INDEPENDENT ORBITER ASSESSMENT

ANALYSIS OF THE HYDRAULICS/
WATER SPRAY BOILER SUBSYSTEM

19 DECEMBER 1986
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15 December 1986

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MCDONNELL DOUGLAS ASTRONAUTICS COMPANY
HOUSTON DIVISION

SPACE TRANSPORTATION SYSTEM ENGINEERING AND OPERATIONS SUPPORT

WORKING PAPER NO. 1.0-WP-VA86001-20
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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 Hydraulics/Water Spray Boiler Subsystem.

The hydraulic system provides hydraulic power to gimbal the main engines, actuate the main engine propellant control valves, move the aerodynamic flight control surfaces, lower the landing gear, apply wheel brakes, steer the nosewheel, and dampen the external tank/umbilical plate at external tank (ET) separation. Each hydraulic system has an associated water spray boiler which is used to cool the hydraulic fluid and APU lubricating oil. This analysis breaks the hydraulic system into four divisions.

- Water Spray Boiler (WSB)
- Electrical Power Distribution and Control - Water Spray Boiler (EPD&C - WSB)
- Hydraulics (HYD)
- Electrical Power Distribution and Control - Hydraulics (EPD&C - HYD)

The IOA analysis process utilized available HYD/WSB hardware drawings, schematics and documents for defining hardware assemblies, components, and hardware items. Each level of hardware was evaluated and analyzed for possible failure modes and effects. Criticality was assigned based upon the severity of the effect for each failure mode.

Figure 1 presents a summary of the failure criticalities for each of the four major divisions of the HYD/WSB subsystem. A summary of the number of failure modes, by criticality, is also presented below with Hardware (HW) criticality first and Functional (F) criticality second.
### HYDRAULICS/WATER SPRAY BOILER OVERVIEW ANALYSIS SUMMARY

#### HYD/WSB ANALYSIS SUMMARY

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#### EPD&C - WATER SPRAY BOILER

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#### HYDRAULICS SUBSYSTEM

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#### EPD&C - HYDRAULICS

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**CRIT** - CRITICALITY  
**FM** - FAILURE MODE  
**PCI** - POTENTIAL CRITICAL ITEM
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:

<table>
<thead>
<tr>
<th>Summary of IOA Potential Critical Items (HW/F)</th>
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<tbody>
<tr>
<td>Criticality:</td>
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Of the 430 failure modes analyzed, 166 were determined to be PCIs.
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 available drawings, schematics and documents to breakdown 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 to be 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 HYD/WSB Ground Rules and Assumptions

The HYD/WSB ground rules and assumptions used in the IOA are defined in Appendix B. The subsystem specific ground rules were defined to provide necessary additions and clarifications to the ground rules and assumptions contained in NSTS 22206.
3.0 SUBSYSTEM DESCRIPTION

3.1 Design and Function

The hydraulic subsystem is made up of three independent hydraulic systems, each with its own APU/pump, reservoir, water spray boiler for APU lube oil and hydraulic fluid cooling, and distribution systems. A typical system is shown in Figure 2.

Water Spray Boiler

The water spray boiler (WSB) system consists of three identical independent units, one for each APU/hydraulic system. Each WSB is used while its associated APU is active in order to cool the APU lubricating oil and the Orbiter hydraulic fluid. Each WSB consists of the following components:

- Water tank with gaseous nitrogen (GN2) pressurization
- Internal boiler
- Electronic controllers (two per system)
- Heaters
- Temperature and pressure sensors

The WSB stores water in a bellows-type storage tank, which is pressurized by nitrogen to provide positive water expulsion to feed the boiler. The WSB system operates in either a pool or spray mode. The hydraulic fluid and APU lubricating oil pass through the boiler in a set of tubes which are either immersed in water (pool mode) or sprayed with water from three hydraulic fluid water spray bars and two APU lube oil water spray bars (spray mode).

During ascent and entry the boiler operates in the pool mode. As the vehicle ascends, the APU lube oil heats up. Eventually the boiler water precharge boils off, and the boiler goes into the spray mode (the hydraulic fluid usually does not heat up enough during ascent to require any spray cooling). During the lower part of entry, when the boiler temperature (i.e., the boiling point of water) reaches 188 degrees F, the WSB returns to the pool mode. The spray bars begin discharging water to fill the boiler. As the water reaches the liquid level sensors, the spray is turned off to prevent the boiler from overfilling. The water that is boiled off exits the Orbiter through a steam duct located to the right of the vertical stabilizer.

EPD&C - Water Spray Boiler

The EPD&C support for a typical Water Spray Boiler unit is illustrated in Figure 3. The EPD&C system provides ac and dc power to the WSB related transducers, signal conditioners and logic circuits. Remote power controllers (RPC) in the Aft Power
Figure 2 - HYDRAULICS/WATER SPRAY BOILER DIAGRAM
EPD&C - WATER SPRAY BOILER

Figure 3 - EPD&C - WATER SPRAY BOILER DIAGRAM

AC BUS

CNTL BUS

BOILER CNTRL
PWR/HTR

MN BUS

AFT

PCA

RPCS

BOILER CNTRL

R2

MN BUS

AFT

LCA

DRIVERS

HYDRAULIC
FLUID BYPAS

WATER FEED

VALVES

WSB, H2O TANK

HEATERS

LIQUID LEVEL

SENSORS

CONTROLLER A

CONTROLLER B

BOILER GN2 SUPPLY
Control Assembly (PCA) provide the 28 Vdc required to operate the WSB heaters and solenoid and motor operated valves. Hybrid circuit drivers in aft load control assemblies (LCA) supply power to the boiler control circuits and GN2 supply control circuits respectively in the boiler controllers. Control voltage required to activate the drivers are supplied through boiler control switches located on Orbiter panel R2.

The WSB has two redundant controllers, A and B. Only one controller is used at a time. The controller regulates the water spray and the hydraulic fluid bypass valve (bypasses WSB at 190 degrees F; flows through WSB at 210 degrees F) based on fluid outlet temperature transducers. Controller A provides for computation of WSB water tank quantity by the SM GPC based on water tank temperature transducer and GN2 line pressure readings. Controller B is identical to Controller A except that the following outputs are lost.

- H2O quantity computation
- GN2 tank temperature
- GN2 regulator pressure
- H2O tank pressure
- Hydraulic bypass valve position indicator

The water boiler, water tank, and steam vent are equipped with heaters to prevent freeze-up in orbit. The heaters are cycled automatically by the WSB controller. Each controller controls one set of redundant heaters.

Hydraulic System

The hydraulic system provides the hydraulic power to operate the aerosurface controls (elevons, rudder/speed brake, and body flap), ET umbilical retractors (LH2 and LO2), SSME thrust vector control actuators, SSME control valves, landing gear retract and deployment, main wheel brakes and antiskid control, and nosewheel steering. Hydraulic power is generated by APU driven pumps. Two operational systems are required to provide the maximum aerosurface rotational rates needed for worst-case descent conditions.

Each hydraulic system uses a hydraulic fluid reservoir, which stores and provides fluid to the inlet side of an APU-driven variable-displacement pump. Upon demand, the fluid is pumped through a check valve, a filter, and fluid lines which incorporate a precharged accumulator. The accumulator serves to absorb system pressure surges by means of a priority valve and provides pressurization to the reservoir. An electric motor driven constant displacement circulation pump provides low pressure hydraulic power for hydraulic system thermal conditioning and high pressure hydraulic power for accumulator recharging during the on-orbit flight phase.
**EPD&C - Hydraulics**

The EPD&C support to the hydraulics system is illustrated in Figure 4. The switches, PBIs and circuit breakers which allow the crew to configure and control the EPD&C, and the components of the hydraulic system are located on panels on the flight deck. The electrical power is controlled and distributed by use of power controller assemblies and load controller assemblies. These assemblies are comprised of buses, resistors, fuses, diodes, and remote switching devices (remote power controllers, hybrid circuit drivers, and relays). The power controller assemblies and load controller assemblies distribute dc power to all the system loads using remote switching devices.

The EPD&C provides power to the following hydraulic components.

- Heaters
- Circulation Pumps
- Main Pump Depress Solenoid
- Landing Gear Retract/Circ. Valve
- MPS/TVC Isolation Valve
- Landing Gear Isolation Valve
- Orbiter/ET Umbilical Actuators
- Temperature and Pressure Transducers

### 3.2 Interfaces and Locations

The locations of the hydraulics and water spray boiler components on the Orbiter are shown in Figure 5.

The hydraulics system interfaces with and provides power to the aerosurface controls (elevons, rudder/speedbrake, and body flap), ET umbilical actuators (LH2 and LO2), SSME thrust vector control actuators, SSME control valves, landing gear retract and deploy actuators, main wheel brakes and antiskid control, and nosewheel steering.

The water spray boiler interfaces with the hydraulics system and the APU to provide cooling for the hydraulic fluid and APU lube oil. In addition to this cooling interface, the hydraulics system interfaces with the environmental control and life support system to absorb heat from the Freon heat exchanger.

Both the hydraulics system and the water spray boiler interface with the EPD&C system, the Display and Control (D&C) system, the instrumentation system, and the GPC software. The EPD&C system provides the electric power and the control assemblies for motors and valves. The D&C system provides the capability for the crew to monitor, configure or manually control the systems where necessary. The instrumentation system processes the performance parameters required for system monitoring and control. The GPC software provides automatic control for hydraulic fluid thermal
Figure 4 - EPD&C - HYDRAULICS DIAGRAM

**AFFECTS CIRCULATION PUMP.**
**MDM IS USED FOR PRE-FLIGHT OPERATIONS.**
Figure 5 - HYDRAULICS AND WATER SPRAY BOILER COMPONENT LOCATIONS
conditioning, accumulator pressure maintenance and landing gear isolation valve positioning. It also provides priority rate limiting which automatically manages loads on the remaining hydraulic systems or system if one or two hydraulic systems are lost for ascent or entry.

3.3 Hierarchy

Figure 6 illustrates the hierarchy of the HYD/WSB hardware and the corresponding components used for purposes of analysis. Figures 7 through 25 comprise the detailed system representations.
Figure 6 - HYDRAULICS/WATER SPRAY BOILER ANALYSIS HIERARCHY
WATER SPRAY BOILER

Figure 7 - WATER SPRAY BOILER

1. WATER SPRAY BOILER

2. 1

3. 2

BOILER ASSEMBLY

WATER TANK ASSEMBLY

GN2 SYSTEM

HYD. BYPASS/RELIEF VALVE
Figure 8 - BOILER ASSEMBLY
Figure 10 - GN2 SYSTEM
Figure 11 - HYDRAULIC BYPASS/RELIEF VALVE
Figure 12 - EPD&C WATER SPRAY BOILER
Figure 13 - WSB CONTROLLERS
Figure 14 - HYDRAULIC SYSTEM
Figure 15 - ACCUMULATOR ASSEMBLY
Figure 16 - SSME HYDRAULIC ACCUMULATOR ASSEMBLY
Figure 17 - CIRCULATION PUMP ASSEMBLY
HYDRAULIC DISTRIBUTION, MONITOR AND CONTROL

Figure 18 - HYDRAULIC DISTRIBUTION, MONITOR AND CONTROL
Figure 19 - MAIN PUMP ASSEMBLY
Figure 21 - E.T. UMBILICAL RETRACT ACTUATOR ASSEMBLY
Figure 22 - DRAIN SYSTEM
Figure 23 - FILTER MODULE
Figure 24 - FREON HEAT EXCHANGER
Figure 25 - EPD&C HYDRAULICS
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 for each of the four major subdivisions of the HYD/WSB. Further discussion of each of these subdivisions and the applicable failure modes is provided in subsequent paragraphs. The HYD/WSB analysis hierarchy is illustrated in Figure 6.

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<td>TOTAL</td>
<td>3</td>
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<td>-</td>
<td>89</td>
<td>2</td>
<td>190</td>
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Of these 430 failure modes analyzed, 166 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 worksheet in Appendix C.

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<td>TOTAL</td>
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<td>146</td>
<td>-</td>
<td>15</td>
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4.1 Analysis Results - Water Spray Boiler

The Water Spray Boiler analysis identified 74 failure modes. The WSB analysis breakdown is illustrated in Figures 7 through 11. Most of the failure modes were identified as criticality 2/1R, 3/1R or 3/3. Two PCIs were identified and are listed in Appendix D.

4.2 Analysis Results - EPD&C - Water Spray Boiler

The EPD&C - Water Spray Boiler analysis identified 23 failure modes. The EPD&C - WSB analysis breakdown is illustrated in Figures 12 and 13. Most of the failure modes were 3/1R or 3/3. Three PCIs were identified and are listed in Appendix D.

4.3 Analysis Results - Hydraulic System

The Hydraulics System analysis identified 218 failure modes. The analysis breakdown is illustrated in Figures 14 through 24. Most of the failure modes were 2/1R or 3/3. One hundred and four (104) PCIs were identified and are listed in Appendix D.

It should be noted that contamination of all three hydraulic systems during turnaround servicing was not considered a "single credible event" in evaluating Redundancy Screen C (see paragraph B.3.8) since this was considered a ground operations concern. However, the significant number of inflight hydraulic system anomalies attributed to contamination suggests that it should be analyzed independently as a potential cause of critical failure modes. Without this assumption, all hydraulic failure modes that list contamination as a cause would fail Screen C.

4.4 Analysis Results - EPD&C - Hydraulics

The EPD&C - Hydraulics analysis identified 115 failure modes. The analysis breakdown is illustrated in Figure 25. Twenty-eight (28) PCIs were identified and are listed in Appendix D.
5.0 REFERENCES

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

2. VS70-958109, Integrated System Schematic Hydraulics, Rev. E
3. VS70-958099, Integrated System Schematic Hydraulics, Rev. A, 4-22-82
4. VS70-580996, Schematic-Hydraulic Subsystem, Rev. A, 5-30-85
5. VS70-580999, Schematic-Hydraulic Subsystem, Rev. B, 12-17-84
6. JSC-12770, Shuttle Flight Operations Manual, Volume 9, Auxiliary Power Unit/Hydraulics, Basic, 3-16-81
7. JSC 12820, STS Operational Flight Rules, Final PCN-3, 6-28-85
9. NSTS 22206, Instructions for Preparation of Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL), 10-10-86
### APPENDIX A
#### ACRONYMS

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<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>AOA</td>
<td>Abort Once Around</td>
</tr>
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<td>APU</td>
<td>Auxiliary Power Unit</td>
</tr>
<tr>
<td>ASSY</td>
<td>Assembly</td>
</tr>
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<td>Criticality</td>
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<tr>
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<td>Gallons Per Minute</td>
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<td>Water</td>
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<td>Power Control Assembly</td>
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<tr>
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<tr>
<td>PSI</td>
<td>Pounds Per Square Inch</td>
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RI - Rockwell International
RM - Redundancy Management
RPC - Remote Power Controller
RTLS - Return to Launch Site
SM - Systems Management
SRB - Solid Rocket Booster
SSME - Space Shuttle Main Engine
STS - Space Transportation System
SW - Software
TAL - Transatlantic Abort Landing
TD - Touch Down
TVC - Thrust Vector Control
WSB - Water Spray Boiler
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
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.3 HYD/WSB-Specific Ground Rules and Assumptions

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

1. Where redundant systems perform non-identical functions (e.g. hydraulics systems 1 and 2), use worst case system.

RATIONALE: Need to identify worst case effect.

2. Pyro's for lowering landing gears are "unlike redundant" to hydraulic system 1.

RATIONALE: Pyro's are sufficient to lower the landing gear in absence of an interfering hydraulic system 1 failure.

3. In analysis cases where the meaning of hardware item redundancy seems ambiguous, redundancy is understood to mean that there is one or more systems that are redundant to the system in which the hardware item occurs.

RATIONALE: This is the most conservative assumption for purposes of determining criticality.

4. Loss of redundancy means loss of all capability to perform function.

RATIONALE: Maintain uniform usage within project.

5. Caps and fittings for quick disconnects are considered one component.

RATIONALE: This is the most conservative assumption.

6. For purposes of criticality evaluations during aborts, assume SSME induced aborts.

RATIONALE: This is the most conservative assumption.
7. Leaks (GN2, hydraulic fluid, water) are sufficiently prolonged in time to allow recognition and response.

RATIONALE: This assumption allows for non-trivial case analysis.

8. Contamination of all three hydraulic systems during turnaround servicing is not considered a "single credible event" in evaluating Redundancy Screen C.

RATIONALE: This is considered a ground operations problem although the significant number of inflight hydraulic system anomalies attributed to contamination suggests that it should be analyzed independently as a potential cause of critical failure modes. Without this assumption, all hydraulic failure modes that list contamination as a cause would fail screen C.
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
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 101

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: WATER SPRAY BOILER ASSEMBLY
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

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<td>AOA:</td>
<td>2/1R</td>
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<tr>
<td>DEORBIT:</td>
<td>2/1R</td>
<td>ATO:</td>
<td>2/1R</td>
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<tr>
<td>LANDING/SAFING</td>
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LOCATION: 50V58HX4 (VS70-580999B)
PART NUMBER: MC250-0019-0501

CAUSES: CONTAMINATION, CORROSION, FREEZING

EFFECTS/RATIONALE:
SYSTEM DEGRADATION, OVERHEATING OF HYDRAULIC FLUID AND LUBE OIL.
LOSS OF SYSTEM. WATER FLOW RATE NOT SUFFICIENT TO PROVIDE PROPER COOLING.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-2
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 102

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: WATER SPRAY BOILER ASSEMBLY
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) 
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES

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LOCATION: 50V58HX4 (VS70-580999B)
PART NUMBER: MC250-0019-0501

CAUSES: MECHANICAL SHOCK, CORROSION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF FLUID, LOSS OF THERMAL CONTROL AND POSSIBLE LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-3
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 103

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: LINES AND FITTINGS (GN2-WATER)
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) LINES AND FITTINGS (GN2-WATER)

CRITICALITIES

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LOCATION: 5058HX4 (VS70-580999B)
PART NUMBER:

CAUSES:

EFFECTS/RATIONALE:
LOSS OF H2O OR GN2 DEGRADES THE HYDRAULIC FLUID AND LUBE OIL COOLING, LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-4
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 104

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: HEAT EXCHANGER ASSEMBLY
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) HEAT EXCHANGER ASSY

CRITICALITIES

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LOCATION: 5058HX4 (VS70-580999B)
PART NUMBER:

CAUSES: CONTAINMENT

EFFECTS/RATIONALE:
LOSS OF THERMAL CONTROL, OVERHEATING OF THE FLUID - LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86
C-5
**INDEPENDENT ORBITER ASSESSMENT**  
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

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**ITEM:** HEAT EXCHANGER ASSY  
**FAILURE MODE:** EXTERNAL LEAKAGE  

**LEAD ANALYST:** J. DUVAL  
**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**
1) WATER SPRAY BOILER  
2) WATER SPRAY BOILER ASSY  
3) HEAT EXCHANGER ASSY

**CRITICALITIES**

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**REDUNDANCY SCREENS:**

**LOCATION:** 50V58HX4 (VS70-580999B)

**PART NUMBER:**

**CAUSES:** CORROSION, VIBRATION, MECHANICAL SHOCK, POROSITY

**EFFECTS/RATIONALE:**
LOSS OF HYDRAULIC FLUID AND LUBE OIL. OVERHEATING OF FLUIDS AND LOSS OF SYSTEM AND CONTAMINATION AND STOPPAGE OF THE WATER SPRAY BARS.

**REFERENCES:** VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE 12/23/86**  
C-6
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86
SUBSYSTEM: HYD/WSB
MDAC ID: 106

ITEM: HEAT EXCHANGER ASSY
FAILURE MODE: CORE LEAKAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) HEAT EXCHANGER ASSY
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LOCATION: 50V58HX4 (VS70-580999B)
PART NUMBER: 50V58HX4 (VS70-580999B)

CAUSES: CORROSION, VIBRATION, MECHANICAL SHOCK, POROSITY

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC FLUID AND LUBE OIL. OVERHEATING OF FLUIDS WITH POSSIBLE LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-7
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86
SUBSYSTEM: HYD/WSB
MDAC ID: 107

ITEM: HEAT EXCHANGER ASSY
FAILURE MODE: HEADER LEAKAGE

LEAD ANALYST: J. DUVAL

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) HEAT EXCHANGER ASSY

CRITICALITIES

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LOCATION: 50V58HX4 (VS70-580999B)
PART NUMBER:

CAUSES: CORROSION, VIBRATION, MECHANICAL SHOCK, POROSITY

EFFECTS/RATIONALE:
NO EFFECT ON SYSTEM COOLING, POSSIBLE MIXING OF APU LUBE OIL AND HYDRAULIC FLUID.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 108

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/IR
ABORT: 2/IR

ITEM: SPRAY VALVE (WATER SUPPLY)
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) SPRAY VALVE (WATER SUPPLY)
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LOCATION: 50V58MT109 (VS70-580999B)

PART NUMBER:

CAUSES: CORROSION, SHOCK, VIBRATION, JAMMING

EFFECTS/RATIONALE:
CANNOT TRANSFER WATER TO SPRAY BARS. HYDRAULIC FLUID AND LUBE OIL CANNOT BE COOLED, LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-9
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 109

ITEM: SPRAY VALVE (WATER SUPPLY)
FAILURE MODE: FAILS TO CLOSE/LEAKAGE

LEAD ANALYST: J. DUVAL
LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) SPRAY VALVE (WATER SUPPLY)
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LOCATION: 50V58MT109 (VS70-580999B)
PART NUMBER:

CAUSES: BINDING, JAMMING, CORROSION, SHOCK, DAMAGED SEAT

EFFECTS/RATIONALE:
DEPLETES H2O SUPPLY, HYDRAULIC FLUID, LUBE OIL OVERHEATS, LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-10
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 110
ITEM: SPRAY VALVE (WATER SUPPLY)
FAILURE MODE: ELECTRICAL SHORT OR OPEN
LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) SPRAY VALVE (WATER SUPPLY)
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LOCATION: 50V58MT109 (VS70-580999B)
PART NUMBER: CAUSES: VIBRATION, MECHANICAL SHOCK, INSULATION BREAKDOWN

EFFECTS/RATIONALE:
VALVE REMAINS IN LAST COMMANDED POSITION. SWITCHING REDUNDANT TO CONTROLLER ACTIVATES THE REDUNDANT COIL AND RESTORES NORMAL OPERATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-11
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 11

ITEM: BOILER TANK TEMP SENSORS
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) BOILER TANK TEMP SENSOR

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CORROSION, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
FALSE READINGS TO THE CONTROLLER. OPEN CIRCUIT WOULD SEND "COLD" TEMP READINGS TO THE CONTROLLER. REDUNDANT HEATERS FOR BOILER AND WATER TANK ARE AVAILABLE USING REDUNDANT CONTROLLER.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-12
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 112

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: BOILER TANK TEMP SENSORS
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) BOILER TANK TEMP SENSOR
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: SHORT TO GROUND

EFFECTS/RATIONALE:
FALSE READING (HOT) TO THE CONTROLLER CAUSING THE HEATERS TO BE
TURNED OFF BY THE CONTROLLERS UNTIL HEATERS OR CB OPEN. H2O IN
THE TANK WOULD FREEZE. REDUNDANT CONTROLLER RESTORES NORMAL
OPERATION TO BOILER AND WATER TANK HEATERS.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-13
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 113

ITEM: BOILER TANK TEMP SENSORS
FAILURE MODE: OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) BOILER TANK TEMP SENSOR
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, CALIBRATION SHIFT

EFFECTS/RATIONALE:
ERRACTIC SIGNALS TO THE CONTROLLER RESULTING IN ERRACTIC TEMP CONTROL OF THE BOILER AND WATER TANK. REDUNDANT HEATERS AVAILABLE USING REDUNDANT CONTROLLER. ERRATIC H2O TANK HEATER OPERATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-14
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/1R
MDAC ID: 114  ABORT: 2/1R

ITEM: BOILER TANK HEATERS
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: J. DUVAL    SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) BOILER TANK HEATERS
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LOCATION: 5058HX4 (VS70-580999B)

PART NUMBER: 5058HX4 (VS70-580999B)

CAUSES: CORROSION, VIBRATION

EFFECTS/RATIONALE:
HEATERS PREVENT A FREEZEUP IN ORBIT. THE TANK IS EXPOSED TO SPACE THROUGH THE STEAM DUMP NOZZLE. SWITCHING TO THE REDUNDANT CONTROLLER TO ACTIVATE THE SECONDARY HEATERS.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86    C-15
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 115

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: BOILER TANK HEATERS
FAILURE MODE: SHORTED

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON


LOCATION: 5058HX4 (VS70-580999B)
PART NUMBER: 5058HX4 (VS70-580999B)

CAUSES: CORROSION, VIBRATION

EFFECTS/RATIONALE:
A SHORT TO GROUND WILL CAUSE THE HEATER ELEMENT CB TO OPEN AND THE EFFECT WILL BE THE SAME AS FOR ELECTRICAL THE OPEN CONDITION. SWITCH TO REDUNDANT CONTROLLER.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-16
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 116

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: STEAM VENT RELIEF VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) STEAM VENT RELIEF VALVE
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LOCATION: 50V58P34(VS70-580999B)
PART NUMBER:

CAUSES: CORROSION, JAMMING, BINDING

EFFECTS/RATIONALE:
VALVE REQUIRED IF STEAM DUMP NOZZLE FLOW IS RESTRICTED (SECOND FAILURE).

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-17
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB
MDAC ID: 117

ITEM: STEAM DUMP NOZZLE
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) STEAM DUMP NOZZLE
4) 
5) 
6) 
7) 
8) 
9) 

CRITICALITIES

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LOCATION: 50V58NZ1(VS70-580999B)
PART NUMBER:

CAUSES: LOSS OF HEATER

EFFECTS/RATIONALE:
DURING BOILER OPERATION THE STEAM WOULD HAVE NO ESCAPE ROUTE, ACTIVATING THE STEAM VENT RELIEF VALVE. LOSS OF SYSTEM. REDUNDANT CONTROLLER WILL RESTORE NORMAL/OPERATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-18
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 118

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: HYDRAULIC/LUBE OIL WATER FILTERS
FAILURE MODE: LOSS OF FLOW

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) HYDRAULIC/LUBE OIL WATER FILTERS
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CRITICALITIES

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LOCATION: 50V58HX4 (VS70-580999B)
PART NUMBER: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
NO WATER FLOW TO HYDRAULIC OR LUBE OIL HEAT EXCHANGERS. LOSS OF SYSTEM, NO FLUID COOLING.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-19
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

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LEAD ANALYST: J. DUVAL

SUBSYSTEM: HYD/WSB

MDAC ID: 119

HIGHEST CRITICALITY

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BREAKDOWN HIERARCHY:
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2) WATER SPRAY BOILER ASSY
3) STEAM DUMP NOZZLE
4) STEAM DUMP NOZZLE TEMP SENSOR
5)...
9)...

CRITICALITIES

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LOCATION: 50V58NZ1(VS70-580999B)

PART NUMBER: c[P]

CAUSES: VIBRATION, CORROSION, MECHANICAL SHOCK, SHORT

EFFECTS/RATIONALE:
FALSE READINGS (HOT) TO THE CONTROLLER CAUSING THE HEATER TO BE TURNED OFF. THE SHORT WOULD CAUSE THE HEATER 2ND OR CB TO OPEN. SWITCHING TO REDUNDANT CONTROLLER ACTIVATES REDUNDANT TEMP SENSOR AND HEATER.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-20
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 120

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: STEAM DUMP NOZZLE TEMP SENSOR
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) STEAM DUMP NOZZLE
4) STEAM DUMP NOZZLE TEMP SENSOR
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LOCATION: 50V58NZ1(VS70-580999B)

PART NUMBER:

CAUSES: VIBRATION, CORROSION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
FALSE READINGS TO CONTROLLER. OPEN CIRCUIT WOULD SEND "COLD" TEMP READINGS TO THE CONTROLLER. REDUNDANT INDICATOR B IS AVAILABLE USING REDUNDANT CONTROLLER. HEATERS STAY ON CONTINUOUSLY NO ADVERSE AFFECT. REDUNDANT CONTROLLER RESTORES NORMAL CYCLING.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-21
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 121

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: STEAM DUMP NOZZLE TEMP SENSOR
FAILURE MODE: OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) STEAM DUMP NOZZLE
4) STEAM DUMP NOZZLE TEMP SENSOR
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LOCATION: 50V58NZ1(VS70-580999B)
PART NUMBER:

CAUSES: CORROSION, CALIBRATION SHIFT

EFFECTS/RATIONALE:
ERRATIC SIGNALS TO THE CONTROLLER. VARIABLE TEMPERATURE CONTROL OF THE NOZZLE. REDUNDANT CONTROLLER AVAILABLE TO RESTORE NORMAL OPERATION. POSSIBLE RESTRICTED FLOW.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-22
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB   FLIGHT: 3/1R
MDAC ID: 122  ABORT: 3/1R

ITEM: STEAM NOZZLE HEATERS
FAILURE MODE: ELECTRICAL OPEN OR SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) STEAM DUMP NOZZLE
4) STEAM NOZZLE HEATER

CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER: 50V58HX4(VS70-580999B)

CAUSES: INSULATION BREAKDOWN, CORROSION

EFFECTS/RATIONALE:
SHORT WILL CAUSE CB TO OPEN CAUSING FREEZING OF THE H2O, BLOCKING THE STEAM VENT. OVERHEATING OF HYDRAULIC FLUID, AND LUBE OIL Switch TO REDUNDANT CONTROLLER AND HEATERS.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-23
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 123

ITEM: BOILER WATER FILL AND DRAIN
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) BOILER H2O FILL AND DRAIN

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LOCATION: 50V58HX4(VS70-580999B)

CAUSES: VIBRATION, MECHANICAL SHOCK, CORROSION

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC, DEGRADATION OF COOLING OF HYDRAULIC FLUID AND LUBE OIL DURING ENTRY WITH LOSS OF APU/SYSTEM. POSSIBLE LOSS OF SYSTEM DUE TO LUBE OIL OVERHEATING ON ASCENT CANNOT SUSTAIN POOLING.
(CAP - CONSIDERED PART OF ASSEMBLY.)

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-24
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86
SUBSYSTEM: HYD/WSB
MDAC ID: 124

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: BOILER H2O DRAIN
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) BOILER H2O DRAIN
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: CORROSION, BINDING, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
CANNOT DRAIN WATER BOILER. REMOVE AND REPLACE QUICK DISCONNECT.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-25
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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ITEM: LUBE OIL DRAIN  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL  
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) LUBE OIL DRAIN

LOCATION: 50V58HX4(VS70-580999B)  
PART NUMBER: MC621-0038-0300

CAUSES: CORROSION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
CANNOT DRAIN LUBE OIL FROM SPRAY BOILER. REMOVE AND REPLACE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

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REPORT DATE 12/23/86  C-26
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 126

ITEM: LUBE OIL DRAIN
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) LUBE OIL DRAIN
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER: MC621-0038-0300

CAUSES:
EFFECTS/RATIONALE:
LOSS OF APU GEARBOX LUBE OIL, POSSIBLE LOSS OF APU. (CAP - CONSIDERED PART OF ASSEMBLY).

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-27
### INDEPENDENT ORBITER ASSESSMENT

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

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#### BREAKDOWN HIERARCHY:

1. WATER SPRAY BOILER
2. WATER SPRAY BOILER ASSY
3. LIQUID LEVEL SENSOR
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**REDUNDANCY SCREENS:**


**LOCATION:**

50V58HX4(VS70-580999B)

**PART NUMBER:**

50V58HX4(VS70-580999B)

**CAUSES:**

CORROSION, VIBRATION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

**EFFECTS/RATIONALE:**

PREVENTS PULSING. INABILITY TO COOL HYDRAULIC FLUID AND LUBE OIL AFTER SECOND FAILURE. SWITCH TO REDUNDANT CONTROLLER.

**REFERENCES:**

VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE 12/23/86**

C-28
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 128

ITEM: LIQUID LEVEL SENSOR
FAILURE MODE: ERRONEOUS DRY CONDITION

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) LIQUID LEVEL SENSOR
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CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CORROSION, SHORT

EFFECTS/RATIONALE:
ALLOWS PULSING WHEN LUBE OIL TEMP >250. SWITCH TO REDUNDANT CONTROLLER B. NO MISSION OR CREW/VEHICLE EFFECT.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 129

HIGHEST CRITICALITY
FLIGHT: HDW/FUNC 3/1R
ABORT: 3/1R

ITEM: LIQUID LEVEL SENSOR
FAILURE MODE: OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL     SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) LIQUID LEVEL SENSOR

CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: CORROSION, MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:
ERRATIC COOLING AND WATER CONTROL REDUNDANT CONTROLLER RESTORES NORMAL OPERATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-30
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 130

ITEM: LUBE OIL TEMP SENSOR
FAILURE MODE: ERRONEOUS HOT CONDITION, OUT OF TOLERANCE
LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) LUBE OIL TEMP SENSOR
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CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, CORROSION, MECHANICAL, SHORT

EFFECTS/RATIONALE:
EXCESSIVE SPRAYING OF WITH POSSIBLE DEPLETION OF H2O, LIMITED RUN TIME. SW. TO REDUNDANT CONTROLLER. LOSS OF SYSTEM WITH SECOND FAILURE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-31
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB
MDAC ID: 131

ITEM: LUBE OIL TEMP SENSOR
FAILURE MODE: ERRONEOUS COLD CONDITION, OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER SPRAY BOILER ASSY
3) LUBE OIL TEMP SENSOR
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5) ...
6) ...
7) ...
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9) ...

CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: VIBRATION, CORROSION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
EXCESSIVE HEATING OF LUBE OIL. SW. TO REDUNDANT CONTROLLER. LOSS OF COOLING AND SYSTEM WITH SECOND FAILURE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-32
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86
SUBSYSTEM: HYD/WSB
MDAC ID: 132

ITEM: WATER TANK
FAILURE MODE: BURST

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK
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LOCATION: 5058HX4 (VS70-580999B)
PART NUMBER:

CAUSES: FATIGUE, WELD FLAW

EFFECTS/RATIONALE:
LOSS OF H2O TANK BY BURSTING COULD CAUSE LOSS A ADJACENT SYSTEMS. POSSIBLE LOSS OF THERMAL INSULATION ON ALL WSB'S. POSSIBLE LOSS OF VEHICLE AND CREW.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-33
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 11/16/86

**SUBSYSTEM:** HYD/WSB

**MDAC ID:** 133

**HIGHEST CRITICALITY**

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**ITEM:** WATER TANK

**FAILURE MODE:** LEAKAGE - H2O EXTERNAL

**LEAD ANALYST:** J. DUVAL

**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**

1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK
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**CRITICALITIES**

**LOCATION:** 5058HX4 (VS70-580999B)

**PART NUMBER:**

**CAUSES:** FATIGUE, CORROSION, MECHANICAL SHOCK

**EFFECTS/RATIONALE:** LOSS OF THERMAL CONTROL RESULTING IN THE LOSS OF WSB SYSTEM.

**REFERENCES:** VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE** 12/23/86

C-34
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86
SUBSYSTEM: HYD/WSB
MDAC ID: 134

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: WATER TANK
FAILURE MODE: LEAKAGE - GN2 INTERNAL-EXTERNAL

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK

CRITICALITIES

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LOCATION: 5058HX4 (VS70-580999B)

PART NUMBER:

CAUSES: CORROSION, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LEAKAGE OF GN2 THROUGH THE BELLAWS OR TANK PREVENTS THE EXPULSION OF H2O TO THE WSB WITH RESULTING LOSS OF COOLING WITH SUBSEQUENT LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-35
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 135

ITEM: WATER TANK FILL
FAILURE MODE: FAIL TO OPEN

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK FILL

CRITICALITIES

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LOCATION: 50V58PD10(VS70-580999B)
PART NUMBER: MC621-0038-0010

CAUSES: CORROSION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
CANNOT FILL TANK. REMOVE AND REPLACE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-36
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 136

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: WATER TANK FILL
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK FILL
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LOCATION: 50V58PD10(VS70-580999B)
PART NUMBER: MC621-0038-0010

CAUSES: CORROSION, VIBRATION, MECHANICAL SHOCK, CONTAMINATION

EFFECTS/RATIONALE:
DEGRADATION OF HYDRAULIC AND LUBE OIL COOLING. LOSS OF SYSTEM.
(CONSIDERS DISCONNECT AND CAP AS ONE ASSEMBLY.)

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-37
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 137

ITEM: WATER TANK HEATER
FAILURE MODE: LOSS OF TEMP CONTROL

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK HEATERS
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LOCATION: 50V58HX4(VS70-580999B)

CAUSES: VIBRATION, CORROSION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
HEATERS WOULD NOT BE TURNED ON. NO H2O TANK TEMP CONTROL.
SELECTING REDUNDANT CONTROLLER REDUNDANT CONTROLLER RETURNS NORMAL TANK TEMP CONTROL.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-38
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 138

ITEM: WATER TANK HEATER
FAILURE MODE: LOSS OF TEMP CONTROL
LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK HEATERS
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LOCATION: 50V58HX4(VS70-580999B)

CAUSES: SHORT TO GROUND

EFFECTS/RATIONALE:
A SHORT TO GROUND WILL CAUSE THE HEATER ELEMENT AND/OR THE CB TO OPEN AND THE EFFECT WILL BE THE SAME AS FOR THE OPEN CONDITION, HEATERS INOPERATIVE. REDUNDANT CONTROLLER RETURNS NORMAL TANK TEMP CONTROL.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-39
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 139

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: WATER TANK TEMP SENSOR
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK TEMP SENSOR
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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: VIBRATION, CORROSION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
FALSE READINGS TO CONTROLLER A. FALSE READINGS WILL CAUSE THE H2O QUANTITY CALCULATIONS TO BE IN ERROR.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-40
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 140

ITEM: WATER TANK TEMP SENSOR
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK TEMP SENSOR
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CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER: 50V58HX4(VS70-580999B)

CAUSES: VIBRATION, CORROSION, MECHANICAL SHOCK, SHORT

EFFECTS/RATIONALE:
FALSE READINGS (HOT). ERRONEOUS QUANTITY CALCULATION. HEATER AND/OR CB WILL OPEN.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-41
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 141

ITEM: WATER TANK TEMP SENSOR
FAILURE MODE: OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WATER TANK ASSY
3) WATER TANK TEMP SENSOR

CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CALIBRATION SHIFT

EFFECTS/RATIONALE:
ERRATIC READINGS TO THE CONTROLLER. INCORRECT H2O QUANTITY CALCULATIONS.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-42
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 142

ITEM: GN2 TANK
FAILURE MODE: BURST
LEAD ANALYST: J. DUVAL

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 TANK
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CRITICALITIES

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LOCATION: 5058HX4 (VS70-580999B)
PART NUMBER:
CAUSES: FATIGUE, WELD FLAW

EFFECTS/RATIONALE:
LOSS OF GN2 TANK BY BURSTING COULD CAUSE LOSS OF ADJACENT SYSTEMS. POSSIBLE LOSS OF THERMAL INSULATION ON ALL WSB'S. POSSIBLE LOSS OF VEHICLE AND CREW.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/24/86  C-43
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86
SUBSYSTEM: HYD/WSB
MDAC ID: 143

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: GN2 TANK
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. DUVAL

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 TANK

CRITICALITIES
FLIGHT PHASE HDW/FUNC ABORT HDW/FUNC
PRELAUNCH: /NA 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


LOCATION: 5058HX4 (VS70-580999B)
PART NUMBER:

CAUSES: FATIGUE, CORROSION, MECHANICAL SHOCK

EFFECTS/RATIO:ALE:
LOSS OF GN2 PREVENTS EXPULSION OF H2O TO THE BOILER RESULTING IN THE LOSS OF COOLING AND THE SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-44
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 144

ITEM: GN2 REGULATOR VALVE
FAILURE MODE: FAILS TO CLOSE (LEAKAGE)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 REGULATOR VALVE

CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION

EFFECTS/RATIONALE:
The full GN2 pressure, 2500 PSIG, would open the GN2 relief valve which would stay open until the pressure reduces to the relief valve reseat pressure. The system pressure would equalize to this pressure.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-45
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB
MDAC ID: 145

ITEM: GN2 REGULATOR VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 REGULATOR VALVE

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LOCATION: 50V58HX4(VS70-580999B)

CAUSES: VIBRATION, MECHANICAL SHOCK, PIECE-PART FAILURE

EFFECTS/RATIONALE:
NO GN2 PRESSURE TO THE H2O TANK. NO THERMAL CONTROL OF THE HYDRAULIC FLUID OR LUBE OIL. LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 146

HIGHEST CRITICALITY
ABORT: 2/1R

ITEM: GN2 REGULATOR RELIEF VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: J. DUVAL   SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 REGULATOR RELIEF VALVE
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CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, DAMAGED SEAT

EFFECTS/RATIONALE:
THE H2O TANK GN2 WOULD ESCAPE THROUGH THE OPEN RELIEF VALVE. NO PRESSURE FOR THE H2O TANK. NO WATER SPRAY CAPABILITY. LOSS OF SYSTEM ON ASCENT WHEN LUBE OIL TEMP EXCEEDS LIMITS. LOSS OF SYSTEM IN DE-ORBIT PHASE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-47
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 147

ITEM: GN2 REGULATOR RELIEF VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 REGULATOR RELIEF VALVE
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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: CORROSION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT NEED SECOND FAILURE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86

C-48
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 148

ITEM: GN2 SHUTOFF VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 SHUTOFF VALVE

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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER: 50V58HX4(VS70-580999B)

CAUSES: JAMMING, CORROSION, SHOCK

EFFECTS/RATIONALE:
NO H2O TANK PRESSURIZATION. LOSS OF THERMAL CONTROL OF HYDRAULIC FLUID AND LUBE OIL. LOSS OF SYSTEM IF LUBE OIL COOLING LOST.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE: 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 149  ABORT: /NA

ITEM: GN2 SHUTOFF VALVE
FAILURE MODE: FAILS TO CLOSE (INTERNAL LEAKAGE)

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 SHUTOFF VALVE

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: CONTAMINATION, DAMAGED SEAT, LOSS OF SIGNAL

EFFECTS/RATIONALE:
NO EFFECT.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-50
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 150

ITEM: GN2 SHUTOFF VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 SHUTOFF VALVE
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: CONTAMINATION, DAMAGED SEAT

EFFECTS/RATIONALE:
DEPLETION OF GN2. LOSS OF THERMAL CONTROL OF LUBE OIL AND HYDRAULIC FLUID. LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 151

ITEM: GN2 FILL DISCONNECT
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 FILL DISCONNECT
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LOCATION: 50V58PD28(VS70-580999B)
PART NUMBER: ME276-0032-0013

CAUSES: CONTAMINATION, CORROSION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
CANNOT FILL TANK, REMOVE AND REPLACE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-52
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 152

ITEM: GN2 FILL DISCONNECT
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 FILL DISCONNECT
4) 
5) 
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LOCATION: 50V58PD28(VS70-580999B)
PART NUMBER: ME276-0032-0013

CAUSES: CONTAMINATION, CORROSION, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF H2O TANK PRESSURIZATION. DEGRADATION OF HYDRAULIC AND LUBE OIL COOLING. POSSIBLE LOSS OF SYSTEM. CAP CONSIDERED PART OF THE DISCONNECT.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-53
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 153

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: GN2 VENT DISCONNECT
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 VENT DISCONNECT
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CRITICALITIES

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LOCATION: 50V58PD28(VS70-580999B)
PART NUMBER: ME276-0032-0015

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
WILL NOT VENT DURING H2O TANK FILLING. CANNOT CHECK H2O QUANTITY DURING FILLING.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-54
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 154

ITEM: GN2 VENT DISCONNECT
FAILURE MODE: LEAKAGE (EXTERNAL)

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 VENT DISCONNECT
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LOCATION: 50V58PD28(VS70-580999B)
PART NUMBER: ME276-0032-0015

CAUSES: CONTAMINATION, DAMAGED SEAT

EFFECTS/RATIONALE:
LOSS OF GN2 PRESSURE. DEGRADED COOLING OF HYDRAULIC FLUID AND APU LUBE OIL. POSSIBLE LOSS OF HYDRAULIC SYSTEM ON ASCENT DUE TO HIGH LUBE OIL TEMPS. CAP AND DISCONNECT CONSIDERED ONE UNIT.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-55
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 155  ABORT: /NA

ITEM: GN2 TANK TEMP SENSOR
FAILURE MODE: ERRONEOUS HIGH TEMP-OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 TANK
4) GN2 TANK TEMP SENSOR
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LOCATION: 50V58HX4(VS70-58099B)
PART NUMBER:

CAUSES: CORROSION, VIBRATION

EFFECTS/RATIONALE:
THE ERRONEOUS SIGNALS WOULD RESULT IN FALSE H2O QUANTITY CALCULATIONS. GN2 PRESSURE READINGS WOULD DETECT ERRONEOUS TEMPS.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-56
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 11/03/86

**SUBSYSTEM:** HYD/WSB

**MDAC ID:** 156

**HIGHEST CRITICALITY**

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**REDUNDANCY SCREENS:**


**LOCATION:** 50V58HX4(VS70-580999B)

**PART NUMBER:**

**CAUSES:** CORROSION, VIBRATION

**EFFECTS/RATIONALE:**

THE ERRONEOUS SIGNALS WOULD RESULT IN FALSE H2O QUANTITY CALCULATION. GN2 PRESSURE READINGS WOULD DETECT ERRONEOUS TEMPERATURES.

**REFERENCES:** VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE 12/23/86**

C-57
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 157

HIGHEST CRITICALITY HDW/FUNC
ABORT: /NA

ITEM: GN2 TANK PRESSURE SENSOR
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL   SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 TANK PRESSURE SENSOR
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
NO OUTPUT FROM THE POTENTIOMETER TO CONTROLLER A. NO MONITORING OF THE GN2 TANK PRESSURE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-58
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 158

HIGHEST CRITICALITY

ITEM: GN2 TANK PRESSURE SENSOR
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 TANK PRESSURE SENSOR

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, SHORT

EFFECTS/RATIONALE:
NO OUTPUT FROM THE POTENTIOMETER TO CONTROLLER A. NO MONITORING
OF GN2 TANK PRESSURE.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

REPORT DATE 12/23/86 C-59
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 159

HIGHEST CRITICALITY: FLIGHT: 3/3
ABORT: /NA

ITEM: GN2 TANK PRESSURE SENSOR
FAILURE MODE: OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 TANK PRESSURE SENSOR
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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

CAUSES:

EFFECTS/RATIONALE:
ERRORNEOUS OUTPUT OF SENSOR. UNRELIABLE GN2 TANK PRESSURE INDICATIONS.
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 160  ABORT: /NA

ITEM: GN2 REGULATOR OUT PRESSURE SENSOR
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 REGULATOR PRESSURE SENSOR
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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
ERRONEOUS OUTPUT FROM THE POTENTIOMETER TO CONTROLLER A. THE GN2 REGULATOR OUT PRESSURE IS REQUIRED FOR THE H2O TANK QUANTITY CALCULATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-61
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 161

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: GN2 REGULATOR PRESSURE SENSOR
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 REGULATOR PRESSURE SENSOR
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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: CONTAMINATION, SHORT

EFFECTS/RATIONALE:
ERRONEOUS OUTPUT TO THE CONTROLLER. ERRONEOUS H20 TANK QUANTITY CALCULATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-62
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 162

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: GN2 REGULATOR PRESSURE SENSOR
FAILURE MODE: PHYSICAL BINDING

LEAD ANALYST: J. DUVAL    SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 REGULATOR PRESSURE SENSOR
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LOCATION: 50V58HX4(VS70-580999B)

CAUSES: CORROSION, MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:
STATIC POTENTIOMETER OUTPUT. NO CHANGE IN H2O QUANTITY DISPLAY.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-63
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 163  ABORT: /NA

ITEM: GN2 REGULATOR PRESSURE SENSOR
FAILURE MODE: OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 REGULATOR PRESSURE SENSOR
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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: CALIBRATION SHIFT, VIBRATION, MECHANICAL SHOCK, CALIBRATION SHIFT

EFFECTS/RATIONALE:
ERRONEOUS OUTPUT. UNRELIABLE AND ERRATIC H2O TANK QUANTITY CALCULATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-64
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 164

ITEM: GN2 FILTER
FAILURE MODE: LOSS OF FLOW
LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) GN2 SYSTEM
3) GN2 FILTER
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CRITICALITIES

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LOCATION: 50V58HX4 (VS70-580999B)
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF GN2 PRESSURE TO WATER TANK RESULTS IN NO COOLING OF HYDRAULIC AND LUBE OIL. LOSS OF SYSTEM.

REFERENCES:

REPORT DATE 12/23/86 C-65
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB
MDAC ID: 165

ITEM: HYDRAULIC BYPASS VALVE
FAILURE MODE: FAILS IN HEAT EXCHANGER POSITION

LEAD ANALYST: J. DUVAL

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC BYPASS VALVE

CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER: 50V58HX4(VS70-580999B)

CAUSES: CONTAMINATION, JAMMING, BINDING, CORROSION

EFFECTS/RATIONALE:
ON ASCENT THE HYDRAULIC FLUID DOES NOT REQUIRE COOLING. WITH THE LUBE OIL SPRAY VALVE OPEN THE HYDRAULIC FLUID RECEIVES THE SAME COOLING AS THE LUBE OIL. THIS COULD AFFECT THE CIRC PUMP OPERATIONS WARMING THE HYDRAULIC FLUID.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-66
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 166

ITEM: HYDRAULIC BYPASS VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS RELIEF/VALVE
3) HYDRAULIC BYPASS VALVE
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LOCATION: 50V58HX4(VS70-580999B)

CAUSES: CONTAMINATION, CORROSION, BINDING

EFFECTS/RATIONALE:
DEPLETION OF HYDRAULIC FLUID, OVERHEATING OF HYDRAULIC FLUID, LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-67
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 167

ITEM: HYDRAULIC BYPASS VALVE
FAILURE MODE: FAILS IN BYPASS POSITION

LEAD ANALYST: J. DUVAL   SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC BYPASS VALVE

CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER: 50VS8HX4(VS70-580999B)

CAUSES: CONTAMINATION, CORROSION, BINDING, JAMMING

EFFECTS/RATIONALE: NO THERMAL CONTROL OF HYDRAULIC FLUID, EXCESSIVE HEATING OF LUBE OIL WOULD CAUSE LOSS OF SYSTEM ON ASCENT. OVERHEATING OF HYDRAULIC FLUID AND LUBE OIL ON DEORBIT CAUSES LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-68
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 168

ITEM: HYDRAULIC RELIEF VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC RELIEF VALVE
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: CONTAMINATION, DAMAGED SEAT, WEAK SPRING, CORROSION

EFFECTS/RATIONALE:
EXCESSIVE LEAKAGE WOULD DEPLETE THE HYDRAULIC FLUID. THERMAL CONTROL WOULD BE DEGRADED. LOSS OF SYSTEM.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-69
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 169  ABORT: 2/1R

ITEM: HYDRAULIC RELIEF VALVE
FAILURE MODE: RELIEF VALVE FAILS TO CLOSE

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC RELIEF VALVE
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: CONTAMINATION, BINDING, VIBRATION

EFFECTS/RATIONALE:
WITH THE VALVE ON THE OPEN POSITION HYDRAULIC FLUID WILL BYPASS THE WSB RESULTING IN THE FLUID EXCEEDING THE TEMP LIMIT OF 275 DEGREES F. FAILING TO CLOSE HAS NO EFFECT DURING ASCENT. THIS FAILURE IS MORE APPLICABLE DURING DEORBIT THAN DURING ASCENT.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-70
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB
MDAC ID: 170

ITEM: HYDRAULIC RELIEF VALVE
FAILURE MODE: RELIEF VALVE FAILS CLOSED

LEAD ANALYST: J. DUVAL

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC RELIEF VALVE

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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: BINDING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
WITH THE VALVE IN THE CLOSED POSITION AND THE BYPASS VALVE OPERATIVE THERE IS NO DEGRADATION OF THE SYSTEM UNDER NORMAL FLOW CONDITIONS.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-71
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 171 ABORT: 3/1R

ITEM: HYDRAULIC BYPASS VALVE MOTOR
FAILURE MODE: FAILS TO START

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC BYPASS VALVE MOTOR
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: LOSS OF INPUT SIGNAL

EFFECTS/RATIONALE:
VALVE REMAINS IN LAST DRIVEN POSITION. IF LAST POSITION WAS
BYPASS, NO FLUID COOLING. IF IN HX POSITION, ALL FLUID WOULD
FLOW THROUGH THE HX UNDER NORMAL FLOW CONDITIONS. SWITCH TO
REDUNDANT CONTROLLER TO RESTORE NORMAL OPERATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-72
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/1R
MDAC ID: 172  ABORT: 3/1R

ITEM: HYDRAULIC BYPASS/RELIEF VALVE TEMP SENSOR
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC BYPASS/RELIEF VALVE TEMP SENSOR
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LOCATION:  50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: CORROSION, SHOCK, VIBRATION, SHORT

EFFECTS/RATIONALE:
A SHORTED XDUCER WOULD SEND A COLD TEMP READING TO THE CONTROLLER
CAUSING THE BYPASS VALVE TO GO TO THE BYPASS POSITION RESULTING
IN NO COOLING OF THE FLUID. SWITCHING TO THE REDUNDANT
CONTROLLER WOULD RESTORE NORMAL OPERATION.

REFERENCES:  VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

REPORT DATE 12/23/86  C-73
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/1R
MDAC ID: 173  ABORT: 3/1R

ITEM: HYDRAULIC BYPASS/RELIEF VALVE TEMP SENSOR
FAILURE MODE: OUT OF TOLERANCE

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC BYPASS/RELIEF VALVE TEMP SENSOR
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: VIBRATION, SHOCK, CALIBRATION SHIFT

EFFECTS/RATIONALE:
ERRONEOUS READINGS TO CONTROLLER WOULD RESULT IN ERRATIC CONTROL OF THE HYDRAULIC FLUID TEMP. SWITCHING TO REDUNDANT CONTROLLER RESTORES NORMAL OPERATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-74
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 174

ITEM: HYDRAULIC BYPASS/RELIEF VALVE TEMPERATURE SENSOR
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) HYDRAULIC BYPASS/RELIEF VALVE
3) HYDRAULIC BYPASS/RELIEF VALVE TEMP SENSOR
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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER:

CAUSES: CORROSION, SHOCK, VIBRATION, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
AN OPEN TRANSDUCER WOULD SIGNAL A HIGH TEMP TO THE CONTROLLER, THIS WOULD START THE WATER SPRAY DEPLETING THE H2O. THERE IS A REDUNDANT SENSOR IN THE VALVE. SWITCHING TO THE REDUNDANT CONTROLLER WOULD RESTORE NORMAL OPERATION.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-75
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 175

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: CB
FAILURE MODE: LOSS OF AC VOLTAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL L4
3) CB (131,135)

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LOCATION: 31V73A4(VS70-580119E)
PART NUMBER:

CAUSES: OPEN

EFFECTS/RATIONALE:
LOSS OF AC VOLTAGE TO BOILER CNTRL/PWR/HTR SWITCH. LOSS OF ALL CONTROLLER OUTPUTS. SWITCH TO REDUNDANT CONTROLLER FOR NORMAL OPERATION.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-76
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 176

ITEM: BY-PASS RELAY
FAILURE MODE: FAILS TO TRANSFER TO GROUND TEST POSITION

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) BY-PASS RELAY
4)
5)
6)
7)
8)
9)

CRITICALITIES

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LOCATION: 32V73A2(VS70-580119E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, LOSS OF POWER

EFFECTS/RATIONALE:
LOSS OF CHECKOUT OF WATER SPRAY BOILER INSTRUMENTATION DURING PRELAUNCH CHECKOUT. NO LOSS OF FUNCTIONS.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-77
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 177

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: BOILER CONTROL POWER/HEATER SW
FAILURE MODE: LOSS OF OUTPUT FROM SELECTED CONTROLLER

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) BOILER CONTROL POWER/HEATER SW (S41)
4)...
8)...
9)...

CRITICALITIES

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LOCATION: 32V73A2(VS70-580119E)

PART NUMBER: 32V73A2(VS70-580119E)

CAUSES: SHORT TO GROUND

EFFECTS/RATIONALE:
LOSS OF OUTPUT TO PCA AND BOILER CONTROL SW. LOSS OF CONTROLLER OUTPUTS RESULTING LOSS OF HYDRAULIC FLUID AND APU LUBE OIL COOLING. POSSIBLE LOSS OF SYSTEM ON ASCENT. SWITCH TO REDUNDANT CONTROLLER TO RESTORE NORMAL OPERATION.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-78
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 178

ITEM: BOILER CONTROL POWER/HEATER SW
FAILURE MODE: FAILS TO CLOSE IN SELECTED CONTROLLER POSITION

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) BOILER CONTROL POWER/HEATER SW (S41)

CRITICALITIES

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LOCATION: 32V73A2(VS70-580119E)
PART NUMBER:

CAUSES: CONTAMINATION, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NO POWER TO CONTROLLER THROUGH PCA AND BOILER CONTROL SWITCH. LOSS OF HEATERS. LOSS OF HYDRAULIC FLUID AND APU LUBE OIL COOLING. POSSIBLE LOSS OF SYSTEM ON ASCENT. SWITCHING TO REDUNDANT CONTROLLER RESTORES NORMAL OPS.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-79
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 179

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: BOILER CNTRL SW
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) BOILER CNTRL SW (S38)
4) 
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8) 
9) 

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LOCATION: 32V73A2(VS70-580119E)
PART NUMBER:

CAUSES: SHORT TO GROUND

EFFECTS/RATIONALE:
CB OPENS—NO OUTPUT TO DRIVER TO CONTROLLER CONTROL CIRCUITS.
LOSS OF WSB.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-80
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 180

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: BOILER CNTRL SW
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) BOILER CNTRL SW (S38)
4)  
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LOCATION: 32V73A2(VS70-580119E)
PART NUMBER:

CAUSES: CONTAMINATION, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NO INPUT TO DRIVER FOR CONTROL CIRCuits IN CONTROLLER. NO OUTPUT FOR CONTROLLER FUNCTIONS.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-81
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 181

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: RESISTOR-CURRENT LIMITER (5.1K, 3/4W)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) RESISTOR-CURRENT LIMITER (5.1K 3/4 W)
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LOCATION: 32V73A2(V70-580119E)

PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
LOSS OF SIGNAL TO MDM, LOSS OF POWER ON INDICATION TO TLM.

REFERENCES: V70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-82
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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REPORT DATE 12/23/86 C-83
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 183

HIGHEST CRITICALITY: HDW/FUNC
ABORT: 2/1R

ITEM: RESISTOR-CURRENT LIMITER
FAILURE MODE: LOSS OF VOLTAGE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) RESISTOR-CURRENT LIMITER
   (A20R1, A20R2, A117R1, A117R2, A23R1, A23R2)
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7) ...
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9) ...

CRITICALITIES

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LOCATION: 32V73A2(VS70-580119E)
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
LOSS OF VOLTAGE TO WSB CONTROLLER AND THE GN2 SHUTOFF VLV.
SWITCH TO REDUNDANT CONTROLLER TO RESTORE NORMAL OPS.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-84
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 184

ITEM: BOILER N2 SUPPLY SW
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) BOILER N2 SUPPLY SW (S44)
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8) 
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CRITICALITIES

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LOCATION: 32V73A2(VS70-580119E)

PART NUMBER:

CAUSES: SHORT TO GROUND (A OR B CONTROLLER CONTACTS)

EFFECTS/RATIONALE:
CB OPENS, NO OUTPUT TO DRIVER. REDUNDANT CONTROLLER COIL REMAINS ENERGIZED.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-85
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 11/12/86

**SUBSYSTEM:** HYD/WSB

**MDAC ID:** 185

**ITEM:** BOILER N2 SUPPLY SW

**FAILURE MODE:** FAILS TO CLOSE

**LEAD ANALYST:** J. DUVAL

**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**

1) WATER SPRAY BOILER - EPD&C
2) PANEL R2
3) BOILER N2 SUPPLY SW (S44)

**CRITICALITIES**

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**LOCATION:** 32V73A2(VS70-580119E)

**PART NUMBER:**

**CAUSES:** CONTAMINATION, MECHANICAL SHOCK (A OR B CONTROLLER CONTACTS)

**EFFECTS/RATIONALE:**

NO OUTPUT TO DRIVER. VALVE STAYS OPEN.

**REFERENCES:** VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE 12/23/86 C-86**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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| ITEM: HYBRID DRIVER CIRCUIT | FAILURE MODE: LOSS OF OUTPUT |

| LEAD ANALYST: J. DUVAL | SUBSYS LEAD: W. DAVIDSON |

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) LOAD CONTROL ASSY
3) HYBRID DRIVER CIRCUIT
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LOCATION: 55V76A122(VS70-580119E)

CAUSES: VIBRATION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

EFFECTS/RATIONALES:
LOSS OF LCA DRIVER SUPPLYING CONTROL VOLTAGE TO CONTROLLER, OR
GN2 SHUTOFF VALVE DRIVER. REDUNDANT CONTROLLER RESTORES NORMAL
OPS.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

REPORT DATE 12/23/86 C-87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86

SUBSYSTEM: HYD/WSB
MDAC ID: 187

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: HYBRID DRIVER CIRCUIT
FAILURE MODE: CONTINUOUS OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) LOAD CONTROL ASSY
3) HYBRID DRIVER CIRCUIT
4)
5)
6)
7)
8)
9)

CRITICALITIES

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LOCATION: 55V76A122(VS70-580119E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION, SHORT

EFFECTS/RATIONALE:
LCA DRIVER CONDUCTS CONTINUOUSLY (28V OR GN2 SHUTOFF VLV). NO EFFECT. CONTROLLER CONTROL CIRCUITS CONTROL OUTPUT OF CONTROLLER DRIVERS.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-88
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 188

ITEM: RPC
FAILURE MODE: FAILS OFF

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PCA-POWER CONTROL ASSY
3) RPC-REMOTE POWER CONTROLLER
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CRITICALITIES

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LOCATION: 55V76A135(VS70-580119E)
PART NUMBER:

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF A PCA RPC RESULTING IN LOSS OF 28V FOR HEATERS, VALVE SOLENOIDS, ETC. SWITCHING TO REDUNDANT CONTROLLER RESTORES NORMAL OPERATION.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-89
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 189

ITEM: RPC
FAILURE MODE: FAILS ON
LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) PCA-POWER CONTROL ASSY
3) RPC-REMOTE POWER CONTROLLER
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LOCATION: 55V76A135(VS70-580119E)
PART NUMBER:

CAUSES: VIBRATION, CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT-BOTH RPC'S IN A PCA MUST BE ON FOR AN OUTPUT.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-90
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86
SUBSYSTEM: HYD/WSB
MDAC ID: 190

ITEM: ISOLATION DIODE
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL    SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER - EPD&C
2) AFT PCA
3) ISOLATION DIODE (AICR 6,8)
4) 
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6) 
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CRITICALITIES

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LOCATION: 55V76A135(VS70-580119E)

PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, CONTAMINATION, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
LOSS OF CONTROLLER OUTPUTS. LOSS OF HYDRAULIC FLUID AND APU LUBE OIL COOLING. LOSS OF HYDRAULIC SYSTEM. SWITCH TO REDUNDANT CONTROLLER TO RESTORE NORMAL OPS.

REFERENCES: VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-91
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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ITEM: ISOLATION DIODE
FAILURE MODE: LOSS OF ISOLATION (AICR5,7)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) AFT PCA
3) ISOLATION DIODE (AICR 5,7)

CRITICALITIES

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LOCATION:

PART NUMBER:

CAUSES: THERMAL STRESS, STRUCTURAL FAILURE, SHORT

EFFECTS/RATIONALE:
LOSS OF ISOLATION BETWEEN CONTROL BUSES. BUS VOLTAGE DIFFERENCE IS NOMINALLY NEGLIGIBLE. NO EFFECT.

REFERENCES:

REPORT DATE 12/23/86 C-92
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 192

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: CONTROLLER A
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WSB CONTROLLERS
3) CONTROLLER A
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CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER:

CAUSES: ELECTRICAL OPEN OR SHORT, CORROSION

EFFECTS/RATIONALE:
LOSS OF CONTROL OF: HEATERS, VALVES, SENSORS SPRAY, BYPASS, H2O QUANTITY CALCULATIONS. SWITCHING TO CONTROLLER B WILL RESTORE FUNCTIONS EXCEPT GN2 TANK TEMP, GN2 REG. PRESSURE H2O TANK TEMP. HYD. BYPASS POSITION INDICATOR.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-93
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/1R
MDAC ID: 193  ABORT: 3/1R

ITEM: CONTROLLER A
FAILURE MODE: ERRATIC OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WSB CONTROLLERS
3) CONTROLLER A
4)  5)  6)  7)  8)  9)

CRITICALITIES

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LOCATION: 50V58HX4(VS70-580999B)

CAUSES: VIBRATION, CORROSION, ELECTRICAL DRIFT

EFFECTS/RATIONALE:
RANDOM OPERATION OF VALVES AND HEATERS, INCORRECT H2O QUANTITY CALCULATIONS. SWITCH TO REDUNDANT CONTROLLER.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-94
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/1R
MDAC ID: 194  ABORT: 2/1R

ITEM: CONTROLLER B
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WSB CONTROLLERS
3) CONTROLLER B
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LOCATION: 50V58HX4(VS70-580999B)

PART NUMBER: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-95
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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ITEM: CONTROLLER B
FAILURE MODE: ERRATIC OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) WATER SPRAY BOILER
2) WSB CONTROLLERS
3) CONTROLLER B

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LOCATION: 50V58HX4(VS70-580999B)
PART NUMBER: 50V58HX4(VS70-580999B)

CAUSES: ELECTRICAL DRIFT, CORROSION, VIBRATION

EFFECTS/RATIONALE:
RANDOM OPERATION OF VALVES AND HEATERS SWITCH TO REDUNDANT CONTROLLER.

REFERENCES: VS70-580999B, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-96
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 11/12/86  
**HIGHEST CRITICALITY**  
**HDW/FUNC**

**SUBSYSTEM:** HYD/WSB  
**MDAC ID:** 196

**ITEM:** HYBRID DRIVER CIRCUIT (CONTROLLER)  
**FAILURE MODE:** LOSS OF OUTPUT

**LEAD ANALYST:** J. DUVAL  
**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**
1) WATER SPRAY BOILER - EPD&C  
2) WSB CONTROLLER  
3) HYBRID DRIVER CIRCUIT
4)  
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**REDUNDANCY SCREENS:**  
A [ 1 ]  
B [NA ]  
C [ P ]

**LOCATION:** 55V76A122(VS70-580119E)

**PART NUMBER:**

**CAUSES:** VIBRATION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

**EFFECTS/RATIONALE:**

LOSS OF OUTPUT FOR CONTROLLER FUNCTIONS (28V, GN2 SHUTOFF VLV). REDUNDANT CONTROLLER AVAILABLE FOR NORMAL OPS.

**REFERENCES:** VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE** 12/23/86  
C-97
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 11/12/86  |  **HIGHEST CRITICALITY** | **HDW/FUNC**
**SUBSYSTEM:** HYD/WSB | **FLIGHT:** 3/1R | **ABORT:** 2/1R
**MDAC ID:** 197

**ITEM:** HYBRID DRIVER CIRCUIT (CONTROLLER)
**FAILURE MODE:** CONTINUOUS OUTPUT

**LEAD ANALYST:** J. DUVAL  |  **SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**
1) WATER SPRAY BOILER - EPD&C
2) WSB CONTROLLER
3) HYBRID DRIVER CIRCUIT

**CRITICALITIES**

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**REDUNDANCY SCREENS:**

**LOCATION:** 55V76A122(VS70-580119E)

**PART NUMBER:**

**CAUSES:** VIBRATION, MECHANICAL SHOCK, CONTAMINATION, SHORT

**EFFECTS/RATIONALE:**
ENABLE CONTROLLER/GN2 SHUTOFF VLV DRIVER CONDUCTS CONTINUOUSLY. CONSTANT OUTPUT SIGNAL, NO EFFECT SWITCH TO REDUNDANT CONTROLLER TO RESTORE NORMAL OPS.

**REFERENCES:** VS70-580119E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE 12/23/86**  |  C-98
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB
MDAC ID: 401

ITEM: ACCUMULATOR
FAILURE MODE: EXTERNAL LEAKAGE, GN2, THRU SEAL ASSY.

LEAD ANALYST: W. DAVIDSON        SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) ACCUMULATOR
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CRITICALITIES

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LOCATION:  50V58AU10, 11, 12 (VS70-580999)
PART NUMBER:  MC621-0035-0008

CAUSES: SEAL DAMAGE.

EFFECTS/RATIONALE:
LOSS OF ACCUMULATOR GN2 PRESSURE AND RESULTANT LOSS OF RESERVOIR
BOOTSTRAP PRESSURE CAUSES POSSIBLE CIRC. PUMP AND MAIN PUMP
CAVITATION AND PUMP DAMAGE. CONTINUOUS CIRC. PUMP OPERATION WILL
PROVIDE HEAD PRESSURE FOR MAIN PUMP STARTUP.

REFERENCES: VS70-580999

REPORT DATE 12/23/86      C-99
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 402

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 1/1

ITEM: ACCUMULATOR
FAILURE MODE: EXTERNAL LEAKAGE, HYD. FLUID, THRU SEAL ASSY.

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) ACCUMULATOR
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LOCATION: 50V58AU10, 11, 12, (VS70-580999)
PART NUMBER: MC621-0035-0008

CAUSES: SEAL DAMAGE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-100
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 403

ITEM: ACCUMULATOR
FAILURE MODE: STRUCTURAL FAILURE, (RUPTURE), CYLINDER
LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) ACCUMULATOR
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LOCATION: 50V58AU10, 11, 12, (VS70-580999)
PART NUMBER: MC621-0035-0008

CAUSES: MATERIAL DEFECT

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM/RUPTURE CAUSES LOSS OF ALL GN2 AND HYDRAULIC FLUID. EFFECT OF POTENTIAL SCHRAPNEL IS UNKNOWN.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-101
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 11/03/86  
**SUBSYSTEM:** HYD/WSB  
**MDAC ID:** 404

**ITEM:** ACCUMULATOR  
**FAILURE MODE:** PHYSICAL BINDING, JAMMING, PISTON  
**LEAD ANALYST:** W. DAVIDSON  
**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**
1) ACCUMULATOR ASSY
2) ACCUMULATOR
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**LOCATION:** 50V58AU10, 11, 12, (VS70-580999)

**PART NUMBER:** MC621-0035-0008

**CAUSES:** CONTAMINATION, GALLING

**EFFECTS/RATIONALE:**
LOSS OF ONE HYDRAULIC SYSTEM. GN2 PRESSURE WOULD NOT PRESSURIZE HYDRAULIC RESERVOIR PUMP. CAVITATION WOULD RESULT.

**REFERENCES:** VS70-580999

**REPORT DATE 12/23/86**  C-102
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 405

ITEM: PRESSURE GAGE
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) PRESSURE GAGE
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LOCATION: 50V58AU10, 11, 12, (VS70-580999)
PART NUMBER:

CAUSES: DEFECTIVE MECHANISM, CALIBRATION SHIFT

EFFECTS/RATIONALE:
LOW ACCUMULATOR GN2 PRESSURE, POSSIBLE EXCESSIVE CIRC. PUMP CYCLES AND POSSIBLE DAMAGE TO CIRC. PUMP DUE TO CAVITATION IF NOT CORRECTED ON GROUND.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-103
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86
SUBSYSTEM: HYD/WSB
MDAC ID: 406

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESSURE GAGE
FAILURE MODE: OFFSCALE HIGH/LOW

LEAD ANALYST: W. DAVIDSON \hspace{2cm} SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) PRESSURE GAGE
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REDUNDANCY SCREENS:

LOCATION: 50V58AU10, 11, 12, (VS70-580999)
PART NUMBER:

CAUSES: DEFECTIVE MECHANISM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE/FAILURE WOULD BE RECOGNIZED ON THE GROUND AND HAS NO EFFECT IN FLIGHT.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-104
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 407

ITEM: RELIEF VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) RELIEF VALVE

CRITICALITIES

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LOCATION: 50V58AU10, 11, 12, (VS70-580999)

PART NUMBER:

CAUSES: CONTAMINATION, GALLING, SPRING FAILURE

EFFECTS/RATIONALE:
OVERPRESSURE IN PISTON/CYLINDER CAVITY. POSSIBLE GN2 IN HYDRAULIC FLUID IF GN2 ENTERS FLUID SIDE OF PISTON.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-105
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 408

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/3
ABORT: 3/3

ITEM: RELIEF VALVE

FAILURE MODE: FAILS TO CLOSE (INTERNAL LEAK)

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) RELIEF VALVE

CRITICALITIES

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LOCATION: 50V58AU10, 11, 12, (VS70-580999)

PART NUMBER:

CAUSES: CONTAMINATION, GALLING, SPRING FAILURE

EFFECTS/RATIONALE:
POSSIBLE CONTAMINATION OF ACCUM. CYLINDER/PISTON ASSY. FROM CASE DRAIN BACK FLOW.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-106
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 409

ITEM: GN2 PRESSURE TRANSDUCER
FAILURE MODE: OFF SCALE HIGH

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) GN2 PRESS TRANSDUCER
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LOCATION:
PART NUMBER: 50V58MT520, 527, 534 (VS70-580999)

CAUSES: DEFECTIVE MECHANISM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
MUST RELY ON RESERVOIR PRESSURE AND LINE PressURES TO IDENTIFY ACCUM/RESERVOIR LEAK AND TO DISTINGUISH BETWEEN GN2 LEAKS AND HYDRAULIC LEAKS.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-107
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 410  ABORT: 3/3

ITEM: GN2 PRESSURE TRANSDUCER
FAILURE MODE: OFF SCALE LOW

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) GN2 PRESS TRANSDUCER
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LOCATION:
PART NUMBER: 50V58MT520, 527, 534 (VS70-580999)

CAUSES: DEFECTIVE MECHANISM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
MUST RELY ON RESERVOIR PRESSURE AND LINE PressURES TO IDENTIFY ACCUM/RESERVOIR LEAKS AND TO DISTINGUISH BETWEEN GN2 LEAKS AND HYDRAULIC LEAKS

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-108
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 411

HIGHEST CRITICALITY

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ABORT: 3/3

HIGHEST CRITICALITY FLIGHT: 3/3
ABORT: 3/3

ITEM: GN2 PRESSURE TRANSDUCER
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) GN2 PRESS TRANSDUCER

CRITICALITIES

LOCATION:
PART NUMBER: 50V58MT520, 527, 534 (VS70-580999)

CAUSES: DEFECTIVE MECHANISM, CALIBRATION SHIFT

EFFECTS/RATIONALE:
MUST RELY ON RESERVOIR PRESSURE AND LINE PRESSURES TO IDENTIFY ACCUM/RESERVOIR LEAK AND TO DISTINGUISH BETWEEN GN2 LEAKS AND HYDRAULIC LEAKS.

REFERENCES: VS70-580999

REPORT DATE 12/23/86
C-109
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB
MDAC ID: 412

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: GN2 FILL VALVE
FAILURE MODE: EXTERNAL LEAKAGE, GN2

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) ACCUMULATOR ASSY
2) GN2 FILL VALVE
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LOCATION: 50V58FJ6, 7, 8 (VS70-580999)

PART NUMBER: 50V58FJ6, 7, 8 (VS70-580999)

CAUSES: DEFECTIVE MECHANISM

EFFECTS/RATIONALE:
LOSS OF ACCUMULATOR GN2 PRESSURE AND RESULTANT LOSS OF RESERVOIR
BOOTSTRAP PRESSURE CAUSES POSSIBLE CIRC. PUMP AND MAIN PUMP
CAVITATION AND PUMP DAMAGE. CONTINUOUS CIRC PUMP OPERATION WILL
PROVIDE HEAD PRESSURE FOR MAIN PUMP STARTUP.

REFERENCES: VS70-580999
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 413

ITEM: SSME ACCUMULATOR
FAILURE MODE: EXTERNAL LEAKAGE (GN2) THRU SEAL ASSY

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) SSME HYD. ACCUM. ASSY
2) SSME ACCUMULATOR
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CRITICALITIES

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LOCATION: 50V58AU5, 7, 9 (VS70-580999)
PART NUMBER: MC621-0035-0006

CAUSES: SEAL DAMAGE

EFFECTS/RATIONALE:
LOSS OF TRANSIENT SUPPRESSION FUNCTION. NO EFFECT ON HYDRAULIC SYSTEM. EFFECT ON SSME'S ARE UNKNOWN, HENCE CRITICALITIES DO NOT REFLECT EFFECT ON SSME'S.

REFERENCES: VS70-580999

REPORT DATE 12/23/86
C-111
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB
MDAC ID: 414

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: SSME ACCUMULATOR
FAILURE MODE: EXTERNAL LEAKAGE (HYD. FLUID) THRU SEAL ASSY.

LEAD ANALYST: W. DAVIDSON

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) SSME HYD. ACCUM. ASSY
2) SSME ACCUMULATOR

CRITICALITIES

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LOCATION: 50V58AU5, 7, 9 (VS70-580999)
PART NUMBER: MC621-0035-0006

CAUSES: SEAL DAMAGE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM/LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-112
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 415

ITEM: SSME ACCUMULATOR
FAILURE MODE: PHYSICAL BINDING, JAMMING, PISTON

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) SSME HYD. ACCUM. ASSY
2) SSME ACCUMULATOR
3) 4) 5) 6) 7) 8) 9)

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LOCATION: 50V58AU5, 7, 9 (VS70-580999)
PART NUMBER: MC621-0035-0006

CAUSES: CONTAMINATION, GALLING

EFFECTS/RATIONALE:
LOSS OF TRANSIENT SUPPRESSION FUNCTION. NO EFFECT ON HYDRAULIC SYSTEM. EFFECT ON SSME'S UNKNOWN, HENCE CRITICALITIES DO NOT REFLECT EFFECT ON SSME'S.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-113
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 416

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: 3/3

ITEM: GN2 FILL VALVE
FAILURE MODE: EXTERNAL LEAKAGE (GN2)

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) SSME HYD. ACCUM. ASSY
2) GN2 FILL VALVE

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LOCATION: 50V58J18, 19, 20 (VS70-580999)

PART NUMBER:

CAUSES: DEFECTIVE MECHANISM

EFFECTS/RATIONALE:
LOSS OF TRANSIENT SUPPRESSION FUNCTION. NO EFFECT ON HYDRAULIC SYSTEM. EFFECT ON SSME'S UNKNOWN, HENCE CRITICALITIES DO NOT REFLECT EFFECT ON SSME'S.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-114
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86
SUBSYSTEM: HYD/WSB
MDAC ID: 417

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/IR
ABORT: 1/1

ITEM: SSME ACCUMULATOR
FAILURE MODE: STRUCTURAL FAILURE, (RUPTURE), CYLINDER

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) SSME HYD. ACCUM. ASSY
2) SSME ACCUMULATOR
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LOCATION: 50V58AU5, 7, 9 (VS70-580999)
PART NUMBER:

CAUSES: MATERIAL DEFECT

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM/RUPTURE CAUSES LOSS OF HYDRAULIC FLUID. EFFECT OF POTENTIAL SCHRAPNEL IS UNKNOWN.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-115
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB

MDAC ID: 421

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/3

ABORT: 3/3

ITEM: PRESSURE TRANSDUCER

FAILURE MODE: OFFSCALE HIGH

LEAD ANALYST: W. DAVIDSON

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) SSME HYD. ACCUM. ASSY
2) PRESSURE TRANSDUCER
3) 4) 5) 6) 7) 8) 9)

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LOCATION: 50V58MT54, 55, 56 (VS70-580999)

PART NUMBER: ME449-0177-6178

CAUSES: DEFECTIVE MECHANISM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ABILITY TO IDENTIFY GN2 LEAK.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-116
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB

MDAC ID: 422

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/3

ABORT: 3/3

ITEM: PRESSURE TRANSDUCER

FAILURE MODE: OFFSCALE LOW

LEAD ANALYST: W. DAVIDSON SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:

1) SSME HYD. ACCUM. ASSY
2) PRESSURE TRANSDUCER
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LOCATION: 50V58MT54, 55, 56 (VS70-580999)

PART NUMBER: ME449-0177-6178

CAUSES: DEFECTIVE MECHANISM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF ABILITY TO IDENTIFY GN2 LEAK.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-117
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 423

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: ERRONEOUS READING

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) SSME HYD. ACCUM. ASSY
2) PRESSURE TRANSDUCER
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LOCATION: 50V58MT54, 55, 56 (VS70-580999)
PART NUMBER: ME449-0177-6178

CAUSES: DEFECTIVE MECHANISM, CALIBRATION SHIFT

EFFECTS/RATIONALE:
LOSS OF ABILITY TO IDENTIFY GN2 LEAK.

REFERENCES:

REPORT DATE 12/23/86 C-118
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86

SUBSYSTEM: HYD/WSB

MDAC ID: 424

HIGHEST CRITICALITY

FLIGHT: 3/3

ABORT: 3/3

ITEM: GN2 PRESSURE GAGE

FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W. DAVIDSON

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:

1) SSME HYD. ACCUM. ASSY
2) GN2 PRESSURE GAGE
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LOCATION: 50V58AU5, 7, 9 (VS70-580999)

PART NUMBER:

CAUSES: DEFECTIVE MECHANISM, CALIBRATION SHIFT

EFFECTS/RATIONALE:

LOSS OF PRESSURE INDICATION. NO EFFECT IN FLIGHT.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-119
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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LEAD ANALYST: W. DAVIDSON

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) SSME HYD. ACCUM. ASSY
2) GN2 PRESSURE GAGE
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LOCATION: 50V58AU5, 7, 9 (VS70-580999)

PART NUMBER:

CAUSES: DEFECTIVE MECHANISM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE. FAILURE WOULD BE RECOGNIZED ON THE GROUND, AND HAS NO EFFECT IN FLIGHT.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-120
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 426

ITEM: AC INDUCTION MOTOR
FAILURE MODE: NO MOTOR POWER OUTPUT TO CIRC. PUMP

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) AC INDUCTION MOTOR
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LOCATION: 50V58PP1, 2, 3 (VS70-580999).

CAUSES: ELECTRICAL SHORT, ELECTRICAL OPEN CIRCUIT, INVERTER FAILURE

EFFECTS/RATIONALE:
LOSS OF BOOTSTRAP ACCUMULATOR REPRESS CAPABILITY AND LOSS OF HYDRAULIC THERMAL CONTROL CAPABILITY ON ONE SYSTEM.

REFERENCES: VS70-580999; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-121
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 427
HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/1R
ABORT: 3/1R

ITEM: INVERTER
FAILURE MODE: LOSS OF ELECTRIC POWER TO CIRC. PUMP INDUCTION MOTOR.

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) AC INDUCTION MOTOR
3) INVERTER

CRITICALITIES

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LOCATION: 50V58PP1, 2, 3 (VS70-580999)
PART NUMBER:

CAUSES: ELECTRICAL SHORT, ELECTRICAL OPEN CIRCUIT

EFFECTS/RATIONALE:
LOSS OF BOOTSTRAP ACCUMULATOR REPRESS CAPABILITY AND LOSS OF HYDRAULIC THERMAL CONTROL CAPABILITY.

REFERENCES: VS70-580999; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-122
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/1R
MDAC ID: 428  ABORT: 3/1R

ITEM: LOW PRESS PUMP  FAILURE MODE: LOSS OF HYDRAULIC OUTPUT

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) LOW PRESS PUMP
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CRITICALITIES

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LOCATION: 50V58PP1, 2, 3 (VS70-580999)

PART NUMBER:

CAUSES: LOSS OF ELECTRICAL MOTOR OUTPUT, PIECE-PART STRUCTURAL FAILURE, CONTAMINATION

EFFECTS/RATIONALE:
POSSIBLE LOSS OF ONE HYDRAULIC SYSTEM/LOSS OF HYDRAULIC OUTPUT FROM LOW PRESSURE PUMP RESULTS IN LOSS OF HYDRAULIC FLUID THERMAL CONTROL AND ACCUMULATOR REPRESS CAPABILITY. HYDRAULIC FLUID COMPONENT TEMP BELOW -40 DEGREES IS DEFINED AS LOSS OF HYDRAULIC SYSTEM.

REFERENCES: VS70-580999; JSC 20923, PCN 1; JSC-18341, PCN 3

REPORT DATE 12/23/86  C-123
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/1R
MDAC ID: 429  ABORT: 3/1R

ITEM: HI PRESS PUMP
FAILURE MODE: LOSS HYDRAULIC OF OUTPUT
LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) HI PRESS PUMP
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LOCATION: 50V58PP1, 2, 3 (VS70-580999)

PART NUMBER:

CAUSES: LOSS OF ELECTRIC MOTOR OUTPUT, PIECE-PART STRUCTURAL
FAILURE, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC THERMAL CONTROL CAPABILITY AND LOSS OF
CAPABILITY TO REPRESSURIZE ACCUMULATOR IN ONE HYDRAULIC SYSTEM.
WILL RESULT IN LOSS OF ONE HYDRAULIC SYSTEM IF COUPLED WITH A GN2
OR HYDRAULIC LEAK.

REFERENCES: VS70-580999; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-124
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 430

ITEM: PRESS ACTIVATED RELIEF VALVE
FAILURE MODE: FAILS TO CLOSE (INTERNAL LEAKAGE)

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTIVATED RELIEF VALVE

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LOCATION: 50V58PP1, 2, 3 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, DAMAGED SEAT, SPRING FAILURE

EFFECTS/RATIONALE:
LOSS OR DEGRATION OF CIRC. PUMP THERMAL CONTROL CAPABILITY.
ABILITY TO REPRESSURIZE ACCUMULATOR IS NO AFFECTED.

REFERENCES: VS70-580999; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-125
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTIVATED RELIEF VALVE
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LOCATION: 50V58PP1, 2, 3 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, GALLLING

EFFECTS/RATIONALE:
HIGHER THAN NORMAL HYDRAULIC PRESSURE DURING CIRC. PUMP OPERATION. POSSIBLE CIRC. PUMP MOTOR DAMAGE.

REFERENCES: VS70-580999; JSC 18341, PCN-3

REPORT DATE 12/23/86  C-126
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 432

ITEM: BLEED VALVE
FAILURE MODE: FAILS TO REMAIN CLOSED (EXTERNAL LEAKAGE)

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) BLEED VALVE
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LOCATION: 50V58MV16, 17, 18, 19, 20, 21 (VS70-580999)
PART NUMBER:
CAUSES: CONTAMINATION, DAMAGED SEAT

EFFECTS/RATIONALE:
LOSS OF ONE HYRAULIC SYSTEM/LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999, VS70-958102

REPORT DATE 12/23/86  C-127
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 433

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESS ACTUATED CONTROL VALVE
FAILURE MODE: FAILS TO SWITCH (CLOSE)

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS. ACTUATED CONTROL VALVE
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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: PILOT VALVE FAILURE, UNLOADER VALVE FAILURE, BLOCKED FILTER

EFFECTS/RATIONALE:
FAILURE TO SWITCH RESULTS IN FAILURE TO REPRESSURIZE ACCUMULATOR

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-128
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86
SUBSYSTEM: HYD/WSB
MDAC ID: 434

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: PRESS ACTUATED CONTROL VALVE
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC PUMP ASSEMBLY
2) PRESS. ACTUATED CONTROL VALVE
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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-129
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 435

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: PILOT VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS. ACTUATED CONTROL VALVE
3) PILOT VALVE

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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, SEAT OR BALL DAMAGE, BROKEN SPRING

EFFECTS/RATIONALE:
HYDRAULIC LEAK PATH FROM ACCUMULATOR TO RETURN LINE. LOSS OF RESERVOIR PRESSURE.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-130
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 436

ITEM: PILOT VALVE
FAILURE MODE: FAILS TO OPEN
LEAD ANALYST: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTUATED CONTROL VALVE
3) PILOT VALVE

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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: BROKEN SPRING

EFFECTS/RATIONALE:
CIRC. PUMP WILL NOT REPRESSURIZE ACCUMULATOR. PRESSURE WILL
REMAIN LOW SINCE FLOW FROM HIGH PRESSURE CIRC. PUMP IS INTO
SYSTEM CIRCULATION LINES AT LOW (350 PSIA) PRESSURE.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86  C-131
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 437

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: PILOT VALVE
FAILURE MODE: INTERNAL LEAKAGE FROM HIGH PRESS TO RETURN LINE

LEAD ANALYST: W. DAVIDSON SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTUATED CONTROL VALVE
3) PILOT VALVE
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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, SEAT OR BALL DAMAGE, BROKEN SPRING

EFFECTS/RATIONALE:
ACCUMULATOR PRESSURE WILL DECREASE AND REQUIRE REPRESSURIZATION.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 438

ITEM: FILTER
FAILURE MODE: RESTRICTED/BLOCKED FLOW

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTUATED CONTROL VALVE
3) FILTER
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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
FAILURE TO RECHARGE ACCUMULATOR USING CIRC. PUMP.

REFERENCES: VS70-580999, VS70-958102, JSC-18341, PCN-3

REPORT DATE 12/23/86 C-133
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 439

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: FILTER
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE-INTERNAL)

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTUATED CONTROL VALVE
3) FILTER

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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, MATERIAL FAILURE

EFFECTS/RATIONALE:
CONTAMINATION IN THE HYDRAULIC SYSTEM.

REFERENCES: VS70-580999, VS70-958102, JSC-18341, PCN-3

REPORT DATE 12/23/86 C-134
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 440

ITEM: PRESS. ACTIVATED BYPASS VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTUATED CONTROL VALVE
3) PRESS. ACTIVATED BYPASS VALVE (UNLOADER VALVE)
4) 
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CRITICALITIES

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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, BROKEN SPRING

EFFECTS/RATIONALE:
FAILURE TO REPRESSURIZE ACCUMULATOR. FLOW IS FROM HIGH PRESS PUMP TO LOW PRESS (350 PSIA) SYSTEM OUTLET.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86  C-135
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 441

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESS. ACTIVATED BYPASS VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTUATED CONTROL VALVE
3) PRESS. ACTIVATED BYPASS VALVE (UNLOADER VALVE)
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LOCATION: 50V58PV29, 30, 31 (VS70-580999)

PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, GALLING

EFFECTS/RATIONALE:
NO EFFECT. THE ACCUMULATOR PRESSURE WILL EXCEED EXPECTED VALUE. PRIORITY VALVE WILL PREVENT OVERPRESS. POSSIBLE CIRC. PUMP DAMAGE.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 442

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: PRESS. ACTIVATED BYPASS VALVE
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTUATED CONTROL VALVE
3) PRESS. ACTIVATED BYPASS VALVE (UNLOADER VALVE)
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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, SEAT OR BALL DAMAGE

EFFECTS/RATIONALE:
CIRC. PUMP WILL NOT REPRESSURIZE ACCUMULATOR. PRESSURE WILL REMAIN LOW SINCE FLOW FROM HIGH PRESSURE CIRC. PUMP IS IN TO SYSTEM CIRCULATION LINES AT LOWER (350 PSIA) PRESSURE.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86  C-137
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 443

ITEM: CHECK VALVE
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESS ACTUATED CONTROL VALVE
3) CHECK VALVE
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LOCATION: 50V58PV29, 30, 31 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, SEAT DAMAGE

EFFECTS/RATIONALE:
POSSIBLE CIRC. PUMP DAMAGE FROM BACK PRESSURE AT STARTUP.
ACCUMULATOR PRESSURE WILL BLEED DOWN CAUSING HIGHER THAN EXPECTED
CIRC. PUMP CYCLES TO KEEP ACCUMULATOR CHARGED. BACK FLOW THRU
FILTER COULD CONCENTRATE CONTAMINANT IN UNLOADER VALVE.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-138
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86

HIGHEST CRITICALITY

SUBSYSTEM: HYD/WSB

FLIGHT: 3/3

MDAC ID: 444

ABORT: 3/3

ITEM: PRESSURE TRANSDUCER

FAILURE MODE: OFFSCALE HIGH/LOW

LEAD ANALYST: W. DAVIDSON

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:

1) CIRC. PUMP ASSY
2) PRESSURE TRANSDUCER

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LOCATION: 50V58MT8, 17, 26 (VS70-580999)

PART NUMBER: ME499-0177-6162

CAUSES: DEFECTIVE MECHANISM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE. OUTPUT USED TO MONITOR CIRC. PUMP OPERATION. OTHER MEASUREMENTS AVAILABLE TO CONFIRM OPERATION.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-139
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 445

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) CIRC. PUMP ASSY
2) PRESSURE TRANSDUCER
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LOCATION: 50V58MT8, 17, 26 (VS70-580999)
PART NUMBER: ME499-0177-6162

CAUSES: DEFECTIVE MECHANISM, CALIBRATION SHIFT

EFFECTS/RATIONALE:
POSSIBLE OFF NOMINAL CIRC PUMP CYCLING BY SM SOFTWARE.

REFERENCES: VS70-580999; VS70-958102; JSC-18341, PCN-3

REPORT DATE 12/23/86 C-140
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 446

ITEM: TEMPERATURE TRANSDUCERS NOT USED FOR CIRC PUMP TEMPERATURE CONTROL
FAILURE MODE: OFFSCALE HIGH/LOW

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) TEMPERATURE TRANSDUCERS

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LOCATION: SYSTEM WIDE
PART NUMBER:
CAUSES: ELECTRICAL SHORT OR OPEN CIRCUIT, PIECE-PART FAILURE

EFFECTS/RATIONALE:
NONE. TEMPERATURE TRANSDUCERS ARE ADEQUATELY REDUNDANT.

REFERENCES: VS70-580999

REPORT DATE 12/23/86    C-141
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
HIGHEST CRITICALITY
HDW/FUNC
SUBSYSTEM: HYD/WSB
FLIGHT: 3/3
MDAC ID: 447
ABORT: 3/3

ITEM: TEMPERATURE TRANSDUCERS MONITORED BY FDA AND USED FOR CIRC PUMP TEMPERATURE CONTROL
FAILURE MODE: OFFSCALE HIGH/LOW

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) TEMPERATURE TRANSDUCERS
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CRITICALITIES
FLIGHT PHASE HDW/FUNC ABORT HDW/FUNC
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LIFTOFF: 3/3 TAL: 3/3
ONORBIT: 3/3 AOA: 3/3
DEORBIT: 3/3 ATO: 3/3
LANDING/SAFING: 3/3


LOCATION: SYSTEM WIDE
PART NUMBER:

CAUSES: ELECTRICAL SHORT OR OPEN CIRCUIT, PIECE-PART FAILURE

EFFECTS/RATIONALE:
NO EFFECT FOR OFFSCALE HIGH TRANSDUCER. CIRC. PUMP INADVERTANTLY TURNED ON FOR OFFSCALE LOW TRANSDUCER. CREW ACTION WILL CORRECT.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-142
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 448  ABORT: 1/1

ITEM: QUICK DISCONNECTS—GROUND SERVICING (RETURN)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) QUICK DISCONNECT

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LOCATION: 50V58PD13,15,17 (VS70-580999)
PART NUMBER: MC621-0024-0800

CAUSES: DAMAGED SEAT/POPPET, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86  HIGHEST CRITICALITY 3/1R
SUBSYSTEM: HYD/WSB         HDW/FUNC 3/1R
MDAC ID: 449   ABORT: 3/1R

ITEM: QUICK DISCONNECT-GROUND SERVICING (SUPPLY)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) QUICK DISCONNECT
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LOCATION: 50V58PD14,16,18 (VS70-580999)

CAUSES: DAMAGED SEAT/POPPET, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT. CHECK VALVE IN LINE WILL CONSTRAIN LEAK.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-144
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86
SUBSYSTEM: HYD/WSB
MDAC ID: 450

ITEM: QUICK DISCONNECT-HYD. GROUND POWER SUPPLY-LANDING GEAR STOW/DEPLOY
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) QUICK DISCONNECT-HYD. GND. PWR-L.G.
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LOCATION: 50V58PD27 (VS70-580999)
PART NUMBER: MC621-0024-0400

CAUSES: DAMAGED SEAT/POPPET

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM 1 FOR LOWERING LANDING GEAR AND BRAKING.

REFERENCES: VS70-580999
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86
SUBSYSTEM: HYD/WSB
MDAC ID: 451

ITEM: QUICK DISCONNECT-HYD/SSME (SUPPLY)
FAILURE MODE: INADVERTENT DISCONNECT

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) QUICK DISCONNECT
3) QUICK DISCONNECT-HYD./SSME
4) QUICK DISCONNECT-HYD/SSME
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LOCATION: 50V58PD1,3,5 (VS70-580999)
PART NUMBER: MC621-0024-0210/0110

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC PRESSURE TO ENGINE VALVES ON ONE SSME. ENGINE VALVES LOCK AT CURRENT THROTTLE SETTING.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-146
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86
SUBSYSTEM: HYD/WSB
MDAC ID: 452

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: QUICK Disconnect-HYD/SSME (RETURN)
FAILURE MODE: INADVERTENT DISCONNECT

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYdraulICS DISTRIBUTION, MONITORING AND CONTROL
2) QUICK Disconnect-HYD./SSME
3) 
4) 
5) 
6) 
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8) 
9) 

CRITICALITIES

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LOCATION: 50V58PD2,4,6 (VS70-580999)
PART NUMBER: MC621-0024-0610/0510

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF DIFFERENTIAL PRESSURE ACROSS TVC ACTUATORS AND SSME CONTROL VALVES.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-147
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86
SUBSYSTEM: HYD/WSB
MDAC ID: 453

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: QUICK DISCONNECT-HYD/SSME (SUPPLY)
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) QUICK DISCONNECT - HYD/SSME
3)
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LOCATION: 50V58PD1,3,5 (VS70-580999)
PART NUMBER: MC621-0024-0210/0110

CAUSES: VIBRATION, CONTAMINATION, MATERIAL DEFECT

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM./LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-148
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86
SUBSYSTEM: HYD/WSB
MDAC ID: 454

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: QUICK DISCONNECT-HYD/SSME (RETURN)
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) QUICK DISCONNECT-HYD/SSME
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LOCATION: 50V58PD2,4,6 (VS70-580999)
PART NUMBER: MC621-0024-0610/0510

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM./LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-149
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 455  ABORT: 3/3

ITEM: CHECK VALVE-RETURN LINE FROM ENG'S/ACT'S
FAILURE MODE: FAILS TO CLOSE (INTERNAL LEAKAGE)

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) CHECK VALVES
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LOCATION: 50V58CV1,2,3 (VS70-580999)
PART NUMBER: ME284-0434-1020

CAUSES: CONTAMINATION, DAMAGED SEAT
EFFECTS/RATIONALE:
NO EFFECT WITHOUT A SECOND FAILURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-150
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 456

ITEM: CHECK VALVE-RETURN LINE FROM ENG'S/ACT'S FAILS TO OPEN

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) CHECK VALVES
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LOCATION: 50V58CV1,2,3 (VS70-580999)
PART NUMBER: ME284-0434-1020

CAUSES: CONTAMINATION, GALLING

EFFECTS/RATIONALE:
LOSS OF PRESSURE DIFFERENTIAL ACROSS TVC ACTUATORS AND SSME CONTROL VALVES. EXCEED RETURN LINE DESIGN PRESSURE. (NOT A CREDIBLE FAILURE DURING PRELAUNCH AND LAUNCH PHASES.)

REFERENCES: V70-580999

REPORT DATE 12/23/86  C-151
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 457

ITEM: HOSE AND SWIVEL ASSY: TVC ACTUATORS
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) HOSE AND SWIVEL ASSY
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LOCATION:
50V58FH1,2,5,6,7,8,9,10,13,14,15,16,19,20,21,22,25,26,27,28,31,32,33,34
(VS70-580999)
PART NUMBER: MC277-0002-
1113,1114,1116,1117,1118,1121,1122,1123,2122,2125,2131,2133,2134,
2140,2141,2142

CAUSES: RUPTURE, SWIVEL LEAKAGE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. ACTUATOR SWITCHES TO REDUNDANT
SYSTEM. LOSS OF HYDRAULIC PRESSURE TO ONE SSME CAUSES CONTROL
VALVE LOCKUP.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-152
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 458

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: HOSE AND SWIVEL ASSY: TVC ACTUATORS/SSME HYD-SUPPLY LINES
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) HOSE AND SWIVEL ASSY
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LOCATION: 50V58FH75,77,79 (VS70-580999)
PART NUMBER: MC277-0002-1010,1111,1012

CAUSES: RUPTURE, SWIVEL LEAKAGE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. ACTUATOR SWITCHES TO REDUNDANT SYSTEM. LOSS OF HYDRAULIC PRESSURE TO ONE SSME CAUSES CONTROL VALVE LOCKUP.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-153
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 459

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 1/1

ITEM: HOSE AND SWIVEL ASSY: TVC ACTUATORS/SSME HYD.
RETURN LINES
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) HOSE AND SWIVEL ASSY
3) 4) 5) 6) 7) 8) 9)

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LOCATION: 50V58FH74, 76, 78 (VS70-580999)
PART NUMBER: MC277-0002-2158, 2057, 2159

CAUSES: RUPTURE, SWIVEL LEAKAGE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. ACTUATOR SWITCHES TO REDUNDANT
SYSTEM. LOSS OF HYDRAULIC PRESSURE TO ONE SSME CAUSES CONTROL
VALVE LOCKUP.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-154
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 460

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: HOSE AND SWIVEL ASSY: WATER SPRAY BOILERS
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
2) HOSE AND SWIVEL ASSY
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LOCATION: 50V58FH95,96,97,98,99,100 (VS70-580999)
PART NUMBER: MC277-0002-2160,2161,2162,2163,2164,2165

CAUSES: RUPTURE, SWIVEL LEAKAGE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. LOSS OF SUFFICIENT FLUID CAUSES
PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-155
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: HYD/WSB
MDAC ID: 461

HIGHEST CRITICALITY HDW/FUNC
ABORT: 2/1R

ITEM: NOSE WHEEL STEERING FLEX HOSE ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) NOSE WHEEL STEERING FLEX HOSE ASSEMBLY

CAUSES: PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
STEERING OF THE ORBITER MUST BE ACCOMPLISHED BY DIFFERENTIAL BRAKING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

LOCATION: 21V58FH80,81 (VS70-580996)
PART NUMBER: ME271-0079-10(03),(15)

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INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: HYD/WSB
MDAC ID: 462

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: MAIN LANDING GEAR FLEX HOSE (EXTEND)
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) MAIN LANDING GEAR FLEX HOSE (EXTEND)
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LOCATION: 67V58FH54,57 (VS70-580996)
PART NUMBER: ME271-0079-1001

CAUSES: PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
LANDING GEAR MUST BE DEPLOYED BY THE PYROTECHNIC DEVICES.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-157
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: HYD/WSB
MDAC ID: 463

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: MAIN LANDING GEAR FLEX HOSE (RETRACT)
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) MAIN LANDING GEAR FLEX HOSE (RETRACT)
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LOCATION: 67V58FH55,56 (VS70-580996)
PART NUMBER: ME271-0079-1002

CAUSES: PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
NO EFFECT ON THE DEPLOYMENT OF LANDING GEAR. NOSEWHEEL STEERING MIGHT REQUIRE DIFFERENTIAL BRAKING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-158
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86
SUBSYSTEM: HYD/WSB
MDAC ID: 464

ITEM: HYDRAULIC LINE
FAILURE MODE: LINE RUPTURE BETWEEN HYDRAULIC PUMPS AND LANDING GEAR AND MPS/TVC ISOVALVES

LEAD ANALYST: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) HYDRAULIC LINE
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CRITICALITIES

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LOCATION:
PART NUMBER:

CAUSES: STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-159
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86
SUBSYSTEM: HYD/WSB
MDAC ID: 465

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: HYDRAULIC LINE (SUPPLY) SYSTEM 1
FAILURE MODE: LINE RUPTURE BETWEEN L.G. ISOVALVES AND L.G.
CONTROL VALVES

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) HYDRAULIC LINE - SYSTEM 1
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LOCATION:
PART NUMBER:

CAUSES: STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM 1 FOR LOWERING LANDING GEAR AND BRAKING.

REFERENCES: VS70-580999

REPORT DATE 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/1R

ABORT: 3/1R

ITEM: HYDRAULIC LINE (RETURN) SYSTEM 1

FAILURE MODE: LINE RUPTURE BETWEEN L.G. CONTROL VALVES AND L.G.
RETURN LINE CHECK VALVE

LEAD ANALYST: W. DAVIDSON

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) HYDRAULIC LINE - SYSTEM 1
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LOCATION:

PART NUMBER:

CAUSES: STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM 1 FOR BRAKING AND NOSE WHEEL STEERING.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-161
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86
SUBSYSTEM: HYD/WSB
MDAC ID: 467

ITEM: HYDRAULIC LINE
FAILURE MODE: LINE RUPTURE (HYDRAULIC SUPPLY) BETWEEN MPS/TVC ISOVALVE AND ACT'S/SSME'S

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) HYDRAULIC LINE
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LOCATION:
PART NUMBER:

CAUSES: STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM./LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-162
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86        HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB   FLIGHT: 2/1R
MDAC ID: 468         ABORT: 1/1

ITEM: HYDRAULIC LINE
FAILURE MODE: LINE RUPTURE (RETURN) BETWEEN ACT’S/SSME’S AND RETURN LINE CHECK VALVE

LEAD ANALYST: W. DAVIDSON      SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) HYDRAULIC LINE
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CRITICALITIES

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LOCATION:
PART NUMBER:

CAUSES: STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM./LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-163
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 469

HIGHEST CRITICALITY

FLIGHT: 2/1R
ABORT: 2/1R

ITEM: REDUNDANT SHUTOFF VALVE (N.O.)
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) REDUNDANT SHUTOFF VALVE (N.O.)
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LOCATION: 67V58LV9 (VS70-580999)
PART NUMBER: MC621-0046-0005

CAUSES: SOLENOID FAILURE, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF ISOLATION REDUNDANCY FOR HYDRAULIC RETRACT COMMAND.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-164
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 470

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: REDUNDANT SHUTOFF VALVE (N.O.)
FAILURE MODE: PREMATURE CLOSE

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) REDUNDANT SHUTOFF VALVE (N.O.)
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LOCATION: 67V58LV9 (VS70-580999)
PART NUMBER: MC621-0046-0005

CAUSES: SOLENOID FAILURE, PREMATURE ELECTRICAL POWER TO SOLENOID.

EFFECTS/RATIONALE:
NO EFFECT. PROVIDES PREMATURE ISOLATION REDUNDANCY.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-165
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86
SUBSYSTEM: HYD/WSB
MDAC ID: 471

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: REDUNDANT SHUTOFF VALVE (N.O.)
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING AND CONTROL
2) REDUNDANT SHUTOFF VALVE (N.O.)
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CRITICALITIES
FLIGHT PHASE HDW/FUNC ABORT HDW/FUNC
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LIFTOFF: 3/3 TAL: 2/1R
ONORBIT: 3/3 AOA: 2/1R
DEORBIT: 2/1R ATO: 2/1R
LANDING/SAFING: 2/1R


LOCATION: 67V58LV9 (VS70-580999)
PART NUMBER: MC621-0046-0005

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM 1 FOR LOWERING LANDING GEAR AND BRAKING.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-166
## INDEPENDENT ORBITER ASSESSMENT
### ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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**ITEM:** LANDING GEAR DUMP SOLENOID VALVE (N.C.)
**FAILURE MODE:** FAILS TO OPEN

**LEAD ANALYST:** W. DAVIDSON  **SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) L.G. DUMP SOLENOID VALVE (N.C.)
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**LOCATION:** 67V58LV10 (VS70-580999)
**PART NUMBER:** MC621-0046-0003

**CAUSES:** SOLENOID FAILURE

**EFFECTS/RATIONALE:**
LOSS OF REDUNDANT RETURN PATH FROM RETRACT/LOCK LINES.

**REFERENCES:** VS70-580999

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**REPORT DATE** 12/23/86  **C-167**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 473

ITEM: LANDING GEAR DUMP SOLENOID VALVE (N.C.)
FAILURE MODE: PREMATURE OPEN

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) L.G. DUMP SOLENOID VALVE (N.C.)
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LOCATION: 67V58LV10 (VS70-580999)
PART NUMBER: MC621-0046-0003

CAUSES: SOLENOID FAILURE, PREMATURE ELECTRICAL POWER TO SOLENOID.

EFFECTS/RATIONALE:
PROVIDES REDUNDANT RETURN PATH FROM RETRACT SIDE OF L.G. ACTUATOR. L.G. CONTROL UP/CIRC SOLENOID VALVE ALSO PROVIDES A RETURN PATH.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-168
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86
SUBSYSTEM: HYD/WSB
MDAC ID: 474

ITEM: LANDING GEAR DUMP SOLENOID VALVE (N.C.)
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING AND CONTROL
2) L.G. DUMP SOLENOID VALVE (N.C.)
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LOCATION: 67V58LV10 (VS70-580999)
PART NUMBER: MC621-0046-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NO EFFECT ON THE DEPLOYMENT OF LANDING GEAR. NOSEWHEEL STEERING MIGHT REQUIRE DIFFERENTIAL BRAKING.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-169
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86
SUBSYSTEM: HYD/WSB
MDAC ID: 475

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: PRIORITY VALUE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) ACCUMULATOR PRIORITY VALVE

LOCATION: 50V5813,14,15, (VS70-580999)
PART NUMBER: MC284-0417-0001/MC364-0011-0013

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM/LOSS OF RESERVOIR PRESSURE CAUSES
LOSS OF PUMP HEAD PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-170
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 476 ABORT: 2/1R

ITEM: PRIORITY VALVE
FAILURE MODE: LEAKAGE, INTERNAL (ACCUMULATOR TO SYSTEM THRU CHECK VALVE)

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) ACCUMULATOR PRIORITY VALVE
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LOCATION: 50V5813,14,15 (VS70-580999)
PART NUMBER: MC284-0417-0001/MC364-0011-0013

CAUSES: CONTAMINATION, BROKEN SPRING

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM/LOSS OF RESERVOIR PRESSURE CAUSES LOSS OF PUMP HEAD PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-171
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86
SUBSYSTEM: HYD/WSB
MDAC ID: 477

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: PRIORITY VALVE
FAILURE MODE: LEAKAGE, INTERNAL ACCUMULATOR TO RESERVOIR THRU DRAIN PORT

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) ACCUMULATOR PRIORITY VALVE
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LOCATION: 50V5813,14,15 (VS70-580999)
PART NUMBER: MC284-0417-0001/MC364-0011-0013

CAUSES: DAMAGED O'RING

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM/LOSS OF RESERVOIR PRESSURE CAUSES LOSS OF PUMP HEAD PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-172
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86
SUBSYSTEM: HYD/WSB
MDAC ID: 478

ITEM: ACCUMULATOR DUMP VALVE
FAILURE MODE: INTERNAL LEAKAGE (ACCUMULATOR/RESERVOIR TO SYSTEM)

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) ACCUMULATOR DUMP VALVE
3) ...

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LOCATION: 50V58MV1,2,3 (VS70-580999)
PART NUMBER: MC621-0034-0001/MC364-0011-0011

CAUSES: DAMAGED SEAL

EFFECTS/RATIONALE:
POSSIBLE LOSS OF ONE HYDRAULIC SYSTEM/LOSS OF RESERVOIR PRESSURE
CAUSES LOSS OF PUMP HEAD PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-173
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 479

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: LANDING GEAR ISOLATION VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR ISO. VALVE

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LOCATION: 50V58LV26,27,28 (VS70-580999)
PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: SOLENOID FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC POWER TO EXTEND LANDING GEAR (SYS 1), LOSS OF REDUNDANT HYDRAULIC POWER TO BRAKES (SYS 2 & 3), LOSS OF THERMAL CONTROL IN SYS 2 & 3.

REFERENCES: V70-580999

REPORT DATE 12/23/86 C-174
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86

SUBSYSTEM: HYD/WSB
MDAC ID: 480

ITEM:   LANDING GEAR ISOLATION VALVE
FAILURE MODE:  PREMATURE CLOSE

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR ISO. VALVE
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LOCATION: 50V58LV26,27,28 (VS70-580999)
PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: SOLENOID SPRING FAILURE, INADVERTANT SIGNAL TO SOLENOID

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC POWER TO EXTEND LANDING GEAR (SYS 1), LOSS OF REDUNDANT HYDRAULIC POWER TO BRAKES (SYS 2 & 3), LOSS OF THERMAL CONTROL IN SYS 2 & 3.

REFERENCES: V70-580999

REPORT DATE 12/23/86  C-175
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 481

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: LANDING GEAR ISOLATION VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR ISO. VALVE
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LOCATION: 50V58LV26,27,28 (VS70-580999)
PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: SOLENOID FAILURE

EFFECTS/RATIONALE:
LOSS OF REDUNDANT ISOLATION OF LANDING GEAR EXTEND CIRCUITS. LOSS OF HYDRAULIC SYSTEM ISOLATION FROM LEAKS IN BRAKE CIRCUITS AND LANDING GEAR CIRCUITS.

REFERENCES: V70-580999

REPORT DATE 12/23/86 C-176
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86

SUBSYSTEM: HYD/WSB
MDAC ID: 482

HIGHEST CRITICALITY

FLIGHT: 2/1R
ABORT: 2/1R

ITEM: LANDING GEAR ISOLATION VALVE
FAILURE MODE: PREMATURE OPEN

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR ISO. VALVE
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LOCATION: 50V58LV26,27,28 (VS70-580999)
PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: SOLENOID SPRING FAILURE, INADVERTENT SIGNAL TO SOLENOID

EFFECTS/RATIONALE:
LOSS OF REDUNDANT ISOLATION OF LANDING GEAR EXTEND CIRCUITS.
LOSS OF HYDRAULIC SYSTEM ISOLATION FROM LEAKS IN BRAKE CIRCUITS.

REFERENCES: V70-580999

REPORT DATE 12/23/86 C-177
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 483

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: LANDING GEAR ISOLATION VALVE
FAILURE MODE: INTERNAL LEAK

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR ISO. VALVE
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LOCATION: 50V58LV26,27,28 (VS70-580999)
PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: DAMAGED SOLENOID BALL OR SEAT.

EFFECTS/RATIONALE:
VALVE FUNCTION IS NOT AFFECTED. LEAKAGE IS TO RETURN PORT.

REFERENCES: V70-580999
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86

HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: HYD/WSB

FLIGHT: 2/1R

MDAC ID: 484

ABORT: 2/1R

ITEM: LANDING GEAR ISOLATION VALVE

FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING AND CONTROL
2) LANDING GEAR ISO VALVE

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LOCATION: 50V58L26, 27, 28 (VS70-580999)

PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. LOSS OF SUFFICIENT FLUID CAUSES PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-179
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 485

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: LANDING GEAR ISOLATION VALVE POS. INDICATION
FAILURE MODE: ERRONEOUS OUTPUT (OPEN)

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR ISO. VALVE
3) L.G. ISO. VALVE POSITION IND.

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LOCATION: 50V58LV26,27,28 (VS70-580999)
PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: BROKEN SPRING

EFFECTS/RATIONALE:
LOSS OF STATUS INFORMATION.

REFERENCES:

REPORT DATE 12/23/86  C-180
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 486  ABORT: 2/1R

ITEM: LANDING GEAR CONTROL UP/CIRC. SOLENOID VALVE
FAILURE MODE: PREMATURE OPEN (PRESS TO RETRACT/LOCK LINES)

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) L.G. CONTROL UP/CIRC. SOLENOID VALVE
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LOCATION: 67V58LV25 (VS70-580999)
PART NUMBER: MC621-0029-0005

CAUSES: SOLENOID SPRING FAILURE, PREMATURE SOLENOID ACTIVATION

EFFECTS/RATIONALE:
LOSS OF ISOLATION REDUNDANCY FOR HYDRAULIC RETRACT COMMAND. LOSS OF REDUNDANT RETRACT/LOCK TO RETURN LINE PATH. LG DUMP SOLENOID VALVE PROVIDES PATH.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-181
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 487  ABORT: 2/1R

ITEM: LANDING GEAR CONTROL UP/CIRC. SOLENOID VALVE
FAILURE MODE: FAILS TO CLOSE (PROVIDE PATH FROM RETRACT/LOCK TO RETURN LINES)

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) L.G. CONTROL UP/CIRC. SOLENOID VALVE
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LOCATION: 67V58LV25 (VS70-580999)
PART NUMBER: MC621-0029-0005

CAUSES: CONTAMINATION, SPRING FAILURE

EFFECTS/RATIONALE:
LOSS OF ISOLATION REDUNDANCY FOR HYDRAULIC RETRACT COMMAND. LOSS OF REDUNDANT RETRACT/LOCK TO RETURN LINE PATH. LG DUMP SOLENOID VALVE PROVIDES PATH.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-182
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 488

HIGHEST CRITICALITY

FLIGHT: 3/3
ABORT: 3/3

ITEM: LANDING GEAR CONTROL UP/CIRC. SOLENOID VALVE
FAILURE MODE: LEAKAGE, INTERNAL

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) L.G. CONTROL UP/CIRC. SOLENOID VALVE
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LOCATION: 67V58LV25 (VS70-580999)
PART NUMBER: MC621-0029-0005

CAUSES: DAMAGED SOLENOID BALL OR SEAT.

EFFECTS/RATIONALE:
VALVE FUNCTION IS NOT AFFECTED. LEAKAGE IS TO RETURN PORT.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-183
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 489  ABORT: 2/1R

ITEM: LANDING GEAR CONTROL UP/CIRC SOLENOID VALVE
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING AND CONTROL
2) L.G. CONTROL UP/CIRC SOLENOID VALVE
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LOCATION: 67V58LV25 (VS70-580999)
PART NUMBER: MC621-0029-0005

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM 1 FOR LOWERING LANDING GEAR AND BRAKING.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-184
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 490

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: RESTRICTOR, HYDRAULIC, L.G. RETRACT LINE
FAILURE MODE: BLOCKED OR RESTRICTED FLOW

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) L.G. CONTROL UP/CIRC. SOLENOID VALVE
3) RESTRICTOR, HYD. L.G. RETRACT LINE
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LOCATION: 67V58PF4 (VS70-580999)
PART NUMBER: ME251-0010-0001

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OR DEGRADED EFFECTIVITY OF REDUNDANT PATH FROM RETRACT/LOCK TO RETURN LINE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-185
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 491
HIGHEST CRITICALITY HDW/FUNC: FLIGHT: 2/1R
ABORT: 2/1R

ITEM: LANDING GEAR CONTROL VALVE-2POS, 3WAY, SOLENOID
OPERATED
FAILURE MODE: FAILS TO SWITCH TO LG EXTEND POSITION

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR CONTROL VALVE

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LOCATION: 67V58LV11 (V70-580999)
PART NUMBER: MC621-0029-0005

CAUSES: DEFECTIVE SOLENOID

EFFECTS/RATIONALE:
FAIL TO GET HYDRAULIC POWER TO LANDING GEAR EXTEND/UNLOCK
ACTUATORS. RELY ON PYRO'S TO LOWER LANDING GEAR.

REFERENCES: V70-580999

REPORT DATE 12/23/86 C-186
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 1/1
MDAC ID: 492  ABORT: 1/1

ITEM: LANDING GEAR CONTROL VALVE-2POS, 3WAY, SOLENOID
OPERATED
FAILURE MODE: PREMATURE SWITCH TO LG EXTEND POSITION

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR CONTROL VALVE
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LOCATION: 67V58LV11 (VS70-580999)
PART NUMBER: MC621-0029-0005

CAUSES: SOLENOID SPRING FAILURE, PREMATURE SOLENOID ACTIVATION

EFFECTS/RATIONALE:
LANDING GEAR WILL EXTEND WHEN L.G. ISO VALVE IS OPENED AT A RELATIVE VELOCITY OF 800 FPS. PROBABLE LOSS OF CREW AND VEHICLE.

REFERENCES: V70-580999

REPORT DATE 12/23/86  C-187
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 493  ABORT: 3/3

ITEM: LANDING GEAR CONTROL VALVE-2POS, 3WAY, SOLENOID
OPERATED
FAILURE MODE: LEAK, INTERNAL

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR CONTROL VALVE
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LOCATION: 67V58LV11 (VS70-580999)
PART NUMBER: MC621-0029-0005

CAUSES: DAMAGED SOLENOID BALL OR SEAT

EFFECTS/RATIONALE:
VALVE FUNCTION IS NOT AFFECTED. LEAKAGE IS TO RETURN PORT.

REFERENCES: V70-580999

REPORT DATE 12/23/86  C-188
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 494  ABORT: 2/1R

ITEM: LANDING GEAR CONTROL VALVE - 2 POS, 3 WAY, SOLENOID
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) LANDING GEAR CONTROL VALVE
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LOCATION: 67V58LV11 (VS70-580999)
PART NUMBER: MC621-0029-0005

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM 1 FOR LOWERING LANDING GEAR AND BRAKING.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-189
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 495

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: MPS/TVC SHUTOFF VALVE
FAILURE MODE: FAILS TO TRANSFER FROM HYDRAULIC POWER MODE TO THERMAL CONTROL MODE.

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) MPS/TVC HYD. SHUTOFF VALVE

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LOCATION: 50V58LV34,35,36 (VS70-580999)
PART NUMBER: MC284-0469-0027/MC364-0011-0051

CAUSES: SOLENOID FAILURE

EFFECTS/RATIONALE:
HIGHER THAN EXPECTED HYDRAULIC FLOW CAUSES HIGHER THAN EXPECTED ELECTRICAL POWER CONSUMPTION BY CIRC. PUMP & HIGHER THAN EXPECTED USE OF APU FUEL DURING DESCENT BECAUSE OF EXTRA LOAD. LOSS OF HYDRAULIC SYSTEM WOULD OCCUR AT APU FUEL DEPLETION.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-190
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 496

ABORT: 1/1

ITEM: MPS/TVC SHUTOFF VALVE
FAILURE MODE: PREMATURE TRANSFER FROM HYDRAULIC POWER MODE TO THERMAL CONTROL MODE DURING ASCENT.

LEAD ANALYST: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) MPS/TVC HYD. SHUTOFF VALVE

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LOCATION: 50V58LV34,35,36 (VS70-580999)
PART NUMBER: MC284-0469-0027/MC364-0011-0051

CAUSES: PREMATURE POWER TO SOLENOID, SOLENOID SPRING FAILURE

EFFECTS/RATIONALE:
LOSS OF POWER FROM ONE HYDRAULIC SYSTEM TO TVC ACTUATORS, LOSS OF HYDRAULIC POWER TO ONE SSME.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-191
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 497

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: MPS/TVC SHUTOFF VALVE
FAILURE MODE: FAILS TO TRANSFER FROM THERMAL CONTROL MODE TO HYDRAULIC POWER MODE FOR ENGINE REPOSITIONING.

LEAD ANALYST: W. DAVIDSON SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) MPS/TVC HYD. SHUTOFF VALVE
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LOCATION: 50V58LV34,35,36 (VS70-580999)
PART NUMBER: MC284-0469-0027/MC364-0011-0051

CAUSES: SOLENOID FAILURE

EFFECTS/RATIONALE:
LOSS OF REDUNDANT CAPABILITY TO REPOSITION ENGINES. MUST USE REDUNDANT HYDRAULIC SYSTEM.

REFERENCES: VS70-580999

REPORT DATE 12/23/86 C-192
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 498  ABORT: 1/1

ITEM: MPS/TVC SHUTOFF VALVE
FAILURE MODE: EXTERNAL LEAK

LEAD ANALYST: W. DAVIDSON  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
2) MPS/TVC HYD. SHUTOFF VALVE
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LOCATION: 50V58LV34, 35, 36 (VS70-580999)
PART NUMBER: MC284-0469-0027/MC364-0011-0051

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE HYDRAULIC SYSTEM. LOSS OF SUFFICIENT FLUID CAUSE PUMP CAVITATION AND LOSS OF HYDRAULIC PRESSURE.

REFERENCES: VS70-580999

REPORT DATE 12/23/86  C-193
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 600

ITEM: PUMP (MECHANICAL)
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) PUMP (MECHANICAL)

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029-0006

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-194
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 601

ITEM: PUMP (MECHANICAL)
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) PUMP (MECHANICAL)

CRITICALITIES

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029-0006

CAUSES: MECHANICAL SHOCK
EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO OPERATE PUMP.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-195
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 602

ITEM: PUMP (MECHANICAL)
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) PUMP (MECHANICAL)

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029-0006

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
PUMP IS UNABLE TO SUPPLY FLUID TO THE SYSTEM.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-196
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 603

MDAC ID: 603

ITEM: DEPRESSURIZATION VALVE
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) DEPRESSURIZATION VALVE
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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-197
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 604

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: DEPRESSURIZATION VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) DEPRESSURIZATION VALVE
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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO DEPRESSURIZE MAIN PUMP FOR MAIN PUMP STARTUP.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-198
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 605

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 1/1

ITEM: DEPRESSURIZATION VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) DEPRESSURIZATION VALVE
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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO CONTROL PUMP PRESSURIZATION.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-199
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

SUBSYSTEM: HYD/WSB
MDAC ID: 606

ITEM: DEPRESSURIZATION VALVE
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) DEPRESSURIZATION VALVE
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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO CONTROL PUMP PRESSURIZATION.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-200
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 607

ITEM: DEPRESSURIZATION VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) DEPRESSURIZATION VALVE

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: PIECE-PART STRUCTURAL FAILURE
EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-201
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 608  ABORT: 1/1

ITEM: DEPRESSURIZATION VALVE
FAILURE MODE: SHORTED

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) DEPRESSURIZATION VALVE
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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO CONTROL PUMP PRESSURIZATION.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-202
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 609

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: PRESSURE COMPENSATOR SPOOL VALVE
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) PRESSURE COMPENSATOR SPOOL VALVE
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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-203
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 610

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: PRESSURE COMPENSATOR SPOOL VALVE
FAILURE MODE: FAILS TO MAXIMUM OUTPUT POSITION

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) PRESSURE COMPENSATOR SPOOL VALVE
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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: CONTAMINATION, BINDING/JAMMING

EFFECTS/RATIONALE:
VOLUME OF DISPLACED FLUID REMAINS FIXED DUE TO INABILITY TO CONTROL CAM STROKE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-204
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 611

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: PRESSURE COMPENSATOR SPOOL VALVE
FAILURE MODE: FAILS TO MINIMUM OUTPUT POSITION

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) PRESSURE COMPENSATOR SPOOL VALVE

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: CONTAMINATION, SPRING FAILURE, BINDING/JAMMING

EFFECTS/RATIONALE:
VOLUME OF DISPLACED FLUID REMAINS FIXED DUE TO INABILITY TO CONTROL CAM STROKE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-205
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 612  ABORT: 1/1

ITEM: FLEX HOSE (SUCTION)  FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) FLEX HOSE (SUCTION)

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: ME271-0079-200(5),(6),(7)

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE: LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-206
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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ITEM: FLEX HOSE (SUPPLY)
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) FLEX HOSE (SUPPLY)

CRITICALITIES

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: ME271-0079-102(1),(2),(3)

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-207
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 614

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 1/1

ITEM: FLEX HOSE (CASE)
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) FLEX HOSE (CASE)

CRITICALITIES

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996).
PART NUMBER: ME271-0079-300(3),(4),(3)

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-208
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 615

HIGHEST CRITICALITY

ITEM: SHAFT SEAL DRAIN PORT
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) SHAFT SEAL DRAIN PORT

CRITICALITIES

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LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
MINOR CONTAMINATION COULD OCCUR IN THE AFT FUSELAGE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-209
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 619

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 2/1R
ABORT: 3/3

ITEM: CHECK VALVE (SUPPLY)
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) CHECK VALVE (SUPPLY)
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LOCATION: 50V58CV(25),(28),(31) (VS70-580996)
PART NUMBER: ME284-0434-2020

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
PRESSURE FROM CIRCULATION PUMP COULD DAMAGE MAIN PUMP.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-210
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 620

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: CHECK VALVE (SUPPLY)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) CHECK VALVE (SUPPLY)

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LOCATION: 50V58CV(25),(28),(31) (VS70-580996)
PART NUMBER: ME284-0434-2020

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-211
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 621 ABORT: 1/1

ITEM: CHECK VALVE (CASE)
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) CHECK VALVE (CASE)
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LOCATION: 50V58CV(24),(27),(30) (VS70-580996)
PART NUMBER: ME284-0434-2008

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF MAIN PUMP OUTPUT. FAILURE IS NOT CREDIBLE DURING MAIN PUMP OPERATIONS.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-212
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 622

ITEM: CHECK VALVE (CASE)
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) CHECK VALVE (CASE)

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LOCATION: 50V58CV(24),(27),(30) (VS70-580996)
PART NUMBER: ME284-0434-2008

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
BACK FLUSH OF CASE FILTER DURING GROUND OPERATIONS COULD CONTAMINATE PUMP CASE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-213
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 623

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: CHECK VALVE (CASE)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) MAIN HYDRAULIC PUMP
3) CHECK VALVE (CASE)

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LOCATION: 50V58CV(24),(27),(30), (VS70-580996)
PART NUMBER: ME284-0434-2008

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-214
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 624

ITEM: HYDRAULIC RESERVOIR
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR

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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE, CORROSION

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-215
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 625

ITEM: HYDRAULIC RESERVOIR
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO PRESSURIZE RESERVOIR.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-216
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 626

ITEM: HYDRAULIC RESERVOIR
FAILURE MODE: INTERNAL LEAKAGE (LOW PRESSURE-TO-DRAIN)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-217
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 627

ITEM: HYDRAULIC RESERVOIR
FAILURE MODE: INTERNAL LEAKAGE (HIGH PRESSURE-TO-LOW PRESSURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
HIGH AND LOW PRESSURE WILL EQUALIZE, THEREBY ELIMINATING THE CAPABILITY TO VARY PRESSURE ON THE STORED FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-218
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB
MDAC ID: 628

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: LOW PRESSURE RELIEF VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) LOW PRESSURE RELIEF VALVE
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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
OVERPRESSURIZATION COULD DAMAGE THE RESERVOIR.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86

C-219
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB
MDAC ID: 629

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: LOW PRESSURE RELIEF VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) LOW PRESSURE RELIEF VALVE
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CRITICALITIES
FLIGHT PHASE HDW/FUNC ABORT HDW/FUNC
PRELAUNCH: 3/3 RTLS: 1/1
LIFTOFF: 2/1R TAL: 2/1R
ONORBIT: 2/1R AOA: 2/1R
DEORBIT: 2/1R ATO: 2/1R
LANDING/SAFING: 2/1R


LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC FLUID. RESERVOIR PRESSURE CANNOT BE ADEQUATELY CONTROLLED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-220
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 630

ITEM: LOW PRESSURE RELIEF VALVE
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) LOW PRESSURE RELIEF VALVE
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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062

CAUSES: PIECE-PART STRUCTURAL FAILURE
EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-221
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 631  ABORT: 1/1

ITEM: LOW PRESSURE RELIEF VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) LOW PRESSURE RELIEF VALVE

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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062

CAUSES: PIECE-PART STRUCTURAL FAILURE
EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-222
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 632

ITEM: HORIZONTAL/BLEED SAMPLE VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) HORIZONTAL/BLEED SAMPLE VALVE
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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062

CAUSES: PIECE-PART STRUCTURAL FAILURE
EFFECTS/RATIONALE: LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-223
### INDEPENDENT ORBITER ASSESSMENT
### ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 11/05/86  
**SUBSYSTEM:** HYD/WSB  
**MDAC ID:** 633  

**ITEM:** VERTICAL/BLEED SAMPLE VALVE  
**FAILURE MODE:** EXTERNAL LEAKAGE

**LEAD ANALYST:** W. E. PARKMAN  
**SUBSYS LEAD:** W. DAVIDSON

### BREAKDOWN HIERARCHY:

1. HYDRAULIC SUBSYSTEM  
2. HYDRAULIC RESERVOIR  
3. VERTICAL/BLEED SAMPLE VALVE  

### CRITICALITIES

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

**LOCATION:**  
50V58TK(4),(5),(6) (VS70-580996)  
**PART NUMBER:** MC282-0062

**CAUSES:** PIECE-PART STRUCTURAL FAILURE  
**EFFECTS/RATIONALE:**  
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

**REFERENCES:** JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

**REPORT DATE** 12/23/86  
**C-224**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86          HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB       FLIGHT: 3/3
MDAC ID: 634             ABORT: 3/3

ITEM: FLUID VOLUME TRANSDUCER
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W. E. PARKMAN       SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) FLUID VOLUME TRANSDUCER
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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062

CAUSES: VIBRATION, CALIBRATION SHIFT

EFFECTS/RATIONALE:
LOSS OF RESERVOIR QUANTITY DATA.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86       C-225
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 635

HIGHEST CRITICALITY

FLIGHT: 3/3
ABORT: 3/3

ITEM: FLUID VOLUME TRANSDUCER
FAILURE MODE: FAILS OFFSCALE-HI

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) FLUID VOLUME TRANSDUCER

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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF RESERVOIR QUANTITY DATA.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-226
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB
MDAC ID: 636

ITEM: FLUID VOLUME TRANSDUCER
FAILURE MODE: FAILS OFFSCALE-LO

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) FLUID VOLUME TRANSDUCER
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LOCATION: 50V58TK(4),(5),(6) (VS70-580996)
PART NUMBER: MC282-0062

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF RESERVOIR QUANTITY DATA.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-227
**INDEPENDENT ORBITER ASSESSMENT**  
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 11/05/86  
**HIGHEST CRITICALITY** HDW/FUNC  
**MDAC ID:** 637

**SUBSYSTEM:** HYD/WSB  
**FLIGHT:** 3/3

**ABORT:** 3/3

**ITEM:** PRESSURE TRANSDUCER  
**FAILURE MODE:** ERRONEOUS INDICATION

**LEAD ANALYST:** W. E. PARKMAN  
**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**  
1) HYDRAULIC SUBSYSTEM  
2) HYDRAULIC RESERVOIR  
3) PRESSURE TRANSDUCER  
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**CRITICALITIES**  

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

**LOCATION:**  
50V58MT(7),(16),(25) (VS70-580996)

**PART NUMBER:** ME449-0177-6103/6173

**CAUSES:** CONTAMINATION, VIBRATION, CALIBRATION SHIFT

**EFFECTS/RATIONALE:**  
LOSS OF PRESSURE DATA.

**REFERENCES:** JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

**REPORT DATE** 12/23/86  
**C-228**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 638

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: FAILS OFFSCALE-HI

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) PRESSURE TRANSDUCER

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LOCATION: 50V58MT(7),(16),(25) (VS70-580996)
PART NUMBER: ME449-0177-6103/6173

CAUSES: VIBRATION
EFFECTS/RATIONALE:
LOSS OF PRESSURE DATA.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-229
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 639

ITEM: PRESSURE TRANSUDER
FAILURE MODE: FAILS OFFSCALE-LO

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) HYDRAULIC RESERVOIR
3) PRESSURE TRANSUDER

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LOCATION: 50V58MT(7),(16),(25) (VS70-580996)
PART NUMBER: ME449-0177-6103/6173

CAUSES: VIBRATION
EFFECTS/RATIONALE: LOSS OF PRESSURE DATA.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-230
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86
SUBSYSTEM: HYD/WSB
MDAC ID: 643

HIGHEST CRITICALITY FLIGHT: 2/1R
ABORT: 1/1

ITEM: E.T. UMBILICAL RETRACT ACTUATOR
FAILURE MODE: RUPTURE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
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CRITICALITIES

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE: 12/23/86 C-231
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 644

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT:
2/1R
ABORT:
1/1

ITEM: E.T. UMBILICAL RETRACT ACTUATOR
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB

MDAC ID: 645

HIGHEST CRITICALITY FLIGHT: 3/3
ABORT: 3/3

ITEM: E.T. UMBILICAL RETRACT ACTUATOR

FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR

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LOCATION: 50V58AC(11-16) (VS70-580996)

PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF FLUID WILL REDUCE DAMPING CAPABILITIES.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-233
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 646  ABORT: 3/3

ITEM: E.T. UMBILICAL RETRACT ACTUATOR
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
DAMPING OF THE UMBILICAL PLATE WILL BE REDUCED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-234
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

HIGHEST CRITICALITY

SUBSYSTEM: HYD/WSB

MDAC ID: 647

FLIGHT: 3/3

ABORT: 3/3

ITEM: EXTEND SOLENOID VALVE

FAILURE MODE: FAILS OPEN

LEAD ANALYST: W. E. PARKMAN

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) EXTEND SOLENOID VALVE
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LOCATION: 50V58AC(11-16) (VS70-580996)

PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
TIME FOR ACTUATOR RETRACTION WILL BE INCREASED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-235
DATE: 11/05/86

SUBSYSTEM: HYD/WSB

MDAC ID: 648

ITEM: EXTEND SOLENOID VALVE

FAILURE MODE: FAILS CLOSED

LEAD ANALYST: W. E. PARKMAN

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) EXTEND SOLENOID VALVE
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LOCATION: 50V58AC(11-16) (VS70-580996)

PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
FLUID WILL NOT BE SUPPLIED TO THE EXTEND SWITCHING VALVE AND THE LOCK VALVE THROUGH THE EXTEND SOLENOID VALVE. THEREFORE ACTUATOR CANNOT BE EXTENDED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-236
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 649

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: EXTEND SOLENOID VALVE
FAILURE MODE: SHORTED

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) EXTEND SOLENOID VALVE

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO CONTROL EXTEND SOLENOID VALVE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-237
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB
MDAC ID: 650

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: FLOW CONTROL VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) FLOW CONTROL VALVE

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE: OVERPRESSURIZATION COULD DAMAGE ACTUATOR.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-238
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 651  ABRORT: 3/3

ITEM: FLOW CONTROL VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) FLOW CONTROL VALVE

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE: PRESSURE SUPPLIED TO EXTEND THE ACTUATOR WILL BE REDUCED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-239
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB

MDAC ID: 652

ITEM: EXTEND SWITCHING VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) EXTEND SWITCHING VALVE

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

LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
ACTUATOR CANNOT BE EXTENDED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-240
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSS
MDAC ID: 653

ITEM: EXTEND SWITCHING VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) EXTEND SWITCHING VALVE

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
COULD SLOW RETRACTION OF ACTUATOR DUE TO OPPOSING PRESSURE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-241
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT:  3/3
MDAC ID: 654  ABORT:  3/3

ITEM: BYPASS FLOW VALVE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) BYPASS FLOW VALVE

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LOCATION:  50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
PRESSURE TO EXTEND OR RETRACT THE ACTUATOR WOULD BE REDUCED. THE ACTUATOR SHOULD FUNCTION IN A DEGRADED MODE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-242
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB
MDAC ID: 655

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: BYPASS FLOW VALVE
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) BYPASS FLOW VALVE
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CRITICALITIES

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO FLOW FLUID THROUGH ACTUATOR WITH VALVES CLOSED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-243
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86  
SUBSYSTEM: HYD/WSB  
MDAC ID: 656

HIGHEST CRITICALITY  
HDW/FUNC

FLIGHT: 3/3  
ABORT: 3/3

ITEM: RESET VALVE  
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN  
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM  
2) E.T. UMBILICAL RETRACT ACTUATOR  
3) RESET VALVE  
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REDUNDANCY SCREENS:  
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B [NA ]  
C [NA ]

LOCATION: 50V58AC(11-16) (VS70-580996)

PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
FLUID PREVIOUSLY USED TO EXTEND THE ACTUATOR CANNOT BE USED TO RESET LOCK VALVE.

REFERENCES:  
JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  
C-244
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 657

ITEM: RESET VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) RESET VALVE
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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
PRESSURE NEEDED TO EXTEND ACTUATOR IS REDUCED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-245
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 658

ITEM: DAMPER ASSEMBLY
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) DAMPER ASSEMBLY

CRITICALITIES

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION
EFFECTS/RATIONALE:
LOSS OF PRESSURE USED TO RETRACT ACTUATOR.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-246
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 659

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RETRACT SOLENOID VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) RETRACT SOLENOID VALVE

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LOCATION: 50V58AC(II-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
PRESSURE NEEDED TO SWITCH LOCK VALVE AND RETRACT SWITCHING VALVE IS LOST WHICH INHIBITS THE RETRACTION OF THE ACTUATOR.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-247
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 660

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RETRACT SOLENOID VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) RETRACT SOLENOID VALVE
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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
ACTUATOR CANNOT BE EXTENDED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-248
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 661

ITEM: RETRACT SOLENOID VALVE
FAILURE MODE: SHORTED

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) RETRACT SOLENOID VALVE

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO CONTROL POSITION OF RETRACT SOLENOID VALVE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-249
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB
MDAC ID: 662

ITEM: LOCK VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) LOCK VALVE
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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
ACTUATOR CANNOT BE EXTENDED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-250
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 663

ITEM: LOCK VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
LEAD: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) LOCK VALVE

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
POSITION OF ACTUATOR IS NOT FIXED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-251
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 664

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RETRACT SWITCHING VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) RETRACT SWITCHING VALVE
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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
ACTUATOR CANNOT BE RETRACTED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-252
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86

SUBSYSTEM: HYD/WSB
MDAC ID: 665

ITEM: RETRACT SWITCHING VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) RETRACT SWITCHING VALVE

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
ACTUATOR CANNOT BE EXTENDED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-253
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 666

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: THERMAL RELIEF VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) THERMAL RELIEF VALVE
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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: FAILS TO OPEN

EFFECTS/RATIONALE:
COULD CREATE A LEAK IN THE ACTUATOR DUE TO OVERPRESSURIZATION, WHICH WOULD CONTAMINATE A SMALL PORTION OF THE UMBILICAL PLATE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-254
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 667

ITEM: THERMAL RELIEF VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) THERMAL RELIEF VALVE
4) 
5) 
6) 
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8) 
9) 

CRITICALITIES

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
ACTUATOR RETRACTION WILL BE EFFECTED DUE TO UNDERPRESSURIZATION.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-255
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 668

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: SHAFT DRAIN SEAL
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) SHAFT DRAIN SEAL
4)
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CRITICALITIES

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LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
MINOR LOSS OF FLUID FROM THE HYDRAULIC SYSTEM.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-256
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 669

ITEM: FLEX HOSE & SWIVEL ASSEMBLY (SUPPLY)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) FLEX HOSE & SWIVEL ASSEMBLY (SUPPLY)
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CRITICALITIES

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LOCATION: 50V58FH(82),(84),(86),(88),(90),(92) (VS70-580996).

PART NUMBER: MC277-0002-2050/2053

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-257
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 670

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: FLEX HOSE & SWIVEL ASSEMBLY (RETURN)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) FLEX HOSE & SWIVEL ASSEMBLY (RETURN)
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LOCATION: 50V58FH(83),(85),(87),(89),(91),(93) (VS70-580996)
PART NUMBER: MC277-0002-2051/2052

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-258
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 671

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: CHECK VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) CHECK VALVE

CRITICALITIES

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LOCATION: 50V58CV(35-40) (VS70-580996)
PART NUMBER: ME284-0434-1006

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
COULD INHIBIT THE OPERATION OF ONE E.T. UMBILICAL RETRACT ACTUATOR.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-259
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 672

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: CHECK VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) CHECK VALVE

CRITICALITIES

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LOCATION: 50V58CV(35-40) (VS70-580996)
PART NUMBER: ME284-0434-1006

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
HYDRAULIC PRESSURE COULD BE FORCED THROUGH THE E.T. UMBILICAL ACTUATOR IN THE REVERSE DIRECTION.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-260
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 673  ABORT: 1/1

ITEM: CHECK VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) E.T. UMBILICAL RETRACT ACTUATOR
3) CHECK VALVE
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CRITICALITIES

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LOCATION: 50V58CV(35-40) (VS70-580996)
PART NUMBER: ME284-0434-1006

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-261
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86  HIGHEST CRITICALITY HDW/FUNC: 3/3
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 677  ABORT: 1/1

ITEM: MANUAL DRAIN VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) MANUAL DRAIN VALVES
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CRITICALITIES

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LOCATION: 50V58MV(43),(44),(45),(46),(47),(48) (VS70-580996)
PART NUMBER: ME284-0559-0001

CAUSES: PIECE-PARTSTRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-262
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 678

HIGHEST CRITICALITY FLIGHT: 3/3
ABORT: 3/3

ITEM: DRAIN (FROM RESERVOIRS, MAIN PUMPS, AND ACCUMULATORS)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) DRAIN (FROM SYSTEM)

CRITICALITIES

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LOCATION: 34C,34G,40F(VS70-580996)
PART NUMBER: 34C,34G,40F(VS70-580996)

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
CONTAMINATION OF THE AFT FUSELAGE BY HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-263
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86  
SUBSYSTEM: HYD/WSB  
MDAC ID: 679  

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3  
ABORT: 3/3

ITEM: DRAIN (OVERBOARD)  
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN  
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) DRAIN (OVERBOARD)

CRITICALITIES

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

LOCATION: 50V58FJ5 (VS70-580996)

PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
AN INCREASED SUPPLY OF GN2 AND HYDRAULIC FLUID COULD INITIATE AN EXTERNAL LEAK IN THE DRAIN SYSTEM.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86

SUBSYSTEM: HYD/WSB
MDAC ID: 680

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: SHAFT SEAL DRAIN HOSE
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) SHAFT SEAL DRAIN HOSE

CRITICALITIES

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LOCATION: 50V58FH94 (VS70-580996)
PART NUMBER: V070-585406-002

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
COULD CAUSE AN EXTERNAL LEAK IN THE DRAIN SYSTEM, WHICH WOULD CONTAMINATE AFT SECTION OF ORBITER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-265
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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ITEM: SHAFT SEAL DRAIN HOSE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:

1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) SHAFT SEAL DRAIN HOSE

CRITICALITIES

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LOCATION: 50V58FH94 (VS70-580996)
PART NUMBER: V070-585406-002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
BODY FLAP COULD RECEIVE A SMALL AMOUNT OF CONTAMINATION.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-266
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 682

ITEM: SHAFT SEAL MANIFOLD DRAIN
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) SHAFT SEAL MANIFOLD DRAIN

CRITICALITIES

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LOCATION: 50V58PV28 (VS70-580996)
PART NUMBER: V070-585413-001

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
COULD INITIATE AN EXTERNAL LEAK WHICH WOULD CONTAMINATE THE BODY FLAP.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-267
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 683

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: SHAFT SEAL MANIFOLD DRAIN
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) SHAFT SEAL MANIFOLD DRAIN
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LOCATION: 50V58PV28 (VS70-580996)
PART NUMBER: V070-585413-001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
SMALL QUANTITIES OF GN2 AND HYDRAULIC FLUID COULD CONTAMINATE THE BODY FLAP.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-268
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 684
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OLEOPHOBIC FILTER (TYPE I)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) OLEOPHOBIC FILTER (TYPE I)

CRITICALITIES

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LOCATION: 50V58FL4 (VS70-580996)
PART NUMBER: MC286-0076-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
SMALL QUANTITIES OF GN2 AND HYDRAULIC FLUID COULD CONTAMINATE THE AFT FUSELAGE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-269
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 685

ITEM: SURFACE THERMAL SWITCH
FAILURE MODE: FAILS ON

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) SURFACE THERMAL SWITCH

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LOCATION: 50V58S(16),(17),(116),(117) (VS70-580996)
PART NUMBER: MC452-0147-00(28), (34)

CAUSES: VIBRATION

EFFECTS/RATIONALE:
SWITCH TO ALTERNATE HEAT CONTROLLER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-270
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 686

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: SURFACE THERMAL SWITCH
FAILURE MODE: FAILS OFF

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) SURFACE THERMAL SWITCH
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LOCATION: 50V58S(16),(17),(116),(117) (VS70-580996)
PART NUMBER: MC452-0147-00(28), (34)

CAUSES: VIBRATION

EFFECTS/RATIONALE:
SWITCH TO ALTERNATE HEAT CONTROLLER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-271
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 687

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 3/3

ITEM: LINE ELECTRIC HEATERS
FAILURE MODE: FAILS ON

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) LINE ELECTRIC HEATERS
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LOCATION: 50V58HR(16),(17) (VS70-580996)
PART NUMBER: MC363-0044-00(56), (57)

CAUSES: VIBRATION

EFFECTS/RATIONALE:
SWITCH TO REDUNDANT HEATER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-272
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86

SUBSYSTEM: HYD/WSB
MDAC ID: 688

ITEM: LINE ELECTRIC HEATERS
FAILURE MODE: FAILS OFF

LEAD ANALYST: W. E. PARKMAN

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) LINE ELECTRIC HEATERS
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LOCATION: 50V58HR(16),(17) (VS70-580996)
PART NUMBER: MC363-0044-00(56), (57)

CAUSES: VIBRATION

EFFECTS/RATIONALE:
SWITCH TO REDUNDANT HEATER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-273
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 689

ITEM: OLEOPHOBIC FILTER (TYPE II)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) BODY FLAP
4) OLEOPHOBIC FILTER (TYPE II)
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LOCATION: 50V58FL(9),(10),(11) (VS70-580996)
PART NUMBER: MC286-0076-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
SMALL QUANTITIES OF GN2 AND HYDRAULIC FLUID COULD CONTAMINATE THE AFT FUSELAGE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-274
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 690

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: 3/3

ITEM: MANIFOLD SHAFT SEAL DRAIN
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) MANIFOLD SHAFT SEAL DRAIN
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LOCATION: 70V58PV27. (VS70-580996)
PART NUMBER: V070-587104-001

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
COULD INITIATE AN EXTERNAL LEAK WHICH WOULD CONTAMINATE A PORTION OF THE VERTICAL STABILIZER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-275
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 691

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: MANIFOLD SHAFT SEAL DRAIN
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) MANIFOLD SHAFT SEAL DRAIN
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LOCATION: 70V58PV27 (VS70-580996)
PART NUMBER: V070-587104-001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
SMALL QUANTITIES OF GN2 AND HYDRAULIC FLUID COULD CONTAMINATE THE VERTICAL STABILIZER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-276
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 692

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OVERBOARD DRAIN
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) OVERBOARD DRAIN
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LOCATION: 70V58FJ4 (VS70-580996)
PART NUMBER: V070-587106

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
COULD INITIATE AN EXTERNAL LEAK WHICH WOULD CONTAMINATE A PORTION OF THE VERTICAL STABILIZER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-277
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 693

HIGHEST CRITICALITY

ITEM: OVERBOARD DRAIN
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) OVERBOARD DRAIN

CRITICALITIES

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LOCATION: 70V58FJ4 (VS70-580996)
PART NUMBER: V070-587106

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
VERTICAL STABILIZER WOULD RECEIVE A SMALL AMOUNT OF CONTAMINATION.

REFERENCES: JSC-1174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-278
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 694

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OLEOPHOBIC FILTER (TYPE I)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) OLEOPHOBIC FILTER (TYPE I)

CRITICALITIES

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LOCATION: 70V58FL5 (VS70-580996)
PART NUMBER: MC286-0076-0001

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
A SMALL QUANTITY OF HYDRAULIC FLUID COULD CONTAMINATE THE RUDDER/SPEED BRAKE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-279
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86  HIGHEST CRITICITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 695  ABORT: 3/3

ITEM: SURFACE THERMAL SWITCH
FAILURE MODE: FAILS ON

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) SURFACE THERMAL SWITCH
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LOCATION: 70V58S(4),(104) (VS70-580996)
PART NUMBER: MC452-0147-0031,(34)

CAUSES: VIBRATION

EFFECTS/RATIONALE:
SWITCH TO ALTERNATE HEAT CONTROLLER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-280
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86

SUBSYSTEM: HYD/WSB
MDAC ID: 696

HIGHEST CRITICALITY

FLIGHT: 3/3
ABORT: 3/3

ITEM: SURFACE THERMAL SWITCH
FAILURE MODE: FAILS OFF

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) SURFACE THERMAL SWITCH

CRITICALITIES

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LOCATION: .70V58S(4),(104) (VS70-580996)
PART NUMBER: MC452-0147-0031(34)

CAUSES: VIBRATION

EFFECTS/RATIONALE:
SWITCH TO ALTERNATE HEAT CONTROLLER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-281
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 697

ITEM: LINE ELECTRIC HEATER
FAILURE MODE: FAILS ON

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) LINE ELECTRIC HEATER

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LOCATION: 70V58HR4(15A),(15B),(15C) (VS70-580996)
PART NUMBER: MC363-0044-00(59),(60),(61)

CAUSES: VIBRATION

EFFECTS/RATIONALE:
SWITCH TO REDUNDANT HEATER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-282
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 698

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: LINE ELECTRIC HEATER
FAILURE MODE: FAILS OFF

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) DRAIN SYSTEM
3) RUDDER/SPEED BRAKE DRAIN
4) LINE ELECTRIC HEATER

CRITICALITIES

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LOCATION: 70V58HR4(15A),(15B),(15C) (VS70-580996)
PART NUMBER: MC363-0044-00(59),(60),(61)

CAUSES: VIBRATION

EFFECTS/RATIONALE:
SWITCH TO REDUNDANT HEATER.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-283
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 699

ITEM: CIRCULATION PUMP CHECK VALVE
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) CIRCULATION PUMP CHECK VALVE

CRITICALITIES

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LOCATION: 50V58CV(23),(26),(29) (VS70-580996)
PART NUMBER: ME284-0434-2006

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-284
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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| LOCATION: | 50V58CV(23),(26),(29) (VS70-580996) |
| PART NUMBER: | ME284-0434-2006 |

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
OVERPRESSURIZATION COULD TERMINATE CIRCULATION PUMP OPERATIONS.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-285
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 
SUBSYSTEM: HYD/WSB
MDAC ID: 701

ITEM: GSE CHECK VALVE
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W.E. PARKMAN

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) GSE CHECK VALVE

CRITICALITIES

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


LOCATION: 50V58CV(32),(33),(34) (VS70-580996)
PART NUMBER: ME284-0434-1016

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONAL:
LOSS OF ONE HYDRAULIC SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-286
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:   HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB   FLIGHT: 3/3
MDAC ID:  702  ABORT: 3/3

ITEM: GSE CHECK VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W.E. PARKMAN   SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) GSE CHECK VALVE

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LOCATION: 50V58CV(32),(33),(34) (VS70-580996)
PART NUMBER: ME284-0434-1016

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
GROUND OPERATIONS ARE EFFECTED DUE TO BLOCKAGE OF THE SYSTEM.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-287
### INDEPENDENT ORBITER ASSESSMENT
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:**

**SUBSYSTEM:** HYD/WSB

**MDAC ID:** 703

**ITEM:** GSE CHECK VALVE

**FAILURE MODE:** FAILS TO CLOSE

**LEAD ANALYST:** W.E. PARKMAN  
**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**
1) HYDRAULIC SUBSYSTEM  
2) FILTER MODULE  
3) GSE CHECK VALVE

**CRITICALITIES**

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**LOCATION:** 50V58CV(32),(33),(34) (VS70-580996)

**PART NUMBER:** ME284-0434-1016

**CAUSES:** CONTAMINATION

**EFFECTS/RATIONALE:**

NONE DURING FLIGHT OPERATIONS.

**REFERENCES:** JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

**REPORT DATE 12/23/86**  
**C-288**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86

SUBSYSTEM: HYD/WSB
MDAC ID: 704

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: CIRCULATION PUMP CHECK VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) CIRCULATION PUMP CHECK VALVE
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LOCATION: 50V58CV(23),(26),(29) (VS70-580996)
PART NUMBER: ME284-0434-2006

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
CIRCULATION PUMP DAMAGE COULD OCCUR DURING MAIN PUMP OPERATIONS.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-289
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 705

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSDUCER (PRECEDING FILTER)

CRITICALITIES

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LOCATION: 50V58MT(3),(12),(21) (VS70-580996)
PART NUMBER: ME449-0177-6105

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSDUCER READING THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-290
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 706

ITEM: PRESSURE TRANSUDER
FAILURE MODE: FILTER OFFSCALE-HI

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSUDER (PRECEDING FILTER)
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LOCATION: 50V58MT(3),(12),(21) (VS70-580996)
PART NUMBER: ME449-0177-6105

CAUSES: VIBRATION
EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSUDER THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-291
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 707  ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: FAILS OFFSCALE-LO

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSDUCER (PRECEDING FILTER)

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LOCATION:  50V58MT(3),(12),(21) (VS70-580996)
PART NUMBER:  ME449-0177-6105

CAUSES:  VIBRATION

EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSDUCER READING THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES:  JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-292
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 708

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 1/1

ITEM: SUPPLY FILTER
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) SUPPLY FILTER
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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-293
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 709

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: SUPPLY FILTER
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) SUPPLY FILTER
4) 5) 6) 7) 8) 9)

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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO SUPPLY HYDRAULIC FLOW AND PRESSURE TO THE SYSTEM.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-294
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 710

HIGHEST CRITICALITY

FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSDUCER (AFTER FILTER)

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LOCATION: 50V58MT(2),(11),(20) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSDUCER READING THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-295
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 711

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: FAILS OFFSCALE-HI

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSDUCER (AFTER FILTER)
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LOCATION: 50V58MT(2),(11),(20) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSDUCER READING THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-296
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 712

HIGHEST CRITICALITY

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: FAILS OFFSCALE-LO

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSDUCER (AFTER FILTER)
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LOCATION: 50V58MT(2),(11),(20) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSDUCER READING THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-297
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 713  ABORT: 1/1

ITEM: RELIEF VALVE
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) RELIEF VALVE
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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE
EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-298
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 714

ITEM: RELIEF VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) RELIEF VALVE

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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
OVERPRESSURIZATION OF THE SYSTEM COULD DAMAGE MAIN PUMP.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-299
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 715

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RELIEF VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) RELIEF VALVE

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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
SYSTEM COULD BECOME INOPERATIVE IF UNDERPRESSURIZATION OCCURS.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
HIGHEST CRITICALITY
SUBSYSTEM: HYD/WSB
FLIGHT: 3/3
MDAC ID: 716
ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: ERRONEOUS INDICATION

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSDUCER (AFTER RELIEF VALVE)
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LOCATION: 50V58MT(160),(161),(162) (VS70-580996)
PART NUMBER: ME449-0177-6105

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSDUCER READING THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-301
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 717

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: FAILS OFFSCALE-HI

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSDUCER (AFTER RELIEF VALVE)

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LOCATION: 50V58MT(160),(161),(162) (VS70-580996)
PART NUMBER: ME449-0177-6105

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSDUCER READING THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-302
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 718

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: FAILS OFFSCALE-LO

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) PRESSURE TRANSDUCER (AFTER RELIEF VALVE)

CRITICALITIES

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LOCATION: 50V58MT(160),(161),(162) (VS70-580996)
PART NUMBER: ME449-0177-6105

CAUSES: VIBRATION

EFFECTS/RATIONALE:
LOSS OF A PRESSURE TRANSDUCER READING THAT IS USED IN PRIORITY RATE LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-303
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET 

DATE: 11/11/86  
SUBSYSTEM: HYD/WSB  
MDAC ID: 719  

HIGHEST CRITICALITY  HDW/FUNC  
FLIGHT: 2/1R  
ABORT: 1/1  

ITEM: CASE FILTER  
FAILURE MODE: EXTERNAL LEAKAGE  

LEAD ANALYST: W. E. PARKMAN  
SUBSYS LEAD: W. DAVIDSON  

BREAKDOWN HIERARCHY:  
1) HYDRAULIC SUBSYSTEM  
2) FILTER MODULE  
3) CASE FILTER  
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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-304
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 720

ITEM: CASE FILTER
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) CASE FILTER
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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
FAILURE IS NOT CREDIBLE DURING MAIN PUMP OPERATIONS.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-305
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 721

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RETURN FILTER
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) RETURN FILTER

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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: PIECE-PART

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-306
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86
SUBSYSTEM: HYD/WSB
MDAC ID: 722

ITEM: RETURN FILTER
FAILURR MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FILTER MODULE
3) RETURN FILTER

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LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF SYSTEM DUE TO INABILITY TO SUPPLY ADEQUATE FLOW THROUGH THE SYSTEM.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-307
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 723

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: FREON/OIL HEAT EXCHANGER
FAILURE MODE: INTERNAL LEAKAGE (FREON TO FREON)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGER SUBSYSTEM
3) FREON/OIL HEAT EXCHANGER
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LOCATION: 26C (VS70-580996)
PART NUMBER: MC250-0001-0015

CAUSES: MECHANICAL SHOCK

EFFECTS/RATIONALE:
FREON LOOP PRESSURE WOULD EQUALIZE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-308
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 724  ABORT: 1/1

ITEM: FREON/OIL HEAT EXCHANGER
FAILURE MODE: INTERNAL LEAKAGE (FREON-TO-HYDRAULIC FLUID)

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGER SUBSYSTEM
3) FREON/OIL HEAT EXCHANGER
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LOCATION: 26C (VS70-580996)
PART NUMBER: MC250-0001-0015

CAUSES: MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM DUE TO FREON CONTAMINATION. FREON SYSTEM WILL DEPRESSURIZE.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-309
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 725

ITEM: FREON/OIL HEAT EXCHANGER
FAILURE MODE: EXTERNAL LEAKAGE OF HYDRAULIC FLUID

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGER SUBSYSTEM
3) FREON/OIL HEAT EXCHANGER
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LOCATION: 26C (VS70-580996)
PART NUMBER: MC250-0001-0015

CAUSES: MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-310
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 726

HIGHEST CRITICALITY
FLIGHT: 3/2R
ABORT: 3/2R

ITEM: FREON/OIL HEAT EXCHANGER
FAILURE MODE: RESTRICTED FLOW (HYDRAULIC FLUID)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGER SUBSYSTEM
3) FREON/OIL HEAT EXCHANGER
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LOCATION: 26C (VS70-580996)
PART NUMBER: MC250-0001-0015

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO HEAT HYDRAULIC FLUID IN ONE SYSTEM USING THE FREON/OIL HEAT EXCHANGER. SYSTEM CAN BE HEATED BY OPERATING MAIN PUMP OR BARBECUING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-311
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 727

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: FREON/OIL HEAT EXCHANGER
FAILURE MODE: RESTRICTED FLOW (FREON)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGER SUBSYSTEM
3) FREON/OIL HEAT EXCHANGER
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LOCATION: 26C (VS70-580996)
PART NUMBER: MC250-0001-0015

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF ONE FREON SYSTEM.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-312
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 728

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: THERMAL CONTROL VALVE
FAILURE MODE: FAILS OPEN (BYPASS MODE)

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGER SUBSYSTEM
3) THERMAL CONTROL VALVE
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LOCATION: 50V58PV(22),(23),(24) (VS70-580996)
PART NUMBER: MC284-0412-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO HEAT ONE HYDRAULIC SYSTEM USING THE FREON/OIL HEAT EXCHANGER. SYSTEM CAN BE HEATED BY OPERATING MAIN PUMP OR BARBECUING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-313
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 11/03/86  
**SUBSYSTEM:** HYD/WSB  
**MDAC ID:** 729

**HIGHEST CRITICALITY**  
**HDW/FUNC**  
**FLIGHT:** 3/3  
**ABORT:** 3/3

**ITEM:** THERMAL CONTROL VALVE

**FAILURE MODE:** FAILS OPEN (FREON/OIL HEAT EXCHANGER MODE)

**LEAD ANALYST:** W. E. PARKMAN  
**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGER SUBSYSTEM
3) THERMAL CONTROL VALVE
4)  
5)  
6)  
7)  
8)  
9)

**CRITICALITIES**

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

**LOCATION:** 50V58PV(22),(23),(24) (VS70-580996)

**PART NUMBER:** MC284-0412-0002

**CAUSES:** PIECE-PART STRUCTURAL FAILURE, CONTAMINATION

**EFFECTS/RATIONALE:**
CIRCULATION PUMP HYDRAULIC FLUID WILL BE CONTINUOUSLY HEATED. SHUT-OFF SHOULD OCCUR WHEN HYDRAULIC FLUID INCREASES TO TEMPERATURE LIMIT.

**REFERENCES:** JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

**REPORT DATE:** 12/23/86  
**C-314**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 730

ITEM: THERMAL CONTROL VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGER SUBSYSTEM
3) THERMAL CONTROL VALVE

CRITICALITIES

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LOCATION: 50V58PV(22),(23),(24) (VS70-580996)
PART NUMBER: MC284-0412-0002

CAUSES: MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF ONE SYSTEM DUE TO DEPLETION OF HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86  C-315
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86
SUBSYSTEM: HYD/WSB
MDAC ID: 731

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: THERMAL CONTROL VALVE
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SUBSYSTEM
2) FREON/OIL HEAT EXCHANGERS SUBSYSTEM
3) THERMAL CONTROL VALVE

CRITICALITIES

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LOCATION: 50V58PV(22),(23),(24) (VS70-580996)
PART NUMBER: MC284-0412-0002

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FREON/OIL HEAT EXCHANGER WILL SUPPLY HEAT TO ONLY A PORTION OF CIRCULATING HYDRAULIC FLUID.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS 22206

REPORT DATE 12/23/86 C-316
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86

SUBSYSTEM: HYD/WSB
MDAC ID: 800

ITEM: RESISTOR (SWITCH 28)
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC BRAKE HEATER
2) PANEL R4
3) RESISTOR (SWITCH 28)

CRITICALITIES

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LOCATION: 32V73A4 (VS70-580109)
PART NUMBER: A6R1

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO ONE SET OF BRAKE HEATERS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-317
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 801

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LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC BRAKE HEATER
2) PANEL R4
3) RESISTOR (SWITCH 28)
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LOCATION: 32V73A4 (VS70-580109)
PART NUMBER: A6R1

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-318
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 802 ABORT: /NA

ITEM: SWITCH 28
FAILURE MODE: OPEN/SHORT TO GROUND

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC BRAKE HEATER
2) PANEL R4
3) SWITCH 28
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CRITICALITIES

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LOCATION: 32V73A4 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO ONE SET OF BRAKE HEATERS, CB OPENS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-319
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 803

ITEM: REMOTE POWER CONTROLLER NO. 37
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC BRAKE HEATER
2) MID-BODY POWER CONTROL ASSEMBLY 1
3) REMOTE POWER CONTROLLER NO. 37
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CRITICALITIES

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LOCATION: 40V76A25 (VS70-580109)

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO ONE SET OF BRAKE HEATERS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-320
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 804

ITEM: REMOTE POWER CONTROLLER NO. 37
FAILURE MODE: CONTINUOUS OUTPUT

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC BRAKE HEATER
2) MID-BODY POWER CONTROL ASSEMBLY 1
3) REMOTE POWER CONTROLLER NO. 37
4) REMOTE POWER CONTROLLER NO. 37
5) REMOTE POWER CONTROLLER NO. 37
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LOCATION: 40V76A25 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-321
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 805

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: /NA

ITEM: RESISTOR (SWITCH 19)
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) PANEL A12
3) RESISTOR (SWITCH 19)
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LOCATION: 36V73A12 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO ONE SET OF RUDDER/SPEED BRAKE, BODY FLAP A, AND
BODY FLAP B HEATERS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-322
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86

SUBSYSTEM: HYD/WSB
MDAC ID: 806

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: RESISTOR (SWITCH 19)
FAILURE MODE: SHORTED

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) PANEL A12
3) RESISTOR (SWITCH 19)

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LOCATION: 36V73A12 (VS70-580109)

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE: NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-323
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 807

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: /NA

ITEM: SWITCH 19
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) PANEL A12
3) SWITCH 19

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LOCATION: 36V73A12 (VS70-580109)

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO ONE SET OF RUDDER/SPEED BRAKE, BODY FLAP A, AND BODY FLAP B HEATERS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-324
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86

HIGHEST CRITICALITY

FLIGHT: 3/3

ABORT: /NA

SUBSYSTEM: HYD/WSB

MDAC ID: 808

ITEM: SWITCH 19

FAILURE MODE: SHORTED

LEAD ANALYST: W. E. PARKMAN

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) PANEL A12
3) SWITCH 19

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LOCATION: 36V73A12 (VS70-580109)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-325
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 809

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/1R
ABORT: /NA

ITEM: REMOTE POWER CONTROLLER NO. 40
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) MID-BODY POWER CONTROL ASSEMBLY 2
3) REMOTE POWER CONTROLLER NO. 40

CRITICALITIES

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LOCATION: 40V76A26 (VS70-580109)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO ONE SET OF RUDDER/SPEED BRAKE, BODY FLAP A, AND BODY FLAP B HEATERS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-326
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86  
SUBSYSTEM: HYD/WSB  
MDAC ID: 810  

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: REMOTE POWER CONTROLLER NO. 40
FAILURE MODE: CONTINUOUS OUTPUT

LEAD ANALYST: W. E. PARKMAN  
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) MID-BODY POWER CONTROL ASSEMBLY 2
3) REMOTE POWER CONTROLLER NO. 40
4) 
5) 
6) 
7) 
8) 
9)

CRITICALITIES
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PRELAUNCH:     /NA       RTLS:    /NA
LIFTOFF:       /NA       TAL:     /NA
ONORBIT:       3/3       AOA:     /NA
DEORBIT:       /NA       ATO:     /NA
LANDING/SAFING:/NA


LOCATION: 40V76A26 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-327
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 811

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: /NA

ITEM: FUSE 51, 52, 53
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) MID-BODY POWER CONTROL ASSEMBLY 2
3) FUSE 51, 52, 53

CRITICALITIES

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LOCATION: 40V76A26 (VS70-580109)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO BODY FLAP A HEATERS NO. 1, BODY FLAP B HEATER 1, RUDDER SPEED BRAKE HEATER NO. 1, RESPECTIVELY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-328
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 812

HIGHEST CRITICALITY

FLIGHT: 3/1R
ABORT: /NA

ITEM: THERMOSTAT (S16, S17, S4)
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) AFT BODY
3) THERMOSTAT (S16, S17, S4)
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LOCATION: 70V58S4 (VS70-580109)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO BODY FLAP 1 HEATER 1, BODY FLAP B HEATER 1, RUDDER SPEED BRAKE HEATER 1, RESPECTIVELY. LOSS OF REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-329
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 813

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: /NA

ITEM: THERMOSTAT (S16, S17, S4)
FAILURE MODE: SHORTED

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC HEATER AFT FUSELAGE
2) AFT BODY
3) THERMOSTAT (S16, S17, S4)
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LOCATION: 70V58S4 (VS70-580109)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF POWER TO BODY FLAP A HEATER 1, BODY FLAP B HEATER 1, RUDDER SPEED BRAKE HEATER 1, RESPECTIVELY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-330
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 814

ITEM: MASTER EVENTS CONTROLLER
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) E.T. UMBILICAL RETRACT ACTUATORS
2) AFT AVIONICS BAY 4
3) MASTER EVENTS CONTROLLER

CRITICALITIES

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LOCATION: 54V76A13 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF REDUNDANCY IN THE LH2, LOX ACTUATORS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-331
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 815  ABORT: /NA

ITEM: MASTER EVENTS CONTROLLER
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) E.T. UMBILICAL RETRACT ACTUATORS
2) AFT AVIONICS BAY 4
3) MASTER EVENTS CONTROLLER
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LOCATION: 54V76A13 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-332
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 816

ITEM: POWER CONTACTOR (K3, K4)
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT AVIONICS BAY 4
3) AFT POWER CONTACTOR ASSEMBLY NO. 4
4) POWER CONTACTOR (K3, K4)

CRITICALITIES

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LOCATION: 54V76A134 (VS70-580109)

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF REDUNDANCY POWER TO ONE CIRC PUMP.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-333
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 817

ITEM: POWER CONTACTOR (K3, K4)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT AVIONICS BAY 4
3) AFT POWER CONTACTOR ASSEMBLY NO. 4
4) POWER CONTACTOR (K3, K4)

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LOCATION: 54V76A134 (VS70-580109)

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT UNTIL SECOND FAILURE (SECOND CONTACTOR ENERGIZES).

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 818

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: HYBRID DRIVER (K3), AR TYPE III
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT AVIONICS BAY 4
3) AFT LOAD CONTROL ASSEMBLY NO. 1
4) HYBRID DRIVER (K3)
5) AR TYPE III

CRITICALITIES

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LOCATION: 54V76A121 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT. HYD CIRC PUMP SW TO OFF WILL DEACTIVATE THE AFFECTED PUMP.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-335
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 819

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: /NA

ITEM: HYBRID DRIVER (K3), AR TYPE III
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT AVIONICS BAY 4
3) AFT LOAD CONTROL ASSEMBLY NO. 1
4) HYBRID DRIVER (K3)
5) AR TYPE III

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LOCATION: 54V76A121 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK
EFFECTS/RATIONALE:
LOSS OF REDUNDANT POWER TO ONE CIRC PUMP.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-336
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 820

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/IR
ABORT: /NA

ITEM: HYBRID DRIVER (K4), AR TYPE III
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT AVIONICS BAY 4
3) AFT LOAD CONTROL ASSEMBLY NO. 1
4) HYBRID DRIVER (K4)
5) AR TYPE III

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LOCATION: 54V76A121 (VS70-580109)

PART NUMBER: 54V76A121 (VS70-580109)

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF REDUNDANT POWER TO ONE CIRC PUMP.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-337
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 821

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: HYBRID DRIVER (K4), AR TYPE III
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: W. E. PARKMAN
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT AVIONICS BAY 4
3) AFT LOAD CONTROL ASSEMBLY NO. 1
4) HYBRID DRIVER (K4)
5) AR TYPE III
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LOCATION: 54V76A121 (VS70-580109)

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT. REQUIRES SECOND FAILURE (K-4 DRIVER FAILS ON).

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-338
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 822

ITEM: HYBRID DRIVER (K4), AR TYPE II
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT AVIONICS BAY 4
3) AFT LOAD CONTROL ASSEMBLY NO. 1
4) HYBRID DRIVER (K4)
5) AR TYPE II

CRITICALITIES

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LOCATION: 54V76A121 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF REDUNDANCY TO SHUT-OFF CIRC PUMP DURING APU START.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 823  ABORT: /NA

ITEM: HYBRID DRIVER (K4), AR TYPE II
FAILURE MODE: OPEN

LEAD ANALYST: W. E. PARKMAN  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT AVIONICS BAY 4
3) AFT LOAD CONTROL ASSEMBLY NO. 1
4) HYBRID DRIVER (K4)
5) AR TYPE II
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9)

CRITICALITIES

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LOCATION: 54V76A121 (VS70-580109)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF AUTOMATIC CIRC PUMP SHUT-OFF DURING APU START. HYD CIRC PUMP SW TO OFF WILL DEACTIVATE AFFECTED CIRC PUMP.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-340
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

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**ITEM:** RESISTOR, CURRENT LIMITER - 1.2K  
**FAILURE MODE:** SHORT

**LEAD ANALYST:** J. DUVAL  
**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**
1) HYDRAULIC CIRC PUMP  
2) AFT LCA  
3) RESISTOR, CURRENT LIMITER - 1.2K  
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**REDUNDANCY SCREENS:** A [NA ]  
B [NA ]  
C [NA ]

**LOCATION:** 55V76A122 (VS70-580109E)

**PART NUMBER:**

**CAUSES:** VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

**EFFECTS/RATIONALE:**  
NO EFFECT ON MISSION. INPUT IS TO GROUND USE ONLY CIRCUIT.

**REFERENCES:** VS70-580109E; SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE 12/23/86**

C-341
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 825

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: RESISTOR, CURRENT LIMITER - 1.2K
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) RESISTOR, CURRENT LIMITER - 1.2K
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LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF SIGNAL TO FWD LCA #2. LOSS OF CONTROL SIGNAL TO RPC 41.
NO EFFECT - GROUND USE ONLY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-342
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 826

ITEM: BLOCKING DIODE - 3A
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) BLOCKING DIODE - 3A
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CRITICALITIES

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LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER: 

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT. ONLY ONE LCA IS ACTIVE AT ANY GIVEN TIME. SHORT WOULD NOT PREVENT INHIBIT SIGNAL FROM TURNING OFF THE REDUNDANT LCA DRIVER.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-343
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 827

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: BLOCKING DIODE - 3A
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) BLOCKING DIODE - 3A

CRITICALITIES

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LOCATION: 55V76A122 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT. ONLY ONE LCA IS ACTIVE AT ANY GIVEN TIME. IF REDUNDANT LCA WAS ACTIVE THE OPEN DIODE WOULD PREVENT TURNING OFF THE REDUNDANT LCA DRIVER.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-344
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 828

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: RESISTOR CURRENT LIMITER - 5.1K
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) RESISTOR, CURRENT LIMITER - 5.1K

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LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
HIGH SIGNAL INPUT TO MDM. ERRONEOUS MEASUREMENT. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 . C-345
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 829
HIGHEST CRITICALITY FLIGHT: 3/3
ABORT: /NA

ITEM: RESISTOR, CURRENT LIMITER - 5.1K
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) RESISTORS CURRENT LIMITER - 5.1K
4) 5)
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HDW/FUNC

CRITICALITIES
FLIGHT PHASE HDW/FUNC ABORT HDW/FUNC
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LANDING/SAFING: /NA


LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF INPUT SIGNAL TO MDM. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-346
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 830

ITEM: RESISTORS - VOLTAGE DIVIDERS - 1.8K
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) RESISTORS - VOLTAGE DIVIDERS - 1.8K
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LOCATION: 55V76A122 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF INPUT SIGNAL TO MDM. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-347
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 831

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: RESISTORS - VOLTAGE DIVIDERS - 1.8K
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) RESISTORS - VOLTAGE DIVIDERS - 1.8K
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LOCATION: 55V76A122 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
HIGH INPUT TO MDM. ERRONEOUS MEASUREMENT. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-348
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 832

HIGHEST CRITICALITY: FLIGHT: 3/3
ABORT: /NA

ITEM: CURRENT LIMITER RESISTORS 2.15K
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) CURRENT LIMITER RESISTORS – 2.15K
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LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
HIGH INPUT SIGNAL TO MDM. ERRONEOUS OUTPUT MEASUREMENT. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-349
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 833  ABORT: /NA

ITEM: CURRENT LIMITER RESISTORS 2.15K
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) CURRENT LIMITER RESISTORS - 2.15K
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LOCATION: 55V76A122 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF INPUT SIGNALS TO MDM. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-350
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 834

ITEM: BLOCKING DIODE - 3A
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) BLOCKING DIODE - 3A
4)
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6)
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CRITICALITIES

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LOCATION: 55V76A122 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT. LOSS OF ISOLATION BETWEEN CIRC PUMP SW AND HYBRID DRIVER TYPE III.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-351
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
SUBSYSTEM: HYD/WSB
MDAC ID: 835

ITEM: BLOCKING DIODE - 3A
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) BLOCKING DIODE - 3A
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LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF INPUT SIGNAL FROM GPC SW POSITION TO HYBRID DRIVER, TYPE III. NO EFFECT. REQUIRES SECOND FAILURE (LOSS OF SECOND HYDRAULIC SYSTEM).

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-352
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86  HIGHEST CRITICALITY  HDW/FUNC

SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 836  ABORT: /NA

ITEM: BLOCKING DIODE - MDM CIRCUIT 3A
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) BLOCKING DIODE - MDM CIRCUIT 3A
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LOCATION: 55V76A122 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT. LOSS OF ISOLATION BETWEEN THE MDM AND THE CIRC PUMP SW "ON" POSITION SIGNAL.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-353
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86
HIGHEST CRITICALITY
HDW/FUNC

SUBSYSTEM: HYD/WSB
FLIGHT: 3/1R

MDAC ID: 837
ABORT: /NA

ITEM: BLOCKING DIODE - MDM CIRCUIT 3A
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) BLOCKING DIODE - MDM CIRCUIT 3A
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LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF MDM INPUT TO HYBRID DRIVER WITH THE CIRC PUMP SW (S29) IN THE GPC POSITION. NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-354
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 838

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: BLOCKING DIODES SW "ON" CIRCUIT (3A)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) BLOCKING DIODES SW "ON" CIRCUIT (3A)
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LOCATION: 55V76A122 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-355
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 839

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: /NA

ITEM: BLOCKING DIODES SW "ON" CIRCUIT (3A)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) AFT LCA
3) BLOCKING DIODES SW "ON" CIRCUIT (3A)
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LOCATION: 55V76A122 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF CONTROL VOLTAGE TO HYBRID DRIVER, TYPE III. LOSS OF REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86   C-356
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 840

ITEM: CURRENT LIMITER RESISTOR, 1.21K
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) PANEL R2
3) CURRENT LIMITER RESISTOR, 1.21K
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LOCATION:
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
LOSS OF CONTROL VOLTAGE TO HYBRID DRIVER TYPE III. LOSS OF REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 841

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: HYD CIRC PUMP SW 29
FAILURE MODE: Fails in "ON" position (all contacts)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) PANEL R2
3) HYD CIRC PUMP SW 29
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LOCATION: 32V73A2 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NO EFFECT. CIRC PUMP SHUTDOWN NORMAL WITH APU STARTUP.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-358
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 842

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/1R
ABORT: /NA

ITEM: HYD CIRC PUMP SW 29
FAILURE MODE: FAILS IN "OFF" POSITION (ALL CONTACTS)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) PANEL R2
3) HYD CIRC PUMP SW 29
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LOCATION: 32V73A2, (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF THERMAL CYCLE AND RESERVOIR REPRESS CAPABILITY USING CIRC PUMP.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-359
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 843
HIGHEST CRITICALITY FLIGHT: 3/3
ABORT: /NA

ITEM: HYD CIRC PUMP SW 29
FAILURE MODE: FAILS IN GPC POSITION (ALL CONTACTS)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) PANEL R2
3) HYD CIRC PUMP SW 29
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LOCATION: 32V73A2 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF MANUAL CIRC PUMP OPERATION. NORMAL POSITION IS "GPC".

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-360
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86

SUBSYSTEM: HYD/WSB
MDAC ID: 844

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: /NA

ITEM: CURRENT LIMITER RESISTOR, 1.21K
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) PANEL R2
3) PWR SW25 - MN B
4) CURRENT LIMITER RESISTOR, 1.21K
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HYDRAULIC CIRC PUMP
PANEL R2
PWR SW25 - MN B
CURRENT LIMITER RESISTOR, 1.21K


LOCATION: 36V73A12 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
LOSS OF ONE CONTROL VOLTAGE TO HYBRID DRIVER, TYPE III. LOSS OF REDUNDANT CIRC PUMP ACTIVATION CIRCUIT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 845

ITEM: FUSE F7, F15
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) PANEL R2
3) CONTROL BUS
4) FUSE F7, F15

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LOCATION: 36V73A12 (VS70-58Q109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
LOSS OF REDUNDANCY POWER TO CIRC PUMP ACTIVATION CIRCUITS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-362
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 846

ITEM: PWR SW S25
FAILURE MODE: FAILS IN MN A/MN B (ALL CONTACTS)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC CIRC PUMP
2) PANEL A12
3) PWR SW S25

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LOCATION: 36V73A12 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF FUNCTION. LOSS OF REDUNDANCY POWER TO CIRC PUMP ACTIVATION CIRCUITS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-363
**INDEPENDENT ORBITER ASSESSMENT**  
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

<table>
<thead>
<tr>
<th>Item:</th>
<th>HYDRAULIC FLUID QUANTITY METER, CB 57</th>
</tr>
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<tbody>
<tr>
<td>Failure Mode:</td>
<td>OPEN, SHORT, CALIBRATION SHIFT</td>
</tr>
</tbody>
</table>

**Lead Analyst:** J. Duval  
**Subsys Lead:** W. Davidson

**Breakdown Hierarchy:**
1) HYDRAULIC SYSTEM  
2) HYDRAULIC FLUID QUANTITY METER  
3) CB 57

**Criticalities**

<table>
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<tr>
<th>Flight Phase</th>
<th>HDW/Func</th>
<th>Abort</th>
<th>HDW/Func</th>
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<td>Landing/Safing:</td>
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**Redundancy Screens:**
A [NA]  
B [NA]  
C [NA]

**Location:** 31V73A4, 34V73A8A8 (VS70-580109E)

**Part Number:**
- References: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**Report Date:** 12/23/86  
C-364
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 848

ITEM: HYBRID DRIVER, TYPE IV
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT LCA
4) HYBRID DRIVER TYPE IV
5)
6)
7)
8)
9)

CRITICALITIES

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<tr>
<th>FLIGHT PHASE</th>
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LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT. RPC FAILED ON (SECOND FAILURE) WOULD ENERGIZE DEPRESS SOLENOID. LOSS OF SYSTEM.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-365
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 849

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: HYBRID DRIVER, TYPE IV
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT LCA
4) HYBRID DRIVER, TYPE IV
5)
6)
7)
8)
9)

CRITICALITIES

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LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:
CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION
EFFECTS/RATIONALE:
LOSS OF FUNCTION. LOSS OF REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-366
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 850

ITEM: RPC
FAILURE MODE: INADVERTENT OUTPUT
LEAD ANALYST: J. DUVAL    SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT LCA
4) RPC

CRITICALITIES

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LOCATION: 55V76A135 (VS70-58Q109E)
PART NUMBER:
CAUSES: VIBRATION, THERMAL STRESS, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT. RETURN DRIVER FAILED ON (SECOND FAILURE) WOULD ENERGIZE DEPRESS SOLENOID. LOSS OF SYSTEM.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86   C-367
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 851

ITEM: RPC
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT LCA
4) RPC

CRITICALITIES

<table>
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LOCATION: 55V76A135 .(VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION, THERMAL STRESS

EFFECTS/RATIONALE:
LOSS OF FUNCTION. LOSS OF REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-368
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86

SUBSYSTEM: HYD/WSB
MDAC ID: 852

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: BLOCKING DIODE, GROUND MDM (-1A,-3A)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA, AFT LCA
4) BLOCKING DIODE, GROUND MDM (-1A,-3A)

CRITICALITIES

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LOCATION: 54V76A121, 54V76A134 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF ISOLATION OF MDM FROM VEHICLE COMMANDS. NO EFFECT ON FLIGHT OPS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-369
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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<td>FAILURE MODE:</td>
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LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA, AFT LCA
4) BLOCKING DIODE, GROUND MDM (-1A,-3A)
5)
6)
7)
8)
9)

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<td>FLIGHT PHASE</td>
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<td>DEORBIT:</td>
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<td>LANDING/SAFING:</td>
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LOCATION: 54V76A121, 54V76A134 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF INPUT FROM MDM. NO EFFECT ON FLIGHT OPS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-370
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 854

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: BLOCKING DIODES, GROUND MDM (-1A, -3A)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA, AFT LCA
4) BLOCKING DIODES, (-1A, -3A)

CRITICALITIES

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LOCATION: 54V76A121, 54V76A134 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE: LOSS OF REDUNDANCY. LOSS OF POWER TO REDUNDANT RPC AND DRIVER.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-371
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86
SUBSYSTEM: HYD/WSB
MDAC ID: 855

ITEM: BLOCKING DIODES, (-1A, -3A)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA, AFT LCA
4) BLOCKING DIODES, (-1A, -3A)
5) 
6) 
7) 
8) 
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CRITICALITIES

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LOCATION: 54V76A121, 54V76A134 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT ON FLIGHT OPS. LOSS OF ISOLATION OF CONTROL BUSES FROM GROUND COMMAND.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-372
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 856  ABORT: /NA

ITEM: RESISTOR, CURRENT LIMITER (2.15K)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) RESISTOR CURRENT LIMITER (2.15K)
5)
6)
7)
8)
9)

CRITICALITIES

<table>
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<th>FLIGHT PHASE</th>
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LOCATION: 54V76A134 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
HIGH INPUT SIGNAL TO MDM. ERRONEOUS OUTPUT MEASUREMENT. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-373
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 857

ITEM: RESISTOR, CURRENT LIMITER (2.15K)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) RESISTOR CURRENT LIMITER (2.15K)
5)
6)
7)
8)
9)

CRITICALITIES

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LOCATION: 54V76A134 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION
EFFECTS/RATIONALE:
LOSS OF INPUT TO MDM. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-374
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 858

ITEM: RESISTOR, CURRENT LIMITER (5.1K)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) RESISTOR, CURRENT LIMITER (5.1K)

CRITICALITIES

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LOCATION: 55V76A135 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
HIGH INPUT TO MDM RESULTING IN ERRONEOUS OUTPUT MEASUREMENT. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-375
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 859

HIGHEST CRITICALITY
FLIGHT:
ABORT:

ITEM: RESISTOR, CURRENT LIMITER (5.1K)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) RESISTOR, CURRENT LIMITER (5.1K)
5)
6)
7)
8)
9)

CRITICALITIES

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LOCATION: 55V76A135 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO INPUT TO MDM. LOSS OF MEASUREMENT. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-376
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 860

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: SWITCH, HYD MAIN PUMP PRESS (S26,27,28)
FAILURE MODE: FAILS IN "NORM" POSITION (ALL CONTACTS)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) PANEL R2
4) SWITCH, HYD MAIN PUMP PRESS (S26,27,28)
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LOCATION: 32V73A2 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF POWER TO ENERGIZE DEPRESS SOLENOID. UNABLE TO PRESSURIZE AFFECTED HYDRAULIC SYSTEM.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86
C-377
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 861

ITEM: SWITCH, HYD MAIN PUMP PRESS (S26,27,28)
FAILURE MODE: FAILS IN "LOW" POSITION (ALL CONTACTS)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) PANEL R2
4) SWITCH, HYD MAIN PUMP PRESS (S26,27,28)

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LOCATION: 32V73A2 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
CONTINUOUS POWER TO DEPRESS SOLENOID. UNABLE TO PRESSURIZE AFFECTED HYDRAULIC SYSTEM. LOSS OF SYSTEM.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-378
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 862

ITEM: RESISTOR (1.8K)
FAILURE MODE: SHORT TO GROUND

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA, AFT LCA
4) RESISTOR (1.8K)

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LOCATION: 54V76A121, 55V76A135, 55V76A134 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF INPUT TO MDM.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-379
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 863

HIGHEST CRITICALITY
HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: RESISTOR, (1.8K)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) RESISTOR, (1.8K)
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LOCATION: 55V76A135 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
HIGH INPUT TO MDM RESULTING IN ERRONEOUS OUTPUT. NO EFFECT ON MISSION OR CREW SAFETY.
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 864

HIGHEST CRITICALITY: FLIGHT: 3/3
ABORT: /NA

ITEM: RESISTOR, (2.2K)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) RESISTOR, (2.2K)
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LOCATION: 55V76A135 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO INPUT TO MDM. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-381
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 865  ABORT: /NA

ITEM: RESISTOR, (2.2K)
FAILURE MODE: SHORTED

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS 'VLV SOLENOID CIRCUIT
3) AFT PCA
4) RESISTOR, (2.2K)
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LOCATION: 55V76A135 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
HIGH INPUT TO MDM RESULTING IN ERRONEOUS OUTPUT OF THE MDM. NO EFFECT ON MISSION OR CREW SAFETY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-382
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 866

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: /NA

ITEM: FUSE (1A, F14)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) PANEL R2
4) FUSE (1A, F14)
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CRITICALITIES

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LOCATION: 32V73A2 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF REDUNDANT CAPABILITY TO ENERGIZE DEPRESS VALVE SOLENOID.
LOSS OF FUNCTION.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-383
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 867

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: CURRENT LIMITER RESISTOR (1.21K)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) PANEL R2
4) CURRENT LIMITER RESISTOR (1.21K, A9R2)
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CRITICALITIES

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LOCATION: 32V73A2 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT ON TURNING ON THE RETURN CIRCUIT DRIVER. LOSS OF PROTECTION FOR BUS FROM FAILURE DOWNSTREAM (SECOND FAILURE).

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-384
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 868

HIGHEST CRITICALITY
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: CURRENT LIMITER RESISTOR (1.21K)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) PANEL R2
4) CURRENT LIMITER RESISTOR (1.21K)

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LOCATION: 32V73A2 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF REDUNDANT CAPABILITY TO ENERGIZE DEPRESS VALVE SOLENOID.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-385
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/1R
MDAC ID: 869  ABORT: 3/1R

ITEM: CURRENT LIMITER RESISTOR (1.21K)
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) PANEL R2
4) CURRENT LIMITER RESISTOR (1.21K)
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LOCATION: 32V73A2 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF REDUNDANT CAPABILITY TO ENERGIZE DEPRESS VALVE SOLENOID.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-386
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 870  ABORT: /NA

ITEM: CURRENT LIMITER RESISTOR (1.21K)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) PANEL R2
4) CURRENT LIMITER RESISTOR (1.21K)
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LOCATION: 32V73A2 (VS70-580109E)

PART NUMBER:

CAUSES: CONTAMINATION, THERMAL SHOCK, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT ON ENERGIZING DEPRESS SOLENOID. LOSS OF PROTECTION TO BUSES FROM FAILURE DOWNSTREAM.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-387.
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 871

ITEM: BLOCKING DIODE (15A)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) BLOCKING DIODE (15A)
5) 
6) 
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CRITICALITIES

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LOCATION: 55V76A135 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
NO EFFECT ON ENERGIZING DEPRESS SOLENOID. SWITCHING HYD MAIN PUMP PRESS SW TO NORMAL MAY DAMAGE RETURN CIRCUIT DRIVER WITH THE INDUCTIVE VOLTAGE WITH RESULTING LOSS OF FUNCTION AND REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-388
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86
SUBSYSTEM: HYD/WSB
MDAC ID: 872

ITEM: BLOCKING DIODE (15A)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) BLOCKING DIODE (15A)
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LOCATION: 55V76A135 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
LOSS OF REDUNDANT CAPABILITY TO ENERGIZE DEPRESS VALVE SOLENOID.
NO PATH THROUGH REDUNDANT RETURN DRIVER.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-389
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 873  ABORT: /NA

ITEM: BLOCKING DIODE (12A)
FAILURE MODE: SHORT
LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) BLOCKING DIODE (12A)
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LOCATION: 55V76A135 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
NO EFFECT ON ENERGIZING THE DEPRESS SOLENOID. LACK OF PROTECTION TO RPC. REQUIRES SECOND FAILURE FOR EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-390
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: HYD/WSB
MDAC ID: 874

ITEM: BLOCKING DIODE (12A)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC MAIN PUMP
2) DEPRESS VLV SOLENOID CIRCUIT
3) AFT PCA
4) BLOCKING DIODE (12A)
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LOCATION: 55V76A135 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF REDUNDANT CAPABILITY TO ENERGIZE DEPRESS VALVE SOLENOID.
LOSS OF REDUNDANT RPC.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 875  ABORT: 3/3

ITEM: LG RETRACT/CIRC VLV SW
FAILURE MODE: FAILS IN "CLOSE" POSITION (ALL CONTACTS)

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) MAIN HYDRAULIC SYSTEM 1
2) RETRACT CIRC VALVE
3) PANEL R4
4) LG RETRACT/CIRC VLV SW
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LOCATION: 32V73A4 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NO EFFECT. "CLOSE" POSITION IS NORMAL POSITION FOR FLIGHT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-392
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86
SUBSYSTEM: HYD/WSB
MDAC ID: 876

ITEM: LG RETRACT/CIRC VLV SW
FAILURE MODE: FAILS IN "GPC" POSITION (ALL CONTACTS)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) MAIN HYDRAULIC SYSTEM 1
2) RETRACT CIRC VALVE
3) PANEL R4
4) LG RETRACT/CIRC VLV SW
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LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
RETRACT/CIRC VALVE STAYS ENERGIZED WHEN CIRC PUMP IS ON.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-393
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 877  ABORT: 2/1R

ITEM: LG RETRACT/CIRC VLV SW  FAILURE MODE: FAILS IN "OPEN" POSITION (ALL CONTACTS)

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) MAIN HYDRAULIC SYSTEM 1
2) RETRACT/CIRC VALVE
3) PANEL R4
4) LG RETRACT/CIRC VLV SW

CRITICALITIES

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LOCATION: 32V73A4 (VS70-580109E)

PART NUMBER: 32V73A4 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
RETRACT/CIRC VALVE STAYS ENERGIZED UNTIL LG ARM IS INITIATED. VALVE MAY STICK IN OPEN POSITION DUE TO EXCESSIVE HEATING IF SOLENOID REMAINS ENERGIZED FOR AN EXTENDED PERIOD.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-394
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: HYD/WSB
MDAC ID: 878

ITEM: INDICATOR
FAILURE MODE: LOSS OF OUTPUT (OPEN, SHORT)

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) INDICATOR

CRITICALITIES

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LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, THERMAL STRESS, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT. AVAILABLE TEMPS, PRESSURES PROVIDE DATA TO DETERMINE VALVE POSITION.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-395
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 879  ABORT: 3/3

ITEM: RESISTOR, CURRENT LIMITER (1.21K)
FAILURE MODE: OPEN/SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) INDICATOR POWER
4) RESISTOR, CURRENT LIMITER (1.2K)
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LOCATION: 54V76A12 (VS70-580109E)

PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK, CONTAMINATION

EFFECTS/RATIONALE:
OPEN RESISTOR - NO POWER TO OPEN/CLOSE INDICATION OR MDM - NO EFFECT. VALVE POSITION CAN BE DETERMINED BY PRESSURES AND TEMPS. SHORT - NO CURRENT LIMITING, NO BUS PROTECTION FROM ELECTRICAL FAILURES DOWNSTREAM (SECOND FAILURE).

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-396
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: HYD/WSB
MDAC ID: 880

HIGHEST CRITICALITY

ITEM: RESISTOR, CURRENT LIMITER (5.1K)
FAILURE MODE: OPEN/SHORT

LEAD ANALYST: J. DUVAL
LEAD: W. DAVIDSON
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1, 2, 3)
3) RESISTOR, CURRENT LIMITER (5.1K)

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LOCATION: 54V76A12 (VS70-580109E)

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK, CONTAMINATION

EFFECTS/RATIONALE:
NO EFFECT - MONITOR FUNCTION. NO INPUT TO MDM.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-397
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 881  ABORT: /NA

ITEM: BLOCKING DIODE, "CLOSE" GROUND COMMAND
FAILURE MODE: OPEN/SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1, 2, 3)
3) BLOCKING DIODE, "CLOSE" GROUND COMMAND
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LOCATION: 54V76A12 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, THERMAL STRESS, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT. GROUND TESTING ONLY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-398
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
SUBSYSTEM: HYD/WSB
MDAC ID: 882

ITEM: BLOCKING DIODE (RETURN CIRCUIT)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) BLOCKING DIODE (RETURN CIRCUIT)

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LOCATION: 54V76A12 (VS70-580109E)

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF ISOLATION BETWEEN GROUND AND VEHICLE COMMANDS - NO EFFECT IN FLIGHT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-399
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 883 ABORT: 2/1R

ITEM: BLOCKING DIODE (RETURN CIRCUIT)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) BLOCKING DIODE (RETURN CIRCUIT)

CRITICALITIES

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LOCATION: 54V96A12 (VS70-580109E)
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO COMMAND VALVE. AOA - LIMIT RUN TIME OF AFFECTED AFU TO CONSERVE FUEL.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-400
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 884

HIGHEST CRITICALITY: HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE IV, RETURN CIRCUIT
FAILURE MODE: CONTINUOUS OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) HYBRID DRIVER, TYPE IV, RETURN CIRCUIT
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LOCATION: 54V76A12 (VS70-580109E)
PART NUMBER:

CAUSES: INTERNAL SHORT

EFFECTS/RATIONALE:
NO EFFECT, CLOSE DRIVER MUST BE ENERGIZED TO CLOSE VALVE (SECOND FAILURE). IF SECOND FAILURE OCCURS, ENGINE THROTTLE VALVES WILL LOCK IN CURRENT POSITION.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-401
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 2/1R
MDAC ID: 885  ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE IV, RETURN CIRCUIT
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1, 2, 3)
3) HYBRID DRIVER, TYPE IV, RETURN CIRCUIT
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LOCATION: 54V76AI2 (VS70-580109E)
PART NUMBER:

CAUSES: OPEN, THERMAL STRESS, SHORT TO GROUND

EFFECTS/RATIONALE:
CANNOT OPERATE ISO VALVE. AOA ABORT, LIMIT APU RUN TIME TO CONSERVE APU FUEL.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-402
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

| DATE: 12/01/86 | HIGHEST CRITICALITY | HDW/FUNC |
| SUBSYSTEM: HYD/WSB | FLIGHT: | 2/1R |
| MDAC ID: 886 | ABORT: | 2/1R |

ITEM: HYBRID DRIVER, TYPE III, VLV CLOSE CIRCUIT
FAILURE MODE: CONTINUOUS OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1, 2, 3)
3) HYBRID DRIVER, TYPE III, VLV CLOSE CIRCUIT
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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 |


LOCATION: 54V76A12 (VS70-580109E)

PART NUMBER:

CAUSES: INTERNAL SHORT

EFFECTS/RATIONALE:
CONTINUOUS OUTPUT HAS NO EFFECT WITHOUT THE RETURN DRIVER TURNED ON (SECOND FAILURE). RETURN DRIVER ACTIVATION WOULD CLOSE VALVE. VALVE CLOSURE WOULD CAUSE THE LOSS OF HYDRAULIC POWER TO THE ENGINE CONTROL VALVE. LOSS OF ME CONTROL DURING THROTTLE BACK (IN THE "BUCKET") WOULD CAUSE POSSIBLE LOSS OF CREW/VEHICLE.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-403
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 887  ABORT: 2/1R

ITEM: HYBRID DRIVER, TYPE III, VLV CLOSE CIRCUIT
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1, 2, 3)
3) HYBRID DRIVER, TYPE III, VLV CLOSE CIRCUIT
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LOCATION: 54V76A121 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, THERMAL STRESS, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO CLOSE VALVE ON ORBIT. NO EFFECT ON NORMAL DEORBIT. DUE TO INCREASED TIME FOR AN AOA, LIMIT RUN TIME OF APU TO CONSERVE FUEL.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-404
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 888

ITEM: HYBRID DRIVER, TYPE III, VLV OPEN CIRCUIT
FAILURE MODE: CONSTANT OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) HYBRID DRIVER, TYPE III, VLV CLOSE CIRCUIT

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LOCATION: 54V76A121 (VS70-580109E)

CAUSES: INTERNAL SHORT

EFFECTS/RATIONALE:
VLV IS IN OPEN POSITION FOR LAUNCH. CONSTANT OUTPUT HAS NO EFFECT UNTIL RETURN DRIVER IS ENERGIZED. WHEN CLOSE COMMAND IS ACTIVATED, THE RETURN DRIVER WILL BE TURNED ON. WITH BOTH OPEN AND CLOSED COMMAND ON THE VALVE, MECHANICAL PROPERTIES WILL DETERMINE WHICH COMMAND WILL BE EFFECTIVE.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  . C-405
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 889

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: 3/3

ITEM: HYBRID DRIVER, TYPE III, VLV OPEN CIRCUIT
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL   SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) HYBRID DRIVER, TYPE III, VLV OPEN CIRCUIT

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LOCATION: 54V76A121 (VS70-580109E)

CAUSES: OPEN, THERMAL STRESS, SHORT TO GROUND

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO COMMAND VALVE OPEN. VALVE OPEN FOR LAUNCH.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-406
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 890

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: 2/1R

ITEM: BLOCKING DIODE, 3A, CLOSE CIRCUIT
FAILURE MODE: OPEN/SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) BLOCKING DIODE, 3A, CLOSE CIRCUIT
4) HEATER

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LOCATION: 54V76A121 (VS70-580109E)

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
OPEN - LOSS OF CAPABILITY TO CLOSE ISO VALVE. INCREASES APU FUEL USAGE. LIMITING RUN TIME OF APU DURING AOA REQUIRED TO CONSERVE APU FUEL. SHORT - NO EFFECT. DIODE REQUIRED FOR GROUND OPERATIONS ONLY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-407
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 891

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: MPS/TVC ISO VLV CONTROL SW
FAILURE MODE: INADVERTENT/PREMATURE OPERATION

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) MPS/TVC ISO VLV CONTROL SW
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LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, STRUCTURAL FAILURE, MECHANICAL SHOCK

EFFECTS/RATIONALE:
VALVE NORMALLY CLOSED AFTER MECO. OPENING VALVE DURING DESCENT AFFECTS APU FUEL USAGE. LIMIT RUNTIME OF APU DURING DESCENT MAY BE REQUIRED DEPENDING ON WHEN FAILURE OCCURS. CLOSING VALVE DURING LIFTOFF - LOSS OF HYDRAULIC POWER TO ENGINE CONTROL VALVE. LOSS IN "BUCKET" POSSIBLE LOSS OF VEHICLE & CREW.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-408
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 892

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 2/1R

ITEM: MPS/TVC ISO VLV CONTROL SW
FAILURE MODE: FAILS IN CENTER POSITION

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1, 2, 3)
3) MPS/TVC ISO VLV CONTROL SWITCH
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LOCATION: 32V73A4 (VS70-580109E)

PART NUMBER:

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ABILITY TO OPERATE ISO VALVE. LIMIT APU RUN TIME TO CONSERVE APU FUEL FOR AOA.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-409
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 893

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: 3/3

ITEM: CURRENT LIMITER RESISTOR (1.21K) RETURN DRIVER POWER CONTROL
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) CURRENT LIMITER RESISTOR (1.21K) RETURN DRIVER POWER CONTROL
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LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

CAUSES: CONTAMINATION, THERMAL STRESS

EFFECTS/RATIONALE:
NO EFFECT. LOSS OF CURRENT LIMITING. LOSS OF PROTECTION TO BUS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-410
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86
SUBSYSTEM: HYD/WSB
MDAC ID: 894

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: 2/1R

ITEM: CURRENT LIMITER RESISTOR (1.21K) RETURN POWER CONTROL
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) CURRENT LIMITER RESISTOR (1.21K) RETURN POWER CONTROL

CRITICALITIES

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LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
LOSS OF RETURN PATH PREVENTS OPERATING ISO VALVE. LIMIT RUN TIME OF APU TO CONSERVE APU FUEL FOR AOA.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-411
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86
SUBSYSTEM: HYD/WSB
MDAC ID: 895

ITEM: CURRENT LIMITER RESISTOR (1.21K) OPEN/CLOSE DRIVERS POWER CONTROL
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL        SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1,2,3)
3) CURRENT LIMITER RESISTOR (1.21K) OPEN/CLOSE DRIVERS POWER CONTROL

CRITICALITY:

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LOCATION: 32V73A4 (VS70-580109E)

CAUSES: CONTAMINATION, THERMAL STRESS

EFFECTS/RATIONALE:
NO EFFECT. LOSS OF CURRENT LIMITING. LOSS BUS PROTECTION.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86   C-412
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86

SUBSYSTEM: HYD/WSB

MDAC ID: 896

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: CURRENT LIMITER RESISTOR (1.21K) POWER CONTROL

FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM
2) MPS/TVC ISOLATION VALVE (SYSTEMS 1, 2, 3)
3) CURRENT LIMITER RESISTOR (1.21K) POWER CONTROL

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LOCATION: 32V73A4 (VS70-580109E)

PART NUMBER: 32V73A4 (VS70-580109E)

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
LOSS OF CONTROL BUS VOLTAGE PREVENTS OPERATION OF SOLENOID VALVE.
LIMIT RUN TIME OF APU TO CONSERVE APU FUEL FOR AOA.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-413
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86
SUBSYSTEM: HYD/WSB
MDAC ID: 897

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: ISOLATION DIODE
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) ISOLATION DIODE
5)
6)
7)
8)
9)

CRITICALITIES

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LOCATION: 54V76A121 (VS70-580109E)

PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
NO EFFECT. THE MAIN DC BUS AND GSE BUS ARE BOTH 28V.
INADVERTENT APPLICATION OF GSE POWER TO BUS HAS NO EFFECT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-414
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86
SUBSYSTEM: HYD/WSB
MDAC ID: 898

ITEM: ISOLATION DIODE (SYSTEM 1)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) ISOLATION DIODE (SYSTEM 1)

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LOCATION: 54V76A121 (VS70-580109E)

CAUSES: OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
LOSS OF ABILITY TO CLOSE LG ISO VALVE.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-415
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86
SUBSYSTEM: HYD/WSB
MDAC ID: 899

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: CONTROLLER, HYBRID DRIVER, TYPE III (CLOSE)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) CONTROLLER, HYBRID DRIVER, TYPE III (CLOSE)
5) 6) 7) 8) 9)

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LOCATION: 54V76A121 (VS70-580109E)
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
CONTINUOUS POWER TO THE "CLOSE" SOLENOID WOULD PREVENT THE ISO VALVE FROM OPENING. THIS FAILURE WOULD PREVENT LOWERING THE LG USING HYDRAULIC POWER. LOSS OF NOSE WHEEL STEERING.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-416
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 11/28/86

**SUBSYSTEM:** HYD/WSB

**MDAC ID:** 900

**HIGHEST CRITICALITY**

**FLIGHT:** HDW/FUNC 3/3

**ABORT:** /NA

**ITEM:** CONTROLLER, HYBRID DRIVER, TYPE III (CLOSE)

**FAILURE MODE:** LOSS OF OUTPUT

**LEAD ANALYST:** J. DUVAL

**SUBSYS LEAD:** W. DAVIDSON

**BREAKDOWN HIERARCHY:**

1) HYDRAULIC SYSTEM
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) CONTROLLER, HYBRID DRIVER, TYPE III (CLOSE)
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**REDUNDANCY SCREENS:** A [NA] B [NA] C [NA]

**LOCATION:** 54V76A121 (VS70-580109E)

**PART NUMBER:**

**CAUSES:** VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

**EFFECTS/RATIONALE:**

LOSS OF ABILITY TO CLOSE LG ISO VALVE. NO EFFECT ON MISSION OR CREW/VEHICLE AFTER LAUNCH.

**REFERENCES:** VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE** 12/23/86

C-417
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 901

HIGHEST CRITICALITY

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ITEM: CONTROLLER, HYBRID DRIVER, TYPE III (OPEN)
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) CONTROLLER, HYBRID DRIVER, TYPE III (OPEN)
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LOCATION:
PART NUMBER:

CAUSES: SHORT TO GROUND, ELECTRICAL OPEN

EFFECTS/RATIONALE:
LOSS OF ABILITY TO OPEN LG ISO VALVE.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-418
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 902

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: CONTROLLER, HYBRID DRIVER, TYPE III (OPEN)
FAILURE MODE: INADVERTENT OUTPUT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) CONTROLLER, HYBRID DRIVER, TYPE III (OPEN)
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LOCATION:
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LG ISO VLV OPENS PREMATURELY. FAILURE OF LG CONTROL VALVE WOULD RESULT IN PREMATURE DEPLOYMENT OF LG (SECOND FAILURE). POSSIBLE LOSS CREW/VEHICLE.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-419
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86
SUBSYSTEM: HYD/WSB
MDAC ID: 903

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: INDICATOR (DS1,2,3)
FAILURE MODE: SHORT

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) INDICATOR (DS1,2,3)
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LOCATION: 32V73A4 (VS70-580109E)

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, CONTAMINATION

EFFECTS/RATIONALE:
LOSS OF PANEL INDICATION. POSSIBLE ERRONEOUS INDICATION.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-420
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86
SUBSYSTEM: HYD/WSB
MDAC ID: 904

ITEM: INDICATOR (DSI,2,3)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL      SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) INDICATOR (DS1,2,3)

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LOCATION: 32V73A4 (VS70-580109E)

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB  FLIGHT: 3/3
MDAC ID: 905  ABORT: 3/3

ITEM: MDM INPUT CURRENT LIMITER RESISTOR (5.1K)
FAILURE MODE: OPEN/SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) PANEL R4
4) MDM INPUT CURRENT LIMITER RESISTOR (5.1K)
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LOCATION:

PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
OPEN RESISTOR PREVENTS MDM INPUT TO ISO VALVE MONITOR CIRCUIT.
SHORTED RESISTOR PROVIDES NO CURRENT LIMITING TO MONITOR CIRCUIT.
NO EFFECT ON MISSION OR VEHICLE OPERATIONS. ERRONEOUS OUTPUT.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-422
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86

SUBSYSTEM: HYD/WSB
MDAC ID: 906

ITEM: ISOLATION DIODE (MONITOR CIRCUIT)
FAILURE MODE: OPEN/SHORT

LEAD ANALYST: J. DUVAL  SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) ISOLATION DIODE (MONITOR CIRCUIT)

CRITICALITIES

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LOCATION:
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
OPEN DIODE PREVENTS GSE POWER TO THE MONITOR CIRCUIT. SHORTED DIODE PROVIDES NO PROTECTION BETWEEN GND AND VEHICLE BUSES. NO EFFECT ON MISSION OR VEHICLE OPERATIONS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86  C-423
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86
SUBSYSTEM: HYD/WSB
MDAC ID: 907

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: 3/3

ITEM: CURRENT LIMITER RESISTOR (1.2K)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) ISOLATION LIMITER RESISTOR (1.2K)
5)
6)
7)
8)
9)

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LOCATION:
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
PROVIDES CURRENT LIMITING IN MONITORING CIRCUIT. NO EFFECT IN THE MISSION OR VEHICLE OPERATIONS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-424
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86
SUBSYSTEM: HYD/WSB
MDAC ID: 908

ITEM: GSE ISOLATION DIODE
FAILURE MODE: OPEN - SHORT

LEAD ANALYST: J. DUVAL

SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) GSE ISOLATION DIODE
5)
6)
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9)

CRITICALITIES

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LOCATION:

PART NUMBER:

CAUSES: VIBRATION, THERMAL STRESS, MECHANICAL SHOCK

EFFECTS/RATIONALE:
AN OPEN PREVENTS GSE OPEN/CLOSE COMMANDS. DOES NOT AFFECT MISSION OR VEHICLE OPERATIONS. A SHORT PROVIDES NO ISOLATION BETWEEN THE VEHICLE AND GSE. NO AFFECT ON MISSION OR VEHICLE OPERATIONS.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-425
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 909

ITEM: MDM ISOLATION DIODE
FAILURE MODE: N

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) MDM ISOLATION DIODE
5) 
6) 
7) 
8) 
9) 

CRITICALITIES

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LOCATION:
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF REDUNDANCY IN LG DOWN COMMAND. LOSS OF GPC/MDM "OPEN" COMMAND. SECOND FAILURE IN SYSTEM 1 (OPEN DIODE, SW FAILURE) RESULTS IN POSSIBLE LOSS OF CREW/VEHICLE.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-426
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 910

ITEM: VEHICLE ISOLATION DIODE
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) AFT LCA
4) VEHICLE ISOLATION DIODE

CRITICALITIES

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LOCATION:
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF PATH TO "OPEN" DRIVER. LOSS OF ABILITY TO OPEN ISO VALVE USING THE SW. LOSS OF REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-427
## INDEPENDENT ORBITER ASSESSMENT
### ORBITER SUBSYSTEM ANALYSIS WORKSHEET

**DATE:** 11/19/86  
**SUBSYSTEM:** HYD/WSB  
**MDAC ID:** 911

**ITEM:** LG HYDRAULIC ISOLATION VLV SW  
**FAILURE MODE:** INADVERTENTLY CONDUCTS (OPEN POSITION)

**LEAD ANALYST:** J. DUVAL  
**SUBSYS LEAD:** W. DAVIDSON

### BREAKDOWN HIERARCHY:

1) HYDRAULIC SYSTEM 1  
2) LANDING GEAR ISOLATION VALVE  
3) PANEL R4  
4) LG HYDRAULIC ISOLATION VLV SW  
5)  
6)  
7)  
8)  
9)

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

**LOCATION:**

**PART NUMBER:**

**CAUSES:** INTERNAL SHORT

**EFFECTS/RATIONALE:**

PREMATURE OPENING OF ISO VLV HAS NO EFFECT UNTIL A SECOND FAILURE, I.E. LG CONTROL VLV. OPENS.

**REFERENCES:** VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

**REPORT DATE 12/23/86**

C-428
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 912

HIGHEST CRITICALITY
FLIGHT: 2/1R
ABORT: 2/1R

ITEM: LG HYDRAULIC ISOLATION VLV SW
FAILURE MODE: INADVERTENTLY CONDUCTS (CLOSE POSITION)

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) PANEL R4
4) LG HYDRAULIC ISOLATION VLV SW
5) 
6) 
7) 
8) 
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LOCATION:
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
INADVERTENT OPERATION OF LG CLOSE DRIVER. LOSS OF REDUNDANCY. GPC COMMAND OPEN WILL OPEN VALVE.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-429
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 913

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: LG HYDRAULIC ISOLATION VLV SW
FAILURE MODE: FAIL TO CLOSE

LEAD ANALYST: J. DUVAL
SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) PANEL R4
4) LG HYDRAULIC ISOLATION VLV SW
5) 
6) 
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LOCATION:

PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF MANUAL CONTROL OF LG ISO VLV. VLV OPERATED BY GPC COMMAND. LOSS OF REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86 C-430
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86
SUBSYSTEM: HYD/WSB
MDAC ID: 914

ITEM: ISO VLV CTL CIRCUIT RESISTOR (1.21K)
FAILURE MODE: OPEN

LEAD ANALYST: J. DUVAL   SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:
1) HYDRAULIC SYSTEM 1
2) LANDING GEAR ISOLATION VALVE
3) PANEL R4
4) ISO VLV CTL CIRCUIT RESISTOR (1.21K)

CRITICALITIES

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LOCATION:
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS

EFFECTS/RATIONALE:
PANEL R4 SWITCH CANNOT OPEN LG HYDRAULIC ISO VALVE. VALVE IS OPERATED BY THE FLIGHT SOFTWARE. LOSS OF REDUNDANCY.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL II, SECT 12

REPORT DATE 12/23/86   C-431
## APPENDIX D
### POTENTIAL CRITICAL ITEMS

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<td>WATER SPRAY BOILER ASSEMBLY</td>
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<td>BOILER WATER FILL AND DRAIN</td>
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