INDEPENDENT ORBITER ASSESSMENT

ANALYSIS
OF THE
REACTION CONTROL
SYSTEM
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MCDONNELL DOUGLAS ASTRONAUTICS COMPANY
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SPACE TRANSPORTATION SYSTEM ENGINEERING AND OPERATIONS SUPPORT

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INDEPENDENT ORBITER ASSESSMENT
ANALYSIS OF THE REACTION CONTROL SYSTEM

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1.0 EXECUTIVE SUMMARY

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

Although the aft Reaction Control System (RCS) and Orbital Maneuvering System (OMS) are housed in the same pod, this report only addresses the RCS, both aft and forward. The OMS report addresses the analysis of the OMS separately.

The purpose of the RCS is to provide thrust in and about the X, Y, Z axes for External Tank (ET) separation; orbit insertion maneuvers; orbit translation maneuvers; onorbit attitude control; rendezvous; proximity operations (payload deploy and capture); deorbit maneuvers; and abort attitude control. The RCS is situated in three independent modules, one forward in the orbiter nose and one in each OMS/RCS pod. Each RCS module consists of the following subsystems:

- o Helium Pressurization Subsystem
- o Propellant Storage and Distribution Subsystem
- o Thruster Subsystem
- o Electrical Power Distribution and Control Subsystem

Figure 1 presents a summary of the failure criticalities for each of the major divisions of the RCS. A summary of the number of failure modes, by criticality, is also presented below with Hardware (HW) criticality first and Functional (F) criticality second.

Summary of IOA Failure Modes By Criticality (HW/F)							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
Number :	70	106	137	288	448	1223	2272

RCS ANALYSIS SUMMARY

CRIT.	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
#FM	70	106	137	288	448	1223	2272
#PCI	70	106	137	131	146		590

PROPELLANT STORAGE & DISTRIBUTION SUBSYSTEM

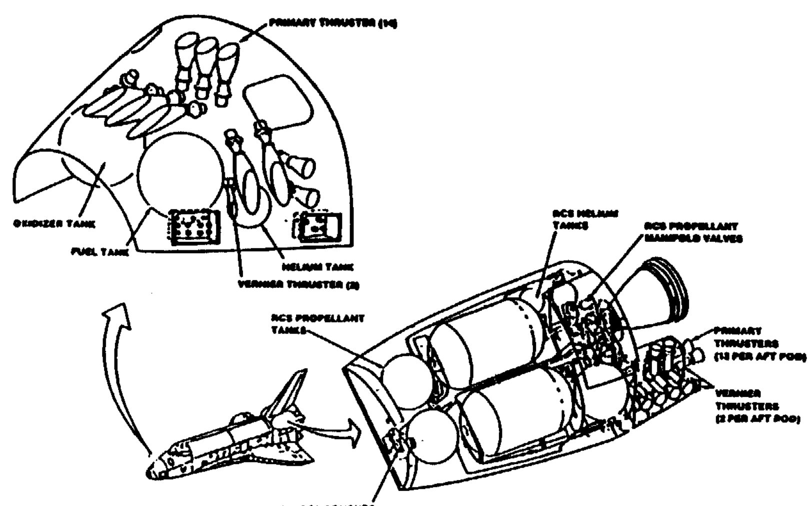
CRIT.	#FM	#PCI
1/1	40	40
2/1R	31	31
2/2	7	7
3/1R	10	4
3/2R	1	1
3/3	41	-
TOTAL	130	83

THRUSTER SUBSYSTEM

CRIT.	#FM	#PCI
1/1	24	24
2/1R	1	1
2/2	2	2
3/1R	3	-
3/2R	2	-
3/3	-	-
TOTAL	32	27

HELIUM PRESSURIZATION SUBSYSTEM

CRIT.	#FM	#PCI
1/1	6	6
2/1R	25	25
2/2	-	-
3/1R	7	-
3/2R	-	-
3/3	8	-
TOTAL	46	31



ELECTRICAL POWER DISTRIBUTION & CONTROL SUBSYSTEM

CRIT.	#FM	#PCI
1/1	-	-
2/1R	49	49
2/2	128	128
3/1R	268	127
3/2R	445	145
3/3	1174	-
TOTAL	2064	449

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

Figure 1 - RCS OVERVIEW ANALYSIS SUMMARY

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 :	70	106	137	131	146	590

Of the failure modes analyzed, 307 could potentially result in a loss of life and/or loss of vehicle.

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 reevaluation results for completeness and technical accuracy.

2.2 Scope

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

2.3 Analysis Approach

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

Step 1.0 Subsystem familiarization
- 1.1 Define subsystem functions
- 1.2 Define subsystem components
- 1.3 Define subsystem specific ground rules and assumptions

Step 2.0 Define subsystem analysis diagram
- 2.1 Define subsystem
- 2.2 Define major assemblies
- 2.3 Develop detailed subsystem representations

Step 3.0 Failure events definition
- 3.1 Construct matrix of failure modes
- 3.2 Document IOA analysis results

Step 4.0 Compare IOA analysis data to NASA FMEA/CIL
- 4.1 Resolve differences
- 4.2 Review in-house
- 4.3 Document assessment issues
- 4.4 Forward findings to Project Manager

2.4 RCS Ground Rules and Assumptions

The RCS specific ground rules and assumptions used in the IOA analysis are presented in Appendix B.

3.0 SUBSYSTEM DESCRIPTION

3.1 Functional and Hardware Description

The Shuttle Orbiter includes three RCS packages, one forward and two aft, one in each of the left and right OMS/RCS pods (Figure 2). Each RCS package consists of the following subsystems:

- o Helium Pressurization
- o Propellant Storage and Distribution
- o Thruster
- o Electrical Power Distribution and Control

Figures 3 through 6 present an overview of the RCS breakdown hierarchy utilized in this analysis.

During a typical Shuttle mission, the RCS jets are used during External Tank (ET) separation, orbit insertion, orbital operations, deorbit maneuver, and entry. The Aft RCS (ARCS) is active from prelaunch through the transition to aerosurface control during entry. The Forward RCS (FRCS) is active from prelaunch through the post-deorbit propellant dump and is disabled for entry. Figures 7 and 8 are hardware schematics of the FRCS and ARCS, respectively.

The RCS jets are first used in the mission after Main Engine Cutoff (MECO) to maintain vehicle attitude until ET separation. The RCS provides a translation maneuver during ET separation to ensure Orbiter separation from the ET. The RCS is also used to control roll in the event of the failure of two main engines during ascent.

After OMS-1 burn cutoff, the vehicle goes into attitude hold. The crew uses the Translational Hand Controller (THC) to command RCS translational maneuvers to null any residual velocity. Attitude hold is maintained until the maneuver to OMS-2 burn attitude which is performed manually by the crew using the Rotational Hand Controller (RHC). The RCS +X jets can be used to complete either the OMS-1 or OMS-2 burns or to perform the OMS-2 burn entirely in the case of OMS engine failures. In this case, the OMS-to-RCS interconnect capability will be used to feed OMS propellant to the four +X RCS thrusters.

Once in orbit, after the OMS-2 burn is completed, RCS maneuvers are performed to control the vehicle attitude according to the flight plan. For onorbit attitude control the crew may select either primary or vernier jets.

During deorbit, the RCS is used to maneuver to the OMS deorbit burn attitude, null any residual velocity, dump excess propellant for center-of-gravity control, and maneuver to the Entry Interface (EI) attitude. In case both OMS engines malfunction,

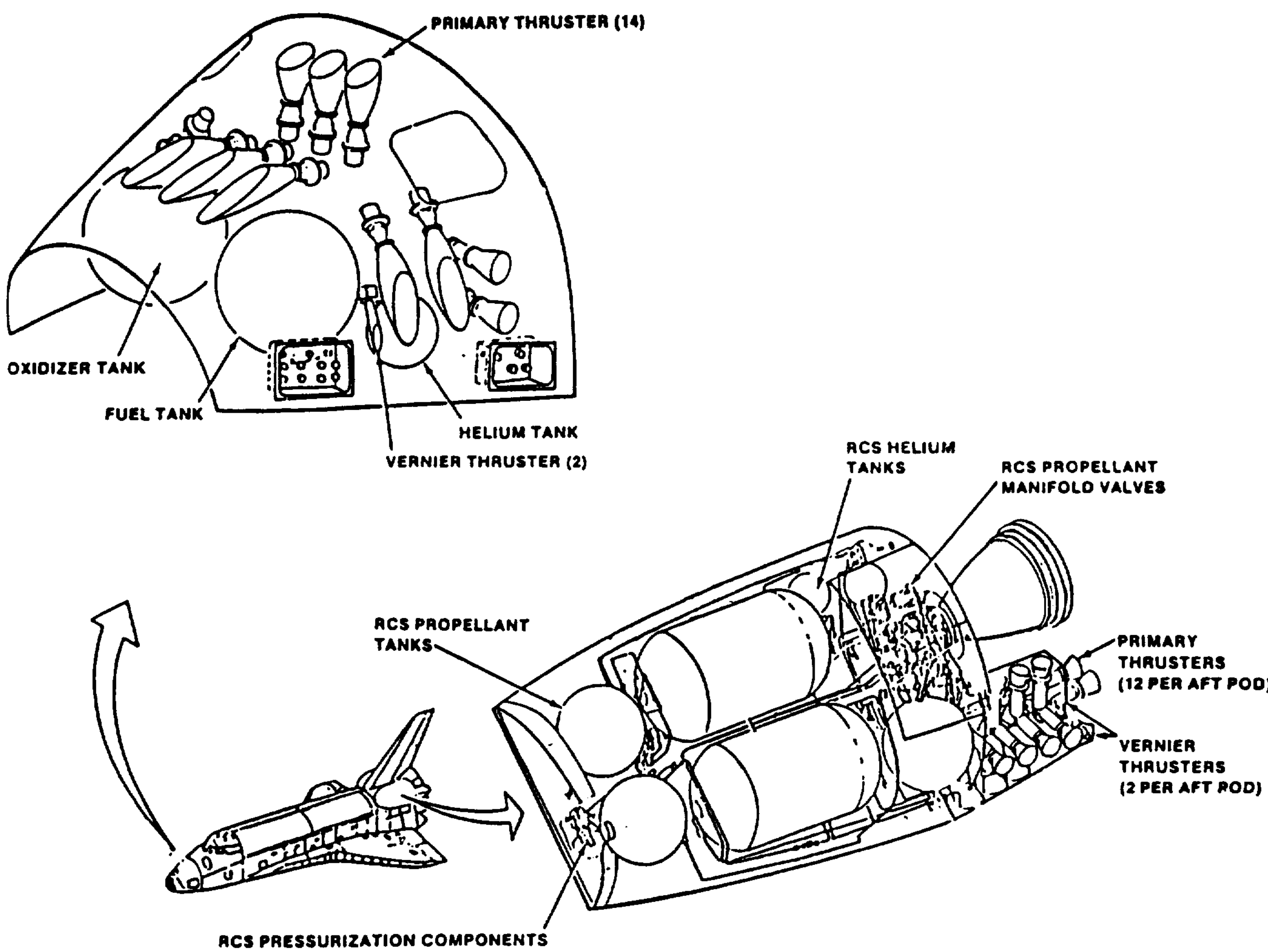


Figure 2 - REACTION CONTROL SYSTEM (RCS)

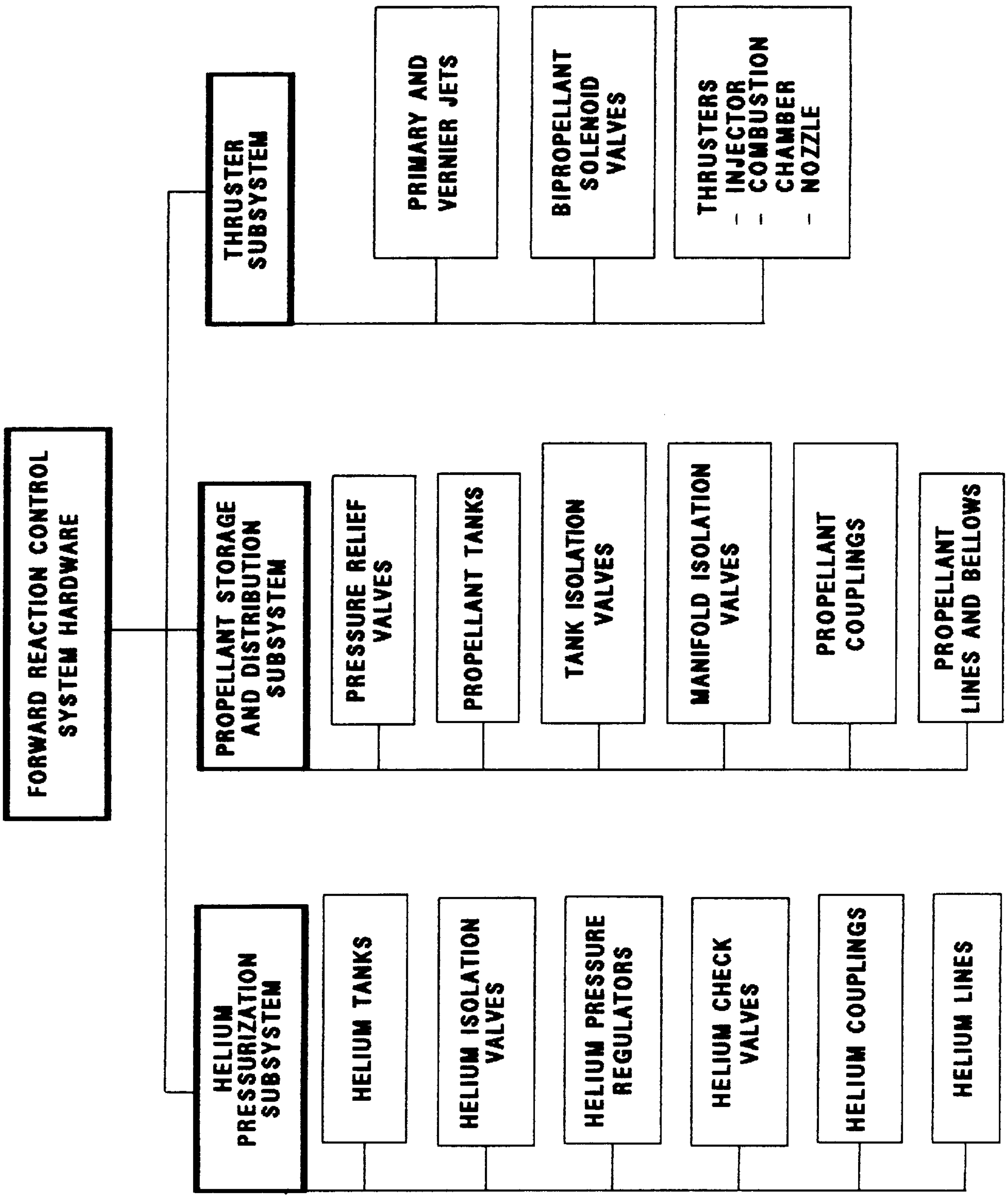


Figure 3 - FORWARD RCS HARDWARE BREAKDOWN HIERARCHY

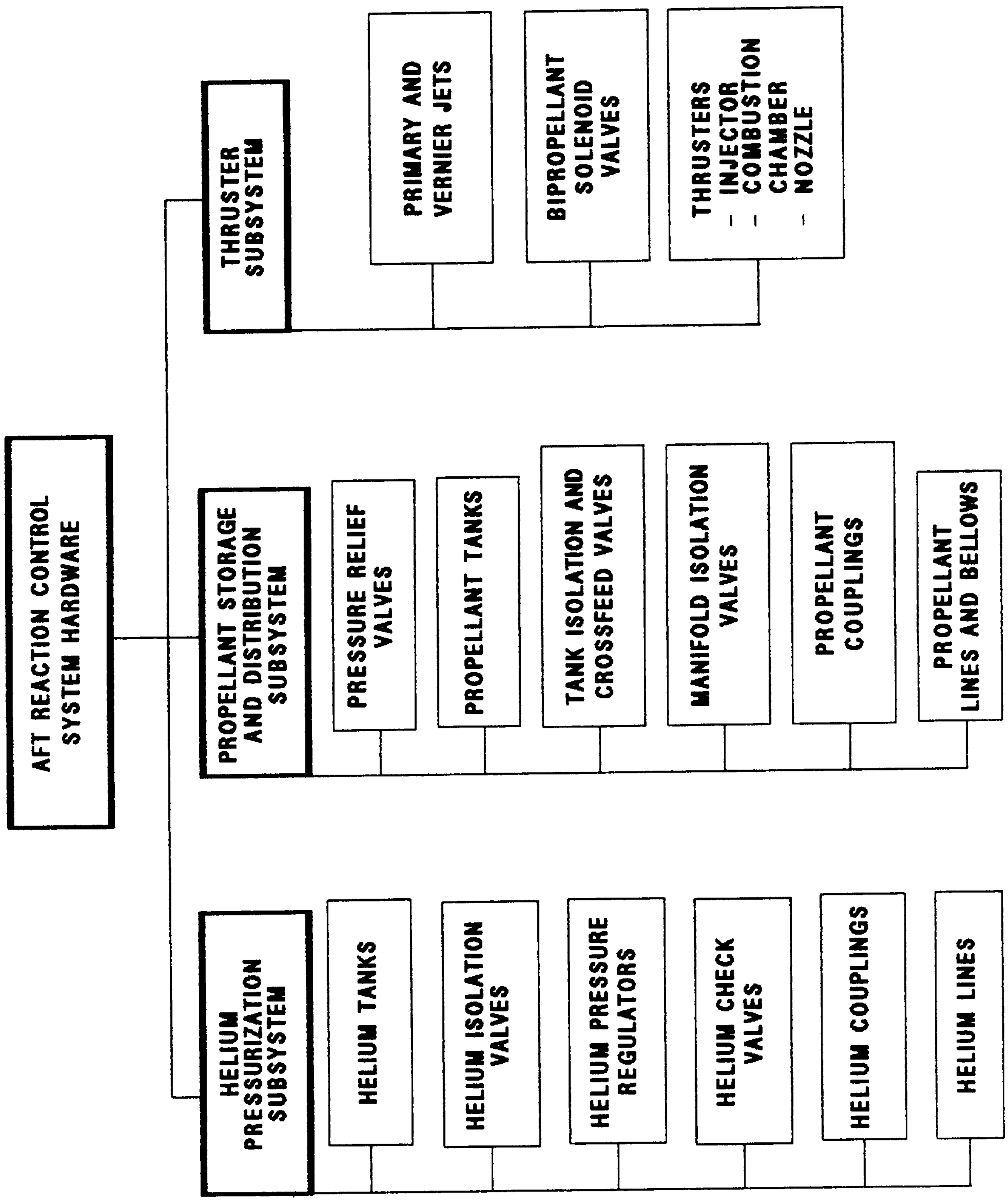


Figure 4 - AFT RCS HARDWARE BREAKDOWN HIERARCHY

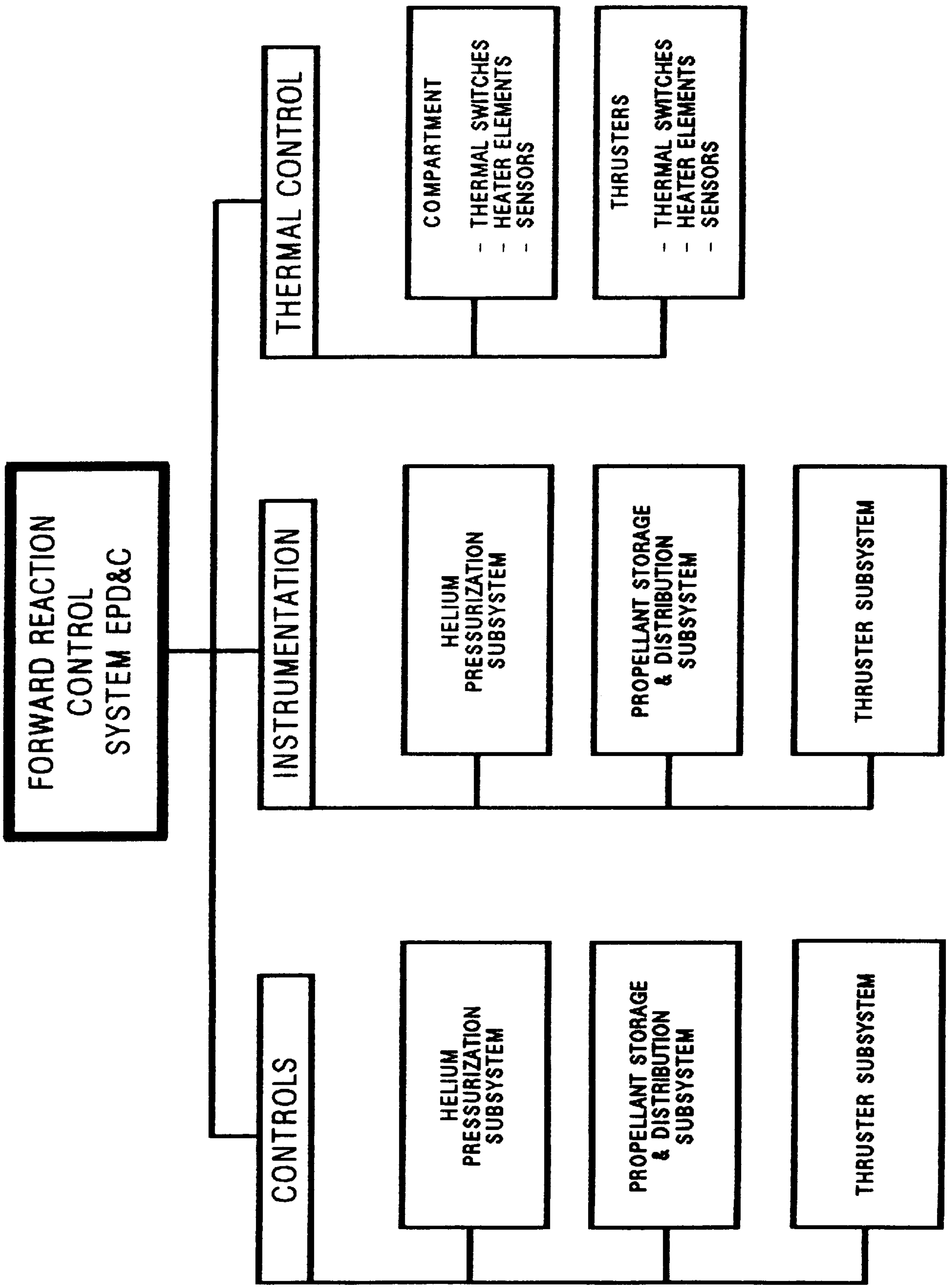


Figure 5 - FORWARD RCS EPD&C BREAKDOWN HIERARCHY

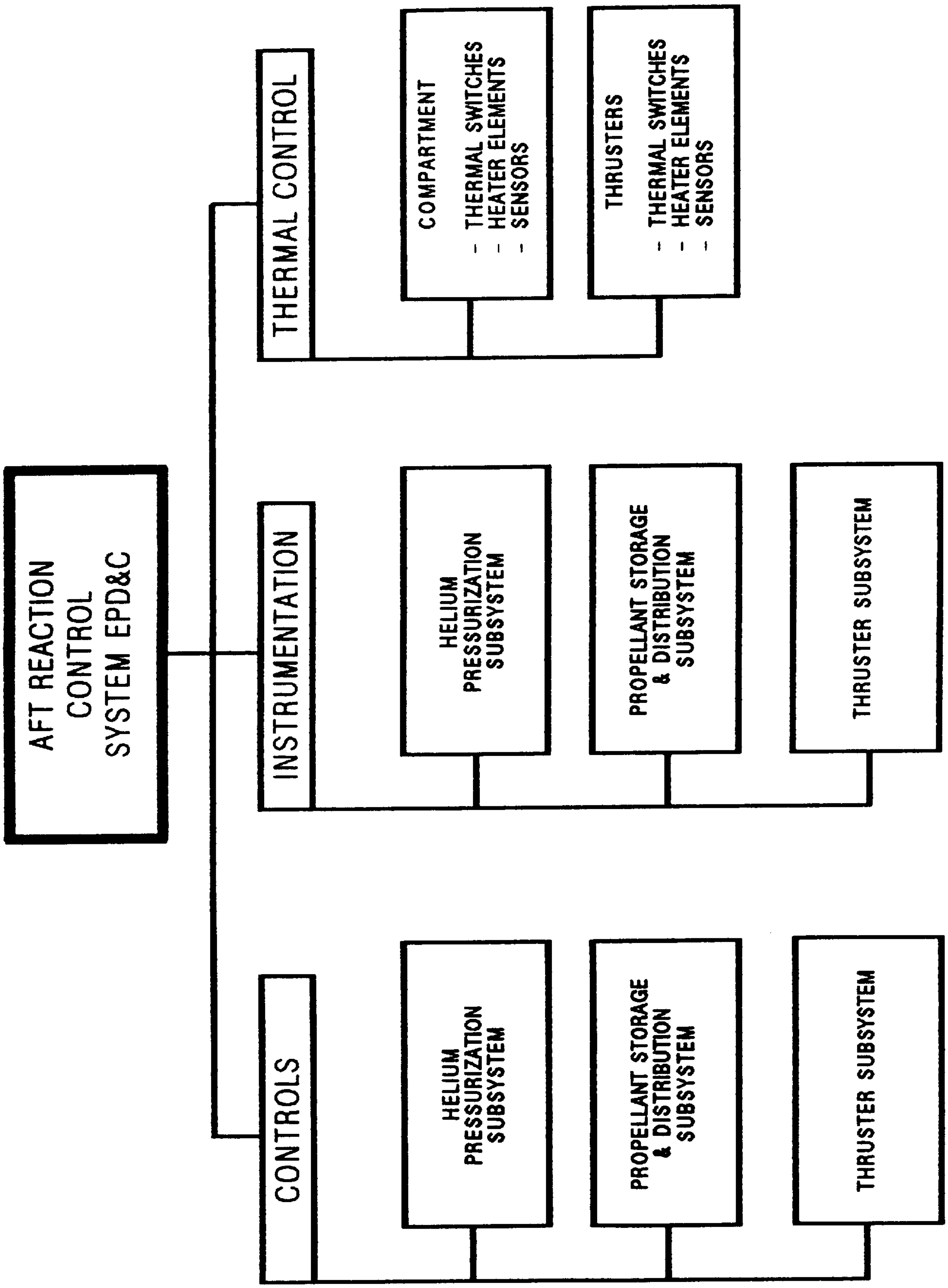


Figure 6 - AFT RCS EPD&C BREAKDOWN HIERARCHY

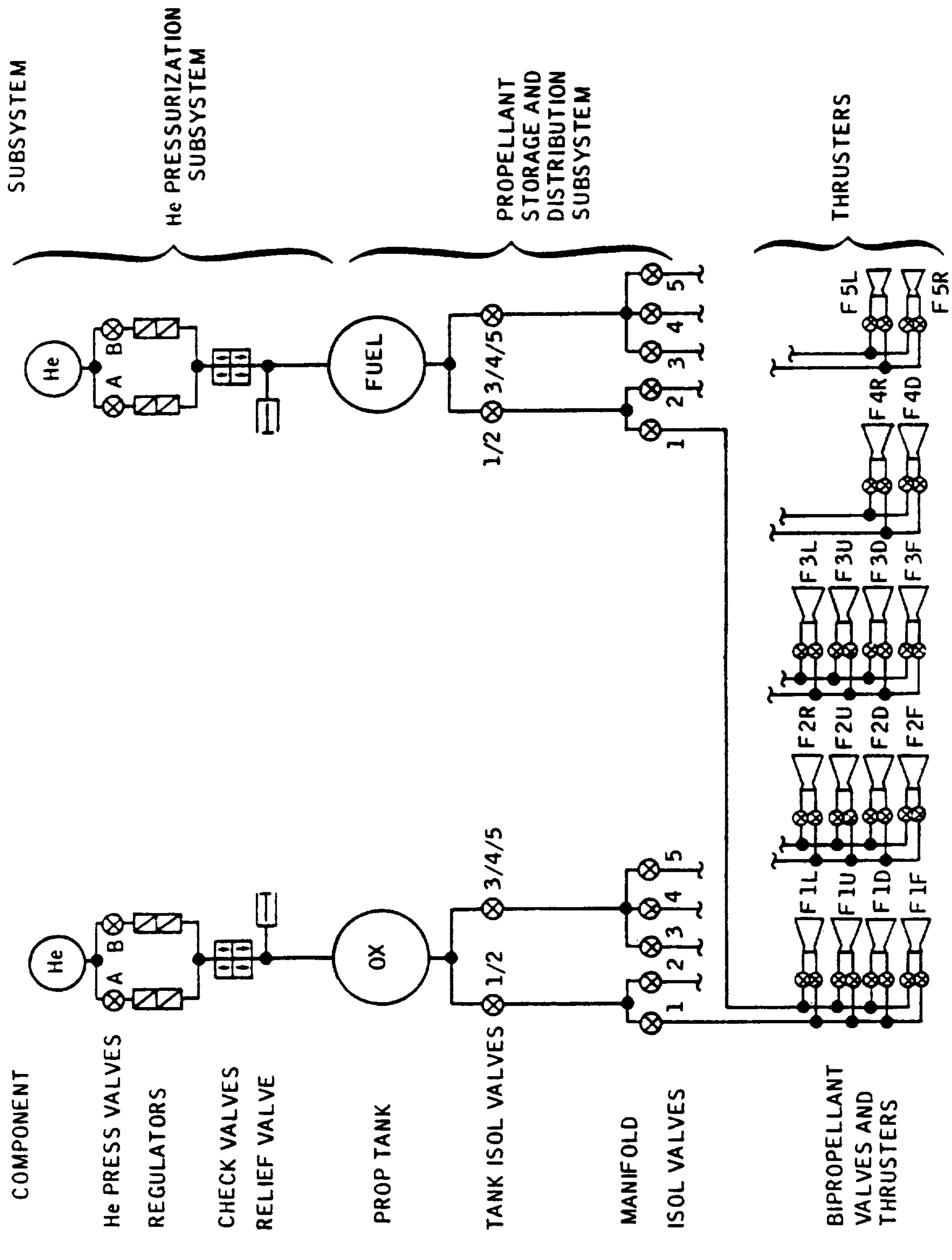


Figure 7 - FORWARD RCS SCHEMATIC

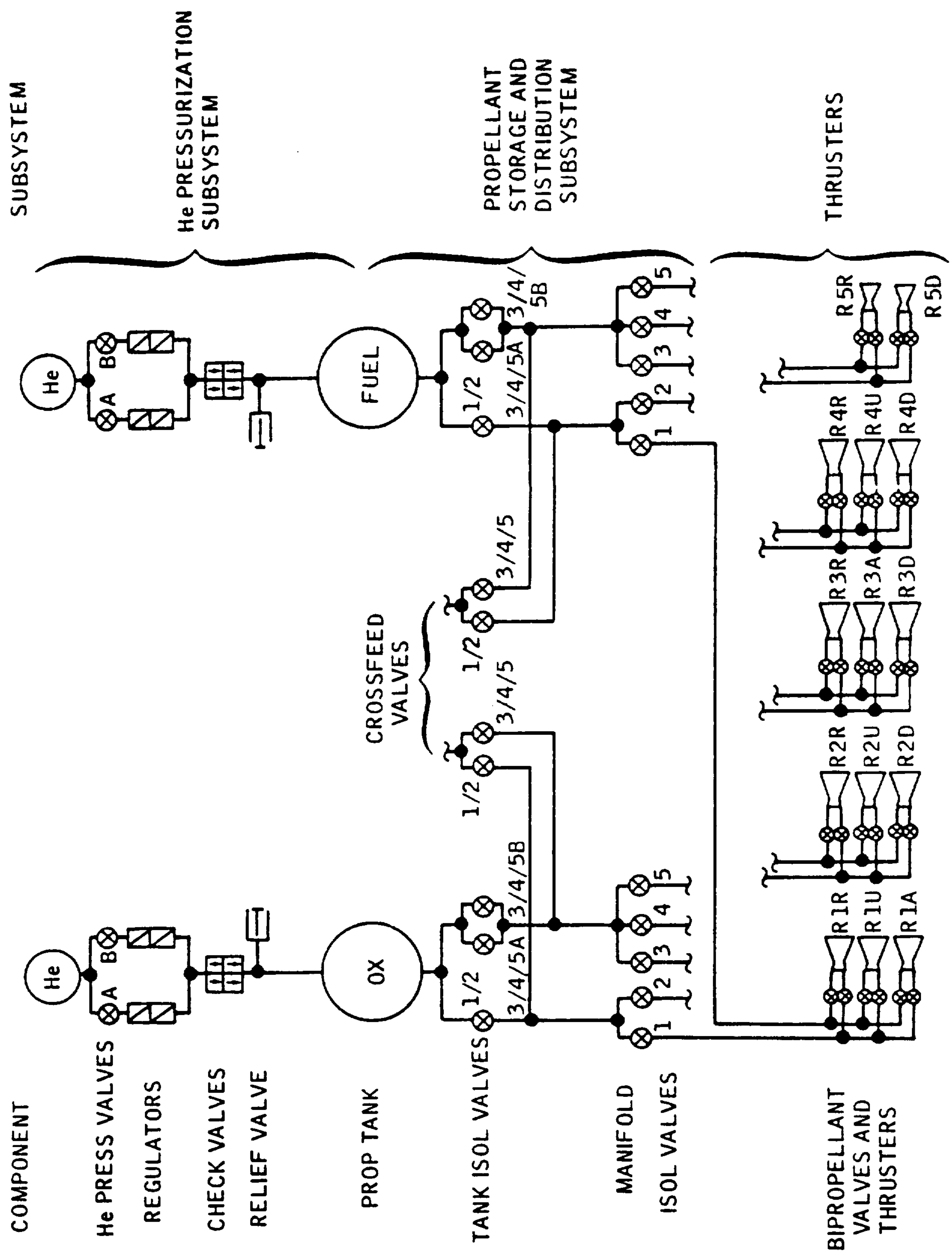


Figure 8 - AFT RCS SCHEMATIC

the RCS can be used to perform or complete the deorbit burn. In this case, the OMS-to-RCS interconnect will be selected to feed OMS propellant to the four +X RCS thrusters.

Once the deorbit burn is completed, the vehicle is maneuvered to the EI attitude.

From EI (400,000 ft) to approximately 262,000 ft, the vehicle is controlled in roll, pitch, and yaw with the ARCS jets. The GPCs disable the roll thrusters below this altitude, since the vehicle is captured and stable in the roll axis. Shortly after entering blackout, the pitch thrusters are disabled. From this time on, the elevons are used to control pitch and banking. The yaw thrusters are still used to assist the rudder. This mode of control will be used until the vehicle slows to Mach 1 where the yaw thrusters are disabled. Total vehicle control is then accomplished by the aerodynamic control surfaces through landing.

3.1.1 Helium Pressurization Subsystem

The pressurization subsystem regulates and distributes helium to the propellant tanks. This subsystem consists of two helium storage tanks, isolation valves, pressure regulators, check valves, and the lines necessary for filling, draining, and distributing the helium.

3.1.1.a Helium Storage Tanks

The high pressure helium supply is contained in two 1.761 cubic ft spherical storage tanks in each module. The tanks are made of a titanium liner overwrapped with fiberglass. One tank supplies helium pressure to the fuel propellant tank while the other helium tank supplies pressure to the oxidizer propellant tank. The helium tank's maximum operating pressure is 4000 psig and is proof-pressure tested to 4480 psig.

3.1.1.b Helium Isolation Valve

For each propellant there are two helium isolation valves in parallel between the helium tanks and the pressure regulators which are used to isolate the high-pressure gaseous helium from the remainder of the pressurization subsystem (Figure 9).

The helium isolation valves are operated by two solenoids, one of which is momentarily energized to magnetically latch the valve open. The second solenoid magnetically unlatches the valve, allowing spring and helium pressure to force the valve closed.

The switching logic for the helium isolation valves is contained in the Forward and Aft Load Control Assemblies (FLCA and ALCA). Solenoid and power logic

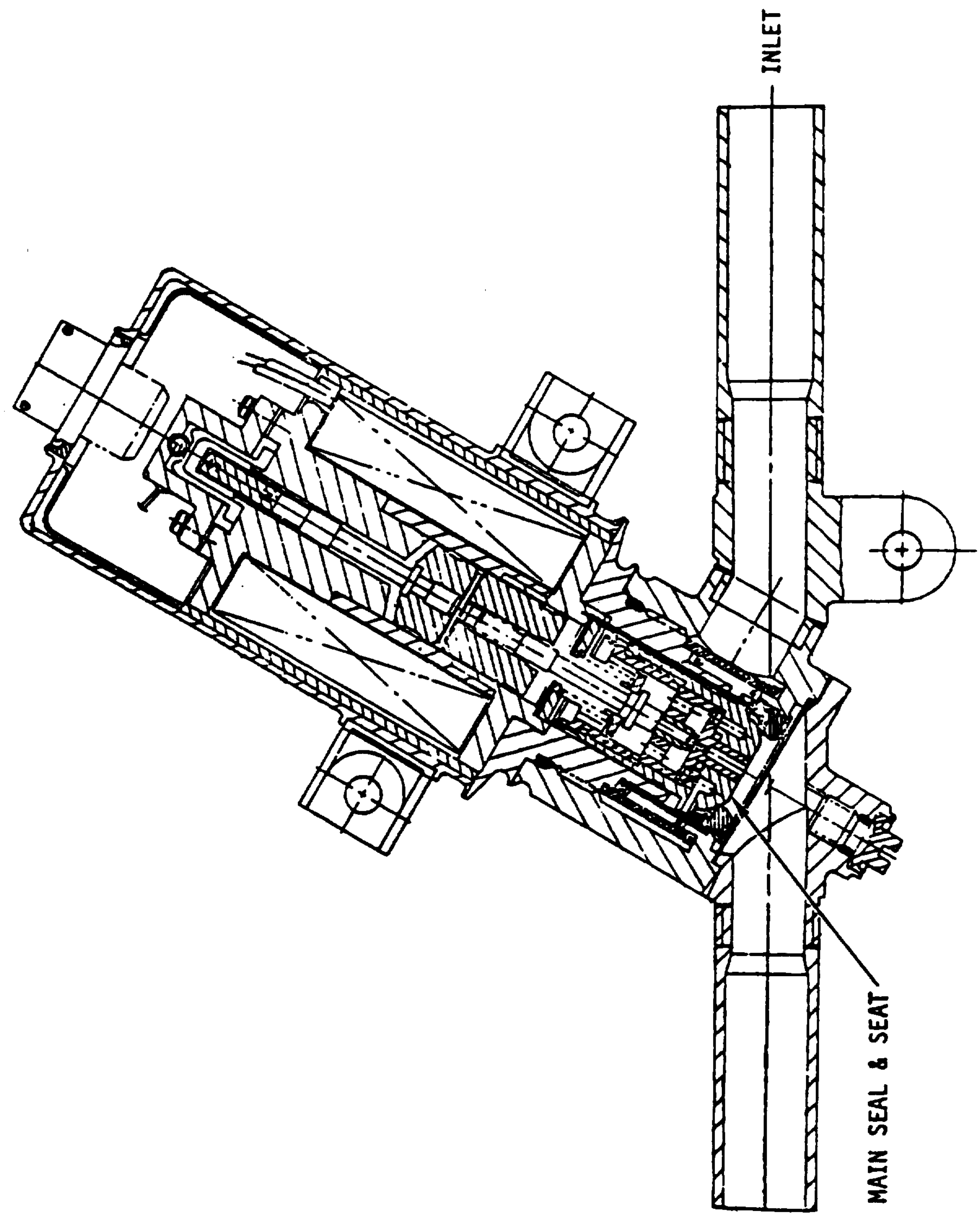


Figure 9 - HELIUM ISOLATION VALVE

is provided by the Power Control Assemblies (PCA), which are located within the LCAs. The LCAs and PCAs must be powered up in order to operate the helium isolation valves.

The helium isolation valves are controlled by the FWD RCS, AFT LEFT RCS, and AFT RIGHT RCS HE PRESS A/B switches on panels O7 and O8. These are permanent position switches (OPEN, GPC, CLOSE), but only apply momentary power to the solenoid due to the logic in the LCA. Each switch controls two isolation valves, one in the helium oxidizer line and one in the helium fuel line.

These valves contain microswitches which are activated when the valves are fully open or closed. When commanded, the switch logic allows a one-second delay for the valves to reach the command position before sending a position indication signal to the GPCs, telemetry, and a position indicator (talkback) above each switch. Power is then removed from the solenoids. The talkback logic displays barberpole when the valves are in motion or when there is a position mismatch between the fuel and oxidizer helium valves. Otherwise, the talkback shows OP for open valves and CL for closed valves.

The GPC can command the isolation valve to open and close to maintain the system pressurization and to prevent overpressurization when the isolation valve switch is in the GPC position. In the event of a switch failure in the GPC position, the crew can open or close the valves using the GPC memory read/write procedures.

The valve's nominal operating pressure is 200 to 4000 psig and limits the flow to 81 scfm.

3.1.1.c Pressure Regulator Assembly

Helium pressure regulation is accomplished by two regulator assemblies connected in parallel and located downstream of each helium isolation valve (Figure 10). Each assembly contains two regulators, primary and secondary, connected in series so that if the primary regulator fails open, the secondary regulator can regulate the pressure within acceptable limits. The regulators cannot be controlled manually or by the GPC.

The primary and secondary regulators regulate the tank pressure to 245 psig and 256 psig, respectively. The flow rate is limited to 81 scfm for 500 to 1400 psig inlet pressure, and 150 scfm for 1400 to 4000 psig inlet pressure.

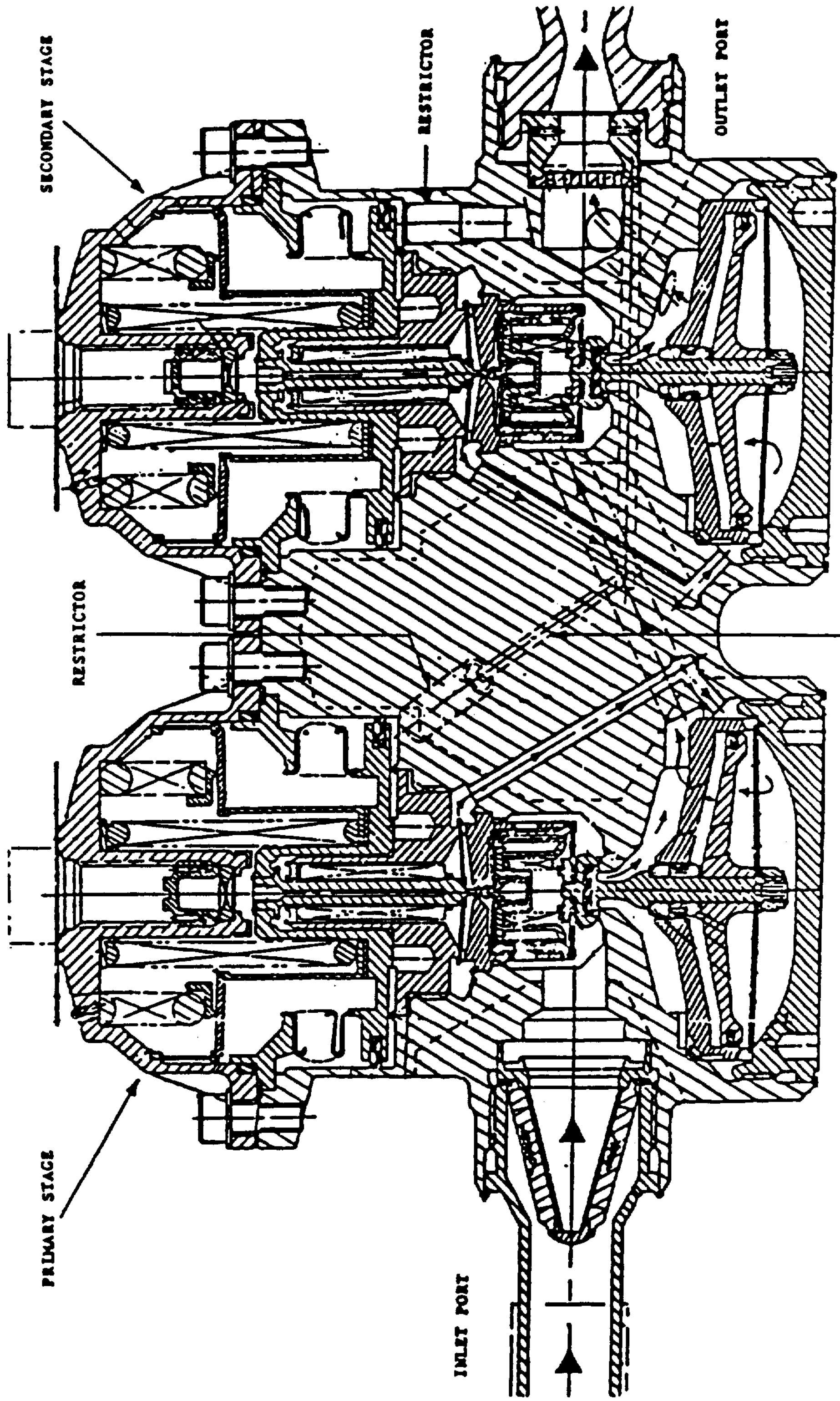


Figure 10 - HELIUM PRESSURE REGULATOR ASSEMBLY

3.1.1.d Check Valve Assembly

A check valve assembly, located between the pressure regulator assemblies and each relief valve, is used to preclude backflow of helium or propellant vapors or liquids (Figure 11). Each assembly contains four independent check valves connected in series-parallel. The check valves cannot be controlled manually or by the GPC.

The valve's normal operating pressure is 355 psig, with a maximum of 370 psig.

3.1.2 Propellant Storage and Distribution Subsystem

The propellant subsystem distributes the fuel and oxidizer to the thrusters. This subsystem consists of propellant tanks, pressure relief valves, tank isolation valves, crossfeed valves, manifold isolation valves, and the lines and couplings necessary for filling, draining, and distributing the propellant.

3.1.2.a Propellant Tanks

Each RCS module contains two titanium 39.2-inch spherical propellant tanks, one for fuel and one for oxidizer (Figure 12). Each tank contains an internally-mounted surface-tension screen Propellant Acquisition Device (PAD) which acquires and delivers the propellant to the RCS thrusters on demand. The surface-tension device also prevents the helium pressurant gas from entering the propellant or the propellant distribution lines prior to propellant depletion. The forward propellant tanks have PADs which are designed to operate primarily in a low-g environment. The aft propellant tanks are designed to operate in both high and low-g regimes.

3.1.2.b Pressure Relief Valve Assembly

The helium pressure relief valve assembly is located between each check valve assembly and the propellant tank, and will vent excess pressure overboard before it can over pressurize the propellant tanks (Figure 13). The assembly consists of a burst diaphragm, filter, and relief valve. The burst diaphragm is of the non-fragmentation type, but the filter is further insurance that fragmentation or particles will not reach the relief valve seat. The relief valve cannot be controlled manually or by the GPC.

The burst disk ruptures at 332 psig. The relief valve reseats at 310 psig.

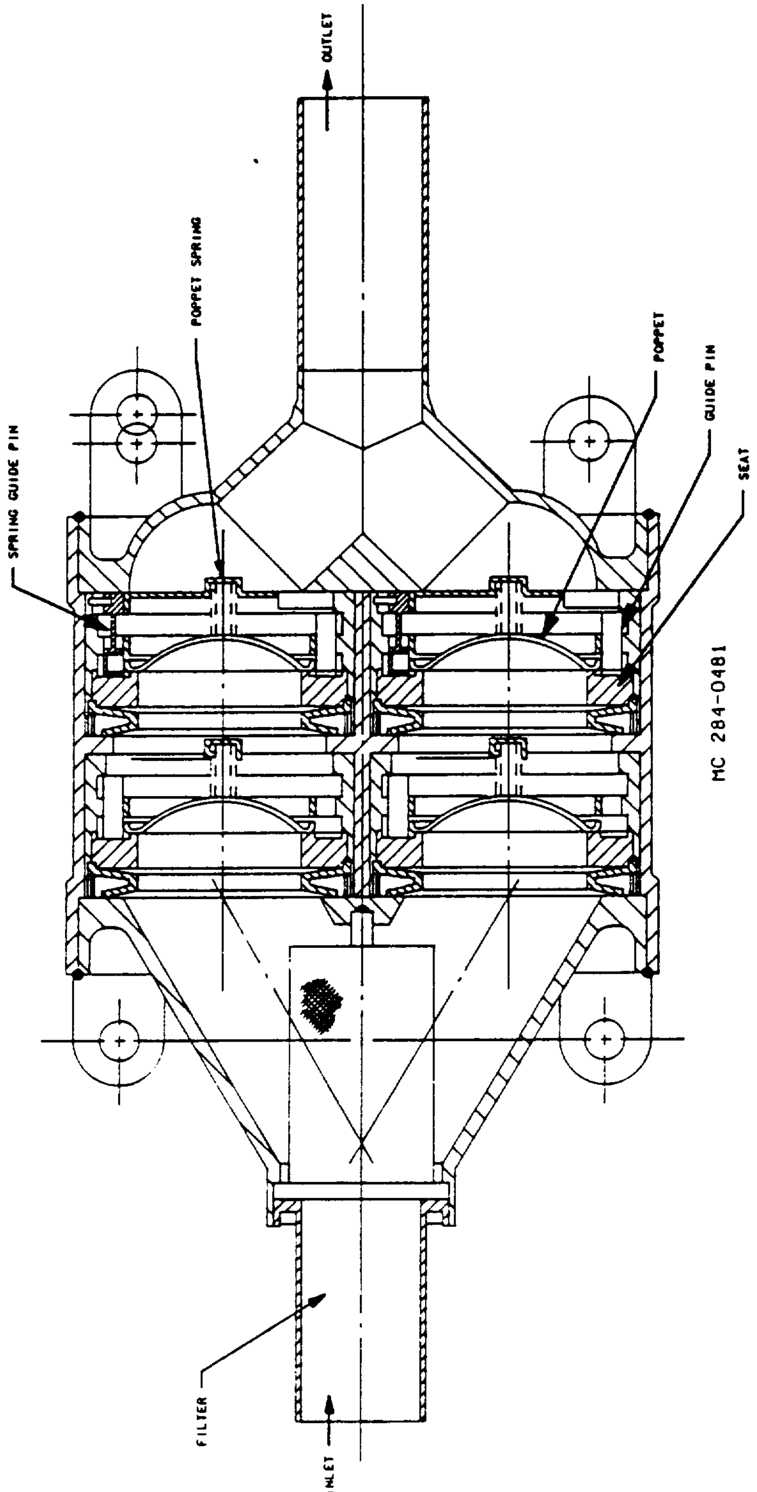
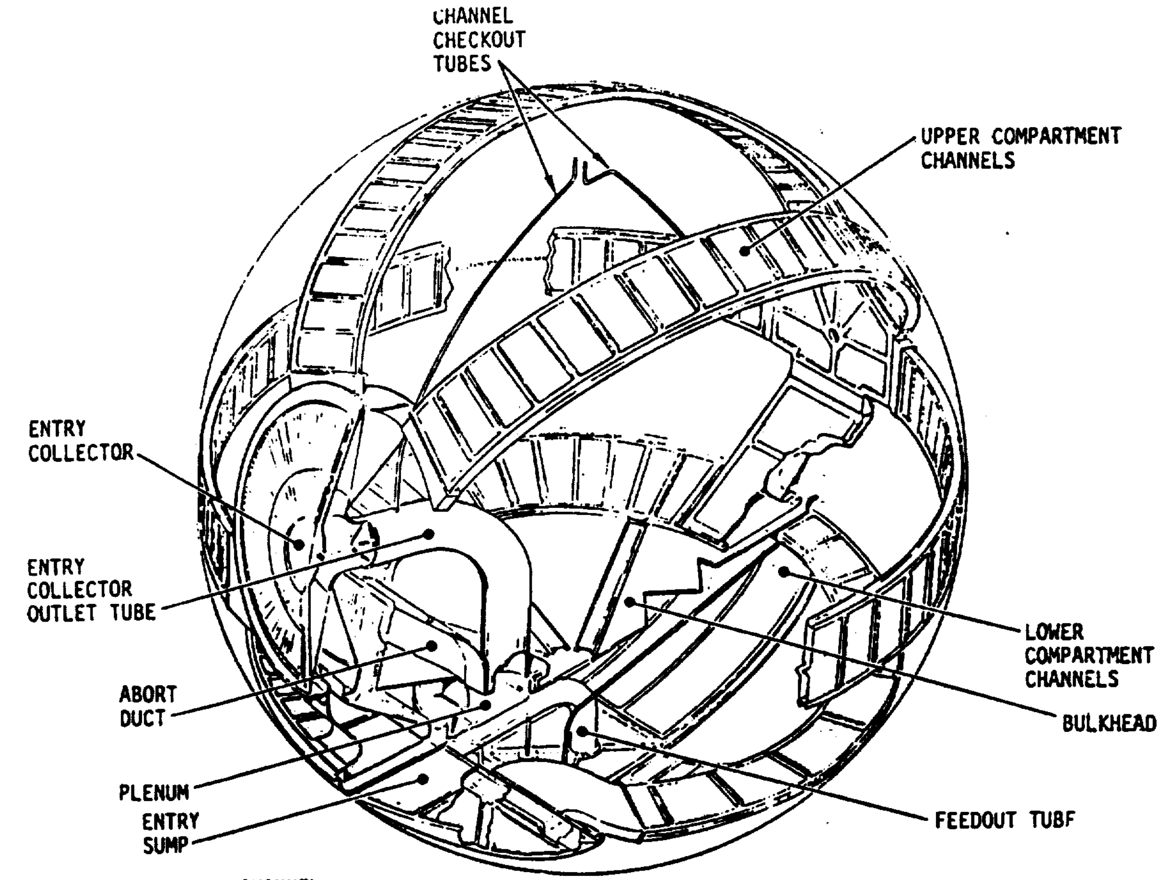


Figure 11 - QUAD CHECK VALVE ASSEMBLY



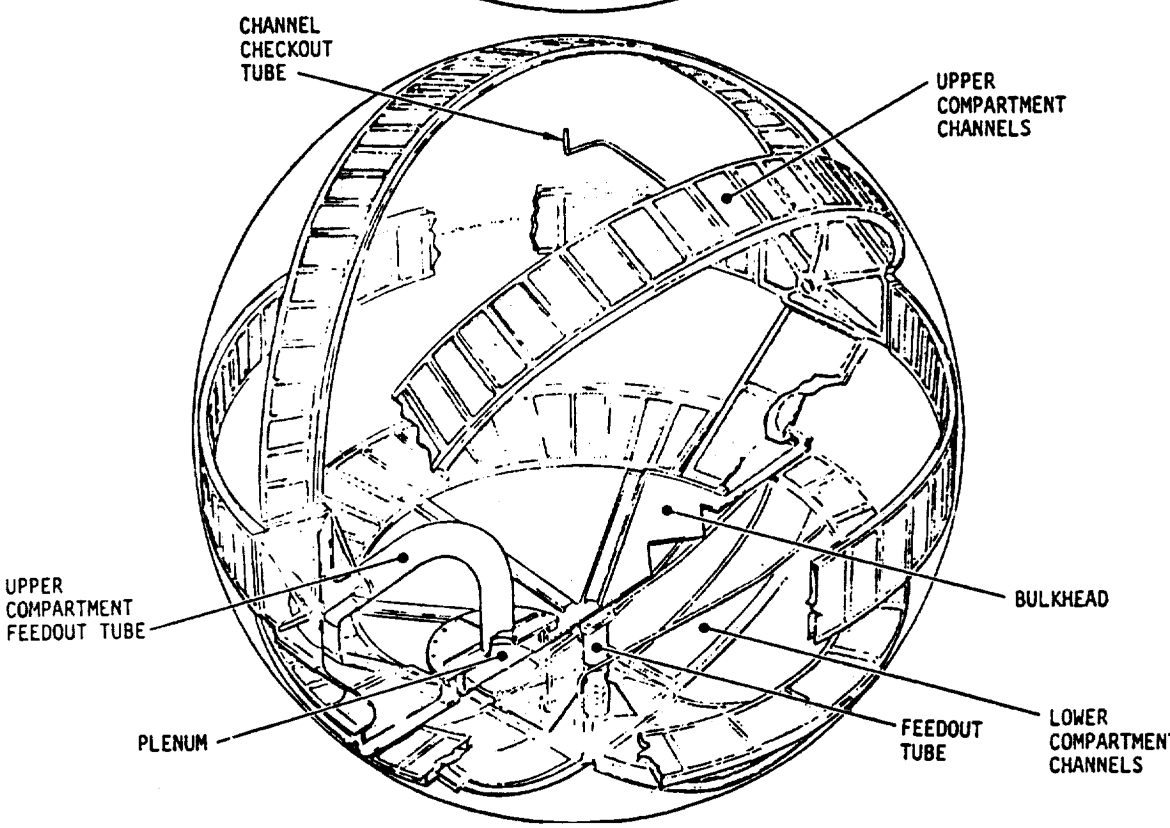


Figure 12 - AFT AND FORWARD RCS PROPELLANT TANKS

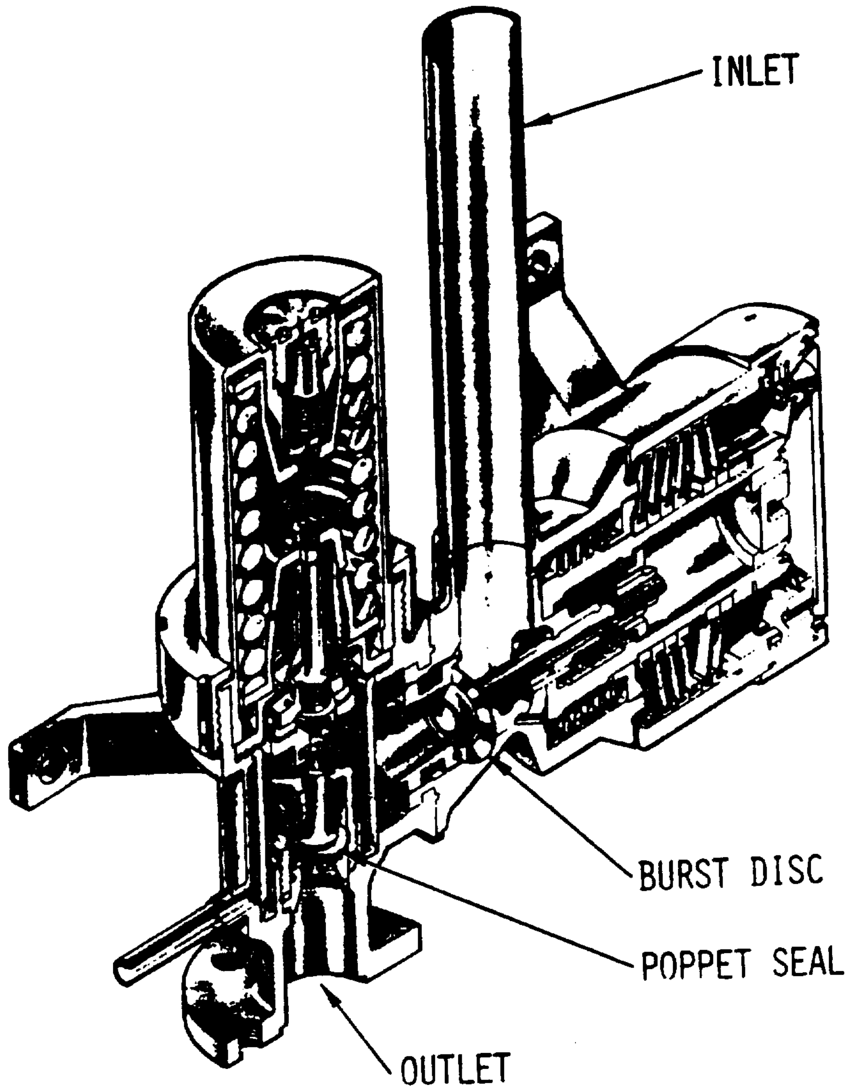


Figure 13 - PRESSURE RELIEF VALVE ASSEMBLY

3.1.2.c Tank Isolation, Crossfeed, and Manifold 1/2/3/4 Isolation Valves

The RCS propellant tank isolation, crossfeed, and manifold 1/2/3/4 isolation valves are all AC motor valves. Once a valve reaches the open or closed position, an open or close microswitch is automatically closed to remove AC power from the valve motor. A signal is also sent to the GPC, to the ground, and to the valve position indicator (talkback), located above each switch. The talkback logic displays barberpole when the valves are in motion or when there is a position mismatch between the fuel and the oxidizer valves. Otherwise, the talkback shows "OP" for open valves and "CL" for closed valves.

The tank isolation valves are located between the propellant tanks and the manifold isolation valves, and are used to isolate the propellant tanks from the remainder of the subsystem (Figure 14).

The tank isolation valves are AC motor-operated and contain a lift-off ball-flow control device. For each module, one valve isolates each propellant tank from the 1/2 manifold. Two valves in parallel isolate each propellant tank from the 3/4/5 manifold line in the aft modules, and one valve isolates each propellant tank from the 3/4/5 manifold line in the forward module.

The tank isolation valves are controlled by the FWD RCS, AFT LEFT RCS, and AFT RIGHT RCS TANK ISOLATION 1/2 and 3/4/5 switches on panels O7 and O8. These are permanent position switches (OPEN, GPC, CLOSE). Switch logic, relay logic, and motor logic for the isolation valves are contained in the Forward and Aft Motor Control Assemblies (FMCA and AMCA). Therefore, it is necessary to have the MCAs powered up to operate the tank isolation valves.

The tank isolation valves are normally maintained open throughout the mission with the switch in the GPC position. With the switch in the GPC position, the logic in the MCA is designed to receive computer commands to control the valves. The GPC reconfigures the aft tank isolation valves and the RCS and OMS crossfeed valves in case of OMS-to-RCS interconnect, or for RCS/RCS crossfeed operations. Manual configuration is required in the case of manual RCS/RCS crossfeed and on orbit/deorbit OMS-to-RCS interconnect. In the event of a switch failure in the GPC position, the crew can open or close the valves using GPC memory read/write procedures.

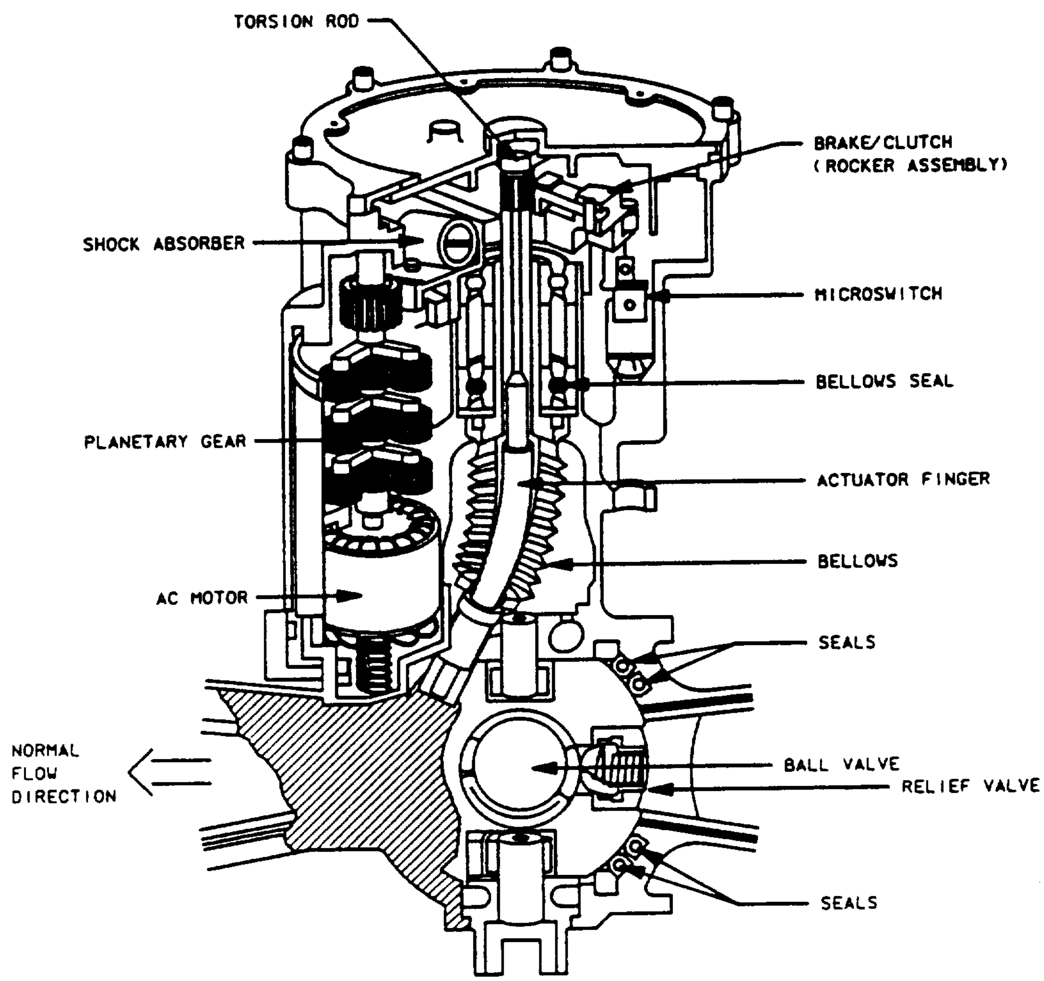


Figure 14 - AC MOTOR VALVE

The RCS crossfeed valves are contained only in the ARCS pods, and are used to isolate the RCS propellant cross-feed lines from the OMS interconnect lines (Figure 14). They are located between the tank isolation valves and the manifold isolation valves.

The RCS crossfeed valves are AC motor-operated and contain a lift-off ball-flow control device. One pair of valves, one fuel and one oxidizer valve, isolate the RCS crossfeed lines from the 1/2 propellant lines. One pair of valves isolate the RCS crossfeed lines from the 3/4/5 propellant lines. The RCS crossfeed valves are controlled by the LEFT, RIGHT RCS CROSSFEED 1/2 and 3/4/5 switches on panel O9. These are permanent position switches (OPEN, GPC, CLOSE). Switch logic, relay logic, and motor logic for the isolation valves are contained in the AMCA. Therefore, it is necessary to have the MCAs powered up to operate the RCS crossfeed valves.

The RCS crossfeed valves are normally maintained closed throughout the mission, with the switch in the GPC position. With the switch in the GPC position, the logic in the MCA is designed to receive computer commands to control the valves. The GPC reconfigures these valves, the OMS crossfeed valves, and the tank isolation valves in case of OMS-to-RCS interconnect during aborts, or for RCS/RCS crossfeed operations. Manual configuration is required in the case of manual RCS/RCS crossfeed and on orbit/deorbit OMS-to-RCS interconnect. In the event of a switch failure in the GPC position, the crew can open or close the valves using GPC memory read/write procedures.

The primary manifold isolation valves are located between the tank isolation valves, downstream of the RCS crossfeed valves, and the primary thrusters (Figure 14). They are used to isolate the primary thrusters from the propellant subsystem.

The primary manifold isolation valves are AC motor-operated and contain a lift-off ball flow control device. For each module, one valve isolates each manifold from each propellant. The primary manifold isolation valves are controlled by the FWD RCS, AFT LEFT RCS, and AFT RIGHT RCS MANIFOLD ISOLATION 1, 2, 3, and 4 switches on panels O7 and O8. These are permanent position switches (OPEN, GPC, CLOSE). Switch logic, relay logic, and motor logic for the isolation valves are contained in the FMCA and AMCA. Therefore, it is necessary to have the MCAs powered up to operate the manifold isolation valves.

Redundancy Management (RM) is used to monitor the microswitches in these valves, and can cause the valves to be declared closed, and the jets on that manifold to be removed from the Jet Available Table. The crew can override the RM by CRT keyboard entries and reselect the manifold and its jets.

The primary manifold isolation valves are normally maintained open throughout ascent and entry, with the switch in the GPC position. With the switch in the GPC position, the logic in the MCA is designed to receive computer commands to control the valves. These valves are controlled by the GPC during aborts and are controlled by RM at all times. In the event of a switch failure in the GPC position, the crew can open or close the valves using GPC memory read/write procedures.

3.1.2.d Vernier Manifold Isolation Valves

The vernier manifold isolation valves are located between the tank isolation valves, downstream of the RCS crossfeed valves, and the vernier thrusters (Figure 15). They are used to isolate the thrusters from the propellant subsystem.

The vernier manifold isolation valves are DC solenoid operated. One valve isolates each vernier manifold from each propellant. The manifold isolation valves are controlled by the FWD RCS, AFT LEFT RCS, and AFT RIGHT RCS MANIFOLD 5 ISOLATION switches on panels O7 and O8. These are permanent position switches (OPEN, GPC, CLOSE). Switch logic for the vernier manifold valves is contained in the FLCA and ALCA. Solenoid logic and power logic is provided by the Power Control Assemblies (PCAs). Therefore, it is necessary to have the LCAs powered up to operate the manifold isolation valves.

Once a valve reaches the open or closed position, a microswitch is automatically closed to remove DC power from the valve solenoid. A signal is also sent to the GPC, to the ground, and to the valve position indicator (talkback) located above each switch. The talkback logic displays barberpole when the valves are in motion or when there is a position mismatch between the fuel and the oxidizer valves. Otherwise, the talkback shows "OP" for open valves and "CL" for closed valves. Redundancy Management (RM) is used to monitor the microswitches in these valves, and can cause the valves to be declared closed, and the vernier jets to be deselected. The crew can override the RM by CRT keyboard entries and reselect the vernier jets.

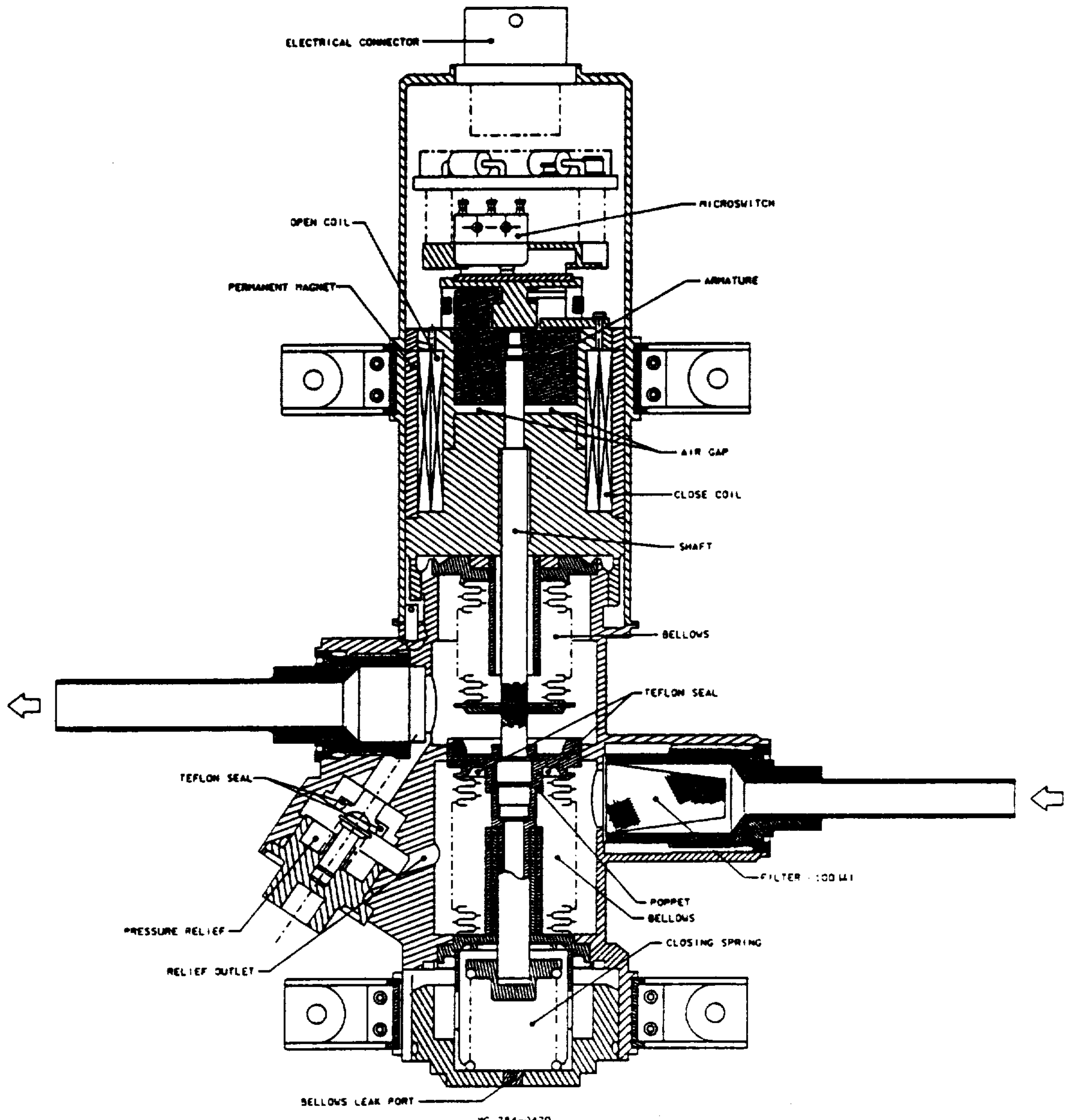


Figure 15 - VERNIER MANIFOLD ISOLATION VALVE

The vernier manifold isolation valves are normally maintained open throughout orbit and closed during ascent and entry, with the switch in the GPC position. With the switch in the GPC position, the logic in the LCAs and PCAs is set up to receive computer commands to control the valves. The GPC controls these valves by RM at all times. In the event of a switch failure in the GPC position, the crew can open or close the valves using the GPC memory read/write procedures.

3.1.3 Thruster Subsystem

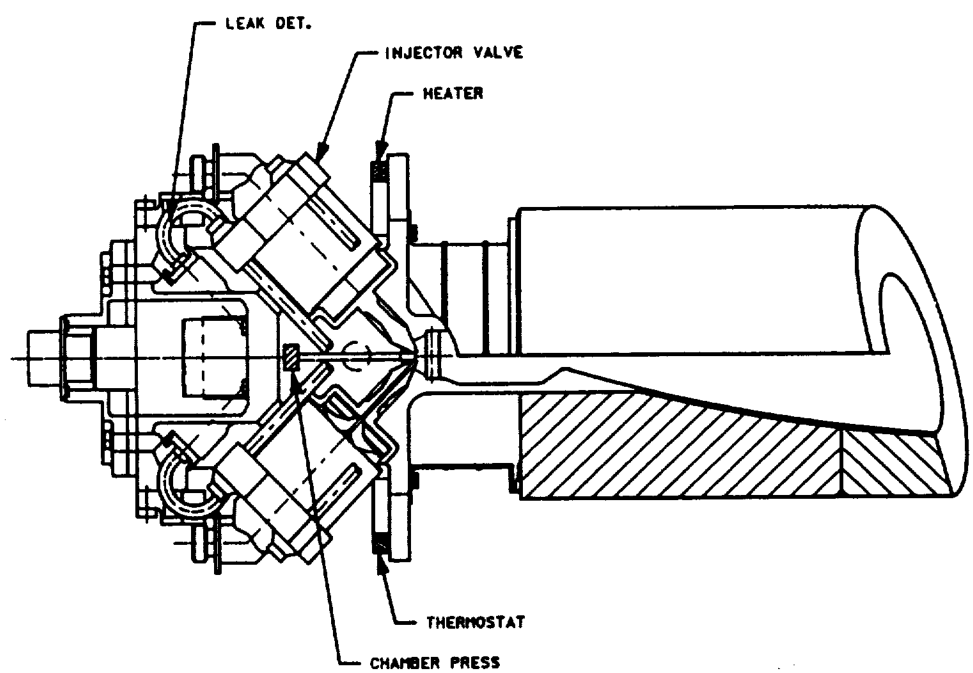
The RCS jet thrusters are pressure-fed, bipropellant, hypergolic engines. There are two types of thrusters in the Shuttle: the primary thrusters, and the vernier thrusters (Figure 16). Both types of thrusters contain a fuel and oxidizer bipropellant solenoid valve, injector head assembly, combustion chamber, expansion nozzle, and an electrical junction box and can be operated in either pulse mode or steady-state mode.

3.1.3.a Bipropellant Valves

The bipropellant control valves control the flow of propellants to the thrusters by opening and closing in response to electrical fire commands (Figure 17). Each primary jet engine assembly contains two injector solenoid pilot poppet valves, one for fuel and one for oxidizer. They are operated by coaxially-wound coils which are energized open by a fire command, and are spring-loaded closed. When the pilot valves open, the propellant's hydraulic pressure opens the main poppet valves to allow the propellants into the injector. The vernier jets use single-stage, solenoid-operated poppet valves.

The fuel and oxidizer valves on the primary jet thrusters are mechanically linked. The pilot valve is activated by a 80 msec pulse sent from the Reaction Jet Driver. Commands are issued every 80 msec, so the minimum on or off time is 80 msec. The vernier bipropellant valves are operated similarly by a mechanically linked torque motor.

During normal operations, if the isolation and manifold valves are properly configured, a fire command to a jet will cause that jet's bipropellant valves to open. Removal of the fire command will cause the bipropellant valves to close.



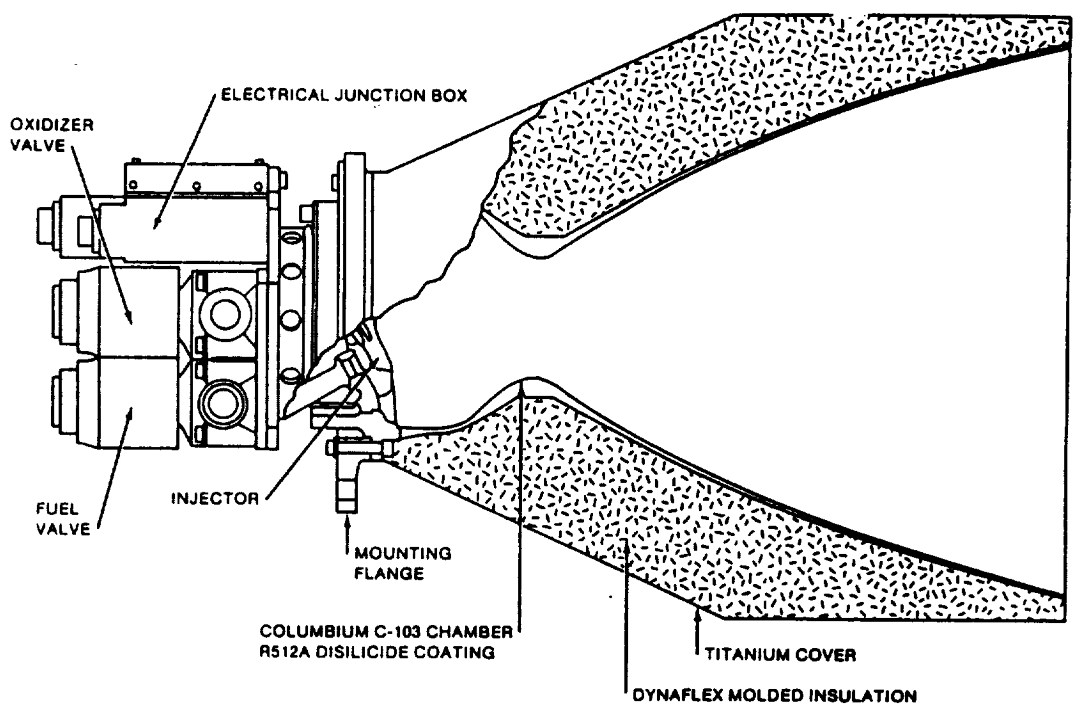
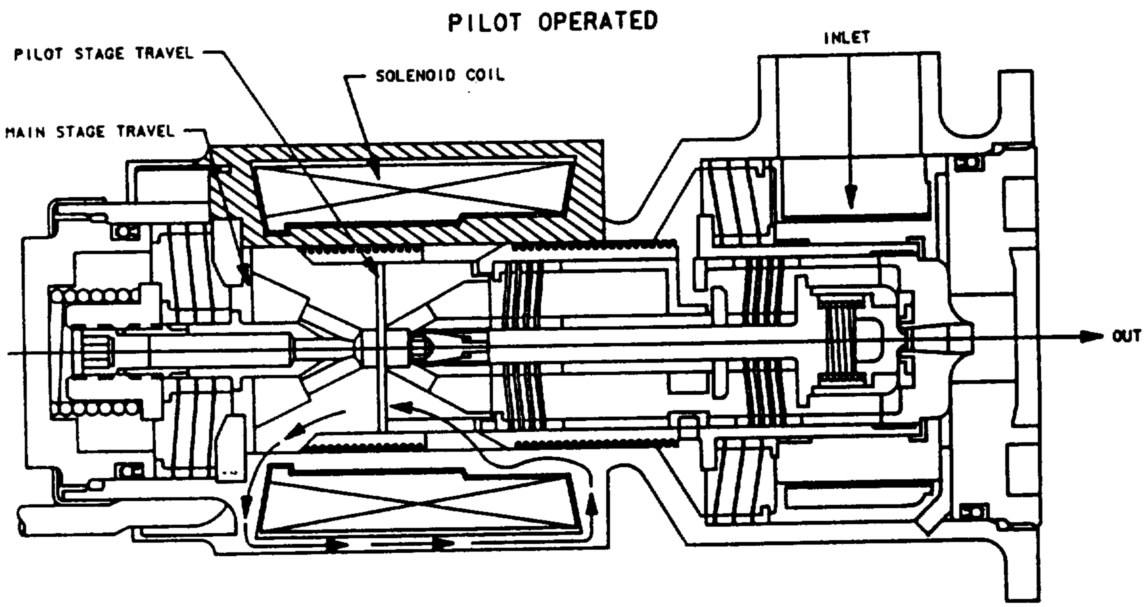


Figure 16 - VERNIER AND PRIMARY THRUSTERS



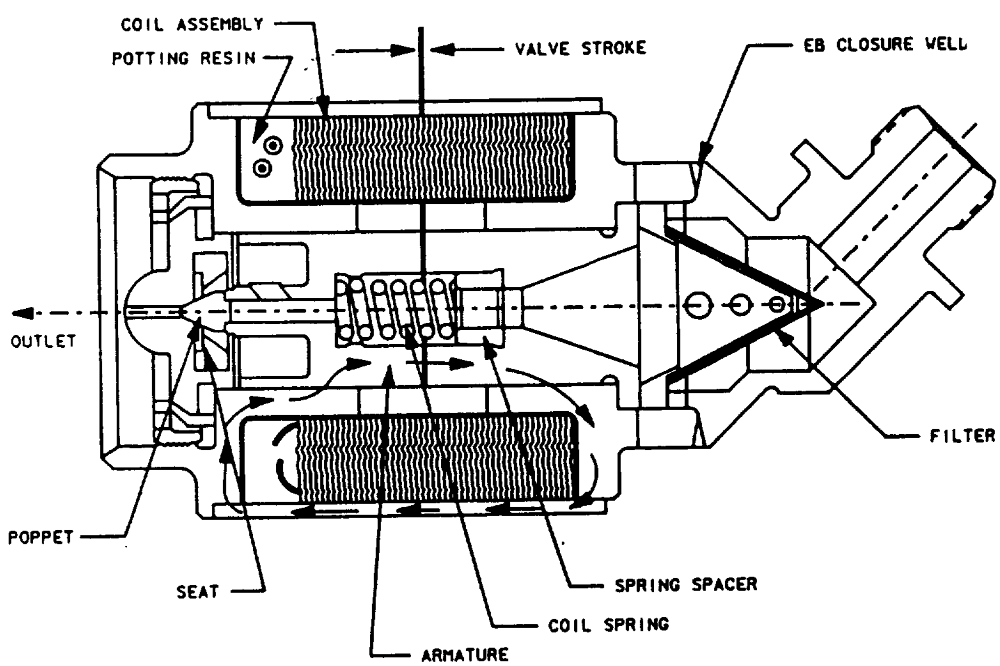


Figure 17 - PRIMARY AND VERNIER THRUSTER VALVES

3.1.3.b Injector Head Assembly

Each RCS jet contains an injector head assembly which directs the propellant flow from the bipropellant control valves to the combustion chamber (Figure 18). The injector is welded to the combustion chamber.

For the primary jets, injector holes are arranged in two concentric rings (outer fuel, inner oxidizer) which are canted to cause impingment of the hypergolic propellants within the combustion chamber. Separate fuel holes near the outer edge of the injector plate provide cooling for the combustion chamber wall. Spaced between these fuel inlet holes are acoustic cavities which are of varied depth to prevent acoustic resonance when the jet is fired.

For the vernier jets, fuel and oxidizer enter the combustion chamber through a single pair of injector holes which are also canted to provide impingment of the fuel and oxidizer streams for combustion. The combustion chamber wall is cooled by making the fuel stream more divergent than the oxidizer stream.

Unlike stream impingment is used to improve propellant mixing in the combustion chamber with a mixture ratio of 1.6 lbs oxidizer to 1.0 lbs fuel for both the primary and vernier jets.

The primary jets operate at 152 psia, produce 870 lbs (vacuum) thrust, and have a specific impulse of 280 seconds. The vernier jets operate at 106 psia, produce 25 lbs (vacuum) thrust, and have a specific impulse of 265 seconds.

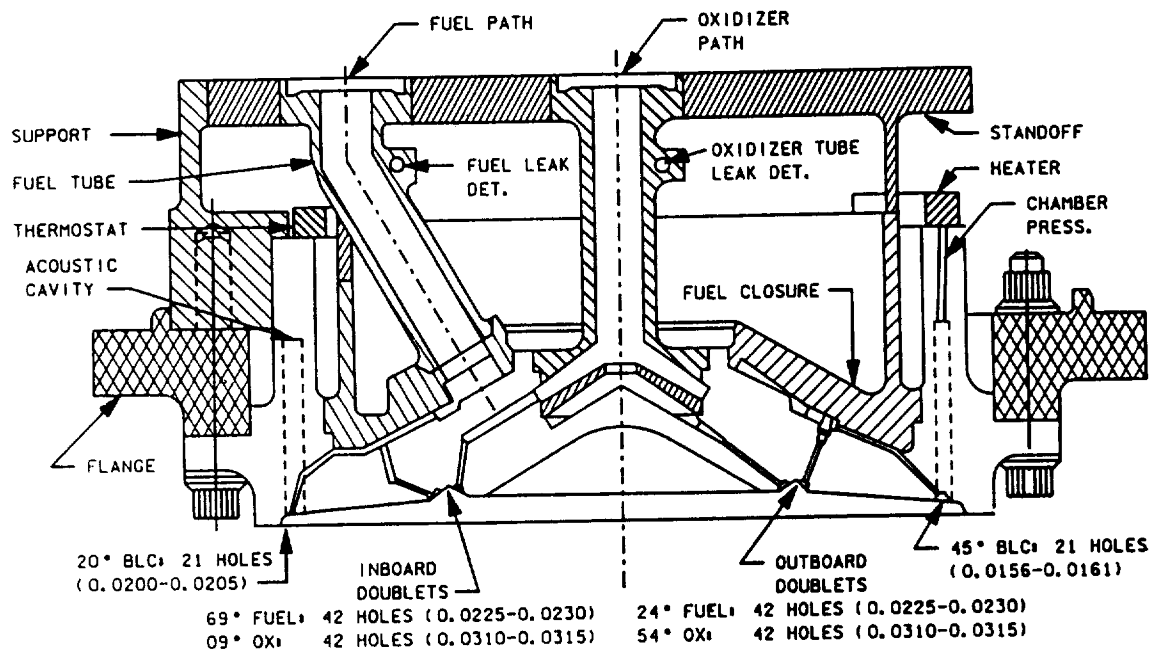
3.1.3.c Combustion Chamber and Nozzle

The combustion chamber and nozzle are made of columbium C-103 with a R512A Disilicide coating 0.003-inches thick. Behind the columbium is Dynaflex molded insulation covered with 0.02-inch thick titanium on the outside.

3.1.4 Electrical Power Distribution and Control Subsystem

3.1.4.a Electrical Junction Box

The electrical junction box on each RCS thruster contains an electric heater and thermostat, a chamber pressure transducer, a propellant leak detection device, and the electrical connections to the bipropellant valves. The electrical heater contains one heating element and is thermostatically controlled.



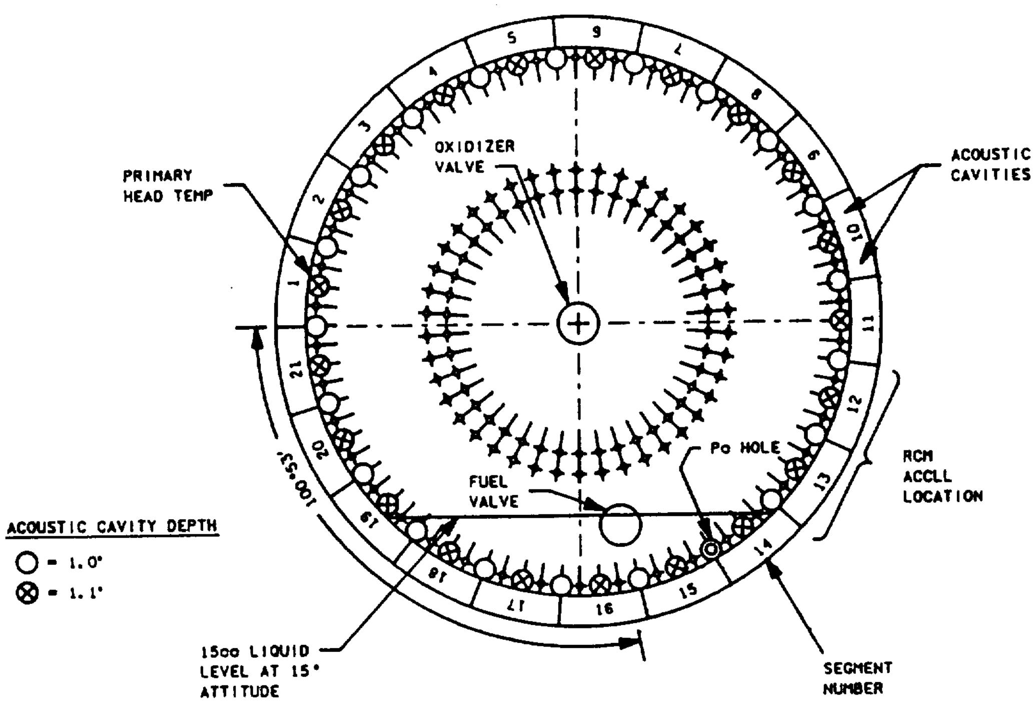


Figure 18 - INJECTOR HEAD ASSEMBLY

The thermostat is set to a predetermined range, and will regulate the on and off cycles of the heater as long as voltage is present. The heaters are controlled by the RCS/OMS HEATERS switches on panel A14. These are two-position switches, OFF and AUTO, and the heater is controlled by the thermostat when this switch is in the AUTO position.

3.2 Redundancy Management

The RCS Redundancy Management (RM) monitors the RCS jets' chamber pressures, temperatures, reaction jet driver output discretes and jet fire commands, and manifold valves status. It also provides a limited amount of automatic jet deselection and alerts the crew when a fault is detected.

The Data Processing System (DPS) software provides status information on I/O errors to the RCS RM software, referred to as commfaults (communications faults). Commfault indicators are set as the result of bus masking, Bus Control Element (BCE) bypasses, and Bus Terminal Unit (BTU) bypasses. When an I/O error is detected on a BCE chain by any GPC, the data on the entire chain is flagged as invalid (commfaulted) for the applications software. On subsequent transactions, if the problem is isolated, only the faulty element is flagged as invalid. In a similar way, if a bus mask is set all BCEs and data associated with that bus is indicated via commfault as being in error. In any case, the commfault will be set or latched when it is present for two consecutive passes.

Commfaults are included in the RCS RM requirements to help prevent the redundant GPCs from moding to dissimilar software, to optimize the number of jets available for use, and to prevent the RCS RM from generating additional alerts to the Flight Control Operational Software (FCOS) generated alerts associated with commfaults. The RCS RM uses the MDM and Line Replaceable Unit (LRU) commfaults (where LRU is defined to be either one RCS jet or one RCS manifold), and will reconfigure for commfaults, regardless of whether the commfault is permanent, permanent and subsequently removed, or transient. The MDM and LRU commfaults are set in the FCOS software when a commfault is present for two cycles. There are 44 jet LRU commfaults and 15 manifold LRU commfaults.

All input signals associated with any one LRU (where LRU is defined as either one RCS jet or one RCS manifold) will be within the same BCE, and the FCOS will set a BCE flag for a BCE if it determines an I/O problem at the BCE level. This flag will be used by the manifold status monitor in determining the commfault state of the RCS LRU, and/or input signals for the LRU. A jet with an LRU commfault will not have any of its status flags or counters modified as long as the fault exists, except by subsequent crew action. An MDM commfault will set all LRU commfaults for each BCE associated with the MDM commfault, thus suspending the operation of the RCS RM failure monitors. An I/O reset on a CRT keyboard will reset any latched commfaults. LRU commfaults or transducer failures will cause the quantity monitor to use substitute measurements or constants, and the CRTs will shown on "M" to indicate missing data. If a substitute is not available or a constant is used, the calculations are suspended, a down arrow appears on the CRT, and a class 3 alarm is output.

All input signals associated with an LRU are required to be within the same BCE. The input signals associated with each RCS jet are a chamber pressure discrete, fuel and oxidizer injector temperatures, and reaction jet driver output discrete. The input signals associated with each manifold are the open and close discretes for the fuel and oxidizer manifold isolation valves.

3.2.1 Jet Failed-On Monitor

The Jet Failed Monitor uses the Reaction Jet Driver (RJD) output discretes and the jet fire command discretes provided by the RCS CMD SOP to detect jets failed on.

The Jet Failed-On Monitor uses the jet fire command A discretes, the reaction jet driver output discretes, the jet RM inhibit discretes, and the jet LRU commfault discretes as inputs, and outputs the jet failed-on indicator discretes and the jet failed on counter discretes. There are 44 of each of these discretes.

The Jet Failed-On Monitor's logic ANDs the reaction jet driver output discrete with the complement of the jet fire command A discrete, and declares the jet failed-on if this calculation is true for three consecutive cycles. Consecutive passes are not affected by commfaults or by cycles in which there are fire commands for the affected jets. The three consecutive cycle logic will be reset; however, if the noncommanded jet has its reaction jet driver output discrete reset to indicate the jet is not firing. A jet failed-on declaration will not cause automatic deselection of the jet by RM, nor will the Digital Autopilot (DAP) reconfigure the Jet Priority Table.

A jet failed-on determination will set the jet failed-on indicator discrete and the jet failed-on counter discrete. These discretes will be reset when the associated jet's RM inhibit discrete is reset. The Jet Failed-On Monitor outputs the jet failed-on indicators to displays and controls and to the Jet Fault Limit Module.

The Jet Failed-On Monitor's design is valid for a minimum jet fire command pulse of 80 msec on and 80 msec off. The crew will be alerted by a class 2 alarm, the backup C&W

lights and RCS jet light on the C&W matrix on panel F7, a fault message on the CRT fault message line, and jet-on indications on the RCS SPEC display and the GNC SYS SUM 1 and 2 displays.

The Jet Failed-On Monitor is active in OPS 1, 2, 3, 6, and 8 in the PASS, and 1, 3, and 6 for the BFS, but only if BFS is engaged.

3.2.2 Jet Failed-Off Monitor

The Jet Failed-Off Monitor uses the jet fire command discretes provided by the RCS Command SOP, and the jet chamber pressure feedback discretes provided by the RJDs to detect jets failed off.

The Jet Failed-Off Monitor uses the jet fire command A discretes, the jet chamber pressure discretes, the jet RM inhibit discretes, and the jet LRU commfault discretes as inputs, and outputs the jet failed-off indicator discretes and the jet failed-off counter discretes. There are 44 of each of these discretes.

The Jet Failed-Off Monitor's logic ANDs the jet fire command A discrete with the complement of the jet chamber pressure discrete, and declares the jet failed off if this calculation is true for three consecutive cycles. Consecutive passes are not affected by commfaults or by cycles in which there are no fire commands for the affected jets. However, consecutive passes leading to a failed-off indication must begin anew if, prior to reaching the third consecutive cycle, the fire command and its associated pressure discrete indicates that the jet has fired. The RCS RM will automatically deselect a jet which has failed off, and the DAP will reconfigure jet selection accordingly. (See section 3.6.1 for the DAP Jet Select Logic description.)

A failed-off jet determination will set the associated jet failed-off indicator and the jet failed-off counter discretes. These discretes will be reset when the associated jet's RM inhibit discrete is reset. The Jet Failed-Off Monitor outputs these jet failed-off indicator discretes to the Jet Fault Limit Module and to displays and controls. The Jet Failed-Off Monitor will be inhibited for the jet which has failed off until the crew resets the RM inhibit discrete.

The Jet Failed-Off Monitor design is valid for a minimum jet fire command pulse mode of 80 msec on and 80 msec off. The crew is alerted to a failure by a class 2 alarm, the backup C&W light and RCS jet light on the C&W matrix on panel F7, a fault message on the CRT fault message line, and a jet-off indication on the RCS SPEC display and the GNC SYS SUM 1 and 2 displays. The Jet Failed Off Monitor is active in OPS 2, 3, 6, and 8 in the PASS, and 1, 3, and 6 for the BFS, but only if BFS is engaged.

3.2.3 Jet Leak Monitor

The Jet Leak Monitor uses the jet fuel and oxidizer injector temperature transducer outputs of each jet to detect a leaking jet.

The Jet Leak Monitor uses the jet fuel and oxidizer injector temperatures, the jet RM inhibit discretes, and the jet LRU commfault discretes as inputs, and outputs the jet failed leak indicator discretes and the jet failed leak counter discretes. There are 44 of each of these discretes.

The Jet Leak Monitor's Logic compares the jet fuel and oxidizer injector temperatures with the specified temperature limit of 30 degrees F, and declares the Jet Failed Leak if either of the temperatures are less than 30 degrees F for three consecutive cycles. Consecutive passes leading to a Jet Failed Leak indication will begin anew if the fuel and oxidizer temperatures are both greater than 30 degrees F before the jet leak counter reaches three. The RCS RM will automatically deselect a jet which is declared leaking and the DAP will reconfigure jet selection accordingly.

A Jet Failed Leak determination will set the associated jet failed leak indicator and jet failed leak counter discretes. These discretes will be reset when the associated jets RM inhibit discrete is reset. The Jet Leak Monitor outputs the Jet Failed Leak indicator discretes to the Jet Fault Limit Module and to crew displays.

The crew is alerted to a failure by a class 2 alarm, the backup C&W light and the RCS jet light on the C&W matrix on panel F7, a fault message on the CRT fault message line, and a Jet Failed Leak indication on the RCS SPEC display and the GNC SYS SUM 1 and 2 displays.

The Jet Leak Monitor is active in OPS 2, 3, and 8 for the PASS, and 1, 3, and 6 for the BFS, but only if BFS is engaged.

3.2.4 Jet Fault Limit Module

The Jet Fault Limit module limits the number of jets which can be automatically deselected in response to failures detected by RCS RM. The limits are modifiable by crew input on the RCS SPEC display (RCS F, L, R Jet Fail Limit integers - one integer per pod). This module also reconfigures a jet's availability status (jet deselect output discretes

(44)) in response to crew inputs on the RCS SPEC display (jet RM inhibit discretes (44) and jet deselect input discretes (44)).

An automatic deselection of a jet occurs if all of the following are satisfied:

- o Jet Failed-Off or Jet Failed Leak (Jet Failed-On failures do not result in automatic deselection)
- o Jet select/deselect status is "SELECT"
- o Jet's manifold status is "OPEN"
- o RM is not inhibited for this jet
- o Jet failure has not been overridden
- o The number of automatic deselections of primary jets on this pod is less than the associated Jet Fail Limit (no limit on vernier jets)

All jet failures detected will be announced to the crew even if they do not cause automatic jet deselection. If multiple failures occur on a jet, only the last failure will be annunciated. Failure indicators are the same as in the Jet Failed Off and Jet Failed Leak Monitors.

The jet fail limit counter is incremented by the number of jets which have been automatically deselected for that pod by the RCS RM and is decremented by one for each automatically deselected jet that is reselected. The vernier jets do not increment or decrement the jet fail limit counter. The Jet Fail Limit valves are individually changeable in major modes 2 and 3 on the RCS SPEC display. An increase in the Jet Fail Limit allows previously failed jets to be deselected, providing the above requirements are met. A descrease in the Jet Fail Limit will not cause a change in the status of any jet. Note that setting the Jet Fail Limit equal to or less than the number of jets which have been automatically deselected will effectively inhibit the RCS RM for that pod.

A jet's status can be changed from deselect to select only by item entry on the RCS SPEC page. Failure resets or reductions in the Jet Fail Limit will not cause the status to be reset to select. The select item entries cause the override to be invoked if there is a declared failure for that jet, and will make those failures inoperative in the Jet Fault Limit module. An overridden failure will remain overridden until the applicable failure is reset.

Automatic deselection of a jet can be prevented by the use of the Inhibit item entries on the RCS SPEC page. Changing the Inhibit to Not Inhibited will reset a jet's failures, but will not cause the Jet Fail Limit to be incremented or decremented. Reset by use of the RM Inhibit of a failure which has been overridden will reset the override. Jet failures are unordered; that is, if there are more candidates for automatic deselection than is permitted by the

Jet Fail Limit, there is no preference as to which of the candidates will be deselected.

3.2.5 Manifold Status Monitor

The Manifold Status Monitor uses the open and close discretes of the oxidizer and fuel manifold isolation valves (provided by the monitor control assemblies) to determine the open/close status for each jet manifold.

The Manifold Status Monitor uses the fuel and oxidizer manifold valve open discretes (15 of each discrete), the fuel and oxidizer close discretes (15 of each), the manifold status discrete (15 discretes), the manifold LRU commfault discretes (15 discretes), the MDM commfault discretes (8 discretes), and the manifold status override discrete (one discrete) as inputs, and outputs the manifold open/close status discretes (15 discretes), the RCS manifold RM dilemma discretes (15 discretes), and the RM power fail discrete (one discrete).

The Manifold Status Monitor monitors the open and close discretes for each manifold for any changes of state. A change of state in any one or more of these discretes will cause a redetermination of that manifold's open/close status, independent of status changes made by the crew. This redetermination also contains logic which will determine if a power failure has occurred and will determine whether a dilemma exists on a manifold (tables 3-I and 3-II). A power failure condition exists when all of the open and close discretes on a manifold are false for three consecutive cycles, and will cause the RM Power Fail Flag to be set. The manifold sets identified in Table 3-II are the only manifolds which require power failure determination. This flag will remain set until the GNC FDA module honors it, when it will then be reset. There is only one RM Power Fail Flag and all manifolds are capable of setting it, but each can set the flag only once. Whenever a dilemma exists for three consecutive passes, the RCS manifold RM Dilemma Flag for that manifold will be set. MDM or LRU commfaults will not modify the dilemma pass counter or the RM Dilemma Flag. The flag will be reset, however, if any of the four manifold open/close discretes change state.

TABLE 3-I - MANIFOLD STATUS

LOGICAL STATE OF:					MANIFOLD STATUS	RCS MANIFOLD RM DILEMMA
INPUT OPEN		DISCRETES CLOSE				
Fuel	Ox.	Fuel	Ox.	POWER FAILURE		
0	0	0	0	Yes	(Previous)	No
0	0	0	0	No	Close	No
0	0	0	1	N/A	Close	No
0	0	1	0	N/A	Close	No
0	0	1	1	N/A	Close	No
0	1	0	0	N/A	Close	Yes
0	1	0	1	N/A	Close	Yes
0	1	1	0	N/A	Close	Yes
0	1	1	1	N/A	Close	No
1	0	0	0	N/A	Close	Yes
1	0	0	1	N/A	Close	Yes
1	0	1	0	N/A	Close	Yes
1	0	1	1	N/A	Close	No
1	1	0	0	N/A	Open	No
1	1	0	1	N/A	Open	No
1	1	1	0	N/A	Open	No
1	1	1	1	N/A	Close	Yes

The manifold status from the previous pass is to be maintained.

TABLE 3-II MANIFOLD SETS
FOR POWER FAILURE DETERMINATION

o Forward No. 3 and Forward No. 4
o Aft Left No. 1 and Aft Right No. 1
o Aft Left No. 2 and Aft Right No. 2
o Aft Left No. 3 and Aft Right No. 3
o Aft Left No. 4 and Aft Right No. 4

The transition of an MDM commfault discrete from false to true will cause the status of all affected manifolds to be set to close in all major modes. In major mode 1, the same is true of an LRU commfault. In major modes 2 and 3, the transition of an LRU commfault will cause no change in manifold statuses.

The crew is able to override the status of all manifolds on an individual basis by item entries on the RCS SPEC display via the Manifold Status Override. The setting of this discrete for a manifold will change the manifold's status to its complementary state and will then reset the discrete. The use of the Manifold Status Override feature will not inhibit or modify any of the other functions of the manifold status monitor. The module will continue to honor subsequent changes in the affected manifold's input signals (open/close discretes, commfaults, override discrete) as specified in this section.

The Manifold Close Status Override is used in Major Modes 1 and 3 open all manifolds whose status is closed and whose open/close discretes are in dilemma. This discrete can be set by item entry on the Override page, and will be reset to false after the reconfiguration is complete. The use of the Manifold Close Status Override feature will not inhibit or modify any of the other functions of the Manifold Status Monitor.

3.2.6 Available Jet Status Table

The Available Jet Status table module provides a list of jets available for use to the Jet Select Logic Module in the Flight Control System software.

The Available Jet Status Table uses the manifold open/close discretes (15 discretes) from the Manifold Status Monitor, and the jet deselect output discretes (44 discretes) from the Jet Fault Limit Module as inputs, and outputs the jet available discretes (44 discretes) and the jet status change discrete (one discrete).

The Available Jet Status Table's logic "AND"s the jet deselect output discrete with the manifold open/close status discrete and statuses a jet as available to the Flight Control System if the discretes indicate select and open, respectively. The Available Jet Status Table will be computed each time that the jet status change discrete is true.

In the BFS, jet failures are detected only when BFS is engaged. The Jet Failed Leaking and Jets Failed-Off detection in the BFS is the same as in the PASS, but the jet chamber pressure feedback discrete is used for Jet Fail-On detection in the BFS rather than the RJD output discrete which is used in the PASS.

3.3 Interfaces and Locations

The RCS interfaces with the following systems: Data Processing System, Displays and Controls, Caution and Warning, Orbital Maneuvering System, Electrical Power Distribution and Control, and the Pulse Code Modulator. In addition, the RCS interfaces with the crew.

3.3.1 Data Processing System

The RCS sends data consisting of pressures, temperatures, and valve positions to the Data Processing System (DPS) through the flight-critical Multiplexer Demultiplexers (MDMs) to have the data processed by the GPCs. The GPCs use this data to monitor and display the configuration and status of the RCS. The GPCs also provide valve configuration commands to the RCS and jet on/off commands to the RCS via the Reaction Jet Drivers Aft and Forward (RJDA and RJDF).

The Flight Control software uses the RCS Digital Automatic Pilot (DAP) to hold attitude or to accomplish an attitude maneuver by virtue of an error correction method. The State Estimator takes IMU data from the Attitude Processor software (ATT PROC), filters it, and sends it to a module called RCS Errors Phase Plane. In the RCS Errors module, attitude commands coming from the hand controller or from the Universal Pointing software (which runs the display by the same name) are compared with the actual attitude as computed by the State Estimator. The result is an attitude error and rate error which are passed on to the Phase Plane module. The Phase Plane Module generates positive or negative rate commands for each axis. These commands are sent to the RCS Activity Lights and to the Jet Select module.

The Jet Select Module uses a look-up table to determine how many jets are needed from each directional cluster. (A "directional cluster" is a group of jets located within the same pod, forward, left, or right, which provide thrust in the same axis and direction.) There are several such tables which take into account jet failures, propellant feed constraints, and usage of OMS propellant. A Jet Priority Table is used to determine the particular jets to be fired. Each jet in a directional cluster is assigned a priority permission. If RCS RM removes a jet from the Available Jet Status Table, the jet will be removed from the Jet Priority Table. Thus, the Jet Select Module logic will automatically select the next highest priority jet in that directional cluster. The crew has the capability to change a jet's priority on the Jet Priority Table or to override RM deselection of a jet from the Available Jet Status Table.

3.3.2 Displays and Controls

RCS data is sent to the Displays and Controls (D&C) to be displayed on dedicated displays. Switches and circuit breakers in the D&C panels are used for manual valve configuration and power routing to the RCS.

3.3.3 Caution and Warning

A selected portion of the RCS parameters are sent to the Caution and Warning (C&W) unit, where they are limit sensed to determine if RCS anomalies exist. If system anomalies are found, the C&W issues signals that illuminate the proper light on the C&W panel, the master alarm pushbutton indicators (pbis), and turn on the C&W tone.

3.3.4 Orbital Maneuvering System

The ARCS modules are connected with each other and with the OMS by propellant interconnect lines so that either or both OMS module's propellants can be fed to either or both of the ARCS modules.

3.3.5 Electrical Power Distribution and Control System

The Electrical Power Distribution and Control System (EPD&C) provides both AC and DC power to the RCS.

3.3.6 Pulse Code Modulator

Data from the RCS is routed through the Input/Output (I/O) MDMs to the Pulse Code Modulator (PCM) for incorporation in the telemetry downlink to be sent to the ground and to the onboard recorders.

3.3.7 Crew

The crew monitors and controls the RCS performance through CRT displays, fault messages, keyboard item entries, C&W indications, and associated switches and indicators.

3.4 Hierarchy

Figures 3 through 6 illustrate the hierarchy of the RCS hardware components. Figures 7 through 18 depict the functional details of the RCS subsystem components.

4.0 ANALYSIS RESULTS

Detailed analysis results for each of the identified failures are presented in Appendix C. Tables I and II present summaries of the failure criticalities for the three hardware subsystems of the forward and aft RCS, respectively. Tables III and IV present summaries of the failure criticalities for the Electrical Power Distribution and Control (EPD&C) subsystems of the forward and aft RCS, respectively. Further discussion of each of these subsystems and the applicable failure modes is provided in subsequent paragraphs. The RCS analysis hierarchy is illustrated in Figures 3 through 6.

Of the ninety-nine (99) forward RCS hardware failure modes analyzed, sixty-eight (68) were determined to be PCIs. Of the one hundred nine (109) aft RCS hardware failure modes analyzed, seventy-three (73) were determined to be PCIs. Summaries of the forward and aft RCS hardware PCIs are presented in Tables V and VI, respectively. Of the nine hundred ninety-four (994) forward RCS EPD&C failure modes analyzed, two hundred twenty-two (222) were determined to be PCIs. Of the one thousand seventy (1070) aft RCS EPD&C failure modes analyzed, two hundred twenty-seven (227) were determined to be PCIs. Summaries of the forward and aft RCS EPD&C PCIs are presented in tables VII and VIII, respectively.

Appendix D contains a cross reference between each PCI and analysis worksheet in Appendix C.

TABLE I Summary of IOA Failure Modes and Criticalities (FRCS HW)

Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
HE PRESS SUBSYSTEM							
STORAGE TANK	1	-	-	-	-	-	1
TANK ISOLATION VALVES	-	1	-	1	-	-	2
REGULATOR ASSEMBLIES	-	5	-	1	-	-	6
QUAD CHECK VALVE ASSEMBLY	-	2	-	-	-	-	2
COUPLINGS (SINGLE SEAL)	-	3	-	-	-	3	6
COUPLINGS (DOUBLE SEAL)	-	-	-	1	-	1	2
LINES AND FITTINGS	2	2	-	-	-	-	4
PROP STOR & DIST SUBSYSTEM							
PROPELLANT TANKS	1	-	-	-	-	-	1
PROPELLANT CHANNEL SCREENS	1	-	-	-	-	-	1
PROPELLANT FEEDOUT TUBES	1	-	-	-	-	-	1
PRESSURE RELIEF ASSEMBLIES	1	1	-	-	-	-	2
GROUND MANUAL ISOL VALVES	2	-	-	-	-	1	3
GIMBAL BELLOWS	2	-	-	-	-	-	2
TANK ISOL VALVES	2	2	-	-	-	2	6
MANIFOLD ISOL VLVS, PRIMARY	2	4	-	-	-	4	10
MANIFOLD ISOL VLVS, VERNIER	-	-	1	-	-	1	2
JET ALIGNMENT BELLOWS, PRIMARY	2	-	-	-	-	-	2
JET ALIGNMENT BELLOWS, VERNIER	2	-	-	-	-	-	2
COUPLINGS (SINGLE SEAL)	-	12	-	-	-	12	24
COUPLINGS (DOUBLE SEAL)	-	-	-	1	-	1	2
LINES AND FITTINGS	2	-	-	-	-	-	2
THRUSTER SUBSYSTEM							
PRIMARY JETS							
BIPROP SOLENOID VALVES	6	1	-	-	2	-	9
COMBUSTION CHAMBER OR NOZZLE	1	-	-	-	-	-	1
VERNIER JETS							
BIPROP SOLENOID VALVES	4	-	1	-	-	-	5
COMBUSTION CHAMBER OR NOZZLE	1	-	-	-	-	-	1
TOTAL	33	33	2	4	2	25	99

TABLE II Summary of IOA Failure Modes and Criticalities (ARCS HW)

Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
HE PRESS SUBSYSTEM							
STORAGE TANK	1	-	-	-	-	-	1
TANK ISOLATION VALVES	-	1	-	1	-	-	2
REGULATOR ASSEMBLIES	-	5	-	1	-	-	6
QUAD CHECK VALVE ASSEMBLY	-	2	-	-	-	-	2
COUPLINGS (SINGLE SEAL)	-	2	-	-	-	2	4
COUPLINGS (DOUBLE SEAL)	-	-	-	2	-	2	4
LINES AND FITTINGS	2	2	-	-	-	-	4
PROP STOR & DIST SUBSYSTEM							
PROPELLANT TANKS	1	-	-	-	-	-	1
PROPELLANT CHANNEL SCREENS	1	-	-	-	-	-	1
PROPELLANT FEEDOUT TUBES	1	-	-	-	-	-	1
PRESSURE RELIEF ASSEMBLIES	1	1	-	-	-	-	2
GROUND MANUAL ISOL VALVES	2	-	-	-	-	1	3
GIMBAL BELLOWS	2	-	-	-	-	-	2
TANK ISOL VALVES	2	1	1	1	1	-	6
CROSSFEED VALVES	2	-	4	-	-	-	6
MANIFOLD ISOL VLVS, PRIMARY	2	-	-	4	-	4	10
MANIFOLD ISOL VLVS, VERNIER	-	-	1	-	-	1	2
JET ALIGNMENT BELLOWS, PRIMARY	2	-	-	-	-	-	2
JET ALIGNMENT BELLOWS, VERNIER	2	-	-	-	-	-	2
COUPLINGS (SINGLE SEAL)	-	10	-	-	-	10	20
COUPLINGS (DOUBLE SEAL)	-	-	-	4	-	4	8
LINES AND FITTINGS	4	-	-	-	-	-	4
THRUSTER SUBSYSTEM							
PRIMARY JETS							
BIPROP SOLENOID VALVES	6	-	-	3	-	-	9
COMBUSTION CHAMBER OR NOZZLE	1	-	-	-	-	-	1
VERNIER JETS							
BIPROP SOLENOID VALVES	4	-	1	-	-	-	5
COMBUSTION CHAMBER OR NOZZLE	1	-	-	-	-	-	1
TOTAL	37	24	7	16	1	24	109

TABLE III Summary of IOA Failure Modes and Criticalities(FRCS EPD&C)

Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
HE PRESS SUBSYSTEM							
CONTROLS							
VALVES							
CONTROLLER	-	3	-	4	-	1	8
DIODE	-	4	-	4	-	4	12
DRIVER	-	3	-	6	-	3	12
FUSE	-	-	-	2	-	-	2
RESISTOR	-	-	-	-	-	16	16
SWITCH, TOGGLE	-	-	-	10	-	5	15
INSTRUMENTATION							
INDICATOR, POSITION	-	-	-	1	-	-	1
SENSOR, PRESSURE	-	-	-	-	-	8	8
SENSOR, TEMPERATURE	-	-	-	-	-	6	6
PROP STOR & DIST SUBSYSTEM							
CONTROLS							
VALVES							
CONTROLLER	-	-	-	-	3	3	6
DIODE	-	4	-	50	4	114	172
DRIVER	-	4	1	-	3	28	36
FUSE	-	-	-	6	1	3	10
RELAY	-	16	-	4	-	20	40
RESISTOR	-	-	-	-	-	108	108
SWITCH, TOGGLE	-	-	-	10	23	48	81
INSTRUMENTATION							
INDICATOR, POSITION	-	-	-	5	1	-	6
SENSOR, PRESSURE	-	-	-	-	-	24	24
SENSOR, TEMPERATURE	-	-	-	-	-	14	14
THRUSTER SUBSYSTEM							
CONTROLS							
VALVES							
CONTROLLER	-	-	13	-	4	7	24
DIODE	-	-	4	-	19	15	38
DRIVER	-	-	8	-	3	1	12
FUSE	-	-	6	-	4	3	13
RELAY	-	-	3	-	-	3	6
RESISTOR	-	-	-	-	6	74	80
SWITCH, TOGGLE	-	-	23	-	31	20	74
INSTRUMENTATION							
SENSOR, CONTINUITY	-	-	-	-	-	4	4
SENSOR, PRESSURE	-	-	-	-	10	-	10
SENSOR, TEMPERATURE	-	-	-	-	10	-	10

TABLE III Summary of IOA Failure Modes and Criticalities (FRCS EPD&C)

Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
THERMAL CONTROL SUBSYSTEM							
THRUSTERS							
FUSE	-	-	5	-	-	-	5
HEATER	-	-	2	2	4	-	8
RESISTOR	-	-	-	-	-	10	10
SWITCH, THERMAL	-	4	1	1	2	-	8
SWITCH, TOGGLE	-	-	14	10	5	11	40
POD							
DRIVER	-	-	-	-	24	-	24
FUSE	-	-	-	-	12	-	12
HEATER	-	-	-	-	12	-	12
RELAY	-	-	-	-	4	-	4
RESISTOR	-	-	-	-	4	12	16
SWITCH, TOGGLE	-	-	-	-	3	-	3
THERMOSTAT	-	-	-	-	4	-	4
TOTAL	-	38	80	115	196	565	994

TABLE IV Summary of IOA Failure Modes and Criticalities (ARCS EPD&C)

Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
HE PRESS SUBSYSTEM							
CONTROLS							
VALVES							
CONTROLLER	-	-	-	16	-	-	16
DIODE	-	-	-	8	-	12	20
DRIVER	-	2	-	18	-	4	24
FUSE	-	-	-	4	-	-	4
RESISTOR	-	-	-	-	-	32	32
SWITCH, TOGGLE	-	-	-	10	-	5	15
INSTRUMENTATION							
INDICATOR, POSITION	-	-	-	1	-	-	1
SENSOR, PRESSURE	-	-	-	-	-	8	8
SENSOR, TEMPERATURE	-	-	-	-	-	4	4
PROP STOR & DIST SUBSYSTEM							
CONTROLS							
VALVES							
CONTROLLER	-	-	-	-	3	3	6
DIODE	-	3	-	3	9	25	40
DRIVER	-	-	4	4	5	39	52
FUSE	-	-	-	6	9	2	17
RELAY	-	-	12	15	10	11	48
RESISTOR	-	-	-	-	-	158	158
SWITCH, TOGGLE	-	2	-	22	42	43	109
INSTRUMENTATION							
INDICATOR, POSITION	-	-	-	3	1	-	4
SENSOR, PRESSURE	-	-	-	-	-	8	8
SENSOR, TEMPERATURE	-	-	-	-	-	4	4
THRUSTER SUBSYSTEM							
CONTROLS							
VALVES							
CONTROLLER	-	-	2	-	24	10	36
DIODE	-	-	2	-	50	20	72
DRIVER	-	-	4	-	16	4	24
FUSE	-	-	-	-	19	-	19
RELAY	-	-	-	-	3	3	6
RESISTOR	-	-	-	-	9	113	122
SWITCH, TOGGLE	-	-	8	-	48	56	112
INSTRUMENTATION							
SENSOR, CONTINUITY	-	-	-	-	-	5	5
SENSOR, PRESSURE	-	-	-	8	-	12	20
SENSOR, TEMPERATURE	-	-	-	3	1	8	12

TABLE IV Summary of IOA Failure Modes and Criticalities (ARCS EPD&C)							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
THERMAL CONTROL SUBSYSTEM							
THRUSTERS							
DRIVER	-	-	1	9	-	-	10
FUSE	-	-	2	4	-	-	6
HEATER	-	-	2	6	-	-	8
RESISTOR	-	-	-	-	-	10	10
SWITCH, THERMAL	-	4	1	3	-	-	8
SENSOR, TOGGLE	-	-	10	10	-	10	30
TOTAL	-	11	48	153	249	609	1070

TABLE V Summary of IOA Potential Critical Items (FRCS HW)

Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
HE PRESS SUBSYSTEM						
STORAGE TANK	1	-	-	-	-	1
TANK ISOLATION VALVES	-	1	-	-	-	1
REGULATOR ASSEMBLIES	-	5	-	-	-	5
QUAD CHECK VALVE ASSEMBLY	-	2	-	-	-	2
COUPLINGS (SINGLE SEAL)	-	3	-	-	-	3
LINES AND FITTINGS	2	2	-	-	-	4
PROP STOR & DIST SUBSYSTEM						
PROPELLANT TANKS	1	-	-	-	-	1
PROPELLANT CHANNEL SCREENS	1	-	-	-	-	1
PROPELLANT FEEDOUT TUBES	1	-	-	-	-	1
PRESSURE RELIEF ASSEMBLIES	1	1	-	-	-	2
GROUND MANUAL ISOL VALVES	2	-	-	-	-	2
GIMBAL BELLOWS	2	-	-	-	-	2
TANK ISOL VALVES	2	2	-	-	-	4
MANIFOLD ISOL VLVS, PRIMARY	2	4	-	-	-	6
MANIFOLD ISOL VLVS, VERNIER	-	-	1	-	-	1
JET ALIGNMENT BELLOWS, PRIMARY	2	-	-	-	-	2
JET ALIGNMENT BELLOWS, VERNIER	2	-	-	-	-	2
COUPLINGS (SINGLE SEAL)	-	12	-	-	-	12
LINES AND FITTINGS	2	-	-	-	-	2
THRUSTER SUBSYSTEM						
PRIMARY JETS						
BIPROP SOLENOID VALVES	6	1	-	-	-	7
COMBUSTION CHAMBER OR NOZZLE	1	-	-	-	-	1
VERNIER JETS						
BIPROP SOLENOID VALVES	4	-	1	-	-	5
COMBUSTION CHAMBER OR NOZZLE	1	-	-	-	-	1
TOTAL	33	33	2	-	-	68

TABLE VI Summary of IOA Potential Critical Items (ARCS HW)						
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
<u>HE PRESS SUBSYSTEM</u>						
STORAGE TANK	1	-	-	-	-	1
TANK ISOLATION VALVES	-	1	-	-	-	1
REGULATOR ASSEMBLIES	-	5	-	-	-	5
QUAD CHECK VALVE ASSEMBLY	-	2	-	-	-	2
COUPLINGS (SINGLE SEAL)	-	2	-	-	-	2
LINES AND FITTINGS	2	2	-	-	-	4
<u>PROP STOR & DIST SUBSYSTEM</u>						
PROPELLANT TANKS	1	-	-	-	-	1
PROPELLANT CHANNEL SCREENS	1	-	-	-	-	1
PROPELLANT FEEDOUT TUBES	1	-	-	-	-	1
PRESSURE RELIEF ASSEMBLIES	1	1	-	-	-	2
GROUND MANUAL ISOL VALVES	2	-	-	-	-	2
GIMBAL BELLOWS	2	-	-	-	-	2
TANK ISOL VALVES	2	1	1	-	1	5
CROSSFEED VALVES	2	-	4	-	-	6
MANIFOLD ISOL VLVS, PRIMARY	2	-	-	4	-	6
MANIFOLD ISOL VLVS, VERNIER	-	-	1	-	-	1
JET ALIGNMENT BELLOWS, PRIMARY	2	-	-	-	-	2
JET ALIGNMENT BELLOWS VERNIER	2	-	-	-	-	2
COUPLINGS (SINGLE SEAL)	-	10	-	-	-	10
LINES AND FITTINGS	4	-	-	-	-	4
<u>THRUSTER SUBSYSTEM</u>						
PRIMARY JETS						
BIPROP SOLENOID VALVES	6	-	-	-	-	6
COMBUSTION CHAMBER OR NOZZLE	1	-	-	-	-	1
VERNIER JETS						
BIPROP SOLENOID VALVES	4	-	1	-	-	5
COMBUSTION CHAMBER OR NOZZLE	1	-	-	-	-	1
TOTAL	37	24	7	4	1	73

TABLE VII Summary of IOA Potential Critical Items (FRCS EPD&C)						
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
HE PRESS SUBSYSTEM						
CONTROLS						
VALVES						
CONTROLLER	-	3	-	-	-	3
DIODE	-	4	-	4	-	8
DRIVER	-	3	-	2	-	5
FUSE	-	-	-	1	-	1
SWITCH, TOGGLE	-	-	-	5	-	5
PROP STOR & DIST SUBSYSTEM						
CONTROLS						
VALVES						
DIODE	-	4	-	42	2	48
DRIVER	-	4	1	-	-	5
RELAY	-	16	-	4	-	20
SWITCH, TOGGLE	-	-	-	6	12	18
THRUSTER SUBSYSTEM						
CONTROLS						
VALVES						
CONTROLLER	-	-	13	-	-	13
DIODE	-	-	4	-	19	23
DRIVER	-	-	8	-	-	8
FUSE	-	-	6	-	-	6
RELAY	-	-	3	-	-	3
RESISTOR	-	-	-	-	6	6
SWITCH, TOGGLE	-	-	23	-	-	23
THERMAL CONTROL SUBSYSTEM						
THRUSTERS						
FUSE	-	-	5	-	-	5
HEATER	-	-	2	-	-	2
SWITCH, THERMAL	-	4	1	-	-	5
SWITCH, TOGGLE	-	-	14	1	-	15
TOTAL	-	38	80	65	39	222

TABLE VIII Summary of IOA Potential Critical Items (ARCS EPD&C)						
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
HE PRESS SUBSYSTEM						
CONTROLS						
VALVES						
CONTROLLER	-	-	-	6	-	6
DIODE	-	-	-	8	-	8
DRIVER	-	2	-	4	-	6
SWITCH, TOGGLE	-	-	-	5	-	5
PROP STOR & DIST SUBSYSTEM						
CONTROLS						
VALVES						
CONTROLLER	-	-	-	-	2	2
DIODE	-	3	-	3	9	15
DRIVER	-	-	4	4	2	10
RELAY	-	-	12	13	8	33
SWITCH, TOGGLE	-	2	-	6	19	27
THRUSTER SUBSYSTEM						
CONTROLS						
VALVES						
CONTROLLER	-	-	2	-	-	2
DIODE	-	-	2	-	50	52
DRIVER	-	-	4	-	-	4
FUSE	-	-	-	-	7	7
RESISTOR	-	-	-	-	9	9
SWITCH, TOGGLE	-	-	8	-	-	8
THERMAL CONTROL SUBSYSTEM						
THRUSTERS						
DRIVER	-	-	1	9	-	10
FUSE	-	-	2	4	-	6
HEATER	-	-	2	-	-	2
SWITCH, THERMAL	-	4	1	-	-	5
SWITCH, TOGGLE	-	-	10	-	-	10
TOTAL	-	11	48	62	106	227

4.1 Analysis Results - Helium Pressurization Subsystem

4.1.1 Analysis Results - Forward Helium Pressurization Subsystem

Twenty-three (23) failure modes were analyzed in the forward helium pressurization subsystem and sixteen (16) were identified as PCIs. All sixteen of the PCIs are single point failures which could result in possible damage to surrounding components, inability to repressurize the propellant tanks, system over-pressurization, or migration of propellants into helium lines.

These critical failures are caused by helium tank structural failure, helium leakage due to structural failure of components or lines, flow path loss due to failure-to-open of components or system contamination, and check valve failures.

4.1.2 Analysis Results - Aft Helium Pressurization Subsystem

Twenty-three (23) failure modes were analyzed in the aft helium pressurization subsystem and fifteen (15) were identified as PCIs. All fifteen of the PCIs are single point failures which could result in possible damage to surrounding components, inability to repressurize the propellant tanks, system over-pressurization, or migration of propellants into helium lines.

These critical failures are caused by helium tank structural failure, helium leakage due to structural failure of components or lines, flow path loss due to failure-to-open of components or system contamination, and check valve failures.

4.2 Analysis Results - Propellant Storage and Distribution Subsystem

4.2.1 Analysis Results - Forward Propellant Storage and Distribution Subsystem

Sixty (60) failure modes were analyzed in the forward propellant storage and distribution subsystem, of which thirty-eight (38) were identified as PCIs. All thirty-eight of the PCIs are single point failures which could result in leakage of propellant, loss of propellant flow path, inability to use or deplete propellant, system overpressurization, loss of manifolds, and loss of thrusters.

These critical failures are caused by structural failure of the propellant tank, components, and propellant lines, seal failures, contamination, failure of valves to operate, failure of the pressure relief assembly, and propellant tank screen structural failures.

4.2.2 Analysis Results - Aft Propellant Storage and Distribution Subsystem

Seventy (70) failure modes were analyzed in the aft propellant storage and distribution subsystem, of which forty-five (45) were identified as PCIs. Forty (40) of the forty-five PCIs are single point failures which could result in leakage of propellant, loss of propellant flow path, inability to use or deplete propellant, system overpressurization, loss of manifolds or crossfeed valves, loss of thrusters, and loss of vehicle control. The remaining five (5) PCIs could result in loss of life or vehicle during an RTLS abort due to the inability to complete OMS or RCS propellant dumps leading to possible violations of pod structural constraints or vehicle entry center-of-gravity limits.

These critical failures are caused by structural failure of the propellant tank, components, and propellant lines, seal failures, contamination, failure of valves to operate, failure of the pressure relief assembly, and propellant tank screen structural failures.

4.3 Analysis Results - Thruster Subsystem

4.3.1 Analysis Results - Forward Thruster Subsystem

Sixteen (16) failure modes were analyzed in the forward thruster subsystem, of which fourteen (14) were identified as PCIs. All of the fourteen PCIs are single point failures resulting in excessive propellant usage, leakage of propellant, loss of propellant flow path, engine explosion or burnthrough, loss of thruster on-off control, and inability to deplete propellants leading to Orbiter center-of-gravity limit violations during entry.

These critical failures are caused by loss of vernier jets, structural failure of components and propellant lines, seal failures, contamination, failure to open or close of thruster valves, deselection of opposite-firing thrusters by Redundancy Management, improper propellant mixture ratios, and structural failures of the injector assembly, combustion chamber, and nozzle extension.

4.3.2 Analysis Results - Aft Thruster Subsystem

Sixteen (16) failure modes were analyzed in the aft thruster subsystem, of which thirteen (13) were identified as PCIs. All of the thirteen PCIs are single point failures resulting in excessive propellant usage, leakage of propellant, loss of propellant flow path, engine explosion or burnthrough, loss of thruster on-off control, or loss of vehicle control.

These critical failures are caused by loss of vernier jets, structural failure of components and propellant lines, seal failures, contamination, failure to open or close of thruster valves, deselection of opposite-firing thrusters by Redundancy Management, improper propellant mixture ratios, and structural failures of the injector assembly, combustion chamber, and nozzle extension.

4.4 Analysis Results - Electrical Power Distribution and Control Subsystem

4.4.1 Analysis Results - Controls

4.4.1.1 Analysis Results - Forward Controls

Seven hundred sixty-five (765) failure modes were analyzed in the forward EPD&C controls subsystem, of which one hundred ninety-five (195) were identified as PCIs. Of the 195 PCIs, ninety-two (92) are single point failures since their failure resulted in critical valves being stuck open or closed. Another sixty-four (64) of the 195 PCIs could result in loss of vehicle/ life if all redundancy were lost. The remaining thirty-nine (39) PCIs could result in loss of mission if all redundancy were lost.

Criticalities assigned to forward EPD&C failure modes were derived from the effect the failure had on the component being controlled, which was one or more valves, in all cases. Therefore, critical EPD&C failure modes caused critical valves to be stuck open or closed resulting in inability to use or deplete propellant, system overpressurization, zots, loss of manifolds, and loss of thrusters.

4.4.1.2 Analysis Results - Aft Controls

Nine hundred thirty-two (932) failure modes were analyzed in the aft EPD&C controls subsystem, of which one hundred ninety-four (194) were identified as PCIs. Of the 194 PCIs, thirty-nine (39) are single point failures since their failure resulted in critical valves being stuck open or closed. Another forty-nine (49) of the 194 PCIs could result in loss of vehicle/life if all redundancy were lost. The remaining one hundred six (106) PCIs could result in loss of mission if all redundancy were lost.

Criticalities assigned to aft EPD&C failure modes were derived from the effect the failure had on the component being controlled, which was one or more valves, in all cases. Therefore, critical EPD&C failure modes caused critical valves to be stuck open or closed resulting in inability to use or deplete propellant, system overpressurization, zots, loss of manifolds, loss of thrusters, and loss of vehicle control.

4.4.2 Analysis Results - Instrumentation

4.4.2.1 Analysis Results - Forward Instrumentation

Eighty-three (83) failure modes have been analyzed in the forward EPD&C instrumentation subsystem, of which zero (0) were PCIs.

4.4.2.2 Analysis Results - Aft Instrumentation

Sixty-six (66) failure modes have been analyzed in the aft EPD&C instrumentation subsystem, of which zero (0) were PCIs.

4.4.3 Analysis Results - Thermal Control

4.4.3.1 Analysis Results - Forward Thermal Control

Seventy-five (75) failure modes were analyzed in the forward pod thermal control subsystem, of which zero (0) were identified as PCIs.

Seventy-one (71) failure modes were analyzed in the forward thruster thermal control subsystem, of which twenty-seven (27) were identified as PCIs. Twenty-six (26) of the 27 PCIs are single point failures resulting in thruster explosion or loss of thruster thermal control and unplanned changes in mission operations. The remaining one (1) PCI could result in loss of life or vehicle after the failure of all redundancy.

4.4.3.2 Analysis Results - Aft Thermal Control

All of the OMS/RCS pod heaters and thermostats were analyzed in the OMS analysis and are presented in the OMS report.

Seventy-two (72) failure modes were analyzed in the aft thruster thermal control subsystem, of which thirty-three (33) were identified as PCIs. Twenty (20) of the 33 PCIs are single point failures resulting in thruster explosion or loss of thruster thermal control and unplanned changes in mission operations. The remaining thirteen (13) PCIs could result in loss of life or vehicle after the loss of redundancy.

5.0 REFERENCES

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

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2. Reaction Control System Shuttle Flight Operations Manual, Volume 8D, March 31, 1980

3. OMS/RCS Systems Briefs Handbook, October 1, 1984

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15. MC284-0421, Rev E, 5-3-82, Pressure Relief Valve, Proc. spec., RI.

16. MC284-0430, Rev E, 6-22-81, AC Motor Valve, Proc. spec., RI.

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22. 73P550015, Rev B, 3-22-82, Gimbal Bellows, Proc. spec., MDAC.

23. 73P550003 Alignment Bellows Drawing, MDAC.

24. MC282-0061, Rev. G, RCS Propellant Tank, Proc. Spec., MDAC.

25. MC271-0095, RCS Propellant Line Flexible Assembly, Proc. Spec., MDAC.

26. MC467-0029, Rev. G, RCS Vernier Thruster Assembly, Proc. Spec., MDAC.

27. VS70-420309, Rev. D, 6-4-84, Aft RCS Subsystem Control Left OMS Pod Schematic Diagram.

28. JSC-11174, Space Shuttle Systems Handbook, Rev. C, DNC-5, 9-13-85.

APPENDIX A
ACRONYMS

AC	-	Alternating Current
ALC	-	Aft Load Controller
ALCA	-	Aft Load Control Assembly
AMCA	-	Aft Motor Control Assembly
AOA	-	Abort-Once-Around
APC	-	Aft Power Controller
ARCS	-	Aft Reaction Control System (Subsystem)
ASSY	-	Assembly
ATO	-	Abort-To-Orbit
ATT	-	Attitude
BCE	-	Bus Control ELement
BFS	-	Backup Flight System
BTU	-	Bus Terminal Unit
C&W	-	Caution and Warning
CIL	-	Critical Items List
CL	-	Close (Closed)
CMD	-	Command, Commander
CNTL	-	Control
CNTLR	-	Controller
CRIT	-	Criticality
CRT	-	Cathode-Ray Tube
D&C	-	Displays and Controls
DAP	-	Digital Autopilot
dc	-	Direct Current
DOD	-	Department of Defense
DPS	-	Data Processing System (Subsystem)
DTO	-	Detailed Test Objective
EI	-	Entry Interface
EPDC	-	Electrical Power Distribution and Control
ET	-	External Tank
F	-	Fahrenheit
F	-	Functional
FA	-	Flight Aft
FCOS	-	Flight Control Operating System
FDA	-	Fault Detection and Annunciation
FF	-	Flight Forward
FLCA	-	Forward Load Control Assembly
FLT	-	Flight
FM	-	Failure Mode
FMCA	-	Forward Motor Control Assembly
FMEA	-	Failure Modes and Effects Analysis
FRCS	-	Forward Reaction Control System (Subsystem)
FSW	-	Flight Software
ft	-	Feet
FU	-	Fuel
FUNC	-	Function
FWD	-	Forward
G	-	Gravity
GFE	-	Government Furnished Equipment
GNC	-	Guidance, Navigation, and Control

GPC	-	General Purpose Computer
GSE	-	Ground Support Equipment
He	-	Helium
HW	-	Hardware
I/C	-	Interconnect
I/O	-	Input/Output
ID	-	Inside Diameter
IMU	-	Inertial Measurement Unit
IOA	-	Independent Orbiter Assessment
ISOL	-	Isolation
ISP	-	Initial Specific Impulse
JSC	-	Johnson Space Center
L	-	Left
LCA	-	Load Controller Assembly
LRU	-	Line Replaceable Unit
MAN	-	Manual
MCA	-	Motor Control Assembly
MCC	-	Mission Control Center (JSC)
MDAC	-	McDonnell Douglas Astronautics Company
MDM	-	Multiplexer/Demultiplexer
MECO	-	Main Engine Cutoff
MM	-	Major Mode
MMH	-	Monomethyl Hydrazine
msec	-	Millisecond
N2O4	-	Nitrogen Tetroxide
NA	-	Not Applicable
NASA	-	National Aeronautics and Space Administration
NSTS	-	National Space Transportation System
NTO	-	Nitrogen Tetroxide
OA	-	Operational Aft
OF	-	Operational Forward
OI	-	Operational Instrumentation
OMRSD	-	Operational Maintenance Requirements and Specifications Document
OMS	-	Orbital Maneuvering System
OP	-	Open
OPS	-	Operations Sequence
OX	-	Oxidizer
OXID	-	Oxidizer
P	-	Pitch
PAD	-	Propellant Acquisition Device
PASS	-	Primary Avionics Software System
PBI	-	Push-Button Indicator
Pc	-	Chamber Pressure
PCA	-	Power Control Assembly
PCI	-	Potential Critical Item
PCM	-	Pulse Code Modulation
PCMMU	-	Pulse Code Modulation Master Unit
PLS	-	Primary Landing Site
PRCS	-	Primary Reaction Control System (jet)
PRESS	-	Pressure
PROC	-	Processor
psi	-	Pounds per Square Inch
psia	-	Pounds per Square Inch Absolute

psid	-	Pounds per Square Inch Differential
psig	-	Pounds per Square Inch Gage
PTI	-	Programmed Test Input
PWR	-	Power
R	-	Right
R	-	Roll
RCS	-	Reaction Control System
RHC	-	Rotation Hand Controller
RI	-	Rockwell International
RJD	-	Reaction Jet Driver
RM	-	Redundancy Management
RPC	-	Remote Power Controller
RTLS	-	Return-to-Launch Site
scfm	-	Standard Cubic Feet per Minute
SFOM	-	Shuttle Flight Operations Manual
SOP	-	Subsystem Operating Program
SPEC	-	Specification
SSSH	-	Space Shuttle Systems Handbook
STS	-	Space Transportation System
SUM	-	Summary
SYS	-	System
TAL	-	Transatlantic Abort Landing
THC	-	Translation Hand Controller
TK	-	Tank
TPS	-	Thermal Protection System
VERN	-	Vernier
VLV	-	Valve
VRCS	-	Vernier Reaction Control System (jet)
Y	-	Yaw

APPENDIX B

DEFINITIONS, 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 RCS 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. The function of an RCS thruster is to provide thrust in a certain axis and direction. Therefore, from a top down system analysis approach, thrusters which fire in the same axis and direction may be considered redundant to each other. The function of electrical systems is to provide power to the components of the RCS hardware systems. Redundancy, as applied to electrical systems, is considered to be redundant electrical paths, systems, or controls. Therefore, thrusters which fire in the same direction may not be considered redundant to an electrical failure. Thruster hardware and certain electrical components may be grouped by firing axes.

2. For the ARCS, entry criticalities are dependent on the number of pitch, yaw, and roll thrusters available (e.g., loss of pitch control results in loss of vehicle). Abort criticalities for both FRCS and ARCS are also dependent upon the number of thrusters available in certain axes. All aft RCS pitch, yaw, and roll thrusters and all forward RCS yaw thrusters are required for the successful completion of OMS/RCS propellant dumps during RTLS aborts. The time available to complete propellant dumps is less during RTLS than during other intact abort modes.

3. Only PASS software is considered in this analysis. BFS is not considered for flight or abort analyses. RCS Redundancy Management (RM), certain software sequences, and Software Operating Procedures (SOPs) are considered in the analysis.

4. Inability to accomplish DTOs or PTIs during entry due to an RCS failure can lead to loss of mission during the deorbit phase.

5. Internal leakage of a valve is fluid which leaks through the valve into the line. External leakage of a valve is fluid which leaks through the valve housing.

6. Coupling caps are considered redundancy for quick disconnect couplings. Leaks through poppet seals and coupling caps are assumed to be leaking overboard, not internally. Where it cannot be determined how many seals exist in a coupling, it will be assumed that only a poppet seal and a cap seal exist.

7. The pressure relief valve is considered to be an emergency system because it incorporates a burst disk.

8. If applicable, the redundancy and criticalities assigned to an electrical component may be tied to those assigned to hardware components affected by the failure of the electrical component.

9. Software capabilities which allow control over the operation of hardware components are considered to be redundant to electrical components which control the operation.

10. For the thermal control analysis it is assumed that, at the time of vehicle liftoff, all areas of the thermal environment are within redlines.

11. Instrumentation passage of screen B does not require the ability to discern between sensor or hardware failure, but on detection of the measurement being out of a predefined limit. The ability to differentiate between sensor and hardware failure will be reflected in the criticality assignment.

12. It is assumed that propellants leaking through RCS thrusters will not freeze during aborts due to the short duration of these phases.

13. It is assumed that after the failure of an RCS thruster, the RCS redundancy management will automatically deselect the opposite-firing thruster.

14. The Shuttle Launch Commit Criteria and Background (JSC 16007) and the Operational Maintenance Requirements and Specifications Document (OMRSD) will not be used to determine the passage of redundancy screens. The criteria for determining screen passage outlined in NSTS 22206 will be used as the basis for the passage or failure of the redundancy screens.

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. 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

LEGEND FOR IOA RCS MDAC ID

- 100- 198 - Forward RCS Hardware
- 199- 307 - Aft RCS Hardware
- 308-1301 - Forward RCS EPD&C
- 1302-2371 - Aft RCS EPD&C

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	1/1
MDAC ID:	100	ABORT:	1/1

ITEM: HELIUM STORAGE TANK
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM STORAGE TANK
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: MECHANICAL SHOCK, HIGH PRESSURE, VIBRATION

EFFECTS/RATIONALE:
LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 C, D.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 101

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

ITEM: HELIUM FILL COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM FILL COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 A, B.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 102

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

ITEM: HELIUM FILL COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM FILL COUPLING
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 [ ] B [ ] C [ ]

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 103

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

ITEM: HE ISOL A & B VLVS
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN) OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE ISOL A & B VLVS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PRESSURE REGULATORS. FAILURE OF ALL REDUNDANCY WILL CAUSE OVERPRESSURIZATION AND RUPTURE OF TANKS AND/OR LINES, AND MAY CAUSE ZOTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 104

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

ITEM: HE ISOL A & B VLVS
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE ISOL A & B VLVS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
STANDBY REDUNDANCY. NEXT ASSOCIATED FAILURE (OTHER VALVE A OR B) WILL CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 C, D.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 105

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

ITEM: HE LINE, ALL EXCEPT ISOL VLV TO PRESS REGULATOR
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE LINE, ALL EXCEPT ISOL VLV TO PRESS REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN HELIUM TANK AND QUAD CHECK VALVES
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
FAILURE WILL CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY, WILL AFFECT ONORBIT OPERATIONS, AND WILL CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 106

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

ITEM: HE LINE, ALL EXCEPT ISOL VLV TO PRESS REGULATOR
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE LINE, ALL EXCEPT ISOL VLV TO PRESS REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN HELIUM TANK AND QUAD CHECK VALVES
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 107

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

ITEM: HE LINE, ISOL VLV TO PRESS REGULATOR
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE LINE, ISOL VLV TO PRESS REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN HELIUM ISOLATION VALVES AND PRESSURE REGULATOR
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY CLOSING HELIUM ISOLATION VALVE, AND USING THE PARALLEL HELIUM SUPPLY PATH. FAILURE CAUSES LOSS OF HELIUM PRESSURIZATION. NEXT ASSOCIATED FAILURE WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 108

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

ITEM: HE LINE, ISOL VLV TO PRESS REGULATOR
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE LINE, ISOL VLV TO PRESS REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN HELIUM ISOLATION VALVES AND PRESSURE REGULATOR
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL HELIUM PATH. FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	109	ABORT:	3/1R

ITEM: HIGH PRESSURE HELIUM TEST PORT COUPLINGS A & B
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HIGH PRESSURE HELIUM TEST PORT COUPLINGS A & B
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: FUEL/OXIDIZER PRESSURE SYSTEM INTERNAL PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. FAILURE OF ALL REDUNDANCY WILL CAUSE LOSS OF HELIUM PRESSURIZATION. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 A, B.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 110

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

ITEM: HIGH PRESSURE HELIUM TEST PORT COUPLINGS A & B
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HIGH PRESSURE HELIUM TEST PORT COUPLINGS A & B
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER PRESSURE SYSTEM INTERNAL PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 111

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

ITEM: HE PRESS REGULATOR ASSEMBLY
FAILURE MODE: FAILS OPEN OR REGULATES AT HIGHER THAN NORMAL PRESSURE

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE PRESS REGULATOR ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE HELIUM ISOLATION VALVE AND THE SERIES PRESSURE REGULATOR. FAILURE OF ALL REDUNDANCY WILL CAUSE OVERPRESSURIZATION AND RUPTURE OF THE TANK AND LINES, AND MAY CAUSE ZOTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 A, B.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 112

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

ITEM: HE PRESS REGULATOR ASSEMBLY
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE PRESS REGULATOR ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
STANDBY REDUNDANCY. NEXT ASSOCIATED FAILURE (PARALLEL REGULATOR OR PARALLEL HE ISOLATION VALVE) WILL CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 A, B.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 113

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

ITEM: HE PRESS REGULATOR ASSEMBLY
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE PRESS REGULATOR ASSEMBLY
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:	3/3		

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, BLOCKAGE OF INLET FILTER

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL REGULATOR. RESTRICTED FLOW THROUGH REGULATORS MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIOS, WHICH MAY RESULT IN ZOTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 114

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

ITEM: HE PRESS REGULATOR ASSEMBLY
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE PRESS REGULATOR ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY HELIUM ISOLATION VALVE AND PARALLEL REGULATOR. CREW ACTION TO CLOSE ISOLATION VALVE TO LEAKING REGULATOR AND OPEN REDUNDANT PATH WILL PREVENT TOTAL HELIUM LOSS. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG TO EXCEED SAFETY BOUNDARIES DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT. THERE ARE NO VALVES OR CAPS IN THE SENSING PORT LINES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 A, B.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 115

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

ITEM: HE PRESS REGULATOR PRIMARY SENSING PORT
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE PRESS REGULATOR PRIMARY SENSING PORT
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL HELIUM PATH AND MANUAL OPERATION OF THE HELIUM ISOLATION VALVE. NEXT ASSOCIATED FAILURE WILL RESULT IN LOSS OF HELIUM PRESSURIZATION CAUSING THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ENTRY OR ABORTS TO MEET THE CG SAFETY BOUNDARIES DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-50.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 116

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

ITEM: HE PRESS REGULATOR PRIMARY SENSING PORT
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE PRESS REGULATOR PRIMARY SENSING PORT
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL REGULATOR. FAILURE WILL CAUSE REGULATOR TO REGULATE AT A HIGHER PRESSURE WHICH MAY CAUSE AN UNACCEPTABLE MIXTURE RATIO, RESULTING IN ZOTS. ZOTS MAY CAUSE THRUSTER VALVE DAMAGE LEADING TO PROPELLANT IGNITION WITHIN THE POD AND/OR NOZZLE BURNTHROUGH.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-50.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 117

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

ITEM: HE PRESS REGULATOR OUTLET TEST PORT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE PRESS REGULATOR OUTLET TEST PORT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR CAP) WILL BE UNDETECTABLE. NEXT ASSOCIATED FAILURE WILL CAUSE LOSS OF HELIUM PRESSURIZATION. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 B, H, I, 6-50, 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 118

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

ITEM: HE PRESS REGULATOR OUTLET TEST PORT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE PRESS REGULATOR OUTLET TEST PORT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-50.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 119

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

ITEM: QUAD CHECK VALVE ASSEMBLY
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN) OR LEAKS (REVERSE FLOW)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) QUAD CHECK VALVE ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NEXT ASSOCIATED FAILURE (VALVE IN SERIES WITH FAILED VALVE FAILS OPEN) WILL ALLOW PROPELLANT TO BACKFLOW INTO THE HELIUM PRESSURIZATION SYSTEM. THIS CAN CAUSE LOSS OF LIFE DURING GROUND SERVICING DUE TO INHALATION OF PROPELLANT VAPORS. CORROSION OF HELIUM REGULATORS AND/OR HELIUM ISOLATION VALVES BY PROPELLANT WHICH HAS BACKFLOWED MAY CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 120

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

ITEM: QUAD CHECK VALVE ASSEMBLY
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) QUAD CHECK VALVE ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: PIECE-PART STRUCTURAL FAILURE, LOW TEMPERATURE FREEZES PROPELLANT INSIDE VALVE

EFFECTS/RATIONALE:
NEXT ASSOCIATED FAILURE (PARALLEL VALVE FAILS CLOSED) WILL CAUSE LOSS OF HELIUM PRESSURIZATION. LOSS OF HELIUM PRESSURIZATION CAPABILITY WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 C, D.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 121

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

ITEM: QUAD CHECK VALVE TEST PORT COUPLINGS A & B
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) QUAD CHECK VALVE TEST PORT COUPLINGS A & B
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL CAUSE LOSS OF HELIUM UNTIL CREW CLOSES HELIUM ISOLATION VALVES. FAILURE OF ALL REDUNDANCY WILL CAUSE LOSS OF HELIUM PRESSURIZATION, WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 122

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

ITEM: QUAD CHECK VALVE TEST PORT COUPLINGS A & B
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) QUAD CHECK VALVE TEST PORT COUPLINGS A & B
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	1/1
MDAC ID:	123	ABORT:	1/1

ITEM: PROPELLANT TANK
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROPELLANT TANK
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 [ ] B [ ] C [ ]

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: MECHANICAL SHOCK, HIGH PRESSURE, VIBRATION

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO THE POD/VEHICLE. LOSS OF PROPELLANT INTO THE POD CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

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INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 124

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

ITEM: PROP LINES, ALL
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP LINES, ALL
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 [ ] B [ ] C [ ]

LOCATION: ANY LINE BETWEEN PROPELLANT TANK AND THRUSTERS.
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
PRESSURE IN TANK AND LINE WILL FORCE PROPELLANT OUT OF LINE INTO POD/VEHICLE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 125

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

ITEM: PROP LINES, ALL
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP LINES, ALL
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: ANY LINE BETWEEN PROPELLANT TANK AND THRUSTERS.
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 126

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

ITEM: PROP FILL VENT REGULATOR CHECKOUT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP FILL VENT REGULATOR CHECKOUT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 A, B.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 127

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

ITEM: PROP FILL VENT REGULATOR CHECKOUT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP FILL VENT REGULATOR CHECKOUT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 128

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

ITEM: PROP CHANNEL SCREENS
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP CHANNEL SCREENS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PROPELLANT TANK INTERIOR
PART NUMBER: FU & OX:

CAUSES: HIGH PRESSURE, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
HELIUM INGESTION WILL CAUSE ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH. FAILURE IS NOT DETECTABLE UNTIL THRUSTERS FAIL DUE TO HELIUM INGESTION OR ZOTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); RCS 2102, FIG. 3.1.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 129

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

ITEM: PROP FEEDOUT TUBE
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP FEEDOUT TUBE
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PROPELLANT TANK INTERIOR
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VACUUM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 F APPLIES; RCS 2102, FIG. 3.1.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 130

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

ITEM: PROP TK UPPER COMPARTMENT CHANNEL CHECKOUT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK UPPER COMPARTMENT CHANNEL CHECKOUT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS FRONT TRUNNION
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 E.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 131

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

ITEM: PROP TK UPPER COMPARTMENT CHANNEL CHECKOUT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK UPPER COMPARTMENT CHANNEL CHECKOUT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FRCS FRONT TRUNNION
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	2/1R
MDAC ID:	132	ABORT:	2/1R

ITEM: PROP TK LOWER COMPARTMENT CHANNEL BLEED COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK LOWER COMPARTMENT CHANNEL BLEED COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 E.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 133

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

ITEM: PROP TK LOWER COMPARTMENT CHANNEL BLEED COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK LOWER COMPARTMENT CHANNEL BLEED COUPLING
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 [ ] B [ ] C [ ]

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: FRCS FLIGHT: 2/1R
MDAC ID: 134 ABORT: 2/1R

ITEM: PROP TK LOWER COMPARTMENT BULKHEAD BLEED COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK LOWER COMPARTMENT BULKHEAD BLEED COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 E.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 135

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

ITEM: PROP TK LOWER COMPARTMENT BULKHEAD BLEED COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK LOWER COMPARTMENT BULKHEAD BLEED COUPLING
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 [ ] B [ ] C [ ]

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6;
VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 136

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

ITEM: PROP TK VENT AND REGULATOR CHECKOUT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK VENT AND REGULATOR CHECKOUT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 E.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY		HDW/FUNC
SUBSYSTEM:	FRCS		FLIGHT:	3/3
MDAC ID:	137		ABORT:	3/3

ITEM: PROP TK VENT AND REGULATOR CHECKOUT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK VENT AND REGULATOR CHECKOUT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY		HDW/FUNC
SUBSYSTEM:	FRCS		FLIGHT:	1/1
MDAC ID:	138		ABORT:	1/1

ITEM: GIMBAL BELLOWS
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GIMBAL BELLOWS
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 [ ] B [ ] C [ ]

LOCATION: DOWNSTREAM OF PROPELLANT TANK
PART NUMBER: FU & OX: 73P550015-1006

CAUSES: HIGH PRESSURE, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
ASSUME THIS IS A SINGLE BARRIER FAILURE, THAT IS, NO INTERNAL LEAK PATH REDUNDANCY EXISTS. FAILURE RESULTS IN PROPELLANT LEAKING INTO THE POD/VEHICLE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 139

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

ITEM: GIMBAL BELLOWS
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GIMBAL BELLOWS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: DOWNSTREAM OF PROPELLANT TANK
PART NUMBER: FU & OX: 73P550015-1006

CAUSES: CONTAMINATION, VACUUM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 F.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 140

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

ITEM: PRESSURE RELIEF ASSEMBLY
FAILURE MODE: BURST DISK RUPTURES AT LOW PRESSURE, OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PRESSURE RELIEF ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: MATERIAL FLAW, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (BURST DISK RUPTURE) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE (PRESSURE RELIEF VALVE) WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 A, B.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 141

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

ITEM: PRESSURE RELIEF ASSEMBLY
FAILURE MODE: BURST DISK FAILS TO RUPTURE, RUPTURES AT A HIGHER THAN NOMINAL PRESSURE, OR POPPET VALVE FAILS CLOSED AFTER BURST DISK RUPTURES AT NOMINAL PRESSURE.

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PRESSURE RELIEF ASSEMBLY
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 [ ] B [ ] C [ ]

LOCATION: FRCS POD
PART NUMBER: FU & OX:

CAUSES: MATERIAL FLAW, CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
OVERPRESSURIZATION OF PROPELLANT TANK AND LINES WILL CAUSE TANK AND/OR LINE RUPTURE. LOSS OF PROPELLANT INTO THE POD CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	142	ABORT:	3/1R

ITEM: RELIEF VALVE TEST PORT COUPLING
FAILURE MODE: PRESSURE RELIEF VALVE TEST PORT FAILS TO CLOSE (FAILS OPEN) OR LEAKS OVERBOARD

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RELIEF VALVE TEST PORT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (BURST DISC RUPTURE) CANNOT BE DETECTED. FAILURE OF ALL REDUNDANCY WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 A, B.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 143

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

ITEM: RELIEF VALVE TEST PORT COUPLING
FAILURE MODE: PRESSURE RELIEF VALVE TEST PORT FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RELIEF VALVE TEST PORT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 144

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

ITEM: GROUND MANUAL ISOLATION VALVE
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GROUND MANUAL ISOLATION VALVE
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK (GROUND HANDLING)

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 145

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

ITEM: GROUND MANUAL ISOLATION VALVE
FAILURE MODE: FAILS TO REMAIN OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GROUND MANUAL ISOLATION VALVE
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK (GROUND HANDLING)

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF HELIUM PRESSURIZATION (VALVE IS UPSTREAM OF PROPELLANT TANKS). LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 C, D.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 146

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

ITEM: GROUND MANUAL ISOLATION VALVE
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GROUND MANUAL ISOLATION VALVE
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK (GROUND HANDLING)

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF PROPELLANT AND HELIUM. PROPELLANT WILL LEAK INTO THE POD CAUSING CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 147

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

ITEM: PROP TK ISOL VLVS 1/2 & 3/4/5
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK ISOL VLVS 1/2 OR 3/4/5
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN PROPELLANT TANK AND MANIFOLD ISOLATION VALVES
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO POD/VEHICLE CAUSING CORROSION, WHICH CAN RESULT IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (43DC).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: FRCS FLIGHT: 1/1
MDAC ID: 148 ABORT: 1/1

ITEM: PROP TK ISOL VLVS 1/2 & 3/4/5
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK ISOL VLVS 1/2 OR 3/4/5
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN PROPELLANT TANK AND MANIFOLD ISOLATION VALVES
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (43DC).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 149

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

ITEM: PROP TK ISOL VLV 1/2
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK ISOL VLV 1/2
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN PROPELLANT TANK AND MANIFOLD ISOLATION VALVES
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 150

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

ITEM: PROP TK ISOL VLV 1/2
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK ISOL VLV 1/2
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN PROPELLANT TANK AND MANIFOLD ISOLATION VALVES
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY IN ALL PHASES EXCEPT RTLS IS PROVIDED BY THE 3/4/5 TANK ISOLATION VALVE. FIRST FAILURE WILL CAUSE LOSS OF EIGHT PRIMARY JETS WHICH WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE INABILITY TO EXPEL ENOUGH PROPELLANT DURING RTLS TO MEET THE CG SAFETY BOUNDARIES. SIMILARLY, FAILURE OF ALL REDUNDANCY (3/4/5 VALVE) WILL RESULT IN LOSS OF VEHICLE DURING ENTRY AND ALL OTHER ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 151

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

ITEM: PROP TK ISOL VLV 3/4/5
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK ISOL VLV 3/4/5
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN PROPELLANT TANK AND MANIFOLD ISOLATION VALVES
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 152

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

ITEM: PROP TK ISOL VLV 3/4/5
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK ISOL VLV 3/4/5
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN PROPELLANT TANK AND MANIFOLD ISOLATION VALVES
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY IN ALL PHASES EXCEPT RTLS IS PROVIDED BY THE 1/2 TANK ISOLATION VALVE. FIRST FAILURE WILL CAUSE LOSS OF SIX PRIMARY JETS WHICH WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE INABILITY TO EXPEL ENOUGH PROPELLANT DURING RTLS TO MEET THE CG SAFETY BOUNDARIES. SIMILARLY, FAILURE OF ALL REDUNDANCY (1/2 VALVE) WILL RESULT IN LOSS OF VEHICLE DURING ENTRY AND ALL OTHER ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 153

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

ITEM: MANIFOLD 1/2 FILL & DRAIN/PURGE COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1/2 FILL & DRAIN/PURGE COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 E.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 154

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

ITEM: MANIFOLD 1/2 FILL & DRAIN/PURGE COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1/2 FILL & DRAIN/PURGE COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 155

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

ITEM: MANIFOLD 3/4/5 FILL & DRAIN/PURGE COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3/4/5 FILL & DRAIN/PURGE COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT); FLIGHT RULE 6-41 E.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 156

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

ITEM: MANIFOLD 3/4/5 FILL & DRAIN/PURGE COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3/4/5 FILL & DRAIN/PURGE COUPLING
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 [ ] B [ ] C [ ]

LOCATION: HELIUM/FUEL/OXIDIZER SERVICING PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 157

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

ITEM: MANIFOLD 1, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	2/1R
MDAC ID:	158	ABORT:	1/1

ITEM: MANIFOLD 1, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, ISOL VLV
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY IN ALL PHASES EXCEPT RTLS FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION ON OTHER MANIFOLDS. NEXT ASSOCIATED FAILURE MAY RESULT IN INABILITY TO COMPLETE FRCS DUMP, LEADING TO POSSIBLE VIOLATION OF THE CG SAFETY BOUNDARY. DURING RTLS, JETS ON OTHER MANIFOLDS FIRING IN THE SAME DIRECTION AS THOSE ON THIS MANIFOLD ARE NOT CONSIDERED TO BE REDUNDANT, SINCE LOSS OF THE FOUR PRIMARY JETS ON THIS MANIFOLD WILL AFFECT PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-942099 REV D EO D01 (42BN & 42BT); RCS SFOM, FIG. 3-4.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 159

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

ITEM: MANIFOLD 1, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF THE MANIFOLD AND POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. FAILURE OF ALL REDUNDANCY MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANT DURING RTLS TO MEET THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 160

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

ITEM: MANIFOLD 1, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 161

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

ITEM: MANIFOLD 2, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	2/1R
MDAC ID:	162	ABORT:	1/1

ITEM: MANIFOLD 2, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, ISOL VLV
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY IN ALL PHASES EXCEPT RTLS FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION ON OTHER MANIFOLDS. NEXT ASSOCIATED FAILURE MAY RESULT IN INABILITY TO COMPLETE FRCS DUMP, LEADING TO POSSIBLE VIOLATION OF THE CG SAFETY BOUNDARY. DURING RTLS, JETS ON OTHER MANIFOLDS FIRING IN THE SAME DIRECTION AS THOSE ON THIS MANIFOLD ARE NOT CONSIDERED TO BE REDUNDANT, SINCE LOSS OF THE FOUR PRIMARY JETS ON THIS MANIFOLD WILL AFFECT PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-942099 REV D EO D01 (43DE); RCS SFOM, FIG. 3-4.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 163

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

ITEM: MANIFOLD 2, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF THE MANIFOLD AND POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. FAILURE OF ALL REDUNDANCY MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANT DURING RTLS TO MEET THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	164	ABORT:	3/3

ITEM: MANIFOLD 2, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 165

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

ITEM: MANIFOLD 3, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 166

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

ITEM: MANIFOLD 3, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, ISOL VLV
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY IN ALL PHASES EXCEPT RTLS FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION ON OTHER MANIFOLDS. NEXT ASSOCIATED FAILURE MAY RESULT IN INABILITY TO COMPLETE FRCS DUMP, LEADING TO POSSIBLE VIOLATION OF THE CG SAFETY BOUNDARY. DURING RTLS, JETS ON OTHER MANIFOLDS FIRING IN THE SAME DIRECTION AS THOSE ON THIS MANIFOLD ARE NOT CONSIDERED TO BE REDUNDANT, SINCE LOSS OF THE FOUR PRIMARY JETS ON THIS MANIFOLD WILL AFFECT PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-942099 REV D EO D01 (43DE); RCS SFOM, FIG. 3-4.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 167

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

ITEM: MANIFOLD 3, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF THE MANIFOLD AND POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. FAILURE OF ALL REDUNDANCY MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANT DURING RTLS TO MEET THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: FRCS FLIGHT: 3/3
MDAC ID: 168 ABORT: 3/3

ITEM: MANIFOLD 3, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 169

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

ITEM: MANIFOLD 4, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: FRCS FLIGHT: 2/1R
MDAC ID: 170 ABORT: 1/1

ITEM: MANIFOLD 4, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, ISOL VLV
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY IN ALL PHASES EXCEPT RTLS FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION ON OTHER MANIFOLDS. NEXT ASSOCIATED FAILURE MAY RESULT IN INABILITY TO COMPLETE FRCS DUMP, LEADING TO POSSIBLE VIOLATION OF THE CG SAFETY BOUNDARY. DURING RTLS, JETS ON OTHER MANIFOLDS FIRING IN THE SAME DIRECTION AS THOSE ON THIS MANIFOLD ARE NOT CONSIDERED TO BE REDUNDANT, SINCE LOSS OF THE FOUR PRIMARY JETS ON THIS MANIFOLD WILL AFFECT PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-942099 REV D EO D01 (43DE); RCS SFOM, FIG. 3-4.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 171

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

ITEM: MANIFOLD 4, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF THE MANIFOLD AND POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. FAILURE OF ALL REDUNDANCY MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANT DURING RTLS TO MEET THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 172

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

ITEM: MANIFOLD 4, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 173

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

ITEM: MANIFOLD 5, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 174

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

ITEM: MANIFOLD 5, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, ISOL VLV
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:	2/2	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF VRCS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 175

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

ITEM: MANIFOLD 5, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF THE MANIFOLD AND POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 176

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

ITEM: MANIFOLD 5, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER MANIFOLD DRAIN, PURGE AND CHECKOUT PANEL
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
VALVE NORMALLY CLOSED.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 177

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

ITEM: MANIFOLD ISOL VLVS
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD ISOL VLVS
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 [ ] B [ ] C [ ]

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO POD/VEHICLE WHICH WILL CAUSE CORROSION, RESULTING IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 178

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

ITEM: MANIFOLD ISOL VLVS
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD ISOL VLVS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN TANK ISOLATION VALVES AND THRUSTERS
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, CAUSING ZOTS AND/OR NOZZLE BURNTHROUGH, RESULTING IN LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-942099 REV D EO D01 (43DE).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 179

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

ITEM: JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER LINES LEADING INTO JET BIPROPELLANT VALVE
PART NUMBER: FU & OX:

CAUSES: HIGH PRESSURE, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
THIS FAILURE CAUSES PROPELLANT TO LEAK INTO THE POD/VEHICLE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	1/1
MDAC ID:	180	ABORT:	1/1

ITEM: JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER LINES LEADING INTO JET BIPROPELLANT VALVE
PART NUMBER: FU & OX:

CAUSES: VACUUM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 181

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

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, ALL AXES
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN/ON)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
A FAILED-ON JET CAN CAUSE CONTACT WITH PAYLOADS DURING RENDEZVOUS, RESULTING IN LOSS OF VEHICLE AND/OR EVA CREW. RM WILL NOT DESELECT JET; MUST BE SECURED BY CREW CLOSING ITS MANIFOLD. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 182

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

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, ALL AXES
FAILURE MODE: LEAKS EXTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO POD/VEHICLE, CAUSING CORROSION, RESULTING IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 183

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

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, ALL AXES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, ALL AXES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 184

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

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, -X AXIS
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, -X AXIS
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM, LOW TEMPERATURE FREEZES PROPELLANT IN VALVE

EFFECTS/RATIONALE:
REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION. RM WILL DESELECT JET. FAILURE CANNOT BE DETECTED UNTIL JET TRIES TO FIRE. LOSS OF ALL REDUNDANCY AFFECTS ONORBIT OPERATIONS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 185

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

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, -X AXIS
FAILURE MODE: LEAKS INTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, -X AXIS
5)
6)
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CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO COMBUSTION CHAMBER, WHICH CAN FREEZE, RESULTING IN LOSS OF THE JET. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE. LEAKAGE ONORBIT CAN CAUSE LOSS OF LIFE FOLLOWING EVA IF CREW IS CONTAMINATED BY PROPELLANTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	2/1R
MDAC ID:	186	ABORT:	1/1

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, Y AXIS
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, Y AXIS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM, LOW TEMPERATURE FREEZES PROPELLANT IN VALVE

EFFECTS/RATIONALE:
REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION. RM WILL DESELECT JET. FAILURE CANNOT BE DETECTED UNTIL JET TRIES TO FIRE. NEXT ASSOCIATED FAILURE ONORBIT MAY CAUSE CONTACT WITH PAYLOADS AND/OR EVA CREW AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ABORTS AND ENTRY TO MEET THE CG SAFETY BOUNDARIES. FAILURE DURING RTLS MAY RESULT IN THE INABILITY TO COMPLETE A FRCS DUMP.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 187

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

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, Y AXIS
FAILURE MODE: LEAKS INTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, Y AXIS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO COMBUSTION CHAMBER, WHICH CAN FREEZE, RESULTING IN LOSS OF THE JET. FAILURE OF ALL REDUNDANCY MAY CAUSE INABILITY TO DUMP ENOUGH PROPELLANTS DURING ENTRY OR ABORTS TO MEET THE CG SAFETY BOUNDARIES.
LEAKAGE ONORBIT CAN CAUSE LOSS OF LIFE FOLLOWING EVA IF CREW IS CONTAMINATED BY PROPELLANTS. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 188

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

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, Z AXIS
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, Z AXIS
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM, LOW TEMPERATURE FREEZES PROPELLANT IN VALVE

EFFECTS/RATIONALE:
REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION. RM WILL DESELECT JET. FAILURE CANNOT BE DETECTED UNTIL JET TRIES TO FIRE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 189

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

ITEM: THRUSTER BIPROP SOLENOID VLV, PRIMARY, Z AXIS
FAILURE MODE: LEAKS INTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, PRIMARY, Z AXIS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO COMBUSTION CHAMBER, WHICH CAN FREEZE, RESULTING IN LOSS OF THE JET. INHALATION OF PROPELLANT ON THE GROUND CAN CAUSE LOSS OF LIFE.
LEAKAGE ONORBIT CAN CAUSE LOSS OF LIFE FOLLOWING EVA IF CREW IS CONTAMINATED BY PROPELLANTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 190

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

ITEM: JET ALIGNMENT BELLOWS, VERNIER, ALL AXES
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) JET ALIGNMENT BELLOWS, VERNIER, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXID LINES LEADING INTO JET BIPROP VALVE
PART NUMBER: FU & OX:

CAUSES: HIGH PRESSURE, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
THIS FAILURE CAUSES PROPELLANT TO LEAK INTO POD/VEHICLE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION. FAILURE CAUSES HAZARD TO GROUND CREW.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	1/1
MDAC ID:	191	ABORT:	3/3

ITEM: JET ALIGNMENT BELLOWS, VERNIER, ALL AXES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) JET ALIGNMENT BELLOWS, VERNIER, ALL AXES
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:	1/1	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: FUEL/OXID LINES LEADING INTO JET BIPROP VALVE
PART NUMBER: FU & OX:

CAUSES: VACUUM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 192

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

ITEM: THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN/ON)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
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:	1/1	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF VERNIER RCS. RM WILL NOT DESELECT JET, MUST BE SECURED BY CREW CLOSING ITS MANIFOLD. A FAILED ON JET CAN CAUSE CONTACT WITH PAYLOADS DURING RENDEZVOUS, RESULTING IN LOSS OF VEHICLE, AND/OR EVA CREW.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 193

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

ITEM: THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
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:	2/2	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM, LOW TEMPERATURE FREEZES PROPELLANT IN VALVE

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF VERNIER RCS. RM WILL DESELECT JETS. FAILURE CANNOT BE DETECTED UNTIL JET IS COMMANDED TO FIRE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 194

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

ITEM: THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
FAILURE MODE: LEAKS EXTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO POD/VEHICLE CAUSING CORROSION, RESULTING IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 195

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

ITEM: THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
FAILURE MODE: LEAKS INTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO COMBUSTION CHAMBER, WHICH CAN FREEZE, RESULTING IN LOSS OF THE VERNIER RCS. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE. LEAKAGE ONORBIT CAN CAUSE LOSS OF LIFE FOLLOWING EVA IF CREW IS CONTAMINATED BY PROPELLANT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 196

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

ITEM: THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL AXES
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:	1/1	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 197

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

ITEM: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, PRIMARY, ALL AXES
FAILURE MODE: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION BURNTHROUGH

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, PRIMARY, ALL AXES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: IMPROPER MIXTURE RATIO FROM RESTRICTED PROPELLANT FLOW, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
HOT, HIGH PRESSURE GAS VENTS INTO POD.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: FRCS
MDAC ID: 198

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

ITEM: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, VERNIER, ALL AXES
FAILURE MODE: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION BURNTHROUGH

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, VERNIER, ALL AXES
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:	1/1	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: IMPROPER MIXTURE RATIO FROM RESTRICTED PROPELLANT FLOW, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF VRCS. HOT, HIGH PRESSURE GAS VENTING INTO POD.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.6; VS70-942099 REV D EO D01 (42BN & 42BT).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 199

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

ITEM: HELIUM STORAGE TANK
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM STORAGE TANK
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC282-0082-0032,0031

CAUSES: MECHANICAL SHOCK, HIGH PRESSURE, VIBRATION

EFFECTS/RATIONALE:
LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS AND MAY CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 200

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

ITEM: HELIUM FILL COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM FILL COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL SERVICING PANEL
PART NUMBER: FU & OX: MC276-0017-402,403

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 201

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

ITEM: HELIUM FILL COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM FILL COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS FUEL SERVICING PANEL
PART NUMBER: FU & OX: MC276-0017-0402,0403

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 202

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

ITEM: HE ISOL A & B VLVS
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN) OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE ISOL A & B VLVS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0419-0012,0011 or 0022,0021

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE DUAL SERIES PRESSURE REGULATOR AND MANUAL OPERATION OF THE HELIUM ISOLATION VALVE. FAILURE OF ALL REDUNDANCY WILL CAUSE OVERPRESSURIZATION OF TANKS AND/OR LINES, AND MAY CAUSE ZOTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 203

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

ITEM: HE ISOL A & B VLVS
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE ISOL A & B VLVS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-00419-0012,0011 or 0022,0021

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
STANDBY REDUNDANCY. NEXT ASSOCIATED FAILURE (OTHER VALVE A OR B) WILL CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-8C, 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 204

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

ITEM: HE LINE, ALL EXCEPT ISOL VLV TO PRESS REGULATOR
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE LINE, ALL EXCEPT ISOL VLV TO PRESS REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN HELIUM TANK AND QUAD CHECK VALVE
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
FAILURE WILL RESULT IN LOSS OF HELIUM PRESSURIZATION, WHICH WILL AFFECT ONORBIT OPERATIONS AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ABORTS OR ENTRY TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CA & 43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 205

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

ITEM: HE LINE, ALL EXCEPT ISOL VLV TO PRESS REGULATOR
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE LINE, ALL EXCEPT ISOL VLV TO PRESS REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN HELIUM TANK AND QUAD CHECK VALVE
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CA & 43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 206

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

ITEM: HE LINE, ISOL VLV TO PRESS REGULATOR
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE LINE, ISOL VLV TO PRESS REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: BETWEEN HELIUM ISOL VLVS AND PRESS REG
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL HELIUM PATH. NEXT ASSOCIATED FAILURE CAUSES LOSS OF HELIUM PRESSURIZATION. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND/OR CG SAFETY BOUNDARIES TO BE EXCEEDED DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CA & 43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 207

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

ITEM: HE LINE, ISOL VLV TO PRESS REGULATOR
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HE LINE, ISOL VLV TO PRESS REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: ANY LINE BETWEEN PROPELLANT TANK AND THRUSTERS.
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL HELIUM PATH. FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CA & 43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	3/1R
MDAC ID:	208	ABORT:	3/1R

ITEM: HIGH PRESSURE HELIUM TEST PORT COUPLINGS A & B
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HIGH PRESSURE HELIUM TEST PORT COUPLINGS A & B
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: ME276-0032-0021,0019

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. FAILURE OF ALL REDUNDANCY WILL CAUSE LOSS OF HELIUM PRESSURIZATION. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 209

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

ITEM: HIGH PRESSURE HELIUM TEST PORT COUPLINGS A & B
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HIGH PRESSURE HELIUM TEST PORT COUPLINGS A & B
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: ME276-0032-0021,0019

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 210

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

ITEM: HELIUM PRESSURE REGULATOR ASSEMBLY
FAILURE MODE: FAILS OPEN OR REGULATES AT HIGHER THAN NORMAL PRESSURE

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM PRESSURE REGULATOR ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0418-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE HELIUM ISOLATION VALVE AND THE SERIES PRESSURE REGULATOR. FAILURE OF ALL REDUNDANCY WILL CAUSE OVERPRESSURIZATION AND RUPTURE OF THE PROPELLANT TANK AND LINES, AND MAY CAUSE ZOTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 211

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

ITEM: HELIUM PRESSURE REGULATOR ASSEMBLY
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM PRESSURE REGULATOR ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0418-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
STANDBY REDUNDANCY. NEXT ASSOCIATED FAILURE (PARALLEL REGULATOR OR PARALLEL HELIUM ISOLATION VALVE) WILL CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY. LOSS OF HELIUM PRESSURIZATION WILL CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND THE CG SAFETY BOUNDARIES TO BE EXCEEDED DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 212

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

ITEM: HELIUM PRESSURE REGULATOR ASSEMBLY
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM PRESSURE REGULATOR ASSEMBLY
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:	3/3		

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0418-0012,0011

CAUSES: BLOCKAGE OF INLET FILTER

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL REGULATOR. RESTRICTED FLOW THROUGH REGULATORS MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, WHICH MAY RESULT IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 213

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

ITEM: HELIUM PRESSURE REGULATOR ASSEMBLY
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM PRESSURE REGULATOR ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0418-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL REGULATOR AND MANUAL OPERATION OF THE HELIUM ISOLATION VALVE. FAILURE OF ALL REDUNDANCY WILL RESULT IN LOSS OF HELIUM PRESSURIZATION, CAUSING THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ENTRY OR ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	2/1R
MDAC ID:	214	ABORT:	2/1R

ITEM: HELIUM PRESSURE REGULATOR PRIMARY SENSING PORT
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM PRESSURE REGULATOR PRIMARY SENSING PORT
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL/OXIDIZER CHECKOUT PANEL
PART NUMBER: FU & OX: 73A620096-2001

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MANUAL OPERATION OF THE HELIUM ISOLATION VALVE AND THE PARALLEL HELIUM PATH. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE TANK LANDING CONSTRAINT AND CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT. THERE ARE NO VALVES OR CAPS IN THE SENSING PORT LINES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 215

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

ITEM: HELIUM PRESSURE REGULATOR PRIMARY SENSING PORT
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM PRESSURE REGULATOR PRIMARY SENSING PORT
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL/OXIDIZER CHECKOUT PANEL
PART NUMBER: FU & OX: 73A620096-2001

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY PARALLEL HELIUM PATH, AND OTHER SERIES PRESSURE REGULATOR. NEXT ASSOCIATED FAILURE WILL CAUSE REGULATION AT A HIGHER PRESSURE WHICH MAY CAUSE AN UNACCEPTABLE MIXTURE RATIO AND/OR RUPTURE OF THE PROPELLANT TANKS AND LINES. ZOTS MAY CAUSE THRUSTER VALVE DAMAGE, LEADING TO PROPELLANT IGNITION WITHIN THE POD AND/OR THRUSTER NOZZLE BURNTHROUGH.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-50.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 216

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

ITEM: HELIUM PRESSURE REGULATOR OUTLET TEST PORT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM PRESSURE REGULATOR OUTLET TEST PORT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL/OXIDIZER TEST PORT PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR CAP) WILL BE UNDETECTABLE. NEXT ASSOCIATED FAILURE WILL CAUSE LOSS OF HELIUM PRESSURIZATION. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE TANK LANDING CONSTRAINT AND CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 217

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

ITEM: HELIUM PRESSURE REGULATOR OUTLET TEST PORT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) HELIUM PRESSURE REGULATOR OUTLET TEST PORT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS FUEL/OXIDIZER TEST PORT PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-50.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	2/1R
MDAC ID:	218	ABORT:	2/1R

ITEM: QUAD CHECK VALVE ASSEMBLY
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN) OR LEAKS (REVERSE FLOW)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) QUAD CHECK VALVE ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0481-0002,0001

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NEXT ASSOCIATED FAILURE (VALVE IN SERIES WITH FAILED VALVE FAILS OPEN) WILL ALLOW PROPELLANT TO BACKFLOW TO THE REGULATORS. THIS CAN CAUSE LOSS OF LIFE DURING GROUND SERVICING DUE TO INHALATION OF PROPELLANT VAPORS. CORROSION OF HELIUM REGULATORS AND/OR HELIUM ISOLATION VALVES BY PROPELLANT WHICH HAS BACKFLOWED MAY CAUSE LOSS OF HELIUM PRESSURIZATION CAPABILITY.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 219

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

ITEM: QUAD CHECK VALVE ASSEMBLY
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) QUAD CHECK VALVE ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0481-0002,0001

CAUSES: PIECE-PART STRUCTURAL FAILURE, LOW TEMPERATURE FREEZES PROPELLANT INSIDE VALVE

EFFECTS/RATIONALE:
NEXT ASSOCIATED FAILURE (PARALLEL VALVE FAILS CLOSED) WILL CAUSE LOSS OF HELIUM PRESSURIZATION. LOSS OF HELIUM PRESSURIZATION CAPABILITY WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND THE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	3/1R
MDAC ID:	220	ABORT:	3/1R

ITEM: QUAD CHECK VALVE TEST PORT COUPLINGS A & B
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) QUAD CHECK VALVE TEST PORT COUPLINGS A & B
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: OMS/RCS FUEL/OXIDIZER CHECKOUT PANEL
PART NUMBER: FU & OX: ME276-0032-0007,0008

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. FAILURE OF ALL REDUNDANCY WILL CAUSE LOSS OF HELIUM UNTIL CREW CLOSES HELIUM ISOLATION VALVES. LOSS OF HELIUM PRESSURIZATION WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 221

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

ITEM: QUAD CHECK VALVE TEST PORT COUPLINGS A & B
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) HE PRESS SUBSYSTEM
4) QUAD CHECK VALVE TEST PORT COUPLINGS A & B
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS FUEL/OXIDIZER CHECKOUT PANEL
PART NUMBER: FU & OX: ME276-0032-0007,0008

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 222

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

ITEM: PROPELLANT TANK
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROPELLANT TANK
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC282-0061-0604,0603

CAUSES: MECHANICAL SHOCK, HIGH PRESSURE, VIBRATION

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF PROPELLANT INTO THE POD/VEHICLE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 223

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

ITEM: PROP LINES, ALL
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP LINES, ALL
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 [ ] B [ ] C [ ]

LOCATION: ANY LINE BETWEEN PROPELLANT TANK AND THRUSTERS.
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
PRESSURE IN TANK AND LINE WILL FORCE PROPELLANT OUT OF LINE INTO POD/VEHICLE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CA & 43DA; 43CH & 43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 224

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

ITEM: PROP LINES, ALL
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP LINES, ALL
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: ANY LINE BETWEEN PROPELLANT TANK AND THRUSTERS.
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, CAUSING ZOTS AND/OR NOZZLE BURNTHROUGH RESULTING IN LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CA & 43DA; 43CB & 43DB).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 225

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

ITEM: PROP FILL/VENT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP FILL/VENT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL SERVICING PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF CREW FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	3/3
MDAC ID:	226	ABORT:	3/3

ITEM: PROP FILL/VENT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP FILL/VENT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS FUEL SERVICING PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 227

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

ITEM: PROP CHANNEL SCREENS
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP CHANNEL SCREENS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PROPELLANT TANK INTERIOR
PART NUMBER: FU & OX:

CAUSES: HIGH PRESSURE, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
HELIUM INGESTION WILL CAUSE ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH. FAILURE IS NOT DETECTABLE UNTIL THRUSTERS FAIL DUE TO HELIUM INGESTION OR ZOTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); RCS 2102, FIG. 3.2.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 228

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

ITEM: PROP FEEDOUT TUBE
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP FEEDOUT TUBE
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PROPELLANT TANK INTERIOR
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, VACUUM

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 J, K AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 229

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

ITEM: PROP TK UPPER COMPARTMENT CHANNEL CHECKOUT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK UPPER COMPARTMENT CHANNEL CHECKOUT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: ME276-0032-0007,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. FAILURE OF ALL REDUNDANCY WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 J, K AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 230

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

ITEM: PROP TK UPPER COMPARTMENT CHANNEL CHECKOUT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK UPPER COMPARTMENT CHANNEL CHECKOUT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: ME276-0032-0007,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 231

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

ITEM: PROP TK LOWER COMPARTMENT CHANNEL BLEED COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK LOWER COMPARTMENT CHANNEL BLEED COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: NOT SPECIFIED ON DRAWING
PART NUMBER: FU & OX: MC276-0018-3451,3401

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 J, K AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 232

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

ITEM: PROP TK LOWER COMPARTMENT CHANNEL BLEED COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK LOWER COMPARTMENT CHANNEL BLEED COUPLING
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 [ ] B [ ] C [ ]

LOCATION: NOT SPECIFIED ON DRAWING
PART NUMBER: FU & OX: MC276-0018-3451,3401

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 233

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

ITEM: PROP TK LOWER COMPARTMENT CHECKOUT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK LOWER COMPARTMENT CHECKOUT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: ME276-0032-0007,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. FAILURE OF ALL REDUNDANCY WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 J, K AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 234

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

ITEM: PROP TK LOWER COMPARTMENT CHECKOUT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK LOWER COMPARTMENT CHECKOUT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: ME276-0032-0007,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 235

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

ITEM: PROP TK PLENUM SCREEN CHECKOUT COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK PLENUM SCREEN CHECKOUT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: NOT SPECIFIED ON DRAWING
PART NUMBER: FU & OX: ME276-0032-0007,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. FAILURE OF ALL REDUNDANCY WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 J, K AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 236

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

ITEM: PROP TK PLENUM SCREEN CHECKOUT COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK PLENUM SCREEN CHECKOUT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: NOT SPECIFIED ON DRAWING
PART NUMBER: FU & OX: ME276-0032-0007,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5;
VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 237

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

ITEM: PROP TK ENTRY SUMP BLEED COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK ENTRY SUMP BLEED COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL SERVICING PANEL
PART NUMBER: FU & OX: MC276-0018-3452,3402

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 J, K AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 238

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

ITEM: PROP TK ENTRY SUMP BLEED COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TK ENTRY SUMP BLEED COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS FUEL SERVICING PANEL
PART NUMBER: FU & OX: MC276-0018-3452,3402

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 239

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

ITEM: GIMBAL BELLOWS
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GIMBAL BELLOWS
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 [ ] B [ ] C [ ]

LOCATION: DOWNSTREAM OF PROPELLANT TANK
PART NUMBER: FU & OX: 73P550015-1006

CAUSES: HIGH PRESSURE, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
ASSUME THIS IS A SINGLE BARRIER FAILURE, THAT IS, NO INTERNAL LEAK PATH REDUNDANCY EXISTS. FAILURE RESULTS IN PROPELLANT LEAKING INTO THE POD/VEHICLE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	1/1
MDAC ID:	240	ABORT:	1/1

ITEM: GIMBAL BELLOWS
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GIMBAL BELLOWS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: DOWNSTREAM OF PROPELLANT TANK
PART NUMBER: FU & OX: 73P550015-1006

CAUSES: VACUUM, CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 J, K AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 241

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

ITEM: PRESSURE RELIEF ASSEMBLY
FAILURE MODE: BURST DISK RUPTURES AT LOW PRESSURE, OR LEAKS

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PRESSURE RELIEF ASSEMBLY
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0421-0012,0011

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (BURST DISC RUPTURE) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF CREW FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 242

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

ITEM: PRESSURE RELIEF ASSEMBLY
FAILURE MODE: BURST DISK FAILS TO RUPTURE, RUPTURES AT A HIGHER THAN NOMINAL PRESSURE, OR POPPET VALVE FAILS CLOSED AFTER BURST DISK RUPTURES AT NOMINAL PRESSURE.

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PRESSURE RELIEF ASSEMBLY
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0421-0012,0011

CAUSES: MATERIAL FLAW, CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
OVERPRESSURIZATION OF PROPELLANT TANK AND LINES WILL CAUSE TANK AND/OR LINE RUPTURE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND/OR PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	3/1R
MDAC ID:	243	ABORT:	3/1R

ITEM: RELIEF VALVE TEST PORT COUPLING
FAILURE MODE: PRESSURE RELIEF VALVE TEST PORT FAILS TO CLOSE (FAILS OPEN) OR LEAKS OVERBOARD

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RELIEF VALVE TEST PORT COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL/OXIDIZER CHECKOUT PANEL
PART NUMBER: FU & OX: ME276-0032

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (BURST DISC RUPTURE) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING DEORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF CREW FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 244

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

ITEM: RELIEF VALVE TEST PORT COUPLING
FAILURE MODE: PRESSURE RELIEF VALVE TEST PORT FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RELIEF VALVE TEST PORT COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS FUEL/OXIDIZER CHECKOUT PANEL
PART NUMBER: FU & OX: ME276-0032

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 245

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

ITEM: GROUND MANUAL ISOLATION VALVE
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GROUND MANUAL ISOLATION VALVE
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0480-0002,0001

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK (GROUND HANDLING)

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 246

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

ITEM: GROUND MANUAL ISOLATION VALVE
FAILURE MODE: FAILS TO REMAIN OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GROUND MANUAL ISOLATION VALVE
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0480-0002,0001

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK (GROUND HANDLING)

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF HELIUM PRESSURIZATION (VALVE LOCATED UPSTREAM OF PROPELLANT TANK). LOSS OF HELIUM PRESSURIZATION WILL CAUSE THE TANK LANDING WEIGHT CONSTRAINTS AND CG SAFETY BOUNDARIES TO BE EXCEEDED DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA); FLIGHT RULE 6-41 G, H, I AND 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 247

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

ITEM: GROUND MANUAL ISOLATION VALVE
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) GROUND MANUAL ISOLATION VALVE
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0480-0002,0001

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, MECHANICAL SHOCK (GROUND HANDLING)

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF PROPELLANT AND HELIUM. PROPELLANT WILL LEAK INTO THE POD. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DA).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 248

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

ITEM: PROP TANK ISOL VLVS 1/2 & 3/4/5
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TANK ISOL VLVS 1/2 & 3/4/5
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO THE POD/VEHICLE, CAUSING CORROSION, WHICH COULD RESULT IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DC).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 249

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

ITEM: PROP TANK ISOL VLVS 1/2 & 3/4/5
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TANK ISOL VLVS 1/2 & 3/4/5
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DC).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 250

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

ITEM: PROP TANK ISOL VLV 1/2
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TANK ISOL VLV 1/2
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE 3/4/5 A & B ISOLATION VALVES. FAILURE WILL AFFECT CROSSFEED OPERATIONS AND ENTRY DTOs AND PTIs. FAILURE OF ALL REDUNDANCY MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ENTRY OR ABORTS TO MEET THE TANK LANDING CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DC).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 251

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

ITEM: PROP TANK ISOL VLV 1/2
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TANK ISOL VLV 1/2
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY DURING ALL PHASES EXCEPT RTLS IS PROVIDED BY THE 3/4/5 A & B ISOLATION VALVES. FIRST FAILURE WILL CAUSE LOSS OF SIX PRIMARY JETS WHICH WILL AFFECT ONORBIT CROSSFEED OPERATIONS, ENTRY DTOs AND PTIs, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANT DURING RTLS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS, AND/OR THE CG SAFETY BOUNDARIES. SIMILARLY, NEXT ASSOCIATED FAILURE MAY RESULT IN LOSS OF VEHICLE DURING ENTRY AND OTHER ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DC); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 252

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

ITEM: PROP TANK ISOL VLV 3/4/5/ A & B
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TANK ISOL VLV 3/4/5/ A & B
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
FAILURE OF THE PARALLEL 3/4/5 VALVE WILL AFFECT CROSSFEED OPERATIONS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ABORTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DB).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 253

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

ITEM: PROP TANK ISOL VLV 3/4/5/ A & B
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) PROP TANK ISOL VLV 3/4/5/ A & B
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE PARALLEL 3/4/5 ISOLATION VALVE AND THE 1/2 ISOLATION VALVE. FAILURE OF BOTH VALVES ONORBIT WILL AFFECT CROSSFEED OPERATIONS AND ENTRY DTOs AND PTIs. FAILURE OF ALL REDUNDANCY WILL CAUSE LOSS OF SIX PRIMARY JETS WHICH MAY CAUSE INABILITY TO EXPEL ENOUGH PROPELLANT DURING RTLS TO MEET THE CG SAFETY BOUNDARIES. SIMILARLY, FAILURE OF ALL REDUNDANCY MAY RESULT IN LOSS OF VEHICLE DURING ENTRY AND OTHER ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DB); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 254

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

ITEM: MANIFOLD 1/2 GROUND PURGE COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1/2 GROUND PURGE COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL/OXIDIZER DRAIN PURGE PANEL
PART NUMBER: FU & OX: MC276-0018-3852,3802

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DD).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 255

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

ITEM: MANIFOLD 1/2 GROUND PURGE COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1/2 GROUND PURGE COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS FUEL/OXIDIZER DRAIN PURGE PANEL
PART NUMBER: FU & OX: MC276-0018-3852,3802

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DD).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	2/1R
MDAC ID:	256	ABORT:	2/1R

ITEM: MANIFOLD 3/4/5 GROUND PURGE COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3/4/5 GROUND PURGE COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS FUEL/OXIDIZER DRAIN PURGE PANEL
PART NUMBER: FU & OX: MC276-0018-3852,3802

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE POSSIBLE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DC).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 257

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

ITEM: MANIFOLD 3/4/5 GROUND PURGE COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3/4/5 GROUND PURGE COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS FUEL/OXIDIZER DRAIN PURGE PANEL
PART NUMBER: FU & OX: MC276-0018-3852,3802

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DD).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 258

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

ITEM: RCS CROSSFEED VLV 1/2 OR 3/4/5
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RCS CROSSFEED VLV 1/2 OR 3/4/5
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CD & 43DD); RCS 2102, FIG. 7-2 AND 8-1. FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 259

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

ITEM: RCS CROSSFEED VLV 1/2 OR 3/4/5
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RCS CROSSFEED VLV 1/2 OR 3/4/5
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO THE POD/VEHICLE, CAUSING CORROSION, WHICH COULD RESULT IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CD & 43DD); RCS 2102, FIG. 7-2 AND 8-1. FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	2/2
MDAC ID:	260	ABORT:	3/3

ITEM: RCS CROSSFEED VLV 1/2
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RCS CROSSFEED VLV 1/2
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:	2/2	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
DURING ONORBIT, THIS MAY AFFECT CROSSFEED OPERATIONS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CD & 43DD); RCS 2102, FIG. 7-2 AND 8-1. FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 261

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

ITEM: RCS CROSSFEED VLV 1/2
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RCS CROSSFEED VLV 1/2
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
FAILURE WILL AFFECT CROSSFEED OPERATIONS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANT DURING ABORTS TO MEET THE TANK LANDING CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES. THERE IS NO REDUNDANCY TO CROSSFEED TO THE 1/2 THRUSTERS ONORBIT, AND NO REDUNDANCY DURING RTLS BECAUSE OF THE FIXED RCS AND OMS DUMP LENGTHS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CD & 43DD); RCS 2102, FIG. 7-2 AND 8-1. FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 262

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

ITEM: RCS CROSSFEED VLV 3/4/5
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RCS CROSSFEED VLV 3/4/5
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:	2/2	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
DURING ONORBIT, THIS MAY AFFECT CROSSFEED OPERATIONS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CD & 43DD); RCS 2102, FIG. 7-2 AND 8-1. FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 263

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

ITEM: RCS CROSSFEED VLV 3/4/5
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) RCS CROSSFEED VLV 3/4/5
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
FAILURE WILL AFFECT CROSSFEED OPERATIONS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANT DURING ABORTS TO MEET THE TANK LANDING CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES. THERE IS NO REDUNDANCY TO CROSSFEED TO THE 3/4/5 THRUSTERS ONORBIT, AND NO REDUNDANCY DURING RTLS BECAUSE OF THE FIXED RCS AND OMS DUMP LENGTHS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CD & 43DD); RCS 2102, FIG. 7-2 AND 8-1. FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 264

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

ITEM: CROSSFEED LINES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) CROSSFEED LINES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: ANY LINE BETWEEN PROPELLANT TANK AND THRUSTERS.
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, CAUSING ZOTS AND/OR NOZZLE BURNTHROUGH, RESULTING IN LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CD & 43DD).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 265

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

ITEM: CROSSFEED LINES
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) CROSSFEED LINES
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 [ ] B [ ] C [ ]

LOCATION: ANY LINE BETWEEN PROPELLANT TANK AND THRUSTERS.
PART NUMBER: FU & OX:

CAUSES: VIBRATION, MECHANICAL SHOCK, HIGH PRESSURE

EFFECTS/RATIONALE:
PRESSURE IN TANK AND LINE WILL FORCE PROPELLANT OUT OF LINE INTO POD/VEHICLE. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43CA & 43DA; 43CH & 43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	2/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	ARCS	FLIGHT:	3/3
MDAC ID:	266	ABORT:	3/3

ITEM: MANIFOLD 1, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0006,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DE).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 267

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

ITEM: MANIFOLD 1, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, ISOL VLV
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0006,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY FOR ALL PHASES EXCEPT RTLS FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION FROM DIFFERENT MANIFOLDS. LOSS OF ALL REDUNDANCY MAY RESULT IN LOSS OF VEHICLE DURING ENTRY DUE TO INABILITY TO CONTROL VEHICLE. DURING RTLS, JETS ON OTHER MANIFOLDS FIRING IN THE SAME DIRECTION AS THOSE ON THIS MANIFOLD ARE NOT CONSIDERED TO BE REDUNDANT, SINCE LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE THE INABILITY TO EXPEL ENOUGH RCS AND/OR OMS PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DE); RCS SFOM, FIG. 3-4.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 268

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

ITEM: MANIFOLD 1, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE INABILITY TO EXPEL ENOUGH PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS, AND/OR THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 269

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

ITEM: MANIFOLD 1, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 270

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

ITEM: MANIFOLD 2, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0006,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DE).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 271

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

ITEM: MANIFOLD 2, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, ISOL VLV
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0006,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY FOR ALL PHASES EXCEPT RTLS FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION FROM DIFFERENT MANIFOLDS. LOSS OF ALL REDUNDANCY MAY RESULT IN LOSS OF VEHICLE DURING ENTRY DUE TO INABILITY TO CONTROL VEHICLE. DURING RTLS, JETS ON OTHER MANIFOLDS FIRING IN THE SAME DIRECTION AS THOSE ON THIS MANIFOLD ARE NOT CONSIDERED TO BE REDUNDANT, SINCE LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE THE INABILITY TO EXPEL ENOUGH RCS AND/OR OMS PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DE); RCS SFOM, FIG. 3-4.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 272

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

ITEM: MANIFOLD 2, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE INABILITY TO EXPEL ENOUGH PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS, AND/OR THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 273

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

ITEM: MANIFOLD 2, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 274

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

ITEM: MANIFOLD 3, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0006,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DF).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 275

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

ITEM: MANIFOLD 3, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, ISOL VLV
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0006,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY FOR ALL PHASES EXCEPT RTLS FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION FROM DIFFERENT MANIFOLDS. LOSS OF ALL REDUNDANCY MAY RESULT IN LOSS OF VEHICLE DURING ENTRY DUE TO INABILITY TO CONTROL VEHICLE. DURING RTLS, JETS ON OTHER MANIFOLDS FIRING IN THE SAME DIRECTION AS THOSE ON THIS MANIFOLD ARE NOT CONSIDERED TO BE REDUNDANT, SINCE LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE THE INABILITY TO EXPEL ENOUGH RCS AND/OR OMS PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DF); RCS SFOM, FIG. 3-4.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 276

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

ITEM: MANIFOLD 3, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE INABILITY TO EXPEL ENOUGH PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS, AND/OR THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 277

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

ITEM: MANIFOLD 3, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 278

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

ITEM: MANIFOLD 4, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0006,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DF).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 279

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

ITEM: MANIFOLD 4, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, ISOL VLV
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0430-0006,0005

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
REDUNDANCY FOR ALL PHASES EXCEPT RTLS FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION FROM DIFFERENT MANIFOLDS. LOSS OF ALL REDUNDANCY MAY RESULT IN LOSS OF VEHICLE DURING ENTRY DUE TO INABILITY TO CONTROL VEHICLE. DURING RTLS, JETS ON OTHER MANIFOLDS FIRING IN THE SAME DIRECTION AS THOSE ON THIS MANIFOLD ARE NOT CONSIDERED TO BE REDUNDANT, SINCE LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE THE INABILITY TO EXPEL ENOUGH RCS AND/OR OMS PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DF); RCS SFOM, FIG. 3-4.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 280

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

ITEM: MANIFOLD 4, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE INABILITY TO EXPEL ENOUGH PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS, AND/OR THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 281

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

ITEM: MANIFOLD 4, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3851,3801

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 282

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

ITEM: MANIFOLD 5, ISOL VLV
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS INTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, ISOL VLV
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0420-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DG).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 283

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

ITEM: MANIFOLD 5, ISOL VLV
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, ISOL VLV
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:	2/2	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX: MC284-0420-0012,0011

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF VRCS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DG).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 284

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

ITEM: MANIFOLD 5, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN), OR LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, GROUND PURGE/DRAIN COUPLING
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3451,3401

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FIRST FAILURE (COUPLING OR COUPLING CAP) CANNOT BE DETECTED. NEXT ASSOCIATED FAILURE WILL RESULT IN PROPELLANT LEAKING OVERBOARD WHICH COULD IGNITE DURING ASCENT, ENTRY, OR ABORTS, RESULTING IN LOSS OF VEHICLE. DURING ONORBIT, LOSS OF ALL REDUNDANCY WILL CAUSE LOSS OF LIFE FOLLOWING EVA OPERATIONS IF EVA SUITS ARE CONTAMINATED BY LEAKING PROPELLANT. LOSS OF THE THREE PRIMARY JETS ON THIS MANIFOLD MAY CAUSE INABILITY TO EXPEL ENOUGH PROPELLANTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS, AND/OR THE CG SAFETY BOUNDARIES. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 285

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

ITEM: MANIFOLD 5, GROUND PURGE/DRAIN COUPLING
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, GROUND PURGE/DRAIN COUPLING
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS THRUSTER ACCESS PANEL
PART NUMBER: FU & OX: MC276-0018-3451,3401

CAUSES: CONTAMINATION, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
NONE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 286

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

ITEM: MANIFOLD ISOL VLVS
FAILURE MODE: LEAKS EXTERNALLY

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD ISOL VLVS, ALL
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 [ ] B [ ] C [ ]

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO POD/VEHICLE, CAUSING CORROSION WHICH CAN RESULT IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DE).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 287

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

ITEM: MANIFOLD ISOL VLVS
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD ISOL VLVS, ALL
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: OMS/RCS POD
PART NUMBER: FU & OX:

CAUSES: VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DE).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 288

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

ITEM: JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXIDIZER LINES LEADING INTO JET BIPROPELLANT VALVE
PART NUMBER: FU & OX: 73P550003-1002,1001

CAUSES: HIGH PRESSURE, VIBRATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
THIS FAILURE CAUSES PROPELLANT TO LEAK INTO THE POD/VEHICLE. THERE ARE TWO ALIGNMENT BELLOWS PER PRCS JET. LOSS OF PROPELLANT CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 289

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

ITEM: JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: FUEL/OXIDIZER LINES LEADING INTO JET BIPROPELLANT VALVE
PART NUMBER: FU & OX: 73P550003-1002,1001

CAUSES: VACUUM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 290

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, ALL AXES
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN/ON)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
A FAILED ON JET CAN CAUSE CONTACT WITH PAYLOADS DURING RENDEZVOUS, RESULTING IN LOSS OF VEHICLE, AND/OR EVA CREW, AND CAN CAUSE LOSS OF VEHICLE DURING ENTRY OR ABORTS. RM WILL NOT DESELECT JET, MUST BE SECURED BY CREW CLOSING ITS MANIFOLD. INHALATION OF PROPELLANT VAPORS ON THE GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 291

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, ALL AXES
FAILURE MODE: LEAKS EXTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO POD/VEHICLE, CAUSING CORROSION WHICH COULD RESULT IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 292

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, ALL AXES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, ALL AXES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 293

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, +X AXIS
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, +X AXIS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM, LOW TEMPERATURE FREEZES PROPELLANT IN VALVE

EFFECTS/RATIONALE:
REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION. RM WILL DESELECT JET. FAILURE MAY AFFECT ONORBIT OPERATIONS AND WILL AFFECT THE + X JET RCS DEORBIT CAPABILITY. FAILURE MAY ALSO AFFECT RCS AND OMS DUMPS DURING ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 294

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, +X AXIS
FAILURE MODE: LEAKS INTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, +X AXIS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO COMBUSTION CHAMBER, WHERE IT CAN FREEZE, RESULTING IN LOSS OF THE JET. RM WILL ANNOUNCE THE JET AS FAILED LEAKING AND DESELECT THE JET. FAILURE WILL CAUSE LOSS OF RCS DEORBIT CAPABILITY. LEAKAGE ONORBIT CAN CAUSE LOSS OF LIFE FOLLOWING EVA IF EVA CREW IS CONTAMINATED BY PROP. PROPELLANTS WILL NOT HAVE ENOUGH TIME TO FREEZE DURING ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 295

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, Y AXIS
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, Y AXIS
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM, LOW TEMPERATURE FREEZES PROPELLANT IN VALVE

EFFECTS/RATIONALE:
REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION. RM WILL DESELECT JET. FAILURE MAY AFFECT ONORBIT OPS AND MAY RESULT IN LOSS OF VEHICLE CONTROL DURING ENTRY. FAILURE MAY ALSO AFFECT RCS AND OMS DUMPS DURING ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 296

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, Y AXIS
FAILURE MODE: LEAKS INTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, Y AXIS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO COMBUSTION CHAMBER, WHERE IT CAN FREEZE, RESULTING IN LOSS OF THE JET. RM WILL ANNOUNCE THE JET AS FAILED LEAKING AND DESELECT THE JET. FAILURE OF ALL REDUNDANCY MAY RESULT IN LOSS OF CONTROL DURING ENTRY. LEAKAGE ONORBIT CAN CAUSE LOSS OF LIFE FOLLOWING EVA IF EVA CREW IS CONTAMINATED BY PROP. PROPELLANTS WILL NOT HAVE ENOUGH TIME TO FREEZE DURING ABORTS.
PROPELLANTS WILL NOT HAVE ENOUGH TIME TO FREEZE DURING ABORTS. INHALATION OF PROP VAPORS ON GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 297

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, Z AXIS
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, Z AXIS
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM, LOW TEMPERATURE FREEZES PROPELLANT IN VALVE

EFFECTS/RATIONALE:
REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY THRUSTERS WHICH FIRE IN THE SAME DIRECTION. RM WILL DESELECT JET. FAILURE MAY AFFECT ONORBIT OPS AND MAY RESULT IN LOSS OF VEHICLE CONTROL DURING ENTRY. FAILURE MAY ALSO AFFECT RCS AND OMS DUMPS DURING ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 298

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, PRIMARY, Z AXIS
FAILURE MODE: LEAKS INTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, PRIMARY, Z AXIS
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO COMBUSTION CHAMBER, WHERE IT CAN FREEZE, RESULTING IN LOSS OF THE JET. RM WILL ANNOUNCE THE JET AS FAILED LEAKING AND DESELECT THE JET. FAILURE OF ALL REDUNDANCY MAY RESULT IN LOSS OF CONTROL DURING ENTRY. LEAKAGE ONORBIT CAN CAUSE LOSS OF LIFE FOLLOWING EVA IF EVA CREW IS CONTAMINATED BY PROP. PROPELLANTS WILL NOT HAVE ENOUGH TIME TO FREEZE DURING ABORTS.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 299

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

ITEM: JET ALIGNMENT BELLOWS, VERNIER, ALL AXES
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE OR LEAK)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) JET ALIGNMENT BELLOWS, VERNIER, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: FUEL/OXID LINES LEADING INTO JET BIPROP VALVE
PART NUMBER: FU & OX:

CAUSES: HIGH PRESSURE, VIBRATIOPN, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
THIS FAILURE CAUSES PROP TO LEAK INTO THE POD/VEHICLE. LOSS OF PROP CAN CAUSE CORROSION, LEADING TO ELECTRICAL SHORTS AND PROP IGNITION. FAILURE CAUSES HAZARD TO GROUND CREW.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 300

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

ITEM: JET ALIGNMENT BELLOWS, VERNIER, ALL AXES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) PROP STOR & DIST SUBSYSTEM
4) JET ALIGNMENT BELLOWS, VERNIER, ALL AXES
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:	1/1	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: FUEL/OXID LINES LEADING INTO JET BIPROP VALVE
PART NUMBER: FU & OX:

CAUSES: VACUUM, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 301

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
FAILURE MODE: FAILS TO CLOSE (FAILS OPEN/ON)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
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:	1/1	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF VERNIER RCS. RM WILL NOT DESELECT JET; MUST BE SECURED BY CREW CLOSING ITS MANIFOLD. A FAILED ON JET CAN CAUSE CONTACT WITH PAYLOADS DURING RENDEZVOUS, RESULTING IN LOSS OF VEHICLE AND/OR EVA CREW.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 302

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
FAILURE MODE: FAILS TO OPEN (FAILS CLOSED)

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
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:	2/2	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE, LOSS OF SIGNAL FROM MDM, LOW TEMPERATURE FREEZES PROPELLANT IN VALVE

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF VERNIER RCS. RM WILL DESELECT JET. FAILURE CANNOT BE DETECTED UNTIL JET IS COMMANDED TO FIRE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 303

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
FAILURE MODE: LEAKS EXTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
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 [ ] B [ ] C [ ]

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO POD/VEHICLE, CAUSING CORROSION AND RESULTING IN ELECTRICAL SHORTS AND PROPELLANT IGNITION.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 304

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
FAILURE MODE: LEAKS INTERNALLY, ONE PROPELLANT

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN PROPELLANT LEAKING INTO INTO COMBUSTION CHAMBER, WHERE IT CAN FREEZE, RESULTING IN LOSS OF THE VERNIER RCS. LEAKAGE ONORBIT CAN CAUSE LOSS OF LIFE FOLLOWING EVA IF CREW IS CONTAMINATED BY PROPELLANTS. INHALATION OF PROP VAPORS ON GROUND CAN CAUSE LOSS OF LIFE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 305

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

ITEM: THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES
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:	1/1	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE MAY CAUSE UNACCEPTABLE PROPELLANT MIXTURE RATIO, RESULTING IN ZOTS AND/OR THRUSTER NOZZLE BURNTHROUGH AND LOSS OF VEHICLE.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH)

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 306

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

ITEM: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, PRIMARY, ALL AXES
FAILURE MODE: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION BURNTHROUGH

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, PRIMARY, ALL AXES
5)
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: IMPROPER MIXTURE RATIO, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
HOT, HIGH PRESSURE GAS VENTS INTO POD.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH); FLIGHT RULE 6-95.

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 2/26/87
SUBSYSTEM: ARCS
MDAC ID: 307

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

ITEM: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, VERNIER, ALL AXES
FAILURE MODE: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION BURNTHROUGH

LEAD ANALYST: SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) HARDWARE COMPONENTS
2) ASSEMBLIES
3) THRUSTER SUBSYSTEM
4) THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, VERNIER, ALL AXES
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:	1/1	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

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

LOCATION: JET ASSEMBLY
PART NUMBER: FU & OX:

CAUSES: IMPROPER MIXTURE RATIO, PIECE-PART STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE RESULTS IN LOSS OF VRCS. HOT, HIGH PRESSURE GAS VENTS INTO POD.

REFERENCES: JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, 11.5; VS70-943099 REV B EO B12 (43DH).

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 308

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

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) CONTROLLER, REMOTE POWER
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22RPC27; 82V76A23RPC27

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE GPC COMMAND SIGNAL TO OPEN FU & OX HE ISOL A/B VLV. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN BOTH A & B HE ISOL VLVs FAILED CLOSED CASE. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN TRAPPED PROPELLANTS CAUSING THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ABORTS AND DEORBIT, LOSS OF LIFE/VEHICLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 309

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

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) CONTROLLER, REMOTE POWER
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:	3/3		

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22RPC27; 82V76A23RPC27

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU & OX HE ISOL A/B VLVs BECOMING STUCK INTO OPEN POSITION. THEREFORE THE HELIUM TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT. LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND RUPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 310

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

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) CONTROLLER, REMOTE POWER
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:	3/3		

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22RPC40; 82V76A23RPC39

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND FU & OX HE ISOL A/B VLVs CLOSED USING CREW SWITCH OR GPC. WORST CASE RESULTS IN HE ISOL A/B VLVs BECOMING STUCK IN THE OPEN POSITION. THEREFORE THE HE TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT. LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND RUPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 311

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

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) CONTROLLER, REMOTE POWER
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22RPC40; 82V76A23RPC39

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CAPABILITY TO COMMAND FU & OX HE ISOL A/B VLVs USING GPC. CREW SWITCH CAN STILL OPEN OR CLOSE VLVs. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN FU & OX HE ISOL A/B VLVs BECOMING STUCK IN THE CLOSED POSITION. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN PROPELLANTS CAUSING THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 312

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

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) CONTROLLER, REMOTE POWER
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 2, PCA 2; F BAY 3, PCA 3
PART NUMBER: 82V76A23RPC26; 83V76A24RPC27

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CREW SWITCH SIGNAL TO OPEN FU & OX HE ISOL A/B VLV. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN BOTH A & B HE ISOL VLVs FAILED CLOSED CASE. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN TRAPPED PROPELLANTS CAUSING THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ABORTS AND DEORBIT, LOSS OF LIFE/VEHICLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 313

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

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) CONTROLLER, REMOTE POWER
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:	3/3		

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

LOCATION: F BAY 2, PCA 2; F BAY 3, PCA 3
PART NUMBER: 82V76A23RPC26; 83V76A24RPC27

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU & OX HE ISOL A/B VLVs BECOMING STUCK INTO OPEN POSITION. THEREFORE THE HELIUM TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT. LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND RUPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	314	ABORT:	3/1R

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) CONTROLLER, REMOTE POWER
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:	3/3		

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22RPC41; 82V76A23CR7

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND FU & OX HE ISOL A/B VLVs CLOSED USING CREW SWITCH OR GPC. WORST CASE RESULTS IN HE ISOL A/B VLVs BECOMING STUCK IN THE OPEN POSITION. THEREFORE THE HE TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT. LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND RUPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 315

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

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) CONTROLLER, REMOTE POWER
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22RPC41; 82V76A23CR7

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CAPABILITY TO INHIBIT THE FU & OX HE ISOL A/B VLV "CLOSE" CMD. THE INHIBIT FUNCTION IS USED FOR POWER SAVINGS AND IN CASE OF A FAILURED ON COMMAND. NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 316

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16CR J1-85; 82V76A17CR J1-85

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND FU & OX HE ISOL A/B VLVs CLOSED USING GPC. CREW SWITCH CAN STILL OPEN OR CLOSE VLVS. LOSS OF ALL REDUNDANCY IS POSSIBLE INABILITY TO ISOLATE HE SYSTEM LEADING TO OVERPRESSURIZATION AND POSSIBLE RUPTURE OF PROP TANKS OR LINES, FIRE/HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 317

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16CR J1-85; 82V76A17CR J1-85

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN GPC AND CREW SWITCH CLOSE COMMANDS. THE FAILURE CAN RESULT IN LOSS OF THE GPC OR CREW SWITCH TO OPERATE THE FU & OX HE ISOL A/B VLVs. LOSS OF ALL REDUNDANCY IS POSSIBLE INABILITY TO ISOLATE HE SYSTEM LEADING TO OVERPRESSURIZATION AND POSSIBLE RUPTURE OF PROP TANKS OR LINES, FIRE/HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

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INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 318

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16CR J2-79; 82V76A17CR J2-79

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND FU & OX HE ISOL A/B VLVs CLOSED USING CREW SWITCH. GPC CAN STILL OPEN OR CLOSE VLVS. LOSS OF ALL REDUNDANCY IS POSSIBLE INABILITY TO ISOLATE HE SYSTEM LEADING TO OVERPRESSURIZATION AND POSSIBLE RUPTURE OF PROP TANKS OR LINES, FIRE/HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 319

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16CR J2-79; 82V76A17CR J2-79

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN GPC AND CREW SWITCH CLOSE COMMANDS. THE FAILURE CAN RESULT IN LOSS OF THE GPC OR CREW SWITCH TO OPERATE THE FU & OX HE ISOL A/B VLVs. LOSS OF ALL REDUNDANCY IS POSSIBLE INABILITY TO ISOLATE HE SYSTEM LEADING TO OVERPRESSURIZATION OF PROP TANKS OR LINES, FIRE/HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	2/1R
MDAC ID:	320	ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22CR37; 82V76A23CR8

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CREW SWITCH SIGNAL TO OPEN FU & OX HE ISOL A/B VLV. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN BOTH A & B HE ISOL VLVs FAILED CLOSED CASE. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN TRAPPED PROPELLANTS CAUSING THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ABORTS AND DEORBIT, LOSS OF LIFE/VEHICLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 321

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22CR37; 82V76A23CR8

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN MAIN BUSES WHEN THE GPC CMDS THE FU & OX HE ISOL A/B VLVs OPEN. THE WORST CASE EFFECT IS LOSS OF THE GPC OR CREW SWITCH "OPEN" CMD. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN BOTH A & B HE ISOL VLVs BECOMING STUCK IN THE CLOSED POSITION. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN TRAPPED FRCS PROPELLANTS CAUSING THE VEHICLE SAFETY CG BOUNDARIES TO BE EXCEEDED.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 322

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22CR13; 82V76A23RPC38

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE GPC COMMAND SIGNAL TO OPEN FU & OX HE ISOL A/B VLV. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN BOTH A & B HE ISOL VLVs FAILED CLOSED CASE. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN TRAPPED PROPELLANTS CAUSING THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ABORTS AND DEORBIT, LOSS OF LIFE/VEHICLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 323

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, PCA 1; F BAY 2, PCA 2
PART NUMBER: 81V76A22CR13; 82V76A23RPC38

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN MAIN BUSES WHEN THE CREW SWITCH CMDS THE FU & OX HE ISOL A/B VLVs OPEN. THE WORST CASE EFFECT IS LOSS OF THE GPC OR CREW SWITCH "OPEN" CMD. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN BOTH A & B HE ISOL VLVs BECOMING STUCK IN THE CLOSED POSITION. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN TRAPPED FRCS PROPELLANTS CAUSING THE VEHICLE SAFETY CG BOUNDARIES TO BE EXCEEDED.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 324

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS3
PART NUMBER: 33V73A8CR1; 82V76A17AR J4-55 TYPE II

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE THE FU & OX HE ISOL VLVs POSITION TALKBACK TO HARDWIRED CREW INDICATOR. NO IMPACT, VALVE TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 325

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS3
PART NUMBER: 33V73A8CR1; 82V76A17AR J4-55 TYPE II

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 326

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL 08 DS3
PART NUMBER: 33V73A8CR2; 33V73A8CR3

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE THE FU HE ISOL VLVs POSITION TALKBACK TO HARDWIRED CREW INDICATOR. NO IMPACT, VALVE TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 327

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS3
PART NUMBER: 33V73A8CR2; 33V73A8CR3

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 328

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
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:	3/3		

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

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16AR J4-50 TYPE I; 82V76A17AR J4-50 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND FU & OX HE ISOL A/B VLVs CLOSED USING CREW SWITCH OR GPC. WORST CASE RESULTS IN HE ISOL A/B VLVs BECOMING STUCK IN THE OPEN POSITION. THEREFORE THE HE TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT. LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND RUPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 329

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16AR J4-50 TYPE I; 82V76A17AR J4-50 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CAPABILITY TO COMMAND FU & OX HE ISOL A/B VLVs USING GPC. CREW SWITCH CAN STILL OPEN OR CLOSE VLVs. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN FU & OX HE ISOL A/B VLVs BECOMING STUCK IN THE CLOSED POSITION. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN PROPELLANTS CAUSING THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 330

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16AR J4-51 TYPE I; 82V76A17AR J4-51 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE GPC COMMAND SIGNAL TO OPEN FU & OX HE ISOL A/B VLV. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN BOTH A & B HE ISOL VLVs FAILED CLOSED CASE. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN TRAPPED PROPELLANTS CAUSING THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ABORTS AND DEORBIT, LOSS OF LIFE/VEHICLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	331	ABORT:	3/1R

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
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:	3/3		

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

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16AR J4-51 TYPE I; 82V76A17AR J4-51 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU & OX HE ISOL A/B VLVs BECOMING STUCK INTO OPEN POSITION. THEREFORE THE HELIUM TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT. LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND RUPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 332

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 2, LCA 2; F BAY 3, LCA 3
PART NUMBER: 82V76A17AR J4-57 TYPE I; 83V76A18R J1-92 (A)

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CREW SWITCH SIGNAL TO OPEN FU & OX HE ISOL A/B VLV. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN BOTH A & B HE ISOL VLVs FAILED CLOSED CASE. FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN TRAPPED PROPELLANTS CAUSING THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ABORTS AND DEORBIT, LOSS OF LIFE/VEHICLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 333

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
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:	3/3		

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

LOCATION: F BAY 2, LCA 2; F BAY 3, LCA 3
PART NUMBER: 82V76A17AR J4-57 TYPE I; 83V76A18R J1-92 (A)

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU & OX HE ISOL A/B VLVs BECOMING STUCK INTO OPEN POSITION. THEREFORE THE HELIUM TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT. LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND RUPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 334

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16AR J4-53 TYPE II; 82V76A17AR J4-53 TYPE II

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
DUAL EFFECT: FIRST, FALSE INDICATION OF FU & OX HE ISOL A/B VLV MISMATCH (GPC HAS CORRECT POSITION); TALKBACK NOT MISSION CRTICAL. SECOND, LOSE CONTROL FEEDBACK TO REMOVE POWER FROM VLV ONCE IT HAS LATCHED; VALVE CAN WITHSTAND CONTINUOUS ENERGIZATION.

REFERENCES: VS70-942099 REV D EO D01; MC284-0420 REV C AMENDMENT SEQ 8

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 335

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
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:	3/3		

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

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16AR J4-53 TYPE II; 82V76A17AR J4-53 TYPE II

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
FAILURE RESULTS IN A FALSE CREW (BARBER POLE) INDICATION OF VLV CLOSURE AND A FALSE CONTROL FEEDBACK WHICH INHIBITS ALL GPC AND CREW SWITCH "CLOSE" COMMANDS. THE FAILURE CAN RESULT IN ONE OF THE TWO FU & OX HE ISOL (A OR B) VLV'S BECOMING STUCK IN THE OPEN POSITION. THEREFORE THE HE TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT. LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND POSSIBLE RUPPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 336

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS4
PART NUMBER: 81V76A16AR J4-55 TYPE II; 33V73A8CR4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
DUAL EFFECT: FIRST, FALSE INDICATION OF FU & OX HE ISOL A/B VLV MISMATCH (GPC HAS CORRECT POSITION); TALKBACK NOT MISSION CRTICAL. SECOND, LOSE CONTROL FEEDBACK TO REMOVE POWER FROM VLV ONCE IT HAS LATCHED; VALVE CAN WITHSTAND CONTINUOUS ENERGIZATION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 337

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 DS4
PART NUMBER: 81V76A16AR J4-55 TYPE II; 33V73A8CR4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
FAILURE RESULTS IN A FALSE CREW (BARBER POLE) INDICATION OF VLV OPENING AND A FALSE CONTROL FEEDBACK WHICH INHIBITS ALL GPC AND CREW SWITCH "OPEN" COMMANDS. THE FAILURE CAN RESULT IN ONE OF THE TWO (A OR B) HE ISOL VALVES FAILING CLOSED CASE.
FOR THIS CASE, LOSS OF ALL REDUNDANCY TO THE VALVES WILL CAUSE LOSS OF HE PRESSURIZATION CAPABILITY, WHICH WILL AFFECT ONORBIT OPERATIONS AND MAY CAUSE THE VEHICLE CG SAFETY BOUNDARIES TO BE EXCEEDED DURING ENTRY OR ABORTS DUE TO THE TRAPPED PROPELLANT'S WEIGHT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 338

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
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:	3/3		

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

LOCATION: PNL O8 DS4
PART NUMBER: 81V76A16AR J4-52 TYPE I; 82V76A17AR J4-52 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND FU & OX HE ISOL A/B VLVs CLOSED USING CREW SWITCH OR GPC. WORST CASE RESULTS IN HE ISOL A/B VLVs BECOMING STUCK IN THE OPEN POSITION. THEREFORE THE HE TK CANNOT BE ISOLATED FROM THE PROPELLANT SYSTEM, NO IMMEDIATE EFFECT.
LOSS OF ALL REDUNDANCY IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND RUPTURE OF PROP TANKS OR LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 339

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS4
PART NUMBER: 81V76A16AR J4-52 TYPE I; 82V76A17AR J4-52 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CAPABILITY TO INHIBIT THE FU & OX HE ISOL A/B VLV "CLOSE" CMD. THE INHIBIT FUNCTION IS USED FOR POWER SAVINGS AND IN CASE OF A FAILURED ON COMMAND. NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 340

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

ITEM: FUSE, 1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) FUSE, 1A
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S16; PNL O8 S17
PART NUMBER: 33V73A8F4; 33V73A8F23

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND FU & OX HE ISOL A/B VLVs CLOSED USING CREW SWITCH. GPC CAN STILL OPEN OR CLOSE VLVS. LOSS OF ALL REDUNDANCY IS POSSIBLE INABILITY TO ISOLATE HE SYSTEM LEADING TO OVERPRESSURIZATION AND POSSIBLE RUPTURE OF PROP TANKS OR LINES, FIRE/HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 341

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

ITEM: FUSE, 1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) FUSE, 1A
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:	3/3		

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

LOCATION: PNL O8 S16; PNL O8 S17
PART NUMBER: 33V73A8F13; 33V73A8F28

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ALL BUT ONE COMMAND (A GPC OPEN CMD) TO OPERATE FU & OX HE ISOL A/B VLVs. THE FAILURE RESULTS IN EITHER A OR B HE ISOL VALVE FAILED OPEN. THE EFFECT IS POSSIBLE LOSS OF LIFE/VEHICLE DUE TO OVERPRESSURIZATION AND POSSIBLE RUPTURE OF PROP TANKS LINES, FIRE/EXPLOSION HAZARD, AND HAZARD TO GROUND CREW. MAY ALSO CAUSE ZOTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 342

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-86 TO J2-79 (A); 82V76A17R J1-86 TO J2-79 (A)

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FRCS HE PRESS VLV A/B POSITION TALKBACK TO GPC. NO IMPACT, VALVE POSITION TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 343

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-86 TO J2-79 (A); 82V76A17R J1-86 TO J2-79 (A)

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 344

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-86 TO J2-79 (B); 82V76A17R J1-86 TO J2-79 (B)

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 345

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-86 TO J2-79 (A); 82V76A17R J1-86 TO J2-79 (A)

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FRCS HE PRESS VLV A/B POSITION TALKBACK TO GPC. NO IMPACT, VALVE POSITION TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 346

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, LCA 2; F BAY 3, LCA 3
PART NUMBER: 82V76A17R J1-92 (A); 83V76A18AR J4-57 TYPE I

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FRCS HE PRESS VLV A/B POSITION TALKBACK TO GPC. NO IMPACT, VALVE POSITION TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 347

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, LCA 2; F BAY 3, LCA 3
PART NUMBER: 82V76A17R J1-92 (A); 83V76A18AR J4-57 TYPE I

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 348

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-88; 82V76A17R J1-88

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE THE FU HE ISOL VLVs POSITION TALKBACK TO GPC. NO IMPACT, VALVE TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 349

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-88; 82V76A17R J1-88

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 350

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-90; 82V76A17R J1-90

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE THE FU HE ISOL VLVs POSITION TALKBACK TO GPC. NO IMPACT, VALVE TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 351

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-90; 82V76A17R J1-90

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 352

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-91; 82V76A17R J1-91

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE THE OX HE ISOL VLVs POSITION TALKBACK TO GPC. NO IMPACT, VALVE TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 353

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-91; 82V76A17R J1-91

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	354	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-89; 82V76A17R J1-89

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE THE OX HE ISOL VLVs POSITION TALKBACK TO GPC. NO IMPACT, VALVE TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 355

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-89; 82V76A17R J1-89

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 356

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J1-104; 82V76A17R J2-104

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
DUAL EFFECT: FIRST, FALSE INDICATION: CREW HARDWARE TALKBACK WILL INDICATE FU & OX HE ISOL VLV MISMATCH AND GPC WILL INDICATE BOTH VALVES STUCK PARTIALLY OPEN/PARTIALLY CLOSED; VALVE TALKBACK NOT MISSION CRITICAL..
SECOND, LOSE CONTROL FEEDBACK TO REMOVE POWER FROM VALVE ONCE IT HAS LATCHED: VALVE CAN WITHSTAND CONTINUOUS ENERGIZATION.

REFERENCES: VS70-942099 REV D EO D01; MC284-0420 REV C AMENDMENT SEQ 8

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 357

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1; F BAY 2, LCA 2
PART NUMBER: 81V76A16R J2-104; 82V76A17R J2-104

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE TO HYBRID DRIVER LOGIC CIRCUIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/13/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	358	ABORT:	3/1R

ITEM: HE OX & FU ISOL VLV A OR B SWITCH
FAILURE MODE: SWITCH FAILS IN THE OPEN POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE PRESSURE REGULATOR AND THE PRESSURE RELIEF VALVE. IF THE SWITCH FAILS IN THE OPEN POSITION WHILE THE VALVE IS IN ANY POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY MDM COMMAND.
FAILURE OF ALL REDUNDANCY WILL RESULT IN THE OVERPRESSURIZATION AND RUPTURE OF THE PROPELLANT TANKS AND/OR LINES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 359

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH
FAILURE MODE: SWITCH FAILS IN THE CLOSED POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS AND THE PARALLEL ISOL VALVE. IF THE SWITCH FAILS IN THE CLOSED POSITION WHILE THE VALVE IS IN ANY POSITION, THE VALVE WILL CLOSE. IF THE MDM OPEN COMMAND IS ALSO PRESENT, OR THE SWITCH OPEN COMMAND IS ALSO PRESENT, THE VALVE WILL CYCLE OPEN AND CLOSED UNTIL THE MDM OR SWITCH OPEN COMMAND IS REMOVED, OR UNTIL THE CONTROL BUS POWER IS REMOVED FROM EITHER OF THE SWITCH'S CLOSE CONTACTS. TO OPEN THE VALVE, CREW MUST REMOVE POWER FROM EITHER OF THE SWITCH'S CLOSE CONTACTS 5,6, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPREATIONS, AND WILL CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 360

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH
FAILURE MODE: SWITCH FAILS IN THE GPC POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE PRESSURE REGULATOR AND THE PRESSURE RELIEF VALVE. TO OPERATE THE VALVE, THE CREW MUST USE THE GPC READ/WRITE PROCEDURES. IF THE VALVE IS CLOSED AND THE MDM OPEN COMMAND PATH FAILS, THE VALVE CANNOT BE OPENED BY THE MDM SWITCH COMMANDS. IF THE VALVE IS OPEN WHEN THE SWITCH FAILS, AND ALL REDUNDANCY FAILS, THE RESULT WILL BE OVERPRESSURIZATION AND RUPTURE OF THE PROPELLANT TANKS AND/OR LINES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 361

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH OPEN CONTACTS 1, 2
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 362

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH OPEN CONTACTS 1, 2
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 363

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 364

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 365

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH CLOSE CONTACTS 5, 6
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM CLOSE COMMAND, THE PRESSURE REGULATOR, AND THE PRESSURE RELIEF VALVE. IF THE CLOSE CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE OPENED BY THE SWITCH OR BY THE MDM COMMAND, AND CANNOT BE CLOSED BY THE SWITCH COMMAND, ONLY BY THE MDM COMMAND. FAILURE OF ALL REDUNDANCY WILL RESULT IN OVERPRESSURIZATION AND RUPTURE OF THE PROPELLANT TANKS AND/OR LINES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 366

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH CLOSE CONTACTS 5, 6
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS, THE OTHER SWITCH CLOSE CONTACTS, AND THE PARALLEL ISOL VALVE. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE GPC OR CLOSED POSITION, THE VALVE WILL CLOSE, AND CANNOT BE OPENED BY MDM COMMAND, ONLY BY SWITCH COMMAND. IF THE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN POSITION, THE VALVE WILL REMAIN OPEN, AND CANNOT BE CLOSE BY MDM COMMAND, ONLY BY SWITCH COMMAND. TO OPEN THE VALVE WITH THE MDM COMMAND, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CLOSE CONTACTS 5,6, AND USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROP DURING ENTRY AND ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 367

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH OPEN CONTACTS 7, 8
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH OPEN CONTACTS 7, 8
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/1R		

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS AND THE PARALLEL ISOL VALVE. IF THE OPEN CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE CLOSED BY SWITCH OR MDM COMMAND, BUT CANNOT BE OPENED BY SWITCH COMMAND, ONLY BY MDM COMMAND. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, AND MAY RESULT IN THE INABILITY TO EXPEL ENOUGH PROPELLANT DURING ENTRY AND ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 368

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH OPEN CONTACTS 7, 8
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH OPEN CONTACTS 7, 8
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE PRESSURE REGULATOR AND THE PRESSURE RELIEF VALVE . IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN OR GPC POSITION, THE VALVE WILL OPEN. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE CLOSED POSITION, OR IF THE MDM CLOSE COMMAND IS ALSO PRESENT, THE VALVE WILL CYCLE OPEN AND CLOSED UNTIL CONTROL BUS POWER TO THE OPEN OR CLOSE CONTACTS IS REMOVED, OR UNTIL THE MDM CLOSE COMMAND IS REMOVED.
FAILURE OF ALL REDUNDANCY WILL RESULT IN THE OVERPRESSURIZATION AND RUPTURE OF THE PROPELLANT TANKS AND/OR LINES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 369

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH GPC CONTACTS 9, 10
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH GPC CONTACTS 9, 10
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMAND AND THE PARALLEL ISOLATION VALVE. IF THE GPC CONTACTS FAIL OPEN, THE VALVE CAN BE OPENED BY SWITCH OR MDM COMMAND, CAN BE CLOSED BY SWITCH COMMAND, AND CANNOT BE CLOSED BY MDM COMMAND UNLESS THE SWITCH IS IN THE CLOSED POSITION. FAILURE OF ALL REDUNDANCY WILL RESULT IN LOSS OF GPC CONTROL OF THE HELIUM PRESSURE.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 370

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH GPC CONTACTS 9, 10
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH GPC CONTACTS 9, 10
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE OTHER CLOSE CONTACTS AND THE SWITCH AND MDM OPEN COMMAND. FIRST FAILURE WILL HAVE NO EFFECT. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO THE OPEN VALVE, WHICH WILL AFFECT ONORBIT OPERATIONS AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ENTRY OR ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 371

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH CLOSE CONTACTS
11, 12
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH CLOSE CONTACTS 11, 12
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE SWITCH GPC CONTACTS AND THE MDM CLOSE COMMAND, AND BY THE PRESSURE REGULATORS AND THE PRESSURE RELIEF VALVE. IF THE CLOSE CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION,
CAN BE OPENED BY THE SWITCH OR MDM COMMAND, BUT CANNOT BE CLOSED BY THE SWITCH OR MDM CLOSE COMMAND. THE VALVE CAN BE CLOSED BY PLACING THE SWITCH IN THE GPC POSITION, AND THEN USING THE GPC READ/WRITE PROCEDURES.
FAILURE OF ALL REDUNDANCY WILL RESULT IN THE OVERPRESSURIZATION AND RUPTURE OF THE PROPELLANT TANKS AND/OR LINES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 372

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH CLOSE CONTACTS 11, 12
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH CLOSE CONTACTS 11, 12
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: PNL O8 S16
PART NUMBER: 33V73A8S16; S17

CAUSES: CONTAMINATION,VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE OTHER SWITCH CLOSE CONTACTS AND THE PARALLEL ISOL VALVE. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, AND CAN BE CLOSED AND OPENED BY SWITCH OR MDM COMMAND. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ENTRY OR ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV D EO D01, CA, DA

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 373

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

ITEM: HE TK PRESS-2 PRESS SENSOR
FAILURE MODE: INDICATES LOWER PRESSURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE TK PRESS-2 PRESS SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/19/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	374	ABORT:	3/3

ITEM: HE TK PRESS-2 PRESS SENSOR
FAILURE MODE: INDICATES HIGHER PRESSURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE TK PRESS-2 PRESS SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 375

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

ITEM: HE FU TK PRESS-1 PRESS SENSOR
FAILURE MODE: INDICATES LOWER PRESSURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE FU TK PRESS-1 PRESS SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 376

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

ITEM: HE FU TK PRESS-1 PRESS SENSOR
FAILURE MODE: INDICATES HIGHER PRESSURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE FU TK PRESS-1 PRESS SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 377

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

ITEM: HE OX TK PRESS-1 PRESS SENSOR
FAILURE MODE: INDICATES LOWER PRESSURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE OX TK PRESS-1 PRESS SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 378

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

ITEM: HE OX TK PRESS-1 PRESS SENSOR
FAILURE MODE: INDICATES HIGHER PRESSURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE OX TK PRESS-1 PRESS SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 379

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

ITEM: HE OX TK PRESS-2 PRESS SENSOR
FAILURE MODE: INDICATES LOWER PRESSURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE OX TK PRESS-2 PRESS SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 380

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

ITEM: HE OX TK PRESS-2 PRESS SENSOR
FAILURE MODE: INDICATES HIGHER PRESSURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE OX TK PRESS-2 PRESS SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 381

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

ITEM: HE OX TK TEMP-1 TEMP SENSOR
FAILURE MODE: INDICATES LOWER TEMPERATURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE OX TK TEMP-1 TEMP SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT15

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK TEMPERATURE SENSOR AND REDUNDANT PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/19/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	382	ABORT:	3/3

ITEM: HE OX TK TEMP-1 TEMP SENSOR
FAILURE MODE: INDICATES HIGHER TEMPERATURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE OX TK TEMP-1 TEMP SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT15

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK TEMPERATURE SENSOR AND REDUNDANT PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 383

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

ITEM: HE OX TK TEMP-1 TEMP SENSOR
FAILURE MODE: INDICATES LOWER TEMPERATURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE OX TK TEMP-1 TEMP SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK TEMPERATURE SENSOR AND REDUNDANT PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 384

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

ITEM: HE OX TK TEMP-1 TEMP SENSOR
FAILURE MODE: INDICATES HIGHER TEMPERATURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE OX TK TEMP-1 TEMP SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK TEMPERATURE SENSOR AND REDUNDANT PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 385

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

ITEM: HE FU TK TEMP-1 TEMP SENSOR
FAILURE MODE: INDICATES LOWER TEMPERATURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE FU TK TEMP-1 TEMP SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK TEMPERATURE SENSOR AND REDUNDANT PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 386

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

ITEM: HE FU TK TEMP-1 TEMP SENSOR
FAILURE MODE: INDICATES HIGHER TEMPERATURE THAN ACTUAL

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE TK
5) HE FU TK TEMP-1 TEMP SENSOR
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 [ ] B [ ] C [ ]

LOCATION: FWD FUSELAGE AREA 20
PART NUMBER: 22V42MT2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FAILURE OF TANK TEMPERATURE SENSOR AND REDUNDANT PRESSURE SENSORS WILL CAUSE GROUND AND FLIGHT CREW DIFFICULTY IN DETECTING A TANK LEAK. CREW MAY MAKE BAD DECISION BASED ON ERRONEOUS DATA.

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 387

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

ITEM: HE OX & FU ISOL VLV A OR B SWITCH TALKBACK
FAILURE MODE: ERRONEOUS INDICATION (FAILS HIGH, FAILS LOW, FAILS MIDTRAVEL)

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) INSTRUMENTATION
3) HE PRESS SUBSYSTEM
4) HE OX & FU ISOL A & B VLVS
5) HE OX & FU ISOL VLV A OR B SWITCH TALKBACK
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:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

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

LOCATION: PNL O8 DS3, DS4
PART NUMBER: 33V73A8DS3; DS4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
FWD RCS HE PRESS A/B POSITION INDICATION WOULD FALSELY SHOW A BARBERPOLE INDICATING EITHER THE FU OR OX A OR B VALVES ARE STUCK PARTIALLY OPEN/CLOSED OR THERE IS A POSITION MISMATCH BETWEEN THE TWO VALVES. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF DIRECT VALVE TALKBACK TO CREW. WORST CASE WOULD BE FALSELY FAILING THE A OR B VALVE CLOSED RESULTING IN LOSS OF MISSION DUE TO SAFETY CONSIDERATIONS (ONE FAILURE AWAY FROM LOSS OF VEHICLE/LIFE).

REFERENCES: VS70-942099 REV D EO D01; JSC 11174, SPACE SHUTTLE SYSTEMS HANDBOOK, PAGE 11.6

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 388

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU TK ISOL 1/2 VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01; MC482-0430 REV E AMENDMENT SEQ. 7

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 389

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CONT BUS CA1 AND MNC WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION. NO EFFECT ON MISSION, ANY POSSIBLE CURRENT FLOW WILL BE LIMITED BY SERIES RESISTANCE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 390

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR21

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU ISOL 1/2 VALVE USING CREW SWITCH. THE VALVE IS STILL FULLY OPERATIONAL USING GPC CMDS. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSE. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS ABORTS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 391

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR21

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 1/2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVE FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 392

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU ISOL 1/2 VALVE USING CREW SWITCH. THE VALVE IS STILL FULLY OPERATIONAL USING GPC CMDS. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSE. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS ABORTS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 393

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 1/2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVE FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 394

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "OPEN" COMMAND AND CLOSE THE OX TK ISOL 1/2 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 395

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN FU & OX CONTROL FEEDBACKS. CONTROL FEEDBACKS INHIBIT VALVE OPERATION AFTER COMMAND HAS BEEN COMPLETED. THE FAILURE CAN RESULT IN THE OX ISOL 1/2 VALVE FAILING MIDTRAVEL WHEN COMMANDED OPEN. THE EFFECT WOULD BE LOSS OF EIGHT PRIMARY JETS CAUSING AN INABILITY TO COMPLETE TIME CRITICAL DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 396

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU & OX TK ISOL 1/2 VALVES USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 1/2 AND MANIFOLD ISOL 1&2 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 397

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "CLOSE" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 1/2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVE FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 398

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR22

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU ISOL 1/2 VALVE USING GPC CMDS. THE VALVE IS STILL FULLY OPERATIONAL USING CREW SWITCH. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSE. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS ABORTS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 399

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR22

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 1/2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVE FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 400

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN OX ISOL 1/2 VALVE USING GPC CMDS. THE VALVE IS STILL FULLY OPERATIONAL USING CREW SWITCH. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSE. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS ABORTS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	401	ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 1/2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVE FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 402

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU & OX TK ISOL 1/2 VALVES USING GPC COMMANDS. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 1/2 AND MANIFOLD ISOL 1&2 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 403

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "CLOSE" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 1/2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVE FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 404

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR18

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU TK ISOL 1/2 VALVES USING GPC COMMANDS. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 1/2 AND MANIFOLD ISOL 1&2 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 405

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR18

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "CLOSE" CMDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF ABILITY TO CLOSE FU & OX TK ISOL 1/2 VALVES USING CREW SWITCH OR GPC. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND MANIFOLD ISOL 1 OR 2 BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 406

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU TK ISOL 1/2 VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 407

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CONT BUS CA1 AND MNC WHEN THE CREW SWITCH IS PLACED IN THE OPEN POSITION. NO EFFECT ON MISSION, ANY POSSIBLE CURRENT FLOW WILL BE LIMITED BY SERIES RESISTANCE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 408

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR25

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "CLOSE" COMMAND AND OPEN THE FU TK ISOL 1/2 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 409

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR25

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN FU & OX CONTROL FEEDBACKS. CONTROL FEEDBACKS INHIBIT VALVE OPERATION AFTER COMMAND HAS BEEN COMPLETED. THE FAILURE CAN RESULT IN THE OX ISOL 1/2 VALVE FAILING MIDTRAVEL WHEN COMMANDED CLOSED. THE EFFECT COULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 410

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU TK ISOL 1/2 VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 411

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CONT BUS CA1 AND MNC WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION. NO EFFECT ON MISSION, ANY POSSIBLE CURRENT FLOW WILL BE LIMITED BY SERIES RESISTANCE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 412

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "OPEN" COMMAND AND CLOSE THE FU TK ISOL 1/2 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 413

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN FU & OX CONTROL FEEDBACKS. CONTROL FEEDBACKS INHIBIT VALVE OPERATION AFTER COMMAND HAS BEEN COMPLETED. THE FAILURE CAN RESULT IN THE FU ISOL 1/2 VALVE FAILING MIDTRAVEL WHEN COMMANDED OPEN. THE EFFECT WOULD BE LOSS OF EIGHT PRIMARY JETS CAUSING AN INABILITY TO COMPLETE TIME CRITICAL DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 414

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR17

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU TK ISOL 1/2 VALVES USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 1/2 AND MANIFOLD ISOL 1&2 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 415

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR17

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "CLOSE" CMDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF ABILITY TO CLOSE FU & OX TK ISOL 1/2 VALVES USING CREW SWITCH OR GPC. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND MANIFOLD ISOL 1 OR 2 BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 416

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR19

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE OX TK ISOL 1/2 VALVES USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 1/2 AND MANIFOLD ISOL 1&2 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 417

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR19

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU TK ISOL 1/2 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 1 OR 2 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 418

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR26

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "CLOSE" COMMAND AND OPEN THE OX TK ISOL 1/2 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 419

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR26

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN FU & OX CONTROL FEEDBACKS. CONTROL FEEDBACKS INHIBIT VALVE OPERATION AFTER COMMAND HAS BEEN COMPLETED. THE FAILURE CAN RESULT IN THE FU ISOL 1/2 VALVE FAILING MIDTRAVEL WHEN COMMANDED CLOSED. THE EFFECT COULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 420

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM OX TK ISOL 1/2 VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 421

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CONT BUS CA2 AND MNC WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION. NO EFFECT ON MISSION, ANY POSSIBLE CURRENT FLOW WILL BE LIMITED BY SERIES RESISTANCE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 422

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR20

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE OX TK ISOL 1/2 VALVES USING GPC COMMANDS. CREW SWITCH IS STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 1/2 AND MANIFOLD ISOL 1&2 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN
INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 423

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR20

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 1/2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVE FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 424

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR25

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU TK ISOL 3/4/5 VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01; MC284-0430 REV E AMENDMENT SEQ. 7

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 425

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR25

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEEN CONT BUS AB1 AND MNA WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION. NO EFFECT ON MISSION, ANY POSSIBLE CURRENT FLOW WILL BE LIMITED BY SERIES RESISTANCE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 426

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR26

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU ISOL 3/4/5 VALVE USING CREW SWITCH. THE VALVE IS STILL FULLY OPERATIONAL USING GPC CMDS. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSE. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 427

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR26

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 3/4/5 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 428

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR27

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU ISOL 3/4/5 VALVE USING CREW SWITCH. THE VALVE IS STILL FULLY OPERATIONAL USING GPC CMDS. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSE. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 429

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR27

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 3/4/5 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 430

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR19

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "OPEN" COMMAND AND CLOSE THE OX TK ISOL 3/4/5 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 431

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR19

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN FU & OX CONTROL FEEDBACKS. CONTROL FEEDBACKS INHIBIT VALVE OPERATION AFTER COMMAND HAS BEEN COMPLETED. THE FAILURE CAN RESULT IN THE OX ISOL 3/4/5 VALVE FAILING MIDTRAVEL WHEN COMMANDED OPEN. THE EFFECT WOULD BE LOSS OF SIX PRIMARY JETS CAUSING AN INABILITY TO COMPLETE TIME CRITICAL DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES DURING DEORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 432

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR20

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU & OX TK ISOL 3/4/5 VALVES USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOLD ISOL 3, 4 & 5 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4 AND 5, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 433

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR20

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "CLOSE" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 3/4/5 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 434

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR22

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU ISOL 3/4/5 VALVE USING GPC CMDS. THE VALVE IS STILL FULLY OPERATIONAL USING CREW SWITCH. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSE. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 435

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR22

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 3/4/5 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 436

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN OX ISOL 3/4/5 VALVE USING GPC CMDS. THE VALVE IS STILL FULLY OPERATIONAL USING CREW SWITCH. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSE. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 437

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 3/4/5 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 438

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR21

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU & OX TK ISOL 3/4/5 VALVES USING GPC COMMANDS. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOLD ISOL 3, 4, & 5 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, AND 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 439

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR21

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "CLOSE" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 3/4/5 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 440

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR15

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU TK ISOL 3/4/5 VALVES USING GPC COMMANDS. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOLD ISOL 3, 4 & 5 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, AND 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 441

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR15

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH CLOSE CMDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF ABILITY TO CLOSE FU & OX TK ISOL 3/4/5 VALVES USING CREW SWITCH OR GPC. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOL ISOL 3, 4, OR 5 BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, OR 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 442

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU TK ISOL 3/4/5 VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 443

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CONT BUS AB1 AND MNA WHEN THE CREW SWITCH IS PLACED IN THE OPEN POSITON. NO EFFECT ON MISSION, ANY POSSIBLE CURRENT FLOW WILL BE LIMITED BY SERIES RESISTANCE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 444

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "CLOSE" COMMAND AND OPEN THE FU TK ISOL 3/4/5 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 445

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN FU & OX CONTROL FEEDBACKS. CONTROL FEEDBACKS INHIBIT VALVE OPERATION AFTER COMMAND HAS BEEN COMPLETED. THE FAILURE CAN RESULT IN THE OX ISOL 3/4/5 VALVE FAILING MIDTRAVEL WHEN COMMANDED CLOSED. THE EFFECT COULD BE AND INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, OR 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 446

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU TK ISOL 3/4/5 VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 447

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEEN CONT BUS AB1 AND MNA WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION. NO EFFECT ON MISSION, ANY POSSIBLE CURRENT FLOW WILL BE LIMITED BY SERIES RESISTANCE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 448

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR18

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "OPEN" COMMAND AND CLOSE THE FU TK ISOL 3/4/5 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 449

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR18

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN FU & OX CONTROL FEEDBACKS. CONTROL FEEDBACKS INHIBIT VALVE OPERATION AFTER COMMAND HAS BEEN COMPLETED. THE FAILURE CAN RESULT IN THE FU ISOL 3/4/5 VALVE FAILING MIDTRAVEL WHEN COMMANDED OPEN. THE EFFECT WOULD BE LOSS OF SIX PRIMARY JETS CAUSING AN INABILITY TO COMPLETE TIME CRITICAL DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES DURING DEORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 450

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU TK ISOL 3/4/5 VALVES USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOLD ISOL 3, 4 & 5 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, AND 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 451

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH CLOSE CMDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF ABILITY TO CLOSE FU & OX TK ISOL 3/4/5 VALVES USING CREW SWITCH OR GPC. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOL ISOL 3, 4, 5 BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, OR 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 452

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR16

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE OX TK ISOL 3/4/5 VALVES USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOLD ISOL 3, 4 & 5 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, AND 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 453

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR16

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH CLOSE CMDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF ABILITY TO CLOSE FU & OX TK ISOL 3/4/5 VALVES USING CREW SWITCH OR GPC. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOL ISOL 3, 4, 5 BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, OR 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 454

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "CLOSE" COMMAND AND OPEN THE OX TK ISOL 3/4/5 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 455

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN FU & OX CONTROL FEEDBACKS. CONTROL FEEDBACKS INHIBIT VALVE OPERATION AFTER COMMAND HAS BEEN COMPLETED. THE FAILURE CAN RESULT IN THE FU ISOL 3/4/5 VALVE FAILING MIDTRAVEL WHEN COMMANDED CLOSED. THE EFFECT COULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, OR 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 456

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM OX TK ISOL 3/4/5 VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 457

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEEN CONT BUS AB2 AND MNA WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION. NO EFFECT ON MISSION, ANY POSSIBLE CURRENT FLOW WILL BE LIMITED BY SERIES RESISTANCE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 458

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

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR17

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE OX TK ISOL 3/4/5 VALVES USING GPC COMMANDS. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOLD ISOL 3, 4 & 5 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, AND 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 459

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

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DIODE
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR17

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN GPC AND CREW SWITCH "OPEN" COMMANDS. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR CREW SWITCH TO CONTROL OX & FU TK ISOL 3/4/5 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN TK ISOL 1/2 AND 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO DEPLETE/USE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 460

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
HARDWIRED TALKBACK (BARBER POLE) TO CREW WILL FALSELY INDICATE FU & OX ISOL 1/2 VALVE MISMATCH WHEN VALVES ARE COMMANDED TO OPEN POSITION. GPC WILL INDICATE CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 461

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
HARDWIRED TALKBACK (BARBER POLE) TO CREW WILL FALSELY INDICATE FU & OX ISOL 1/2 VALVE MISMATCH WHEN VALVES ARE COMMANDED TO CLOSE POSITION. GPC WILL INDICATE CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 462

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR2

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
HARDWIRED TALKBACK (BARBER POLE) TO CREW WILL FALSELY INDICATE FU & OX ISOL 1/2 VALVE MISMATCH WHEN VALVES ARE COMMANDED TO CLOSE POSITION. GPC WILL INDICATE CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 463

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR2

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
HARDWIRED TALKBACK (BARBER POLE) TO CREW WILL FALSELY INDICATE FU & OX ISOL 1/2 VALVE MISMATCH WHEN VALVES ARE COMMANDED TO OPEN POSITION. GPC WILL INDICATE CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 464

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111AR3

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
HARDWIRED TALKBACK (BARBER POLE) TO CREW WILL FALSELY INDICATE FU & OX ISOL 3/4/5 VALVE MISMATCH WHEN VALVES ARE COMMANDED TO OPEN POSITION. GPC WILL INDICATE CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 465

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111AR3

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
HARDWIRED TALKBACK (BARBER POLE) TO CREW WILL FALSELY INDICATE FU & OX ISOL 3/4/5 VALVE MISMATCH WHEN VALVES ARE COMMANDED TO CLOSE POSITION. GPC WILL INDICATE CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 466

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111AR4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
HARDWIRED TALKBACK (BARBER POLE) TO CREW WILL FALSELY INDICATE FU & OX ISOL 3/4/5 VALVE MISMATCH WHEN VALVES ARE COMMANDED TO CLOSE POSITION. GPC WILL INDICATE CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 467

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

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111AR4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
HARDWIRED TALKBACK (BARBER POLE) TO CREW WILL FALSELY INDICATE FU & OX ISOL 3/4/5 VALVE MISMATCH WHEN VALVES ARE COMMANDED TO OPEN POSITION. GPC WILL INDICATE CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 468

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

ITEM: FUSE, 1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) FUSE, 1A
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8F41

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU & OX TK ISOL 1/2 VALVES USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 1/2 AND MANIFOLD ISOL 1&2 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 1 OR 2. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 469

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

ITEM: FUSE, 1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) FUSE, 1A
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL 08 S23
PART NUMBER: 33V73A8F36

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN OR CLOSE FU & OX ISOL 1/2 VALVE USING CREW SWITCH. THE VALVES ARE STILL FULLY OPERATIONAL USING GPC CMDS. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 & 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO USE/DEPLETE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 470

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

ITEM: FUSE, 1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) FUSE, 1A
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8F16

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE FU & OX TK ISOL 3/4/5 VALVES USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE. LOSS OF ALL REDUNDANCY RESULTS IN THE TK ISOL 3/4/5 AND MANIFOLD ISOL 3, 4 & 5 VALVES BECOMING STUCK IN THE OPEN POSITION. THE EFFECT WOULD BE AN INABILITY TO ISOLATE THE TANKS FROM MANIFOLDS 3, 4, AND 5. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 471

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

ITEM: FUSE, 1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) FUSE, 1A
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8F7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN OR CLOSE FU & OX ISOL 3/4/5 VALVES USING CREW SWITCH. THE VALVES ARE STILL FULLY OPERATIONAL USING GPC CMDS. LOSS OF ALL REDUNDANCY RESULTS IN TK ISOL 1/2 & 3/4/5 VALVES FAILED CLOSED. THE EFFECT IS AN INABILITY TO USE/DEPLETE PROPELLANTS CONSEQUENTLY CG SAFETY BOUNDARIES WILL BE EXCEEDED DURING RTLS RESULTING IN LOSS OF VEHICLE/LIFE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 472

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE CAN RESULT IN THE FU TK ISOL 1/2 VALVE BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT WOULD BE LOSS OF EIGHT PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES.
DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 473

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU TK ISOL 1/2 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 1 OR 2 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS 1 OR 2. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 474

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K2

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU TK ISOL 1/2 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 1 OR 2 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS 1 OR 2. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 475

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K2

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NO EFFECT ON FU TK ISOLATION 1/2 VALVE OPERATION. WHAT WAS LOST WAS A SAFEGUARD DESIGNED TO KEEP A SINGLE RELAY FAILURE FROM CAUSING AN IMMEDIATE LOSS OF MISSION CAPABILITY BY FAILING THE FU TK ISOL VALVE CLOSED. SECOND FAILURE (FAILURE OF REDUNDANT RELAY) RESULTS IN THE LOSS OF EIGHT PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES DURING DEORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 476

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K3

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU TK ISOL 1/2 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 1 OR 2 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS
1 OR 2. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 477

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K3

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE CAN RESULT IN THE FU TK ISOL 1/2 VALVE BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT WOULD BE LOSS OF EIGHT PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES.
DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 478

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE CAN RESULT IN THE OX TK ISOL 1/2 VALVE BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT WOULD BE LOSS OF EIGHT PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES.
DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 479

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE OX TK ISOL 1/2 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 1 OR 2 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS 1 OR 2. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 480

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K5

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE OX TK ISOL 1/2 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 1 OR 2 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS 1 OR 2. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 481

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K5

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NO EFFECT ON OX TK ISOLATION 1/2 VALVE OPERATION. WHAT WAS LOST WAS A SAFEGUARD DESIGNED TO KEEP A SINGLE RELAY FAILURE FROM CAUSING AN IMMEDIATE LOSS OF MISSION CAPABILITY BY FAILING THE OX TK ISOL VALVE CLOSED. SECOND FAILURE (FAILURE OF REDUNDANT RELAY) RESULTS IN THE LOSS OF EIGHT PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES DURING DEORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 482

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K6

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE OX TK ISOL 1/2 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 1 OR 2 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS 1 OR 2. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 483

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K6

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE CAN RESULT IN THE OX TK ISOL 1/2 VALVE BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT WOULD BE LOSS OF EIGHT PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES.
DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	2/1R
MDAC ID:	484	ABORT:	1/1

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K3

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE CAN RESULT IN THE FU TK ISOL 3/4/5 VALVE BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT WOULD BE LOSS OF SIX PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES AND STRUCTURAL CONSTRAINTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 485

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K3

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU TK ISOL 3/4/5 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 3, 4 OR 5 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS FROM PROP TANKS. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 486

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU TK ISOL 3/4/5 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 3, 4 OR 5 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS FROM PROP TANKS. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 487

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NO EFFECT ON FU TK ISOLATION 3/4/5 VALVE OPERATION. WHAT WAS LOST WAS A SAFEGUARD DESIGNED TO KEEP A SINGLE RELAY FAILURE FROM CAUSING AN IMMEDIATE LOSS OF MISSION CAPABILITY BY FAILING THE FU TK ISOL VALVE CLOSED. SECOND FAILURE (FAILURE OF REDUNDANT RELAY) RESULTS IN THE LOSS OF SIX PRIMARY JETS CAUSING AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES DURING DEORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 488

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K5

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE FU TK ISOL 3/4/5 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 3, 4 OR 5 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS FROM PROP TANKS. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 489

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K5

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE CAN RESULT IN THE FU TK ISOL 3/4/5 VALVE BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT WOULD BE LOSS OF SIX PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES AND STRUCTURAL CONSTRAINTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 490

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K6

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE CAN RESULT IN THE OX TK ISOL 3/4/5 VALVE BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT WOULD BE LOSS OF SIX PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES AND STRUCTURAL CONSTRAINTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 491

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K6

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE OX TK ISOL 3/4/5 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 3, 4 OR 5 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS FROM PROP TANKS. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 492

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K7

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE OX TK ISOL 3/4/5 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 3, 4 OR 5 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS FROM PROP TANKS, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 493

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K7

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NO EFFECT ON OX TK ISOLATION 3/4/5 VALVE OPERATION. WHAT WAS LOST WAS A SAFEGUARD DESIGNED TO KEEP A SINGLE RELAY FAILURE FROM CAUSING AN IMMEDIATE LOSS OF MISSION CAPABILITY BY FAILING THE FU TK ISOL VALVE CLOSED. SECOND FAILURE (FAILURE OF REDUNDANT (RELAY) RESULTS IN THE LOSS OF SIX PRIMARY JETS CAUSING AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES DURING DEORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 494

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

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K8

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE OX TK ISOL 3/4/5 VALVE FAILING OPEN. THE VALVE IS NORMALLY OPEN. REDUNDANCY FOR THIS FUNCTION IS PROVIDED BY MANIFOLD 3, 4 OR 5 ISOLATION VALVE. LOSS OF THESE VALVES RESULTS IN AN INABILITY TO ISOLATE MANIFOLDS FROM PROP TANKS. NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 495

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

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RELAY
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K8

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE CAN RESULT IN THE OX TK ISOL 3/4/5 VALVE BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT WOULD BE LOSS OF SIX PRIMARY JETS CAUSING AN INABILITY TO EXPEL ENOUGH PROPELLANT TO MEET THE CG SAFETY BOUNDARIES DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ONORBIT. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE/LIFE SINCE TRAPPED PROPELLANTS WOULD EXCEED CG SAFETY BOUNDARIES AND STRUCTURAL CONSTRAINTS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 496

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ONE OF THREE REDUNDANT RESISTORS WHICH PROVIDE ISOLATION BETWEEN MAIN BUS AND VALVE POSITION TALKBACKS TO GPC. FAILURE OF ALL THREE RESISTORS RESULTS IN LOSS OF ALL TALKBACK FOR BOTH THE FU & OX ISOL 1/2 VALVE, NO EFFECT SINCE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 497

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO HARDWIRED AND GPC TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 498

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R12

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ONE OF THREE REDUNDANT RESISTORS WHICH PROVIDE ISOLATION BETWEEN MAIN BUS AND VALVE POSITION TALKBACKS TO GPC. FAILURE OF ALL THREE RESISTORS RESULTS IN LOSS OF ALL TALKBACK FOR BOTH THE FU & OX ISOL 1/2 VALVE, NO EFFECT SINCE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 499

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R12

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO HARDWIRED AND GPC TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 500

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ONE OF THREE REDUNDANT RESISTORS WHICH PROVIDE ISOLATION BETWEEN MAIN BUS AND VALVE POSITION TALKBACKS TO GPC. FAILURE OF ALL THREE RESISTORS RESULTS IN LOSS OF ALL TALKBACK FOR BOTH THE FU & OX ISOL 1/2 VALVE, NO EFFECT SINCE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 501

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO HARDWIRED AND GPC TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 502

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR THE FU TK ISOL 1/2 VALVE TO GPC (OPEN POSITION ONLY). HARDWIRE TALKBACK TO CREW WILL INDICATE CORRECT POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 503

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 504

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R18

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR CREW SWITCH POSITION TO GPC (OPEN POSITION ONLY). NO EFFECT, SWITCH OPERATION CAN BE INDIRECTLY DETERMINED BY VALVE OPERATION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 505

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R18

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	506	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R27

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR THE FU TK ISOL 1/2 VALVE TO GPC (CLOSE POSITION ONLY). HARDWIRE TALKBACK TO CREW WILL INDICATE CORRECT POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 507

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R27

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	508	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR CREW SWITCH POSITION TO GPC (CLOSE POSITION ONLY). NO EFFECT, SWITCH OPERATION CAN BE INDIRECTLY DETERMINED BY VALVE OPERATION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 509

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	510	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R15

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR THE OX TK ISOL 1/2 VALVE TO GPC (OPEN POSITION ONLY). HARDWIRE TALKBACK TO CREW WILL INDICATE CORRECT POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 511

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R15

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 512

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R28

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR THE OX TK ISOL 1/2 VALVE TO GPC (CLOSE POSITION ONLY). HARDWIRE TALKBACK TO CREW WILL INDICATE CORRECT POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 513

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R28

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 514

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ONE OF THREE REDUNDANT RESISTORS WHICH PROVIDE ISOLATION BETWEEN MAIN BUS AND VALVE POSITION TO GPC. FAILURE OF ALL THREE RESISTORS RESULTS IN LOSS OF ALL TALKBACKS FOR BOTH FU & OX ISOL 3/4/5 VALVE, NO EFFECT SINCE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 515

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO HARDWIRE AND GPC TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 516

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ONE OF THREE REDUNDANT RESISTORS WHICH PROVIDE ISOLATION BETWEEN MAIN BUS AND VALVE POSITION TO GPC. FAILURE OF ALL THREE RESISTORS RESULTS IN LOSS OF ALL TALKBACKS FOR BOTH FU & OX ISOL 3/4/5 VALVE, NO EFFECT SINCE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 517

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO HARDWIRE AND GPC TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 518

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ONE OF THREE REDUNDANT RESISTORS WHICH PROVIDE ISOLATION BETWEEN MAIN BUS AND VALVE POSITION TO GPC. FAILURE OF ALL THREE RESISTORS RESULTS IN LOSS OF ALL TALKBACKS FOR BOTH FU & OX ISOL 3/4/5 VALVE, NO EFFECT SINCE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 519

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

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO HARDWIRE AND GPC TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 520

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR THE FU TK ISOL 3/4/5 VALVE TO GPC (OPEN POSITION ONLY). HARDWIRE TALKBACK (BARBER POLE) TO CREW WILL INDICATE CORRECT POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 521

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/27/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	522	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR CREW SWITCH POSITION TO GPC (OPEN POSITION ONLY). NO EFFECT, SWITCH OPERATION CAN BE INDIRECTLY DETERMINED BY VALVE OPERATION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 523

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 524

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR THE FU TK ISOL 3/4/5 VALVE TO GPC (CLOSE POSITION ONLY). HARDWIRE TALKBACK (BARBER POLE) TO CREW WILL INDICATE CORRECT POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 525

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 526

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR CREW SWITCH POSITION TO GPC (CLOSE POSITION ONLY). NO EFFECT, SWITCH OPERATION CAN BE INDIRECTLY DETERMINED BY VALVE OPERATION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 527

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 528

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R22

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR THE OX TK ISOL 3/4/5 VALVE TO GPC (OPEN POSITION ONLY). HARDWIRE TALKBACK (BARBER POLE) TO CREW WILL INDICATE CORRECT POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 529

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R22

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 530

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE TALKBACK FOR THE OX TK ISOL 3/4/5 VALVE TO GPC (CLOSE POSITION ONLY). HARDWIRE TALKBACK (BARBER POLE) TO CREW WILL INDICATE CORRECT POSITION. LOSS OF ALL REDUNDANCY HAS NO IMPACT SINCE VALVE TALKBACK IS NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/27/87
SUBSYSTEM: FRCS
MDAC ID: 531

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

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, TALKBACK STILL AVAILABLE TO GPC.

REFERENCES: VS70-942099 REV D EO D01; MC284-0430 REV E AMENDMENT SEQ. 7

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/13/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	532	ABORT:	3/3

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH
FAILURE MODE: SWITCH FAILS IN THE OPEN POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM CLOSE COMMANDS. IF THE SWITCH FAILS IN THE OPEN POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY THE SWITCH OR BY THE MDM COMMANDS. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM CONTACTS SETS AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/13/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	533	ABORT:	2/1R

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH
FAILURE MODE: SWITCH FAILS IN THE CLOSED POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE SWITCH FAILS IN THE CLOSED POSITION, THE VALVE WILL CLOSE AND CANNOT BE OPENED BY THE SWITCH OR BY THE MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CLOSE CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 534

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

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH
FAILURE MODE: SWITCH FAILS IN THE GPC POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
VALVE CANNOT BE CONTROLLED BY SWITCH, ONLY BY MDM COMMANDS, TO OPERATE THE VALVE, THE CREW MUST USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WHILE THE VALVE IS IN THE CLOSED POSITION WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ENTRY AND ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/13/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	535	ABORT:	2/1R

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH OPEN CONTACTS 1, 2
6)
7)
8)
9)

CRITICALITIES

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

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

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM COMMANDS. IF THE OPEN CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CANNOT BE OPENED BY THE SWITCH COMMANDS, ONLY BY MDM COMMANDS, AND CAN BE CLOSED BY SWITCH OR MDM COMMAND. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO BURN ENOUGH PROPELLANT DURING RTLS ABORTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 536

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

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH OPEN CONTACTS 1, 2
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 [ ] B [ ] C [ ]

LOCATION: PNL 08 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM COMMANDS. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN OR GPC POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY MDM COMMAND, ONLY BY SWITCH COMMAND. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE CLOSED POSITION, THE VALVE WILL REMAIN CLOSED, AND CANNOT BE OPENED BY MDM COMMANDS, ONLY BY SWITCH COMMANDS. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES.
FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC; FLIGHT RULE 6-95

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 537

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

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

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

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 538

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 539

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH CLOSE CONTACTS 5, 6
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM COMMANDS. IF THE CLOSDE CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSTION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE OPENED BY SWITCH OR MDM COMMANDS, AND CANNOT BE CLOSED BY SWITCH COMMANDS,
ONLY BY MDM COMMANDS. FAILURE OF THE MDM CLOSE COMMANDS WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 540

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH CLOSE CONTACTS 5, 6
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE OTHER SWITCH CLOSE CONTACTS AND THE MDM CLOSE COMMANDS. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE CLOSED BY SWITCH OR MDM COMMAND, AND CANNOT BE OPENED BY SWITCH OR MDM COMMANDS. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY AND MAY CAUSE THE INABILITY TO BURN ENOUGH PROPELLANT DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 541

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH OPEN CONTACTS 7, 8
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH OPEN CONTACTS 7, 8
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NO REDUNDANCY PROVIDED PROVIDED TO INHIBIT THE CLOSE RELAYS. IF THE OPEN CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, AND CAN BE OPENED OR CLOSED BY THE SWITCH OR MDM COMMANDS.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 542

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH OPEN CONTACTS 7, 8
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH OPEN CONTACTS 7, 8
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NO REDUNDANCY PROVIDED TO INHIBIT THE CLOSE RELAYS. IF THE OPEN CONTACTS FAIL WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CANNOT BE CLOSED BY SWITCH OR MDM COMMAND, AND CAN BE OPENED BY SWITCH OR MDM COMMANDS. TO CLOSE THE VALVE WITH THE MDM COMMAND, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE OPEN CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC; FLIGHT RULE 6-95

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 543

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH GPC CONTACTS 9, 10
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH GPC CONTACTS 9, 10
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 544

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH GPC CONTACTS 9, 10
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH GPC CONTACTS 9, 10
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 545

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH CLOSE CONTACTS 11, 12
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH CLOSE CONTACTS 11, 12
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM COMMANDS. IF THE CLOSE CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSTION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE OPENED BY SWITCH OR MDM COMMANDS, AND CANNOT BE CLOSED BY SWITCH COMMANDS,
ONLY BY MDM COMMANDS. FAILURE OF THE MDM CLOSE COMMANDS WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: FRCS FLIGHT: 3/1R
MDAC ID: 546 ABORT: 2/1R

ITEM: OX & FU TK ISOL VLV 1/2 SWITCH CLOSE CONTACTS 11, 12
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 1/2
5) OX & FU TK ISOL VLV 1/2 SWITCH CLOSE CONTACTS 11, 12
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S23
PART NUMBER: 33V73A8S23

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE OTHER SWITCH CLOSE CONTACTS AND THE MDM CLOSE COMMANDS. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION AND CAN BE CLOSED BY SWITCH OR MDM COMMAND, BUT CANNOT BE OPENED BY SWITCH OR MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CLOSE CONTACTS, AND USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ENTRY AND ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 547

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH
FAILURE MODE: SWITCH FAILS IN THE OPEN POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM CLOSE COMMANDS. IF THE SWITCH FAILS IN THE OPEN POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY THE SWITCH OR BY THE MDM COMMANDS. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM CONTACTS SETS AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 548

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH
FAILURE MODE: SWITCH FAILS IN THE CLOSED POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/1R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE SWITCH FAILS IN THE CLOSED POSITION, THE VALVE WILL CLOSE AND CANNOT BE OPENED BY THE SWITCH OR BY THE MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CLOSE CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 549

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH
FAILURE MODE: SWITCH FAILS IN THE GPC POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/1R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
VALVE CANNOT BE CONTROLLED BY SWITCH, ONLY BY MDM COMMANDS. TO OPERATE THE VALVE, THE CREW MUST USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WHILE THE VALVE IS IN THE CLOSED POSITION WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ENTRY AND ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/13/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	550	ABORT:	2/1R

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH OPEN CONTACTS 1, 2
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/1R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM COMMANDS. IF THE OPEN CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CANNOT BE OPENED BY THE SWITCH COMMANDS, ONLY BY MDM COMMANDS, AND CAN BE CLOSED BY SWITCH OR MDM COMMAND. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO BURN ENOUGH PROPELLANT DURING RTLS ABORTS TO MEET THE TANK LANDING WEIGHT CONSTRAINTS AND/OR THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 551

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH OPEN CONTACTS 1, 2
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM COMMANDS. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN OR GPC POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY MDM COMMAND, ONLY BY SWITCH COMMAND. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE CLOSED POSITION, THE VALVE WILL REMAIN CLOSED, AND CANNOT BE OPENED BY MDM COMMANDS, ONLY BY SWITCH COMMANDS. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES.
FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC; FLIGHT RULE 6-95

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 552

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 553

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 554

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH CLOSE CONTACTS 5, 6
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM COMMANDS. IF THE CLOSDE CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSTION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE OPENED BY SWITCH OR MDM COMMANDS, AND CANNOT BE CLOSED BY SWITCH COMMANDS,
ONLY BY MDM COMMANDS. FAILURE OF THE MDM CLOSE COMMANDS WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 555

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 3/1R

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH CLOSE CONTACTS 5, 6

FAILURE MODE: SWITCH CLOSE CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH CLOSE CONTACTS 5, 6
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/1R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE OTHER SWITCH CLOSE CONTACTS AND THE MDM CLOSE COMMANDS. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE CLOSED BY SWITCH OR MDM COMMAND, AND CANNOT BE OPENED BY SWITCH OR MDM COMMANDS. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY AND MAY CAUSE THE INABILITY TO BURN ENOUGH PROPELLANT DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 556

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH OPEN CONTACTS 7, 8
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH OPEN CONTACTS 7, 8
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NO REDUNDANCY PROVIDED PROVIDED TO INHIBIT THE CLOSE RELAYS. IF THE OPEN CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, AND CAN BE OPENED OR CLOSED BY THE SWITCH OR MDM COMMANDS.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 557

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH OPEN CONTACTS 7, 8
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH OPEN CONTACTS 7, 8
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NO REDUNDANCY PROVIDED TO INHIBIT THE CLOSE RELAYS. IF THE OPEN CONTACTS FAIL WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CANNOT BE CLOSED BY SWITCH OR MDM COMMAND, AND CAN BE OPENED BY SWITCH OR MDM COMMANDS. TO CLOSE THE VALVE WITH THE MDM COMMAND, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE OPEN CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC; FLIGHT RULE 6-95

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 558

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH GPC CONTACTS 9, 10
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH GPC CONTACTS 9, 10
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 559

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH GPC CONTACTS 9, 10
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH GPC CONTACTS 9, 10
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 560

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH CLOSE CONTACTS 11, 12
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH CLOSE CONTACTS 11, 12
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM COMMANDS. IF THE CLOSE CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSTION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE OPENED BY SWITCH OR MDM COMMANDS, AND CANNOT BE CLOSED BY SWITCH COMMANDS,
ONLY BY MDM COMMANDS. FAILURE OF THE MDM CLOSE COMMANDS WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 561

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: OX & FU TK ISOL VLV 3/4/5 SWITCH CLOSE CONTACTS 11, 12
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) OX & FU TK ISOL VLV 3/4/5
5) OX & FU TK ISOL VLV 3/4/5 SWITCH CLOSE CONTACTS 11, 12
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S24
PART NUMBER: 33V73A8S24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE OTHER SWITCH CLOSE CONTACTS AND THE MDM CLOSE COMMANDS. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION AND CAN BE CLOSED BY SWITCH OR MDM COMMAND, BUT CANNOT BE OPENED BY SWITCH OR MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CLOSE CONTACTS, AND USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING ENTRY AND ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CC, DC

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 562

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 3/3

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) CONTROLLER, REMOTE POWER
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, PCA 3
PART NUMBER: 83V76A24RPC29

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE GPC COMMAND SIGNAL TO OPEN MANIFOLD 5 FU & OX ISOL VLVs. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs FAILED CLOSED RESULTING IN LOSS OF VRCS CONTROL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 563

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) CONTROLLER, REMOTE POWER
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, PCA 3
PART NUMBER: 83V76A24RPC29

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 564

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) CONTROLLER, REMOTE POWER
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, PCA 3
PART NUMBER: 83V76A24RPC28

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND MANIFOLD 5 FU & OX ISOL VLVs CLOSE USING CREW SWITCH OR GPC. WORST CASE RESULTS IN MANIFOLD 5 FU & OX VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 565

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 3/3

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) CONTROLLER, REMOTE POWER
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, PCA 3
PART NUMBER: 83V76A24RPC28

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CAPABILITY TO COMMAND MANIFOLD 5 FU & OX ISOL VLVs USING GPC. CREW SWITCH CAN STILL OPEN OR CLOSE VLVs. LOSS OF ALL REDUNDANCY (CREW SWITCH), WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE CLOSED POSITION RESULTING IN LOSS OF VRCS CONTROL, THEREFORE LOSS OF MISSION CAPABILITY.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 566

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 3/3

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) CONTROLLER, REMOTE POWER
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 1, PCA 1
PART NUMBER: 81V76A22RPC28

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CREW SWITCH COMMAND SIGNAL TO OPEN MANIFOLD 5 FU & OX ISOL VLVs. VALVES CAN STILL BE OPENED USING GPC. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs FAILED CLOSED RESULTING IN LOSS OF VRCS CONTROL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 567

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: CONTROLLER, REMOTE POWER
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) CONTROLLER, REMOTE POWER
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, PCA 1
PART NUMBER: 81V76A22RPC28

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 568

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "OPEN" COMMAND AND CLOSE THE MANIFOLD ISOL 1 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 569

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN VALVE CONTROL FEEDBACK AND CREW SWITCH CLOSE COMMANDS WHEN THE MANIFOLD ISOL 1 VALVES ARE IN THE OPEN POSITION. THE EFFECT WOULD BE AN INTERMITTENT CLOSE COMMAND CAUSING THE VALVES TO FAIL PARTIALLY CLOSED WHEN COMMANDED OPEN BY GPC. NO MISSION EFFECT, VALVES ARE FULLY OPERATIONAL UTILIZING CREW SWITCH.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 570

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 1 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 1 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 571

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "OPEN" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 1 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 572

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR12

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU & OX MANIFOLD 2 ISOL VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01; MC284-0420 REV C AMENDMENT SEQ. 8

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 573

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR12

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH (CLOSE POSITION) AND VALVE TALKBACK FROM HYBRID DRIVER. THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION.
CORRECT VALVE POSITIONS AVAILABLE THROUGH GPC. NO IMPACT. VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	574	ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR9

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 1 VALVE USING GPC COMMANDS. CREW SWITCH IS STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 1 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 575

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR9

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "OPEN" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 1 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 576

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "CLOSE" COMMAND AND OPEN THE MANIFOLD ISOL 1 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 577

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN VALVE CONTROL FEEDBACK AND CREW SWITCH OPEN COMMANDS WHEN THE MANIFOLD ISOL 1 VALVES ARE IN THE CLOSE POSITION. THE EFFECT WOULD BE AN INTERMITTENT OPEN COMMAND CAUSING THE VALVES TO FAIL PARTIALLY OPEN WHEN COMMANDED CLOSED BY GPC. NO MISSION EFFECT, VALVES ARE FULLY OPERATIONAL UTILIZING CREW SWITCH.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 578

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU & OX MANIFOLD 2 ISOL VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 579

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH (OPEN POSITION) AND VALVE TALKBACK FROM HYBRID DRIVER. THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE CREW SWITCH IS PLACED IN THE OPEN POSITION.
CORRECT VALVE POSITIONS AVAILABLE THROUGH GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 580

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS16
PART NUMBER: 33V73A8CR5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE MANIFOLD ISOL 1 VALVES ARE COMMANDED OPEN. CORRECT VALVE POSITION AVAILABLE GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 581

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS16
PART NUMBER: 33V73A8CR5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	582	ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS16
PART NUMBER: 33V73A8CR6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE MANIFOLD ISOL 1 VALVES ARE COMMANDED CLOSED. CORRECT VALVE POSITION AVAILABLE GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 583

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS16
PART NUMBER: 33V73A8CR6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 584

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 1 VALVE USING ONE OF TWO GPC COMMANDS. OTHER GPC COMMAND AND CREW SWITCH STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 1 AND TK ISOL 1/2 VALVES FAILING OPEN. THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 585

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 1 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 586

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 1 VALVE USING ONE OF TWO GPC COMMANDS. OTHER GPC COMMAND AND CREW SWITCH STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 1 AND TK ISOL 1/2 VALVES FAILING OPEN.
THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 587

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 1 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 588

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 1 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 1 AND TK ISOL 1/2 VALVES FAILING OPEN. THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 589

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1CR11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 1 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 590

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "OPEN" COMMAND AND CLOSE THE MANIFOLD ISOL 2 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 591

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2; MCA 2
PART NUMBER: 82V76A112A1CR1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN VALVE CONTROL FEEDBACK AND CREW SWITCH CLOSE COMMANDS WHEN THE MANIFOLD ISOL 2 VALVES ARE IN THE OPEN POSITION. THE EFFECT WOULD BE AN INTERMITTENT CLOSE COMMAND CAUSING THE VALVES TO FAIL PARTIALLY CLOSED WHEN COMMANDED OPEN BY GPC. NO MISSION EFFECT, VALVES ARE FULLY OPERATIONAL UTILIZING CREW SWITCH.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 592

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR9

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 2 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 2 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 593

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR9

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "OPEN" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 594

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU & OX MANIFOLD 2 ISOL VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01; MC284-0420 REV C AMENDMENT SEQ. 8

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 595

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR2

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH (CLOSE POSITION) AND VALVE TALKBACK FROM HYBRID DRIVER. THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION.
CORRECT VALVE POSITIONS AVAILABLE THROUGH GPC. NO IMPACT. VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 596

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 2 VALVE USING GPC COMMANDS. CREW SWITCH IS STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 2 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 597

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "OPEN" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 598

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "CLOSE" COMMAND AND OPEN THE MANIFOLD ISOL 2 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 599

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR6

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN VALVE CONTROL FEEDBACK AND CREW SWITCH OPEN COMMANDS WHEN THE MANIFOLD ISOL 2 VALVES ARE IN THE CLOSE POSITION. THE EFFECT WOULD BE AN INTERMITTENT OPEN COMMAND CAUSING THE VALVES TO FAIL PARTIALLY OPEN WHEN COMMANDED CLOSED BY GPC. NO MISSION EFFECT, VALVES ARE FULLY OPERATIONAL UTILIZING CREW SWITCH.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 600

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU & OX MANIFOLD 2 ISOL VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 601

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR5

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH (OPEN POSITION) AND VALVE TALKBACK FROM HYBRID DRIVER. THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE CREW SWITCH IS PLACED IN THE OPEN POSITION.
CORRECT VALVE POSITIONS AVAILABLE THROUGH GPC. NO IMPACT. VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 602

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS17
PART NUMBER: 33V73A8CR7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE MANIFOLD ISOL 2 VALVES ARE COMMANDED OPEN. CORRECT VALVE POSITION AVAILABLE GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 603

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS17
PART NUMBER: 33V73A8CR7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 604

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS17
PART NUMBER: 33V73A8CR8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE MANIFOLD ISOL 2 VALVES ARE COMMANDED CLOSED. CORRECT VALVE POSITION AVAILABLE GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 605

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS17
PART NUMBER: 33V73A8CR8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	606	ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 2 VALVE USING ONE OF TWO GPC COMMANDS. OTHER GPC COMMAND AND CREW SWITCH STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 2 AND TK ISOL 1/2 VALVES FAILING OPEN. THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 607

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 608

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 2 VALVE USING ONE OF TWO GPC COMMANDS. OTHER GPC COMMAND AND CREW SWITCH STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 2 AND TK ISOL 1/2 VALVES FAILING OPEN.
THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 609

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR4

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	610	ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 2 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 2 AND TK ISOL 1/2 VALVES FAILING OPEN. THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 611

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1CR3

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 2 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 612

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "OPEN" COMMAND AND CLOSE THE MANIFOLD ISOL 3 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 613

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR7

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN VALVE CONTROL FEEDBACK AND CREW SWITCH CLOSE COMMANDS WHEN THE MANIFOLD ISOL 3 VALVES ARE IN THE OPEN POSITION. THE EFFECT WOULD BE AN INTERMITTENT CLOSE COMMAND CAUSING THE VALVES TO FAIL PARTIALLY CLOSED WHEN COMMANDED OPEN BY GPC. NO MISSION EFFECT, VALVES ARE FULLY OPERATIONAL UTILIZING CREW SWITCH.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 614

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR33

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 3 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 3 VALVE FAILING CLOSED CASE. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF LIFE/VEHICLE) OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 615

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR33

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "OPEN" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 3 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 616

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU & OX MANIFOLD 4 ISOL VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01; MC284-0420 REV C AMENDMENT SEQ. 8

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 617

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH (CLOSE POSITION) AND VALVE TALKBACK FROM HYBRID DRIVER. THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION.
CORRECT VALVE POSITIONS AVAILABLE THROUGH GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/1R
MDAC ID:	618	ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR37

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 3 VALVE USING GPC COMMANDS. CREW SWITCH IS STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 3 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 619

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR37

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "OPEN" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 3 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 620

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR34

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "CLOSE" COMMAND AND OPEN THE MANIFOLD ISOL 3 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 621

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR34

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN VALVE CONTROL FEEDBACK AND CREW SWITCH OPEN COMMANDS WHEN THE MANIFOLD ISOL 3 VALVES ARE IN THE CLOSE POSITION. THE EFFECT WOULD BE AN INTERMITTENT OPEN COMMAND CAUSING THE VALVES TO FAIL PARTIALLY OPEN WHEN COMMANDED CLOSED BY GPC. NO MISSION EFFECT, VALVES ARE FULLY OPERATIONAL UTILIZING CREW SWITCH.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 622

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR38

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU & OX MANIFOLD 4 ISOL VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 623

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: SAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR38

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH (OPEN POSITION) AND VALVE TALKBACK FROM HYBRID DRIVER. THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE CREW SWITCH IS PLACED IN THE OPEN POSITION.
CORRECT VALVE POSITIONS AVAILABLE THROUGH GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 624

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS18
PART NUMBER: 33V73A8CR9

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE MANIFOLD ISOL 3 VALVES ARE COMMANDED OPEN. CORRECT VALVE POSITION AVAILABLE GPC. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 625

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS18
PART NUMBER: 33V73A8CR9

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 626

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS18
PART NUMBER: 33V73A8CR10

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE MANIFOLD ISOL 3 VALVES ARE COMMANDED CLOSED. CORRECT VALVE POSITION AVAILABLE GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 627

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS18
PART NUMBER: 33V73A8CR10

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 628

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3,
PART NUMBER: 83V76A113A1CR14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 3 VALVE USING ONE OF TWO GPC COMMANDS. OTHER GPC COMMAND AND CREW SWITCH STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 3 AND TK ISO 3/4/5 VALVES FAILING OPEN. THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 629

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3,
PART NUMBER: 83V76A113A1CR14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 3 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 630

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3,
PART NUMBER: 83V76A113A1CR11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 3 VALVE USING ONE OF TWO GPC COMMANDS. OTHER GPC COMMAND AND CREW SWITCH STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 3 AND TK ISO 3/4/5 VALVES FAILING OPEN.
THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 631

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3,
PART NUMBER: 83V76A113A1CR11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 3 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 632

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 3 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 3 AND TK ISO 3/4/5 VALVES FAILING OPEN. THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 633

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 3 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 634

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR16

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "OPEN" COMMAND AND CLOSE THE MANIFOLD ISOL 4 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 635

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR16

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN VALVE CONTROL FEEDBACK AND CREW SWITCH CLOSE COMMANDS WHEN THE MANIFOLD ISOL 4 VALVES ARE IN THE OPEN POSITION. THE EFFECT WOULD BE AN INTERMITTENT CLOSE COMMAND CAUSING THE VALVES TO FAIL PARTIALLY CLOSED WHEN COMMANDED OPEN BY GPC. NO MISSION EFFECT, VALVES ARE FULLY OPERATIONAL UTILIZING CREW SWITCH.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 636

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR36

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 4 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 4 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 637

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR36

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "OPEN" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 4 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 638

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR15

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU & OX MANIFOLD 1 ISOL VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01; MC284-0420 REV C AMENDMENT SEQ. 8

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 639

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR15

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH (CLOSE POSITION) AND VALVE TALKBACK FROM HYBRID DRIVER. THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE CREW SWITCH IS PLACED IN THE CLOSE POSITION.
CORRECT VALVE POSITIONS AVAILABLE THROUGH GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 640

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 4 VALVE USING GPC COMMANDS. CREW SWITCH IS STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 4 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 641

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/1R
ABORT:	2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "OPEN" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 4 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	642	ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR35

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OVERRIDE A GPC "CLOSE" COMMAND AND OPEN THE MANIFOLD ISOL 4 VALVE USING CREW SWITCH. NO EFFECT ON MISSION, GPC COMMANDS STILL AVAILABLE TO CLOSE VALVE.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 643

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR35

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN VALVE CONTROL FEEDBACK AND CREW SWITCH OPEN COMMANDS WHEN THE MANIFOLD ISOL 4 VALVES ARE IN THE CLOSE POSITION. THE EFFECT WOULD BE AN INTERMITTENT OPEN COMMAND CAUSING THE VALVES TO FAIL PARTIALLY OPEN WHEN COMMANDED CLOSED BY GPC. NO MISSION EFFECT, VALVES ARE FULLY OPERATIONAL UTILIZING CREW SWITCH.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 644

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR29

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM FU & OX MANIFOLD 1 ISOL VALVE TO DE-ENERGIZE RELAY ONCE THE VALVE REACHES THE COMMANDED POSITION. NO EFFECT ON MISSION, AC MOTOR VALVE DESIGNED TO WITHSTAND CONTINUOUS POWER.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 645

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR29

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH (OPEN POSITION) AND VALVE TALKBACK FROM HYBRID DRIVER. THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE CREW SWITCH IS PLACED IN THE OPEN POSITION.
CORRECT VALVE POSITIONS AVAILABLE THROUGH GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 646

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS19
PART NUMBER: 33V73A8CR11

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE MANIFOLD ISOL 4 VALVES ARE COMMANDED OPEN. CORRECT VALVE POSITION AVAILABLE GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 647

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS19
PART NUMBER: 33V73A8CR11

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 648

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS19
PART NUMBER: 33V73A8CR12

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE WILL RESULT IN A FALSE INDICATION OF A VALVE MISCOMPARE WHEN THE MANIFOLD ISOL 4 VALVES ARE COMMANDED CLOSED. CORRECT VALVE POSITION AVAILABLE GPC. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 649

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL 08 DS19
PART NUMBER: 33V73A8CR12

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 650

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR9

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 4 VALVE USING ONE OF TWO GPC COMMANDS. OTHER GPC COMMAND AND CREW SWITCH STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 4 AND TK ISOL 1/2 VALVES FAILING OPEN. THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 651

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3]   B [P]   C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR9

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 4 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 652

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR12

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 4 VALVE USING ONE OF TWO GPC COMMANDS. OTHER GPC COMMAND AND CREW SWITCH STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 4 AND TK ISOL 1/2 VALVES FAILING OPEN.
THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 653

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR12

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 4 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 654

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO CLOSE THE FU & OX MANIFOLD ISOL 4 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE TO CLOSE VALVE. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 4 AND TK ISO 3/4/5 VALVES FAILING OPEN. THE EFFECT WOULD BE AN INABILITY TO ISOLATE TANK FROM MANIFOLD, NO MISSION IMPACT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 655

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DIODE
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1CR13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE DIODE ISOLATION BETWEEN CREW SWITCH AND GPC "CLOSE" COMMAND. FAILURE COULD POSSIBLY RESULT IN LOSS OF GPC OR SWITCH TO CONTROL OX & FU MANIFOLD ISOL 4 VALVE OPERATION. LOSS OF ALL REDUNDANCY, WORST CASE, CAN RESULT IN THE MANIFOLD ISOL VALVE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/19/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	656	ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18CR J1-93

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND MANIFOLD 5 FU & OX ISOL VLVs CLOSE USING GPC. CREW SWITCH CAN STILL OPEN OR CLOSE VLVs. WORST CASE RESULTS IN MANIFOLD 5 FU & OX VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 657

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18CR J1-93

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN CREW SWITCH AND GPC CLOSE COMMANDS. THE FAILURE CAN RESULT IN LOSS OF GPC OR CREW SWITCH TO OPERATE THE MANIFOLD 5 FU & OX ISOL VLVs. WORST CASE RESULTS IN MANIFOLD 5 FU & OX VLVs BECOMING STUCK IN THE OPEN POSITION.
NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 658

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18CR J2-87

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN CREW SWITCH AND GPC CLOSE COMMANDS. THE FAILURE CAN RESULT IN LOSS OF GPC OR CREW SWITCH TO OPERATE THE MANIFOLD 5 FU & OX ISOL VLVs. WORST CASE RESULTS IN MANIFOLD 5 FU & OX VLVs BECOMING STUCK IN THE OPEN POSITION.
NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 659

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18CR J2-87

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN CREW SWITCH AND GPC CLOSE COMMANDS. THE FAILURE CAN RESULT IN LOSS OF GPC OR CREW SWITCH TO OPERATE THE MANIFOLD 5 FU & OX ISOL VLVs. WORST CASE RESULTS IN MANIFOLD 5 FU & OX VLVs BECOMING STUCK IN THE OPEN POSITION.
NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 660

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 1, PCA 1
PART NUMBER: 81V76A22CR14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CREW SWITCH COMMAND SIGNAL TO OPEN MANIFOLD 5 FU & OX ISOL VLVs. VALVES CAN STILL BE OPENED USING GPC. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs FAILED CLOSED RESULTING IN LOSS OF VRCS CONTROL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 661

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 1, PCA 1
PART NUMBER: 81V76A22CR14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN MAIN BUSES WHEN THE GPC CMDS THE MANIFOLD 5 FU & OX ISOL VLVs OPEN. THE WORST CASE EFFECT IS LOSS OF THE GPC OR CREW SWITCH "OPEN" CMD. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN THE MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE CLOSE POSITION RESULTING IN LOSS OF VRCS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/19/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/2R
MDAC ID:	662	ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 1, PCA 1
PART NUMBER: 81V76A22CR38

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE GPC COMMAND SIGNAL TO OPEN MANIFOLD 5 FU & OX ISOL VLVs. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs FAILED CLOSED RESULTING IN LOSS OF VRCS CONTROL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 663

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION: F BAY 1, PCA 1
PART NUMBER: 81V76A22CR38

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ISOLATION BETWEEN MAIN BUSES WHEN THE CREW SWITCH CMDS THE MANIFOLD 5 FU & OX ISOL VLVs OPEN. THE WORST CASE EFFECT IS LOSS OF THE GPC OR CREW SWITCH "OPEN" CMD. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN THE MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE CLOSE POSITION RESULTING IN LOSS OF VRCS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 664

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS20
PART NUMBER: 33V73A8CR13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE MANIFOLD 5 FU & OX VLV POSITION (OPEN) TALKBACK TO GPC. VALVE POSITION TALKBACK NOT MISSION CRITICAL. THIS IS HARDWIRED TO CREW INDICATOR.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 665

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS20
PART NUMBER: 33V73A8CR13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 666

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS20
PART NUMBER: 33V73A8CR14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE MANIFOLD 5 FU & OX VLV POSITION (CLOSED) TALKBACK TO GPC. VALVE POSITION TALKBACK NOT MISSION CRITICAL. THIS IS HARDWIRED TO CREW INDICATOR.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 667

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DIODE
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DIODE
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 DS20
PART NUMBER: 33V73A8CR14

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 668

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111AR2 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 1 VALVES (OPEN POSITION). DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH WHEN THE VALVES ARE COMMANDED OPEN. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINUOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 669

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DRIVER, HYBRID
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111AR2 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE CONTROL FEEDBACK FROM MANIFOLD ISOL 1 VALVES (OPEN POSITION) CONTINUALLY HIGH CAUSING LOSS OF ALL VALVE OPEN COMMANDS. THE FINAL RESULT WOULD BE THE ISOL VALVES STUCK IN CLOSED POSITION. THE EFFECT, AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 670

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111AR1 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 1 VALVES (CLOSE POSITION). DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH WHEN THE VALVES ARE COMMANDED CLOSED. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINUOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 671

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111AR1 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE CONTROL FEEDBACK FROM MANIFOLD ISOL 1 VALVES (CLOSE POSITION) CONTINUALLY HIGH CAUSING LOSS OF ALL VALVE CLOSE COMMANDS. THE FINAL RESULT WOULD BE THE ISOL VALVES STUCK IN OPEN POSITION. NO MISSION EFFECT, VALVES ARE NORMALLOY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 1 FROM THE PROPELLANT TANKS, NO IMPACT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 672

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112AR1 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 2 VALVES (OPEN POSITION). DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH WHEN THE VALVES ARE COMMANDED OPEN. NO IMPACT ON MISSION. VALVE'S AC MOTOR CAN WITHSTAND CONTINUOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 673

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DRIVER, HYBRID
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112AR1 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE CONTROL FEEDBACK FROM MANIFOLD ISOL 2 VALVES (OPEN POSITION) CONTINUALLY HIGH CAUSING LOSS OF ALL VALVE OPEN COMMANDS. THE FINAL RESULT WOULD BE THE ISOL VALVES STUCK IN CLOSED POSITION. THE EFFECT, AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 674

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112AR2 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 2 VALVES (CLOSE POSITION). DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH WHEN THE VALVES ARE COMMANDED CLOSED. NO IMPACT ON MISSION. VALVE'S AC MOTOR CAN WITHSTAND CONTINUOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 675

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112AR2 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE CONTROL FEEDBACK FROM MANIFOLD ISOL 2 VALVES (CLOSE POSITION) CONTINUALLY HIGH CAUSING LOSS OF ALL VALVE CLOSE COMMANDS. THE FINAL RESULT WOULD BE THE ISOL VALVES STUCK IN OPEN POSITION. NO MISSION EFFECT, VALVES ARE NORMALLOY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 2 FROM THE PROPELLANT TANKS, NO IMPACT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 676

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR4 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 3 VALVES (OPEN POSITION). DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH WHEN THE VALVES ARE COMMANDED OPEN. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINUOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 677

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DRIVER, HYBRID
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR4 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE CONTROL FEEDBACK FROM MANIFOLD ISOL 3 VALVES (OPEN POSITION) CONTINUALLY HIGH CAUSING LOSS OF ALL VALVE OPEN COMMANDS. THE FINAL RESULT WOULD BE THE ISOL VALVES STUCK IN CLOSED POSITION. THE EFFECT, AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 678

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR3 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 3 VALVES (CLOSE POSITION). DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH WHEN THE VALVES ARE COMMANDED CLOSED. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINUOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 679

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR3 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE CONTROL FEEDBACK FROM MANIFOLD ISOL 3 VALVES (CLOSE POSITION) CONTINUALLY HIGH CAUSING LOSS OF ALL VALVE CLOSE COMMANDS. THE FINAL RESULT WOULD BE THE ISOL VALVES STUCK IN OPEN POSITION. NO MISSION EFFECT, VALVES ARE NORMALLOY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 3 FROM THE PROPELLANT TANKS, NO IMPACT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 680

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR6 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 4 VALVES (OPEN POSITION). DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH WHEN THE VALVES ARE COMMANDED OPEN. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINUOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 681

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DRIVER, HYBRID
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR6 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE CONTROL FEEDBACK FROM MANIFOLD ISOL 4 VALVES (OPEN POSITION) CONTINUALLY HIGH CAUSING LOSS OF ALL VALVE OPEN COMMANDS. THE FINAL RESULT WOULD BE THE ISOL VALVES STUCK IN CLOSED POSITION. THE EFFECT, AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS OR AN INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	682	ABORT:	3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR5 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 4 VALVES (CLOSE POSITION). DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH WHEN THE VALVES ARE COMMANDED CLOSED. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINUOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 683

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113AR5 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE CONTROL FEEDBACK FROM MANIFOLD ISOL 4 VALVES (CLOSE POSITION) CONTINUALLY HIGH CAUSING LOSS OF ALL VALVE CLOSE COMMANDS. THE FINAL RESULT WOULD BE THE ISOL VALVES STUCK IN OPEN POSITION. NO MISSION EFFECT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 1 FROM THE PROPELLANT TANKS, NO IMPACT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 684

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 2
PART NUMBER: 83V76A18AR J4-71 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND MANIFOLD 5 FU & OX ISOL VLVs CLOSE USING CREW SWITCH OR GPC. WORST CASE RESULTS IN MANIFOLD 5 FU & OX VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 685

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, LCA 2
PART NUMBER: 83V76A18AR J4-71 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CAPABILITY TO COMMAND MANIFOLD 5 FU & OX ISOL VLVs USING GPC. CREW SWITCH CAN STILL OPEN OR CLOSE VLVs. LOSS OF ALL REDUNDANCY (CREW SWITCH), WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE CLOSED POSITION RESULTING IN LOSS OF VRCS CONTROL, THEREFORE LOSS OF MISSION CAPABILITY.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 686

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/2R
ABORT:	3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18AR J4-51 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE GPC COMMAND SIGNAL TO OPEN MANIFOLD 5 FU & OX ISOL VLVs. VALVES CAN STILL BE OPENED USING CREW SWITCH. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs FAILED CLOSED RESULTING IN LOSS OF VRCS CONTROL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 687

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18AR J4-51 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 688

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A16AR J4-48 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CREW SWITCH COMMAND SIGNAL TO OPEN MANIFOLD 5 FU & OX ISOL VLVs. VALVES CAN STILL BE OPENED USING GPC. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs FAILED CLOSED RESULTING IN LOSS OF VRCS CONTROL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 689

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A16AR J4-48 TYPE I

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN THE MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 690

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 2
PART NUMBER: 83V76A18AR J4-53 TYPE II

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
DUAL EFFECT: FIRST, FALSE INDICATION OF MANIFOLD 5 FU & OX ISOL VLV MISMATCH (GPC HAS CORRECT POSITIONS); VALVE TALKBACK NOT MISSION CRITICAL. SECOND, LOSE CONTROL FEEDBACK TO REMOVE POWER FROM VLV ONCE IT HAS LATCHED: VALVE CAN WITHSTAND CONTINUOUS ENERGIZATION.

REFERENCES: VS70-943099 REV B EO B12; MC284-0420 REV C AMENDMENT SEQ. 8

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 691

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 2
PART NUMBER: 83V76A18AR J4-53 TYPE II

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
FAILURE RESULTS IN A FALSE CREW (BARBER POLE) INDICATION OF VLV CLOSURE AND A FALSE CONTROL FEEDBACK WHICH INHIBITS ALL GPC AND CREW SWITCH "CLOSE" COMMANDS. WORST CASE EFFECT WOULD BE THE MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANTS CAN BE ISOLATED FROM THRUSTER BY THE TK ISOL 3/4/5 VLVs.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/19/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	692	ABORT:	3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18AR J4-55 TYPE II

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
DUAL EFFECT: FIRST, FALSE INDICATION OF MANIFOLD 5 FU & OX ISOL VLV MISMATCH (GPC HAS CORRECT POSITIONS); VALVE TALKBACK NOT MISSION CRITICAL. SECOND, LOSE CONTROL FEEDBACK TO REMOVE POWER FROM VLV ONCE IT HAS LATCHED: VALVE CAN WITHSTAND CONTINUOUS ENERGIZATION.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 693

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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:	2/2	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18AR J4-55 TYPE II

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
FAILURE RESULTS IN A FALSE CREW (BARBER POLE) INDICATION OF VLV OPENING AND A FALSE CONTROL FEEDBACK WHICH INHIBITS ALL GPC AND CREW SWITCH "OPEN" COMMANDS. WORST CASE EFFECT WOULD BE THE MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE CLOSE POSITION RESULTING IN LOSS OF MISSION DUE TO LOSS OF VRCS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 694

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18AR J5-K TYPE III

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND MANIFOLD 5 FU & OX ISOL VLVs CLOSE USING CREW SWITCH OR GPC. WORST CASE RESULTS IN MANIFOLD 5 FU & OX VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 695

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: DRIVER, HYBRID
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) DRIVER, HYBRID
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18AR J5-K TYPE III

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CAPABILITY TO INHIBIT THE MANIFOLD 5 FU & OX ISOL VLV "CLOSE" CMD. THE INHIBIT FUNCTION IS USED FOR POWER SAVINGS AND IN CASE OF A GPC OR SWITCH FAILURE. NO EFFECT ON MISSION.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 696

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: FUSE,1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) FUSE,1A
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PNL O8 S30
PART NUMBER: 33V73A8F10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN OR CLOSE FU & OX MANIFOLD ISOL 1 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 1 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 697

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: FUSE,1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) FUSE,1A
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PNL O8 S31
PART NUMBER: 33V73A8F27

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN OR CLOSE FU & OX MANIFOLD ISOL 2 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 2 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 698

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: FUSE,1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) FUSE,1A
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PNL O8 S32
PART NUMBER: 33V73A8F38

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN OR CLOSE FU & OX MANIFOLD ISOL 3 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 3 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 699

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: 2/1R

ITEM: FUSE,1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) FUSE,1A
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/1R
ONORBIT:	3/2R	AOA:	3/1R
DEORBIT:	3/1R	ATO:	3/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PNL O8 S33
PART NUMBER: 33V73A8F43

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN OR CLOSE FU & OX MANIFOLD ISOL 4 VALVE USING CREW SWITCH. GPC COMMANDS ARE STILL AVAILABLE FOR VALVE OPERATION. LOSS OF ALL REDUNDANCY RESULTS IN MANIFOLD ISOL 4 VALVE FAILING CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 700

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: FUSE,1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) FUSE,1A
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S34
PART NUMBER: 33V73A8F39

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO COMMAND MANIFOLD 5 FU & OX ISOL VLVs CLOSE USING CREW SWITCH. GPC CAN STILL OPEN OR CLOSE VLVs. WORST CASE RESULTS IN MANIFOLD 5 FU & OX VLVs BECOMING STUCK IN THE OPEN POSITION. NO MISSION EFFECT, PROPELLANT CAN BE ISOLATED FROM THRUSTERS BY THE TK ISOL 3/4/5 VLVs. VERNIER THRUSTERS ARE NOT USED DURING ENTRY OR ABORTS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 701

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/2R
ABORT:	3/3

ITEM: FUSE,1A
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) FUSE,1A
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:	3/2R	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: PNL O8 S34
PART NUMBER: 33V73A8F44

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE ALL BUT ONE COMMAND (A GPC OPEN CMD) TO OPERATE MANIFOLD 5 FU & OX ISOL VLVs. LOSS OF ALL REDUNDANCY, WORST CASE, RESULTS IN MANIFOLD 5 FU & OX ISOL VLVs BECOMING STUCK IN THE CLOSED POSITION. THE EFFECT IS LOSS OF MISSION DUE TO LOSS OF VRCS.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 702

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RELAY
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 1 VALVES. THE FAILURE CAN RESULT IN THE ISOL VALVES BECOMING STUCK IN THE CLOSE POSITION. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR INABILITY TO COMPLETE FULL MISSION REQUIREMENTS ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 703

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN FU & OX MANIFOLD ISOL 1 VALVES BECOMING STUCK IN THE OPEN POSITION. NO MISSION IMPACT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 2 FROM PROPELLANT TANKS, NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 704

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K2

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN FU & OX MANIFOLD ISOL 1 VALVES BECOMING STUCK IN THE OPEN POSITION. NO MISSION IMPACT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 2 FROM PROPELLANT TANKS, NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 705

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RELAY
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111K2

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
FIRST FAILURE CAUSES FU & OX MANIFOLD ISOL 1 VALVES TO BE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 706

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	2/1R
ABORT:	1/1

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RELAY
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112K1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 2 VALVES. THE FAILURE CAN RESULT IN THE ISOL VALVES BECOMING STUCK IN THE CLOSE POSITION. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR INABILITY TO COMPLETE FULL MISSION REQUIREMENTS ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 707

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112K1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN FU & OX MANIFOLD ISOL 2 VALVES BECOMING STUCK IN THE OPEN POSITION. NO MISSION IMPACT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 2 FROM PROPELLANT TANKS, NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	708	ABORT:	3/3

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112K2

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN FU & OX MANIFOLD ISOL 2 VALVES BECOMING STUCK IN THE OPEN POSITION. NO MISSION IMPACT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 2 FROM PROPELLANT TANKS, NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 709

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RELAY
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112K2

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
FIRST FAILURE CAUSES FU & OX MANIFOLD ISOL 2 VALVES TO BE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 710

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RELAY
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2]   B [P]   C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K7

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 3 VALVES. THE FAILURE CAN RESULT IN THE ISOL VALVES BECOMING STUCK IN THE CLOSE POSITION. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR INABILITY TO PERFORM FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 711

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K7

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN FU & OX MANIFOLD ISOL 3 VALVES BECOMING STUCK IN THE OPEN POSITION. NO MISSION IMPACT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 4 FROM PROPELLANT TANKS, NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	712	ABORT:	3/3

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K8

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN FU & OX MANIFOLD ISOL 3 VALVES BECOMING STUCK IN THE OPEN POSITION. NO MISSION IMPACT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 4 FROM PROPELLANT TANKS, NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 713

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RELAY
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K8

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
FIRST FAILURE CAUSES FU & OX MANIFOLD ISOL 3 VALVES TO BE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 714

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RELAY
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K9

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE ABILITY TO OPEN FU & OX MANIFOLD ISOL 4 VALVES. THE FAILURE CAN RESULT IN THE ISOL VALVES BECOMING STUCK IN THE CLOSE POSITION. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR INABILITY TO COMPLETE FULL MISSION REQUIREMENTS ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 715

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K9

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN FU & OX MANIFOLD ISOL 4 VALVES BECOMING STUCK IN THE OPEN POSITION. NO MISSION IMPACT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 1 FROM PROPELLANT TANKS, NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 716

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RELAY
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RELAY
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K10

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
THE FAILURE RESULTS IN FU & OX MANIFOLD ISOL 4 VALVES BECOMING STUCK IN THE OPEN POSITION. NO MISSION IMPACT, VALVES ARE NORMALLY OPEN. LOSS OF ALL REDUNDANCY RESULTS IN AN INABILITY TO ISOLATE MANIFOLD 1 FROM PROPELLANT TANKS, NO EFFECT ON MISSION.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 717

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: 1/1

ITEM: RELAY
FAILURE MODE: FAILS HIGH

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RELAY
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	1/1
LIFTOFF:	3/3	TAL:	2/1R
ONORBIT:	3/2R	AOA:	2/1R
DEORBIT:	2/1R	ATO:	2/1R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113K10

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
FIRST FAILURE CAUSES FU & OX MANIFOLD ISOL 4 VALVES TO BE FAILED CLOSED. THE EFFECT WOULD BE AN INABILITY TO COMPLETE TIME CRITICAL PROPELLANT DUMPS DURING RTLS (LOSS OF VEHICLE/LIFE) OR AN INABILITY TO COMPLETE FULL MISSION OBJECTIVES ON ORBIT.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 718

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 1 VALVES. DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION, AND SECOND, THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 719

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	720	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FWD RCS MANIFOLD ISOL 1 SWITCH TALKBACK (CLOSE POSITION) TO GPC. SWITCH POSITION CAN BE INDIRECTLY DETERMINED BY MONITORING VALVE POSITION TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 721

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R13

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 722

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R12

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FWD RCS MANIFOLD ISOL 1 SWITCH TALKBACK (OPEN POSITION) TO GPC. SWITCH POSITION CAN BE INDIRECTLY DETERMINED BY MONITORING VALVE POSITION TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 723

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R12

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 724

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R17

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FU MANIFOLD 1 ISOL VALVE POSITION TALKBACKS (CLOSE POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT, VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 725

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R17

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 726

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R26

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FU MANIFOLD 1 ISOL VALVE POSITION TALKBACKS (OPEN POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 727

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R26

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY		HDW/FUNC
SUBSYSTEM:	FRCS		FLIGHT:	3/3
MDAC ID:	728		ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R27

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE OX MANIFOLD 1 ISOL VALVE POSITION TALKBACKS (OPEN POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 729

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R27

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 730

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R25

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE OX MANIFOLD 1 ISOL VALVE POSITION TALKBACKS (CLOSE POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 731

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, MCA 1
PART NUMBER: 81V76A111A1R25

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 732

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 2 VALVES. DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION AND SECOND THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH. NO IMPACT ON MISSION. VALVE'S AC MOTOR CAN WITHSTAND CONTINOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 733

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R1

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 734

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FWD RCS MANIFOLD ISOL 2 SWITCH TALKBACK (CLOSE POSITION) TO GPC. SWITCH POSITION CAN BE INDIRECTLY DETERMINED BY MONITORING VALVE POSITION TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 735

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R8

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 736

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R9

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FWD RCS MANIFOLD ISOL 2 SWITCH TALKBACK (OPEN POSITION) TO GPC. SWITCH POSITION CAN BE INDIRECTLY DETERMINED BY MONITORING VALVE POSITION TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 737

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R9

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	738	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FU MANIFOLD 2 ISOL VALVE POSITION TALKBACKS (CLOSE POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 739

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R10

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 740

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FU MANIFOLD 2 ISOL VALVE POSITION TALKBACKS (OPEN POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 741

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R24

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 742

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R25

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE OX MANIFOLD 2 ISOL VALVE POSITION TALKBACKS (OPEN POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 743

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R25

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 744

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE OX MANIFOLD 2 ISOL VALVE POSITION TALKBACKS (CLOSE POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	745	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 2, MCA 2
PART NUMBER: 82V76A112A1R11

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 746

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3,
PART NUMBER: 83V76A113A1R1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 3 VALVES. DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION, AND SECOND, THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 747

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3,
PART NUMBER: 83V76A113A1R1

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 748

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R16

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE FWD RCS MANIFOLD ISOL 3 SWITCH TALKBACK (CLOSE POSITION) TO GPC. SWITCH POSITION CAN BE IN DIRECTLY DETERMINED BY MONITORING VALVE POSITION TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 749

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R16

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 750

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R19

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE FWD RCS MANIFOLD ISOL 3 SWITCH TALKBACK (OPEN POSITION) TO GPC. SWITCH POSITION CAN BE INDIRECTLY DETERMINED BY MONITORING VALVE POSITION TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 751

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R19

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 752

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R22

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE FU MANIFOLD 3 ISOL VALVE POSITION TALKBACKS (CLOSE POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 753

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R22

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 754

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R23

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE FU MANIFOLD 3 ISOL VALVE POSITION TALKBACKS (OPEN POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 755

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R23

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 756

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R31

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE OX MANIFOLD 3 ISOL VALVE POSITION TALKBACKS (OPEN POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 757

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R31

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 758

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R30

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE OX MANIFOLD 3 ISOL VALVE POSITION TALKBACKS (CLOSE POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 759

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R30

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 760

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE CONTROL FEEDBACK FROM THE FU & OX MANIFOLD ISOL 4 VALVES. DUAL EFFECT: FIRST THE RELAY WILL NOT AUTOMATICALLY BE DE-ENERGIZED ONCE THE VALVES REACH THEIR COMMANDED POSITION, AND SECOND, THE CREW INDICATOR WILL FALSELY INDICATE A VALVE MISMATCH. NO IMPACT ON MISSION, VALVE'S AC MOTOR CAN WITHSTAND CONTINOUS POWER AND VALVE TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 761

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R4

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 762

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R17

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE FWD RCS MANIFOLD ISOL 4 SWITCH TALKBACK (CLOSE POSITION) TO GPC. SWITCH POSITION CAN BE IN DIRECTLY DETERMINED BY MONITORING VALVE POSITION TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 763

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R17

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 764

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R29

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE FWD RCS MANIFOLD ISOL 4 SWITCH TALKBACK (OPEN POSITION) TO GPC. SWITCH POSITION CAN BE INDIRECTLY DETERMINED BY MONITORING VALVE POSITION TALKBACKS.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 765

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R29

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 766

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R6

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE FU MANIFOLD 1 ISOL VALVE POSITION TALKBACKS (CLOSE POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 767

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R6

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/26/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	768	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R24

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE FU MANIFOLD 1 ISOL VALVE POSITION TALKBACKS (OPEN POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 769

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R24

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 770

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE OX MANIFOLD 1 ISOL VALVE POSITION TALKBACKS (OPEN POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 771

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R32

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 772

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R7

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
LOSE OX MANIFOLD 4 ISOL VALVE POSITION TALKBACKS (CLOSE POSITION) TO GPC. CREW POSITION INDICATOR WILL SUPPLY CORRECT VALVE POSITION. LOSS OF ALL REDUNDANCY IS LOSS OF ALL TALKBACKS. NO IMPACT VALVE POSITION TALKBACKS ARE NOT MISSION CRITICAL.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/26/87
SUBSYSTEM: FRCS
MDAC ID: 773

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 4, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3
PART NUMBER: 83V76A113A1R7

CAUSES: CONTAMINATION, VIBRATION, PIECE PART FAILURE, OVERLOAD

EFFECTS/RATIONALE:
NONE, VALVE POSITION TALKBACK STILL AVAILABLE TO GPC & CREW.

REFERENCES: VS70-942099 REV D EO D01

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 774

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-94 TO J2-87 (A)

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FRCS MANIFOLD 5 ISOL SWITCH POSITION TALKBACK TO GPC. NO IMPACT SWITCH TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 775

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-94 TO J2-87 (A)

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 776

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-94 TO J2-87 (A)

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 777

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-94 TO GND (B)

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FRCS MANIFOLD 5 ISOL SWITCH POSITION TALKBACK TO GPC. NO IMPACT SWITCH TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/19/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	778	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1
PART NUMBER: 81V76A16R J1-82

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE FRCS MANIFOLD 5 ISOL SWITCH POSITION TALKBACK TO GPC. NO IMPACT SWITCH TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 779

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER
SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 1, LCA 1
PART NUMBER: 81V76A16R J1-82

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/19/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/3
MDAC ID:	780	ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-88

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE MANIFOLD 5 FU VLV POSITION TALKBACK TO GPC. VALVE POSITION TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 781

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-88

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 782

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-90

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE MANIFOLD 5 FU VLV POSITION TALKBACK TO GPC. VALVE POSITION TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 783

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-90

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 784

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-91

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE MANIFOLD 5 OX VLV POSITION TALKBACK TO GPC. VALVE POSITION TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 785

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-91

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 786

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-89

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
LOSE MANIFOLD 5 OX VLV POSITION TALKBACK TO GPC. VALVE POSITION TALKBACK NOT MISSION CRITICAL.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 787

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 5.1K 1/4W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 5.1K 1/4W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, LCA 3
PART NUMBER: 83V76A18R J1-89

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 788

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS OPEN

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3,
PART NUMBER: 83V76A18R J2-83, 104

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
DUAL EFFECT: FIRST, FALSE INDICATION; CREW HARDWIRED TALKBACK WILL INDICATE MANIFOLD 5 FU & OX ISOL VLV MISMATCH AND GPC WILL INDICATE BOTH VLVs STUCK PARTIALLY OPEN/PARTIALLY CLOSED; TALKBACKS ARE NOT MISSION CRITICAL. SECOND, LOSE CONTROL FEEDBACK TO REMOVE POWER FROM VALVE ONCE IT HAS LATCHED; VALVE CAN WITHSTAND CONTINUOUS POWER APPLICATION.

REFERENCES: VS70-943099 REV B EO B12; MC284-0420 REV C AMENDMENT SEQ. 8

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/19/87
SUBSYSTEM: FRCS
MDAC ID: 789

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: RESISTOR, 1.2K 2W
FAILURE MODE: FAILS SHORT

LEAD ANALYST: V.J. BURKEMPER   SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 5, OX & FU ISOL VLVS
5) RESISTOR, 1.2K 2W
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 [ ] B [ ] C [ ]

LOCATION: F BAY 3A, MCA 3,
PART NUMBER: 83V76A18R J2-83, 104

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, SWITCH TALKBACK STILL AVAILABLE TO HYBRID DRIVER LOGIC CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 790

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE OPEN POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM CLOSE COMMANDS. IF THE SWITCH FAILS IN THE OPEN POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY SWITCH OR MDM COMMAND. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE OPEN CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/13/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/2R
MDAC ID:	791	ABORT:	2/1R

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE CLOSED POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	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: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE SWITCH FAILS IN THE CLOSED POSITION, THE VALVE WILL CLOSE AND CANNOT BE OPENED BY SWITCH OR MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE SWITCH'S CLOSE CONTACTS AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF THE MDM COMMAND PATH WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/13/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/2R
MDAC ID:	792	ABORT:	2/1R

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE GPC POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	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: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
VALVE CAN NOT BE CONTROLLED BY SWITCH, ONLY BY MDM OPEN OR CLOSE COMMANDS. TO OPERATE THE VALVE, THE CREW MUST USE THE GPC READ/WRITE PROCEDURES. FAILURE OF THE MDM COMMAND PATH WHILE THE VALVE IS IN THE CLOSED POSITION WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTH DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 793

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 2/1R

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/2R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE OPEN CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CANNOT BE OPENED BY SWITCH COMMAND, ONLY BY MDM COMMAND, AND CAN CLOSED BY THE SWITCH OR THE MDM. FAILURE OF THE MDM COMMAND PATH WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 794

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM CLOSE COMMANDS. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN OR GPC POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY SWITCH OR MDM COMMAND. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE CLOSED POSITION, THE VALVE WILL REMAIN CLOSED AND CAN BE OPENED WITH THE SWITCH, BUT CANNOT BE CLOSED AGAIN BY SWITCH OR MDM COMMAND. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CONTACTS, AND THEN USE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 795

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 796

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 797

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH CLOSE CONTACTS 5, 6
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM CLOSE COMMANDS. IF THE CLOSE CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE OPENED BY SWITCH OR MDM COMMAND, BUT CANNOT BE CLOSED BY SWITCH COMMAND, ONLY BY MDM COMMAND. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 798

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 2/1R

ITEM: MANIFOLD 1, OX & FU ISOL VLV SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 1, OX & FU ISOL VLVS
5) MANIFOLD 1, OX & FU ISOL VLV SWITCH CLOSE CONTACTS 5, 6
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/2R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S30
PART NUMBER: 33V73A8S30

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE CLOSED OR GPC POSITION, THE VALVE WILL CLOSE AND CANNOT BE OPENED BY SWITCH OR MDM COMMAND. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN POSITION, THE VALVE WILL REMAIN OPEN AND CAN BE CLOSED WITH THE SWITCH, BUT CANNOT BE OPENED AGAIN BY SWITCH OR MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CLOSE CONTACTS, AND THEN USE GPC READ/WRITE PROCEDURES. FAILURE OF THE MDM COMMAND PATH WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 799

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE OPEN POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM CLOSE COMMANDS. IF THE SWITCH FAILS IN THE OPEN POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY SWITCH OR MDM COMMAND. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE OPEN CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 800

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 2/1R

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE CLOSED POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	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: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE SWITCH FAILS IN THE CLOSED POSITION, THE VALVE WILL CLOSE AND CANNOT BE OPENED BY SWITCH OR MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE SWITCH'S CLOSE CONTACTS AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF THE MDM COMMAND PATH WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 801

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 2/1R

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE GPC POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	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: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
VALVE CAN NOT BE CONTROLLED BY SWITCH, ONLY BY MDM OPEN OR CLOSE COMMANDS. TO OPERATE THE VALVE, THE CREW MUST USE THE GPC READ/WRITE PROCEDURES. FAILURE OF THE MDM COMMAND PATH WHILE THE VALVE IS IN THE CLOSED POSITION WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTH DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 802

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/2R
ABORT:	2/1R

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/2R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE OPEN CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CANNOT BE OPENED BY SWITCH COMMAND, ONLY BY MDM COMMAND, AND CAN CLOSED BY THE SWITCH OR THE MDM. FAILURE OF THE MDM COMMAND PATH WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 803

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM CLOSE COMMANDS. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN OR GPC POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY SWITCH OR MDM COMMAND. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE CLOSED POSITION, THE VALVE WILL REMAIN CLOSED AND CAN BE OPENED WITH THE SWITCH, BUT CANNOT BE CLOSED AGAIN BY SWITCH OR MDM COMMAND. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CONTACTS, AND THEN USE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 804

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 805

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 806

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH CLOSE CONTACTS 5, 6
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM CLOSE COMMANDS. IF THE CLOSE CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CAN BE OPENED BY SWITCH OR MDM COMMAND, BUT CANNOT BE CLOSED BY SWITCH COMMAND, ONLY BY MDM COMMAND. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:	1/13/87	HIGHEST CRITICALITY	HDW/FUNC
SUBSYSTEM:	FRCS	FLIGHT:	3/2R
MDAC ID:	807	ABORT:	2/1R

ITEM: MANIFOLD 2, OX & FU ISOL VLV SWITCH CLOSE CONTACTS 5, 6
FAILURE MODE: SWITCH CLOSE CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 2, OX & FU ISOL VLVS
5) MANIFOLD 2, OX & FU ISOL VLV SWITCH CLOSE CONTACTS 5, 6
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/2R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S31
PART NUMBER: 33V73A8S31

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE CLOSED OR GPC POSITION, THE VALVE WILL CLOSE AND CANNOT BE OPENED BY SWITCH OR MDM COMMAND. IF THE CLOSE CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN POSITION, THE VALVE WILL REMAIN OPEN AND CAN BE CLOSED WITH THE SWITCH, BUT CANNOT BE OPENED AGAIN BY SWITCH OR MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CLOSE CONTACTS, AND THEN USE GPC READ/WRITE PROCEDURES. FAILURE OF THE MDM COMMAND PATH WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 808

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: MANIFOLD 3, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE OPEN POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) MANIFOLD 3, OX & FU ISOL VLV SWITCH
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S32
PART NUMBER: 33V73A8S32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM CLOSE COMMANDS. IF THE SWITCH FAILS IN THE OPEN POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY SWITCH OR MDM COMMAND. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE OPEN CONTACTS, AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 809

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 2/1R

ITEM: MANIFOLD 3, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE CLOSED POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) MANIFOLD 3, OX & FU ISOL VLV SWITCH
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	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: PNL O8 S32
PART NUMBER: 33V73A8S32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE SWITCH FAILS IN THE CLOSED POSITION, THE VALVE WILL CLOSE AND CANNOT BE OPENED BY SWITCH OR MDM COMMAND. TO OPEN THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE SWITCH'S CLOSE CONTACTS AND THEN USE THE GPC READ/WRITE PROCEDURES. FAILURE OF THE MDM COMMAND PATH WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 810

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/2R
ABORT:	2/1R

ITEM: MANIFOLD 3, OX & FU ISOL VLV SWITCH
FAILURE MODE: SWITCH FAILS IN THE GPC POSITION

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) MANIFOLD 3, OX & FU ISOL VLV SWITCH
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	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: PNL O8 S32
PART NUMBER: 33V73A8S32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
VALVE CAN NOT BE CONTROLLED BY SWITCH, ONLY BY MDM OPEN OR CLOSE COMMANDS. TO OPERATE THE VALVE, THE CREW MUST USE THE GPC READ/WRITE PROCEDURES. FAILURE OF THE MDM COMMAND PATH WHILE THE VALVE IS IN THE CLOSED POSITION WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTH DURING ABORTS AND ENTRY, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 811

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: 2/1R

ITEM: MANIFOLD 3, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) MANIFOLD 3, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	2/1R
LIFTOFF:	3/3	TAL:	3/2R
ONORBIT:	3/2R	AOA:	3/2R
DEORBIT:	3/2R	ATO:	3/2R
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION: PNL O8 S32
PART NUMBER: 33V73A8S32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY THE MDM OPEN COMMANDS. IF THE OPEN CONTACTS FAIL OPEN WHILE THE SWITCH IS IN ANY POSITION, THE VALVE WILL REMAIN IN THAT POSITION, CANNOT BE OPENED BY SWITCH COMMAND, ONLY BY MDM COMMAND, AND CAN CLOSED BY THE SWITCH OR THE MDM. FAILURE OF THE MDM COMMAND PATH WILL AFFECT ONORBIT OPERATIONS, PROPELLANT DUMP LENGTHS DURING ABORTS, AND MAY CAUSE THE INABILITY TO EXPEL ENOUGH PROPELLANTS DURING RTLS ABORTS TO MEET THE CG SAFETY BOUNDARIES.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 812

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: MANIFOLD 3, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
FAILURE MODE: SWITCH OPEN CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) MANIFOLD 3, OX & FU ISOL VLV SWITCH OPEN CONTACTS 1, 2
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 [ ] B [ ] C [ ]

LOCATION: PNL O8 S32
PART NUMBER: 33V73A8S32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
REDUNDANCY PROVIDED BY MDM CLOSE COMMANDS. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE OPEN OR GPC POSITION, THE VALVE WILL OPEN AND CANNOT BE CLOSED BY SWITCH OR MDM COMMAND. IF THE OPEN CONTACTS FAIL CLOSED WHILE THE SWITCH IS IN THE CLOSED POSITION, THE VALVE WILL REMAIN CLOSED AND CAN BE OPENED WITH THE SWITCH, BUT CANNOT BE CLOSED AGAIN BY SWITCH OR MDM COMMAND. TO CLOSE THE VALVE, THE CREW MUST REMOVE CONTROL BUS POWER FROM THE CONTACTS, AND THEN USE GPC READ/WRITE PROCEDURES. FAILURE OF ALL REDUNDANCY WILL CAUSE THE INABILITY TO CLOSE THE VALVE.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 813

HIGHEST CRITICALITY	HDW/FUNC
FLIGHT:	3/3
ABORT:	3/3

ITEM: MANIFOLD 3, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL OPEN

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) MANIFOLD 3, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S32
PART NUMBER: 33V73A8S32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 1/13/87
SUBSYSTEM: FRCS
MDAC ID: 814

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: 3/3

ITEM: MANIFOLD 3, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
FAILURE MODE: SWITCH GPC CONTACTS FAIL CLOSED

LEAD ANALYST: V.J. BURKEMPER SUBSYS LEAD: D.J. PAUL

BREAKDOWN HIERARCHY:
1) ELECTRICAL COMPONENTS
2) CONTROLS
3) PROP STOR & DIST SUBSYSTEM
4) MANIFOLD 3, OX & FU ISOL VLVS
5) MANIFOLD 3, OX & FU ISOL VLV SWITCH GPC CONTACTS 3, 4
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC	ABORT	HDW/FUNC
PRELAUNCH:	3/3	RTLS:	3/3
LIFTOFF:	3/3	TAL:	3/3
ONORBIT:	3/3	AOA:	3/3
DEORBIT:	3/3	ATO:	3/3
LANDING/SAFING:	3/3		

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PNL O8 S32
PART NUMBER: 33V73A8S32

CAUSES: CONTAMINATION, VIBRATION, MECHANICAL SHOCK, THERMAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
NONE, THESE CONTACTS ARE NOT IN A CIRCUIT.

REFERENCES: VS70-943099 REV B EO B12, CE, DE

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