

# **INDEPENDENT ORBITER ASSESSMENT**

## **ANALYSIS OF THE MAIN PROPULSION SYSTEM**

**16 JANUARY 1987**



MCDONNELL DOUGLAS ASTRONAUTICS COMPANY  
HOUSTON DIVISION

SPACE TRANSPORTATION SYSTEM ENGINEERING AND OPERATIONS SUPPORT

WORKING PAPER NO. 1.0-WP-VA86001-22

INDEPENDENT ORBITER ASSESSMENT  
ANALYSIS OF THE ORBITER MAIN PROPULSION SYSTEM

16 January 1987

This Working Paper is Submitted to NASA under  
Task Order No. VA86001, Contract NAS 9-17650

PREPARED BY: W.J. McNicoll  
W.J. McNicoll  
MPS Analyst  
Independent Orbiter  
Assessment

PREPARED BY: M. McNeely  
M. McNeely  
MPS Analyst  
Independent Orbiter  
Assessment

PREPARED BY: K.A. Holden  
K.A. Holden  
MPS Analyst  
Independent Orbiter  
Assessment

APPROVED BY: A.J. Marino  
A.J. Marino  
MPS Lead  
Independent Orbiter  
Assessment

PREPARED BY: T.E. Emmons  
T.E. Emmons  
MPS Analyst  
Independent Orbiter  
Assessment

APPROVED BY: G.W. Knori  
G.W. Knori  
Technical Manager  
Independent Orbiter  
Assessment

PREPARED BY: H.J. Lowery  
H.J. Lowery  
MPS Analyst  
Independent Orbiter  
Assessment

APPROVED BY: W.F. Huning  
W.F. Huning  
Deputy Program Manager  
STSEOS





## CONTENTS

|   | Page |
|---|------|
| 1.0 EXECUTIVE SUMMARY                                       | 1    |
| 2.0 INTRODUCTION  | 4    |
| 2.1 Purpose   | 4    |
| 2.2 Scope   | 4    |
| 2.3 Analysis Approach                                       | 4    |
| 2.4 Orbiter MPS Ground Rules and Assumptions                | 5    |
| 3.0 SUBSYSTEM DESCRIPTION                                   | 6    |
| 3.1 Design and Function                                     | 6    |
| 3.1.1 Propellant Management Subsystem<br>Function           | 6    |
| 3.1.2 The PMS Components                                    | 6    |
| A. Liquid Propellant Supply and<br>Distribution Network     | 6    |
| B. Gaseous Propellant Collection<br>and Supply Network      | 14   |
| C. Valves   | 15   |
| 3.1.3 Orbiter MPS - Helium Subsystem<br>General Description | 17   |
| 3.1.4 Helium Subsystem Components                           | 17   |
| A. Supply Tank  | 17   |
| B. Valves   | 21   |
| C. Supply Tank Isolation Valves                             | 21   |
| D. Interconnect Valves                                      | 21   |
| E. Manifold Pressurization Valves                           | 22   |
| F. LH2 RTLS Pump Pressurization Valves                      | 22   |
| G. Pressure Regulators                                      | 23   |
| H. Relief Valves  | 23   |
| 3.2 Interfaces and Locations                                | 23   |
| 3.3 Hierarchy   | 23   |
| 4.0 ANALYSIS RESULTS  | 24   |
| 4.1 Liquid Oxygen (LO2)                                     | 24   |
| 4.2 Liquid Hydrogen (LH2)                                   | 25   |
| 4.3 Helium  | 25   |
| 5.0 REFERENCES  | 26   |
| APPENDIX A ACRONYMS   | A-1  |
| APPENDIX B DEFINITIONS, GROUND RULES, AND ASSUMPTIONS       | B-1  |
| B.1 Definitions   | B-2  |
| B.2 Project Level Ground Rules and Assumptions              | B-4  |
| B.3 Subsystem Specific Ground Rules and Assumptions         | B-6  |

|                                     |      |
|-------------------------------------|------|
|                                     | Page |
| APPENDIX C DETAILED ANALYSIS        | C-1  |
| APPENDIX D POTENTIAL CRITICAL ITEMS | D-1  |

#### List of Figures

|   |      |
|---|------|
|   | Page |
| Figure 1 - ORBITER MPS OVERVIEW ANALYSIS SUMMARY            | 2    |
| Figure 2A - ORBITER MPS SUBSYSTEM                           | 7    |
| 2B - ORBITER MPS LO2 OVERVIEW                               | 8    |
| 2C - ORBITER MPS LH2 SUBSYSTEM OVERVIEW                     | 9    |
| 2D - ORBITER MPS HELIUM SUBSYSTEM OVERVIEW                  | 10   |
| Figure 3 - PROPELLANT MANAGEMENT SUBSYSTEM<br>OXIDIZER FLOW | 11   |
| Figure 4 - PROPELLANT MANAGEMENT SUBSYSTEM<br>FUEL FLOW     | 12   |
| Figure 5 - HELIUM SUBSYSTEM; STORAGE AND REGULATION         | 18   |
| Figure 6A - PNEUMATIC HELIUM DISTRIBUTION                   | 19   |
| Figure 6B - PNEUMATIC HELIUM DISTRIBUTION (CONCLUDED)       | 20   |

#### List of Tables

|   |      |
|---|------|
|   | Page |
| Table I - SUMMARY OF IOA FAILURE MODES<br>AND CRITICALITIES | 24   |
| Table II - SUMMARY OF IOA POTENTIAL CRITICAL ITEMS          | 24   |

# Independent Orbiter Assessment Analysis of the Main Propulsion System

## 1.0 EXECUTIVE SUMMARY

The McDonnell Douglas Astronautics Company (MDAC) was selected in June 1986 to perform an Independent Orbiter Assessment (IOA) of the Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL). Direction was given by the STS Orbiter and GFE Projects Office to perform the hardware analysis using the instructions and ground rules defined in NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. The IOA approach features a top-down analysis of the hardware to determine failure modes, criticality, and potential critical items. To preserve independence, this analysis was accomplished without reliance upon the results contained within the NASA FMEA/CIL documentation. This report documents (Appendix C) the independent analysis results for the Orbiter Main Propulsion System (MPS) hardware.

The Orbiter MPS consists of two subsystems; the Propellant Management Subsystem (PMS) and the Helium Subsystem. The PMS is a system of manifolds, distribution lines and valves by which the liquid propellants pass from the External Tank (ET) to the Space Shuttle Main Engines (SSMEs) and gaseous propellants pass from the SSMEs to the ET. The Helium Subsystem consists of a series of helium supply tanks and their associated regulators, check valves, distribution lines, and control valves. The Helium Subsystem supplies helium that is used within the SSMEs for in-flight purges and provides pressure for actuation of SSME valves during emergency pneumatic shutdowns. The balance of the helium is used to provide pressure to operate the pneumatically actuated valves within the PMS.

The IOA analysis made use of available Orbiter MPS schematics and hardware assembly and component drawings. Each component was evaluated and analyzed for possible failure modes and effects. Criticalities were assigned based on the worst possible effect of each failure mode.

A summary of the number of possible failure modes and corresponding criticalities is given below. The presentation format is Hardware (HW) criticality first and Functional (F) criticality second.

| Summary of IOA Failure Modes By Criticality (HW/F) |     |      |     |      |      |     |       |
|--|-----|------|-----|------|------|-----|-------|
| Criticality:                                       | 1/1 | 2/1R | 2/2 | 3/1R | 3/2R | 3/3 | TOTAL |
| Number :   | 129 | 142  | 30  | 94   | 70   | 225 | 690   |

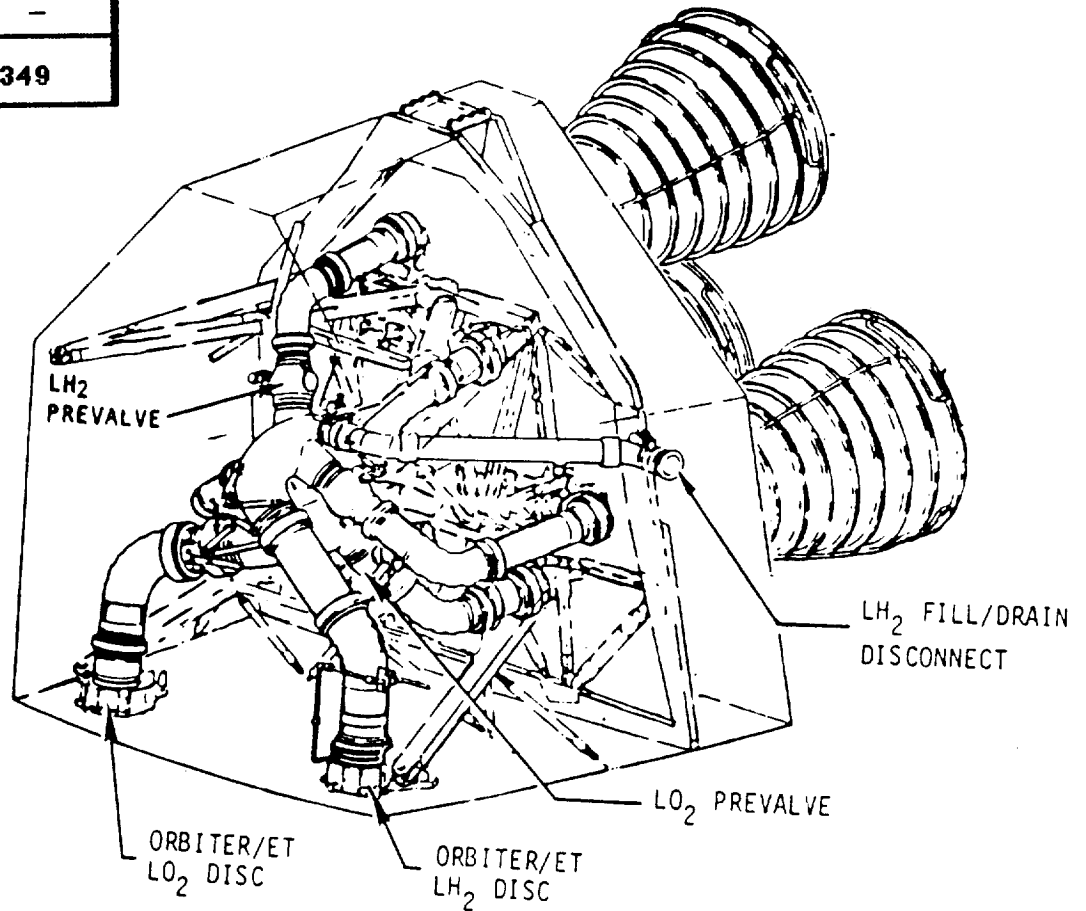
Figure 1 presents a summary of the failure criticalities for each of the MPS subsystems.

For each failure mode identified, the criticality and redundancy screens were examined to identify critical items. A summary of Potential Critical Items (PCIs) is presented as follows:

| Summary of IOA Potential Critical Items (HW/F) |     |      |     |      |      |       |
|--|-----|------|-----|------|------|-------|
| Criticality:                                   | 1/1 | 2/1R | 2/2 | 3/1R | 3/2R | TOTAL |
| Number :                                       | 129 | 142  | 30  | 25   | 23   | 349   |

Of the 690 failure modes analyzed, 349 were determined to be PCIs.

| ORBITER MPS SUMMARY |            |            |
|---------------------|------------|------------|
| CRIT                | #FM        | #PCI       |
| 1/1                 | 129        | 129        |
| 2/1R                | 142        | 142        |
| 2/2                 | 30         | 30         |
| 3/1R                | 94         | 25         |
| 3/2R                | 70         | 23         |
| 3/3                 | 225        | -          |
| <b>TOTAL</b>        | <b>690</b> | <b>349</b> |



| LO2 SYSTEM |     |      |
|------------|-----|------|
| CRIT       | #FM | #PCI |
| 1/1        | 53  | 53   |
| 2/1R       | 61  | 61   |
| 2/2        | 11  | 11   |
| 3/1R       | 56  | 14   |
| 3/2R       | 43  | 7    |
| 3/3        | 39  | -    |

| LH2 SYSTEM |     |      |
|------------|-----|------|
| CRIT       | #FM | #PCI |
| 1/1        | 64  | 64   |
| 2/1R       | 30  | 30   |
| 2/2        | -   | -    |
| 3/1R       | 25  | 11   |
| 3/2R       | -   | -    |
| 3/3        | 64  | -    |

| HELIUM SYSTEM |     |      |
|---------------|-----|------|
| CRIT          | #FM | #PCI |
| 1/1           | 12  | 12   |
| 2/1R          | 51  | 51   |
| 2/2           | 19  | 19   |
| 3/1R          | 13  | -    |
| 3/2R          | 27  | 16   |
| 3/3           | 122 | -    |

Figure 1 - ORBITER MPS OVERVIEW ANALYSIS SUMMARY

## 2.0 INTRODUCTION

### 2.1 Purpose

The 51-L Challenger accident prompted the NASA to readdress safety policies, concepts, and rationale being used in the National Space Transportation System (NSTS). The NSTS Office has undertaken the task of reevaluating the FMEA/CIL for the Space Shuttle design. The MDAC is providing an independent assessment of the Orbiter FMEA/CIL for completeness and technical accuracy.

### 2.2 Scope

The scope of the independent FMEA/CIL assessment activity encompasses those Shuttle Orbiter subsystems and GFE hardware identified in the Space Shuttle Independent FMEA/CIL Assessment Contractor Statement of Work. Each subsystem analysis addresses hardware, functions, internal and external interfaces, and operational requirements for all mission phases.

### 2.3 Analysis Approach

The independent analysis approach is a top-down analysis utilizing as-available drawings to break down the respective subsystem into components and low-level hardware items. Each hardware item is evaluated for failure mode, effects, and criticality. These data are documented in the respective subsystem analysis report, and are used to assess the NASA and Prime Contractor FMEA/CIL reevaluation results. The IOA analysis approach is summarized in the following Steps 1.0 through 3.0. Step 4.0 summarizes the assessment of the NASA and Prime Contractor FMEAs/CILs that is performed and documented at a later date.

#### Step 1.0 Subsystem familiarization

- 1.1 Define subsystem functions
- 1.2 Define subsystem components
- 1.3 Define subsystem specific ground rules and assumptions

#### Step 2.0 Define subsystem analysis diagram

- 2.1 Define subsystem
- 2.2 Define major assemblies
- 2.3 Develop detailed subsystem representations

#### Step 3.0 Failure events definition

- 3.1 Construct matrix of failure modes
- 3.2 Document IOA analysis results

Step 4.0 Compare IOA analysis data to NASA FMEA/CIL

4.1 Resolve differences

4.2 Review in-house

4.3 Document assessment issues

4.4 Forward findings to Project Manager

## 2.4 Orbiter MPS Ground Rules and Assumptions

The Orbiter MPS ground rules and assumptions used in the IOA are defined in Appendix B.

### 3.0 SUBSYSTEM DESCRIPTION

#### 3.1 Design and Function

The Orbiter Main Propulsion System is composed of the Propellant Management Subsystem (PMS) consisting of the LO2 and LH2 subsystems and the Helium Subsystem (Figures 2A thru 2D). The PMS is a system of manifolds, distribution lines, and valves by which the liquid propellants pass from the ET to the SSMEs. Some of the propellants are vaporized in the engine and returned to the ET to maintain ullage pressure. The Helium Subsystem consists of a series of helium supply tanks and their associated regulators, check valves, distribution lines, and control valves. The Helium Subsystem supplies helium that is used within the SSMEs for in-flight purges and provides pressure for actuating SSME valves during emergency pneumatic shutdowns. The balance of the helium is used to provide pressure to actuate all the pneumatically operated valves within the PMS.

##### 3.1.1 Propellant Management Subsystem Function

During engine burn, propellants under tank pressure flow from the ET to the Orbiter through two umbilicals; one for LO2 and the other for LH2 (Figures 3 and 4, respectively).

The PMS also provides a path which allows gases tapped from the three engines to flow back to the ET, through two gas umbilicals, to maintain pressures in the fuel and oxidizer tanks.

The PMS also functions during phases other than engine burn. During prelaunch, the PMS is used to control the loading of propellants in the ET. During orbit, PMS controls propellant dump, vacuum inerting, and system repressurization (for entry).

##### 3.1.2 The PMS Components

The PMS contains the following major components (Figures 3 and 4).

- A. Liquid Propellant Supply and Distribution Network. The network is composed of all the liquid propellant lines used to load propellants during prelaunch, feed propellants to the SSMEs during engine burn, and dump residual propellants after ET separation. Specifically, the network consists of:

1. Propellant Feedline Manifolds - There are two 17-inch diameter manifolds in the Orbiter, one for LO2 and one for LH2. Both of the manifolds have a feedline disconnect valve at one end and two fill and drain valves (one inboard, one outboard) connected in series at the other end. The feedline manifolds connect to the ET liquid propellant



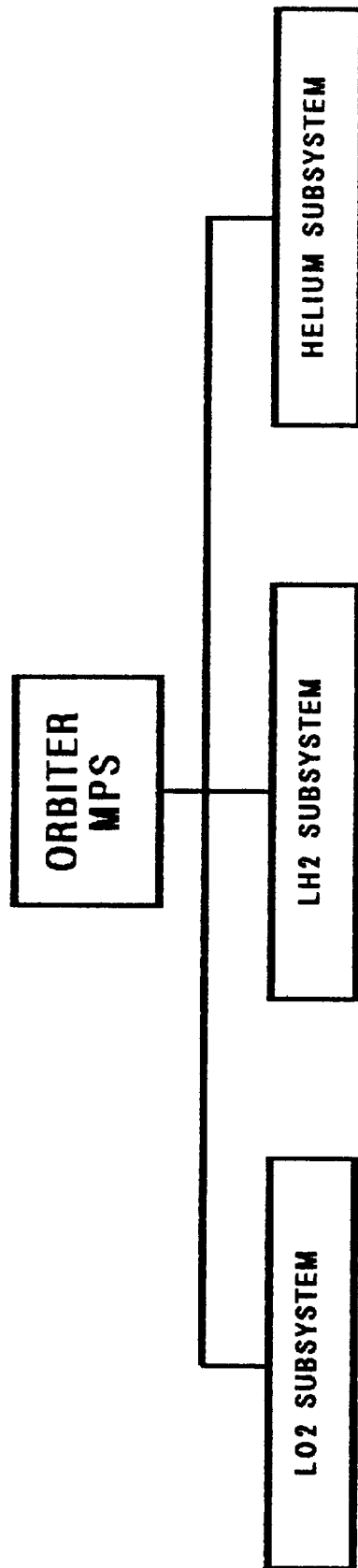


Figure 2A - ORBITER MPS SUBSYSTEMS

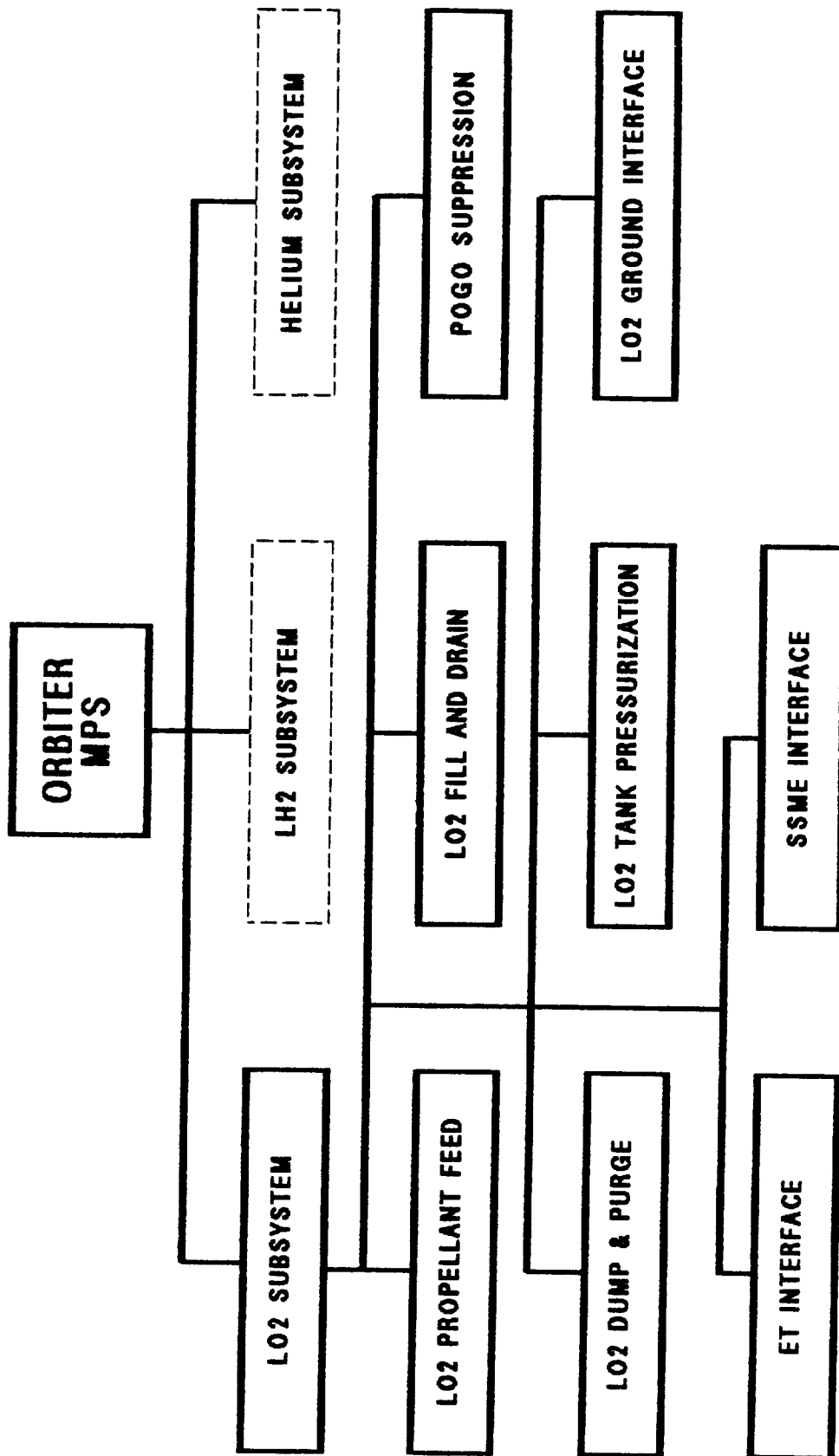


Figure 2B - ORBITER MPS L02 SUBSYSTEM OVERVIEW

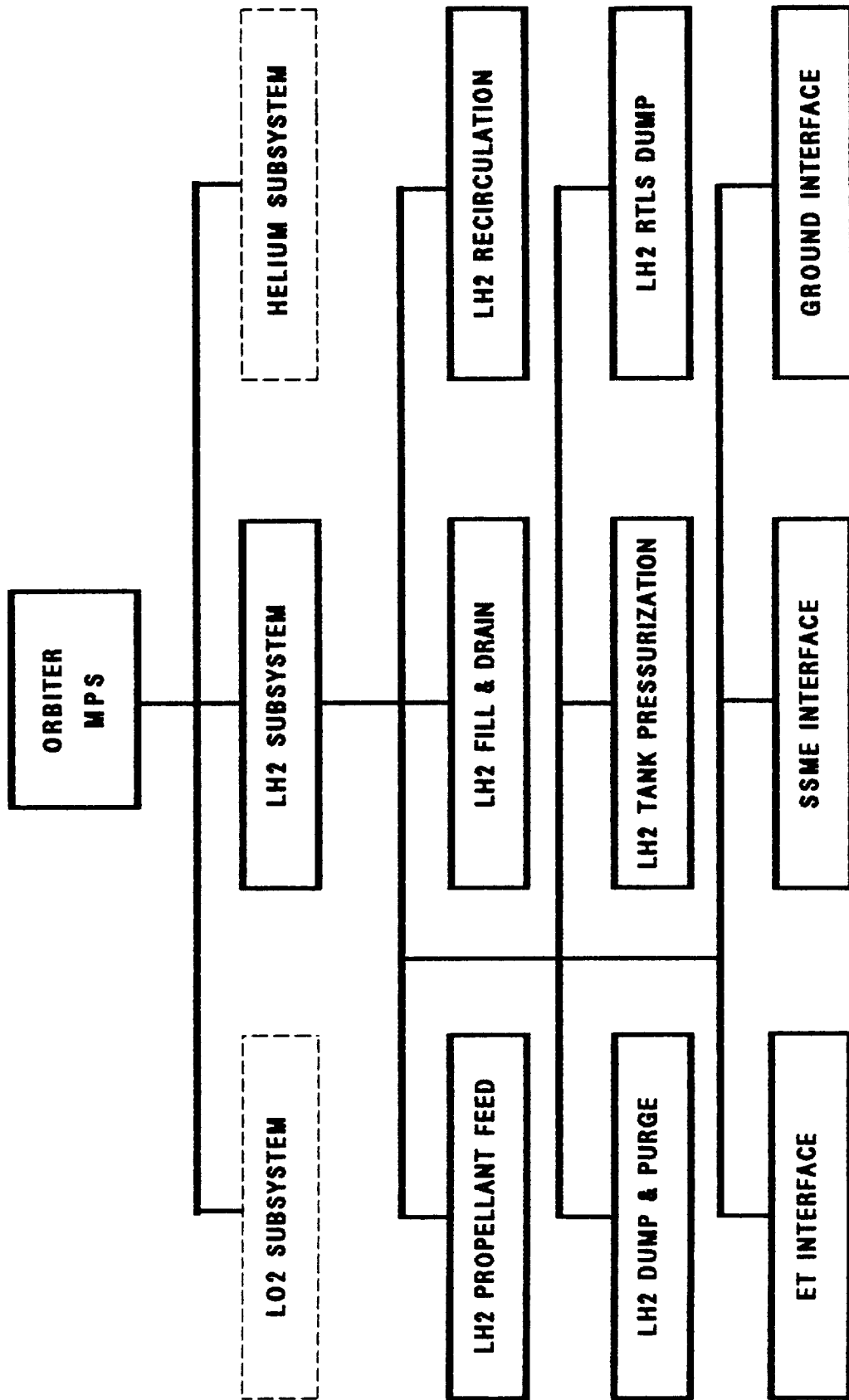


Figure 2C - ORBITER MPS LH2 SUBSYSTEM OVERVIEW

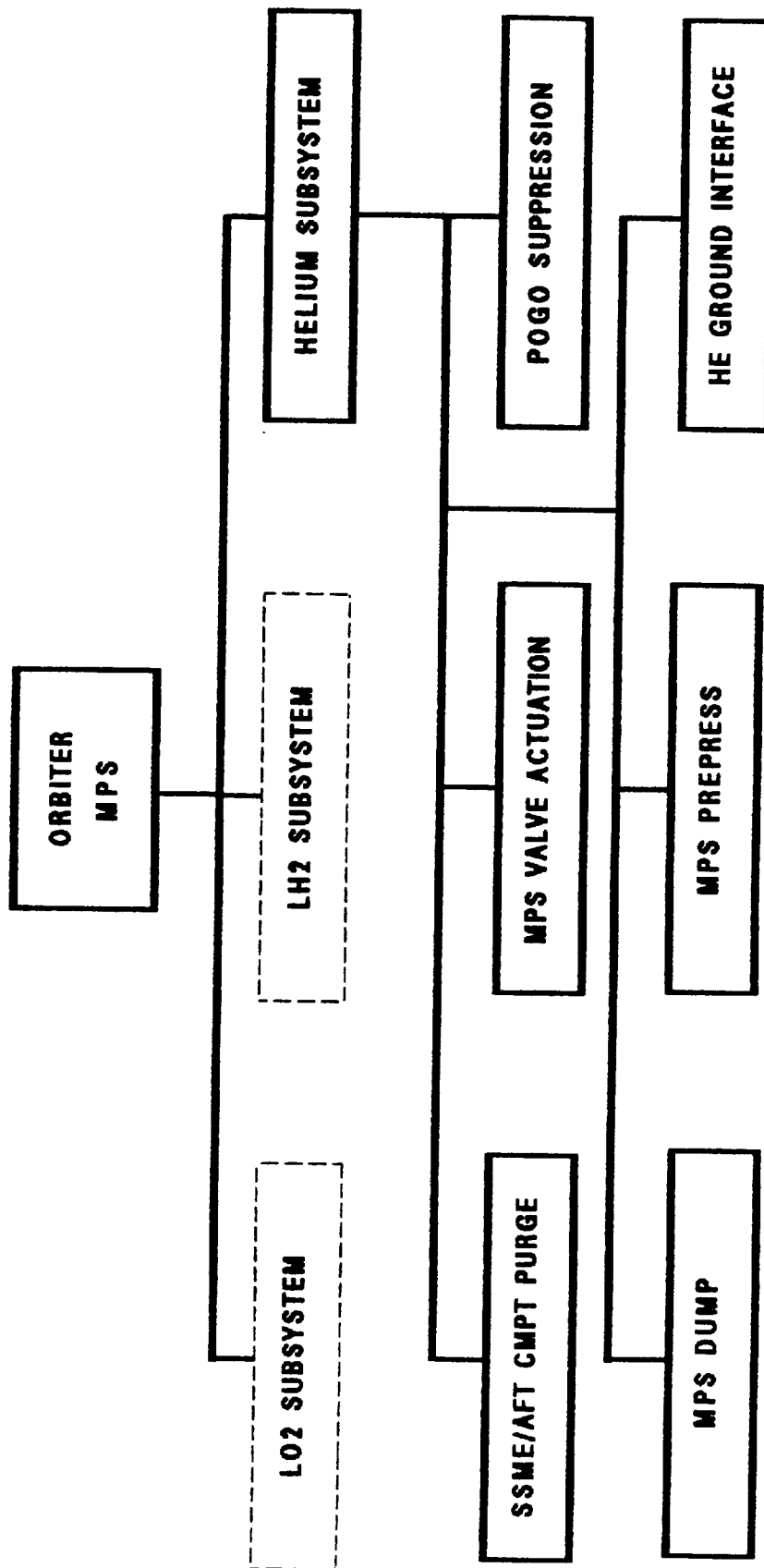


Figure 2D - ORBITER MPS HELIUM SUBSYSTEM OVERVIEW

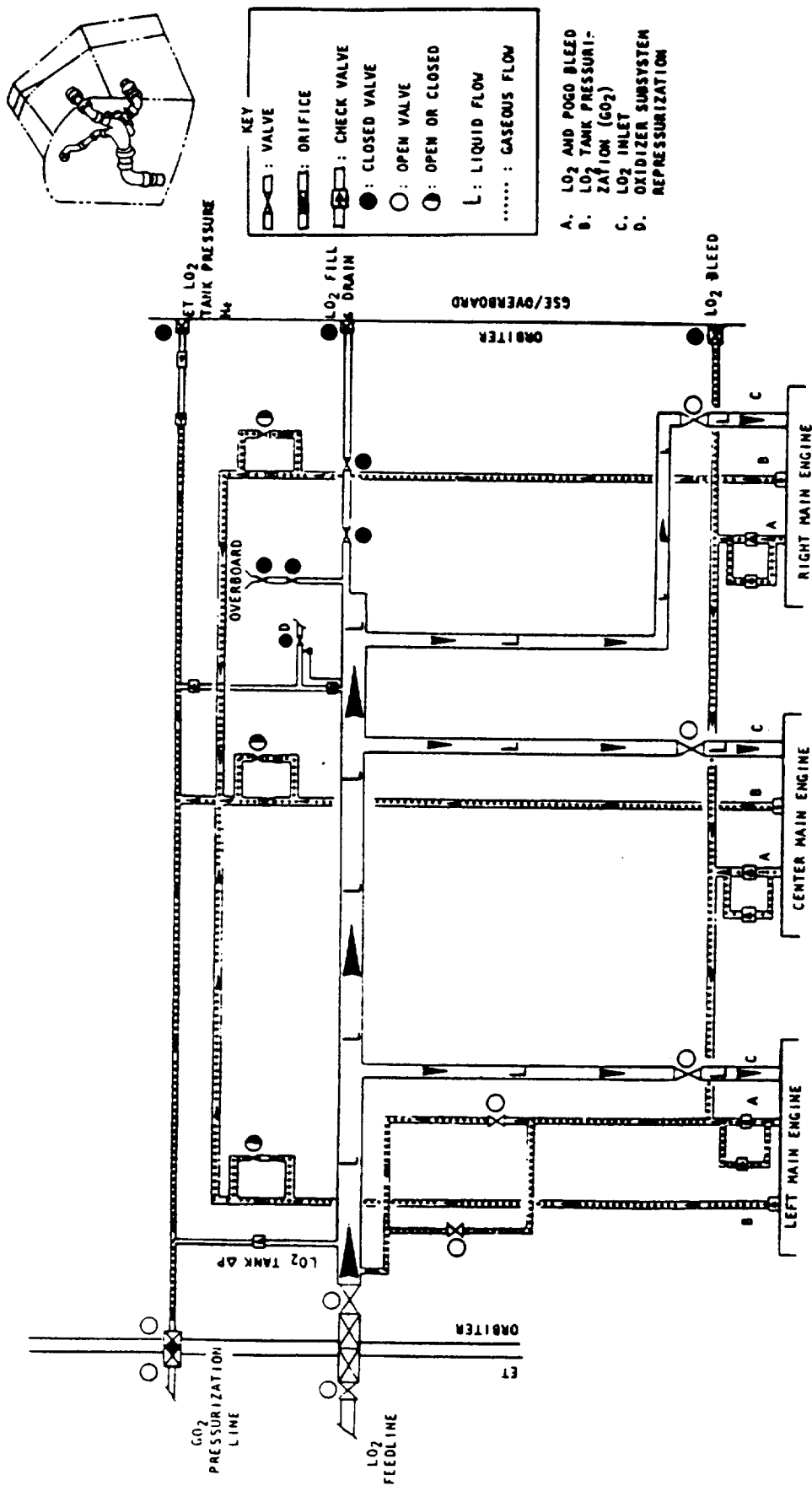


Figure 3 - PROPELLANT MANAGEMENT SUBSYSTEM OXIDIZER FLOW

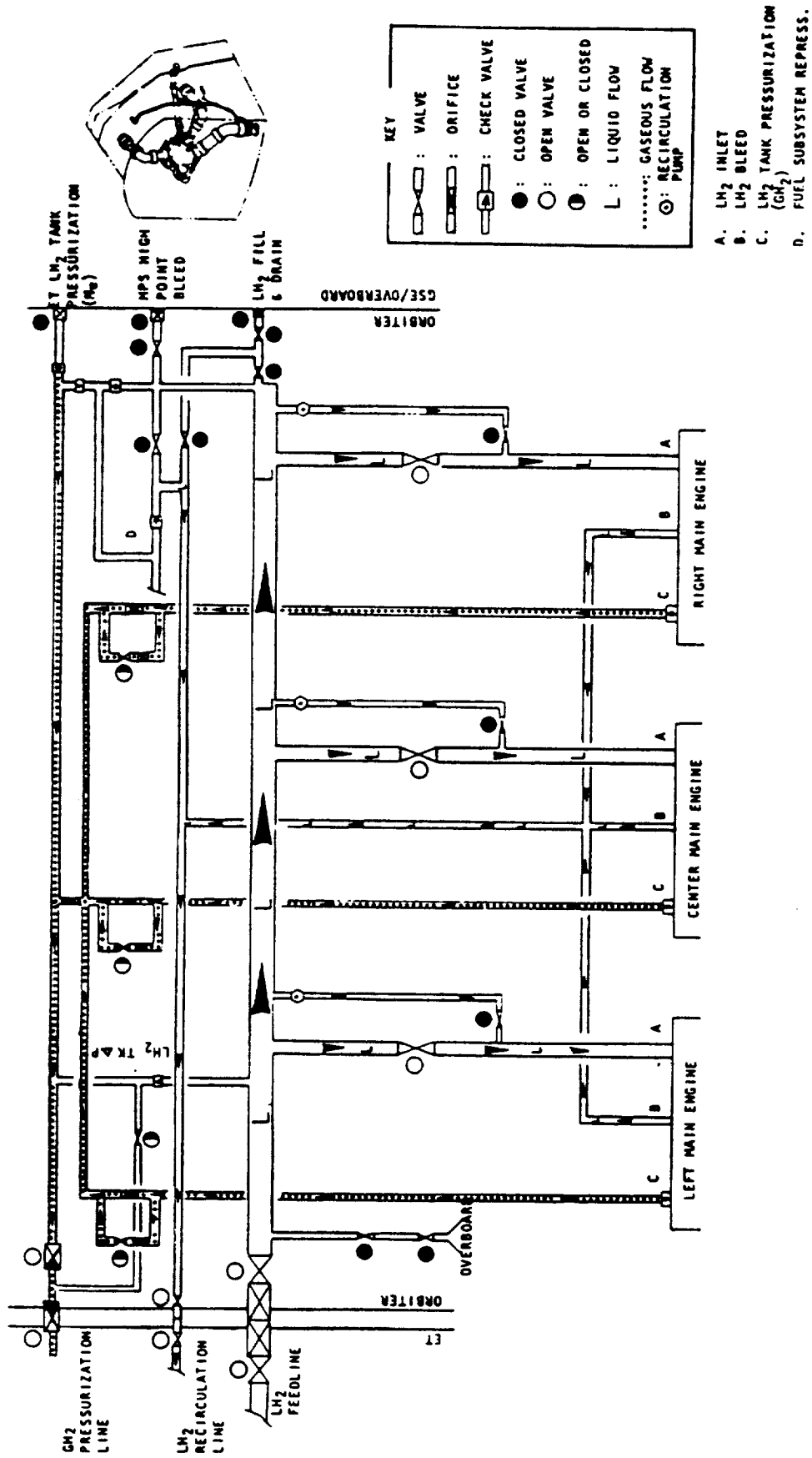


Figure 4 - PROPELLANT MANAGEMENT SUBSYSTEM FUEL FLOW

umbilicals at the feedline disconnect valve, and to either GSE liquid propellant umbilicals (prelaunch only), or overboard at the outboard fill and drain valves.

Between the feedline disconnect valves and the inboard fill and drain valves are three outlets for the three engine propellant feedlines and one outlet for the propellant feedline relief line. The LH2 feedline manifold contains an extra outlet for the LH2 Return to Launch Site (RTLIS) feedline dump line. (See paragraph 4 below.) Pressures within the LO2 and the LH2 feedline manifolds (MANF) can be monitored on the two ENG MANF meters on Panel F7 or the CRT display Guidance and Navigation Control (GNC) System (SYS) SUMM 1 Backup Flight System (BFS).

2. Engine Propellant Feedlines - There are six 12-inch diameter feedlines in the Orbiter, three for LO2 and three for LH2. Each of the LO2 engine propellant feedlines connects to the LO2 feedline manifold at one end and to the Low Pressure Oxidizer Turbopump (LPOT) inlet of one of the SSMEs at the other end. Likewise, each of the LH2 engine propellant feedlines connects to the LH2 feedline manifold at one end and to the Low Pressure Fuel Turbopump (LPFT) inlet at one of the SSMEs at the other end. There is one pre valve in each of the six engine propellant feedlines. The pre valves are designated as left, center, or right (engine) LO2 pre valve; or left, center, or right (engine) LH2 pre valve.
3. Propellant Feedline Relief Line - There are two 1-inch diameter relief lines in the Orbiter, one for LO2 and one for LH2. Each relief line connects to one of the propellant feedline manifolds at one end and to an overboard port at the other end. Each relief line contains a relief valve and a pneumatically actuated relief isolation valve. The isolation valve is mounted in series with, and upstream of, the relief valve. Flow through the relief line and relief valve is enabled by relieving closing pressure on the normally open isolation valve, allowing it to open.

The position of the relief isolation valve (2) is controlled by one of two FEEDLINE RLF ISOL switches on Panel R4. Normally these switches are left in the GPC position. With the switches (2) in this position, both relief isolation valves will be opened automatically immediately after MECO.

The purpose of the relief lines is to prevent excessive pressure build-ups, generated by heatup and expansion of the propellants in the feedline manifolds, by allowing the pressure to be vented overboard through the relief valves.

4. LH2 RTLS Feedline Dump Line - This is a single 2 inch diameter line which connects to the LH2 feedline manifold at one end and to an overboard port at the other end. (The overboard port is located on the outer skin of the left side of the Orbiter between the Orbital Maneuvering System (OMS) pod and the upper surface of the wing.) The line is used for dumping residual LH2 during an RTLS abort. In non-RTLS situations, the pilot can use the backup LH2 dump switch to open these valves. Flow through the line is controlled by two series-connected, normally closed, LH2 RTLS dump valves (one inboard, one outboard) which are mounted in the line. The LH2 RTLS dump valves are controlled automatically by GPC commands.

B. Gaseous Propellant Collection and Supply Network. The network consists of all the lines used to collect and supply gaseous propellants (GO2 and GH2) from all three SSMEs to the ET to maintain propellant tank pressure during main engine burn. (Note: This network has no major function after ET separation.) Specifically, the gaseous propellant collection and supply network consists of the following.

1. Engine ET Pressurization Output Lines - There are six 0.63-inch diameter pressurization lines in the Orbiter, three for GO2 and three for GH2. Each of the GO2 pressurization lines connects to the oxidizer heat exchanger outlet of one of the SSMEs at one end and the GO2 ET pressurization manifold at the other end. Each of the GH2 pressurization lines connects to the LPFT turbine outlet of one of the SSMEs at one end and the GH2 ET pressurization manifold at the other end. Six flow control valves are used to control ullage pressure in the two ET propellant tanks.
2. ET Pressurization Manifolds - There are two 2-inch diameter manifolds in the Orbiter, one for GO2 and one for GH2. At each end of both manifolds are self-sealing quick disconnects. The pressurization manifolds connect to the ET gaseous propellant umbilicals at one set of quick-disconnects and to the GSE helium pressurization umbilicals at the other set of quick-disconnects. The GSE helium



pressurization umbilicals (2) are used for the initial pressurization of the ET propellant tanks during prelaunch.

Each pressurization manifold contains inlets for the three engine ET pressurization output lines. (The ET GH2 pressurization manifold contains, in addition to the three inlets, an outlet for the GH2 pressurization vent line. (See paragraph 3 below.)

3. GH2 Pressurization Vent Line - This is a single line which connects to the ET GH2 pressurization manifold line at one end and to an overboard port at the other end. This line is used exclusively for vacuum inerting the GH2 pressurization lines during orbit. Flow through the line is controlled by the normally closed GH2 pressurization line vent valve which is mounted in the line. This valve is controlled by the GH2 PRESS LINE VENT switch on cockpit Panel R4.

- C. Valves - There are two basic types of valves used in the PMS: those that are pneumatically actuated and those that are electrically actuated. Pneumatically actuated valves are used where large loads are encountered, such as in the control of liquid propellant flows. Electrically actuated valves are used where lighter loads are encountered, such as in the control of gaseous propellant flows.

Pneumatically actuated valves can be further divided into two subtypes - those that require pneumatic pressure to open and close the valve (type 1) and those that are spring-loaded to one position and require pneumatic pressure to move to the other position (type 2).

The following is a list of the type 1 valves.

- LH2 feedline disconnect valve
- LO2 feedline disconnect valve
- LH2 prevalues (3)
- LO2 prevalues (3)
- LH2 inboard fill/drain valve
- LO2 inboard fill/drain valve
- LH2 outboard fill/drain valve
- LO2 outboard fill/drain valve

Each type 1 valve actuator is equipped with two electrically actuated solenoid valves. Each of the two solenoid valves controls helium pressure to either an "open" port or a "close" port on the actuator.

Energizing the solenoid valve connected to the "open" port will allow helium pressure to open the pneumatic valve. Similarly, closing of the pneumatic valve is performed by energizing the solenoid valve connected to the "close" port. (The LO2 Prevalves have four solenoids, two redundant solenoids each to control helium pressure to the "open" and to the "closed" ports.)

Removing power from a solenoid valve not only removes helium pressure from the corresponding port of the pneumatic actuator, but also allows the helium pressure trapped in that side of the actuator to vent overboard. Removing power from both solenoids allows the pneumatic valve to remain in its last commanded position.

The following is a list of the type 2 valves.

- LH2 RTLS inboard dump valve, Normally Closed (NC)
- LH2 RTLS outboard dump valve (NC)
- LH2 feedline relief shutoff valve, Normally Open (NO)
- LO2 feedline relief shutoff valve (NO)
- LO2 Pogo accumulator recirculation valve (NO)

Each type 2 valve is equipped with a single electrically actuated solenoid valve which controls helium pressure to either an "open" port or a "close" port on the actuator. Removing power from the solenoid valve removes helium pressure from the corresponding port of the pneumatic actuator and allows helium pressure trapped in that side of the actuator to vent overboard. Spring force will then take over and drive the valve to the opposite position. If the spring force drives the valve to the open position, the valve is referred to as a Normally Open (NO) valve. If the spring force drives the valve to the closed position, the valve is referred to as a Normally Closed (NC) valve.

The following is a list of the electrically actuated solenoid valves:

- H2 pressurization line vent valve (NC)
- GH2 pressurization flow control valves (3) (NO)
- GO2 pressurization flow control valves (3) (NO)

The above electrically actuated valves are spring-loaded to one position and move to the other position when power is applied. These valves are referred to as either normally open or normally closed, based on their position in the de-energized state.

### 3.1.3 Orbiter MPS - Helium Subsystem General Description

The helium subsystem consists of seven 4.7-ft<sup>3</sup> helium supply tanks, three 17.3-ft<sup>3</sup> helium supply tanks, and their associated regulators, check valves, distribution lines, and control valves (Figure 5). Four of the 4.7-ft<sup>3</sup> helium supply tanks are located within the Orbiter aft of the payload bay area. The other three 4.7-ft<sup>3</sup> supply tanks and the three 17.3-ft<sup>3</sup> supply tanks are located below the payload bay liner and above the main landing gear cavity. Each of the 17.3-ft<sup>3</sup> supply tanks is plumbed to two of the 4.7-ft<sup>3</sup> supply tanks (one in the mid-body, the other in the aft body) to form three sets of three tanks. Each set of tanks, thus formed, normally provides helium to only one engine and for this reason is commonly referred to by the engine's designation; for example, "left engine helium." This helium is used for in-flight purges of engines, aft compartments, and provides pressure for actuating engine valves during emergency pneumatic shutdowns.

The remaining 4.7-ft<sup>3</sup> helium supply tank (the one which is not connected to a 17.3-ft<sup>3</sup> tank) is called the "pneumatic helium" supply tank. It normally provides pressure to actuate all of the pneumatically operated valves within the propellant management subsystem (Figure 5).

Each of the four helium supply circuits described above (three engine helium and one pneumatic helium) will operate independently until after MECO, when the three "out" helium interconnect valves will be opened, connecting all circuits to a common manifold. This interconnection can be performed manually by the crew; however, normally the GPC will automatically interconnect the circuits just before the start of the MPS propellant dump.

### 3.1.4 Helium Subsystem Components

The helium subsystem contains the following major components.

- A. Supply Tank - Each engine helium supply tank cluster consists of two 4.7-ft<sup>3</sup> supply tanks and one 17.3-ft<sup>3</sup> supply tank. One of the 4.7-ft<sup>3</sup> tanks and the 17.3-ft<sup>3</sup> tank are located in the mid-body area of the Shuttle under the payload bay liner, in an area originally reserved for additional Power Reactant Supply and Distribution (PRSD) cryogenic storage. The 17.3-ft<sup>3</sup> tank is identical to that used in the OMS. The remaining 4.7-ft<sup>3</sup> tank is located in the rear of the Shuttle, aft of the payload bay bulkhead. The single 4.7-ft<sup>3</sup> pneumatic helium supply tank is also located in this area. Prior to lift-off, all helium supply tanks will be pressurized to a nominal value of 4500 psia.

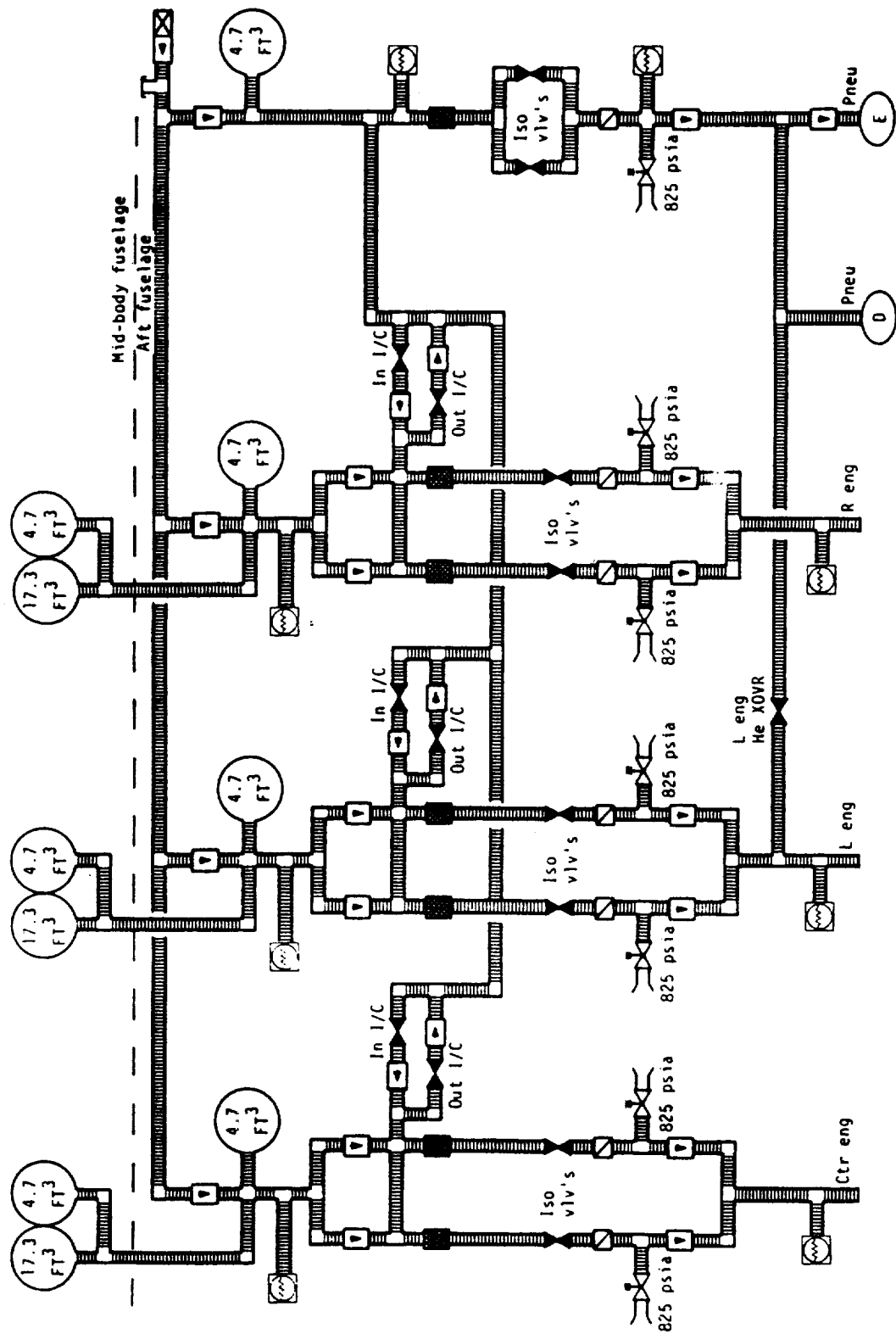
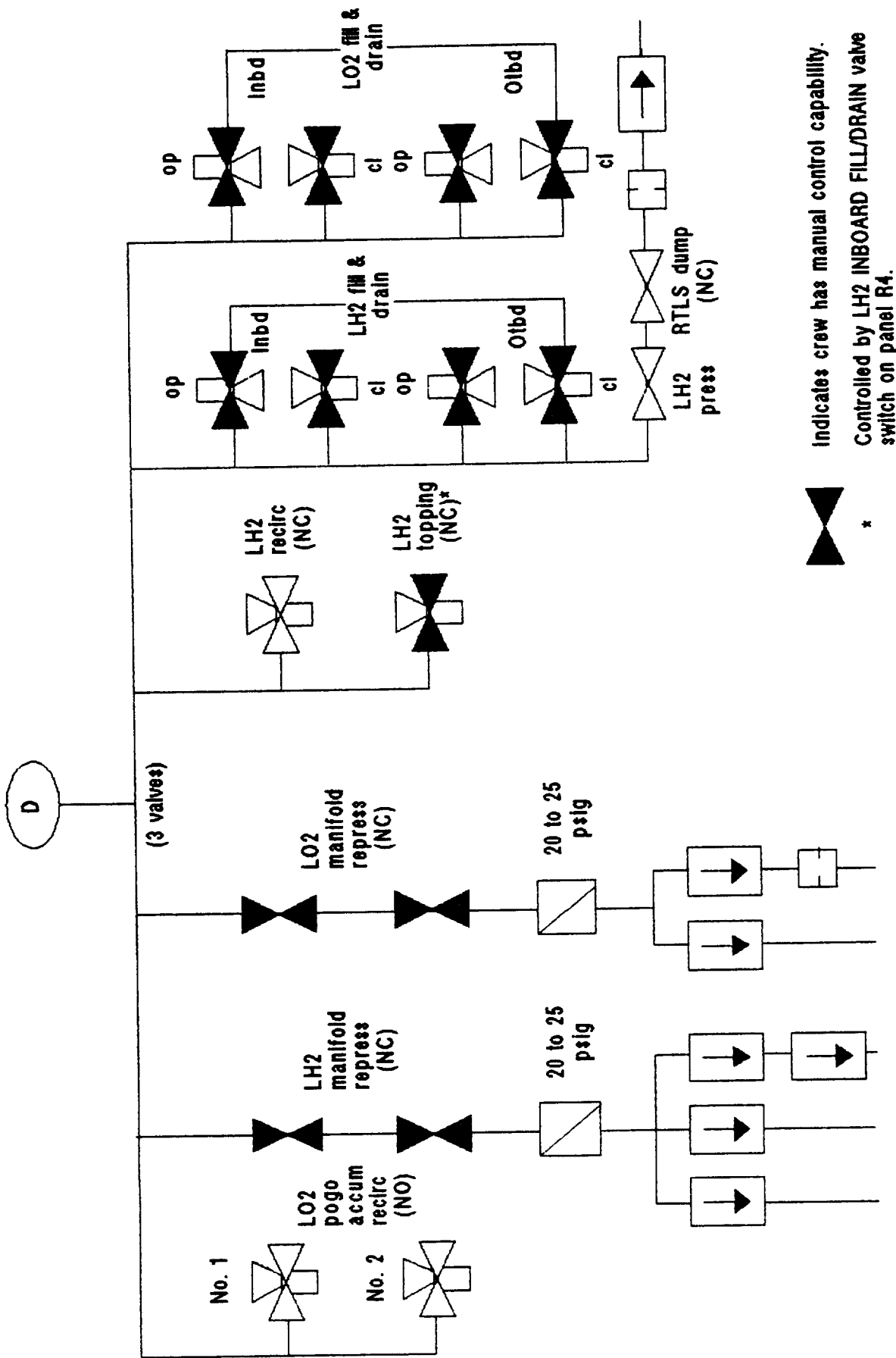


Figure 5 - HELIUM SUBSYSTEM; STORAGE AND REGULATION



Indicates crew has manual control capability.  
 Controlled by LH2 INBOARD FILL/DRAIN valve  
 switch on panel R4.

\* 

Figure 6A - PNEUMATIC HELIUM DISTRIBUTION

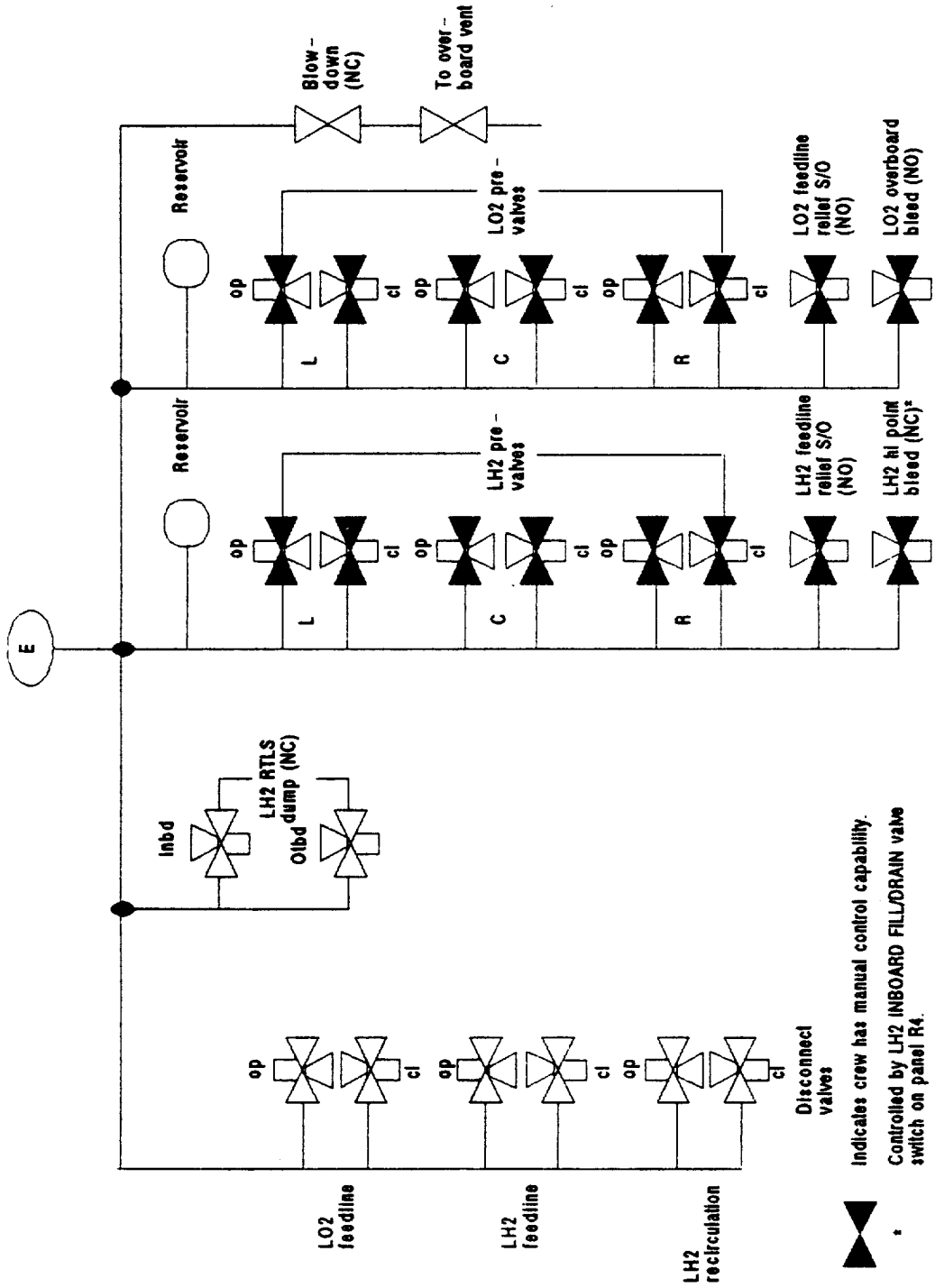


Figure 6B - PNEUMATIC HELIUM DISTRIBUTION

- B. Solenoid Actuated Valves - All of the valves in the helium subsystem are spring-loaded to one position and electrically actuated to the other position.

Valve position is controlled via electrical signals from either the GPCs or a manual switch. The crew can control only a portion of the valves through cockpit switches, the remainder are controlled automatically by the GPCs.

- C. Supply Tank Isolation Valves - There are eight supply tank isolation valves in the helium subsystem. The valves are connected in parallel to each engine helium supply tank cluster and to the pneumatic supply tank in pairs. In the case of the engine helium supply tanks, each pair of isolation valves control helium flow through one leg of a dual helium supply regulator circuit. Each helium supply circuit contains two check valves, a filter, an isolation valve, a regulator, and a relief valve.

The two isolation valves connected to the pneumatic supply tank are also connected in parallel. The rest of the corresponding helium supply circuit consists of a filter, the two isolation valves, a regulator, a relief valve, and a single check valve.

Each isolation valve (with the exception of the two pneumatic helium isolation valves) can be individually controlled by it's own cockpit switch. The two pneumatic helium isolation valves are controlled by a single switch on Panel R2.

- D. Interconnect Valves - Each engine helium supply tank cluster has two interconnect valves. Each valve in the pair of interconnect valves is connected in series with a check valve. Because of the check valves, helium can flow through the interconnect valves in one direction only. The interconnect valves are oriented in such a manner that one interconnect valve controls helium flow into the circuit and the other interconnect valve controls helium flow out of the circuit. The "in" interconnect valve controls He flow into the associated engine helium distribution lines from the pneumatic helium supply tank. The "out" interconnect valve controls helium flow out of the associated engine helium supply tank cluster to the pneumatic helium distribution lines.

Each pair of interconnect valves (per engine) are controlled by a single cockpit switch. This switch has three positions: IN OPEN/OUT CLOSE, GPC, and IN CLOSE/OUT OPEN. With the switch in the IN OPEN/OUT CLOSE position, the "in" interconnect valve will be

opened and the "out" interconnect valve closed. The IN CLOSE/OUT OPEN switch position will do the reverse. With the switch in the GPC position, both valves are closed unless commanded to the open position by the GPCs. In the event of an RTLS during a normal flight the GPC will signal the "in" interconnect valve to open automatically at MECO and close automatically 20 seconds later. The "out" interconnect valve is opened automatically at the beginning of the LO2 dump and closed automatically at the end of the LH2 dump. If an engine was shut down prior to MECO, however, the corresponding "in" interconnect valve will remain closed at MECO. At any other time, placing the switch in the GPC position results in both interconnect valves closing and remaining closed.

There is an additional crossover (interconnect) valve connected downstream of the left engine helium supply regulators to the pneumatic helium distribution system. In the event of a pneumatic helium regulator failure (note - only one regulator in this line), this crossover valve would be opened, the pneumatic helium isolation valve would be closed, and the left engine helium supply would then provide regulated helium pressure through the crossover valve to the pneumatic helium distribution system. This crossover valve is controlled by its own three-position cockpit switch. The three switch positions are labeled OPEN, GPC, and CLOSE.

- E. Manifold Pressurization Valves - (Figure 6A) - The manifold pressurization valves are located downstream of the pneumatic helium pressure regulator and are used to control the flow of helium to the propellant manifolds during nominal propellant dumps and manifold repressurization. There are four of these valves, grouped in pairs. One pair of valves controls helium pressure to the LO2 propellant manifolds, and the other pair controls helium pressure to the LH2 propellant manifolds.
- F. LH2 RTLS Dump Pressurization Valves - (Figure 6B) - The LH2 RTLS dump pressurization valves are located downstream of the pneumatic helium pressure regulator and are used to control the pressurization of the LH2 propellant manifolds during an RTLS LH2 dump. There are two of these valves, connected in series. Unlike the LH2 manifold pressurization valves, the LH2 RTLS dump pressurization valves cannot be controlled from the cockpit. During an RTLS abort, valves will be opened and closed automatically by GPC commands.



One additional difference between the nominal and the RTLS LH2 dumps is in the routing of the helium and the location at which it enters the LH2 feedline manifold. For the nominal LH2 dump, helium passes through the LH2 manifold pressurization valves and enters the feedline manifold in the vicinity of the LH2 feedline disconnect valve. For the RTLS LH2 dump, helium passes through the LH2 RTLS dump pressurization valves and enters the feedline manifold in the vicinity of the LH2 inboard fill/drain valve (on the inboard side).

- G. Pressure Regulators - Each engine helium supply tank cluster has two pressure regulators, operating in parallel. Each regulator controls pressure in one leg of a dual-redundant helium supply circuit. The pressure regulators for the helium supply tanks are set to provide outlet pressures in the range of 715 psig to 770 psig. Downstream of this regulator are two more regulators, the LH2 manifold pressure regulator and the LO2 manifold pressure regulator. These regulators are used only during MPS propellant dump and manifold repressurization. Both regulators are set to provide outlet pressures in the range of 20 to 25 psig. Flow through the regulators is controlled by the appropriate set (2) of normally closed manifold pressurization valves (Figure 6).
- H. Relief Valves - Downstream of each pressure regulator (with the exception of the two manifold repress regulators) is a relief valve. The purpose of the relief valve is to protect the downstream helium distribution lines from the overpressurization (and rupture) in the event the associated pressure regulator fails fully open. The relief valves in the helium supply circuits are set to relieve at 825 +/- 25 psig and reseal at 785 psig.

### 3.2 Interfaces and Locations

The MPS system hardware is located in the aft fuselage compartment behind the payload bay but forward of the main engines. The MPS system interfaces with the Orbiter's three main engines, the external tank, and the ground during prelaunch and post landing.

### 3.3 Hierarchy

Figure 2 illustrates the hierarchy of the MPS hardware components.

#### 4.0 ANALYSIS RESULTS

Detailed analysis results for each of the identified failure modes are presented in Appendix C. Table I presents a summary of the failure criticalities. Further discussion of each of these subdivisions and the applicable failure modes is provided in subsequent paragraphs.

| Criticality: | 1/1 | 2/1R | 2/2 | 3/1R | 3/2R | 3/3 | TOTAL |
|--------------|-----|------|-----|------|------|-----|-------|
| LO2          | 53  | 61   | 11  | 56   | 43   | 39  | 263   |
| LH2          | 64  | 30   | -   | 25   | -    | 64  | 183   |
| Helium       | 12  | 51   | 19  | 13   | 27   | 122 | 244   |
| TOTAL        | 129 | 142  | 30  | 94   | 70   | 225 | 690   |

Of these 690 failure modes analyzed, 349 were determined to be PCIs. A summary of the PCIs is presented in Table II. Appendix D contains a cross reference between each PCI and analysis worksheets in Appendix C.

| Criticality: | 1/1 | 2/1R | 2/2 | 3/1R | 3/2R | TOTAL |
|--------------|-----|------|-----|------|------|-------|
| LO2          | 53  | 61   | 11  | 14   | 7    | 146   |
| LH2          | 64  | 30   | -   | 11   | -    | 105   |
| Helium       | 12  | 51   | 19  | -    | 16   | 98    |
| TOTAL        | 129 | 142  | 30  | 25   | 23   | 349   |

#### 4.1 Analysis Results - Liquid Oxygen (LO2)

Failures related to the LO2 components were analyzed. Critical failures were due to external leaks, spontaneous ignition and mechanical failures of valves.

The LO2 components were individually analyzed. Critical failures involved the loss of propellant overboard, fire in the aft fuselage and fire/explosions in the SSMEs. The LO2 manifold repressurization was the only noncritical failure in this system. One hundred twenty-nine (129) failures were identified to be PCIs.

#### 4.2 Analysis Results - Liquid Hydrogen (LH2)

Critical failures of components involved line ruptures and flow restrictions, mechanical and electrical failures of valves and disconnects, and external leakage. One hundred five (105) failures were identified to be PCIs.

#### 4.3 Analysis Results - Helium

Critical failures of components involved mechanical and electrical failures of valves, and external leakage. Noncritical failures involved quick disconnects' inability to mate/demate, and electrical failures of valves. Ninety-eight (98) failures were identified to be PCIs.

## 5.0 REFERENCES

Reference documentation available from NASA and Rockwell was used in the analysis. The documentation used included the following:

1. Main Propulsion System Workbook, 3/01/82
2. Main Propulsion System - Fluid Flows, 10/25/78
3. Shuttle Flight Operations Manual, Volume 8A, MPS, 8/31/81
4. Booster Systems Briefs, 10/01/84
5. SSME Training Data, Engine Orientation, 5/31/80
6. Instructions for Preparation of FMEA and CIL for the STS, NSTS 22206, 10/10/86
7. Space Shuttle Systems Handbook, Volumes 1-2, Revision C, DNC-5, 9/13/85
8. Integrated System Schematic, MPS, OV-099, 103, 104, 5/27/86
9. STS Mission Problem Tracking List
10. OV-099 Operational Configuration CIL, Mechanical/Fluid Systems, Book 1 of 4, 3/01/82
11. OV-099 Operational Configuration CIL, ECLSS/Power Systems, Book 2 of 4, 3/01/82
12. OV Operational Configuration CIL, Propulsion Systems, Book 3 of 4, 11/01/82
13. OV Operational Configuration CIL, Avionics Systems, Book 4 of 4, 11/01/82
14. Operations and Maintenance Requirements and Specifications, 12/17/85
15. Operations and Maintenance Requirements and Specification Document, 3/06/86
16. Problem Records, 7/22/86
17. Shuttle Orbiter OV-102 CDR, Safety Analysis Report, Volume I, Management Summary, 4/27/77
18. Shuttle Orbiter OV-102 CDR, Safety Analysis Report, Volume II, Structures Systems, 4/27/77
19. Shuttle Orbiter OV-102 CDR, Safety Analysis Report, Volume III, Mechanical Systems, 4/27/77
20. Shuttle Orbiter OV-102 CDR, Safety Analysis Report, Volume IV, Propulsion Systems, 4/27/77
21. Shuttle Orbiter OV-102 CDR, Safety Analysis Report, Volume V, Power System, 4/27/77
22. Shuttle Orbiter OV-102 CDR, Safety Analysis Report, Volume VII, ECLSS, 4/27/77
23. Shuttle Orbiter OV-102 CDR, Safety Analysis Report, Volume VIII, Crew Station Systems, 4/27/77
24. FMEA - Lightweight and Heavyweight Tanks, 7/20/81
25. Integrated System Schematic, OV-102, MPS, 10/26/79
26. Crew Software Interface, CSI 2102, 9/30/84
27. Rockwell International Component Specifications:
  - a. MC271-0073, LH2 Engine Feed Line Assembly, 10/26/83
  - b. MC271-0074, LO2 Engine Feed Line Assembly, 11/07/83
  - c. MC271-0075, LH2 Line Assembly, 5/28/80
  - d. MC271-0076, LH2/LO2 Fill & Drain Line Assembly, 12/02/83

- e. MC276-0003, 1 Inch GHE & GN2 Disconnect, 1/11/85
- f. MC276-0004, 1.5 Inch LO2/LH2 Disconnect, 1/04/85
- g. MC276-0005, LO2/LH2 Orbiter to Ground Fill & Drain Disconnect, 4/18/83
- h. MC276-0032, Test Point Couplings, 2/10/75
- i. MC280-0017, H2 & O2 Pressurant Flow Control Valve 4/11/84
- j. MC281-0030, LH2 Recirculation Pump Assembly, 4/12/82
- k. MC284-0389, LH2/LO2 Orbiter to Tank Feed System Disconnect, 2/01/82
- l. MC284-0390, LH2 Orbiter to Tank Recirculation Disconnect, 7/27/79
- m. MC284-0391, GH2/GO2 Orbiter to Tank Disconnect, 10/25/79
- n. MC284-0395, LO2/LH2 1.5/2 Inch Shutoff Valve, 6/27/79
- o. MC284-0396, Propellant Shutoff Prevalve, 7/24/82
- p. MC284-0397, Propellant Fill & Drain Valve, 6/22/84
- q. MC284-0403, Two Way Solenoid Valve, 6/24/80
- r. MC284-0406, LO2/LH2 Relief Shutoff Valve, 5/05/76
- s. ME284-0479, Engine Isolation Check Valve, 8/20/80
- t. MC284-0501, Engine Isolation Check Valve, 1/31/83
- u. MC284-0515, Dual Check Valve, 11/11/82
- v. MC432-0205, LO2/LH2 Level Point Sensor, 4/15/81
- w. ME284-0472, HE Check Valve, 4/04/80
- x. MC284-0404, 3 Way HE Solenoid Valve, 4/01/75
- y. MC284-0533, HE Regulator, 11/13/79
- z. MC284-0399, LO2 Manif Repress Regulator
- aa. MC284-0398, HE Relief Valve, 12/14/77
- bb. MC282-0082, HE Supply Tank, 12/14/76
- cc. MC282-0070, LO2 Prevalve Pneu Accumulator, 10/31/75
- dd. ME276-0032, Test Point Coupling, 2/10/75
- ee. ME284-0474, LH2 3/8 Inch Relief Valve, 9/10/74
- ff. ME286-0056, HE Supply Filter, 11/04/74
- gg. VO70-451756, Pneu HE Panel 4 Test Port
- hh. VO70-415532, LH2 Repress Reg Outlet Test Port, 12/08/75
- ii. VO70-415568, LO2 Repress Reg Outlet Test Port, 5/17/76
- jj. VO70-415585, Helium Fill Disc. Check Valve Test Port, 4/16/76
- kk. VO70-415446, LO2 Prepress Disc. Check Valve Test Port, 3/11/76
- ll. VO70-415790, HE Supply Test Port, 4/13/78
- mm. VO70-415133, Check Valve CV24 Leakage Test Port, 8/21/80
- nn. VO70-415545, LH2 Feed Manif RTLS Repress Orifice, 12/19/75
- oo. VO70-414548, LH2 Pressurization System Test Port Fittings, 3/25/76
- pp. VO70-415468, LO2 Relief System Test Port Fitting, 7/13/77
- qq. VO70-415552, GO2 Pressurization Manifold Orifice Assembly, 3/05/767



APPENDIX A  
ACRONYMS

|      |   |   |
|------|---|---|
| AFV  | - | Anti-Flood Valve                                    |
| ASI  | - | Augmented Spark Igniter                             |
| ATVC | - | Ascent Thrust Vector Control                        |
| CCV  | - | Chamber Coolant Valve                               |
| CCVA | - | Chamber Coolant Valve Assembly                      |
| EIU  | - | Engine Interface Unit                               |
| EMR  | - | Engine Mixture Ratio                                |
| ET   | - | External Tank                                       |
| FBV  | - | Fuel Bleed Valve                                    |
| FPB  | - | Fuel Preburner                                      |
| FPL  | - | Full Power Level                                    |
| FPOV | - | Fuel Preburner Oxidizer Valve                       |
| GCV  | - | Gaseous Oxygen Control Valve                        |
| GH2  | - | Gaseous Hydrogen                                    |
| GHe  | - | Gaseous Helium                                      |
| GN2  | - | Gaseous Nitrogen                                    |
| GND  | - | Ground  |
| GO2  | - | Gaseous Oxygen                                      |
| GSE  | - | Ground Support Equipment                            |
| H2   | - | Hydrogen  |
| He   | - | Helium  |
| HEX  | - | Heat Exchanger                                      |
| HGM  | - | Hot Gas Manifold                                    |
| HPFT | - | High Pressure Fuel Turbopump                        |
| HPOT | - | High Pressure Oxidizer Turbopump                    |
| HPV  | - | Helium Precharge Valve                              |
| I/C  | - | Interconnect  |
| ISP  | - | Specific Impulse                                    |
| LH2  | - | Liquid Hydrogen                                     |
| LO2  | - | Liquid Oxygen                                       |
| LOX  | - | Liquid Oxygen                                       |
| LPFT | - | Low Pressure Fuel Turbopump                         |
| LPOT | - | Low Pressure Oxidizer Turbopump                     |
| LPS  | - | Launch Processor System<br>Launch Processing System |
| MANF | - | Manifold  |
| MCC  | - | Main Combustion Chamber                             |
| ME   | - | Main Engine   |
| MEC  | - | Master Events Controller                            |
| MECO | - | Main Engine Cutoff                                  |
| MFV  | - | Main Fuel Valve                                     |
| MOV  | - | Main Oxidizer Valve                                 |
| MPL  | - | Minimum Power Level                                 |
| MPS  | - | Main Propulsion System                              |
| MVA  | - | Main Valve Actuator                                 |
| NC   | - | Normally Closed                                     |
| NO   | - | Normally Open                                       |
| NPSP | - | Net Positive Suction Pressure                       |
| OBV  | - | Oxidizer Bleed Valve                                |
| OPB  | - | Oxidizer Preburner                                  |

|       |   |                                   |
|-------|---|-----------------------------------|
| OPOV  | - | Oxidizer Preburner Oxidizer Valve |
| PAV   | - | Pressure Actuated Valve           |
| P/B   | - | Preburner                         |
| PBVA  | - | Propellant Bleed Valve Assembly   |
| Pc    | - | Chamber Pressure                  |
| PCI   | - | Potential Critical Item           |
| PCV   | - | Purge Check Valves                |
| PMS   | - | Propellant Management Subsystem   |
| POP   | - | Preburner Oxidizer Pump           |
| RIV   | - | Recirculation Isolation Valve     |
| RPC   | - | Remote Power Controller           |
| RPL   | - | Rated Power Level                 |
| SRB   | - | Solid Rocket Booster              |
| SSME  | - | Space Shuttle Main Engine         |
| SSMEC | - | SSME Controller                   |



## **APPENDIX B**

### **DEFINITIONS, GROUND RULES, AND ASSUMPTIONS**

- B.1 Definitions**
- B.2 Project Level Ground Rules and Assumptions**
- B.3 Subsystem-Specific Ground Rules and Assumptions**

APPENDIX B  
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.1 Definitions

Definitions contained in NSTS 22206, Instructions For Preparation of FMEA/CIL, 10 October 1986, were used with the following amplifications and additions.

INTACT ABORT DEFINITIONS:

RTLS - begins at transition to OPS 6 and ends at transition to OPS 9, post-flight

TAL - begins at declaration of the abort and ends at transition to OPS 9, post-flight

AOA - begins at declaration of the abort and ends at transition to OPS 9, post-flight

ATO - begins at declaration of the abort and ends at transition to OPS 9, post-flight

CREDIBLE (CAUSE) - an event that can be predicted or expected in anticipated operational environmental conditions. Excludes an event where multiple failures must first occur to result in environmental extremes

CONTINGENCY CREW PROCEDURES - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

EARLY MISSION TERMINATION - termination of onorbit phase prior to planned end of mission

EFFECTS/RATIONALE - description of the case which generated the highest criticality

HIGHEST CRITICALITY - the highest functional criticality determined in the phase-by-phase analysis

MAJOR MODE (MM) - major sub-mode of software operational sequence (OPS)

MC - Memory Configuration of Primary Avionics Software System (PASS)

MISSION - assigned performance of a specific Orbiter flight with payload/objective accomplishments including orbit phasing and altitude (excludes secondary payloads such as GAS cans, middeck P/L, etc.)

MULTIPLE ORDER FAILURE - describes the failure due to a single cause or event of all units which perform a necessary (critical) function

OFF-NOMINAL CREW PROCEDURES - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

OPS - software operational sequence

PRIMARY MISSION OBJECTIVES - worst case primary mission objectives are equal to mission objectives

PHASE DEFINITIONS:

PRELAUNCH PHASE - begins at launch count-down Orbiter power-up and ends at moding to OPS Major Mode 102 (liftoff)

LIFTOFF MISSION PHASE - begins at SRB ignition (MM 102) and ends at transition out of OPS 1 (Synonymous with ASCENT)

ONORBIT PHASE - begins at transition to OPS 2 or OPS 8 and ends at transition out of OPS 2 or OPS 8

DEORBIT PHASE - begins at transition to OPS Major Mode 301 and ends at first main landing gear touchdown

LANDING/SAFING PHASE - begins at first main gear touchdown and ends with the completion of post-landing safing operations

APPENDIX B  
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.2 IOA Project Level Ground Rules and Assumptions

The philosophy embodied in NSTS 22206, Instructions for Preparation of FMEA/CIL, 10 October 1986, was employed with the following amplifications and additions.

1. The operational flight software is an accurate implementation of the Flight System Software Requirements (FSSRs).

RATIONALE: Software verification is out-of-scope of this task.

2. After liftoff, any parameter which is monitored by system management (SM) or which drives any part of the Caution and Warning System (C&W) will support passage of Redundancy Screen B for its corresponding hardware item.

RATIONALE: Analysis of on-board parameter availability and/or the actual monitoring by the crew is beyond the scope of this task.

3. Any data employed with flight software is assumed to be functional for the specific vehicle and specific mission being flown.

RATIONALE: Mission data verification is out-of-scope of this task.

4. All hardware (including firmware) is manufactured and assembled to the design specifications/drawings.

RATIONALE: Acceptance and verification testing is designed to detect and identify problems before the item is approved for use.

5. All Flight Data File crew procedures will be assumed performed as written, and will not include human error in their performance.

RATIONALE: Failures caused by human operational error are out-of-scope of this task.

6. All hardware analyses will, as a minimum, be performed at the level of analysis existent within NASA/Prime Contractor Orbiter FMEA/CILs, and will be permitted to go to greater hardware detail levels but not lesser.

RATIONALE: Comparison of IOA analysis results with other analyses requires that both analyses be performed to a comparable level of detail.

7. Verification that a telemetry parameter is actually monitored during AOS by ground-based personnel is not required.

RATIONALE: Analysis of mission-dependent telemetry availability and/or the actual monitoring of applicable data by ground-based personnel is beyond the scope of this task.

8. The determination of criticalities per phase is based on the worst case effect of a failure for the phase being analyzed. The failure can occur in the phase being analyzed or in any previous phase, whichever produces the worst case effects for the phase of interest.

RATIONALE: Assigning phase criticalities ensures a thorough and complete analysis.

9. Analysis of wire harnesses, cables, and electrical connectors to determine if FMEAs are warranted will not be performed nor FMEAs assessed.

RATIONALE: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

10. Analysis of welds or brazed joints that cannot be inspected will not be performed nor FMEAs assessed.

RATIONALE: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

11. Emergency system or hardware will include burst discs and will exclude the EMU Secondary Oxygen Pack (SOP), pressure relief valves and the landing gear pyrotechnics.

RATIONALE: Clarify definition of emergency systems to ensure consistency throughout IOA project.

## APPENDIX B

### B.3 SUBSYSTEM SPECIFIC GROUND RULES AND ASSUMPTIONS

The IOA was performed to the component/assembly level of the subsystem of the MPS. The analysis considered the worst case effects of the hardware/functional failure on the subsystem, mission, and crew/vehicle safety.

1. All like and unlike redundancy will be considered in determining functional criticality. The MPS function is to provide delta V for the vehicle to reach orbit. Since loss of one main engine during the early part of ascent requires a mission abort, any failure that results in the loss of one main engine will be considered loss of mission (Crit 2). Since, for most of the ascent, two engines are required for a successful abort, loss of two or three engines will be considered loss of life/vehicle (Crit 1).

RATIONALE: These failure modes are directly applicable to worst case MPS subsystem component analyses.

2. Only MPS Orbiter items will be analyzed for the MPS interface to the Ground, External Tank, and the Main Engines.

RATIONALE: Non-orbiter program hardware are not within the scope of this task.

3. Aborts are assumed to be caused by loss of an engine. Any failure within a component that can shut down an engine could leave only one engine in operation and therefore could lead to loss of vehicle (Crit 1).

RATIONALE: This failure mode is directly applicable to worst case MPS subsystem component analysis.

4. Undesignated or "Mil-Spec" lines in the MPS system will not be considered as failure sources except at unwelded component joints. The components will be identified from generic MPS system schematic drawing(s) VS70-41500X. The component connection configurations (welded, screwed, flanged) will be determined from the appropriate RI Specification drawing. Failure modes of the unwelded lines will not be considered, unless different from the failure modes of the component(s) or system to which they are attached.

RATIONALE: Undesignated lines do not have any reference documentation, and they are out of the scope of this task.

**APPENDIX C  
DETAILED ANALYSIS**

This section contains the IOA analysis worksheets generated during the analysis of this subsystem. The information on these worksheets is intentionally similar to the NASA FMEAs. Each of these sheets identifies the hardware item being analyzed, and parent assembly, as well as the function. For each failure mode, the possible causes are outlined, and the assessed hardware and functional criticality for each mission phase is listed, as described in the NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. Finally, effects are entered at the bottom of each sheet, and the worst case criticality is entered at the top.

**LEGEND FOR IOA ANALYSIS WORKSHEETS**  
-----

**Hardware Criticalities:**

- 1 = Loss of life or vehicle
- 2 = Loss of mission or next failure of any redundant item (like or unlike) could cause loss of life/vehicle
- 3 = All others

**Functional Criticalities:**

- 1R = Redundant hardware items (like or unlike) all of which, if failed, could cause loss of life or vehicle.
- 2R = Redundant hardware items (like or unlike) all of which, if failed, could cause loss of mission.

**Redundancy Screen A:**

- 1 = Is Checked Out PreFlight
- 2 = Is Capable of Check Out PreFlight
- 3 = Not Capable of Check Out PreFlight
- NA = Not Applicable

**Redundancy Screens B and C:**

- P = Passed Screen
- F = Failed Screen
- NA = Not Applicable

APPENDIX C  
TABLE OF CONTENTS

|   | PAGE  |
|---|-------|
| 1001 - LO2 MECHANICAL WORKSHEETS              | C-2   |
| 2001 - LH2 MECHANICAL WORKSHEETS              | C-117 |
| 3010 - ENGINE HELIUM MECHANICAL WORKSHEETS    | C-239 |
| 4010 - PNEUMATIC HELIUM MECHANICAL WORKSHEETS | C-277 |
| 5000 - LO2 ELECTRICAL WORKSHEETS              | C-440 |
| 6011 - LH2 ELECTRICAL WORKSHEETS              | C-588 |
| 7100 - HELIUM ELECTRICAL WORKSHEETS           | C-649 |



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: MPS FLIGHT: 3/2R  
 MDAC ID: 1001 ABORT: 2/1R

ITEM: GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19, 20)  
 FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) 02 SUBSYSTEM
- 3) 02 TANK PRESS
- 4) GO2 PRESSURE ISOLATION CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | CRITICALITIES | ABORT | HDW/FUNC |
|-----------------|----------|---------------|-------|----------|
| PRELAUNCH:      | 3/3      |               | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     |               | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      |               | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      |               | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |               |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
 PART NUMBER: ME284-0479-0003,0023

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE SUPPLIES GO2 FROM A SSME TO PRESSURIZE THE ET LO2 TANK. THIS ULLAGE PRESSURE IS NECESSARY FOR EFFICIENT OPERATION OF THE SSMS (THE PROPELLENT WILL RUN OUT). THE LOSS OF ALL REDUNDANCY DURING AN ABORT WILL RESULT IN THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-02004C



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1003 ABORT: 1/1

ITEM: GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19, 20)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURE ISOLATION CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0479-0003,0023

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE SUPPLIES GO2 FROM A SSME TO PRESSURIZE THE ET LO2 TANK.  
A GO2 LEAK IS A FIRE/EXPLOSION HAZARD (LOSS OF VEHICLE).

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/20/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1004 ABORT: /NA

ITEM: GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19 20)  
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) 02 SUBSYSTEM
- 3) LO2 SSME INTERFACE
- 4) GO2 PRESSURE ISOLATION CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0479-0003,0023

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

IF THIS VALVE IS OPEN DURING THE PRELAUNCH PHASE, HELIUM SUPPLIED FROM THE GROUND TO PRESSURIZE THE ET LO2 TANK CAN ENTER THE SSME AND RUPTURE THE HEAT EXCHANGER. THE RESULT CAN BE A FIRE/EXPLOSION IN THE SSME. (LOSS OF VEHICLE)

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C7

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1005     | ABORT:              | 1/1      |

ITEM: GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19, 20)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 SSME INTERFACE
- 4) GO2 PRESSURE ISOLATION CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ NA ]            B [ NA ]            C [ NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    ME284-0479-0003,0023

CAUSES:    CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:

THE LAUNCH WILL BE DELAYED IF THIS VALVE DOES NOT OPEN BEFORE LIFTOFF.

IF THE CHECK VALVE DOES NOT OPEN, THE PRESSURE CAUSED BY THE TRAPPED GO2 WILL RUPTURE THE HEAT EXCHANGER. THE RESULT CAN BE A FIRE/EXPLOSION IN THE SSME. (LOSS OF VEHICLE)

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C7

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/20/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1006 ABORT: 1/1

ITEM: GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19, 20)  
FAILURE MODE: SPONTANEOUS IGNITION IN/OF PART

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 SSME INTERFACE
- 4) GO2 PRESSURE ISOLATION CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0479-0003,0023

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE CAN SUPPLY ENOUGH ENERGY TO START THE VALVE ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT.

THE FIRE COULD SPREAD CAUSING A LARGER FIRE/EXPLOSION IN THE SSME. (LOSS OF VEHICLE)

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C; PROBLEM REPORT NO AC8335-01

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1011 ABORT: /NA

ITEM: LO2 TANK PRE-PRESS CHECK VALVE (CV16)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) LO2 TANK PRE-PRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

IF THIS CHECK VALVE FAILS TO OPEN DURING PRELAUNCH, THE ET LO2 TANK WILL NOT BE PRESSURIZED. THE LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1012 ABORT: 2/1R

ITEM: LO2 TANK PRE-PRESS CHECK VALVE (CV16)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) LO2 TANK PRE-PRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

ULLAGE PRESSURE IS NECESSARY FOR EFFICIENT OPERATION OF THE  
SSMES. THE LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF THE  
MISSION (NOT ENOUGH PROPELLENT).  
IF THIS FAILURE OCCURS DURING AN ABORT, THE VEHICLE WILL BE LOST.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-  
0200C



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 1013 ABORT: 1/1

ITEM: LO2 TANK PRE-PRESS CHECK VALVE (CV16)  
FAILURE MODE: SPONTANEOUS IGNITION IN/OF PART

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) LO2 TANK PRE-PRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE ON THE VALVE CAN SUPPLY ENOUGH ENERGY TO START THE VALVE ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT. (FIRE HAZARD)

BURN THROUGH OF THIS VALVE WILL CAUSE LOSS OF ULLAGE PRESSURE. THE PROPELLENT WILL RUN OUT (LESS EFFICIENT SSME OPERATIONS). THE VEHICLE WILL BE LOST IF THIS HAPPENS DURING AN ABORT.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; NO PROBLEM REPORT NO. AC8335-01; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1014 ABORT: 1/1

ITEM: LO2 TANK PRE-PRESS CHECK VALVE (CV16)  
FAILURE MODE: SPONTANEOUS IGNITION IN/OF PART

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) SSME INTERFACE
- 4) LO2 TANK PRE-PRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE ON THE VALVE CAN SUPPLY ENOUGH ENERGY TO START THE VALVE ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT. THE VEHICLE WILL BE LOST IF THE FIRE SPREADS TO A SSME, CAUSING A LARGER FIRE/EXPLOSION.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; NO PROBLEM REPORT NO. AC8335-01; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: MPS FLIGHT: 1/1  
 MDAC ID: 1021 ABORT: 1/1

ITEM: LO2 BLEED CHECK VALVE (CV31, 33, 35)  
 FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) Pogo SUPPRESSION
- 4) LO2 BLEED CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
 PART NUMBER: MC284-0515-0002,0003

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THESE VALVES SUPPLY LO2 TO THE POGO SUPPRESSION SYSTEM.  
 FAILURE OF THE POGO SUPPRESSION SYSTEM ON ONE OR MORE ENGINES  
 COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF  
 UNPREDICTABLE AMPLITUDE WHICH CAN LEAD TO THE LOSS OF THE  
 VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
 BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
 SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-  
 0200C



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1023 ABORT: 2/1R

ITEM: LO2 BLEED CHECK VALVE (CV31, 33, 35)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 SSME INTERFACE
- 4) LO2 BLEED CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0515-0002,0003

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF A LO2 BLEED CHECK VALVE WILL CAUSE LO2 PUMP CAVITATION LEADING TO SSME SHUTDOWN.  
THE LOSS OF ALL REDUNDANCY DURING AN ABORT CAN LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1024 ABORT: 1/1

ITEM: LO2 BLEED CHECK VALVE (CV31, 33, 35)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 SSME INTERFACE
- 4) LO2 BLEED CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0515-0002,0003

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

A FAILURE OF THIS VALVE TO REMAIN CLOSED DURING ENGINE OPERATION  
COULD CAUSE RUPTURE OF THE ENGINE AND/OR ORBITER LO2 BLEED LINE.  
THE RESULTING FIRE/EXPLOSION WILL DESTROY THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-  
0200C

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: MPS FLIGHT: /NA  
 MDAC ID: 1025 ABORT: 1/1

ITEM: LO2 BLEED CHECK VALVE (CV31, 33, 35)  
 FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROPELLANT FEED
- 4) LO2 BLEED CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 1/1      |
| LIFTOFF:        | /NA      | TAL:  | 1/1      |
| ONORBIT:        | /NA      | AOA:  | 1/1      |
| DEORBIT:        | /NA      | ATO:  | 1/1      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
 PART NUMBER: MC284-0515-0002,0003

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

THIS VALVE PREVENTS THE LOSS OF LO2 THROUGH A SHUTDOWN SSME (TWO SSMES RUNNING IS AN ABORT CASE). THIS LOSS OF LO2 CAN CAUSE THE LOSS OF THE VEHICLE (NOT ENOUGH PROPELLANT TO FINISH THE ABORT). THE LO2 LOST THROUGH THE SHUTDOWN SSME IS FROM THE POGO SUPPRESSION SYSTEM. FAILURE OF THIS POGO SUPPRESSION SYSTEM CAN ALSO LEAD TO THE DESTRUCTION OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/13/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 1026     | ABORT:              | 2/1R     |

ITEM: LO2 BLEED CHECK VALVE (CV31, 33, 35)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROPELLANT FEED
- 4) LO2 BLEED CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/2R          | TAL:  | 2/1R     |
| ONORBIT:        | 2/2R          | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0515-0002,0003

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

THIS CASE APPLIES FROM AFTER MECO AND BEFORE THE MPS DUMP. THE UNLIKE REDUNDANT PART IS THE PREVALVE RELIEF VALVE. THE LOSS OF ALL REDUNDANCY MAY CAUSE THE PROPELLANT FEED LINE (BETWEEN THE PREVALVE AND THE SSME) TO RUPTURE. THE RESULTING OVERPRESSURIZATION OF THE AFT FUSELAGE WILL CAUSE THE LOSS OF THE MISSION IN THE ONORBIT MISSION PHASES AND THE LOSS OF THE VEHICLE DURING THE DEORBIT MISSION PHASE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1027 ABORT: /NA

ITEM: LO2 BLEED CHECK VALVE (CV31, 33, 35)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) FILL & DRAIN
- 4) LO2 BLEED CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0515-0002,0003

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS CHECK VALVE MUST BE CLOSED PRIOR TO SSME IGNITION. FAILURE  
WILL DELAY THE LAUNCH.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1031 ABORT: 2/1R

ITEM: GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURE FLOW CONTROL VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC280-0017-0018,0024,0028

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

TWO OF THE THREE (ONE FOR EACH SSME) VALVES ARE NECESSARY TO PRESSURIZE THE ET LO2 TANK. THE ET LO2 TANK ULLAGE PRESSURE IS NECESSARY FOR EFFICIENT OPERATION OF THE SSMES (NOT ENOUGH PROPELLENT TO FINISH THE MISSION).

FLOW THROUGH BOTH ORIFICES IS NECESSARY FOR PROPER OPERATION OF THIS VALVE. CONTAMINATE PARTICLES CAN CLOG ONE AND/OR BOTH ORIFICES IN THIS VALVE. THE LOSS OF ALL REDUNDANCY DURING AN ABORT CAN LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; MPS 2102; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1032 ABORT: 2/1R

ITEM: GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURE FLOW CONTROL VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC280-0017-0018,0024,0028

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

TWO OF THE THREE (ONE FOR EACH SSME) VALVES ARE NECESSARY TO PRESSURIZE THE ET LO2 TANK. THE ET LO2 TANK ULLAGE PRESSURE IS NECESSARY FOR EFFICIENT OPERATION OF THE SSMES. GO2 FLOW THROUGH THIS VALVE IS NECESSARY TO PRESSURIZE THE ET LO2 TANK. THE LOSS OF ALL REDUNDANCY DURING AN ABORT CAN CAUSE THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/1R  
MDAC ID: 1033 ABORT: 3/1R

ITEM: GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURE FLOW CONTROL VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC280-0017-0018,0024,0028

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF THESE VALVES TO CLOSE COULD OVERPRESSURIZE THE ET LO2 TANK. THE ET LO2 TANK FAILURE WILL CAUSE THE LOSS OF THE VEHICLE IF THE ET LO2 TANK PRESSURE RELIEF VALVES ALSO FAIL (SECOND ORDER FAILURE).

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 1034 ABORT: 1/1

ITEM: GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)  
FAILURE MODE: SPONTANEOUS IGNITION IN/OF PART

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURE FLOW CONTROL VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC280-0017-0018,0024,0028

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE ON THE VALVE CAN SUPPLY ENOUGH ENERGY TO START THE VALVE ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT. (FIRE HAZARD)  
BURN THROUGH OF THIS VALVE WILL CAUSE THE LOSS OF ULLAGE PRESSURE. THE PROPELLENT CAN RUN OUT (LESS EFFICIENT SSME OPERATIONS). (LOSS OF VEHICLE DURING AN ABORT)

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; MPS 2102; SEIFASSMEO SD75-SH-0200C; PROBLEM REPORT NO AC8335-01

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1035 ABORT: 1/1

ITEM: GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)  
FAILURE MODE: SPONTANEOUS IGNITION IN/OF PART

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) SSME INTERFACE
- 4) GO2 PRESSURE FLOW CONTROL VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC280-0017-0018,0024,0028

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE ON THE VALVE CAN SUPPLY ENOUGH ENERGY TO START THE VALVE ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT. (FIRE HAZARD)  
THE VEHICLE WILL BE LOST IF THE FIRE SPREADS TO A SSME CAUSING A LARGER FIRE/EXPLOSION.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C; PROBLEM REPORT NO AC8335-01

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1041 ABORT: /NA

ITEM: LO2 FEED (ORB/ET) DISCONNECT (PD1)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 FEED (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0389-0511,0521,0161

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE MUST BE OPEN TO LOAD LO2 INTO THE ET. FAILURE OF THIS VALVE WILL PREVENT THE LOADING OF LO2 INTO THE ET. THE SUDDEN CLOSING OF THIS VALVE DURING FAST FILL WOULD RESULT IN A PRESSURE SPIKE.

THE WORST CASE IS RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770





INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/13/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1043     | ABORT:              | 1/1      |

ITEM: LO2 FEED (ORB/ET) DISCONNECT (PD1)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEED (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0389-0511,0521,0161

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LO2 MUST FLOW THROUGH THIS VALVE TO FEED THE SSMES. THE POSSIBLE RESULTS OF A FLOW INTERRUPTION INCLUDE SSME SHUT DOWN, UNCONTAINED SSME DAMAGE AND FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 1044 ABORT: 3/3

ITEM: LO2 FEED (ORB/ET) DISCONNECT (PD1)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEED (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 2/2           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0389-0511,0521,0161

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE IS CLOSED AFTER MECO TO PREVENT OUTGASSING IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE FAILURE OF THIS VALVE WILL CAUSE THE LOSS OF THE MISSION.

THIS VALVE IS ALSO CLOSED TO PREVENT CONTAMINATION OF THE MPS DURING/AFTER ENTRY.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1045 ABORT: 1/1

ITEM: LO2 FEED (ORB/ET) DISCONNECT (PD1)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEED (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0389-0511,0521,0161

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LEAKING LO2 IS A FIRE/EXPLOSION HAZARD (LOSS OF VEHICLE).

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; V070-415203

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 1046 ABORT: 3/3

ITEM: LO2 FEED (ORB/ET) DISCONNECT (PD1)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 ET INTERFACE
- 4) LO2 FEED (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 2/2      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0389-0511,0521,0161

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE IS CLOSED FOR ET SEPARATION TO LIMIT MOVEMENT OF THE ET (CAUSED BY THE BOILING LO2) DURING SEPARATION. FAILURE OF THIS VALVE WILL DELAY ET SEPARATION UNTIL TANK PRESSURE HAS DECAYED TO SAFE PRESSURE LEVEL. OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE THIS FAILURE COULD CAUSE THE LOSS OF MISSION.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFAETO SD75-SH-0130

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1051 ABORT: /NA

ITEM: GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN, EXTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) GO2 PRESSURIZATION (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0391-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS DISCONNECT PASSES GAS (HE FROM GROUND SUPPORT AND GO2 FROM THE SSME HEAT EXCHANGERS) TO PRESSURIZE THE ET LO2 TANK. IF THE ET LO2 TANK IS NOT AT THE REQUIRED ULLAGE PRESSURE, THE LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 1052 ABORT: 1/1

ITEM: GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURIZATION (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0391-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS DISCONNECT PASSES GO2 TO PRESSURIZE THE ET LO2 TANK. THE ET LO2 TANK ULLAGE PRESSURE IS NECESSARY FOR EFFICIENT OPERATION OF THE SSMES. THIS LOSS OF ULLAGE PRESSURE WILL RESULT IN NOT ENOUGH PROPELLANT TO FINISH THE MISSION.

IF THIS FAILURE OCCURS DURING THE LIFTOFF MISSION PHASE, THE MISSION WILL BE LOST. IF THIS FAILURE OCCURS DURING AN ABORT, THE VEHICLE MAY BE LOST.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1053 ABORT: 1/1

ITEM: GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURIZATION (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0391-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS DISCONNECT PASSES GO2 TO PRESSURIZE THE ET LO2 TANK. THE ET LO2 TANK ULLAGE PRESSURE IS NECESSARY FOR EFFICIENT OPERATION OF THE SSMEs (NOT ENOUGH PROPELLENT TO FINISH THE MISSION). A LO2 LEAK IS A FIRE/EXPLOSION HAZARD (LOSS OF VEHICLE).

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C; V070-415404



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/13/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/2      |
| MDAC ID:   | 1054     | ABORT:              | 1/1      |

ITEM: GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)  
FAILURE MODE: SPONTANEOUS IGNITION IN/OF PART

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURIZATION (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0391-0001

CAUSES:                      CONTAMINATION

EFFECTS/RATIONALE:

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE ON THIS PART CAN SUPPLY ENOUGH ENERGY TO START THE PART ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT. (FIRE HAZARD)  
THE BURN THROUGH OF THIS VALVE WILL CAUSE THE LOSS OF THE ET LO2 TANK ULLAGE PRESSURE. THE PROPELLENT WILL RUN OUT (LESS EFFICIENT SSME OPERATIONS). (LOSS OF VEHICLE DURING AN ABORT)

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C; PROBLEM REPORT NO. AC8335-01

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 11/13/86 **HIGHEST CRITICALITY** **HDW/FUNC**  
**SUBSYSTEM:** MPS **FLIGHT:** 1/1  
**MDAC ID:** 1055 **ABORT:** 1/1

**ITEM:** GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)  
**FAILURE MODE:** SPONTANEOUS IGNITION IN/OF PART

**LEAD ANALYST:** K.A. HOLDEN **SUBSYS LEAD:** A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) SSME INTERFACE
- 4) GO2 PRESSURIZATION (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

**REDUNDANCY SCREENS:** A [NA ] B [NA ] C [NA ]

**LOCATION:** AFT FUSELAGE  
**PART NUMBER:** MC284-0391-0001

**CAUSES:** CONTAMINATION

**EFFECTS/RATIONALE:**

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE ON THIS PART CAN SUPPLY ENOUGH ENERGY TO START THE PART ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT. THE VEHICLE WILL BE LOST IF THE FIRE SPREADS TO A SSME CAUSING A LARGER FIRE/EXPLOSION.

**REFERENCES:** VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C; PROBLEM REPORT NO. AC8335-01

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1056 ABORT: 3/3

ITEM: GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 ET INTERFACE
- 4) GO2 PRESSURIZATION (ORB/ET) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0391-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF THIS VALVE TO CLOSE WILL RESULT IN CONTAMINATION OF  
THE MPS DURING THE DEORBIT AND LANDING MISSION PHASES.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFAETO SD75-SH-0130

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 1061     | ABORT:              | /NA      |

ITEM: LO2 TANK PRE-PRESS (ORB/GND) DISC (PD9)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) FILL & DRAIN
- 4) LO2 TANK PRE-PRESS (ORB/GND) DISC
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC276-0003-0007

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE ET LO2 TANK IS PRESSURIZED WITH GROUND SUPPORT HE THROUGH THIS DISCONNECT. IF THE ET LO2 TANK IS NOT PRESSURIZED, THE LAUNCH WILL BE DELAYED.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 1062     | ABORT:              | /NA      |

ITEM: LO2 TANK PRE-PRESS (ORB/GND) DISC (PD9)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) GROUND INTERFACE
- 4) LO2 TANK PRE-PRESS (ORB/GND) DISC
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC276-0003-0007

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

THIS CHECK VALVE PREVENTS THE LOSS OF THE ET LO2 TANK ULLAGE PRESSURE THROUGH THE DISCONNECT. THE LAUNCH WILL BE DELAYED IF THE ET LO2 TANK PRESSURE FALLS BELOW LIMITS.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/13/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/2R     |
| MDAC ID:   | 1063     | ABORT:              | 2/1R     |

ITEM: LO2 TANK PRE-PRESS (ORB/GND) DISC (PD9)  
FAILURE MODE: FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) LO2 TANK PRE-PRESS (ORB/GND) DISC
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC276-0003-0007

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE ET LO2 TANK ULLAGE PRESSURE IS NECESSARY FOR THE EFFICIENT OPERATION OF THE SSMES (NOT ENOUGH PROPELLENT LEFT TO FINISH THE MISSION).  
THE LOSS OF ALL REDUNDANCY DURING THE LIFTOFF MISSION PHASE WILL CAUSE THE LOSS OF THE MISSION. THE LOSS OF ALL REDUNDANCY DURING AN ABORT MAY CAUSE THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 1064 ABORT: 2/1R

ITEM: LO2 TANK PRE-PRESS (ORB/GND) DISC (PD9)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) LO2 TANK PRE-PRESS (ORB/GND) DISC
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
A GO2 LEAK IS A FIRE/EXPLOSION HAZARD (LOSS OF VEHICLE).

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1071 ABORT: /NA

ITEM: LO2 GROUND FILL & DRAIN (ORB/GND) DISCONNECT  
(PD12)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 GROUND FILL & DRAIN (ORB/GND) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTL:  | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC274-0005-0012,0032

CAUSES: PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

LO2 IS LOADED INTO THE ET LO2 TANK THROUGH THIS DISCONNECT. THE LAUNCH WILL BE DELAYED IF THE LO2 IS NOT LOADED.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; V070-415703



**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 1072     | ABORT:              | /NA      |

ITEM: LO2 GROUND FILL & DRAIN (ORB/GND) DISCONNECT  
(PD12)  
FAILURE MODE: EXTERNAL LEAKAGE (ONTO THE ORBITER SKIN)

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 GROUND FILL & DRAIN (ORB/GND) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC274-0005-0012,0032

CAUSES:    PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

LEAKAGE AT THE GROUND/ORBITER INTERFACE OF THIS DISCONNECT CAN SPRAY LO2 ONTO THE ORBITER TPS. THIS LEAKAGE WILL CAUSE THE LAUNCH TO BE DELAYED (POTENTIAL DAMAGE TO TPS, FIRE HAZARD).

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; V070-415703

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1073     | ABORT:              | /NA      |

ITEM: LO2 GROUND FILL & DRAIN (ORB/GND) DISCONNECT (PD12)  
FAILURE MODE: EXTERNAL LEAKAGE (INTO AFT FUSELAGE)

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 GROUND FILL & DRAIN (ORB/GND) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC274-0005-0012,0032

CAUSES:    PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

SEAL FAILURE OF THIS DISCONNECT WILL SPRAY LO2 INTO THE AFT FUSELAGE. THE O2 IS A FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; V070-415703

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1081 ABORT: /NA

ITEM: LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT (PD13)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0004-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LO2 FLOWS OUT OF THIS DISCONNECT DURING THE PRELAUNCH SSME THERMAL CONDITIONING. SINCE THIS THERMAL CONDITIONING IS NECESSARY FOR SSME IGNITION, THIS FAILURE WILL DELAY THE LAUNCH.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1082 ABORT: /NA

ITEM: LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT (PD13)  
FAILURE MODE: EXTERNAL LEAKAGE (ONTO THE ORBITER SKIN)

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0004-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE AT THE GROUND/ORBITER INTERFACE OF THIS DISCONNECT CAN SPRAY LO2 ONTO THE ORBITER TPS. THIS LEAKAGE WILL CAUSE THE LAUNCH TO BE DELAYED (POTENTIAL DAMAGE TO TPS, FIRE HAZARD).

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1083 ABORT: /NA

ITEM: LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT (PD13)  
FAILURE MODE: EXTERNAL LEAKAGE (INTO AFT FUSELAGE)

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0004-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

SEAL FAILURE OF THIS DISCONNECT WILL SPRAY LO2 INTO THE AFT FUSELAGE. THE LO2 IS A FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C; V070-415305

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1084 ABORT: 2/1R

ITEM: LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT (PD13)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0004-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE PREVENTS THE VENTING OVERBOARD OF THE LO2 FROM THE SSME BLEED CHECK VALVES. THE VENTING OF THIS LO2 MAY NOT LEAVE ENOUGH PROPELLANT TO REACH ORBIT. THE LOSS OF ALL REDUNDANCY DURING THE LIFTOFF MISSION PHASE WILL CAUSE THE LOSS OF THE MISSION. THE LOSS OF ALL REDUNDANCY DURING AN ABORT MAY CAUSE THE DESTRUCTION OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 1085 ABORT: 2/1R

ITEM: LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT (PD13)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) POGO SUPPRESSION
- 4) LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0004-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE PREVENTS THE VENTING OVERBOARD OF THE LO2 (USED IN THE POGO SUPPRESSION SYSTEM) FROM THE SSME BLEED CHECK VALVES. THIS LOSS OF THE LO2 WOULD PREVENT THE PROPER OPERATION OF THE POGO SUPPRESSION SYSTEM.

THE POGO SUPPRESSION SYSTEM PREVENTS THE BUILDUP OF LOW FREQUENCY OSCILLATIONS. THE LOSS OF ALL REDUNDANCY COULD LEAD TO THE DESTRUCTION OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1091 ABORT: /NA

ITEM: GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING  
(PD15)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME276-0032-0017

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

A GO2 LEAK IS A FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1092 ABORT: 1/1

ITEM: GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING  
(PD15)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME276-0032-0017

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE AT THIS TEST POINT COUPLING CAN CAUSE THE LOSS OF THE ET LO2 TANK ULLAGE PRESSURE. THIS TANK PRESSURE IS NECESSARY FOR THE EFFICIENT OPERATION OF THE SSMES (NOT ENOUGH PROPELLENT LEFT TO FINISH THE MISSION).

A GO2 LEAK IS A FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 1093 ABORT: 1/1

ITEM: GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING  
(PD15)  
FAILURE MODE: SPONTANEOUS IGNITION IN/OF PART

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME276-0032-0017

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE ON THIS PART CAN SUPPLY ENOUGH ENERGY TO START THE PART ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT. (FIRE HAZARD)  
THE BURN THROUGH OF THIS PART WILL CAUSE THE LOSS OF THE ET LO2 TANK ULLAGE PRESSURE. THE PROPELLENT WILL RUN OUT (LESS EFFICIENT SSME OPERATIONS). (LOSS OF VEHICLE DURING AN ABORT)

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C; PROBLEM REPORT NO AC8335-01

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1094     | ABORT:              | 1/1      |

ITEM: GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING  
(PD15)  
FAILURE MODE: SPONTANEOUS IGNITION IN/OF PART

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) SSME INTERFACE
- 4) GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                ME276-0032-0017

CAUSES:                      CONTAMINATION

EFFECTS/RATIONALE:

A FIRE CAN BE STARTED BY SPONTANEOUS IGNITION OF A CONTAMINATE PARTICLE. THE IMPACT OF A CONTAMINATE PARTICLE ON THIS PART CAN SUPPLY ENOUGH ENERGY TO START THE PART ON FIRE. THIS IS A PURE O2 ATMOSPHERE EFFECT.  
THE VEHICLE WILL BE LOST IF THE FIRE SPREADS TO A SSME CAUSING A LARGER FIRE/EXPLOSION.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C; PROBLEM REPORT NO AC8335-01

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1101 ABORT: /NA

ITEM: LO2 PREVALVE (PV1, 2, 3)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 PREVALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE PREVALVES ARE OPEN DURING THE LO2 LOADING TO THERMALLY CONDITION THE SSMS. SINCE THIS THERMAL CONDITIONING IS NECESSARY FOR SSME IGNITION, THE LAUNCH WILL BE DELAYED IF THE PREVALVES DO NOT OPEN.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/2      |
| MDAC ID:   | 1102     | ABORT:              | 1/1      |

ITEM: LO2 PREVALVE (PV1, 2, 3)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 PREVALVE
- 5)
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC284-0396-0005

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE PREVALVE MUST BE OPEN FOR SSME OPERATION. THE PREMATURE CLOSURE OF A PREVALVE WILL SHUTDOWN AND POSSIBLY DAMAGE THE SSME. IF THIS FAILURE OCCURS DURING THE LIFTOFF MISSION PHASE, THE MISSION WILL BE LOST. IF THIS FAILURE OCCURS DURING AN ABORT, THE VEHICLE MAY BE LOST.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1103 ABORT: 1/1

ITEM: LO2 PREVALVE (PV1, 2, 3)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 PREVALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

A LO2 LEAK IS A FIRE/EXPLOSION HAZARD.  
THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 1104 ABORT: 2/1R

ITEM: LO2 PREVALVE (PV1, 2, 3)  
FAILURE MODE: FAILS TO RELIEVE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 PREVALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 2/2R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS CASE IS FOR THE TIME AFTER MECO AND BEFORE THE MPS DUMP. THE UNLIKE REDUNDANT PART IS THE BLEED CHECK VALVE. THE LOSS OF ALL REDUNDANCY MAY CAUSE THE PROPELLANT FEED LINE (BETWEEN THE PREVALVE AND THE SSME) TO RUPTURE.

THE RESULTING OVERPRESSURIZATION OF THE AFT FUSELAGE WILL CAUSE THE LOSS OF THE MISSION IN THE ONORBIT MISSION PHASES AND THE LOSS OF THE VEHICLE DURING THE DEORBIT PHASE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/1R  
MDAC ID: 1105 ABORT: 3/1R

ITEM: LO2 PREVALVE (PV1, 2, 3)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 DUMP & PURGE
- 4) LO2 PREVALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3           | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R          | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE PREVALVE MUST BE OPEN TO DUMP THE LO2 TRAPPED IN THE LINES.  
THE LOSS OF ALL REDUNDANCY ONORBIT WILL CAUSE THE LOSS OF THE  
MISSION (OUTGASSING MAY INTERFERE WITH SOME PAYLOADS).  
THE AFT CG LIMIT WILL BE VIOLATED IF THIS PROPELLENT IS NOT  
DUMPED. THEREFORE, THE LOSS OF ALL REDUNDANCY WILL CAUSE THE  
LOSS OF THE VEHICLE DURING THE DEORBIT PHASE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

C-2



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/27/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1106 ABORT: 3/3

ITEM: LO2 PREVALVE (PV1, 2, 3)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 DUMP & PURGE
- 4) LO2 PREVALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE PREVALVES ARE CLOSED AFTER THE DUMP TO PREVENT THE  
CONTAMINATION OF THE MPS DURING AND AFTER REENTRY. FAILURE WILL  
NOT HAVE A SIGNIFICANT EFFECT ON THE VEHICLE OR MISSION.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/27/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1107 ABORT: 1/1

ITEM: LO2 PREVALVE (PV1, 2, 3)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) SSME INTERFACE
- 4) LO2 PREVALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE RESULTS OF A PREMATURE PREVALVE CLOSURE MAY INCLUDE UPSTREAM FEEDLINE RUPTURE (CAUSED BY A EXCESSIVE SYSTEM PRESSURE SURGE), UNCONTAINED ENGINE DAMAGE, POSSIBLE MULTIPLE ENGINE DAMAGE AND/OR FIRE/EXPLOSION.

THE WORST CASE RESULT IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/27/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1108 ABORT: 1/1

ITEM: LO2 PREVALVE (PV1, 2, 3)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) SSME INTERFACE
- 4) LO2 PREVALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS FAILURE (CRITICAL DURING MECO) WILL CAUSE A LOSS OF PRESSURE AT THE LO2 PUMP INLET. THIS COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE RESULT IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 1121     | ABORT:              | /NA      |

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 FEEDLINE RELIEF SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0406-0001,0002

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE PREVENTS THE LOSS OF LO2 FROM THE FEEDLINE MANIFOLD.  
THE FAILURE OF THIS VALVE WILL DELAY THE LAUNCH.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1122 ABORT: 2/1R

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)  
FAILURE MODE: FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEEDLINE RELIEF SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0406-0001,0002

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE LOSS OF ALL REDUNDANCY DURING ASCENT WILL ALLOW THE VENTING OF LO2 THROUGH THE MANIFOLD RELIEF VALVE. POSSIBLY THERE WILL NOT BE ENOUGH PROPELLENT TO REACH ORBIT. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1123 ABORT: 1/1

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEEDLINE RELIEF SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 2/2      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0406-0001,0002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

EXTERNAL LEAKAGE OF THIS VALVE WILL SPRAY LO2 INTO THE AFT FUSELAGE. THIS LO2 IS A POTENTIAL FIRE/EXPLOSION HAZARD DURING ASCENT. THE MISSION IS LOST IN THE ONORBIT MISSION PHASES (OUTGASSING GO2 COULD INTERFERE WITH SOME PAYLOADS). THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1124 ABORT: 1/1

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 DUMP & PURGE
- 4) LO2 FEEDLINE RELIEF SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 1/1      |
| LIFTOFF:        | 3/3           | TAL:  | 1/1      |
| ONORBIT:        | 2/2           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0406-0001,0002

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE FAILURE OF THIS VALVE TO OPEN AFTER MECO WILL CAUSE THE RUPTURE OF THE LO2 FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED.  
THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1131 ABORT: /NA

ITEM: LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0007,0010,0013

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LO2 FLOWS THROUGH THIS VALVE DURING PROPELLANT LOADING. THE SUDDEN CLOSING OF THIS VALVE DURING FAST FILL WOULD RESULT IN A PRESSURE SPIKE. THE WORST CASE IS RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770





INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1133 ABORT: /NA

ITEM: LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERIOR  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0007,0010,0013

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE PROVIDES A REDUNDANT CLOSURE OF THE LO2 PROPELLENT  
FEED MANIFOLD. SINCE IT IS NECESSARY FOR THIS VALVE TO BE CLOSED  
PRIOR TO LAUNCH, THIS FAILURE WILL CAUSE THE LAUNCH TO BE  
DELAYED.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1134 ABORT: 2/1R

ITEM: LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)  
FAILURE MODE: FAILS TO REMAIN CLOSED, INTERIOR LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0007,0010,0013

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE LOSS OF ALL REDUNDANCY WILL ALLOW THE LOSS OF LO2 THROUGH THIS VALVE. THIS COULD LEAVE THE VEHICLE WITHOUT ENOUGH PROPELLENT TO REACH ORBIT.  
THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT.  
THE VEHICLE COULD BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 1135 ABORT: 2/1R

ITEM: LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)  
FAILURE MODE: EXTERIOR LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0007,0010,0013

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

EXTERIOR LEAKAGE OF THIS VALVE WILL SPRAY LO2 INTO THE AFT FUSELAGE. THERE MAY NOT BE ENOUGH PROPELLANT TO REACH ORBIT. THE O2 IS A FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1136 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 DUMP & PURGE
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0007,0010,0013

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE OPENS FOR VACUUM INERTING TO DUMP ANY REMAINING LO2 TRAPPED IN THE MPS. THIS FAILURE WILL NOT CAUSE THE LOSS OF THE VEHICLE OR OF THE MISSION.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1137 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 DUMP & PURGE
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0007,0010,0013

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE CLOSES AFTER VACUUM INERTING TO PREVENT THE  
CONTAMINATION OF THE MPS DURING REENTRY/LANDING. THIS FAILURE  
WILL NOT CAUSE THE LOSS OF THE VEHICLE OR OF THE MISSION.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1151 ABORT: /NA

ITEM: LO2 INBOARD FILL AND DRAIN VALVE (PV10)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0008,0011,0014

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LO2 FLOWS THROUGH THIS VALVE DURING PROPELLENT LOADING. THE SUDDEN CLOSING OF THIS VALVE DURING FAST FILL WOULD RESULT IN A PRESSURE SPIKE. THE WORST CASE IS RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/12/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1152     | ABORT:              | /NA      |

ITEM: LO2 INBOARD FILL AND DRAIN VALVE (PV10)  
FAILURE MODE: EXTERIOR LEAKAGE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0397-0008,0011,0014

CAUSES:    PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS FAILURE COULD SPRAY LO2 INTO THE AFT FUSELAGE.    THIS O2 IS A  
FIRE/EXPLOSION HAZARD.  
THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1153 ABORT: /NA

ITEM: LO2 INBOARD FILL AND DRAIN VALVE (PV10)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERIOR  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0008,0011,0014

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE PROVIDES A REDUNDANT CLOSURE OF THE LO2 PROPELLENT  
FEED MAINFOLD. SINCE IT IS NECESSARY FOR THIS VALVE TO BE CLOSED  
PRIOR TO LAUNCH, THIS FAILURE WILL CAUSE THE LAUNCH TO BE  
DELAYED.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1154 ABORT: 3/3

ITEM: LO2 INBOARD FILL AND DRAIN VALVE (PV10)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 DUMP & PURGE
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0008,0011,0014

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE OPENS FOR VACUUM INERTING TO DUMP ANY REMAINING LO2 TRAPPED IN THE MPS. THIS FAILURE WILL NOT CAUSE THE LOSS OF THE MISSION AND/OR VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1155 ABORT: 1/1

ITEM: LO2 INBOARD FILL AND DRAIN VALVE (PV10)  
FAILURE MODE: FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) SSME INTERFACE
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0008,0011,0014

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

OPENING OF THE INBOARD FILL AND DRAIN VALVE DURING BOOST WOULD ALLOW A GAS POCKET TO ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMEs. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN (LOSS OF VEHICLE).

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1156 ABORT: 2/1R

ITEM: LO2 INBOARD FILL AND DRAIN VALVE (PV10)  
FAILURE MODE: FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0008,0011,0014

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE LOSS OF ALL REDUNDANCY WILL ALLOW THE LOSS OF LO2 THROUGH THIS VALVE. THIS COULD LEAVE THE VEHICLE WITHOUT ENOUGH PROPELLENT TO REACH ORBIT.  
THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT.  
THE VEHICLE COULD BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1157 ABORT: 1/1

ITEM: LO2 INBOARD FILL AND DRAIN VALVE (PV10)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 OUTBOARD FILL AND DRAIN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0008,0011,0014

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

EXTERIOR LEAKAGE OF THIS VALVE WILL SPRAY LO2 INTO THE AFT FUSELAGE. THERE MAY NOT BE ENOUGH PROPELLENT TO REACH ORBIT. THE O2 IS A FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/12/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 1171     | ABORT:              | /NA      |

ITEM: LO2 BLEED SHUTOFF VALVE (PV19)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 BLEED SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0395-0035,0045,0055

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LO2 FLOWS THROUGH THIS VALVE AS PART OF THE PRELAUNCH SSME THERMAL CONDITIONING. SINCE THIS THERMAL CONDITIONING IS NECESSARY FOR SSME IGNITION, THIS FAILURE WILL CAUSE THE LAUNCH TO BE DELAYED.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1172 ABORT: /NA

ITEM: LO2 BLEED SHUTOFF VALVE (PV19)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERIOR  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 BLEED SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0035,0045,0055

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

SINCE THIS VALVE PREVENTS THE VENTING OVERBOARD OF THE LO2 FROM  
THE SSME BLEED CHECK VALVES, IT MUST BE CLOSED PRIOR TO SSME  
IGNITION. IF THIS VALVE FAILS, THE LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 1173 ABORT: 2/1R

ITEM: LO2 BLEED SHUTOFF VALVE (PV19)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERIOR  
LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 BLEED SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0035,0045,0055

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE PREVENTS THE VENTING OVERBOARD OF THE LO2 FROM THE SSME BLEED CHECK VALVES. THIS FAILURE MAY NOT LEAVE ENOUGH PROPELLENT TO REACH ORBIT. THE LOSS OF ALL REDUNDANCY DURING THE LIFTOFF MISSION PHASE WILL CAUSE THE LOSS OF THE MISSION. THE LOSS OF ALL REDUNDANCY DURING AN ABORT MAY CAUSE THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770



**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/12/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1174     | ABORT:              | 1/1      |

ITEM: LO2 BLEED SHUTOFF VALVE (PV19)  
FAILURE MODE: EXTERIOR LEAKAGE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 BLEED SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC284-0395-0035,0045,0055

CAUSES:    PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

EXTERIOR LEAKAGE OF THIS VALVE WILL SPRAY LO2 INTO THE AFT FUSELAGE. THERE MAY NOT BE ENOUGH PROPELLENT TO REACH ORBIT. THE O2 IS A FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/12/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1175     | ABORT:              | 1/1      |

ITEM: LO2 BLEED SHUTOFF VALVE (PV19)  
FAILURE MODE: FAILS TO RELIEVE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 BLEED SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 2/2           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0395-0035,0045,0055

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE INCORPORATES A RELIEF FUNCTION (AFTER MECO AND BEFORE THE MPS DUMP). FAILURE OF THIS PART COULD CAUSE THE RUPTURE OF THE LINE BETWEEN THE SHUTOFF AND DISCONNECT VALVES. THE BOILING OF THE LO2 COULD OVERPRESSURIZE THE AFT FUSELAGE CAUSING THE LOSS OF THE VEHICLE DURING REENTRY/LANDING.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/12/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1176     | ABORT:              | 1/1      |

ITEM: LO2 BLEED SHUTOFF VALVE (PV19)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) POGO SUPPRESSION
- 4) LO2 BLEED SHUTOFF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0395-0035,0045,0055

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF THIS VALVE WOULD STOP THE POGO SUPPRESSION SYSTEM.  
FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1182 ABORT: /NA

ITEM: LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV20,  
21)  
FAILURE MODE: FAILS TO OPEN, FAILS TO REMAIN OPEN

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 POGO ACCUMULATOR RECIRCULATION VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0012,0022,0032,0052

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THESE VALVES ARE OPENED JUST PRIOR TO SSME IGNITION. SINCE BOTH VALVES MUST BE OPEN FOR THE OPERATION OF THE POGO SUPPRESSION SYSTEM, THE FAILURE OF EITHER VALVE WILL DELAY THE LAUNCH.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1183 ABORT: 1/1

ITEM: LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV20,  
21)  
FAILURE MODE: EXTERIOR LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 POGO ACCUMULATOR RECIRCULATION VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0012,0022,0032,0052

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

EXTERIOR LEAKAGE OF THIS VALVE WILL SPRAY LO2 INTO THE AFT FUSELAGE. THERE MAY NOT BE ENOUGH PROPELLENT LEFT TO REACH ORBIT. THE O2 IS A FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/12/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 1184     | ABORT:              | 2/1R     |

ITEM: LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV20, 21)  
FAILURE MODE: FAILS TO RELIEVE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) SSME INTERFACE
- 4) LO2 POGO ACCUMULATOR RECIRCULATION VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0395-0012,0022,0032,0052

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THESE VALVES INCORPORATE A RELIEF FUNCTION TO PREVENT THE RUPTURE OF THE LO2 FEEDLINE (FOR THE TIME AFTER MECO AND BEFORE THE MPS DUMP).

THE CONSEQUENCES INCLUDE FIRE/EXPLOSION HAZARD AND OVERPRESSURIZATION OF THE AFT FUSELAGE. THIS COULD RESULT IN THE LOSS OF THE VEHICLE DURING REENTRY/LANDING.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770; SEIFASSMEO SD75-SH-0200C





**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/12/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/1R     |
| MDAC ID:   | 1191     | ABORT:              | 3/1R     |

ITEM: LO2 LOW LEVEL LIQUID SENSOR (MT1, 2)  
FAILURE MODE: ERRONEOUS OUTPUT (FALSE WET)

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 LOW LEVEL LIQUID SENSOR
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC432-0205-0022

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, VIBRATION

**EFFECTS/RATIONALE:**

FALSE WET SENSOR READINGS COULD ALLOW THE SSMES BURN UNTIL ALL THE PROPELLENT IS USED. THE POSSIBLE RESULTS OF A SSME RUNNING DRY INCLUDE UNCONTAINED ENGINE DAMAGE AND FIRE/EXPLOSION. THE LOSS OF ALL REDUNDANCY COULD CAUSE THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 1192 ABORT: 2/1R

ITEM: LO2 LOW LEVEL LIQUID SENSOR (MT1, 2)  
FAILURE MODE: ERRONEOUS OUTPUT (FALSE DRY)

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 LOW LEVEL LIQUID SENSOR
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC432-0205-0022

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, VIBRATION

**EFFECTS/RATIONALE:**

FALSE DRY SENSOR READINGS COULD PREMATURELY SHUT DOWN THE SSMES.  
THE LOSS OF ALL REDUNDANCY WILL CAUSE THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1201 ABORT: /NA

ITEM: LO2 SYSTEM DELTA P TRANSDUCER (MT44, 50)  
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 SYSTEM DELTA P TRANSDUCER
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC449-0164-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS COMPONENT PROVIDES AN INDIRECT MEASURE OF THE PROPELLENT LEVEL IN THE ET LO2 TANK. THE FAILURE OF THIS COMPONENT WILL DELAY THE LAUNCH.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1202 ABORT: 1/1

ITEM: LO2 SYSTEM DELTA P TRANSDUCER (MT44, 50)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) LO2 SYSTEM DELTA P TRANSDUCER
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC449-0164-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

A LO2 LEAK IS A POTENTIAL FIRE/EXPLOSION HAZARD.  
THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 1211 ABORT: 2/1R

ITEM: LO2 PREPRESS DISCONNECT CHECK VALVE TEST PORT  
(TP9)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 TANK PRESS
- 4) LO2 PREPRESS DISCONNECT CHECK VALVE TEST PORT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415446-001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE THROUGH THIS TEST PORT COULD CAUSE A LOSS OF ET LO2 TANK ULLAGE PRESSURE. BECAUSE OF THE LESS EFFICIENT SSME OPERATIONS, THERE WILL NOT BE ENOUGH PROPELLANT TO FINISH THE MISSION. THE VEHICLE MAY BE LOST DURING AN ABORT.  
AN O2 LEAK IS A POTENTIAL FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1221 ABORT: 1/1

ITEM: LO2 17 INCH ORBITER DISCONNECT TEST PORT (TP17,  
18)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROPELLANT FEED
- 4) LO2 17 INCH ORBITER DISCONNECT TEST PORT
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0389-0501, 0521

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

A LO2 LEAK IS A POTENTIAL FIRE/EXPLOSION HAZARD.  
THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 1231 ABORT: 2/1R

ITEM: LO2 FEEDLINE RELIEF TEST PORT (TP24)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROPELLANT FEED
- 4) LO2 FEEDLINE RELIEF TEST PORT
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: V070-415468-001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

A LO2 LEAK IS A POTENTIAL FIRE/EXPLOSION HAZARD.  
THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1241 ABORT: 1/1

ITEM: LO2 FEEDLINE MANIFOLD (MA1)  
FAILURE MODE: BLOCKED FLOW

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEEDLINE MANIFOLD
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0074-0005

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK (PRELAUNCH) AND FROM THE ET LO2 TANK TO THE SSMES (LIFTOFF). THE POSSIBLE EFFECTS OF BLOCKED FLOW INCLUDE PREMATURE SSME SHUT DOWN, UNCONTAINED SSME DAMAGE AND FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/14/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1242     | ABORT:              | 1/1      |

ITEM: LO2 FEEDLINE MANIFOLD (MA1)  
FAILURE MODE: RUPTURE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEEDLINE MANIFOLD
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 2/2      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC271-0074-0005

CAUSES:    PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK (PRELAUNCH) AND FROM THE ET LO2 TANK TO THE SSMES (LIFTOFF). THE SSMES WILL BE SHUT DOWN. LO2 FROM THIS RUPTURED LINE IS A FIRE/EXPLOSION HAZARD. BOILING OF THE LO2 CAN OVERPRESSURIZE AND THUS DESTROY THE AFT FUSELAGE. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1243 ABORT: 1/1

ITEM: LO2 FEEDLINE MANIFOLD (MA1)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEEDLINE MANIFOLD
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0074-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK (PRELAUNCH) AND FROM THE ET LO2 TANK TO THE SSMES (LIFTOFF). THE LEAKING LO2 IS A POTENTIAL FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/14/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 1244     | ABORT:              | 3/3      |

ITEM: LO2 FEEDLINE MANIFOLD (MA1)  
FAILURE MODE: LOSS OF INSULATION

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEEDLINE MANIFOLD
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC271-0074-0005

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK (PRELAUNCH) AND FROM THE ET LO2 TANK TO THE SSMES (LIFTOFF). THE FAILURE OF INSULATION ON THIS LINE WILL PREVENT THE PRELAUNCH PROPELLENT THERMAL CONDITIONING. THIS FAILURE WILL DELAY THE LAUNCH.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1251 ABORT: /NA

ITEM: LO2 FILL & DRAIN LINE (FH1)  
FAILURE MODE: BLOCKED FLOW

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 FILL & DRAIN LINE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0076-0002,0012

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK. IT IS NOT IN USE DURING FLIGHT.  
THE LO2 WILL NOT BE LOADED INTO THE ET LO2 TANK IF THIS LINE IS BLOCKED. THIS FAILURE WILL DELAY THE LAUNCH.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1252 ABORT: /NA

ITEM: LO2 FILL & DRAIN LINE (FH1)  
FAILURE MODE: RUPTURE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 FILL & DRAIN LINE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTL:  | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0076-0002,0012

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK. IT IS NOT IN USE DURING FLIGHT. LO2 FROM THIS RUPTURED LINE IS A POTENTIAL FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1253 ABORT: /NA

ITEM: LO2 FILL & DRAIN LINE (FH1)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 FILL & DRAIN LINE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0076-0002,0012

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK. IT IS NOT IN USE DURING FLIGHT. THE LEAKING LO2 IS A POTENTIAL FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/14/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 1254     | ABORT:              | /NA      |

ITEM: LO2 FILL & DRAIN LINE (FH1)  
FAILURE MODE: LOSS OF INSULATION

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 FILL & DRAIN
- 4) LO2 FILL & DRAIN LINE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC271-0076-0002,0012

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK. IT IS NOT IN USE DURING FLIGHT. THE FAILURE OF INSULATION ON THIS LINE WILL PREVENT THE PRELAUNCH THERMAL CONDITIONING OF THE PROPELLENT. THIS FAILURE WILL DELAY THE LAUNCH.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1261 ABORT: 1/1

ITEM: LO2 17 INCH FEEDLINE (FH2)  
FAILURE MODE: BLOCKED FLOW

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 17 INCH FEEDLINE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC274-0074-0001,0201

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK (PRELAUNCH) AND FROM THE ET LO2 TANK TO THE SSMES (LIFTOFF). THE POSSIBLE EFFECTS OF BLOCKED FLOW INCLUDE PREMATURE SSME SHUTDOWN, UNCONTAINED SSME DAMAGE AND FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/17/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1262     | ABORT:              | 1/1      |

ITEM: LO2 17 INCH FEEDLINE (FH2)  
FAILURE MODE: RUPTURE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 17 INCH FEEDLINE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 2/2           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC274-0074-0001,0201

CAUSES:    PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK (PRELAUNCH) AND FROM THE ET LO2 TANK TO THE SSMES (LIFTOFF). THE SSMES WILL BE SHUT DOWN. LO2 FROM THIS RUPTURED LINE IS A FIRE/EXPLOSION HAZARD. BOILING OF THE LO2 CAN OVERPRESSURIZE AND THUS DESTROY THE AFT FUSELAGE. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1263 ABORT: 1/1

ITEM: LO2 17 INCH FEEDLINE (FH2)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 17 INCH FEEDLINE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC274-0074-0001,0201

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK (PRELAUNCH) AND FROM THE ET LO2 TANK TO THE SSMS (LIFTOFF). THE LEAKING LO2 IS A POTENTIAL FIRE/EXPLOSION HAZARD. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1264 ABORT: 3/3

ITEM: LO2 17 INCH FEEDLINE (FH2)  
FAILURE MODE: LOSS OF INSULATION

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 17 INCH FEEDLINE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC274-0074-0001,0201

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE GROUND TO THE ET LO2 TANK (PRELAUNCH) AND FROM THE ET LO2 TANK TO THE SSMES (LIFTOFF). THE FAILURE OF INSULATION ON THIS LINE WILL PREVENT THE PRELAUNCH PROPELLENT THERMAL CONDITIONING. THIS FAILURE WILL DELAY THE LAUNCH.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1271 ABORT: 1/1

ITEM: LO2 12 INCH FEEDLINE (FH3, 4, 5)  
FAILURE MODE: BLOCKED FLOW

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 12 INCH FEEDLINE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC274-0074-0202,0302

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE 17 INCH FEEDLINE TO A SSME. THE POSSIBLE EFFECTS OF BLOCKED FLOW IN THIS LINE INCLUDE PREMATURE SSME SHUTDOWN, UNCONTAINED SSME DAMAGE AND FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1272 ABORT: 1/1

ITEM: LO2 12 INCH FEEDLINE (FH3, 4, 5)  
FAILURE MODE: RUPTURE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 12 INCH FEEDLINE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 2/2      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC274-0074-0202,0302

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE 17 INCH FEEDLINE TO A SSME. A SSME WILL BE SHUTDOWN. LO2 FROM THIS RUPTURED LINE IS A FIRE/EXPLOSION HAZARD. BOILING OF THE LO2 CAN OVERPRESSURIZE AND THUS DESTROY THE AFT FUSELAGE. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/17/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 1273     | ABORT:              | 1/1      |

ITEM: LO2 12 INCH FEEDLINE (FH3, 4, 5)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN                      SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 12 INCH FEEDLINE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC274-0074-0202,0302

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS LINE TRANSPORTS LO2 FROM THE 17 INCH FEEDLINE TO A SSME.  
THE LEAKING LO2 IS A POTENTIAL FIRE/EXPLOSION HAZARD. THE WORST  
CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM  
BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102;  
SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 1281 ABORT: 2/1R

ITEM: LO2 FEED MANIFOLD RELIEF VALVE (RV5)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) LO2 FEED MANIFOLD RELIEF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0501-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

EXTERNAL LEAKAGE OF THIS VALVE WILL SPRAY LO2 INTO THE AFT FUSELAGE. THIS LO2 IS A POTENTIAL FIRE/EXPLOSION HAZARD DURING ASCENT.

THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770





INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 1283 ABORT: 1/1

ITEM: LO2 FEED MANIFOLD RELIEF VALVE (RV5)  
FAILURE MODE: FAILS TO RELIEVE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 DUMP & PURGE
- 4) LO2 FEED MANIFOLD RELIEF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 1/1      |
| LIFTOFF:        | 3/3      | TAL:  | 1/1      |
| ONORBIT:        | 2/2      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0501-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS VALVE RELIEVES PRESSURE IN THE LO2 FEEDLINE MANIFOLD AFTER MECO. THE LO2 FEEDLINE MANIFOLD WILL RUPTURE IF ALL REDUNDANCY IS LOST.

THE AFT FUSELAGE IS OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOAD). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE (LOSS OF VEHICLE).

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1291 ABORT: 3/3

ITEM: GO2 PRESSURE MANIFOLD REPRESS ORIFICE (RP1)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 DUMP & PURGE
- 4) GO2 PRESSURE MANIFOLD REPRESS ORIFICE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | /NA      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415552-001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS ORIFICE PASSES HELIUM FROM THE PNEUMATIC HELIUM SUPPLY SYSTEM INTO THE GO2 LINES TO REPRESSURIZE THESE LINES PRIOR TO REENTRY.

THE FAILURE OF THIS PART WILL ALLOW THE CONTAMINATION OF THE MPS BY THE ATMOSPHERE DURING REENTRY. THIS WILL NOT CAUSE THE LOSS OF THE VEHICLE OR OF THE MISSION.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 1292 ABORT: 3/3

ITEM: GO2 PRESSURE MANIFOLD REPRESS ORIFICE (RP1)  
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: K.A. HOLDEN SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) O2 SUBSYSTEM
- 3) LO2 PROP FEED
- 4) GO2 PRESSURE MANIFOLD REPRESS ORIFICE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415552-001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THIS ORIFICE (AND CHECK VALVE CV12) PREVENTS THE BLEEDING OF LO2 FROM THE 17 INCH LO2 FEEDLINE INTO THE GO2 (ET LO2 TANK ULLAGE PRESSURE) SYSTEM.  
THE LOSS OF ALL REDUNDANCY WILL NOT CAUSE THE LOSS OF THE VEHICLE OR OF THE MISSION.

REFERENCES: VS70-41500X; SSSH DWG 10.11; OMRSD; BOOSTER SYSTEM BRIEFS JSC-19041; MAIN PROPULSION SYSTEM WORKBOOK MPS 2102; SHUTTLE FLIGHT OPERATIONS MANUAL JSC-12770

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2001 ABORT: 3/1R

ITEM: LH2 INBOARD FILL AND DRAIN VALVE (PV12)  
FAILURE MODE: FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 INBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | CRITICALITIES | ABORT | HDW/FUNC |
|-----------------|----------|---------------|-------|----------|
| PRELAUNCH:      | 1/1      |               | RTLS: | /NA      |
| LIFTOFF:        | 3/3      |               | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      |               | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     |               | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R     |               |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

INABILITY TO FILL LH2 TANK WILL CAUSE LAUNCH DELAY. FAILURE DURING TANK FILL MAY CAUSE RUPTURE OF FILL LINE, RELEASING LH2 AND CREATING A FIRE/EXPLOSION HAZARD. INABILITY TO DUMP RESIDUAL LH2 WOULD ALLOW HYDROGEN TO MIX WITH ATMOSPHERIC OXYGEN DURING ENTRY OR ON THE GROUND, FORMING AN EXPLOSIVE MIXTURE. VALVE IS NOT REQUIRED TO OPEN DURING RTLS. VACUUM INERTING PROCEDURE SERVES AS A REDUNDANCY.

REFERENCES: JSC-19041, BOOSTER SYSTEMS BRIEFS; VS70-41500X

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: MPS FLIGHT: 1/1  
 MDAC ID: 2002 ABORT: 1/1

ITEM: LH2 INBOARD FILL AND DRAIN VALVE (PV12)  
 FAILURE MODE: FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 INBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
 PART NUMBER: MC284-0397-0015

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

PREIGNITION FAILURE WILL CAUSE LAUNCH DELAY, OR, IF ALL REDUNDANCY FAILS, THE VEHICLE CAN BE DESTROYED BY FIRE/EXPLOSION OF ESCAPING LH2. FAILURE AFTER ENGINE START WILL ALLOW A GAS POCKET TO ENTER THE FEEDLINE, RESULTING IN ENGINE PUMP CAVITATION AND EXPLOSION OF THE ENGINE(S). IF THE O/B VALVE ALSO FAILS, LH2 WILL ESCAPE THE VEHICLE, RESULTING IN A LOW LEVEL SHUTDOWN BEFORE GUIDANCE INITIATED MECO AND/OR CREATION OF AN EXPLOSIVE MIXTURE OF H2 AND ATMOSPHERIC O2 OUTSIDE THE VEHICLE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/1R  
MDAC ID: 2003 ABORT: 3/1R

ITEM: LH2 INBOARD FILL AND DRAIN VALVE (PV12)  
FAILURE MODE: FAIL TO OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 INBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | 3/3           | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: CONTAMINATION, BINDING, PEICE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

INABILITY TO FILL TANK WILL CAUSE LAUNCH DELAY. NO REDUNDANCY FOR PRELAUNCH PHASE. LOSS OF ALL REDUNDANCY WOULD MAKE DUMPING LH2 RESIDUALS IMPOSSIBLE. VENTING H2 GAS COULD CREATE AN EXPLOSIVE MIXTURE WITH ATMOSPHERIC O2 DURING DEORBIT AND LANDING. THE VALVE IS NOT REQUIRED TO OPEN DURING RTLS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/1R  
MDAC ID: 2004 ABORT: 3/1R

ITEM: LH2 INBOARD FILL AND DRAIN VALVE (PV12)  
FAILURE MODE: FAIL TO CLOSE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 INBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: CONTAMINATION, BINDING, PEICE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAIL TO CLOSE PRELAUNCH WOULD CAUSE LAUNCH DELAY. FAILURE TO CLOSE 6 SEC AFTER MPS DUMP START WOULD ALLOW H2 TO FREEZE IN THE FILL AND DRAIN LINE, PREVENTING A NORMAL DUMP. NO REDUNDANCY TO PREVENT FREEZE-UP, BUT ALTERNATE PATHS EXIST TO DUMP REMAINING LIQUID H2. LOSS OF REDUNDANCY WOULD TRAP H2, WHICH COULD ESCAPE DURING ENTRY AND LANDING TO CREATE AN EXPLOSIVE MIXTURE WITH ATMOSPHERIC OXYGEN.

REFERENCES: JSC-19041; BOOSTER SYSTEMS BRIEFS, VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2005 ABORT: 1/1

ITEM: LH2 INBOARD FILL AND DRAIN VALVE (PV12)  
FAILURE MODE: FAIL TO RELIEVE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 INBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | /NA           | AOA:  | 1/1      |
| DEORBIT:        | /NA           | ATO:  | 1/1      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: CONTAMINATION, BINDING

EFFECTS/RATIONALE:

FAILURE TO RELIEVE WILL ALLOW PRESSURE BUILDUP FROM BOILOFF OF RESIDUAL LH2. EFFECT OF THIS FAILURE IS POSSIBLE RUPTURE OF LH2 FILL LINE. MPS DUMP WILL RELIEVE ANY PRESSURE BUILDUP. FAILURE MODE IS NA AFTER MPS INERTING SINCE THE VALVE IS THEN LEFT OPEN FOR THE REMAINDER OF THE FLIGHT. NO REDUNDANCY FOR THIS MODE.

REFERENCES: JSC-19041; BOOSTER SYSTEMS BRIEFS; MC271-0076



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2006 ABORT: 3/3

ITEM: LH2 INBOARD FILL AND DRAIN VALVE (PV12)  
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 INBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURE  
FAILURE

EFFECTS/RATIONALE:

LAUNCH MAY BE DELAYED IF INDICATOR FAILS PRELAUNCH. FAILURE  
AFTER LIFTOFF IS CRIT 3. LH2 MANIFOLD PRESSURE TRANSDUCER COULD  
BE CONSIDERED REDUNDANT FOR SOME PORTIONS OF FLIGHT SUCH AS MPS  
VACUUM INERTING. LEVEL SENSORS ARE A REDUNDANCY FOR  
PRELAUNCH.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2007 ABORT: 1/1

ITEM: LH2 INBOARD FILL AND DRAIN VALVE (PV12)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 INBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: MECHANICAL SHOCK, VIBRATION, PROCEDURAL ERROR, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD ON THE PAD AND WHILE STILL IN THE ATMOSPHERE DURING POWERED FLIGHT. NO HAZARD AFTER MPS DUMP AND PURGE.

REFERENCES: V070-415702

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2011 ABORT: 1/1

ITEM: LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)  
FAILURE MODE: FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 OUTBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | /NA      |
| LIFTOFF:        | 3/3           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

INABILITY TO FILL TANK WILL CAUSE LAUNCH DELAY. FAILURE DURING  
TANK FILL MAY CAUSE RUPTURE OF FILL LINE, RELEASING LH2 AND  
CREATING A FIRE/EXPLOSION HAZARD. INABILITY TO DUMP RESIDUAL LH2  
WOULD ALLOW VENTING GH2 TO COMBINE WITH ATMOSPHERIC OXYGEN AND  
CREATE AN EXPLOSIVE MIXTURE DURING ENTRY AND LANDING.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 2012 ABORT: 2/1R

ITEM: LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)  
FAILURE MODE: FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 OUTBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. LOSS OF REDUNDANCY DURING PRELAUNCH WILL ALLOW LH2 TO FLOW OUT THE FILL LINE, CREATING A FIRE/EXPLOSION HAZARD. SECOND FAILURE DURING POWERED FLIGHT (LOSS OF ALL REDUNDANCY) WILL ALLOW LH2 TO ESCAPE, CAUSING ENGINE SHUTDOWN PRIOR TO GUIDANCE INITIATED MECO. INBOARD VALVE HAS POSITION INDICATOR SO LOSS OF REDUNDANCY IS READILY DETECTABLE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/06/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2013     | ABORT:              | 1/1      |

ITEM: LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)  
FAILURE MODE: FAIL TO OPEN

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 OUTBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | 3/3           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0397-0015

CAUSES:    CONTAMINATION, BINDING, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

INABILITY TO FILL TANK WILL CAUSE LAUNCH DELAY. INABILITY TO DUMP RESIDUAL LH2 WOULD ALLOW GH2 VENTING DURING ENTRY AND LANDING TO CREATE AN EXPLOSIVE MIXTURE WITH ATMOSPHERIC O2. THE VALVE IS NOT REQUIRED TO OPEN DURING AN RTLS.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2014 ABORT: 2/1R

ITEM: LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)  
FAILURE MODE: FAIL TO CLOSE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 OUTBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: CONTAMINATION, BINDING, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. LOSS OF REDUNDANCY OR SECOND FAILURE DURING TAL WILL ALLOW H2 TO CONTINUE ESCAPING THE VEHICLE, COMBINE WITH ATMOSPHERIC OXYGEN AND CREATE A FIRE/EXPLOSION HAZARD. NORMAL TAL DUMP IS ONLY A PARTIAL ONE. LOSS OF REDUNDANCY IS READILY DETECTABLE VIA VALVE POSITION INDICATORS. THE VALVE DOES NOT OPEN DURING RTLS.

REFERENCES: JSC-19041

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2015 ABORT: 3/3

ITEM: LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)  
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 OUTBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. THIS FUNCTION CAN BE  
CONSIDERED TO HAVE REDUNDANCY FOR SOME FLIGHT PHASES OR EVENTS.  
IF THE LEVEL SENSORS INDICATE THE LH2 TANK IS FILLING, THE VALVE  
IS SURELY OPEN. IF LH2 MANIFOLD PRESSURE DROPS DURING  
SCHEDULED TIME FOR LH2 DUMP, THE VALVE MUST BE OPEN. NO  
REDUNDANCY FOR MAIN ENGINE ASCENT PHASE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2016 ABORT: 1/1

ITEM: LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 OUTBOARD FILL AND DRAIN VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0397-0015

CAUSES: MECHANICAL SHOCK, VIBRATION, PROCEDURAL ERROR, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 CAN LEAD TO A FIRE OR EXPLOSION DURING POWERED FLIGHT OR WHILE STILL ON THE PAD. NO HAZARD AFTER MPS DUMP AND PURGE.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2021 ABORT: 1/1

ITEM: LH2 FILL AND DRAIN LINE (FH6)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 FILL AND DRAIN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 1/1      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0076-0021

CAUSES: OVERPRESSURIZATION

EFFECTS/RATIONALE:

NO REDUNDANCY TO PREVENT OR LIMIT DAMAGE TO OTHER SYSTEM COMPONENTS FROM CATASTROPHIC FAILURE. DAMAGE TO OTHER SYSTEMS CAN DESTROY THE VEHICLE. THE FAILURE COULD ONLY OCCUR AS A RESULT OF A PREVIOUS FAILURE OF THE RELIEF VALVE BUILT INTO THE I/B FILL AND DRAIN VALVE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2022 ABORT: 3/3

ITEM: LH2 FILL AND DRAIN LINE (FH6)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 FILL AND DRAIN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0076-0021

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL PREVENT TANK FILL AT SCHEDULED RATES.  
LAUNCH DELAY TO CLEAR LINE WILL BE NECESSARY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2023 ABORT: 3/3

ITEM: LH2 FILL AND DRAIN LINE (FH6)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 FILL AND DRAIN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0076-0021

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WILL ALLOW LH2 TEMPERATURE TO INCREASE DURING LOADING.  
IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL BE PREVENTED  
AND LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2031 ABORT: 1/1

ITEM: LH2 GROUND FILL AND DRAIN (ORB/GND) DISCONNECT  
(ORBITER HALF) (PD11)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 GROUND FILL AND DRAIN (ORB/GND) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 3/3           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0005-0041,-0021

CAUSES: CONTAMINATION, PROCEDURAL ERROR, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD. LEAKING LH2 CAN DAMAGE TPS TILES AND CAUSE LOSS OF VEHICLE DURING ENTRY. LEAKAGE WILL ONLY OCCUR PRELAUNCH.

REFERENCES: VS70-41500X, JSC-19041, BOOSTER SYSTEMS BRIEFS

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2041 ABORT: 1/1

ITEM: LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORB HALF)  
(PD17)  
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0004-0003

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF LH2 IS A FIRE/EXPLOSION HAZARD. LEAKING RESIDUAL  
HYDROGEN DURING POWERED ASCENT CAN COMBINE WITH ATMOSPHERIC  
OXYGEN AND CREATE AN EXPLOSIVE MIXTURE. LEAKING LH2 DURING  
PRELAUNCH CAN DAMAGE TPS TILES AND CAUSE LOSS OF VEHICLE DURING  
ENTRY.

REFERENCES: VS70-41500X

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|                |                     |          |
|----------------|---------------------|----------|
| DATE:          | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: MPS | FLIGHT:             | 2/1R     |
| MDAC ID: 2042  | ABORT:              | 2/1R     |

ITEM: LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORB HALF)  
(PD17)  
FAILURE MODE: FAIL TO CLOSE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

|                     | <b>CRITICALITIES</b> |              |                 |
|---------------------|----------------------|--------------|-----------------|
| <b>FLIGHT PHASE</b> | <b>HDW/FUNC</b>      | <b>ABORT</b> | <b>HDW/FUNC</b> |
| PRELAUNCH:          | 2/2R                 | RTLS:        | 2/1R            |
| LIFTOFF:            | 2/1R                 | TAL:         | 2/1R            |
| ONORBIT:            | 3/3                  | AOA:         | 2/1R            |
| DEORBIT:            | 3/3                  | ATO:         | 2/1R            |
| LANDING/SAFING:     | 3/3                  |              |                 |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ F ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC276-0004-0003

**CAUSES:**    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

VALVE IS EXPECTED TO CLOSE PRELAUNCH AND REMAIN CLOSED. FAILURE SHOULD CAUSE LAUNCH DELAY. LOSS OF REDUNDANCY WILL ALLOW LH2 TO ESCAPE THE VEHICLE DURING ASCENT RESULTING IN LOSS OF VEHICLE. IF NOMINAL ORBIT IS ACHIEVED, REMAINING H2 WILL BE VENTED AND BE OF NO FURTHER CONSEQUENCE.

REFERENCES:    VS70-41500X, VO70-415610

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|                |                     |          |
|----------------|---------------------|----------|
| DATE:          | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: MPS | FLIGHT:             | 2/1R     |
| MDAC ID: 2043  | ABORT:              | 2/1R     |

ITEM: LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORB HALF)  
(PD17)  
FAILURE MODE: FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ F ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC276-0004-0003

CAUSES:    PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

PRELAUNCH FAILURE SHOULD CAUSE LAUNCH DELAY. SECOND FAILURE, OR LOSS OF ALL REDUNDANCY WILL ALLOW ESCAPE OF LH2 FROM THE MAIN FEEDLINE DURING ASCENT. ENGINES COULD CUTOFF EARLY OR EXPLODE BECAUSE OF LOW PUMP INLET PRESSURE.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/15/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2044 ABORT: /NA

ITEM: LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORB HALF)  
(PD17)  
FAILURE MODE: FAIL TO OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0004-0003

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
FAILURE TO OPEN PRELAUNCH WILL PRECLUDE LIFTOFF. NOT REQUIRED TO  
OPEN IN ANY OTHER PHASE.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/15/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/1R  
MDAC ID: 2051 ABORT: 3/1R

ITEM: LH2 REPLENISH VALVE (PV13)  
FAILURE MODE: FAIL TO OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 REPLENISH VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0021,-0031,-0041,-0051

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE PRELAUNCH WILL CAUSE LAUNCH DELAY. LOSS OF ALL REDUNDANCY WILL PRECLUDE LH2 DUMP. HYDROGEN COULD THEN ESCAPE THE VEHICLE THROUGH THE RELIEF VALVE DURING ENTRY AND LANDING, CREATING AN EXPLOSIVE MIXTURE WITH ATMOSPHERIC OXYGEN. THE VALVE IS NOT REQUIRED TO OPEN DURING RTLS.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/15/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/1R  
MDAC ID: 2053 ABORT: 3/1R

ITEM: LH2 REPLENISH VALVE (PV13)  
FAILURE MODE: FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 REPLENISH VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | 3/3           | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0021,-0031,-0041,-0051

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. LOSS OF ALL REDUNDANCY WIL PREVENT LH2 DUMP. RESIDUAL H2 WILL ESCAPE THROUGH THE RELIEF VALVE THROUGHOUT THE REMAINDER OF THE FLIGHT. THIS IS A HAZARD DURING ENTRY AND LANDING, WHEN THE H2 CAN COMBINE WITH ATMOSPHERIC OXYGEN.

REFERENCES: JSC-19041, BOOSTER SYSTEMS BRIEFS; VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/15/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 2054 ABORT: 2/1R

ITEM: LH2 REPLENISH VALVE (PV13)  
FAILURE MODE: FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 REPLENISH VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0021,-0031,-0041,-0051

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. LOSS OF ALL REDUNDANCY, OR SECOND FAILURE, WILL ALLOW LH2 TO DUMP OVERBOARD DURING POWERED FLIGHT, RESULTING IN LOSS OF VEHICLE.

REFERENCES: SSSH; VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/15/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2055 ABORT: 1/1

ITEM: LH2 REPLENISH VALVE (PV13)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 REPLENISH VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0021,-0031,-0041,-0051

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE IS A FIRE/EXPLOSION HAZARD. LEAKAGE OF RESIDUAL H2 DURING POWERED FLIGHT CAN CREATE AN EXPLOSIVE MIXTURE WITH ATMOSPHERIC OXYGEN. NO REDUNDANCY FOR THIS MODE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2061 ABORT: 3/3

ITEM: LH2 HI POINT BLEED VALVE (PV22)  
FAILURE MODE: FAIL TO REMAIN OPEN, FAIL TO OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0023,-0033,-0043,-0053

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. IF LAUNCH OCCURS,  
THIS FAILURE WILL HAVE NO HARMFUL EFFECTS. NO REDUNDANCY FOR  
THIS FAILURE MODE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/16/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 2062     | ABORT:              | 2/1R     |

ITEM: LH2 HI POINT BLEED VALVE (PV22)  
FAILURE MODE: FAIL TO REMAIN CLOSED, FAIL TO CLOSE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ F ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0395-0023,-0033,-0043,-0053

CAUSES:    PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. SECOND FAILURE, OR LOSS OF ALL REDUNDANCY, WOULD ALLOW LH2 TO ESCAPE THROUGH THE BLEED DISCONNECT AND CAUSE LOSS OF VEHICLE, ON THE PAD OR DURING POWERED ASCENT, BY FIRE OR EXPLOSION.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2063 ABORT: 1/1

ITEM: LH2 HI POINT BLEED VALVE (PV22)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0023,-0033,-0043,-0053

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 CAN CREATE AN EXPLOSIVE MIXTURE WITH ATMOSPHERIC O2 BEFORE LAUNCH OR DURING POWERED ASCENT. POSSIBLE DESTRUCTION OF THE VEHICLE.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2071 ABORT: 1/1

ITEM: LH2 SYSTEM DELTA-P TRANSDUCER (MT44, MT50)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 SYSTEM DELTA-P TRANSDUCER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC449-0164-0002

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKING HYDROGEN IS A(N) FIRE/EXPLOSION HAZARD. POSSIBLE  
DESTRUCTION OF THE VEHICLE.

REFERENCES: VS70-415007

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2072 ABORT: 3/3

ITEM: LH2 SYSTEM DELTA-P TRANSDUCER (MT44, MT50)  
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 SYSTEM DELTA-P TRANSDUCER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC449-0164-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THE TRANSDUCER IS ONLY USED DURING PRELAUNCH. FAILURE CAN CAUSE LAUNCH DELAY. LOSS OF ALL REDUNDANCY WILL CAUSE LAUNCH DELAY. IF LAUNCH OCCURS, FAILURE WILL HAVE NO EFFECT ON OTHER PHASES.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2081 ABORT: 1/1

ITEM: LH2 HI POINT BLEED LINE (FH19)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 1/1           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0010

CAUSES: OVERPRESSURIZATION

EFFECTS/RATIONALE:

RUPTURE OF THE LINE CAN CAUSE DAMAGE TO OTHER COMPONENTS LEADING TO THE POSSIBLE DESTRUCTION OF THE VEHICLE. ESCAPING HYDROGEN IS ALSO A HAZARD.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2082 ABORT: 3/3

ITEM: LH2 HI POINT BLEED LINE (FH19)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SUBSYSTEM
- 3) LH2 HI POINT BLEED LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0010

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
FAILURE WILL CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2083 ABORT: 1/1

ITEM: LH2 HI POINT BLEED LINE (FH19)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 FILL AND DRAIN SYSTEM
- 3) LH2 HI POINT BLEED LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0010

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD SPEED UP BOILOFF OF RESIDUAL LH2 IN THE LINE. THE  
INCREASING PRESSURE MAY CAUSE THE LINE TO BURST, RESULTING IN  
LOSS OF VEHICLE. NO HAZARD AFTER MPS DUMP & PURGE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2091 ABORT: /NA

ITEM: LH2 RECIRCULATION DISCONNECT VALVE (PD3)  
FAILURE MODE: FAIL TO OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION (ORB/ET) DISCONNECT VALVE (ORB HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0390-0005,-0006,-0016,-0026

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WOULD NOT ALLOW RECIRCULATION TO BEGIN AND WOULD FORCE A LAUNCH DELAY. THE VALVE IS NOT COMMANDED TO OPEN IN ANY OTHER PHASE. NO REDUNDANCY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/20/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2092 ABORT: 3/3

ITEM: LH2 RECIRCULATION DISCONNECT VALVE (PD3)  
FAILURE MODE: FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION (ORB/ET) DISCONNECT VALVE (ORB HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0390-0005,-0006,-0016,-0026

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE BEFORE LAUNCH WILL CAUSE LAUNCH DELAY. IF LH2 RECIRCULATION AND TOPPING ARE ACCOMPLISHED BEFORE THE FAILURE, IT WILL HAVE NO IMPACT ON THE MISSION.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2093 ABORT: 1/1

ITEM: LH2 RECIRCULATION DISCONNECT VALVE (PD3)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION (ORB/ET) DISCONNECT VALVE (ORB HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0390-0005,-0006,-0016,-0026

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

IF THE VALVE IS NOT CLOSED AT ET SEP, THE THRUST OF ESCAPING LH2 CAN CAUSE RECONTACT WITH THE ET AND LOSS OF THE ORBITER. IF RECONTACT DAMAGE IS LIMITED TO TPS TILES, THE ORBITER CAN BE DESTROYED DURING ENTRY. AERO FORCES WILL PREVENT RECONTACT AFTER A RTLS ET SEP.

REFERENCES: VS70-41500X



**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/17/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2094     | ABORT:              | 1/1      |

ITEM: LH2 RECIRCULATION DISCONNECT VALVE (PD3)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION (ORB/ET) DISCONNECT VALVE (ORB HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0390-0005,-0006,-0016,-0026

CAUSES:    MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD, ON THE PAD OR IN  
POWERED ASCENT. LEAKING LH2 CAN DAMAGE TPS TILES AND CAUSE LOSS  
OF VEHICLE DURING ENTRY.

REFERENCES:

C-3

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/20/86  
 SUBSYSTEM: MPS  
 MDAC ID: 2101

HIGHEST CRITICALITY HDW/FUNC  
 FLIGHT: 3/3  
 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP VALVE (PV14, PV15, PV16)  
 FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]      B [NA ]      C [NA ]

LOCATION:            AFT FUSELAGE  
 PART NUMBER:    MC284-0395-0021,-0031,-0041,-0051

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. IF LAUNCH OCCURS, THIS FAILURE WILL HAVE NO EFFECT ON THE MISSION.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/20/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2102 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP VALVE (PV14, PV15, PV16)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0021,-0031,-0041,-0051

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE CAN CAUSE LAUNCH DELAY. IF LAUNCH OCCURS, THIS FAILURE WILL HAVE NO HARMFUL EFFECT.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/20/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2103 ABORT: 1/1

ITEM: LH2 RECIRCULATION PUMP VALVE (PV14, PV15, PV16)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0021,-0031,-0041,-0051

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD PRELAUNCH AND DURING  
POWERED ASCENT WHEN THE VEHICLE IS STILL IN THE ATMOSPHERE. NO  
HAZARD AFTER MPS DUMP AND PURGE.

REFERENCES: VA70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/20/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2111 ABORT: 1/1

ITEM: LH2 PRESTART CONDITIONING MANIFOLD (MA3)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING MANIFOLD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 1/1      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0017

CAUSES: OVERPRESSURIZATION

EFFECTS/RATIONALE:

BURST OF A LINE CAN POTENTIALLY DAMAGE OTHER COMPONENTS AND LEAD TO DESTRUCTION OF THE VEHICLE OR LOSS OF LIFE. ESCAPING HYDROGEN IS ALSO A HAZARD.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/20/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2112 ABORT: 1/1

ITEM: LH2 PRESTART CONDITIONING MANIFOLD (MA3)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING MANIFOLD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0017

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD ON THE PAD AND WHILE STILL IN THE ATMOSPHERE DURING POWERED FLIGHT. NO HAZARD AFTER MPS DUMP AND PURGE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2113 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING MANIFOLD (MA3)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING MANIFOLD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0017

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
FAILURE MAY CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2114 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING MANIFOLD (MA3)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING MANIFOLD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0017

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW LH2 TEMPERATURE TO INCREASE DURING PRESTART  
CONDITIONING. IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL  
BE PREVENTED, AND LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2121 ABORT: 1/1

ITEM: LH2 PRESTART CONDITIONING PUMP LINE (FH11, FH13,  
FH15)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING PUMP LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 1/1           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0011,-0012,-0013

CAUSES: OVERPRESSURIZATION

EFFECTS/RATIONALE:

BURST OF THE LINE CAN DAMAGE OTHER COMPONENTS AND LEAD TO LOSS OF LIFE OR VEHICLE. ESCAPING HYDROGEN IS ALSO A HAZARD.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2122 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING PUMP LINE (FH11, FH13,  
FH15)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING PUMP LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0011,-0012,-0013

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
FAILURE MAY CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2123 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING PUMP LINE (FH11, FH13,  
FH15)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING PUMP LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0011,-0012,-0013

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW LH2 TEMPERATURE TO INCREASE DURING PRESTART  
CONDITIONING. IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL  
BE PREVENTED, AND LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/21/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2131 ABORT: 1/1

ITEM: LH2 PRESTART CONDITIONING RETURN LINE (FH12, FH14,  
FH16)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING RETURN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 1/1      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0015,-0016,-0024

CAUSES: OVERPRESSURIZATION

EFFECTS/RATIONALE:

RUPTURE OF THE LINE CAN DAMAGE OTHER COMPONENTS AND LEAD TO LOSS OF LIFE OR VEHICLE IN ANY FLIGHT PHASE. ESCAPING H2 WOULD BE A FIRE/EXPLOSION HAZARD DURING PRELAUNCH OR MPS ASCENT.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/21/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2132 ABORT: 1/1

ITEM: LH2 PRESTART CONDITIONING RETURN LINE (FH12, FH14,  
FH16)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING RETURN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0015,-0016,-0024

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD ON THE PAD OR DURING  
POWERED FLIGHT. NO HAZARD AFTER MPS DUMP AND PURGE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/21/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2133 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING RETURN LINE (FH12, FH14,  
FH16)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING RETURN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0015,-0016,-0024

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
FAILURE MAY CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2134 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING RETURN LINE (FH12, FH14,  
FH16)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING RETURN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0015,-0016,-0024

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW LH2 TEMPERATURE TO INCREASE DURING PRESTART  
CONDITIONING. IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL  
BE PREVENTED, AND LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/21/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2141 ABORT: 1/1

ITEM: LH2 PRESTART CONDITIONING REPLENISH LINE (FH17)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING REPLENISH LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 1/1      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0019

CAUSES: OVERPRESSURIZATION

EFFECTS/RATIONALE:

RUPTURE OF THE LINE CAN DAMAGE OTHER PARTS AND CAUSE LOSS OF LIFE OR VEHICLE. ESCAPING HYDROGEN IS ALSO A HAZARD.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2142 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING REPLENISH LINE (FH17)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING REPLENISH LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0019

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
FAILURE MAY CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2143 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING REPLENISH LINE (FH17)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING REPLENISH LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0019

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW LH2 TEMPERATURE TO INCREASE DURING  
REPLENISHMENT. IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL  
BE PREVENTED, AND LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/21/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2151 ABORT: 1/1

ITEM: LH2 PRESTART CONDITIONING RETURN LINE (FH18)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING RETURN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 1/1      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0018

CAUSES: OVERPRESSURIZATION

EFFECTS/RATIONALE:

RUPTURE OF THE LINE CAN CAUSE DAMAGE TO OTHER PARTS THAT COULD LEAD TO LOSS OF LIFE OR VEHICLE. ESCAPING HYDROGEN IS ALSO A HAZARD.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2152 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING RETURN LINE (FH18)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING RETURN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0018

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
FAILURE MAY CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2153 ABORT: 3/3

ITEM: LH2 PRESTART CONDITIONING RETURN LINE (FH18)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 PRESTART CONDITIONING RETURN LINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0075-0018

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW LH2 TEMPERATURE TO INCREASE DURING PRESTART  
CONDITIONING. IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL  
BE PREVENTED, AND LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/21/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2161     | ABORT:              | 1/1      |

ITEM: LH2 RECIRCULATION MANIFOLD RELIEF VALVE (RV7)  
FAILURE MODE: FAIL TO OPEN (RELIEVE)

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION MANIFOLD RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0474-0002, -0003

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW RUPTURE OF LH2 PRESTART CONDITIONING RETURN LINES, REPLENISH LINE OR MANIFOLD DURING THE PERIOD FROM MECO + 2 SEC (CLOSING OF LH2 RECIRCULATION DISCONNECT VALVE) TO OMS-1 IGNITION + 6 SEC (OPENING OF TOPPING VALVE) WHEN THESE LINES ARE ISOLATED.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/22/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 2162     | ABORT:              | 3/3      |

ITEM: LH2 RECIRCULATION MANIFOLD RELIEF VALVE (RV7)  
FAILURE MODE: FAIL TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION MANIFOLD RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0474-0002, -0003

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
NO HAZARDOUS EFFECTS.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2163 ABORT: 1/1

ITEM: LH2 RECIRCULATION MANIFOLD RELIEF VALVE (RV7)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION MANIFOLD RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0474-0002, -0003

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD WHEN THE VEHICLE IS IN THE ATMOSPHERE. NO HAZARD AFTER MPS DUMP & PURGE.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2164 ABORT: 3/3

ITEM: LH2 RECIRCULATION MANIFOLD RELIEF VALVE (RV7)  
FAILURE MODE: FAIL TO CLOSE (RESEAT)

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION MANIFOLD RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0474-0002, -0003

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
NO HAZARDOUS EFFECTS.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/21/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2171 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP (PP1, PP2, PP3)  
FAILURE MODE: INADVERTENT OPERATION

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC281-0030-0001

CAUSES: INADVERTENT ACTIVATION, PROCEDURAL ERROR, IMPROPER INPUT

EFFECTS/RATIONALE:

PRELAUNCH FAILURE MAY CAUSE LAUNCH DELAY. FAILURE IN OTHER  
FLIGHT PHASES IS NOT HAZARDOUS.

REFERENCES: VS70-41500X

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

DATE: 10/21/86 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: MPS FLIGHT: 3/3  
 MDAC ID: 2172 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP (PP1, PP2, PP3)  
 FAILURE MODE: INTERMITTENT OPERATION, ERRATIC OPERATION

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
 PART NUMBER: MC281-0030-0001

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
 FAILURE DURING PRELAUNCH RECIRCULATION COULD CAUSE LAUNCH DELAY.  
 NO EFFECT ON OTHER PHASES.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/21/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 2173     | ABORT:              | 3/3      |

ITEM: LH2 RECIRCULATION PUMP (PP1, PP2, PP3)  
FAILURE MODE: FAIL TO START

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC281-0030-0001

CAUSES:    MECHANICAL SHOCK, CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PUMP IS USED ONLY DURING PRELAUNCH. FAILURE WILL CAUSE LAUNCH DELAY. IF ONE PUMP FAILS, THE REMAINING PUMPS COULD PROVIDE ADEQUATE CONDITIONING IF THE PREVALVE CORRESPONDING TO THE FAILED PUMP IS OPENED. LOSS OF ALL REDUNDANCY IS POSSIBLE BECAUSE ALL THREE PUMPS ARE CONTAINED IN A SINGLE PACKAGE.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2174 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP (PP1, PP2, PP3)  
FAILURE MODE: FAIL TO STOP

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC281-0030-0001

CAUSES: PROCEDURAL ERROR, IMPROPER INPUT, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
FAILURE WILL CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/21/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2175 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP (PP1, PP2, PP3)  
FAILURE MODE: PREMATURE OPERATION

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC281-0030-0001

CAUSES: PROCEDURAL ERROR, INADVERTENT ACTIVATION

EFFECTS/RATIONALE:  
FAILURE COULD CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2176 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP (PP1, PP2, PP3)  
FAILURE MODE: DELAYED OPERATION

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |           |
|-----------------|---------------|-----------|
|                 | HDW/FUNC      | ABORT     |
| PRELAUNCH:      | 3/3           | RTLS: 3/3 |
| LIFTOFF:        | 3/3           | TAL: 3/3  |
| ONORBIT:        | 3/3           | AOA: 3/3  |
| DEORBIT:        | 3/3           | ATO: 3/3  |
| LANDING/SAFING: | 3/3           |           |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC281-0030-0001

CAUSES: PROCEDURAL ERROR, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
FAILURE COULD CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2177 ABORT: 1/1

ITEM: LH2 RECIRCULATION PUMP (PP1, PP2, PP3)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION PUMP (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC281-0030-0001

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD. NO HAZARD AFTER MPS  
DUMP & PURGE.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2181 ABORT: 3/3

ITEM: LH2 PRE-PRESS CHECK VALVE (CV17)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) LH2 TANK PRE-PRESS CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

INABILITY TO PRE-PRESSURIZE THE LH2 TANK WILL CAUSE LAUNCH DELAY.  
THE VALVE IS NOT NORMALLY OPEN IN ANY OTHER PHASE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 2182 ABORT: 2/1R

ITEM: LH2 PRE-PRESS CHECK VALVE (CV17)  
FAILURE MODE: FAIL TO CLOSE (RESEAT), FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) LH2 TANK PRE-PRESS CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ F ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

SECOND FAILURE WILL ALLOW ULLAGE PRESSURE TO BE LOST, RESULTING IN LAUNCH DELAY DURING PRELAUNCH OR LOSS OF VEHICLE DURING POWERED FLIGHT.

REFERENCES: VS70-41500X

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/23/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2183     | ABORT:              | 1/1      |

ITEM: LH2 PRE-PRESS CHECK VALVE (CV17)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) LH2 TANK PRE-PRESS CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0472-0005

CAUSES:    MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD.    NO HAZARD AFTER MPS  
DUMP & PURGE.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/23/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 2191     | ABORT:              | 1/1R     |

ITEM: GH2 PRESSURIZATION ISOLATION CHECK VALVE  
(CV21, CV22, CV23)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION ISOLATION CHECK VALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 1/1R     |
| ONORBIT:        | 3/3           | AOA:  | 1/1R     |
| DEORBIT:        | 3/3           | ATO:  | 1/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0479-0002, -0012

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE MAY CAUSE LAUNCH DELAY. SECOND FAILURE, OR LOSS OF ALL REDUNDANCY WILL CAUSE LOW ULLAGE PRESSURE AND MULTIPLE ENGINE SHUTDOWN DURING ASCENT. FAILURE DURING ABORT WILL CAUSE SHUTDOWN OF REMAINING ENGINES AND LOSS OF VEHICLE.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/24/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2192 ABORT: 1/1

ITEM: GH2 PRESSURIZATION ISOLATION CHECK VALVE  
(CV21,CV22,CV23 AND TEST PORTS TP5,TP6,TP7)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION ISOLATION CHECK VALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0479-0002, -0012

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD, DURING PRELAUNCH OR  
POWERED FLIGHT. NO HAZARD AFTER MPS DUMP & PURGE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/27/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 2201 ABORT: 1/1R

ITEM: GH2 PRESSURIZATION FLOW CONTROL VALVE  
(LV56, LV57, LV58)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION FLOW CONTROL VALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 1/1R     |
| ONORBIT:        | 3/3           | AOA:  | 1/1R     |
| DEORBIT:        | 3/3           | ATO:  | 1/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC280-0017-0015, -0361

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

SECOND ASSOCIATED FAILURE WILL CAUSE LOSS OF VEHICLE BECAUSE OF LOW ULLAGE PRESSURE. LOSS OF ALL REDUNDANCY WILL CAUSE LAUNCH DELAY OR LOSS OF VEHICLE DURING POWERED ASCENT. LOW ULLAGE PRESSURE DURING ABORTS CAN CAUSE SHUTDOWN OF REMAINING ENGINES AND LOSS OF VEHICLE.

REFERENCES: VS70-41500X

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|                   |          |                            |                 |
|-------------------|----------|----------------------------|-----------------|
| <b>DATE:</b>      | 10/27/86 | <b>HIGHEST CRITICALITY</b> | <b>HDW/FUNC</b> |
| <b>SUBSYSTEM:</b> | MPS      | <b>FLIGHT:</b>             | 2/1R            |
| <b>MDAC ID:</b>   | 2202     | <b>ABORT:</b>              | 1/1R            |

**ITEM:** GH2 PRESSURIZATION FLOW CONTROL VALVE  
(LV56, LV57, LV58)  
**FAILURE MODE:** FAIL TO CLOSE, FAIL TO REMAIN CLOSED

**LEAD ANALYST:** W.J.MCNICOLL      **SUBSYS LEAD:** A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION FLOW CONTROL VALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| <b>CRITICALITIES</b> |                 |              |                 |
|----------------------|-----------------|--------------|-----------------|
| <b>FLIGHT PHASE</b>  | <b>HDW/FUNC</b> | <b>ABORT</b> | <b>HDW/FUNC</b> |
| PRELAUNCH:           | 2/1R            | RTLS:        | 1/1R            |
| LIFTOFF:             | 2/1R            | TAL:         | 1/1R            |
| ONORBIT:             | 3/3             | AOA:         | 1/1R            |
| DEORBIT:             | 3/3             | ATO:         | 1/1R            |
| LANDING/SAFING:      | 3/3             |              |                 |

**REDUNDANCY SCREENS:**    A [ 2 ]      B [ F ]      C [ P ]

**LOCATION:**      AFT FUSELAGE  
**PART NUMBER:**    MC280-0017-0015, -0361

**CAUSES:**    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

SECOND ASSOCIATED FAILURE WILL ALLOW OVERPRESSURIZATION OF TANK AND RELIEVING OF GH2 AT LOW ALTITUDE, CREATING A FIRE/EXPLOSION HAZARD. LH2 TANK TPS FIRE CAN CAUSE ET STRUCTURAL FAILURE. LOSS OF ALL REDUNDANCY WILL CAUSE OVERPRESSURIZATION OF TANK.

**REFERENCES:**    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/27/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2203 ABORT: 1/1

ITEM: GH2 PRESSURIZATION FLOW CONTROL VALVE  
(LV56, LV57, LV58)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION FLOW CONTROL VALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC280-0017-0015, -0361

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKING H2 IS A FIRE/EXPLOSION HAZARD. NO HAZARD AFTER MPS DUMP & PURGE.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/27/86  
SUBSYSTEM: MPS  
MDAC ID: 2211

HIGHEST CRITICALITY HDW/FUNC  
FLIGHT: 1/1  
ABORT: 1/1

ITEM: GH2 PRESSURIZATION DISCONNECT (PD5)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION (ORB/ET) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |           |
|-----------------|---------------|-----------|
|                 | HDW/FUNC      | ABORT     |
| PRELAUNCH:      | 3/3           | RTLS: 1/1 |
| LIFTOFF:        | 1/1           | TAL: 1/1  |
| ONORBIT:        | 3/3           | AOA: 1/1  |
| DEORBIT:        | 3/3           | ATO: 1/1  |
| LANDING/SAFING: | 3/3           |           |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0391-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. FAILURE DURING POWERED ASCENT WILL CUT OFF GH2 FLOW TO THE LH2 TANK. SUBSEQUENT LOSS OF ULLAGE PRESSURE WILL CAUSE MULTIPLE ENGINE SHUTDOWN AND LOSS OF VEHICLE. NO REDUNDANCY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/28/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2212     | ABORT:              | 1/1      |

ITEM: GH2 PRESSURIZATION DISCONNECT (PD5)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION (ORB/ET) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0391-0001

CAUSES:    PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

THRUST FROM ESCAPING H2 AT ET SEP CAN CAUSE RECONTACT WITH ET AND DESTRUCTION OF VEHICLE. VEHICLE CAN BE DESTROYED ON ENTRY IF TPS TILES ARE DAMAGED IN RECONTACT WITH ET. RECONTACT WITH ET CAN DESTROY VEHICLE IN ABORTS, EXCEPT RTLS WHERE AERO FORCES WILL PREVENT RECONTACT. FAILURE NA FOR PRELAUNCH, DISCONNECT IS NOT REQUIRED TO CLOSE. NO REDUNDANCY.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/28/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2213     | ABORT:              | 1/1      |

ITEM: GH2 PRESSURIZATION DISCONNECT (PD5)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION (ORB/ET) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ NA ]                      B [ NA ]                      C [ NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0391-0001

CAUSES:    MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL ALLOW HELIUM LEAKAGE AND WILL CAUSE LAUNCH DELAY. FAILURE DURING ASCENT WILL ALLOW LEAKAGE OF H2 AND CREATE A FIRE/EXPLOSION HAZARD. NO HAZARD AFTER MPS DUMP & PURGE.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/28/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2221 ABORT: /NA

ITEM: LH2 TANK GROUND PRE-PRESS DISCONNECT (PD10)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) LH2 TANK GROUND PRE-PRESSURIZATION (ORB/GND) DISCONNECT (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL PREVENT PREPRESSURIZATION OF LH2 TANK AND CAUSE LAUNCH DELAY. FAILURE DOES NOT APPLY TO OTHER PHASES SINCE THE DISCONNECT/CHECK VALVE IS ONLY REQUIRED TO OPEN DURING PRELAUNCH. NO REDUNDANCY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/28/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 2222 ABORT: 2/1R

ITEM: LH2 TANK GROUND PRE-PRESS DISCONNECT (PD10)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED, EXTERNAL  
LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) LH2 TANK GROUND PRE-PRESSURIZATION (ORB/GND) DISCONNECT  
(ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ F ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

SECOND ASSOCIATED FAILURE WILL ALLOW GH2 TO ESCAPE OVERBOARD.  
VEHICLE CAN BE DESTROYED BY FIRE OR EXPLOSION OF ESCAPING GH2 OR  
STRUCTURAL FAILURE OF LH2 TANK FROM LOSS OF ULLAGE PRESSURE.  
ONLY ONE REDUNDANT COMPONENT, SO LOSS OF ALL REDUNDANCY SIMILARLY  
CAUSES LOSS OF VEHICLE. LOSS OF REDUNDANCY IS NOT READILY  
DETECTABLE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/29/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2231 ABORT: 1/1

ITEM: GH2 PRESSURIZATION MANIFOLD TEST POINT COUPLING  
(PD16)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION MANIFOLD TEST POINT COUPLING
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME276-0032-0017

CAUSES: CONTAMINATION, VIBRATION, PROCEDURAL ERROR

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD DURING PRELAUNCH OR  
POWERED FLIGHT. NO HAZARD AFTER MPS DUMP & PURGE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/29/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 2241 ABORT: 2/1R

ITEM: LH2 PREPRESSURIZATION DISCONNECT CHECK VALVE TEST  
PORT (TP10)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) LH2 PREPRESSURIZATION DISCONNECT CHECK VALVE TEST PORT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ F ]

LOCATION: AFT FUSELAGE  
PART NUMBER: V070-415446-001

CAUSES: CONTAMINATION, VIBRATION, PROCEDURAL ERROR

EFFECTS/RATIONALE:

SECOND ASSOCIATED FAILURE WILL ALLOW LEAKAGE OF H2, CREATING A  
FIRE/EXPLOSION HAZARD DURING PRELAUNCH OF POWERED FLIGHT.  
LOSS OF REDUNDANCY IS NOT READILY DETECTABLE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/29/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2251     | ABORT:              | 1/1      |

ITEM: GH2 PRESSURIZATION DUAL CHECK VALVE TEST PORT  
(TP21, TP22, TP23)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION DUAL CHECK VALVE (INLET) TEST PORT (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    V070-415448-001

CAUSES:    CONTAMINATION, VIBRATION, PROCEDURAL ERROR

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD.    NO HAZARD AFTER MPS  
DUMP & PURGE.

REFERENCES:    VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/29/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2261     | ABORT:              | 1/1      |

ITEM: LH2 FEED DISCONNECT VALVE (PD2)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 FEED (ORB/ET) DISCONNECT VALVE (ORB HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC284-0389-0051, -0411, -0431

CAUSES:    PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PREIGNITION FAILURE WILL PREVENT TANK FILL AND/OR LH2 RECIRCULATION AND THEREBY DELAY LAUNCH. FAILURE DURING TANK FILL MAY CAUSE RUPTURE OF FEEDLINE MANIFOLD, RELEASING LH2 AND CREATING A FIRE/EXPLOSION HAZARD. FAILURE DURING ENGINE BURN WILL CUT OFF FUEL FLOW TO THE ENGINES, RESULTING IN LOSS OF VEHICLE. NO REDUNDANCY.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/29/86 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: MPS FLIGHT: 1/1  
 MDAC ID: 2262 ABORT: 1/1

ITEM: LH2 FEED DISCONNECT VALVE (PD2)  
 FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 FEED (ORB/ET) DISCONNECT VALVE (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
 PART NUMBER: MC284-0389-0051, -0411, -0431

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE WILL ALLOW THRUST FROM ESCAPING H2 TO ROTATE THE VEHICLE AFTER ET SEPARATION AND CAUSE RECONTACT WITH THE ET. IMPACT COULD CAUSE LOSS OF VEHICLE DIRECTLY OR DAMAGE TO TPS TILES CAUSED BY IMPACT MAY DESTROY THE VEHICLE DURING ENTRY. RECONTACT AFTER RTLS ET SEP IS PREVENTED BY AERO FORCES.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/29/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2263 ABORT: 1/1

ITEM: LH2 FEED DISCONNECT VALVE (PD2)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 FEED (ORB/ET) DISCONNECT VALVE (ORBITER HALF)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0389-0051, -0411, -0431

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD. LEAKING LH2 CAN DAMAGE  
TPS TILES AND CAUSE LOSS OF VEHICLE DURING ENTRY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/29/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2271 ABORT: 1/1

ITEM: LH2 PREVALVE (PV4,PV5,PV6)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0006

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

PREIGNITION FAILURE WILL PREVENT ENGINE START. FAILURE AFTER  
ENGINE START WILL DEPRIVE THE ENGINE OF LH2 AND CAUSE IT TO  
EXPLODE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/30/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2272 ABORT: 3/3

ITEM: LH2 PREVALVE (PV4,PV5,PV6)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0006

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
PREMATURE OPENING DURING PRELAUNCH MAY CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/30/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2273 ABORT: 1/1

ITEM: LH2 PREVALVE (PV4,PV5,PV6)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0006

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD. NO HAZARD AFTER MPS  
DUMP & PURGE.

REFERENCES: VS70-41500X

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |      |                     |          |
|------------|------|---------------------|----------|
| DATE:      |      | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS  | FLIGHT:             | 1/1      |
| MDAC ID:   | 2274 | ABORT:              | 1/1      |

ITEM: LH2 PREVALVE (PV4,PV5,PV6)  
FAILURE MODE: FAIL TO RELIEVE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC284-0396-0006

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

FAILURE COULD ALLOW PROPELLANT FEEDLINE TO RUPTURE, CAUSING DAMAGE TO OTHER COMPONENTS AND POSSIBLE DESTRUCTION OF THE VEHICLE. NO HAZARD DURING PERIODS WHEN THE VALVE IS OPEN.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/30/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2275 ABORT: 3/3

ITEM: LH2 PREVALVE (PV4,PV5,PV6)  
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0396-0006

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/30/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2281 ABORT: 1/1

ITEM: LH2 17 INCH ORBITER DISCONNECT TEST PORT  
(TP11,TP12)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 17 INCH ORBITER DISCONNECT TEST PORT (2)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0389-0401, -0431

CAUSES: CONTAMINATION, VIBRATION, PROCEDURAL ERROR

EFFECTS/RATIONALE:  
LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD. NO HAZARD AFTER MPS  
DUMP & PURGE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|                |  |                     |          |
|----------------|--|---------------------|----------|
| DATE:          |  | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: MPS |  | FLIGHT:             | 1/1      |
| MDAC ID: 2291  |  | ABORT:              | 1/1      |

ITEM: LH2 FEEDLINE MANIFOLD (MA2)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 FEEDLINE MANIFOLD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 1/1           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC271-0073-0005

CAUSES:    OVERPRESSURIZATION

EFFECTS/RATIONALE:

RUPTURE OF THE LINE DURING PRELAUNCH WILL ALLOW LH2 TO ESCAPE, CREATING A FIRE/EXPLOSION HAZARD. RUPTURE DURING POWERED FLIGHT WILL CAUSE MULTIPLE ENGINE SHUTDOWN OR EXPLOSION AND LOSS OF VEHICLE. ONORBIT FAILURE CAN CAUSE OUTRIGHT DESTRUCTION OF THE VEHICLE OR DAMAGE THAT COULD DESTROY THE VEHICLE ON ATTEMPTING TO LAND.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/31/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2292 ABORT: 1/1

ITEM: LH2 FEEDLINE MANIFOLD (MA2)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 FEEDLINE MANIFOLD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0073-0005

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

FAILURE DURING PRELAUNCH WILL CAUSE LAUNCH DELAY. FAILURE DURING POWERED FLIGHT COULD CAUSE LOSS OF VEHICLE BECAUSE OF INCORRECT PUMP INLET FLOW CONDITIONS. ENGINES MAY SHUT DOWN OR EXPLODE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2293 ABORT: 3/3

ITEM: LH2 FEEDLINE MANIFOLD (MA2)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 FEEDLINE MANIFOLD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0073-0005

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW LH2 TEMPERATURE TO INCREASE DURING PRESTART  
CONDITIONING. IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL  
BE PREVENTED AND LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/30/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2301 ABORT: 1/1

ITEM: LH2 17 INCH FEEDLINE (FH7)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 17 INCH FEEDLINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 1/1           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0073-0001

CAUSES: OVERPRESSURIZATION

EFFECTS/RATIONALE:

RUPTURE OF THE LINE DURING PRELAUNCH WILL ALLOW LH2 TO ESCAPE, CREATING A FIRE/EXPLOSION HAZARD. RUPTURE DURING POWERED FLIGHT WILL CAUSE MULTIPLE ENGINE SHUTDOWN OR EXPLOSION AND LOSS OF VEHICLE. ONORBIT FAILURE CAN CAUSE OUTRIGHT DESTRUCTION OF THE VEHICLE OR DAMAGE THAT COULD DESTROY THE VEHICLE ON ATTEMPTING TO LAND.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/31/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2302 ABORT: 1/1

ITEM: LH2 17 INCH FEEDLINE (FH7)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 17 INCH FEEDLINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0073-0001

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. FAILURE DURING POWERED FLIGHT COULD CAUSE LOSS OF VEHICLE FROM ENGINE EXPLOSION OR SHUTDOWN DUE TO VIOLATION OF TURBOPUMP INLET FLOW CONDITION REQUIREMENTS.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/19/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 2303     | ABORT:              | 3/3      |

ITEM: LH2 17 INCH FEEDLINE (FH7)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 17 INCH FEEDLINE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC271-0073-0001

CAUSES:    MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW LH2 TEMPERATURE TO INCREASE DURING PRESTART  
CONDITIONING. IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL  
BE PREVENTED AND LAUNCH WILL BE DELAYED.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/30/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 2311     | ABORT:              | 1/1      |

ITEM: LH2 12 INCH FEEDLINE (FH8, FH9, FH10)  
FAILURE MODE: RUPTURE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 12 INCH FEEDLINE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 1/1           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC271-0073-0202,-0203,-0204,-0302,-0303-,0304

CAUSES:    OVERPRESSURIZATION

EFFECTS/RATIONALE:

RUPTURE DURING PRELAUNCH CAN DESTROY THE VEHICLE. ESCAPING LH2 IS A FIRE/EXPLOSION HAZARD. FAILURE DURING POWERED FLIGHT WILL CAUSE ENGINE SHUTDOWN OR EXPLOSION AND LOSS OF VEHICLE. ONORBIT FAILURE CAN DESTROY THE VEHICLE OUTRIGHT OR CAUSE DAMAGE THAT WILL MAKE A SAFE LANDING IMPOSSIBLE.

REFERENCES:    VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/30/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2312 ABORT: 1/1

ITEM: LH2 12 INCH FEEDLINE (FH8,FH9,FH10)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 12 INCH FEEDLINE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0073-0202,-0203,-0204,-0302,-0303-,0304

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
PRELAUNCH FAILURE WILL CAUSE LAUNCH DELAY. FAILURE DURING  
POWERED FLIGHT COULD CAUSE ENGINE SHUTDDOWN OR ENGINE EXPLOSION  
AND LOSS OF VEHICLE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2313 ABORT: 3/3

ITEM: LH2 12 INCH FEEDLINE (FH8,FH9,FH10)  
FAILURE MODE: LOSS OF INSULATING VACUUM

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 12 INCH FEEDLINE (3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC271-0073-0202,-0203,-0204,-0302,-0303-,0304

CAUSES: MECHANICAL SHOCK, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE WOULD ALLOW LH2 TEMPERATURE TO INCREASE DURING PRESTART CONDITIONING. IF LH2 TEMPERATURE IS TOO HIGH, ENGINE START WILL BE PREVENTED AND LAUNCH WILL BE DELAYED.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2321 ABORT: 1/1

ITEM: LH2 FEEDLINE RELIEF SHUTOFF VALVE (PV8)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF SHUTOFF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0406-0002

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE TO OPEN AT MECO WILL ALLOW PRESSURE IN THE PROPELLANT  
MANIFOLD AND LINES TO INCREASE AND CAUSE THE LINE TO BURST AND  
DESTROY THE VEHICLE.  
VALVE IS NOT REQUIRED TO OPEN PRELAUNCH.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2322 ABORT: 1/1

ITEM: LH2 FEEDLINE RELIEF SHUTOFF VALVE (PV8)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF SHUTOFF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0406-0002

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE WILL ALLOW LH2 TO ESCAPE THE VEHICLE THROUGH THE FEEDLINE RELIEF VALVE AFTER MAIN ENGINE START, CREATING A FIRE/EXPLOSION HAZARD.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2323 ABORT: 1/1

ITEM: LH2 FEEDLINE RELIEF SHUTOFF VALVE (PV8)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF SHUTOFF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0406-0002

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LEAKAGE OF LH2 IS A FIRE/EXPLOSION HAZARD.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2331 ABORT: 1/1

ITEM: LH2 FEEDLINE RELIEF LINE TEST PORT (TP25)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF LINE TEST PORT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 3/3      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: V070-415426-001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, PROCEDURAL ERROR

EFFECTS/RATIONALE:

SINCE MPS DUMP IS ONLY A PARTIAL ONE FOR RTLS AND TAL ABORTS, THE FAILURE WILL ALLOW LEAKAGE OF LH2/GH2 AND CREATE A FIRE/EXPLOSION HAZARD DURING RTLS AND TAL ENTRY, LANDING AND POST-LANDING. SINCE THE FEEDLINE RELIEF VALVE IS OPENED AT MECO, THERE IS NO DANGER PRIOR TO MECO. NO DANGER AFTER A COMPLETE MPS DUMP & PURGE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2341 ABORT: 1/1

ITEM: LH2 FEEDLINE MANIFOLD RELIEF VALVE (RV6)  
FAILURE MODE: FAIL TO OPEN (RELIEVE)

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE MANIFOLD RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0501-0002

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

FAILURE WILL ALLOW PRESSURE TO INCREASE IN THE FEEDLINE MANIFOLD UNTIL IT BURSTS AND THE VEHICLE WILL BE DESTROYED.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2342 ABORT: 3/3

ITEM: LH2 FEEDLINE MANIFOLD RELIEF VALVE (RV6)  
FAILURE MODE: FAIL TO REMAIN CLOSED, INTERNAL LEAKAGE, FAIL TO  
CLOSE (RESEAT)

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE MANIFOLD RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0501-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE IS NOT A HAZARD. THE RELIEF VALVE HAS NO HYDROGEN  
PRESSURE ON IT UNTIL THE ISOLATION VALVE IS OPENED AT MECO.

REFERENCES: VS70-41500X



**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/05/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 2343     | ABORT:              | 3/3      |

ITEM: LH2 FEEDLINE MANIFOLD RELIEF VALVE (RV6)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE MANIFOLD RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0501-0002

CAUSES:    MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

FAILURE IS NOT A HAZARD. THE RELIEF VALVE HAS NO HYDROGEN PRESSURE ON IT UNTIL THE ISOLATION VALVE IS OPENED AT MECO.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86  
SUBSYSTEM: MPS  
MDAC ID: 2351

HIGHEST CRITICALITY HDW/FUNC  
FLIGHT: 3/3  
ABORT: 3/3

ITEM: LH2 DUMP PRESSURIZATION ORIFICE (RP10)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL  
SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 DUMP PRESSURIZATION ORIFICE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: V070-415135-001

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

FAILURE IS NOT A HAZARD, BUT MAY FORCE A SECOND VACUUM INERTING OF MPS LINES DURING ORBITAL OPERATIONS.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2352 ABORT: 1/1

ITEM: LH2 DUMP PRESSURIZATION ORIFICE (RP10)  
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 DUMP PRESSURIZATION ORIFICE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: V070-415135-001

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LEAKAGE OF HYDROGEN WILL CREATE A FIRE/EXPLOSION HAZARD.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2361 ABORT: 3/3

ITEM: LH2 FEEDLINE RELIEF FLAME ARRESTOR (FL1)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF FLAME ARRESTOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: V070-451430-004

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
FAILURE IS NOT A HAZARD.

REFERENCES: VS70-41500X

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/07/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 2371     | ABORT:              | 3/3      |

ITEM: LH2 PRESSURIZATION LINE VENT VALVE (LV52)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) LH2 SYSTEM
- 2) HYDROGEN VACUUM INERTING SYSTEM
- 3) LH2 PRESSURIZATION LINE VENT VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0403-0002

CAUSES:    CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**

FAILURE DOES NOT CREATE A HAZARDOUS CONDITION.    GASEOUS HYDROGEN  
WILL BE TRAPPED IN THE ET PRESSURIZATION MANIFOLD.

REFERENCES:    VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2372 ABORT: 3/3

ITEM: LH2 PRESSURIZATION LINE VENT VALVE (LV52)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) HYDROGEN VACUUM INERTING SYSTEM
- 3) LH2 PRESSURIZATION LINE VENT VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0002

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
FAILURE DOES NOT CREATE A HAZARDOUS CONDITION.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2373 ABORT: 1/1

ITEM: LH2 PRESSURIZATION LINE VENT VALVE (LV52)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) HYDROGEN VACUUM INERTING SYSTEM
- 3) LH2 PRESSURIZATION LINE VENT VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE OF H2 IS A FIRE/EXPLOSION HAZARD. NO HAZARD AFTER MPS  
DUMP & PURGE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2381 ABORT: 1/1

ITEM: LH2 FEED RTLS INBOARD VALVE (PV17)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 FEED RTLS INBOARD VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 1/1      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0023,-0033,-0043,-0053

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE WILL PREVENT DUMP OF LH2 DURING RTLS. HYDROGEN WILL VENT THROUGH THE RELIEF VALVE DURING DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD. NO HAZARD IN ANY OTHER PHASE.

REFERENCES: VS70-41500X



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 2382 ABORT: 2/1R

ITEM: LH2 FEED RTLS INBOARD VALVE (PV17)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 FEED RTLS INBOARD VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ F ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0023,-0033,-0043,-0053

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF A REDUNDANT COMPONENT (OUTBOARD VALVE) WILL ALLOW LH2 TO ESCAPE THE VEHICLE CREATING A FIRE/EXPLOSION HAZARD. LOSS OF LH2 WILL CAUSE ENGINES TO SHUT DOWN EARLY, RESULTING IN LOSS OF VEHICLE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2383 ABORT: 1/1

ITEM: LH2 FEED RTLS INBOARD VALVE (PV17)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 FEED RTLS INBOARD VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0023,-0033,-0043,-0053

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LEAKAGE OF LH2 IS A FIRE/EXPLOSION HAZARD.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 2391 ABORT: 1/1

ITEM: LH2 FEED RTLS OUTBOARD VALVE (PV18)  
FAILURE MODE: FAIL TO OPEN, FAIL TO REMAIN OPEN

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 FEED RTLS OUTBOARD VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 1/1      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0024,-0034,-0044,-0054

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE WILL PREVENT DUMP OF LH2 DURING RTLS. HYDROGEN WILL VENT THROUGH THE RELIEF VALVE DURING DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD. NO HAZARD IN ANY OTHER PHASE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 2392 ABORT: 2/1R

ITEM: LH2 FEED RTLS OUTBOARD VALVE (PV18)  
FAILURE MODE: FAIL TO CLOSE, FAIL TO REMAIN CLOSED

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 FEED RTLS OUTBOARD VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ F ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0024,-0034,-0044,-0054

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF A REDUNDANT COMPONENT (INBOARD VALVE) WILL ALLOW LH2 TO ESCAPE THE VEHICLE AND CREATE A FIRE/EXPLOSION HAZARD. LOSS OF LH2 WILL CAUSE ENGINES TO SHUT DOWN EARLY, RESULTING IN LOSS OF VEHICLE.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 2393 ABORT: 1/1

ITEM: LH2 FEED RTLS OUTBOARD VALVE (PV18)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W.J.MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) LH2 SYSTEM
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 FEED RTLS OUTBOARD VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0395-0024,-0034,-0044,-0054

CAUSES: MECHANICAL SHOCK, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LEAKAGE OF LH2 IS A FIRE/EXPLOSION HAZARD.

REFERENCES: VS70-41500X

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 3010 ABORT: 1/1R

ITEM: ENGINE HELIUM SUPPLY CHECK VALVE (CV1,CV2,CV3)  
FAILURE MODE: FAILS TO CLOSE, OR REMAIN CLOSED

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) E1, 2, 3 HELIUM SUPPLY
- 3) CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: ME284-0472-0002

CAUSES: POPPET SEAT FAILURE, CONTAMINATION, SPRING BREAKAGE

EFFECTS/RATIONALE:

TWO SEPARATE FAILURES OF UNLIKE PARTS MUST OCCUR FOR LOSS OF HELIUM TO AN ENGINE FROM THE SUPPLY VIA THIS PATH. LOSS OF ALL REDUNDANCY MAY RESULT IN THE LOSS OF HELIUM TO AN ENGINE CAUSING SHUTDOWN.

REFERENCES: RI MAIN PROPULSION SYSTEM SCHEMATICS, VS70-415001, 006, 007 & 008. BOOSTER SYS'S. BRIEFS, JSC-19401, 1-OCT.1984; RI SPEC DWG FOR ME284-0472 PARTS.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 3011 ABORT: 3/3

ITEM: ENGINE HELIUM SUPPLY CHECK VALVE (CV1,CV2,CV3)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) E1, 2, 3 HELIUM SUPPLY
- 3) CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: ME284-0472-0002

CAUSES: BLOCKAGE (GROSS CONTAMINATION)

EFFECTS/RATIONALE:

FAILURE TO OPEN PREVENTS PRESSURIZATION OF AN ENGINE HELIUM SUPPLY TANK WHICH IS EASILY DETECTABLE DURING PRELAUNCH. FAILURE TO OPEN AT ANY OTHER TIME HAS NO EFFECT.

REFERENCES: RI MAIN PROPULSION SYSTEM SCHEMATICS, VS70-415001, 006, 007 & 008. BOOSTER SYS'S. BRIEFS, JSC-19401, 1-OCT.1984; RI SPEC DWG FOR ME284-0472 PARTS.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 3020 ABORT: 2/1R

ITEM: HELIUM SUPPLY DISCONNECT(ORB/GND, ORB HALF), (PD8)  
FAILURE MODE: FAILS TO CLOSE, OR REMAIN CLOSED

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) INLET BOTTLE SUPPLY FROM GSE
- 3) ORBITER HALF DISCONNECT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: LEFT T-O UMBILICAL PANEL  
PART NUMBER: MC276-0003-0006 (TYPE I)

CAUSES: POPPET SEAT FAILURE, CONTAMINATION, SPRING BREAKAGE

EFFECTS/RATIONALE:

TWO SEPARATE FAILURES OF UNLIKE PARTS MUST OCCUR (CV1-3 AND PD-8 POPPET SEAT) FOR LOSS OF HELIUM FROM THE SUPPLY TANK THROUGH THE DISCONNECT. LOSS OF ALL REDUNDANCY MAY RESULT IN THE LOSS OF HELIUM TO AN ENGINE CAUSING SHUTDOWN.

REFERENCES: RI MAIN PROPULSION SYS. SCHEMATIC, VS70-41500X; RI SPEC DWG FOR MC276-0003 PARTS; BOOSTER SYSTEM BRIEFS, JSC19401, 1-OCT.1984.



**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/08/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/2R     |
| MDAC ID:   | 3021     | ABORT:              | 2/1R     |

ITEM:                 HELIUM SUPPLY DISCONNECT (ORB/GND, ORB HALF),  
(PD8)  
FAILURE MODE:       EXTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY                 SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) HELIUM SUPPLY
- 2) INLET BOTTLE SUPPLY FROM GSE
- 3) ORBITER HALF DISCONNECT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                 B [ F ]                 C [ P ]

LOCATION:                 AFT COMPARTMENT  
PART NUMBER:        MC276-0003-0006 (TYPE 1)

CAUSES:    SWIVEL SEAL FAILURE; SCRATCHED OR GOUGED SWIVEL AT SEAL INTERFACE

**EFFECTS/RATIONALE:**

TWO SEPARATE FAILURES OF UNLIKE PARTS MUST OCCUR (CV1-3 AND PD-8 SWIVEL SEAL) FOR LOSS OF HELIUM FROM THE SUPPLY TANK THROUGH THE DISCONNECT. LOSS OF ALL REDUNDANCY MAY RESULT IN THE LOSS OF HELIUM TO AN ENGINE CAUSING SHUTDOWN.

REFERENCES:    RI MAIN PROPULSION SYS. SCHEMATIC, VS70-41500X; RI SPEC DWG FOR MC276-0003 PARTS; BOOSTER SYSTEM BRIEFS, JSC19401, 1-OCT.1984.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 3030 ABORT: 2/1R

ITEM: TEST PORT (TP8)  
FAILURE MODE: LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SYSTEM
- 2) HELIUM FILL LINE
- 3) TEST PORT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: V070-415585-002

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF THE SEAL AT THE TEST PORT (TP8) PLUG IS FUNCTIONALLY THE SAME AS THE QD (PD8) POPPET OR EXTERNAL LEAKAGE FAILURES. TWO SEPARATE FAILURES OF UNLIKE PARTS MUST OCCUR (CV1-3 AND THE TP-8 SEAL) FOR LOSS OF HELIUM FROM THE SUPPLY TANK. LOSS OF ALL REDUNDANCY MAY RESULT IN LOSS OF HELIUM SUPPLY TO AN ENGINE.

REFERENCES: RI MPS SCHEMATICS, VS70-41500X; RI SPEC DWG V070-415585-002

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3040 ABORT: 1/1

ITEM: 17.3 CU. FT. HELIUM SUPPLY TANK (TK6, 8, 10)  
FAILURE MODE: RAPID LEAK

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) HELIUM SUPPLY TANKS
- 3) 17.3 FT3 TANK
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: PAYLOAD BAY; UNDER PLB LINER  
PART NUMBER: MC282-0082-0001

CAUSES: MANUFACTURING DEFECT, FATIGUE AT WELD JOINT, SEAL  
FAILURE

EFFECTS/RATIONALE:

RAPID LOSS OF HELIUM MAY LEAD TO LOSS OF AN ENGINE DURING ASCENT.  
TANKS INSTALLED UNDER PAYLOAD BAY LINER. MAY REQUIRE REMOVAL OF  
PAYLOADS FOR ACCESS IF LEAKAGE IS ISOLATED BEFORE FLIGHT.

REFERENCES: RI MPS SCHEMATIC VS7041500X; RI SPEC DWG MC284-0082

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3050 ABORT: 1/1

ITEM: 4.7 CU. FT. HELIUM SUPPLY TANK (TK1,2,3,7,9,11)  
FAILURE MODE: RAPID LEAK

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM
- 2) HELIUM SUPPLY TANKS
- 3) 4.7 CU. FT. SIZE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: UNDER PAYLOAD BAY LINER & AFT COMPARTMENT  
PART NUMBER: MC282-0082-0010

CAUSES: MANUFACTURING DEFECT, FATIGUE AT WELD JOINT, SEAL FAILURE

EFFECTS/RATIONALE:

RAPID LOSS OF HELIUM MAY LEAD TO LOSS OF AN SSME ENGINE DURING POWERED FLIGHT. TANKS 7, 9, 11 LOCATED UNDER PAYLOAD BAY LINER. MAY REQUIRE PAYLOAD REMOVAL FOR ACCESS IF LEAKAGE IS ISOLATED BEFORE FLIGHT.

REFERENCES: RI MPS SCHEMATIC VS70-41500X, RI SPEC DWG MC282-0082

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/09/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/2      |
| MDAC ID:   | 3060     | ABORT:              | 1/1      |

ITEM: PRESSURE TAP PORT (TP26,27,28)  
FAILURE MODE: RAPID LEAK

LEAD ANALYST: M.L.MCNEELY                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SYSTEM
- 2) ENGINE HELIUM SUPPLY
- 3) TEST PORT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT COMPARTMENT  
PART NUMBER:                V070-415790-001

CAUSES:    SEAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF THE SEAL AT THE TEST PORT (TP26, 27 OR 28) IS FUNCTIONALLY THE SAME AS A RAPID LEAK IN A HELIUM SUPPLY TANK. LOSS OF ALL REDUNDANCY MAY RESULT IN LOSS OF HELIUM SUPPLY TO AN ENGINE.

REFERENCES:    RI MPS SCHEMATIC, VS70-41500X; RI SPEC DWG V070-415790-001

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 3070 ABORT: 3/3

ITEM: ENGINE HELIUM SUPPLY CHECK VALVE  
(CV25,26;36,37;41,42)  
FAILURE MODE: FAILS TO CLOSE, OR REMAIN CLOSED

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SYSTEM
- 2) ENGINE HELIUM SUPPLY REG INLET
- 3) CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: ME284-0472-0002

CAUSES: POPPET SEAT FAILURE, CONTAMINATION, SPRING BREAKAGE

EFFECTS/RATIONALE:

CHECK VALVE IS NORMALLY OPEN DURING ENGINE OPERATION. FAILING TO CLOSE IS A MODE ONLY CONSIDERED AFTER LOSS OF HELIUM IN ONE SYSTEM FOLLOWED BY AN ATTEMPT TO INTERCONNECT FROM ANOTHER SUPPLY.

REFERENCES: RI MPS SCHEMATIC VS70-41500X; RI SPEC DWG MC284-0472; BOOSTER SYS. BRIEFS, JSC 19401, 1-OCT.1984.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 3071 ABORT: 2/1R

ITEM: ENGINE HELIUM SUPPLY CHECK VALVE  
(CV25,26;36,37;41,42)  
FAILURE MODE: FAILS TO OPEN, OR REMAIN OPEN

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SYSTEM
- 2) ENGINE HELIUM SUPPLY REG INLET
- 3) CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: ME284-0472-0002

CAUSES: GROSS CONTAMINATION

EFFECTS/RATIONALE:

FAILURE OF EITHER CHECK VALVE IN THE REDUNDANT REG PATHS IS NOT DETECTABLE DURING THE HELIUM USAGE PERIOD. ONLY WHEN BOTH FAIL IS THE LOSS OF REDUNDANCY APPARENT.

REFERENCES: RI MPS SCHEMATIC VS70-41500X; RI SPEC DWG MC284-0472; BOOSTER SYS. BRIEFS, JSC 19401, 1-OCT.1984.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 3080 ABORT: 2/1R

ITEM: ENGINE HELIUM SUPPLY FILTER - PANEL A;B  
(FL2,6;3,7;4,8)  
FAILURE MODE: RESTRICTED FLOW, BLOCKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) FILTER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: ME286-0056-0001

CAUSES: GROSS CONTAMINATION

EFFECTS/RATIONALE:

RESTRICTED FLOW OR BLOCKAGE MAY BE INDICATED BY REG OUT PRESSURE V41P1(X)54, (PANEL A), V41P1(X)53, (PANEL B) DEGRADED OR ZERO. HOWEVER, REG PRESSURE AS STATED IS NOT DEFINITIVE FOR THIS FILTER FAILURE MODE.

REFERENCES: RI MPS SCHEMATIC, VS7041500X; RI SPEC DWG ME286-0056.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/10/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/2R     |
| MDAC ID:   | 3081     | ABORT:              | 2/1R     |

ITEM: ENGINE HELIUM SUPPLY FILTER - PANEL A;B  
(FL2,6;3,7;4,8)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A, B
- 3) FILTER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:            AFT COMPARTMENT  
PART NUMBER:    ME286-0056-0001

CAUSES:    SEAL FAILURE

EFFECTS/RATIONALE:

TWO SEPARATE SEALS (PER FILTER) MUST FAIL FOR EXTERNAL LEAKAGE TO OCCUR. LEAKAGE AT THIS POINT CANNOT BE DISTINGUISHED FROM LEAKAGE ABOVE THE PANEL A INLET CHECK VALVE (CV26,37,42), OR PANEL B (CV25,36,41).

REFERENCES:    RI MPS SCHEMATIC, VS7041500X; RI SPEC DWG ME286-0056.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3082 ABORT: 1/1

ITEM: ENGINE HELIUM SUPPLY FILTER - PANEL A;B  
(FL2,6;3,7;4,8)  
FAILURE MODE: STRUCTURAL FAILURE (ELEMENT COLLAPSE)

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A, B
- 3) FILTER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: ME286-0056-0001

CAUSES: HIGH DELTA P ACROSS THE ELEMENT CAUSED BY GROSS  
CONTAMINATION.

EFFECTS/RATIONALE:

POSSIBLE CONTAMINATION OF ALL DOWNSTREAM COMPONENTS. WORST CASE  
EFFECTS CAUSE ENGINE SHUTDOWN. ELEMENT DESIGN DELTA P  
REQUIREMENT IS 25% OF THE OPERATING PRESSURE (MINIMUM) OR 1125  
PSID. WORST CASE DELTA P COULD BE AS HIGH AS 4500 PSID.

REFERENCES: RI MPS SCHEMATIC, VS7041500X; RI SPEC DWG ME286-  
0056.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 3090 ABORT: 3/1R

ITEM: ENGINE HELIUM SUPPLY ISOLATION VALVE  
(LV1,2;3,4;5,6)  
FAILURE MODE: FAILS TO OPEN, OR REMAIN OPEN

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ISOLATION VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0403-0017 (099,103&104); -0007 (102) (TYPE V)

CAUSES: FAILURE TO VENT CLOSING PRESSURE THRU PILOT BALL & UPPER SEAT; FAILURE TO SEAL INLET PRESSURE FROM REFERENCE CAVITY; LOSS OF ELECTRICAL SIGNAL; LOSS OF COMMAND SIGNAL (ENTRY PURGE)

EFFECTS/RATIONALE:

FAILURE TO OPEN OR REMAIN OPEN IS EASILY RECOGNIZABLE. SHOULD THE VALVE FAIL TO REMAIN OPEN DURING ENGINE OPERATION A REDUNDANT SUPPLY ROUTE IS AVAILABLE, BUT ONLY ONE FAILURE AWAY FROM LOSS OF AN ENGINE FROM LOSS OF HELIUM (MISSION FAILURE). DURING ABORTS, SHOULD THIS SCENARIO OCCUR, LOSS OF THE 2ND ENGINE (SEE MPS GRs) RESULTS IN LOSS OF VEHICLE AND CREW.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEM BRIEFS, JSC 19041, 1-OCT-84.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 3091 ABORT: 3/3

ITEM: ENGINE HELIUM SUPPLY ISOLATION VALVE  
(LV1,2;3,4;5,6)  
FAILURE MODE: FAILS TO CLOSE, GROSS INTERNAL LEAKAGE.

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ISOLATION VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT

PART NUMBER: MC284-0403-0017 (099,103&104); -0007 (102) (TYPE V)

CAUSES: PLUGGED INTERNAL FILTER; PUSH ROD PIN BROKEN; MAIN PILOT  
SPRING OR MAIN POPPET SPRING BROKEN; DAMAGED MAIN POPPET SEAL

EFFECTS/RATIONALE:

FAILURE TO CLOSE HAS NO EFFECT UNLESS FOLLOWED BY A FAILURE  
DOWNSTREAM DUE TO LEAKAGE OF OTHER PARTS.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEM BRIEFS, JSC 19041, 1-OCT-  
84.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3092 ABORT: 1/1

ITEM: ENGINE HELIUM SUPPLY ISOLATION VALVE  
(LV1,2;3,4;5,6)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ISOLATION VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0403-0017 (099,103&104); -0007 (102) (TYPE V)

CAUSES: FAILURE OF METAL 'V' SEALS OR SOLENOID ASSEMBLY SEALS

EFFECTS/RATIONALE:

GROSS LEAKAGE RESULTS IN LOSS OF ENGINE HELIUM SUPPLY TO A GIVEN ENGINE. WORST CASE LEAKAGE MAY RESULT IN ENGINE SHUTDOWN DUE TO LOSS OF HELIUM PURGE. CROSSOVER OF OTHER ENGINE HELIUM SUPPLIES OR PNEUMATIC HELIUM SUPPLY VIA INLET/OUTLET PATH ONLY FEEDS THE LEAK. CROSSOVER (LV10) FROM THE PNEUMATIC SUPPLY TO ENGINE #2 DOWNSTREAM OF THE LEAK IS A SOLUTION, BUT ONLY FOR #2 ENGINE. HOWEVER, LOCATION OF ANY LEAK IS IMPOSSIBLE DURING POWERED FLIGHT.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEM BRIEFS, JSC 19041, 1-OCT-84.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 3110 ABORT: 2/1R

ITEM: ENGINE HELIUM PRESSURE REGULATOR (PR1,7;2,8;3,9)  
FAILURE MODE: FAILS TO OPEN, REMAIN OPEN, FAILS OUT OF TOLERANCE  
(LO)

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) PRESSURE REGULATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0533-0004

CAUSES: CONTAMINATION OF THE PILOT POPPET ASSEMBLY

EFFECTS/RATIONALE:

REG OUTLET PRESSURE AT ZERO OR DEGRADED BELOW 715 PSI IS EASILY DETECTED. NO ACTION IS NECESSARY AS A REDUNDANT PATH IS AVAILABLE. ENGINE #2 IS UNIQUE IN THAT AN ADDITIONAL PATH IS AVAILABLE DOWNSTREAM OF THE FAILED REGULATOR, HOWEVER, THE CRITICALITY FOR ENGINE #2 IS NOT DIFFERENT FROM ENGINES #1 AND #3.

REFERENCES: RI MAIN PROPULSION SYS SCHEMATIC V270-41500X;  
BOOSTER SYSTEM BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
MC284-0533.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3111 ABORT: 1/1

ITEM: ENGINE HELIUM PRESSURE REGULATOR (PR1,7;2,8;3,9)  
FAILURE MODE: FAILS OUT OF TOLERANCE (HIGH)

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) PRESSURE REGULATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0533-0004

CAUSES: REFERENCE PRESSURE AND PILOT FAIL TO SENSE DOWNSTREAM  
DEMAND CHANGES; CONTAMINATION OF PILOT ASSEMBLY.

EFFECTS/RATIONALE:

REGULATOR OUTLET PRESSURE PERMANENTLY RISES ABOVE DOWNSTREAM  
RELIEF VALVE SETTING. FAILURE MAY RESULT IN LOSS OF ENGINE  
HELIUM THROUGH THE OPEN RELIEF VALVE.

REFERENCES: RI MAIN PROPULSION SYS SCHEMATIC V270-41500X;  
BOOSTER SYSTEM BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
MC284-0533.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3112 ABORT: 1/1

ITEM: ENGINE HELIUM PRESSURE REGULATOR (PR1,7;2,8;3,9)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) PRESSURE REGULATOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0533-0004

CAUSES: SEAL FAILURE INTERNALLY OR AT REGULATOR PORTS

EFFECTS/RATIONALE:

GROSS LEAKAGE MAY RESULT IN LOSS OF ENGINE HELIUM.

REFERENCES: RI MAIN PROPULSION SYS SCHEMATIC V270-41500X;  
BOOSTER SYSTEM BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
MC284-0533.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/22/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/2      |
| MDAC ID:   | 3120     | ABORT:              | 1/1      |

ITEM: ENGINE HE RELIEF VALVE PANEL A;B (RV1,8;2,9;3,10)  
FAILURE MODE: FAILS TO CLOSE (RESEAT), OR REMAIN CLOSED

LEAD ANALYST: M.L.MCNEELY                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT COMPARTMENT  
PART NUMBER:    MC284-0398-0005 (OV099,103,104); -0004 (OV102)

CAUSES:    MAIN POPPET SEAT FAILURE; PILOT POPPET, MAIN POPPET OR  
            POPPET SEAT PISTON SPRING FAILURE.

EFFECTS/RATIONALE:

FAILURE TO CLOSE OR RESEAT FIRST REQUIRES A FAILURE (OPEN) OF THE  
UPSTREAM REGULATOR ALLOWING THE RELIEF SETTING TO BE REACHED.  
FAILURE TO RESEAT MAY THEN RESULT IN DUMPING HELIUM OVERBOARD  
CAUSING ENGINE SHUTDOWN SHOULD THE HELIUM SUPPLY BE DEPLETED  
PRIOR TO MECO.    FAILURE TO REMAIN CLOSED RESULTS IN THE SAME  
EFFECT.

REFERENCES:    RI MAIN PROPULSION SYSTEM SCHEMATIC, VS70-41500X,  
                  BOOSTER SYSTEMS BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
                  MC284-0398; SSSH REV C, DWG 10.8 MPS HELIUM SUPPLY

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3121 ABORT: 1/1

ITEM: ENGINE HE RELIEF VALVE PANEL A;B (RV1,8;2,9;3,10)  
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0398-005 (OV099,103,104); -004 (OV102)

CAUSES: MAIN POPPET SEAT FAILURE; PILOT POPPET SEAT FAILURE,  
SPRING BREAKAGE

EFFECTS/RATIONALE:

FAILURE IS NOT DETECTABLE AT VALVE EXCEPT DURING CHECKOUT.  
OCCURANCE DURING POWERED FLIGHT IS MANIFESTED BY HIGHER THAN  
USUAL HELIUM CONSUMPTION FOR A GIVEN ENGINE SUPPLY. WORST CASE  
LEAKAGE MAY RESULT IN LOSS OF HELIUM SUPPLY TO AN OPERATING  
ENGINE CAUSING SHUTDOWN. THIS FAILURE IS FUNCTIONALLY SAME AS  
MDAC 3120 EXCEPT IS NOT A RESULT OF FAILURE OF ANOTHER COMPONENT.

REFERENCES: RI MAIN PROPULSION SYSTEM SCHEMATIC, VS70-41500X,  
BOOSTER SYSTEMS BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
MC284-0398; SSSH REV C, DWG 10.8 MPS HELIUM SUPPLY

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/23/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/2      |
| MDAC ID:   | 3122     | ABORT:              | 1/1      |

ITEM: ENGINE HE RELIEF VALVE PANEL A;B (RV1,8;2,9;3,10)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: M.L.MCNEELY                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:                  AFT COMPARTMENT  
PART NUMBER:    MC284-0398-005 (OV099,103,104); -004 (OV102)

CAUSES:    PLUGGED SENSE LINE; CONTAMINATION OF FILTER IN SENSE  
PORT; OR SENSE LINE OPEN

EFFECTS/RATIONALE:

MAY EXCEED BURST PRESSURE SPEC VALUE CAUSING RUPTURE OF VALVE OR  
DOWNSTREAM COMPONENTS. FAILURE TO OPEN IS A MODE ONLY CONSIDERED  
IF UPSTREAM REGULATOR FAILS HIGH. MAY BE DETECTABLE BY REG OUT  
PRESSURE MEASUREMENT V41P1153/54;1253/54;1353/54, GOING  
OFFSCALE HIGH.

REFERENCES:    RI MAIN PROPULSION SYSTEM SCHEMATIC, VS70-41500X,  
BOOSTER SYSTEMS BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
MC284-0398; SSSH REV C, DWG 10.8 MPS HELIUM SUPPLY

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3123 ABORT: 1/1

ITEM: ENGINE HE RELIEF VALVE PANEL A;B (RV1,8;2,9;3,10)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0398-005 (OV099,103,104); -004 (OV102)

CAUSES: SEAL LEAKAGE AT VALVE INLET OR THRU INTERNAL SEALS

EFFECTS/RATIONALE:

WORST CASE LEAKAGE MAY RESULT IN DEPLETION OF ENGINE HELIUM SUPPLY CAUSING SHUTDOWN.

REFERENCES: RI MAIN PROPULSION SYSTEM SCHEMATIC, VS70-41500X,  
BOOSTER SYSTEMS BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
MC284-0398; SSSH REV C, DWG 10.8 MPS HELIUM SUPPLY

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/23/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3130 ABORT: 1/1

ITEM: ENGINE HELIUM SUPPLY RELIEF VALVE SENSE LINE  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) RELIEF VALVE
- 4) SENSE LINE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: UNKNOWN

CAUSES: CRACKED LINE, LOOSE OR BROKEN B-NUT

EFFECTS/RATIONALE:

FAILURE COMPROMISES THE ABILITY OF THE RELIEF VALVE TO SENSE AN OVERPRESSURE CAUSED BY A FAILED (OPEN) REGULATOR. LOSS OF ALL ABILITY TO SENSE DOWNSTREAM PRESSURE DISABLES THE RELIEF VALVE (SEE MDAC #3122). GROSS LEAKAGE OF THE LINE MAY RESULT IN LOSS OF ENGINE HELIUM CAUSING ENGINE SHUTDOWN.

REFERENCES: RI MAIN PROPULSION SYSTEM SCHEMATIC, VS70-41500X  
BOOSTER SYSTEM BRIEFS, JSC-19401, 1-OCT-84.

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/24/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 3140     | ABORT:              | 3/3      |

ITEM: ENGINE REG OUTLET CHECK VLV (CV5,29;6,40;7,45)  
FAILURE MODE: FAILS TO CLOSE, OR REMAIN CLOSED

LEAD ANALYST: M.L.MCNEELY                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) REG OUTLET CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT COMPARTMENT  
PART NUMBER:    ME284-0472-0034 (099,103,104); -0014 (OV102)

CAUSES:    POPPET SEAT FAILURE; CONTAMINATION; SPRING BREAKAGE

**EFFECTS/RATIONALE:**

FAILURE HAS NO EFFECT UNLESS ACCOMPANIED BY ANOTHER PARTICULAR FAILURE IN THE SAME FLOW PATH. IF THE PATH HAS BEEN ISOLATED AND A "LEAK" EXISTS BETWEEN THE ISOLATION VALVE (LV1-6) AND THE CHECK VALVE (OPEN RELIEF VALVE), LOSS OF HELIUM COULD RESULT IN ENGINE SHUTDOWN.

REFERENCES:    RI MAIN PROPULSION SYS. SCHEMATIC, VS70-41500X;  
BOOSTER SYSTEMS BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
ME284-0472

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/24/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 3141 ABORT: 2/1R

ITEM: ENGINE REG OUTLET CHECK VLV (CV5,29;6,40;7,45)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) REG OUTLET CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: ME284-0472-0034 (099,103,104); -0014 (OV102)

CAUSES: BLOCKAGE (GROSS CONTAMINATION)

EFFECTS/RATIONALE:

FAILURE TO OPEN PREVENTS HELIUM FLOW THROUGH 1 LEG OF REDUNDANT PATHS PROVIDED TO EACH ENGINE. FAILURE IS FAIRLY EASY TO DETECT BY REG OUT PRESSURE REACHING LOCKUP VALVE. MEASUREMENT IS UPSTREAM OF THE CHECK VALVE. FAILURE OF BOTH FLOW PATHS (FOR ENGINE 1&3) WOULD CAUSE ENGINE SHUTDOWN. THREE FLOW PATHS ARE AVAILABLE FOR ENGINE 2.

REFERENCES: RI MAIN PROPULSION SYS. SCHEMATIC, VS70-41500X;  
BOOSTER SYSTEMS BRIEFS, JSC-19401, 1-OCT-84; RI SPEC DWG FOR  
ME284-0472

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/05/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/2      |
| MDAC ID:   | 3150     | ABORT:              | 1/1      |

ITEM: ENGINE HELIUM SUPPLY INTERCONNECT INLET VALVE  
(LV59,61,63)  
FAILURE MODE: FAILS TO OPEN OR REMAIN OPEN

LEAD ANALYST: M.L.MCNEELY                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE INTERCONNECT INLET VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT COMPARTMENT  
PART NUMBER:    MC284-0403-0017 (OV099,103,104); -0007 TYPE V (102)

CAUSES: FAILURE TO VENT CLOSING PRESSURE THRU PILOT BALL AND UPPER SEAT; FAILURE TO SEAL INLET PRESSURE FROM REFERENCE CAVITY; LOSS OF ELECTRICAL SIGNAL.

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT UNLESS IT BECOMES NECESSARY TO SUPPLY PNEUMATIC HELIUM TO AN ENGINE HELIUM PURGE SYSTEM. THE LEFT ENGINE INTERCONNECT INLET VALVE (LV61) IS ALSO CRITICAL TO AFT COMPARTMENT PURGES DURING RTLS AND TAL ABORT LANDING PHASES.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEMS BRIEFS, JSC19041, 1-OCT-84.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/27/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 3151 ABORT: 3/3

ITEM: ENGINE HELIUM SUPPLY INTERCONNECT INLET VALVE  
(LV59,61,63)  
FAILURE MODE: FAILS TO CLOSE; GROSS INTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE INTERCONNECT INLET VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0403-0017 (OV099,103,104); -0007 TYPE V (102)

CAUSES: PLUGGED INTERNAL FILTER; PUSH ROD PIN BROKEN; MAIN PILOT  
SPRING OR MAIN POPPET SPRING BROKEN; DAMAGED MAIN POPPET SEAT.

EFFECTS/RATIONALE:

FAILURE TO CLOSE HAS NO EFFECT. FLOW FROM AN ENGINE SYSTEM IS  
PREVENTED BY A CHECK VALVE; UNDESIREDFLOW TO AN ENGINE SYSTEM IS  
PREVENTED BY AN ISOLATION VALVE.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEMS BRIEFS, JSC19041, 1-OCT-  
84.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 3152 ABORT: 3/3

ITEM: ENGINE HELIUM SUPPLY INTERCONNECT INLET VALVE  
(LV59, 61, 63)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE INTERCONNECT INLET VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT

PART NUMBER: MC284-0403-0017 (OV099,103,104); -0007 TYPE V (102)

CAUSES: FAILURE OF METAL 'V' SEALS OR SOLENOID ASSEMBLY SEALS

EFFECTS/RATIONALE:

GROSS LEAKAGE RESULTS IN LOSS OF PNEUMATIC VALVE HELIUM SUPPLY.  
WORST CASE LEAKAGE MAY DEplete PNEUMATIC SUPPLY. HOWEVER,  
ACCUMULATORS PROVIDE VALVE CLOSING CAPABILITY AFTER MECO.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEMS BRIEFS, JSC19041, 1-OCT-84.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/27/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 3160     | ABORT:              | 3/3      |

ITEM: ENGINE HELIUM SUPPLY INTERCONNECT OUTLET VALVE  
(LV60,62,64)  
FAILURE MODE: FAILS TO OPEN, OR REMAIN OPEN

LEAD ANALYST: M.L.MCNEELY                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE INTERCONNECT OUTLET VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT COMPARTMENT  
PART NUMBER:    MC284-0403-0011 (OV099,103,104); -0001 (102)

CAUSES: FAILURE TO VENT CLOSING PRESSURE THRU PILOT BALL AND  
UPPER SEAT; FAILURE TO SEAL INLET PRESSURE FROM REFERENCE CAVITY;  
LOSS OF ELECTRICAL SIGNAL

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT DURING POWERED FLIGHT AS FLIGHT RULES  
PREVENT OPENING OUTLET VALVES TO SUPPLY ENGINE HELIUM TO ANOTHER  
ENGINE OR TO THE PNEUMATIC SUPPLY SYSTEM DURING THIS PERIOD.  
REDUNDANT PATHS ARE AVAILABLE FOR FAILURE TO OPEN DURING MPS DUMP  
AND ENTRY.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEMS BRIEFS, JSC19041, 1-OCT-  
84.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 3161 ABORT: 3/3

ITEM: ENGINE HELIUM SUPPLY INTERCONNECT OUTLET VALVE  
(LV60, 62, 64)  
FAILURE MODE: FAILS TO CLOSE, INTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE INTERCONNECT OUTLET VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION:  
PART NUMBER:

CAUSES: PLUGGED INTERNAL FILTER; SOLENOID ACTUATOR PIN BROKEN,  
MAIN OR PILOT POPPET SEAT FAILURE.

EFFECTS/RATIONALE:  
FAILURE TO CLOSE HAS NO EFFECT. UNDESIRE FLOW TO ANOTHER ENGINE  
SYSTEM IS PREVENTED BY THE INTERCONNECT INLET VALVE. UNDESIRE  
REVERSE FLOW IS PREVENTED BY A CHECK VALVE. HELIUM FLOW TO THE  
PNEUMATIC SYSTEM WILL OCCUR IF THE PNEUMATIC SYSTEM PRESSURE  
IS BELOW THAT OF THE ENGINE SYSTEM.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEMS BRIEFS, JSC19041, 1-OCT-  
84.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3162 ABORT: 1/1

ITEM: ENGINE HELIUM SUPPLY INTERCONNECT OUTLET VALVE  
(LV60,62,64)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE INTERCONNECT OUTLET VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0403-0017 (OV099,103,104); -007 TYPE V (102)

CAUSES: FAILURE OF METAL 'V' SEALS OR SOLENOID ASSEMBLY SEALS

EFFECTS/RATIONALE:

GROSS LEAKAGE RESULTS IN LOSS OF ENGINE HELIUM SUPPLY TO A GIVEN ENGINE. WORST CASE LEAKAGE MAY RESULT IN ENGINE SHUTDOWN DUE TO LOSS OF HELIUM PURGE. THE PROBABILITY OF METALLIC TYPE SEAL FAILURE IS UNKNOWN.

REFERENCES: RI MPS SCHEMATIC, VS70-415001 (102); VS70-41500X.  
RI SPEC DWG MC284-0403. BOOSTER SYSTEMS BRIEFS, JSC19041, 1-OCT-84.

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|                   |             |                            |                 |
|-------------------|-------------|----------------------------|-----------------|
| <b>DATE:</b>      |             | <b>HIGHEST CRITICALITY</b> | <b>HDW/FUNC</b> |
| <b>SUBSYSTEM:</b> | <b>MPS</b>  | <b>FLIGHT:</b>             | <b>3/3</b>      |
| <b>MDAC ID:</b>   | <b>3170</b> | <b>ABORT:</b>              | <b>3/3</b>      |

**ITEM:** ENGINE HELIUM INTERCONNECT CHECK VALVE-PANEL  
**OUTLET (CV28,39,44)**  
**FAILURE MODE:** FAILS TO CLOSE, REMAIN CLOSED

**LEAD ANALYST:** M.L.MCNEELY                      **SUBSYS LEAD:** A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE HE INTERCONNECT CHECK VALVE- OUTLET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| <b>CRITICALITIES</b>   |                 |              |                 |
|------------------------|-----------------|--------------|-----------------|
| <b>FLIGHT PHASE</b>    | <b>HDW/FUNC</b> | <b>ABORT</b> | <b>HDW/FUNC</b> |
| <b>PRELAUNCH:</b>      | <b>3/3</b>      | <b>RTLS:</b> | <b>3/3</b>      |
| <b>LIFTOFF:</b>        | <b>3/3</b>      | <b>TAL:</b>  | <b>3/3</b>      |
| <b>ONORBIT:</b>        | <b>3/3</b>      | <b>AOA:</b>  | <b>3/3</b>      |
| <b>DEORBIT:</b>        | <b>3/3</b>      | <b>ATO:</b>  | <b>3/3</b>      |
| <b>LANDING/SAFING:</b> | <b>3/3</b>      |              |                 |

**REDUNDANCY SCREENS:**    A [NA ]                      B [NA ]                      C [NA ]

**LOCATION:**                      AFT COMPARTMENT  
**PART NUMBER:**    MC284-0472-0002

**CAUSES:**    POPPET SEAT FAILURE; CONTAMINATION; SPRING BREAKAGE

**EFFECTS/RATIONALE:**

FAILURE HAS NO EFFECT.    OUTLET INTERCONNECT VALVE PREVENTS  
UNDESIRABLE REVERSE FLOW.

**REFERENCES:**    RI MAIN PROPULSION SYSTEM SCHEMATICS, VS70-415001,  
006, 007 & 008.    BOOSTER SYS'S. BRIEFS, JSC-19401, 1-OCT.1984; RI  
SPEC DWG FOR ME284-0472 PARTS.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|                |                     |          |
|----------------|---------------------|----------|
| DATE: 11/05/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: MPS | FLIGHT:             | 3/3      |
| MDAC ID: 3171  | ABORT:              | 3/3      |

ITEM: ENGINE HELIUM INTERCONNECT CHECK VALVE-PANEL  
 OUTLET (CV28,39,44)  
 FAILURE MODE: FAILS TO OPEN, OR REMAIN OPEN

LEAD ANALYST: M.L.MCNEELY                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE HE INTERCONNECT CHECK VALVE- OUTLET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |           |
|-----------------|---------------|-----------|
|                 | HDW/FUNC      | ABORT     |
| PRELAUNCH:      | 3/3           | RTLS: 3/3 |
| LIFTOFF:        | 3/3           | TAL: 3/3  |
| ONORBIT:        | 3/3           | AOA: 3/3  |
| DEORBIT:        | 3/3           | ATO: 3/3  |
| LANDING/SAFING: | 3/3           |           |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT COMPARTMENT  
 PART NUMBER:                MC284-0472-0002

CAUSES:    GROSS CONTAMINATION

EFFECTS/RATIONALE:

CHECK VALVE IS NORMALLY CLOSED DURING POWERED FLIGHT. FLOW THROUGH VALVE IS ONLY REQUIRED DURING MPS DUMP AND ENTRY PURGE DURING WHICH OTHER FLOW PATHS ARE AVAILABLE.

REFERENCES:    RI MAIN PROPULSION SYSTEM SCHEMATICS, VS70-415001, 006, 007 & 008. BOOSTER SYS'S. BRIEFS, JSC-19401, 1-OCT.1984; RI SPEC DWG FOR ME284-0472 PARTS.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 3180 ABORT: 3/3

ITEM: ENGINE HELIUM INTERCONNECT CHECK VALVE-PANEL INLET  
(CV27,38,43)  
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE HELIUM INTERCONNECT CHECK VALVE- INLET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0472-0002

CAUSES: POPPET SEAT FAILURE; CONTAMINATION; SPRING BREAKAGE

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT. INLET INTERCONNECT VALVE PREVENTS  
UNDESIRABLE REVERSE FLOW.

REFERENCES: RI MAIN PROPULSION SYSTEM SCHEMATICS, VS70-415001,  
006, 007 & 008. BOOSTER SYS'S. BRIEFS, JSC-19401, 1-OCT.1984; RI  
SPEC DWG FOR ME284-0472 PARTS.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/07/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3181 ABORT: 1/1

ITEM: ENGINE HELIUM INTERCONNECT CHECK VALVE-PANEL INLET  
(CV27,38,43)  
FAILURE MODE: FAILS TO OPEN, OR REMAIN OPEN

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SUPPLY
- 2) ENGINE HELIUM REG PANEL A,B
- 3) ENGINE HELIUM INTERCONNECT CHECK VALVE- INLET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: MC284-0472-0002

CAUSES: GROSS CONTAMINATION

EFFECTS/RATIONALE:

CHECK VALVE IS NORMALLY CLOSED DURING POWERED FLIGHT. FLOW THROUGH CHECK VALVE IS REQUIRED NOMINALLY AT ET SEP (AUTO SEQUENCE) AND DURING PURGE PREP/PURGE (CV38 ONLY) DURING ENTRY (MANUAL SEQUENCE). OFF NOMINAL FLOW IS NECESSARY ONLY WHEN PNEUMATIC HELIUM IS SUPPLIED TO SUPPLEMENT ENGINE HELIUM PURGE REQUIREMENTS VIA INLET INTERCONNECT VALVE.

REFERENCES: RI MAIN PROPULSION SYSTEM SCHEMATICS, VS70-415001, 006, 007 & 008. BOOSTER SYS'S. BRIEFS, JSC-19401, 1-OCT.1984; RI SPEC DWG FOR ME284-0472 PARTS.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/24/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 3190 ABORT: 3/3

ITEM: MAIN ENGINE GN2 PURGE DISCONNECT (ORB HALF) (PD14)  
FAILURE MODE: FAILS TO CLOSE OR REMAIN CLOSED

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) GN2 SUPPLY
- 2) INLET ENGINE GN2 PURGE SUPPLY FROM GSE
- 3) ORBITER HALF DISCONNECT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: LEFT T-0 UMBILICAL PANEL  
PART NUMBER: MC276-0003-0017 (OV103); -0007 (099,102,104)

CAUSES: POPPET SEAT FAILURE; CONTAMINATION; SPRING BREAKAGE

EFFECTS/RATIONALE:

NO EFFECT. GN2 PURGE CEASES PRIOR TO L/OFF.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 3200 ABORT: 1/1

ITEM: FACILITY PORTS  
FAILURE MODE: GROSS LEAKAGE

LEAD ANALYST: M.L.MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) HELIUM SYSTEM
- 2) ENGINE 1,2,3 HELIUM REG PANELS A;B
- 3) FACILITY PORTS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 2/2           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: UNKNOWN

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE FROM ANY PANEL FACILITY PORT, WHETHER THE HIGH PRESSURE SIDE OR LOW PRESSURE SIDE MAY DEplete AN ENGINE HELIUM SUPPLY.

REFERENCES: RI MPS SCHEMATICS, VS70-41500X

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

DATE: 9/16/86 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: MPS FLIGHT: 3/2R  
 MDAC ID: 4010 ABORT: 3/2R

ITEM: PNEU VALVE HE SUPPLY CHECK VALVE (CV4)  
 FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
 LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HELIUM SUPPLY CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/2R     |
| LIFTOFF:        | 3/2R          | TAL:  | 3/2R     |
| ONORBIT:        | 3/3           | AOA:  | 3/2R     |
| DEORBIT:        | 3/3           | ATO:  | 3/2R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
 PART NUMBER: ME284-0472-0002

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
 FAILURE

**EFFECTS/RATIONALE:**

PNEUMATIC HELIUM WILL NOT BE USABLE FOR LAUNCH-LAUNCH DELAY OR  
 MISSION SCRUB. PNEUMATIC HELIUM WILL NOT BE AVAILABLE FOR MPS  
 VALVE ACTUATION. LOSS OF ALL FUNCTIONAL REDUNDANCY WILL RESULT  
 IN LOSS OF HELIUM OVERBOARD. LOSS OF MISSION DUE TO LOSS OF  
 CHECK VALVE FUNCTION. LOSS OF MISSION DUE TO LOSS OF VALVE  
 ACTUATION CAPABILITY.

**REFERENCES:**

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |         |                     |          |
|------------|---------|---------------------|----------|
| DATE:      | 9/16/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS     | FLIGHT:             | 3/3      |
| MDAC ID:   | 4011    | ABORT:              | 3/3      |

ITEM: PNEU VALVE HE SUPPLY CHECK VALVE (CV4)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HELIUM SUPPLY CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | CRITICALITIES | ABORT | HDW/FUNC |
|-----------------|----------|---------------|-------|----------|
| PRELAUNCH:      | 3/3      |               | RTLS: | /NA      |
| LIFTOFF:        | /NA      |               | TAL:  | /NA      |
| ONORBIT:        | /NA      |               | AOA:  | /NA      |
| DEORBIT:        | /NA      |               | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |               |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                ME284-0472-0002

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
PNEUMATIC HELIUM WILL NOT BE USABLE FOR LAUNCH-LAUNCH DELAY OR  
MISSION SCRUB.    LOSS OF ALL FUNCTIONAL REDUNDANCY WILL RESULT IN  
INABILITY TO LOAD PNEUMATIC HELIUM.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/1R  
MDAC ID: 4020 ABORT: 3/1R

ITEM: PNEU VALVE HE REG OUTLET CHECK VALVE (CV8)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HE REG OUTLET CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0024

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF ALL FUNCTIONAL REDUNDANCY WILL RESULT IN LOSS OF HELIUM  
OVERBOARD. LOSS OF LIFE/VEHICLE DUE TO LOSS OF MPS VALVE  
ACTUATION CAPABILITY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/10/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 4021     | ABORT:              | 2/1R     |

ITEM: PNEU VALVE HE ISOLATION CHECK VALVE (CV8)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HE REG OUTLET CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0472-0013

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE BECAUSE PNEUMATIC HELIUM WILL NOT BE AVAILABLE FOR MPS VALVE ACTUATION AND AFT COMPARTMENT PURGE. LOSS OF ALL FUNCTIONAL REDUNDANCY WILL RESULT IN LOSS OF CHECK VALVE FUNCTION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4030 ABORT: 2/1R

ITEM: PNEU VALVE HE ISOLATION CHECK VALVE (CV9)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HE ISOLATION CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0013

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE BECAUSE PNEUMATIC HELIUM WILL NOT BE AVAILABLE FOR MPS DUMP VALVE ACTUATION AND AFT COMPARTMENT PURGE. LOSS OF ALL FUNCTIONAL REDUNDANCY WILL RESULT IN LOSS OF CHECK VALVE FUNCTION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/10/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/2R     |
| MDAC ID:   | 4031     | ABORT:              | 3/2R     |

ITEM: PNEU VALVE HE ISOLATION CHECK VALVE (CV9)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN OPEN, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HE ISOLATION CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/2R     |
| LIFTOFF:        | 3/2R          | TAL:  | 3/2R     |
| ONORBIT:        | 3/3           | AOA:  | 3/2R     |
| DEORBIT:        | 3/3           | ATO:  | 3/2R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                ME284-0472-0013

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF ALL FUNCTIONAL REDUNDANCY WILL RESULT IN LOSS OF CHECK VALVE FUNCTION.    LOSS OF MISSION DUE TO LOSS OF MPS VALVE ACTUATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/10/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4040     | ABORT:              | 3/3      |

ITEM: GO2 PRESS MANIF REPRESS CHECK VALVE (CV10)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GO2 PRESS MANIF. REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0472-0011

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CHECK BACKFLOW DURING MPS GO2 MANIFOLD DUMP.    SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 10/10/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4041     | ABORT:              | 3/3      |

ITEM: GO2 PRESS MANIF REPRESS CHECK VALVE (CV10)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GO2 PRESS MANIF. REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    ME284-0472-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
HELIUM WILL NOT BE FED INTO THE GO2 PRESSURE MANIFOLD FOR DUMP AND REPRESS. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/12/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4050     | ABORT:              | 3/3      |

ITEM: LO2 FEED MANIF REPRESS CHECK VALVE (CV12)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEED MANIF REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0472-0013

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO CHECK BACKFLOW DURING MPS LO2 MANIFOLD DUMP.    SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 4051 ABORT: 1/1

ITEM: LO2 FEED MANIF REPRESS CHECK VALVE (CV12)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEED MANIF REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | /NA           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | /NA           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0013

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF MPS LO2 MANIFOLD DUMP  
CAPABILITY. LOSS OF FLIGHT CONTROL DUE TO EXCESSIVE AFT CG.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4060 ABORT: 3/3

ITEM: GH2 PRESS MANIF REPRESS CHECK VALVE (CV13)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GH2 PRESS MANIF REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CHECK BACKFLOW DURING MPS GH2 MANIFOLD  
DUMP. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4061 ABORT: 3/3

ITEM: GH2 PRESS MANIF REPRESS CHECK VALVE (CV13)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GH2 PRESS MANIF REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP AND REPRESS GH2 MANIFOLD. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4070 ABORT: 3/3

ITEM: LH2 RECIRC MANIF REPRESS CHECK VALVE (CV14)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC MANIF REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CHECK BACKFLOW DURING MPS LH2 RECIRC  
MANIFOLD DUMP. SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4071 ABORT: 3/3

ITEM: LH2 RECIRC MANIF REPRESS CHECK VALVE (CV14)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC MANIF REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP AND REPRESS THE MPS LH2 RECIRC  
MANIFOLD. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86  
 SUBSYSTEM: MPS  
 MDAC ID: 4080

HIGHEST CRITICALITY HDW/FUNC  
 FLIGHT: 3/3  
 ABORT: 3/3

ITEM: LH2 FEED MANIF NOM REPRESS CHECK VALVE (CV15)  
 FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED MANIF NOM REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
 PART NUMBER:                ME284-0472-0024

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
 LOSS OF CAPABILITY TO CHECK BACKFLOW DURING MPS LH2 FEED MANIFOLD DUMP.    SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4081 ABORT: 3/3

ITEM: LH2 FEED MANIF NOM REPRESS CHECK VALVE (CV15)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED MANIF NOM REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0024

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP AND REPRESS THE MPS LH2 FEED MANIFOLD.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86  
SUBSYSTEM: MPS  
MDAC ID: 4090

HIGHEST CRITICALITY  
FLIGHT: 2/1R  
ABORT: 2/1R

HDW/FUNC  
2/1R  
2/1R

ITEM: LO2 TANK PRE-PRESS CHECK VALVE (CV16)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO  
SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 TANK PRE-PRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | /NA           | AOA:  | 2/1R     |
| DEORBIT:        | /NA           | ATO:  | 2/1R     |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF ULLAGE PRESSURE RESULTS IN ALL THREE MAIN ENGINES SHUTDOWN AND LOSS OF LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4091 ABORT: 3/3

ITEM: LO2 TANK PRE-PRESS CHECK VALVE (CV16)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 TANK PRE-PRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO HELIUM PREPRESS PRELAUNCH. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4100 ABORT: 2/1R

ITEM: LH2 TANK PRE-PRESS CHECK VALVE (CV17)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 TANK PRE-PRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | /NA           | AOA:  | 2/1R     |
| DEORBIT:        | /NA           | ATO:  | 2/1R     |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0005

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF ULLAGE PRESSURE RESULTS IN ALL THREE MAIN ENGINE SHUTDOWN  
AND LOSS OF LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/13/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4101     | ABORT:              | 3/3      |

ITEM: LH2 TANK PRE-PRESS CHECK VALVE (DV17)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 TANK PRE-PRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | CRITICALITIES | ABORT | HDW/FUNC |
|-----------------|----------|---------------|-------|----------|
| PRELAUNCH:      | 3/3      |               | RTLS: | /NA      |
| LIFTOFF:        | /NA      |               | TAL:  | /NA      |
| ONORBIT:        | /NA      |               | AOA:  | /NA      |
| DEORBIT:        | /NA      |               | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |               |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                ME284-0472-0005

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO HELIUM PREPRESS PRELAUNCH. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86  
 SUBSYSTEM: MPS  
 MDAC ID: 4110

HIGHEST CRITICALITY  
 FLIGHT: 3/3  
 ABORT: 3/3

ITEM: GH2 PRESS MANIFOLD REPRESS CHECK VALVE (CV24)  
 FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GH2 PRESS MANIFOLD REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
 PART NUMBER:                ME284-0472-0011

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
 LOSS OF CAPABILITY TO CHECK BACKFLOW DURING MPS GH2 PRESS MANIFOLD DUMP AND REPRESS.    SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/13/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4111 ABORT: 3/3

ITEM: GH2 PRESS MANIFOLD REPRESS CHECK VALVE (CV24)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GH2 PRESS MANIFOLD REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP AND REPRESS GH2 PRESS MANIFOLD.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/14/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4120     | ABORT:              | 3/3      |

ITEM: LH2 FEED MANIF RTLS REPRESS CHECK VALVE (CV30)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED MANIF RTLS REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0472-0024

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO CHECK BACKFLOW DURING MPS LH2 FEED MANIFOLD DUMP & REPRESS.    SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4121 ABORT: 3/3

ITEM: LH2 FEED MANIF RTLS REPRESS CHECK VALVE (CV30)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED MANIF RTLS REPRESS CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0472-0024

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP AND REPRESS LH2 RTLS MANIFOLD. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4130 ABORT: 3/3

ITEM: PNEU VALVE HE SUPPLY-ISOLATION VALVE (LV7,LV8)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU VALVE HE SUPPLY-ISOLATION VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0403-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO USE PNEUMATIC HELIUM FOR MPS VALVE  
ACTUATION. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4131 ABORT: 3/3

ITEM: PNEU VALVE HE SUPPLY-ISOLATION VALVE (LV7,LV8)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU VALVE HE SUPPLY-ISOLATION VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0403-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO USE PNEUMATIC HELIUM FOR MPS VALVE  
ACTUATION. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4132 ABORT: 3/3

ITEM: PNEU VALVE HE SUPPLY-ISOLATION VALVE (LV7,LV8)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU VALVE HE SUPPLY-ISOLATION VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0403-0011

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO USE PNEUMATIC HELIUM FOR MPS DUMP AND  
PURGE. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4140 ABORT: 2/1R

ITEM: PNEU HE CROSSOVER SOLENOID (LV10)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU HE CROSSOVER SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0403-0003

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF MPS HELIUM AFT COMPARTMENT  
PURGE RESULTING IN LH2 AND LO2 MIXING WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4141 ABORT: 2/1R

ITEM: PNEU HE CROSSOVER SOLENOID (LV10)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU HE CROSSOVER SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0403-0003

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LOSS OF MPS AFT COMPARTMENT PURGE RESULTING IN LO2 AND LH2 MIXING WITH EXPLOSION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4142 ABORT: 3/3

ITEM: PNEU HE CROSSOVER SOLENOID (LV10)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU HE CROSSOVER SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0403-0003

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO ISOLATE THE HELIUM CROSSOVER. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4150 ABORT: 3/3

ITEM: LO2 PREVALVE OPENING SOLENOID (LV12,LV14,LV16)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO OPEN THE SOLENOID VALVE. SYSTEM  
DEGRADATION. LO2 PREVALVE REMAINS OPEN WITHOUT HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4151 ABORT: 3/3

ITEM: LO2 PREVALVE OPENING SOLENOID (LV12, LV14, LV16)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE SOLENOID VALVE OPEN. SYSTEM  
DEGRADATION. LO2 PREVALVE REMAINS OPEN WITHOUT HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/25/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 4152     | ABORT:              | 2/1R     |

ITEM: LO2 PREVALVE OPENING SOLENOID (LV12, LV14, LV16)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    ME284-0404-0021

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LO2 PREVALVE TO CLOSE AT MECO RESULTING IN SSME PUMP OVERSPEED AND EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4160 ABORT: 2/1R

ITEM: LO2 PREVALVE OPENING SOLENOID (LV13, LV15, LV17)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LO2 PREVALVE TO CLOSE AT  
MECO RESULTING IN SSME PUMP OVERSPEED AND EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/25/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 4161     | ABORT:              | 2/1R     |

ITEM: LO2 PREVALVE CLOSING SOLENOID (LV13,LV15,LV17)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO                  SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                    B [ F ]                    C [ P ]

LOCATION:                    AFT FUSELAGE  
PART NUMBER:    ME284-0404-0021

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LO2 PREVALVE TO CLOSE AT MECO RESULTING IN SSME PUMP OVERSPEED AND EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4162 ABORT: 3/3

ITEM: LO2 PREVALVE CLOSING SOLENOID (LV13, LV15, LV17)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |           |
|-----------------|---------------|-----------|
|                 | HDW/FUNC      | ABORT     |
| PRELAUNCH:      | 3/3           | RTLS: 3/3 |
| LIFTOFF:        | 3/3           | TAL: 3/3  |
| ONORBIT:        | 3/3           | AOA: 3/3  |
| DEORBIT:        | 3/3           | ATO: 3/3  |
| LANDING/SAFING: | 3/3           |           |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE SOLENOID CLOSED. SYSTEM  
DEGRADATION. LO2 PREVALVE REMAINS CLOSED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/15/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4164     | ABORT:              | 3/3      |

ITEM: LH2 PREVALVE OPENING SOLENOID (LV18, LV20, LV22)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM
- 3) PNEUMATIC HELIUM
- 4) LH2 PREVALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0404-0001

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO OPEN THE SOLENOID VALVE.    SYSTEM DEGRADATION.    LH2 PREVALVE REMAINS OPEN WITHOUT HELIUM PRESSURE.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4165 ABORT: 3/3

ITEM: LH2 PREVALVE OPENING SOLENOID (LV18, LV20, LV22)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM
- 3) PNEUMATIC HELIUM
- 4) LH2 PREVALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE SOLENOID VALVE OPEN. SYSTEM  
DEGRADATION. LH2 PREVALVE REMAINS OPEN WITHOUT HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4166 ABORT: 2/1R

ITEM: LH2 PREVALVE OPENING SOLENOID (LV18, LV20, LV22)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM
- 3) PNEUMATIC HELIUM
- 4) LH2 PREVALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LH2 PREVALVE TO CLOSE AT  
MECO RESULTING IN MIXING OF LH2 WITH LO2 IN THE SSME WITH AN  
EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4167 ABORT: 2/1R

ITEM: LH2 PREVALVE CLOSING SOLENOID (LV19, LV21, LV23)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM
- 3) PNEUMATIC HELIUM
- 4) LH2 PREVALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LH2 PREVALVE TO CLOSE  
RESULTING IN LH2 MIXING WITH LO2 WITH AN SSME EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4168 ABORT: 2/1R

ITEM: LH2 PREVALVE CLOSING SOLENOID (LV19,LV21,LV23)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM
- 3) PNEUMATIC HELIUM
- 4) LH2 PREVALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LH2 PREVALVE TO CLOSE AT  
MECO RESULTING IN LH2 MIXING WITH LO2 WITH AN SSME EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4169 ABORT: 3/3

ITEM: LH2 PREVALVE CLOSING SOLENOID (LV19, LV21, LV23)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM
- 3) PNEUMATIC HELIUM
- 4) LH2 PREVALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE SOLENOID. SYSTEM DEGRADATION.  
LH2 PREVALVE REMAINS CLOSED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4170 ABORT: 2/1R

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID  
(LV24)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 2/1R          | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF LO2 FEEDLINE MANIFOLD  
PRESSURE RELIEF WITH LO2 MANIFOLD RUPTURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4171 ABORT: 2/1R

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID  
(LV24)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 2/1R          | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF LO2 FEEDLINE MANIFOLD  
PRESSURE RELIEF WITH LO2 MANIFOLD RUPTURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4172 ABORT: 2/1R

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID  
(LV24)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO EXTERNAL LEAKAGE OF LO2 OVERBOARD  
DURING LAUNCH, DUE TO LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4180 ABORT: 2/1R

ITEM: LH2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID  
(LV25)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 2/1R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF LH2 FEEDLINE MANIFOLD  
PRESSURE RELIEF WITH LH2 MANIFOLD RUPTURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4181 ABORT: 2/1R

ITEM: LH2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID  
(LV25)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 2/1R          | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LOSS OF LH2 FEEDLINE MANIFOLD PRESSURE RELIEF WITH LH2 MANIFOLD PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4182 ABORT: 2/1R

ITEM: LH2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID  
(LV25)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO EXTERNAL LEAKAGE OF LH2 OVERBOARD  
DURING LAUNCH, DUE TO LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/01/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 4190     | ABORT:              | 2/1R     |

ITEM: HE SUPPLY BLOWDOWN VALVE (LV26,LV27)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) HE SUPPLY BLOWDOWN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 2/1R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R     |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    ME284-0404-0002

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF AFT COMPARTMENT PURGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4191 ABORT: 2/1R

ITEM: HE SUPPLY BLOWDOWN VALVE (LV26, LV27)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) HE SUPPLY BLOWDOWN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0002

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF AFT COMPARTMENT PURGE  
RESULTING IN LO2 AND LH2 MIXING WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4192 ABORT: 2/1R

ITEM: HE SUPPLY BLOWDOWN VALVE (LV26, LV27)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) HE SUPPLY BLOWDOWN VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 2/1R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME284-0404-0002

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LOSS OF HELIUM FOR MPS LO2 DUMP.  
LOSS OF MPS LO2 DUMP RESULTS IN LOSS OF FLIGHT CONTROL.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4200 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL VALVE OPENING SOLENOID (LV28)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LO2 OUTBOARD FILL VALVE SOLENOID.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4201 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL VALVE OPENING SOLENOID (LV28)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LO2 FILL VALVE SOLENOID OPEN.  
SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4202 ABORT: 2/1R

ITEM: LO2 OUTBOARD FILL VALVE OPENING SOLENOID (LV28)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF LO2 OVERBOARD RESULTING IN  
EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4210 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL VALVE CLOSING SOLENOID (LV29)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO OPEN THE LO2 FILL VALVE CLOSING SOLENOID.  
SYSTEM DEGRADATION. FILL VALVE REMAINS CLOSED WITH NO HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4211 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL VALVE CLOSING SOLENOID (LV29)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LO2 FILL VALVE CLOSING SOLENOID  
OPEN. SYSTEM DEGRADATION. FILL VALVE REMAINS CLOSED WITH NO  
HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4212 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL VALVE CLOSING SOLENOID (LV29)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO KEEP THE LO2 FILL VALVE CLOSING SOLENOID  
CLOSED. SYSTEM DEGRADATION. FILL VALVE WILL REMAIN CLOSED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4220 ABORT: 3/3

ITEM: LO2 INBOARD FILL VALVE OPENING SOLENOID (LV30)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 INBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LO2 FILL VALVE OPENING SOLENOID.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4221 ABORT: 3/3

ITEM: LO2 INBOARD FILL VALVE OPENING SOLENOID (LV30)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 INBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO KEEP THE LO2 FILL VALVE OPENING SOLENOID  
OPEN. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4222 ABORT: 2/1R

ITEM: LO2 INBOARD FILL VALVE OPENING SOLENOID (LV30)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 INBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LO2 FILL VALVE OPENING AND LO2  
EXTERNAL LEAKAGE WITH LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4223 ABORT: 3/3

ITEM: LO2 INBOARD FILL VALVE CLOSING SOLENOID (LV31)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 INBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LO2 FILL VALVE CLOSING SOLENOID.  
SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4224 ABORT: 2/1R

ITEM: LO2 INBOARD FILL VALVE CLOSING SOLENOID (LV31)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 INBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LO2 FILL VALVE OPENING AND LO2  
EXTERNAL LEAKAGE WITH LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4225 ABORT: 3/3

ITEM: LO2 INBOARD FILL VALVE CLOSING SOLENOID (LV31)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 INBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE LO2 FILL VALVE CLOSING SOLENOID.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4226 ABORT: 3/3

ITEM: LH2 OUTBOARD FILL VALVE OPENING SOLENOID (LV32)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN LH2 OUTBOARD FILL VALVE SOLENOID.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4227 ABORT: 3/3

ITEM: LH2 OUTBOARD FILL VALVE OPENING SOLENOID (LV32)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LH2 FILL VALVE SOLENOID OPEN.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4228 ABORT: 2/1R

ITEM: LH2 OUTBOARD FILL VALVE OPENING SOLENOID (LV32)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 OUTBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF LH2 OVERBOARD RESULTING IN  
EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4229 ABORT: 3/3

ITEM: LH2 OUTBOARD FILL VALVE CLOSING SOLENOID (LV33)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 OUTBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO CLOSE THE LH2 FILL VALVE SOLENOID. SYSTEM  
DEGRADATION. FILL VALVE REMAINS CLOSED WITH NO HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4230 ABORT: 3/3

ITEM: LH2 OUTBOARD FILL VALVE CLOSING SOLENOID (LV33)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 OUTBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LH2 FILL VALVE CLOSING SOLENOID  
OPEN. SYSTEM DEGRADATION. FILL VALVE REMAINS CLOSED WITH NO  
HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4231 ABORT: 3/3

ITEM: LH2 OUTBOARD FILL VALVE CLOSING SOLENOID (LV33)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 OUTBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO KEEP THE LH2 FILL VALVE CLOSING SOLENOID  
CLOSED. SYSTEM DEGRADATION. FILL VALVE WILL REMAIN CLOSED.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4232 ABORT: 3/3

ITEM: LH2 INBOARD FILL VALVE OPENING SOLENOID (LV34)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 INBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 FILL VALVE OPENING SOLENOID.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4233 ABORT: 3/3

ITEM: LH2 INBOARD FILL VALVE OPENING SOLENOID (LV34)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 INBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP OPEN THE LH2 FILL VALVE OPENING SOLENOID. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4234 ABORT: 2/1R

ITEM: LH2 INBOARD FILL VALVE OPENING SOLENOID (LV34)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 INBOARD FILL VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LH2 FILL VALVE OPENING AND LH2  
EXTERNAL LEAKAGE WITH LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4235 ABORT: 3/3

ITEM: LH2 INBOARD FILL VALVE CLOSING SOLENOID (LV35)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 INBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 FILL VALVE CLOSING SOLENOID.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4236 ABORT: 2/1R

ITEM: LH2 INBOARD FILL VALVE CLOSING SOLENOID (LV35)  
FAILURE MODE: FAILS TO REMAIN OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 INBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LH2 FILL VALVE OPENING AND LH2  
EXTERNAL LEAKAGE WITH LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4237 ABORT: 3/3

ITEM: LH2 INBOARD FILL VALVE CLOSING SOLENOID (LV35)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 INBOARD FILL VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE LH2 FILL VALVE CLOSING SOLENOID.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4240 ABORT: 3/3

ITEM: LH2 RECIRC PUMP VALVE OPENING SOLENOID (LV36)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC PUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | /NA           | ATO:  | 3/3      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 RECIRC VALVES. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4241 ABORT: 3/3

ITEM: LH2 RECIRC PUMP VALVE OPENING SOLENOID (LV36)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC PUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | /NA      | ATO:  | 3/3      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP OPEN THE LH2 RECIRC VALVES. SYSTEM  
DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4242 ABORT: 3/3

ITEM: LH2 RECIRC PUMP VALVE OPENING SOLENOID (LV36)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC PUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | /NA           | AOA:  | 3/3      |
| DEORBIT:        | /NA           | ATO:  | 3/3      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE LH2 RECIRC VALVES. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/03/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4250     | ABORT:              | 3/3      |

ITEM: LH2 REPLENISH VALVE OPENING SOLENOID(LV39)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 REPLENISH VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0404-0012

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 REPLENISH VALVE.    SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4251 ABORT: 3/3

ITEM: LH2 REPLENISH VALVE OPENING SOLENOID(LV39)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 REPLENISH VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP OPEN THE LH2 REPLENISH VALVE. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4252 ABORT: 2/1R

ITEM: LH2 REPLENISH VALVE OPENING SOLENOID(LV39)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 REPLENISH VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE TO CLOSE THE LH2 REPLENISH  
VALVE RESULTING IN LH2 LEAK OVERBOARD WITH EXPLOSION AND LOSS OF  
ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4260 ABORT: 2/1R

ITEM: LO2 MANIFOLD REPRESS VALVE (LV40,LV41)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 MANIFOLD REPRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 2/1R          | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0003

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF LO2 MPS DUMP RESULTING IN  
LOSS OF FLIGHT CONTROL.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4261 ABORT: 2/1R

ITEM: LO2 MANIFOLD REPRESS VALVE (LV40, LV41)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 MANIFOLD REPRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 2/1R          | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0003

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LOSS OF MPS LO2 DUMP RESULTING IN LOSS OF FLIGHT CONTROL.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/2R  
MDAC ID: 4262 ABORT: 3/2R

ITEM: LO2 MANIFOLD REPRESS VALVE (LV40, LV41)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 MANIFOLD REPRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/2R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/2R     |
| ONORBIT:        | 3/3      | AOA:  | 3/2R     |
| DEORBIT:        | 3/3      | ATO:  | 3/2R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0003

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LO2 REPRESS VALVE CLOSED RESULTING  
IN SSME SHUTDOWN AND LOSS OF MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4270 ABORT: 3/3

ITEM: LH2 MANIFOLD REPRESS VALVE (LV42, LV43)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 MANIFOLD REPRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0003

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 REPRESS VALVE. SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/03/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4271     | ABORT:              | 3/3      |

ITEM: LH2 MANIFOLD REPRESS VALVE (LV42, LV43)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 MANIFOLD REPRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0403-0003

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LH2 REPRESS VALVE OPEN.    SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/1R  
MDAC ID: 4272 ABORT: 3/1R

ITEM: LH2 MANIFOLD REPRESS VALVE (LV42, LV43)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 MANIFOLD REPRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0003

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO KEEP THE LH2 REPRESS VALVE CLOSED RESULTING  
IN HELIUM INGESTION INTO ALL THREE MAIN ENGINES WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/09/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4280     | ABORT:              | 3/3      |

ITEM: LO2 FEED DISCONNECT VALVE OPENING SOLENOID (LV46)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEED DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LO2 FEED DISCONNECT VALVE PRELAUNCH.    SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/09/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 4281     | ABORT:              | 2/1R     |

ITEM: LO2 FEED DISCONNECT VALVE OPENING SOLENOID (LV46)  
FAILURE MODE: FAILS TO REMAIN OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEED DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:              MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LO2 FEED DISCONNECT OPENING SOLENOID TO REMAIN OPEN AND LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/09/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4282     | ABORT:              | 3/3      |

ITEM: LO2 FEED DISCONNECT VALVE OPENING SOLENOID (LV46)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEED DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE LO2 FEED DISCONNECT VALVE.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4290 ABORT: 3/3

ITEM: LO2 FEED DISCONNECT VALVE CLOSING SOLENOID (LV47)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEED DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LO2 FEED DISCONNECT VALVE CLOSING  
SOLENOID. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4291 ABORT: 3/3

ITEM: LO2 FEED DISCONNECT VALVE CLOSING SOLENOID (LV47)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEED DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LO2 FEED DISCONNECT VALVE CLOSING  
SOLENOID OPEN. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4292 ABORT: 3/3

ITEM: LO2 FEED DISCONNECT VALVE CLOSING SOLENOID (LV47)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 FEED DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO KEEP THE LO2 FEED DISCONNECT VALVE CLOSING  
SOLENOID CLOSED. SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/09/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4300     | ABORT:              | 3/3      |

ITEM: LH2 FEED DISCONNECT VALVE OPENING SOLENOID (LV48)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 FEED DISCONNECT VALVE.    SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4301 ABORT: 2/1R

ITEM: LH2 FEED DISCONNECT VALVE OPENING SOLENOID (LV48)  
FAILURE MODE: FAILS TO REMAIN OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LH2 FEED DISCONNECT OPENING SOLENOID TO REMAIN OPEN AND LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/09/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4302     | ABORT:              | 3/3      |

ITEM: LH2 FEED DISCONNECT VALVE OPENING SOLENOID (LV48)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC284-0404-0021

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE LH2 FEED DISCONNECT VALVE.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4310 ABORT: 3/3

ITEM: LH2 FEED DISCONNECT VALVE CLOSING SOLENOID (LV49)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO OPEN THE LH2 FEED DISCONNECT VALVE CLOSING  
SOLENOID. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/09/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4311     | ABORT:              | 3/3      |

ITEM: LH2 FEED DISCONNECT VALVE CLOSING SOLENOID (LV49)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0404-0021

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LH2 FEED DISCONNECT VALVE CLOSING  
SOLENOID OPEN.    SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4312 ABORT: 3/3

ITEM: LH2 FEED DISCONNECT VALVE CLOSING SOLENOID (LV49)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO KEEP THE LH2 FEED DISCONNECT VALVE CLOSING  
SOLENOID CLOSED. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4320 ABORT: 3/3

ITEM: LH2 RECIRC DISCONNECT VALVE OPENING SOLENOID  
(LV50)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 RECIRC DISCONNECT VALVE.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4321 ABORT: 3/3

ITEM: LH2 RECIRC DISCONNECT VALVE OPENING SOLENOID  
(LV50)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LH2 RECIRC DISCONNECT VALVE  
OPENING SOLENOID OPEN. SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 4322 ABORT: 1/1

ITEM: LH2 RECIRC DISCONNECT VALVE OPENING SOLENOID  
(LV50)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC DISCONNECT VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LH2 RECIRC DISCONNECT  
VALVE OPENING SOLENOID TO CLOSE RESULTING IN LH2 LEAK OVERBOARD  
WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 4330 ABORT: 1/1

ITEM: LH2 RECIRC DISCONNECT VALVE CLOSING SOLENOID  
(LV51)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LH2 RECIRC DISCONNECT  
VALVE CLOSING SOLENOID TO OPEN RESULTING IN LH2 LEAK OVERBOARD  
WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/03/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 4331     | ABORT:              | 1/1      |

ITEM: LH2 RECIRC DISCONNECT VALVE CLOSING SOLENOID  
(LV51)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO FAILURE TO KEEP LH2 RECIRC DISCONNECT  
VALVE CLOSING SOLENOID OPEN RESULTING IN LH2 LEAK OVERBOARD WITH  
EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4332 ABORT: 3/3

ITEM: LH2 RECIRC DISCONNECT VALVE CLOSING SOLENOID  
(LV51)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 RECIRC DISCONNECT VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE LH2 RECIRC DISCONNECT VALVE  
CLOSING SOLENOID CLOSED. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/03/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4340     | ABORT:              | 1/1      |

ITEM: LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID  
(LV72)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]            B [NA ]            C [NA ]

LOCATION:            AFT FUSELAGE  
PART NUMBER:    MC284-0404-0012

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LH2 RTLS FEEDLINE DUMP FAILURE AND  
LH2 LEAKAGE OVERBOARD THROUGH FEEDLINE RELIEF WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/03/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4341     | ABORT:              | 1/1      |

ITEM: LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID (LV72)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0404-0012

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LH2 RTLS FEEDLINE DUMP FAILURE AND LH2 LEAKAGE OVERBOARD THROUGH FEEDLINE RELIEF WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/03/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 4342     | ABORT:              | 2/1R     |

ITEM: LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID  
(LV72)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0404-0012

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LH2 RTLS FEEDLINE DUMP VALVES FAIL OPEN AND LH2 LEAKAGE OVERBOARD WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4350 ABORT: 1/1

ITEM: LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID  
(LV73)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LH2 RTLS FEEDLINE DUMP FAILURE AND  
LH2 LEAKAGE OVERBOARD THROUGH FEEDLINE RELIEF WITH EXPLOSION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/04/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4351     | ABORT:              | 1/1      |

ITEM: LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID  
(LV73)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:                MC284-0404-0012

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO LH2 RTLS FEEDLINE DUMP FAILURE AND  
LH2 LEAKAGE OVERBOARD THROUGH FEEDLINE RELIEF WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4352 ABORT: 2/1R

ITEM: LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID  
(LV73)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LH2 RTLS FEEDLINE DUMP VALVES FAIL  
OPEN AND LH2 LEAKAGE OVERBOARD WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4360 ABORT: 3/3

ITEM: LH2 FEED MANIFOLD RTLS PRESS VALVE (LV74,LV75)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED MANIFOLD RTLS PRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0002

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 FEED MANIFOLD RTLS PRESS  
VALVE. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86  
 SUBSYSTEM: MPS  
 MDAC ID: 4361

HIGHEST CRITICALITY HDW/FUNC  
 FLIGHT: 3/3  
 ABORT: 3/3

ITEM: LH2 FEED MANIFOLD RTLS PRESS VALVE (LV74, LV75)  
 FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED MANIFOLD RTLS PRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
 PART NUMBER:                MC284-0403-0002

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
 FAILURE

EFFECTS/RATIONALE:  
 LOSS OF CAPABILITY TO KEEP THE LH2 FEED MANIFOLD RTLS PRESS VALVE  
 SOLENOID OPEN.    SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4362 ABORT: 2/1R

ITEM: LH2 FEED MANIFOLD RTLS PRESS VALVE (LV74, LV75)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED MANIFOLD RTLS PRESS VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0403-0002

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LIFE/VEHICLE DUE TO HELIUM INGESTION INTO ALL THREE MAIN  
ENGINES RESULTING IN EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4370 ABORT: 2/1R

ITEM: LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LO2 OVERBOARD BLEED VALVE OPENING  
RESULTING IN LO2 LEAKAGE OVERBOARD WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4371 ABORT: 2/1R

ITEM: LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LO2 OVERBOARD BLEED VALVE OPENING  
RESULTING IN LO2 LEAKAGE OVERBOARD WITH EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/04/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 3/3      |
| MDAC ID:   | 4372     | ABORT:              | 3/3      |

ITEM: LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:    MC284-0404-0012

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO CLOSE THE LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID.    SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4380 ABORT: 3/3

ITEM: LO2 POGO ACCUM RECIRC VALVE CLOSING SOLENOID  
(LV77, LV78)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 POGO ACCUM RECIR VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE LO2 POGO ACCUM RECIRC VALVE.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4381 ABORT: 3/3

ITEM: LO2 POGO ACCUM RECIRC VALVE CLOSING SOLENOID  
(LV77, LV78)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 POGO ACCUM RECIRC VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE LO2 POGO ACCUM RECIRC VALVE.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4382 ABORT: 2/1R

ITEM: LO2 POGO ACCUM RECIRC VALVE CLOSING SOLENOID  
(LV77, LV78)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 POGO ACCUM RECIR VALVE CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LO2 POGO SUPPRESSION  
RESULTING IN VEHICLE STRUCTURAL DAMAGE AND LOSS OF FLIGHT  
CONTROL.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4390 ABORT: 3/3

ITEM: LH2 HI POINT BLEED VALVE OPENING SOLENOID (LV79)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 HI POINT BLEED VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE LH2 HI POINT BLEED VALVE OPENING  
SOLENOID. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4391 ABORT: 3/3

ITEM: LH2 HI POINT BLEED VALVE OPENING SOLENOID (LV79)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 HI POINT BLEED VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO KEEP OPEN THE LH2 HI POINT BLEED VALVE  
OPENING SOLENOID. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4392 ABORT: 2/1R

ITEM: LH2 HI POINT BLEED VALVE OPENING SOLENOID (LV79)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 HI POINT BLEED VALVE OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0012

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE TO CLOSE THE LH2 HI POINT  
BLEED VALVE OPENING SOLENOID RESULTING IN LH2 LEAK OVERBOARD WITH  
LOSS OF ALL FUNCTIONAL REDUNDANCY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4400 ABORT: 2/1R

ITEM: LO2 PREVALVE REDUNDANT CLOSING SOLENOID  
(LV80, LV81, LV82)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE REDUNDANT CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LO2 PREVALVE TO CLOSE AT  
MECO RESULTING IN SSME PUMP OVERSPEED AND EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4401 ABORT: 2/1R

ITEM: LO2 PREVALVE REDUNDANT CLOSING SOLENOID  
(LV80, LV81, LV82)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE REDUNDANT CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LO2 PREVALVE TO CLOSE AT  
MECO RESULTING IN SSME PUMP OVERSPEED AND EXPLOSION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4402 ABORT: 3/3

ITEM: LO2 PREVALVE REDUNDANT CLOSING SOLENOID  
(LV80, LV81, LV82)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE REDUNDANT CLOSING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO KEEP THE SOLENOID CLOSED. SYSTEM  
DEGRADATION. LO2 PREVALVE REMAINS CLOSED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4410 ABORT: 3/3

ITEM: LO2 PREVALVE REDUNDANT OPENING SOLENOID  
(LV83, LV84, LV85)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE REDUNDANT OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO OPEN THE SOLENOID VALVE. SYSTEM  
DEGRADATION. LO2 PREVALVE REMAINS OPEN WITHOUT HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4411 ABORT: 3/3

ITEM: LO2 PREVALVE REDUNDANT OPENING SOLENOID  
(LV83, LV84, LV85)  
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE REDUNDANT OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO OPEN THE SOLENOID VALVE. SYSTEM  
DEGRADATION. LO2 PREVALVE REMAINS OPEN WITHOUT HELIUM PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4412 ABORT: 2/1R

ITEM: LO2 PREVALVE REDUNDANT OPENING SOLENOID  
(LV83, LV84, LV85)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE REDUNDANT OPENING SOLENOID
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0404-0021

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO FAILURE OF LO2 PREVALVE TO CLOSE AT  
MECO. RESULTING IN SSME PUMP OVERSPEED AND EXPLOSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4420 ABORT: 2/1R

ITEM: LO2 TANK GND PRE-PRESS (ORB/GND) DISC. (ORB HALF)  
(PD9)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 TANK GND PRE-PASS (ORB/GND) DISC (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | /NA      | AOA:  | 2/1R     |
| DEORBIT:        | /NA      | ATO:  | 2/1R     |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LO2 ULLAGE PRESSURE RESULTS IN ALL THREE MAIN ENGINES  
SHUTDOWN AND LOSS OF LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4421 ABORT: 3/3

ITEM: LO2 TANK GND PRE-PRESS (ORB/GND) DISC. (ORB HALF)  
(PD9)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 TANK GND PRE-PASS (ORB/GND) DISC (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO HELIUM PREPRESS DURING PRELAUNCH. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4422 ABORT: 2/1R

ITEM: LO2 TANK GND PRE-PRESS (ORB/GND) DISC. (ORB HALF)  
(PD9)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 TANK GND PRE-PASS (ORB/GND) DISC (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | /NA      | AOA:  | 2/1R     |
| DEORBIT:        | /NA      | ATO:  | 2/1R     |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LO2 ULLAGE PRESSURE RESULTS IN ALL THREE MAIN ENGINES  
SHUTDOWN AND LOSS OF LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4430 ABORT: 2/1R

ITEM: LH2 TANK GND PRE-PRESS (ORB/GND) DISC. (ORB HALF)  
(PD10)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 TANK GND PRE-PRESS (ORB/GND) DISC (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | /NA      | AOA:  | 2/1R     |
| DEORBIT:        | /NA      | ATO:  | 2/1R     |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LH2 ULLAGE PRESSURE RESULTS IN ALL THREE MAIN ENGINES  
SHUTDOWN AND LOSS OF LIFE/VEHICLE.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4431 ABORT: 3/3

ITEM: LH2 TANK GND PRE-PRESS (ORB/GND) DISC. (ORB HALF)  
(PD10)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 TANK GND PRE-PRESS (ORB/GND) DISC (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO HELIUM PREPRESS DURING PRELAUNCH. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4432 ABORT: 2/1R

ITEM: LH2 TANK GND PRE-PRESS (ORB/GND) DISC. (ORB HALF)  
(PD10)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 TANK GND PRE-PRESS (ORB/GND) DISC (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | /NA      | AOA:  | 2/1R     |
| DEORBIT:        | /NA      | ATO:  | 2/1R     |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF LH2 ULLAGE RESULTS IN ALL THREE MAIN ENGINES SHUTDOWN AND LOSS OF LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 4460 ABORT: 1/1

ITEM: TEST PORT, PNEU HE OUTLET (TP1)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) TEST PORT, PNEU HE OUTLET
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415756-002

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE BECAUSE PNEUMATIC HELIUM WILL NOT BE  
AVAILABLE FOR MPS DUMP VALVE ACTUATION AND AFT COMPARTMENT PURGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4470 ABORT: 3/3

ITEM: TEST PORT, LH2 REPRESS REG OUTLET (TP3)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) TEST PORT, LH2 REPRESS REG OUTLET
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415532-001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP AND REPRESS THE LH2 REPRESS MANIFOLD.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4480 ABORT: 3/3

ITEM: TEST PORT, LO2 REPRESS REG OUTLET (TP4)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) TEST PORT, LO2 REPRESS REG OUTLET
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415532-001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP AN REPRESS THE LO2 REPRESS MANIFOLD.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4490 ABORT: 2/1R

ITEM: TEST PORT, LO2 PREPRESS DISC. CHECK VALVE (TP9)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) TEST PORT, LO2 PREPRESS DISC. CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | /NA           | AOA:  | 2/1R     |
| DEORBIT:        | /NA           | ATO:  | 2/1R     |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415446-001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF LO2 ULLAGE PRESSURE RESULTS IN ALL THREE MAIN ENGINES  
SHUTDOWN AND LOSS OF LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
 ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/17/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 2/1R     |
| MDAC ID:   | 4500     | ABORT:              | 2/1R     |

ITEM: TEST PORT, LH2 PREPRESS DISC. CHECK VALVE (TP10)  
 FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO                    SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) TEST PORT, LH2 PREPRESS DISC. CHECK VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | /NA      | AOA:  | 2/1R     |
| DEORBIT:        | /NA      | ATO:  | 2/1R     |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                    B [ P ]                    C [ P ]

LOCATION:            AFT FUSELAGE  
 PART NUMBER:    VO70-415446-001

CAUSES:    VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
 FAILURE

EFFECTS/RATIONALE:  
 LOSS OF LH2 ULLAGE PRESSURE RESULTS IN ALL THREE MAIN ENGINES  
 SHUTDOWN AND LOSS OF LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 4510 ABORT: 2/2

ITEM: TEST PORT, PNEU SUPPLY HELIUM (TP29)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) TEST PORT, PNEU SUPPLY HELIUM
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/2      |
| LIFTOFF:        | 2/2      | TAL:  | 2/2      |
| ONORBIT:        | 3/3      | AOA:  | 2/2      |
| DEORBIT:        | 3/3      | ATO:  | 2/2      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415790-001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF MISSION DUE TO LOSS OF PNEUMATIC HELIUM FOR MPS VALVE  
ACTUATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4520 ABORT: 3/3

ITEM: TEST PORT, CHECK VALVE CV24 LEAKAGE (TP36)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) TEST PORT, CHECK VALVE CV24 LEAKAGE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415133-001

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP AND REPRESS THE GH2 PRESS MANIFOLD.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4530 ABORT: 2/1R

ITEM: PNEU VALVE HE SUPPLY REGULATOR (PR4)  
FAILURE MODE: RESTRICTED FLOW, FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU VALVE HE SUPPLY REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |            |
|-----------------|---------------|------------|
|                 | HDW/FUNC      | ABORT      |
| PRELAUNCH:      | 3/3           | RTLS: 2/1R |
| LIFTOFF:        | 2/1R          | TAL: 2/1R  |
| ONORBIT:        | /NA           | AOA: 2/1R  |
| DEORBIT:        | /NA           | ATO: 2/1R  |
| LANDING/SAFING: | /NA           |            |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0399-004

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF LIFE/VEHICLE DUE TO LOSS OF ALL REDUNDANCY FOR MPS VALVE ACTUATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4531 ABORT: 3/3

ITEM: PNEU VALVE HE SUPPLY REGULATOR (PR4)  
FAILURE MODE: FAILS TO CLOSE, FAILS MID-TRAVEL

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU VALVE HE SUPPLY REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0399-004

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO REGULATE PNEUMATIC HELIUM FLOW FOR MPS  
VALVE ACTUATION AND MPS DUMP AND REPRESS. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4540 ABORT: 2/1R

ITEM: LO2 MANIF REPRESS REGULATOR (PR5)  
FAILURE MODE: RESTRICTED FLOW, FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 MANIF REPRESS REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | /NA      | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0399-004

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP THE LO2 MANIFOLD RESULTS IN LOSS OF  
LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4541 ABORT: 3/3

ITEM: LO2 MANIF REPRESS REGULATOR (PR5)  
FAILURE MODE: FAILS TO CLOSE, FAILS MID-TRAVEL

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 MANIF REPRESS REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0399-004

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO REGULATE HELIUM PRESSURE DURING MPS LO2  
MANIFOLD DUMP AND REPRESS. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4550 ABORT: 2/1R

ITEM: LH2 MANIF REPRESS REGULATOR (PR6)  
FAILURE MODE: RESTRICTED FLOW, FAILS TO OPEN, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 MANIF REPRESS REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | /NA      | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0399-004

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS LIFE/VEHICLE DUE TO FAILURE TO REPRESS THE LH2 MANIFOLD  
RESULTING IN RUPTURE AND LH2 LEAK.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4551 ABORT: 3/3

ITEM: LH2 MANIF REPRESS REGULATOR (PR6)  
FAILURE MODE: FAILS TO CLOSE, FAILS MID-TRAVEL

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 MANIF REPRESS REGULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0399-004

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO REGULATE HELIUM DURING LH2 MANIFOLD DUMP  
AND REPRESS. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4560 ABORT: 3/3

ITEM: PNEU VALVE HE SUPPLY RELIEF VALVE (RV4)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU VALVE HE SUPPLY RELIEF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0398-0005

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO REGULATE PNEUMATIC HELIUM FOR MPS VALVE  
ACTUATION AND MPS DUMP AND REPRESS. SYSTEM DEGRADATION.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4561 ABORT: 3/3

ITEM: PNEU VALVE HE SUPPLY RELIEF VALVE (RV4)  
FAILURE MODE: FAILS TO CLOSE, EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU VALVE HE SUPPLY RELIEF VALVE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC284-0398-0005

CAUSES: VIBRATION, CONTAMINATION, OR PIECE-PART STRUCTURAL  
FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO USE PNEUMATIC HELIUM FOR MPS VALVE  
ACTUATION. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/2  
MDAC ID: 4570 ABORT: 2/2

ITEM: PNEU VALVE HE SUPPLY TANK (TK4)  
FAILURE MODE: EXTERNAL LEAKAGE, STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU VALVE HE SUPPLY TANK
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/2      |
| LIFTOFF:        | 2/2      | TAL:  | 2/2      |
| ONORBIT:        | /NA      | AOA:  | 2/2      |
| DEORBIT:        | 3/3      | ATO:  | 2/2      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ NA ] B [ NA ] C [ NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC282-0082-0010

CAUSES: VIBRATION OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PNEUMATIC HELIUM FOR MPS VALVE ACTUATOR AND MPS DUMP AND REPRESS. LOSS OF CAPABILITY TO FEED PNEUMATIC HELIUM TO AN ENGINE HELIUM SYSTEM WILL RESULT IN LOSS OF MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4580 ABORT: 2/1R

ITEM: LO2 PREVALVE PNEU ACCUMULATOR (AU5)  
FAILURE MODE: EXTERNAL LEAKAGE, STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LO2 PREVALVE PNEU ACCUMULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | /NA           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC282-0070-0001

CAUSES: VIBRATION OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP LO2 MANIFOLD RESULTS IN LOSS OF  
LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 2/1R  
MDAC ID: 4590 ABORT: 2/1R

ITEM: LH2 PREVALVE PNEU ACCUMULATOR (AU6)  
FAILURE MODE: EXTERNAL LEAKAGE, STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 PREVALVE PNEU ACCUMULATOR
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | /NA      | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC282-0070-0001

CAUSES: VIBRATION OR PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP LO2 MANIFOLD RESULTS IN LOSS OF  
LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4600 ABORT: 3/3

ITEM: LH2 FEED MANIF RTLS REPRESS ORIFICE (RP9)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) LH2 FEED MANIF RTLS REPRESS ORIFICE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: VO70-415545-001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP LH2 RTLS MANIFOLD. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4610 ABORT: 3/3

ITEM: PNEU HE SUPPLY FILTER (FL5)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEU HE SUPPLY FILTER
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: ME286-0056-0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO USE PNEUMATIC HELIUM FOR MPS VALVE  
ACTUATOR. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4620 ABORT: 3/3

ITEM: PNEUMATIC HE FILL LINE (.50",.375",.625" DIA)  
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HELIUM FILL LINE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | /NA      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO USE PNEUMATIC HELIUM FOR MPS VALVE  
ACTUATION. SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 4630 ABORT: 1/1

ITEM: PNEUMATIC HE PRESSURE LINE (.50" DIA)  
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HE PRESSURE LINE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | /NA           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP LO2 MANIFOLD RESULTS IN LOSS OF  
LIFE/VEHICLE.

REFERENCES:



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 1/1  
MDAC ID: 4640 ABORT: 1/1

ITEM: PNEUMATIC HE PRESS VALVE ACTUATION LINE (.25",.38"  
DIA)  
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HE PRESS VALVE ACTUATION LINE
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | /NA      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP LO2 MANIFOLD RESULTS IN LOSS OF  
LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 11/18/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | MPS      | FLIGHT:             | 1/1      |
| MDAC ID:   | 4650     | ABORT:              | 1/1      |

ITEM: PNEUMATIC HELIUM INTERCONNECT LINE  
(.63", 1.00", .50" DIA)  
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: A.J.MARINO                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) PNEUMATIC HE INTERCONNECT LINE
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | /NA           | AOA:  | 1/1      |
| DEORBIT:        | 1/1           | ATO:  | 1/1      |
| LANDING/SAFING: | 1/1           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT FUSELAGE  
PART NUMBER:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO DUMP THE LO2 MANIFOLD RESULTS IN LOSS OF LIFE/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4660 ABORT: 3/3

ITEM: GN2 PURGE (ORB/GND) DISC. (ORB HALF) (PD14)  
FAILURE MODE: FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL  
LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GN2 PURGE (ORB/GND) DISC. (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE THE GN2 PURGE DISCONNECT VALVE.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4662 ABORT: 3/3

ITEM: GN2 PURGE (ORB/GND) DISC. (ORB HALF) (PD14)  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GN2 PURGE (ORB/GND) DISC. (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO PURGE THE SSME'S PRELAUNCH. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4664 ABORT: 3/3

ITEM: GN2 PURGE (ORB/GND) DISC. (ORB HALF) (PD14)  
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GN2 PURGE (ORB/GND) DISC. (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | /NA      |
| LIFTOFF:        | /NA      | TAL:  | /NA      |
| ONORBIT:        | /NA      | AOA:  | /NA      |
| DEORBIT:        | /NA      | ATO:  | /NA      |
| LANDING/SAFING: | /NA      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO PURGE SSME'S WITH NITROGEN PRELAUNCH.  
SYSTEM DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: MPS FLIGHT: 3/3  
MDAC ID: 4666 ABORT: 3/3

ITEM: GN2 PURGE (ORB/GND) DISC. (ORB HALF) (PD14)  
FAILURE MODE: FAILS TO OPEN, EXTERNAL LEAKAGE, FAILS TO CLOSE,  
FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE

LEAD ANALYST: A.J.MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) HELIUM SUPPLY
- 3) PNEUMATIC HELIUM
- 4) GN2 PURGE (ORB/GND) DISC. (ORB HALF)
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | /NA           | TAL:  | /NA      |
| ONORBIT:        | /NA           | AOA:  | /NA      |
| DEORBIT:        | /NA           | ATO:  | /NA      |
| LANDING/SAFING: | /NA           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT FUSELAGE  
PART NUMBER: MC276-0003-0007

CAUSES: VIBRATION, CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:  
LOSS OF CAPABILITY TO CLOSE GN2 DISCONNECT VALVE. SYSTEM  
DEGRADATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/3  
MDAC ID: 5000 ABORT: 3/3

ITEM: LO2 PREVALVE CONTROL CIRCUIT  
FAILURE MODE: ALL CREDIBLE MODES: OPENS, SHORTS, LOSS OF POWER

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) AFT LCA 1, 2 & 3
- 7) LO2 PREVALVE CONTROL CIRCUIT
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES

PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, TEMPERATURE, MISHANDLING/ABUSE

EFFECTS/RATIONALE:

THESE CIRCUITS PROVIDE POWER, CONTROL AND MONITORING FOR THE LO2 PREVALVES.

THE CRITICALITY 3 ITEMS REFERENCED ON THIS SHEET INCLUDE 78 RESISTORS AND 72 DIODES. THE ITEMS WITH A CRITICALITY OTHER THAN 3 ARE LISTED SEPERATELY UNDER MDAC ID 5001 THROUGH 5076.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5001 ABORT: 3/1R

ITEM: LO2 PREVALVE TOGGLE SWITCH  
FAILURE MODE: FAILS (SHORTS) (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) AFT LCA 1, 2 & 3
- 7) PANEL R4
- 8) LO2 PREVALVE TOGGLE SWITCH (3) (S11, S12 & S13)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7456

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5002 ABORT: 3/1R

ITEM: LO2 PREVALVE TOGGLE SWITCH  
FAILURE MODE: FAILS (SHORTS) (FALSE CLOSE COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) AFT LCA 1, 2 & 3
- 7) PANEL R4
- 8) LO2 PREVALVE TOGGLE SWITCH (3) (S11, S12 & S13)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7456

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1, PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN). THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5003 ABORT: 3/1R

ITEM: FUSE (1A) (4 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN (INHIBIT CLOSE COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) AFT LCA 1, 2 & 3
- 7) PANEL R4
- 8) FUSE (1A) (12) (F16 THROUGH F24, F49, F50, F51)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME451-0018-0100

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL STRESS, CHEMICAL DEGRADATION

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5004 ABORT: 3/1R

ITEM: FUSE (1A) (4 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN (INHIBIT OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) AFT LCA 1, 2 & 3
- 7) PANEL R4
- 8) FUSE (1A) (12) (F16 THROUGH F24, F49, F50, F51)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME451-0018-0100

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL STRESS, CHEMICAL DEGRADATION

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1, PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN). THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5011 ABORT: 2/1R

ITEM: MDM (FA1)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBITS CLOSING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 4
- 5) LO2 PREVALVE CLOSING SOLENOID CIRCUITS
- 6) MDM (FA1) (54V72A7)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 4  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|                      |                     |          |
|----------------------|---------------------|----------|
| DATE: 1/20/87        | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID: 5012        | ABORT:              | 2/1R     |

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBITS CLOSING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 5
- 5) LO2 PREVALVE CLOSING SOLENOID CIRCUITS
- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AVIONICS BAY 5  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87  
 SUBSYSTEM: EPD&C/MPS  
 MDAC ID: 5013

HIGHEST CRITICALITY HDW/FUNC  
 FLIGHT: 2/1R  
 ABORT: 2/1R

ITEM: MDM (FA3)  
 FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBITS CLOSING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 6
- 5) LO2 PREVALVE CLOSING SOLENOID CIRCUITS
- 6) MDM (FA3) (56V72A9)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |            |
|-----------------|---------------|------------|
|                 | HDW/FUNC      | ABORT      |
| PRELAUNCH:      | /NA           | RTLS: 2/1R |
| LIFTOFF:        | 2/1R          | TAL: 2/1R  |
| ONORBIT:        | 3/3           | AOA: 2/1R  |
| DEORBIT:        | 3/3           | ATO: 2/1R  |
| LANDING/SAFING: | 3/3           |            |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION: AVIONICS BAY 6  
 PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5014 ABORT: 2/1R

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBITS CLOSING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 6
- 5) LO2 PREVALVE CLOSING SOLENOID CIRCUITS
- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5015 ABORT: 3/1R

ITEM: MDM (FA1)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBITS ACTIVATING  
OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 4
- 5) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 6) MDM (FA1) (54V72A7)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R          | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 4  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1, PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN). THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5016 ABORT: 3/1R

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBITS ACTIVATING  
OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 5
- 5) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 5  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1,  
PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN).  
THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE  
UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR  
FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5017 ABORT: 3/1R

ITEM: MDM (FA3)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBITS ACTIVATING  
OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 6
- 5) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 6) MDM (FA3) (56V72A9)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R          | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1, PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN). THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5018 ABORT: 3/1R

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBITS ACTIVATING  
OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 6
- 5) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1,  
PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN).  
THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE  
UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR  
FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5019 ABORT: 3/1R

ITEM: MDM (FA1)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (PREMATURELY ACTIVATES  
OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 4
- 5) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 6) MDM (FA1) (54V72A7)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 4  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE  
PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE  
MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP  
INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE  
DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE  
VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/22/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 5020      | ABORT:              | 3/1R     |

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (PREMATURELY ACTIVATES OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 5
- 5) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AVIONICS BAY 5  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5021 ABORT: 3/1R

ITEM: MDM (FA3)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (PREMATURELY ACTIVATES  
OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 6
- 5) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 6) MDM (FA3) (56V72A9)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE  
PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE  
MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP  
INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE  
DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE  
VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5022 ABORT: 3/1R

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (PREMATURELY ACTIVATES  
OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAY 6
- 5) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE  
PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE  
MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP  
INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE  
DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE  
VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5031 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3 (2 PER CIRCUIT)  
FAILURE MODE: FAIL ON (FALSE OPEN COMMAND, ACTIVATE LV12, LV14,  
LV16)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) LO2 PREVALVE OPENING SOLENOID (LV12, LV14 & LV16) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (6) (54V76A121(2), 55V76A122(2),  
56V76A123(2))
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE  
PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE  
MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP  
INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE  
DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE  
VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5032 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE 3 (2 PER CIRCUIT)  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV12, LV14 & LV16)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) LO2 PREVALVE OPENING SOLENOID (LV12, LV14 & LV16) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (6) (54V76A121(2), 55V76A122(2),  
56V76A123(2))
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1,  
PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN).  
THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE  
UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR  
FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5033 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE 1  
FAILURE MODE: FAIL OFF (INHIBIT LV12, LV14, LV16)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) LO2 PREVALVE OPENING SOLENOID (LV12, LV14 & LV16) CIRCUIT
- 7) HYBRID DRIVER, TYPE 1 (54V76A121, 55V76A122, 56V76A123)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1, PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN). THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/22/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 5034      | ABORT:              | 3/1R     |

ITEM: REMOTE POWER CONTROLLER (2 PER CIRCUIT)  
FAILURE MODE: FAIL ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) LO2 PREVALVE OPENING SOLENOID (LV12, LV14 & LV16) CIRCUIT
- 7) REMOTE POWER CONTROLLER (6) (RPC38(3), RPC42(3))
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]            B [ P ]            C [ P ]

LOCATION:            AFT PCA 4, 5 & 6  
PART NUMBER:    MC450-0017-1030

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURES DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5035 ABORT: 3/1R

ITEM: DIODE, ISOLATION (12A) (2 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN, FAILS TO CONDUCT POWER

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) LO2 PREVALVE OPENING SOLENOID (LV12, LV14 & LV16) CIRCUIT
- 7) DIODE, ISOLATION (12A) (6) (A2CR30(3), A2CR34(3))
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT PCA 4, 5 & 6  
PART NUMBER: JANTX1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1, PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN). THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|                      |                     |          |
|----------------------|---------------------|----------|
| DATE: 1/20/87        | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID: 5041        | ABORT:              | 2/1R     |

ITEM: HYBRID DRIVER, TYPE 3 (2 PER CIRCUIT)  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV13, LV15, LV17)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) LO2 PREVALVE CLOSING SOLENOID (LV13, LV15 & LV17) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (6) (54V76A121(2), 55V76A122(2), 56V76A123(2))
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT LCA 1, 2 & 3  
PART NUMBER:                MC477-0263-0002

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87  
 SUBSYSTEM: EPD&C/MPS  
 MDAC ID: 5042

HIGHEST CRITICALITY  
 FLIGHT: 2/1R  
 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 1  
 FAILURE MODE: FAIL OFF (INHIBIT LV13, LV15, LV17)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) LO2 PREVALVE CLOSING SOLENOID (LV13, LV15 & LV17) CIRCUIT
- 7) HYBRID DRIVER, TYPE 1 (3) (54V76A121, 55V76A122, 56V76A123)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | /NA           | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:            AFT LCA 1, 2 & 3  
 PART NUMBER:    MC477-0261-0002

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5043 ABORT: 2/1R

ITEM: REMOTE POWER CONTROLLER (2 PER CIRCUIT)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV13, LV15, LV17)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) LO2 PREVALVE CLOSING SOLENOID (LV13, LV15 & LV17) CIRCUIT
- 7) REMOTE POWER CONTROLLER (6) (RPC37(3), RPC41(3))
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 1, 2 & 3  
PART NUMBER: MC450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5044 ABORT: 2/1R

ITEM: DIODE, ISOLATION (12A) (2 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN, FAILS TO CONDUCT POWER (INHIBIT LV13,  
LV15, LV17)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) LO2 PREVALVE CLOSING SOLENOID (LV13, LV15 & LV17) CIRCUIT
- 7) DIODE, ISOLATION (12A) (6) (A2CR29(3), A2CR33(3))
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT PCA 4, 5 & 6  
PART NUMBER: JANTX1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE  
PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE  
MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP  
INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE  
DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE  
VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5051 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3 (2 PER CIRCUIT)  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV80, LV81, LV82)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
  - 2) O2
  - 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
  - 4) AVIONICS BAYS 4, 5 & 6
  - 5) AFT LCA 1, 2 & 3
  - 6) LO2 PREVALVE REDUNDANT CLOSING SOLENOID (LV80, LV81 & LV82)
- CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (6) (54V76A121(2), 55V76A122(2), 56V76A123(2))
  - 8)
  - 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5052 ABORT: 2/1R

ITEM: REMOTE POWER CONTROLLER (2 PER CIRCUIT)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV80, LV81, LV82)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
  - 2) O2
  - 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
  - 4) AVIONICS BAYS 4, 5 & 6
  - 5) AFT PCA 4, 5 & 6
  - 6) LO2 PREVALVE REDUNDANT CLOSING SOLENOID (LV80, LV81 & LV82)
- CIRCUIT
- 7) REMOTE POWER CONTROLLER (6) (RPC27(3), RPC28(3))
  - 8)
  - 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 4, 5 & 6  
PART NUMBER: MC450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
 MDAC ID: 5053 ABORT: 2/1R

ITEM: DIODE, ISOLATION (12A) (2 PER CIRCUIT)  
 FAILURE MODE: FAILS OPEN, FAILS TO CONDUCT POWER (INHIBIT LV80,  
 LV81, LV82)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) LO2 PREVALVE REDUNDANT CLOSING SOLENOID (LV80, LV81 & LV82)

**CIRCUIT**

- 7) DIODE, ISOLATION (12A) (6) (A2CR19(3), A2CR20(3))
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT PCA 4, 5 & 6  
 PART NUMBER: JANTX1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
 SHOCK, VIBRATION, THERMAL SHOCK

**EFFECTS/RATIONALE:**

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE  
 PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE  
 MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP  
 INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE  
 DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE  
 VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5061 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3 (2 PER CIRCUIT)  
FAILURE MODE: FAIL ON (FALSE OPEN COMMAND, ACTIVATE LV83, LV84,  
LV85)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) LO2 PREVALVE REDUNDANT OPENING SOLENOID (LV83, LV84 & LV85)  
CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (6) (54V76A121(2), 55V76A122(2),  
56V76A123(2))
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE  
PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE  
MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP  
INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE  
DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE  
VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11,  
11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5062 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE 3 (2 PER CIRCUIT)  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV83, LV84 & LV85)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
  - 2) O2
  - 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
  - 4) AVIONICS BAYS 4, 5 & 6
  - 5) AFT LCA 1, 2 & 3
  - 6) LO2 PREVALVE REDUNDANT OPENING SOLENOID (LV83, LV84 & LV85)
- CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (6) (54V76A121(2), 55V76A122(2), 56V76A123(2))
  - 8)
  - 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1, PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN). THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5063 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER (2 PER CIRCUIT)  
FAILURE MODE: FAIL ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
  - 2) O2
  - 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
  - 4) AVIONICS BAYS 4, 5 & 6
  - 5) AFT PCA 4, 5 & 6
  - 6) LO2 PREVALVE REDUNDANT OPENING SOLENOID (LV83, LV84 & LV85)
- CIRCUIT
- 7) REMOTE POWER CONTROLLER (6) (RPC13(3), RPC44(3))
  - 8)
  - 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 4, 5 & 6  
PART NUMBER: MC450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5064 ABORT: 3/1R

ITEM: DIODE, ISOLATION (12A) (2 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN, FAILS TO CONDUCT POWER

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
  - 2) O2
  - 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
  - 4) AVIONICS BAYS 4, 5 & 6
  - 5) AFT PCA 4, 5 & 6
  - 6) LO2 PREVALVE REDUNDANT OPENING SOLENOID (LV83, LV84 & LV85)
- CIRCUIT
- 7) DIODE, ISOLATION (12A) (6) (A2CR35(3), A2CR36(3))
  - 8)
  - 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT PCA 4, 5 & 6  
PART NUMBER: JANTX1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF THIS PART WILL ALLOW ONE OF THE PREVALVES (PV1, PV2 & PV3) TO CLOSE PREMATURELY (FAIL TO REMAIN OPEN). THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5071 ABORT: 3/1R

ITEM: DIODE (10 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN (INHIBIT OPEN COMMAND TO OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) DIODE BOARDS 56V76A207, 208 & 209
- 6) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 7) DIODE (30)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: DIODE BOARDS 56V76A207, 208 & 209  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF ONE OF THESE DIODES WILL CAUSE THE LOSS OF THE OPEN COMMAND. ONE OF THE PREVALVES (PV1, PV2 & PV3) WILL CLOSE PREMATURELY (FAIL TO REMAIN OPEN) IF ALL REDUNDANCY IS LOST. THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1



**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/26/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 5072      | ABORT:              | 3/1R     |

ITEM: DIODE (2 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN (INHIBIT OPEN COMMAND TO OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT PCA 4, 5 & 6
- 6) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 7) DIODE (6) (A1CR29(3), A1CR46(3))
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R          | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:            AFT PCA 4, 5 & 6  
PART NUMBER:    SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

**EFFECTS/RATIONALE:**

THE FAILURE OF ONE OF THESE DIODES WILL CAUSE THE LOSS OF THE OPEN COMMAND. ONE OF THE PREVALVES (PV1, PV2 & PV3) WILL CLOSE PREMATURELY (FAIL TO REMAIN OPEN) IF ALL REDUNDANCY IS LOST. THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5073 ABORT: 3/1R

ITEM: DIODE (3 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN (INHIBIT OPEN COMMAND TO OPENING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) LO2 PREVALVE OPENING SOLENOID CIRCUITS
- 7) DIODE (9)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/2R          | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF ONE OF THESE DIODES WILL CAUSE THE LOSS OF THE OPEN COMMAND. ONE OF THE PREVALVES (PV1, PV2 & PV3) WILL CLOSE PREMATURELY (FAIL TO REMAIN OPEN) IF ALL REDUNDANCY IS LOST. THE RESULTING SYSTEM PRESSURE SURGE COULD CAUSE A RUPTURE OF THE UPSTREAM FEEDLINE, UNCONTAINED ENGINE DAMAGE AND/OR FIRE/EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5074 ABORT: 3/1R

ITEM: DIODE (10 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN (INHIBIT CLOSE COMMAND TO CLOSING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) DIODE BOARDS 56V76A207, 208 & 209
- 6) LO2 PREVALVE CLOSING SOLENOID CIRCUITS
- 7) DIODE (30)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: DIODE BOARDS 56V76A207, 208 & 209  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF ONE OF THESE DIODES WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/26/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 5075      | ABORT:              | 3/1R     |

ITEM: DIODE (6 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN (INHIBIT CLOSE COMMAND TO CLOSING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) PCA 4, 5 & 6
- 6) LO2 PREVALVE CLOSING SOLENOID CIRCUITS
- 7) DIODE (18) (A1CR20(3), A1CR27(3), A1CR28(3), A1CR37(3), A1CR44(3), A1CR45(3))
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:                      AFT PCA 4, 5 & 6  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

**EFFECTS/RATIONALE:**

THE FAILURE OF ONE OF THESE DIODES WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.  
THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5076 ABORT: 3/1R

ITEM: DIODE (7 PER CIRCUIT)  
FAILURE MODE: FAILS OPEN (INHIBIT CLOSE COMMAND TO CLOSING SOLENOIDS)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 PREVALVE (1 PER SSME) (PV1, PV2 & PV3)
- 4) AVIONICS BAYS 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) LO2 PREVALVE CLOSING SOLENOID CIRCUITS
- 7) DIODE (21)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FAILURE OF ONE OF THESE DIODES WILL PREVENT THE CLOSURE OF ONE OF THE PREVALVES (PV1, PV2 & PV3). IF THIS FAILURE OCCURS DURING THE MECO SEQUENCE, THERE WILL BE A LOSS OF PRESSURE AT THE LO2 PUMP INLET.

THIS FAILURE COULD CAUSE A PUMP OVERSPEED, UNCONTAINED ENGINE DAMAGE AND/OR EXPLOSION. THE WORST CASE IS THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEETS 10, 10.1, 11, 11.1, 12 & 12.1

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/12/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/3      |
| MDAC ID:   | 5120      | ABORT:              | 3/3      |

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE CONTROL CIRCUIT  
FAILURE MODE: ALL CREDIBLE MODES: OPENS, SHORTS, LOSS OF POWER

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 1 & 3
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CONTROL CIRCUIT
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      SEE REFERENCES  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, TEMPERATURE, MISHANDLING/ABUSE

**EFFECTS/RATIONALE:**

THIS CIRCUIT PROVIDES POWER, CONTROL AND MONITORING FOR THE LO2 FEEDLINE RELIEF SHUTOFF VALVE.  
THE CRITICALITY 3 ITEMS REFERENCED ON THIS SHEET INCLUDE 12 RESISTORS AND 5 DIODES. THE ITEMS WITH A CRITICALITY OTHER THAN 3 ARE LISTED SEPERATELY UNDER MDAC ID 5121 THROUGH 5139.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5121 ABORT: 2/1R

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE TOGGLE SWITCH  
FAILURE MODE: FAIL SHORTED OPEN TO BUS (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) PANEL R4
- 5) LO2 FEEDLINE RELIEF VALVE TOGGLE SWITCH (S17)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7354

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5122 ABORT: 2/1R

ITEM: LO2 FEEDLINE RELIEF SHUTOFF VALVE TOGGLE SWITCH  
FAILURE MODE: FAIL PREMATURE OPEN-TO-BUS (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) PANEL R4
- 5) LO2 FEEDLINE RELIEF VALVE TOGGLE SWITCH (S17)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |          |      |
|-----------------|---------------|----------|------|
| HDW/FUNC        | ABORT         | HDW/FUNC |      |
| PRELAUNCH:      | /NA           | RTLS:    | 2/1R |
| LIFTOFF:        | 3/3           | TAL:     | 2/1R |
| ONORBIT:        | 3/2R          | AOA:     | 2/1R |
| DEORBIT:        | 2/1R          | ATO:     | 2/1R |
| LANDING/SAFING: | 3/3           |          |      |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7354

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5123 ABORT: 3/1R

ITEM: RESISTER, LIMIT (1.2K)  
FAILURE MODE: FAILS OPEN, SHORTS (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) PANEL R4
- 5) RESISTOR, LIMIT (1.2 K) (3)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: RWR80S1211FR

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL STRESS

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24). THE FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5124 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE 3 (AR42)  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 1
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) HYBRID DRIVER, TYPE 3 (AR42)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: MID PCA 1  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/12/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID:   | 5125      | ABORT:              | 2/1R     |

ITEM: HYBRID DRIVER, TYPE 3 (AR42)  
FAILURE MODE: FUSE FAIL ON (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 1
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) HYBRID DRIVER, TYPE 3 (AR42)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R          | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      MID PCA 1  
PART NUMBER:                MC477-0263-0002

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5126 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE 3 (AR30)  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 3
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) HYBRID DRIVER, TYPE 3 (AR30)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: MID PCA 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24), THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/12/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID:   | 5127      | ABORT:              | 2/1R     |

ITEM: HYBRID DRIVER, TYPE 3 (AR30)  
FAILURE MODE: FUSE FAIL ON (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 3
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

**CIRCUIT**

- 6) HYBRID DRIVER, TYPE 3 (AR30)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      MID PCA 3  
PART NUMBER:                MC477-0263-0002

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

**EFFECTS/RATIONALE:**

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5128 ABORT: 2/1R

ITEM: REMOTE POWER CONTROLLER (RPC28)  
FAILURE MODE: FAIL ON/CLOSED (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
  - 2) O2
  - 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
  - 4) MID PCA 1
  - 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)
- CIRCUIT
- 6) REMOTE POWER CONTROLLER (RPC28)
  - 7)
  - 8)
  - 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: MID PCA 1  
PART NUMBER: MC450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|                      |                     |          |
|----------------------|---------------------|----------|
| DATE: 1/12/87        | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID: 5129        | ABORT:              | 2/1R     |

ITEM: REMOTE POWER CONTROLLER (RPC32)  
FAILURE MODE: FAIL ON/CLOSED (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 3
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

**CIRCUIT**

- 6) REMOTE POWER CONTROLLER (RPC32)
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      MID PCA 3  
PART NUMBER:                MC450-0017-1030

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

**EFFECTS/RATIONALE:**

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/15/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5130 ABORT: 2/1R

ITEM: REMOTE POWER CONTROLLER (RPC32)  
FAILURE MODE: FAIL OPEN (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 3
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) REMOTE POWER CONTROLLER (RPC32)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: MID PCA 3  
PART NUMBER: MC450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24), THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/16/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/2R     |
| MDAC ID:   | 5131      | ABORT:              | 3/1R     |

ITEM: REMOTE POWER CONTROLLER (RPC28)  
FAILURE MODE: FAIL OPEN (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 1
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) REMOTE POWER CONTROLLER (RPC28)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      MID PCA 1  
PART NUMBER:                MC450-0017-1030

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24), THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5132 ABORT: 2/1R

ITEM: MDM (FA3)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) AVIONICS BAY 6
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) MDM (FA3) (56V72A9)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5133 ABORT: 3/1R

ITEM: MDM (FA3)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) AVIONICS BAY 6
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) MDM (FA3) (56V72A9)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5134 ABORT: 2/1R

ITEM: MDM (FA1)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) AVIONICS BAY 4
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) MDM (FA1) (54V72A7)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R          | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 4  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5135 ABORT: 3/1R

ITEM: MDM (FA1)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) AVIONICS BAY 4
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) MDM (FA1) (54V72A7)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 4  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24). THE FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5136 ABORT: 2/1R

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (ACTIVATE LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) AVIONICS BAY 5
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 5  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL ACTIVATE THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL CLOSE. THE LOSS OF ALL REDUNDANCY AFTER MECO WILL CAUSE THE RUPTURE OF THE FEEDLINE MANIFOLD. THE AFT FUSELAGE WILL BE OVERPRESSURIZED. THE MISSION IS LOST IN THE ONORBIT MISSION PHASE (OUTGASSING GO2 CAN INTERFERE WITH SOME PAYLOADS). THE VEHICLE COULD BE DESTROYED IN THE DEORBIT PHASE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/12/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5137 ABORT: 3/1R

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) AVIONICS BAY 5
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 5  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5138 ABORT: 3/1R

ITEM: DIODE, ISOLATION (1A, 12A)  
FAILURE MODE: FAIL OPEN (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
  - 2) O2
  - 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
  - 4) MID PCA 1
  - 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)
- CIRCUIT
- 6) DIODE, ISOLATION (1A, 12A) (4) (A2CR8, A5CR1, A5CR2, A5CR4)
  - 7)
  - 8)
  - 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: MID PCA 1  
PART NUMBER: JANTXVIN4246, JANT1N1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 19



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/16/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/2R     |
| MDAC ID:   | 5139      | ABORT:              | 3/1R     |

ITEM: DIODE, ISOLATION (1A, 12A)  
FAILURE MODE: FAIL OPEN/SHORT (INHIBIT LV24)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)
- 4) MID PCA 3
- 5) LO2 FEEDLINE RELIEF SHUTOFF VALVE CLOSING SOLENOID (LV24)

CIRCUIT

- 6) DIODE, ISOLATION (1A, 12A) (6) (A1CR32, A1CR36, A1CR37, A1CR39, A4CR3, A4CR4)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      MID PCA 3  
PART NUMBER:                JANTXVIN4246, JANT1N1204RA

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL STOP THE OPERATION OF THE HELIUM SOLENOID (LV24). THE LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7) WILL OPEN. PROPELLENT WILL BE VENTED OVERBOARD IF ALL REDUNDANCY IS LOST. THE MISSION WILL BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 19

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/2  
MDAC ID: 5141 ABORT: 1/1

ITEM: LO2 PROPELLENT DUMP SEQUENCE TOGGLE SWITCH  
FAILURE MODE: SHORTS (PREMATURE DUMP START)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) PANEL R2
- 4) LO2 PROPELLENT DUMP SEQUENCE TOGGLE SWITCH (S1)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 2/2      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7203

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE MPS DUMP COMMAND. IF THIS COMMAND IS EXECUTED, PROPELLENT WILL BE LOST OVERBOARD. THE WORST CASE IS THE VEHICLE WILL NOT REACH ORBIT. THE MISSION MAY BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE MAY BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5142 ABORT: 2/1R

ITEM: LO2 PROPELLENT DUMP SEQUENCE TOGGLE SWITCH  
FAILURE MODE: FAIL OPEN (DUMP IS NOT STARTED)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) PANEL R2
- 4) LO2 PROPELLENT DUMP SEQUENCE TOGGLE SWITCH (S1)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R     | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7203

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE FAILURE OF THE MPS DUMP WILL LEAVE LO2 TRAPPED IN THE LINES AND IN THE SSMES. THE OUTGASSING OF O2 DURING THE ONORBIT MISSION PHASE COULD INTERFERE WITH SOME PAYLOADS. THE WEIGHT OF THIS TRAPPED LO2 WILL MOVE THE VEHICLE CG PAST THE AFT CG LIMIT. THE WORST CASE IS THE LOSS OF ALL REDUNDANCY WILL CAUSE THE LOSS OF THE VEHICLE DURING THE DEORBIT MISSION PHASE.

REFERENCES: SSWH DWG 10.11A

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
 MDAC ID: 5143 ABORT: 2/1R

ITEM: FUSE (F31, F32)  
 FAILURE MODE: FAIL OPEN (DUMP IS NOT STARTED)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) PANEL R2
- 4) LO2 PROPELLENT DUMP SEQUENCE TOGGLE SWITCH (S1)
- 5) FUSE (2) (F31, F32)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | CRITICALITIES | ABORT | HDW/FUNC |
|-----------------|----------|---------------|-------|----------|
| PRELAUNCH:      | 3/3      |               | RTLS: | 2/1R     |
| LIFTOFF:        | 3/3      |               | TAL:  | 2/1R     |
| ONORBIT:        | 3/2R     |               | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     |               | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |               |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
 PART NUMBER: MC451-0018-0100

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THE FAILURE OF THE MPS DUMP WILL LEAVE LO2 TRAPPED IN THE LINES AND IN THE SSMES. THE OUTGASSING OF O2 DURING THE ONORBIT MISSION PHASE COULD INTERFER WITH SOME PAYLOADS. THE WEIGHT OF THIS TRAPPED LO2 WILL MOVE THE VEHICLE CG PAST THE AFT CG LIMIT. THE WORST CASE IS THE LOSS OF ALL REDUNDANCY WILL CAUSE THE LOSS OF THE VEHICLE DURING THE DEORBIT MISSION PHASE.

REFERENCES: SSWH DWG 10.11A

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: EPD&C/MPS FLIGHT: 3/3  
 MDAC ID: 5160 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL & DRAIN VALVE CONTROL CIRCUIT  
 FAILURE MODE: ALL CREDIBLE MODES: OPENS, SHORTS, LOSS OF POWER

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) LO2 OUTBOARD FILL & DRAIN VALVE CONTROL CIRCUIT
- 7)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
 PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, TEMPERATURE, MISHANDLING/ABUSE

**EFFECTS/RATIONALE:**

THIS CIRCUIT PROVIDES POWER, CONTROL AND MONITORING FOR THE OUTBOARD FILL AND DRAIN VALVE.  
 THE CRITICALITY 3 ITEMS REFERENCED ON THIS SHEET INCLUDE 8 RESISTORS AND 3 DIODES. THE ITEMS WITH A CRITICALITY OTHER THAN 3 ARE LISTED SEPERATELY UNDER MDAC ID 5161 THROUGH 5176.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/24/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5161 ABORT: 3/1R

ITEM: LO2 OUTBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL SHORTED OPEN-TO-BUS

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) PANEL R4
- 7) LO2 OUTBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S6)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7153

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL OPEN. LO2 WILL BE VENTED OVERBOARD. THE MISSION COULD BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE COULD BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/24/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5162 ABORT: 3/1R

ITEM: LO2 OUTBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL PREMATURE OPEN-TO-BUS

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) PANEL R4
- 7) LO2 OUTBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S6)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7153

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL OPEN. LO2 WILL BE VENTED OVERBOARD. THE MISSION COULD BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE COULD BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5163 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL OPEN (PREMATURE DEACTIVATE LV28)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) PANEL R4
- 7) LO2 OUTBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S6)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7153

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL DISABLE THE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5164 ABORT: 3/3

ITEM: LO2 OUTBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL SHORTED/PREMATURE (FALSE ACTIVATION OF LV29)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) PANEL R4
- 7) LO2 OUTBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S6)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7153

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A FALSE CLOSE COMMAND TO THE CLOSING SOLENOID (LV29). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5165 ABORT: 3/3

ITEM: FUSE  
FAILURE MODE: FAIL OPEN (PREMATURE DEACTIVATE LV28)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) PANEL R4
- 7) FUSE (1A) (F8)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME451-0018-0100

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL DISABLE THE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/24/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5166 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL ON THE OPEN COMMAND

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (56V76A123)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL OPEN. LO2 WILL BE VENTED OVERBOARD. THE MISSION COULD BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE COULD BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/24/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5167 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL PREMATURE/ERRONEOUS OPEN COMMAND

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (56V76A123)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL OPEN. LO2 WILL BE VENTED OVERBOARD. THE MISSION COULD BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE COULD BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|                      |                     |          |
|----------------------|---------------------|----------|
| DATE: 1/26/87        | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID: 5168        | ABORT:              | 3/3      |

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL OFF (PREMATURE DEACTIVATION LV28)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (56V76A123)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT LCA 3  
PART NUMBER:                MC477-0263-0002

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL DISABLE THE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87  
 SUBSYSTEM: EPD&C/MPS  
 MDAC ID: 5169

HIGHEST CRITICALITY HDW/FUNC  
 FLIGHT: 2/1R  
 ABORT: 3/3

ITEM: HYBRID DRIVER, TYPE 3  
 FAILURE MODE: FAIL ON (PREMATURE ACTIVATION OF LV29)

LEAD ANALYST: HOLDEN/LOWERY  
 SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) LO2 OUTBOARD FILL & DRAIN VALVE CLOSING SOLENOID (LV29)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (56V76A209)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ]      B [ P ]      C [ P ]

LOCATION: AFT LCA 3  
 PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A FALSE CLOSE COMMAND TO THE CLOSING SOLENOID (LV29). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/26/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 5170      | ABORT:              | 3/3      |

ITEM: DIODE, ISOLATION  
FAILURE MODE: FAIL OFF (PREMATURE DEACTIVATION LV28)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)

**CIRCUIT**

- 7) DIODE (2)
- 8)
- 9)

**CRITICALITIES**

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT LCA 3  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

**EFFECTS/RATIONALE:**

THIS FAILURE WILL DISABLE THE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5171 ABORT: 3/3

ITEM: DIODE, ISOLATION  
FAILURE MODE: FAIL OFF (PREMATURE DEACTIVATION LV28)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
  - 2) O2
  - 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
  - 4) AVIONICS BAY 6
  - 5) DIODE BOARD 55V76A209
  - 6) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)
- CIRCUIT
- 7) DIODE (3A) (2) (CR17, CR18)
  - 8)
  - 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: DIODE BOARD 55V76A209  
PART NUMBER: JANTXV1N5551

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL DISABLE THE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/24/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5172 ABORT: 2/1R

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS ON COMMAND

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)

CIRCUIT

- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL OPEN. LO2 WILL BE VENTED OVERBOARD. THE MISSION COULD BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE COULD BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/26/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 5173      | ABORT:              | 3/3      |

ITEM: MDM (FA4)  
FAILURE MODE: FAIL OFF (PREMATURE DEACTIVATION LV28)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)

CIRCUIT

- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AVIONICS BAY 6  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL DISABLE THE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5174 ABORT: 3/3

ITEM: MDM (FA4)  
FAILURE MODE: FAIL ON (PREMATURE ACTIVATE LV29)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) LO2 OUTBOARD FILL & DRAIN VALVE CLOSING SOLENOID (LV29)

CIRCUIT

- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A FALSE CLOSE COMMAND TO THE CLOSING SOLENOID (LV29). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/26/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 5175      | ABORT:              | 3/3      |

ITEM: MDM (LA1)  
FAILURE MODE: FAIL OFF (PREMATURE DEACTIVATION LV28)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)

CIRCUIT

- 6) MDM (LA1) (56V72A33)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AVIONICS BAY 6  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL DISABLE THE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL CLOSE. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A SUDDEN PRESSURE SPIKE IN THE LINE. THE WORST CASE IS A RUPTURE OF THE ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5176 ABORT: 3/1R

ITEM: MDM (LA1)  
FAILURE MODE: FAIL ON (PREMATURE ACTIVATE LV28)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OUTBOARD FILL & DRAIN VALVE (PV9)
- 4) AVIONICS BAY 6
- 5) LO2 OUTBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV28)

CIRCUIT

- 6) MDM (LA1) (56V72A33)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV28). IF ALL REDUNDANCY IS LOST, THE OUTBOARD FILL & DRAIN VALVE (PV9) WILL OPEN. LO2 WILL BE VENTED OVERBOARD. THE MISSION COULD BE LOST IF THIS FAILURE OCCURS DURING ASCENT. THE VEHICLE COULD BE LOST IF THIS FAILURE OCCURS DURING AN ABORT.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/3  
MDAC ID: 5500 ABORT: 3/3

ITEM: LO2 INBOARD FILL & DRAIN VALVE CONTROL CIRCUIT  
FAILURE MODE: ALL CREDIBLE MODES: OPENS, SHORTS, LOSS OF POWER

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 INBOARD FILL & DRAIN VALVE CONTROL CIRCUIT
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, TEMPERATURE, MISHANDLING/ABUSE

EFFECTS/RATIONALE:

THIS CIRCUIT PROVIDES POWER, CONTROL AND MONITORING FOR THE LO2  
INBOARD FILL & DRAIN VALVE.

THE CRITICALITY 3 ITEMS REFERENCED ON THIS SHEET INCLUDE 8  
RESISTORS AND 4 DIODES. THE ITEMS WITH A CRITICALITY OTHER THAN  
3 ARE LISTED SEPERATELY UNDER MDAC ID 5501 THROUGH 5533.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/06/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5501 ABORT: 3/1R

ITEM: LO2 INBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL SHORTED OPEN-TO-BUS

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) PANEL R4
- 7) LO2 INBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7257

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV30). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST.

GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5502 ABORT: 3/1R

ITEM: LO2 INBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL PREMATURE OPEN-TO-BUS

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) PANEL R4
- 7) LO2 INBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7257

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV30). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST. GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMEs. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5503 ABORT: 3/3

ITEM: LO2 INBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL PREMATURE OFF (INHIBIT LV30)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) PANEL R4
- 7) LO2 INBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7257

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE OPENING SOLENOID (LV30) OPEN  
COMMAND. THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL  
REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL,  
THERE WILL BE A PRESSURE SPIKE IN THE LINES.  
THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY  
LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND  
FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5504 ABORT: 3/3

ITEM: LO2 INBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL ON (PREMATURE/ERRONEOUS ACTIVATE LV31)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) PANEL R4
- 7) LO2 INBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7257

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE CLOSE COMMAND TO THE CLOSING SOLENOID (LV31). THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5505 ABORT: 3/1R

ITEM: LO2 INBOARD FILL & DRAIN TOGGLE SWITCH  
FAILURE MODE: FAIL OPEN/PREMATRE OFF (INHIBIT LV31)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) PANEL R4
- 7) LO2 INBOARD FILL & DRAIN VALVE TOGGLE SWITCH (S7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7257

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV31). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST. GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5506 ABORT: 3/3

ITEM: FUSE (2) (1A)  
FAILURE MODE: FAIL PREMATURE OFF (INHIBIT LV30)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) PANEL R4
- 7) FUSE (2) (1A) (F9, F10)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: E451-0018-0100

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE OPENING SOLENOID (LV30) OPEN COMMAND. THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5507 ABORT: 2/1R

ITEM: FUSE (1A)  
FAILURE MODE: FAIL OPEN/PREMATURE OFF (INHIBIT LV31)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) PANEL R4
- 7) FUSE (1A) (F10)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: E451-0018-0100

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV31). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST. GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/06/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5511 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL ON THE OPEN COMMAND

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (2) (56V76A122AR(2))
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/2      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV30). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST.

GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/06/87 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
 MDAC ID: 5512 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
 FAILURE MODE: FAIL PREMATURE/ERRONEOUS ON THE OPEN COMMAND

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (2) (56V76A122AR(2))
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
 PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV30). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST.

GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5513 ABORT: 3/3

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL PREMATURE OFF (INHIBIT LV30)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (2) (56V76A122AR(2))
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE OPENING SOLENOID (LV30) OPEN COMMAND. THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5514 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL OPEN/PREATURE OFF (INHIBIT LV31)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 INBOARD FILL & DRAIN VALVE CLOSING SOLENOID (LV31)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (56V76A122AR)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV31). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST.

GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5515 ABORT: 3/3

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL ON (PREMATURE/ERRONEOUS ACTIVATE LV31)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 INBOARD FILL & DRAIN VALVE CLOSING SOLENOID (LV31)

CIRCUIT

- 7) HYBRID DRIVER, TYPE 3 (56V76A122AR)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE CLOSE COMMAND TO THE CLOSING SOLENOID (LV31). THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5521 ABORT: 3/1R

ITEM: MDM (FA1)  
FAILURE MODE: PREMATURE/ERRONEOUS OPEN COMMAND

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 4
- 5) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 6) MDM (FA1) (54V72A7)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 4  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV30). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST.

GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/06/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5522 ABORT: 3/1R

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS OPEN COMMAND

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 6
- 5) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE OPEN COMMAND TO THE OPENING SOLENOID (LV30). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST.

GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
 MDAC ID: 5523 ABORT: 3/3

ITEM: MDM (LA1)  
 FAILURE MODE: FAIL PREMATURE OFF (INHIBIT LV30)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 6
- 5) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 6) MDM (LA1) (56V72A33)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
 PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE OPENING SOLENOID (LV30) OPEN COMMAND. THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5524 ABORT: 3/3

ITEM: MDM (FA1)  
FAILURE MODE: FAIL PREMATURE OFF (INHIBIT LV30)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 4
- 5) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 6) MDM (FA1) (54V72A7)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 4  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE OPENING SOLENOID (LV30) OPEN COMMAND. THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5525 ABORT: 3/3

ITEM: MDM (FA2)  
FAILURE MODE: FAIL ON (PREMATURE/ERRONEOUS ACTIVATE LV31)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) LO2 INBOARD FILL & DRAIN VALVE CLOSING SOLENOID (LV31)

CIRCUIT

- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 5  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL GIVE A PREMATURE CLOSE COMMAND TO THE CLOSING SOLENOID (LV31). THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5526 ABORT: 3/1R

ITEM: MDM (FA2)  
FAILURE MODE: FAIL OPEN/PREMATURE OFF (INHIBIT LV31)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) LO2 INBOARD FILL & DRAIN VALVE CLOSING SOLENOID (LV31)

CIRCUIT

- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 5  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE CLOSE COMMAND OF THE CLOSING SOLENOID (LV31). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST.

GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5531 ABORT: 3/3

ITEM: DIODE (2)  
FAILURE MODE: FAIL PREMATURE OFF (INHIBIT LV30)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) DIODE BOARD 55V76A208
- 6) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 7) DIODES (2) (CR13, CR20)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: DIODE BOARD 55V76A208  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE OPENING SOLENOID (LV30) OPEN COMMAND. THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5532 ABORT: 3/3

ITEM: DIODE (3A) (4)  
FAILURE MODE: FAIL PREMATURE OFF (INHIBIT LV30)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 INBOARD FILL & DRAIN VALVE OPENING SOLENOID (LV30)

CIRCUIT

- 7) DIODES (3A) (4)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
PART NUMBER: JANTXIN5551

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE OPENING SOLENOID (LV30) OPEN COMMAND. THE INBOARD FILL & DRAIN VALVE (PV10) WILL CLOSE IF ALL REDUNDANCY IS LOST. IF THIS FAILURE OCCURS DURING FAST FILL, THERE WILL BE A PRESSURE SPIKE IN THE LINES. THE WORST CASE IS THE RUPTURE OF ORBITER AND/OR GSE FACILITY LINES. THE RESULTS COULD BE AFT FUSELAGE OVERPRESSURIZATION AND FIRE HAZARD IN THE ORBITER AND ON THE PAD.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5533 ABORT: 3/1R

ITEM: DIODES (2) (3A)  
FAILURE MODE: FAIL OPEN/PREATURE OFF (INHIBIT LV31)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 INBOARD FILL & DRAIN VALVE (PV10)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 INBOARD FILL & DRAIN VALVE CLOSING SOLENOID (LV31)

CIRCUIT

- 7) DIODES (2) (3A)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
PART NUMBER: JANTXIN5551

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV31). THE INBOARD FILL & DRAIN VALVE (PV10) WILL OPEN IF ALL REDUNDANCY IS LOST. GAS TRAPPED IN THE LINE WOULD ENTER THE FEEDLINES RESULTING IN POTENTIAL CAVITATION OF PUMPS ON ONE OR MORE SSMES. THE POSSIBLE RESULTS INCLUDE MULTIPLE SSME SHUTDOWN, PUMP DAMAGE, FIRE AND EXPLOSION (LOSS OF VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 17

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/3  
MDAC ID: 5550 ABORT: 3/3

ITEM: LO2 OVERBOARD BLEED VALVE CONTROL CIRCUIT  
FAILURE MODE: ALL CREDIBLE MODES: OPENS, SHORTS, LOSS OF POWER

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 5 & 6
- 5) AFT PCA 2 & 3
- 6) AFT LCA 2
- 7) LO2 OVERBOARD BLEED VALVE CONTROL CIRCUIT
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, TEMPERATURE, MISHANDLING/ABUSE

EFFECTS/RATIONALE:

THIS CIRCUIT PROVIDES POWER, CONTROL AND MONITORING FOR THE LO2 OVERBOARD BLEED VALVE.

THE CRITICALITY 3 ITEMS REFERENCED ON THIS SHEET INCLUDE 6 RESISTORS. THE ITEMS WITH A CRITICALITY OTHER THAN 3 ARE LISTED SEPERATELY UNDER MDAC ID 5551 THROUGH 5561.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5551 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (55V76A122AR)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5552 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (56V76A123AR)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/14/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID:   | 5553      | ABORT:              | 2/1R     |

ITEM: HYBRID DRIVER, TYPE 1  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (56V76A123AR)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT LCA 3  
PART NUMBER:                MC477-0261-0002

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 14





INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5555 ABORT: 2/1R

ITEM: REMOTE POWER CONTROLLER (RPC23)  
FAILURE MODE: FAIL OPEN (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 6
- 5) AFT PCA 3
- 6) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC23)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 3  
PART NUMBER: ME450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5556 ABORT: 2/1R

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 5
- 5) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 5  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5557 ABORT: 2/1R

ITEM: MDM (FA3)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 6
- 5) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 6) MDM (FA3) (56V72A9)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5558 ABORT: 2/1R

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 6
- 5) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 1/1  
MDAC ID: 5559 ABORT: 1/1

ITEM: DIODE (12A)  
FAILURE MODE: FAIL OPEN/SHORT (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 5
- 5) AFT PVA 2
- 6) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 7) DIODE (12A) (2) (A3CR14, A3CR15)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT PCA 2  
PART NUMBER: JANTXIN1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 1/1  
MDAC ID: 5560 ABORT: 1/1

ITEM: DIODE (12A)  
FAILURE MODE: FAIL OPEN/SHORT (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 6
- 5) AFT PVA 3
- 6) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 7) DIODE (12A) (A2CR7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 1/1      |
| LIFTOFF:        | 1/1           | TAL:  | 1/1      |
| ONORBIT:        | 3/3           | AOA:  | 1/1      |
| DEORBIT:        | 3/3           | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT PCA 3  
PART NUMBER: JANTXIN1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 1/1  
MDAC ID: 5561 ABORT: 1/1

ITEM: DIODE  
FAILURE MODE: FAIL OPEN/SHORT (INHIBIT LV76)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 OVERBOARD BLEED VALVE (PV19)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76) CIRCUIT
- 7) DIODE (2)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 3/3      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT LCA 2  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL INHIBIT THE HELIUM SOLENOID (LV76). THE LO2 OVERBOARD BLEED VALVE (PV19) WILL OPEN. LO2 WILL BE LOST OVERBOARD. THE POGO SUPPRESSION SYSTEM WILL NOT WORK. FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/3  
MDAC ID: 5600 ABORT: 3/3

ITEM: MPS INSTRUMENT POWER CIRCUIT  
FAILURE MODE: FAILS OPEN, SHORTED, INADVERTANT OPERATIONS

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) MPS INSTRUMENT POWER CIRCUIT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION

EFFECTS/RATIONALE:

THIS CIRCUIT PROVIDES POWER TO THE MPS LO2/LH2 MANIFOLD GAGES.  
ALL COMPONENTS IN THIS CIRCUIT ARE CRITICALITY 3. THE FAILURE OF  
THESE PARTS WILL NOT CAUSE THE LOSS OF THE VEHICLE OR MISSION.

REFERENCES: SSWH DWG 10.11A



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/15/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/3      |
| MDAC ID:   | 5650      | ABORT:              | 3/3      |

ITEM: GO2 PRESSURE FLOW CONTROL VALVE CONTROL CIRCUIT  
FAILURE MODE: ALL CREDIBLE MODES: OPENS, SHORTS, LOSS OF POWER

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) GO2 PRESSURE FLOW CONTROL VALVE (1 PER SSME) (LV53, LV54 & LV55)
- 4) AVIONICS BAY 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) GO2 PRESSURE FLOW CONTROL VALVE CONTROL CIRCUIT
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      SEE REFERENCES  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, TEMPERATURE, MISHANDLING/ABUSE

EFFECTS/RATIONALE:

THESE CIRCUITS PROVIDE POWER, CONTROL AND MONITORING FOR THE GO2 PRESSURE FLOW CONTROL VALVES.

THE CRITICALITY 3 ITEMS REFERENCED ON THIS SHEET INCLUDE 6 DIODES AND 3 RESISTORS. THE ITEMS WITH A CRITICALITY OTHER THAN 3 ARE LISTED SEPERATELY UNDER MDAC ID 5651 THROUGH 5654.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 39

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/15/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5651 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE 3 (1 PER CIRCUIT)  
FAILURE MODE: FAIL ON (ACTIVATE LV53, LV54, LV55)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) GO2 PRESSURE FLOW CONTROL VALVE (1 PER SSME) (LV53, LV54 & LV55)
- 4) AVIONICS BAY 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) HYBRID DRIVER, TYPE 3 (3) (54V76A121, 55V76A122, 56V76A123)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

GO2 TO PRESSURIZE THE ET LO2 TANK FLOWS THROUGH THE PRESSURE FLOW CONTROL VALVES (LV53, LV54 LV55). THIS FAILURE WILL GIVE A FALSE OPEN COMMAND TO THESE VALVES.  
THE WORST CASE IS THE LOSS OF ALL REDUNDANCY WILL RESULT IN THE OVERPRESSURIZATION OF THE ET (LOSS OF THE VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 39

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/15/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5652 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3 (1 PER CIRCUIT)  
FAILURE MODE: FUSE FAIL OPEN (INHIBIT LV53, LV54, LV55)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) GO2 PRESSURE FLOW CONTROL VALVE (1 PER SSME) (LV53, LV54 & LV55)
- 4) AVIONICS BAY 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) HYBRID DRIVER, TYPE 3 (3) (54V76A121, 55V76A122, 56V76A123)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL PREVENT THE OPENING OF THE PRESSURE CONTROL VALVES (LV53, LV54, LV55). GO2 TO PRESSURIZE THE ET LO2 TANK FLOWS THROUGH THESE VALVES. THIS ET LO2 TANK ULLAGE PRESSURE IS NECESSARY FOR THE EFFICIENT OPERATION OF THE SSMES. THE LOSS OF ALL REDUNDANCY DURING AN ABORT CAN CAUSE THE LOSS OF THE VEHICLE (NOT ENOUGH PROPELLENT TO FINISH THE MISSION).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 39

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/15/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5653 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE 3 (1 PER CIRCUIT)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (ACTIVATE LV53, LV54, LV55)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) GO2 PRESSURE FLOW CONTROL VALVE (1 PER SSME) (LV53, LV54 & LV55)
- 4) AVIONICS BAY 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) HYBRID DRIVER, TYPE 3 (3) (54V76A121, 55V76A122, 56V76A123)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1, 2 & 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

GO2 TO PRESSURIZE THE ET LO2 TANK FLOWS THROUGH THE PRESSURE FLOW CONTROL VALVES (LV53, LV54, LV55). THIS FAILURE WILL GIVE A FALSE OPEN COMMAND TO THESE VALVES.  
THE WORST CASE IS THE LOSS OF ALL REDUNDANCY WILL RESULT IN THE OVERPRESSURIZATION OF THE ET (LOSS OF THE VEHICLE).

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 39

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|                      |                     |          |
|----------------------|---------------------|----------|
| DATE: 1/15/87        | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: EPD&C/MPS | FLIGHT:             | 3/2R     |
| MDAC ID: 5654        | ABORT:              | 2/1R     |

ITEM: HYBRID DRIVER, TYPE 3 (1 PER CIRCUIT)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV53, LV54, LV55)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPD&C/MPS
- 2) O2
- 3) GO2 PRESSURE FLOW CONTROL VALVE (1 PER SSME) (LV53, LV54 & LV55)
- 4) AVIONICS BAY 4, 5 & 6
- 5) AFT LCA 1, 2 & 3
- 6) HYBRID DRIVER, TYPE 3 (3) (54V76A121, 55V76A122, 56V76A123)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT LCA 1, 2 & 3  
PART NUMBER:                MC477-0263-0002

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

**EFFECTS/RATIONALE:**

THIS FAILURE WILL PREVENT THE OPENING OF THE PRESSURE CONTROL VALVES (LV53, LV54, LV55). GO2 TO PRESSURIZE THE ET LO2 TANK FLOWS THROUGH THESE VALVES. THIS ET LO2 TANK ULLAGE PRESSURE IS NECESSARY FOR THE EFFICIENT OPERATION OF THE SSMES. THE LOSS OF ALL REDUNDANCY DURING AN ABORT CAN CAUSE THE LOSS OF THE VEHICLE (NOT ENOUGH PROPELLENT TO FINISH THE MISSION).

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 39

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/3  
MDAC ID: 5700 ABORT: 3/3

ITEM: LO2 POGO ACCUMULATOR RECIRCULATION VALVE CONTROL  
CIRCUIT  
FAILURE MODE: ALL CREDIBLE MODES: OPENS, SHORTS, LOSS OF POWER

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 POGO ACCUMULATOR RECIRCULATION VALVE (2) (PV20, PV21)
- 4) AVIONICS BAY 4 & 5
- 5) AFT LCA 1 & 2
- 6) LO2 POGO ACCUMULATOR RECIRCULATION VALVE CONTROL CIRCUIT
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, TEMPERATURE, MISHANDLING/ABUSE

EFFECTS/RATIONALE:

THESE CIRCUITS PROVIDE POWER, CONTROL AND MONITORING FOR THE LO2  
POGO ACCUMULATOR RECIRCULATION VALVES.  
THE CRITICALITY 3 ITEMS REFERENCED ON THIS SHEET INCLUDE 6  
RESISTORS AND 4 DIODES. THE ITEMS WITH A CRITICALITY OTHER THAN  
3 ARE LISTED SEPERATELY UNDER MDAC ID 5701 THROUGH 5705.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5701 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE 3 (2 PER CIRCUIT)  
FAILURE MODE: FAIL ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 POGO ACCUMULATOR RECIRCULATION VALVE (2) (PV20, PV21)
- 4) AVIONICS BAY 4 & 5
- 5) AFT LCA 1 & 2
- 6) LO2 POGO ACCUMULATOR RECIRCULATION VALVE CLOSING SOLENOID  
(2) (LV77, LV78)
- 7) HYBRID DRIVER, TYPE 3 (2 PER CIRCUIT) (4) (54V76A121AR(2),  
55V76A122AR(2))
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1 & 2  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL PREMATURELY ACTIVATE THE HELIUM SOLENOIDS  
(LV77, LV78), CLOSING THE POGO RECIRCULATION VALVES (PV20, PV21).  
THE LOSS OF ALL REDUNDANCY WILL STOP THE POGO SUPPRESSION SYSTEM.  
THE FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN  
STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE  
AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5702 ABORT: 3/1R

ITEM: MDM (FA1)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV20)
- 4) AVIONICS BAY 4
- 5) LO2 POGO ACCUMULATOR RECIRCULATION VALVE CLOSING SOLENOID (LV77)
- 6) MDM (FA1) (54V72A7)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 4  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL PREMATURELY ACTIVATE THE HELIUM SOLENOID (LV77), CLOSING THE POGO RECIRCULATION VALVE (PV20). THE LOSS OF ALL REDUNDANCY WILL STOP THE POGO SUPPRESSION SYSTEM. THE FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5703 ABORT: 3/1R

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV21)
- 4) AVIONICS BAY 5
- 5) LO2 POGO ACCUMULATOR RECIRCULATION VALVE CLOSING SOLENOID (LV78)
- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 5  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL PREMATURELY ACTIVATE THE HELIUM SOLENOID (LV78), CLOSING THE POGO RECIRCULATION VALVE (PV21). THE LOSS OF ALL REDUNDANCY WILL STOP THE POGO SUPPRESSION SYSTEM. THE FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/1R  
MDAC ID: 5704 ABORT: 3/1R

ITEM: MDM (FA3)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV20)
- 4) AVIONICS BAY 6
- 5) LO2 POGO ACCUMULATOR RECIRCULATION VALVE CLOSING SOLENOID (LV77)
- 6) MDM (FA3) (56V72A9)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL PREMATURELY ACTIVATE THE HELIUM SOLENOID (LV77), CLOSING THE POGO RECIRCULATION VALVE (PV20). THE LOSS OF ALL REDUNDANCY WILL STOP THE POGO SUPPRESSION SYSTEM. THE FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/14/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 5705      | ABORT:              | 3/1R     |

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV21)
- 4) AVIONICS BAY 6
- 5) LO2 POGO ACCUMULATOR RECIRCULATION VALVE CLOSING SOLENOID (LV78)
- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AVIONICS BAY 6  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THIS FAILURE WILL PREMATURELY ACTIVATE THE HELIUM SOLENOID (LV78), CLOSING THE POGO RECIRCULATION VALVE (PV21). THE LOSS OF ALL REDUNDANCY WILL STOP THE POGO SUPPRESSION SYSTEM. THE FAILURE OF THE POGO SUPPRESSION SYSTEM COULD RESULT IN STRUCTURAL OSCILLATIONS AND FEEDLINE PRESSURES OF UNPREDICTABLE AMPLITUDE WHICH COULD LEAD TO THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 14

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/3  
MDAC ID: 5750 ABORT: 3/3

ITEM: ET/ORBITER DISCONNECT VALVE CONTROL CIRCUIT  
FAILURE MODE: ALL CREDIBLE MODES: OPENS, SHORTS, LOSS OF POWER

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5 & 6
- 5) AFT PCA 2 & 3
- 6) AFT LCA 2 & 3
- 7) ET/ORBITER DISCONNECT VALVE CONTROL CIRCUIT
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, TEMPERATURE, MISHANDLING/ABUSE

EFFECTS/RATIONALE:

THESE CIRCUITS PROVIDE POWER, CONTROL AND MONITORING FOR THE FEED  
DISCONNECT VALVE.

THE CRITICALITY 3 ITEMS REFERENCED ON THIS SHEET INCLUDE 12  
RESISTORS AND 7 DIODES. THE ITEMS WITH A CRITICALITY OTHER THAN  
3 ARE LISTED SEPERATELY UNDER MDAC ID 5751 THROUGH 5779.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5751 ABORT: 3/3

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 5  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT  
OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD  
INTERFERE WITH THE OPERATION OF SOME PAYLOADS.  
THEREFORE A FALSE OPEN COMMAND TO THE OPENING SOLENOID (LV46)  
COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5752 ABORT: 3/3

ITEM: MDM (FA3)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 6) MDM (FA3) (55V72A9)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/2R          | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE A FALSE OPEN COMMAND TO THE OPENING SOLENOID (LV46) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5753 ABORT: 3/3

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 6) MDM (FA4) (55V72A10)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE A FALSE OPEN COMMAND TO THE OPENING SOLENOID (LV46) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/16/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/2R     |
| MDAC ID:   | 5754      | ABORT:              | 3/3      |

ITEM: MDM (FA2)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV47)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 6) MDM (FA2) (55V72A8)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/2R          | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AVIONICS BAY 5  
PART NUMBER:                SEE REFERENCES

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE THE FAILURE OF THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV47) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 21



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/87  
SUBSYSTEM: EPD&C/MPS  
MDAC ID: 5755

HIGHEST CRITICALITY HDW/FUNC  
FLIGHT: 3/2R  
ABORT: 3/3

ITEM: MDM (FA3)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV47)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 6) MDM (FA3) (56V72A9)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE THE FAILURE OF THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV47) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5756 ABORT: 3/3

ITEM: MDM (FA4)  
FAILURE MODE: PREMATURE/ERRONEOUS OFF (INHIBIT LV47)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 6) MDM (FA4) (56V72A10)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/2R          | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AVIONICS BAY 6  
PART NUMBER: SEE REFERENCES

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE THE FAILURE OF THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV47) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5761 ABORT: 3/3

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (56V76A123)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT  
OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD  
INTERFERE WITH THE OPERATION OF SOME PAYLOADS.  
THEREFORE A FALSE OPEN COMMAND TO THE OPENING SOLENOID (LV46)  
COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5762 ABORT: 3/3

ITEM: HYBRID DRIVER, TYPE 1  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 7) HYBRID DRIVER, TYPE 1 (56V76A123)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 3  
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE A FALSE OPEN COMMAND TO THE OPENING SOLENOID (LV46) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/08/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 3/2R     |
| MDAC ID:   | 5763      | ABORT:              | 3/3      |

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL ON (FALSE OPEN COMMAND)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (55V76A122)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | /NA           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/2R          | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT LCA 2  
PART NUMBER:    MC477-0263-0002

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT  
OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD  
INTERFERE WITH THE OPERATION OF SOME PAYLOADS.  
THEREFORE A FALSE OPEN COMMAND TO THE OPENING SOLENOID (LV46)  
COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5764 ABORT: 3/3

ITEM: REMOTE POWER CONTROLLER (RPC 19)  
FAILURE MODE: FAIL ON/CLOSED

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT PCA 3
- 6) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC 19)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 3  
PART NUMBER: MC450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:  
THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE A FALSE OPEN COMMAND TO THE OPENING SOLENOID (LV46) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5765 ABORT: 3/3

ITEM: REMOTE POWER CONTROLLER (RPC 20)  
FAILURE MODE: FAIL ON/CLOSED

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) AFT PCA 2
- 6) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC 20)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 2  
PART NUMBER: MC450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT  
OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD  
INTERFERE WITH THE OPERATION OF SOME PAYLOADS.  
THEREFORE A FALSE OPEN COMMAND TO THE OPENING SOLENOID (LV46)  
COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5766 ABORT: 2/1R

ITEM: REMOTE POWER CONTROLLER (RPC 19)  
FAILURE MODE: FAILS PREMATURE/OFF (INHIBIT LV46)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT PCA 3
- 6) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC 19)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 3  
PART NUMBER: MC450-0017-1030

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LO2 MUST FLOW THROUGH THE FEED DISCONNECT VALVE (PD1) TO FEED THE SSMES. THE POSSIBLE RESULTS OF A FLOW INTERRUPTION INCLUDE SSME SHUTDOWN, UNCONTAINED ENGINE DAMAGE AND FIRE/EXPLOSION. THEREFORE THE LOSS OF THE OPEN COMMAND TO THE OPENING SOLENOID (LV46) WILL CAUSE THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/16/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID:   | 5767      | ABORT:              | 2/1R     |

ITEM: REMOTE POWER CONTROLLER (RPC 20)  
FAILURE MODE: FAILS PREMATURE/OFF (INHIBIT LV46)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) AFT PCA 2
- 6) FEED DISCONNECT VALVE OPENING SOLENOID (LV46) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC 20)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT PCA 2  
PART NUMBER:                MC450-0017-1030

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:  
LO2 MUST FLOW THROUGH THE FEED DISCONNECT VALVE (PD1) TO FEED THE SSMES. THE POSSIBLE RESULTS OF A FLOW INTERUPTION INCLUDE SSME SHUTDOWN, UNCONTAINED ENGINE DAMAGE AND FIRE/EXPLOSION. THEREFORE THE LOSS OF THE OPEN COMMAND TO THE OPENING SOLENOID (LV46) WILL CAUSE THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5771 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL ON (FALSE CLOSE COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (56V76A123)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 3  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LO2 MUST FLOW THROUGH THE FEED DISCONNECT VALVE (PD1) TO FEED THE SSMES. THE POSSIBLE RESULTS OF A FLOW INTERRUPTION INCLUDE SSME SHUTDOWN, UNCONTAINED ENGINE DAMAGE AND FIRE/EXPLOSION. THEREFORE A FALSE COMMAND TO THE CLOSING SOLENOID (LV47) WILL CAUSE THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5772 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 1  
FAILURE MODE: PREMATURE/ERRONEOUS ON (FALSE CLOSE COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT LCA 3
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) HYBRID DRIVER, TYPE 1 (56V76A123)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 3  
PART NUMBER: MC477-0261-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LO2 MUST FLOW THROUGH THE FEED DISCONNECT VALVE (PD1) TO FEED THE  
SSMES. THE POSSIBLE RESULTS OF A FLOW INTERRUPTION INCLUDE SSME  
SHUTDOWN, UNCONTAINED ENGINE DAMAGE AND FIRE/EXPLOSION.  
THEREFORE A FALSE COMMAND TO THE CLOSING SOLENOID (LV47) WILL  
CAUSE THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5773 ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE 3  
FAILURE MODE: FAIL ON (FALSE CLOSE COMMAND)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) AFT LCA 2
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) HYBRID DRIVER, TYPE 3 (55V76A122)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2  
PART NUMBER: MC477-0263-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LO2 MUST FLOW THROUGH THE FEED DISCONNECT VALVE (PD1) TO FEED THE  
SSMES. THE POSSIBLE RESULTS OF A FLOW INTERRUPTION INCLUDE SSME  
SHUTDOWN, UNCONTAINED ENGINE DAMAGE AND FIRE/EXPLOSION.  
THEREFORE A FALSE COMMAND TO THE CLOSING SOLENOID (LV47) WILL  
CAUSE THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/08/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 2/1R     |
| MDAC ID:   | 5774      | ABORT:              | 2/1R     |

ITEM: REMOTE POWER CONTROLLER (RPC 20)  
FAILURE MODE: FAIL ON/CLOSED

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT PCA 3
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC 20)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      AFT PCA 3  
PART NUMBER:    MC450-0017-1036

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:  
LO2 MUST FLOW THROUGH THE FEED DISCONNECT VALVE (PD1) TO FEED THE SSMES. THE POSSIBLE RESULTS OF A FLOW INTERRUPTION INCLUDE SSME SHUTDOWN, UNCONTAINED ENGINE DAMAGE AND FIRE/EXPLOSION. THEREFORE A FALSE COMMAND TO THE CLOSING SOLENOID (LV47) WILL CAUSE THE LOSS OF THE VEHICLE.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 2/1R  
MDAC ID: 5775 ABORT: 2/1R

ITEM: REMOTE POWER CONTROLLER (RPC 21)  
FAILURE MODE: FAIL ON/CLOSED

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) AFT PCA 2
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC 21)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 3/3           | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 2  
PART NUMBER: MC450-0017-1036

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LO2 MUST FLOW THROUGH THE FEED DISCONNECT VALVE (PD1) TO FEED THE SSMES. THE POSSIBLE RESULTS OF A FLOW INTERRUPTION INCLUDE SSME SHUTDOWN, UNCONTAINED ENGINE DAMAGE AND FIRE/EXPLOSION. THEREFORE A FALSE COMMAND TO THE CLOSING SOLENOID (LV47) WILL CAUSE THE LOSS OF THE VEHICLE.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5776 ABORT: 3/3

ITEM: REMOTE POWER CONTROLLER (RPC 20)  
FAILURE MODE: FAIL PREMATURE/OFF (INHIBIT LV47)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT PCA 3
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC 20)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 3  
PART NUMBER: MC450-0017-1036

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH  
SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT  
OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD  
INTERFERE WITH THE OPERATION OF SOME PAYLOADS.  
THEREFORE THE LOSS OF THE CLOSE COMMAND TO THE CLOSING SOLENOID  
(LV47) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPD&C/MPS FLIGHT: 3/2R  
MDAC ID: 5777 ABORT: 3/3

ITEM: REMOTE POWER CONTROLLER (RPC 21)  
FAILURE MODE: FAIL PREMATURE/OFF (INHIBIT LV47)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) AFT PCA 2
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) REMOTE POWER CONTROLLER (RPC 21)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/2R     | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT PCA 2  
PART NUMBER: MC450-0017-1036

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE THE LOSS OF THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV47) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |           |                     |          |
|------------|-----------|---------------------|----------|
| DATE:      | 1/27/87   | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPD&C/MPS | FLIGHT:             | 2/2      |
| MDAC ID:   | 5778      | ABORT:              | 3/3      |

ITEM: DIODE (12A)  
FAILURE MODE: FAIL OPEN (INHIBIT LV47)

LEAD ANALYST: HOLDEN/LOWERY                      SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 5
- 5) AFT PCA 2
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) DIODE (12A) (2) (A2CR13, A2CR14)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | CRITICALITIES<br>ABORT | HDW/FUNC |
|-----------------|----------|------------------------|----------|
| PRELAUNCH:      | /NA      | RTLS:                  | 3/3      |
| LIFTOFF:        | 3/3      | TAL:                   | 3/3      |
| ONORBIT:        | 2/2      | AOA:                   | 3/3      |
| DEORBIT:        | 3/3      | ATO:                   | 3/3      |
| LANDING/SAFING: | 3/3      |                        |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      AFT PCA 2  
PART NUMBER:                JANTXIN1204RA

CAUSES:    PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE THE LOSS OF THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV47) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES:    SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: EPD&C/MPS FLIGHT: 2/2  
 MDAC ID: 5779 ABORT: 3/3

ITEM: DIODE (12A)  
 FAILURE MODE: FAIL OPEN (INHIBIT LV47)

LEAD ANALYST: HOLDEN/LOWERY SUBSYS LEAD: A. J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPD&C/MPS
- 2) O2
- 3) ET/ORBITER FEED DISCONNECT VALVE (PD1)
- 4) AVIONICS BAY 6
- 5) AFT PCA 3
- 6) FEED DISCONNECT VALVE CLOSING SOLENOID (LV47) CIRCUIT
- 7) DIODE (12A) (A2CR16)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | /NA      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 2/2      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT PCA 3  
 PART NUMBER: JANTXIN1204RA

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION, MECH SHOCK, VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THE FEED DISCONNECT VALVE (PD1) IS CLOSED AFTER MECO TO PREVENT OUTGASSING OF O2 IN THE ONORBIT PHASE. THIS OUTGASSING COULD INTERFERE WITH THE OPERATION OF SOME PAYLOADS. THEREFORE THE LOSS OF THE CLOSE COMMAND TO THE CLOSING SOLENOID (LV47) COULD CAUSE THE LOSS OF THE MISSION.

REFERENCES: SSWH DWG 10.11A; VS72-941099 SHEET 21

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/09/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6011 ABORT: 3/3

ITEM: POWER & CONTROL CIRCUITS FOR LH2 FEEDLINE  
DISCONNECT VALVE  
FAILURE MODE: OPEN, SHORTED, INADVERTENT OPERATION, ERRONEOUS  
OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) HYDROGEN FEED SYSTEM
- 3) LH2 FEEDLINE DISCONNECT VALVE (PD2)
- 4) HELIUM OPEN/CLOSE CONTROL SOLENOID VALVES (LV48, LV49)
- 5) AVBAY 5,6
- 6) AFT PCA 2,3
- 7) AFT LCA 2,3
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: THERMAL SHOCK, VIBRATION, CONTAMINATION, MECHANICAL  
SHOCK

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCED WILL HAVE NO HAZARDOUS EFFECT ON  
CREW, VEHICLE OR MISSION AND ARE THUS ASSIGNED CRITICALITY 3/3.  
ELECTRICAL COMPONENTS INCLUDED ARE 4 DIODES, 12 MDMS AND 13  
RESISTORS. COMPONENTS ASSIGNED CRITICALITIES OTHER THAN 3/3 ARE  
ADDRESSED SEPARATELY UNDER MDAC 6012 THROUGH 6016.

REFERENCES: RI DRAWING VS72-941102, SHT 15. MAJOR HARDWARE  
ITEMS ASSOCIATED WITH THIS CIRCUITRY ARE THE LH2 FEEDLINE  
DISCONNECT VALVE, MC284-0389-0051(0411,0431), AND ITS  
CORRESPONDING CONTROL SOLENOIDS, MC284-0404-0021.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/09/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6012 ABORT: 2/1R

ITEM: HYBRID DRIVER CONTROLLER (6)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) HYDROGEN FEED SYSTEM
- 3) LH2 FEEDLINE DISCONNECT VALVE (PD2)
- 4) HELIUM OPEN/CLOSE CONTROL SOLENOID VALVES (LV48, LV49)
- 5) AVBAY 5, 6
- 6) AFT LCA 2, 3
- 7) HYBRID DRIVER CONTROLLER (4 TYPE III, 2 TYPE I)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC477-0263,0002, MC477-0261-0002; 56V76A12AR

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE WILL PREVENT OPERATION (OPEN OR CLOSE) OF THE FEEDLINE DISCONNECT OR MAY ALLOW VALVE TO CLOSE DURING FILL, WITH THE POSSIBLE RESULT A RUPTURE OF THE FEEDLINE MANIFOLD AND CREATION OF A FIRE/EXPLOSION HAZARD. FAILURE CAUSING THE VALVE TO CLOSE DURING POWERED FLIGHT WILL DESTROY THE VEHICLE. FAILURE DURING ASCENT WILL ALLOW LH2 TO ESCAPE THE ET AT SEPARATION, CAUSING RECONTACT WITH THE ORBITER AND LOSS OF VEHICLE, OR RECONTACT MAY CAUSE DAMAGE TO TPS, PREVENTING A SAFE REENTRY. AERO FORCES DURING RTLS WILL PREVENT RECONTACT.

REFERENCES: RI DRAWING VS72-941102, SHT 15.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/09/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6013 ABORT: 2/1R

ITEM: REMOTE POWER CONTROLLER (4)  
FAILURE MODE: FAIL OPEN, FAIL CLOSED, INADVERTENT OPERATION

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) HYDROGEN FEED SYSTEM
- 3) LH2 FEEDLINE DISCONNECT VALVE (PD2)
- 4) HELIUM OPEN/CLOSE CONTROL SOLENOID VALVES (LV48, LV49)
- 5) AVBAY 5,6
- 6) AFT PCA 2,3
- 7) REMOTE POWER CONTROLLER (4)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC450-0017-1030: 55V76A132RPC22,23,  
56V76A133RPC21,22

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE WILL PREVENT OPERATION OF THE FEEDLINE DISCONNECT VALVE. PRELAUNCH FAILURE MAY CAUSE LAUNCH DELAY, OR MAY ALLOW VALVE TO CLOSE DURING FILL, WITH THE POSSIBLE RESULT A RUPTURE OF THE FEEDLINE MANIFOLD AND CREATION OF A FIRE/EXPLOSION HAZARD. FAILURE CAUSING THE VALVE TO CLOSE DURING POWERED FLIGHT WILL DESTROY THE VEHICLE. FAILURE DURING ASCENT WILL ALLOW H2 TO ESCAPE THE ET AND ORBITER AT SEPARATION, CAUSING RECONTACT AND DAMAGE TO TPS TILES, PREVENTING A SAFE REENTRY, OR DESTRUCTION OF THE VEHICLE. AERO FORCES DURING RTLS WILL PREVENT RECONTACT.

REFERENCES: RI DRAWING VS72-941102, SHT 15.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/09/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6014 ABORT: 2/1R

ITEM: ISOLATION AND BLOCKING DIODES (6)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) HYDROGEN FEED SYSTEM
- 3) LH2 FEEDLINE DISCONNECT VALVE (PD2)
- 4) HELIUM OPEN/CLOSE CONTROL SOLENOID VALVES (LV48,LV49)
- 5) AVBAY 5,6
- 6) AFT PCA 2,3
- 7) ISOLATION AND BLOCKING DIODES
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION:

PART NUMBER: JANTX1N1204RA: 55V76A132A2CR8,15, 55V76A133A2CR5,6,  
55V76A133A3CR5,13

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE WILL PREVENT OPERATION OF THE FEEDLINE DISCONNECT VALVE. PRELAUNCH FAILURE MAY CAUSE LAUNCH DELAY. FAILURE DURING ASCENT WILL ALLOW H2 TO ESCAPE THE ET AND ORBITER AT SEPARATION, CAUSING RECONTACT AND DAMAGE TO TPS TILES, PREVENTING A SAFE REENTRY, OR IMMEDIATE DESTRUCTION OF THE VEHICLE. AERO FORCES DURING RTLS WILL PREVENT RECONTACT.

REFERENCES: RI DRAWING VS72-941102, SHT 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6015 ABORT: 2/1R

ITEM: FLIGHT CRITICAL AFT MDM (3)  
FAILURE MODE: FAIL ON, FAIL OFF

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) HYDROGEN FEED SYSTEM
- 3) LH2 FEEDLINE DISCONNECT VALVE (PD2)
- 4) HELIUM OPEN/CLOSE CONTROL SOLENOID VALVES (LV48, LV49)
- 5) AVBAY 5,6
- 6) FLIGHT CRITICAL AFT MDM (3)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R     | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC615-0004-6110,5110: 56V72A9,10, 55V75A14

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE OF A REDUNDANT ITEM WILL PREVENT OPERATION OF THE FEEDLINE DISCONNECT VALVE. PRELAUNCH FAILURE MAY CAUSE LAUNCH DELAY, OR MAY ALLOW VALVE TO CLOSE DURING FILL, WITH THE POSSIBLE RESULT A RUPTURE OF THE FEEDLINE MANIFOLD AND CREATION OF A FIRE/EXPLOSION HAZARD. FAILURE CAUSING THE VALVE TO CLOSE DURING POWERED FLIGHT WILL DESTROY THE VEHICLE. FAILURE DURING ASCENT WILL ALLOW H2 TO ESCAPE THE ET AND ORBITER AT SEPARATION, CAUSING RECONTACT AND DAMAGE TO THE TPS TILES, PREVENTING A SAFE REENTRY, OR IMMEDIATE DESTRUCTION OF THE VEHICLE. AERO FORCES WILL PREVENT RECONTACT DURING RTLS.

REFERENCES: RI DRAWING VS72-941102, SHT 15

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/14/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 1/1  
MDAC ID: 6016 ABORT: 1/1

ITEM: INDICATOR SWITCH (PD2)  
FAILURE MODE: FAIL OPEN, FAIL TO TRANSFER

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) HYDROGEN FEED SYSTEM
- 3) LH2 FEEDLINE DISCONNECT VALVE (PD2)
- 4) POSITION INDICATOR SWITCH
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: 50V41PD2

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

PRELAUNCH FAILURE MAY CAUSE LAUNCH DELAY. FAILURE DURING ASCENT MAY CAUSE INCORRECT POSITION INDICATION, ALLOWING ET SEP WITH DISCONNECT VALVES OPEN. ESCAPING H2 COULD CAUSE THE ORBITER AND/OR ET TO ROTATE AND RECONTACT EACH OTHER. RECONTACT CAN CAUSE DAMAGE TO TPS TILES, PREVENTING A SAFE REENTRY, OR IMMEDIATE DESTRUCTION OF THE ORBITER. AERO FORCES WILL PREVENT RECONTACT DURING AN RTLS ABORT.

REFERENCES: RI DRAWING VS72-941102, SHT 15



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|                     |                     |          |
|---------------------|---------------------|----------|
| DATE: 1/15/87       | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: EPDC/MPS | FLIGHT:             | 3/3      |
| MDAC ID: 6021       | ABORT:              | 3/3      |

ITEM: POWER & CONTROL CIRCUITS FOR LH2 RTLS DUMP VALVES  
(2)  
FAILURE MODE: OPEN, SHORTED, INADVERTENT OPERATION, ERRONEOUS  
OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 RTLS DUMP VALVES (PV17,PV18) NORMALLY CLOSED
- 4) LH2 RTLS DUMP VALVE OPENING SOLENOIDS (LV72,LV73)
- 5) AVBAY 4,6
- 6) AFT LCA 1,3
- 7) MID PCA-3, AFT PCA-1
- 8) VALVE POWER & CONTROL CIRCUITS
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                SEE REFERENCES  
PART NUMBER:        SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL  
SHOCK

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCED WILL HAVE NO HAZARDOUS EFFECT ON  
CREW, VEHICLE OR MISSION AND ARE THUS ASSIGNED CRITICALITY 3/3.  
ELECTRICAL COMPONENTS INCLUDED ARE 14 RESISTORS, 2 DIODES, 2 MDMS  
AND 2 INDICATOR SWITCHES.

REFERENCES: RI DRAWING VS72-941102, SHT 14. MAJOR HARDWARE  
ITEMS ASSOCIATED WITH THIS CIRCUITRY ARE THE LH2 RTLS DUMP  
VALVES, MC284-0395-0023(0024,0033,0034,0043,0044,0053,0054) AND  
THEIR ASSOCIATED OPENING SOLENOIDS, MC284-0404-0012.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/15/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6022 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (6)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 RTLS DUMP VALVES (PV17,PV18) NORMALLY CLOSED
- 4) LH2 RTLS DUMP VALVE OPENING SOLENOIDS (LV72,LV73)
- 5) AVBAY 4,6
- 6) AFT LCA 1,3
- 7) HYBRID DRIVER CONTROLLERS (6)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC477-0261-0002, 56V76A121AR(2); MC477-0263-0002,  
56V76A123AR(4)

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL PREVENT LH2 RTLS DUMP. HYDROGEN WILL VENT THROUGH THE RELIEF VALVE DURING RTLS DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/15/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6023 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER (4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 RTLS DUMP VALVES (PV17,PV18) NORMALLY CLOSED
- 4) LH2 RTLS DUMP VALVE OPENING SOLENOIDS (LV72,LV73)
- 5) AVBAY 4,6
- 6) MID PCA-3, AFT PCA-1
- 7) REMOTE POWER CONTROLLERS (4)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC450-0017: 40V76A27RPC29,30, 54V76A131RPC31,32

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL PREVENT LH2 RTLS DUMP VALVES FROM OPERATING. HYDROGEN WILL VENT THROUGH THE RELIEF VALVE DURING RTLS DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/15/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6024 ABORT: 3/1R

ITEM: BLOCKING DIODE (4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 RTLS DUMP VALVES (PV17,PV18) NORMALLY CLOSED
- 4) LH2 RTLS DUMP VALVE OPENING SOLENOIDS (LV72,LV73)
- 5) AVBAY 4,6
- 6) AFT PCA-1, MID PCA-3
- 7) BLOCKING DIODES (4)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: JANTX1N1204RA: 40V76A27A4CR7,8, 54V76A131A3CR3,9

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL PREVENT LH2 RTLS DUMP VALVES FROM OPERATING. HYDROGEN WILL VENT THROUGH THE RELIEF VALVE DURING RTLS DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/15/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6025 ABORT: 3/1R

ITEM: ISOLATION DIODE (2)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 RTLS DUMP VALVES (PV17,PV18) NORMALLY CLOSED
- 4) LH2 RTLS DUMP VALVE OPENING SOLENOIDS (LV72,LV73)
- 5) AVBAY 4,6
- 6) AFT PCA-1
- 7) ISOLATION DIODES (2)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: JANTX1N1204RA: 54V76A131CR4,10

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL PREVENT LH2 RTLS DUMP VALVES FROM OPERATING. HYDROGEN WILL VENT THROUGH THE RELIEF VALVE DURING RTLS DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6026 ABORT: 3/1R

ITEM: FLIGHT CRITICAL AFT MDM (FA1,FA3,FA4)  
FAILURE MODE: FAIL ON, INADVERTENT OPERATION

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 RTLS DUMP VALVES (PV17,PV18) NORMALLY CLOSED
- 4) LH2 RTLS DUMP VALVE OPENING SOLENOIDS (LV72,LV73)
- 5) AVBAY 4,6
- 6) MDM (3)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 54V72A7, 56V72A9,10

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL CAUSE LH2 RTLS DUMP VALVES TO OPEN, ALLOWING LH2 TO ESCAPE THE VEHICLE AND CREATE A FIRE/EXPLOSION HAZARD. LOSS OF LH2 WILL CAUSE ENGINES TO SHUTDOWN EARLY, RESULTING IN LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/16/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6027 ABORT: 3/1R

ITEM: FLIGHT CRITICAL AFT MDM (FA1,FA3,FA4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RTLS DUMP SYSTEM
- 3) LH2 RTLS DUMP VALVES (PV17,PV18) NORMALLY CLOSED
- 4) LH2 RTLS DUMP VALVE OPENING SOLENOIDS (LV72,LV73)
- 5) AVBAY 4,6
- 6) MDM (3)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 54V72A7, 56V72A9,10

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
LOSS OF ALL REDUNDANCY WILL PREVENT LH2 RTLS DUMP VALVES FROM OPERATING. HYDROGEN WILL VENT THROUGH THE RELIEF VALVE DURING RTLS DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6051 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP VALVE OPENING SOLENOID  
ENERGIZING CIRCUITRY  
FAILURE MODE: ERRONEOUS OUTPUT, LOSS OF OR PARTIAL OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) H2 EPDC
- 3) LH2 RECIRCULATION PUMP VALVES (PV14, PV15, PV16)
- 4) LH2 RECIRCULATION PUMP VALVE OPENING SOLENOID (LV36)
- 5) AV BAY 4
- 6) AFT LCA-1
- 7) LH2 RECIRCULATION PUMP VALVE OPENING SOLENOID ENERGIZING  
CIRCUITRY
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: CIRCUIT COMPONENT FAILURE

EFFECTS/RATIONALE:  
FAILURE MAY CAUSE LAUNCH DELAY. NO HAZARDOUS CONDITION FOR CREW  
OR VEHICLE.

REFERENCES: VS72-941102, SHT 12.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6061 ABORT: 3/3

ITEM: LH2 RECIRCULATION PUMP CONTROL CIRCUITRY  
FAILURE MODE: ERRONEOUS OUTPUT, LOSS OF OR PARTIAL OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) MPS
- 2) H2 EPDC
- 3) LH2 RECIRCULATION PUMP (PP1, PP2, PP3)
- 4) AV BAYS 4,5,6
- 5) LH2 RECIRCULATION PUMP CONTROL CIRCUITRY
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: CIRCUIT COMPONENT FAILURE

EFFECTS/RATIONALE:  
FAILURE MAY CAUSE LAUNCH DELAY. NO HAZARDOUS CONDITION FOR CREW OR VEHICLE.

REFERENCES: VS72-941102, SHT 12.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6071 ABORT: 2/1R

ITEM: FUSE, 1A (3)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 INBOARD FILL & DRAIN, TOPPING, AND HIGH POINT BLEED VALVES (PV12,PV13,PV22)
- 4) PANEL R4 (SWITCH LOCATION)
- 5) FUSES (3)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: ME451-0018-0100; 32V73A4F12,13,14

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE WILL PRECLUDE MPS DUMP AND INERT. HYDROGEN WILL ESCAPE THROUGH THE RELIEF VALVE DURING ENTRY AND LANDING, CREATING A FIRE/EXPLOSION HAZARD. NO EFFECT ON RTLS BECAUSE RTLS DUMP IS NOT MADE THROUGH FILL & DRAIN VALVES.

REFERENCES: VS72-941102, SHT 13.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|                     |                     |          |
|---------------------|---------------------|----------|
| DATE: 1/22/87       | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: EPDC/MPS | FLIGHT:             | 2/1R     |
| MDAC ID: 6072       | ABORT:              | 2/1R     |

ITEM: TOGGLE SWITCH  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 INBOARD FILL & DRAIN, TOPPING, AND HIGH POINT BLEED VALVES (PV12,PV13,PV22)
- 4) PANEL R4 (SWITCH LOCATION)
- 5) TOGGLE SWITCH
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | /NA      |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      SEE REFERENCES  
PART NUMBER:    ME452-0102-7256: 32V73A459

CAUSES:    VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE WILL PRECLUDE MPS DUMP AND INERT.    HYDROGEN WILL ESCAPE THROUGH THE RELIEF VALVE DURING ENTRY AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.    NO EFFECT ON RTLS BECAUSE RTLS DUMP IS NOT MADE THROUGH FILL & DRAIN VALVES.

REFERENCES:    VS72-941102, SHT 13.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6073 ABORT: 2/1R

ITEM: TOGGLE SWITCH  
FAILURE MODE: FAIL SHORTED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 INBOARD FILL & DRAIN, TOPPING, AND HIGH POINT BLEED VALVES (PV12, PV13, PV22)
- 4) PANEL R4 (SWITCH LOCATION)
- 5) TOGGLE SWITCH
- 6)
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: ME452-0102-7256: 32V73A459

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

SECOND FAILURE DURING TANK FILL MAY CAUSE I/B FILL & DRAIN VALVE TO CLOSE, POSSIBLY RESULTING IN RUPTURE OF THE FILL LINE, RELEASE OF LH2 AND CREATION OF A FIRE/EXPLOSION HAZARD. SECOND FAILURE AFTER ENGINE START MAY ALLOW VALVE TO OPEN, RESULTING IN GAS FROM THE FILL LINE CAUSING CAVITATION IN THE ENGINE PUMPS AND ENGINE EXPLOSION. SECOND FAILURE CAN PRECLUDE MPS DUMP, ALLOWING H2 TO ESCAPE OVERBOARD DURING ENTRY AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.

REFERENCES: VS72-941102, SHT 13.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 1/22/87  | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPDC/MPS | FLIGHT:             | 3/1R     |
| MDAC ID:   | 6074     | ABORT:              | 3/1R     |

ITEM: HYBRID DRIVER CONTROLLER (4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 INBOARD FILL & DRAIN, TOPPING, AND HIGH POINT BLEED VALVES (PV12,PV13,PV22)
- 4) PANEL R4 (SWITCH LOCATION)
- 5) AV BAY 4
- 6) AFT LCA-1
- 7) HYBRID DRIVER CONTROLLERS (4)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R          |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ P ]                      C [ P ]

LOCATION:                      SEE REFERENCES  
PART NUMBER:    MC477-0263-0002: 54V76A121AR(3)

CAUSES:    VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL MAKE THE INBOARD FILL & DRAIN VALVE INOPERATIVE. THIS WILL PRECLUDE LH2 DUMP AND ALLOW H2 TO VENT DURING ENTRY AND LANDING, CREATING A FIRE/EXPLOSION HAZARD. NO HAZARD DURING RTLS, SINCE RTLS DUMP DOES NOT USE THE FILL & DRAIN VALVES.

REFERENCES:    VS72-941102, SHT 13.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6075 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER  
FAILURE MODE: INADVERTENT OUTPUT (SHORTED)

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 INBOARD FILL & DRAIN, TOPPING, AND HIGH POINT BLEED VALVES (PV12,PV13,PV22)
- 4) PANEL R4 (SWITCH LOCATION)
- 5) AV BAY 4
- 6) AFT LCA-1
- 7) HYBRID DRIVER CONTROLLERS (4)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 3/3      |
| LIFTOFF:        | 2/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC477-0263-0002: 54V76A121AR(3)

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

SECOND FAILURE DURING TANK FILL MAY CAUSE INBOARD FILL & DRAIN VALVE TO CLOSE, POSSIBLY RESULTING IN RUPTURE OF FILL & DRAIN LINE, RELEASE OF LH2 AND CREATION OF A FIRE/EXPLOSION HAZARD. SECOND FAILURE CAN PRECLUDE MPS DUMP, ALLOWING H2 TO ESCAPE OVERBOARD DURING ENTRY AND LANDING, CREATING A FIRE/EXPLOSION HAZARD. NO HAZARD DURING RTLS.

REFERENCES: VS72-941102, SHT 13.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6076 ABORT: 3/1R

ITEM: ISOLATION DIODES (16)  
FAILURE MODE: FAIL OPEN, FAIL SHORTED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 INBOARD FILL & DRAIN, TOPPING, AND HIGH POINT BLEED VALVES (PV12,PV13,PV22)
- 4) PANEL R4 (SWITCH LOCATION)
- 5) AV BAY 4
- 6) AFT LCA-1
- 7) ISOLATION DIODES (16)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: JANTX 54V76A121CR

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL MAKE THE INBOARD FILL & DRAIN VALVE INOPERATIVE. THIS WILL PRECLUDE LH2 DUMP AND ALLOW H2 TO VENT DURING ENTRY AND LANDING, CREATING A FIRE/EXPLOSION HAZARD. NO HAZARD DURING RTLS, SINCE RTLS DUMP DOES NOT USE THE FILL & DRAIN VALVES.

REFERENCES: VS72-941102, SHT 13.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6077 ABORT: 3/3

ITEM: CURRENT LIMITING RESISTORS (9) AND BLEED RESISTORS  
(2)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 INBOARD FILL & DRAIN, TOPPING, AND HIGH POINT BLEED VALVES (PV12,PV13,PV22)
- 4) PANEL R4 (SWITCH LOCATION)
- 5) AV BAY 4
- 6) AFT LCA-1
- 7) CURRENT LIMITING RESISTORS (9) AND BLEED RESISTORS (2)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: RLR07C512GR(7), RLR20C222GR(2), RLR07C182G(2):  
54V76A121

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
FAILURE WILL HAVE NO HAZARDOUS EFFECT ON CREW OR VEHICLE.

REFERENCES: VS72-941102, SHT 13.





INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/22/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6079 ABORT: 3/3

ITEM: VALVE SWITCH INDICATOR  
FAILURE MODE: FAIL OPEN, INADVERTENT OPERATION

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 INBOARD FILL & DRAIN, TOPPING, AND HIGH POINT BLEED VALVES (PV12,PV13,PV22)
- 4) PANEL R4 (SWITCH LOCATION)
- 5) AV BAY 4, 5, 6
- 6) AFT LCA-1
- 7) VALVE SWITCH INDICATOR (3)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: 50V41PV12,13,22

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
FAILURE WILL HAVE NO HAZARDOUS EFFECT ON CREW OR VEHICLE.

REFERENCES: VS72-941102, SHT 13 AND 16.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 1/20/87  | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPDC/MPS | FLIGHT:             | 2/1R     |
| MDAC ID:   | 6081     | ABORT:              | 2/1R     |

ITEM: 1A FUSE  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32, LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) FUSE
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:                      SEE REFERENCES  
PART NUMBER:    ME451-0018-0100

CAUSES:    VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE WILL PRECLUDE MPS LH2 DUMP. H2 WILL VENT OVERBOARD DURING DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.  
NO HAZARDOUS EFFECT ON RTLS, BECAUSE FILL & DRAIN VALVES ARE NOT USED DURING RTLS.

REFERENCES:    RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6082 ABORT: 2/1R

ITEM: TOGGLE SWITCH, 32V73A438  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32, LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) TOGGLE SWITCH
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: ME452-0102-7153

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE WILL PRECLUDE MPS LH2 DUMP. H2 WILL VENT OVERBOARD DURING DESCENT AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.

NO HAZARDOUS EFFECT ON RTLS, BECAUSE FILL & DRAIN VALVES ARE NOT USED DURING RTLS.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6083 ABORT: 3/1R

ITEM: TOGGLE SWITCH  
FAILURE MODE: FAIL SHORTED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32, LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) TOGGLE SWITCH
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: ME452-0102-7153: 32V73A458

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY CAN LEAD TO SEVERAL CRITICAL SITUATIONS, AS FOLLOWS. FAILURE(S) DURING TANK FILL CAN CAUSE FILL & DRAIN VALVE TO CLOSE, CAUSING RUPTURE OF FILL LINE, RELEASING LH2 AND CREATING A FIRE/EXPLOSION HAZARD. FAILURES DURING POWERED FLIGHT COULD ALLOW FILL & DRAIN VALVES TO OPEN, RELEASING LH2 AND CREATING A FIRE/EXPLOSION HAZARD OR CAUSING EARLY ENGINE SHUTDOWN AND LOSS OF VEHICLE. FAILURES COULD PREVENT LH2 DUMP AND ALLOW H2 TO VENT OVERBOARD DURING ENTRY AND LANDING, CREATING A FIRE/EXPLOSION HAZARD.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6084 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER (2)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32, LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AV BAY 5
- 7) AFT LCA-2
- 8) HYBRID DRIVER CONTROLLER
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC471-0263-0002

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL PREVENT OPERATION OF OUTBOARD FILL & DRAIN VALVE, PRECLUDING MPS LH2 DUMP AND ALLOWING H2 TO VENT OVERBOARD DURING ENTRY AND LANDING. THIS WILL CREATE A FIRE/EXPLOSION HAZARD AND MAY CAUSE LOSS OF VEHICLE. NO HAZARDOUS EFFECT DURING RTLS, BECAUSE THE O/B FILL & DRAIN VALVE IS NOT USED DURING RTLS MPS DUMP.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6085 ABORT: 2/1R

ITEM: HYBRID DRIVER CONTROLLER  
FAILURE MODE: INADVERTENT OUTPUT, SHORTED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32,LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AV BAY 5
- 7) AFT LCA-2
- 8) HYBRID DRIVER CONTROLLER
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R          | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 2/1R     |
| ONORBIT:        | 3/3           | AOA:  | 2/1R     |
| DEORBIT:        | 2/1R          | ATO:  | 2/1R     |
| LANDING/SAFING: | 2/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC471-0263-0002

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY COULD ALLOW O/B FILL & DRAIN VALVE TO CLOSE DURING TANK FILL, RESULTING IN RUPTURE OF FILL LINE AND RELEASE OF LH2, CREATING A FIRE/EXPLOSION HAZARD. LOSS OF ALL REDUNDANCY DURING POWERED FLIGHT WILL ALLOW BOTH FILL & DRAIN VALVES TO OPEN, RELEASING LH2 AND CAUSING EARLY ENGINE SHUTDOWN, RESULTING IN LOSS OF VEHICLE. LOSS OF ALL REDUNDANCY CAN ALSO PREVENT OPERATION OF O/B FILL & DRAIN VALVE, PRECLUDING LH2 DUMP AND ALLOWING VENTING OF H2 TO CREATE A FIRE/EXPLOSION DURING ENTRY AND LANDING.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6086 ABORT: 3/1R

ITEM: ISOLATION DIODE (4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32, LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AV BAY 5
- 7) AFT LCA-2
- 8) ISOLATION DIODES (4)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R     | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R     |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: JANTXV1N5551

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL PREVENT OPERATION OF OUTBOARD FILL & DRAIN VALVE, PRECLUDING MPS LH2 DUMP AND ALLOWING H2 TO VENT OUTBOARD DURING ENTRY AND LANDING. THIS WILL CREATE A FIRE/EXPLOSION HAZARD AND MAY CAUSE LOSS OF VEHICLE. NO HAZARDOUS EFFECT DURING RTLS, BECAUSE THE O/B FILL & DRAIN VALVE IS NOT USED DURING RTLS MPS DUMP.

REFERENCES: RI DRAWING VS72-941102, SHT 14.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/20/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6087 ABORT: 3/3

ITEM: CURRENT LIMITING RESISTOR (4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32,LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AV BAY 5
- 7) AFT LCA-2
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: RLR07512GR

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK

EFFECTS/RATIONALE:  
FAILURE WILL HAVE NO HAZARDOUS EFFECT ON CREW OR VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6088 ABORT: 3/1R

ITEM: MDM  
FAILURE MODE: FAIL OPEN, INADVERTENT OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32, LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AV BAY 5
- 7) MDM FA2
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/1R          | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/1R          |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MDM FA2, 55V72A8

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY WILL PREVENT OPERATION OF OUTBOARD FILL AND DRAIN VALVE, PRECLUDING MPS LH2 DUMP AND ALLOWING H2 TO VENT OVERBOARD DURING ENTRY AND LANDING. THIS WILL CREATE A FIRE/EXPLOSION HAZARD AND MAY CAUSE LOSS OF VEHICLE. NO HAZARDOUS EFFECT DURING RTLS, BECAUSE THE O/B FILL AND DRAIN VALVE IS NOT USED DURING RTLS MPS DUMP.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6089 ABORT: 3/3

ITEM: VALVE SWITCH INDICATOR  
FAILURE MODE: FAIL OPEN, SHORTED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 OUTBOARD FILL & DRAIN VALVE (PV11)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV32, LV33)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) VALVE SWITCH INDICATOR
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: 50V411PV11

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
THE FAILURE WILL HAVE NO HAZARDOUS EFFECT ON CREW OR VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6101 ABORT: 3/3

ITEM: LH2 FEEDLINE RELIEF ISOLATION VALVE POWER AND  
CONTROL CIRCUITS  
FAILURE MODE: LOSS OF OUTPUT, ERRONEOUS OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 FILL & DRAIN SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH POSITION)
- 6) MID PCA-1, -3
- 7) VALVE POWER AND CONTROL CIRCUITS
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCES WILL NOT AFFECT CREW, VEHICLE OR MISSION. ELECTRICAL ITEMS INCLUDED ARE 5 RESISTORS, 2 DIODES AND 2 MDMS. ELECTRICAL ITEMS WITH A CRITICALITY OTHER THAN 3/3 ARE LISTED SEPARATELY UNDER MDAC ID 6102 THROUGH 6109.

REFERENCES: RI DRAWING VS72-941102 SHT 14. MAJOR HARDWARE ASSOCIATED WITH THIS CIRCULTRY IS THE LH2 FEEDLINE RELIEF ISOLATION VALVE.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6102 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER (2)  
FAILURE MODE: FAIL OPEN, INADVERTENT OPERATION

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) MID PCA-1, -3
- 7) RPC 24, 31
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC450-0017-1030: 40V76A25AR48, 40V76A27AR29

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY MAY CAUSE ISOLATION VALVE TO OPEN DURING PRELAUNCH OR POWERED FLIGHT. ESCAPING H2 WILL CREATE A FIRE/EXPLOSION HAZARD. FAILURE OF REDUNDANT ITEMS CAN ALSO PREVENT VALVE FROM OPENING AT MECO, ALLOWING RUPUTRE OF LH2 FEEDLINE MANIFOLD AND LOSS OF VEHICLE.

REFERENCES: VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6103 ABORT: 2/1R

ITEM: HYBRID DRIVER CONTROLLER  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) MID PCA-1, -3
- 7) HYBRID DRIVER CONTROLLER
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC477-0263-0002: 40V76A25AR48, 40V76A27AR29

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE MAY CAUSE NORMALLY OPEN ISOLATION VALVE TO OPEN DURING PRELAUNCH OR POWERED FLIGHT. ESCAPING H2 WILL CREATE A FIRE/EXPLOSION HAZARD. LOSS OF FUEL COULD ALSO CAUSE EARLY ENGINE SHUTDOWN AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6104 ABORT: 3/1R

ITEM: TOGGLE SWITCH  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) TOGGLE SWITCH
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FWD FLIGHT DECK, PANEL R4  
PART NUMBER: ME452-0102-7354: 32V73A458

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY MAY CAUSE NORMALLY OPEN ISOLATION VALVE TO OPEN DURING PRELAUNCH OR POWERED FLIGHT. ESCAPING H2 WILL CREATE FIRE/EXPLOSION HAZARD. LOSS OF FUEL COULD ALSO CAUSE EARLY ENGINE SHUTDOWN AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 1/1R  
MDAC ID: 6105 ABORT: 1/1R

ITEM: TOGGLE SWITCH  
FAILURE MODE: FAIL SHORTED, INADVERTENT OPERATION

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) TOGGLE SWITCH
- 7)
- 8)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 1/1R          | RTLS: | 1/1R     |
| LIFTOFF:        | 1/1R          | TAL:  | 1/1R     |
| ONORBIT:        | 3/3           | AOA:  | 1/1R     |
| DEORBIT:        | 3/3           | ATO:  | 1/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FWD FLIGHT DECK, PANEL R4  
PART NUMBER: ME452-0102-7354: 32V73A458

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

A SHORT ACROSS THE "OPEN" CONTACTS WILL OVERRIDE REDUNDANT CLOSE COMMANDS AND TURN OFF REDUNDANT VALVE DRIVERS. THE ISOLATION VALVE WILL OPEN AND ESCAPING H2 WILL CREATE A FIRE/EXPLOSION HAZARD.

REFERENCES: RI DRAWING VS72-941102, SHT 14.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6106 ABORT: 3/1R

ITEM: CURRENT LIMITING RESISTOR (3)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) MID PCA-1, -3
- 7) CURRENT LIMITING RESISTORS (3)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: RWR8051211FR: 32V73A4A9R1, 32V73A4ABR3

CAUSES: VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY MAY CAUSE NORMALLY OPEN ISOLATION VALVE TO OPEN DURING PRELAUNCH OR POWERED FLIGHT. ESCAPING H2 WILL CREATE A FIRE/EXPLOSION HAZARD. LOSS OF FUEL COULD ALSO CAUSE EARLY ENGINE SHUTDOWN AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6107 ABORT: 3/1R

ITEM: ISOLATION DIODE (11)  
FAILURE MODE: FAIL OPEN, FAIL SHORTED, OUT OF TOLERANCE, LEAKAGE

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) MID PCA -1, -3
- 7) ISOLATION DIODES (11)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 1 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: JANTXV1N424C: 3273A4CR

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY MAY CAUSE NORMALLY OPEN ISOLATION VALVE TO OPEN DURING PRELAUNCH OR POWERED FLIGHT. ESCAPING H2 WILL CREATE A FIRE/EXPLOSION HAZARD. LOSS OF FUEL COULD ALSO CAUSE EARLY ENGINE SHUTDOWN AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6108 ABORT: 2/1R

ITEM: ISOLATION DIODE (3)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) MID PCA -1, -3
- 7) ISOLATION DIODES (3)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 1 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: JANTX1N1204RA: 40V76A25ACR11, 4076A27A4CR1, CR2

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND FAILURE MAY CAUSE NORMALLY OPEN ISOLATION VALVE TO OPEN DURING PRELAUNCH OR POWERED FLIGHT. ESCAPING H2 WILL CREATE A FIRE/EXPLOSION HAZARD. LOSS OF FUEL COULD ALSO CAUSE EARLY ENGINE SHUTDOWN AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6109 ABORT: 3/1R

ITEM: MDM (FA1, FA3, FA4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 DUMP SYSTEM
- 3) LH2 FEEDLINE RELIEF ISOLATION VALVE (PV8)
- 4) LH2 FEEDLINE RELIEF ISOLATION VALVE CLOSING SOLENOID (LV25)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AV BAY 4, 6
- 7) MDM FA1, FA3, FA4
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 54V75A13, 54V75A15, 54V72A9

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY MAY CAUSE NORMALLY OPEN ISOLATION VALVE TO OPEN DURING PRELAUNCH OR POWERED FLIGHT. ESCAPING H2 WILL CREATE A FIRE/EXPLOSION HAZARD. LOSS OF FUEL COULD ALSO CAUSE EARLY ENGINE SHUTDOWN AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 14.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6121 ABORT: 1/1R

ITEM: HYBRID DRIVER CONTROLLER  
FAILURE MODE: FAIL ON, SHORTED, INADVERTENT OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION FLOW CONTROL VALVE (LV56, LV57, LV58)
- 4) PANEL R2 (SWITCH LOCATION)
- 5) AVBAY 4, 5, 6
- 6) AFT LCA-1, -2, -3
- 7) HYBRID DRIVER CONTROLLERS (6)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 2/1R          | RTLS: | 1/1R     |
| LIFTOFF:        | 2/1R          | TAL:  | 1/1R     |
| ONORBIT:        | 3/3           | AOA:  | 1/1R     |
| DEORBIT:        | 3/3           | ATO:  | 1/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 54V76A121, 55V76A122, 56V76A123

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND ASSOCIATED FAILURE WILL CAUSE TWO FLOW CONTROL VALVES TO BE OPEN UNNECESSARILY. THIS WILL RESULT IN OVERPRESSURIZATION OF LH2 TANK. RELIEVING OF EXCESS GH2 PRESSURE AT LOW ALTITUDE WILL CREATE A FIRE/EXPLOSION HAZARD. FIRST FAILURE DURING ABORTS (ONE ENGINE OUT) CAN CREATE SUCH A HAZARD.

REFERENCES: RI DRAWING VS72-941102, SHT 26.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6122 ABORT: 1/1R

ITEM: HYBRID DRIVER CONTROLLER  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION FLOW CONTROL VALVE (LV56, LV57, LV58)
- 4) PANEL R2 (SWITCH LOCATION)
- 5) AVBAY 4, 5, 6
- 6) AFT LCA-1, -2, -3
- 7) HYBRID DRIVER CONTROLLERS (6)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 1/1R     |
| ONORBIT:        | 3/3      | AOA:  | 1/1R     |
| DEORBIT:        | 3/3      | ATO:  | 1/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 54V76A121, 55V76A122, 56V76A123

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

SECOND ASSOCIATED FAILURE WILL PREVENT TWO FLOW CONTROL VALVES FROM OPENING WHEN THEY SHOULD. THIS WILL RESULT IN LOW ULLAGE PRESSURE AND POSSIBLE LOSS OF VEHICLE. FIRST FAILURE DURING ABORTS (ONE ENGINE ALREADY OUT) CAN CAUSE LOW ULLAGE PRESSURE AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 26.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 6123 ABORT: 1/1R

ITEM: FUSE (3)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 TANK PRESSURIZATION SYSTEM
- 3) GH2 PRESSURIZATION FLOW CONTROL VALVE (LV56, LV57, LV58)
- 4) PANEL R2 (SWITCH LOCATION)
- 5) FUSE, 1A (F18, F19, F20)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 1/1R     |
| ONORBIT:        | 3/3      | AOA:  | 1/1R     |
| DEORBIT:        | 3/3      | ATO:  | 1/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK

EFFECTS/RATIONALE:

SECOND ASSOCIATED FAILURE WILL PREVENT TWO FLOW CONTROL VALVES FROM OPENING WHEN THEY SHOULD. THIS WILL RESULT IN LOW ULLAGE PRESSURE AND POSSIBLE LOSS OF VEHICLE. FIRST FAILURE DURING ABORTS (ONE ENGINE ALREADY OUT) CAN CAUSE LOW ULLAGE PRESSURE AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT 26.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6131 ABORT: 3/3

ITEM: GH2 PRESSURIZATION LINE VENT VALVE SOLENOID  
ENERGIZING CIRCUITRY  
FAILURE MODE: ERRONEOUS OUTPUT, LOSS OF OR PARTIAL OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) GH2 PRESSURIZATION LINE VENT VALVE (LV52)
- 3) AV BAYS 4,5,6
- 4) GH2 PRESSURIZATION LINE VENT VALVE ENERGIZING CIRCUITRY
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AFT COMPARTMENT  
PART NUMBER: SEE REFERENCES

CAUSES: CIRCUIT COMPONENT FAILURE

EFFECTS/RATIONALE:  
FAILURE DOES NOT CREATE A HAZARDOUS CONDITION FOR CREW OR  
VEHICLE.

REFERENCES: VS72-941102, SHT 16.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/21/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 1/1  
MDAC ID: 6141 ABORT: 1/1

ITEM: MDM (FA4)  
FAILURE MODE: FAILS OPEN, INADVERTENT OPERATION, FAILS ON

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION DISCONNECT VALVE (PD3)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV50, LV51)
- 5) AV BAY 6
- 6) MDM FA4
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: 56V72A10

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE WILL PREVENT CLOSURE OF RECIRCULATION DISCONNECT VALVE. IF THE VALVE IS NOT CLOSED AT ET SEP, THE THRUST OF ESCAPING LH2 CAN CAUSE RECONTACT WITH THE ET AND LOSS OF THE ORBITER. IF RECONTACT DAMAGE IS LIMITED TO TPS TILES, THE ORBITER CAN BE DESTROYED DURING ENTRY. AERO FORCES WILL PREVENT RECONTACT FOLLOWING AN RTLS ET SEP.

REFERENCES: VS72-941102, SHT 16.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/21/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 1/1  
MDAC ID: 6142 ABORT: 1/1

ITEM: HYBRID DRIVER CONTROLLER (2)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION DISCONNECT VALVE (PD3)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV50, LV51)
- 5) AV BAY 6
- 6) AFT LCA-3
- 7) HYBRID DRIVER CONTROLLERS (2)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 1/1      | TAL:  | 1/1      |
| ONORBIT:        | 3/3      | AOA:  | 1/1      |
| DEORBIT:        | 1/1      | ATO:  | 1/1      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC471-0263-0002: 56V76A123AR

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE WILL PREVENT CLOSURE OF RECIRCULATION DISCONNECT VALVE. IF THE VALVE IS NOT CLOSED AT ET SEP, THE THRUST OF ESCAPING LH2 CAN CAUSE RECONTACT WITH THE ET AND LOSS OF THE ORBITER. IF RECONTACT DAMAGE IS LIMITED TO TPS TILES, THE ORBITER CAN BE DESTROYED DURING ENTRY.

AERO FORCES WILL PREVENT RECONTACT FOLLOWING AN RTLS ET SEP.

REFERENCES: VS72-941102, SHT 16.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/21/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6143 ABORT: 3/3

ITEM: CURRENT LIMITING RESISTOR, 5.1K (4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION DISCONNECT VALVE (PD3)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV50, LV51)
- 5) AV BAY 6
- 6) AFT LCA-3
- 7) CURRENT LIMITING RESISTORS (4)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: RLR07C512GR: 56V76A123R

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
NO HAZARDOUS EFFECT ON CREW OR VEHICLE.

REFERENCES: VS72-941102, SHT 16.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/21/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6144 ABORT: 3/3

ITEM: ISOLATION DIODES (4)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION DISCONNECT VALVE (PD3)
- 4) OPEN/CLOSE CONTROL SOLENOIDS (LV50, LV51)
- 5) AV BAY 6
- 6) AFT LCA-3
- 7) ISOLATION DIODES (4)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: JANTX1N5551: 56V76A123CR

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
NO HAZARDOUS EFFECT ON CREW OR VEHICLE.

REFERENCES: VS72-941102, SHT 16.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/21/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6145 ABORT: 3/3

ITEM: POSITION INDICATOR SWITCH  
FAILURE MODE: FAIL OPEN, FAIL SHORTED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 RECIRCULATION SYSTEM
- 3) LH2 RECIRCULATION DISCONNECT VALVE (PD3)
- 4) POSITION INDICATOR SWITCH
- 5)
- 6)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: 50V41PD3

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
NO HAZARDOUS EFFECT ON CREW OR VEHICLE.

REFERENCES: VS72-941102, SHT 16.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/28/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 6151 ABORT: 3/3

ITEM: LH2 PREVALVE POWER & CONTROL CIRCUITS  
FAILURE MODE: FAIL OPEN, FAIL SHORTED, INADVERTENT OUTPUT,  
ERRONEOUS OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AVBAY 4,5,6
- 7) AFT PCA -4,-5,-6
- 8) AFT LCA -1,-2,-3
- 9) PREVALVE POWER & CONTROL CIRCUITS

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

ALL CIRCUIT COMPONENTS ARE CRITICALITY 3/3 WITH THE EXCEPTION OF 9 FUSES, 3 SWITCHES, 12 RPCS, 84 DIODES AND 4 MDMS. THESE ITEMS ARE ASSESSED UNDER MDAC ID 6152 THROUGH 6160.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10. MAJOR HARDWARE ASSOCIATED WITH THIS CIRCUITRY IS THE LH2 PREVALVES (3), MC284-0396-0006, AND THEIR ASSOCIATED OPENING AND CLOSING SOLENOIDS (6), MC284-0404-0021.

C-8

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6152 ABORT: 3/1R

ITEM: FUSE  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) 1A FUSES (9)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/1R          | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: ME451-0018-0100: 32V73A4F25 THRU F33

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
LOSS OF ALL REDUNDANCY MAY CAUSE PREVALVE TO CLOSE DURING POWERED FLIGHT, RESULTING IN LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6153 ABORT: 3/1R

ITEM: TOGGLE SWITCH  
FAILURE MODE: FAIL OPEN, FAIL CLOSED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) TOGGLE SWITCH (3)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FWD FLIGHT DECK, PANEL R4  
PART NUMBER: ME452-0102-7354: 32V73A4514, 515, 516

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY COULD CAUSE PREVALVE TO CLOSE DURING ENGINE BURN, RESULTING IN ENGINE EXPLOSION AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6154 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER, 3A  
FAILURE MODE: FAIL OPEN, FAIL SHORTED, INADVERTENT OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AVBAY 4,5,6
- 7) AFT PCA -4,-5,-6
- 8) REMOTE POWER CONTROLLERS, 3A (12)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC450-0017-1030: 54V76A134RPC35,36,39,40,  
55V76A135RPC35,36,39,40, 56V76A136RPC35,36,39,40

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY COULD CAUSE PREVALVE TO CLOSE DURING ENGINE BURN, RESULTING IN ENGINE EXPLOSION AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6155 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER, TYPE I (6)  
FAILURE MODE: FAIL OPEN, FAIL SHORTED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AVBAY 4,5,6
- 7) AFT LCA -1,-2,-3
- 8) HYBRID DRIVER CONTROLLER, TYPE I (6)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC477-0261-0002: 54V76A121AR(2), 55V76A122AR(2), 55V76A123AR(2)

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY COULD CAUSE PREVALVE TO CLOSE DURING ENGINE BURN, RESULTING IN ENGINE EXPLOSION AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6156 ABORT: 3/1R

ITEM: HYBRID DRIVER CONTROLLER, TYPE III (12)  
FAILURE MODE: FAIL OPEN, FAIL SHORTED

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AVBAY 4,5,6
- 7) AFT LCA -1,-2,-3
- 8) HYBRID DRIVER CONTROLLERS, TYPE III (12)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: MC477-0261-0002: 54V76A121AR(4), 55V76A122AR(4), 55V76A123AR(4)

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY COULD CAUSE PREVALVE TO CLOSE DURING ENGINE BURN, RESULTING IN ENGINE EXPLOSION AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6157 ABORT: 3/1R

ITEM: ISOLATION DIODES, 12A (18)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AVBAY 4,5,6
- 7) AFT PCA -4,-5,-6
- 8) ISOLATION DIODES, 12A (18)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES

PART NUMBER: JANTX1N1204RA: 54V76A134A4CR25 THRU 28,31,32,  
55V76A135A4CR25 THRU 28,31,32, 56V76A136A4CR25 THRU 28,31,32

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY COULD CAUSE PREVALVE TO CLOSE DURING  
ENGINE BURN, RESULTING IN ENGINE EXPLOSION AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6158 ABORT: 3/1R

ITEM: ISOLATION DIODES, 4.2A (3)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AVBAY 4,5,6
- 7) AFT PCA -4,-5,-6
- 8) AFT LCA -1,-2,-3
- 9) ISOLATION DIODES, 4.2A (30)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES

PART NUMBER: JANTXV1N4246: 54V76A134A1CR11,12,15,16,18,  
54V76A134A2CR11,12,15,16,18, 55V76A135A1CR11,12,15,16,18,  
55V76A135A2CR11,12,15,16,18, 56V76A136A1CR11,12,15,16,18,  
56V76A136A2CR11,12,15,16,18

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY COULD CAUSE PREVALVE TO CLOSE DURING  
ENGINE BURN, RESULTING IN ENGINE EXPLOSION AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 6159 ABORT: 3/1R

ITEM: ISOLATION DIODE (36)  
FAILURE MODE: FAIL OPEN

LEAD ANALYST: MCNICOLL/EMMONS SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AVBAY 4,5,6
- 7) AFT PCA -4,-5,-6
- 8) AFT LCA -1,-2,-3
- 9) ISOLATION DIODES (36)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/1R     | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 54V76A121AXXXXX(12), 55V76A122AXXXXX(12),  
56V76A123AXXXXX(12)

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF ALL REDUNDANCY COULD CAUSE PREVALVE TO CLOSE DURING  
ENGINE BURN, RESULTING IN ENGINE EXPLOSION AND LOSS OF VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHT. 9 AND 10.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 1/29/87  | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPDC/MPS | FLIGHT:             | 2/1R     |
| MDAC ID:   | 6160     | ABORT:              | 2/1R     |

ITEM: MODULATOR DEMODULATOR (4)  
FAILURE MODE: FAIL OPEN, FAIL SHORTED, ERRONEOUS OUTPUT

LEAD ANALYST: MCNICOLL/EMMONS                      SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) LH2 PROPELLANT FEED SYSTEM
- 3) LH2 PREVALVES (PV4, PV5, PV6)
- 4) PREVALVE CONTROL SOLENOIDS (LV18, LV19, LV20, LV21, LV22, LV23)
- 5) PANEL R4 (SWITCH LOCATION)
- 6) AVBAY 4,5,6
- 7) MDM FA1, FA2, FA3, FA4
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 2/1R     | RTLS: | 2/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS:    A [ 2 ]                      B [ F ]                      C [ P ]

LOCATION:                      SEE REFERENCES  
PART NUMBER:    54V72A7, 55V72A8, 56V72A9, 56V72A10

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:  
SECOND FAILURE COULD CAUSE PREVALVE TO CLOSE DURING ENGINE BURN, RESULTING IN ENGINE EXPLOSION AND LOSS OF VEHICLE.

REFERENCES:    RI DRAWING VS72-941102, SHT. 9 AND 10.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7100 ABORT: 3/3

ITEM: VALVE POWER & CONTROL CIRCUITS FOR HELIUM  
ISOLATION VALVES  
FAILURE MODE: OPEN, SHORTED, INADVERTENT OPERATION

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM ISOLATION VALVES, REG PNL A,B (LV 1,2; 3,4; 5,6)
- 4) PANEL R2 (SWITCH LOCATION)
- 5) AVBAY 4,5,6
- 6) AFT LCA 1,2,3
- 7) AFT PCA 4,5,6
- 8) VALVE POWER & CONTROL CIRCUITS
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCED ON THIS SHEET WILL NOT EFFECT CREW, VEHICLE, OR MISSION. ALL ARE CRITICALITY 3. ELECTRICAL ITEMS INCLUDED ARE 39 RESISTORS, 18 DIODES, AND 6 REMOTE POWER CONTROLLERS. ELECTRICAL ITEMS WITH A CRITICALITY OTHER THAN 3 ARE LISTED SEPARATELY UNDER MDAC ID 7110 THROUGH 7180.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19. MAJOR HARDWARE ASSOCIATED WITH THIS CIRCUITRY ARE THE SSME HELIUM ISOLATION VALVES(6), ME284-0403-0017(0007).



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7110 ABORT: 3/1R

ITEM: FUSE, LAMP (9)  
FAILURE MODE: OPEN, FAILS TO CONDUCT

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM SUPPLY ISOL VALVE A,B (LV 1,2; 3,4; 5,6)
- 4) AV BAY 4,5,6
- 5) ALCA 1,2,3
- 6) APCA 4,5,6
- 7) PANEL R2
- 8) FUSE (F 76,61,62; 27,25,26; 59,57,58)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME451-0010-0100

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK,  
CONTAMINATION

EFFECTS/RATIONALE:

FAILURE TO OPEN OR REMAIN OPEN IS EASILY RECOGNIZABLE. SHOULD THE VALVE FAIL TO REMAIN OPEN DURING ENGINE OPERATION A REDUNDANT SUPPLY ROUTE IS AVAILABLE, BUT ONLY ONE FAILURE AWAY FROM LOSS OF AN ENGINE FROM LOSS OF HELIUM (MISSION FAILURE). DURING ABORTS, SHOULD THIS SCENARIO OCCUR, LOSS OF THE 2ND ENGINE (SEE MPS GRs) RESULTS IN LOSS OF VEHICLE AND CREW.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7120 ABORT: 3/1R

ITEM: TOGGLE SWITCH, 1P3T (3)  
FAILURE MODE: OPEN, FAILS TO TRANSFER, SHORTED

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM SUPPLY ISOLATION 'A' VALVES (LV 1,3,5)
- 4) AV BAY 4,5,6
- 5) ALCA 1,2,3
- 6) PANEL R2
- 7) TOGGLE SWITCH (S 55,56,57)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7103

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION, PIECE PART  
STRUCTURAL FAILURE.

EFFECTS/RATIONALE:

FAILURE TO OPEN OR REMAIN OPEN IS EASILY RECOGNIZABLE. SHOULD  
THE VALVE FAIL TO REMAIN OPEN DURING ENGINE OPERATION A REDUNDANT  
SUPPLY ROUTE IS AVAILABLE, BUT ONLY ONE FAILURE AWAY FROM LOSS OF  
AN ENGINE FROM LOSS OF HELIUM (MISSION FAILURE). DURING  
ABORTS, SHOULD THIS SCENARIO OCCUR, LOSS OF THE 2ND ENGINE (SEE  
MPS GRs) RESULTS IN LOSS OF VEHICLE AND CREW.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7130 ABORT: 3/1R

ITEM: TOGGLE SWITCH, 2P3T (3)  
FAILURE MODE: OPEN, FAILS TO TRANSFER, SHORTED

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM SUPPLY ISOLATION 'B' VALVES (LV 2,4,6)
- 4) AV BAY 4,5,6
- 5) ALCA 1,2,3
- 6) APCA 4,5,6
- 7) PANEL R2
- 8) TOGGLE SWITCH (S 12,13,14)
- 9)

|                 | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: UNKNOWN

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION, PIECE PART  
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE TO OPEN OR REMAIN OPEN IS EASILY RECOGNIZABLE. SHOULD  
THE VALVE FAIL TO REMAIN OPEN DURING ENGINE OPERATION A REDUNDANT  
SUPPLY ROUTE IS AVAILABLE, BUT ONLY ONE FAILURE AWAY FROM LOSS OF  
AN ENGINE FROM LOSS OF HELIUM (MISSION FAILURE). DURING  
ABORTS, SHOULD THIS SCENARIO OCCUR, LOSS OF THE 2ND ENGINE (SEE  
MPS GRs) RESULTS IN LOSS OF VEHICLE AND CREW.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7140 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE III (3)  
FAILURE MODE: OPEN, CLOSE, INADVERTENT OPERATION

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM SUPPLY ISOLATION VALVES 'A' (LV 1,3,5)
- 4) AV BAY 4,5,6
- 5) ALCA 1,2,3
- 6) HYBRID DRIVER (AR #s UNKNOWN)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 1,2,3  
PART NUMBER: ME477-0263-0002

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK,  
CONTAMINATION

EFFECTS/RATIONALE:

FAILURE TO OPEN OR REMAIN OPEN IS EASILY RECOGNIZABLE. SHOULD THE VALVE FAIL TO REMAIN OPEN DURING ENGINE OPERATION A REDUNDANT SUPPLY ROUTE IS AVAILABLE, BUT ONLY ONE FAILURE AWAY FROM LOSS OF AN ENGINE FROM LOSS OF HELIUM (MISSION FAILURE). DURING ABORTS, SHOULD THIS SCENARIO OCCUR, LOSS OF THE 2ND ENGINE (SEE MPS GRs) RESULTS IN LOSS OF VEHICLE AND CREW.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/18/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7150 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE I (6)  
FAILURE MODE: OPEN, CLOSE, INADVERTENT OPERATION

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM SUPPLY ISOLATION VALVES 'B' (LV 2,4,6)
- 4) AV BAY 4,5,6
- 5) ALCA 2,3,1
- 6) APCA 6,4,5
- 7) HYBRID DRIVER (AR #s UNKNOWN)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: AFT LCA 2,3,1  
PART NUMBER: ME477-0261-0002

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK,  
CONTAMINATION

EFFECTS/RATIONALE:

FAILURE TO OPEN OR REMAIN OPEN IS EASILY RECOGNIZABLE. SHOULD THE VALVE FAIL TO REMAIN OPEN DURING ENGINE OPERATION A REDUNDANT SUPPLY ROUTE IS AVAILABLE, BUT ONLY ONE FAILURE AWAY FROM LOSS OF AN ENGINE FROM LOSS OF HELIUM (MISSION FAILURE). DURING ABORTS, SHOULD THIS SCENARIO OCCUR, LOSS OF THE 2ND ENGINE (SEE MPS GRs) RESULTS IN LOSS OF VEHICLE AND CREW.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7160 ABORT: 3/1R

ITEM: ISOLATION DIODES (6)  
FAILURE MODE: SHORTED, OPEN

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM SUPPLY ISOLATION VALVES 'B' (LV 2,4,6)
- 4) AV BAY 4,5,6
- 5) APCA 5,6,4
- 6) ISOLATION DIODES (A4CR23, A4CR24)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT PCA 5/6; 6/4; 4/5  
PART NUMBER: JANTX1N1204RA

CAUSES: VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE TO OPEN OR REMAIN OPEN IS EASILY RECOGNIZABLE. SHOULD THE VALVE FAIL TO REMAIN OPEN DURING ENGINE OPERATION A REDUNDANT SUPPLY ROUTE IS AVAILABLE, BUT ONLY ONE FAILURE AWAY FROM LOSS OF AN ENGINE FROM LOSS OF HELIUM (MISSION FAILURE). DURING ABORTS, SHOULD THIS SCENARIO OCCUR, LOSS OF THE 2ND ENGINE (SEE MPS GRs) RESULTS IN LOSS OF VEHICLE AND CREW.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/05/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7170 ABORT: 3/1R

ITEM: ISOLATION DIODES (9)  
FAILURE MODE: FAILS OPEN

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM SUPPLY ISOLATION VALVES (LV1,2;3,4;5,6)
- 4) AV BAY 4,5,6
- 5) APCA 4,5,6
- 6) ISOLATION DIODES (A3CR3, A1CR4, -3 EACH)
- 7) ALCA 1,2,3
- 8) ISOLATION DIODES (# UNKNOWN-3)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT PCA 4,5,6; AFT LCA 1,2,3  
PART NUMBER: JANTXV1N4246

CAUSES: VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THESE DIODES ARE INLINE DEVICES TO THE SWITCHES CONTROLLING EACH OF THE ISOLATION VALVES. LOSS OF ALL REDUNDANCY DURING POWERED FLIGHT MAY RESULT IN LOSS OF MISSION AND IN THE ABORT CASES MAY RESULT IN LOSS OF VEHICLE OR CREW DUE TO LOSS OF HELIUM PURGE TO AN ENGINE.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/05/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7180 ABORT: 3/1R

ITEM: ISOLATION DIODES (3)  
FAILURE MODE: FAILS OPEN

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM SUPPLY ISOLATION VALVES, REG PNL A (LV1,3,5)
- 4) AV BAY
- 5) ALCA 1,2,3
- 6) ISOLATION DIODES (AR # UNKNOWN)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AFT LCAs 1,2,3  
PART NUMBER: JANTXY1N4246

CAUSES: VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THESE DIODES ARE IN SERIES WITH THE OUTPUT OF MDM CHANNELS SUPPLYING REDUNDANT SIGNALS TO THE HELIUM ISOL VALVES 'A'. COMMANDS THRU THE MDM'S ARE TERMINATED AT MECO. LOSS OF ALL REDUNDANCY DURING POWERED FLIGHT MAY RESULT IN LOSS OF MISSION OR POSSIBLE LOSS OF VEHICLE OR CREW DURING ABORT CASES.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7190 ABORT: 3/3

ITEM: MDM, FLIGHT AFT 1,2,3,4  
FAILURE MODE: FAILS OPEN, ERRONEOUS OUTPUT (OFF)

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM ISOLATION VALVES, REG PNL A,B (LV1,2;3,4;5,6)
- 4) AV BAY 4,5,6
- 5) MDM FA 1,2,3,4
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/2R     | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AVIONICS BAYS 4,5,6  
PART NUMBER: MC615-0004-6110,5110

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

DURING POWERED FLIGHT THE ISOL VALVES ARE COMMANDED ON THRU THE MDM AS WELL AS FROM PANEL R2. FAILURE TO OUTPUT HAS NO EFFECT UNLESS ACCOMPANIED BY OTHER FAILURES.

REFERENCES: RI DWG VS72-941102 SHT. 17,18,19 AND BOOSTER SYSTEMS BRIEFS, JSC 19401, 1-OCT-1984.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7191 ABORT: 3/3

ITEM: MDM, FLIGHT AFT 1,2,3,4  
FAILURE MODE: FAILS SHORTED, ERRONEOUS OUTPUT (ON)

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM ISOLATION VALVES, REG PNL A,B (LV1,2;3,4;5,6)
- 4) AV BAY 4,5,6
- 5) MDM FA 1,2,3,4
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AVIONICS BAYS 4,5,6  
PART NUMBER: MC615-0004-6110,5110

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

DURING POWERED FLIGHT THE ISOL VALVES ARE COMMANDED ON THRU THE MDM'S AS WELL AS FROM PANEL R2. FAILING ON DURING THIS PERIOD OR AFTER MECO HAS NO EFFECT. FAILING ON DURING RTLS OR TAL ABORTS HAS NO EFFECT SINCE THE 'B' VALVE OF THE LEFT ENGINE (LV4) IS REQUIRED TO BE OPEN FOR PURGE OF THE AFT COMPARTMENT WHILE ENGINE PNEUMATIC PACKAGE PRESSURE ACTUATED VALVES PREVENT OVERBOARD LOSS OF HELIUM THRU THE ENGINES. FAILING ON HAS NO EFFECT DURING NORMAL ENTRIES AS ISOL VALVES (LV 1,2,3,5,6) ARE PLACED IN THE CLOSED POSITION (CREW) BLOCKING ERRONEOUS MDM OUTPUTS.

REFERENCES: RI DWG VS72-941102 SHT. 17,18,19 AND BOOSTER SYSTEMS BRIEFS, JSC 19401, 1-OCT-1984.

**INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

|            |          |                     |          |
|------------|----------|---------------------|----------|
| DATE:      | 12/17/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: | EPDC/MPS | FLIGHT:             | 3/3      |
| MDAC ID:   | 7200     | ABORT:              | 3/3      |

ITEM: VALVE POWER AND CONTROL CIRCUITS FOR HELIUM INTERCONNECT INLET VALVES  
FAILURE MODE: OPEN, SHORTED, INADVERTENT OPERATION

LEAD ANALYST: EMMONS/MCNEELY                      SUBSYS LEAD: A.J.MARINO

**BREAKDOWN HIERARCHY:**

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) PANEL R2 (SWITCH LOCATION)
- 5) AV BAY 4,5,6
- 6) MPCA 1,2,3
- 7) VALVE POWER AND CONTROL CIRCUITS
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       | HDW/FUNC |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT |          |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS:    A [NA ]                      B [NA ]                      C [NA ]

LOCATION:                      SEE REFERENCE  
PART NUMBER:                SEE REFERENCE

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK, THERMAL SHOCK

EFFECTS/RATIONALE:  
FAILURE OF ITEMS REFERENCED ON THIS SHEET WILL NOT EFFECT CREW, VEHICLE OR MISSION. ALL ARE CRITICALITY 3. ELECTRICAL ITEMS INCLUDED WITHIN THIS SHEET ARE 33 RESISTORS, 12 ISOLATION DIODES, 6 REMOTE POWER CONTROLLERS AND 9 HYBRID DRIVERS. FAILURE MODES FOR COMPONENTS WITH A CRITICALITY OTHER THAN 3 ARE LISTED SEPARATELY UNDER MDAC ID 7210 THROUGH 7260.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19. MAJOR HARDWARE ASSOCIATED WITH THIS CIRCUITRY ARE THE SSME HARDWARE HELIUM INTERCONNECT INLET VALVES (6). ME284-0403-0017(0007).

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7210 ABORT: 3/1R

ITEM: FUSE, LAMP (6)  
FAILURE MODE: OPEN, FAILS TO CONDUCT

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) MPCA 1,2,3
- 6) FUSE (F 73,74,75,28,29,30)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME451-0018-0100

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK,  
CONTAMINATION

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT UNLESS IT BECOMES NECESSARY TO SUPPLY PNEUMATIC HELIUM TO AN ENGINE HELIUM PURGE SYSTEM. THE LEFT ENGINE INTERCONNECT INLET VALVE (LV61) IS ALSO CRITICAL TO AFT COMPARTMENT PURGES DURING RTLS AND TAL ABORT LANDING PHASES.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/2R  
MDAC ID: 7220 ABORT: 1/1R

ITEM: TOGGLE SWITCH, 2P3T (3)  
FAILURE MODE: OPEN, FAILS TO TRANSFER, SHORTED

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) ALCA 1,2,3
- 6) MPCA 1,2,3
- 7) PANEL R2
- 8) TOGGLE SWITCH (S 9,10,11)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1R     |
| LIFTOFF:        | 2/2R     | TAL:  | 1/1R     |
| ONORBIT:        | 3/3      | AOA:  | 1/1R     |
| DEORBIT:        | 3/3      | ATO:  | 1/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: FLIGHT STATION  
PART NUMBER: ME452-0102-7203

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION, PIECE PART  
STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT UNLESS IT BECOMES NECESSARY TO SUPPLY  
PNEUMATIC HELIUM TO AN ENGINE HELIUM PURGE SYSTEM. THE LEFT  
ENGINE INTERCONNECT INLET VALVE (LV61) IS ALSO CRITICAL TO AFT  
COMPARTMENT PURGES DURING RTLS AND TAL ABORT LANDING PHASES.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7230 ABORT: 2/1R

ITEM: ISOLATION DIODES (6)  
FAILURE MODE: OPEN

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) MPCA 1,2,3
- 6) ISOLATION DIODES (A2CR12,15; 14,A4CR9; 10,5)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 2/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 2/1R     |
| ONORBIT:        | 3/3      | AOA:  | 2/1R     |
| DEORBIT:        | 3/3      | ATO:  | 2/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: MID PCA 1/2; 2/3; 3/1  
PART NUMBER: JANTX1N1188RA (35A, A2CR12); JANTX1N1204RA (12A,  
ALL OTHERS)

CAUSES: VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT UNLESS IT BECOMES NECESSARY TO SUPPLY PNEUMATIC HELIUM TO AN ENGINE HELIUM PURGE SYSTEM. THE LEFT ENGINE INTERCONNECT INLET VALVE (LV61) IS ALSO CRITICAL TO AFT COMPARTMENT PURGES DURING RTLS AND TAL ABORT LANDING PHASES.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 2/1R  
MDAC ID: 7231 ABORT: 1/1R

ITEM: ISOLATION DIODES (6)  
FAILURE MODE: SHORTED

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) MPCA 1,2,3
- 6) ISOLATION DIODES (A2CR12,15; 14,A4CR9; 10,5)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 1/1R     |
| LIFTOFF:        | 2/1R     | TAL:  | 1/1R     |
| ONORBIT:        | 3/3      | AOA:  | 1/1R     |
| DEORBIT:        | 3/3      | ATO:  | 1/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: MID PCA 1/2; 2/3; 3/1  
PART NUMBER:

CAUSES: VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT UNLESS IT BECOMES NECESSARY TO SUPPLY PNEUMATIC HELIUM TO AN ENGINE HELIUM PURGE SYSTEM. THE LEFT ENGINE INTERCONNECT INLET VALVE (LV61) IS ALSO CRITICAL TO AFT COMPARTMENT PURGES DURING RTLS AND TAL ABORT LANDING PHASES. AN INCREASE IN MAIN BUS VOLTAGE, IN THE REDUNDANT CIRCUIT, ABOVE THE FAILED CIRCUIT BUS VOLTAGE WILL RESULT IN REVERSE CURRENT THRU THE SHORTED DIODE AND RPC. THIS WILL CAUSE THE REDUNDANT RPC TO TURN OFF DUE TO CURRENT OVERLOAD. AS A RESULT, THE HIGHER CRITICALITY IS ASSIGNED TO ABORT CASES.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7240 ABORT: 3/1R

ITEM: REMOTE POWER CONTROLLER (6)  
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) MPCA 1,2,3
- 6) RPCA (39,37; 38,33; 38,34)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: MID PCA 1/2; 2/3; 1/3  
PART NUMBER: MC450-0017-1050

CAUSES: VIBRATION, THERMAL SHOCK, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT UNLESS IT BECOMES NECESSARY TO SUPPLY PNEUMATIC HELIUM TO AN ENGINE HELIUM PURGE SYSTEM. THE LEFT ENGINE INTERCONNECT INLET VALVE (LV61) IS ALSO CRITICAL TO AFT COMPARTMENT PURGES DURING RTLS AND TAL ABORT LANDING PHASES.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/22/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7250 ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE I (6)  
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) MPCA 1,2,3
- 6) HYBRID DRIVERS (AR 51,41; 42,31; 32,50)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: MID PCA 1/2; 2/3; 3/1  
PART NUMBER: ME477-0261-0002

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK,  
CONTAMINATION

EFFECTS/RATIONALE:

FAILURE HAS NO EFFECT UNLESS IT BECOMES NECESSARY TO SUPPLY PNEUMATIC HELIUM TO AN ENGINE HELIUM PURGE SYSTEM. THE LEFT ENGINE INTERCONNECT INLET VALVE (LV61) IS ALSO CRITICAL TO AFT COMPARTMENT PURGES DURING RTLS AND TAL ABORT LANDING PHASES.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/05/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/2R  
MDAC ID: 7260 ABORT: 3/1R

ITEM: ISOLATION DIODES (12)  
FAILURE MODE: FAILS OPEN

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) MPCA 1,2,3
- 6) ISOLATION DIODES (A6CR3,4,5,6 - 1 EACH, A5CR3,4,5,6 - 2 EACH)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/2R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: MID PCA 1,2,3  
PART NUMBER: JANTXV1N4246

CAUSES: VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

THESE DIODES ARE INSTALLED IN SERIES WITH THE OUTPUT OF MDM CHANNELS SUPPLYING REDUNDANT SIGNALS TO THE INTERCONNECT INLET VALVES. COMMANDS THRU THE MDM'S ARE TERMINATED AT MECO. LOSS OF ALL REDUNDANCY DURING POWERED FLIGHT MAY RESULT IN LOSS OF MISSION OR LOSS OF VEHICLE OR CREW DURING ABORT CASES.

REFERENCES: RI DRAWING VS72-941102 SHT. 17, 18, 19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7270 ABORT: 3/1R

ITEM: MDM, FLIGHT AFT 1,2,3  
FAILURE MODE: FAILS OPEN, ERRONEOUS OUTPUT (OFF)

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) MDM FA 1,2,4
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ F ] C [ P ]

LOCATION: AVIONICS BAY 4,5,6  
PART NUMBER: MC615-0004-6110,5110

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE TO OUTPUT HAS NO EFFECT DURING POWERED FLIGHT AS THE INLET VALVES ASSOCIATED WITH THESE MDM'S ARE NOT OPENED DURING THIS PERIOD. FAILURE TO OUTPUT DURING AN RTLS OR TAL ABORTS MAY SEVERELY LIMIT THE QUANTITY OF HELIUM AVAILABLE FOR THE AFT COMPARTMENT PURGE. THIS PURGE HAS BEEN IDENTIFIED AS MANDATORY TO PREVENT HYDROGEN ACCUMULATION AND POSSIBLE EXPLOSION DURING THE LANDING PHASE OF THESE ABORTS. NOTE: THE CRITICALITY APPLIES TO THE MDM'S (FA 2,3,) SUPPORTING THE LEFT ENGINE INTERCONNECT INLET VALVE ONLY (LV61). ALL OTHERS ARE CRIT 3.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/29/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7271 ABORT: 3/3

ITEM: MDM, FLIGHT AFT 1,2,3  
FAILURE MODE: FAILS SHORTED, ERRONEOUS OUTPUT (ON)

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT INLET VALVES (LV 59,61,63)
- 4) AV BAY 4,5,6
- 5) MDM FA 1,2,4
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: AVIONICS BAY 4,5,6  
PART NUMBER: MC615-0004-6110,5110

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF THE MDM IN THIS MODE HAS NO EFFECT ON LOSS OF HELIUM FROM THE SYSTEM. HOWEVER, UNEXPECTED PRESSURE VARIATIONS MAY OCCUR ACROSS THE SYSTEM.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/17/86 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7300 ABORT: 3/3

ITEM: VALVE POWER AND CONTROL CIRCUITS FOR HELIUM  
INTERCONNECT OUTLET VALVES  
FAILURE MODE: OPEN, SHORTED, INADVERTENT OPERATION

LEAD ANALYST: EMMONS/MCNEELY SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) ENGINE HELIUM SYSTEM
- 3) HELIUM INTERCONNECT OUTLET VALVES (LV 60,62,64)
- 4) AV BAY 4,5,6
- 5) ALCA 1,2,3
- 6) VALVE POWER & CONTROL CIRCUITS
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK,  
CONTAMINATION, PIECE PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCED ON THIS SHEET WILL NOT EFFECT CREW, VEHICLE OR MISSION. ALL ARE CRITICALITY 3. ELECTRICAL ITEMS INCLUDED WITHIN THIS SHEET ARE 12 RESISTORS, 9 ISOLATION DIODES, 3 HYBRID DRIVERS, 3 SWITCHES, AND 3 FUSES. THE 3 FUSES AND 3 SWITCHES ARE COMMON TO THE SINGLE REDUNDANT STRING OF THE INLET VALVES AND ARE ASSESSED A CRITICALITY OF 3 WITH RESPECT TO THE OUTLET VALVES, BUT NOT THE INLET VALVES. SEE MDAC ID 7210 AND 7220.

REFERENCES: RI DRAWING VS72-941102 SHT. 17,18,19. MAJOR HARDWARE ASSOCIATED WITH THIS CIRCUITRY ARE THE SSME HELIUM INTERCONNECT OUTLET VALVES (6). MC284-0403-0011(-0001).

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7400 ABORT: 3/3

ITEM: PNEUMATIC HELIUM SUPPLY ISOLATION VALVE POWER AND  
CONTROL CIRCUIT  
FAILURE MODE: OPEN, SHORTED, INADVERTENT OPERATION

LEAD ANALYST: W.J. MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM ISOLATION VALVE, REG PNL 4 (LV7, LV8)
- 4) PANEL R2 (SWITCH LOCATION)
- 5) AVBAY 4, 5, 6
- 6) AFT LCA 1, 2
- 7) VALVE POWER & CONTROL CIRCUITS
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCED WILL NOT AFFECT CREW, VEHICLE OR MISSION. ELECTRICAL ITEMS INCLUDED ARE 5 RESISTORS AND 14 DIODES.

REFERENCES: RI DRAWING VS72-941102 SHT 20. MAJOR HARDWARE ASSOCIATED WITH THIS CIRCUITRY ARE THE PNEUMATIC HELIUM ISOLATION VALVES (2), MC284-0403-0011.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7420 ABORT: 3/3

ITEM: PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE POWER  
AND CONTROL CIRCUIT  
FAILURE MODE: FAILS OPEN, SHORTED, OR INADVERTENT OPERATION

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE (LV10)
- 4) PANEL R2 (SWITCH LOCATION)
- 5) AV BAY 6
- 6) AFT LCA 3
- 7) PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE CONTROL CIRCUIT
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:  
FAILURE OF ITEMS REFERENCED WILL NOT AFFECT CREW, VEHICLE, OR  
MISSION. ELECTRICAL ITEMS INCLUDED ARE 4 RESISTORS AND 2 DIODES.

REFERENCES: RI DRAWING VS72-941102, SHT 18.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7430 ABORT: 3/1R

ITEM: PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE CONTROL  
CIRCUIT SWITCH  
FAILURE MODE: FAIL TO OPEN, FAIL TO CLOSE, SHORTED TO GROUND

LEAD ANALYST: W.J. MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE (LV10) CONTROL CIRCUIT
- 4) TOGGLE SWITCH (PANEL R2,S54)
- 5)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FWD FLIGHT DECK  
PART NUMBER: ME452-0102-7103

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF SWITCH WILL PREVENT OPERATION OF CROSSOVER VALVE. NO EFFECT ON CREW OR VEHICLE IN NOMINAL FLIGHT BUT LOSS OF CREW OR VEHICLE IN ABORT MODES, DUE TO LOSS OF AFT COMPARTMENT PURGE.

REFERENCES: RI DRAWING VS72-941102 SHT 18.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7440 ABORT: 3/1R

ITEM: PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE CONTROL  
CIRCUIT FUSE  
FAILURE MODE: FAILS OPEN (PREMATURE/ERRONEOUS)

LEAD ANALYST: W.J. MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE (LV10) CONTROL CIRCUIT
- 4) PANEL R2 (SWITCH LOCATION)
- 5) FUSE, 1A (F76)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: FWD FLIGHT DECK  
PART NUMBER: ME451-0018-0100

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF FUSE WILL PREVENT OPERATION OF CROSSOVER VALVE. NO EFFECT ON CREW OR VEHICLE IN NOMINAL FLIGHT BUT LOSS OF LIFE OR VEHICLE IN ABORT MODES, DUE TO LOSS OF AFT COMPARTMENT PURGE.

REFERENCES: RI DRAWING VS72-941102 SHT 18.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7450 ABORT: 3/1R

ITEM: PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE CONTROL  
CIRCUIT ISOLATION DIODES  
FAILURE MODE: FAILS OPEN (PREMATURE/ERRONEOUS)

LEAD ANALYST: W.J. MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE (LV10) CONTROL CIRCUIT
- 4) PANEL R2 (SWITCH LOCATION)
- 5) AVBAY 6
- 6) AFT LCA 3
- 7) ISOLATION DIODES (4)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 56V76A123CR

CAUSES: VIBRATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF ISOLATION DIODES WILL PREVENT OPERATION OF CROSSOVER VALVE. NO EFFECT ON CREW OR VEHICLE IN NOMINAL FLIGHT, BUT LOSS OF CREW OR VEHICLE IN ABORT MODES, DUE TO LOSS OF AFT COMPARTMENT PURGE.

REFERENCES: RI DRAWING VS72-941102 SHT 18.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/08/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7460 ABORT: 3/1R

ITEM: PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE CONTROL  
CIRCUIT HYBRID DRIVER CONTROLLER  
FAILURE MODE: FAILS OFF (PREMATURE/ERRONEOUS)

LEAD ANALYST: W.J. MCNICOLL SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM CROSSOVER SOLENOID VALVE (LV10) CONTROL CIRCUIT
- 4) PANEL R2 (SWITCH LOCATION)
- 5) AVBAY 6
- 6) AFT LCA 3
- 7) HYBRID DRIVER CONTROLLER
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/3      | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: ME477-0263-0002

CAUSES: VIBRATION, THERMAL SHOCK, MECHANICAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF DRIVER WILL PREVENT OPERATION OF CROSSOVER VALVE. NO EFFECT ON CREW OR VEHICLE IN NOMINAL FLIGHT, BUT LOSS OF CREW OR VEHICLE IN ABORT MODES, DUE TO LOSS OF AFT COMPARTMENT PURGE.

REFERENCES: RI DRAWING VS72-941102 SHT 18.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7470 ABORT: 3/3

ITEM: HELIUM SUPPLY BLOWDOWN VALVES POWER AND CONTROL  
CIRCUIT  
FAILURE MODE: FAILS OPEN, SHORTED, OR INADVERTENT OPERATION

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM SUPPLY BLOWDOWN VALVES (LV26, LV27)
- 4) AV BAY 4
- 5) AFT LCA 1
- 6) BLOWDOWN VALVE POWER AND CONTROL CIRCUITS
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCED WILL NOT AFFECT CREW, VEHICLE OR  
MISSION. ELECTRICAL ITEMS INCLUDED ARE 2 RESISTORS AND 2 DIODES.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7480 ABORT: 3/1R

ITEM: HELIUM SUPPLY BLOWDOWN VALVES CONTROL CIRCUIT  
HYBRID DRIVER CONTROLLER  
FAILURE MODE: FAILS ON (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM SUPPLY BLOWDOWN VALVES (LV20,LV27)
- 4) AV BAY 4
- 5) AFT LCA 1
- 6) BLOWDOWN VALVE CONTROL CIRCUIT HYBRID DRIVER CONTROLLER  
(ARIIII)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 54V76A121

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF DRIVER ON WILL ALLOW OFF NOMINAL OPENING OF BLOWDOWN VALVES RESULTING IN LOSS OF HELIUM AVAILABLE FOR LO2 DUMP. LOSS OF LO2 DUMP RESULTS IN LOSS OF FLIGHT CONTROL AND LOSS OF LIFE/VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7490 ABORT: 3/1R

ITEM: HELIUM SUPPLY BLOWDOWN VALVES CONTROL CIRCUIT MDM  
COMMANDS  
FAILURE MODE: FAILS ON (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J. MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) PNEUMATIC HELIUM SUPPLY BLOWDOWN VALVES (LV20, LV27)
- 4) AV BAY 4
- 5) AFT LCA 1
- 6) BLOWDOWN VALVE CONTROL CIRCUIT MDM COMMANDS (FA3, FA4)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: V41K1631N, 35N

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF MDM COMMAND ON WILL ALLOW OFF NOMINAL OPENING OF BLOWDOWN VALVES RESULTING IN LOSS OF HELIUM AVAILABLE FOR LO2 DUMP. LOSS OF LO2 DUMP RESULTS IN LOSS OF FLIGHT CONTROL.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7500 ABORT: 3/3

ITEM: LO2 MANIFOLD REPRESS VALVES POWER AND CONTROL  
CIRCUIT  
FAILURE MODE: FAILS OPEN, SHORTED OR INADVERTENT OPERATION

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LO2 MANIFOLD REPRESS VALVES (LV40,LV41)
- 4) AV BAY 6
- 5) AFT LCA 3
- 6) LO2 MANIFOLD REPRESS VALVES POWER AND CONTROL CIRCUITS
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCED WILL NOT AFFECT CREW, VEHICLE OR MISSION. ELECTRICAL ITEMS INCLUDED ARE 5 RESISTORS AND 10 DIODES.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7510 ABORT: 3/1R

ITEM: LO2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT HYBRID  
DRIVER CONTROLLER  
FAILURE MODE: FAILS OFF (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LO2 MANIFOLD REPRESS VALVES (LV40,LV41)
- 4) AV BAY 6
- 5) AFT LCA 3
- 6) LO2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT HYBRID DRIVER  
CONTROLLER (ARIII)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |            |
|-----------------|---------------|------------|
|                 | HDW/FUNC      | ABORT      |
| PRELAUNCH:      | 3/3           | RTLS: 3/1R |
| LIFTOFF:        | 3/1R          | TAL: 3/1R  |
| ONORBIT:        | 3/3           | AOA: 3/1R  |
| DEORBIT:        | 3/3           | ATO: 3/1R  |
| LANDING/SAFING: | 3/3           |            |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 56V76A123

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF DRIVER OFF WILL NOT ALLOW OPENING OF REPRESS VALVES  
RESULTING IN LOSS OF HELIUM AVAILABLE FOR MPS LO2 DUMP. LOSS OF  
LO2 DUMP RESULTS IN LOSS OF FLIGHT CONTROL AND LOSS OF  
LIFE/VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
 SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
 MDAC ID: 7520 ABORT: 3/1R

ITEM: LO2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT MDM  
 COMMANDS  
 FAILURE MODE: FAILS OFF (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LO2 MANIFOLD REPRESS VALVES (LV40,LV41)
- 4) AV BAY 6
- 5) AFT LCA 3
- 6) LO2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT MDM COMMANDS
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
 PART NUMBER: V41F1535X,37X

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF MDM COMMANDS OFF WILL NOT ALLOW OPENING OF REPRESS VALVES RESULTING IN LOSS OF HELIUM AVAILABLE FOR MPS LO2 DUMP. LOSS OF LO2 DUMP RESULTS IN LOSS OF FLIGHT CONTROL AND LOSS OF LIFE/VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7530 ABORT: 3/1R

ITEM: LO2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT SWITCH  
FAILURE MODE: FAILS OFF (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LO2 MANIFOLD REPRESS VALVES (LV40,LV41)
- 4) PANEL R4
- 5) TOGGLE SWITCH (S1)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
|-----------------|----------|-------|----------|
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: CONTAMINATION, PIECE PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

FAILURE OF SWITCH OFF WILL NOT ALLOW LO2 MANIFOLD REPRESS VALVES TO OPEN RESULTING IN LOSS OF LO2 DUMP. LOSS OF LO2 DUMP RESULTS IN LOSS OF FLIGHT CONTROL AND LOSS OF LIFE/VEHICLE.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7540 ABORT: 3/3

ITEM: LH2 MANIFOLD REPRESS VALVES POWER AND CONTROL  
CIRCUIT  
FAILURE MODE: FAILS OPEN, SHORTED, OR INADVERTENT OPERATION

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LH2 MANIFOLD REPRESS VALVES (LV42,LV43)
- 4) AV BAY 5
- 5) AFT LCA 2
- 6) LH2 MANIFOLD REPRESS VALVES POWER AND CONTROL CIRCUIT
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/3      |
| LIFTOFF:        | 3/3      | TAL:  | 3/3      |
| ONORBIT:        | 3/3      | AOA:  | 3/3      |
| DEORBIT:        | 3/3      | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF ITEMS REFERENCED WILL NOT AFFECT CREW, VEHICLE, OR MISSION. ELECTRICAL ITEMS INCLUDED ARE 5 RESISTORS AND 10 DIODES.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7550 ABORT: 3/1R

ITEM: LH2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT HYBRID  
DRIVER CONTROLLER  
FAILURE MODE: FAILS ON (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LH2 MANIFOLD REPRESS VALVES (LV42,LV43)
- 4) AV BAY 5
- 5) AFT LCA 2
- 6) LH2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT HYBRID DRIVER  
CONTROLLER (ARIII)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 55V76A122

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF HYBRID DRIVER CONTROLLER ON WILL ALLOW OFF NOMINAL  
OPENING OF THE LH2 MANIFOLD REPRESS VALVES WITH HELIUM INGESTION  
INTO ALL THREE MAIN ENGINES RESULTING IN EXPLOSION.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7560 ABORT: 3/1R

ITEM: LH2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT MDM  
COMMANDS  
FAILURE MODE: FAILS ON (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LH2 MANIFOLD REPRESS VALVES (LV42,LV43)
- 4) AV BAY 5
- 5) AFT LCA 2
- 6) LH2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT MDM COMMANDS
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: V41K1435X,37X

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF MDM COMMAND ON WILL ALLOW OFF NOMINAL OPENING OF LH2  
MANIFOLD REPRESS VALVES WITH HELIUM INGESTION INTO ALL THREE MAIN  
ENGINES RESULTING IN EXPLOSION.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7570 ABORT: 3/1R

ITEM: LH2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT SWITCH  
FAILURE MODE: FAILS ON (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LH2 MANIFOLD REPRESS VALVES (LV42,LV43)
- 4) PANEL R4
- 5) LH2 MANIFOLD REPRESS VALVES CONTROL CIRCUIT SWITCH (S2)
- 6)
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF THE SWITCH ON WILL ALLOW OFF NOMINAL OPENING OF LH2  
MANIFOLD REPRESS VALVES WITH HELIUM INGESTION INTO ALL THREE MAIN  
ENGINES RESULTING IN EXPLOSION.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/3  
MDAC ID: 7580 ABORT: 3/3

ITEM: LH2 FEED MANIFOLD RTLS PRESS VALVES POWER AND  
CONTROL CIRCUIT  
FAILURE MODE: FAILS OPEN, SHORTED, OR INADVERTENT OPERATION

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LH2 FEED MANIFOLD RTLS PRESS VALVES (LV74,LV75)
- 4) AV BAY 4
- 5) AFT LCA 1 & 3
- 6) LH2 FEED MANIFOLD RTLS PRESS VALVES POWER AND CONTROL  
CIRCUIT
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/3      |
| LIFTOFF:        | 3/3           | TAL:  | 3/3      |
| ONORBIT:        | 3/3           | AOA:  | 3/3      |
| DEORBIT:        | 3/3           | ATO:  | 3/3      |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [NA ] B [NA ] C [NA ]

LOCATION: SEE REFERENCES  
PART NUMBER: SEE REFERENCES

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:  
FAILURE OF ITEMS REFERENCED WILL NOT AFFECT CREW, VEHICLE, OR  
MISSION. ELECTRICAL ITEMS INCLUDED ARE 10 RESISTORS AND 8  
DIODES.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.1.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7590 ABORT: 3/1R

ITEM: LH2 FEED MANIFOLD RTLS PRESS VALVES REMOTE POWER  
CONTROLLER  
FAILURE MODE: FAILS ON (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LH2 FEED MANIFOLD RTLS PRESS VALVES (LV74, LV75)
- 4) AV BAY 4
- 5) AFT LCA 1 & 3
- 6) LH2 FEED MANIFOLD RTLS PRESS VALVES REMOTE POWER CONTROLLERS  
(RPC27,28,29 & 30)
- 7)
- 8)
- 9)

| FLIGHT PHASE    | CRITICALITIES |       |          |
|-----------------|---------------|-------|----------|
|                 | HDW/FUNC      | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3           | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R          | TAL:  | 3/1R     |
| ONORBIT:        | 3/3           | AOA:  | 3/1R     |
| DEORBIT:        | 3/3           | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3           |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 40V76A27, 54V76A131

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF REMOTE POWER CONTROLLER ON WILL ALLOW OFF NOMINAL  
OPENING OF LH2 RTLS PRESS VALVES WITH HELIUM INGESTION INTO ALL  
THREE MAIN ENGINES RESULTING IN EXPLOSION.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.1.



INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7600 ABORT: 3/1R

ITEM: LH2 FEED MANIFOLD RTLS PRESS VALVES HYBRID DRIVER  
CONTROLLER  
FAILURE MODE: FAILS ON (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
  - 2) PNEUMATIC HELIUM SYSTEM
  - 3) LH2 FEED MANIFOLD RTLS PRESS VALVES (LV74,LV75)
  - 4) AV BAY 4
  - 5) AFT LCA 1 & 3
  - 6) LH2 FEED MANIFOLD RTLS PRESS VALVES HYBRID DRIVER
- CONTROLLERS (ARIII)
- 7)
  - 8)
  - 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: 56V76A123, 54V76A121

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF HYBRID DRIVER CONTROLLER ON WILL ALLOW OFF NOMINAL  
OPENING OF LH2 RTLS PRESS VALVES WITH HELIUM INGESTION INTO ALL  
THREE MAIN ENGINES RESULTING IN EXPLOSION.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.1.

INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87 HIGHEST CRITICALITY HDW/FUNC  
SUBSYSTEM: EPDC/MPS FLIGHT: 3/1R  
MDAC ID: 7610 ABORT: 3/1R

ITEM: LH2 FEED MANIFOLD RTLS PRESS VALVES MDM COMMANDS  
FAILURE MODE: FAILS ON (PREMATURE/ERRONEOUS)

LEAD ANALYST: A.J. MARINO SUBSYS LEAD: A.J.MARINO

BREAKDOWN HIERARCHY:

- 1) EPDC/MPS
- 2) PNEUMATIC HELIUM SYSTEM
- 3) LH2 FEED MANIFOLD RTLS PRESS VALVES (LV74,LV75)
- 4) AV BAY 4
- 5) AFT LCA 1 & 3
- 6) LH2 FEED MANIFOLD RTLS PRESS VALVES MDM COMMANDS
- 7)
- 8)
- 9)

| CRITICALITIES   |          |       |          |
|-----------------|----------|-------|----------|
| FLIGHT PHASE    | HDW/FUNC | ABORT | HDW/FUNC |
| PRELAUNCH:      | 3/3      | RTLS: | 3/1R     |
| LIFTOFF:        | 3/1R     | TAL:  | 3/1R     |
| ONORBIT:        | 3/3      | AOA:  | 3/1R     |
| DEORBIT:        | 3/3      | ATO:  | 3/1R     |
| LANDING/SAFING: | 3/3      |       |          |

REDUNDANCY SCREENS: A [ 2 ] B [ P ] C [ P ]

LOCATION: SEE REFERENCES  
PART NUMBER: V41K1905X, 06X, 07X, 08X, 09X, 10X

CAUSES: VIBRATION, CONTAMINATION, THERMAL SHOCK

EFFECTS/RATIONALE:

FAILURE OF MDM COMMANDS ON WILL ALLOW OFF NOMINAL OPENING OF LH2 RTLS PRESS VALVES WITH HELIUM INGESTION INTO ALL THREE MAIN ENGINES RESULTING IN EXPLOSION.

REFERENCES: RI DRAWING VS72-941102, SHEET 20.1.

APPENDIX D  
POTENTIAL CRITICAL ITEMS

| <u>MDAC<br/>ID</u> | <u>ITEM</u>                                       | <u>FAILURE MODE</u>                                      |
|--------------------|---|--|
| 1001               | GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19, 20) | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |
| 1002               | GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19, 20) | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1003               | GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19, 20) | EXTERNAL LEAKAGE   |
| 1004               | GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19 20)  | FAILS TO CLOSE   |
| 1005               | GO2 PRESSURE ISOLATION CHECK VALVE (CV18, 19, 20) | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |
| 1006               | GO2 PRESSUR ISOLATION CHECK VALVE (CV18, 19, 20)  | SPONTANEOUS IGNITION IN/OF PART                          |
| 1012               | LO2 TANK PRE-PRESS CHECK VALVE (CV16)             | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1013               | LO2 TANK PRE-PRESS CHECK VALVE (CV16)             | SPONTANEOUS IGNITION IN/OF PART                          |
| 1014               | LO2 TANK PRE-PRESS CHECK VALVE (CV16)             | SPONTANEOUS IGNITION IN/OF PART                          |
| 1021               | LO2 BLEED CHECK VALVE (CV31, 33, 35)              | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |
| 1022               | LO2 BLEED CHECK VALVE (CV31, 33, 35)              | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |
| 1023               | LO2 BLEED CHECK VALVE (CV31, 33, 35)              | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |
| 1024               | LO2 BLEED CHECK VALVE (CV31, 33, 35)              | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1025               | LO2 BLEED CHECK VALVE (CV31, 33, 35)              | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1026               | LO2 BLEED CHECK VALVE (CV31, 33, 35)              | FAILS TO OPEN  |
| 1031               | GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)    | RESTRICTED FLOW  |
| 1032               | GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)    | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |
| 1033               | GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)    | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1034               | GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)    | SPONTANEOUS IGNITION IN/OF PART                          |
| 1035               | GO2 PRESSURE FLOW CONTROL VALVE (LV53, 54, 55)    | SPONTANEOUS IGNITION IN/OF PART                          |
| 1041               | LO2 FEED (ORB/ET) DISCONNECT (PD1)                | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |

| <u>MDAC<br/>ID</u> | <u>ITEM</u>  | <u>FAILURE MODE</u>                                      |
|--------------------|--|--|
| 1042               | LO2 FEED (ORB/ET) DISCONNECT (PD1)                     | EXTERNAL LEAKAGE   |
| 1043               | LO2 FEED (ORB/ET) DISCONNECT (PD1)                     | FAILS TO REMAIN OPEN                                     |
| 1044               | LO2 FEED (ORB/ET) DISCONNECT (PD1)                     | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1045               | LO2 FEED (ORB/ET) DISCONNECT (PD1)                     | EXTERNAL LEAKAGE   |
| 1046               | LO2 FEED (ORB/ET) DISCONNECT (PD1)                     | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1052               | GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)           | FAILS TO REMAIN OPEN                                     |
| 1053               | GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)           | EXTERNAL LEAKAGE   |
| 1054               | GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)           | SPONTANEOUS IGNITION IN/OF PART                          |
| 1055               | GO2 PRESSURIZATION (ORB/ET) DISCONNECT (PD4)           | SPONTANEOUS IGNITION IN/OF PART                          |
| 1063               | LO2 TANK PRE-PRESS (ORB/GND) DISC (PD9)                | FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE                 |
| 1064               | LO2 TANK PRE-PRESS (ORB/GND) DISC (PD9)                | EXTERNAL LEAKAGE   |
| 1073               | LO2 GROUND FILL & DRAIN (ORB/GND) DISCONNECT (PD12)    | EXTERNAL LEAKAGE (INTO AFT FUSELAGE)                     |
| 1083               | LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT (PD13)        | EXTERNAL LEAKAGE (INTO AFT FUSELAGE)                     |
| 1085               | LO2 OVERBOARD BLEED (ORB/GND) DISCONNECT (PD13)        | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1091               | GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING (PD15) | EXTERNAL LEAKAGE   |
| 1092               | GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING (PD15) | EXTERNAL LEAKAGE   |
| 1093               | GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING (PD15) | SPONTANEOUS IGNITION IN/OF PART                          |
| 1094               | GO2 PRESSURIZATION MANIFOLD TEST POINT COUPLING (PD15) | SPONTANEOUS IGNITION IN/OF PART                          |
| 1102               | LO2 PREVALVE (PV1, 2, 3)                               | FAILS TO REMAIN OPEN                                     |
| 1103               | LO2 PREVALVE (PV1, 2, 3)                               | EXTERNAL LEAKAGE   |
| 1104               | LO2 PREVALVE (PV1, 2, 3)                               | FAILS TO RELIEVE   |
| 1107               | LO2 PREVALVE (PV1, 2, 3)                               | FAILS TO REMAIN OPEN                                     |
| 1108               | LO2 PREVALVE (PV1, 2, 3)                               | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1123               | LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)                | EXTERNAL LEAKAGE   |
| 1124               | LO2 FEEDLINE RELIEF SHUTOFF VALVE (PV7)                | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |
| 1131               | LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)                | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |

| <u>MDAC<br/>ID</u> | <u>ITEM</u>   | <u>FAILURE MODE</u>                                      |
|--------------------|---|--|
| 1132               | LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)             | EXTERNAL LEAKAGE   |
| 1135               | LO2 OUTBOARD FILL AND DRAIN VALVE (PV9)             | EXTERIOR LEAKAGE   |
| 1151               | LO2 INBOARD FILL AND DRAIN VALVE (PV10)             | FAILS TO OPEN, FAILS TO REMAIN OPEN                      |
| 1152               | LO2 INBOARD FILL AND DRAIN VALVE (PV10)             | EXTERIOR LEAKAGE   |
| 1155               | LO2 INBOARD FILL AND DRAIN VALVE (PV10)             | FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE                 |
| 1157               | LO2 INBOARD FILL AND DRAIN VALVE (PV10)             | EXTERNAL LEAKAGE   |
| 1174               | LO2 BLEED SHUTOFF VALVE (PV19)                      | EXTERIOR LEAKAGE   |
| 1175               | LO2 BLEED SHUTOFF VALVE (PV19)                      | FAILS TO RELIEVE   |
| 1176               | LO2 BLEED SHUTOFF VALVE (PV19)                      | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 1183               | LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV20, 21) | EXTERIOR LEAKAGE   |
| 1184               | LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV20, 21) | FAILS TO RELIEVE   |
| 1185               | LO2 POGO ACCUMULATOR RECIRCULATION VALVE (PV20, 21) | FAILS TO REMAIN OPEN                                     |
| 1192               | LO2 LOW LEVEL LIQUID SENSOR (MT1, 2)                | ERRONEOUS OUTPUT (FALSE DRY)                             |
| 1202               | LO2 SYSTEM DELTA P TRANSDUCER (MT44, 50)            | EXTERNAL LEAKAGE   |
| 1211               | LO2 PREPRESS DISCONNECT CHECK VALVE TEST PORT (TP9) | EXTERNAL LEAKAGE   |
| 1221               | LO2 17 INCH ORBITER DISCONNECT TEST PORT (TP17, 18) | EXTERNAL LEAKAGE   |
| 1231               | LO2 FEEDLINE RELIEF TEST PORT (TP24)                | EXTERNAL LEAKAGE   |
| 1241               | LO2 FEEDLINE MANIFOLD (MA1)                         | BLOCKED FLOW   |
| 1242               | LO2 FEEDLINE MANIFOLD (MA1)                         | RUPTURE  |
| 1243               | LO2 FEEDLINE MANIFOLD (MA1)                         | EXTERNAL LEAKAGE   |
| 1252               | LO2 FILL & DRAIN LINE (FH1)                         | RUPTURE  |
| 1253               | LO2 FILL & DRAIN LINE (FH1)                         | EXTERNAL LEAKAGE   |
| 1261               | LO2 17 INCH FEEDLINE (FH2)                          | BLOCKED FLOW   |
| 1262               | LO2 17 INCH FEEDLINE (FH2)                          | RUPTURE  |
| 1263               | LO2 17 INCH FEEDLINE (FH2)                          | EXTERNAL LEAKAGE   |
| 1271               | LO2 12 INCH FEEDLINE (FH3, 4, 5)                    | BLOCKED FLOW   |
| 1272               | LO2 12 INCH FEEDLINE (FH3, 4, 5)                    | RUPTURE  |
| 1273               | LO2 12 INCH FEEDLINE (FH3, 4, 5)                    | EXTERNAL LEAKAGE   |
| 1281               | LO2 FEED MANIFOLD RELIEF VALVE (RV5)                | EXTERNAL LEAKAGE   |
| 1282               | LO2 FEED MANIFOLD RELIEF VALVE (RV5)                | FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE                 |

| <u>MDAC<br/>ID</u> | <u>ITEM</u>  | <u>FAILURE MODE</u>                     |
|--------------------|--|---|
| 1283               | LO2 FEED MANIFOLD RELIEF VALVE (RV5)                                 | FAILS TO RELIEVE                        |
| 2001               | LH2 INBOARD FILL AND DRAIN VALVE (PV12)                              | FAIL TO REMAIN OPEN                     |
| 2002               | LH2 INBOARD FILL AND DRAIN VALVE (PV12)                              | FAIL TO REMAIN CLOSED                   |
| 2005               | LH2 INBOARD FILL AND DRAIN VALVE (PV12)                              | FAIL TO RELIEVE                         |
| 2007               | LH2 INBOARD FILL AND DRAIN VALVE (PV12)                              | EXTERNAL LEAKAGE                        |
| 2011               | LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)                             | FAIL TO REMAIN OPEN                     |
| 2012               | LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)                             | FAIL TO REMAIN CLOSED                   |
| 2013               | LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)                             | FAIL TO OPEN                            |
| 2016               | LH2 OUTBOARD FILL AND DRAIN VALVE (PV11)                             | EXTERNAL LEAKAGE                        |
| 2021               | LH2 FILL AND DRAIN LINE (FH6)  | RUPTURE                                 |
| 2031               | LH2 GROUND FILL AND DRAIN (ORB/GND) DISCONNECT (ORBITER HALF) (PD11) | EXTERNAL LEAKAGE                        |
| 2041               | LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORB HALF) (PD17)            | EXTERNAL LEAK                           |
| 2042               | LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORB HALF) (PD17)            | FAIL TO CLOSE                           |
| 2043               | LH2 HI POINT BLEED (ORB/GND) DISCONNECT (ORB HALF) (PD17)            | FAIL TO REMAIN CLOSED                   |
| 2054               | LH2 REPLENISH VALVE (PV13)   | FAIL TO REMAIN CLOSED                   |
| 2055               | LH2 REPLENISH VALVE (PV13)   | EXTERNAL LEAKAGE                        |
| 2062               | LH2 HI POINT BLEED VALVE (PV22)                                      | FAIL TO REMAIN CLOSED,<br>FAIL TO CLOSE |
| 2063               | LH2 HI POINT BLEED VALVE (PV22)                                      | EXTERNAL LEAKAGE                        |
| 2071               | LH2 SYSTEM DELTA-P TRANSDUCER (MT44, MT50)                           | EXTERNAL LEAKAGE                        |
| 2081               | LH2 HI POINT BLEED LINE (FH19)                                       | RUPTURE                                 |
| 2083               | LH2 HI POINT BLEED LINE (FH19)                                       | LOSS OF INSULATING VACUUM               |
| 2093               | LH2 RECIRCULATION DISCONNECT VALVE (PD3)                             | FAIL TO CLOSE, FAIL TO REMAIN CLOSED    |
| 2094               | LH2 RECIRCULATION DISCONNECT VALVE (PD3)                             | EXTERNAL LEAKAGE                        |
| 2103               | LH2 RECIRCULATION PUMP VALVE (PV14, PV15, PV16)                      | EXTERNAL LEAKAGE                        |
| 2111               | LH2 PRESTART CONDITIONING MANIFOLD (MA3)                             | RUPTURE                                 |
| 2112               | LH2 PRESTART CONDITIONING MANIFOLD (MA3)                             | EXTERNAL LEAKAGE                        |
| 2121               | LH2 PRESTART CONDITIONING PUMP LINE (FH11, FH13, FH15)               | RUPTURE                                 |

| <u>MDAC ID</u> | <u>ITEM</u>  | <u>FAILURE MODE</u>                                    |
|----------------|--|--|
| 2131           | LH2 PRESTART CONDITIONING RETURN LINE (FH12, FH14, FH16)                             | RUPTURE  |
| 2132           | LH2 PRESTART CONDITIONING RETURN LINE (FH12, FH14, FH16)                             | EXTERNAL LEAKAGE                                       |
| 2141           | LH2 PRESTART CONDITIONING REPLENISH LINE (FH17)                                      | RUPTURE  |
| 2151           | LH2 PRESTART CONDITIONING RETURN LINE (FH18)   | RUPTURE  |
| 2161           | LH2 RECIRCULATION MANIFOLD RELIEF VALVE (RV7)  | FAIL TO OPEN (RELIEVE)                                 |
| 2163           | LH2 RECIRCULATION MANIFOLD RELIEF VALVE (RV7)  | EXTERNAL LEAKAGE                                       |
| 2177           | LH2 RECIRCULATION PUMP (PP1, PP2, PP3)   | EXTERNAL LEAKAGE                                       |
| 2182           | LH2 PRE-PRESS CHECK VALVE (CV17)   | FAIL TO CLOSE (RESEAT), FAIL TO REMAIN CLOSED          |
| 2183           | LH2 PRE-PRESS CHECK VALVE (CV17)   | EXTERNAL LEAKAGE                                       |
| 2191           | GH2 PRESSURIZATION ISOLATION CHECK VALVE (CV21,CV22,CV23)                            | FAIL TO OPEN, FAIL TO REMAIN OPEN                      |
| 2192           | GH2 PRESSURIZATION ISOLATION CHECK VALVE (CV21,CV22,CV23 AND TEST PORTS TP5,TP6,TP7) | EXTERNAL LEAKAGE                                       |
| 2201           | GH2 PRESSURIZATION FLOW CONTROL VALVE (LV56,LV57,LV58)                               | FAIL TO OPEN, FAIL TO REMAIN OPEN                      |
| 2202           | GH2 PRESSURIZATION FLOW CONTROL VALVE (LV56,LV57,LV58)                               | FAIL TO CLOSE, FAIL TO REMAIN CLOSED                   |
| 2203           | GH2 PRESSURIZATION FLOW CONTROL VALVE (LV56,LV57,LV58)                               | EXTERNAL LEAKAGE                                       |
| 2211           | GH2 PRESSURIZATION DISCONNECT (PD5)  | FAIL TO OPEN, FAIL TO REMAIN OPEN                      |
| 2212           | GH2 PRESSURIZATION DISCONNECT (PD5)  | FAIL TO CLOSE, FAIL TO REMAIN CLOSED                   |
| 2213           | GH2 PRESSURIZATION DISCONNECT (PD5)  | EXTERNAL LEAKAGE                                       |
| 2222           | LH2 TANK GROUND PRE-PRESS DISCONNECT (PD10)  | FAIL TO CLOSE, FAIL TO REMAIN CLOSED, EXTERNAL LEAKAGE |
| 2231           | GH2 PRESSURIZATION MANIFOLD TEST POINT COUPLING (PD16)                               | EXTERNAL LEAKAGE                                       |
| 2241           | LH2 PREPRESSURIZATION DISCONNECT CHECK VALVE TEST PORT (TP10)                        | EXTERNAL LEAKAGE                                       |
| 2251           | GH2 PRESSURIZATION DUAL CHECK VALVE TEST PORT (TP21,TP22,TP23)                       | EXTERNAL LEAKAGE                                       |
| 2261           | LH2 FEED DISCONNECT VALVE (PD2)  | FAIL TO OPEN, FAIL TO REMAIN OPEN                      |
| 2262           | LH2 FEED DISCONNECT VALVE (PD2)  | FAIL TO CLOSE, FAIL TO REMAIN CLOSED                   |
| 2263           | LH2 FEED DISCONNECT VALVE (PD2)  | EXTERNAL LEAKAGE                                       |

| <u>MDAC</u><br><u>ID</u> | <u>ITEM</u>   | <u>FAILURE MODE</u>                     |
|--------------------------|---|---|
| 2271                     | LH2 PREVALVE (PV4,PV5,PV6)                              | FAIL TO OPEN, FAIL TO<br>REMAIN OPEN    |
| 2273                     | LH2 PREVALVE (PV4,PV5,PV6)                              | EXTERNAL LEAKAGE                        |
| 2274                     | LH2 PREVALVE (PV4,PV5,PV6)                              | FAIL TO RELIEVE                         |
| 2281                     | LH2 17 INCH ORBITER DISCONNECT<br>TEST PORT (TP11,TP12) | EXTERNAL LEAKAGE                        |
| 2291                     | LH2 FEEDLINE MANIFOLD (MA2)                             | RUPTURE                                 |
| 2292                     | LH2 FEEDLINE MANIFOLD (MA2)                             | RESTRICTED FLOW                         |
| 2301                     | LH2 17 INCH FEEDLINE (FH7)                              | RUPTURE                                 |
| 2302                     | LH2 17 INCH FEEDLINE (FH7)                              | RESTRICTED FLOW                         |
| 2311                     | LH2 12 INCH FEEDLINE<br>(FH8,FH9,FH10)                  | RUPTURE                                 |
| 2312                     | LH2 12 INCH FEEDLINE<br>(FH8,FH9,FH10)                  | RESTRICTED FLOW                         |
| 2321                     | LH2 FEEDLINE RELIEF SHUTOFF<br>VALVE (PV8)              | FAIL TO OPEN, FAIL TO<br>REMAIN OPEN    |
| 2322                     | LH2 FEEDLINE RELIEF SHUTOFF<br>VALVE (PV8)              | FAIL TO CLOSE, FAIL TO<br>REMAIN CLOSED |
| 2323                     | LH2 FEEDLINE RELIEF SHUTOFF<br>VALVE (PV8)              | EXTERNAL LEAKAGE                        |
| 2331                     | LH2 FEEDLINE RELIEF LINE TEST<br>PORT (TP25)            | EXTERNAL LEAKAGE                        |
| 2341                     | LH2 FEEDLINE MANIFOLD RELIEF<br>VALVE (RV6)             | FAIL TO OPEN (RELIEVE)                  |
| 2352                     | LH2 DUMP PRESSURIZATION<br>ORIFICE (RP10)               | EXTERNAL LEAK                           |
| 2373                     | LH2 PRESSURIZATION LINE VENT<br>VALVE (LV52)            | EXTERNAL LEAKAGE                        |
| 2381                     | LH2 FEED RTLS INBOARD VALVE<br>(PV17)                   | FAIL TO OEPN, FAIL TO<br>REMAIN OPEN    |
| 2382                     | LH2 FEED RTLS INBOARD VALVE<br>(PV17)                   | FAIL TO CLOSE, FAIL TO<br>REMAIN CLOSED |
| 2383                     | LH2 FEED RTLS INBOARD VALVE<br>(PV17)                   | EXTERNAL LEAKAGE                        |
| 2391                     | LH2 FEED RTLS OUTBOARD VALVE<br>(PV18)                  | FAIL TO OPEN, FAIL TO<br>REMAIN OPEN    |
| 2392                     | LH2 FEED RTLS OUTBOARD VALVE<br>(PV18)                  | FAIL TO CLOSE, FAIL TO<br>REMAIN CLOSED |
| 2393                     | LH2 FEED RTLS OUTBOARD VALVE<br>(PV18)                  | EXTERNAL LEAKAGE                        |
| 3010                     | ENGINE HELIUM SUPPLY CHECK<br>VALVE (CV1,CV2,CV3)       | FAILS TO CLOSE, OR REMAIN<br>CLOSED     |
| 3020                     | HELIUM SUPPLY DISCONNECT<br>(ORB/GND, ORB HALF), (PD8)  | FAILS TO CLOSE, OR REMAIN<br>CLOSED     |
| 3021                     | HELIUM SUPPLY DISCONNECT<br>(ORB/GND, ORB HALF), (PD8)  | EXTERNAL LEAKAGE                        |
| 3030                     | TEST PORT (TP8)   | LEAKAGE                                 |
| 3040                     | 17.3 CU. FT. HELIUM SUPPLY<br>TANK (TK6, 8, 10)         | RAPID LEAK                              |
| 3050                     | 4.7 CU. FT. HELIUM SUPPLY<br>TANK (TK1,2,3,7,9,11)      | RAPID LEAK                              |



| <u>MDAC ID</u> | <u>ITEM</u>   | <u>FAILURE MODE</u>                                      |
|----------------|---|--|
| 3060           | PRESSURE TAP PORT (TP26,27,28)                                  | RAPID LEAK   |
| 3071           | ENGINE HELIUM SUPPLY CHECK VALVE (CV25,26;36,37;41,42)          | FAILS TO OPEN, OR REMAIN OPEN                            |
| 3080           | ENGINE HELIUM SUPPLY FILTER - PANEL A;B (FL2,6;3,7;4,8)         | RESTRICTED FLOW, BLOCKAGE                                |
| 3081           | ENGINE HELIUM SUPPLY FILTER - PANEL A;B (FL2,6;3,7;4,8)         | EXTERNAL LEAKAGE   |
| 3082           | ENGINE HELIUM SUPPLY FILTER - PANEL A;B (FL2,6;3,7;4,8)         | STRUCTURAL FAILURE (ELEMENT COLLAPSE)                    |
| 3092           | ENGINE HELIUM SUPPLY ISOLATION VALVE (LV1,2;3,4;5,6)            | EXTERNAL LEAKAGE   |
| 3111           | ENGINE HELIUM PRESSURE REGULATOR (PR1,7;2,8;3,9)                | FAILS OUT OF TOLERANCE (HIGH)                            |
| 3112           | ENGINE HELIUM PRESSURE REGULATOR (PR1,7;2,8;3,9)                | EXTERNAL LEAKAGE   |
| 3120           | HE RELIEF VALVE PANEL A;B (RV1,8;2,9;3,10)                      | FAILS TO CLOSE (RESEAT), OR REMAIN CLOSED                |
| 3121           | ENGINE HE RELIEF VALVE PANEL A;B (RV1,8;2,9;3,10)               | INTERNAL LEAKAGE   |
| 3122           | ENGINE HE RELIEF VALVE PANEL A;B (RV1,8;2,9;3,10)               | FAILS TO OPEN  |
| 3123           | ENGINE HE RELIEF VALVE PANEL A;B (RV1,8;2,9;3,10)               | EXTERNAL LEAKAGE   |
| 3130           | ENGINE HELIUM SUPPLY RELIEF VALVE SENSE LINE                    | EXTERNAL LEAKAGE   |
| 3150           | ENGINE HELIUM SUPPLY INTERCONNECT INLET VALVE (LV59,61,63)      | FAILS TO OPEN OR REMAIN OPEN                             |
| 3162           | ENGINE HELIUM SUPPLY INTERCONNECT OUTLET VALVE (LV60,62,64)     | EXTERNAL LEAKAGE   |
| 3181           | ENGINE HELIUM INTERCONNECT CHECK VALVE-PANEL INLET (CV27,38,43) | FAILS TO OPEN, OR REMAIN OPEN                            |
| 3200           | FACILITY PORTS  | GROSS LEAKAGE  |
| 4021           | PNEU VALVE HE ISOLATION CHECK VALVE (CV8)                       | FAILS TO OPEN, EXTERNAL LEAKAGE                          |
| 4030           | PNEU VALVE HE ISOLATION CHECK VALVE (CV9)                       | FAILS TO OPEN, EXTERNAL LEAKAGE                          |
| 4051           | LO2 FEED MANIF REPRESS CHECK VALVE (CV12)                       | FAILS TO OPEN  |
| 4090           | LO2 TANK PRE-PRESS CHECK VALVE (CV16)                           | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 4100           | LH2 TANK PRE-PRESS CHECK VALVE (CV17)                           | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 4152           | LO2 PREVALVE OPENING SOLENOID (LV12,LV14,LV16)                  | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |

| <u>MDAC<br/>ID</u> | <u>ITEM</u>  | <u>FAILURE MODE</u>  |
|--------------------|--|--|
| 4160               | LO2 PREVALVE OPENING<br>SOLENOID (LV13, LV15, LV17)          | FAILS TO OPEN, EXTERNAL<br>LEAKAGE                             |
| 4161               | LO2 PREVALVE CLOSING<br>SOLENOID (LV13, LV15, LV17)          | FAILS TO REMAIN OPEN   |
| 4166               | LH2 PREVALVE OPENING<br>SOLENOID (LV18, LV20, LV22)          | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4167               | LH2 PREVALVE CLOSING<br>SOLENOID (LV19, LV21, LV23)          | FAILS TO OPEN, EXTERNAL<br>LEAKAGE                             |
| 4168               | LH2 PREVALVE CLOSING<br>SOLENOID (LV19, LV21, LV23)          | FAILS TO REMAIN OPEN   |
| 4170               | LO2 FEEDLINE RELIEF SHUTOFF<br>VALVE CLOSING SOLENOID (LV24) | FAILS TO OPEN, EXTERNAL<br>LEAKAGE                             |
| 4171               | LO2 FEEDLINE RELIEF SHUTOFF<br>VALVE CLOSING SOLENOID (LV24) | FAILS TO REMAIN OPEN   |
| 4172               | LO2 FEEDLINE RELIEF SHUTOFF<br>VALVE CLOSING SOLENOID (LV24) | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4180               | LH2 FEEDLINE RELIEF SHUTOFF<br>VALVE CLOSING SOLENOID (LV25) | FAILS TO OPEN, EXTERNAL<br>LEAKAGE                             |
| 4181               | LH2 FEEDLINE RELIEF SHUTOFF<br>VALVE CLOSING SOLENOID (LV25) | FAILS TO REMAIN OPEN   |
| 4182               | LH2 FEEDLINE RELIEF SHUTOFF<br>VALVE CLOSING SOLENOID (LV25) | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4190               | HE SUPPLY BLOWDOWN VALVE<br>(LV26, LV27)                     | FAILS TO OPEN, EXTERNAL<br>LEAKAGE                             |
| 4192               | HE SUPPLY BLOWDOWN VALVE<br>(LV26, LV27)                     | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4202               | LO2 OUTBOARD FILL VALVE<br>OPENING SOLENOID (LV28)           | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4222               | LO2 INBOARD FILL VALVE<br>OPENING SOLENOID (LV30)            | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4224               | LO2 INBOARD FILL VALVE<br>CLOSING SOLENOID (LV31)            | FAILS TO REMAIN OPEN   |
| 4228               | LH2 OUTBOARD FILL VALVE<br>OPENING SOLENOID (LV32)           | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4234               | LH2 INBOARD FILL VALVE<br>OPENING SOLENOID (LV34)            | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4236               | LH2 INBOARD FILL VALVE<br>CLOSING SOLENOID (LV35)            | FAILS TO REMAIN OPEN,<br>EXTERNAL LEAKAGE                      |
| 4252               | LH2 REPLENISH VALVE OPENING<br>SOLENOID (LV39)               | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4260               | LO2 MANIFOLD REPRESS VALVE<br>(LV40, LV41)                   | FAILS TO OPEN, EXTERNAL<br>LEAKAGE                             |

| <u>MDAC ID</u> | <u>ITEM</u>  | <u>FAILURE MODE</u>                                      |
|----------------|--|--|
| 4261           | LO2 MANIFOLD REPRESS VALVE (LV40, LV41)                    | FAILS TO REMAIN OPEN                                     |
| 4281           | LO2 FEED DISCONNECT VALVE OPENING SOLENOID (LV46)          | FAILS TO REMAIN OPEN, EXTERNAL LEAKAGE                   |
| 4301           | LH2 FEED DISCONNECT VALVE OPENING SOLENOID (LV48)          | FAILS TO REMAIN OPEN, EXTERNAL LEAKAGE                   |
| 4322           | LH2 RECIRC DISCONNECT VALVE OPENING SOLENOID (LV50)        | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 4330           | LH2 RECIRC DISCONNECT VALVE CLOSING SOLENOID (LV51)        | FAILS TO OPEN, EXTERNAL LEAKAGE                          |
| 4331           | LH2 RECIRC DISCONNECT VALVE CLOSING SOLENOID (LV51)        | FAILS TO REMAIN OPEN                                     |
| 4340           | LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID (LV72)   | FAILS TO OPEN, EXTERNAL LEAKAGE                          |
| 4341           | LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID (LV72)   | FAILS TO REMAIN OPEN                                     |
| 4342           | LH2 FEED RTLS INBOARD DUMP VALVE OPENING SOLENOID (LV72)   | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 4350           | LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID (LV73)  | FAILS TO OPEN, EXTERNAL LEAKAGE                          |
| 4351           | LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID (LV73)  | FAILS TO REMAIN OPEN                                     |
| 4352           | LH2 FEED RTLS OUTBOARD DUMP VALVE OPENING SOLENOID (LV73)  | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 4362           | LH2 FEED MANIFOLD RTLS PRESS VALVE (LV74, LV75)            | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 4370           | LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76)          | FAILS TO OPEN, EXTERNAL LEAKAGE                          |
| 4371           | LO2 OVERBOARD BLEED VALVE CLOSING SOLENOID (LV76)          | FAILS TO REMAIN OPEN                                     |
| 4382           | LO2 POGO ACCUM RECIRC VALVE CLOSING SOLENOID (LV77, LV78)  | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 4392           | LH2 HI POINT BLEED VALVE OPENING SOLENOID (LV79)           | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |
| 4400           | LO2 PREVALVE REDUNDANT CLOSING SOLENOID (LV80, LV81, LV82) | FAILS TO OPEN, EXTERNAL LEAKAGE                          |
| 4401           | LO2 PREVALVE REDUNDANT CLOSING SOLENOID (LV80, LV81, LV82) | FAILS TO REMAIN OPEN                                     |
| 4412           | LO2 PREVALVE REDUNDANT OPENING SOLENOID (LV83, LV84, LV85) | FAILS TO CLOSE, FAILS TO REMAIN CLOSED, INTERNAL LEAKAGE |

| <u>MDAC<br/>ID</u> | <u>ITEM</u>  | <u>FAILURE MODE</u>   |
|--------------------|--|---|
| 4420               | LO2 TANK GND PRE-PRESS<br>(ORB/GND) DISC. (ORB HALF)<br>(PD9)  | FAILS TOA CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE |
| 4422               | LO2 TANK GND PRE-PRESS<br>(ORB/GND) DISC. (ORB HALF)<br>(PD9)  | EXTERNAL LEAKAGE  |
| 4430               | LH2 TANK GND PRE-PRESS<br>(ORB/GND) DISC. (ORB HALF)<br>(PD10) | FAILS TO CLOSE, FAILS TO<br>REMAIN CLOSED, INTERNAL<br>LEAKAGE  |
| 4432               | LH2 TANK GND PRE-PRESS<br>(ORB/GND) DISC. (ORB HALF)<br>(PD10) | EXTERNAL LEAKAGE  |
| 4460               | TEST PORT, PNEU HE OUTLET<br>(TP1)                             | EXTERNAL LEAKAGE  |
| 4490               | TEST PORT, LO2 PREPRESS DISC.<br>CHECK VALVE (TP9)             | EXTERNAL LEAKAGE  |
| 4500               | TEST PORT, LH2 PREPRESS DISC.<br>CHECK VALVE (TP10)            | EXTERNAL LEAKAGE  |
| 4510               | TEST PORT, PNEU SUPPLY<br>HELIUM (TP29)                        | EXTERNAL LEAKAGE  |
| 4530               | PNEU VALVE HE SUPPLY<br>REGULATOR (PR4)                        | RESTRICTED FLOW, FAILS TO<br>OPEN, EXTERNAL LEAKAGE             |
| 4540               | LO2 MANIF REPRESS REGULATOR<br>(PR5)                           | RESTRICTED FLOW, FAILS TO<br>OPEN, EXTERNAL LEAKAGE             |
| 4550               | LH2 MANIF REPRESS REGULATOR<br>(PR6)                           | RESTRICTED FLOW, FAILS TO<br>OPEN, EXTERNAL LEAKAGE             |
| 4570               | PNEU VALVE HE SUPPLY TANK<br>(TK4)                             | EXTERNAL LEAKAGE, STRUCTURAL<br>FAILURE (RUPTURE)               |
| 4580               | LO2 PREVALVE PNEU ACCUMULATOR<br>(AU5)                         | EXTERNAL LEAKAGE, STRUCTURAL<br>FAILURE (RUPTURE)               |
| 4590               | LH2 PREVALVE PNEU ACCUMULATOR<br>(AU6)                         | EXTERNAL LEAKAGE, STRUCTURAL<br>FAILURE (RUPTURE)               |
| 4630               | PNEUMATIC HE PRESSURE LINE<br>(.50" DIA)                       | STRUCTURAL FAILURE (RUPTURE)                                    |
| 4640               | PNEUMATIC HE PRESS VALVE<br>ACTUATION LINE (.25",.38" DIA)     | STRUCTURAL FAILURE (RUPTURE)                                    |
| 4650               | PNEUMATIC HELIUM INTERCONNECT<br>LINE (.63",1.00",.50" DIA)    | STRUCTURAL FAILURE (RUPTURE)                                    |
| 5001               | LO2 PREVALVE TOGGLE SWITCH                                     | FAILS (SHORTS) (FALSE OPEN<br>COMMAND)                          |
| 5002               | LO2 PREVALVE TOGGLE SWITCH                                     | FAILS (SHORTS) (FALSE CLOSE<br>COMMAND)                         |
| 5003               | FUSE (1A) (4 PER CIRCUIT)                                      | FAILS OPEN (INHIBIT CLOSE<br>COMMAND)                           |
| 5004               | FUSE (1A) (4 PER CIRCUIT)                                      | FAILS OPEN (INHIBIT OPEN<br>COMMAND)                            |
| 5011               | MDM (FA1)  | PREMATURE/ERRONEOUS OFF<br>(INHIBITS CLOSING SOLENOIDS)         |
| 5012               | MDM (FA2)  | PREMATURE/ERRONEOUS OFF<br>(INHIBITS CLOSING SOLENOIDS)         |

| <u>MDAC</u><br><u>ID</u> | <u>ITEM</u>  | <u>FAILURE MODE</u>   |
|--------------------------|--|---|
| 5013                     | MDM (FA3)  | PREMATURE/ERRONEOUS OFF<br>(INHIBITS CLOSING SOLENOIDS)             |
| 5014                     | MDM (FA4)  | PREMATURE/ERRONEOUS OFF<br>(INHIBITS CLOSING SOLENOIDS)             |
| 5031                     | HYBRID DRIVER, TYPE 3<br>(2 PER CIRCUIT)           | FAIL ON (FALSE OPEN COMMAND,<br>ACTIVATE LV12, LV14, LV16)          |
| 5033                     | HYBRID DRIVER, TYPE 1                              | FAIL OFF (INHIBIT LV12,<br>LV14, LV16)                              |
| 5035                     | DIODE, ISOLATION (12A)<br>(2 PER CIRCUIT)          | FAILS OPEN, FAILS TO CONDUCT<br>POWER                               |
| 5041                     | HYBRID DRIVER, TYPE 3<br>(2 PER CIRCUIT)           | FUSE FAIL OPEN (INHIBIT LV13,<br>LV15, LV17)                        |
| 5042                     | HYBRID DRIVER, TYPE 1                              | FAIL OFF (INHIBIT LV13, LV15,<br>LV17)                              |
| 5043                     | REMOTE POWER CONTROLLER<br>(2 PER CIRCUIT)         | PREMATURE/ERRONEOUS OFF<br>(INHIBIT LV13, LV15, LV17)               |
| 5044                     | DIODE, ISOLATION (12A)<br>(2 PER CIRCUIT)          | FAILS OPEN, FAILS TO CONDUCT<br>POWER (INHIBIT LV13, LV15,<br>LV17) |
| 5051                     | HYBRID DRIVER, TYPE 3<br>(2 PER CIRCUIT)           | FUSE FAIL OPEN (INHIBIT LV80,<br>LV81, LV82)                        |
| 5052                     | REMOTE POWER CONTROLLER<br>(2 PER CIRCUIT)         | PREMATURE/ERRONEOUS OFF<br>(INHIBIT LV80, LV81, LV82)               |
| 5053                     | DIODE, ISOLATION (12A)<br>(2 PER CIRCUIT)          | FAILS OPEN, FAILS TO CONDUCT<br>POWER (INHIBIT LV80, LV81,<br>LV82) |
| 5061                     | HYBRID DRIVER, TYPE 3<br>(2 PER CIRCUIT)           | FAIL ON (FALSE OPEN COMMAND,<br>ACTIVATE LV83, LV84, LV85)          |
| 5064                     | DIODE, ISOLATION (12A)<br>(2 PER CIRCUIT)          | FAILS OPEN, FAILS TO CONDUCT<br>POWER                               |
| 5071                     | DIODE (10 PER CIRCUIT)                             | FAILS OPEN (INHIBIT OPEN<br>COMMAND TO OPENING SOLENOIDS)           |
| 5072                     | DIODE (2 PER CIRCUIT)                              | FAILS OPEN (INHIBIT OPEN<br>COMMAND TO OPENING SOLENOIDS)           |
| 5073                     | DIODE (3 PER CIRCUIT)                              | FAILS OPEN (INHIBIT OPEN<br>COMMAND TO OPENING SOLENOIDS)           |
| 5074                     | DIODE (10 PER CIRCUIT)                             | FAILS OPEN (INHIBIT CLOSE<br>COMMAND TO CLOSING SOLENOIDS)          |
| 5075                     | DIODE (6 PER CIRCUIT)                              | FAILS OPEN (INHIBIT CLOSE<br>COMMAND TO CLOSING SOLENOIDS)          |
| 5076                     | DIODE (7 PER CIRCUIT)                              | FAILS OPEN (INHIBIT CLOSE<br>COMMAND TO CLOSING SOLENOIDS)          |
| 5121                     | LO2 FEEDLINE RELIEF SHUTOFF<br>VALVE TOGGLE SWITCH | FAIL SHORTED OPEN-TO-BUS<br>(ACTIVATE LV24)                         |
| 5122                     | LO2 FEEDLINE RELIEF SHUTOFF<br>VALVE TOGGLE SWITCH | FAIL PREMATURE OPEN-TO-BUS<br>(ACTIVATE LV24)                       |
| 5125                     | HYBRID DRIVER, TYPE 3 (AR42)                       | FUSE FAIL ON (ACTIVATE LV24)  |
| 5127                     | HYBRID DRIVER, TYPE 3 (AR30)                       | FUSE FAIL ON (ACTIVATE LV24)  |
| 5128                     | REMOTE POWER CONTROLLER<br>(RPC28)                 | FAIL ON/CLOSED (ACTIVATE<br>LV24)                                   |

| <u>MDAC ID</u> | <u>ITEM</u>                                | <u>FAILURE MODE</u>                          |
|----------------|--|--|
| 5129           | REMOTE POWER CONTROLLER (RPC32)            | FAIL ON/CLOSED (ACTIVATE LV24)               |
| 5130           | REMOTE POWER CONTROLLER (RPC32)            | FAIL OPEN (INHIBIT LV24)                     |
| 5132           | MDM (FA3)                                  | PREMATURE/ERRONEOUS ON (ACTIVATE LV24)       |
| 5134           | MDM (FA1)                                  | PREMATURE/ERRONEOUS ON (ACTIVATE LV24)       |
| 5136           | MDM (FA2)                                  | PREMATURE/ERRONEOUS ON (ACTIVATE LV24)       |
| 5141           | LO2 PROPELLENT DUMP SEQUENCE TOGGLE SWITCH | SHORTS (PREMATURE DUMP START)                |
| 5142           | LO2 PROPELLENT DUMP SEQUENCE TOGGLE SWITCH | FAIL OPEN (DUMP IS NOT STARTED)              |
| 5143           | FUSE (F31, F32)                            | FAIL OPEN (DUMP IS NOT STARTED)              |
| 5165           | FUSE                                       | FAIL OPEN (PREMATURE DEACTIVATE LV28)        |
| 5168           | HYBRID DRIVER, TYPE 3                      | FAIL OFF (PREMATURE DEACTIVATION LV28)       |
| 5169           | HYBRID DRIVER, TYPE 3                      | FAIL ON (PREMATURE ACTIVATION OF LV29)       |
| 5506           | FUSE (2) (1A)                              | FAIL PREMATURE OFF (INHIBIT LV30)            |
| 5507           | FUSE (1A)                                  | FAIL OPEN/PREMATURE OFF (INHIBIT LV31)       |
| 5511           | HYBRID DRIVER, TYPE 3                      | FAIL ON THE OPEN COMMAND                     |
| 5512           | HYBRID DRIVER, TYPE 3                      | FAIL PREMATURE/ERRONEOUS ON THE OPEN COMMAND |
| 5513           | HYBRID DRIVER, TYPE 3                      | FAIL PREMATURE OFF (INHIBIT LV30)            |
| 5514           | HYBRID DRIVER, TYPE 3                      | FAIL OPEN/PREMATURE OFF (INHIBIT LV31)       |
| 5515           | HYBRID DRIVER, TYPE 3                      | FAIL ON (PREMATURE/ERRONEOUS ACTIVATE LV31)  |
| 5551           | HYBRID DRIVER, TYPE 3                      | FUSE FAIL OPEN (INHIBIT LV76)                |
| 5552           | HYBRID DRIVER, TYPE 3                      | FUSE FAIL OPEN (INHIBIT LV76)                |
| 5553           | HYBRID DRIVER, TYPE 1                      | FUSE FAIL OPEN (INHIBIT LV76)                |
| 5554           | REMOTE POWER CONTROLLER (RPC24)            | FAIL OPEN (INHIBIT LV76)                     |
| 5555           | REMOTE POWER CONTROLLER (RPC23)            | FAIL OPEN (INHIBIT LV76)                     |
| 5556           | MDM (FA2)                                  | PREMATURE/ERRONEOUS OFF (INHIBIT LV76)       |
| 5557           | MDM (FA3)                                  | PREMATURE/ERRONEOUS OFF (INHIBIT LV76)       |
| 5558           | MDM (FA4)                                  | PREMATURE/ERRONEOUS OFF (INHIBIT LV76)       |
| 5559           | DIODE (12A)                                | FAIL OPEN/SHORT (INHIBIT LV76)               |

| <u>MDAC ID</u> | <u>ITEM</u>                             | <u>FAILURE MODE</u>                           |
|----------------|---|---|
| 5560           | DIODE (12A)                             | FAIL OPEN/SHORT (INHIBIT LV76)                |
| 5561           | DIODE                                   | FAIL OPEN/SHORT (INHIBIT LV76)                |
| 5766           | REMOTE POWER CONTROLLER (RPC 19)        | FAILS PREMATURE/OFF (INHIBIT LV46)            |
| 5767           | REMOTE POWER CONTROLLER (RPC 20)        | FAILS PREMATURE/OFF (INHIBIT LV46)            |
| 5771           | HYBRID DRIVER, TYPE 3                   | FAIL ON (FALSE CLOSE COMMAND)                 |
| 5772           | HYBRID DRIVER, TYPE 1                   | PREMATURE/ERRONEOUS ON (FALSE CLOSE COMMAND)  |
| 5773           | HYBRID DRIVER, TYPE 3                   | FAIL ON (FALSE CLOSE COMMAND)                 |
| 5774           | REMOTE POWER CONTROLLER (RPC 20)        | FAIL ON/CLOSED                                |
| 5775           | REMOTE POWER CONTROLLER (RPC 21)        | FAIL ON/CLOSED                                |
| 5778           | DIODE (12A)                             | FAIL OPEN (INHIBIT LV47)                      |
| 5779           | DIODE (12A)                             | FAIL OPEN (INHIBIT LV47)                      |
| 6012           | HYBRID DRIVER CONTROLLER (6)            | FAIL OPEN                                     |
| 6013           | REMOTE POWER CONTROLLER (4)             | FAIL OPEN, FAIL CLOSED, INADVERTENT OPERATION |
| 6014           | ISOLATION AND BLOCKING DIODES (6)       | FAIL OPEN                                     |
| 6015           | FLIGHT CRITICAL AFT MDM (3)             | FAIL ON, FAIL OFF                             |
| 6016           | INDICATOR SWITCH (PD2)                  | FAIL OPEN, FAIL TO TRANSFER                   |
| 6026           | FLIGHT CRITICAL AFT MDM (FA1, FA3, FA4) | FAIL ON, INADVERTENT OPERATION                |
| 6071           | FUSE, 1A (3)                            | FAIL OPEN                                     |
| 6072           | TOGGLE SWITCH                           | FAIL OPEN                                     |
| 6073           | TOGGLE SWITCH                           | FAIL SHORTED                                  |
| 6075           | HYBRID DRIVER CONTROLLER                | INADVERTENT OUTPUT (SHORTED)                  |
| 6078           | MDM (FA1, 2, LA1)                       | FAIL ON, INADVERTENT OPERATION                |
| 6081           | 1A FUSE                                 | FAIL OPEN                                     |
| 6082           | TOGGLE SWITCH, 32V73A438                | FAIL OPEN                                     |
| 6085           | HYBRID DRIVER CONTROLLER                | INADVERTENT OUTPUT, SHORTED                   |
| 6086           | ISOLATION DIODE (4)                     | FAIL OPEN                                     |
| 6088           | MDM                                     | FAIL OPEN, INADVERTENT OUTPUT                 |
| 6102           | REMOTE POWER CONTROLLER (2)             | FAIL OPEN, INADVERTENT OPERATION              |
| 6103           | HYBRID DRIVER CONTROLLER                | FAIL OPEN                                     |
| 6105           | TOGGLE SWITCH                           | FAIL SHORTED, INADVERTENT OPERATION           |
| 6108           | ISOLATION DIODE (3)                     | FAIL OPEN                                     |
| 6109           | MDM (FA1, FA3, FA4)                     | FAIL OPEN                                     |
| 6121           | HYBRID DRIVER CONTROLLER                | FAIL ON, SHORTED, INADVERTENT OUTPUT          |
| 6122           | HYBRID DRIVER CONTROLLER                | FAIL OPEN                                     |

| <u>MDAC<br/>ID</u> | <u>ITEM</u>                                | <u>FAILURE MODE</u>                            |
|--------------------|--|--|
| 6123               | FUSE (3)                                   | FAIL OPEN                                      |
| 6141               | MDM (FA4)                                  | FAILS OPEN, INADVERTENT<br>OPERATION, FAILS ON |
| 6142               | HYBRID DRIVER CONTROLLER (2)               | FAIL OPEN                                      |
| 6155               | HYBRID DRIVER CONTROLLER,<br>TYPE I (6)    | FAIL OPEN, FAIL SHORTED                        |
| 6156               | HYBRID DRIVER CONTROLLER,<br>TYPE III (12) | FAIL OPEN, FAIL SHORTED                        |
| 6157               | ISOLATION DIODES, 12A (18)                 | FAIL OPEN                                      |
| 6158               | ISOLATION DIODES, 4.2A (3)                 | FAIL OPEN                                      |
| 6159               | ISOLATION DIODE (36)                       | FAIL OPEN                                      |
| 6160               | MODULATOR DEMODULATOR (4)                  | FAIL OPEN, FAIL SHORTED,<br>ERRONEOUS OUTPUT   |
| 7110               | FUSE, 1AMP (9)                             | OPEN, FAILS TO CONDUCT                         |
| 7120               | TOGGLE SWITCH, 1P3T (3)                    | OPEN, FAILS TO TRANSFER,<br>SHORTED            |
| 7130               | TOGGLE SWITCH, 2P3T (3)                    | OPEN, FAILS TO TRANSFER,<br>SHORTED            |
| 7160               | ISOLATION DIODES (6)                       | SHORTED, OPEN                                  |
| 7170               | ISOLATION DIODES (9)                       | FAILS OPEN                                     |
| 7180               | ISOLATION DIODES (3)                       | FAILS OPEN                                     |
| 7190               | MDM, FLIGHT AFT 1,2,3,4                    | FAILS OPEN, ERRONEOUS<br>OUTPUT (OFF)          |
| 7210               | FUSE, 1AMP (6)                             | OPEN, FAILS TO CONDUCT                         |
| 7220               | TOGGLE SWITCH, 2P3T (3)                    | OPEN, FAILS TO TRANSFER,<br>SHORTED            |
| 7231               | ISOLATION DIODES (6)                       | SHORTED  |
| 7260               | ISOLATION DIODES (12)                      | FAILS OPEN                                     |









**MCDONNELL DOUGLAS ASTRONAUTICS COMPANY - HOUSTON  
16055 SPACE CENTER BLVD, HOUSTON, TEXAS 77062**