-16	.12E-16	.30E-16		
	NOMEX	11.900	.37E+05	0.	0.	0.	0.	.40E+06	.74E+05	.47E+06	.1762	23
306	FUSLAG	.911E-04	.72E+05	0.	.17E+06	.11E+06	.77E+05	.18E-16	.12E-16	.30E-16		
	NOMEX	11.150	.36E+05	0.	0.	0.	0.	.39E+06	.72E+05	.46E+06	.1720	24
315	FUSLAG	.232E-04	.72E+05	0.	.17E+06	.11E+06	.77E+05	.17E-16	.12E-16	.29E-16		
	LRSI	-2.690	.36E+05	0.	0.	0.	0.	.39E+06	.72E+05	.46E+06	.1710	25
317	FUSLAG	.277E-04	.61E+03	0.	.14E+04	.91E+03	.64E+03	.15E-18	.10E-18	.25E-18		
	NOMEX	-16.960	.30E+03	0.	0.	0.	0.	.32E+04	.61E+03	.39E+04	.0014	26
TOTAL		.124E-02	.42E+06	0.	.97E+08	.63E+08	.45E+08	.10E-13	.70E-14	.17E-13		
			.21E+08	0.	0.	0.	0.	.23E+09	.42E+08	.27E+09	100.0000	

Figure 8 continued

CONTENTS: RETURN FLUX AT 398.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** SORTED BY TYPE OF MATERIAL ***

SURFACE NUMBER	SECTION / MATERIAL	MASS LOSS (GM/SEC) / TEMP (DEG C)	SPECIES RETURN FLUX CONTRIBUTIONS (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL RTNFLX
50	RADOOR	.377E-04	.36E+07	0.	.83E+07	.54E+07	.38E+07	.87E-15	.60E-15	.15E-14
	TEFLON	17.430	.18E+07	0.	0.	0.	0.	.19E+08	.36E+07	.23E+08
44	RADOOR	.295E-04	.27E+07	0.	.63E+07	.41E+07	.29E+07	.66E-15	.45E-15	.11E-14
	TEFLON	10.310	.14E+07	0.	0.	0.	0.	.15E+08	.27E+07	.17E+08
40	RADOOR	.377E-04	.18E+07	0.	.42E+07	.27E+07	.19E+07	.44E-15	.30E-15	.75E-15
	TEFLON	17.430	.90E+06	0.	0.	0.	0.	.98E+07	.18E+07	.12E+08
54	RADOOR	.286E-04	.15E+07	0.	.34E+07	.22E+07	.16E+07	.36E-15	.25E-15	.61E-15
	TEFLON	9.420	.74E+06	0.	0.	0.	0.	.80E+07	.15E+07	.95E+07
TOTAL	TEFLON	.134E-03	.97E+07	0.	.22E+08	.14E+08	.10E+08	.23E-14	.16E-14	.39E-14
			.48E+07	0.	0.	0.	0.	.52E+08	.97E+07	.61E+08
140	WING	.792E-04	.44E+07	0.	.10E+08	.67E+07	.47E+07	.11E-14	.74E-15	.18E-14
	NOMEX	15.280	.22E+07	0.	0.	0.	0.	.24E+08	.44E+07	.28E+08
110	WING	.768E-04	.43E+07	0.	.10E+08	.65E+07	.46E+07	.10E-14	.72E-15	.18E-14
	NOMEX	15.140	.21E+07	0.	0.	0.	0.	.23E+08	.43E+07	.28E+08
142	WING	.635E-04	.33E+07	0.	.75E+07	.49E+07	.35E+07	.79E-15	.54E-15	.13E-14
	NOMEX	14.250	.16E+07	0.	0.	0.	0.	.17E+08	.33E+07	.21E+08
112	WING	.631E-04	.32E+07	0.	.73E+07	.48E+07	.34E+07	.77E-15	.53E-15	.13E-14
	NOMEX	14.080	.16E+07	0.	0.	0.	0.	.17E+08	.32E+07	.20E+08
137	ELEVON	.435E-04	.30E+07	0.	.69E+07	.45E+07	.32E+07	.73E-15	.50E-15	.12E-14
	NOMEX	25.110	.15E+07	0.	0.	0.	0.	.16E+08	.30E+07	.19E+08
107	ELEVON	.820E-04	.30E+07	0.	.68E+07	.44E+07	.32E+07	.72E-15	.49E-15	.12E-14
	NOMEX	25.110	.15E+07	0.	0.	0.	0.	.16E+08	.30E+07	.19E+08
134	WING	.354E-04	.11E+07	0.	.26E+07	.17E+07	.12E+07	.27E-15	.19E-15	.46E-15
	NOMEX	19.170	.55E+06	0.	0.	0.	0.	.60E+07	.11E+07	.71E+07
104	WING	.349E-04	.11E+07	0.	.25E+07	.16E+07	.12E+07	.27E-15	.18E-15	.45E-15
	NOMEX	18.750	.54E+06	0.	0.	0.	0.	.59E+07	.11E+07	.70E+07
136	ELEVON	.335E-04	.69E+06	0.	.16E+07	.10E+07	.73E+06	.17E-15	.11E-15	.28E-15
	NOMEX	27.360	.34E+06	0.	0.	0.	0.	.37E+07	.69E+06	.44E+07

Figure 8 continued

CONTENTS: RETURN FLUX AT 398.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** SORTED BY TYPE OF MATERIAL ***(CONT)

SURFACE NUMBER	SECTION / MATERIAL	MASS LOSS (GM/SEC) / TEMP (DEG C)	SPECIES RETURN FLUX CONTRIBUTIONS (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL RTNFLX
106	ELEVON	.335E-04	.65E+06	0.	.15E+07	.98E+06	.69E+06	.16E-15	.11E-15	.27E-15
	NOMEX	27.360	.32E+06	0.	0.	0.	0.	.35E+07	.65E+06	.41E+07
102	WING	.157E-03	.19E+06	0.	.43E+06	.28E+06	.20E+06	.45E-16	.31E-16	.76E-16
	NOMEX	28.220	.92E+05	0.	0.	0.	0.	.99E+06	.19E+06	.12E+07
130	WING	.154E-04	.15E+06	0.	.34E+06	.22E+06	.16E+06	.36E-16	.24E-16	.60E-16
	NOMEX	5.410	.73E+05	0.	0.	0.	0.	.79E+06	.15E+06	.94E+06
100	WING	.151E-04	.14E+06	0.	.33E+06	.21E+06	.15E+06	.34E-16	.24E-16	.58E-16
	NOMEX	5.000	.70E+05	0.	0.	0.	0.	.76E+06	.14E+06	.90E+06
316	FUSLAG	.934E-04	.74E+05	0.	.17E+06	.11E+06	.79E+05	.18E-16	.12E-16	.30E-16
	NOMEX	11.900	.37E+05	0.	0.	0.	0.	.40E+06	.74E+05	.47E+06
306	FUSLAG	.911E-04	.72E+05	0.	.17E+06	.11E+06	.77E+05	.18E-16	.12E-16	.30E-16
	NOMEX	11.150	.36E+05	0.	0.	0.	0.	.39E+06	.72E+05	.46E+06
317	FUSLAG	.277E-04	.61E+03	0.	.14E+04	.91E+03	.64E+03	.15E-18	.10E-18	.25E-18
	NOMEX	-16.960	.30E+03	0.	0.	0.	0.	.32E+04	.61E+03	.39E+04
TOTAL	NOMEX	.947E-03	.25E+08	0.	.58E+08	.38E+08	.27E+08	.61E-14	.42E-14	.10E-13
			.13E+08	0.	0.	0.	0.	.14E+09	.25E+08	.16E+09
64	OMS	.200E-04	.72E+06	0.	.17E+07	.11E+07	.77E+06	.17E-15	.12E-15	.29E-15
	LRSI	-13.020	.36E+06	0.	0.	0.	0.	.39E+07	.72E+06	.46E+07
84	OMS	.199E-04	.70E+06	0.	.16E+07	.11E+07	.75E+06	.17E-15	.12E-15	.29E-15
	LRSI	-13.040	.35E+06	0.	0.	0.	0.	.38E+07	.70E+06	.45E+07
305	FUSLAG	.229E-04	.87E+05	0.	.20E+06	.13E+06	.92E+05	.21E-16	.14E-16	.35E-16
	LRSI	-3.160	.43E+05	0.	0.	0.	0.	.46E+06	.87E+05	.55E+06
315	FUSLAG	.232E-04	.72E+05	0.	.17E+06	.11E+06	.77E+05	.17E-16	.12E-16	.29E-16
	LRSI	-2.690	.36E+05	0.	0.	0.	0.	.39E+06	.72E+05	.46E+06
TOTAL	LRSI	.859E-04	.16E+07	0.	.36E+07	.24E+07	.17E+07	.38E-15	.26E-15	.65E-15
			.78E+06	0.	0.	0.	0.	.85E+07	.16E+07	.10E+08
11	BAY	.426E-04	.39E+07	0.	.90E+07	.59E+07	.42E+07	.95E-15	.65E-15	.16E-14
	BLKHED	-6.260	.19E+07	0.			0.	.21E+08	.39E+07	.25E+08

Figure 8 continued

CONTENTS: RETURN FLUX AT 398.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** SORTED BY TYPE OF MATERIAL ***(CONT)

SURFACE NUMBER	SECTION / MATERIAL	MASS LOSS (GM/SEC) / TEMP (DEG C)	SPECIES RETURN FLUX CONTRIBUTIONS (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL RTNFLX
13	BAY	.348E-04	.16E+07	0.	.35E+07	.24E+07	.17E+07	.38E-15	.26E-15	.64E-15
	BLKHED	-12.140	.78E+06	0.	0.	0.	0.	.84E+07	.16E+07	.10E+08
TOTAL	BLKHED	.774E-04	.55E+07	0.	.13E+08	.83E+07	.59E+07	.13E-14	.92E-15	.23E-14
			.27E+07	0.	0.	0.	0.	.30E+08	.55E+07	.35E+08

Figure 8 continued

CONTENTS: SUMMARY RETURN FLUX AT 398.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.97E+07	0.	.22E+08	.14E+08	.10E+08	.23E-14	.16E-14	.39E-14	
	.49E+07	0.	0.	0.	0.	.52E+08	.97E+07	.61E+08	22.9
NOMEX	.25E+08	0.	.58E+08	.38E+08	.27E+08	.61E-14	.42E-14	.10E-13	
	.13E+08	0.	0.	0.	0.	.14E+09	.25E+08	.16E+09	60.2
LRSI	.16E+07	0.	.36E+07	.24E+07	.17E+07	.38E-15	.26E-15	.65E-15	
	.78E+06	0.	0.	0.	0.	.85E+07	.16E+07	.10E+08	3.8
BLKHED	.55E+07	0.	.13E+08	.83E+07	.59E+07	.13E-14	.92E-15	.23E-14	
	.27E+07	0.	0.	0.	0.	.30E+08	.55E+07	.35E+08	13.1
TOTAL	.42E+08	0.	.97E+08	.63E+08	.45E+08	.10E-13	.70E-14	.17E-13	
	.21E+08	0.	0.	0.	0.	.23E+09	.42E+08	.27E+09	100.0

Figure 8 concluded

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.11E+07	0.	.26E+07	.17E+07	.12E+07	.27E-15	.19E-15	.46E-15	
	.56E+06	0.	0.	0.	0.	.61E+07	.11E+07	.72E+07	38.1
NOMEX	.17E+05	0.	.39E+05	.26E+05	.18E+05	.41E-17	.29E-17	.70E-17	
	.85E+04	0.	0.	0.	0.	.92E+05	.17E+05	.11E+06	.6
LRSI	.10E+07	0.	.23E+07	.15E+07	.11E+07	.25E-15	.17E-15	.42E-15	
	.50E+06	0.	0.	0.	0.	.54E+07	.10E+07	.65E+07	34.2
BLKHED	.82E+06	0.	.19E+07	.12E+07	.86E+06	.20E-15	.14E-15	.33E-15	
	.40E+06	0.	0.	0.	0.	.43E+07	.82E+06	.51E+07	27.2
TOTAL	.30E+07	0.	.68E+07	.45E+07	.32E+07	.72E-15	.50E-15	.12E-14	
	.15E+07	0.	0.	0.	0.	.16E+08	.30E+07	.19E+08	100.0

Figure 9 Summary Predictions for OFT-3 Time Intervals Analyzed

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.32E+07	0.	.72E+07	.47E+07	.33E+07	.76E-15	.54E-15	.13E-14	
	.16E+07	0.	0.	0.	0.	.17E+08	.32E+07	.20E+08	48.8
NOMEX	.23E+07	0.	.51E+07	.34E+07	.24E+07	.54E-15	.38E-15	.92E-15	
	.11E+07	0.	0.	0.	0.	.12E+08	.23E+07	.14E+08	34.8
LRSI	.12E+06	0.	.26E+06	.17E+06	.12E+06	.27E-16	.19E-16	.47E-16	
	.56E+05	0.	0.	0.	0.	.60E+06	.12E+06	.72E+06	1.8
BLKHED	.97E+06	0.	.22E+07	.14E+07	.10E+07	.23E-15	.16E-15	.39E-15	
	.47E+06	0.	0.	0.	0.	.50E+07	.97E+06	.60E+07	14.7
TOTAL	.66E+07	0.	.15E+08	.96E+07	.68E+07	.16E-14	.11E-14	.27E-14	
	.32E+07	0.	0.	0.	0.	.34E+08	.66E+07	.41E+08	100.0

Figure 9 continued

REPORT NO. 43 *** OFT-3 PREFLIGHT EVAL. *** IECM MASS SPEC (07:25:00-07:40:00) 01/26/78 09.02.24. PAGE 9

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.90E+07	0.	.20E+08	.13E+08	.92E+07	.21E-14	.15E-14	.36E-14	
	.42E+07	0.	0.	0.	0.	.46E+08	.90E+07	.55E+08	23.0
NOMEX	.24E+08	0.	.53E+08	.34E+08	.24E+08	.56E-14	.40E-14	.95E-14	
	.11E+08	0.	0.	0.	0.	.12E+09	.24E+08	.15E+09	61.3
LRSI	.16E+07	0.	.34E+07	.22E+07	.16E+07	.36E-15	.26E-15	.62E-15	
	.74E+06	0.	0.	0.	0.	.80E+07	.16E+07	.96E+07	4.0
BLKHED	.46E+07	0.	.10E+08	.65E+07	.46E+07	.11E-14	.76E-15	.18E-14	
	.22E+07	0.	0.	0.	0.	.23E+08	.46E+07	.28E+08	11.7
TOTAL	.39E+08	0.	.86E+08	.56E+08	.40E+08	.91E-14	.65E-14	.16E-13	
	.18E+08	0.	0.	0.	0.	.20E+09	.39E+08	.24E+09	100.0

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
LINER	.11E+08	0.	.23E+08	.15E+08	.11E+08	.24E-14	.18E-14	.42E-14	
	.50E+07	0.	0.	0.	0.	.53E+08	.11E+08	.64E+08	9.0
TEFLON	.15E+08	0.	.33E+08	.21E+08	.1[illegible]E+08	.35E-14	.25E-14	.60E-14	
	.70E+07	0.	0.	0.	0.	.76E+08	.15E+08	.92E+08	12.6
NOMEX	.70E+08	0.	.15E+09	.10E+09	.71E+08	.16E-13	.12E-13	.28E-13	
	.33E+08	0.	0.	0.	0.	.36E+09	.70E+08	.43E+09	59.8
LRSI	.58E+07	0.	.13E+08	.83E+07	.59E+07	.13E-14	.97E-15	.23E-14	
	.27E+07	0.	0.	0.	0.	.30E+08	.58E+07	.35E+08	5.0
BLKHED	.16E+08	0.	.34E+08	.22E+08	.16E+08	.36E-14	.26E-14	.62E-14	
	.74E+07	0.	0.	0.	0.	.80E+08	.16E+08	.96E+08	13.5
TOTAL	.12E+09	0.	.26E+09	.17E+09	.12E+09	.27E-13	.20E-13	.46E-13	
	.55E+08	0.	0.	0.	0.	.59E+09	.12E+09	.71E+09	100.0

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.90E+07	0.	.19E+08	.13E+08	.89E+07	.20E-14	.15E-14	.35E-14	
	.41E+07	0.	0.	0.	0.	.45E+08	.90E+07	.54E+08	23.0
NOMEX	.24E+08	0.	.51E+08	.33E+08	.24E+08	.54E-14	.40E-14	.94E-14	
	.11E+08	0.	0.	0.	0.	.12E+09	.24E+08	.14E+09	61.3
LRSI	.16E+07	0.	.33E+07	.22E+07	.16E+07	.35E-15	.26E-15	.61E-15	
	.72E+06	0.	0.	0.	0.	.78E+07	.16E+07	.94E+07	4.0
BLKHED	.46E+07	0.	.98E+07	.64E+07	.45E+07	.10E-14	.76E-15	.18E-14	
	.21E+07	0.	0.	0.	0.	.23E+08	.46E+07	.27E+08	11.7
TOTAL	.39E+08	0.	.84E+08	.55E+08	.39E+08	.88E-14	.65E-14	.15E-13	
	.18E+08	0.	0.	0.	0.	.19E+09	.39E+08	.23E+09	100.0

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.90E+07	0.	.16E+08	.10E+08	.73E+07	.17E-14	.15E-14	.31E-14	
	.34E+07	0.	0.	0.	0.	.37E+08	.90E+07	.46E+08	23.0
NOMEX	.24E+08	0.	.42E+08	.27E+08	.19E+08	.44E-14	.40E-14	.84E-14	
	.90E+07	0.	0.	0.	0.	.98E+08	.24E+08	.12E+09	61.3
LRSI	.16E+07	0.	.27E+07	.18E+07	.13E+07	.29E-15	.26E-15	.55E-15	
	.59E+06	0.	0.	0.	0.	.64E+07	.16E+07	.79E+07	4.0
BLKHED	.45E+07	0.	.80E+07	.52E+07	.37E+07	.84E-15	.76E-15	.16E-14	
	.17E+07	0.	0.	0.	0.	.19E+08	.45E+07	.23E+08	11.7
TOTAL	.39E+08	0.	.69E+08	.45E+08	.32E+08	.72E-14	.65E-14	.14E-13	
	.15E+08	0.	0.	0.	0.	.16E+09	.39E+08	.20E+09	100.0

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Figure 9 continued

REPORT NO. 43 *** OFT-3 PREFLIGHT EVAL. *** IECM MASS SPEC (11:40:00-11:40:01) 01/26/78 09.03.44. PAGE 11

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.90E+07	0.	.16E+08	.10E+08	.72E+07	.16E-14	.15E-14	.31E-14	
	.34E+07	0.	0.	0.	0.	.36E+08	.90E+07	.45E+08	23.0
NOMEX	.24E+08	0.	.42E+08	.27E+08	.19E+08	.44E-14	.40E-14	.84E-14	
	.90E+07	0.	0.	0.	0.	.97E+08	.24E+08	.12E+09	61.3
LRSI	.16E+07	0.	.27E+07	.18E+07	.13E+07	.29E-15	.26E-15	.55E-15	
	.58E+06	0.	0.	0.	0.	.63E+07	.16E+07	.79E+07	4.0
BLKHED	.45E+07	0.	.79E+07	.52E+07	.37E+07	.84E-15	.76E-15	.16E-14	
	.17E+07	0.	0.	0.	0.	.18E+08	.45E+07	.23E+08	11.7
TOTAL	.39E+08	0.	.68E+08	.44E+08	.31E+08	.72E-14	.65E-14	.14E-13	
	.15E+08	0.	0.	0.	0.	.16E+09	.39E+08	.20E+09	100.0

Figure 9 continued

CONTENTS: RETURN FLUX AT 400.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** HIGHEST TO LOWEST CONTRIBUTOR ***

ENG/VENT NUMBER	TYPE	LOCATION	SPECIES RETURN FLUX CONTRIBUTION (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	TOTAL RTN FLX (GM/CM**2/SEC) (MOLECULES/CM**2/SEC)	% OF TOTAL	PLACE
7345	RCS	ARU +Z	0.	0.	.23E+16	.27E+16	.36E+15	.28E-06		
			.53E+13	.12E+16	.12E+16	.11E+15	.88E+13	.79E+16	99.9765	1
7246	RCS	ALD -Z	0.	0.	.53E+12	.64E+12	.84E+11	.66E-10		
			.12E+10	.27E+12	.29E+12	.27E+11	.21E+10	.18E+13	.0235	2
TOTAL			0.	0.	.23E+16	.27E+16	.36E+15	.28E-06		
			.53E+13	.12E+16	.12E+16	.11E+15	.88E+13	.79E+16	100.00	

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.90E+07	0.	.16E+08	.10E+08	.72E+07	.16E-14	.15E-14	.31E-14	
	.34E+07	0.	0.	0.	0.	.36E+08	.90E+07	.45E+08	23.0
NOMEX	.24E+08	0.	.42E+08	.27E+08	.19E+08	.44E-14	.40E-14	.84E-14	
	.89E+07	0.	0.	0.	0.	.97E+08	.24E+08	.12E+09	61.3
LRSI	.16E+07	0.	.27E+07	.18E+07	.13E+07	.29E-15	.26E-15	.55E-15	
	.58E+06	0.	0.	0.	0.	.63E+07	.16E+07	.79E+07	4.0
BLKHED	.45E+07	0.	.79E+07	.52E+07	.37E+07	.83E-15	.76E-15	.16E-14	
	.17E+07	0.	0.	0.	0.	.18E+08	.45E+07	.23E+08	11.7
TOTAL	.39E+08	0.	.68E+08	.44E+08	.31E+08	.72E-14	.65E-14	.14E-13	
	.15E+08	0.	0.	0.	0.	.16E+09	.39E+08	.20E+09	100.0

Figure 9 continued

CONTENTS: RETURN FLUX AT 400.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** HIGHEST TO LOWEST CONTRIBUTOR ***

ENG/VENT NUMBER	TYPE	LOCATION	SPECIES RETURN FLUX CONTRIBUTION (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	TOTAL RTN FLX (GM/CM**2/SEC) (MOLECULES/CM**2/SEC)	% OF TOTAL	PLACE
7245	RCS	ALU +Z	0.	0.	.16E+18	.19E+18	.25E+17	.20E-04		
			.37E+15	.83E+17	.87E+17	.81E+16	.62E+15	.56E+18	49.6058	1
7345	RCS	ARU +Z	0.	0.	.16E+18	.19E+18	.25E+17	.20E-04		
			.37E+15	.83E+17	.87E+17	.81E+16	.62E+15	.56E+18	49.6058	2
7116	RCS	FLD -Z	0.	0.	.43E+15	.52E+15	.68E+14	.53E-07		
			.10E+13	.22E+15	.23E+15	.22E+14	.17E+13	.15E+16	.1333	3
7126	RCS	FLD -Z	0.	0.	.43E+15	.52E+15	.68E+14	.53E-07		
			.10E+13	.22E+15	.23E+15	.22E+14	.17E+13	.15E+16	.1333	4
TOTAL			0.	0.	.32E+18	.39E+18	.51E+17	.40E-04		
			.75E+15	.17E+18	.18E+18	.16E+17	.13E+16	.11E+19	100.00	

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.64E+09	0.	.11E+10	.72E+09	.51E+09	.12E-12	.11E-12	.22E-12	
	.24E+09	0.	0.	0.	0.	.26E+10	.64E+09	.32E+10	23.0
NOMEX	.17E+10	0.	.30E+10	.19E+10	.14E+10	.31E-12	.28E-12	.59E-12	
	.63E+09	0.	0.	0.	0.	.69E+10	.17E+10	.86E+10	61.3
LRSI	.11E+09	0.	.19E+09	.13E+09	.89E+08	.20E-13	.18E-13	.39E-13	
	.41E+08	0.	0.	0.	0.	.45E+09	.11E+09	.56E+09	4.0
BLKHED	.32E+09	0.	.56E+09	.37E+09	.26E+09	.59E-13	.54E-13	.11E-12	
	.12E+09	0.	0.	0.	0.	.13E+10	.32E+09	.16E+10	11.7
TOTAL	.28E+10	0.	.48E+10	.31E+10	.22E+10	.51E-12	.46E-12	.97E-12	
	.10E+10	0.	0.	0.	0.	.11E+11	.28E+10	.14E+11	100.0

Figure 9 continued

CONTENTS: RETURN FLUX AT 400.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** HIGHEST TO LOWEST CONTRIBUTOR ***

ENG/VENT NUMBER	TYPE	LOCATION	SPECIES RETURN FLUX CONTRIBUTION (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	TOTAL RTN FLX (GM/CM**2/SEC) (MOLECULES/CM**2/SEC)	% OF TOTAL	PLACE
7245	RCS	ALU +Z	0.	0.	.23E+16	.27E+16	.36E+15	.28E-06		
			.53E+13	.12E+16	.12E+16	.11E+15	.88E+13	.79E+16	49.6058	1
7345	RCS	ARU +Z	0.	0.	.23E+16	.27E+16	.36E+15	.28E-06		
			.53E+13	.12E+16	.12E+16	.11E+15	.88E+13	.79E+16	49.6058	2
TOTAL			0.	0.	.45E+16	.55E+16	.72E+15	.57E-06		
			.11E+14	.24E+16	.25E+16	.23E+15	.18E+14	.16E+17	100.00	

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OF POOR QUALITY

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT: GASSING	TOTAL	% OF TOTAL
TEFLON	.90E+07	0.	.16E+08	.10E+08	.72E+07	.16E-14	.15E-14	.31E-14	
	.33E+07	0.	0.	0.	0.	.36E+08	.90E+07	.45E+08	23.0
NOMEX	.24E+08	0.	.42E+08	.27E+08	.19E+08	.44E-14	.40E-14	.83E-14	
	.89E+07	0.	0.	0.	0.	.97E+08	.24E+08	.12E+09	61.3
LRSI	.16E+07	0.	.27E+07	.18E+07	.13E+07	.29E-15	.26E-15	.54E-15	
	.58E+06	0.	0.	0.	0.	.63E+07	.16E+07	.79E+07	4.0
BLKHED	.45E+07	0.	.79E+07	.52E+07	.37E+07	.83E-15	.76E-15	.16E-14	
	.17E+07	0.	0.	0.	0.	.18E+08	.45E+07	.23E+08	11.7
TOTAL	.39E+08	0.	.68E+08	.44E+08	.31E+08	.71E-14	.65E-14	.14E-13	
	.15E+08	0.	0.	0.	0.	.16E+09	.39E+08	.20E+09	100.0

Figure 9 continued

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CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.89E+07	0.	.41E+07	.27E+07	.19E+07	.43E-15	.15E-14	.19E-14	
	.88E+06	0.	0.	0.	0.	.95E+07	.89E+07	.18E+08	23.0
NOMEX	.24E+08	0.	.11E+08	.71E+07	.50E+07	.11E-14	.39E-14	.51E-14	
	.23E+07	0.	0.	0.	0.	.25E+08	.24E+08	.49E+08	61.3
LRSI	.16E+07	0.	.71E+06	.46E+06	.33E+06	.75E-16	.26E-15	.33E-15	
	.15E+06	0.	0.	0.	0.	.17E+07	.16E+07	.32E+07	4.0
BLKHED	.45E+07	0.	.21E+07	.13E+07	.96E+06	.22E-15	.75E-15	.97E-15	
	.44E+06	0.	0.	0.	0.	.48E+07	.45E+07	.93E+07	11.7
TOTAL	.39E+08	0.	.18E+08	.12E+08	.82E+07	.19E-14	.64E-14	.83E-14	
	.38E+07	0.	0.	0.	0.	.41E+08	.39E+08	.80E+08	100.0

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
LINER	.11E+08	0.	.24E+07	.16E+07	.11E+07	.26E-15	.18E-14	.20E-14	
	.53E+06	0.	0.	0.	0.	.57E+07	.11E+08	.16E+08	9.0
TEFLON	.15E+08	0.	.35E+07	.23E+07	.16E+07	.37E-15	.25E-14	.28E-14	
	.75E+06	0.	0.	0.	0.	.81E+07	.15E+08	.23E+08	12.8
NOMEX	.70E+08	0.	.16E+08	.11E+08	.75E+07	.17E-14	.12E-13	.13E-13	
	.35E+07	0.	0.	0.	0.	.38E+08	.70E+08	.11E+09	59.7
LRSI	.58E+07	0.	.13E+07	.88E+06	.62E+06	.14E-15	.96E-15	.11E-14	
	.29E+06	0.	0.	0.	0.	.31E+07	.58E+07	.89E+07	5.0
BLKHED	.16E+08	0.	.37E+07	.24E+07	.17E+07	.39E-15	.26E-14	.30E-14	
	.79E+06	0.	0.	0.	0.	.85E+07	.16E+08	.24E+08	13.4
TOTAL	.12E+09	0.	.27E+08	.18E+08	.13E+08	.29E-14	.19E-13	.22E-13	
	.58E+07	0.	0.	0.	0.	.63E+08	.12E+09	.18E+09	100.0

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.32E+07	0.	.39E+06	.25E+06	.18E+06	.41E-16	.53E-15	.57E-15	
	.84E+05	0.	0.	0.	0.	.91E+06	.32E+07	.41E+07	48.8
NOMEX	.23E+07	0.	.28E+06	.18E+06	.13E+06	.29E-16	.38E-15	.41E-15	
	.60E+05	0.	0.	0.	0.	.65E+06	.23E+07	.29E+07	34.8
LRSI	.11E+06	0.	.14E+05	.92E+04	.65E+04	.15E-17	.19E-16	.20E-16	
	.30E+04	0.	0.	0.	0.	.33E+05	.11E+06	.15E+06	1.8
BLKHED	.96E+06	0.	.12E+06	.76E+05	.54E+05	.12E-16	.16E-15	.17E-15	
	.25E+05	0.	0.	0.	0.	.27E+06	.96E+06	.12E+07	14.7
TOTAL	.65E+07	0.	.80E+06	.52E+06	.37E+06	.84E-16	.11E-14	.12E-14	
	.17E+06	0.	0.	0.	0.	.19E+07	.65E+07	.84E+07	100.0

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.11E+07	0.	.11E+05	.70E+04	.50E+04	.11E-17	.19E-15	.19E-15	
	.23E+04	0.	0.	0.	0.	.25E+05	.11E+07	.11E+07	38.1
NOMEX	.17E+05	0.	.16E+03	.11E+03	.75E+02	.17E-19	.28E-17	.28E-17	
	.35E+02	0.	0.	0.	0.	.38E+03	.17E+05	.17E+05	.6
LRSI	.10E+07	0.	.97E+04	.63E+04	.45E+04	.10E-17	.17E-15	.17E-15	
	.21E+04	0.	0.	0.	0.	.23E+05	.10E+07	.10E+07	34.2
BLKHED	.80E+06	0.	.77E+04	.50E+04	.36E+04	.81E-18	.13E-15	.13E-15	
	.17E+04	0.	0.	0.	0.	.18E+05	.80E+06	.82E+06	27.2
TOTAL	.29E+07	0.	.28E+05	.18E+05	.13E+05	.30E-17	.49E-15	.49E-15	
	.61E+04	0.	0.	0.	0.	.66E+05	.29E+07	.30E+07	100.0

Figure 9 continued

CONTENTS: SUMMARY RETURN FLUX AT 400.0 KM ALTITUDE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** LISTED BY MATERIAL TYPE ***(CONT)

SECTION SUMMARY	SPECIES RETURN FLUX (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	EARLY DESORPTION (GM/CM**2) (MOLECULES/CM**2)	OUT GASSING	TOTAL	% OF TOTAL
TEFLON	.86E+07	0.	.36E+04	.23E+04	.17E+04	.38E-18	.14E-14	.14E-14	
	.77E+03	0.	0.	0.	0.	.84E+04	.86E+07	.86E+07	23.0
NOMEX	.23E+08	0.	.96E+04	.62E+04	.44E+04	.10E-17	.38E-14	.38E-14	
	.21E+04	0.	0.	0.	0.	.22E+05	.23E+08	.23E+08	61.4
LRSI	.15E+07	0.	.62E+03	.41E+03	.29E+03	.66E-19	.25E-15	.25E-15	
	.13E+03	0.	0.	0.	0.	.15E+04	.15E+07	.15E+07	4.0
BLKHED	.44E+07	0.	.18E+04	.12E+04	.84E+03	.19E-18	.73E-15	.73E-15	
	.39E+03	0.	0.	0.	0.	.42E+04	.44E+07	.44E+07	11.7
TOTAL	.38E+08	0.	.16E+05	.10E+05	.72E+04	.16E-17	.62E-14	.62E-14	
	.34E+04	0.	0.	0.	0.	.36E+05	.38E+08	.38E+08	100.0

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Figure 9 continued

CONTENTS: RETURN FLUX AT 400.0 KM ALTITUDE - ENUMERATED BY SOURCE

CRITICAL SURFACE NO. = 1000
FIELD-OF-VIEW (SR) = .100

*** HIGHEST TO LOWEST CONTRIBUTOR ***

ENG/VENT NUMBER	TYPE	LOCATION	SPECIES RETURN FLUX CONTRIBUTION (MOLECULES/CM**2) OUTG1 / O2	OUTG2 / CO	H2O / H2	N2 / H	CO2 / MMHNO3	TOTAL RTN FLX (GM/CM**2/SEC) (MOLECULES/CM**2/SEC)	% OF TOTAL	PLACE
9000	OMS	ARA +X	0.	0.	.25E+15	.31E+15	.40E+14	.32E-07		
			.59E+12	.13E+15	.14E+15	.13E+14	.99E+12	.89E+15	100.0000	1
TOTAL			0.	0.	.25E+15	.31E+15	.40E+14	.32E-07		
			.59E+12	.13E+15	.14E+15	.13E+14	.99E+12	.89E+15	100.00	

Figure 9 continued

4.0 RECOMMENDATIONS

The following items are recommendations that are considered desirable in further development of mission analysis capability for for the SPACE program. Some of these recommendations pertain specifically to the continued development of a mission profile model while others are model improvements in resolution and output format. The recommendations are listed approximately in order of importance or desirability.

a) Surface-to-surface deposition routines that utilize surface to surface viewfactors to determine incident flux, condensation coefficients and resulting deposition are desirable. Previously, model development has been oriented towards calculating those parameters related to contamination control criteria in the form of return flux and molecular number column densities. However, mission analysis will require surface to surface deposition for payloads while in the bay, during deployment and rendezvous situations.

b) Additional lines-of-sight (total of 8) at 82.5^{o} off of the Z axis should be input to improve the resolution and ability of moving lines-of-sight for column densities and return flux calculations. Viewfactor sets between all sources and the points along these lines-of-sight would be calculated and included as permanent files in the SPACE program.

c) For all lines-of-sight it would be desirable to include more points for density calculations near the vehicle. Currently the spacing is 5 meters and should be reduced to 1 or 2.5 meter spacing. This will allow a higher degree of accuracy and resolution for flight analysis parameters in the form of column densities and return flux.

d) The return flux condensation coefficients should be updated over the current scheme in the SPACE program. Currently, arbitrary values are input. Because of the large range of temperature variations that will exist for all Shuttle Orbiter flights and payload combinations, a systemmatic approach should be developed. Even though the contaminant molecules may be returned to Orbiter/Payload surfaces at velocities greater than thermal velocities there still should exist a source/collector temperature relation in determining condensation coefficients. It is recommended a $\frac{T_{source} - T_{collector}}{Constant}$ should be developed for return flux sources and surfaces impinged upon. The main assumption here is that return flux molecules have the same surface accommodation coefficient as molecules at thermal velocities with no interactions with the ambient.

e) The SPACE model should have incorporated into it a geometry of the elevon in an up position, that can be called as input for mission analysis. This will become important for mission analysis where column densities and return flux of the evaporator and engines must be reduced.

f) The Induced Environment Contamination Monitor (IECM) should be input to the model along with a proposed noble gas purge system that will be used to monitor return flux at the mass spectrometer on the IECM. This analysis will be used to confirm and/or update the model routines.

g) The resolution of Orbiter surfaces should be increased for situations where sensors viewing the orbiter may see only a portion of a large surface node in the model. The areas of concern are the radiator surfaces, payload bay liner surfaces and wing surfaces. Viewfactors for these new surfaces would be calculated for all 25 proposed lines-of-sight and input to the SPACE program as permanent change or an optional file to be used only when a higher degree of resolution is required.

h) Mission profile development should be continued in light of the OFT 3 simulation performed during the present study effort. A review should be made of major contamination events for the initial Shuttle Orbiter flights and the types of payloads so that appropriate parameters can be calculated with sufficient time resolution to meet mission support requirements. Specific preflight, real time and postflight contamination analysis should be established to support the mission profile modeling direction.

i) The capability to 3 dimensional plot density and flux values around the Shuttle Orbiter would be desirable. This could be accomplished by utilizing a display computer program that is currently available at JSC. This would allow visual inspection and interpretation of literally thousands of calculations. Trends and effects could be more easily recognized with the use of this plot capability.

j) Since the SPACE model is becoming more complex as requirements are placed upon it and capability is increased, an effort to streamline or reduce run time should be initiated and continued during development and implementation of changes and application to unique problem areas.

APPENDIX A

THERMAL MAPPER CONVERSION PROGRAM

APPENDIX A

THERMAL MAPPER CONVERSION PROGRAM

1. NODE MAPPER

The node mapper portion of the program is contained in unit 14. Figure A-1 shows the data contained in this unit. The first column designates the contamination node number, the second column the percentage of the node that is represented by a thermal node, the third column designates the thermal model used for correlation and finally, the fourth column designates the node in the thermal program that was used. J refers to the JSC mid fuselage thermal model, RA refers to the Rockwell aft section model and RF to the Rockwell forward section model.

2. CONVERSION PROGRAM

Figure A-2 is a listing of the actual conversion program that utilizes the unit 14 input and SINDA tape input.

				52	.50	J	2317	97	.22	RA	6017
				52	.50	J	2327	97	.78	RA	6019
1	.22	J	2579	54	.50	J	2377	100	1.00	J	1001
1	.22	J	2589	54	.50	J	2387	102	1.00	J	1001
1	.28	J	2659	56	.50	J	2357	104	.66	RA	751
1	.09	J	2669	56	.50	J	2367	104	.34	RA	753
1	.19	J	2809	60	.32	RA	10001	110	.45	J	1002
2	.22	J	2559	60	.18	RA	10002	110	.55	J	1003
2	.22	J	2569	60	.18	RA	10003	112	.66	RA	755
2	.28	J	2639	60	.32	RA	10004	112	.16	RA	757
2	.28	J	2649	62	.32	RA	10001	112	.18	RA	759
3	.22	J	2539	62	.18	RA	10002	115	1.00	J	1001
3	.22	J	2549	62	.18	RA	10003	117	.35	J	1002
3	.28	J	2619	62	.18	RA	10004	117	.65	J	1003
3	.28	J	2629	64	.18	RA	10005	118	.10	J	1002
4	.22	J	2519	64	.18	RA	10006	118	.90	J	1003
4	.22	J	2529	64	.18	RA	10007	119	1.00	RA	759
4	.28	J	2599	64	.18	RA	10008	121	.35	J	1002
4	.28	J	2609	64	.09	RA	10009	121	.65	J	1003
5	.22	J	579	64	.10	RA	10010	106	1.00	RA	961
5	.22	J	589	64	.09	RA	10011	107	.15	RA	963
5	.28	J	659	66	.43	RA	10018	107	.47	RA	965
5	.09	J	669	66	.57	RA	10019	107	.15	RA	967
5	.19	J	809	67	.35	RA	10018	107	.23	RA	969
6	.22	J	559	67	.65	RA	10019	122	.10	J	1002
6	.22	J	569	68	.75	RA	10018	122	.90	J	1003
6	.28	J	639	68	.25	RA	10019	130	1.00	J	3001
6	.28	J	649	70	.34	RA	10017	132	1.00	J	3001
7	.22	J	539	70	.33	RA	10019	134	.66	RA	752
7	.22	J	549	70	.32	RA	10018	134	.34	RA	754
7	.28	J	619	72	.45	RA	10017	140	.45	J	3002
7	.28	J	629	72	.55	RA	10019	140	.55	J	3003
8	.22	J	519	74	1.00	RA	10019	142	.66	RA	756
8	.22	J	529	76	.67	RA	10017	142	.16	RA	758
8	.28	J	599	76	.33	RA	10019	142	.18	RA	760
8	.28	J	609	77	.22	RA	10017	145	1.00	J	3001
11	.25	J	919	77	.78	RA	10019	147	.35	J	3002
11	.25	J	929	80	.32	RA	6001	147	.65	J	3003
11	.25	J	2919	80	.18	RA	6002	148	.10	J	3002
11	.25	J	2929	80	.18	RA	6003	148	.90	J	3003
13	.14	J	439	80	.32	RA	6004	149	1.00	RA	760
13	.17	J	449	82	.32	RA	6001	151	.35	J	3002
13	.05	J	459	82	.18	RA	6002	151	.65	J	3003
13	.14	J	469	82	.18	RA	6003	137	.15	RA	964
13	.14	J	479	82	.32	RA	6004	137	.47	RA	966
13	.17	J	489	84	.18	RA	6005	137	.15	RA	968
13	.14	J	499	84	.18	RA	6006	137	.23	RA	970
13	.05	J	509	84	.18	RA	6007	152	.10	J	3002
20	1.00	J	317	84	.18	RA	6008	152	.90	J	3003
22	1.00	J	357	84	.09	RA	6009	450	1.00	RA	771
24	1.00	J	327	84	.10	RA	6010	451	1.00	RA	771
26	1.00	J	367	84	.09	RA	6011	452	1.00	RA	771
30	1.00	J	2357	86	.43	RA	6018	453	1.00	RA	771
32	1.00	J	2317	86	.57	RA	6019	454	1.00	RA	771
34	1.00	J	2327	87	.35	RA	6018	455	1.00	RA	773
36	1.00	J	2367	87	.65	RA	6019	456	1.00	RA	773
40	.50	J	337	88	.75	RA	6018	457	1.00	RA	773
40	.50	J	347	88	.25	RA	6019	458	1.00	RA	773
42	.50	J	317	90	.34	RA	6017	459	1.00	RA	773
42	.50	J	367	90	.33	RA	6019	460	1.00	RA	772
44	.50	J	377	90	.32	RA	6018	461	1.00	RA	772
44	.50	J	387	92	.45	RA	6017	462	1.00	RA	772
46	.50	J	357	92	.55	RA	6019	463	1.00	RA	772
46	.50	J	367	94	1.00	RA	6019	464	1.00	RA	772
50	.50	J	2337	96	.67	RA	6017	465	1.00	RA	774

Figure A-1 Node Mapper Data

[illegible]	[illegible]	[illegible]	[illegible]
467	1.00	RA	774
468	1.00	RA	774
469	1.00	PA	774
301	.67	J	131
301	.33	J	141
305	.12	J	141
305	.22	J	151
305	.21	J	161
305	.21	J	171
305	.24	J	181
306	.10	J	141
306	.22	J	151
306	.23	J	161
306	.23	J	171
306	.24	J	181
307	.10	RA	701
307	.08	RA	702
307	.13	RA	703
307	.12	RA	704
307	.17	RA	705
307	.11	RA	706
307	.07	RA	707
307	.06	RA	708
307	.16	RA	709
311	.67	J	2131
311	.33	J	2141
315	.12	J	2141
315	.22	J	2151
315	.21	J	2161
315	.21	J	2171
315	.24	J	2181
316	.10	J	2141
316	.22	J	2151
316	.23	J	2161
316	.23	J	2171
316	.24	J	2181
317	.10	RA	711
317	.08	RA	712
317	.13	RA	713
317	.12	RA	714
317	.17	RA	715
317	.11	RA	716
317	.07	RA	717
317	.06	RA	718
317	.16	RA	719
420	1.00	RA	703
425	1.00	RA	713
250	.06	RA	7052
250	.12	RA	7055
250	.06	RA	7057
250	.76	RA	7059
260	.06	RA	7051
260	.06	RA	7053
260	.06	RA	7054
260	.06	RA	7056
260	.76	RA	7058
202	1.00	RA	793
203	1.00	RA	799
380	.40	RA	789
380	.60	RA	791
381	.40	RA	788
381	.60	RA	790
382	.50	RA	791
382	.15	RA	781
382	.25	RA	793

[illegible]	[illegible]	[illegible]	[illegible]
383	.50	RA	790
383	.15	RA	780
383	.25	RA	792
383	.10	RA	786
384	.45	RA	783
384	.20	RA	793
384	.12	RA	787
384	.13	RA	785
384	.10	RA	781
385	.45	RA	782
385	.20	RA	792
385	.12	RA	780
385	.13	RA	784
385	.10	RA	780
386	.33	RA	781
386	.67	RA	783
387	.33	RA	780
387	.67	RA	782
388	.60	RA	787
388	.40	RA	785
389	.60	RA	786
389	.40	RA	784
390	.60	RA	785
390	.40	RA	787
391	.60	RA	784
391	.40	RA	786
392	.60	RA	788
392	.30	RA	786
392	.10	RA	784
393	.60	RA	789
393	.30	RA	787
393	.10	RA	785
160	1.00	RF	1
161	.26	RF	2413
161	.37	RF	12
161	.37	RF	19
162	.26	RF	2438
162	.37	RF	15
162	.37	RF	27
163	.60	RF	2410
163	.25	RF	13
163	.15	RF	19
164	.60	RF	2435
164	.25	RF	14
164	.15	RF	27
165	.60	RF	2411
165	.25	RF	13
165	.15	RF	20
166	.60	RF	2436
166	.25	RF	14
166	.15	RF	26
167	.25	RF	2412
167	.20	RF	13
167	.55	RF	20
168	.25	RF	2437
168	.20	RF	14
168	.55	RF	26
169	.25	RF	2419
169	.50	RF	21
169	.25	RF	22
170	.25	RF	2444
170	.25	RF	24
170	.50	RF	25
171	.50	RF	2406
171	.50	RF	22

[illegible]	[illegible]	[illegible]	[illegible]
172	.50	RF	24
174	.08	RF	31
174	.20	RF	32
174	.13	RF	33
174	.13	RF	34
174	.13	RF	38
174	.13	RF	39
174	.20	RF	40
175	.31	RF	35
175	.08	RF	36
175	.15	RF	20
175	.15	RF	21
175	.16	RF	22
175	.15	RF	23
177	.31	RF	37
177	.23	RF	26
177	.15	RF	25
177	.16	RF	24
177	.15	RF	23
180	1.00	RF	28
181	1.00	RF	28
182	1.00	RF	29
183	1.00	RF	17
184	1.00	RF	18
185	1.00	RF	18
190	.50	RF	16
190	.50	RF	30
230	.20	RA	7003
230	.18	RA	7004
230	.15	RA	7006
230	.16	RA	7007
230	.15	RA	7009
230	.16	RA	7010
240	.28	RA	7001
240	.28	RA	7002
240	.22	RA	7005

Figure A-1 Continued

```
@FOR,IS TEMP
C
C
C        TAPE10 = NEW OUTPUT NODE/TEMP (INPUT TO SPACE)
C        TAPE11 = FORE ROCKWELL SINDA TAPE
C        TAPE12 =  MID(390) JSC SINDA TAPE
C        TAPE13 =  AFT ROCKWELL SINDA TAPE
C        TAPE14 =  MMA/OTHER NODE MAP
C
C          THIS MODEL USES @FORE@ROCKWELL (UNIT 11)THERMAL MODEL,
C                  JSC 390 MID-SECTION(UNIT12)THERMAL MODEL,
C                  AND THE @AFT@ROCKWELL (UNIT13) THERMAL MODEL
C                  TO GENERATE A @TAPE10@FOR INPUT TO THE MMA
C                  SPACE PROGRAM. TAPE 10 IS THE NODE/TEMP
C                  FILE USED FOR CONTAMINATION INPUT
C
      DIMENSION MMAI(400),PERC(400),IKEY(400),NEWN(400)
      DIMENSION JSC(66),JSCC(66),TJSC(66)
      DIMENSION IRF(35),IRFC(35),TIRF(35)
      DIMENSION IRA(105),IRAC(105),TIRA(105)
      DIMENSION HEAD1(12),HEAD2(12),HEAD3(12),ISUB3(3),TIME(3)
      DIMENSION MMAO(300),TEMPC(7,300)
      LOGICAL FORE,AFT,MID,DEBUG
      NAMELIST/TIN/ FORE,MID,AFT,DEBUG,NUMBER
C
      REWIND 10
      REWIND 11
      REWIND 12
      REWIND 13
      REWIND 14
C
      READ(5,TIN)
C
C        READ IN MMA=JSC/ROCK NODE MAPPER
C
      DO 1 I=1,400
      READ(14,100,END=2)MMAI(I),PERC(I),IKEY(I),NEWN(I)
      IF(MMAI(I).EQ.0) GO TO 2
      ISORT=I
    1 CONTINUE
    2 CONTINUE
  100 FORMAT(I5,F10.2,A2,3X,I5)
      CALL BLCKT(JSC,IRF,IRA,ISUB3)
C         LOOP OVER NUMBER OF TEMPERATURE SLOTS
C
      DO 1000 NUM=1,NUMBER
C
C     CAREFULLY ZERO OUT ARRAYS TIRF TJSC TIRA TIME
C
      DO 300 NP=1,35
      TIRF(NP)=0.0
  300 CONTINUE
      DO 301 NP=1,66
      TJSC(NP)=0.0
  301 CONTINUE
      DO 302 NP=1,105
      TIRA(NP)=0.0
  302 CONTINUE
C
C     CHEQUE WHICH OR ANY MODELS ARE BEING USED AND BUILD THEIR SHORT AR
C
      IF(.NOT.FORE)GO TO 3
      IUNIT=11
```

Figure A-2 Conversion Program

```
      CALL SORT(IRF,IRFC,TIRF,NUM,ISUB3,K,IUNIT,HEAD1,TIME(1))
      WRITE(6,102) (HEAD1(I),I=1,12),TIME(1)
    3 CONTINUE
      IF(.NOT.MID) GO TO 4
      IUNIT=12
      K=2
      CALL SORT(JSC,JSCC,TJSC,NUM,ISUB3,K,IUNIT,HEAD2,TIME(2))
      WRITE(6,102)(HEAD2(I),I=1,12),TIME(2)
    4 CONTINUE
      IF(.NOT.AFT) GO TO 5
      IUNIT=13
      K=3
      CALL SORT(IRA,IRAC,TIRA,NUM,ISUB3,K,IUNIT,HEAD3,TIME(3))
      WRITE(6,102)(HEAD3(I),I=1,12),TIME(3)
    5 CONTINUE
  102 FORMAT(1H1,10X,12A6,5X,5HTIME,F10.2)
C
C          START CALCULATING TEMPERATURES FOR MMA NODES
C
      IF((DEBUG).AND.(NUM.LE.2)) WRITE(6,103)
  103 FORMAT(1H1,//,10X,13HDEBUG OUTPUT,/,
     *10X,3HMMA,3X,4HPERC,2X,5HOTHER,2X,5HMODEL,3X,5HOTHER,5X,
     *5HACCUM,3X,5HACCUM,2X,3HMMA,
     *10X,4HNODE,8X,4HNODE,4X,3HKEY,4X,7HTEMP(F),3X,7HTEMP(F),
     *1X,4HPERC,3X,3HSUB)
C
C      LOOP TO ACTUALLY COMPUTE NEW TEMPERATURES
C      ICT IS MMA SUBSCRIPT
      ICT=0
C
      DO 6 I=1,ISORT
      ICT=ICT + 1
      IF(I.EQ.1) GO TO 14
      IF(MMAI(I).EQ.MMAI(I-1)) GO TO 8
    7 MMAO(ICT)=MMAI(I)
      TPERC=PERC(I)
      IFLAG=0
      GO TO 9
    8 CONTINUE
      TPERC=TPERC + PERC(I)
      IF(TPERC.GT.1.0) GO TO 7
      ICT=ICT-1
      IFLAG=1
    9 CONTINUE
C
      IMODEL=IKEY(I)
      INEED =NEWN(I)
C
C     SEARCH SHORT  OTHER ARRAYS FOR TEMPERATURES
C
      IF((IMODEL.EQ.2HRF).AND.(FORE))
     *          CALL SHORT(INEED,IRF,TIRF,ISUB3(1),TFO,IMODEL)
      IF((IMODEL.EQ.2HJ ).AND.(MID))
     *          CALL SHORT(INEED,JSC,TJSC,ISUB3(2),TFO,IMODEL)
      IF((IMODEL.EQ.2HRA).AND.(AFT))
     *          CALL SHORT(INEED,IRA,TIRA,ISUB3(3),TFO,IMODEL)
C
C          NOW YOU HAVE FOUND A TEMPERATURE FOR THE NODE
C                      PROCEED.
C
      IF(IFLAG.EQ.1) GO TO 10
C           WHOLE TEMPERATUE
      TEMRF=TFO * PERC(I)
      TEMPC(NUM,ICT)=CENTI(TEMPF)
      GO TO 11
```

Figure A-2 (Continued)

```
C          PARTIAL  TEMPERTURE
      TEMPF = TEMPF +(TFO *PERC(I))
      TEMPC(NUM,ICT)= CENTI(TEMPF)
   11 CONTINUE
C
C     WRITE( DEBUG) RESULTS
C
      IF(DEBUG) WRITE(6,104)
     *MMAO(ICT),PERC(I),NEWN(I),IKEY(I),TFO,TEMPF,TPERC,ICT
  104 FORMAT(9X,I5,1X,F5.1,1X,I5,4X,A2,4X,F8.2,2X,F8.2,1X,F4.1,3X,I3)
   14 IF(TPERC.GT.1) GO TO 12
      GO TO 13
   12 WRITE(6,202)MMAI(I),PERC(I),JSCN(II)
  202 FORMAT(1X,20H+++ CAUTION MMA NODE ,I5,
     *      1X,17H HAS A PERCENT OF,F6.2,
     *      1X,16H FOR OTHER NODE ,I5,/,
     *    1X,37HTHIS PERC ADDED WITH OTHERS IS GT ONE,
     *    1X,34H IT IS BEING DISCARDED-CHECK FILES)
      TPERC=0.0
   13 CONTINUE
    6 CONTINUE
C
C          END OF ONE SET OF TEMPERATURES@
      IF(DEBUG)WRITE(6,105)
      IF(DEBUG)WRITE(6,106)(MMAO(IK),TEMPC(NUM,IK),IK=1,ICT)
  105 FORMAT(1H1,//,10X,24HDEBUG  MMA NODE  TEMP(C))
  106 FORMAT(20X,I5,1X,F10.2)
C
C     END  LOOP OVER TIME INCREMENTS
 1000 CONTINUE
C
C         WRITE SPACE UNIT 10
C
      WRITE(10,107)((MMAO(IC),TEMPC(NUM,IC),NUM=1,NUMBER),IC=1,ICT)
  107 FORMAT(I5,7F10.3)
      RETURN
      END
*FOR,IS BLCKT,BLCKT
      SUBROUTINE  BLCKT (JSC,IRF,IRA,ISUB3)
C
C        MASTER ARRAYS FOR NODES USE BY MMA FROM 3 THERMAL MODELS
C
      DIMENSION JSC(66),IRF(35),IRA(105),ISUB3(3)
      DATA(JSC(I),I=1,66)
     1/2519,2529,2539,2549,2559,2569,2579,2589,2669,2809,
     2 2919,2929,469,499,519,529,539,549,559,569,579,589,
     3 669,809,919,929,439,479,449,459,489,509,317,327,
     4 337,347,357,367,377,387,2317,2327,2337,2347,2357,
     52367,2377,2387,1001,1002,1003,3001,3002,3003,131,
     6141,151,161,171,181,2131,2141,2151,2161,2171,2181/
      DATA(IRF(I),I=1,35)
     1/2413,12,19,2410,13,2411,20,2412,2419,21,22,2438,
     215,27,2435,14,2436,26,2437,2444,25,24,2406,32,33,
     334,35,36,2431,40,39,38,37,31,23/
      DATA(IRA(I),I=1,105)
     1/6001,6002,6003,6004,6005,6006,6007,6008,6009,6010,
     26011,10001,10002,10003,10004,10005,10006,10007,10008,
     310009,10010,10011,6117,6118,6119,10017,10018,10019,
     4751,753,755,757,759,961,963,965,967,969,771,773,752,
     5754,756,758,760,962,964,966,968,970,772,774,
     6701,702,703,704,705,706,707,708,709,711,712,713,
     7 714,715,716,717,718,719,7051,7052,7053,7055,7058,
     87059,793,799,781,783,785,786,780,782,784,787,789,
     9791,793,788,790,792,7005,7006,7007,7008,7009,7010,
     *7001,7002,7003,7004,7056,7057,7054/
```

ORIGINAL PAGE IS OF POOR QUALITY

Figure A-2 Continued

```
      END
@FOR,IS SORT,SORT
C
      SUBROUTINE SORT(NODEA,SAVSUB,STEMP,NUM,ISUB3,K,IUNIT,HEAD,TIMES)
C           INSPECT EACH THERMAL MODEL AND SELECT ONLY THOSE
C           SUBSCRIPTS YOU WILL NEED IN YOUR ANALYSIS
C           SAVE THIS ARRAY AS *SAVSUB*
C           TEMPERATURE ARRAY IS *STEMP*.
C           THESE ARE SHORT ARRAYS.THE ACTUAL SINDA RECORDS RANGE
C           IN LENGTH FROM  500 TO 1900 WORDS. THIS SUBROUTINE WILL
C           DUMP THESE LARGE ARRAYS INTO *MNODES*(FOR NODES) AND
C           * TTEMP * FOR SELECTION. THIS SUBROUTINE WILL GATHER UP
C           THE SHORTENED ARRAYS, AND LEAVE TO DO THE REPETIVE
C           IN SPECTING.A FLAG CALLED NUM IS USE HERE TO SKIP
C           THE READ OF THE NODE  RECORD.NUM MAY ONLY RANGE FROM
C           1 TO 7  AS THIS IS THE MAX NO OF TEMPERATURES ALLOWABLE
C           ON THE SPACE UNIT 10.THE USERMUST DEFINE NUM.
C           NODEA=ONE OF THE 3ARRAYS DATED IN OF JSC/R NODES NEEDED
C          (ILSUB=LARGE SUBSCRIPTS SAVED, SINDA@S REC LGNTH PER MODEL)
C
      DIMENSION MNODES(2000), TTEMP(2000)
      DIMENSION SAVSUB(105),STEMP(105)
      DIMENSION NODEA(105),ISUB(3),ILSUB(3)
      DIMENSION HEAD(12)
      INTEGER SAVSUB,HEAD
      LOGICAL FORE,MID,AFT,DEBUG
C             ROLL IN LARGE  ARRAYS
      IF(NUM.GT.1) GO TO 4
      READ(IUNIT,END=101) HEAD,(LL,I=1,5),NW,NPR,NVP,LL,LL,LL,NW,LL,LL,
     *       NSL,NW,NPR,NVP,(MNODES(I),I=1,NSL)
C
C     CREAT A SUBSCRIPT ARRAY FOR FUTURE USE  FOR THIS MODEL
      ILSUB(K)=NSL
      M=ISUB3(K)
      DO 1 I=1,M
      DO 2 J=1,NSL
      IF(MNODES(J).EQ.0) GO TO 4
      JJ=J
      IF(NODEA(I).EQ.MNODES(J))GO TO 5
    2 CONTINUE
      WRITE(6,100) NODEA(I)
  100 FORMAT(20X,32H **CAUTION A MATCH FOR OTHERNODE,I5,
     *44H WAS NEVER FOUND.                           )
      GO TO 1
    5 SAVSUB(I)=JJ
    1 CONTINUE
    4 CONTINUE
C              NOW  COLLECT TEMPERATURES  ONE ON ONE  FROM SAVSUB
      NSL=ILSUB(K)
      READ(IUNIT,END=101)TIME(K),L,L,L,L,(TTEMP(I),I=1,NSL)
      DO 6 I=1,M
      K=SAVSUB(I)
      STEMP(I)=TTEMP(K)
    6 CONTINUE
      IF(DEBUG)WRITE(6,102)(NODEA(I),STEMP(I),SAVSUB(I),I=1,M)
  102 FORMAT(10X,I5,2X,F10.3,2X,I5)
  101 WRITE(6,103) IUNIT
  103 FORMAT(" EOF ENCOUNTERED ON UNIT ",I5)
      RETURN
      END
@FOR,IS SHORT,SHORT
      SUBROUTINE SHORT(INEED,ION,TMP,IS,TFO,IMODEL)
      DIMENSION ION(110),TMP(110)
C
```

Figure A-2 Continued

```
C
      DO 1 I=1,IS
      ISUB=I
      IF(INEED.EQ.ION(I)) GO TO 2
    1 CONTINUE
      GO TO 3
    2 TFQ=TMP(ISUB)
      RETURN
    3 WRITE(6,100)INEED,IMODEL
  100 FORMAT(10X,19H***** CAUTION *****,
     *           30H,NO TEMPERATURE FOUND FOR NODE,I5,
     *          2X,10H IN MODEL,A2)
      RETURN
      END
@FOR,IS CENTI,CENTI
      FUNCTION CENTI(T)
      CENTI =(5./9.)*(T-32.)
      RETURN
      END
```

Figure A-2 Continued

APPENDIX B

SPACE PROGRAM CHANGES FOR FILTER INCLUSION

APPENDIX B

SPACE PROGRAM CHANGES FOR FILTER INCLUSION

1. BLCKA - The changes to BLCKA are shown by the black lines in Figure B-1. These were required for inclusion into the SPACE program.

2. BLCKC - Figure B-2 shows the changes to this subroutine as indicated by the black lines.

3. MLOSSR - Figure B-3 shows the changes to this subroutine as indicated by the black lines.

```
      SUBROUTINE  BLCKA                                                 BLCKA   5
C                                                                       BLCKA   6
C          ***************************************************         BLCKA   7
C          *                                                 *         BLCKA   8
C          *                BLOCK  DATA  A                   *         BLCKA   9
C          *                                                 *         BLCKA  10
C          ***************************************************         BLCKA  11
C                                  CODED BY: M. HETRICK  2/16/77       BLCKA  12
C                                            D. STRANGE  1/21/77       BLCKA  13
C  OBJECTIVE:                                                           BLCKA  14
C    THIS ROUTINE SETS UP THE STS ORBITER CONFIGURATION BY DEFINING     BLCKA  15
C    GEOMETRIC SURFACES,THEIR IDENTIFICATION NUMBERS, LOCATION, MATERIAL BLCKA  16
C    AND AREA.                                                          BLCKA  17
C      IDENT     = SURFACE IDENTIFICATION NUMBER                        BLCKA  18
C      SECT      = ORBITER/SPACELAB GEOMETRIC SUBSECTION                BLCKA  19
C         RADOOR= RADIATOR DOOR                                         BLCKA  20
C         BAY   = PAYLOAD BAY LINER, SIDE STRIPS, BULKHEADS             BLCKA  21
C         TAIL  = TAILFIN                                               BLCKA  22
C         CREW  = NOSE,CREW SECTION                                     BLCKA  23
C         WING  = WINGS                                                 BLCKA  24
C         FUSLAG= FUSELAGE                                              BLCKA  25
C         OMS   = OMS PODS                                              BLCKA  26
C         FILTER =OVERBOARD/INBOARD FILTERS                             BLCKA  27
C      MATRL     = SURFACE MATERIAL                                     BLCKA  28
C         LINER = PAYLOAD BAY LINER                                     BLCKA  29
C         BLKHED= FORE AND AFT BAY BULKHEADS                            BLCKA  30
C         TEFLON= TEFLON                                                BLCKA  31
C         LRSI  = LOW TEMP RSI                                          BLCKA  32
C         HRSI  = HIGH TEMP RSI                                         BLCKA  33
C         NOMEX = PAINTED FELT                                          BLCKA  34
C         RCC   = CARBON                                                BLCKA  35
C         CRACKS= LEAKING SURFACE                                       BLCKA  36
C         WINDOW= CABIN WINDOWS                                         BLCKA  37
C         FILI  = INBOARD FILTERS                                       BLCKA  38
C         FILO  = OVERBOARD FILTERS                                     BLCKA  39
C      AREA      = SURFACE AREA IN SQUARE INCHES                        BLCKA  40
C                                                                       BLCKA  41
      COMMON/CNTRL/DEPSIT,DBUGA, DBUGB, DBUGC, DBUGD, ED,     ENG,      BLCKA  42
     1             EVAP,  FIVP,  LEAK,  LMOP,  MAXTMP,MCD,              BLCKA  43
     2             MFPATH,NEWCON,NEWTNL,NEWMFP,NEWMFS,NEWMLC,NEWTCD,    BLCKA  44
     3             MINTMP,ORBITR,OUT,   REFLCT,REPORT(50),              BLCKA  45
     4             RFAS,  RFSS,  SMTP,  TITLE(12),    TSTART(3),        BLCKA  46
     5             TSTOP(3),     GO,    SUNL,  SUNM,  SUNH              BLCKA  47
      COMMON/PTSRCE/CIDENT(50),CLOC(50),CTYPE(50),CXLOC(50),CYLOC(50),  BLCKA  48
     1              CZLOC(50),PLUMEC(10,5),SPECMF(10,5)                 BLCKA  49
      COMMON/SEGA/JTOTAL,JKEEP,KINDS,KTOTAL                             BLCKA  50
      COMMON/SOURCE/SURFSC(300),PNTSC(50),ONTIME(50),SSURFS(300)        BLCKA  51
      COMMON/SURF/IDENT(300),SECT(300),MATRL(300),AREA(300)             BLCKA  52
      LOGICAL   DBUGA,ED,ENG,EVAP,FIVP,LEAK,LMOP,ORBITR,OUT,SMTP,REFLCT BLCKA  53
      DIMENSION IORBTR(1000),IPTS(300)                                  BLCKA  54
      INTEGER CIDENT,CLOC,CTYPE,CXLOC,CYLOC,CZLOC,PNTSC,SECT,SSURFS,    BLCKA  55
     1        SURFSC                                                    BLCKA  56
C                                                                       BLCKA  57
C  CURRENTLY THERE ARE 190 SURFACES USED ON THE ORBITER SYNTHESIS       BLCKA  58
      DATA NSURFO /190/                                                 BLCKA  59
C  ************************************                                 BLCKA  60
C     * * MASTER ARRAY FOR ORBITER * *                                  BLCKA  61
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```
      C                                                                BLCKA   62
            DATA(IORBTR(I),I=1,40)                                     BLCKA   63
           1  /20,6HRADOOR,6HTEFLON, 12200,                            BLCKA   64
           2   22,6HRADOOR,6HTEFLON, 12200,                            BLCKA   65
           3   24,6HRADOOR,6HTEFLON, 12200,                            BLCKA   66
           4   26,6HRADOOR,6HTEFLON, 12200,                            BLCKA   67
           5   30,6HRADOOR,6HTEFLON, 12200,                            BLCKA   68
           6   32,6HRADOOR,6HTEFLON, 12200,                            BLCKA   69
           7   34,6HRADOOR,6HTEFLON, 12200,                            BLCKA   70
           8   36,6HRADOOR,6HTEFLON, 12200,                            BLCKA   71
           9   40,6HRADOOR,6HTEFLON, 25580,                            BLCKA   72
           *   42,6HRADOOR,6HTEFLON, 25580/                            BLCKA   73
      C   10                                                           BLCKA   74
            DATA(IORBTR(I),I=41,80)                                    BLCKA   75
           1  /44,6HRADOOR,6HTEFLON, 25580,                            BLCKA   76
           2   46,6HRADOOR,6HTEFLON, 25580,                            BLCKA   77
           3   50,6HRADOOR,6HTEFLON, 25580,                            BLCKA   78
           4   52,6HRADOOR,6HTEFLON, 25580,                            BLCKA   79
           5   54,6HRADOOR,6HTEFLON, 25580,                            BLCKA   80
           6   56,6HRADOOR,6HTEFLON, 24990,                            BLCKA   81
           7   21,6HFUSLAG,6H  LRSI, 12200,                            BLCKA   82
           8   23,6HFUSLAG,6H  LRSI, 12200,                            BLCKA   83
           9   25,6HFUSLAG,6H  LRSI, 12200,                            BLCKA   84
           *   27,6HFUSLAG,6H  LRSI, 12200/                            BLCKA   85
      C   20                                                           BLCKA   86
            DATA(IORBTR(I),I=81,120)                                   BLCKA   87
           1  /31,6HFUSLAG,6H  LRSI, 12200,                            BLCKA   88
           2   33,6HFUSLAG,6H  LRSI, 12200,                            BLCKA   89
           3   35,6HFUSLAG,6H  LRSI, 12200,                            BLCKA   90
           4   37,6HFUSLAG,6H  LRSI, 12200,                            BLCKA   91
           5   41,6HFUSLAG,6H  LRSI, 25580,                            BLCKA   92
           6   43,6HFUSLAG,6H  LRSI, 25580,                            BLCKA   93
           7   45,6HFUSLAG,6H  LRSI, 25580,                            BLCKA   94
           8   47,6HFUSLAG,6H  LRSI, 25580,                            BLCKA   95
           9   51,6HFUSLAG,6H  LRSI, 24990,                            BLCKA   96
           *   53,6HFUSLAG,6H  LRSI, 24990/                            BLCKA   97
      C   30                                                           BLCKA   98
            DATA(IORBTR(I),I=121,160)                                  BLCKA   99
           1  /55,6HFUSLAG,6H  LRSI, 24990,                            BLCKA  100
           2   57,6HFUSLAG,6H  LRSI, 24990,                            BLCKA  101
           3  202,6HFUSLAG,6H  LRSI, 32520,                            BLCKA  102
           4  203,6HFUSLAG,6H  LRSI, 32520,                            BLCKA  103
           5  230,6HFUSLAG,6H  LRSI, 25730,                            BLCKA  104
           6  240,6HFUSLAG,6H  LRSI, 16340,                            BLCKA  105
           7  241,6HFUSLAG,6H  LRSI, 16340,                            BLCKA  106
           8  250,6HFUSLAG,6H  LRSI, 19580,                            BLCKA  107
           9  260,6HFUSLAG,6H  LRSI, 20240,                            BLCKA  108
           *  301,6HFUSLAG,6H  LRSI, 26600/                            BLCKA  109
      C   40                                                           BLCKA  110
            DATA(IORBTR(I),I=161,200)                                  BLCKA  111
           1 /305,6HFUSLAG,6H  LRSI, 30930,                            BLCKA  112
           2  306,6HFUSLAG,6H NOMEX, 30930,                            BLCKA  113
           3  307,6HFUSLAG,6H NOMEX, 24770,                            BLCKA  114
           4  311,6HFUSLAG,6H  LRSI, 26600,                            BLCKA  115
           5  315,6HFUSLAG,6H  LRSI, 30930,                            BLCKA  116
           6  316,6HFUSLAG,6H NOMEX, 30930,                            BLCKA  117
           7  317,6HFUSLAG,6H NOMEX, 24770,                            BLCKA  118
```

Figure B-1 Continued

```
     8  420,6HFUSLAG,6H  LRSI,  1312,
     9  425,6HFUSLAG,6H  LRSI,  1312,
     *   60,6H    OMS,6H  LRSI,  1145/
C   50
      DATA(IORBTR(I),I=201,240)
     1  /62,6H    OMS,6H  LRSI,  7850,
     2   64,6H    OMS,6H  LRSI, 37920,
     3   66,6H    OMS,6H  LRSI,  1991,
     4   67,6H    OMS,6H  LRSI,  2028,
     5   68,6H    OMS,6H  LRSI,   415,
     6   70,6H    OMS,6H  LRSI,   895,
     7   72,6H    OMS,6H  LRSI,  1406,
     8   74,6H    OMS,6H  LRSI,  1312,
     9   76,6H    OMS,6H  LRSI,  715,
     *   77,6H    OMS,6H  LRSI,  600/
C   60
      DATA(IORBTR(I),I=241,280)
     1  /80,6H    OMS,6H  LRSI,  1145,
     2   82,6H    OMS,6H  LRSI,  7813,
     3   84,6H    OMS,6H  LRSI, 37740,
     4   86,6H    OMS,6H  LRSI,  1991,
     5   87,6H    OMS,6H  LRSI,  2028,
     6   88,6H    OMS,6H  LRSI,   415,
     7   90,6H    OMS,6H  LRSI,   895,
     8   92,6H    OMS,6H  LRSI,  1406,
     9   94,6H    OMS,6H  LRSI,  1312,
     *   96,6H    OMS,6H  LRSI,   715/
C   70
      DATA(IORBTR(I),I=281,320)
     1  /97,6H    OMS,6H  LRSI,   601,
     2  100,6H   WING,6H NOMEX,  6356,
     3  102,6H   WING,6H NOMEX, 29590,
     4  104,6H   WING,6H NOMEX,  9125,
     5  110,6H   WING,6H NOMEX, 23340,
     6  112,6H   WING,6H NOMEX, 19380,
     7  115,6H   WING,6H  LRSI, 19280,
     8  117,6H   WING,6H  HRSI,  5650,
     9  118,6H   WING,6H  HRSI,  2508,
     *  119,6H   WING,6H  LRSI,  3302/
C   80
      DATA(IORBTR(I),I=321,360)
     1 /121,6H   WING,6H   RCC,  2251,
     2  122,6H   WING,6H   RCC,  3123,
     3  130,6H   WING,6H NOMEX,  6356,
     4  132,6H   WING,6H NOMEX, 29590,
     5  134,6H   WING,6H NOMEX,  9125,
     6  140,6H   WING,6H NOMEX, 23340,
     7  142,6H   WING,6H NOMEX, 19380,
     8  145,6H   WING,6H  LRSI, 19280,
     9  147,6H   WING,6H  HRSI,  5650,
     *  148,6H   WING,6H  HRSI,  2508/
C   90
      DATA(IORBTR(I),I=361,400)
     1 /149,6H   WING,6H  LRSI,  3302,
     2  151,6H   WING,6H   RCC,  2251,
     3  152,6H   WING,6H   RCC,  3123,
     4  106,6HELEVON,6H NOMEX,  6499,
```

Figure B-1 Continued

```
     5  107,6HELEVON,6H NOMEX, 17210,
     6  136,6HELEVON,6H NOMEX,  6499,
     7  137,6HELEVON,6H NOMEX,  9125,
     8  450,6HELEVON,6H NOMEX,   138,
     9  451,6HELEVON,6H NOMEX,   415,
     *  452,6HELEVON,6H NOMEX,   692/
C  100
      DATA(IORBTR(I),I=401,440)
     1 /453,6HELEVON,6H NOMEX,   960,
     2  454,6HELEVON,6H NOMEX,  1246,
     3  455,6HELEVON,6H NOMEX,  1523,
     4  456,6HELEVON,6H NOMEX,  1800,
     5  457,6HELEVON,6H NOMEX,  2076,
     6  458,6HELEVON,6H NOMEX,  2353,
     7  459,6HELEVON,6H NOMEX,  2630,
     8  460,6HELEVON,6H NOMEX,   138,
     9  461,6HELEVON,6H NOMEX,   415,
     *  462,6HELEVON,6H NOMEX,   692/
C  110
      DATA(IORBTR(I),I=441,480)
     1 /463,6HELEVON,6H NOMEX,   969,
     2  464,6HELEVON,6H NOMEX,  1246,
     3  465,6HELEVON,6H NOMEX,  1523,
     4  466,6HELEVON,6H NOMEX,  1800,
     5  467,6HELEVON,6H NOMEX,  2076,
     6  468,6HELEVON,6H NOMEX,  2353,
     7  469,6HELEVON,6H NOMEX,  2630,
     8  160,6H  CREW,6H   RCC,  7191,
     9  161,6H  CREW,6H  LRSI,  9348,
     *  162,6H  CREW,6H  LRSI,  9348/
C  120
      DATA(IORBTR(I),I=481,520)
     1 /163,6H  CREW,6H  LRSI,  3380,
     2  164,6H  CREW,6H  LRSI,  3380,
     3  165,6H  CREW,6H  LRSI,  4253,
     4  166,6H  CREW,6H  LRSI,  4253,
     5  167,6H  CREW,6H  HRSI, 12590,
     6  168,6H  CREW,6H  HRSI, 12590,
     7  169,6H  CREW,6H  HRSI,  9600,
     8  170,6H  CREW,6H  HRSI,  9600,
     9  171,6H  CREW,6H  HRSI,  3705,
     *  172,6H  CREW,6H  HRSI,  3705/
C  130
      DATA(IORBTR(I),I=521,560)
     1 /174,6H  CREW,6H  LRSI, 20720,
     2  175,6H  CREW,6H  LRSI, 10150,
     3  177,6H  CREW,6H  LRSI, 10150,
     4  180,6H  CREW,6HWINDOW,  1424,
     5  181,6H  CREW,6HWINDOW,  1424,
     6  182,6H  CREW,6HWINDOW,  1424,
     7  183,6H  CREW,6HWINDOW,  1424,
     8  184,6H  CREW,6HWINDOW,  1424,
     9  185,6H  CREW,6HWINDOW,  1424,
     *  190,6H  CREW,6H  LRSI, 10250/
C  140
      DATA(IORBTR(I),I=561,600)
     1 /380,6H  TAIL,6H  LRSI, 16920,
```

Figure B-1 Continued

```
     2  381,6H  TAIL,6H  LRSI, 16920,                  BLCKA  233
     3  382,6H  TAIL,6H  LRSI,  8833,                  BLCKA  234
     4  383,6H  TAIL,6H  LRSI,  8833,                  BLCKA  235
     5  384,6H  TAIL,6H  LRSI, 13940,                  BLCKA  236
     6  385,6H  TAIL,6H  LRSI, 13940,                  BLCKA  237
     7  386,6H  TAIL,6H  LRSI,  6116,                  BLCKA  238
     8  387,6H  TAIL,6H  LRSI,  6116,                  BLCKA  239
     9  388,6H  TAIL,6H  LRSI,  2744,                  BLCKA  240
     *  389,6H  TAIL,6H  LRSI,  2744/                  BLCKA  241
C  150                                                 BLCKA  242
      DATA(IORBTR(I),I=601,640)                        BLCKA  243
     1 /390,6H  TAIL,6H  LRSI,  1160,                  BLCKA  244
     2  391,6H  TAIL,6H  LRSI,  1160,                  BLCKA  245
     3  392,6H  TAIL,6H  LRSI,  3081,                  BLCKA  246
     4  393,6H  TAIL,6H  LRSI,  3981,                  BLCKA  247
     5  399,6H  TAIL,6H  HRSI,  3823,                  BLCKA  248
     6    1,6H   BAY,6H LINER, 26620,                  BLCKA  249
     7    2,6H   BAY,6H LINER, 26620,                  BLCKA  250
     8    3,6H   BAY,6H LINER, 26620,                  BLCKA  251
     9    4,6H   BAY,6H LINER, 26620,                  BLCKA  252
     *    5,6H   BAY,6H LINER, 26620/                  BLCKA  253
C  160                                                 BLCKA  254
      DATA(IORBTR(I),I=641,680)                        BLCKA  255
     1   /6,6H   BAY,6H LINER, 26620,                  BLCKA  256
     2    7,6H   BAY,6H LINER, 26620,                  BLCKA  257
     3    8,6H   BAY,6H LINER, 26620,                  BLCKA  258
     4   11,6H   BAY,6HBLKHED, 32690,                  BLCKA  259
     5   13,6H   BAY,6HBLKHED, 32690,                  BLCKA  260
     6  440,6H   BAY,6H LINER,  3444,                  BLCKA  261
     7  441,6H   BAY,6H LINER,  3444,                  BLCKA  262
     8  442,6H   BAY,6H LINER,  3444,                  BLCKA  263
     9  443,6H   BAY,6H LINER,  3444,                  BLCKA  264
     *  445,6H   BAY,6H LINER,  3444/                  BLCKA  265
C  170                                                 BLCKA  266
      DATA(IORBTR(I),I=681,720)                        BLCKA  267
     1 /446,6H   BAY,6H LINER,  3444,                  BLCKA  268
     2  447,6H   BAY,6H LINER,  3444,                  BLCKA  269
     3  448,6H   BAY,6H LINER,  3444,                  BLCKA  270
     4  570,6HFILTER,6H  FILI,   207,                  BLCKA  271
     5  571,6HFILTER,6H  FILI,   207,                  BLCKA  272
     6  572,6HFILTER,6H  FILI,   207,                  BLCKA  273
     7  573,6HFILTER,6H  FILI,   207,                  BLCKA  274
     8  580,6HFILTER,6H  FILI,   207,                  BLCKA  275
     9  581,6HFILTER,6H  FILI,   207,                  BLCKA  276
     *  582,6HFILTER,6H  FILI,   207/                  BLCKA  277
C  180                                                 BLCKA  278
      DATA(IORBTR(I),I=721,760)                        BLCKA  279
     1 /583,6HFILTER,6H  FILI,   207,                  BLCKA  280
     2  575,6HFILTER,6H  FILO,   144,                  BLCKA  281
     3  576,6HFILTER,6H  FILO,   144,                  BLCKA  282
     4  577,6HFILTER,6H  FILO,   144,                  BLCKA  283
     5  578,6HFILTER,6H  FILO,   144,                  BLCKA  284
     6  585,6HFILTER,6H  FILO,   144,                  BLCKA  285
     7  586,6HFILTER,6H  FILO,   144,                  BLCKA  286
     8  587,6HFILTER,6H  FILO,   144,                  BLCKA  287
     9  588,6HFILTER,6H  FILO,   144,                  BLCKA  288
     *   13,6H  BAYL,6HCRACKS, 32690/                  BLCKA  289
```

Figure B-1 Continued

```
C
C     ***************************************
C         * * MASTER ARRAY FOR ENGINES * *
C
C
C     FORWARD RCS ENGINES
      DATA(IPTS(I),I=1,84)
     1 /7112,6HFLF -X,6H   RCS,  332,   -14,   389,
     2  7122,6HFCF -X,6H   RCS,  332,     0,   391,
     3  7132,6HFRF -X,6H   RCS,  332,    14,   389,
     4  7123,6HFLS +Y,6H   RCS,  360,   -47,   368,
     5  7113,6HFLS +Y,6H   RCS,  360,   -47,   354,
     6  7115,6HFLU +Z,6H   RCS,  350,   -13,   395,
     7  7125,6HFCU +Z,6H   RCS,  350,     0,   395,
     8  7135,6HFRU +Z,6H   RCS,  350,    13,   395,
     9  7116,6HFLD -Z,6H   RCS,  333,   -41,   381,
     *  7126,6HFLD -Z,6H   RCS,  347,   -45,   386,
     1  7144,6HFRS -Y,6H   RCS,  362,    47,   368,
     2  7134,6HFRS -Y,6H   RCS,  362,    47,   354,
     3  7136,6HFRD -Z,6H   RCS,  333,    41,   381,
     4  7146,6HFRD -Z,6H   RCS,  347,    45,   386/
C     AFT RCS ENGINES LEFT SIDE OF ORBITER
      DATA(IPTS(I),I=85,156)
     5 /7211,6HALA +X,6H   RCS, 1557,  -119,   473,
     6  7231,6HALA +X,6H   RCS, 1557,  -132,   473,
     7  7243,6HALS +Y,6H   RCS, 1516,  -123,   459,
     8  7223,6HALS +Y,6H   RCS, 1529,  -123,   459,
     9  7233,6HALS +Y,6H   RCS, 1542,  -122,   459,
     *  7213,6HALS +Y,6H   RCS, 1555,  -122,   459,
     1  7245,6HALU +Z,6H   RCS, 1516,  -132,   481,
     2  7225,6HALU +Z,6H   RCS, 1529,  -132,   481,
     3  7215,6HALU +Z,6H   RCS, 1542,  -132,   481,
     4  7246,6HALD -Z,6H   RCS, 1516,  -112,   437,
     5  7226,6HALD -Z,6H   RCS, 1529,  -111,   440,
     6  7236,6HALD -Z,6H   RCS, 1542,  -110,   443/
C     AFT RCS ENGINES RIGHT SIDE OF ORBITER
      DATA(IPTS(I),I=157,228)
     7 /7311,6HARA +X,6H   RCS, 1557,   119,   473,
     8  7331,6HARA +X,6H   RCS, 1557,   132,   473,
     9  7344,6HARS -Y,6H   RCS, 1516,   123,   459,
     *  7324,6HARS -Y,6H   RCS, 1529,   123,   459,
     1  7334,6HARS -Y,6H   RCS, 1542,   123,   459,
     2  7314,6HARS -Y,6H   RCS, 1555,   123,   459,
     3  7345,6HARU +Z,6H   RCS, 1516,   132,   481,
     4  7325,6HARU +Z,6H   RCS, 1529,   132,   481,
     5  7315,6HARU +Z,6H   RCS, 1542,   132,   481,
     6  7346,6HARD -Z,6H   RCS, 1516,   112,   437,
     7  7326,6HARD -Z,6H   RCS, 1529,   111,   440,
     8  7336,6HARD -Z,6H   RCS, 1542,   110,   443/
C     RCS VERNIER ENGINES
      DATA(IPTS(I),I=229,264)
     9 /8116,6HFLD -Z,6H   VCS,  324,   -46,   374,
     *  8136,6HFRD -Z,6H   VCS,  324,    46,   374,
     1  8257,6HALD -Z,6H   VCS, 1565,  -144,   459,
     2  8258,6HALS +Y,6H   VCS, 1565,  -118,   457,
     3  8357,6HARD -Z,6H   VCS, 1565,   144,   459,
     4  8358,6HARS +Y,6H   VCS, 1565,  -118,   457/
```

C-2


```
C  FLASH EVAPORATER
      DATA(IPTS(I),I=265,276)
     5 /6877,6HARS +Y,6H EVAP1, 1506,   127,   305,
     6  6879,6HALS -Y,6H EVAP1, 1506,  -127,   305/
C  OMS ENGINES
      DATA(IPTS(I),I=277,288)
     7 /9000,6HARA +X,6H   OMS, 1557,   127,   473,
     8  9002,6HALA +X,6H   OMS, 1557,  -127,   347/
C
C+++++++++++++++++++++++++++++++++++++++++++++++++++
      IF(.NOT.(ENG .OR.EVAP)) GO TO 21
      KK=0
      DO 20 K=1,300,6
      KK=KK+1
      CIDENT(KK)= IPTS(K)
      CLOC(KK)  = IPTS(K+1)
      CTYPE(KK) = IPTS(K+2)
      CXLOC(KK) = IPTS(K+3)
      CYLOC(KK) = IPTS(K+4)
      CZLOC(KK) = IPTS(K+5)
      PNTSC(KK) = IPTS(K)
   20 CONTINUE
      KTOTAL = 48
   21 CONTINUE
C
      NDATAO=4*NSURFO
      II=0
      DO 40 I=1,NDATAO,4
      II=II+1
      IDENT(II)=IORBTR(I)
      SECT(II) =IORBTR(I+1)
      MATRL(II)=IORBTR(I+2)
      AREA(II) =IORBTR(I+3)
      IF(MATRL(II).NE.6HCRACKS ) GO TO 29
      IF(LEAK) GO TO 29
      II=II-1
      GO TO 35
   29 IF( SECT(II).NE.6H   BAY .AND.SECT(II).NE.6H  BAYL) GO TO 30
      IF(LMOP.OR.SMTP.OR.FIVP ) II=II-1
      GO TO 35
   30 IF(.NOT.(ED.OR.OUT.OR.REFLCT)) II=II-1
   35 CONTINUE
   40 CONTINUE
C
      IF(II.GT.300) CALL ERRORA(15,0)
      JTOTAL = II
      IF (DBUGA) WRITE(8,6000) JTOTAL
 6000 FORMAT("   WRITE(8,6000) JTOTAL  ",I10)
C
C  JTOTAL IS USED TO INDICATE THE MAXIMUM NUMBER OF PRESET SURFACES THAT
C  WILL BE EXAMINED DURING THE ANALYSIS.  THE USER CAN TURN OFF ANY
C  NUMBER THRU NAMELIST MPDB.
C
C  INSERT IDENT INTO SURFSC AND SSURF AS PART OF THE INITIALIZATION
C
      IF(.NOT.(ED.OR.OUT.OR.LEAK.OR.REFLCT)) RETURN
      DO 110 I=1,JTOTAL
```

Figure B-1 Continued

```
 400            SSURFS(I) = IDENT(I)                                    BLCKA    404
                SURFSC(I)=IDENT(I)                                      BLCKA    405
            110 CONTINUE                                                BLCKA    406
                RETURN                                                  BLCKA    407
                END                                                     BLCKA    408
```

SYMBOLIC REFERENCE MAP (R=2)

```
ENTRY POINTS     DEF LINE     REFERENCES
    1  BLCKA          1        398       403

VARIABLES      SN  TYPE          RELOCATION
 1604  AREA        REAL       ARRAY   SURF        REFS       48   DEFINED     375
    0  CIDENT      INTEGER    ARRAY   PTSRCE      REFS       44       51   DEFINED     357
   62  CLOC        INTEGER    ARRAY   PTSRCE      REFS       44       51   DEFINED     358
  144  CTYPE       INTEGER    ARRAY   PTSRCE      REFS       44       51   DEFINED     359
  226  CXLOC       INTEGER    ARRAY   PTSRCE      REFS       44       51   DEFINED     360
  310  CYLOC       INTEGER    ARRAY   PTSRCE      REFS       44       51   DEFINED     361
  372  CZLOC       INTEGER    ARRAY   PTSRCE      REFS       44       51   DEFINED     362
    1  DBUGA       LOGICAL            CNTRL       REFS       38       49       389
    2  DBUGB       REAL               CNTRL       REFS       38
    3  DBUGC       REAL               CNTRL       REFS       38
    4  DBUGD       REAL               CNTRL       REFS       38
    0  DEPSIT      REAL               CNTRL       REFS       38
    5  ED          LOGICAL            CNTRL       REFS       38       49       383       398
    6  ENG         LOGICAL            CNTRL       REFS       38       49       353
    7  EVAP        LOGICAL            CNTRL       REFS       38       49       353
   10  FIVP        LOGICAL            CNTRL       REFS       38       49       381
  137  GO          REAL               CNTRL       REFS       38
  117  I           INTEGER                        REFS      372      373       374       375     2*400     2*401
                                               DEFINED      370      399
    0  IDENT       INTEGER    ARRAY   SURF        REFS       48      400       401   DEFINED       372
  116  II          INTEGER                        REFS      371      372       373       374       375       376       378
                                                 2*380      381      383       387       388   DEFINED       369       371
                                                   378      381      383
  120  IORBTR      INTEGER    ARRAY               REFS       50      372       373       374       375
                                               DEFINED       59       71        83        95       107       119       131
                                                   143      155      167       179       191       203       215       227
                                                   239      251      263       275
 2070  IPTS        INTEGER    ARRAY               REFS       50      357       358       359       360       361       362
                                                   363  DEFINED      292       308       322       336       344       348
    1  JKEEP       INTEGER            SEGA        REFS       46
    0  JTOTAL      INTEGER            SEGA        REFS       46      389       399   DEFINED       388
  114  K           INTEGER                        REFS      357      358       359       360       361       362       363
                                               DEFINED      355
    2  KINDS       INTEGER            SEGA        REFS       46
  113  KK          INTEGER                        REFS      356      357       358       359       360       361       362
                                                   363  DEFINED      354       356
    3  KTOTAL      INTEGER            SEGA        REFS       46  DEFINED       365
   11  LEAK        LOGICAL            CNTRL       REFS       38       49       377       398
   12  LMOP        LOGICAL            CNTRL       REFS       38       49       381
 1130  MATRL       INTEGER    ARRAY   SURF        REFS       48      376   DEFINED       374
   13  MAXTMP      INTEGER            CNTRL       REFS       38
```

Figure B-1 Concluded

```
     7                       4*0.0/
      DATA(TAW(1,M),M=1,10)/2*4100.,8*18./
C
C     ***  TEFLON  ***
      DATA(RTE(2,M),M=1,10)
     1                      /5.00E-10,
     2                       0.0,
     3                       2.10E-09,
     4                       1.31E-09,
     5                       1.06E-09,
     6                       5.00E-10,
     7                       4*0.0/
      DATA(TAW(2,M),M=1,10)/2*4100.,8*18./
C
C     ***  NOMEX  ***
      DATA(RTE(3,M),M=1,10)
     1                      /1.24E-09,
     2                       0.0,
     3                       5.21E-09,
     4                       3.25E-09,
     5                       2.62E-09,
     6                       1.24E-09,
     7                       4*0.0/
      DATA(TAW(3,M),M=1,10)/2*4100.,8*18./
C
C     ***  LRSI  ***
      DATA(RTE(4,M),M=1,10)
     1                      /5.10E-10,
     2                       0.0,
     3                       2.14E-09,
     4                       1.34E-09,
     5                       1.08E-09,
     6                       5.10E-10,
     7                       4*0.0/
      DATA(TAW(4,M),M=1,10)/2*4100.,8*18./
C
C     ***  HRSI  ***
      DATA(RTE(5,M),M=1,10)
     1                      /5.20E-10,
     2                       0.0,
     3                       2.18E-09,
     4                       1.38E-09,
     5                       1.10E-09,
     6                       5.20E-10,
     7                       4*0.0/
      DATA(TAW(5,M),M=1,10)/2*4100.,8*18./
C
C     ***  RCC  ***
      DATA(RTE(6,M),M=1,10)
     1                      /1.00E-12,
     2                       0.0,
     3                       4.20E-12,
     4                       2.62E-12,
     5                       2.12E-12,
     6                       1.00E-12,
     7                       4*0.0/
      DATA(TAW(6,M),M=1,10)/2*4100.,8*18./
```

Figure B-2 continued

```
      C
      C      ***  BULKHEAD  ***
             DATA(RTE(7,M),M=1,10)
            1                      /1.00E-09,
            2                        0.0,
            3                        4.20E-09,
            4                        2.62E-09,
            5                        2.12E-09,
            6                        1.00E-09,
            7                            4*0.0/
             DATA(TAW(7,M),M=1,10)/2*4100.,8*18./
      C
      C      ***  WINDOW  ***
             DATA(RTE(8,M),M=1,10)
            1                      /0.0,
            2                        0.0,
            3                        0.0,
            4                        0.0,
            5                        0.0,
            6                        0.0,
            7                     4*0.0/
             DATA(TAW(8,M),M=1,10)/10*4100./
      C
      C      ***  MTCS - MULTI-LAYER INSULATION  ***
             DATA(RTE(9,M),M=1,10)
            1                      /0.0,
            2                        1.29E-09,
            3                        1.89E-06,
            4                        1.20E-06,
            5                        9.77E-07,
            6                        4.60E-07,
            7                            4*0.0/
             DATA(TAW(9,M),M=1,10)/2*4100.,8*3./
      C
      C      ***  PTCS  -  CHEMGLAZE  ***
             DATA(RTE(10,M),M=1,10)
            1                      /3.99E-11,
            2                        0.0,
            3                        4.41E-09,
            4                        2.75E-09,
            5                        2.23E-09,
            6                        1.05E-09,
            7                            4*0.0/
             DATA(TAW(10,M),M=1,10)/2*4100.,8*10./
      C
      C
      C      ***  CABIN ATMOSPHERE LEAKS (CRACKS) ***
      C      AREA = 3.27E4 SQ INCHES
             DATA(RTE(11,M),M=1,10)
            1                      /0.0,
            2                        0.0,
            3                        8.725E-10,
            4                        6.540E-08,
            5                        8.725E-10,
            6                        2.007E-08,
            7                            4*0.0/
             DATA(TAW(11,M),M=1,10)/10*0.0/
```

Figure B-2 continued

```
C
C     ***  LMOP LEAKAGE (LEAKL)***
C     AREA = 1.937E5 SQ INCHES
      DATA(RTE(12,M),M=1,10)
     1                     /0.0,
     2                      0.0,
     3                      2.50E-10,
     4                      1.88E-08,
     5                      2.50E-10,
     6                      5.75E-09,
     7                          4*0.0/
      DATA(TAW(12,M),M=1,10)/10*0.0/
C     ***  SMTP LEAKAGE (LEAKS)***
C     AREA = 1.215E5 SQ INCHES
      DATA(RTE(13,M),M=1,10)
     1                     /0.0,
     2                      0.0,
     3                      3.99E-10,
     4                      2.99E-08,
     5                      3.99E-10,
     6                      9.18E-09,
     7                          4*0.0/
      DATA(TAW(13,M),M=1,10)/10*0.0/
C
C     ***  PAYLOAD BAY LINER INSIDE VENTS (FILI)  ***
      DATA(RTE(14,M),M=1,10)
     1                     /0.0,
     2                      0.0,
     3                      1.36E-8,
     4                      1.02E-6,
     5                      1.36E-8,
     6                      3.43E-7,
     7                          4*0.0/
      DATA(TAW(14,M),M=1,10)/10*0.0/
C
C     ***  PAYLOAD BAY LINER OVERBOARD VENTS (FILO)  ***
      DATA(RTE(15,M),M=1,10)
     1                     /0.0,
     2                      0.0,
     3                      3.55E-09,
     4                      2.67E-07,
     5                      3.55E-09,
     6                      8.15E-08,
     7                          4*0.0/
      DATA(TAW(15,M),M=1,10)/10*0.0/
C
C THE FOLLOWING IS USED TO PLACATE THE CDC LOADER
C
      DO 10 M=1,10
      DO 5 K=1,15
      RATE(K,M) = RTE(K,M)
    5 TAU(K,M)  = TAW(K,M)
   10 CONTINUE
C
C *************************
C     * * MATERIALS  LIST * *
      KINDS=15
```

Figure B-2 continued

```
      DATA(KKIND(K),K=1,15)
     1    /6H LINER,
     2     6HTEFLON,
     3     6H NOMEX,
     4     6H  LRSI,
     5     6H  HRSI,
     6     6H   RCC,
     7     6HBLKHED,
     8     6HWINDOW,
     9     6H  MTCS,
     *     6H  PTCS,
     1     6HCRACKS,
     2     6H LEAKL,
     3     6H LEAKS,
     4     6H  FILI,
     5     6H  FILO/
C
      DO 20 K=1,15
   20 KIND(K)=KKIND(K)
C
C   ****************************************************************
C   * * LIST OF SPECIES,MOLECULAR WEIGHTS AND DIAMETERS(CENTIMETERS) * *
C   * * THAT WILL BE USED TO COMPUTE COLLISION CROSS SECTIONS        * *
C   * * REFERENCE HIRSCHFELDER,CURTISS AND BIRD
C   * *
      DATA(SDATA(K),K=1,30)
     1    /6H OUTG1,   100.,  7.800E-8,
     2     6H OUTG2,   100.,  7.800E-8,
     3     6H   H2O,    18.,  3.245E-8,
     4     6H    N2,    28.,  4.132E-8,
     5     6H   CO2,    44.,  4.485E-8,
     6     6H    O2,    32.,  3.853E-8,
     7     6H    CO,    28.,  4.029E-8,
     8     6H    H2,     2.,  3.331E-8,
     9     6H     H,     1.,  2.640E-8,
     *     6HMMHNO3,    46.,  4.500E-8/
C
      KK=0
      DO 30 K=1,28,3
      KK=KK+1
      SPECIE(KK) = SDATA(K)
      MOLWT(KK)  = SDATA(K+1)
   30 DIA(KK)    = SDATA(K+2)
C   *****************************
C     * * LIST OF SURFACE LOCATIONS * *
      DATA(PLCE(K),K=1,10)
     1    /6H   BAY,
     2     6H  CREW,
     3     6HFUSLAG,
     4     6H   OMS,
     5     6HRADOOR,
     6     6H  TAIL,
     7     6H  WING,
     8     6HMODULE,
     9     6H  PLT1,
     *     6H  PLT2/
      DATA(PLCE(K),K=11,20)
```

Figure B-2 continued

```
     1     /6H  PLT3,
     2      6H  PLT4,
     3      6H  PLT5,
     4      6HWINDOW,
     5      6HELEVON,
     6      6H  BAYL,
     7      6H  MODL,
     8      6H WINDL,
     9      6HFILTER,
     *      6H  NONE/
C
      DO 40 I=1,20
   40 PLACE(I)=PLCE(I)
C
C***************************************************************
C   LOAD IN THE SPECIES MASS FRACTIONS TO BE USED FOR THE
C   SHUTTLE ENGINES AND EVAPORATOR
C
      DATA(SPDATA(K),K=1,50)
C  TYPE OUT1  OUT2  H2O   N2    CO2   O2    CO    H2    H    MMH HNO3
     1 /0.0,  0.0, .290, .420, .078, .001, .184, .017, .001, .002,
     2  0.0,  0.0, .290, .420, .078, .001, .184, .017, .001, .002,
     3  0.0,  0.0, .290, .420, .078, .001, .184, .017, .001, .002,
     4  0.0,  0.0,1.000,  0.0,  0.0,  0.0,  0.0,  0.0,  0.0,  0.0,
     5  0.0,  0.0,1.000,  0.0,  0.0,  0.0,  0.0,  0.0,  0.0,  0.0/
      DO 60 K=1,5
      DO 50 L=1,10
   50 SPECMF(L,K)=SPDATA( (K-1)*10+L )
   60 CONTINUE
C
C   LOAD IN THE PLUME FUNCTION COEFICIENTS
C
      DATA(PFDATA(K),K=1,50)
C       C1     C2     C3   THETA1 C5    C6   THETA2 MFLUX VELOC  TYPE
     1 /1351.,10.00,.0126,64.0, 35.0,-.0350,180.,  0.,3.5E+5,6H   RCS,
     2   23.2, 8.65,.0137,40.0,5.810,-.0467,140.,.054,3.5E+5,6H   VCS,
     3  9332.,10.65,.0126,64.0,235.5,-.0350,180.,  0.,3.5E+5,6H   OMS,
     4   4.47, 6.00,.0176,36.8, 1.14,-.0773,148.,.002,1.0E+5,6H EVAP2,
     5  1.963, 6.00,.0106,148.,   0.,    0.,148.,  0.,1.0E+5,6H EVAP1/
C
      DATA(NPLME(K),K=1,5)
C      TYPES OF ENGINES/VENTS
     1 /  6H   RCS,
     2    6H   VCS,
     3    6H   OMS,
     4    6H EVAP2,
     5    6H EVAP1/
C
C
      DO 80 K=1,5
      DO 70 L=1,10
   70 PLUMEC(L,K) = PFDATA( (K-1) * 10 + L )
   80 CONTINUE
      DO 90 K=1,5
   90 NPLUME(K) = NPLME(K)
      RETURN
      END
```

Figure B-2 - continued

```
      SUBROUTINE MLOSSR(J)                                            MLOSSR   5
C                                                                     MLOSSR   6
C         **********************************************              MLOSSR   7
C         *                                            *              MLOSSR   8
C         *         SPECIES  MASS  LOSS  RATE          *              MLOSSR   9
C         *                                            *              MLOSSR  10
C         **********************************************              MLOSSR  11
C                                  CODED BY: M. HETRICK  2/16/77      MLOSSR  12
C OBJECTIVE:                                                          MLOSSR  13
C   THE OBJECTIVE OF THIS FUNCTION IS TO ASSIGN THE RATE AT WHICH     MLOSSR  14
C   SPECIES M IS LEAVING THE SURFACES. THERE ARE 10 SPECIES CURRENTLY MLOSSR  15
C   BEING MONITORED ALTHOUGH ONLY SIX (M=1,6) ARE LOST AS ORIGINAL    MLOSSR  16
C   MATERIAL FROM SURFACES. THE FOLLOWING TABLE LISTS MASS FRACTIONS  MLOSSR  17
C   OF THE VARIOUS SPECIES DURING CERTAIN ON-ORBIT EVENTS. MOLE       MLOSSR  18
C   FRACTION ARE GIVEN IN PARENTHESES.                                MLOSSR  19
C                                                                     MLOSSR  20
C   SPECIE,M       EARLY      OUTGAS     ENG         EVAP       LEAKAGE MLOSSR 21
C                  DESORP     PERIOD     FIRINGS     OPERATION          MLOSSR 22
C                  PERIOD                                             MLOSSR  23
C     1- OUTGAS1              1.0                                     MLOSSR  24
C     2- OUTGAS2               X                                      MLOSSR  25
C     3- H2O      .420(.570)             .290(.328)  1.0      .010(.016) MLOSSR 26
C     4- N2       .262(.229)             .420(.306)           .750(.760) MLOSSR 27
C     5- CO2      .212(.118)             .078(.036)           .010(.007) MLOSSR 28
C     6- O2       .100(.076)             .001(.001)           .230(.219) MLOSSR 29
C     7- CO                              .184(.134)                   MLOSSR  30
C     8- H2                              .017(.017)                   MLOSSR  31
C     9- ENG1(H)                         .001(.015)                   MLOSSR  32
C    10- ENG2(MMHNO3)                    .002(.001)                   MLOSSR  33
C                                                                     MLOSSR  34
C TESTING HAS SHOWN THAT THE H2O,CO2,N2,AND O2 ARE DESORBED FROM A    MLOSSR  35
C SURFACE WITHIN 10 TO 20 HOURS AFTER INSERTION INTO VACUMN(ORBIT)    MLOSSR  36
C THESE GASES ARE REABSORBED UPON RE-ENTRY SO THEIR MASS LOSS RATES   MLOSSR  37
C ARE NOT A FUNCTION OF THE AGE OF THE SURFACE. HOWEVER SPECIES THAT  MLOSSR  38
C ARE UNIQUE TO THE MANUFACTURING PROCESS SUCH AS LARGE MOLECULAR     MLOSSR  39
C WEIGHT OILS DO HAVE MASS LOSS RATES THAT ARE A FUNCTION OF LONG TERM MLOSSR 40
C SURFACE HISTORY. GENERALLY THESE OILS HAVE A LOW CONCENTRATION ON   MLOSSR  41
C THE GROUND AND THERE IS NO SIGNIFICANT REABSORPTION.                MLOSSR  42
C                                                                     MLOSSR  43
      COMMON/CMLOSS/MLR(300,10),MDOT(300)                             MLOSSR  44
      COMMON/CNTRL/DEPSIT,DBUGA, DBUGB, DBUGC, DBUGD, ED,    ENG,     MLOSSR  45
     1             EVAP,  FIVP,  LEAK,  LMOP,  MAXTMP,MCD,            MLOSSR  46
     2             MFPATH,NEWCON,NEWTNL,NEWMFP,NEWMFS,NEWMLC,NEWTCD,  MLOSSR  47
     3             MINTMP,ORBITR,OUT,   REFLCT,REPORT(50),            MLOSSR  48
     4             RFAS,  RFSS,  SMTP,  TITLE(12),    TSTART(3),      MLOSSR  49
     5             TSTOP(3),     GO,    SUNL,  SUNM,  SUNH            MLOSSR  50
      COMMON/MDF/ ATCODE, TIME(6),RFSURF(10),RECEVR(50),              MLOSSR  51
     2           BETA,PITCH,YAW,ROLL,ALT,RMAXL,                       MLOSSR  52
     3           DSMCD(25),PHIL(25),THETAL(25),XLOS(25),YLOS(25),     MLOSSR  53
     4           ZLOS(25),COSXX(10),COSXY(10),COSXZ(10),COSYX(10),    MLOSSR  54
     5           COSYY(10),COSYZ(10),COSZX(10),COSZY(10),COSZZ(10),   MLOSSR  55
     6           DPHI(10),DOMEGA(10),DTHETA(10),                      MLOSSR  56
     7           PHI1(10),PHI2(10),THETA1(10),THETA2(10),VX,VY,VZ,    MLOSSR  57
     8           X0(10),Y0(10),Z0(10),DSRTNF(25),RMAXRF               MLOSSR  58
      COMMON/SURF/IDENT(300),SECT(300),MATRL(300),AREA(300)           MLOSSR  59
      COMMON/SOURCE/SURFSC(300),PNTSC(50),ONTIME(50),SSURFS(300)      MLOSSR  60
      COMMON/TMP/ TEMPOS(300),TEMPOR(60)                              MLOSSR  61
```

Figure B-3 MLOSSR Changes

```
      COMMON/RATES1/RATE(15,10),TAU(15,10)
      COMMON/RATES2/AGEORB,   AGESLB,   KIND(15), SPECIE(10),MOLWT(10),
     1          PLACE(20),DIA(10)
      COMMON/SEGA/JTOTAL,JKEEP,KINDS,KTOTAL
      COMMON/SPEC/MOUT1,MOUT2,MED1,MED2,M1,M2
      DIMENSION T(10),TCOEF(10)
      REAL MLR
      INTEGER SSURFS,SURFSC
      LOGICAL DBUGA,ED,OUT
C
C
C
C  THE AGE OF THE ORBITER AND SPACELAB SURFACES IS SPECIFIED AS AGEORB
C  AND AGESLB.
C
      AGE = AGEORB
      IF(SURFSC(J).GT.1000)AGE=AGESLB
C
C  IN GENERAL THE TIME USED FOR LOSS OF THE LOW MOLECULAR WEIGHT GASES
C  IS THE TIME FROM LAUNCH MINUS 3 MINUTES(TIME TO REACH C.10-3 TORR)
C  WHEREAS THE TIME USED FOR THE LARGE MOLECULAR WEIGHT SPECIES(M=1&2)
C  IS FIGURED USING THE AGE OF THE SURFACE PLUS TIME ON ORBIT
C
      TIMEOO=TSTART(1)*60.+ TSTART(2) + TSTART(3)/60. - 3.
C
      IF(TIMEOO.LT.0.) CALL ERRORB(1,0)
      T(1)=TIMEOO + AGE
      T(2)=TIMEOO + AGE
      T(3)=TIMEOO
      T(4)=TIMEOO
      T(5)=TIMEOO
      T(6)=TIMEOO
      T(7)=TIMEOO
      T(8)=TIMEOO
      T(9)=TIMEOO
      T(10)=TIMEOO
C
C  THE CURRENT TEMPERATURE OF SURFACE SURFSC(J) IS TEMPOS(J)
C
      TJ = TEMPOS(J)
CL,1100,1300
C  DEFINE THE MATERIAL AND COMPUTE THE MASS LOSS RATE OF EACH SPECIES
C
C  THE SECTION OF THE CONFIGURATION IN WHICH NJ CAN BE FOUND IS SECT(J)
C  THE KIND OF SURFACE IS MATRL(J)
      DO 30 K=1,KINDS
      IF(MATRL(J).EQ. KIND(K)) GO TO 40
   30 CONTINUE
      CALL ERRORB(2,MATRL(J))
   40 CONTINUE
      IKIND=K
C
            IF(DBUGA) WRITE(8,6100)IKIND,SURFSC(J),J
      GO TO (100,200,300,400,500,600,700,800,900,1000,1100,1200,1300,
     1       1400,1500),IKIND
C
C  ***  MATERIAL IS PAYLOAD LINER  ***
```

Figure B-3 continued

```
  100 CONTINUE
      DO 101 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(1,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(1,M)*60.))
  101 CONTINUE
      RETURN
C
C  ***  MATERIAL IS TEFLON  ***
  200 CONTINUE
      DO 201 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(2,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(2,M)*60.))
  201 CONTINUE
      RETURN
C
C  ***  MATERIAL IS NOMEX  ***
  300 CONTINUE
      DO 301 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(3,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(3,M)*60.))
  301 CONTINUE
      RETURN
C
C  ***  MATERIAL IS LRSI  ***
  400 CONTINUE
      DO 401 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(4,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(4,M)*60.))
  401 CONTINUE
      RETURN
C
C  ***  MATERIAL IS HRSI  ***
  500 CONTINUE
      DO 501 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(5,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(5,M)*60.))
  501 CONTINUE
      RETURN
C
C  ***  MATERIAL IS RCC  ***
  600 CONTINUE
      DO 601 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(6,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(6,M)*60.))
  601 CONTINUE
      RETURN
C
C  ***  MATERIAL IS THE BULKHEAD  ***
  700 CONTINUE
      DO 701 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(7,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(7,M)*60.))
  701 CONTINUE
      RETURN
C
C  ***  MATERIAL IS A SURFACE THAT LEAKS CABIN ATMOSPHERE  ***
 1100 CONTINUE
```

Figure B-3 continued

```
      DO 1101 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(11,M)
 1101 CONTINUE
      RETURN
C
C  ***  MATERIAL IS MTSC  ***
  900 CONTINUE
      IF(.NOT.OUT) GO TO 903
      DO 901 M=MOUT1,MOUT2
      TCOEF(M) = (TJ-125.)/11.
      MLR(J,M)= RATE(9,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(9,M)*60.))
  901 CONTINUE
  903 IF(.NOT.ED) RETURN
      E = 7500.
      R = 1.98
      TJK =  TJ + 273.
      DO 902 M = MED1,MED2
      TCOEF(M) = (E/R)*(1./373. - 1./TJK)
      MLR(J,M)= RATE(9,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(9,M)*60.))
  902 CONTINUE
      RETURN
C
C
C  ***  MATERIAL IS PTSC  ***
 1000 CONTINUE
      IF(.NOT.OUT) GO TO 1003
      DO 1001 M=MOUT1,MOUT2
      TCOEF(M) = (TJ-125.)/20.
      MLR(J,M)= RATE(10,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(10,M)*60.))
 1001 CONTINUE
 1003 IF(.NOT.ED) RETURN
      E = 7500.
      R = 1.98
      TJK =  TJ + 273.
      DO 1002 M = MED1,MED2
      TCOEF(M) = (E/R)*(1./373. - 1./TJK)
      MLR(J,M)= RATE(10,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(10,M)*60.))
 1002 CONTINUE
      RETURN
C
C  ***  MATERIAL IS WINDOW  ***
  800 CONTINUE
      DO 801 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(8,M) * EXP(TCOEF(M)) * EXP(T(M)/(-TAU(8,M)*60.))
  801 CONTINUE
      RETURN
C
C  ***  MATERIAL IS LMDP CABIN LEAKS  ***
 1200 CONTINUE
      DO 1201 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(12,M)
 1201 CONTINUE
      RETURN
C
```

Figure B-3 continued

```
C  ***  MATERIAL IS SMTP CABIN LEAKS  ***
 1300 CONTINUE
      DO 1301 M=M1,M2
      TCOEF(M)=(TJ - 100.) / 29.
      MLR(J,M)= RATE(13,M)
 1301 CONTINUE
      RETURN
C
C  ***  MATERIAL IS FILI     ***
 1400 CONTINUE
      DO 1401 M=M1,M2
      MLR(J,M)= RATE(14,M)
 1401 CONTINUE
      RETURN
C
C  ***  MATERIAL IS FILO      ***
 1500 CONTINUE
      DO 1501 M=M1,M2
      MLR(J,M)= RATE(15,M)
 1501 CONTINUE
      RETURN
C
 6100       FORMAT("   MLOSSR(100) IKIND,SURFSC(J),J",3I10)
      END
```

Figure B-3 concluded

SYMBOLIC REFERENCE MAP (R=2)

ENTRY POINTS		DEF LINE	REFERENCES									
3	MLOSSR	1	120	128	136	144	152	160	168	176	185	193
			203	211	219	227	235	242	249			

VARIABLES		SN	TYPE	RELOCATION							
702	AGE		REAL			REFS	84	85	DEFINED	73	74
0	AGEORB		REAL		RATES2	REFS	59	73			
1	AGESLB		REAL		RATES2	REFS	59	74			
107	ALT		REAL		MDF	REFS	47				
1604	AREA		REAL	ARRAY	SURF	REFS	55				
0	ATCODE		REAL		MDF	REFS	47				
103	BETA		REAL		MDF	REFS	47				
337	COSXX		REAL	ARRAY	MDF	REFS	47				
351	COSXY		REAL	ARRAY	MDF	REFS	47				
363	COSXZ		REAL	ARRAY	MDF	REFS	47				
375	COSYX		REAL	ARRAY	MDF	REFS	47				
407	COSYY		REAL	ARRAY	MDF	REFS	47				
421	COSYZ		REAL	ARRAY	MDF	REFS	47				
433	COSZX		REAL	ARRAY	MDF	REFS	47				
445	COSZY		REAL	ARRAY	MDF	REFS	47				
457	COSZZ		REAL	ARRAY	MDF	REFS	47				
1	DBUGA		LOGICAL		CNTRL	REFS	41	66	110		
2	DBUGB		REAL		CNTRL	REFS	41				
3	DBUGC		REAL		CNTRL	REFS	41				
4	DBUGD		REAL		CNTRL	REFS	41				
0	ZEPSIT		REAL		CNTRL	REFS	41				