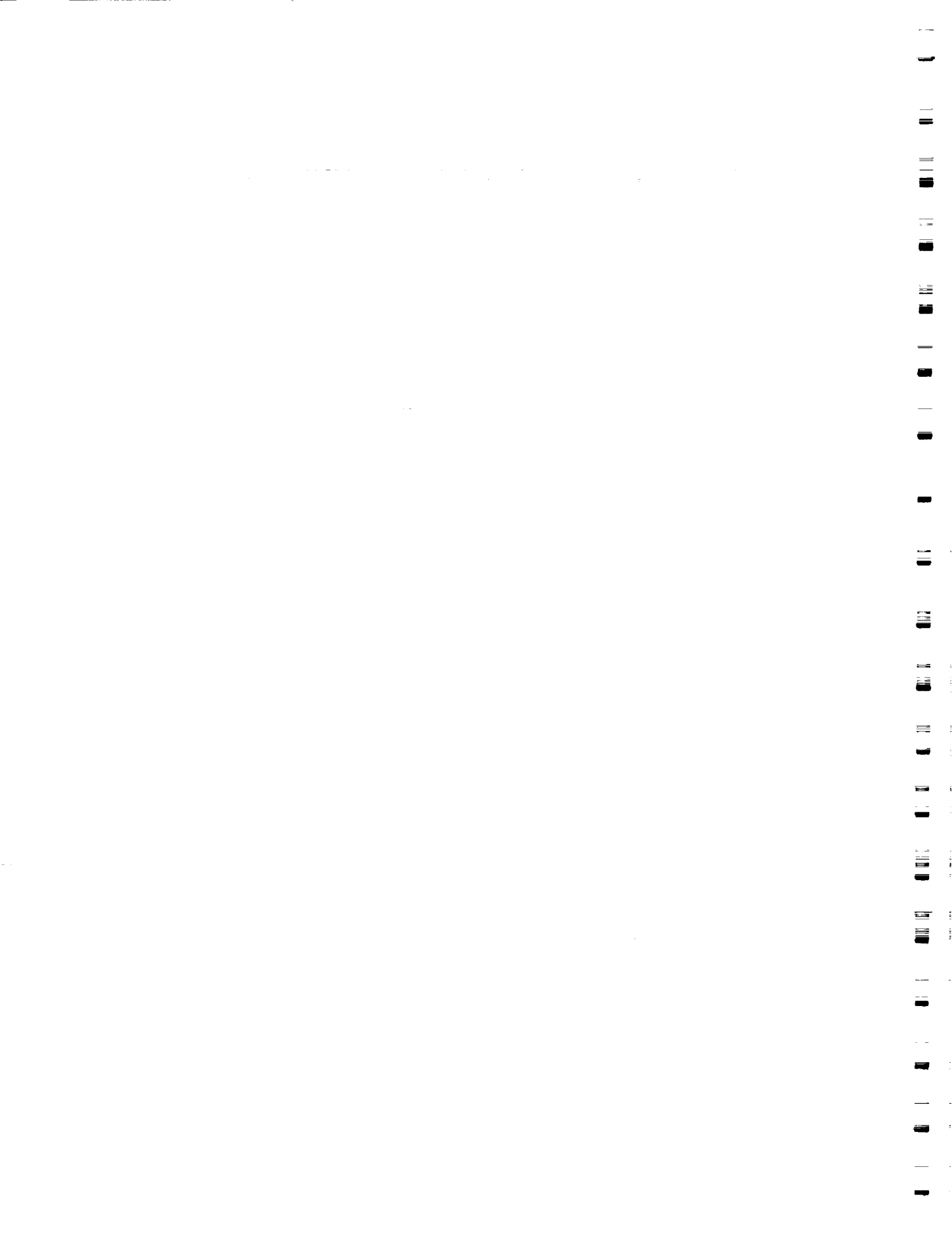


INDEPENDENT ORBITER ASSESSMENT

ANALYSIS OF THE HYDRAULICS/ WATER SPRAY BOILER SUBSYSTEM

19 DECEMBER 1986



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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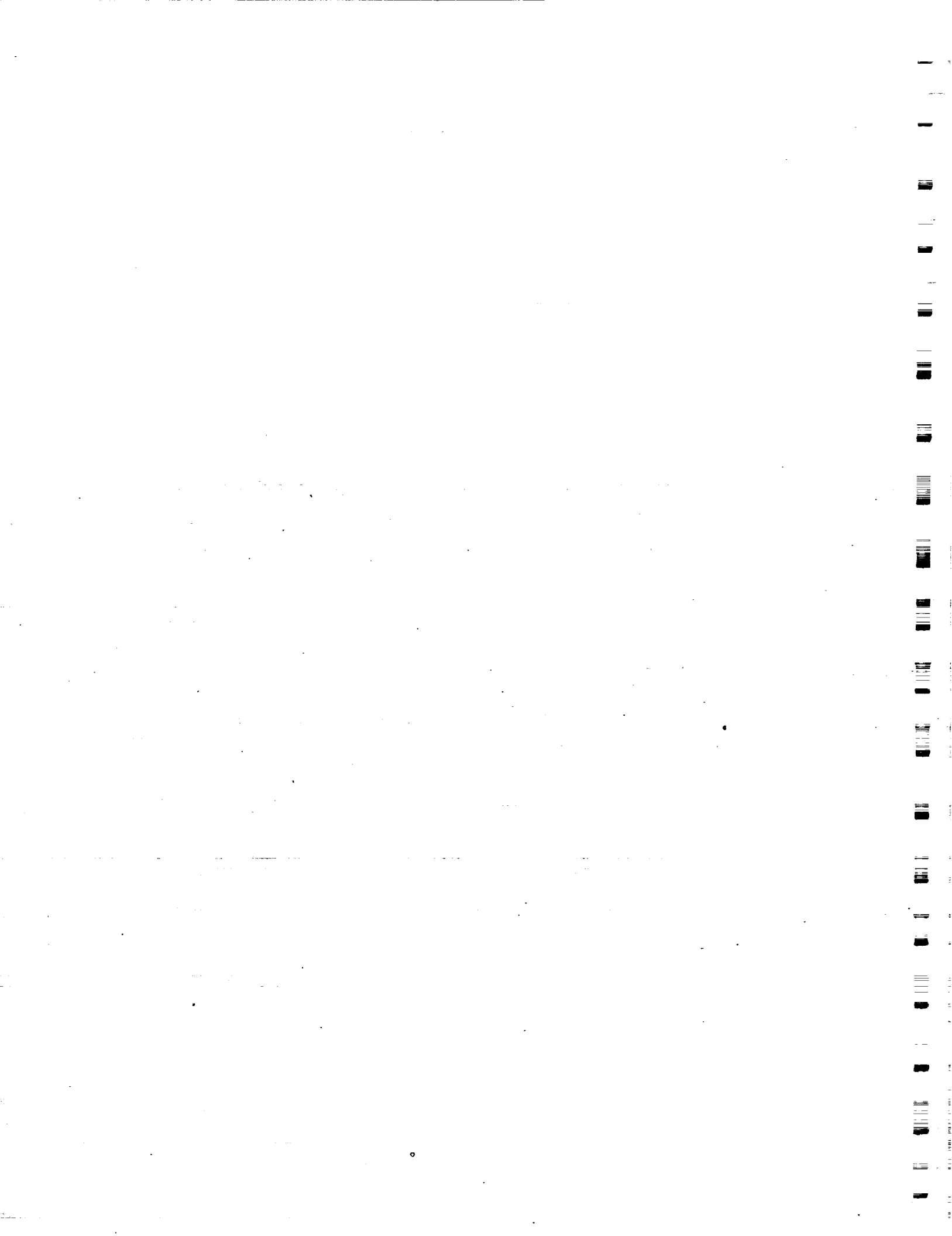
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Independent Orbiter Assessment Analysis of the Hydraulics/Water Spray Boiler Subsystem

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.

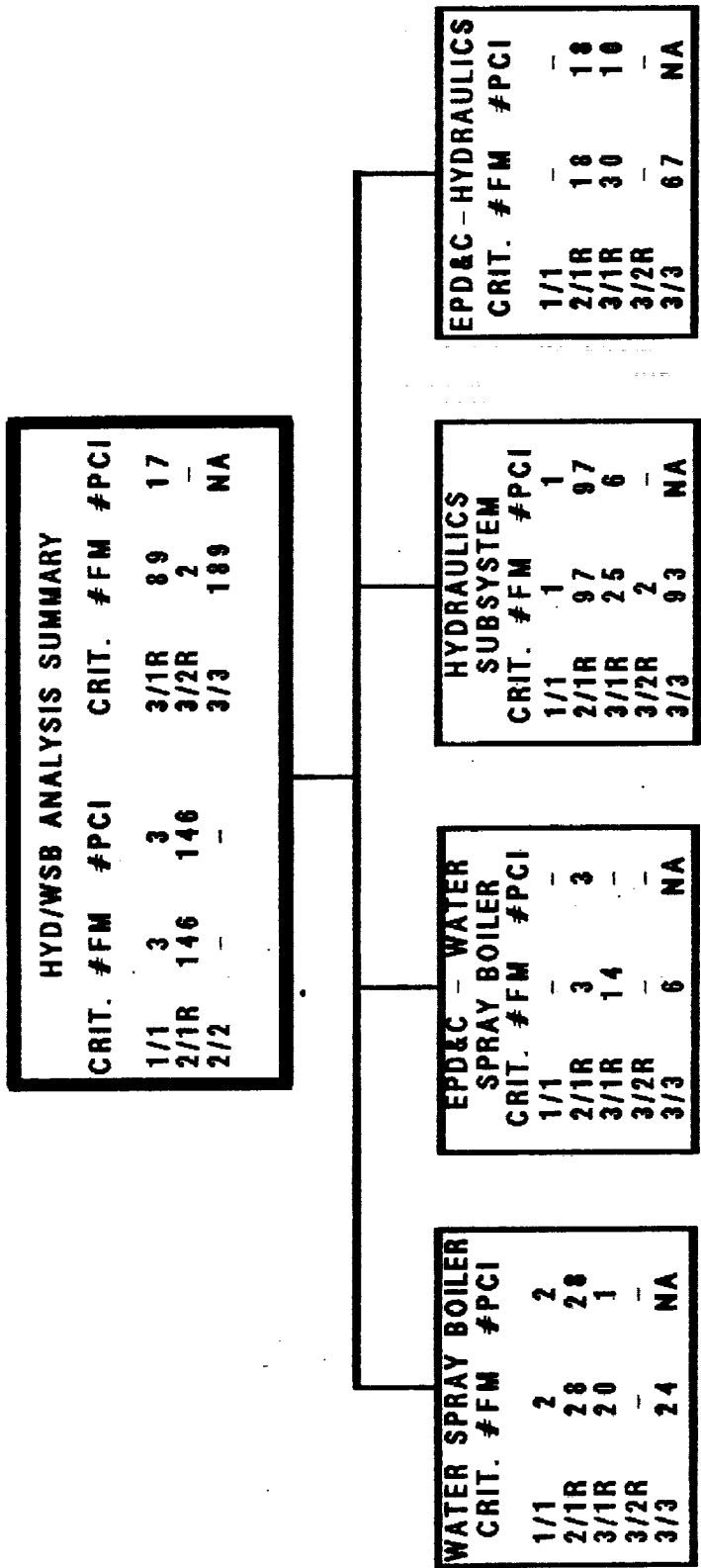
The hydraulic system provides hydraulic power to gimbal the main engines, actuate the main engine propellant control valves, move the aerodynamic flight control surfaces, lower the landing gear, apply wheel brakes, steer the nosewheel, and dampen the external tank/umbilical plate at external tank (ET) 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.

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



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

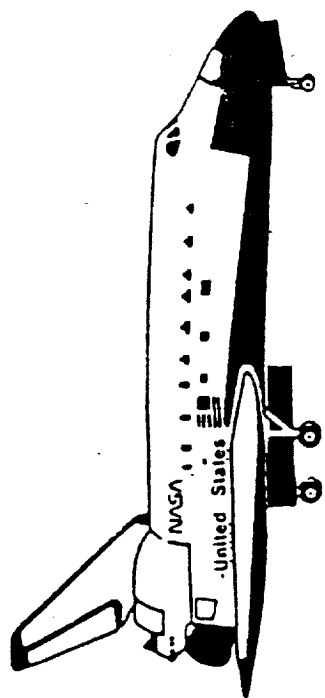


Figure 1 - HYDRAULICS/WATER SPRAY BOILER OVERVIEW ANALYSIS SUMMARY

Summary of IOA Failure Modes By Criticality (HW/F)							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
Number :	3	146	-	89	2	190	430

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

Summary of IOA Potential Critical Items (HW/F)						
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
Number :	3	146	-	17	-	166

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:

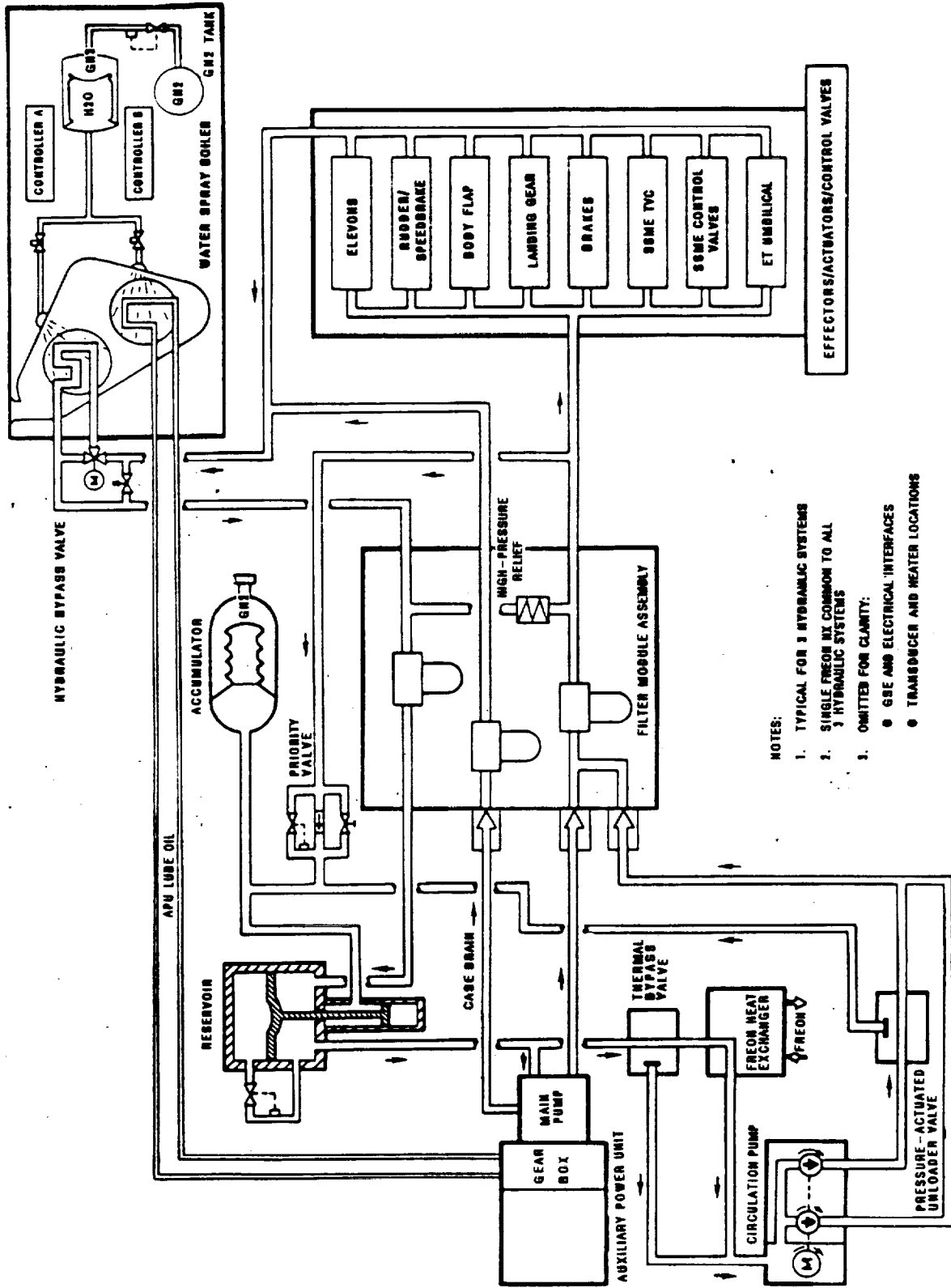
- o Water tank with gaseous nitrogen (GN2) pressurization
- o Internal boiler
- o Electronic controllers (two per system)
- o Heaters
- o Temperature and pressure sensors

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 overflowing. 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



- NOTES:
1. TYPICAL FOR 3 HYDRAULIC SYSTEMS
 2. SINGLE FREON IN COMMON TO ALL 3 HYDRAULIC SYSTEMS
 3. OMITTED FOR CLARITY:
 - GBE AND ELECTRICAL INTERFACES
 - TRANSDUCER AND HEATER LOCATIONS

Figure 2 - HYDRAULICS/WATER SPRAY BOILER DIAGRAM

EPD&C - WATER SPRAY BOILER

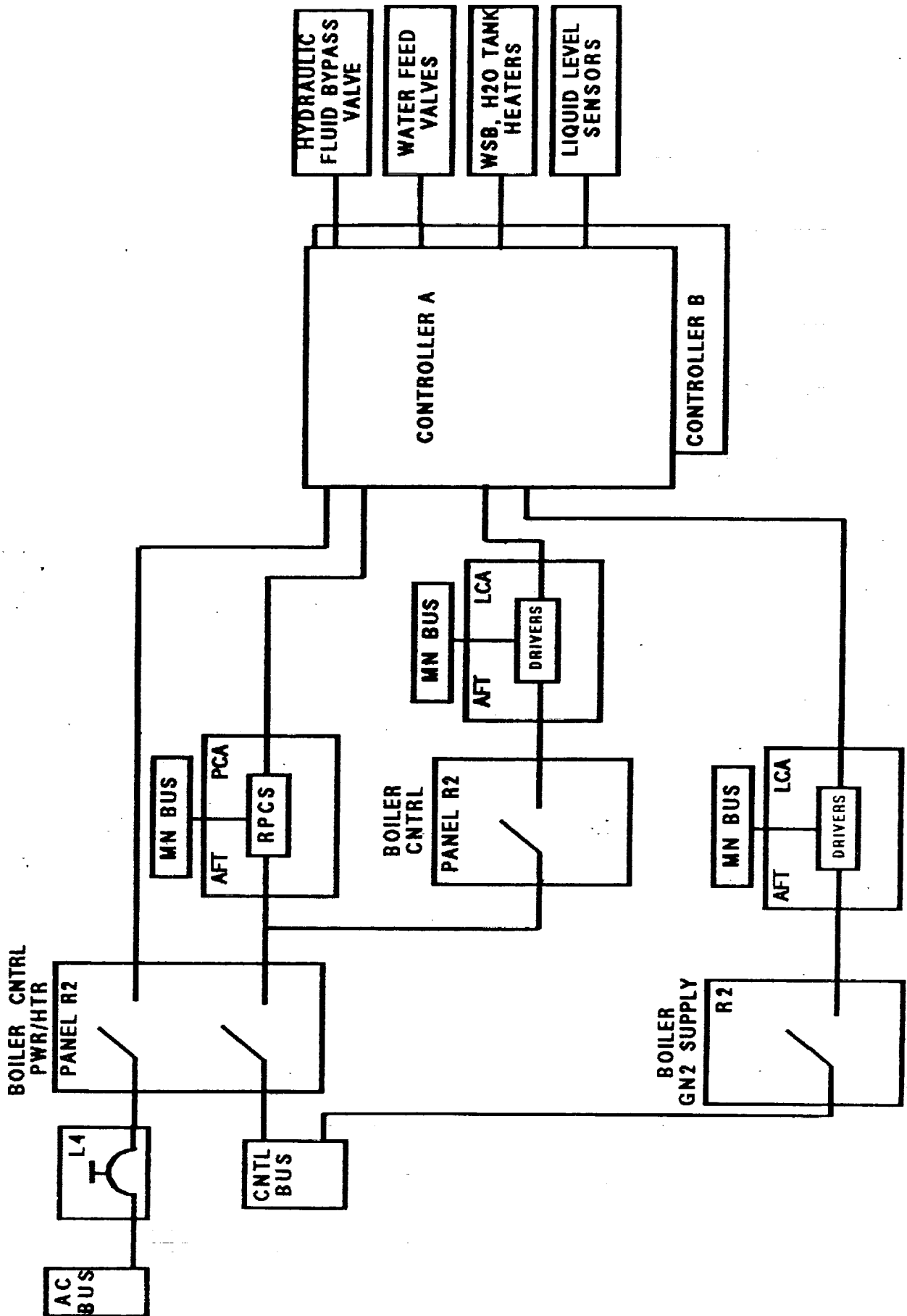


Figure 3 - EPD&C - WATER SPRAY BOILER DIAGRAM

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.

- o H2O quantity computation
- o GN2 tank temperature
- o GN2 regulator pressure
- o H2O tank pressure
- o 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.

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

3.2 Interfaces and Locations

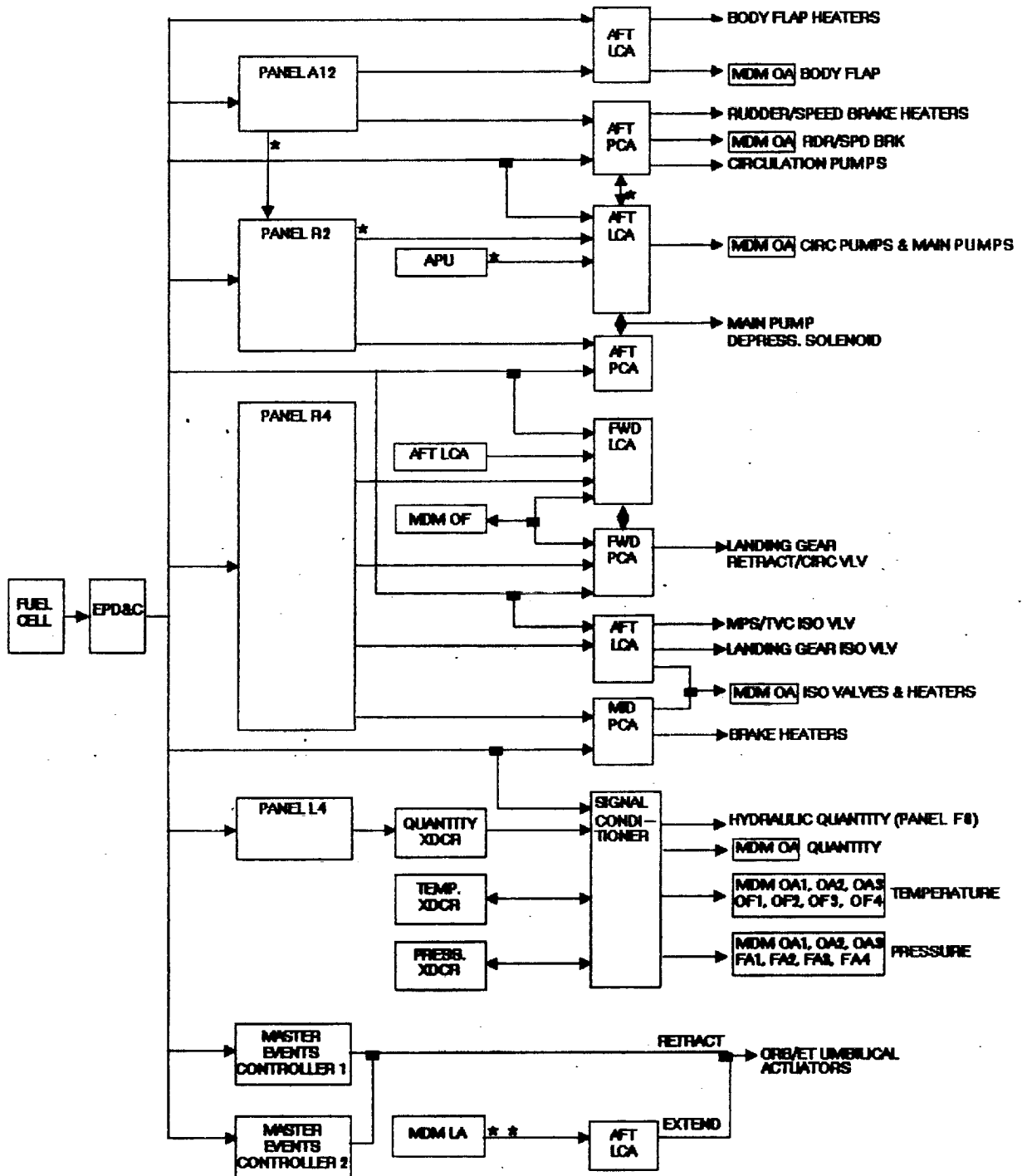
The locations of the hydraulics and water spray boiler components on the Orbiter are shown in Figure 5.

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

EPD&C - HYDRAULICS DIAGRAM



* AFFECTS CIRCULATION PUMP.
 ** MDM US USED FOR PRE-FLIGHT OPERATIONS.

Figure 4 - EPD&C - HYDRAULICS DIAGRAM

HYDRAULICS AND WATER SPRAY BOILER COMPONENT LOCATIONS

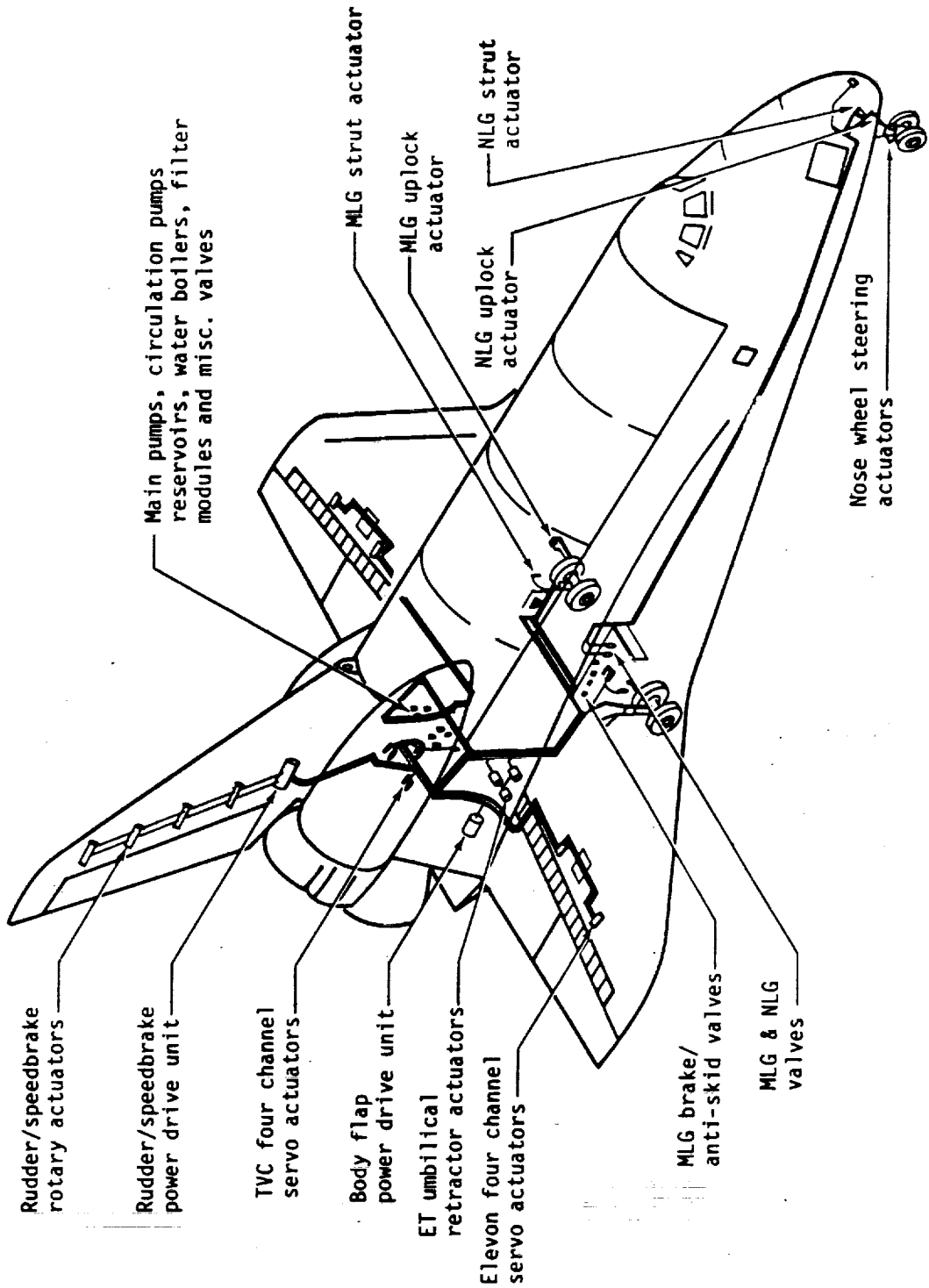


Figure 5 - HYDRAULICS AND WATER SPRAY BOILER COMPONENT LOCATIONS

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.

HYDRAULICS/WATER SPRAY BOILER ANALYSIS HIERARCHY

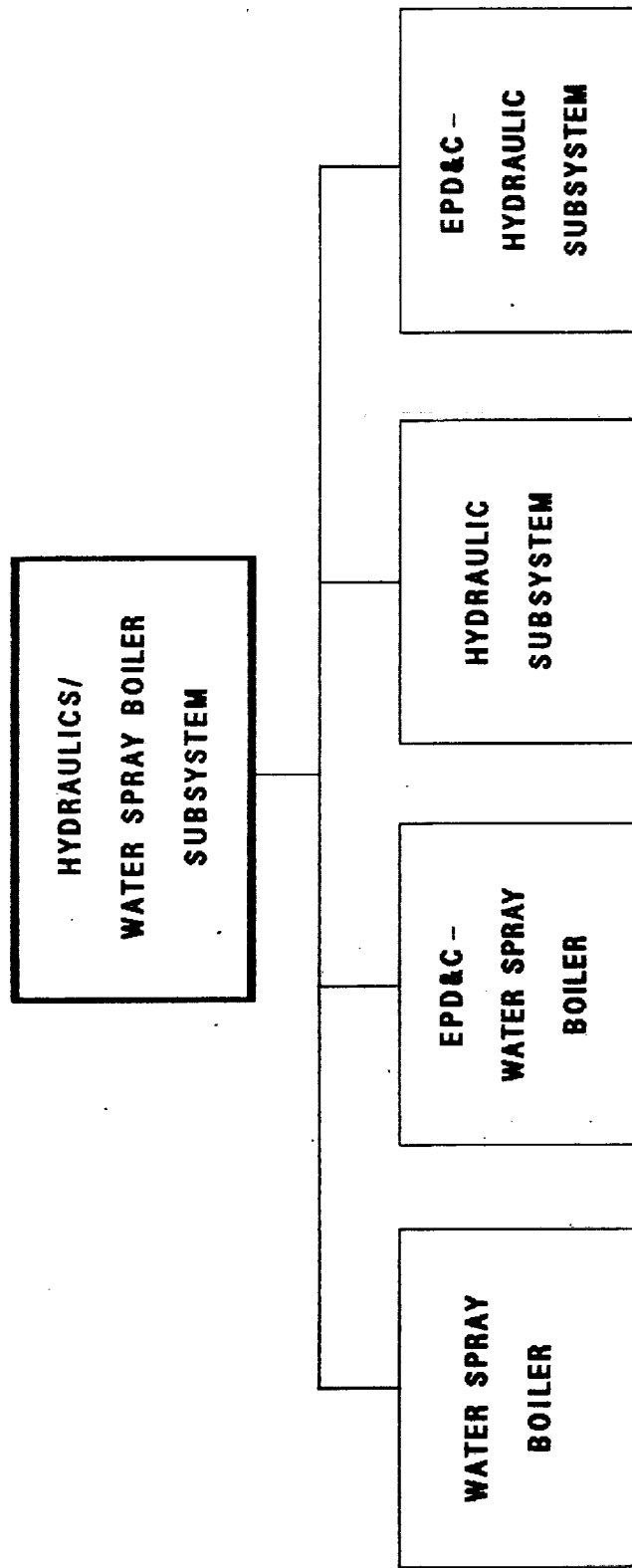


Figure 6 - HYDRAULICS/WATER SPRAY BOILER ANALYSIS HIERARCHY

WATER SPRAY BOILER

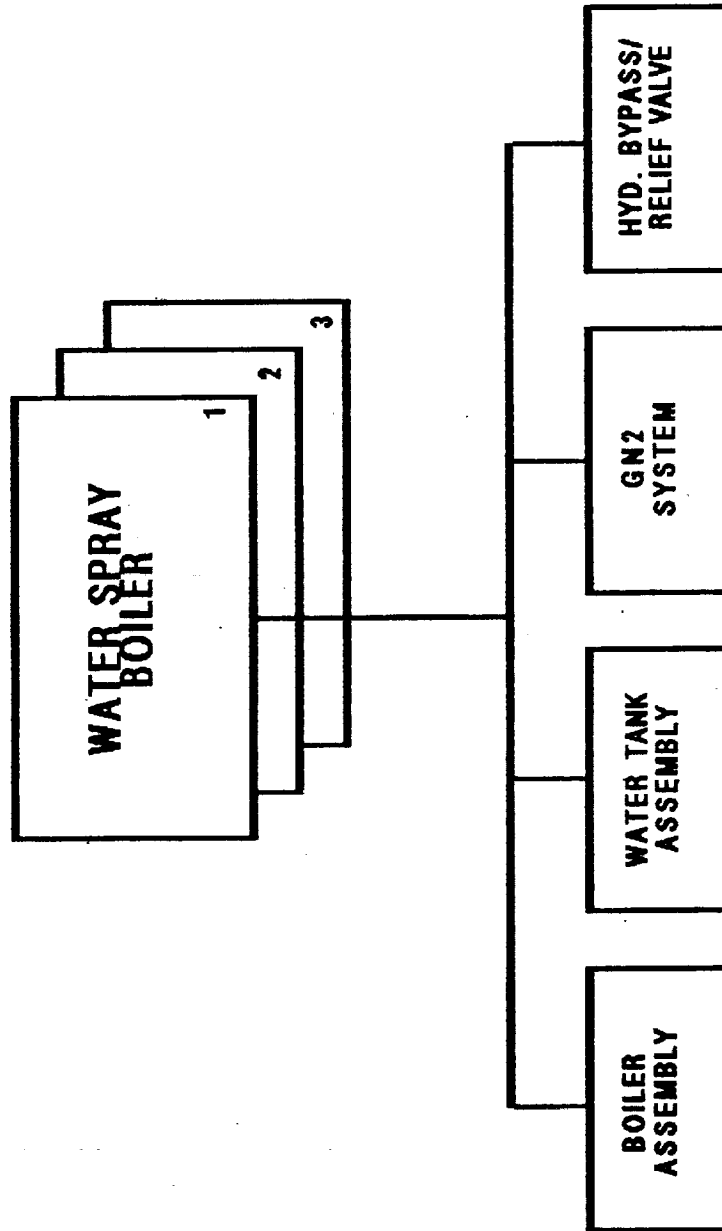


Figure 7 - WATER SPRAY BOILER

BOILER ASSEMBLY

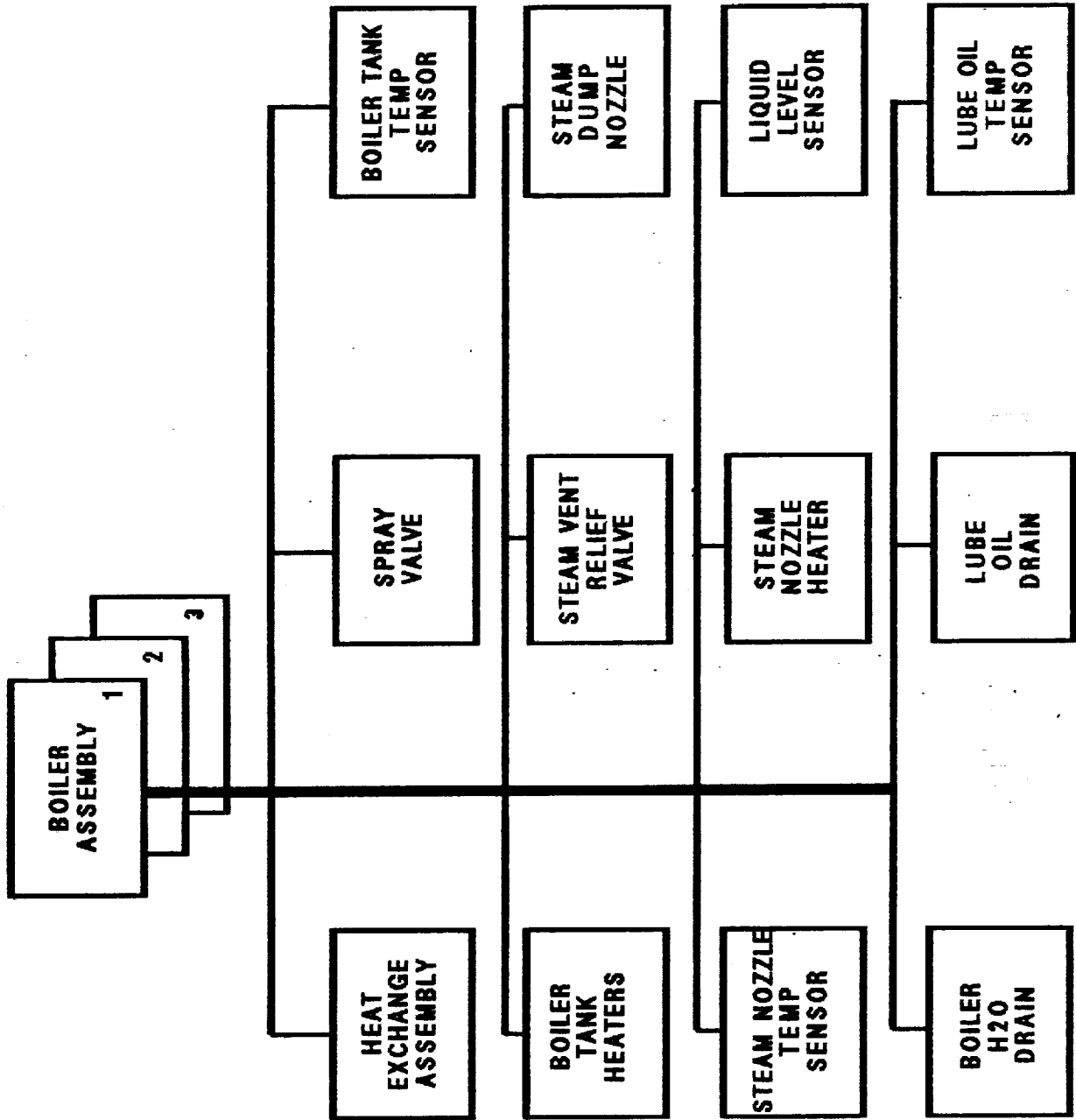


Figure 8 - BOILER ASSEMBLY

WATER TANK ASSEMBLY

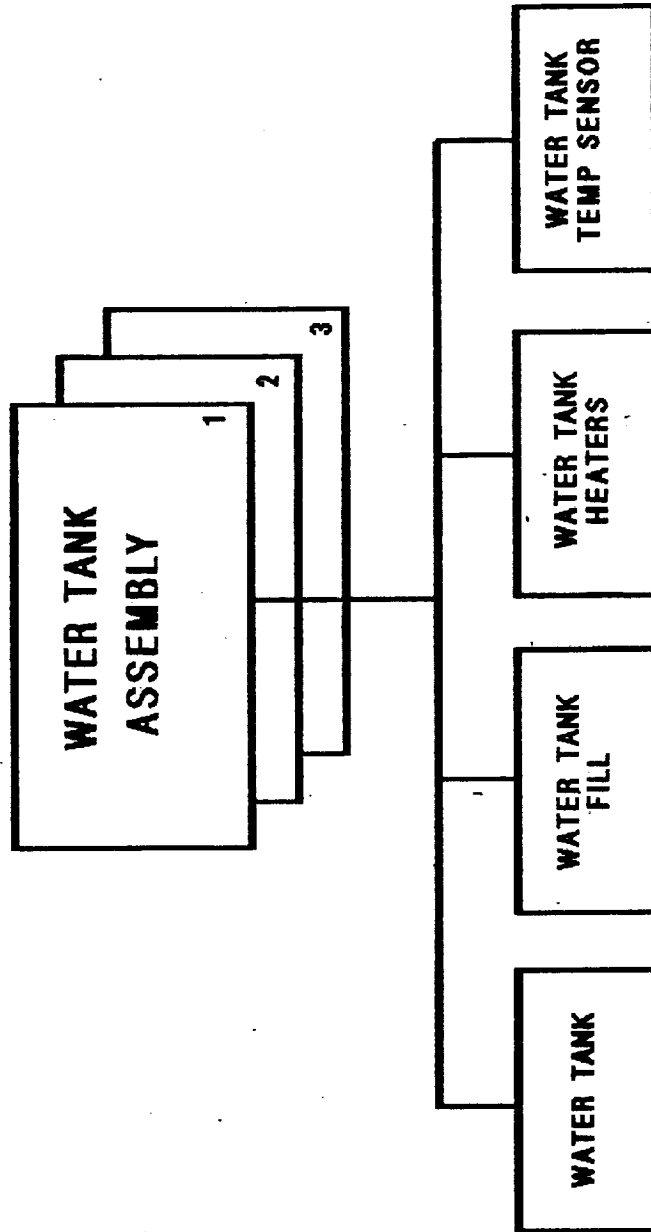
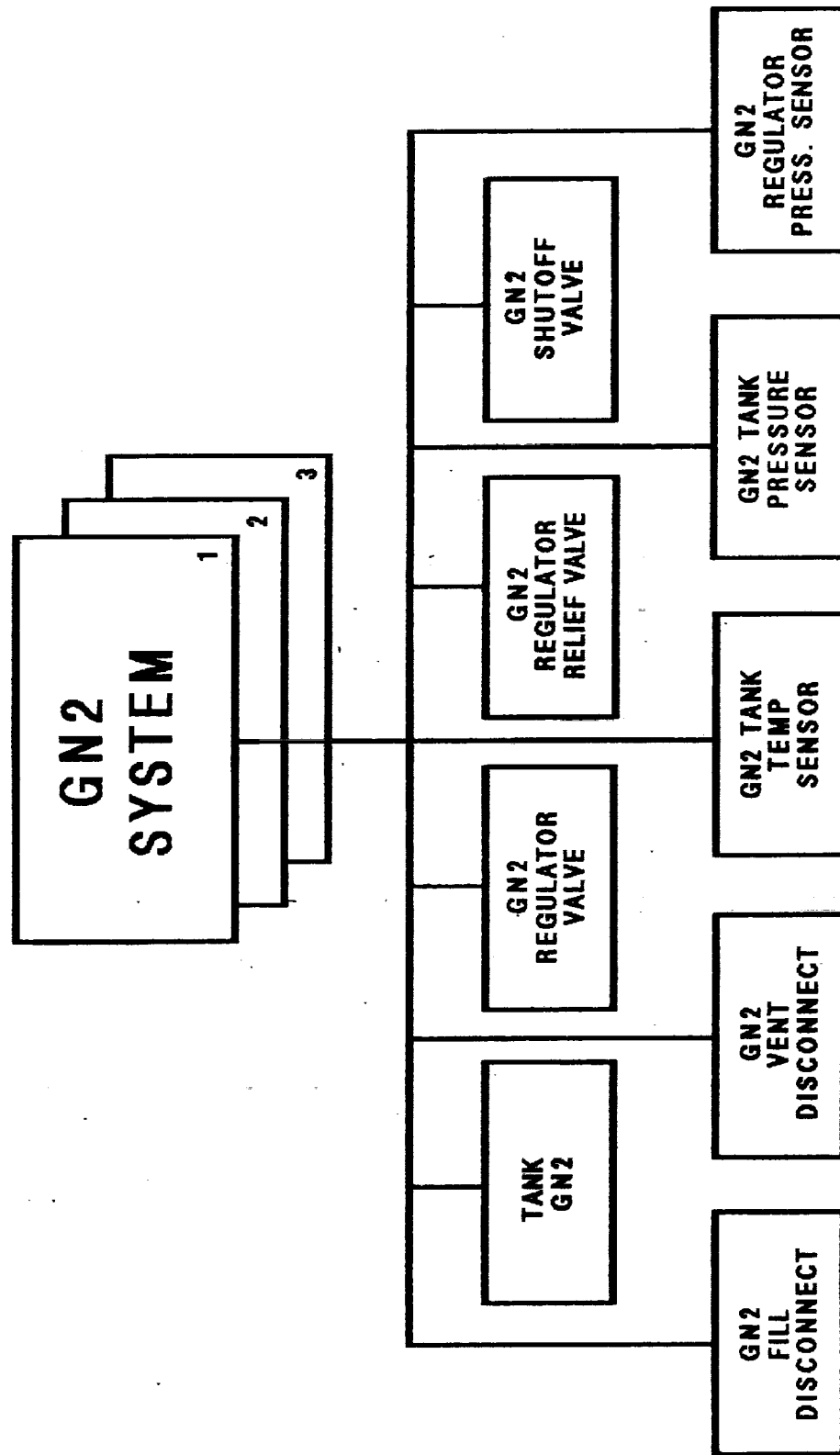


Figure 9 - WATER TANK ASSEMBLY

GN2 SYSTEM



HYD001GF 12/10/86

Figure 10 - GN2 SYSTEM

HYDRAULIC BYPASS/RELIEF VALVE

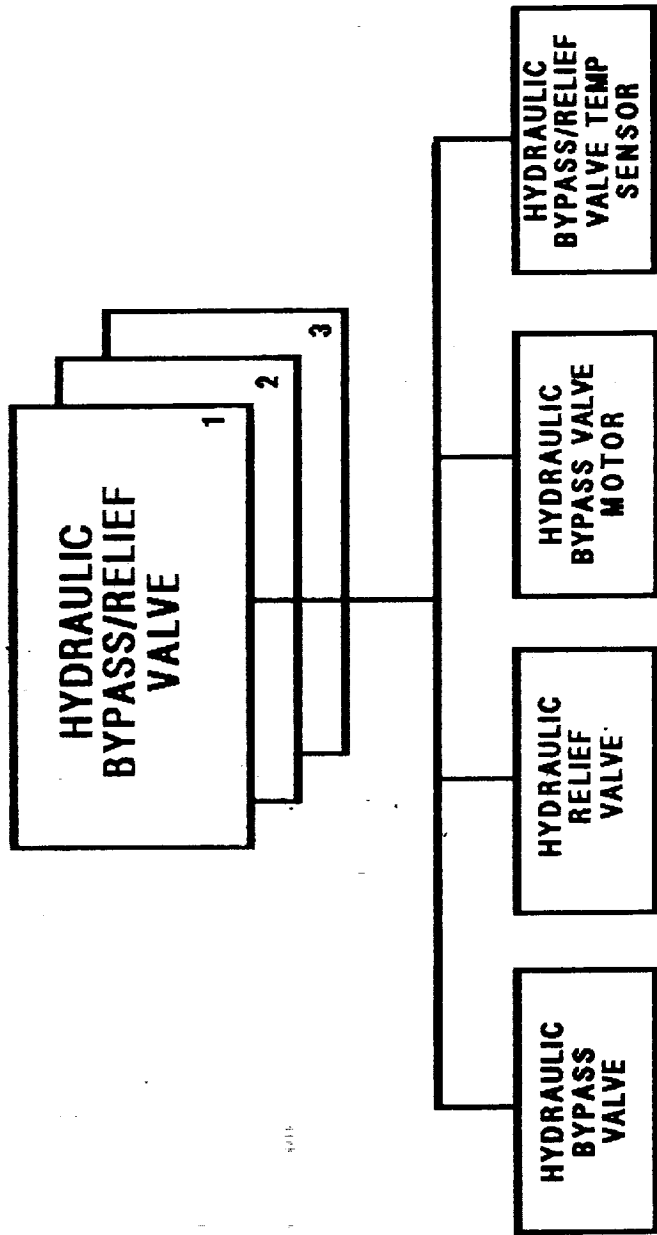


Figure 11 - HYDRAULIC BYPASS/RELIEF VALVE

EPD&C WATER SPRAY BOILER

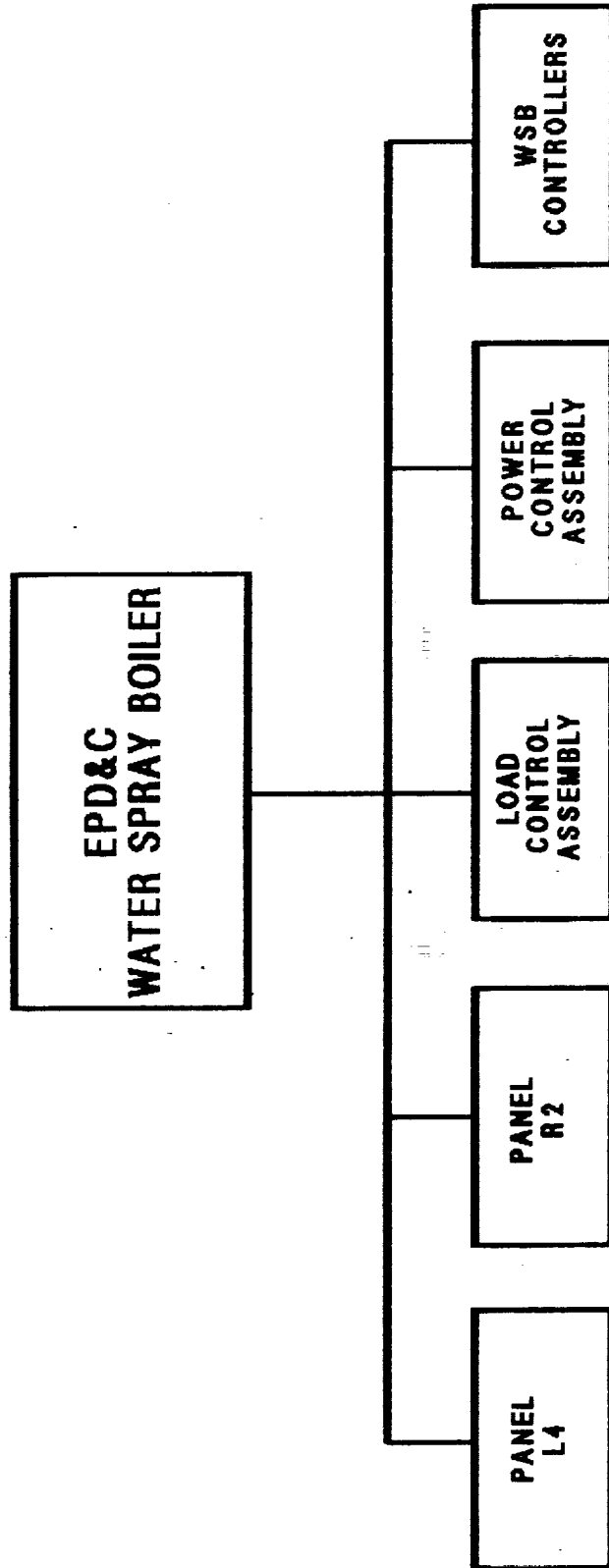


Figure 12 - EPD&C WATER SPRAY BOILER

WSB CONTROLLERS

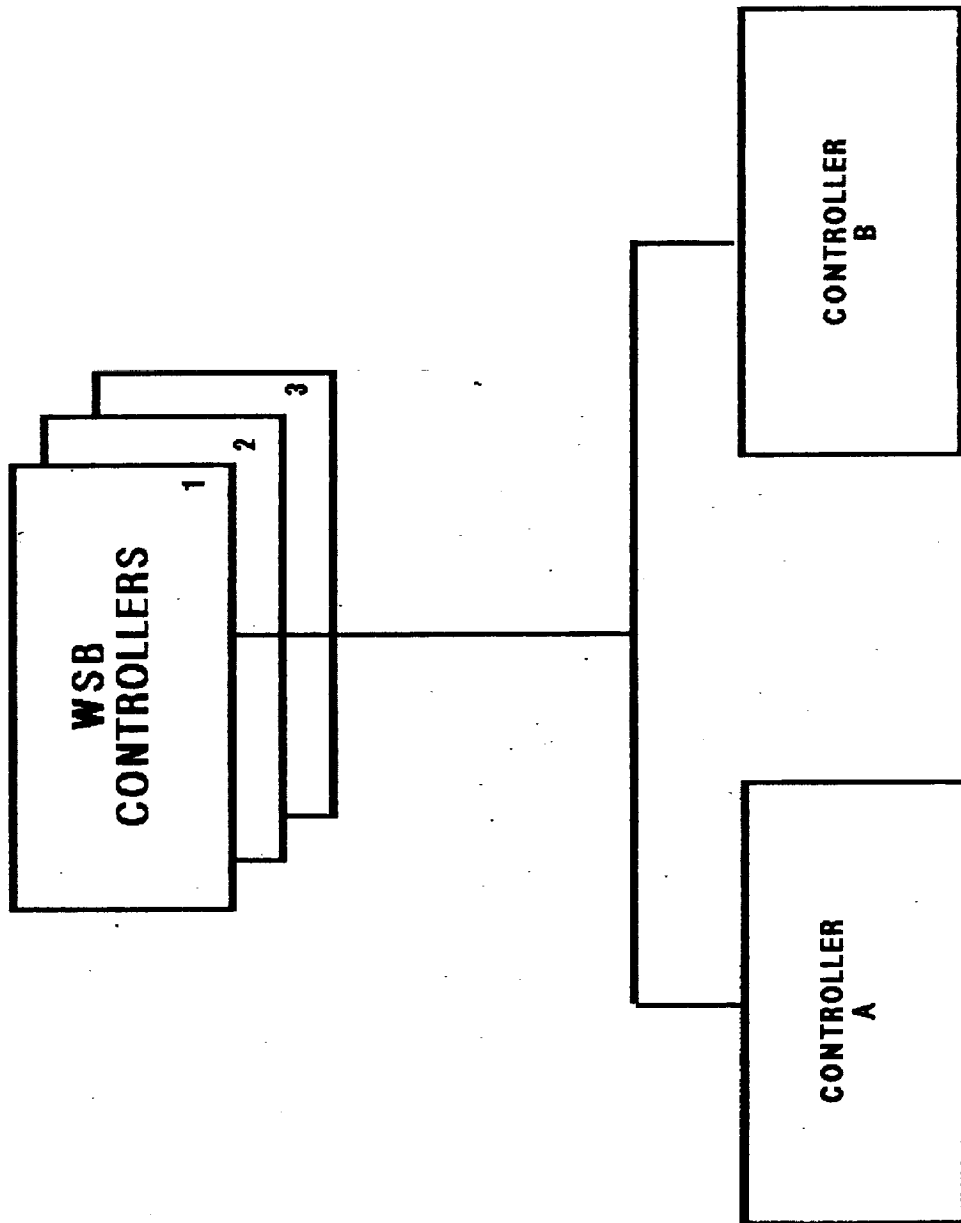


Figure 13 - WSB CONTROLLERS

ACCUMULATOR ASSEMBLY

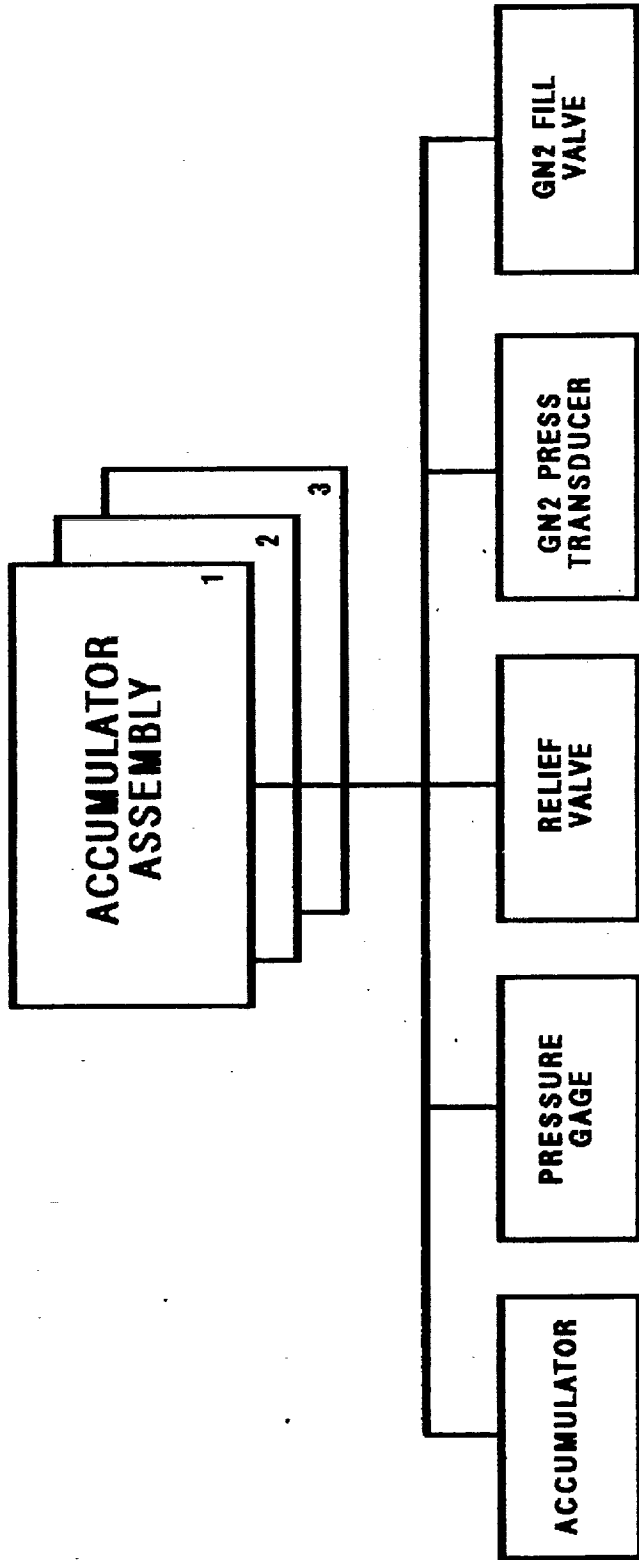


Figure 15 - ACCUMULATOR ASSEMBLY

SSME HYDRAULIC ACCUMULATOR ASSEMBLY

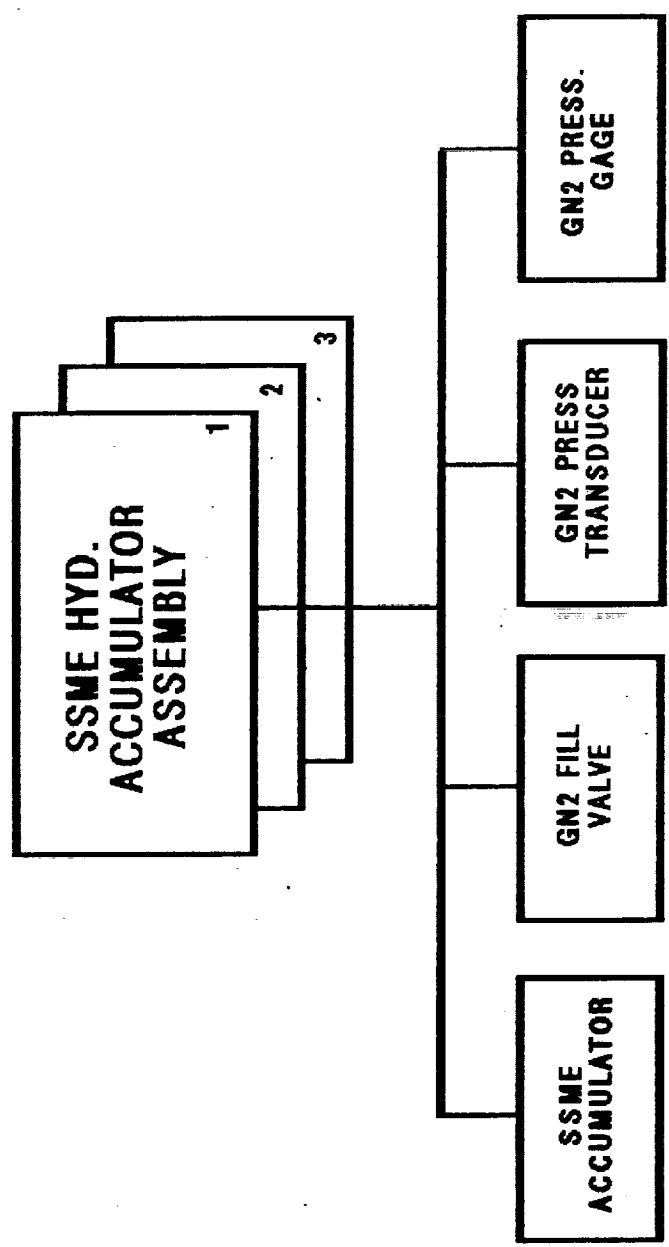


Figure 16 - SSME HYDRAULIC ACCUMULATOR ASSEMBLY

CIRCULATION PUMP ASSEMBLY

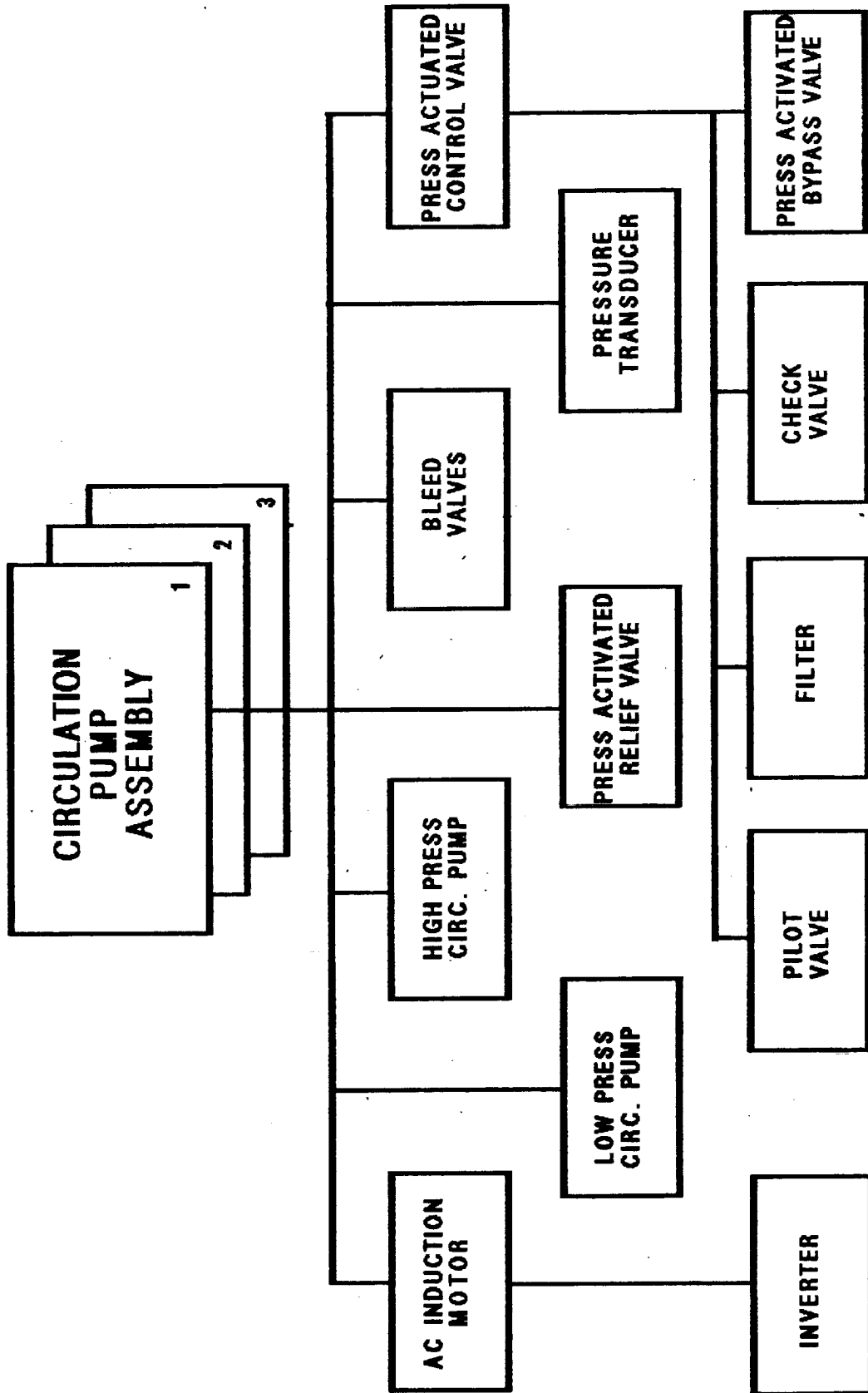


Figure 17 - CIRCULATION PUMP ASSEMBLY

HYDRAULIC DISTRIBUTION, MONITOR AND CONTROL

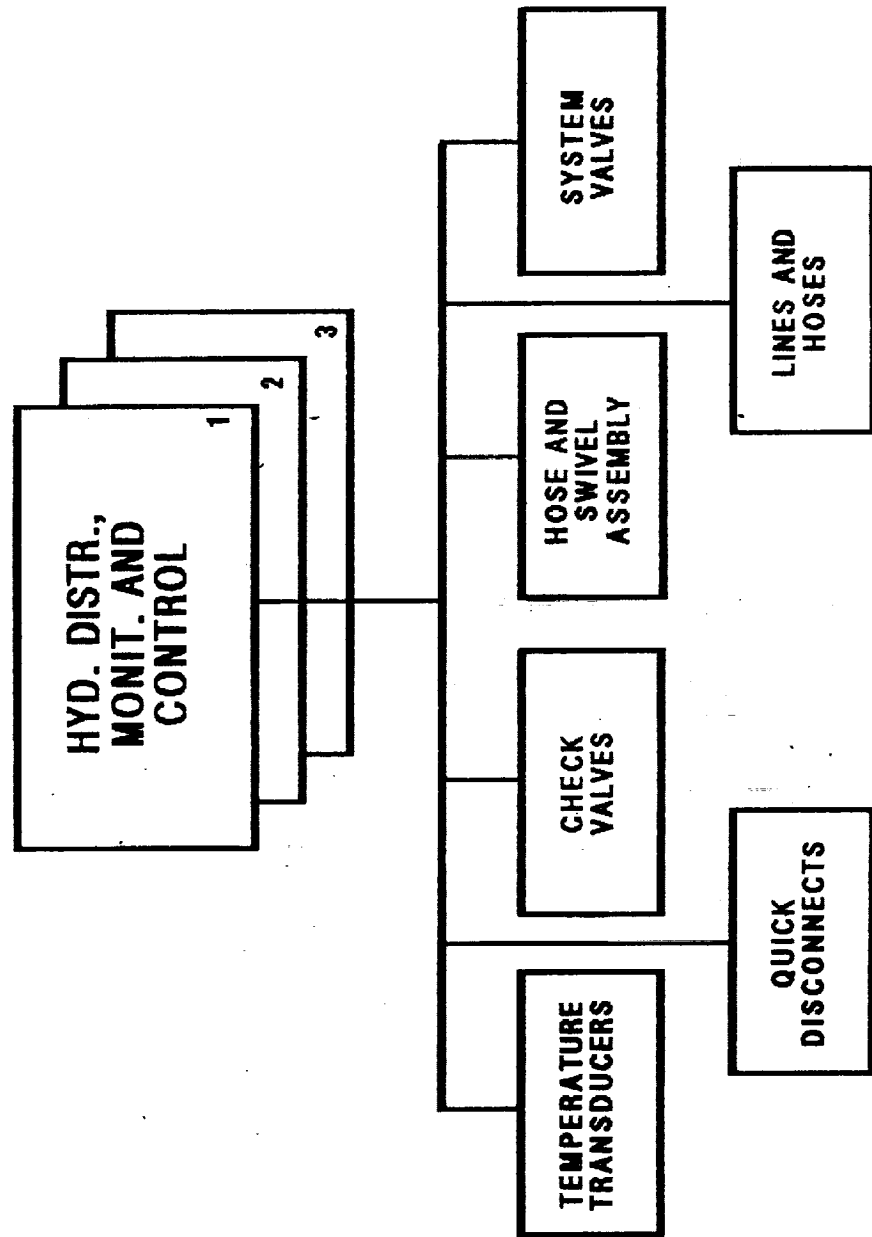


Figure 18 - HYDRAULIC DISTRIBUTION, MONITOR AND CONTROL

MAIN PUMP ASSEMBLY

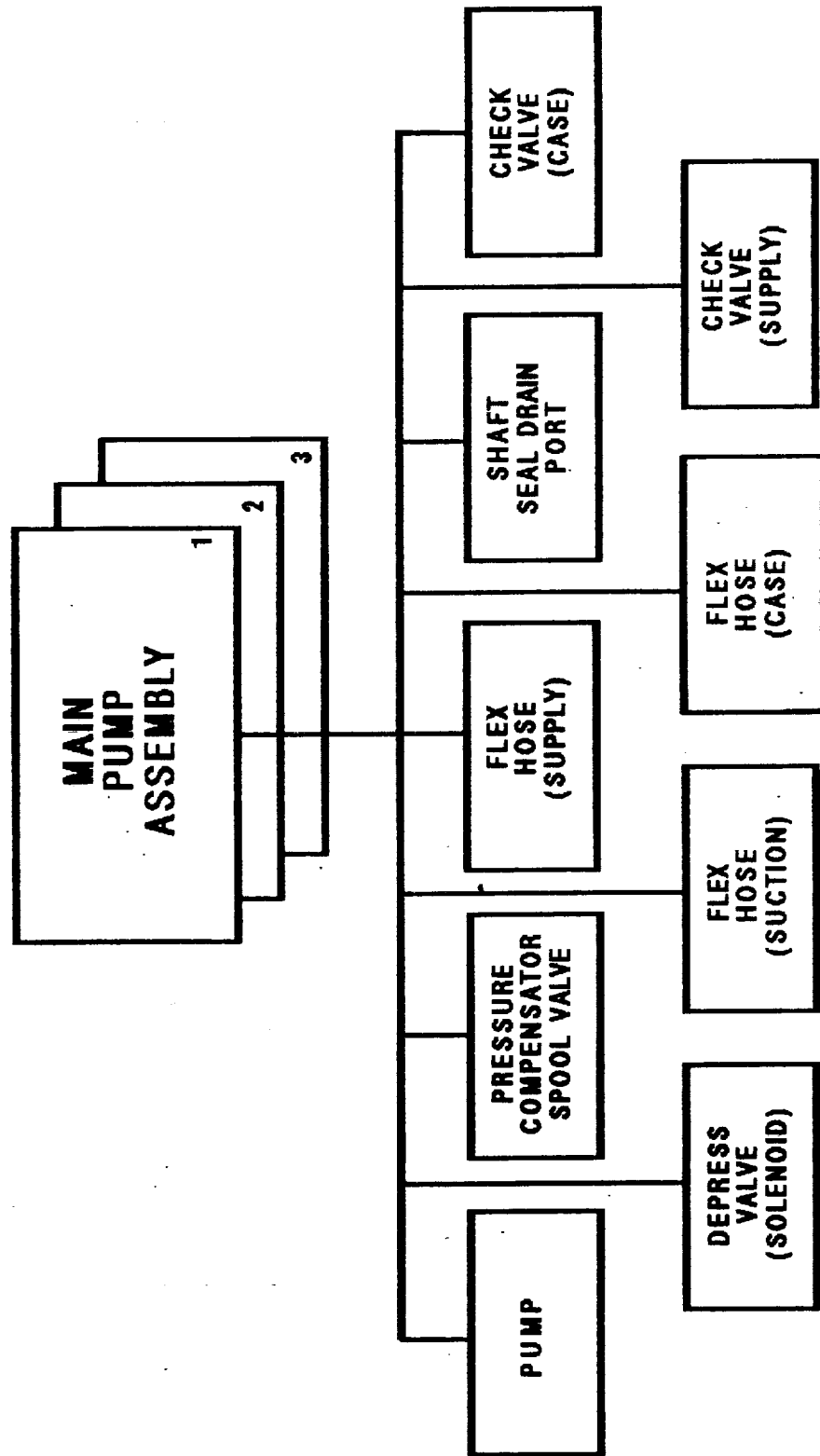


Figure 19 - MAIN PUMP ASSEMBLY

RESERVOIR ASSEMBLY

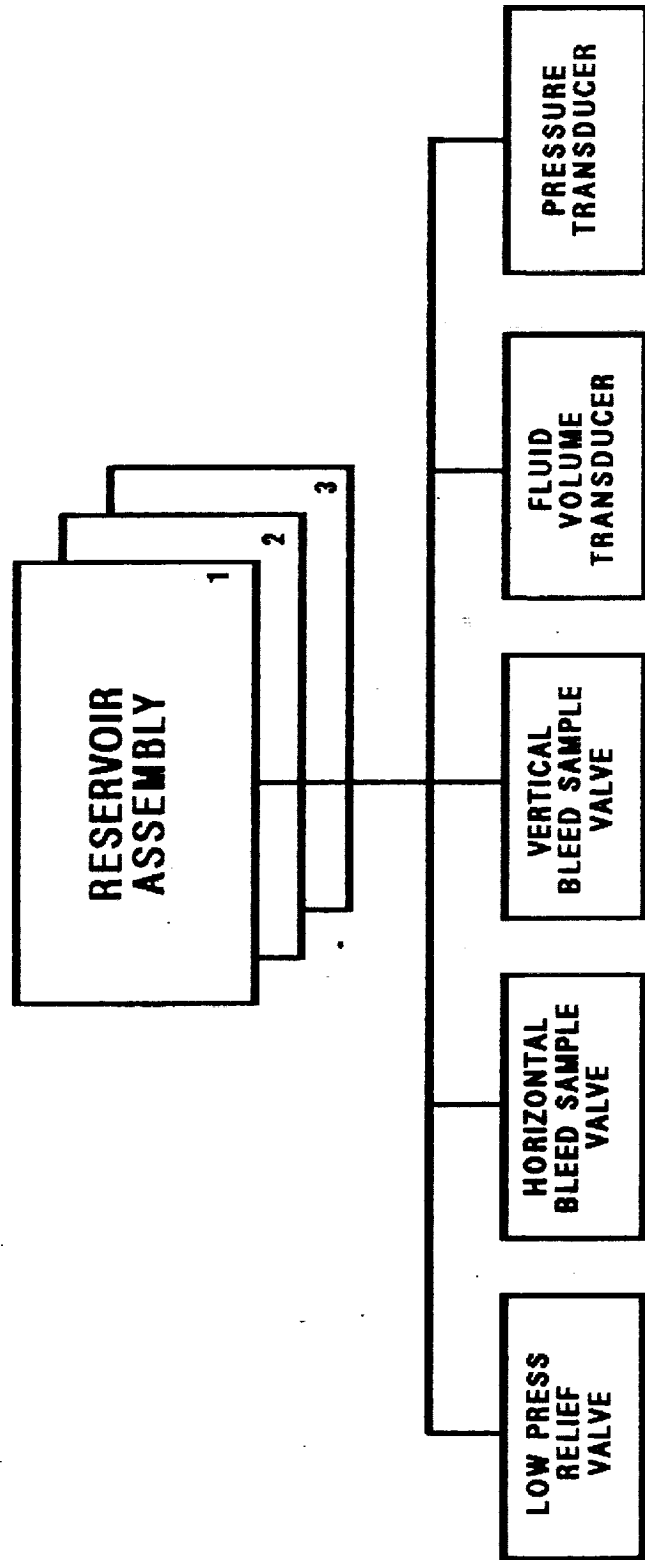


Figure 20 - RESERVOIR ASSEMBLY

E.T. UMBILICAL RETRACT ACTUATOR ASSEMBLY

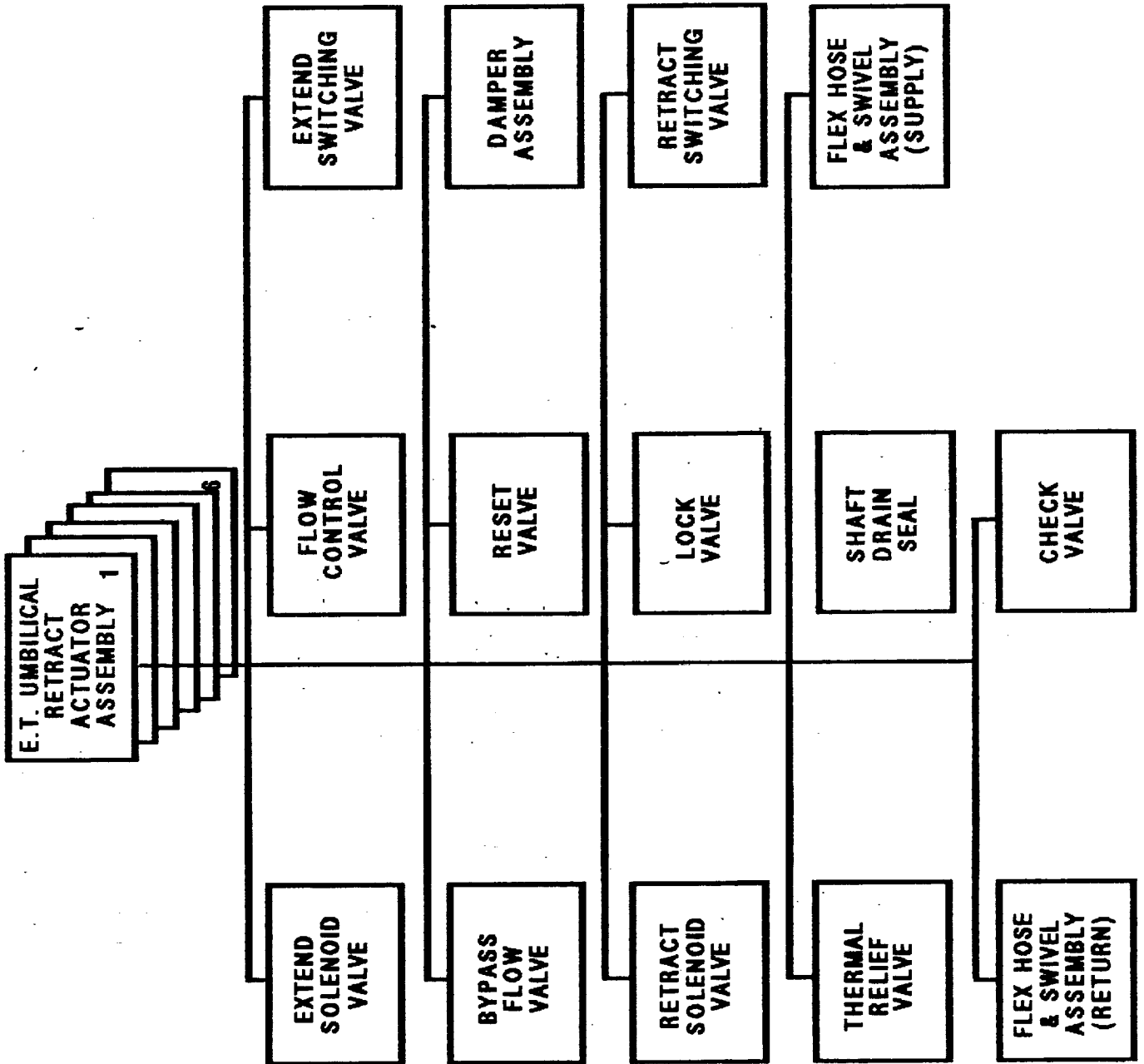


Figure 21 - E.T. UMBILICAL RETRACT ACTUATOR ASSEMBLY

DRAIN SYSTEM

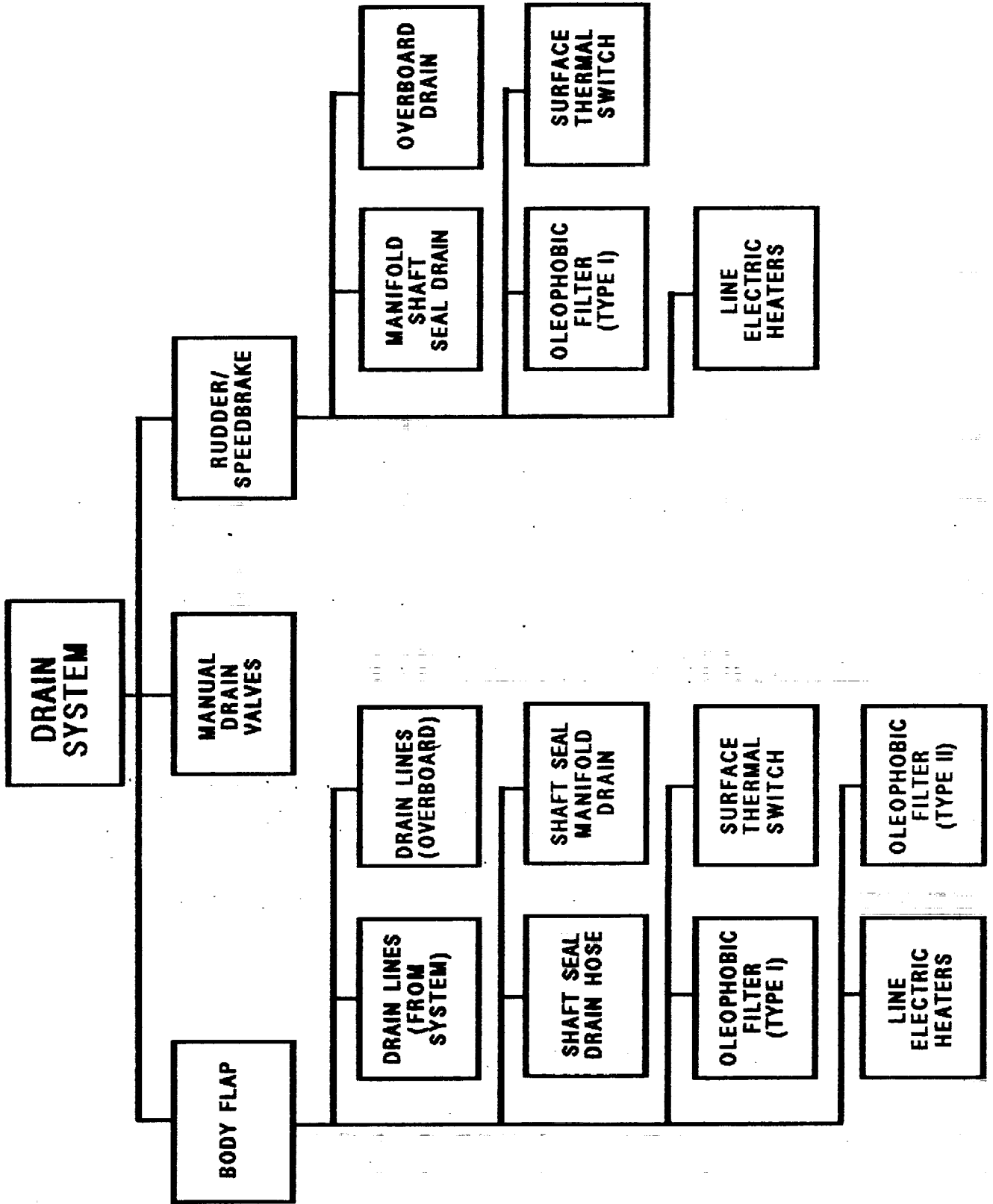


Figure 22 - DRAIN SYSTEM

FILTER MODULE

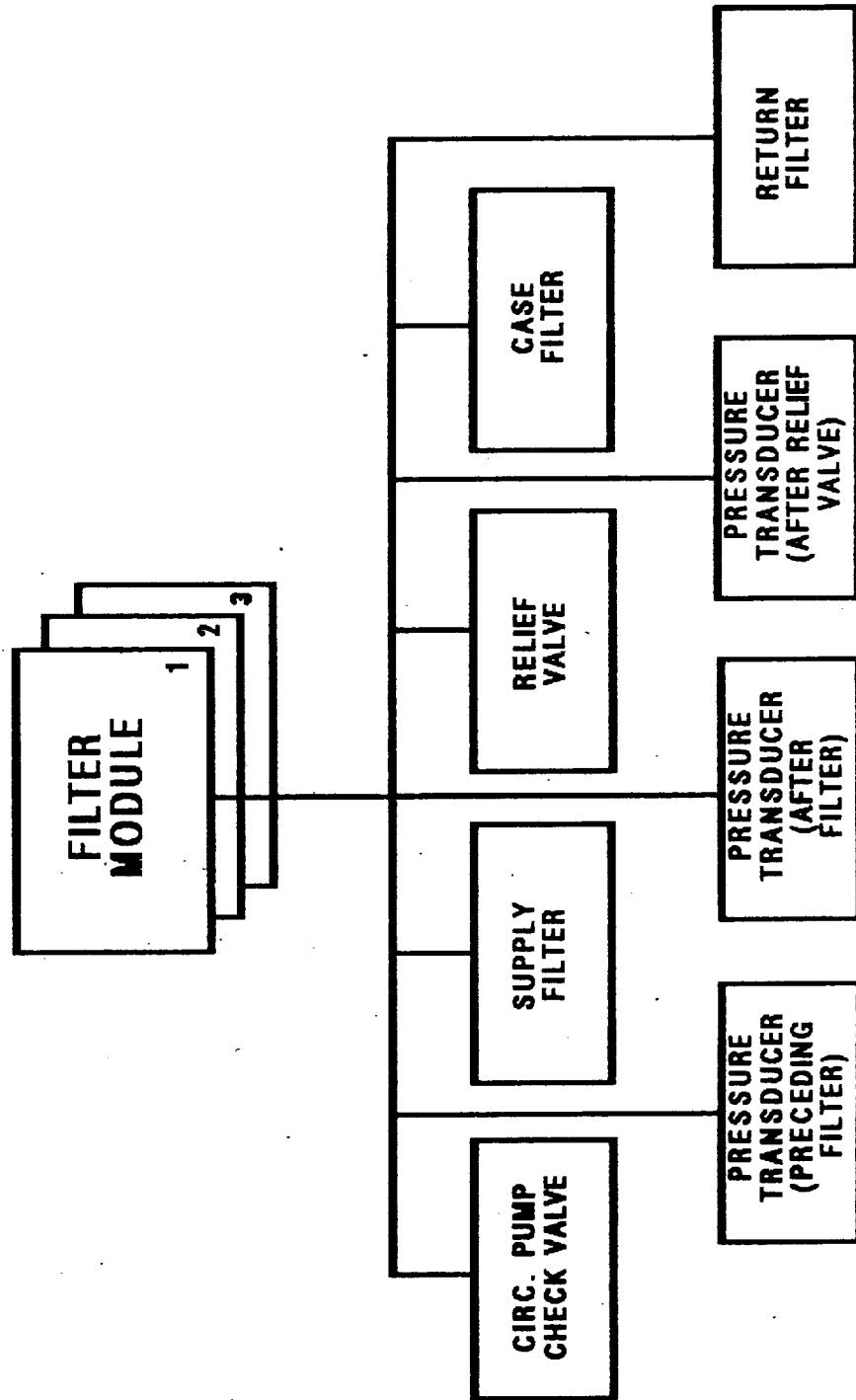


Figure 23 - FILTER MODULE

FREON HEAT EXCHANGER

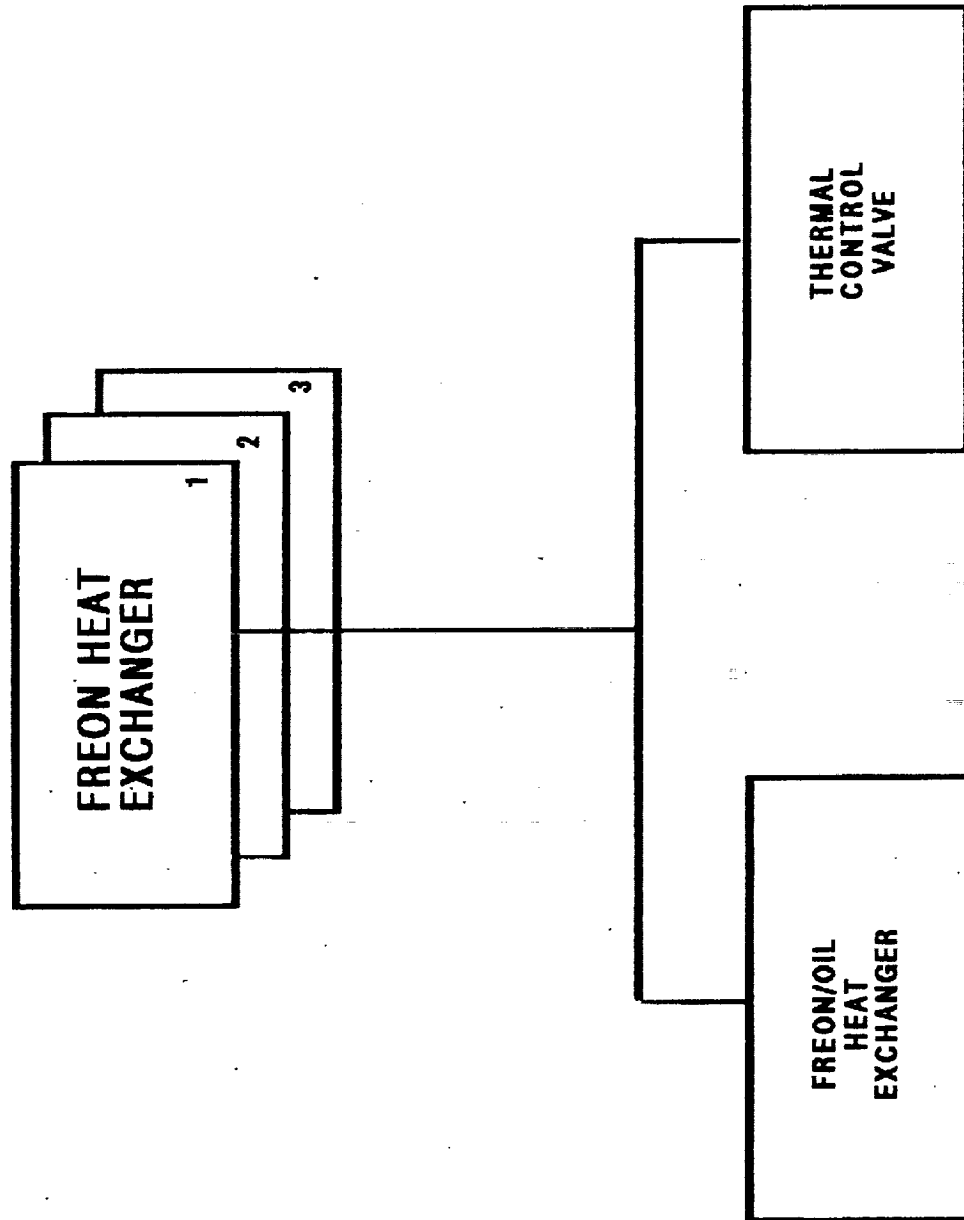


Figure 24 - FREON HEAT EXCHANGER

EPD&C HYDRAULICS

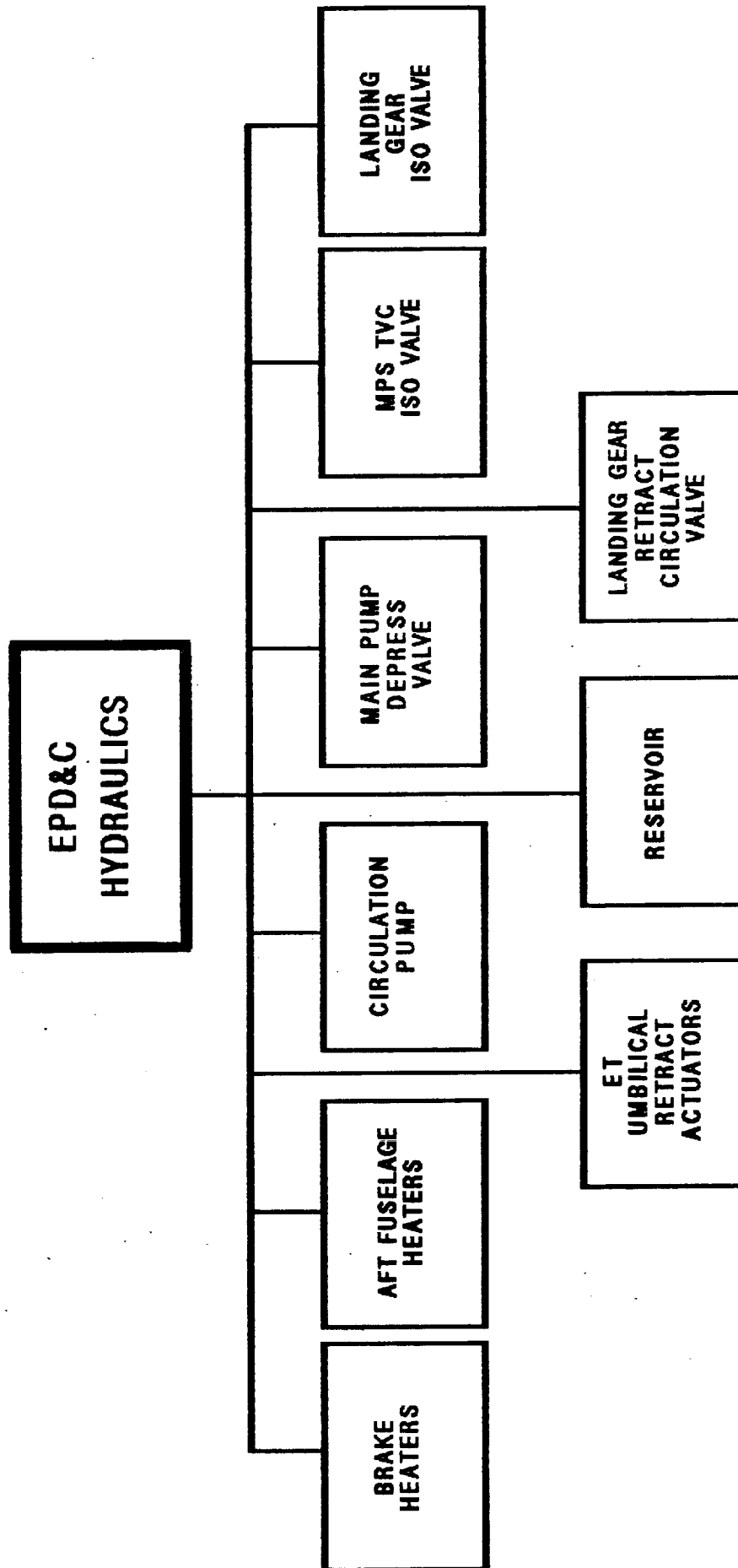


Figure 25 - EPD&C HYDRAULICS

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.

Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
WSB	2	28	-	20	-	24	74
EPD&C - WSB	-	3	-	14	-	6	23
HYD	1	97	-	25	2	93	218
EPD&C - HYD	-	18	-	30	-	67	115
TOTAL	3	146	-	89	2	190	430

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.

Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
WSB	2	28	-	1	-	31
EPD&C - WSB	-	3	-	-	-	3
HYD	1	97	-	6	-	104
EPD&C - HYD	-	18	-	10	-	28
TOTAL	3	146	-	15	-	166

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:

1. JSC-18341, Mechanical Systems Console Handbook Volume II - Systems Briefs, Rev. A PCN-3, 2-7-86
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
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APPENDIX A
ACRONYMS

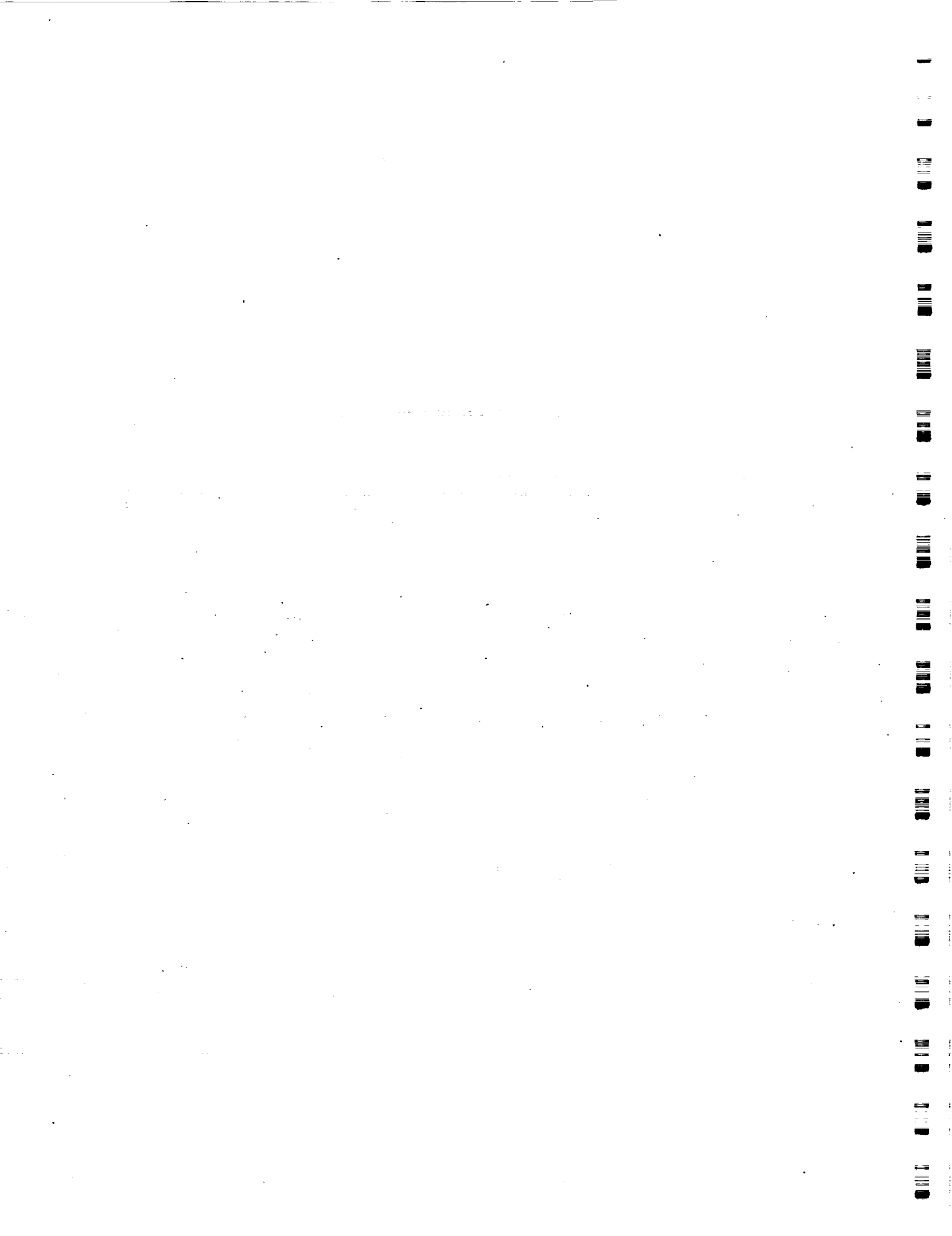
AC - Alternating Current
AOA - Abort Once Around
APU - Auxiliary Power Unit
ASSY - Assembly
ATO - Abort to Orbit
BFS - Backup Flight System
CIL - Critical Items List
CIRC - Circulation
CNTL - Control
CRIT - Criticality
CRT - Cathode Ray Tube
C&W - Caution and Warning System
DC - Direct Current
DISTR - Distribution
DPS - Data Processing System
DU - Display Unit
EPD&C - Electrical Power Distribution and Control
ET - External Tank
F - Functional
FA - Flight Aft
FF - Flight Forward
FM - Failure Mode
FMEA - Failure Mode and Effects Analysis
GFE - Government Furnished Equipment
GN2 - Gaseous Nitrogen
GPC - General Purpose Computer
GPM - Gallons Per Minute
GSE - Ground Support Equipment
HW - Hardware
HYD - Hydraulics
H2O - Water
IOA - Independent Orbiter Assessment
JSC - Johnson Space Center
LCA - Load Control Assembly
LH2 - Liquid Hydrogen
LO2 - Liquid Oxygen
MDAC - McDonnell Douglas Astronautics Company
MDM - Multiplexer/Demultiplexer
MEC - Main Engine Controller
MN - Main
MONIT - Monitoring
MPS - Main Propulsion System
NA - Not Applicable
NASA - National Aeronautics and Space Administration
NSTS - National Space Transportation System
OMRSD - Operational Maintenance Requirements and Specifications Document
PBI - Push Button Indicator
PCA - Power Control Assembly
PCI - Potential Critical Item
PSI - Pounds Per Square Inch

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.

APPENDIX C
DETAILED ANALYSIS

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

LEGEND FOR IOA ANALYSIS WORKSHEETS

Hardware Criticalities:

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

Functional Criticalities:

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

Redundancy Screen A:

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

Redundancy Screens B and C:

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



INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 101 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

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

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 102 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

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 103 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 104 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF THERMAL CONTROL, OVERHEATING OF THE FLUID - LOSS OF SYSTEM.

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 105 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 106 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 107 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 108 ABORT: 2/1R

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 109 ABORT: 2/1R

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

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

BREAKDOWN HIERARCHY:

- 1) WATER SPRAY BOILER
- 2) WATER SPRAY BOILER ASSY
- 3) SPRAY VALVE (WATER SUPPLY)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		
	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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 110 ABORT: 2/1R

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 111 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 112 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 113 ABORT: 3/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 115 ABORT: 2/1R

ITEM: BOILER TANK HEATERS
FAILURE MODE: SHORTED

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

BREAKDOWN HIERARCHY:

- 1) WATER SPRAY BOILER
- 2) WATER SPRAY BOILER ASSY
- 3) BOILER TANK HEATERS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [F] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 116 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 50V58PD34(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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 117 ABORT: 3/1R

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 118 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 119 ABORT: 3/1R

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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 121 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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

CAUSES: CORROSION, CALIBRATIONS 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

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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 123 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 124 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 125 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 126 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 127 ABORT: 3/1R

ITEM: LIQUID LEVEL SENSOR
FAILURE MODE: ERRONEOUS HIGH H2O LEVEL

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

BREAKDOWN HIERARCHY:

- 1) WATER SPRAY BOILER
- 2) WATER SPRAY BOILER ASSY
- 3) LIQUID LEVEL SENSOR
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 128 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 129 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 130 ABORT: 3/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 131 ABORT: 3/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 1/1
MDAC ID: 132 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 133 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 134 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 135 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 136 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 137 ABORT: 3/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 138 ABORT: 3/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 139 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 140 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 141 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 1/1
MDAC ID: 142 ABORT: 1/1

ITEM: GN2 TANK
FAILURE MODE: BURST

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

BREAKDOWN HIERARCHY:

- 1) WATER SPRAY BOILER
- 2) GN2 SYSTEM
- 3) GN2 TANK
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 143 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: -A [1] B [P] C [P]

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

CAUSES: FATIGUE, CORROSION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

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

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INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 144 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 145 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 146 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 148 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 150 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 151 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 152 ABORT: 2/1R

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)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 153 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 154 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 156 ABORT: /NA

ITEM: GN2 TANK TEMP SENSOR
FAILURE MODE: ERRONEOUS LOW 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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 50V58HX4(VS70-58099B)
PART NUMBER:

CAUSES: CORROSION, VIBRATION

EFFECTS/RATIONALE:

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 157 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	11/03/86	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	HYD/WSB	FLIGHT:	3/3
MDAC ID:	158	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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 161 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

CAUSES: CONTAMINATION, SHORT

EFFECTS/RATIONALE:

ERRONEOUS OUTPUT TO THE CONTROLLER. ERRONEOUS H2O TANK QUANTITY
CALCULATION.

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 162 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 164 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 166 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 167 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 168 ABORT: 2/1R

ITEM: HYRAULIC 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

REDUNDANCY SCREENS: A [1] B [P] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 170 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [3] B [NA] C [P]

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 174 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 175 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 176 ABORT: /NA

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

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 177 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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 178 ABORT: 2/1R

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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 HYRAULIC 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 180 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	11/12/86	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	HYD/WSB	FLIGHT:	3/3
MDAC ID:	181	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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	11/12/86	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	HYD/WSB	FLIGHT:	3/3
MDAC ID:	182	ABORT:	/NA

ITEM: RESISTOR-VOLTAGE DIVIDER (12K, 1/4W)
FAILURE MODE: OPEN

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

BREAKDOWN HIERARCHY:

- 1) WATER SPRAY BOILER - EPD&C
- 2) PANEL R2
- 3) RESISTOR-VOLTAGE DIVIDER (12K 1/4W)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 184 ABORT: 2/1R

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 185 ABORT: 3/1R

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 186 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

CAUSES: VIBRATION, MECHANICAL SHOCK, OPEN (ELECTRICAL)

EFFECTS/RATIONALE:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 187 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

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 188 ABORT: 2/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 189 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	11/12/86	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	HYD/WSB	FLIGHT:	3/1R
MDAC ID:	190	ABORT:	2/1R

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 192 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

CAUSES: CONTAMINATION, CORROSION, ELECTRICAL SHORT OR OPEN

EFFECTS/RATIONALE:

LOSS OF FUNCTION, POSSIBLE LIMITED RUNTIME OR LOSS OF SYSTEM.
LOSS OF GN2 TANK TEMP, GN2 REG PRESS, H2O TANK TEMP, HYD BYPASS
VALVE POSITION INDICATOR.

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 195 ABORT: 3/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/12/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 196 ABORT: 2/1R

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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [1] B [NA] C [P]

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 401 ABORT: 3/1R

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 402 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 403 ABORT: 1/1

ITEM: ACCUMULATOR
FAILURE MODE: STRUCTURAL FAILURE, (RUPTURE), CYLINDER

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

BREAKDOWN HIERARCHY:

- 1) ACCUMULATOR ASSY
- 2) ACCUMULATOR
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 404 ABORT: 2/1R

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

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

BREAKDOWN HIERARCHY:

- 1) ACCUMULATOR ASSY
- 2) ACCUMULATOR
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 405 ABORT: 3/3

ITEM: PRESSURE GAGE
FAILURE MODE: ERRONEOUS INDICATION

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

BREAKDOWN HIERARCHY:

- 1) ACCUMULATOR ASSY
- 2) PRESSURE GAGE
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

CAUSES: DEFECTIVE MECHANISM, CALIBRATION SHIFT

EFFECTS/RATIONALE:

LOW ACCUMULATOR GN2 PRESURE.POSSIBLE EXCESSIVE CIRC. PUMP CYCLES
AND POSSIBLE DAMAGE TO CIRC. PUMP DUE TO CAVITATION IF NOT
CORRECTED ON GROUND.

REFERENCES: VS70-580999

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 406 ABORT: 3/3

ITEM: PRESSURE GAGE
FAILURE MODE: OFFSCALE HIGH/LOW

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

BREAKDOWN HIERARCHY:

- 1) ACCUMULATOR ASSY
- 2) PRESSURE GAGE
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 407 ABORT: 3/3

ITEM: RELIEF VALVE
FAILURE MODE: FAILS TO OPEN

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

BREAKDOWN HIERARCHY:

- 1) ACCUMULATOR ASSY
- 2) RELIEF VALVE
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 408 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 409 ABORT: 3/3

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION:

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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 411 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 412 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 413 ABORT: 3/3

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 414 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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 HYRAULIC PRESSURE.

REFERENCES: VS70-580999

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 415 ABORT: 3/3

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)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/17/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 417 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 421 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)

CRITICALITIES

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

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

LOCATION: 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.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 422 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 423 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 424 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 5.0V58AU5, 7, 9 (VS70-580999)
PART NUMBER:

CAUSES: DEFECTIVE MECHANISM, CALIBRATION SHIFT

EFFECTS/RATIONALE:
LOSS OF PRESSURE INDICATION. NO EFFECT IN FLIGHT.

REFERENCES: VS70-580999

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 425 ABORT: 3/3

ITEM: GN2 PRESSURE GAGE
FAILURE MODE: OFFSCALE HIGH/LOW

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

BREAKDOWN HIERARCHY:

- 1) SSME HYD. ACCUM. ASSY
- 2) GN2 PRESSURE GAGE
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 426 ABORT: 3/1R

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 50V58PP1, 2, 3 (VS70-580999)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 427 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 430 ABORT: 3/1R

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 431 ABORT: 3/1R

ITEM: PRESS ACTIVATED RELIEF VALVE
FAILURE MODE: FAILS TO OPEN

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

BREAKDOWN HIERARCHY:

- 1) CIRC. PUMP ASSY
- 2) PRESS ACTIVATED RELIEF VALVE
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: 50V58PP1, 2, 3 (VS70-580999)
PART NUMBER: MC284-0438-0001

CAUSES: CONTAMINATION, GALLING

EFFECTS/RATIONALE:

HIGHTER THAN NORMAL HYDRAULIC PRESSURE DURING CIRC. PUMP
OPERATION. POSSIBLE CIRC. PUMP MOTOR DAMAGE.

REFERENCES: VS70-580999; JSC 18341, PCN-3

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 432 ABORT: 1/1

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 433 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 434 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 435 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 436 ABORT: 3/1R

ITEM: PILOT 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) PILOT VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 437 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 438 ABORT: 3/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 439 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 440 ABORT: 3/1R

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 442 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 443 ABORT: 3/1R

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	12/01/86	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	HYD/WSB	FLIGHT:	3/3
MDAC ID:	445	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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 446 ABORT: 3/3

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: SYSTEM WIDE
PART NUMBER:

CAUSES: ELECTRICAL SHORT OR OPEN CIRCUIT, PIECE-PART FAILURE

EFFECTS/RATIONALE:

NONE. TEMPERATURE TRANSDUCERS ARE ADEQUATELY REDUNDANT.

REFERENCES: VS70-580999

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: - 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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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 HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 50V58PD14,16,18 (VS70-580999)
PART NUMBER:

CAUSES: DAMAGED SEAT/POPPET, CONTAMINATION

EFFECTS/RATIONALE:

NO EFFECT. CHECK VALVE IN LINE WILL CONSTRAIN LEAK.

REFERENCES: VS70-580999

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 450 ABORT: 2/1R

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.
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

C-3

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC
 SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
 MDAC ID: 451 ABORT: 1/1

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 452 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)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 453 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 454 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 456 ABORT: 1/1

ITEM: CHECK VALVE-RETURN LINE FROM ENG'S/ACT'S
FAILURE MODE: FAILS TO OPEN

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

BREAKDOWN HIERARCHY:

- 1) HYDRAULICS DISTRIBUTION, MONITORING AND CONTROL
- 2) CHECK VALVES
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 457 ABORT: 1/1

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 458 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 459 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)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 460 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 461 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 21V58FH80,81 (VS70-580996)
PART NUMBER: ME271-0079-10(03),(15)

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 462 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)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 67V58FH54,57 (VS70-580996)
PART NUMBER: ME271-0079-1001

CAUSES: PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:

LANDING GEAR MUST BE DEPLOYED BY THE PYROTECHIC DEVICES.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS
22206

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 463 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)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 464 ABORT: 1/1

ITEM: HYDRAULIC LINE
FAILURE MODE: LINE RUPTURE BETWEEN HYDRAULIC PUMPS AND LANDING
GEAR AND MPS/TVC ISOVALVES

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

BREAKDOWN HIERARCHY:

- 1) HYDRAULIC DISTRIBUTION, MONITORING, AND CONTROL
- 2) HYDRAULIC LINE
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		
	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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 465 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION:
PART NUMBER:

CAUSES: STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM 1 FOR LOWERING LANDING GEAR AND BRAKING.

REFERENCES: VS70-580999

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 466 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION:
PART NUMBER:

CAUSES: STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF HYDRAULIC SYSTEM 1 FOR BRAKING AND NOSE WHEEL STEERING.

REFERENCES: VS70-580999

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/09/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 467 ABORT: 1/1

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 469 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.)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 470 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.)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 471 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.)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 472 ABORT: 3/1R

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.)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 473 ABORT: 3/3

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.)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 474 ABORT: 2/1R

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.)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 475 ABORT: 2/1R

ITEM: PRIORITY VALVE
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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 477 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/14/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 478 ABORT: 2/1R

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 479 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 480 ABORT: 2/1R

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 481 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 50V58LV26,27,28 (VS70-580999)
PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: SOLENOID FAILURE

EFFECTS/RATIONALE:

LOSS OF REDUNANT ISOLATION OF LANDING GEAR EXTEND CIRCUITS. LOSS OF HYDRAULIC SYSTEM ISOLATION FROM LEAKS IN BRAKE CIRCUITS AND LANDING GEAR CIRCUITS.

REFERENCES: V70-580999

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 482 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 483 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 485 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.
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 50V58LV26,27,28 (VS70-580999)
PART NUMBER: MC284-0469-0023/MC364-0011-0052

CAUSES: BROKEN SPRING

EFFECTS/RATIONALE:
LOSS OF STATUS INFORMATION.

REFERENCES:

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 488 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 491 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 67V58LV11 (VS70-580999)
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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 495 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 497 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 600 ABORT: 1/1

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 601 ABORT: 1/1

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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.		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 602 ABORT: 1/1

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 603 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

LOCATION: 50V58PP(4),(5),(6) (VS70-580996)
PART NUMBER: MC281-0029

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
LOSS OF ONE SYTEM 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: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 604 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 605 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 606 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 607 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		
	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		

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 609 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 610 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 611 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 613 ABORT: 1/1

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 614 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 615 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 619 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 620 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		
	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		

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

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

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 622 ABORT: 3/3

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 623 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 624 ABORT: 1/1

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 625 ABORT: 1/1

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 626 ABORT: 1/1

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES	
	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	

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 627 ABORT: 1/1

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 628 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 629 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 630 ABORT: 1/1

ITEM: LOW PRESSURE RELIEF VALVE
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:

- 1) HYDRAULIC SUBSYSTEM
- 2) HYDRAULIC RESERVOIR
- 3) LOW PRESSURE RELIEF VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
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		

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
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		

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 632 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 633 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 635 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 636 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 637 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 638 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) HYDRAULIC RESERVOIR
- 3) PRESSURE TRANSDUCER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 639 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) HYDRAULIC RESERVOIR
- 3) PRESSURE TRANSDUCER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 643 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 644 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

FLIGHT PHASE	CRITICALITIES		HDW/FUNC
	HDW/FUNC	ABORT	
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		

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

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 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 645 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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

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
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 647 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATC:	3/3
LANDING/SAFING:	3/3		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 648 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 649 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 651 ABORT: 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 652 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 653 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 655 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 656 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 657 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 658 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 659 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 50V58AC(11-16) (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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 660 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 50V58AC(11-16) (VS70-580996)
PART NUMBER: MC287-0050-0003

CAUSES: CONTAMINTION, VIBRATION

EFFECTS/RATIONALE:
ACTUATOR CANNOT BE EXTENDED.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS
22206

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 661 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 662 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 663 ABORT: 3/3

ITEM: LOCK 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) LOCK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 664 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 665 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 666 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 667 ABORT: 3/3

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)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 668 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 669 ABORT: 1/1

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 670 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 671 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 672 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 678 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 34C,34G,40F(VS70-580996)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 679 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 680 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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 681 ABORT: 3/3

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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 682 ABORT: 3/3

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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 683 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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 684 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 685 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) BODY FLAP
- 4) SURFACE THERMAL SWITCH
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 686 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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 687 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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 688 ABORT: 3/3

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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 689 ABORT: 3/3

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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 690 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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 691 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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 692 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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 693 ABORT: 3/3

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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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-11174, JSC-12770, VS70-580996, VS70-958099, NSTS
22206

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 694 ABORT: 3/3

ITEM: OLEPHOBIC 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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY 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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 696 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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 697 ABORT: 3/3

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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 698 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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 699 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/2R
MDAC ID: 700 ABORT: 3/2R

ITEM: CIRCULATION PUMP 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) CIRCULATION PUMP CHECK VALVE
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 701 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

LOCATION: 50V58CV(32),(33),(34) (VS70-580996)
PART NUMBER: ME284-0434-1016

CAUSES: PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:

LOSS OF ONE HYDRAULIC 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: 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 703 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 704 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 705 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 706 ABORT: 3/3

ITEM: PRESSURE TRANSDUCER
FAILURE MODE: FILTER OFFSCALE-HI

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:

- 1) HYDRAULIC SUBSYSTEM
- 2) FILTER MODULE
- 3) PRESSURE TRANSDUCER (PRECEDING FILTER)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 50V58MT(3),(12),(21) (VS70-580996)
PART NUMBER: ME449-0177-6105

CAUSES: VIBRATION

EFFECTS/RATIONALE:

LOSS OF A PRESSURE TRANSDUCER THAT IS USED IN PRIORITY RATE
LIMITING.

REFERENCES: JSC-11174, JSC-12770, VS70-580996, VS70-958099, NSTS
22206

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 708 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 709 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)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 710 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 711 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 712 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 FILTER)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 714 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 715 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 717 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 718 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 719 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

LOCATION: 50V58FL(6),(7),(8) (VS70-580996)
PART NUMBER: MC621-0026-0002

CAUSES: PIECE-PART STRUCTURAL FAIURE

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: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 720 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 721 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/11/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 722 ABORT: 1/1

ITEM: RETURN FILTER
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:

- 1) HYDRAULIC SUBSYSTEM
- 2) FILTER MODULE
- 3) RETURN FILTER
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 723 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 725 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/2R
MDAC ID: 726 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 727 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 728 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 729 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			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 730 ABORT: 1/1

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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		

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/25/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 731 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 800 ABORT: /NA

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 801 ABORT: /NA

ITEM: RESISTOR (SWITCH 28)
FAILURE MODE: SHORTED

LEAD ANALYST: W. E. PARKMAN SUBSYS LEAD: W. DAVIDSON

BREAKDOWN HIERARCHY:

- 1) HYDRAULIC BRAKE HEATER
- 2) PANEL R4
- 3) RESISTOR (SWITCH 28)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 803 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 40V76A25 (VS70-580109)

PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 804 ABORT: /NA

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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 805 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 806 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 807 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 808 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 809 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 810 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			
FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	/NA	RTLS:	/NA
LIFTOFF:	/NA	TAL:	/NA
ONORBIT:	3/3	AOA:	/NA
DEORBIT:	/NA	ATO:	/NA
LANDING/SAFING:	/NA		

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 811 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 812 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 813 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 816 ABORT: /NA

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 54V76A134 (VS70-580109)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 818 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
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 819 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
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 820 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
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 821 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
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 54V76A121 (VS70-580109)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 822 ABORT: /NA

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
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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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
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 824 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 826 ABORT: /NA

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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. 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 828 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 829 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)
- 6)
- 7)
- 8)
- 9)

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 830 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 831 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 832 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 55V76A122 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 834 ABORT: /NA

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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. LOSS OF ISOLATION BETWEEN CIRC PUMP SW AND HYBRID
DRIVER TYPE III.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 835 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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. 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 838 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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 840 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) CURRENT LIMITER RESISTOR, 1.21K
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 841 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 842 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 843 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 844 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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 845 ABORT: /NA

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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 36V73A12 (VS70-58Q109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 846 ABORT: /NA

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/05/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 847 ABORT: 3/3

ITEM: HYDRAULIC FLUID QUANTITY METER, CB 57
FAILURE MODE: OPEN, SHORT, CALIBRATION SHIFT

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

BREAKDOWN HIERARCHY:

- 1) HYDRAULIC SYSTEM
- 2) HYDRAULIC FLUID QUANTITY METER
- 3) CB 57
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 31V73A4, 34V73A8A8 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, MECHANICAL SHOCK, THERMAL STRESS,
CONTAMINATION

EFFECTS/RATIONALE:

NO EFFECT ON MISSION OR CREW SAFETY. QUANTITY MAY BE CALCULATED
WITH GN2 PRESS AND TEMP.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 848 ABORT: 3/3

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

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

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. RPC FAILED ON (SECOND FAILURE) WOULD ENERGIZE DEPRESS
SOLENOID. LOSS OF SYSTEM.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 849 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

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 850 ABORT: 3/3

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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 55V76A135 (VS70-580109E)
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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 851 ABORT: 3/1R

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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 852 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 853 ABORT: /NA

ITEM: BLOCKING DIODE, 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 DIODE, GROUND MDM (-1A,-3A)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 854 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/04/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 855 ABORT: /NA

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)
- 9)

CRITICALITIES

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

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

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

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)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 857 ABORT: /NA

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

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

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

LOCATION: 54V76A134 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 858 ABORT: /NA

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 55V76A135 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 860 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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	12/03/86	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	HYD/WSB	FLIGHT:	2/1R
MDAC ID:	861	ABORT:	1/1

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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 32V73A2 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 862 ABORT: /NA

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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 863 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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 864 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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 55V76A135 (VS70-580109E)
PART NUMBER:

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

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 866 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 868 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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 871 ABORT: 3/1R

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)
- 7)
- 8)
- 9)

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

REDUNDANCY SCREENS: A [3] B [F] C [P]

LOCATION: 55V76A135 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/03/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 872 ABORT: 3/1R

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/1R
MDAC ID: 874 ABORT: 3/1R

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

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

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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 878 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 880 ABORT: 3/3

ITEM: RESISTOR, CURRENT LIMITER (5.1K)
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) RESISTOR, CURRENT LIMITER (5.1K)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 54V76A12 (VS70-580109E)
PART NUMBER:

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 882 ABORT: 3/3

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 54V76A12 (VS70-580109E)
PART NUMBER:

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

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)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 54V76A12 (VS70-580109E)
PART NUMBER:

CAUSES: THERMAL STRESS, VIBRATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF CAPABILITY TO COMMAND VALVE. AOA - LIMIT RUN TIME OF
AFFECTED APU TO CONSERVE FUEL.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 884 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [3] B [F] C [P]

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 54V76A12 (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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 888 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 54V76A121 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 889 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 54V76A121 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 890 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
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 54V76A121 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 891 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 892 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 893 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/01/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 894 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 895 ABORT: 3/3

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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 896 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
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 898 ABORT: /NA

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION: 54V76A121 (VS70-580109E)
PART NUMBER:

CAUSES: OPEN (ELECTRICAL)

EFFECTS/RATIONALE:
LOSS OF ABILITY TO CLOSE LG ISO VALVE.

REFERENCES: VS70-580109E, SPACE SHUTTLE SYSTEMS HANDBOOK, VOL
II, SECT 12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 899 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)

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

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

LOCATION: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/28/86
SUBSYSTEM: HYD/WSB
MDAC ID: 900

HIGHEST CRITICALITY
FLIGHT: 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 1
- 2) LANDING GEAR ISOLATION VALVE
- 3) AFT LCA
- 4) CONTROLLER, HYBRID DRIVER, TYPE III (CLOSE)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86
SUBSYSTEM: HYD/WSB
MDAC ID: 901

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

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION:
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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 902 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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION:
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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 904 ABORT: 3/3

ITEM: INDICATOR (DS1,2,3)
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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION: 32V73A4 (VS70-580109E)
PART NUMBER:

CAUSES: VIBRATION, STRUCTURAL FAILURE, MECHANICAL SHOCK

EFFECTS/RATIONALE:

LOSS OF PANEL INDICATION. POSSIBLE ERRONEOUS INDICATION.

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)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION:
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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 906 ABORT: 3/3

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

LOCATION:
PART NUMBER:

CAUSES: 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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 907 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)

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

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

LOCATION:
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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/24/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 908 ABORT: /NA

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)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

LOCATION:
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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 909 ABORT: 2/1R

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

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

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

LOCATION:
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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/21/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 910 ABORT: 2/1R

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
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 911 ABORT: 2/1R

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)

CRITICALITIES

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

REDUNDANCY SCREENS: A [2] B [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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	11/18/86	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	HYD/WSB	FLIGHT:	2/1R
MDAC ID:	912	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)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 3/3
MDAC ID: 913 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)
- 7)
- 8)
- 9)

CRITICALITIES

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

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

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 11/18/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: HYD/WSB FLIGHT: 2/1R
MDAC ID: 914 ABORT: 2/1R

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)
- 5)
- 6)
- 7)
- 8)
- 9)

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

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

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

APPENDIX D
POTENTIAL CRITICAL ITEMS

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
101	WATER SPRAY BOILER ASSEMBLY	RESTRICTED FLOW
102	WATER SPRAY BOILER ASSEMBLY	EXTERNAL LEAKAGE
103	LINES AND FITTINGS (GN2-WATER)	
104	HEAT EXCHANGER ASSEMBLY	RESTRICTED FLOW
105	HEAT EXCHANGER ASSY	EXTERNAL LEAKAGE
106	HEAT EXCHANGER ASSY	CORE LEAKAGE
107	HEAT EXCHANGER ASSY	HEADER LEAKAGE
108	SPRAY VALVE (WATER SUPPLY)	FAILS TO OPEN
109	SPRAY VALVE (WATER SUPPLY)	FAILS TO CLOSE/LEAKAGE
115	BOILER TANK HEATERS	SHORTED
118	HYDRAULIC/LUBE OIL WATER FILTERS	LOSS OF FLOW
123	BOILER WATER FILL AND DRAIN	EXTERNAL LEAKAGE
126	LUBE OIL DRAIN	EXTERNAL LEAKAGE
132	WATER TANK	BURST
133	WATER TANK	LEAKAGE - H2O EXTERNAL
134	WATER TANK	LEAKAGE - GN2 INTERNAL-EXTERNAL
136	WATER TANK FILL	EXTERNAL LEAKAGE
142	GN2 TANK	BURST
143	GN2 TANK	LEAKAGE
144	GN2 REGULATOR VALVE	FAILS TO CLOSE (LEAKAGE)
145	GN2 REGULATOR VALVE	FAILS TO OPEN
146	GN2 REGULATOR RELIEF VALVE	FAILS TO CLOSE
148	GN2 SHUTOFF VALVE	FAILS TO OPEN
150	GN2 SHUTOFF VALVE	EXTERNAL LEAKAGE
152	GN2 FILL DISCONNECT	EXTERNAL LEAKAGE
154	GN2 VENT DISCONNECT	LEAKAGE (EXTERNAL)
164	GN2 FILTER	LOSS OF FLOW
166	HYDRAULIC BYPASS VALVE	EXTERNAL LEAKAGE
167	HYDRAULIC BYPASS VALVE	FAILS IN BYPASS POSITION
168	HYRAULIC RELIEF VALVE	EXTERNAL LEAKAGE
169	HYDRAULIC RELIEF VALVE	RELIEF VALVE FAILS TO CLOSE
179	BOILER CNTRL SW	LOSS OF OUTPUT
180	BOILER CNTRL SW	FAILS TO CLOSE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
196	HYBRID DRIVER CIRCUIT (CONTROLLER)	LOSS OF OUTPUT
402	ACCUMULATOR	EXTERNAL LEAKAGE, HYD. FLUID, THRU SEAL ASSY.
403	ACCUMULATOR	STRUCTURAL FAILURE, (RUPTURE), CYLINDER
404	ACCUMULATOR	PHYSICAL BINDING, JAMMING, PISTON
414	SSME ACCUMULATOR	EXTERNAL LEAKAGE (HYD. FLUID) THRU SEAL ASSY.
417	SSME ACCUMULATOR	STRUCTURAL FAILURE, (RUPTURE), CYLINDER
432	BLEED VALVE	FAILS TO REMAIN CLOSED (EXTERNAL LEAKAGE)
434	PRESS ACTUATED CONTROL VALVE	EXTERNAL LEAK
439	FILTER	STRUCTURAL FAILURE (RUPTURE-INTERNAL)
448	QUICK DISCONNECTS- GROUND SERVICING (RETURN)	EXTERNAL LEAKAGE
450	QUICK DISCONNECT-HYD. GROUND POWER SUPPLY- LANDING GEAR STOW/DEPLOY	EXTERNAL LEAKAGE
451	QUICK DISCONNECT- HYD/SSME (SUPPLY)	INADVERTENT DISCONNECT
452	QUICK DISCONNECT- HYD/SSME (RETURN)	INADVERTENT DISCONNECT
453	QUICK DISCONNECT- HYD/SSME (SUPPLY)	EXTERNAL LEAK
454	QUICK DISCONNECT- HYD/SSME (RETURN)	EXTERNAL LEAK
456	CHECK VALVE-RETURN LINE FROM ENG'S/ACT'S	FAILS TO OPEN
457	HOSE AND SWIVEL ASSY:TVC ACTUATORS	EXTERNAL LEAKAGE
458	HOSE AND SWIVEL ASSY:TVC ACTUATORS/SSME HYD-SUPPLY LINES	EXTERNAL LEAKAGE
459	HOSE AND SWIVEL ASSY:TVC ACTUATORS/SSME HYD. RETURN LINES	EXTERNAL LEAKAGE
460	HOSE AND SWIVEL ASSY: WATER SPRAY BOILERS	EXTERNAL LEAKAGE
461	NOSE WHEEL STEERING FLEX HOSE ASSEMBLY	STRUCTURAL FAILURE (RUPTURE)
462	MAIN LANDING GEAR FLEX HOSE (EXTEND)	STRUCTURAL FAILURE (RUPTURE)
463	MAIN LANDING GEAR FLEX HOSE (RETRACT)	STRUCTURAL FAILURE (RUPTURE)

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
464	HYDRAULIC LINE	LINE RUPTURE BETWEEN HYDRAULIC PUMPS AND LANDING GEAR AND MPS/TVC ISOVALVES
465	HYDRAULIC LINE (SUPPLY) SYSTEM 1	LINE RUPTURE BETWEEN L.G. ISOVALVES AND L.G. CONTROL VALVES
466	HYDRAULIC LINE (RETURN) SYSTEM 1	LINE RUPTURE BETWEEN L.G. CONTROL VALVES AND L.G. RETURN LINE CHECK VALVE
467	HYDRAULIC LINE	LINE RUPTURE (HYDRAULIC SUPPLY) BETWEEN MPS/TVC ISOVALVE AND ACT'S/SSME'S
468	HYDRAULIC LINE	LINE RUPTURE (RETURN) BETWEEN ACT'S/SSME'S AND RETURN LINE CHECK VALVE
469	REDUNDANT SHUTOFF VALVE (N.O.)	FAILS TO CLOSE
471	REDUNDANT SHUTOFF VALVE (N.O.)	EXTERNAL LEAK
472	LANDING GEAR DUMP SOLENOID VALVE (N.C.)	FAILS TO OPEN
474	LANDING GEAR DUMP SOLENOID VALVE (N.C.)	EXTERNAL LEAK
475	PRIORITY VALVE	FAILS TO CLOSE
476	PRIORITY VALVE	LEAKAGE, INTERNAL (ACCUMULATOR TO SYSTEM THRU CHECK VALVE)
477	PRIORITY VALVE	LEAKAGE, INTERNAL ACCUMULATOR TO RESERVOIR THRU DRAIN PORT
478	ACCUMULATOR DUMP VALVE	INTERNAL LEAKAGE (ACCUMULATOR/RESERVOIR TO SYSTEM)
479	LANDING GEAR ISOLATION VALVE	FAILS TO OPEN
480	LANDING GEAR ISOLATION VALVE	PREMATURE CLOSE
481	LANDING GEAR ISOLATION VALVE	FAILS TO CLOSE
482	LANDING GEAR ISOLATION VALVE	PREMATURE OPEN
484	LANDING GEAR ISOLATION VALVE	EXTERNAL LEAK
486	LANDING GEAR CONTROL UP/CIRC. SOLENOID VALVE	PREMATURE OPEN (PRESS TO RETRACT/LOCK LINES)
487	LANDING GEAR CONTROL UP/CIRC. SOLENOID VALVE	FAILS TO CLOSE (PROVIDE PATH FROM RETRACT/LOCK TO RETURN LINES)
489	LANDING GEAR CONTROL UP/CIRC SOLENOID VALVE	EXTERNAL LEAK
490	RESTRICTOR, HYDRAULIC, L.G. RETRACT LINE	BLOCKED OR RESTRICTED FLOW

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
491	LANDING GEAR CONTROL VALVE-2POS, 3WAY, SOLENOID OPERATED	FAILS TO SWITCH TO LG EXTEND POSITION
492	LANDING GEAR CONTROL VALVE-2POS, 3WAY, SOLENOID OPERATED	PREMATURE SWITCH TO LG EXTEND POSITION
494	LANDING GEAR CONTROL VALVE - 2 POS, 3 WAY, SOLENOID	EXTERNAL LEAK
495	MPS/TVC SHUTOFF VALVE	FAILS TO TRANSFER FROM HYDRAULIC POWER MODE TO THERMAL CONTROL MODE.
496	MPS/TVC SHUTOFF VALVE	PREMATURE TRANSFER FROM HYDRAULIC POWER MODE TO THERMAL CONTROL MODE DURING ASCENT.
497	MPS/TVC SHUTOFF VALVE	FAILS TO TRANSFER FROM THERMAL CONTROL MODE TO HYDRAULIC POWER MODE FOR ENGINE REPOSITIONING.
498	MPS/TVC SHUTOFF VALVE	EXTERNAL LEAK
600	PUMP (MECHANICAL)	STRUCTURAL FAILURE (RUPTURE)
601	PUMP (MECHANICAL)	PHYSICAL BINDING/JAMMING
602	PUMP (MECHANICAL)	RESTRICTED FLOW
603	DEPRESSURIZATION VALVE	STRUCTURAL FAILURE (RUPTURE)
604	DEPRESSURIZATION VALVE	FAILS TO OPEN
605	DEPRESSURIZATION VALVE	FAILS TO CLOSE
606	DEPRESSURIZATION VALVE	PHYSICAL BINDING/JAMMING
607	DEPRESSURIZATION VALVE	EXTERNAL LEAKAGE
608	DEPRESSURIZATION VALVE	SHORTED
609	PRESSURE COMPENSATOR SPOOL VALVE	STRUCTURAL FAILURE (RUPTURE)
610	PRESSURE COMPENSATOR SPOOL VALVE	FAILS TO MAXIMUM OUTPUT POSITION
611	PRESSURE COMPENSATOR SPOOL VALVE	FAILS TO MINIMUM OUTPUT POSITION
612	FLEX HOSE (SUCTION)	STRUCTURAL FAILURE (RUPTURE)
613	FLEX HOSE (SUPPLY)	STRUCTURAL FAILURE (RUPTURE)
614	FLEX HOSE (CASE)	STRUCTURAL FAILURE (RUPTURE)
619	CHECK VALVE (SUPPLY)	FAILS TO CLOSE
620	CHECK VALVE (SUPPLY)	EXTERNAL LEAKAGE
621	CHECK VALVE (CASE)	FAILS TO OPEN
623	CHECK VALVE (CASE)	EXTERNAL LEAKAGE
624	HYDRAULIC RESERVOIR	STRUCTURAL FAILURE (RUPTURE)
625	HYDRAULIC RESERVOIR	PHYSICAL BINDING/JAMMING
626	HYDRAULIC RESERVOIR	INTERNAL LEAKAGE (LOW PRESSURE-TO-DRAIN)
627	HYDRAULIC RESERVOIR	INTERNAL LEAKAGE (HIGH PRESSURE-TO-LOW PRESSURE)
628	LOW PRESSURE RELIEF VALVE	FAILS TO OPEN

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
629	LOW PRESSURE RELIEF VALVE	FAILS TO CLOSE
630	LOW PRESSURE RELIEF VALVE	INTERNAL LEAKAGE
631	LOW PRESSURE RELIEF VALVE	EXTERNAL LEAKAGE
632	HORIZONTAL/BLEED SAMPLE VALVE	EXTERNAL LEAKAGE
633	VERTICAL/BLEED SAMPLE VALVE	EXTERNAL LEAKAGE
643	E.T. UMBILICAL RETRACT ACTUATOR	RUPTURE
644	E.T. UMBILICAL RETRACT ACTUATOR	EXTERNAL LEAKAGE
669	FLEX HOSE & SWIVEL ASSEMBLY (SUPPLY)	EXTERNAL LEAKAGE
670	FLEX HOSE & SWIVEL ASSEMBLY (RETURN).	EXTERNAL LEAKAGE
671	CHECK VALVE	FAILS TO OPEN
672	CHECK VALVE	FAILS TO CLOSE
673	CHECK VALVE	EXTERNAL LEAKAGE
677	MANUAL DRAIN VALVE	EXTERNAL LEAKAGE
699	CIRCULATION PUMP CHECK VALVE	STRUCTURAL FAILURE (RUPTURE)
701	GSE CHECK VALVE	STRUCTURAL FAILURE (RUPTURE)
704	CIRCULATION PUMP CHECK VALVE	FAILS TO CLOSE
708	SUPPLY FILTER	STRUCTURAL FAILURE (RUPTURE)
709	SUPPLY FILTER	RESTRICTED FLOW
713	RELIEF VALVE	STRUCTURAL FAILURE (RUPTURE)
714	RELIEF VALVE	FAILS TO OPEN
715	RELIEF VALVE	FAILS TO CLOSE
719	CASE FILTER	EXTERNAL LEAKAGE
721	RETURN FILTER	EXTERNAL LEAKAGE
722	RETURN FILTER	RESTRICTED FLOW
723	FREON/OIL HEAT EXCHANGER	INTERNAL LEAKAGE (FREON TO FREON)
724	FREON/OIL HEAT EXCHANGER	INTERNAL LEAKAGE (FREON-TO-HYDRAULIC FLUID)
725	FREON/OIL HEAT EXCHANGER	EXTERNAL LEAKAGE OF HYDRAULIC FLUID
726	FREON/OIL HEAT EXCHANGER	RESTRICTED FLOW (HYDRAULIC FLUID)
727	FREON/OIL HEAT EXCHANGER	RESTRICTED FLOW (FREON)
729	THERMAL CONTROL VALVE	FAILS OPEN (FREON/OIL HEAT EXCHANGER MODE)
730	THERMAL CONTROL VALVE	EXTERNAL LEAKAGE
814	MASTER EVENTS CONTROLLER	OPEN
844	CURRENT LIMITER RESISTOR, 1.21K	OPEN

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
849	HYBRID DRIVER, TYPE IV	LOSS OF OUTPUT
851	RPC	LOSS OF OUTPUT
860	SWITCH, HYD MAIN PUMP PRESS (S26,27,28)	FAILS IN "NORM" POSITION (ALL CONTACTS)
861	SWITCH, HYD MAIN PUMP PRESS (S26,27,28)	FAILS IN "LOW" POSITION (ALL CONTACTS)
866	FUSE (1A, F14)	OPEN
868	CURRENT LIMITER RESISTOR (1.21K)	OPEN
869	CURRENT LIMITER RESISTOR (1.21K)	OPEN (ELECTRICAL)
871	BLOCKING DIODE (15A)	SHORT
872	BLOCKING DIODE (15A)	OPEN
874	BLOCKING DIODE (12A)	OPEN
877	LG RETRACT/CIRC VLV SW	FAILS IN "OPEN" POSITION (ALL CONTACTS)
883	BLOCKING DIODE (RETURN CIRCUIT)	OPEN
884	HYBRID DRIVER, TYPE IV, RETURN CIRCUIT	CONTINUOUS OUTPUT
885	HYBRID DRIVER, TYPE IV, RETURN CIRCUIT	LOSS OF OUTPUT
886	HYBRID DRIVER, TYPE III, VLV CLOSE CIRCUIT	CONTINUOUS OUTPUT
891	MPS/TVC ISO VLV CONTROL SW	INADVERTENT/PREMATURE OPERATION
896	CURRENT LIMITER RESISTOR (1.21K) POWER CONTROL	OPEN
899	CONTROLLER, HYBRID DRIVER, TYPE III (CLOSE)	INADVERTENT OUTPUT
901	CONTROLLER, HYBRID DRIVER, TYPE III (OPEN)	LOSS OF OUTPUT
902	CONTROLLER, HYBRID DRIVER, TYPE III (OPEN)	INADVERTENT OUTPUT
909	MDM ISOLATION DIODE	N
910	VEHICLE ISOLATION DIODE	OPEN
911	LG HYDRAULIC ISOLATION VLV SW	INADVERTENTLY CONDUCTS (OPEN POSITION)
912	LG HYDRAULIC ISOLATION VLV SW	INADVERTENTLY CONDUCTS (CLOSE POSITION)
914	ISO VLV CTL CIRCUIT RESISTOR (1.21K)	OPEN

